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01/02/2019

**CDL**

**User  
manual**

**100-200 gph  
Hobby RO**



Thank you for purchasing a CDL Hobby reverse osmosis system. This document will help you make the most of your product.

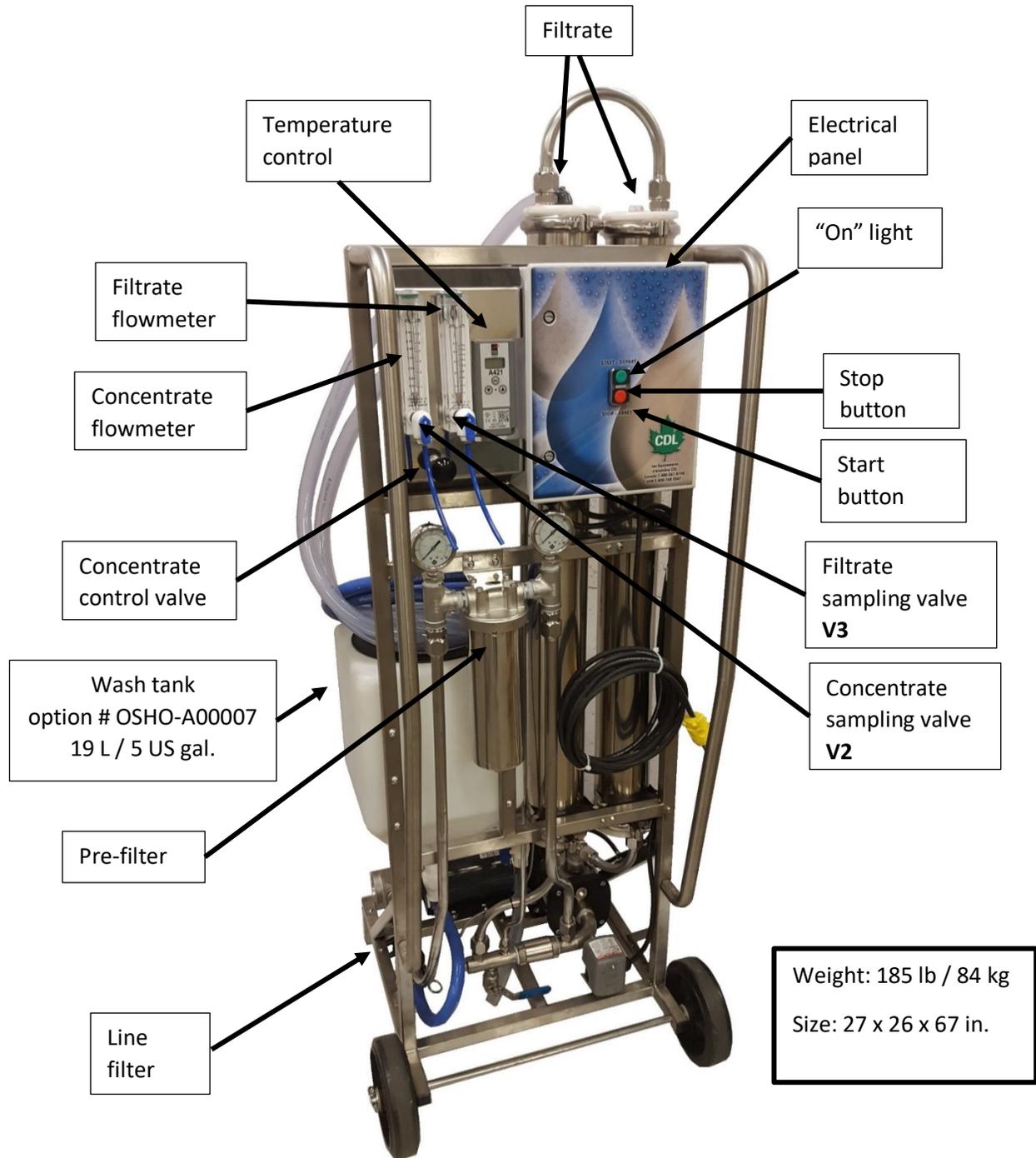


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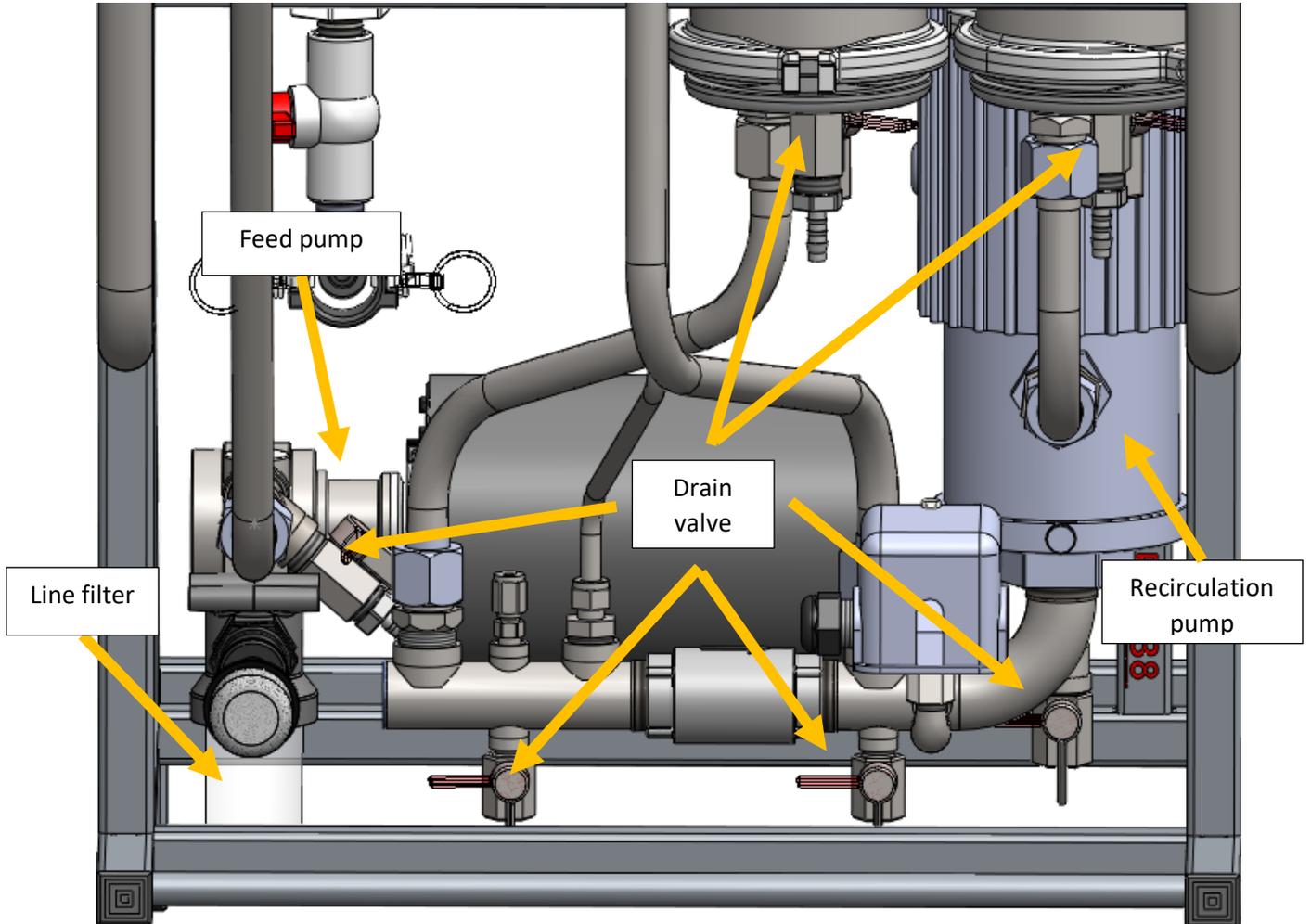
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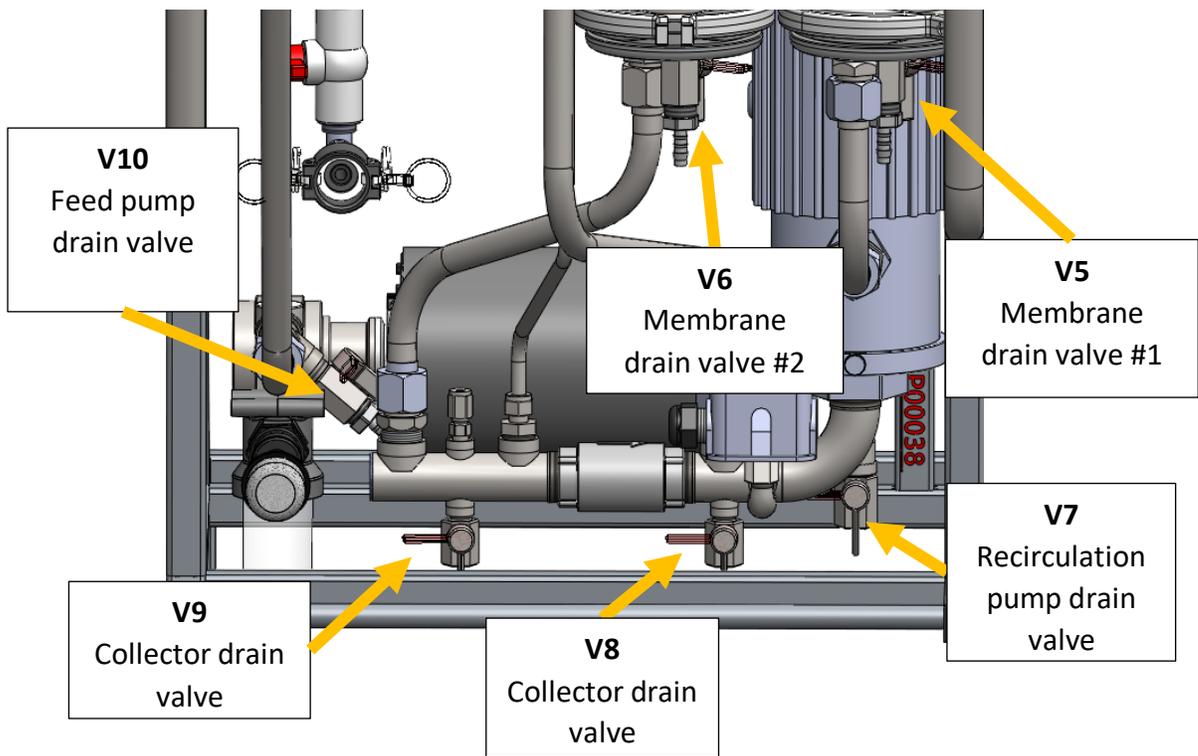
