USER MANUAL

MINI MICRO
REVERSE OSMOSIS SYSTEM

h2o innovation®

LEADER™

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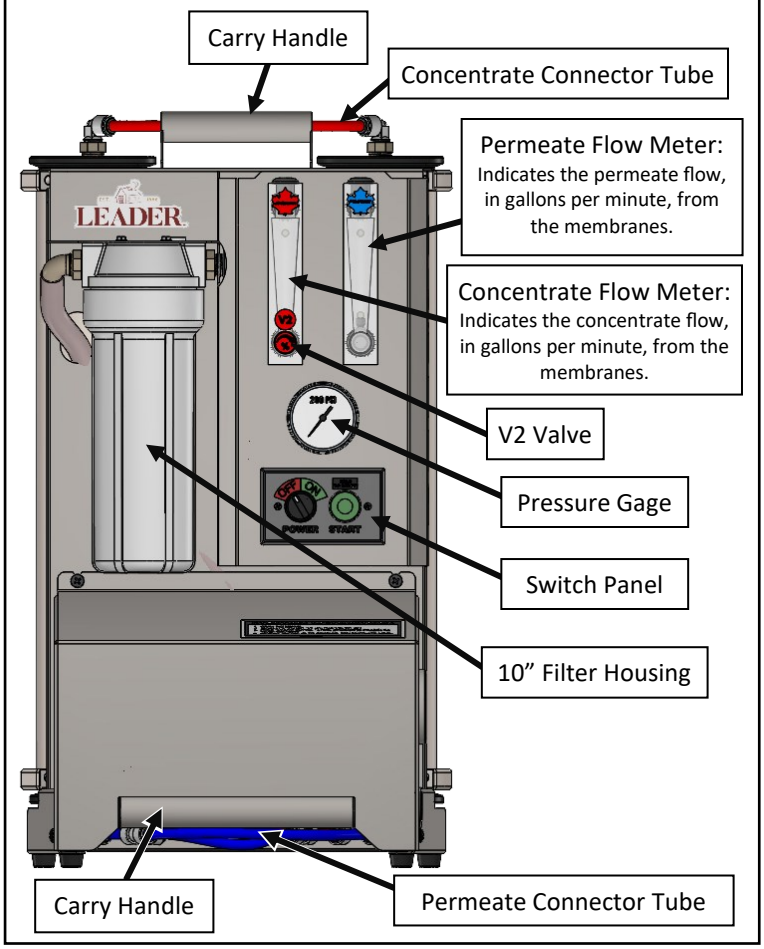
INTRODUCTION

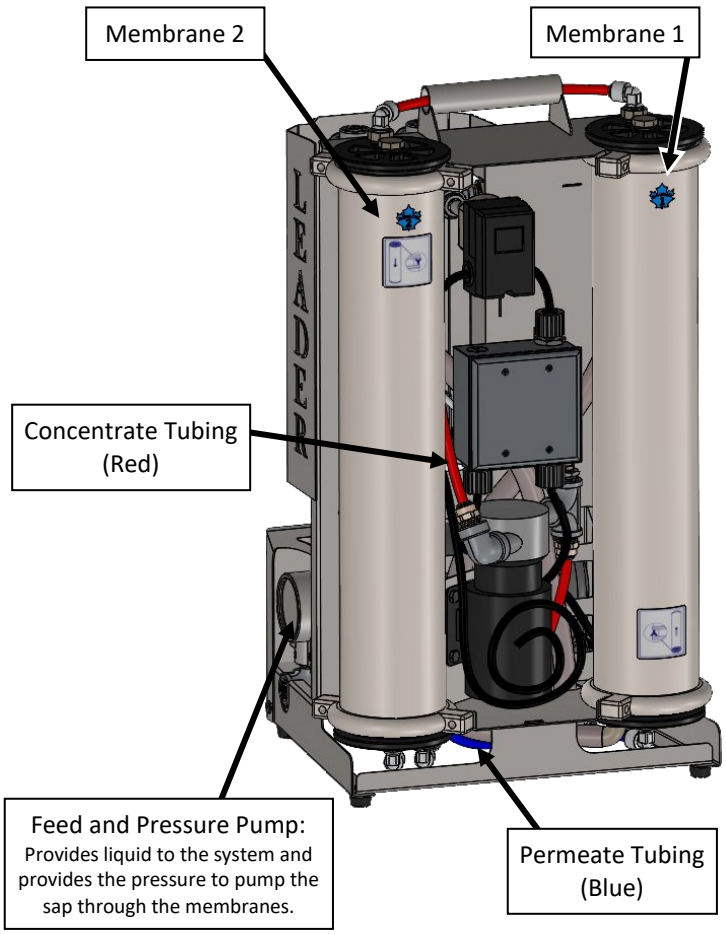
The Mini MicRO system is designed to significantly improve the producer's productivity by generating higher sugar percentage sap. The system removes water from the sap resulting in a more concentrated sugar solution entering the evaporator. This in turn shortens the boil time required and resulting in fuel and time savings. The Mini MicRO is ideally suited for the small producer seeking to gain the advantage of a large reverse osmosis system.

EQUIPMENT DESCRIPTION

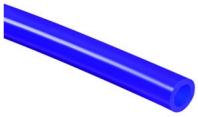
FRONT VIEW



REAR & SIDE VIEW



OPTIONAL SETUP EQUIPMENT, PARTS & SUPPLIES

3/8" X 1/2" NPT Straight 	1/2" SS Band Clamp 	3/8" Red Tube (push to connect) 	3/8" Blue Tube (push to connect) 	1/2" NPT 3-Way SS Ball Valve 	1/2" Braided Hose 
TEFLON Tape 	Glycol 	RO Soap 	Food Grade Grease 	Citric Acid 	10" Cartridge Filter 
pH Test Strips 	Digital Thermometer 	Digital Refractometer 	12" Sap Hydrometer 	Test Cup 	Sap Refractometer 

SETUP

- All materials used should be approved for potable water. No copper should be used.
- When installing plumbing for the system, factor in the system may need to be moved.
- All feed piping to the system must be at least as large as the feed on the system itself.
- All installations must meet applicable governmental regulations.

Area Required

The space to be used should prevent the RO system from freezing and should have adequate ventilation during operations to prevent overheating. The base dimensions are: 15” x 16” x 28” and a minimum of two feet around the system is recommended. The room should have adequate drainage and the walls, ceiling and floor should be easy to clean.

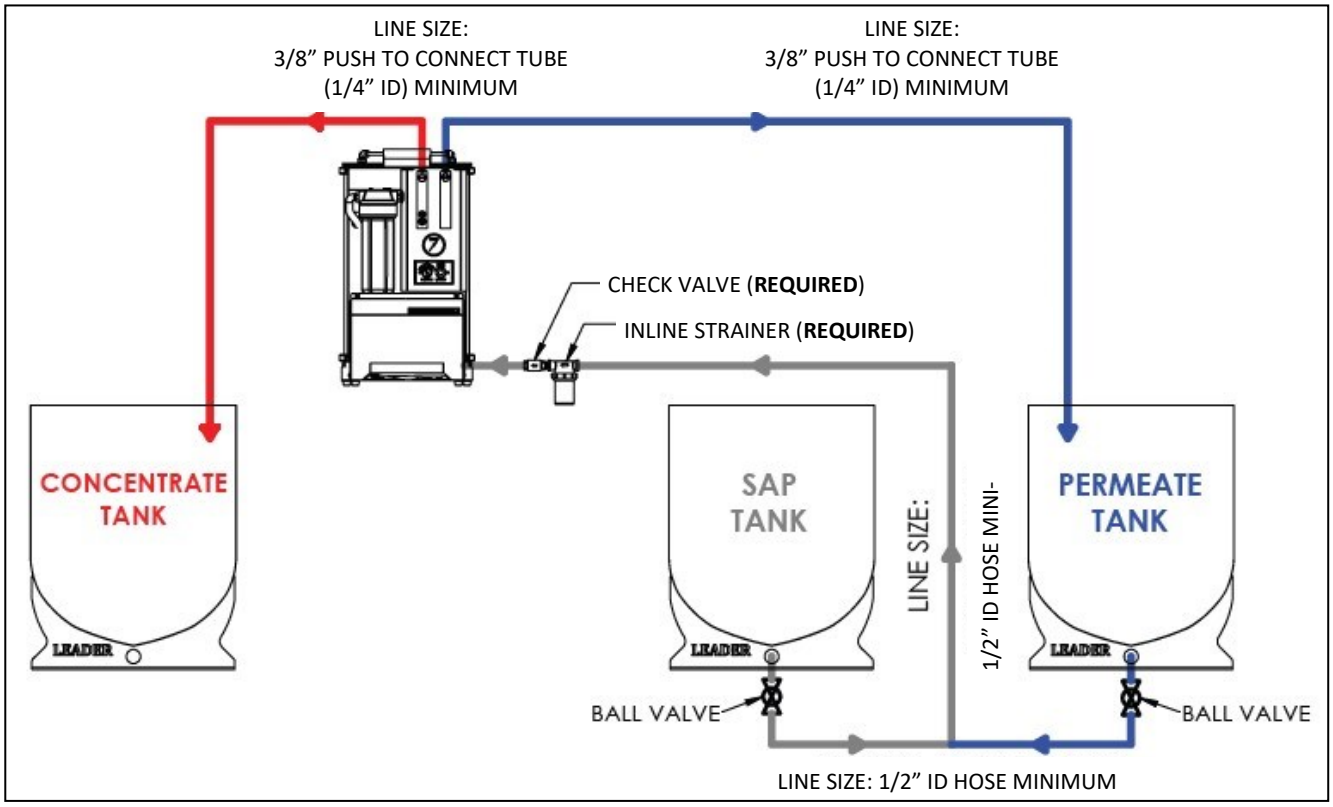
Power Requirements

The system requires a 15 amp circuit or greater. All electrical work should be performed by a licensed electrician and meet all local codes.

