LAPIERRE

naturally innovative

1000 SERIES REVERSE OSMOSIS (R. O.)

USER MANUAL

August **2023**

LAPIERRE

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Naturally innovative

A leader in equipment and products for the maple syrup industry, LAPIERRE EQUIPMENT distinguishes itself by its ability to innovate and develop high-performance solutions. This is what enables it to make significant changes in production techniques and processes in order to increase crop yield of high quality syrup.

LAPIERRE EQUIPMENT has a wealth of experience accumulated over three generations of maple syrup producers. These are also people driven by passion and a deep desire to help the industry evolve with the utmost respect for nature.

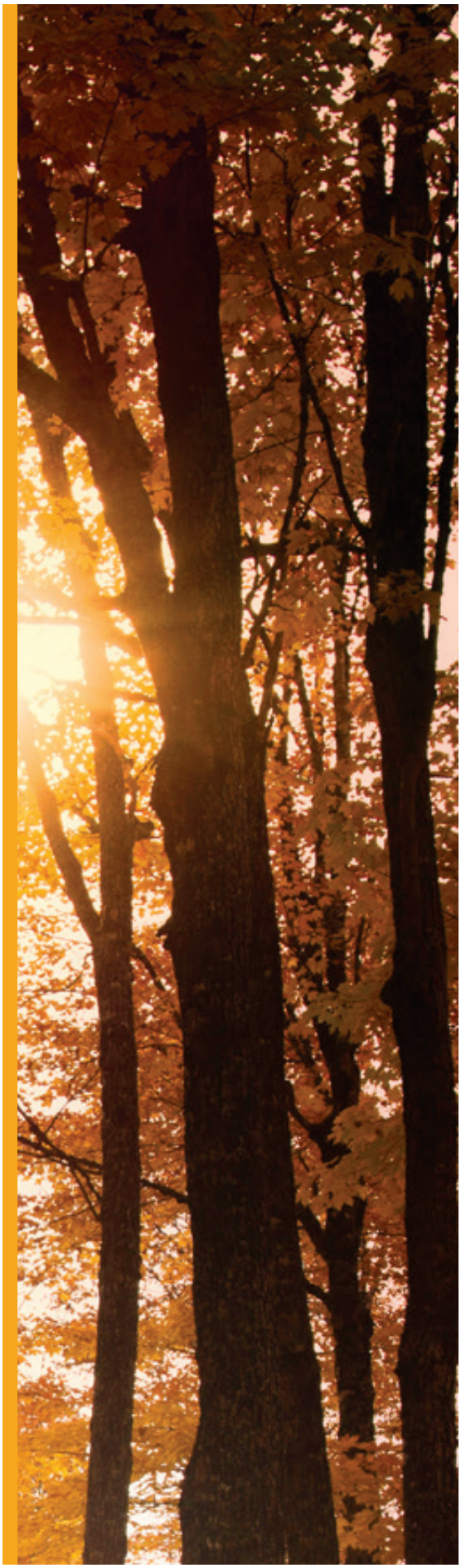
Honoured to serve your customers

LAPIERRE EQUIPMENT is honoured to actively assist maple syrup producers during the sugar season.

Today you have made a wise choice for at least two good reasons: the superior quality of our products and the exceptional quality of all our expert advisers in the region.

We sincerely appreciate your trust. And we will be happy to serve you again in your future equipment purchases, regardless of the size of your sugar bush.

Thank you!



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1000 SERIES REVERSE OSMOSIS (R. O.)

Please note the information required below when dealing with customer service professionals. You can easily find this information on the **data plate** on your 1000 SERIES R. O. as well as on **your invoice**. You can also refer to *Section 1* of this manual for additional information.

Models shown:
One pressure vessel on the left, two pressure vessels on the right.
Models shown may differ from your model.

IMPORTANT INFORMATION ABOUT YOUR 1000 SERIES R. O.

Customer Service: 819 548.5454 | 1 833 548.5454 | info@elapierre.com

Model number: _____

Serial number: _____

Purchase date: _____

Invoice number: _____

We will be pleased to answer any of your questions, please do not hesitate to contact us.

1000 SERIES REVERSE OSMOSIS (R. O.)

- **1000 SERIES R. O. WITH 1 OR 2 PRESSURE VESSELS:** This user's manual can be used as a reference for models with one or two pressure vessels.
- **LATEST VERSION OF THIS USER'S MANUAL:** Please refer to our website for the latest version of this user's manual.

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SECTION 1 **WHERE TO FIND INFORMATION ABOUT YOUR EQUIPMENT**

When you contact our customer service professionals, it is important to have certain information about your equipment on hand as you will be asked for it.

You can easily find this information on the **data plate** on your 1000 Series R. O. as well as on **your invoice**.

Information about the equipment	**Data plate** (affixed to your equipment)	**Invoice**
Model number	✓	✓
Serial number	✓	✓
Purchase date	–	✓
Invoice number	–	✓

2.1 INSTRUCTIONS

- It is important to read, understand and follow the instructions and warnings contained in this user manual.
- This manual must be stored in a known place and accessible at all times by staff.
- All product operators must be familiar with the contents of this manual.

2.2 WARNING

Electricity

- Before turning On the equipment, check the power supply specifications. You will find these specifications on the 1000 Series R. O. data sheet. Also check the specifications of the electrical circuit you intend to use. Then make sure that the two components are compatible.
- Never connect the electrical cords to overloaded electrical circuits.
- Never use extension cords that are longer than necessary or of low gauge.
- Make sure that the electrical cords are in good working order, that they are not pinched or stripped, and that they are not altered in any way that could affect their safe use.
- Never touch a stripped wire when it is live. Then turn Off the power and repair the equipment before turning it back On and using it.
- The user must check the grounding circuit. Some equipment must be used or connected to other equipment that is also equipped with a grounding circuit. Disabling or a malfunctioning of this circuit may cause equipment operating conditions that are hazardous to its users.
- Always unplug the power cord from the equipment when it is not going to be used for a long period of time.

Liquids

- Never expose the 1000 Series R. O. to rain or excessive condensation.
- Never bring liquids into contact with the electronic components.
- Unless otherwise specified, never submerge the electrical components of this equipment.
- Never spray, wet or pour any liquid on the 1000 Series R. O. pumps.

Other

- Always keep hair, hands, and jewellery away from equipment components that are operating, or may unexpectedly start up.
- Never place heavy objects on your equipment as their weight could damage parts of your 1000 Series R. O.

2.3 REPAIRS AND MAINTENANCE

- Stop using the equipment immediately if a malfunction is detected.
- Only LAPIERRE EQUIPMENT authorized personnel may carry out repairs on this equipment.
- Unauthorized modifications or repairs may result in hazardous operating conditions. These conditions may also cause varying degrees of injury to users.
- Always disconnect the power supply before performing any maintenance or repairs.
- It is recommended that equipment inspections and maintenance be carried out diligently to ensure optimal operational integrity.
- Never disassemble the electrical components of this equipment.

