

ECO-Series



REVERSE OSMOSIS
SYSTEM

USER MANUAL

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Your ECO-Series Reverse Osmosis System is a durable piece of equipment which, with proper care, will last for many years. This User Manual outlines installation, operation, maintenance and troubleshooting details vital to the sustained performance of your system.

If your system is altered at the site of operation, or if the feedwater conditions change, please contact your local dealer or distributor to determine the proper recovery for your application

DO NOT, UNDER ANY CIRCUMSTANCES, REMOVE ANY CAUTION, WARNING OR OTHER DESCRIPTIVE LABELS FROM THE SYSTEM.

IN ORDER TO MAINTAIN THE MANUFACTURER'S WARRANTY, AN OPERATING LOG MUST BE MAINTAINED AND COPIES WILL NEED TO BE SENT TO YOUR LOCAL DEALER OR DISTRIBUTOR FOR REVIEW.

PRIOR TO OPERATING OR SERVICING THE REVERSE OSMOSIS SYSTEM, THIS USER MANUAL MUST BE READ AND FULLY UNDERSTOOD. KEEP THIS AND OTHER ASSOCIATED INFORMATION FOR FUTURE REFERENCE AND FOR NEW OPERATORS OR QUALIFIED PERSONNEL NEAR THE SYSTEM.

The Safety section of this User Manual outlines the various safety headings used throughout this manual's text and are enhanced and defined below:



CAUTION: INDICATES STATEMENTS THAT ARE USED TO IDENTIFY CONDITIONS OR PRACTICES THAT COULD RESULT IN EQUIPMENT OR OTHER PROPERTY DAMAGE.



WARNING: INDICATES STATEMENTS THAT ARE USED TO IDENTIFY CONDITIONS OR PRACTICES THAT COULD RESULT IN INJURY OR LOSS OF LIFE. FAILURE TO FOLLOW WARNINGS COULD RESULT IN SERIOUS INJURY OR EVEN DEATH.



ELECTRICAL HAZARD: INDICATES STATEMENTS THAT ARE USED TO IDENTIFY HIGH-VOLTAGE AND POTENTIAL SHOCK/ ELECTROCUTION.

STATEMENTS IN BOLD AND ALL CAPITALS ARE ADVISORY OR INFORMATIONAL STATEMENTS OF PARTICULAR IMPORTANCE TO THE HEADING UNDER WHICH THEY ARE FOUND.

PRECAUTIONARY STATEMENTS



PLEASE READ THE ENTIRE MANUAL BEFORE PROCEEDING WITH THE INSTALLATION AND START-UP. FAILURE TO FOLLOW INSTRUCTIONS OR OPERATING PARAMETERS MAY LEAD TO THE PRODUCT'S FAILURE, WHICH CAN CAUSE PROPERTY DAMAGE AND/OR PERSONAL INJURY.



DO NOT USE WHERE THE WATER IS MICROBIOLOGICALLY UNSAFE OR OF UNKNOWN QUALITY WITHOUT ADEQUATE DISINFECTION BEFORE OR AFTER THE SYSTEM.



ALWAYS TURN OFF THE UNIT, SHUT OFF THE FEEDWATER, RELIEVE PRESSURE, AND DISCONNECT THE ELECTRICAL POWER BEFORE WORKING ON THE UNIT.



DO NOT CLOSE THE CONCENTRATE VALVE COMPLETELY.



PRE-TREATMENT MUST BE SUFFICIENT TO ELIMINATE CHEMICALS, ORGANICS OR INORGANICS THAT COULD ATTACK THE MEMBRANE MATERIAL.



DO NOT OPERATE THE SYSTEM WITH INSUFFICIENT FEED FLOW. NEVER ALLOW THE PUMP TO RUN DRY.



NEVER ALLOW THE UNIT TO FREEZE OR OPERATE WITH A FEEDWATER TEMPERATURE ABOVE 85°F.



DO NOT PERMIT CHLORINE TO BE PRESENT IN THE FEED WATER.



DO NOT SHUT DOWN THE SYSTEM FOR EXTENDED PERIODS. IT IS BEST TO RUN THE SYSTEM AS MUCH AS POSSIBLE ON A CONTINUOUS BASIS.



ELECTRICAL INSTALLATION SHOULD BE DONE BY QUALIFIED, TRAINED ELECTRICIANS. INSTALLATION SHOULD BE TO LOCAL CODES.

DO

- Change the cartridge filters regularly.
- Monitor the system and keep a daily log.
- Run the system as much as possible on a continuous basis.
- Adjust the system recovery to the recommended value.
- Always feed the pump with filtered water.

**DON'T**

- Permit chlorine to enter or be present in the feed water.
- Shut down the system for extended periods.
- Close the throttle valve completely.
- Operate the system with insufficient feed flow or pressure.
- Operate the pump dry.



Nothing has a greater effect on a reverse osmosis system than the feed water quality. If your system is altered at the site of operation or if the feed water conditions change, please contact your local dealer or distributor to determine the proper recovery for your application. Before starting the RO system it is strongly suggested to obtain an up to date water analysis of the water to be treated.



IT IS VERY IMPORTANT TO MEET THE MINIMUM FEED WATER AND OPERATING REQUIREMENTS OUTLINED IN THIS MANUAL. FAILURE TO DO SO WILL CAUSE DAMAGE OR FAILURE OF THE SYSTEM COMPONENTS AND MEMBRANES. DAMAGE TO THE SYSTEM DUE TO OPERATION OUTSIDE OF THE SPECIFICATIONS OUTLINED IN THIS MANUAL WILL VOID THE MANUFACTURERS WARRANTY. CHECK YOUR FEED WATER CHEMISTRY AND, IF NECESSARY, CONSULT WITH YOUR LOCAL DEALER OR DISTRIBUTOR BEFORE START UP OF THE SYSTEM.

OPERATING LIMITS*

Design Temperature, °F	77	Maximum Turbidity, NTU	1
Maximum Feed Temperature, °F	85	Maximum Free Chlorine, ppm	0
Minimum Feed Temperature, °F	40	Maximum TDS, ppm	2000
Maximum Ambient Temperature, °F	120	Maximum Hardness, gpg	0
Minimum Ambient Temperature, °F	40	Maximum pH (continuous)	10
Maximum Feed Pressure, PSI	85	Minimum pH (continuous)	4
Minimum Feed Pressure, PSI	45	Maximum pH (cleaning 30 minutes)	13
Maximum Operating Pressure, PSI	200	Minimum pH (cleaning 30 minutes)	1
Maximum SDI Rating	< 3		

*If any of the feed water parameters are not within the limits given, consult your local dealer or distributor for assistance.



HIGHER TDS AND/OR LOWER TEMPERATURES WILL REDUCE THE SYSTEM'S PRODUCTION.



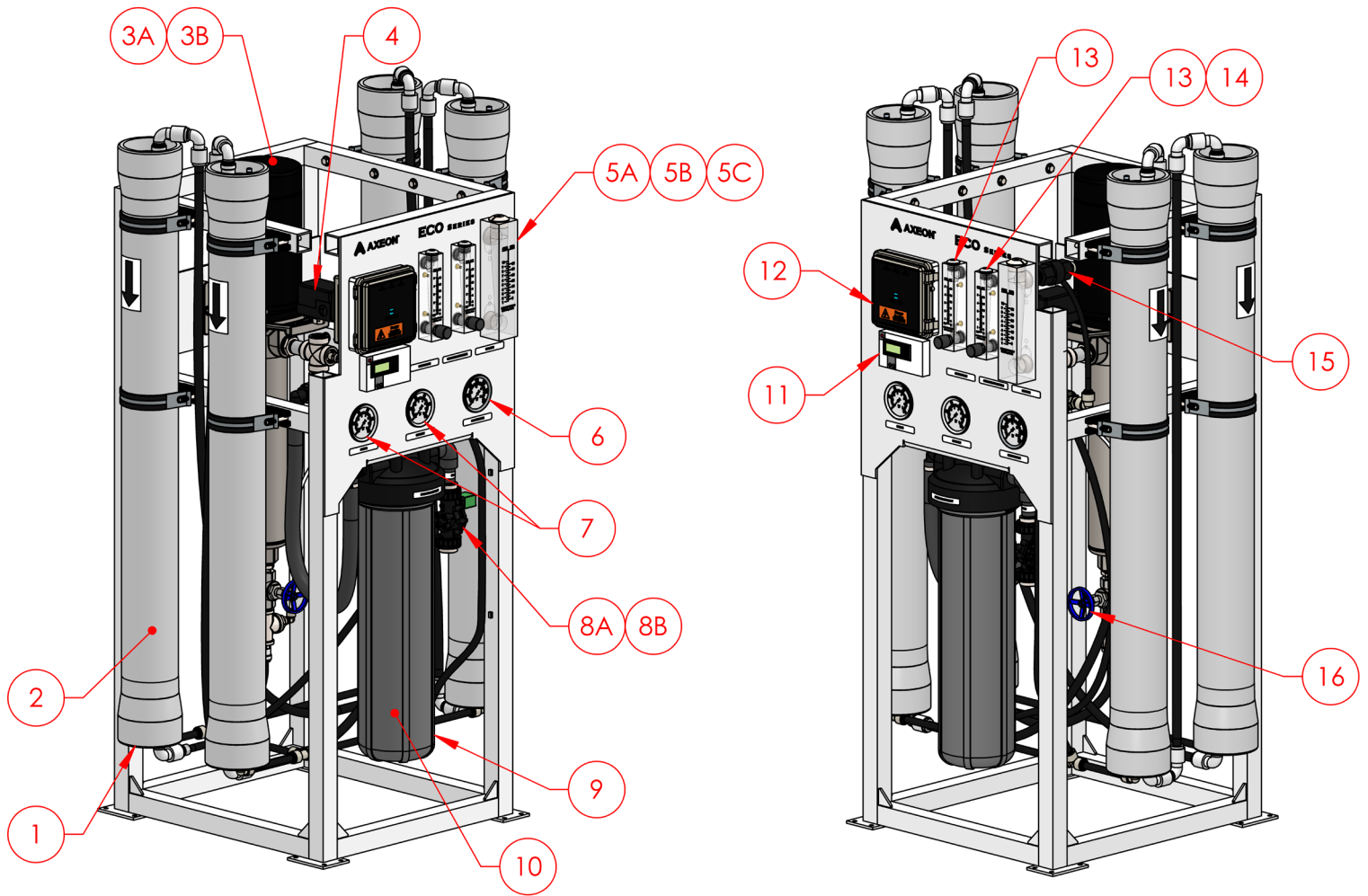
DO NOT EXCEED THE MAXIMUM OPERATING PRESSURE.

