AmeriWater
The Water Purification Specialists

PORTABLE MROS

OPERATION & MAINTENANCE MANUAL

MODEL MROS

Manufactured With Pride
In The USA

www.ameriwater.com • 800-535-5585

3345 Stop 8 Rd. • Dayton, OH 45414

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Rev. P

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SECTION 1, GENERAL INFORMATION

1.1 INTRODUCTION

Congratulations on your decision to use the MROS system! The MROS 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. It is a portable water treatment unit that has the capacity to supply one dialysis machine. It provides quiet operation for bedside use and is intended to be used in hospitals, clinics, home care, and dialysis centers.

All models of the MROS 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 model MROS.

Your MROS 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 as soon as you receive it. Please notify AmeriWater® as soon as any problem is noticed.

The initials "PAA" are used occasionally throughout this manual to generically represent the hydrogen peroxide/peroxyacetic acid disinfecting solution that is to be used for disinfection. Peracidin® is an example of this solution. The caution on the front panel of the MROS 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 afterhours emergencies 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 MROS 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 MROS water treatment system complies with the National Electrical Standards for Product Safety and Construction.

According to the categories of ANSI/AAMI Standards, the MROS 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 MROS functioning resulted in the following MROS standards being set.

TEST PERFORMED	MROS 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 MROS is PVC plastic for additional operator safety.

The MROS is compliant with ANSI/AAMI ESI-1993, Safe Current Limits for Electro medical Apparatus.

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

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

The MROS 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 MROS is intended for use in the electromagnetic environment specified below. The customer or the end user of the MROS should assure that it is used in such an environment.		
Emissions Test	Compliance	Electromagnetic environment - guidance
RF emissions CISPR 11	Group 1	The MROS 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 MROS 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 MROS is intended for use in the electromagnetic environment specified below. The customer or end user of the MROS 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 MROS requires continued operation during power mains interruptions, it is recommended that the MROS 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 MROS is intended for use in the electromagnetic environment specified below. The customer or end user of the MROS 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 MROS, 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 MROS is used exceeds the applicable RF compliance level above, the MROS should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as re-orienting or relocating the MROS.</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 MROS

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

The MROS is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of the MROS can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the MROS 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!

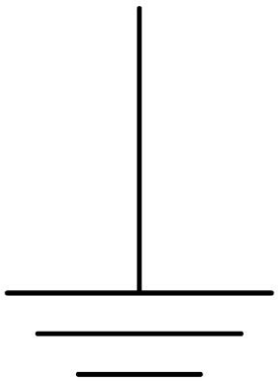
Open by qualified service personnel only!
Ouverture par le personnel qualifié seulement!

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

Minimum, Maximum, and Ideal incoming water temperature	Min = 41° F (5° C) Max = 90° F (33° C) Ideal Temperature = 77° F (25° C)
Incoming water pH range	6 – 9
Prefilter gauge pressure (when the MROS is running) – Minimum Maximum	 20 PSI 50 PSI (**P**ounds per **S**quare **I**nch)
Pump pressure – Minimum Maximum	 100 PSI 150 PSI
Water pressure to dialysis machine	30 PSI or Less
Maximum output of product water @ 77°F (25°C), TDS<1000 ppm of NaCl, & pump pressure of 150 PSI	MROS - 730 GPD (2763 LPD) using two membranes (2.5” dia x 21”) (**G**allons **P**er **D**ay / **L**iters **P**er **D**ay)

Connections	Incoming Tap Water = 3/4" Female GHT Product Water for Dialysis = 3/4" Male GHT Reject to Drain = 3/8" hose (**G**arden **H**ose **T**hread)
Electrical Requirements	115V/60Hz/20A GFI (**G**round **F**ault **I**nterrupter)
Dimensions Packaged Dimensions Unpackaged	52" H x 42" W x 38" D 47” H x 17” W x 24” D
Shipping Weight Operating Weight	237 LBS 135 LBS

Materials that Contact Product Water:

ABS	Polyethylene
Acrylic	Polypropylene
Carbon	Stainless Steel
Nylon	Tygon
PVC	Buna N
Polyester	

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

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 MROS OUTPUT WATER QUALITY

The physician in charge 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 MROS 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

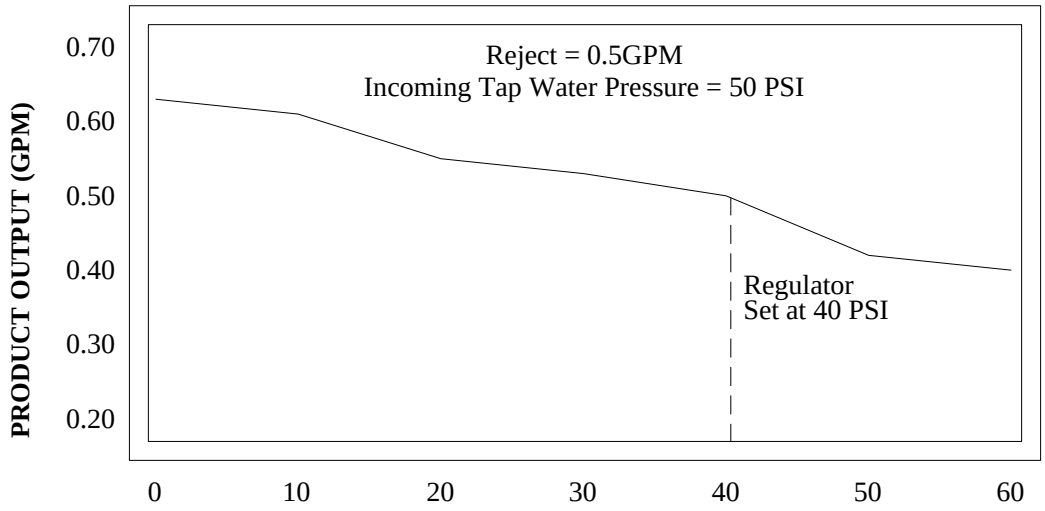
Carbon Block Filtration

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 PORTABLE MROS PERFORMANCE CHARACTERISTICS



At the left side of the chart, the number of gallons per minute in product output is shown.

On the bottom of the chart, the amount of backpressure PSI is shown.

There are seven set points shown on the chart, which explain how the amount of backpressure relates to the amount of product water available.

Back Pressure (PSI)	Product Water For Dialysis (GPM)
60	0.40
50	0.42
40	0.50
30	0.53
20	0.55
10	0.61
0	0.63

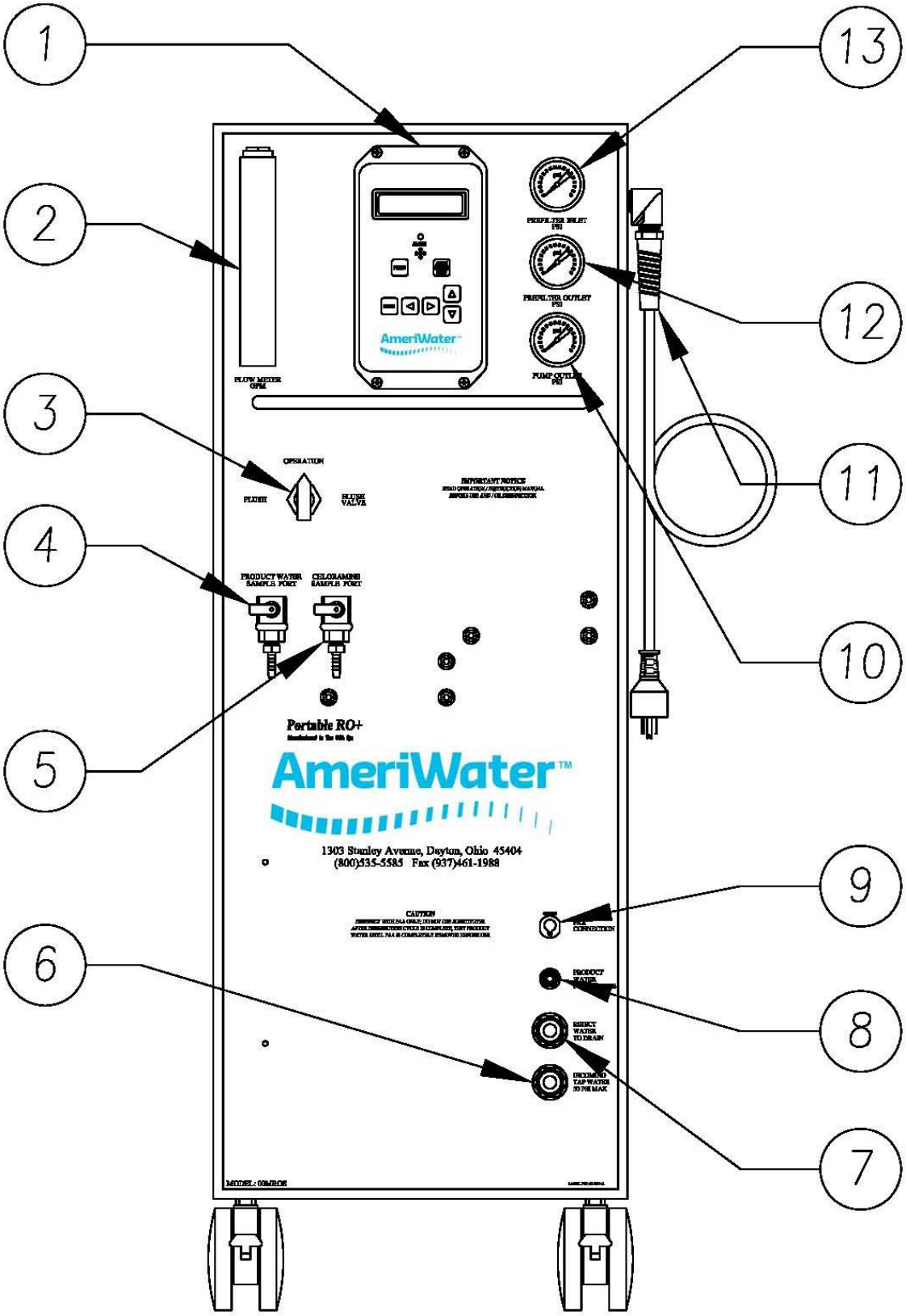
In actual installation, however, a pressure regulator is used to limit the product water pressure to 30 PSI, maximum. The pressure that would exceed this limit is directed back to the inlet of the pump.

2.5 TEMPERATURE AFFECTS ON MROS PRODUCTION RATES

MROS membrane performance is affected by water temperature. The Product Water Flow Rate and Output decreases as the temperature of the Incoming Tap Water decreases. The temperature can affect the product water output by as much as 1.5% to 2.0% per degree Fahrenheit.

