



# MaxPure MPRO-300 RO™ System Commercial Grade Reverse Osmosis System

(Single Membrane Model Produces 300 Gallons Per Day)



## INSTALLATION AND OPERATING MANUAL

# **SpectraPure<sup>®</sup>**

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## SYSTEM DESCRIPTION & SPECIFICATIONS

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Sediment Pre-Filter	1 micron MicroTec™ Sediment Pre-Filter
Carbon Filter	5 micron carbon block pre-filter
Carbon Filter	1 micron carbon block pre-filter
RO Membrane Type	300 GPD Thin-film composite
Rejection Rate	Greater than 95%
Input Water Pressure	40-80 psi line pressure*
Input Water Temp	77°F (25°C)

Nominal Membrane Flow Rates @ 65 psi, 77° F, & 500 ppm TDS :

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GPD (lpd)	Product Water Flow Rate	Concentrate Flow Rate
300	1 182 ml/min	4728 ml/min

### Reverse Osmosis Membrane Feed Water Requirements

Operating Pressure*	40 – 80 psi (2.75 – 5.5 bar)
pH Range	3 – 11
Temperature Range	38°F – 100° F (3°C – 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 CaCO <sub>3</sub> )
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 high flow booster pump (BPHF-MO-115(230)).

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

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## SYSTEM DESCRIPTION :

The incoming feed water from a cold supply pipe valve is directed through 3/8" BLACK tubing and is first passed through a 1 micron Micro-Tec™ sediment pre-filter. This filter is used to remove excessive turbidity, sand, dust, silt etc. that may cause the carbon filter to plug up. The next two stages of filtration is a 5 and 1 micron carbon block pre-filter. These filters are used to remove organics and chlorine from the feed water that can damage the membrane. The final stage of the system is the R.O. membrane. A high rejection Thin Film Composite (TFC) membrane is used in this system. This removes as much as 98% of most inorganic salts, all micro-organisms and almost all high molecular weight organics in the water.

**Fig. A: Single-Membrane Filter**



3/8" BLACK LINE: Tap Water  
1/4" BLUE LINE: Product Water  
1/4" YELLOW LINE: Waste Water  
(Flow Restrictor is inside the Waste line)



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## **SYSTEM INITIALIZATION**

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If you are setting up your system for the first time or replacing a membrane, please see the "Checking the Concentrate to Purified Water Ratio" section on page 6-8 .

### SYSTEM HOOK-UP:

1. Attach the garden hose adapter (**black tubing**) to your cold water source. Never run hot water (greater than 100° F (38° 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).

***Check the system to ensure that all fittings are tight and leak-free before leaving the system unattended. Monitor for at least 72 hrs.***

*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 can be placed into a Rubber Maid™ trash can or set up automatically using a Liquid Level Controllers. (Liquid Level Controllers and Automatic shut off accessories sold separately.)

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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 3X the product flow rate. 3X to 5X is an acceptable concentrate flow rate.

### Procedure:

1. Locate the Yellow waste line. Direct the waste line into a sink drain.
2. Locate the Blue product line . Direct the product line into a sink drain.
3. Turn on the Feed Supply Valve and let the system run for 20 min.
4. Collect product water from the blue line into a measuring cup for one minute. Measure the collected amount **in milli-liters**. (30 ml = 1 oz) Do the same with the waste water.

WASTE IN MILLILITERS \_\_\_\_\_ ML

DIVIDED BY

PRODUCT IN MILLILITERS \_\_\_\_\_ ML

The resultant is the Concentrate to Product Ratio

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

5. If ratio is **less than 3:1**= Remove Flow Restrictor as shown on page 8-9 and cut 1" off.
6. Re-measure your ratio and repeat procedure untill you acheive a 3/1 ratio.
7. If ratio is **greater than 5:1**, flow restrictor requires replacement (Please contact SpectraPure Inc for a longer FR)

