

N – SERIES



N – 12000 PICTURED

MEMBRANE SYSTEM USER MANUAL

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INTRODUCTION

The N – 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.

MEMBRANE ELEMENTS DO NOT COME PRE-LOADED. INSTALL MEMBRANES IN ACCORDANCE WITH THIS MANUAL BEFORE BEGINNING OPERATION.

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

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

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

SAFETY

Defined below are the three safety headings used throughout this User Manual's text.



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



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



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



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.

OPERATING DO'S AND DON'TS

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.
- 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.
- Operate the system with insufficient feed flow or pressure.
- Operate the pump dry.



FEED WATER AND OPERATION SPECIFICATIONS

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 SDI Rating | <3 |
| Minimum Feed Temperature, °F | 40 [†] | Maximum Free Chlorine, ppm | 0 |
| Maximum Ambient Temperature, °F | 120 | Maximum TDS, ppm | 2,000 [†] |
| Minimum Ambient Temperature, °F | 40 | Maximum Hardness, gpg | 0 |
| Maximum Feed Pressure, PSI | 85 | Maximum pH (continuous) | 10 |
| Minimum Feed Pressure, PSI | 45 | Minimum pH (continuous) | 4 |
| Maximum Operating Pressure, PSI | 200 | Maximum pH (cleaning 30 minutes) | 12 |
| Operating Range, PSI | 150 – 200 ^{††} | Minimum pH (cleaning 30 minutes) | 2 |

[†] Low temperatures and feedwater quality, such as high TDS levels will significantly affect the systems production capabilities and performance. Computer projections must be run for individual applications which do not meet or exceed minimum and maximum operating limits for such conditions.

^{††} System Operating Pressure is based on 60 psi feed pressure, minimum concentrate flow as stated and an average of 2000 gpd flow per membrane at 77°F.

*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.

N – SERIES SYSTEM SPECIFICATION CHART

| MODELS | N – 2000 | N – 4000 | N – 6000 | N – 8000 | N – 12000 | N – 16000 |
|---|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
| DESIGN | | | | | | |
| Configuration | Single Pass | Single Pass | Single Pass | Single Pass | Single Pass | Single Pass |
| Feedwater TDS max ppm | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 |
| Standard Recovery % ^{†††} | 32 | 48 | 58 | 65 | 58 | 65 |
| FLOW RATES | | | | | | |
| Permeate Flow Rate (gpd / lpd) ^{†††} | 2,000 / 7,570 | 4,000 / 15,141 | 6,000 / 22,712 | 8,000 / 30,283 | 12,000 / 45,425 | 16,000 / 60,566 |
| Permeate Flow Rate (gpm / lpm) ^{†††} | 1.39 / 5.26 | 2.78 / 10.52 | 4.16 / 15.75 | 5.56 / 21.05 | 8.33 / 31.53 | 11.11 / 42.06 |
| Minimum Concentrate Flow Rate (gpm / lpm) | 3.00 / 11.36 | 3.00 / 11.36 | 3.00 / 11.36 | 3.00 / 11.36 | 6.00 / 22.72 | 6.00 / 22.72 |
| Concentrate Recycle Flow Rate (gpm / lpm) | Up to 2.00 / 7.57 | Up to 5.00 / 18.93 | Up to 5.00 / 18.93 | Up to 5.00 / 18.93 | Up to 5.00 / 18.93 | Up to 5.00 / 18.93 |
| CONNECTIONS | | | | | | |
| Feed (inch) | 1 FNPT | 1 FNPT | 1 FNPT | 1 FNPT | 1 FNPT | 1 FNPT |
| Permeate (inch) | 1/2 QC | 1/2 QC | 1 FNPT | 1 FNPT | 1 FNPT | 1 FNPT |
| Concentrate (inch) | 1/2 QC | 1/2 QC | 1 FNPT | 1 FNPT | 1 FNPT | 1 FNPT |
| MEMBRANES | | | | | | |
| Membrane(s) Per Vessel | 1 | 1 | 1 | 1 | 1 | 1 |
| Membrane Quantity | 1 | 2 | 3 | 4 | 6 | 8 |
| Membrane Size | 4040 | 4040 | 4040 | 4040 | 4040 | 4040 |
| Nominal TDS Rejection % | 98.50 | 98.50 | 98.50 | 98.50 | 98.50 | 98.50 |
| VESSELS | | | | | | |
| Vessel Array | 1 | 1:1 | 1:1:1 | 1:1:1:1 | 2:2:2 | 2:2:2:2 |
| Vessel Quantity | 1 | 2 | 3 | 4 | 6 | 8 |
| PUMPS | | | | | | |
| Pump Type | Multi-Stage | Multi-Stage | Multi-Stage | Multi-Stage | Multi-Stage | Multi-Stage |
| Motor HP | 1.5 | 1.5 | 2 | 2 | 2 | 2 |
| RPM at 60 Hz | 3480 | 3480 | 3480 | 3480 | 3480 | 3480 |
| SYSTEM ELECTRICAL | | | | | | |
| Standard Voltage + Amp Draw | 220V, 60HZ, 1PH, 8.5A | 220V, 60HZ, 1PH, 8.5A | 220V, 60HZ, 1PH, 11.0A | 220V, 60HZ, 1PH, 11.0A | 220V, 60HZ, 1PH, 11.0A | 220V, 60HZ, 1PH, 11.0A |
| SYSTEM DIMENSIONS | | | | | | |
| Approximate Dimensions ^{††††} L x W x H (in / cm) | 25 x 16 x 55 / 63.3 x 40.6 x 140 | 25 x 16 x 55 / 63.3 x 40.6 x 140 | 32 x 24 x 55 / 81.3 x 61.0 x 140 | 32 x 24 x 55 / 81.3 x 61.0 x 140 | 32 x 24 x 55 / 81.3 x 61.0 x 140 | 32 x 24 x 55 / 81.3 x 61.0 x 140 |
| Approximate Weigh ^{†††††} (lbs / kg) | 120 / 55 | 130 / 59 | 180 / 82 | 210 / 95 | 240 / 109 | 270 / 123 |

^{†††} Product flow and standard recovery rates are based on feedwater conditions as stated above. Do not exceed the recommended permeate flow.

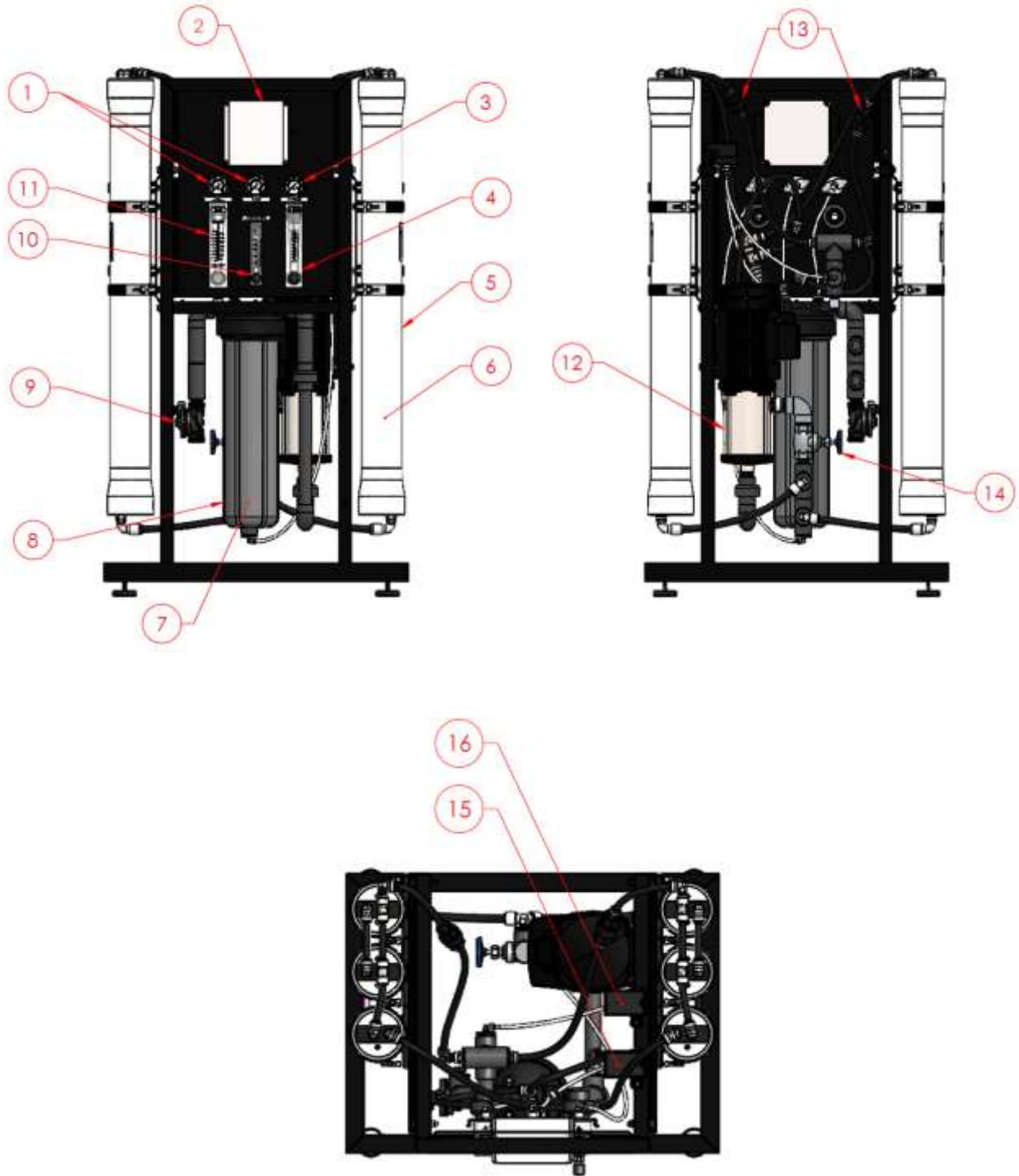
^{††††} Does not include operating space requirements.