General Connection

Flows as shown will not all be active at the same time. To determine which flows are active reference later sections in the document detailing the cycles on pages 7 through 9 (concentrate, desugar, rinse and wash). Dependent on the location, other arrangements are likely. It is beyond the scope of this document to recommend the best layout for all situations. It is recommended you contact your salesperson or your local dealer for assistance in deciding the correct tanks and layout for your needs. → ***ALWAYS STOP THE SYSTEM PRIOR TO CHANGING THE POSITIONS OF ANY HOSES***

Recommended Setup



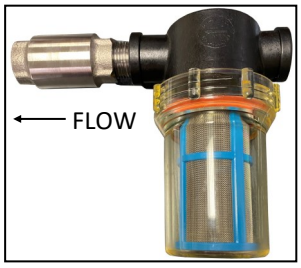
Strainer Connection

Plumbing from the supply tanks is recommended to be 1/2” braided hose (see page 3 for optional setup equipment, parts and supplies). **Inline strainer and check valve are REQUIRED.**

An inline strainer is supplied and will prevent large contaminants from reaching the system. The check valve is required to prevent back flow in the RO that could damage the vane pump.

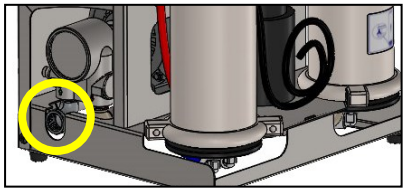
The connection can be made as follows:

1. Identify the flow direction through the strainer. There is an arrow on the top of the strainer which shows the direction of flow. The input side pushes the liquid through the strainer prior to it going into the system.
2. Install a ball valve before the inline strainer so the strainer can be removed and cleaned.



System Input

1. The incoming fluid connector is on the bottom of the right side of the system. It is a ½" NPT stainless steel female connector.



2. It is recommended a three way valve be installed to the incoming connector.
   a. Connect one side of the three way valve to the incoming sap.
   b. Connect one side of the three way valve to the incoming from the wash tank.

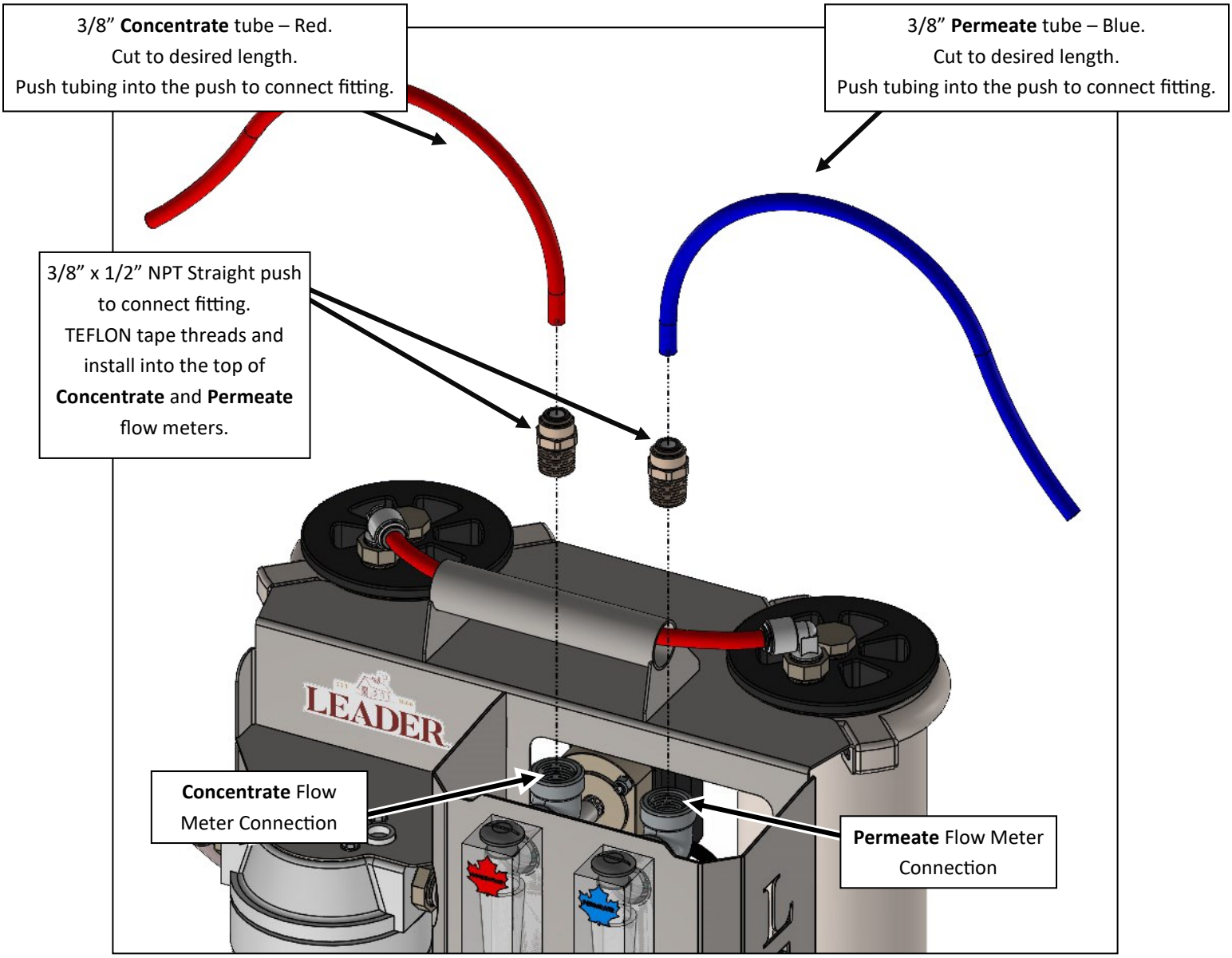
Concentrate and Permeate Outflow Connections

The connections to the outflow side of the concentrate and permeate flow meters are to ½" NPT.
The connections below describe one method connecting to the flow meters. This is only a recommended method.

In order to assemble the connections, you will need (all sold separately):

- 3/8" x 1/2" NPT Straight push to connect fitting, QTY: 2
- Blue tube 3/8", length to reach permeate storage tank from the system unit.
- Red tube 3/8", length to reach concentrate tank from the system unit.

