



# OWNER'S MANUAL

## FOR ALL REVERSE OSMOSIS SYSTEMS

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THIS MANUAL IS TO BE LEFT WITH THE OWNER OF THE EQUIPMENT FOR REFERENCE AND PURPOSES AND TECHNICAL GUIDANCE. IT IS STRONGLY RECOMMENDED THAT QUALIFIED DEALER SERVICE PERSONNEL BE CONTACTED IN THE EVENT OF AN UNKNOWN INTERRUPTION OF SERVICE OR APPARENT PRODUCT MALFUNCTION. AN ANNUAL PREVENTATIVE MAINTENANCE INSPECTION BY A WATER DEPOT PROFESSIONAL IS RECOMMENDED TO ENSURE TROUBLE-FREE AND CONTINUOUS OPERATION.

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## CAUTION:

The Centers for Disease Control and Prevention (CDC) and the Environmental Protection Agency (EPA) have issued guidance to people with severely weakened immune systems who may want to take extra precautions to reduce the risk of infection with *Cryptosporidium* from drinking water. This guidance pertains to people with HIV/AIDS, patients receiving treatment for cancer, recipients of organ or bone marrow transplants, transplant patients taking immunosuppressive drugs, and persons who have congenital immunodeficiencies.

The EPA has stated that they do not know the importance of drinking water compared to other possible sources of *Cryptosporidium* to determine how most people become infected. The CDC-EPA guidance suggest that immunosuppressed individuals discuss their risks with their health care provider.

All individuals should take adequate precaution when changing the filter cartridges, including wearing protective gloves, to avoid direct contact with the exhausted cartridges.

For complete specifications, refer to the Performance Data Sheet.

## Water Depot

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Barrie, ON

L4N 8W8

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## SECTION I. INTRODUCTION

Your new Reverse Osmosis (R.O.) Drinking Water System uses a combination of filtration technologies to reduce unwanted contaminants in your water supply. The following steps combine to give you the best in clear sparkling drinking water:

**MECHANICAL FILTRATION** - The Sediment Pre-filter will remove the larger particles such as silt, rust and scale. Its 5 micron (equal to 0.0002 inch) nominal rating helps to give maximum life to the R.O. Membrane.

**CARBON BLOCK** – The Carbon Block Pre-filter contains carbon with a vast network of pores. The tremendous surface area of these pores (typically 800-1200 square meters per gram of carbon) gives the carbon very good adsorptive sites for substances that contribute to tastes and odors. The carbon block in the Pre-filter will remove any chlorine that may be present in the feed water. This pretreatment is necessary for membrane protection.

**REVERSE OSMOSIS MEMBRANE** – The R.O. Membrane is the heart of the filtration system. It is designed to reduce the dissolved mineral content of the water. Minerals picked up in the environment by the water are measured as Total Dissolved Solids (TDS). In the Reverse Osmosis process, dissolved minerals are separated from the incoming water (the Permeate). The excess minerals are rinsed to drain (the Reject Water).

The membrane is a specially constructed, fully aromatic polyamide film, and is classified as a Thin Film Composite (T.F.C.). The spiral wound construction of the R.O. Membrane provides maximum surface area for water production and is less susceptible to fouling by particulate matter, turbidity and colloidal materials.

**IN-LINE ACTIVATED CARBON COCONUT SHELL POST FILTER** – The In-Line Activated Carbon Post Filter is located after the Holding Tank and reduces the tastes and odors that may pass through the system. It adds a final polish to the water.

**AUTOMATIC SHUTOFF VALVE** – The ASO Valve senses when the product water tank is full and closes the feed water supply to prevent excess reject water from going to drain when the unit is not producing water.

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### IMPORTANT NOTICES:

This reverse osmosis system contains replaceable treatment components critical for effective performance. It is the user's responsibility to, and the manufacturer strongly recommends that the user, periodically test the product water to verify the system is performing satisfactorily.

This system is acceptable for treatment of influent concentrations of no more than 27 mg/l nitrate and 3 mg/l nitrite in combination measured as N and is certified for nitrate/nitrite reduction only for water supplies with a pressure of 40 psig (280 kPa) or greater.

**DO NOT USE WITH WATER THAT IS MICROBIOLOGICALLY UNSAFE OR OF UNKNOWN QUALITY, WITHOUT ADEQUATE DISINFECTION BEFORE OR AFTER THE SYSTEM.** Systems certified for cyst reduction may be used on disinfected water that may contain filterable cysts.

## SECTION II. SPECIFICATIONS

### TABLE A – QUALIFIED SYSTEM PERFORMANCE

Because the performance of an R.O. Membrane is highly dependent upon pressure, temperature and TDS, the following should be used for comparison purposes only.

	3 Stage	4 Stage	5 Stage	5 with pump
Membrane Production <sup>1</sup>	35 ± 5 gpd	50 ± 5 gpd	75 ± 5 gpd	75 ± 5 gpd
Membrane TDS Reduction <sup>1</sup>	94% min– 99% max	94% min– 99% max	94% min– 99% max	94% min– 99% max
System Production <sup>2</sup>	35 gpd	50 gpd	75 gpd	75 gpd
TDS Reduction <sup>2</sup>	94% min– 99% max	94% min– 99% max	94% min– 99% max	94% min– 99% max
Drain (reject water) Flow	3 – X product flow	3 – X product flow	3 – X product flow	3 – X product flow
Empty Storage Tank Pre-charge	5-7 psig air	5-7 psig air	5-7 psig air	5-7 psig air
Storage Tank Capacity <sup>3</sup>	2.5 gallons	4.0 gallons	4.0 gallons	4.0 gallons

<sup>1</sup> Industry standards measure RO Membranes performance with no backpressure on the product water, at 65 psig (450kPa) and 77°F (25°C). Further conditions on the above are 500 ppm TDS and a 15% recovery rate. Production rate and TDS reduction figures are for a new Membrane that has been rinsed for 24 hours. The production rate of a new Membrane can decrease by 10% per year or more, depending upon the scaling and fouling tendencies of the Feed Water.