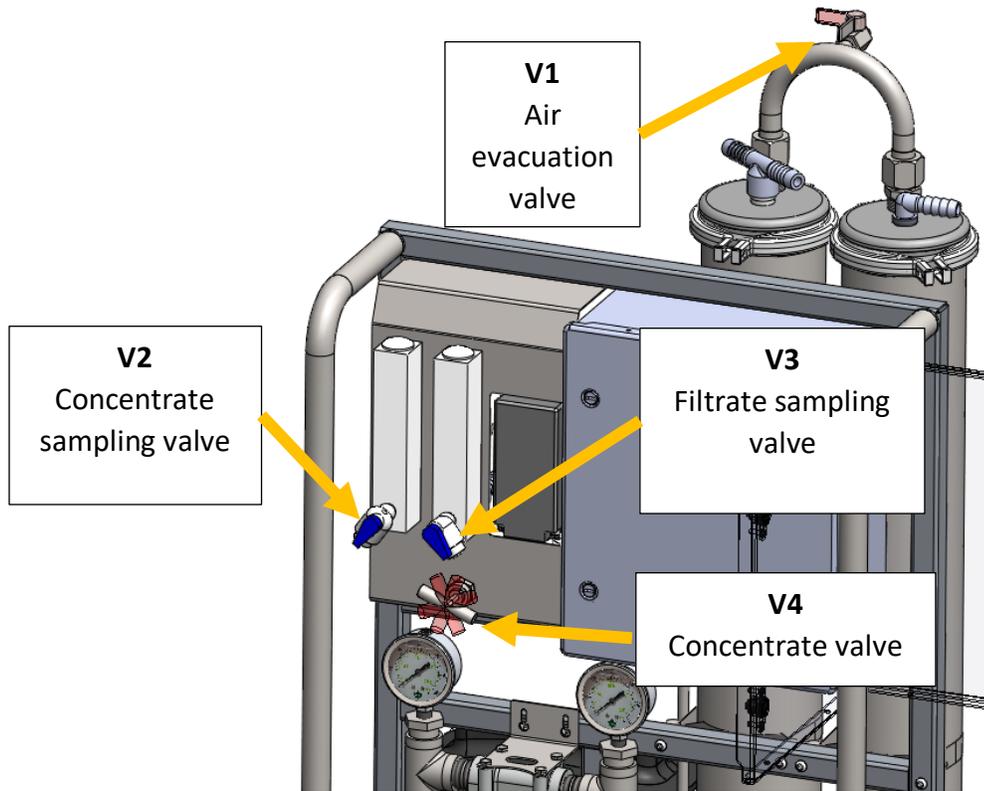


Product diagram



Valve locations





## Definitions

**Sap**: Liquid that comes from a maple tree. Generally, this water contains around 2% sugar and mineral salts.

**Filtrate**: Pure water that no longer contains sugar. It is created when it runs through a membrane in the reverse osmosis (RO) system. It is used to wash the machine.

