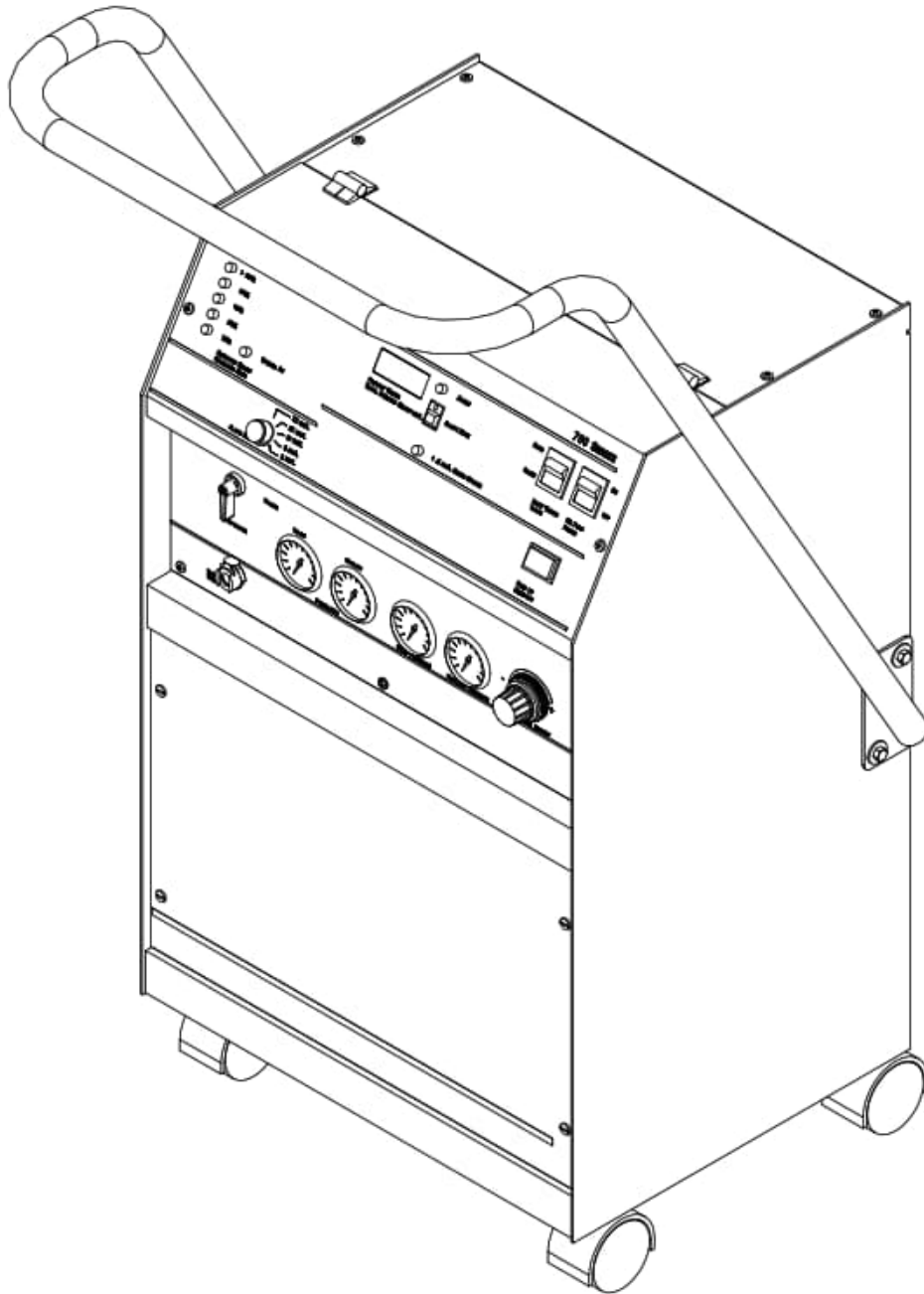


700 SERIES REVERSE OSMOSIS UNIT

Operation and Maintenance Manual



700 SERIES RO SYSTEM

Installation, Operation, and Maintenance Manual

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CHAPTER ONE:

GENERAL INFORMATION

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1.1 The Manual

This manual has been prepared to provide the operator with information regarding the installation, use, maintenance, and troubleshooting of 700 Series RO systems.

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

This manual has been written in narrative form, supplemented with schematics and drawings for clarification. Most procedures mentioned in this manual can be performed by the operator. Any exceptions will be clearly identified by a qualifying statement.

1.2 Safety Summary

Words of **ENHANCED CAPITAL** letters are used to identify labels on the device and key safety or qualifying statements. A list of all symbols and abbreviations is located at the end of this chapter.

This safety summary does not contain all of the safety statements in the manual. Other safety statements are included within the manual text and are enhanced and defined as follows:

NOTE: “Notes” are statements that provide further clarification.

CAUTION: A “Caution” statement is used to identify conditions or practices that could result in equipment or other property damage.

WARNING: A “Warning” statement is used to identify conditions or practices that could result in personal injury or loss of life.

READ THIS MANUAL:

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

USE PROPER POWER CONNECTIONS:

Use proper wiring and connection methods to satisfy hospital electric codes.



DO NOT REMOVE COVERS OR PANELS:

To avoid electrical shock hazard, do not remove covers or panels when power is supplied to the device. Do not operate the device when covers or panels are removed.

SHOCK HAZARD:

Connect this device to a properly grounded connection in accordance with the National Electrical Code. **DO NOT** under any circumstances remove the ground wire or ground prong from any power plug. Do not use extension cords or an adapter without proper consideration.

DEVICE LABELING:

Do not under any circumstances remove any Caution, Warning, or other descriptive labels from the devices until the conditions warranting the label are eliminated.

DO NOT OPERATE IN FLAMMABLE ATMOSPHERES:

To avoid fire or explosion, do not operate this device in an explosive environment.

RO ORIENTATION:

RO may only be operated in a vertical orientation.

 **WARNING:** Cancer and Reproductive Harm – www.P65Warnings.ca.gov

1.3 Applications

The 700 Series RO is designed to purify water by forcing water through a semi-permeable membrane. Water purified by reverse osmosis has had 95% of the dissolved ions and 99% of most other contaminants removed. The quality of the purified water, referred to as product water or permeate, depends on the quality of the feed water and normally is equal to or exceeds AAMI, and ASTM type III or IV. Such water is suitable for such applications as hemodialysis, glassware rinsing, beverage reconstitution, solution preparation, and numerous other scientific, commercial, and industrial applications.

1.4 Contraindications

<p>WARNING: This system is not designed, sold, or intended for use in producing water for injection (WFI) or other sterile solutions.</p>
--

Furthermore, this device is not intended to be used outside of its specifications or limitations.

1.5 Environmental Considerations



Prior to the installation of the 700 Series RO System, it will be necessary to provide utilities and create an environment suitable for the trouble free operation of the RO system and its accessories.

POWER:

All electrical components operate on single phase power. Histories of power failure, power surges, and low line voltages should be noted and reported to the manufacturer or its agent, as they may create adverse conditions for the operation of equipment.

WATER:

Reverse osmosis systems require a reliable water source. The 700 Series Unit needs a minimum of 30 PSI pressure at a minimum flow of 2 gallons per minute. It is important to run water at the design flow rate when testing water pressure rather than reading static pressure.

WARNING: The product water quality is proportional to the feed water quality. The product water may exceed acceptable limits if the feed water deteriorates significantly. The user should monitor the feed water quality periodically.

DRAIN:

A drain outlet is required by the RO system. The drain must have a minimum capacity of 2 gallons per minute of continuous flow for as long and as often as the RO is operating.

TEMPERATURE:

The 700 Series unit is normally connected to a cold water supply. The performance specifications of the RO are based on 77°F (25°C) feed temperature. Each degree Fahrenheit the feed water temperature falls, the RO product flow decreases approximately 1.5%, and each degree Celsius drop, the product flow is reduced by 3% (refer to Technote 113 for the “Temperature Correction Factors” chart). In climates where the winter water temperature drops significantly below 77°F, it may be necessary to temper the water.

WARNING: The temperature of the tempered water should be monitored closely with a thermometer, as high temperatures can damage the RO membranes and harm the patient. Refer to the inlet water requirements (Section 1.7.1) for the maximum operating temperature for the 700 Series RO.

CAUTION: It is necessary to keep the unit from freezing to prevent serious damage to the RO unit.



NOISE:

The RO unit does not generate significant noise levels. Hard walls reflect noise and will make the unit seem louder.

WATER PURITY:

Plumbing materials can significantly contribute to the contamination of the water. Metallic pipes (with the exception of 316 stainless steel) must be eliminated once the purification process has begun. Schedule 40 or 80 PVC pipes, polypropylene, PVDF, and other FDA recommended materials are suitable for most grades of purified water. Care must also be exercised over the choice of thread sealant. Teflon tape is suitable for all threaded connections in this system.

WARNING: Ordinary pipe dope must be avoided since it may leach objectionable and potentially dangerous impurities into the water.

1.6 Theory of Operation

The 700 Series RO is a fully cabinetized, portable reverse osmosis unit that purifies a given feed water by way of reverse osmosis for use in hemodialysis applications. The 700 Series RO possesses monitoring for pressure, product water quality, and membrane performance (percent rejection). The unit includes pre-filtration to remove particulates greater than 5 microns which could foul the RO membranes and damage the high pressure pump. The RO pump provides the pressure required to drive water through the RO membranes at economical flow rates and improves the membrane rejection performance. The fluid controls provide a means of managing required flow rates and pressures. The following paragraphs detail the function of these fluid control components which are used within the unit.

1.6.1 Components of the 700 Series RO

The 700 Series RO product water wetted components consist of the following materials.

Component	Material
Product Tubing	Polyethylene
High Pressure Housings	304 SS
Fittings	Acetal or Polypropylene
Conductivity Sensors	Acetal and 316 SS
O-rings	EPDM or Nitrile
Check Valve (Product)	Acetal (body), Nitrile (o-ring) and 302 SS (spring)
Check Valve (Product Return)	Polypropylene (body/poppet), Ethylene Propylene (o-ring), 302 SS (spring), and Teflon (poppet seat)
Endcap	Noryl
Thermistor	Minimum 303 SS
Element	PVC (center tube), Polypropylene (spacer), EPDM (seal) and Tricot (membrane)

The **Inlet Solenoid** is located at the inlet of the 700 Series RO and serves to shut off the water supply to the system. It is actuated when the inlet water valve switch is placed in the ON position. This valve allows you to change the pre-filter without having to turn off the main water supply.

The **Pre-Filter**, located in a blue housing at the back of the 700 Series Unit, is a cartridge type filter with a nominal rating of 5 microns. The purpose of this element is to collect any particles larger than 5 microns which may be detrimental to output water quality and subsequent components in the system. The filter is monitored on the inlet and outlet by 0 to 100 PSI panel mounted gauges.

The **Pressure Adjust** regulator is used to adjust the product pressure. This is displayed on the product pressure gauge.

Next in line is the **Inlet Water Check Valve**. This is to prevent back flow of disinfectants or cleaning agents into the pre-filter.

The **Inlet Water Sensor** monitors the quality of the inlet water. Inlet quality is compared to the outlet (product) water and is displayed as "percent rejection" on the front panel.

The **High-Pressure Pump** provides up to a 200 PSI boost of the inlet water to the reverse osmosis membrane assembly (ROMA). The RO pump pressure is displayed on a 0 to 300 PSI gauge mounted on the front panel.

One to four **ROMAs** may be included in the 700 Series Unit. Thin film membrane units provide 250 to 1000 gallons per day of product water.

The **Waste Flow** is controlled by a length of 1/8" tubing. The length and diameter will cause resistance to flow (friction loss) in the tube and will govern the water flow to drain.

The **Operate/Flush Valve** on the front panel is used to flush the membrane surface and to accelerate the rinse out of cleaners or disinfectants from the unit. Some pump noise (chattering) is normal in the flush position. The unit is in "flush" from the full open (flush) to just before the fully closed (operate) position.

Product Water Pressure is read on a 0 to 60 PSI panel mounted gauge on the front panel. Product pressure will only register when the product is back pressured (valve closed or connected to dialysis unit).

The **Product Recirculation Check Valve** prevents over-pressuring of the product supply. The product water pressure will increase to the set point of the product pressure regulator, opening the Product Recirculation Check Valve. Excess product water is recirculated back to the inlet water line (after the inlet check valve).

The **Product Water Sensor** is used in conjunction with the inlet water sensor by the percent rejection circuitry to calculate dissolved solids rejection rate. The rate of rejection is displayed in a 5 LED array on the front panel.

The **Product Check Valve** is used to prevent anything from back flowing into the product side of the membranes. Back flow into the product line can cause damage to the membranes.

The **TDS Sensor** samples the product water quality via the sensor probe, and the quality of the product water is indicated on a digital display on the front panel. The monitor is temperature compensated to adjust the display value to changing water temperature.

The **Product Valve** is a 1/4-turn ball valve located in the back of the unit. This is where the connection for hooking up to the product water is located.

The **Disinfect Inlet Port** is a quick disconnect valve that allows access to the inlet water side of the pump. The valve is used whenever cleaners or disinfectants are introduced to the unit. The valve can also be used as a sample port for testing feed water for chlorine/chloramine and hardness.

WARNING: Water from this port is NOT RO product water and should not be used for dialysis solutions. This port may be used as a source of pretreated filtered water to fill containers for cleaners or disinfectants.

The **Disinfect Switch** is used to introduce disinfectants and cleaners into the unit. For added safety, this switch illuminates red when disinfecting the machine.

CAUTION: When drawing disinfectants or cleaning solutions, do not allow the unit to draw air. This will cause irreparable damage to the RO pump.

1.6.2 Monitors and Controls

Inlet Water Valve Switch is mounted on the front panel. The switch is used to energize the solenoid, pressurizing the system with feed water.

RO Pump Power Switch is mounted on the front panel. The switch is used to energize the RO pump/motor. The inlet water switch must be on for the pump/motor to operate.

Disinfect Switch is mounted on the front panel. This switch is used to introduce disinfectant or cleaning agents into the unit.

The **Pressure Adjust** regulator is used to set the maximum product pressure needed. Adjusting this will also result in small adjustments in the pump pressure.

Product Pressure Gauge reads the product pressure from 0 to 60 PSI. Product pressure will read zero PSI when product line is not connected to dialysis unit and product valve is open.

The **Pump Pressure Gauge** reads the pump pressure from 0 to 300 PSI. It is used for monitoring during operation and when adjusting the pump pressure.

Pre-Filter Pressure Gauges read the inlet water pressure from 0 to 100 PSI. The inlet gauge indicates the feed water pressure available to the unit. The output gauge indicates the pressure available after the filter. The difference (delta), along with other variables, is used to determine when the filter must be changed.

The **Operate/Flush Valve** is a 1/4-turn ball valve. When in the operate mode, the valve is in the closed position. When the valve is turned at any point towards flush, the valve is open. The closer to the flush point you turn the valve, the more the valve is open. The valve bypasses the waste flow orifice tube.

Disinfect Port is a quick disconnection port for the introduction of disinfectant or cleaning agents.

The **Percent Rejection Display** is a 5 LED array that indicates how well the RO membranes are performing. The lights correspond to 99%, 95%, 90%, 85%, and >70% rejection. The 99% light, when energized, indicates a need to evaluate the RO system performance. RO units do not normally perform in excess of 99%; verify this reading with an independent meter and take corrective action if indicated. Some RO membranes under optimum conditions will achieve this level of performance.

The **Product Water Total Dissolved Solids (TDS)** digital display indicates product water purity. It is temperature compensated to adjust the value of the display with changing water temperature for better accuracy.

The **Less Than .5 mg/L Check System** lamp indicates when the TDS is .5 mg/L or less. This indicates a need to evaluate the RO system performance. RO units do not normally have this low of a product TDS. Verify this reading with an independent meter and take corrective action if indicated. RO membranes under optimum conditions (good feed water) may achieve this level of performance.

The **Alarm Set** switch allows the operator to set the TDS level at which the alarm will sound. The alarm should be set to twice the initial TDS reading. If the set point is exceeded, an audible alarm will sound.

NOTE:

Choose the alarm set point that is closest to twice the initial installation TDS reading.

The **Alarm Mute** switch will mute the audible alarm for 30-45 seconds. A red indicator lamp is displayed on the switch when the mute switch has been pressed.

1.6.3 Optional Equipment

The organization offers a number of optional items to adapt the equipment to meet specific needs. Options are available to increase the volume of water produced or to increase the quality of the water produced. Options are also available to add control features not available on the standard systems. Frequently requested options are briefly described in the following paragraphs. If more information is needed or if other options are desired, please consult the factory.

Pretreatment Carts attaches to the 700 Series Unit. Depending on the cart, it will hold any combination of two or three of the following tank sizes, .25 c.f., .47 c.f., .60 c.f., or .85 c.f..

Carbon Filter Tanks protect the RO membrane from being damaged by chlorine and removes lower molecular weight dissolved organics from RO feed water. The filter incorporates a bed of granular activated carbon. Carbon tanks come in semi-automatic control valve and exchange head styles.

WARNING: Carbon is not regenerated and must be replaced when exhausted.

WARNING: A suitable carbon filter should always be present as pretreatment for the RO unit in order to prevent chlorine/chloramine damage to the thin film RO membrane and harm to the patient. The organization strongly recommends use of two carbon tanks used in series.

The **Softener** removes calcium, magnesium, and other scale producing contaminants from the feed water. It is an ion exchange device that substitutes sodium for larger and more highly charged cations in the feed water. Their removal prevents the buildup of scale on the membrane surface. The control valve drives the regeneration of the device and will remove the hardness ions with a brine solution and rinse the ion exchange bed afterwards. The control valve is normally governed by a semi-automatic time clock.

1.7 Specifications

1.7.1 Inlet Water Requirements

	<u>Minimum</u>	<u>Maximum</u>
Flow	2.0 GPM	N/A
Temperature		
TF Membranes	1.7°C (35°F)	35°C (95°F)
TF Membranes (Cold Water)	1.7°C (35°F)	50°C (122°F)

NOTE:

Operating at lower temperatures may make it impossible for the 700 Series RO to produce adequate permeate for the dialysis machine.

pH (Operating)		
TF Membranes	2.0	11.0
TF Membranes (Cold Water)	2.0	11.0
pH w/Chloramines Present (Operating)		
TF Membranes	4.0	8.5
TF Membranes (Cold Water)	4.0	7.5
pH (Cleaning)		
TF Membranes	1.0	11.5
TF Membranes (Cold Water)	1.0	11.5
Pressure, Dynamic	30 PSI	100 PSI

1.7.2 Flow Rates

Product Flow based on the following conditions:

Operating Pressure: 190 ± 10 PSI
 Product Pressure: 1 PSI
 Feed Water Temperature: 77°F (25°C)

<u>Model Number</u>	<u>Flow Rates</u>			
	<u>GPM</u>	<u>LPM</u>	<u>GPD</u>	<u>LPD</u>
701 (TF membranes)	.17	.64	250	921.6
702 (TF membranes)	.34	1.31	500	1892.5
703 (TF membranes)	.52	1.97	750	2838.7
704 (TF membranes)	.69	2.62	1000	3785.0
*704 (TF cold water)	.54	2.06	784	2966.4

* Cold-water machine flow rates based on 50°F (10°C)

Membrane flux may vary ±15%

Waste Flow: .84 GPM (3.2 LPM) (±10%)

1.7.3 Electrical Requirements

Motor 1/3 HP
 Voltage 115 ~/230 ~
 Hertz 60/50
 Phase 1
 Amp Draw 8/5

1.7.4 Physical Characteristics

	<u>Short Cabinet</u>	<u>Short Cabinet (w/handle)</u>	<u>Tall Cabinet</u>
Height	30 inches	38 1/2 inches	39 1/2 inches
Depth	18 inches	24 1/4 inches	18 inches
Width	14 inches	20 3/8 inches	14 inches

Weight - Operating

<u>Model</u>	<u>Weight</u>
701	60 lbs.
702	70 lbs.
703	80 lbs.
704	90 lbs.

