

Better Water LLC

2020 RO

Operator Manual



rev. May 2020

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**Visit our website to see our complete product line of
water purification products!**

www.betterwater.com

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 (purchase orders)	Fax (615) 355-6065
	Email orders@betterwater.com
	Phone (615) 355-6063
Customer Service (returns)	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 **2020 RO** is manufactured to the utmost quality. With proper care, preventative maintenance, and proper use, it should provide you with a very effective means of treating water for dialysis treatments.

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 **2020 RO**.

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)


The RO cannot do the job alone. It is important to understand and monitor the changing tap water conditions, which include contaminants, temperature, pH, pressure and flow-rates, which have a direct impact on the quality and quantity of the RO's output. This RO was designed to your specifications and requirements. Since municipal water conditions are constantly changing, good two-way communications with your municipal water supplier coupled with routine testing of the tap water is vital to the safe and effective operation of this device.

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 and Service Manuals. 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, Features, and Requirements
- Maintenance Schedule
- Related Consumable and Replacement Parts

SPECIFICATIONS	
Operating Weight	450-600 lbs
Dimensions	Height 77" x Length 36" x Width 30"
Electrical	24 vac Control Voltage 208V Models: 3 phase, 30 amp, 60 Hz (3 hots, 1 neutral, 1 ground) 230V Models: 1 phase, 50 amp, 60 Hz (2 hots, 1 neutral, 1 ground) 460V Models: 3 phase, 15 amp, 60 Hz (3 hots, 1 neutral, 1 ground)
FEATURES	
Sample Port	Product sample port, sanitary, stainless-steel, post .03 filter
Standard Alarms	Poor Water Quality Alarm High Feed Temperature Alarm Low Pressure Alarm High Pump Pressure Alarm High Membrane Pressure Alarm High Product Pressure Alarm
Optional External Accessories	Remote Alarm Box, Disinfect Tank
REQUIREMENTS	
Floor Space	Level floor with sufficient space around the device for installation, operation, and service.
Electrical	Power outlet near the center of the device per specifications above.
Inlet Water Connection	Pre-treated water. Connection: 1", 90°, Hose-barb
Product Water Connection	Connection: 3/4", male, threaded
Drain	Sanitary drain capable of discharging 20 gallons per minute. Must be an open drain (<i>air-gapped</i>) Primary Drain Connection: 3/4", female, threaded Sample Port Drain Connection: 3/4", male, threaded
Loop	The distribution loop should be constructed of materials that comply with current AAMI standards. It is critical for direct-feed systems, that the distribution loop be properly sized, so assistance should be sought from Better Water or an authorized dealer when determining its size and length. Installation should also comply with current AAMI standards.
Pressure	Feed water pressure should be a minimum of 20 psi, a maximum of 90 psi, with the optimum pressure at 40 psi. The minimum pressure must be maintained with the water flowing at the maximum required flow-rate.
Flow Rate	The minimum flow-rate in gallons per minute is based on the incoming pre-treatment equipment.
Chlorine / Chloramines	Chlorine is commonly used as a disinfecting agent in municipal water systems. Disinfection by-products can form when disinfectants, such as chlorine, react with naturally present compounds in the water. Chlorine/Chloramines in the feed water must be less than 0.1 ppm.
Silt Density Index (SDI)	Silt Density Index (SDI) is a measure of the amount of suspended solids and colloidal materials in the feed water. High SDI values can lead to membrane fouling. A SDI of less than 3 SDI units is considered acceptable.

Turbidity	Turbidity in water is caused by suspended and colloidal matter such as clay, silt, finely divided organic matter, inorganic matter, plankton, and other microscopic organisms. Feed water turbidity must be less than 1 nephelometric turbidity units.
Hardness	Hardness is characteristic of feed water due to the presence of dissolved calcium and magnesium. Water hardness is responsible for most scale formation and can form insoluble residue in pipes and other water contact surfaces. Hardness is usually expressed in grains per gallon, or parts per million, all as calcium carbonate equivalent. Hardness level in the feed water must be less than 3 grains per gallon, or 51.3 parts per million.
Temperature	Feed water temperature must be between 50° F and 92° F. The optimum temperature is 77° F. The maximum temperature is factory set at 92°F, so the RO will shut-down at 93°F. This setting can be adjusted if necessary.

The importance of monitoring and controlling the feed water cannot be underestimated

MEMBRANE ARRAY FLOW RATE SPECIFICATIONS

The flow rates for the arrays listed below are rated at 77°F feed water, ± 20% and at 50% recovery.

2020 RO Series	Product Flow	Reject Flow	Re-Circulate Flow
2 Membrane Array	2.50 GPM	2.50 GPM	3.5 GPM
3 Membrane Array	3.75 GPM	3.75 GPM	3.5 GPM

MAINTENANCE SCHEDULE							
MAINTENANCE TASKS	Each Shift	Daily	Weekly	Monthly	3 Months	6 Months	Other
Check the system for leaks	X	X					Visual inspection
Monitor the system for unusual sounds	X	X					Auditory inspection
Clean external surfaces; - Use a soft damp cloth. Do not use bleach.			X				Use a soft, damp towel or sponge. DO NOT USE BLEACH.
Perform a low pH cleaning and disinfection. - See "General Cleaning and Disinfecting Information" section				X			
Perform a low pH cleaning, high pH cleaning, and disinfection. - See "General Cleaning and Disinfecting Information" section					X		
Verify Water Quality Monitor Board, calibrating if necessary - See "System Maintenance" section				X			
Verify Flush Timer day and time setting - See "System Maintenance" section				X	X		
Change 5 micron Pre-Filter - See "System Maintenance" section				X			Change every 30 days or when the ΔP reaches or exceeds 15 psi.
Change .03 micron Final Filter - See "System Maintenance" section						X	Change every 6 months or when the ΔP reaches or exceeds 15 psi.
Change Membranes - See "System Maintenance" section							Every 3-5 years, or when low flow rates are experienced, or percent rejection drops below operational parameters.
Perform chemical, microbial, and endotoxin testing on feed and product water as per AAMI requirements. Submit to a qualified testing laboratory.							Annually, or more often as needed.



NOTE

The maintenance schedule is merely a recommendation by Better Water, but it is up to the discretion of the Medical Director of the facility as to when they are performed, which may be more often or less often at their discretion as circumstances and company policy dictate.

RELATED CONSUMABLE and REPLACEMENT PARTS		
DESCRIPTION	PART#	PICTURE
REPLACEMENT PARTS		
4" x 40" Membrane only for current Fiberglass Housings - Inner O-Ring EQFHOO00911 - Outer O-Ring EQFHOO01587	SUMEM008	
4" x 40" Membrane with Adapters for Stainless Steel Housings (<i>manufactured prior to September 2006</i>) - Inner O-Ring EQFHOO01588 - Outer O-Ring EQFHOO01587	EQSUBMEM001	
4" x 40" Membrane with Adapters for Codeline Housings (<i>manufactured prior to September 2006</i>) - Inner O-Ring EQFHOO01891 - Outer O-Ring EQFHOO01587	EQSUBMEM002	
10", 5 micron, Pre-Filter - Housing O-Ring SUMIOO00587	SUCAOO00551	
10", .03 micron, Final-Filter - Housing O-Ring SUMIOO00589 - 10" Standard False Cartridge SUFFOO00581	SUCAPE00574	
BWI-1000, Acid Cleaner, low pH cleaner	SUMCOO00572	
BWI-2000, Alkaline Cleaner, high pH cleaner	SUMCOO00571	
MinnCare Cold Sterilant, Disinfectant	SUMCOO00575	
<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
MinnCare 1% Test Strips	SUMCOO00577	
MinnCare Residual Test Strips	SUMCOO00576	
BWI-3000, MemStore, Preservative	SUMCOO00574	
Clean/Disinfect Tank - Includes hoses and connections	EQASSYDISTANK	
RO Pump, Air-Cooled - 2 HP	EQPUGRCRN3-12-1 1 phase EQPUGRCRN3-12-3 3 phase	
Remote Alarm Box	EQASSYNSMB01601	
24V Digital Flush Timer <i>* Note older model 2020 ROs used an analog flush timer and that part number is ELPWSW00989</i>	ELPWSW00991	
RO Monitor PCB	EQMOBO01351	

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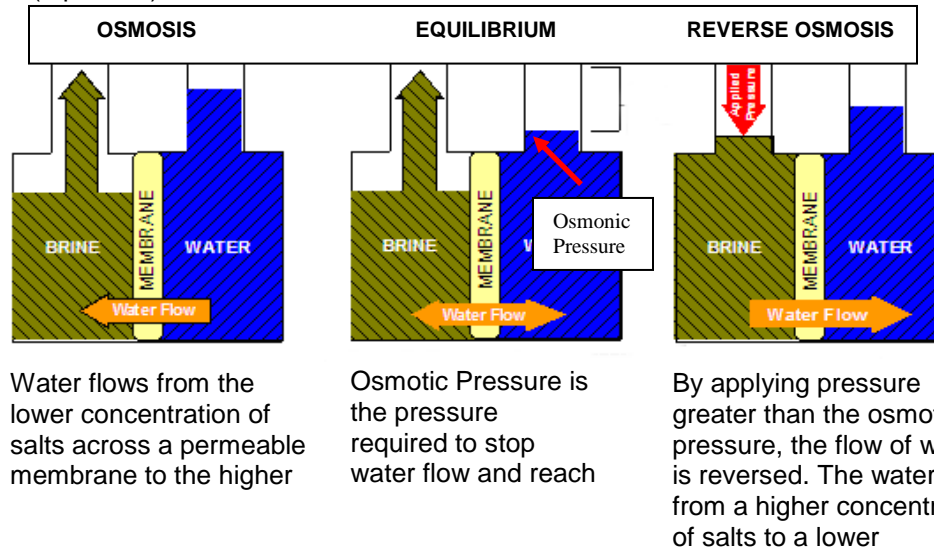
RELATED CONSUMABLE and REPLACEMENT PARTS		
DESCRIPTION	PART#	PICTURE
RO Display Board	EQMOBO01352	
Conductivity Probe	EQSUBCP01545	

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

DEVICE INFORMATION

REVERSE OSMOSIS PROCESS

The Reverse Osmosis (RO) Machine is a multiple-membrane, device that is pressurized by a stainless steel pump and motor. The Reverse Osmosis process uses a semi-permeable membrane to separate and remove dissolved solids, organics, Pyrogen, submicron colloidal matter from the water. The process is called "reverse" osmosis since it requires pressure to force pure water across a membrane, leaving the impurities behind. Reverse Osmosis is capable of removing 95%-99% of the total dissolved solids (TDS) thus providing safe, pure water. Based upon your facility's specifications and information about tap water data, the RO was designed and built to exacting standards and Good Manufacturing Practices as outlined by the FDA. The RO is a device that uses a membrane separation process for removing solvent (contaminants) from solution (tap water).



The RO is the most important and costly component in the water treatment system. With appropriate pretreatment of the tap water, proper cleaning and disinfection, the RO membrane life can be prolonged for several years.

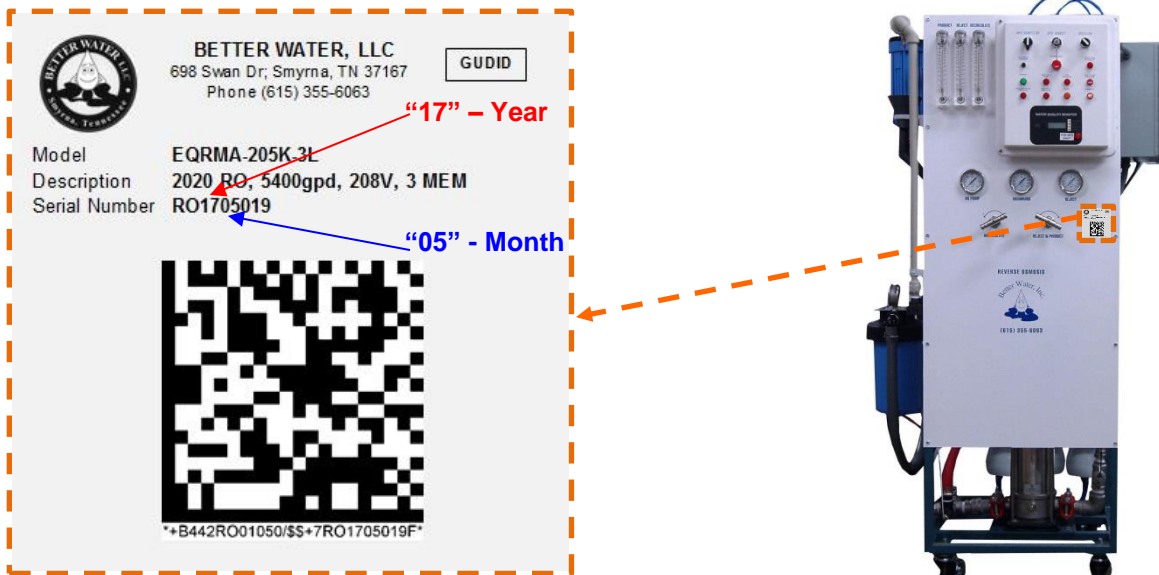
MODELS

There are several models of the 2020 RO, based on the number of membranes and electrical requirements. The operation, service, and replacement parts of these units are basically the same.

Part#	Membranes	Gallons per Day	Gallons per Minute	Electrical Requirements
EQRMA-203K-1H	2	3600 gpd	2.50 gpm	230V, Single Phase
EQRMA-203K-3H	2	3600 gpd	2.50 gpm	460V, Three Phase
EQRMA-203K-3L	2	3600 gpd	2.50 gpm	208V, Three Phase
EQRMA-205K-1H	3	5400 gpd	3.75 gpm	230V, Single Phase
EQRMA-205K-3H	3	5400 gpd	3.75 gpm	460V, Three Phase
EQRMA-205K-3L	3	5400 gpd	3.75 gpm	208V, Three Phase

IMPORTANT INFORMATION FOR SUPPORT

Adhered to the front of each 2020 RO 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 RO was produced in **2017**, in the month of **May**.*

PRODUCT DESCRIPTION

DESCRIPTION:

The **2020 RO** has been designed and built to meet the specific needs for your water system in a minimal amount of floor space, adding a neat and clean look to your water room. Based on the number of membranes it is designed to produce RO water at 2.50 to 3.75 gallons per minute for hemodialysis. It can be used for both Tank-Feed and Direct-Feed applications.

The **Frame** is constructed of welded stainless-steel with a durable powder-coat paint finish to reduce rust and corrosion.

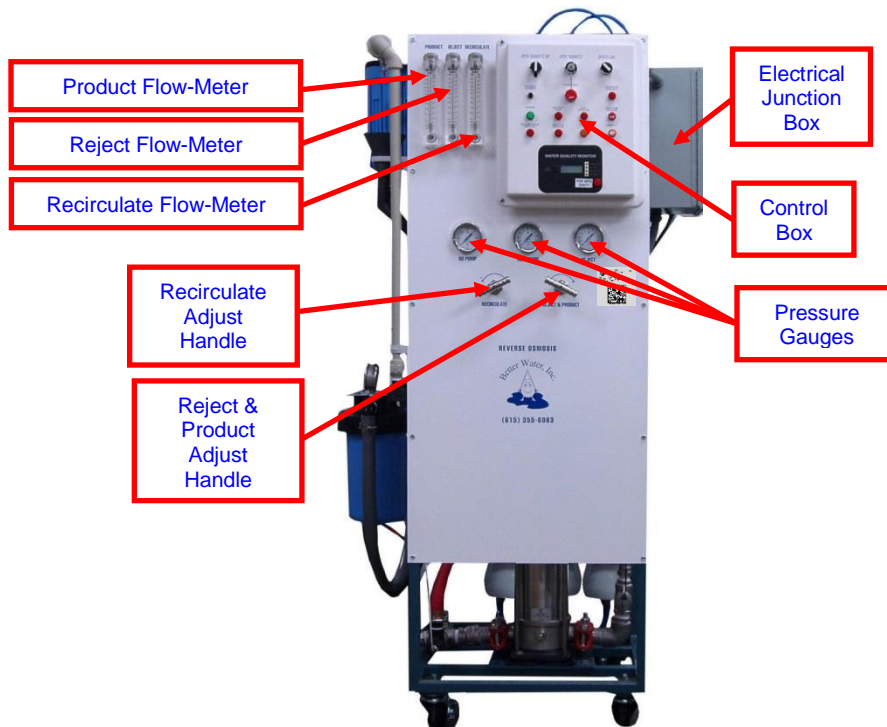
The RO has a **Pump** that is used to raise the osmotic pressure across the thin film composite **4" x 40" Membranes** to produce safe, pure water. For additional filtration, this unit has a **Pre-Filter** (5 micron, 10") as well as a **Final Filter** (.03 micron 10").