MODELS	ECO-2000	ECO-4000	ECO-6000	ECO-8000
DESIGN				
Configuration	Single Pass	Single Pass	Single Pass	Single Pass
Feedwater TDS max (ppm)	2,000	2,000	2,000	2,000
Standard Recovery with Recycle %	Up to 60	Up to 75	Up to 75	Up to 75
FLOW RATES				
Permeate Flow Rate (gpd / lpd)	2,000 / 7,570	4,000 / 15,140	6,000 / 22,710	8,000 / 30,285
Permeate Flow Rate (gpm / lpm)	1.39 / 5.26	2.78 / 10.45	4.17 / 15.79	5.56 / 21.05
Concentrate Flow Rate (minimum)	3.00 gpm	3.00 gpm	3.00 gpm	3.00 gpm
Concentrate Recycle Flow Rate	Up to 2.00 gpm	Up to 5.00 gpm	Up to 5.00 gpm	Up to 5.00 gpm
CONNECTIONS				
Feed (inch)	3/4 FNPT	3/4 FNPT	3/4 FNPT	3/4 FNPT
Permeate (inch)	1/2 QC	1/2 QC	1/2 QC	1/2 QC
Concentrate (inch)	1/2 QC	1/2 QC	1/2 QC	1/2 QC
MEMBRANE				
Membrane Quantity	1	2	3	4
Membrane Size	4040	4040	4040	4040
Nominal TDS Rejection %	99.20	99.20	99.20	99.20
VESSELS				
Vessel Array	1	1:1	1:1:1	1:1:1:1
Vessel Quantity	1	2	3	4
PUMP				
Pump Type	Multi-stage	Multi-stage	Multi-stage	Multi-stage
Motor HP	1/2-3/4	1/2-3/4	1-1 1/2	1-1 1/2
RPM at 60HZ	3450	3450	3450	3450
SYSTEM ELECTRICAL				
Controller	C-26	C-26	C-26	C-26
High Voltage Service + Amp Draw	110V 1PH 60 HZ 13.4A**	110V 1PH 60 HZ 13.4A*	220V 1PH 60 HZ 10.94A**	220V 1PH 60 HZ 10.94A**
SYSTEM DIMENSIONS				
Approximate Dimensions L x W x H (in / cm)**	25 x 26 x 56 / 64 x 66 x 143	25 x 30 x 56 / 64 x 76 x 143	25 x 30 x 56 / 64 x 76 x 143	25 x 30 x 56 / 64 x 76 x 143
Approximate Weight (lbs / kg).	130 / 59	140 / 64	155 / 70	180 / 82

Warranty Evaluation Test Conditions: Permeate flow rates and salt rejection based on the following test conditions—550 ppm, filtered and dechlorinated municipal tap water, 77°F / 25°C, 15% recovery, 7.0 pH and the specified operating pressure for membrane element type. Data taken after 60 minutes of operation.

* Varies with motor manufacturer.

** Does not include operating space requirements.



ECO-8000 PICTURED

ITEM NUMBER	PART NUMBER	DESCRIPTION	MODELS
1	210924	ASSEMBLY, VESSEL, PRESSURE, FRP-4040, OEM-8000	ECO 2000–8000
2	211757	MEMBRANE, XE1, 4040, DRY, AXEON	ECO 2000–8000
3A	207129	PUMP, BOOSTER, 1/2-3/4HP, 115/230V, 1PH, 7FBT05S4, FRANKLIN	ECO 2000–4000
3B	207130	PUMP, BOOSTER, 1-1 1/2HP, 115/230V, 1PH, 7FBT1S4, FRANKLIN	ECO 6000–8000
4	200906	SWITCH, PRESSURE, LOW, N/O 15-30, 1/4 FNPT	ECO 2000–8000
5A	210950	METER, FLOW, PM, 1-10 GPM, 1" MNPT X 1/2" FNPT, SS FTG, AXEON	ECO 8000
5B	211447	METER, FLOW, PM, 0.2-2 GPM, 1/2"MNPT X 1/4"FNPT, AXEON	ECO 2000
5C	210951	METER, FLOW, PM, .5-5 GPM, 1/2" MNPT X 1/4" FNPT, AXEON	ECO 4000–6000
6	203511	GAUGE,PM,GLY FILL, 0-300 PSI/BAR, 2.5 DIA,SS, 1/4"MNPT,AXEON	ECO 2000–8000
7	204165	GAUGE, BKM, GLY FILL, 0-100 PSI/BAR, 2.5" DIA, 1/4" MNPT, AXEON	ECO 2000–8000
8A	207472	VALVE, SOLENOID, 2-WAY, COMPOSITE, 120V, N/C, 3/4"FNPT, ASCO	ECO 2000–4000
8B	207088	VALVE, SOLENOID, 2-WAY, COMPOSITE, 220V, 3/4"FNPT, ASCO	ECO 6000–8000
9	207289	HOUSING, FILTER, BLK/GRY, 4.5" X 20", SGL O-RING, NPR, 3/4" FNPT, AXEON	ECO 2000–8000
10	200640	CARTRIDGE, SEDIMENT, POLYPRO, 4.5" X 20", 5 MIC	ECO 2000–8000
11	203385	METER, TDS, INLINE, FRONT PANEL	ECO 2000–8000
12	210355	CONTROLLER, COMPUTER, C-26, 110V/220V, 1PH, 50/60HZ	ECO 2000–8000
13	205104	METER, FLOW, PM, 0.5-5 GPM, SS VALVE, 1/2" MNPT X 1/2" MNPT, AXEON	ECO 2000–8000
14	205103	METER, FLOW, PM, 0.2-2 GPM, SS VALVE, 1/2" MNPT X 1/2" MNPT, AXEON	ECO 2000
15	200965	VALVE, CHECK, PVC, 1/2" FNPT X 1/2" FNPT	ECO 2000–8000
16	200994	VALVE, GLOBE, SS, 3/4" FNPT	ECO 2000–8000

MEMBRANES

The reverse osmosis system is equipped with AXEON XE1–Series RO membranes. These membranes separate impurities from water through the reverse osmosis process.



PUMP

The ECO–Series systems use a multi-stage booster pump. If any damage occurs to your system’s pump, contact your local dealer or distributor and inform them of your system and pump model.



PRE-FILTRATION

ECO–Series systems are supplied with a 5-micron sediment filter. Change the filtration cartridge when a 10–15 psi differential exists between the filter in and filter out pressure.



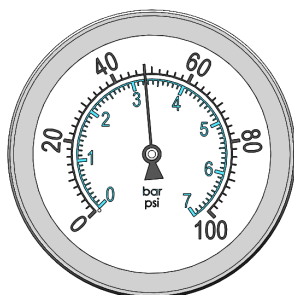
CAUTION

THE SYSTEM MUST BE OPERATED ON FILTERED WATER ONLY.

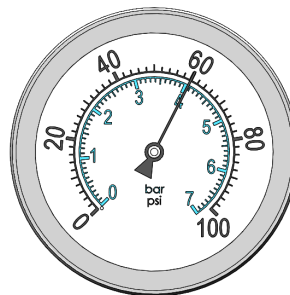
PRE-FILTER PRESSURE GAUGES

These gauges measure the feed water pressure when it enters and exits the pre-filter. A pressure differential of 10–15 psi or more between the two pressure gauges indicates that the pre-filters require replacement.

EXAMPLE: If the inlet pressure is 60 psi, the filter should be changed when the outlet pressure is 50 psi or below.



FILTER OUT



FILTER IN

PERMEATE FLOW METER

A clear acrylic analog flow meter is provided to measure the amount of product water the RO system is producing as gallons/liters per minute.



CONCENTRATE (WASTE) FLOW METER

The concentrate pressure gauge measures the pressure of the concentrate water as it exits the last membrane of the system. Subtracting the concentrate pressure from the pump pressure will give the pressure drop across the membrane array.

CONCENTRATE RECYCLE FLOW METER

The concentrate recycle flow meter is equipped with a needle valve to control the amount of concentrate water being recycled through the system. Water that would normally go down the drain as waste is diverted back into the system before the pump for reprocessing, thus increasing the system's percent of recovery. The concentrate recycle flow meter measures the amount of water the system is recycling as gallons/liters per minute.



LOW PRESSURE SWITCH

The low pressure switch shuts off the system when the feedwater pressure drops below 15 psi, preventing damage to the pump. The system restarts automatically when there is a constant pressure of 35 psi or more.



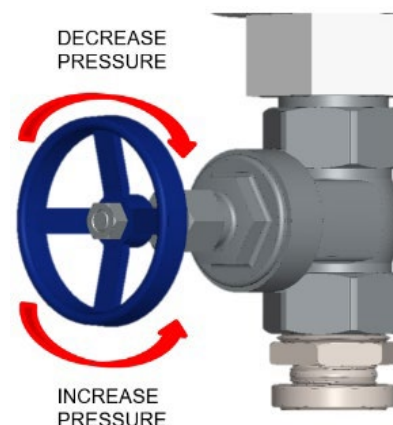
IF YOU NOTICE THE PRESSURE FLUCTUATING, AND THE SYSTEM CYCLING OFF AND ON, TURN THE SYSTEM OFF AND ENSURE THAT PROPER FEED FLOW AND PRESSURE ARE AVAILABLE TO THE SYSTEM.

