SUPRA

Operation and Maintenance Manual
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I. INTRODUCTION

The Supra is the most advanced system in its category. It is the first separator offering a serial and a parallel operation. Moreover, it is the first one to be equipped with the Booster pump, which significantly increases the concentration rate without using more energy. This system results from a long-term industrial expertise in reverse osmosis.

II. DRAWINGS AND SPECIFICATIONS
Control Panel

Temperature Gauge

Unit #2

Unit #1
Installation of Filtration Units

System with 3 pressure pumps

Feeding Unit #1

Feeding Unit #2
System with 2 pressure pumps

Feeding Unit #1

Feeding Unit #2
III. STARTING-UP OF SUPRA

Operation

The first thing to do is select between the Serial and Parallel mode. To do so, use the appropriate selector.

The Serial mode allows your system to concentrate to a higher brix level – just as if you used twice the same machine. The Booster pump can be activated only in the Serial mode.

The Parallel mode allows you to produce more flow. In this mode all membrane housings will operate in parallel.

In cleaning mode, or if you want to operate only one of the 2 units, make sure that the valves are in Parallel mode.

Note: Always stop the system before changing the operating mode of the selector.

For a Serial operation:

When you choose the Serial mode, Unit #1 controls will work for both units.

- Make sure that the sap water tank feeds the 2 inputs.
- Make sure that the 2 Serial/Parallel valves are in Serial mode.
- Position #1 selector to Concentration.

The system will start. First the feed pumps will start. When the pressure is high enough, the pressure pumps will start, followed by the recirculation pumps.

When the system is running, it needs to be adjusted following the required specifications using the concentration valves and the pressure valves of unit #1.

If your unit is equipped with the Booster pump, turn the selector to ON to start it.
For a Parallel operation:
In the Parallel mode, #1 and #2 osmosis controls are independent; it is exactly as if you had two separate systems.

- Make sure that the sap water tank feeds the 2 inputs.
- Make sure that the 2 Serial/Parallel valves are in Parallel mode.
- Position #1 AND #2 selectors to Concentration.

To operate the Supra, turn the selector to START to start the primer pump. When the pressure is high enough, the pressure pump will start. If the system doesn’t reach the minimum pressure required, try again and set the selector to OFF before positioning it back to ON. A few seconds will be needed before the recirculation pumps start.

If your system is equipped with a Booster pump, it will be disabled in the Parallel mode.

System Shutdown
To stop the Supra, turn the selector to OFF, which will simultaneously stop the three pumps. The Supra also has several protective devices that will stop the system immediately in case of problems. Coupled with light indicators, these devices are the following:

- High water temperature
- Low pressure pump inlet pressure
- Motor fault
IV. General Characteristics

Main Module Specifications

- Dimensions: Big frame | Small frame
  - Height: 77" | 77"
  - Width: 44" | 34"
  - Depth: 80" | 80"

- Plumbing hook up: Big frame | Small frame
  - Maple sap inlet: 2 x 2½ " | 2 x 2"
  - Permeate outlet: 2 x 1" FNPT
  - Concentrate outlet: 2 x 1" FNPT
  - Drain: 1 ½” PVC slick

- Feeding pump
  - Stainless steel pump, equipped with a 2 HP, 60 Hz, 3500 rpm, 230 volts single-phased motor.

- Pressure pump:
  - 20 gpm activated by a 7.5 HP, 60 Hz, 3500 rpm, 230 volts single-phased motor.

- Recirculation pump:
  - 75 gpm activated by a 1 HP, 60 Hz, 3500 rpm, 230 volts motor.

- Easy-to-read flowmeters made of transparent glass:
  - Concentrate flowmeter: 0-15 gpm 1 per unit
  - Permeate flowmeter: 0-35 gpm 1 per unit

- Three (3) reliable and easy-to-read (glycerin) pressure gauges:
  - Pressure before and after the 5-micron prefilter
  - Membrane pressure

- Visual thermometer

- Safety switches

- Low pressure switch (adjusted between 15 and 25 PSI) located at the prefilter outlet – to completely shut down the unit

- High temperature switch located at the prefilter outlet, adjusted to 40ºC or 104º F

- Stainless steel frame.