<sup>2</sup> Actual capacity measure at 50 psig, 77° ±2°F, and 735 mg/l TDS per ANSI/NSF Standard 58.

<sup>3</sup> 5 psig pre-charge and 40 psig water pressure in tank.

### TABLE B – RECOMMENDED OPERATING LIMITS FOR FEED WATER

	3 Stage	4 Stage	5 Stage	5 with pump
Water Pressure	40-100 psig	40-100 psig	40-100 psig	40-100 psig
TDS	2000 ppm	2000 ppm	2000 ppm	2000 ppm
Temperature	40-100°F	40-100°F	40-100°F	40-100°F
pH	3-11	3-11	3-11	3-11
Hardness	>100 gpd	>100 gpd	>100 gpd	>100 gpd
Iron	> 0.1 ppm	> 0.1 ppm	> 0.1 ppm	> 0.1 ppm
Manganese	> 0.05 ppm	> 0.05 ppm	> 0.05 ppm	> 0.05 ppm
Hydrogen Sulfide	None	None	None	None
Chlorine	None (see note)	None (see note)	None (see note)	None (see note)
Bacteria	Must be potable**	Must be potable**	Must be potable**	Must be potable**

**NOTE: Chlorine will damage a T.F.C. Membrane. The Activated Carbon Pre-filter will remove chlorine from the incoming water. Change filter every 6 months, more often if the water contains more than 1 ppm chlorine.**

**\*\*DO NOT USE WITH WATER THAT IS MICROBIOLOGICALLY UNSAFE OR OF UNKNOWN QUALITY, WITHOUT ADEQUATE DISINFECTION BEFORE OR AFTER THE SYSTEM.**

### SECTION III. PREPARATION

#### A. Major System Components

The following components comprise the R.O. Drinking Water System. (Refer to Fig. 1 below for general system layout.)

1. An R.O. Manifold Assembly
2. Housings and Housing O-rings
3. A Drinking Water Holding Tank
4. A Dispensing Faucet
5. A Feed Water Ball Valve
6. A Drain Clamp
7. Plastic Tubing and Tube Connectors
8. A Reverse Osmosis Membrane (sealed in a plastic bag)
9. A Sediment Pre-filter (shrink wrapped)
10. An Activated Carbon Pre-filter (shrink wrapped)
11. An In-Line Activated Carbon Post Filter
12. Other items necessary for installation may include wood screws or machine screws and nuts for mounting the manifold, or concrete anchors for hanging on basement wall. Additional tubing or tube connectors. Plastic wire ties for organizing tubing.
13. Installation Kit

