Installation, Operation & Maintenance Manual

Commercial For & Industrial Reverse Osmosis Systems

ultimawater.com

Table of Contents

Specifications

Specification	LP-300	LP-800
GPD	300	800
LPM	0.8	2.1
Feed Water Pipe Size	1/2” FIP	1/2” FIP
Outlet Pipe Size	3/8” Compression	3/8” Compression
RO Membrane Size	(1) 2 1/2” x 21” TFC	(1) 4’ x 21” TFC
Recovery Rate	Up To 50%	Up To 50%
Motor HP	0.5	0.5
Volts / Hz	110v or 220v/ 60Hz	110v or 220v/ 60Hz
Amps	6	6
Recycle Line	yes	yes
Permeate Flow Meter	yes	yes
Concentrate Flow Meter	yes	yes
Recycle Flow Meter	no / optional	no / optional
Low Pressure Switch	yes	yes
Height, Length & Width	37” x 20” x 18”	37” x 20” x 18”
Pre-Filter Cartridge	SL 10 x 2.5-5/50mic	SL 10 x 2.5-5/50mic
Shipping Weight	?? lbs.	??? lbs.

Specification	LP-2000	LP-4000
GPD	2000	4000
LPM	5.2	10.4
Feed Water Pipe Size	1/2” FIP	3/4” FIP
Outlet Pipe Size	1/2” Compression	1/2” Compression
RO Membrane Size	(1) 4” x 40” TFC	(2) 4’ x 40” TFC
Recovery Rate	Up To 60%	Up To 60%
Motor HP	3/4	1.0
Volts / Hz	110v or 220v/ 60Hz	110v or 220v / 60Hz
Amps	9	9
Recycle Line	yes	yes
Permeate Flow Meter	yes	yes
Concentrate Flow Meter	yes	yes
Recycle Flow Meter	no / optional	no / optional
Low Pressure Switch	yes	yes
Height, Length & Width	59” x 26” x 18”	59” x 26” x 18”
Pre-Filter Cartridge	SL 10 x 2.5-5/50mic	BB 20 x 4.5-5/50mic
Shipping Weight	??? lbs.	??? lbs.

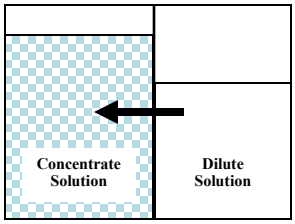
Specification	LP-5500	LP-7000
GPD	5500	7000
LPM	14.3	18.2
Feed Water Pipe Size	1” FIP	1” FIP
Outlet Pipe Size	1/2” Compression	1/2” Compression
RO Membrane Size	(3) 4” x 40” TFC	(4) 4’ x 40” TFC
Recovery Rate	Up To 60%	Up To 75%
Motor HP	1.5	2.0
Volts / Hz	230v / 60Hz	230v / 60Hz
Amps	9	13
Recycle Line	yes	yes
Permeate Flow Meter	yes	yes
Concentrate Flow Meter	yes	yes
Recycle Flow Meter	no / optional	no / optional
Low Pressure Switch	yes	yes
Height, Length & Width	59” x 26” x 18”	59” x 26” x 18”
Pre-Filter Cartridge	BB 20 x 4.5-5/50mic	BB 20 x 4.5-5/50mic
Shipping Weight	??? lbs.	??? lbs.

Introduction:

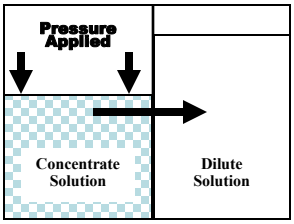
This manual is designed to aid in the installation of your new system. It will also familiarize yourself with the whole RO process and how to maintain the system after installation. However if you feel the need for help at anytime, please feel free to call.

Reverse Osmosis:

Reverse Osmosis is, by definition, the forcing of water under pressure through a semi-permeable membrane. Regular osmosis is the traveling of a fluid from an area of low concentration to an area of high concentration. Our system simply applies pressure to the area of higher concentration forcing the reverse. This is info you may never need, but is good to know.