- A 5-micron sediment cartridge filter

- Three (3) adjustment valves:
  - Permeate control valve located at the pressure pump outlet
  - Concentrate control valve located on the concentrate flowmeter
  - Concentrate bypass valve to carry out high-flow washings

- Two (2) sampling valves, located on the permeate and concentrate flowmeters

- One integrated wash tank, approx. 78 liters, used to wash the membranes at the end of each concentration cycle.

- A 8" x 40" membrane with a stainless steel housing resisting to high pressure. The installed membrane is a high-performance TFC (Thin Film Composite) membrane manufactured by H2O Innovation

- Powerful electrical connectors
**Electrical Consumption**

The following table shows the electrical consumption depending on the selected equipment:

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Number of Membranes</th>
<th>Pressure Pump</th>
<th>Intensity at 240 V</th>
</tr>
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<tr>
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<td>4</td>
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<td>PFH-SUPRA-6-2-P</td>
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<td>155</td>
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<td>PFH-SUPRA-7-2-P-1</td>
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<td>164</td>
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<tr>
<td>PFH-SUPRA-7-2-G-1</td>
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<td>164</td>
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<tr>
<td>PFH-SUPRA-8-2-P</td>
<td>8</td>
<td>2</td>
<td>164</td>
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<td>PFH-SUPRA-9-2-G-1</td>
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<tr>
<td>PFH-SUPRA-9-3-G-1</td>
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<tr>
<td>PFH-SUPRA-10-2-G-3-1</td>
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<td>209</td>
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<td>PFH-SUPRA-10-3-G-3-1</td>
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<td>255</td>
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<td>PFH-SUPRA-12-3-G-1</td>
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<td>3</td>
<td>255</td>
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<tr>
<td>PFH-SUPRA-12-3-G-3-1</td>
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<td>273</td>
</tr>
<tr>
<td>PFH-SUPRA-15-3-G-3-1</td>
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<td>3</td>
<td>300</td>
</tr>
</tbody>
</table>
V. Plumbing Installation

The Supra is part of an integrated system of maple sap gathering and concentration. To make sure it operates efficiently within this system, it must be correctly connected to the other elements of the system. The following explanations will provide you with installation suggestions. The physical layout of the place may change, but the suggested principles of connection are important to operate the system in a safe, efficient and reliable way.

Required Tanks

There are 3 required tanks:

- Permeate tank. To gather pure water (permeate) extracted from maple sap. This pure water will be used to wash your separator.
- Maple sap tank. To accumulate a sufficient supply of maple sap to feed your separator.
- Concentrate tank. To accumulate a sufficient supply of concentrated water to feed your evaporator.

The capacity of the tanks is related to the importance of your maple bush (i.e. the number of taps), to the size and performance of your evaporator, and to the way you want to manage your equipment.

Considering all these possibilities, we will not provide you here with any rules or formulas. We suggest you consult with your H2O Innovation distributor according to your personal needs. However, we remind you that most Canadian and American specialists recommend that maple sap should be concentrated and boiled as soon as possible after being collected, so as to get a better-quality syrup.

Connecting System to Tanks

The permeate and maple sap tanks must be connected to the feeding pump. To prevent any discharge and bacterial contamination, we recommend an air gap connection between the line and the drain.

The concentrate outlet must be connected to the concentrate tank.

The permeate outlet must be connected to the permeate tank.

The most important thing to keep in mind is that you must always be able to connect or isolate, if necessary, one or more components depending on the various cycles of the separator, on the various functions of each component, and in case of repair.

Availability of H2O Innovation Technicians

You can ask H2O Innovation technicians to connect your Supra to your gathering and concentration system. Ask your distributor to get a quote for a complete installation.
Membrane Installation

Make sure to follow the water flow using the arrow on the membrane and to install the U-cup in the correct orientation. The U-cup makes the water enter the membrane and prevents it from going around it.
VI. Operation Cycles of the Supra

Concentration Cycle

First

This cycle is carried out in two stages:

- First flush away towards the drain all rinsing water from membrane and pipes, for approximately one minute.
- Then concentrate maple sap.

Step-by-step procedure

- Shut all valves
- Open maple sap tank outlet valve
- Open maple sap valve before the Supra unit
- Set the permeate derivation valve to allow permeate to flow towards the permeate tank
- Set the concentrate derivation valve to allow concentrate to flow towards the wash tank and open the outlet valve of the wash tank to flush it away – long enough for the last rinsing water to be flushed away from the membrane and replaced by concentrated maple sap.

