USER MANUAL

MICRO
REVERSE OSMOSIS SYSTEM

LEADER™
WE HELP YOU GET MAPLE DONE

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TABLE OF CONTENTS

INTRODUCTION

A Leader Evaporator Springtech Reverse Osmosis system is designed to significantly improve the producer's productivity by generating higher sugar percentage sap. Through use of high pressure, 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 Leader Evaporator MicRO is ideally suited for the small producer seeking to gain the advantage of a large reverse osmosis system at an economical cost.

Some of the features of the Springtech MicRO are:

- Easy accessibility to pumps and membranes.
- Stainless steel frame, membrane housings, pumps and pump housings.
- Flow meter for the permeate of the membrane and for the system concentrate.

An optional Wash Tank and Valve kit are offered for the MicRO system. The kit provides for a washing process standard on the larger RO systems. The washing process allows for more efficiency and longer life of the membrane(s).

THEORY OF OPERATION

In reverse osmosis, through the use of special semi-permeable membranes and high pressure, water is forced, in a pure form, through the membrane while the concentrated solution remains outside the membrane and is concentrated. For the sugar maker this means water (permeate) is removed from the sap and a sap with a higher sugar level (concentrate) is produced for the evaporation process.

Terms

Semi-permeable Membrane – Unit consisting of multi layers of spacers and membranes

Pre-Filter – Designed to remove suspended solids from the sap incoming to the reverse osmosis system

Feed Pump – The initial pump designed to supply the reverse osmosis unit with sap and maintain pressure in the system

Pressure Pump – The pump designed to provide the pressure needed to force the sap through the reverse osmosis membrane

Pressure Vessel – The containment unit for the semi-permeable membrane

Permeate – the water removed from the maple sap during the concentrate cycle

Concentrate – the maple sap having a higher percentage of sugar because water (permeate) has been removed

Permeate Holding Tank – A tank designed to hold a minimum twice the hourly output of the system

Concentrate Cycle – Process during which water is removed from maple sap resulting in Concentrate and Permeate

De-Sugaring Cycle - Process to reclaim sugars from the membrane during which Permeate is run through the reverse osmosis unit using Concentrate cycle valve settings

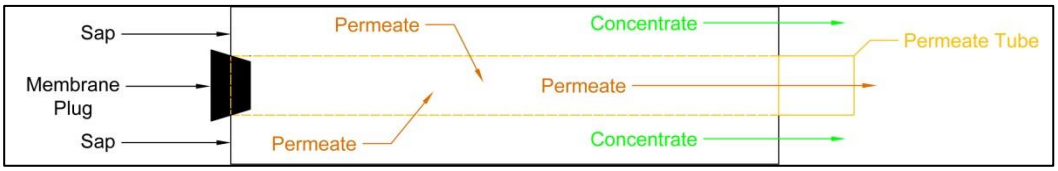
Rinse Cycle – Cleaning process of passing stored Permeate through the Reverse Osmosis system and out to drain

Chemical Wash Cycle – Process of chemical washing the membranes by recirculating a solution through the reverse osmosis system. Dependent on requirement, chemical maybe be alkali or acid.

Permeability Test – Test to determine the performance of the membranes against a benchmark

Sap Recirculation Loop – Process of recirculating output from the concentrate cycle to the raw sap tank, increasing the concentration of the sap in the tank. NOTE: This loop is not recommended for this system.

Description of Membrane



The drawing above represents the flow of liquid through a membrane in the system. The membrane is housed in a pressure vessel (not shown).

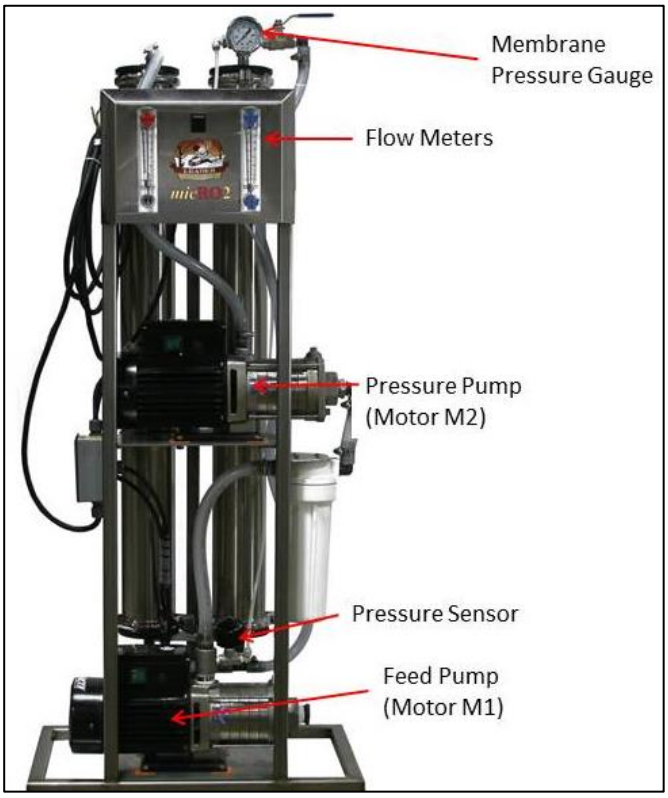
EQUIPMENT DESCRIPTION

The LEADER EVAPORATOR Springtech Reverse Osmosis System is designed to offer maximum concentration to cost performance. Through optimizing of pumps and membranes the reverse osmosis systems deliver greater flow potential to the user. The LEADER EVAPORATOR Springtech Reverse Osmosis system is designed and built using the same principles of superior quality applied to our evaporators.

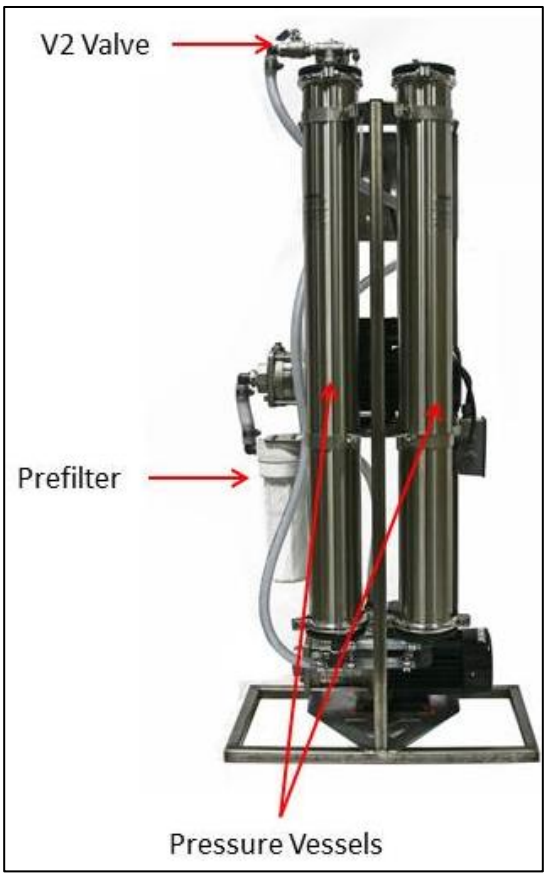
The LEADER EVAPORATOR Springtech MicRO Reverse Osmosis System is covered by a manufacturer's warranty – See ATTACHMENT #3.

NOTES:

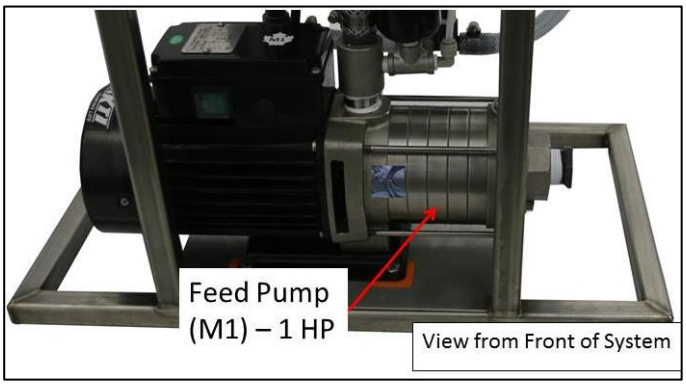
1. Pictures, sketches and drawings presented in this document are not to scale.
2. Directions (right and left) will be as facing the front of the system except where facing such parts as valves.
3. The pictures in this section are of a system with two membranes. A system with a single membrane is offered.



Front View

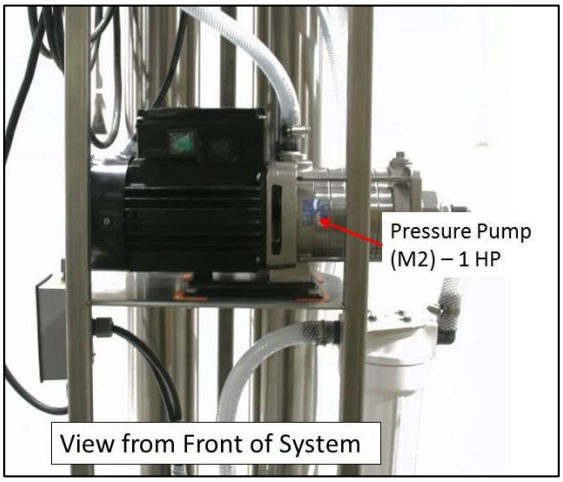


Rear View



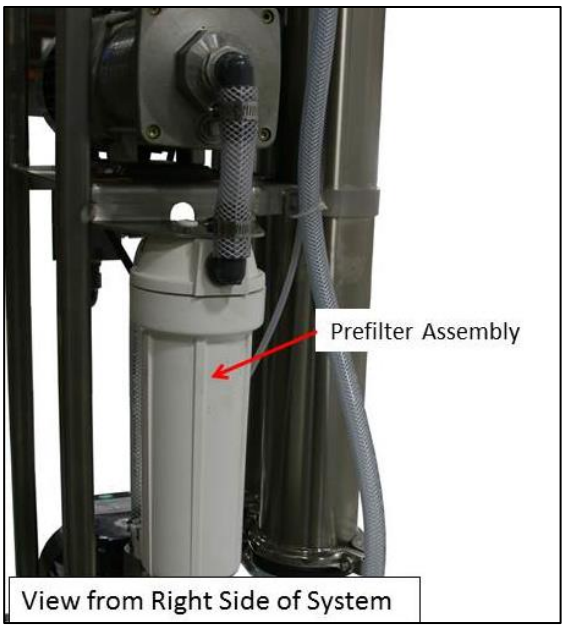
Feed Pump

Provides liquid to the system and is the first stage of pressurizing the system



Pressure Pump

Second stage of pressurizing the system required to process the sap through the membranes



Prefilter Assembly

Prefilter assembly removes contaminants prior to sap entering the membranes.