Osmosis



Reverse Osmosis

Terms:

Source Water

Source water refers to the feed water sent to the system which allow it to operate. This water is usually filtered to remove any chlorine and other organics and softened before it feeds the RO system

Permeate / Product Water

Permeate or product water is the ***good water*** they bought the system for in the first place. This is the product water of the whole RO system

Concentrate / Reject Water / Waste Water

Concentrate refers to the waste water that is sent down the drain or rejected by the RO system. This water carries all the contaminates or most of the TDS that have been removed by the RO system.

Water Quality

Water Quality is a measure of how good the water is whether it is the source water or product water. This can refer to TDS or hardness or SDI. This could be measured in grains per gallon if it is hardness or parts per million if it is TDS. SDI is a measure in itself.

Percent Recovery

The percent recovery refers to the amount of product water vs waste water that goes down the drain as compared to the total feed water coming into the unit.

Percent Rejection

Percent rejection refers to TDS of the water before and after the RO membrane. If the source water is 1000ppm coming into an RO and the product water is 50ppm, than the percent rejection would be 95%.

TDS

TDS stands for Total Dissolved Solids which is a combination of all the inorganics in the water. This is measured by conductivity and other things can affect the conductivity of water such as bacteria in the water. Bacteria is the most common cause of a test resulting with a high result.

SDI

SDI stands for Silt Density Index (SDI) which is a measure of turbidity or fine amounts of colloidal matter in the water. This can have a fouling affect on the unit cause by the feed water or source water.

Water Temperature:

Water production and water quality of any RO system is a variable depending on water temperature and pressure. The international standard for rating RO systems is with operating temperature of 77°F (25°C), 60 psi (4.2 bar) inlet pressure and 1000 ppm TDS feed water quality. Lower temperatures and lower pressure will reduce the production.

The chart below may help in the calculation of water production.

Water Temperature		Production Increase/Decrease (With TFC Membranes)
F	C	
40°	4°	0.48
50	10	0.60
60	16	0.73
70	21	0.88
77	25	1.00
80	27	1.06
90	32	1.26

Water Pressure:

Typical RO systems should have inlet water pressure of 40 psi minimum and not over 90 psi to function properly. (If the pressure is over 90 psi we recommend a pressure regulator). Should these limitations not be met, this could void the warranty.

General Information:

You can expect years of satisfactory service from your new RO system with proper care and maintenance. Please follow these instructions closely. Failure to do so may void the warranty.

Feed/ Source Water:

The feed water quality can have a massive effect on the performance of the reverse osmosis system. Pretreatment of the feed water maybe needed if these recommendations can not be met. We recommend that you try to maintain the following feed water conditions.

Inlet Feed Water

Item	Recommendation
Hardness	Less than 1 gpg
Free Chlorine	0 ppm
TDS	Less than 1000 ppm
SDI	Less than 5
pH	3-11
Iron	Less than 0.01 ppm
Silica	Less than 10 ppm
Manganese	Less than 0.05 ppm
Turbidity	Less than 1 NTU
Temperature	40°F - 95°F (4°C-32°C)
Pressure	20-90 psi (2.8 - 6.3 bar)

Determining the product water demand and the proper unit:

1. In many cases the product water may be needed at a higher volume for a shorter period of time. You must make sure the proper amount of product water is available when needed. This will help you determine the proper size unit and storage tank. You can have a smaller unit with a larger storage tank (this may cause a bacteria growth if that is an issue). Or you can go with a larger unit and a smaller storage tank (this will keep the water fresher and less bacteria growth). In either case the production of the unit and the volume of storage space must be sufficient to supply enough product water during these high demand times.
2. Water production rate on the unit may be less, should the feed water be colder than 25°C (77°F). As a general rule, product output will reduce by 3% for each 1°C (just under 2°F). An increase in feed water pressure can increase production and a decrease can reduce the production rate.

Water Analysis and Pretreatment Considerations:

1. A complete water analysis is recommended to determine what unit is needed and what pre-treatment maybe necessary.
2. Chlorine must be removed from the feed water prior to the RO unit. This is usually done with a mineral bed granular activated carbon filter. This unit will be part of the pre-treatment system ahead of the RO unit. Chlorine damage to the thin film composite membranes will void their warranty.
3. Hardness is also a consideration when laying out a system. A Reverse Osmosis system will work on hard water but it is better to have the water softened or use a chemical feed system. Membrane life is usually more than doubled by feeding the system with soft water.
4. Should the feed water have other minerals such as iron, manganese, hydrogen sulfide, turbity, etc. These should also be dealt with prior to the reverse osmosis system during the pre-treatment phase.
5. A test for Silt Density Index (SDI) should also be done and dealt with during the pre-treatment phase.