PUMP THROTTLE VALVE

The Pump Throttle Valve is installed as a standard feature on the ECO-Series Reverse Osmosis Systems. It provides an adjustment for pump pressure. As the feedwater temperature decreases, and/or the feedwater TDS increases, the system will require a higher operating pressure to produce the specified permeate flow.

ADJUSTING THE THROTTLE VALVE

To decrease the pressure, turn the handle clockwise. To increase the pressure, turn the handle counter clockwise.



The ECO-Series Reverse Osmosis Systems are equipped with AXEON XE1-Extra Low Energy Membranes unless otherwise specified. General membrane element performance characteristics are listed below.

XE1-Extra Low Energy Membranes

Membrane Type: Polyamide Thin-Film Composite

Maximum Operating Temperature: 113°F (45°C)

Maximum Operating Pressure: 600 psi (41 bar)

pH Range, Continuous Operation*: 2–11

pH Range, Short Term Cleaning (30 Min.): 1–13

Maximum Feed Silt Density Index (SDI): 5

Chlorine Tolerance: 0 ppm

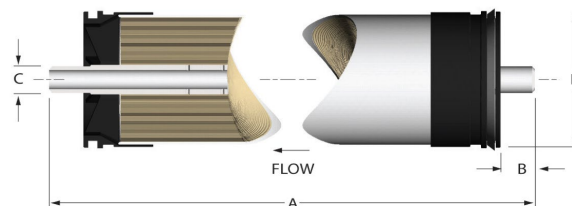
Maximum Feed Flow Rate (gpm): 4.0" = 14

*Maximum temperature for continuous operations above pH10 is 95°F (35°C).

Product Specifications				
Part Number	Description	Applied Pressure psi / bar	Permeate Flow Rate gpd / m3/d	Nominal Salt Rejection (%)
211757	XE1-4040	100 / 6.89	2400 / 9.09	99.20%

Warranty Evaluation Test Conditions: Permeate flow and salt rejection based on the following test conditions—550 ppm, filtered and dechlorinated municipal tap water, 77°F / 25°C, 15% recovery at the specified operating pressure. Minimum salt rejection is 96%. Permeate flows for warranty evaluation may vary +/-20%.

Dimensions inch / mm				
Description	A	B	C	D
XE1-4040	40 / 1016	1.04 / 26.42	0.75 / 19.10	3.90 / 99



Proper start-up of reverse osmosis water treatment systems is essential to prepare the membranes for operating service and to prevent membrane damage due to overfeeding or hydraulic shock. Before initiating system start-up procedures, membrane pretreatment, loading of the membrane elements, instrument calibration and other system checks should be completed.

Avoid any abrupt pressure or cross-flow variations on the spiral elements during start-up, shutdown, cleaning or other sequences to prevent possible membrane damage. During start-up, a gradual change from a standstill to operating state is recommended as follows:

- Feed pressure should be increased gradually over a 30–60 second time frame.
- Cross-flow velocity at set operating point should be achieved gradually over 15–20 seconds.
- Permeate obtained from first hour of operation should be discarded.
- Maximum pressure drops across an entire pressure vessel (housing) is 15 psi / 1.03 bar.
- Avoid static permeate-side backpressure at all times.

Under certain conditions, the presence of free chlorine, chloramines and other oxidizing agents will cause premature membrane failure. Since oxidation damage is not covered under warranty, the manufacturer recommends removing all oxidizing agents by pretreatment prior to membrane exposure. Please contact the manufacturer or your supplier for more information.

Do not use this initial permeate for drinking water or food preparation. Keep elements moist at all times after initial wetting. To prevent biological growth during prolonged system shutdowns, it is recommended that membrane elements be immersed in a preservative solution. Rinse out the preservative before use. For membrane warranty details, please contact the manufacturer or your supplier for more information.

If operating limits and guidelines given in this product specification sheet are not strictly followed, the warranty will be null and void. The customer is fully responsible for the effects of incompatible chemicals and lubricants on elements. Use of any such chemicals or lubricants will void the warranty. These membranes may be subject to drinking water application restrictions in some countries: please check the application status before use and sale. The use of this product in and of itself does not necessarily guarantee the removal of cysts and pathogens from water. Effective cyst and pathogen reduction is dependent on the complete system design and on the operation and maintenance of the system.

No freedom from infringement of any patent owned by the manufacturer or others is to be inferred. Because use conditions and applicable laws may differ from one location to another and may change with time, customer is responsible for determining whether products and the information in this document are appropriate for customer's use and for ensuring that customer's workplace and disposal practices are in compliance with applicable laws and other governmental enactments. The claims made may not have been approved for use in all countries. The manufacturer assumes no obligation or liability for the information in this document. **NO WARRANTIES ARE GIVEN; ALL IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE ARE EXPRESSLY EXCLUDED.**

ECO-Series Reverse Osmosis Systems are designed to produce the amount of permeate water per day as specified in the description suffix. For example, the ECO-8000 produces 8,000 gallons per day of permeate water at the listed operating test conditions.

REJECTION

The amount of total dissolved solids (TDS) rejected by the membrane is expressed as a percentage. ECO-Series reverse osmosis systems are designed to reject up to 99.20% NaCl depending on feed water chemistry. A 99.20% rejection rate means that 99.20% of total dissolved solids do not pass through the membrane. To calculate the percent of rejection, use the following formula:

$$\% \text{ REJECTION} = \frac{\text{FEED TDS} - \text{PERMEATE TDS}}{\text{FEED TDS}} \times 100$$

Example:

$$\frac{550 \text{ TDS} - 4.25 \text{ TDS}}{550 \text{ TDS}} \times 100 = 99.20\% \text{ REJECTION}$$

RECOVERY

The amount of permeate water recovered for use is expressed as a percentage. To calculate percent of recovery, use the following formula:

$$\% \text{ RECOVERY} = \frac{\text{PRODUCT WATER FLOW RATE}}{\text{FEED WATER FLOW RATE}} \times 100$$

Example:

$$\frac{5.55 \text{ GPM}}{8.55 \text{ GPM}} \times 100 = 65\% \text{ RECOVERY}$$



ALL FLOW RATES MUST BE EXPRESSED IN THE SAME UNITS, TYPICALLY GALLONS PER MINUTE (GPM).

MOUNTING

When choosing a location to install the system, select an area with enough room to remove the membranes and easily access components and connections. Make sure there is enough room for service to be performed on the system. Take into consideration where your electrical power supply is located and where the nearest drain is located. Do not install system in direct sunlight or subject the system to temperature extremes and/or excess humidity.

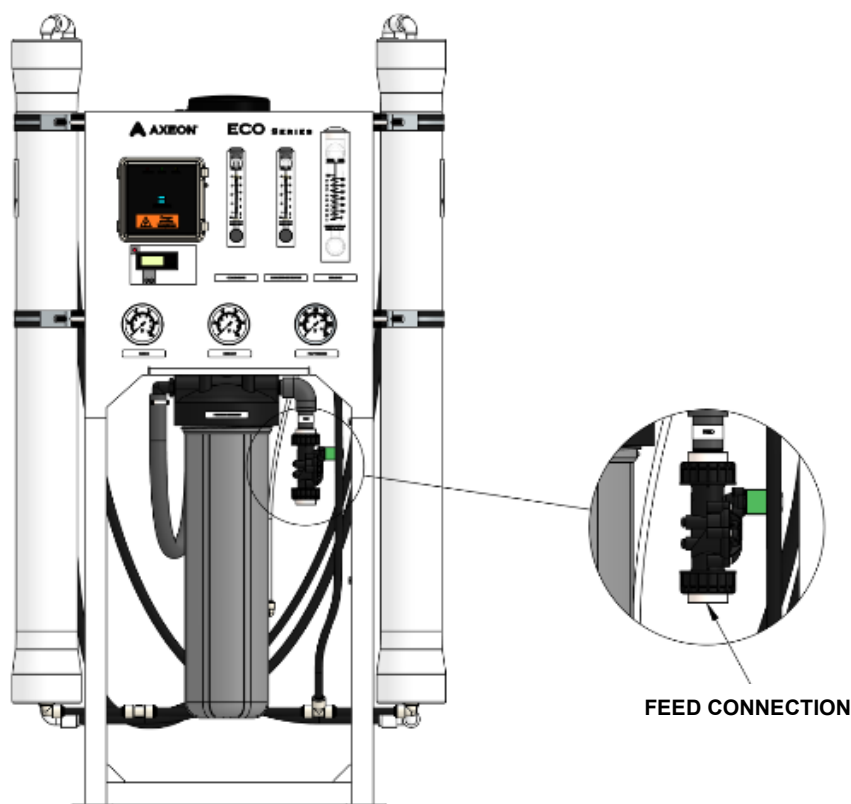
The ECO-Series system should be secured in compliance with state and local regulations.

FEED WATER CONNECTION

Attach the water supply plumbing to the 3/4" FNPT solenoid valve labeled "FEED".



ECO-SERIES SYSTEMS MUST HAVE A FEED WATER LINE TO THE SYSTEM NO LESS THAN 3/4". USING SMALLER LINE SIZES WILL CAUSE PRESSURE FLUCTUATIONS AND POSSIBLY AFFECT THE PUMP PERFORMANCE.



PERMEATE WATER (PRODUCT) CONNECTION

Locate the 1/2" QC connector after the check valve on the outlet of the flow meter labeled "PERMEATE", and attach to storage tank. Ensure that the permeate water can flow freely with no backpressure. Backpressure can cause irreversible damage to the membrane elements. The permeate line can be run to the holding tank with PVC fittings or other FDA approved materials. This is so the material being used does not dissolve into the permeate water.



