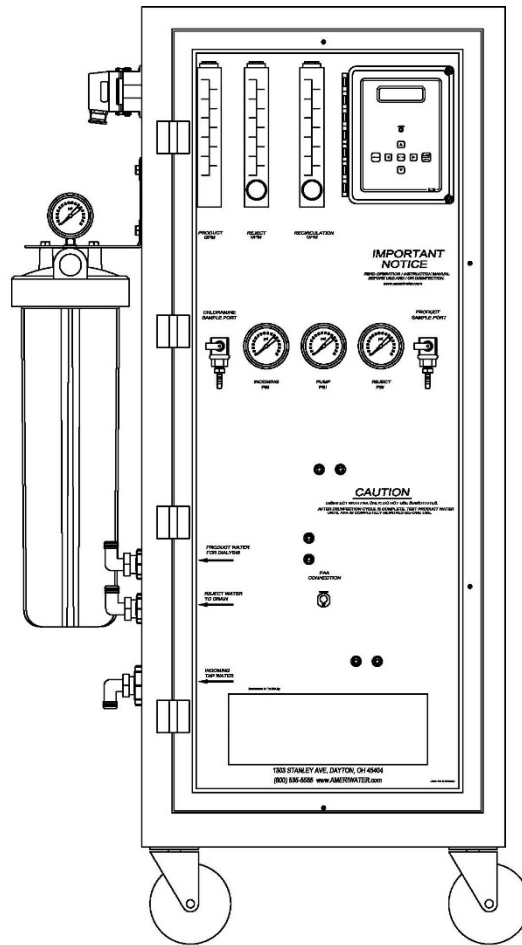




Healthcare RO3X OPERATION & MAINTENANCE MANUAL



**Manufactured With Pride
In The USA**

www.ameriwater.com • 800-535-5585

AmeriWater • 3345 Stop 8 Rd. • Dayton, OH 45414

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1.0 GENERAL INFORMATION

1.1 INTRODUCTION

This system is designed to pretreat and purify water for use in health care applications. The system is shipped with required water treatment components. If the system will be running without softened water, the PT401 system will need to be connected to the side of the RO. This Operation Manual was written specifically for the RO3X model. Your system was thoroughly tested and in excellent condition when it was shipped to you. However, because damage during shipment is possible, please unpack and carefully inspect the system as soon as you receive it. Please notify AmeriWater if any problems are encountered.

Please read the Operations Manual before using the system. Contact AmeriWater Customer Service with any questions at 1-800-535-5585 Monday through Friday 8:00 a.m. to 5:00 p.m. Eastern Time. For after-hours emergencies call 1-800-535-5585 and follow the instructions on the recorded message. Our on-call technician will return your call as soon as possible. This entire Operations Manual should be read before operating or servicing the system. This Operations Manual should then be kept near the system and used as a reference and troubleshooting guide.

WARNING: This Reverse Osmosis System (RO) contains a preservative solution to prevent microbiological growth and freezing. Discard all product water for at least two hours of operation before placing the RO in service.

Materials that Contact Product Water:

ABS	Acrylic	Carbon	EPDM
Nylon	Polyester	Polyethylene	Polypropylene
PVC	Stainless Steel	TFCM* (Polyimide)	Tygon

*Thin Film Composite Membrane

All of the above listed materials meet FDA and/or NSF standards.

Safety Features

The RO is equipped with several safety features for the benefit the user. They consist of the following:

Color-coded inlets and outlets are on the membrane assemblies to avoid mix-ups.

INCOMING TAP WATER, PRODUCT WATER, and REJECT WATER TO DRAIN hoses are labeled to prevent incorrect connections.

An audible alarm sounds whenever water quality drops to an unacceptable level.

1.2 ELECTRICAL LEAKAGE STANDARDS

The AmeriWater RO water treatment systems comply with the IEC 61010-1 Standards for Product Safety and Construction.

The cabinet of the RO is PVC for additional operator safety.

The RO is compliant with IEC 61010-1, Safe Current Limits for Electro medical Apparatus. All major components of the RO (controller, pump, solenoid valve, antiscalant pump) as well as other components are UL listed.

C This product has been tested to the requirements of CAN/CSA-C22.2 No. 61010-1, second edition, including Amendment 1, or a later version of the same standard incorporating the same level of testing requirements.



Product marked with this symbol indicates that it is protected throughout by double insulation or reinforced insulation

1.3 CAUTIONARY SYMBOLS



Caution, risk of electrical shock!
Attention, risque de choc électrique!

Open by qualified service personnel only!
Ouverture par le personnel qualifié seulement!

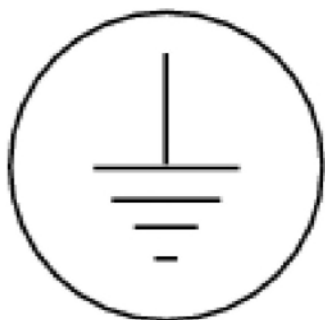
Refer to this Operation and Maintenance Manual for instructions and safety considerations. **Référez-vous au manuel des Opérations et Entretien pour instructions et mesures de sécurité.**



Caution, risk of danger!
Attention, danger potentiel!

For service by qualified service personnel only!
Entretien par le personnel qualifié seulement!

Replace with 120Vac, 15amp, time-delay fuse only.
Remplacer avec 120Vac, 15 amp, fusible à retardement seulement.



Earth Ground terminal
Borne de mise à la terre

2.0 TECHNICAL INFORMATION

2.1 SPECIFICATIONS

Ideal, minimum, and maximum incoming water temperature		Min = 41° F (5° C) Max = 90° F (33° C) Ideal Temperature = 77° F (25° C)		
Prefilter gauge pressure (when the RO is running) Minimum Maximum		20 PSI 90 PSI (P ounds per S quare I nch)		
Pump pressure – Minimum Maximum		150 PSI 275 PSI		
Maximum output of product water @ 77°F (25°C), TDS<1000 ppm of NaCl, & pump pressure of 150 psi.		RO3X – APPROXIMATELY 5,500 GPD (APPROXIMATELY 24,800 LPD) (G allons P er D ay / L iters P er D ay)		
Power Ratings	Voltage	Frequency	Phase Ø	Amp Draw
RO Controller	115 VAC	60HZ	1Ø	10
RO Pump	208 VAC	60HZ	3Ø	10
Connections		RO Feed = 3/4" Plain hose RO Product = 1/2" Plain hose RO Drain = 3/4" Plain hose		
Electrical Requirements		(1) X 115V/60Hz/15A dedicated Dual Outlet GFI (G round F ault I nterrupter) for RO controller & DI Polisher (1) X dedicated disconnect switch rated for 3Phase / 208VAC/60HZ/20AMP with Ground		
Shipping Weight Operating Weight		300 lbs. 420 lbs.		

Table 2.1

2.2 ENVIRONMENTAL/TRANSPORT CONDITIONS EXPECTED

ENVIRONMENTAL CONDITIONS ANTICIPATED

This device is intended to be used under the following conditions:

Indoor use;

Altitude up to 2000 m; 6562 feet

Temperature between 5°C and 40°C; 41°F and 104°F

Maximum relative humidity 80% for temperatures up to 31°C (87.8°F) decreasing linearly to 50% relative humidity at 40°C (104°F)

MAINS supply voltage fluctuations up to $\pm 10\%$ of the nominal voltage;

Transient overvoltages present on MAINS supply = CATEGORY II;

Applicable RATED POLLUTION degree 2.

TRANSPORT CONDITIONS ANTICIPATED

Altitude up to 2000 m; 6562 feet

Temperature between 5°C and 40°C; 41°F and 104°F

Maximum relative humidity 80% for temperatures up to 31°C (87.8°F) decreasing linearly to 50% relative humidity at 40°C (104°F)

3.0 COMPONENTS AND SCHEMATICS

THEORY OF OPERATION:

The process of osmosis can be reversed by placing pressure upon the feed water side (concentrated solution side) of the membrane. Water will be forced through the membrane barrier to yield water that is purer on the lower pressure side of the membrane than on the more concentrated solution side (higher pressure side) of the membrane. The feed water will become more “concentrated,” and will be discharged through the reject port known as “reject water” or “concentrate”.

Hence, the liberation of purer water from its solutions is caused by the reversal of the osmotic pressure; the operation is termed “Reverse Osmosis”. Reverse Osmosis is commonly referred to as “RO”.

LIFE EXPECTANCY OF COMPONENTS:

The 2 Carbon Cartridge Filters will last for up to 150 hours depending upon the content of the incoming water. These should be changed whenever chlorine breakthrough occurs or DP (Differential Pressure) across the filters.

The PT401 anti-scalant should be refilled every 150 hours as well.

3.1 EXTERNAL FRONT VIEW

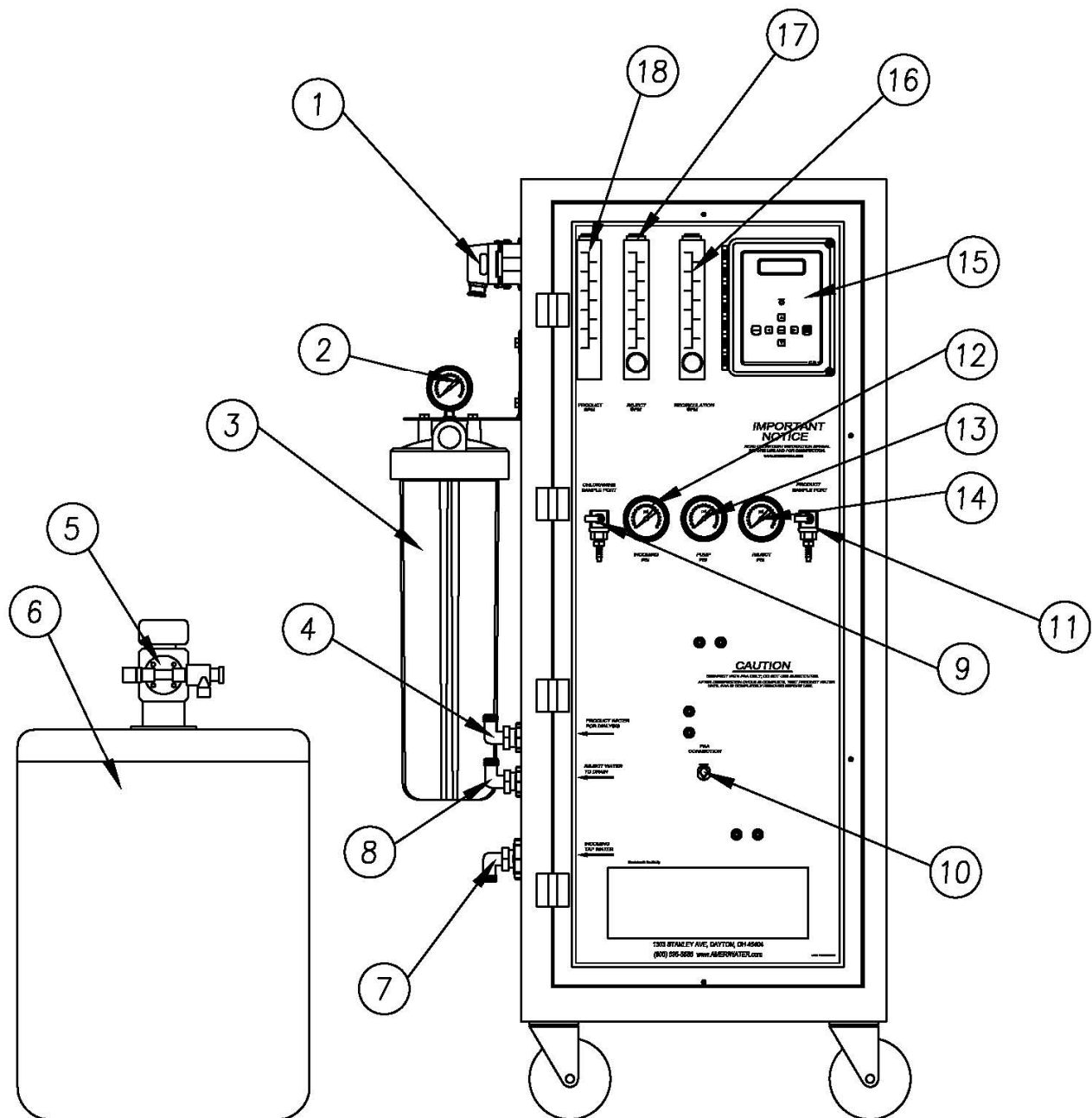


Figure 3.1

IDENTIFICATION OF COMPONENTS (EXTERNAL FRONT VIEW)

1. **SIDE ENTRY HOODS:** External connection for float level switches (4 pin connection) and PT Pump power connection (5 pin connection).
2. **PREFILTER INLET GAUGE** – Gauge that measures the pressure in pounds per square inch (PSI) of the incoming tap water as it enters the carbon block prefilters.
3. **CARBON CARTRIDGE FILTERS** – Dual 10-micron carbon cartridges for removal of chlorine.
4. **PRODUCT WATER** – Hose transmitting purified water from the RO system to the DI Polisher or Storage Tank.
5. **PT401 FEED PUMP** – Injects PT401 Antiscalant / Scale inhibitor solution at a predetermined dosage based on a water hardness. The PT401 pump runs when the main pump runs.
6. **PT401 ANTISCALANT / SCALE INHIBITOR** – Plastic container filled with PT401 solution to prevent the RO membranes from scaling. The plastic container should be refilled with PT401 solution when it reaches the half-full level. Do not use if water supply is softened.
7. **INCOMING TAP WATER** – Hose feeding tap water into the RO system.
8. **REJECT WATER TO DRAIN** – Hose transmitting wastewater to the drain.
9. **CHLORINE SAMPLE PORT** – Valve with nozzle to let small amounts of water out to test for the presence of chlorine before the RO membranes.
10. **PAA QUICK CONNECT FITTING (RO)** – Quick connect fitting that the PAA container is connected to on the RO for sanitization.
11. **PRODUCT WATER SAMPLE PORT** – Valve with nozzle to let small amounts of water out to test the quality of the product water.
12. **PREFILTER OUTLET GAUGE** – Gauge that measures the pressure in pounds per square inch (PSI) of the water after going through the carbon cartridge filters. Change the filters when the outlet gauge reads 15 PSI less than the inlet gauge.
13. **PUMP PRESSURE** – Gauge that measures the primary feed pressure in pounds per square inch (PSI) from the pump to the RO membranes.
14. **REJECT PRESSURE** – Gauge that measures the pressure in pounds per square inch (PSI) from the reject of the membranes.

