

# Aquamax Laboratory Water systems Operation Manual



Aquamax Basic  
Aquamax UF  
Aquamax UV  
Aquamax UV/UF

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## Introduction

# Aquamax? Laboratory Water Systems



All Aquamax laboratory water systems listed below produce consistent ultra-pure water with resistivity of 18.2 megohm/cm with bacteria levels less than 1 cfu/ml and exceed A.T.S.M. and NCCLS Type 1 water specifications. The Aquamax comes in 4 different versions allowing for even greater water purity levels for highly critical applications.

### **Aquamax Basic**

Produces A.T.S.M. and NCCLS type 1, 2 and 3 water for general chemistry applications requiring low ionic content and bacteria free water. This unit uses activated carbon, deionization and sub-micron filtration. All Aquamax polishing systems have a built in re-circulation pump and automatically circulate every hour to keep you systems cleaner and ready to use.

### **Aquamax UV**

Is the same as the basic and also incorporates a 185 nm UV (ultraviolet) system for organic carbon destruction to ultra low levels less than 5ppb TOC

### **Aquamax UF**

Is the same as the basic and also incorporates an ultrafilter for production of water containing pyrogen levels less than 0.005 eu/ml.

### **Aquamax UV/UF**

Is the same as the basic unit and also incorporates a 185 nm UV (ultraviolet) system for organic carbon destruction to ultra low levels less than 5ppb TOC as well as an ultrafilter for production of water containing pyrogen levels less than 0.005 eu/ml. The Aquamax UV/UF system produces water that is ideal for reagent or standard preparation for HPLC, IC, GC, AAS, ICP and ICP-MS applications.

## Principle of Ultrapure Water Production

### **HP-PACK? High Purity Filter Cartridge Pack**

The high purity pack (HP-PACK? ) is the heart of the Aquamax water system. It is specially designed to provide water that is virtually free of ions and organic contamination. This special filter pack contains specially prepared activated carbon, high mixed bed ion exchange resin and specialized organic scavenging resin. This combination of high purified filter media makes the Aquamax suitable for producing water for extremely sensitive applications such as HPLC, Cell Culture, Semi-Conductors, Pharmaceuticals as well as other general laboratory uses.

### **Ultraviolet light – Sterilizing and Organic Oxidation System**

The Aquamax UV and UV/UF systems contain a UV lamp that generates 185 and 254 nanometer wavelengths of Ultraviolet light. The 254 nm wavelength is effective in controlling bacterial growth in water systems. The adsorption of UV light by the DNA and proteins in the microbial cell results in the inactivation of the microorganism. The UV lamp also integrates a 185 nm wavelength ultraviolet photo-oxidation module for reduction of organic contamination. Total Organic Carbon (TOC) levels in ultra-pure water is reduced to 5ppb as the 185 nm wavelength light oxidizes total organic carbon forming carbon dioxide.

### **Ultrafiltration Membrane**

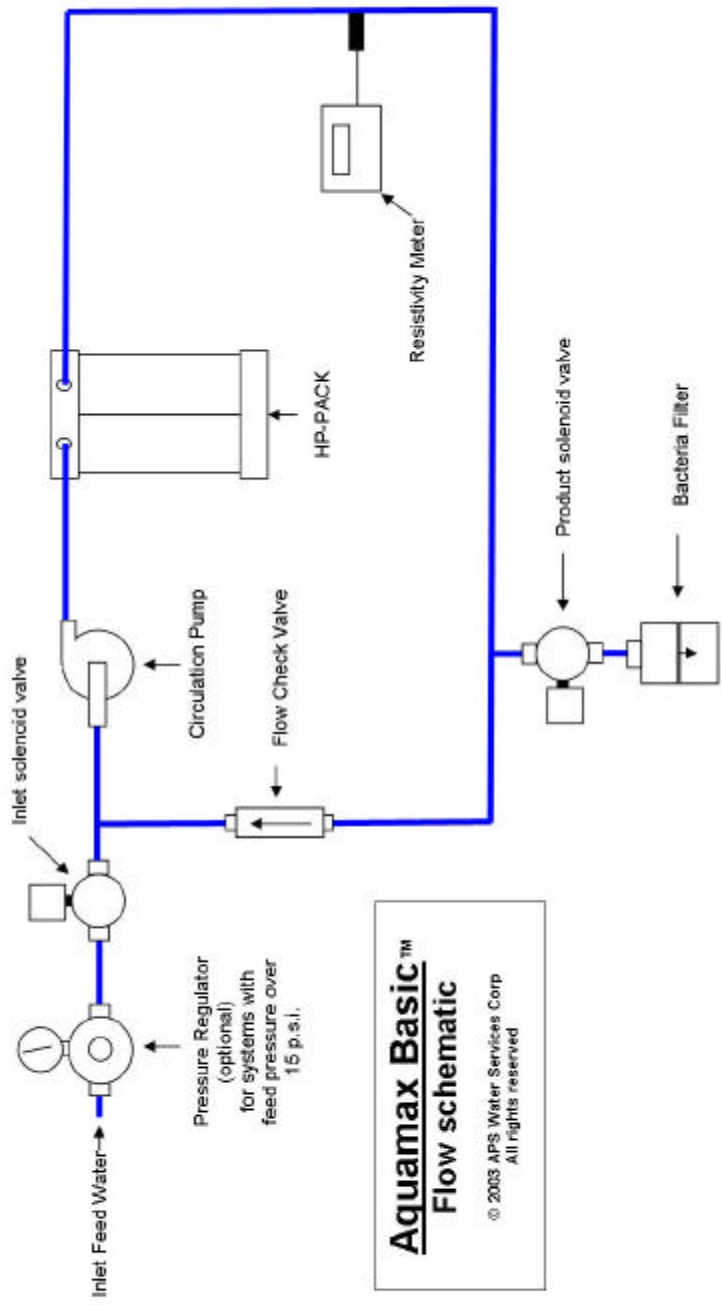
The Aquamax UV and UV/UF systems contain a 5,000 mol wt. cut-off ultrafiltration membrane that is designed to remove pyrogens/endotoxins. Pyrogens are cell wall fragments from dead cells and can be detected by using a Limulus Amebocyte Lysate test (LAL). Pyrogens are removed for water used in cell culture applications, media manufacturing, In vitro fertilization and any injectable drug.

