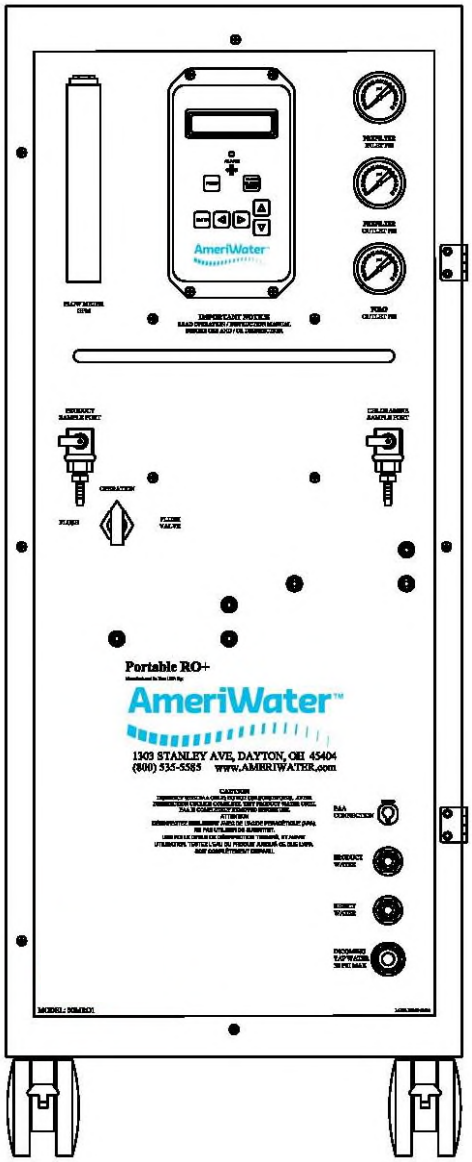
AmeriWater
The Water Purification Specialists

MRO1 SERIES

OPERATION & MAINTENANCE MANUAL



Manufactured With Pride
In The USA

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

PN 98-0144
Rev. L

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SECTION 1, GENERAL INFORMATION

1.1 INTRODUCTION

Congratulations on your decision to use the MRO1 system! The MRO1 is a stand alone water treatment system for use in hemodialysis applications. It is designed to pretreat and purify water resulting in product water that meets or exceeds ANSI/AAMI RD62 requirements for use in making dialysate for hemodialysis. This model has the capacity to supply one to two dialysis machines. The MRO1 provides quiet operation for bedside use and is intended for use in hospitals, clinics, home care, and dialysis centers.

All models of the MRO1 are shipped completely assembled with required and optional water treatment components. The model that you purchased was selected for the volume of water needed and the analysis of your input water. This Operation Manual was written for the MRO1 model.

Your MRO1 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 MRO1 as soon as you receive it. Please notify AmeriWater® if any problems are encountered.

The initials "PAA" are used occasionally throughout this manual to generically represent the hydrogen peroxide/peroxyacetic acid solution that is to be used for disinfection. Peracidin® is an example of this solution. The caution on the front panel of the MRO1 that states "Use only PAA/Use no substitutes" means that any of these products are acceptable. Do not attempt to use anything other than hydrogen peroxide/peroxyacetic acid disinfecting solution.

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 standard 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.

NOTE: 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.

CAUTION: No person should attempt to operate or service the AmeriWater MRO1 without prior authorization, instruction, and training from AmeriWater and/or your medical facility director.

1.2 RESTRICTION ON USE

CAUTION: ***When used as a medical device, Federal law restricts this device to sale by or on the order of a physician per 21CFR §801.109 (b)(1)!***

1.3 ELECTRICAL LEAKAGE STANDARDS

The AmeriWater MRO1 water treatment system complies with the National Electrical Standards for Product Safety and Construction.

According to the categories of ANSI/AAME Standards, the MRO1 is considered a Nonpatient Contact Medical Device.

During the design process the individual components were tested and the initial test results for the electrical components (pump, solenoid valves, and controller) were all less than 0.1 microampere leakage.

Completed product testing with the MRO1 functioning resulted in the following MRO1 standards being set.

TEST PERFORMED	MRO1 ELECTRICAL LEAKAGE STANDARD	ANSI / AAMI SAFE LIMITS STANDARDS
Normal Polarity	<10 microamperes	100 microamperes
Neutral Open (single fault)	<100 microamperes	500 microamperes
Ground Open (single fault)	<100 microamperes	500 microamperes
Ground & Neutral Open *	<200 microamperes	Not Required

* Although this test is not required by ANSI/AAMI, it is still performed as an additional safety measure.

The cabinet of the MRO1 is PVC for additional operator safety.

The MRO1 is compliant with ANSI/AAMI ESI-1993, Safe Current Limits for Electro medical Apparatus. All major components of the MRO1 (controller, pump, solenoid valve, antiscalant pump) as well as other components are UL listed.

This MRO1 conforms to UL STD 60601-1 and has been certified to CSA STD C22.2 NO. 601.1.

The MRO1 is Class II electrical equipment. Grounding is accomplished via functional earth terminals and double insulation is used to protect against shock.

The MRO1 requires special precautions regarding EMC during installation and use. Installation must follow the instructions indicated within this manual.

CAUTION: Portable and mobile RF communications equipment can affect this device.

WARNING: The use of other accessories with this device may affect the EMC of this device.

1.4 GUIDANCE ON ELECTROMAGNETIC EMISSIONS

Guidance and manufacturer's declaration – electromagnetic emissions		
The MRO1 is intended for use in the electromagnetic environment specified below. The customer or the end user of the MRO1 should assure that it is used in such an environment.		
Emissions Test	Compliance	Electromagnetic environment - guidance
RF emissions CISPR 11	Group 1	The MRO1 uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
RF emissions CISPR 11	Class B	The MRO1 is suitable for use in all establishments, including domestic establishments and those directly connected to the public low-voltage power supply network that supplies building used for domestic purposes.
Harmonic emissions IEC 61000-3-2	Class A	
Voltage fluctuations / flicker emissions IEC 61000-3-3	Complies	

1.5 GUIDANCE ON ELECTROMAGNETIC IMMUNITY

Guidance and manufacturer's declaration – electromagnetic immunity			
The MRO1 is intended for use in the electromagnetic environment specified below. The customer or end user of the MRO1 should assure that it is used in such an environment.			
Immunity test	IEC 60601 test level	Compliance Level	Electromagnetic environment - guidance
Electrostatic discharge (ESD) IEC 61000-4-2	± 6 kV contact ± 8 kV air	B A	Floors should be wood, concrete, or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%.
Electrical fast transient / burst IEC 61000-4-4	± 2 kV for power supply lines ± 1 kV for input / output lines	A N/A	Mains power quality should be that of a typical commercial or hospital environment.
Surge IEC 61000-4-5	± 1 kV line(s) to line(s) ± 2 kV line(s) to earth	A A	Mains power quality should be that of a typical commercial or hospital environment.
Voltage dips, short interruptions and voltage variations on power supply input lines IEC 61000-4-11	<5% U_T (> 95% dip in U_T) for 0,5 cycle 40% U_T (60% dip in U_T) For 5 cycles 70% U_T (30% dip in U_T) For 25 cycles <5% U_T (>95% dip in U_T) for 5s	B B B B	Mains power quality should be that of a typical commercial or hospital environment. If the user of the MRO1 requires continued operation during power mains interruptions, it is recommended that the MRO1 be powered from an uninterruptable power supply or battery.
Power frequency (50/60 HZ) magnetic field IEC 61000-4-8	3 A/m	A	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.
NOTE U_T is the a.c. mains voltage prior to application of the test level.			

1.6 GUIDANCE ON ELECTROMAGNETIC IMMUNITY NON-LIFE SUPPORTING EQUIPMENT

<table>
<tr><th colspan="4">Guidance and manufacturer's declaration – electromagnetic immunity</th></tr>
<tr><td colspan="4">The MRO1 is intended for use in the electromagnetic environment specified below. The customer or end user of the MRO1 should assure that it is used in such an environment.</td></tr>
<tr><td>Immunity test</td><td>IEC 60601 test level</td><td>Compliance Level</td><td>Electromagnetic environment - guidance</td></tr>
<tr><td>Conducted RF

IEC 61000-4-6

Radiated RF

IEC 61000-4-3</td><td>3 Vrms

150 kHz to 80 MHz

3 V/m

80 MHz to 2.5 GHz</td><td>3V

3V/m</td><td>Portable and mobile RF communications equipment should be used no closer to any part of the MRO1, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter.

Recommended separation distance

$d = [1.17]\sqrt{P}$

$d = [1.17]\sqrt{P}$ 80 MHZ to 800 MHz

$d = [2.33]\sqrt{P}$ 800 MHz to 2.3 GHz

Where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and d is the recommended separation distance in meters (m).

Field strength from fixed RF transmitters, as determined by an electromagnetic site survey, [a] should be less than the compliance lever in each frequency range. [b]

Interference may occur in the vicinity of equipment marked with the following symbol:

  </td></tr>
<tr><td colspan="4">NOTE 1 At 80 MHz and 800 MHz, the higher frequency applies.</td></tr>
<tr><td colspan="4">NOTE 2 These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.</td></tr>
<tr><td colspan="4">a Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which the MRO1 is used exceeds the applicable RF compliance level above, the MRO1 should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as re-orienting or relocating the MRO1.</td></tr>
<tr><td colspan="4">b Over the frequency range 150 kHz to 80 MHz, field strengths should be less than 3 V/m.</td></tr>
</table>

1.7 SEPERATION DISTANCES FOR RF DEVICES AND MRO1

Recommended separation distances between portable and mobile RF communications equipment and the MRO1.

The MRO1 is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of the MRO1 can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the MRO1 as recommended below, according to the maximum output power of the communication equipment,

Rated maximum output power of transmitter **W**	**Separation distance according to frequency of transmitter** **m**		
	150 kHz to 80 MHz $d = [1.17]\sqrt{P}$	80 MHz to 800 MHz $d = [1.17]\sqrt{P}$	800MHz to 2.5GHz $d = [2.33]\sqrt{P}$
0.01	0.12	0.12	0.23
0.1	0.37	0.37	0.74
1	1.17	1.17	2.33
10	3.70	3.70	7.37
100	11.70	11.70	23.30

For transmitters rated at a maximum output power not listed above, the recommended separation distance *d* in meters (m) can be estimated using the equation applicable to the frequency of the transmitter, where *P* is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer.

NOTE 1 At 80 MHz and 800 MHz, the higher frequency applies.

NOTE 2 These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.

1.8 CAUTIONARY SYMBOLS

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

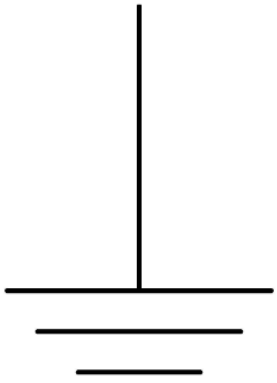
Open by qualified service personnel only!
Ouverture par le personnel qualifié seulement!

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

SECTION 2, 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 MRO1 is running) Minimum Maximum	 20 PSI 50 PSI (**P**ounds per **S**quare **I**nch)
Pump pressure – Minimum Maximum	 120 PSI 210 PSI
Water pressure to dialysis machine	40 PSI or less
Maximum output of product water @ 77°F (25°C), TDS<1000 ppm of NaCl, & pump pressure of 150 psi.	MRO1 - 1400 GPD (5299 LPD) (**G**allons **P**er **D**ay / **L**iters **P**er **D**ay)

Connections	Feed =3/4” Female GHT Product = 3/4" Male GHT Drain = 1/2" hose with check valve (**G**arden **H**ose **T**hread)
Electrical Requirements	115V/60Hz/20A GFI (**G**round **F**ault **I**nterrupter)
Dimensions Packaged Dimensions not Packaged	58" H x 42" W x 38" D 52”H x 18 ½”W x 24”D

Materials that Contact Product Water:

ABS
Acrylic
Carbon
Nylon
PVC
Polyester
Polyethylene
Polypropylene
Stainless Steel
Thin Film Composite Membrane (polyimide)
Tygon

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

00810118 On-board Catalytic Carbon Exchange Tank Specifications:

Tank Dimensions: 6” X 35”
Amount of Catalytic Carbon: 0.5 ft^3

2.2 SPECIFIC ENVIRONMENTAL/TRANSPORT CONDITIONS ANTICIPATED

ENVIRONMENTAL CONDITIONS ANTICIPATED

1. This medical device is intended to be used under the following conditions:
2. Indoor use;
3. Altitude up to 6,562 ft (2,000 m);
4. Temperature between 41°F (5°C) and 104°F (40°C);
5. Maximum relative humidity 80% for temperatures up to 88°F (31°C) decreasing linearly to 50% relative humidity at 104°F (40°C);
6. MAINS supply voltage fluctuations up to ± 10% of the nominal voltage;
7. Transient over voltages present on MAINS supply = CATEGORY II;
8. Applicable RATED POLLUTION degree 2.

TRANSPORT CONDITIONS ANTICIPATED

1. Altitude up to 6,562 ft (2,000 m);
2. Temperature between 41°F (5°C) and 104°F (40°C);
3. Maximum relative humidity 80% for temperatures up to 88°F (31°C) decreasing linearly to 50% relative humidity at 104°F (40°C);

2.3 MRO1 Output Water Quality

The Medical Director of dialysis has the ultimate responsibility for selecting the maximum allowable levels of chemical contaminants in the water and also is responsible for monitoring the water. The AmeriWater MRO1 System is designed to produce water that meets or exceeds ANSI/AAMI RD62 requirements.

Thin Film Composite Membrane

Contaminants	Percentage Removal
Calcium	99.5
Magnesium	99.5
Sodium	98.0
Potassium	97.0
Fluoride	87.0 - 93.0
Nitrate (NO_3)	60.0 - 75.0
Sulfate	99.5
Copper	98.0 - 99.0
Barium	96.0 - 98.0
Zinc	98.0 - 99.0
Aluminum	98.0 - 99.0
Arsenic	94.0 - 96.0
Lead	96.0 - 98.0
Silver	93.0 - 96.0
Cadmium	96.0 - 98.0
Chromium	96.0 - 98.0
Selenium	94.0 - 96.0
Mercury	96.0 - 98.0
Antimony	96.0 - 98.0
Beryllium	96.0 - 98.0
Thallium	96.0 - 98.0

Carbon Filtration

Contaminants	Iodine Number
Chlorine, Chloramines, and Organics	825 mg/g, min. (Peroxide No. -- 19 max.)

