Installation, Operation & Maintenance Manual

For

Commercial & Industrial Reverse Osmosis Systems

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Specifications

Specification	RO300G-FL	RO500G-FL	RO1000G-FL	RO1200G-FL
GPD	300	500	1,000	1,200
LPM	0.8	1.3	2.6	3.2
Feed water pipe	3/4” FNPT	3/4” FNPT	3/4” FNPT	3/4” FNPT
Outlet pipe	3/8” Compression	3/8” Compression	3/8” Compression	3/8" Compression
RO membrane	One 2.5” x 21” thin film	Two 2.5” x 21” thin film	One 4” x 21” thin film	One 4" x 21" thin film
Recovery rate	Up to 50%*	22%	Up to 50% *	20%
Motor H.P.	0.5	0.5	1	1
Volts / Hz	110 v / 60 hz	110 v / 60 hz	110 v / 60 hz	110 v / 60 hz
Amps	7	7	14	14
Recycle line	Yes	No	Yes	No
Permeate flow meter	Yes	Yes	Yes	Yes
Concentrate flow meter	No	No	No	Yes
Recycle flow meter	Yes	No	Yes	No
Low pressure switch	Yes	Yes	Yes	Yes
Height x lg. x width	37” x 20” x 18”	37” x 20” x 18”	37” x 20” x 18”	37” x 20” x 18”
Pre-filter cartridge	20” x 2.5” x 2.75” (2)	20” x 2.5” x 2.75” (2)	20” x 2.5” x 2.75” (2)	20” x 2.5” x 2.75” (2)
Shipping weight	70 lbs.	80 lbs.	104 lbs.	117 lbs.

	RO1800G-FL	RO3600G-FL	RO5400G-FL
GPD	1,800	3,600	5,400
LPM	4.7	9.5	14.2
Feed water pipe	3/4” FNPT	3/4” FNPT	3/4” FNPT
Outlet pipe	1/2” Compression	1/2” Compression	1/2” Compression
RO membrane	One 4” x 40” thin film	Two 4” x 40” thin film	Three 4” x 40” thin film
Recovery rate	Up to 60% *	Up to 60% *	Up to 60% *
Motor H.P.	3.0	3.0	3.0
Volts / Hz.	110 v / 60hz	230 v / 60hz	230 v / 60hz
Amps	9	9	9
Recycle line	Yes	Yes	No
Permeate flow meter	Yes	Yes	Yes
Concentrate flow meter	Yes	Yes	Yes
Recycle flow meter	Yes	Yes	No
Low pressure switch	Yes	Yes	Yes
Height x lg x width	59” x 26” x 18”	59” x 26” x 18”	59” x 26” x 18”
Pre-filter cartridge	20” x 2.5” x 2.75” (2)	20” x 2.5” x 2.75” (2)	20” x 2.5” x 2.75” (1)
Shipping weight	180 lbs.	262 lbs.	341 lbs.

	RO7200G-FL	RO10800G-FL
GPD	7,200	10,800
LPM	18.9	28.4
Feed water pipe	3/4” FNPT	1” FNPT
Outlet pipe	1/2” Compression	1/2” Compression
RO membrane	Four 4” x 40” thin film	Six 4" x 40" thin film
Recovery rate	Up to 75% *	Up to 75% *
Motor H.P.	3.0	5.5
Volts / Hz.	230 v / 60 hz	230 v / 60 hz
Amps	9	12
Recycle line	Yes	Yes
Permeate flow meter	Yes	Yes
Concentrate flow meter	Yes	Yes
Recycle flow meter	Yes	Yes
Low pressure switch	Yes	Yes
Height x lg. x width	59” x 25” x 18”	59” x 25” x 18”
Pre-filter cartridge	None (pre-filter required)	None (pre-filter required)
Shipping weight	349 lbs.	509 lbs.

*With recycle lines. (Recovery rates vary with recycle lines and water production is based on a number of site specific factors.)

Introduction

Reverse Osmosis (R/O) Systems are designed to provide the commercial and industrial user with the most trouble free, cost effective and reliable form of water treatment available, by providing every option necessary for a successful installation. RO systems utilize stainless steel pressure vessels, stainless steel frames and skids, solid state controls, integral conductivity monitors, flow controls, pressure gauges, throttling valves, high pressure relief valves, dual stage pre-filters, low suction pressure cut-off controls and recirculation loops on most models for high recovery rates and optimum performance.

Reverse Osmosis Systems are engineered to function with both well and municipal water sources (with chlorine removal provided). We utilize the most current membrane technology available, and dissolved solids removal rates are typically 97% or more.

Principles of Reverse Osmosis

R/O systems employ ***thin film composite spiral wound membrane elements*** for superior performance. To simply describe the process, pump pressure is used to supply source water to reverse osmosis membranes. These special membranes allow only high quality water to permeate them. In turn, they reject metals, salts, ionic and organic impurities which are processed to waste. Suspended solids are removed by pre-filters which are standard components on all RO systems.

Terms:

Source water

The water supplied to an RO system.

Permeate / Product water

Usable water produced by the r/o system.

Concentrate / Reject water / Waste water

Water containing metals and salts which have been rejected by the membrane (s).

Water quality

Water quality from an RO system is determined with a conductivity meter which measures total dissolved solids in water. The results are generally measured in parts per million (ppm) or milligrams per liter (mg/l).

Percent recovery

This term refers to the amount of purified water recovered for use, expressed as a percentage of the feed water. To calculate percent recovery, divide product water rate by feed water rate multiplied by 100.

