# Craft Brew 2000 GPD
# Reverse Osmosis System


## For Questions or Service
## Call Us 805-777-7037

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# INTRODUCTION

Your Craft Brew 2000 GPD 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.

The test results which are included with this User's Manual indicate your systems permeate (product) and concentrate (waste) test results.

If your system is altered at the site of operation or if the feed water conditions change, please contact Craft Brew Water (805-777-7037) 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 CRAFT BREW WATER 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. FOR QUESTIONS CONTACT CRAFT BREW WATER (805-777-7037)

# 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.**

# FEED WATER AND 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 | | | | |
|---|---|---|---|---|
| Maximum Feed Temperature °F (°C) | 85 (29.00) | | Maximum Turbidity NTU | 1 |
| Minimum Feed Temperature °F (°C) | 40 (4.44) | | Maximum TDS | <2000 |
| Maximum Ambient Temperature °F (°C) | 120 (48.89) | | Maximum Free Chlorine ppm | 0 |
| Minimum Ambient Temperature °F (°C) | 40 (4.44) | | Maximum Hardness gpg†† | 0 |
| Maximum Feed Pressure psi (bar) | 85 (5.86) | | Maximum pH (Continuous) | 11 |
| Minimum Feed Pressure psi (bar) | 30 (2.41) | | Minimum pH (Continuous) | 5 |
| Maximum Operating Pressure psi (bar) | 150 (10.34) | | Maximum pH (Cleaning 30 Min.) | 12 |
| Maximum SDI Rating SDI | <3 | | Minimum pH (Cleaning 30 Min.) | 2 |

Test Parameters: 550 TDS Filtered (5-Micron), De-Chlorinated, Municipal Feed Water, 65 psi (4.50 bar) Feed Pressure, 150 psi (10.34 bar) Operating Pressure, 77 Degrees F (25 Degrees C), Recovery as stated, 7.0 pH. Data taken after 60 minutes of operation.

- Low temperatures and high Feed Water TDS levels will significantly affect systems production capabilities. Computer projections should be run for individual applications.
- Scale prevention measures must be taken to prolong membranes life.

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

# REJECTION, RECOVERY AND FLOW RATES

Craft Brew 2000 GPD 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 Craft Brew 2000 GPD 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:

**(Continued On Next Page)**

**% Rejection = [(Feed TDS – Product TDS) / Feed TDS] x 100**

Example:

**98.5% = [(550-8.25)/550] x 100**

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

Craft Brew 2000 GPD reverse osmosis systems are designed to reject up to 98.5% NaCl (Sodium Chloride) 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:

**% Recovery = (Product Water Flow Rate / Feed Water Flow Rate) x 100**

Example:

**50% = (1.04/2.04) x 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 Craft Brew 2000 GPD systems require a continuous flow of water with a minimum feed pressure of 30 psi, not to exceed 85°F.

### FEED WATER CONNECTION

1. Locate the 3/4” feed water inlet located on the big blue filter housing. (Item K, Figure 1A, Page 10)
2. Attach the inlet piping to the 3/4” FNPT feed water inlet on the big blue filter housing.
3. Be certain that all the components of the feed water are soluble at the concentrations attained in the system.

**NOTE:** FEED LINE MUST BE MINIMUM 3/4” INCH.

## PERMEATE (PRODUCT WATER) CONNECTION

Locate the 1/2” FNPT fitting labeled “Permeate” and attach to storage tank if it’s float switch controlled. Ensure that the permeate water can flow freely with no backpressure. Backpressure can cause irreversible damage to the membrane elements. The 1/2” 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 1-2 POINTS LOWER THAN THE FEED WATER PH. A LOW PH CAN BE VERY AGGRESSIVE TO SOME PLUMBING MATERIALS SUCH AS COPPER PIPING.

## CONCENTRATE (WASTEWATER) CONNECTION

Locate the 1/2” FNPT fitting labeled “Waste” and attach the tubing 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 Craft Brew 2000 GPD systems is a carbonator motor. The unit is available in 110 or 220 Volt 50/60 Hertz 1 Phase. Each system is equipped with a 5-foot electrical cord. 110V models are equipped with a plug.

Ensure that the electrical circuit supplying the system is compatible with the requirements of the specific system 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.

Craft Brew 2000 GPD systems are typically controlled with a float switch in a storage tank. The float switch turns the system on when the water level in the tank drops, and off when the tank is full. Float switches can be obtained from Craft Brew Water (805-777-7037). If a float switch is to be used, install it at this time.

**PRE-FILTRATION**

Craft Brew 2000 GPD systems are supplied with a 5-micron sediment filter. Change the cartridge once every 3 months or when a 10-15 psi differential exists between the pre-filter. Ask Craft Brew Water (805-777-7037) about Pre-Filtration systems, if required.

**NOTE:** THE SYSTEM MUST BE OPERATED ON SEDIMENT FILTRATED WATER ONLY.

**PUMP**

The pump type used on the Craft Brew 2000 GPD system is stainless steel multi-stage pump.

If any damage occurs to your system's pump, a re-build kit may be available. Contact Craft Brew Water (805-777-7037) for further information.

# CRAFT BREW 2000 GPD SYSTEM IDENTIFICATION

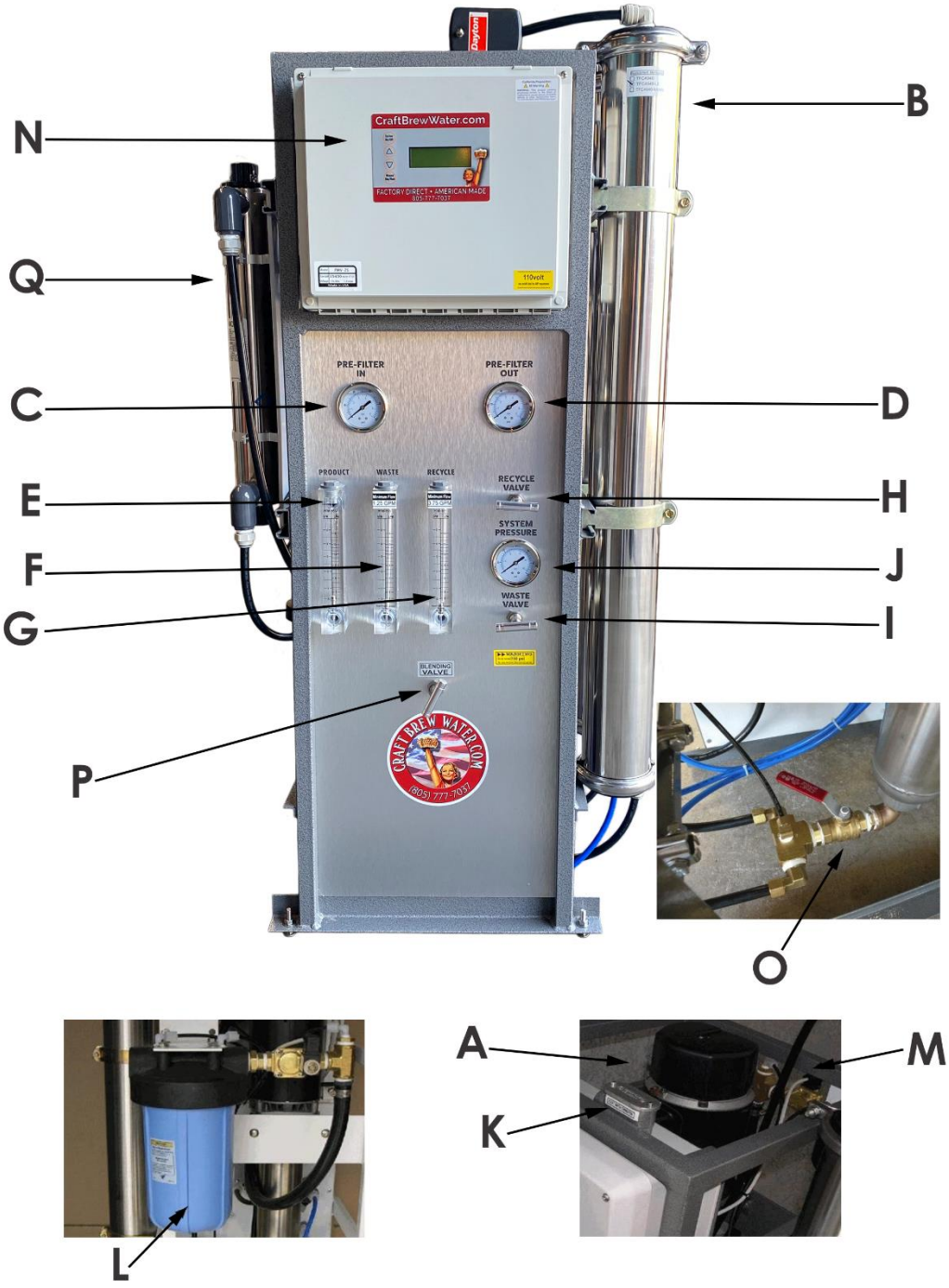



FIGURE 1

# CRAFT BREW 2000 GPD SYSTEM IDENTIFICATION (CONT)

A) **HIGH PRESSURE PUMP AND PUMP MOTOR:** The pump is responsible for creating the necessary high pressure needed for efficient R.O. operation. Pressure is adjusted by the waste control valve.