Recommended Concentrate & Permeate Flow Meter Connections



Wash Tank

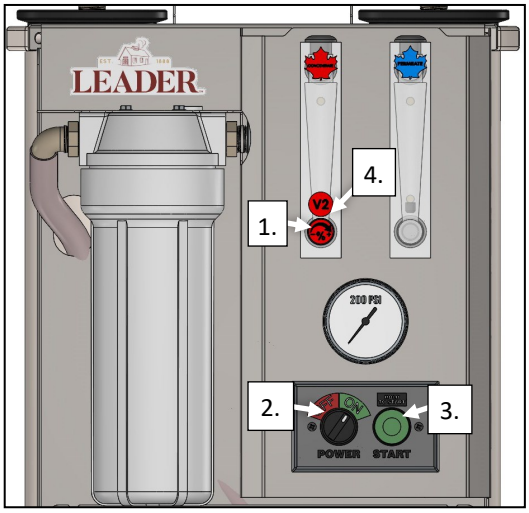
To properly maintain the membranes of the system, a wash cycle (pg. 8) must be done on a periodic basis. A tank is required in which the wash solution is mixed and then circulated through the system. A wash tank is not supplied with the standard system. *Always **STOP** the system prior to changing the positions of any hoses/tubes.*

OPERATION

Starting the System

STARTUP SEQUENCE FOR ANY CYCLE

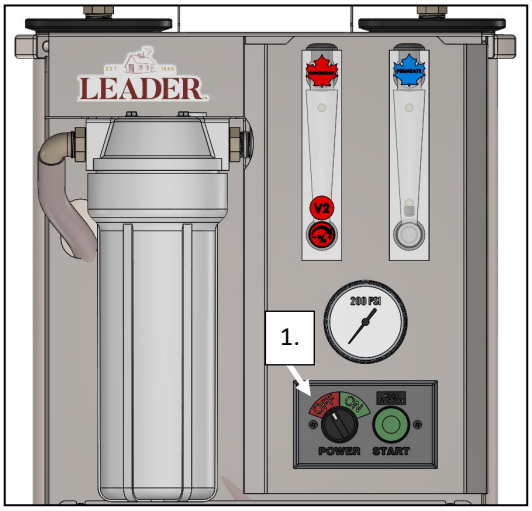
1. Open “V2” valve
2. Turn power selector switch to “ON”
3. Hold “START” button until operating pressure reaches 50PSI (see note below for further startup instructions)
4. Adjust “V2” valve to desired flow/concentrate level



NORMAL SHUTDOWN OR RESET FOR LOW PRESSURE

1. Power switch to the “OFF” position.

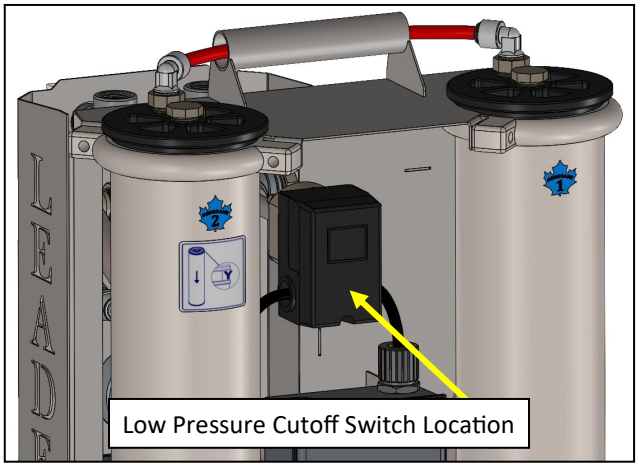
Low pressure shutoff will occur when the flow of fluid into the system has been interrupted (generally when the sap or permeate tank has been emptied during rinsing).



*NOTE: The “START” button must be held until the low pressure cutoff switch engages. An audible “click” can sometimes be heard when this occurs at around 45-50psi.

You will know that the low pressure cutoff switch has engaged when the machine continues to run after the “START” button has been released.

- Cutoff switch may take longer to engage if there is excessive air in the system. Continue to hold the “START” button until enough air has left the system and the RO stays running. This generally occurs on first startup, with new membranes, or when air enters the feed lines when changing tanks.
- Cutoff switch may engage well before 40-50psi if tubes with an ID greater than 1/4” are used on the concentrate and permeate discharge.



Adjusting V2 (Flow Valve) for Operations

V2 is adjusted for concentration output by flow or % sugar. As the valve is opened the concentrate flow increases and the membrane pressure will decrease. The sugar% in the concentrate will be decreased. As the valve is closed the flow of concentrate will decrease. The sugar% in the concentrate will increase.

The maximum pressure is 110 psi.

Initial System Cleaning

To prepare the system after setup;

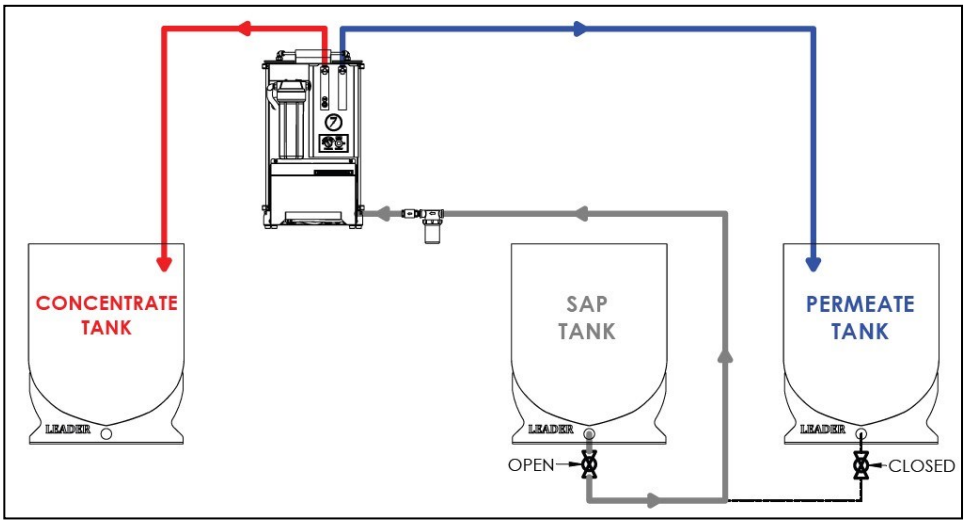
1. Put approximately 65 US gallons of non-chlorinated well or spring water into a clean permeate storage tank (use permeate if available).

2. Place the output hoses from the permeate and concentrate meters so they will go to drain. Place the incoming hose to the feed pump so it will draw permeate water from the permeate tank. Run a rinse cycle (pg. 8) using a minimum 65 US gallons of water from the permeate tank. While this cycle is running check all fittings, piping, connections, and hoses for leaks. Repair, as necessary.
3. At the end of the rinse cycle change, move the permeate and concentrate meter outflow hoses so the liquid flows into the wash tank. Fill the wash tank with approximately 2 US gallons of water up to 118°.
4. Mix alkaline R/O soap with the liquid in the wash tank until the required pH of 12 is reached.
5. Connect the wash tank to the feed pump and run an alkaline wash cycle (pg. 9) for ½ hour. Place the output hoses from the permeate and concentrate meters so they will go to drain. Place the incoming hose to the feed pump so it will draw permeate water from the permeate tank. Run a rinse cycle (pg. 8) using a minimum 65 US gallons of water from the permeate tank. Run the benchmark permeability test (pg.15).

Concentrate Cycle

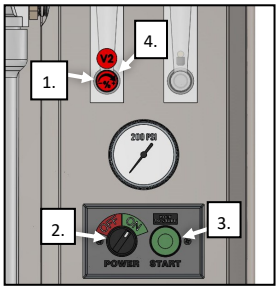
In this cycle the system inputs sap and cycles it through the membranes resulting in a concentrated liquid (concentrate) and the water being removed (permeate). *For concentrate cycle settings and positions, position V2 valve and the hoses as follows:*

- **Place the output end of the concentrate hose into the concentrate tank.**
- **Place the output end of the permeate hose into the permeate tank.**
- **Connect the input side of the strainer to the sap tank.**



STARTUP SEQUENCE - CONCENTRATE

1. Open "V2" valve
2. Turn power selector switch to "ON"
3. Hold "START" button until operating pressure reaches 50PSI (*see pg. 6 for startup note*)
4. Adjust "V2" valve to desired flow/concentrate level

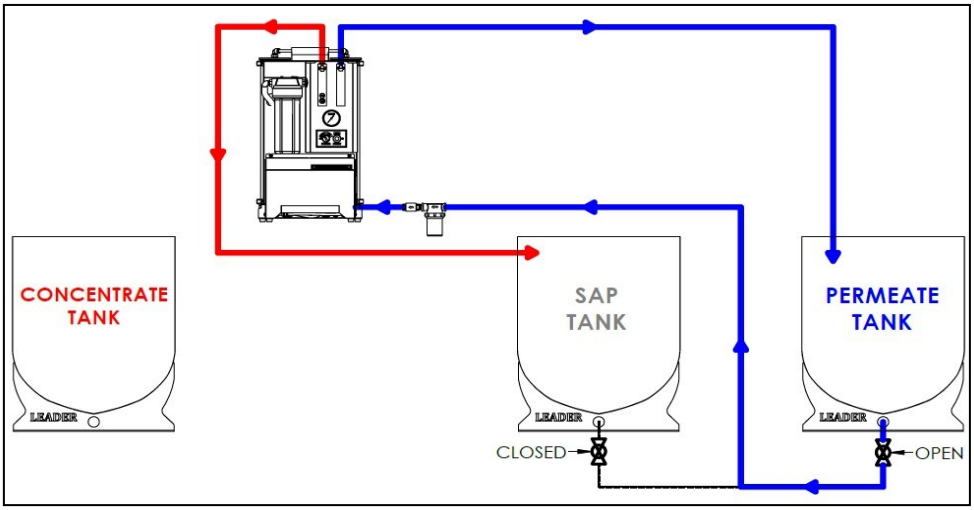


Desugar Cycle

In this cycle the permeate is run in a concentrate cycle to flush accumulated sugar from the membranes. *For desugar cycle settings and positions, position V2 valve and the hoses as follows:*

