

# VERTEX

*Water Products*

# PureWaterMachine™

**REVERSE OSMOSIS UNDERSINK  
WATER FILTRATION SYSTEM**

**OWNERS INSTALLATION  
MANUAL**



**VERTEX WATER PRODUCTS**



**WQA GOLD SEAL APPROVAL:** The Pure Water Machine filter has been tested and certified by the Water Quality Association according to NSF/ANSI 58 for the reduction of contaminants. See the Performance Data Sheet, page 14 & 15, for specific substances and reduction performance.

The VERTEX PURE WATER MACHINE is made with quality components to provide cleaner, safer drinking water. No chemicals are added or used in this system. To preserve the GOLD SEAL approval and filter capability, it is required that the filter elements be replaced at the intervals and with replacement elements as specified in section 4.0 of this manual.

*This manual is applicable to Product Models:*

<i>PT-4.0</i>	<i>PT-4.0/50</i>
<i>PT-4.0/P</i>	<i>PT-4.0/P/50</i>
<i>PT-4.0/5</i>	<i>PT-4.0/5/50</i>
<i>PT-4.0/5/P</i>	<i>PT-4.0/5/P/50</i>

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## Nitrate/Nitrite Test Instructions

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If you purchased your system specifically for nitrate reduction, Vertex recommends testing with the kit supplied herein to establish that nitrate and nitrite are being reduced to acceptable levels.

We recommended tests be made on the filtered water each 6 months to assume it conforms. Open the PurTest package, take out one strip. Insert a strip in a sample of filtered water for a few seconds, then withdraw and wait for 60 seconds. Color change on the end pad is for nitrate, and the upper pad is for nitrite.

Replacement test kits may be purchased from your dealer.

Each 6 months, the water should be sent to a certified water laboratory, or to the county for tests on the filtered water for any additional items of concern.

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## *i* NOTICE

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This instruction manual was written to guide a professional plumber to make an easy installation of the VERTEX Pure Water Machine. The installation shall conform to state and local laws and regulations.

This manual covers systems with 36 allon per day membranes (PT-4.0, PT-4.0/P, PT-4.0/5, PT-4.0/5/P) and systems with 50 gallons per day membranes (PT-4.0/50, PT-4.0/P/50), PT-4.0/5/50, PT-4.0/5/P/50).

This filter system can be installed by the homeowner who has sufficient tools and skills. Be cautioned that an extra faucet for purified water will be installed . This requires a 7/8-inch diameter hole in the sink top. If there is not an extra hole existing, a new one must be drilled. For a porcelain sink, this requires a special drill (7/8" Relton cutter) which costs about \$160 and requires skill to use.

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## *ii* PARTS LIST

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### PARTS CONTAINED IN THE PURE WATER MACHINE CARTON

- 1-Box containing storage tank
- 1-Box with filter assemblies
- 1-Set of 1/4" plastic tubes, orange, white, black
- 1-clean water faucet and fittings
- 1-set of hardware consisting of:
  - Inlet water 1/4" ball valve and 1/2" feed line adapter
  - 1/4" plastic ball valve for tank shutoff
  - Drain saddle clamp
  - 5-pcs. Tube inserts

### OPTIONAL

- 1-Pump Transformer - for models with booster pump

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# 1.0 INTRODUCTION

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The VERTEX Pure Water Machine is a 4-stage water cleansing system. The principal cleansing of the water of dissolved solids is by the Reverse Osmosis membrane filter (stage 3).

Stage One is a sediment filter which removes particles of rust, sand and other trash in the water line down to 5-microns in size.

Stage Two is an activated carbon block filter which removes odors, chlorine and foreign tastes.

Stage Three is an advanced reverse osmosis membrane for removal of dissolved solids. This is the heart of the system. The reverse osmosis technology on average removes 95% of the dissolved solids. Dissolved solids are not removed by municipal water treatment systems. This is why the Vertex Pure Water Machine is an important safety factor for the water you drink and use in your cooking. Chemical contaminants such as chromium-6, lead, nitrates, and selenium which seep into municipal water systems are removed.

The water pressure against the reverse osmosis membrane forces the water molecules through the membrane, but the larger contaminant molecules are kept behind and are flushed to the sewer. The clean water goes to the storage tank and is held there ready to use. When the faucet is opened, clean water from the storage tank flows through the activated carbon polishing filter to the faucet for your use. The tank is prepressurized with a bladder which pushes the water out through the final carbon filter.

A special faucet is installed on your sink which dispenses safe, good tasting drinking water which is especially good for coffee, tea and drinks. By extending a line to your refrigerator, it can be used to make ice cubes.

**LIFE.** The filter life is specified by the number of gallons of water flowing through the system. Normal household will use two to three gallons of purified water daily. The filters are good for 1500 to 3000 gallons total usage depending on water quality. Therefore the filter elements, Stages 1,2, & 4 should be changed at least once a year. The Reverse Osmosis membrane has a longer effective life-span (5-year maximum) and it should be changed once every three years. See section 4.0

5-stage systems have an additional carbon pre-filter. All other stages are the same as described above.

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## 2.0 INSTALLATION

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Before starting the installation, you should measure the water pressure that is available under the sink to power the Pure Water machine RO. If the pressure is less than 40-psig, it is too low; and if it is 90-psig, it may be too high. The solution if the pressure is too low is to use a model with a booster pump. The solution for high water pressure, is to put a pressure regulator in the inlet water line to the house. A pressure of 60-75 psig is normal.

### 2.1 Location of RO unit

The RO unit may be located under the kitchen sink or in the basement. A cold water supply line must be close by. When locating the system under a sink make sure there is adequate room for the filter module assembly as well as the storage tank. For best performance the tank should be located as close to the clean water faucet (supplied) as possible (within 20 feet).

