



### 60 GPH Single Post RO DP



Revision 1

### Responsible Use and Liability Disclaimer

The products offered by The RO Bucket LLC are intended for use by individuals who have become knowledgeable regarding the reverse osmosis process as it relates to maple syrup production. **Follow all indications and directions and observe reasonable care when utilizing this product.** Possible hazards associated with the use of the product include, but are not limited to:

- Shock/Electrocution - Always use a ground fault outlet and surge protector. Always wear shoes and keep electrical cord away from wet/moist surfaces. Always run discharge hoses into containers. Never allow them to spill onto nearby surfaces.
- Fire - Do not use the product in potentially explosive, flammable, or corrosive environments. In the event the thermal protection function is enabled, unplug the unit and wait one hour before using again. Do not disassemble or alter the motor or driver. Use only the provided transformer.
- Physical hazards - The product works under high pressure. Always wear safety goggles and point hoses away from your body and face.
- Leaks – Closely monitor the operation of the product. Regularly inspect and repair any components that are leaking.

In no event shall The RO Bucket LLC be liable for any direct, indirect, punitive, incidental, special, or consequential damages to property or life whatsoever arising out of or connected with the use or misuse of our products.

## Table of Contents:

1. Definitions
2. Specifications
3. Diagram of system
4. Working theory of system
5. Initial start-up and maintenance
  - a. Testing and flushing system
  - b. Prefilter replacement
  - c. Membrane replacement
6. Sap concentration
7. Membrane cleaning
8. Storage
9. Warranty

## 1. Definitions:

**Permeate** – Pure water that is removed from sap. A large amount of permeate should always be saved. It is used to clean the membrane after concentrating sap.

**Concentrate** – Sap that has undergone water removal (contains a higher sugar percentage than “raw sap”).

**Pre-filter** – the 10” blown polypropylene filter that is used to remove small particle from the sap, protecting the “reverse osmosis membrane”. Pre-filters are replaced every 200-300 gallons of sap.

**Membrane** – the 40” reverse osmosis membrane is used to separate water from “raw sap”. The membrane is located in the longer stainless cylinder and generally lasts several years.

**Recirculation valve** – this valve is used to send concentrated sap back to the inlet of the pump. The recirculation valve allows the precise control of system pressure at various single pass concentration levels.

**Concentration valve** – This valve is used to vary the concentrate:permeate ratio. Using this valve, in combination with the recirculation valve, sap can be concentrated anywhere between 4 and 10 brix in a single pass

## 2. Specifications:

The 60gph single post RO system features:

- Two 60gph diaphragm pumps connected in parallel
- Suction side mounted 10” prefilter housing
- High pressure stainless membrane housing
- OEM high flow 40” commercial RO membrane
- Quick connect intake, permeate, and concentrate hoses
- Concentrate and Recirculation valves for maximum efficiency
- Single pass concentration from 2% to 4% sugar at 60gph (30 gallons of concentrate and 30 gallons of permeate)
- Single pass concentrations up to 6% sugar at reduced flow rates using recirculation

### 3. Diagram:



1. High Pressure Pump
2. Prefilter Housing
3. RO Membrane
4. Concentrate Valve
5. Permeate Flow Meter
6. Recirc Valve
7. Permeate Outlet
8. Concentrate Outlet

### 4. Working Theory of System:

The 60gph single pass RO system utilizes two 60gph high-pressure diaphragm pumps. These pumps **can** be allowed to run dry. The 5 micron prefilter housing is mounted on the suction side of the system reducing the need for a suction strainer or additional filter before the pumps. Once liquid passes through the pumps, it flows into the bottom of the 40" stainless membrane housing. Separated liquid then flows out of the two outlet ports at the top of the membrane. The open port (center) is permeate water, and the other port that is plumbed to the two flow meters with the valves is the concentrate. Concentrate and permeate flow are regulated, as well as system pressure, using the concentrate valve and recirculation valve.