Prefilter assembly requires one 10” cartridge filter

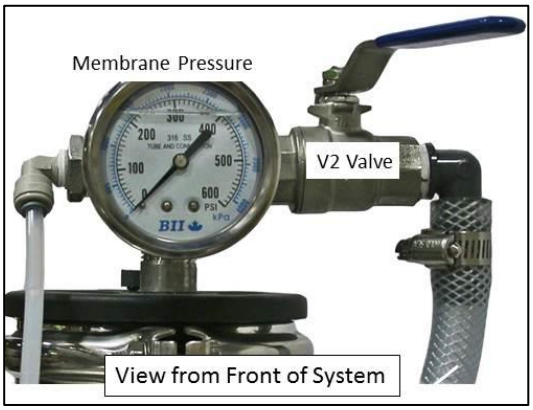
Sap is pumped from the feed pump through the prefilter then to the pressure pump.

Front Panel

The Pressure Switch activates or deactivates the functioning of the low pressure shutoff control of the system.

The Concentrate Flow Meter indicates the liquid flow, in gallons per minute, from the concentrate side of the pressure vessel(s).

The Permeate Flow Meter indicates the permeate flow, in gallons per minute, from the membrane(s).



Membrane Pressure Gauge and Control Valve

Membrane pressure is read after the last membrane.

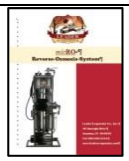
WARNING: DO NOT ALLOW THE PRESSURE ON THE MEMBRANE(S) TO EXCEED 220 psi.

V2 controls the flow from the concentrate side of the membranes. It is opened ½ way when starting then adjusted to the desired concentration level.

NOTE: If you have purchased the optional Wash Tank and Valve kit there will be references to document MAN160 which is specific to adding that kit as part of the setup. Review document MAN160 prior to proceeding with the setup as outlined in this document to determine differences in setup and operational requirements.

The Leader Springtech Reverse Osmosis system consists of the following parts:

Included Equipment

ITEM	LEADER ORDER #	DESCRIPTION / PHOTO
Springtech MicRO One Membrane Two Membrane	 70010 70012	
Springtech MicRO User Manual		

ITEM	LEADER ORDER #	DESCRIPTION / PHOTO
Springtech MicRO Quick Start Guide		

Optional Setup Equipment, Parts and Supplies

ITEM	LEADER ORDER #	DESCRIPTION / PHOTO
1" Quick Coupler C Qty: 2		
1" Stainless Steel Band Clamp		
1" Braided Hose (by the foot)		
½" PVC Plastic to Iron Adapter		
½" Stainless Steel Band Clamp		
Strainer Y 1" modified with bleeder valve	70209	
Citric Acid, 1 lb.		
Membrane Preservative, 1 lb.		
12" Sap Hydrometer		

ITEM	LEADER ORDER #	DESCRIPTION / PHOTO
1" Quick Coupler F		
1" PVC Ball Valve		
TEFLON Tape		
½" Braided Hose		
Digital Thermometer		
RO Soap 5 Lbs.		
Glycol, 1 gal.		
10" Cartridge Filter		
Long 2" Diameter Test Cup		

Digital Refractometer		
pH Meter		
Food Grade Grease		
Free Standing Leg Tank – 325 gallon – for Two Membrane RO		

Sap Refractometer		
pH Meter Replacement Probe		
Open Topped Stock Tank – 150 Gallon – for PERMEATE for Single Membrane RO	5	
MicRO Wheel Kit	700005	

SETUP

NOTES:

- 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 for such items as maintenance. It is recommended the connections be made with fittings such as quick disconnects.
- All feed piping to the system must be at least as large as the feed on the system itself – 1" is recommended
- All installations must meet applicable governmental regulations.

Area Required

The space to be used should be capable of preventing the RO system from freezing. Additionally, it will need to have adequate ventilation during operations to prevent overheating.

The dimensions of the unit are

Dimension	Standard	With Optional Kit
Width	14"	17"
Length	24"	26"
Heigth	57"	57"

A minimum of two feet around the system is recommended.

The room should have adequate drainage. The walls, ceiling and floor should be easy to clean.

Power Requirements

The system requires 220V / 1 Phase, 15 amps, 3 wire connection. All electrical work should be done by a licensed electrician and meet all local codes.

MOTOR ID	MOTOR FUNCTION	SIZE (HP)	NAMEPLATE AMPERAGE
M1	Feed Pump	1	5
M2	Pressure Pump	1	5

General Connection Layout

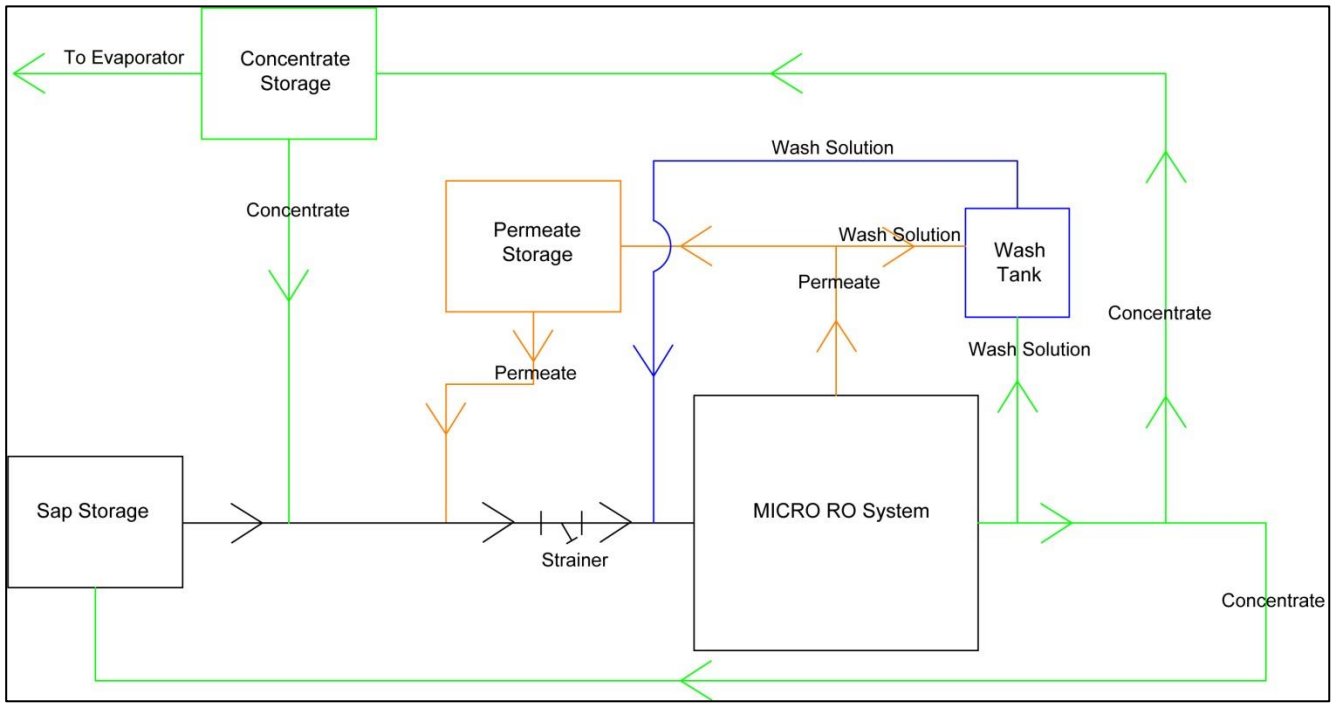
To setup the MICRO RO system, the following flows must be able to be established – Reference document MAN160 if using the Wash Tank and Valve kit;

- Sap tank to system input,
- Permeate tank to system input,
- Wash tank to system input,
- Concentrate flow meter output to concentrate tank,
- Concentrate flow meter output to wash tank,
- Permeate flow meter output to permeate tank,
- Permeate flow meter output to wash tank,
- Concentrate flow meter output to sap tank.

Hoses flowing into tanks can have open ends allowing for easy change of location from one tank to another for example move concentrate hose from concentrate tank to wash tank.

The following illustrates a generalized layout for all possible flows with the Springtech RO system. The drawing shows tank connections to the system. 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 (concentrate, recirculation, 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 LEADER EVAPORATOR salesperson or your local Distributor / Dealer for assistance in deciding the correct tanks and layout for your needs.

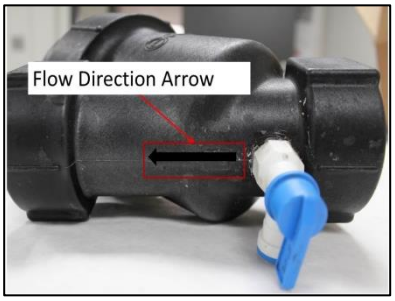
Required Flows Diagram



Green lines indicate possible flows from the Concentrate flow meter output.
Brown lines indicate possible flows from the Permeate flow meter output.
Blue line indicates flow from the Wash tank.
Black line from Sap Storage is flow of raw sap

Strainer Connection

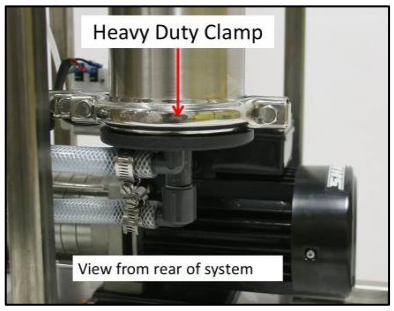
Plumbing from the supply tanks is recommended to be 1" ID. A "Y-"strainer is not supplied but is highly recommended. The strainer will prevent large contaminants from reaching the system. The connection can be made as follows:



1. Identify the flow direction through the strainer,. There is an arrow on 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. Additionally, when mounting the strainer, the spigot should be on top as it will need to be opened to bleed air from the system,

2. Install a valve before and after the Y strainer so the strainer can be removed and cleaned.

Vessel and Pump Drains



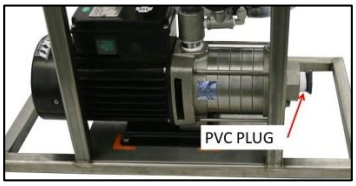
- The Membrane Vessel drains are located under the membrane vessels. To drain the vessels remove the heavy duty clamps and the caps. NOTE: Use caution when removing clamps and caps as the membrane may slide down out of the vessel as the cap is removed.