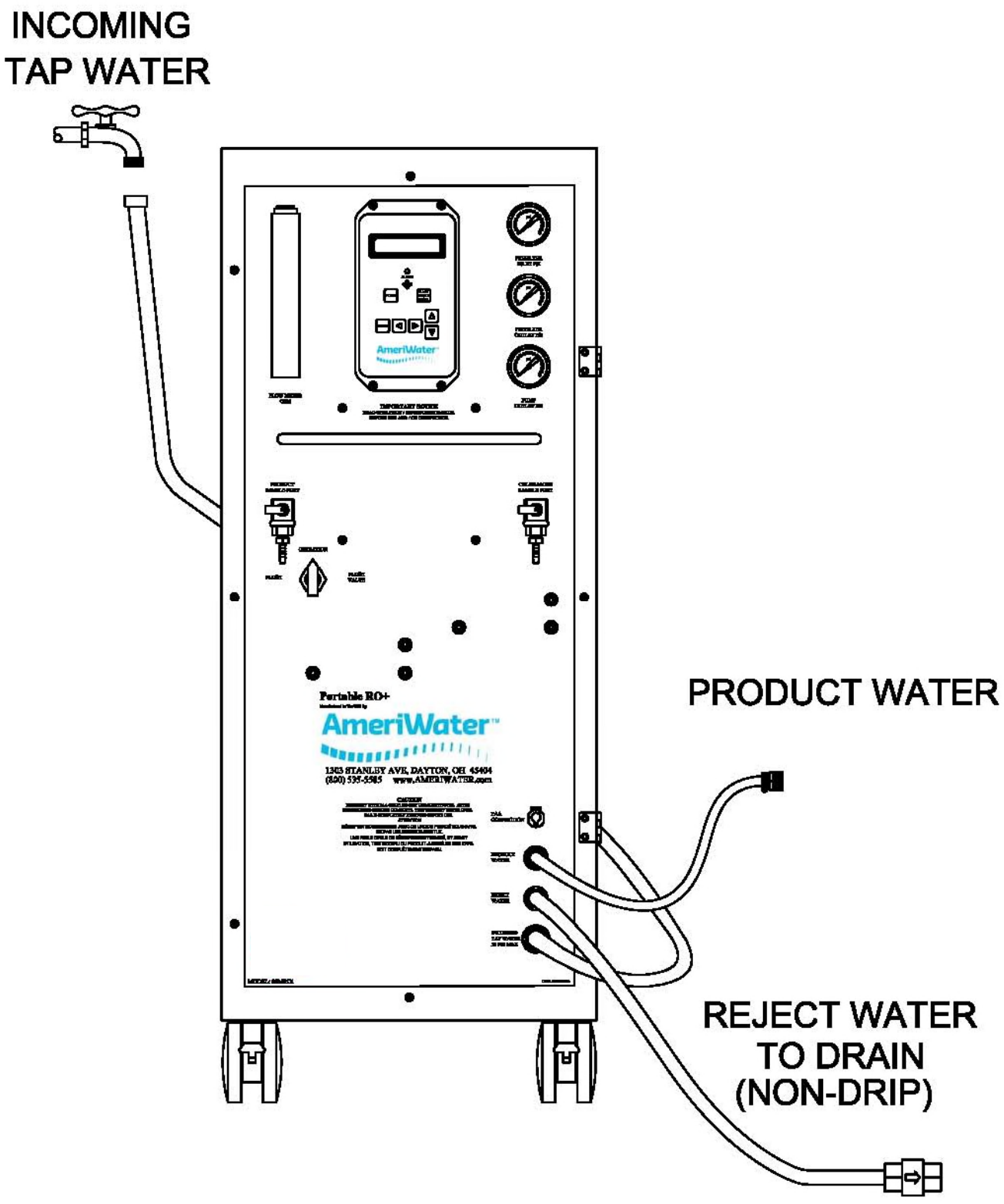
PT401 Antiscalant/Scale Inhibitor

Contaminants	Chemical Feed System
Membrane Scale Control	Not to exceed 40 ppm based on water analysis

2.4 TEMPERATURE CORRECTED MRO1 PRODUCTION RATES

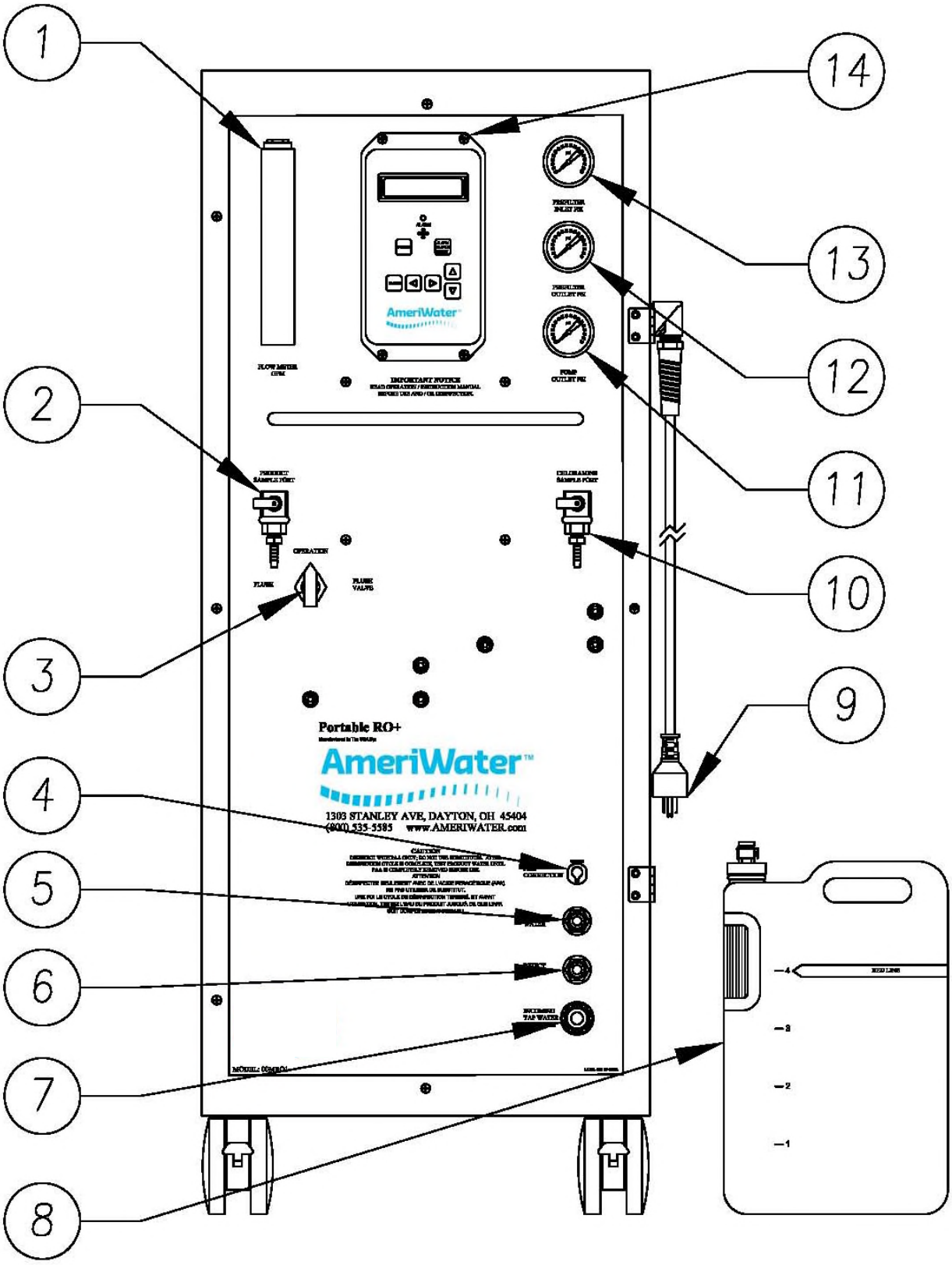
MRO1 membrane performance is affected by water temperature. The Product Water Flow Rate and Output decreases as the temperature of the Incoming Tap Water decreases.

2.5 MRO1 DIRECT FEED TO DIALYSIS MACHINE(S)



SECTION 3, COMPONENTS AND SCHEMATICS

3.1 EXTERNAL FRONT VIEW



IDENTIFICATION OF COMPONENTS (EXTERNAL VIEW)

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

2. **PRODUCT WATER SAMPLE PORT –** Valve with nozzle to let small amounts of water out to test the quality of the product water for dialysis.

3. **TEMPORARY FLUSH VALVE –** When the unit is in operation (feeding a dialysis machine), the valve must be in the "IN SERVICE" position. **Do not place the TEMPORARY FLUSH VALVE in the FLUSH position when the MRO1 is feeding a dialysis machine. Serious injury to the patient may occur!**

4. **PAA QUICK CONNECT FITTING (MRO1) –** Quick connect fitting that the PAA container is connected to on the MRO1 for sanitization.

5. **PRODUCT WATER FOR DIALYSIS –** Connection for hose transmitting purified water from the MRO1 system to the dialysis machine.

6. **REJECT WATER TO DRAIN –** Connection for hose conveying wastewater to the drain.

7. **INCOMING TAP WATER –** Connection for hose feeding tap water into the MRO1 system.

8. **PAA CONTAINER –** The PAA container is used to mix the solution used for disinfection, and attaches to the MRO1 (for disinfection) via quick connect fittings.

9. **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.

10. **CHLORAMINES SAMPLE PORT –** Valve with nozzle to let small amounts of water out to test for the presence of chloramines before the MRO1 membrane.

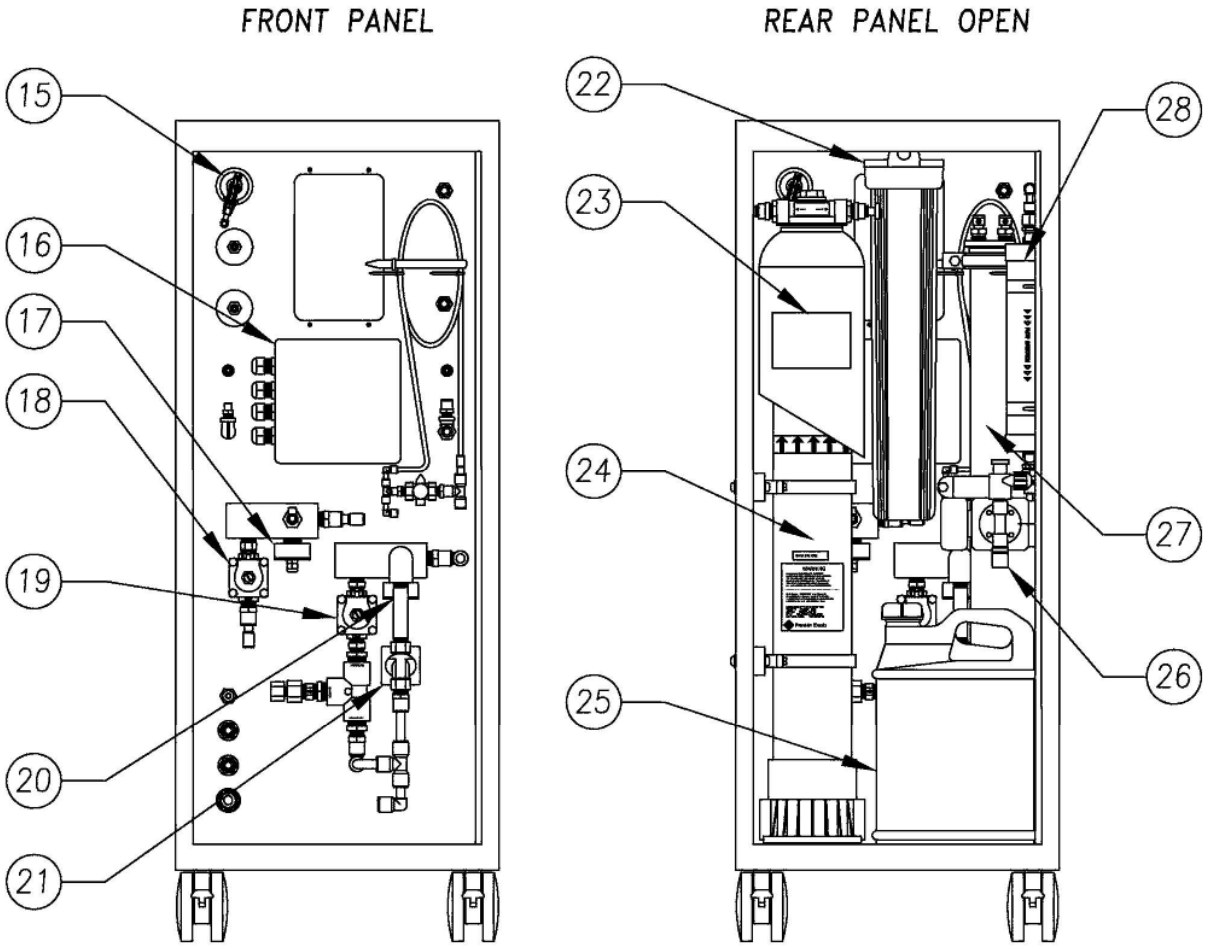
11. **PUMP PRESSURE –** Gauge that measures the primary feed pressure in pounds per square inch (PSI) from the pump to the MRO1 membrane.

12. **PREFILTER OUTLET GAUGE –** Gauge that measures the pressure in pounds per square inch (PSI) of the water after going through the micron prefilter. Change the micron prefilter when the outlet gauge reads 10 PSI less than the prefilter inlet gauge.

13. **PREFILTER INLET GAUGE –** Gauge that measures the pressure in pounds per square inch (PSI) of the incoming tap water as it enters the device.

14. **CONTROLLER –** Control mechanism for the MRO1 (Section 6, MRO1 Controller).

3.2 INTERNAL REAR VIEW



IDENTIFICATION OF COMPONENTS (INTERNAL VIEW)

15. **PRESSURE SWITCH** – Protects the pump from running when there is insufficient source water.

16. **MOTOR STARTER** – Provides power to the pump motor(s) when the 24VAC signal is received from the controller. This will also convert the 115VAC to 24VAC to operate the controller.

17. **PRODUCT CONDUCTIVITY SENSOR** – Measures the conductivity of the product water in microsiemens.

