SpectraPure®
INNOVATORS IN WATER TECHNOLOGY

The CSP™ RO System

Reverse Osmosis Water Purification System

(Single and Dual Membrane Models)

INSTALLATION AND OPERATING MANUAL

WARNING

Please read carefully before proceeding with installation. Failure to follow any attached instructions or operating parameter may lead to the product's failure and possible damage to property.

09-26-2019

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Thank You for your purchase of a SpectraPure® System. With proper installation and maintenance, this system will provide you with high quality water for years to come. All SpectraPure® products are rigorously tested by us for safety and reliability. If you have any questions or concerns, please contact our customer service department at 1.800.685.2783 or refer to our online troubleshooting at www.spectrapure.com.

SYSTEM SPECIFICATIONS:

Sediment Prefilter	0.5 micron MicroTec™ sediment prefilter (SF-MT-0.5-10)
Carbon Filter	0.5 micron carbon block prefilter (CF-0.5-10)
RO Membrane Type	Thin-Film Composite (TFC)
Rejection Rate	Greater than 96% average
Input Water Pressure	60 psi (4.15 bar) line pressure*
Input Water Temp	77˚F (25˚C)
Recovery Rate	25% (i.e. 25% of the water will be collected as pure water)

Nominal Membrane Flow Rates @ 60 psi & 77˚ F:

GPD (lpd)	Product Water Flow Rate	Concentrate Flow Rate
90 (340)	236 ml/min	708 ml/min
180 (680)	473 ml/min	1419 ml/min

Reverse Osmosis Feed Water Requirements:

For the 1 year TFC membrane prorated warranty to be honored, the following conditions must be met:

Operating Pressure*	40 – 80 psi (2.75 – 5.5 bar)
pH Range	3 – 11
Maximum Temperature	113˚ F (45˚ C)
Maximum Turbidity	1.0 NTU
Maximum Silt Density Index	5.0 (based on 15 min. test time)
Maximum Chlorine	less than 0.1 ppm
Maximum TDS	2000 ppm
Maximum Hardness	10 grains (170 ppm as CaCO3)
Maximum Iron	less than 0.1 ppm
Maximum Manganese	less than 0.1 ppm
Maximum Hydrogen Sulfide	0 ppm
Langelier Saturation Index	LSI must be negative

*Operating pressure less than 40 psi may require a booster pump:
less than 49 GPD use BPLF-MO-115(-230),
more than 49 GPD use BPHF-MO-115(-230)

*Operating pressure greater than 80 psi will require a pressure reducing valve.

Warning: SpectraPure does not recommend drinking deionized water.

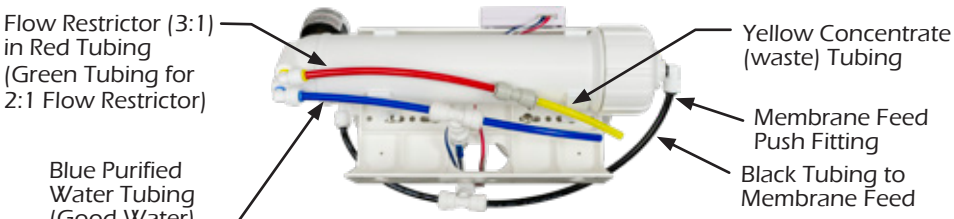
SYSTEM DESCRIPTION:

The CSP™ RO System is a three stage reverse osmosis system.

1. First, the incoming feed water is passed through a 0.5 micron MicroTec™ sediment prefilter. This filter is required to remove excess turbidity (particulate matter) that may cause the membrane to plug.
2. The second stage of filtration is a 0.5 micron carbon block prefilter. This filter removes organics and chlorine from the feed water that can damage the membrane.
3. The third filtration stage of the system is a high rejection thin film composite (TFC) reverse osmosis membrane. It removes over 96% of most inorganic salts, all microorganisms and almost all high molecular weight organics in the water.