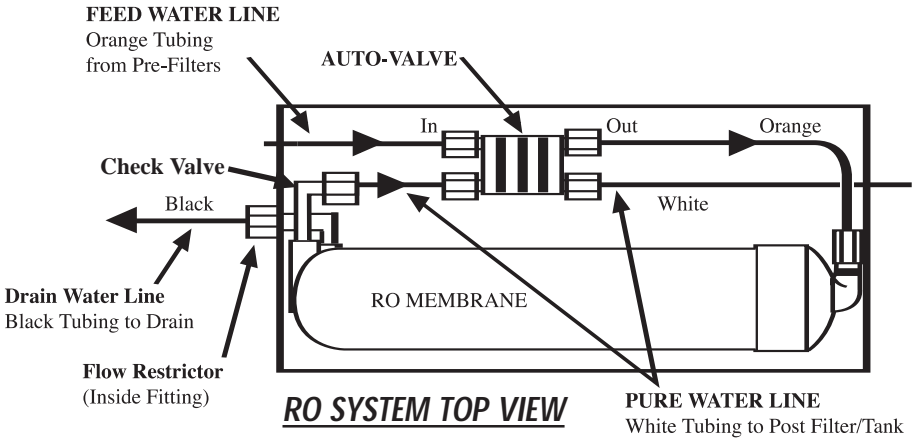
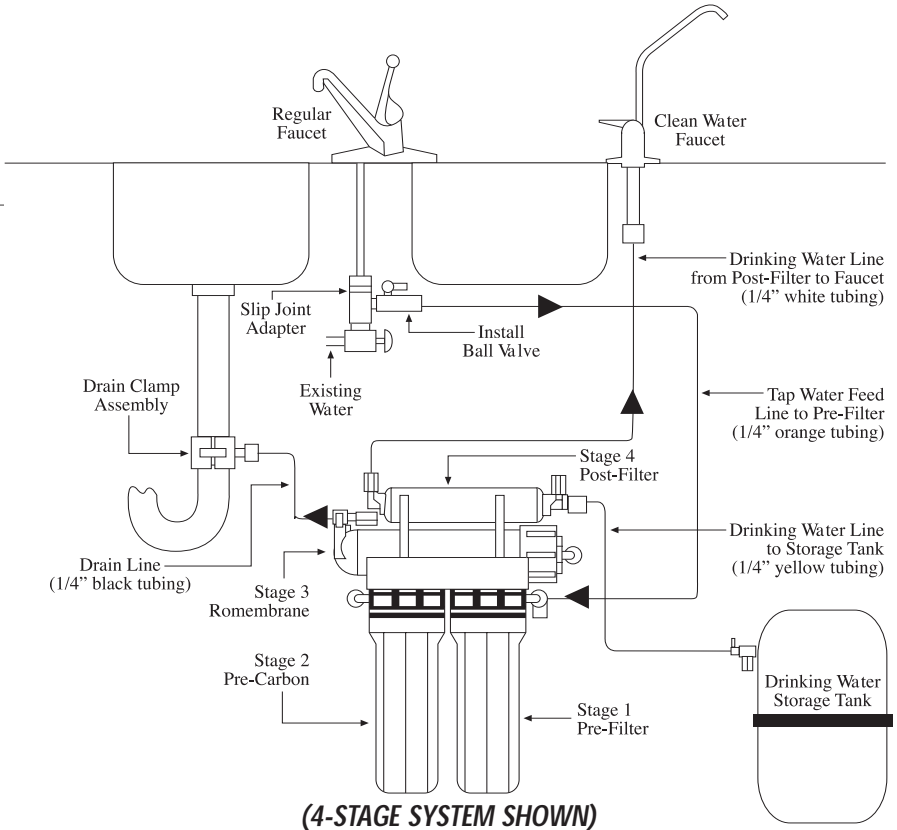
### 2.2 Mounting the RO filter unit under a sink (Fig. 1.)

Mount the unit to the wall of the sink cabinet. Pre-fit the unit by positioning the bottom of the pre-filter cartridges 2 inches off the floor of the cabinet. This clearance is necessary to make room to remove the housings when replacing the filter cartridges. Mark the location of the 2 mounting holes in the mounting bracket. Install 2 mounting screws leaving 1/8 inch clearance under the screw head. Check the fit by mounting the RO filter unit but don't install yet.

A 1/4" ball valve is supplied so the homeowner can easily shut off feed water when leaving the home unattended. The best overall protection from potential water leaks in the kitchen, hot water heater, or utility room is to install an automatic leak detector shutoff valve to the house (Vertex P/N LC-8021).

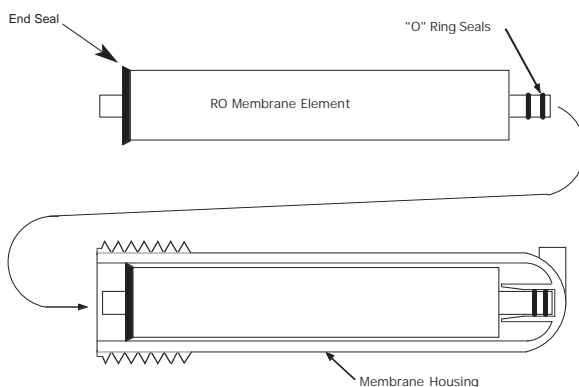
**Figure 1**

**Fig. 1.**



**Figure 2**

**MEMBRANE INSTALLATION**



**2.3 Install RO membrane element in housing (See Figure 2)**

The RO membrane element is packed separately because the membrane has been tested by the manufacturer and sealed in plastic with preservative. Remove the membrane element from its sealed plastic bag. To install the membrane in the housing first loosen the inlet fitting nut (the end of the housing with the single fitting) and remove the tube. Unscrew the membrane housing cap. Notice that one end of the RO membrane has two “O” rings on it. This end slides in first. Check that the “O” rings are tight and in their grooves. Lubricate lightly with cooking oil or vaseline. Install the membrane so the black sealing ring on the membrane is at the open end of the housing. Press the membrane in and feel the two “O” rings seat in the housing. Make sure they seat properly on the barrel of the housing, then reinstall the housing end cap and tighten securely. Reinstall the tubing and fitting and secure fitting nut.

**2.4 Connecting the feed water supply (Fig. 3)**

The feed water assembly consists of 1/2” brass slip joint adapter, a black washer, and a 1/4” x 1/4” ball valve. Locate these parts in the installation kit.

Locate the cold water shut off valve under the sink and turn it off. Open the cold water faucet to release the pressure. On single handled faucets, the hot water may have to be turned off to prevent any hot water cross-over. If water continues to come out of the faucet with the under-sink valves turned off, the house main valve will have to be turned off.

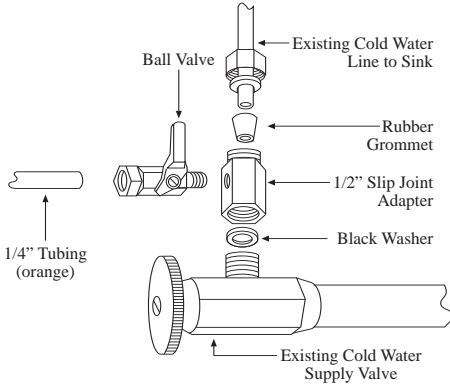
With the water turned off, disconnect the cold water riser tube (flex line) from the valve. Install the slip joint connector with the black washer. Loosen the nut and separate the cold riser tube from the faucet shank. Gently bend the riser tube so that the slip joint adapter fits onto the faucet shank. Reinstall the cold riser tube on the slip joint connector using the existing cone washer. For Solid copper tube the procedure is the same except you must cut a piece of the riser tube about 3/4” to 1” so the slip joint adapter can fit between the valve and the riser tube. Wrap several turns of



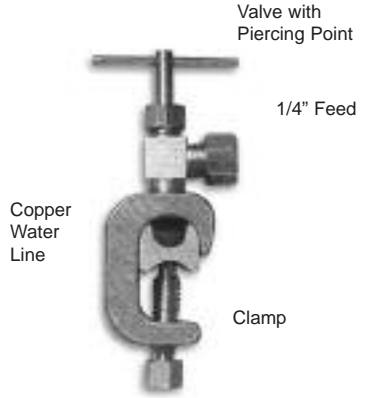
teflon tape on the ball valve and install on the slip joint connector.