The **Control Box** contains the electronic components for operational control, monitoring, and alarms. The following are additional features incorporated into the RO's Control Box:

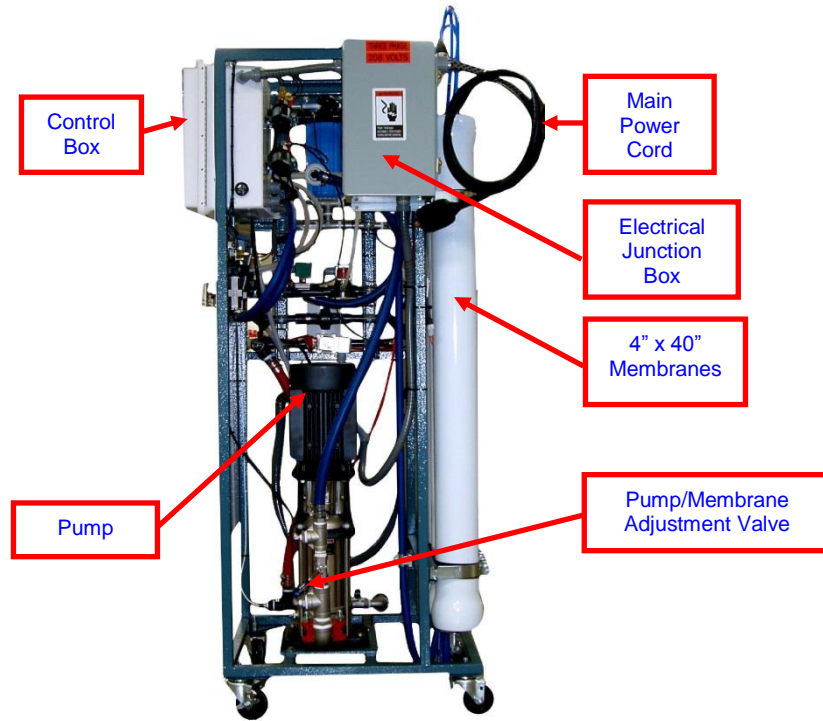
- A **Digital Flush Timer** to control the frequency and duration of a flush cycle.
- A **Water Quality Monitor** to display % rejection, feed TDS, and product TDS, and alarm in a poor water quality condition.
- **Timed Operate** feature to allow the RO to run for thirty minutes prior to the operator performing daily checks.
- Interfaces with the **Interlock Wiring System** to shut the RO off when any of the pre-treatment components go into regenerate or backwash mode, and provide a visual indicator.
- Interfaces with the **Level Control System** to turn the RO off and on based on water levels in the Storage Tank.

Mounted on the **Front Panel** of the RO, are **Flow-Meters** and **Pressure Gauges** for monitoring, as well as **Adjustment Handles** to achieve optimum performance.

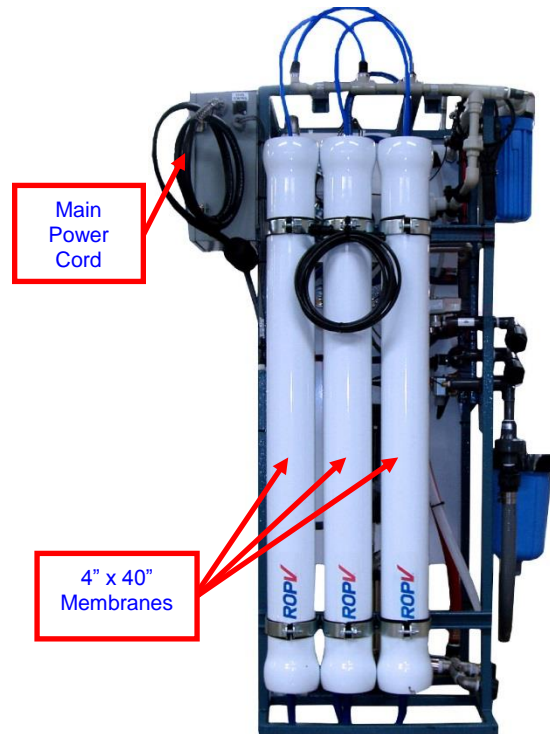
DETAILED VIEW OF 2020 RO, Front Side



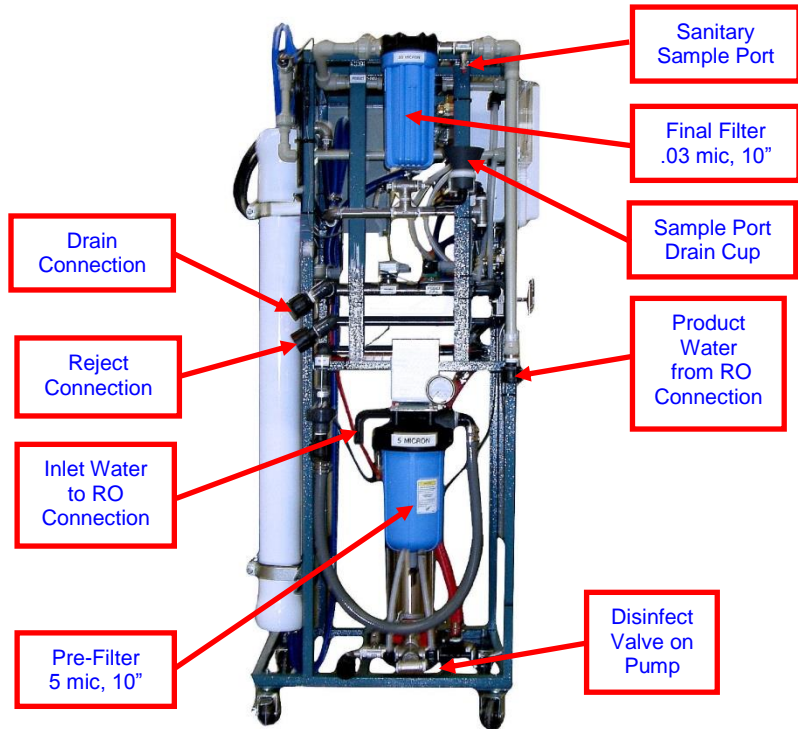
DETAILED VIEW OF 2020 RO, Right Side



DETAILED VIEW OF 2020 RO, Back Side



DETAILED VIEW OF 2020 RO, Left Side



DETAILED VIEW OF CONTROL BOX



SYSTEM COMPONENTS: Control Box

The 2020 RO is a semi-automated system comprised of several components that provide monitoring and control capabilities. The **Control Box** is the heart of the RO and houses the following:

- Various **Switches** and **Buttons** for control.
- Various **Alarm Lights** and an **Audible Alarm** to alert the operator to alarm conditions. These will continue until the alarm conditions are cleared or the alarms are reset by pressing the ALARM RESET button. The system also has a remote alarm which is usually installed near an operator or nurses' station.
- **24 VAC Power Supply** which provides power to the analog/integrated circuit board and solenoid valves.
- **Water Quality Monitor** which displays water quality in parts-per-million (*ppm*) or micro-Siemens ($\mu\text{S}/\text{cm}$).
- **Digital Flush Timer** to control the frequency of the flush cycle.
- **Temperature Controller** to set and monitor desired pretreated feed water temperature.
- **Tank-Stby-Direct Switch** controls either Tank Feed or Direct Feed functionality.



Water Quality Monitor

The Water Quality Monitor displays the following by pressing the Mode Switch: % Rejection, Feed TDS, Product TDS, and Set-Point. These numbers can be displayed in either parts-per-million (ppm) or micro-siemens (μm), depending on dip-switch settings. Parts-per-millions is the default set at the factory.

This monitor is comprised of two parts; the monitor board which is inside the control box and the display board which is in the control box cover. The monitor board has buttons for calibrating and dip-switches for board options.

When the RO first starts it will go into a poor water quality condition, at which time the product water will be diverted to drain, and the Poor Water Quality Alarm light will illuminate. Normally it will come up to good water quality within the first minute or so, at which time the alarm light will go out. If it remains in poor water quality longer than three minutes, an audible alarm will sound, and the divert to drain will continue.

Once the RO has come up to good water quality and has been running for some time, and a poor water condition is detected, the alarm will instantly sound, the alarm light illuminate, and the product water will be diverted to drain until a good water quality is obtained.

See the section on System Maintenance for details on how to reset and calibrate the WQM monitor board.



part#
EQMOB001352
WQM, RO Display



part#
EQMOB001351
WQM, RO Monitor Board

Digital Flush Timer

The Digital Flush Timer is an important component of the Reverse Osmosis Machine, located inside the control box. The flush timer is a 24-hour adjustable 24 volt digital mechanism that controls the frequency and duration of the Flush Cycle.

The Flush timer serves two purposes: It is used to set the time of day, and the frequency and duration of the Flush Cycle(s).

The digital flush timer is equipped with a battery back-up, so loss of power to the RO will not affect the timer operation. However, the actual life of the battery is not known so the timer should be checked monthly for correct time of day setting.

The Flush Timer was preset by the system installers on the day of the installation. Once the Frequency and the Length of the Flush Cycle have been set, that setting will remain until manually changed.

See the section on System Maintenance for details on battery replacement and adjustments.



part#
ELPWSW00991
Digital Flush Timer, 24V

Temperature Controller

The Temperature Controller inside the control box monitors the pretreated feed water temperature at the RO. A high-temperature set-point is set via this controller and in the event the water temperature reaches this set-point a high-temperature alarm light will illuminate, an audible alarm sound, and the RO will shut-off.

** See Technical Service Bulletin TSB2014001 in Appendix B if replacing.*



part#
EQKIT-EL001
Temperature Controller
and Bracket

Tank-Stby-Direct Switch

The Tank-Stby-Direct switch is a three position toggle switch which determines if the RO will run in conjunction with the signals from the floats in a reservoir or will run continuously.

Switch Setting:

DIRECT	RO will run continuously, and bypass the float switches in the reservoir. For direct feed ROs only.
STBY	RO will not run
TANK	RO will recognize float signals from the reservoir.

There is a fuse above the switch, for the 24 vac power to the main control board and water quality monitor.

NOTE: On devices manufactured prior to August 2007, and from August 2010 to present this switch is located inside the control box. On devices manufactured from August 2007 through July 2010, this switch is on the outside of the control box.



part#
ELPWSW01109
On-Off-On, 3 pos. Switch
ELLFFS00836
4 amp Slow Blow Fuse

Components That Work In Conjunction With the Control Box

Located on the back of the control box are four switches, each with their own unique purpose:

A **High Membrane Pressure Switch** monitors the RO's membrane pressure. If a high membrane pressure condition occurs, the RO will alarm and shut down.

Part# **ELPWSW00986**

A **High Pump Pressure Switch** monitors the RO's pump pressure. If a high membrane pressure condition occurs, the RO will alarm and shut down.

Part# **ELPWSW00988**

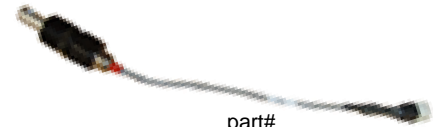
A **High Product Pressure Switch** monitors the product pressure from the RO. If a high product pressure condition occurs, the RO will alarm and shut down.

Part# **ELPWSW00987**

A **Low Pressure Switch** monitors the suction side of the pump during operation and flush modes, but not in the disinfect cycle. In the event there is insufficient pressure to the RO, the RO will alarm and shutdown.

Part# **ELPWSW00985**

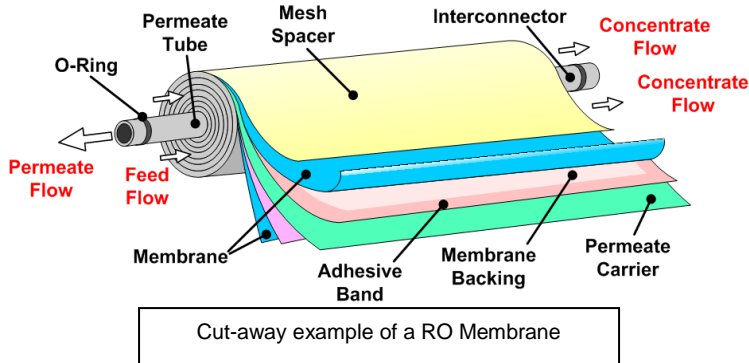
There are also two **Conductivity Probes (Feed & Product)**, which work in concert to measure TDS as a function of conductivity. These work in conjunction with the water quality monitor to display feed and product TDS and to determine poor water quality.



part#
EQSUBCP01545
Conductivity Probe

SYSTEM COMPONENTS: Membranes

The **Membranes** are at the heart of the reverse osmosis process, and the number in use will vary based on the 2020 RO model. These membranes are semi-permeable, allowing water that is being purified to pass through it, while rejecting the contaminants that remain. The reverse osmosis process uses these membranes to separate and remove dissolved solids, organics, pyrogens, and submicron colloidal matter from the water. The process is called “reverse” osmosis since it requires pressure to force water across the membranes, leaving the impurities behind. Reverse osmosis is capable of removing up to 95-99% of the total dissolved solids (TDS), thereby providing safe, and pure water.



part#
SUMEM008
4" x 40" Membrane

RO SINGLE MEMBRANE SPECIFICATION (equivalent or better)	
Membrane Type	4" x 40" Polyamide
Configuration	Spiral wound full fit
Active Membrane Area	85 - 90 sq. ft.
Recommended Applied Pressure	75 - 250 psi
Max. Applied Pressure	400 psi
Max. Operating Temperature	122° F
Feed Water PH Operating Range	4.0 - 11.0
Optimum PH Range for Optimum % Rejection	5.0 - 8.5
Chlorine Tolerance	< .1 ppm
Max. Feed Flow GPM	20
Minimum Brine Flow / Permeate Flow Ratio	5:1
Max. SDI (15 minutes)	3
Max. Turbidity NTU	< 1
Permeate Flow GPD	2487.5 (+/- 25%)
Minimum Rejection Rate	98% based on test conditions *
* Test conditions = 2000 ppm NaCl @ 225 psi, 77° F, 15% recovery, pH 8.0	

Nominal Rejection Characteristics of Reverse Osmosis Membranes

Ion	% Rejection*	Ion	% Rejection*	Ion	% Rejection*
Sodium	90-95	Lead	94-96	Cadmium	95-97
Calcium	92-95	Chloride	90-95	Silver	90-95
Magnesium	94-97	Bicarbonate	85-95	Mercury	94-96
Potassium	85-95	Nitrate	50-70	Barium	94-96
Iron	92-96	Fluoride	85-90	Chromium	94-96
Manganese	92-96	Silicate	80-90	Bromide	85-90

Aluminum	95-98	Phosphate	95-97	Borate	25-50
Ammonium	85-90	Chromate	80-90	Sulfate	96-98
Copper	96-98	Cyanide	80-90	Arsenic	90-95
Nickel	96-98	Sulfite	94-96	Selenium	90-95
Zinc	96-98	Thiosulfate	94-97	Ferrocyanide	96-98
Strontium	95-97				

* The above percent rejection is for reference only. Actual rejection will depend on the exact chemistry, temperature, pressure, and TDS content of the feed water.

* Source: Applied Membranes, Inc.

SYSTEM COMPONENTS: Pre-Filter; Particulate Filtration Cartridge (10", 5 micron filter)

DESCRIPTION:

A basic particulate filtration consisting of a 10" housing fitted with a cartridge type filter element. These are specified to trap particulate matter of 5 microns or larger at a specified flow rate. There is a post-filter gauge to measure pressure drop that indicates filter clogging. The filter housing is threaded for easy cleaning and filter element exchanges.



part#

SUCA000551

Pre-Filter, 5 micron, 10"

MONITORING REQUIREMENTS:

Daily: Check pre and post-filter pressure, and ΔP (*pressure drop*) across it while the RO is running.

MAINTENANCE:

- Replace filters every 30 days or as required if there is a ΔP (*pressure drop*) across the filter of greater than 15 psi while the RO is running; whichever comes first.
- When changing the filter, the inside of the filter housing should be wiped down with a clean cloth using either water or a mild (1%) bleach solution.

* See *System Maintenance section*

SYSTEM COMPONENTS: Final-Filter; Particulate Filtration Cartridge (10", .03 micron filter)

DESCRIPTION:

The .03 final filter is located on the upper-left side of the RO on the Product Line and is followed by a Sanitary Sampling Port. This filter uses a standard, 10" filter Housing.



part#

SUCAPE00574

Final Filter, .03 micron, 10"

MAINTENANCE:

- Replace filters every 6 months or as required if there is a ΔP (*pressure drop*) across the filter of greater than 15 psi while the RO is running; whichever comes first.
- When changing the filter, the inside of the filter housing should be wiped down with a clean cloth using either water or a mild (1%) bleach solution.
- * See *System Maintenance section*
- **NOTE:** *If high organics are present in the feed water, an alternative 20" .05 micron filter is available. Part number SUCAPE00569*

SYSTEM COMPONENTS: Pump

The RO uses a stainless-steel, multi-stage, centrifugal, **Pump** which will automatically shut-off in a no water condition. This is a heavy-duty pump designed for years of service with proper operation. It is a vertical pump, mounted in the center of the RO rack.



part#

EQPUGRCRN3-12-1

RO Pump, 2HP, 1 Phase

EQPUGRCRN3-12-3

RO Pump, 2HP, 3 Phase

MONITORING REQUIREMENTS:

RO pressures should be monitored to ensure optimum performance.

MAINTENANCE:

Other than routine cleaning and priming the pump if the system pressure is released, there are no specific maintenance procedures for the pump.

SYSTEM COMPONENTS: Remote Alarm Box (optional)

The RO Remote Alarm Box is a molded plastic box, usually located on the patient floor, in a position where it can be easily seen by clinic personnel during normal work duties. The box is equipped with audible and visual alarms that monitor the RO and Reservoir water level.