Percent rejection

RO membranes are rated by the amount of dissolved solids they reject from source water. For example if feed water contains 100 ppm of dissolved solids and the product water after the membrane has 10 ppm, the rejection rate 90%.

TDS

Total dissolved solids.

SDI

Silt density index, or a measure of the amount of colloidal material in water and approximates the fouling potential of feed water.

Water temperature

Product water quality and production of any RO system is dependent on pressure and temperature. RO systems are rated at standard conditions of 77˚ F (25˚ C), 60 psi (4.2 bar) inlet pressure and 1,000 TDS feed water quality. Lower temperatures will result in less water passing through the membranes and decreased water production. As a rule, at given pressures and TDS levels, for each one degree (F) change in water temperature the change in water production is approximately 2%.

Use the chart shown below to adjust water production rates based on water temperature:

Water temperature ˚F	˚C	Production Factor* (Using thin film membranes)
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

*Percent of rated production.

Water pressure

RO systems require a minimum of 40 psi feed pressure to function properly. The maximum feed water pressure is 90 psi. (Use pressure regulators if necessary over 90 psi.)

General information

With proper care and maintenance, Reverse Osmosis Systems will provide years of satisfactory service. These instructions give operating and maintenance details which are vital to the sustained performance of each system.

Feed / source water inlet requirements

The source water requirements shown below are essential for proper operation:

Inlet feed water requirements

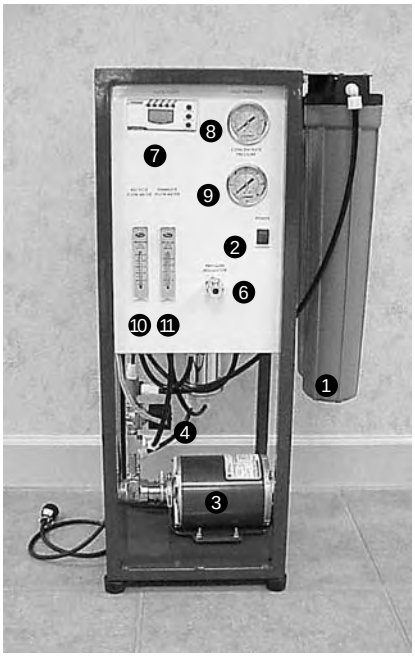
Factor	Requirement
Hardness	<1 grain per gallon
Free chlorine	0 ppm
T.D.S.	<1,000 ppm
S.D.I.	<5
pH	3-11
Iron	<0.01 ppm
Silica	<10 ppm
Manganese	<0.05 ppm
Turbidity	<1 NTU
Temperature	40˚F - 95˚F (4˚C - 32˚C)
Pressure	40 - 90 psi (2.8 – 6.3 bar)

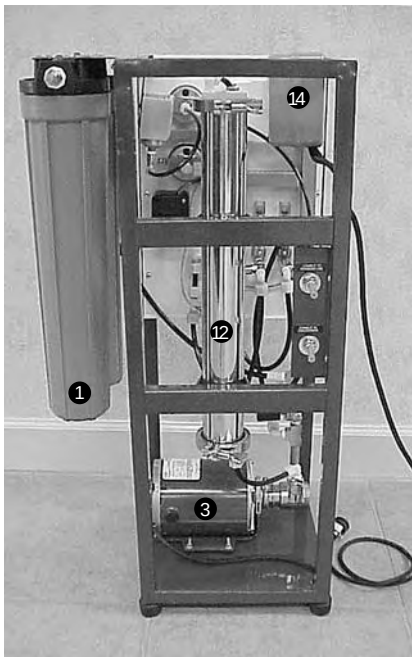
Note: Pretreatment may be required if the above parameters are not met. Failure to meet feed water requirements may foul membranes, void the warranty and possibly make it necessary to down-rate performance.

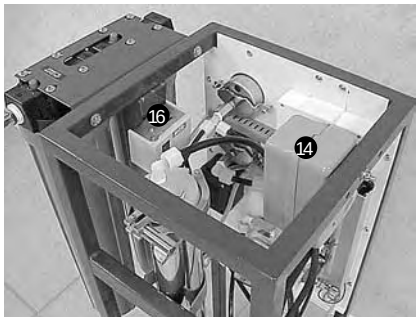
All specifications listed in this manual are based on an average of 1,000 TDS feed water, 77˚F (25˚C) temperature and 60 psi (4.2 bar) pressure. Typically, higher pressure differentials and higher temperatures increase water production and water quality. Maximum pressure and temperature limits must be observed, however.

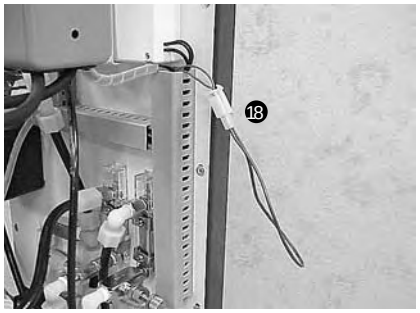
Components

Prior to installation, identify the following components:







