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Extreme

Built By: Leader Evaporator Co., Inc.

EXTREME HC-8 Reverse Osmosis System



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INTRODUCTION

A Leader Evaporator Springtech EXTREME Reverse Osmosis system is designed to significantly improve the producer's productivity by generating high 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 resulting in fuel and time savings.

Some of the features of the Springtech EXTREME HC-8 are:

- Easy accessibility to pumps and membranes
- Stainless steel frame, membrane housings, pumps and pump housings
- Ability to reverse the flow of the system
- Fast wash cycle
- With reasonable sap – the ability to generate high brix concentrate with a single pass
- Flow meters for the permeate of each membrane and one for the system concentrate

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 Unit – 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 – Purified 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

Reverse Flow Concentrate Cycle – Concentrate cycle in which the flow through the system is reversed allowing more even use of the membranes

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

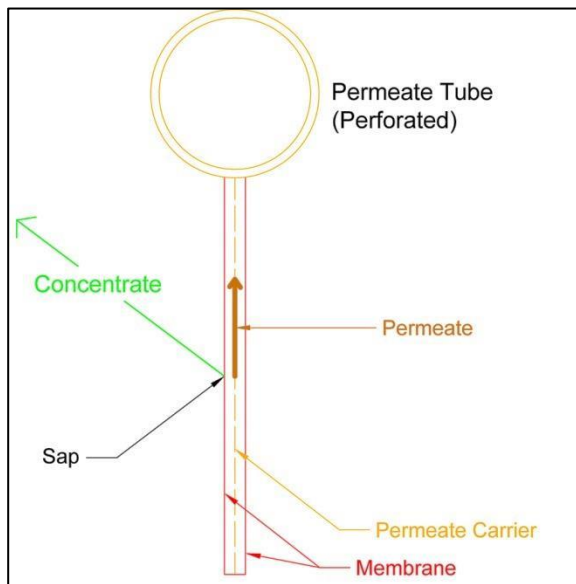
Rinse Cycle – Cleaning process of passing stored Permeate through the Reverse Osmosis system and out to drain

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

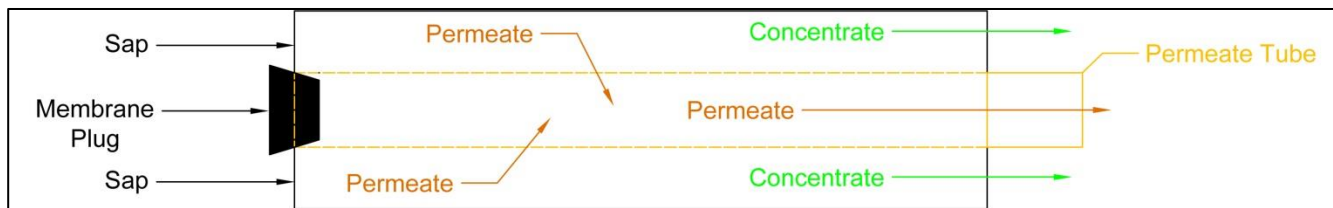
Sap Concentration Loop – Process of recirculating output from the concentrate cycle to the raw sap tank, increasing the concentration of the sap in the tank

Description of Membrane



The basic units of the reverse osmosis membrane are described in the *cross section* drawing.

- Attached to the permeate tube is a membrane unit consisting of a permeate carrier between two membranes.
- There are a number of these membrane units attached around the outside of the permeate tube.
- Between each of the membrane units is a spacer through which the sap and concentrate can flow.
- The permeate tube is perforated so the permeate can be collected from the membrane unit.
- At each unit as the sap is pressurized, the permeate can flow through the membrane and be carried to the permeate tube. The concentrate cannot penetrate the membrane and is pushed out the membrane assembly.
- The membrane units are wound around the permeate tube and an outside support structure is placed around the wound assembly.



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

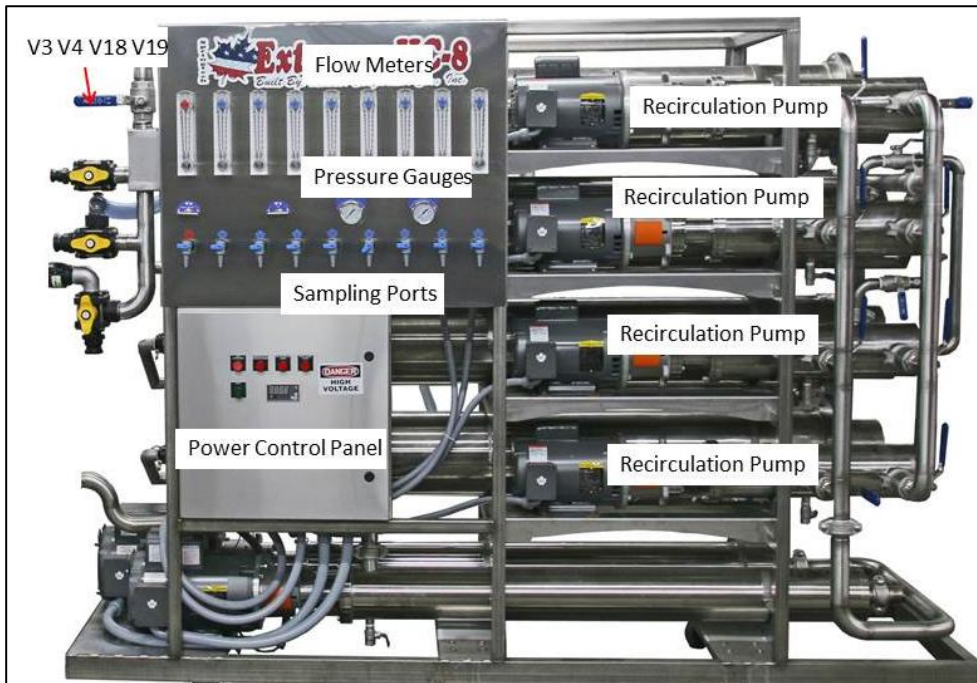
EQUIPMENT DESCRIPTION

The LEADER EVAPORATOR Springtech EXTREME 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 EXTREME Reverse Osmosis system is designed and built using the same principles of superior quality applied to our evaporators.

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

NOTES:

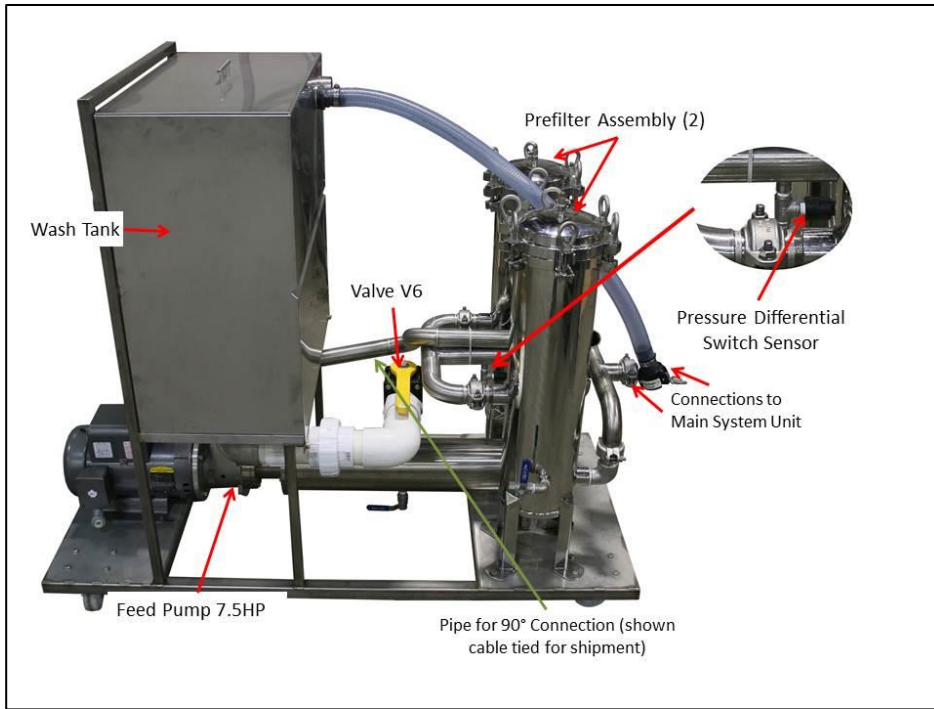
1. Pictures, sketches and drawings presented in this document are not to scale.
2. Directions (right and left) will be as facing the front of the system.
3. The feed pump, pre filters and wash tank are mounted as a separate unit to be attached to the main system.



Front View



Rear View

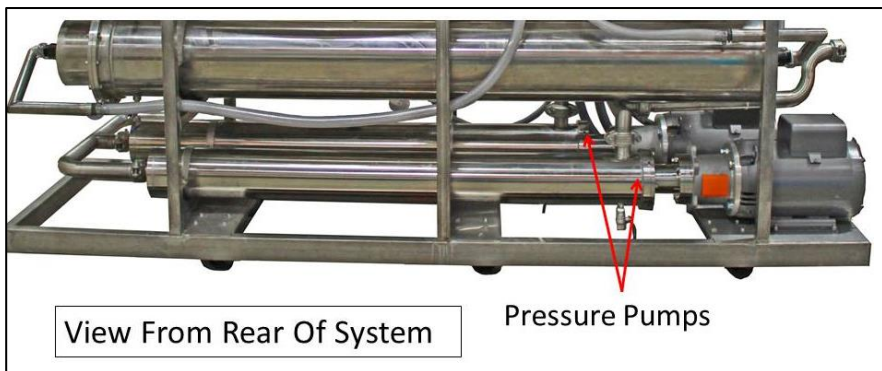


Feed Pump, Pre Filter, Wash Tank Unit

Feed Pump provides liquid to the system and is the first stage of pressurizing the system

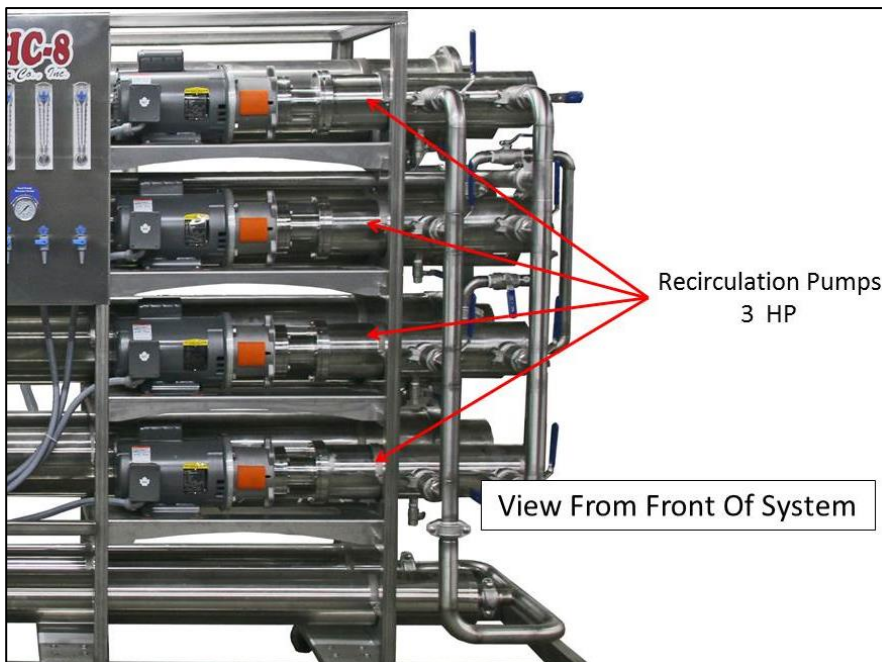
Prefilter requires (5) - 20" cartridge filters for each housing

Wash tank is used to mix the chemical solution for cleaning the system.



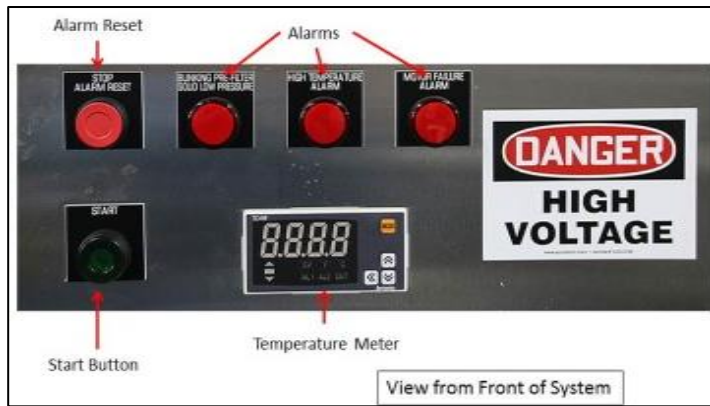
Pressure Pumps

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



Recirculation Pumps

Recirculates liquid within the vessel to which they are attached.



Control Panel

Start button when pressed starts the system pumps in sequence.

The STOP or STOP / ALARM RESET button is a master reset for all the alarms and will stop the machine when pressed.

The Temperature Meter indicates the temperature of the liquid flowing through the system.

Pressure Alarm indicates a pressure condition in the system related to the pressure pump requirements. The alarm light may be solid (low pressure) or blinking (prefilter). This alarm can be part of normal operations. The machine will shut down when the indicator light is activated.

High Temperature Alarm indicates the Wash cycle has completed. This alarm is part of normal operations. The machine will shut down when the alarm light is on.

Motor Failure Alarm is due a motor contactor tripping. Contact Leader Evaporator.



Flow Meters

The Concentrate Meter indicates the liquid flow from the concentrate side of the pressure vessels in gallons per minute.

The Permeate Meters indicate the permeate flow from each membrane in gallons per minute.



Pressure Gauges

Feed pump pressure is read after the prefilters.

Membrane pressure is read after the last membrane.

WARNING: DO NOT ALLOW THE OPERATING PRESSURE TO EXCEED 550 psi.



Sampling Ports

Concentrate port is used to sample the liquid concentrate to determine the sugar percentage.

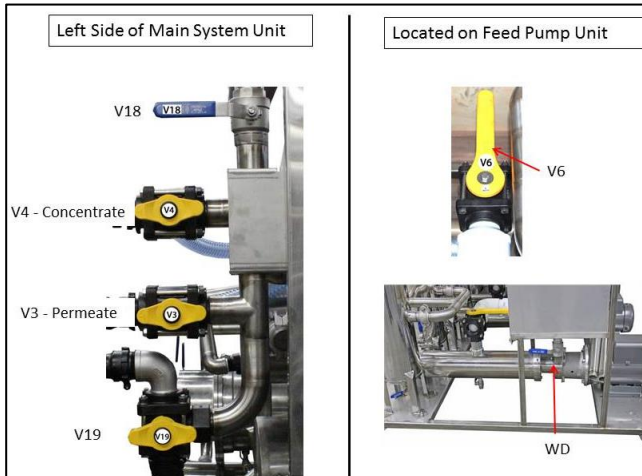
The Permeate ports are used to sample the permeate from the membranes to determine if they are allowing sugar to pass through.



V1 and V2 Valves

V1 controls the pressure to the membranes. It is opened ½ way when starting then adjusted to reach the pressure wanted. Close V1 to raise the pressure in the system.

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.