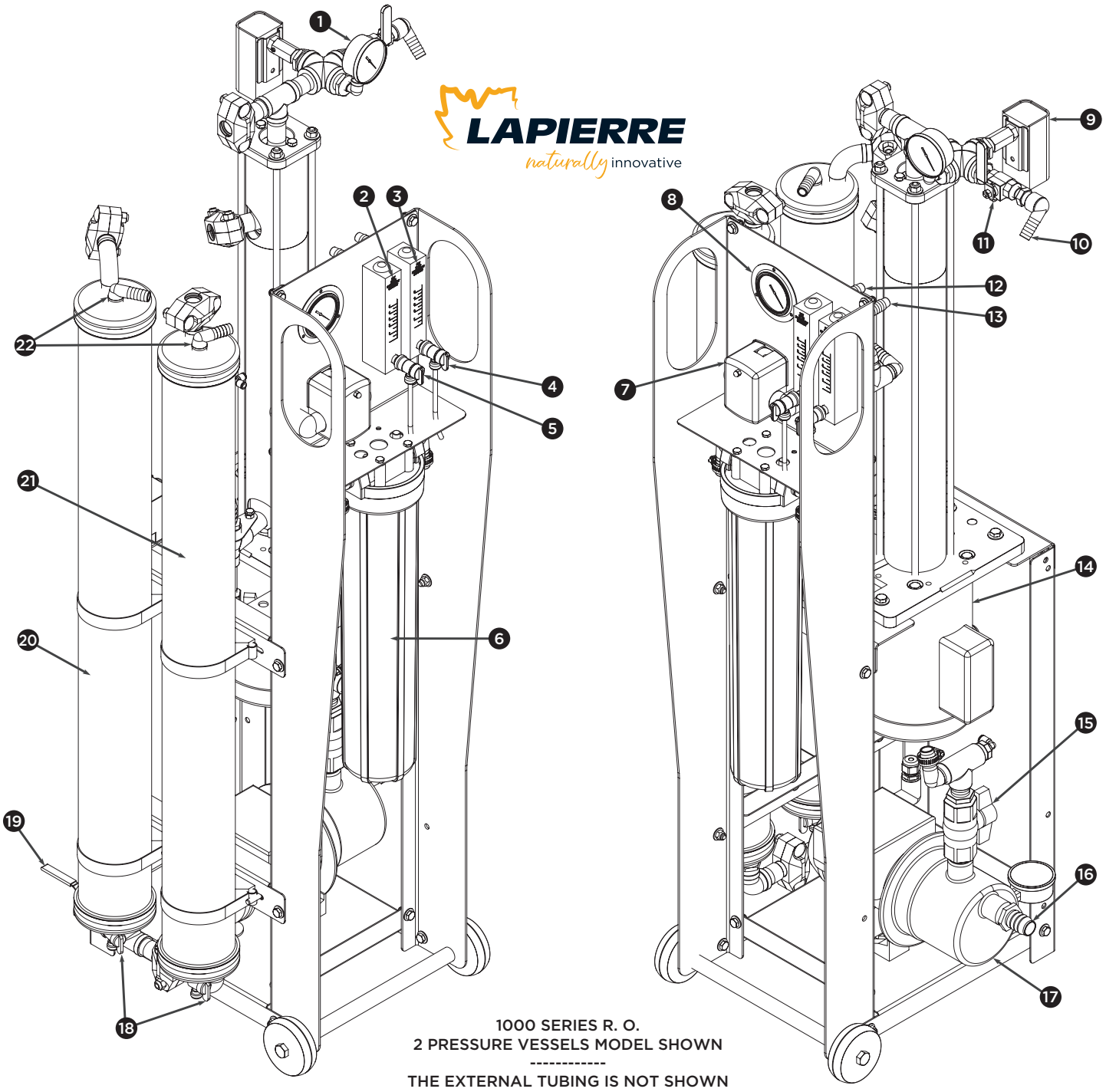
PROTECT CHILDREN

- Never allow children to use this equipment.
- Never leave children unattended in proximity to this equipment, whether it is switched On or not.

SECTION 3 **IDENTIFICATION OF THE 1000 SERIES R. O. COMPONENTS**

Below is a list of the main components of a 1000 Series R. O.

ILLUSTRATION 1 | Identification of the 1000 Series R. O. components



1000 SERIES R. O.
2 PRESSURE VESSELS MODEL SHOWN

THE EXTERNAL TUBING IS NOT SHOWN

No.	Part Description
1	High-pressure gauge
2	Concentrate flowmeter
3	Filtrate flowmeter
4	Filtrate sampling valve
5	Concentrate sampling valve
6	Cartridge prefilter
7	Electric start switch
8	Supply pressure gauge
9	Temperature control/stop
10	Concentrate flowmeter outlet
11	Concentrate adjustment valve
12	Concentrate outlet connection
13	Filtrate outlet connection
14	High-pressure pump
15	Feed pump isolation valve
16	Maple sap or filtrate connection inlet
17	Feed pump
18	Filtrate tubes drain valves
19	Pressure vessel(s) and membrane(s) drainage valve
20	Membrane pressure vessel No. 1
21	Membrane pressure vessel No. 2
22	Filtrate flowmeter outlets

Note that your 1000 Series R. O. should ideally be installed in a heated area, away from humidity and frost. If not, and if there is a risk of freezing, it is necessary to drain the equipment.

4.1 WHAT YOU SHOULD CHECK WHEN YOU RECEIVE YOUR 1000 SERIES R. O.

Your 1000 Series R. O. must be **SAFELY INSTALLED ON A HORIZONTAL AND PERFECTLY STABLE SURFACE.** Its weight presents a real danger. If it tips or tilts, it may cause severe injury to the operator and others in the vicinity of the equipment.

Here is a checklist to follow when you receive your 1000 Series R. O.

4.1.1 1000 Series R. O. status

- Check the condition of the R. O. as soon as it arrives.
- Although LAPIERRE EQUIPMENT applies rigorous quality control in the plant and before shipping, please note, photograph and advise your LAPIERRE EQUIPMENT representative of any defects or imperfections that may be observed on the day your equipment is received.

4.1.2 Purchase order

- Have the purchase order on hand.
- Make sure, by a visual count, that you have received all the items indicated on the order form such as the membranes, the storage canisters for membranes, the wash tank and the accessories that may be included depending on the options you chose when you placed your order.
- Also ensure that all items are in good condition.

4.2 INSTALLATION OF THE MEMBRANES

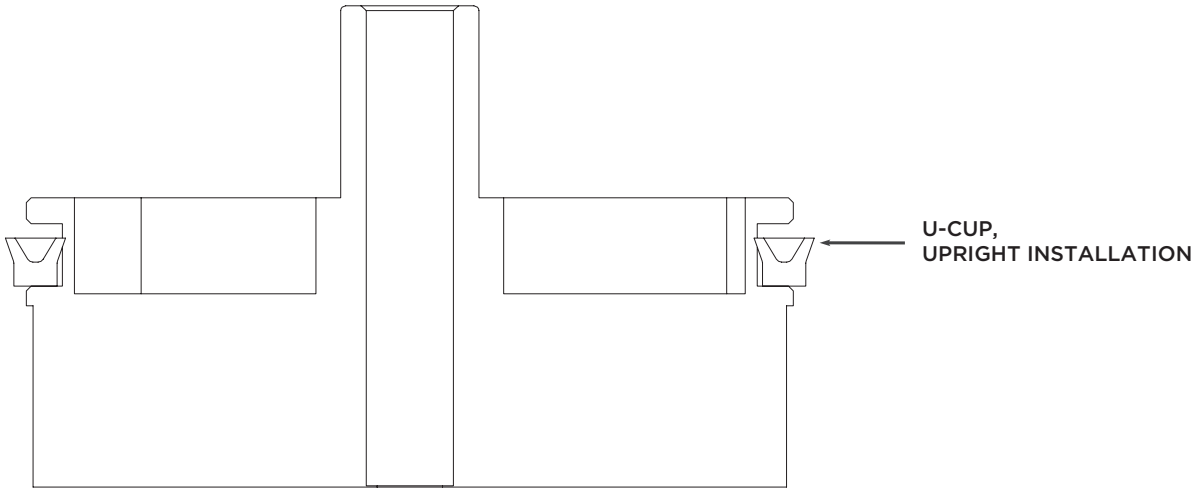
Below are the instructions for installing the membrane(s), depending on the single or dual pressure vessel model of your 1000 Series R. O.

4.2.1 1000 Series R. O. with one pressure vessel

It is important to pay special attention to the following details when installing the membrane in the pressure vessel of your R. O.

- In order to facilitate the insertion and the setting of the membrane in its pressure vessel, coat with a food grade grease:
  - the two O-rings installed on the contour of the pressure vessel cover,
  - the U-cup installed on the membrane,
  - as well as the contours of the two filtrate tubes located at each end of the membrane.
- Since your membrane has only one U-cup, make sure that:
  - this one is found in the upper part of the pressure vessel,
  - the installation is facing upwards, as shown in *Illustration 2*.

ILLUSTRATION 2 | Top of the pressure vessel and membrane, and orientation of the U-cup



4.2.2 1000 Series R. O. with two pressure vessels

Extra care is required when installing the two membranes of each pressure vessel of your 1000 Series R. O. with two pressure vessels.

In fact, the direction in which the fluids flow in each of the pressure vessels is reversed in relation to each other.

Therefore, proceed as follows when installing your membranes.

- Identify the Nos. 1 and 2 pressure vessels of your R. O. from *Illustration 3* below.
- For each membrane, coat with a food grade grease the two O-rings installed in the pressure vessel cover, the U-cup installed on the membrane, and the contours of the two filtrate tubes located at each end of the membrane.
- Since each membrane has only one U-cup, make sure that it is located at the top of each of the two pressure vessels **and that its orientation is as shown in *Illustration 4* below**, for each of the two pressure vessels:

  - pressure vessel No. 1: U-cup facing up,
  - pressure vessel No. 2: U-cup facing downwards.