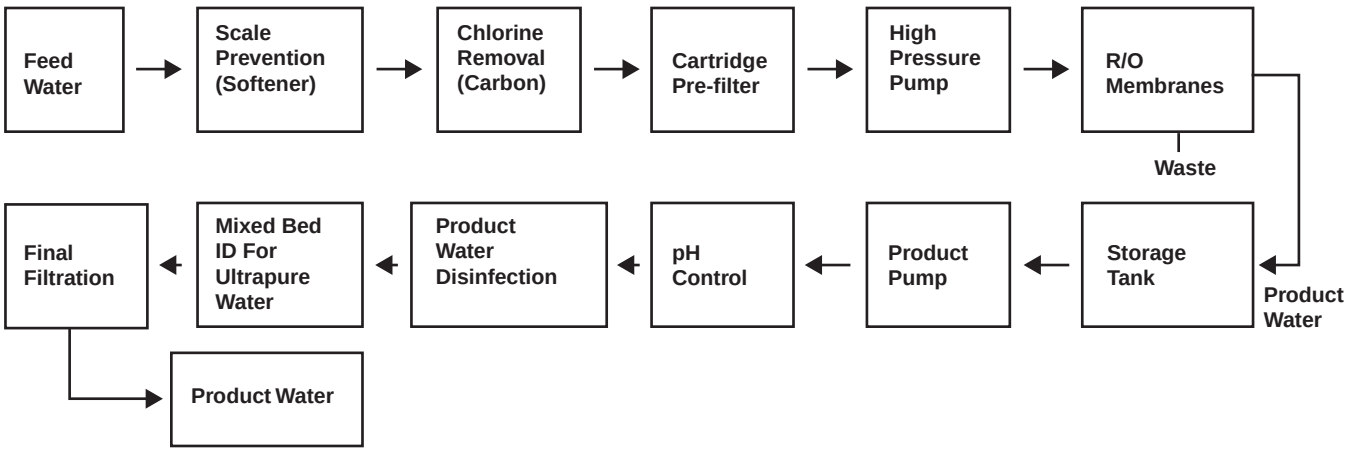


Level switch connector wire

1. Pre-filters
2. Power switch
3. High pressure pump
4. Solenoid valve (pump inlet valve)
5. Solenoid valve (auto flush valve)
6. Pressure regulator valve
7. Electronic control
8. Inlet pressure gauge
9. Concentrate pressure gauge (waste)
10. Recycle line flow meter
11. Permeate flow meter (product water)
12. Membrane housing (s)
13. Membrane (s) (not shown)
14. Starter motor box
15. Recycle line valve (optional)
16. Low pressure switch
17. Power cord
18. Level switch connector for storage tank
19. Tube connector fittings

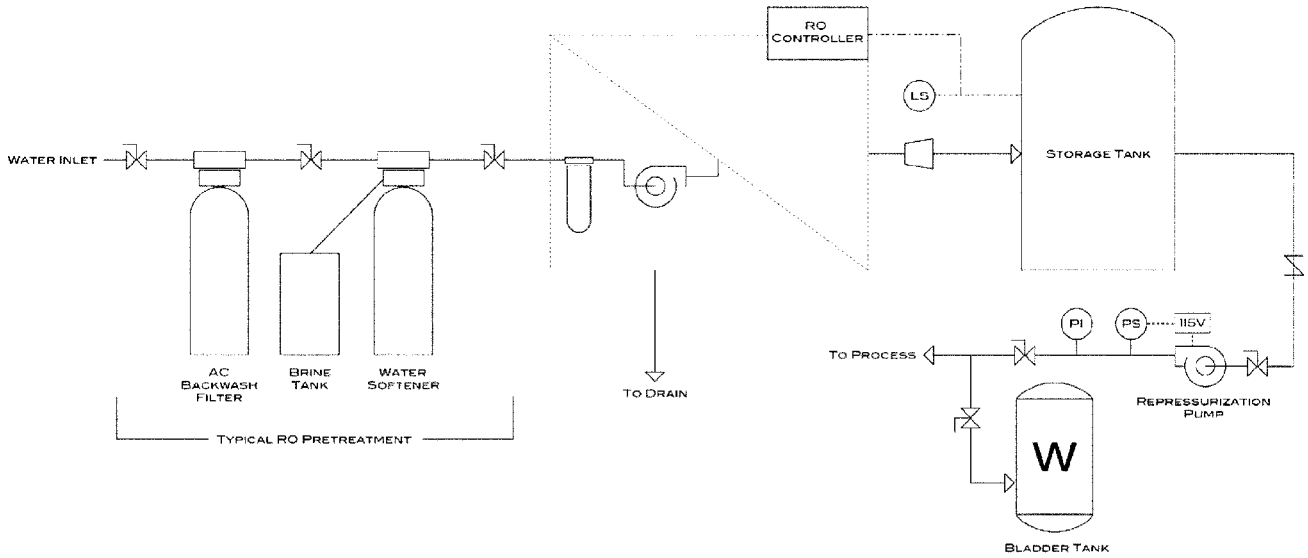
General RO Process Diagram

A general process water diagram using reverse osmosis technology is shown below:



Flow Diagram

Flow through a typical reverse osmosis system is shown below:



LEGEND:

LS - LEVEL SWITCH
PI - PRESSURE INDICATOR
PS - PRESSURE SWITCH

REVERSE OSMOSIS SYSTEM SCHEMATIC

Installation:

1. System location

The RO system should be located on a level surface in an area sheltered from sun, wind and rain. The temperature in this area should be maintained, and should not fall below 35˚F, nor greater than 95˚F. If these limits are exceeded, damage to components may result and the warranty may be considered void.
It is important to allow sufficient space around the unit so maintenance can easily be performed.