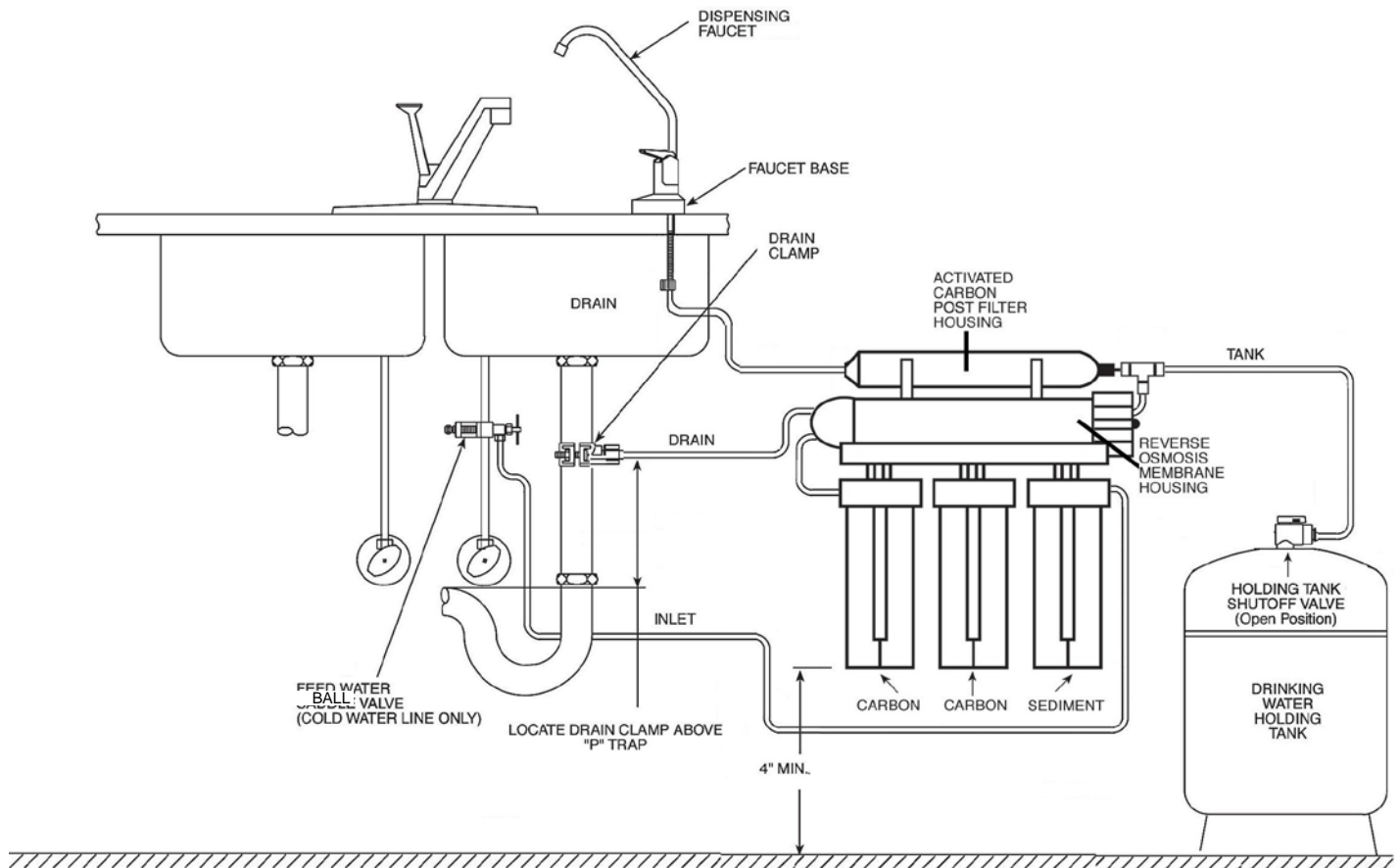
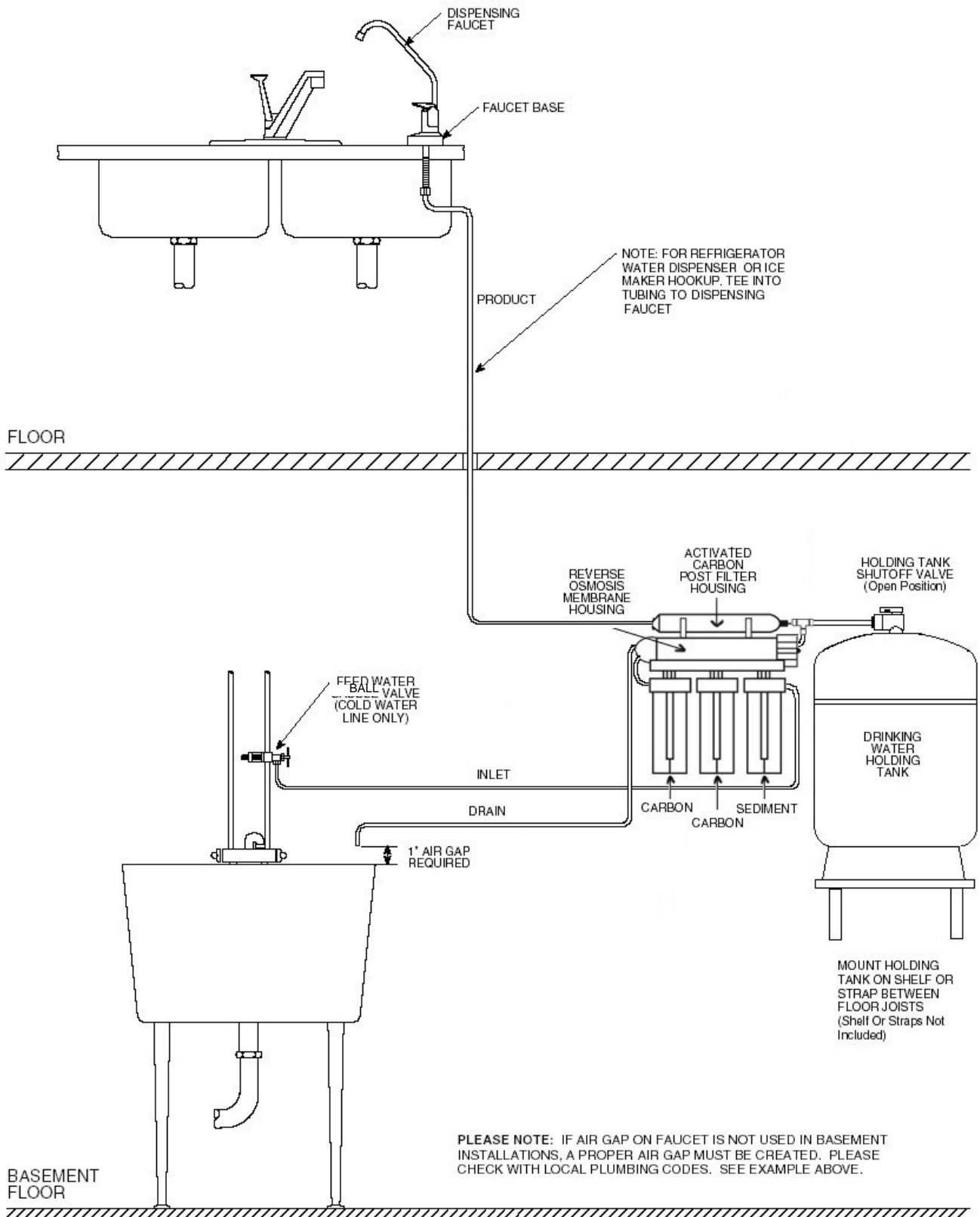


Figure 1



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## B. Tools Recommended for Installation

The following tools will cover most of the installation sites encountered:

1. 3/8" variable speed electric drill.
2. Extension work light with outlet.
3. Safety glasses.
4. 11/4" Greenlee hole punch and 1/8" and 1/2" metal drill bits for pilot hole.
6. Center punch and hammer.
7. 11/4" wood bit.
8. Concrete drill bits.
9. Assorted wood and metal drill bits including 7/32" metal drill bit.
10. Phillips head and flat blade screwdrivers.
11. 1/2", 9/16" and 5/8" open end wrenches.
12. 10" Crescent wrench with jaws taped to hold faucet.
13. Basin wrench or 10" pipe wrench.
14. Teflon tape.
15. Wide masking tape or duct tape.
16. Plastic tubing cutter.
17. Extra plastic tubing.
18. Low range air pressure gauge.
19. Small bottle of liquid chlorine bleach.
20. Paper towels, wisk broom and assorted clean up materials.

## C. Site Selection for Major System Components

The R.O. System was designed to fit under a sink, however, because of space limitations or other reasons, the system's flexible design allows for other locations. When determining the location remember that access to a cold water tap line, the household drain, and ease of filter replacement are important considerations.

All components and tubing should be located in an area not exposed to freezing temperatures. If winter temperatures are sever, the area should be above the minimum temperature listed in Table B, page 2 for proper performance. Do not expose unit or tubing to direct sunlight.