ILLUSTRATION 3 | Identification of pressure vessels No. 1 and No. 2

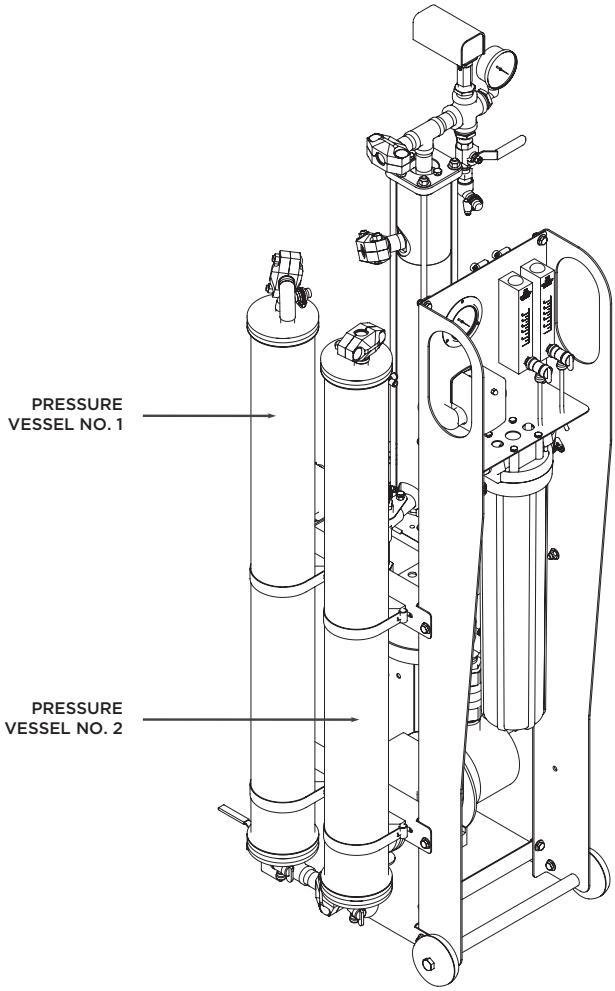
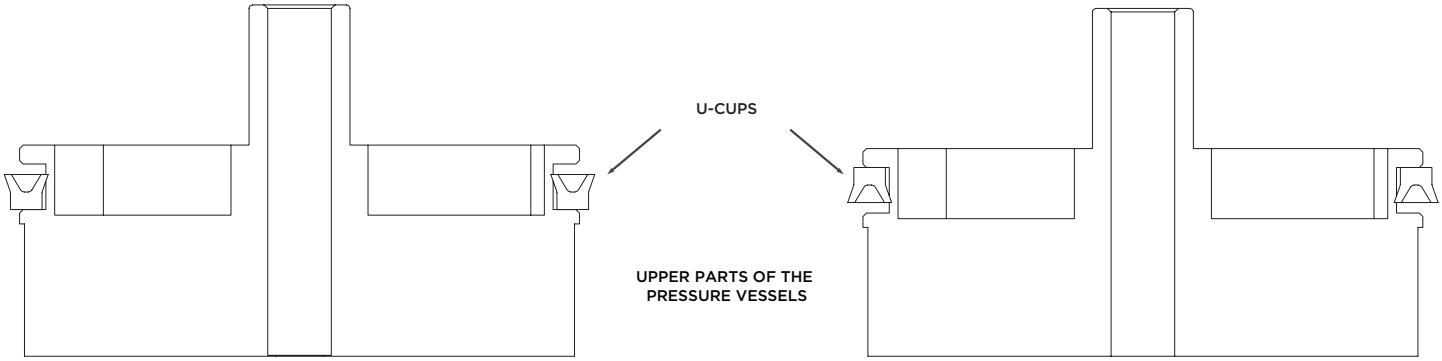


ILLUSTRATION 4 | Orientation of U-cup joints in the pressure vessels



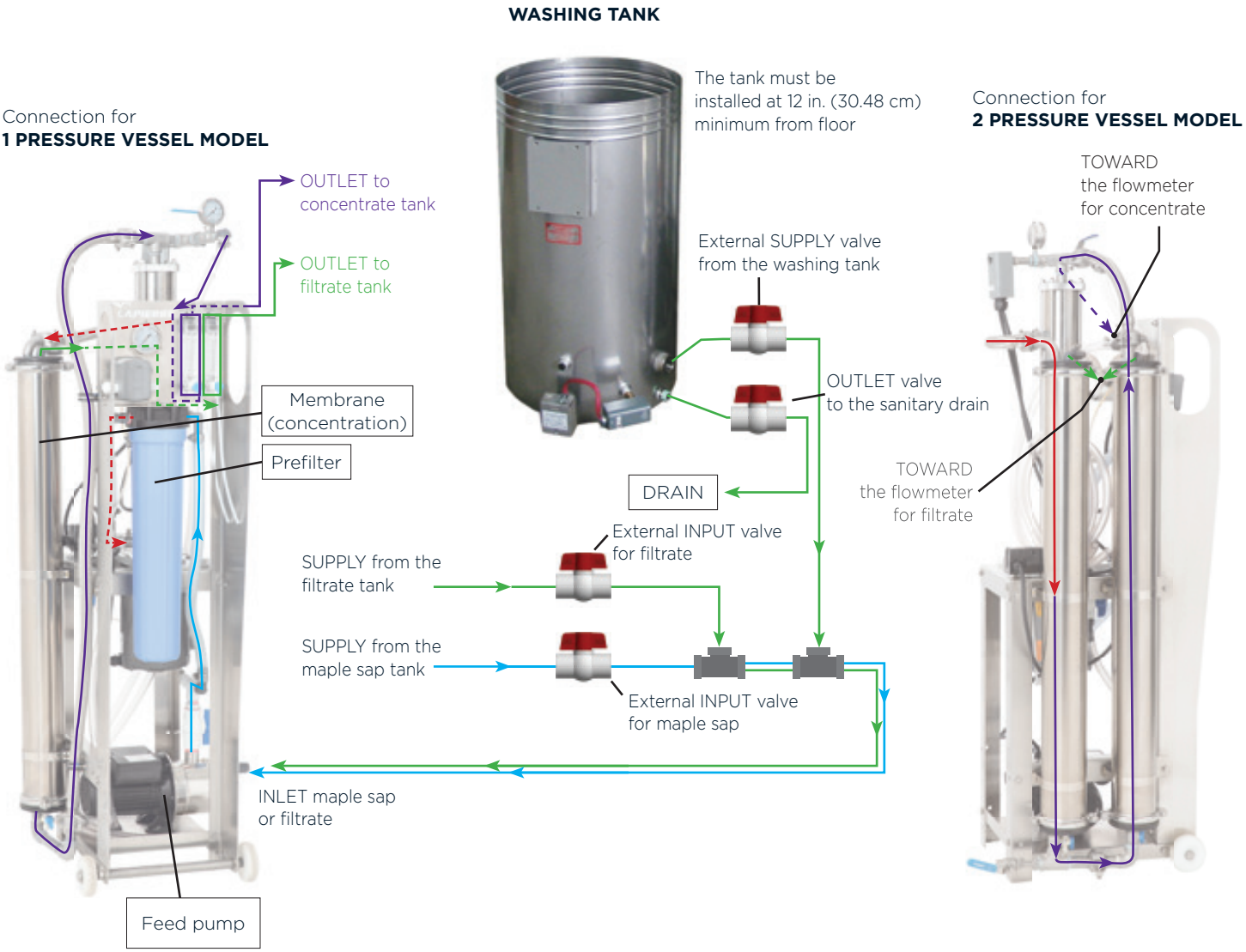
4.3 INSTALLATION OF THE EXTERNAL TUBING

To complete the installation of your 1000 Series R. O., you will need to connect the tubing for fluid flow. Below are instructions on how to do this.

ILLUSTRATION 5 | Fluid flow and tubing connection

Fluid flow in the 1000 Series R. O.

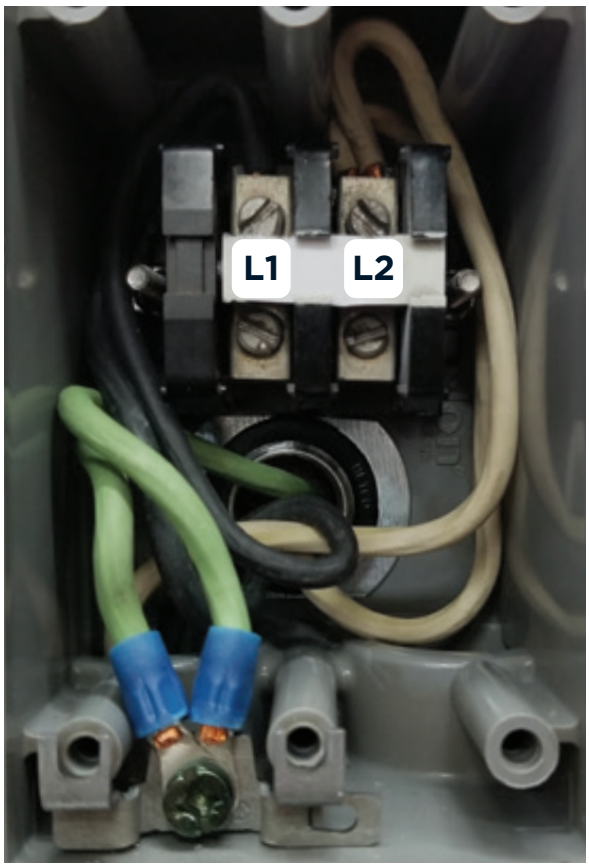
- **Maple sap** ➜ **Prefiltered maple sap** ➜ **Filtrate**
  ➜ **Concentrate**



4.4 CONNECTING THE MAIN POWER SUPPLY TO THE 1000 SERIES R. O.

Below are the instructions for connecting the electrical and grounding wires in the main electrical box of the 1000 Series R. O.

ILLUSTRATION 6 | View of the wire connection



THE INSTALLATION OF THE POWER SUPPLY MUST BE DONE BY A QUALIFIED CONTRACTOR.
The work must be carried out in accordance with the local regulations in force.

- The electrical box is 240 volts, 1 phase.
- The wires shown in the picture are pre-installed at the factory.
- The electrical contractor shall connect:
  - the two power wires to connectors L-1 and L-2,
  - the green ground wire to the connector on the lower left side of the image.

PROTECT CHILDREN

- Never allow children to use this equipment.
- Never leave children unattended in proximity to this equipment, whether it is switched On or not.

Also be especially cautious with other **PEOPLE NEAR THE EQUIPMENT**, whether they are children, family members, guests, as well as with pets.

5.1 STANDARD CHECKS BEFORE STARTING UP THE 1000 SERIES R. O.

Below are the steps to follow before starting up the 1000 Series R. O.

5.1.1 Checking connections for leaks and strength

Check the following connections for leaks and firmness:

- the connection for the concentrate outlet (*Illustration 1 No. 12*),
- the connection for the filtrate outlet (*Illustration 1 No. 13*),
- the connection for the maple sap or filtrate inlet (*Illustration 1 No. 16*),
- all other tubes that are connected to the R. O.