Power Cable Length: 6 ft. for all models

1.7.5 Membrane Performance Characteristics

Salt rejection: TF Membranes 95% minimum

Test Solution: Inlet water 1000 PPM NaCl
 Conductivity: 2000 micro mhos-cm

Operating Pressure: 190 ± 10 PSI

Product Back Pressure: 0 PSI

1.7.6 Environmental Requirements

	<u>Minimum</u>	<u>Maximum</u>
Ambient Temperature	4°C (39°F)	32°C (90°F)
Storage Temperature	2°C (35°F)	32°C (90°F)
Altitude	N/A	10,000 feet

NOTE: This equipment will function in a condensing environment. The user/operator should recognize that moisture can be caused by condensation and is not necessarily an equipment leak.

1.7.7 Approvals

This medical equipment has been tested and demonstrated compliance with the following standards:

- CAN/CSA Standard C22.2 No. 601.1
- UL 2601-1

1.8 Disposal

Disposal of this product or its parts must be carried out according to local disposal codes.

1.9 Electromagnetic Interference

This equipment can generate, uses, and can radiate radio frequency energy and, if not installed and used in accordance with these instructions, may cause harmful interference to other devices in the vicinity. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference with other devices, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving device.
- Increase the separation between the equipment.
- Connect the equipment into an outlet on a circuit different from that to which the other device(s) is connected.
- Contact the field service technician or manufacturer for help.

1.10 Service Assistance

If service assistance is required, take the following steps:

1. Consult the "Troubleshooting" section of this manual (Chapter Five). If the problem cannot be identified and corrected by any of the procedures found in that section, then
2. Call the dealer in your area.
3. Call Technical Support Department at (800) 633-3080. Technicians are available for all calls between 7:00 a.m. and 7:00 p.m. CST, Monday through Friday. Technicians are also available at other times for **emergency calls only**. Product consultants will be on hand to discuss the problem with you and endeavor to rectify it over the phone. If the problem appears to be of a more serious nature, you will be given instructions regarding the action to be taken. Prior to making the phone call, you must be prepared to answer two questions:
 - 1) What unit do you have; i.e., 700 Series Unit?
 - 2) What is the serial number of your unit (this is found on the back of unit)?
4. In addition, for **Non-Emergency** issues, you may e-mail technicalsupport.mcpur@xylem.com and a Technician will respond generally within one working day.

1.11 Return Material Authorization (RMA) Procedure

If you wish to return materials for warranty evaluation and/or credit, please have your original sales order, invoice, and device serial number available when you call. Call us at (800) 633-3080 and request Technical Support. A Technical Support representative will provide instruction and a return material authorization number, **which needs to be clearly written on the outside of the box used to ship your materials**. All equipment must be shipped with the freight prepaid by the customer. Call our Customer Service Center with any questions or issues concerning freight claims and a representative will discuss your situation.

All materials to be returned must be rendered into a non-hazardous condition prior to shipping.

1.12 Symbols and Abbreviations

AAMI	Association for the Advancement of Medical Instrumentation
C	Centigrade
cc	Cubic Centimeters
CSA	Canadian Standards Association
cm	Centimeters
cfu/ml	Colony Forming Unit per milliliter
EU	Endotoxin Unit
DI	Deionization
F	Fahrenheit
Ft.	Foot (feet)
GAC	Granular Activated Carbon
gr	Grains
Lbs.	Pounds
LED	Light Emitting Diode
LPM	Liters per Minute
Megohm-cm	Million Ohms - Centimeter
mw	Molecular Weight
PSI	Pounds per Square Inch
GPD	Gallons Per Day
GPM	Gallons Per Minute
mg/L	Milligrams per liter
MNPT	Male National Pipe Thread
RO	Reverse Osmosis
TF	Thin Film
CA	Cellulose Acetate
PA	Polyamide
TFC	Thin Film Composite
ROMA	Reverse Osmosis Membrane Assembly
QD	Quick Disconnect
UL	Underwriters Laboratory
~	Volts Alternating Current

Notes:

CHAPTER TWO:

INSTALLATION/INITIAL SYSTEM START-UP

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2.1 Installation Considerations

CAUTION: The RO has been packaged in a storage solution designed to preserve the system until it is ready for operation. The RO should be installed by the date shown on the label adhered to the outside of the original packaging.

1. Select a location for the 700 Series Unit near the required utilities and dialysis equipment.
2. The RO unit requires 115 VAC (or 230 VAC, 5 amps) power for operation and consumes 8 amps of current.
3. The RO unit also requires nominally 2 GPM water at 30 PSI. The water may also require some pretreatment to ensure maximum performance and suitability.
4. A drain with a capacity of 2 GPM is required for the RO unit.
5. Back flow prevention may be required in accordance with local codes.

CAUTION: RO units with thin film membranes must be rinsed to drain with normal pressures for a minimum of one (1) hour before exposure to Minncare HD, and a minimum of six (6) hours before exposure to Formaldehyde or irreversible damage may occur.

2.2 Handle Installation

1. Position handle on RO with gripping area on operating side of RO.
2. Use a bolt and locking washer in each hole to secure handle to cabinet.

2.3 Carbon Installation and Rinse Procedure

WARNING: Do not rinse carbon tanks until they are ready to be used in service. Carbon tanks that have been wetted and allowed to sit unused will grow bacteria; however, regular idle times; i.e., overnight or weekends, is appropriate.

CAUTION: Supply water with a pH above 8.5 and containing chloramines will adversely affect the operation of the RO membrane.



Materials Required:

Carbon tank
Feed line
Rinse line
pH test indicator
Total chlorine test kit
Teflon tape
Water supply (sink)
Screwdriver (Phillips or standard)
Pliers or pipe wrench

If the RO unit is supplied with a carbon tank, the carbon tank must be rinsed before connecting to the RO unit.

CAUTION: Failure to rinse the carbon media tank according to the following procedure will result in immediate and irreparable damage to the RO membrane. Carbon fines and ash from the granular activated carbon (GAC) will dislodge from the media and foul the RO membrane, causing permanent damage.

1. Install hose fittings (1/2" male pipe thread x male garden hose thread) in the inlet and outlet ports. Wrap the pipe threads with 2-3 turns of Teflon pipe sealing tape prior to installation.
2. Install the sample valve in the 1/4" female port (adjacent to the inlet port). Use Teflon tape on pipe sealing threads.

NOTE: The initial flushing of the carbon tank must consist of passing water backwards through the carbon tank to drain (Steps 3-6). This reverse flush lifts and expands the carbon bed to facilitate removal of carbon fines and ash.

3. Install the supply water line on the OUTLET fitting (for initial filling and purging of air).
4. Install a drain line on the INLET fitting and route this hose to a drain.
5. Attach the feed water line to your water source. Partially open the supply water valve. The water should begin filling the tank, with air being expelled through the drain line to the drain.



6. When all the air is expelled from the tank (no more air passing out of the drain line), continue to rinse for at least 20 minutes and then close the feed water valve.

WARNING: After all of the air is purged and the tank has been back-washed, the lines **MUST** be reinstalled in the normal service position. Chlorine/chloramine will not be adequately removed if hoses are not correctly installed (see Step 7).

7. Disconnect the outlet (drain) line from the tank INLET fitting at this time. Disconnect the feed water line from the tank OUTLET fitting and re-install on the INLET. Install the drain line on the OUTLET fitting.
8. Open the supply water valve slowly (ensure that the drain line is properly attached to the drain so that spillage does not occur). The valve may be fully opened at this time. Rinse the tank in this manner for at least 20 minutes.
9. While the tank is rinsing, open the sample valve briefly to allow any fine carbon particles and air to escape, and then close the sample valve.
10. Check the supply and outlet water conductivity with a hand held meter. The water quality should be the same. If the outlet water conductivity is higher than the supply, continue to rinse until they are equal.
11. After the outlet quality has stabilized at the same value as the inlet, close the supply water valve.

CAUTION: Allow the carbon tank to soak for at least two hours before continuing the rinse procedure. If possible, allow the carbon tank to soak 12-24 hours.

12. When the soak time is complete, open the supply water valve fully and rinse the carbon tank for one hour. (Outlet hose should still be connected to the drain.)
13. Check the conductivity of the supply and output water with a hand held meter. When the conductivity of both the supply water and the output water are equal, the tank is ready for testing.
14. Reduce the flow through the carbon tank to approximately 1 gallon per minute. Wait 3 minutes, and then collect a sample of the output water to be tested immediately for total chlorine. Refer to instructions in chlorine test kit (P/NW3T578280).



15. If total chlorine test is negative, tank is ready to be placed in service.
16. Secure the tank in its carrier and connect the hoses for normal operation.
17. Proceed with the balance of the RO set-up procedure (Section 2.4).

WARNING: Always confirm the absence of total chlorine/chloramines in the carbon tank output water before operating the RO unit or patient injury and irreparable damage to the TF membranes will occur.

2.4 Installation Procedure

CAUTION: If a carbon tank is present on the RO system, the carbon tank must be completely rinsed of all carbon fines and ash before connecting to the RO unit. Otherwise, irreparable damage to the TF membrane will result (refer to Carbon Installation and Rinse Procedure, Section 2.2).

WARNING: The Series 700 RO is stored with a bacteria inhibitor from the factory. Follow all Material Safety Data Sheet (SDS) guidelines that are included with the unit.

WARNING: RO units with thin film membranes must be rinsed to drain with normal pressures for a minimum of one (1) hour before exposure to Minncare HD[®], and a minimum of six (6) hours before exposure to Formaldehyde or irreversible damage may occur.

1. Unpack the 700 Series RO and inspect the contents for the following;
 - 700 Series RO
 - Manual (this document)
 - Hose Kit
2. Inspect the RO for damage. Inspect internal fittings for breakage.
3. Connect the 700 Series RO inlet tubing connector to the inlet cold water supply.
4. Connect the waste water line to the drain in accordance with the local plumbing code.

5. Connect the product rinse line connector to the product valve. The product valve is located in the lower left corner of the rear of the unit. Open the product valve.
6. Make sure that the inlet water valve switch and RO pump power switch are in the OFF position. Plug the power cord into a 115 VAC (230 VAC) grounded outlet. Do not use an extension cord or an adapter without proper consideration.
7. Turn on the water supply to the unit.
8. Turn the Operate/Flush valve to the FLUSH position.
9. Turn on the inlet water valve switch. Water will start to fill the unit. Allow the unit to rinse to drain for five minutes after water begins to flow from drain line. Inlet and outlet pressure gauges should indicate pressure.
10. Turn on RO pump power switch.

NOTE: The Operate/Flush valve may need to be rotated part way towards the operate position if the pump makes excessive noise.

11. Slowly turn the Operate/Flush valve to the operate position. Pump pressure should not exceed 200 PSI. If 200 PSI is exceeded, adjust pump pressure on pump head.
12. Let unit run for an additional 15 minutes or until percent rejection and TDS values have stabilized.

WARNING: Ensure that TDS and membrane performance are normal for region. Consult physician. An AAMI analysis and bacteria test of the product water must be obtained and interpreted before using the RO unit for hemodialysis treatment (refer to Product Water Analysis procedure and Product Water Culture Procedure).

13. Set the product water TDS alarm limit switch as prescribed by the physician. The switch is normally set to twice the initial TDS reading (or “next higher” setting) at start-up.
14. Disinfect and rinse the RO unit with approved disinfectant before using for hemodialysis treatment. (Refer to Formaldehyde and Minncare HD® disinfection procedures in Chapter Four).

NOTE: Disinfect the RO unit every day for one week after installation. This will ensure that bacteria levels in the fluid paths will be controlled. Sample the purified water for bacteria before each disinfection (see Product Water Culture Procedure). After one week of results within normal limits, the interval between disinfections may be increased.

WARNING: After cleaning or disinfection, product water **must be verified to be free of residual cleaner or disinfectant.**

15. Unit is now ready for use.

2.5 Product Water Analysis Procedure

In order to ensure that the RO is performing at or above AAMI (Association for the Advancement of Medical Instrumentation) Standards, it is necessary to do an AAMI Water Quality Analysis test.

WARNING: There are many documented clinical risks in using less than AAMI Standard product water (refer to Technote 103, "AAMI Hemodialysis Water Quality Standards").

NOTE: Follow the procedures recommended by your water quality-testing laboratory if they vary from the following steps.

Materials Required:

Product water sampling kit
Sterile gauze
Tape
Container (such as small bucket)

1. Operate the RO unit for at least 15 minutes before drawing the water sample.
2. Hold product line over the container, open the product valve, and run product water for 60 seconds.
3. Aseptically remove the lid from the sample bottle and rinse the bottle twice with RO product water.
4. Fill the bottle completely with RO product water and cap immediately.



5. Place the bottle and completed requisition back in the pre-addressed mailer and mail it directly to the laboratory.

NOTE: Total chlorine must be measured on-site. Tests for chlorine/chloramine (total chlorine) are not typically reported on the AAMI Analysis. Chlorine and chloramine dissipate from the water sample over time and reported results may be inaccurate.

NOTES:

CHAPTER THREE:

SYSTEM OPERATION

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3.1 Daily Start-Up Procedure

WARNING: Verification of an absence of sanitizers, disinfectants and chlorine/chloramines must be performed before water is used for any patient related uses.

1. Connect the RO unit to the required utilities (feed water, drain, power).
2. Ensure that all valves in the water supply line to the unit are opened.
3. Ensure that the product valve is open and the product rinse line is connected to the unit with the other end in a drain.
4. Move the inlet water valve switch to the open position. When water flows to drain, the RO pump power switch can be moved to the ON position.
5. The pressure gauges should indicate normal pressure readings:
 - a. Pre-filter gauges should read between 25 and 100 PSI within 15 seconds of turning system on. Pre-filter pressure differential should be less than 8 PSI over clean filter pressure differential. Change filter before using system if pressure differential is exceeded.
 - b. Pump pressure gauge should read 190 PSI (± 10 PSI) within 15 seconds.

NOTE: The product gauge should indicate zero PSI with the product valve open and the product rinse line to drain.

6. The "Percent Rejection" monitor should indicate 95% rejection within 2 minutes of start-up. It is normal for rejection to drop off until membranes have rinsed up to optimum quality.
7. The TDS monitor should stabilize within 2 minutes of start-up. The TDS during this time may be higher than the alarm set point. The audible alarm may be muted at this time by pressing the alarm mute switch. The alarm mute switch will silence the audible alarm for 30-45 seconds each time the switch is used.

WARNING: When unit is used for dialysis service, a test for formaldehyde or sanitizer residual and chloramines at the dialyzer connection line MUST be performed.

8. Record data on the daily log sheet.
9. The 700 Series Unit is now ready for hooking up to the dialysis unit.

3.2 Shut Down Procedure

1. Turn off the RO pump power switch.
2. Turn off the inlet water valve switch.
3. Turn off inlet water supply.
4. Briefly turn on the inlet water valve switch. This will release pressure from the feed water hose. When the pressure is released, turn off switch.

<p>NOTE: If the 700 Series Unit is to be stored for more than 24 hours (unit not being operated), the unit should be stored in an approved disinfectant (not Minncare HD[®] or other oxidizing products). Refer to the disinfect storage procedure in this manual.</p>
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5. Disconnect from utilities and store unit.

CHAPTER FOUR:

ROUTINE MAINTENANCE

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The 700 Series RO systems have been designed to operate with a minimum of operator attention. Like all mechanical systems, they will operate longer with less trouble when operator maintenance is performed regularly. Operator maintenance on a reverse osmosis system is limited to maintaining performance logs, cleaning and disinfection, periodic lubrication, and cartridge replacement. The maintenance procedures have been categorized by their frequency of action and are as follows (specific instructions follow the maintenance schedule):

NOTE:

The Series 700 outer surface can be cleaned at any point with a damp rag. Use soapy water or isopropyl alcohol.

4.1 Daily/Per Treatment Requirements

1. Observe and record hardness level in the pretreatment log (for systems with water softener pretreatment).
2. Observe and record salt level in brine tank (for systems with water softener pretreatment).
3. Observe and record chlorine/chloramine concentrations in the pretreatment log. Follow instructions included in each test kit.

WARNING: Take corrective action or contact your local service representative if any pretreatment device fails to provide adequate treatment of feed water before continuing with the use of the RO unit.

4. Observe and record the pre-filter inlet and outlet pressure gauges on the operation log. The difference in the pressure values will measure the condition of the filter cartridge. When the pressure differential (delta P) increases 8 PSI above the clean delta P, the cartridges need to be changed (or sooner if pre-filter core appears soiled). To change the pre-filter, the 700 Series RO unit must be turned off. The pre-filter inlet and outlet gauges should read zero PSI. The pre-filter bowl can now be removed by rotating clockwise. Remove old filter; install new filter and filter bowl.
5. Observe and record the pump pressure on the operation log.
6. Observe and record the percent rejection and TDS water quality on the operation log.

4.2 Weekly Requirements

1. Observe or measure and record the waste and product flow rates on the operation log. Allow water temperatures to stabilize before attempting to record results to prevent errors due to fluctuating temperatures. (Refer to Technote 113, "Temperature Correction Factors".)
2. Observe or measure and record the feed water temperature. Systems with blending valves have thermometers installed in the plumbing. A hand held thermometer may also be used. The water temperature has a significant effect in the product flow rate of the RO membrane and on the evaluation of the membrane's need to be cleaned.
3. Disinfect system if needed. Refer to membrane disinfection procedure in this chapter.

4.3 Monthly Requirements

1. Take product water culture for bacteria colony forming units count (. Refer to product water culture procedure in this chapter. Product water must meet the AAMI and CSA Standards for both bacteria (AAMI 100 CFU max level (or lower if required by national legislation or regulations) / 50 CFU action level (typically the limit will be 50% of the maximum allowable level)) and endotoxin levels (AAMI and CSA 0.25 EU max (or lower if required by national legislation or regulations) / 0.125 EU action level (typically at 50% of the maximum allowable level)).
2. Visually inspect pre-filter core. On occasion, the pressure differential between the two pre-filter gauges will not alter significantly; however, the pre-filter will be soiled. If the core of the pre-filter is dirty, particulates are breaking through the pre-filter, traveling downstream, and causing damage to the pump and RO membranes. If this is the case, the pre-filter will require more frequent replacement on a routine basis. See specific instructions in this chapter.

NOTE: This procedure should be followed every thirty days, or when pressure increases by 8 PSI over clean filter delta P, whichever occurs first.
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4.4 Quarterly Requirements

1. Clean membranes. Refer to membrane cleaning procedure in this chapter.
2. Disinfect membranes. Membranes should be disinfected after cleaning. Refer to membrane disinfection procedure in this chapter.

4.5 Semi-Annual Requirements

1. Lubricate motor (if required, refer to motor manufacturer's label). Refer to specific lubricating instructions in this chapter.
2. Check the Product Recirculation check valve for proper operation. Refer to the check valve test instructions in this procedure.
3. Tighten all electrical connections.

4.6 Annual Requirements

1. AAMI Water Quality Analysis of the product water should be conducted at least yearly. (Refer to Water Quality Analysis Procedure in Chapter Two.)

4.7 Pre-Filter Cartridge Replacement

Check the pre-filter at least monthly. When changing the white pre-filter cartridge, the user should inspect the inside core for color. If the inside is discolored then the filter has been used too long and should be changed more often. If pre-filters require frequent changing, additional pre-filtration is recommended.