**Concentrate**: Sugar water obtained after sap has run through the RO system, removing the pure water.

**Feed pump**: Pump that uses pressure to push the sap through the membranes.

**Recirculation pump**: Pump that recirculates sap through the membrane housings to prevent the membranes from becoming clogged.

**Line filter**: Filter at the entrance of the feed pump that prevents debris from entering the pump.

**Pre-filter**: Filter that sits before the membranes and prevents debris from entering the system and the recirculation pump.

**Concentrate valve**: Valve that controls the flow of the concentrate exiting the system.

**Flowmeter**: Tool used to measure the flow. Reads in US gallons/minute and litres/minute.

## Safety

It is important to read this document before using the reverse osmosis system. It contains information on how to use the system safely. Misuse can be dangerous for the user because of the system's working pressure.

## Inspection

Perform a quick visual inspection once you receive the system to check for breaks or anomalies. Inspect it again before each use.

## Installation

Ensure that the RO system is installed according to the requirements below. The product's lifespan may be shortened if its installation does not follow CDL's recommendations.



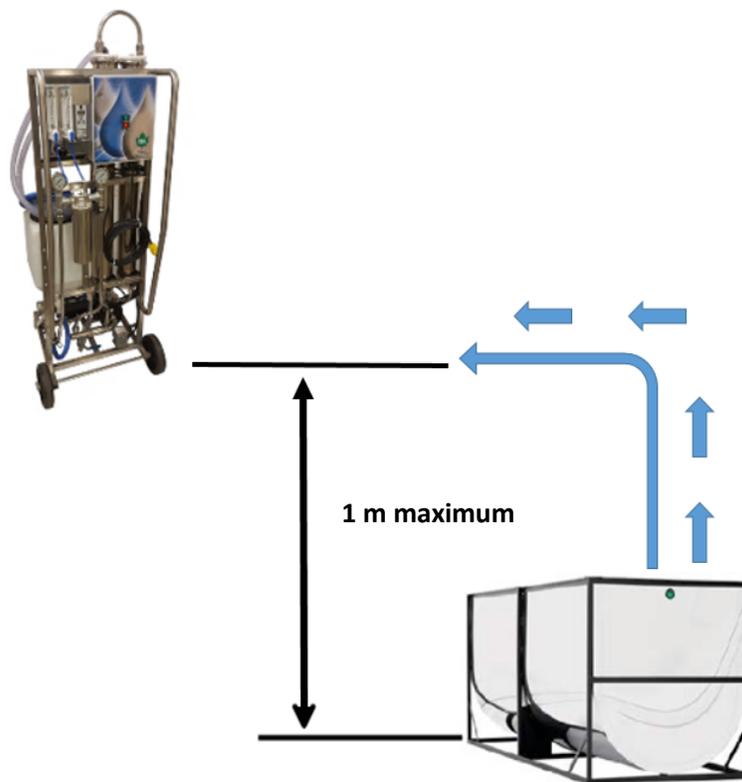
## Electrical

**110 V version:** The machine must be plugged into a 110 V single-phase outlet. **\*It is important to put a 20 AMP circuit breaker and ensure the wire's gauge is sufficient. Use a 5-20 type socket for connecting the machine. If an extension cord must be used, it must be at least 12 AWG.** An extension cord that is too long or that has too high of a gauge may overload the motors. Overloading may cause the motors to overheat and break.

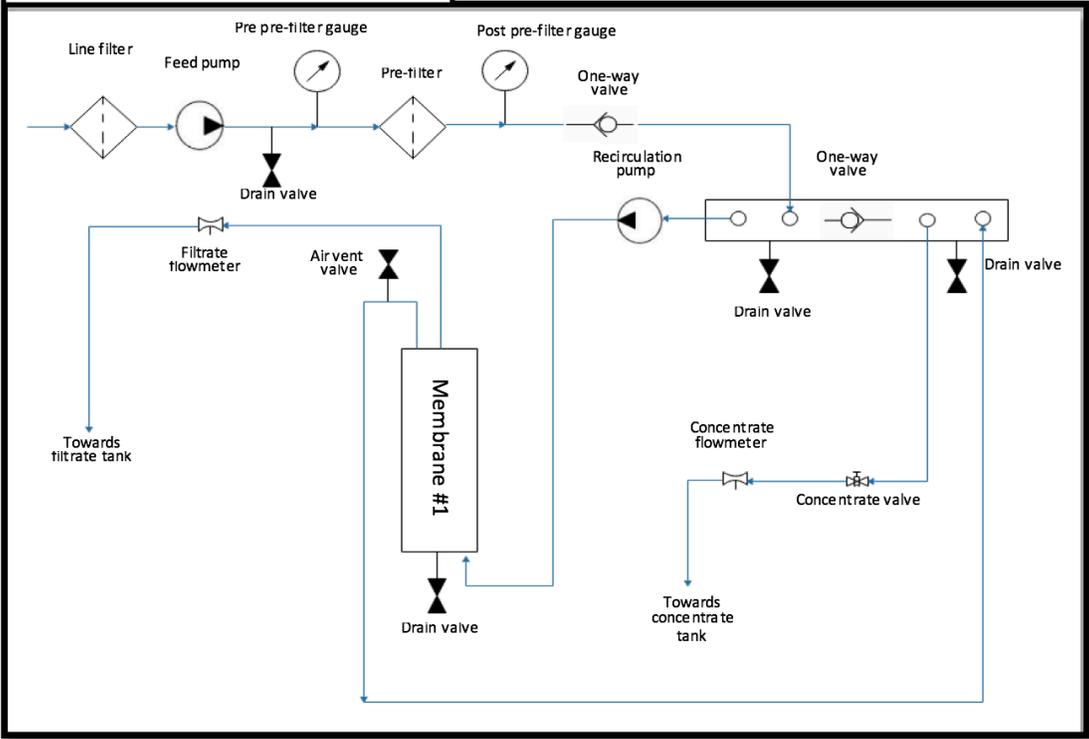
**220 V version:** The machine must be plugged into a 220 V single-phase outlet.