SECTION 3, COMPONENTS AND SCHEMATICS

3.1 EXTERNAL VIEW



IDENTIFICATION OF COMPONENTS (EXTERNAL VIEW)

1. **CONTROLLER -** Control mechanism for the MROS (see Section 6).

2. **PRODUCT GPM –** Flow meter that measures the flow of the Product Water For Dialysis in gallons per minute (GPM) and liters per minute (LPM).

3. **FLUSH VALVE -** When the MROS is in operation (feeding a dialysis machine), the valve must be in the OPERATION position. Change to the FLUSH position to bypass the flow control, and allow a faster flow of water to drain.

4. **PRODUCT SAMPLE PORT -** Nozzle with valve to let a small amount of water out to test the PRODUCT WATER FOR DIALYSIS quality.

5. **CHLORAMINES SAMPLE PORT -** Nozzle with valve to let a small amount of water out to test for the presence of chloramines before the MROS membrane.

6. **INCOMING TAP WATER -** Hose connection to feed tap water into the MROS.

7. **REJECT WATER TO DRAIN -** Hose connection to carry wastewater to drain.

8. **PRODUCT WATER FOR DIALYSIS -** Hose connection for transmitting purified water from MROS system to dialysis machine.

9. **PAA CONNECT -** Quick connect that the PAA CONTAINER'S tubing is connected to the MROS connector for disinfection.

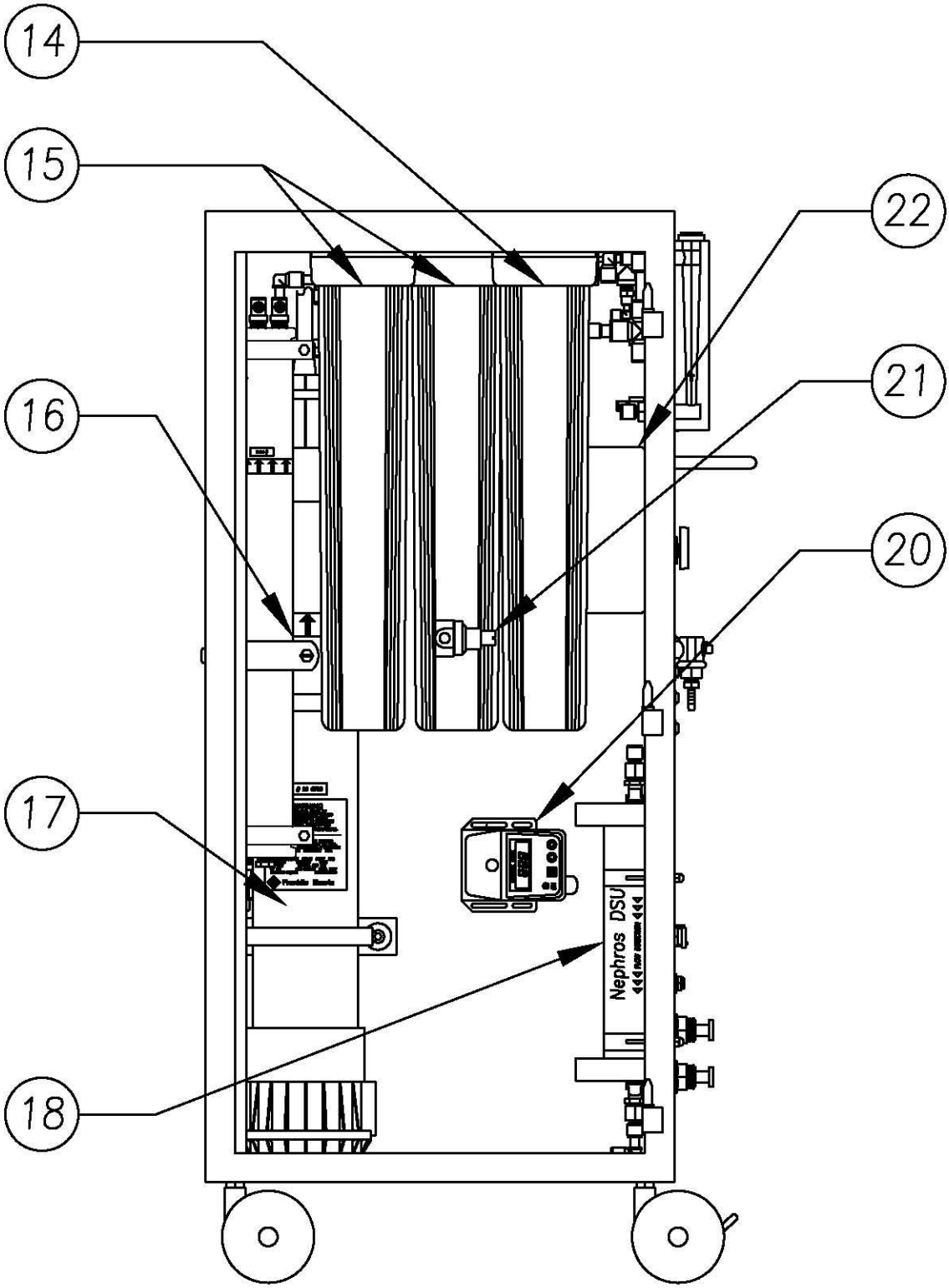
10. **PUMP PSI -** Gauge that measures the primary feed pressure (in pounds per square inch) from the pump to the MROS membrane.

11. **115V POWER -** Plug that supplies the unit with 115V power.

12. **PREFILTER OUTLET GAUGE -** Gauge that measures the pressure (in pounds per square inch) of the water after going through and out the prefilter. The outlet pressure should never be greater than 10 psi from what was initially recorded from the PREFILTER INLET GAUGE.

13. **PREFILTER INLET GAUGE -** Gauge that measures the pressure (in pounds per square inch) of the INCOMING TAP WATER going into the micron prefilter.

3.2 INTERNAL VIEW



IDENTIFICATION OF COMPONENTS (INTERNAL VIEW)

14. **SEDIMENT PRE-FILTER** – 1 Micron pre-filter to remove sediment prior to the carbon block cartridge filters.

15. **CHLOR-PLUS CARBON BLOCK** - A set of chloramine reduction carbon cartridges contained within a filter housing to remove sediment.

16. **MEMBRANES -** Spiral-wound, thin film, composite membranes for reverse osmosis.

17. **RO PUMP -** Provides the pressure for the MROS. The MROS ON-OFF switch controls the pump motor.

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

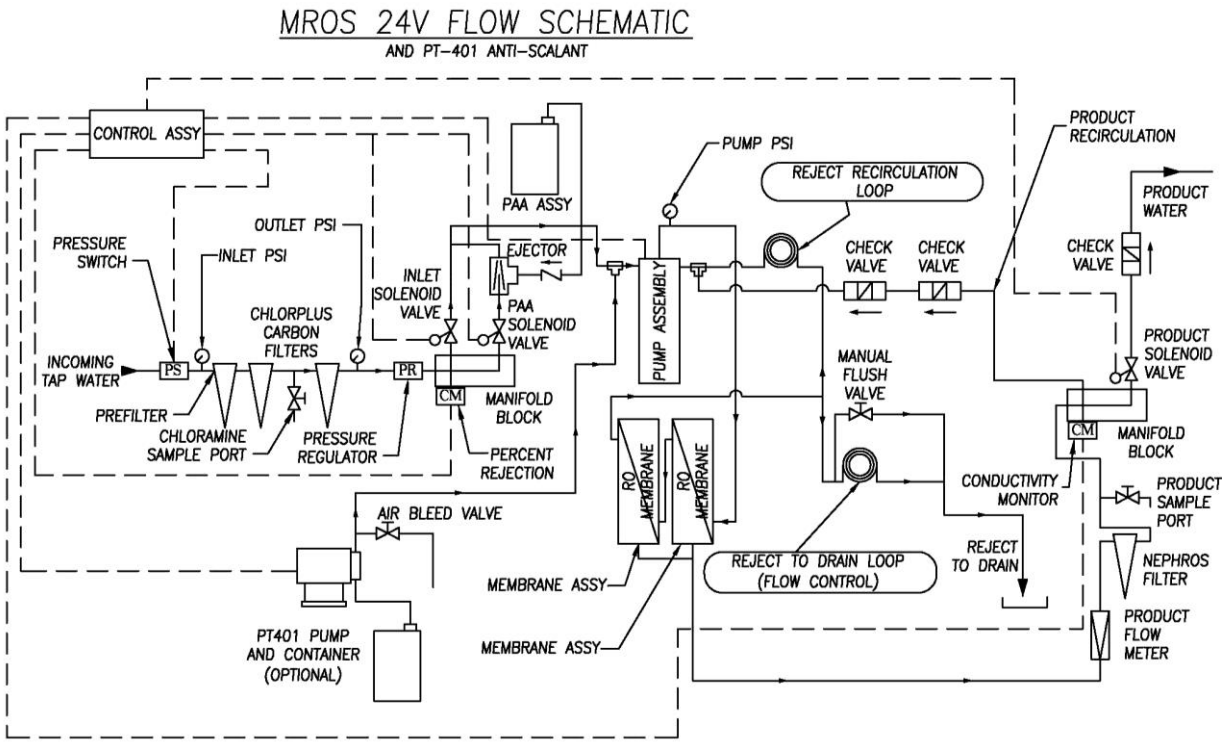
19. **PT401 ANTISCALANT/SCALE INHIBITOR -** Plastic bottle filled with 2 1/2 gallons of PT401 solution to prevent the MROS membrane from scaling. The plastic bottle should be refilled with PT401 solution when it reaches the half-full level. This resides in the cabinet assembly below the filter bowls. Not shown in this view for clarity.

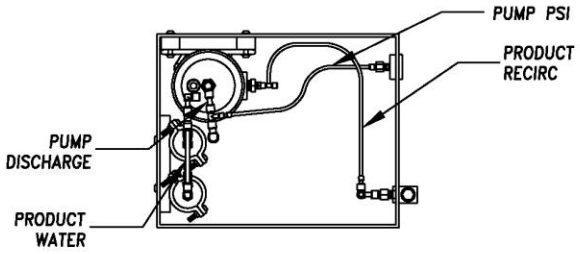
20. **PT401 FEED PUMP (Optional) -** Injects PT401 Antiscalant/Scale Inhibitor solution at a predetermined dosage based on a water analysis. The PT401 pump runs when the main pump runs.