Flow Control Valves

These valves control the flow of liquid through the system

V3 – Permeate flow

V4 – Concentrate flow

V6 – Feed flow

V18 – Cleaning or Concentrate flow

V19 – Drain or Wash Tank

MEMBRANE FLOW

V41, V41 BYPASS, V42, V43, V44, V44 BYPASS

V51, V52, V53, V54



VALVE	TYPE	HANDLE POSITION	LIQUID FROM - TO	HANDLE POSITION	LIQUID FROM-TO
V3	3 - Way	HANDLE POINTED LEFT	Membranes to Permeate out	HANDLE POINTED RIGHT	Membranes to Valve V19
V4	3 - Way	HANDLE POINTED LEFT	Membranes to Concentrate out	HANDLE POINTED RIGHT	Membranes to Valve V19
V6	3 - Way	HANDLE TOWARD INCOMING PIPE	External to Feed Pump	HANDLE TOWARD WASH TANK PIPE	Wash Tank to Feed Pump
V18	2 - Way	HANDLE POINTED HORIZONTAL	No Flow	HANDLE POINTED VERTICAL	Membranes to Valve V19












VALVE	TYPE	HANDLE POSITION	LIQUID FROM - TO	HANDLE POSITION	LIQUID FROM-TO
V19	3 - Way	HANDLE POINTED VERTICAL	Membranes to Wash Tank	HANDLE POINTED HORIZONTAL	Membranes to Drain
BP	2 - Way	HANDLE POINTED HORIZONTAL	No Flow	HANDLE POINTED VERTICAL	Membrane to Membrane
WD	2 - Way	HANDLE POINTED HORIZONTAL	Recirculation to feed pump	HANDLE POINTED VERTICAL	Wash Tank Drain
V41	2 - Way	HANDLE POINTED VERTICAL	No Flow	HANDLE POINTED HORIZONTAL	Liquid from Pressure Pump into Recirculation Pump
V41 Bypass	2 - Way	HANDLE POINTED FORWARD	No Flow	HANDLE POINTED RIGHT	Liquid from lower pressure vessel to upper pressure vessel
V42	2 - Way	HANDLE POINTED VERTICAL	No Flow	HANDLE POINTED HORIZONTAL	Liquid from Pressure Pump into Recirculation Pump
V43	2 - Way	HANDLE POINTED VERTICAL	No Flow	HANDLE POINTED HORIZONTAL	Liquid from Pressure Pump into Recirculation Pump
V44	2 - Way	HANDLE POINTED VERTICAL	No Flow	HANDLE POINTED HORIZONTAL	Liquid from Pressure Pump into Recirculation Pump
V44 Bypass	2 - Way	HANDLE POINTED DOWN	No Flow	HANDLE POINTED RIGHT	Liquid from upper pressure vessel to lower pressure vessel
V51	2 - Way	HANDLE POINTED VERTICAL	No Flow	HANDLE POINTED HORIZONTAL	Concentrate from Membranes to Front Panel
V52	2 - Way	HANDLE POINTED VERTICAL	No Flow	HANDLE POINTED HORIZONTAL	Concentrate from Membranes to Front Panel
V53	2 - Way	HANDLE POINTED VERTICAL	No Flow	HANDLE POINTED HORIZONTAL	Concentrate from Membranes to Front Panel
V54	2 - Way	HANDLE POINTED VERTICAL	No Flow	HANDLE POINTED HORIZONTAL	Concentrate from Membranes to Front Panel

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

Included Equipment

ITEM	LEADER ORDER #	DESCRIPTION / PHOTO	ITEM	LEADER ORDER #	DESCRIPTION / PHOTO
Springtech EXTREME HC-8	700088HC		Connection Pipe for 90° Setup		
Springtech EXTREME HC-8 User Manual			Springtech EXTREME HC-8 Quick Start Guide		
1 – 1/2" Quick Coupler C Qty: 2	47160		1" Quick Coupler C Qty: 1	47148	
Strainer Y 3" modified with bleeder valve	70141		2" Threaded to 3" Slip Connector	195	

Optional Setup Equipment, Parts and Supplies

ITEM	LEADER ORDER #	DESCRIPTION / PHOTO	ITEM	LEADER ORDER #	DESCRIPTION / PHOTO
Membrane Preservative, 1 lb.	70001		RO Soap 5 Lbs.	69992	
Citric Acid, 1 lb.	70008		Glycol, 1 gal.	70009	
20" Cartridge Filter	70012		Food Grade Grease	55095	
Digital Refractometer	61058		Sap Refractometer	61073	
12" Sap Hydrometer	61061		Long 2" Diameter Test Cup	59006	
pH Meter	61060		pH Meter Replacement Probe	61060P	

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 Springtech Leader Extreme system must be at least as large as the feed on the system itself – 3” minimum 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.

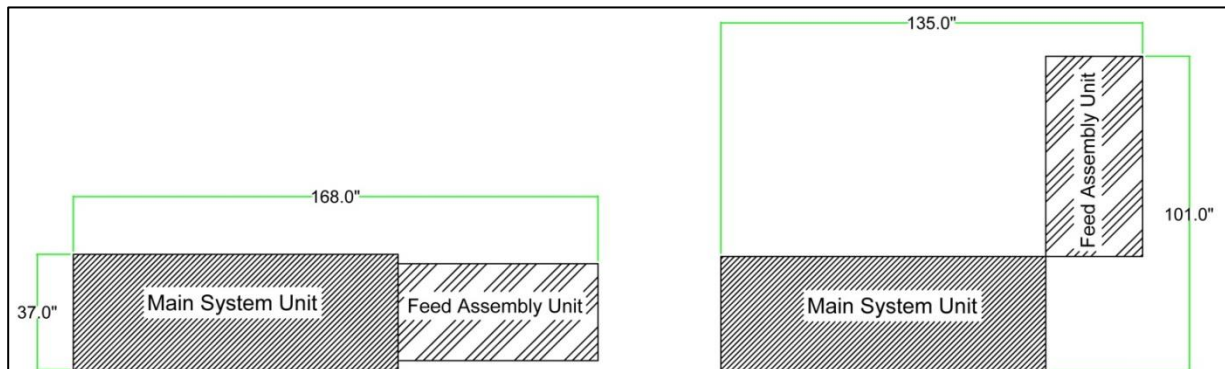
The dimensions of the main system unit are

- Width – 37”
- Length – 104”
- Height – 77”

The dimensions for the Feed Pump, Pre-Filter, Wash Tank unit are

- Width – 31”
- Length – 64”
- Height – 56”

NOTE – The Feed Pump, Pre-Filter, Wash Tank unit can be attached to the main system unit in one of two ways.



A minimum of two feet around the system is recommended. You must also be able to obtain an additional 8 feet in length in order to remove membranes and pump assemblies.

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

Power Requirements

The system requires 220V / 1 Phase, 178 amps. All electrical work should be done by a licensed electrician and meet all local codes.

See ATTACHMENT #1 for electrical schematic.

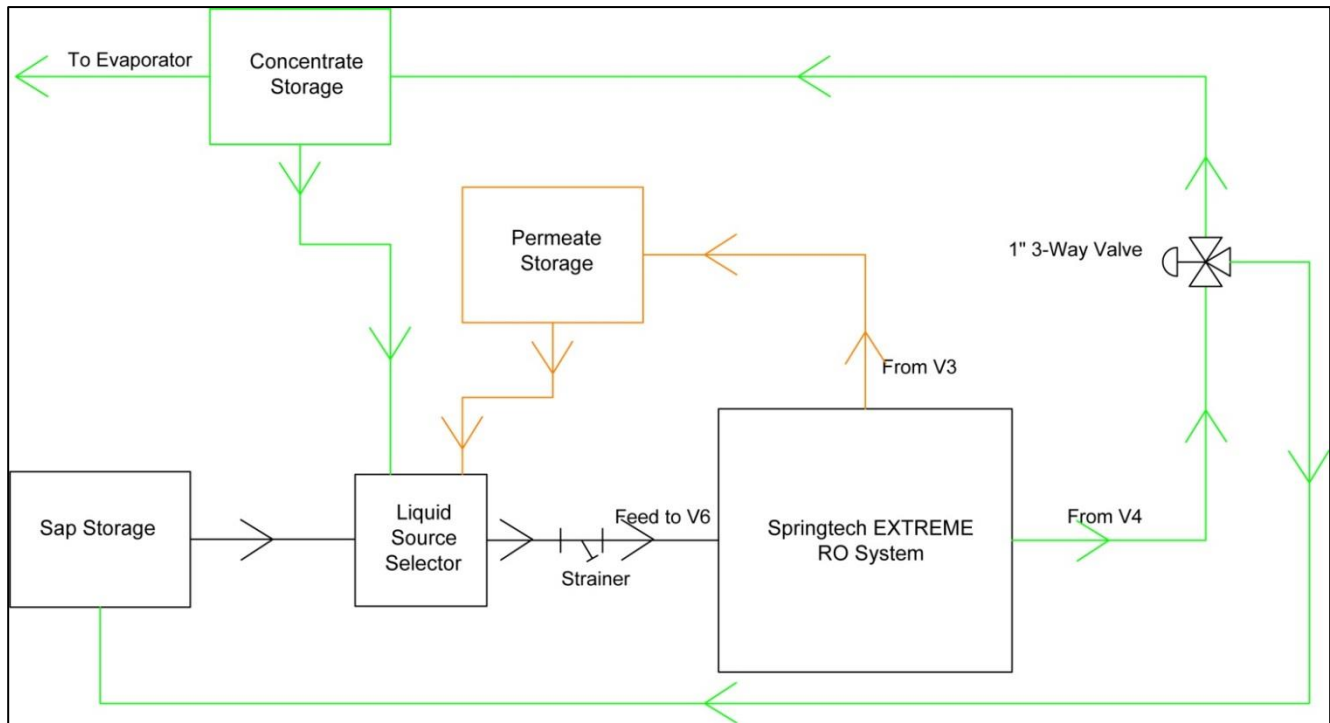
MOTOR ID	MOTOR FUNCTION	SIZE (HP)	NAMEPLATE AMPERAGE
M1	Feed Pump	7.5	30
M2	Pressure Pump	10	46
M3	Pressure Pump	10	46
M4	Recirculation Pump	3	14
M5	Recirculation Pump	3	14
M6	Recirculation Pump	3	14
M7	Recirculation Pump	3	14

NOTE: Any time the control panel is opened, the power should be turned off at the source.

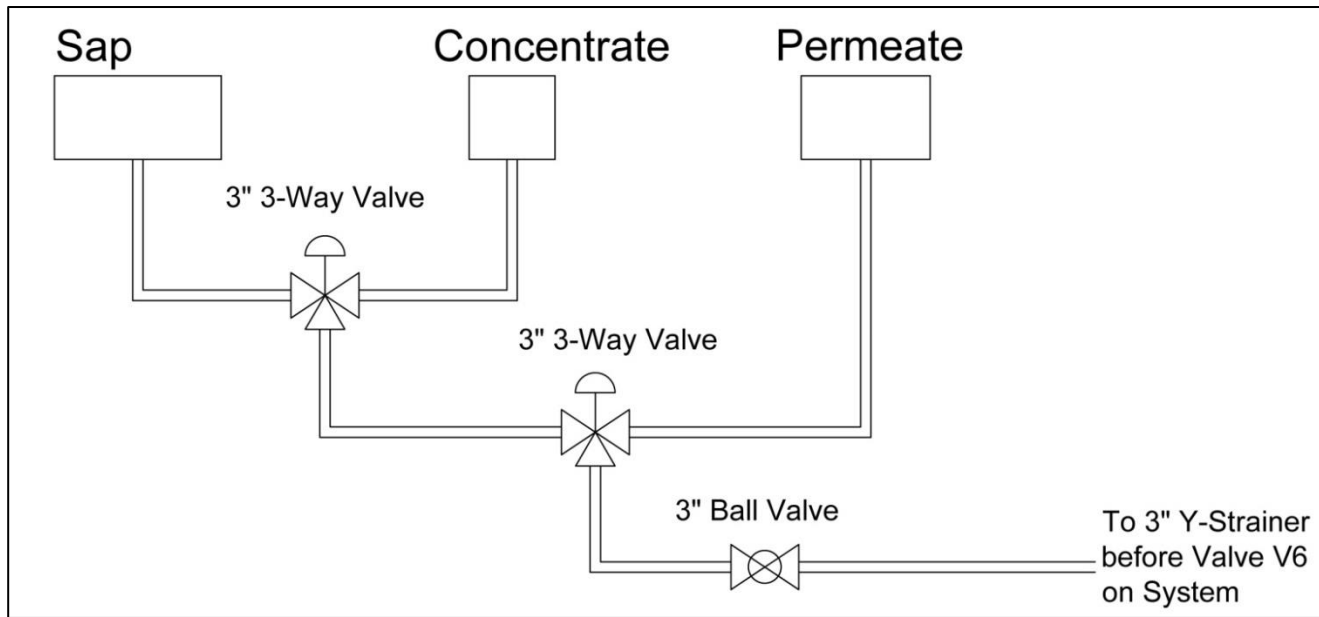
General Connection Layout

The following illustrates a generalized layout for connections with the Springtech EXTREME RO System. The first drawing shows tank connections to the system. The second drawing shows an arrangement of valves to connect the incoming liquid to the system. 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 sales person or your local Distributor / Dealer for assistance in deciding the correct tanks and layout for your needs.

Simple 3 Tank RO Diagram



Liquid Source Selector



Valves should be in the R/O room for ease of operation. Additional valves and tanks may be required depending upon installation.

NOTE: When installing the piping from the feed tanks a minimum number of elbows should be used.

Strainer to Valve V6 Connection

A 3" Y-strainer is supplied with the system. The input to the strainer will need to be 3". Plumbing from the supply tanks is recommended to be a minimum of 3" ID. The strainer is not mounted to the system. It will need to be mounted by the user.

The input to valve V6 is 2". The system is supplied with a 3" to 2" reducing adapter.

When installing - make the connection from the strainer to valve V6.



Y- Strainer



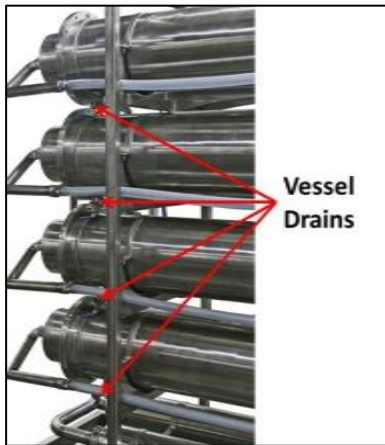
Reducing adapter

Vessel, Pump, Pre Filter Canister And Wash Tank Drains

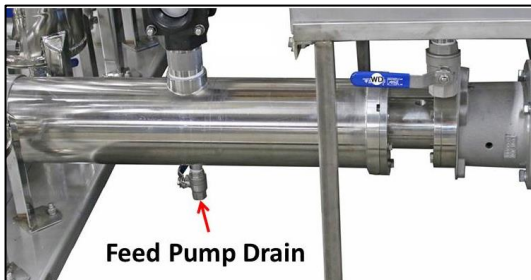
Vessel and pump drains are provided with a ½” stainless steel ball valve. Vessels and pumps being drained may contain concentrate. It is recommended the drains be setup to allow collection of the liquid. You will need (items not included);

- 15 – ½” PVC adapters - optionally to allow for 90° connection use combo elbows
- 15 – ½” Stainless Steel band clamps
- 15 pieces of ½” Food Grade Braided hose long enough to connect to the drain adapter and to reach the collection point

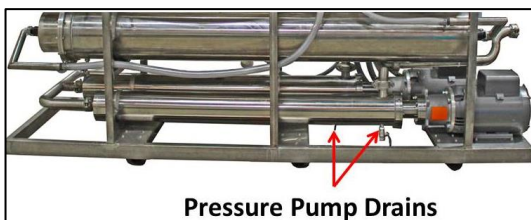
The drains are located:



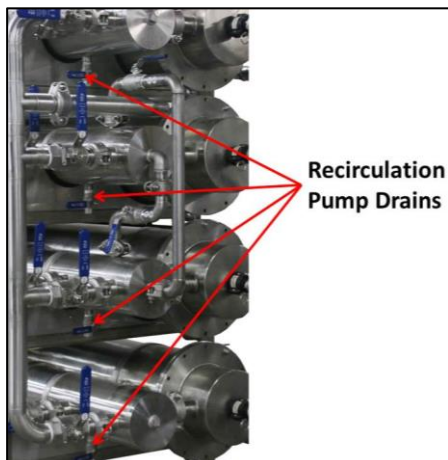
- 1 under each membrane



- 1 under the feed pump



- 1 under each pressure pump



- 1 under each recirculation pump

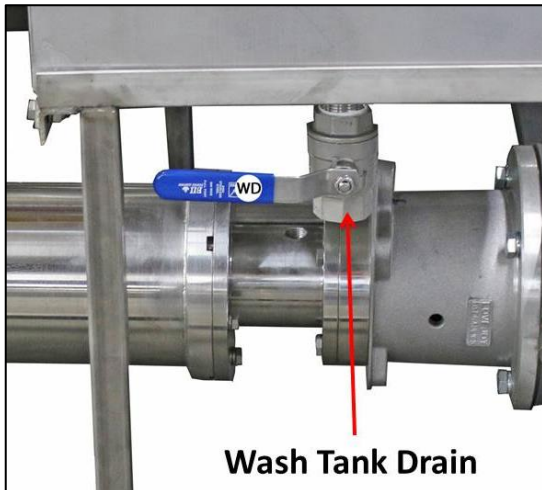


- 1 under each pre filter canister
- 1 on the side of each pre filter canister

The wash tank drain is provided with a 1" stainless steel ball valve. To setup the drain you will need (items not included);

- 1 – 1" PVC adapters - optionally to allow for 90° connection use combo elbows
- 1 – 1" Stainless Steel band clamps
- 1 piece of 1" hose long to connect to the drain adapter and to reach the collection point

The drain is located:

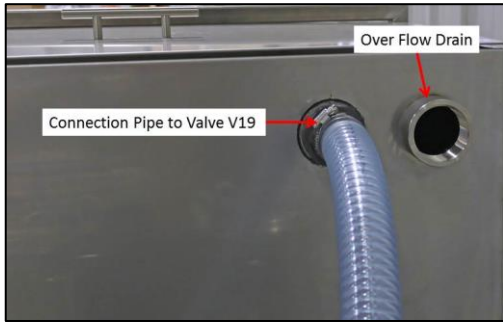


- Under the wash tank

The wash tank is also supplied with a 2" connection for an overflow drain. The recommended connection to the drain is as follows (items not included):

- Install a 2" 90° combo elbow into the wash tank overflow connection and use 2" piping to drain

The drain is located:



Near the top of the wash tank

Install drain connections as follows:



1. Teflon tape the PVC adapter. Optionally if a 90° connection is preferred, Teflon tape a combo elbow and use it in place of the straight adapters where desired.



2. Thread the PVC adapter into the stainless steel ball valve.



3. Cut the hose to length (to reach from the ball valve to the point where you will be collecting the liquid). Place a stainless steel band clamp over one end of the hose. Slide the hose onto the PVC adapter. Position the stainless steel band clamp over the hose on the adapter and tighten the band clamp.

V3, V4 and V19 Connections

V3, V4 and V19 valves are to be setup so the connections can be easily disconnected and reconnected as necessary. The following is the recommended connection detail.

