AmeriWater®
The Water Purification Specialists

Operation & Maintenance Manual

Central Sterile RO2

00HC-0045

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Manufactured With Pride in the USA

98-0106 Rev K

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1 USER INFORMATION

1.1 Manual Definitions

NOTE: This symbol points out important information for working with the system in a proper manner.

WARNING: This symbol refers to a possible danger that threatens the safety and life of persons.

CAUTION: This symbol refers to a possibly hazardous situation. Failure to observe these references may result in minor injuries and/or damage to property.

1.2 Introduction

This system is designed to pretreat and purify water for use in sterile processing 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 inside of the RO. This Operation Manual was written specifically for the RO2 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 Operation 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 Operation Manual should be read before operating or servicing the system. This Operation 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 of the user.

- 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.

1.3 Electrical Leakage Standards

The AmeriWater RO2 water treatment systems comply with the IEC 61010-1 Standards for Product Safety and Construction.

The cabinet of the RO2 is PVC for additional operator safety.

The RO2 is compliant with IEC 61010-1 Safe Current Limits. All major components of the RO (controller, pump, solenoid valve, antiscalant pump, etc.) are UL listed.

1.4 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

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.

1.5 Warranty Policy

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

2 TECHNICAL INFORMATION

2.1 System 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 50 PSI (**P**ounds per **S**quare **I**nch)		
Pump pressure Minimum Maximum		 100 PSI 180 PSI		
Maximum output of product water @ 77°F (25°C), TDS<1000 ppm of NaCl, & pump pressure of 150 psi.		RO2 – APPROXIMATELY 2,800 GPD (APPROXIMATELY 10,598 LPD) (**G**allons **P**er **D**ay / **L**iters **P**er **D**ay)		
Power Ratings	Voltage	Frequency	Phase Ø	Amp Draw
RO	120 VAC	60HZ	1Ø	14
RO Connection		Provided Hose Length	External Connection	
Inlet Tap ½" Plain Hose		8 ft	¾" FGHT	
Product ½" Plain Hose		4 ft	¾" MGHT	
Reject to Drain ½" Plain Hose		8 ft	½" FPT	
Electrical Requirements		**Controller Power:** 115V/60Hz/20A dedicated Dual Outlet GFI (Ground Fault Interrupter) for RO controller		
Shipping Weight Operating Weight		507 lbs. 975 lbs.		

2.2 Environmental Conditions Anticipated

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

- Indoor use
- Altitude up to 6562 feet (2000 m)
- Temperature between 41°F and 104°F (5°C and 40°C)
- Maximum relative humidity 80% for temperatures up to 87.8°F (31°C) decreasing linearly to 50% relative humidity at 104°F (40°C)
- MAINS supply voltage fluctuations up to ± 10% of the nominal voltage
- Transient overvoltages present on MAINS supply = CATEGORY II
- Applicable RATED POLLUTION degree 2

2.3 Transport Conditions Anticipated

- Altitude up to 6562 feet (2000 m)
- Temperature between 41°F and 104°F (5°C and 40°C)
- Maximum relative humidity 80% for temperatures up to 87.8°F (31°C) decreasing linearly to 50% relative humidity at 104°F (40°C)

2.4 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”.

Plastic container filled with PT401 solution to prevent the RO membranes from scaling is provided and should be used in the absence of a water softener.

2.5 System Components

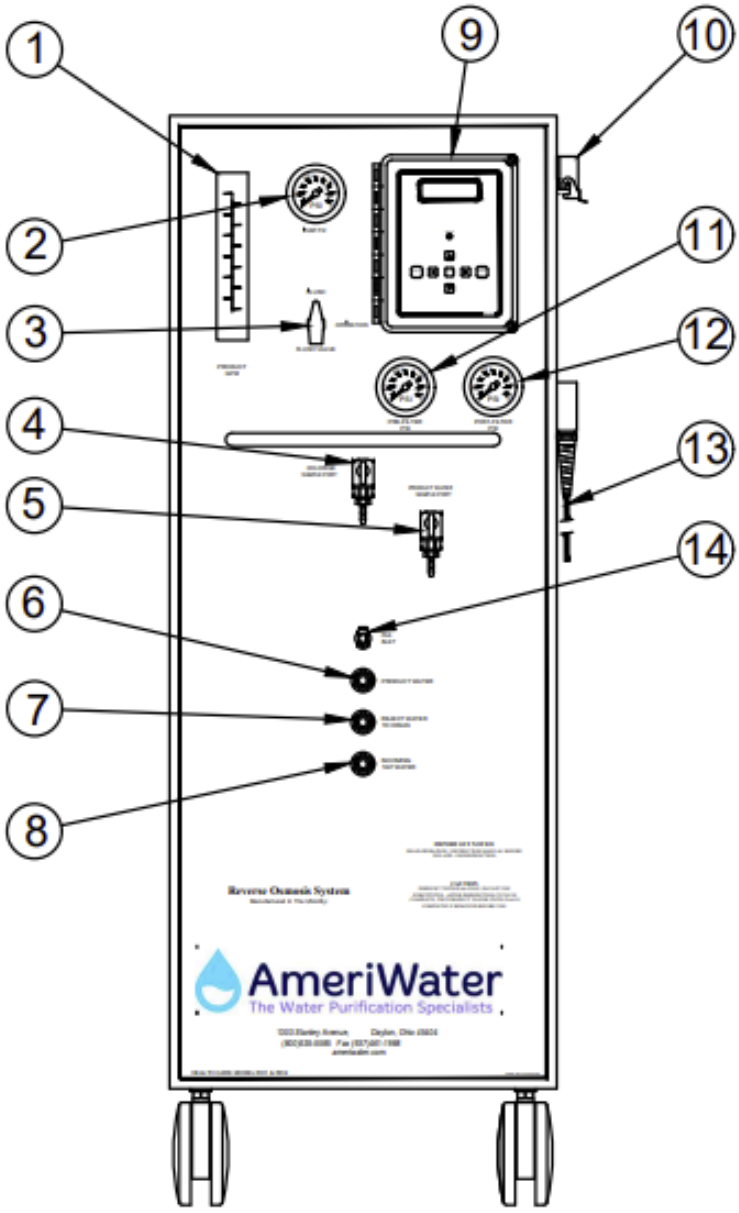


Figure 1: External Front View

IDENTIFICATION OF COMPONENTS (*Figure 1*)

1. **PRODUCT GPM:** Flowmeter that measures the flow of the product water in gallons per minute (GPM) and liters per minute (LPM).

2. **PUMP PRESSURE:** Gauge that measures the primary feed pressure in pounds per square inch (PSI) from the pump through the RO2 membrane.

3. **TEMPORARY FLUSH VALVE:** When the unit is in operation, the valve must be in the "OPERATION" position. Move the valve to the "FLUSH" position to bypass the flow control and allow a faster flow of water to the drain during membrane flush.

4. **CHLORINE SAMPLE PORT:** Valve with nozzle to let small amounts of water out to test for the presence of chlorines before the RO2 membrane.

5. **PRODUCT WATER SAMPLE PORT:** Valve with nozzle to let small amounts of water out to test the quality of the product water.

6. **PRODUCT WATER:** Hose transmitting purified water from the RO2 system to the DI Polisher or Storage Tank.

7. **REJECT WATER TO DRAIN:** Hose transmitting wastewater to the drain.

8. **INCOMING TAP WATER:** Hose feeding tap water into the RO2 system.

9. **CONTROLLER:** Control mechanism for the RO2.

10. **SIDE ENTRY HOOD:** External wire installation for float level switches.

11. **PREFILTER INLET GAUGE:** Gauge that measures the pressure in pounds per square inch (PSI) of the incoming tap water as it enters the micron prefilter.

12. **POST FILTER OUTLET GAUGE:** Gauge that measures the pressure in pounds per square inch (PSI) of the water after going through the carbon cartridge filter. Change the micron prefilter when the outlet gauge reads 15 PSI less than the prefilter inlet gauge.

13. **HOSPITAL GRADE POWER CORD:** Must be connected to a single phase, 3-conductor type, hospital grade receptacle with a ground fault interrupter (GFI) at 115V, 20amp, and 60Hz.

14. **PAA QUICK CONNECT FITTING (RO):** Quick connect fitting that the PAA container is connected to on the RO2 for sanitization.

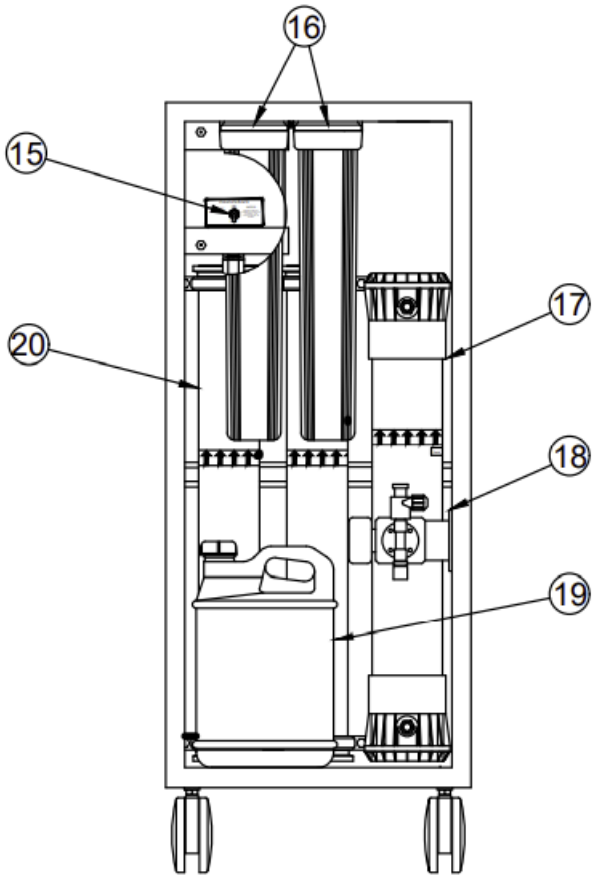


Figure 2: Internal Rear View

IDENTIFICATION OF COMPONENTS (*Figure 2*)

15. CLEAN IN PLACE (CIP) SWITCH: When the CIP Switch is placed in the ON position, all RO2 fail-safe modes are disabled for low pressure membrane cleaning with the optional AmeriWater Clean In Place System (P/N 00CIP1).

