REPLACEMENT PARTS

Model	Replacement Part
SF-MT-0.5-10	.5 micron MicroTec™ Sediment Filter
CF-0.5-10	.5 micron Carbon Block Pre-Filter
MEM-0025	25 gpd (95 lpd) TFC Membrane
MEM-0040	40 gpd (151 lpd) TFC Membrane
MEM-0060	60 gpd (228 lpd) TFC Membrane
MEM-0090	90 gpd (340 lpd) TFC Membrane (use 2 for 180 gpd (680 lpd) System)
FR-25	Flow Restrictor for 25 gpd (95 lpd) System
FR-40	Flow Restrictor for 40 gpd (151 lpd) System
FR-60	Flow Restrictor for 60 gpd (228 lpd) System
FR-90	Flow Restrictor for 90 gpd (340 lpd) System
FR-180	Flow Restrictor for 180 gpd (680 lpd) System
DI-SFCI-10	SilicaFree™ Color Change DI Cartridge
DI-AR-CI-10	Chloramine Removal Cartridge
GHA-4	1/4" (6.35 mm) Garden Hose Adapter
XWR-UNIV	Filter Wrench

Optional Accessories

Model	Optional Part
FAU-SMP	Quick Connect Faucet Coupler
TS-C61	Micro-Siemens Conductivity Tester (0-1999 uS/cm)
TS-T71	Total Disolved Solids Tester (0-1999 ppm TDS)
TK-CL-25	Total Chlorine Test Kit
VA-FVK-4	Flush Valve Kit
BPLF-MO-115	Low-Flow Booster Pump, 115V
BPLF-MO-230	Low-Flow Booster Pump, 230V
BPHF-MO-115	Hi-Flow Booster Pump, 115V
BPHF-MO-230	Hi-Flow Booster Pump, 230V

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

SpectraPure®
INNOVATORS IN WATER TECHNOLOGY

SpectraPlus 2000™ RO/DI System

Reverse Osmosis/Ion Exchange Water Purification System

(Single and Dual Membrane Models)

INSTALLATION AND OPERATING MANUAL

REV 07-13-2006

TABLE OF CONTENTS

CHOOSING A MOUNTING LOCATIONS

When considering a location for the installation of the RO System, consider the following factors:

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 100˚ F (38˚ 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 .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 .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, as described on page 11-12.
4. Operating reverse osmosis systems on softened feed water greatly reduces the chances of membrane fouling.
5. Use the optional flush valve kit after each use of the system to extend membrane life up to 6 months.

STORAGE

1. It is recommended that you store your RO System in a cool place when not being used.
2. Your RO System must be protected from freezing or temperatures above 100˚ F (38˚C).

TERMS AND CONDITIONS OF SALE

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 oblligation 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 or “C.O.D. - CUSTOMER CHECK ACCEPTABLE” basis. In the interim period during which credit references are being evaluated, all orders must be shipped “C.O.D. - CERTIFIED FUNDS” (cash, cashiers check or money order).

10. All returned checks (due to insufficients funds or closed accounts) will be subjected to a **$25 penalty charge.**

Invoices on Net 30 accounts not paid within 30 days of shipment will be considered delinquent and will accure Finance charges at the rate of 1.5% per month (18% per annum).

THREE YEAR LIMITED WARRANTY

Effective on products purchased after March 10, 2005.

SpectraPure, Inc.® warrants the product to the original owner only to be free of defects in material and workmanship for a period of three years 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 pre filters and membranes are not covered under the three year warranty.

SpectraPure warrants (pro-rated) the performance of tested SpectraSelect™ RO membrane elements only, for one year from date of receipt by the buyer, providing that the loss of performance was not caused by fouling , neglect or water conditions exceeding the feed water parameters listed in the applicable product manual (refer to detailed membrane warranty information). SpectraPure will, on confirmation of loss of performance during the warranty period, credit the pro-rated amount of the current catalog price of the element. The disposable filters and cartridges are not covered under the 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 Goods Authorization (RGA) 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 by-product 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 three year limited warranty does not apply to consumable items, including but not limited to, filters and cartridges unless specifically stated above***

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SYSTEM TROUBLESHOOTING GUIDE

Product Water - Low Production Rate

Cause	Corrective Action
Plugged pre-filters	Replace pre-filters
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

MEMBRANE TROUBLESHOOTING GUIDE

The following chart illustrates the procedure for determination of RO membrane performance. However, the chart represents only rough guidelines for determining performance of RO membrane. Depending on your tap water chemistry, the rejection characteristics of the membrane may vary significantly.

