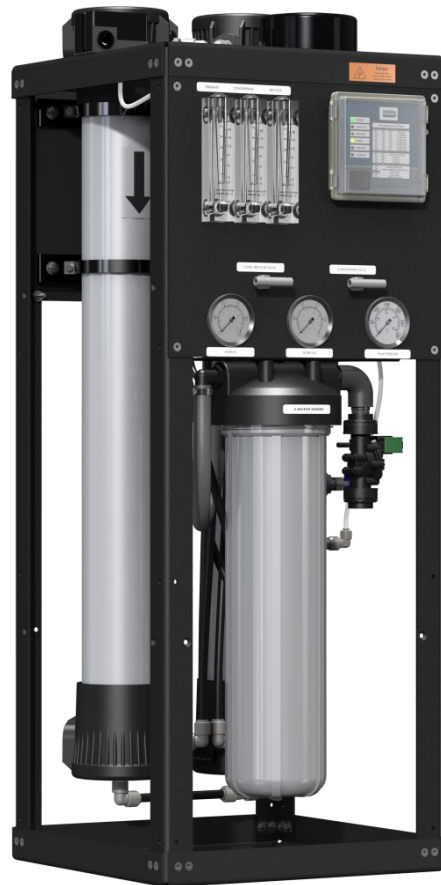


Membrane System User's Manual

Model

IH2O: 2000 - 8000 Series



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INTRODUCTION

Your IH2O - Series RO System is a durable piece of equipment which, with proper care, will last for many years. This User's Manual outlines installation, operation, maintenance and troubleshooting details vital to the sustained performance of your system.

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



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



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

SAFETY

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

NOTE: INDICATES STATEMENTS THAT PROVIDE FURTHER INFORMATION AND CLARIFICATION.



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



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



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



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

- DO NOT USE WHERE THE WATER IS MICROBIOLOGICALLY UNSAFE OR OF UNKNOWN QUALITY WITHOUT ADEQUATE DISINFECTION BEFORE OR AFTER THE SYSTEM.
- PRETREATMENT MUST BE SUFFICIENT TO ELIMINATE CHEMICALS, ORGANICS OR INORGANICS THAT COULD ATTACK THE MEMBRANE MATERIAL.
- ALWAYS TURN OFF THE UNIT, SHUT OFF THE FEED WATER, AND DISCONNECT THE ELECTRICAL POWER BEFORE WORKING ON THE UNIT.
- NEVER ALLOW THE PUMP TO RUN DRY.
- NEVER START THE PUMP WITH THE CONCENTRATE VALVE CLOSED.
- NEVER ALLOW THE UNIT TO FREEZE OR OPERATE WITH A FEED WATER TEMPERATURE ABOVE 100°F.

FEED WATER & OPERATION SPECIFICATIONS

Nothing has a greater effect on a reverse osmosis system than the feed water quality.



NOTE: IT IS VERY IMPORTANT TO MEET THE MINIMUM FEED WATER REQUIREMENTS. FAILURE TO DO SO WILL CAUSE THE MEMBRANES TO FOUL AND VOID THE MANUFACTURER'S WARRANTY.

OPERATING LIMITS

Operating Parameters:*

Feed Temperature	40 - 85°F
System Inlet Pressure	45 - 85 PSIG
Maximum Operating Pressure (@77°F)	200 PSIG (Nominal)

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

Feed Water Requirements:**

Maximum SDI Rating	< 3
Maximum Turbidity	1 NTU
Maximum Free Chlorine and/or Chloramines	0 PPM
pH (continuous)	3 - 11
pH (cleaning - 30 min.)	2 - 12

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



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

REJECTION, RECOVERY AND FLOW RATES

IH2O - Series Reverse Osmosis Systems are designed to produce permeate water at the capacities indicated by the suffix in the system's name under the conditions listed above. For example, the IH2O-2000 produces 2000 gallons per day of permeate water at the listed operating test conditions.

The amount of total dissolved solids (TDS) rejected by the membrane is expressed as a percentage. For example, a 98.5% rejection rate means that 98.5% of total dissolved solids do not pass through the membrane. To calculate the % rejection, use the following formula:

$$\% \text{ Rejection} = [(\text{Feed TDS} - \text{Product TDS}) / \text{Feed TDS}] \times 100$$

Example:

$$98.5\% = [(550 - 8.25) / 550] \times 100$$



NOTE: ALL TDS FIGURES MUST BE EXPRESSED IN THE SAME UNITS, TYPICALLY PARTS PER MILLION (PPM) OR MILLIGRAMS PER LITER (MG/L).

IH2O - Series Reverse Osmosis Systems are designed to reject up to 98.5% NaCl, unless computer projections have been provided or stated otherwise.

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

$$\% \text{ Recovery} = (\text{Product Water Flow Rate} / \text{Feed Water Flow Rate}) \times 100$$

Example:

$$50\% = (1.02 / 2.04) \times 100$$



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

SYSTEM REQUIREMENTS AND OPERATION GUIDELINES

PLUMBING

The membranes and high pressure pumps used on IH2O - Series systems require a continuous flow of water with a minimum feed pressure of 45 psi, not to exceed 85°F.

FEED WATER CONNECTION

1. Locate the 3/4" FNPT solenoid valve feed water inlet.
2. Attach the inlet piping to the 3/4" FNPT solenoid valve feed water inlet.
3. Be certain that all of the components of the feed water are soluble at the concentrations attained in the system.



NOTE: FEED LINE MUST BE MINIMUM 1/2" INCH.

PERMEATE (PRODUCT WATER) CONNECTION

Locate the 1/2" Quick Connect fitting on the flow meter labeled "permeate" and attach to storage tank. The permeate line can be run to the holding tank with PVC fittings, or other FDA approved materials. This is so the material being used does not dissolve into the permeate water.



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

CONCENTRATE (WASTE WATER) CONNECTION

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



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

ELECTRICAL

The motor used on the IH2O - Series systems are pump and motor combinations. The motor is available in 110/220 Volt 60 Hertz 1 Phase. Each IH2O Series system is equipped with an 8 foot electrical cord. IH2O - Series systems that are 110 Volt 60 Hertz 1 Phase models come with a 3 prong electrical plug.