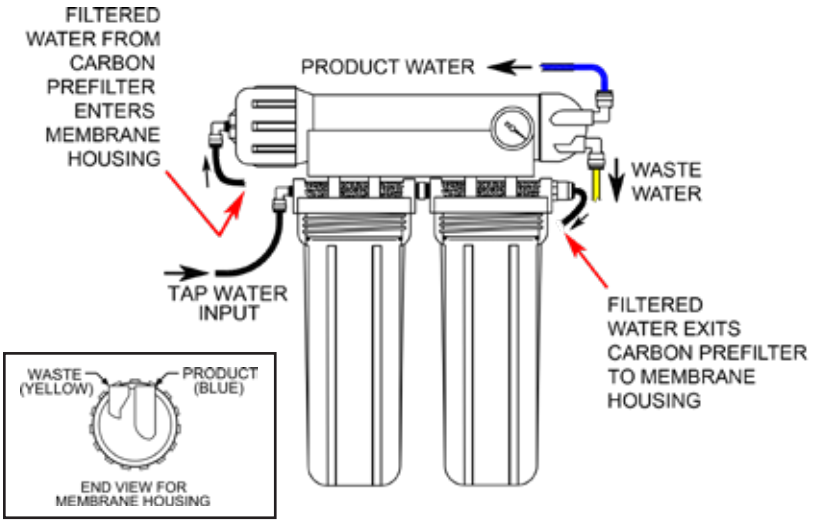
Fig. A: System Diagram

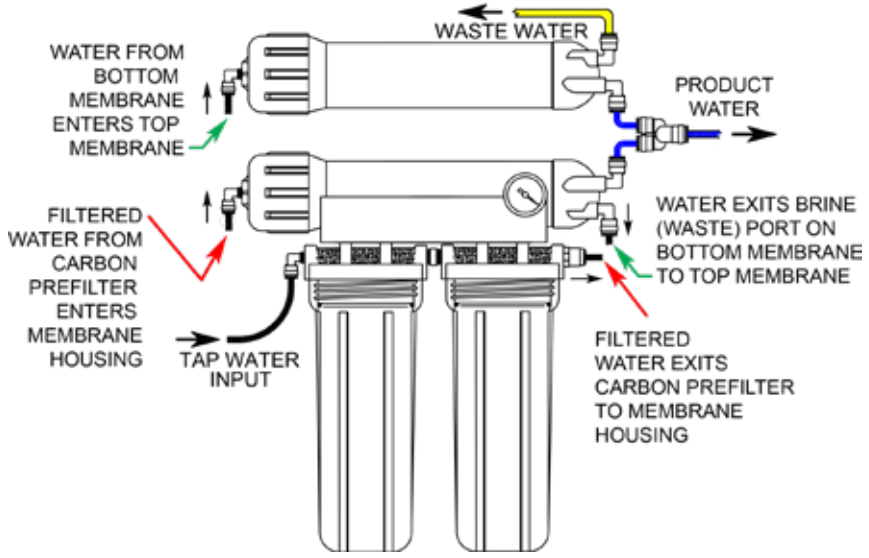
Front View



Top View

SINGLE MEMBRANE SYSTEM-FIGURE B





DUAL MEMBRANE SYSTEM-FIGURE C

WHAT IS REVERSE OSMOSIS?

Osmosis is a process in nature that allows fluid of a lower concentration to pass through a semi-permeable membrane into a fluid of a higher concentration (See Figure 1). Because of the difference in salt concentration, pure water flows through the membrane as though a pressure were being applied to it (Figure 2). The effective driving force is called the osmotic pressure. As a rough guide, the osmotic pressure is equal to about 1 psi (pounds per square inch) per 100 ppm Total Dissolved Solids (TDS). When enough pressure is applied to the solution with a higher concentration it can then pass through the membrane into the solution of lower concentration. (See Figure 3). This is the basis of Reverse Osmosis.

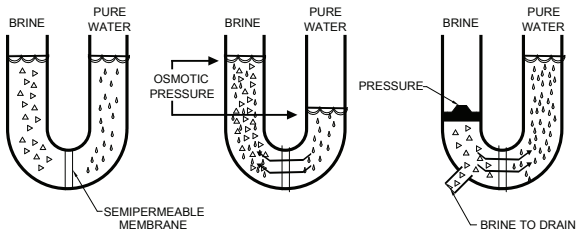


Figure 1 **Figure 2** **Figure 3**

Household water pressure is used to force tap water through the semipermeable RO membrane. The membrane only allows the purest of water molecules to pass through it while over 98% of most salts and other impurities are rejected and automatically rinsed from the membrane down the drain.

WHAT DOES THE SYSTEM DO?

SpectraPure's CSP™ RO System uses household water pressure to reverse a natural physical process called osmosis. Water, under pressure, is forced through a semipermeable membrane where minerals and impurities are screened out and sent down the drain with waste water. These minerals and impurities are measured as total dissolved solids (TDS).