18. **PRODUCT SOLENOID** – Solenoid valve that is normally open and closes when the product quality drops below the set-point to prevent poor quality water from passing through the product hose.

19. **DISINFECT SOLENOID** – Solenoid valve that is normally closed and opens during the disinfection process for the MRO.

20. **INLET CONDUCTIVITY SENSOR** – Measures the conductivity of the incoming water in microsiemens.

21. **INLET SOLENOID** – Solenoid valve that is normally closed and opens when the controller is in operation.

22. **PREFILTER** – A 10 micron carbon block filter is provided.

23. **CARBON TANK** – Catalytic Carbon exchange tank for the removal of chlorine and chloramines**.**

24. **PUMP** – Provides the pressure for the MRO1 system. The MRO1 ON/OFF switch controls the pump motor.

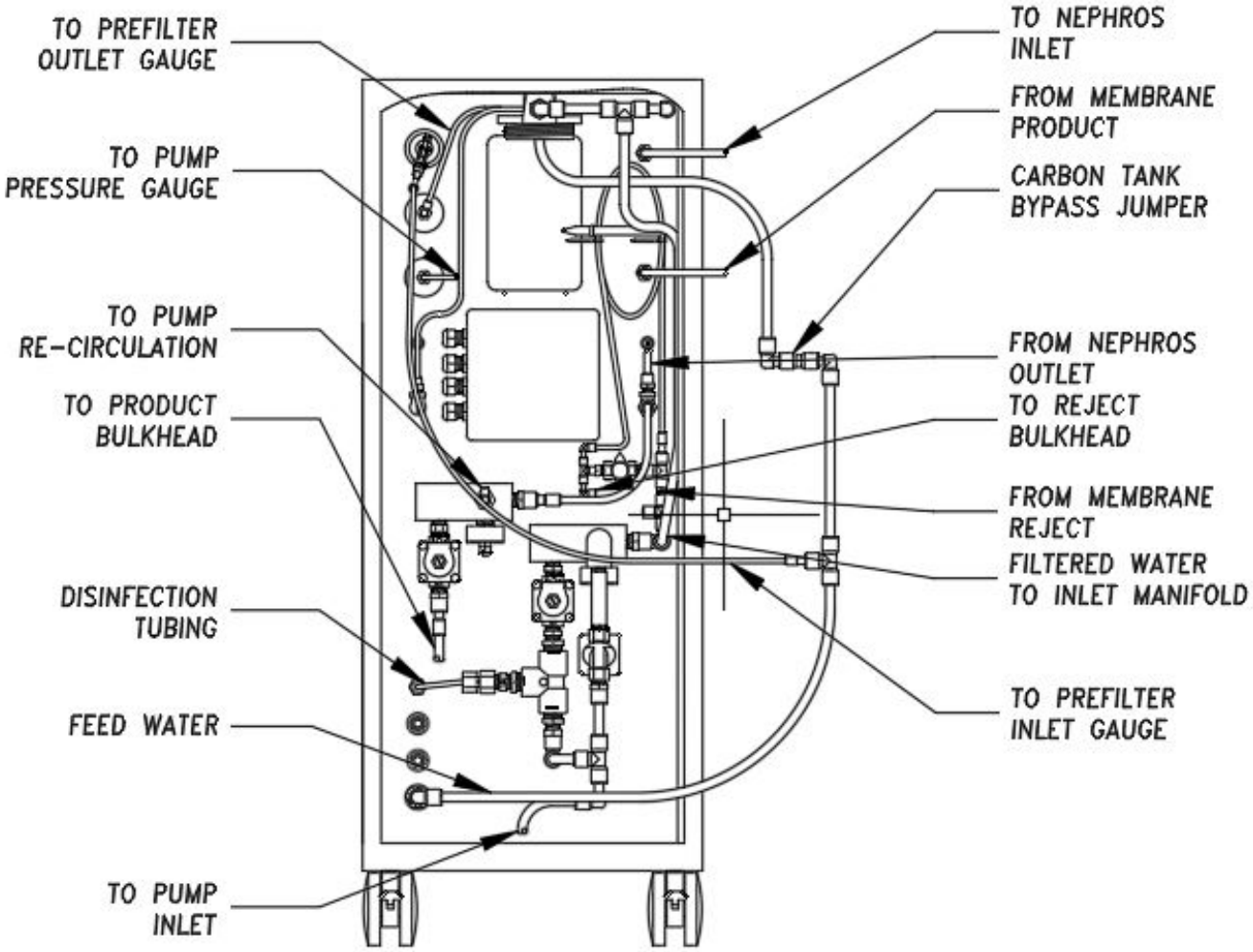
25. **PT401 ANTISCALANT / SCALE INHIBITOR** – Plastic container filled with 2 ½ gallons of PT401 solution to prevent the MRO1 membrane from scaling. The plastic container should be refilled with PT401 solution when it reaches the half-full level.(Optional)

26. **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. (Optional)

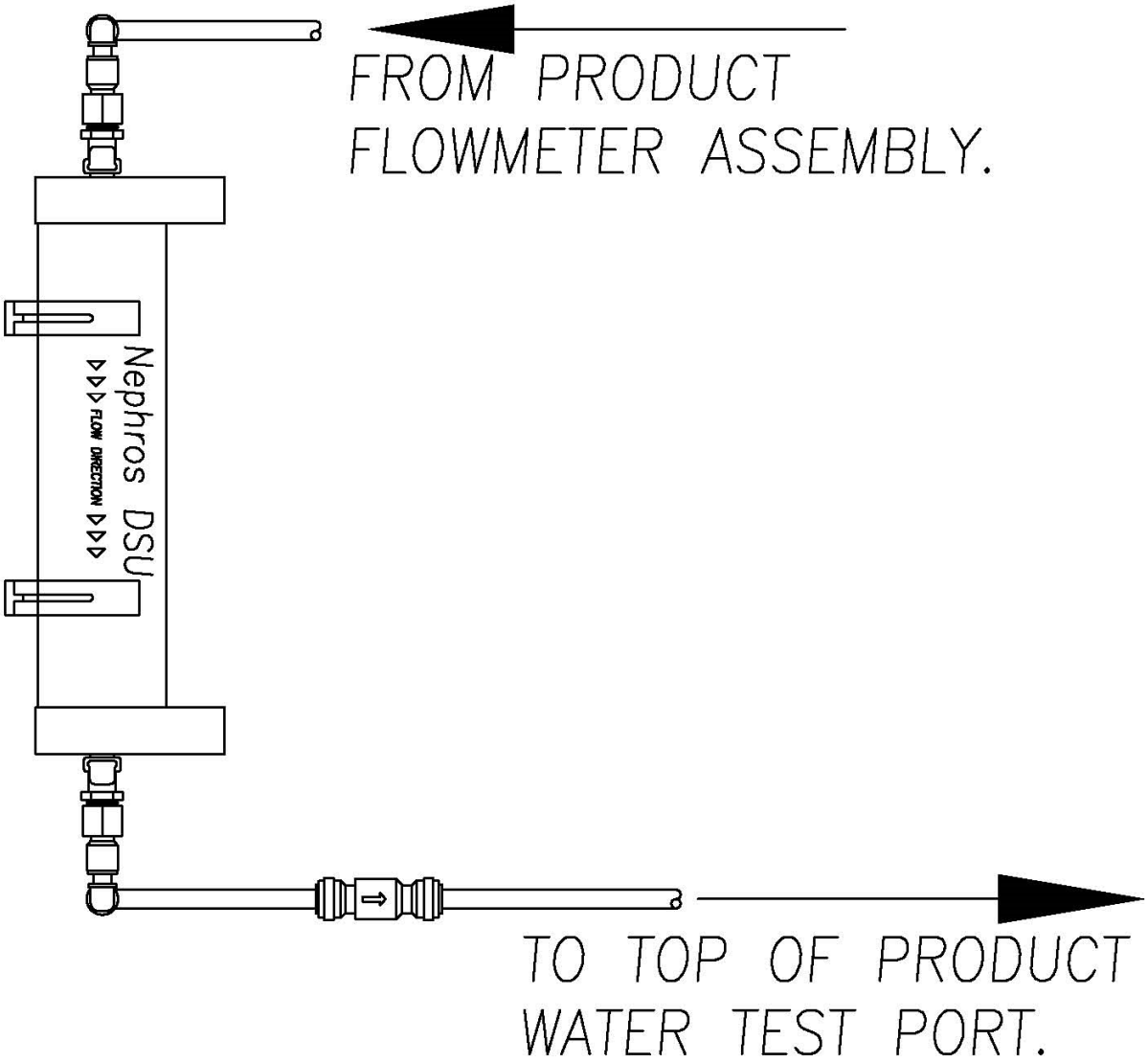
27. **MEMBRANE** – Spiral-wound, thin film, composite membranes for reverse osmosis.

28. **NEPHROS DSU** – Filter to block biological contaminants from the patient.

3.3 MRO1 TUBING DIAGRAMS

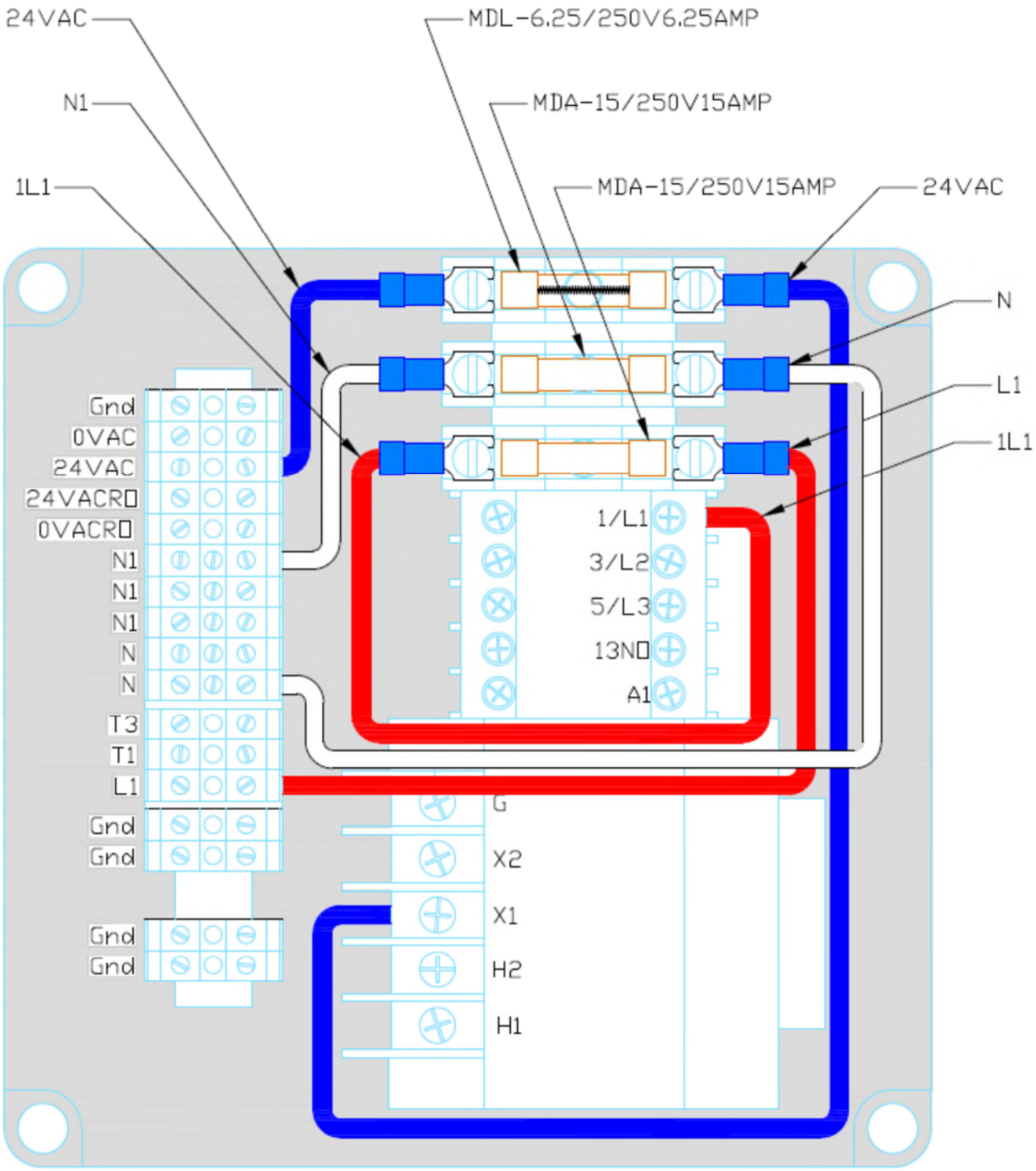


3.4 NEPHROS TUBING DIAGRAM

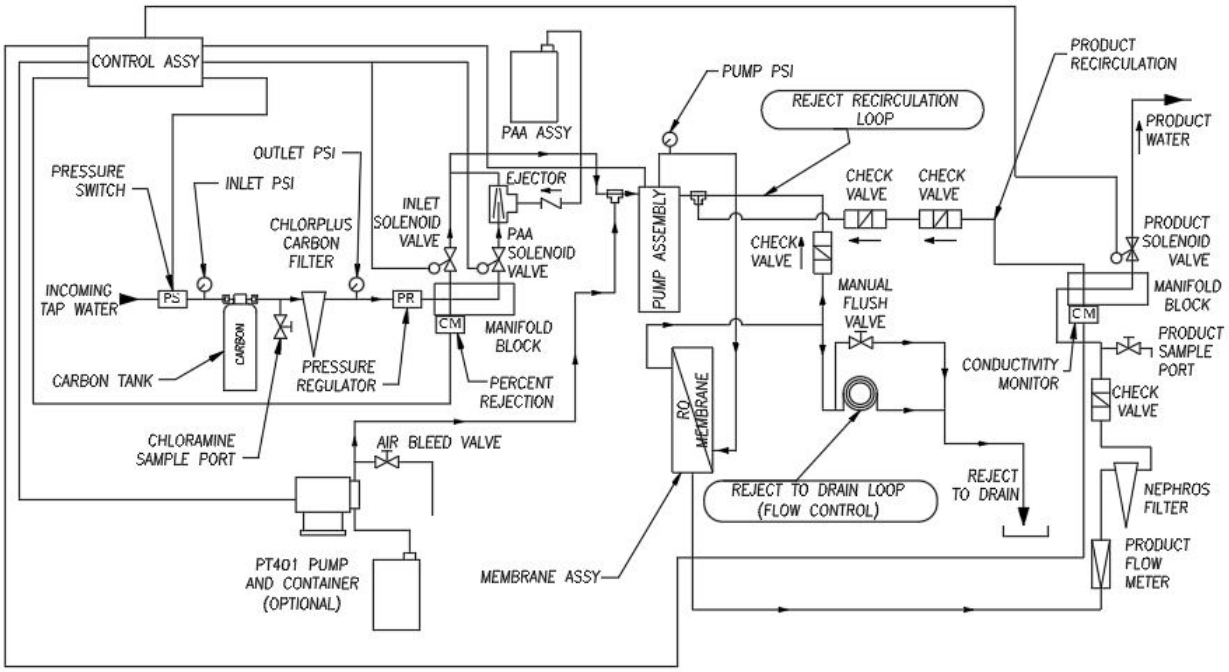


NEPHROS DSU FILTER TUBING DIAGRAM

3.5 ELECTRICAL DIAGRAM, MRO1



3.6 FLUID DIAGRAM, MRO1



SECTION 4, MRO1 STARTUP & OPERATION

4.1 CAUTION

NOTE: This entire Operations Manual should be read before operating or servicing the MRO1 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.