Ensure that the electrical circuit supplying the system is compatible with the requirements of the specific IH2O model you are installing.



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



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

IH2O - Series systems are controlled with a high pressure switch in a permeate line. The liquid pressure switch turns the system on when the permeate water pressure drops below 40 psi, and off when the permeate water pressure exceeds 60 psi.

PRE-FILTRATION

IH2O - Series systems are supplied with a catalytic carbon block filter. Change the cartridge once a month or when a 10-15 psi differential exists between two pre-filter gauges.



NOTE: THE SYSTEM MUST BE OPERATED ON FILTERED WATER ONLY.

PUMP

The pump type used on the IH2O - Series systems is multi-stage centrifugal stainless steel. If any damage occurs to your system's pump, a re-build kit may be available. Contact your local dealer or distributor and inform them of your system and pump model.

MOUNTING

The free standing system should be bolted down or securely fastened in compliance with local regulation standards.

MEMBRANE ELEMENTS

IH2O - Series Reverse Osmosis Systems equipped with Thin Film Composite (TFC) HF5 Ultra Low Energy membranes, unless otherwise specified. General membrane element performance characteristics are listed below.

HF5 – Ultra Low Energy membrane

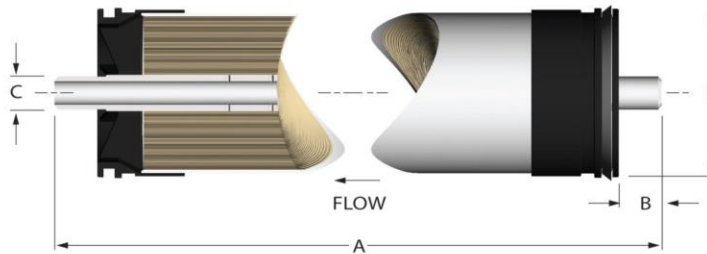
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|------------------------------------|-------------------------------|--|--------|
| ■ Membrane Type: | Polyamide Thin-Film Composite | ■ pH Range, Short Term Cleaning (30 Min.): | 1 – 13 |
| ■ Maximum Operating Temperature: | 113°F (45°C) | ■ Maximum Feed Silt Density Index: | 5 |
| ■ Maximum Operating Pressure: | 400 psi (27.58 bar) | ■ Chlorine Tolerance: | 0 ppm |
| ■ pH Range, Continuous Operation*: | 2 – 11 | | |

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

Product Specifications

Part Number	Description	Applied Pressure psi (bar)	Permeate Flow Rate psi (gpd)	Applied Pressure psi (bar)	Permeate Flow Rate gpd (m3/d)	Nominal Salt Rejection (%)
200392	HF5 – 4014	80 (5.52)	600 (2.27)	100 (6.89)	720 (3.72)	98.5
200393	HF5 – 4021	80 (5.52)	1000 (3.79)	100 (6.89)	1200 (4.54)	98.5
200394	HF5 – 4040	80 (5.52)	2500 (9.46)	100 (6.89)	3000 (11.36)	98.5

Test Parameters: 550 TDS Filtered (5 Micron), De-Chlorinated, Municipal Feed Water, 77 Degrees F, 15% Permeate Recovery, 6.5 - 7.0 pH Range, at the Specified Operating Pressure. Data Taken After 30 Minutes of Operation. Maximum Pressure drop for each element is 13 psi. Minimum salt rejection is 96%. Permeate flow for individual elements may vary +/- 20%.



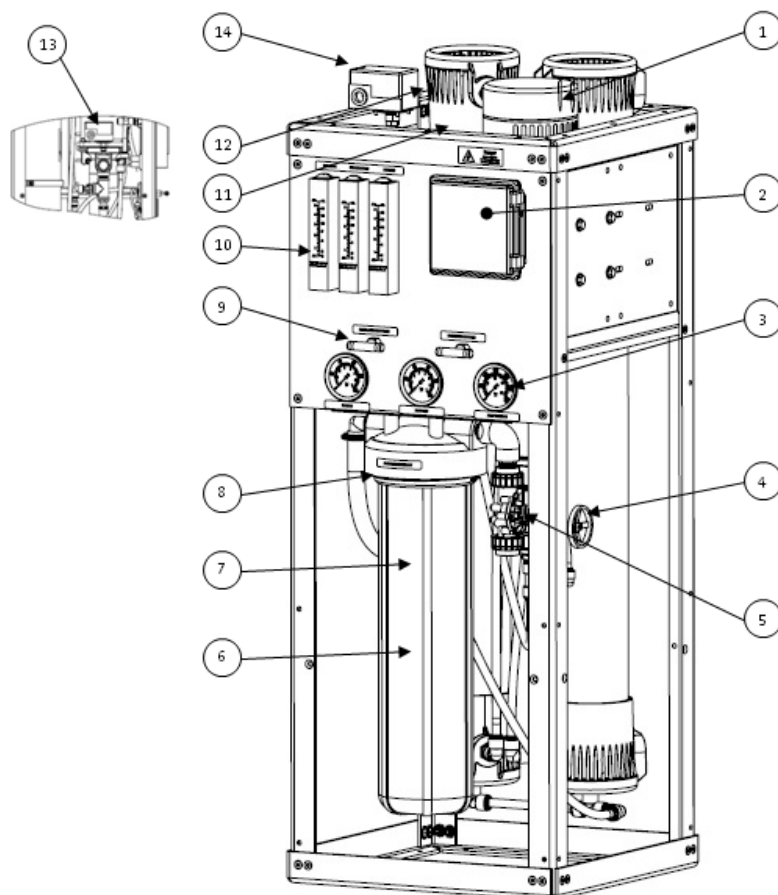
Dimensions inch (mm):

Description	A	B	C	D
HF5 – 4014	14 (355.6)	1.1 (27.94)	0.75 (19.05)	3.95 (100.3)
HF5 – 4021	21 (533.4)	1.1 (27.94)	0.75 (19.05)	3.95 (100.3)
HF5 – 4040	40 (1016.0)	1.1 (27.94)	0.75 (19.05)	3.95 (100.3)

Under certain conditions, the presence of free chlorine and other oxidizing agents will cause premature membrane failure. Since oxidation damage is not covered under warranty, the manufacturer recommends removing residual free chlorine by pretreatment prior to membrane exposure. Wet tested membrane elements must be kept sealed and moist when in storage. Drying out may occur and damage the membrane permanently. Prevent elements from freezing or being exposed to direct sunlight. Wet tested elements are vacuum sealed in a polyethylene bag containing 1.0% sodium meta-bisulfite and then packaged in a cardboard box. Discard the permeate for the first twenty-four hours of operation. The permeate flow (product water flow) varies with feed water temperature. For membrane warranty information, please contact the manufacturer.