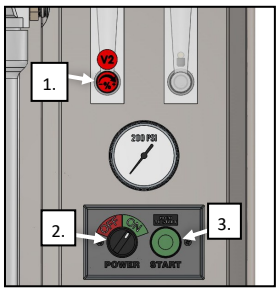
<u>V2 - Leave where set during the concentrate cycle</u>

- **Place the output end of the concentrate hose into the sap tank at the end opposite of where the sap feeds to the system.**
- **Place the output end of the permeate hose into the permeate tank.**
- **Connect the input side of the feed pump to the permeate tank.**



STARTUP SEQUENCE - DESUGAR

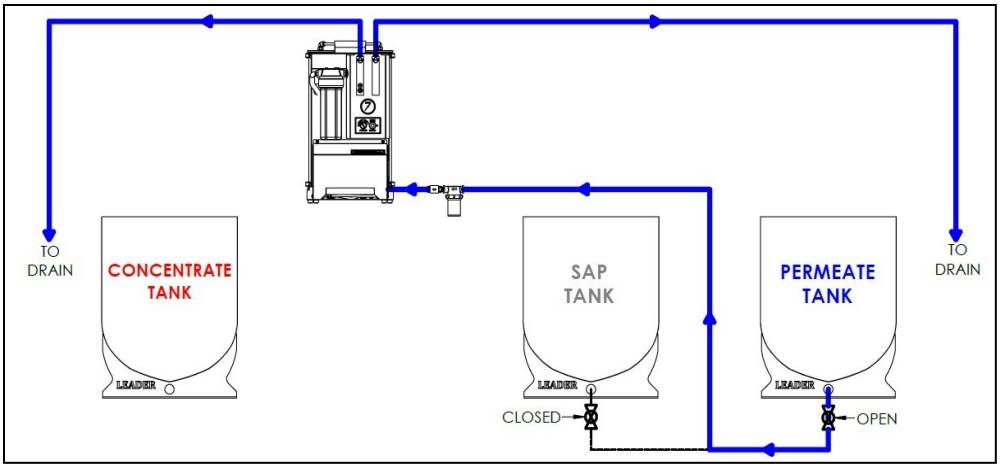
1. Leave "V2" valve where it was set during concentrate cycle
2. Turn power selector switch to "ON"
3. Hold "START" button until operating pressure reaches 50PSI (*see pg. 6 for startup note*)



Rinse Cycle

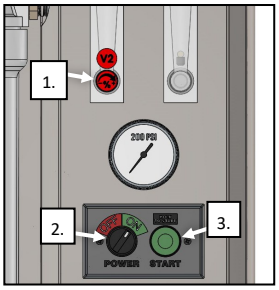
In this cycle permeate is run through the system to rinse sugar, minerals, and bacteria from the R/O. A rinse cycle is required before and after every wash cycle. At least 65 US gallons of permeate is required in a rinse following a chemical wash. Desugar and rinsing the system every 4 to 6 hours can help to maintain higher performance rates. *For rinse cycle settings and positions, position V2 valve and the hoses as follows:*

- **Place the output end of the concentrate hose so it will go to drain.**
- **Place the output end of the permeate hose so it will go to drain.**
- **Connect the input side of the feed pump to the permeate tank.**



STARTUP SEQUENCE - RINSE

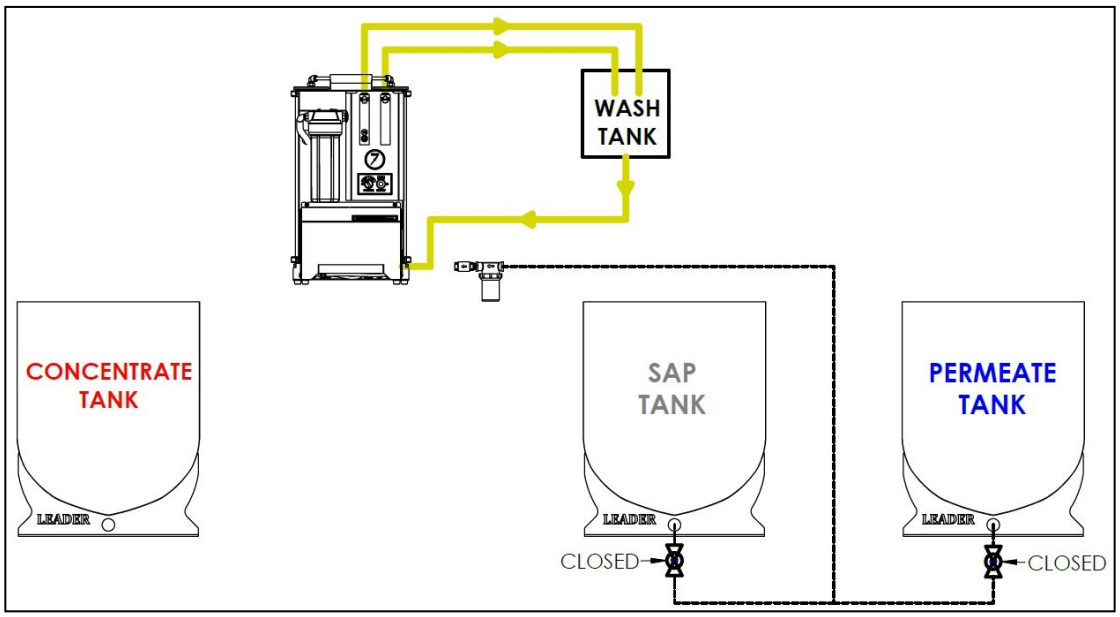
1. Open "V2" valve fully
2. Turn power selector switch to "ON"
3. Hold "START" button until operating pressure reaches 50PSI (*see pg. 6 for startup note*)



Wash Cycle

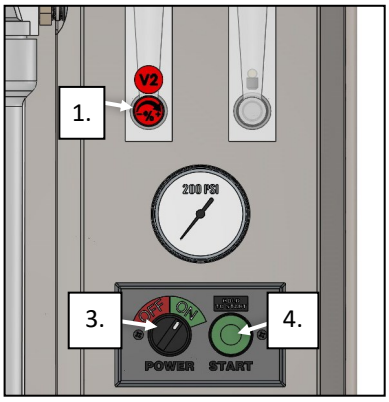
For wash cycle settings and positions, position V2 valve and the hoses as follows:

- **Place the output end of the concentrate hose into the wash tank.**
- **Place the output end of the permeate hose into the wash tank.**
- **Connect the input side of the feed pump to the wash tank.**



STARTUP SEQUENCE - WASH

1. Open "V2" valve fully
2. Add the chemical to be used into the wash tank (see next page for the 3 different wash cycle options) for the type of wash to be performed. Ensure the wash tank has been filled first.
3. Turn power selector switch to "ON"
4. Hold "START" button until operating pressure reaches 50PSI (*see pg. 6 for startup note*)
5. Stop the system (turn power switch to off)
6. Do a permeability test (pg. 15)
7. If the test is good, continue to rinse with any additional permeate



There are three different wash cycles. 1. A hot water wash which can be run when good clear sap was processed and the flows are still good. 2. An alkaline soap wash is done to remove bacteria from the system. 3. An acid soak and wash is done to remove mineral deposits from the system. Generally the acid soak is used where the system does not recover flow rates after the alkaline soap wash.
In order to perform any wash cycle it is necessary to preheat water and pour it into the tank to be used as the wash tank. The water should be heated to approximately 118°F. The wash tank should hold approximately 2 gallons.

Hot Water Wash

1. Perform a rinse cycle (pg. 8) using a minimum of 65 US gallons of permeate.
2. At the end of the rinse cycle, place the end of the permeate and concentrate hoses into the wash tank.
3. Set the system intake to the wash tank. Pour approximately 2 gallons of preheated permeate into the wash tank. Run the wash cycle for ½ hour.
4. Perform a Rinse cycle using a minimum of 65 US gallons of permeate water.

Alkaline Soap Wash

1. Perform a rinse cycle (pg. 8) using a minimum of 65 US gallons of permeate. At the end of the rinse cycle, place the end of the permeate and concentrate hoses into the wash tank.
2. Add 2 US gallons of preheated permeate to the wash tank then add R/O soap to the wash tank and mix. Add R/O soap until the required pH of 12 is reached.
3. Check the pH of the wash solution every 15 minutes. Maintain the pH by adding soap as needed.
4. Start and run the system for ½ hour.
5. Perform a rinse cycle using a minimum of 65 US gallons of permeate.
6. Disconnect the wash tank from the feed pump and drain the wash tank.