Method of Testing	Calculate % Rejection	Test Results	Conclusion
TDS/ Conductivity Tester	Measure feed water and RO product water TDS/ Conductivity	Is Rejection greater than 95% ?	No - Replace Membrane Yes - Membrane OK
Alkalinity Test Kit	Measure feed water and RO product water Alkalinity	Is Rejection greater than 90% ?	No - Replace Membrane Yes - Membrane OK
Hardness Test Kit	*Measure feed water and RO product water Hardness	Is Rejection greater than 90%?	No - Replace Membrane Yes - Membrane OK

*Caution: This test is not to be used on softened water sources.

USING THE PRESSURE GAUGE

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

Membrane Output Calculation Example

What is the expected GPD from a 75 GPD System at 40 psi pressure and 60°F water temperature?

PCF = 40 ÷ 60 = 0.666
TCF = 0.754 (from Table 1)
Expected GPD = 75 × 0.666 × 0.754 = 37.7 GPD ± 15%

37.7 GPD would be the Actual Production Rate

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 a Conductivity Meter (TS-C61) or TDS Meter (TS-T71).

Procedure:

1. Measure tap water conductivity. (Call it X)
2. Run the system for 15-20 minutes.
3. Rinse test instrument cell 2-3 times with RO water.
4. Measure RO water conductivity directly from the blue product water line. (Call it Y).
5. Subtract RO water conductivity from tap water conductivity. (X - Y)
6. Divide this quantity by tap water conductivity. (X - Y) ÷ X
7. Rejection = [(X - Y) ÷ X] ×100

* Conductivity in the above procedure could be replaced by hardness, alkalinity, nitrate, phosphate, silica etc. (measured in ppm or mg/l).

Rejection of the RO Membrane Calculation Example

1. Tap water hardness = 150 ppm (X)
2. RO water hardness = 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 Hardness Rejection = 95.3 % : Rejection rates less than 95% may indicate that the membrane should be replaced.

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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.

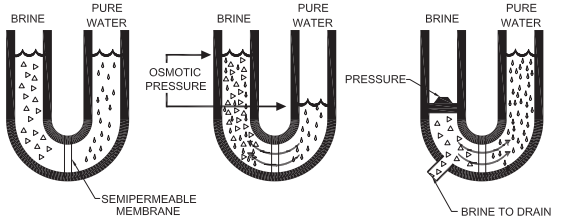

Figure 1 **Figure 2** **Figure 3**

Household water pressure is used to force tap water through the semipermeable R.O. 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 SpectraPlus 2000™ System uses household water pressure to reverse a natural physical process called osmosis. Water, under pressure is forced through a semi-permeable membrane where minerals and impurites 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 SpectraPlus 2000™ system includes replaceable sediment and carbon pre-filters. The sediment pre-filter removes sand, dirt, rust particles and other particulates while the carbon pre-filter takes chlorine and organics out of the feed water. The water then passes through the RO membrane and through the Deionization Cartridges which removes any remaining impurities in the RO water and provides less than 1 PPM pure water.

The SpectraPlus 2000™ System gives you a continous supply of sparkling clear water for your aquarium and hydroponics. The reliability with the SpectraPlus 2000™ Water Treatment System is greatly improved over other systems and costly maintenance is avoided.

SYSTEM SPECIFICATIONS

Sediment Pre-Filter	0.5 micron MicroTec™ sediment pre-filter
Carbon Filter	0.5 micron carbon block pre-filter
RO Membrane Type	Thin-Film Composite (TFC)
DI Cartridges	SilicaFree™ Color-Indicating Anion Dual Layer Color-Indicating Deionizing
Rejection Rate	Greater than 98% average
Input Water Pressure	60 psi (4.15 bar) line pressure*
Input Water Temp	77˚F (25˚C)
Recovery Rate	20% (i.e. 20% 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
25 (95)	66 ml/min	264 ml/min
40 (151)	105ml/min	420 ml/min
60 (228)	158 ml/min	632 ml/min
90 (340)	235ml/min	940 ml/min
180 (680)	470ml/min	1880 ml/min

Reverse Osmosis Membrane Feed Water Requirements

For the 1 year SpectraSelect TFC membrane pro-rated 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	100˚ F (38˚ 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
Langlier Saturation Index	LSI must be negative

*Operating pressure less than 40 psi will 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.

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TESTING THE QUALITY OF THE MEMBRANE

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 500 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

TROUBLESHOOTING WATER PURITY MONITOR
Some FAQs

Q:Does monitor read "good" or "bad" when it is unplugged ?