2. Plumbing

The membranes and high pressure pumps used require a continuous and non-turbulent flow of water to the system. Minimum feed pressure is 40 psi. Please see table, below for minimum flow rates:

Minimum Feed Water Flow Rates

Model Number	Max. Production (GPD)	Minimum Flow (GPM)
RO300G-FL	300	2.0
RO500G-FL	500	2.0
RO1000G-GL	1,000	4.5
RO1200G-GL	1,200	5.0
RO1800G-FL	1,800	9.3
RO3600G-FL	3,600	13.7
RO5400G-FL	5,400	13.9
RO7200G-FL	7,200	13.9
RO10800G-FL	10,800	16.5

3. Feed water

Piping for feed water to the RO system should be either copper or plastic. Iron and carbon steel pipe will increase the iron content of the raw feed water and adversely affect the RO system's performance. Temperature of the feed water must not exceed 95˚F.

Important: Install a pressure gauge on the feed water line to be able to determine when pre-filter cartridges should be replaced based on pressure differential.

4. Product water (permeate) line connection

Connect the product water (permeate) line to the manifold on the back side of the system. This line should not have valves and should run as directly as possible to the storage tank. If net back pressure is greater than 10 psig, consult factory. If it is necessary to install valves in the product water line, a pressure relief valve rated at the full capacity of the unit and set at 5 psig, must be installed between the RO product water connection and the first valve in the product water line. Use plastic or stainless steel pipe on product line; do not use copper.

Note: When starting up a new unit or after new membranes are installed, the product water must be diverted to drain during initial one hour flush. Be sure to re-connect product water line after unit has been fully flushed.

5. Concentrate (waste) line connection

Connect the waste line (concentrate) to the manifold on the back side of the system. The waste from the system should have an air break between it and the building drain system. The tubing or piping used for discharge of the concentrate should be run to an open drain in a free and unrestricted manner. Any restrictions or blockage in the drain can cause backpressure, which will increase the system's operating pressure and may result in damage to the system's components.

Note:

All plumbing must be completed according to plumbing codes. Please check local authorities for requirements that may apply.

6. Electrical

A properly sized electrical service must be provided by the customer. Standard motors and electrical requirements are as follows:

Electrical Requirements

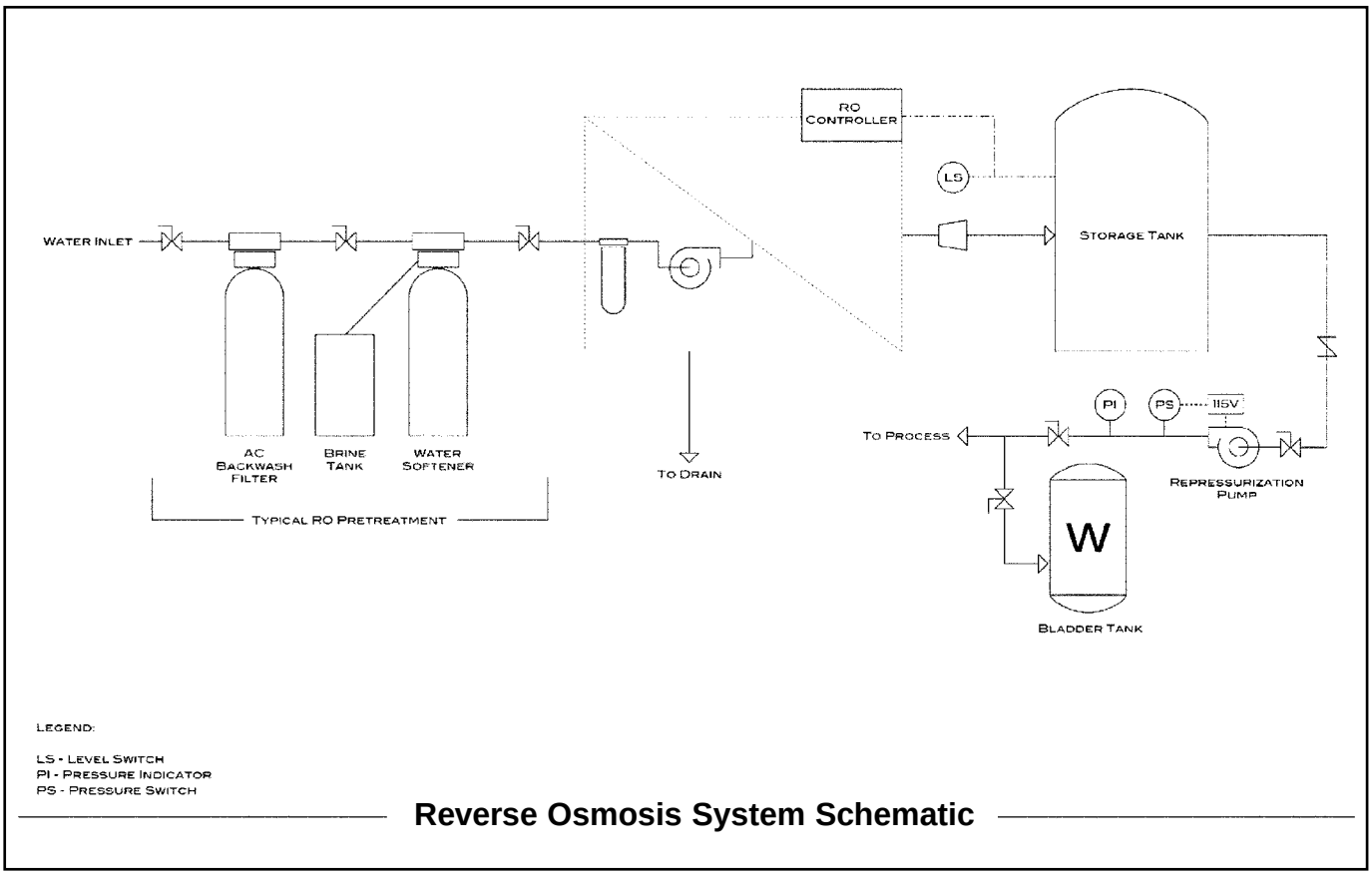
Model Number	H.P.	Voltage	Phase
RO300G-FL	0.5	110 v 60 hz	Single
RO500G-FL	0.5	110 v 60 hz	Single
RO1000G-FL	1.0	110 v 60 hz	Single
RO1200G-FL	1.0	110 v 60 hz	Single
RO1800G-FL	3.0	230 v 60 hz	Three
RO3600G-FL	3.0	230 v 60 hz	Three
RO5400G-FL	3.0	230 v 60 hz	Three
RO7200G-FL	3.0	230 v 60 hz	Three
RO10800G-FL	4.0	230 v 60 hz	Three