The system connects to a house COLD water pipe for a water supply. The system includes replaceable sediment, carbon prefilters and a membrane. The sediment prefilter removes sand, dirt, rust particles and other particulates while the carbon prefilter takes chlorine and organics out of the feed water. The water then passes through the RO membrane.

The CSP™ System gives you a continuous supply of sparkling clear, delicious water for drinking, cooking, hydroponics etc. Foods will look better and taste better too. The reliability with the CSP™ Water Treatment System is greatly improved over other systems and costly maintenance is avoided. The system eliminates the need to buy bottled water. Instead, it puts high quality water at your fingertips.

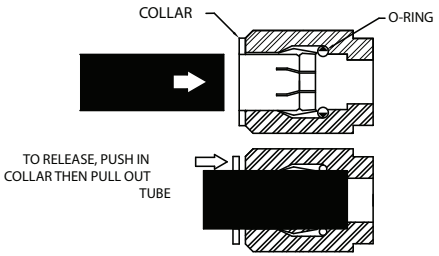
WORKING WITH PUSH FITTINGS:

To remove the tubing from its push fitting:

1. Firmly depress and hold the push fitting collar down with your thumbnail.
2. While the push fitting collar is depressed, pull the tubing straight out of the push fitting. Once the tubing is removed, release the collar.

To reinsert the tubing into its push fitting:

1. Moisten the O-ring seal inside the push fitting by dripping a few drops of clean water into the fitting.
2. Grasp the tubing near the end, and insert the tubing into the push fitting.
3. Push the tubing into the fitting until resistance is felt, approximately 1/2 inch (12.7 mm). The tubing is now resting on the O-ring seal inside the fitting.
4. Firmly push the tubing approximately an additional 1/4 inch (6.35 mm) further into the fitting to completely seat the line into the fitting and past the O-ring seal.
5. Turn on the system water supply and check for leaks prior to further use or testing. If a leak is observed, you may not have pushed the tubing into the push fitting far enough to seal the tubing against the O-ring. Turn off the system water supply and reseat the tubing as described above.



CHOOSING A MOUNTING LOCATION:

When considering a location for the installation of the RO System, take the following factors into account:

Light Sources

1. Most of the components of this system are plastic and are subject to damage by ultraviolet light from the sun and other sources such as metal halide lighting.
2. Algae is more likely to thrive inside the clear filter housings when exposed to bright light.
3. Avoid installing this unit in bright light or direct sunlight.

Temperature Extremes

1. The unit must be kept out of areas that are subject to freezing temperatures.
2. High temperatures greater than 113° F (45° C) must be avoided. If the unit is used outside, avoid putting the system in direct sunlight or connecting it to a garden hose that may be exposed to sunlight.

TIPS FOR LONG MEMBRANE LIFE:

1. Replacement of 0.5 micron sediment filter once every 6 months. This will prevent membrane fouling due to silt or sediment depositing on the membrane.
2. Replacement of 0.5 micron carbon block filter at least once every 6 months or when chlorine breakthrough occurs. This will ensure good membrane life and protect the membrane from chlorine damage.
3. Membrane should not be operated at lower than the recommended concentrate to purified water ratios.
4. Operating reverse osmosis systems on softened feed water greatly reduces the chances of membrane fouling.

STORAGE

1. It is recommended that you store your RO System in a cool place when not being used. Do not let the membrane dry out.

SYSTEM INITIALIZATION:

1. Attach the garden hose adapter **(connected to the black tubing)** to your cold water source. Never run hot water (greater than 113˚F/45˚C) through the system.
2. Place the **yellow concentrate (waste) tubing** and the **blue purified (product) water tubing** into a drain. Do not restrict flow from these lines.
3. Open the cold water supply valve. You may use pressure up to 80 psi (5.5 bar).

   CAUTION: Check the system to ensure that all fittings are tight and leak- free before leaving the system unattended. (If anything is leaking, contact SpectraPure for assistance.)

   NOTE: It is recommended that at least 2 gallons (7.57 liters) of purified water be discarded now before collecting purified water for use. If the unit is not used for several days, run the system for at least 10 minutes before collecting any water. This will flush out any stale water in the system.
4. Finish the installation by connecting the yellow line to a drain. The blue line may be placed into a Rubbermaid™ trash can or set up for automatic operation using a Liquid Level Controller (LLC-S-115), (LLC-M-115) or the Auto ShutOff Kit (ASOFK).