### **Polisher Cartridge**

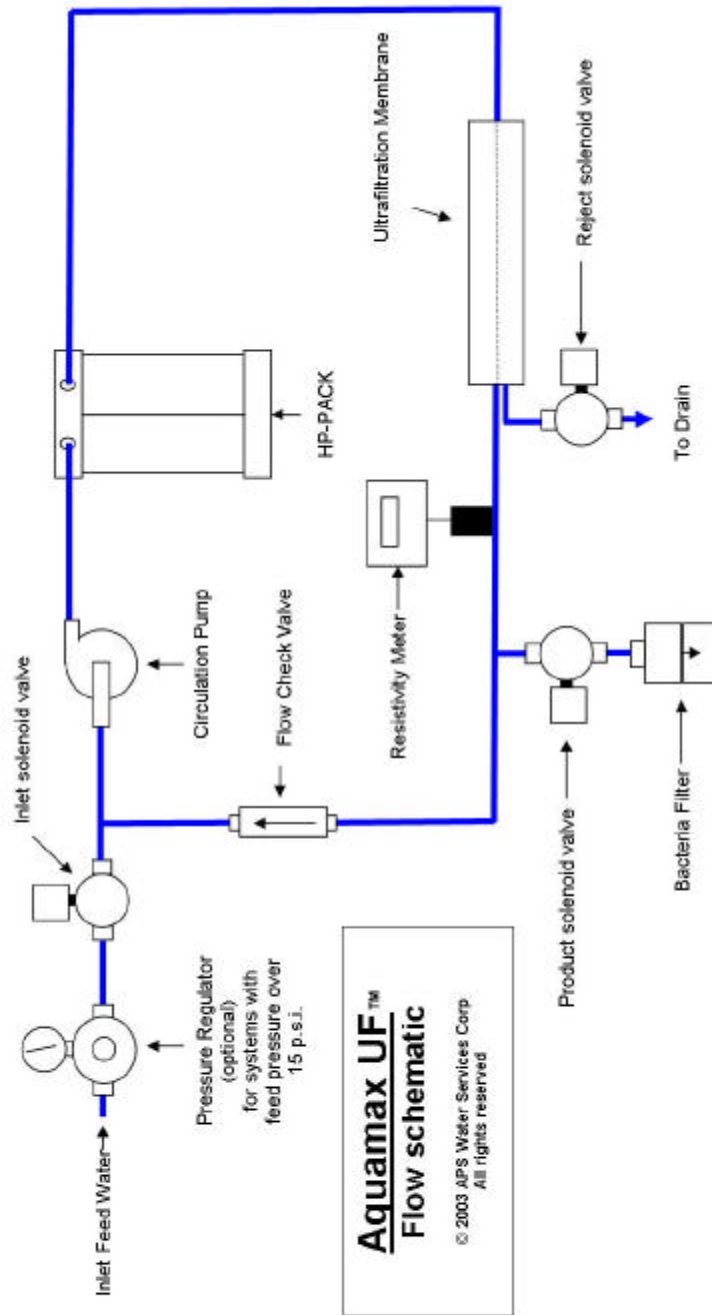
The Aquamax UV and UV/UF systems contain a final polishing cartridge. The polisher cartridge is designed to remove CO<sub>2</sub> that is formed in ultraviolet lights without re-introducing organic contamination into the systems.