The electrical supply to the system must be compatible with the requirements for each model. We highly recommend a licensed electrician install your system in accordance with local and national electrical codes. Please check with local authorities for requirements that may apply.

Note: See electrical schematics and directions how to hook up level controls in appendix.

Level controls

In most installations it is necessary to use the level switch connector wire (24 volt) to install a level control or an electrical switch to turn the RO system on and off based on the water level in the storage tank. Typically, a qualified electrician is needed to complete this necessary installation. A pressure or level switch is acceptable. (Mercury type.)



Reverse Osmosis System Schematic

Pumps

All pumps are heavy-duty, centrifugal pumps and they are not self-priming. Never let pumps run dry. Operating pumps without sufficient feed water will damage pumps. Feed pumps with filtered water only.

Pre-filtration

Most RO systems come with particulate pre-filters to remove suspended particles down to five (5) micron in size. Change pre-filter cartridges at least every month or when there pressure differential of 10% or more that start-up pressure differential with clean cartridges. Use pressure gauges provided. Additional pretreatment may be required, depending on feed water parameters.

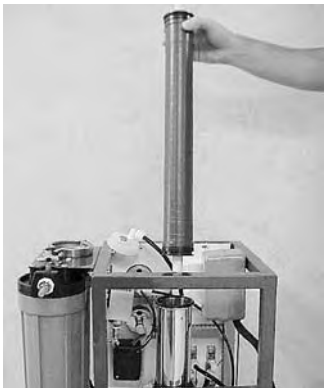
Caution:

If the pre-filters become clogged and the water flow to the pump is reduced or interrupted, cavitations may occur. Damage to pump may result.

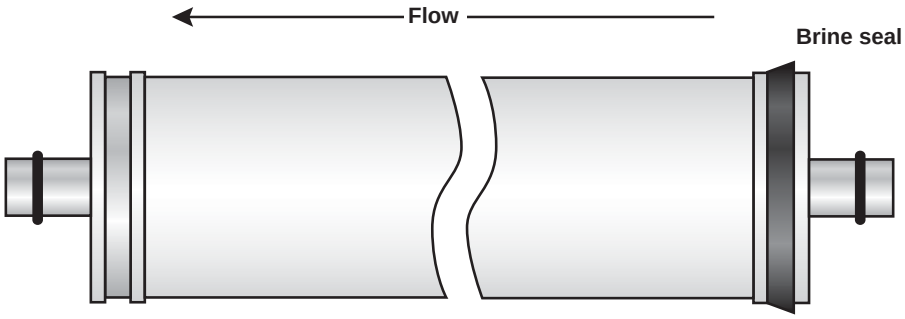
Inspection

Prior to start-up, carefully inspect system. Check plumbing, electrical connections and make sure no connections have become loose during shipment.

Membrane installation



Install membrane with brine seal located at the top of the membrane



Membrane with brine seal at right. Lubricate brine seal prior to assembly.

All membranes are shipped loose and should be installed prior to start-up. They are also shipped dry to better handle extreme temperatures during shipment and storage.

To install membranes, remove the end cap from the top of each membrane housing by loosening the wing nuts on the top clamp(s). (It is not necessary to disconnect the tubing.) Each membrane comes with “U” cup seal at one end, used to act as a check to force feed water through the membranes. It is important to install each membrane so the brine seal will face the upstream end of the vessel to prevent feed bypass while the unit is in operation. (See diagram above; be sure to note direction of flow.)

When installing membranes, be sure brine seal in orientated properly and the o-rings do not fold over when inserting them into the membrane housings. If necessary, use a small screwdriver to keep the brine seal from bending over; otherwise, by pass my result.

Note: With multiple membrane systems, it is necessary to identify the direction of flow for each membrane housing by tracing the pump outlet piping through each housing. Look for directional arrows on each membrane housings.

Prior to installation, gently lubricate the brine seal and permeate tube o-rings with glycerine or soapy water if a lubricant is not available. Insert membranes downward into the housings, with the brine seal at the top end of the membrane. Be sure to push each membrane as far down into the housing as possible until the top of the tube is flush or slightly below the rim of the housing. Once this has been accomplished, allow the membrane to seat itself on the bottom end cap. Make sure the brine seal is in place, replace the top end cap and tighten wing nuts. Do not use silicone-based lubricants to moisten brine seals.

Note: Product water must be sent to drain for the first one hour of operation.

Membrane removal & replacement

To remove membrane, remove wing nut from top of each membrane housing, remove cap and pull membrane upward using pliers if necessary.