In order to assemble the connections you will need (braided hose and clamps sold separately);

- 3 – C style Quick Couplers (two 1 – ½”, one 1”)
- 3 (minimum) stainless steel band clamps – (two (minimum) 1 – ½”, one (minimum) 1”)
- 1” ID braided food grade hose with length to make the connection to the Concentrate tank. 1 – ½” ID braided food grade hose with length to make the connection to the Permeate tank. The connection to the drain can be made with flexible hose.

V19 – Connection To Drain



1. Cut 1 – ½” ID flexible hose to reach from the valve V19 to the drain connection.
2. Place at least one 1 – ½” stainless steel band clamp over one end of the hose.
3. Slide the hose onto the 1 – ½” C style quick coupler.
4. Position the stainless steel band clamp(s) over the hose on the coupler and tighten the band clamp(s).
5. Secure the other end of the hose to the drain connection.
6. Connect the quick couplers by opening the latches on the C style coupler (position the metal latch arms out perpendicular to the body of the coupler) then sliding the C coupler onto the F coupler. Pull the metal latch arms back down to the sides of the C coupler.

V3 – Connection To Permeate Storage



1. Cut 1 – ½” ID food grade braided hose to length – from valve V3 to the fill connection for the permeate tank.
2. Place at least one 1 – ½” stainless steel band clamp over one end of the hose.
3. Slide the hose onto a 1 – ½” C style quick coupler.
4. Position the stainless steel band clamp(s) over the hose on the adapter and tighten the band clamp(s).
5. Secure the other end of the hose to the permeate tank fill connection.
6. Connect the quick couplers by opening the latch on the C style coupler (position the metal latch arms out perpendicular to the body of the coupler) then sliding the C coupler onto the F coupler. Pull the metal latch arms back up to the sides of the C coupler.

V4 - Connection to the Concentrate Storage



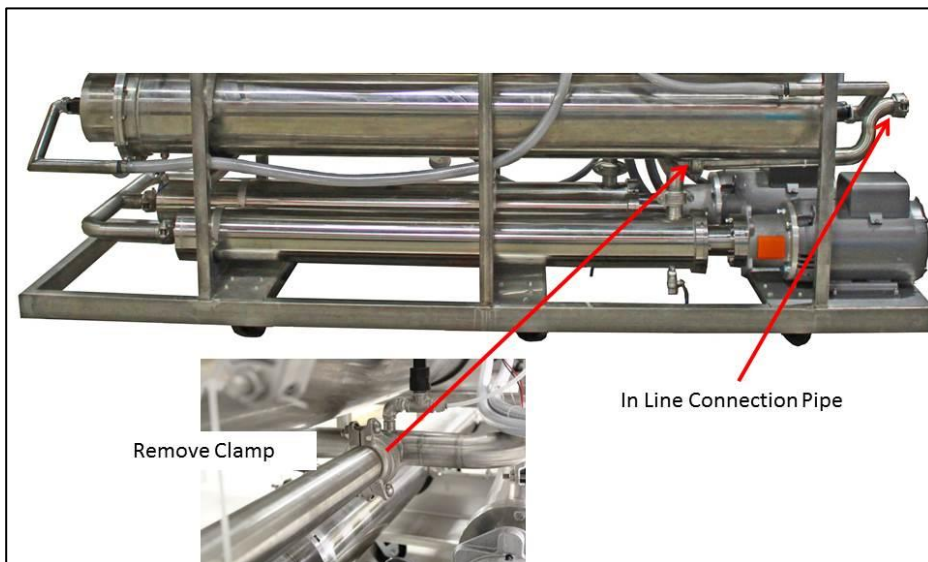
1. Cut 1" ID food grade braided hose to length – from valve V4 to the fill connection for the concentrate tank.
2. Place at least one 1" stainless steel band clamp over one end of the hose.
3. Slide the hose onto a 1" C style quick coupler.
4. Position the stainless steel band clamp(s) over the hose on the adapter and tighten the band clamp(s).
5. Secure the other end of the hose to the concentrate tank fill connection.
6. Connect the quick couplers by opening the latch on the C style coupler (position the metal latch arms out perpendicular to the body of the coupler) then sliding the C coupler onto the F coupler. Pull the metal latch arms back up to the sides of the C coupler.

Connecting the Main System Unit to the Feed Unit

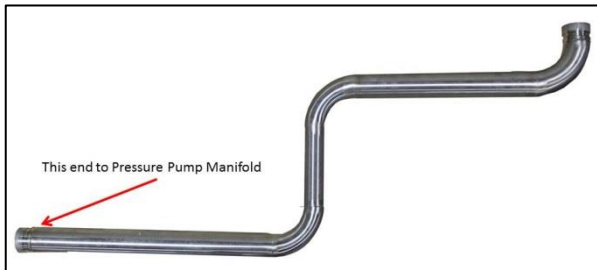
The two units can be setup in one of two ways; in line or at a 90° Angle.

Changes for 90° Connection

In order to connect the units at a 90° angle, the system feed connection pipe must be changed. The main system unit is supplied with the connection pipe for an in line setup. The 90° connection pipe is also supplied and is installed as follows:



1. Remove the in line connection pipe by removing the 1 – ½” clamp connecting it to the pressure pump manifold pipe.

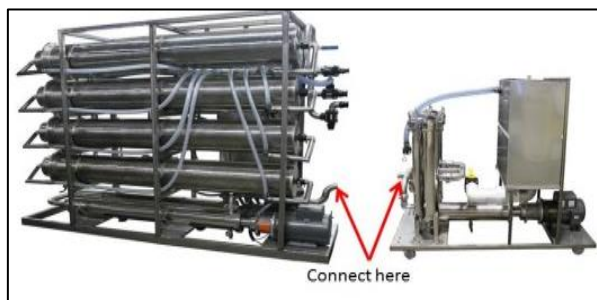


2. Remove the 1 – ½” clamp from the other end of the pipe.

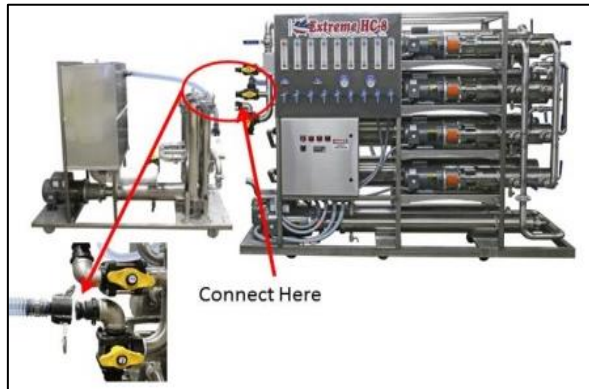
3. Place the 90° connection pipe into place on the main system unit. The long end will connect to the pressure pump manifold pipe.
4. Secure the pipe in place with the 1 – ½” clamp removed from the in line connection pipe. Ensure the sides of the clamp are properly aligned to the grooves in the pipes. It may be necessary to rotate the pipe to make the final connections to the feed unit so do not fully tighten.

Connecting the Main System and Feed Units

1. Position the main system unit in its operating location. See the earlier section on the area required.
2. Position the feed unit so the end of the connection pipe on the main system unit and the end of the pipe from the feed pump align. Note if the connection pipe was changed to the 90° connection pipe it may need to be turned for proper alignment.



3. Place one of the 1 – ½” clamps over the ends of the pipes. Ensure the clamps are properly aligned in the grooves of the pipes. Tighten both clamps.



4. Connect the quick coupler on the hose from the wash tank to the quick coupler on the top of valve V19.

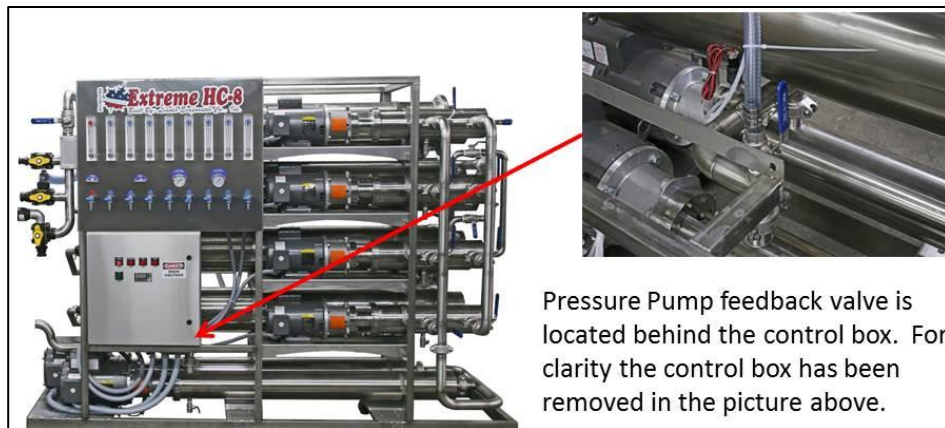
OPERATION

When starting the Reverse Osmosis unit there is a sequence in which the pumps will activate. Pressing the START button will first activate the feed pump. In normal operations within 30 seconds the first pressure pump will start followed by the second pressure pump then each of the recirculation pumps, one at a time.

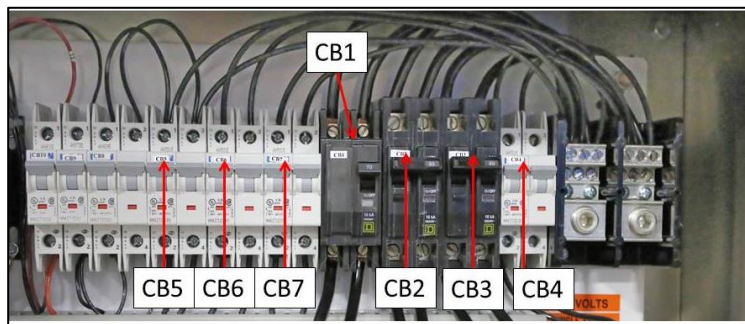
During any cycle if permeate is not available, use non chlorinated well or spring water.

Startup of System with Little or No Fluid

1. Set the system valves for a rinse cycle (see page 40).
2. Close the pressure pump feedback ball valve.



3. Turn off the power to the system at the source.
4. Open the control box by turning the latches on the right side of the panel then opening the door carefully to the left.
5. Turn off the pressure and recirculation pump breakers:



BREAKER ID	CIRCUIT	START POSITION
CB1	Feed Pump	ON
CB2	Pressure Pump	OFF
CB3	Pressure Pump	OFF
CB4	Recirculation Pump	OFF
CB5	Recirculation Pump	OFF
CB6	Recirculation Pump	OFF
CB7	Recirculation Pump	OFF

6. Close the control box cover and turn the latches to fasten.
7. Turn on the power to the system at the source.
8. Ensure your source valves (water or permeate) are open to feed the system.
9. Press the START button to start the feed pump.
10. 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.

11. Press the STOP button to stop the feed pump.
12. Turn off the power to the system at the source.
13. Open the control box and position breakers CB1, CB2, CB3, CB4, CB5, CB6 and CB7 to the ON position.
14. Close the control box cover and refasten the latches.
15. Turn on the power to the system at the source.
16. Open the pressure pump feedback ball valve.
17. Proceed to the instructions for the Initial System Cleaning.

Initial System Cleaning

To prepare the system after setup;

NOTE: IF the system has not been filled with fluid, follow the instruction in the section “Startup of System with Little or No Fluid”.

1. Put approximately 4800 US gallons of non-chlorinated well or spring water into a clean permeate storage tank.
2. Set the valves for and run a rinse cycle (see page 40) using a minimum 2400 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 the position of valve V19 so the liquid flow is directed to the wash tank. When the wash tank is approximately $\frac{2}{3}$ full, return V19 to the drain position.
4. Mix alkaline R/O soap with the liquid in the wash tank until a pH of 11 is reached. Note – this is for FILMTEC E8 membranes. (If other membranes are being used, consult with a Leader Sales person or a local Distributor / Dealer).
5. Set the valves for and run an alkaline wash cycle (see page 43) allowing the system to run until the automatic temperature shutdown at 118°F.
6. Set the valves for and run a rinse cycle (see page 40) using a minimum 2400 US gallons of water from the permeate tank.
7. Run the benchmark permeability test (see page 24).

Data Logging

Data on the operation of the system should be recorded and kept. See ATTACHMENT #2 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 port
- Permeate 1 Flow – gallons per minute of permeate from membrane 1 – reading from the top of the stainless steel float in the permeate flow meter
- Permeate 2 Flow – gallons per minute of permeate from membrane 2 – reading from the top of the stainless steel float in the permeate flow meter
- Permeate 3 Flow – gallons per minute of permeate from membrane 2 – reading from the top of the stainless steel float in the permeate flow meter
- Permeate 4 Flow – gallons per minute of permeate from membrane 2 – reading from the top of the stainless steel float in the permeate flow meter
- Permeate 5 Flow – gallons per minute of permeate from membrane 2 – reading from the top of the stainless steel float in the permeate flow meter

- Permeate 6 Flow – gallons per minute of permeate from membrane 2 – reading from the top of the stainless steel float in the permeate flow meter
- Permeate 7 Flow – gallons per minute of permeate from membrane 2 – reading from the top of the stainless steel float in the permeate flow meter
- Permeate 8 Flow – gallons per minute of permeate from membrane 2 – 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 from temperature gauge on the control panel of the system (°F)
- Feed Pressure – reading from the pressure gauge on the control panel of the system (psi)
- 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 – Add all Permeate Flows together
 - TOTAL FLOW - Add all Permeate Flows 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 Flows and Concentrate Flow together
 - Multiply Total Flow by 60 and record the resulting number as the GPH Processed

Cycles and Timing

The Springtech EXTREME HC-2 has 5 defined cycles; Concentrate, Reverse Concentrate, Desugar, Rinse and Wash. The following table outlines recommended intervals

CYCLE	INTERVAL
Concentrate	Run 1 to 12 hours dependent on sap quality
Reverse Concentrate	Run 1 to 12 hours dependent on sap quality
Desugar	Run at the end of every Concentrate cycle or at the end of each day
Rinse	Run after the Desugar cycle
Wash	Chemical wash after a rinse. A chemical wash should be run after 12 hours of concentrating or at the end of every day. NOTE: If only a few hundred gallons of sap was run and the machine is to be cleaned, run a hot water wash

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

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

Permeability Test

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 new or at the start of a new season. The permeate flow rates are the basis for the results of the test.

Performing the permeability test for benchmarking:

1. Perform a rinse (see page 40) then fill the wash tank $\frac{3}{4}$ full of permeate by moving valve V19 to the vertical up position.
2. Set the valves to the wash cycle position (see page 42).
3. Close valve V18.
4. Run the system until the temperature reaches 55°F.
5. Adjust the membrane pressure to 200 psi using valves V1 and V2. Valve V18 may need to be opened slightly.
NOTE: If the starting temperature is higher than 55°F, the same results can be obtained at 70°F and 150psi operating pressure
6. Record the flow rates from all the permeate flow meters and from the concentrate meter.
7. Total the permeate meter flow rates and multiply by 60 to give a US gallons per hour rate. This number will be the rate (benchmark rate) for comparison to past and future testing. Record this number in the data log with Activity "T".

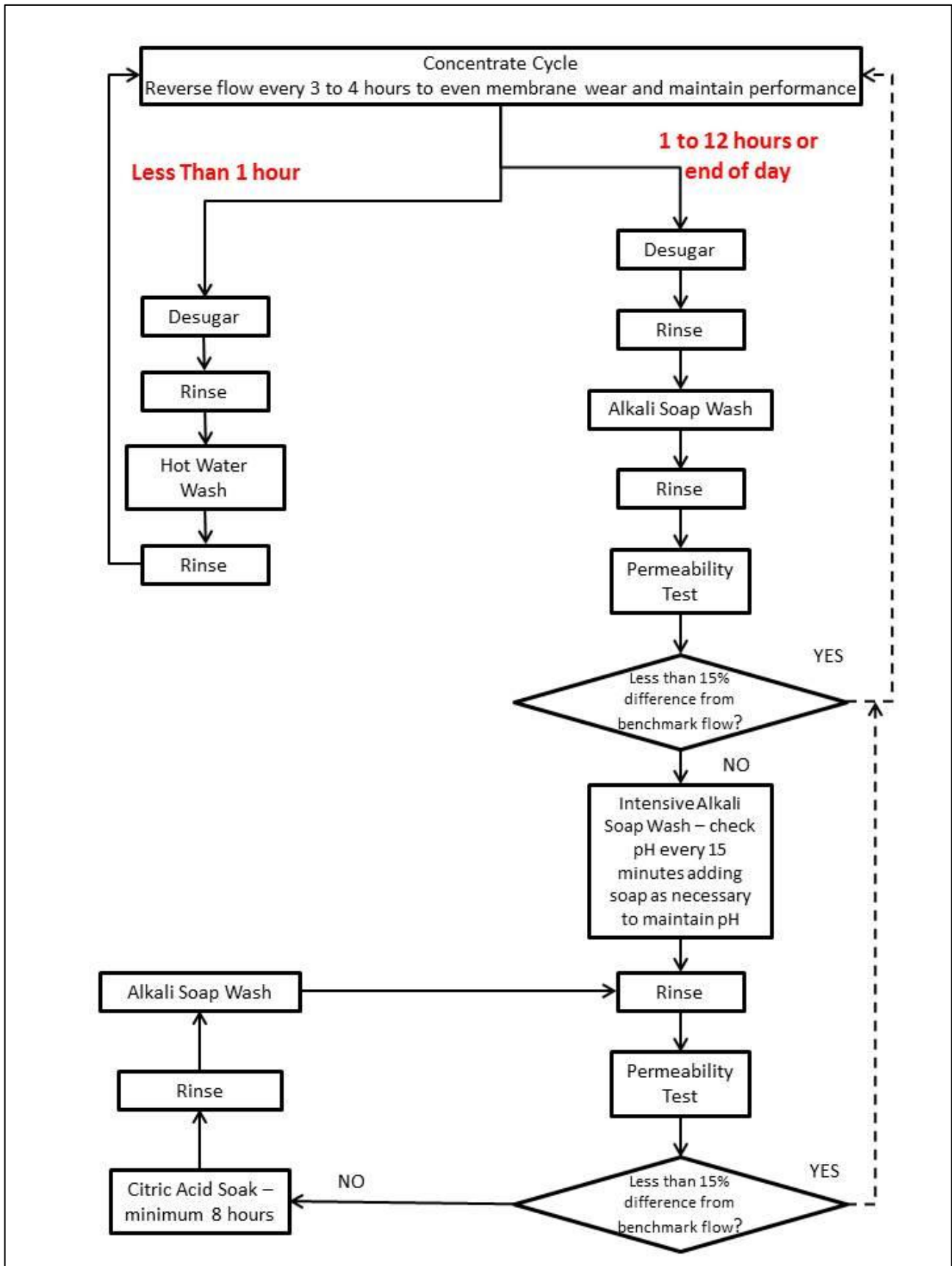
A permeability test should be performed after each wash cycle. The test is performed as described above for steps 2 through 6. Compare the flow rate obtained in the test with previous benchmark rates. If the flow rate is less than the benchmark rate by 15% or more then further cleaning will be necessary. See the flow chart on page 25.

