

MANUAL FOR OPERATION & MAINTENANCE OF WM SERIES REVERSE OSMOSIS SYSTEMS



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DESIGN BASIS & SYSTEM DESIGN SPECIFICATIONS

Model	Design Conditions				Line Sizes (Inches)			Design Pump Flow (GPM)	Pump model and HP			
	Permeate Flow		Conc. Flow to Drain (GPM)	Design Recovery (%)	Inlet	Perm.	Conc.		Pump Model No.	Motor Model No.	Motor HP @ indicated voltage	Full Load Amps (FLA) @ indicated voltage
WM-122521A-216	250	0.17	0.51	25	1/2	3/8	1/4	1.7	112B100F31XX	P-MP828	1/3	4
WM-122521A-215	250	0.17	0.51	25	1/2	3/8	1/4	2.1	112A125F11XX	P-MP871	1/3	5
WM-222521A-216	500	0.35	1.05	25	1/2	3/8	1/4	1.7	112B100F31XX	P-MP828	1/3	4
WM-222521A-215	500	0.35	1.05	25	1/2	3/8	1/4	2.1	112A125F11XX	P-MP871	1/3	5
WM-322521A-216	1000	0.69	0.69	50	1/2	3/8	1/4	1.7	112B100F31XX	P-MP828	1/3	4
WM-322521A-215	1000	0.69	0.69	50	1/2	3/8	1/4	2.1	112A125F11XX	P-MP871	1/3	5
WM-422521A-216	1200	0.83	0.83	50	1/2	3/8	1/4	2.1	112A125F31XX	P-MP871	1/2	5
WM-422521A-215	1200	0.83	0.83	50	1/2	3/8	1/4	2.3	112A140F11XX	P-MG573	3/4	8
WM-225A-216	1500	1.04	1.04	50	1/2	1/2	1/4	4.0	1114B240F11BA250	P-MP872	3/4	7
WM-225A-215	1500	1.04	1.04	50	1/2	1/2	1/4	4.4	114E265F11XX	P-MG574	1	10
WM-325A-216	2500	1.74	1.74	50	1/2	1/2	1/4	4.0	1114B240F11BA250	P-MP872	3/4	7
WM-325A-215	2500	1.74	1.74	50	1/2	1/2	1/4	4.4	114E265F11XX	P-MG574	1	10
WM-425A-216	3000	2.08	2.08	50	1/2	1/2	1/4	4.0	1114B240F11BA250	P-MP872	3/4	7
WM-425A-215	3000	2.08	2.08	50	1/2	1/2	1/4	4.4	114E265F11XX	P-MG574	1	10
WM-24A-216	4000	2.78	2.78	50	1/2	1/2	1/2	5.5	114E330F11XX	P-MG573	1	8
WM-24A-215	4000	2.78	2.78	50	1/2	1/2	1/2	5.5	114E330F11XX	P-MG574	1	10

* Water must be softened or have antiscalant injection. Check with factory to make sure this recovery will not cause any scaling problems with your feedwater.


- All models have the membrane array designed in series.


DESIGN BASIS


- Systems rated at: 77°F (25°C) using 1000 PPM sodium chloride solution operating at 170 psi (12 kg/cm²) pressure. System capacity changes significantly with water temperature. For higher TDS a water analysis must be supplied and could result in modifications to the system.
- Minimum feed pressure to RO System: 40 PSI.
- Chlorine must be removed if present in feed water prior to RO with a carbon filter or with chemical injection.
- Water must be pretreated with a softener or antiscalant injection to avoid scaling the membranes.
- Feed water turbidity: Less than 1 NTU; Feed water silt density index (SDI): 3 maximum. If exceeded, pretreatment with media filter recommended. All pretreatment equipment and SDI test kits are available from Applied Membranes.
- Capacity Basis: 24 hrs/day

DESIGN NOTES

1. **Pump flow/Feed flow:** The pump has been designed to include recycle flow (if any) coming back to the pump inlet from the concentrate stream based on desired recovery. The sum of permeate flow, concentrate flow and recycle flow (if any) will equal the pump design flow.
2. **Permeate flow:** Indicates design flow rate from RO membranes as product water for use.
3. **Concentrate flow:** Water flowing to the drain. Concentrate flow is critical for proper system operation. For proper concentrate flows, refer to the system design information above.
4. **Recycle flow:** Flow stream that returns from the concentrate line back to the pump intake, rather than to the drain.

 **Note:** Permeate flow should not exceed recommended flow.

 **Note:** System pressure is a variable. It is important to adjust the pressure to get the correct permeate and concentrate flows. The exact value of the pressure is not important.

 **Note:** Permeate flow will increase at higher temperature.

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GENERAL INFORMATION AND SAFETY

DISCLAIMER:

The information contained in this document is subject to change without notice. Applied Membranes, Inc. shall not be liable for technical or editorial omissions made herein; nor for incidental or consequential damages resulting from the furnishing, performance, or use of this material.

READ THIS MANUAL:

Prior to operating or servicing this unit, this manual must be read and understood. If anything is not clear, call for assistance before proceeding. Keep this and other associated manuals for future reference and for new operators or qualified service personnel.

⚠ USE PROPER POWER CONNECTIONS:

Use proper wiring and connection methods to satisfy local electrical codes. **SHOCK HAZARD:** Connect this unit to a properly grounded connection in accordance with the National Electrical Code. **DO NOT**, under any circumstances, remove the ground wire or ground prong from any power plug. Do not use extension cords or an adapter without proper consideration.

⚠ SERVICE WARNING:

To prevent electrical shock, disconnect power to the system prior to servicing.

⚠ WARNING:

Do not make any alteration or modification in the wiring or plumbing of the system. This can result in damage to the system and cause injury to operators or users.

⚠ WARNING:

Flush the system for at least 30 minutes before use to remove all chemicals present.



CAUTION:

Chlorine will damage the membranes. Chlorine must be removed from the feed stream before entering the system.



CAUTION:

Never let the system freeze. Freezing can damage the membrane and plumbing.

SYSTEM INSTALLATION

LOCATION

Select a location for the RO system with adequate clearance from walls and other equipment to enable servicing of the pump / motor assemblies, membranes, cartridge prefilter and other serviceable components. Allow at least four (4) feet of clearance at the top end of the membrane housings for future membrane replacement.

The unit must be located near a drain able to accommodate up to 5 GPM. This is in addition to any other equipment sharing the drain.

A grounded power supply of the appropriate voltage matching your system model's voltage with 15 amp fuse protection and a local disconnect switch is required.