- 15. **CONTROLLER** – Control mechanism for the RO.
- 16. **RECIRCULATION GPM** – Flowmeter that indicates the flow of water that is recirculated back to the pump's inlet. A valve is incorporated into the flowmeter to allow adjustment.
- 17. **REJECTION GPM** – Flowmeter that indicates the flow of water that is rejected to the drain. A valve is incorporated into the flowmeter to allow adjustment.
- 18. **PRODUCT GPM** – Flowmeter that measures the flow of the product water in gallons per minute (GPM) and liters per minute (LPM).

3.2 INTERNAL REAR VIEW

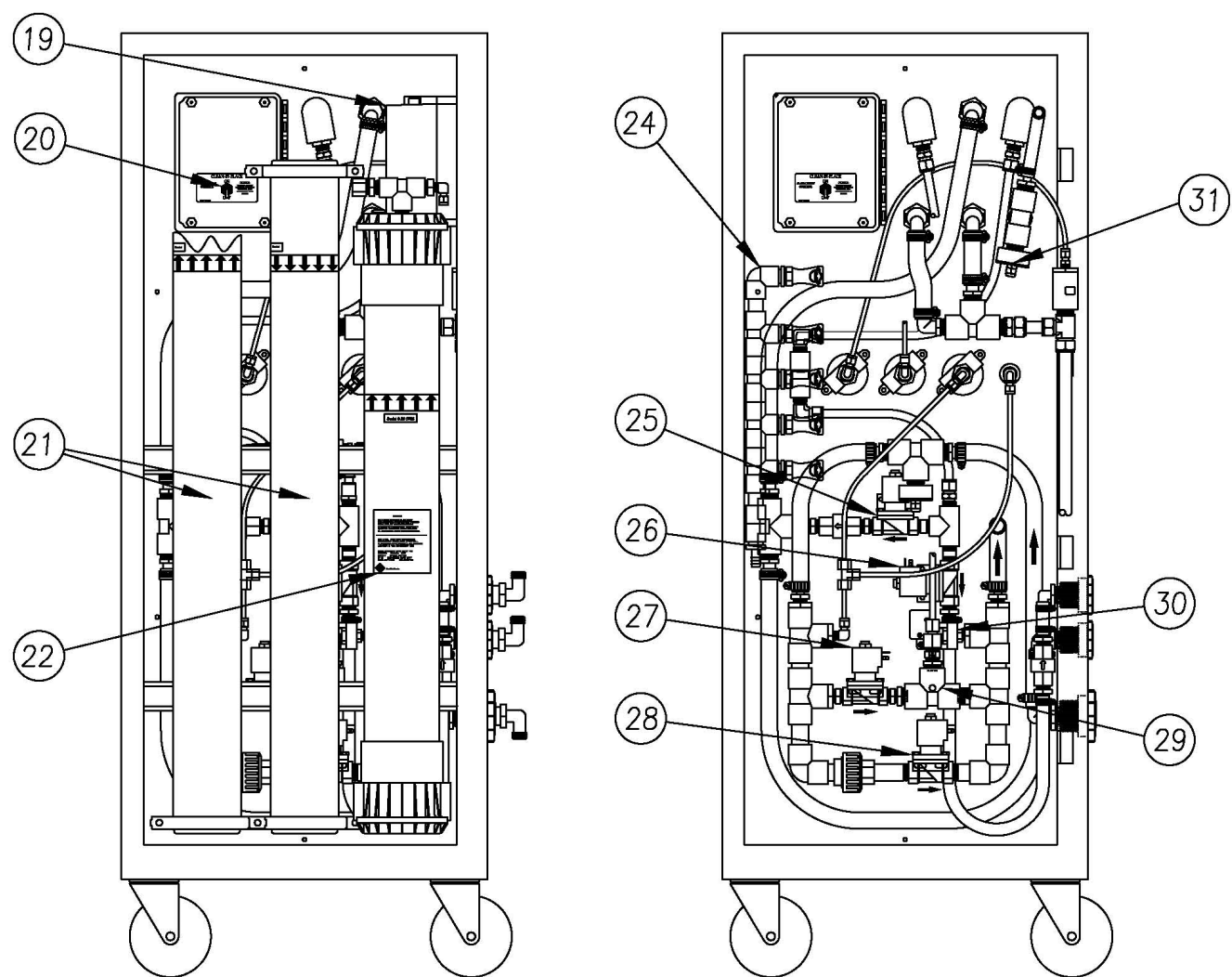


Figure 3.2

IDENTIFICATION OF COMPONENTS (INTERNAL REAR VIEW)

- 19. MOTOR CONTACTOR/OVERLOAD RELAY:** Starts and stops the pump motor and protects the motor from overload.
- 20. CLEAN IN PLACE SWITCH (ALARM FAULT OVERRIDE):** When the Clean In Place (CIP) switch is placed to the ON position, all RO fail-safe modes are disabled for low-pressure membrane cleaning with the optional AmeriWater Clean In Place system (P/N 00CIP2). The controller will display a warning that the CIP mode is active.
- 21. MEMBRANE:** Fiberglass wrapped, spiral-wound, thin film composite membrane for reverse osmosis.
- 22. PUMP:** Provides the driving pressure for the reverse osmosis system.
- 23. PRODUCT HEADER ASSY:** This header directs all product water from the membranes to the flow meter.
- 24. INCOMING CONDUCTIVITY SENSOR:** Cell that reads the quality of the feed water.
- 25. PRODUCT TO DRAIN SOLENOID:** Opens when water quality is below set point.
- 26. PRODUCT TO USE SOLENOID:** Closes when water quality is below set point.
- 27. DISINFECT SOLENOID ASSEMBLY:** Opens to allow the hydrogen peroxide/ peroxyacetic acid mixture to draw into the system to soak for the sanitize cycle.
- 28. FEED SOLENOID ASSEMBLY:** Opens when the RO system is on to allow water to feed through the system, closes when the system is OFF.
- 29. DISINFECT EJECTOR:** Causes suction to draw solution from PAA jug when the Disinfect Solenoid is opened.
- 30. LOW PRESSURE SWITCH:** Switch to protect the pump in the event that the feed pressure drops below 20 PSI.
- 31. PRODUCT CONDUCTIVITY SENSOR:** Cell that reads the quality of the product water.

3.3 ELECTRICAL DIAGRAM, RO3X

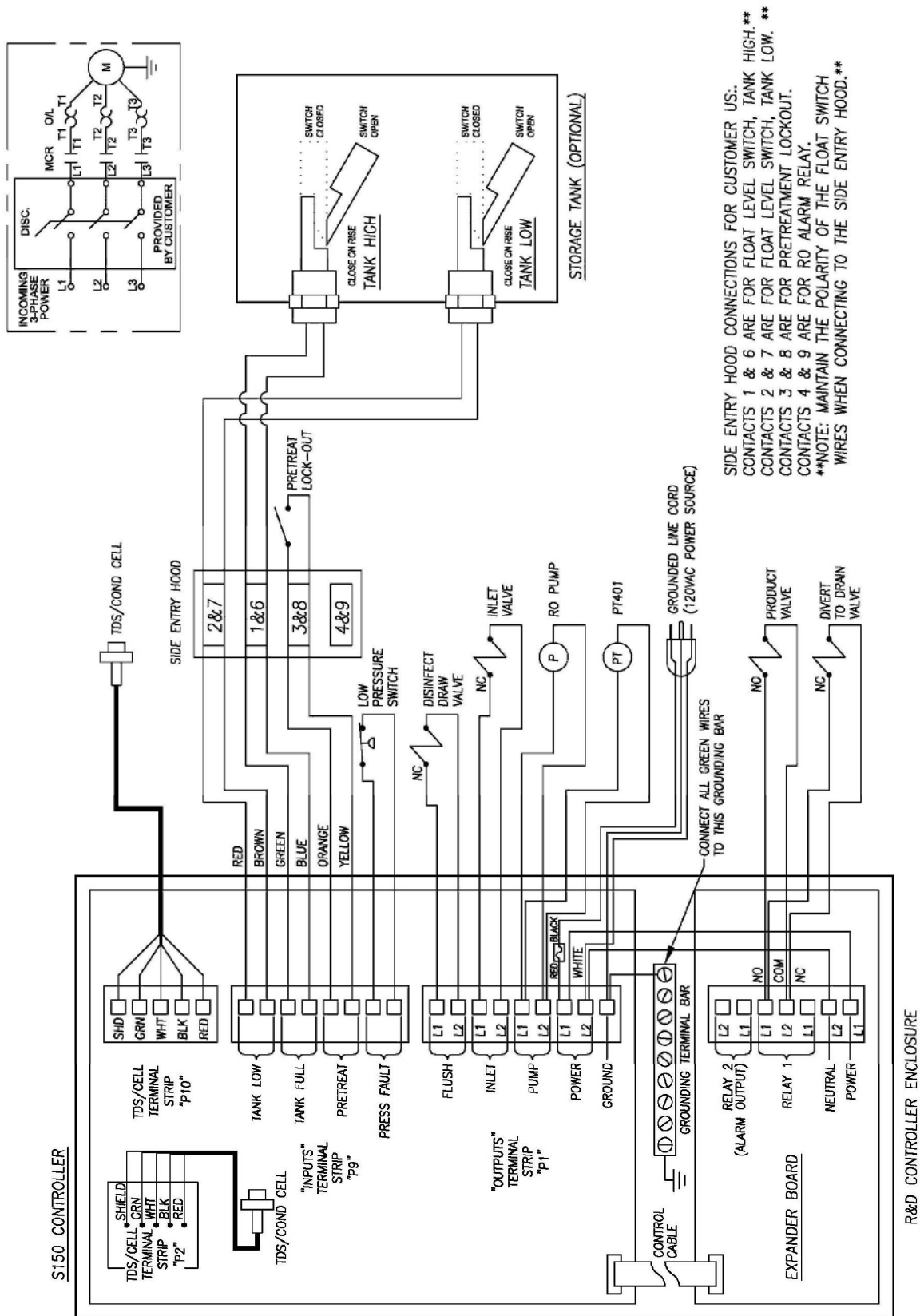


Figure 3.3

3.4 FLUID DIAGRAM, RO3X

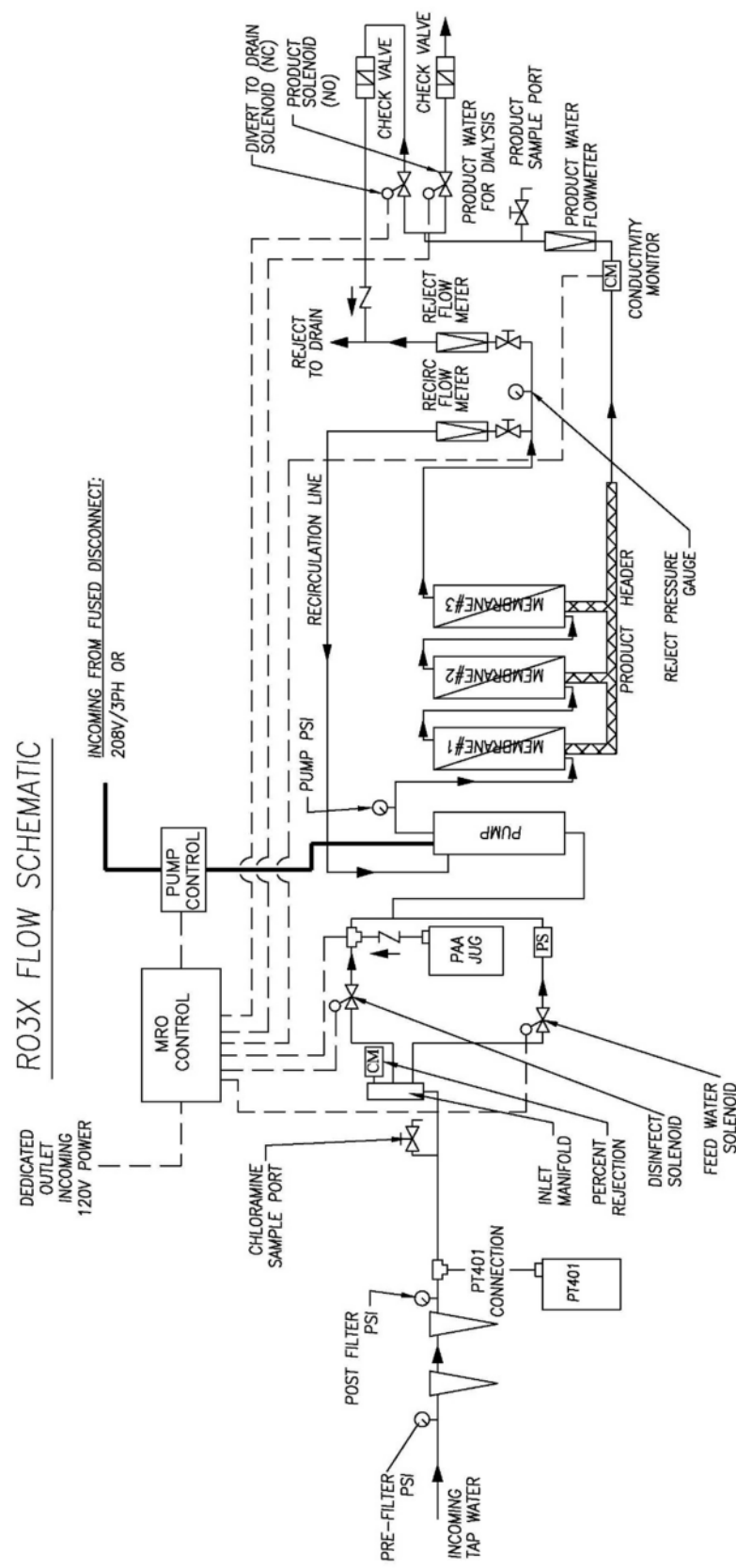


Figure 3.4

4.0 RO STARTUP & OPERATION

4.1 CAUTION

NOTE: This entire Operations Manual should be read before operating or servicing the RO3X system. The Operations Manual should then be kept near the system and used as a reference and troubleshooting guide.