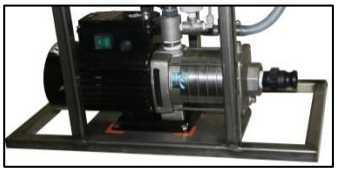
- The feed pump drain is a 7/16" stainless steel plug located on the front of the pump housing.
- Pressure pump drain is a 7/16" stainless steel plug located on the front of the pump housing.

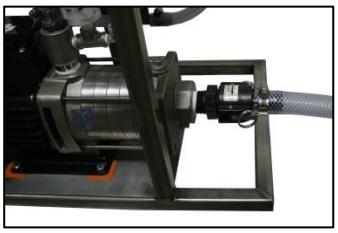
System Fluid Connections

The system connections are to be setup so the connections can be easily disconnected and reconnected as necessary. The following is the recommended connection detail. If using the optional Wash Tank and Valve Kit refer to document MAN160 for connection information. Return to this document at the OPERATION section.

System Input







1. Remove the PVC threaded plug from the end of the pump.
2. Obtain a 1" "F" style quick connector.
3. Teflon tape the threaded end.
4. Thread the "F" connector into the feed pump and tighten the connector.
5. Obtain a length of 1" braided hose that will connect to the strainer output.
6. Slide a 1" stainless steel band clamp over one end of the hose.
7. Slide the hose onto a 1" C style quick coupler and tighten the clamp over the coupler.
8. Pull the metal latches on the quick coupler out to the sides (perpendicular to the body of the quick coupler) then slide the open end of the coupler over the F style coupler on valve V6.
9. Raise the metal latches on the quick coupler back to the side of the C quick coupler while pressing the couplers together.

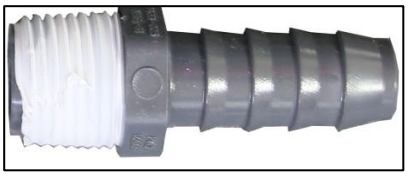
Concentrate and Permeate Outflow Connections

The connections to the outflow side of the concentrate and permeate flow meters are to ½" couplers located at the top of the meters. The connections below describe one method connecting to the flow meters. If you are frequently going to move the system and want to have added flexibility, use ½" "F" style quick connectors on the tops of the flow meters and ½" "C" style quick couplers on the ends of the hoses to be connected to the flow meters. The method below describes more permanent connection.

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

- Two ½" PVC plastic to iron adapters,
- Two (minimum) ½" Stainless Steel Band clamp,
- ½" ID braided food grade hose with length to make the connections for the Permeate and Concentrate tank. The length of each hose should be sufficient to reach the wash tank.

Concentrate Flow Meter Connection

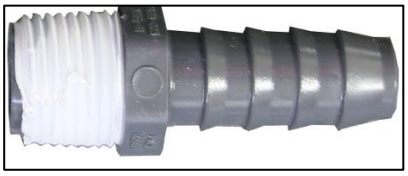


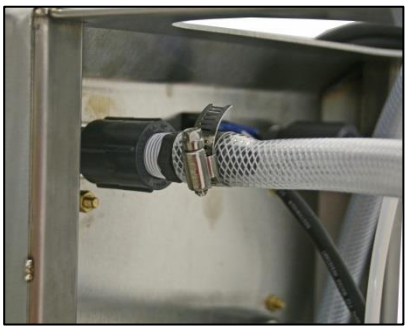
1. Teflon tape the threaded end of a ½" PVC plastic to iron adapter.
2. Thread the adapter into the top rear of the concentrate flow meter. The flow meter is on the left hand side of the front panel. Tighten the adapter.
3. Cut a length of ½" ID braided hose of sufficient length to connect to the concentrate flow meter outflow connector to the concentrate tank or the wash tank whichever length is greater.
4. Place at least one ½" stainless steel band clamp over the hose.
5. Slide the hose onto the barbed end of the ½" PVC plastic to iron adapter.

6. Position the stainless steel band clamp(s) over the hose on the adapter and tighten the band clamps.

7. Place the open end of the hose into the concentrate tank.

Permeate Flow Meter Connection





1. Teflon tape the threaded end of a ½" PVC plastic to iron adapter.

2. Thread the adapter into the top rear of the permeate flow meter. The flow meter is on the right hand side of the front panel. Tighten the adapter.

3. Cut a length of ½" ID braided hose of sufficient length to connect to the permeate flow meter outflow connector to the permeate tank or the wash tank whichever length is greater.

4. Place at least one ½" stainless steel band clamp over the hose.

5. Slide the hose onto the barbed end of the ½" PVC plastic to iron adapter.

6. Position the stainless steel band clamp(s) over the hose on the adapter and tighten the band clamps.

7. Place the open end of the hose into the permeate tank.

Wash Tank (To Be Supplied By User or the optional Wash Tank and Valve kit))

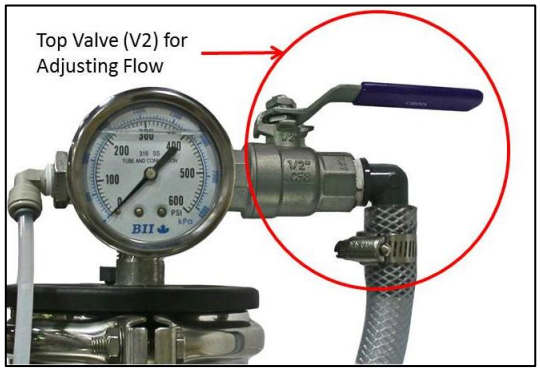
In order to properly maintain the membranes of the system, a wash cycle must be done on a periodic basis. A tank is required in which the wash solution is mixed and then circulated through the system. A wash tank is not supplied with the standard system but can purchased (part of the Wah Tank and Valve kit).

OPERATION

NOTE: Always STOP the system prior to changing the positions of any hoses.

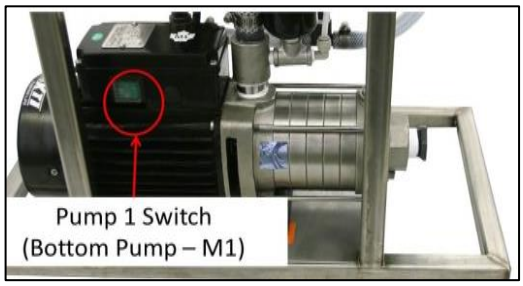
Starting the System

For any cycle to be run the following is the startup sequence.

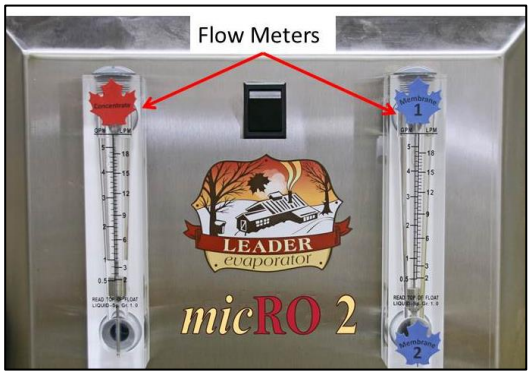


1. Open the top valve

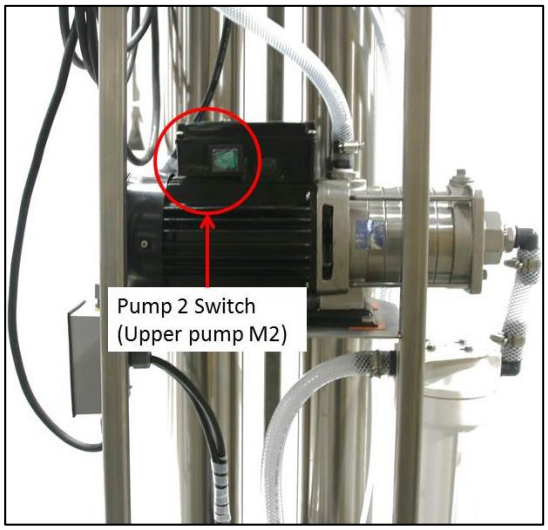
2. Place the Pressure Switch (located in the center of the front panel) in the START (Down) position.



3. Start the feed pump (bottom pump)

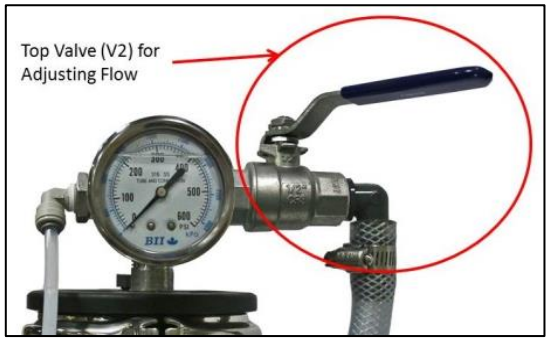


4. Run the feed pump until most of the air has been purged from the flow meters on the front of the machine.



5. Start the pressure pump (upper pump).

6. Place the Pressure Switch in the RUN (Up) position.

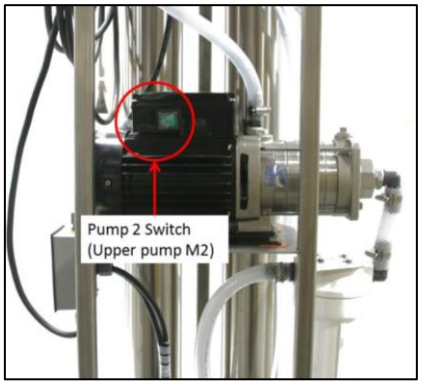


7. Using the valve on the top of the right side membrane, adjust to the desired flow rate.

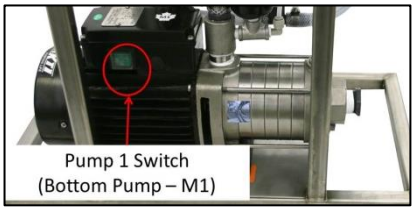
Reset For Low Pressure Shutoff

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).