## Plumbing

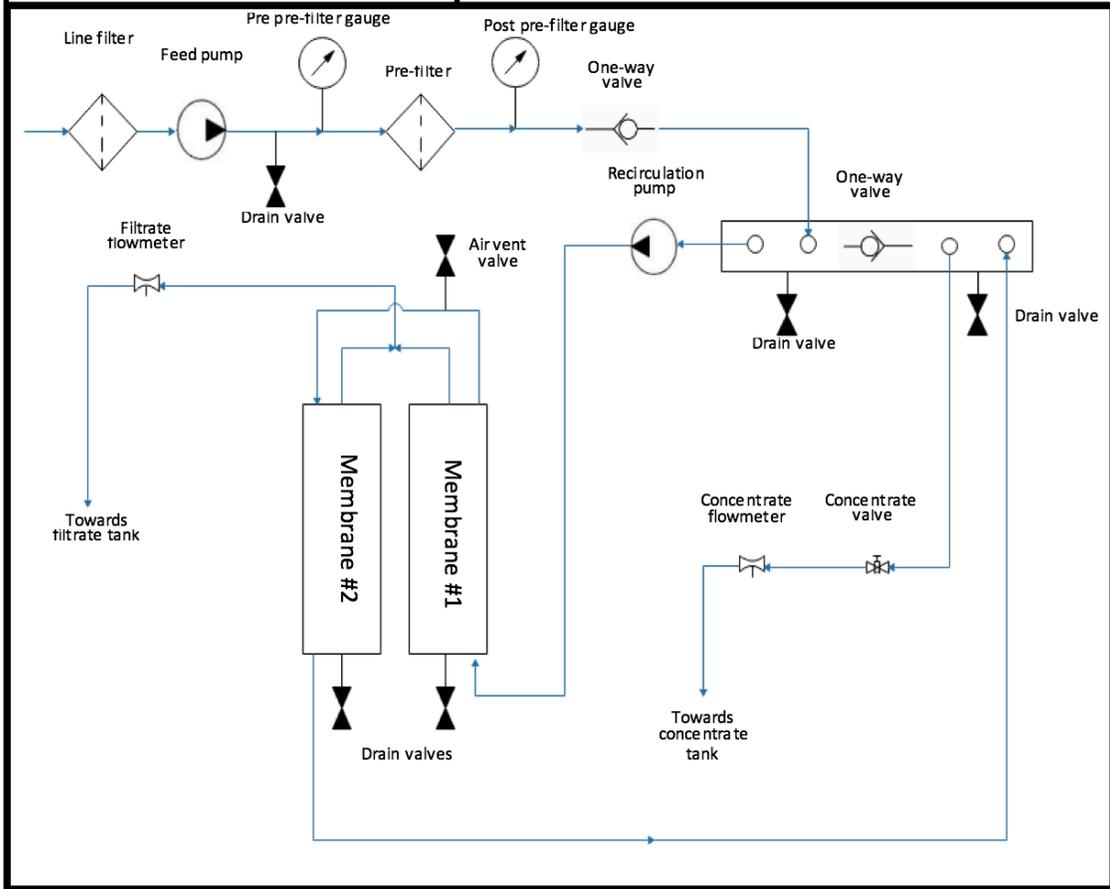
The system contains an 8-foot suction line. **Do not extend this line. If it is extended, the pump may run dry for too long upon starting, which may damage internal parts.** To prevent bubbles from forming in the feed pump, do not place the pump more than 1 m above the bottom of the tank.