A:The monitor reads "bad-RED" when it is unplugged.

Q: What if the light switches between "green" and "red" between successive depressions of the "push-to-test" water purity monitor?

A: Do not press the "push-to-test" button rapidly in quick succession. Wait at least 5 minutes between two successive depressions of the button for an accurate reading.

Q:How should the probe be mounted for an accurate reading?

A:The probe should be mounted VERTICALLY, at the bottom of the T.

Q:How long does the battery last ?

A:1 year approx.

Q:How do you determine if the battery needs replacement ?

A:Depressing "push-to-test" button does not give any light.

Q: If the monitor shows a red light, what does it mean?

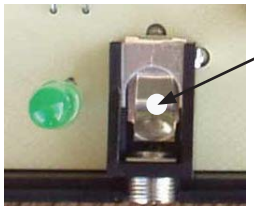
A: It means that either the membrane is bad OR either the probe or monitor is faulty.

Q:How do you determine if the probe or monitor is faulty?

A:Refer to the troubleshooting guide.

IMPORTANT NOTE: ONLY USE ALKALINE BATTERIES.
Other Batteries will cause erroneous readings.

Fig. K: Purity Monitor Jack



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SYSTEM DESCRIPTION

The SpectraPlus 2000™ system is a five stage reverse osmosis de-ionization system.

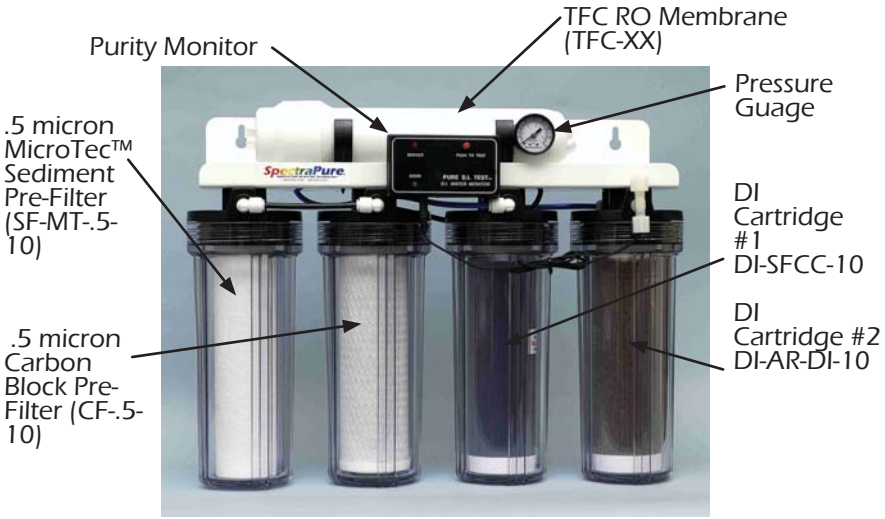
1. First, the incoming feed water is passed through a 0.5 micron Micro-Tec sediment pre-filter. This filter is required to remove excess turbidity (particulate matter) that may cause the carbon block filter to plug.
2. The second stage of filtration is a 0.5 micron carbon block pre-filter. This filter 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 98% of most inorganic salts, all micro-organisms and organics above 100 diatoms molecular weight.
4. The fourth stage filter is a color changing, strong base anion cartridge. The anion exchange resin removes all negative ions and replaces them with hydroxyl ions.
5. The fifth stage of the system is a Dual Layer Deionization cartridge. This cartridge removes almost all minerals and organics that may pass through the membrane, producing laboratory grade water with >18 Mohm / cm resistivity. The result of processing water through all five stages is ultra-high purity "mineral-free water". This System is also available with a semi-conductor-grade mixed-bed resin cartridge for more critical applications.

The SpectraPlus 2000™ system comes equipped with a water purity monitor that indicates when the final DI stage(housing position #4) is exhausted.

This super-capacity RO/DI system consists of newly developed color-indicating DI resin cartridges with twice as much phosphates/silica removal resin as in previous designs.

Maintenance and trouble-shooting procedures have been made easy and effective with a combination of the DI purity monitor, color-indicating DI resins, and a built-in pressure gauge. It is recommended that you keep replacement cartridges on hand, ready to install as soon as the monitor indicates that the cartridge in use is exhausted.