The Remote Alarm Monitoring Box requires no external power supply, but receives 24vac power and signals from the RO which it is monitoring. This box has 2 RED lights; one that will illuminate when the RO goes into an alarm condition and one when the water level in the reservoir falls below the low-level sensor. The AMBER light will illuminate and flash when the RO is in Disinfect Mode.

AAMI standards require that the RO alarms be audible in the patient area. If the RO is located close enough to be heard in the patient area, the remote alarm may be omitted.



part#
EQASSYNSMB01601
RO Remote Alarm Box

SYSTEM COMPONENTS: Clean/Disinfect Tank

The Clean/Disinfect Tank is made of a non-corrosive, molded plastic with a lid, and is used for manual cleaning and disinfecting. The tank is equipped with 2 ports on the top (*side*) and a single port on the bottom (*side*), and all the necessary hoses, valves and fittings (*some assembly required*).



part#
EQASSYDISTANK
Clean/Disinfect Tank

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:

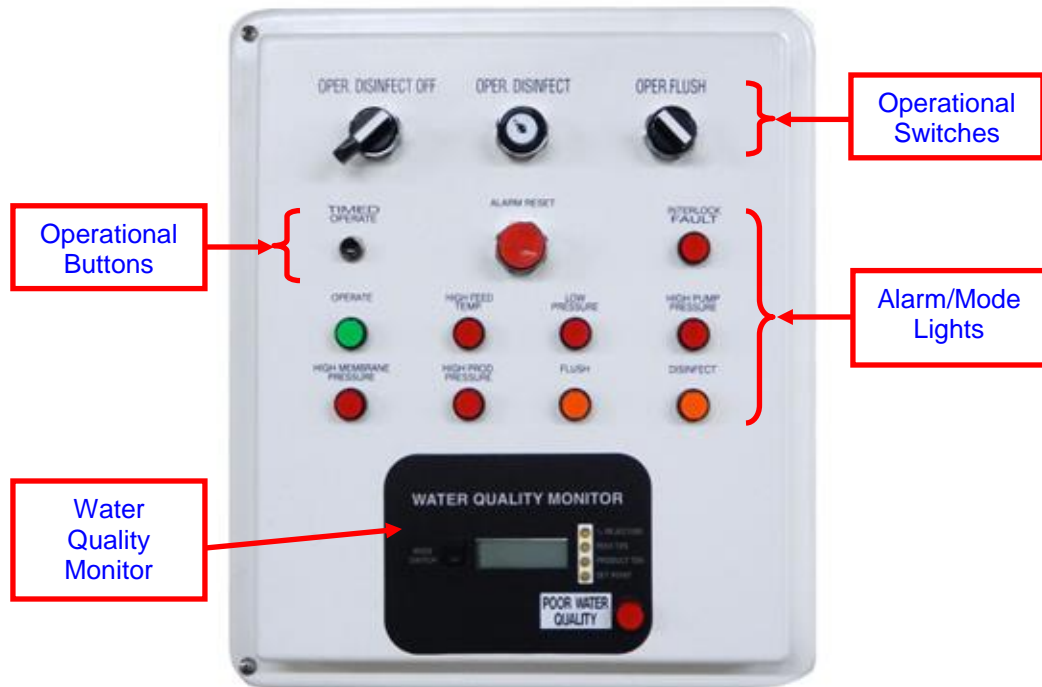
- Food and Drug Administration (FDA)
- National Association of Nephrology Technicians/Technologists (NANT)
- Association for the Advancement of Medical Instrumentation (AAMI)

The RO was designed and built to your facility's specifications and information regarding the current tap water conditions at your site. There is not a Reverse Osmosis Machine on the market that is a panacea for all water treatment requirements. The RO cannot do the job alone. It is imperative to monitor the tap water and feed water conditions.

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 the CONTROL BOX and RO FRONT PANEL

Following is a description of each of the switches, buttons, and alarm/mode lights on the control box.



OPERATIONAL SWITCHES

OPER-DISINFECT-OFF Switch: 3-position operational switch

OFF – Turns the RO OFF.

OPER – RO is in normal operation mode.

DISINFECT – Places the RO in disinfect mode. The OPER-DISINFECT Keyed Switch must also be in the DISINFECT position to initiate this cycle.

OPER-DISINFECT Keyed Switch: 2-position keyed switch which is an additional safety feature, preventing unauthorized activation of the disinfect cycle since a key must be inserted to turn this switch.

OPER – RO is in normal operation mode

DISINFECT – Places the RO in disinfect mode. The OPER-DISINFECT-OFF Switch must also be in the DISINFECT position to initiate this cycle.

OPER-FLUSH Switch: 2-position operational switch

OPER – Places the RO in normal operation mode.

FLUSH – Places the RO in flush mode as programmed by the digital flush timer. Flush mode will turn the RO on to flush for a preset number of minutes every so many preset hours to prevent stagnation. The default set at the factory is to flush for 15 minutes every 4 hours.

OPERATIONAL BUTTONS

TIMED OPERATE Button: This button, when pressed allows the RO to run for 30 minutes prior

to the operator performing their daily checks (*such as chlorine, hardness, etc.*). The Timed Operate Mode runs for 30 minutes, which cannot be altered or changed, and will turn off automatically.

- **NOTE:** The **TANK-STBY-DIRECT switch** must be in the TANK position before starting the Timed Operate. It can be activated when in the STBY position but is not recommended.

The Timed Operate will not operate in DIRECT mode.

- **NOTE:** During this timed operate cycle, the storage tank sensors are inactive. When the Timed Operate cycle is completed, the storage tank sensors are reactivated for normal operation.

NOTE: This feature was not available on models manufactured prior to 2010.

ALARM RESET Button: Once an alarm condition occurs and has been corrected, pressing this button silences any audible alarms, and turns off any alarm lights that are illuminated. If the alarm condition still exists when this button is pressed the alarms will continue. This does not correct the condition which caused the alarm.

ALARM/MODE LIGHTS

INTERLOCK FAULT Light: This light will illuminate and alert the operator that the pre-treatment interlock system has been interrupted. This is normal during the backwash and/or regeneration of any pre-treatment media tanks. This light will also illuminate when other fault conditions occur, such as interlock wires being disconnected, and any interlock relay failures of Main Control Board. The RO will not run when this light is illuminated. If the RO is running and the interlock initiates, the RO will shutdown. If this light is illuminated and no media tank is in backwash or regeneration mode, call for assistance.

- **NOTE:** This feature was not available on models manufactured prior to 2010.

OPERATE Light: This light illuminates when the RO is in normal operation or flush mode, but will not be lit during the disinfect cycle.

HIGH FEED TEMP Alarm Light: Alerts that the RO is experiencing high feed water temperature, which would be greater than the set-point set on the temperature controller.

LOW PRESSURE Alarm Light: Alerts that the RO is experiencing low pressure.

HIGH PUMP PRESSURE Alarm Light: Alerts that the RO is experiencing high pump pressure.

HIGH MEMBRANE PRESSURE Alarm Light: Alerts that the RO is experiencing high membrane pressure.

HIGH PROD PRESSURE Alarm Light: Alerts that the RO is experiencing high product pressure.

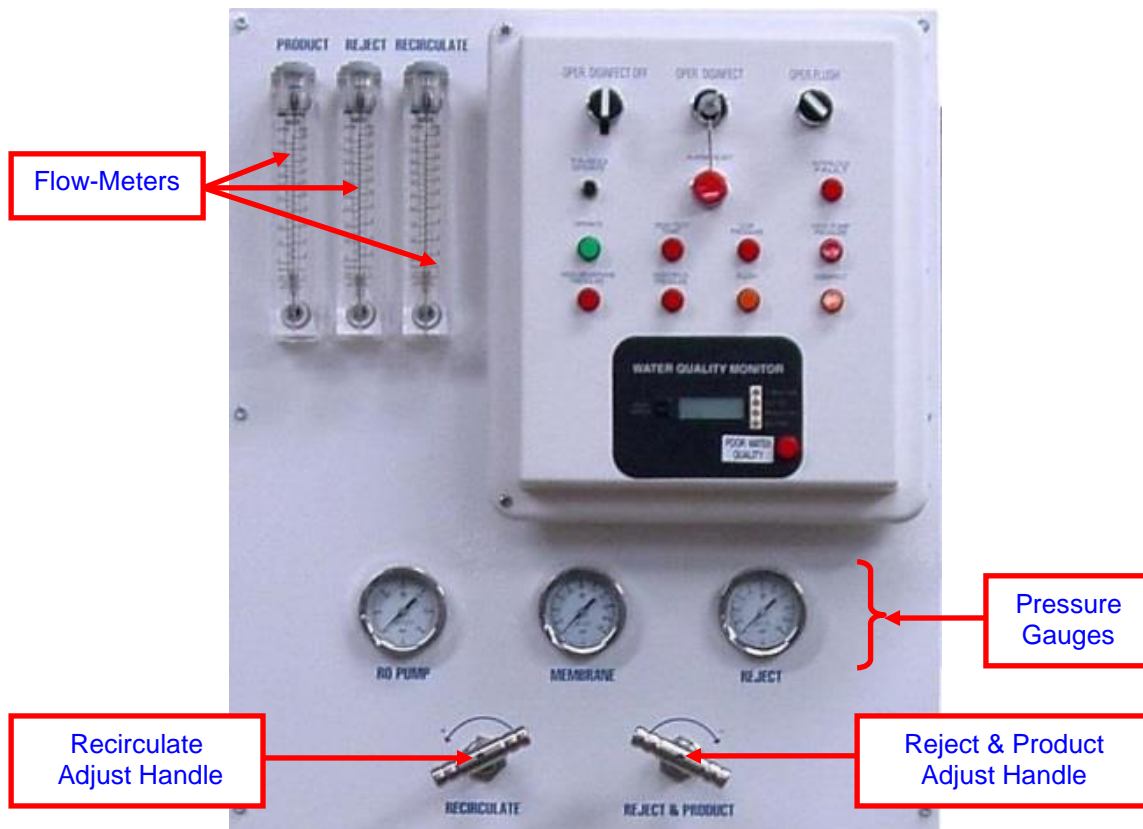
FLUSH Mode Light: Signals that the RO is in actually running the flush cycle. Although the OPER-FLUSH Switch may be in the FLUSH position, this light will only illuminate when the flush cycle is running.

DISINFECT Mode Light: Signals that the RO is in disinfect mode.

WATER QUALITY MONITOR

The Water Quality Monitor displays the following by pressing the Mode Switch: % Rejection, Feed TDS, Product TDS, and Set-Point. These numbers can be displayed in either parts-per-million (ppm) or micro-siemens (μm), depending on dip-switch settings. Parts-per-millions is the default set at the factory. It also has a Poor Water Quality alarm light.

FRONT PANEL

**PRODUCT Flow-Meter:**

This flow-meter provides a visual measurement in gallons per minute of the amount of product water flow. See *Membrane Array Flow Rate Specifications* section for designed flow rates.

REJECT Flow-Meter:

This flow-meter provides a visual measurement in gallons per minute of the amount of reject water flow. See *Membrane Array Flow Rate Specifications* section for designed flow rates.

RECIRCULATE Flow-Meter:

This flow-meter provides a visual measurement in gallons per minute of the amount of recirculate water flow. See *Membrane Array Flow Rate Specifications* section for designed flow rates.

RECIRCULATE ADJUST Handle:

This handle is used to adjust the gallons per minute (gpm) back to the pump, increasing and decreasing proportionately. See *User Adjustments: Product and Reject Flow* section for more information.

REJECT & PRODUCT ADJUST Handle:

This handle is used to adjust the gallons-per-minute back to the pump, increasing and decreasing proportionately. See *User Adjustments: Product and Reject Flow* section for more information.

PRESSURE GAUGES:

RO Pump – Measures the amount of pressure post RO-Pump.

Membrane – Measures the amount of pressure across the RO membranes.

Reject – Measures the amount of reject water pressure.

INITIAL START-UP

The following should be done when starting the RO...

- ... for the first time, *assuming installation is complete*
- ... after a membrane change
- ... after proper storage.

NOTICE

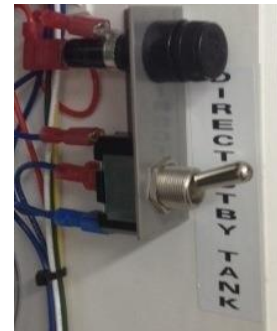
RO's and new membranes are shipped from the factory, packed in a preservative solution. The preservative must be removed by flushing to drain for a minimum of 2 hours, on initial start-up and when the membranes are changed.

WARNING

Disinfectants and cleaners can cause serious injury or death to patients undergoing hemodialysis treatment.

Do not change the position of the OPER-DISINFECT switch until everything is checked and cleared and it is safe to proceed.

1. If a Tank-Feed system, attach a hose from the **3-Way Valve on the Reservoir**, running the other end to drain, and then turn the valve to drain.
 - If a Direct-Feed system, connect a hose from the **End of Loop 3-Way Valve on/or near the RO** (*location of valve determined by install*), running the other end to drain, and then turn to drain.
2. Open the **Junction Box** and turn the breaker **ON**.
3. Plug the RO power cord into an electrical outlet.
4. Locate the **TANK-STBY-DIRECT Switch** and set to **DIRECT** mode.



4. Set the RO in normal Operate Mode
 - Turn the **OPER-DISINFECT-OFF Switch** to **OPER**
 - Turn the **OPER-DISINFECT Keyed Switch** to **OPER**
 - Turn the **OPER-FLUSH Switch** to **OPER**



5. Then push the **ALARM RESET button** to silence any alarms and start the RO.



6. Let run for a minimum of 2 hours, diverting the product water to drain.
7. Perform a disinfect procedure.
 - * *For instructions see the System Maintenance: Cleaning and Disinfecting section.*

8. Perform bacteria/endotoxins tests which must meet established standards.
9. Turn the RO **OFF** by turning the **OPER-DISINFECT-OFF Switch** to **OFF**.
10. Set the Digital Flush Timer to flush every 4 hours in 15 minute intervals.
 * For instructions see the *System Maintenance: Flush Timer* section.
 - NOTE: Do not set flush times during pre-treatment backwash or regeneration.
11. Locate the **TANK-STBY-DIRECT Switch** and set to the mode based on the type of system, which will be either **TANK** mode or **DIRECT** mode.



Switch Down – Tank Mode



Switch Up – Direct Mode

12. If a Tank-Feed system, turn the **3-Way Valve on the Reservoir** to **RO**.
 - If a Direct-Feed system, turn the **End of Loop 3-Way Valve on/or near the RO** (*location of valve determined by install*) to **RO**.
13. The RO is now ready for normal start-up and daily use.
 - Start the RO as detailed in the *“Daily Operation”* section and check the operation values after the Quality Purge Cycle. If the RO is not within these operating parameters, adjustments may have to be made. See the *“User Adjustments”* section.
 - Check the product flow, reject flow, and re-circulate flow rates and compare to the previously stated *“Membrane Array Flow Rate Specifications”* section based on the number of RO membranes.
 - Also perform a thorough quality assurance check of the entire water treatment system including the pre-treatment, post-treatment, and distribution.

DAILY OPERATION

1. Check the **RO CONTROL PANEL**. All alarm lights should be **OFF** and **NO** audible alarm should be sounding. If any one or more of the alarm lights are **ON** and/or an audible alarm is sounding, press the **ALARM RESET Button**. All alarm lights should go out and audible alarms should stop sounding.



2. Turn the **OPER-DISINFECT Keyed Switch** to **OPER** position.



- *NOTE: If this switch is in the DISINFECT position, you MUST verify that the RO does NOT contain any disinfecting or cleaning solution BEFORE proceeding to the next step.*

WARNING

Disinfectants and cleaners can cause serious injury or death to patients undergoing hemodialysis treatment.

3. Turn the **OPER-DISINFECT-OFF Switch** to **OPER**.

- *NOTE: If the switch is in the DISINFECT or OFF position, see step 2 and the warning above.*



4. If you must reset the switches listed above, the alarm lights will illuminate and the audible alarm will sound, press the **ALARM RESET Button** to return the alarms to normal.



5. Turn the **OPER-FLUSH Switch** to **OPER**

- *NOTE: Should the Storage Tank level have dropped to the RO START Proximity sensor, the RO would have automatically started upon turning the switch from FLUSH to OPER.*

- On start-up the **Quality Purge cycle** will commence. An air purge cycle will run for approximately 30 seconds, then the RO pump will start, the product purge valve will open and run to drain until the water quality is above the set point. This is a normal function to advise you that the first water produced by the RO is being routed to drain until the water quality equals to or surpasses the set-point on the water quality monitor. This purge cycle may take approximately two minutes.

After the Quality Purge Cycle has completed, the RO should be operating within the following parameters:

- a. Membrane Pressure should read: **75-250** psi
- b. Reject Pressure: no standard
- c. Product Pressure should read: **less than 25 psi** on Tank-Feed systems and **less than 70** psi on Direct-Feed systems
- d. The water quality should be **above the set-point (90%)**

If the RO is not within these operating parameters, adjustments may have to be made. See the User Adjustments section.

6. If water quality tests are to be performed then do the following:

- Press the **TIMED OPERATE Button**.
- This will start the RO which will run for 30 minutes.
- After the first 15 minutes, perform the required water tests, while the RO is running for an additional 15 minutes.



MONITORING PROCEDURES

The 2020 RO System **must be monitored** on a **daily** basis by a **qualified technician** recording the items listed below on a quality assurance check list. An example **RO Daily Start-Up Check List** is provided in the **Appendix A** of this manual and may be reproduced for use. These checks are best made when the RO is running during the Timed Operate cycle, after it has run for at least 15 minutes.