The manufacturer believes the information and data contained herein to be accurate and useful. The information and data are offered in good faith, but without guarantee, as conditions and methods of use of products are beyond the manufacturer's control. The manufacturer assumes no liability for results obtained or damages incurred through the application of the presented information and data. It is the user's responsibility to determine the appropriateness of these products for the user's specific end uses.

SYSTEM IDENTIFICATION



ITEM NO.	DESCRIPTION	P/N	MODEL
1	PUMP, BOOSTER, 0.5HP, 115/230V, 1PH, 7JBT05S4, FRANKLIN	207129	2000-4000
1	PUMP, BOOSTER, 1HP, 115/230V, 1PH, 7JBT1S4, FRANKLIN	207130	6000-8000
2	CONTROLLER, COMPUTER, C23, 110/220V, 1PH, 6X6X4 BOX, OEM	207749	2000-8000
3	GAUGE, PM, GLYFILL, 0-300 PSI/BAR, 2.5" DIA, 1/4" MNPT, AXEON	200904	2000-8000
3	GAUGE, PM, GLYFILL, 0-100 PSI/BAR, 2.5" DIA, 1/4" MNPT, AXEON	204165	2000-8000
4	VALVE, GLOBE, SS, 3/4" FNPT	200994	2000-8000
5	KIT, SOLENOID, 3/4" FPT, 120V, W/DIN AND 2 METER CORD, ASCO	207626	2000-4000
5	KIT, SOLENOID, 3/4" FPT, 220V, W/DIN AND 2 METER CORD, ASCO	207627	6000-8000
6	CARTRIDGE, CARBON BLOCK, CHLORAMINE 4.5" X 20", 1 MIC	208009	2000-8000
7	HOUSING, FILTER, BLK/GRY, 4.5" X 20", SGL O-RING, NPR, 3/4" FNPT, AXEON	207289	2000-8000
8	O-RING, HOUSING, FILTER, SGL, 4.5", PENTEK	203654	2000-8000
9	VALVE, NEEDLE, SS 316L, 1/2" FNPT, AXEON	201006	2000-8000
10	METER, FLOW, PM, 0.2-2 GPM, 1/2" MNPT x 1/2" MNPT, AXEON	200897	2000
10	METER, FLOW, PM, 1-5 GPM, 1/2" MNPT x 1/2" MNPT, AXEON	200898	4000-8000
10	METER, FLOW, PM, 1-10 GPM, 1" MNPT x 1" MNPT, AXEON	200899	8000
11	MEMBRANE, HF5, 4039, DRY, AXEON	207089	2000-8000
12	VESSEL, PRESSURE, MEMBRANE, PVC, 4039, 1/2" P X 1/2" C FNPT	207094	2000-8000
13	SWITCH, PRESSURE, LOW, N/O, 15-30 PSI, 1/4" FNPT	200906	2000-8000
14	SWITCH, PRESSURE, HIGH, N/C 40-60, 1/4" FNPT	200907	2000-8000

FIGURE 1

MEMBRANE INSTALLATION, REMOVAL AND REPLACEMENT

Installing and replacing membranes in the pressure vessels is an easy process if you have the proper information and tools at hand. Please refer to the following instructions when removing and replacing membrane elements:



WARNING: ALL PRESSURE GAUGES MUST READ ZERO BEFORE PROCEEDING. BEFORE ATTEMPTING, DISCONNECT THE POWER FROM THE SYSTEM AND BLEED ALL WATER PRESSURE FROM THE SYSTEM.

1. Remove the black end cap from the top of the membrane housing. This is done by removing yellow locking clip and then the white snap ring on the membrane housing end.
2. Remove the replacement membrane element(s) from the shipping box; the membrane(s) should be contained within a plastic oxygen barrier bag.

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

3. Cut the bag open as close as possible to the seal at one end of the bag, so the bag may be re-used if necessary.
4. Make sure that all parts are clean and free from dirt. Examine the brine seal, and permeate tube for nicks or cuts. Replace the o-rings or brine seal if damaged.
5. Flow directions should be observed for installation of each element into their respective pressure vessels.

REPLACING THE MEMBRANE ELEMENT:



WARNING: THE BRINE SEAL MUST BE IN THE SAME POSITION FOR EACH MEMBRANE ELEMENT HOUSING. THE BRINE SEAL IS A RUBBER SEAL

THAT PROTRUDES ON ONE SIDE OF THE MEMBRANE AND IS ALWAYS ON THE FEED SIDE OF THE MEMBRANE ELEMENT. FOR MTMS SERIES RO SYSTEMS THE BRINE SEAL SHOULD BE ON THE TOP SIDE OF THE MEMBRANE HOUSING.

1. Remove one membrane element at a time from the pressure vessels, from the top of each housing. Long nose pliers may be necessary to pull the old membrane element out of the membrane element housing.
2. Lubricate the brine seal with a non-petroleum based lubricant, such as Dow Corning® 111. Do not use a petroleum-based lubricant.
3. Install membranes with brine seal location depicted in (Figure 2).
4. With a smooth and constant motion, push the membrane element into the housing so the brine seal enters the housing without coming out of the brine seal groove.
5. Once membrane has been fully inserted into vessel re-install black end plug, white snap ring (ensure that white snap ring is fully seated all the way around end plug), and yellow locking clip.
6. Reconnect any fittings that may have been disconnected when the membrane pressure vessels were disassembled.
7. To Start-Up the system, please refer to the Initial Start-Up section of this manual.