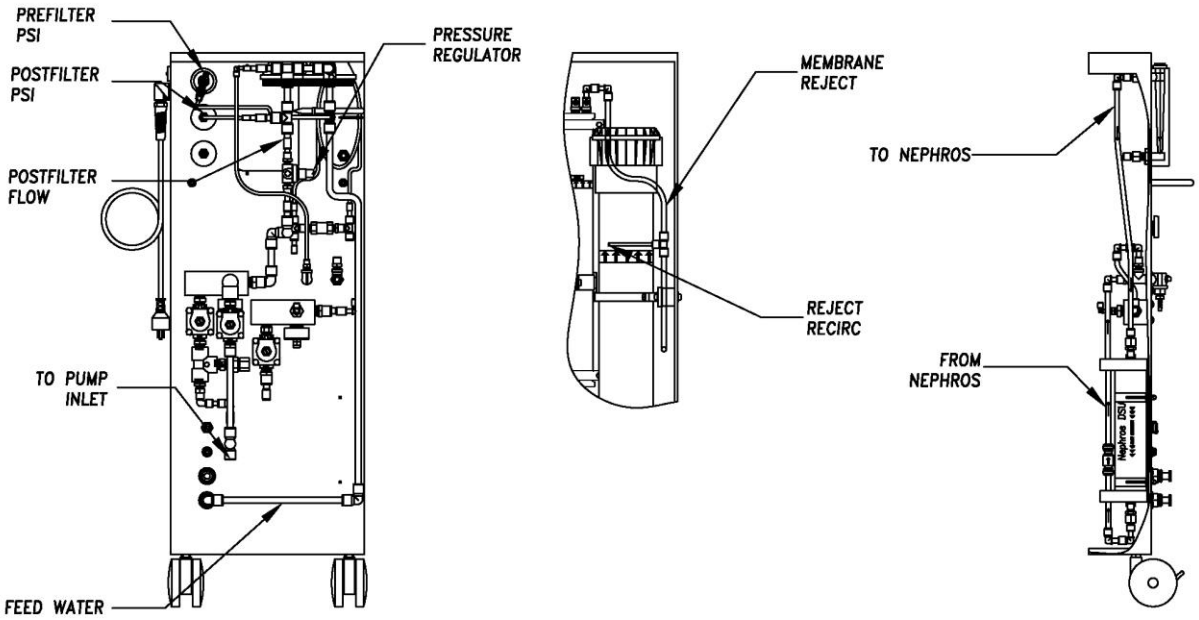
21. **PRODUCT REGULATOR VALVE –** This regulator is factory pre-set to 30PSI. Adjustments to this may cause problems with the equipment after the RO. Increasing the value by loosening the locking nut and turning the knurled knob clockwise will result in the line pressure being increased. Decreasing the pressure by turning the knurled know counter-clockwise will result in the product water being re-circulated into the pump at a lower back pressure.

22. **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.

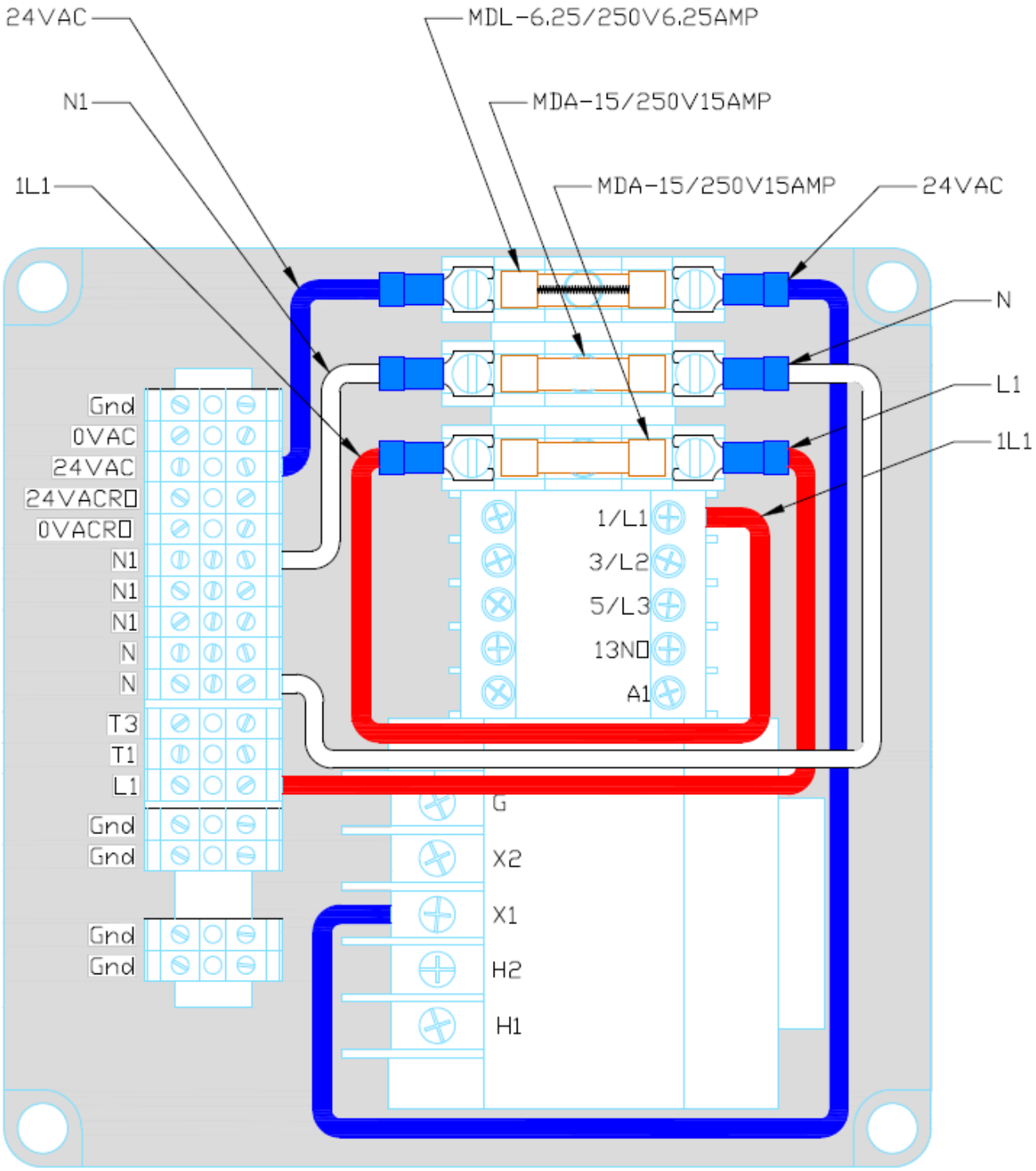
3.3 MROS FLOW DIAGRAM







3.4 MROS ELECTRICAL SCHEMATICS



SECTION 4, MROS STARTUP & OPERATION

4.1 CAUTION

NOTE: This entire Operations Manual should be read before operating or servicing the MROS. 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 MROS without prior authorization or instruction from your medical facility director.

The following operating or water supply conditions could cause an accident or the MROS 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 electric shock to the operator or patient. Electric that is provided to the device must be within the standard NEMA range (115V +/- 10%).

2. The MROS must only be plugged directly into a GFI receptacle. It must not be plugged into an extension cord.

3. All local plumbing and electrical requirements must be met.

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 quickly foul the membrane.

6. The MROS system is equipped with 2 carbon block cartridge filters to remove chlorine and chloramines. It is important to test for chlorine and chloramines at the CHLORAMINES SAMPLE PORT before each patient treatment or every 4 hours of use. Chlorine will deteriorate the membrane and cause system failure. AmeriWater recommends using 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 that is 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 Incoming

tap water to verify that it is within the specified range (pH Water / Bicarbonate / Dialysate Test Strips, P/N 97PH20901). Contact AmeriWater if your pH is above 8.5.

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

WARNING: **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 the presence of PAA in the Product Water Hose after rinsing the disinfection solution out of the system. Do not use the MROS until the PAA residual is less than 3 PPM at the Product Water Hose.

WARNING: **Never operate the MROS with a dialysis machine if the Water Conductivity exceeds the set point, indicating Poor Quality.**

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

11. Minimum feed pressure when the MROS is operating is 20 PSI. Maximum feed pressure when the MROS is operating is 50 PSI.

WARNING: **Pressure above 50 PSI may lead to leaks in the device.**

12. The prefilter must be replaced every time the membranes are changed, or when the differential pressure on the prefilter gauges is 10 PSI greater than the initial recorded startup differential pressure. Refer to Start-Up Log in section 4.7.

CAUTION: **If the prefilter is not replaced, damage may occur to the pump and/or membrane.**

13. If the system is operated without a prefilter, the membrane will foul.

WARNING: **The Clean In Place Setting must be OFF during normal operation. If the Clean In Place Setting is left ON during normal operation, all MROS fail-safe modes will be disabled and damage to the MROS or injury to the patient may occur.**

14. Minimize the opportunities for bacterial growth between use! To minimize bacterial growth, operate the MROS for 5 minutes in “FLUSH” and then 10 minutes with the FLUSH VALVE in “OPERATION” before connecting to a dialysis machine and using for dialysis.

    Whenever the MROS is not used for a period of several hours, the “Membrane Flush Feature” of the MROS should be programmed to be active when in the STANDBY mode (See section 5.4 for activating this feature). The water must be turned on or pump failure will occur.

Before determining a bacteria count, the MROS 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 is known to increase in population when water is not moving.

4.2 SAFETY FEATURES

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

1. 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.

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

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

4. A low-pressure cut-off switch is used to prevent damage to the MROS pump if low-pressure situations occur.

5. Product water re-circulates to the pump inlet when there is either backpressure on the product line or poor quality water is indicated.

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 MROS will remain stationary during startup.

2. Remove the plugs from the PRODUCT WATER, REJECT WATER TO DRAIN, and INCOMING TAP WATER fittings on the front of the MROS. This is done be depressing the gray collet towards the body of the fitting while gently pulling the plug out.