Monitoring Requirements: *(record on a Quality Assurance Check List)*

- RO switch positions
- RO lights and alarms
- Water flow and pressures
- Water quality
- Bacteria/endotoxins *(check at least monthly; more often if necessary)* must meet established standards

Quality assurance checks should also be performed periodically such as monthly or quarterly, and after maintenance such as filter and membrane changing to ensure the RO is operating properly. An example **RO Quality Assurance Check List** is provided in the **Appendix A** of this manual and may be reproduced for use.

END OF DAY PROCEDURE

After the hemodialysis day is over, the RO should be placed in FLUSH Mode by changing the setting on only one switch.

NOTE

**The RO is not completely turned-off.
It is placed into an idle or standby mode that is called the FLUSH Mode.**

1. Ensure there are no further requirements for water for hemodialysis or other systems used in your facility.
2. Turn the **OPER-FLUSH Switch** to **FLUSH**, and the RO will enter into an automatic and scheduled Flush program. The amber Flush Light will come on when the RO actually starts-up and goes into flush at the pre-determined time, or when manually cycled into the flush mode.



SHUT DOWN PROCEDURE

To turn the RO OFF, terminating all functions, simply...

1. Turn the **OPER-DISINFECT-OFF Switch** to **OFF**.



GENERAL CLEANING and DISINFECTING INFORMATION

To perform at peak efficiency the RO system must periodically be cleaned and disinfected. These procedures are a crucial part of ensuring optimum performance of the RO membranes.

The **Cleaning Process** is designed to remove mineral deposits that may build-up on internal surfaces.

The **Disinfecting Process** is designed to significantly reduce bacteria and endotoxins that may build-up in the water and on the internal 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.

CLEANING and DISINFECTING FREQUENCY

As the manufacturer, Better Water LLC recommends the following:

- **If membrane fouling is indicated:** Low pH Clean with BWI-1000 and Disinfection with Minncare
- **Monthly:** Low pH Clean with BWI-1000 and Disinfection with Minncare (*in that order*).
- **Quarterly:** Low pH Clean with BWI-1000, High pH Clean with BWI-2000, and Disinfection with Minncare (*in that order*).
- **If the RO has been in storage** and should have been loaded with preservative, then after rinsing of preservative the following should be done: Low pH Clean with BWI-1000, High pH Clean with BWI-2000, and Disinfection with Minncare (*in that order*).

Cleaning and disinfecting should be initiated if membranes are fouled indicated when...

... the **Product Flow decreases** and the **Reject Flow increases**, and the two cannot be adjusted to design specifications

... the **Membrane Pressure increases**, and the **Reject Pressure decreases** which indicates a pressure drop across the membrane array. Example: In a 4 membrane array:

Membrane Pressure **150 psi** – Reject Pressure **70 psi** = **80 psi / 4 = 20 psi** drop across each membrane.

... the **Water Quality Monitor** indicates a **continuous decline in water quality**

The RO may require more frequent cleaning and disinfecting, which is ultimately the Medical Director's responsibility to determine and is typically based on water testing.

Facilities that have more than one distribution loop should clean, disinfect, and rinse each loop separately.

RESIDUAL CHEMICAL TESTING

Users should refer to the chemical agent manufacturer to determine the appropriate method for testing for residual chemical substances in the water after cleaning and disinfecting. The water must be clear of detectable levels of cleaning and disinfecting agents prior to use with patients

CAUTION

If performing both Low pH and High pH cleanings, always perform the Low pH first, otherwise the membrane can be damaged.

WARNING

DO NOT use “Hydrochloric Acid” based products for disinfection and/or cleaning the RO as these can damage the internal components and will void the Limited Warranty. Use only the recommended products as previously detailed.

Also DO NOT use “Sodium Hypochlorite” (bleach) based products as these will damage the membrane.

NOTICE

Changes in the tap water pH, TDS, temperature, or pressure, can also cause significant changes in the overall performance of the RO.

WATER SAMPLING

This RO is but a part of a total system designed to create AAMI quality water. As such, it is recommended that the water samples be drawn not only from the RO, but also from the other components in order to capture a complete view of the bio-burden impacting the system. Here are a few examples of these other sample points:

- Municipal Feed Water
- Pre-Treatment Water to the RO
- Product Water from the RO prior to cleaning and disinfecting
- Product Water from the RO after cleaning and disinfecting
- Within the Distribution Loop
- From the Reservoir

The user should draw samples from the RO before and after the cleaning and disinfecting procedure in order to measure the effectiveness of the cleaning and disinfecting process. Copies of the test results should be filed and available for review.

OUTSOURCED WATER TESTING

A laboratory specified by the physician or Medical Director should perform chemical and microbial analyses as outlined in the current AAMI/ISO Standards to determine the current compatibility of the system with the feed water and the suitability of the system for providing product water meeting the AAMI requirements. This should be performed annually or more often if needed but, is it is ultimately at the discretion of the physician or Medical Director.

Better Water LLC recommends bacterial testing should be performed once a month on the RO product water by a qualified microbiological laboratory. More frequent bacterial testing should be performed if the system has undergone repair or if the results of the cultures exhibit higher than allowable counts. Testing may increase or decrease at the discretion of the Facility Medical Director.

SANITIZING THE SANITARY SAMPLE PORTS

The sanitary sample port should be sanitized immediately BEFORE AAMI and biological sampling.



1. Turn the port stem to the left to open and allow a full flow of liquid to pass out of the port for 1-2 minutes. Then close the port by turning the stem to the right.
2. 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.
3. Insert the needle all the way into the port through the stem opening, and express most of the sanitizer into the port. Allow a few milliliters to flow out of the port outlet.
4. As the needle is removed from the opening, squirt the remaining few milliliters of sanitizer over the outer surface of the stem.
5. When ready to sample, open the port for 1 to 2 minutes to allow product water to rinse the residuals and any endotoxins from the sample port before sampling.

SAMPLE COLLECTING from a SANITARY SAMPLE PORT

In an effort to allow accurate bacterial testing of the product water from the RO, the Sanitary Sampling Port was added to all models produced August 2010 and later.



- *Sample Ports on RO's produced before August 2010 **SHOULD NOT** be used to collect samples for bacteria cultures or LAL's. These sample ports should only be used to measure TDS only.*



PROCEDURE

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. Sanitize the sample port as previously instructed.
3. Wipe the outside of the port with an alcohol wipe.
4. 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.
5. 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.
 - Replace the plastic cap on the Sanitary Sample Port.
6. Follow appropriate procedures for collection of samples with Accu Vials for colony count and LAL.

CLEANING and DISINFECTING REQUIRED MATERIALS

Part#	Description	Notes/Usage
EQASSYDISTANK	Clean/Disinfect Tank	- Used to mix water and chemicals for the cleaning and disinfecting procedure.
SUMCOO00572 	BW-1000, Acid Cleaner, low pH For CLEANING - scale removal	- Replaces MinnClean AC - Application: For removing mineral scale in membrane applications. - Acid Cleaner 1000 must be used before Alkaline Cleaner 2000, MemStore, or MinnCare. - It can be used on brass.
SUMCOO00571 	BW-2000, Alkaline Cleaner, high pH For CLEANING - organic removal	- Replaces MinnClean TF - Application: For removing grime, grease, oil, and biological matter on thin film composite membranes. Mineral deposits can inhibit the Alkaline Cleaner, so the Acid Cleaner 1000 should be used first to remove these deposits. - It can be used on brass.
SUMCOO00575 	MinnCare Cold Sterilant For DISINFECTING	- Application: MinnCare Cold Sterilant is an oxidant that stops organism growth by oxidizing microbial cell proteins and enzyme systems, and effectively removes biofilm. - It can be used on units with stainless steel fittings only.
SUMCOO00577 	MinnCare 1% Test Strips For DISINFECTING	- Used to verify the proper dilution of the Sterilant solution. - Follow manufacturer's instructions for proper use.
SUMCOO00576 	MinnCare Residual Test Strips For DISINFECTING	- Used to verify no residual Sterilant is present after flushing and rinsing. - Follow manufacturer's instructions for proper use.

SUMMARY of CLEANING and DISINFECTING

- If **DISINFECTING**... use **MinnCare Cold Sterilant**
- If **CLEANING**... use **BWI-1000 Acid Cleaner and BWI-2000 Alkaline Cleaner**

NOTICE

Better Water LLC does not recommend using Isopure Step 1 & Step 2 to clean the membranes, as these could potentially reduce the lifespan of the membrane.

CLEANING and DISINFECTING PROCEDURE (Tank Feed)

The procedure below applies to the Low pH cleaning, High pH cleaning, and disinfection.

WARNING

**Chemical cleaners and disinfectants can cause serious injury or death.
Do not disinfect or clean the RO or Loop while patients are dialyzing.**

Proper protective equipment must be used.

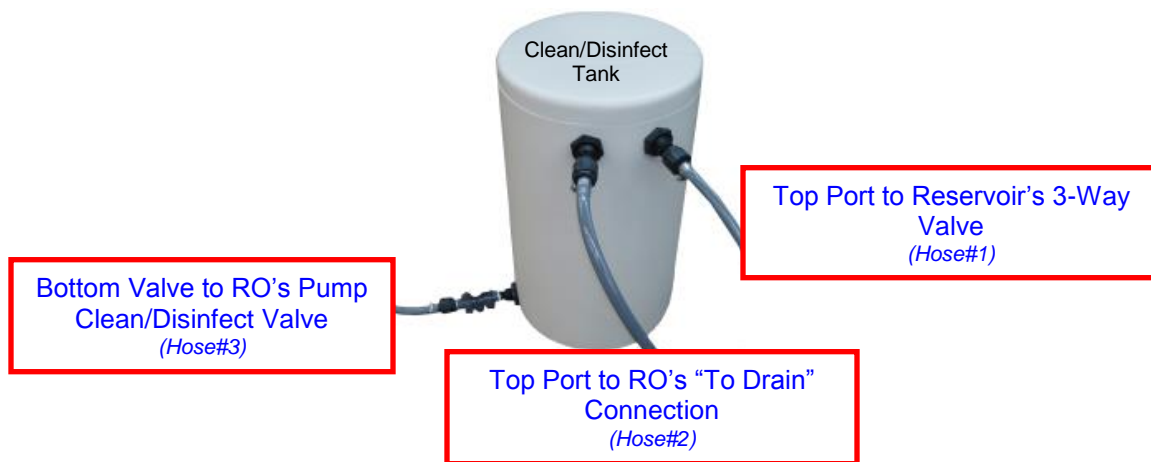
The preparation and handling of these chemical solutions must be done in accordance with the specifications established for the particular chemical and their Material Safety Data Sheet (MSDS).

These procedures should be performed by trained and qualified technicians.

In general the steps for disinfecting and cleaning are same with the exception of the chemical used for each, and the type of test strips used to verify either the presence or absence of those chemicals. Depending on whether disinfecting or cleaning, a distinction is made in individual steps by prefacing either "**IF DISINFECTING...**" or "**IF CLEANING...**". Also the generic word "**chemical**" will be used to refer to either disinfectant if disinfecting or cleaner if cleaning.

In order to simplify the terminology used in this procedure the following terms will be used:

- The **Storage Tank** will be referred to as the **Reservoir**
- The **Clean/Disinfect Tank** will be referred to as the **Tank**
- There are three hoses supplied with the Tank which will referred to as follows:
 - **HOSE#1** – Tank Product Hose (*longest of the 3; ends: female & female*)
 - **HOSE#2** – Tank Drain Hose (*ends: male & male*)
 - **HOSE#3** – Tank Disinfect Hose (*ends: male & female*)



PROCEDURE

1. Place a warning placard stating “**DO NOT USE – CLEANING/DISINFECTING IN PROGRESS**”. End users should be notified as well that this procedures in in progress.

2. Open the **Control Box** and flip the **DIRECT-STBY-TANK Switch** to **DIRECT**.



3. Prepare the **Tank**.

a. Open the **Tank's Bottom Valve** so it can be rinsed.

b. Connect **Hose#1** from the **Reservoir's 3-Way Valve** to the **Tank's Top Right Port**.

c. Turn the **Reservoir's 3-Way Valve** so it flows to this hose.

d. Start the **RO** in normal Operate Mode and rinse the Tank with RO product water.

- Turn the **OPER-DISINFECT-OFF Switch** to **OPER**

- Turn the **OPER-DISINFECT Keyed Switch** to **OPER**

- Turn the **OPER-FLUSH Switch** to **OPER**

- Press the **ALARM RESET Button** if the alarm sounds.

* Once the RO is in good water quality it will start to fill the Tank.

e. After rinsing the **Tank**, close the **Tank's Bottom Valve**.

f. Fill the **Tank** with RO product water.

- **IF CLEANING**, fill **Tank** with 15 gallons (approximately 14 inches).

- **IF DISINFECTING**, fill **Tank** with 20 gallons (approximately 18 inches).

- Once filled with the desired amount turn the RO OFF by turning the

OPER-DISINFECT-OFF Switch to **OFF**.



4. Prepare **RO** and **Hoses**.

a. Disconnect the **RO's Drain Hose** from the **RO's "To Drain" Connection** and connect **Hose#2** from that connection to the **Tank's Top Left Port**.

b. Connect **Hose#3** from the **RO Pump's Clean/Disinfect Ball Valve** to the **Tank's Bottom Valve**.

5. Prime **Hose#3**

a. Loosen the Parker connection at the **RO Pump's Clean/Disinfect Ball Valve**.

b. Open the **Tank's Bottom Valve**, prime the hose, and then tighten the loosened Parker connection.

c. Open the **RO Pump's Clean/Disinfect Ball Valve**.

- **NOTE:** If this hose hasn't been properly primed the pump will air lock and could cause damage to the pump.

6. Start **RO** in Disinfect Mode and begin circulation...

- Turn the **OPER-DISINFECT-OFF Switch** to **DISINFECT**

- Turn the **OPER-DISINFECT Keyed Switch** to **DISINFECT**

- Turn the **OPER-FLUSH** switch to **OPER**

* Verify flow by looking at the **Product and Reject Flow-Meters**, and visually see if water flowing back in to the Tank otherwise re-prime **Hose#3**. Also check for leaks and correct before proceeding.



7. **IF CLEANING**... before beginning cleaning, take a baseline pH reading from the product water returning into the **Tank** to compare to tests to follow.

8. Add chemicals for procedure...

- **IF DISINFECTING**, add 750 mL of either Renalin or MinnCare to the **Tank**.

- **IF CLEANING**, add 1 lb or 454 grams of either Low pH (*BWI-1000*) or High pH (*BWI-2000*) cleaner to the Tank. If using a *graduated cylinder measure*, 340 mL of Low pH cleaner (*BWI-1000*) and 490 mL for High pH cleaner (*BWI-2000*).

9. After circulating for a few minutes verify the strength of the chemical in the Tank using appropriate medium for chemical used.

- **IF DISINFECTING**, a 1% Peracetic acid test strip should be used to verify that the solution returning back to the **Tank** is at 1%.
- **IF CLEANING**, verify the pH of the chemical used by checking the solution returning back to the **Tank**. For Low pH cleaner the pH should read less than 3 pH units. For High pH cleaner the pH should read greater than 9 pH units.

10. Circulate for an additional 15 minutes.

11. After the 15 minute circulation, turn the **RO OFF**.

- Turn the **OPER-DISINFECT-OFF Switch** to **OFF**.
- **IF DISINFECTING**, let dwell for a minimum of 2 hours.
- **IF CLEANING**, no recommended dwell time is required.



WARNING

When performing following instructions, the hoses connected to the Tank will contain chemical solution. When each hose is disconnected, the solution will drain from the hose. Use either a disposable container to collect the solution as it drains, or hold the end of each hose in an elevated position which will cause the solution to drain to the Tank. Take appropriate safety measures to avoid injury from splash and spills.

12. Prepare to Rinse.

- a. Close the **RO Pump's Clean/Disinfect Valve** and the **Tank's Bottom Valve**.
- b. Disconnect **Hose#3** from the **RO Pump's Clean/Disinfect Valve** and run to drain.
- c. Open the **Tank's Bottom Valve** to drain the **Tank**, closing it once empty.

13. First Rinse.

- a. Disconnect **Hose#1** from **Tank** and put to drain.
- b. Disconnect **Hose#2** from **RO's "To Drain" Connection** and reconnect the **RO's Drain Hose** to that connection.

c. Start the **RO** and allow to rinse for 30-45 minutes.

- Turn the **OPER-DISINFECT-OFF Switch** to **OPER**
- Turn **OPER-DISINFECT Keyed Switch** to **OPER**
- Turn **OPER-FLUSH Switch** to **OPER**

- Press the **ALARM RESET Button** if alarm sounds.

* Once the RO is in good water quality it will begin to rinse.



14. First Check for Residuals.

- **IF CLEANING**, verify that the pH from the product returns to baseline pH that was observed before cleaning. If any chemical detected, continue rinsing until clear.
- **IF DISINFECTING**, verify that the chemical has been rinsed out from the product, use a residual test strip. If the residual test strip shows a positive reading, continue rinsing to drain until a negative reading is obtained.

15. **IF DISINFECTING**, turn the **RO OFF** for a **Rebound Break**.

- a. Turn the **OPER-DISINFECT-OFF Switch** to **OFF**.