^{†††††} Does not include membrane(s).

Test Parameters: 550 TDS Filtered (5 - Micron), Dechlorinated, Municipal Feedwater, 65 psi / 4.50 bar Feed Pressure, 100 psi / 6.9 bar Operating Pressure, 77°F / 25°C, Recovery as stated, 7.0 pH. Data taken after 60 minutes of operation.

To Obtain the System's Maximum Recovery please contact your local dealer in order to provide details on the specific application and feed water composition. Maximum recovery of the system varies depending on feed water composition.

N – SERIES COMPONENT IDENTIFICATION DESCRIPTION



| ITEM NUMBER | PART NUMBER | DESCRIPTION | MODEL(S) |
|-------------|-------------|---|-----------------|
| 1 | 210703 | GAUGE, PM, GLY FILL, 0–100 PSI/BAR, 2" DIA, 1/4" MNPT, AXEON | N 2000 - 16000 |
| 2 | 211454 | CONTROLLER, COMPUTER, AX-8000, 220V, 1PH | N 2000 - 16000 |
| 3 | 210702 | GAUGE, PM, GLY FILL, 0–300 PSI/BAR, 2" DIA, 1/4" MNPT, AXEON | N 2000 - 16000 |
| 4 | 205104 | METER, FLOW, PM, 1-5 GPM, SS VALVE, 1/2" MNPT X 1/4" FNPT, AXEON | N 2000 - 4000 |
| 4 | 205105 | METER, FLOW, PM, 1-10 GPM, SS VALVE, 1" MNPT X 1/2" FNPT, AXEON | N 6000 - 16000 |
| 5 | 209853 | HOUSING, MEMBRANE, FRP-300E, 4040, 1/2" P x 1/2" C FNPT, AXEON | N 2000 - 16000 |
| 6 | 211064 | MEMBRANE, HE, 4040, AXEON | N 2000 - 16000 |
| 7 | 200640 | CARTRIDGE, SEDIMENT, POLYPRO, 4.5" X 20", 5 MIC, SDF-45-2005, AXEON | N 2000 - 16000 |
| 8 | 207290 | HOUSING, FILTER, BLK/GRY, 4.5" X 20", SGL O-RING, NPR, 1" FNPT, AXEON | N 2000 - 16000 |
| 9 | 204914 | VALVE, SOLENOID, N/C, UL, 220V, 1" FNPT, NO DIN, GC | N 2000 - 16000 |
| 10 | 205103 | METER, FLOW, PM, 0.2-2 GPM, SS VALVE, 1/2" MNPT X 1/4" FNPT, AXEON | N 2000 |
| 10 | 205104 | METER, FLOW, PM, 1-5 GPM, SS VALVE, 1/2" MNPT X 1/4" FNPT, AXEON | N 4000 - 16000 |
| 11 | 200897 | METER, FLOW, PM, 0.2–2 GPM, 1/2" MNPT x 1/2" MNPT, AXEON | N 2000 |
| 11 | 200898 | METER, FLOW, PM, 1–5 GPM, 1/2" MNPT x 1/2" MNPT, AXEON | N 4000 |
| 11 | 200899 | METER, FLOW, PM, 1–10 GPM, 1" MNPT x 1" MNPT, AXEON | N 6000 - 8000 |
| 11 | 200900 | METER, FLOW, PM, 2–20 GPM, 1" MNPT x 1" MNPT, AXEON | N 12000 - 16000 |
| 12 | 211008 | PUMP, BOOSTER, 1.5HP, 115/230V, 1PH, CM1-7 GRUNDFOS | N 2000 - 4000 |
| 12 | 211007 | PUMP, BOOSTER, 2HP, 115/230V, 1PH, CM3-8 GRUNDFOS | N 6000 - 16000 |
| 13 | 200965 | VALVE, CHECK, PP, GLASS FILLED, BLACK, 1/2" FNPT X 1/2" FNPT | N 2000 - 16000 |
| 14 | 202270 | VALVE, GLOBE, SS, 1/2" FNPT | N 2000 - 4000 |
| 14 | 200994 | VALVE, GLOBE, SS, 3/4" FNPT | N 6000 - 8000 |
| 14 | 200995 | VALVE, GLOBE, SS, 1" FNPT | N 12000 - 16000 |
| 15 | 200907 | SWITCH, PRESSURE, HIGH, N/C, 40–60 PSI, 1/4" FNPT | N 2000 - 16000 |
| 16 | 200906 | SWITCH, PRESSURE, LOW, N/O, 15–30PSI, 1/4"FNPT | N 2000 - 16000 |

CONTROLLER

The N – Series systems come standard with an AX – 8000 Controller. The AX – 8000 Series controller is a state of the art, microprocessor controlled system for commercial and industrial reverse osmosis.

The AX – 8000 includes numerous standard features such as pressure switch control, motor contactor, TDS / Conductivity monitor with programmable setpoints, pretreatment lock out, tank level switch controls, flush valve control, and programmable membrane flush type and mode. The AX – 8000 Series controller displays system, sensor, and switch input status on an easy to read 4 line, 20 character backlit display. User programmable setpoints allow fast and easy adjustment of system parameters.

PRE-FILTRATION

N – 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.



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 40 psi, the filter should be changed when the outlet pressure is 25 - 30 psi or below.



FILTER IN



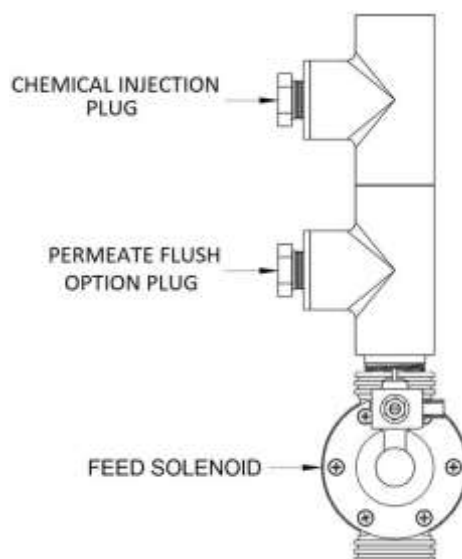
FILTER OUT

PERMEATE FLUSH PORT AND PLUG

The permeate flush port is to be used with an optional permeate flush kit. The 1/2" PVC plug is located before the chemical injection port and after the feed solenoid valve, as shown in the picture. The plug should be removed and the kit should be installed as per the instructions provided with the kit.

CHEMICAL INJECTION PORT AND PLUG

The chemical injection port is to be used with an optional chemical injection system. The 1/2" PVC plug is located before the filter and after the permeate flush port, as shown in the picture. The plug should be removed and a chemical injector should be installed in its place when using a chemical injection system.





N – SERIES SYSTEMS COME STANDARD WITH A CHEMICAL INJECTION ELECTRICAL PLUG. THIS PLUG IS INTENDED ONLY FOR CHEMICAL INJECTION PUMPS. DO NOT USE THIS PLUG FOR ANYTHING OTHER THAN ITS INTENDED PURPOSE. DO NOT EXCEED 5 AMPS.

LOW PRESSURE SWITCH

The low pressure switch shuts off the system when the feed water 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.

PUMP

The N – Series systems use a multi-stage centrifugal stainless steel 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.

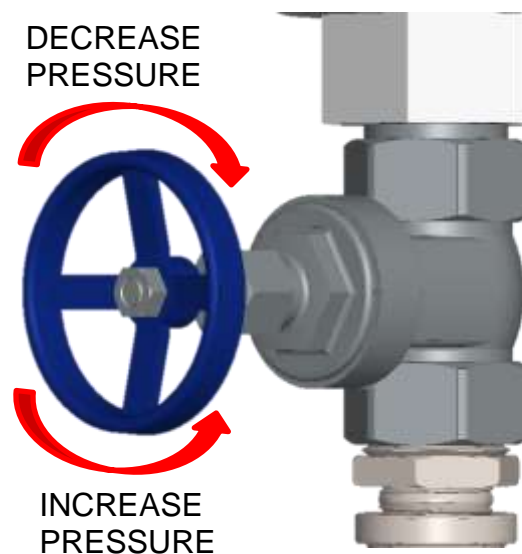


NEVER RUN THE PUMP DRY. OPERATING THE PUMP WITHOUT SUFFICIENT FEED FLOW WILL CAUSE DAMAGE OR FAILURE.

PUMP THROTTLE VALVE

The pump throttle valve is installed as a standard feature on the N – Series Reverse Osmosis Systems. It provides an adjustment for pump pressure. As the feed water temperature decreases, and/or the feed water TDS increases, the system will require a higher operating pressure to produce the specified permeate flow.

To decrease the pressure, turn the handle clockwise. To increase the pressure, turn the handle counter clockwise as shown below.



PUMP PRESSURE GAUGE

The pump pressure gauge measures the pressure of the water as it exits the pump to enter the first membrane in the system.

MEMBRANES

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

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 FLOW METER

A clear acrylic analog flow meter is provided to measure the amount of wastewater the RO system is sending to the drain as gallons/liters per minute. The concentrate flow meter is equipped with an integrated needle valve to control flow and pressure through the system.