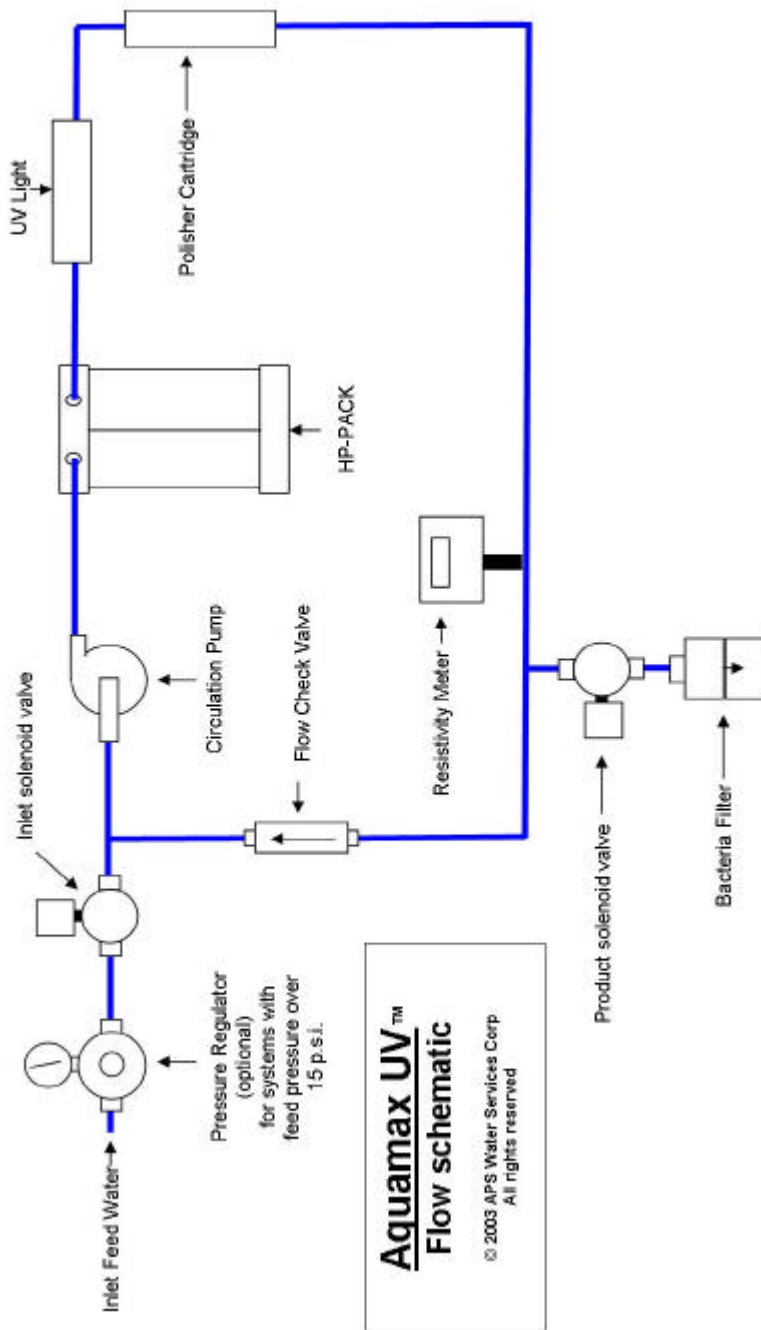
### **Bacteria Filter**

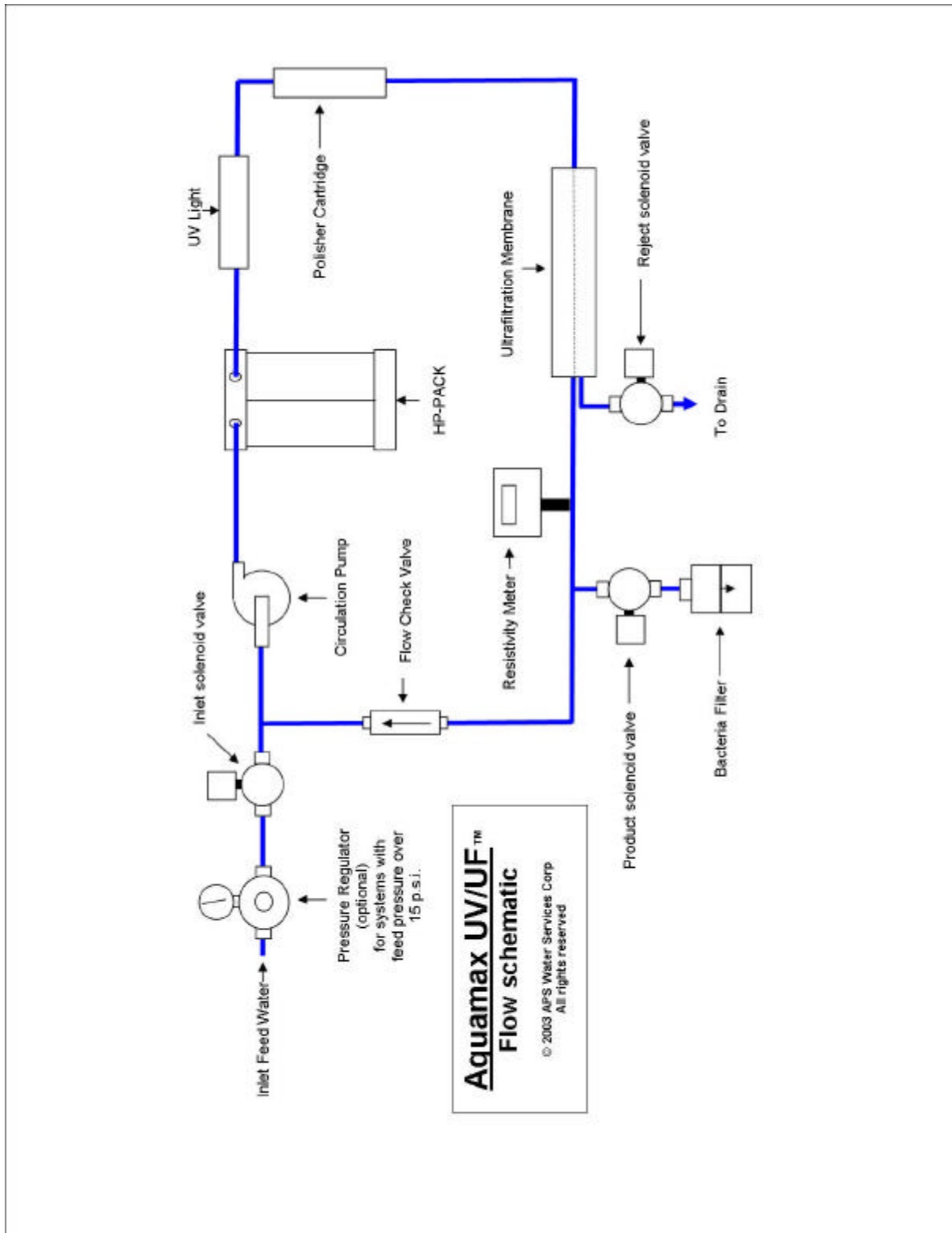
All Aquamax systems use an absolute 0.22 micron filter is designed to remove bacteria and particulates in the purified water. This filter also comes with a sterile filling bell that helps protect the outlet tip from getting contaminated.