In some cases the Pure Water Machine is supplied with a saddle Valve which can clamp over a copper pipe and make the hole and seal at once. (See figure 4).

**Figure 3**



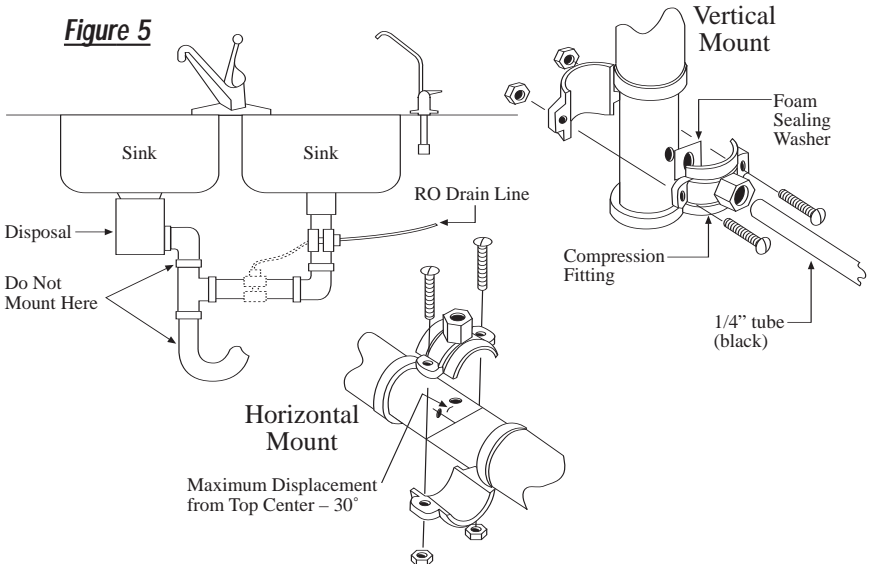
**Figure 4**



## 2.5 Installation of drain connection (Fig. 5)

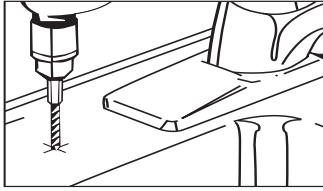
Place the drain outlet saddle on the drain pipe. Allow proper space for the drilling operation. Tighten the saddle bolts evenly on both sides. Using the opening in the drain outlet saddle as a guide, drill a 1/4" hole in the drain pipe. Clean any debris out of the drain saddle connection.

**Figure 5**

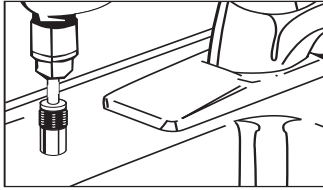
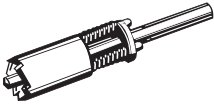


## 2.6 Installation of clean water faucet (Fig. 6)

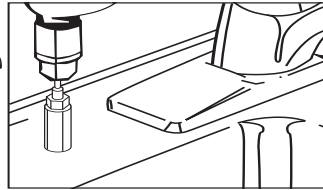
### Step 1. Pilot Drill



### Step 2. Spring Loaded Porcelain Saw (Relton Cutter)



### Step 3. Finish Hole Saw



The faucet should be positioned with aesthetics, function, and convenience in mind. An ample flat area is required for the faucet base so that it can be drawn down tight. The space under the sink below where the faucet will be mounted must be clear of any obstructions.

Some conditions may eliminate the need to drill a hole in the sink such as a faucet previously installed in the sink, a hole covered by a chrome hole cover, or an unused spray handle. If any of these situations are present, you may mount the faucet in one of these holes.

The sink drilling process is not complicated, but requires a certain amount of caution and forethought. Porcelain sinks can be chipped if care is not exercised when drilling the hole for the faucet.

[NOTE: This procedure is for the non air gap faucet provided.]

## 2.7 Porcelain/Enamel over Steel or Cast Iron Sinks

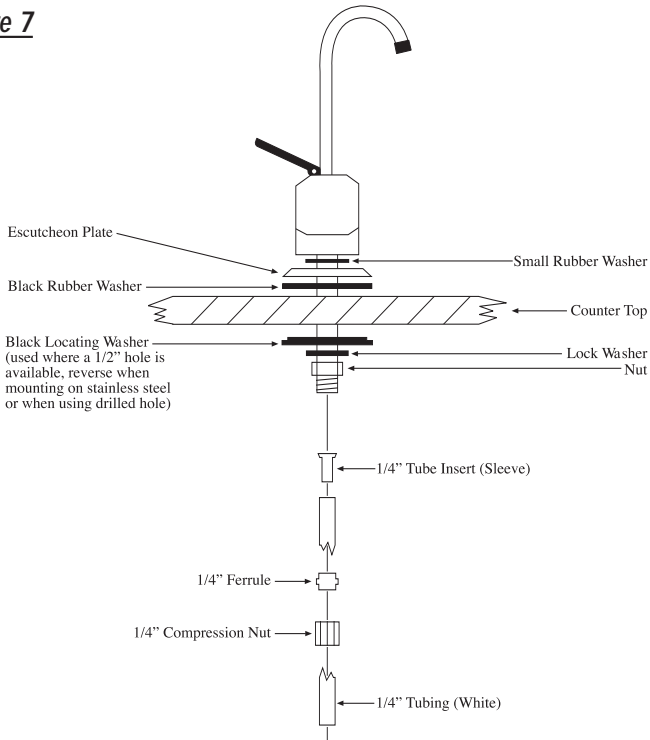
Using a small diameter carbide tipped drill, drill a pilot hole completely through the porcelain and the material underneath. Remove any metal chips that fall into the sink to prevent rust stains. Place the spring-loaded porcelain cutter bit in to the drill chuck. Make sure the pilot guide is inserted tightly. Insert the pilot guide onto the pilot hole. Push down gently on the drill motor to apply light pressure to the porcelain surface. Start the drill motor, turning as slowly as possible. After the initial cut has started, motor speed may be gradually increased. The cut may require three to four minutes to complete. Going faster could result in excessive chipping. Be sure a complete ring has been cut through the porcelain to the metal underneath.