WARNING: This Reverse Osmosis System (RO) contains a preservative solution to prevent microbiological growth and freezing. Discard all product water for at least two hours of operation before placing the RO in service.

The following operating or water supply conditions could cause an accident or the RO system to fail:

1. The electrical source must be single phase, 3-conductor type provided with a hospital grade receptacle and a ground fault interrupter (GFI) at 115V, 60Hz. The proper polarity and ground integrity must be initially checked and thereafter maintained. Failure to do so may result in electrical shock to the operator.
2. The RO must only be plugged directly into a GFI receptacle. It must not be plugged into an extension cord or power strip that could cause low amperage.
3. All local plumbing and electrical requirements should be met.



To avoid electrical shock, always unplug the RO system before opening the face of the electrical controller.

4. Incoming water should be between 41° F and 90° F (5° C and 33° C). It is not recommended to use water at temperatures below 41° F (5° C) because it will reduce membrane performance significantly. Use only the cold water supply unless using an automatic blending valve to get 77° F (25° C) water. Never use water warmer than 90° F (33° C).
5. Water with silt density index (SDI) above 5 SDI will foul the membrane.
6. It is important to test for chlorine and chloramines at the CHLORAMINES SAMPLE PORT before each use of the system. Chlorine will deteriorate the membrane and cause system failure. It is recommended to use a Total Chlorine test kit, such as Water Check 2 Low Level Chlorine/Chloramines Test Strips (P/N 97CM20201).
7. Incoming tap water pH should be within EPA National Secondary Drinking Water Regulations of 6.5 - 8.5. Incoming tap water with pH higher or lower than the regulation may cause higher conductivity in the product water. If the water changes drastically, the membrane will be harder to clean. Periodically check the pH of the incoming tap water to verify that it is within the specified range (pH Water/Bicarbonate/Dialysate Test Strips P/N 97PH20901).

CAUTION: Mixing chlorine and hydrogen peroxide/peroxyacetic acid causes a toxic chemical reaction. Never allow them to mix! Do not use chlorine to disinfect the system!

8. Use only the exact amount of hydrogen peroxide/peroxyacetic acid disinfectant solution (PAA) and in proper dilution during disinfection of the system.
9. It is important to test for PAA in the Product Water after rinsing during disinfection of the system. Do not use the system until all traces of the disinfecting solution in the Product Water are gone.
10. Always maintain water flow and pressure to avoid damage to the pump.
11. Minimum feed pressure is 20 PSI (while the RO is in operation, with flow). Maximum feed pressure is 90 PSI.
12. If the system is operated without a micron prefilter, the membranes will foul.

WARNING: The Clean In Place Switch, located inside the cabinet on the back of the controller, must be in the OFF position during normal operation. If the Clean In Place Switch is left in the ON position during normal operation, all RO fail-safe modes will be disabled, and damage to the RO.

13. Minimize the opportunities for bacterial growth between uses!

Whenever the RO is not used for a period of several hours, and connected to a Storage Tank, the “Membrane Flush Feature” of the RO should be programmed to be active when in the OPERATE mode (See section 5.4 for activating this feature). This feature will flush the RO when the Storage Tank is full and the water level is maintained at the Tank Full High float switch by diverting the Product Water to drain.

4.2 SAFETY FEATURES

The RO is equipped with several safety features for the benefit of the user. They consist of the following:

1. Disinfection using (PAA) disinfecting solution instead of formaldehyde increases safety and avoids health risks associated with formaldehyde. Using PAA does not require additional ventilation, and disposal is safe and easy. Important information regarding the usage and handling of PAA is listed in Section 5.3, A WORD ABOUT HYDROGEN PEROXIDE/PEROXYACETIC ACID, and in PAA Materials Safety Data Sheet. Please read them carefully.
2. INCOMING TAP WATER, PRODUCT WATER and REJECT WATER TO DRAIN hoses are labeled to prevent incorrect connections.
3. Low pressure shutdown protects the pump if the feed pressure drops below 20 PSI.
4. An audible alarm sounds whenever water quality drops to an unacceptable level.

WARNING: The AmeriWater model RO3X is considered a non-portable device. It can be connected to a Storage Tank system. For this reason, there is a divert to drain on this model. The Product water will divert to drain as long as the conductivity is out of specification (no water will be sent to the Storage Tank). The poor quality alarm for the RO will sound, but the water that is already in the storage tank can continue to be used.

4.3 INITIAL STARTUP

WARNING: This Reverse Osmosis System (RO) contains a preservative solution to prevent microbiological growth and freezing. Discard all product water for at least two hours of operation before placing the RO in service.

1. Lock the two front casters so that the RO will remain stationary during startup.
2. Remove the protective covers from the PRODUCT WATER, REJECT WATER TO DRAIN and INCOMING TAP WATER barbed fittings on the side of the RO.
3. Slide the hose clamps over the hoses that were provided in the installation package for holding the 3 hoses in place on the RO.

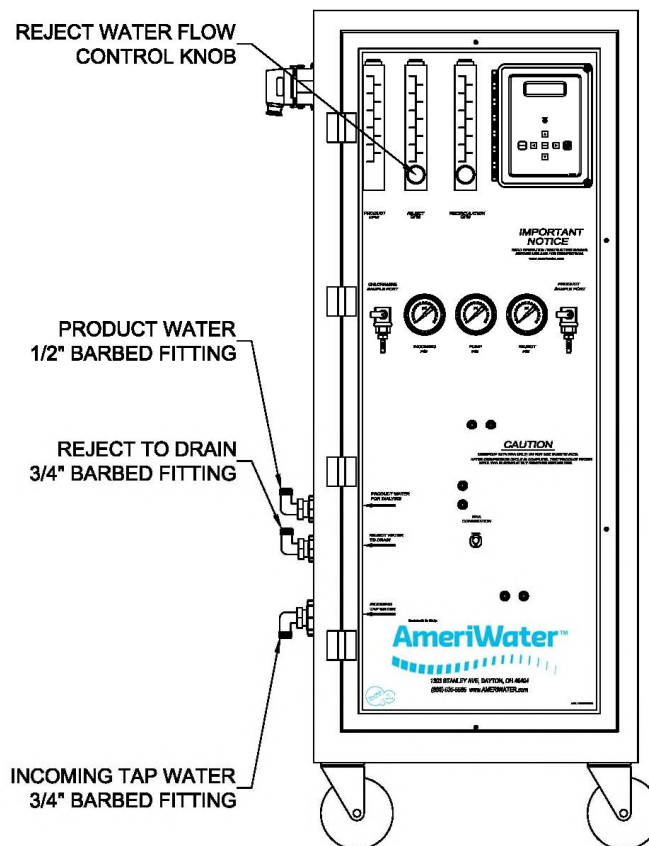


Figure 4.1

Slip the INCOMING TAP WATER, PRODUCT WATER and REJECT WATER TO DRAIN hoses over the appropriate barbed fitting, then secure each with a hose clamp.

CAUTION: To assure proper assembly, hoses **MUST** be fully inserted over the barbed area and a little beyond for the clamp to hold in the “necked-down” area of the barbed fitting.

4. Connect the RO INCOMING TAP WATER hose to the potable cold water supply using the Incoming Tap Water hose and fittings supplied. If utilizing a blending valve, ensure hot and cold water lines are flushed prior to operating the RO. Adjust blend valve to 77 °F (25 °C). Do not

exceed 82 °F (28 °C).

5. The REJECT WATER TO DRAIN hose coming out of the RO system is for reject water. The water from this hose will always go down a drain. Leave at least a 2" air gap between the hose and the drain to prevent contamination or siphoning.
6. The PRODUCT WATER hose should also be secured to the drain until the start-up flush and initial disinfection cycle are completed, and the water quality is in the good range (below the conductivity setpoint, and not in alarm).
7. Open the access cover and make sure that the "CIP" switch is in the "OFF" position.
8. Plug the power cord into a dedicated 115-volt GFI receptacle.
9. The high voltage power cord must be connected to an appropriately sized disconnect for the voltage and the phases used. Connection to a wall disconnect must be done by a qualified electrician.
10. If a plug on the high voltage power cord has been installed, there must be a matching "twist lock" high voltage polarized receptacle that has been installed by a qualified electrician.

For 3 phase applications, the 3-wire connections must be verified to give the correct rotation on the RO pump. If not, specified pressure cannot be obtained, and the pump will quickly overheat.

11. Turn on the potable water supply to the RO. Allow the membranes to fill with water. This may take up to 5 minutes. Failure to do so may cause damage to the RO.
12. Turn on the RO by pressing the POWER key, and allow it to run making sure the water is properly flowing out the Reject and Product hoses.
14. With the RO Operating, adjust the valve on the **Reject** flowmeter until the flow rate is equal to the product flow rate of the RO. This will be 50% recovery. Operating the RO at higher recovery percentage may reduce the life span of the RO membranes. Recovery is calculated via the following equation:

$$\frac{\text{Product Flow (GPM)}}{\text{Feed Flow (GPM)}} \times 100\% = \text{RO Recovery}$$

15. With the RO Operating, adjust the valve on the **Recirculation** flow meter until the recirculation flow rate is approximately 1/3rd of the reject flow rate.
16. Starting the RO the first time, the user can verify that the RO is operating correctly by checking the flow meters, the controller and the inlet and outlet pressure gauges. The flow meters will show movement on the flow bobbbers in the flow meters. The flow meters should be reading 50% product / 50% reject and 33.3% recirc. The controller will show on the screen operating parameters, such as quality of water, Temp of water. The incoming and outlet gauges will show pressure reading on the gauge. There will be a differential of pressure between the two gauges.

17. At this point, the preservative in the RO and the membranes needs to be completely flushed from the RO.

18. Turn the REJECT FLOW CONTROL KNOB located at the bottom of the Reject Flow meter counter-clockwise to allow the RO to run in full-flow Reject flush for about 15 minutes, afterwards, turn the same knob clockwise so that the reject flow is approximately equal to the Product water flow, and run for 15 more minutes. Check for leaks during this time.

NOTE: The RO conductivity alarm may sound, which is normal when the RO is in FLUSH. Press the ALARM SILENCE key on the RO controller to silence the alarm. The alarm will restart after a 3 minute delay.

19. The conductivity value, after flushing and being put back into the service mode, must be within the acceptable limit.

20. After a thorough flushing of the preservative, the RO must be disinfected prior to being put into service for dialysis use. **(See Disinfecting The System, Section 5).**

21. When all disinfection procedures have been completed, turn on the feed water supply.

22. Press the POWER key (the display will show OPERATING after a 10 second delay).

NOTE: The conductivity may alarm for a few seconds before dropping into the desired range.

23. Press the POWER key (the display will show STANDBY). Connect the PRODUCT WATER hose to the Direct Feed Loop or Storage Tank inlet.
(Be sure to connect the Product Water hose aseptically).

4.4 SYSTEM SHUTDOWN

Ordinarily, an RO3X is connected to a water use system that is used continually. Therefore, frequent shutting down is not necessary. If the RO must be shut down for an extended period, contact Ameriwater for instructions.

5.0 DISINFECTING THE SYSTEM

5.1 DISINFECTION PROCEDURE

Be sure to refer to your facilities Start-Up Log. This will help you verify that all steps are performed and recorded to disinfect the system properly.

5.1a. DISINFECTING THE RO3X ONLY

1. Switch off the RO3X by pressing the POWER key (the display will show STANDBY).

WARNING: The disinfection mode will allow PAA to flow through the PRODUCT WATER hose. This is to allow disinfection of the hoses.

2. To disinfect only the RO3X that is connected to a Storage Tank, disconnect the PRODUCT WATER hose from the tank and place along with the REJECT WATER TO DRAIN hose in a drain.
4. Put on rubber gloves, apron, and goggles.

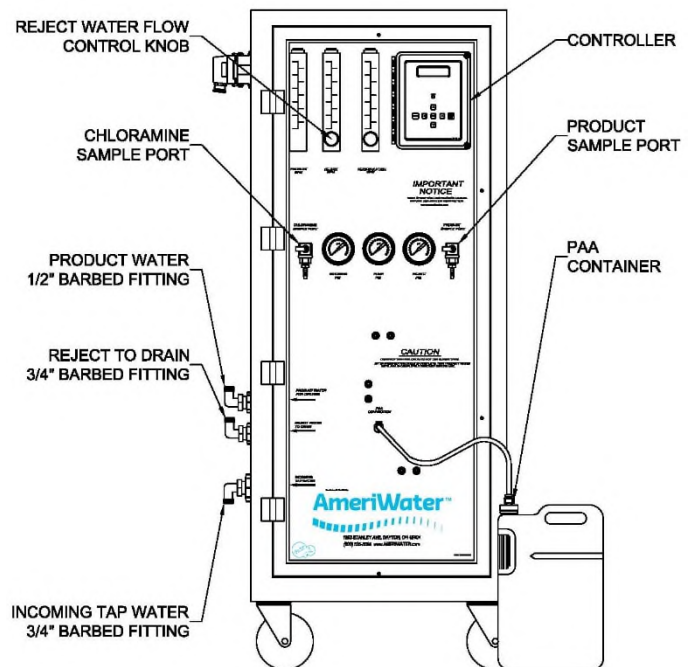


FIGURE 5.1

5. Unscrew the cap assembly of the PAA container (plastic 2 ½ gallon container).

CAUTION: Exposure to hydrogen peroxide/ peroxyacetic acid concentrate or solution may cause severe chemical burns to the skin or eyes. Additional information regarding the safe handling of PAA is found in this section, on the Peracidin container, and in the material safety data sheet. Please read carefully before using.