A Rebound Break is for 15-20 minutes, and is highly recommended as some residual chemical could still be present in the membranes even if a negative result was obtained during rinsing. After the rebound break time has been completed (15-20 min), restart the RO in normal Operate



mode again and recheck for Residual. If the residual is positive, continue to rinse until a negative result is achieved. Once the residual is negative, turn the RO OFF and allow for another Rebound Break of 15-20 minutes. Turn the RO ON, and re-check for residual. Repeat this process as many times as necessary until a negative residual is obtained after the residual break.

16. Final Rinse.

a. Restart the **RO** and run for 15 minutes.

- Turn the **OPER-DISINFECT-OFF Switch** to **OPER**
- Turn the **OPER-DISINFECT Keyed Switch** to **OPER**
- Turn the **OPER-FLUSH Switch** to **OPER**

- Press the **ALARM RESET Button** if the alarm sounds.

* Once the RO is in good water quality it will begin to rinse.



17. Final Check for Residuals.

- **IF DISINFECTING**, verify that the chemical has been rinsed out from the product, use a residual test strip. If the residual test strip shows a positive reading, continue rinsing to drain until a negative reading is obtained.

- **IF CLEANING**, verify that the pH from the product returns to baseline pH that was observed before cleaning. If any chemical detected, continue rinsing until clear.

18. Finalize.

a. Once the **RO** has been verified to be clear of chemicals turn the **RO OFF**.

- Turn the **OPER-DISINFECT-OFF Switch** to **OFF**.

b. Turn the **Reservoir's 3-Way Valve** back to "Tank", so RO product water goes to the Reservoir.

c. Disconnect **Hose#1** from the **Reservoir's 3-Way Valve**.

d. Open the **Control Box** and flip the **DIRECT-STBY-TANK Switch** to **TANK**.



e. Place the **RO** back into normal operating mode by turning the **OPER-DISINFECT-OFF Switch** to **OPER**.

* Press the **ALARM RESET** button if any alarms.

f. Once the **Tank** is empty, close the **Tank's Bottom Valve**.

- Disconnect, drain, and store all **Tank Hoses**.



WARNING

It is critically important that no residual chemicals are present before proceeding.

CLEANING and DISINFECTING PROCEDURE (Direct Feed)

The procedure below applies to the Low pH cleaning, High pH cleaning, and disinfection.

WARNING

**Chemical cleaners and disinfectants can cause serious injury or death.
Do not disinfect or clean the RO or Loop while patients are dialyzing.**

Proper protective equipment must be used.

The preparation and handling of these chemical solutions must be done in accordance with the specifications established for the particular chemical and their Material Safety Data Sheet (MSDS).

These procedures should be performed by trained and qualified technicians.

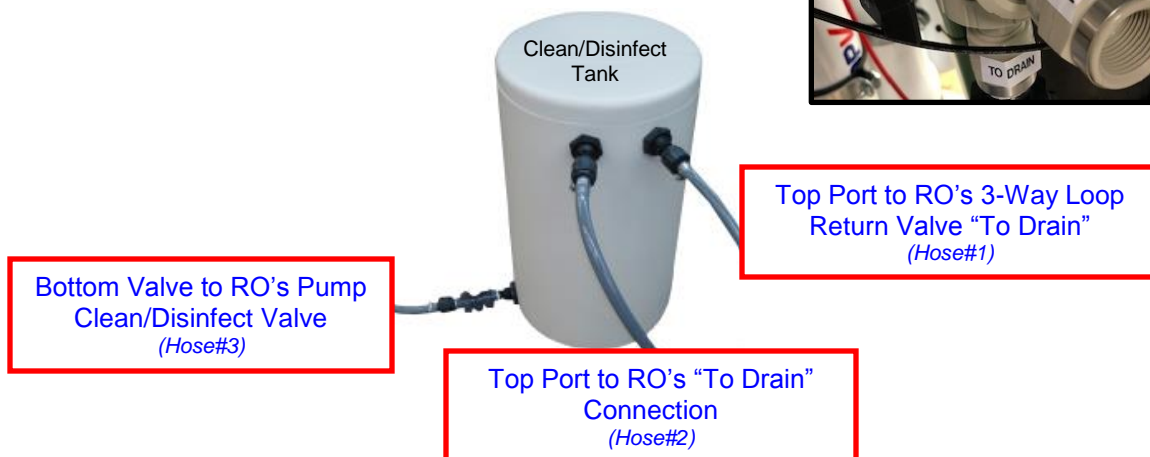
In general the steps for disinfecting and cleaning are same with the exception of the chemical used for each, and the type of test strips used to verify either the presence or absence of those chemicals. Depending on whether disinfecting or cleaning, a distinction is made in individual steps by prefacing either "**IF DISINFECTING...**" or "**IF CLEANING...**". Also the generic word "**chemical**" will be used to refer to either disinfectant if disinfecting or cleaner if cleaning.

In order to simplify the terminology used in this procedure the following terms will be used:

- The **Clean/Disinfect Tank** will be referred to as the **Tank**. It has two top connection ports and the bottom valve.

- There are three hoses supplied with the Tank which will referred to as follows:
 - **HOSE#1** – Tank Product Hose (*longest of the 3; ends: female & female*)
 - **HOSE#2** – Tank Drain Hose (*ends: male & male*)
 - **HOSE#3** – Tank Disinfect Hose (*ends: male & female*)

- A Direct Feed RO has a **3-Way Loop Return Valve** that Tank Feed RO's don't have. It is located in the center of the device underneath the hydroblock. It has two connection points labeled as "**LOOP RETURN**" and "**TO DRAIN**".



Better Water LLC; rev. May 2020

PROCEDURE

1. Place a warning placard stating “**DO NOT USE – CLEANING/DISINFECTING IN PROGRESS**”. End users should be notified as well that this procedures in in progress.
2. Prepare the **Tank**.
 - a. Open the **Tank’s Bottom Valve** so it can be rinsed.
 - b. Remove the cap on the **RO’s 3-Way Loop Return Valve “To Drain” Connection**.
 - c. Connect **Hose#1** from the **RO’s 3-Way Loop Return Valve’s “To Drain” Connection** to the **Tank’s Top Right Port**.
 - d. Turn **RO’s 3-Way Loop Return Valve** to “**TO DRAIN**”.
 - e. Start the **RO** in Operate Mode and rinse the **Tank** with RO product water.
 - Turn the **OPER-DISINFECT-OFF Switch** to **OPER**.
 - Turn the **OPER-DISINFECT Keyed Switch** to **OPER**.
 - Turn the **OPER-FLUSH Switch** to **OPER**.
 - * Press the **ALARM RESET Button** if the alarm sounds.
 - * Once the **RO** is in good water quality it will start to fill the **Tank**.
 - f. After rinsing the **Tank**, close the **Tank’s Bottom Valve**.
 - g. Fill the **Tank** with RO product water.
 - **IF CLEANING**, fill **Tank** with 15 gallons (approximately 14 inches.)
 - **IF DISINFECTING**, fill **Tank** with 20 gallons (approximately 18 inches).
 - h. Once the **Tank** has been filled, turn the **RO’s 3-Way Loop Return Valve** to “**LOOP RETURN**”.
3. Prepare **RO** and **Hoses**.
 - a. Disconnect the **RO’s Drain Hose** from the **RO’s “To Drain” Connection** and connect **Hose#2** from that connection to the **Tank’s Top Left Port**.
 - b. Connect **Hose#3** from the **RO Pump’s Clean/Disinfect Ball Valve** to the **Tank’s Bottom Valve**.
4. Prime **Hose#3**.
 - a. Loosen the Parker connection at the **RO Pump’s Clean/Disinfect Ball Valve**.
 - b. Open the **Tank’s Bottom Valve**, prime the hose, and then tighten the loosened Parker connection.
 - c. Open the **RO Pump’s Clean/Disinfect Ball Valve**.
 - **NOTE:** If this hose hasn’t been properly primed the pump will air lock and could cause damage to the pump.
5. Put the **RO** in disinfect mode.
 - Turn the **OPER-DISINFECT-OFF Switch** to **DISINFECT**.
 - Turn the **OPER-DISINFECT Keyed Switch** to **DISINFECT**.
 - Turn the **OPER-FLUSH Switch** to **OPER**.
 - * Verify flow by looking at the **Product and Reject Flow-Meters**, and visually see if water flowing back in to the **Tank** otherwise re-prime **Hose#3**. Also check for leaks and correct before proceeding.
6. **IF CLEANING**... before beginning cleaning, take a baseline pH reading from the product water returning into the **Tank** to compare to tests to follow.
7. Add the appropriate amount of chemical (*cleaner or disinfectant*).
 - **IF DISINFECTING**, add 750 mL of either Renalin or MinnCare to the **Tank**.
 - **IF CLEANING**, add 1 lb or 454 grams of either Low pH (*BWI-1000*) or High pH (*BWI-2000*) cleaner to the **Tank**. If using a *graduated cylinder measure*, 340 mL of Low pH cleaner (*BWI-1000*) and 490 mL for High pH cleaner (*BWI-2000*).
8. After circulating for a few minutes verify the strength of chemical in the **Tank** using appropriate medium for chemical used.



- **IF DISINFECTING**, a 1% Peracetic acid test strip should be used to verify that the solution returning back to the **Tank** is at 1%.
- **IF CLEANING**, verify the pH of the chemical used by checking the solution returning back to the **Tank**. For Low pH cleaner the pH should read less than 3 pH units. For High pH cleaner the pH should read greater than 9 pH units.

9. Circulate for an additional 15 minutes.

10. After the 15 minute circulation, turn the **RO OFF**.

a. Turn the **OPER-DISINFECT-OFF Switch** to **OFF**.

- **IF DISINFECTING**, let dwell for a **minimum of 2 hours**.
- **IF CLEANING**, no recommended dwell time is required.



WARNING

When performing following instructions, the hoses connected to the Tank will contain chemical solution. When each hose is disconnected, the solution will drain from the hose. Use either a disposable container to collect the solution as it drains, or hold the end of each hose in an elevated position which will cause the solution to drain to the Tank. Take appropriate safety measures to avoid injury from splash and spills.

11. Prepare to Rinse.

a. Close the **RO Pump's Clean/Disinfect Valve** and the **Tank's Bottom Valve**.

b. Disconnect **Hose#3** from close the **RO Pump's Clean/Disinfect Valve** and run to drain.

c. Open the **Tank's Bottom Valve** to drain the **Tank**, closing it once empty.

12. First Rinse.

a. Turn the **RO's 3-Way Loop Return Valve** to "**TO DRAIN**".

b. Disconnect the **Hose#1** from the **Tank** and place to drain.

c. Disconnect **Hose#2** from the **RO's "To Drain" Connection** and reconnect the **RO's Drain Hose** to that connection.

d. Start **RO** and allow to rinse for 30-45 minutes.

- Turn the **OPER-DISINFECT-OFF Switch** to **OPER**
- Turn the **OPER-DISINFECT Keyed Switch** to **OPER**
- Turn the **OPER-FLUSH Switch** to **OPER**
- Press the **ALARM RESET Button** if the alarm sounds.

* Once the RO is in good water quality it will begin to rinse.



13. First Check for Residuals.

- **IF DISINFECTING**, verify that the chemical has been rinsed out from the product, use a residual test strip. If the residual test strip shows a positive reading, continue rinsing to drain until a negative reading is obtained.

- **IF CLEANING**, verify that the pH from the product returns to baseline pH that was observed before cleaning. If any chemical detected, continue rinsing until clear.

14. Second Rinse.

a. Turn **OPER-DISINFECT-OFF Switch** to **OFF**.

b. Turn the **RO's 3-Way Loop Return Valve** to "**LOOP RETURN**".

c. Start **RO** in and allow to rinse for 15 minutes.

- Turn the **OPER-DISINFECT-OFF Switch** to **OPER**
- Turn the **OPER-DISINFECT Keyed Switch** to **OPER**
- Turn the **OPER-FLUSH Switch** to **OPER**



- Press the **ALARM RESET Button** if the alarm sounds.
- * Once the RO is in good water quality it will begin to rinse.

15. Second Check for Residuals.

- **IF CLEANING**, test for the absence of chemical before proceeding. Verify that the pH from the product returns to baseline pH that was observed before cleaning. If any chemical detected, continue rinsing until clear.
- **IF DISINFECTING**, verify that the chemical has been rinsed out from the product, use a residual test strip. If the residual test strip shows a positive reading, continue rinsing to drain until a negative reading is obtained.

16. IF DISINFECTING, turn the RO OFF for a Rebound Break.

a. Turn the **OPER-DISINFECT-OFF Switch** to **OFF**.

A Rebound Break is for 15-20 minutes, and is highly recommended as some residual chemical could still be present in the membranes even if a negative result was obtained during rinsing. After the rebound break time has been completed (15-20 min), restart the RO in normal Operate mode again and recheck for Residual. If the residual is positive, continue to rinse until a negative result is achieved. Once the residual is negative, turn the RO OFF and allow for another Rebound Break of 15-20 minutes. Turn the RO ON, and re-check for residual. Repeat this process as many times as necessary until a negative residual is obtained after the residual break.



17. Final Rinse.

a. Turn the RO's 3-Way Loop Return Valve to "To Drain".

b. Restart the RO and run for 15 minutes.

- Turn the **OPER-DISINFECT-OFF Switch** to **OPER**
- Turn the **OPER-DISINFECT Keyed Switch** to **OPER**
- Turn the **OPER-FLUSH Switch** to **OPER**
- Press the **ALARM RESET Button** if the alarm sounds.
- * Once the RO is in good water quality it will begin to rinse.



18. Final Check for Residuals.

- **IF DISINFECTING**, verify that the chemical has been rinsed out from the product, use a residual test strip. If the residual test strip shows a positive reading, continue rinsing to drain until a negative reading is obtained.
- **IF CLEANING**, verify that the pH from the product returns to baseline pH that was observed before cleaning. If any chemical detected, continue rinsing until clear.

19. Finalize.

a. Once the RO has been verified to be clear of chemicals turn the RO OFF.

- Turn the **OPER-DISINFECT-OFF Switch** to **OFF**.

b. Remove **Hose#1** from RO's 3-Way Loop Return Valve and put cap back on.

c. Place the RO back into normal operating mode by turning the **OPER-DISINFECT-OFF Switch** to **OPER**.

- * Press the **ALARM RESET** button if any alarms.

d. Once the **Tank** is empty, close the **Tank's Bottom Valve**.

- Disconnect, drain, and store all **Tank Hoses**.



WARNING

It is critically important that no residual chemicals are present before proceeding.

SYSTEM MAINTENANCE

USER ADJUSTMENTS

On occasion, the RO may require adjustments that can be performed by **qualified operators**. There are many factors that can affect the performance of the RO. If minor adjustments to the RO do not produce the desired results, investigate changes in the water feeding the RO.

Water pH, temperature, pressure, TDS, and flow changes can cause a reduction in the RO performance. **In worst case situations**, changes to the tap water can create conditions the RO cannot handle without supplemental water treatment.

CAUTION

Only qualified RO operators should make adjustments to the unit.

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

While making adjustments, the RO must be running with no alarm conditions indicated.

The inlet water temperature must be 50-92°F with 77°F being optimum. The temperature must be measured while the RO is in normal operation. The RO inlet water pressure must be between 20 and 90 psi (optimum 40 psi) while flowing at the rate specified for this unit. See Unit Specification Sheet.

USER ADJUSTMENTS: PRODUCT and REJECT FLOW

Peak efficiency for the RO is based on the Product and Reject Flow. The Reject & Product Adjustment T-Handle located on the front of the RO is used to make this adjustment. This procedure describes how to adjust both Product and Reject Flow.



1. Locate the Reject & Product T-Handle on the front of the RO panel, which adjusts the Reject/Product Regulating Valve.
2. Slowly turn the T-Handle either clockwise or counter-clockwise adjust the flows. The goal is to balance or get the product and reject flows as close as possible.
 - Examples: **Product Flow = 5.0 gpm; Reject Flow = 5.0 gpm; Recovery = 50%**
 See *Membrane Array Flow Rate Specifications* section for designed flow rates.
3. After the Reject and Product Flows have been balanced, perform a Quality Assurance Check on the RO to insure all pressures and flows are within design specifications.

USER ADJUSTMENTS: RECIRCULATION FLOW

The recirculate flow is adjusted by turning the Recirculate Adjustment T-handle located on the front of the RO. Recirculate flow is increased by turning the T-handle clockwise, and decreased by turning it counter-clockwise. See *Membrane Array Flow Rate Specifications* section for designed flow rates.



USER ADJUSTMENTS: MEMBRANE PRESSURE

The membrane pressure can be adjusted by opening and closing the Pump/Membrane Adjustment Valve located near the pump.

USER ADJUSTMENTS: REJECT PRESSURE

There is **no** reject pressure adjustment on this RO. The Reject Pressure is used solely to monitor the pressure drop across the membrane.

USER ADJUSTMENTS: PRODUCT PRESSURE

If a Tank Feed System, there are **no** requirements to adjust the Product Pressure.

For Direct Feed Systems the Product Pressure should be adjusted only when there are no requirements for RO water.

1. Locate the Pressure Bypass T-handle at the end of the distribution loop (return to RO).
2. Turn the T-handle clockwise to increase product pressure, and counter-clockwise to decrease product pressure.
 - Maximum product pressure is 70 psi.
 - Product pressure must be greater than feed water/Pre-Filter out pressure to the RO.Adjustments on feed water pressure may be required before attempting to adjust product pressure.