SpectraPure® Inc. Assumes no responsibility for water damage due to leaks. It is the user's responsibility to determinethat the system is leak-free.

Membrane Output Calculation

Membranes produce the rated gallons per day (GPD) at 60 psi (4.1 bars) operating pressure, 77°F (25°C) operating temperature and 250 ppm total dissolved solids.

Membrane output gallons per day (GPD) depends on operating pressure, water temperature and the ppm TDS in the feed water.

Expected GPD = Rated GPD × PCF × TCF

PCF is the pressure correction factor
TCF is the temperature correction factor

Calculation of Pressure Correction Factor (PCF): The output (GPD) from the membrane is directly proportional to the applied pressure.

NOTE: The membrane is rated to produce the rated GPD at 60 psi. For any pressure other than 60 psi the output GPD is multipled by the PCF.

PCF = Line Pressure (in psi) ÷ 60

Calculation of Temperature Correction Factor (TCF): The output (GPD) also decreases with decrease in temperature. This is because water viscosity increases with decrease in water temperature.

Temperature Correction Factor Table (TCF)

°F /°C	TCF	°F /°C	TCF	°F /°C	TCF
41.0 /5	0.521	59.0 /15	0.730	77.0 /25	1.000
42.8 /6	0.540	60.8 /16	0.754	78.8 /26	1.031
44.6 /7	0.560	62.6 /17	0.779	80.6 /27	1.063
46.4 /8	0.578	64.4 /18	0.804	82.4 /28	1.094
48.2 /9	0.598	66.2 /19	0.830	84.2 /29	1.127
50.0 /10	0.620	68.0 /20	0.857	86.0 /30	1.161
51.8 /11	0.640	69.8 /21	0.884	87.8 /31	1.196
53.6 /12	0.661	71.6 /22	0.912	89.6 /32	1.232
55.4 /13	0.684	73.4 /23	0.941	91.4 /33	1.267
57.2/14	0.707	75.2 /24	0.970	93.2 /34	1.304

Membrane Output Calculation Example

What is the expected GPD from a 90 GPD System at 40 psi pressure and 60°F water temperature?

PCF = 40 ÷ 60 = 0.666
TCF = 0.754
Expected GPD = 90 × 0.666 × 0.754 = 45.2 GPD ± 20%

45.2 GPD would be the Actual Production Rate

Membrane Performance Test

The performance of a RO membrane is measured by its ability to reject salts (or TDS-Total Dissolved Solids).

Important: Test the quality of the membrane once every 6 months.

Note: This procedure will require the use of the DM-1 TDS Meter.

Procedure:

1. Measure tap water TDS. This is the "IN" setting on the meter. (Call it X)
2. Run the system for 10-15 minutes.
3. Measure RO water TDS directly on the "OUT" setting on the meter. (Call it Y).
4. Subtract RO water TDS from tap water TDS. (X - Y)
5. Divide this quantity by tap water TDS. (X - Y) ÷ X
6. Rejection = [(X - Y) ÷ X] ×100

Rejection of the RO Membrane Calculation Example

1. Tap water TDS = 150 ppm (X)
2. RO water TDS = 7 ppm (Y)
3. X - Y = 143 ppm
4. (X - Y) ÷ X = 143 ÷ 150 = 0.953
5. Rejection = [(X - Y) ÷ X] ×100 = 0.953 ×100 = 95.3

Membrane TDS Rejection = 95.3 %: Rejection rates less than 95% may indicate that the membrane should be replaced.

METERING AND DIAGNOSTICS:

This SpectraPure purification system has been fully equipped with sufficient instrumentation to make monitoring and troubleshooting an easy process. The provided pressure gauge is used to determine the tap water pressure and to evaluate the condition of the sediment and carbon prefilters.

USING THE PRESSURE GAUGE

The pressure gauge is used to monitor the condition of the Sediment and Carbon Prefilters **(not the RO Membrane)**. When the filters are new, the gauge will indicate the actual available house water pressure. As the filters collect particulates, the pressure will begin to drop. A 15-20% (or more) drop in pressure would indicate that the prefilters are in need of replacement.

USING THE DUAL-PROBE TDS METER (DM1 METER)

The digital TDS meter (dual probe) will provide a reliable means of evaluating the performance of the RO membrane. The numbers from the two probe readings can be used to calculate the percentage of rejection of the (TFC) RO membrane.