The high pressure pumps are equipped with an internal pressure regulator set to around 150psi. At pressure above 150psi, the internal regulator will open and liquid will recirculate internally, inside the pump head. When utilizing the recirculation valve, the system pressure can be adjusted to around 125psi (ideal conditions). This ensures that the internal regulator in the high pressure pumps stay closed, and the maximum amount of liquid is passing across the membrane (even at single pass, high concentration levels, like when going directly from 2-6% sugar). Without the recirculation valve, system pressure would continue to climb as the concentrate valve is closed, and there would be no way to lower the pressure.

Generally, a 50/50 flow of concentrate to permeate at 125psi will yield a total of 60gph processing (30 gallons of concentrate and 30 gallons of permeate). If you want to run a 1:3 ratio of concentrate to permeate, the flow will be reduced, and you will be opening the recirculation valve slightly to maintain appropriate system pressure (125psi). This ratio will yield concentrate with a higher sugar concentration. Your flow meters will read around .25gpm concentrate, .5gpm permeate, and .1gpm recirculation.

## 4. Initial Start Up and Maintenance

Minor assembly is required on our shipped dolly systems. Assemble using the supplied literature. When assembling a kit, ensure all fittings are snug. Always test outdoors (or a suitable area that will not be damaged by leaks).

**Initial start up** – Flush the system for 15 minutes with a nonchlorinated, potable water source (well water is generally suitable)

1. Fill a 5 gallon bucket (minimum) with clean water.
2. Connect the intake hose into the inlet of the prefilter housing. Insert the concentrate and permeate discharge hoses into the quick connect fittings (located at the top of the appropriate flow meters).
3. Place all three hoses (intake, concentrate, and permeate) into the 5 gallon bucket, filled with clean water. Ensure that all three hoses stay at the bottom.
4. Open the concentrate valve fully counter clockwise (slight resistance will be noticeable when it is fully open. Do not over turn it). Close the recirculation needle valve by turning it clockwise.
5. Plug in the systems power cords into a gfi surge protector with an on/off switch and turn the switch on.
6. The system will begin to fill with water. After a minute or so, you should have flow out of the concentrate hose.
7. After running the system for 10 minutes, slowly close the concentrate valve until the system reaches 50 psi pressure. Check the system for leaks, repairing any drips if necessary.
8. After 5 minutes, ensure that concentrate and permeate are flowing out of the discharge hoses.
9. This completes the initial start up rinse and inspection. You can now turn the pumps off and leave the system full of liquid until you are ready to use it.
10. Always store the system with the concentrate and recirculation valves closed.

## Maintenance

**Changing prefilters** – The 10” prefilter cartridge should be replaced after every use, and every 300 gallons of sap.

1. Turn the system off and open both the concentrate and recirculation needle valves.
2. Unscrew the base of the prefilter housing and lower the base (which contains the prefilter).
3. Empty the base, clean it if necessary, and install the new filter.
4. Installation is opposite of removal. The threads and o-ring seals should be lubricated periodically with a small amount of food safe grease/lubricant.

**Membrane replacement** – The RO membrane should last five years and does not need to be removed for storage. The membrane needs to be removed/installed from the bottom. Always note the location and orientation of the lip seal and ensure that it is reinstalled correctly.

1. Drain the membrane housing by removing a lower push connect fitting
2. Loosen the two 14mm bolts on the upper housing cap and remove the retaining ring. Using a flat blade screwdriver AND slight force on the fitting assembly, carefully work the plastic cap upwards.
3. Loosen and remove the two stainless straps holding the membrane housing to the steel dolly.
4. Carefully lay the stainless housing down on a padded surface to gain access to the lower housing cap.
5. Remove the lower housing cap using the same procedure as Step 2 above.

6. Carefully pull the membrane out from the top, while pushing from the bottom (if necessary). Be careful not to damage the center permeate port (that needs to seal on the center o-rings in the cap).
7. When reinstalling the membrane, insert it from the bottom of the housing. The lip seal should always be towards the upper housing cap, with the u cup facing down (inlet pressure should force the u cup into the stainless housing).
8. Assembly is opposite of removal.

**Repairing leaking fittings** – should a small leak develop in a connection, repair the leak immediately to avoid possible damage to the electric motor. Most threaded connections can usually be tightened. If that is not possible, remove the fitting and reseal it with Teflon tape.