CAUTION: WET MEMBRANES ARE SHIPPED IN A PRESERVATIVE SOLUTION. THE MEMBRANES MUST BE FLUSHED FOR AT LEAST 30 MINUTES TO REMOVE THE PRESERVATIVE FROM THE MEMBRANE. DISCARD ALL OF THE PERMEATE, WHICH IS PRODUCED DURING THE FLUSH PERIOD.

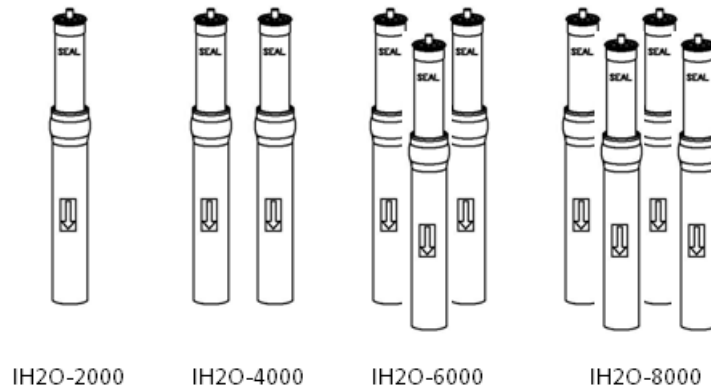


FIGURE 2 View from the back of IH2O – SERIES RO systems.

SYSTEM PURGING

Carefully inspect your system before initial start-up. Check that all plumbing and electrical connections are not loose or have not come undone during shipment. A filter housing wrench will accompany your IH2O - Series Reverse Osmosis System.



NOTE: LEAVE THE POWER TO THE SYSTEM OFF FOR THIS PROCEDURE.

1. Redirect permeate water to the drain for this procedure.
2. Fully open the concentrate valve (Figure 1, Item 9, Counter Clockwise).
3. Fully close the recycle valve (Figure 1, Item 9, Clockwise).
4. Fully open the throttle valve (Figure 1, Item 4, Counter Clockwise).
5. To activate the Solenoid bypass feature, place the three way push button located on the front panel of the C-23 controller to the FLUSH position (Figure 3).
6. Turn the feed water on and let the system purge until no visible bubbles appear from concentrate flow meter.
7. Place the three way push button in OFF position (Figure 3).

C-23 CONTROLLER

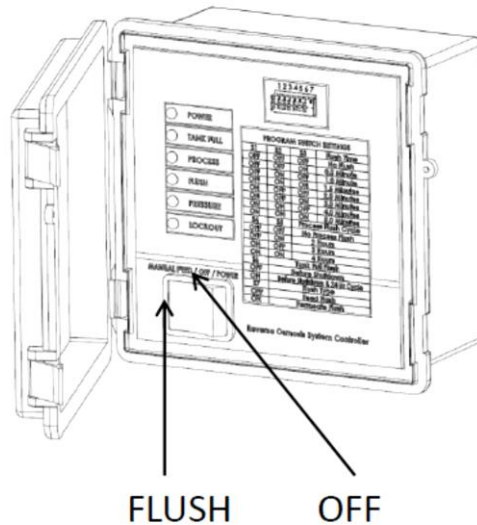


FIGURE 3

INITIAL START-UP

1. Keep the permeate water line to drain for this procedure.
2. Fully open the concentrate valve (Figure 1, Item 9, Counter Clockwise).
3. Fully close the recycle valve (Figure 1, Item 9, Clockwise)
4. Adjust the throttle valve at 50% open (Figure 1, Item 4, Counter Clockwise).
5. Turn the RO system on and adjust the concentrate (waste) valve, recycle valve, and the throttle valve to the designed flow and pressure (refer to Product Specification on page 18).
6. Inspect the system for leaks.
7. Allow the system to run 30 minutes to flush the preservative solution from the system.
8. After 30 minutes, shut down the system.
9. Re-direct the permeate water back to the tank and then turn the system back on.
10. Record the readings daily for a week; after one week record the readings once a week.

OPERATING DO'S AND DON'TS

DO:

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

DON'T

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

DESIGN BASIS FOR IH2O: 2000 - 8000

SPECIFICATION

Product Specifications				
	IH20-2000	IH20-4000	IH20-6000	IH20-8000
Design				
Configuration	Single Pass	Single Pass	Single Pass	Single Pass
Feed Water Source***	Up to 2,000 ppm	Up to 2,000 ppm	Up to 2,000 ppm	Up to 2,000 ppm
System Recovery ^	30% – 50%	30% – 50%	30% – 50%	30% – 50%
System Recovery with Recycle	50% – 75%	50% – 75%	50% – 75%	50% – 75%
Rejection and Flow Rates				
Nominal Salt Rejection	Up to 98.5%	Up to 98.5%	Up to 98.5%	Up to 98.5%
Permeate Flow Rate*	1.39 gpm	2.78 gpm	4.17 gpm	5.56 gpm
Concentrate Flow Rate (Minimum)	3.00 gpm	3.00 gpm	3.00 gpm	3.00 gpm
Concentrate Recycle Flow Rate	Up to 2.00 gpm	Up to 5.00 gpm	Up to 5.00 gpm	Up to 5.00 gpm
Connections				
Feed Connection	3/4" FNPT	3/4" FNPT	3/4" FNPT	3/4" FNPT
Permeate Connection	1/2" MNPT	1/2" MNPT	1/2" MNPT	1/2" MNPT
Concentrate Connection	1/2" MNPT	1/2" MNPT	1/2" MNPT	1" MNPT
Membranes				
Membranes Per Vessel	1	1	1	1
Membrane Quantity	1	2	3	4
Membrane Size	4039	4039	4039	4039
Vessels				
Vessel Array	1	1:1	1:1:1	1:1:1:1
Vessel Quantity	1	2	3	4
Pumps				
Pump Type	Multi-Stage	Multi-Stage	Multi-Stage	Multi-Stage
Motor HP	1/2 HP	1/2 HP	1 HP	1 HP
RPM @ 60 HZ	3450	3450	3450	3450
Electrical				
Standard Voltage	115V 1Ph 60 HZ	115V 1Ph 60 HZ	230V 1Ph 60 HZ	230V 1Ph 60 HZ
System Dimensions**				
Approx. Dimensions (L x W x H)	18" x 18" x 45"	18" x 18" x 45"	18" x 18" x 45"	18" x 18" x 45"
Approx. Weight	100 lbs.	120 lbs.	140 lbs.	160 lbs.