NOTE: This procedure should be followed every thirty days or when pressure increases by 8 PSI over clean filter delta P, whichever occurs first.

1. Turn the system OFF and let pressures drop to zero on gauges.
2. Remove the pre-filter bowl by rotating it to the left until it is free of the head.

3. Remove the cartridge from the bowl slowly to prevent excess spillage and discard. Empty water from the bowl and wipe inside of bowl with paper towel. Rinse bowl thoroughly.
4. Install new cartridge into bowl. Cartridge should be flush with the top of the bowl.
5. Align hole in cartridge with guidepost in head. Rotate the bowl until threaded hand tight.
6. Turn on the inlet water valve switch to purge the air from the pre-filter bowl and inspect for leaks.
7. When a consistent stream of water to drain is seen, turn off the inlet water valve switch.
8. The system is now ready for use.

4.8 Motor Lubricant Procedure (if required)

NOTE:

Only perform this procedure on motors that have plugs on each end of the motor and have instructions on the motor identification plate indicating the requirement.

NOTE:

During initial start-up and after performing motor lubrication procedure, a hot oily smell may be detected. This is normal and should dissipate over time.

1. Remove the plastic plugs at both ends of the motor housing near the motor shaft.
2. Follow instructions on motor identification plate for type and quantity of oil to be added. If unable to read motor plate, add three drops of SAE 20 wt. non-detergent motor oil into the opening.
3. Replace the plastic plugs.
4. Turn on the motor and run for 10 minutes.

4.9 Product Recirculation Check Valve Test

4.9.1 Product Recirculation Check Valve Test (Gross failure test)

1. Operate RO normally for 10-15 minutes, with product stream directed to drain.
2. With product stream directed to drain, observe and record TDS and rejection percentage values displayed on RO monitor.
3. Shut off permeate flow: Disconnect product hose from QD port.
4. Observe and record TDS / rejection values with product flow shut off.
5. Restore product flow to drain.
6. Repeat steps 2-5 three times.

RESULTS

No significant change in TDS or rejection: CHECK VALVE FUNCTIONING PROPERLY

Fluctuation in TDS or rejection. When product flow is directed to drain (Product Pressure near zero), TDS increases and/or rejection decreases significantly. With product flow shut off (Product Pressure at normal maximum), TDS value and rejection percentage normalizes: CHECK VALVE FAILURE, replace check valve.

4.9.2 Product Recirculation Check Valve Test With Valve In RO Unit

1. Measure TDS of Product water using a handheld meter. If RO display and TDS measurement do not match within a small amount, replace check valve. If values match, check valve is functioning correctly.
2. Measure and record the Product Water Flow (using a flow meter or graduated cylinder and stopwatch). After determining flow rate, slowly kink the waste line being careful to not close off the flow completely. Measure Product Water Flow again and compare against previous results. If there is a noticeable increase in flow, the check valve needs replaced.
3. If none of the above occurs, check valve is functioning correctly. For further verification, proceed with the following test.

4.9.3 With Valve Removed From RO Unit

1. Apply pressure in opposite direction of flow indicated on check valve. Check pressure reading (using a gauge) and for seepage. Remove pressure from valve and cycle it (push in direction of flow several times using care not to scratch or damage valve). Reapply pressure in opposite direction of flow and recheck pressure and for seepage. If pressure does not drop and no seepage is found, valve is functioning correctly.

4.10 Cleaning Indications

Foulants such as minerals, silt, and organics collect on the RO membrane surface and cause the RO membrane to plug and diminish in its function. Many of these foulants are prevented by proper selection of pretreatment equipment, while others are treatable only with more sophisticated pretreatment designs. Regardless of the foulant, it is essential to promptly clean the membrane once cleaning is indicated. The longer a foulant is allowed to remain in contact with the RO membrane, the more difficult it will be to remove. In severe cases, repeated cleaning may be required.

NOTE: Some foulants CANNOT be removed with cleaning; membrane performance may not be fully restored. Observe the appearance of the cleaning solution before discarding it. If the solution is heavily soiled, repeat the cleaning procedure with fresh solution of the same type (high Ph or low Ph).

Routine cleaning of the RO membranes in conjunction with regular disinfection will keep bacteria counts at a minimum and the RO membrane performance at its best. Cleaning removes the silt, organic, and mineral deposits that collect on the RO membrane surface which, if left untreated, encourage bacterial growth and eventually impair the RO membranes' ability to perform. Disinfection kills most of the bacteria that may be present in the system, but it does not remove the deposits on the membrane.

There are a variety of indications for cleaning membranes. The most common is a reduced product flow rate. Remember that a reduction in inlet water temperature can also result in a reduced flow rate. Refer to Technote 113, "Temperature Correction Factors," to determine the reduction in flow that can be attributed to reduced water temperature. Clean the membranes whenever the temperature compensated flow rate drops by 10%. A loss in the membrane performance (percent rejection) or increase in TDS of the product water may also be an indication to clean the membranes. A good preventive maintenance practice is to clean the membranes on a quarterly basis, or more often if needed.

4.10.1 Pre-Cleaning Procedure

There are two types of cleaners available, a low Ph cleaner (calcium/iron removal) and a high Ph cleaner (silt/organics removal). The low Ph cleaner attacks mineral scale deposits such as calcium, magnesium, and iron build-up. The high Ph cleaner will remove accumulated silt and organic matter from the RO membrane.

CAUTION: The different cleaners must not be mixed together. Introduce the low Ph cleaner first, thoroughly rinse the system, and then use the high Ph cleaner.

WARNING: The solution is a mild irritant to eyes and skin. It is recommended that protective gloves and eye protection be worn when handling the cleaner. Neither respiratory protection nor special ventilation are required.

Materials Required:

Liqui-Clean 113 - (Low pH liquid) – Part No. W2T934418 (1 Gal.)
Liqui-Clean 515 - (High pH liquid) – Part No. W2T912365 (1 Gal.)
2 Gallons Pretreated Water
Clean Container
Product Rinse Hose
“**DO NOT USE**” Warning Labels
Cleaning/Disinfect Log Sheets
Most Current Log Sheets for Water Quality Comparison
pH Test Strips

4.10.1.1 Pre-Cleaning Preparation

Read and understand instructions on cleaner container before beginning procedure.

1. Connect the water inlet line to the water supply and the waste and product lines to drain. Turn the RO unit and water supply on.
2. Establish a pre-cleaning % rejection, TDS, and pH record on the cleaning disinfect log sheet.
3. Prepare the cleaning solution by adding the amount of cleaner as specified on the labeling to two gallons of pretreated or RO product water.



CAUTION: Water to be used must be chlorine free if TFC membranes are being used.

WARNING: This water is not suitable to mix dialysate or other fluids used for dialysis purposes.

4. Turn the RO pump power and inlet water valve switches off.

WARNING: Label machine with appropriate warning signs such as “DO NOT USE/ CONTAINS CLEANER” to prevent use of RO until properly rinsed.

5. Connect disinfect hose quick disconnect fitting to disinfect port on unit. Place other end in cleaning solution.
6. Connect product rinse hose to product port and place other end in cleaning solution. Product valve must be in open position.
7. Place end of waste hose in cleaning solution.

4.10.1.2 Cleaner Recirculation and Dwell Time

1. Rotate Operate/Flush valve to FLUSH position.
2. Using the disinfect switch, operate unit for three minutes.

CAUTION: Some pump noise (chattering) is normal in the flush position. Excessive pump noise (chattering) can be damaging to the pump. The unit is in “flush” from the full open (FLUSH) to just before the fully closed (OPERATE) position. Adjust valve to reduce chattering of the pump.

CAUTION: Check that there is waste flow within 10 seconds. If not, turn off power and verify the disinfect line is connected properly.

CAUTION: DO NOT ALLOW PUMP TO RUN DRY. Also, do not allow air to be drawn into the RO system, as this will damage the pump.

NOTE: The cleaners will foam; this is normal. If using a closed container, provide a vent to the atmosphere to relieve pressure.

3. Close the product valve on the back of the RO for approximately 10 seconds and then re-open it.



4. Let unit stand dormant with cleaning solution for thirty minutes.
5. Remove the waste hose from the cleaning solution and place in the drain.
6. Using the disinfect switch, turn unit on and flush approximately ½ gallon of solution to drain.
7. Place waste hose back in cleaning solution container.
8. Using the disinfect switch, turn unit on and operate for five minutes.
9. Close the product valve on the back of the RO for approximately 10 seconds and then re-open it.
10. Remove the product and waste hose from the cleaning solution tank and place them in the drain.

4.10.1.3 Post-Cleaning Rinse Procedure

1. Using the disinfect switch, turn unit on and run cleaning solution to drain until container is empty.

CAUTION: DO NOT ALLOW PUMP TO RUN DRY. As an alternative, the solution may be poured in the drain.

2. Rinse and drain the cleaning solution tank and the hoses and then let them air dry.
3. Disconnect disinfect hose from unit.
4. Turn on water supply to unit. If it is closed, rotate the Operate/Flush valve to the full FLUSH position.
5. Place inlet water valve switch in the on position. Let water flow to drain for one minute.
6. Rotate Operate/Flush valve to OPERATE position.
7. Place RO pump power switch in ON position. Run unit until water quality stabilizes (nominally 30 minutes). Refer to current log sheets for water quality reading comparison. The presence of cleaner can be tested for by using a phosphate testing kit.

8. During this rinse period, rotate the Operate/Flush valve to the FLUSH position briefly and then back to OPERATE three times to build up and release pump pressure. This aids in flushing the cleaner from the system.
9. Close the product valve on the back of the RO for approximately 10 seconds and then re-open it.
10. Test the product water for post-cleaning Ph and compare it to the pre-cleaning Ph level. The values should be the same or very close to the pre-cleaning Ph. If it is not, continue rinsing in the OPERATE position until equalization of the values occurs.
11. When all the parameters (% Rejection, TDS, Ph) have normalized, operate the RO for an additional 20 minutes in rinse mode.
12. Repeat the cleaning procedure with the other Ph cleaner. The organization recommends using a low Ph cleaner first, followed by a high Ph cleaner after rinsing thoroughly.
13. Turn the RO pump and inlet water switches OFF. Disconnect the product rinse line, drain, and store it.
14. Reconnect the product line to its original connection.
15. Remove the “DO NOT USE” warning label.
16. The 700 Series RO system is now ready for use.

4.10.2 BIOSAN™ Cleaning Procedure

BIOSAN is a liquid cleaner/descaler agent intended for use in removing mineral scale and organic biofilms from RO water systems.

WARNING: BIOSAN is not intended for use in hemodialysis machines.

WARNING: The solution is a mild irritant to eyes and skin. It is recommended that gloves (latex/vinyl) and eye protection be worn when handling BIOSAN. Neither respiratory protection nor special ventilation are required.

Materials Required:

BIOSAN cleaner

RO product water

2-gallon minimum cleaning solution container with wide mouth

pH test strips

Product rinse line (clear hose with female garden hose connection)

“**DO NOT USE**” warning labels

Cleaning/disinfect log sheet

Most current log sheets for water quality comparison.

4.10.2.1 Pre-BIOSAN Cleaning Procedure

Read and understand all BIOSAN cleaning instructions before beginning procedure.

1. Connect the water inlet line to water supply. Turn on the RO unit and water supply. Establish a pre-cleaning % rejection and TDS and record on the Cleaning/Disinfect Log Sheet. Test a sample of product water for pre-cleaning Ph. Record for later comparison.
2. Prepare the BIOSAN solution in accordance with the manufacturer's instructions.
3. Turn off the RO pump power and inlet water valve switches.

WARNING: Label machine with appropriate warning signs such as “DO NOT USE/ CONTAINS BIOSAN” to prevent use of RO until properly rinsed.

4. Connect the disinfect hose quick disconnect fitting to the disinfect port on unit. Place the other end of the hose in the cleaning solution.
5. Connect the product rinse hose to the product port and place the other end of hose in the cleaning solution. The product valve must be **open**.
6. Place the end of the waste hose in the cleaning solution.

4.10.2.2 BIOSAN Recirculation and Dwell Time

1. Rotate the Operate/Flush valve to OPERATE position. This will allow the BIOSAN to pass from the reject side of the membrane through to the product side of the membrane for total system exposure to the cleaning solution once the unit is turned on in disinfect mode (Step #2).
2. Using the disinfect switch, operate the RO for three minutes. Check that there is waste flow within 10 seconds. If not, turn off the RO using the disinfect switch and verify that the disinfect line is connected properly.
3. Turn the Operate/Flush valve to FLUSH position and operate the RO using the disinfect switch for an additional 3 minutes. The pump will be somewhat noisy during this time. The FLUSH mode will allow the flow of cleaner only on the reject side of the RO membrane to flush particulates away. Very little or no product water will be made.
4. Close the product valve on the back of the RO for approximately 10 seconds and then re-open it.

NOTE: The BIOSAN will foam; this is normal. If using a closed container, provide a vent to atmosphere to relieve pressure.

5. Allow the BIOSAN to dwell a minimum of one hour.

NOTE: Thin-film RO membranes: The RO unit may be stored in BIOSAN for up to two weeks with systems utilizing thin-film RO membranes. Cellulose acetate membranes: A maximum dwell time of three hours is advised with cellulose acetate RO membranes.

6. Remove the waste hose from the cleaning solution and place in the drain.

4.10.2.3 Post-BIOSAN™ Cleaning Rinse Procedure

1. Using the disinfection switch, turn unit on and run cleaning solution to drain until the container is empty. This aids in emptying the container of cleaning solution.
 - a. During this time, close the product valve on the back of the RO for approximately 10 seconds and then re-open it.

CAUTION: DO NOT ALLOW PUMP TO RUN DRY. Alternatively, the solution may be poured in drain.

2. Disconnect disinfect hose from unit.
3. Ensure that the water supply to the RO unit is on.
4. Push inlet water valve switch to the OPEN position. Let water flow to drain for one minute.
5. Rotate Operate/Flush valve to OPERATE position.
6. Set RO pump power switch in ON position. Rinse for 20 minutes with Operate/Flush valve in OPERATE position until % rejection and TDS monitor displays normalize; e.g., 'usual' % rejection and 'usual' TDS reading. Refer to operating log for 'usual' readings and compare to pre-cleaning values.
7. During this rinse period, rotate the Operate/Flush valve to the FLUSH position briefly and then back to OPERATE three times to build-up and release pump pressure (aids in flushing cleaner from system).
8. During this period, close the product valve on the back of the RO for approximately 10 seconds and then re-open it.
9. Test product water for post-cleaning Ph and compare to pre-cleaning Ph level. The values should be the same or very close to the pre-cleaning Ph. If it is not, continue rinsing in the OPERATE position until equalization of the values occurs.
10. When all parameters (% Rejection, TDS, Ph) have normalized, operate unit for an additional 20 minute rinse.
11. Turn OFF the RO pump and inlet water valve switches and CLOSE the product valve.

12. Reconnect the product line to its original connection, and open the black product valve.
13. Remove the “DO NOT USE/CONTAINS BIOSAN” warning label. The 700 Series RO System is now ready for use.

4.11 Membrane Disinfection Indications

DETERMINATION OF MICROBIAL CULTURING AND DISINFECTION FREQUENCY IS THE RESPONSIBILITY OF THE OPERATING FACILITY. The following is recommended for critical applications where bacteria and endotoxins are a major concern.

Routine disinfection should occur when bacteria growth is above the limits set by the facility or over 50 CFU (action limit set in both the AAMI and CSA standards) is detected. Disinfection at lower CFUs will inhibit colonization of bacteria in the system and the distribution plumbing.

Disinfect the RO Unit every week for one month after installation. This will ensure that bacteria levels in the fluid paths will be controlled. Sample the purified water for bacteria before each disinfection. After one month of “no growth” samples, the interval between disinfections may be increased. Disinfection should occur when ANY “growth” is detected. This will inhibit colonization of bacteria in the system and the distribution plumbing.

4.11.1 Formaldehyde Disinfection Procedure

CAUTION: RO units with thin film membranes must be rinsed to drain with normal pressures for a minimum of six (6) hours before exposure to formaldehyde, or irreversible damage may occur.

WARNING: Always wear rubber gloves, apron, and face mask. Use proper ventilation during disinfection and rinse-out. A face respirator with an organic cartridge to remove formaldehyde fumes may be worn. **DO NOT BREATHE FUMES OR ALLOW FORMALDEHYDE TO COME IN CONTACT WITH SKIN OR EYES.**

Materials Required:

Five Gallon Container

800 ml Formaldehyde, 37%

2 gallons pretreated water

Formaldehyde test kit

Product rinse line (clear hose with female garden hose connection)

“**DO NOT USE**” warning labels

Cleaning/disinfect log sheet

Most current log sheets for water quality comparison.

WARNING: Place “DANGER,” “POISON,” or “DO NOT USE” signs on all use points in the system.

4.11.1.1 Pre-Formaldehyde Disinfection Preparation

1. Turn the 700 Series Unit off.

WARNING: Label machine with appropriate warning signs such as “DO NOT USE/ CONTAINS FORMALDEHYDE” to prevent use of RO until properly rinsed.

2. Disconnect the RO system from the dialysis machine.
3. Connect the RO product rinse line to the product port and open product valve. Place other end in drain.
4. Verify that the Operate/Flush valve is in the OPERATE position.

5. Prepare a 4% solution of formaldehyde, 800 ml of formaldehyde to 2 gallons of pre-treated water. The 2 gallons of solution is adequate for 700 Series RO. If the 700 Series Unit is to be disinfected in series with a dialysis unit, a larger volume of solution may be required.
6. Route waste line to drain.
7. Attach the quick disconnect end of the sanitize line to disinfect port of the unit. Place other end of sanitize line in disinfectant.

4.11.1.2 Formaldehyde Recirculation and Dwell Time

1. Using the disinfect switch, operate the RO until the disinfectant has been drawn up. (Check that there is waste flow within 10 seconds. If not, turn off the RO using the switch and verify that the disinfect line is submerged in the solution.) Do not allow air to be drawn into the RO system, as this will damage the pump.
2. Momentarily turn on the inlet water valve switch (approximately 5 seconds) and then turn off again. This allows the water to rinse the disinfectant from the sanitize line and quick disconnect connection.

WARNING: Failure to perform this step creates a potentially dangerous situation (FORMALDEHYDE SPILLAGE) and prolongs the rinsing out of the disinfectant.

3. Test for the presence of formaldehyde in the product line.
4. Disconnect the sanitize line from the unit's quick disconnect port.
5. Place a FORMALDEHYDE warning label on the system where it is clearly visible.
6. Turn off product valve.
7. Rinse lines and disinfect tank with the water to remove formaldehyde.
8. Allow disinfect solution to remain in contact for a minimum of two hours, or preferably overnight.

NOTE: Unit may be stored for up to one year at this time.

4.11.1.3 Post-Formaldehyde Disinfection Rinse Procedure

1. Rotate product valve to the OPEN position.
2. Ensure product and waste lines are in the drain.
3. Rotate the Operate/Flush valve to the FLUSH position.
4. Turn on inlet water valve and allow system to rinse for 2 minutes.
5. Turn on RO power switch and run unit for 10 minutes.

<p>NOTE: The Operate/Flush valve may need to be rotated partially closed (towards the OPERATE position) if the pump makes excessive noise.</p>

6. Rotate Operate/Flush valve to the OPERATE position.
7. Turn off RO pump power switch for 1 minute. Turn on the RO pump switch for 2-3 minutes. This will rinse out any trapped formaldehyde in the 700 Series RO.
8. Continue to rinse for an additional 5 minutes.
9. Check product line for disinfectant with test kit. If the test is positive, continue to rinse until a negative test is obtained. Remove warning signs from unit only after negative test confirms absence of formaldehyde.
10. Remove the “DO NOT USE/CONTAINS FORMALDEHYDE” warning label. The 700 series RO System is now ready for use.