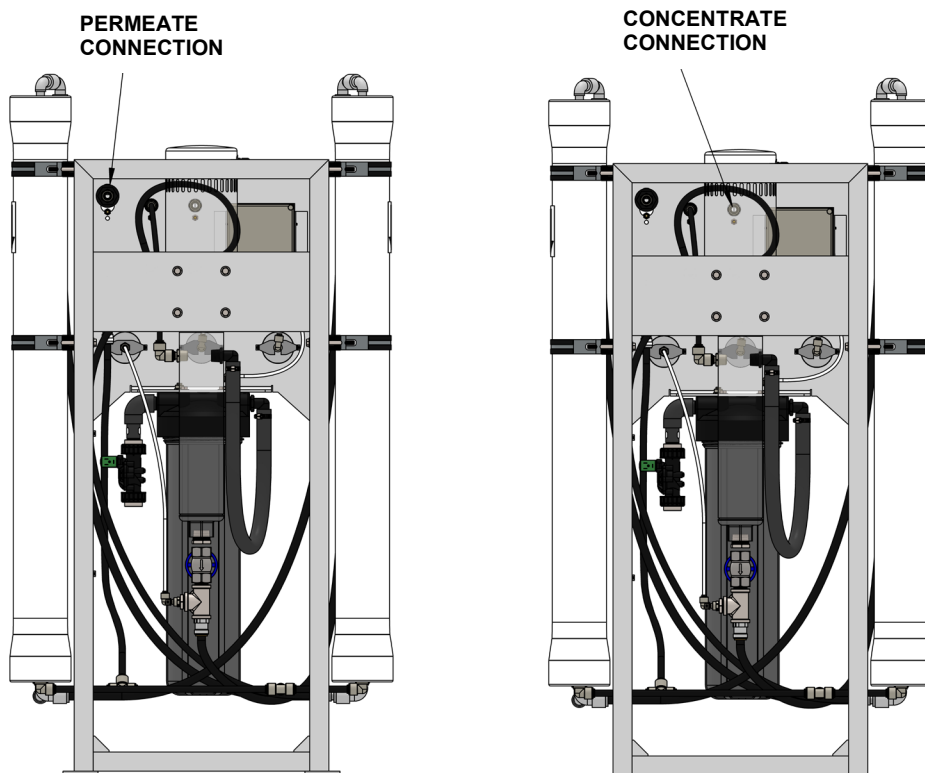
THE PH OF THE REVERSE OSMOSIS PERMEATE WATER WILL TYPICALLY BE 1-2 POINTS LOWER THAN THE FEED WATER PH. A LOW PH CAN BE VERY AGGRESSIVE TO SOME PLUMBING MATERIALS SUCH AS COPPER PIPING.

CONCENTRATE WATER (WASTE) CONNECTION

Locate the 1/2" QC outlet on the flow meter labeled "CONCENTRATE" and attach to a drain. Run the concentrate line to an open drain in a free and unrestricted manner (no backpressure).



ANY RESTRICTIONS OR BLOCKAGE IN THE DRAIN LINE CAN CAUSE BACKPRESSURE, WHICH WILL INCREASE THE SYSTEM'S OPERATING PRESSURE. THIS CAN RESULT IN DAMAGE TO THE SYSTEM'S MEMBRANES AND COMPONENTS.



ELECTRICAL

The motor used on the ECO-Series systems are pump and motor combinations. The motor is available in 110/220 VAC 60 Hertz 1 Phase. Each ECO-Series system is equipped with an eight-foot electrical cord and a three-pronged electrical plug. ECO-2000 and 4000 models are 110V and ECO-6000 and 8000 models are 220V.

Ensure that the electrical circuit supplying the system is compatible with the requirements of the specific ECO-Series model you are installing.



IT'S RECOMMENDED THAT A LICENSED ELECTRICIAN WIRE YOUR SYSTEM ACCORDANCE WITH LOCAL AND NATIONAL ELECTRICAL CODES (NEC).



TO REDUCE THE RISK OF ELECTRICAL SHOCK, THE INCOMING POWER SUPPLY MUST INCLUDE A PROTECTIVE EARTH GROUND.

ECO-Series systems are typically controlled with a liquid level switch in a storage tank. The liquid level switch turns the system on when the water level in the tank drops, and off when the tank is full. Liquid level switches can be obtained by your local dealer or distributor. If a liquid level switch is to be used, install it at this time.



ALL PRESSURE GAUGES MUST READ ZERO BEFORE BEGINNING THIS PROCEDURE. TURN THE SYSTEM OFF, DISCONNECT THE POWER, AND BLEED ALL WATER PRESSURE FROM THE SYSTEM

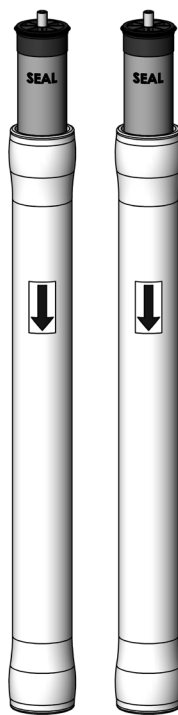


THE BRINE SEAL MUST BE IN THE CORRECT POSITION FOR EACH MEMBRANE HOUSING IN ORDER FOR THE MEMBRANE TO FUNCTION CORRECTLY.

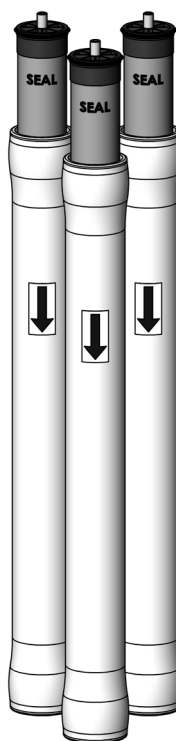
ALL BRINE SEALS ARE ON TOP



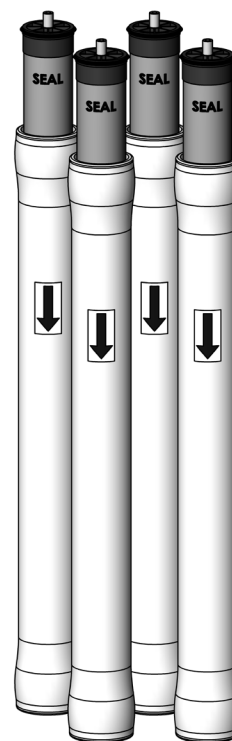
ECO-2000



ECO-4000



ECO-6000



ECO-8000



WEAR GLOVES FOR THE FOLLOWING STEPS IN ORDER NOT TO CONTAMINATE THE MEMBRANE.

1. Remove the permeate plumbing and/or fittings from the permeate port of the top end plug on the pressure vessel. Unscrew and remove the two locking crescents using a #5 Hex wrench. Thread the nipple and tee into the end plug permeate port to hand tightness. Pull the pipe with tee outward to remove the end plug. If the pressure vessel has been in operation for an extended time, a slight rocking motion or forceful tug may be required. Set the end plug aside in a clean area where the O-ring will not pick up dirt or debris.



2. Remove the membrane bag containing the membrane element from the shipping box.
3. Cut the bag open as close as possible to the seal at the end of the bag, so the bag may be re-used if necessary.
4. Make sure that all parts are clean and free from dirt. Examine the brine seal and permeate tube for nicks or cuts. Replace the O-rings or brine seal if damaged.
5. Remove the old membranes from the pressure vessels. Use long nose pliers to pull the old membrane out of the pressure vessel.
6. Lubricate the brine seal and O-rings on the new membranes with a non-petroleum based lubricant, such as Dow Corning® 111. Do not use a petroleum-based lubricant.
7. Apply the same lubricant to the inside of the pressure vessel below the groove for the locking crescents, where the membrane brine seal will make contact when inserted.
8. Install membranes with brine seal on top.
9. The membrane should stop when fully seated on the bottom end plug.

10. Reassemble the top end plugs.



MAKE SURE THE O-RINGS AND END PLUGS ARE FREE FROM DIRT AND DEBRIS BEFORE RE-INSTALLING. DIRT AND OTHER FOREIGN MATERIALS LEFT ON THE END PLUGS CAN CAUSE LEAKS AND/OR DAMAGE THE MEMBRANES AND CAUSE CONTAMINATION.

11. Re-install the end plugs by gently and evenly pushing them onto the pressure vessel. Ensure that you do not pinch or fatigue any O-rings while re-installing the end plug. Push the end plug in until it is seated just below the groove for the locking crescents.
12. Reinstall the locking crescents and securely tighten the screws.
13. Reconnect any fittings that may have been disconnected when the pressure vessels were disassembled.
14. To start-up the system, please refer to the System Purging/Initial Start-Up section of this User's Manual.



THE MEMBRANES MUST BE FLUSHED FOR AT LEAST 1 HOUR TO REMOVE THE PRESERVATIVE FROM THE MEMBRANE. DISCARD ALL OF THE PERMEATE PRODUCED DURING THE FLUSH PERIOD.



MAKE SURE THE SYSTEM POWER IS OFF BEFORE BEGINNING THIS PROCEDURE.

1. Redirect permeate water to the drain for this procedure.
2. Fully open the concentrate valve by turning it counter-clockwise.
3. Fully close the concentrate recycle valve by turning it clockwise.
4. Fully open the throttle valve by turning it counter-clockwise.
5. Activate the manual feed flush feature by pressing and holding the power button on the C-26 Controller for 5 seconds. To end the flush press the power button once.
6. Let the system purge until no visible bubbles appear from concentrate flow meter. It may be necessary to flush the system more than one cycle.





CAREFULLY INSPECT YOUR SYSTEM BEFORE INITIAL START UP. CHECK THAT ALL THE PLUMBING AND ELECTRICAL CONNECTIONS ARE IN PLACE AND SECURELY FASTENED.

Keep the permeate water line to drain for this procedure.