- 1. Drinking Faucet** – The faucet should be placed near the sink where drinking water is normally obtained. Convenience of use (filling of water pitchers and glasses), and an open area beneath the faucet under the sink for attaching product and drain tubing are considerations. A 2" diameter flat surface is required above and below the installation site. The thickness of the mounting surface should not exceed 1 1/4". Watch for strengthening webbing on the underside of cast iron sinks.
- 2. Drinking Water Holding Tank** – The Holding Tank may be placed where it is convenient within 10 feet of the faucet; under the sink, in an adjacent cabinet are the best choices or in a basement within 20 feet of the faucet. If a longer run of tubing is required, the tubing should be the 3/8" diameter OD size to prevent a high pressure drop. Remember, these tanks can weigh up to 30 pounds when full of water; a firm, level area is required.
- 3. R.O. Manifold Assembly** – The manifold can be installed on either the right or left side of the under-sink area or a cabinet. The right side is recommended because all the tubing will be to the back of the cabinet and out of the way. Installation in the basement is also an option; one location is near the laundry/utility sink where cold potable water and rain access are handy. The mounting location should allow adequate clearance and accessibility for cartridge changes.

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**4. Feed Water Connection** – The Feed Water Ball Valve should be located as close to the manifold assembly as possible. **USE A POTABLE COLD WATER SUPPLY ONLY.** Softened water is preferred as it will extend the life of the R.O. Membrane.

**5. Drain Connection** – The waste water must go to a drain connection with easy access.

Do NOT connect the system drain line to the dishwasher drain or near the garbage disposal.

#### **SECTION IV. INSTALLATION STEPS**

All plumbing should be done in accordance with state and local plumbing codes.

In restricted under-sink areas, it may be easier to install the faucet first. Allow adequate tubing lengths for any final component position.

##### **A. Faucet Installation**

2a. Drilling a stainless steel sink:

- Center punch the hole to provide a starting point for the drill.
- Start with a smaller drill as a pilot, and then drill a ½" diameter hole to accept the bolt of a 1¼ " Greenlee Hole Punch (1¼" chassis punch).
- Clean away any chips.
- Install the punch and tighten the nut to cut the hole.
- Deburr any sharp edges.

2b. Drilling a porcelain sink:

It is best to use a special 1¼" diameter cutter designed for porcelain. A carbide tipped masonry bit is a second choice.

- Place a piece of tape over the area to be drilled to help prevent chipping.
- Drill a pilot hole for the porcelain cutter. Use the pilot drill supplied with the kit or a carbide tipped drill.
- When drilling the 1¼" hole, drill slowly and carefully; the porcelain chips easily.
- After drilling, clean the area well. Iron fillings, if left in place, can cause rust stains.

2c. Drilling a counter top:

**NOTE:** The counter top must be less than 1¼" thick. (See Sec. IV, A.2b, page 6.) Treat ceramic tiles as porcelain until the tile is penetrated, then use the carbide tipped metal cutter.

Formica counter tops may be drilled with a good 1¼" wood bit, drilling a 3/32" pilot hole will help keep the bit going straight.