MAINTENANCE SCHEDULE							
MAINTENANCE TASKS	Each Shift	Daily	Weekly	Monthly	3 Months	6 Months	Other
Check the system for leaks	X	X					Visual inspection
Monitor the system for unusual sounds	X	X					Auditory inspection
Clean external surfaces; - Use a soft damp cloth. Do not use bleach.			X				Use a soft, damp towel or sponge. DO NOT USE BLEACH.
Perform a low pH cleaning and disinfection. - See "General Cleaning and Disinfecting Information" section				X			
Perform a low pH cleaning, high pH cleaning, and disinfection. - See "General Cleaning and Disinfecting Information" section					X		
Verify Water Quality Monitor Board, calibrating if necessary - See "System Maintenance" section				X			
Verify Flush Timer day and time setting - See "System Maintenance" section				X	X		
Change 5 micron Pre-Filter - See "System Maintenance" section				X			Change every 30 days or when the ΔP reaches or exceeds 15 psi.
Change .03 micron Final Filter - See "System Maintenance" section						X	Change every 6 months or when the ΔP reaches or exceeds 15 psi.
Change Membranes - See "System Maintenance" section							Every 3-5 years, or when low flow rates are experienced, or percent rejection drops below operational parameters.
Perform chemical, microbial, and endotoxin testing on feed and product water as per AAMI requirements. Submit to a qualified testing laboratory.							Annually, or more often as needed.

NOTE

The maintenance schedule is merely a recommendation by Better Water, but it is up to the discretion of the Medical Director of the facility as to when they are performed, which may be more often or less often at their discretion as circumstances and company policy dictate.

SYSTEM MAINTENANCE: Digital Flush Timer, Standard Operation

Normally, the Reverse Osmosis Machine Membranes should be flushed multiple times per day and for only 15 minutes per flush.

- If your operation is considered less than normal (*less than 6 days a week operation*), the FREQUENCY of the FLUSH CYCLE should be set to occur more often. In this case, we recommend that the FREQUENCY of the FLUSH CYCLE should be set to occur (*at a minimum*) once every four hours for 15 minutes per flush cycle.

- If you should elect to operate the clinic (*water treatment system*) on an unscheduled basis, there would be no problem, because the OPERATE-FLUSH switch controls the Flush Timer. In other words, the Flush Timer would be inactivated when the OPERATE-FLUSH switch is in the OPERATE position, and when the OPERATE-FLUSH switch is returned to the FLUSH position, the FLUSH TIMER would be reactivated. In either position of the OPERATE-FLUSH switch, the FLUSH TIMER CLOCK would continue to keep the correct time of the day; however, the position of the OPERATE-FLUSH switch would determine if a flush of the membranes would occur or not.



part#
ELPWSW00991
24V Digital Flush Timer

CAUTION

The time that a FLUSH CYCLE is scheduled should not coincide with the backwash or regeneration of any pre-treatment component. If the two should occur simultaneously, it could trigger a LOW PRESSURE ALARM due to insufficient water pressure and insufficient quantity being available to meet the demand. If an interlock is already initiated the RO will be shutdown, and therefore couldn't go into flush.

SYSTEM MAINTENANCE: Replace Digital Flush Timer Battery

WARNING

Electrical Hazard
The RO Control Box has 24 VAC

It is recommended that operators verify the time and day at least monthly. The digital flush timer is equipped with a **Lithium CR2032** battery. If the battery fails, it should be replaced.

1. Remove the 4 amp fuse (*in black fuse holder*) inside the Control Box. This will disconnect all 24 volt power from the Control Box.
2. Remove the Timer from the Control Box Back Plate by removing the white plastic retainers threaded onto the threaded studs in the corners of the timer.
3. It is not necessary or recommended that the wires be disconnected from the timer.
4. Gently pull the timer straight out, without putting undue strain on the wires. Gently turn the timer so the back is facing out.
5. The battery is located on the back of the timer.

6. With a coin or screwdriver, open the battery compartment and remove the old battery.
7. Replace the battery (**Lithium CR2032**), taking care to insert the new battery properly.
8. Replace the battery cover.
9. Gently put the timer back on the 4 retaining threaded studs and replace the white plastic threaded retainers.
10. Replace the 4 amp fuse.
11. With a pin-small pointed object screwdriver blade-paperclip push the **RESET button** to do a complete reset.
12. Set the clock and re-program all flush cycles.

SYSTEM MAINTENANCE: Set Digital Flush Timer Current Day and Time

1. Press and HOLD the **CLOCK button** while doing the following
2. Press the **DAY button** to scroll through the day options until the desired day is displayed
3. Press the **HOURL button** to scroll through the hour options until the desired hour is displayed
4. Press the **MIN button** to scroll through the minute options until the desired minute is displayed
5. When set to correct day, hour, and minute, Release the **CLOCK button**

* **NOTE:** *This Timer Does Not Have a Daylight Savings Time feature. If you are in an area that recognizes the time change twice a year, you will need to reset the timer at each time change.*

SYSTEM MAINTENANCE: Set Digital Flush Timer Flush Frequency

1. Decide the frequency the RO will be flushed.
 - This timer has the capacity to program up to eight different flush day and time combinations if needed, but the recommended is only 6 times.
 - The recommended minimum flush time should not be less than 15 minutes.
2. Press the **TIMER button**. The display should read **1 ON --:--** or **1 ON** and a time if previously set.
 - *The 1 denotes that this is the first of eight possible programmable flush settings. The ON denotes the start or time the flush will begin.*
3. Press the **DAY button** to scroll the multiple day options available. The only option strongly recommended by Better Water, LLC is the **7 days, Mo, Tu, We, Th, Fr, Sa, Su** option since the flush mode directly affects the RO's performance.
4. Press the **HOURL button** to scroll through the hour options until the desired hour is displayed.

5. Press the **MIN button** to scroll through the minute options until the desired minute is displayed.
6. Press the **TIMER button**. The display should read **1 OFF --:--** or **1 OFF** and a time if previously set.
 - The 1 denotes that this is the first of eight possible programmable flush settings. The OFF denotes the end or the time the flush will stop.
7. Press the **DAY button** to scroll the multiple day options available. The only option strongly recommended by Better Water, LLC is the **7 days, Mo, Tu, We, Th, Fr, Sa, Su** option since the flush mode directly affects the RO's performance.
8. Press the **HOURL button** to scroll through the hour options until the desired hour is displayed.
9. Press the **MIN button** to scroll through the minute options until the desired minute is displayed.
 - **Verify that there is at least a 15 minute difference between the ON and OFF times.**

* To program other flush mode day(s) and times simply press the **TIMER button** to set the other ON and OFF flush mode programs, then follow the same instructions above starting with step #2 to set the days and start and end times.

EXAMPLE: If the timer is set as follows:

1 ON 08:00 AM Mo Tu We Th Fr Sa Su

1 OFF 08:15 AM Mo Tu We Th Fr Sa Su

- In this example, the first flush program for the RO is set to start flush mode every day of the week at 8:00 am and end at 8:15 am.

- If a second flush time is needed, the program would be as follows:

2 ON 03:00 PM Mo Tu We Th Fr Sa Su

2 OFF 03:15 PM Mo Tu We Th Fr Sa Su

- In this example, the second flush program for the RO is set to start flush mode every day of the week at 3:00 pm and end at 3:15 pm.

It is recommended that the RO should go into a Flush cycle 6 times per day. This covers three day/week operations and six day/week operations when the RO is not in regular use. Up to eight time intervals can be set, but 6 is recommended.

It is also recommended that the RO not be set to flush during the regularly scheduled backwash or regeneration of filters and softeners. If the timer is set during these times, the Interlock System will prevent the RO from running, (or will shut down the RO). If the RO does not get a proper and regular FLUSH, fouling of the RO membranes or Low Pressure Alarms can occur.

SYSTEM MAINTENANCE: Perform a Manual Flush using the Digital Flush Timer

This timer has a Manual Flush Feature. When the MANUAL button on the flush timer is pressed a horizontal-indicator line on the LCD display above the ON - AUTO - OFF will change positions to indicate which mode it is in. Each time the MANUAL button is pressed the horizontal-indicator line moves to indicate what mode the timer is in.

1. Set the following RO switches:

- Turn the **OPERATE-DISINFECT-OFF Switch** to **OPERATE**
- Turn **OPERATE-DISINFECT Key Switch** to **OPERATE**
- Turn the **OPERATE-FLUSH Switch** to **FLUSH**



- Then push the **ALARM RESET Button** to start the RO.

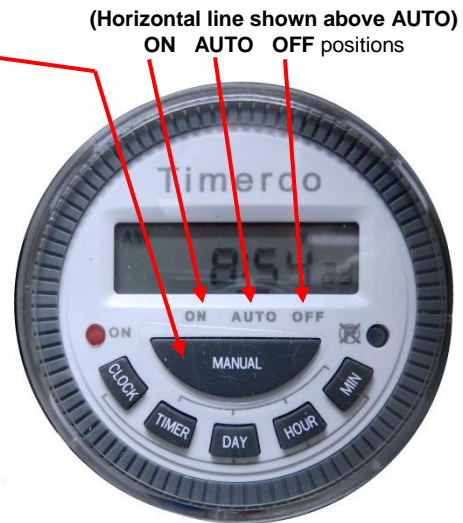


2. Push the **MANUAL button** on the flush timer.
 - The horizontal line in the display should be above **ON**. *If not continue pressing the MANUAL button until the horizontal-indicator line is above ON.*

3. The RO will start a Flush cycle. (*This will be indicated on the timer display and RED indicator light on the timer*)

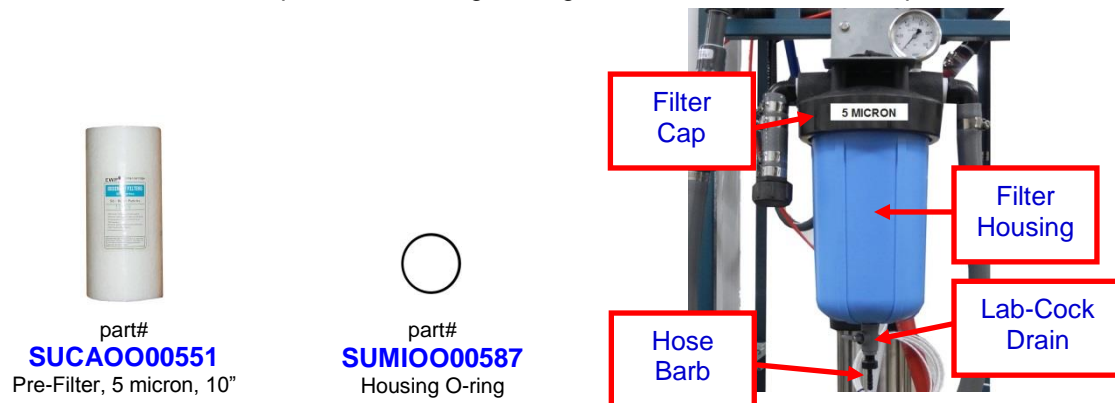
4. To terminate the Manual Flush Mode, push the **MANUAL button** twice or until the horizontal-indicator line is above **OFF**.

5. Push the **MANUAL button** once more so the horizontal-indicator line is above **AUTO**. **NOTE: if the horizontal-indicator line in the LCD display is not above AUTO, the RO will not flush automatically in FLUSH MODE.**



SYSTEM MAINTENANCE: Change 5 micron, 10" Pre-Filter

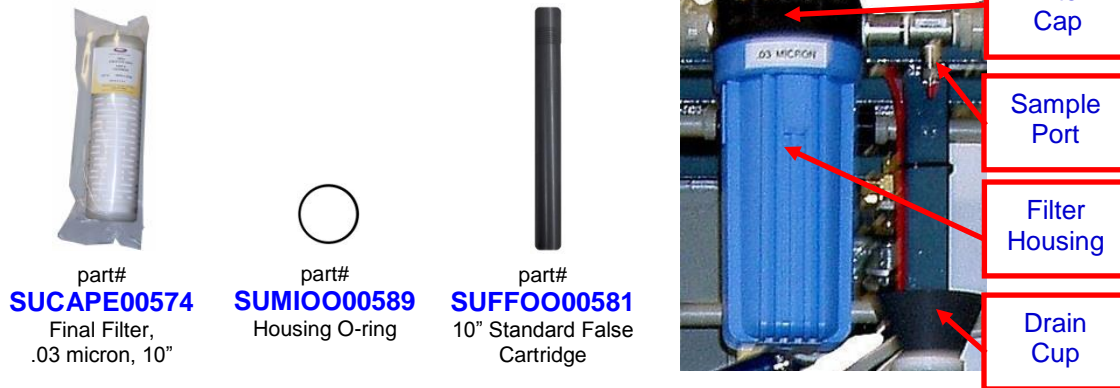
Better Water LLC, recommends that the 5 micron filter be changed monthly or when the ΔP reaches or exceeds 15 psi. The housing O-Ring should be examined and replaced if necessary.



1. Turn the RO OFF.
2. Close the valve from the Pre-Treatment to the RO Pre-Filter to stop water flow to the RO.
3. Either place a container under the Pre-Filter Housing Lab-Cock or attach a drain-tube from the Hose Barb on the Lab-Cock on the Pre-Filter Housing to a container or drain.
4. Open the Lab-Cock to allow water to begin to drain from the filter housing.
5. Using a filter wrench, loosen the filter housing just enough to allow air to enter the housing which will result in a greater flow of water draining from the housing.
6. Allow all the water to drain from the housing.
7. Unscrew the filter housing to remove it.
8. Remove the old filter, remove the new filter's plastic covering, and then place in the housing.
9. Carefully re-seat the filter housing to the mount, and screw in to tighten, making sure the O-Ring is properly seated.
- Use the filter wrench to tighten, but do not over tighten.
10. Close the Lab-Cock on the bottom of the Pre-Filter Housing.
11. Open the valve from the Pre-Treatment to the RO Pre-Filter to allow water flow to the RO.
12. Slowly open the Lab-Cock for several seconds to verify water is flowing into the housing and purge some of the trapped air.
13. Close the Lab-Cock and check for leaks, tightening the housing with the wrench if necessary.
14. Remove the container from under the housing or the drain-tube from the Lab-Cock.
15. Start the RO and allow to run for a few minutes to verify water flow and check for leaks around the Pre-Filter Housing, then turn the RO OFF.
16. The filter is now ready for use.

SYSTEM MAINTENANCE: Change .03 micron, 10" Final-Filter

Better Water LLC, recommends that the .03 micron filter be changed every 6 month. The housing O-Ring should be examined and replaced if necessary.



1. Turn the RO OFF.
2. Slowly open the Sample Port after the Final Filter Housing to allow water to begin to drain from the filter housing.
3. Allow as much water as will to drain from the housing, and then close the Sample Port.
4. Using a filter wrench, slowly unscrew the filter housing to remove it.
- **NOTE:** It will still be full of water, which should be discarded.
5. Remove the old filter and replace with a new filter.
6. Carefully re-seat the filter housing to the mount, and screw in to tighten, making sure the O-Ring is properly seated.
- Use the filter wrench to tighten, but do not over tighten.
7. Start the RO and allow to run for a few minutes to verify water flow and check for leaks around the Pre-Filter Housing.
8. Slowly open the Sample Port for several seconds to verify water is flowing into the housing and purge the trapped air.
9. Close the Sample-Port and check for leaks, tightening the housing with the wrench if necessary.
10. Perform a disinfection of the RO.
13. The filter is now ready for use.

NOTE: Older model 2020 ROs had a capsule filter as the final filter. See the part number to the right if ordering a replacement.

To replace, simply disconnect the fittings on the filter's inlet and outlet connections, removing the old filter, and replacing it with a new one.

part#
SUCAPE00547
Capsule Filter,
.03 micron, 10"



SYSTEM MAINTENANCE: Change Membranes and O-Rings

Better Water LLC, recommends that the membranes be changed if low flow rates or percent of rejection fall below operational parameters after cleaning.

The life of an RO membrane is dependent on many factors such as feed water quality, properly operating pre-treatment and routine maintenance such as membrane cleanings and disinfections.

Normally, you can expect the membranes to last from 3-5 years or more. Eventually, you will need to replace membranes and the following should be used as a guide for this procedure.

CAUTION

Failure to follow these instructions can result in voiding the membrane warranty.

NOTE

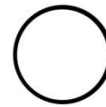
It is recommended that the O-Rings be replaced when the membranes are replaced, and that medical grade glycerin be used as a lubricate because of its water-solubility.



part#
SUMEM008
4" x 40" Membrane



part#
EQFHOO00911
Inner End-Cap O-ring



part#
EQFHOO01587
Outer End-Cap O-ring

For Older Model ROs:

RO models manufactured prior to September 2006 were made with different membrane housings than the fiberglass ones used currently. If ordering replacement membranes and O-rings for these ROs call Technical Support for assistance.

WARNING

Membranes are packed in a chemical preservative which must be handled in accordance with their Material Safety Data Sheet (MSDS) available on our website.

Proper protective equipment must be used.

These procedures should be performed by trained and qualified technicians.