⚠ Caution: The system must not be located near any corrosive chemicals, or in an area where the temperature may exceed 113°F (45°C).

⚠ Warning: The system must be properly grounded to avoid injury from electrical shock.

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WALL-MOUNTING

⚠ Note: Do not use a bolt size smaller than 5/16". (Bolts and washers are not provided.)

Concrete Wall Mounting

Place the unit against the wall, level the unit and mark the wall through the mounting holes in the sides of the frame. Drill the holes in the wall and mount the unit.

Wall Mounting Kit (Optional ~ not included unless ordered)

If the wall is not concrete and wall mounting is necessary, a wall mounting bracket kit is available. The bracket has holes for mounting on 16", 18" and 20" centers.

- Part# A615 - for 27"L Units (WM-12521A, WM-22521A or WM-225A)
- Part # A616 - for 34"L Units (WM-32521A, WM-42521A, WM-325A, WM-425A, WM-24A)

Place the bracket on the wall with the flat side toward the wall, level the bracket and mark the wall through the appropriate holes. Drill holes in the wall and mount the bracket. Assemble the RO unit to the "H" frame. Lift the assembled unit so that the frame slides over the two studs on the top of the bracket. Secure the unit with the washers and nuts supplied with the kit.

Stand Mounting (Stand Optional ~ not included unless ordered)

If the RO unit requires floor mounting, a rigid steel stand (Part # A626) is available. Secure the unit with 1/4" bolts, washers and nuts.

SYSTEM ASSEMBLY

WM Systems are shipped with the vessel assembly in a separate package in order to reduce shipping costs and prevent damage in transit.

Mount system according to appropriate method above before beginning assembly.

1. Unwrap pre-filter cartridge and place in filter housing. Screw housing base onto housing cap installed on the system.
2. Mount the pressure vessels to the system. First loosen the vessel clamps on the system, then match the numbered labels on the vessels to the numbered labels on the system to confirm the correct position. Push the vessels into the clamps, then squeeze to tighten.

The top collar of the vessel should be resting on the top clamp.



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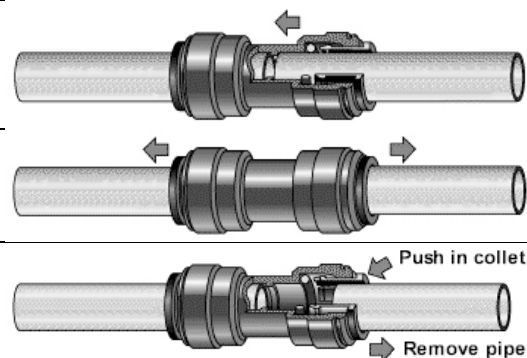
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3. Install the tubing/connections:
Each connection and pre-cut tubing segment is labeled with a number. Starting with the tubing labeled (1), remove the plugs also labeled with (1) and insert the ends of the tubing into the fittings. Continue on with all other numbered tubing segments.
4. Remove the protective tape from the recycle valve.



To ensure a secure seal using quick connect fittings:

- Push the tubing into the fitting, to the pipe stop. The collet (gripper) has teeth which hold the tubing firmly in position while the 'O' Ring provides a permanent leak proof seal.
- **Check the Seal:** Pull on the tubing to check it is secure. It is good practice to test the system prior to leaving site and/or before use.
- **To Disconnect:** Ensure system is depressurized before removing fittings. Push in the collet against the face of the fitting. With the collet held in this position the tube can be removed. The fitting can then be re-used.



PLUMBING

Refer to the P&ID on page 20 for further information.

⚠ Note: All plumbing is to be done in accordance with state and local codes.

⚠ Caution: This unit produces high quality water which can cause corrosion or leaching of the plumbing following the system. Use only plumbing components of inert material that are compatible with the application. Copper plumbing cannot be used.

Plumbing materials can significantly contribute to the contamination of the water. Care must be exercised over the choice of thread sealants. Teflon tape is suitable for all threaded connections in this system. Pipe dope can leach objectionable impurities into the water and must be avoided.

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Feed Water Connection:

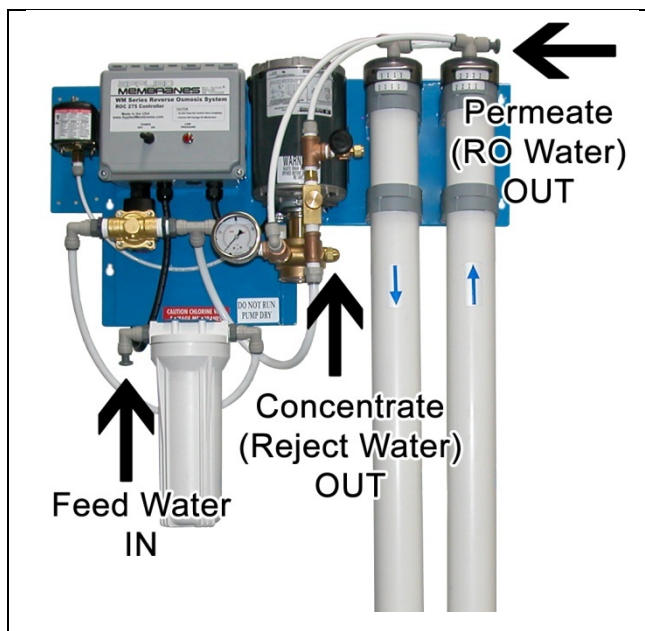
Connect the raw water supply to the inlet of the solenoid valve (P.O.C), observing the following:

- The line size shall be 1/2" or larger to minimize pressure loss.
- A manual valve may be installed on this line to shut off the water supply if it will ever be needed. Be sure that this valve in no way restricts the water flow when it is fully open.

Water supply min pressure 40 P.S.I. Max pressure 100 P.S.I. A pressure regulator may be required.

Concentrate/Reject Connection

Connect a line to the concentrate connection point on the skid (refer to picture). The drain must have a minimum capacity which meets or exceeds the concentrate output of your system. Check the Design Specification (page 3) for your model.



Permeate/Product Water Connection

Connect the product water line to the product connection point on the system (refer to picture). Run this line to your storage tank or other downstream equipment, observing the following:

- Run this line in such a manner as to minimize static head pressure in the product line.
- A check valve is recommended to prevent back flow to the RO membranes. This check valve should be installed on the output of the product connection point.
- The product line should have no restrictions to the product flow.
- Connect the product line to a bulkhead fitting at the top of the storage tank.

⚠ Caution: RO Membranes will fail immediately if the product water is allowed to flow backward into the elements. Use a check valve and ensure that there are no restrictions on the product flow to prevent backflow.