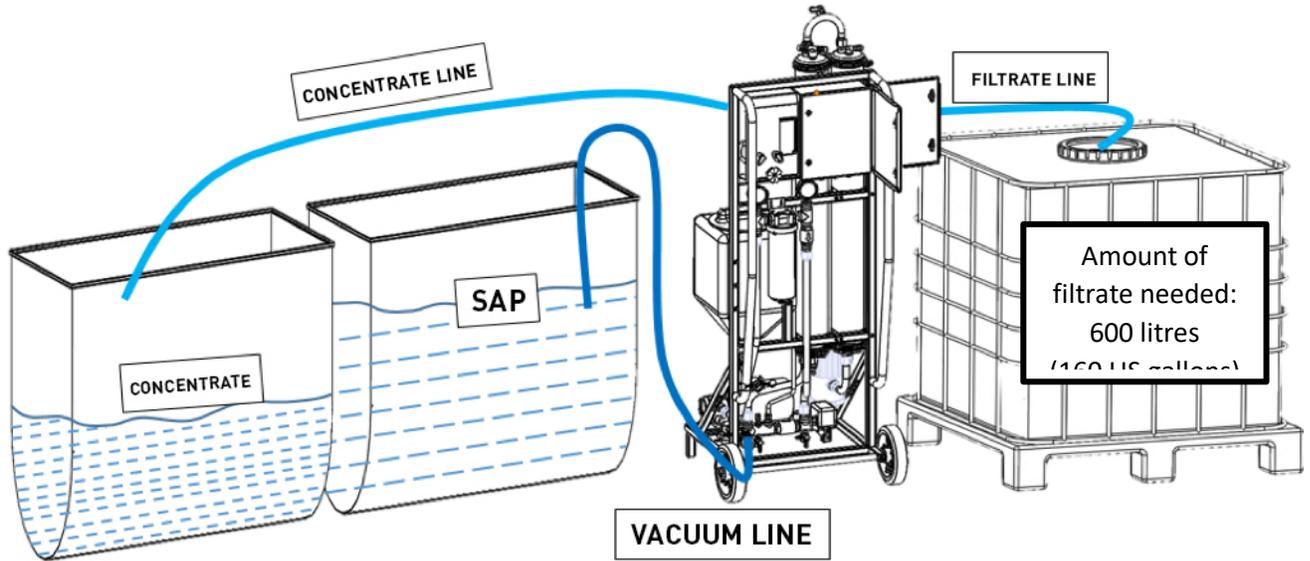
**1-membrane water circuit**



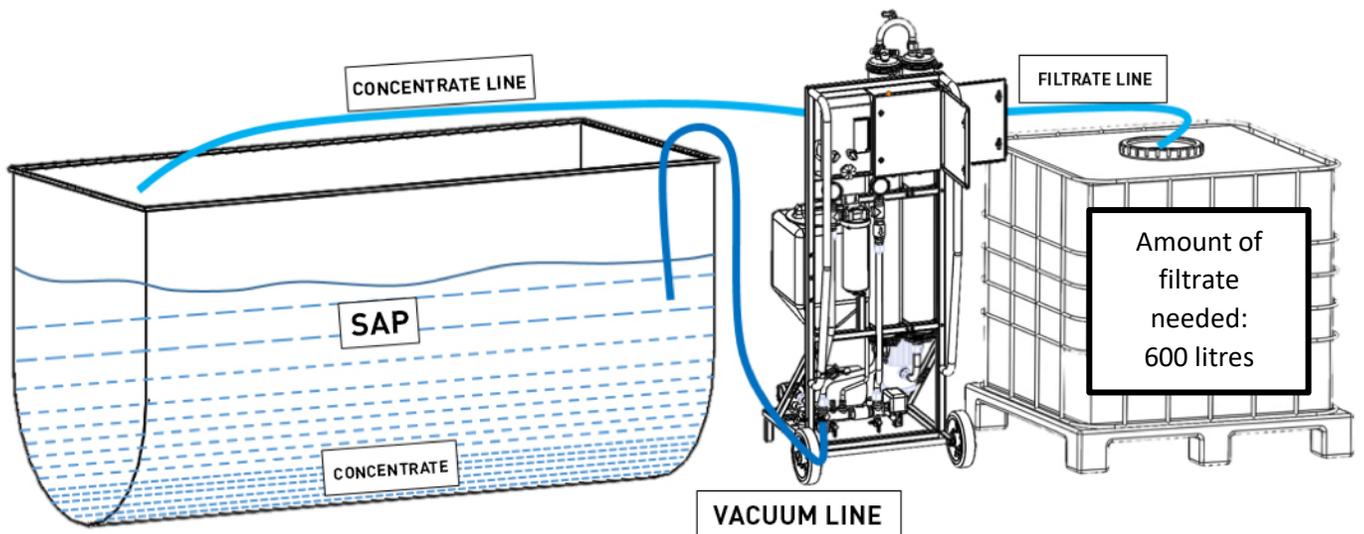
## 2-membrane water circuit



## Standard concentration

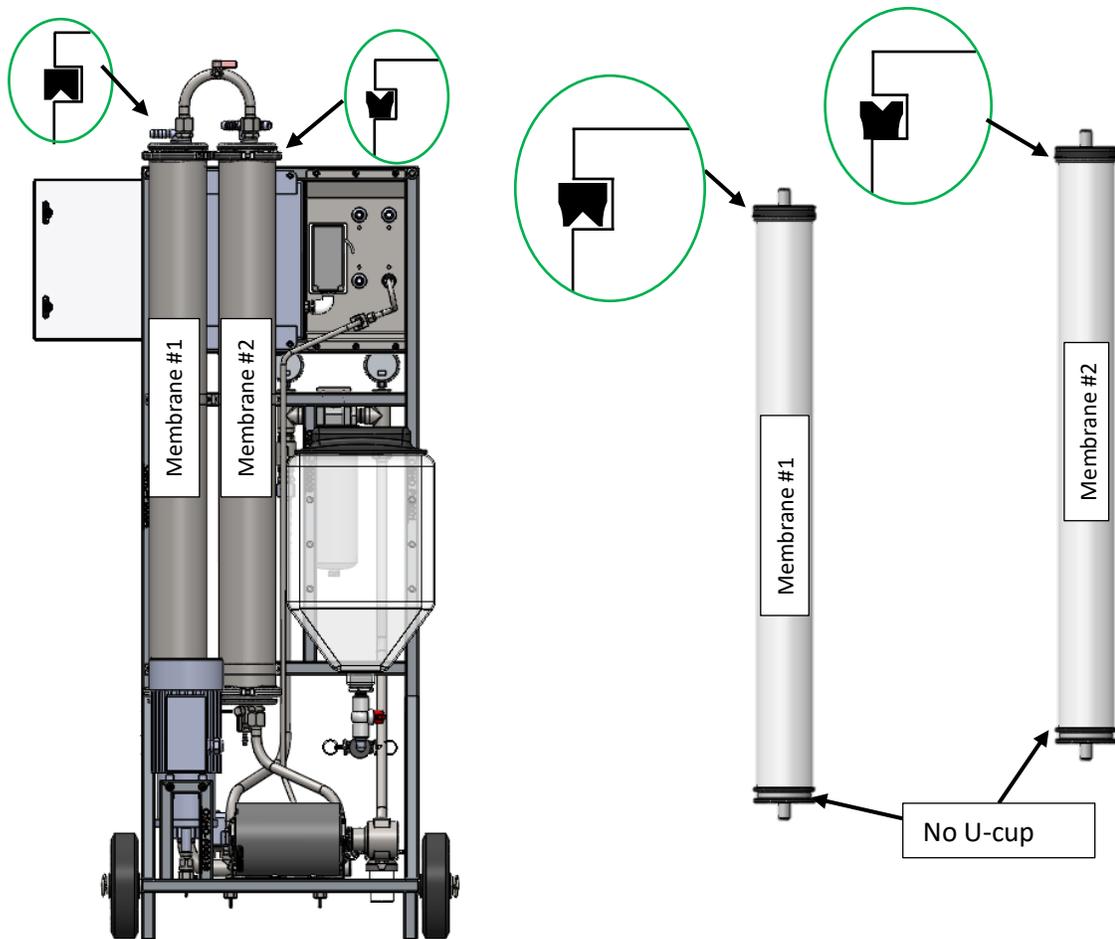


## Batch concentration (sparging)

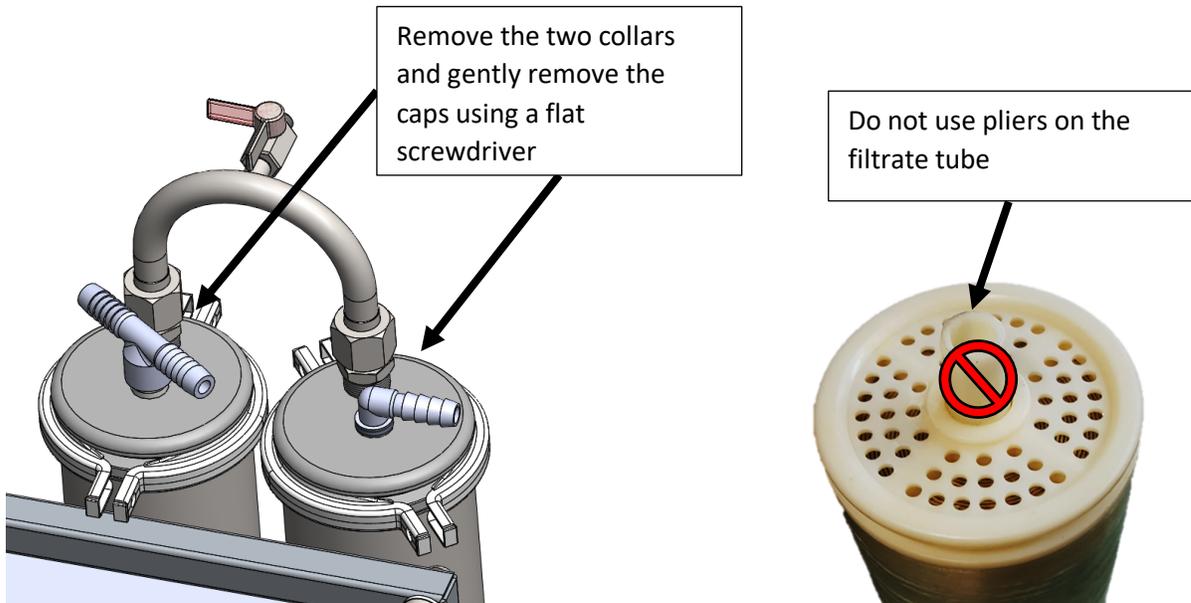


## Membrane installation

When using new membranes in the RO system, **these steps must be followed in order: Rinse, soap wash, rinse.** If these steps are not followed, the membranes' performance and life span may be affected. Ensure that the U-cups are installed according to the diagram. Add food-grade grease to the gaskets and U-cups. Once the membranes are in place, rotate them slightly in the housing to ensure everything is working properly. **\*Note: do not use too much grease. Excess grease may plug pores in the membrane.**