4.11.2 Minncare HD® Disinfection Procedure

Minncare HD is a Peracetic Acid and Hydrogen Peroxide based solution. This product referred to in this procedure typically has 20% hydrogen peroxide and 4% peroxyacetic acid before dilution. Other products are available with these same chemicals in different ratios; these are not acceptable for use in the Series 700 RO.

WARNING:

Always wear rubber gloves, apron and facemask. Use proper ventilation during disinfection and rinse-out. **DO NOT BREATHE FUMES OR ALLOW Minncare HD. TO COME IN CONTACT WITH SKIN OR EYES.** Always follow recommendations found in the Material Safety Data Sheet and any applicable OSHA standards for the chemical being used.

WARNING:

Label the machine with appropriate warning signs such as **"DO NOT USE/ CONTAINS Minncare HD."** To prevent use of the RO until it is properly rinsed.

CAUTION:

New replacement thin film membranes must be rinsed to drain with normal pressures for a minimum of one (1) hour before first exposure to Minncare HD. No mandatory pre-rinse of the membranes is required for future disinfections.

CAUTION:

Minncare HD is corrosive to most metals other than stainless steel. The Series 700 uses only compatible materials. Minncare HD type products contain oxidizing agents and are potentially damaging to thin film (polyamide) membranes. It is imperative that all the precautions and instructions are followed correctly. Failure to comply with these instructions, which incorporate instructions from the membrane manufacturer, will jeopardize the system performance and the warranty.

Materials Required:

- Correct amount of disinfectant, per manufacturers' instructions
- 2 gallons RO water
- Clean wide mouth container with volume of 2 ½ gallon or more
- Product rinse line (clear hose with female fitting on one end, open on the other)
- “**DO NOT USE**” warning labels or signs (not provided)
- cleaning/disinfect log sheets
- most current log sheets for water quality comparison
- Gross and residual disinfectant test strips
- Proper protective body wear

4.11.2.1 Minncare HD® Pre-Disinfection Preparation**CAUTION:**

When Minncare HD is to be used as a disinfectant, several preparatory steps are required by the organization as well as the membrane manufacturer. Failure to comply with these instructions, which incorporate instructions from the membrane manufacturer, will jeopardize the system performance and warranty.

- a. The system must be free of all incompatible materials.
- b. Clean the membranes with an iron-removing low pH cleaner. Liquiclean 113 may be used, or chemicals such as 0.1% HCl or 0.4% phosphoric acids. It is essential that all iron and other transition metals be removed from the membrane surface.

CAUTION:

The RO system must be disconnected from the tempered water source (if present). The solution temperature must be monitored closely. At temperatures above 25°C the Minncare HD solution becomes very aggressive towards the RO membranes and will damage them in a short period of time. The disinfection procedure will raise the temperature of the solution. The operator must be prepared to add ice to the solution or discontinue the procedure when the water temperature approaches 77°F (25°C).

1. Read and understand the Minncare HD disinfection procedure. Pay particular attention to steps a and b in CAUTION statement above before initiating the procedure.
2. Ensure the cleaning/disinfectant container is clean. Add two gallons (7.6 liters) of RO permeate (product water) to the container.
3. Add 2.6 ounces (80 milliliters) of disinfectant concentrate to the container and mix to prepare a 1:100 (1%) dilution.



WARNING:

Label the machine with appropriate warning signs such as "**DO NOT USE/ CONTAINS DISINFECTANT**" to prevent use of the RO until properly rinsed.

4. Disconnect the dialysis machine from the RO product port and install the product rinse line. Place the open end in the disinfectant solution container. Attach the quick-disconnect end of the disinfect line to the disinfect port of the RO. Put the open end of the disinfect line in the disinfectant.
5. Disconnect the waste line from the drain connection and place the open end in the disinfectant solution container.

CAUTION:

By connecting all the lines to the disinfect/cleaning tank, the system is set-up for recirculation. Never leave the unit unattended in the recirculation mode.

4.11.2.2 Minncare HD® Disinfection and Dwell Time

1. Verify that the operate/flush valve is in the OPERATE position.
2. Lift the guard cover and push the disinfect switch once and circulate the solution through the system for five minutes. After three minutes of circulation, test the product line for the presence of disinfectant. Continue circulating until a positive test is achieved.
3. Close the product valve on the back of the RO for approximately 10 seconds and then re-open it.

CAUTION:

Check that there is waste flow within 10 seconds. If not, turn RO OFF and verify that the disinfect line is connected properly.

CAUTION:

DO NOT ALLOW PUMP TO RUN DRY. Damage will occur if pump is run dry.

CAUTION:

Do not allow air or foam to be drawn up into the RO unit, as this will damage the pump.

CAUTION:

Do not allow the solution temperature to climb above 25°C during this step. Failure to control temperature will result in rapid deterioration of the membrane, resulting in poor rejection.

4. Place the product and waste lines into a drain. Protect the product line from contamination.



- Using the disinfect switch, turn the RO on and run solution to the drain until the container empties. Alternately, the container may be carefully poured in the drain.

WARNING:

Make sure the drain line is secured in the drain. Disinfectant will be flowing out of the drain line during this step. Observe the disinfectant level in the tank. It will begin to empty to drain. Turn the power switch OFF when the disinfectant tank is almost empty.

CAUTION:

Do not allow air to be drawn up into the RO unit, as this will damage the pump.

- Turn off the RO; do not operate the RO dry.
- Momentarily turn the inlet water valve switch on (approximately 5 seconds.) This allows the water to rinse the disinfectant from the disinfect line and quick-disconnect connection.

WARNING:

Failure to perform this step creates a potentially dangerous situation (DISINFECTANT SPILLAGE) and prolongs the rinsing out of the disinfectant.

- Remove the disinfect line from the disinfect port. Rinse, drain and store it.
- Allow the RO to soak in the disinfecting solution for 1 -12 hrs. Use the shortest possible soak time that results in adequate microbiological control (to maximize membrane life).

4.11.2.3 Minncare HD® Post-Disinfection Rinse Procedure

- Connect the product rinse line, input water and waste lines to the RO.
- Ensure that the product rinse and waste lines are connected to the drain.
- Rotate the operate/flush valve to the flush position.
- Turn on the inlet water valve switch and allow the system to rinse for 2 minutes.
- Turn on the RO power switch and run the RO for 2-3 minutes.

CAUTION:

Some pump noise (chattering) is normal in the flush position. Excessive noise (chattering) can be damaging to the pump. The RO is in “flush” from the full open (flush) position to just before the fully closed (operate) position. Adjust it by partially closing the flush valve to reduce the chattering of the pump.

- Rotate the operate/flush valve to the operate position.



7. Rinse for 20 minutes with the Operate/Flush valve in the Operate position until the % rejection and TDS monitors' displays normalize; e.g., 'usual' % rejection and 'usual' TDS reading. Refer to your operating log for 'usual' readings and compare to the pre-disinfection values.
 - During this rinse period, rotate the Operate/Flush valve to the Flush position briefly and then back to Operate three times to build-up and release pump pressure. This aids in flushing the disinfectant from the system.
 - During this rinse period, close the product valve on the back of the RO for approximately 10 seconds and then re-open it two to three times to aid in rinsing the product water bypass lines.
8. Check the product line for residual Minncare HD[®] with an appropriate test kit. If the test is positive, continue to rinse until a negative test is obtained.
9. When test for Minncare HD is negative, turn the RO unit OFF.
10. Disconnect the product rinse line and store it.
11. Remove the “**DO NOT USE/CONTAINS DISINFECTANT**” warning label.
12. **The Series 700 RO System is now ready for use.**

NOTE:

Success of the disinfection procedure may be ascertained by taking a water culture after completion. See the “Product Water Culture Microbiological Testing” in this chapter.

4.12 Product Water Microbiological Testing

Product water must meet the AAMI and CSA Standards for both bacteria (AAMI 100 CFU max level (or lower if required by national legislation or regulations) / 50 CFU action level (typically the limit will be 50% of the maximum allowable level)) and endotoxin levels (AAMI and CSA 0.25 EU max (or lower if required by national legislation or regulations) / 0.125 EU action level (typically at 50% of the maximum allowable level)).

4.12.1 Product Water Culture Procedure

Materials Required:

- Bucket or similar container
- Sterile specimen container, such as Millipore (red) or 3M Commercial Standard Plate count sampler, or a container your lab may require

LAB CONSIDERATIONS:

- Consult your lab to find out what type of sterile container to use and how much product (RO) water is required to perform the test, and any other specific requirements of the laboratory.
- Make certain that your laboratory is informed of the correct procedure for performing a product water culture. A "spread plate method" NOT a "calibrated loop" technique should be used, with tryptic soy agar or equivalent agar, NOT blood or chocolate agar.
- If tested incorrectly, the results may be inaccurate. The sample should be assayed within 30 minutes of obtaining it, or refrigerated (5°C) immediately and assayed within a 24 hour period.
- Obtain the samples wearing long sleeves and a mask to prevent contamination of samples, use a "mid-stream" "clean catch" type procedure.

NOTE:

Follow facility protocols (gloves, mask, etc.) for collection of samples.

This procedure assumes the RO is connected to power and water and is running in normal operating condition.

1. Turn off RO and connect the extension hose to the product line. Place the other end in a drain.
2. Turn on the RO unit. Allow the RO unit to run for 10-15 minutes.
3. Remove the extension hose.
4. Using aseptic technique, hold the product line over a container, and allow product water to flow for 30 seconds (minimum).
5. Maintaining aseptic technique, hold the product line over the sterile container with the product water flowing.
6. Fill the container with RO product water. (If using commercial samplers, follow the manufacturer's instructions.)
7. Aseptically cap the specimen container immediately.
8. Label the specimen appropriately with:



- Test to be performed - "culture/colony count"
 - Sample source - product water/RO, machine serial number and room location
 - Time and date sample obtained
 - Person who obtained specimen
 - Any other pertinent information or procedures your facility or lab requires
9. The samples should be assayed within 30 minutes of collection or refrigerated at 5°C immediately and assayed within a 24-hour period.

4.13 System Storage

This storage procedure has been established to store both cellulose acetate (CA) and thin film (TF) RO units. It is not recommended that a unit be dormant longer than 24 hours without disinfectant. Units that have been left unused for more than 24 hours risk the possibility of exceeding the acceptable bacterial limits. Units to be stored should first be disinfected with one of the acceptable procedures in this chapter.

CAUTION: Minncare HD® is not an acceptable disinfectant for storage of systems. Storage of systems with Minncare HD® will result in irreversible damage.

4.13.1 Formaldehyde Storage Procedure

WARNING: Always wear rubber gloves, apron, and face mask. If the room has ventilation, use it. If not, wear a face respirator with an organic cartridge to remove formaldehyde fumes. **DO NOT BREATHE FUMES OR ALLOW FORMALDEHYDE TO COME IN CONTACT WITH SKIN OR EYES.**

1. If formaldehyde is chosen to disinfect the unit, follow the instructions for formaldehyde disinfection.
2. Do not rinse out after disinfectant has been introduced to the unit.
3. Disconnect disinfect line, feed water hose, and power and close product outlet valve.
4. Coil hoses and power cord and cover the unit with a large plastic bag to protect the unit from dust.



NOTE: All units can be safely stored in 4% formaldehyde for up to one year.

WARNING: After storage, the RO unit must be completely rinsed of formaldehyde and a bacterial culture performed and interpreted before use.

4.13.2 BIOSAN Storage Procedure

WARNING: It is recommended that gloves (latex/vinyl) and eye protection be worn when handling BIOSAN.

1. Disinfect and rinse unit with acceptable disinfectant.
2. Follow BIOSAN procedure in this chapter.
3. Do not rinse out after BIOSAN has been introduced to the unit.
4. Disconnect disinfect line, feed water hose, and power and close product outlet valve.
5. Coil hoses and power cord and cover the unit with a large plastic bag to protect the unit from dust.

CAUTION: Units with Thin-Film membranes may be stored for up to two weeks. Units with Cellulose Acetate membranes should not be stored in BIOSAN.

WARNING: After storage, the RO unit must be completely rinsed of BIOSAN and a bacterial culture performed and interpreted before use.

Notes:

CHAPTER FIVE:

TROUBLESHOOTING GUIDE

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5.1 Unit Fails to Run

1. **Power off.**
 - a. Check position of switches.
 - b. Check power cord (plugged in).
 - c. Check outlet and circuit breaker/fuse panel for power with voltmeter.
 - d. Check fuses in unit.
2. **Improper line voltage.**
 - a. Verify that line and equipment voltages are compatible.
3. **Loose electrical connections.**
 - a. Check all wiring connections to verify solid connection.
4. **Inlet water valve switch not activated.**
 - a. Check position of switch.
 - b. Replace switch.
5. **Power switch inoperative.**
 - a. Replace with power switch.
6. **Pump motor inoperative.**
 - a. Verify that voltage supply is correct and motor is wired for correct voltage. Correct as necessary.
 - b. Motor thermal overload switch tripped (most motors have automatic internal reset). Motor will restart when it cools approximately 10-15 minutes. Correct reason for the overload.
 - c. Replace motor.
7. **Pump inoperative.**
 - a. Inspect pump and motor coupling for wear.
 - b. Clean any debris or liquid from connection area.
8. **Solenoid inoperative.**
 - a. Verify that all wiring connections are secure.
 - b. Verify coil is secure.
 - c. Replace solenoid.

5.2 Unit Runs Intermittently

1. **Loose electrical connection.**
 - a. Verify that all wiring connections are secure.
2. **Pump pressure too high.**
 - a. Adjust pressure at pump head.
3. **Thermal overload trips.**
 - a. Verify line voltage and motor amperage draw.
 - b. Disassemble pump/motor at clamp and inspect coupler for wear.
 - c. Pump pressure too high (see 5.2.2).

5.3 Motor Runs Hot

1. **Voltage too low.**
 - a. Check voltage against serial label and motor label; correct condition.
2. **Excessive current draw.**
 - a. Verify that flow rates and pressures are within unit specifications.
 - b. Confirm amperage draw with meter.
 - c. Motor insulation shorted; replace motor.
 - d. Check motor/pump coupling for alignment.

5.4 Water Produced While Unit Is Off

1. **Faulty inlet water solenoid valve.**
 - a. Cycle valve off and on with inlet water valve switch to clear obstruction.
 - b. Replace valve.
2. **Faulty inlet water valve switch.**
 - a. Check switch with ohm meter; replace switch.

5.5 Low Pump Pressure

1. **No pressure develops above level of feed pressure.**
 - a. Verify motor operation.
 - b. Verify Flush valve is in the OPERATE position.
 - c. Replace pump.

2. **Pressure develops but does not achieve normal operating pressure.**
 - a. **Waste or product flow too high.**
 1. Check water temperature and flow rate.
 - b. **Faulty pressure regulator.**
 1. Replace regulator.
 - c. **Pump adjusted improperly.**
 1. Adjust pump at pump head.
 - d. **Pump worn out or damaged.**
 1. Replace pump.

5.6 Pressure Gauge Vibrates Erratically

1. **Air in gauge tubing.**
 - a. Loosen tube fitting at gauge to bleed air.

2. **Obstruction in pressure gauge orifice.**
 - a. Remove obstruction.

3. **Faulty gauge.**
 - a. Replace gauge.

5.7 Excess Product Pressure (Too High)

1. **Pressure regulator improperly adjusted.**
 - a. Decrease pressure regulator setting.

2. **Product flow rate too high.**
 - a. Decrease pump operating pressure.
 - b. Temperature too high.
 - c. Membrane damaged; replace membrane.

5.8 Product Flow Too Low

1. **Pump pressure too low.**
 - a. See 5.5.
2. **Low feed water temperature.**
 - a. Upgrade unit size with additional membranes.
 - b. Install or adjust temperature blending valve.
3. **Membrane fouled or scaled.**
 - a. See test report for original flow rate.
 - b. Clean membrane.
 - c. Replace membrane.
4. **Center tube of ROMA collapsed from operating at high temperatures.**
 - a. Correct temperature problem.
 - b. Replace membrane.
5. **Check pretreatment for brackish water.**
 - a. Check inlet water for high conductivity.
 - b. Check water softener for proper function.
6. **Product recirculation check valve failed.**
 - a. Refer to Maintenance Procedures for Check Valve Test.

5.9 Product Flow Too High

REJECTION SATISFACTORY.

1. **Pump pressure too high.**
 - a. Adjust pressure regulator on RO panel.
2. **Temperature too high.**
 - a. Adjust temperature-blending valve.
 - b. Correct plumbing error that allows the cold water to be heated.

REJECTION UNSATISFACTORY.

1. **ROMA internal seals damaged, dirty, or dislodged.**
 - a. Disassemble ROMA, clean and inspect O-rings and seals.
2. **Membrane hydrolyzed (exposed to oxidant).**
 - a. Verify condition of pretreatment equipment.
 - b. Replace membrane.
3. **Waste flow too low.**
 - a. Check waste flow rate.
 - b. Check for blockage or kink in waste line.
4. **Membrane damaged (or ruptured).**
 - a. Check for high product pressure.
 - b. Check for product line being back pressured.
5. **Product recirculation check valve failed.**
 - a. Refer to Maintenance Procedures for Check Valve Test.

5.10 Low Percent Rejection

1. **Waste flow too low.**
 - a. Disinfectant or cleaner not rinsed from unit.
 - b. Check waste flow control.
 - c. Check for obstruction or kink in waste line.
2. **Pump pressure too low.**
 - a. Adjust pressure regulator.
 - b. Adjust pump head pressure relief screw.
3. **Product flow too high.**
 - a. See 5.9.
4. **Membrane scaled or fouled.**
 - a. Verify condition of pretreatment equipment.
 - b. See membrane cleaning procedure in this manual.

5. **Erroneous meter readout.**
 - a. Verify water quality with independent meter.
 - b. Check all quick disconnects connections.
 - c. Replace inlet water sensor probe.
 - d. Replace product water sensor probe (percent rejection).
 - e. Replace monitor circuit board.
6. **Membrane failure.**
 - a. Replace membrane.
7. **Change in feed water TDS.**
 - a. Verify feed and product water quality with independent meter.

5.11 TDS Value High

1. **Waste flow too low.**
 - a. Measure and compare to original data. Correct as necessary.
2. **Waste pressure too low.**
 - a. Adjust pressure regulator.
3. **Product flow too high.**
 - a. See 5.9.
4. **Membrane scaled or fouled.**
 - a. Verify operation of pretreatment equipment.
 - b. See membrane cleaning procedure in this manual.
5. **Erroneous meter readout.**
 - a. Verify water quality with independent meter.
 - b. See 5.11.8.
 - c. TDS water probe wire disconnected or loose.
 - d. Replace TDS water sensor probe.
 - e. Replace monitor circuit board.
 - f. Replace thermistor.

6. **Membrane failure.**
 - a. Replace membrane.
7. **Change in feed water TDS.**
 - a. Verify water quality with independent meter.
8. **Product recirculation check valve failed.**
 - a. Refer to Maintenance Procedures for Check Valve Test.

5.12 RO Fails to Draw Disinfectant

1. **Pre-filter bowl leaking on vacuum.**
 - a. Tighten bowl.
 - b. Inspect and clean pre-filter bowl seal; replace seal.
 - c. Replace filter bowl.
2. **Disinfect line kinked or plugged.**
 - a. Clear disinfect line.
3. **Air leak on disinfect draw line.**
 - a. Immerse tube in solution.
 - b. Check that quick disconnect fitting is connected securely.
 - c. Check tube for cracks or holes.
 - d. Replace quick disconnect fitting.
4. **Solenoid failure in open position.**
 - a. See 5.4.