Maintaining a constant TDS level is a good indication your RO system is working properly. It is advisable to replace membranes when TDS levels increase or flow has diminished to unacceptable limits. For this reason, it is essential to keep a periodic log to record TDS levels. The timing of membrane replacement depends on feed water quality and a number of other factors. To optimize performance and prolong membrane life, see Membrane Cleaning instructions, described later in these directions.

Pre start-up

Once systems are installed check the following:

- Make sure there are no obstructions in the concentrate or permeate lines
- Be sure the level control assembly is properly connected
- Check the pump rotation to coincide with the arrow on pump
- Verify all pre-treatment equipment is installed and operational
- Tighten all plumbing fittings (important)

System start-up procedures

Follow these procedures for best results:

1. Open pressure regulator valve on the panel, optional recycle valve partially open. Open pump throttling valves (if provided with your model) one-half open.

Pressure regulator valve on panel

Recycle line valve (if provided)

Pump throttling valve (larger models only)

2. Disconnect the product (permeate) water tubing and send it to drain for initial one hour start-up.

3. Vent air from pre-filter housings using pressure relief button.

4. Turn the on / off switch on.

5. Verify the solenoid after the pump has opened and water has begun to flow through the system.

6. Upon activation of the RO high pressure pump (which is on a time delay to allow the unit to fill with water) begin to close the pressure regulator valve to about two-thirds open to balance the system. (Remove valve cover with wrench.)

7. On larger systems with pump throttling valves, begin to increase pressure by opening the gate valve to balance the system.

8. Allow the unit to produce at 100 psi of pressure on the concentrate pressure gauge.

Note:

The permeate flow for product water should not exceed the designed flow rate of the system (see below).

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

Model	GPD	GPM	LPM
RO300G-FL	300	0.2	0.8
RO500G-FL	500	0.3	1.3
RO1000G-FL	1,000	0.7	2.6
RO1200G-FL	1,200	0.8	3.2
RO1800G-FL	1,800	1.2	4.7
RO3600G-FL	3,600	2.5	9.5
RO5400G-FL	5,400	3.8	14.2
RO7200G-FL	7,200	5.0	18.9
RO10800G-FL	10,800	7.5	28.4

Continue to regulate pressure regulator and gate valves until proper flow is maintained.

9. On models where recycle lines are provided, after initial start up begin to open the recycle valve so the recycle flow meter reads approximately one-half the designed permeate flow rate of the system.

10. Re-adjust the pump throttle valve to the correct specific recovery and permeate production rates indicated. (Do not exceed system pressure above 225 psi).

11. Allow the unit to process water to drain for approximately one hour.

12. Turn unit off, reconnect the permeate line to storage tank and turn the unit back on.

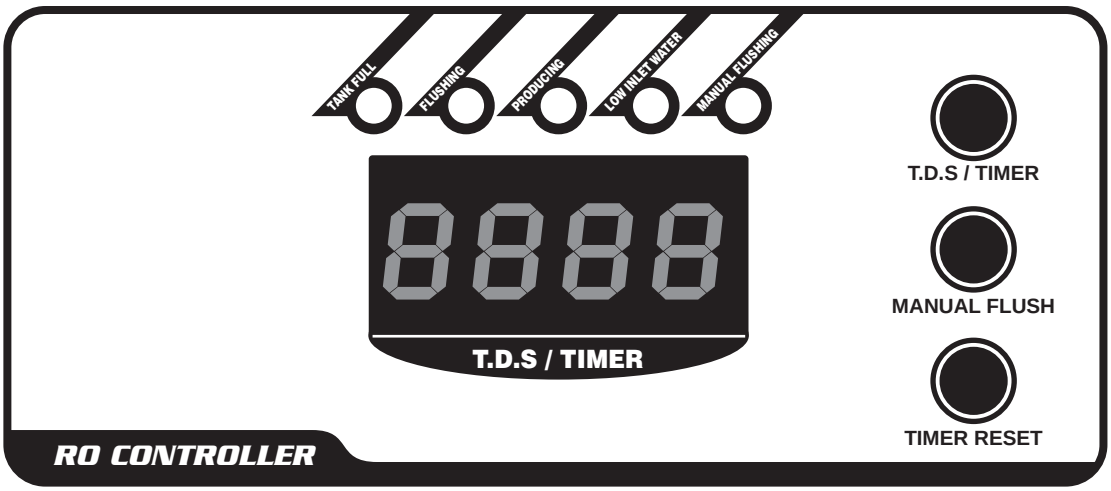
13. Allow system to fill storage tank.

14. Monitor conductivity on the permeate line to verify 97% TDS reduction.

15. Verify the level control turns the RO system on and off when the high level is reached.

16. Fill in the O&M log sheet with the final flow, pressure, temperature and conductivity readings.

Controls



Control functions include the following

1. Power on. (Controller provides a 60 second delay, to allow for flushing).

2. TDS / timer. (Push button to switch between accumulated timer and TDS reading. When TDS falls between 0-40 ppm, this reading is reliable. When TDS is exceptionally high, “99” will be indicated. Push button again to switch to accumulated timer display.

3. Reset button is used to reset to accumulated timer.

LED lights

The following five lights are shown on the face of the controller:

A. “Tank full” light is illuminated when tank is full. (Pick up signal from pressure switch or level switch to stop the system when storage tank is full.)

B. “Flushing” light is on during period of time RO membranes are being flushed.

C. “Producing” light is on when the booster pump is operational.

D. “Low inlet water” light is continuously on when water supply pressure is sufficient. When water supply pressure is not sufficient, light will flash. (Connect to the pressure switch to keep the system from running without incoming water.)