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

$$(1 - (\text{Current Measured GPM} / \text{Benchmark GPM})) \times 100$$

Note concerning the chart – if the sap is of good quality (high clarity with no visible suspended material) and the performance of the system cannot be returned to the benchmark level with alkaline soap chemical wash, it will need an acid soak. Acid soak will help remove mineral deposits. If the sap is of poor quality and bacteria is responsible for poor overall performance the alkaline soap wash should remove the problem.

NOTE: This applies to FILMTEC E8 membranes.



Flow Valve Information

The following is a table illustrating the type of valve being used and where fluid flows when the valves are in certain positions. NOTE: Flow as stated only occurs when all valves are set for the proper cycles.

VALVE	TYPE	HANDLE POSITION	LIQUID FROM - TO	HANDLE POSITION	LIQUID FROM-TO
V3	3 - Way	HANDLE POINTED LEFT	Membranes to Permeate out	HANDLE POINTED RIGHT	Membranes to Valve V19
V4	3 - Way	HANDLE POINTED LEFT	Membranes to Concentrate out	HANDLE POINTED RIGHT	Membranes to Valve V19
V6	3 - Way	HANDLE TOWARD INCOMING PIPE	External to Feed Pump	HANDLE TOWARD WASH TANK PIPE	Wash Tank to Feed Pump
V18	2 - Way	HANDLE POINTED HORIZONTAL	No Flow	HANDLE POINTED VERTICAL	Membranes to Valve V19
V19	3 - Way	HANDLE POINTED VERTICAL	Membranes to Wash Tank	HANDLE POINTED HORIZONTAL	Membranes to Drain
BP	2 - Way	HANDLE POINTED HORIZONTAL	No Flow	HANDLE POINTED VERTICAL	Membrane to Membrane
WD	2 - Way	HANDLE POINTED HORIZONTAL	Recirculation to feed pump	HANDLE POINTED VERTICAL	Wash Tank Drain
V41	2 - Way	HANDLE POINTED VERTICAL	No Flow	HANDLE POINTED HORIZONTAL	Liquid from Pressure Pump into Recirculation Pump
V41 Bypass	2 - Way	HANDLE POINTED FORWARD	No Flow	HANDLE POINTED RIGHT	Liquid from lower pressure vessel to upper pressure vessel
V42	2 - Way	HANDLE POINTED VERTICAL	No Flow	HANDLE POINTED HORIZONTAL	Liquid from Pressure Pump into Recirculation Pump
V43	2 - Way	HANDLE POINTED VERTICAL	No Flow	HANDLE POINTED HORIZONTAL	Liquid from Pressure Pump into Recirculation Pump
V44	2 - Way	HANDLE POINTED VERTICAL	No Flow	HANDLE POINTED HORIZONTAL	Liquid from Pressure Pump into Recirculation Pump
V44 Bypass	2 - Way	HANDLE POINTED DOWN	No Flow	HANDLE POINTED RIGHT	Liquid from upper pressure vessel to lower pressure vessel
V51	2 - Way	HANDLE POINTED VERTICAL	No Flow	HANDLE POINTED HORIZONTAL	Concentrate from Membranes to Front Panel
V52	2 - Way	HANDLE POINTED VERTICAL	No Flow	HANDLE POINTED HORIZONTAL	Concentrate from Membranes to Front Panel

V53	2 - Way	HANDLE POINTED VERTICAL	No Flow		HANDLE POINTED HORIZONTAL	Concentrate from Membranes to Front Panel
V54	2 - Way	HANDLE POINTED VERTICAL	No Flow		HANDLE POINTED HORIZONTAL	Concentrate from Membranes to Front Panel

The following is a summary table of the system cycles and the related valve settings for the cycle specified. Detail on the cycle settings is in the sections that follow.

CYCLE	Concentrate	Reverse Concentrate	Desugar	Rinse	Wash
V1	Open ½ way then adjust	Open ½ way then adjust	Open ½ way then adjust	Open Fully	Open Fully
V2	Open minimum ½ way then adjust	Open minimum ½ way then adjust	Open minimum ½ way then adjust	Open Fully	Open Fully
V3	Handle Points Horizontal Left	Handle Points Horizontal Left	Handle Points Horizontal Left	Handle Points Horizontal Right	Handle Points Horizontal Right
V4	Handle Points Horizontal Left	Handle Points Horizontal Left	Handle Points Horizontal Left	Handle Points Horizontal Right	Handle Points Horizontal Right
V6	Handle Points Toward Incoming Pipe (Sap)	Handle Points Toward Incoming Pipe (Sap)	Handle Points Toward Incoming Pipe (Permeate)	Handle Points Toward Incoming Pipe (Permeate)	Handle Points Toward Wash tank Pipe
V18	Handle Pointed Horizontal	Handle Pointed Horizontal	Handle Pointed Horizontal	Handle Pointed Vertical	Handle Pointed Vertical
V19	Vertical	Vertical	Vertical	Horizontal	Vertical
Drains	Closed	Closed	Closed	Closed	Closed
BP	Vertical	Vertical	Vertical	Vertical	Vertical
WD	Handle Pointed Horizontal	Handle Pointed Horizontal	Handle Pointed Horizontal	Handle Pointed Horizontal	Handle Pointed Horizontal except vertical to drain wash tank
V41	Handle Pointed Horizontal	Handle Pointed Vertical	Handle Pointed Horizontal	Handle Pointed Horizontal	Handle Pointed Horizontal
V41 Bypass	Handle Pointed Right	Handle Pointed Forward	Handle Pointed Right	Handle Pointed Right	Handle Pointed Right
V42	Handle Pointed Vertical	Handle Pointed Vertical	Handle Pointed Vertical	Handle Pointed Vertical	Handle Pointed Vertical
V43	Handle Pointed Vertical	Handle Pointed Vertical	Handle Pointed Vertical	Handle Pointed Vertical	Handle Pointed Vertical
V44	Handle Pointed Vertical	Handle Pointed Horizontal	Handle Pointed Vertical	Handle Pointed Vertical	Handle Pointed Vertical
V44 Bypass	Handle Pointed Vertical	Handle Pointed Right	Handle Pointed Vertical	Handle Pointed Vertical	Handle Pointed Vertical
V51	Handle Pointed Vertical	Handle Pointed Horizontal	Handle Pointed Vertical	Handle Pointed Vertical	Handle Pointed Vertical
V52	Handle Pointed Vertical	Handle Pointed Vertical	Handle Pointed Vertical	Handle Pointed Vertical	Handle Pointed Vertical
V53	Handle Pointed Vertical	Handle Pointed Vertical	Handle Pointed Vertical	Handle Pointed Vertical	Handle Pointed Vertical
V54	Handle Pointed Horizontal	Handle Pointed Vertical	Handle Pointed Horizontal	Handle Pointed Horizontal	Handle Pointed Horizontal

NOTE: During the Rinse cycle, if the machine shuts down due to low pressure and the feed line has been bled or if during the Wash Cycle the machine shuts down due to low pressure, check the prefilters. If the prefilters are dirty, replace and retry the rinse/wash cycle. If the prefilters appear clean or are new and the problem continues, partially close valve V18 until an operating pressure of 50 – 80 psi is reached and run the remainder of the cycle.

During operation the recirculation pumps continuously recirculate the liquid within the pressure vessel. Flow between membranes occurs at the rate fluid (concentrate and permeate) is withdrawn from the system. The table below illustrates the fluid path for each cycle through the control valves, pumps and pressure vessels

Cycle	Concentrate	Reverse Concentrate	Desugar	Rinse	Wash
Input	Sap	Sap	Permeate	Permeate	Recirculate
Flow	V6	V6	V6	V6	V6
	V41	V44	V41	V41	V41
	Bottom Recirculation Pump	Top Recirculation Pump	Bottom Recirculation Pump	Bottom Recirculation Pump	Bottom Recirculation Pump
	Bottom PV	Top PV	Bottom PV	Bottom PV	Bottom PV
	Center PV	Top Recirculation Pump Outlet	Center PV	Center PV	Center PV
	Center Recirculation Pump Out	V44 BP	Center Recirculation Pump Out	Center Recirculation Pump Out	Center Recirculation Pump Out
	V41 BP	Center Recirculation Pump Inlet	V41 BP	V41 BP	V41 BP
	Top Recirculation Pump Inlet	Center PV	Top Recirculation Pump Inlet	Top Recirculation Pump Inlet	Top Recirculation Pump Inlet
	Top PV	Bottom PV	Top PV	Top PV	Top PV
	Top Recirculation Pump	Bottom Recirculation Pump	Top Recirculation Pump	Top Recirculation Pump	Top Recirculation Pump
	V54	V51	V54	V54	V54
	V4	V4	V4	V18	V18
	Concentrate Tank	Concentrate Tank	Sap/Concentrate Tank	V19	V19
				Drain	Wash Tank

PV – Pressure Vessel

Adjusting V1 and V2 for Operations

There are two methods of determining how to set the V1 and V2 valves.

- Concentrate Preferred – Turn V1 to a minimum flow and turn V2 until the desired concentration is obtained. Adjust V1 until the flow desired is reached. Readjust V2 until the concentration desired is reached.
- Volume Preferred – Turn V2 to a minimum and Turn V1 until the desired flow is reached. Adjust V2 until the concentration desired is reached. Readjust V1 until the desired flow is reached.

The maximum pressure is 550 psi with a recommended level of 400 to 500 psi.

V2 is adjusted for concentration output by flow or % sugar.

Sample Port Use

When using the concentrate sample port, run approximately 1 test cup of concentrate through in order to purge the lines. Pour that cup back into the raw sap tank. Draw a second cup and sample..

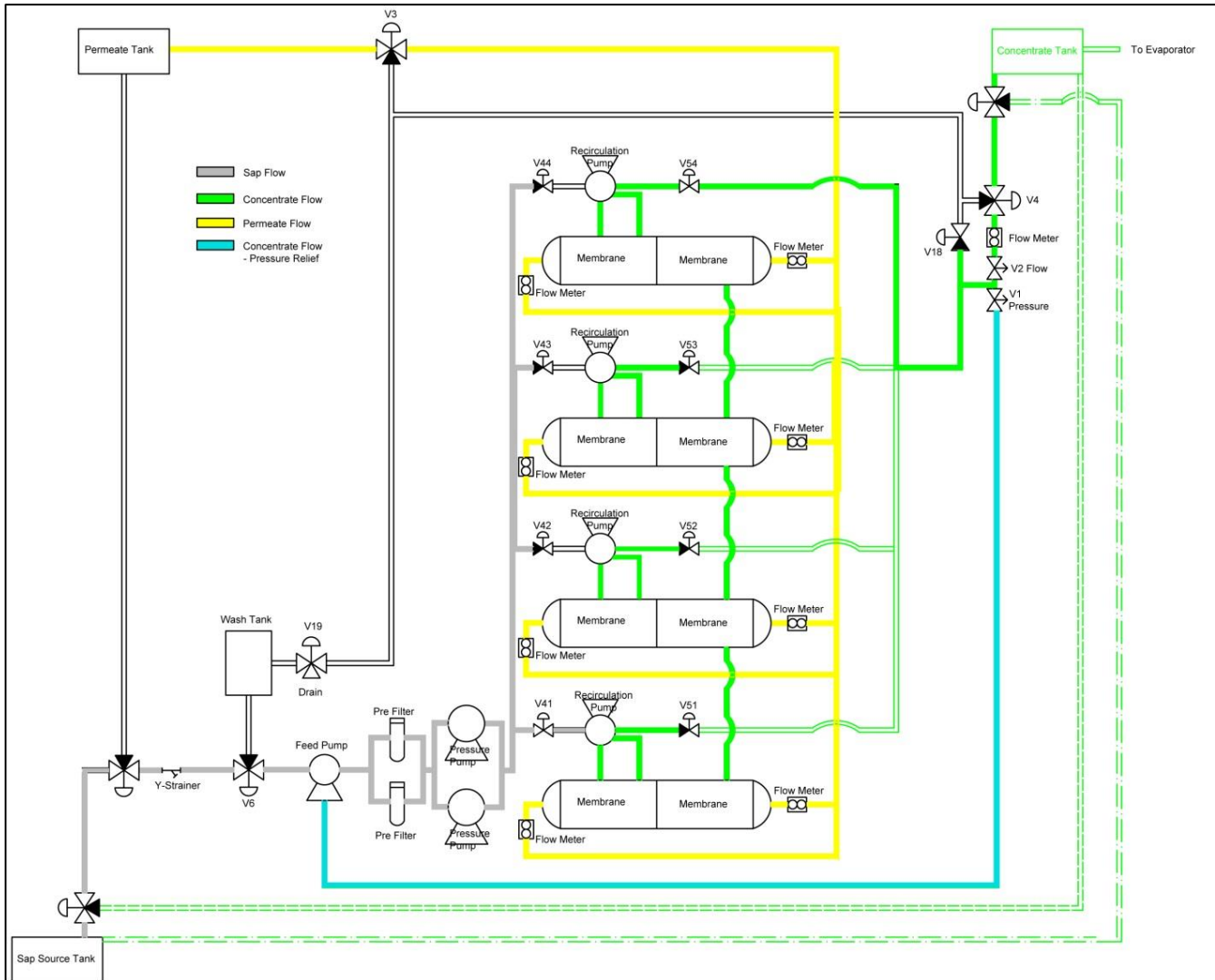
The permeate sampling ports should be purged as done with the concentrate sample port. The permeate through these ports should be sampled once per day.

Concentrate Cycle

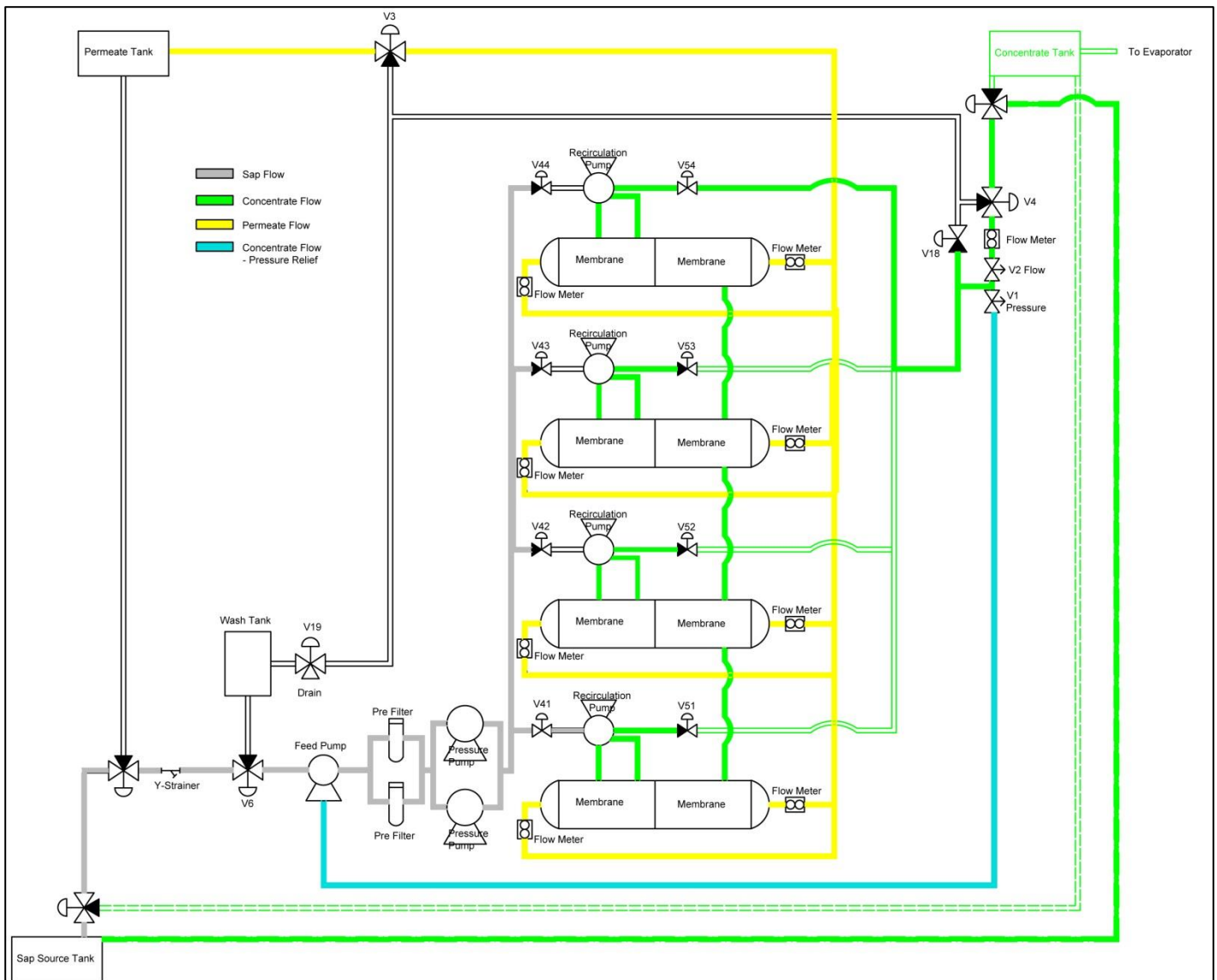
In this cycle the system inputs sap or pre-concentrated sap and cycles it through the membranes resulting in a concentrated liquid (concentrate) and the water being removed (permeate).