16. CARBON CARTRIDGE FILTERS: Dual 10-micron carbon cartridges for removal of chlorine & sediment.

17. PUMP: Provides the pressure for the RO2 system. The RO2 ON/OFF switch controls the pump motor.

18. PT401 FEED PUMP: Injects PT401 Antiscalant / Scale inhibitor solution at a predetermined dosage based on a water analysis. The PT401 pump runs when the main pump runs.

19. PT401 ANTISCALANT / SCALE INHIBITOR: Plastic container filled with 2 ½ gallons of PT401 solution to prevent the RO2 membrane from scaling. The plastic container should be refilled with PT401 solution at least monthly or when on when it reaches the half-full level.

20. MEMBRANES: Spiral-wound, thin film, composite membranes for reverse osmosis.

2.6 Electrical Schematic

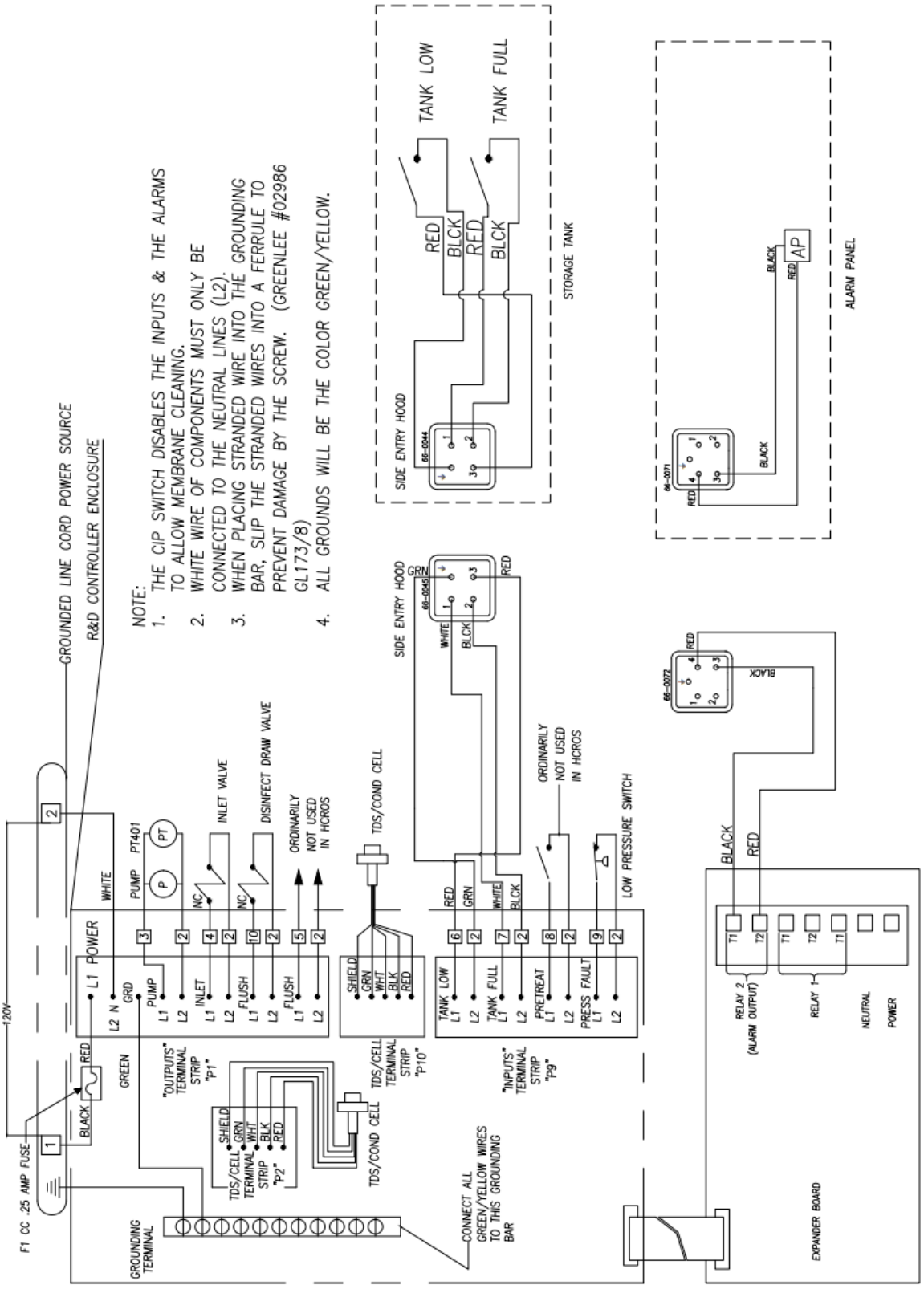


Figure 3: Electrical Diagram, RO2

2.7 Flow Schematic

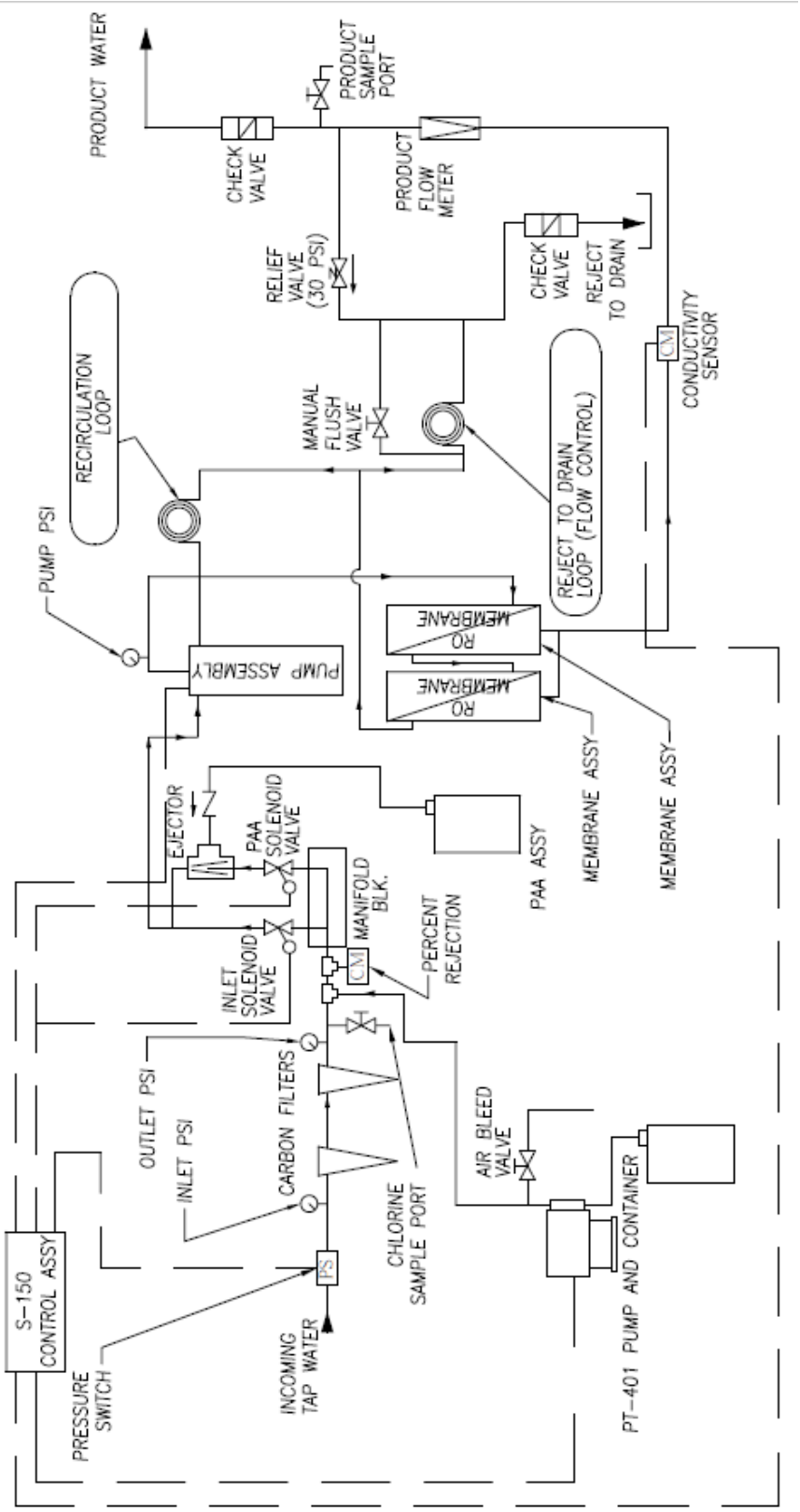


Figure 4: RO2 Flow Schematic

3 SYSTEM INSTALLATION

3.1 Pre-Installation Requirements

1. Utility requirements;
   a. Plumbing: ¾" ball valve with NPT threads and dynamic pressure of at least 20 PSI at 10 GPM.
   b. Electrical: see Section 2.1.
2. Hot and cold city/tap water supply line flushed and free of debris before equipment installation.
3. Floor drain within 4 feet of the RO/DI system capable of handling up to 10 GPM flow.
4. Supply piping to the washer/disinfector/sterilizer system(s) within 3 feet of the RO/DI distribution pump with a shut off valve.
5. Access space of 1 foot on each side and behind the water treatment equipment with a 3 foot aisle in front of the equipment or required to meet local codes.