Note:

Pressure switch is set at the factory to activate when inlet pressure falls below 25 psi. See appendix how to adjust switch.

E. “Manual flushing” light is on during manual flush of the RO membranes.

Controller functions

A. “Flushing” is automatically accomplished when tank is full, power is first turned on and the system has been continuously running for twenty-four (24) hours.

B. “Delay” is programmed into the controller to provide a twenty (20) second delay when the tank is practically full or when there is low water supply to prevent the system from picking up the wrong signal.

Operation & Maintenance

After start-up procedures are completed and your system is operational, it will function automatically. In other words, the unit will start and shut-off depending on the water level in the storage tank. If the RO system will not be in use for 72 hours or more, store membranes in a 0.2% solution of hydrogen peroxide.

Check RO system daily and enter operational parameters in O&M log. Operators should look for trends and make adjustments, should pressures increase, production falls off or if water quality begins to deteriorate. Consult trouble-shooting guide for suggestive corrective measures.

Monitor pressure gauges on pre-filters. Remember to change out activated carbon pre-filters every three (3) months. Check pump seals every three months.

Note:

It is advisable to change pre-filter cartridges when the feed water pressure differential doubles from the initial ▲P.

Optional pressure gauge

To better determine when this is necessary, an optional pressure gauge should be installed on the feed water line before the system.

Trouble-Shooting

Following, is a trouble-shooting guide for customers to diagnose most problems that may occur. In addition, our customer service personnel can help with specific problems or questions.

Trouble Shooting Guide

Problem	Probable Cause	Corrective action
RO unit is not making enough water	1. Water temperature is too low. 2. Low water supply pressure. 3. RO membranes are fouled. 4. Low RO pump pressure. 5. Increasing product pressure. 6. Feed water TDS level is too high.	1. Control temperature. 2. Check pre-filters & replace. 3. Clean membranes and replace if necessary. 4. Increase pressure by adjusting reject valve. 5. Check piping and valves. 6. Common occurrence since production is based on feed water conditions.
RO unit is making too much water	1. O-ring by-pass in membrane vessel. 2. Chlorine damage to membrane. 3. Water temperature has increased. 4. Reverse flow, causing rupture in membrane.	1. Remove membranes and inspect o-rings to be sure they are sealed properly; replace if necessary. 2. Replace membrane. 3. Control temperature. 4. Replace membrane and check valve on product water line.
TDS in product water is too high	1. O-ring by-pass in membrane vessel. 2. Chlorine damage to membrane 3. Membrane is fouled. 4. Reverse flow, casing rupture. 5. Feed water TDS has increased.	1. See above. 2. Replace membrane. 3. Clean or replace . 4. See above. 5. Cannot be adjusted.
RO pump will not stay on	1. Low supply water pressure to unit. 2. RO reject valve is open too far. 3. High pressure light is on.	1. Check pre-filters; replace Check supply pressure 2. Adjust. reject valve. 3. Adjust reject valve.
RO pump runs but no product water	1. Instruments are not reading correctly. 2. Blockage in product water lines. 3. Reject flush solenoid is not closed.	1. Calibrate or replace. 2. Check and correct. 3. Check flow through valve.

Membrane cleaning

Periodic cleaning of membranes can improve system performance. In normal conditions, mineral scale, biological matter, colloidal particles and organic substances can foul membranes.

Warning

Cleaning chemicals are dangerous and can cause injury and damage. Read and comply with all safety and disposal precautions. It is the user’s responsibility to comply with all federal, state and local regulations that may apply.

Inorganic anti-fouling cleaning

Use an acid cleaning solution to remove inorganic salts such as CaCO3, CaSO4, BaSO4 and metal oxides, such as iron from reverse osmosis membranes. Do not use sulfuric acid because it may cause calcium sulfate to precipitate on the membranes. Recommended cleaning solutions for inorganic cleaning include:

- Solution of 0.2% hydrochloric acid (HCL)
- Solution of 0.5% phosphoric acid (H_3PO_4)
- Solution of 0.2% sulfamic acid
- Solution of 1.0% sodium hydrosulfite

Organic anti-fouling cleaning

Use alkaline cleaning solutions to remove silica, bio films and organic matter from membranes. Acceptable cleaning solutions for organic cleaning include:

- Solution of 0.1% sodium hydroxide (NaOH)
- Solution of 0.1% sodium hydroxide (NaOH) and 0.1% of tetra-sodium salt of ethylene diamine tetraacetic acid (Na-EDTA)
- Solution of 0.1% sodium hydroxide (NaOH) and 0.05% sodium salt of dodecyl-sulfate (NaDDS)
- Solution of 1.0% sodium triphosphate (STP), 1.0% trisodium phosphate (TSP) and 1.0% Na-EDTA

The pH of the solutions above should be approximately 12 and temperature of the solution less than 86∞F.

Membrane cleaning directions

To set-up a cleaning station, follow these directions:

1. Record the amount and TDS of the permeate with the system set at normal operating pressure.

2. Prepare approximately 15 gallons of inorganic cleaning solution (with a pH of approximately 2) in a polypropylene or fiberglass reinforced plastic tank with a removable cover. Use RO water for make up water if possible.

3. Connect a hose from the cleaning solution tank to the inlet of the pre-filter on the RO unit. Ensure there is a flooded inlet to the pump or positive feed pressure.

4. Feed the permeate and the drain tubes back to the cleaning solution tank so that the solution will recirculate during cleaning.