The "IN" position of the switch relates to the "IN" probe installed on the black tap water line before the RO membrane.

The "OUT" position of the switch relates to the "OUT" probe installed on the blue RO product water line after the RO membrane.

Warning!!:

The DM1 TDS Meter does not detect the presence of CO2, silica, organic contaminants or microorganisms, nor should it be used as a medical or scientific instrument. It should be used as an indicator or guide only, and does not imply that the water is safe for human consumption. No application other than monitoring the electrical conductivity of water is expressed or implied.

SEDIMENT PREFILTER REPLACEMENT:

A Sediment Filter will usually last approx. 4-6 months, depending on the quality of the tap water and quantity of water being produced. (The life span of the filter is determined by the turbidity, iron content, organics, and total particulate volume in your water source). The best way to determine when your Sediment Prefilter needs replacement is to monitor the Pressure Gauge. When you have a drop in pressure of 15-20% below your normal gauge pressure, replace the filter. To verify this, run water through the system without the filter in its housing. If the pressure returns to your normal house pressure without the filter, you will know the filter you just took out was plugged up and causing the pressure drop.

**NOTE: A drop in the system's production is, in most cases, an indication that the sediment filter has become saturated with contaminants and will need to be replaced. If you remove the sediment and the pressure does not return to normal, the carbon filter may be plugged. If your water contains a great deal of sediment or chlorine, the prefilters may require more frequent changes to maintain adequate production rate and extended membrane life.

Sediment Prefilter Replacement

Materials Required: 0.5 micron MicroTec™ Sediment Filter (SF-MT-0.5-10), Filter Wrench

Procedure:

1. Turn off water supply to the system.
2. Refer to Fig. A (System Diagram). Using the provided filter housing wrench, remove the housing on the left. Unscrew it counterclockwise as viewed from the bottom.
3. Remove the old filter and discard.
4. Thoroughly wash the housing with a mixture of hot soapy water and a few teaspoons of household bleach. Rinse well with clean hot water.
5. Install the new prefilter onto the round port in the head of the housing, Screw the housing back onto the assembly and hand-tighten **only**.

   NOTE: **Do not use filter wrench to tighten housings. Over-tightening will damage housings and void your warranty.**
6. Proceed with carbon block filter replacement.

* If your water contains a great deal of sediment or chlorine, the prefilters may require more frequent changes to maintain adequate production rate and extended membrane life.

CARBON BLOCK FILTER REPLACEMENT:

A Carbon Filter will usually lasts 4-6 months ,depending on the chlorine (or chloramine) content of your tap water and quantity of water being produced. The best way to determine when your Carbon Block Prefilter needs replacement is to use a chlorine test kit.

Any chlorine level above 0.1 ppm will cause damage to the membrane and indicates that the carbon block filter must be changed. To test for chlorine breakthrough, collect a 10 ml sample of the concentrate from the yellow tubing and test the chlorine concentration using test kit TK-CL-10-KIT. If the chlorine concentration is above 0.1ppm, replace the carbon prefilter.

**NOTE: A drop in the system's production is, in most cases, an indication that the sediment filter has become saturated with contaminants, but a carbon filter can also decrease production if it's covered with extremely fine sediment. If the carbon becomes plugged with sediment, it will no longer be able to remove chlorine.

Carbon Block Filter Replacement

Materials Required: 0.5 micron Carbon Block Filter (CF-0.5-10), Filter Wrench, Chlorine Test Kit (TK-CL-10-KIT)

Procedure:

1. Turn off water supply to the system.
2. Refer to Fig. A (System Diagram). Using the provided filter housing wrench, remove the housing on the right. Unscrew it counterclockwise as viewed from the bottom.
3. Remove the old filter and discard.
4. Thoroughly wash the housing with a mixture of hot soapy water and a few teaspoons of household bleach. Rinse well with clean hot water.
5. Install the new carbon block filter, making sure that the black gaskets on both ends of the filter are firmly seated in the gasket recesses.
6. Screw the housing back onto the assembly and hand-tighten **only**.