**CAUTION!** Do not run pump dry - do not exceed the recommended operating pressure 150 PSI (see cover page for specific rating). The pump motor spins the pump at high speeds to create increased pressure to the R.O. membrane. Information regarding the motor style and electrical specifications is identified on label affixed to the motor.

B) **REVERSE OSMOSIS MEMBRANE:** Thin Film Composite membranes remove up to 99%+ of the suspended solids. The membrane housing contains the R.O. membrane. The housing may be PVC, stainless steel, or fiberglass, depending on the designated material at purchase.

C) **PRE-FILTER IN GAUGE:** This gauge measures the water pressure before the pre-filter. When there is a drop 10 - 15 psi difference of pressure readings between the pre-filter in and pre-filter out gauges, the pre-filter is getting clogged and must be changed. This gauge always registers a reading.

D) **PRE-FILTER OUT GAUGE:** This gauge measures the water pressure after the pre-filter. When there is a drop 10 - 15 psi difference of pressure readings between the two gauges, the pre-filter is getting clogged and must be changed. This gauge registers a reading only while system is running.

E) **PRODUCT FLOW METER:** The product flow meter measures the amount of product water in gallons per minute or liters per minute.

F) **WASTE FLOW METER:** This meter is calibrated in gallons per minute (gpm). The waste flow meter measures the amount of wastewater to drain. The proper ratio of waste-to-product water recovery is set by viewing this meter.

G) **RECYCLE FLOW METER:** The recycle flow meter measures the amount of water being recycled in gallons per minute or liters per minute.

H) **RECYCLE VALVE:** This valve takes a portion of the wastewater from the R.O. membrane and feeds it back into the inlet side of the high-pressure pump. The valve is used to fine-tune and adjust the pressure of the high-pressure pump.

# CRAFT BREW 2000 GPD SYSTEM IDENTIFICATION (CONT)

I) **WASTE CONTROL VALVE:** This valve regulates the flow of wastewater exiting the membrane. It creates the necessary operating pressure in the membrane. Adjust this valve until it matches minimum waste flow rate indicated on the label next to the waste flow meter.


**CAUTION! This waste control valve should never be closed completely. Closing valve completely can result in membrane and system damage.** Adjusting this valve to attain the proper waste/product water ratio is done by turning control knob located on the body of the valve. Turning clockwise will increase the pressure setting within the membrane and reduce the amount of wastewater.


**CAUTION!** Do not exceed the maximum 150 PSI. Turning counterclockwise will reduce the pressure in the membrane and increase the wastewater.

J) **SYSTEM PRESSURE GAUGE:** This gauge measures the water pressure in PSI that is discharged from the high-pressure pump. The pressure to this gauge is adjusted to recommended pressure (see cover page for specific system pressure rating). By turning the waste control valve clockwise, the pressure will increase; counterclockwise will decrease pressure. This gauge registers a reading only while R.O. system is running.

**K) FLOAT SWITCH CONNECTION:** A splice box is provided to make a connection between the tank float (level) switch and the R.O. system. The customer must provide wire to make this connection. Make sure all wire colors are matched from the float switch to the R.O. system. The R.O. system will not start without the float switch connections being made.

L) **PRE-FILTER:** The pre-filter removes sediment particles down to 5 microns to help protect the pump and R.O. membrane. The pre-filter is mounted to the frame. The pre-filter is not to be considered as the only method of pre-treatment. Refer to product specifications “Feed Water Parameters” for proper pre-treatment for your application.

# CRAFT BREW 2000 GPD SYSTEM IDENTIFICATION (CONT)

M) **INLET SOLENOID VALVE:** This valve is located on the input side of pressure pump. This valve will shut off the feed supply of water when the unit is in the non-operating mode. This valve is a normally closed when not supplied with electrical current. If electrical current should be shut off, this valve would close, thus stopping the feed water.

N) **ELECTRICAL CONTROL BOX:** This houses the intelligent control processor. Refer to page 25 for further details on this component.

O) **THROTTLE VALVE:** Located on the discharge side of the pump, the throttle valve regulates the R.O. high pressure pump flow output to prevent system over-pressurizing. When adjusting the pressure and waste flow rate with the waste and recycle control needle valves use the throttle valve to balance the pump output flow. Use small adjustments between the waste and recycle control and throttle valves when making any pressure and flow adjustments.

**IMPORTANT:** At any time NEVER close the throttle valve completely. Damage will occur to the pressure pump. If the throttle valve is opened completely for any reason, it is most likely the R.O. system will shut down on high pressure. If this happens, one of two things may have occurred. Either the waste control needle valve is closed too much, or the throttle valve is opened too far. It is important the waste control valve and the throttle valve are adjusted in small increments at a time. Keeping in mind that there is a minimum waste flow requirement to help keep the membrane from fouling.

P) **BLENDING VALVE:** Some applications require an increase in TDS. To manually increase your desired level of TDS in the product water, this valve may be used to do so.

Q) **ULTRA-VIOLET FILTER:** The ultra-violet filter is designed to disinfect your product water, removing biological contaminants from the final product.

# PRE-START CHECK LIST

1. Ensure that the pre-filter cartridge is in place.
2. Check that there is a minimum inlet pressure of 30 PSI.
3. Ensure the system is powered OFF.
4. Make sure the system is plugged into a proper electrical supply (as indicated on label, on side of electrical box).
5. Open the waste valve 3 to 5 turns.
6. Ensure the waste and product lines are connected to your drain and storage tank(s)
7. Ensure that your tank level/float switch controls are connected properly.

# INITIAL START-UP

1. Do not start the system until pre-start checklist is completed.

2. Make sure the inlet water is turned on and check the pressure on your prefilter and post filter gauges.

3. Press the system ON/OFF button located on the control panel.

4. A low-Pressure warning will come across the screen. After a few seconds, a 20 second count down will start. When the count reaches 5 seconds press the on/off button and turn the unit off.

5. Press the on/off button again and let the unit finish the 20 second countdown.

6. Immediately monitor the system pressure gauge to ensure that the R.O. system **DOES NOT EXCEED** the recommended system pressure of 150 PSI.

7. Slowly adjust the waste control valve so that:

   B) Waste flow meter (GPM) is at proper rate (see sticker on top of flow meter)
   C) System pressure gauge is at proper PSI (see page 18 for specific rating)

8. The R.O. system should now be running properly.

9. The product waters PPM should take about 20 minutes to reach optimum quality.

**Note:** Below is a formula to use to help you calculate the R.O. systems flow rates. For example, the system should be adjusted until it produces about 2000 GPD or 1.38 GPM of permeate (product water) at 77˚F. Do not exceed 150 psi to achieve designed permeate flow.

**GPM = GPD/1440**

Example:

**1.38 = 2000/1440**

# CRAFT BREW 2000 GPD DESIGN SPECIFICATIONS

| Ctaft Brew 2000 GPD Specifications | |
|---|---|
| **Design** | |
| Configuration | Single Pass |
| Feed Water Source *** | TDS <2000 ppm |
| Recovery with Concentrate Recycle | Up To 75% |
| **Rejection and Flow Rates** | |
| Nominal Salt Rejection % | 98.5 |
| Permeate Flow * gpm (lpm) | 1.38 (5.22) |
| Minimum Feed Flow gpm (lpm) | 2.00 (7.57) |
| Minimum Concentrate Flow gpm (lpm) | 0.50 (1.89) |
| **Connections** | |
| Feed (In) | ¾ FNPT |
| Permeated (In) | ½ FNPT |
| Concentrated (In) | ½ FNPT |
| **Membranes** | |
| Membranes Membrane(s) Per Vessel | 1 |
| Membrane Quantity | 1 |
| Membrane Size | 4040 |
| **Vessels** | |
| Vessel Array | 1 |
| Vessel Quantity | 1 |
| **Standard Pump** | |
| Pump Type | Stainless Steel Multi-Stage Pump |
| Motor HP | 3/4 HP |
| **Electrical** | |
| Standard Voltage | 110V, 60 Hz, 1 PH, 11.6 AMP |
| Voltage Options | 220V, 60 Hz, 1PH, 5.8 AMP |
| **System Dimensions and Weight** | |
| L x W x H ** (in / cm) | 24 x 29 x 53 (61 x 74 x 135) |
| Weight (lb / kg) | 140 (63.50) |
| | |
| *** Product flow and recovery rates are based on feedwater conditions.** | |
| **** Does not include operating space requirements.** | |
| ***** Treatment ability of the RO system is dependent on feed water quality.** | |


**WARNING:** NEVER EXCEED THE MAXIMUM PRESSURE RATING OF YOUR SYSTEM.

# OPERATING DO's AND DON'Ts

**DO:**

- Change the cartridge filters regularly.
- Monitor the system and keep a daily/weekly 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 waste needle valve completely.
- Operate the system with insufficient feed flow.
- Operate the pump dry.
- Block permeate water flow.