CONCENTRATE RECYCLE FLOW METER

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. The concentrate recycle flow meter is equipped with an integrated needle valve to control the amount of concentrate water being recycled through the system.



RECYCLING CONCENTRATE WATER WILL INCREASE THE DISSOLVED SOLIDS IN THE WATER BEING PROCESSED BY THE MEMBRANES THUS AFFECTING THE PERMEATE QUALITY. EXCESSIVE RECYCLING MAY CAUSE PREMATURE FOULING OR SCALING OF THE MEMBRANE ELEMENTS.

MEMBRANE INFORMATION

N – Series reverse osmosis systems come standard with HE – Series Low Energy membranes. General membrane element performance characteristics are listed on the following membrane specification chart.

MEMBRANE ELEMENT SPECIFICATIONS

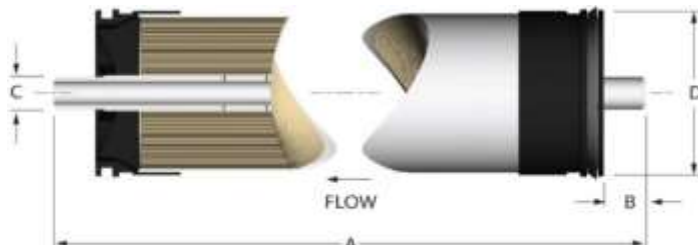
HE – Series Ultra Low Energy Membranes (Standard)

| | |
|---|---|
| Membrane Type: Polyamide Thin – Film Composite | pH Range, Short Term Cleaning (30 Min.): 2 – 12 |
| Maximum Operating Temperature: 113°F (45°C) | Maximum Feed Silt Density Index (SDI): 5 |
| Maximum Operating Pressure: 400 psi (27.58 bar) | Chlorine Tolerance: 0 ppm |
| pH Range, Continuous Operation*: 3 – 10 | Maximum Feed Flow Rate (gpm): 14 |

*Maximum temperature for continuous operations above pH 10 is 95 °F (35 °C).

| Product Specifications | | | | Dimension inch / mm | | | |
|------------------------|-------------|-------------------------------|---------------------------------|---------------------|--------------|--------------|--------------|
| Part Number | Description | Applied Pressure psi / bar | Permeate Flow Rate gpd / lpd | A | B | C | D |
| 211064 | HE – 4040 | 100 / 6.9 | 2400 / 9084.99 | 40 / 1016.00 | 1.04 / 26.50 | 0.75 / 19.05 | 3.90 / 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 and the specified operating pressure. Minimum salt rejection is 96%. Permeate flows for warranty evaluation may vary +/-20%. Maximum pressure drop at 15 psig / 0.9 bar.



All 4040 elements fit nominal 4.00" I.D. membrane housings.

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 crossflow 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 drop across an entire single membrane pressure vessel (housing) can be up to 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.**

MEMBRANE PERFORMANCE

N – Series Reverse Osmosis Systems are designed to produce 2,000 GPD at 77°F (nominal) of permeate water per membrane at 98.5% rejection under the proper conditions. For example, the N – 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. N – Series reverse osmosis systems are designed to reject up to 98.5% NaCl depending on feed water chemistry. A 98.5% rejection rate means that 98.5% 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:

$$\frac{550 \text{ TDS} - 8.25 \text{ TDS}}{550 \text{ TDS}} \times 100 = 98.5\% \text{ REJECTION}$$

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).

SYSTEM INSTALLATION

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.

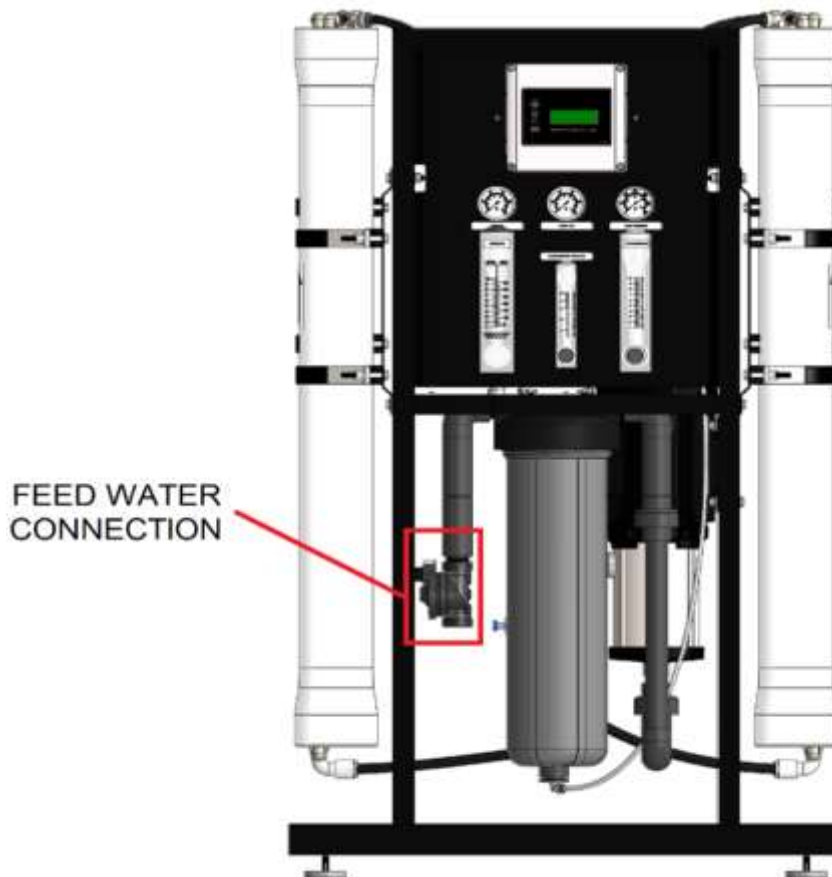
The N – Series system should be secured in compliance with state and local regulations.

FEED WATER CONNECTION

Attach the water supply plumbing to the 1" FNPT solenoid valve labeled "FEED".



N – SERIES SYSTEMS MUST HAVE A FEED WATER LINE TO THE SYSTEM NO LESS THAN 1". USING SMALLER LINE SIZES WILL CAUSE PRESSURE FLUCTUATIONS AND POSSIBLY AFFECT THE PUMP PERFORMANCE.



PERMEATE WATER (PRODUCT) CONNECTION

Locate the 1/2" quick connection (N – 2000 and N – 4000) or 1" union (N – 6000 thru N – 16000) on the outlet of the permeate flow meter labeled "PERMEATE", and run plumbing to a storage tank.



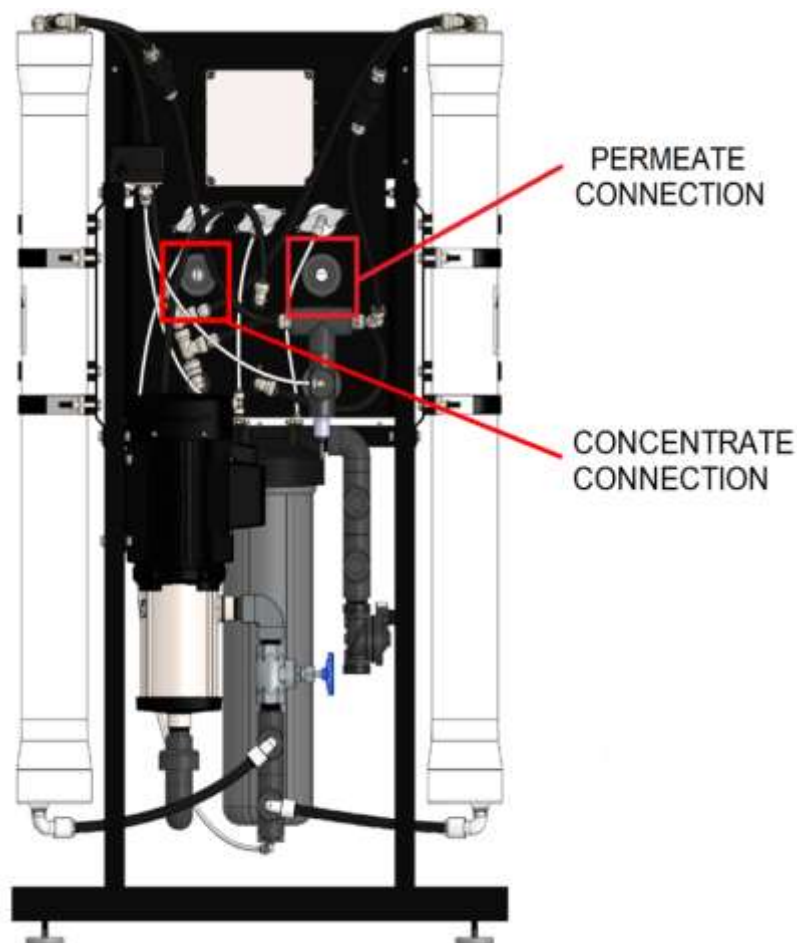
THE PH OF THE REVERSE OSMOSIS PERMEATE WATER WILL TYPICALLY BE 1-2 POINTS LOWER THAN THE FEED WATER PH. A LOW PH CAN BE VERY AGGRESSIVE TO SOME PLUMBING MATERIALS SUCH AS COPPER PIPING.

CONCENTRATE WATER (WASTE) CONNECTION

Locate the 1/2" quick connection (N – 2000 and N – 4000) or 1" union (N – 6000 thru N – 16000) on the outlet of the concentrate flow meter labeled "CONCENTRATE", and run plumbing to a drain. It is advised that an air-break be used on the concentrate line to prevent siphoning of water from the pressure vessels when the system is in standby.