There are two output options within the Concentrate Cycle. The first is to direct the concentrate to the concentrate tank. The second is to direct the concentrate to the sap tank – this is called the Sap Concentration Loop. Valves are required between valve V4 and the concentrate tank allowing the option for concentrate to be directed to the sap tank (valves sold separately).

Standard Concentrate Output



Sap Concentration Loop



Concentrate Cycle Valve Settings – also available on the Quick Start Guide

1. Position the valves as follows:

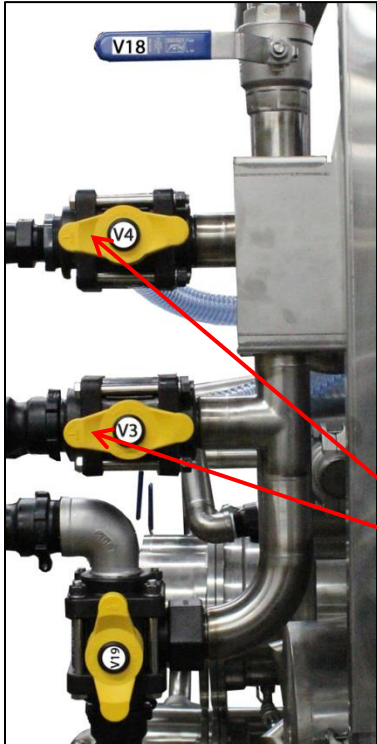


V1 – Open ½ way to start then adjust to the desired maximum pressure. (Do NOT exceed 550 psi)

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



WD – Horizontal Left, valve is closed



V3 – Horizontal Left

V4 – Horizontal Left

V18 – Horizontal Left

V19 - With V3 and V4 in the concentrate setting V19 should have no flow. Direct V19 to the wash tank as a precaution.



V6 – The flow indicator should be toward the pipe incoming from the exterior source selector. Input from source selector should be from the raw sap (or previously concentrated sap).



V41 – Horizontal Left

V41 BP – Right (Open)

V42 – Vertical Up

V43 – Vertical Up

V44 – Vertical Up

V44 BP – Vertical Down (Closed)

V51 – Vertical Up

V52 – Vertical Up

V53 – Vertical Up

V54 – Horizontal Left

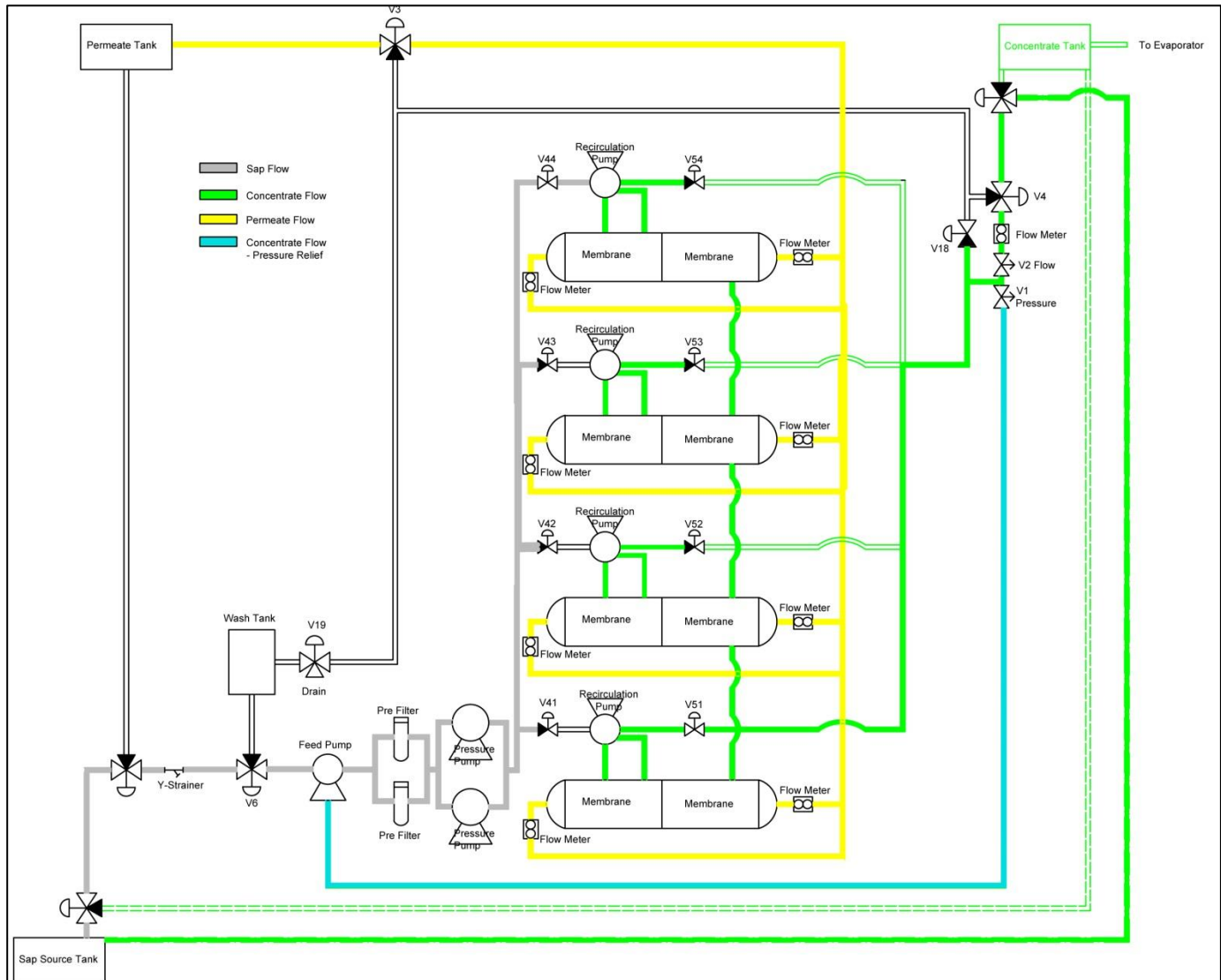
BP Vertical

2. Press the START button on the control panel. Within 30 seconds all pumps should start.
3. If the system does not continue to run due to a LOW PRESSURE ALARM;
 - a. Light is SOLID - Repeat Step 2 up to 2 additional times. The STOP ALARM RESET button will need to be pressed after each time.
 - b. Light is BLINKING – Press the STOP button to reset the alarm. Check the prefilters, changing as necessary. Repeat Step 2.
4. If the system does not start on the third try, bleed the system. To bleed the system, open the valve on the top of the strainer (installed before valve V6) until all the air is released from the system. Close the bleed valve.
5. When the machine has started, adjust V1 and V2 to produce the desired conditions.

Reverse Flow Concentrate Cycle

This cycle allows for reversing the flow in the system in order to extend the time between membrane cleanings.

Reverse Flow Concentrate Output



NOTE: Flow can be changed without stopping the system if the sequence below is followed:

1. Change V51 to Horizontal Left
2. Change V44 to Horizontal Left
3. Change V44 BP to Horizontal Right
4. Change V54 to Vertical Up
5. Change V41 to Vertical Up
6. Change V41 BP to Forward

Reverse Flow Concentrate Cycle Valve Settings – also available on the Quick Start Guide

1. Position the valves as follows:



V1 – Open ½ way to start then adjust to the desired level
(Do NOT exceed 550 psi)

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



WD – Horizontal Left, valve is closed



V3 – Horizontal Left

V4 – Horizontal Left

V18 – Horizontal Left

V19 - With V3 and V4 in the concentrate setting
V19 should have no flow. Direct V19 to the
wash tank as a precaution.



V6 – The flow indicator should be toward the pipe incoming
from the exterior source selector. Input from source
selector should be from the raw sap (or previously
concentrated sap).



- V41 – Vertical Up
- V41 BP – Forward (Closed)
- V42 – Vertical Up
- V43 – Vertical Up
- V44 – Horizontal Left
- V44 BP – Horizontal (Open)
- V51 –Horizontal Left
- V52 – Vertical Up
- V53 – Vertical Up
- V54 – Vertical Up
- BP Vertical

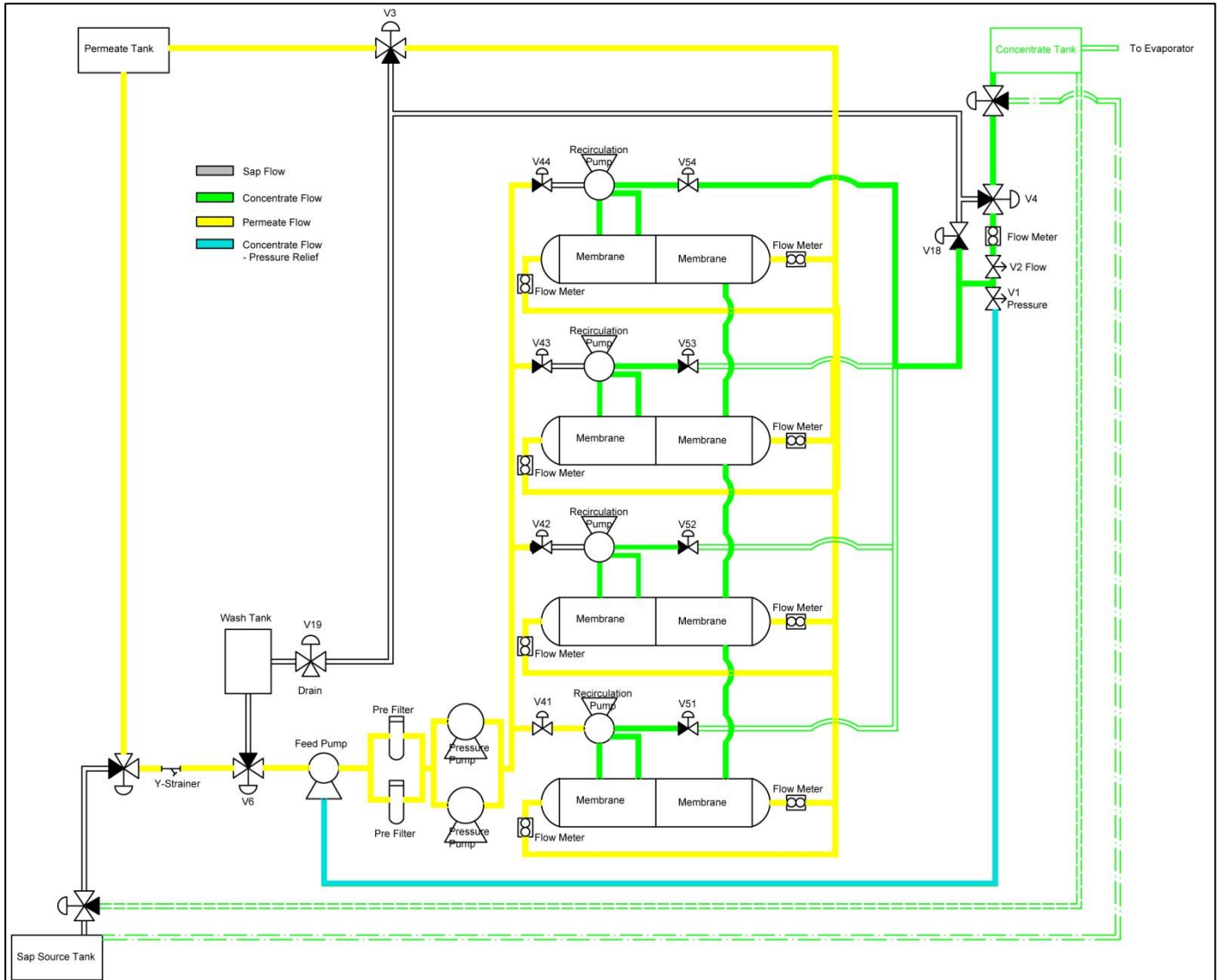
2. Press the START button on the control panel. Within 30 seconds all pumps should start.
3. If the system does not continue to run due to a LOW PRESSURE ALARM;
 - a. Light is SOLID - Repeat Step 2 up to 2 additional times. The STOP ALARM RESET button will need to be pressed after each time.
 - b. Light is BLINKING – Press the STOP button to reset the alarm. Check the prefilters, changing as necessary. Repeat Step 2.
4. If the system does not start on the third try, bleed the system. To bleed the system, open the valve on the top of the strainer (installed before valve V6) until all the air is released from the system. Close the bleed valve.
5. When the machine has started, adjust V1 and V2 to produce the desired conditions.

Desugar Cycle

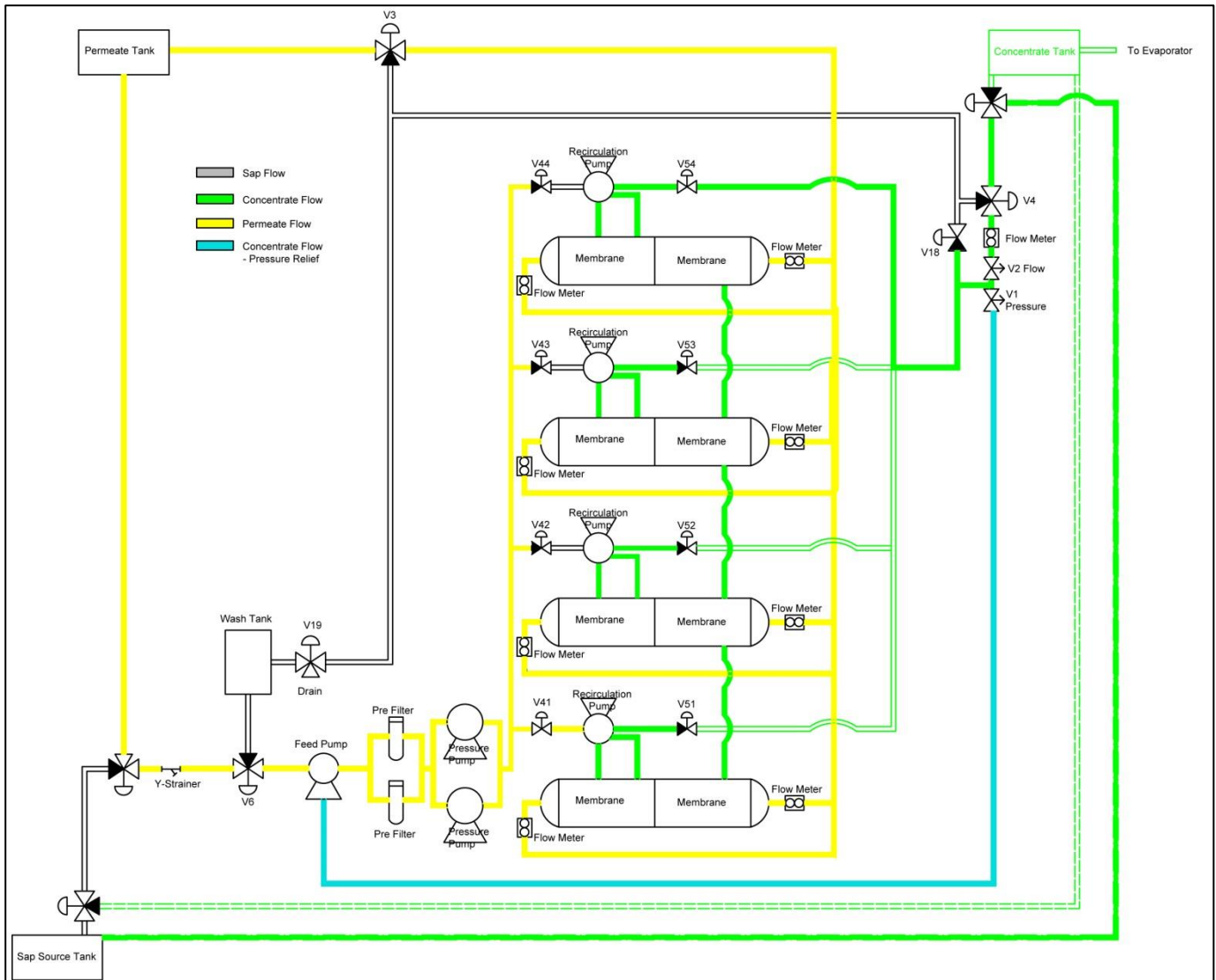
In this cycle the permeate is run in a Concentrate cycle to flush accumulated sugar from the membranes. Dependent on the operation, the Desugar process may be done in one of the following ways:

- Flushing liquid for the full cycle is run to the concentrate tank
- Flushing liquid for the full cycle is run to the sap tank
- Flushing liquid for the part of the cycle with the highest concentration of sugar is run to the concentrate tank then the remainder is run to the sap tank

Flush Liquid Running To Concentrate Tank (first part of Desugar with higher sugar % being rinsed out)



Flush Liquid Running To Sap Tank (later part of Desugar with lower sugar % being rinsed out)



Desugar Cycle Valve Settings – also available on the Quick Start Guide

1. Position the valves as follows:



V1 – Leave valve where it was set during the concentration cycle.