5.1.2 Checking the cartridge prefilter and membranes

- Make sure the cartridge prefilter (*Illustration 1 No. 6*) is installed and not damaged.
- Ensure that the membranes of the pressure vessels (*Illustration 1 Nos. 20 and 21*) are not clogged using the PEP Test.
  - Refer to *Section 5.3: PEP test of the membrane* for more information on this test.

5.2 OPERATION OF THE 1000 SERIES R. O.

5.2.1 Reading and using flowmeter results

The two flowmeters (*Illustration 1 Nos. 2 and 3*) on your R. O. are used to read the amount of liquid flowing per minute through your R. O. when it is running. Also, it is with these results that you will easily determine the *total flow rate of maple sap* processed by your R. O. In addition, they allow you to calculate the current concentration percentage of your equipment.

Two valves are installed on these two flowmeters to collect samples of the liquids flowing through these measuring instruments (*Illustration 1 Nos. 4 and 5*).

5.2.1.1 Determine the total flow rate of maple sap

To determine the total flow rate of the maple sap using the flowmeters, simply add up the flow rates of concentrate (*Illustration 1 No. 2*) and filtrate (*Illustration 1 No. 3*) measured on the two flowmeters of the R. O.

The flowmeters measure flow rates in gallons per minute (gpm) on the left and liters per minute (lpm) on the right. Flow is measured by a float that moves up and down the flowmeter tube according to the volume of liquid flowing per minute. The top of the float, shown in blue in the examples below, refers to the result of the measurement, which is 2 gpm for both concentrate and filtrate in Example No. 1.

TABLE 1 | TOTAL MAPLE SAP FLOW

EXAMPLE NO. 1		**EXAMPLE NO. 2**	
Concentrate	**Filtrate**	**Concentrate**	**Filtrate**
Result: 2 gpm	Result: 2 gpm	Result: 1 gpm	Result: 2 gpm
			
TOTAL FLOW OF MAPLE SAP		**TOTAL FLOW OF MAPLE SAP**	
Concentrate 2 gpm + Filtrate 2 gpm = **4 gallons per minute** of maple sap		Concentrate 1 gpm + Filtrate 2 gpm = **3 gallons per minute** of maple sap	

This table can be found in *Appendix C* where you can enter your results.

5.2.1.2 Determine the percentage of concentration with the flow rates

To determine the percentage of concentration, or percentage of pure sap removed, simply divide the measured flow rate of filtrate by the total flow rate of maple sap calculated above.

TABLE 2 | PERCENTAGE OF CONCENTRATION WITH FLOW RATES

PERCENTAGE OF CONCENTRATION WITH FLOW RATES		
	Example No. 1	**Example No. 2**
Filtrate flow rate (results from Table 1) (*divided by* / ÷)	2 gpm	2 gpm
Total flow rate of maple sap (results from Table 1)	4 gpm	3 gpm
% CONCENTRATION (or pure water removed)	**50%**	**66%**

This table can be found in *Appendix C* where you can enter **your** results.

5.2.1.3 Determine the percentage of concentration with the Brix degrees

There is a second possibility to determine the percentage of concentration. It uses the Brix degrees of the maple sap and the concentrate. The Brix represents the percentage of sugar in a liquid solution. It is expressed in Brix degrees (°Brix) and each degree is equivalent to 1% sugar.

To do this, collect a sample of maple sap. Then, from the concentrate sampling valve (*Illustration 1 No. 5*), also collect a sample of concentrate. Measure the sugar content of each liquid with a refractometer (not supplied).

First, divide the Brix level of the maple sap by that of the concentrate (X% below). Then subtract this result from 100% (100% - X%).

TABLE 3 | PERCENTAGE OF CONCENTRATION WITH BRIX DEGREES

PERCENTAGE OF CONCENTRATION WITH BRIX DEGREES		
	Example No. 3	**Example No. 4**
Brix degree of maple sap (*divided by / ÷*) Brix degree of the concentrate	2 4	2 6
X% Percentage of total liquid volume remaining	50%	33%
100% - X% **CONCENTRATION %** OR PURE SAP REMOVED	**50%**	**66%**

This table can be found in *Appendix C* where you can enter your results.

5.2.2 First use of the season or use of a new membrane

When using for the first time this season or using a new membrane, it is important to perform a short rinse cycle (see *Section 5.2.5: Short Rinse*) if you have access to potable water.

If not, use maple sap to rinse. The sap must be discarded for 5 minutes before starting the concentration cycle.

Before the filtrate can be recovered, it must also be discarded during the rinse cycle and the first 30 minutes of the concentration cycle.

5.2.3 Concentration

Here is the checklist to follow when operating your 1000 Series R. O.

1. Close the valves that are not needed for concentration, i.e. the drain valve of the pressure vessel(s) and membranes (*Illustration 1 No. 19*), and the filtrate and concentrate sampling valves (*Illustration 1 Nos. 4 and 5*).
2. Open the external INPUT valve for maple sap (*Illustration 5*) which feeds the inlet connection to the feed pump (*Illustration 1 No. 16*), the feed pump isolation valve (*Illustration 1 No. 15*) and the concentrate adjustment valve (*Illustration 1 No. 11*).
3. Turn on the R. O. by pushing the lever on the right side of the electric start switch (*Illustration 1 No. 7*) upwards.
   - Maintain resistance until the supply pump reaches a pressure of at least 20 psi on the supply pressure gauge (*Illustration 1 No. 8*).

- When this value is reached, the high-pressure pump (*Illustration 1 No. 14*) starts and the pressure of at least 20 psi on the supply pump then keeps the pumps running.
  - If the R. O. stops at the start of the high-pressure pump, close the concentrate adjustment valve (*Illustration 1 No. 11*) slightly to create resistance to flow.
    - Then adjust this valve to obtain the desired pressure.
    - Check the concentrate and filtrate flow rates at the flowtmeters (*Illustration 1, Nos 2 and 3*).

4. Check for the presence of sugar in the filtrate.
   - To do this, first take a filtrate sample from the flowmeter tube through the filtrate sampling valve (*Illustration 1 No. 4*).
   - Then measure the sugar content of the filtrate with a refractometer (not supplied).
     - This filtrate must not contain any sugar (0 °Brix).
       - If not, refer to the Troubleshooting Kit (see *Section 7.4: There is the presence of sugar in my filtrate*).
5. Concentrate until the maple sap is used up or the concentration performance decreases.
   - Refer to *Section 5.3: PEP test of the membrane* for performance.

5.2.4 Evacuation of the concentrate (desugaring cycle)

The following is a checklist for the evacuation of the concentrate (desugaring cycle).

1. If it is on, turn off the R. O.
2. Close the external INPUT valve for maple sap (*Illustration 5*) which feeds the inlet connection to the feed pump (*Illustration 1 No. 16*).
3. Open the external INPUT valve for filtrate (*Illustration 5*) which feeds the inlet connection to the feed pump (*Illustration 1 No. 16*).
4. Open the concentrate adjustment valve (*Illustration 1 No. 11*).
5. Be sure to send the concentrate to the concentrate tank and the filtrate to the tank you have provided.
6. Start the R. O., as described in *Section 5.2.3: Concentration.*
7. Continue the operation until the Brix degree of the concentrate, from the concentrate flowmeter (*Illustration 1 No. 2*), is less than 1 °Brix.

5.2.5 Short rinse (10 minutes)

The following is a checklist for the short rinse operation.

1. Ensure that:
   - the external INPUT valve for maple sap (*Illustration 5*) that feeds the inlet connection to the feed pump (*Illustration 1 No. 16*) is closed,
   - the external INPUT valve for filtrate (*Illustration 5*) which feeds the inlet connection to the feed pump (*Illustration 1 No. 16*) is open.
2. Be sure to drain the filtrate and concentrate into the drain.
3. Turn on the R. O. by turning the lever on the right side of the electric start switch (*Illustration 1 No. 7*) upward.
   - Maintain resistance until the supply pump reaches a pressure of at least 20 psi on the supply pressure gauge (*Illustration 1 No. 8*).
   - When this value is reached, the high-pressure pump (*Illustration 1 No. 14*) starts and the pressure of at least 20 psi on the supply pump then keeps the pumps running.

- If the R. O. stops at the start of the high-pressure pump, close the concentrate adjustment valve (*Illustration 1 No. 11*) slightly to create resistance to flow.
  - o Adjust this valve to obtain the desired pressure.

4. Let the R. O. runs for 10 minutes.

5.2.6 Long rinse (30 minutes)

The following is a checklist for the long rinse operation.

1. First evacuate the concentrate as described earlier in *Section 5.2.4: Evacuation of the concentrate* (*desugaring cycle*).
   - Ensure that:
     - the external INPUT valve for maple sap (*Illustration 5*) that feeds the inlet connection to the feed pump (*Illustration 1 No. 16*) is closed,
     - the external INPUT valve for filtrate (*Illustration 5*) which feeds the inlet connection to the feed pump (*Illustration 1 No. 16*) is open.
2. Be sure to drain the filtrate and concentrate into the drain.
3. Turn on the R. O. by turning the lever on the right side of the electric start switch (*Illustration 1 No. 7*) upward.
   - Maintain resistance until the supply pump reaches a pressure of at least 20 psi on the supply pressure gauge (*Illustration 1 No. 8*).
   - When this value is reached, the high-pressure pump (*Illustration 1 No. 14*) starts and the pressure of at least 20 psi on the supply pump then keeps the pumps running.
     - If the R. O. stops at the start of the high-pressure pump, close the concentrate adjustment valve (*Illustration 1 No. 11*) slightly to create resistance to flow.
       - o Adjust this valve to obtain the desired pressure.
4. Let the R. O. runs for 30 minutes.