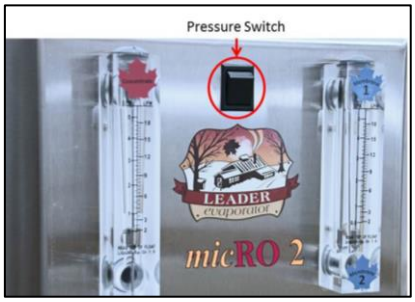
DO NOT SHUT OFF THE *PRESSURE SWITCH* BEFORE SHUTTING OFF THE PUMPS



1. Shut off the pressure pump (pump #2)

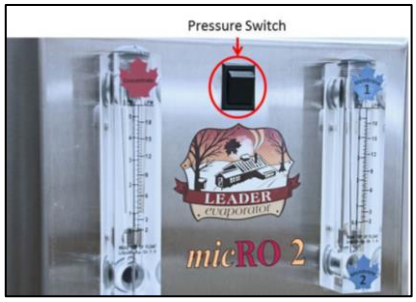


2. Shut off the feed pump (pump #1)

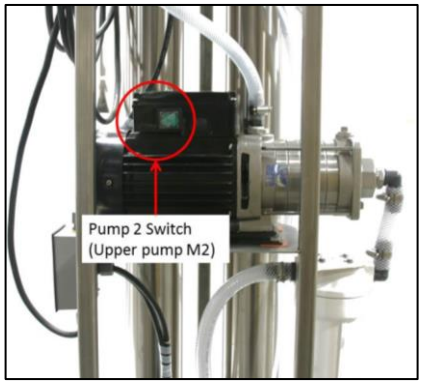


3. Place the Pressure Switch (located at the center of the control panel) in the START (Down) position.

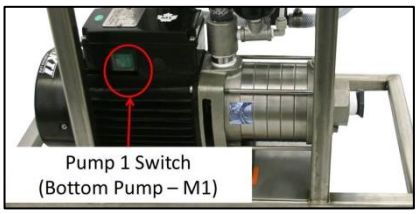
Normal Shutdown



1. Place the Pressure Switch (located at the center of the control panel) in the START (Down) position.



2. Shut off the pressure pump (pump #2)



3. Shut off the feed pump (pump #1)

Sampling

In order 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 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 Springtech MicRO has 4 defined cycles; Concentrate, Desugar, Rinse and Wash. The following table outlines 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 days 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 days 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 2.25 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 1.75 GPM to 2.00 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 Evaporator for assistance.

LOGGING DATA FOR THE PERMEABILITY TEST

To log data for the Permeability test, use the Membrane Permeability Test Sheet. A copy is attached (see Attachment #2) 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.

Performing the permeability test:

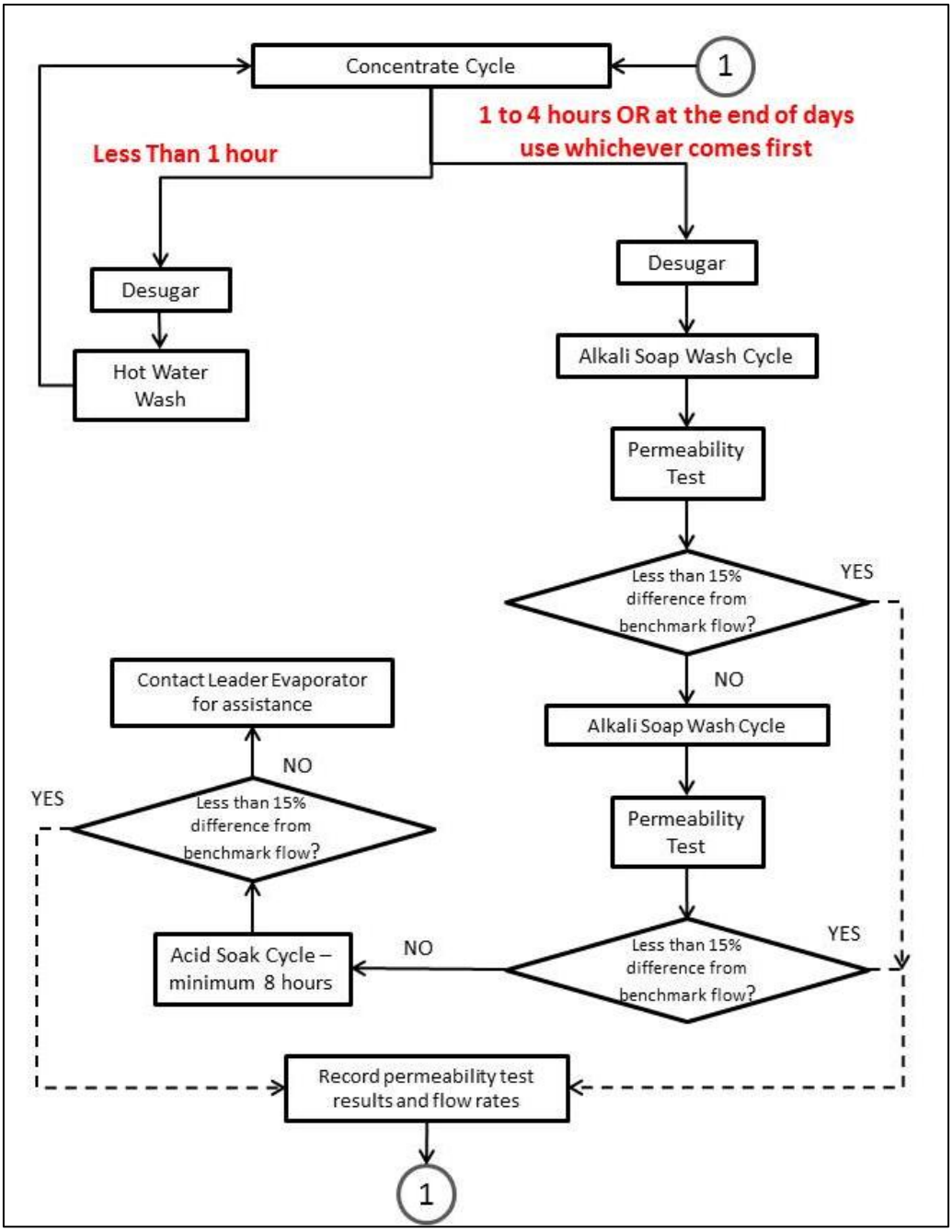
1. Perform a rinse (see page 25) then fill the wash tank ⅔ full of permeate by moving the ends of the concentrate and permeate hoses to the wash tank.
2. Set the valves in the wash cycle position (see page 26).
3. Run the system until the temperature reaches 70°F.
4. Adjust the membrane pressure to 150 psi using valve V2.
5. 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 6. 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 the flow chart on page 19.

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.

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



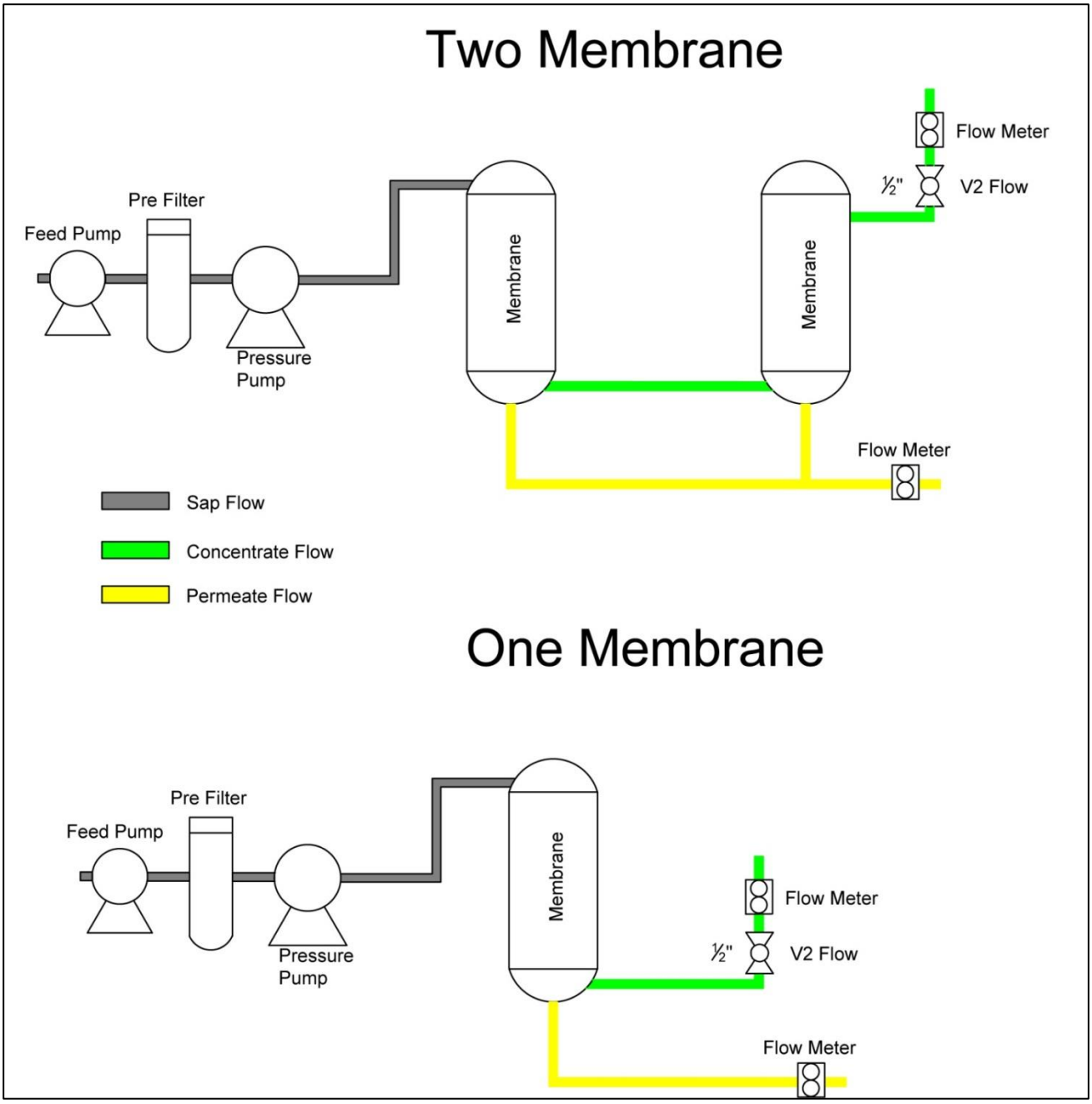
Adjusting V2 (Flow Valve) for Operations

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 220 psi.

Generalized System Schematic

The following drawings represent the parts of the systems (one membrane and two membranes). In the cycle illustrations the system will be represented as a rectangle labelled as "System". NOTE: In all the cycle drawings, the left side is the input side and the right side is the output side of the system.



Refer to document MAN160 for the Initial System Cleaning and the operations cycles (Concentrate, Desugar, Rinse and wash). Return to this document for Maintenance and Attachments.