⚠ Caution: The highest point of the tubing should not be higher than four feet above the top of the RO modules, or the elements may be damaged.

1. Remove the bulkhead nut from the bulkhead fitting and place the bulkhead through the opening in the tank from the

ELECTRICAL CONNECTIONS

⚠ WARNING! Disconnect all the power supplies when performing any electrical wiring.

⚠ All electrical connections should be done by a qualified electrician and are to be in accordance with state and local codes.

Note: For Full Load Amps and Fuses Information, please see system design specifications on page 3. Provide circuit breaker protection as outlined in this chart.

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Voltages Codes:

- **116** = 110 Volts, Single Phase, 60 Hz
- **216** = 220 Volts, Single Phase, 60 Hz
- **215** = 220 Volts, Single Phase, 50 Hz

120 VAC 1 phase systems: The system has power cord provided on the system. Plug into electrical outlet that has been rated for the required amperage.

220 VAC 1 phase systems: The system has a power cord attached to the system. The cord is left without a connector on it. The customer is to supply a connector that matches the receptacle at the installation site. The system can also be hard wired into a disconnect that has an amperage rating to handle the system. The black and white wires are the hot leads and the green goes to a good ground. Follow all NEC and local electrical codes.

SERIES ROC-275 RO SYSTEM CONTROLLER INSTALLATION AND SETUP

Specifications

- Power: 240 VAC, 50/60Hz, 10 Watts
- Environment: -22°F to 140°F, indoor rated
- Enclosure: 8" X 6" X 4" (203mm X 152mm X 101mm)
- Front Panel: Overlay with power on/off switch and low pressure light.
- Inputs: Pressure switch activates ON at 9 psi, OFF at 15 psi.
- Delay on: Alarm activates 5 seconds after pressure switch activates.

Relay Outputs

- Pump Contactor: 20 amp @ 227 VAC, 1 HP @ 115 VAC, 2 HP @ 230 VAC

Installation: Power Wiring

Refer to the photograph and drawings on the following pages for location of all terminal strips, connectors and jumpers. All terminals on the board are labeled.

To open the control panel door, press down and turn the two (2) screws counterclockwise. Carefully lift the cover by rotating it to the top of the panel.

The terminal strip accepts 12-20 AWG size wires without special connectors. To remove or add wires to the terminal strip, push a 1/8" blade screwdriver into the corresponding center opening and pull down on the screwdriver for an upper terminal connection or pull up on the screwdriver for a lower terminal connection. Use two small screwdrivers to remove a jumper connection or jumper clip removal tool.

The control panel has one (1) 7/8" hole on the bottom of the panel and one (1) 7/8" hole on the right side to allow for external connections. The hole plug on the right side is to provide 230 or 208 VAC/60Hz/1 pH power to terminals L1 & L2. The hole plug on the bottom side is to provide signal wires and power accessory equipment. Remove the hole plug and use a strain relief to secure 12 AWG power wires.

Pretreatment Lockout Switch

In systems with pretreatment, a signal must be sent from the pretreatment unit to shut down the reverse osmosis unit during regeneration. Shutdown will prevent membrane damage due to untreated feed water and pump damage due to starvation. For multiple pretreatment contacts, wire these contacts in series.

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Tank Full Switch

For 2 level switch operation, the upper switch is connected to the tank full input and the lower switch is connected to the tank full low input. When both switches are clear, the RO unit will run. The RO unit will continue to run when the water level rises and the lower switch becomes active. When the upper switch becomes active, after the 5 second delay, the RO unit will shut down. FUL will show on the display. When the tank level drops and the upper level switch clears, the status LED will begin to flash and the RO unit will remain off. When the lower level switch clears, the LED will go off, and the RO will restart.

Dump Solenoid

For direct feed applications, the dump solenoid is used to relieve product pressure to drain when the pump turns off. Connect a wire between terminal 4 on the terminal strip to one lead from the solenoid. Connect the other lead from the solenoid to terminal L2 on the terminal strip. Connect the ground lead from the solenoid to terminal G on the terminal strip.

SYSTEM OPERATION

SERIES ROC-275 RO SYSTEM CONTROLLER OPERATION

Power On

When the power switch is turned on, the inlet solenoid valve and the pump contactor are energized and the RO system is started.

Low Pressure

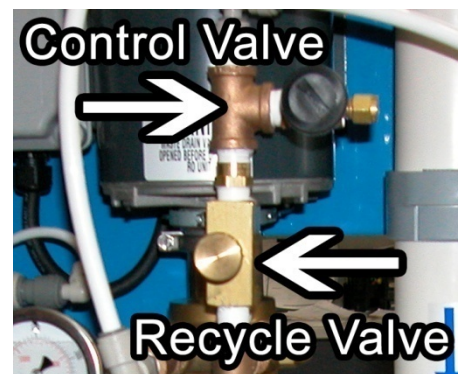
If a contact closure is received from the feed pressure switch, the inlet pressure relay is initiated and the low pressure indicator light goes on. If the switch stays closed for 5 seconds, the RO unit will stop. It will remain off until the low pressure condition is cleared and the unit is turned off and back on. There are no other indicators shown.



INITIAL SYSTEM START-UP

Refer to the P&ID on page 20 for valve and gauge locations.

1. Direct the product water tubing to drain.
2. Open the feed water supply valve.
3. Open the concentrate control valve (CV-1) fully counterclockwise.
4. Close the recycle valve (CV-2).
5. Press the power button to turn the system on. Note inlet water pressure must be at least 40 psi.



Caution: If the pump chatters loudly, it is starving for water (cavitating). Turn the unit OFF immediately to prevent pump damage. Correct the low pressure condition before proceeding.

6. If incoming pressure is too high, an inlet pressure regulator (not included) may be installed. This should be set at 40 psi.
7. Some fittings may have loosened during shipment. Check for leaks at all tube fittings and threaded joints.

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8. Allow the unit to run for at least 30 minutes to flush the preservative solution from the system.
9. Once the preservative solution has been flushed from the system, shut down the system by pressing the 'power' button and redirect the permeate flow to desired product storage tank or down-stream equipment.
10. Restart the System.
11. Adjust the Control Valve (CV-1) and Recycle Valve (CV-2) until the specified permeate flow and recycle flow are obtained.

⚠ Caution: Do not exceed the rated permeate flow or the rated recycle flow – otherwise membranes may be irreversibly fouled.

⚠ Caution: Do not operate the system with the control valve closed.

Note: By setting the feed pressure as low as possible to meet the application requirement, the service life of the pump and RO elements will be optimized. The system should be run continuously when possible, rather than go through frequent start/stop cycles.