6. Add 800 ml of 100% PAA disinfecting solution to the PAA Container, and fill with water to the red line (tap water or treated water may be used).
7. Screw the cap assembly securely back onto the PAA container.
8. Agitate the container in a circular motion for approximately 10 seconds.
9. Connect the PAA tubing male fitting into the quick disconnect fitting that is mounted on the front of the cabinet of the RO3X (Figure 5.1).

10. Press and hold the LEFT ARROW key and then, press the RIGHT ARROW key. This will access the DISINFECT MODE. The controller display will show DISINFECT ENABLED and the keys can be released.
11. When in DISINFECT ENABLED, the signal from the conductivity cell is disabled. The Product Water for Dialysis will pass through and out the PRODUCT WATER hose laden with PAA disinfectant. If connected to a small direct feed loop, PAA disinfectant solution will also pass into the loop.
12. Pressing and holding the ENTER key will activate the disinfect function, draw PAA from the container and pump PAA solution through the RO3X.
13. Adjust the REJECT flow control knob so that the PAA will be drawn into the RO3X in approximately 2 minutes. (Figure 5.1) The REJECT flow amount will have to be determined the first time the PAA is drawn in, and noted the flow that will empty the container in approximately 2 minutes.
14. Continue holding the ENTER key until the PAA container is empty, then immediately release the ENTER key.

NOTE: The ENTER key must be held until all the PAA is drawn into the RO3X.

- a. Avoid stopping and starting the disinfect function which may cause a thermal overload of the RO3X pump.
 - b. Releasing the ENTER key may cause the system to lose its prime preventing all of the disinfectant from being drawn into the RO3X.
 - c. Approximately ¼” of the solution will remain in the bottom of the PAA container. This is normal and may be emptied down the drain after the entire process is complete.
15. Record on the Start-Up Log that this step was performed.
 16. The RO3X should be filled with PAA disinfecting solution. To ensure that PAA solution has been pumped through the RO3X, use Peracid test strips (P/N 97hp20401):
 - a. Using a test strip, test the water the REJECT WATER TO DRAIN hose, the result must be at least 1% (500 ppm).
 - b. Use another test strip at the PRODUCT WATER hose, the result must be at least 0.5% (250 ppm).
 - c. If the desired levels are not reached, press and hold “ENTER” button to force disinfectant thru the hoses.
 17. Label the RO3X with appropriate WARNING signs (Example: “DO NOT USE / CONTAINS DISINFECTANT”).
 18. Leave the RO3X in the DISINFECT ENABLED mode, and allow the PAA solution to soak for 60 minutes within the RO3X.

WARNING: Soaking longer than twelve hours may cause damage to the membrane.

19. Record the Start and Stop times on the Log to have a record of how long the membrane soaked in PAA disinfecting solution.
 20. After the required soak time is achieved in the DISINFECT mode, flush the residual PAA from the disinfectant draw plumbing by:
 - a. Rinse and fill the PAA Container to the red line with dechlorinated water from the Chloramine Sample Port and connect the PAA tubing to the PAA connection on the front of the RO3X.
 - b. Press and hold the ENTER key to turn on the Disinfect Draw function and THE DISPLAY WILL READ **DISINFECT ENABLED DRAW**. Continue to hold the ENTER key, until all of the water is drawn in and you begin to see air bubbles in the draw tube. This will flush out any residual PAA left in the injection plumbing.
 - c. Disconnect the PAA Container and PAA tubing from the PAA connection on the front of the RO3X.
 21. Press the ALARM SILENCE/RESET key to exit the DISINFECT Mode and verify that the RO3X is off (STANDBY).
 22. DO NOT reconnect the PRODUCT WATER hose at this time!
 23. Turn on the RO3X by pressing the POWER key. Open the REJECT VALVE to allow full flow of REJECT WATER. Record the Start time on the Startup Log. Allow the machine to run at this setting for at least 15 minutes.
 24. After rinsing with the REJECT VALVE allowing full flow for at least 15 minutes, turn the REJECT VALVE clockwise until the REJECT flow is approximately equal to the PRODUCT flow (normal operation reject flow). Allow the RO3X to run for 15 more minutes.
 25. After the first 30 minutes, repeat 15 more minutes of full flow through the REJECT VALVE + 15 minutes of operation a normal operation reject flow. This will give a total of 60 minutes of running time to remove the disinfectant. Begin to test for the presence of PAA with residual test strips (**Renal Check PX Test Strips (P/N 97PX20501)**) at product and reject hoses.
 26. Continue to periodically test for the presence of residual PAA at the CHLORAMINE SAMPLE PORT (at the front of the RO3X) until no trace of PAA is detected by the residual test strips.
- WARNING:** Continue rinsing and testing with test strips until all test strips show a negative residual result (no color change) to ensure that there are NO traces of PAA disinfecting solution remaining in the entire water system. AmeriWater recommends using Renal Check PX Test Strips (P/N 97PX20501)
26. Record the Stop time on the Startup Log to have a record of how long it takes for the disinfecting solution to completely rinse out. Place a checkmark on the log to verify that residual PAA tested negative.
 27. Disinfection is complete.

28. If the RO3X was disconnected during disinfection from the storage tank, it can be reconnected for use once it is producing water within the acceptable conductivity range.

5.2 A WORD ABOUT HYDROGEN PEROXIDE/PEROXYACETIC ACID

Do not use hydrogen peroxide/peroxyacetic acid concentrate (PAA) after the expiration date. Using outdated PAA may cause incomplete disinfection. PAA loses effectiveness if not kept out of direct sunlight and/or the cap is not tightly sealed. Using ineffective disinfecting solution will cause incomplete disinfection. Using less than the required volume of PAA concentrate will result in incomplete disinfection.

Disposal of Outdated Hydrogen Peroxide/Peroxyacetic Acid:

Supplies Needed - a sink with a supply of tap water
 - rubber gloves, lab apron, and goggles
 - a supply of paper towels

1. Put on rubber gloves, apron and goggles.



CAUTION: Exposure to PAA concentrate or solution may cause severe chemical burns to skin or eyes.

2. Start a flow of cold tap water to dilute the PAA as it flows down the sink drain.
3. Slowly and carefully pour the disinfecting solution down the drain, taking care to avoid spills, splashes, or breathing the vapors.



CAUTION: Splashing PAA concentrate may cause severe chemical burns.

4. Rinse the emptied PAA container with tap water to remove all traces of the chemical. **Rinsing emptied containers is needed to protect waste handlers from accidental exposure to the chemical.**
5. Rinse the drain with tap water to remove residual disinfecting solution from the surfaces and flush the chemical from the drains.
6. Discard the emptied and rinsed container in a waste receptacle or set aside for recycling.
7. Inspect the area for spilled or dripped disinfecting solution. Wipe up small spills with a damp paper towel. Larger spills should be either flushed to drain with water or removed with a water bucket and floor mop.

WARNING: Verify that there is no chlorine (bleach) in the water bucket or floor mop. Chlorine (bleach) will cause a severe chemical reaction when it comes in contact with PAA concentrate!

8. Rinse rubber gloves with tap water to remove any residues due to handling.
9. Return rubber gloves, apron, and goggles to their storage area.

5.4 MEMBRANE FLUSH FEATURE (AUTO FLUSH)

The MEMBRANE FLUSH FEATURE is the preferred means for minimizing bacterial growth for the RO3X during periods of low water usage. Ordinarily these sizes of RO are connected to a loop or storage tank only having 1-2 days of non-use when dialysis procedures are not being carried out. The RO3X can be set up to discourage microbiological growth by “flushing” periodically.

The Membrane Flush feature is disabled as a default from the factory for RO3X models. Refer to the default setpoints in Section 6.4. If these default settings do not meet your particular need, then they can be changed. See Section 6.5 on how to change from the default settings.

FLUSH MODE	RO PUMP	INLET VALVE	DIVERT VALVE
3 (FOR STORAGE TANK APPLICATIONS)	ON	OPEN	ENABLED

FLUSH MODE #3 assumes that the **RO is connected to a storage tank** and, therefore, will divert the PRODUCT WATER to the drain. This minimizes bacterial growth and directs all the water to the drain, rather than refill the storage tank. **FLUSH MODE #3** will cause all the water to be diverted to drain for each MEMBRANE AUTO FLUSH cycle.

SETPOINT SETTING

Flush Type	6 (Off hours)
Flush Time	15 to 45 (minutes)
Flush Mode	3 (Inlet valve open, pump on)
Flush Interval	4 to 12 (hours)

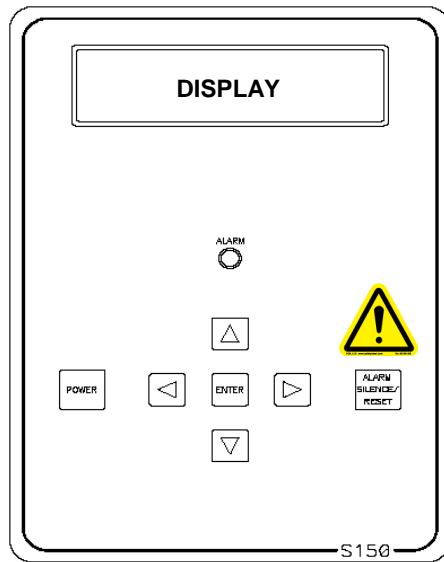
The RO must be connected to the electric power source, incoming water supply, and drain at all times for this feature to be operable.

The Flush Time and Flush Interval settings are recommended settings, but may be adjusted to fit your specific needs. Contact your AmeriWater representative for guidance.

6.0 RO CONTROLLER

6.1 FRONT PANEL CONTROLS AND INDICATORS

FIGURE 6.1



DISPLAY - Shows status of system.

ALARM LAMP - Flashes when fault causes an RO system shut down. On steady when a Setpoint is exceeded that does not cause an RO system shut down.

POWER KEY - Places controller in operating or standby mode.

LEFT ARROW KEY - Scrolls through Setpoints starting with first Setpoint.

RIGHT ARROW KEY - Scrolls through Setpoints starting with last Setpoint.

UP ARROW KEY - Increases value of Setpoint.

DOWN ARROW KEY - Decreases value of Setpoint

ENTER KEY - Confirms entry of new Setpoint value

ALARM SILENCE/RESET KEY - Push once for alarm silence and twice to reset system after a shut down has occurred.

ACCESSING DISINFECT MODE - Push and hold the left arrow key, and then push the right arrow key.

(NOTE: The J2 jumper must already be installed to make this an active mode. Ref. Fig. 6.2).

DISINFECT - Push the ENTER key and hold until all of the solution is drawn into the RO.

6.2 CONTROLLER OPERATION

GENERAL OPERATION

The unit has 2 modes of operation, a standby mode and an operating mode that are controlled by the POWER key. In the standby mode, the unit is effectively off. All outputs are turned off and the display shows STANDBY. In the operating mode, the unit operates automatically. All inputs are monitored and the outputs are controlled accordingly. Pressing the POWER key will toggle the unit from STANDBY to OPERATE or from OPERATE to STANDBY. If power is removed from the unit, when power is reapplied, the unit will restart in the mode it was in when power was removed.

DISPLAY

The display is a 2 line x 20-character backlit liquid crystal display. System operating status and sensor readings are shown on this display. Set point information can, also, be shown on this display.

OPERATING STATUS MESSAGES

The operating status of the unit is shown on the top line of the display. The following list describes the items shown for the operating status.

STANDBY - The unit is in the STANDBY mode.

DELAY 99 - The unit is in the RO start delay. The number is the seconds remaining before the RO pump starts.

OPERATING - The RO unit is operating.

TANK FULL - The unit is shut down due to a tank full condition.

TANK FULL 99 - The unit is shut down due to a tank full condition. If the number is blinking, the tank full high switch has cleared, but the tank full low switch is still active. If the number is on steady, both tank level switches have cleared and the delay is counting down.

PRETREAT - The unit is shut down due to a pretreat lockout condition.

PRESS FAULT - The unit is shut down due to a pressure fault condition.

MEMB FLUSH 99 – Membrane Flush is active. The number is the minutes remaining in the flush cycle.

CONDUCTIVITY

The Conductivity is shown on the top line after the unit operating status. When the unit is in STANDBY, because of a shut down condition, the reading is replaced with '----'. If the reading is over range, the reading is shown as '^^^' when in the OPERATE mode.

OPERATING HOURS

The current operating hours are shown on the bottom line.

TEMPERATURE

The current water temperature is shown on the bottom line to the right of operating hours. When the unit is in STANDBY due to a shut down condition, the reading is replaced with '---'.

WARNING MESSAGES

Warning messages are also shown on the second line. If any warnings are active, the active warnings will alternate with the normal displays for the bottom line. The following lists the warning messages.

HI COND - The Conductivity reading has exceeded the programmed limit.

TANK FULL OPERATION

The unit can be operated with 1 or 2 level switches. With 1 level switch, the switch is connected to the tank full high input. When this switch has been active for 5 seconds, the unit will shut down on tank full. TANK FULL will show on the display. When the tank full condition clears, the display will show TANK FULL 99. The number is the tank full restart time and the unit will restart when this delay times out.

For 2 level switch operation, the upper switch is connected to the tank full high input and the lower switch is connected to the tank full low input. When both switches are "open", the RO unit will start. The RO unit will continue to run when the water level rises, and while the lower switch becomes active (closed). When the upper switch becomes active (closes), after the 5 second delay, the RO unit will shut down. TANK FULL will show on the display. When the tank level drops and the upper level switch clears, the display will show TANK FULL 99 and the RO unit will remain off. The number is the tank full restart time and the number will blink until the lower level switch clears (opens). When the lower level switch clears (opens), the number will remain steady and the RO will restart when the delay times out.

TANK FULL RESTART

The tank full restart is the delay before the RO unit starts when a tank full condition clears. This delay can be in minutes or in seconds. The TF Restart Setpoint selects seconds or minutes.