3.2 General Installation

1. Two (2) hose clamps are to be used per hose connection.
2. A visual inspection is to be performed upon finishing installation and start-up of each system to ensure each component will function as intended. This includes, but is not limited to: lids and respective O-rings are not damaged or loose, damaged or loose hoses, leakage, secured power outlets, etc.

3.3 RO2 Installation

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, 20amp, and 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. It is suggested that the RO be placed on an electrical supply with emergency backup.

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.

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

3. 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) as 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).

4. Water with silt density index (SDI) above 5 SDI will foul the membrane.

5. The RO system may be equipped with a pretreatment system to remove chlorine. It is important to test for chlorine at the chlorine sample port periodically. Chlorine will

deteriorate the membrane and cause system failure. It is recommended to use a chlorine test strip.

6. 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 will 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 (IBT pH Water Test Strips P/N 97PH20901).

7. Always maintain water flow and pressure to avoid damage to the pump.

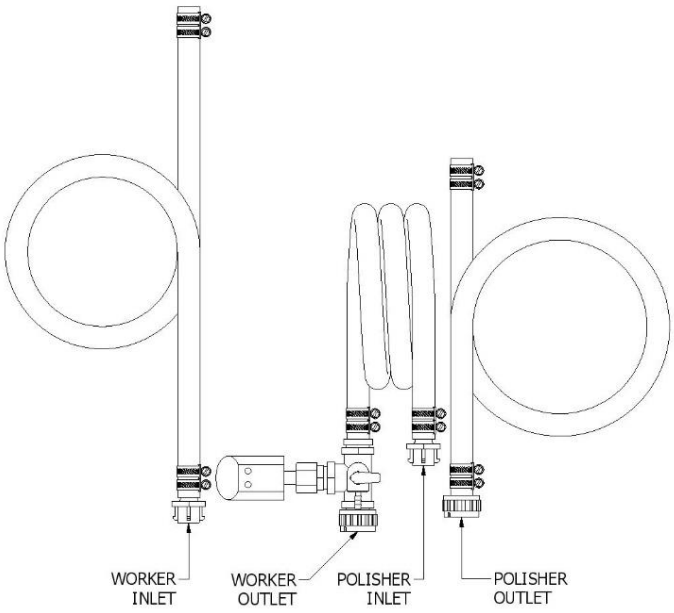
8. Minimum feed pressure is 20 PSI @ 6 GPM (while the RO is in operation, with flow). Maximum feed pressure is 50 PSI.

9. Remove the plugs from the product water, reject water to drain, and incoming tap water fittings on the front of the RO.

10. Connect the INCOMING TAP WATER, PRODUCT WATER and REJECT WATER TO DRAIN hoses to the appropriate fittings on the RO. All hoses should run to the right side of the RO. This will allow you to move the RO forward to access the rear panel.

NOTE: To remove the hoses, depress the gray "collet" inward while gently pulling the hose out. The tubing extension MUST be fully inserted into the fitting body to the tube stop.

CAUTION: To ensure proper assembly, tubing extension MUST be fully inserted into the fitting body to the tube stop.



11. Open the back cover and remove any packing foam.

4 SYSTEM START-UP PROCEDURES

4.1 Caution

NOTE: This entire Operations Manual should be read before operating or servicing the RO 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.

1. It is important to test for chlorine and chloramines at the CHLORINE 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).

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!

2. Use only the exact amount of hydrogen peroxide/peroxyacetic acid disinfectant solution (PAA) and in proper dilution during disinfection of the system.

3. 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.

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.

4. Ameriwater recommends installing a sediment filter added as pretreatment for the RO.

4.2 Safety Features

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

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 6.2, A WORD ABOUT HYDROGEN PEROXIDE/PEROXYACETIC ACID. Please read carefully.

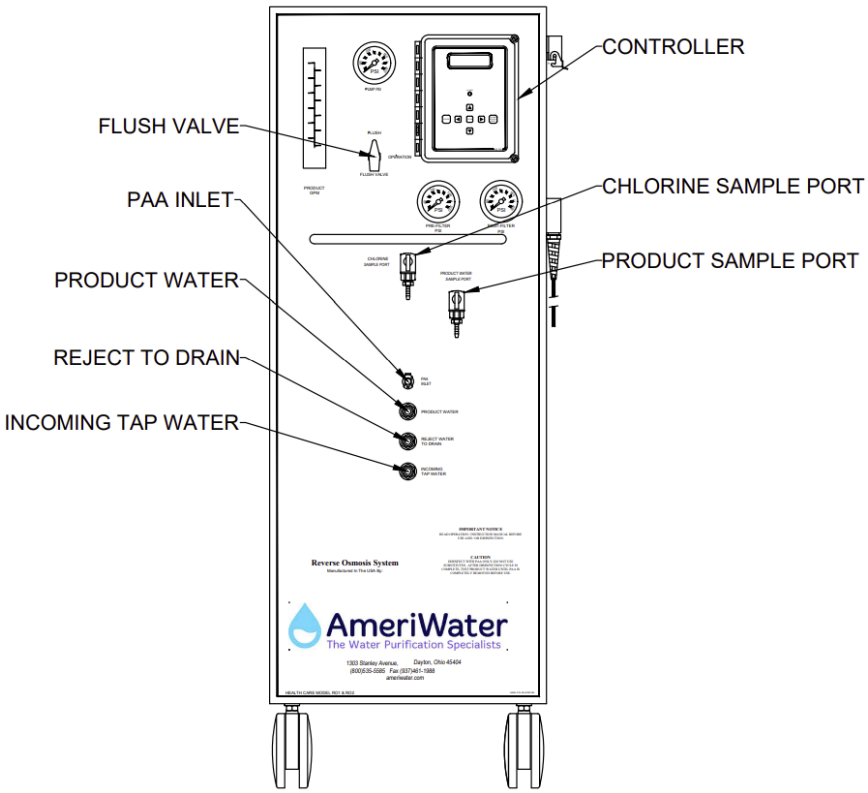
INCOMING TAP WATER, PRODUCT WATER, and REJECT WATER TO DRAIN hoses are labeled to prevent incorrect connections.

Low pressure shutdown protects the pump if the feed pressure drops below 20 PSI.

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

4.3 RO

1. Lock the two front casters so that the RO will remain stationary during start-up.



NOTE: The incoming, product, and reject hoses were installed on the RO in the install steps.

NOTE: **Before connecting incoming feed water to RO, ensure feed water line is routed to drain and until the water is clear to prevent rusty water from clogging the system.**

2. 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).

3. The reject water to drain hose coming out of the RO system is for reject water. The water from this hose will go down the sink or drain. Leave at least a 2" air gap between the hose and the drain to prevent contamination or siphoning.

4. 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 set-point, and not in alarm).

5. Open the access cover and make sure that the “CIP” switch is in the “ON” position.

6. Plug the controller power cord into a dedicated 115-volt, 20-amp GFI receptacle.

WARNING: Before start-up, membranes on the RO will need to be wetted in order to prevent damage caused by air pressure.

7. Turn on the potable water supply to the RO.

8. Inorder to allow the membranes to fill with water, press the power button and allow the 10 second pump timer to count down to 2 seconds before turning it off. This will allow water to be pushed through the system at a low pressure.

9. Repeat previous step up to 10 times. This may take up to 5 minutes. Ensure water is flowing through the drain and flowmeters.

10. Open the access cover and switch the “CIP switch to the “OFF” position.

11. 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.

12. With the RO operating, turn the FLUSH VALVE to the OPERATION position.

13. The user can verify that the RO is operating correctly by checking the flowmeters, the controller, and the inlet and outlet pressure gauges. The flowmeters will show movement on the flow bobbers in the flowmeters. The controller will show on the screen operating parameters, such as quality of water and temperature 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 (outlet subtracted by the inlet).

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

15. Turn the FLUSH VALVE to the FLUSH position to allow the RO to run in full-flow reject flush for about fifteen minutes. Afterwards, turn the FLUSH VALVE to the OPERATION position and run for an additional 2 hours. Check for leaks during this time.

NOTE: The RO conductivity alarm may sound, which is normal when it 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.

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

17. After a thorough flushing of the preservative, the RO **must** be disinfected prior to being put into service for use. Reference section 6.1.1 for the disinfection procedure.

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

19. Press the power key (the display will show operating after a ten second delay).

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

20. 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).

21. Refer to the Monitoring Log in Section 5.3. Complete the log, making sure that the system is operating within all the required ranges.

WARNING: Do not use the RO until all specifications are met.

CAUTION: Although the water treatment system may produce water of sufficient quality to meet the requirements of AAMI standards, distribution of the water may degrade its quality to the point where it no longer meets the requirements of this standard. AmeriWater offers information about ultra-pure water piping to prevent the degradation of product water in a water loop.

4.3.1 PT401 Priming Procedure

WARNING: Do not use the PT401 anti-scalant if your system has softened water. Turn off the system by depressing the on / off button on the PT401 pump.

AmeriWater RO products featuring the PT401 anti-scalant system are equipped with a priming valve. The following procedure should be followed during the initial start-up of the RO system, and whenever the PT401 pump loses its prime:

1. Open the priming valve by turning it to counterclockwise three times.

2. Verify that the RO is on and running.

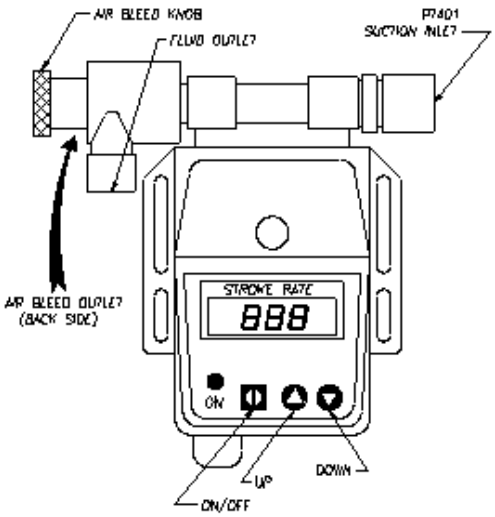
3. Be sure the injection pump's suction line is immersed in solution in the PT401 container.