## 6. Sap Concentration

1. Place the intake hose into the raw sap. Ensure that the hose stays at the bottom of the tank.
  - a. Place the concentrate and permeate hoses into the raw sap container (allow to recirculate until the system fills).
  - b. Plug in the systems power cords into a surge protector and turn the switch to “on”. The pumps will change pitch after a couple of seconds once sap reaches the pump head and the system begins filling.
  - c. After a minute or two, you should get a steady flow of concentrate with no air bubbles. At this point, slowly close the concentrate valve to a pressure of 100 psi.
  - d. Once permeate starts flowing, adjust the concentrate valve until an estimated 1:1 flow ratio is achieved across the concentrate and permeate hose (they are flowing equally).
  - e. At any point, the recirculation valve can be opened or closed when necessary to maintain a pressure of 125-150psi. If a more concentrated single pass is desired (30% concentrate and 70% permeate), simply close the concentrate valve while opening the recirculation valve (maintaining 125-150psi).
  - f. When all of the sap has been processed, close the recirculation valve and open the concentrate valve fully. Allow the system to pump itself dry.
  - g. Proceed to the cleaning.

## 7. Membrane cleaning

### **If the system is going to be used within 24-48 hours:**

- a. Replace the prefilter (see maintenance section above)

Rinse the membrane with 25-30 gallons of permeate water (run the system for 15 minutes). Leave the concentrate valve fully open and the recirculation valve fully closed. Allow the discharge hoses to run to drain.

4. Turn off the pumps. Leave the system full of liquid.

### **If the system is NOT going to be used within 48 hours:**

1. Replace the prefilter (see maintenance section above)
2. Rinse the membrane with 50 gallons of permeate water (run the system for 15-30 minutes). Leave the concentrate valve fully open and the recirculation valve fully closed. Allow the discharge hoses to run to drain.
3. Turn off the pump. Leave the system full of liquid.
4. Prepare a 5 gallon bucket of 100f water. Add the appropriate amount of RO soap (follow directions on the manufacturer's label).
5. Place all three hoses in the 5 gallon bucket (intake, concentrate and permeate hoses).
6. Run the system for 15 minutes (recirculation with all three hoses in the same bucket). The concentrate valve should be fully open and the recirculation valve should be fully closed.
7. After 15 minutes, turn off the system. Close the prefilter isolation valve and keep the system full of liquid.
8. This liquid needs to be flushed out before processing sap.

9. Alternatively to running the soap solution, the membrane can be flushed with 5 gallons of water every 48 hours until the next use.

**Long term storage:** When storing the system for end of season, it is advisable to do an additional wash with citric acid. Follow the procedure above for "If the system is not going to be used within 24-48 hours". Additionally:

1. Prepare a 5 gallon bucket of 100f water. Add the appropriate amount of ro soap (follow directions on the manufacturer's label).
2. Place all three hoses in the 5 gallon bucket (intake, concentrate and permeate hoses).  
Run the system for 30 minutes (recirculation with all three hoses in the same bucket). The concentrate valve should be fully open and the recirculation valve should be fully closed.
3. After 30 minutes, turn off the system.
4. Flush the system with 5 gallons of clean water. The purpose of this is to dilute the ro soap mixture and flush the pump heads. Leave the system full of liquid
5. Store the system in a non-humid place and make sure the exterior components stay dry. Keep the system from freezing.

## 8. Warranty

The majority of components comprising our products are intended to be easily replaceable and relatively inexpensive. It is expected that the user becomes familiar with how the product functions and has the ability to repair broken fittings, hoses, and leaks. Furthermore, the user must perform routine maintenance (filter changes, routine membrane flushing, etc.).

Membrane fouling, bacterial growth, and unpleasant odors can all develop due to improper maintenance and handling. While membrane degradation is not covered by a warranty, our customer service team will gladly help you determine the cause of such issues and help you improve product performance moving forward.

The high pressure pump has a **one-year warranty** from the date of purchase. This warranty covers manufacturer defects. It does not cover damage caused by freezing, submersion in water, rough handling, or premature pump body scoring due to being run dry.