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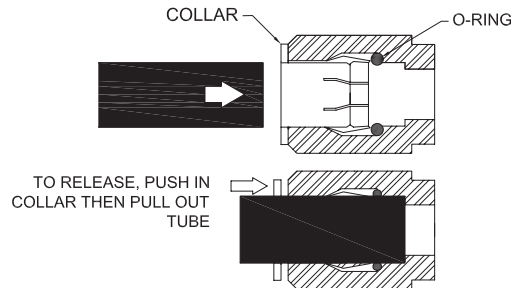
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## FLOW RESTRICTOR REMOVAL, ADJUSTMENT, AND REPLACEMENT:

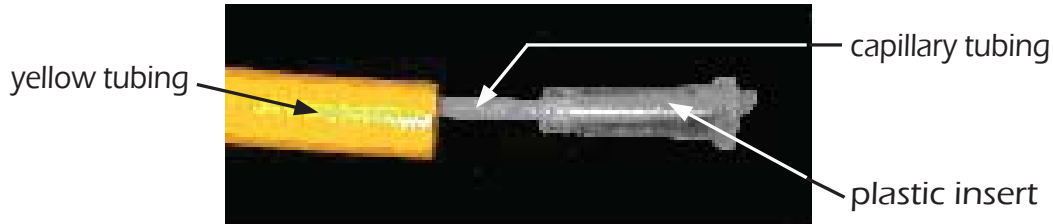
1. Locate the yellow concentrate tubing (Page 8) Remove the tubing from its push-fitting at the membrane as follows:
  - a.) Firmly depress and hold the push-fitting collar down with your thumbnail.
  - b.) While the push-fitting collar is depressed, pull the tubing straight out of the push-fitting. 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. B). 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 collar and thin capillary tubing) may then be gently extracted.

**Note: Sometimes, the Flow Restrictor might get stuck in the membrane fitting. To remove, use needle nose pliers and rock the collar back and forth, while pulling. Take care not to crush, stretch or otherwise damage the delicate capillary tubing.**
3. Using a new single-edge razor blade, carefully measure and then cut the flow restrictor.
4. 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 otherwise damage the end of the capillary tubing protruding from the end of the insert.
5. 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.
6. 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. B: Flow Restrictor Assembly**



## ***FILTER REPLACEMENT***

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### SEDIMENT PRE-FILTER REPLACEMENT

**Maintenance Regime:** For maximum contaminant removal and long membrane life, the sediment pre-filter 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 the pre-filter may require more frequent changes to maintain adequate production rate and extended membrane life.

**Materials Required:** 1 micron MicroTec™ Sediment Filter (SF-MT-1-10)

#### **Procedure:**

1. Turn off water supply to the system.
2. Using the provided filter wrench, remove the left clear sediment pre-filter housing. Unscrew it counterclockwise as viewed from the bottom
3. Remove the old filter from the housing 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 in the head of the housing, screw the housing back onto the assembly, and **hand tighten only**.
6. Proceed with carbon block filter replacement.

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## CARBON BLOCK FILTER REPLACEMENT

**Maintenance Regime:** At least every 6 months or when chlorine breakthrough greater than 0.1 ppm occurs in the concentrate from yellow line. 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-25. If the chlorine concentration is above 0.1 ppm, replace the carbon pre-filter.

**Materials Required:** 5 & 1 micron Carbon Block Filter (CF-5-10 & CF-1-10)

### **Procedure:**

1. Turn off water supply to the system.
2. Using the provided filter wrench, remove the right clear carbon block filter housing. Unscrew it counterclockwise as viewed from the bottom.
3. Remove the old filter from the housing 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**.
7. Turn on system water supply and check for leaks.