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

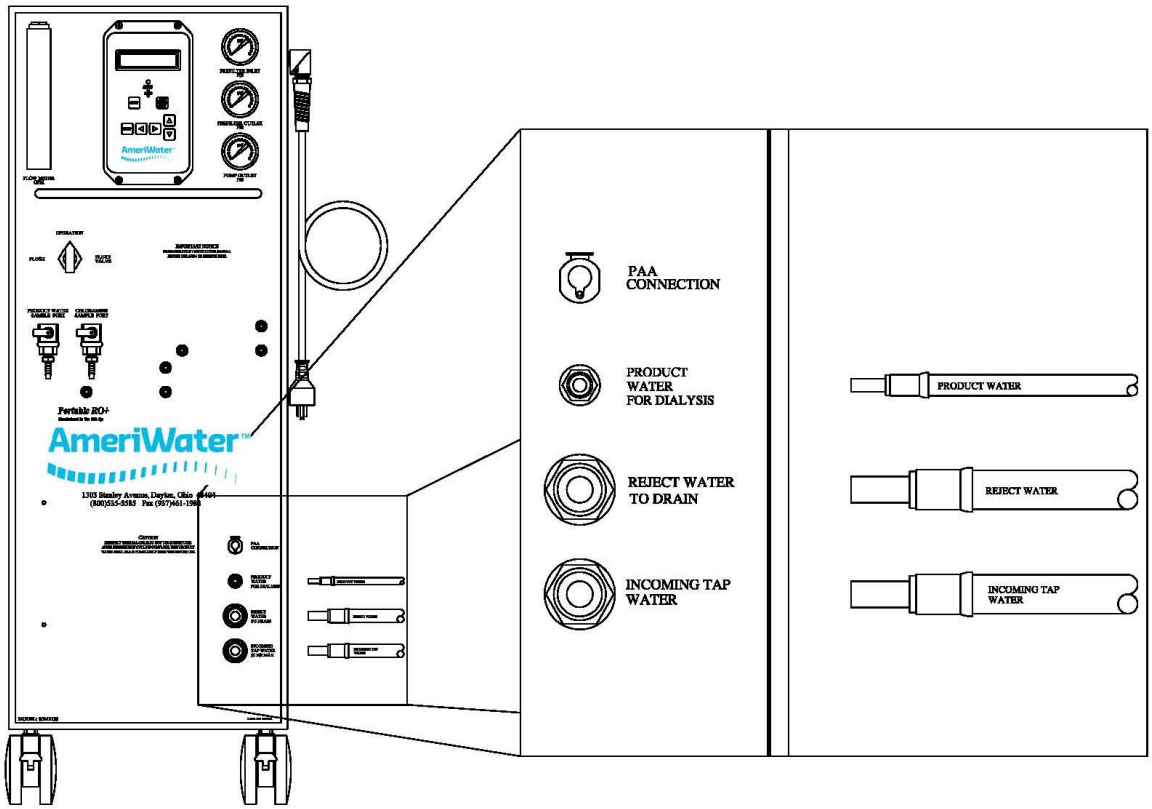


FIGURE 4.1

- Insert tubing all the way to the tube stop in the fitting body.
  - ¼" connection should go in at least ½"
  - ⅜" connection should go in at least ¾".
  - ½" connection should go in at least 1"

CAUTION: To ensure proper assembly, tubing MUST be fully inserted into the fitting body to the tube stop. To remove the hoses from the quick connect fittings, simply depress the gray collet towards the body of the fitting while gently pulling the tube out.

4. Connect the MROS INCOMING TAP WATER hose to your potable cold water supply using the fittings supplied (Figure 4.2). 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 MROS system is for reject water. The water from this hose will go down the sink or drain (Figure 4.2). Leave at least a 1/2" 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 or drain until the rinse out and disinfection cycle is completed and the water quality is in the good range (below conductivity set-point and not in alarm).

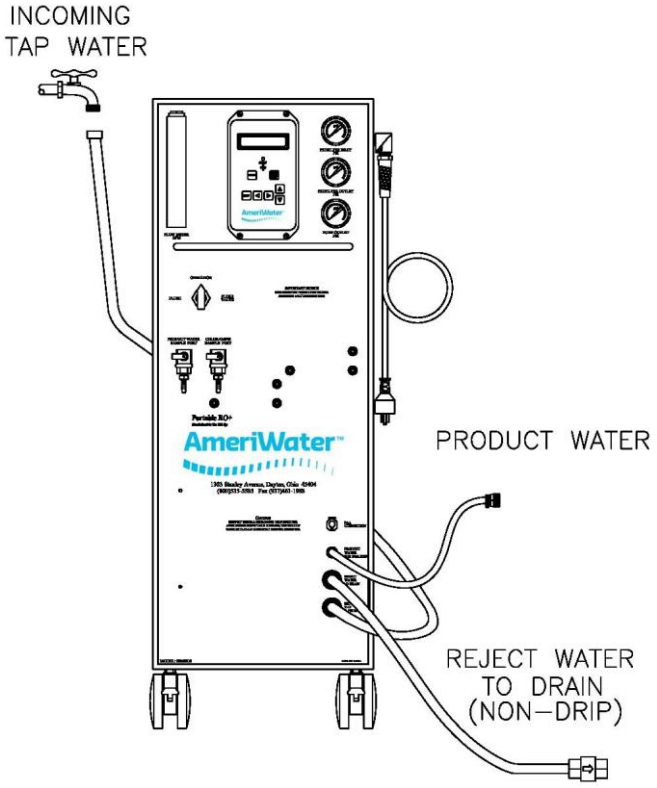


FIGURE 4.2

7. Open the access panel.

8. Remove the PAA CONTAINER from inside the MROS and set-aside until ready to disinfect.

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

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

11. Turn on the MROS and place the FLUSH VALVE in the FLUSH position. Allow the MROS to run in FLUSH for 5 minutes.

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

12. 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.

13. Disinfect the system before use. (See Disinfecting Instructions, Section 5)

14. When all disinfection procedures have been completed, turn on the feed water supply to the MROS.

15. 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.

16. Turn the FLUSH VALVE to the OPERATION position. The PRODUCT GPM FLOWMETER should indicate at least 0.20 GPM (0.8 LPM).

17. Refer to the Start-Up Log in Section 4.7. Complete the entire MROS Performance section; making sure that the system is operating within all the required ranges.

WARNING: Do not use the MROS to feed a dialysis machine until all performance specifications are met.

18. 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 hose to the dialysis machine (Note: See the Operations Manual for your dialysis machine for instructions. Perform the procedure aseptically).

4.4 SYSTEM SHUTDOWN

1. Before turning off the POWER key, it is recommended to open the FLUSH VALVE and allow the MROS 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 or drain. All of the hoses may be secured by the hose strap on the side of the MROS for storage or transport of the MROS.

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 MROS, push or pull the system by the handle on the front of the MROS cabinet. Never pull the MROS by the hoses as this could damage the device.

WARNING: DO NOT attempt to push or pull the MROS from the side! This could cause the MROS to tip over and may result in injury and/or damage to the system.

4.5 DAILY OPERATION

1. Verify that the MROS unit is connected to a water supply (incoming water pressure will be indicated on the prefilter gauges).

2. Disconnect the PRODUCT HOSE from the dialysis machine and direct it to a drain.

3. Place the FLUSH VALVE in “FLUSH.”

4. Turn on the MROS and allow the MROS to rinse for 5 to 10 minutes.

   NOTE: The pump pressure will be lower and conductivity will be higher than normal when the MROS is in FLUSH. The conductivity alarm may sound.

   Rinsing the MROS requires greater amounts of FEED WATER than normal operation. If the pressure feeing the MROS is low, it may enter a LOW PRESSURE FAULT during FLUSH.

5. Place the FLUSH VALVE in “OPERATION.”

6. Verify that the FEED WATER temperature is between 41°F and 90°F.

7. Verify that the PREFILTER GAUGES indicate at least 20 PSI (**P**ounds per **S**quare **I**nch).

8. Verify that the pressure drop across the PREFILTER GAUGES is within 10 PSI of the value originally recorded on the STARTUP LOG.

9. Verify that the PUMP PRESSURE GAUGE indicates 100 – 150 PSI.

10. Verify that the PRODUCT WATER conductivity drops below the alarm set point (MROS no longer in CONDUCTIVITY ALARM).

11. Verify that the PRODUCT FLOWMETER indicates at least 0.20 GPM (**G**allons **P**er **M**inute) or 0.80 LPM (**L**iters **P**er **M**inute). Product water flow will be affected by feed water temperature (reference 2.5).

12. Verify that the chloramines concentration at the CHLORAMINE SAMPLE PORT is less than 0.10 PPM (**P**arts **P**er **M**illion).

13. If BIOTROL+ was used to store the MROS, verify that the PRODUCT WATER pH is within range at the PRODUCT SAMPLE PORT or PRODUCT WATER HOSE.

14. When operation parameters are met, turn OFF the MROS and connect the PRODUCT HOSE to the dialysis machine to begin treatment (turn the MROS back ON when connected to the dialysis machine).

15. After treatment, disconnect the PRODUCT HOSE and direct it to a drain.

16. Place the FLUSH VALVE in “FLUSH” and allow the MROS to run at this setting for 5 to 10 minutes.

17. Turn OFF the MROS. Preserve with BIOTROL+ if the MROS will be stored for 72 hours or more (see section 5.3 for preservative information).

4.6 RECOMMENDED MONITORING SCHEDULE

Item to monitor	What to monitor	Typical range of values	Typical interval	Comments
Feed water	Temperature	41ºF - 90ºF	Daily	NA
Prefilter Gauges	Pressure	At least 20 PSI	Daily	NA
Prefilter Gauges	Pressure drop across filter(s)	Within 10 PSI of the value originally recorded on the STARTUP LOG	Daily	NA
Carbon filtration	Total chlorine at Chloramines Sample Port	$\leq$ 0.1 mg/l of total chlorine	Daily	Prior to each patient shift or every 4 hours of operation.
Reverse Osmosis	Product water conductivity and calculated rejection	Conductivity below alarm set point. Trend Rejection %	Daily	MROS provides continuous monitoring.
Reverse Osmosis	Product and reject flow rates and calculated recovery.	Product water flow rate $\geq$ 0.20 gpm	Daily	NA
PT401 Antiscalant if MROS includes this option	PT401 level in PT401 container	Container ½ full or greater.	Weekly	NA
Product Water	Bacterial growth and endotoxins	Total viable microbial count and Endotoxin levels defined in current AAMI standards.	Monthly or as defined by the results of the validation process.	Specific testing is performed to troubleshoot contamination until a pattern of consistent compliance with limits can be demonstrated.
Product Water	Chemical contaminants as listed in current AAMI standards.	Maximums as listed in current AAMI standards.	Yearly	Feed water should be monitored yearly also to evaluate overall performance of the RO.
Conductivity display	Accuracy of display	Within 5% of a calibrated hand-held meter reading	Yearly	The conductivity display should be calibrated if it is not within 5% of the reading on a calibrated hand-held meter.