# 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.

**NOTE:** Make sure to annually check your waters chemistry before and after the R.O. unit. Pre-treat the water and/or reduce the system's recovery as required. Please consult us at Craft Brew Water (805-777-7037) for further details and information.

**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 30 PSI or more.

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

## PUMP THROTTLE VALVE

This valve is installed as a standard feature on the Craft Brew 2000 GPD reverse osmosis systems. It provides an adjustment for pump pressure, which will vary as the required system pressure changes. 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. The Craft Brew 2000 GPD system installed in Florida may provide the specified permeate flow of 1.38 GPM at 100 psi; however, the same system installed in Maine – much colder feed water – may require 150 psi to produce the same amount of permeate. **Never exceed 150 psi.**

Example:

**98.5% = [(550-8.25)/550] x 100**

**%Rejection = (Feed TDS – Product TDS)/ (Feed TDS) x 100**

# MEMBRANE REMOVAL AND REPLACEMENT

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 end caps from the top of the membrane housings. This is done by removing the clamp fitting on the top of the membrane housing. Use a Flat-Head screwdriver to loosen the membrane cap. The end cap has slots for the Screwdriver.

2. Remove the membrane bag containing the membrane element from the shipping box.

**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 the end of the bag, so the bag may be re-used if necessary.

4. Make sure that all parts are clean and free from dirt. Examine the brine seal and permeate tube for nicks or cuts. Replace the O-rings or brine seal if damaged.

5. Flow directions should be observed for installation of each element into each housing.

As time progresses, the efficiency of the membrane will be reduced. In general, the salt rejection does not change significantly until two or three years after installation when operated on properly pretreated feed water. The permeate flow rate will begin to decline slightly after one year of operation, but can be extended with diligent flushing and cleaning of the system. A high pH and/or precipitation of hardness can cause premature loss in rejection.

**REPLACING THE MEMBRANE ELEMENT:**


**WARNING:** THE BRINE SEAL MUST BE IN THE SAME POSITION FOR EACH MEMBRANE ELEMENT HOUSING, SO MARK EACH HOUSING PRIOR TO REMOVING THE MEMBRANE ELEMENTS. 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.

1. Remove one membrane element at a time from the membrane element housings, from the top of the 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 non-petroleum-based lubricant, Silicone DC 111.

3. Install the brine seal side of the membrane element first. When the housings have a direction of flow from bottom to top, the brine seal should be located at the bottom of the housing. (Figure 2, Page 21)

4. At a slight angle, insert the membrane while slightly rotating the element being careful not to tear or flip the brine seal. A slow twisting motion should be used to insert the membrane element, to ensure the brine seal stays in place. Re-lube the brine seal if necessary.

5. 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.

6. Re-install the end caps by gently twisting the end cap while pushing it onto the housing. Ensure that you do not pinch or fatigue any O-rings while re-installing the end caps. Push the end caps on until the outer diameter of the plug is flush with the outer diameter of the membrane housing.

7. Reinstall the clamp fitting holding the end cap and membrane housing together.

8. Reconnect any fittings that may have been disconnected when the membrane element housings were disassembled.

9. To start-up the system, please refer to the Initial Start-Up section of this manual. (See Page 15)


**CAUTION:** WET MEMBRANES ARE SHIPPED IN A PRESERVATIVE SOLUTION. THE MEMBRANES MUST BE FLUSHED FOR AT LEAST 1 HOUR TO REMOVE THE PRESERVATIVE FROM THE MEMBRANE. DISCARD ALL OF THE PERMEATE FOR THE FIRST HOUR, WHICH IS PRODUCED DURING THE FLUSH PERIOD.

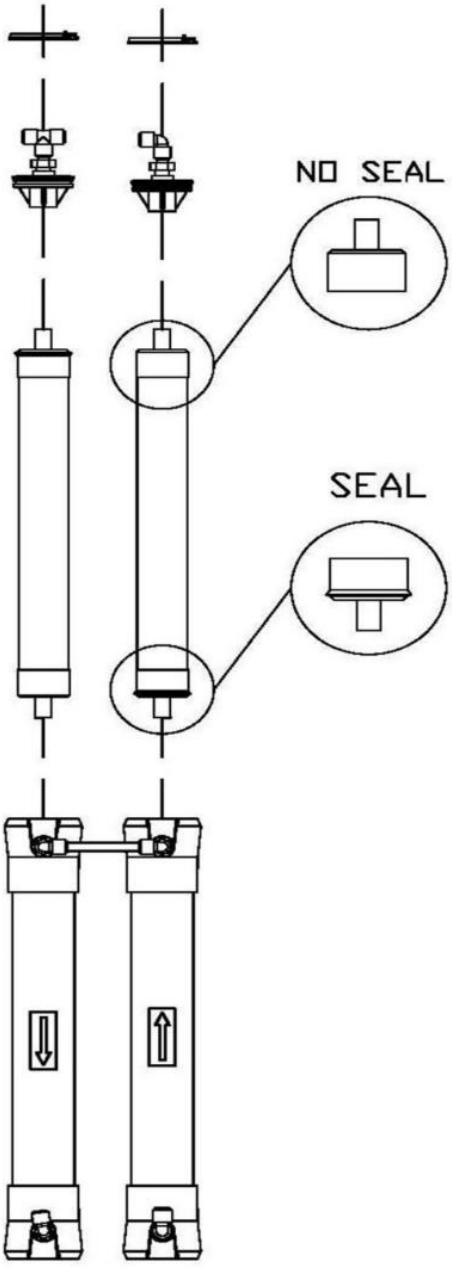



FIGURE 2

View from the side of the Craft Brew 2000 GPD reverse osmosis system.

# 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, Page 10)
3. Allow the system to run for 2-3 minutes.
4. After 2-3 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

**NOTE:** 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% H2O2 (Hydrogen Peroxide), venting the air outside of the pressure vessels. Use the overflow technique: circulate the H2O2 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 H2O2 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 H2O2.

**Preparing system for shipment (continued):**

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).

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.

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

11. After draining is complete, reconnect all the plumbing.

# CRAFT BREW 2000 GPD TROUBLESHOOTING

| Symptoms | Possible Causes | Corrective Actions |
|---|---|---|
| Low Inlet Pressure | Low supply pressure | Increase inlet pressure |
| | Cartridge filters plugged | Change filters |
| | Solenoid valve malfunction | Replace* sol. valve and/or coil |
| | Leaks | Fix any visible leaks |
| | Low inlet flow | Adjust concentrate valve |
| | Cold feed water | See temperature correction sheet |
| | | |
| Low Permeate Flow | Low operating pressure | See low inlet pressure |
| | Defective membrane brine seal | Inspect and/or replace* brine seal |
| | Fouled or scaled membrane | Clean membranes** |
| | Damaged product tube O-rings | Inspect and/or replace* |
| | Damaged or oxidized membrane | Replace* membrane |
| | | |
| High permeate flow | Exceeding maximum feed water temperature | See temperature correction sheet |
| | Low operating pressure | See low inlet pressure |
| | Damage product tube O-rings | Inspect and/or replace* |
| | | |
| Poor permeate quality | Damaged or oxidized membrane | Replace* membrane |
| | Metal Oxide Fouling | Improve pretreatment to remove metals. Clean with acid cleaners. |
| | Colloidal Fouling | Optimize pretreatment for Colloid removal. Clean with high pH anionic cleaners. |
| | | |
| Membrane fouling | Scaling (CaSO4, CaSO3, BaSO4, SiO2) | Increase acid addition and anti-scalant dosage for CaVO3 and CaCO4. Reduce recovery. Clean with acid cleaners. |
| | Biological Fouling | Shock dosage of Sodium Bisulfate. Continuous feed of Sodium Bisulfate 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. |