Place the finish hole saw into the drill chuck. Make sure the pilot guide is inserted tightly. Insert the pilot guide into the pilot hole. Begin cut using a slow speed and light pressure until the porcelain has been penetrated to the material underneath. Remove the saw from the hole and clean all debris from the porcelain surface. Reinsert saw into the hole and cut through the remaining material.

## 2.8 Install Faucet (Fig. 7)

Disassemble the hardware from the threaded stud except for the top base plate and sealing gasket. Install the faucet in the sink hole. From below the sink assemble the mounting hardware. Use a deep socket to tighten the nut.

**Figure 7**



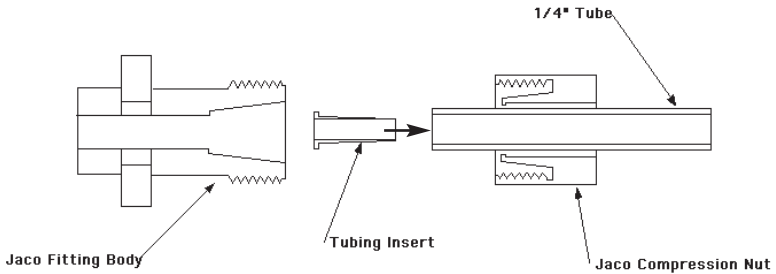
## 2.9 Tubing Connections (Fig. 8)

- a. The standard tubing connections on the Pure Water Machine are of "JACO" design and manufacture. Use the tubing sections provided and the tubing inserts. Follow the instructions in Figure 7 to make the connections. Use a 5/8" open-end wrench to tighten the JACO nuts on the tube. Hand tightening is not sufficient and may lead to leaks. **MAKE SURE THAT THERE ARE NO THREADS SHOWING UNDER THE NUT.** If you cut the tubing, make sure it is square cut so the tubing insert fits squarely against the end.

**Figure 8**

**Assembly Instructions:**

1. Slide compression nut over tube
2. Push tubing insert into end of tube
3. Insert end of tubing into Jaco fitting body
4. Tighten compression nut so that no threads are showing



**b. Feed Water Line**

Connect the orange colored 1/4" inlet tubing to the ball valve installed in step 2.4 above. To reduce the Water-Hammer effect on this fitting, make a large loop in the tubing before the connection on the sediment filter. To connect, remove compression nut and ferrule and slide on to tube. Insert tube over the ball valve tube as shown in Fig. 3. Slide nut over threads and tighten.

**c. Drain Line**

Find the black colored 1/4" tubing. Connect the tube to the drain saddle clamp from step 2.5. Push tube into fitting about 1/2 inch. Tighten plastic nut.

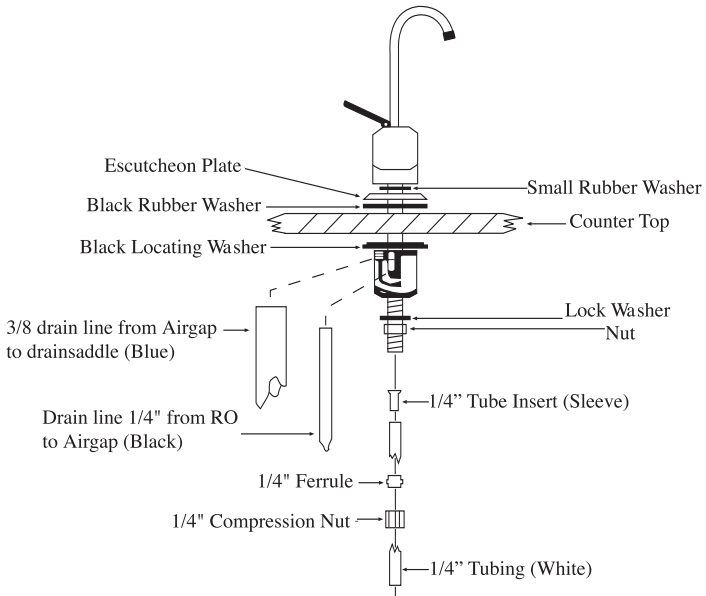
**d. Faucet Line**

Find the white colored 1/4" tubing and install a tube insert into the end of the tube. Slide on the ferrule and compression nut. Connect the tube to the faucet. Push the tube into the fitting until it stops. Tighten the metal ferrule nut.

**e. Tank Line**

Install the plastic ball valve on the storage tank. Find the yellow colored 1/4" tubing and install a tube insert into the end of the tube. Connect the tube to the plastic ball valve on the tank. Push tube into fitting until it stops. Tighten plastic nut. Turn the valve to the on position. The tank comes pre-charged from the factory at 5-7 psi. Double check the pressure with a tire gage (the air fitting is on the opposite end of the tank from the ball valve). If it is less than 5 psi add 2 psi with a compressor or bicycle pump. Note: Putting more pressure than 7 psi does not help to increase water flow through the faucet.

**Figure 9**



## 2.10 Air-Gap Faucet Installation (Figure 9)

Air-Gap Faucets are sometimes required by municipal code. The faucet is designed to take the waste water from the membrane to the top of the sink and then let it flow by gravity to the drain saddle. The objective is to prevent possible backup of drain water from the sink to the membrane in the event of a sink clog. A drain saddle with 3/8" instead of 1/4" is used. An extra section of 3/8" tubing (blue) is used from the faucet to the drain.

### Sink Preparation

Drill the appropriate size hole in the kitchen sink to accommodate the air-gap faucet.

### Drain Connection

Follow instructions of section 2.5 except drill a 3/8" hole in the drain pipe.

### Tubing Connections

Find the black colored 1/4" drain line from the membrane. Remove from membrane housing. Connect this tube to the 1/4" barbed fitting on the air-gap faucet.

Find the 3/8" blue tubing in the parts kit. Connect this tube to the 3/8" barbed fitting on the air-gap faucet. Install the faucet assembly (with tubes attached) into the sink hole. Secure the faucet per instructions in section 2.8. Re-attach the 1/4" black tubing to the drain side of the RO membrane housing. Be sure to tighten the fitting nut securely. Attach the 3/8" tube to the drain connector. Tighten the fitting nut securely. Attach the pure water line to the faucet per the instructions in section 2.9-D.

**Note:** To reduce drain noise gently curve the black tubing from the air-gap faucet to the drain connection.

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## 3.0 System Start-Up

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### 3.1 Start-Up

Start the system by opening the feed water ball valve. Make sure the ball valve on the storage tank is in the closed position. Check for leaks for at least 10 minutes. If water leaks from a fitting, retighten the fitting nut. Open the product water faucet and let the water flow until all the air has been expelled from the system. This will take about 30 minutes. Close the product water faucet. Make sure drain water has stopped flowing within one minute.