12. Run unit and check again for leaks, repair prior to placing unit in service.
13. Test the operation of the pressure switch by slowly closing the inlet water supply valve. The unit should shut off after a short 5 second time delay.

⚠ Caution: If the unit does not shut off, turn the unit OFF immediately to prevent pump damage. Disconnect the electrical power source, then check the wiring and replace or adjust the switch if necessary. (Pressure switch adjustment instructions in maintenance on page 15.)

14. Once all the desired flows are set, allow the system to run for approximately 30 minutes. Then record the performance information using the system operation data log on page 12. The values recorded at startup will be important for determining system performance at a later date.

OPERATING DO's & DON'Ts

DO:

1. Change the cartridge filters regularly
2. Monitor the system and keep a log daily
3. Run the system, as much as possible, on a continuous basis.
4. Adjust the system recovery to the recommended value

DON'T

1. Permit chlorine in the feed water.
2. Shut down the system for extended periods.
3. Close the throttle valve completely.
4. Operate the system with insufficient feed flow.

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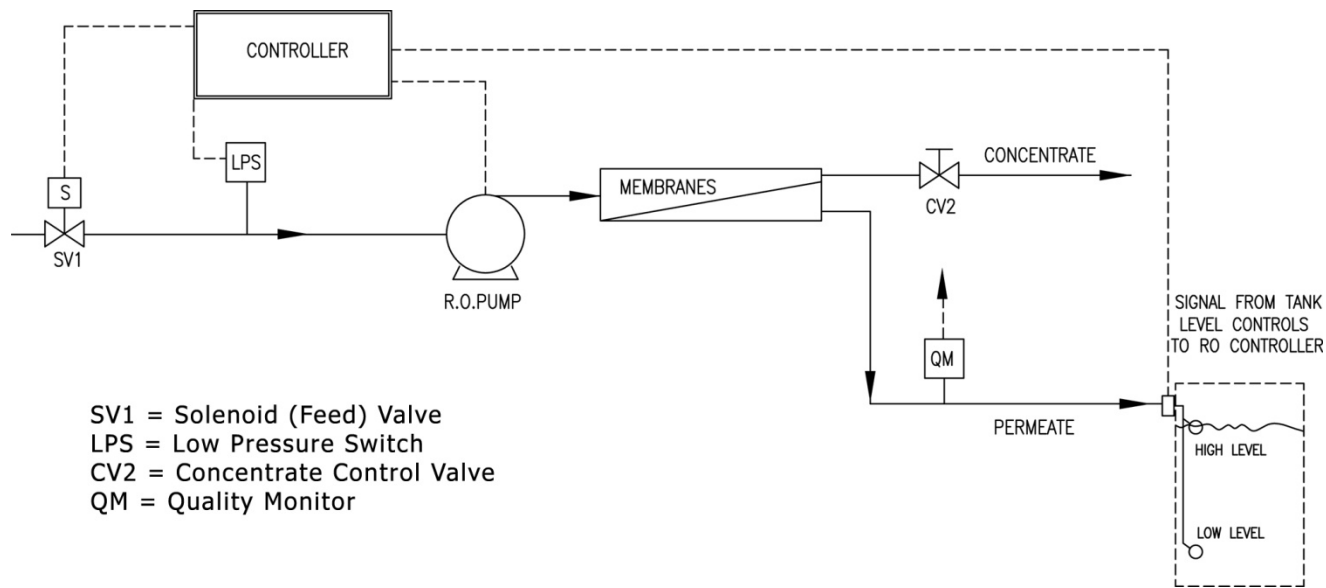
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SYSTEM AUTOMATION

When a tank level control (sold separately) is installed, the system will automatically turn on when the water level in the permeate tank reaches the mid level float, and turn off when the water meets the high level float.

Options with two or three float switches can be added to this system:

- High level float switch: Signals when tank is full and shuts down the unit.
- Low level float switch: Signals when the tank is half empty and turns the unit on.
- (Optional third switch) Tank empty switch: Signals when the tank is empty to shut off the repressurization pump (not included with the system).



Example of typical start-up sequence:

1. Water level in tank drops to low level.
2. Solenoid opens to allow feed water into the system.
3. Incoming feed must meet/exceed low pressure setpoint for the pump to turn on. (This will indicate sufficient inlet water supply to operate the pump without cavitation.)
4. Pump will start after delay (typically 5-10 seconds).
5. Permeate and concentrate flows are determined by manual control of concentrate valve.
6. System will continue to run until the water level in the tank reaches high level.
7. Once the water reaches high level, pump will stop and a flush cycle will begin. The solenoid will close once the flush is complete.

SYSTEM SHUT-DOWN

1. Flip the power switch into the OFF Position.
2. Turn off the main power disconnect. This removes all power from both the power and control enclosures.
3. If the RO System is to be shut down for more than a week, a membrane preservative should be used. Refer to the instructions for preserving the system.
4. When the system is restarted after extended shutdown, both permeate and concentrate should be diverted to the drain for at least 30 minutes.

SYSTEM MONITORING AND RECORD KEEPING

The system should be monitored and all pertinent data recorded on a daily basis. Data is needed to determine the operating efficiency and for performing system maintenance. The latter includes cleaning of the membranes, adjusting the operating conditions, replacement of the membranes, and antiscalant use. Use the system data logging form the following page.

*Membrane warranty claims cannot be processed without adequate operating data and history of the RO System.

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DATA LOG

	Data for Each Date/Time						
Date/Time							
Temperature (Deg. F)							
Feed							
Pressures (PSI)							
Feed							
System							
Media Filter IN							
Media Filter* OUT							
Cartridge Filter* IN							
Cartridge Filter OUT							
Flow (GPM)							
Permeate** (P)							
Concentrate (C)							
Feed = P + C							
TDS (PPM)							
Feed							
Permeate							
Other							
pH, Feed							
Cl ₂ , Feed (ppm)							
Scale Inhibitor (ppm)							

* If Included.

**Temperature and net pressure of the feed water must be taken into account before comparing or evaluating the performance of the reverse osmosis system.

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DATA NORMALIZATION – SYSTEM OPERATING TEMPERATURE

The water temperature is one of the key factors in the performance of the reverse osmosis membrane element. A higher temperature will result in more product flow and a lower temperature will result in less product flow.

All reverse osmosis membrane elements and systems are rated at 77° Fahrenheit (25° Celsius).

To find the membrane permeate rate at a different temperature, follow these steps:

Find the temperature correction factor (TCF) from the below table. Divide the rated permeate flow at 77° Fahrenheit by the temperature correction factor. The result is the permeate flow at the desired temperature.