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## LONG REACH FAUCET

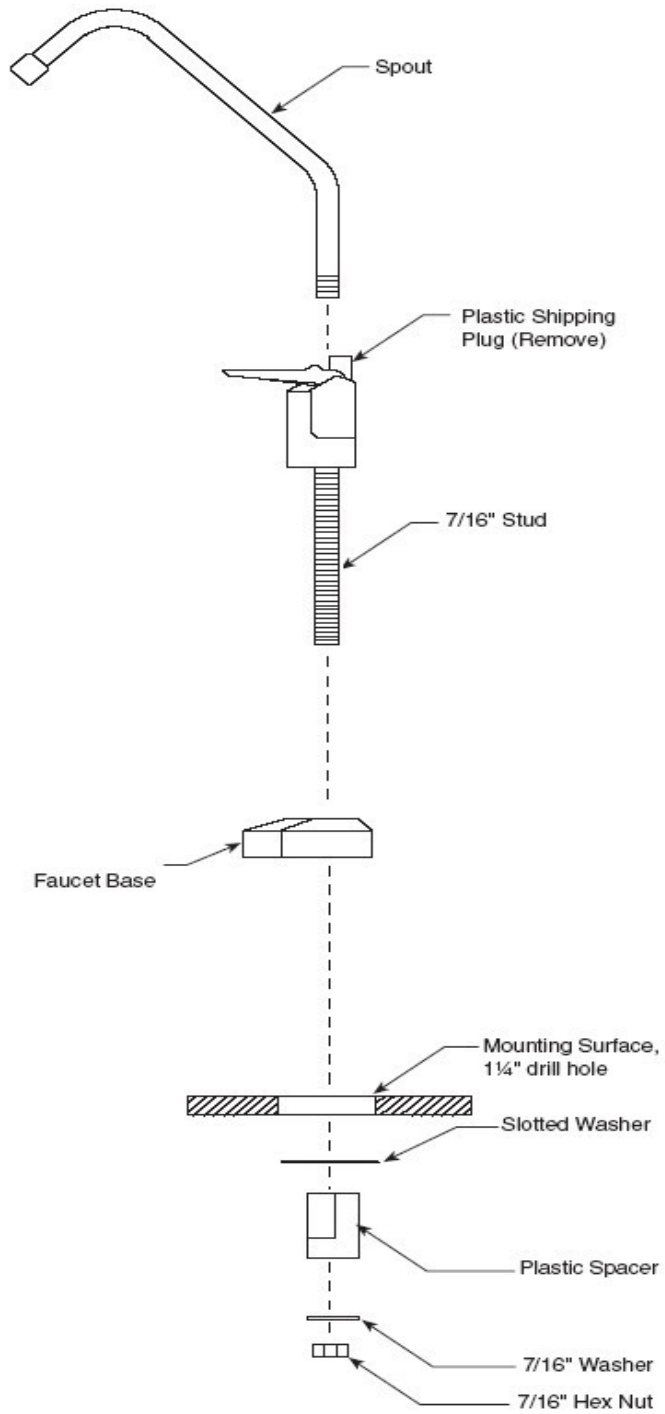


Figure 2A

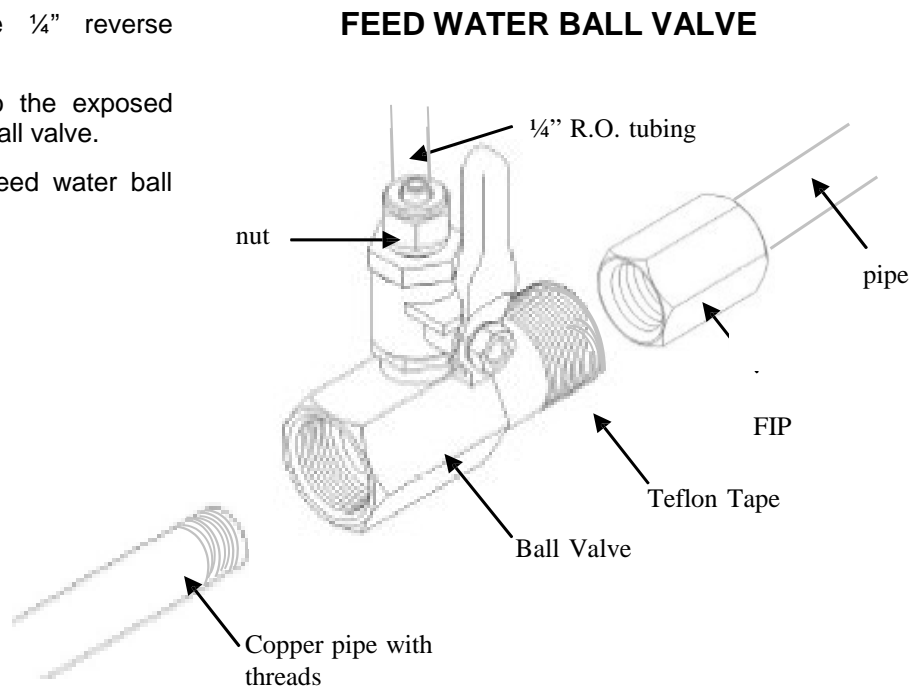
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## B. Feed Water Ball Valve Installation

Decide on location. Do NOT connect to a hot water feed line. If you are not sure of the supply, run the hot water and feel the supply piping. Water over 100°F may cause permanent damage to the R.O. Membrane. (Refer to Fig. 3 on page 9.)

1. Shut off the water supply and drain the line.
2. To install the Feed Water Ball Valve:
  - You will require 1 – ½" MIP fitting (threaded on one end).
  - To begin, unscrew the copper pipe and fitting which is located directly under the sink.
  - Place some Teflon Tape on the threads of the copper pipe as well as the threads on the feed water ball valve.
  - Screw the copper pipe into the feed water ball valve.
  - Screw the pipe with the FIP fitting onto the opposite end of feed water ball valve.
  - Remove nut from the feed water ball valve.
  - Slide the nut onto the ¼" reverse osmosis tubing.
  - Place the ¼" tubing onto the exposed threads of the feed water ball valve.
  - Screw the nut onto the feed water ball valve.

3. With the Feed Water Ball Valve closed, open the sink faucet and the water supply and allow the water to run for a few minutes to flush any debris caused by the installation.
  - Close the faucet and check the Feed Water Ball Valve for leaks.
  - Once installation of Reverse Osmosis unit is completed open feed water ball valve to allow flow of water.



**Figure 3**

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### C. Drain Clamp Installation

Choose the drain outlet location.

The following are instructions for discharging in the sink drain pipe. (Refer to Fig. 1, page 3)

1. Position the Drain Clamp on the sink drain pipe above the drain trap. Allow room for drilling. Tighten securely.
2. Use a battery powered or properly grounded drill. Using the Clamp port as a drill guide, drill a  $7/32$ " hole through the wall of the drain pipe. Do NOT penetrate the opposite side of the pipe.

3. Locate the  $3/8$ " Black Drain Tubing connected to the Reverse Osmosis Unit. Route to the tubing to the Drain Clamp and trim to length.

**NOTE:** When cutting the polytubing make clean, square cuts, failing to do so could result in poor connections and possible leaks.

**CAUTION:** The lowest point of the line should be the point of connection to the Drain Clamp. There should be no sag in the line as this may cause excessive noise as the reject water is flowing to drain.

- Refer to Fig. 4, below. To connect the Drain Tubing, install the Compression Nut and the Brass Insert.
- Insert the tubing into the Drain Clamp and tighten the Compression Nut.

### 3/8" DRAIN CLAMP ASSEMBLY

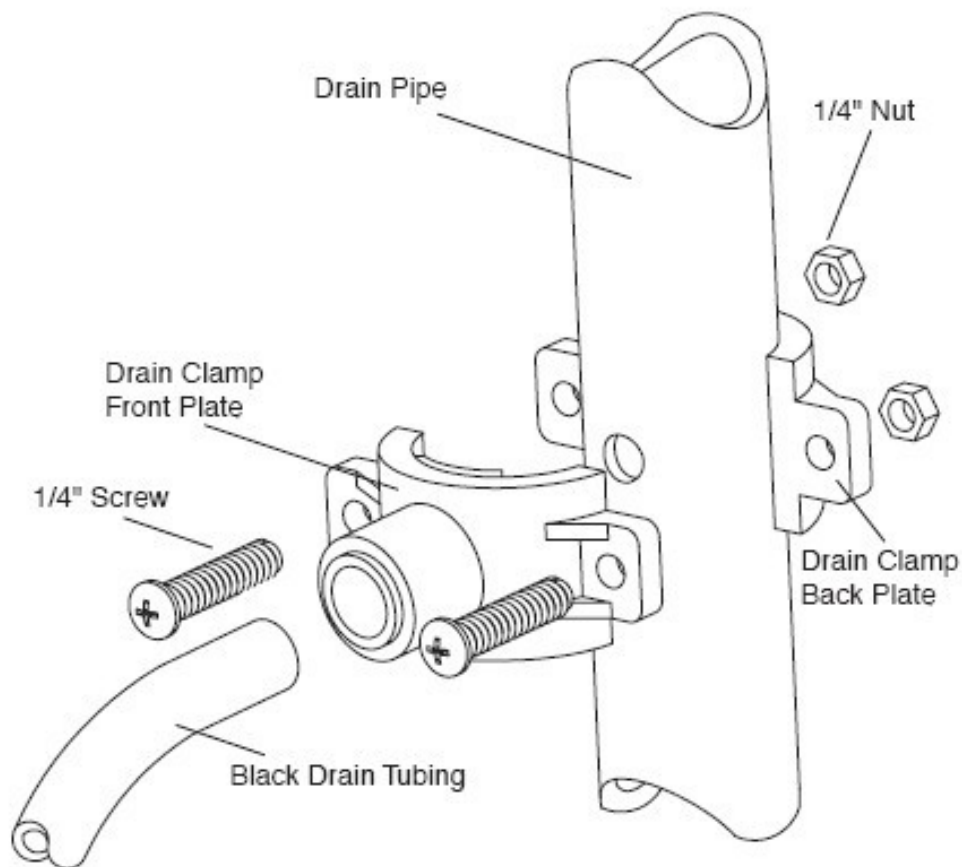


Figure 4

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#### D. Position the Drinking Water Holding Tank and Make the Final Hose Connections