Unit Life Expectancy:

To extend the life or to expect normal life of this reverse osmosis system it is best to make sure you have soft and filtered pre-treatment of the feed water going into this system.

Should you not be able to maintain these water quality recommendations, some of the following pretreatments processes on the next page may be necessary.

Some Possible Pre-Treatment Options

Mineral Bed Filter

This unit is used to remove some of the larger particles or sediment in the water. These are usually larger particles that you can see with the naked eye. As this system plugs up, it will need to be backwashed to remove these particles. This backwashing can be initiated by timeclock or pressure differential.

Water Softener

This unit is used to remove the hardness from the water. Hardness is calcium and magnesium or dissolved limestone as a rule. This hardness can cause hardness fouling of the membrane(s). It is possible to inject an approved anti-scalents through chemical feed.

Carbon Filter

This system is used to remove chlorine and other organics from your feed water. Free chlorine can rapidly cause damage to the thin film composite membranes.

WARNING: The residual free chlorine present in most city water supplies WILL damage and void the warranty on the thin film composite membranes used in our equipment. Carbon filtration or sodium bisulfite injection should be used to remove the free chlorine.

Chemical Injection

This is used as a rule to feed anti-scalent, coagulant, or sodium bisulfite into the feed water or to adjust the feed water pH.

Pre-Filter Cartridge

This is used to remove smaller suspended matter usually smaller than you can see with the naked eye. This cartridge is usually a 5 micron sediment filter and should be changed when the pressure drops by 5-10psi. Our system is designed to automatically shut down the system if pressure drops below this point.

Iron and Manganese

These contaminant are usually removed to a point below 0.01ppm. Special filter medias and/or chemical treatment is commonly used.

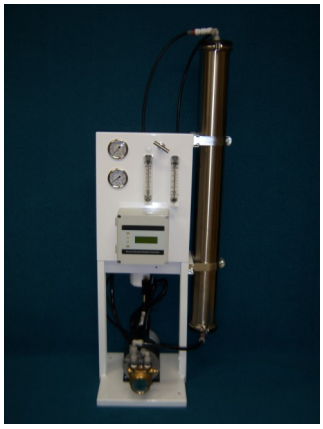
pH

The pH is usually adjusted down to reduce the scaling characteristics of the water.

Silica

Silica is very pH sensitive and silica scaling can be reduced by chemical feed and/or reducing recovery.

Our Units



LP-2000

This is our 2000 gallon a day system and is designed to be more compact for easy installation. Just because it is small does not mean went cheap on it. This unit has most of the same features our larger systems offer.

LP-4000

This is our 4000 gallon a day system and can easily handle your medium demand applications. Our systems come standard with an advanced controller which monitors several items on the system. One of those is the pressure differential on the pre-filter and tells you when it needs changing.