Initial System Cleaning

To prepare the system after setup;

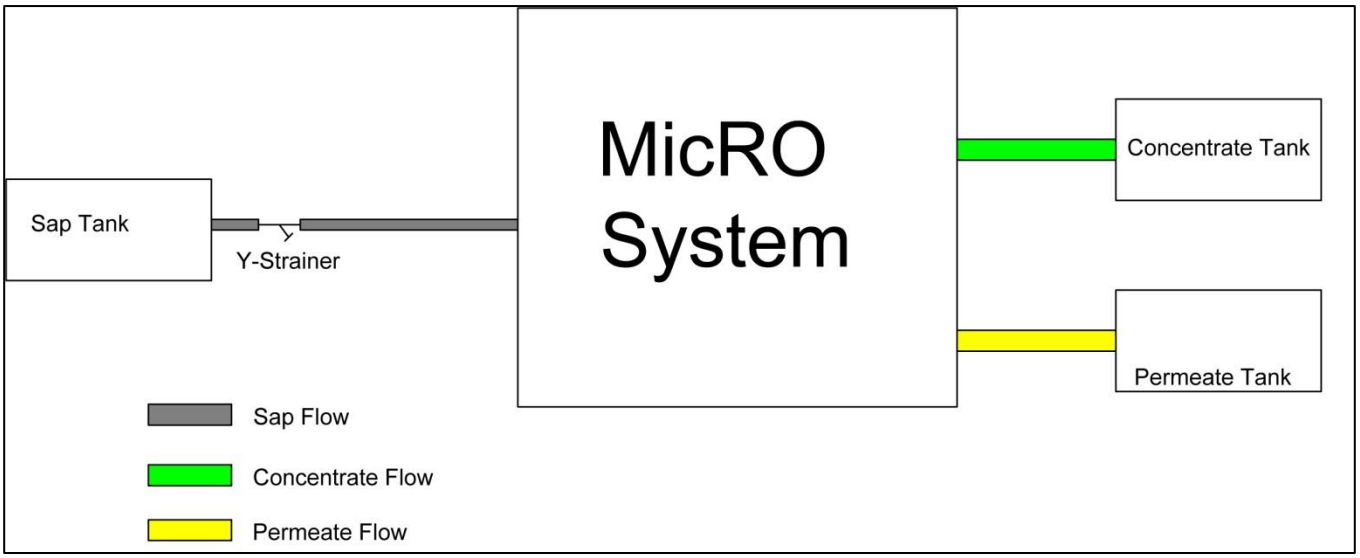
1. Put approximately 250 US gallons for a two membrane system (125 gallons for a one membrane system) of non-chlorinated well or spring water into a clean permeate storage tank.
2. Place the output hoses from the permeate and concentrate meters so they will go to drain. Place the incoming hose to the feed pump so it will draw permeate water from the permeate tank. Run a rinse cycle (see page 25) using a minimum 125 US gallons of water (63 gallons for a one membrane system) 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 flow into the wash tank. Fill the wash tank to approximately ⅔ full.
4. Mix alkaline R/O soap with the liquid in the wash tank until the required is reached. To determine the required pH, refer to the Serial Number Data Sheet that initially accompanied the system. NOTE: If the membrane(s) is (are) changed, reference the data sheet accompanying the new membrane(s).
5. Connect the wash tank to the feed pump and run an alkaline wash cycle (see page 26). Run the system until a temperature of 118°F when measured in the wash tank.
6. 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 (see page 25) using a minimum 125 US gallons of water (63 gallons for a one membrane system) from the permeate tank. Run the benchmark permeability test (see page 18).

Concentrate Cycle

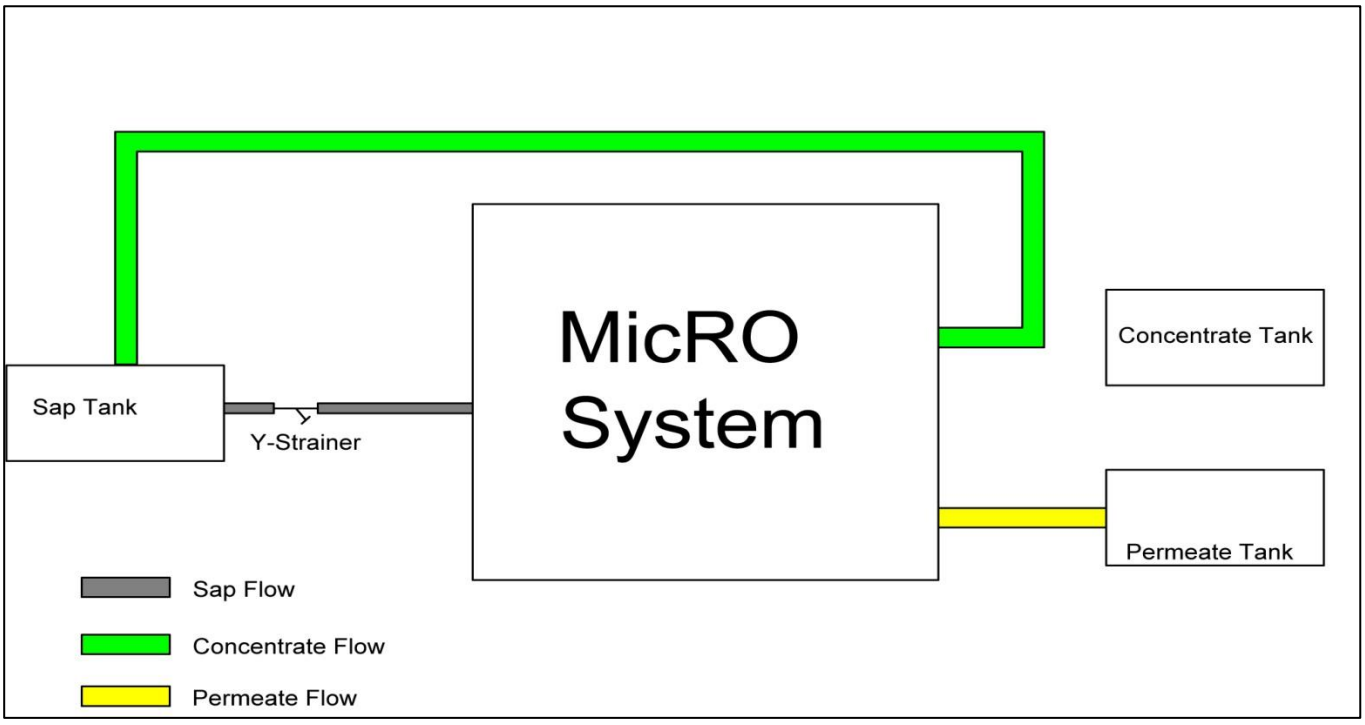
In this cycle the system inputs sap or pre-concentrated sap and cycles it through the membrane(s) resulting in a concentrated liquid (concentrate) and the water being removed (permeate).

There are two output options within the Concentrate Cycle. The first is to direct the concentrate to the concentrate tank. This is called the Concentrate Cycle. The second is to direct the concentrate to the sap tank – this is called the Sap Recirculation Loop. **NOTE: Recirculation of this type is not recommended for this system as it will foul the membranes more quickly than normal operation.**

Standard Concentrate Cycle

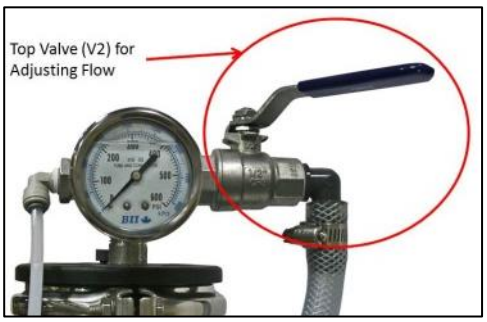


Recirculation Output



Concentrate Cycle Settings / Positions – also available on the Quick Start Guide

1. Position V2 valve and the hoses as follows:



V2 – Open a minimum of ½ way to start
then adjust to the desired
concentration level or flow.

- Place the output end of the concentrate hose into the concentrate tank. If doing Recirculation, place the end of the concentrate hose into the Sap tank.
- Place the output end of the permeate hose into the permeate tank.
- Connect the input side of the strainer to the sap tank.

2. Place the Pressure Switch (located in the center of the front panel) in the START (Down) position.

3. Start the feed pump (bottom pump)

4. Run the feed pump until most of the air has been purged from the flow meters on the front of the machine.

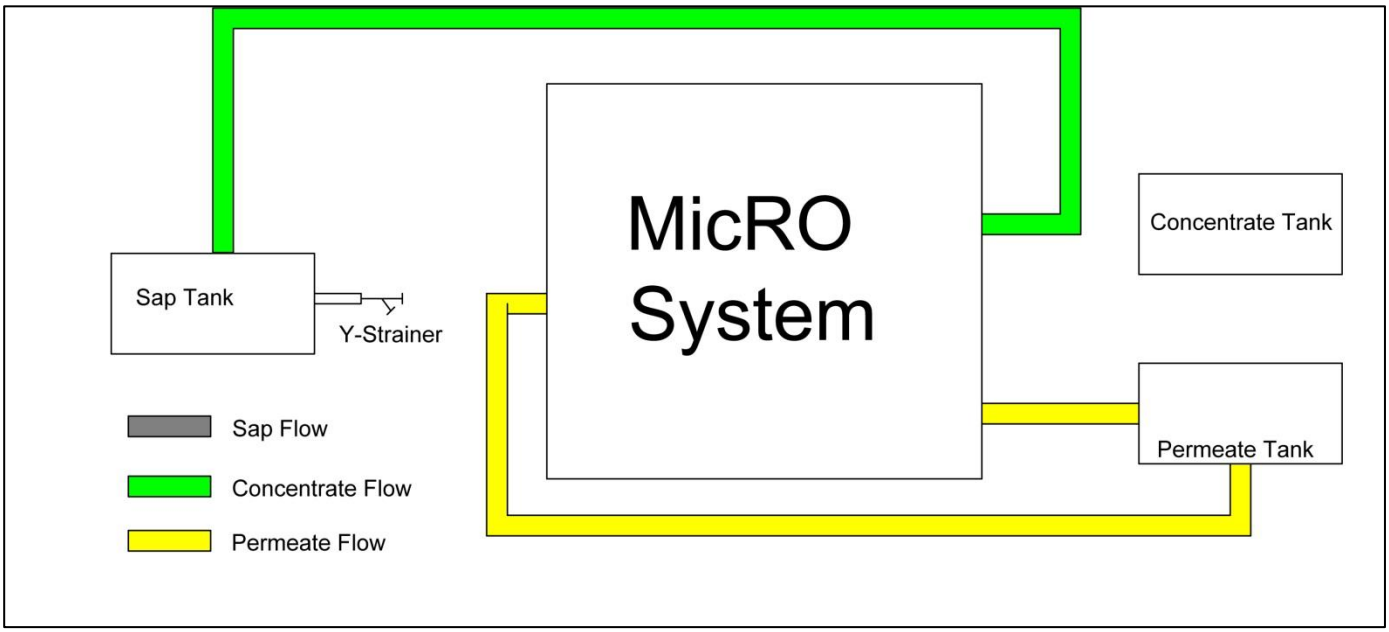
5. Start the pressure pump (upper pump).