CAUTION: No person should attempt to operate or service the MRO1 without prior authorization or instruction from your medical facility director.

The following operating or water supply conditions could cause an accident or the MRO1 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, 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 or patient. It is suggested that the MRO1 be placed on an electric supply with emergency backup.

2. The MRO1 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 electric shock, always unplug the MRO1 system before opening the motor starter enclosure.

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. The MRO1 system is equipped with a pretreatment system to remove chlorine and chloramines. 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 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 (pH Water/Bicarbonate/Dialysate Test Strips P/N 97PH20901). Contact AmeriWater if the pH is above 8.5.

CAUTION: Mixing chlorine and hydrogen peroxide/peroxyacetic acid causes a toxic chemical reaction. Never allow them to mix!

CAUTION: Do not use chlorine to disinfect the system!

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

9. It is important to test for PAA in the Product Water For Dialysis after rinsing during disinfection of the system. Do not use the system until the PAA is below 3 PPM in the PRODUCT WATER FOR DIALYSIS hose.

CAUTION: Never operate the MRO1 with a dialysis machine if the water conductivity exceeds the set point, indicating Poor Quality!

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

11. Minimum feed pressure is 20 PSI (while the MRO1 is in operation, with flow). Maximum feed pressure is 50 PSI.

12. All exhausted or contaminated carbon must be disposed of and replaced with fresh new catalytic carbon. All exhausted carbon tanks that are shipped to AmeriWater for exchange will be replaced with brand new virgin catalytic carbon. If your facility does not use AmeriWater's service for proper disposal of exhausted carbon, the medical facility director is responsible for properly handling it.

13. The carbon block filter must be replaced every time that the membranes and/or carbon tanks are changed, or when the differential pressure on the prefilter gauges is 10 PSI or greater.

CAUTION: If the carbon block filter is not replaced, damage may occur to the pump and/or membrane.

14. If the system is operated without a carbon block filter, the membrane will foul.

15. Minimize the opportunities for bacterial growth between uses!

CAUTION: To minimize bacterial growth, operate the MRO for 5 minutes in "FLUSH" and then 5 minutes with the FLUSH VALVE in "OPERATION" before connecting to a dialysis machine and using for dialysis.

Whenever the MRO is not used for a period of several hours, the "Membrane Flush Feature" of the MRO should be programmed to be active when in the STANDBY mode (See section 5.4 for activating this feature).

Before determining a bacteria count, the MRO should be PLACED in FLUSH for 5 minutes, and then placed in OPERATE for 5 – 10 more minutes after a period of non-use, but before taking a sample of the PRODUCT WATER. Bacteria are known to increase in population when water is not moving.

4.2 SAFETY FEATURES

The MRO1 is equipped with several safety features for the benefit of both the user and the patient. They consist of the following:

Disinfection using hydrogen peroxide/peroxyacetic acid disinfecting solution instead of formaldehyde to increase safety and avoid health risks associated with formaldehyde. Hydrogen peroxide/peroxyacetic acid produces no harmful by-products or side effects, thus it is safer for patients. Using hydrogen peroxide/peroxyacetic acid does not require additional ventilation, and disposal is safe and easy. Important information regarding the usage and handling of hydrogen peroxide/peroxyacetic acid is listed in Section 5.2, A WORD ABOUT HYDROGEN PEROXIDE/PEROXYACETIC ACID, and in the hydrogen peroxide/peroxyacetic acid Materials Safety Data Sheet. Please read them carefully.

Color-coded inlets and outlets are on the membrane assembly and carbon tank 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.

Low pressure shutdown to protect the pump whenever the feed pressure is too low.

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 MRO1 will remain stationary during startup.

2. Depress the gray collets to remove the plugs from the PRODUCT WATER, REJECT WATER TO DRAIN, and INCOMING TAP WATER fittings on the front of the MRO1.

3. Connect the INCOMING TAP WATER, PRODUCT WATER and REJECT WATER TO DRAIN hoses to the appropriate fittings (see Figure 4.1).

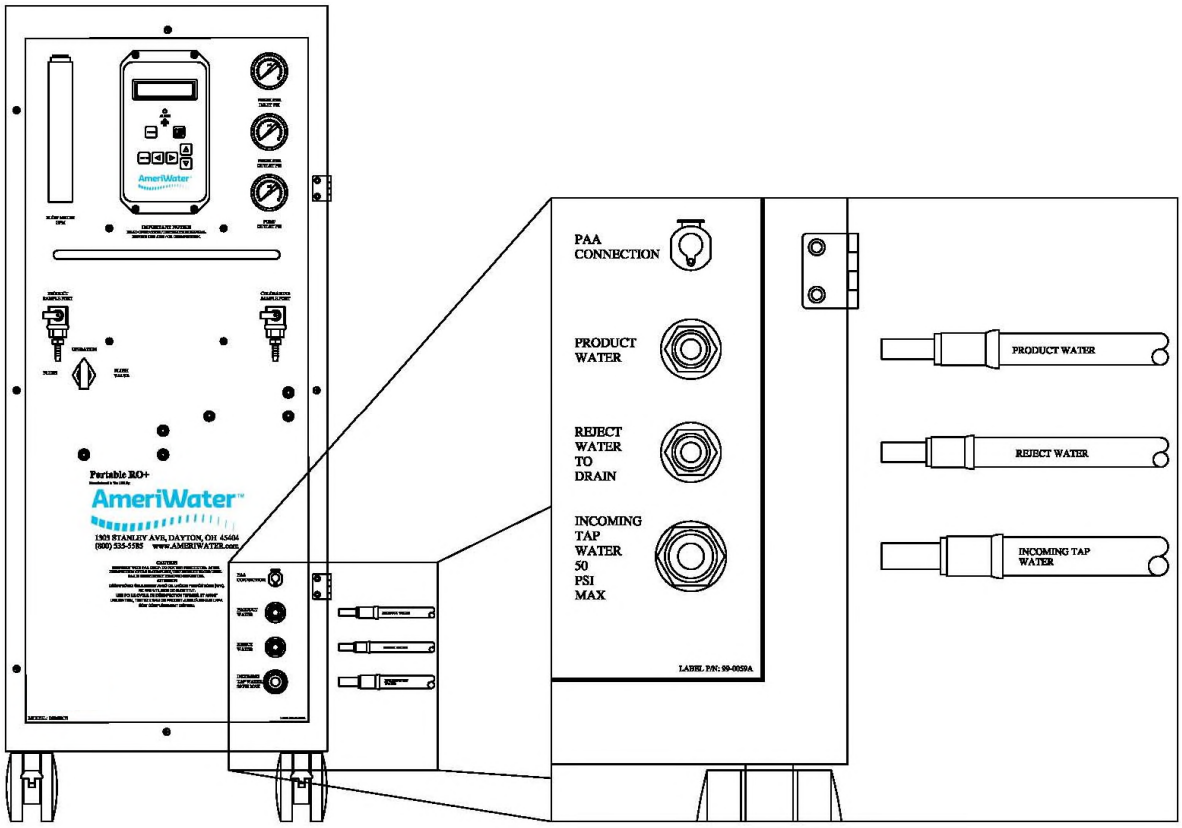


FIGURE 4.1

- Insert the hose assembly tube extension into the appropriate bulkhead fitting in the front of the cabinet. The hose assemblies come in the installation kit for the MRO.
- Gripping the tube insert, firmly press this into the fitting until you reach the positive stop. The Inlet hose will go in approximately 1" and the Product and Reject hoses will go in about ¾".

NOTE: To remove the hoses, depress the gray "collet" inward while gently pulling the hose out.

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

4. Connect the MRO1 INCOMING TAP WATER hose to the potable cold water supply using the Incoming Tap Water hose and fittings supplied. If blending both warm and cold water to improve product flow rate, do not exceed 90° F (33° C).

5. The REJECT WATER TO DRAIN hose coming out of the MRO1 system is for reject water. The water from this hose will go down the sink. 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 sink until the disinfection cycle is completed and the water quality is in the good range (below the conductivity setpoint and not in alarm).

7. Open the access panel.

8. If your MRO1 was ordered with the optional PT401 antiscalant system, remove the gray packing foam between the PT401 CONTAINER and the cabinet wall.

9. Remove the carbon bypass jumper by depressing the gray "collet" inward while gently pulling the tube elbow out.

NOTE: These type of fittings work like "Chinese Hand Cuffs." To disconnect, push in on the gray "collet" while gently pulling the tube elbow out.

   a. Remove the catalytic carbon tank from the box. DO NOT lift the carbon tank by the inlet and outlet fittings! Grasp the fiberglass body of the tank to lift.

   b. Remove the plugs from the inlet and outlet fittings by depressing the gray "collet". The carbon tanks must be conditioned prior to installation by connecting the carbon filter's outlet to the inlet tubing that is ordinarily connected to the filter's inlet, then connect the reject hose (adapter fitting is provided in the installation kit) or a piece of ½" OD tubing to the inlet of the carbon tank. With the carbon filter's outlet port connected to the inlet tubing, turn on the water to full flow and reverse flush for at least 5 minutes as the water coming out of the carbon tank's inlet is directed to a sink. When it is time to connect the carbon tank filter prior to dialysis use, connect the carbon tank in the inlet water circuit in place of the by-pass jumper. The elbow from the inlet bulkhead connects to the inlet (green), while the elbow going to the filter connects to the outlet (yellow). Reverse flushing also removes the entrapped air from the carbon tank.

10. Close the access panel.

11. Plug the power cord into a 115-volt, 20-amp GFI receptacle.

12. Turn on the potable cold water supply to the MRO1.

13. Turn on the MRO1 and place the FLUSH VALVE in the FLUSH position. Allow the MRO1 to run in FLUSH for 5 minutes. Check for leaks on the carbon tank at this time.

NOTE: The MRO1 conductivity alarm may sound, which is normal when the MRO1 is in FLUSH. Press the ALARM SILENCE key on the MRO1 controller to silence the alarm. The alarm will restart after a 3 minute delay.

14. After flushing for 5 minutes, turn the FLUSH VALVE to OPERATION position and run for 2 hours to rinse the preservative out of the system.

15. Disinfect the system prior to use **(See Disinfecting The System, Section 5).**

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

17. 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.

18. Turn the FLUSH VALVE to the OPERATION position. The PRODUCT GPM FLOWMETER should indicate at least 0.5 GPM (1.89 LPM) for the MRO1.

19. Refer to the Start-Up Log in Section 4.5. Complete the entire MRO1 Performance section making sure that the system is operating within all the required ranges.

WARNING: Do <u>not</u> use the MRO1 to feed a dialysis machine until <u>all</u> specifications are met.

20. When the log shows that all start-up conditions are met, the system is now ready for use. Press the POWER key (the display will show STANDBY). Connect the PRODUCT WATER FOR DIALYSIS HOSE to the dialysis machine **(Note: See the Operations Manual for your dialysis machine for instructions, and perform the procedure aseptically).**

4.4 SYSTEM SHUTDOWN

1. Before turning off the POWER key, it is recommended to turn the FLUSH VALVE to the FLUSH position and allow the MRO1 to flush 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 dialysis machine 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 MRO1 for storage or transport of the MRO1.

6. Store the system until next use. If the system will be stored for more than 24 hours, it is recommended that the system be stored with a suitable RO preservative or allowed to run in OPERATION at least every 8 hours to discourage microbiological growth during storage. Refer to section 5.3 for detail on the recommended preservation method, or enable the MEMBRANE FLUSH FEATURE (Section 5.4).

7. See Initial Startup in Section 4.3 for instructions before the next use. **The system will need to be preserved or disinfected before the next use if it sits unused for 1 or more days, or in accordance to the guidelines of your medical facility director.**

8. When transporting the MRO1, push or pull the system by the handle only.

WARNING: **DO NOT attempt to push or pull the MRO1 from the side! This will cause the MRO1 to tip over and may result in injury and/or damage to the system. Use only the handle at the front of the cabinet to move the MRO.**

4.5 STARTUP AND OPERATION LOG

1) DATE								
RO PERFORMANCE (DURING WATER FLOW)								
2) Temperature **(41ºF - 90ºF)**								
3) Product flow **(MRO1 minimum 0.5 GPM)**								
4) Pump PSI **(120 - 210 PSI)**								
5) Pre-filter Gauge (Feed) **(20 - 50 PSI)**								
6) Filter Pressure Drop **(maximum 10 PSI)**								
7) Hour Meter Reading								
8) Chloramines Test **(maximum 0.1 PPM)**								
9) Product Water Quality Reading								
9a.) Percent Rejection								
DISINFECTION CYCLE								
10) Complete PAA Draw								
11) Record PAA in Reject Water **(≥ 1%)**								
12) Record PAA Test Product Water **(≥ 0.5%)**								
13) 60 Minute Soak Start Time								
14) 60 Minute Soak Stop Time								
15) Rinse Start Time								
16) Rinse Stop Time								
17) PAA Test to Less than 3 PPM at Product & Reject Hoses and Product Test Port.								
STORAGE WITH MEMBRANE PRESERVATIVE								
18) Product Water Pre-Storage pH								
19) Complete Draw								
20) Rinse Start Time								
21) Rinse Stop Time								
22) Product Water Post - Storage pH (± 1 of Pre-Storage pH)								
EXCHANGE								
23) Carbon Block Filter (monthly)								
24) Clean or Replace the Membrane								
25) Onboard Carbon Exchange (3 months max)								
26) Add PT401 Antiscalant (as consumed)								
27) Change Nephros Filter (max 12 months)								
INITIALS								

NOTE: Be sure to operate the MRO1 with the TEMPORARY FLUSH VALVE in the FLUSH position for 5 minutes prior to and following each treatment. When a value is indicated on the form, ensure that a value is recorded on the form.