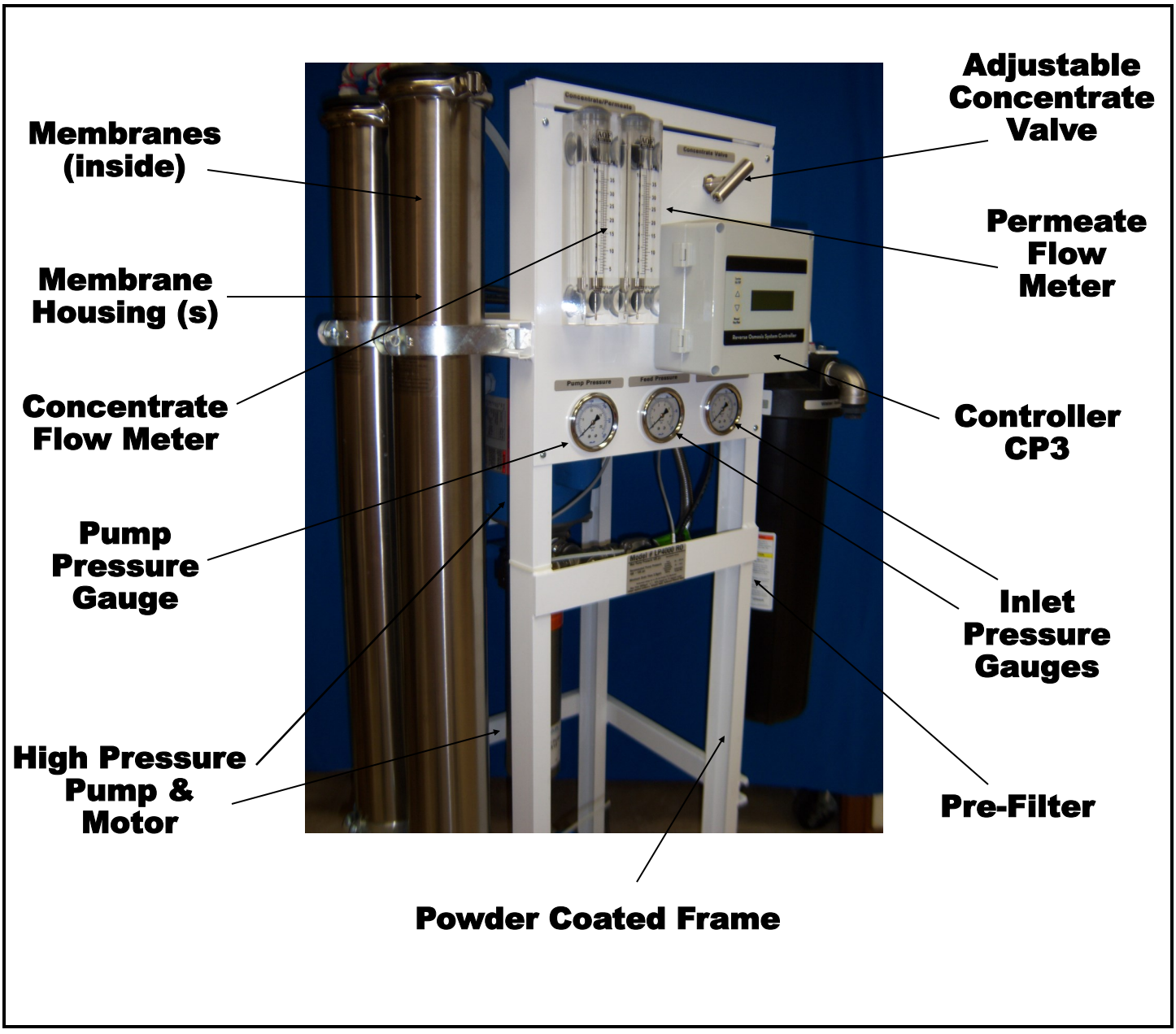
LP-5500 & LP-7000

These units are capable of producing 5500 and 7000 gallons a day. They are built on the same frame only with a larger pump and different membrane configuration. The standard units are very similar as to options and features.

Every reference in this manual to performance or specification is based on TDS of 1000 ppm, Pressure of 60 psi, and a temperature of 77° F (25°). A higher pressure or temperature or both will increase water production and quality. Conversely lower of either or both will reduce quality and production. Maximum and minimum limit recommendations on both must be observed.

Features and Options Identified

Prior to installation, familiarize yourself with the different components of the unit.