4.7 STARTUP LOG

1. DATE								
RO PERFORMANCE								
2. Temperature **(41ºF - 90ºF)**								
3. Product flow **(minimum 0.20 GPM)**								
4. Pump psi **(100 - 150 PSI)**								
5. Pre-filter Gauge (Feed) **(20 - 50 PSI)**								
6. Pre-filter Outlet Gauge								
6a. Filter Pressure Drop								
Note; The filters **must** be changed when the pressure drop is 10 PSI greater than first recorded.								
7. Hour Meter Reading								
8. Chloramines Test **(maximum 0.1 PPM)**								
9. Product Water Conductivity Reading								
9a. Percent Rejection								
DISINFECTION CYCLE								
10. Complete PAA Draw								
11a. PAA Test in Reject Water (≥1%)								
11b. PAA Test in Product Water (≥0.5%)								
12. 60 Minute Soak Start Time								
13. 60 Minute Soak Stop Time								
14. Rinse Start Time								
15. Rinse Stop Time								
16. PAA Test to less than 3 PPM at Product and								
Reject Hoses and Product Sample Port.								
STORAGE WITH MEMBRANE PRESERVATIVE								
17. Product Water Pre-Storage pH								
18. Complete Draw								
19a. Rinse Start Time								
19b. Rinse Stop Time								
20. Product Water Post-Storage pH								
EXCHANGE								
21a. Micron Prefilter (monthly)								
21b. Carbon Block Filters								
22. Clean or Replace the Membrane								
23. Add PT401 Antiscalant (as consumed)								
24. Change Nephros Filter (max 12 months)								
25. INITIALS								

NOTE: Be sure to operate the MROS with the Flush Valve in the FLUSH position for 5 minutes prior to and following each treatment. Whenever a value is indicated in the left column, a value must be recorded in the corresponding box on the form.

SECTION 5, DISINFECTING THE SYSTEM

5.1 DISINFECTING THE SYSTEM

AmeriWater recommends that all MROS 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 Section 4.7. This will help you verify that all steps are performed and recorded to disinfect the system properly.

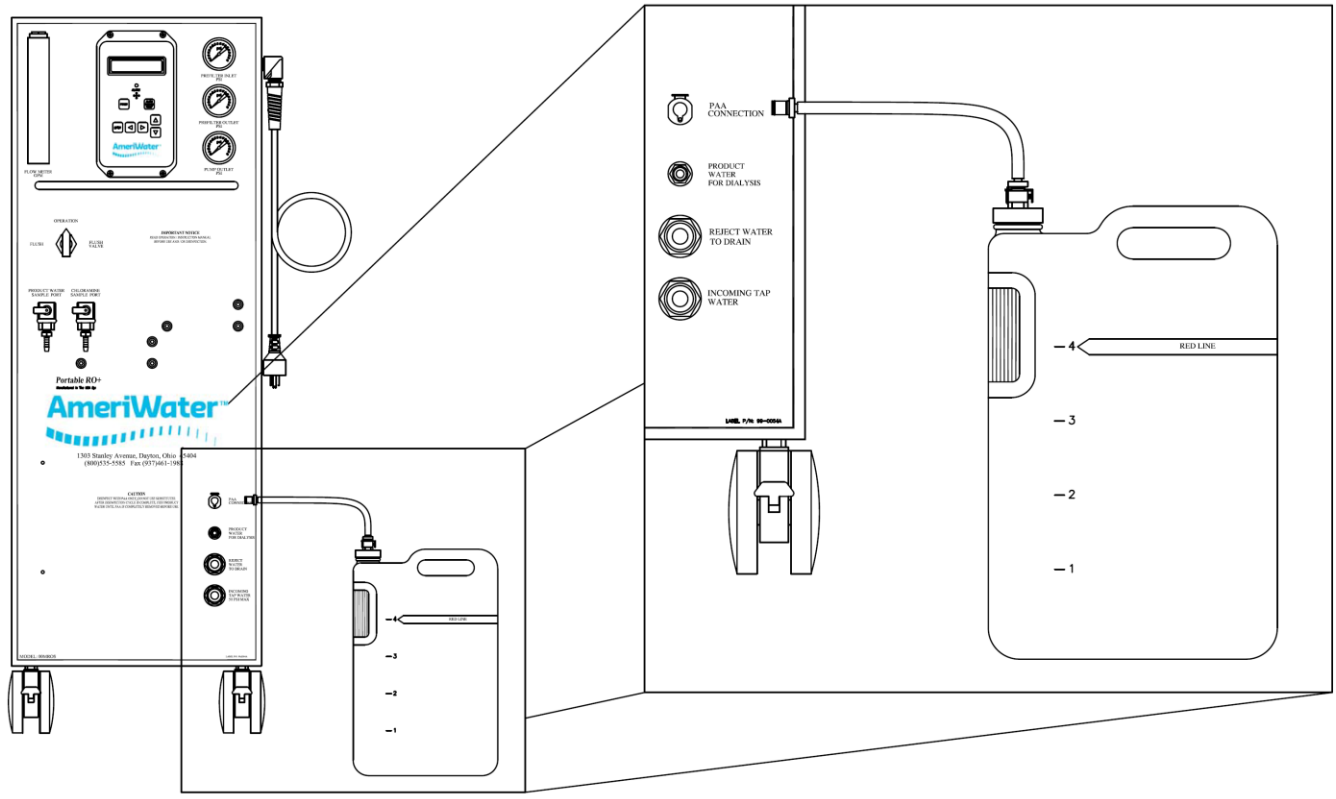


FIGURE 5.1

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

2. Unhook the MROS system from the dialysis machine by disconnecting the PRODUCT WATER hose.

CAUTION: When disinfecting the MROS, the Product Water hose must <u>not</u> be connected to a dialysis machine.

3. Place the PRODUCT WATER hose with the REJECT WATER TO DRAIN hose at a sink. Secure PRODUCT WATER hose in place so that the entire length of the hose will “flood” during disinfection.

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

5. Unscrew the cap assembly of the PAA container (plastic gallon container, see Figure 5.1).

CAUTION: Exposure to hydrogen peroxide/peroxyacetic acid concentrate or solution may cause severe chemical burns to skin or eyes. Additional information regarding hydrogen peroxide/peroxyacetic acid is found in this section, on your PAA bottle, and the Material Safety Data Sheet. Please read carefully before using.

6. Add 150 ml of 100% hydrogen peroxide/peroxyacetic acid disinfecting solution to the PAA Container and fill with water to the red line. (You may use tap water or treated water). Screw the cap assembly back on the PAA container.

7. Lightly shake or tilt the container to mix the solution.

8. Connect the PAA tubing to the PAA connection on the front of the MROS (Figure 5.1).

9. Turn the FLUSH VALVE to the FLUSH position.

10. Turn on the feed water supply to the MROS.

11. 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 then the keys can be released.

12. Press and hold the ENTER key. Pressing and holding the ENTER key will turn on the Disinfect Draw function and the display will read **DISINFECT ENABLED DRAW**. Continue to hold the ENTER key, until all of the PAA is drawn in. If the PAA tubing begins to suck air, immediately release the ENTER key.

13. Place the FLUSH VALVE in the OPERATE position. Avoid extra time running because PAA will be diluted.

CAUTION: Avoid sucking air when the container is near empty.

NOTE: The ENTER key must be held until the PAA container is nearly empty.

a. Avoid stopping and starting the disinfect function which may cause a thermal overload of the MROS pump. If a thermal overload occurs, it will automatically reset in 5 minutes – a pause is required to allow the pump overload to reset before resuming the PAA draw.

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 may remain in the bottom of the plastic container. This is normal and may be emptied down the drain after the entire process is complete.

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

15. At this point, the MROS is filled with the hydrogen peroxide/peroxyacetic acid (PAA) disinfecting solution. To ensure that this solution has passed through the system, use a PAA test strip (supplied in the installation kit – Peracid Test Strips, P/N 97HP20401) at the REJECT WATER TO DRAIN hose; the results should be at least 1% (500 ppm). Use another PAA test strip (Peracid Test Strips, P/N 97HP20401) at the PRODUCT WATER hose; the result here should be at least 0.5% (250 ppm).

NOTE: You may need to press the ENTER key to sample the flow being discharged from the REJECT WATER TO DRAIN hose, and the PRODUCT WATER hose. If the test strip does **not** show hydrogen peroxide/peroxyacetic acid disinfecting solution at the specified levels in the Reject Water and Product Water, press the ENTER key again to continue flow; repeat the PAA test at the REJECT WATER TO DRAIN hose and PRODUCT WATER hose until both test positive (at the specified levels). If the test strip still does not show the disinfecting solution at the required levels, repeat disinfect draw procedure until the tests at the Drain hose and Product Water hose show positive at the required levels.

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

17. **In order to assure that the MROS will not be used for dialysis, leave the MROS in the DISINFECT ENABLED mode.**

18. The FLUSH VALVE must remain in the OPERATION position during the soak time.

19. Allow the PAA mixture to soak in the MROS for at least 60 minutes.

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

20. Record the Soak Start and Stop times on the Log to have a record of how long the membrane was soaked in PAA disinfecting solution.

WARNING: DO *NOT* HOOK UP THE DIALYSIS MACHINE AT THIS TIME.

21. Record the rinse Start time on the Log.

22. After the soaking time has elapsed, turn on the MROS by pressing the ALARM/SILENCE RESET to restart the MROS in the operating mode.

23. 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 MROS.

    b. Switch off the MROS 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 MROS.

24. Place the FLUSH VALVE in the OPERATION position.

25. Turn on the MROS by pressing the ALARM/SILENCE RESET to restart the MROS in the operating mode.

26. Allow the machine to run at its current setting for at least 15 minutes.

27. After rinsing the MROS in the normal operating mode for 15 minutes (minimum) turn the FLUSH VALVE to the FLUSH position, and allow the MROS to run for another 15 minutes.

28. After the time has elapsed running in the FLUSH position, return the FLUSH VALVE to the OPERATION position, and continue rinsing for 15 minutes or until the water from the PRODUCT WATER hose, REJECT WATER TO DRAIN hose and the product sample port test negative for PAA.

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

29. Record the Stop time on the Log to have a record of how long it took to completely rinse out the disinfecting solution. Record on the Log Sheet that the residual PAA tested negative.

30. Disinfection is now complete. Press the POWER key to turn off the MROS. The display will show STANDBY.

WARNING: Although it is a necessity to use a carbon filter to remove chlorine and chloramines from the incoming water, the carbon filter, also, is a good environment for bacteria to grow. It is very important that the MRO is put into fast flush for 5 minutes, then 5 minutes of operation, minimum, before every use (not connected to a dialysis machine) to minimize the bacteria growth. An MRO that seems to be quickly re-infected after a thorough disinfection procedure may be re-infected from an insufficiently flushed carbon filter.