1. Fully open the concentrate valve by turning it counter-clockwise.
2. Fully close the concentrate recycle valve by turning it clockwise.
3. Fully close the throttle valve clockwise. Once fully closed, open half a turn counter-clockwise.
4. Turn the RO system on and adjust the concentrate (waste) valve, recycle valve and the throttle valve to the designed flow and pressure.
5. Inspect the system for leaks.
6. Allow the system to run 1 hour to flush the preservative solution from the system.
7. After 30 minutes, shut down the system.
8. Re-direct the permeate water back to the tank and then turn the system back on.
9. Record the readings daily for a week; after one week record the readings once a week.

FLUSHING THE SYSTEM

The system should be flushed weekly to remove sediment from the surface of the membranes. To manually flush the system, follow these steps:

1. The system must be operating during the flush procedure.
2. Fully open the concentrate valve by turning it counter-clockwise.
3. Allow the system to run for 10 to 20 minutes.
4. After 10 to 20 minutes, close the concentrate valve to its previous setting. Ensure the proper concentrate flow rate is going to the drain.
5. The system is now ready to operate.

RO SHUT-DOWN PROCEDURE

1. Purge system. See Purging and Initial Start-up instructions.
2. Turn off feed supply water from system.
3. Set the system power switch to the off position. Unplug the system power cord from wall.
4. When the unit is ready to restart please follow the initial start-up procedures. The permeate line should be diverted to drain for 30 minutes.

If the RO unit is to be shut down for an extended period of time, a membrane preservative should be used to preserve the membranes. See Preparing Unit for Storage or Shipment instructions.

PREPARING UNIT FOR STORAGE

If the system is to be shut down for an extended period, a membrane preservative should be used to preserve the membranes.



PRIOR TO STORING YOUR SYSTEM, THE SYSTEM SHOULD BE CLEANED WITH AXEON C-10 AND C-20 CLEANERS, FLUSHED WITH PERMEATE WATER AND M-100 SOLUTION FOR MEMBRANES TO PROTECT IT FROM BIOLOGICAL ATTACK.



THE PRESSURE VESSELS AND PLUMBING LINES OF THE SYSTEM MUST BE COMPLETELY DRAINED OR FILLED WITH 20-40% POLYGLYCOL MIX (TO PREVENT FREEZING). ANY WATER REMAINING IN THE PLUMBING OF A SYSTEM MAY FREEZE, CAUSING SERIOUS DAMAGE.

1. Completely immerse the elements in the membrane housings using 2% M-100 solution*.
*For cold weather/winter storage add 20-40% by weight Polyglycol to the 2% M-100 solution. Add Polyglycol AFTER the 2% M-100 solution has been mixed.
2. Separate the preservative solution from the air outside by closing all valves. Any contact with oxygen will oxidize the M-100 solution.
3. Check the pH once a week. When the pH becomes 3 or lower, change the preservation solution.
4. Repeat this process at least once a month.

A membrane's stated permeate production rate is based on a water temperature of 77°F degrees Fahrenheit. Temperatures above or below 77°F will increase or decrease the membrane's production rate.

Find the temperature correction factor (TCF) for your water temperature on the table located on the next page. Divide the rated permeate flow by the temperature correction factor. The result is the nominal permeate flow rate the system should achieve at actual water temperature. Permeate flow should be within 20% of the rated production, after correcting the feed water temperatures above or below 77°F. Check your permeate flow meter to determine the permeate flow rate.

Example:

$$5 \text{ GPM at } 59^\circ\text{F} \rightarrow \frac{5 \text{ GPM}}{1.422} = 3.52 \text{ GPM}$$

$$5 \text{ GPM at } 77^\circ\text{F} \rightarrow \frac{5 \text{ GPM}}{1} = 5 \text{ GPM}$$

$$5 \text{ GPM at } 84^\circ\text{F} \rightarrow \frac{5 \text{ GPM}}{.892} = 5.62 \text{ GPM}$$

TEMPERATURE CORRECTION TABLE

Temperature °F (°C)	TCF	Temperature °F (°C)	TCF	Temperature °F (°C)	TCF	Temperature °F (°C)	TCF	Temperature °F (°C)	TCF
50.0 (10.0)	1.711	57.2 (14.0)	1.475	64.4 (18.0)	1.276	71.6 (22.0)	1.109	78.8 (26.0)	0.971
50.2 (10.1)	1.705	57.4 (14.1)	1.469	64.6 (18.1)	1.272	71.8 (22.1)	1.105	79.0 (26.1)	0.968
50.4 (10.2)	1.698	57.6 (14.2)	1.464	64.8 (18.2)	1.267	72.0 (22.2)	1.101	79.2 (26.2)	0.965
50.5 (10.3)	1.692	57.7 (14.3)	1.459	64.9 (18.3)	1.262	72.1 (22.3)	1.097	79.3 (26.3)	0.962
50.7 (10.4)	1.686	57.9 (14.4)	1.453	65.1 (18.4)	1.258	72.3 (22.4)	1.093	79.5 (26.4)	0.959
50.9 (10.5)	1.679	58.1 (14.5)	1.448	65.3 (18.5)	1.254	72.5 (22.5)	1.090	79.7 (26.5)	0.957
51.1 (10.6)	1.673	58.3 (14.6)	1.443	65.5 (18.6)	1.249	72.7 (22.6)	1.086	79.9 (26.6)	0.954
51.3 (10.7)	1.667	58.5 (14.7)	1.437	65.7 (18.7)	1.245	72.9 (22.7)	1.082	80.1 (26.7)	0.951
51.4 (10.8)	1.660	58.6 (14.8)	1.432	65.8 (18.8)	1.240	73.0 (22.8)	1.078	80.2 (26.8)	0.948
51.6 (10.9)	1.654	58.8 (14.9)	1.427	66.0 (18.9)	1.236	73.2 (22.9)	1.075	80.4 (26.9)	0.945
51.8 (11.0)	1.648	59.0 (15.0)	1.422	66.2 (19.0)	1.232	73.4 (23.0)	1.071	80.6 (27.0)	0.943
52.0 (11.1)	1.642	59.2 (15.1)	1.417	66.4 (19.1)	1.227	73.6 (23.1)	1.067	80.8 (27.1)	0.940
52.2 (11.2)	1.636	59.4 (15.2)	1.411	66.6 (19.2)	1.223	73.8 (23.2)	1.064	81.0 (27.2)	0.937
52.3 (11.3)	1.630	59.5 (15.3)	1.406	66.7 (19.3)	1.219	73.9 (23.3)	1.060	81.1 (27.3)	0.934
52.5 (11.4)	1.624	59.7 (15.4)	1.401	66.9 (19.4)	1.214	74.1 (23.4)	1.056	81.3 (27.4)	0.932
52.7 (11.5)	1.618	59.9 (15.5)	1.396	67.1 (19.5)	1.210	74.3 (23.5)	1.053	81.5 (27.5)	0.929
52.9 (11.6)	1.611	60.1 (15.6)	1.391	67.3 (19.6)	1.206	74.5 (23.6)	1.049	81.7 (27.6)	0.926
53.1 (11.7)	1.605	60.3 (15.7)	1.386	67.5 (19.7)	1.201	74.7 (23.7)	1.045	81.9 (27.7)	0.924
53.2 (11.8)	1.600	60.4 (15.8)	1.381	67.6 (19.8)	1.197	74.8 (23.8)	1.042	82.0 (27.8)	0.921
53.4 (11.9)	1.594	60.6 (15.9)	1.376	67.8 (19.9)	1.193	75.0 (23.9)	1.038	82.2 (27.9)	0.918
53.6 (12.0)	1.588	60.8 (16.0)	1.371	68.0 (20.0)	1.189	75.2 (24.0)	1.035	82.4 (28.0)	0.915
53.8 (12.1)	1.582	61.0 (16.1)	1.366	68.2 (20.1)	1.185	75.4 (24.1)	1.031	82.6 (28.1)	0.913
54.0 (12.2)	1.576	61.2 (16.2)	1.361	68.4 (20.2)	1.180	75.6 (24.2)	1.028	82.8 (28.2)	0.910
54.1 (12.3)	1.570	61.3 (16.3)	1.356	68.5 (20.3)	1.176	75.7 (24.3)	1.024	82.9 (28.3)	0.908
54.3 (12.4)	1.564	61.5 (16.4)	1.351	68.7 (20.4)	1.172	75.9 (24.4)	1.021	83.1 (28.4)	0.905
54.5 (12.5)	1.558	61.7 (16.5)	1.347	68.9 (20.5)	1.168	76.1 (24.5)	1.017	83.3 (28.5)	0.902
54.7 (12.6)	1.553	61.9 (16.6)	1.342	69.1 (20.6)	1.164	76.3 (24.6)	1.014	83.5 (28.6)	0.900
54.9 (12.7)	1.547	62.1 (16.7)	1.337	69.3 (20.7)	1.160	76.5 (24.7)	1.010	83.7 (28.7)	0.897
55.0 (12.8)	1.541	62.2 (16.8)	1.332	69.4 (20.8)	1.156	76.6 (24.8)	1.007	83.8 (28.8)	0.894
55.2 (12.9)	1.536	62.4 (16.9)	1.327	69.6 (20.9)	1.152	76.8 (24.9)	1.003	84.0 (28.9)	0.892
55.4 (13.0)	1.530	62.6 (17.0)	1.323	69.8 (21.0)	1.148	77.0 (25.0)	1.000	84.2 (29.0)	0.889
55.6 (13.1)	1.524	62.8 (17.1)	1.318	70.0 (21.1)	1.144	77.2 (25.1)	0.997	84.4 (29.1)	0.887
55.8 (13.2)	1.519	63.0 (17.2)	1.313	70.2 (21.2)	1.140	77.4 (25.2)	0.994	84.6 (29.2)	0.884
55.9 (13.3)	1.513	63.1 (17.3)	1.308	70.3 (21.3)	1.136	77.5 (25.3)	0.991	84.7 (29.3)	0.882
56.1 (13.4)	1.508	63.3 (17.4)	1.304	70.5 (21.4)	1.132	77.7 (25.4)	0.988	84.9 (29.4)	0.879
56.3 (13.5)	1.502	63.5 (17.5)	1.299	70.7 (21.5)	1.128	77.9 (25.5)	0.985	85.1 (29.5)	0.877
56.5 (13.6)	1.496	63.7 (17.6)	1.294	70.9 (21.6)	1.124	78.1 (25.6)	0.982	85.3 (29.6)	0.874
56.7 (13.7)	1.491	63.9 (17.7)	1.290	71.1 (21.7)	1.120	78.3 (25.7)	0.979	85.5 (29.7)	0.871
56.8 (13.8)	1.486	64.0 (17.8)	1.285	71.2 (21.8)	1.116	78.4 (25.8)	0.977	85.6 (29.8)	0.869
57.0 (13.9)	1.480	64.2 (17.9)	1.281	71.4 (21.9)	1.112	78.6 (25.9)	0.974	85.8 (29.9)	0.866

°F=(°C x 9/5) + 32

Corrected Flow Rate= (Measured Flow Rate) * (TCF @ Feed Water Temp.)