PREPARATION

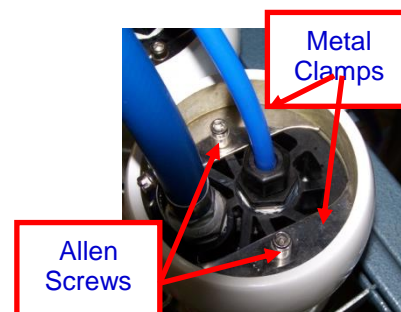
1. Make sure that there are no requirements for RO water (*no patients are dialyzing*).
2. Turn the RO OFF and unplug or disconnect from the main power source.
3. Turn OFF the **RO Inlet Valve from the Pre-treatment**.
4. Depress the red pressure relief button on the Big Blue Pre-Filter to the RO to relieve the pressure.

UNPACK MEMBRANES

5. Open and unpack the membranes from their shipping cartons.
6. **Verify Correct Membranes**
 - Before opening the boxes of the new membranes, verify that they are the correct membranes for your RO.
 - **If they are not the correct membranes, DO NOT ATTEMPT to install them.**
 - A “**RO MEMBRANE**” label should be adhered to the box. This label will have a received date. Membrane is good for one year from this date.
 - Each membrane is also labeled with an individual serial number which should be recorded and also noted in which membrane housing the specific membrane will be installed.
7. **Open and Unpack the New Membrane**
 - Open the membrane box.
 - If the membrane was ordered with adapters which are required for older model housings, these adapters will be in one end of the box, so don't discard the box without retrieving these.
 - Remove the bagged membrane from the box discarding the packing material.
 - Do not open the bag containing the membrane

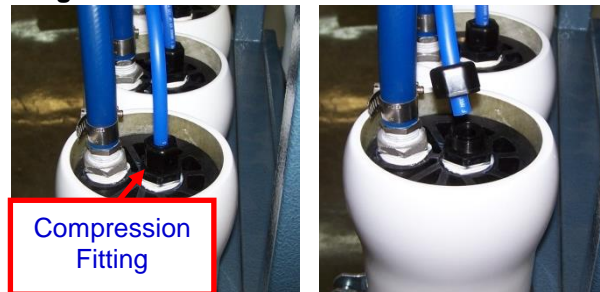
REPLACE MEMBRANES**8. Remove the end-cap clamps**

- On the top of the membrane housing, locate the 2 metal clamps that secure the membrane end cap.
- Loosen and/or remove the Allen Screws securing the end cap. There are 2 clamps and Allen screws on each end cap.
- After removing the Allen Screws (or loosening them enough for the clamps to be removed, slide the clamps toward the center of the membrane housing until they are released from the groove in the membrane housing.



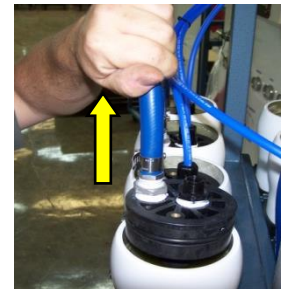
9. Remove the Compression nut and Blue Tubing.

- Locate and loosen the compression nut on the top of the end cap that secures the blue tubing.
- It is only necessary to remove the outermost nut, and this should only be hand tight.
- It is NOT necessary to remove the entire compression fitting from the end cap.
- Remove the Compression nut, leaving it attached to the blue tubing.
- Move this tubing out of the way.



10. Remove the End Cap

- With the metal clamps and smaller blue tubing removed, grasp the larger blue hose and firmly wiggle the hose and end cap back and forth while pulling up to remove the end cap from the housing.
- Move the end cap (still attached to the blue hose) out of the way.
- **NOTE:** If the end cap is too tight and will not move, refer to **Alternate Membrane End Cap Removal Procedure**, detailed below.



11. Remove the Old Membrane

- Reach into the membrane housing and grasp the membrane by the membrane adapter and gently pull the membrane out of the housing and discard.
- It may be necessary to grasp the membrane adapter or one of the "spokes" with a pair of needle nose pliers to pull it out.



12. Install the New Membrane

- **CAUTION: As stated before, the new membrane is packed in a liquid preservative, so take caution in handling to prevent slippage and exposure to prevent injury.**
- This preservative can be drained from the packaging into a suitable container and transferred to a drain, or...
- This preservative can be poured into the membrane housing as the membrane is being installed.
- **Install new spacer adapters into each end of the membrane if required, based on the membrane housing.**
- Hold the membrane, *still in the foil bag*, upright above the membrane housing, with the open end of the foil bag down.
- **Slowly and gently** allow the membrane to slide through the foil bag and into the membrane housing.
- **CAUTION: DO NOT allow the membrane to quickly drop into the membrane housing, as this can cause damage to the membrane adapter.**

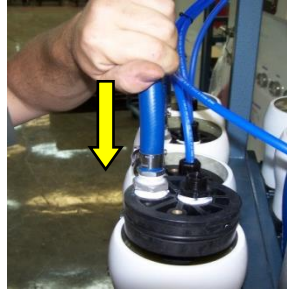


13. Lubricate the End Cap

- Apply lubricant to the outer O-Rings of the end cap.
 - Glycerin is recommended, KY Jelly can also be used
 - **DO NOT USE VASELINE, PLUMBER'S GREASE OR SILICONE GREASE.**

**14. Re-Install the End Cap**

- Line up the end cap so the membrane adapter fits into the center hole in the end cap.
- Push end cap down until it seats securely and the groove in the membrane housing is visible.

**15. Re-Install the End Cap Clamps**

- Lay the metal clamps in place and slide them toward the outside until they seat in the grooves in the membrane housing.
- Line up the metal clamps so the Allen screws will line up with the brass threaded part in the end cap.
- Tighten the Allen screws securing both metal clamps.

**16. Re-Install the blue tubing and the compression nut**

- Insert the blue tubing into the compression socket and tighten the compression nut.
- Only tighten the compression nut **HAND TIGHTEN - DO NOT USE A WRENCH**, making sure not to cross thread.



- 17. Repeat the preceding steps for each membrane to be replaced.**

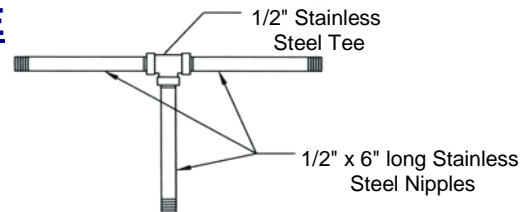
AFTER REPLACEMENT

- 18. After installation of all membranes, the RO should be started and the Product Water flushed to drain for a minimum of 2 hours.**

ALTERNATE MEMBRANE END-CAP REMOVAL PROCEDURE, USING "TEE-HANDLE TOOL"

NOTE
It is recommended that a "Tee-Handle Removal Tool" be fabricated to facilitate membrane removal.

NOTE



After the RO has been in use for several years, you may find it difficult to remove the end cap by just pulling on the blue hose in which case follow the following steps:

1. After removing the metal clamps and the compression nut securing the blue tubing, remove the compression fitting that is threaded into the end cap by using a socket wrench.



2. Remove any excess Teflon tape from the socket that may have been left.



3. Insert a "Tee Handled Removal Tool" into the end cap, where the compression fitting was.

- CAUTION: DO NOT OVERTIGHTEN the stainless steel nipple, as this can crack or split the end cap.
- Only thread the nipple in a few turns or until it is snug.



4. Grasp the Tool and move it back and forth while pulling upward to break the end cap loose and remove it.

5. Clean any old Teflon tape and/or pipe dope from the compression fitting that was removed.

- Wrap only 3-4 wraps of new Teflon tape on the threads of the compression fitting.
- Apply a very small amount of Teflon pipe dope to the threads/tape.
- Re-install compression fitting in the end cap, being extremely careful not to over-tighten as this can crack or split the end cap.



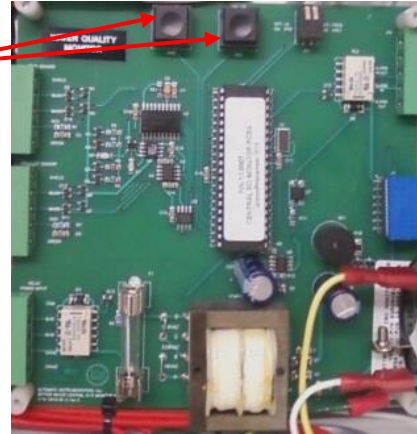
SYSTEM MAINTENANCE: Factory Reset the Water Quality Monitor Board

1. Turn the **OPERATE-DISINFECT-OFF Switch** to **OFF**.



2. Open the Control Box.

3. Locate the two small black square push buttons on the water quality board, labeled **CAL UP** and **CAL DOWN**.



4. Push in **CAL UP** and **CAL DOWN** black buttons simultaneously and hold them for five seconds, while continuing to hold them in.

5. Turn the **OPERATE-DISINFECT-OFF Switch** to **OPERATE**, and press the **ALARM RESET Button**, while continuing to hold both black buttons.



6. Release both black buttons, after five seconds.

7. Turn the **OPERATE-DISINFECT-OFF Switch** to **OFF**, and wait 5-10 seconds.



8. Turn the **OPERATE-DISINFECT-OFF Switch** to **OPERATE**.



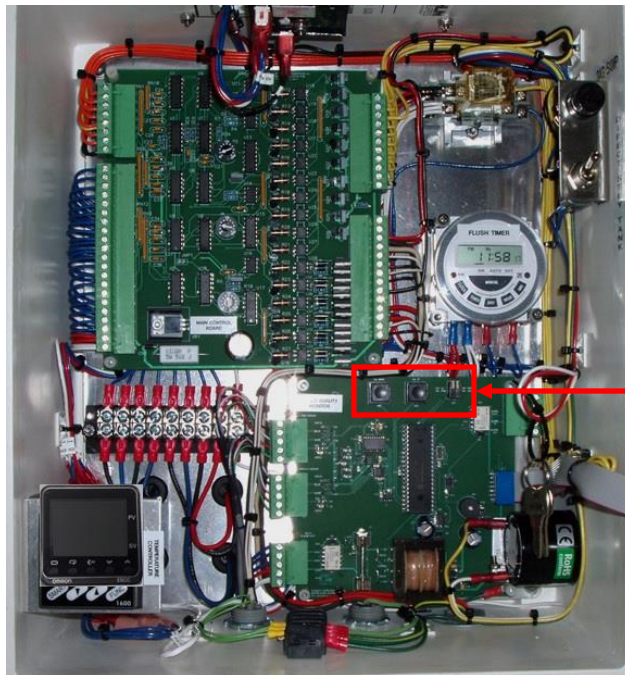
9. Close the Control Box.

*** The RO Control Board has now been factory reset.**

SYSTEM MAINTENANCE: Calibration of the Water Quality Monitor Board

The Water Quality Monitor Board is calibrated at the factory, and if replaced will need to be re-calibrated. This requires the use of a Hand-Held TDS Meter, and calibrated **NaCl Solution (not 442 solution)**. Follow the instructions specific to the TDS Meter. This procedure is the same for setting the display to read in PPM or μS .

1. With the RO running, record the readings as displayed on Water Quality Monitor; record % Rejection, Feed TDS and Product TDS.
2. Take a sample from the Feed Water (somewhere in Pre-Treatment) and determine the TDS with the Hand Held Meter. Record this reading. (This is Feed TDS reading from the Hand Held Meter.)
3. With the RO running, take a Product Water sample from the sample port on the top left side of the RO and determine the TDS with the Hand Held Meter. Record this reading. (This is the Product TDS reading from the Hand Held Meter.)
4. Compare the Feed & Product TDS readings from the RO to the Feed & Product TDS readings of your Hand Held Meter. If the readings are the same, no calibration is needed. If the readings are different, proceed as follows:
5. Verify the setting of the **DIP Switches**:
 - **Left DIP Switch** should be in the **ON position (pushed back)** for PPM reading, or in the **OFF position (pulled forward)** for μS .
 - **Right DIP Switch (Prod/Rej)** should always be in the **ON position (pushed back)**.
6. Locate the **CAL DOWN & CAL UP Buttons** on the Water Quality Monitor Board.



To Calibrate FEED TDS

1. With the RO running, press the **MODE Switch** on the Water Quality Monitor until “**FEED TDS**” is displayed.
2. Press the **CAL DOWN** or **CAL UP Buttons** until the reading displayed matches the reading from the Hand Held Meter.
3. Once this is set, push the **MODE Switch** until %Rejection is reading “**CAL**”. *The new setting will only be saved if “CAL” is displayed on %Rejection.*
4. Verify the setting of the **DIP Switches**:
 - **Left DIP Switch** should be in the **ON position (pushed back)** for PPM reading, or in the **OFF position (pulled forward)** for μS .
 - **Right DIP Switch (Prod/Rej)** should always be in the **ON position (pushed back)**.

To Calibrate PRODUCT TDS

1. Press the **MODE Switch** on the Water Quality Monitor until **PRODUCT TDS** is displayed.
2. Press the **CAL DOWN** or **CAL UP Buttons** until the reading displayed matches the reading from the Hand Held Meter.
3. Once this is set, push the **MODE Switch** until %Rejection is reading “**CAL**”. *The new setting will only be saved if “CAL” is displayed on %Rejection.*

To Verify % REJECTION

The Water Quality Monitor Control Board automatically calculates the % Rejection. The following mathematical equation can be used to convert FEED TDS & PRODUCT TDS values to a % Rejection, and verify the Control Board is accurately calculating the % Rejection:

$$\text{FEED TDS} - \text{PRODUCT TDS} = \text{REJECTED SUM} \div \text{FEED TDS} \times 100 = \% \text{REJECTION}$$

Example: if FEED TDS=402 and PRODUCT TDS=10

$$402 - 10 = 392 \div 402 \times 100 = 97.5\% \text{ REJECTION}$$

LONG TERM STORAGE: PRESERVE and PACK

Before preserving and storing the RO it should be cleaned with a Low pH cleaner first, High pH cleaner second, and disinfect third. Sample as per your procedures for colony count (cultures), endotoxins (LAL), and AAMI.

WARNING


**Preservatives can cause serious injury or death.
Do not preserve and pack the RO while patients are dialyzing.**

Proper protective equipment must be used.

The preparation and handling of these chemical solutions must be done in accordance with the specifications established for the particular chemical and their Material Safety Data Sheet (MSDS).

These procedures should be performed by trained and qualified technicians.

REQUIRED MATERIALS

Part#	Description	Notes/Usage
SUMCO00574 	BWI-3000, MemStore Preservative	- Replaces MinnClean MP - Application: To prevent microbial growth in the RO and Membranes during storage. - It can be used on brass.

In order to simplify the terminology used in this procedure the following terms will be used:

- The **Storage Tank** will be referred to as the **Reservoir**
- The **Clean/Disinfect Tank** will be referred to as the **Tank**
- There are three hoses supplied with the Tank which will referred to as follows:
 - **HOSE#1** – Tank Product Hose (*longest of the 3; ends: female & female*)
 - **HOSE#2** – Tank Drain Hose (*ends: male & male*)
 - **HOSE#3** – Tank Disinfect Hose (*ends: male & female*)

PUTTING THE RO INTO STORAGE

1. Place a warning placard stating “**DO NOT USE – PACKING in PRESERVATIVE IN PROGRESS**”. End users should be notified as well that this procedures in in progress.

2. Turn the RO OFF by turning the **OPER-DISINFECT-OFF Switch** to **OFF**.



3. Open the **Control Box** and flip the **DIRECT-STBY-TANK Switch** to **DIRECT**.



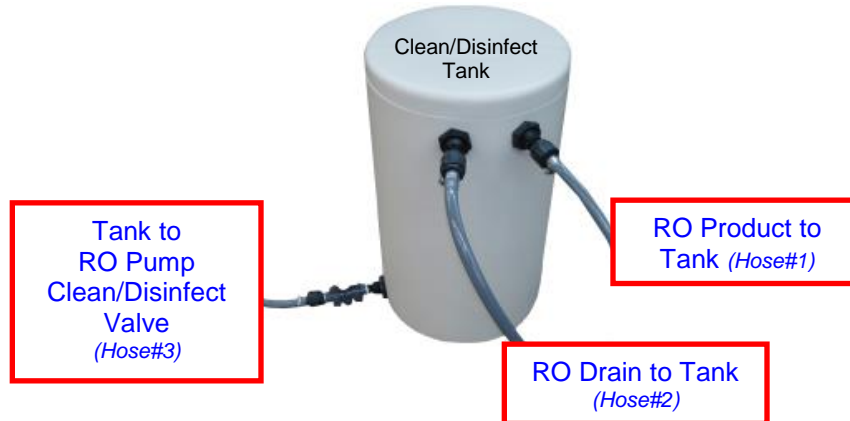
4. Remove the RO's filters.

a. Remove the Pre-Filter Housing, then remove and discard the pre-filter. Secure Pre-Filter Housing to the Frame.

b. Remove the Final-Filter Housing, then remove and discard the final-filter. Install the false tube, and then reinstall the Final-Filter Housing.

5. Setup the Tank.

- Disconnect the RO's Product Hose from the RO Product Port.
- Connect **Hose#1** from the RO Product Port to the Tank's Top Right Port.
- Connect **Hose#3** to the Tank's Bottom Valve, and direct to drain.
- Open the Tank's Bottom Valve so it can be rinsed.



6. Prepare the Tank.

a. Start the RO in normal Operate Mode and rinse the Tank with RO product water.

- Turn the **OPER-DISINFECT-OFF Switch** to **OPER**
- Turn the **OPER-DISINFECT Keyed Switch** to **OPER**
- Turn the **OPER-FLUSH Switch** to **OPER**
- Press the **ALARM RESET Button** if the alarm sounds.