* Product flow and recovery rates are based on equipment test parameters.

** Does not include operating space requirements.

*** Treatment ability of the RO System is dependent on feed water quality. Performance projections must be run for each installation.

OPERATION AND MAINTENANCE

The reverse osmosis process causes the concentration of impurities. The impurities may precipitate (come out of solution) when their concentration reaches saturation levels.



NOTE: PRECIPITATION CAN SCALE OR FOUL MEMBRANES AND MUST BE PREVENTED.

Check your feed water chemistry and pre-treat the water and/or reduce the system's recovery as required. If necessary, consult with your local dealer or distributor.

PRE-FILTER PRESSURE GAUGES

These gauges measure the feed water pressure when it enters and exits the pre-filters. A pressure differential of 10 - 15 psi or more on the two pressure gauges indicates that the pre-filters require servicing. For example, if the inlet pressure is 40 psi, the filter should be changed when the outlet pressure is 30 psi or below.

PERMEATE (PRODUCT) FLOW METER AND CONCENTRATE (WASTE) FLOW METER

These flow meters indicate the flow rates of the permeate and concentrate water. The measurements, when added together, also indicate the feed water flow rate or (total flow rate); if the system is not equipped with a concentrate recycle valve.



CAUTION: EXCESSIVE RECYCLING MAY CAUSE PREMATURE FOULING OR SCALING OF THE MEMBRANE ELEMENTS.

LOW PRESSURE SWITCH

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



If you notice the pressure fluctuating, and the system cycling off and on, turn the system off and ensure that proper feed flow and pressure are available to the system.

HIGH PRESSURE SWITCH

The high pressure switch shuts off the system when the product water pressure exceeds 60 PSI, preventing damage to the system. The system restarts automatically when the pressure drops below 40 psi.

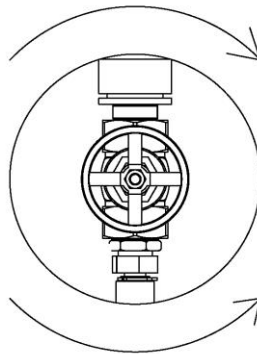
PUMP THROTTLE VALVE

The Pump Throttle Valve is installed as a standard feature on the IH2O - Series Reverse Osmosis Systems. It provides an adjustment for pump pressure. As the feed water temperature decreases, and/or the feed water TDS increases, the system will require a higher operating pressure to produce the specified permeate flow.

ADJUSTING THE THROTTLE VALVE

To decrease the pressure, turn the handle clockwise. To increase the pressure turn the handle counter clockwise (Figure 4).

DECREASE PRESSURE



INCREASE PRESSURE

FIGURE 4

FLUSHING THE SYSTEM

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

1. The system must be operating during the flush procedure.
2. Fully open the concentrate valve (Figure 1, Item 9).
3. Allow the system to run for 10 to 20 minutes.

4. After 10 to 20 minutes, close the concentrate valve to its previous setting. Ensure the proper concentrate flow rate is going to the drain.
5. The system is now ready to operate.



PREPARING UNIT FOR STORAGE OR SHIPMENT

Prior to shipping or storing your system, the system should be cleaned with an appropriate cleaner, flushed with water and protected from biological attack with an appropriate solution for membrane elements. The membrane housing(s) and plumbing lines of the system must be completely drained. Any water remaining in the plumbing of a system may freeze, causing serious damage.

Preparing system for storage:

1. Totally immerse the elements in the membrane housing in a solution of 2 % M-100 solution, venting the air outside of the pressure vessels. Use the overflow technique: circulate the M-100 solution in such a way that the remaining air in the system is minimized after the recirculation is completed. After the pressure vessel is filled, the M-100 solution should be allowed to overflow through an opening located higher than the upper end of the highest pressure vessel being filled.
2. Separate the preservation solution from the air outside by closing all valves. Any contact with oxygen will oxidize the M-100 solution.
3. Check the pH once a week. When the pH becomes 3 or lower, change the preservation solution.
4. Repeat this process at least once a month.

During the shutdown period, the plant must be kept frost-free, or the temperature must not exceed 113°F (45°C).

Preparing unit for shipment:

5. Disconnect the inlet, concentrate, pre-filter, and permeate plumbing.
6. Drain all water from the pre-filter cartridge housings by unscrewing the housings, removing the pre-filter cartridges, and drain the water from the housings.
7. Disconnect the tubing from the connectors on the permeate and concentrate inlets and outlets.

8. Fully open the concentrate valve.

9. Drain the flow meters.

Allow the system to drain for a minimum of eight hours or until the opened ports quit dripping.

After draining is complete, reconnect all of the plumbing.

REVERSE OSMOSIS TROUBLESHOOTING

SYMPTOMS	POSSIBLE CAUSES	CORRECTIVE ACTION
Low Inlet Pressure	Low supply pressure	Increase inlet pressure
	Cartridge filters plugged	Change filters
	Solenoid valve malfunction	Replace sol. valve and/or coil
	Motor may not be drawing correct current	Use clamp-on amp meter to check the motor amp draw.
	Concentrate valve might be damaged	Replace needle valve
	Leaks	Fix any visible leaks
Low Permeate Flow	Low inlet flow	Adjust concentrate valve
	Cold feed water	See temperature correction sheet
	Low operating pressure	See low inlet pressure
	Defective membrane brine seal	Inspect and/or replace brine seal
	Fouled or scaled membrane	Clean membranes
High permeate flow	Damaged product tube o-rings	Inspect and/or replace
	Damaged or oxidized membrane	Replace membrane
	Exceeding maximum feed water temperature	See temperature correction sheet
Poor permeate quality	Low operating pressure	See low inlet pressure
	Damage product tube o-rings	Inspect and/or replace
	Damaged or oxidized membrane	Replace membrane
Membrane fouling	Metal Oxide Fouling	Improve pretreatment to remove metals. Clean with acid cleaners.
	Colloidal Fouling	Optimize pretreatment for colloid removal. Clean with high pH anionic cleaners.
	Scaling (CaSO ₄ , CaSO ₃ , BaSO ₄ , SiO ₂)	Increase acid addition and antiscalant dosage for CaVO ₃ and CaCO ₄ . Reduce recovery. Clean with acid cleaners
	Biological Fouling	Shock dosage of Sodium Bi-Sulfate. Continuous feed of Sodium Bi-Sulfate at reduced pH. Chlorination and de-chlorination. Replace cartridge filters.
	Organic Fouling	Activated Carbon or other pretreatment. Clean with high pH cleaner.
	Chlorine Oxidation	Check Chlorine feed equipment and de-chlorination system.
	Abrasion of membrane by Crystalline Material	Improve pretreatment. Check all filters for media leakage.