On the control panel

- Open the concentrate control valve (a few turns)
- Start the system
- When you see water in the permeate flowmeter, adjust the concentration valve like this: more opened at the beginning, then slowly shut it until you reach the desired level of concentration

At the tanks

- After about 1 minute of operation, take a sample to check if the concentrated water begins to sweeten.
- If so, set the concentrate control valve to feed the concentrate tank.

Check regularly the adjustment of both concentrate and permeate valves, most importantly during the first half-hour of operation, and then hourly.

One hour before ending the concentration cycle, fill in the wash tank with permeate.
Warnings:

- Check the prefilter before each concentration cycle and during operation.
- Change the filter cartridge when you note a pressure difference of more than 20 psi. Check the appropriate pressure gauges for the pressure before and after the prefilter.
- Immediately (or at least within the next 30 minutes) following a concentration cycle, you have to run a rinse cycle to eliminate sugar and bacteria.

Rinse Cycle

General overview:

It is well-known that maple sap is a solution which contains a good amount of sugar and bacteria. The spiral-type of the membrane collects sugar and bacteria deposits on its surface and in the wound mesh. That is why it is absolutely necessary to regularly rinse the reverse osmosis system.

This cycle is carried out in two stages:

- Flush away concentrated water from membranes towards concentrate tank so as not to lose sap at the concentrate, then drain the water through the wash tank.
- Rinse membranes with permeate water for 15 minutes.

Step-by-step procedure:

- Shut all valves
- Open feeding valve of permeate tank
- Set permeate derivation valve to allow permeate to flow towards the permeate tank
- Temporarily divert concentrate outlet towards the concentrate tank
- Completely open wash valve
- Start system
- Let it run for one or two minutes until concentrated water is flushed away from membranes and pipes
- Set concentrate derivation valve to allow concentrate to flow towards the wash tank and open outlet valve to drain during rinsing.
- Calculate PWP
- If the flow rate loss exceeds 20%, carry out a washing.
Wash Cycle

General overview

For the same reasons mentioned in the rinse cycle section, bacterial and mineral accumulation on membranes makes washing compulsory when the membrane reaches a flow rate loss of 20% or more. This is why it is imperative to regularly check the efficiency of your membranes through PWP calculation.

Step-by-step procedure

- Carry out a complete rinse cycle. Make sure to keep some permeate for the final rinse.
- Fill wash tank with permeate up to overflow.
- Add the appropriate quantity of cleaner depending on the number of membranes, or use a pH reader to adjust the pH to 12 with Bio-membrane
- Shut all valves
- Make sure to feed the feeding pumps with a cleansing solution
- Divert concentrate and permeate outlets towards the wash tank using the derivation valves

On the control panel

- Completely open concentrate control valve
- Completely open permeate control valve
- Start both units in parallel mode if you wash both; otherwise you can just start one.

- Let the solution circulate until the system automatically stops. As the solution heats up, automatic shut-off will occur when temperature reaches 40°C (104°F).
- Empty wash tank
- Carry out a rinse cycle to wash away all cleaner residues
<table>
<thead>
<tr>
<th>Number of membranes</th>
<th>Bio-Membrane Quantity</th>
<th>Bio-Membrane Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supra 4</td>
<td>3.5 L in a full tank</td>
<td>2.5 L in ½ tank</td>
</tr>
<tr>
<td>Supra 6</td>
<td>4 L in a full tank</td>
<td>3 L in ½ tank</td>
</tr>
<tr>
<td>Supra 7</td>
<td>4.3 L in a full tank</td>
<td>3.3 L in ½ tank</td>
</tr>
<tr>
<td>Supra 8</td>
<td>4.5 L in a full tank</td>
<td>3.5 L in ½ tank</td>
</tr>
<tr>
<td>Supra 9</td>
<td>4.7 L in a full tank</td>
<td>3.7 L in ½ tank</td>
</tr>
<tr>
<td>Supra 10</td>
<td>5 L in a full tank</td>
<td>4 L in ½ tank</td>
</tr>
<tr>
<td>Supra 12</td>
<td>5.6 L in a full tank</td>
<td>4.6 L in ½ tank</td>
</tr>
<tr>
<td>Supra 15</td>
<td>6.2 L in a full tank</td>
<td>5.2 L in ½ tank</td>
</tr>
</tbody>
</table>

The quantity used may be reduced if you use the Ultra Bio-Membrane.