Open the tank ball valve and let the system run about 2-hours to get a complete tankful. Then open the clean water faucet on the sink and empty the tank. This is to flush the system and remove the preservative from the RO membrane, as well as flush carbon "fines" from the post filter

If the waste water continues to run after the tank is full, it may mean there is air binding the autovalve. Empty the tank again by opening the faucet. This will help to clear more air from the system. If the waste water running persists, remove the connection and the stainless steel checkvalve at the outlet of the RO stage. Clean the check valve, reassemble and start the system again.

### 3.2 Air Purge

The water moves slowly through the PureWaterMachine™. Small amounts of air therefore tend to hang up in corners and accumulate over a period of time. This can cause the autovalve to malfunction (not close properly), letting water run continuously to the drain. The instructions in 3.1 "Start-Up" should be rigidly followed.

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## 4.0 Recommended Filter Changes

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### 4.1 Filter Replacement, Pure Water Machine

This system contains a replacement treatment component, the reverse osmosis membrane element, which is critical to effective reduction of TDS. Replacement part numbers and changeout periods for the RO and other filter elements are shown below. The product water should be tested periodically to verify that the system is performing satisfactorily in addition to making the parts replacements specified.

To maintain the Gold Seal Certification, only these replacement parts should be used.

	Recommended Changeout Interval
RO Membrane Element 36-gpd, P/N MF-4009	once each 3 years
RO Membrane Element 50-gpd, P/N MM-4220	once each 3 years
First stage sediment filter, 5-micron, P/N SF-4001	once each year
Second stage activated carbon block, P/N CF-4000	once each year (use two for 5-stage)
Post filter fourth stage, activated carbon, P/N IF-4002	once each year

The yearly replacements are available in a kit (FK-100, for 4-stage systems) (FK-101, for 5-stage systems) which includes the sediment, carbon, and post filter. In addition, 2 new “O” rings to replace the ones in the canister and a filter removal wrench are included!

These filter replacement elements and kits are available from your DEALER. If not available there, you may order these parts from Vertex, specifying the above part numbers.  
Vertex Water Products - 5138 Brooks St., Unit A, Montclair, Ca., 91763  
Phone 909-626-2100

## 4.2 Standard Filter Elements

When you buy or install your *PureWaterMachine*<sup>™</sup>, we recommend that you buy the first year replacement kit (fk-100), described above. This includes Stage 1, 2, and 4 filter elements and 2 new “O” rings.

This kit comes in a plastic satchel which can be attached to the installed *PureWaterMachine*<sup>™</sup> under your sink. There is a space to write in the date of replacement, which is one year from date of installation. In this way you will have your reminder date for replacement and the parts to do it on hand.

In the replacement kit are instructions for replacement and cleaning, and a handy wrench to unscrew the Stage 1 and Stage 2 filter bodies.

The replacement kit described for model PT-4.0 may be ordered by specifying FK-100. Replacement kit for the 5 stage model PT-4.0/5 is FK-101. To order the filter kit with the RO replacement element, specify FK-100/36 or FK-101/36 (5 stage). Or FK-100/50; FK-101/50 for 50gpd systems.

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## 5.0 Filter Replacement Procedure

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Turn off the feed water at the feed water ball valve. Empty at least 1.5 gallons from the storage tank to take any back pressure off the system. Put a shallow pan under the RO system to catch any water that may spill during the operation.

Unscrew the filter housing and carefully lift it to the sink to drain or empty the water remaining in it. Remove the spent filter cartridge. Remove the old “O” rings in the housing. Sanitize the housings by adding 1 tablespoon of chlorine bleach to the empty housing and then filling with tap water. Let stand for 10 minutes. Empty the solution and rinse with clear water and dry.

Install the new cartridges in the housings. Make sure the white polypropylene sediment element goes into the housing marked “sediment” and the carbon filter goes into the housing marked “carbon”. Prepare the new “O” rings by covering with a thin layer of Vaseline or cooking oil. Install the new “O” rings into the grooves of the housing. Screw the housing to the cap on the bracket. When the “sediment” and “carbon” labels on the housing are centered at the front, the housings should be secure (See Figure 10).



*Figure 10*

If there is a small leak when the water is turned on, a slight turn of the housing (about 1/4") should stop it. **DO NOT OVER TIGHTEN**. If the leak persists, unscrew the housing and re-seat the "O" ring into the groove

For the in-line post filter, loosen both compression fittings and remove tubing as well as complete fitting. Remove in-line filter and discard. Install new filter. Reinstall the compression fittings making sure to use teflon tape on the threaded portion of the fitting that goes into the filter. Reinstall the tubing at each end and tighten the compression nuts. Re-start the system by opening the feed water ball valve. Follow the procedure in 3.1.

### **5.1 Filter Housing Replacement**

The filter canisters, sediment and carbon, including the caps must be replaced every five years. Order Vertex part number FH-1000 to order replacement part.



## 6.0 Installation Troubleshooting

<b>Problem</b>	<b>Possible Cause</b>	<b>Solution</b>
<ul style="list-style-type: none"> <li>• No or low water production.</li> </ul>	<ul style="list-style-type: none"> <li>• Feed water shut off.</li> <li>• Tank valve closed or partially closed.</li> <li>• Low feed pressure. Feed pressure must be at least 40 psi.</li> </ul>	<ul style="list-style-type: none"> <li>• Turn on feed water.</li> <li>• Open tank valve.</li> <li>• Increase inlet water pressure or install booster pump if feed water pressure is less than 40 psi.</li> </ul>
<ul style="list-style-type: none"> <li>• Leak at filter housing.</li> </ul>	<ul style="list-style-type: none"> <li>• Defective or misaligned O-ring.</li> </ul>	<ul style="list-style-type: none"> <li>• Shut off feed valve and tank valve. Turn on faucet. Change or realign O-ring.</li> </ul>
<ul style="list-style-type: none"> <li>• Leak at threaded connection.</li> </ul>	<ul style="list-style-type: none"> <li>• Not properly tightened.</li> </ul>	<ul style="list-style-type: none"> <li>• Tighten compression fitting.</li> </ul>
<ul style="list-style-type: none"> <li>• Bad-tasting water.</li> </ul>	<ul style="list-style-type: none"> <li>• Post-filter cartridge not flushed completely.</li> </ul>	<ul style="list-style-type: none"> <li>• Flush one or two tanks of pure water through system.</li> </ul>
<ul style="list-style-type: none"> <li>• Water runs to drain all the time.</li> </ul>	<ul style="list-style-type: none"> <li>• Auto-valve not closing properly. See Fig. 1</li> <li>• Check valve not functioning properly</li> </ul>	<ul style="list-style-type: none"> <li>• Purge the system again. Lock the clean water valve open and turn the inlet water on for thirty minutes</li> </ul>
<ul style="list-style-type: none"> <li>• RO Production good at first but falls off in months or weeks.</li> </ul>	<ul style="list-style-type: none"> <li>• High TDS and/or Iron and Manganese.</li> </ul>	<ul style="list-style-type: none"> <li>• Consult your dealer or Factory and provide water analysis.</li> </ul>
<ul style="list-style-type: none"> <li>• TDS reading of output is greater than 10% of input</li> </ul>	<ul style="list-style-type: none"> <li>• RO membrane O-rings leaking.</li> </ul>	<ul style="list-style-type: none"> <li>• Remove RO, replace 2 O-rings</li> </ul>

## 7.0 Two-Year Limited Warranty

Vertex Water Products sells its products through independent water dealers who re-sell the product to the end user.