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

N – Series systems are available in 220V/60HZ/1PH. Each N – Series system is equipped with an 8 foot electrical cord.

It is best that the N – Series system be wired to a dedicated electrical circuit. Ensure that the electrical circuit supplying the system is compatible with the requirements of the specific N - Series model you are installing.



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



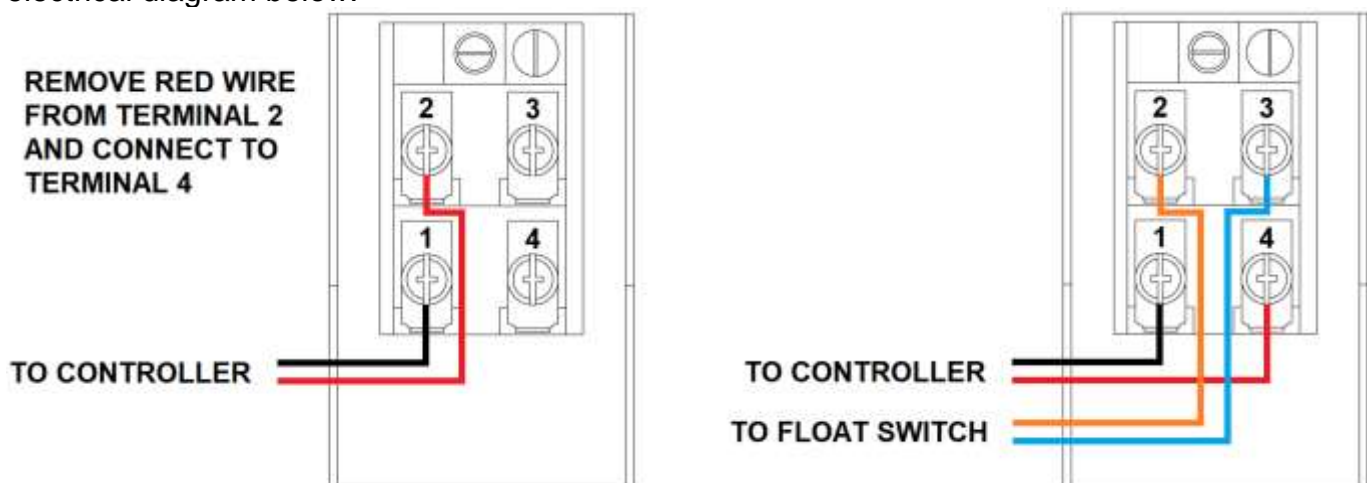
IT IS RECOMMENDED THAT A LICENSED ELECTRICIAN WIRE YOUR SYSTEM IN ACCORDANCE WITH LOCAL AND NATIONAL ELECTRICAL CODES (NEC).

HIGH PRESSURE SWITCH

N-Series systems are controlled with a normally closed high pressure switch to be used with a bladder tank or a float valve. The high pressure switch turns the system off when the pressure reaches 60psi and turns on when the pressure drops below 40psi.

LIQUID LEVEL (FLOAT) SWITCH FOR ATMOSPHERIC TANKS

Although controlled with a permeate high pressure switch, a float switch can be installed to work in conjunction with the high pressure switch. 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. To install a normally closed float switch, locate the high pressure switch (Item 15) and remove the the red wire from terminal 2 and relocate it to terminal 4. Cut the float switch pigtails and strip back ½” of each of the wire insulations. Install the float switch leads to terminals 2 and 3. See electrical diagram below.



MEMBRANE INFORMATION AND HANDLING



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



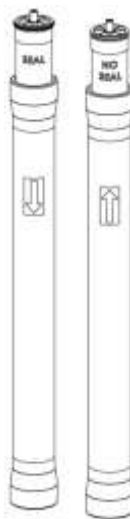
THE BRINE SEAL MUST BE IN THE CORRECT POSITION FOR EACH MEMBRANE HOUSING IN ORDER FOR THE MEMBRANE TO FUNCTION CORRECTLY.

Pay close attention to the flow direction arrows on the membrane housings when installing new membranes. Refer to the following chart:

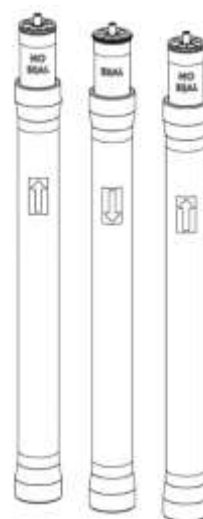
N – 2000



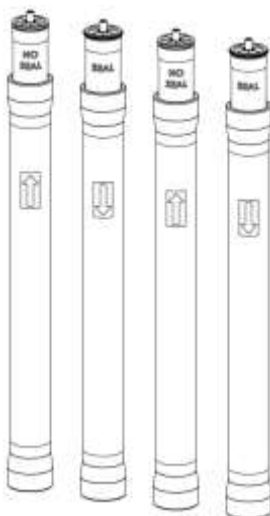
N – 4000



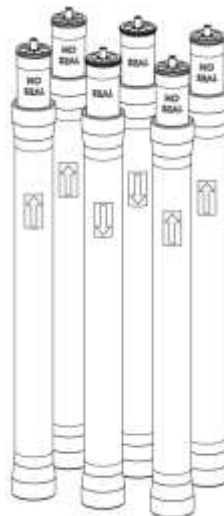
N – 6000



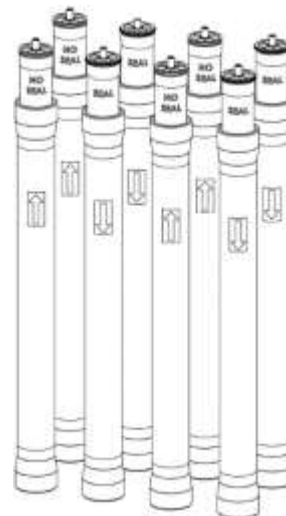
N – 8000



N – 12000



N – 16000

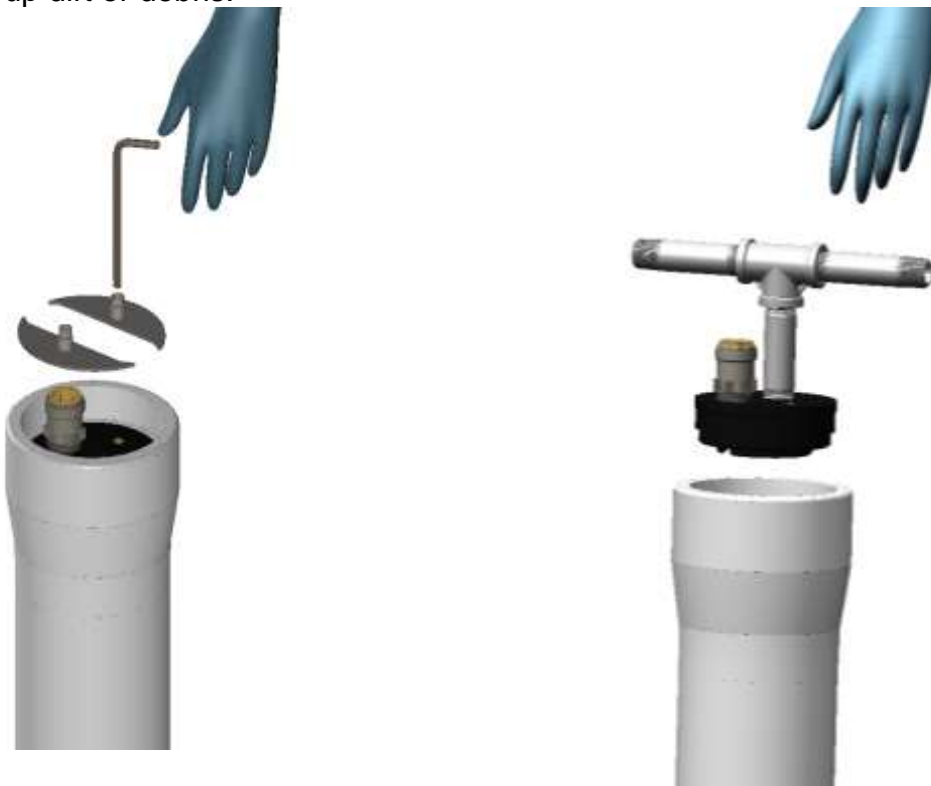


MEMBRANE INSTALLATION / REPLACEMENT



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. Use a ½" x 6" PVC nipple (or similar material) and thread it into the end plug permeate port to hand tightness. Pull the pipe 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 location depicted in the membrane flow chart on the previous page.

9. When loading a membrane brine seal first, insert the membrane at a slight angle while gently rotating, being careful not to tear or flip the brine seal. With a smooth and constant motion, carefully push the membrane into the pressure vessel. A slow twisting motion should be used while inserting the membrane to ensure the brine seal stays in place. If there is considerable resistance when attempting to insert the membrane remove it and re-lube the brine seal and pressure vessel entrance as necessary. Pushing the membrane into the pressure vessel forcefully will cause the brine seal to flip at which point the membrane will no longer operate properly.
10. The membrane should stop when fully seated on the bottom end plug.
11. 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.

12. 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.
13. Reinstall the locking crescents and securely tighten the screws.
14. Reconnect any fittings that may have been disconnected when the pressure vessels were disassembled.
15. 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.