TANK FULL OVERRIDE

A timed tank full override can be initiated when the RO unit is shut down due to a tank full condition. Pressing the Alarm Silence/Reset key for 3 seconds during a tank full condition will enable the tank full override. The RO will start and TF OVERRIDE 9 will show on the display. The number is the minutes remaining in the override timer. When the override times out, the unit will return to the tank full shut down condition. The TANK FULL OVERRIDE will divert all water to the drain, whether the water quality is good or bad coming into the RO.

PRESSURE FAULT

If the pressure fault input becomes active (closes) and stays active for the delay programmed in the PF Delay Setpoint, the unit will shut down for a pressure fault. The display will show PRESS FAULT, the alarm lamp will flash and the audible alarm will sound. The pressure fault can be cleared by pressing the Alarm Silence/Reset key twice.

AUTO RESET

If a pressure fault shut down occurs and the Auto Reset Setpoint is programmed to 0, the unit will remain shut down until manually reset. If the Auto Reset Setpoint is programmed to a value greater than 0, the unit will automatically clear the pressure fault and attempt to restart after this delay times out.

ALARM SILENCE

When a shut down occurs that causes the audible alarm to sound, the alarm can be silenced by pressing the Alarm Silence/Reset key once. The alarm will remain silenced for 3 minutes [180 seconds (AAMI RD62 standard)] when the Alarm Silence Setpoint is programmed to the factory default 3. If the Alarm Silence Setpoint is programmed to a value other than 3, the alarm will resound after this delay times out. Pressing the Alarm Silence/Reset key will silence the alarm and reset this delay.

PRETREAT

If the pretreat input becomes active (closes) and stays active for 2 seconds, the unit will shut down in a pretreat lockout condition. PRETREAT will show on the display and the unit will remain shut down as long as the pretreat input is active.

HIGH CONDUCTIVITY

If the Conductivity reading exceeds the limit programmed the Cond Limit Setpoint for the delay programmed in the Cond Delay Setpoint, the alarm lamp will light and the HI COND warning message will show on the display. This warning will clear when the Conductivity drops below the Setpoint.

When the High Conductivity warning message is active, the RO will divert the PRODUCT WATER to drain (through the Reject hose), until the Product water conductivity goes back into the acceptable quality range.

ALARM OUTPUT

The Expansion I/O relay 2 has been programmed to operate as an alarm relay. The relay will energize whenever a warning or alarm condition occurs. The relay will remain energized as long as the warning/alarm condition is active.

6.3 CONTROLLER ADJUSTMENTS

Your controller has been calibrated prior to shipment and the conductivity set point has been preset based on an analysis of your water provided at the time of sale. It may be necessary to periodically calibrate the Conductivity. If the controller should require calibration, follow the instructions below. Please contact AmeriWater at 800/535-5585 or 937/461-8833 if you have any questions regarding the procedure.

CONDUCTIVITY CALIBRATION

Refer to Figure 6.2 for adjustment location (SPAN). To calibrate the Conductivity, place the cell in a known standard solution. Adjust the span adjustment for the correct reading. If the cell is installed, the unit can be calibrated by taking a sample from the PRODUCT TEST PORT and testing it with a known, calibrated meter. Adjust the span control until the reading matches the meter.

Refer to figure 6 for adjustment location. To calibrate the 2nd TDS / Conductivity, place the cell in a known standard solution. Adjust the span adjustment for the correct reading. If the cell is installed, the unit can be calibrated by taking a sample of the water and testing it with a known, good meter. Adjust the span control until the reading matches the meter.

DISPLAY ADJUSTMENT

The display contrast can be adjusted for best viewing by adjusting control R3. This control is located toward the upper right corner of the board, just to the left of the cell connector.

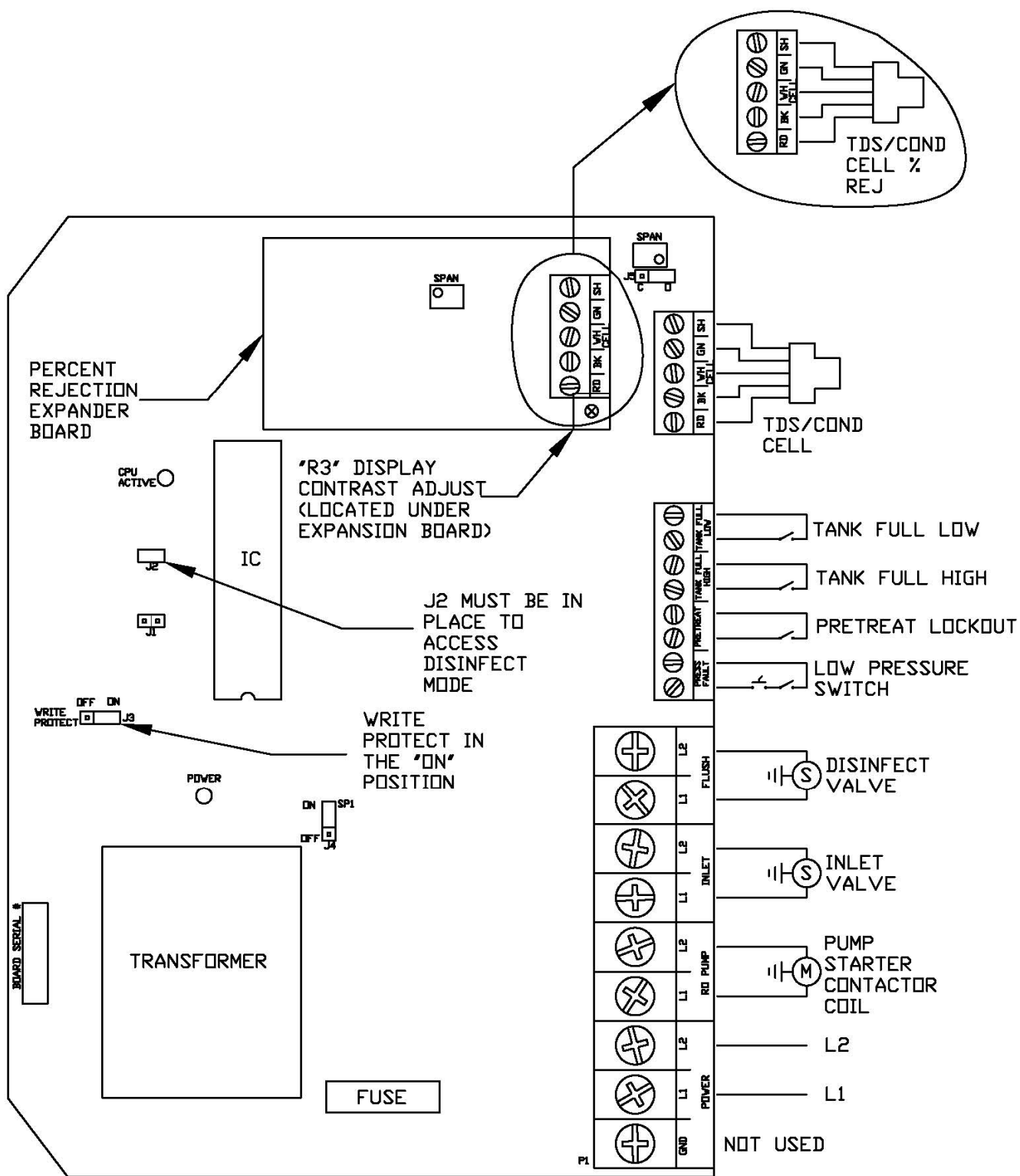


FIGURE 6.3

RIBBON CABLE
FROM MAIN BOARD
CONNECTION

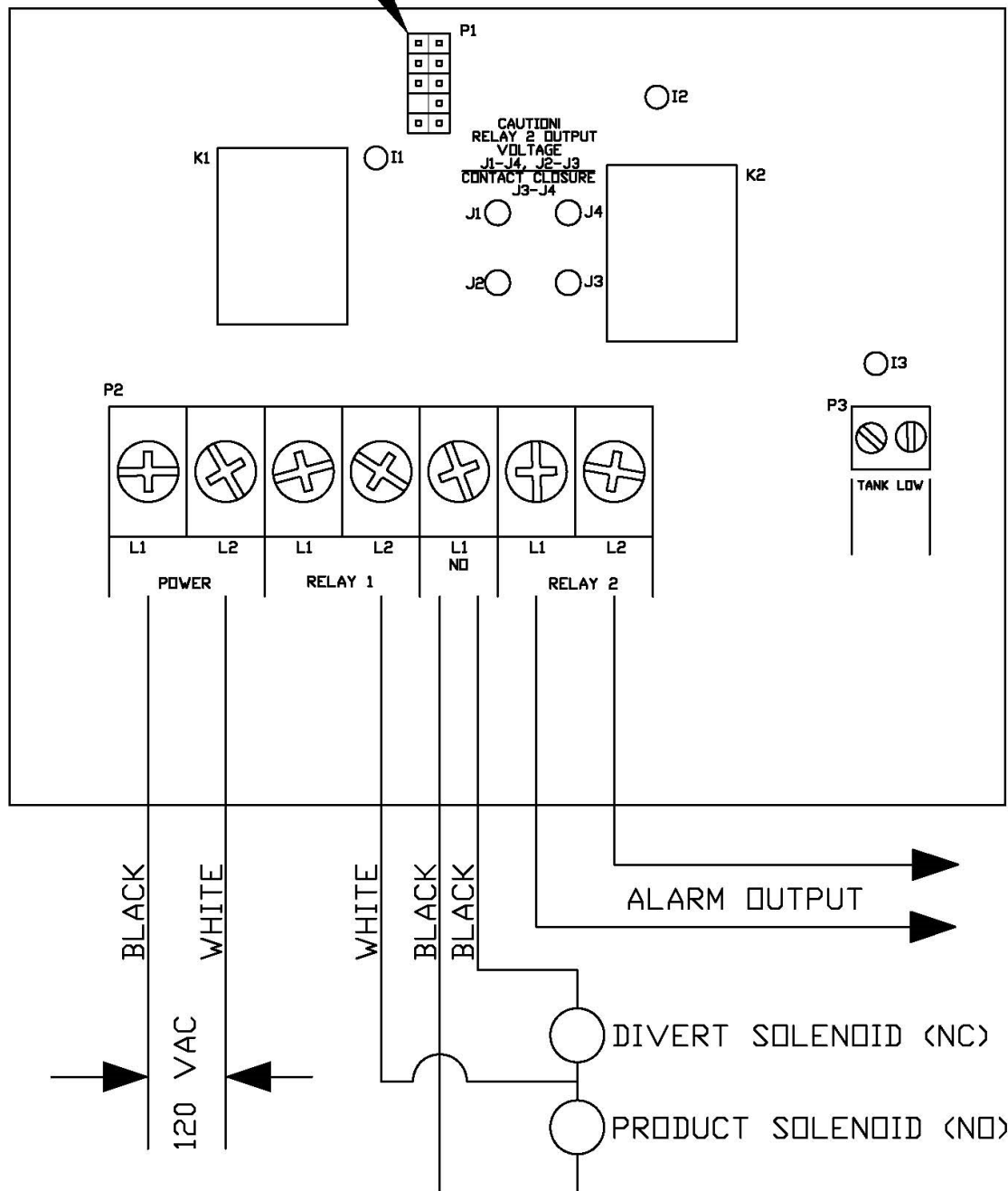


FIGURE 6.3

6.4 STANDARD SETPOINTS

SETPOINT SETTINGS	DESCRIPTION	RANGE	DEFAULT	USER
TDS/Cond Limit	When this value is met or exceeded, the alarm lamp will light and high TDS/Cond will show on the display. To disable, set to 0.	0-999 μS or PPM*	Based on water analysis.	
TDS/Cond Delay	When the limit Setpoint is exceeded, no alarm will be given until this time has expired.	0-999 seconds	10	
RO Start Delay	The amount of time between the inlet valve opening and the RO pump start.	0-99 Seconds	10	
Press Fault Delay	The time a pressure fault must be active before a pressure fault shut down occurs.	0-99 Seconds	10	
Auto Reset	When a pressure fault shut down is active, the system will attempt to restart after this delay. If set to 0, system must be manually reset.	0-99 minutes	0	
Alarm Silence	If the audible alarm is silenced, after this delay, the alarm will resound. If set to 0, the alarm will remain silenced.	0-99 minutes	3	
TF Restart Delay	When a tank full condition clears, the system will restart after this delay.	0-99 sec/min	5	
TF Restart	Selects whether the tank full restart delay is in seconds or minutes. 0=seconds, 1=minutes.	0-1	0	
TFO Time	The amount of time that a tank full override lasts.	0-15 Minutes	3	
Tank Lo Restart	Not Used			
Flush Type	Selects the type of flush. Set to 0 to disable.	0-8	0	
Flush Time	The length of time a membrane flush cycle will last when flush is active.	0-99	0	

* μS = microsiemens; PPM = Parts Per Million

SETPOINT DEFAULT	DESCRIPTION	RANGE		USER
Flush Interval	The interval between flush cycles. Only valid with operation hour, elapsed time or off flush types.	0-99	0	
			minutes	
Flush Mode	Selects if the inlet and RO pump relays operate during flush.	1-4	0	
Maximum Hours	If the current operating hours exceed this limit, the operating hours warning will occur. To disable, set to 0.	0-65000	0	
			hours	
Current Hours	Current number of hours of RO system operation.	0-65000	0	
			hours	
Expander Mode	Not Used			
Temp Offset	Allows adjustment of temperature reading by +/-5 degrees.	± 5	0	
Temp UOM	Selects display of temperature in °F or °C	0-1	0	
Switch Select	Selects if switch inputs are normally open or normally closed.	0-32	0	
TDS/Cond UOM	Selects display of water quality in uS or PPM	0-1	0	
NOTE: If this Setpoint is changed, the unit must be recalibrated.				
TDS/Cond Range	Selects range of TDS/Conductivity monitor	0-6	1	
	0-50, 1-100, 2-250, 3-500, 4-1000, 5-2500			
	6-5000			
NOTE: If this Setpoint is changed, the unit must be recalibrated.				
C2 Range	Selects range of TDS/Conductivity monitor	0-6	4	
	0-50, 1-100, 2-250, 3-500, 4-1000, 5-2500			
	6-5000			
NOTE: If this Setpoint is changed, the unit must be recalibrated and range components may need to be changed.				
C2 Limit	When this valve is met or exceeded, the alarm lamp will light and high TDS/Cond will show on the display. To disable, set to 0.			
%Rej	The 2 nd TDS/Conductivity is used to monitor water, programming this setpoint to 1 allows the % rejection to be displayed.			