Vertex warrants the Pure Water Machine to be free from defects in materials and workmanship for a period of TWO YEARS from date of purchase. This warranty does not cover damage resulting from accident, mis-use, neglect, improper installation, or subsection to water pressure in excess of 100 lbs. per square inch. The warranty shall extend only to the original purchaser of the product from a Vertex dealer for use by the purchaser. Any modifications of the product shall render the warranty invalid and Vertex will have no further responsibility. All warranty claims must be made to the Vertex dealer from which the product was purchased.

Vertex shall in no event be liable for any incidental or consequential damages of any kind; the sole obligation of Vertex being limited to repair or replacement of defective parts of product. Proof of purchase, date of purchase, and name of dealer are required.

Any implied warranties herein are limited in duration to a period of two years from the date of original purchase or the shortest period allowed by law.

# 8.0 Performance Data Sheet

## Vertex Pure Water Machine™ Reverse Osmosis Water Filter System

This is a water filter system optimized to produce good drinking water for home use.  
Models are PT-4.0, PT-4.0/P, PT-4.0/5 and PT-4.0/5/P



### WQA GOLD SEAL APPROVAL (Water Quality Association)

This system has been tested and certified by the Water Quality Association according to NSF/ANSI 58 for reduction of the substances listed below. The concentration of the indicated substances in water entering the system was reduced to a concentration less than or equal to the permissible limit for water leaving the system, as specified by NSF/ANSI 58. Test results: Average Clean Water Production Rate = 16.6 gpd at an efficiency rate percentage of 10.1% efficiency. Efficiency rating is the percentage of influent water to the system that is available to the user as reverse osmosis treated water under operating conditions that approximate typical daily usage. Test parameters: 25°C, 50psig and pH of 7.5. Performance under actual conditions may vary.

### Contaminant Reduction Summary

Substance	Influent Challenge Concentration mg/L	Max permissible product water concentration mg/L	Minimum Percent (%) Reduction	Average Percent (%) Reduction
Arsenic (+5)	0.30 ± 10%	0.010	98.7	99.6
Barium	10.0 ± 10%	2.0	97.7	98.8
Cadmium	0.03 ± 10%	0.005	97.3	98.8
Chromium (+6)	0.3 ± 10%	0.1	97.6	99.1
Chromium (+3)	0.3 ± 10%	0.1	99.6	99.7
Copper	3.0 ± 10%	1.3	98.3	99.0
Fluoride	8.0 ± 10%	1.5	96.3	97.7
Lead	0.15 ± 10%	0.010	99.3	99.3
Nitrate/Nitrite	30 ± 10%	10	65.6	75.8
Radium (226/228)	25 pCi/L	5 pCi/L	80.0	80.0
Selenium	0.10 ± 10%	0.05	97.8	98.1
TDS	750 ± 10%	187	88.0	92.2
Turbidity	11 ± 1 NTU	0.5 NTU	96.7	98.9

This system is acceptable for treatment of influent concentrations of 27ppm or less Nitrate and 3ppm of Nitrite in combination and is certified for nitrate/nitrite reduction for water pressure of 40psig or more.

This system has been tested for the treatment of water containing pentavalent arsenic (also known as As(V), As(+5), or arsenate) at concentrations of [0.050 mg/L or 0.30 mg/L] or less. This system reduces pentavalent arsenic, but may not remove other forms of arsenic. This system is to be used on water supplies containing a detectable free chlorine residual or on water supplies that have been demonstrated to contain only pentavalent arsenic. Treatment with chloramines (combined chlorine) is not sufficient to ensure complete conversion of trivalent arsenic to pentavalent arsenic. Please see the Arsenic Facts section of the Performance Data Sheet for further information.

Conforms to NSF/ANSI 58 for pentavalent arsenic reduction. See 8.1 arsenic facts section for an explanation of reduction performance.

### Specifications

36 gallon per day reverse osmosis membrane  
16.6 gallon per day clean water production at 50 psig inlet and at 77°F(25°C)  
Storage tank: 4.0 gallon total volume; 2.2 gallon water volume  
Dimensions: 14in. long by 7in. wide by 18in. high; Tank: 11in. dia by 15 1/2in. high  
Weight: 26 pounds

### Conditions of Use

Do not use with water that is microbiologically unsafe, or of unknown quality, without adequate disinfection before or after the system.  
Pressure: Minimum-40psig; Maximum-100psig  
Temperature: 40 to 100°F  
pH Range = 3.0 to 10, max iron content - 0.3ppm  
Turbidity of inlet water-less than 1.0 NTU, maximum TDS-1500ppm

This system contains replaceable treatment components critical to effective reduction of TDS. Replacement parts and numbers are shown below. The product water should be tested periodically to verify that the system is performing satisfactorily in addition to making the parts replacement specified.

RO Membrane Element 36gpd, P/N MF-4009  
First stage sediment filter, 5-micron, P/N SF-4001  
Second stage activated carbon block, P/N CF-4000  
Post filter fourth stage, activated carbon, P/N IF-4002

Recommended Changeout Interval  
once each 3 years  
once each year  
once each year  
once each year

See OWNER INSTALLATION manual for complete installation/operation and maintenance requirements, including manufacturer's limited warranty.

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# 8.1 Performance Data Sheet

## Vertex Pure Water Machine™ Reverse Osmosis Water Filter System

This is a water filter system optimized to produce good drinking water for home use. Models are PT-4.0/50, PT4.0/P/50, PT-4.0/5/50 and PT-4.0/5/P/50



### WQA GOLD SEAL APPROVAL (Water Quality Association)

This system has been tested and certified by the Water Quality Association according to NSF/ANSI 58 for reduction of the substances listed below. The concentration of the indicated substances in water entering the system was reduced to a concentration less than or equal to the permissible limit for water leaving the system, as specified by NSF/ANSI 58. Test results: Average Clean Water Production Rate = 32 gpd at an efficiency rate percentage of 14.6% efficiency. Efficiency rating is the percentage of influent water to the system that is available to the user as reverse osmosis treated water under operating conditions that approximate typical daily usage. Test parameters: 25°C, 50psig and pH of 7.5. Performance under actual conditions may vary.