5.13 RO Pump Leaks

1. **Tubing connection leaking.**
 - a. Tighten or reconnect tubing fitting.
2. **Mechanical seal failure (leaks out vent hole).**
 - a. Replace pump.

5.14 TDS Value Fluctuates

1. **Product recirculation check valve failed.**
 - a. Refer to Maintenance Procedures for Check Valve Test.

SPARE PARTS LIST

Please Note: Part Numbers are subject to change without warning. Please verify all part numbers when ordering spare parts.

PART NUMBER	DESCRIPTION
W2T919574	CASTER S-700, LARGE OPTION
W2T919581	CASTER STANDARD
W2T915447 *	CHECK VALVE, FEED LINE
W2T915447	CHECK VALVE, PRODUCT LINE
W2T911923 *	CHECK VALVE, PRODUCT RETURN
W2T934418	CLEANER, LIQUI-CLEAN113, 1GAL, LOW PH, LIQUID
W2T912365	CLEANER, LIQUI-CLEAN515, 1GAL, HIGH PH, LIQUID
W2T913097	DISINFECT PORT, QD (FEMALE)
W2T914819	DISINFECT PORT, QD (MALE)
W2T913468/4 **	FILTER, 1 MICRON, 9 7/8", 4-PACK
W2T913469/4 **	FILTER, 5 MICRON, 9 7/8", 4-PACK
W2T913866/4 **	FILTER, CARBON, 9 7/8", 4-PACK
W2T914060	FUSE, 1/8 AMP, SLOW BLOW
W2T911926	FUSE, 1/4 AMP, SLOW BLOW
W2T913457	FUSE, 5 AMP, SLOW BLOW
W2T911938	FUSE, 8 AMP, SLOW BLOW
W2T911977 *	GAUGE, PRE-FILTER PRESSURE
W2T914122 *	GAUGE, PRODUCT PRESSURE
W2T911976 *	GAUGE, PUMP PRESSURE
W2T912776	GHT, FEED WATER LINE FITTING
W2T913588	MEMBRANE CLEANER, BIOSAN, 1 GAL.
W2T913589	MEMBRANE CLEANER, BIOSAN, 5 GAL.
W2T913222	ELEMENT,AG2521TF
W2T913227	MEMBRANE ONLY, 2 1/2" X 21", TAPE WRAPPED, COLD WATER
W2T291396	ELBOW FITTING, 3/8" SF X 3/8" MNPT
W2T914653	PLUG, SS, 1/4" MNPT
W2T498999	ENDCAP FOR FLARED HOUSING

PART NUMBER	DESCRIPTION
W2T497901	CLAMP, HALF, FOR FLARED HOUSING (4 PER HOUSING REQUIRED)
W2T913204	O-RING, SMALL, FOR FLARED HOUSING
W2T913205	O-RING, LARGE, FOR FLARED HOUSING
W2T914174	ROMA HOUSING, FLARED
W2T79177	TEE, 1/4" SF
W2T395117	ADAPTER, 1/4" SF STEM X 1/4" MNPT
W2T291427	ELBOW FITTING, 3/8" SF X 1/4" MNPT
W2T291434	ELBOW FITTING, 1/4" SF X 1/4" MNPT
W2T913989	FASTENER, 1/4 TURN FRONT COVER (REQUIRES W2T914022)
W2T914022	WASHER, 1/4 TURN FRONT COVER (REQUIRES W2T913989)
W3T572386***	MOTOR, 1/3 HP, 115V, 60HZ
W3T578325	PCB ASSY, % REJECTION
W3T577927	PCB ASSY, CONDUCTIVITY
W3T577788	PCB ASSY, DISPLAY
W2T913700	POWER CORD, S-700
W3T572914	POWER SUPPLY, 115 V, 60 HERTZ
W3T577457	POWER SUPPLY, 230 V, 50 HERTZ
W3T572695	PRE-FILTER HOUSING ASSEMBLY
W3T577786	PROBE, % REJECTION (FEED)
W3T577786	PROBE, % REJECTION (PRODUCT)
W2T913106 *	O-RING, PRE-FILTER (9 7/8)
W3T577786	PROBE, TOTAL DISSOLVED SOLIDS
W2T915609 *	PUMP, 100 GPH, SS, W/REGULATOR
W2T914907	REGULATOR, PRODUCT PRESSURE ADJUSTMENT
W2T926421	SWITCH, DISINFECT (50 HZ)
W2T915101	SWITCH, DISINFECT (60 HZ)
W2T915091	SWITCH, GUARD (50/60 HZ)
W2T915097	SWITCH, INLET WATER VALVE
W2T926466	SWITCH, LENS (50/60 HZ)
W2T915097	SWITCH, RO PUMP POWER
W2T913098	VALVE, FEED WATER SOLENOID, 115 V, 60 HERTZ
W2T919674	VALVE, FEED WATER SOLENOID, 230 V, 50 HERTZ



PART NUMBER	DESCRIPTION
W2T915413 *	VALVE, OPERATE/FLUSH
W2T915413	VALVE, PRODUCT WATER
W2T915911	DISINFECT, MINNCARE, 4X1QT
W2T912432	MINNCARE RESIDUAL TEST STRIPS
W2T912435	MINNCARE 1% TEST STRIPS

* Suggested Stock Item

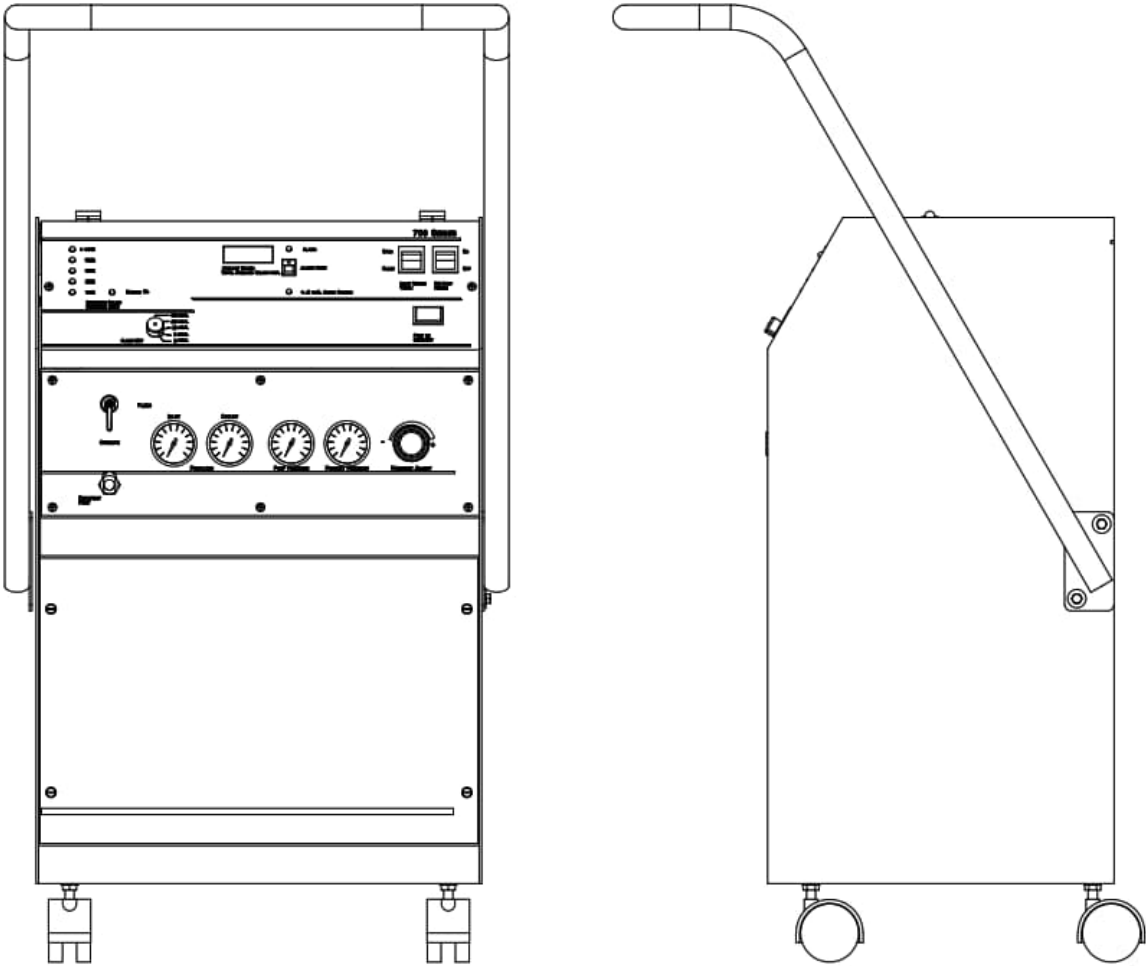
** Suggested Stock Item If Applicable to Unit

*** Wired for 115V/60Hz operation. Follow motor wiring plate if 230V/50Hz operation needed.

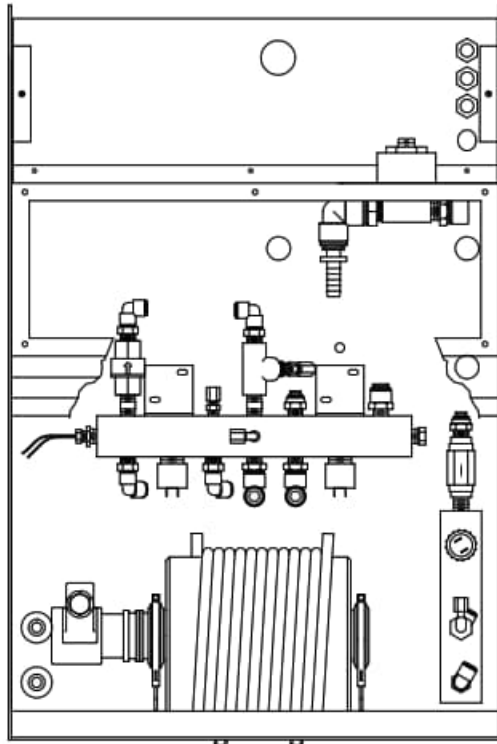
CHAPTER SIX:

DRAWINGS

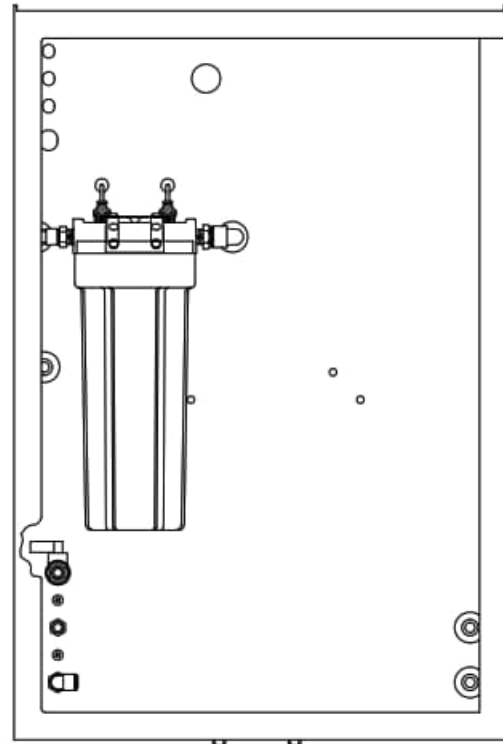
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700 Series RO System
Cabinet View Illustration



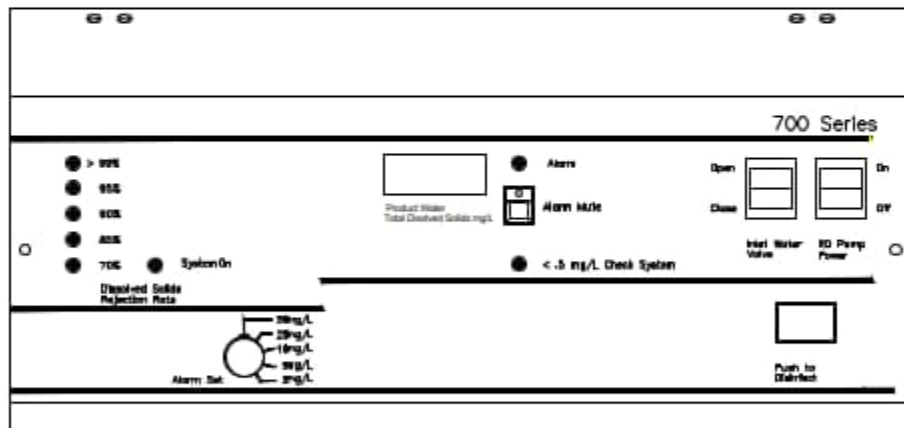
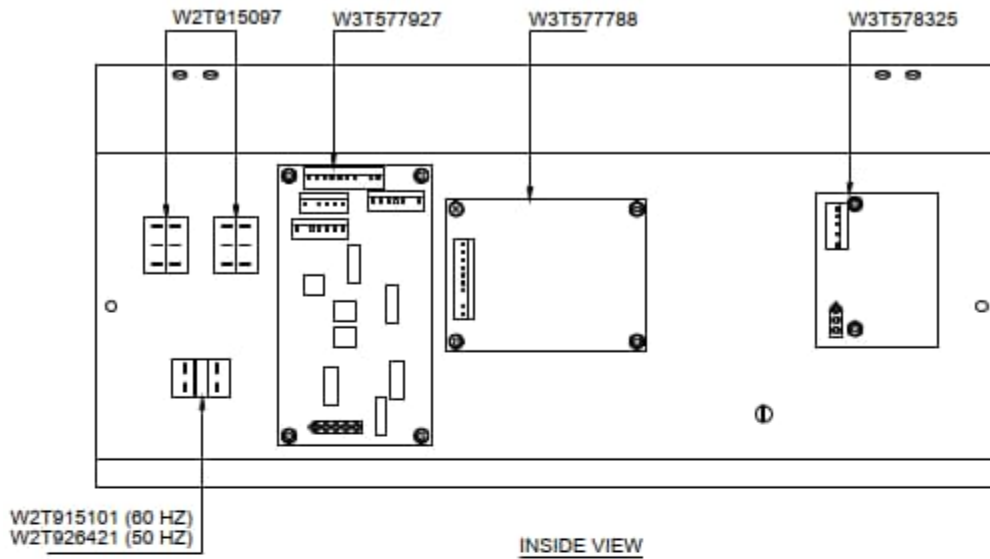
FRONT VIEW



REAR VIEW

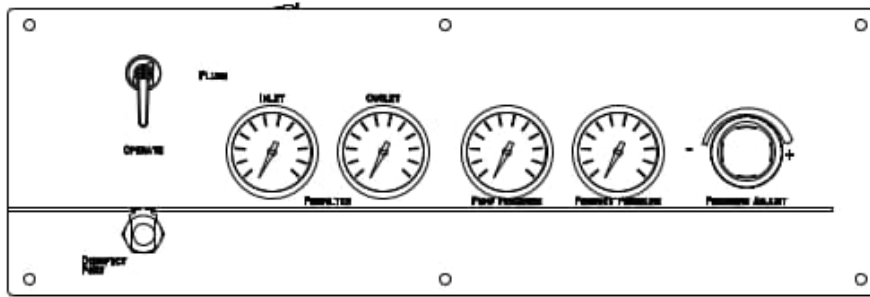
NOTE:
MEMBRANE ASSEMBLIES NOT SHOWN
FOR CLARITY

700 Series RO System
Internal Assemblies

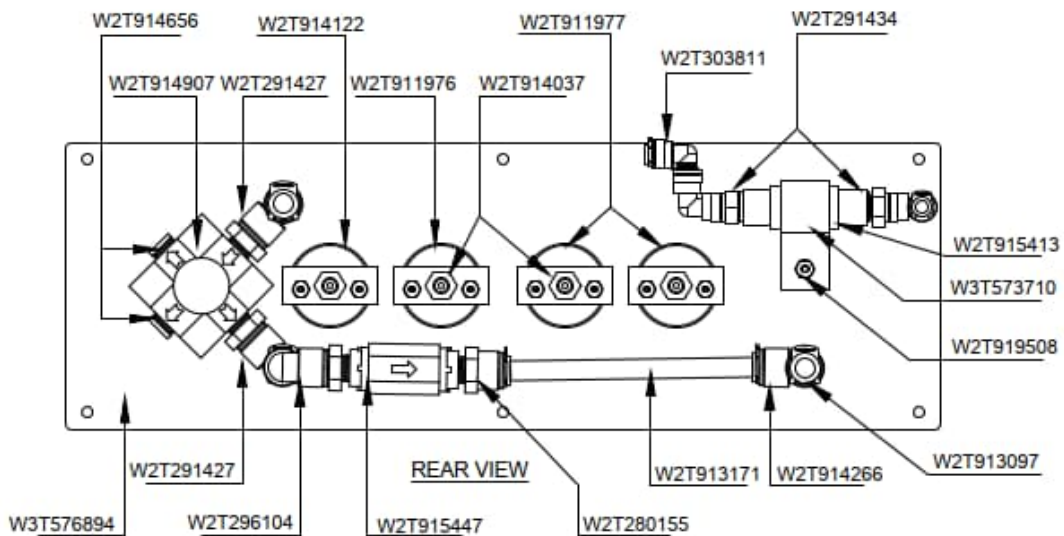


PART NO.	DESCRIPTION
W3T577927	CONDUCTIVITY PC BOARD
W3T578325	% REJECTION PC BOARD
W3T577788	TDS DISPLAY PC BOARD
W2T915097	ROCKER SWITCH
W2T915101	PUSH SWITCH (60 HZ)
W2T926421	PUSH SWITCH (50 HZ)