5. Turn on the reverse osmosis pump. Adjust the concentrate control valve (drain restrictor) to a con centrate pressure of 50 psi (3.5 bar). Run the pump for approximately thirty (30) minutes.

6. Turn the system off and reconnect to the feed water supply.

7. Turn the system on and flush at 50 psi (3.5 bar) for 15 minutes. Discard all of the permeate and concentrate water.

8. Adjust the system to normal operating pressure and record the amount and TDS of the permeate water after the acid cleaning to assess any improvements in the system's performance.

9. Repeat this procedure for organic cleaning solution (with a pH from 11 to 12).

10. Readjust the concentrate pressure to original operating pressure for normal operation. After the cleaning procedure is complete, check the amount and TDS of the permeate to evaluate the effectiveness of the cleaning process.

Disinfection

Hydrogen peroxide or renalin may be use for disinfection. Procedures are identical to the membrane cleaning directions described above, with the following exceptions:

1. Remove deposits on membranes and other system parts with an alkaline cleaner prior to disinfection.

2. Clean the RO system with an acid cleaner to remove iron from membranes. (Iron or other heavy metals catalyze membrane degradation when peroxide is present.) Flush with water after acid cleaning.

3. Circulate a solution of 0.2%-0.25% hydrogen peroxide or renalin and RO product water for 20 minutes. The solution temperature must not exceed 77˚ F (25˚ C) to prevent damage to membranes. (A pH of 3-4 optimal results and longer membrane life.)

4. Soak membranes in a disinfecting solution 2 - 12 hours. (Two hours is needed to kill 90% and 12 hours is needed to kill 99% of the bacteria present.)

Spare parts

To order spare parts refer to the flow chart below.

Part Number	Description
CMSHS203	Pressure switch
CSVNC04110	Pump inlet solenoid valve
CSVNC06110	Auto-flush solenoid valve
STS068	Controller
CSW09A220	Motor start box
ST2521	Stainless steel RO housing, 300 & 500 GPD
ST2521 CAP	Cap, RO housing, 300 & 500 GPD
ST2521 CLAMP	Clamp, RO housing, 300 & 500 GPD
ST2521ORING	O-ring, RO housing, 300 & 500 GPD
ST4021	Stainless steel RO housing, 800 & 1000 GPD
ST4021 CAP	Cap, RO housing, 800 & 1000 GPD
ST4021 CLAMP	Clamp, RO housing, 800 & 1000 GPD
ST4021ORING	O-ring, RO housing, 800 & 1000 GPD
ST4040	Stainless steel RO housing, 1800, 3600, 5400, 7200, 10800 GPD
ST4040 CLAMP	Clamp, RO housing, 1800, 3600, 5400, 7200, 10800 GPD
ST4040ORING	O-ring, RO housing, 1800, 3600, 5400, 7200, 10800 GP

Limited warranty

Commercial & Industrial Reverse Osmosis systems are warranted to the original purchaser to be free of defects in material and workmanship for a period of one year from date of shipment. Should defects occur, manufacturer will repair or replace parts which are defective. Shipping and labor costs are excluded for this limited warranty, and these costs are the customer's responsibility. Normal wear, accident, abuse, misuse, unauthorized alteration or repair are also excluded. Manufacturer will not be responsible for any incidental or consequential damages, losses or expenses arising from the installation or use of any RO system.

Distributed By:

Operation Log

Company _____ Model number _____

Date				
Time				
Hours of operation				
Inlet pressure (on optional pre-filter gauge)				
Post pre-filter pressure (inlet pressure on panel)				
Pressure differential				
Permeate pressure				
Feed pressure				
Concentrate pressure				
Differential pressure				
Pump discharge				
Permeate flow				
Concentrate flow				
Feed flow				
Percent recovery				
Feed flow				
Feed conductivity				
Permeate conductivity				
Percent rejection				
Feed pH				
Permeate pH				
Scale inhibitor feed				
Acid feed				
Sodium Bisulfite feed				

Feed water:

Iron (mg/L)				
Free chlorine (mg/L)				
Hardness (PPM, CaCO3)				
Turbidity (NTU)				

Note:

The amount of total dissolved solids (TDS) rejected by the membrane is expressed as a percentage. For example, a 96% rejection rate means that 96% of total dissolved solids do not pass through the membrane. To calculate the percent rejection use the following formula:

$$\frac{\text{Feed Water TDS - Product Water TDS}}{\text{Feed Water TDS}} \times 100 = \%\ \text{rejection}$$

The amount of purified water recovered for use is expressed as a percentage of the feed water. This is termed recovery. To calculate percent recovery, use the following formula:

$$\frac{\text{Product Water Flow Rate}}{\text{Feed Water Flow Rate}} \times 100 = \%\ \text{recovery}$$

All flow rates must be expressed in the same units (eg. gpm).

Appendix

Pressure switch adjustment

Note there are two Phillips head screws on top of pressure switch. These screws are used to adjust the pressure switch.

The right screw (facing the switch) is pre-set at the factory at 20 psi (1.4 bar). This is the minimum inlet water pressure needed to start the system. The switch can be adjusted by turning the screw, and the new pressure setting will be indicated on the gauge. (the pressure gauge is calibrated in bar not psi.)

The left screw (facing the switch) is set at 14 psi (1 bar). This is the inlet water pressure drop needed to shut off system. This screw can also be adjusted by turning the screw, and the new pressure setting will be indicated on the gauge.

With the factory pre-settings, the system will start up when the inlet water pressure is 20 psi or greater, and the system will shut off when the pressure falls 6 psi below 20 psi (or at 14 psi).