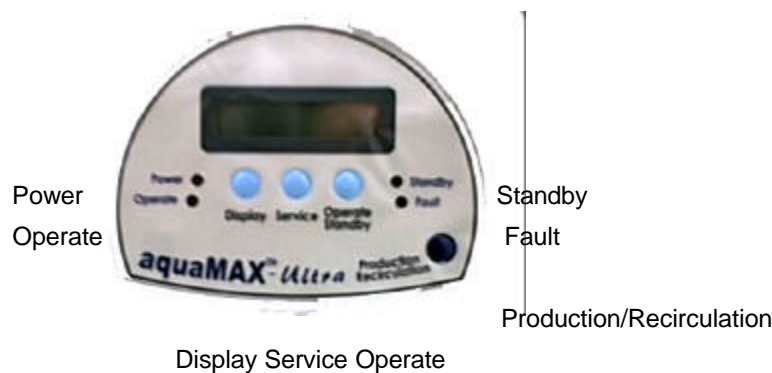
**Aquamax Basic™**  
**Flow schematic**  
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**Front configuration**



<Fig. 1-4-1> Front configuration

**LED**

Power : Confirm if power is supplied normally

Operate : Displays when? Operate? or? Service?

Standby : Displays when? Standby? or? Service?

Fault : Displays when normal operation is not possible by accompanying periodic alarms.

**Membrane key**

Display : display temperature during the production.

Service : select the Recirculation / Press down /Temp. calibration On/Off key.

Operate/Standby : change the operate/standby state.

Production/Recirculation : change the Production/Recirculation state on the operation state.

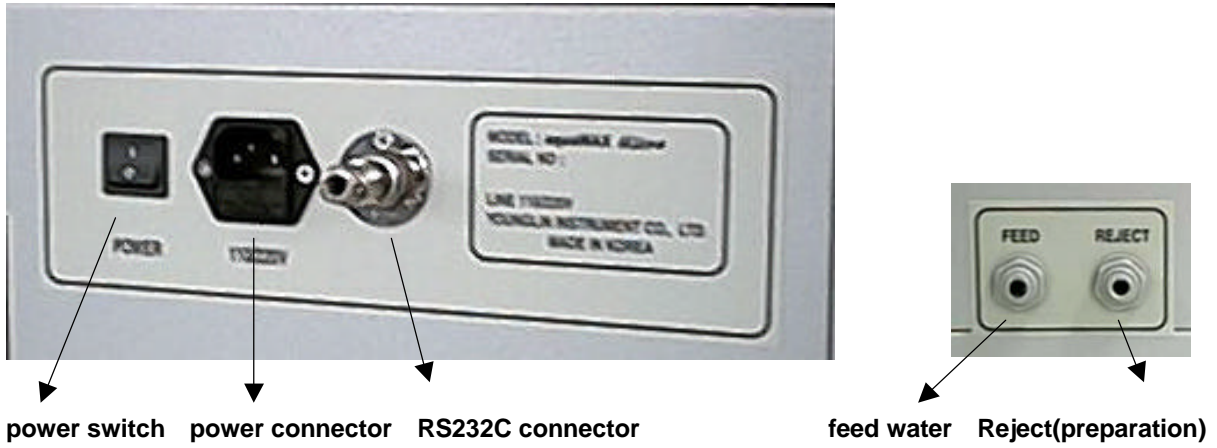
**Exhaust**

0.22 μm final filter mounted on the top ensures complete removal of microorganics and particles at the point-of-use.

In the case at the point-of-use hose, need to pay attention the quality of the hose.

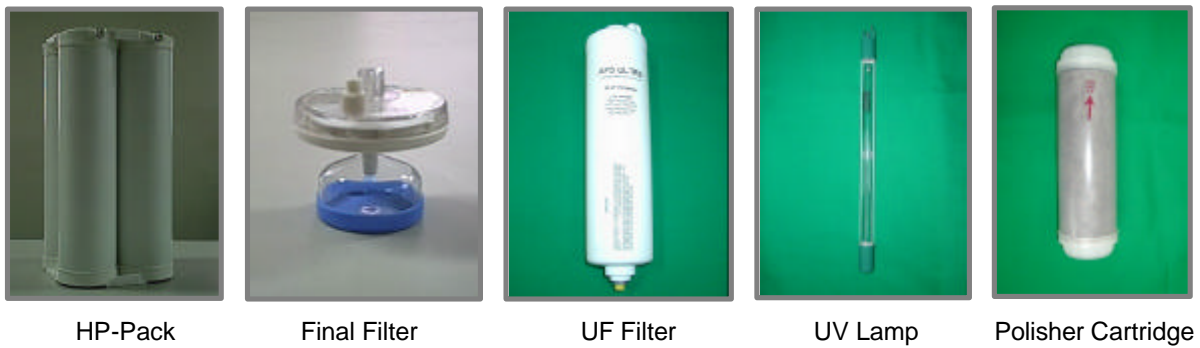


**Rear side**



<Fig. 1-4-2> Aquamax – Ultra rear side

**Accessories**



<Fig. 1-4-3> Aquamax – Ultra accesories

## 1-5 Comparison of Water Quality

			Ion Exchange Water			
Dissolved Inorganics (CaCO <sub>3</sub> , ppm)	170	0.3	0.1~0.05	0.025	20	-
Resistivity (M $\Omega$ · cm, 25 )	0.003	2	0.1~10	18.2	0.2~0.5	0.1~1.0
Silica(ppm)	1	0.05	<0.01	<0.01	0.1	<0.01
Heavy Metal(ppm)	1	0.05	<0.01	<0.01	0.1	<0.01
Dissolved Organics(ppm)	1 ~ 2	<1	<1	<1	<1	-
Bacteria(cfu/? )	>100	<10	>100	*	<10	-
Small Particles(>5? /? )	>10,000	<100	>10,000	*	<10	-

<Table 1-5-2> Water Classification According to CAP, ASTM Standards

	Resistivity (M $\Omega$ · cm)	
AquaMAX Standard	0.2~0.5	2.0~5.0
AquaMAX Standard with Ion Exchange addition	2.0~10	0.1~0.5
Laoratory-Grade	0.1~1.0	1.0~10
Analytical-Grade	1.0~2.0	0.5~1.0
Reagent-Grade	10	~ 0.05