### Contaminant Reduction Summary

Substance	Influent Challenge Concentration mg/L	Max permissible product water concentration mg/L	Minimum Percent (%) Reduction	Average Percent (%) Reduction
Arsenic (+5)	0.30 ± 10%	0.010	98.7	99.6
Barium	10.0 ± 10%	2.0	97.7	98.8
Cadmium	0.03 ± 10%	0.005	97.3	98.8
Chromium (+6)	0.3 ± 10%	0.1	97.6	99.1
Chromium (+3)	0.3 ± 10%	0.1	99.6	99.7
Copper	3.0 ± 10%	1.3	98.3	99.0
Fluoride	8.0 ± 10%	1.5	96.3	97.7
Lead	0.15 ± 10%	0.010	99.3	99.3
Radium (226/228)	25 pCi/L	5 pCi/L	80.0	80.0
Selenium	0.10 ± 10%	0.05	97.8	98.1
TDS	750 ± 10%	187	88.0	92.2
Turbidity	11 ± 1 NTU	0.5 NTU	96.7	98.9

This system has been tested for the treatment of water containing pentavalent arsenic (also know as As(V), As(+5), or arsenate) at concentrations of [0.050 mg/L or 0.30 mg/L] or less. This system reduces pentavalent arsenic, but may not remove other forms of arsenic. This system is to be used on water supplies containing a detectable free chlorine residual or on water supplies that have been demonstrated to contain only pentavalent arsenic. Treatment with chloramines (combined chlorine) is not sufficient to ensure complete conversion of trivalent arsenic to pentavalent arsenic. Please see the Arsenic Facts section of the Performance Data Sheet for further information

Conforms to NSF/ANSI 58 for pentavalent arsenic reduction. See 8.1 arsenic facts section for an explanation of reduction performance.

### Specifications

50 gallon per day reverse osmosis membrane  
 32 gallon per day clean water production at 50 psig inlet and at 77°F(25°C)  
 Storage tank: 4.0 gallon total volume; 2.2 gallon water volume  
 Dimensions: 14in. long by 7in. wide by 18in. high Tank: 11in. dia by 15 1/2in. high Weight: 26 pounds

### Conditions of Use

Do not use with water this is microbiologically unsafe, or of unknown quality, without adequate disinfection before or after the system.  
 Pressure: Minimum-40psig; Maximum-100psig  
 Temperature: 40 to 100°F  
 pH Range = 3.0 to 10, max iron content - 0.3ppm  
 Turbidity of inlet water-less than 1.0 NTU, maximum TDS-1500ppm

This system contains replaceable treatment components critical to effective reduction of TDS. Replacement parts and numbers are shown below. The product water should be tested periodically to verify that the system is performing satisfactorily in addition to making the parts replacement specified.

RO Membrane Element 50gpd, P/N MM-4220  
 First stage sediment filter, 5-micron, P/N SF-4001  
 Second stage activated carbon block, P/N CF-4000  
 Post filter fourth stage, activated carbon, P/N IF-4002

Recommended Changeout Interval  
 once each 3 years  
 once each year  
 once each year  
 once each year

See OWNER INSTALLATION manual for complete installation/operation and maintenance requirements, including manufacturer's limited warranty.

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## 8.2 Arsenic Facts

Arsenic (abbreviated As) is found naturally in some well water. Arsenic in water has no color, taste, or odor. It must be measured by a laboratory test. Public water utilities must have their water tested for arsenic. You can get the results from your water utility. If you have your own well, you can have the water tested. The local health department or state environmental health agency can provide a list of certified labs. The cost is typically \$15 to \$30. Information about arsenic in water can be found on the internet at the U.S. Environmental Protection Agency website: [www.epa.gov/safe-water/arsenic.html](http://www.epa.gov/safe-water/arsenic.html).

There are two forms of arsenic: pentavalent arsenic (also called As(V), As(+5), and arsenate) and trivalent arsenic (also called As(III), As(+3), and arsenite). In well water, arsenic may be pentavalent, trivalent, or a combination of both. Special sampling procedures are needed for a lab to determine what type and how much of each type of arsenic is in the water. Check with the labs in your area to see if they can provide this type of service.

Reverse osmosis (RO) water treatment systems do not remove trivalent arsenic from water very well. RO systems are very effective at removing pentavalent arsenic. A free chlorine residual will rapidly convert trivalent arsenic to pentavalent arsenic. Other water treatment chemicals such as ozone and potassium permanganate will also change trivalent arsenic to pentavalent arsenic. A combined chlorine residual (also called chloramine) may not convert all the trivalent arsenic. If you get your water from a public water utility, contact the utility to find out if free chlorine or combined chlorine is used in the water system.

The PT-4.0, PT-4.0/P, PT-4.0/5 and PT-4.0/5/P systems are designed to remove pentavalent arsenic. They will not convert trivalent arsenic to pentavalent arsenic. The system was tested in a lab. Under testing conditions, the systems reduced 0.30 mg/L (ppm) pentavalent arsenic to 0.010 mg/L (ppm) (the USEPA standard for drinking water) or less. The performance of the system may be different at your installation. Have the water tested for arsenic to check whether the system is working properly.

The RO component (MF-4009) of the PT-4.0 system must be replaced every 12 months or when the test above rises above 10ppm to ensure the system will continue to remove pentavalent arsenic. The component identification and locations where you can purchase the component are listed in the installation/operation manual.

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## 9.0 Other Models

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### 9.1 PT-4.0/P and PT-4.0/5/P Pure Water Machine with booster pump

The booster pump is used when the city water pressure is below 40 psi. The booster pump allows the RO system to run at peak efficiency by providing a pressure of about 80 psi to the RO membrane. (See Fig. 11)

The standard model PT-4.0/P, 4-stage system with pump, has these additional features:

1. A 24 volt DC diaphragm pump powered by a step down transformer (115 VAC/24 VDC 60 Hz). An electrical outlet is recommended to be close by the RO installation point.
2. A high pressure switch to monitor the pressure in the storage tank and turn off the pump when the tank is full