5.2.7 Hot water rinse

The following is a checklist for the hot water rinse operation.

NOTE | To perform a hot water rinse, the washing tank must first be filled with hot water.

1. First evacuate the concentrate as described earlier in *Section 5.2.4: Evacuation of the concentrate* (*desugaring cycle*).
2. Then proceed with a short rinse, as previously described in *Section 5.2.5: Short Rinse*.
3. Fill the washing tank (*Illustration 5*) with filtrate to three-quarters of its capacity.
4. Turn off the R. O.
5. Close the external INPUT valve for filtrate (*Illustration 5*) which feeds the inlet connection to the feed pump (*Illustration 1 No. 16*).
6. Open the external SUPPLY valve from the washing tank (*Illustration 5*) which feeds the inlet connection to the feed pump (*Illustration 1 No. 16*).
7. Be sure to send the filtrate and concentrate to the washing tank.
8. Start the R. O., as described in *Section 5.2.3: Concentration*.
9. Operate the R. O. in a closed circuit with the filtrate from the washing tank.
10. The R. O. automatically shuts down when the filtrate has reached a temperature of 113 °F (45 °C).
11. Drain and rinse the washing tank.
12. Finally, proceed with a short rinse, as previously described in *Section 5.2.5: Short Rinse*.

5.2.8 Washing with chemicals

Be very careful when handling and using the chemicals required for this washing operation as there is a risk of burns. **CONSULT THE MANUFACTURER'S INSTRUCTIONS FOR THE WASHING PRODUCTS.**

Note that this operation takes approximately two hours to complete.

The following is a checklist for the chemical washing operation.

1. First evacuate the concentrate as described earlier in *Section 5.2.4: Evacuation of the concentrate* (*desugaring cycle*).
2. Then proceed with a short rinse, as previously described in *Section 5.2.5: Short Rinse*.
3. Fill the washing tank (*Illustration 5*) with filtrate to three-quarters of its capacity.
4. Turn off the R. O.
5. Close the external INPUT valve for filtrate (*Illustration 5*) which feeds the inlet connection to the feed pump (*Illustration 1 No. 16*).
6. Open the external supply valve from the wash tank (*Illustration 5*) which feeds the inlet connection to the supply pump (*Illustration 1 No. 16*).
7. Replace the prefilter used for concentration (*Illustration 1 No. 6*) with a new prefilter to be used exclusively for washing.
   - Note that this new prefilter wash will be used throughout the season for washings.
     - **IMPORTANT** | Make sure you can distinguish between the two prefilters, the one used for concentration and the other for washing.
   - It is recommended to keep the prefilter wash wet between each wash.
     - For example, it could be a container into which you have poured 4 in. (10 cm) of water.
8. Check the prefilter used for concentration:
   - if it is clogged or damaged, discard it and replace it with a new one in step 17 below,
   - if not, save it for step 17 below.
9. Add the membrane soap to the washing tank according to the recommendations indicated on the Lapierre soap container.
   - At the end of the cycle, you can check the pH and adjust the amount of soap for the next wash cycle accordingly.
10. Start the R. O., as described in *Section 5.2.3: Concentration*.
11. Run the R. O. in a closed circuit with the filtrate and soap from the washing tank.
12. Be sure to operate the R. O. at low pressure to promote effective washing.
    - Open the concentrate adjustment valve (*Illustration 1 No. 11*) to create resistance to maintain a minimum pressure of 20 psi and a slight flow of filtrate.
13. The R. O. automatically shuts down when the filtrate has reached a temperature of 113 °F (45 °C).
14. Drain and rinse the washing tank.
    - Dispose of washing waste water according to the standards in force.
15. Make sure to evacuate the filtrate and the concentrate into the drain according to the standards in force.
16. Proceed with a rinse using 100 gallons of filtrate.
17. Replace a concentration prefilter (*Illustration 1 No. 6*) as described in Step 7 above.

NEVER USE A PREFILTER THAT HAS BEEN USED FOR WASHING WITH CHEMICALS to concentrate maple sap.

FOLLOW THE SAFETY INSTRUCTIONS RECOMMENDED BY THE SOAP MANUFACTURER.

5.2.9 Drainage of the 1000 Series R. O.

It is essential to store the R. O. in a heated, frost-free area after each use. Otherwise, if the temperature is likely to be below freezing, it is necessary to proceed with the drainage of certain components of the equipment.

Refer to *Section 5.4.3* for drainage procedures for your R. O.

5.3 PEP TEST OF THE MEMBRANE

We use the word «membrane» in the singular to lighten the text. The following instructions apply to 1000 Series R. O. with one or two membranes.

Initial and Comparative PEP Tests

When your membrane is used for the first time, the **Initial PEP Test** gives you the **Optimal Performance Index (100%)** that you can get from your membrane when **it is new**. This index **then becomes a reference value** to show you the condition of your membrane over its useful life, in terms of its performance in gallons per minute, in subsequent **Comparative PEP Tests**.

TABLE 4 | INITIAL AND COMPARATIVE PEP TESTS

INITIAL PEP TEST	COMPARATIVE PEP TEST
Optimal Performance Index (100%) Performance in gallons per minute (gpm) of filtrate that is extracted by your membrane **when new**.	**Comparative result** Performance in gallons per minute (gpm) of filtrate that is extracted by your membrane **as it is used**.
XX gpm ← Compare these two results → **XX** gpm	
Number to remember = Maximum **15%** difference between the Initial PEP and the Comparative PEP.	
To be valid, the PRESSURE of the Comparative PEP Test (*Table 5, Part 2, Column 2*) must be the same as the REFERENCE PRESSURE of the Initial PEP Test (*Table 5, Part 1, Column 4*).	

To perform these tests, you will need *Table 5: PEP Test Results*. You will find this table on page 25 of this user's manual. A copy of this table is also available in *Appendix A*. We suggest that you make several copies of this appendix to record your initial and subsequent comparative test results.

What is the Optimal Performance Index (100%) of the Initial PEP Test?

The value of the **Optimal Performance Index (100%)** is the same as the **CORRECTED Flow Rate of Filtrate**, which you will find in *Table 5* below, *Part 1, Columns 9 and 8.* This index represents the **filtrate flow rate, in gallons per minute (gpm)**, that is extracted by your new membrane.

When should I have an Initial PEP Test?

• At the beginning of the season, after approximately 8 hours of cumulative use of a new membrane and a rinse.

When should I do a Comparative PEP Test?

• Following a rinse.
• After each rinse and wash.
• At the end of each day of concentration.
• When you suspect a drop in performance of the R. O.

What should I do with my comparative test result?

• Compare the CORRECTED FLOW RATE OF FILTRATE obtained from *Part 2, Column 6*, with the OPTIMAL PERFORMANCE INDEX (100%) from the Initial PEP Test in *Part 1, Column 9*.
  - A drop in filtrate flow rate of 15% or less is noted (*Part 2, Column 7*):
    o you can continue to use your membrane without any problems.
  - A decrease in filtrate flow rate greater than 15% is noted (*Part 2, Column 7*):
    o you must then wash your membrane (see *Section 5.2.8: Washing with chemicals*).

It is important to **REGULARLY MONITOR THE PERFORMANCE OF YOUR MEMBRANE** by means of Comparative PEP Tests. A severe drop in performance may require two or three washes to regain the Optimal Performance Index (100%) of the Initial PEP Test, or it may result in severe clogging requiring a factory wash. Although a factory wash is effective, it is possible that the initial damage is irreversible for the membrane.

5.3.1 DETERMINE THE REFERENCE PRESSURE AT THE INITIAL PEP TEST

What you need to know about membrane temperature and permeability. It is important to know that the permeability of a membrane is influenced by the temperature of the liquid being filtered.

This finding should be considered when determining the REFERENCE PRESSURE for the INITIAL PEP TEST (*Table 5, Part 1, Column 4*) performed at the beginning of the season when temperatures are normally colder. At this point, your objective is to set a pressure threshold that can be reached during the ENTIRE SEASON during your subsequent COMPARATIVE PEP TESTS, **considering the temperature variations that may be encountered**. These comparative tests, versus the initial test, allow you to see if there is a loss of performance of your membrane.

That being said, trial-and-error experience is still the most effective technique for determining the REFERENCE PRESSURE threshold for your R. O. at the beginning of the season. However, as an introduction and insight into the situation, please note the following.

Using the concentrate adjustment valve (*Illustration 1 No. 11*) adjust the filtrate flow rate so that the filtrate flowmeter (*Illustration 1 No. 3*) reads **3 gpm out of 5 if your R. O. has 2 membranes, and 1.5 gpm if it has only one membrane**. When the gpm has stabilized at this level, note the pressure displayed on the high-pressure gauge (*Illustration 1 No. 1*). Round it off to the nearest fifth, such as 135, 140 or 145, and use this pressure as the REFERENCE PRESSURE for the rest of the season.

Important additional instructions are available in the next section.