4. Press the ON key to turn on the PT401 injection pump.

5. Press the “DOWN” key to cycle the STROKE RATE to approximately 360.

6. Run the injection pump until a stream of PT401 without air bubbles flows out of the air bleed tube.

7. Close the adjustment knob <u>completely</u> by turning clockwise until the knob stops, making sure there is no liquid flow out of the air bleed tubing.



If the pump does not prime, repeat the foregoing steps.

Once the pump has been primed, and is pumping the chemical through the head into the water stream, adjust the stroke rate to the recommended settings below.

HARDNESS (Grains Per Gallon)	**STROKE SETTINGS**
1-6 GPG	4
7-20 GPG	5
21-40 GPG	6

For water with hardness greater than 40 GPG, contact AmeriWater for consultation.

At the stroke rate of ten, the PT401 injection pump will put about 30 milliliters (approximately 10 liquid ounces) per hour into the RO incoming water stream.

Repeat these steps as necessary when the system is started after sitting for extended periods or the PT401 Bottle is empty and air has drawn into the pump. The priming may not take as long as the initial time.

PT401 Anti-scalant/Scale Inhibitor	
Contaminants	**Chemical Feed System**
Membrane Scale Control	Not to exceed 40 ppm

WARNING: Overdosing PT401 will adversely affect (blind) the membrane causing a decrease and/or loss of permeate flow.

WARNING: If softened water is supplied, turn off the PT401 system by depressing the on/off button on the chemical feed pump and emptying the PT401 jug.

4.4 System Shutdown

Ordinarily, an RO2 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, however, use the following instructions:

1. Before turning off the RO by pressing the POWER key, turn the FLUSH VALVE to the FLUSH position for 5 minutes. This will flush the concentrate out of the system.

2. Press the POWER key (the display will show STANDBY).

3. Turn off the potable tap water supply to the system.

4. Disconnect the PRODUCT WATER hose from the Direct Feed Loop or Storage tank, and the INCOMING TAP WATER hose from the potable tap water supply. The hoses may be connected together to prevent dirt from entering the hoses.

5. Remove the REJECT WATER TO DRAIN HOSE from the sink. The hoses and power cord may be secured by the hose strap on the side of the RO for storage or transport of the RO.

6. Store the system until next use.

7. When transporting the RO, push or pull the system carefully, because it may be top-heavy and may easily tip over.

5 OPERATION AND MONITORING

5.1 Operation

Once the system has been started, the RO2 will continue to make water until the high-level float switch is tripped on the storage tank. At this point, the RO2 will be placed into standby (tank full) until the low-level float switch is tripped. Once the low level float is tripped, the RO2 will re-initialize and begin to produce water again.

5.2 Bypass Procedure

26. Turn off the POWER to the RO and Distribution Pump.

27. Shut off the water supply to the system.

28. Remove the RO water inlet hose from the source.

29. Retrieve the bypass hose and install to the incoming water supply.

30. Connect the CPC connector into the fitting just after the pump on the storage tank.

31. Turn on the water to begin bypass operation.

5.3 System Monitoring

Under AAMI TIR34 and ST108 requirements, the below listed items need to be monitored on varying intervals.

Water Quality Measurements				
Measurement	**Units**	**Critical Water**	**Type of Testing**	**Frequency**
pH @ 77°F	pH	5.0-7.5	pH meter or Colorimetric dipsticks	Monthly
Conductivity	uS/cm	<10	Conductivity	Daily
Total Alkalinity	mg CaCO3/L	<8	Colorimetric dipsticks	Monthly
Total Hardness	mg CaCO3/L	<1	Determination of ppm CaCO3 or Colorimetric dipsticks	Monthly
Bacteria	CFU/mL	<10	Heterotrophic plate count	Monthly
Endotoxin	EU/mL	<10	LAL test	Monthly

Fill out the monitoring log prior to each use. Having this information available will help to quickly diagnose issues related to performance. Failure to carry out the daily monitoring and maintenance at the indicated intervals will result in reduced performance of the RO system and may void the warranty. The follow page shows a sample log.

FEED WATER QUALITY	Parameters	Results	Date	Initials
Conductivity (uS)	Record			

Hardness (GPG)	Record			
Chlorine (ppm)	Record			
pH	Record			
PRE-FILTRATION	**Parameters**	**Results**	**Date**	**Initials**
Blend Valve Temperature	77°F ± 5°F			
Chlorine Test	≤ 0.1PPM			
RO OPERATION	**Parameters**	**Results**	**Date**	**Initials**
Pre-filter Inlet Pressure	> 25PSI			
Pre-filter Outlet Pressure	> 25PSI			
**Pre-filter Delta Pressure (Subtract Inlet by Outlet)	≤ 10PSI			
Pump Pressure	100 – 230 PSI			
Reject Pressure (PSI)	> 25PSI			
Product Flowrate (GPM)	See Table			
Reject Flowrate (GPM)	See Table			
Recirculation Flowrate (GPM)	See Table			
Conductivity	< 50 uS			
*Percent Rejection	> 90%			
Amount of Hours in Operation	Record			
POST RO	**Parameters**	**Results**	**Date**	**Initials**
Distribution Pump Outlet	> 50PSI			
Storage Tank Loop Return Pressure	> 25PSI			
Storage Tank Loop Return Flowrate	> 8 GPM			
DI Packs / Tank Providing Adequate Resistance	Green Light≥ 1 Meg			
UV Intensity	> 50%			
**Endotoxin Filter Delta Pressure	< 10PSI			
Verify System Normal Display on Main Alarm Panel	Record			
Verify Good Quality Light on Remote Alarm Panel	Green Light			
Verify Resistivity Display on Main Alarm Panel	> 1 MEG			
EXCHANGE	**Frequency**	**Date**		**Initials**
Carbon Block Filter Cartridges				
Clean or Replace the Membrane				
Add PT401 (Anti-scalant) > ½ Full				
DI Polisher Resin Change				
Endotoxin Replaced	Annually			
UV Lamp/Quartz Sleeve Replacement	Annually			
Storage Tank Vent Filter	Annually			
Chemical or Ozone Disinfection	Monthly			

*The RO system can operate below percent rejection parameter due to post deionization treatment.
** From established new filter DP

Assembly Number	RO OPERATION	Parameters
00HC-0015 (HROS)	Product Flowrate (GPM)	.3 - .9
	Reject Flowrate (GPM)	N/A
	Recirculation Flowrate (GPM)	N/A
00HC-0045 (HRO2)	Product Flowrate (GPM)	1.5 – 2.3
	Reject Flowrate (GPM)	N/A
	Recirculation Flowrate (GPM)	N/A
00HC-0060 (HRO3)	Product Flowrate (GPM)	2.75 – 4.00
	Reject Flowrate (GPM)	Equal Product
	Recirculation Flowrate (GPM)	.5 – 1.25
00HC-0075 (HRO4)	Product Flowrate (GPM)	3.00 – 5.25
	Reject Flowrate (GPM)	Equal Product
	Recirculation Flowrate (GPM)	.5 – 1
00HCRO3X402 (HRO3X)	Product Flowrate (GPM)	3.85 - 5.25
	Reject Flowrate (GPM)	Equal Product
	Recirculation Flowrate (GPM)	1.00 - 3.5

5.4 AAMI Monitoring

Reference the Association for the Advancement of Medical Instrumentation (AAMI), for detailed guidelines on addressing water treatment equipment, water quality specifications, and procedures for monitoring water quality.

6 DISINFECTION

AmeriWater recommends that all HCRO systems should be disinfected monthly. Additionally, the system should be disinfected if it has not been: flushed at least every 8 hours; or “preserved”. The following sections will outline the disinfection steps. Refer to Section 5.4 for AAMI standards for disinfection.

6.1 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.

6.1.1 Disinfecting the RO2

1. Switch off the RO 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 RO 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.

3. Put on rubber gloves, apron, and goggles.

4. Unscrew the cap assembly of the PAA container (plastic 1 gallon container).

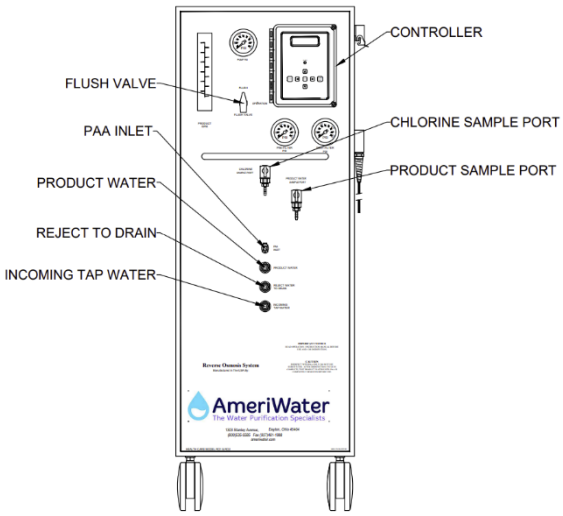


Figure 5

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.

5. Add 150 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).

6. Screw the cap assembly securely back onto the PAA container.

7. Agitate the container in a circular motion for approximately 10 seconds.

8. Connect the PAA tubing male fitting into the quick disconnect fitting that is mounted on the front of the cabinet of the RO (*Figure 5*).

9. Turn the FLUSH VALVE to the FLUSH position.

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 will pass through and out the PRODUCT WATER hose laden with PAA disinfectant.

12. Pressing and holding the ENTER key will activate the disinfect function, draw PAA from the container and pump PAA solution through the RO.