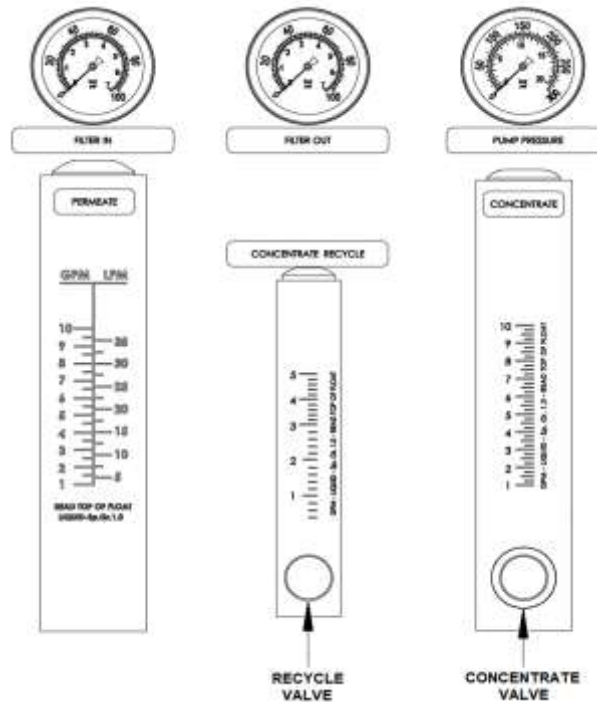
SYSTEM PURGING / INITIAL START UP



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

LEAVE THE POWER TO THE SYSTEM OFF UNTIL STEP 8 OF THIS PROCEDURE.

1. Redirect permeate water to the drain for this procedure.
2. Fully open the concentrate valve. (counterclockwise).
3. Fully close the recycle valve. (clockwise).



4. Fully open the throttle valve by turning it counterclockwise. Refer to pg. 13 for throttle valve instruction.
5. Open the small lever located on the top of the inlet solenoid valve (shown below).
6. Turn the feedwater on and let the system purge until there are no visible air bubbles in the concentrate flow meter.
7. Close the small lever on the top of the solenoid valve.
8. Turn the system on. Adjust the pump throttle valve, concentrate valve, and the recycle valve to allow the system to run at the designed flows and pressures.
9. Allow the system to run uninterrupted for at least 1 hour to flush the preservative solution from the system.
10. Inspect the system for leaks.
11. After 1 hour, shut down the system.
12. Re-direct the permeate water back to the tank and then turn the system back on.
13. Using the Reverse Osmosis System Operation Log provided on page 28, record your system's readings daily for a week. After a week, record the readings at a minimum of once a week. It is suggested to make several copies of this sheet for future use before recording initial readings.



FLUSHING THE SYSTEM

As time progresses, the efficiency of the membrane will be reduced. In general, the salt rejection does not change significantly until two or three years after installation when operated on properly pretreated feed water. The permeate flow rate will begin to decline slightly after one year of operation, but can be extended with diligent flushing and cleaning of the membranes. The system should be flushed regularly to remove sediment from the surface of the membranes. N – Series systems are preprogrammed to flush for 60 seconds on shut down, 2 minutes for permeate flush and 5 minutes for manual flush.

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.

TEMPERATURE CORRECTION FACTORS FOR MEMBRANES

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:

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

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

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

TEMPERATURE CORRECTION TABLE

| Temperature °F (°C) | Temperature Correction Factor | Temperature °F (°C) | Temperature Correction Factor | Temperature °F (°C) | Temperature Correction Factor | Temperature °F (°C) | Temperature Correction Factor | Temperature °F (°C) | Temperature Correction Factor |
|---------------------|-------------------------------|---------------------|-------------------------------|---------------------|-------------------------------|---------------------|-------------------------------|---------------------|-------------------------------|
| 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.)

REVERSE OSMOSIS SYSTEM OPERATION LOG

- 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) | | | | |

TROUBLESHOOTING CHART

| SYMPTOMS | POSSIBLE CAUSES | CORRECTIVE ACTION |
|-----------------------|---|---|
| Low Inlet Pressure | Low supply pressure | Increase inlet pressure |
| | Cartridge filters plugged | Change filters |
| | Leaks | Fix any visible leaks |
| | Low inlet flow | Adjust concentrate valve |
| Low Permeate Flow | Low operating pressure | See low inlet pressure |
| | Cold feed water | See temperature correction sheet |
| | Defective membrane brine seal | Inspect and/or replace brine seal |
| | Fouled or scaled membrane | Clean membranes |
| High permeate flow | Exceeding maximum feed water temperature | See temperature correction sheet |
| | Damaged or oxidized membrane | Replace membrane |
| | Damage product tube O-rings | Inspect and/or replace |
| Poor permeate quality | Damaged or oxidized membrane | Replace membrane |
| | 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. |
| Membrane fouling | 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 other pretreatment. Clean with high pH cleaner. |
| | Chlorine Oxidation | Check chlorine feed equipment and de-chlorination system. |
| | 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