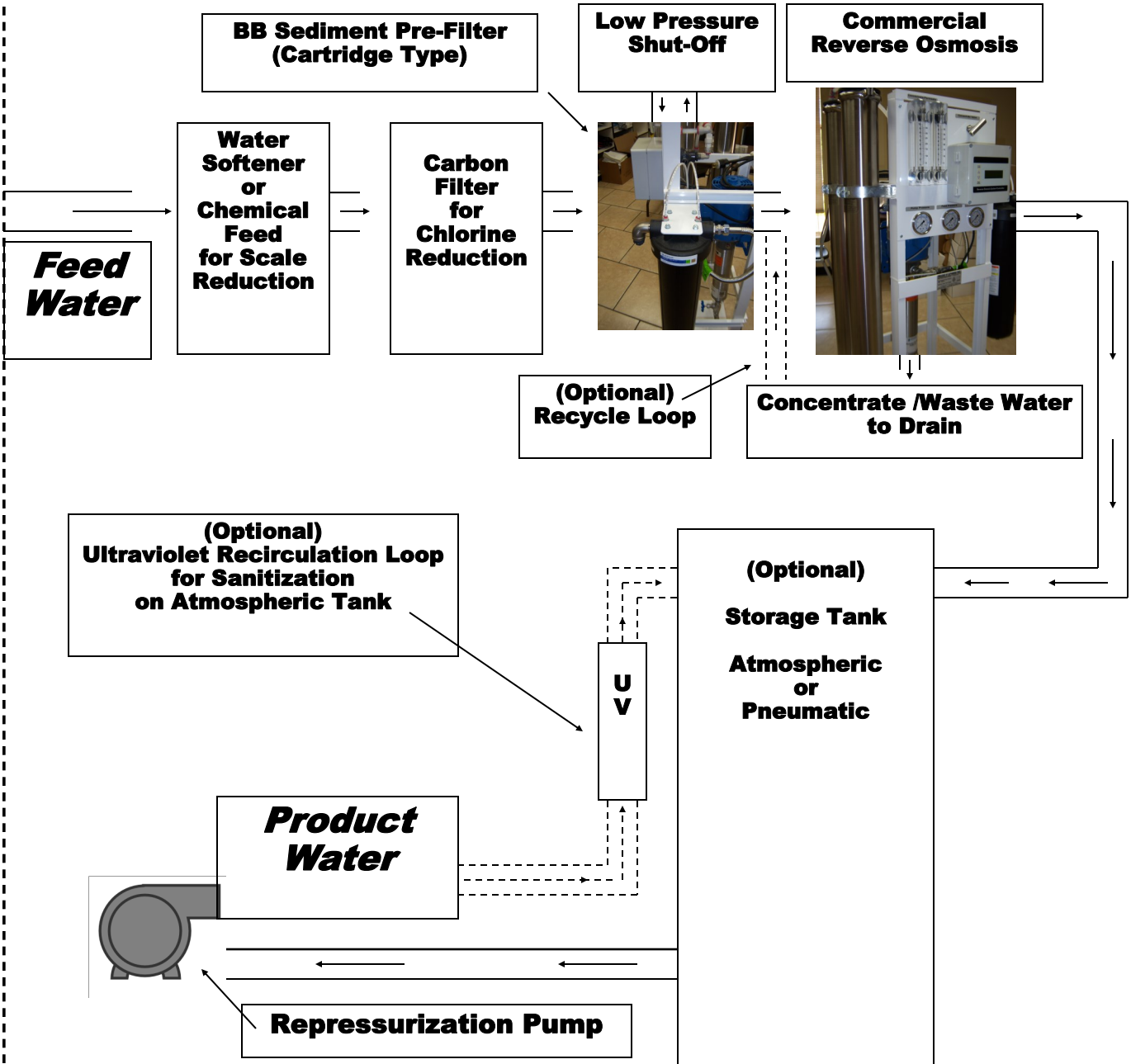


Options

Since we custom build all of our units, virtually any option is available. We have gone the distance to try to cover most of the applications you may encounter but should we have missed anything, we can add it to your unit.

General RO Schematic

A typical Reverse Osmosis system with the flow pattern with options is below.



The design of the overall system will always depend on the application. If bacteria is an issue then the UV recirculation loop will be a lot more important. Should the application be a spot-free rinse in a car wash then this UV loop will not be as necessary. There are too many configuration of systems to layout all of them. Please call us if you have any application that we have not covered.

Installation:

1. System Location

The RO system should be located away from direct sunlight, wind and rain. You should also account for freezing temperatures and remember that lower temperatures reduce production. It would also be wise to leave plenty of room around the unit for future service.