6. Place the Pressure Switch in the RUN (Up) position.

7. Using the valve on the top of the right side membrane, adjust to the desired flow rate.

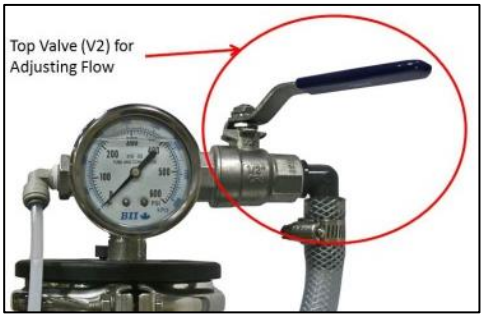
Desugar Cycle

In this cycle the permeate is run in a concentrate cycle to flush accumulated sugar from the membranes.



Desugar Cycle Settings / Positions – also available on the Quick Start Guide

1. Position V2 valve and the hoses as follows:



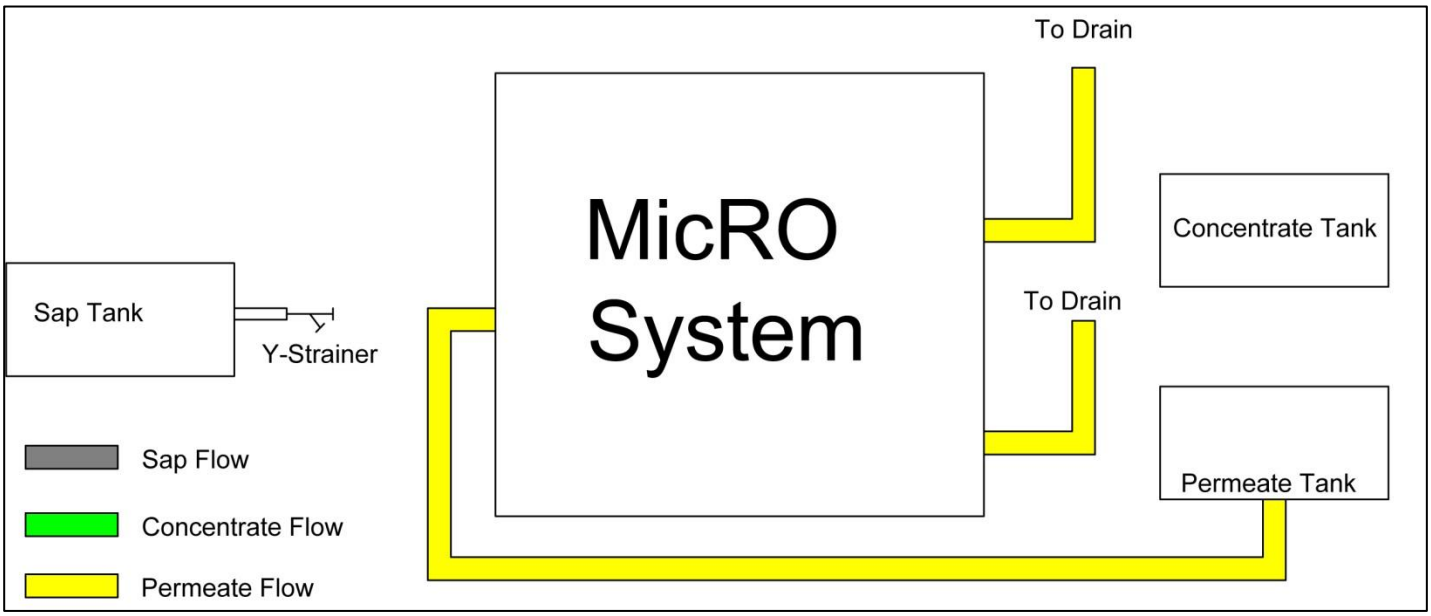
V2 – Leave where set during the concentration cycle.

- 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.

2. Place the Pressure Switch (located in the center of the front panel) in the START (Down) position.
3. Start the feed pump (bottom pump)
4. Run the feed pump until most of the air has been purged from the flow meters on the front of the machine.
5. Start the pressure pump (upper pump).
6. Place the Pressure Switch in the RUN (Up) position.
7. Using the valve on the top of the right side membrane, adjust to the desired flow rate.
8. Check the sugar % coming from the concentrate hose every five minutes. Run the Desugar cycle until the sugar % is down to approximately ½%.
9. Run a rinse cycle (see page 25).

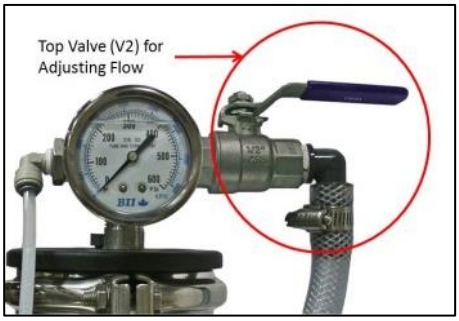
Rinse Cycle

In this cycle permeate is run through the system at high volume and low pressure to rinse sugar, minerals and bacteria from the R/O. A rinse cycle is required before and after every wash cycle. At least 125 US gallons of permeate for a two membrane system (63 gallons for a single membrane system) 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.



Rinse Cycle Settings / Positions – also available on the Quick Start Guide

1. Position V2 valve and the hoses as follows:



V2 – Open completely.

- 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.

2. Place the Pressure Switch (located in the center of the front panel) in the START (Down) position.
3. Start the feed pump (bottom pump)
4. Run the feed pump until most of the air has been purged from the flow meters on the front of the machine.
5. Start the pressure pump (upper pump).
6. Place the Pressure Switch in the RUN (Up) position.
7. When the machine has started, run the rinse cycle (see page 25) until a minimum of 125 US gallons for a 2 membrane system (63 gallons for a single membrane system) of permeate has been processed. If the Rinse is to be followed by a Wash Cycle, at the end of the rinse, fill the wash tank ⅔ full by placing the concentrate and permeate hoses into the wash tank.

Wash Cycle

There are three different wash cycles. A hot water wash which can be run when good clear sap was processed and the flows are still good. An alkaline soap wash is done to remove bacteria from the system. 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.

Hot Water Wash

1. Perform a rinse cycle (see page 25) using a minimum of 125 US gallons of permeate for a two membrane system (63 gallons for a single membrane system) stored for system rinsing.
2. Toward the end of the rinse cycle, place the end of the permeate and concentrate hoses into the wash tank. When the wash tank is ⅔ full shut off the system.
3. Position the hoses as listed below. Start and run the system until the temperature in the wash tank reaches 118°F.
4. Perform a Rinse cycle (see page 25) using a minimum of 125 US gallons for a two membrane system (63 gallons for a single membrane system) of stored permeate water.

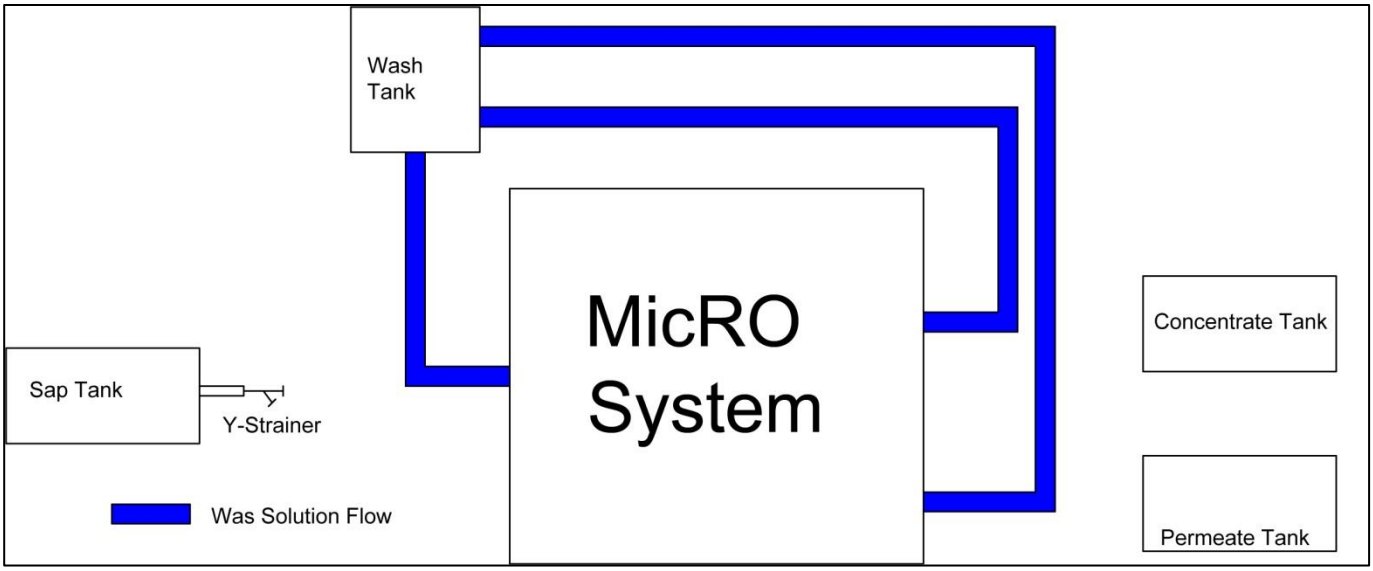
Alkaline Soap Wash

1. Perform a rinse cycle (see page 25) using a minimum of 125 US gallons of permeate for a two membrane system (63 gallons for a single membrane system) stored for system rinsing.
2. Toward the end of the rinse cycle, place the end of the permeate and concentrate hoses into the wash tank. When the wash tank is ⅔ full shut off the system.
3. At the completion of the rinse cycle, add R/O soap (LEADER Order # 69992) to the wash tank and mix. Add R/O soap until the required pH is reached. To determine the required pH, refer to the Machine Serial Number Data Sheet that initially accompanies the system. NOTE: If the membrane(s) was (were) changed, refer to the data sheet that accompanied the new membrane(s).
4. Check the pH of the wash solution every 15 minutes. Maintain the pH by adding soap as needed.
5. Position the hoses as listed below. Start and run the system until the temperature in the wash tank reaches 118°F.
6. Perform a rinse cycle (see page 25) using a minimum of 125 US gallons of permeate for a two membrane system (63 gallons for a single membrane system) stored for system rinsing.
7. Disconnect the wash tank from the feed pump and drain the wash tank.