1. Check the tank pre-charge pressure. Make sure it is between 5 to 7 psig. If not, use a bicycle hand pump or other pump to bring the pressure up to the 5 to 7 psig range.
2. Pull the cap/plug off the top of the tank where the Tank Shut-Off should go. (Refer to Fig. 1, page 3.)
3. Wrap Teflon tape three times around the ¼" male outlet thread. Wrap in the direction of the threads (clockwise when looking down on the Holding Tank). The tape will act as a thread sealant. Screw on the Holding Tank Shut-Off Valve.
4. Locate the 3/8" Tubing. Firmly press one end into the Holding Tank Shut-Off Valve and the other end into the tee. (Refer to Fig. 1, page 3.) The fittings will grab the tubing and seal it in place. Make sure the tubing is pressed all the way in to create a pressure tight connection.

#### E. Start Up

At time of start up and each time the filters are changed the system should be sanitized (also see Operation and Maintenance Sec. V, B.1-4, page 13).

1. Sanitizing the system and installing the Sediment Pre-filter. Use a drip pan to aid clean-up.

**NOTE:** The system should be sanitized BEFORE installing the Activated Carbon Pre-filter and the RO Membrane.

- Use a good quality unscented liquid chlorine household bleach.
- Open the Dispensing Faucet by lifting the black handle and open the Holding Tank Shut-Off Valve (the handle should be parallel with the valve body).
- Remove the Housing on the side of the manifold labeled "SEDIMENT". Pour one capful of bleach (this is approximately 2 tsp. or 10 ml) into one of the white Housings. Unwrap Sediment Pre-filter and install pre-filter (press firmly into place). Engage and firmly tighten the Housing hand tight only.
- Remove all Housings add one capful of bleach in each. Engage and firmly tighten the Housings hand tight only.

- Slowly open the Feed Water Ball Valve (turning counter clockwise).
- As soon as the water begins to come out of the Dispensing Faucet, close the Faucet.
- Let stand for 15 minutes.  
**NOTE:** During this time, check the system carefully for leaks.
- At the end of 15 minutes, CLOSE the Feed Water Ball Valve and open the Dispensing Faucet.
- Allow the Holding Tank to completely drain. Then remove the Activated Carbon Pre-filter Housing, empty, and install the activated Carbon Pre-filter. Firmly tighten the Housing hand tight only.

#### 2. Installing the R.O. Membrane:

- Remove the R.O. Membrane Housing, (the closest of the three to In/Out ports), and empty.
- Insert the Membrane into the Membrane Housing. (The O-rings should be up toward the Membrane Housing cap.) Check the Housing O-ring for proper position in its groove, engage and firmly tighten the Housing hand tight only.

#### 3. Rinsing the system:

- Slowly open the Feed Water Ball Valve fully counter clockwise.
- The Holding Tank Valve should be open. The R.O. System is now making water.
- Do not use the first three full tanks of water.

**CAUTION:** The R.O. Membrane is shipped with a preservative in it (0.5% sodium metabisulfite). This will be rinsed out with the first water produced. Allow the Holding Tank to fill (overnight) and discard the first three full tanks of production.

When the Faucet is first opened, expect air and carbon fines (very fine black powder) from the In-Line Activated Carbon Post Filter to be rinsed out. This is normal for the first tank of water or after the In-line filter is changed.

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## SECTION V. OPERATION & MAINTENANCE

### A. Normal Operation

1. R.O. systems produce drinking water at relatively slow rates, it can take up to 3 hours more to fill the Holding Tank. Normal operation is to let the Holding Tank fill with water and then draw water as is needed. When the pressure in the Holding Tank falls to a given pressure (as the water is being used) the Automatic Shut-Off Valve (ASO Valve) will start water production and the system will refill the Holding Tank. When the Holding Tank is full and no water is being used, the ASO Valve will automatically shut off the feed water to conserve water. The more water that is used (up to the capacity of the system) the better the R.O. system will function. Other uses for the water are flowers, pets and rinsing glassware.

With each use it is recommended that you run the tap for at least 10 seconds prior to using water. This is especially important if the water tap has not been used daily. After periods of non-use, such as a week of vacation, it is better to empty the Holding Tank and allow the system to produce fresh water for use. If the system is not used for 3-4 weeks or longer, it is a good idea to re-sanitize the system and to change the pre-filter and post filters.

### B. Changing Filters

THIS R.O. SYSTEM CONTAINS FILTERS WHICH MUST BE REPLACED AT REGULAR INTERVALS TO MAINTAIN PROPER PERFORMANCE. USE ONLY FACTORY APPROVED FILTERS.

**All individuals should take adequate precautions when changing the filters, including wearing protective gloves, to avoid direct contact with the exhausted filters.**

The recommended interval for changing the filters (not the R.O. Membrane) is every six (6) months. Typical T.F.C. Membrane life expectancy is three years. Local conditions may dictate more frequent changes.

**NOTE:** If the R.O. Membrane is to be replaced, see Sec. IV, F.1-3, page 11, for the proper procedure.

Use a drip pan to catch any water that may spill when the Filter Housings are removed. Refer to Fig. 1, page 3 for component location.