2. Plumbing

The high pressure pumps that feed the RO unit require a constant flow of water at a sufficient flow rate. See table below for minimum flow rates:

Minimum Feed Water Flow Rates

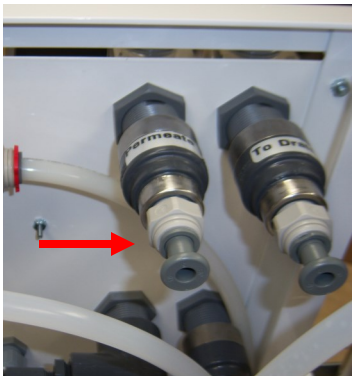
Model Number	Maximum production (GPM)	Minimum Flow Rate (GPM)
LP-300	300	1.0
LP-800	800	2.5
LP-2000	2,000	4.5
LP-4000	4,000	7.5
LP-5500	5,500	10.0
LP-7000	7,000	12.5

3. Feed Water

Piping for the feed water should be either copper or plastic as iron or carbon steel pipe could increase the iron content of the feed water. Temperature of the feed water should not exceed 95° F. This unit comes equipped with pressure differential safety shut-off on the pre-filter so as not to starve the pump of water. This will also let you know when to change the pre-filter.

4. Product Water (Permeate) Line Connection

Connect the product water (permeate) line to outlet side of the permeate flow meter. All of our equipment comes with a built-in check valve on the permeate line. Note: When starting up a new unit, it should run to drain for 30-60 minutes to flush the new membranes. Be sure this product line is not shoved into a drain. If possible, run the product line from above with a substantial air-gap spraying into the drain from above. The normal plumbing code is at least twice the diameter of the drain pipe. A larger gap is preferable to avoid splashing of water from the drain, This may allow bacteria growth that may be able to migrate back into the unit thus causing a potential problem.



5. Concentrate or Waste Line Connection

Connect the concentrate or waste line to the outlet side of the concentrate flow meter. Run this line to an open drain with no restriction and leave an air-gap at the drain end.
Please follow all plumbing local plumbing codes.

6. Electrical Properly sized electrical service is required for proper operation of system. Equipment electrical specification are as follows:

Electrical Specification			
Model Number	**HP**	**Voltage**	**Phase**
LP-300	0.5	110 or 220 / 60hz	Single
LP-800	0.5	110 or 220 / 60hz	Single
LP-2000	0.75	110 or 220 / 60hz	Single
LP-4000	1.0	110 or 220 / 60hz	Single
LP-5500	1.5	220 / 60hz	Single
LP-7000	2.0	220 / 60hz	Single

Please follow all local electrical codes.
Let us know at the time of order whether you wish the system to be wired 110V or 220V.

7. Level Controls

Level controls are a float type in an atmospheric storage tank or a pressure type switch in a pneumatic style. Both are optional with our equipment and can be installed by us. Either one are wired directly into the controller and are controlled by the controller.

8. Pumps

All of our units come with heavy-duty pumps and they are not self-priming. Never let a pump run dry. This may damage the pump and void the warranty.

9. Pre-Filtration

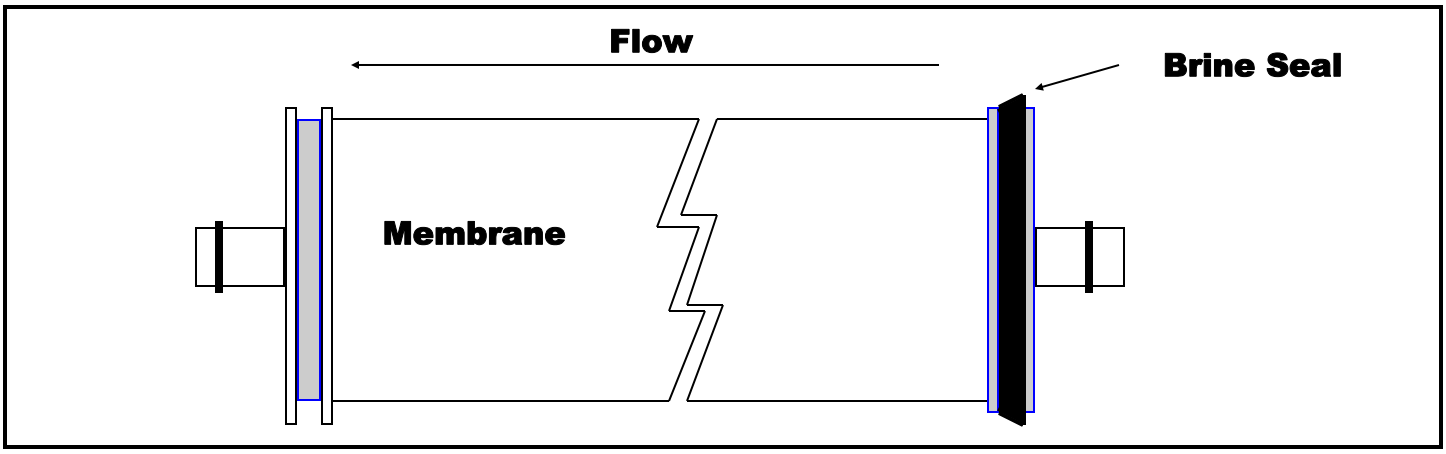
Our units are equipped with a sediment pre-filter which will remove particles down to 5 microns in size. As this pre-filter plugs up it will restrict the flow of water. At this point the controller will shut down the unit until the filter is changed. This option is standard on our equipment. Depending on the feed water, more pre-treatment may be necessary. A water analysis is required to determine the need.