700 Series RO System Monitor Panel

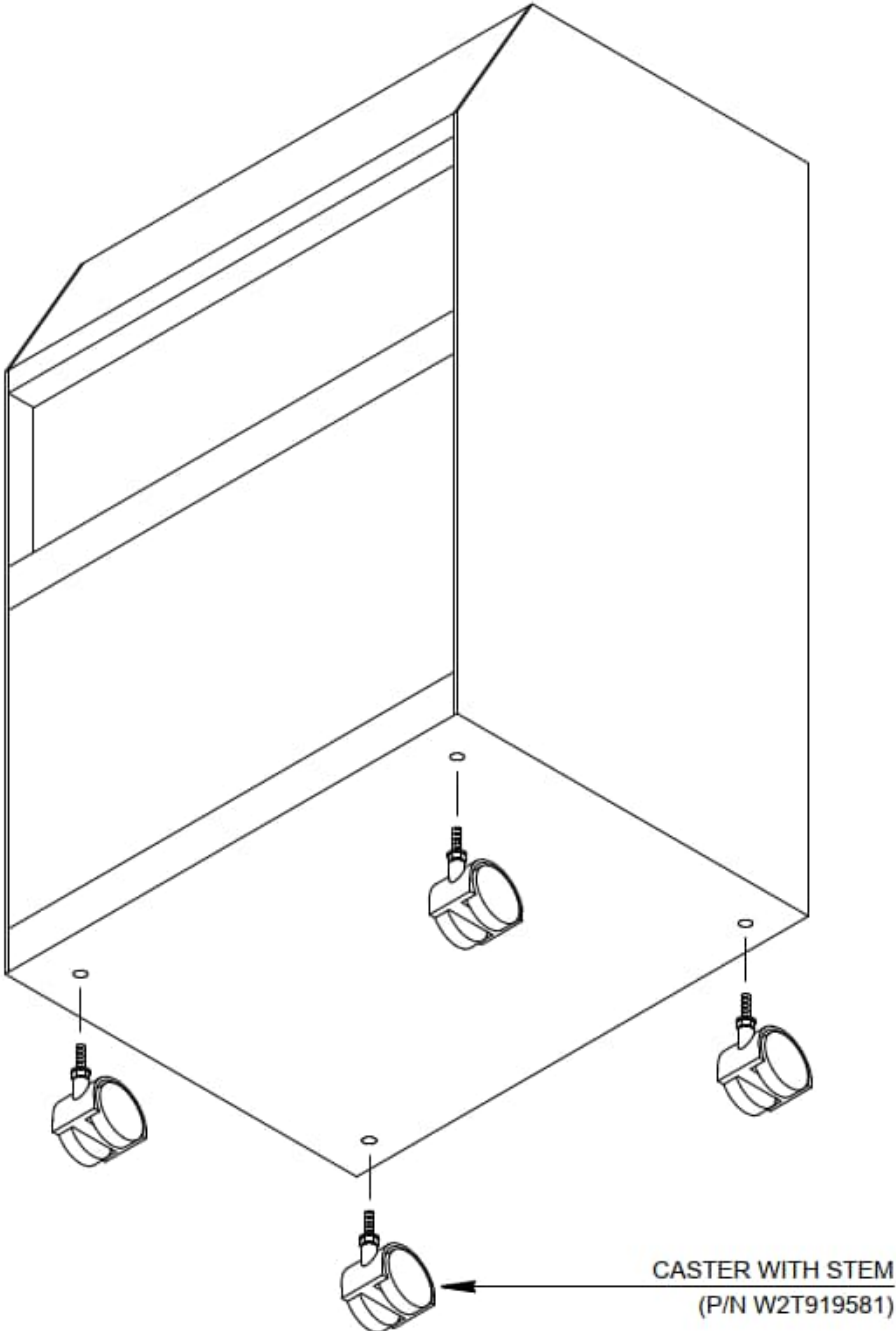


FRONT VIEW

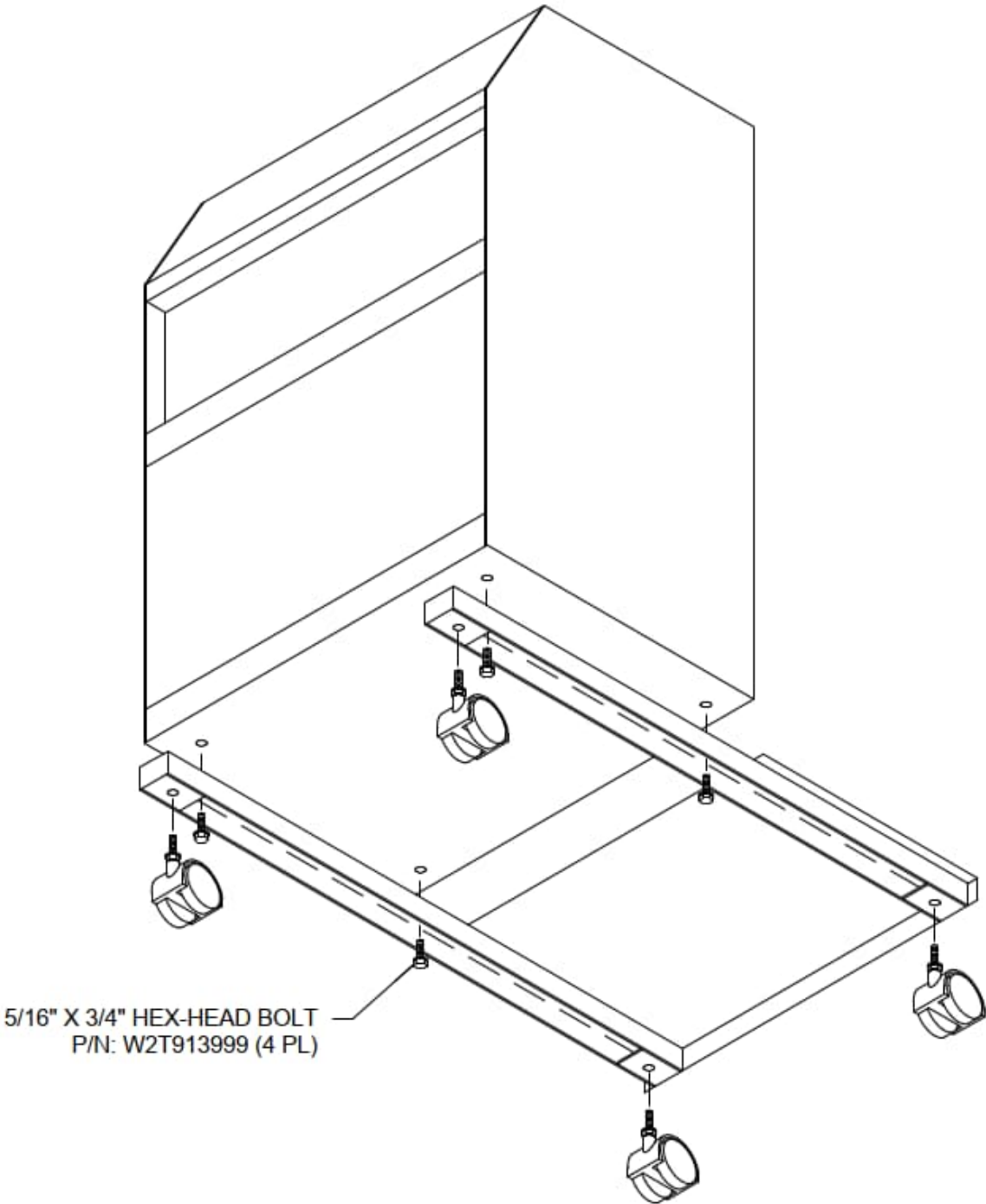


PART NO.	DESCRIPTION
W3T576894	PANEL,SERIES 700,PRESSURE
W3T573710	FLUSH VALVE BRACKET
W2T914907	PRESSURE REGULATOR
W2T926420	PRESSURE REGULATOR MOUNTING NUT
W2T914656	1/4" MNPT PLUG
W2T915413	1/4" FNPT BALL VALVE
W2T913097	3/8" TUBE x 1/4" FLOW QD, PANEL MOUNT
W2T91427	3/8" TUBE x 1/4" NPT ELBOW
W2T91434	1/4" TUBE X 1/4" MNPT ELBOW
W2T914037	1/8" TUBE x 1/8" FNPT FITTING
W2T914122	0-60 PSI GAUGE, PANEL MOUNT
W2T911977	0-100 PSI GAUGE, PANEL MOUNT
W2T911976	0-300 PSI GAUGE, PANEL MOUNT
W2T914266	TEE, 3/8" TUBE X 3/8" TUBE
W2T280155	STRAIGHT, 3/8" TUBE X 1/4" MNPT
W2T915447	CHECK VALVE, 2#, 1/4" FNPT
W2T914266	ELBOW, 3/8" TUBE X 3/8" STEM
W2T303811	ELBOW, 1/4" TUBE X 1/4" STEM
W2T913171	TUBE, PE, 3/8" BLUE
W2T919508	FSTNR,KEPNUT,SS,8-32

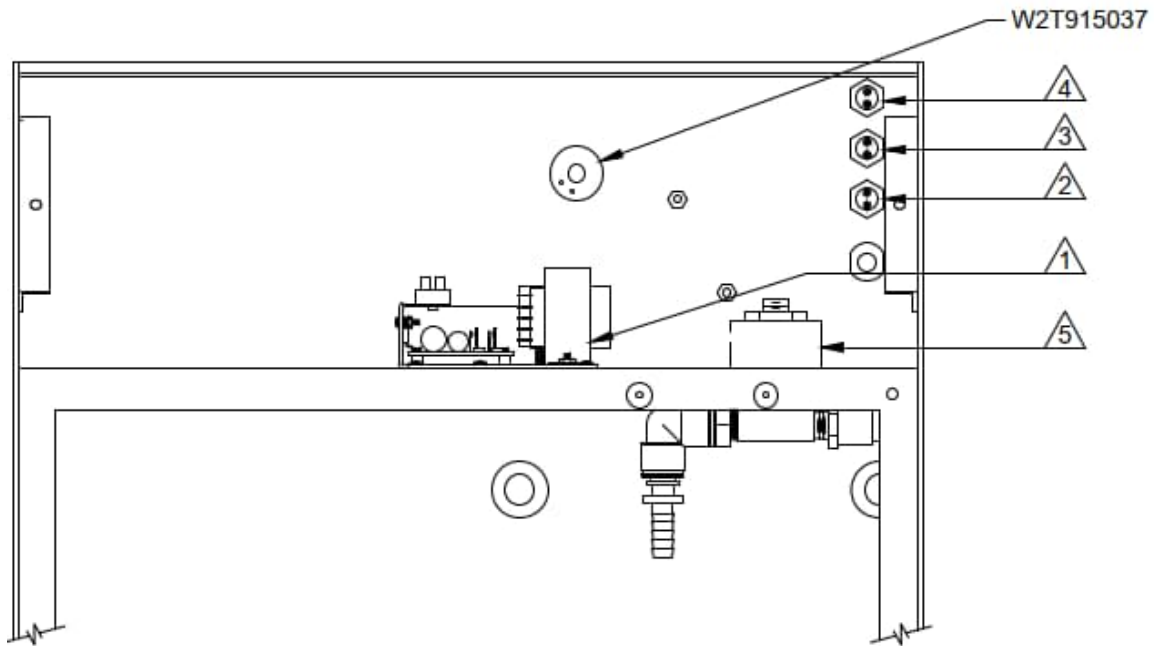
700 Series RO System Pressure Panel Assembly



700 Series RO System
Caster Installation w/o Pretreat Cart



700 Series RO System
Caster Installation with Pretreat Cart

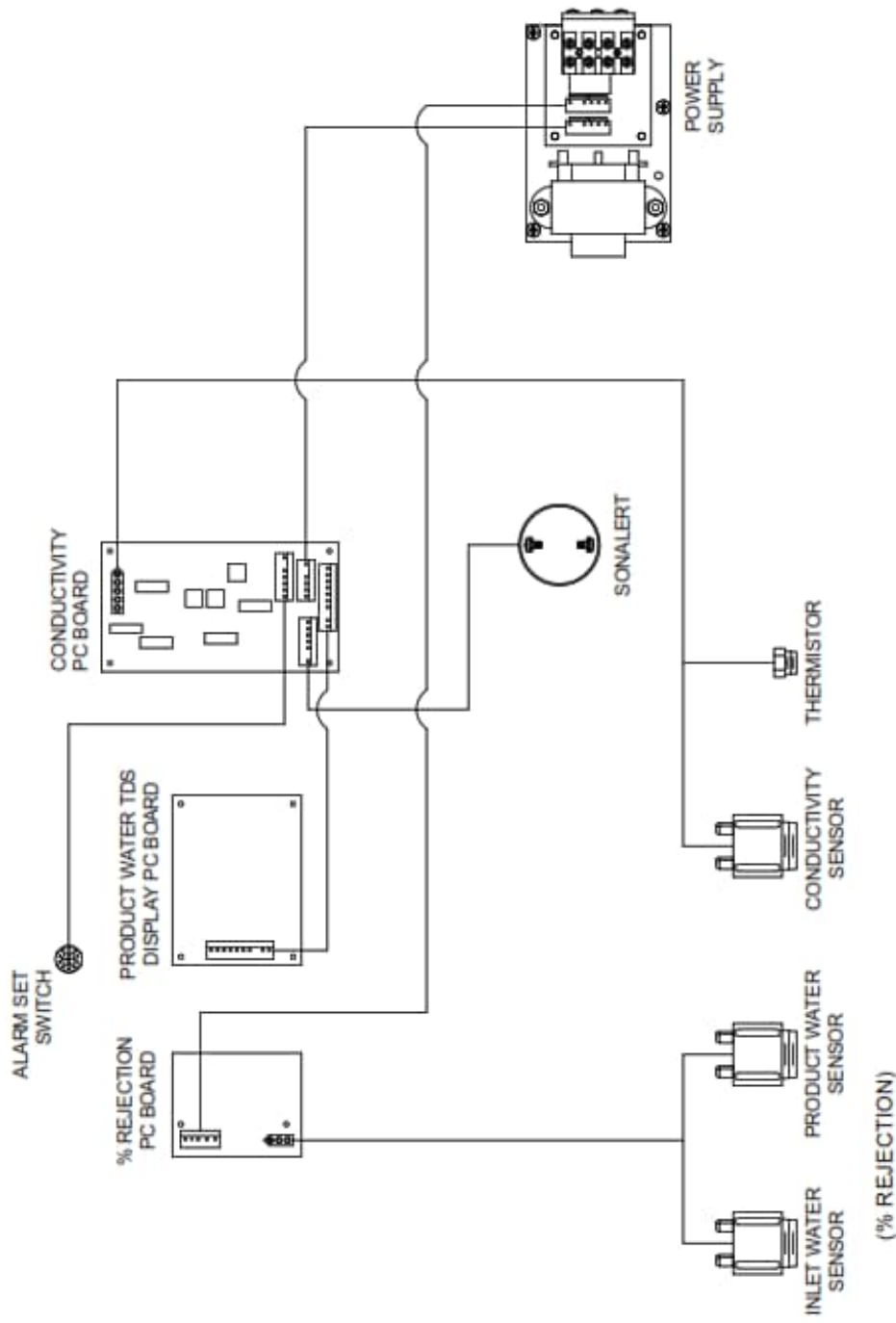


NOTES:

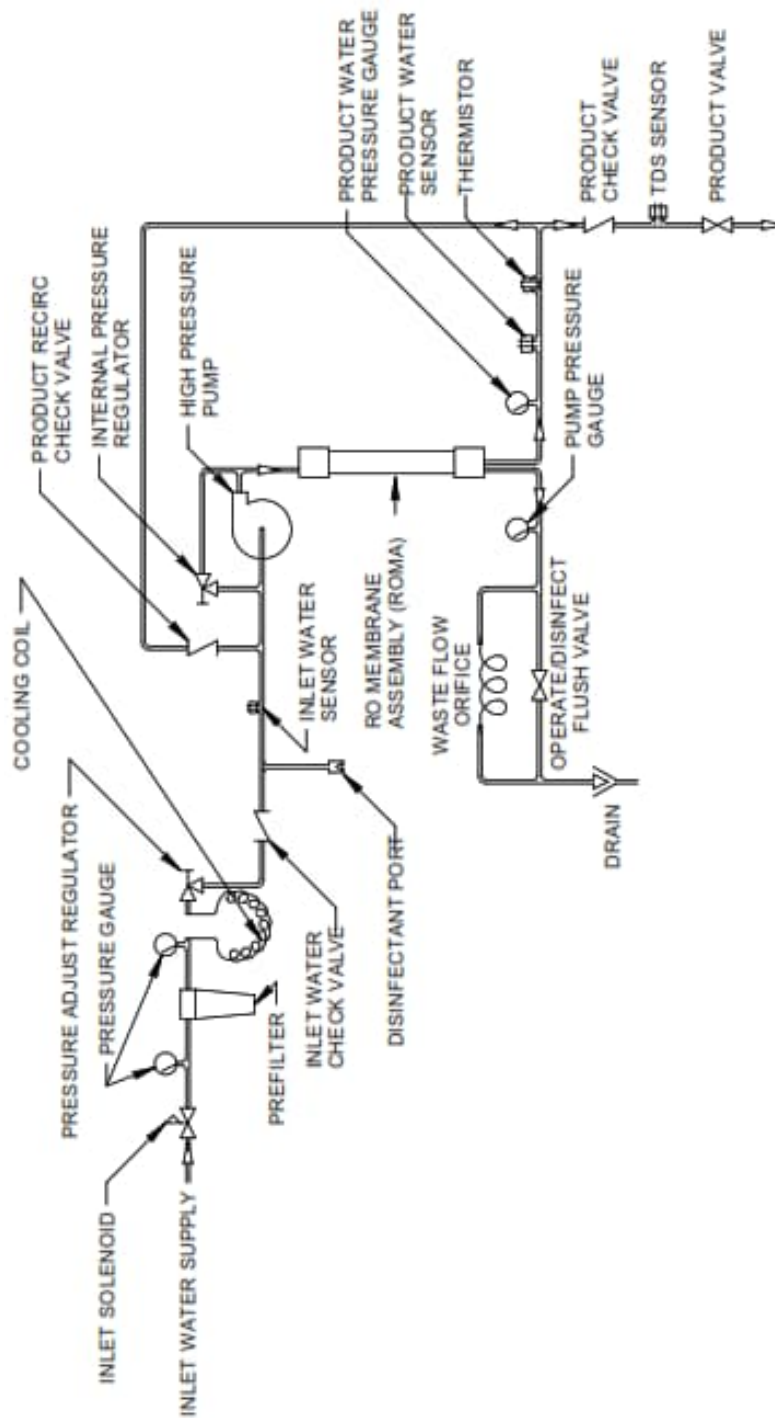
- 1 FOR 50HZ VERSION, USE POWER SUPPLY P/N W3T577457
FOR 60HZ VERSION, USE POWER SUPPLY P/N W3T572914
- 2 FOR 50HZ VERSION, USE 5 AMP SLO BLO FUSE P/N W2T913457
FOR 60HZ VERSION, USE 8 AMP SLO BLO FUSE P/N W2T911938
- 3 FOR 50HZ VERSION, USE 5 AMP SLO BLO FUSE P/N W2T913457
FOR 60HZ VERSION, USE 8 AMP SLO BLO FUSE P/N W2T911938
- 4 FOR 50HZ VERSION, USE 1/8 AMP SLO BLO FUSE P/N W2T914060
FOR 60HZ VERSION, USE 1/4 AMP SLO BLO FUSE P/N W2T911926
- 5 FOR 50HZ VERSION, USE SOLENOID P/N W2T919674
FOR 60HZ VERSION, USE SOLENOID P/N W2T913098
- 6 ACCESS FUSES FROM OPPOSITE SIDE SHOWN