*** Use Craft Brew Water Authorized Parts To Maintain Warranty**
**** Contact Craft Brew Water (805-777-7037) For Cleaning Services**

**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

## SERVICE ASSISTANCE

If service assistance is required, please feel free to contact us at:

**Telephone: 805-777-7037**

**Email: Kim@CBW.Beer**

You can also visit us on the Web at:

**www.CraftBrewWater.com**

# 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) | 1.109 | 78.8 (26) | 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) | 1.09 | 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) | 1.66 | 58.6 (14.8) | 1.432 | 65.8 (18.8) | 1.24 | 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) | 0.94 |
| 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) | 1.63 | 59.5 (15.3) | 1.406 | 66.7 (19.3) | 1.219 | 73.9 (23.3) | 1.06 | 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) | 1.21 | 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) | 1.6 | 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) | 1.18 | 75.6 (24.2) | 1.028 | 82.8 (28.2) | 0.91 |
| 54.1 (12.3) | 1.57 | 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) | 1172 | 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) | 0.9 |
| 54.9 (12.7) | 1.547 | 62.1 (16.7) | 1.337 | 69.3 (20.7) | 1.16 | 76.5 (24.7) | 1.01 | 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) | 1.53 | 62.6 (17.0) | 1.323 | 69.8 (21.0) | 1.148 | 77.0 (25.0) | 1 | 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) | 1.14 | 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) | 1.29 | 71.1 (21.7) | 1.12 | 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) | 1.48 | 64.2 (17.9) | 1.281 | 71.4 (21.9) | 1.112 | 78.6 (25.9) | 0.974 | 85.8 (29.9) | 0.866 |

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:**

**5gpm @ 59˚ F (5 ÷ 1.42 = 3.52 gpm)**

**5gpm @ 77˚ F (5 ÷ 1 = 5 gpm)**

**5gpm @ 84˚ F (5 ÷ 0.89 = 5.62 gpm)**

# OPERATION LOG

Company Name _____

Day of Startup _____

Location _____

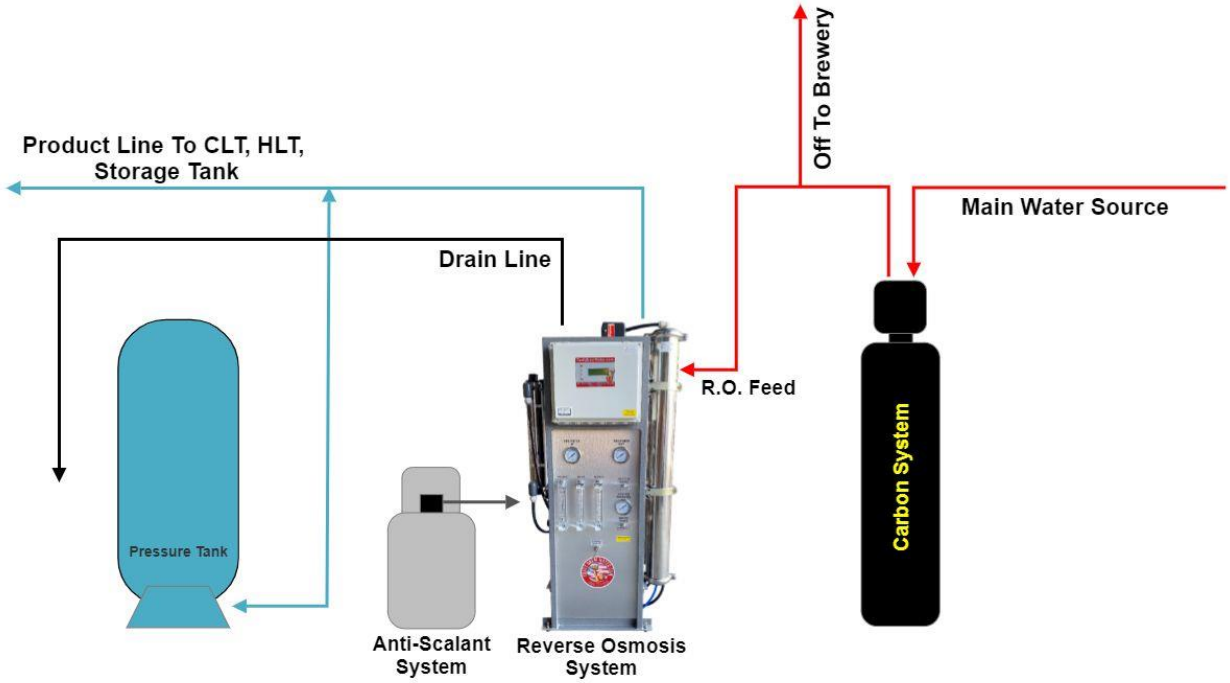
Date of Last Cleaning _____

Week Of _____

System Serial Number _____

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

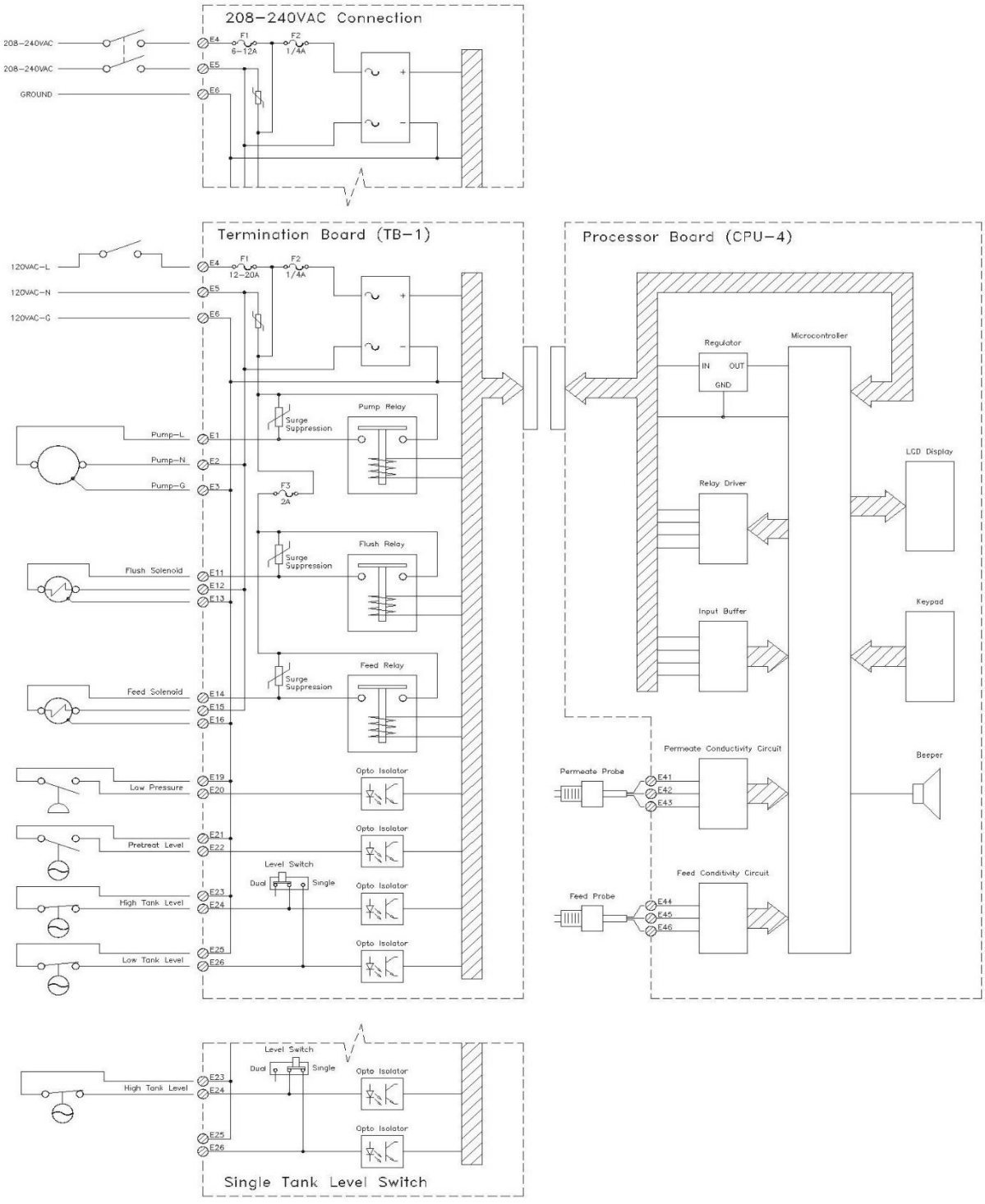
# DRAWINGS


Off To Brewery
Product Line To CLT, HLT, Storage Tank
Main Water Source
Drain Line
R.O. Feed
Carbon System
Pressure Tank
Anti-Scalant System
Reverse Osmosis System