1. Close the Feed Water Ball Valve by turning fully clockwise and open the Dispensing Faucet by lifting the handle. Allow the Holding Tank to empty.
2. Loosen and remove the Sediment Pre-filter and the Activated Carbon Pre-filter Housings. Discard the filters.
3. Wash the inside of the Housings using a mild detergent and a soft cloth. Do not use abrasive cleaners or pads. Thoroughly rinse all soap from the Housings before reassembly.
4. To sanitize the system and replace the filters:

**NOTE:** The system should be sanitized before installing the Activated Carbon Pre-filter.

- Use a good quality unscented liquid chlorine household bleach.
- Add one capful of bleach (this is 2 tsp. or 10 ml) to the Sediment Pre-filter Housing and install the Sediment Pre-filter. Check the Housing O-ring for proper position in its groove, engage and firmly tighten the Housing hand tight only.
- Add one capful of bleach to the Activated Carbon Pre-filter Housing. Install the Housing without the Activated Carbon Pre-filter.
- The Dispensing Faucet should be open, slowly open the Feed Water Ball Valve.
- As soon as the water begins to drip out of the Dispensing Faucet, close the Faucet.
- Let the system stand for 15 minutes.
- At the end of 15 minutes, in the following order, close the Feed Water Ball Valve, close the Holding Tank Valve and open the Dispensing Faucet to release the pressure.
- Remove the Activated Carbon Pre-filter Housing and empty. Remove the wrapping and install the Activated Carbon Pre-filter. Firmly tighten the Housing hand tight only.
- Disconnect the tubing that runs from the Holding Tank to the Tee (see Fig. 1, page 3). Put 50 drops of bleach (this is ½ tsp. or

3 ml) into the tubing and reconnect it to the Tee.

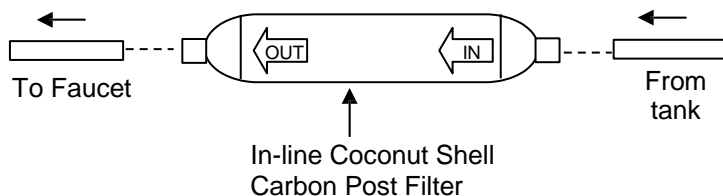
**NOTE:** Now is the convenient time to change the In-Line Activated Carbon Post Filter, see Sec. V, C.1-6, page 14.

- Slowly open the Feed Water Ball Valve. When water begins dripping out of the Dispensing Faucet, in the following order, close the Faucet and then open the Holding Tank Valve.
- Do not open the Faucet for at least 5 hours.
- Discard the first three full tanks of water produced, they will contain chlorine.

### C. Changing the In-Line Activated Carbon Post Filter

1. Close the Feed Water Ball Valve by turning fully clockwise.
2. Close the Holding Tank Valve and then open the Dispensing Faucet to release the pressure.
3. Remove the In-Line Activated Carbon Post Filter. Disconnect the used Post Filter by pressing in the connector's collar and at the same time pulling the tube out of the fitting. Unscrew the fittings on the In-Line, re-Teflon tape them and install them on the new Post Filter. Do not over tighten the fittings.
4. Firmly reconnect the polytubes to the new Post Filter. (Refer to Fig. 5 below.)

### IN-LINE COCONUT SHELL CARBON POST FILTER ASSEMBLY



**Figure 5**

5. Slowly open the Feed Water Ball Valve.
6. When water begins dripping out of the Faucet, in the following order, close the Faucet and open the Holding Tank Valve. When the Faucet is first opened, expect air and carbon fines (very fine black powder), from the new Post Filter to be rinsed out. This is normal for the first tank of water.

## SECTION VI. TECHNICAL DATA

### A. Water Quality

Water quality is normally measured with a special meter that measures the water's ability to conduct electricity. The more dissolved solids in the water, the higher the conductivity. The results are usually reported in **Parts per Million (ppm)** or **Milligrams per Liter (mg/l)** of **Total Dissolved Solids (TDS)**. (Although technically they are not exactly equal, in most discussions ppm = mg/l).

R.O. Membranes are rated by the amount of dissolved solids that are rejected. This rating is a ration of the TDS in the feed water to the TDS in the product water and is reported as **Percent Rejection**. If the feed water contained 100 ppm of TDS and the product water contained 10 ppm of TDS, 90 ppm have been rejected and the reject ration is 90%.

$$\text{Percent Rejection} = \frac{\text{Feed TDS} - \text{Product TDS}}{\text{Feed TDS}}$$

**EXAMPLE:** Feed water is 500 ppm TDS and the product water is 75 ppm TDS.

$$\text{Percent Rejection} = \frac{500 - 75}{500} \times 100\%$$

$$\text{Percent Rejection} = 0.85 \times 100\% \text{ or } 85\%$$

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## B. Water Quantity

Water quantity is termed **Flux** or **Product Water Rate** and is measured as the amount of water produced in one day. It is reported as **Gallons per Day (gpd)** or **Liters per Day (lpd)**.

The flow of water to drain is the **Reject Water Rate** and is measured as Gallons per Day (gpd) or as **Milliliters per Minute (ml/min)**.

Milliliters per minute x 0.38 = gallons per day

EXAMPLE: The drain flow will fill a graduated cylinder to the 150 ml mark in one minute.

$$150 \text{ ml/min.} \times 0.38 = 57 \text{ gpd}$$

If the container available measures ounces, use the following conversion:

$$\text{Ounces per minute} \times 11.2 = \text{gallons per day}$$

EXAMPLE: The product flow will fill 2½ ounces in two minutes.

$$2.5 \text{ oz.} \div 2 \text{ min.} = 1.25 \text{ oz./min.}$$

$$1.25 \text{ oz./min.} \times 11.2 = 14 \text{ gpd}$$

The **Reject Ratio** is the amount of water produced compared to the amount of water flowing to drain.

$$\text{Reject Ratio} = \frac{\text{Reject Rate}}{\text{Product Rate}}$$

EXAMPLE: The product rate is 14 gpd and the reject rate is 42 gpd.

$$\text{Reject Ratio} = 42 \div 14$$

$$\text{Reject Ratio} = 3 \text{ or } 3\text{-to-}1$$

The **Percent Recovery** is another way to measure the amount of water produced as compared to the amount actually used.

$$\% \text{ Recovery} = \frac{\text{Product Rate}}{\text{Feed Rate}} \times 100\%$$

**NOTE:** The total flow or feed water rate into the system is the sum of the product flow and the drain flow.

EXAMPLE: The product water rate is 14 gpd and the drain water rate is 42 gpd

$$\text{Feed Rate} = 14 \text{ gpd} + 42 \text{ gpd} = 56 \text{ gpd}$$

$$\% \text{ Recovery} = \frac{14 \text{ gpd}}{56 \text{ gpd}} \times 100\%$$

$$\% \text{ Recovery} = 0.20 \times 100\% \text{ or } 20\%$$

## C. Net Pressure Differential

Most R.O. Membranes are rated at a standardized condition of 77°F (25°C) and 65 psig (450kPa) discharging to atmospheric pressure.