Feed Water Temperature C °	Feed Water Temperature F°	TCF for Thin Film
1	33.8	3.64
2	35.6	3.23
3	37.4	3.03
4	39.2	2.78
5	41	2.58
6	42.8	2.38
7	44.6	2.22
8	46.4	2.11
9	48.2	2.00
10	50	1.89
11	51.8	1.78
12	53.6	1.68
13	55.4	1.61
14	57.2	1.54
15	59	1.47
16	60.8	1.39
17	62.6	1.34

Feed Water Temperature C °	Feed Water Temperature F°	TCF for Thin Film
18	64.4	1.29
19	66.2	1.24
20	68	1.19
21	69.8	1.15
22	71.6	1.11
23	73.4	1.08
24	75.2	1.04
25	77	1.00
26	78.8	0.97
27	80.6	0.94
28	82.4	0.91
29	84.2	0.88
30	86	0.85
31	87.8	0.83
32	89.6	0.80
33	91.4	0.77
34	93.2	0.75

Feed Water Temperature C °	Feed Water Temperature F°	TCF for Thin Film
35	95	0.73
36	96.8	0.71
37	98.4	0.69
38	100.4	0.67
39	102.2	0.65
40	104	0.63
41	105.8	0.61
42	107.6	0.60
43	109.4	0.58
44	111.2	0.56
45	113	0.54
46	114.8	0.53
47	116.6	0.51
48	118.4	0.49
49	120.2	0.47
50	122	0.46

TROUBLESHOOTING

GENERAL TROUBLESHOOTING

PROBLEM	POSSIBLE CAUSE	SOLUTION
Inlet pressure low	Low supply pressure	Correct incoming supply pressure
	Cartridge filters plugged	Change filters
	Solenoid valve malfunction	Replace solenoid valve and/or coil
Permeate flow low	Low water temperature	Adjust water temperature
	Low system pressure	Adjust control valve
	Membranes fouled	Clean membranes
Pump noisy	Low inlet flow	See "Inlet pressure low"
Permeate quality poor	Low inlet flow	Adjust control valve
	Low system pressure	See above
	Recovery too high	Reduce recovery
	Membranes fouled	Clean membranes
	Membranes damaged	Replace membranes
Feed pressure present, even after tank full	Solenoid malfunction	Replace solenoid
	Coil malfunction	Replace coil
	Controller malfunction	Inspect or replace

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SYSTEM MAINTENANCE

Maintain proper operating conditions.

(See section: “Design Basis” on page 3)

SEDIMENT PRE-FILTER CARTRIDGE

When to Change Sediment Prefilter Cartridge

Sediment cartridge Filters should be changed regularly to maintain proper pump pressure and flow. If the pressure drop across the cartridge filter (as indicated by the differential between the filter inlet and filter outlet pressure gauges) increases by 10 psi, the cartridge filters should be changed.

Changing Cartridge Filters

1. Turn unit off.
2. Close inlet supply valve.
3. Un-assemble the filter housing (twist the sump counter-clockwise).
4. Remove and inspect the cartridge. Replace as needed.
5. Before replacing housing, insure that O ring seal is lubed and placed in groove of housing. Inspect seal and replace as needed.
6. Assemble housing (turn the sump clockwise into the cap until tight).



MEMBRANE CLEANING

When to Clean Membranes

In normal operation, the membrane in reverse osmosis elements can become fouled by mineral scale, biological matter, and grime. These deposits build up during operation until they cause loss in water output or loss of salt rejection, or both. **Elements should be cleaned whenever the water output rate drops by 10 percent from its initial flow rate** (the flow rate established during the first 24 to 48 hours of operation), or when salt content in the product water rises noticeably.

⚠ Note: Check water temperature and apply temperature correction (page 13) to determine if flow loss is due to low feedwater temperature. A malfunction in the pretreatment, pressure control or pump can cause a drop in feedwater delivery pressure, feedwater flow, or product water output, or an increase in salt passage. If such adjustments are needed, the element may not require cleaning.

Common Foulants and Their Associated Symptoms

Foulant	Symptoms	Solution/Cartridge Part #
Biological Growth	Element may have strong odor, possible mold growth on scroll end. Element will likely exhibit low permeate flow, but salt rejection will usually be as good if not better than original test.	Alkaline Cleaner: AM-22 Cartridge: C-C2510-A22
Carbonate Scale	Usually on tap water or brackish water elements only. The element may be noticeably heavier than normal. Element will exhibit low permeate flow and poor salt rejection.	Acid Cleaner: AM-11 Cartridge: C-C2510-A11
Iron Fouling	Rust coloring seen on end of scroll. Possibly some large rust flakes from iron plumbing. Element will exhibit low permeate flow and poor salt rejection. Rust colored reject water may be seen on start of baseline test	Acid Cleaner: AM-11 Cartridge: C-C2510-A11

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Cleaning Sequence

Whether the system needs acid or alkaline cleaning will depend on the type of foulant suspected. We recommend acid cleaning be performed first, even when alkaline cleaning is desired. If system performance recovers with acid cleaning, then alkaline cleaning is not necessary.

1. ACID CLEANING (AM-11, C-C2510-A11)
2. FLUSH
3. ALKALINE CLEANING (AM-22, C-C2510-A22)
4. FLUSH

Cleaning Procedure Using Membrane Cleaning Cartridges

1. Shut down the RO system.
2. Disconnect the permeate line and divert permeate to drain during cleaning.
3. Remove the pre-filter cartridge from the filter housing.
4. Replace the sediment pre-filter cartridge with the cleaning cartridge and assemble into the filter housing.
5. Turn system ON. After 30-40 seconds*, shut down the system.
6. Let the membrane(s) soak in the cleaning solution overnight.
7. Remove the empty cleaning cartridge and replace it with the original filter.
8. Restart the system. Direct the permeate to drain for 5 minutes.
9. Go back to normal operations.

*Instead of time, you may use one of the following criteria:

- a. Run the system until the pH of the concentrate is almost the same as the cleaning solution.
 - AM-11 pH = 3 • AM-22 pH = 10-12
- b. Permeate rate for the system drops to a very low value.



Caution: Handle all chemicals with care. Wear protective clothing and eye protection.



Note: The system must be flushed thoroughly between acid and alkaline cleanings.