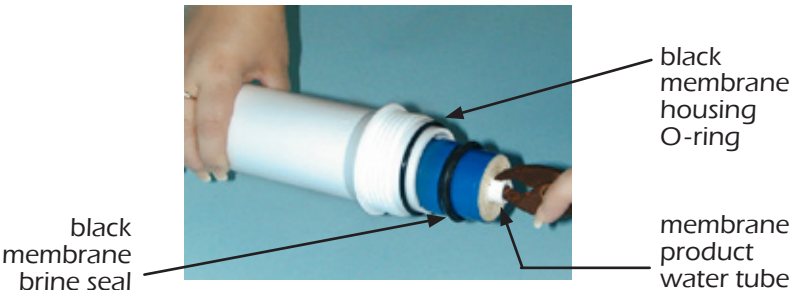
   NOTE: Do not use filter wrench to tighten housings. Over-tightening will damage housings and void your warranty.

7. Turn on system water supply and check for leaks.

RO MEMBRANE REPLACEMENT:

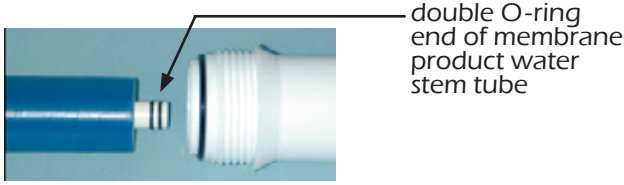
1. Turn off the water supply to the RO system. Place the system where the membrane housing is easily accessible.
2. Remove the black tubing from the membrane feed push fitting by depressing the collar on the fitting with your thumb and pulling the tubing from the push fitting (Page 9).
3. Lift the membrane housing from the retention clips.
4. Unscrew the membrane housing lid. This may require two people.
5. Use a pair of pliers to grasp the membrane stem and pull the membrane from the housing (Fig. D).

Fig. D: Removing the Membrane Element



6. Remove the black housing O-ring (Fig. D). Wash the empty housing with soapy water. Rinse thoroughly with hot, clean water.
7. Insert new membrane into the housing, with the double O-ring end first (Fig. E). The tube must fit into the recess at the bottom of the membrane housing. When the membrane is aligned with the hole, firmly push the membrane into the hole until it bottoms out.

Fig. E: Inserting the New Membrane Element



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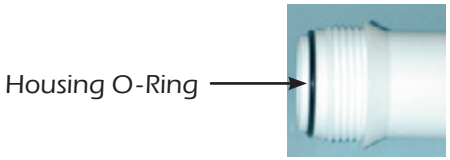
8. Place the black housing O-ring on the housing rim and carefully screw the lid back on to the base.



9. Reconnect the black tubing to the membrane feed push fitting.

NOTE: If you have a dual-membrane system, perform steps 2 thru 9 on the second membrane now.

TROUBLESHOOTING GUIDE:

Product Water - Low Production Rate

Cause	Corrective Action
Plugged prefilters	Replace prefilters
Low water temperature	Heat feed water or use higher GPD membrane
Low feed pressure	Use booster pump or use higher GPD membrane
Fouled membrane	Replace membrane

ONE YEAR LIMITED WARRANTY:

SpectraPure, Inc.® warrants the product to the original owner only to be free of defects in material and workmanship for a period of one year from the date of receipt. SpectraPure's liability under this warranty shall be limited to repairing or replacing at SpectraPure's option, without charge, F.O.B. SpectraPure's factory, any product of SpectraPure's manufacture. SpectraPure will not be liable for any cost of removal, installation, transportation or any other charges which may arise in connection with a warranty claim. Products which are sold but not manufactured by SpectraPure are subject to the warranty provided by the manufacturer of said products and not by SpectraPure's warranty. SpectraPure will not be liable for damage or wear to products caused by abnormal operating conditions, accident, abuse, misuse, unauthorized alteration or repair or, if the product was not installed in accordance with SpectraPure's or other manufacture's printed installation and operating conditions, or damage caused by hot water, freezing, flood, fire or acts of God.

SpectraPure will not be responsible for any consequential damages arising from installation or use of the product, including any water or mold damage due to flooding which may occur due to malfunction or faulty installation, including, but not limited to failure by installer to over- or under-tighten fittings, housings, and/or push-style fittings, or improper installation of push-style fittings. Consumable items such as prefilters and membranes are not covered under the one year warranty.

To obtain service under this warranty, the defective system or components must be returned to SpectraPure with proof of purchase, installation date, failure date and supporting installation data. Any defective product to be returned to the factory must be sent freight prepaid. Documentation supporting the warranty claim and a Return Merchandise Authorization (RMA) number must be included. SpectraPure will not be liable for shipping damages due to the improper packaging of the returned equipment and all returned goods must also have adequate insurance coverage and a tracking number.