Fig. A: System Components



INSTALLING THE WATER PURITY MONITOR

1. Remove front cover from the monitor and connect the supplied 9-volt batery to the snap terminals located on the circuit board (Fig. C). Support the battery terminals with your finger while inserting the battery. For proper operation use only an ALKALINE type battery.
2. Insert the plug from the test probe cable into the jack on the monitor box.
3. Locate the 8-position "dip switch" (Fig. B). Each of the internal settings corresponds to a specific electrical conductivity level measured in micro-siemens (uS). The equivalent natural water" TDS setting in ppm is shown below.
4. Locate switch #7 on the selector switch. Slide (or push-in) the switch to the ON position. Ensure that all remaining switches are in the OFF position. This is the recommended setting to determine the condition of the #2 cartridge.
5. Replace the front cover and fasten with the included screw. Locate monitor at an easily accessible location within 3 feet of the test probe. Attach by peeling the protective cover from the self-adhesive velcro tape and pressing onto the mounting surface.

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TROUBLESHOOTING GUIDE FOR RO/DI SYSTEMS

1. Low production rate:	
a. plugged pre-filters.	i. Replace pre-filters.
b. low water temperature.	ii. Heat feed water OR use higher GPD membrane.
c. low line pressure.	iii. Use booster pump OR use higher GPD membrane.
d. high TDS content.	iv. Use booster pump OR use higher GPD membrane.
e. fouled membrane.	v. Clean or replace membrane to restore flux.
f. plugged flow restrictor.	vi. Replace flow restrictor & membrane.
2. Zero production rate:	
a. Missing flow restrictor.	i. Put flow restrictor in the yellow line.
b. Dried membrane.	ii. Try to restore flux using rubbing alcohol OR replace membrane.
c. Plugged flow restrictor.	iii. Replace flow restrictor and clean/replace membrane.
3. Extremely high production rate:	
a. Ruptured membrane.	i. Replace it.
b. Very high line pressure (> 90 psi).	ii. Use a pressure reducing valve.
4. Red light on purity monitor comes on:	
a. Exhausted deionization cartridge.	i. Replace cartridge.
b. Bad membrane & exhausted cartridge.	ii. Replace membrane & deionization cartridge.
c. Faulty monitor/probe.	iii. Replace monitor/probe.
5. Pressure gauge does not register anything:	
a. Missing flow restrictor.	i. Put flow restrictor in the yellow line.
b. Pressure gauge screwed in too far.	ii. Unscrew pressure gauge one turn and retest.
c. Plugged pressure gauge orifice.	iii. Clean orifice with a needle.
d. Defective pressure gauge.	iv. Replace it.
6. Low deionization cartridge life:	
a. Defective membrane.	i. Replace it.
b. Low pressure (< 40 psi).	ii. Use booster pump.
c. High CO2 levels in water (> 5 ppm).	iii. Aerate RO product water or use a straight anion cartridge ahead of DI cartridge.
d. High TDS in feed water (> 1000 ppm).	iv. NO EASY SOLUTION.
e. High levels of silica, nitrates, phosphates etc. in tap water.	v. Use straight anion cartridge ahead of mixed bed cartridge.
f. High pH tap water (> 9.0).	vi. Acidify feed water to the RO membrane to improve its rejection.

Reconnect the tubing to the membrane housing. Place the flow restrictor in a safe location where it will not be accidentally crushed or damaged.

11. Put the yellow concentrate tubing and the blue product water tubing in the drain and turn on the system water supply. Allow the system to flush for several minutes to remove any loose particles.
12. Turn off the water supply to the system. Remove the yellow tubing from the membrane tubing from the membrane housing and replace the flow restrictor assembly as described on page 13-14.
13. Re-insert the flow restrictor end of the yellow tubing into its push-fitting at the RO membrane and reconnect the yellow concentrate tubing to the membrane housing.
14. Turn on the water supply to the system and check for leaks. Check, and if necessary adjust, the Concentrate to Purified Water Ratio per the procedures described on page 11-12.

Fig. H: Removing the Membrane Element

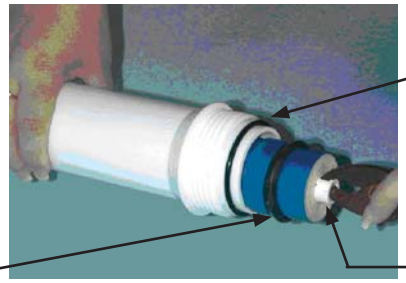
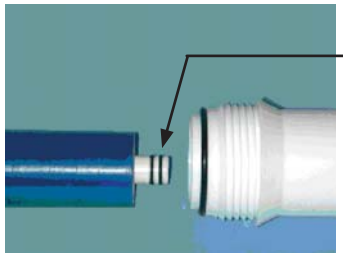


Fig. I: Inserting the New Membrane Element



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USING THE PURITY MONITOR (EPM)

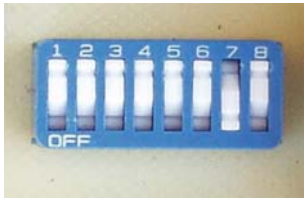
The purity monitor is typically used to monitor the condition of the DI cartridge, and with a simple procedure, monitor the RO membrane.