6.5 TO DISPLAY OR CHANGE SETPOINTS

NOTE: Please contact your AmeriWater representative prior to changing set points.

1. Refer to Figure 6.1 for the location of the keys used to display or change the Setpoints and Figure 6.2 for the location of the write protect jumper, J3. For the unit to be able to accept a change in a Setpoint, the shorting jumper must be in the WRITE PROTECT OFF position (center and left pins).

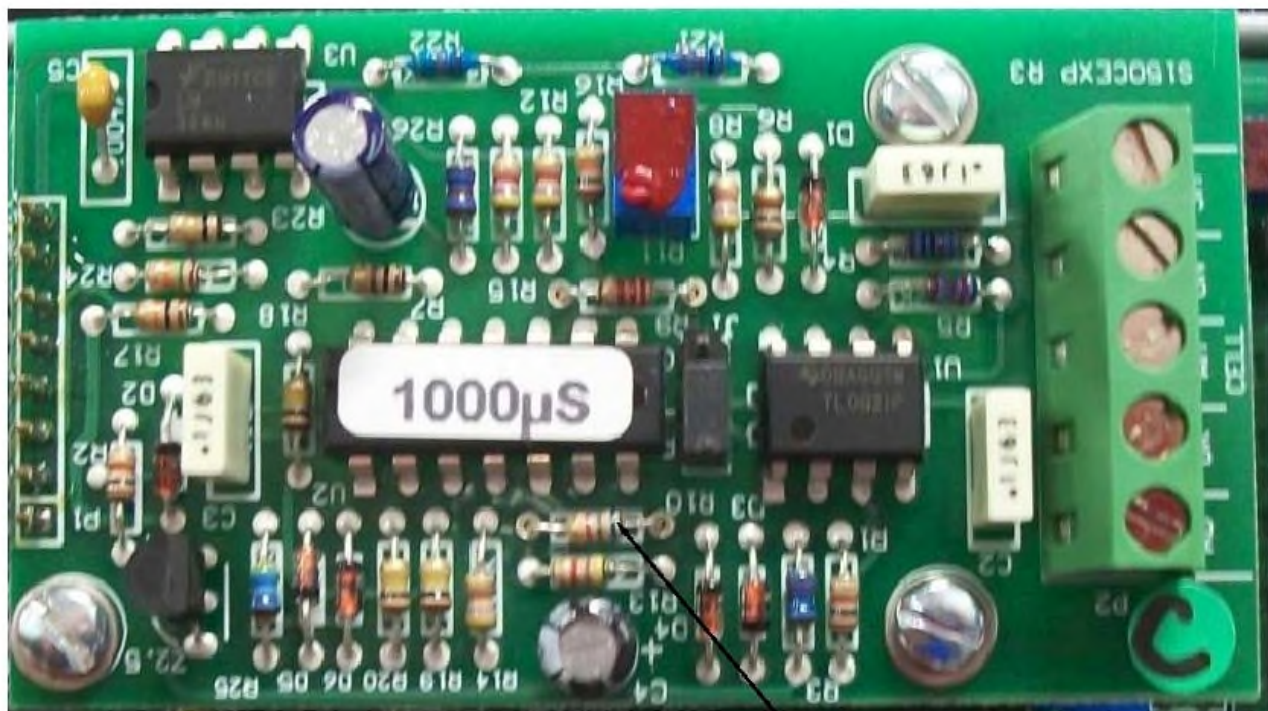
NOTE: Setpoints cannot be changed if the write protect jumper is in the ON position.

2. Use the LEFT and RIGHT ARROW keys to display the Setpoints. Each press of an arrow key will advance the display to the next Setpoint. The Left arrow key starts with the beginning Setpoint and the Right arrow key starts with the last Setpoint.
3. The Up and Down arrow keys are used to increase or decrease the Setpoint value. The value will change by 1 count each time a key is pressed. If the key is pressed and held for >1 second, the Setpoint value will change at a fast rate. When the key is released, the fast rate will be reset. Pressing both the UP and DOWN ARROW keys together will reset the set point value to 0.
4. Pressing the ALARM SILENCE/RESET key at any time will cancel the operation and return the display to the main screen.
5. To accept the new set point value, press the ENTER key.
6. The unit will beep twice if the change is accepted. If the write protect jumper is on, the unit will show WRITE PROTECTED on the display and one long beep will sound.
7. When finished changing Setpoints, the write protect jumper should be placed in the ON position (center and right pins).

6.6 CHANGING RESISTORS ON THE RO CONTROL BOARD FOR C2 RANGE

If your incoming feed conductivity is above the Factory setting C2 range of 0-1000 micro-seimens, then you'll have to swap the resistors on the conductivity board.

1. Switch off the RO by pressing the POWER key (the display will show STANDBY).
2. Turn off all power to RO.
3. Open door on RO controller. Conductivity board you need to get to is on the back of the door.



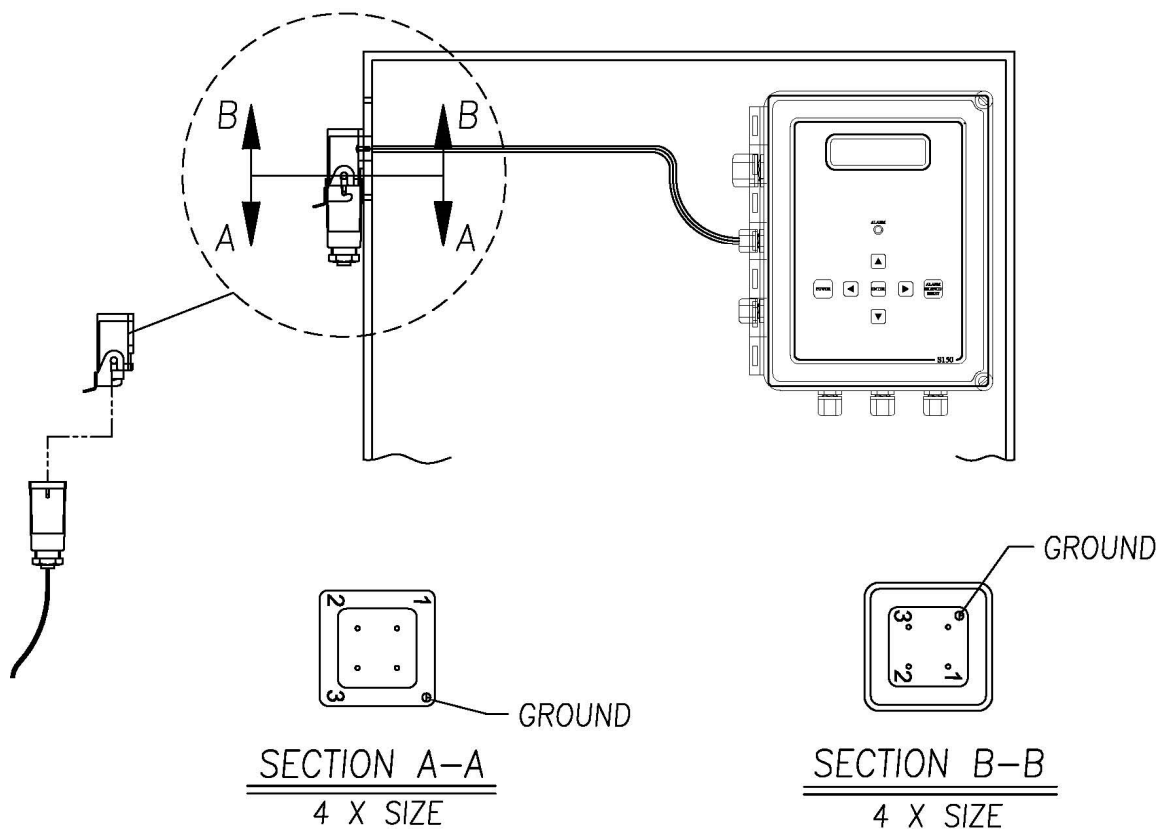
R10 RESISTOR

4. The control system for the RO3X ships with resistor R10 (see above) that can be identified by its color bands (Red-Violet-Red-Gold). If your feed water conductivity exceeds 1,000 $\mu\text{S}/\text{cm}$, you may want to change out the resistor in the R10 position with a replacement resistor, provided by AmeriWater. This replacement resistor can be identified by its color bands (Blue-Grey-Red-Gold). Alternatively, if you have an ohm-meter, the original resistor can be identified by its resistance value of 2.7 k Ω ; the replacement resistor's resistance value is 6.8 k Ω .
5. Remove the R10 resistor with needle nose pliers.
6. Move the replacement resistor to the R10 position.
7. Save the R10 resistor somewhere safe.
8. Close RO controller door.
9. Re-apply power to RO.
10. Go into setpoints in the controller (Ref. Section 10.1).
11. Change the C2 Range setpoint to meet your needs. C2 Range setpoint 5 is 0-2500, 6 is 0-5000.
12. Once the setpoint has been changed, then you need to calibrate the units by taking a sample of the permeate water and testing it with a calibrated conductivity meter.

7.0 STORAGE TANK TO RO WIRING INSTALLATION

FLOAT LEVEL SWITCHES, PRETREAT LOCKOUT & RO ALARM RELAY CONNECTORS

1. Bring the 4 pin female connector on the storage tank float switches over to the RO.
2. Verify that the pins on the 4 pin female and the 4 pin male connectors align with each other as shown in figure 7.1 (1 to 1, 2 to 2, 3 to 3 and ground to ground).
3. Slid female connector into the male connector on the RO, snapping the two together.
4. Engage the lock between the female and male connector.



NOTE:
CONTACTS 1 & 2 ARE
FOR HI TANK.
CONTACTS 3 & GROUND ARE
FOR LOW TANK.

Figure 7.1

8.0 MAINTENANCE

WARNING: If any component of the water treatment system is changed or replaced, the user should conduct appropriate tests to ensure that the revised system meets all standards to which it was initially tested.

WARNING: Maintenance shall be performed by qualified personnel only.

8.1 MAINTAINING THE SYSTEM

Use the following maintenance schedule:

Daily	Complete daily log. Ensure unit is operating within parameters (see below).
Yearly	Check feed and product water quality calibration (see Section 6.3).
As Needed	Replace HRO3X pre-filter cartridge(s), if total chlorine break-through > 0.1, or differential pressure of > 10 PSI.
	Replenish PT401 Antiscalant solution.
	Membrane cleaning, if > 10% loss of product flow / > 10% rise in product conductivity.

Notes:

Your facility needs to provide a Startup Log for the HR3OX system. This must be filled out completely each time the system is used. The HR3OX must operate within the given parameters. The recorded information may be useful in troubleshooting problems.

8.2 PT401 ANTI-SCALANT

The RO3X has been fitted with a PT401 antiscalant system to control feed water hardness. If feedwater is pre-softened, do not use antiscalant.

8.3 MEMBRANE MAINTENANCE INSTRUCTIONS

MEMBRANE REPLACEMENT PROCEDURE:

The membrane is normally replaced when the membrane has become fouled or there is continuous low product flow rate.

Turn off the incoming tap water supply to the RO and unplug the device from the GFI receptacle. Power down the disconnect for the motor starter. (The following procedure will cause water to leak and spill – This could occur at different times during the procedure - You may get wet.)

1. Place a container under the CHLORAMINE SAMPLE (TEST) PORT and slowly open the port to relieve the pressure on the RO system.
2. Place a container under the PRODUCT SAMPLE (TEST) PORT on the front panel and open to allow to drain.
3. Open the back panel of cabinet.
4. Press release button on Product Water Manifold (Manifold located near top at back of left wall – looking in back of cabinet) to disconnect product water hose from all membranes being removed.
5. Disconnect the pump feed and reject discharge hose from the membrane being replaced.
6. Remove the unistrut clamps from membrane and pull the membrane assembly from the cabinet.
7. With membrane removed, loosen inlet cap clamp and remove inlet cap from the membrane assembly.
8. Remove used membranes from the housing.
9. Note the serial number of the replacement membrane and indicate this on the outer housing of the membrane assembly with a label maker.
10. Insert the new membrane into the housing inlet.

NOTE: You must insert membranes into the inlet end of the housing. Inserting a membrane from the discharge end will damage the membrane's brine seal.

11. Install the membrane assembly by reversing the order of steps 1 through 10.
12. Repeat these steps for each membrane that will need to be replaced.

13. Once all membranes have been replaced, turn on power to the motor starter, plug the device back into the GFI receptacle and turn on the incoming water supply.

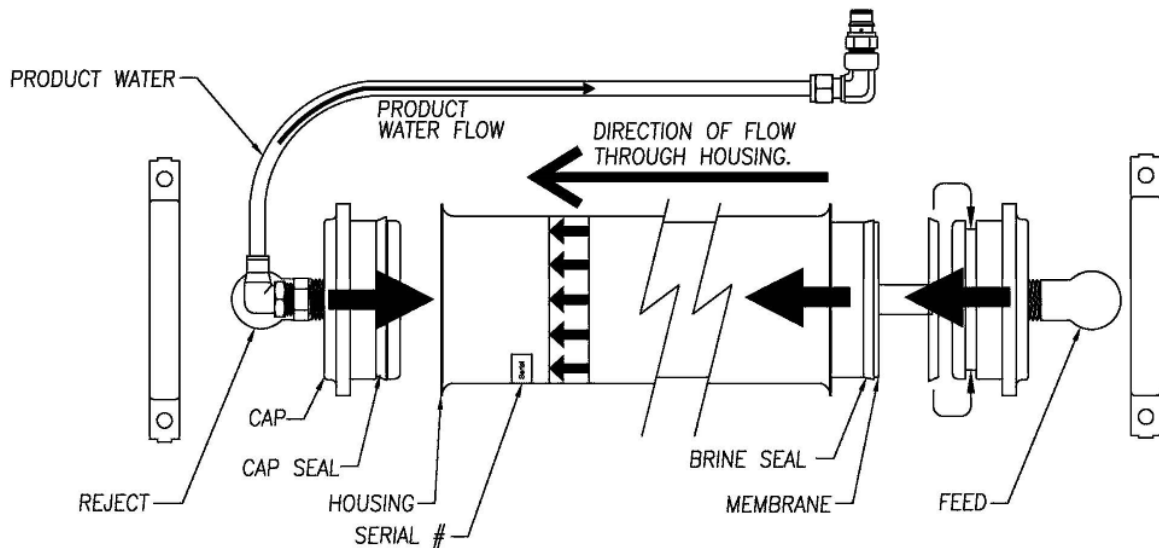


FIGURE 8.6

Rinse Out Cycle

After the exchange is complete, it is important to put the RO through a rinsing out cycle to flush the preservative out of the new membrane.