**Daily putting away**

Rinse your membrane, compare your current PWP with the initial PWP and carry out a washing if necessary. Then let it stand in the rinse cycle permeate until the next day. If you anticipate your system will not be operated for more than 3 days, put a storage solution in the system.

**Warning:**

If you used a bactericide solution, you must carry out a rinsing before concentrating the maple sap.
VII. Flow Calculation

It is easy to calculate the total flow of the Supra. Simply add the concentrate flow to the permeate flow.

- The flowmeters are in gallons per minute
- Read the flow on top of the floater.

Example:
Readings are: 6 GPM of concentrate and 35 GPM of permeate.
Total flow: 6 GPM + 35 GPM = 41 GPM

- To get the total flow per hour, just multiply the total flow by 60.
- Total flow per hour = 41 gallons per min x 60 min per hour = 2,400 GPH (gallons per hour)

Recommended concentration level

To ensure an optimal life time for your membrane, which is one of the most expensive component of the Supra, and to avoid too frequent washings, which delay the production and turn out to be expensive, we recommend that the concentration rate should not exceed 85%. The more membranes your system is equipped with, the more you can concentrate. The Booster pump option also allows to increase the concentration level. Always make sure that each membrane is correctly running.

How to calculate the concentration level

The concentration rate can be calculated as follows: divide the permeate flow by the total flow, and multiply by 100.

Example:
Readings: 6 GPM of concentrate and 35 GPM of permeate.
Total flow: 6 GPM + 35 GPM = 41 GPM
Concentration rate: (permeate 35 / total flow 41 GPM) x 100 = 85%
Pure Water Permeation (PWP) Factor Calculation

Procedure:

- Thoroughly rinse membranes with permeate
- Adjust pressure to **150 psi**
- Read permeate flow
- Read water temperature
- Correct permeate flow to **13°C (55.4°F)**

<table>
<thead>
<tr>
<th>°C</th>
<th>°F</th>
<th>Adjustment Factor</th>
<th>°C</th>
<th>°F</th>
<th>Adjustment Factor</th>
</tr>
</thead>
<tbody>
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<td>0</td>
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<td>0.973</td>
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<td>77</td>
<td>1.35</td>
</tr>
</tbody>
</table>
Data

Initial PWP = 40 gpm (to be taken when the membranes are new, after 12 to 24 hours of use at 13°C (55.4°F)

If today’s readings are: pressure = 150 psi at 20°C (68°F) permeate flow = 36 gpm

PWP calculation is:
PWP = permeate flow / temperature correction factor
PWP = 36 gpm / 1.2 = 30 gpm (flow at 13 °C (55.4°F))

Flow rate loss calculation:
(PWP/Initial PWP)) x 100 = performance rate in %
(36 / 40) x 100 = 90% performance
100% - performance % = Flow rate loss in %
100% - 90% = 10% of rate loss
In this case, washing is not necessary as the loss is below 20%.

VIII. Automatic Shut-Off

The Supra has a protection against low pressure (23 psi) and high temperature (40°C (104°F)). Whenever one of these situations occurs, a safety device triggers the separator’s shutdown.
IX. Maintenance Procedure of the Supra

Seasonal Start-Up (Spring)

If the membranes have been put away in sleeves:

- Take membranes out of sleeves
- Insert membranes into housings following the diagram page 16 or the instructions on the membrane’s housing sticker
- Install membranes in the Supra, then rinse them for approximately 20 minutes with good quality water

If the membranes have been stored in high-pressure housings with a storage solution, drain the whole system and rinse for 20 to 30 minutes before launching the concentration cycle.

Precautions to be taken before starting

New membranes come soaking in a protective liquid. Therefore it is important to rinse them thoroughly before starting production. We recommend a 20-30 minutes rinsing before use.

Surrounding conditions

If your separator has not been stored in a heated room, make sure to heat the place a few hours before starting the system. This room must be heated during the whole production period.