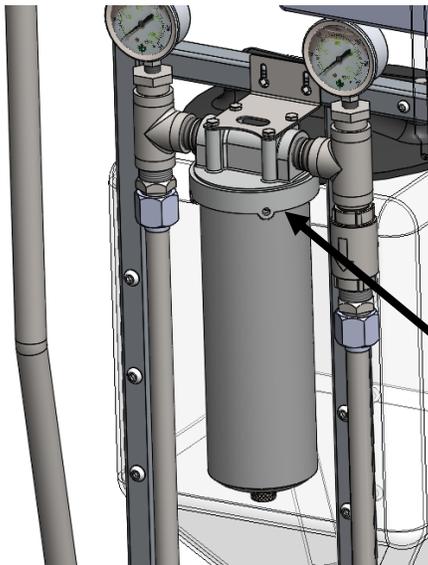


Before removing membranes from the RO system, remove any liquid remaining in the housings using the drain valves. Next, unscrew the collars and remove both covers at the same time. Do not unscrew the concentrate tube. Lay the system flat and remove the membranes. **Do not use pliers to remove the membrane via the filtrate tube! This may damage the tube, causing sugar to run into the filtrate.**



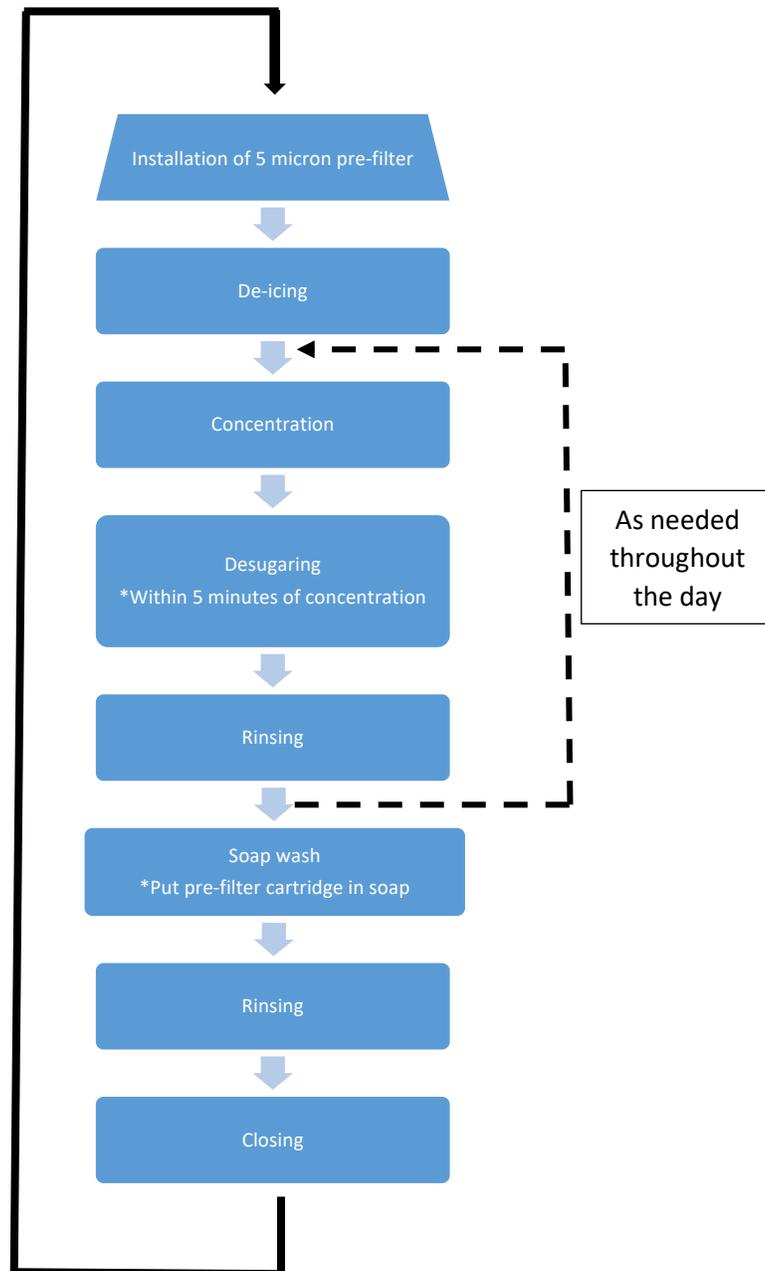
### Pre-filter cartridge

Unscrew the pre-filter housing and insert a 10" 5 micron filter (#6682101). If you have trouble, use the tool designed for this purpose. Put the ring back in place to close everything and ensure that the drain plug is properly in place. **\*Make sure the cartridge is placed correctly in the pre-filter.**



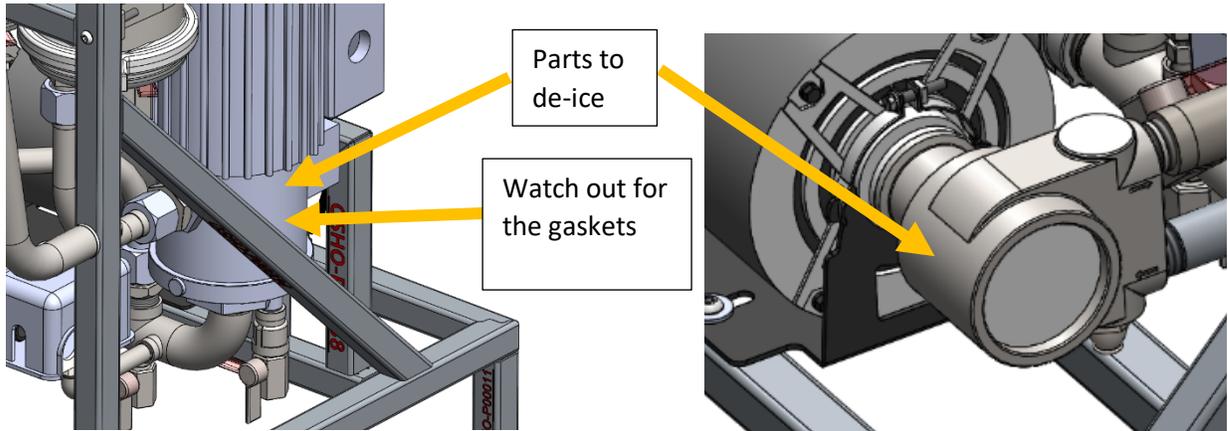
Unscrew this ring to access the pre-filter cartridge

## Daily operations



## De-icing

**If the RO system is used after being exposed to freezing conditions, it must be de-iced before use.** To do so, use a hot air gun to heat the outer stainless steel surface of the feed and recirculation pump. You may also use towels soaked in very hot water. If you choose this method, wrap the towels around the stainless steel parts of the pumps and leave them for several minutes to ensure that no ice remains in the pump. Soak the towels in more hot water as needed. **\*Be careful not to overheat near the recirculation pump, which has gaskets. Additionally, do not use propane torches because the higher heat may melt the pump gaskets.**