Acid Soak

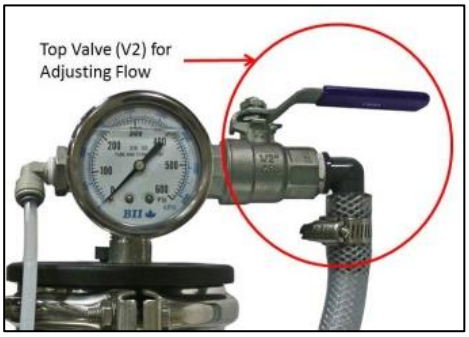
NOTE: ***ONLY*** citric acid is to be used in this system.

1. Perform an alkaline Soap wash as listed above.
2. Toward the end of the rinse cycle (following the wash), place the end of the permeate and concentrate hoses into the wash tank. When the wash tank is ⅔ full shut off the system.
3. Add ⅓ cup of citric acid to the wash tank and mix.
4. Run a wash cycle until the temperature in the wash tank reaches 118°F.
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 (see page 25) using a minimum of 125 US gallons of permeate for a two membrane system (63 gallons for a single membrane system) stored for system rinsing.
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 (see page 25) using a minimum of 125 US gallons of permeate for a two membrane system (63 gallons for a single membrane system) stored for system rinsing.



Wash Cycle Settings / Positions – also available on the Quick Start Guide

1. Position V2 valve and the hoses as follows:



V2 – Open completely.

- 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.

2. Add the chemical to be used into the wash tank for the type of wash to be performed. Ensure the wash tank has been filled first.
3. Place the Pressure Switch (located in the center of the front panel) in the START (Down) position.
4. Start the feed pump (bottom pump)
5. Run the feed pump until most of the air has been purged from the flow meters on the front of the machine.
6. Start the pressure pump (upper pump).
7. Place the Pressure Switch in the RUN (Up) position.
8. Run the wash cycle as specified above; Acid Soap Wash, Acid Soak.
9. Stop the system.
10. Do a permeability test (see page Permeability Test
11. If the test is good, continue to rinse with any additional permeate.

MAINTENANCE

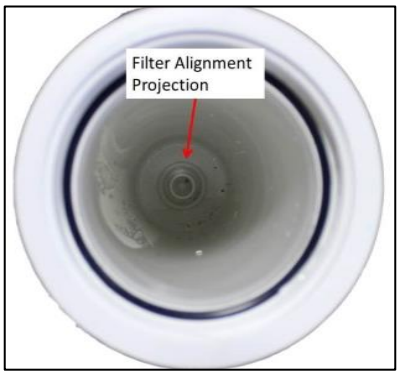
Pre Filters

The following steps outline the procedure for changing the prefilter.

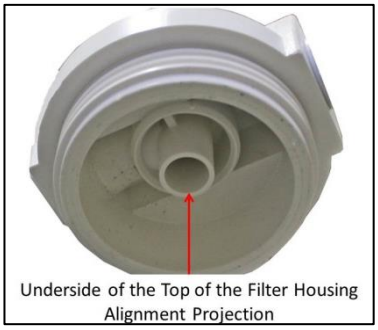
1. Close the valve from the Y-strainer or disconnect the source tank from the feed pump.
2. Loosen and remove the lower portion of the filter housing.
3. Empty the liquid from the housing.

4. Remove the filter from the housing.

5. Wipe the O-rings of the top of the assembly then lubricate with permeate or non-chlorinated well or spring water.



6. Rinse out the housing. Insert a new filter into the housing aligning one of the open ends over the alignment projection.

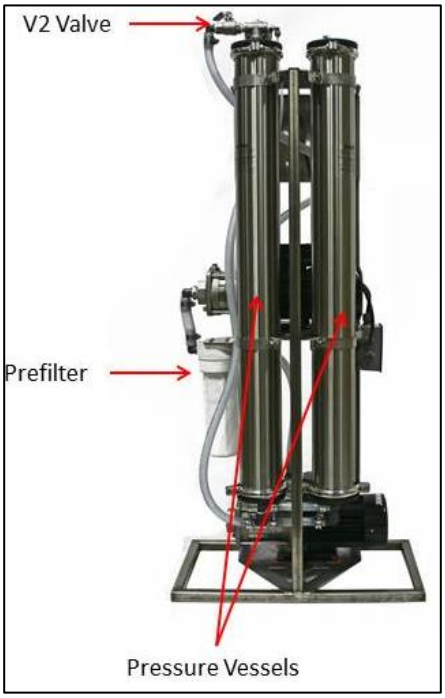


7. Bring the lower filter housing, with the filter installed, up to the underside of the top of the filter housing on the system. Carefully align the open top of the filter with the alignment projection in the top of the filter housing. Thread the bottom of the housing onto the top of the housing and 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.

The LEADER Springtech MicRO will have either one or two membranes. If it is a two membrane system, both membranes should be removed during the process.

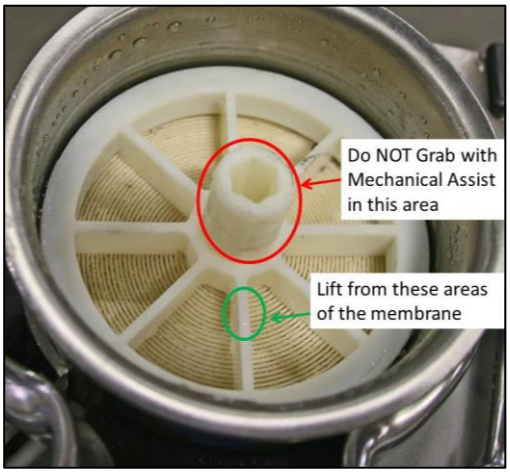


Removal

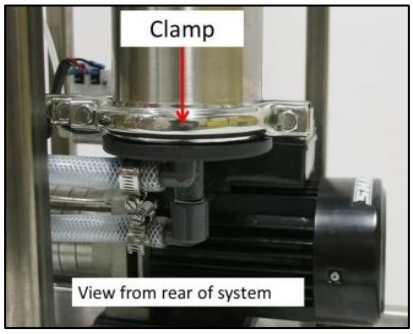
1. Remove the clamps securing the vessel covers by removing the bolts from each side of the clamp.

2. Lift the cover off each of the vessels.

3. Grasp and lift the membrane from the vessel #2, if a two membrane system. Remove the membrane from the single vessel in a one membrane system. 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.



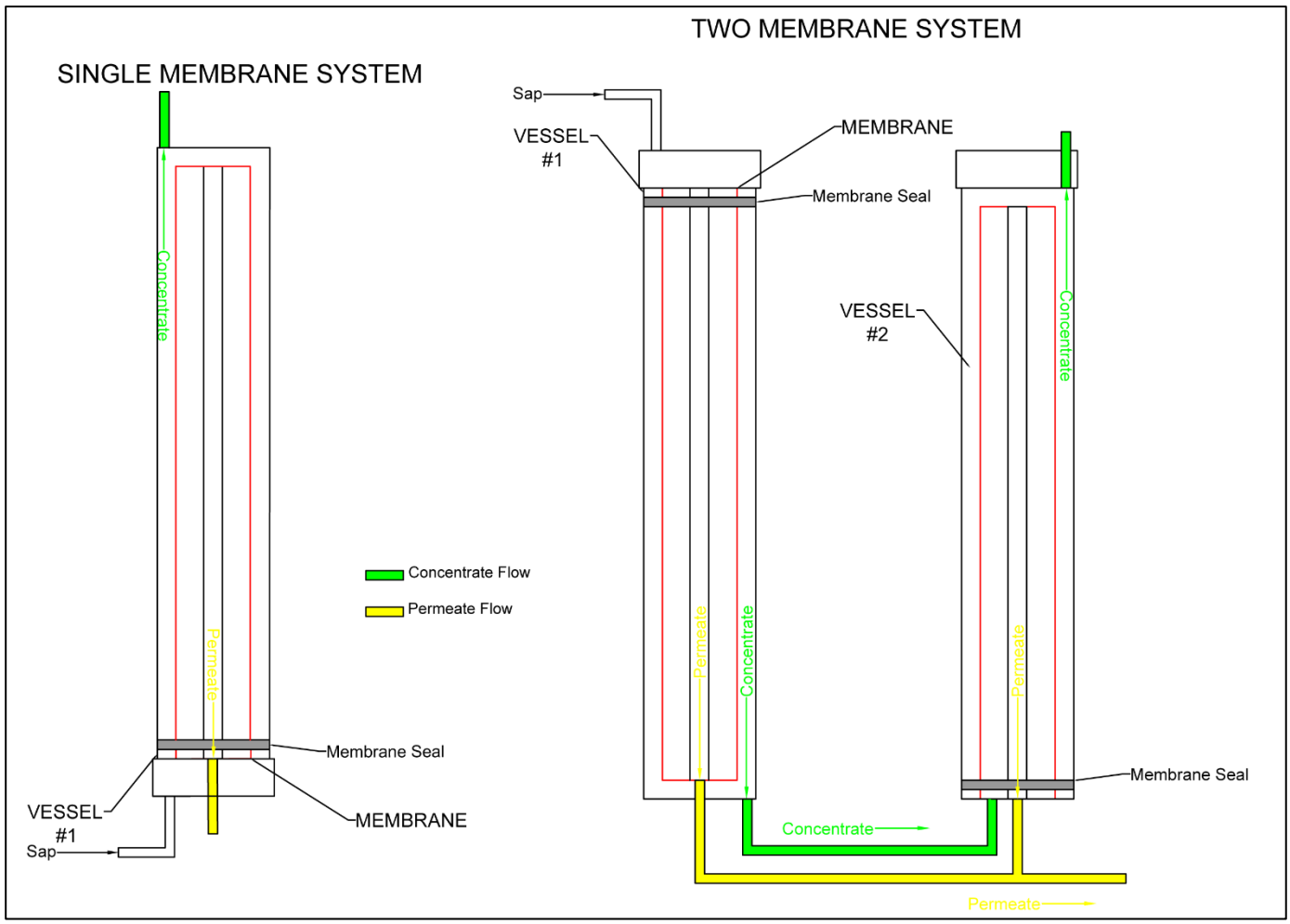
4. Grasp and slowly lift the membrane out of vessel #1, if a two membrane system.



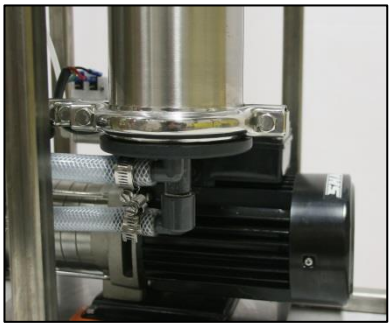
5. To drain the vessels, remove the clamp and cap at the bottom of each of the vessels.