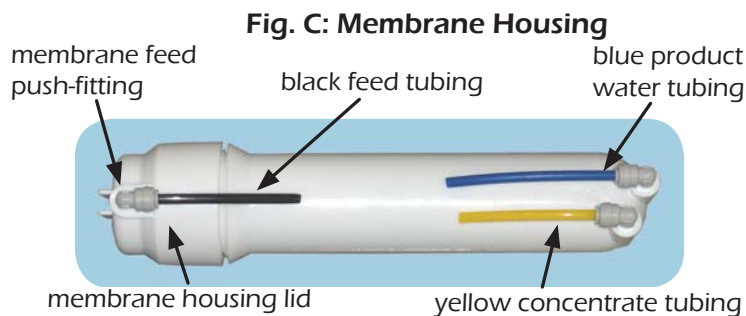
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## RO MEMBRANE REPLACEMENT

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 7).
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).
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.
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.
10. Disconnect the yellow concentrate tubing (Fig.C) from the membrane housing and remove the flow restrictor from the yellow tubing. 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.



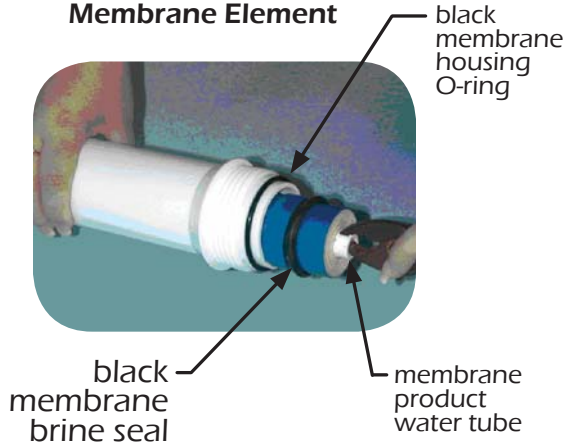
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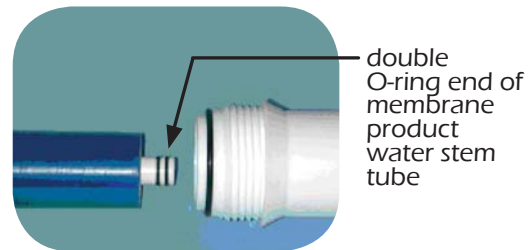
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12. Turn off the water supply to the system. Remove the yellow tubing from the membrane housing and replace the flow restrictor.
13. Re-insert the flow restrictor end of the yellow tubing into its push-fitting at the RO membrane and reconnect the yellow 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.

**Fig. D: Removing the Membrane Element**



**Fig. E: Inserting the New Membrane Element**



## TESTING 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.

$$\text{Expected GPD} = \text{Rated GPD} \times \text{PCF} \times \text{TCF}$$

**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 multiplied by the PCF.

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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 75 GPD System at 40 psi pressure and 60°F water temperature?

$$\text{PCF} = 40 \div 60 = 0.666$$

$$\text{TCF} = 0.754 \text{ (from Table 1)}$$

$$\text{Expected GPD} = 75 \times 0.666 \times 0.754 = 37.7 \text{ GPD} \pm 15\%$$

## Performance Test

The performance of a RO membrane is measured in terms of its rejection characteristics.

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

Note: This procedure will require a Conductivity Meter (TS-C61).

### 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. (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

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\* 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.  $(X - Y) \div X = 143 \div 150 = 0.953$
5. Rejection =  $[ (X - Y) \div X ] \times 100 = 0.953 \times 100 = 95.3$

Membrane Hardness Rejection = 95.3 % : Membrane OK

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## **TROUBLESHOOTING GUIDE**

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### **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.

**Please feel free to contact us here at the factory for  
any technical questions or problems you may have.**

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## ONE 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 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 manufacturer'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 1 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 one 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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## ***REPLACEMENT PARTS***

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<u>Model</u>	<u>Replacement Part</u>
SF-MT-1-10	1 micron MicroTec™ Sediment Filter
CF-5-10	5 micron Carbon Block Pre-Filter
CF-1-10	1 micron Carbon Block Pre-Filter
MEM-0300	300 gpd TFC Membrane
FR-300	Flow Restrictor for 300 gpd System
GHA-6-JG	Gard Hose Adapter with 3/8in Tubing Push Fitting
WR-UNIV	Universal Filter Wrench