PART NO.	DESCRIPTION
W2T915037	SONALERT

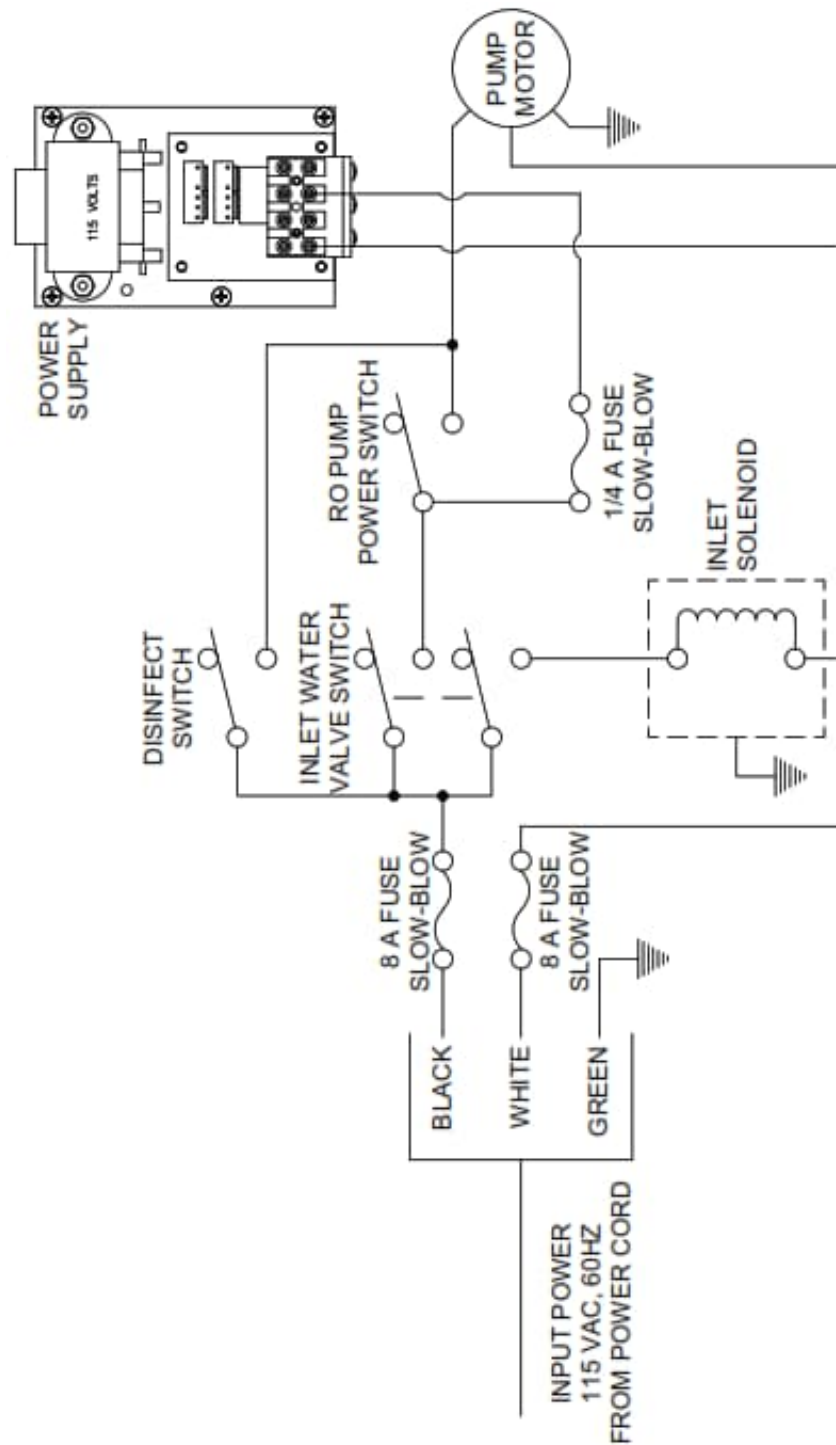
700 Series RO System
Electrical Enclosure Components



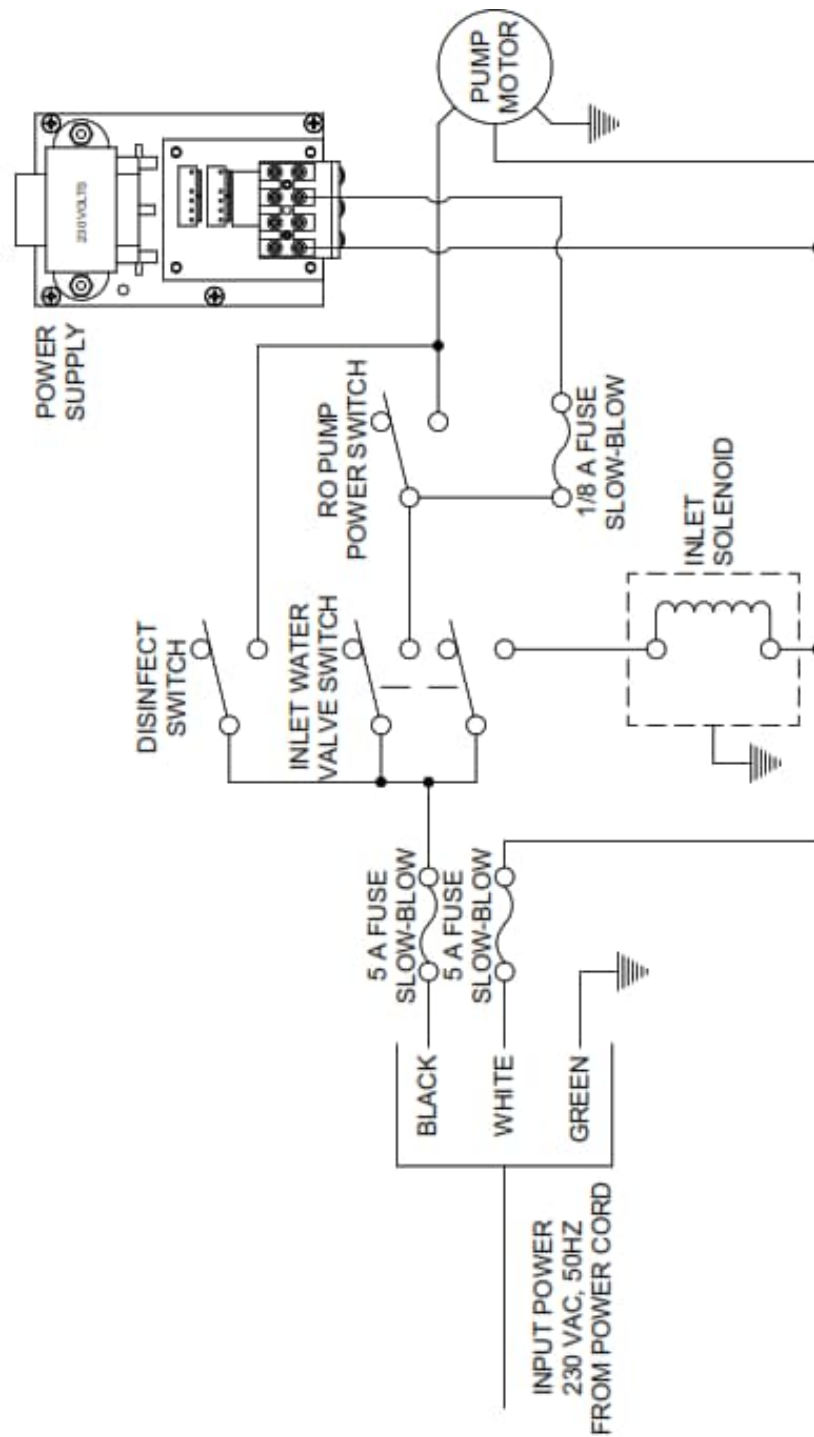
700 Series RO System
 Monitor Cable Routing
 for both 120VAC, 60 Hz and 220VAC, 50 Hz



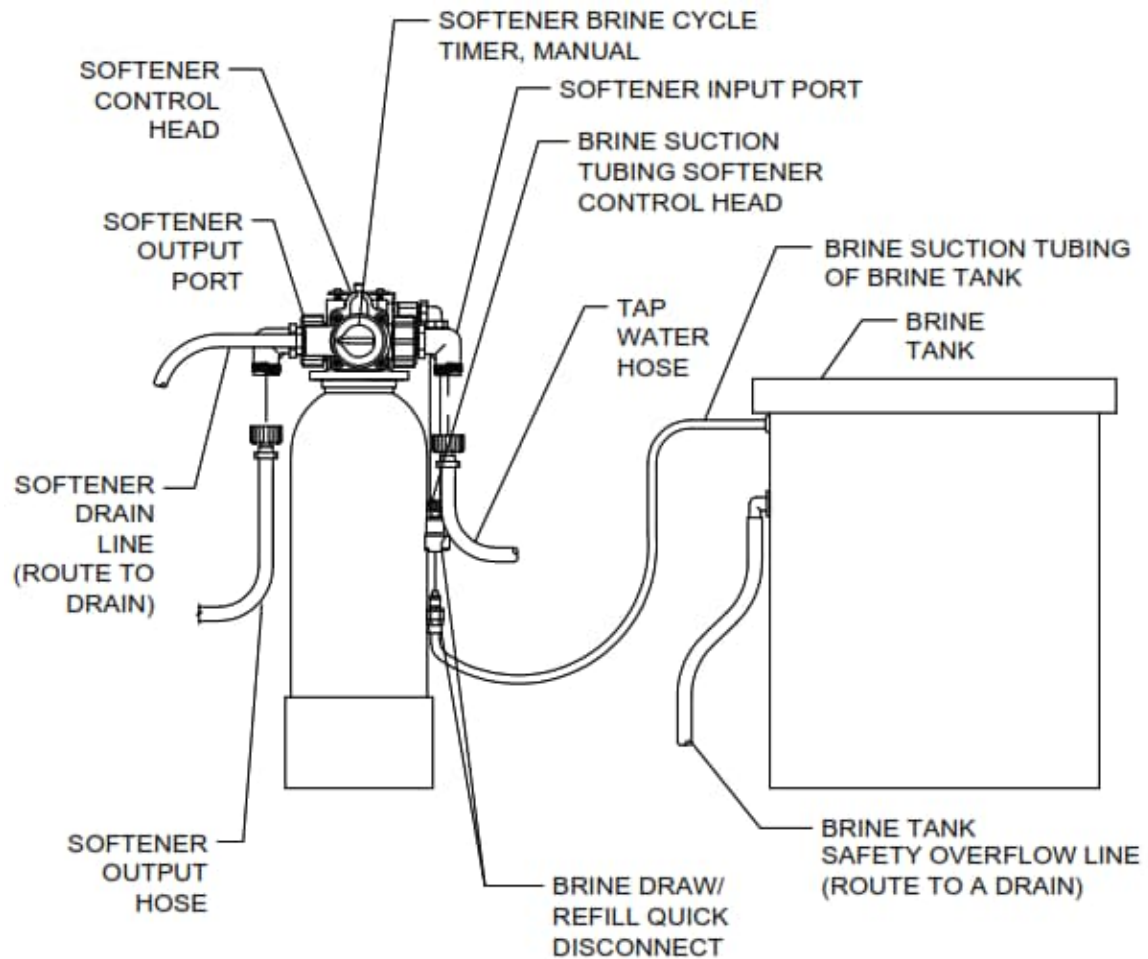
700 Series RO System
Fluid Schematic



700 Series RO System
 Electrical Schematic
 115 VAC 60 Hz



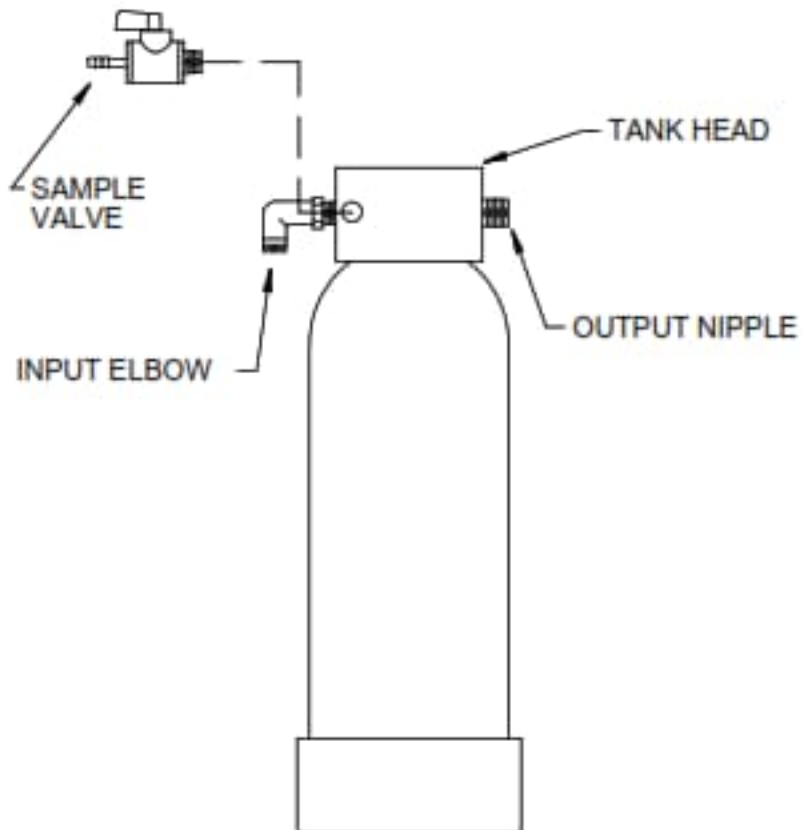
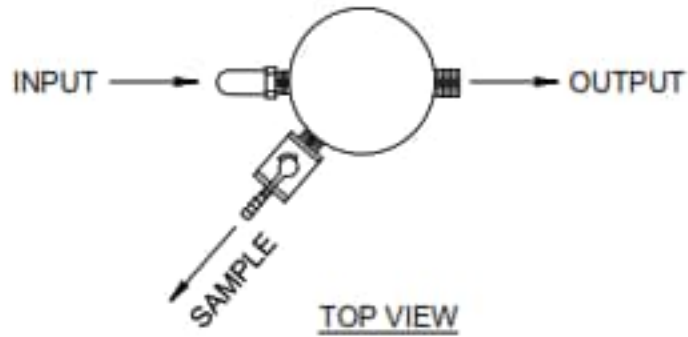
700 Series RO System
 Electrical Schematic
 230 VAC 50 Hz



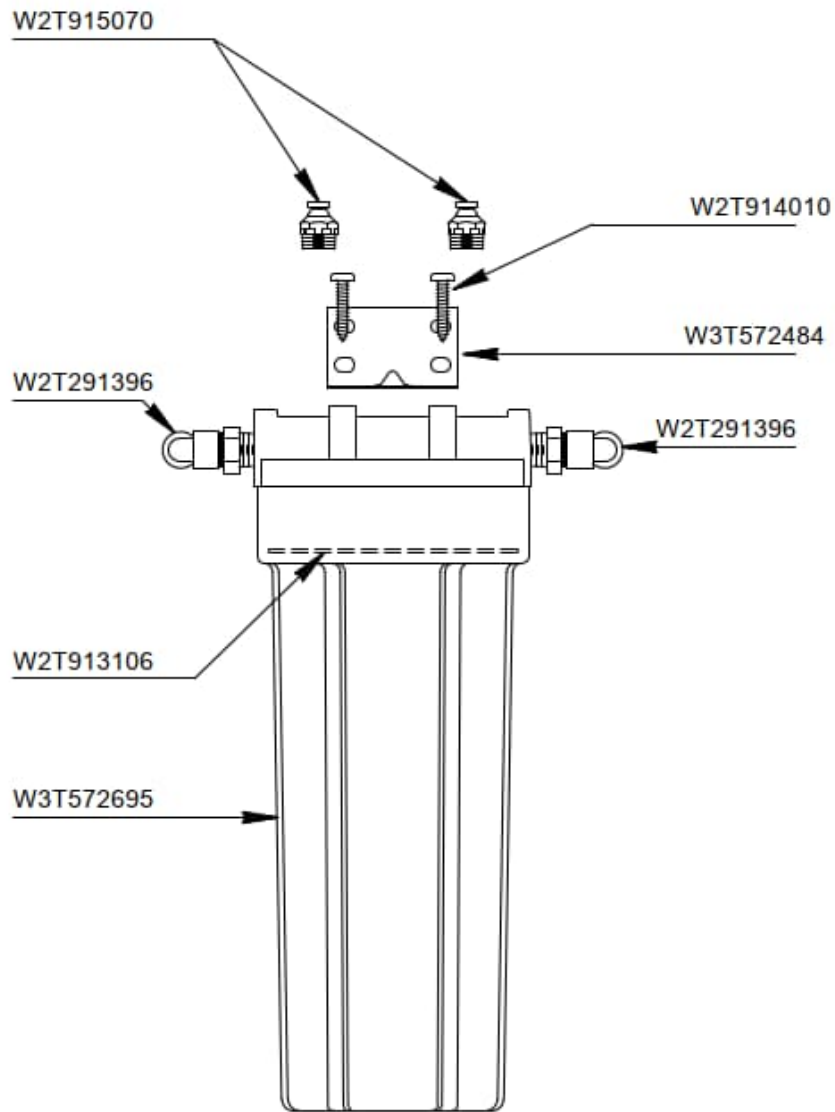
700 Series RO System
Softener/Brine Tank Connections

ASSEMBLY INSTRUCTIONS:

1. REMOVE PLUGS FROM THE TANK HEAD.
2. INSTALL THE INPUT ELBOW, OUTPUT NIPPLE & THE SAMPLE VALVE APPROX. 3-5 TURNS



700 Series RO System
Assembly of Fittings to Pretreatment Tank Head



PART NO.	DESCRIPTION
W3T572695	FILTER HEAD/BOWL
W2T291396	3/8" TUBE x 3/8" NPT ELBOW
W2T915070	1/8" TUBE x 1/4" NPT STRAIGHT
W2T913106	O-RING (INCLUDED IN ME12191)
W3T572484	MOUNTING BRACKET
W2T914010	10-32 x 1/2" SCREW

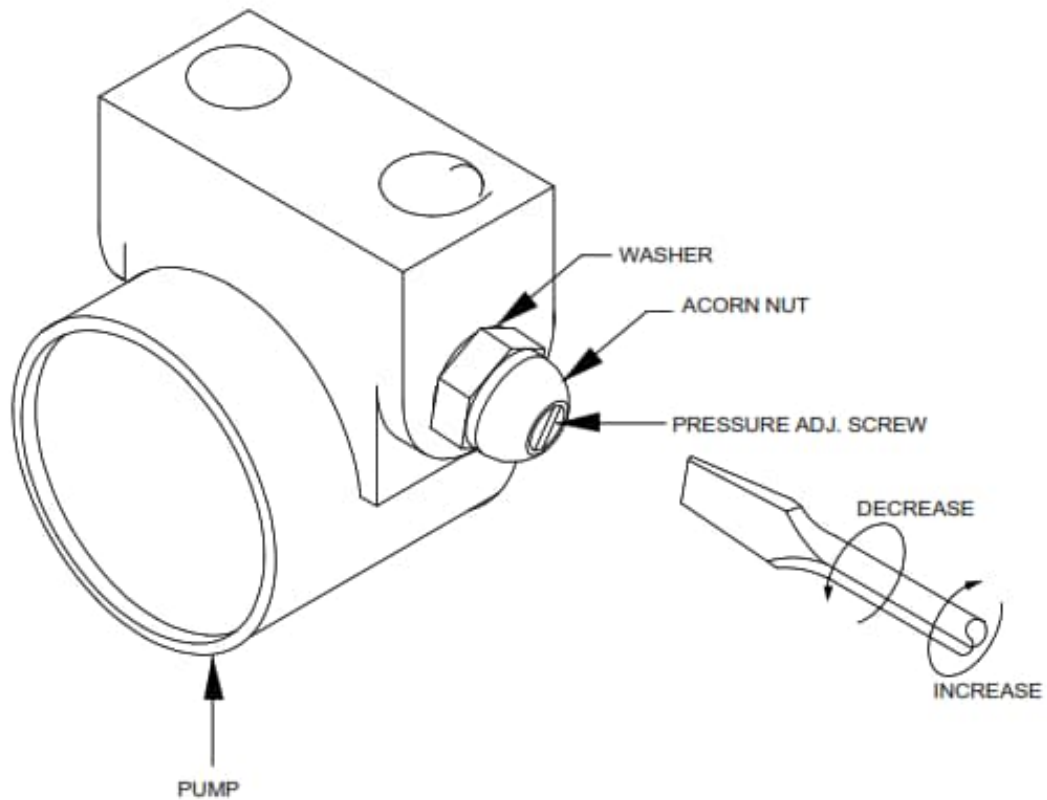
700 Series RO System
Prefilter Housing Assembly

TOOLS REQUIRED:

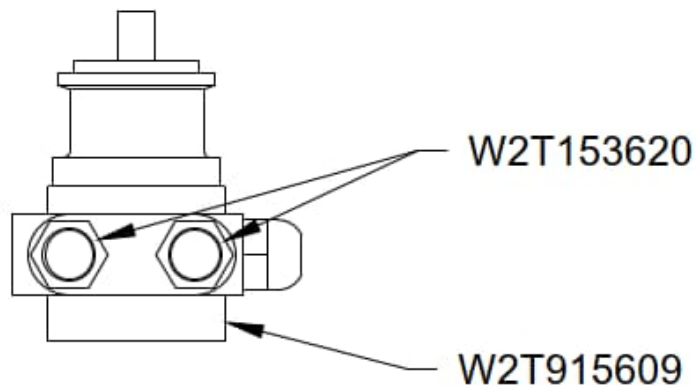
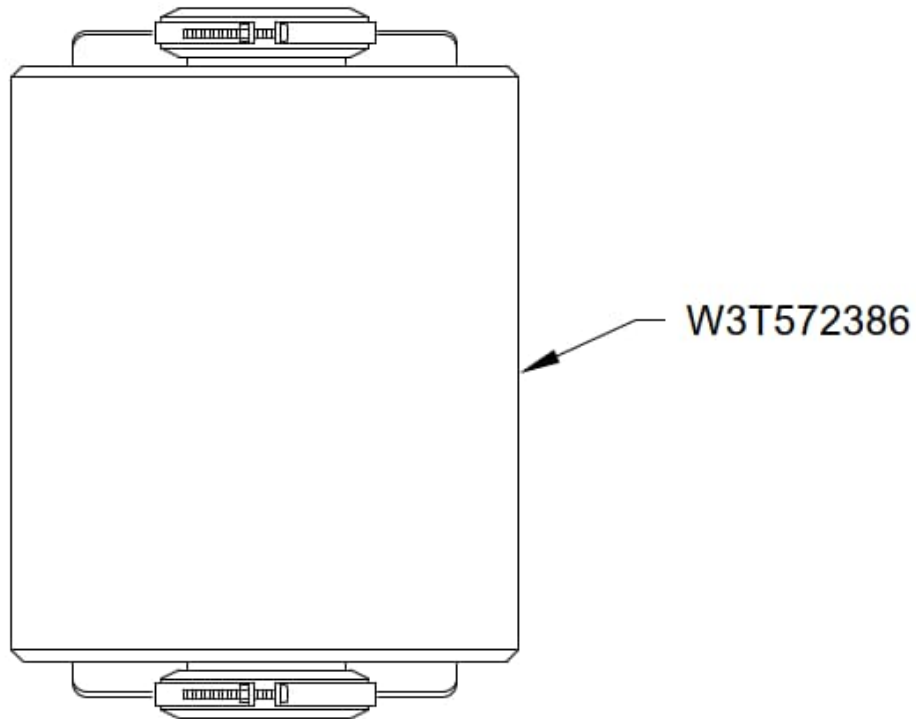
1. FLAT BLADE SCREWDRIVER.
2. 3/4" WRENCH OR EQUIVALENT.
3. TOWEL.