1. Put the PRODUCT WATER hose at a sink.
2. Turn the Reject Flow Control Knob counterclockwise to give full reject flow.
3. Remove power from the RO pump.
4. Turn on the RO and allow water to run through the system for a minimum of 30 minutes until the water is clear. This will rinse the preservative out of the new membrane. During this operation, verify that the membranes are leak free.

WARNING: Replacement membranes come shipped from the manufacturer containing a preservative solution to prevent microbiological growth and freezing. Discard all product water for at least two hours of operation before placing the RO back into service, again.

5. Reconnect the PRODUCT WATER hose.
6. Re-apply power to the RO pump.
7. Turn on the RO. The rinse out cycle is now complete, and the RO is ready for use.

WARNING: If the product water conductivity does not come out of alarm, do not use the system! Continue rinsing, or call AmeriWater for guidance.

9.0 TROUBLESHOOTING AND REPAIR

9.1 TROUBLESHOOTING CHART

WARNING: Only those persons who have read the complete operations manual or who have received authorization from the medical facility director should attempt to troubleshoot and/or repair the RO system.

To assist you in quickly restoring your system into service, AmeriWater will send your replacement part out immediately and check your bad part when it comes in to verify if it is covered under your equipment warranty.

<u>PROBLEM</u>	<u>POSSIBLE CAUSE</u>	<u>CORRECTIVE ACTION</u>
RO will not start	RO not plugged in Circuit breaker blown RO in a FAULT condition	Plug into electrical outlet. Reset the breaker. Check RO controller display for FAULT condition and correct the FAULT.
System has power but no water flow	Feed source not open Feed pressure < 20 PSI Incoming hose kinked Prefilter clogged Circuit board relay is not operating	Open Incoming Tap Water valve. Increase pressure to ≥ 20 PSI. Straighten kinks from the INCOMING TAP WATER hose. Check the prefilter gauges for pressure drop; replace the prefilter if the pressure drop is 10 PSI or greater than initially recorded. Replace the controller circuit board (Section 9.2)
System has power but no water flow (continued)	Feed solenoid is not operating	Test the solenoid (Section 9.5). Replace the valve if it is defective (see Section 9.6).

Disinfect cycle will not operate when holding the ENTER key	<p>DISINFECT MODE has not been accessed correctly.</p> <p>Circuit board relay not operating in DISINFECT MODE.</p> <p>Disinfect Solenoid Valve not operating</p>	<p>Access DISINFECT MODE (see Section 5.1).</p> <p>Replace the controller circuit board (see Section 9.2).</p> <p>Test solenoid valve (Section 9.5). Replace the valve if it fails (Section 9.6).</p>
Pump making excessive noise	<p>Low pressure or flow rate feeding the RO</p> <p>Feed solenoid is not operating</p> <p>Pump motor or impeller failing</p>	<p>Check the prefilter outlet gauge PSI (must be ≥ 20 PSI), and verify that the product flow (flowmeter) > 1 GPM.</p> <p>Test the solenoid (Section 9.5). Replace the valve if it is defective (see Section 9.6).</p> <p>Check PUMP PSI GAUGE to verify that it is within operating parameters.</p> <p>Replace the pump assembly if necessary (see Sections 9.3 and 9.4).</p>
Poor quality product water	<p>High Chlorine levels</p> <p>RO not rinsed thoroughly</p> <p>Reject Flow Meter not properly adjusted.</p> <p>Fouled membrane</p>	<p>Backwash the carbon filter or rebed.</p> <p>Rinse membrane (see Section 8.4).</p> <p>Turn the Reject Flow Meter knob so that the Reject Water flow is equal or slightly greater than the Product Water flow.</p> <p>Exchange membrane. (see Section 8.3).</p> <p>Verify that the conductivity cell accuracy with a known good meter. Follow the calibration procedures in Section 6.5 or replace cell if necessary.</p>

<u>PROBLEM</u>	<u>POSSIBLE CAUSE</u>	<u>CORRECTIVE ACTION</u>
Low product flow rate	Low pressure feeding membrane	Verify that the incoming tap water supply is fully open. The pressure on the prefilter gauges should be ≥ 20 PSI when the RO is operating.
	Low pump PSI	Pump should be operating at 175 – 250 PSI.
	Reject GPM flow rate too high	Adjust Reject Water flow rate.
	Excessive PRODUCT line backpressure	Check for restrictions in the product water hose. Check the feed pressure gauge on the dialysis machine. If the dialysis machine does not have a pressure gauge, install one inline.
	Low temperature incoming tap water	Consult the Temperature Correction Chart to determine if the flow rate is normal in relation to the feed water temperature.
	Prefilter clogged	Check the prefilter gauges for pressure drop. Replace the prefilter cartridge if the pressure drop is ≥ 10 PSI.
	Membrane needs replaced	Replace the membrane.
High Bacteria Count	Too long since the last disinfection or the procedure was not performed correctly	Disinfect the RO following the procedures in Section 5.

9.2 CONTROLLER TROUBLESHOOTING

CAUTION: Hazardous voltages are present when power is applied to the unit. Care should be taken when troubleshooting any of the input power or output circuits. When disconnecting or connecting any board or accessory, be sure power is unplugged.

Before contacting AmeriWater for technical help, verify the programming of all Setpoints, check the display and check the status of all lights and indicators. The more information available when you contact us, the easier it will be to determine the source of the problem. Standard setpoints, and drawings of the controller and pc boards can be found in Section 6.

<u>PROBLEM</u>	<u>INVESTIGATION</u>	<u>CORRECTIVE ACTION</u>
System Inoperative	Is the yellow CPU active LED blinking? If no, is the green power LED, DS1 Lit? If no, is the fuse OK? If no, replace the fuse. If yes, with a voltmeter, verify power is applied to the power terminals L1 and L2.	If power is applied to the power terminals and the other checks are OK, the pc board is defective and should be replaced. If no power is applied to the board, check the power wiring to the system.
Display Blank	Is the green power LED, DS1 lit? If yes, is the CPU active LED, DS9 blinking? If yes, adjust the display contrast adjustment, R3. Is the display still blank?	If no, refer to the system inoperative section. If no, replace the board. If yes, replace the board.
Inlet Valve Will Not Operate	Is the system in standby? If no, are any shut down conditions active? If no, is the inlet LED, DS8 lit? If yes, with a voltmeter, verify if there is power on the inlet terminals. Is there power?	If no, replace the board. If no, replace the board. If yes, check the valve and wiring.
RO Pump Will Not Operate (Cont.)	Is the system in standby?	

	<p>If no, are any shut down conditions active?</p> <p>If no, is the RO LED, DS6 lit?</p> <p>If yes, with a voltmeter, verify if there is power on the RO pump terminals. Is there power?</p>	<p>If no, replace the board.</p> <p>If no, replace the board.</p> <p>If yes, check the pump and wiring.</p>
No or incorrect conductivity reading	<p>Is sensor wired correctly?</p> <p>If yes, is sensor installed inline as shown in the tubing diagram on page 14?</p> <p>If yes, verify correct Conductivity range. Range correct?</p> <p>Does unit calibrate OK?</p> <p>If no, disconnect green and white wires of sensor. Does reading show 0?</p> <p>If yes, reconnect wires and remove sensor from piping and dry. Does reading show 0?</p> <p>If yes, short terminals of cell together. Does reading show '^^^' ?</p>	<p>If no, correct wiring.</p> <p>If no, install correctly.</p> <p>If no, correct range.</p> <p>If yes, calibrate unit.</p> <p>If no, replace board.</p> <p>If no, replace cell.</p> <p>If no, replace board.</p>

9.3 PUMP REPAIR

The following procedures are instructions for removing the pump from the unit.

1. Turn off the water supply and the RO. Unplug the power cord from the electrical outlet and turn off the wall disconnect for the high voltage. If the high voltage cannot be disconnected by a twist-lock plug, make sure there is a “lockout” placed on the handle of the wall disconnect.
2. Open the back panel of the cabinet. Disconnect the pump from the motor starter control box by removing the wires from the connectors
3. Remove the 1/2 black plastic conduit from the wires. Cut the wire harness half way to the pump. Keep the half of the wire harness that way connected to the motor starter in the RO3X cabinet for future use.
4. Disconnect the feed hose on the pump inlet by loosening the hose clamp on the inlet elbow.
5. Disconnect the pump discharge hose. Remove the pump PSI tubing by loosening the compression fitting.
6. Remove the clamp securing the pump assembly and remove the assembly from the cabinet.
7. Loosen the locking ring from the top of the pump to allow the old pump to be removed from the housing. Remove all fittings from the exterior portion of the cap to be re-used on the replacement pump.

9.4 INSTALLING A REPLACEMENT PUMP ASSEMBLY

The following procedures are instructions to install the replacement pump assembly.

1. Compare the new pump to the existing to ensure that the voltage is correct.
2. Slide together pump end and pump motor, tightening nuts in a cross pattern
3. Tighten nuts to between 90-120 in.-lbs.
4. Run wires through sealcon fitting on pump cap.
5. Mount wire shroud with care as to not scuff, crimp or cut wires.
6. Tighten sealcon around wires.
7. Slide the new pump assembly into the housing taking care that the o-ring does not roll.
8. Secure the cap to the housing with the plastic locking ring previously removed.

9. Clean the threads from the fittings that were previously removed. Apply a suitable thread sealant and install into the cap.
10. Insert the pump assembly and reconnect the pump to the frame using the unistrut clamps.
11. Connect the membrane feed tubing and pump pressure gauge tubing to the pump housing outlet port (at the top), and tighten the ferrule nut. Connect the feed tube from the inlet header to the hose barb tee by tightening the hose clamp on the hose barb tee.
12. Connect the pump feed hose to the inlet of the pump by tightening the hose clamp.
13. Take the saved half of the pump wire harness that was previously cut and butt-splice it together with the wires from the replacement pump. Slide supplied heatshrink over the butt-splice location of the harness. Using a heat gun heat the heatshrink around the wire harness.
14. Connect the pump wires to the motor starter box by inserting the wires through the Sealcon fitting on the bottom of the enclosure, and connecting them to the terminal block. Connect the green (ground) wire to the threaded lug in the control box.
15. Reapply power to RO and RO pump. Check that RO Pump builds specified pump pressure (Section 2.1). If it does not build, check rotation of motor.

9.5 SOLENOID TEST PROCEDURE

Feed Solenoid

1. With the RO Off, turn the Incoming Tap Water supply on. **If there is water flowing to the drain, the solenoid has failed open.**
2. Turn on the RO, with the Incoming Tap Water supply still on. **If there is no flow to the drain, the solenoid has failed closed.**
3. Use a voltmeter to verify that power is not being supplied to the INLET SOLENOID VALVE terminal when the RO is off, and that power is being supplied to the terminal when the RO is on. If the power supply is normal, the solenoid valve is bad. If the power supply is not correct, see Section 9, Controller Troubleshooting.

Disinfect Solenoid

1. Turn off the RO.
2. Turn the knob on the Reject Water flow meter counterclockwise about 2 – 3 revolutions.
3. Press and hold the LEFT ARROW KEY and press the RIGHT ARROW KEY to access the DISINFECT MODE.
4. Hold in the ENTER KEY until water flows to the drain. **If there is no water flow to the drain, the solenoid has failed closed.**

9.6 SOLENOID VALVE REPLACEMENT

For all valves, Feed, Disinfect, or Product Divert Solenoid Valves

1. Turn off the RO by pressing the POWER key (the display will show STANDBY), unplug the 120 VAC power cord from the electrical outlet, turn off the wall disconnect, and place a lockout in the disconnect handle.
2. Turn off the incoming tap water supply to the RO.
3. Open the back panel of the cabinet.
4. Remove the membrane(s) and pump (see Section 9.4).
5. Disconnect the solenoid wiring harness plug from the solenoid valve.
6. Disconnect the hoses/tubing from the solenoid valve.
7. Remove the valve from the RO cabinet by unbolting it from the cabinet.
8. Remove the hose/tube fittings from the defective valve.

9. Make sure that the flow direction arrow located on the side of the valve is pointing in the correct direction (same as one being replaced).
10. Install per the kit instructions.
11. Reattach the hose/tubing to the corresponding fittings on the valve.
12. Reconnect the wire harness to the valve.
13. Replace the membrane(s), and pump.
14. To verify that the solenoid valve is installed correctly, follow the Solenoid Test Procedures in Section 9.5.