5.3.2 PERFORM A PEP TEST

INITIAL PEP TEST *(Table 5, Part 1)*

Note that this operation takes approximately five minutes.

Have a blank copy of *Table 5, PEP Test Results*, shown below (*Appendix A*).

The following is a checklist for conducting an initial PEP test:

- open the external INPUT valve for filtrate (*Illustration 5*) which feeds the inlet connection to the feed pump (*Illustration 1 No. 16*),
- perform a concentration operation as described in *Section 5.2.3: Concentration*,
- let the R. O. runs for a few minutes to stabilize.
- INITIAL PEP TEST RESULTS SHEET (*Part 1*)
  - Note the DATE OF INSTALLATION and the SERIAL NUMBER of the membrane,
  - determine and record the REFERENCE PRESSURE according to the instructions in *Section 5.3.1: Determine the reference pressure at the Initial PEP Test*,
  - note the TEMPERATURE OF THE FILTRATE,
    - o this temperature measurement is done by the operator, directly in the tank, using a thermometer (not supplied),
  - note the FILTRATE FLOW RATE (*Illustration 1 No. 3*),
  - calculate and record the CORRECTED FLOW RATE OF THE FILTRATE (*Column 8*),
    - o calculate the CORRECTED FLOW RATE OF THE FILTRATE using the APPROPRIATE CORRECTION FACTOR for the TEMPERATURE OF THE FILTRATE,
      - ✓ refer to *Appendix B* to find the Appropriate Correction Factor,
    - o to perform this calculation, divide the value in the FILTRATE FLOW RATE column by the value of the APPROPRIATE CORRECTION FACTOR,
  - the OPTIMAL PERFORMANCE INDEX (100%) is the result you obtained for the CORRECTED FLOW RATE OF FILTRATE.

COMPARATIVE PEP TESTS *(Table 5, Part 2)*

COMPARATIVE PEP TESTS SHOULD ALWAYS USE THE SAME PRESSURE AS THE INITIAL PEP TEST. To be valid, the PRESSURE of the Comparative PEP Test (*Table 5, Part 2, Column 2*) must be the same as the REFERENCE PRESSURE of the Initial PEP Test (*Table 5, Part 1, Column 4*).

Note that this operation takes approximately five minutes.

Have a copy of *Table 5, PEP Test Results* of the membrane tested in the Initial PEP Test (*Appendix A*).

- Be sure to have recorded the OPTIMAL PERFORMANCE INDEX (100%) on this sheet during the Initial PEP Test.

Here is the checklist for conducting a Comparative PEP Test:

- open the external INPUT valve for filtrate (*Illustration 5*) which feeds the inlet connection to the feed pump (*Illustration 1 No. 16*),
- perform a concentration operation, as described in *Section 5.2.3: Concentration*,
  - note that in the checklist listed in *Section 5.2.3*, **do not open the external INPUT valve for maple sap** (*Illustration 5*) that feeds the inlet connection to the feed pump (*Illustration 1 No. 16*), as described in *No. 2*,
- adjust the concentrate adjustment valve (*Illustration 1 No. 11*) to **the same pressure level as used in the Initial PEP Test**,
- let the R. O. runs for a few minutes to stabilize.
- COMPARATIVE PEP TEST RESULTS SHEET (*Part 2*)
  - Record the DATE and PRESSURE of the R. O. in psi on the high-pressure gauge (*Illustration 1 No. 1*),
  - note the TEMPERATURE OF THE FILTRATE,
    - o this temperature measurement is done by the operator, directly in the tank, using a thermometer (not supplied),
  - note the FILTRATE FLOW RATE (*Illustration 1 No. 3*).

  - Calculate and record the CORRECTED FLOW RATE OF THE FILTRATE,
    - o calculate the CORRECTED FLOW RATE OF THE FILTRATE using the APPROPRIATE CORRECTION FACTOR for the TEMPERATURE OF THE FILTRATE,
      - ✓ refer to *Appendix B* to find the Appropriate Correction Factor,
    - o to perform this calculation, divide the value in the FILTRATE FLOW RATE column by the value of the APPROPRIATE CORRECTION FACTOR,
  - calculate the percentage (%) difference of the CORRECTED FLOW RATE OF FILTRATE with the OPTIMAL PERFORMANCE INDEX (100%),
    - o refer to the formula in *Column 7* of *Table 5 Part 2* to perform this calculation,
    - o if there is a decrease in filtrate flow rate greater than 15%:
      - ✓ then a chemical wash is required (see *Section 5.2.8: Washing with chemicals*).

TABLE 5 | PEP TEST RESULTS

Part 1 | INITIAL PEP TEST RESULTS

	Date of Installation	Serial Number	Reference Pressure (psi)	Temperature of the Filtrate (°F or °C)	Filtrate Flow Rate (gpm)	÷	Appropriate CORRECTION Factor [2]	=	CORRECTED Flow Rate of Filtrate (gpm)	=	(A) Optimal Performance Index (100%) (Filtrate Flow Rate / gpm)
Membrane No. 1											*Copy here the result ohtained in the previous column*
Membrane No. 2											

IMPORTANT | This **Initial PEP Test** should be done at the beginning of the season, after approximately 8 hours of cumulative use of new membranes and a rinse.

Part 2 | COMPARATIVE PEP TEST RESULTS

Date	Pressure (psi) [1]	Temperature of the Filtrate (°F or °C)	Filtrate Flow Rate (gpm)	÷	Appropriate CORRECTION Factor [2]	=	(B) CORRECTED Flow Rate of Filtrate (gpm)	Percentage (%) deviation from the Optimal Performance Index (100%) [Formula: 100 - ((B / A) x 100)] If > 15% = WASHING [3]	Notes

(1) For the Comparative PEP Test to be valid, this PRESSURE must be the same as the REFERENCE PRESSURE of the Initial PEP Test (*Part 1, Column 4*).

(2) See *Appendix B* for the APPROPRIATE CORRECTION FACTOR by TEMPERATURE OF THE FILTRATE. We recommend that you use a copy of *Appendix B*.

(3) If a drop in filtrate flow rate **of more than 15%** is noted, a chemical wash is required.

NOTE | The membrane continues to function if its performance drops below 85%, or if its percentage (%) deviation from the Optimal Performance Index (100%) is greater than 15%. However, a percentage greater than 15% increases the probability of not being able to recover the initial performance of the membrane after a single wash. In fact, several washes may be necessary to recover this initial performance.

5.4 CLOSING AND STORAGE

5.4.1 Short term storage for a few days

Here's what you'll need to store your R .O. for just a few days:

- chemical products for washing,
- one liter of filtrate per membrane,
- storage canisters for the membranes.

1. First wash with chemicals (see *Section 5.2.8*).
2. Remove the cartridge prefilter from the R. O. (*Illustration 1 No. 6*).
3. Discard the prefilter.
4. If there is a risk of freezing, remove the membranes from the pressure vessels (*Illustration 1 Nos. 20 and 21*), otherwise leave them in place.
5. Place each membrane in its storage canister and add one liter of filtrate.
6. Drain as specified in *Section 5.4.3*:
   - of the R. O.,
   - pumps,
   - and flowmeters.
7. Plug the openings of the R. O. and any tubes that remain connected to it when storing to prevent access to small rodents, insects and other pests.
8. Store the R. O. indoors in a dry, cool, heated area.
   - It is strongly recommended that the R. O. be stored in a heated area, away from freezing temperatures.

5.4.2 Long term storage for one year or more

Here's what you'll need to store your R. O. for a year or more:

- chemical products for washing,
- 4.5 liters of filtrate per membrane,
- 31 milliliters (one ounce) of SMBS preservative per membrane,
- one liter of filtrate per membrane,
- storage canisters for the membranes.

Note | Chemicals and the SMBS preservative are available from your LAPIERRE EQUIPMENT distributor.

1. Perform the procedure described above in *Section 5.4.1: Short-term storage for a few days*.
2. Instead of using one liter of filtrate to add to the storage canisters, prepare the following solution instead:
   - thoroughly mix 4.5 liters of filtrate and 31 milliliters (one ounce) of SMBS preservative for each membrane,
   - to protect the membranes from freezing, if necessary, add one liter of glycerin to this solution and mix well,
     - it is not necessary if you store your membranes in a heated place, protected from frost.

Note | Glycerin is available from your LAPIERRE EQUIPMENT distributor.

5.4.3 Drainage procedures for the 1000 Series R. O.

At the end of the season, it is necessary to drain certain components of your R. O., even if it is stored in a place where it is not exposed to freezing.