SECTION 5, DISINFECTING THE SYSTEM

5.1 DISINFECTING THE SYSTEM

The MRO1 system should be disinfected according to specifications of your medical facility director. As a general guideline, AmeriWater recommends that all MRO1 systems should be disinfected at least monthly. Additionally, AmeriWater recommends that the system should be disinfected if it has not been used for 72 hours, flushed at least every 8 hours, or "preserved".

NOTE: Prevailing feed water conditions may require more frequent disinfections to control microbial contamination. If microbial counts exceed safe operating levels, increase the disinfection frequency.

Be sure to refer to the Start-Up Log in Section 4.5. This will help you verify and document that all steps are performed to disinfect the system properly.

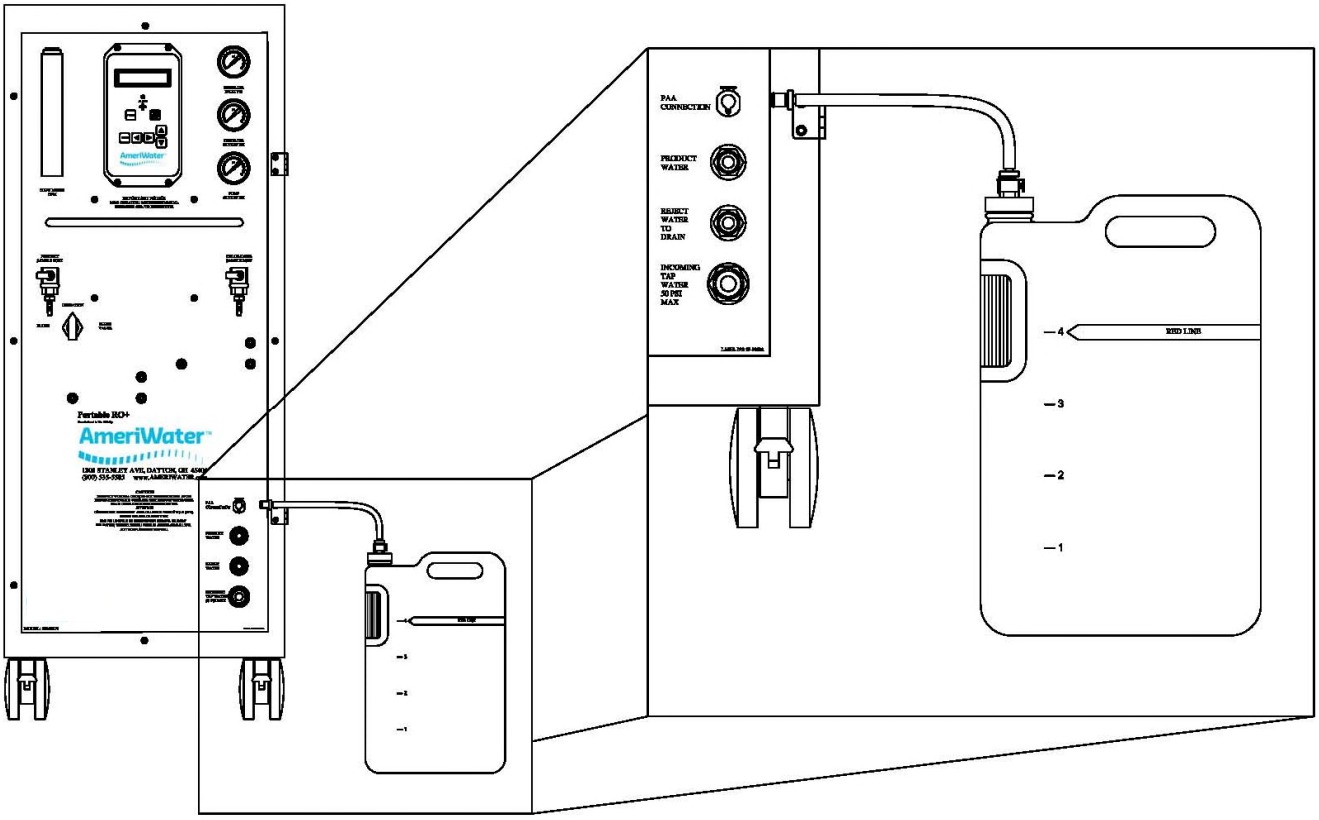


FIGURE 5.1

1. Switch off the MRO1 by pressing the POWER key (the display will show STANDBY).

2. Verify that the feed water supply to the MRO1 is ON.

3. Disconnect the dialysis machine(s) from the MRO1 before starting the disinfection procedure. Disinfectant for the MRO1 may be allowed to enter a dialysis machine. Check your dialysis machine manufacturer's recommendations.

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

4. To disinfect the MRO1, put the PRODUCT WATER hose along with the REJECT WATER TO DRAIN hose in a sink.

5. Unscrew the cap assembly of the PAA container.

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

CAUTION: **Exposure to PAA 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.**

7. Add 150 ml of 100% PAA disinfecting solution to the PAA Container (plastic gallon container) and fill with water to the red line (tap water or treated water may be used).

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

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

10. Connect the PAA tubing male fitting into the PAA Container's quick disconnect fitting that is mounted in the cap assembly (Figure 5.1).

11. Turn the FLUSH VALVE (TEMPORARY FLUSH VALVE) to the FLUSH position (Figure 5.1).

12. Turn on the feed water supply to the MRO1.

13. 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.

14. When in DISINFECT MODE, 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.

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

16. When the PAA empties to a level approximately 2" from the bottom on the PAA Container, turn the FLUSH VALVE to the OPERATION position. Continue holding the ENTER key until the container is empty.

NOTE: The ENTER key must be held until all the PAA is drawn into the MRO1.

a. Avoid stopping and starting the disinfect function which may cause a thermal overload of the MRO1 pump.

b. Releasing the ENTER key may cause the system to lose its prime preventing all of the disinfectant from being drawn into the MRO.

c. Approximately ¼" of the solution will remain in the container. This is normal and may be emptied down the drain after the entire process is complete.

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

18. The MRO should be filled with hydrogen peroxide/peroxyacetic acid disinfecting solution. To ensure that PAA solution has been pumped through the MRO, use Peracid test strips (P/N 97hp20401):
    a. Using a test strip, test the water at 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).

19. Record on the Startup Log that this step was performed.

20. To assure that the MRO will not be used for dialysis, leave the MRO in the DISINFECT ENABLED mode, and allow the PAA solution to soak for at least 60 minutes within the MRO and in the loop if connected to one**.**

21. The FLUSH VALVE should remain in the OPERATION position during soaking.

WARNING: Soaking longer than 12 hours may cause damage to the membrane.

22. Label the MRO1 with appropriate WARNING signs (Example: "DO NOT USE / CONTAINS PAA"). Allow the mixture to soak in the system for at least 60 minutes.

23. Record the Start and Stop times on the Log to have a record of how long the system soaked in hydrogen peroxide/peroxyacetic acid disinfecting solution.

24. After the soaking time has elapsed, turn on the MRO1 by pressing the POWER key with the FLUSH VALVE in the OPERATION position.

25. Flush the residual PAA from the disinfectant draw plumbing.

    a. Fill the PAA Container to the red line with dechlorinated water from the Choramines Sample Port and connect the PAA tubing to the PAA connection on the front of the MRO1.

    b. Switch off the MRO1 by pressing the POWER key (the display will show STANDBY).

    c. Turn the FLUSH VALVE to the FLUSH position.

    d. Press and hold the LEFT ARROW key, and then, press the RIGHT ARROW key to access the DISINFECT MODE. The controller display will show DISINFECT ENABLED, and then the keys can be released.

e. 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.

f. Disconnect the PAA Container PAA tubing from the PAA connection on the front of the MRO1.

26. Place the FLUSH VALVE in the OPERATION position.

27. Turn on the MRO1 by pressing the ALARM/SILENCE RESET to restart the MRO1 in the operating mode. Record the Start time on the Log. Allow the machine to run at its current setting for at least 15 minutes.

WARNING: Do <u>not</u> connect to any dialysis machine at this time. The water quality may register good, but it is possible that some residual PAA solution is still in the system. All of the disinfecting solution <u>MUST</u> be completely flushed out before the system is reconnected to any dialysis machine.

28. After rinsing with the FLUSH VALVE in OPERATION position for at least 15 minutes, turn the FLUSH VALVE to “FLUSH” and allow the MRO to run in “FLUSH” for 15 more minutes.

29. After the MRO has run for a minimum of 15 minutes with the FLUSH VALVE IN OPERATION and 15 more minutes minimum in FLUSH, return the flush valve to OPERATION and allow to run for an additional 15 minutes. Begin to test for the presence of PAA with residual test strips (**Renal Check PX Test Strips (P/N 97PX20501)** at all water outlet points (if connected to a loop).

30. Periodically test for the presence of residual PAA at the ends of the REJECT HOSE, PRODUCT WATER hose and the Product Water Sample port as the water exits the hoses into the sink until less than 3 PPM of PAA is detected by the residual test strips.

WARNING: Continue rinsing and testing with test strips until all test strips show a negative result (no color change) to ensure that there less than 3 PPM of PAA disinfecting solution remaining in the system. AmeriWater recommends using Renal Check PX Test Strips (P/N 97PX20501)

31. Record the Stop time on the 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.

32. Disinfection is complete. Push the POWER key to turn off the MRO1. The display will show STANDBY.

WARNING: The PAA Container PAA tubing must remain disconnected from the PAA connection on the front of the MRO1 during patient treatment!

5.2 A WORD ABOUT HYDROGEN PEROXIDE/PEROXYACETIC ACID

Do not use hydrogen peroxide/peroxyacetic acid (PAA) concentrate after the expiration date. Using outdated PAA concentrate 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 sink with tap water to remove residual disinfecting solution from the surfaces and flush the chemical from the sink traps.

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.

5.3 RO PRESERVATIVE PROCEDURE

AmeriWater has developed a method to discourage bacteria growth in the MRO1 during long or short term storage (up to 6 months). Contact your AmeriWater representative to purchase a BIOTROL+ kit for portable cabinet ROs (part number 000-095-0001). This kit contains all of the required components to preserve the system for up to 6 months.

AmeriWater recommends that the MRO1 be "Auto-Flushed" at least every 8 hours, or "preserved" in BIOTROL+ for storage if the MRO1 is not used for a period of 24 hours or longer.

5.4 MEMBRANE FLUSH FEATURE (AUTO FLUSH)

The MEMBRANE FLUSH FEATURE is an alternative to storing the MRO1 filled with BIOTROL+ when not in use. You can set up the machine to flush periodically when not in use to discourage microbiological growth.

The Membrane Flush feature is disabled as a default from the factory. To enable this feature, set the following setpoints on the MRO1 controller accordingly (See Section 6):

SETPOINT	SETTING
Flush Type	6
Flush Time	15 to 45 (minutes)
Flush Interval	4 to 12 (hours)
Flush Mode	3

FLUSH MODE	RO PUMP	INLET VALVE
3	ON	OPEN

These settings will allow a flush to occur each time an MRO has been placed in "STANDBY" for the number of hours programmed in the Flush Interval Setpoint. 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.

The MRO1 must be connected to the electric power source, incoming water supply, and drain while not in use (in "STANDBY") for this feature to be operable. The FLUSH VALVE must be in the OPERATION position. The MEMBRANE FLUSH FEATURE cycles the MRO1 and directs water to both the PRODUCT WATER and REJECT WATER TO DRAIN hoses.

Before determining a bacteria count, the MRO should be PLACED in FLUSH for 5 minutes, and then placed in OPERATE for 5 – 10 more minutes after a period of non-use, but before taking a sample of the PRODUCT WATER. The sample to be taken from the PRODUCT SAMPLE PORT should be allowed to flow briskly into a container for 1 minute, minimum after flushing the MRO and placing it back into operation before taking the aseptic sample for bacteria count. Bacteria are known to increase in population when water is not moving.

SECTION 6, MRO1 CONTROLLER

6.1 FRONT PANEL CONTROLS AND INDICATORS

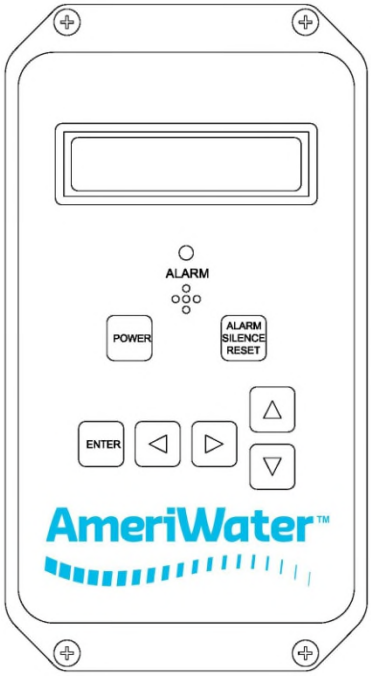


FIGURE 6.1

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. (Release both when it goes into DISINFECT mode).
DISINFECT	- Push the ENTER key and hold until all of the solution is drawn into the MRO.

6.2 CONTROLLER OPERATION

GENERAL OPERATION

The unit has 2 modes of operation, a standby mode and an operation 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 operation 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.

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.

PRESS FAULT - The unit is shut down due to an incoming tap water low pressure fault condition.

MEMB FLUSH 99 - MEMBRANE FLUSH FEATURE is active. The number is the minutes remaining in the 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 total 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 on the bottom line. The following lists the warning messages:

PRESSURE FAULT

If the pressure fault input becomes active 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 will 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 180. If the Alarm Silence Setpoint is programmed to a value other than 180, the alarm will resound after this delay times out. Pressing the Alarm Silence/Reset key will silence the alarm and reset this delay.