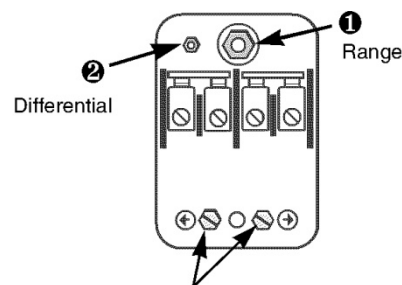
MEMBRANE REPLACEMENT

1. Remove U-pins from vessel.. Use two screw drivers on each side to push end caps out of vessel slowly.
2. Push the membrane out through the vessel from the feed end towards the concentrate end.
3. If there is not enough room to remove the membrane from the vessel through the concentrate end it can be removed from the feed end.
4. Install the new membrane from the feed end. Ensure that the brine seal is oriented towards the feed end. Check that the end adapters and all o rings are in good condition and in position.
5. Replace end plug(s) using glycerin lubricant as required on O rings (AMI Model No. H-C111DC).
6. It is highly recommended to have a spare set of O-rings and brine seal while replacing the membranes.
7. As the membranes may have preservative or be contaminated, please wash your hands thoroughly after replacing membranes.

LOW PRESSURE SWITCH ADJUSTMENT

Adjust in the proper sequence:

1. **Range:** Turn nut down (clockwise) for higher cut-in pressure, or up (counterclockwise) for lower cut-in.
2. **Differential:** Turn nut down (clockwise) for higher-cut-out pressure, or up (counterclockwise) for lower cut-out.



Grounding provisions: #10-32 screws.
Torque screws to 15–20 lb-in (1.7–2.3 N•m).

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SHUT-DOWN AND STORAGE



Caution: Handle all chemicals with care. Wear protective clothing and eye protection.

MEMBRANE STORAGE (OUTSIDE OF RO SYSTEM)

To prevent bacterial growth and help maintain flux, it is recommended that elements be immersed in a solution 20.0 percent, by weight, AM-225 and 1.0 percent by weight AM-88.

Prepare the Solution: Make a water solution by adding about 1 ounce of AM-88 per gallon of water (use RO permeate if possible). Also add about 1.5 lbs of AM-225 per gallon of water.

Storing Elements: Mix the solution well. Soak the elements in this solution for 1 hour. Drain and seal in plastic bags.

RO SYSTEM STORAGE AND BIOCIDAL PROTECTION

To prevent biological growth during storage, shipping, or system shutdowns, it is recommended that RO systems and membranes be immersed in a solution of AM-88. This can be performed using a membrane preservative cartridge, part # C-C2510-A88.

System Preserving Procedure

1. Shut down to RO system.
2. Disconnect the permeate line and direct permeate to drain during cleaning/preserving.
3. Remove the 5M filter cartridge from the pre-filter housing.
4. Replace the filter cartridge with the preservative cartridge and assemble into the filter housing.
5. Turn system ON. After 30-40 seconds, shut down the system.
6. Drain the system of the permeate solution as much as possible by opening a valve/fitting at a low point in the system. Close off the inlet and outlet to the membrane/system.

Flushing out Preservative/Re-start Procedure:

1. Open valves etc. and put the system back in the position it was before preserving.
2. Remove the empty preservative cartridge and replace it with a new cartridge filter.
3. Re-start the system. Direct permeate to drain for at least 30 minutes.
4. Return to normal operation.

DISINFECTION AND STERILIZATION OF RO ELEMENTS

An excellent disinfectant for spiral elements is 0.1 percent **AM-88**. This solution inhibits bacterial growth while maintaining the high flux and salt rejection of elements. It is made by dissolving one ounce of AM-88 in 8 gallons of water. Elements should be flushed with this solution before storage or at the beginning of long down periods.

Sterilization can be achieved with formaldehyde. However, this reagent should not be used unless the element is first operated for 24 hours. Otherwise, severe flux losses may occur in the membrane. After this initial period, the membrane will tolerate any customary formaldehyde concentration used in sterilization.

Other disinfectants and sterilants can be used. Hydrogen peroxide at 100 to 1000 ppm (0.01 to 0.1 percent) is effective at room temperature. Hydrogen peroxide will damage the membrane at higher temperatures, however. Chloramine, Chloramines T and N chloroisocyanurates can be used in spiral elements. They are not very effective as sterilants, however. Also, if they are used in combination with an already heavily fouled (biological) test loop or system, flux losses are occasionally experienced from dead bacterial matter in the feed stream depositing on membrane surfaces. Chlorine dioxide, free of hypochlorite or chlorine, may be used as a disinfectant. Both Chloramines and chlorine dioxide readily pass through membranes, appearing in the permeate.

Chlorine (hypochlorite) is not recommended for disinfecting membrane elements. Permanent damage will occur.

Iodine, quaternary compounds, and phenolic disinfectants cannot be used with spiral elements. All three cause severe flux losses.