CAP : The College of American Pathologists

ASTM : American Society for Testing and Materials

## 1-6 Specification

Names of goods : Ultrawater Purification System

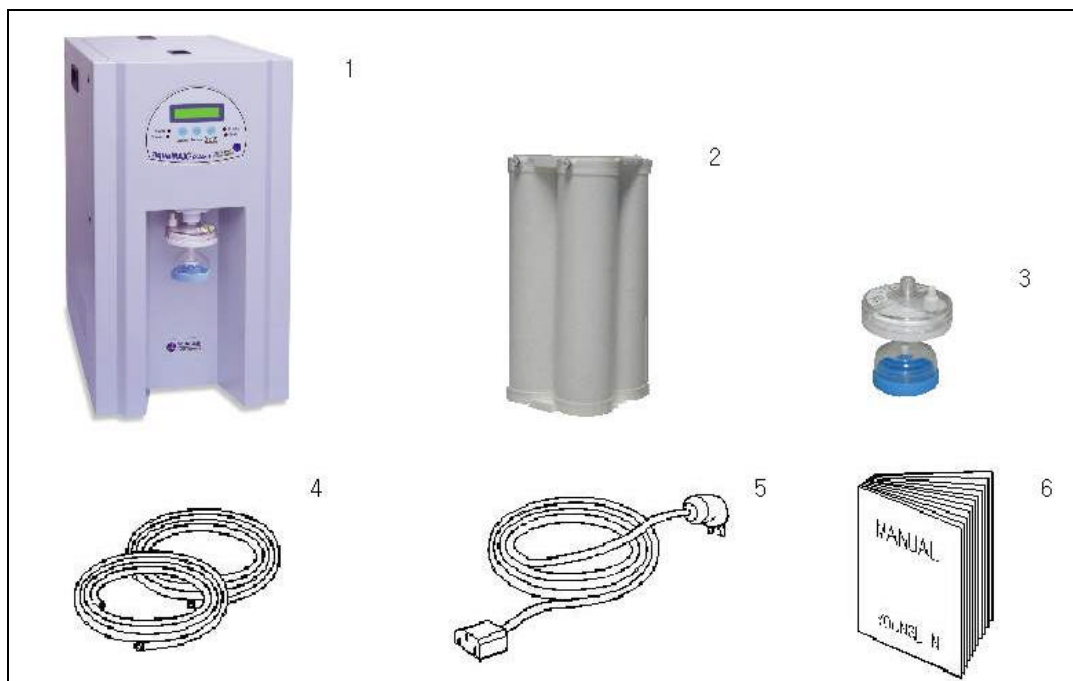
Use : Produce of Ultrapure Water for Regent or Standard Preparation

<Table. 1-6-1> Aquamax – Ultra System Specification

	HP-Pack(High purity) cartridge 0.22 μm Final filter						
	0.5~1.5 L/min (Depend on Hydraulic pressure)						
	18.2 M <sup>2</sup> cm (25°C)						
				Micro-organic			
	5~10 ppb (UV lamp <5ppb)	- (UF filter <0.005Eu/ml)	<1/ml	<1	<0.1 ppb	<0.1 ppb	
	16 x 2 Characters Backlight LCD Digital Display						
	110/220V, 50/60Hz (Automatic transformation)						
	280?480?475mm						
	24 kg						

## 2. Installation

The Aquamax – Ultra standard model is consisted of following items.



<Fig. 2-1-1> The Composition of the Aquamax – ultra

1. Aquamax – Ultra system (fuse 250V, 5A: mounted on the fuse holder)
2. HP-Pack cartridge
3. 0.22 µm Final Filter
4. Tubings for the feed water f 6 , 3m
5. Tubings for the production water f 10, 1.5m
5. Power cord(110/220V)
6. Operating manual
7. UV lamp(optional) 8. UF filter(optional) 9. Polisher Cartridge(optional)

## 2-2 Installation Guide

### 1. Unpacking

Carefully check the packing list against the contents of the container.

### 2. Setup the HP-Pack cartridge

You will need the following step for setup.

(arrangement : put RO or DI water into a washer)

Open the front door

Wet out purewater at the filter's O-ring.

Push the cartridge into after replaces with the same strength the right and the left.

Close to front door .

### 3. Setup the Final Filter

Connect to fitting. Wind a reel with teflon tape about 10 rounds.

### 4. Supply power

Connect to 110/220V code according to supply power.

110/220V power is automatic transformation.

### 5. Initial operation

After Switch On, look around self test.

After finish the self test, inspect the Ready state.

### 6. Connect feed water

Use for 1<sup>st</sup> order R.O(Reverse Osmosis) or D.I(Delonized) water by feed water.

Use for not flow out organic from reservoir inner wall .

Generally reservoir put higher situation than instrument.

After tubing connet to feed water reservoir, fit into the rear side inlet.

Use for 1/4" teflon tubing.

## 3. Operation

### 3-1 Normal Operation

? DISPLAY?

During operation, if press? DISPLAY? key continuously, the menus for resistivity and temperature are appeared. If press the key one more, display the resistivity.

? SERVICE?

At the standby, it is possible to operate two works by pressing? SERVICE? key. Each time Press the key you can select the other operations. Press? PRODUCT/RECIRCULATION? key to work each service mode.

1. Use for initial flushing of filters or for decreasing inner pressure for filter, should exhaust the produced water for 6 minutes in order to flush the filter inside and water tube inside.

**SERVICE**  
**Stabilization..**

**SERVICE**  
**Completed..**

2. At the replacement filter pack, push the Press down key to pressure down of the filter inside.

**SERVICE**  
**PRESS DOWN**

**SERVICE**  
**WAIT.....OK**

3. Pressing ? SERVICE? key for showing the electric conductivity instead of resistivity.

**SERVICE**  
**DISP. : RESIST.**

Pushing the Product/Recirculation key will be shown as follows.

**SERVICE**  
**DISP. : CONDUCT.**

? OPERATE/STANDBY?