Acid Soak

NOTE: ***ONLY*** citric acid is to be used in this system.

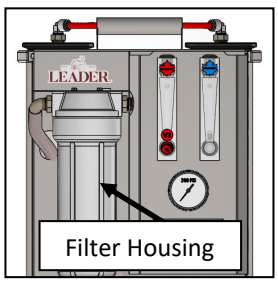
1. Perform an alkaline soap wash as listed above.
2. At the end of the rinse cycle (following the wash), place the end of the permeate and concentrate hoses into the wash tank.
3. Add 2 US gallons of preheated permeate to the wash tank then add ⅓ cup of citric acid to the wash tank and mix.
4. Run a wash cycle for ½ hour.
5. Shut off the system and allow the acid solution to soak for 8 to 24 hours.
6. Drain the wash tank.
7. Perform a rinse cycle (pg. 8) using a minimum of 65 US gallons of permeate.
8. Perform an alkaline soap wash as detailed above.
9. Disconnect the wash tank from the feed pump and drain the wash tank.
10. Perform a rinse cycle using a minimum of 65 US gallons of permeate.

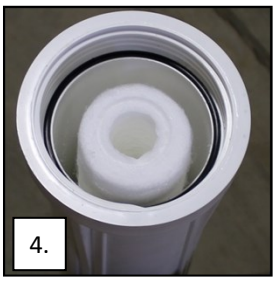
MAINTENANCE

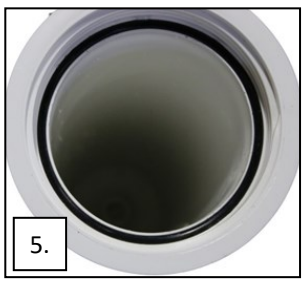
Pre Filters

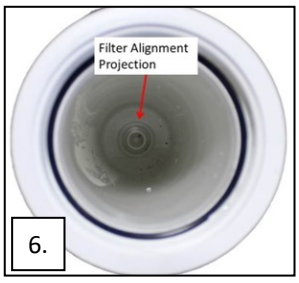
The following steps outline the procedure for changing the prefilter:

1. Close the valve from the inline strainer or disconnect the source tank from the feed pump.
2. Loosen and remove the lower portion of the filter housing.
3. Empty the liquid from the housing.
4. Remove the filter from the housing (see pictures below for reference on the last steps).
5. Rinse out the housing. Insert a new filter into the housing aligning one of the open ends over the alignment projection.
6. Wipe the O-rings of the top of the assembly then lubricate with permeate or non-chlorinated well or spring water.
7. Bring the lower filter housing, with the filter installed, up to the underside of the top of the filter housing on the system. Carefully align the open top of the filter with the alignment projection in the top of the filter housing. Thread the bottom of the housing onto the top of the housing and securely hand tighten.







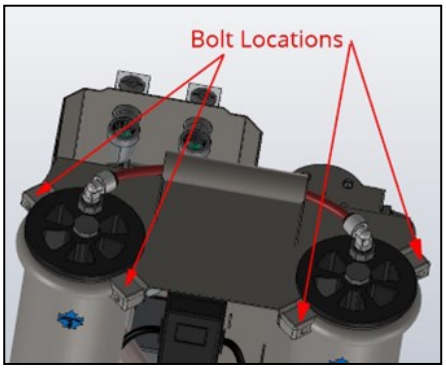


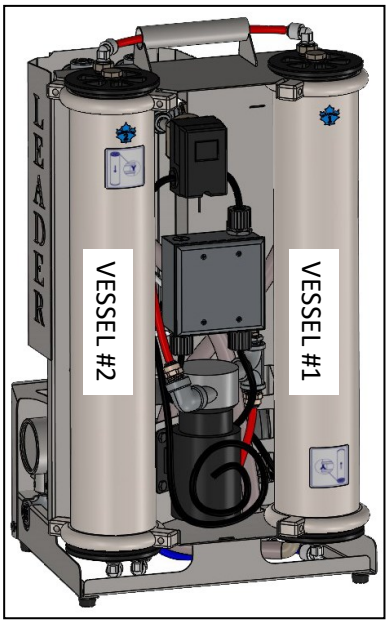
Membrane Removal and Installation

NOTE: Membrane surfaces could produce splinters during handling. It is recommended, clean leather gloves be worn when handling membranes.
Both membranes (contained in vessels) should be removed during the process.

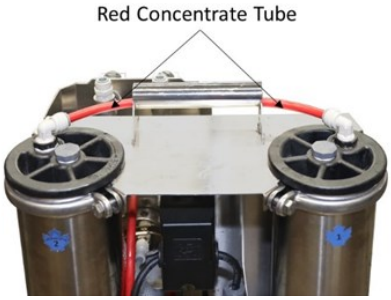
Removal of Membranes

1. Using 13MM wrenches, remove the clamps securing both vessel covers by removing the bolts from each side of the clamp. The nuts for the bolts are located behind the frame of the system.





2. Pull the red concentrate tube from the push to connect fittings (hold down the inner dark grey piece to release the tube) on the top of the vessels. Pull the tube out of the handle and set aside.

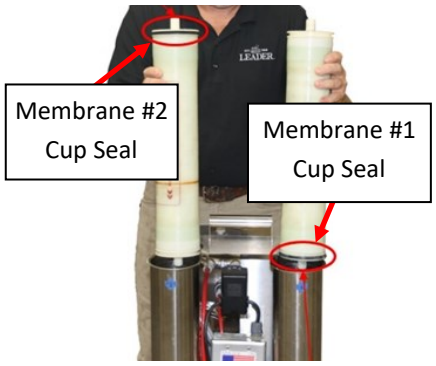


3. Gently pull the vessels away from the system frame so the vessel caps are clear of the system frame.

4. Carefully pry off the vessel cap from each vessel with a straight bladed screwdriver.

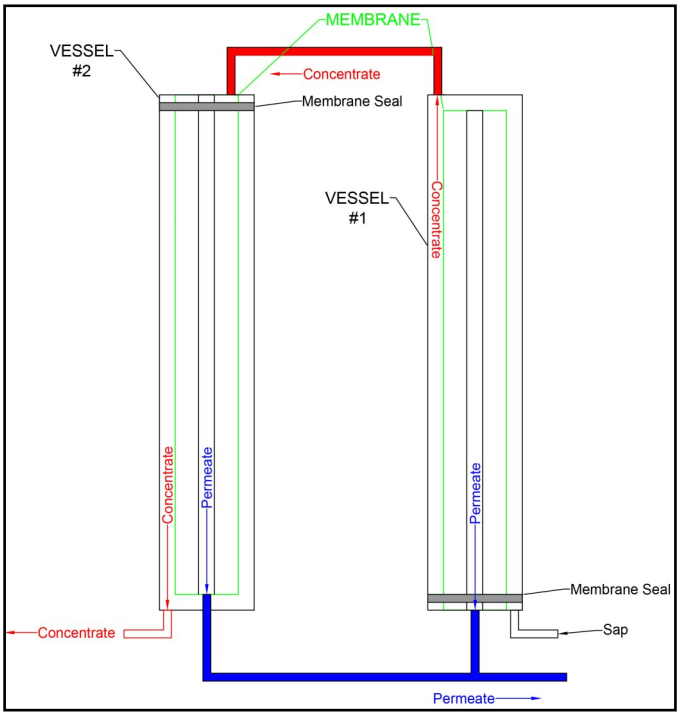
5. With the caps removed the membranes can be removed. Grasp and lift the membranes from each of the vessels. It may be necessary to use a mechanical assist (pliers or vice grips) to hold the membrane while removing. If using mechanical assist ensure you pull by the web NOT the center.

6. When removing the membranes note the orientation of the membrane cup seals.



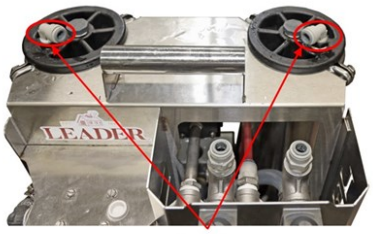
Installation of Membranes

When installing the membranes it is important they are oriented correctly. Flow through and from the membranes must be properly directed for the system to work properly. Permeate flows from the interior of the membrane. Concentrate flows external to the membrane. The seals on the ends of the membranes ensure the flow is directed to the proper pathway. Reference the pictures in the previous and following sections.