1. Before operating the monitor, allow at least 2 gallons of water to run through the system.
2. To test, press the red "push-to-test" button located on the front of the monitor box. At any point, a green or "good" indication means lower electrical conductivity (pure water), while a red or "service" indication means higher conductivity (less pure water). A red or "service" indication would normally imply that membrane replacement and/or deionization cartridge replacement is required.
3. If neither indicator illuminates, replace the battery with the 9 volt ALKALINE type ONLY.

Warning!!: The water purity monitor does not detect the presence of silica, organic contaminants or micro-organisms, 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 water safe for human consumption. No application other than monitoring the electrical conductivity of water is expressed or implied.

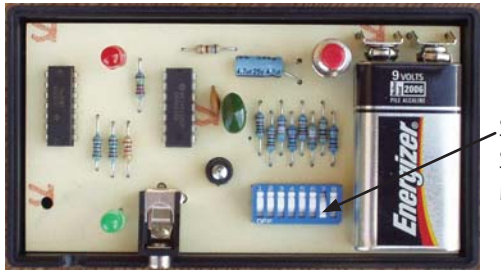
Switch Number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Setting in uS	100	50	20	10	5	2	1	0.5
Setting in ppm	67	33	13	6.7	3.3	1.3	0.67	0.33

Fig. B: Purity Monitor Switches



* If settings are changed for any reason (such as testing the quality of the RO membrane), They should be returned to the original #7 setting after completion of the test.

Fig. C: Purity Monitor Without Cover



SYSTEM INITIALIZATION

If you are setting up your system for the first time or replacing the RO membrane, please see the "Checking the Concentrate to Purified Water Ratio" section on page 11-12 .

System Hook-Up

1. Attach the garden hose adapter to your cold water source. Never run hot water (greater than 100° F (38° C)) through the system.
2. Place the yellow concentrate tubing and the blue purified water tubing into a drain. Do not restrict flow from these lines.
3. Slowly open the cold water supply valve and allow the housings to fill. You may use pressure up to 80 psi (5.5 bar).

Check the system to ensure that all fittings are tight and leak-free before leaving the system unattended.

Note: It is recommended that at least 2 gallons (7.57 liters) of purified water be discarded before collecting purified water for use. If the unit is not used for several days, run the system for at least 15 minutes before collecting any water.

Initally, air trapped in the DI cartridges is a normal condition and will not affect the operation of the DI cartridges.

4. Finish the installation by connecting the yellow line to a drain. The blue line can be placed into a RubberMaid™ trash can or you can set it up for automatic shut-off using a Liquid Level Controller (LLC-S-115 or LLC-M-115) or the Auto Shut-Off Kit (ASOFK).

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

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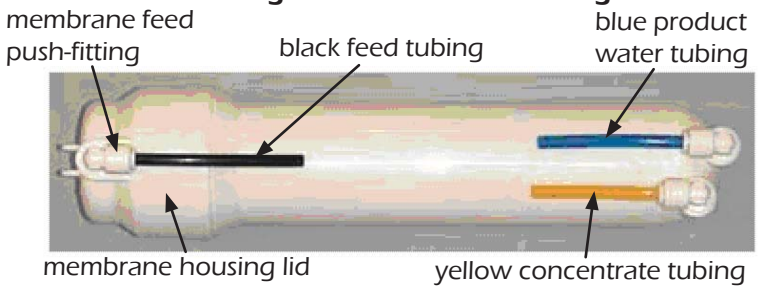
RO MEMBRANE REPLACEMENT

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 13).
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. H).
6. Remove the black housing O-ring (Fig. H). 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. I). 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.
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.

10. Disconnect the yellow concentrate tubing (Fig. B) from the membrane housing and remove the flow restrictor (Fig. C) from the yellow tubing (Refer to the procedure on page 13-14).

Fig. G: Membrane Housing



RO MEMBRANE DIAGNOSTICS

In order to accurately determine the condition of the RO Membrane, a conductivity tester capable of reading the tap water conductivity and the product water conductivity would be required (see Performance Test page 23-24) but the included electronic purity monitor is capable of providing a general idea of the membrane's condition.