- Company Name _____

- Day of Start Up _____

- Location _____

- Date of Last Cleaning _____

- Week Of _____

- System Serial No. _____

Date					
Time					
Hour of Operation					
Filter Inlet Pressure (PSI)					
Filter Outlet Pressure (PSI)					
Concentrate Pressure (PSI)					
Pump Discharge Pressure (PSI)					
Feed Flow (GPM)					
Permeate Flow (GPM)					
Concentrate Flow (GPM)					
Recycle Flow (GPM)					
Recovery %					
Feed Temperature					
Feed TDS (PPM)					
Permeate TDS (PPM)					
Rejection %					
Feed pH					
Permeate pH					
Scale Inhibitor Feed (PPM)					
Iron (mg/L)					
Free Chlorine (mg/L)					
Hardness (GPG CaCO ₃)					

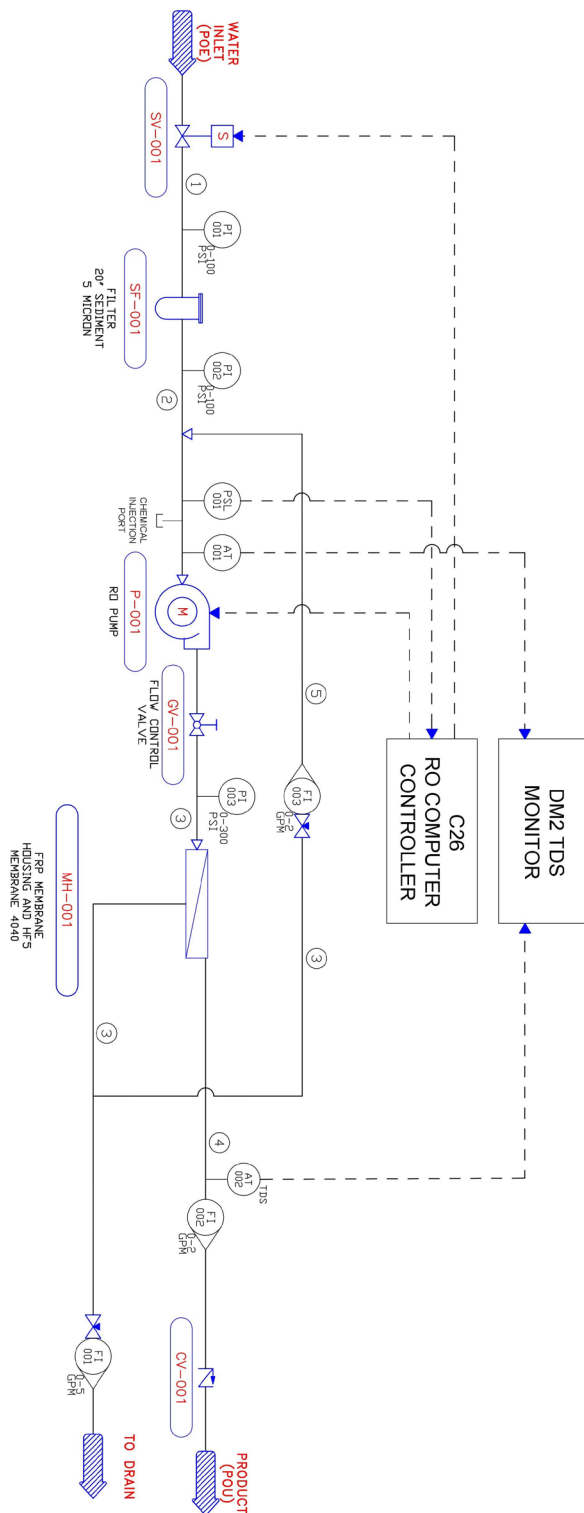
SYMPTOMS	POSSIBLE CAUSES	CORRECTIVE ACTION
Low Inlet Pressure	Low supply pressure	Increase inlet pressure
	Cartridge filters plugged	Change filters
	Solenoid valve malfunction	Replace solenoid valve and/or coil
	Leaks	Fix any visible leaks
Low Permeate Flow	Low inlet flow	Adjust concentrate valve
	Cold feedwater	See temperature correction sheet
	Low operating pressure	See low inlet pressure
	Defective membrane brine seal	Inspect and/or replace brine seal
	Fouled or scaled membrane	Clean membranes
High Permeate Flow	Damaged product tube o-rings	Inspect and/or replace
	Damaged or oxidized membrane	Replace membrane
	Exceeding maximum feedwater temperature	See temperature correction sheet
Poor Permeate Quality	Low operating pressure	See low inlet pressure
	Damage product tube o-rings	Inspect and/or replace
	Damaged or oxidized membrane	Replace membrane
Membrane Fouling	Metal oxide fouling	Improve pretreatment to remove metals. Clean with acid cleaners
	Colloidal fouling	Optimize pretreatment for colloid removal. Clean with high pH anionic cleaners
	Scaling (CaSO ₄ , CaSO ₃ , BaSO ₄ , SiO ₂)	Increase acid addition and antiscalant dosage for CaCO ₃ and CaCO ₄ . Reduce recovery. Clean with acid cleaners
	Biological fouling	Shock dosage of sodium bi-sulfate. Continuous feed of sodium bi-sulfate at reduced pH. Chlorination and de-chlorination. Replace cartridge filters.
	Organic fouling	Activated carbon or another pretreatment. Clean with high pH cleaner
	Abrasion of membrane by crystalline material	Improve pretreatment. Check all filters for media leakage.

TECHNICAL ASSISTANCE

If technical assistance is required:

- Contact your local dealer or distributor
- Prior to making the call, have the following information available:
 - System installation date
 - Serial number
 - Daily log sheets
 - Current operating parameters (e.g., flow, operating pressures, pH, etc.)
 - Detailed description of the problem