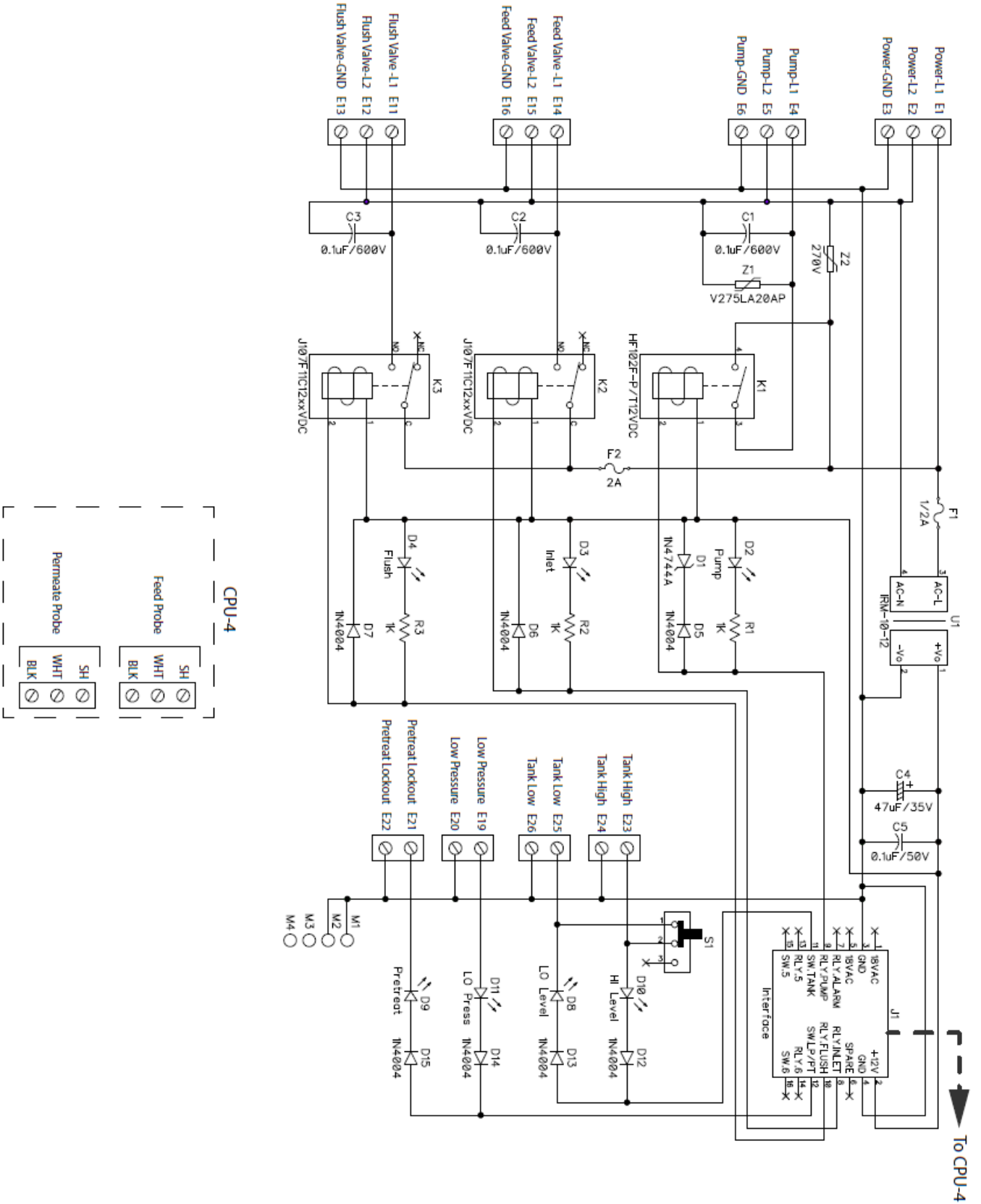
AX – 8000 CONTROLLER SPECIFICATIONS AND INSTRUCTIONS



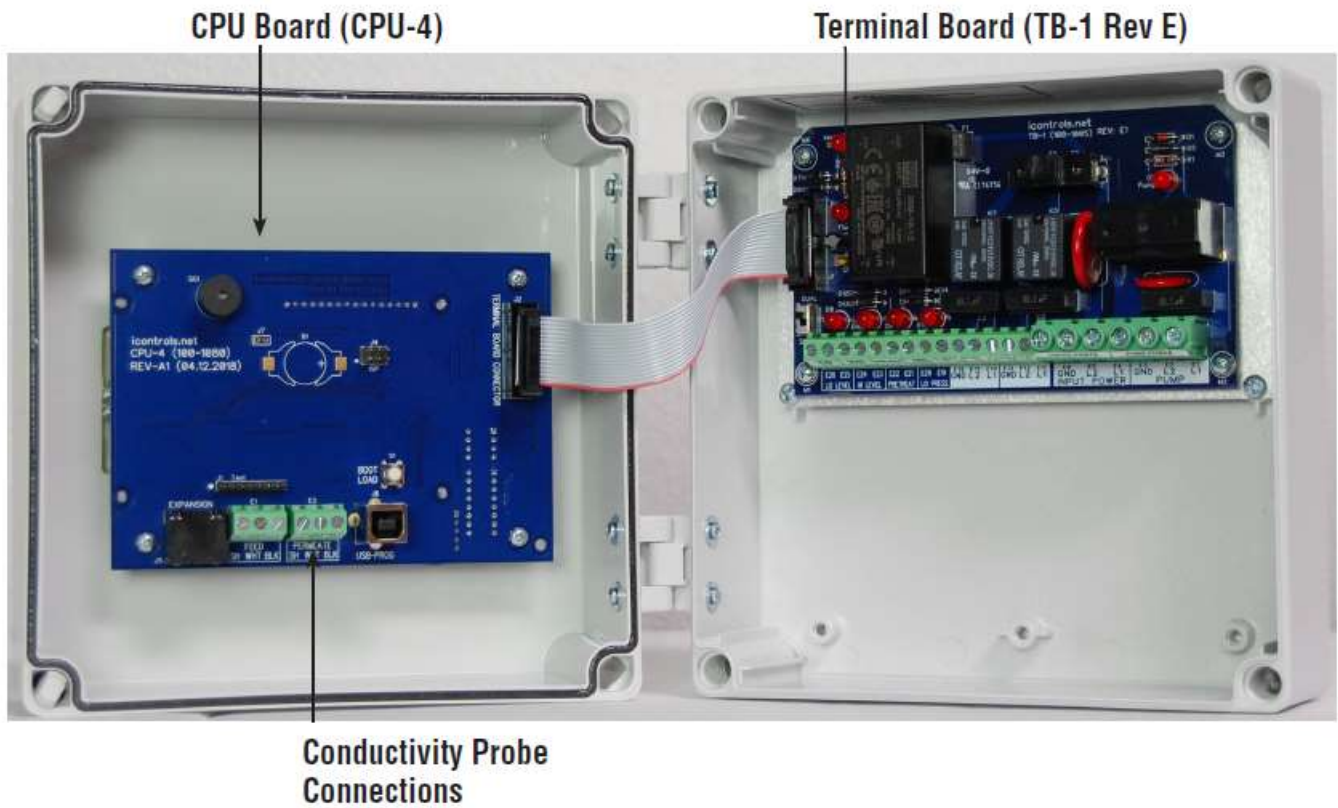
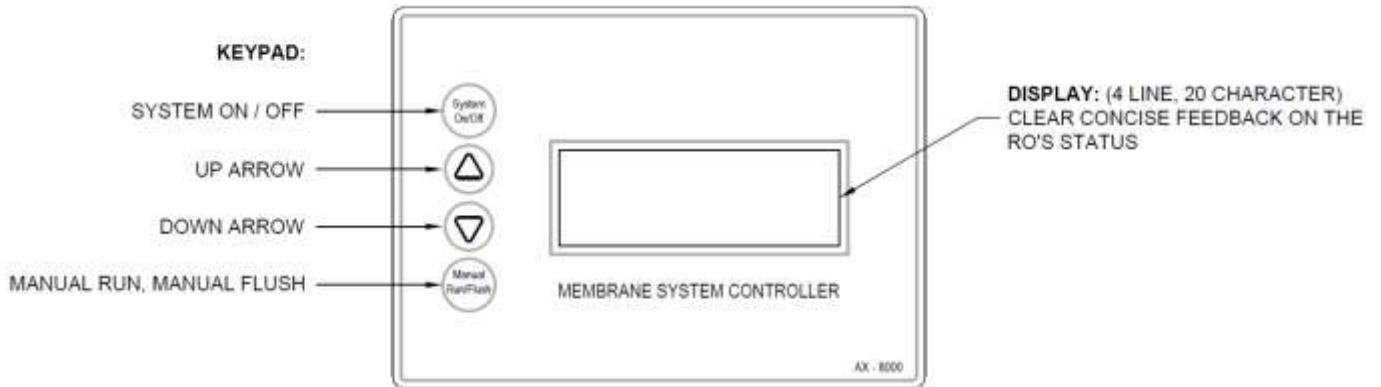
CONTROLLER SPECIFICATIONS

| Inputs | |
|-------------------------|--|
| Tank Level Switches | (2) Normally-Closed. Preprogrammed with a single level switch prewired to a High Pressure switch. The Tank, Low Pressure and Pretreat inputs are 50% duty cycle square wave, 10VDC peak @ 10mA max. The switch inputs are dry contacts only. Applying voltage to these terminals will damage the controller. |
| Inlet Pressure Switch | Normally-Open. |
| Pretreat Lockout Switch | Normally-Closed. |
| Controller Power | 110-120/208-240 VAC, 60/50Hz (Range: 110-240 VAC) |
| Permeate Conductivity | 0-3000 PPM, 0-6000 μ s (standard sensor, CP-1, K=.75) |
| Output Circuit Ratings | |
| Feed Solenoid | 1A. Voltage is the same as motor/supply voltage. |
| Flush Solenoid | 1A. Voltage is the same as motor/supply voltage. |
| Motor | 1.0 HP/110-120V, 2.0 HP/208-240V. |
| Circuit Protection | |
| Relay Fuse | F1, 5x20mm, 2 Amp, BelFuse 5ST 2-R Note: The fuse shown above is for supplemental protection only. Branch circuit protection and disconnect means must be provided externally. See Field Wiring Diagram for Branch Circuit protection requirements. |
| Other | |
| Dimensions | 7" tall, 7" wide, 4" deep. Nema 4X* Polycarbonate Hinged Enclosure. |
| Weight | 2.6 lb. (Basic Configuration). |
| Environment | 0-50°C, 10-90%RH (non-condensing). *Note: After our modification the enclosure rating is Nema 1. |