HIGH CONDUCTIVITY

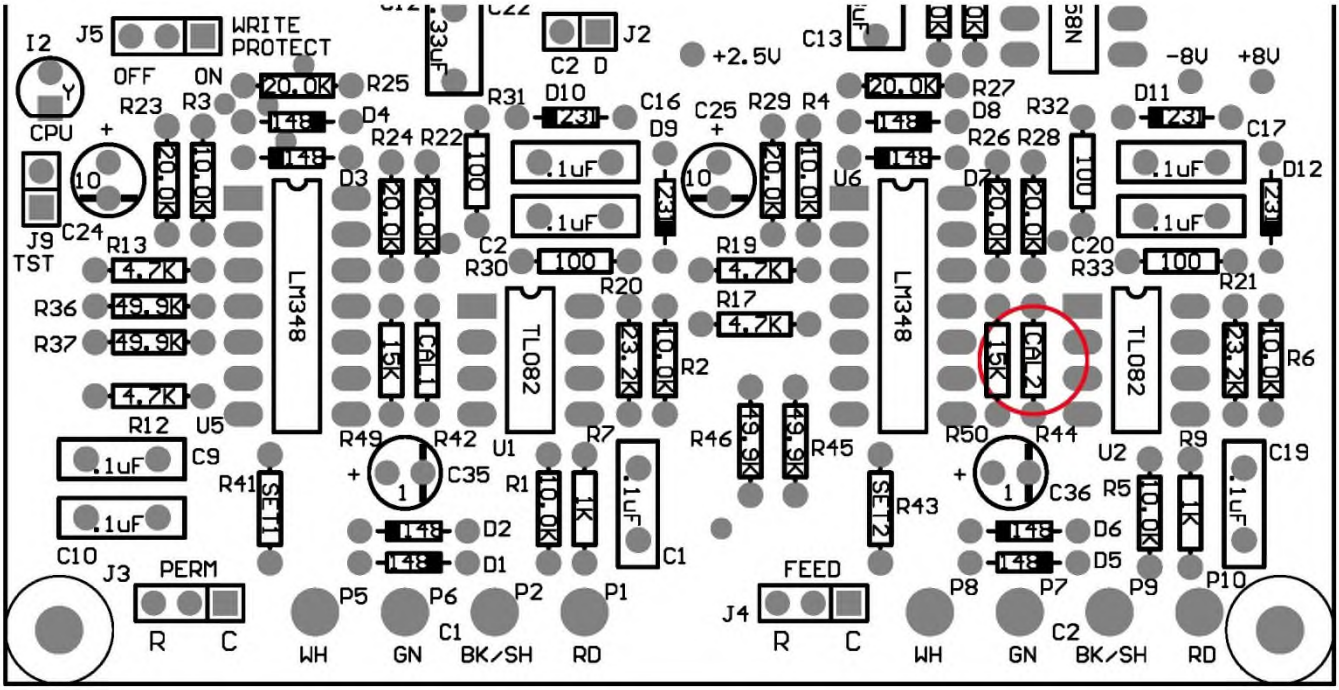
If the Conductivity reading exceeds the limit programmed the Cond Limit Setpoint for the delay programmed in the TDS/Cond Delay Setpoint, the alarm lamp will light and the HI TDS/COND warning message will show on the display. This warning will clear when the Conductivity drops below the Setpoint.

6.3 CONTROLLER ADJUSTMENTS

The 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 TDS/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.

HIGH FEED CONDUCTIVITY

In the event of high feed water conductivity, the unit can be configured to allow the range to go up to 2500 micro-seimens. With the power off to the device, remove the controller from the cabinet by disconnecting all of the wire harnesses inside the cabinet then removing the 4 screws that secure this to the front panel. Ensure to note which conductivity cell correlates to feed for re-installation. Using a Phillips head screwdriver, remove the 6 screws from the back of the controller and pull off the cover. Locate the resistor at R44. Using needle nose pliers, pull this straight out. Some models will have the replacement resistor secured to the panel on the right side. If not present, a 7.5K 1/8w 5% (color code violet/green/red/gold) resistor will have to be procured and shaped to fit into this socket. To install, use the needle nose pliers to slide this straight into the socket. Replace the cover on the back and secure with the 6 screws. Re-install the panel into the RO using the 4 panel mount screws and re-make all electrical connections. Change the “C2 Range” to 5. The unit **MUST** be calibrated prior to use.



CONDUCTIVITY CALIBRATION

Simultaneously pressing the ALARM SILENCE / RESET key and the LEFT ARROW key enters calibration mode. The top line of the display will show CALIBRATE and the 2nd line will show the current readings of the permeate and feed sensors. Initially, ** will show over the permeate reading. The ** indicates the sensor selected for calibration. Pressing the right arrow moves the ** over the feed reading. Pressing the Left arrow key moves the ** back over the permeate reading.

To calibrate the Conductivity, place the cell in a known standard solution. Adjust for the correct reading using the up and down arrows. 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, good meter. Adjust until the reading matches the meter.

To calibrate the 2nd TDS / Conductivity, place the cell in a known standard solution. Adjust the for the correct reading. If the cell is installed, the unit can be calibrated by taking a sample of the water from the CHLORAMINES SAMPLE PORT and testing it with a known, good meter. Adjust the control until the reading matches the meter.

NOTE: Any changes to the conductivity set-points will be automatically saved when calibration mode is exited either by pressing the ALARM SILENCE / RESET key or a delay of approximately 8 seconds.

6.4 STANDARD SETPOINTS

SETPOINT	DESCRIPTION	RANGE	FACTORY SETTING
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.	0-9 Minutes	3
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
Flush Interval	The interval between flush cycles. Only valid with operation hour, elapsed time or off flush types.	0-99 minutes	0

* µS = microsiemens; PPM = Parts Per Million

SETPOINT	DESCRIPTION	RANGE	DEFAULT
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 hours	0
Current Hours	Current number of hours of RO system operation.	0-65000 hours	0
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 **NOTE: If this Setpoint is changed, the unit must be recalibrated.**	0-1	0
TDS/Cond Range	Selects range of TDS/Conductivity monitor 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.**	0-6	1
C2 Range	Selects range of TDS/Conductivity monitor 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.**	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 uS or PPM	0
%Rej	The 2nd TDS/Conductivity is used to monitor feed water, programming this setpoint to 1 allows the % rejection to be displayed.	0-1	1

6.5 TO DISPLAY OR CHANGE SETPOINTS

NOTE: Please contact your AmeriWater representative prior to changing setpoints.

1. Refer to *Figure 6.1* for the location of the keys used to display or change the Setpoints.

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. To “unlock” the setpoints, you will need to perform the following key sequence: UP ARROW, UP ARROW, UP & RIGHT ARROW. When done correctly while in the setpoint screen, you will see * SETPOINT *. If there is no activity for approximately 8 seconds, the controller will revert back to display mode.

4. 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 Setpoint value to 0.

5. Pressing the ALARM SILENCE/RESET key at any time will cancel the operation and return the display to the main screen.

6. To accept the new Setpoint value, press the ENTER key.

7. The unit will beep twice if the change is accepted.

8. When finished changing Setpoints, press the ALARM SILENCE/RESET key to return the display to the main screen.

SECTION 7, 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: **Always remove the MRO1 from the power source and turn off the water prior to any maintenance activities! The pressure will need to be relieved from the system by opening both the Chloramine and Product water sample ports. Maintenance to be performed by qualified personnel only.**

7.1 MAINTAINING THE SYSTEM

1. Use the following maintenance schedule:

Daily	Complete daily log. Ensure unit is operating within parameters (see below).
Monthly	Perform a disinfection of the unit (see Section 5.0).
	Perform product water bacteria and endotoxin testing.
	Replace Carbon Block Filter (when pressure drop is $\geq$ 10 psi greater than the originally recorded value or at least monthly).
3 Months	Replace Catalytic Carbon Tank (when total chlorine > 0.1 mg/L or at least every 3 months)
Yearly	Perform feed and product water AAMI analysis.
	Check feed and product water quality calibration (see Section 6.3).
	Replace Nephros filter (as needed or at least yearly).
As Needed	Membrane cleaning, if > 10% loss of product flow / > 10% rise in product conductivity.

Note: Your facility needs to provide a Startup Log for the MRO1 system. This must be filled out completely each time the system is used. The MRO1 must operate within the given parameters. The recorded information may be useful in troubleshooting problems.

2. AmeriWater has provided a Startup Log for the MRO1 system. This must be filled out completely each time the system is used. The recorded information may be useful in troubleshooting problems encountered with the MRO1. Please see the Startup Log in Section 4.5.

3. The carbon tank, carbon block filter, Nephros DSU filter, and membrane are non-durable components and will need to be exchanged periodically. Carbon tank and carbon block filters are recommended to be exchanged at no greater than 3 month intervals. The Nephros DSU filter should be exchanged at least annually.

4. The MRO1 system will need to be disinfected regularly. The frequency is determined by the usage of the system. If the MRO1 system is being used every day, it should be disinfected monthly. If the system is not used for 72 hours or more, AmeriWater recommends that it be disinfected before use. Prevailing feed water conditions may require more frequent disinfections to control microbial contamination. If microbial counts exceed safe operating levels, increase the disinfection frequency.

5. Bacteria and L.A.L. (Limulus Amebocyte Lysate) testing is required monthly and AAMI testing is required annually. AAMI recommends samples be pulled prior to disinfection.

6. MRO1 System product water quality is dependent on input water quality. Actual product water quality may vary substantially from the value for specified input water. The expected results for the user's water can only be verified on the basis of analysis of the user's water. If there are variations in the input water or changes detected in the output water, contact AmeriWater immediately.

7. Monitoring of the water bacteriology of the system following installation is the responsibility of the user. Total viable microbial counts shall not exceed the AAMI standard for bacterial colony forming units per milliliter (CFU/ML) and endotoxins measured in endotoxin units (EU). See instructions for proper disinfection of the system in Section 5.

8. The accuracy of the Conductivity display should be verified with a calibrated, hand-held meter at least annually. If the conductivity display is not within 5% of the hand-held meter readings, the controller should be calibrated in accordance to the procedures in Section 6.3. Conductivity may also be verified each time an AAMI analysis is done by noting the conductivity readings when the AAMI sample is drawn and verifying the reading with the AAMI results.

7.2 PT401 PRIMING PROCEDURE

AmeriWater MRO1 products featuring the PT401 antiscalant system are equipped with a priming valve. The following procedure should be followed during the initial start up of the MRO1 system, and whenever the PT401 pump loses its prime:

WARNING **DO NOT use PT401 with softened water. Turn off the pump and empty the PT401 container.**

1. Verify that the MRO1 is on and running.

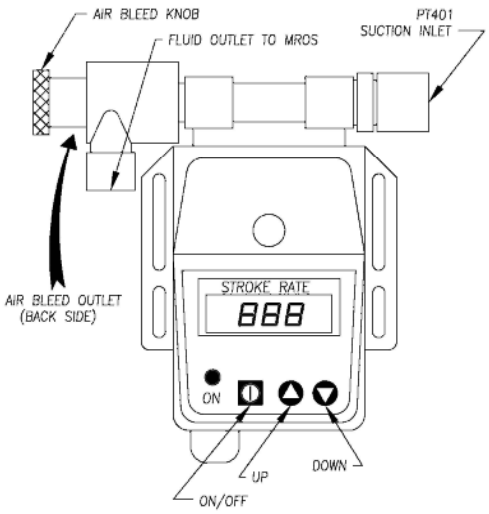
2. Be sure the injection pump's suction line is immersed in solution in the PT401 container.

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

4. Press the "DOWN" key to change the STROKE RATE to 360.

5. Remove the cap from the PT401 container and verify that a stream of PT401 without air bubbles flows out of the air bleed tube.

6. 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.



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

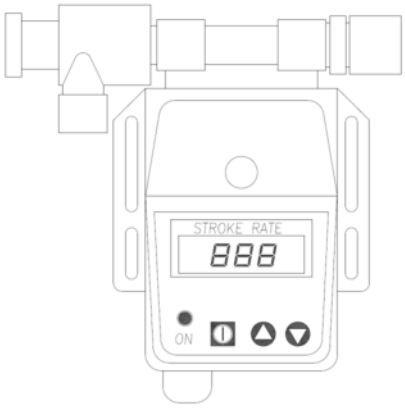
8. Once the pump has been primed, and is pumping the chemical through the head into the water stream, adjust the stroke rate to “10” for an MRO1.

At the stroke rate of 10, the PT401 injection pump will put about 75 milliliters (approximately 2.5 liquid ounces) per hour into the MRO1 incoming water stream.

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

7.3 SETTING THE OPTIONAL PT401 FEED PUMP

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



There is one control that needs to be set on the feed pump.

STROKE RATE = the number of strokes per minute.

Your PT401 Antiscalant/Scale Inhibitor feed pump has been set at the factory default setting for an MRO1 for the stroke rate. The factory default setting supplies the appropriate amount of antiscalant to the system for most water conditions.

If you have very hard water and/or iron water condition, AmeriWater will work with you to set the pump injection rate for your particular water hardness condition. The recommended pump rate is for “average” water hardness. Higher injection rates may be necessary to control hardness and prevent damage to the MRO membrane.

If a reduction of PRODUCT flow or an increase in conductivity is observed over a few months, the PT-401 pump may not be adjusted high enough to control the hardness at your particular hardness condition.

PT401 ANTISCALANT SETTINGS

The digital readout on the PT401 injection pump can be adjusted from 0 to 360 strokes per minute. Based on the hardness of the feed water, the following stroke settings are recommended:

HARDNESS (Grains Per Gallon)	STROKE SETTINGS
1-6 GPG	2
7-20 GPG	3
21-40 GPG	4

For water with hardness greater than 40 GPG, contact AmeriWater for consultation 1-800-535-5585

7.4 REFILLING PT401

The amount of PT401 in the container should be checked weekly. When it is less than half full, you should add more PT401.

1. Remove the cap from the PT401 Container. It is not necessary to remove the rubber stopper with the hose; this will break the prime of the PT401 pump.

2. Refill the bottle with new PT401 purchased from AmeriWater (P/N 95810125, sold in (4) 1 gallon containers). Close the bottle with the cap.

3. Follow the priming procedures (Section 7.2) to ensure the PT401 pump remained primed.

7.5 MEMBRANE MAINTENANCE INSTRUCTIONS

There are two options available for membrane maintenance on the AmeriWater Portable MRO1 System:

- Purchase the AmeriWater Clean In Place System (P/N 00CIP1) and clean the membrane yourself.

- Use the membrane to failure and replace.