V2 – Leave valve where it was set during the concentration cycle.



WD – Horizontal Left, valve is closed



V3 – Horizontal Left

V4 – Horizontal Left

V18 – Horizontal Left

V19 - With V3 and V4 in the concentrate setting V19 should have no flow. Direct V19 to the wash tank as a precaution.



V6 – The flow indicator should be toward the pipe incoming from the liquid source selector. Input from source selector should be from the permeate.

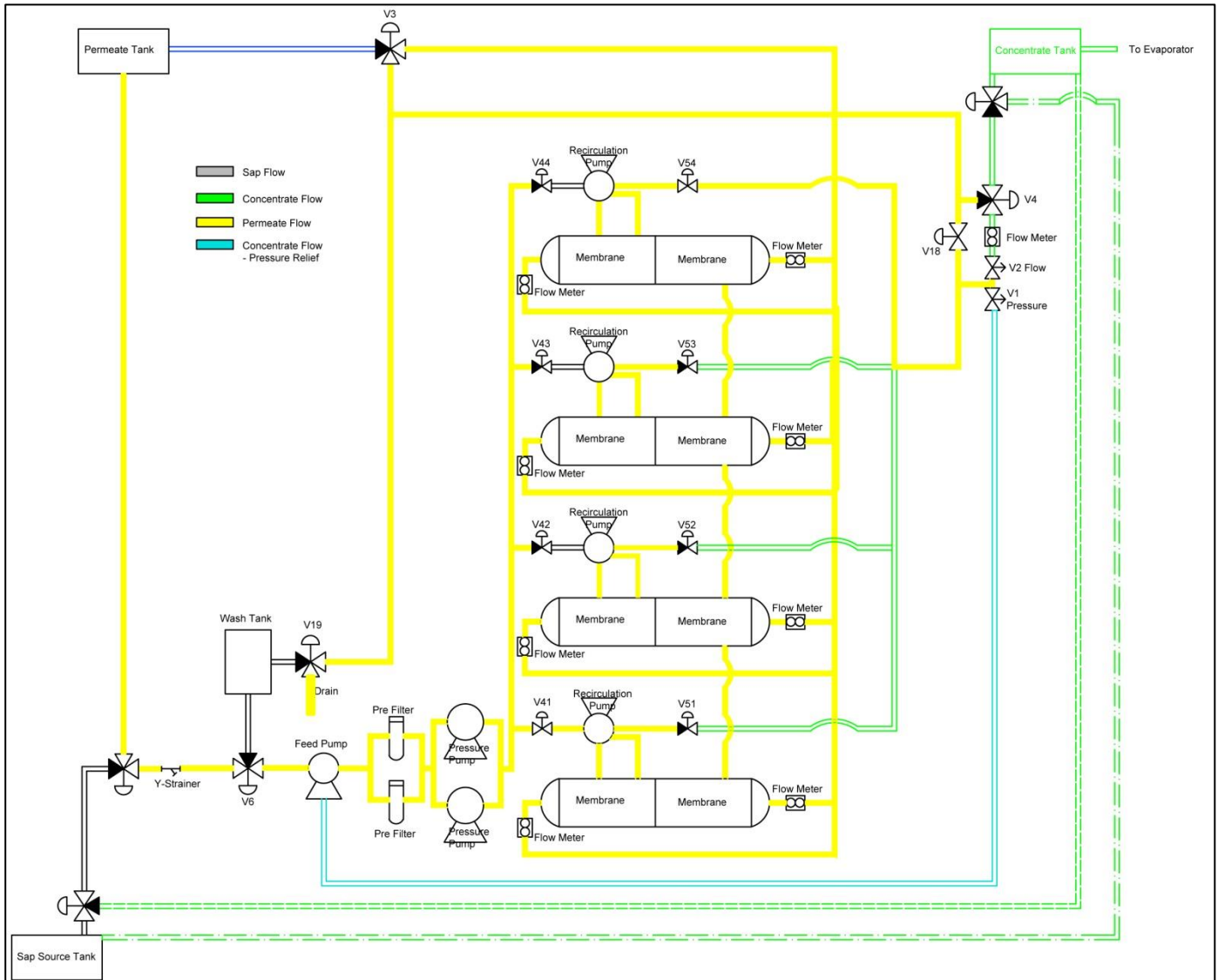


- V41 – Horizontal Left
- V41 BP – Right (Open)
- V42 – Vertical Up
- V43 – Vertical Up
- V44 – Vertical Up
- V44 BP – Vertical Down (Closed)
- V51 – Vertical Up
- V52 – Vertical Up
- V53 – Vertical Up
- V54 – Horizontal Left
- BP Vertical

2. Press the START button on the control panel. Within 30 seconds all pumps should start.
3. If the system does not continue to run due to a LOW PRESSURE ALARM;
 - a. Light is SOLID - Repeat Step 2 up to 2 additional times. The STOP ALARM RESET button will need to be pressed after each time.
 - b. Light is BLINKING – Press the STOP button to reset the alarm. Check the prefilters, changing as necessary. Repeat Step 2.
4. If the system does not start on the third try, bleed the system. To bleed the system, open the valve on the top of the strainer (installed before valve V6) until all the air is released from the system. Close the bleed valve.
5. Check the concentrate sugar % level approximately every 5 minutes. The Desugar cycle should be run until the concentrate sugar is 1% to 2%.

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 2400 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.



Rinse Cycle Valve Settings – also available on the Quick Start Guide

1. Position the valves as follows:



V1 – Open the valve completely

V2 – Open the valve completely



WD – Horizontal Left, valve is closed



V3 – Horizontal Right

V4 – Horizontal Right

V18 – Vertical

V19 – Horizontal Right



V6 – The flow indicator should be toward the pipe incoming from the liquid source selector. Input from source selector should be from the permeate.



- V41 – Horizontal Left
- V41 BP – Right (Open)
- V42 – Vertical Up
- V43 – Vertical Up
- V44 – Vertical Up
- V44 BP – Vertical Down (Closed)
- V51 – Vertical Up
- V52 – Vertical Up
- V53 – Vertical Up
- V54 – Horizontal Left
- BP Vertical

2. Press the START button on the control panel. Within 30 seconds all pumps should start – some air purge may be required.
3. If the system does not continue to run due to a LOW PRESSURE ALARM;
 - a. Light is SOLID - Repeat Step 2 up to 2 additional times. The STOP ALARM RESET button will need to be pressed after each time.
 - b. Light is BLINKING – Press the STOP button to reset the alarm. Check the prefilters, changing as necessary. Repeat Step 2.
4. If the system does not start on the third try, bleed the system. To bleed the system, open the valve on the top of the strainer (installed before valve V6) until all the air is released from the system. Close the bleed valve.
5. If the system does not start due to a LOW PRESSURE ALARM partially close valve V18 until an operating pressure of 50 – 80psi is reached and run the remainder of the cycle.
6. Run the Rinse cycle until a minimum of 2400 US gallons of the stored permeate has been used. If the rinse is to be followed by a wash cycle, fill the wash tank approximately 2/3 full by turning the V19 valve Vertical.

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 40) using a minimum of 2400 US gallons of permeate stored for system rinsing.
2. Toward the end of the rinse cycle, turn valve V19 toward the wash tank feed position. This will direct the flow of permeate to the wash tank. When the wash tank is $\frac{3}{8}$ full, return V19 to the drain position.
3. Set the valves as listed below.
4. Start and run the system until it shuts down automatically. The system will shut down when the temperature reaches 118°F.
NOTE: If the machine shuts down due to low pressure, check the prefilters. If the prefilters are dirty, replace and retry the wash cycle. If the prefilters appear clean or are new and the problem continues, partially close valve V18 until an operating pressure of 50 – 80psi is reached and run the remainder of the cycle.
5. Perform a Rinse cycle (see page 40) using a minimum of 2400 US gallons of stored permeate water.

Alkaline Soap Wash

1. Perform a rinse cycle (see page 40) using a minimum of 2400 US gallons of permeate stored for system rinsing.
2. Toward the end of the rinse cycle, turn valve V19 toward the wash tank feed position. This will direct the flow of permeate to the wash tank. When the wash tank is $\frac{3}{8}$ full, return V19 to the drain position.
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 a pH of 11 is reached. NOTE: This applies to FILMTEC E8 membranes. For other membranes consult with a LEADER sales person or a local distributor / dealer.
4. Set the valves as listed below.
5. Start and run the system until it shuts down automatically. The system will shut down when the temperature reaches 118°F.

NOTE: If the machine shuts down due to low pressure, check the prefilters. If the prefilters are dirty, replace and retry the wash cycle. If the prefilters appear clean or are new and the problem continues, partially close valve V18 until an operating pressure of 50 – 80psi is reached and run the remainder of the cycle.

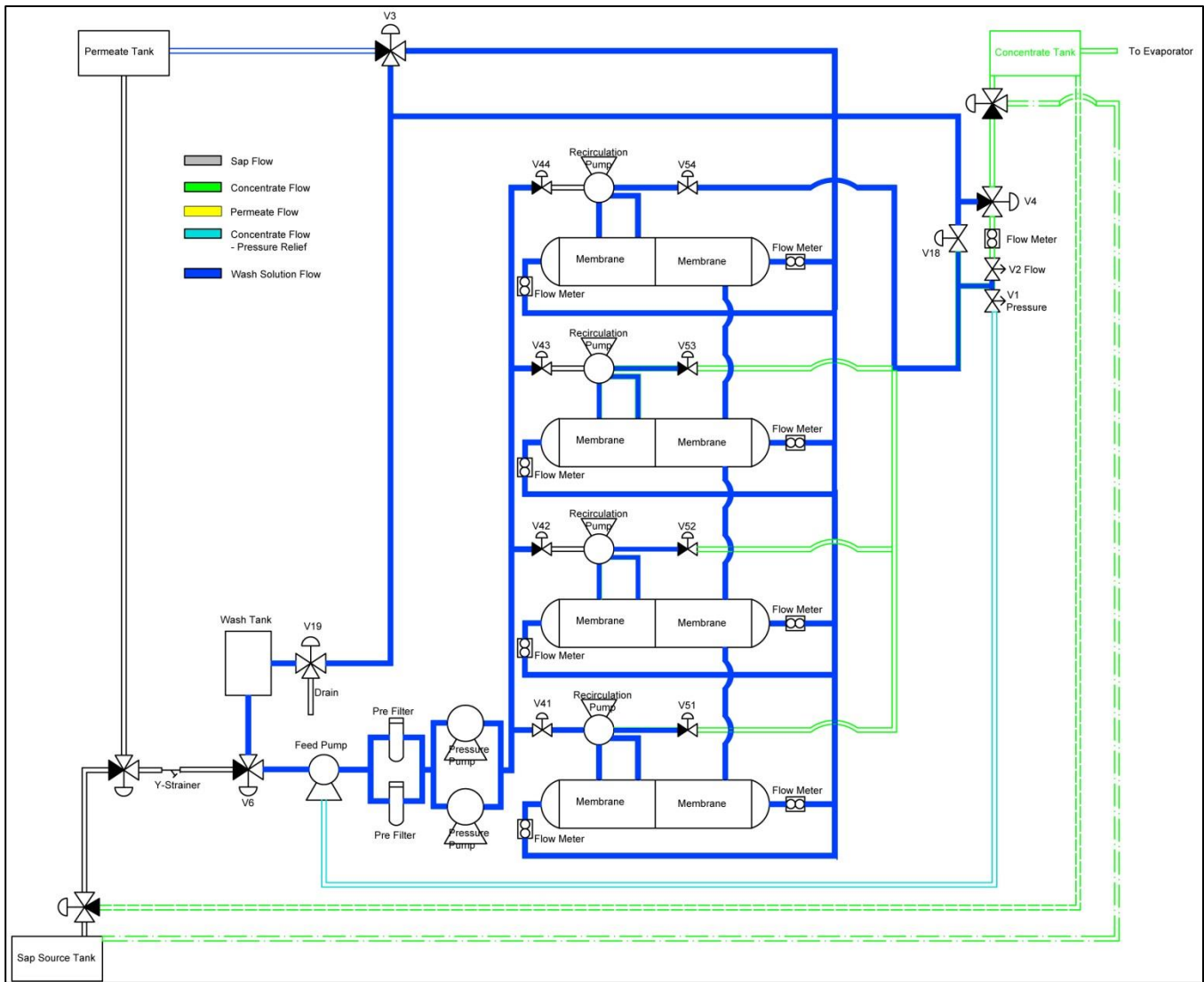
6. Perform a Rinse cycle (see page 40) using a minimum of 2400 US gallons of the stored permeate water.
7. Drain the wash tank. The drain valve is located under the wash tank. Turn the flow indicator to the left.

Intensive Alkaline Soap Wash

1. Follow the directions for the Alkaline Soap Wash.
2. Check the pH of the wash solution every 15 minutes. Maintain the pH by adding soap as needed.

Acid Soak

1. Perform an alkaline Soap wash as listed above.
2. At the end of the rinse cycle (following the wash) turn valve V19 toward the wash tank feed position. Run until the wash tank is approximately $\frac{3}{8}$ full, return V19 to the drain position.
3. Add 5 – $\frac{1}{2}$ cups of citric acid to the wash tank and mix.
4. Run a wash cycle. The system will shut down when the temperature 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 40) using a minimum of 2400 US gallons of stored permeate water.
8. Perform an alkaline soap wash as detailed above.
9. Drain the wash tank.
10. Perform a rinse cycle (see page 40) using a minimum of 2400 US gallons of stored permeate water.



Wash Cycle Valve Settings – also available on the Quick Start Guide

1. Position the valves as follows:

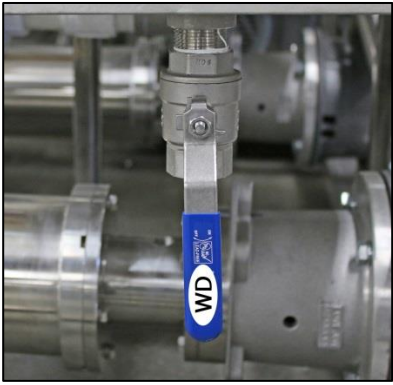


V1 – Open the valve completely

V2 – Open the valve completely



WD – Horizontal Left, valve is closed



WD – At the end of the wash cycle open the valve and drain the wash tank.



V3 –Horizontal Right

V4 – Horizontal Right

V18 – Vertical

V19 – Vertical Up



V6 – The flow indicator should be toward the wash tank



- V41 – Horizontal Left
- V41 BP – Right (Open)
- V42 – Vertical Up
- V43 – Vertical Up
- V44 – Vertical Up
- V44 BP – Vertical Down (Closed)
- V51 – Vertical Up
- V52 – Vertical Up
- V53 – Vertical Up
- V54 – Horizontal Left
- BP Vertical

2. Add the soap required for the type of wash to be performed. NOTE: Ensure the wash tank is filled first.
3. Press the START button on the control panel. Within 30 seconds all pumps should start.
4. If the system does not continue to run due to a LOW PRESSURE ALARM;
 - a. Light is SOLID - Repeat Step 2 up to 2 additional times. The STOP ALARM RESET button will need to be pressed after each time.
 - b. Light is BLINKING – Press the STOP button to reset the alarm. Check the prefilters, changing as necessary. Repeat Step 2.
5. If the system does not start on the third try, bleed the system. To bleed the system, open the valve on the top of the strainer (installed before valve V6) until all the air is released from the system. Close the bleed valve.
6. If the system does not start due to a LOW PRESSURE ALARM partially close valve V18 until an operating pressure of 50 – 80psi is reached and run the remainder of the cycle.
7. Press the STOP ALARM RESET button to reset the alarm.
8. For an alkaline soap wash - run the Wash cycle until the system shuts down automatically. The system shutdown is based on the temperature of the liquid. When the liquid reaches 118°F the system will shut down.
9. Open valve WD to drain the wash tank. When the wash tank has drained, return valve WD to the recirculation position.
10. Run a rinse cycle (see page 40) using a minimum of 2400 US gallons of permeate in the permeate storage tank.
11. Do a permeability test (see page 24). If the test is good, continue the rinse cycle with any additional permeate.