PROCEDURE:

1. OPEN FRONT COVER AND EXPOSE PUMPHEAD.
2. USE SCREWDRIVER AND TURN SCREW AS SHOWN. CLOCKWISE TO INCREASE PRESSURE, COUNTER CLOCKWISE TO DECREASE PRESSURE.
3. CHECK AND ADJUST (IF NEEDED) PRODUCT PRESSURE.
4. REPLACE FRONT COVER.

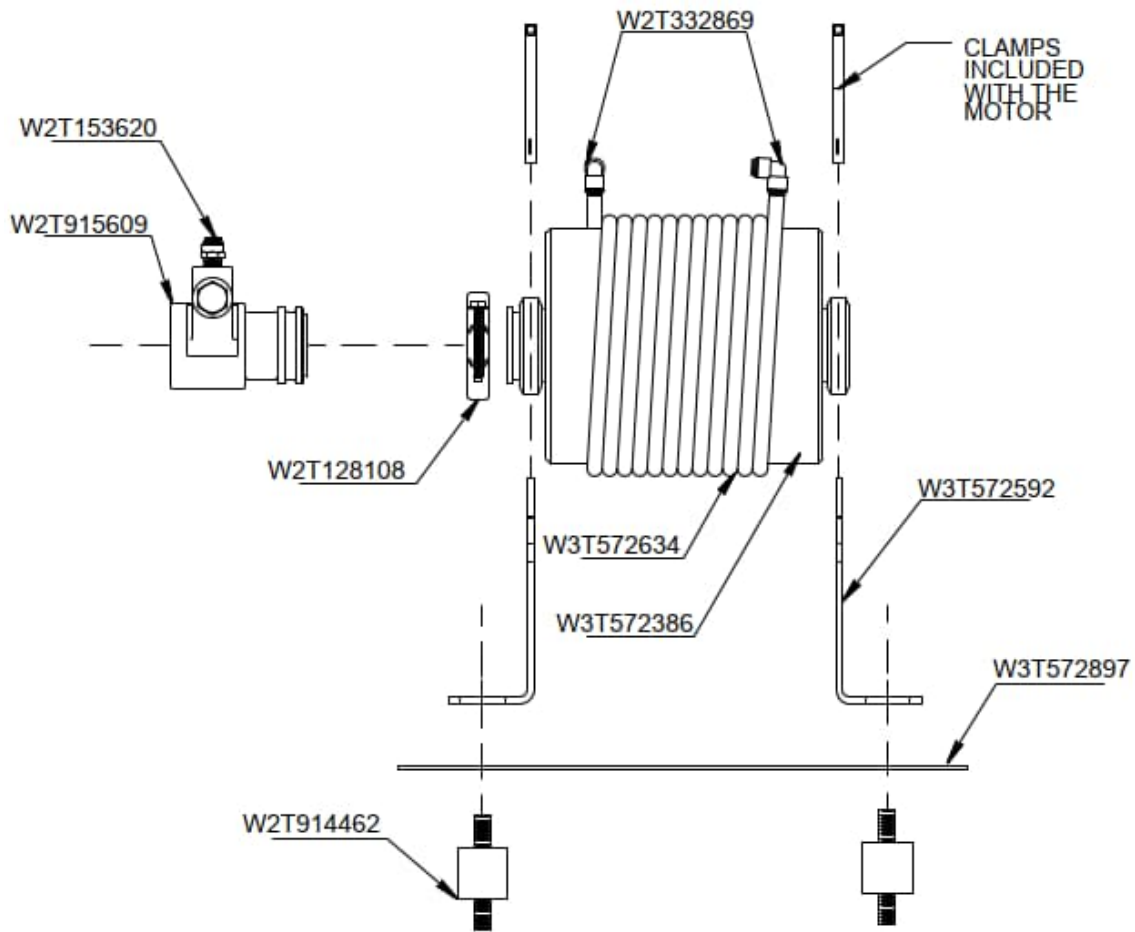


700 Series RO System
Pump Pressure Adjustment
Procedure



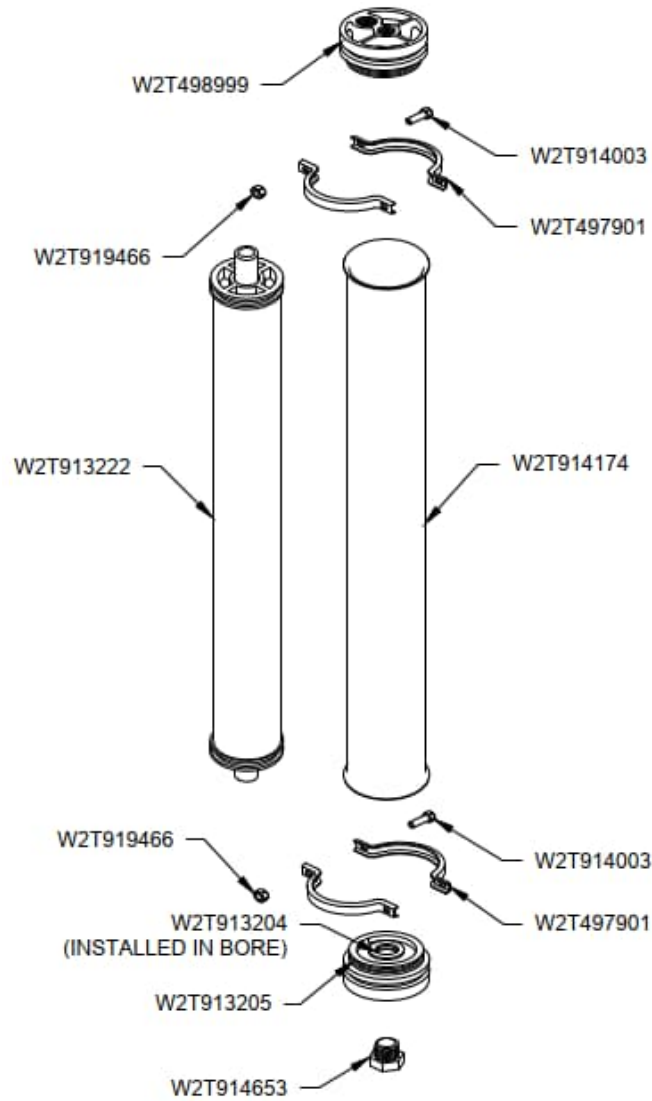
PART NO.	DESCRIPTION
W3T572386	MOTOR, 1/3 HP 120 V 60 Hz
W2T915609	PUMP, SS, 100 GPH
W2T153620	3/8" TUBE x 3/8" MNPT FITTING

700 Series RO System
Pump/Motor Assembly



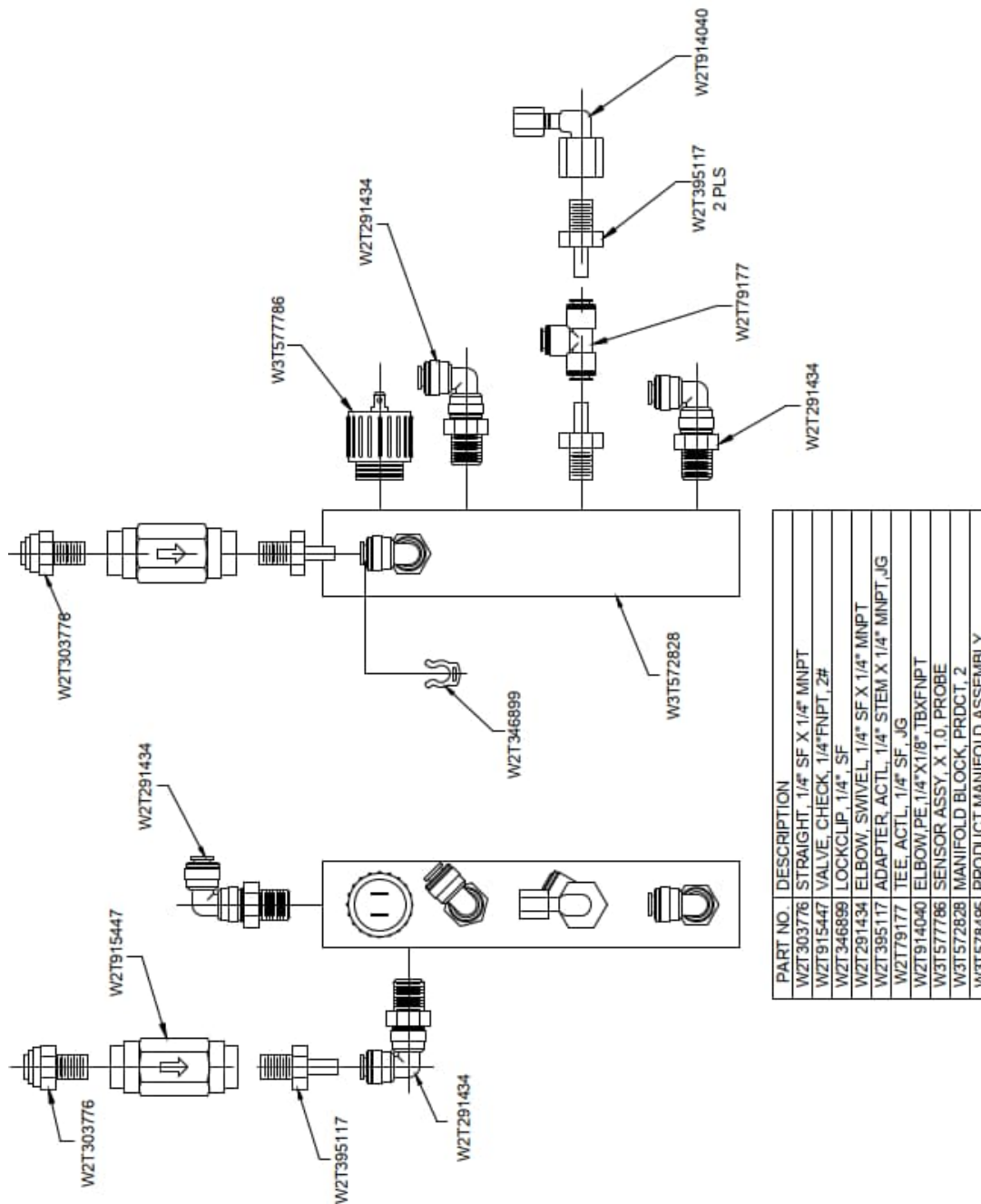
PART NO.	DESCRIPTION
W3T572386	MOTOR, 1/3 HP 115/230, 60/50
W2T915609	PUMP, SS, 100 GPH
W2T153620	3/8" TUBE X 3/8" MNPT FITTING
W2T128108	CLAMP, PUMP/MOTOR
W2T914462	MOTOR, MOUNT, LARGE
W3T572897	PLATE, MOUNT, 9"
W3T572592	BRKT, MOTOR, STND, 1/3HP
W2T332869	ELBOW, UNION, 3/8SF X 3/8SF
W3T572634	COIL, COPPER, 3/8 X 120,5"CL

700 Series RO System
Pump/Motor Assembly

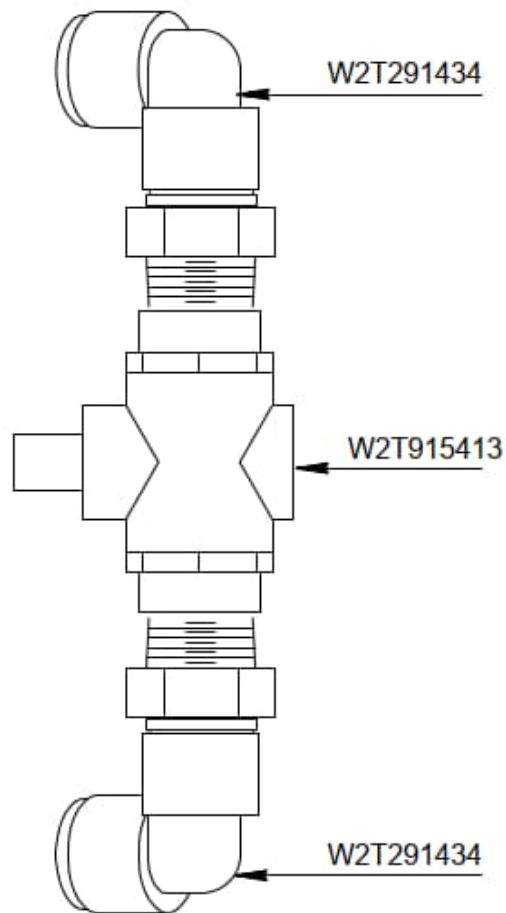


PART NO.	DESCRIPTION
W2T914174	RO MEMBRANE HOUSING
W2T498999	END CAP
W2T914653	PLUG
W2T913204	O-RING
W2T913205	O-RING
W2T913222	MEMBRANE
W2T497901	CLAMP
W2T914003	FSTNR, 1/4-20X3/4
W2T91466	FSTNR, 1/4-20

700 Series RO System
Flared Membrane Assembly (ROMA)



700 Series RO System
Product Manifold Assembly



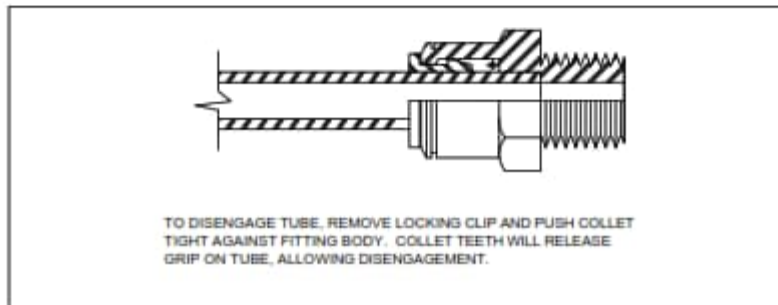
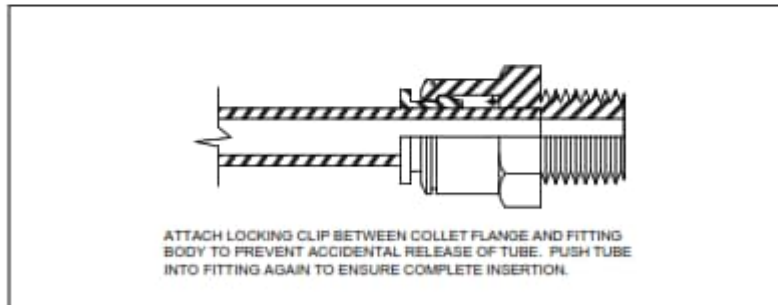
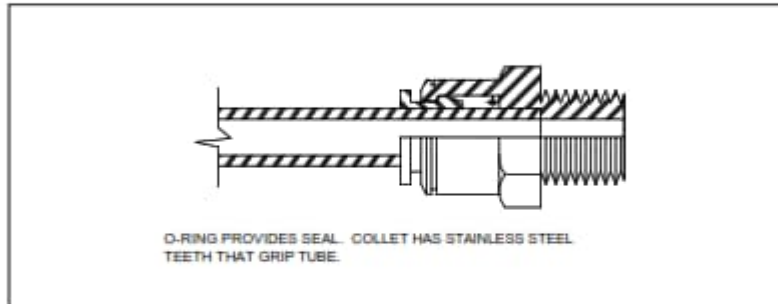
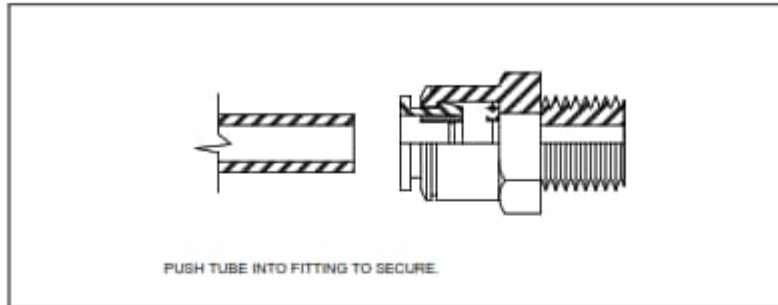
NOTE: HANDLE OF VALVE MUST BE REMOVED FROM VALVE BODY IF FLUSH VALVE ASSEMBLY IS TO BE REMOVED FROM THE FRONT PANEL OF THE 700 SERIES. AFTER ASSEMBLY IS RE-ATTACHED TO THE 700 SERIES FRONT PANEL, THE HANDLE OF THE VALVE CAN BE INSTALLED. THE SCREW MUST BE TORQUED TO BETWEEN 3 AND 5 INCH-POUNDS.

PART NO.	DESCRIPTION
W2T915413	VALVE,BALL,PVC,1/4X1/4FNPT,BK
W2T291434	ELBOW,M,SWIVEL,ACTL,1/4"X1/4",SFXMNPT,JG

700 Series RO System
Flush Valve Assembly

PUSH-IN FITTINGS

NOTE: FITTING IS NOT DESIGNED TO BE DISASSEMBLED. IF THE FITTING LEAKS, CHECK FOR IMPROPER TUBE INSERTION OR TUBE ROUTING THAT MAY CONTRIBUTE TO LEAKAGE. INTERNAL COMPONENT REPLACEMENTS ARE NOT AVAILABLE.



700 Series RO System Fitting Instructions

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Call **(800) 633-3080** for additional information or visit **www.mcpur.com**.



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