If press the? OPERATE/STANDBY? at the initial state (Ready state), the Aquamax-Ultra is on Operate mode. On operation mode, the water revolve inside of system subsequently Recirculation .

? PRODUCT/RECIRCULATION?

press the? OPERATE/STANDBY? key to enter Recirculation state. When the purified water quality reach to the required purity more than 13 M $\Omega$  cm, pressing the ? PRODUCT/RECIRCULATION? key, begin to purified water production. During purified water production, push the ? PRODUCT/RECIRCULATION? key to stop the purified water production and change the Recirculation state.



## 3-2 LED Display

? POWER?

Confirm if power is supplied normally.

? OPERATE?

Displays when? Operate? or? Service? .

? STANDBY?

Displays when? Standby? or? Service? .

? FAULT?

Displays when normal operation is not possible by periodic alarms.

### 3-3 Initial Operation

#### 1. Power Supply

Display on LCD at this time.

**aquaMAX ultra 350**  
**Self test.....OK**

**aquaMAX ultra 330**  
**Younglin ins**

<System configuration>

aquaMAX ultra 350 = Basic type(HP-pack + final filter)

aquaMAX ultra 352 = UF additional type(HP-pack + UF filter + final filter)

aquaMAX ultra 354 = UV/Polisher cartridge additional type(HP-pack + UV filter + Polisher cartridge + final filter)

aquaMAX ultra 355 = UV/UF/Polisher cartridge additional type(HP-pack + UV filter + UF filter + Polisher cartridge + final filter)

After Self test.

**STANDBY**  
**Ready....**

On the Standby key, the screen is displayed Recirculation mode to prevents filter from contamination during every 1 hour for 5 minutes.

**STANDBY** **5min**  
**Recirculation..**

#### 2. Press the Standby/ Operate key.

**OPERATE** **LabWater.com? , 800-460-9011 USA 818-786-0600 Local/International**  
**PRODUCT : 18.2 M? cm**

On the Recirculation mode, displays resistivity.

3. Press the Product/Recirculation key.

If the purified water quality does not reach to 13 M $\Omega$  cm, display following message and stop the purified water production.

**OPERATE**  
**Not stable!!**

If the purified water quality reach to 13 M $\Omega$  cm, begin to the purified water production.

**PRODUCT**  
**PRODUCT 18.2 M $\Omega$  cm**

If want to temperature during the operation, press the? DISPLAY? key.

**PRODUCT**  
**TEMPERATURE 24°C**

#### **Error message**

**FAULT**  
**Filter error**

If the purified water quality does not reach to 13 M $\Omega$  cm, display following message and stop the purified water production.

**Operate**  
**Not stable!!**

## 4. Maintenance

1. The Aquamax-Ultra maintenance
2. Filter preservation
3. Filter replacement
4. Temperature resistivity data acquisition by RS232C
5. Service
  - At the filter replacement resistivity cell calibration

### 4-1 The Aquamax-Ultra maintenance

1<sup>st</sup> order feed water quality preserve

- Ultrapurewater filter is use for R.O(Reverse Osmosis) or D.I.(Deionized) water by feed water. Therefore need feed water quality preserve and use fresh feed water in order to make longer filter life time.

Periodic operation

- If the system is not switch off the power, increase the time of use by every 1 hour 5 minutes recirculation.

### 4-2 Filter preservation

If the system is stopped for a long time keep water in filter.

Prevent filter inside from air.

To resume operation, should perform the stabilization to remove the air and pollutants.

## 4-3 Filter replacement

### 1) HP-Pack Cartridge replacement

- ? At the standby
- ? Push the service key.
- ? Push the service key two times, select the PRESSURE DOWN.
  - confirm OK sign
- ? Open the front door.
- ? Take out cartridge.



<Fig. 4-3-1> Filter Cartridge

- ? Set up new cartridge.
  - Wet out purewater at the filter's O-ring.
  - Push the cartridge into after replaces with the same strength the right and the left.
- ? Close to front door.
- ? After power off/on, operating self test.
  - When normal operation is not possible by accompanying displays Error message.
- ? Push the service key, select the Stabilization, push the Product/Recirculation key, begin to stabilization.
  - Completely remove air in the filter to take effect two or three times.
  - To prepare reservoir.
- ? After stabilization is complete, the unit will produce ultra-pure water.

2) UV lamp replacement

- 1 At the standby
- 2 Push the service key.
- 3 Push the service key two times, select the PRESSURE DOWN.  
- confirm OK sign
- 4 Switch off the power and Open the upper cover.
- 5 Open the stopper upper UV lamp chamber. Separate carefully the UV lamp from the UV lamp chamber.