10. Inspection

Prior to start-up, carefully inspect the system for loose connections that may have loosened during shipping.

11. Membrane installation

Should the membranes need to be installed or replaced, be sure to notice how they were removed. The flow of water will always be from the end of the membrane with the brine seal to the end without the brine seal. Note the drawing of a membrane below:



Note: Brine seals and "O" rings should be lubricated with a "O" ring lubricant prior to installation.

Designed Permeate Flow Rate at 77°F (25°C) and 60 PSI Pressure

Model	GPD	GPM
LP-300	300	0.2
LP-800	800	0.56
LP-2000	2000	1.39
LP-4000	4000	2.67
LP-5500	5500	3.82
LP-7000	7000	4.86

You may need to refer back to this chart later during start-up.

Pre Start-up:

Once the system is installed, check the following:

- Make sure there is no blockage or restriction in the concentrate lines
- Be sure the level control assembly is properly connected
- Verify all the pre-treatment equipment is installed, started–up, rinsed and operational
- Tighten all plumbing fittings
- Make sure the pre-filter cartridge is installed
- Your unit comes with the membranes installed in the housings.
- Follow all local plumbing codes

System Start-Up Procedures:

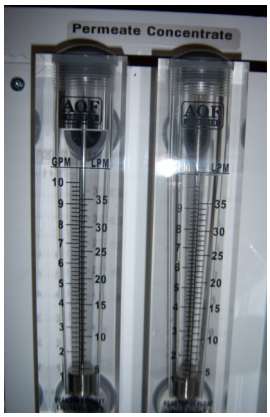
Concentrate valve

Follow these procedures for best results:

1. Open concentrate regulator valve all the way.
2. Open optional recycle valve halfway if your system is so equipped.
3. Disconnect permeate line from storage tank and run to drain for first 30-60 minutes of run time.
4. Before installing the 5 micron pre-filter cartridge, unscrew the sump and check for any debris inside of housing, rinse if needed and reinstall the cartridge. Be sure to lube "O" ring and fill partially with water. Bump tighten with wrench, this should be sufficient. Remember, it's the "O" ring that seals this, not the threads.


Pre- filter

5. Relieve air pressure from pre-filters using the pressure relief valve on filter (if the filter has a pressure relief).
6. Make sure there is water flowing to system before running the pump. Our system has a time delay to allow it to fill with water prior to running.
7. With the permeate line running to drain, run the system watching both, the concentrate line and the permeate line running to drain. Gradually close the concentrate valve till you reach your desired setting, usually 2 or 3 concentrate to 1 permeate. Do not exceed 225psi feed pressure. Watch the flow meters.



Flow meters

8. Make sure there is no back-pressure existing on the concentrate line.
9. Remember at this time you should be running the concentrate and the permeate water to drain for the first 30 minutes or so. Then stop the system and connect the permeate to the storage tank and allow the tank to fill.