Before performing the following membrane test with the purity monitor, the DI cartridges most be removed and the empty housings re-installed; also, the waste to product water ratio must be 4 to 1 or greater (see page 11-12).

1. Turn on the system, let it operate long enough to fill the empty DI housings, then let it run for an additional 20 minutes.
2. Remove the cover from the monitor.
3. Set all switches to the down or OFF Position except switch #1 is ON.
4. Push the test button and record the light indication (a good membrane will show green).
5. Continue through each switch number in order until you observe a red light indication.
6. Record the number of the last green light indication.
7. Look at the graph on page 9. Compare your highest green light indication to the number represented in uS or PPM.

As a general rule we would consider the RO membrane to be in good condition if a green light indication is observed on switch #3 or above. (The higher the switch number the better).

8. If you are in doubt or if you observe a red light on switch #1 or #2 we would recommend calling the factory for assistance. (This condition could be due to either a faulty membrane or monitor).
9. Return monitor to switch #7 ON, all others are OFF.

Note: All water sources are different and are subject to changes in conductivity from season to season which could affect the monitor reading depending on the time of the year. For this reason we recommend the use of a conductivity tester in order to receive the most accurate mea-

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CHECKING THE CONCENTRATE TO PURIFIED WATER RATIO

This procedure will assure you of maximum life and reliability of your SpectraPure System. Failure to perform this procedure can permanently damage the membrane and will void the pro-rated Membrane Warranty.

In order to maximize the life of your SpectraPure RO Membrane, you may need to adjust the ratio of the concentrate to purified water. If not enough concentrate is allowed to flow past the membrane during operation, the impurities will precipitate out on the membrane surface, clogging the RO Membrane. To keep this from happening, the Concentrate to Purified Water Ratio must be checked and adjusted in order to compensate for pressure and temperature variations that exist in all water supplies. The flow rate of the concentrate must be a minimum of 4X the product flow rate. 4X to 6X is an acceptable concentrate flow rate.

Procedure:

1. Open the cold water supply valve and let the system run for 15 minutes. Direct both tube down the drain.
2. Collect product water from the blue tubing into a measuring cup for one minute. Measure the collected amount in milli-liters. Do the same with the waste water from the yellow line.

WASTE (YELLOW) IN MILILITERS_____

DIVIDED BY

PRODUCT (BLUE) IN MILILITERS_____

The resultant is the Concentrate to Product Ratio

(Although not needed in this proceedure, the daily product flow rate in Gallons per Day (GPD) can be calculated to be equal to the product flow rate times 0.38).

3. **If ratio is less than 4:1**

Disconnect yellow drain line from the membrane housing and then remove flow restrictor. Use the appropriate Waste to Product ratio to determine how long to cut the flow restrictor in order to obtain a 4:1 ratio. (Figure D)

* Please refer to pages 13-14 for Flow Restrictor Removal, Adjustment, and Replacement. *

4. **If ratio is greater than 6:1**, flow restrictor requires replacement (Please contact SpectraPure Inc).
5. Turn on feed supply.
6. This completes the procedure.

Fig. D: Flow Restrictor Tables
(For 4:1 Concentrate to Product Ratio)

FR-25 & FR-40 (RED)

PRODUCT RATE ml./min.	gpd	CUT TO LENGTH in.	cm.
110	42	1	2.5
84	32	2	5.1
75	29	3	7.6
69	26	4	10.2
63	24	5	12.7
60	23	6	15.2
55	21	7	17.8
51	19	8	20.3
47	18	9	22.9
45	17	10	25.4
44	17	11	27.9
42	16	12	30.5
40	15	13	33.0
39	15	14	35.6
38	14	15	38.1
37	14	16	40.6

FR-60 (ORANGE)

PRODUCT RATE ml./min.	gpd	CUT TO LENGTH in.	cm.
158	60	1	2.5
130	49	2	5.1
123	47	3	7.6
110	42	4	10.2
99	38	5	12.7
94	36	6	15.2
93	35	7	17.8
88	33	8	20.3
84	32	9	22.9
79	30	10	25.4
76	29	11	27.9
74	28	12	30.5
71	27	13	33.0
68	26	14	35.6
66	25	15	38.1
66	25	16	40.6

FR-90 (YELLOW)