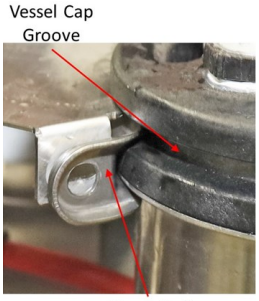
Inspect the seals on the vessel caps. Replace the seals if damaged or leaks had been noticed. Lubricate the seals with food grade grease. Install the caps on the vessels after the membranes have been installed.

When installing the caps onto the vessels ensure the push to connect fittings are pointed toward the top carry handle. This is necessary for re-installing the top red concentrate tube.



Push to connect fitting

To properly install the vessels to the system unit, align the groove in the vessel cap with the curved edge of the system unit (labelled "system unit alignment"). The next picture illustrates the placement of the first half of the clamp which will be the first step in securing the cap to the vessel and the vessel to the system unit.



Clamp Half

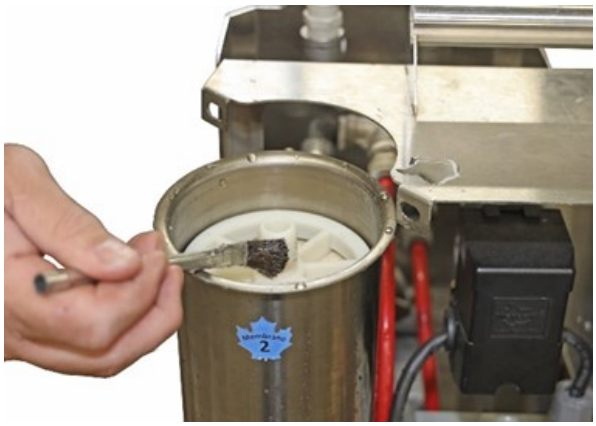
System Unit Alignment

Reinstallation of the Membrane in Vessel: ***Start with vessel #2 and follow the steps again for vessel #1***

1. Lubricate the connection on the bottom of the membrane with food grade grease. The bottom of the membrane will be the end without a seal. ****Food grade grease must be used SPARINGLY as it can lead to clogging.**

2. Lubricate the seal at the top of the membrane with food grade grease.

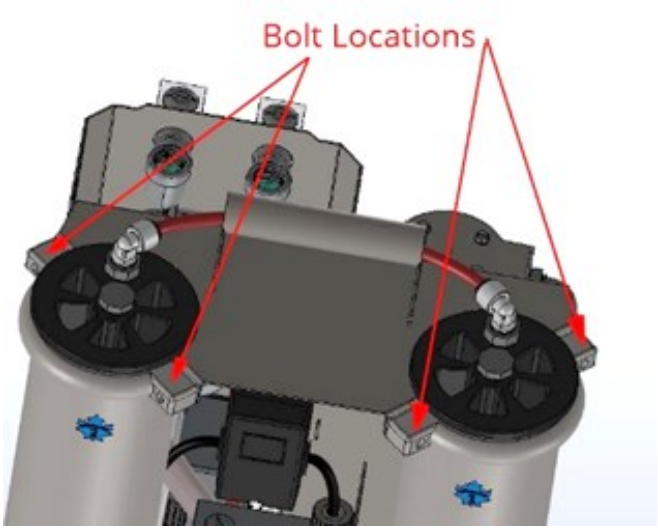
3. Insert the membrane into vessel #2. Ensure the bottom connection slides into the bottom cap. If it is properly installed the top connecter of the membrane will be approximately 1” below the top of the vessel. Lubricate the top connector of the membrane with food grade grease.



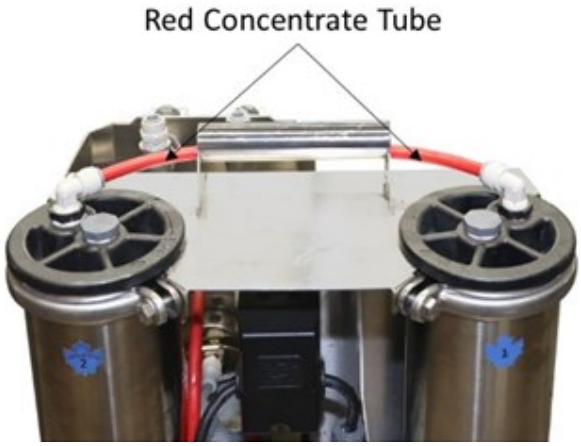
4. Reinstall the vessel cap paying attention to the orientation of the push to connect fitting. The cap should slide down over the membrane connector.

Steps to Complete Installation

1. Install the rest of the clamp halves. Insert the bolts and tighten with 13 MM wrenches.

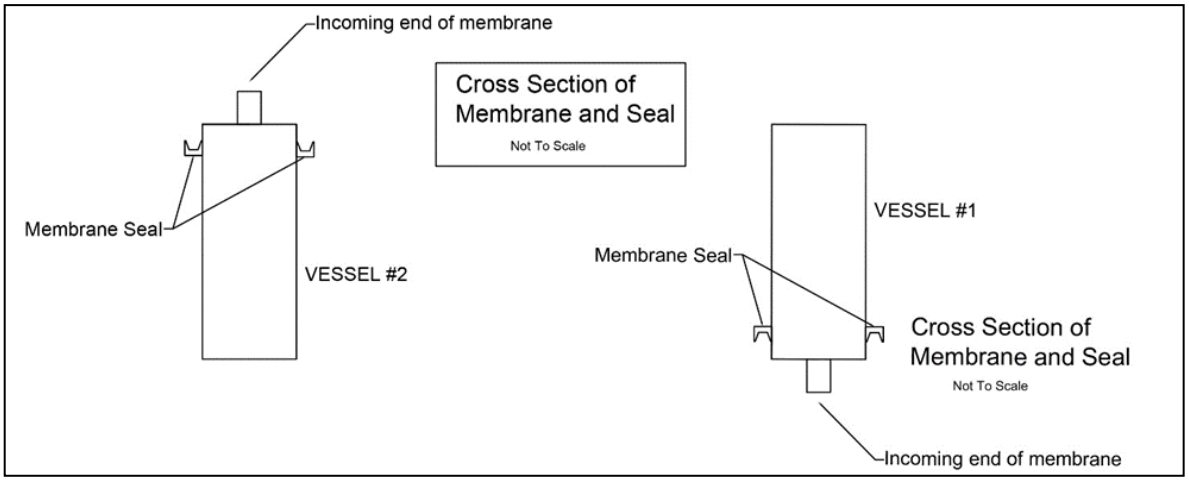


2. Reinstall the red concentrate tube.
   a. Thread the red tube through the top handle of the system.
   b. Push the tube into the push to connect fittings on the top of the vessels.



Replacement of Membrane Seal

When replacing a membrane seal, the seal must be installed correctly. The seal is “U” shaped. The “U” must be positioned so it faces the incoming side of the membrane. See the diagram below.



Daily

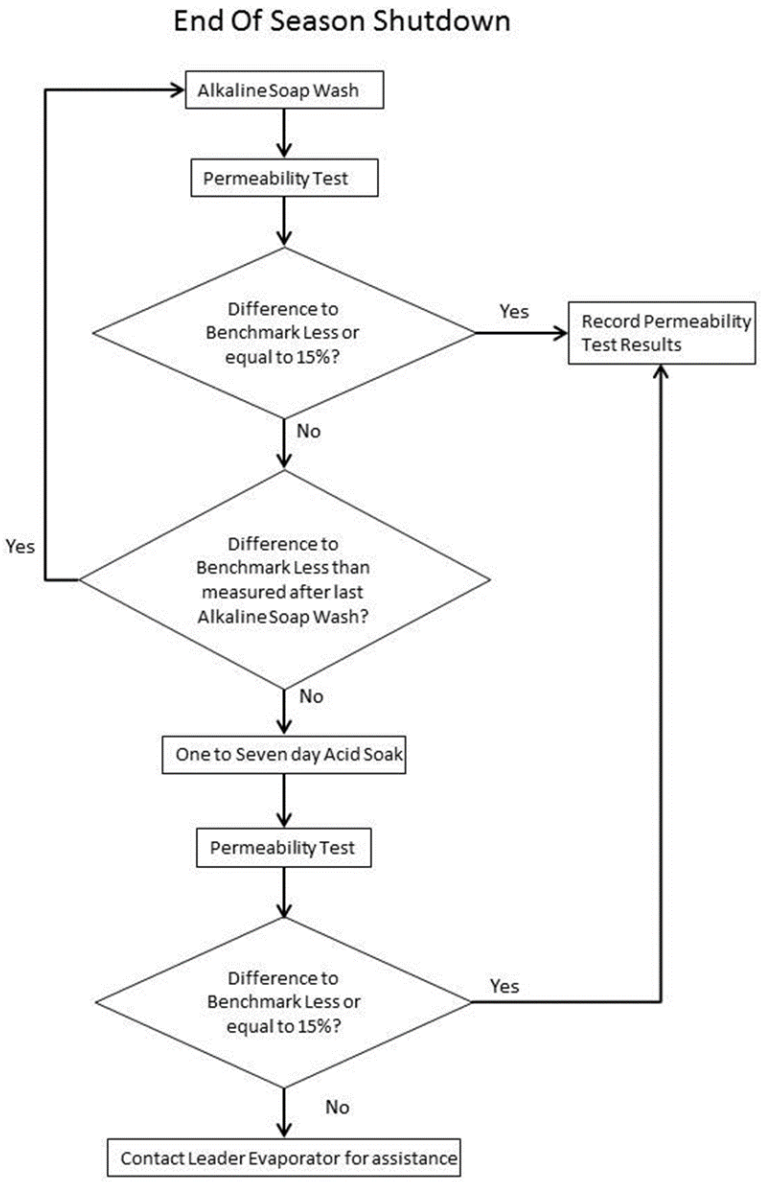
Each day, it is recommended the following be done:

1. Inspect the prefilter. If it is dirty or had a “slimy” coating - change the prefilter.
2. Remove, clean and reinstall the strainer in the inline strainer.
3. Sample the permeate liquid.
    a. Purge the permeate line by running the system and drawing a volume of permeate to a test cup.
    b. Test the permeate sugar level using either a refractometer or a hydrometer.
    c. If the results indicate there is any sugar present check the troubleshooting chart.
4. Check all hoses, piping, fittings and connections for leaks. Repair, as necessary.
5. Run a cycle of Desugar and Alkaline Soap Wash.
6. Do a Permeability test (pg. 15).
7. Inspect and clean storage tanks.
    a. Permeate
    b. Concentrate
    c. Sap

End Of Season Shutdown and Storage

If permeate is not available to perform the rinse and wash cycles said in the following procedure, obtain the necessary volume of non-chlorinated well or spring water.

The following flow chart outlines the steps to follow for the first steps in preparing the system for shutdown. Note the text version follows in Steps 1 – 4.



1. Do an alkaline soap wash (pg. 9).
2. Run a permeability test (pg. 15). Compare the results to the benchmark used at the beginning of the season.
    a. If the results show a difference of greater than 15% and the difference in the percentage is less than the previous alkaline soap wash cycle, repeat the alkaline soap wash cycle.
    b. If the results show a difference greater than 15% and there was no improvement as compared to the previous alkaline soap wash cycle continue to the next step – Acid Soak Cycle.
    c. If the difference is 15% of less, continue with Step 4.
3. Do an acid soak cycle (pg. 9) allow the machine to soak for 1 to 7 days. Run the system to temperature the same way on the last day of the cycle. Run a permeability test.
4. If the difference in results is 15% or less – record the permeability test results. If the results are greater than 15%, contact Leader Evaporator for assistance.
5. Drain the wash tank then close the drain.
6. In the wash tank mix:
    a. 2 US gallons of permeate.
    b. ½ US quart of glycol
7. Set the system valves for a wash cycle (pg. 8) and run the system for 15 minutes. Drain the wash tank.
8. Empty then reinstall the prefilter housing.
9. Drain the pumps then close the drains.
10. Maintain a temperature minimum of 40°F to 50°F in the area where the system is stored. Do not allow the system to freeze.

NOTE: *If there is a possibility of the system freezing, drain all fluid from the system.*

11. Drain and clean all storage tanks. Cover them in order to keep dirt and pests out. NOTE: If permeate is not available for cleaning, use non-chlorinated well or spring water.

Sampling

To determine the sugar % in either the sap or the concentrate.

1. Fill a test cup with the liquid to be measured.
2. Pour the liquid back into the sap tank.
3. Fill the test cup and slowly lower a sap hydrometer into the liquid and read the results.

NOTE: Alternately a sap refractometer (digital or optical) can be used. Make sure they are clean prior to placing the liquid sample on the instrument.

Data Logging

Data on the operation of the system should be recorded and kept. See ATTACHMENT #1 on page 17 for the data sheet format. The following data is recorded:

- Date: Date the information is collected.
- Activity: Concentration cycle (enter a “C”) or Test (enter a “T”)
- Sap %: The sugar concentration of the raw sap
- Concentrate %: The sugar concentration of the concentrate from the system – test results from the concentrate meter output.
- Permeate Flow: Gallons per minute of permeate from membrane flow meter – reading from the top of the stainless steel float in the permeate flow meter
- Concentrate Flow: Gallons per minute of concentration from the system – reading from the top of the stainless steel float in the concentrate flow meter.
- Temperature: Reading taken in the wash tank attached to the system (°F)
- Membrane Pressure: Reading from the pressure gauge on the control panel of the system (psi)
- Water Removal %: Percent of water removed from incoming sap - calculated as follows:
    - PERMEATE FLOW – the flow as indicated on the flow meter
    - TOTAL FLOW - Add Permeate Flow and Concentrate Flow together
    - Divide PERMEATE FLOW by TOTAL FLOW and multiply the result by 100
    - Record this number as the Water Removal %
- GPH Processed – gallons per hour being processed by the system- calculated as follows.
    - TOTAL FLOW – Add Permeate Flow and Concentrate Flow together.
    - Multiply Total Flow by 60 and record the resulting number as the GPH Processed

Cycles and Timing

The Mini MicRO has 4 defined cycles: Concentrate, Desugar, Rinse and Wash. The following table outlines the recommended intervals:

CYCLE	INTERVAL
Concentrate	Run 1 to 4 hours maximum before a minimum of a rinse cycle dependent on sap quality
Desugar	Run at the end of every concentrate cycle OR at the end of each day's use whichever comes first
Rinse	Run after the desugar cycle
Wash	Chemical wash after a rinse. A chemical wash should be run after 4 hours of concentrating OR at the end of every day's use whichever comes first. NOTE: Up to one hour of run time, run a hot water wash

The following cycles always need to be run in sequence when used:

- Desugar
- Desugar - Alkaline Soap Wash (also called Alkaline Soap Wash cycle)
- Desugar - Alkaline Soap Wash - Acid Soak - Alkaline Soap Wash (also called Chemical Wash cycle)

Permeability Test

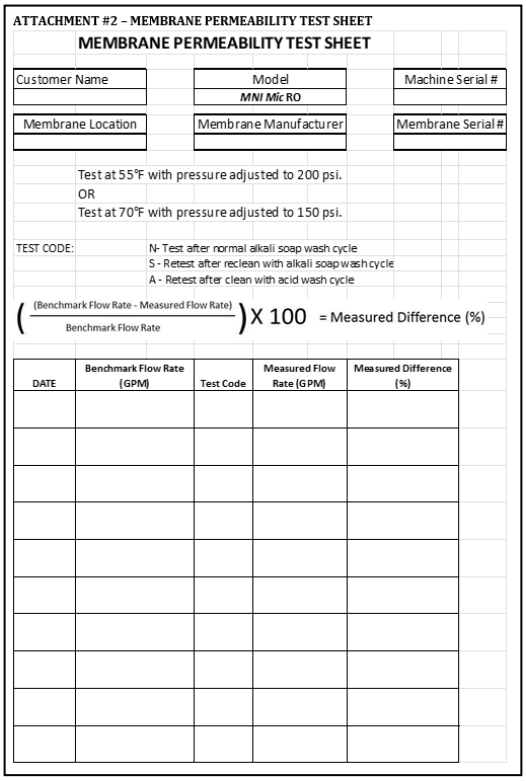
A permeability test determines the permeate flow rate of a membrane. When a membrane is new it will usually have a permeate flow rate of approximately 1.1 GPM when tested. The first or second use will condition the membrane which reduces the permeate flow rate. Typically, due to the construction of the membrane the flow will be reduced by 10% to 15% resulting in a permeate flow rate testing between 0.9 GPM to 1.00 GPM. The membrane flow rate should be tested after the conditioning and this flow rate will be the benchmark for comparison in future testing.

The permeability test is used to monitor the performance of the system. It is based on comparing the results of a benchmark test taken when the system is conditioned or at the end of the previous season after the final cleaning is completed. The permeate flow rate is the basis for the results of the test. Due to the inability to completely clean the membrane, membrane flow rate reductions of up to 10% to 15% as measured season to season are possible. When flow rates have reduced to an unacceptable working level, contact Leader for assistance.