SIMPLIFIED SCHEMATICS

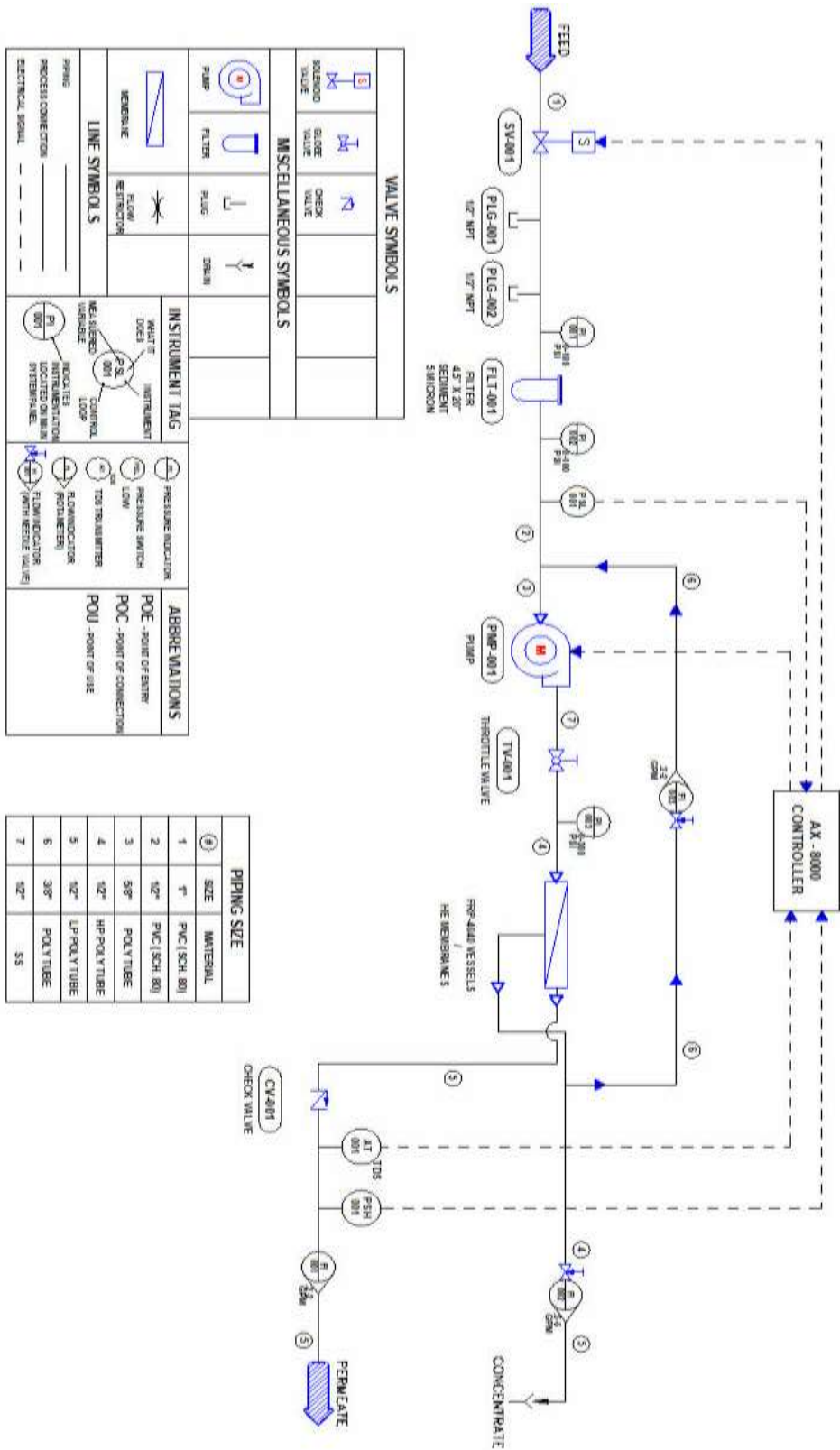


CONTROLLER OVERVIEW



MANUFACTURER'S DRAWINGS

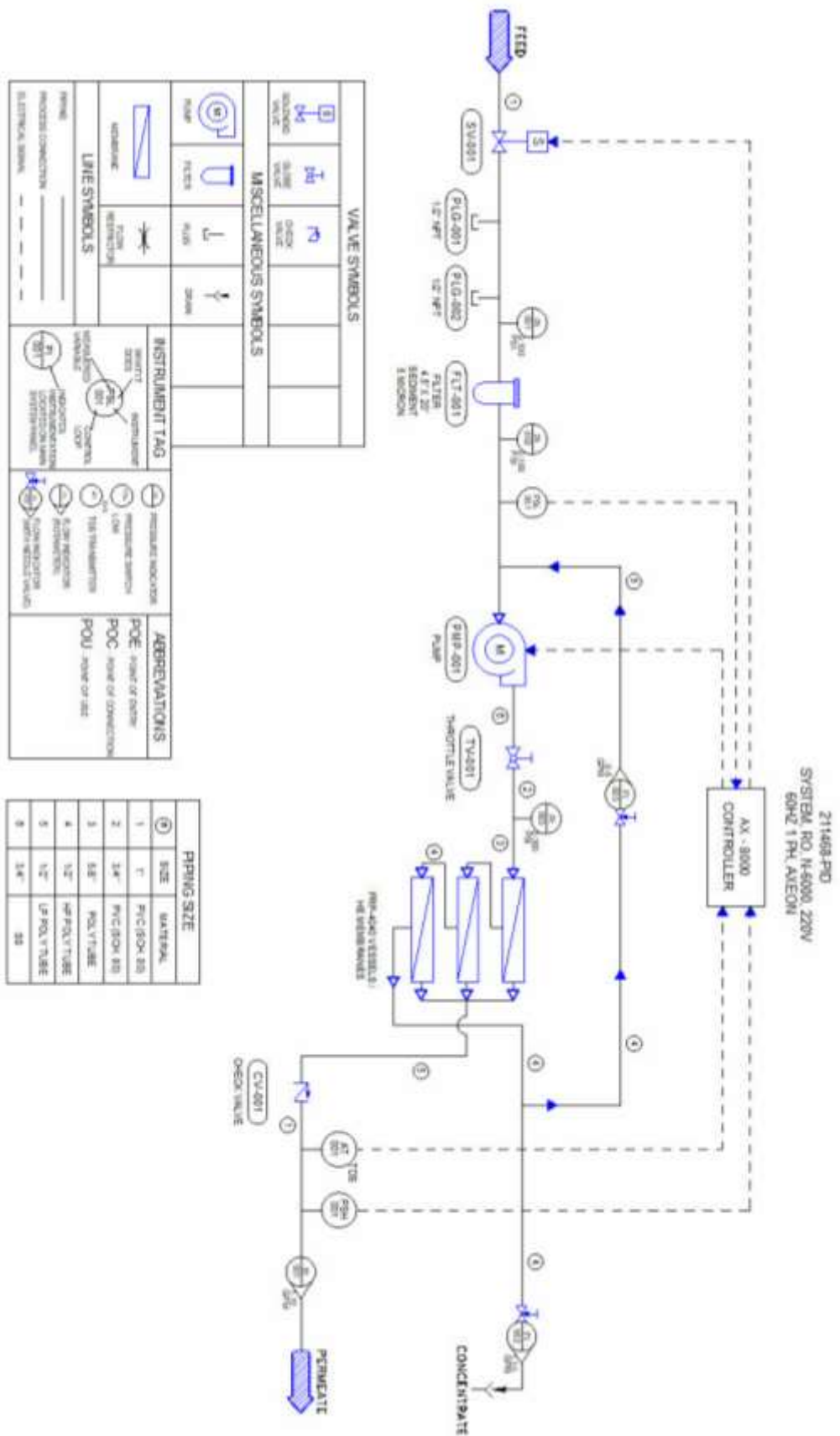
N – 2000 FLOW DIAGRAM



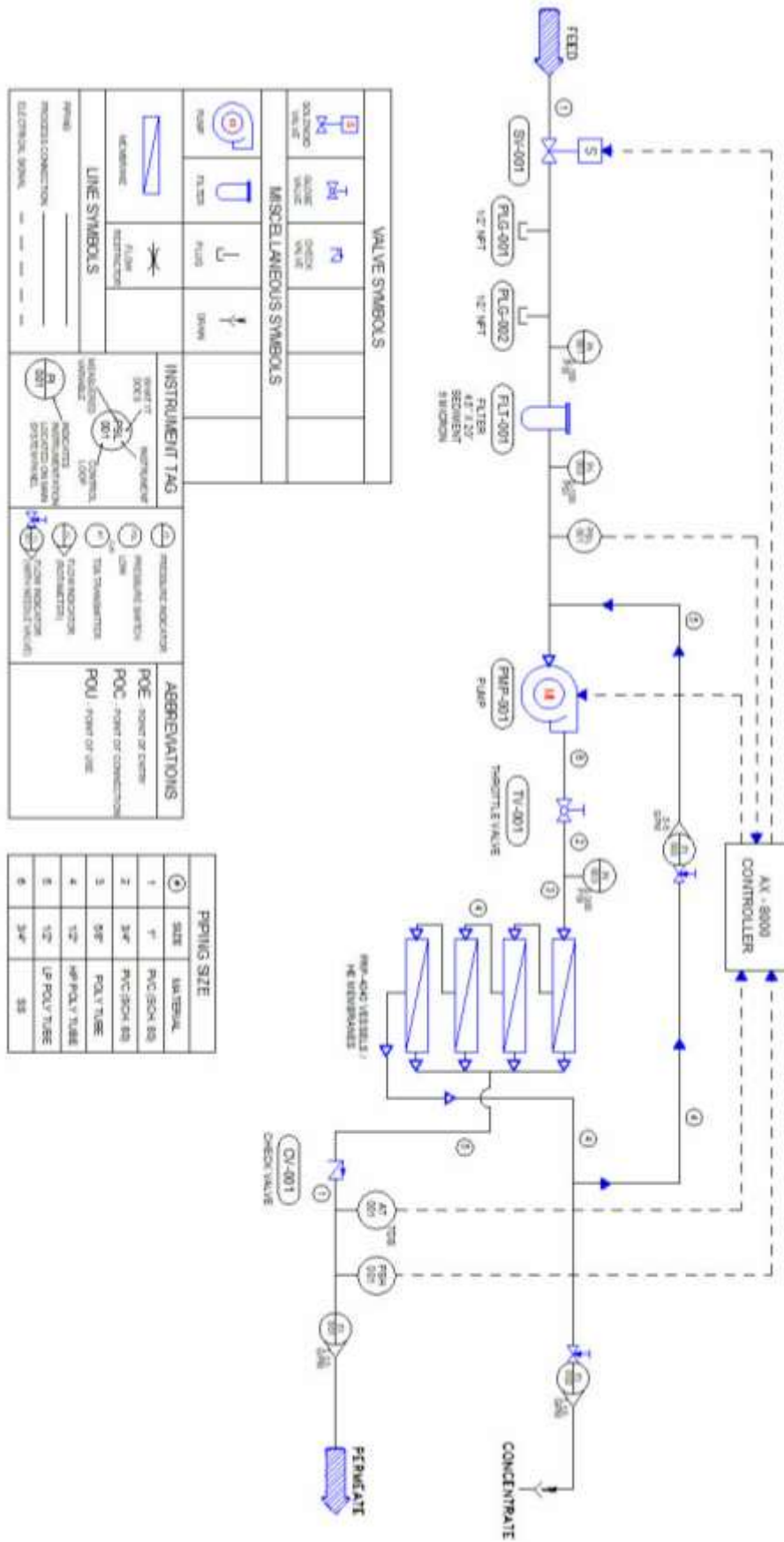
| VALVE SYMBOLS | | MISCELLANEOUS SYMBOLS | | INSTRUMENT TAG | | ABBREVIATIONS | |
|---------------|--------------------|-----------------------|-----------------|----------------|----------------|---------------|--------------------|
| | SOLENOID VALVE | | GLOBE VALVE | | INSTRUMENT TAG | | PRESSURE INDICATOR |
| | CHECK VALVE | | FLOW RESTRICTOR | | INSTRUMENT TAG | | PRESSURE SWITCH |
| | PUMP | | FILTER | | INSTRUMENT TAG | | LOW |
| | PLUG | | DRAIN | | INSTRUMENT TAG | | TDS TRANSMITTER |
| | LINE SYMBOLS | | FLOW RESTRICTOR | | INSTRUMENT TAG | | FLOW INDICATOR |
| | PROCESS CONNECTION | | INSTRUMENT TAG | | INSTRUMENT TAG | | FLOW TRANSMITTER |
| | ELECTRICAL SIGNAL | | INSTRUMENT TAG | | INSTRUMENT TAG | | FLOW TRANSMITTER |

| PIPING SIZE | |
|-------------|--------|
| Ø | SIZE |
| 1 | 1/2" |
| 2 | 3/4" |
| 3 | 1" |
| 4 | 1 1/2" |
| 5 | 2" |
| 6 | 3" |
| 7 | 4" |