* Once the RO is in good water quality it will begin to rinse.

b. After rinsing the Tank, close the Tank's Bottom Valve.

7. Fill the Tank.

a. Fill the Tank with 15 gallons (approximately 14 inches) of RO product water...

b. Once filled with the desired amount turn the RO OFF by turning the **OPER-DISINFECT-OFF Switch** to **OFF**.



8. Final connections.

- Connect the supplied **Hose#2** from RO's Drain Port to the Tank's Top Left Port.
- Remove the end-cap from the RO's Pump Clean/Disinfect Valve's.
- Connect **Hose#3** from the Tank's Bottom Valve to the RO's Pump Clean/Disinfect Valve.
- Before completely tightening the fitting between the hose and the pump, open the Tank's Bottom Valve to prime the hose.
- When water starts trickling out of the fitting then tighten that fitting.
 - **NOTE:** If this hose hasn't been properly primed the pump will air lock and could cause damage to the pump.
- Open the RO's Pump Clean/Disinfect Valve.

10. Start RO in Disinfect Mode and begin circulation...

- Turn the **OPER-DISINFECT-OFF Switch** to **DISINFECT**
- Turn the **OPER-DISINFECT Keyed Switch** to **DISINFECT**
- Turn the **OPER-FLUSH** switch to **OPER**

* The RO will start up immediately.



* Verify flow by looking at the Product and Reject Flow-Meters, and visually see if water flowing back in to the Tank otherwise re-prime Hose#3. Also check for leaks and correct before proceeding.

10. Measure out **BWI 3000 MEMSTOR**; weigh 2.5 lbs (1350 grams) or using a 1000 mL graduated cylinder pour to the 1000 mL mark and pour that into the **Tank**, then measure out another 350 mL in graduated cylinder and pour that into the **Tank** for total of 1350 mL.

11. Circulate the preservative for a total of 15 minutes.

12. After the 15 minute circulation, shut off **RO**.

- Turn the **OPER-DISINFECT-OFF Switch** to **OFF**.
- Turn the **OPER-DISINFECT Keyed Switch** to **OPER**
- Turn the **OPER-FLUSH** switch to **OPER**



WARNING

When performing following instructions, the hoses connected to the Tank will contain chemical solution. When each hose is disconnected, the solution will drain from the hose. Use either a disposable container to collect the solution as it drains, or hold the end of each hose in an elevated position which will cause the solution to drain to the Tank. Take appropriate safety measures to avoid injury from splash and spills.

13. Open the **Control Box** and flip the **DIRECT-STBY-TANK Switch** to **STBY**.

14. Drain the **Tank**.

- a. Close the **Tank's Bottom Valve**.
- b. Close the **RO's Pump Clean/Disinfect Valve**.
- c. Disconnect **Hose#3** from the **RO's Pump Clean/Disinfect Valve**.
- d. Direct **Hose#3** to drain, and open the **Tank's Bottom Valve**, to drain the **Tank**.
- e. After the **Tank** is empty, close the **Tank's Bottom Valve**.
- f. Disconnect, drain, and store all **Tank Hoses**.

15. Final procedures to the **RO**.

- a. Cap or bag the RO's Product Port, Drain Port, Sample Port Drain Port, and Pump Clean/Disinfect Valve.
- b. Unplug, coil, and secure the Main Power Cord to Frame.
- c. Disconnect, coil, and secure the Interlock Wire to the Frame.
- d. Secure Disinfect Key to inside of Control Box.

NOTICE

Preservation is good for 6 months. If longer than 6 month preservation is required the RO will have to be rinsed for 2 hours then repacked again with preservative for each 6 month period.

BRINGING THE RO BACK FROM STORAGE**WARNING**

Preservatives can cause serious injury or death.

Proper protective equipment must be used.

The preparation and handling of these chemical solutions must be done in accordance with the specifications established for the particular chemical and their Material Safety Data Sheet (MSDS).

These procedures should be performed by trained and qualified technicians.

Use extreme care when performing this procedure to prevent exposure to the preservative solution inside the RO. Use caution when removing bags from covered ports, and opening valves or housings.

1. Remove protective plastic bags from openings.
2. Reconnect to drain.
3. Reconnect to water source.
4. Run product hose to drain.
5. Reconnect to power.
6. Install a new Pre-Filter, and reinstall the Pre-Filter Housing.
7. Remove the Final-Filter Housing, taking caution that it will be full of preservative which should be properly discarded. Remove the false-tube, install a new Final-Filter, and then reinstall the Final-Filter Housing.
8. Rinse for at least two hours.
9. Clean and disinfect the RO.
10. Sample as per your procedures for colony count (cultures), endotoxins (LAL), and AAMI.

TROUBLE-SHOOTING GUIDE for 2020 RO

The information in this document is intended to serve as a guide only for qualified operators. It is not all inclusive of the problems that may be encountered. This guide should aid operators with reminders and routine trouble-shooting tasks.

For any problem outside the confines of this guide, call for technical assistance.

Problem	Possible Causes	Possible Solutions
No power to the RO	1. Main breaker tripped in building	1. Reset breaker.
“ ”	2. RO not plugged in	1. Plug RO power cord in. 2. Verify that the Twist-&-Lock plug is seated and locked into receptacle.
“ ”	3. Motor starter protector tripped.	1. Reset motor starter protector in RO junction box.
Power to RO, but RO will not start	1. Interlock circuit interrupted.	1. Verify if any of the pre-treatment equipment (ie. Carbons, Softeners) are in backwash or regeneration. Interlock Fault indicator light will be illuminated if so.
“ “	2. Reservoir water level is above the middle float switch	1. This is normal, and the RO will start when the reservoir water level drops below the middle float.
“ ”	3. RO is in an alarm condition.	1. Identify the specific alarm by checking the alarm lights illuminated on the control box. 2. Press the Alarm Reset button. 3. If alarm continues, review specific alarm conditions listed in this Troubleshooting section.
“ “	4. Operational switches are in the incorrect position.	1. For normal operation the switch settings should be as follows: - OPER-DISINFECT-OFF=OPER - OPER-DISISINFECT=OPER - OPER-FLUSH=OPER - Tank-Stby-Direct in either tank or direct position based on system.
“ “	5. Faulty interlock circuit connection	1. Check all pre-treatment interlock wiring and connections.
RO runs intermittently	1. Low pressure alarm	1. Verify that the city booster pump is operating properly and providing sufficient pressure for RO operation.
“ “	2. High feed temperature alarm	1. Verify that the pre-treatment blending valve is set to 77°F, adjusting if necessary.
“ “	3. High membrane pressure alarm	1. If pressing the ALARM RESET Button does not clear this alarm, contact technical support.

Problem	Possible Causes	Possible Solutions
RO runs intermittently	4. High product alarm	<ol style="list-style-type: none"> 1. For Tank-Feed Systems check the product hose for kinks or obstructions, clearing if necessary. 2. For Direct Feed Systems check the pressure regulating valve at the end of the loop (RO return) and adjust accordingly.
Incoming RO feed water characteristics have changed or Pre-Treatment Equipment operating out of specification.	5. Poor water quality alarm	<ol style="list-style-type: none"> 1. Verify the water quality monitor set-point which is set to 90% at the factory, adjusting if necessary. Once the water quality rises above this the alarm should silence. 2. Determine if feed water or pre-treatment filtration has changed. 3. Check status of pre-treatment equipment. 4. Faulty water quality monitor or conductivity probes.
General problems with and without alarms where RO not running properly.	1. Specific alarm condition designated by a labeled alarm light	<ol style="list-style-type: none"> 1. Press the ALARM RESET Button to silence and reset. 2. If alarm continues, diagnose based on which alarm light illuminated. See "RO Runs Intermittently" section above for details specific to each alarm.
“ “	2. High-level switch malfunction.	<ol style="list-style-type: none"> 1. Gently tap the solenoid which may clear any obstruction. 2. High-level switch or solenoid valve may be faulty.
“ “	3. Product purge valve may be in the open position.	<ol style="list-style-type: none"> 1. If the water quality is good, the product purge valve may be stuck open and require replacing.
“ “	4. RO requires cleaning or disinfecting.	<ol style="list-style-type: none"> 1. Perform cleaning and disinfecting.
“ “	5. Membranes at end of life or fouled.	<ol style="list-style-type: none"> 1. Replace membranes.
“ “	6. Pre-filter or Final-filter fouled.	<ol style="list-style-type: none"> 1. Replace filters.
“ “	7. Inlet hose to RO is kinked or obstructed.	<ol style="list-style-type: none"> 1. Check the status of the hoses, removing kinks and obstructions.
“ “	8. Faulty gauge	<ol style="list-style-type: none"> 1. Verify the accuracy of the gauges, replacing if necessary.

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

SAMPLE CHECK LISTS

RO DAILY START-UP CHECK LIST							
ITEMS TO BE CHECKED	MON	TUE	WED	THU	FRI	SAT	SUN
Date							
Time of Day							
Technician Initials							
OPERATE MODE:							
Switches in the following position for normal operation: (YES/NO) OPER-DISINFECT-OFF Switch = OPER OPER-DISINFECT Switch = OPER OPER-FLUSH Switch = OPER							
Mode lights as follows: (YES/NO) Operate Light = ON Flush Light = OFF Disinfect Light = OFF							
Any Alarms Indicated? (YES/NO)							
RECORD: (Record after Timed Operate button pressed or RO in normal operation and producing water)							
Feed Water Temperature, °F							
Water Pressure, Feeding RO, gpm							
Flow-Meter: Product Flow, gpm							
Flow-Meter: Reject Flow, gpm							
Flow-Meter: Recirculate Flow, gpm							
Water Quality Monitor: % Rejection (>90%), %							
Water Quality Monitor: Feed Water TDS, ppm							
Water Quality Monitor: Product Water TDS, ppm							
WQM: Poor Water Quality Set-Point %							
Gauge: RO Pump Pressure, psi							
Gauge: Membrane Pressure, psi							
Gauge: Reject Pressure, psi							

RO QUALITY ASSURANCE CHECK LIST

A quality assurance check should be performed periodically such as monthly or quarterly, and after maintenance such as filter and membrane changing, to ensure the RO is operating properly.

ITEMS TO BE CHECKED	DATA
Date	
Time of Day	
Technician	
Reason for QA Check (Monthly Check, Quarterly Check, Filter Change, Membrane Change, etc)	
NORMAL OPERATION	
Place RO in normal operation. Does it function properly? - Operate light ON; No alarms; Good water quality; Producing water	YES NO
Verify position of TANK-STBY-DIRECT Switch?	T=Tank S=Stby D=Direct
Check for leaks. Any leaks observed? <i>If yes, list on back of this form.</i>	YES NO
TIMED OPERATE	
Press Timed Operate Button. Does the RO start and produce water, for 30 minutes? (YES/NO)	YES NO
DIGITAL FLUSH TIMER	
Is the correct day and time set on the digital flush timer?	YES NO
Verify flush times are correct?	YES NO
Verify flush timer is in AUTO-MODE?	YES NO
Place RO into flush mode. Does it function properly? - Operate light ON; Flush light ON once RO starts flushing; Flushes per pre-set parameters	YES NO
Initiate a manual flush. Does it function properly?	YES NO
DISINFECT MODE	
Place RO into disinfect mode. Does it function properly? (YES/NO) - Operate light OFF; Disinfect light ON	YES NO
RECORD: (Record after Timed Operate button pressed or RO in normal operation and producing water)	
Flow-Meter: Product Flow, gpm	
Flow-Meter: Reject Flow, gpm	
Flow-Meter: Recirculate Flow, gpm	
Water Quality Monitor: % Rejection (>90%), %	
Water Quality Monitor: Feed Water TDS, ppm	
Water Quality Monitor: Product Water TDS, ppm	
Water Quality Monitor: Poor Water Quality Set-Point %	
Gauge: RO Pump Pressure, psi	
Gauge: Membrane Pressure, psi	
Gauge: Reject Pressure, psi	
OTHER	
Check Pre-Treatment and Post-Treatment equipment	
Submit water samples for lab testing	

APPENDIX C

TECHNICAL SERVICE BULLETINS

TECHNICAL SERVICE BULLETIN

Replacing Chromalox Temperature Controller with Omron Temperature Controller

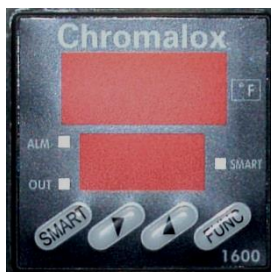
TSB# **TSB2014001**Date **12/05/14**

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OVERVIEW:

Effective December 5, 2014, Better Water will start using the Omron Temperature Controller instead of the Chromalox Temperature Controller because of easier use and programmability. Prior to this, there have been two Chromalox models used. When replacing a Chromalox with an Omron, the only difference is the position of the connecting wires. The part number [ELCPD100001](#) remains the same. The differences between these models and the wiring connection changes are detailed below.

Refer to the pictures below to determine which model you have:



Chromalox model
1600
Part#
[ELCPD100001](#)

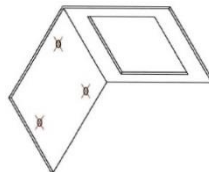


Chromalox model
6040
Part#
[ELCPD100001](#)



New Omron model
Part#
[ELCPD100001](#)

If replacing an older model Chromalox model 1600 Temperature Controller you will also need to order the new model's bracket whose part number is [FXBROO00894](#), which is slightly larger.



New Model Bracket
Part#
[FXBROO00894](#)

WARNING

**To avoid electrical shock, turn the power to the RO OFF, and unplug it from the electrical outlet.
A lock-out tag should be placed on the unit to prevent accidental use while this
Replacement is underway.**

PROCEDURE:

1. Turn OFF power to the RO.
2. Open the cover to the Control Box.
3. Unclip the old model Chromalox Temperature Controller, and gently pull it forward so the attached wires can be accessed.

TECHNICAL SERVICE BULLETIN

Replacing Chromalox Temperature Controller with Omron Temperature Controller

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4. Before releasing the attached wires make note of the individual wire numbers and which post-screws they are attached to on the old model, using the following schematic label for reference.

<p>Chromalox Model 1600</p> <p>Wire #1 to Post #1</p> <p>Wire #2 to Post #2</p> <p>Wire #3 to Post #3</p> <p>Wire #4 to Post #4</p> <p>Wire #5 to Post #5</p> <p>Wire #9 to Post #9</p> <p>Wire #10 to Post #10</p>	<p style="font-size: small;">*HLHS160361050*</p> <p style="font-size: x-small;">WIRING TERMINALS SUPPLY: 24 VAC/DC 2w, 6 VA 50/60 Hz, 6VA SENSOR INPUT: Class 2 OUTPUT: Main SSR: Class 2</p> <p style="font-size: x-small;">OUT2: 1A, 250 VAC~ 50/60 Hz, Res. Load</p> <p style="font-size: x-small;">St: 03 AF</p> <p style="font-size: x-small;">*306456* Made in ITALY (NO)</p>
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<p>Chromalox Model 6040</p> <p>Wire #1 to Post #6</p> <p>Wire #2 to Post #5</p> <p>Wire #3 to Post #4</p> <p>Wire #4 to Post #13</p> <p>Wire #5 to Post #14</p> <p>Wire #9 to Post #9</p> <p>Wire #10 to Post #10</p>	<p style="font-size: x-small;">ALL O/P RELAY CONTACTS 2A RESISTIVE 120-240V AC</p> <p style="font-size: x-small;">THIS IS GENERIC TERMINAL INFORMATION. SEE MANUAL FOR SPECIFIC DETAILS.</p> <p style="font-size: x-small;">(USE COPPER CONDUCTORS EXCEPT ON T/C INPUT)</p>
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4. Carefully release each of the seven wires by loosening the post-screws they are attached to.
5. Once all the wires have been released, carefully remove the old model Chromalox Temperature Controller from the unit.
6. If replacing the bracket, remove the three screws that secure the old bracket.
7. Install the new bracket.
8. Each of the seven wires that were attached are individually numbered. Use the following diagram to attach the correct wire to the correct post-screws on the new Omron Temperature Controller. The schematic label on the side of the Controller should also be referenced to assist with the installation.

<p>Omron Model Wire #1 to Post #4</p> <p>Wire #2 to Post #5</p> <p>Wire #3 to Post #6</p> <p>Wire #4 to Post #1</p> <p>Wire #5 to Post #2</p> <p>Wire #9 to Post #11</p> <p>Wire #10 to Post #12</p>	<p style="font-size: small;">OMRON E5CC-RX3D5M-000 DIGITAL CONTROLLER Ver.2.1 LOT No. 31714M</p> <p style="font-size: x-small;">UL US LISTED For Cont. Eq. 3MS</p> <p style="font-size: x-small;">DO NOT USE</p> <p style="font-size: x-small;">OMRON Corporation Designed by OMRON MADE IN CHINA</p>
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TECHNICAL SERVICE BULLETIN**Replacing Chromalox Temperature Controller with Omron
Temperature Controller**TSB# **TSB2014001**Date **12/05/14**

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9. Install the new Omron Temperature Controller into the Control Box, by carefully pushing it into place and using the clip to properly secure it.
10. Turn ON the power to the RO.
11. Verify the new Omron Temperature Controller is working properly.
12. Close and secure the cover to the Control Box.

APPENDIX D

PRE-SHIP TEST DATA