## Concentration

- 1) Close all drain valves and both sampling valves: V1–V3 and V5–V10.
- 2) Attach the line filter receptacle, which is located at the entrance of the feed pump.
- 3) Install the pre-filter. \*Ideally, use a cartridge other than the one used in washing. Attach the plug below the pre-filter.
- 4) Ensure that the blue feed hose is connected to the pump.
- 5) Open concentrate valve V4 fully.
- 6) Plug the RO system into a 110 V **20 A** or 220 V outlet (depending on system model).
- 7) Place the blue suction hose into the sap tank.
- 8) Place the filtrate and concentrate hoses into the appropriate tank(s).
- 9) Press and hold the green “start” button and gradually close concentrate valve **V4** using the handle until the pressure contact initiates. The recirculation pump will then turn on. Let it run at low pressure until there is no more air in the flowmeters.
- 10) Gradually adjust the concentrate valve until the **concentrate and filtrate have the same flow**.
- 11) Regularly check operation settings.
- 12) Once concentration has ended, gradually decrease the pressure with the concentrate valve until the RO system automatically stops. **\*Note: Do not wait until the system runs out of sap, as the pumps may run dry for too long before stopping. \*Never concentrate to more than 8 degrees Brix.**



## Desugaring

- 1) Place the filtrate and feed hose in the filtrate tank. The concentrate hose must remain in the concentrate tank.
- 2) Start the system to begin the desugaring cycle (step 9 of the concentration cycle).
- 3) Take samples of concentrate at regular intervals, until the concentration is at 0.5 degrees Brix.
- 4) Stop the system.

## Rinsing

- 1) Place the feed hose in the permeate tank. Place the concentrate and filtrate hose over the drain.
- 2) Start the system (step 9 of the concentration cycle). Adjust the pressure to 60 psi. A minimum of 300 L / 80 US gallons of filtrate must be used per membrane.
- 3) Stop the system once the recommended water level has been reached.

## Washing

- 1) Exchange the pre-filter cartridge for one dedicated exclusively to washing.
- 2) Place the concentrate and filtrate hoses in the wash tank (remove the blue plug and insert both hoses into the hole).
- 3) Attach the wash tank hose to the feed pump entrance.
- 4) Fill the wash tank with filtrate **that has been heated to 40 °C** and add the required amount of soap. Follow the manufacturer's recommendations for the amount of soap to use (pH).
- 5) Open the tank valve and start the RO system.
- 6) Adjust the pressure to 60 psi and wash in cycles until the system stops. The wash cycle will end at 43 °C / 109.4 °F.
- 7) Perform the final rinse with all of the remaining filtrate.

## Closing

- 1) Drain all liquid from the wash tank.
- 2) Remove the pre-filter cartridge and unscrew the cap from the bottom of the housing.
- 3) Open drain and concentration valves V1–V10.
- 4) Disconnect the suction hose and drain the water inside.
- 5) Detach the line filter receptacle at the entrance of the feed pump to remove residual water.
- 6) Press and hold the green "start" button for **2 seconds**. **This will evacuate the water remaining inside the feed pump.**
- 7) Repeat step 6 twice, ten seconds apart.
- 8) Unplug the RO system.

## Procedure following a power outage

If the RO system has stopped after a power outage, make sure no ice has formed inside the pumps. Next, follow the **rinse procedure** before restarting concentration.

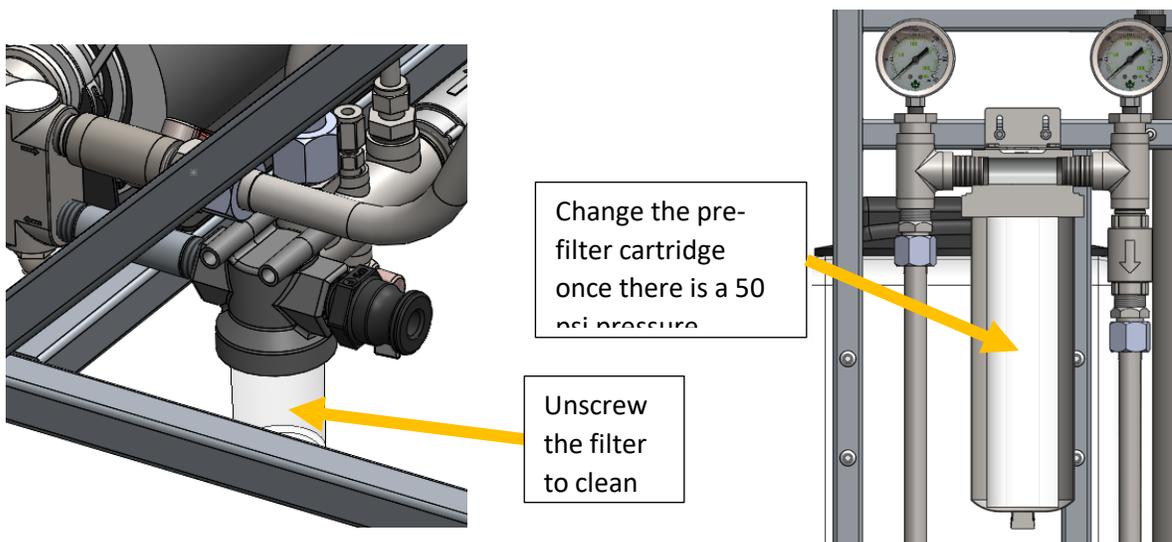


## Draining

It is important to drain the RO system **as soon as you are finished using it**. This will prevent ice from building up if the system is stored in an area that is subject to freezing conditions. Open drain and concentrate valves V1–V10 to remove any liquid remaining in the system.

## Maintenance

The line filter must be cleaned before each use. Blockages in the filter can restrict pump input, causing bubbles to form. This causes premature wear and a shortened life span for the pump. **The pre-filter cartridge must be changed once there is a 50 psi difference between the two gauges.**



## Start-of-season procedure

Before concentrating the first sap harvest of the year, you must follow these steps:

1. Insert a new pre-filter cartridge.
2. Install the membranes in the separator. Pay attention to the direction of the U-cups.
3. Rinse with potable water **that does not contain iron or manganese**.
4. Perform a soap wash.
5. Rinse.

Once these steps are finished, you may begin concentration.



## End-of-season procedure

At the end of the season, it is recommended to perform the following procedures in order before storing the system and its membranes: **soap wash, rinse, citric acid wash, rinse, soap wash, rinse**. Use the following procedure for the citric acid wash:

- 1) Exchange the pre-filter cartridge for one dedicated exclusively to washing.
- 2) Place the concentrate and filtrate hoses in the wash tank (remove the blue plug and insert both hoses into the hole).
- 3) Attach the wash tank hose to the feed pump entrance.
- 4) Fill the wash tank with filtrate **that has been heated to 40 °C** and add a cup of powdered citric acid.
- 5) Open the tank valve and start the RO system.
- 6) Adjust the pressure to 60 psi and wash in cycles until the system stops. The wash cycle will end at 43 °C / 109.4 °F.