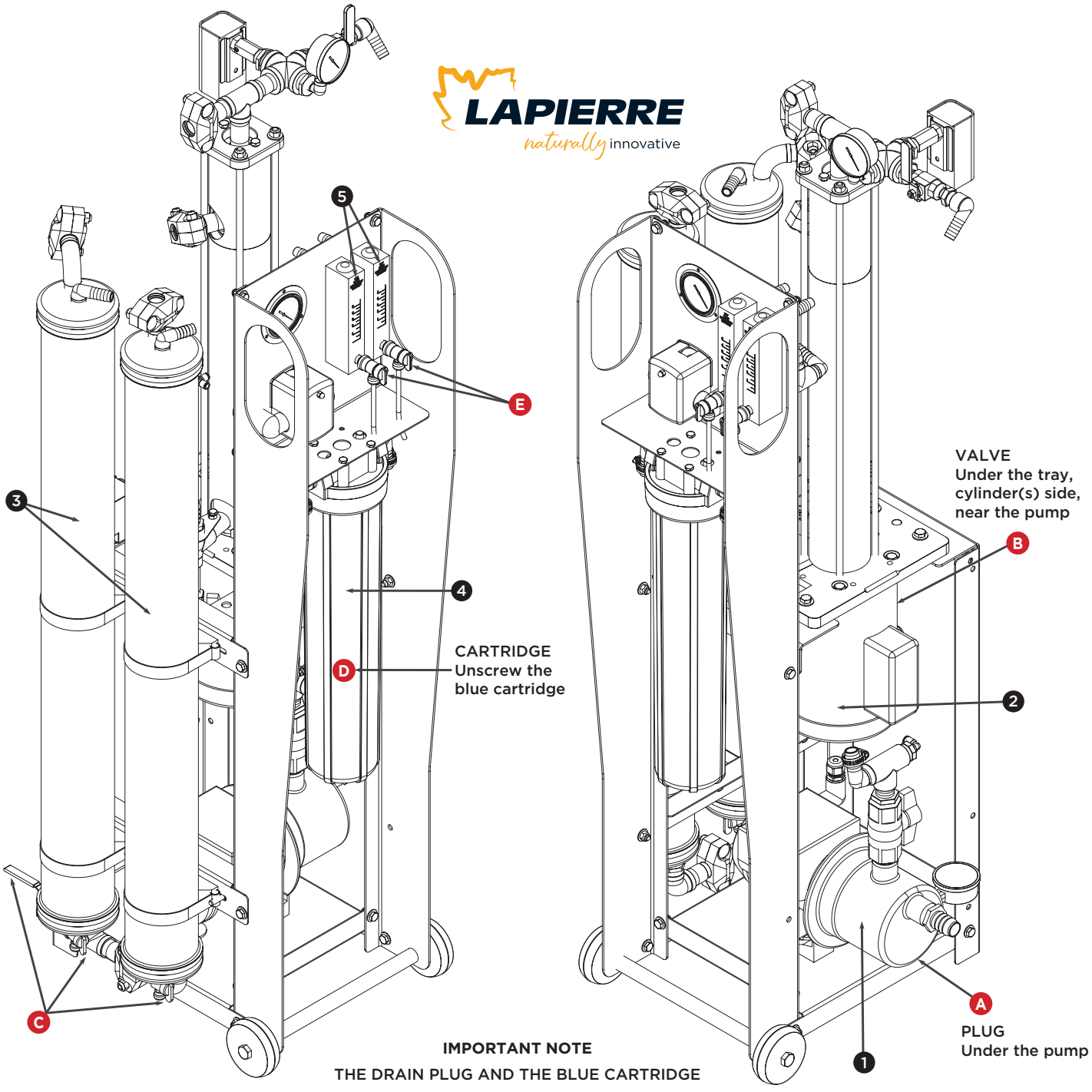
Here is the list of components to be drained:

TABLE 6 | TABLE OF COMPONENTS TO BE DRAINED (see *Illustration 7*)

	COMPONENTS	Drainage by	
1	Feed pump	Plug	**A**
2	High-pressure pump	Valve	**B**
3	Pressure vessels and membranes * (2)	Valves (3)	**C**
4	Cartridge prefilter	Blue cartridge	**D**
5	Flowmeters (2)	Valves (2)	**E**

* Our example shows two pressure vessels (see *Illustration 7 No. 3*). There is only one valve per pressure vessel.

ILLUSTRATION 7 | Identification of the components to be drained



SECTION 6 **EQUIPMENT CLEANING**

Below are the recommended maintenance points to remember when cleaning your 1000 Series R. O.

- The stainless steel components of your equipment must be cleaned with a product specially designed for this purpose. **Do not use flammable liquids**.
- Never use abrasive products, products containing chlorine or muriatic acid (also called hydrochloric acid) to clean the components of your R. O.
- The use of wire brushes and steel wool should also be avoided.

During prolonged storage, even the slightest **CLEANING PRODUCT RESIDUE ON ALL COMPONENTS** will obviously lead to inconvenience and damage at the beginning of the next season. Rinse each cleaned component thoroughly.

7.1 THE 1000 SERIES R. O. STARTS, BUT STOPS AS SOON AS I RELEASE MY FINGER FROM THE ELECTRIC START SWITCH (*Illustration 1 No. 7*)

Solutions

1. First, check to see if the R. O. is reaching the minimum required pressure of 20 psi on the supply pressure gauge (*Illustration 1 No. 8*).
2. Close the concentrate adjustment valve (*Illustration 1 No. 11*) slightly to create resistance to flow.
3. Check that the external INPUT valve for maple sap (*Illustration 5*) that feeds the feed pump inlet connection (*Illustration 1 No. 16*) is open.
4. Check the prefilter (*Illustration 1 No. 6*) for clogging.
   - If necessary, replace it.
5. Check if the plumbing :
   - is obstructed by the presence of debris,
   - has one or more air leaks,
     - an improperly glued or sealed joint may be the cause of this problem.
6. Check that the feed pump (*Illustration 1 No. 17*) is working.

   IMPORTANT | Avoid touching the pump directly, it can be very hot.

7.2 THE 1000 SERIES R. O. STARTS, BUT STOPS AS SOON AS I ENGAGE THE HIGH-PRESSURE PUMP (*Illustration 1 No. 14*)

Solutions

1. First, check to see if the R. O. is reaching the minimum required pressure of 20 psi on the supply pressure gauge (*Illustration 1 No. 8*).
2. Close the concentrate adjustment valve (*Illustration 1 No. 11*) slightly to create resistance to flow.
3. Replace the prefilter (*Illustration 1 No. 6*).
4. Check plumbing for debris blockage.
5. Check the feed pump (*Illustration 1 No. 17*) for blockage.
6. Check that the feed pump (*Illustration 1 No. 17*) is working.

   IMPORTANT | Avoid touching the pump directly, it can be very hot.

7.3 I HEAR A RUMBLING IN AN ELECTRIC MOTOR

Generally, this problem has no immediate significant consequences for the engine. It is possible that the rumbling is caused by a problem with a ball bearing.

- However, this problem must be addressed immediately to avoid significant damage.
- A qualified technician can perform the repair and check the condition of the pump to make sure it is still in good condition.
  - Please note that only a person authorized by LAPIERRE EQUIPMENT may perform repairs on this equipment.
- NEVER OPERATE your R. O. in a wet location.
  - Moisture is a natural enemy of motors and electrical components.
  - A dry area with a well-drained floor can prevent many problems and inconveniences.

7.4 THERE IS THE PRESENCE OF SUGAR IN MY FILTRATE

Solutions

- Check the integrity of the two small O-rings located on the inside center of the bottom and top covers of the pressure vessel(s).
- Ensure that both ends of the membranes are not cracked or broken.

Whether they are related to the situations raised in this troubleshooting kit or related to other conditions, your questions are always welcome at our customer service department. We have the answers to all your questions, contact us!

1000 Series Reverse Osmosis (R. O.)		
MODEL	**Number of pressure vessel(s)**	**Model number**
1000 Series Reverse Osmosis (R. O.)	1	**CN**148-010000**XX**
1000 Series Reverse Osmosis (R. O.)	2	**CN**148-020000**XX**

Specifications are subject to change without notice.

WARRANTY CERTIFICATE

1. Two-year warranty
2. Warranty certificate exclusions
   2.1 Observed conditions
   2.2 Costs and losses
3. Disclaimer of liability
4. Making your warranty claim

KEEP YOUR PURCHASE INVOICE

It is very important to keep the original invoice for the purchase of your equipment or a legible copy of it. Otherwise, LAPIERRE EQUIPMENT INC. will not accept your warranty claim.

The term MANUFACTURER is used for LAPIERRE EQUIPMENT in order to lighten the text.

1. TWO-YEAR WARRANTY

The MANUFACTURER warrants that any new product is free from manufacturing, material and workmanship defects. The warranty is valid for a period of two years from the date of purchase of the product. It applies when the product meets normal conditions of installation, use and maintenance.

PRODUCT DEFECT. The appearance of a defect before the expiry date of the warranty must be reported immediately to the MANUFACTURER. The MANUFACTURER will then repair or replace the defective parts with equivalent new parts.

DEFECTIVE PARTS. Replaced defective parts become the property of the MANUFACTURER. They are recovered during the after-sales service process.

AESTHETICS. The aesthetic appearance of the products - parts and equipment - is covered by a warranty covering 7 days from the date of delivery.

2. WARRANTY CERTIFICATE EXCLUSIONS

2.1 OBSERVED CONDITIONS

This warranty becomes null and void where one or more of the following conditions are observed.

2.1.1 An altered, modified or removed serial number

2.1.2 Product damaged by:

2.1.2.1 User

- Use deemed abusive or negligent.
- Accident caused by the user.

2.1.2.2 Failure to comply with user manual instructions

- Failure by the user to follow the instructions in the user manual: safety instructions, installation of the equipment, start-up and operating procedures, maintenance and cleaning of the equipment, as well as any other installation recommendations provided by the MANUFACTURER.

2.1.2.3 Installation, modification, repair

- Installation in a place not suitable for normal use.
- Unauthorized repair or modification - not approved by our service centre - performed by the customer.
- A repair or modification carried out by a third party not authorized by the MANUFACTURER.