# SPECIFICATIONS

| | |
|---|---|
| ***Inputs*** | |
| **Tank Level Switches** | (2) Normally Closed. *Can be used with a single level switch.* |
| **Inlet pressure switch** | Normally Opened |
| **Pretreat lockout switch** | Normally Opened<br>The Tank, Low Pressure and Pretreat inputs are 50% duty cycle square wave, 10VDC peak @ 10mA max.<br>The switch inputs are dry contacts only. Applying voltage to these terminals will damage the controller. |
| **Controller Power** | 110-120/208-240 VAC, 60/50Hz (Range: 110-240 VAC) |
| **Permeate Conductivity** | 0-3000 PPM, 0-6000 *µs (standard sensor, CP-1, K=.75)* |
| **Feed Conductivity** *(opt)* | 0-3000 PPM, 0-6000 *µs (standard sensor, CP-1, K=.75)* |
| ***Output Circuit Ratings*** | |
| **Feed Solenoid** | 1A. *Voltage is the same as motor/supply voltage.* |
| **Flush Solenoid** | 1A. Voltage is the same as motor/supply voltage. |
| **Motor** | 1.0 HP/110-120V,<br>2.0 HP/208-240V. |
| ***Circuit Protection*** | |
| **Main Power Fuse (110V)** | F1 3AG 20 Amp LittleFuse 314020(P)<br>F1 3AG 4 Amp LittleFuse 312004(P) (Motor contactor coil) |
| **Main Power Fuse (208/240V)** | F1 3AG 15 Amp LittleFuse 314015(P) (For up to 2 HP) |
| **Power Supply Fuse** | F2 3AG ¼ Amp LittleFuse 312.250 |
| **Relay Fuse** | F3 3AG 2 Amp LittleFuse 312002<br>Note: The fuses shown above are for supplemental protection only. Branch circuit protection and disconnect means must be provided externally. |
| ***Other*** | |
| **Dimensions** | 7” tall, 7” wide, 4” deep. Nema 4X* Polycarbonate Hinged Enclosure. |
| **Weight** | 2.6 lb. (Basic Configuration, not including optional wire harness, etc..) |
| **Environment** | 0-50°C, 10-90%RH (non-condensing)<br>Note: After our modification the enclosure rating is Nema 1. |

# SIMPLIFIED SCHEMATIC



# CONTROLLER OVERVIEW

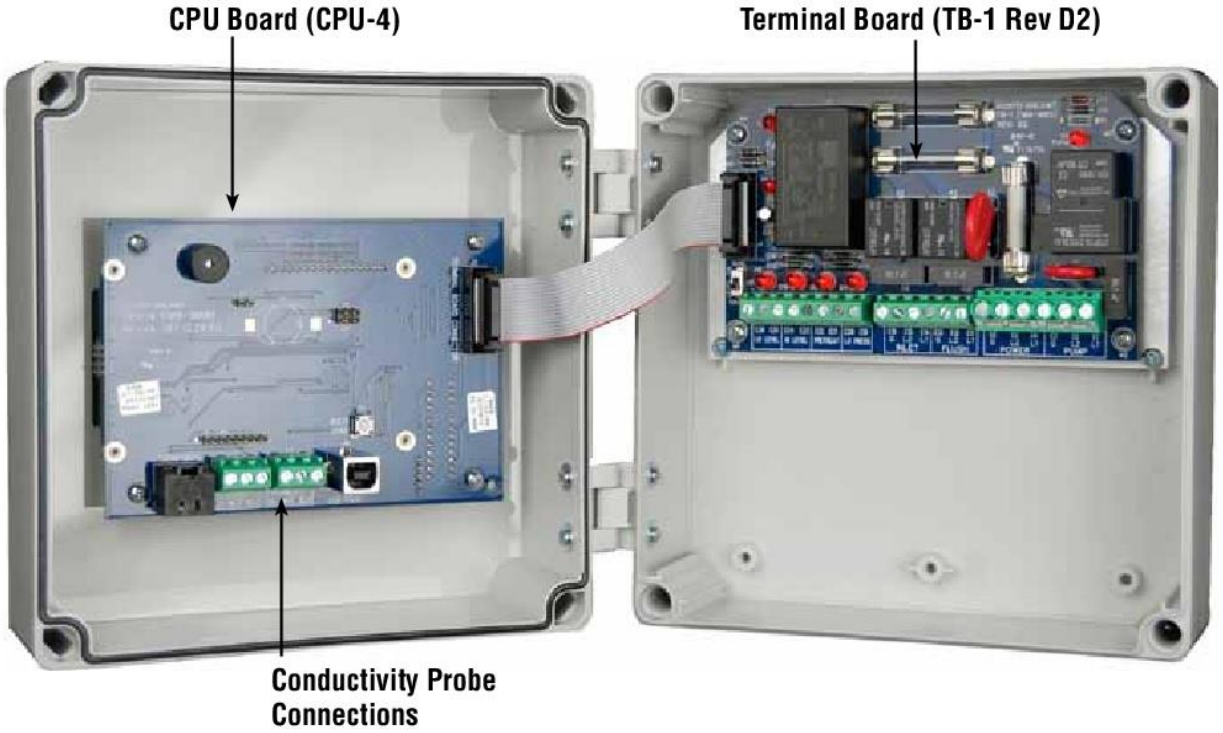
**Keypad**
System ON/OFF
Up Arrow
Down Arrow
Manual Run,
Manual Flush


**Display**

(4 line, 20 character)
Clear, concise feedback on the RO's status.

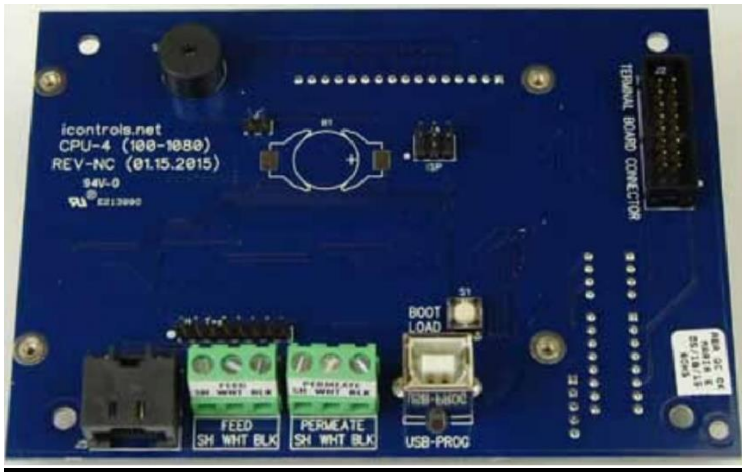
**Alarm**

Display backlight flashes along with audible beeper to indicate alarm condition.