13. 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 RO.

a. Avoid stopping and starting the disinfect function which may cause a thermal overload of the RO pump.
b. Releasing the ENTER key may cause the system to lose its prime preventing all of the disinfectant from being drawn into the RO.
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.

14. Record on the Start-Up Log that this step was performed.

15. The RO should be filled with PAA disinfecting solution. To ensure that PAA solution has been pumped through the RO, 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, add more PAA and dilute with water. Press and hold "ENTER" button to force disinfectant thru the hoses.

16. Label the RO with appropriate WARNING signs (Example: "DO NOT USE / CONTAINS DISINFECTANT").

17. Leave the RO in the DISINFECT ENABLED mode, and allow the PAA solution to soak for 60 minutes within the RO.

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

18. Record the Start and Stop times on the Log to have a record of how long the membrane soaked in PAA disinfecting solution.
19. 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 RO.
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 RO.

20. Press the ALARM SILENCE/RESET key to exit the DISINFECT Mode and verify that the RO is off

(STANDBY).

21. DO NOT reconnect the PRODUCT WATER hose at this time!

22. Turn on the RO by pressing the POWER key. Turn the FLUSH VALVE to the FLUSH position to allow full flow of REJECT WATER. Record the Start time on the Start-up Log. Allow the machine to run at this setting for at least 15 minutes.

23. After rinsing with the FLUSH VALVE in the FLUSH position for at least 15 minutes, return the FLUSH VALVE to the OPERATION position (normal operation reject flow). Allow the RO to run for 15 more minutes.

24. After the first 30 minutes, repeat 15 more minutes of full flow through the FLUSH VALVE + 15 minutes of operation in the OPERATION position. 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.

25. Continue to periodically test for the presence of residual PAA at the CHLORAMINE SAMPLE PORT (at the front of the RO) 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 Start-up 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. The RO can be reconnected to the direct feed loop or storage tank once it is producing water within the acceptable conductivity range.

6.2 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:

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.

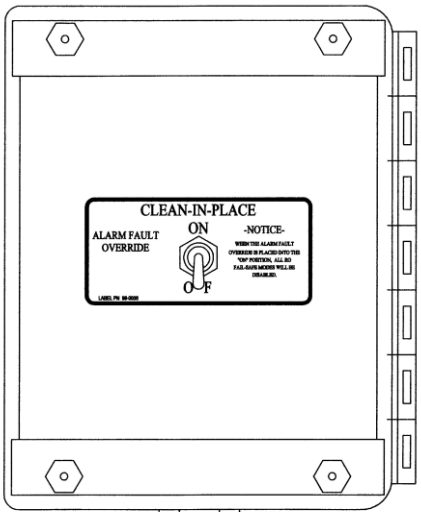
7. Inspect the area for spilled or dripped disinfecting solution. Wipe up small spills with a damp paper towel. Larger spills should be either flushed to drain with water or removed with a water bucket and floor mop.

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.

7 CLEAN IN PLACE (CIP)



1. Move the CLEAN IN PLACE SWITCH (inside the RO on the back of the controller) to the ON position.

CAUTION: To avoid electrical shock, always unplug the RO system before opening the access panel or the face of the electrical controller.

2. Place the FLUSH VALVE in the FLUSH position.

3. Connect the RO PRODUCT WATER hose to the PRODUCT RETURN connection (female garden hose thread) on the CIP Cleaning Drum.

4. Connect the RO REJECT TO DRAIN HOSE to the REJECT RETURN connection (hose barb) on the CIP Cleaning Drum.

5. Connect the RO INCOMING TAP WATER HOSE to the CIP PUMP OUTLET (male garden hose thread).

6. Leave the micron filter in the filter housing, but remove the carbon block.

7. Add 1 cup of AmeriClean B (base cleaning) to the CIP Cleaning Drum and fill with RO water (if available). Stir until dissolved.

8. Plug in the CIP Pump and turn on the RO. Verify recirculation flow inside the cleaning drum.

9. Allow the system to recirculate the cleaning solution for 30 minutes.

10. Turn off the RO and the CIP Pump. Allow the system to soak for 30 minutes.

11. Turn on the RO and CIP Pump and allow them to run an additional 5 minutes.

12. Turn off the RO and CIP Pump.

13. Disconnect the RO REJECT TO DRAIN HOSE and direct it to a drain.

14. Turn on the RO and CIP Pump and run to drain until the CIP Cleaning Drum is emptied.

15. Turn off the RO and CIP Pump and fill the CIP Cleaning Drum with approximately 2 gallons of clean water.

16. Connect the RO REJECT TO DRAIN HOSE to the REJECT RETURN connection on the CIP Cleaning Drum.

17. Turn on the RO and CIP Pump and allow the water to recirculate for at least 1 minute.

18. Turn off the RO and CIP Pump and disconnect the REJECT TO DRAIN HOSE from the CIP Cleaning Drum. Direct the REJECT TO DRAIN HOSE to a drain.

19. Turn on the RO and CIP Pump and continue running to drain until the CIP Cleaning Drum is emptied.

CAUTION: Verify that the AmeriClean B has been thoroughly rinsed from the system prior to proceeding to the next step. Mixing the chemicals may result in an exothermic reaction that may damage the RO system.

20. Repeat steps 7 to 19 using AmeriClean A (acid cleaning) and then proceed to step 21.

21. Disconnect the RO hoses from the CIP system and run the PRODUCT WATER hose and REJECT TO DRAIN hose to a drain. Connect the INCOMING TAP WATER hose to a water supply.

22. Replace carbon block filter and replace micron filter, if necessary.

23. Turn on the feed water supply and the RO, and allow running for 10 minutes.

24. Turn the TEMPORARY FLUSH VALVE to the OPERATION position, and continue running to drain until the conductivity drops below the set-point (not in alarm).

WARNING: DO NOT place the RO in service until all operational parameters are within specification. Consult the START-UP LOG to verify that all specifications are met.

8 CONTROLLER

8.1 RO Front Panel Controls and Indicators

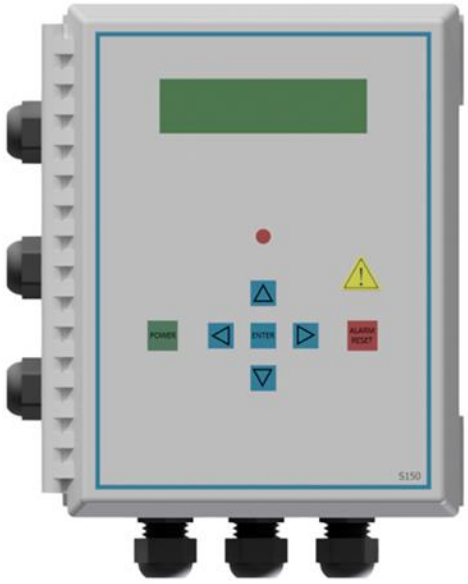


Figure 6: Control Panel

DISPLAY	Shows status of system.
ALARM LAMP	Flashes when fault causes an RO system shut down. On steady when a Set-point 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 Set-points starting with first Set-point
RIGHT ARROW KEY	Scrolls through Set-points starting with last Set-point.
UP ARROW KEY	Increases value of Set-point.
DOWN ARROW KEY	Decreases value of Set-point.
ENTER KEY	Confirms entry of new Set-point value.
ALARM SILENCE/RESET KEY	Push once for alarm silence and twice to reset system after a shutdown has occurred.
ACCESSING DISINFECT MODE	Push and hold the left arrow key, and then push the right arrow key.
DISINFECT DRAW	Push the ENTER key and hold until all of the solution is drawn into the RO.
(NOTE: The J2 jumper must already be installed to make this an active mode. See *Figure 7*)	

8.2 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 Set-point 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 Set-point, 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 Set-point is programmed to 0, the unit will remain shut down until manually reset. If the Auto Reset Set-point 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 Set-point is programmed to the factory default 3. If the Alarm Silence Set-point 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 Set-point for the delay programmed in the Cond Delay Set-point, 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 Set-point.

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.

8.3 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 7* 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 7* for adjustment location. To calibrate the second 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.