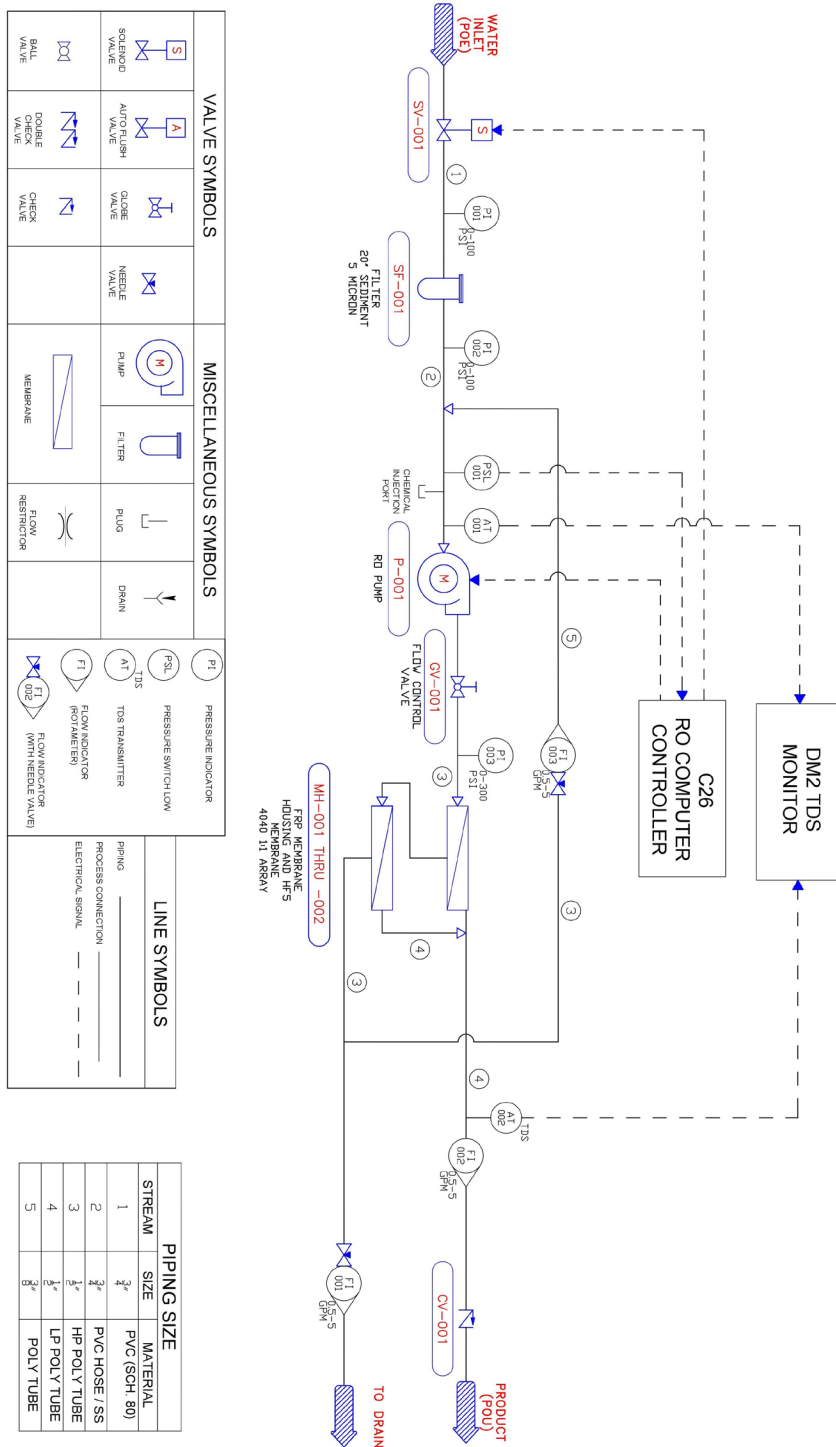
ECO-2000



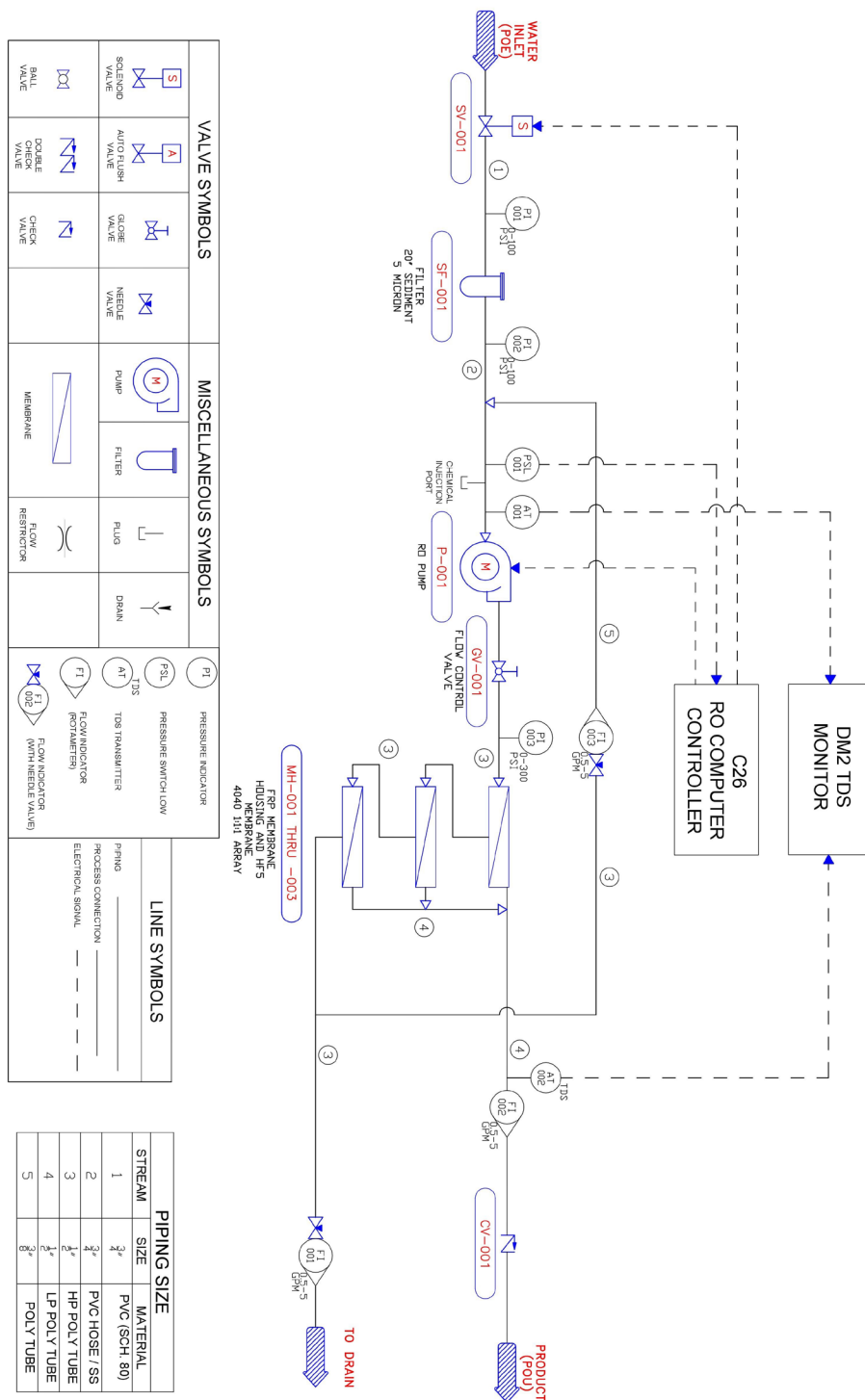
VALVE SYMBOLS		MISCELLANEOUS SYMBOLS		LINE SYMBOLS	
	BALL VALVE		DOUBLE CHECK VALVE		CHECK VALVE
	SOLENOID VALVE		AUTO FLUSH VALVE		GLOBE VALVE
	NEEDLE VALVE		PUMP		FILTER
	FLOW RESTRICTOR		PLUG		DRAIN
	PRESSURE INDICATOR		PRESSURE SWITCH LOW		TDS TRANSMITTER
	FLOW INDICATOR (ROTAMETER)		FLOW INDICATOR (WITH NEEDLE VALVE)		
PINK _____		PROCESS CONNECTION _____		ELECTRICAL SIGNAL _____	

PIPING SIZE		
STREAM	SIZE	MATERIAL
1	3/4"	PVC (SCH. 80)
2	3/4"	PVC HOSE / SS
3	1/2"	HP POLY TUBE
4	1/2"	LP POLY TUBE
5	3/8"	POLY TUBE