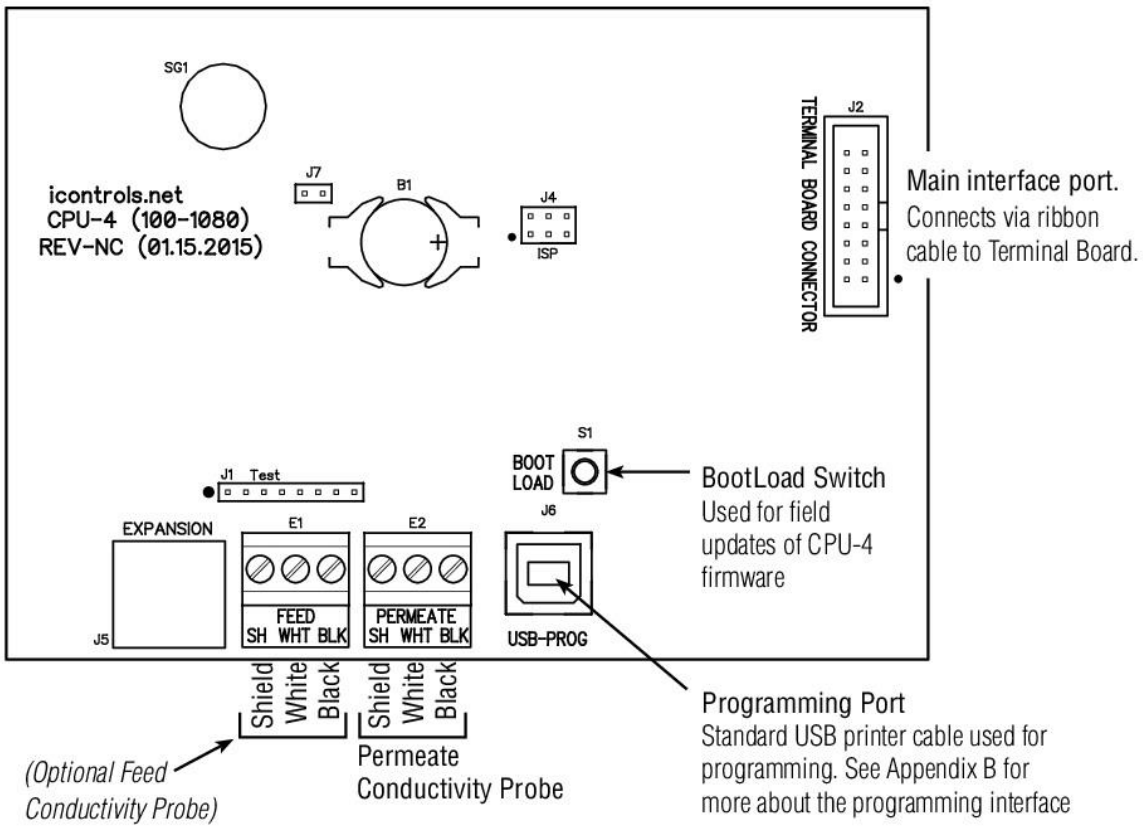


# CONTROLLER DETAIL: CPU-4

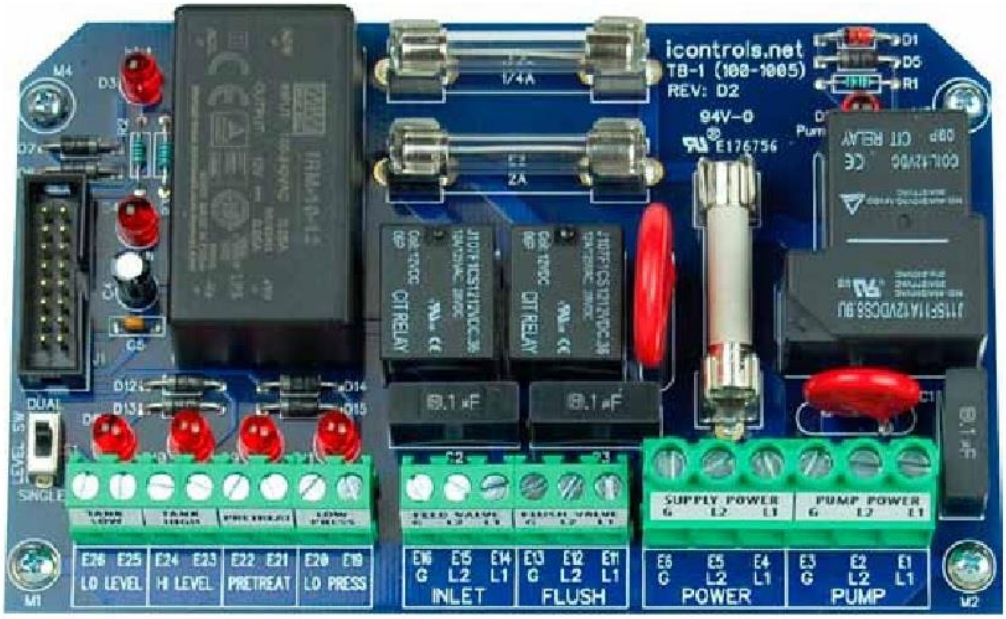
## Typical Configuration

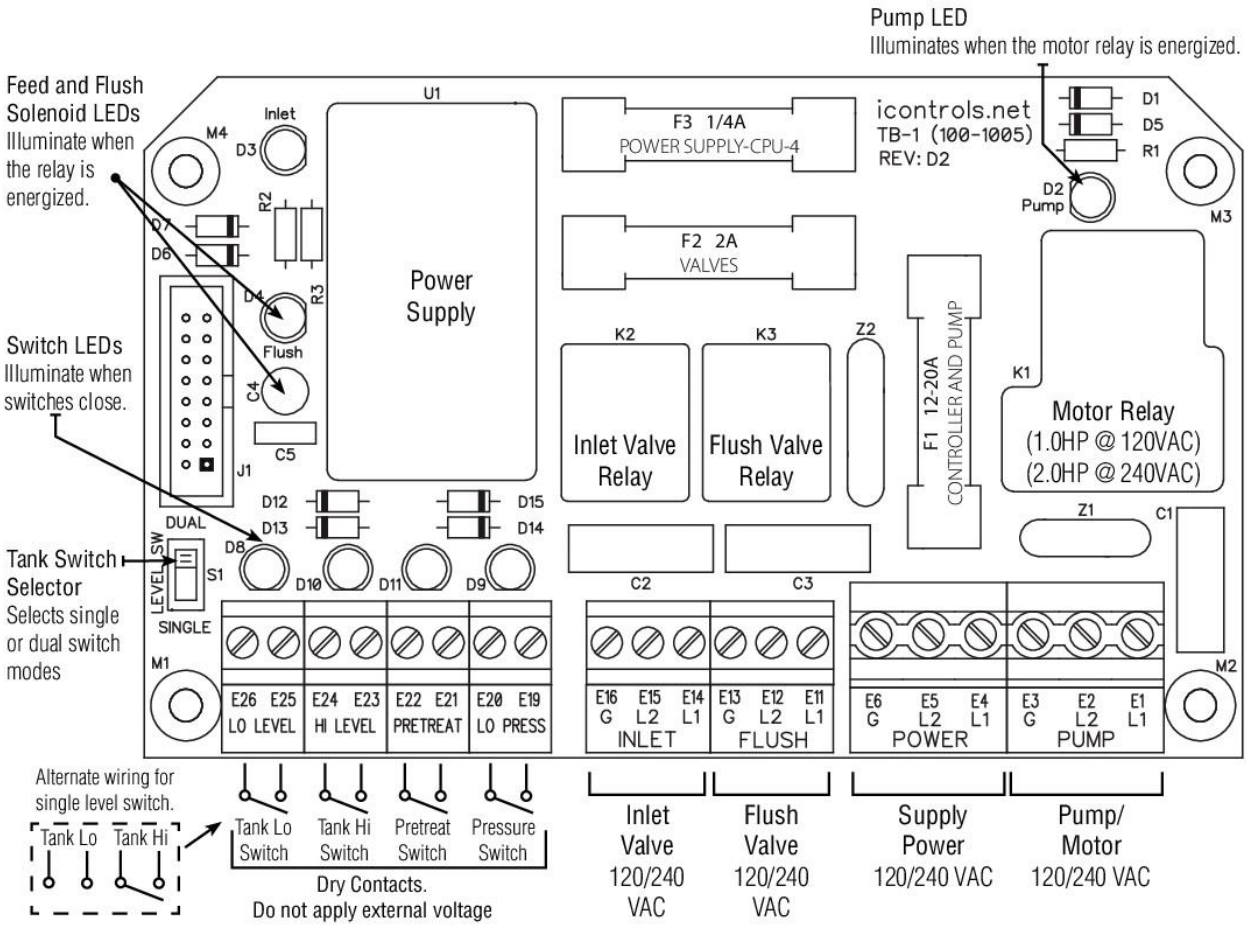



## Detailed View



# CONTROLLER DETAIL: TERMINAL BOARD

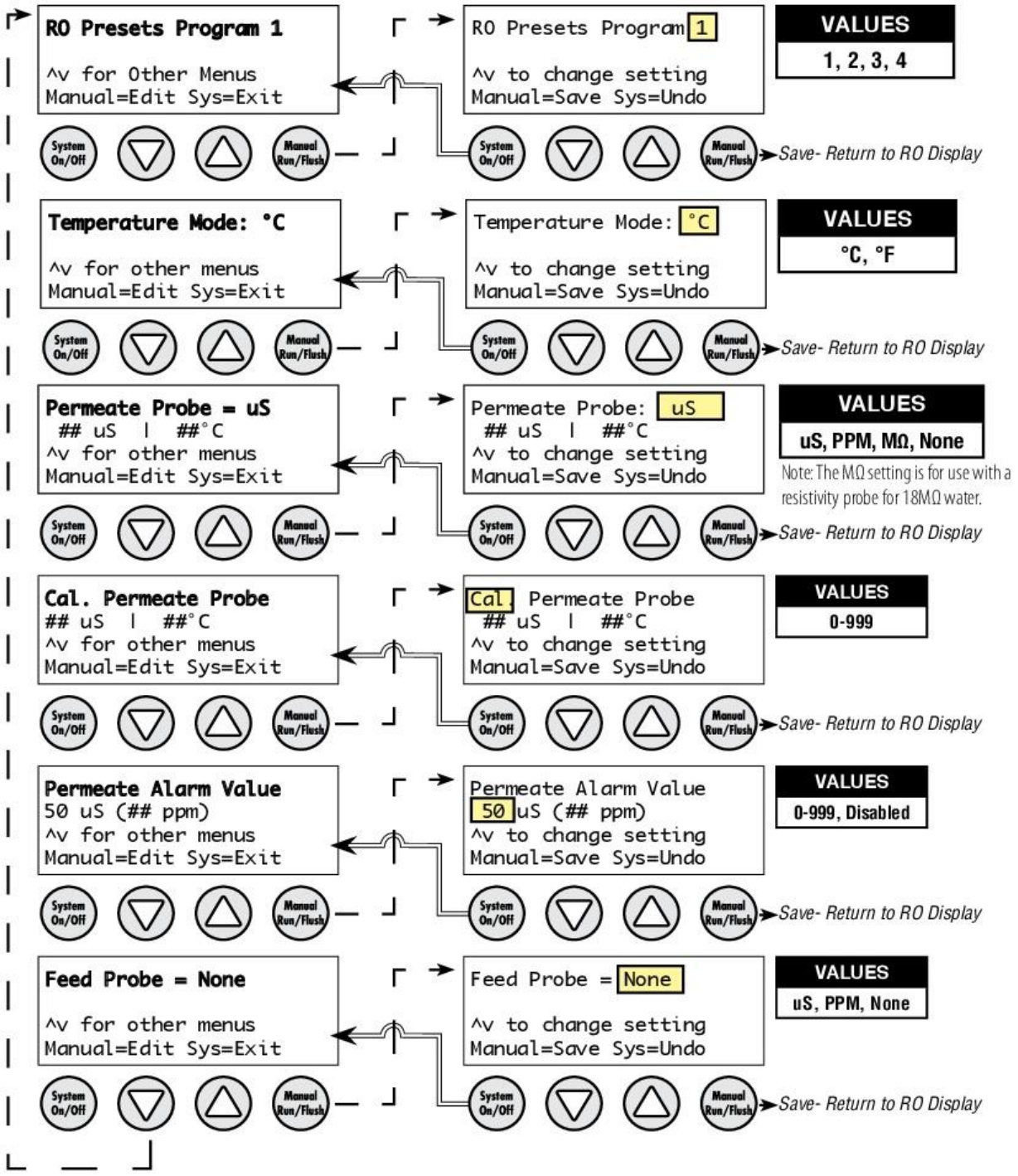


# CONTROLLER PROGRAMING: ACCESSING THE HIDDEN MENUS

1. With the System ON, Press and Hold the UP and Down Arrows.
2. With the UP and Down Arrows depressed, press the System On/Off Switch. The menu will switch to the RO Presets menu shown in the next page

# CONTROLLER PROGRAMING: MENU NAVIGATION




This is a partial view of the internal menus. Additional editable items include: Language, Audible Alarm (ON/OFF), WQ Loss of Signal setting, Hardware & Firmware Version and more.

# CONTROLLER PROGRAMING: PROGRAM SELECTIONS

The controller has 4 separate user-selectable sets of settings for configuring the RO. The factory default settings are shown below. The settings are identical except for variations in the flush behavior.

- Program 1, High Pressure flush.
- Program 2, No Flush
- Program 3, Permeate Flush, (low pressure, inlet valve closed)
- Program 4, Low Pressure, feed water flush
- See the previous page for instructions on how to access the menu for selecting these programs.

| Parameter | Value | Program 1 | Program 2 | Program 3 | Program 4 |
|---|---|---|---|---|---|
| Tank Level Switch delay (actuation and de-actuation) | Seconds | 2 | 2 | 2 | 2 |
| Pressure Switch delay (actuation and de-actuation) | Seconds | 2 | 2 | 2 | 2 |
| Pretreat Switch delay (actuation and de-actuation) | Seconds | 2 | 2 | 2 | 2 |
| | | | | | |
| Pump start delay | Seconds | 10 | 10 | 10 | 10 |
| Inlet Solenoid stop delay | Seconds | 1 | 1 | 1 | 1 |
| Pump start retry interval (restart delay after LP fault) | Seconds | 60 | 60 | 60 | 60 |
| | | | | | |
| Low pressure fault shutdown, # of faults | Faults | 5 | 5 | 5 | 5 |
| Low pressure fault shutdown, time period to count faults | Minutes | 10 | 10 | 10 | 10 |
| Low pressure fault shutdown, reset after shutdown | Minutes | 60 | 60 | 60 | 60 |
| Low pressure timeout fault | Seconds | 60 | 60 | 60 | 60 |
| | | | | | |
| **Flush Behavior** | | High Pressure | No Flush | Permeate Flush | Low Pressure Flush |
| **Startup Flush:** Minutes from last flush | Minutes | 0 | 0 | 0 | 0 |
| **Startup Flush:** Duration | Seconds | 0 | 0 | 0 | 30 |
| **Periodic Flush:** Interval | Minutes | 60 | 0 | 0 | 0 |
| **Periodic Flush:** Duration | Seconds | 30 | 0 | 0 | 0 |
| **Shutdown Flush:** Time from last flush | Minutes | 10 | 0 | 0 | 0 |
| **Shutdown Flush:** Minimum operation | Minutes | 30 | 0 | 0 | 0 |
| **Shutdown Flush:** Duration | Seconds | 60 | 0 | 60 | 60 |
| **Idle Flush:** Interval * | Minutes | 0 | 0 | 0 | 0 |
| **Idle Flush:** Duration * | Seconds | 0 | 0 | 0 | 0 |
| | | | | | |
| Timed Manual Run | Minutes | 5 | 5 | 5 | 5 |
| Timed Manual Flush | Minutes | 5 | 0 | 5 | 5 |

* These features are disabled by default due to the potential for confusion on the part of end-users in the field. They can be enabled when needed via the OEM PC programming interface which allows changes to all the values shown above.

# CONTROLLER PROGRAMMING: PARAMETERS EXPLAINED

| Parameter | Value | Example |
|---|---|---|
| **Input Switch Behaviors** | | |