Electrical check-up

In the building’s main electrical panel, check if the the Supra breaker has been reset to ON.

Plumbing check-up

Make sure all connections between the main unit, the tanks and the drain are functional. Then install a new sediment filter (5-micron cartridge) within the prefilter.

Rinsing

To initiate rinse cycle:

- Look out for any leaks on the Supra and all pipes connecting tanks and drain.
- Check out if pumps and gauges are working properly.
- Do not forget to keep record of all your operations in the maintenance logbook.
- At the end of the day, proceed with the daily putting away operation.
X. General Perspectives

Considering the large amount of micro-organisms (bacteria) that maple sap contains, we could easily say that the Supra separator concentrates a live mixture. Bacteria proliferation is also closely related to surrounding temperature, and to piping and equipment cleanliness. Moreover any experienced producer working with a reverse osmosis system will say that conditions are subject to sudden changes and may quickly deteriorate because of bad hygiene condition. Finally, the reverse osmosis membrane, a major part of your system, designed with very fine pores and its spiral-type structure make cleaning very difficult. Neglecting adequate maintenance will allow accumulation that will obstruct the membrane and may cause permanent damage.

For all those reasons, it is important to look after your separator: Meticulous care will protect your investment and insure quality production for many years. Be on the lookout for any condition that could affect your system. The Supra separator is a very reliable and efficient system that will provide you with quality and low-cost production provided it is regularly and adequately taken care of.

Never a customer regretted having maintained his separator too much. Some regretted not having done it more frequently…

XI. The Maintenance Logbook

To help you keep track of everything and to allow you to easily write down information relating to your installation and prevailing conditions within a season, we provide you with a maintenance and operation logbook.

The logbook allows you to note down quickly all technical data whenever you use your separator.

THE SEPARATOR WARRANTY WILL NOT BE VALID UNLESS YOU CAN PROVE MAINTENANCE WAS DONE ACCORDING TO SPECIFICATIONS, BASED ON THE MAINTENANCE LOGBOOK ACCURATELY AND REGULARLY FILLED OUT.
XII. **Maintenance of the 5-Micron Prefilter**

**Frequency of replacement**
- When the pressure difference at the prefilter is 20 psi. See the appropriate flowmeters.

**Replacement procedure**
- Stop system and close valve before feeding pump.
- Open sampling valves to decompress the Supra.
- Unscrew the prefilter (you should be able to do it manually)
- Take out the cartridge and put the new one
- Manually screw back the prefilter making sure that the O-ring is well-positioned.

**Recommendations**
If you use a lubricant on the O-ring, make sure it is glycerin-based. A petroleum-based lubricant would likely damage the U-cups.
- Don’t use any tool to tighten the prefilter, you would damage it.
- The frequency of replacement of the cartridge depends on the sap water quality flown towards the system. This is why you have to carefully and adequately check the flowmeters.
- At the beginning of a new season, it is imperative to put a new cartridge.
- When the Supra is drained (for instance at the beginning of the season), it is necessary to flush it out by opening the valves located at the pressure pump and the concentrate valve outlets.
- For the first seconds, the air will flow away until all the system is filled with water.

**Compulsory rinsing**
Rinsing is compulsory before the concentration process only if you used a preservation solution.
- This rinsing is a basic though crucial hygienic requirement in every food process. Through this rinsing we make sure that the bactericide solutions within the system are fully flushed out.

Rinsing is compulsory at the end of the concentration process.
- This rinsing is necessary immediately after the concentration process to take away the sap water sweetened solution from the membranes, pumps and pipes. It is the only way to preserve your system and ensure its extended life expectancy.
XIII. **End-of-Season Storage**

**Adequate Washing**

The end-of-season period being a very busy production time, it is necessary to carefully wash the membranes: rinse them, wash them, and rinse them again with permeate. Moreover it is recommended to carry out a second washing followed by another rinsing, before storing the membranes.

**A few rules to be observed:**

Storing your membranes is the most delicate part in putting away your system. You have to carefully follow these four important rules, recommended by membrane manufacturers:

- Membrane should never be exposed to frost when immersed in water. The warranty will be void if the membrane has been exposed to frost, even following a power outage or heating failure.
- Membrane should be stored in a cool place (approx. 7°C (45°F)).
- Membrane should always be kept moist. Manufacturers recommend its complete immersion in a tank or housing.
- Membrane should be immersed in an adequate solution which will prevent bacteria proliferation.
Putting Away the Whole System – Recommended Solution

Before rinsing your system with a storage solution, it is necessary to thoroughly wash it and rinse it with permeate.