PRODUCT RATE ml./min.	gpd	CUT TO LENGTH in.	cm.
269	102	1	2.5
233	88	2	5.1
213	81	3	7.6
198	75	4	10.2
183	69	5	12.7
175	67	6	15.2
164	62	7	17.8
154	58	8	20.3
148	56	9	22.9
141	54	10	25.4
136	52	11	27.9
133	50	12	30.5
129	49	13	33.0
128	48	14	35.6
124	47	15	38.1
124	47	16	40.6

FR-180 (GREEN)

PRODUCT RATE ml./min.	gpd	CUT TO LENGTH in.	cm.
490	186	1	2.5
460	175	2	5.1
430	163	3	7.6
400	152	4	10.2
379	144	5	12.7
356	135	6	15.2
344	131	7	17.8
326	124	8	20.3
311	118	9	22.9
300	114	10	25.4
289	110	11	27.9
281	107	12	30.5
270	103	13	33.0
263	100	14	35.6
259	98	15	38.1
256	97	16	40.6

DEIONIZATION CARTRIDGE #2 REPLACEMENT

(Right-most housing)

The last stage is a dual layer cation/anion cartridge, or in some cases a mixed bed DI. The condition of this cartridge should be judged by observing either a RED or GREEN light indication from the monitor. **Please note that the probe is located after housing #4. Thus, the monitor indicates the condition of the final DI stage cartridge only.**

Turn the on the system and allow water to flow past the monitor probe for at least 20 minutes before attempting to use the monitor. The monitor will indicate GREEN when the cartridge is in good condition and RED if it is exhausted and in need of replacement. (Be sure that switch #7 is in the ON position and all other switches are OFF.)

Replace the third stage cartridge **immediately** if the RED light is on.

Note: In addition to the monitor indicating the DI cartridge condition, the resin will also change color. Note that only the DI-AR-DI-10 cartridge is color indicating, not the lab grade mixed bed cartridge.

The DI-AR-CI-10 cartridge's violet-colored layer is the resin layer used to indicate exhaustion and will change to an orange color when exhausted. The standard cartridge will change color from bottom to top while the "downflow" version will change from top to bottom.

The color change that occurs in this stage gives a general indication of its condition but the monitor will provide the most accurate diagnosis of its condition. There may be local conditions that affect the color-changing characteristics of these DI cartridges. High pH water may prevent these cartridges from changing colors.

Materials Needed: One DI-AR-DI-10 Deionizaton cartridge or (DI-MB-10, filter wrench.

Procedure:

1. Follow the procedure for Cartridge #1 Replacement.

DEIONIZATION CARTRIDGE #1 REPLACEMENT

(Second housing from the right)

The first DI stage is an anion cartridge DI-SF-CI-10. In order to determine the condition of this cartridge, watch for the color to change from the bottom to the top. The color will change from a very dark blue to a lighter blue or tan color. Once the cartridge has changed color by 70 to 80% it **must** be replaced in accordance with the following instructions. (For "down flow" DI systems or systems that incorporate a permeate pump, the color will change from the top to the bottom).There may be local conditions that affect the color-changing characteristics of this DI cartridge. High pH water (due to soda lime softening) may prevent this cartridge from changing colors.

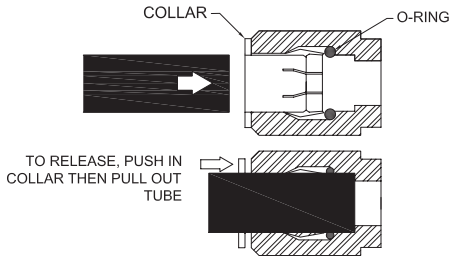
Materials Needed: One DI-SF-CI-10 Deionizaton cartridge, filter wrench.

Procedure:

1. Remove the filter housing from its cap by unscrewing it counter clockwise as viewed from the bottom.
2. Remove and discard the old cartridge from the housing.
3. Thoroughly wash out the housings with hot soapy water to which a few teaspoons of household bleach have been added. Rinse well with clean hot water.
4. Install the new deionization cartridge. Make sure the cartridge is installed in the correct direction as marked on the filter housing and that the top seal is securely attached to the top of the cartridge
5. Re-install the bottom housing onto the cap by rotating it clock-wise and hand tighten ONLY.
6. Turn on system and check for leaks.

FLOW RESTRICTOR REMOVAL, ADJUSTMENT AND REPLACEMENT

1. Locate the yellow concentrate tubing (Fig. E). Remove the tubing from its push-fitting at the membrane as follows:
   a.) Firmly depress and hold the push-fitting collar down with your thumbnail.
   b.) While the push-fitting collar is depressed, pull the tubing straight out of the push-fitting. Once the tubing is removed, release the collar.