| **Tank Level Switch Delay (actuation and de-actuation)** | Seconds | 2.0 |
| This specifies the time that the tank switch must be closed or open before the controller accepts it as a valid condition. The function is to prevent nuisance tripping of the RO especially in small tanks or turbulent tanks | | |
| **Pressure Switch Delay (actuation and de-actuation)** | Seconds | 3 |
| This specifies the time that the pressure switch must be closed or open before the controller accepts it as a valid condition. Since pressure switches usually have built-in hysteresis this value is set at 0. | | |
| **Pretreat Switch Delay (actuation and de-actuation)** | Seconds | 2 |
| This is the time that the pretreat switch must be OPEN before the controller accepts it as a valid condition. | | |
| **Pump/Inlet Solenoid Behaviors** | | |
| **Pump Start Delay** | Seconds | 10 |
| On R.O. start-up, after the tank switch opens, the inlet solenoid valve is energized. When the inlet pressure switch closes this begins the “Pump start delay”. If the pressure switch remains closed, the pump will start after 10 seconds. | | |
| **Inlet Solenoid Stop Delay** | Seconds | 1 |
| This value sets the delay for the inlet solenoid valve to be deenergized following the de-energizing of the motor on R.O. shut down. The purpose is to prevent the pump from operating against a closed suction as the pump spins down. | | |
| **Low Inlet Pressure Behaviors** | | |
| **Pump Start Retry Interval (restart delay after LP fault)** | Seconds | 60 |
| When the inlet pressure switch opens, the controller deenergizes the motor and the inlet solenoid valve remains open. The controller will continue to monitor the inlet pressure switch. After the switch is closed for the duration of the “Pump start retry interval” the motor is reenergized. | | |
| **Low Pressure Fault Shutdown, # of Faults** | Faults | 5 |
| **Low Pressure Fault Shutdown, Time Period to Count Faults** | Minutes | 10 |
| **Low Pressure Fault Shutdown, Reset After Shutdown** | Minutes | 60 |
| These three values work together to determine how the RO handles Low Pressure conditions. The first two values, “# of faults” and “time period to count faults”, sets the limit for the number of low fault conditions over time that are required to place the RO in “Low Pressure Fault Shutdown”. The third value sets the duration of the “Low Pressure Fault Shutdown” which is the period that the RO will remain idle before trying to restart. The purpose of the Low Pressure Fault Shutdown is to prevent an RO from turning OFF/ON repeatedly without any limit. | | |
| **Low Pressure Timeout Fault** | Seconds | 60 |
| If the inlet valve is open, but the pressure is not sufficient to close the inlet pressure switch, the RO would run indefinitely on line pressure. This value sets the time limit for the RO to operate with the inlet valve open with Low Pressure as indicated by an Open inlet pressure switch before a Low Pressure Fault is added to the counter above. | | |
| **Flush Behavior** | | |
| **Time From Last Flush Before Flush on Shutdown** | Minutes | 15 |
| **Minimum Operation Before Flush on Shutdown** | Minutes | 60 |
| **Flush Duration on Shutdown** | Seconds | 60 |
| **Periodic Flush Interval** | Minutes | 60 |
| **Periodic Flush Duration** | Seconds | 30 |