Product Water quality and quantity greatly depend upon the **Net Pressure Differential (+p)** across the R.O. Membrane. This pressure differential is a summation of the feed water pressure at the Membrane, which tries to push the water through, the pressure in the Holding Tank, which tries to push the water backwards and the osmotic pressure, which also tries to push the water backwards.

The **Osmotic Pressure** is in production to the dissolved minerals in the water and can be approximated by 1 psig for each 100 ppm of TDS

EXAMPLE: A feed water with 1500 ppm of TDS would exert a backward pressure of about 15 psig on the membrane.

Net Pressure Differential =

$$\text{Feed Water Pressure} - \text{Holding Tank Pressure} - \text{Osmotic Pressure}$$

The higher the net pressure differential, the higher the quantity and quality of water produced.

Some loss of production is normal when using a pressurized Holding Tank.

## SECTION VII. TROUBLE SHOOTING GUIDE

<b>Problem</b>	<b>Possible Cause</b>	<b>Solution</b>
<b>Low quantity of Product Water from Holding Tank</b>	Feed Water Ball Valve is plugged or closed.	Open Valve or unclog.
	Clogged Sediment Pre-filter or Activated Carbon Pre-filter.	Replace filters.
	Low water pressure.	Feed Water pressure must be above 40 psig.
	R.O. Membrane is fouled.	See Feed Water operating limits. Correct cause of fouling, replace Membrane.
	Plugged In-Line Activated Carbon Post Filter.	Replace Post Filter.
	Air pre-charge pressure in Holding Tank is too high.	Empty water from Holding Tank, and with the faucet open, adjust air pressure to 5 – 7 psig (35–48 kPa) range.
	Air pre-charge is too low	
	Air Bladder in the Holding Tank is ruptured.	Replace tank.
	Holding Tank Valve is closed.	Open Valve.
	No drain flow, the Drain Restrictor is plugged.	Clear or replace Drain Restrictor.
	The Check Valve is stuck.	Free check.
	The ASO Valve is malfunctioning.	Replace ASO Valve components.
<b>Low pressure at the Dispensing Faucet</b>	In-Line Activated Carbon Post Filter is plugged.	Replace Post Filter.
	Air pre-charge in the Holding Tank is too low.	Empty water from Holding Tank and with the faucet open, adjust air pressure to 5 – 7 psig (35-48 kPa) range.
		Check for leakage at the Air Valve Stem.
	Holding Tank Valve is partially closed.	Open Valve
	The dispensing Faucet is out of adjustment or faulty.	Repair or replace Dispensing Faucet.
	Heavy water use, Holding Tank is depleted.	Allow Holding Tank to refill (adding a second Holding Tank will increase storage capacity).
	Low Water Production.	See Low Quantity of Product Water from Holding Tank section above.
<b>High Total Dissolved Solids (TDS) in the Product Water</b>	Clogged Sediment Pre-filter or Activated Carbon Pre-filter.	Replace Filters.
	Low Water Pressure.	Feed Water Pressure must be above 40 psig.
		Check Feed Water Ball Valve.
	R.O. Membrane O-ring is crimped.	Check O-ring.
	R.O. Membrane brine seal is not sealing up into the manifold head.	Check the brine seal.
R.O Membrane is expended.	If Membrane life is unusually short, find and correct the problem. Replace Membrane.	



<b>Problem</b>	<b>Possible Cause</b>	<b>Solution</b>
<b>High Total Dissolved Solids (TDS) in the Product Water (continued)</b>	The Product Water and Drain Water lines are reversed.	Correct plumbing.
	No drain flow, Drain Restrictor is clogged.	Clear or replace Drain Restrictor.
	The ASO Valve is not closing.	Repair or replace the ASO Valve Components.
	New In-Line or Activated Carbon Pre-filter not rinsed completely.	Flush with several full tanks of Product Water.
	The Feed Water TDS has increased.	An increase in Feed Water TDS will give a corresponding increase in Product Water TDS.
<b>Tastes and odors in the Product Water</b>	The In-Line or Activated Carbon Pre-filter is exhausted.	Replace Filters.
	There is foreign matter in the Holding Tank.	Clean, flush and sanitize the system. Replace the filters.
	The Product Water and Drain Water lines are reversed.	Correct plumbing.
	Dissolved gasses in the Feed Water.	Pre-treat Feed Water to remove dissolved gasses.
	Increase in Product Water TDS.	See high TDS in the Product Water section.
<b>Drain Water overflows at the Air Gap Faucet</b>	Drain tubing is clogged.	Clear tubing.
	Drain clamp hole is misaligned.	Align with hole in the drain pipe.
	Excessive drain flow rate.	Replace Drain Restrictor.
<b>Faucet leaks or drips</b>	Leaks from spout.	Adjust Faucet by turning the tee bar just below the handle to provide a small amount of free play in handle when shut off.
		O-rings are bad, repair or replace faucet.
	Leaks from base of the delivery tube.	O-ring is bad, replace O-ring.
	Leaks from beneath the handle.	O-rings are bad. Repair or replace the faucet.
<b>Fitting leaks in general</b>	Close the Feed Water Ball Valve and relieve pressure before disconnecting any tubing or replacing any fitting. Before replacing a fitting, re-cut the tubing and re-insert into the fitting to see if that solves the leak. If pipe threads are leaking, remove and re-tape with Teflon tape.	