MAINTENANCE

Prefilters

When the feed pump pressure drops 20 psi or more, the prefilters may need to be changed. The system has two prefilter canisters. Each canister contains five 20" prefilters (LEADER Order #: 70012). The procedure to change the prefilters is as follows:



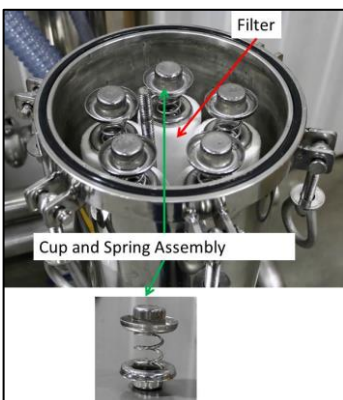
1. Open the lower drain of the filter housing and allow the liquid to drain from the housing. The draining process can be hastened by opening the upper drain also.



2. Loosen the eye nuts and rotate the bolts off the top of the housing cover.



3. Remove the cover from the housing to expose the compression plate which is held in place by a washer and wing nut.



4. Remove the wing nut, washer and compression plate from the top of the filters in the housing. Five filters and associated cup and spring assemblies will be exposed.



5. Remove the cup and spring assemblies from the tops of the filters then remove the filters by pulling straight up so they slide over the guides.



6. Slide the new filters over the guides in the housing.



7. Place one cup and spring assembly into the top of each filter. The projection on the bottom of the cup should fit into the hole in the filter.



8. Place the compression plate over the threaded rod and lower onto the cup and spring assemblies, lining one assembly up in each hole.



9. Secure the compression plate in place by placing the washer over then threading the wing nut onto the threaded rod. Tighten the wing nut.

10. Inspect the O-ring in the housing and replace if necessary. It may also need to be lubricated with food grade grease.



11. Replace the cover, aligning the guides for the eye nuts and secure the eye nuts.



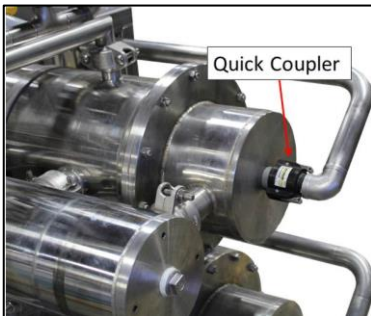
Membrane Removal and Installation

Removal

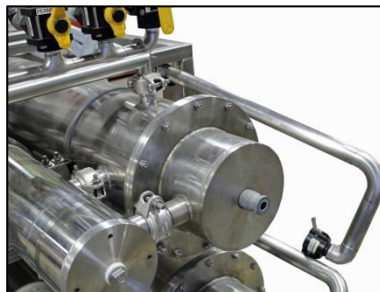
→Common Steps for Removal of Locking and Non Locking Style E8 Membranes

NOTE: Each vessel contains two membranes.

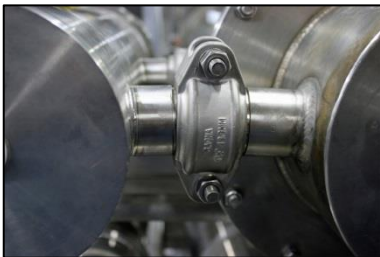
1. Stop the system by pressing the STOP button.
2. Position valve V6 to the wash position.
3. Set valves V3 and V4 in a rinse cycle position.
4. Open the drain of the membrane housing to be changed. Allow the membrane to drain until empty.
5. Disconnect the permeate line(s) quick coupler(s) from the ends of the membrane housing. Quick couplers are located on both ends of the membrane housing.



6. Carefully move the



permeate pipes to the side.



7. Remove the bolts from the metal clamp between the top (right side) of the membrane housing and the recirculation pump.



8. Slide the gasket rubber to the pipe on the pump side of the connection.



9. Using (2) - 9/16" wrenches remove the bolts fastening the end of the membrane housing to the body of the membrane housing.



10. Remove membrane housing cap from the membrane.

11. Determine the style of E8 membrane installed in the system. Visually check the end of the membrane to determine the style.

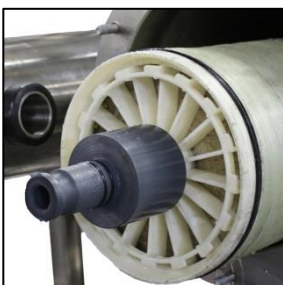


Locking Style E8 Membrane – continue with the section “Removal Of Locking Style E8 Membranes”

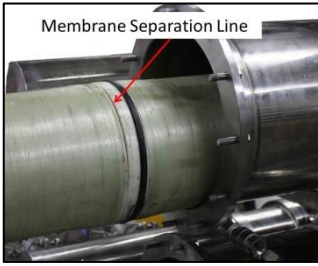


Non Locking Style E8 Membrane – continue with the section “Removal Of Non Locking Style E8 Membranes”

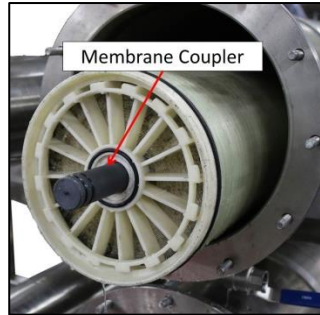
→Steps for Removal Of Locking Style E8 Membrane



1. Remove the alignment coupling from the end of the membrane(s).



2. Slide the paired membranes out of the vessel until the second membrane can be seen. Twist the outer membrane counter clockwise until the joint between the membranes is unlocked – approximately 1”.

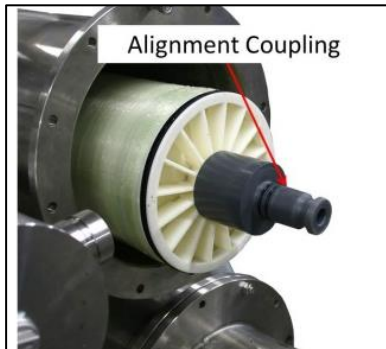


3. Remove the outer membrane then the membrane coupler.

4. Remove the remaining membrane. If the second alignment coupling is still attached to the end of the membrane, remove it.

5. For reinstallation of the membranes, refer to the section “Installation of Hooked Style E8 Membranes”

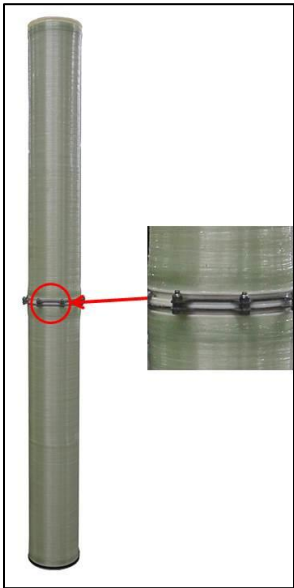
→Steps for Removal Of Non Locking Style E8 Membrane



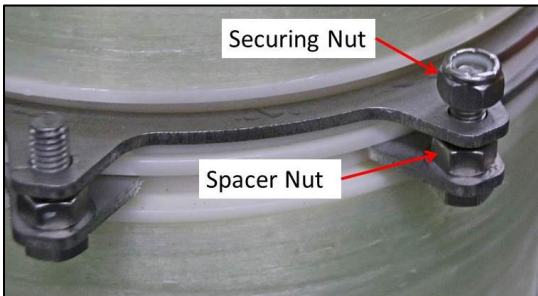
1. Remove the alignment coupling from the end of the membrane.



2. Slide the mated membranes out of the pressure vessel.



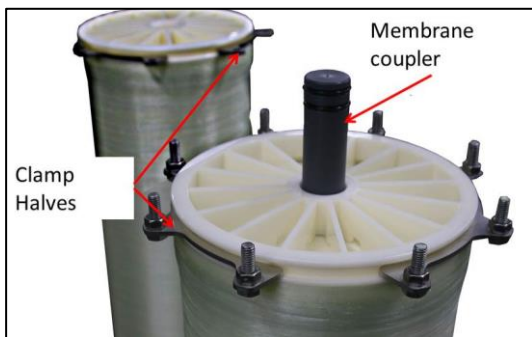
3. Place the membrane assembly on a clean solid surface upright with the nuts of the clamp facing upward.



4. Remove all the securing nuts holding the clamp assembly together. Leave the spacer nuts in place.



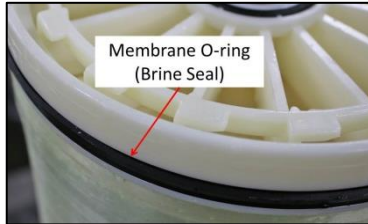
5. Separate the two membranes by raising the upper membrane to clear the clamp bolts and the connector. Place the membrane on a solid clean surface.



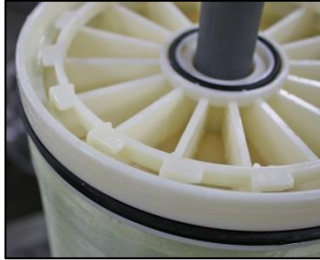
6. Remove the membrane coupler and the clamp halves from each of the membranes.

Installation

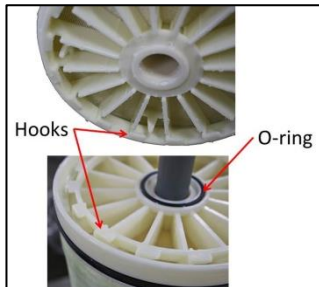
→Steps for Installation of Locking Style E8 Membrane



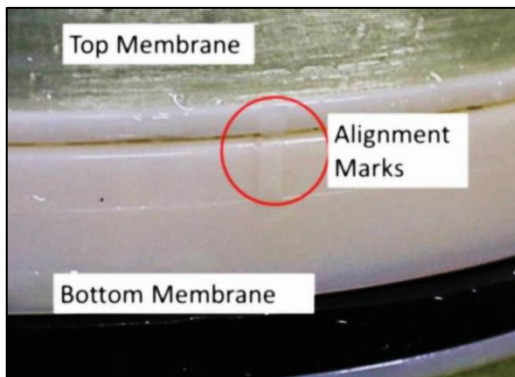
1. Lubricate the membrane O-ring (brine seal) of each membrane with food grade grease.



2. Place one membrane on a solid surface such as a clean floor with the O-ring seal on the upper end. Check the O-rings on the membrane connector then lightly lubricate with food grade grease. Place the connector into the top of the membrane.



3. Lightly lubricate the membrane O-ring with food grade grease then place the second membrane over the connector and aligned so the hooks of the bottom membrane and the hooks of the top membrane will not interfere with the membranes coming together.



4. Slide the two membranes together until they meet. Turn the top membrane clockwise until the two membranes are locked together. There are indicators on the membranes to confirm the correct positioning.



5. Place an alignment fixture into the membrane housing. The fixture used in the factory is pictured here. A suitable fixture can be constructed with a piece of wood 2"X4", a screw eye and a length of wire.



6. Inspect and replace if necessary the four (4) O-rings on the alignment couplings used on both ends of the membranes. Lightly lubricate the O-rings with food grade grease.
7. Using the alignment fixture as a guide, slide the assembled membranes into the membrane housing. Ensure the membrane goes all the way into the housing with the membrane coupling at the left end of the housing seated into the membrane and the coupling is in the hole at the end of the housing.
8. When the membrane is seated, gently lift the front of the membrane and remove the alignment fixture.

→Steps for Installation of Non Locking Style E8 Membrane



1. Place a membrane on a clean solid surface with the brine seal on the top end.



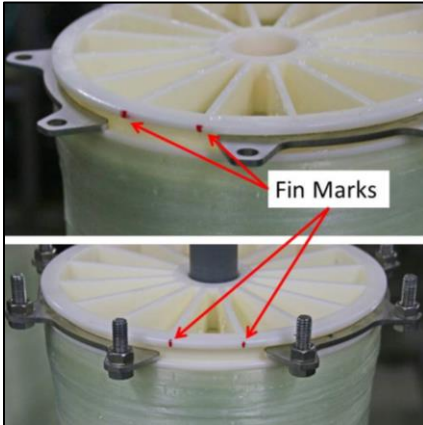
2. Insert the clamp assembly half without the bolts into the brine seal groove.



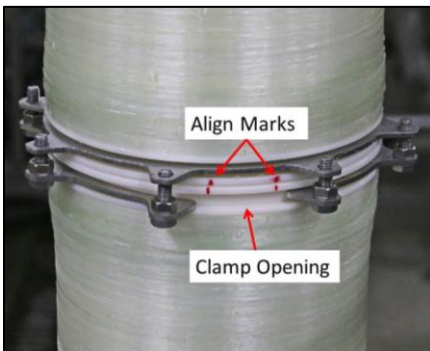
3. Place a second membrane on a clean solid surface with the brine seal down.
4. Insert the membrane coupler into the end of the membrane.



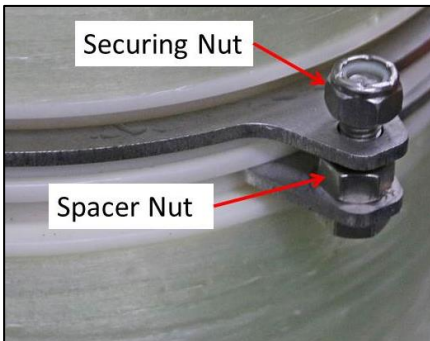
5. Insert the clamp assembly half into the groove at the top portion of the membrane with the bolts pointed up.



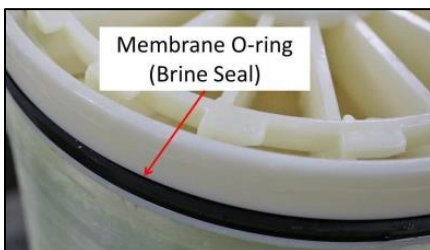
6. Using a marker, mark the outside edge of the clamp end of each membrane where two adjoining support fins meet the outer rim.



7. Place the membrane with the clamp assembly half with not bolts onto the other membrane aligning as follows;
 - a. Center over the connector
 - b. Clamp openings to be on opposite sides of the assembly
 - c. Fin marks to be aligned



8. Secure the two clamp assembly halves together by tightening a nut with insert onto each bolt.



9. Lubricate the membrane O-ring (brine seal) of the bottom membrane with food grade grease.

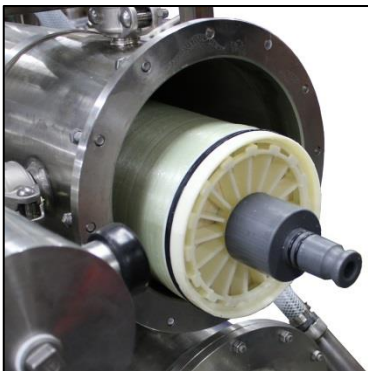


10. Inspect and replace if necessary the four (4) O-rings on the alignment couplings used on both ends of the membranes. Lightly lubricate the O-rings with food grade grease. Ensure the alignment coupling is in place in the upper membrane prior to inserting the membranes into the pressure vessel or has remained in place in the pressure vessel.



11. Slide the mated membranes into the pressure vessel. Ensure the membrane goes all the way into the housing with the membrane coupling at the left end of the housing seated into the membrane and the coupling is in the hole at the end of the housing.

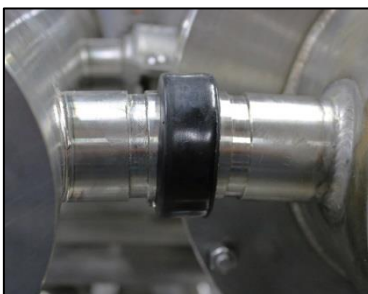
→Common Steps For Installation of Locking and Non Locking Style E8 Membranes



1. Insert the membrane coupling into the end of the membrane.



2. Inspect the O-rings on the membrane housing cap, replace if damaged. Lubricate the O-rings with food grade grease, if necessary. Install the membrane housing end cap aligning the pump connection on the cap with the recirculation pump pipe.



3. Reinstall and loosely tighten the bolts and nuts around the housing cap.
4. Slide the clamp rubber coupler over the membrane housing pipe so that it rests between the grooves.



5. Place the two clamp halves over the rubber seal and aligning the pieces with the grooves in the connector pipes. Place the bolts in the clamp and tighten. Check to ensure the clamp is properly seated and tightened by ensuring the two halves fit tightly together.



6. Securely tighten the nuts and bolts of the membrane housing cap. It is recommended the bolts be tightened in a crisscross pattern.



7. Reconnect the permeate lines at each end of the membrane housing using the quick couplers.

8. Follow the instructions for the Beginning of Season Startup (see page 58).

Daily

Each day or at the end of 6 to 12 hours of running concentrate cycles, it is recommended the following be done:

1. Remove, clean and reinstall the strainer in the Y-strainer.
2. Sample the permeate from each permeate sample port.
 - a. Open the sample port and run one test cup of liquid through the piping to purge material already there
 - b. Draw a sample for testing. 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, connector or alignment couplings. Check the troubleshooting chart.
3. Check all hoses, piping, fittings and connections for leaks. Repair as necessary.
4. Run a cycle of Desugar (see page 36)– Rinse (see page 40) – Alkaline Soap Wash (see page 43)– Rinse (see page 40)
5. Do a Permeability test (see page 24)
6. Inspect and clean storage tanks
 - a. Permeate
 - b. Concentrate
 - c. Sap

Periodic

1. When the feed pump pressure drops 20 psi or more, the prefilters need to be changed (see page 47).
2. If a permeability test (see page 24) indicates the system performance is less than 85% of the benchmarked performance;
 - a. Run a cycle of Rinse (see page 40) – Intensive Alkaline Soap Wash (see page 43) (checking pH 2 to 3 times and adding additional soap as necessary)– Rinse (see page 40) and repeat the permeability test (see page 24).