ABNORMAL PERMEATE FLOW

Permeate flow should be within 20% of the rated production, after correcting the feed water temperatures above or below 77°F. Check your permeate flow meter to determine the permeate flow rate.



NOTE: TO DETERMINE THE TEMPERATURE CORRECTION FACTOR, LOCATE THE TEMPERATURE CORRECTION TABLE IN THIS USER'S MANUAL AND FOLLOW THE DIRECTIONS

TEMPERATURE CORRECTION FACTORS FOR MEMBRANE

Find the temperature correction factor (TCF) from the table below. Divide the rated permeate flow at 77°F by the temperature correction factor. The result is the permeate flow at the desired temperature. (See example on the next page)

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

F = (°C x 9/5) + 32

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

If a system is rated to produce 5 gpm of permeate water @ 77° F, the same system will produce more water at a higher temperature. It will also produce less water at a lower temperature. Use the temperature correction table to obtain the correct flow.

Example:

IH2O-Series User's Manual
MKTF-357

5 gpm @ 59° F ($5 \div 1.42 = 3.52$ gpm)

5 gpm @ 77° F ($5 \div 1 = 5$ gpm)

5 gpm @ 84° F ($5 \div 0.89 = 5.62$ gpm)

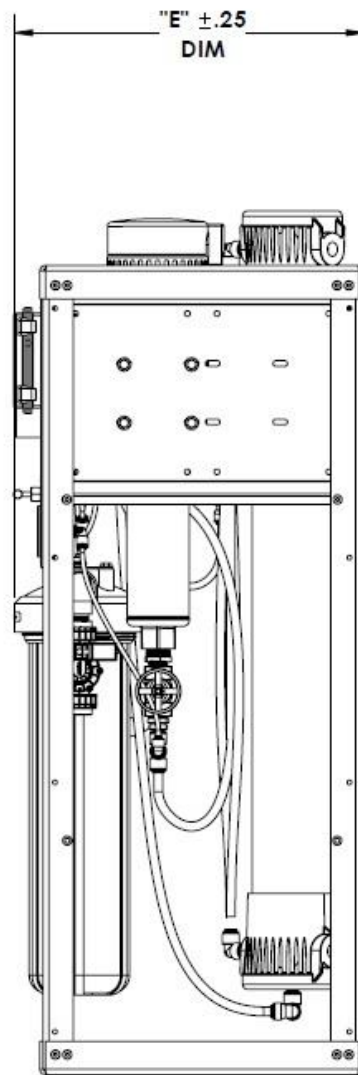
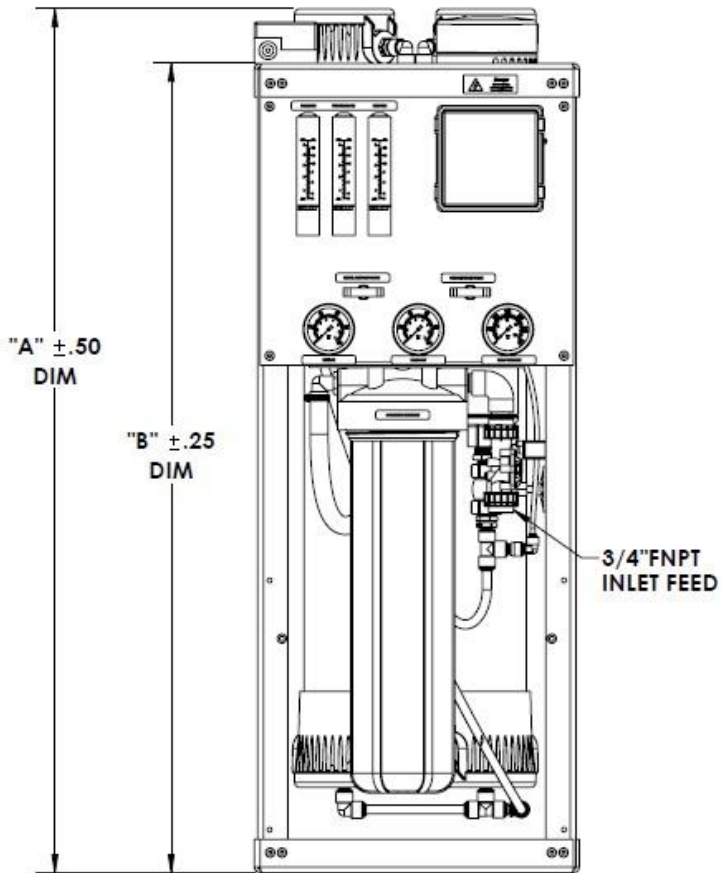
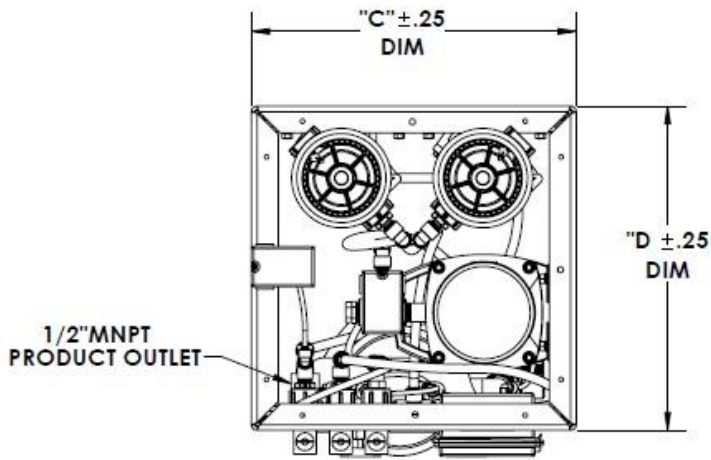
SERVICE ASSISTANCE

If service assistance is required, please complete the following process:

Contact your local dealer or distributor. Prior to making the call, have the following information available: system installation date, serial number, daily log sheets, current operating parameters (e.g. flow, operating pressures, pH, etc.) and a detailed description of the problem.