7.6 AmeriWater Clean In Place (CIP)

1. Simultaneously pressing the POWER and RIGHT ARROW keys access the clean in place mode.

2. Follow the CIP instructions for connecting the drum to the MRO1.

3. Remove the prefilter.

4. Follow the instructions provided in the manual with your CIP system.

WARNING: **DO NOT place the MRO1 in service until all operational parameters are within specification. Consult the STARTUP LOG (See section 4.5) to verify that all specifications are met.**

7.7 EXCHANGE PREPERATION

1. Turn off the MRO1.

2. Turn off the incoming tap water supply.

3. Put a container under the CHLORAMINE TEST PORT. Slowly open the sample port to relieve the pressure and let the water drain.

4. Unplug the MRO1 from the electrical outlet.

5. Open the access panel.

7.8 MEMBRANE REPLACEMENT PROCEDURE

Turn off the incoming tap water supply to the MRO1 and unplug the MRO1 from the GFI receptacle.

1. Follow exchange preparation instructions in section 7.7.

2. Note the location of the nuts on each of the tubing fittings with a witness line.

3. Disconnect the tubing from the color-coded fittings on the membrane assembly. You may get wet. The nuts will remain with the tubing.

4. Remove the clamp securing the membrane assembly to the unistrut in the MRO1 cabinet and remove the membrane assembly from the cabinet.

5. Remove the bottom (inlet) end cap from the housing by loosening the nuts on the end clamp.

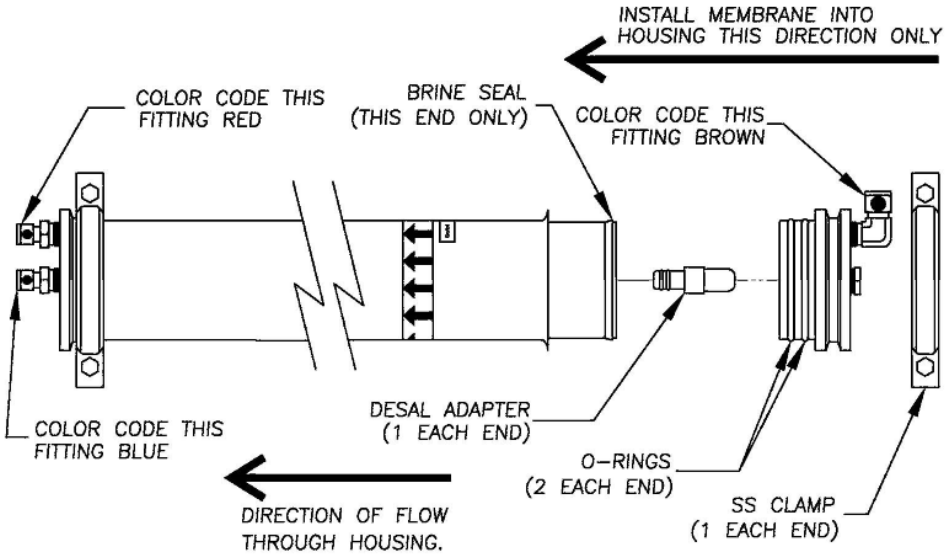
6. Remove the old membrane.

7. Insert the new membrane. Be sure that the brine seal is in the inlet end of the housing per the drawing.

8. Verify that the O-ring is clean and replace the end cap.

9. Secure with the clamp. Install the membrane assembly in the cabinet by securing the membrane assembly to the unistrut in the cabinet with the clamp.

10. Replace the nuts on the appropriate fittings and run down by hand until the secure. Using a wrench, rotate until the witness lines line up. It may be necessary to go slightly beyond the original witness line to get a leak free seal. Turning beyond this will result in the tubing “necking” down and eventually breaking.



Rinse Out Cycle

WARNING: **This Reverse Osmosis (RO) membrane 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 back into service.**

After the exchange is complete, it is important to put the MRO1 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. The Pump pressure will be lower than normal during this rinse out cycle.

3. Turn on the MRO1 and allow water to run through the system for a minimum of 2 hours. This will rinse the preservative out of the new membrane.

4. Turn the FLUSH VALVE to the OPERATION position and allow the MRO1 to run until the conductivity is below the setpoint and no longer alarming. Turn off the MRO1.

5. Disinfect the system per the instructions in section 5.1.

6. Pull an AAMI analysis. The MRO1 can be used after disinfection when it begins producing water to the specifications.

7. Turn off the MRO1 and reconnect the PRODUCT WATER hose to the dialysis machine.

8. Turn on the MRO1. The rinse out cycle is now complete.

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

7.9 EXCHANGE THE PREFILTER

1. Use the filter wrench to unscrew the filter housing and discard the used filter.

2. Partially unwrap the plastic from a brand new filter. Holding the end covered with plastic, place the new filter in the housing. Discard the plastic after installation.

3. Screw the filter housing back on making sure the o-ring is in the groove and not pinched. Hand-tighten, only.

7.10 EXCHANGE CARBON TANK

1. Disconnect the fittings, and remove the carbon tank. Some water may leak out. DO NOT lift the tank by the fittings; grasp the fiberglass body of the tank to lift.

2. Carbon tanks should be backwashed prior to installation:

    a. This can be accomplished by connecting the incoming tap water tubing to the outlet carbon filter outlet (yellow fitting) on the carbon tank.

    b. Remove the REJECT hose from the MRO1 and connect to the inlet (green fitting) of the carbon tank filter, and direct to a drain.

    c. Slowly, turn on the water until it reaches a flow of approximately 3 GPM.

    d. Continue to backwash until the (reversed) flow from the carbon tank is free of color. Then turn off the incoming tap water.

    e. After backwashing, reverse the connections so that the water will flow in the correct direction by connecting the MRO1 inlet tubing to the green fitting on the carbon filter. Connect the MRO1 REJECT hose to the yellow fitting and direct to drain.

    f. Turn on the incoming tap water, again, and “Forward” flush the carbon filter for about 5 minutes to “reseat” the carbon bed, then turn off the incoming tap water.

    g. After forward flushing, remove the REJECT hose, and reinstall it in the REJECT port at the front of the MRO1.

    h. Set the carbon tank into place, and connect the MRO1 plug in elbow from the filter inlet to the yellow fitting on the carbon filter. The inlet to the carbon tank is green, and the outlet is yellow.

IMPORTANT: When the exchange is completed, record the date the exchange was performed on the Startup Log.

SECTION 8, TROUBLESHOOTING AND REPAIR

8.1 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 MRO1 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
MRO1 will not start	MRO1 not plugged in	Plug into electrical outlet.
	Circuit breaker blown	Reset the breaker.
	MRO1 in a FAULT condition	Check MRO1 controller display for FAULT condition and correct the FAULT.
System has power but no water flow	Feed source not open	Open Incoming Tap Water valve.
	Feed pressure < 20 PSI	Increase pressure to ≥ 20 PSI.
	Incoming hose kinked	Straighten kinks from the INCOMING TAP WATER hose.
	Carbon block filter clogged	Check the prefilter gauges for pressure drop; replace the filter if the pressure drop is 10 PSI or greater.
	Carbon tank connected backwards	Check the tank installation at the inlet and outlet for proper connections. Make sure the fittings match colors; inlet is green and outlet is yellow.
	Feed solenoid is not operating	Test the solenoid (Section 8.4). Replace the valve if it is defective (see Section 8.5).

PROBLEM	POSSIBLE CAUSE	CORRECTIVE ACTION
Disinfect cycle will not operate when holding the ENTER key	DISINFECT MODE has not been accessed correctly.	Access DISINFECT MODE (see Section 5.1).
	Controller not operating in DISINFECT MODE.	Replace the controller.
	Disinfect Solenoid Valve not operating	Test solenoid valve (Section 8.4). Replace the valve if it fails (Section 8.5).
Pump making excessive noise	Low pressure or flow rate feeding the MRO1	Check the prefilter outlet gauge PSI (must be $\geq$ 20 PSI), and verify that the product flow > 0.4 GPM.
	Feed solenoid is not operating	Test the solenoid (Section 8.4). Replace the valve if it is defective (see Section 8.5).
	Pump motor or impeller failing	Check PUMP PSI GAUGE to verify that it is within operating parameters. Replace the pump if needed (see Sections 8.2 and 8.3).
	Pump Loose in cabinet	Isolate pump from cabinet.
High Bacteria Count	Too long since the last disinfection or the procedure was not performed correctly	Disinfect the MRO1 following the procedures in Section 5.
Poor quality product water	High Chlorine levels	Replace the Carbon Tank.
	MRO1 not rinsed thoroughly	Rinse membrane (see Section 7.8, Rinse Out Cycle).
	Fouled membrane	a. Clean or replace membrane (section 7). b. Check and correct the antiscalant system.

PROBLEM	POSSIBLE CAUSE	CORRECTIVE ACTION
Poor quality product water Cont'd	FLUSH VALVE in the FLUSH position	Put the FLUSH VALVE in the OPERATION position.
	Conductivity Cell out of calibration	Verify the conductivity cell accuracy with a known good meter. Follow the calibration procedures in Section 6.3 or replace cell if necessary.
	High pH	Call AmeriWater
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 MRO1 is operating.
	Low pump PSI	Pump should be operating at 120 – 210 PSI.
	Reject GPM flow rate too high	Turn FLUSH VALVE to the OPERATION position.
	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	Reference Section 2.4 to determine if the flow rate is normal in relation to the feed water temperature.
	Carbon block filter 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.

8.2 PUMP REMOVAL

Before replacing the pump, be sure the pump's thermal overload has not tripped. Allow the pump to sit at least 5 minutes to reset, then, try to re-start the pump.

1. Turn off the water supply and the MRO1. Unplug the power cord from the electrical outlet. Relieve pressure from the system by opening the chloramines sample port.

2. Open the access panel and remove the carbon tank and filter housing.

3. Remove the PT401 container (if applicable).

4. Disconnect the feed hose on the pump inlet by depressing the gray collett on the fitting and pulling the tubing straight out. Water will begin to drain from the pump.

5. Place a witness mark on the pump discharge and pressure gauge nuts. Loosen the nuts on these fittings and remove from the pump. The volume of the water draining from the pump will increase.

6. Depress the gray colletts on each of the recirculation fittings and remove the tubing from the pump by pulling straight out.

7. Remove the clamps securing the pump assembly and remove the assembly from the cabinet.

8. Open the motor starter and disconnect the pump from the motor starter by removing the wires from the terminals located in the control box. Loosen the strain relief holding these wires in place and pull them out of the motor starter.

9. Remove pump from housing by removing the snap ring on the discharge side of the housing. Carefully lift this out of the housing.

10. Remove all fittings that are to be re-used from this pump and set aside for use in the replacement.

11. Allow the pump to fully drain before shipping (warranty replacement only).

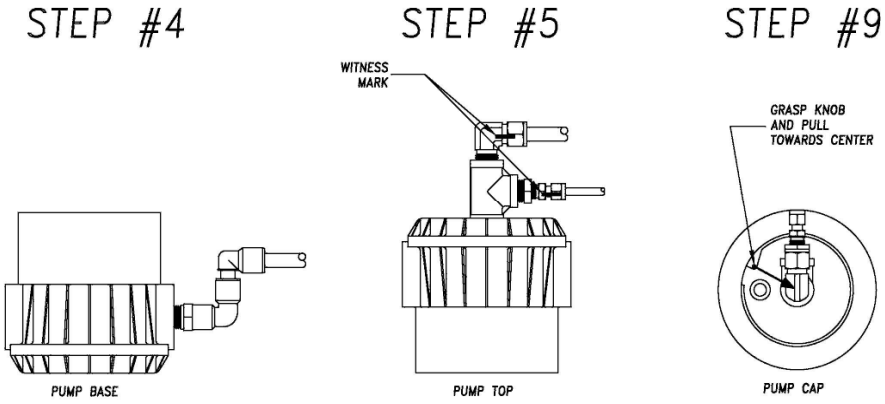


FIGURE 9.1

8.3 INSTALLING AN MRO1 REPLACEMENT PUMP ASSEMBLY

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

1. Install new pump in housing ensuring that the snap retaining ring is fully seated in the groove on the pump housing.

2. Clean the threads on the fittings to be re-used and install in the corresponding locations on the new pump assembly.

3. Connect the membrane feed tube to the pump housing outlet port (at the top), and hand tighten the nut. Use a wrench to tighten this nut to the witness line. It may be necessary to go slightly beyond this to ensure a water tight seal. Do not turn this in excess as this will cause a “necking” of the tubing, and may lead to leaks. Repeat this process for the fitting from the pump pressure gauge.

4. Connect the pump feed tube to the inlet of the pump by inserting into the fitting until it reaches the positive stop. About 1” of the tubing will need to be inserted.

5. Install the recirculation tubing into the fitting. About ½” of the tubing will need to be inserted to reach the positive stop.

6. Connect the pump wires to the motor starter by inserting the wires through the Sealcon fitting and connecting them to the terminal block (Black wire to T1, Neutral to N2 and the Green wire to the grounding terminal). Replace motor starter cover and secure in place.

7. Position the pump housing against the pump clamps. Secure the pump to the cabinet with pump the clamps and tighten to hold in place.

8. Re-install the PT-401 container assembly (if necessary).

9. Replace the filter housing and carbon tank.

10. Close the access panel.

11. Close the chloramines sample port, turn on the water supply and return power to the device.

8.4 SOLENOID TEST PROCEDURE

Feed Solenoid

1. With the MRO1 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 MRO1, 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 when the MRO1 is off, and that 24VAC power is being supplied to the valve when the MRO1 is on. If the power supply is normal, the solenoid valve is bad.

Disinfect Solenoid

1. Turn off the MRO1 & turn the FLUSH VALVE to the FLUSH position.

2. Press and hold the LEFT ARROW KEY and press the RIGHT ARROW KEY to access the DISINFECT MODE.

3. 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.**

Product Solenoid

1. When the MRO1 is running and making good quality water (below the setpoint), **if there is no water flow to the product hose, the solenoid has failed closed.**

2. When the MRO1 is making water above the set point (bad quality), **if there is water flow to the product hose, the solenoid has failed open.**

3. Use a voltmeter to verify that power is not being supplied to the PRODUCT SOLENOID VALVE when the MRO1 is making good quality water, and that 24VAC power is being supplied to the valve when the MRO1 is making bad quality water. If the power supply is normal, the solenoid valve is bad.

8.5 SOLENOID VALVE REPLACEMENT

For any of the Solenoid Valves

1. Turn off the MRO1 by pressing the POWER key (the display will show STANDBY) and unplug the power cord from the electrical outlet.