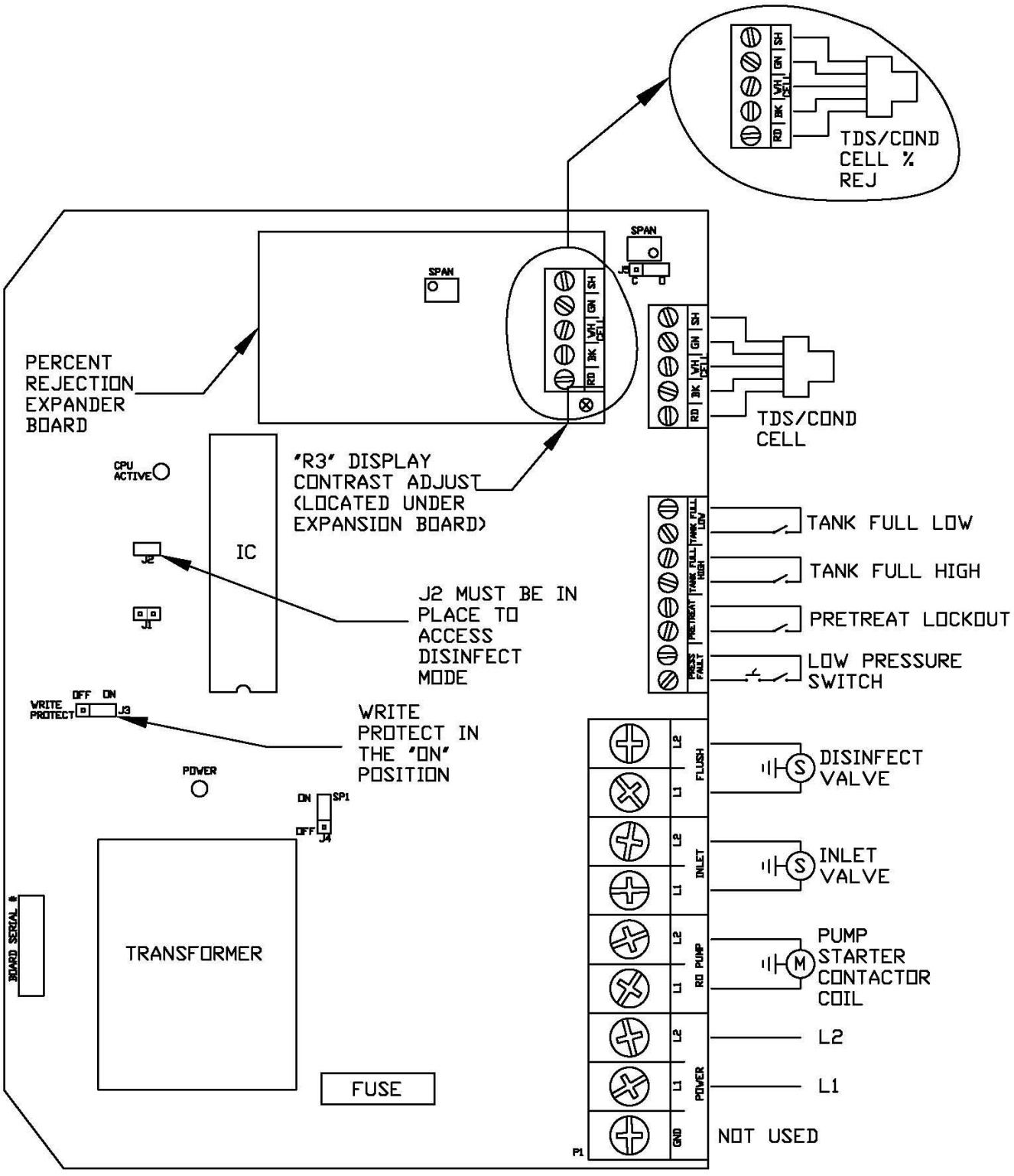

TDS/COND
CELL %
REJ
SPAN
SPAN
PERCENT
REJECTION
EXPANDER
BOARD
TDS/COND
CELL
CPU
ACTIVE
"R3" DISPLAY
CONTRAST ADJUST
(LOCATED UNDER
EXPANSION BOARD)
IC
J2
J1
J2 MUST BE IN
PLACE TO
ACCESS
DISINFECT
MODE
TANK FULL LOW
TANK FULL HIGH
PRETREAT LOCKOUT
LOW PRESSURE
SWITCH
WRITE
PROTECT
OFF ON
J3
WRITE
PROTECT IN
THE "ON"
POSITION
POWER
ON
OFF
SP1
J4
DISINFECT
VALVE
INLET
VALVE
PUMP
STARTER
CONTACTOR
COIL
L2
L1
NOT USED
TRANSFORMER
FUSE
BOARD SERIAL #
P1

Figure 7

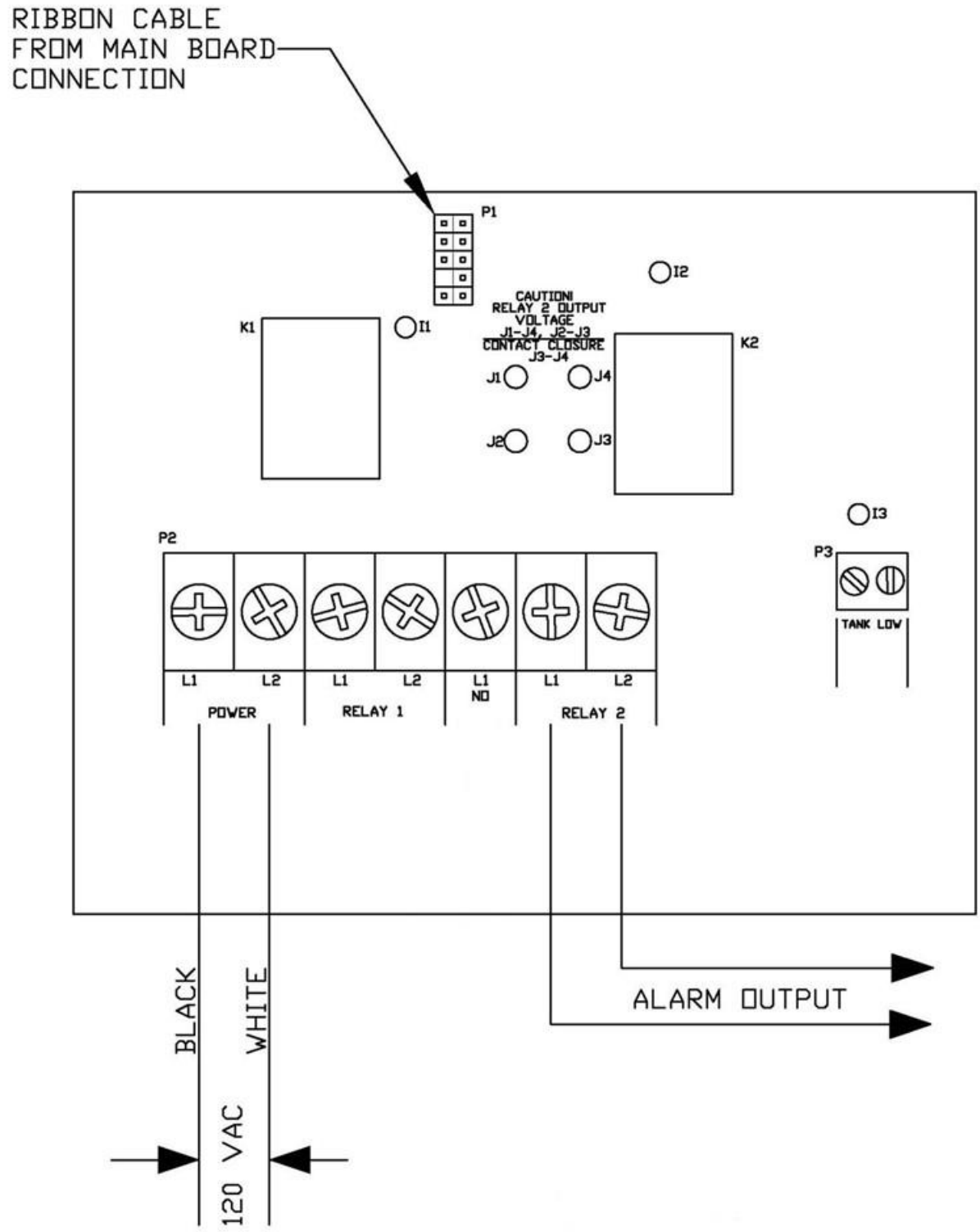

RIBBON CABLE
FROM MAIN BOARD
CONNECTION
P1
I2
CAUTION!
RELAY 2 OUTPUT
VOLTAGE
J1-J4, J2-J3
CONTACT CLOSURE
J3-J4
K1
I1
K2
J1
J4
J2
J3
I3
P2
P3
TANK LOW
L1
L2
L1
L2
L1
NO
L1
L2
POWER
RELAY 1
RELAY 2
BLACK
WHITE
120 VAC
ALARM OUTPUT

Figure 8

8.4 Standard Set-points

SET-POINT	DESCRIPTION	RANGE	FACTORY SETTING	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 set-point 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.	0-99 minutes	3	
Tank Lo Restart	Not Used.	N/A	0	
Flush Type	Selects the type of flush. Set to 0 to disable or 6 to flush during off hours.	0-8	0	
Flush Time	The length of time a membrane flush cycle will last when flush is active.	0-99 minutes	0	
Flush Interval	The interval between flush cycles. Only valid with operation hour, elapsed time or off flush types.	0-99 hours	0	
Flush Mode	Selects if the inlet and RO pump relays operate during flush. Set to 0 to disable.	0-4	0	
Maximum Hours	If the current operating hours exceed this limit, the operating hours warning will occur. Set to 0 to disable.	0-65000 hours	0	
Current Hours	Current number of hours of RO system operation.	0-65000 hours	0	

SET-POINT	DESCRIPTION	RANGE	FACTORY SETTING	USER
Temp Offset	Allows adjustment of temperature reading by ±5 degrees.	± 5	0	
Temp UOM	Selects display of temperature in °F or °C. 0 = °F, 1= °C.	0-1	0	
Switch Select	Selects if switch inputs are normally open or normally closed. Should always be set to 0.	0-31	0	
TDS/Cond UOM[1]	Selects display of water quality in µS or PPM.	0-1	0	
TDS/Cond Range[1]	Selects range of TDS/Conductivity monitor 0 = 50, 1 = 100, 2 = 250, 3 = 500, 4 = 1000, 5 = 2500, 6 = 5000.	0-6	1	
C2 Range[1]	Selects range of TDS/Conductivity monitor 0 = 50, 1 = 100, 2 = 250, 3 = 500, 4 = 1000, 5 = 2500, 6 = 5000.	0-6	4	
C2 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*	0	
%Rej	The 2nd TDS/Conductivity is used to monitor 0-1 feed water, programming this set-point to 1 allows the % rejection to be displayed.	0-1	1	

[1] If this set-point is changed, the unit must be recalibrated. Some setting ranges may require a different resistor to be installed. Reference Section 8.5.

* µS = microsiemens; PPM = Parts Per Million

8.5 To Display or Change Set-points

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

1. Refer to *Figure 6* for the location of the keys used to display or change the Set-points and *Figure 7* for the location of the write protect jumper, J3. For the unit to be able to accept a change in a Set-point, the shorting jumper must be in the WRITE PROTECT OFF position (center and left pins).

NOTE: Set-points cannot be changed if the write protect jumper is in the ON position.

2. Use the LEFT and RIGHT ARROW keys to display the Set-points. Each press of an arrow key will advance the display to the next Set-point. The Left arrow key starts with the beginning Set-point and the Right arrow key starts with the last Set-point.