SpectraPure will not pay for loss or damage caused directly or indirectly by the presence, growth, proliferation, spread or any activity of "fungus", wet or dry rot or bacteria. Such loss or damage is excluded regardless of any other cause or event that contributes concurrently or in any sequence to the loss. We will not pay for loss or damage caused by or resulting from continuous or repeated seepage or leakage of water, or the presence or condensation of humidity, moisture or vapor, that occurs over a period of 14 days or more. "Fungus" and "fungi" mean any type or form of fungus or Mycota or any byproduct or type of infestation produced by such fungus or Mycota, including but not limited to, mold, mildew, mycotoxins, spores, scents or any biogenic aerosols.

SpectraPure will not be liable for any incidental or consequential damages, losses or expenses arising from installation, use, or any other causes. There are no expressed or implied warranties, including merchantability or fitness for a particular purpose, which extend beyond those warranties described or referred to above.

* **The one year limited warranty does not apply to consumable items, including but not limited to, filters and cartridges unless specifically stated above.**

TERMS AND CONDITIONS:

1. Shipping charges on units or parts submitted to our facility for repair or replacement must be borne by the registered purchaser. After repair or replacement, the factory will return the unit or part freight prepaid to the customer.
2. We assume no warranty liability in connection with our equipment other than as herein specified.
3. This warranty is in lieu of all other warranties expressed or implied, including warranties of fitness for a particular purpose.
4. We do not authorize any person or representative to assume for us any other obligation on the sale of our equipment. This is the exclusive remedy and liability for consequential damages under any and all warranties which are excluded to the extent exclusion is permitted by law.
5. Proof of original purchase date must accompany all warranty claims.
6. SpectraPure, Inc. Reserves the right to change prices without notice when necessary. All prices in the catalog are quoted in US dollars.
7. Claims for error in quantity or condition must be made within 10 days of receipt of material. SpectraPure, Inc. will not be responsible for any claimed shortages not reported within 10 days. Returns other than warranty claims may be subject to 20% restocking fee.
8. SpectraPure, Inc. cannot be held liable for damage or loss to a shipment by a freight carrier. Check shipment for damage before acceptance or note on freight bill subject to inspection for concealed damage. Consignee must file claim. SpectraPure, Inc. will offer as much assistance as possible.
9. A complete credit check is required prior to shipping on a Net 30 basis. In the interim period during which credit references are being evaluated, all orders must be prepaid until approved.
10. All returned checks (due to insufficient funds or closed accounts) will be subjected to a **$35 penalty charge.**
11. Invoices on Net 30 accounts not paid within 30 days of shipment will be considered delinquent and will accrue Finance charges at the rate of 1.5% per month (18% per annum).

REPLACEMENT PARTS:

Part Number	Description
SF-MT-0.5-10	0.5 micron MicroTec™ Sediment Filter
CF-0.5-10	0.5 micron Carbon Block Prefilter
MEM-0090	90 gpd TFC Membrane (Use 2 for 180 gpd systems)
FR-90-RED, -GRN	Flow Restrictor for 90 gpd (340 lpd) System
FR-180-RED, -GRN	Flow Restrictors for 180 gpd (680 lpd) System

* Green Flow Restrictors have a 2:1 waste ratio recommended for water <180 ppm
Red Flow Restrictors have a 3:1 waste ratio recommended for water ≥180 ppm

ACCESSORIES:

Part Number	Description
MTR-TDS-EZ	Handheld TDS Meter
COM-100	Handheld Conductivity Meter
MTR-PH80	Handheld pH Meter
FAU-SNP	Quick Connect Faucet Adapter
TK-CL-10-KIT	Total Chlorine Test Kit
TK-CL-10TABS	10 Replacement Tabs for Chlorine Test Kit
GHA-4	1/4" Garden Hose Adapter
WR-UNIV	Filter Wrench
VA-FVK-4	Flush Valve Kit
BPLF-MO-115	Low-Flow (≤60GPD) Booster Pump, 115V
BPLF-MO-230	Low-Flow (≤60GPD) Booster Pump, 230V
BPHF-MO-115	High-Flow (>60GPD) Booster Pump, 115V
BPHF-MO-230	High-Flow (>60GPD) Booster Pump, 230V

See our Web Site for Liquid Level Controls
and other Optional Accessories

Warning: SpectraPure does not recommend drinking deionized water.