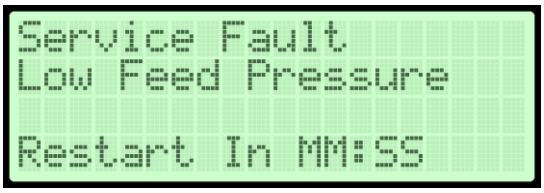
# CONTROLLER PROGRAMMING: PARAMETERS EXPLAINED (CONTINUED)

| Parameter | Value | Example |
|---|---|---|
| | | |
| **Flush Behavior (Cont.)** | | |
| **Unit Idle Flush Interval *** | Minutes | 0 |
| The Unit Idle Flush Interval sets a time after which the RO will start-up and run in the flush mode. This is disabled by default because of the danger of over-flowing a tank if not properly implemented. It is intended for environments where leaving the RO idle for long periods would invite bio-fouling. (0)=disabled | | |
| **Unit Idle Flush Duration *** | Seconds | 0 |
| Sets the duration of the Idle Flush. (0)=disabled | | |
| **Timed Manual Run - Duration of Manual Run** | Minutes | 5 |
| **Timed Manual Flush - Duration of Manual Flush** | Minutes | 5 |
| **Conductivity Probe Sample Rate** | Seconds | 2 |
| **Conductivity Shutdown * (0)=disabled** | Minutes | 0 |

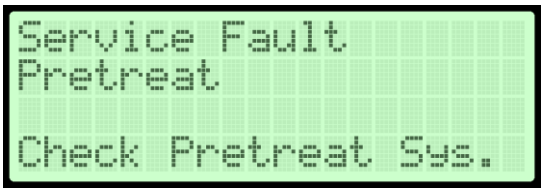
# CONTROLLER FAULT CONDITION DISPLAYS

Below are examples and explanations of the displays which accompany the fault conditions possible on the CPU-4. Fault conditions always indicate a problem of some sort which requires corrective action. The displays provide sufficient information to recognize the source of the fault and the required corrective action.

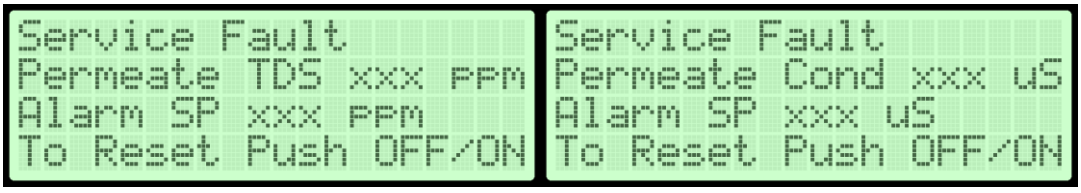
**Low Pressure Fault:** *(System is responding to low pressure condition per system settings)*



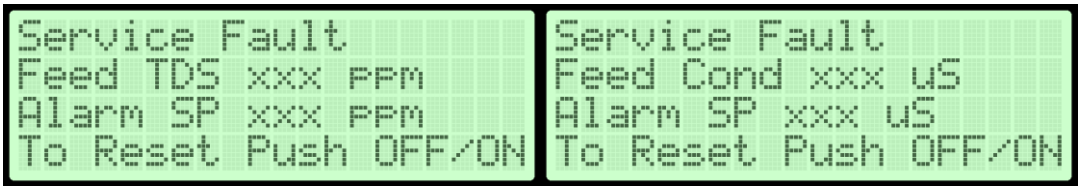

**Pre-Treat Fault:** *(Pretreat Switch is closed indicating problem with pretreat system).*




**Permeate Conductivity Fault:** *(Permeate conductivity is higher than the alarm setpoint.)*



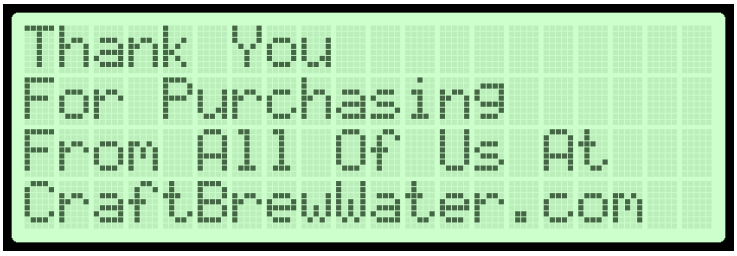

**Feed Conductivity Fault:** *(Feed conductivity is higher than the alarm setpoint.)*



**Conductivity Probe Error messages:**

**Note:** Image is only for reference of line numbers on the LCD screen.

**Line 1**
**Line 2**
**Line 3**
**Line 4**




Line 2 “Interference” - Noise detected by conductivity circuit, valid measurement not possible.

Line 2 “Over-range” - Measurement is out of range for the circuit, probe may also be shorted.

Line 2 “Probe shorted” - Short circuit detected on temperature sensor in probe.

Line 2 “Probe not detected”- Open circuit detected on temperature sensor in probe (white and un-shielded wire)

Line 2 “Probe Startup 1” - Internal reference voltage too high to make valid measurement.

Line 2 “Probe Startup 2” - Internal reference voltage too low to make valid measurement.

Line 2 “Probe Startup 3” - Internal excitation voltage too high to make valid measurement.

Line 2 “Probe Startup 4” - Internal excitation voltage too low to make valid measurement.

# System Warranty

One-Year Limited Warranty

**Warranty Terms**

Subject to the terms and conditions set forth hereinafter, manufacturer warrants to the original purchaser (hereafter the “Customer”) that the systems and products manufactured by 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 manufacturer for each such product. This Warranty does not extend to systems, equipment, or components manufactured by others, nor to systems, equipment, or components manufactured by others and distributed by manufacturer. This Warranty does not extend to equipment or components manufactured by others which have been incorporated into a manufacturer product but, if allowable, manufacturer hereby assigns, without warranty, to the Customer its interest, if any, under any warranty made by the manufacturer of such equipment or component. This Warranty does not cover disposable items such as fuses, O-rings, regeneration materials/chemicals, or other such disposable items, which must be replaced periodically under the normal and foreseeable operating conditions of the goods warranted hereby.

**Warranty Commencement Date**

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

**Warranty Service**

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

The Customer, at the Customer’s risk and expense, shall be responsible for returning such product or component, only after obtaining a Return Goods Authorization (RGA) number from 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, together with (1) RGA number issued by manufacturer at Customer's request; (2) proof of purchase and, if necessary, proof of installation date; (3) a Return Goods Authorization Form; (4) a description of the suspected defects; (5) the serial number of the manufacturer product alleged to be defective; and (6) a description of the type of water and pretreatment equipment which has been utilized in connection with the product, if any. 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, manufacturer will (at 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 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 manufacturer's main headquarters; that is if manufacturer deems that the product is not covered by said Warranty. Manufacturer reserves the right to precondition such travel to Customer's premises upon prepayment of manufacturer's anticipated costs of attending such premises.

**Voidability of Warranty**

This Warranty shall be void and unenforceable as to any manufacturer product which has been damaged by accident, mishandling, abuse or has been repaired, modified, altered, disassembled or otherwise tampered with by anyone other than manufacturer or an authorized manufacturer service representative; or, if any replacement parts are not authorized by 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 THE MANUFACTURER 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 THE MANUFACTURER TO OTHER THAN WHAT IS SET FORTH ABOVE. THIS WARRANTY GIVES THE CUSTOMER SPECIFIC LEGAL RIGHTS AND THE CUSTOMER MAY ALSO HAVE OTHER RIGHTS WHICH VARY FROM JURISDICTION TO JURISDICTION. THE PARTIES RECOGNIZE AND AGREE, THAT IN ALL RESPECTS THE LAWS OF THE STATE OF CALIFORNIA SHALL APPLY TO AND SHALL GOVERN ANY INTERPRETATION OR LEGAL SIGNIFICANCE OF THIS DOCUMENT. NO WARRANTY OR OTHER LIABILITY OF 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 MANUFACTURER'S WARRANTY. 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.