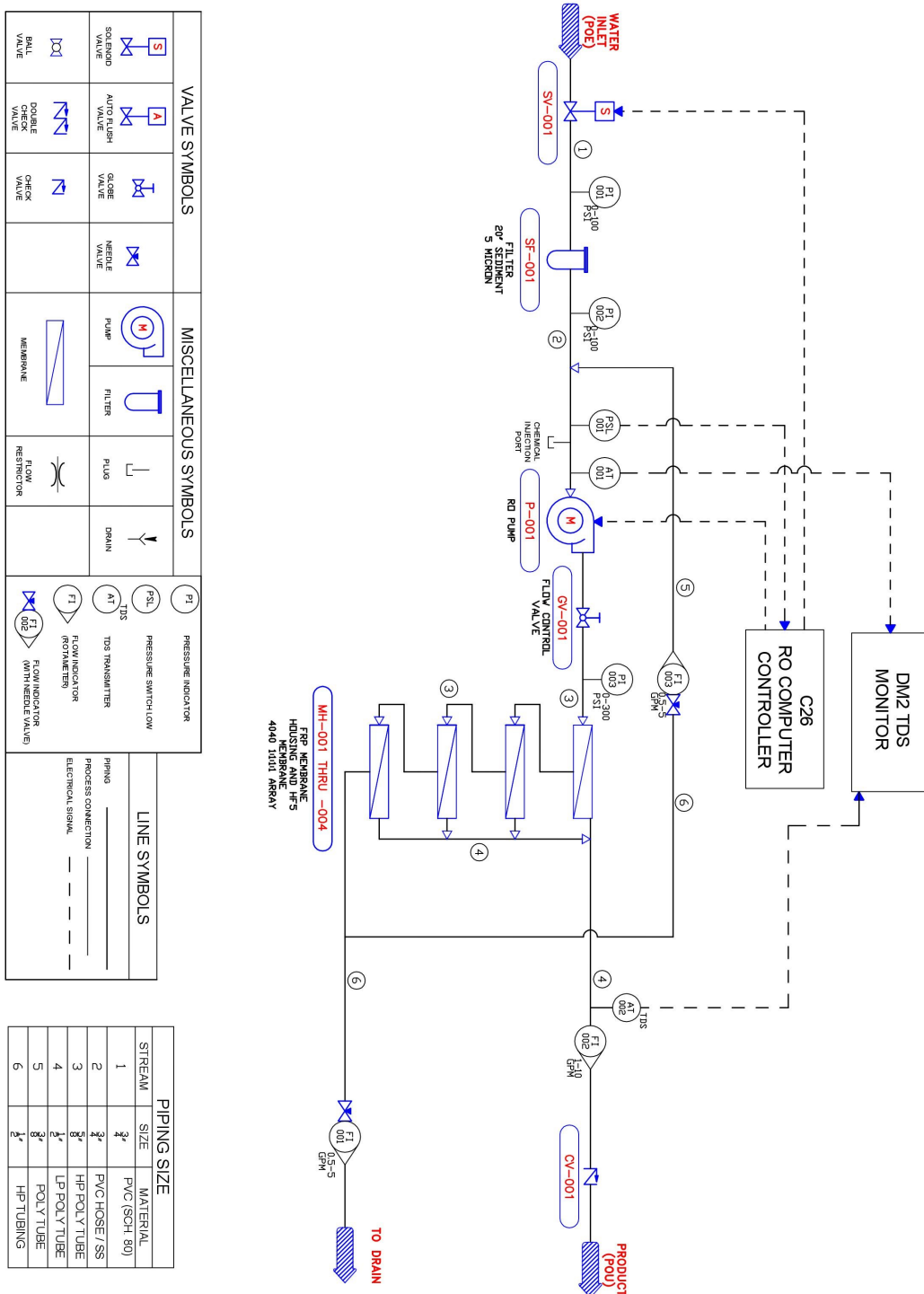
ECO-4000

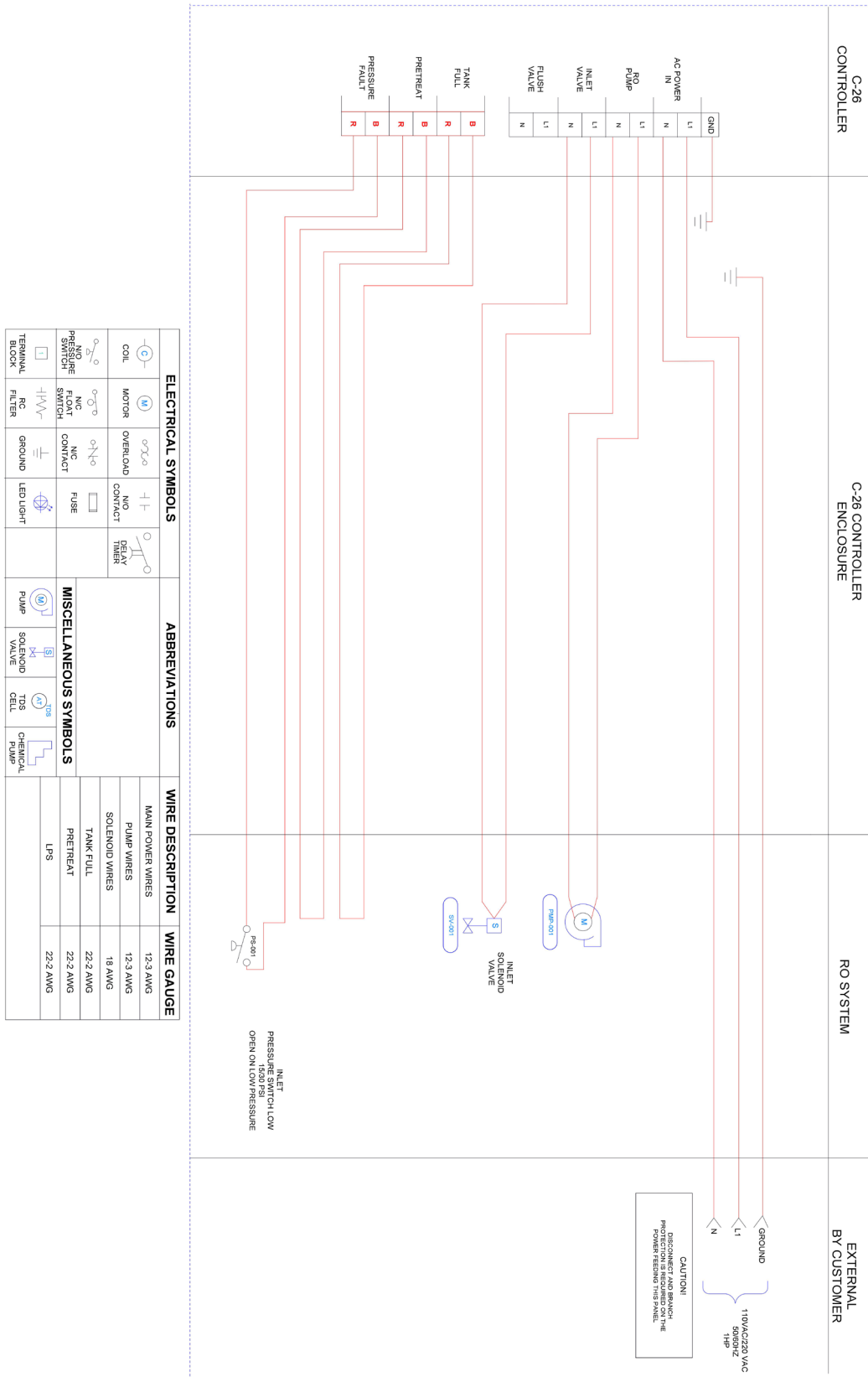


ECO-6000



ECO-8000





Warranty Terms

Subject to the terms and conditions set forth hereinafter, the manufacturer (hereafter “Manufacturer”) warrants to the original purchaser (hereafter the “Customer”) that the systems and products manufactured by the Manufacturer are free from defects in material and in workmanship for twelve (12) months from the Warranty Commencement Date (as defined below) only when used strictly in accordance with the applicable operating instructions and within the range of the operating conditions specified by the Manufacturer for each such product.

This Warranty does not extend to systems, equipment, or components manufactured by others, nor to systems, equipment, or components manufactured by others and distributed by the Manufacturer. This Warranty does not extend to equipment or components manufactured by others which have been incorporated into a Manufacturer product but, if allowable the, Manufacturer hereby assigns, without warranty, to the Customer its interest, if any, under any Warranty made by the Manufacturer of such equipment or component. This Warranty does not cover disposable items such as fuses, O-rings, regeneration materials/chemicals, or other such disposable items, which must be replaced periodically under the normal and foreseeable operating conditions of the goods warranted hereby.

Warranty Commencement Date

The Warranty Commencement Date for each Manufacturer product shall be the later of the date of: (1) receipt by the Customer, or (2) the date of installation at the Customer's premises provided that such installation must occur within three (3) months of shipment from the Manufacturer's manufacturing facility. In no event shall the Warranty Commencement Date exceed three (3) months from the shipment from the Manufacturer's manufacturing facility. The Customer shall provide proof of purchase in order to exercise rights granted under this Warranty. If requested by the Manufacturer, the Customer must also provide proof of the installation date.

Warranty Service

THE MANUFACTURER'S OBLIGATION UNDER THIS WARRANTY IS LIMITED TO THE REPAIR OR REPLACEMENT (AT MANUFACTURER'S SOLE DISCRETION) OF ANY PRODUCT, OR COMPONENT THEREOF, PROVED TO BE DEFECTIVE IN MATERIAL OR WORKMANSHIP WITHIN THE COVERED WARRANTY PERIOD.

The Customer, at the Customer's risk and expense, shall be responsible for returning such product or component, only after obtaining a Return Goods Authorization (RGA) number from the Manufacturer, arranging for freight prepaid, and in conformance with any special packaging and shipping instructions set forth on the operation documentation or RGA instructions, or as otherwise reasonably required, to the Manufacturer, together with (1) RGA number issued by the Manufacturer at Customer's request; (2) proof of purchase and, if necessary, proof of installation date; (3) a Return Goods Authorization Form; (4) a description of the suspected defects; (5) the serial number of the Manufacturer product alleged to be defective; (6) a description of the type of water and pretreatment equipment which has been utilized in connection with the product, if any. The Manufacturer shall, in the Manufacturer's reasonable discretion, be the sole judge of whether a returned product or component is defective in material or workmanship. Required or replaced products or components shall be returned surface freight. In genuine emergency situations, the Manufacturer will (at the Manufacturer's sole discretion) forward replacement parts to the Customer without waiting for authorized return of the questionable part(s). In such cases, Customer will issue a purchase order or other payment guarantee prior to shipment. If the returned part is found to have been misused or abused, or the defective part is not received by the Manufacturer within thirty (30) days; the Customer will be invoiced for the replacement part(s) provided. This Warranty does not cover or include labor and/or travel to the Customer's premise or location or any other location. Charges of \$1000 per day plus associated travel expenses will be incurred by the Customer in providing the Warranty Service at any location other than the Manufacturer's main headquarters; that is if the Manufacturer deems that the product is not covered by said Warranty. The Manufacturer reserves the right to precondition such travel to Customer's premises upon prepayment of the Manufacturer's anticipated costs of attending such premises.

Voidability of Warranty

This Warranty shall be void and unenforceable as to any Manufacturer product which has been damaged by accident, mishandling, abuse or has been repaired, modified, altered, disassembled or otherwise tampered with by anyone other than the Manufacturer or an authorized Manufacturer service representative; or, if any replacement parts are not authorized by the Manufacturer have been used, or, the product has not been installed, operated and maintained in strict accordance and adherence with the operating documentation and manuals for such product. Any expressed Warranty, or similar representation of performance set forth in the operation documentation for media or resin incorporated into the Manufacturer product shall be void and unenforceable unless the feed water requirements set forth in the operating documentation for such product are unequivocally and strictly adhered to.

Limitations and Exclusions

THIS WARRANTY AND REMEDIES DESCRIBED HEREIN AND HEREINABOVE ARE EXCLUSIVE AND IN LIEU OF ANY AND ALL OTHER WARRANTY OR REMEDIES, EXPRESSED OR IMPLIED, INCLUDING WITHOUT LIMITATION, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. IN NO EVENT SHALL THE MANUFACTURER BE LIABLE FOR ANY CONSEQUENTIAL, INCIDENTAL OR OTHER SIMILAR TYPES OF DAMAGES, DAMAGES FOR THE LOSS OF PRODUCTION OR PROFITS, OR INJURY TO PERSON OR PROPERTY. NO PERSON HAS ANY AUTHORITY TO BIND THE MANUFACTURER TO OTHER THAN WHAT IS SET FORTH ABOVE.

THIS WARRANTY GIVES THE CUSTOMER SPECIFIC LEGAL RIGHTS AND THE CUSTOMER MAY ALSO HAVE OTHER RIGHTS WHICH VARY FROM JURISDICTION TO JURISDICTION. THE PARTIES RECOGNIZE AND AGREE, THAT IN ALL RESPECTS THE LAWS OF THE STATE OF CALIFORNIA SHALL APPLY TO AND SHALL GOVERN ANY INTERPRETATION OR LEGAL SIGNIFICANCE OF THIS DOCUMENT.

NO WARRANTY OR OTHER LIABILITY OF THE MANUFACTURER TO CUSTOMER UNDER THIS AGREEMENT OR OTHERWISE WILL IN ANY EVENT EXCEED THE COST OF REPLACEMENT OF THE APPLICABLE MANUFACTURER PRODUCT, PART, OR ACCESSORY THAT IS SUBJECT TO ANY BREACH OF THE MANUFACTURER'S WARRANTY. THE MANUFACTURER WILL NOT BE LIABLE FOR ANY DAMAGE TO ANY PROPERTY OF CUSTOMER OR TO CUSTOMER'S CUSTOMERS FOR ANY CONSEQUENTIAL, INCIDENTAL, OR ECONOMIC LOSS OR COMMERCIAL DAMAGE WHATSOEVER. REMEDIES HEREIN PROVIDED ARE EXPRESSLY MADE THE SOLE AND EXCLUSIVE REMEDIES FOR BREACH OF ANY WARRANTY OR OTHER OBLIGATION HEREUNDER EXPRESS OR IMPLIED OR FROM THE OPERATION OF LAW.