- b. If necessary or at the end of the season, run a cycle of Rinse (see page 40) – Acid Wash (see page 43)– Rinse (see page 40) – Alkaline Soap Wash (see page 43)– Rinse (see page 40) and repeat the permeability test (see page 24).
3. Pump motors will need to be lubricated. The following table describes the lubrication requirements. NOTE: The output of the grease gun will need to be measured prior to lubricating the bearings in order to ensure the proper amount of lubrication is used.
 - a. All bearings require EXXON POLYREX EM lubricant.

MOTOR FUNCTION	HP	Bearing Location	Lubrication Interval (hrs)	Lubrication Amount (ounces)		Bearing Location	Lubrication Interval (hrs)	Lubrication Amount (ounces)
Feed Pump	7.5	Pump end	3600	6.1		Non Pump End	3600	3.9
Pressure Pump	10	Pump end	3600	8.4		Non Pump End	3600	5
Recirculation Pump	3	Pump end	5500	5.0		Non Pump End	5500	3.9

End Of Season Shutdown and Storage

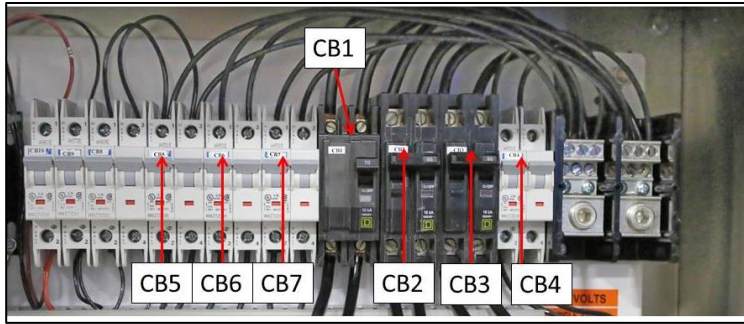
If permeate is not available to perform the rinse and wash cycles stated in the following procedure, obtain the necessary volume of water using non chlorinated well or spring water.

1. Do a rinse cycle (see page 40) – alkaline soap wash (see page 43) – rinse cycle (see page 40).
2. Do an acid soak cycle (see page 43) allowing the system to soak for 1 to 7 days, starting the system once per day and allowing it to run to the auto stop temperature at 118°F.
3. Do a rinse cycle (see page 40) – intensive alkaline soap wash (see page 43) – rinse cycle (see page 40)
4. Perform a permeability test (see page 24). If the test result shows a difference of greater than 15% to the benchmark, repeat the process starting with Step 2.
5. Drain the wash tank (valve WD) then close the drain.
6. In the wash tank mix:
 - a. 40 US gallons of permeate
 - b. 2 US gallons of glycol
 - c. 8 Tablespoons of membrane preservative
7. Set the system valves for a wash cycle (see page 42) and run the system for 15 minutes. Drain the wash tank.
8. Drain the prefilter housings then close the drains.
9. Drain the pumps then close all drains.
10. Maintain a temperature of 40°F to 50°F in the area where the system is stored. Do not allow the system to freeze.
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. Replace prefilters.
3. Open the control box by turning the latches on the right side of the panel then opening the door carefully to the left.
4. Turn off the pressure and recirculation pump breakers:



BREAKER ID	CIRCUIT	START POSITION
CB1	Feed Pump	ON
CB2	Pressure Pump	OFF
CB3	Pressure Pump	OFF
CB4	Recirculation Pump	OFF
CB5	Recirculation Pump	OFF
CB6	Recirculation Pump	OFF
CB7	Recirculation Pump	OFF

5. Close the control box cover and turn the latches to fasten.
6. Ensure your source valves (water or permeate) are open to feed the system.
7. Position the valves for the rinse cycle (see page 40).
8. Press the START button to start the feed pump.
9. 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.
10. Press the STOP button to stop the feed pump.
11. Check all fittings, hoses, connections and parts of the system for leaks. Repair as necessary.
12. Open the control box by turning the latches on the right side of the panel then opening the door carefully to the left.
13. Position breakers CB1, CB2, CB3, CB4, CB5, CB6 and CB7 to the ON position.
14. Close the control box cover and turn the latches to fasten.
15. Run a rinse cycle (see page 40) until a minimum of 2400 US gallons of water have been processed. Near the end of the rinse cycle turn valve V19 down and fill the wash tank 2/3 full. Return valve V19 to its original position.
16. Run a hot water wash cycle (see page 42).
17. Repeat the rinse cycle (see page 40) again filling the wash tank as specified then add R/O soap (LEADER Order # 70006) to the wash tank and mix. Add R/O soap until a pH of 11 is reached.
18. Run an alkaline wash cycle (see page 43).
19. Perform a rinse cycle (see page 40) using a minimum of 2400 US gallons of water.
20. Perform a permeability test (see page 24).
 - a. Compare the results to the results of the test when the system was new. 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.
Feed pump starts but system does not continue running – Low Pressure Alarm	Low Pressure	Inspect incoming plumbing for leaks
		Check and clean Y-strainer
		Pre Filters need changing
	No liquid coming from storage	System needs to be bled
	No liquid coming from storage	Check the positions of all valves
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 alignment coupling or membrane plug	Replace O-ring or alignment coupling or the membrane connector
	Membrane deterioration	Replace membrane
Temperature Alarm Indicator	Normal operations for wash cycle	Reset alarm by pressing the STOP button
Motor Failure Alarm Indicator	Motor contactor has tripped	Contact LEADER Technical Service

ATTACHMENT #1 – ELECTRICAL SCHEMATIC

Service 230 Vac, 1 Phase, 225 Amps, 2 Wire & Ground

Danger
High Voltage

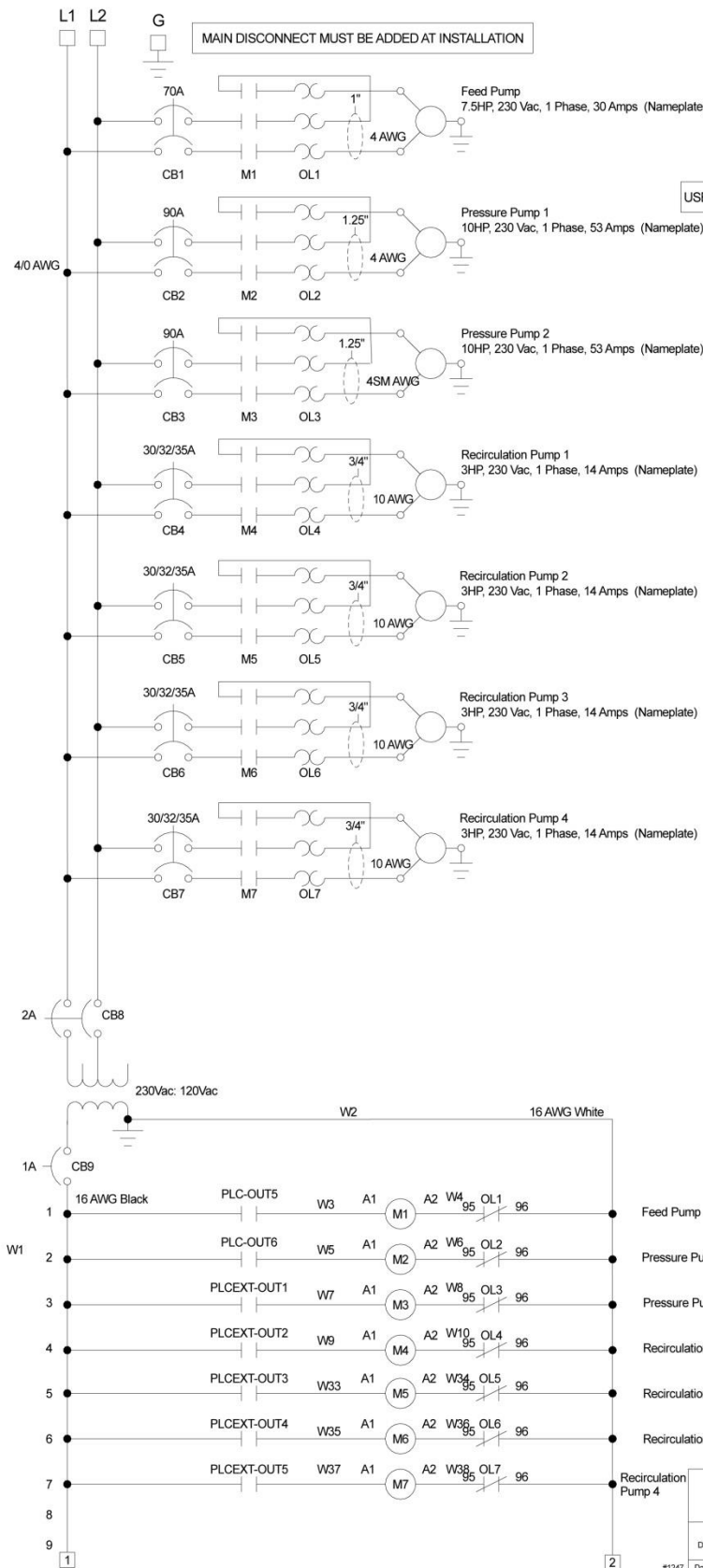
Note:
- All control wire is 16 AWG Red unless otherwise noted.
- All terminal blocks are labeled to their corresponding wire numbers.

TORQUE TERMINALS TO 15lb-in.

USE 75°C COPPER CONDUCTORS ONLY

CONDUIT/FITTINGS TO MEET ENCLOSURE RATING

BONDING OF CONDUCTORS TO BE TIED WITH MAIN GROUND

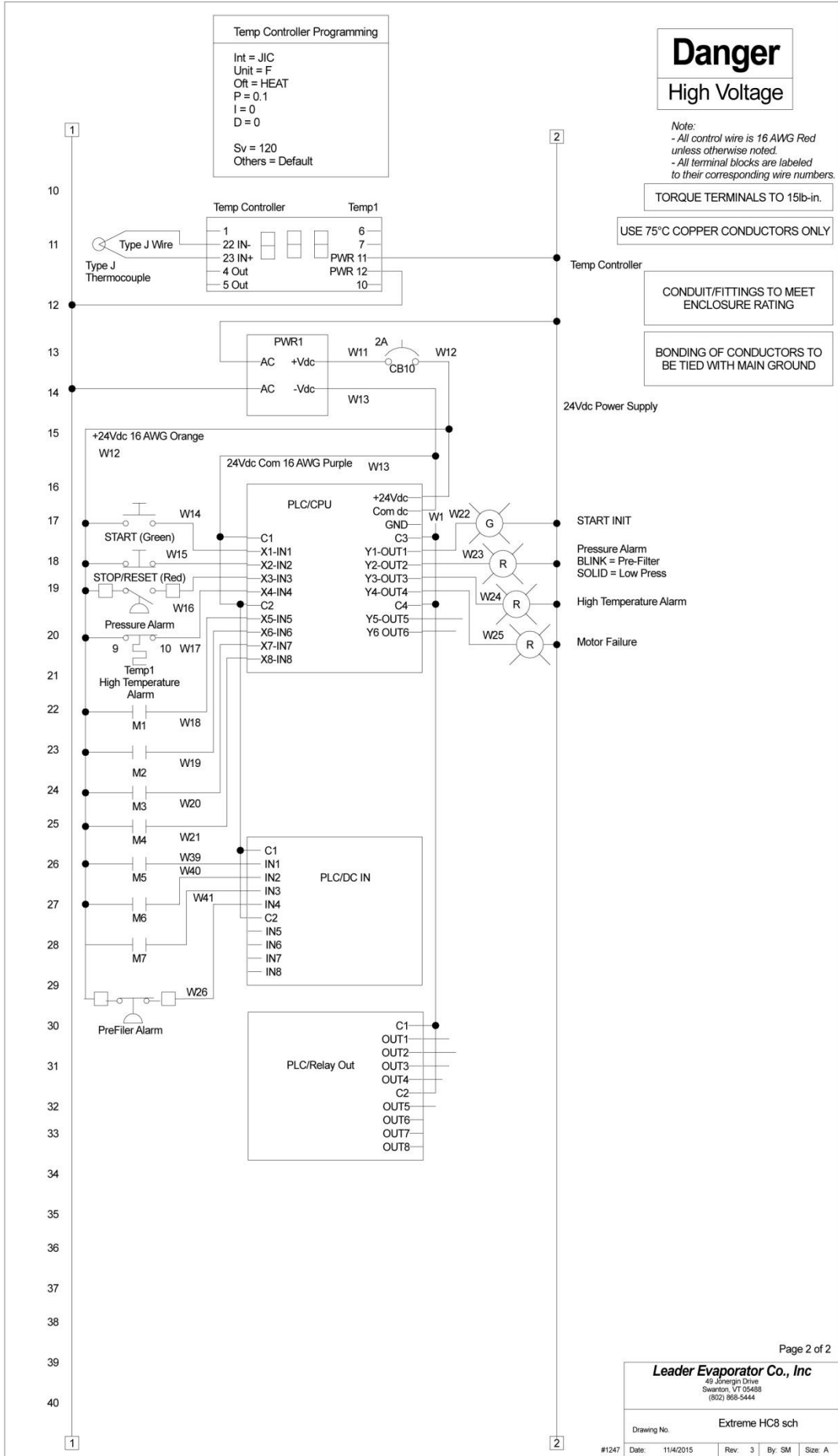


Page 1 of 2

Leader Evaporator Co., Inc
49 Johnson Drive
Swanton, VT 05488
(802) 868-5444

Drawing No. Extreme HC8 sch

#1247 Date: 11/4/2015 Rev. 3 By: SM Size: A



ATTACHMENT #2 – OPERATIONS DATA LOGSHEET

Water Removal % = ((permeate 1 flow + permeate 2 flow + permeate 3 flow + permeate 4 flow + permeate 5 flow + permeate 6 flow + permeate 7 flow + permeate 8 flow) / (permeate 1 flow + permeate 2 flow + permeate 3 flow + permeate 4 flow + permeate 5 flow + permeate 6 flow + permeate 7 flow + permeate 8 flow + concentrate flow))*100

GPH Processed = (permeate 1 flow + permeate 2 flow + permeate 3 flow + permeate 4 flow + permeate 5 flow + permeate 6 flow + permeate 7 flow + permeate 8 flow + concentrate flow)*60

SPRINGTECH EXTREME HC-8 OPERATIONS DATA

	DATE								
	ACTIVITY (C or T)								
SUGAR CONCENTRATION	SAP								
	CONCENTRATE								
FLOW (gpm)	PERMEATE 1								
	PERMEATE 2								
	PERMEATE 3								
	PERMEATE 4								
	PERMEATE 5								
	PERMEATE 6								
	PERMEATE 7								
	PERMEATE 8								
	CONCENTRATE								
	TEMPERATURE								
PRESSURE (psi)	FEED PUMP								
	MEMBRANE								
	WATER REMOVAL %								
	GPH PROCESSED								

	DATE								
	ACTIVITY (C or T)								
SUGAR CONCENTRATION	SAP								
	CONCENTRATE								
FLOW (gpm)	PERMEATE 1								
	PERMEATE 2								
	PERMEATE 3								
	PERMEATE 4								
	PERMEATE 5								
	PERMEATE 6								
	PERMEATE 7								
	PERMEATE 8								
	CONCENTRATE								
	TEMPERATURE								
PRESSURE (psi)	FEED PUMP								
	MEMBRANE								
	WATER REMOVAL %								
	GPH PROCESSED								

	DATE								
	ACTIVITY (C or T)								
SUGAR CONCENTRATION	SAP								
	CONCENTRATE								
FLOW (gpm)	PERMEATE 1								
	PERMEATE 2								
	PERMEATE 3								
	PERMEATE 4								
	PERMEATE 5								
	PERMEATE 6								
	PERMEATE 7								
	PERMEATE 8								
	CONCENTRATE								
	TEMPERATURE								
PRESSURE (psi)	FEED PUMP								
	MEMBRANE								
	WATER REMOVAL %								
	GPH PROCESSED								

	DATE								
	ACTIVITY (C or T)								
SUGAR CONCENTRATION	SAP								
	CONCENTRATE								
FLOW (gpm)	PERMEATE 1								
	PERMEATE 2								
	PERMEATE 3								
	PERMEATE 4								
	PERMEATE 5								
	PERMEATE 6								
	PERMEATE 7								
	PERMEATE 8								
	CONCENTRATE								
	TEMPERATURE								
PRESSURE (psi)	FEED PUMP								
	MEMBRANE								
	WATER REMOVAL %								
	GPH PROCESSED								



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Leader Evaporator Manufacturer's Warranty For Springtech Extreme Reverse Osmosis Machines

Leader Evaporator Co., Inc. warrants our Springtech Extreme 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.