Once the washes are finished, store the membranes in the system or storage canisters. If the membranes are stored in a canister or hermetically sealed bag, use storage solution CDL #80000. **Remove the U-cups** and use a tablespoon of solution for a canister full of filtrate. To do so, lay the separator flat (resting on the handles) and remove the membranes. This will prevent any liquid remaining in the canisters from reaching the system's motors. If the membranes are stored in the system, fill the filtrate machine with 2 litres of food-grade propylene glycol #88020. Leave the membranes in this solution and ensure that the feed, filtrate and concentrate hoses are plugged. Air must not enter the system. **Never store the membranes in the system with storage solution #80000 (sodium metabisulfite). This solution wears down the canister covers and gaskets. Keep the membranes and solution away from freezing conditions.**

## Tips

Here are a few tips to help your RO system run efficiently and increase your yield:

- Perform rinse and wash cycles after each use.
- During the wash cycle, reach the stop temperature of 43 °C / 109.4 °F. Washing is more effective at this temperature.
- Use different pre-filter cartridges for washing and concentration.
- Do not let the membranes sit in maple water for more than 5 minutes. Bacteria in the sap may plug the surface of the membrane.
- If water other than filtrate is used for rinsing, make sure the water does not contain iron or manganese.
- The end-of-season procedure will help extend the life span of the membranes.



## Troubleshooting chart

This chart describes several minor issues the operator may encounter during the season. If a problem arises, refer to this table to find a solution. If the problem persists, contact our technical service.

Problem	Cause	Solution
The system is not starting	<ul style="list-style-type: none"> <li>• It is not plugged in</li> <li>• A fuse may have burnt out</li> </ul>	<ul style="list-style-type: none"> <li>• Check the breakers in the electrical panel</li> <li>• Check the fuses</li> </ul>
The recirculation pump is not starting	<ul style="list-style-type: none"> <li>• The membrane pressure is not high enough</li> <li>• Sap is not reaching the system</li> <li>• Air is entering the system</li> <li>• The pressure switch is not working properly</li> <li>• The pump button is not ON</li> </ul>	<ul style="list-style-type: none"> <li>• Gradually turn the concentrate valve when starting</li> <li>• Make sure the suction hose is not blocked and that it is below the sap level</li> <li>• Check the feed hose</li> <li>• Ensure that there is no ice blocking the pressure switch</li> <li>• Press the ON button on the recirculation pump</li> </ul>
The filtrate flow is decreasing	<ul style="list-style-type: none"> <li>• The membranes are plugged</li> <li>• The sap's Brix is too high</li> </ul>	<ul style="list-style-type: none"> <li>• Perform a wash cycle</li> <li>• Stop the system if it exceeds 8 degrees Brix</li> </ul>
The feed pump is making a strange noise	<ul style="list-style-type: none"> <li>• The line filter is plugged</li> <li>• Air is entering the system</li> <li>• The suction strainer is plugged</li> <li>• Sap is not reaching the pump</li> </ul>	<ul style="list-style-type: none"> <li>• Clean the line filter</li> <li>• Make sure the suction strainer is not blocked</li> <li>• Make sure the suction hose is not blocked</li> <li>• Make sure the suction hose is connected properly</li> </ul>
The wash cycle is not ending on its own	<ul style="list-style-type: none"> <li>• The temperature is below 43 °C</li> </ul>	<ul style="list-style-type: none"> <li>• Preheat the filtrate to 40 °C</li> </ul>
Water is not exiting the sampling valves	The filtrate and concentrate hoses are too low	<ul style="list-style-type: none"> <li>• Place the hoses higher than the flowmeters</li> </ul>



## PWP test

The PWP (**P**ure **W**ater **P**ermeability) test shows how well a membrane is performing. This number allows you to calculate yield losses in the membrane throughout the season by comparing it to the original PEP number. The initial PEP number should be taken after the first 20 hours of use. A correction factor will be used because filtrate flow varies depending on sap temperature. The values will therefore be balanced so they can be calculated as though the sap was at 13 °C).

### How to calculate

1. Start the system in **rinse mode using filtrate**.
2. Adjust the concentrate valve until the pressure reaches 60 psi at the membranes.
3. Once the flowmeters have stabilized and there are no more air bubbles, record the filtrate flowmeter value.
4. Record the water temperature.
5. Take the filtrate value and divide it by the temperature correction factor.

### Example

Initial PWP (after 20 hours of use):

$$\frac{1.1 \text{ GPM (filtrate flow)}}{0.790 \text{ (temperature of 5 °C)}} = 1.392 \text{ GPM}$$

PWP after rinsing (PWP during the season):

$$\frac{0.9 \text{ GPM}}{0.816 \text{ (temperature of 6 °C)}} = 1.102 \text{ GPM}$$

Yield loss calculation

$$\frac{(\text{initial PWP} / \text{PWP after rinsing})}{\text{Initial PWP}} \times 100 = \% \text{ loss}$$

$$\frac{(1.392 / 1.102)}{1.392} \times 100 = 20.83\% \text{ yield loss or } 79.17\% \text{ efficiency}$$



Correction factor table	
Temperature °C / °F	Correction factor
0/32	0.672
1/34	0.695
2/36	0.719
3/37	0.742
4/39	0.766
5/41	0.790
6/43	0.816
7/45	0.842
8/46	0.866
9/48	0.893
10/50	0.919
11/52	0.946
12/54	0.973
13/55	1
14/57	1.028
15/59	1.055
16/61	1.084
17/63	1.112
18/64	1.142
19/66	1.170
20/68	1.2
21/70	1.229
22/72	1.259
23/73	1.289
24/75	1.319
25/77	1.350

Decreases in membrane performance are caused by variations in sap quality. Sap tends to clog membranes more quickly at the beginning and end of the season. **If performance drops by 15% or more during concentration, the procedure must be followed by a wash to prevent clogging.**





## Potential savings

Here is a table showing your potential savings. While these values may vary from one location to another, they give a general idea of the evaporation time you may save.

**Initial amount of sap:** 200 US gal.

**Evaporation:** 16 US gal. / hour

Concentration (Brix)	2	4	6	8
Amount of concentrate to boil	200	100	66.7	50
Amount of water to evaporate (US gal.)	194	94	60.7	44
Evaporation time (%)	100	48.5	31	22.7

## Warranty

The system has a 1-year warranty on all manufacturing defects. The product must be used under normal conditions to be covered. The warranty does not apply if the operator has increased the maximum operating pressure or made any other modifications to the reverse osmosis system.