10.0 SPARE PARTS LISTING

SPARE PARTS LISTING

ITEM #	DESCRIPTION	PART NUMBER	ITEM #	DESCRIPTION	PART NUMBER
1	FLOW METER 1-10 GPM	41530612	12	CONTROLLER ASSEMBLY	R69446010
2	VALVED METER 1-10 GPM	41-0024	13	MEMBRANE	R22-4040
3	SIDE ENTRY HOOD	0167-0014	14	PUMP, 208V, 3 PH, MR02X THRU MR04X	R080-0007
4	BALL VALVE	041003	15	MOTOR STARTER 3 PH	60760445
5	PRESSURE GAUGE 0-100 PSI	43-0012	16	CONDUCTIVITY SENSOR	69446017
6	1/2" HB x MPT ELBOW	14520406	17	0.5" FPT, NC SOLENOID	R59-0002
7	3/4" HB x 1/2" MPT ELBOW	14520408	18	0.5" FPT, NO SOLENOID	R59-0006
8	3/4" HB x MPT ELBOW	14520410	19	0.75" FPT, NC SOLENOID	R59-0015
9	PAA QUICK DISCONNECT	16-0042	20	0.75" EJECTOR	40531603
10	PAA BOTTLE ASSY	0185-0039	21	PRESSURE SWITCH	65-0014
11	0-300 PSI GAUGE	43530714			

Figure 10.1

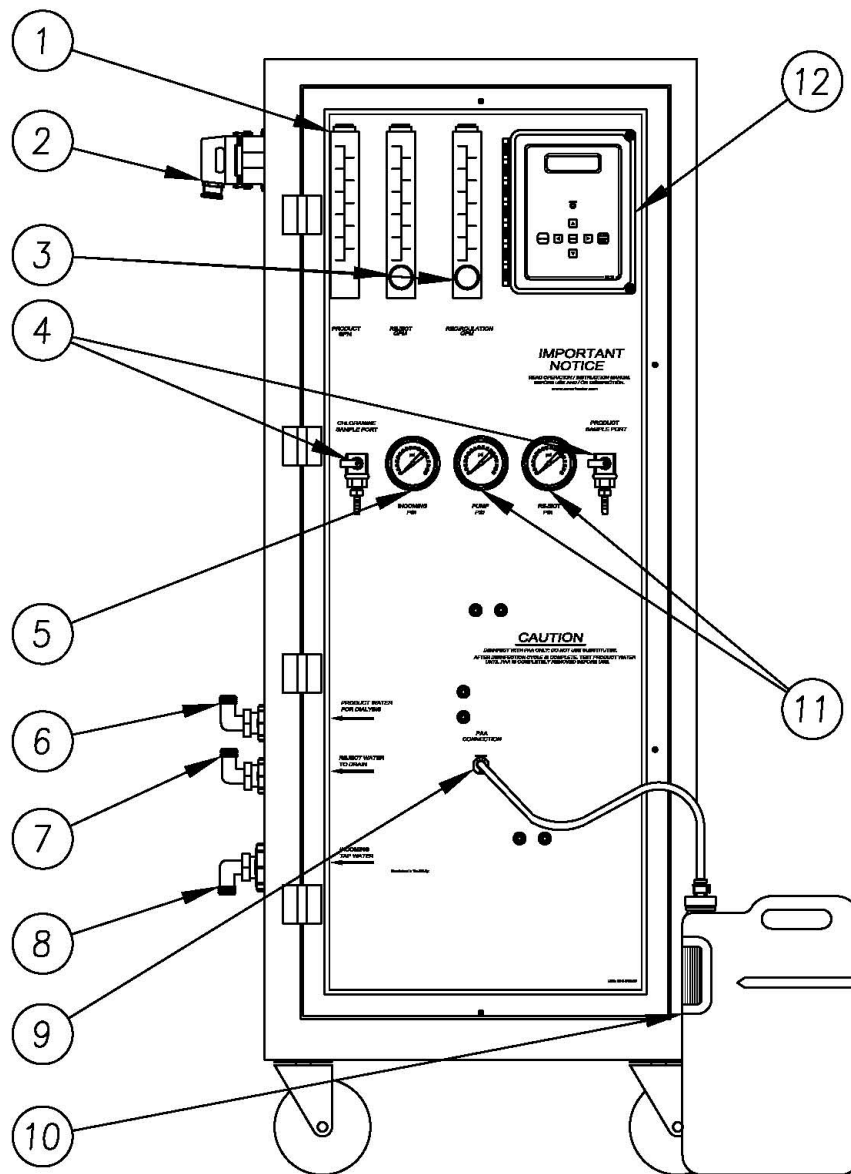


Figure 10.2

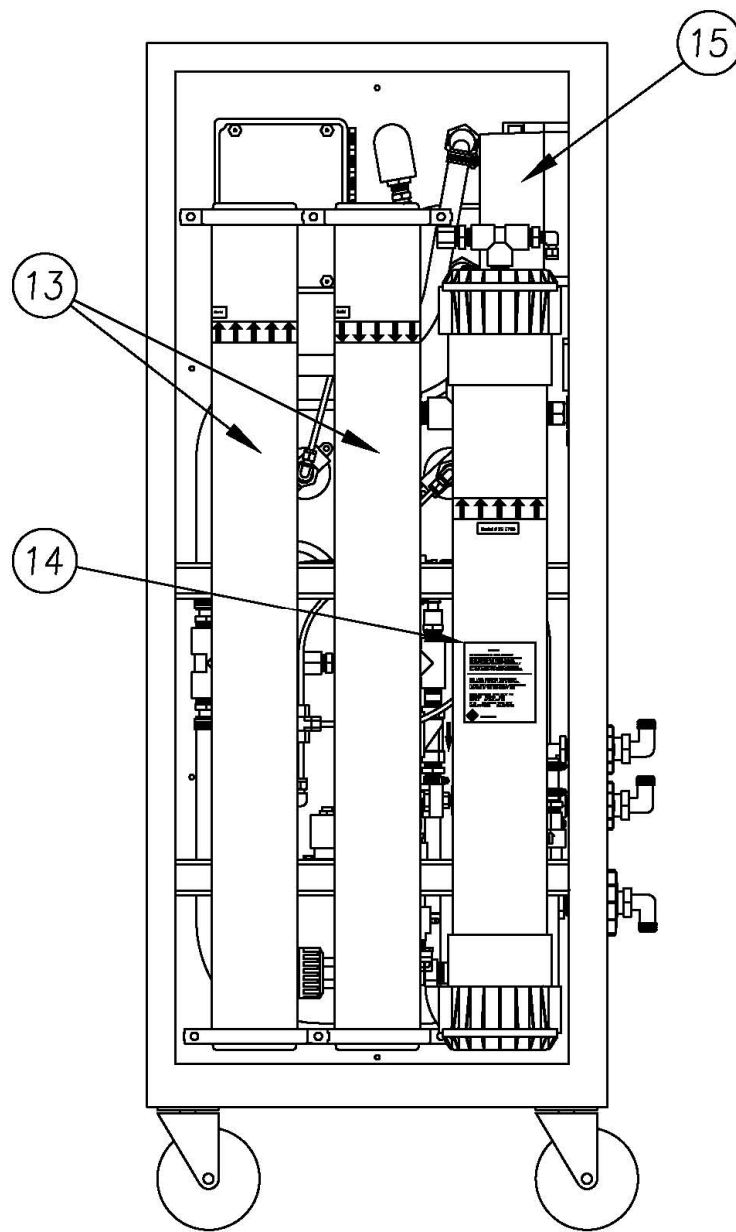
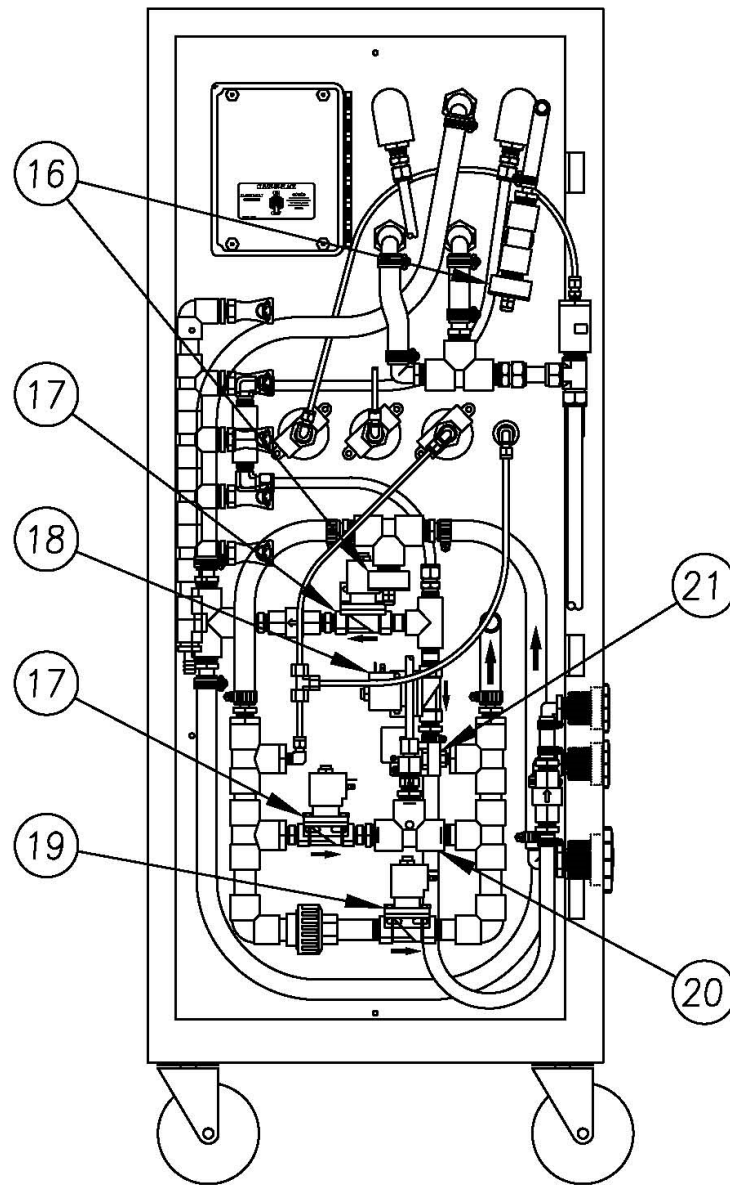


Figure 10.3



**PUMP & MEMBRANES
REMOVED**

Figure 10.4

EXPLANATION OF THE 0013-0002 O-RING REPLACEMENT KIT FOR THE 24-0007 MEMBRANE HOUSING

The 24-0007 membrane housing is purchased from (2) different vendors, Pureteck & Axeon. To identify the correct housing being used with your product, reference the pictures below.

The 0013-0002 o-ring kit contains a quantity of (2) of the 24-0029 o-rings and a quantity of (2) of the 24-0028 u-packing seals that are used on the Pureteck membrane housing for the (2) end caps.

Also included in the kit are a quantity of (4) of the 24-0018 o-rings used on the Axeon membrane housing for the (2) end caps. See the drawing below.

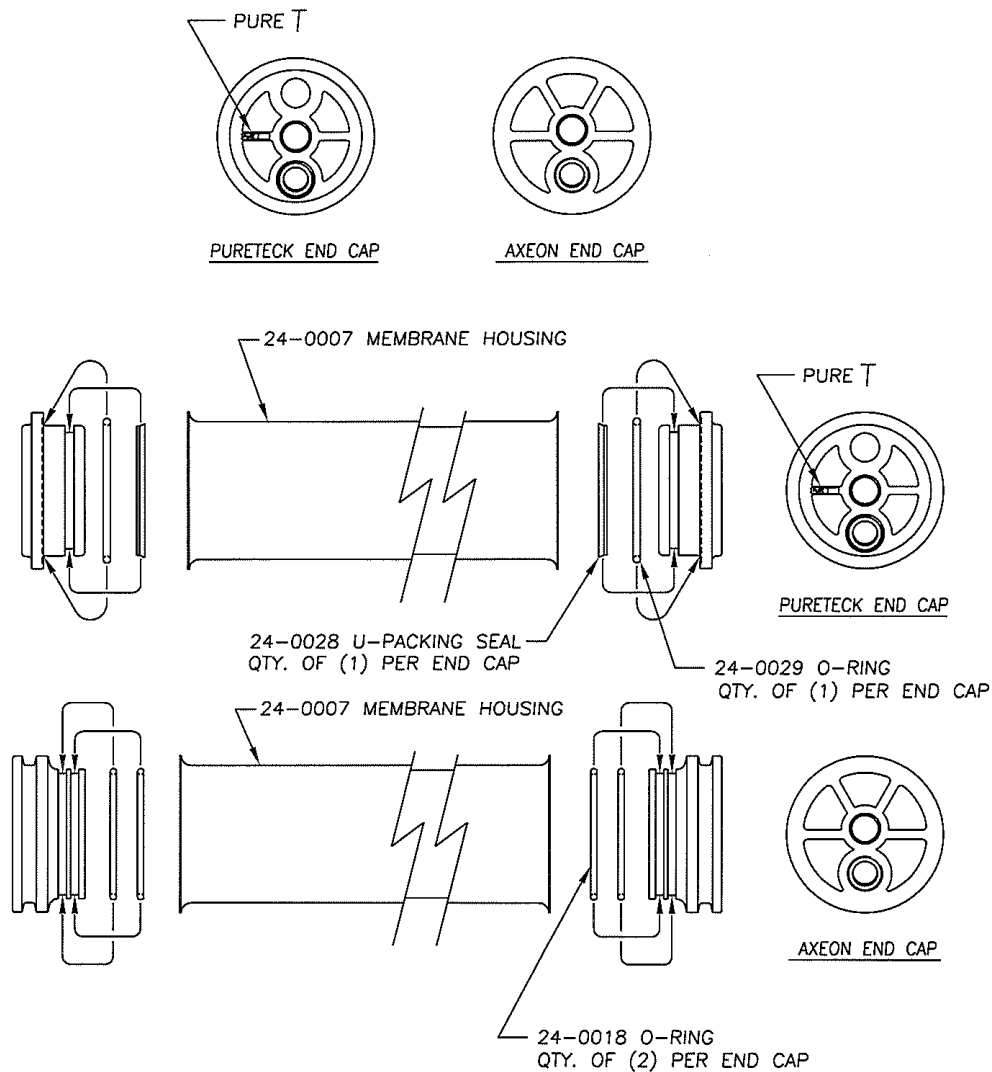


Figure 10.5

11.0 WARRANTY POLICY

This product is covered under the standard AmeriWater warranty policy. For specific terms and conditions, please contact your AmeriWater Sales Representative.