31. Refer to Section 4.3, Initial Startup, Step 16 and make the connections to a dialysis machine per the manufacturer's instructions.

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

5.2 A WORD ABOUT HYDROGEN PEROXIDE/PEROXYACETIC ACID

Do not use hydrogen peroxide/peroxyacetic acid concentrate (PAA) after the expiration date. Using outdated PAA 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 will result with 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 can 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 can 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 surfaces with tap water to remove residual disinfecting solution and to 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 hydrogen peroxide/peroxyacetic acid concentrate!

8. Rinse rubber gloves with tap water to remove any residues from handling.

9. Remove and 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 MROS 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 MROS be “Auto-Flushed” at least every 8 hours, or “preserved” in BIOTROL+ for storage if the MROS 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 MROS with BIOTROL+ when not in use. You can set up the machine to flush periodically while in the STANDBY mode.

The Membrane Flush feature is not activated in the default program from the factory. To enable this feature, set the following setpoints on the MROS controller accordingly (Also, see Section 6, MROS Controller):

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

These settings will allow an automatic flush to occur each time the MROS 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.

For this feature to be operable, the MROS must be connected to the electric power source, incoming water supply, with the PRODUCT & REJECT hoses directed to drain. The manual FLUSH VALVE must be in the OPERATION position.

The MEMBRANE FLUSH FEATURE cycles the MROS and directs water to both the PRODUCT WATER and REJECT WATER TO DRAIN hoses.

SECTION 6, MROS CONTROLLER

6.1 FRONT PANEL CONTROLS AND INDICATORS

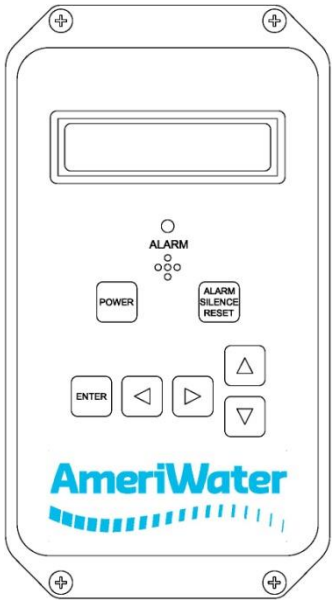


FIGURE 6.1

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

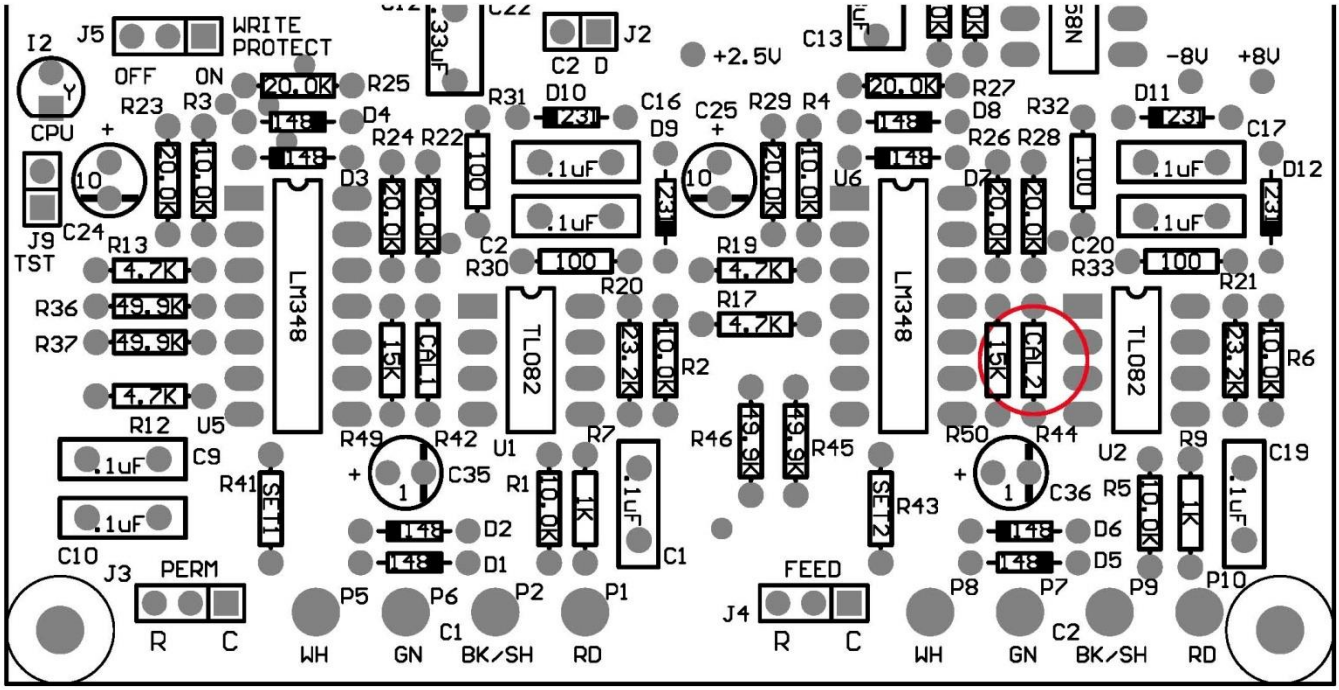
If the Conductivity reading exceeds the limit programmed the Cond Limit Setpoint for the delay programmed in the TDS/Cond Delay Setpoint, the alarm lamp will light and the HI TDS/COND warning message will show on the display. This warning will clear when the Conductivity drops below the Setpoint.

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 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 is exceeded, no alarm will be given until this time has elapsed.	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.	0-180 seconds	180
TF Restart Delay	When a tank full condition clears, the system will restart after this delay. (Not Used)	0-99 sec/min	5
TF Restart	Selects whether the tank full restart delay is in seconds (1) or minutes (2). (Not Used)	0-1	0
TFO Time	The amount of time that a tank full override lasts. (Not Used)	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 Minutes	0
Flush Interval	The interval between flush cycles. Only valid with op hour, elapsed time or off flush types.	0-99 hours	0
Flush Mode	Selects if the inlet and MROS pump relays operate during flush.	0-3	0

* µS = microsiemens; PPM = Part Per Million

SETPOINT	DESCRIPTION	RANGE	FACTORY SETTING
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	Total operation hours of MROS system.	0-65000	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 will light and high TDS/Cond will show on the display. To disable,set to 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 MROS 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.

7.1 MAINTAINING THE SYSTEM

1. Use the following maintenance schedule:

Prior to each patient shift or every 4 hours of operation	Test for chlorine and chloramines (< 0.1 mg/L)
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 Micron Prefilter (when pressure drop is ≥ 10 psi greater than the originally recorded value or at least monthly).
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).
	Replace Carbon Block Filters at least annually or when total chlorine > 0.1 mg/L, or the pressure drop is 10 psi > the originally recorded value.
As Needed	Membrane cleaning, if > 10% loss of product flow and/or > 10% rise in product conductivity.

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

2. A Startup Log for the MROS system has been provided by AmeriWater in Section 4.7. This must be filled out completely each time the system is used.

3. The membrane, micron prefilter, and ChlorPlus carbon prefilter are non-durable components and will need to be exchanged periodically.

4. The MROS system will need to be disinfected regularly. The frequency is determined by the usage of the system. If the MROS 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 that samples be pulled prior to disinfection.

6. MROS 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.

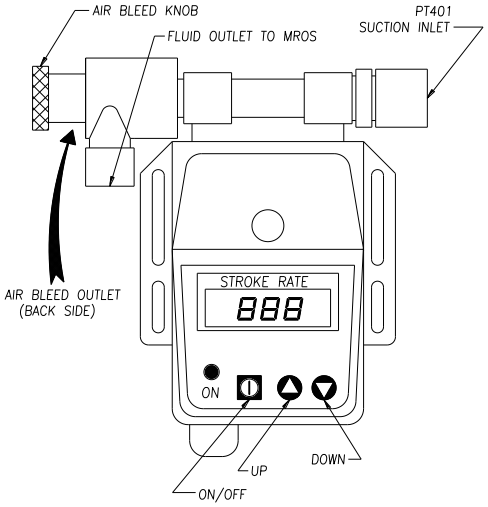
7. Monitoring of the water bacteriology of the system following installation is the responsibility of the user. Total viable microbial counts shall not exceed the AAMI standard for bacterial colony forming units per milliliter (CFU/ML) and endotoxins measured in endotoxin units (EU). See instructions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

7.2 PT401 PRIMING PROCEDURE

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

AmeriWater MROS 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 MROS system, and whenever the PT401 pump loses its prime:



1. Verify that the MROS 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 approximately 360.

5. Remove the cap from the PT401 container and run the injection pump until a stream of PT401 without air bubbles flows out of the air bleed tube.

6. Close the adjustment knob completely by turning clockwise until the knob stops, and make 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 5.

At the stroke rate of 5, the PT401 injection pump will put about 30 milliliters (approximately 1 liquid ounce) per hour into the MROS 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.

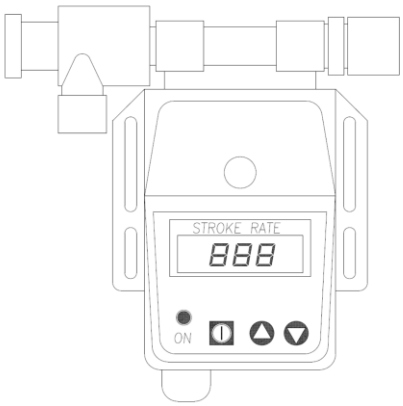
7.3 SETTING THE OPTIONAL PT401 FEED PUMP

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 (Set at 5 during use).

Your PT401 Antiscalant/Scale Inhibitor feed pump has been set at the factory default setting of 5 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 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 bottle. 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 priming steps (Section 7.2) to ensure the PT401 pump remains primed.

7.5 MEMBRANE MAINTENANCE INSTRUCTIONS

There are two options available for membrane maintenance on the AmeriWater Portable MROS 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 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 MROS.

3. Remove the prefilter.

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

WARNING: DO NOT place the MROS in service until all operational parameters are within specification. Consult the STARTUP LOG (See section 4.7) to verify that all specifications are met.

7.7 EXCHANGE INSTRUCTIONS

PREPARATION

1. Turn off the MROS as well as the incoming tap water supply.

2. Put a bucket under the CHLORAMINE and PRODUCT WATER SAMPLE PORTS. Slowly open the sample ports to relieve the pressure and let the water drain.