Logging Data For The Permeability Test

To log data for the Permeability test, use the Membrane Permeability Test Sheet (pg. 18). A copy is attached from which copies can be made. Use the sheet as follows:

1. Fill in your name in the field labelled "Customer Name".
2. The Model Number field will have the system prefilled.
3. Find the Serial Number of the system on the Machine Serial Number Data Sheet and write it in the field labelled "Machine Serial #".
4. The field labelled "Membrane Location" may be left blank.
5. Find the membrane manufacturer information on the Machine Serial Number Data Sheet and write it into the field labelled "Membrane Manufacturer".
6. Find the membrane serial number, on the Machine Serial Number Data Sheet, for the membrane being and write it into the field labelled "Membrane Serial #".
7. After the initial membrane conditioning or after the final end of season cleaning, perform a permeability test. Record the flow rate measured for the membrane in the Benchmark Flow Rate column. This number can be filled in the Benchmark Flow Rate field for all subsequent tests until a new Benchmark test is performed.



ATTACHMENT #2 – MEMBRANE PERMEABILITY TEST SHEET

MEMBRANE PERMEABILITY TEST SHEET

Customer Name	Model	Machine Serial #
	MNI Mic RO	

Membrane Location	Membrane Manufacturer	Membrane Serial #

Test at 55°F with pressure adjusted to 200 psi.
OR
Test at 70°F with pressure adjusted to 150 psi.

TEST CODE:
N- Test after normal alkali soap wash cycle
S - Retest after reclean with alkali soap wash cycle
A - Retest after clean with acid wash cycle

$$\left(\frac{\text{(Benchmark Flow Rate - Measured Flow Rate)}}{\text{Benchmark Flow Rate}}\right) \text{X } 100 = \text{Measured Difference (\%)}$$

DATE	Benchmark Flow Rate (GPM)	Test Code	Measured Flow Rate (GPM)	Measured Difference (%)

Performing The Permeability Test:

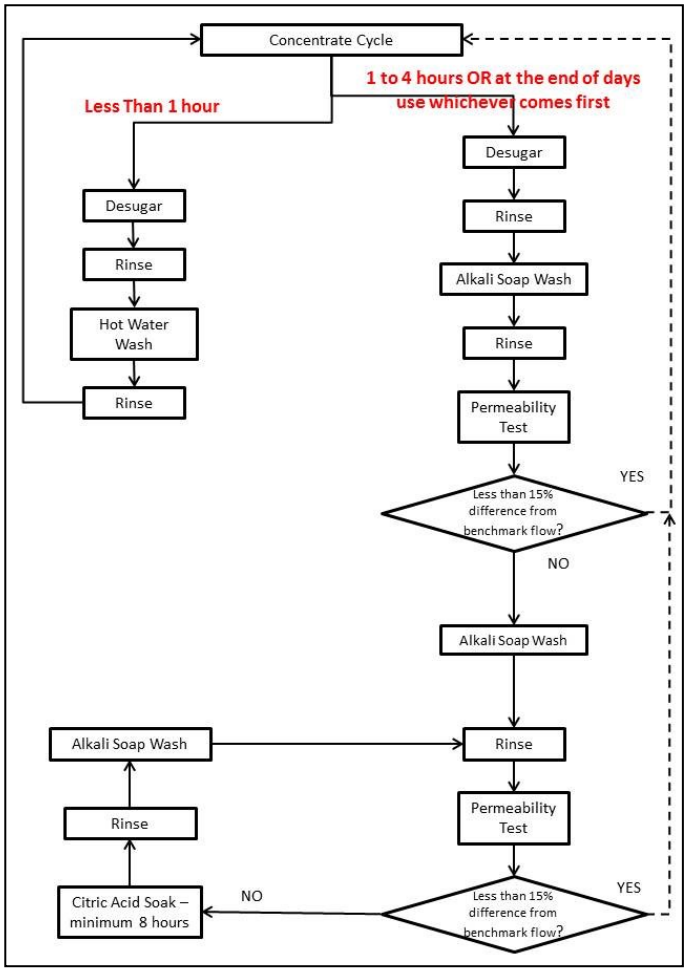
1. Perform a rinse (pg. 8) then fill the wash tank ⅔ full of permeate preheated so the permeate and water will be about 70°F (permeate preheat will need to be hotter than 70° so that when mixed with water it will settle at 70°).
2. Set the valves (or hoses if no valves are in use) in the wash cycle position (pg. 8).
3. Adjust the membrane pressure to **110** psi using valve V2.
4. Record the permeate flow onto the Membrane Permeability Test Sheet in the Measured Flow Rate field, if not performing a Benchmark Flow Rate test.

A permeability test should be performed after each wash cycle. The test is performed as described above for steps 2 through 4. Compare the flow rate obtained in the test with previous benchmark rates. If the measured difference (see the calculation below) is 15% or more then further cleaning will be necessary. *See flow chart on the right.*

To calculate the difference to the benchmark, do the following calculation:

1. Subtract the measured flow rate from the benchmark flow rate.
2. Take the result and divide it by the benchmark flow rate.
3. Multiply the answer by 100 and record the result in the Measured Difference field on the Membrane Permeability Test Sheet.

$$\left(\frac{\text{(Benchmark Flow Rate - Measured Flow Rate)}}{\text{Benchmark Flow Rate}}\right) X\ 100 = \text{Measured Difference (\%)}$$



Beginning Of Season Startup

As permeate will not be available to perform the rinse and wash cycles stated in the following procedure, obtain the necessary volume of water using non chlorinated well or spring water.

1. Connect the reverse osmosis system to the concentrate, permeate and feed lines.
2. Change the prefilter.
3. Ensure you have feed (water or permeate) to the system.
4. Position the valve and hosing for the rinse cycle.
5. Press the START button to start the feed pump.
6. Run the feed pump until most of the bubbles are gone from the flow meters located on the front of the system. This will take 3 to 4 minutes. Not all the bubbles can be removed.
7. Stop the system.
8. Check all fittings, hoses, connections and parts of the system for leaks. Repair, as necessary.
9. Run a rinse cycle until a minimum of 125 US gallons of water have been processed. At the end of the rinse cycle move the concentrate and permeate outflows to the wash tank.
10. Run a hot water wash cycle (pg. 8).
11. Repeat the rinse cycle again filling the wash tank as specified then add R/O soap to the wash tank and mix. Add R/O soap until the required pH of 12 is reached. Run an alkaline wash cycle (pg. 9).
12. Disconnect and drain the wash tank then close the wash tank drain valve.
13. Perform a permeability test (pg. 15).
    a. Compare the results to the results of the test run when the system was new or at the completion of preparation for storage at the end of the previous season. If the results are not acceptable contact LEADER or your local Distributor / Dealer for assistance.
    b. Record the results, if acceptable, and use these results as the reference for test for the season.

TROUBLESHOOTING CHART

The following conditions may occur during operations:

CONDITION	CAUSE	ACTION
Feed pump does not start when START button is held	No power	Verify power is "ON" at the source.
Feed pump starts but system does not continue running	Low pressure	Inspect incoming plumbing for leaks
		Check and clean Y-strainer
		System needs to be bled
	No liquid coming from storage	Check the positions of all valves and hoses
Low rate found during permeability test	Suspected bacteria buildup	Rewash system with R/O alkali soap
	Suspected Mineral Buildup	Acid wash system
Sugar in the permeate	Leak at seal	Replace seal on membrane
	Membrane deterioration	Replace membrane

ATTACHMENT #1 - OPERATIONS DATA LOG SHEET

Water Removal % = ((permeate flow) / (permeate flow + concentrate flow)) *100

GPH Processed = (permeate flow + concentrate flow) *60

Mini MicRO Operations Data Sheet

	DATE								
	ACTIVITY (C or T)								
SUGAR CONCENTRATION	SAP								
	CONCENTRATE								
FLOW (gpm)	PERMEATE								
	CONCENTRATE								
	TEMPERATURE								
PRESSURE (psi)	MEMBRANE								
	WATER REMOVAL %								
	GPH PROCESSED								

	DATE								
	ACTIVITY (C or T)								
SUGAR CONCENTRATION	SAP								
	CONCENTRATE								
FLOW (gpm)	PERMEATE								
	CONCENTRATE								
	TEMPERATURE								
PRESSURE (psi)	MEMBRANE								
	WATER REMOVAL %								
	GPH PROCESSED								

	DATE								
	ACTIVITY (C or T)								
SUGAR CONCENTRATION	SAP								
	CONCENTRATE								
FLOW (gpm)	PERMEATE								
	CONCENTRATE								
	TEMPERATURE								
PRESSURE (psi)	MEMBRANE								
	WATER REMOVAL %								
	GPH PROCESSED								

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$$\left(\frac{\text{(Benchmark Flow Rate - Measured Flow Rate)}}{\text{Benchmark Flow Rate}}\right) X\ 100 = \text{Measured Difference (\%)}$$

DATE	Benchmark Flow Rate (GPM)	Test Code	Measured Flow Rate (GPM)	Measured Difference (%)