2. Turn off the incoming tap water supply to the MRO1. Open the chloramine sample port to relieve the pressure from the system.

3. Disconnect the solenoid wiring harness plug from the solenoid valve that is to be replaced.

4. Remove the 3 screws that secure the manifold block in place.

5. Note the position of the fittings and orientation of the valve to the manifold block. Disconnect the fittings from the solenoid valve.

6. Clean the threads on the fittings to be re-used and prepare them for installation by applying Teflon tape to the threads.

7. Install the prepared fittings in the same location on the replacement valve.

8. Make sure that the flow direction arrow located on the side of the valve is pointing in the correct direction.

9. Bolt the manifold block back onto the MRO1 cabinet.

10. Reattach the tubing to the corresponding fittings on the valve.

11. Reconnect the wire harness to the valve.

12. To verify that the solenoid valve is installed correctly, follow the Solenoid Test Procedures in Section 8.4.

13. Disinfect the RO.

8.6 NEPHROS DSU FILTER REPLACEMENT

1. Power down the RO and turn off the incoming water.

2. Remove RO from electrical outlet.

3. Open the product and chloramines sample ports to relieve pressure from the device.

4. Gain access to the Nephros DSU filter inside of the RO by opening the access panel.

5. Unsnap the quick disconnects from the inlet and outlet of the Nephros DSU filter, then remove filter from cabinet.

6. Remove the new replacement Nephros DSU filter from the plastic bag and remove the protective covers.

7. Snap the quick disconnect from the product flow meter assembly hose into the top of the filter, making sure flow arrows are pointing downward.

8. Snap the quick disconnect from the product water test port hose into the bottom of the filter.

9. Snap the filter into the clips.

10. Close the sample ports and open the water valve.

11. Plug in device and ensure there are no leaks.

12. Close the access panel.

13. Disinfect the RO.

SECTION 9, WARRANTY

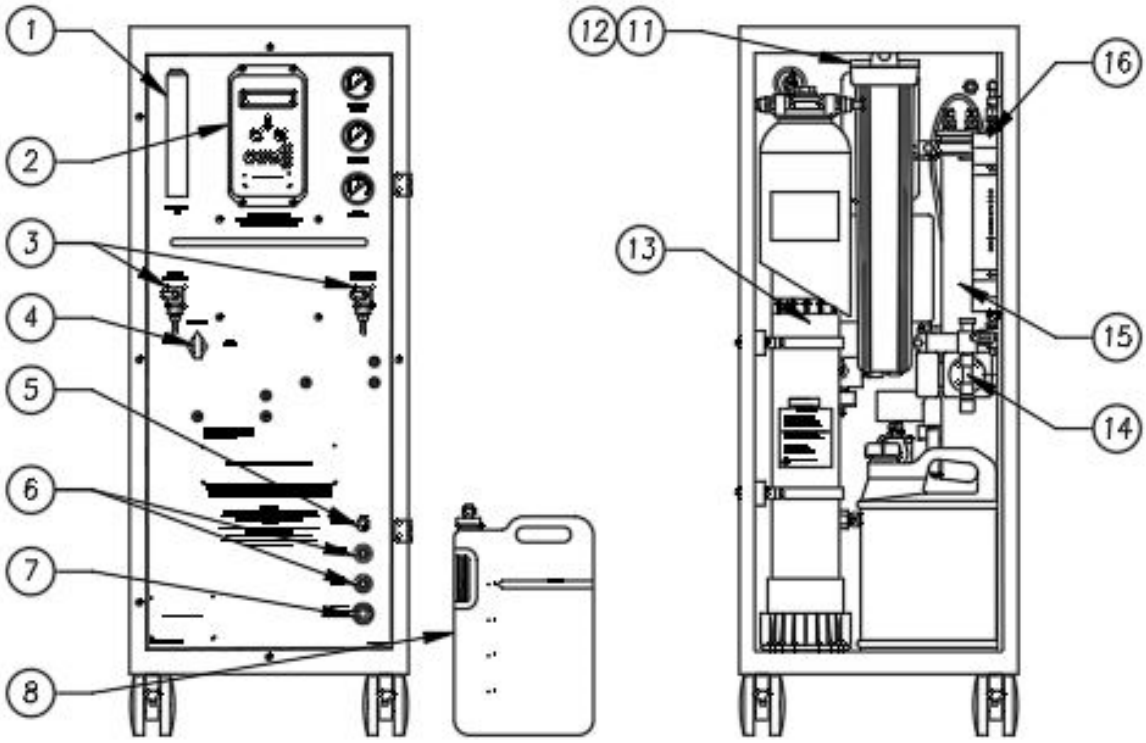
The buyer has a one year warranty on all equipment and parts, excluding non-durable components (e.g., RO membrane, carbon, PT401, micron prefilter, and Nephros DSU filter); provided that the system is not subject to abuse, misuse, alteration, neglect, freezing, accident or negligence; and provided further that the system is not damaged as the result of any unusual force of nature such as, but not limited to, flood, hurricane, tornado, or earthquake. The warranty covers the replacement of equipment and/or parts only. The warranty does not cover labor charges or travel expenses resulting from the service of equipment. The manufacturer is excused if failure to perform its warranty obligations is the result of strikes, government regulation, materials shortages, or other circumstances beyond its control.

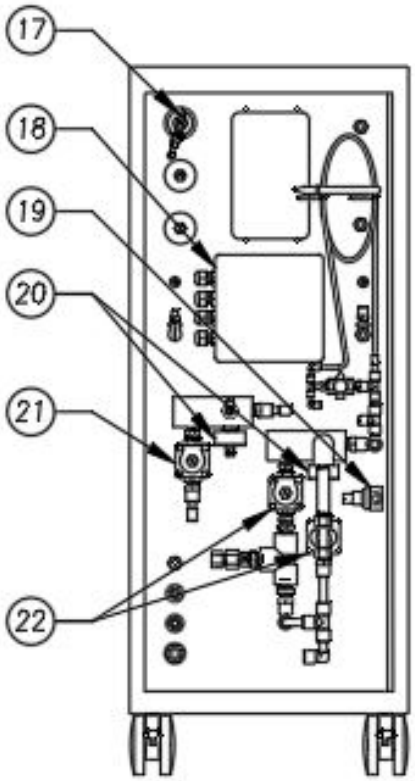
To obtain warranty service, notice must be given to the manufacturer within 30 days of the discovery of the defect.

There are no warranties on the MRO1 system beyond those specifically described above. All implied warranties, including any implied warranty of merchantability or of fitness for a particular purpose are disclaimed to the extent they might extend beyond the above periods. The sole obligation of the manufacturer under these warranties is to replace or repair the component or part which proves to be defective within the specified time period, and the manufacturer is not liable for consequential or incidental damages. No dealer, agent, representative, or other person is authorized to extend or expand the warranties expressly described above.

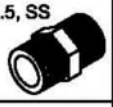
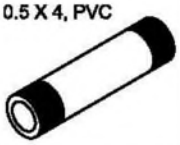
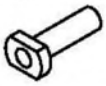
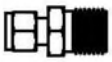
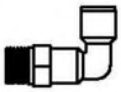
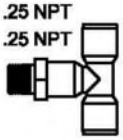
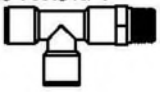
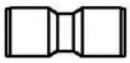
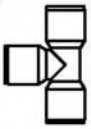
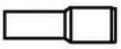
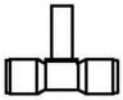
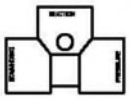
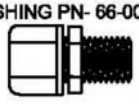
Some states do not allow limitations on how long an implied warranty lasts or exclusions or limitations of incidental or consequential damage, so the limitations and exclusions in the warranty may not apply to you. This warranty gives you specific legal rights, and you may also have other rights, which vary from state to state.

SECTION 10 - MRO1 SPARE PARTS LIST





NO.	DESCRIPTION	PART #
1	FLOW METER	41530606
2	CONTROLLER ASSEMBLY	R69-0019
3	TEST PORT	041004
4	FLUSH VALVE	04-5001
5	PAA CONNECTOR	16-0042
6	3/8 INCH BULKHEAD	10-L277
7	1/2 INCH BULKHEAD	10-L278
8	PAA BOTTLE ASSEMBLY	0185-0020
9	PUMP PRESSURE GAUGE	430001
10	PREFILTER GAUGES	430002
11	FILTER HOUSING	21-0032
12	FILTER O-RING KIT	0013-0001
13	RO PUMP ASSEMBLY	R080-0002
14	PT401 PUMP (OPTIONAL)	R84-0002
15	MEMBRANE ONLY	R22-4026
16	NEPHROS DSU 510K FILTER	20-0009
17	PRESSURE SWITCH	R65-0014
18	MOTOR STARTER	R61-0008
19	PRESSURE REGULATOR	R44-0066
20	CONDUCTIVITY CELL	R69-0020
21	SOLENOID VALVE NO	R59-0023
22	SOLENOID VALVE NC	R59-0022
23	15 PIN CONTROLLER CORD	R69-0021
24	9 PIN CONTROLLER CORD	R69-0022

HOSES INLET P/N: 0112-0030 PRODUCT P/N: 0112-0031 REJECT P/N: 0112-0032 	GARDEN HOSE FEMALE ADAPTER KIT: NUT, WASHER, .5" BARB, P/N: 0112-0046 	NIPPLE P/N: 041610050, 0.5 X CL, PVC P/N: 046531105, 0.5 X CL, PP P/N: 044531107, 0.5 X 1.5, SS 	ELBOW P/N: 041531857 0.5 FPT, PVC P/N: 047-0002 0.5 FPT, PP 
TEE, THREAD, NPT P/N: 044531606, .5, SS 	BUSHING P/N: 044530212 .5M X .25F, SS P/N: 046531848 .5 M X .38 F, PP P/N: 046530201 .5 M X .25 F, PP 	NIPPLE P/N: 041-0003, 0.5 X 4, PVC 	PLUG P/N:10520898 3/8 STEM P/N:10521106 1/2 STEM 
BARB CONNECTORS .38 STEM x .38 BARB P/N: 10521026 .5 STEM X .5 BARB P/N: 10521011 	CHECK VALVE,.5MPT P/N:10720102 	CON, MALE, T X NPT, SS P/N: 10-0020 .25 T X .25 NPT P/N: 10-0021 .38 T X .5 NPT 	ELBOW, MALE, T X NPT, SS P/N: 10-0023 .5 T X .5 NPT 
REPLACEMENT NUTS, SS 10-0027 .38" NUT 10-0028 .5" NUT 	REPLACEMENT FERRULES, SS 10-0030 .38" FERRULE SET 10-0031 .5" FERRULE SET FITTING SIDE  NUT SIDE SOLD IN SETS OF 10 ONLY	MALE QUICK CONNECTORS P/N: 10-L004 .38 T X .38 NPT P/N: 10-L006 .5 T X .5 NPT 	FEMALE QUICK CONNECTOR P/N: 10-L026 .25 T X .25 NPT P/N: 10-L027 .38 T X .38 NPT 
SWIVEL EL, TUBE X NPT P/N: 10-L107 .5 T X .5 NPT 	SWIVEL BR TEE, TUBE X NPT P/N: 10-L127 .25 T X .25 NPT P/N: 10-L129 .38 T X .25 NPT 	SWIVEL RUN TEE, TUBE X NPT P/N: 10-L152 .25 T X .25 NPT P/N: 10-L157 .5 T X .5 NPT 	UNION ELBOW P/N: 10-L202 .38 T X .38 T 
UNION P/N: 10-L230 .5 T X .5 T 	UNION TEE P/N: 10-L253 .38 T X .25 T P/N: 10-L254 .5 T X .5 T P/N: 10-L255 .5 T X .38 T 	REDUCER P/N: 10-L352 3/8" X 1/4" P/N: 10-L353 1/2" X 3/8" 	PLUG-IN EL, STEM x TUBE P/N: 10-L376 .25 P/N: 10-L377 .38 P/N: 10-L378 .5 
PLUG-IN TEE, STEM x TUBE P/N: 10-L402 .38 T X .38 STEM 	Q-CON P/N: 16-0067 .38 F X .38 NPT 	FILTER WRENCH P/N: 21675184 	EJECTOR P/N: 40540-4 
CHECK VALVE, TUBE X TUBE P/N:55-0011 .38 P/N: 55-0015 .25 	STRAIN RELIEF P/N:66510619 	STRAIN RELIEF FITTING P/N:66510621 3 HOLE BUSHING PN- 66-0041 	CASTER 100MM P/N: 94-0013 W/BRAKE P/N: 94-0014 W/O BRAKE 

ROUTINE REPLACEMENT ITEMS (NON-DURABLE COMPONENTS)

PART #	DESCRIPTION
20-5102	10 Micron Carbon Block Filter
20-0009	Nephros DSU 510K Filter
24-0026	Membrane Cap, Clamp and O-ring Kit
95810125	PT401 Antiscalant, (4) 1 Gallon Containers
95810126	PT401 Antiscalant for High pH WATER, (4) 1 Gallon Containers
R22-4026	MRO1 Membrane
00810118R	MRO1 Catalytic Carbon Exchange Tank
95-0006	Peracidin (2) Quart Containers
95-0007	Peracidin (4) Quart Containers
000-095-0001	Kit,Biotrol+,5 Gal Container+Powder,Portable MRO
97HP20401	Test Strips Peracid Test (6 Bottles of 100 Strips each) For Measuring High Range Paracetic Acid
97PX20501	Test Strips Renal Check (6 Bottles of 100 Strips each) For Measuring Residual Peroxide
97PH20901	Test Strips pH (6 Bottles of 100 Strips each) For Measuring pH/Water/Acid,Base/Bicarbonate/Dialysate
97RC22101	WaterCheck RC (6 Bottles of 100 Strips each) For Measuring Residual Chlorine
97CM20201	WaterCheck 2 (6 Bottles of 100 Strips each) For Measuring Low Level Chlorine/Chloramine
LAL	LAL Endotoxin Testing, Exact results in just a few days
AAMI	AAMI Chemical Analysis, Results within one week

*Call AmeriWater or your AmeriWater distributor for pricing.

SECTION 11, DISPOSAL

Disposal of the device is the responsibility of the Medical Director of the facility. All local codes and regulations regarding the disposal must be followed.

Ameriwater recommends that the entire device be cleaned / decontaminated prior to beginning the disposal process. Many of the major components may be eligible for recycling in your area, except for the controller and membranes. It is recommended that these items be incinerated.

⚠ 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.