2. Carefully remove the flow restrictor assembly, now visible as a plastic insert In the end of the yellow tubing (Fig. F). You may use an object such as a dull knife to help pry the flow restrictor insert from the end of the tubing. The entire flow restrictor (consisting of the insert coller and thin capillary tubing) may then be gently extracted.

   Note: Take care not to crush or otherwise damage the delicate capillary tubing.

3. Refer to the Flow Restrictor Tables (Fig. D). Find the table that represents the Flow Restrictor Assembly for the system that you have. Find the **product flow rate** in the left-hand column and the **length of the flow restrictor** in the right-hand column.

   Example: If your Flow Restrictor Assembly is for a 90 GPD Membrane and the **product flow rate** is 170 mL/Min, then the flow restrictor length should be cut to 6.5 inches (16.5 mm). 170 is about halfway between 164 (7 in.) and 175 (6 in.).

4. Using a new single-edge razor blade, carefully measure and then cut the flow restrictor to the total length indicated.

5. Re-insert the flow restrictor assembly into the yellow tubing and firmly re-seat the insert into the end of the yellow tubing by carefully pressing on the insert with your thumbnail. Care should be taken not to crush or other-wise damage the end of the capillary tubing protruding from the end of the insert.

6. Re-insert the yellow tubing into its push-fitting in the RO membrane as follows:
   a.) Moisten the O-ring seal inside the concentrate outlet fitting by dripping a few drops of clean water into the fitting.
   b.) Grasp the yellow tubing near the flow restrictor end, and insert the tubing into the push-fitting. 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.
   c.) 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 O-ring seal.

7. 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 yellow 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.

Fig. E: Reverse Osmosis Assembly

Top/Rear View

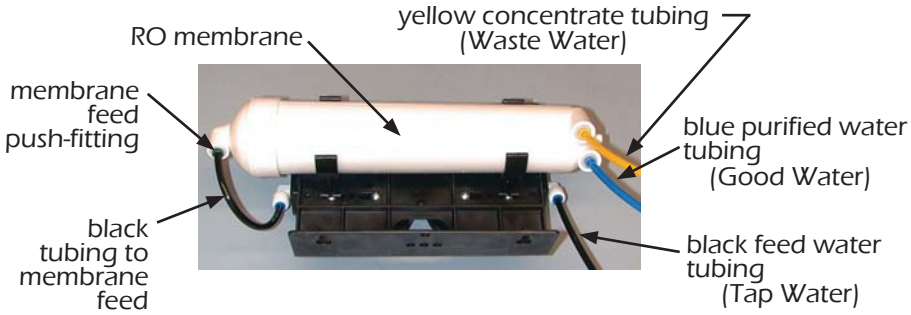
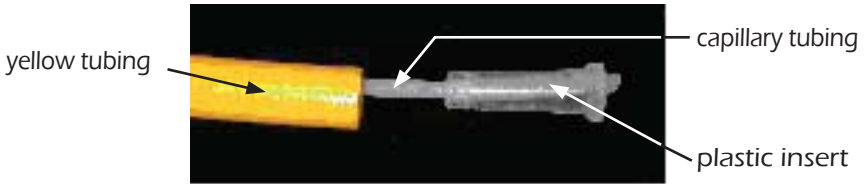


Fig. F: Flow Restrictor Assembly



SpectraPure®

SEDIMENT PRE-FILTER REPLACEMENT

For maximum contaminant removal and long membrane life, the sediment and carbon pre-filters must be changed when a 15-20% drop in pressure is observed OR at least 6-month intervals. If your water contains a great deal of sediment or chlorine, the pre-filters may require more frequent changes to maintain adequate production rate and extended membrane life.

Sediment Pre-Filter 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 photo on page 8. Using the provided filter wrench, remove the first 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 pre-filter onto the round port on 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.

CARBON BLOCK FILTER REPLACEMENT

For maximum contaminant removal and long membrane life, the sediment and carbon pre-filters must be changed when a 15-20% drop in pressure is observed OR at least 6-month intervals. When chlorine breakthrough greater than 0.1 ppm occurs in the yellow concentrate line, test for chlorine breakthrough by collecting a 10 ml sample of the concentrate from the yellow tubing and test the chlorine concentration using test kit TK-CL-25. If the chlorine concentration is

Materials Required: 0.5 micron Carbon Block Filter (CF-0.5-10), Filter Wrench, Chlorine Test Kit (TK-CL-25)

Procedure:

1. Perform steps 1-5 listed above
2. Turn on system water supply and check for leaks.