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COMPONENT IDENTIFICATION- STANDARD FEATURES

Component Identification by P&ID <small>from P&ID on page 20</small>			System Model Numbers <small>(all voltages unless specified)</small>							
			WM-12521A	WM-22521A	WM-32521A	WM-42521A	WM-225A	WM-325A	WM-425A	WM-24A
#	Part No.	Description	Qty.	Qty.	Qty.	Qty.	Qty.	Qty.	Qty.	Qty.
1	H-H38XWW33	Housing for Prefilter (¾" In/Out)	1	1	1	1	1	1	1	-
1	H-H34XBE33	Housing for Prefilter (¾" In/Out)	-	-	-	-	-	-	-	1
1	H-F1005CF	Prefilter Sediment Cartridge, 5 Micron	1	1	1	1	1	1	1	1
2	8210P095	Solenoid valve, ¾" normally closed	1	1	1	1	1	1	1	-
3	I-ROC275	RO System Controller ROC-275	1	1	1	1	1	1	1	1
3	I-PS915CUL	Pressure switch, low (Mounted on control assembly)	1	1	1	1	1	1	1	1
4	3000-8	Recycle Valve, ¾" Brass (CV-2)	1	1	1	1	1	1	1	-
4	300010BR	Recycle Valve, ½" Brass (CV-2)	-	-	-	-	-	-	-	1
5	2232B-3MM	Check Valve, ¾" Brass	1	1	1	1	1	1	1	-
5	OPC-8P-B-V-1	Check Valve, ½" Brass	-	-	-	-	-	-	-	1
6	112B100F31XX	RO Pump, Procon Brass Clamp-On	1 (-216)	1 (-216)	1 (-216)	-	-	-	-	-
6	112A125F11XX	RO Pump, Procon Brass Clamp-On	1 (-215)	1 (-215)	1 (-215)	1 (-216)	-	-	-	-
6	112A140F11XX	RO Pump, Procon Brass Clamp-On	-	-	-	1 (-215)	-	-	-	-
6	114B240F11BA250	RO Pump, Procon Brass Clamp-On	-	-	-	-	1 (-216)	1 (-216)	1 (-216)	-
6	114E265F11XX	RO Pump, Procon Brass Bolt-On	-	-	-	-	1 (-215)	1 (-215)	1 (-215)	-
6	114E330F11XX	RO Pump, Procon Brass Bolt-On	-	-	-	-	-	-	-	1
6	P-MP828	Motor for Pump, 1/3HP @ 60Hz	1 (-216)	1 (-216)	1 (-216)	-	-	-	-	-
6	P-MP871	Motor for Pump, 1/2HP@60Hz, 1/3HP@50Hz	1 (-215)	1 (-215)	1 (-215)	1 (-216)	-	-	-	-
6	P-MP872	RO Motor, ¾ HP, 110-220v/60Hz	-	-	-	-	1 (-216)	1 (-216)	1 (-216)	-
6	P-MG573	Motor for Pump, 1HP@60Hz, 3/4HP@50Hz	-	-	-	1 (-215)	-	-	-	1 (-216)
6	P-MG574	Motor for Pump, 1HP @ 50Hz	-	-	-	-	1 (-215)	1 (-215)	1 (-215)	1 (-215)
7	I-PG400NOS	Pressure Gauge, 0-400 PSI	1	1	1	1	1	1	1	1
8	M-T2521AHF	RO Membrane, 2.5"x21", High Flow	1	2	3	4	-	-	-	-
	M-T2540AHF	RO Membrane, 2.5"x40", High Flow	-	-	-	-	2	3	4	-
	M-T4040ALE	RO Membrane, 4.0"x40", Low Energy	-	-	-	-	-	-	-	2
8	PV2521PVCAU	PVC Membrane Housing, 2.5"x21"	1	2	3	4	-	-	-	-
8	PV2540PVCAU	PVC Membrane Housing, 2.5"x40"	-	-	-	-	2	3	4	-
8	PV4040PWG	PVC Membrane Housing, 4.0"x40"	-	-	-	-	-	-	-	2
9	FNV-4MT-B	Concentrate Control Valve ¼" (CV-1)	1	1	1	1	1	1	1	-
9	300010BR	Concentrate Control Valve ½" (CV-1)	-	-	-	-	-	-	-	1

Voltage Codes: -216 = 220-240V/1PH/60H -215 = 220-240V/1PH/50HZ,

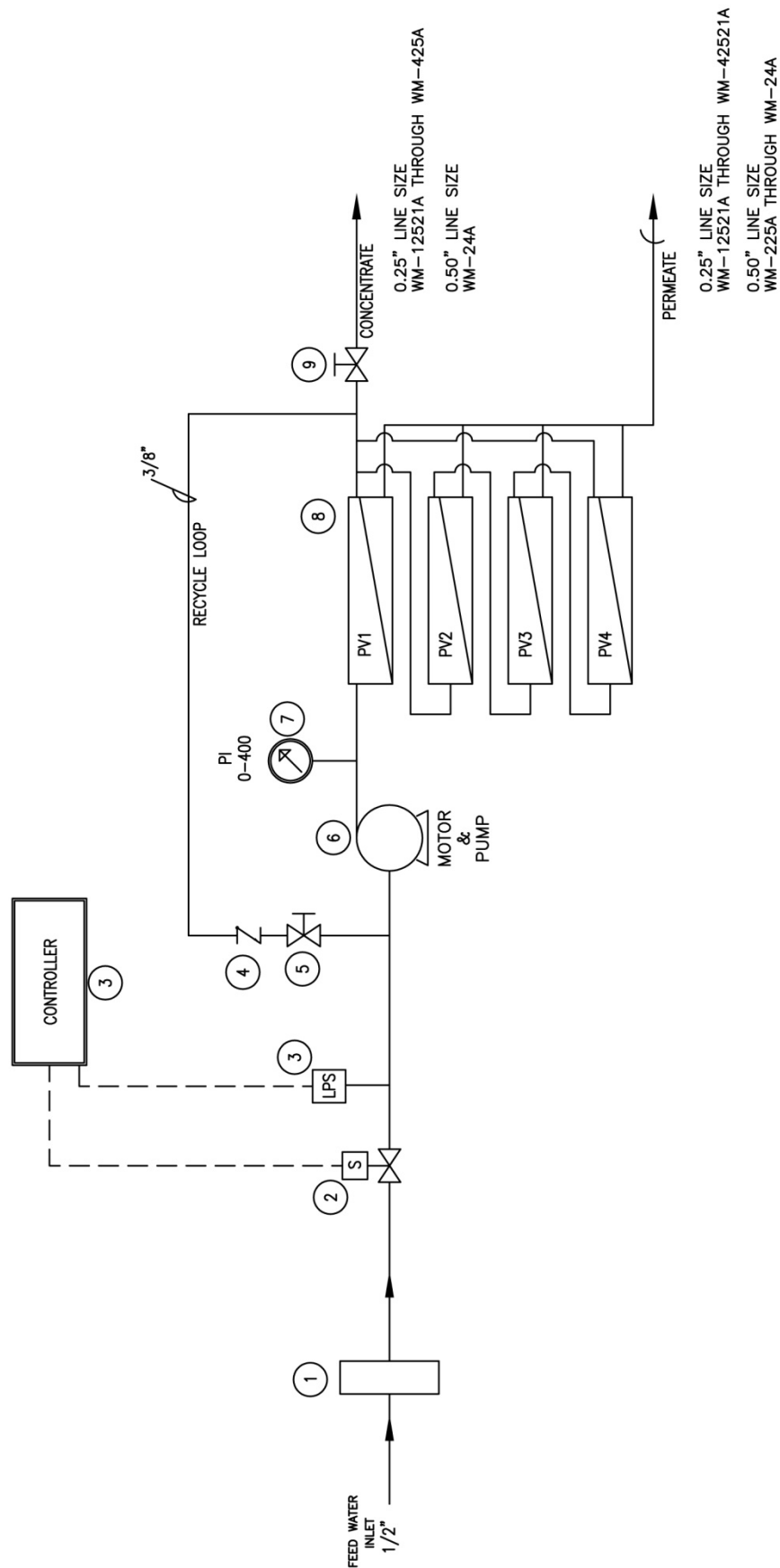
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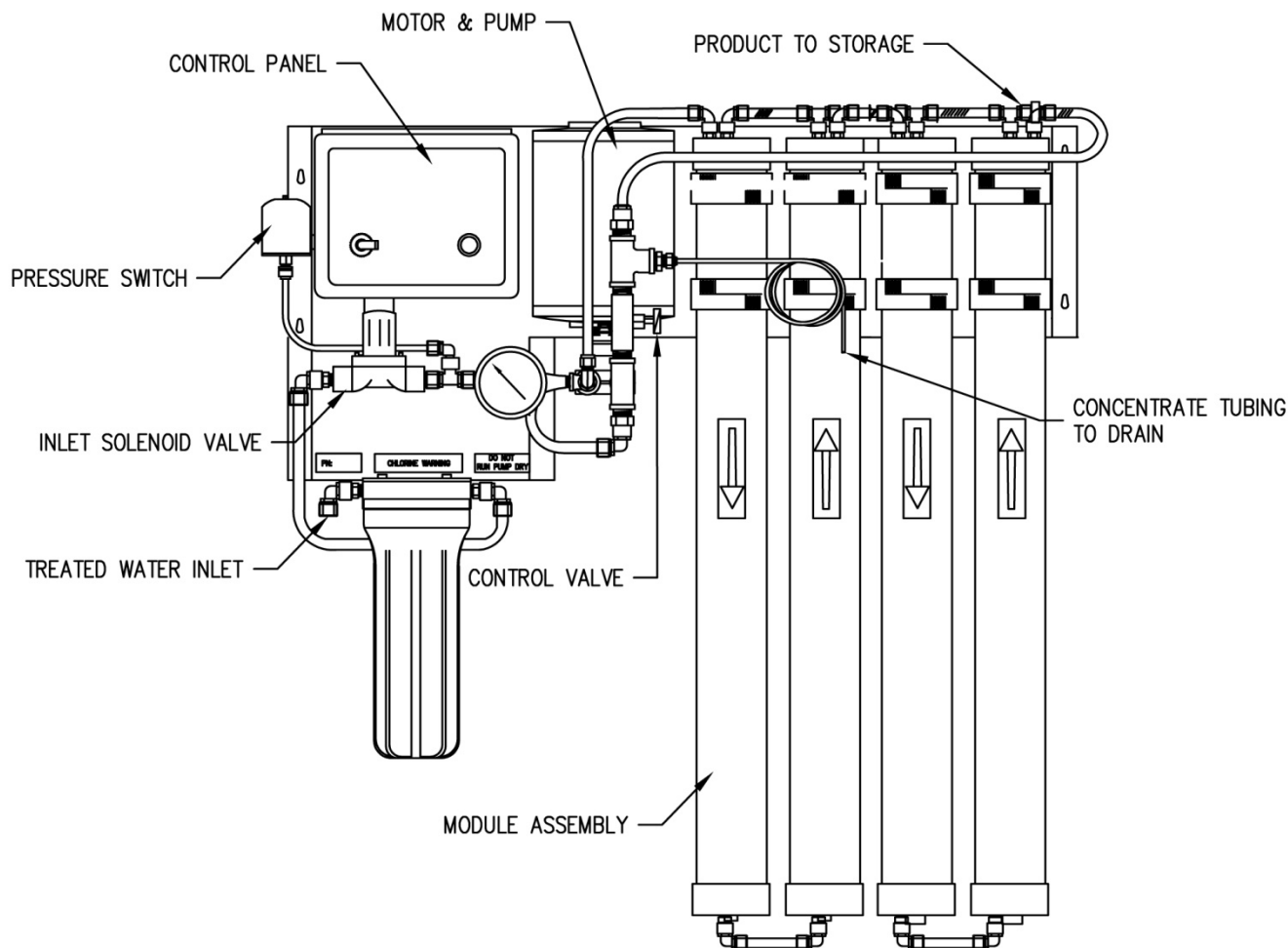
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SYSTEM GENERAL ARRANGEMENT