3. The Up and Down arrow keys are used to increase or decrease the Set-point 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 Set-point 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 Set-points, the write protect jumper should be placed in the ON position (center and right pins).

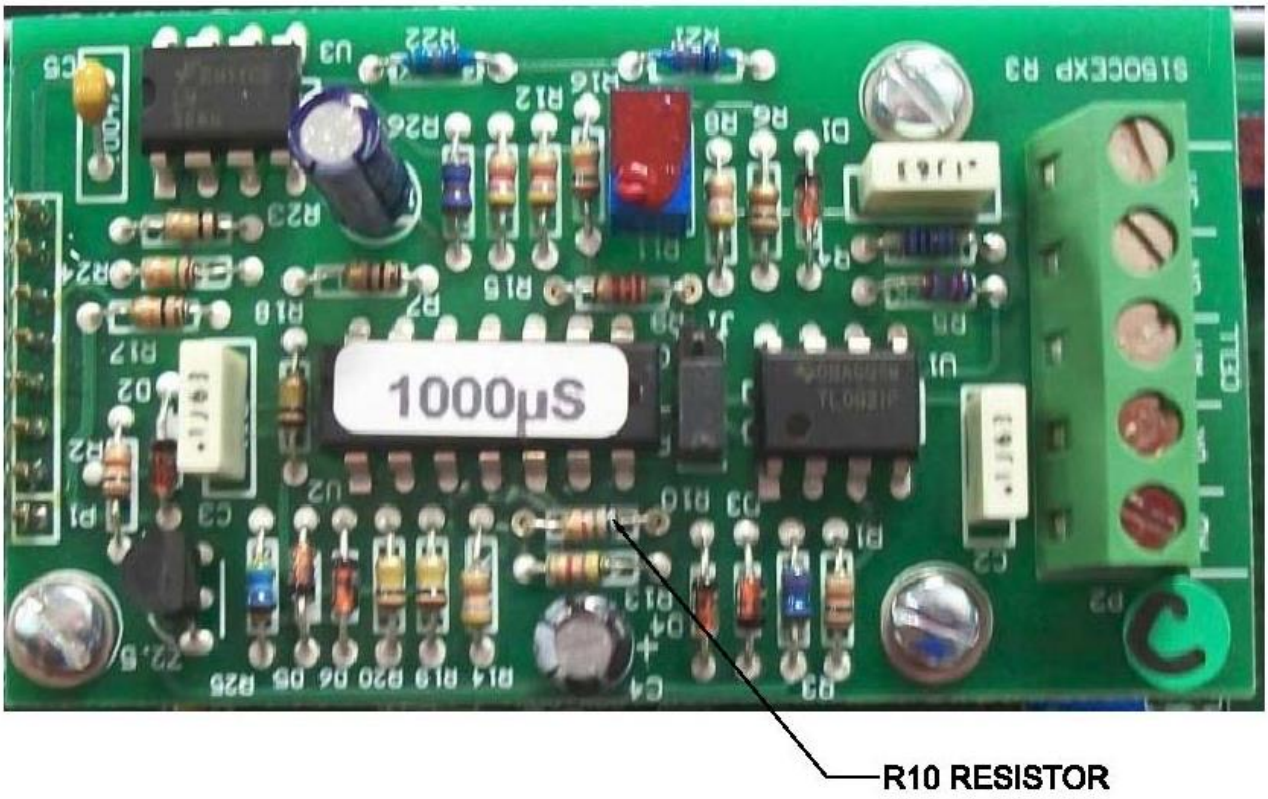
8.6 Changing Resistors On The RO Control Board For C2 Range

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.



4. The control system for the RO 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 µS/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 kΩ; the replacement resistor's resistance value is 6.8 kΩ.

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 set-points in the controller (Ref. Section 8.1).

11. Change the C2 Range set-point to meet your needs. C2 Range set-point 5 is 0-2500, 6 is 0-5000.

12. Once the set-point 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.

9 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.

9.1 Maintaining the System

Use the following maintenance schedule:

Frequency	Maintenance
Daily	Complete daily log. Ensure unit is operating within parameters (see note below).
Yearly	Check feed and product water quality calibration (see Section 8.3).
As Needed	Replace HCRO2 pre-filter cartridge(s), if total chlorine break-through > 0.1, or differential pressure of > 10 PSI.
	Replenish PT401 Anti-scalant solution.
	Membrane cleaning, if > 10% loss of product flow / > 10% rise in product conductivity.

NOTE: Your facility needs to provide a Start-up Log for the RO2 system. This must be filled out completely each time the system is used. The RO2 must operate within the given parameters. The recorded information may be useful in troubleshooting problems. See section 5.3 for an example log.

9.2 Pt401 Anti-Scalant

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

9.3 RO Maintenance Instructions

9.3.1 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 CHLORINE SAMPLE PORT and slowly open the port to relieve the pressure on the RO system.

2. Place a container under the PRODUCT WATER SAMPLE 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.

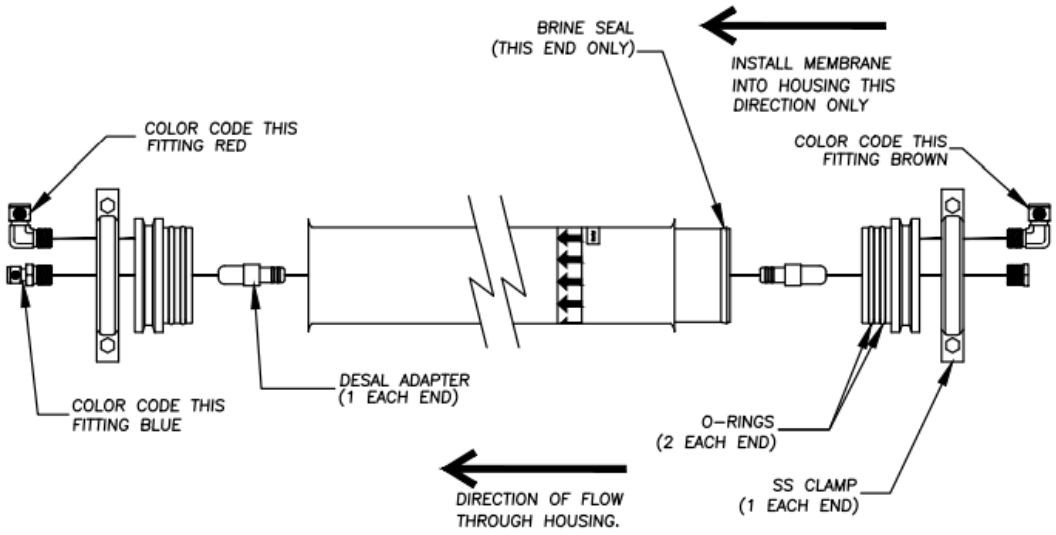


Figure 9

9.3.2 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 Flush Valve to the FLUSH position 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. After a thorough flushing of the preservative, the RO **must** be disinfected prior to being put into service for use. Reference section **Error! Reference source not found.** for the disinfection procedure.

6. Reconnect the PRODUCT WATER hose.

7. Re-apply power to the RO pump.

8. 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.

10 TROUBLESHOOTING AND REPAIR

10.1 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.

PROBLEM	POSSIBLE CAUSE	CORRECTIVE ACTION
RO will not start	1. RO not plugged in 2. Circuit breaker blown 3. RO in a FAULT condition	1. Plug into electrical outlet. 2. Reset the breaker. 3. Check RO controller display for FAULT condition and correct the FAULT.
System has power but no water flow	1. Feed source not open 2. Feed pressure < 20 PSI 3. Incoming hose kinked 4. Pre-filter clogged 5. Circuit board relay is not operating	1. Open Incoming Tap Water valve. 2. Increase pressure to ≥ 20 PSI. 3. Straighten kinks from the INCOMING TAP WATER hose. 4. Check the pre-filter gauges for pressure drop; replace the pre-filter if the pressure drop is 10 PSI or greater than initially recorded. 5. Replace the controller circuit board.
System has power but no water flow (continued)	1. Feed solenoid is not operating	1. Test the solenoid (Section 10.5). Replace the valve if it is defective (see Section 10.6).
Disinfect cycle will not operate when holding the ENTER key	1. DISINFECT MODE has not been accessed correctly. 2. Circuit board relay not operating in DISINFECT MODE 3. Disinfect Solenoid Valve not operating	1. Access DISINFECT MODE (see Section 6.1). 2. Replace the controller circuit board. 3. Test solenoid valve (Section 10.5). Replace the valve if it fails (Section 10.6).
Pump making excessive noise	1. Low pressure or flow rate feeding the RO 2. Feed solenoid is not operating	1. Check the pre-filter outlet gauge PSI (must be ≥ 20 PSI), and verify that the product flow (flowmeter) >

PROBLEM	POSSIBLE CAUSE	CORRECTIVE ACTION
	3. Pump motor or impeller failing	1 GPM. 2. Test the solenoid (Section 10.5). Replace the valve if it is defective (see Section 10.6). 3. Check PUMP PSI GAUGE to verify that it is within operating parameters. Replace the pump assembly if necessary (see Section 10.4).
Poor quality product water	1. High Chlorine levels 2. RO not rinsed thoroughly 3. Reject Flowmeter not properly adjusted. 4. Fouled membrane	1. Backwash the carbon filter or rebed. 2. Rinse membrane (see Section 9.3.2). 3. Turn the Reject Flowmeter knob so that the Reject Water flow is equal or slightly greater than the Product Water flow. 4. Exchange membrane.(see Section 9.3.1). Verify that the conductivity cell accuracy with a known good meter. Follow the calibration procedures in Section 8.6 or replace cell if necessary.
Low product flow rate	1. Low pressure feeding membrane 2. Low pump PSI 3. Reject GPM flow rate too high 4. Excessive PRODUCT line backpressure 5. Low temperature incoming tap water 6. Pre-filter clogged 7. Membrane needs replaced	1. Verify that the incoming tap water supply is fully open. The pressure on the pre-filter gauges should be $\geq$ 20 PSI when the RO is operating. 2. Pump should be operating at 175 – 250 PSI. 3. Adjust Reject Water flow rate. 4. Check for restrictions in the product water hose. Check the feed pressure gauge on the machine. If the machine does not have a pressure gauge, install one inline. 5. Consult the Temperature Correction Chart to determine if the flow rate is

PROBLEM	POSSIBLE CAUSE	CORRECTIVE ACTION
		normal in relation to the feed water temperature. 6. Check the pre-filter gauges for pressure drop. Replace the pre-filter cartridge if the pressure drop is ≥ 10 PSI. 7. Replace the membrane.
High Bacteria Count	1. Too long since the last disinfection or the procedure was not performed correctly	1. Disinfect the RO following the procedures in Section 6.