Installation

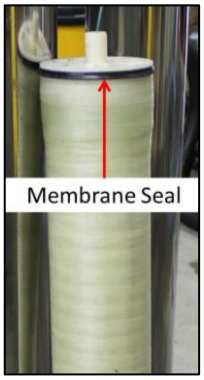
When installing the membrane(s) it is important they are oriented correctly. Flow through and from the membranes must be properly directed for the system to work properly. Permeate flows from the interior of the membrane. Concentrate flows external to the membrane. The seals on the ends of the membranes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



1. Inspect the seals on the vessel caps – top and bottom. Replace the seals if damaged or leaks had been noticed. Lubricate the seals with permeate or non-chlorinated well or spring water.



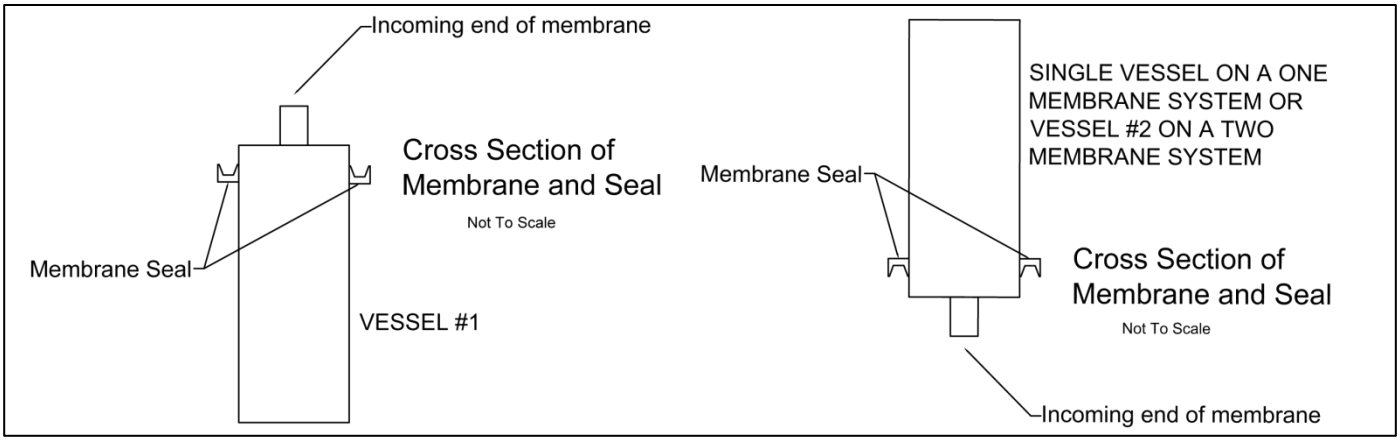
2. Insert the bottom vessel caps into the vessels and secure with the clamps.

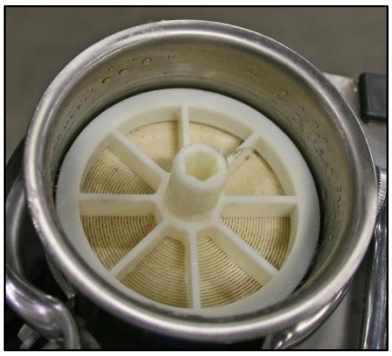


3. Inspect and replace the membrane (brine) seal, if necessary on each membrane. Lubricate the seals with permeate or non-chlorinated well or spring water.

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.





4. Insert a membrane into vessel #1 (vessel #1 if a single membrane system). The end with the seal will go into the vessel last and the seal will be at the top of the vessel when in place. Use caution when installing the membrane – ensure the seal remains in the grooves of the membrane as it enters the vessel. If necessary, lubricate the seal with permeate or non-chlorinated well or spring water.

5. Insert a membrane into vessel #2 if a two membrane system. The end with the seal will go into the vessel first and will be at the bottom of the vessel when in place. Use caution when installing the membrane – ensure the seal remains in the grooves of the membrane as it is installed in the vessel.

6. Insert the vessel caps into the top of the vessels and secure with the clamps. The cap with valve V2 and the pressure gauge will go on vessel #2 of a two membrane system (on the single vessel on a single membrane system).

Daily

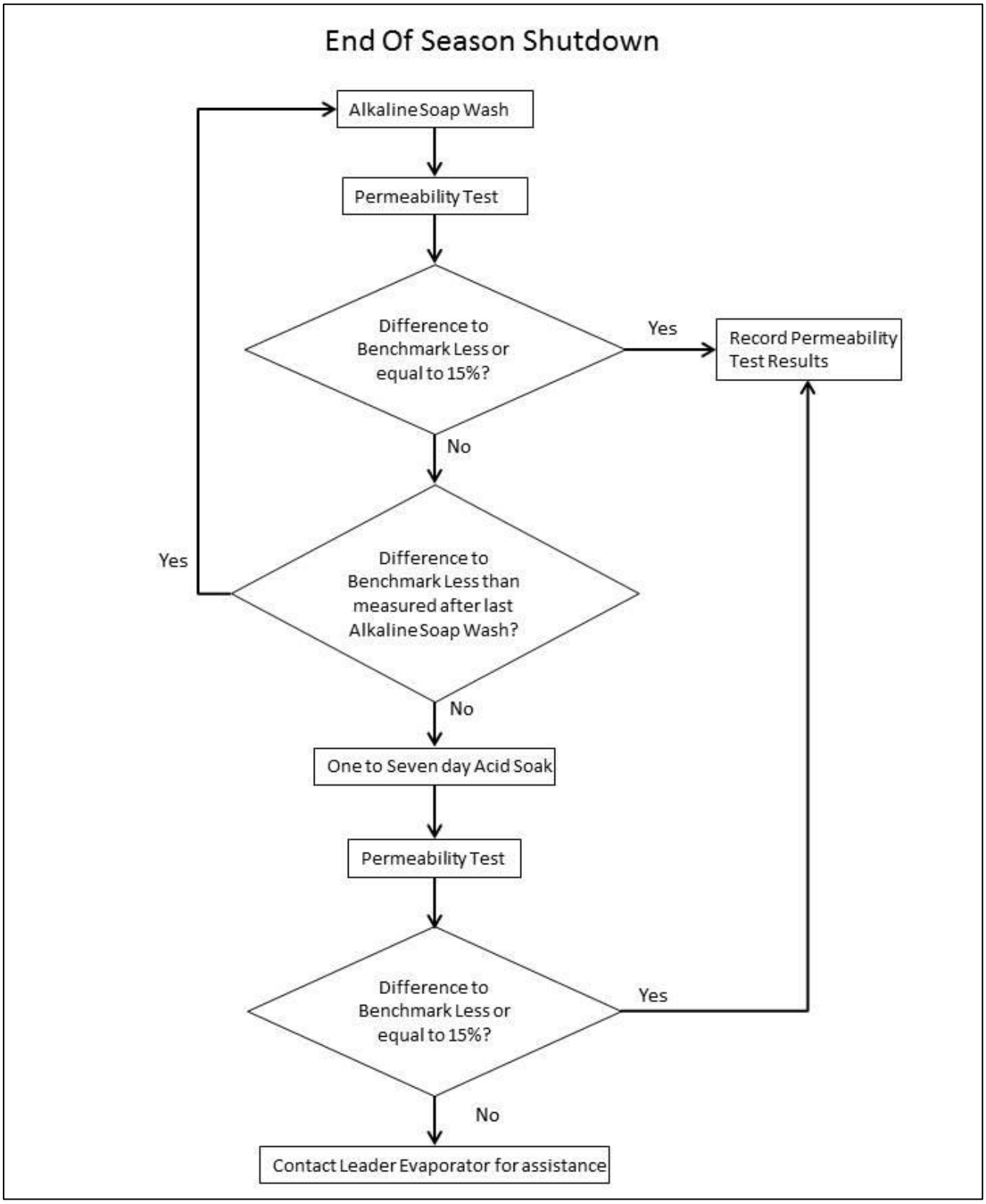
Each day, it is recommended the following be done:

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 Y-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 there is a possible problem with the membrane O-rings or alignment coupling. Check the troubleshooting chart.
4. Check all hoses, piping, fittings and connections for leaks. Repair as necessary.
5. Run a cycle of Desugar (see page 24) and Alkaline Soap Wash (see page 26)
6. Do a Permeability test (see page 18)
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 stated in the following procedure, obtain the necessary volume of water using 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 (see page 26).
2. Run a permeability test. 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 (see page 26) allow the machine to soak for 1 to 7 days starting the system on the first day and allowing it to run to a temperature of 118°F. Run the system to temperature the same way on the last day of the cycle. Run a permeability test (see page 18).
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. 3 US gallons of permeate
    b. ½ US gallons of glycol
    c. ½ teaspoon of membrane preservative
7. Set the system valves for a wash cycle (see page 26) 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.

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 (see page 25).
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 (see page 25) until a minimum of 125 US gallons for a 2 membrane system (63 gallons for a single membrane system) of water have been processed. Near the end of the rinse cycle move the concentrate and permeate outflows to the wash tank and fill the wash tank ⅔full.
10. Run a hot water wash cycle (see page 26).
11. Repeat the rinse cycle (see page 25) again filling the wash tank as specified then add R/O soap (LEADER Order # 69992) to the wash tank and mix. Add R/O soap until the required pH is reached. To determine the required pH, refer to the Machine Serial Number Data Sheet that initially accompanied the system. NOTE: If the membrane(s) was (were) changed, refer to the data sheet for the new membrane(s).

12. Run an alkaline wash cycle (see page 26).
13. Disconnect and drain the wash tank then close the wash tank drain valve.
14. Perform a permeability test (see page 18).
    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 EVAPORATOR 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 pressed	No power	Verify power is "ON" at the source.
		Ensure pressure switch is in the Start (Down) position
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 LOGSHEET

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

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

SPRINGTECH MicRO 2 OPERATIONS DATA

	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								

ATTACHMENT #2 – MEMBRANE PERMEABILITY TEST SHEET

MEMBRANE PERMEABILITY TEST SHEET

Customer Name	Model	Machine Serial #
	***Mic* RO**	

Membrane Location	Membrane Manufacturer	Membrane Serial #

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

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

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

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Leader Evaporator Manufacturer's Warranty For Springtech Reverse Osmosis Machines

Leader Evaporator Co., Inc. warranties our Springtech line of Reverse Osmosis Machines against any manufacturer defects for a period of two years from the date of purchase. This warranty is at the discretion of the manufacturer, Leader Evaporator Co., Inc., to be replaced or repaired, as necessary. All replaced parts become the manufacturer's property. Leader Evaporator Co., Inc. shall not be held responsible for any damage or injury arising from negligence, abuse, improper handling or installation.