3. Place both the REJECT TO DRAIN and PRODUCT WATER hoses into the drain.

4. Turn the FLUSH VALVE counterclockwise to FLUSH position and to allow the water to flow from the membrane reject hose to the drain.

5. Unplug the MROS from the electrical outlet.

6. Open the access cover to the cabinet.

7. If removing the filter housings, use caution to prevent excess spillage in the cabinet.

7.8 MEMBRANE REPLACEMENT

1. Disconnect the tubing from the color-coded fittings on the membrane assemblies. Some water may spill or drip from the fittings.

2. Remove the clamp securing the membrane assembly to the unistrut in the MROS cabinet.

3. Remove the membrane assemblies from the cabinet.

4. Remove the retaining clamp from the inlet end of the 1st housing.

5. Remove the end cap by pulling straight out.

6. Remove the old membrane.

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

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

9. Replace the retaining clamp.

10. If the 2nd membrane assembly is to be replaced, repeat steps 4 through 9.

11. Re-install the membrane assemblies by reverse order of steps 1 through 3.

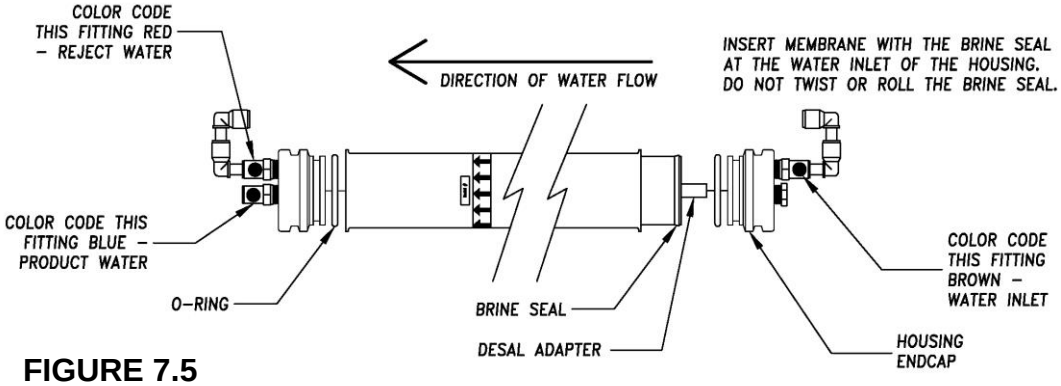


FIGURE 7.5

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

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 MROS through a rinse out cycle to rinse 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. 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 MROS to run until the product water conductivity is below the setpoint and no longer alarming. Turn the MROS off.

5. Disinfect the system per the instructions in section 5.1. Pull an AAMI analysis.

NOTE: The MROS may be used for treatment once all set-points are back within specification prior to receiving the AAMI analysis results.

6. Reconnect the PRODUCT WATER hose to the dialysis machine and turn on the MROS. The rinse out cycle is now complete, and the MROS is ready for use.

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

7.9 EXCHANGE CARTRIDGE PREFILTER

1. Use the filter wrench to unscrew the filter housing.

CAUTION: Even after relieving the pressure from the Chloramine Sample Port, the filter bowls will be full of water. Use care to prevent spillage into the cabinet assembly.

2. Remove and discard the used filter.

3. Partially unwrap the plastic from the new filter. Holding the end covered with plastic, place the new filter in the housing. Discard the remaining plastic after installation.

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

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 MROS system.

PROBLEM	POSSIBLE CAUSE	CORRECTIVE ACTION
MROS will not start	MROS not plugged in	Plug into electrical outlet.
	Circuit breaker blown	Reset the breaker.
	MROS in a FAULT condition	Check MROS controller display for FAULT condition and correct the FAULT.
	Fuse blown	Replace Fuse.
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.
	Prefilter clogged	Check the prefilter gauges for pressure drop; replace the prefilter if the pressure drop is 10 PSI greater than intitial.
	Feed solenoid is not operating	Test the solenoid (see Section 8.4). Replace the valve if it is defective (see Section 8.5).

PROBLEM	POSSIBLE CAUSE	CORRECTIVE ACTION
Disinfection cycle will not operate when holding the ENTER key	DISINFECT MODE has not been accessed correctly.	Access DISINFECT MODE (see SECTION 5)
	Faulty controller.	Replace the controller.
Pump making excessive noise	Low pressure or flow rate feeding the MROS	Check the prefilter outlet gauge PSI (must be ≥ 20 PSI), and verify that the product flow (flowmeter) >0.20 GPM.
	Pump motor or impeller failing	Check PUMP PSI GAUGE to verify that it is within operating parameters. Replace the pump assembly if necessary (see Sections 8.2 and 8.3).
	Pump loose in cabinet	Isolate pump from cabinet.
Poor quality product water	High Chlorine levels	Replace the Carbon Filters.
	MROS not rinsed thoroughly	Rinse membrane (see Section 7.8, Rinse Out Cycle).
	FLUSH VALVE in the FLUSH position	Put the FLUSH VALVE in OPERATION.
	Fouled membrane	a. Clean or replace membranes (Section 7). b. Check and correct the antiscalant system.
	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.

PROBLEM	POSSIBLE CAUSE	CORRECTIVE ACTION
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 MROS is operating.
	Low pump PSI	Pump should be operating at 100 – 150 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.
	Regulator has failed open	Replace the regulator.
	Low temperature incoming tap water	Reference Section 2.5 to determine if the flow rate is normal in relation to the feed water temperature.
	Prefilter clogged	Check the prefilter gauges for pressure drop. Replace the prefilter cartridge if the pressure drop is ≥ 10 PSI from the initial value.
	Fouled Membrane	Clean or replace membranes (Section 7).
High Bacteria Count	Too long since the last disinfection, or the procedure was not performed correctly	Disinfect (or re-disinfect) the MROS following the procedures in Section 5.
	Carbon filter exhausted	Exchange carbon filter.

8.2 PUMP REMOVAL

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

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

1. Turn off the MROS by pressing the POWER key (the display will show STANDBY). Unplug the system from the electrical outlet. Relieve the pressure from the system by opening the Chloramine and Product Water Sample Ports. Open the cabinet door.

2. Remove the optional PT401 container and and filter bowls for ease of access to the motor starter and pump. Detach the pump power cord from the motor starter.

3. Disconnect the feed hose from the inlet located at the bottom/side of the MROS pump. Place a container to catch the water draining from the pump housing.

4. Disconnect the membrane feed hose coming from top/center of the MROS pump housing.

5. Disconnect the recirculation feed hoses from the top of the pump.

6. Remove the screw securing the pump clamp and lift out the pump.

7. Allow the pump to fully drain before shipping.

8.3 INSTALLING A REPLACEMENT PUMP ASSEMBLY

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

1. Position the pump housing against the pump clamp to secure the pump assembly in proper position.

2. Connect the membrane feed tube to the pump housing outlet port (at the top).

3. Connect the pump feed tube to the inlet of the pump.

4. Connect the re-circulation tubing to the top connections on the pump.

5. Connect the pump to the motor starter.

6. Replace filter bowls and close all sample ports.

7. Re-install the optional PT-401 container assembly and return to service.

8.4 SOLENOID TEST PROCEDURE

1. With the MROS Off, turn the INCOMING TAP WATER supply on. If there is water flowing to the drain, the inlet solenoid may be bad. Proceed to Step 3.

2. Turn the MROS On (with the INCOMING TAP WATER supply on). If there is no flow to the drain, the inlet solenoid or wiring harness may be bad. Proceed to Step 3.

3. Use a voltmeter to verify that power is not being supplied to the INLET SOLENOID VALVE spade terminal when the MROS is off, and that power is being supplied to the spade terminal when the MROS is on. If the power supply is normal, the solenoid valve is bad. If the power supply is not correct, replace the controller.

8.5 SOLENOID VALVE REPLACEMENT

1. Prepare the RO per section 7.7.

2. Open the access panel on the cabinet. Remove the filter bowls (if necessary). Remove the wiring harness plugs from the solenoid valves, noting the location of each.

3. Disconnect the tubing from the manifold assembly.

4. Remove the manifold assembly that the valves are mounted to the MROS cabinet by unbolting it from the cabinet.

5. It may be necessary to remove the top half of one of the defective solenoid valves to be able to remove this from the manifold block.

6. Remove the fittings from the defective valve. Clean the threads and apply Teflon tape onto the threads of both fittings, and install them into the new valve.

7. Make sure that the side marked “IN” on the valve is oriented towards the manifold block.

8. If necessary, remove the top half of one of the solenoid valves to thread onto the manifold block. Make sure that the O-ring is re-seated into the groove before re-installing the top half of the solenoid valve.

9. Bolt the manifold assembly into the MROS cabinet and re-attach the tubing to the corresponding fittings on the manifold assembly.

10. Reconnect the wire harness to the valve.

11. Re-install the components that were removed to gain access to the manifold assembly that the solenoid valves are mounted to.

12. Close the access cover and disinfect the system per the instructions in section 5.1 before returning to service.

8.6 CONDUCTIVITY CELL REPLACEMENT

1. Prepare the RO per section 7.7.

2. Disconnect the conductivity sensor wiring. The cell on the product water manifold is wired to the permeate connection and the cell on the incoming water manifold is wired to the feed connection.

3. Remove the appropriate conductivity cell by turning it counter clockwise.

4. Apply pipe thread sealant to the replacement cell and thread into the connection.

5. Route the new cells wiring back to the controller.

6. Turn the water on to the MROS and power up the system. Check for leaks around the cell that was replaced.

7. Calibrate the conductivity cell per the instructions in Section 6.3.

8. Disinfect the system per the instructions in section 5.1 before returning to service.

8.7 LINE CORD REPLACEMENT

1. The line cord can only be replaced with a new line cord provided by AmeriWater by qualified service personnel.

2. Prepare the RO per section 7.7.

3. Remove the filter bowls and set aside.

4. Using a slotted screwdriver, remove the cover for the motor starter.

5. Loosen the strain relief on the existing line cord and remove from the terminal blocks.

6. Gently pull the line cord out of the motor starter.

7. Loosen the strain relief on the exterior of the cabinet assembly and remove the line cord.

8. Feed new line cord in through the strain relief and route to the motor starter through the strain relief.

9. Strip the wire and place the ground in to the green ground terminal, the white wire into the terminal block labeled “N” and the black wire into the terminal block labeled “L1”.