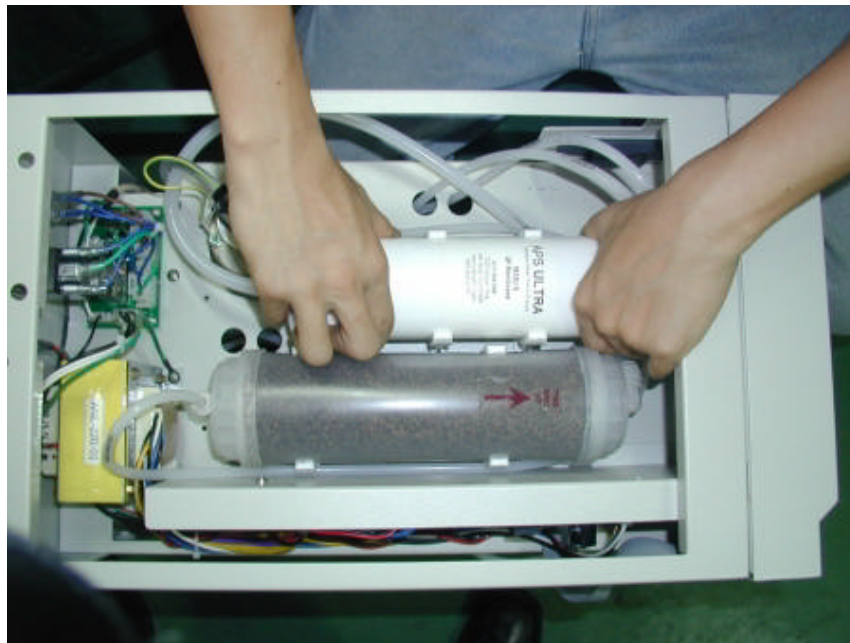


<Fig. 4-3-2> UV lamp chamber

- 6 Set up new UV lamp, and close the stopper upper UV lamp chamber
- 7 Close the upper cover
- 8 After power off/on, operating self test.  
- When normal operation is not possible by accompanying displays Error message.
- 9 Push the service key, select the Stabilization, push the Product/Recirculation key, run the stabilization.  
- Completely remove air in the filter to take effect two or three times.
- 10 After stabilization is complete, the unit will produce ultra-pure water having resistivity up to 18.2M $\Omega$  .cm.

3) UF Filter replacement

- ? At the standby
- ? Push the service key.
- ? Push the service key two times, select the PRESSURE DOWN.
  - confirm OK sign
- ? Switch off the power and Open the upper cover.
- ? Take out the UF filter.



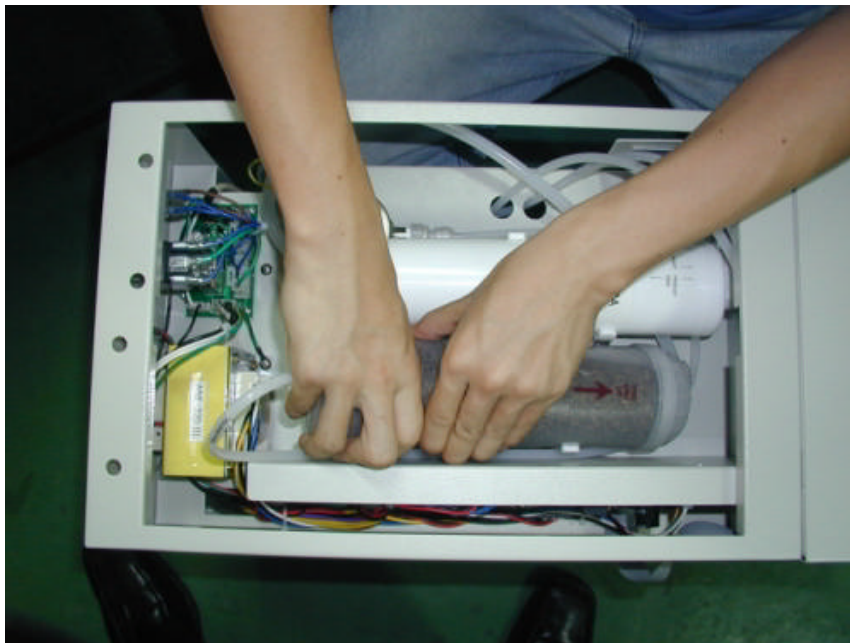
<Fig. 4-3-3> UF filter

- ? Set up new cartridge.
- ? Close the upper cover
- ? After power off/on, operating self-test.
  - When normal operation is not possible by accompanying displays Error message.
- ? Push the service key, select the Stabilization, push the Product/Recirculation key, begin to stabilization.
  - Completely remove air in the filter to take effect two or three times.
  - To prepare reservoir.
- ? After replacement of UF filter, you must perform initial cleaning procedure (p29).

4) Polisher Cartridge replacement

- ? At the standby
- ? Push the service key.

- ④ Push the service key two times, select the PRESSURE DOWN.
  - confirm OK sign
- ④ Switch off the power and Open the upper cover.
- ④ Take out the Polisher Cartridge.
- ④ Set up new cartridge.
- ④ Close the upper cover
- ④ After power off/on, operating self-test.
  - When normal operation is not possible by accompanying displays Error message.
- ④ Push the service key, select the Stabilization, push the Product/Recirculation key, begin to stabilization.
  - Completely remove air in the filter to take effect two or three times.
  - To prepare reservoir.
  - After stabilization is complete, the unit will produce ultra-pure water having resistivity up to 18.2M $\Omega$  .cm.



<Fig. 4-3-4> Polisher Cartridge



## 4-4 Data acquisition by RS232C

It can be temperature and resistivity values data acquisition connect with ascii value from external computer by RS232C connector. In the case of request to Younglin Instrument, receive data on txt cable(Part No. \_\_\_\_ ) connect to external computer by Terminal(VT100).  
Data form is following.

```
=====
AQUAMAX ultra ver 1.00

TEMP RESISTIVITY
-----
243    184
244    185
.      .
.      .
.      .
.      .
250    182
.      .
.      .
```

## 4-5 Resistivity cell calibration

Ultrapure water produces water with resistivity of 18.2 M $\Omega$  cm at 25°C.

The resistivity cell calibration need to when taking goods out of the warehouse and filter replacement.

### **Prepare for calibration**

- Resistivity meter, screwdriver, RS232C connection cable

### **calibration method**

? On the Recirculation/Production state

? Display Resistivity/Temperature.

It can be data acquisition connect with external computer.

? Resistivity measurement by read resistivity meter.

? Adjust a variable resistivity(VR1), resistivity measurement values as same as display values.

After test resistivity(1MO) connect to JP5(ION connector), turn on the VR1, measurement TP1 by DVM at

2.5V, adjust displayed purified water values as same as measurement value.

## Part List

### Part Descriptions and Numbers

#### Systems

Aquamax Basic System	AM0101
Aquamax UV System	AM0201
Aquamax UF System	AM0301
Aquamax UF System	AM0401

#### Replacement Filters

HP- Pack cartridge	QP01A1
0.22 um Final Filter	FF0501
UV Sterilizing Bulb	UV1801
UF filter (5K)	1812U-5
UF filter (10K)	1812U-10
Polisher Cartridge	MB1041

#### Spare Parts

Pump	PU1001
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## Note1. Operation of hand valve

### 1. Filter replacement

This should be done when you replace a HP-Pack cartridge, UV lamp, UF filter or Polisher cartridge.