REPLACEMENT PARTS AND CONSUMABLES

Model No.	Description
H-F1005CF	5 Micron Sediment Pre-Filter Cartridge
C-C2510-A11	Cleaning Cartridge – Acid for Scale Removal
C-C2510-A22	Cleaning Cartridge – Alkaline for Organics Removal

System (any voltage)	# of Mem/ Vessel	RO Membrane Element	Pressure Vessel (complete)	End Plug for Vessel (each)	U-Pin for Vessel (each)	External O- Ring for Vessel (each)	Internal O-Ring for Vessel (each)
WM-12521A	1	M-T2521AHF	PV2521PVCAU	PV-EP25PVC	PV-RR25U1	PV-OR40-330	PV-OR40-210
WM-22521A	2	M-T2521AHF	PV2521PVCAU	PV-EP25PVC	PV-RR25U1	PV-OR40-330	PV-OR40-210
WM-32521A	3	M-T2521AHF	PV2521PVCAU	PV-EP25PVC	PV-RR25U1	PV-OR40-330	PV-OR40-210
WM-42521A	4	M-T2521AHF	PV2521PVCAU	PV-EP25PVC	PV-RR25U1	PV-OR40-330	PV-OR40-210
WM-225A	2	M-T2540AHF	PV2540PVCAU	PV-EP25PVC	PV-RR25U1	PV-OR40-330	PV-OR40-210
WM-325A	3	M-T2540AHF	PV2540PVCAU	PV-EP25PVC	PV-RR25U1	PV-OR40-330	PV-OR40-210
WM-425A	4	M-T2540AHF	PV2540PVCAU	PV-EP25PVC	PV-RR25U1	PV-OR40-330	PV-OR40-210
WM-24A	2	M-T4040ALE	PV4040PWG	PV-EP40PD1212	PV-RR40U	PV-OR40-342	PV-OR40-210

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- SELLER hereby warrants to CUSTOMER that the goods herein described will be free from any liens or encumbrances, that good title to said goods will be conveyed to CUSTOMER by sale of same.

SELLER warrants materials of its own manufacture against defects in material and workmanship under normal conditions of usage and service for one year from whichever of the following events occurs first:

- First use of the system
- Three (3) months following date of shipment from Vista.

Materials not manufactured by seller receive only such warranty, if any, of the manufacturer thereof and which are hereby assigned to CUSTOMER without recourse to SELLER.

SELLER'S obligation under this warranty is limited to and shall be fully discharged by repairing or replacing any defective part FOB its works. SELLER shall not be liable for repair or alterations made without SELLER's prior written approval; for membrane elements becoming plugged by suspended matter, precipitates, or biological growth; or failure to properly maintain the element. SELLER shall not be liable for damages or delays caused by defective material. Elements returned to SELLER for warranty examination must be shipped freight prepaid.

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