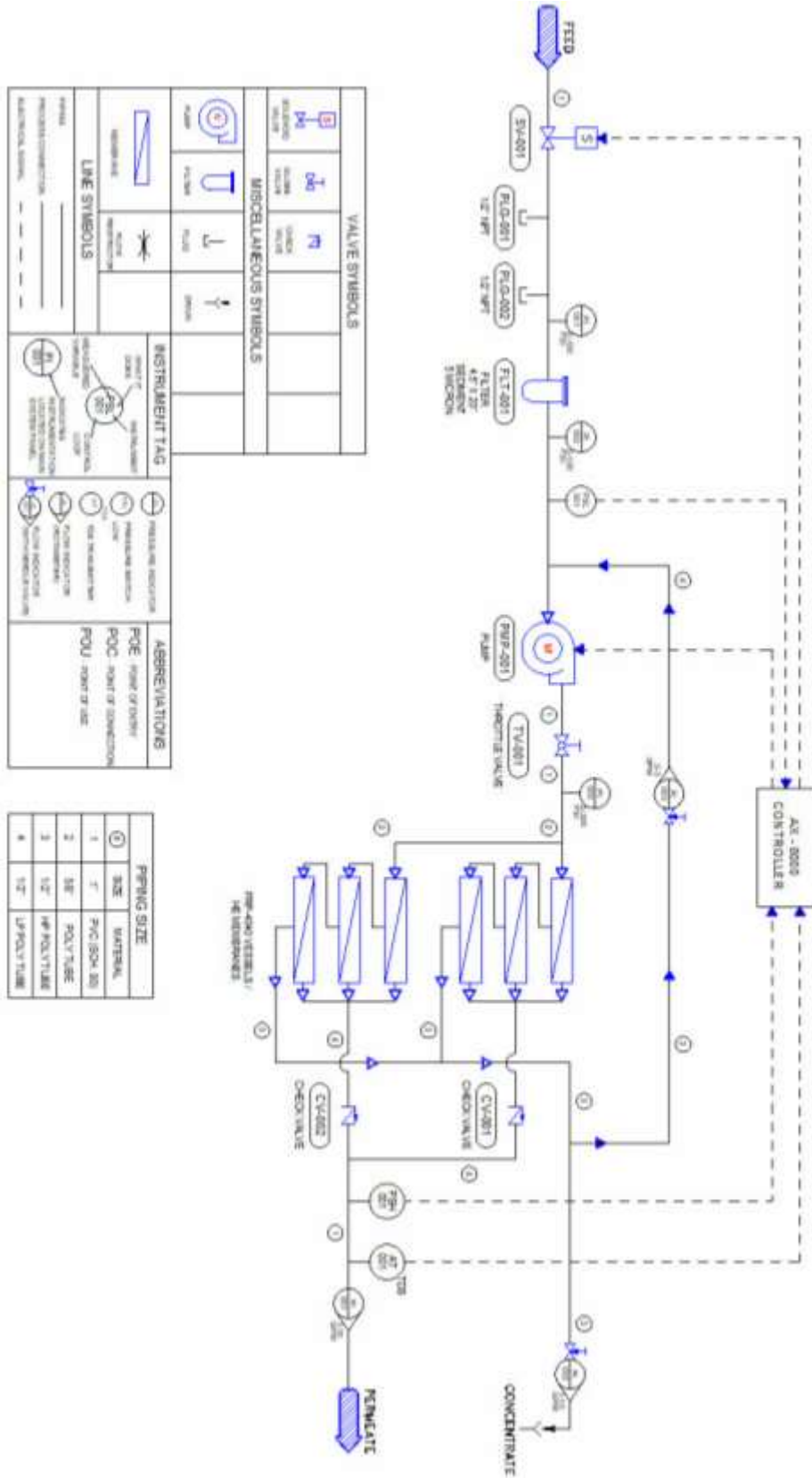
N – 6000 FLOW DIAGRAM



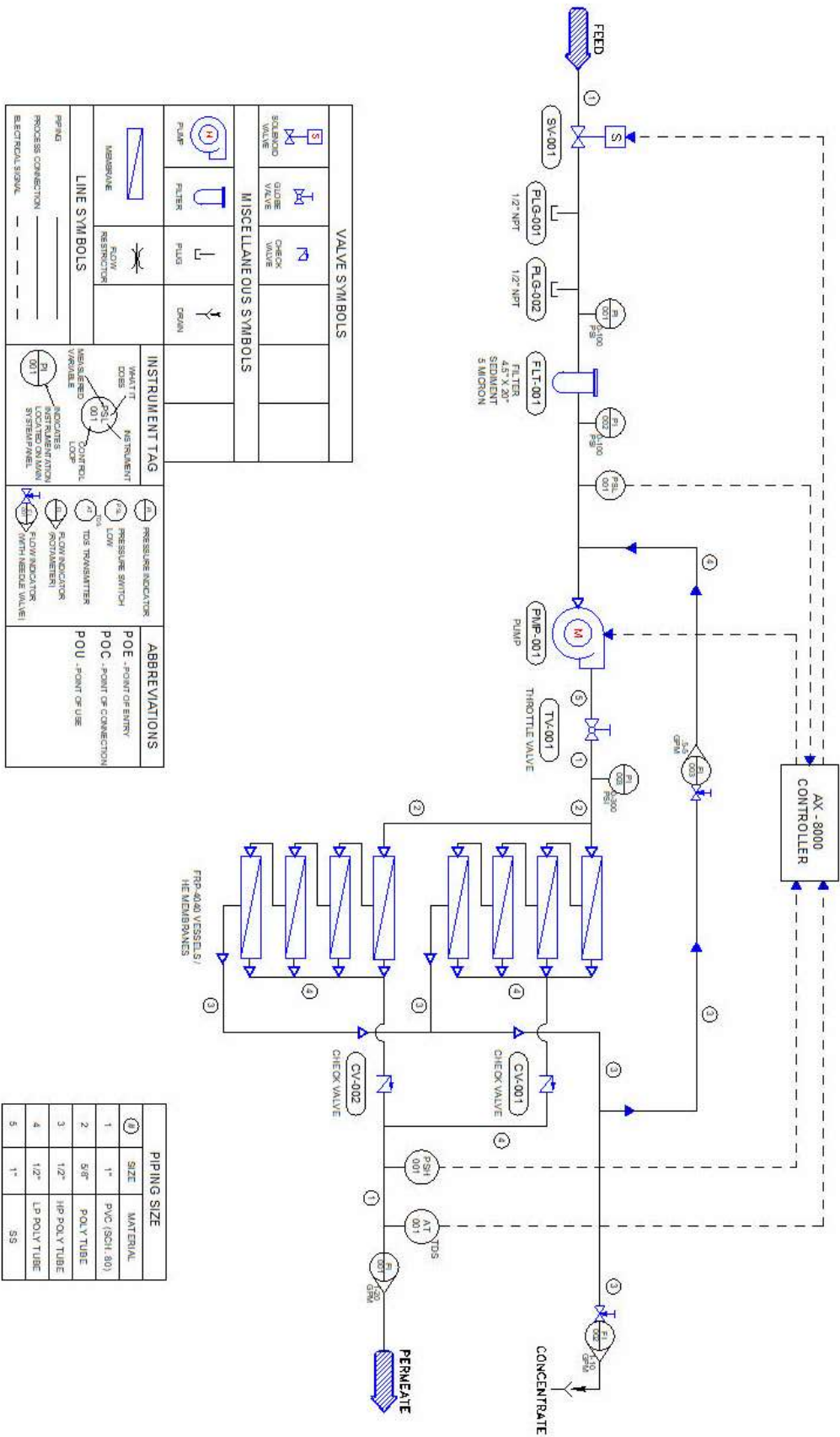
N – 8000 FLOW DIAGRAM



N – 12000 FLOW DIAGRAM



N – 16000 FLOW DIAGRAM



| VALVE SYMBOLS | | MISCELLANEOUS SYMBOLS | | INSTRUMENT TAG | | ABBREVIATIONS | |
|---------------|--------------------|-----------------------|------------------|----------------|--------------------|---------------|---------------------|
| | SOLENOID VALVE | | GLOBE VALVE | | INSTRUMENT TAG | | PRESSURE INDICATOR |
| | CHECK VALVE | | FLOW RESTRICTION | | PRESSURE SWITCH | | POINT OF ENTRY |
| | PUMP | | PLUG | | FLOW TRANSMITTER | | POINT OF CONNECTION |
| | FILTER | | DRAIN | | FLOW INDICATOR | | POINT OF USE |
| LINE SYMBOLS | | INSTRUMENT TAG | | ABBREVIATIONS | | ABBREVIATIONS | |
| | MEMBRANE | | INSTRUMENT TAG | | PRESSURE INDICATOR | | POINT OF CONNECTION |
| | PROCESS CONNECTION | | INSTRUMENT TAG | | FLOW TRANSMITTER | | POINT OF CONNECTION |
| | ELECTRICAL SIGNAL | | INSTRUMENT TAG | | FLOW INDICATOR | | POINT OF USE |

| PIPING SIZE | | |
|-------------|------|---------------|
| ① | SIZE | MATERIAL |
| 1 | 1" | PVC (SCH. 40) |
| 2 | 5/8" | POLY TUBE |
| 3 | 1/2" | HP POLY TUBE |
| 4 | 1/2" | LP POLY TUBE |
| 5 | 1" | SS |

SYSTEM WARRANTY

One-Year Limited Warranty

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.