- 1) Push the [Service] key two times, and select the 'Pressure down' mode.
- 2) Open upper cover.
- 3) Turn the hand valve on.



Hand valve off



Hand valve on

- 4) Push the [Service] key two times, and then select again the 'Pressure down' mode.
- 5) Power off the unit.
- 6) Remove the exhausted HP-Pack cartridge, UV lamp, UF filter or Polisher cartridge.
- 7) Install new HP-Pack cartridge, UV lamp, UF filter or Polisher cartridge.
- 8) Power on the unit and select the 'stabilization' mode two times.
- 9) Confirm the resistivity up to 18.2 M $\Omega$  .cm.



Hand valve on



Hand valve off

2. Low flow rate of ultra-pure water

If the flow(production) rate is less than 0.5L, you must operate the hand valve.

- 1) Power on the unit
- 2) Wait and Display will now read “ready”.
- 3) Open the upper cover and turn the hand valve on.



Hand valve off



Hand valve on

- 4) Wait a minute.
- 5) Air is rejected out of the unit by rejection valve.
- 6) After a minute, turn the hand valve off.
- 7) Confirm the resistivity up to 18.2 M $\Omega$  .cm.
- 8) If the flow(production) rate is still less than 0.5L, try again the above procedure.

Note2. Installation of 0.22um final filter

- 1) Insert and tighten the final filter
- 2) Power on the unit.
- 3) Run the "stabilization" mode two times, and then "production" mode
- 4) Open the valve upper final filter to remove inner air.
- 5) After all of inner air is removed, close the valve.



Note 3. Sanitization procedure for UF filter

For UF version(Aquamax-*Ultra*) or UV/UF version(Aquamax-*Ultra*), it is best to perform periodic cleaning procedures once six month. To sanitize the UF filter, it is necessary to use more than 60L feed water and minimum 1 hour.

1. Put 3g NaOH(Sodium hydroxide) into 50ml bottle and dissolve NaOH with ultra-pure water.
2. Push **SERVICE** key two times, then select **PRESSURE DOWN** mode.
  - confirm OK signal.
3. Power off the unit.
4. Remove 0.22µm final filter and insert tube(φ 6) for sanitization procedure into the dispenser, and place the tube end into waste.
5. Open the upper cover.
6. Power on the unit.
7. Push the **SERVICE** key four times, then Push the **Production** key to select the Sanitize Unit.
8. Confirm "**Inject solution**" state, then open the UF sanitization port.
9. Fill syringe with NaOH solution and inject NaOH solution into UF sanitization port
10. Close the UF sanitization port.
11. Close the upper cover.
12. Push the **Operate** key, and confirm "First Sanitize(20min)".
  - After the First Sanitizing is operated for 20 minutes, and then display "**Feed water**".
  - If PE reservoir is filled feed water more than 20L, push the **Operate** key.
  - After the Second Sanitizing is operated for 20 minutes, and then display "Feed water".
  - If PE reservoir is filled feed water more than 20L, push the **Operate** key.
  - After the Third Sanitizing is operated for 20 minutes, and then display "**Check Resist**".
  - Push the **Operate** key,

Resist.	State
15 MΩ·cm	Stable

- If resistivity of more than 15 MΩ·cm, state has "**stable**" value.-----(1)
  - If resistivity of less than 15 MΩ·cm, state is "**reject**" value.-----(2)
13. If the state shows "**reject**" value(2), the entire sanitization procedure is not complete.
    - Push the **Operate** key to enter "**feed water**" state, and then push the **Operate** key to enter to try again the "**first sanitize**".

14. The sanitizing procedure must be continued until the state has “**stable**” value
15. If the state shows “**stable**” value(1), the entire sanitization procedure is now complete.
  - Push the **Operate** key to enter “ready”.

1)



2)



Figure. Sanitization procedure for UF filter

- 1) Injection of NaOH solution into UF sanitization port
- 2) Inserting of tube for sanitization procedure into the dispenser



**Note 4. Initial Cleaning of UF filter**

When the system is new or whenever a new UF filter is installed, the system should be cleaned. The entire initial cleaning procedure will take approximately 1 hour to complete. To clean the UF filter, it is necessary to use more than 60L feed water.

1. Power on the unit.
2. Push the **SERVICE** key four times, then Push the **Production** key to select the Sanitize Unit.
3. Confirm "**Inject solution**" state,
4. And then push the **Operate** key, and confirm "First Sanitize(20min)".
  - After the First Cleaning(Sanitizing) is operated for 20 minutes, and then display "**Feed water**".
  - If PE reservoir is filled feed water more than 20L, push the **Operate** key.
  - After the Second Cleaning(Sanitizing) is operated for 20 minutes, and then display "Feed water".
  - If PE reservoir is filled feed water more than 20L, push the **Operate** key.
  - After the Third Cleaning(Sanitizing) is operated for 20 minutes, and then display "**Check Resist**".
  - Push the **Operate** key,

Resist.	State
15 M? Ωcm	Stable

- If resistivity of more than 15 M? Ωcm, state has "**stable**" value.-----(1)
  - If resistivity of less than 15 M? Ωcm, state is "**reject**" value.-----(2)
5. If the state shows "**reject**" value(2), the entire sanitization procedure is not complete.
    - Push the **Operate** key to enter "**feed water**" state, and then push the **Operate** key to enter to try again the "**first sanitize**".
  6. The cleaning(sanitizing) procedure must be continued until the state has "**stable**" value
  7. If the state shows "**stable**" value(1), the entire cleaning procedure is now complete.  
 Push the **Operate** key to enter "ready".