2.1.2.4 Parts

- The use of parts other than original MANUFACTURER parts.
- Use of parts obtained through a service centre, technician or distributor not authorized by the MANUFACTURER.
- Use of parts that cause deterioration or damage to the product.

2.1.2.5 Electricity

- A variation, electrical overload or excessive voltage.
- Poor power supply quality or electrical connections.

2.1.2.6 Cleaning products

- The use of cleaning products or acids that are not recommended, or used without following the recommendations of their respective manufacturers.

2.1.2.7 Non-controllable events

- Events that are beyond the MANUFACTURER's control such as mechanical shock; water damage or flooding; fire or burning; storm, earthquake or other natural or man-made disasters.

2.2 COSTS AND LOSSES

This warranty does not cover the following costs or losses.

2.2.1 Costs for:

- making the product accessible during a service call,
- the trip of the authorized technician during a service call,

- service calls for reasons other than those provided for in the warranty. The warranty applies when a defect or malfunction or a defect in manufacture, material or workmanship appears,
- service calls associated with product start-up at the beginning of the season, and shutdown at the end of the season or post-season. However, costs may be covered if specified in the purchase contract,
- service calls received when the warranty expires, i.e., two years from the date of purchase of the product,
- replacement of parts due to normal wear and tear such as seals, insulation joints and gaskets,
- annual equipment tune-ups.

2.2.2 For losses of:

- income caused by the quality of the syrup,
- production related to the provisions covered by this warranty.

3. DISCLAIMER OF LIABILITY

The MANUFACTURER shall not be liable for incidental or consequential damages or implied property damage.

The MANUFACTURER shall not be liable for any direct or consequential loss of time, production or profits, inconvenience, cost of equipment acquisition or parts replacement or storage due to a warranty claim.

4. MAKING YOUR WARRANTY CLAIM

The following is the procedure for making a warranty claim.

- Contact your representative or distributor, our service centre or our head office to submit your warranty claim and plan the necessary after-sales service operation.
- IMPORTANT | For any claim, **the customer must submit a copy of their invoice**. Otherwise, the MANUFACTURER will not accept your claim.
- The MANUFACTURER will then proceed with an inspection of your equipment and confirm whether your warranty claim is accepted. If so, the MANUFACTURER will carry out an after-sales service operation in accordance with the provisions specified in Section 1. TWO-YEAR WARRANTY.
- The functioning equipment will then be returned to the customer in a *condition comparable* to that in which it was received. This *comparable condition* will have been previously determined by the MANUFACTURER and/or one of its representatives or distributors.
- This warranty after-sales service operation **does not extend the warranty period** of the equipment. The end date of the warranty remains the same, i.e., two years from the date of purchase of the product.

Warranty certificate: August 2022 (V03)

SECTION 10 **PARTS AND CONSUMABLES**

Parts for your 1000 Series Reverse Osmosis (R. O.) or any other equipment manufactured at LAPIERRE EQUIPMENT are available at our main plant in Saint-Ludger, Québec, Canada and at our service centers in Waterloo, Québec, Canada and Swanton, Vermont, USA. However, do not hesitate to contact us or visit our website to locate the distributor nearest you.

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APPENDIX A PEP TEST RESULTS

IMPORTANT NOTE TO THE OPERATOR
Make several copies of this chart and record your results. Thank you.

Part 1 | INITIAL PEP TEST RESULTS

	Date of Installation	Serial Number	Reference Pressure (psi)	Temperature of the Filtrate (°F or °C)	Filtrate Flow Rate (gpm)	÷	Appropriate CORRECTION Factor (2)	=	CORRECTED Flow Rate of Filtrate (gpm)	=	(A) Optimal Performance Index (100%) (Filtrate Flow Rate / gpm)
Membrane No. 1											
Membrane No. 2											

IMPORTANT | This **Initial PEP Test** should be done at the beginning of the season, after approximately 8 hours of cumulative use of new membranes and a rinse.

Part 2 | COMPARATIVE PEP TEST RESULTS

Date	Pressure (psi) (1)	Temperature of the Filtrate (°F or °C)	Filtrate Flow Rate (gpm)	Appropriate CORRECTION Factor (2)	(B) CORRECTED Flow Rate of Filtrate (gpm)	Percentage (%) deviation from the Optimal Performance Index (100%) [Formula: 100 - ((B / A) x 100)] If > 15% = WASHING (3)	Notes

Refer to page 24 of this User's Manual, if necessary, for more information about this table.

(1) For the Comparative PEP Test to be valid, this PRESSURE must be the same as the REFERENCE PRESSURE of the Initial PEP Test (*Part 1, Column 4*).

(2) See *Appendix B* for the APPROPRIATE CORRECTION FACTOR by TEMPERATURE OF THE FILTRATE. We recommend that you use a copy of *Appendix B*.

(3) If a drop in FILTRATE FLOW RATE **of more than 15%** is noted, a chemical wash is required.

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APPENDIX B **CORRECTION FACTORS FOR FILTRATE TEMPERATURE**

The correction factors in this table will be useful in calculating the **CORRECTED FLOW RATE OF FILTRATE** required in *Parts 1 and 2 of Appendix A*.

Please use the **APPROPRIATE CORRECTION FACTOR** for the **TEMPERATURE OF THE FILTRATE** found in *Appendix A*.

Temperature °C	Temperature °F	Correction factor
0	32.0	**0.672**
1	33.8	**0.695**
2	35.6	**0.719**
3	37.4	**0.742**
4	39.2	**0.766**
5	41.0	**0.790**
6	42.8	**0.816**
7	44.6	**0.842**
8	46.4	**0.866**
9	48.2	**0.893**
10	50.0	**0.919**
11	51.8	**0.946**
12	53.6	**0.973**

Temperature °C	Temperature °F	Correction factor
13	55.4	**1.000**
14	57.2	**1.028**
15	59.0	**1.055**
16	60.8	**1.084**
17	62.6	**1.112**
18	64.4	**1.142**
19	66.2	**1.170**
20	68.0	**1.200**
21	69.8	**1.229**
22	71.6	**1.259**
23	73.4	**1.289**
24	75.2	**1.319**
25	77.0	**1.350**

APPENDIX C CALCULATION TABLES FOR TOTAL MAPLE SAP FLOW AND PERCENTAGE CONCENTRATION

IMPORTANT NOTE TO THE OPERATOR
Make several copies of this chart and record your results. Thank you.

TOTAL MAPLE SAP FLOW				
Flow of CONCENTRATE (gpm)	**+**	**Flow of FILTRATE (gpm)**	**=**	**Total flow of MAPLE SAP (gpm)**
	+		=	
	+		=	
	+		=	
	+		=	
	+		=	
	+		=	
	+		=	
	+		=	
	+		=	
	+		=	
	+		=	
	+		=	
	+		=	
	+		=	
	+		=	
	+		=	

IMPORTANT NOTE TO THE OPERATOR
Make several copies of this chart and record your results. Thank you.

PERCENTAGE OF CONCENTRATION WITH FLOW RATES

Flow of FILTRATE (gpm)	÷	Total flow of MAPLE SAP (gpm)	=	% of CONCENTRATION
	÷		=	
	÷		=	
	÷		=	
	÷		=	
	÷		=	
	÷		=	
	÷		=	
	÷		=	
	÷		=	
	÷		=	
	÷		=	
	÷		=	
	÷		=	
	÷		=	
	÷		=	

IMPORTANT NOTE TO THE OPERATOR
Make several copies of this chart and record your results. Thank you.

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PERCENTAGE OF CONCENTRATION WITH BRIX DEGREES

Brix degree of MAPLE SAP (°Brix)	÷	Brix degree of the CONCENTRATE (°Brix)	= X%	CONCENTRATION % (100% - X%)
	÷		=	
	÷		=	
	÷		=	
	÷		=	
	÷		=	
	÷		=	
	÷		=	
	÷		=	
	÷		=	
	÷		=	
	÷		=	
	÷		=	
	÷		=	
	÷		=	
	÷		=	

APPENDIX D **TERMINOLOGY AND DEFINITIONS**

BRIX
The Brix represents the percentage of sugar in a liquid solution. It is expressed in degrees Brix (°Brix) and each degree is equivalent to 1% of sugar.

RECOVERY
Percentage of sap from the membrane system feed that emerges as permeate or filtrate.

The recovery percentage can be increased by adjusting a valve at the outlet of the concentrate.

REJECTION
The percentage concentration of solids removed from the feed sap by the membrane system.

PASSAGE
In contrast to the rejection, it is the percentage of concentration of dissolved matter of the feed sap that passes through the membrane.

PERMEATE or FILTRATE
The purified water that is produced by the membrane system.

TOTAL FLOW
The amount of feed liquid that is introduced into the membrane.

This flow rate is usually measured in liters per minute (lpm) or gallons per minute (gpm).

CONCENTRATE FLOW
The amount of concentrated feed liquid that exits the membrane.

The concentrate contains almost all of the dissolved organic and inorganic materials that are present in the feed liquid.

This flow rate is usually measured in liters per minute (lpm) or gallons per minute (gpm).

PERMEATE or FILTRATE FLOW
The amount of permeate or filtrate produced by a membrane surface.

This flow rate is usually measured in liters per minute (lpm) or gallons per minute (gpm).

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We sincerely appreciate your trust.

Thank you!

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