Note: The permeate flow for product water should not exceed the designed flow rate of the system or this may void the warranty. (see below)

Designed Permeate Flow Rate at 77°F (25°C) and 60 PSI Pressure

Model	GPD	GPM
LP-300	300	0.2
LP-800	800	0.56
LP-2000	2000	1.39
LP-4000	4000	2.67
LP-5500	5500	3.82
LP-7000	7000	4.86

10. Make sure the level control in the storage tank is functional and shuts down the system.
11. If the system has a recirculation loop with a UV light, this would be a good time to test it. Set the time to recirculate all the water in storage once every 24 hours through the UV light. This can be done through the controller (see controller manual for how this is done).
12. It is always a good idea to have a good quality TDS meter and the calibration solutions on hand. These can be obtained from B&R Industries.
    When using this type of meter it is always a good idea to rinse thoroughly.

13. Be sure to maintain the "Operational Log Sheet" and look for any trends that may indicate that something on the equipment is headed astray.

<u>The space below is left blank intentionally for you to make any notes:</u>

B&R INDUSTRIES
B&R INDUSTRIES LIMITED WARRANTY
RO System 400gpd – 10,000gpd

Coverage
B&R INDUSTRIES warrants to the original consumer purchaser that the water reverse osmosis **systems** specified below by model and serial number, and the parts listed in this section below, will be free from defects in material and workmanship from the date of purchase for the following periods:

RO System Excluding Membranes and Pre-Filter Cartridge……..……1 year
Computer RO Controller …….……... 1 year
Membrane(s) ……..may need to be replaced depending on incoming water supply, Chemistry and or usage

Installation…….... to be performed by a licensed plumber or installer

THIS WARRANTY IS EFFECTIVE TO ORIGINAL PURCHASER ONLY SO LONG AS The Reverse Osmosis SYSTEM REMAINS AT THE ORIGINAL INSTALLATION SITE.

Some states do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply to you. This warranty gives you specific legal rights, and you may also have other rights, which vary from state to state.

No sales representative, distributor, dealer or other person is authorized to make any other warranty on behalf of B&R INDUSTRIES. Upon expiration of the applicable warranty periods, B&R Industries shall have no further liability related to the products to which the periods apply, except with respect to warranty claims asserted during the appropriate warranty period.

This warranty does not cover installation or damage to tanks resulting from direct sun rays, freezing, mishandling, improper installation, water pressure in excess of 100 pounds per square inch, hot water back-up or ambient temperatures in excess of 140°F. Transformers, if used are warranted for one year. Vacuum damage is not covered. Warranty MUST be presented to the person or persons performing the repair work in order to honor warranty parts, labor charges incurred in connection with the repair and/or replacement of parts, tanks or Reverse Osmosis units, are expressly excluded from this warranty. All transportation and freight costs in connection with the repair and/or replacement of parts, tanks or water conditioning systems are also expressly excluded from this warranty. This warranty does not cover failures or defects that are the result of misuse, mishandling, misapplication, neglect, abuse or degradation from iron, Silica or Oxidizing agents, alteration of product or the adjustment or repair performed by anyone other than **B&R INDUSTRIES** or one of **B&R's** authorized agents, or where the reverse osmosis system has not been installed in compliance with local plumbing codes and ordinances.

All warranties are subject to the requirements set forth in the owner's manual. Upon receipt of any defective product specified above, B&R INDUSTRIES will, at its option, repair or replace the product at its expense, provided that the original purchaser of that product has followed the procedure for obtaining warranty performance set forth below. The product so repaired or used as a replacement will be shipped to the purchaser, at the purchaser's cost.

PURCHASER'S RMEDIES FOR DEFECTS OR FAILURES, TO THE EXTENT BY APPLICABLE LAW, ARE LIMITED TO THE REMEDY PROVIDED BY THE WARRANTY, TO THE EXTENT ENFORCEABLE UNDER APPLICABLE LAW. **B&R INDUSTRIES** SHALL IN NO EVENT BE LIABLE FOR CONSEQUENTIAL OR SPECIAL DAMAGES ARISING OUT OF, OR INABILITY TO USE, THE PRODUCT.

Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

As soon as the purchaser discovers any defect or failure, the product must, within the period of the applicable warranty, notify your local **B&R** dealer of that defect. The purchaser must then return the defective part or item, with all transportation charges prepaid, to your local **B&R** dealer.

Information regarding warranty performance may be obtained by writing to **B&R INDUSTIRES**, 1456 W SCOTT AVE GILBERT, AZ 85233