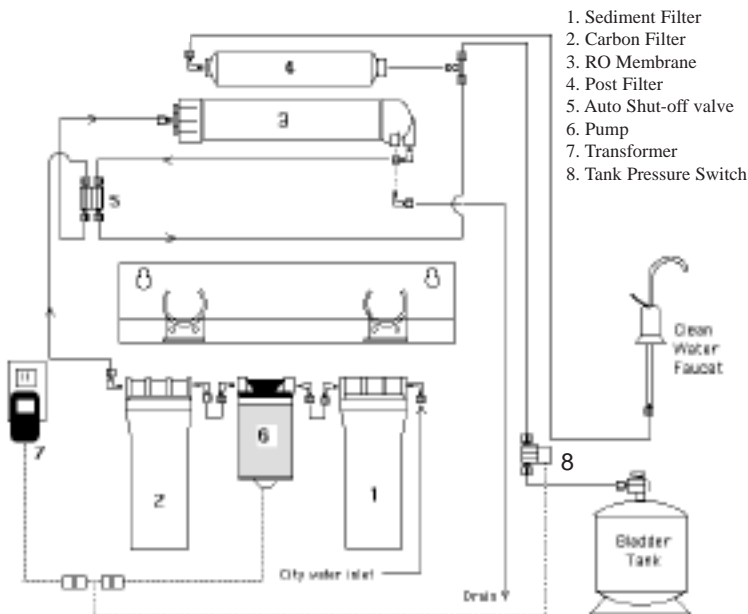
## Installation and Operation

Install the RO system per the instructions in the previous section of this manual.

To start the RO system operating, turn on the water supply. But before plugging in pump transformer, perform the air-purge procedure outlined in section 3.2. After air-purge has been completed plug in pump transformer to an electrical outlet. The pump will start running. From this point on follow the rest of the start-up procedure. The pump will now operate automatically. The pump will start running. From this point on follow the normal start up procedure for the RO system. The pump will now operate automatically.

**Figure 11**

### General Schematic - PT-4.0 with Pump



## Appendix A: Theory of Operation

Flow Schematic (See figure A-1)

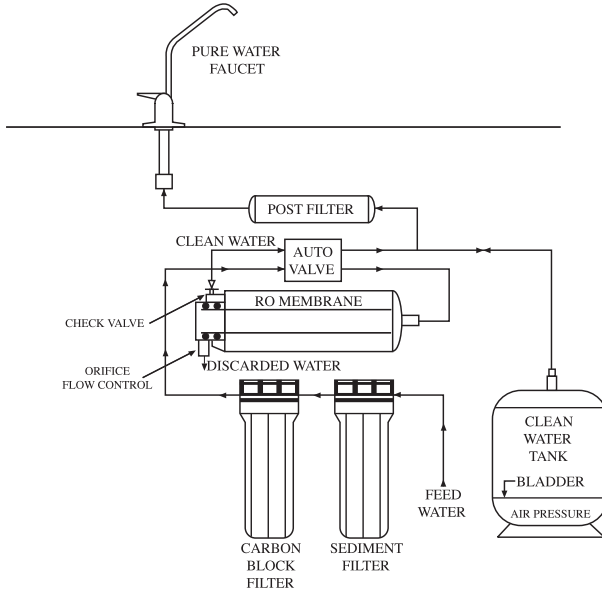


FIGURE A-1

### A.1 Pre-Filters:

The pre-filters have two purposes, one is to clean the water for better consumption, and the second is to prevent the RO membrane from being fouled. The first stage filter removes sediment materials such as sand, rust, pipe scale, and dirt. It is made of a spun polypropylene material that will take out particles down to 5 -microns.

The water then goes to the carbon block filter, which is important for two reasons. First, it takes out 90% of the chlorine in the water thereby protecting the RO membrane from damage by the presence of chlorine. It also removes the taste of the chlorine, as well as other tastes and odors that affect the drinking water changing the flavor of tea, coffee or other mixed drinks. (The carbon accomplishes this by adsorption on its surface). This is a chemical/mechanical process unique to carbon that has been activated -made to have high surface area. The second reason is that the carbon block also takes out VOC's (volatile organic chemicals) which are contaminants from industrial pollution. Claims for reduction of chlorine and VOCs have not yet been certified by the Water Quality Association.

### A.2 The Reverse Osmosis Membrane:

This is the heart of the Machine, and the great protector. The membrane is a replication of human or animal stomach tissue, which permits the water molecule to pass through, but holds the dissolved molecules back. This occurs naturally by osmotic pressure developed because of the content of dissolved solids. To make this happen with the RO membrane we reverse the osmotic pressure by applying pressure to the water (reversing the process of generating pressure) to push the water molecules through the membrane, but keeping most of the dissolved solid molecules behind.

The reverse osmosis technology will, on average, reject 93% of the total dissolved solids in the incoming water. Over time, the RO membrane will foul with a very thin layer of materials and the efficiency will drop, so that the TDS content of the clean water will rise. When it rises to greater than 30% of the inlet TDS value, it is an indicator that the RO membrane should be replaced. This occurs every 3-4 years. (See section 4)

About 4 gallons of water is discarded for every gallon of pure water made. In Figure A-1, the discard is shown with a flow control orifice at the outlet of the RO stage. This is designed to hold back the discard water to the above ratio, and maintain pressure on the water in the membrane. For a 35-gallon per day membrane, approximately 368 milliliters per minute of water are discarded. Note there is a check valve on the clean water outlet from the RO. The purpose is to prevent backflow of water to the membrane from the tank or faucet or because of autovalve failure. In the average household, about 3 gallons of drinking water are used a day.

### **A.3 Auto Control:**

As water is produced the pressure in the storage tank increases. To stop production of water when the tank is full, an auto control valve is used in the system, as shown in Figure A-1. The pressure in the tank is set nominally to be 2/3 of the incoming line pressure. When this ratio is reached the autovalve will close. Normal U.S. city water pressure is 60-psi, therefore the tank pressure, when water flow stops, is 40-psi.

The purified water goes to the tank where it is stored at pressure as described above. The tank has a bladder in it, and on one side is air at 6-psi, initially. The initial volume of the storage tank is 4.0 gallons. As the water fills the tank, it pushes against the bladder, and raises the pressure as it takes space in the tank. When the pressure increases to 40-psi, water flow stops. The net amount of water in the tank when full, less the space taken by the air at 40-psi is approximately 2.5 gallons. When water is drawn through the clean water faucet on the sink, the water flows through the final activated carbon post filter, which polishes the water by taking out any staleness which has set in. When water is supplied to the refrigerator, the line should be therefore taken after the post filter.

When the raw water pressure available is 40-psi or less, the RO membrane will not operate efficiently or produce water at a reasonable rate. To overcome this use a system with a booster pump which will raise the water pressure to 80-psi. This is the MODEL PT-4.0/P described in Section 9.1.

## Notes

### Water Disinfection with chlorine bleach (5.25%)

<u>Quantity</u>	<u>Clean Water</u>	<u>Cloudy Water</u>
1 quart	2 drops	4 drops
1 gallon	8 drops	16 drops
5 gallons	1/2 tsp.	1 tsp.



**VERTEX WATER PRODUCTS**  
**Montclair, CA**

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