Rinsing with a storage solution

- Set the control valves so that the system runs in closed circuit
- Fill in the wash tank with a storage solution
- Let the system run for 5 minutes, then stop it and leave the storage solution inside.

Drainage

Before draining the system, it is necessary to carefully wash it and rinse it in order to prevent turning parts from sticking during storage.

- Empty the membrane housing by unscrewing the bottom tap
- The pump drainage should be carried out as follows:
  - Recirculation pump: to be drained with the housing
  - Pressure pump: take away the feeding pipe and push the check valve
  - Feeding pump: take away the bottom tap
  - Empty all pipes, throw away the 5-micron cartridge

Whatever process you choose, you have to set to OFF the system’s power breaker in the building’s electrical panel so as to make sure that nobody will accidentally start the system.

Storing the membrane only

Your other choice is to store the membrane only in a PVC storage housing, after carefully washing, rinsing and draining your installation.

- Take the membrane out of the separator.
- Add 1 gallon of storage solution to the housing without water
- Keep in a cool place
XIV. The Supra Warranty

All components of your separator are guaranteed for one (1) year, parts and labour, against any construction defect.

Pumps are guaranteed 5 years, parts and 1 year labour.

Warranty does not cover scaling or clogging of the membrane.

The membrane two (2) year warranty will be honoured only if it allows more sugar than allowed by specifications.

Warranty will be valid providing operation and maintenance of the system were carried out as directed in this manual and the logbook has been kept up-to-date with all technical data recorded as required in this manual.

The warranty does not cover damages resulting from frost, misinstallation, faulty operation, accident, modification or misuse of this equipment.

H₂O Innovation will not be liable for any personal prejudice, any loss of production, any material damage, or any direct or indirect damage that could result from malfunction or misuse of this equipment.
XV. Before calling a technician

You will find below an exhaustive list of the usual problems than can occur together with possible solutions to correct them.

Before calling a technician, please read this section which will maybe help you save you time and money.

If you still cannot solve the problem, contact H₂O Innovation customer service. A technician will come and help you out.

<table>
<thead>
<tr>
<th>PROBLEMS</th>
<th>POSSIBLE CAUSES</th>
<th>SOLUTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>System will not start.</td>
<td>Breakers are not reset.</td>
<td>Check breakers in the system’s electrical box.</td>
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<td>System is not plugged.</td>
<td>Check pumps.</td>
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<td></td>
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<td>Check breakers in the building’s electrical panel.</td>
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<td>Check fuses in the system’s electrical box.</td>
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<td>System won’t stop when water</td>
<td>Low-pressure protection faulty or</td>
<td>Check pressure control, adjust it or change it.</td>
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<td>level is too low.</td>
<td>defective.</td>
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<td>System starts but pressure</td>
<td>Concentrate valve too much opened.</td>
<td>Slowly shut concentrate valve (but never fully).</td>
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<td>does not increase</td>
<td>Pump inlet valve closed.</td>
<td>Open inlet valves.</td>
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<td>Water frozen in feeding pipes.</td>
<td>Check system feed water lines.</td>
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<td>No filter in the prefilter.</td>
<td>Pressure pump’ valves are clogged. Send pump to H₂O Innovation’s plant.</td>
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<td>System starts but no pressure</td>
<td>Feed pump not working.</td>
<td>Clear air from system.</td>
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<td>at the prefilter.</td>
<td>Pressure gauge dirty and defective.</td>
<td>Check and clean pressure gauge.</td>
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<td>Replace pressure gauge.</td>
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**Maintenance Logbook**

The logbook must be filled out on a daily basis for the warranty to be valid.

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<thead>
<tr>
<th>Date</th>
<th>Operation Temperature °C</th>
<th>Sap water °Brix</th>
<th>Concentrate °Brix</th>
<th>Concentrate Flow GPM</th>
<th>Permeate Flow GPM</th>
<th>Adjusted to 13°C (55.4°F)</th>
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