10. Replace the motor starter cover and the filter bowls.

SECTION 9, WARRANTY

The buyer has a one year warranty on all equipment and parts, excluding non-durable components (e.g., RO membrane, PT401 solution, and micron prefilter); 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 lightning, 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.

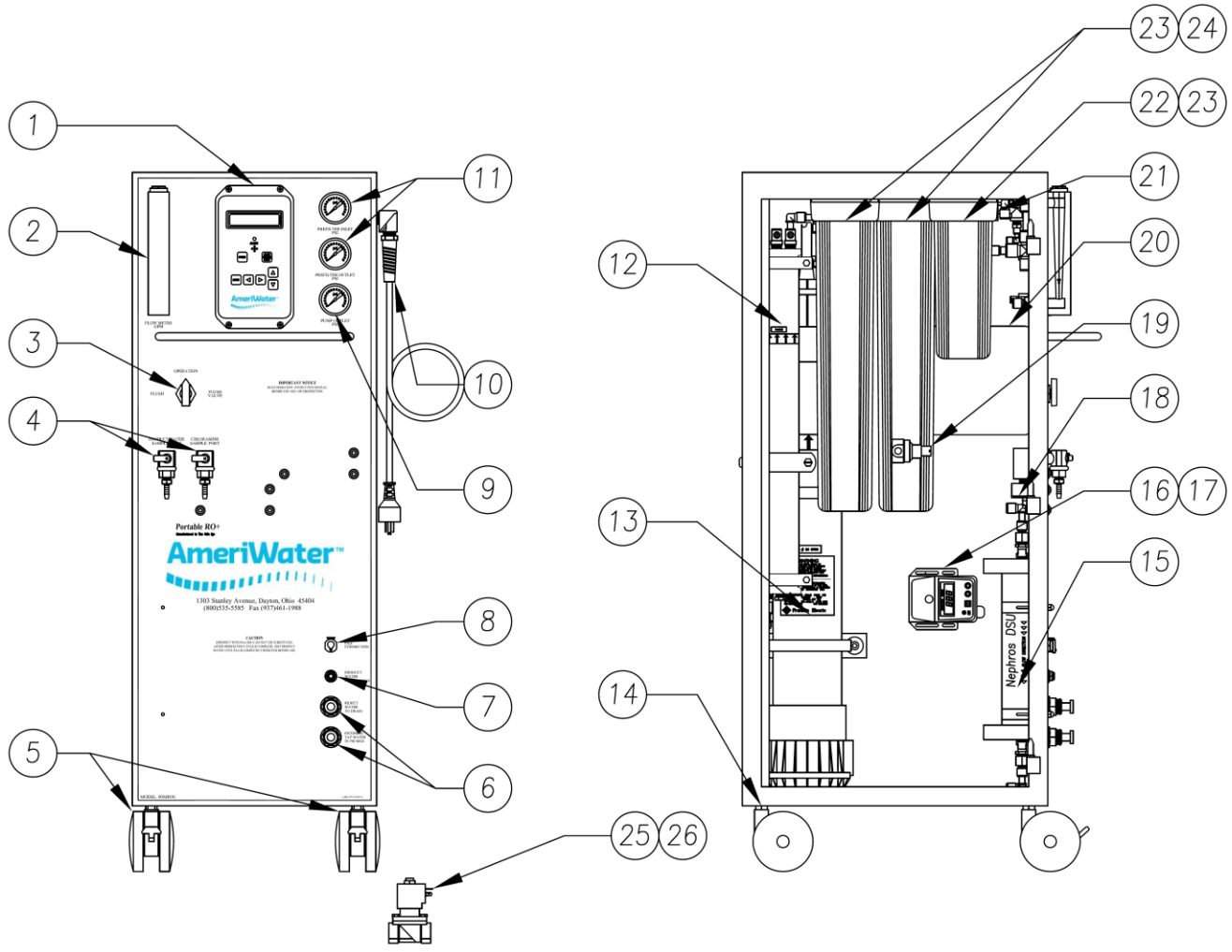
To obtain warranty service, notice must be given to the manufacturer within 30 days of the discovery of the defect.

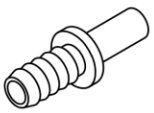
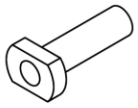
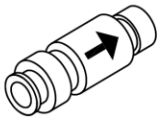
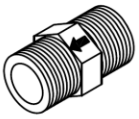
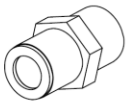
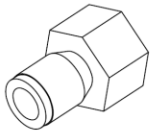
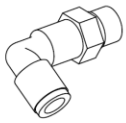
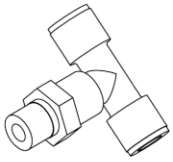
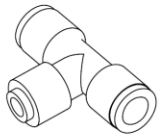
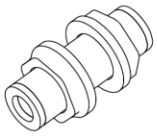
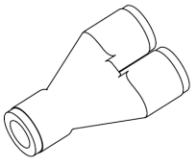
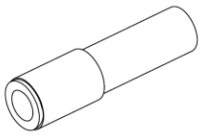
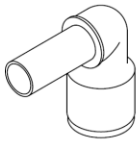
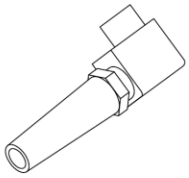
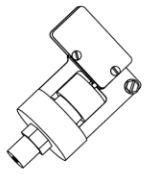
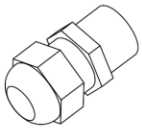
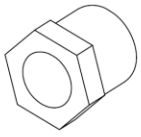
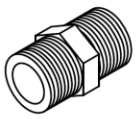
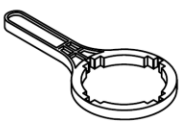
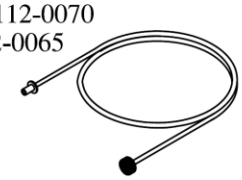
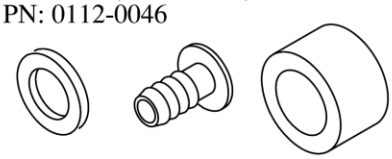
There are no warranties on the MROS system beyond those specifically described above. All implied warranties, including any implied warranty of merchantability or of fitness for a particular purpose are disclaimed to the extent they might extend beyond the above periods. The sole obligation of the manufacturer 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, SPARE PARTS LIST

Item #	Part #	Description	Item #	Part #	Description
1	R69-0019	Controller	15	20-0009	Nephros DSU Filter
2	41530609	Flow Meter	16	R84-0002	Anti-Scalant Pump
3	04-5001	Flush Valve	17	0185-0020	PAA Container
4	041004	Product / Cloramine Port	18	R69-0020	Conductivity Cell
5	94-0013	Caster With Brake	19	R44-0066	Pressure Regulator
6	10-L278	1/2” Bulkhead	20	R61-0008	Motor Starter
7	10-L276	1/4” Bulkhead	21	R65-0014	Pressure Switch
8	16-0042	PAA Connector	22	21-0033	10” Filter Housing (Old Models)
9	430001	Pump Pressure Gauge	23	21530235	O-Ring, Filter
10	66932111	115V Line Cord	24	21-0032	20” Filter Housing
11	430002	Prefilter Gauges	25	R59-0022	Solenoid Valve (NC)
12	R22-2521	Membrane	26	R59-0023	Solenoid Valve (NO)
13	R080-0001	Pump Assembly	N/A	R69-0021	15 PIN Controller patch cord
14	94-0014	Caster	N/A	R69-0022	9 PIN Controller patch cord



BARB CONNECTORS .25 STEM x .25 BARB P/N: 10521027 .5 STEM X .5 BARB P/N: 10521011 	PLUG 1/4 STEM PN-10-L451 1/2 STEM PN-10521106 	CHECK VALVE TUBE X TUBE 3/8" = P/N 55-0011 1/4" = P/N 55-0015 
CHECK VALVE,.5MPT PN-10720102 	MALE QUICK CONNECTORS P/N: 10-L002 0.25 NPT x 0.25 T P/N: 10-L003 0.25 NPT x 0.38 T P/N: 10-L004 0.38 NPT x 0.38 T P/N: 10-L006 0.5 NPT x 0.5 T 	FEMALE QUICK CONNECTOR P/N: 10-L026 0.25 FPT x 0.25T P/N: 10-L027 0.38 FPT x 0.38T 
SWIVEL EL, NPT x TUBE P/N: 10-L105 0.38 NPT x 0.38 T P/N: 10-L107 0.5 NPT x 0.5 T 	SWIVEL BR TEE, NPT x TUBE P/N: 10-L129 0.25 NPT x 0.38 T 	UNION TEE P/N: 10-L253 0.25 T x 0.38 T P/N: 10-L254 0.5 T x 0.5 T 
QUICK CONNECT BULKHEAD P/N: 10-L276 1/4" P/N: 10-L278 1/2" 	2-WAY DIVIDER P/N: 10-L302 3/8" 	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 1/4" = P/N: 10-L376 3/8" = P/N: 10-L377 1/2" = P/N: 10-L378 	STRAIN RELIEF ELBOW 1/2" NPT, SPIRAL PN-66510619 	INLET PRESSURE SWITCH P/N: R65-0014 SET AT 3 PSI 
STRAIN RELIEF FITTING PN-66510621 3 HOLE BUSHING PN- 66-0041 	BUSHING .5 MPT x .25 FPT PN-046530201 .5 MPT x .38 FPT PN-046531848 	NIPPLE,.5MPT X CLOSE PN-046531105 
FILTER WRENCH PN-21675184 	HOSES INLET: 0112-0030 PRODUCT: 0112-0070 REJECT: 0112-0065 	GARDEN HOSE ADAPTER, FPT KIT: NUT, WASHER,.5"BARB PN: 0112-0046 

10.1 ROUTINE REPLACEMENT ITEMS (NON-DURABLE COMPONENTS)

PART #	DESCRIPTION
0124-0024	O-Ring Kit, 2.5” Membrane
20-0009	Nephros DSU 510K Filter
20-1011	1 Micron 10” Prefilter
20-1012	1 Micron 20” Prefilter – Serial # 31539 & Above
20-5012	Chlor-plus Carbon Block Cartridge
63-0004	Fuse, MDA-15, 250V, 15 Amp
63-0010	Fuse, MDL-6.25, 250V, 6.25 Amp
95810125	PT401 Antiscalant, (4) 1 Gallon Containers
95810126	PT401 Antiscalant HpH, (4) 1 Gallon Containers
R22-2521	MROS Membrane (2.5” dia X 21”)
95-0007	Peracidin Disinfectant, 4 Quarts
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 Peracetic Acid
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.