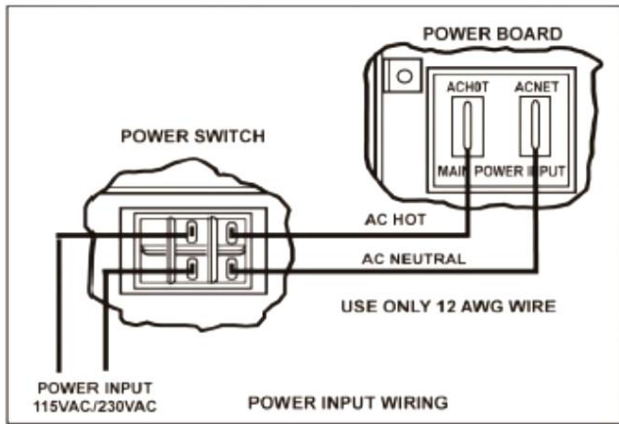
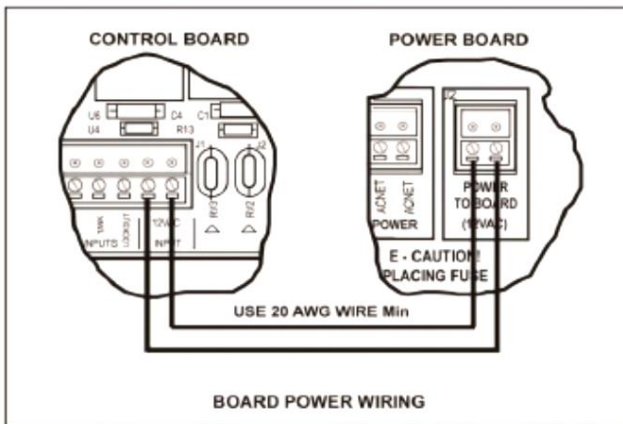
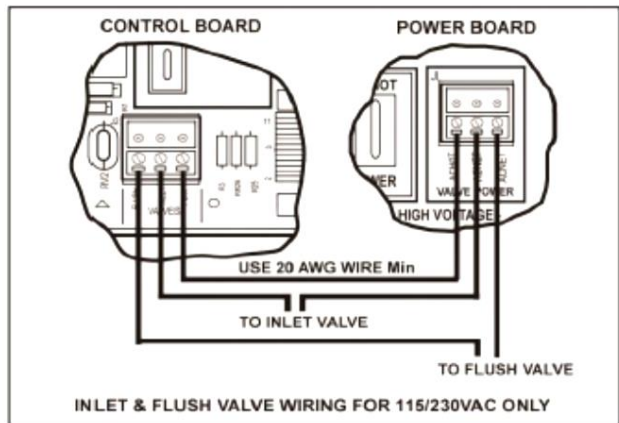
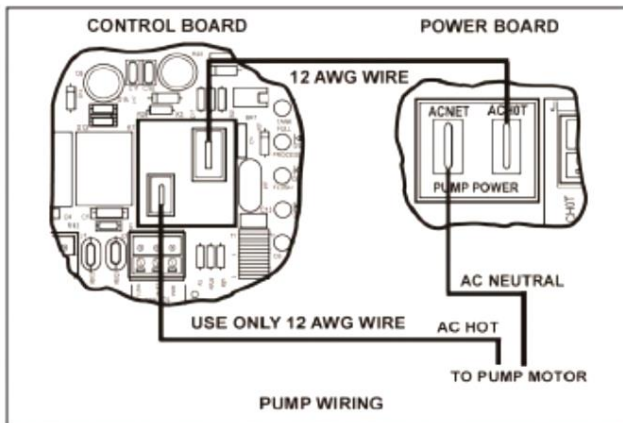
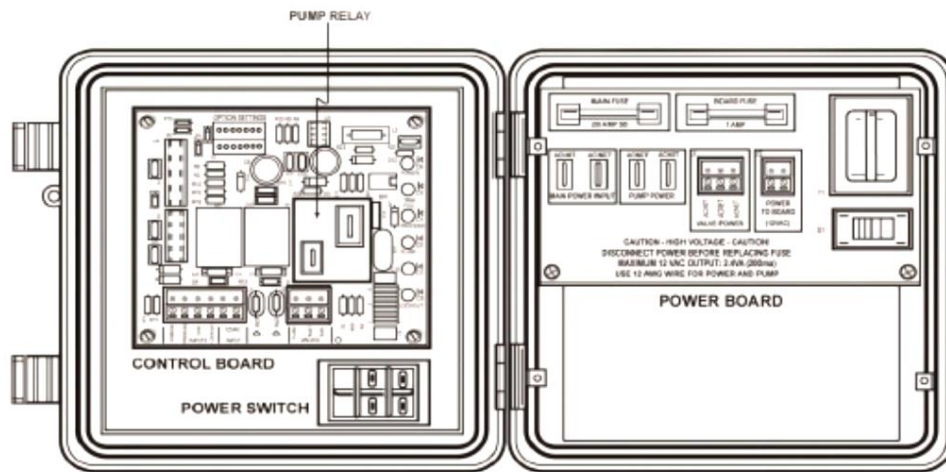
SYSTEM DRAWINGS

DIMMENSIONS	IH2O-2000	IH2O-4000	IH2O-6000	IH2O-8000
"A" DIM	52.70	52.70	52.70	52.70
"B" DIM	45.25	45.25	45.25	45.25
"C" DIM	18.13	18.13	18.13	18.13
"D" DIM	18.13	18.13	18.13	18.13
"E" DIM	19.55	19.55	25.55	25.55