10.2 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 Set-points, 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 set-points, and drawings of the controller and pc boards can be found in Section 8.

PROBLEM	INVESTIGATION	CORRECTIVE ACTION
System Inoperative	1. Is the yellow CPU active LED blinking? 2. If no, is the green power LED, DS1 Lit? 3. If no, is the fuse OK? 4. If no, replace the fuse. 5. If yes, with a voltmeter, verify power is applied to the power terminals L1 and L2.	1. If power is applied to the power terminals and the other checks are OK, the pc board is defective and should be replaced. 2. If no power is applied to the board, check the power wiring to the system.
Display Blank	1. Is the green power LED, DS1 lit? 2. If yes, is the CPU active LED, DS9 blinking? 3. If yes, adjust the display contrast adjustment, R3. Is the display still blank?	1. If no, refer to the system inoperative section. 2. If no, replace the board. 3. If yes, replace the board.
Inlet Valve Will Not Operate	1. Is the system in standby? 2. If no, are any shut down conditions active? 3. If no, is the inlet LED, DS8	1. If no, replace the board. 2. If no, replace the board. 3. If yes, check the valve and wiring.

PROBLEM	INVESTIGATION	CORRECTIVE ACTION
	lit? 4. If yes, with a voltmeter, verify if there is power on the inlet terminals. Is there power?	
RO Pump Will Not Operate	1. Is the system in standby? 2. If no, are any shut down conditions active? 3. If no, is the RO LED, DS6 lit? 4. If yes, with a voltmeter, verify if there is power on the RO pump terminals. Is there power?	1. If no, replace the board. 2. If no, replace the board. 3. If yes, check the pump and wiring.
No or incorrect conductivity reading	1. Is sensor wired correctly? 2. If yes, is sensor installed inline as shown in the tubing diagram on page 14? 3. If yes, verify correct Conductivity range. Range correct? 4. Does unit calibrate OK? 5. If no, disconnect green and white wires of sensor. Does reading show 0? 6. If yes, reconnect wires and remove sensor from piping and dry. Does reading show 0? 7. If yes, short terminals of cell together. Does reading show '^^^' ?	1. If no, correct wiring. 2. If no, install correctly. 3. If no, correct range. 4. If yes, calibrate unit. 5. If no, replace board. 6. If no, replace cell. 7. If no, replace board.

10.3 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 RO 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.

10.4 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-spice 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.

10.5 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 <u>no</u> 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 0, Controller Troubleshooting.

Disinfect Solenoid

1. Turn off the RO.

2. Turn the knob on the Reject Water flowmeter counterclockwise about 2 – 3 revolutions.

3. Press and hold the LEFT ARROW KEY <u>and</u> 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.

10.6 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 10.4).

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.

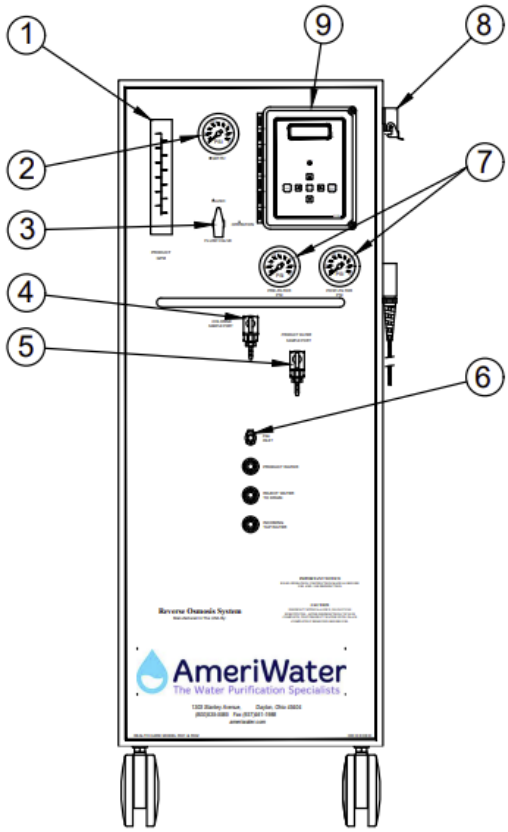
12. Reconnect the wire harness to the valve.

13. Replace the membrane(s), and pump.

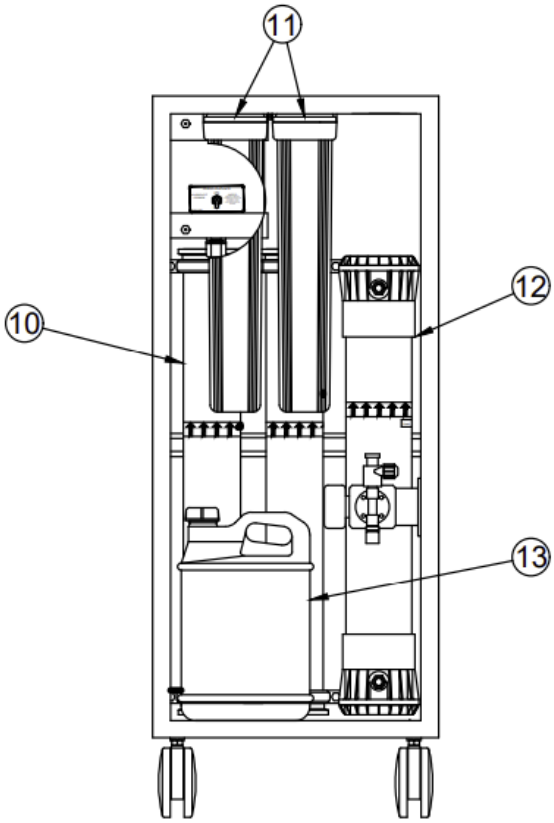
14. To verify that the solenoid valve is installed correctly, follow the Solenoid Test Procedures in Section 10.5.

11 SPARE PARTS LISTING

Item #	Description	Part Number
1		
2	0 – 300 PSI Pump Pressure Gauge	43530714
3	Valve Assembly, Flush, Reject Loop, HCRO2	0142-0003
4	Chlorine Test Port	0148-0006
5	Product Water Test Port	0148-0005
6	Q-Con, CPC, Female Coup W/Shutoffx.25hb, PAA Front Panel Connection	16-0042
7	0 – 100 PSI Pressure Gauge	43-0017
8	Side Entry Hood	0167-0016
9	Controller	69446010
10	Membrane	R22-4026
11	Filter Housing (20”)	21-0032
12	RO Pump Assembly	R80-0125
13	PAA Bottle Assembly 1 Gal Bottle	0185-0020
N/A	Peracidin Disinfectant, 4 Gallons	95-0013
N/A	Carbon Block Filter (10 micron block, 2.5” X 20”)	20-5102
N/A	PT401 Antiscalant, 4 Gallons	95810125
N/A	High Range Peracetic Acid Test Strips	97HP20401
N/A	Low Range Peracetic Acid Test Strips	97PX20501
N/A	O-Ring Kit for 21-0032 Filter Housing (20”)	0013-0001
N/A	Membrane Housing O-Ring Set	24-0026
N/A	PT401 Pump Assembly	R84-0002
N/A	Wire Harness for Solenoid Valves	66932109
N/A	Mini-relief Valve	45760200
N/A	Normally Closed Solenoid Valve	R59-0002
N/A	Normally Open Solenoid Valve	R59-0006
N/A	Incoming Pressure Switch	65511105



Reverse Osmosis System
Front View



Reverse Osmosis System
Rear View

CALIFORNIA PROPOSITION 65

⚠ WARNING

This product can expose you to chemicals such as vinyl chloride (used in the production of PVC) or Nickel (used in the production of stainless steel), that are known to the State of California to cause cancer. For more information go to www.P65Warnings.ca.gov.

Dear Valued Customer,

California Proposition 65 (Prop 65) is the Safe Water and Toxic Enforcement Act of 1986. The State of California began enforcing amendments to California Prop 65 at the end of August 2018. Prop 65 requires manufacturers to provide a clear and reasonable warning to residents of California about chemicals used in products that they purchase that are included on the Prop 65 Chemical List. The chemicals included on the list are chemicals that are known to the State of California to cause cancer, birth defects, or other reproductive harm. One such chemical is Vinyl Chloride, a compound used to produce Polyvinyl Chloride (PVC). The AmeriWater system you have purchased may contain PVC or stainless steel parts.

While warnings are only required in the State of California, AmeriWater has initiated the use of Prop 65 labeling for all products to ensure compliance with California regulations. Please note that the above warning does not necessarily mean that the product that you have purchased is unsafe. Products that have been cleared for market by FDA have been determined to be safe and effective by the United States Food and Drug Administration. The warning is simply a requirement by the State of California. If you wish to obtain additional information, please visit: p65warnings.ca.gov. You may also contact your AmeriWater representative if you have any questions.

Thank you for your understanding and we look forward to continuing to serve you.