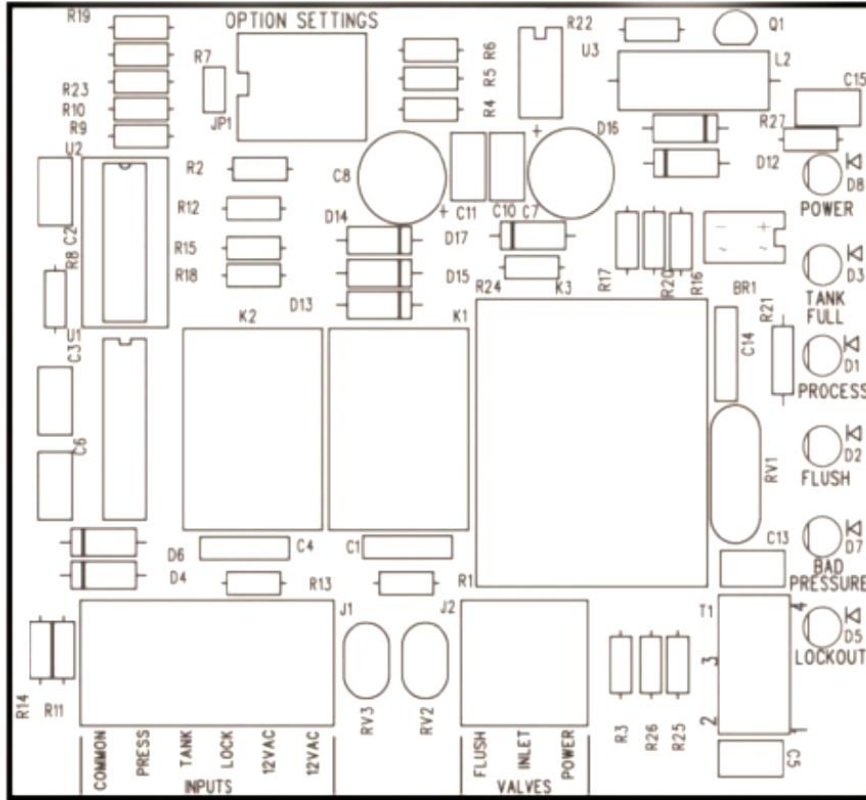
IH2O-4000 IS SHOWN

C-23 RO CONTROLLER INPUT WIRING DIAGRAM I

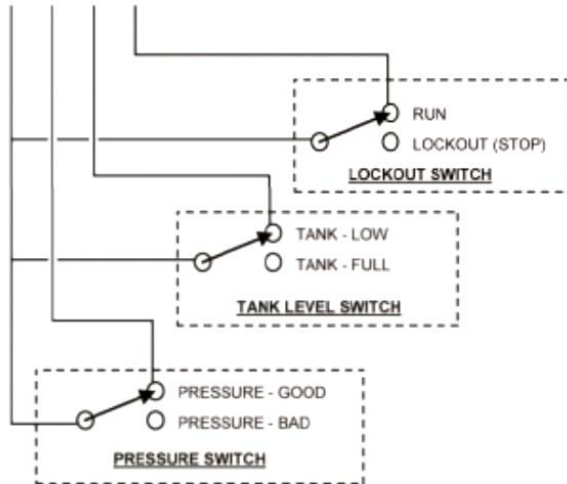


C-23 RO CONTROLLER

INPUT WIRING DIAGRAM II



WIRE SIZE:
20 - 24 AWG
UL-1015



IMPORTANT NOTE:

INPUTS MUST ONLY BE CONNECTED TO ISOLATED CONTACTS
(SWITCHES, RELAYS, ETC.) THAT ARE EITHER OPEN OR CLOSED.
FAILURE TO DO SO MAY CAUSE PERMANENT DAMAGE TO THE CONTROLLER.
Never Apply Any External Voltages to The Signal Inputs, or Damage Will Occur.

REVERSE OSMOSIS SYSTEM WARRANTY

One-Year Limited Warranty

Warranty Terms

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

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

Warranty Commencement Date

The Warranty Commencement Date for each manufacturer product shall be the later of the date of: (1) receipt by the Customer, or (2) the date of installation at the Customer's premises provided that such installation must occur within three (3) months of shipment from the manufacturing facility. In no event shall the Warranty Commencement Date exceed three (3) months from the shipment from the manufacturing facility. The Customer shall provide proof of purchase in order to exercise rights granted under this Warranty. If requested by the manufacturer, the Customer must also provide proof of the installation date. Proof of installation shall be returned by Customer to the manufacturer within thirty (30) days after installation by virtue of supplying a Warranty Validation Card supplied with each product fully completed and signed in ink by Customer and the authorized installer of the product.

Warranty Service

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

The Customer, at the Customer's risk and expense, shall be responsible for returning such product or component, only after obtaining a Return Goods Authorization (RGA) number from the manufacturer, arranging for freight prepaid, and in conformance with any special packaging and shipping instructions set forth on the operation documentation or RGA instructions, or as otherwise reasonably required, to the manufacturer's address set forth below, together with (1) RGA number issued by the manufacturer at Customer's request; (2) proof of purchase and, if necessary, proof of installation date; (3) a Return Goods Authorization Form; (4) a description of the suspected defects; (5) the serial number of the product alleged to be defective; and (6) a description of the type of water and pretreatment equipment which has been utilized in connection with the product, if any. The manufacturer shall, in manufacturer's reasonable discretion, be the sole judge of whether a returned product or component is defective in material or workmanship. Required or replaced products or components shall be returned surface freight. In genuine emergency situations, the manufacturer will (at the manufacturer's sole discretion) forward replacement parts to Customer without waiting for authorized return of the questionable part(s). In such cases, Customer will issue a purchase order or other payment guarantee

prior to shipment. If the returned part is found to have been misused or abused, or the defective part is not received by the manufacturer within thirty (30) days; the Customer will be invoiced for the replacement part(s) provided. This Warranty does not cover or include labor and/or travel to the Customer's premise or location or any other location. Charges of \$1000 per day plus associated travel expenses will be incurred by the Customer in providing the Warranty Service at any location other than the manufacturer's main headquarters; that is if the manufacturer deems that the product is not covered by said Warranty. The manufacturer reserves the right to precondition such travel to Customer's premises upon prepayment of the manufacturer's anticipated costs of attending such premises.

Voidability of Warranty

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

Limitations and Exclusions

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

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

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