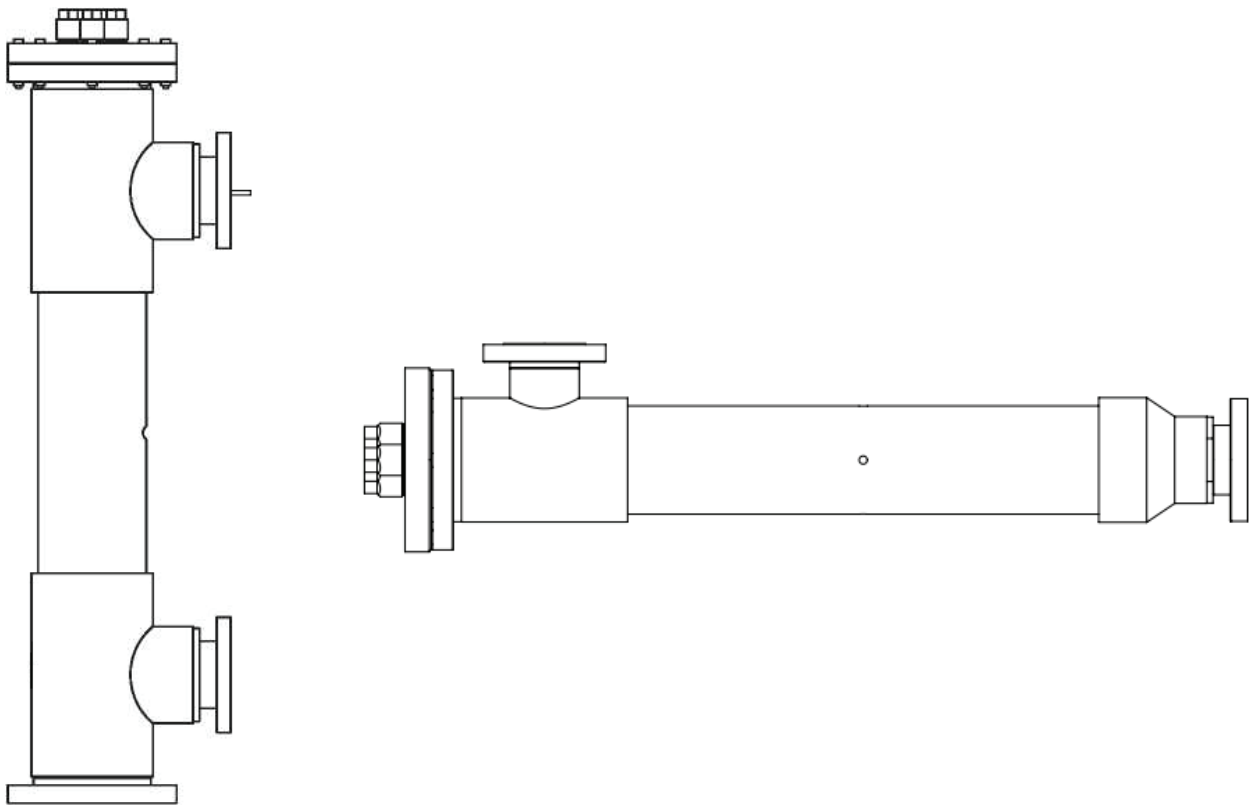




# BIOSHIELD<sup>®</sup> COMMERCIAL UV SYSTEM



## INSTALLATION AND USER'S GUIDE

IMPORTANT SAFETY INSTRUCTIONS  
*READ AND FOLLOW ALL INSTRUCTIONS*  
SAVE THESE INSTRUCTIONS

## CUSTOMER SERVICE / TECHNICAL SUPPORT

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If you have questions about ordering Pentair Aquatics Systems replacement parts and products, please contact:

### CUSTOMER SERVICE

8AM to 7PM—Eastern and Pacific Times

Toll Free: 800.831.7133

Fax: 919.566.8920

### WEB SITE

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## SECTION 1: INTRODUCTION

### General Information

In this manual you will find user information for your Bioshield® Commercial UV System. It is an important document for safety guidance, installation, operation and maintenance. Read and understand all sections of this Manual before starting the installation or operation of this UV system. Strictly follow this Manual and all safety notes, they are for your own safety.

Custom-made, project specific modifications of the UV system and/or additionally integrated components may result in non-conformity of the system and void the warranty.

The information contained in this manual represents our most recent experiences and technical knowledge. This information does not hold a legally binding promise of certain characteristics or suitability for a specific application. The user of the UV system will be required to perform verifications and safety measures.

Pentair Water Pool and Spa, Inc. (Pentair) accepts no responsibility for any problems arising from incorrect installation, lack of routine maintenance as specified in this manual or modifications of the UV system.

**Important Note:** This unit has been tested to confirm a minimum inactivation equivalent of 3 log (99.9%) *C. parvum* in accordance with NSF/ANSI/CAN 50 and the U.S. EPA UV DGM.21 This product has met the requirements of NSF/ANSI/CAN 50, Section N-8.1: Disinfection Efficacy, for the  $\geq$  minimum of a 3-log (99.9%) reduction of *Enterococcus faecium* [ATCC #6569] and *Pseudomonas aeruginosa* [ATCC #27313].<sup>26</sup> This product is intended for secondary disinfection and is intended for use with appropriate residual levels of EPA registered disinfecting chemicals. Specific residual levels of EPA registered disinfecting chemicals may be required by the regulatory agency having authority.

### Glossary

TERM	DESCRIPTION
End of Useful Lamp Life	Recommended time to replace a UV lamp
Fouling	Buildup of scale in the vessel, sensor or quartz sleeve
J/m <sup>2</sup>	Joule per square meter A Unit of UV Dose 10 J/m <sup>2</sup> = 1 mJ/cm <sup>2</sup> = 1,000 uWs/cm <sup>2</sup>
Minimum UV Intensity	Required value at end of lamp life (alarm threshold value) to maintain the minimum UV dose at a given flow rate and a given UV transmission.
nm	Nanometer – Light wavelength measurement
Personal Protective Equipment	Hard Hat, Safety Glasses, Rubber Gloves, Safety Shoes
Power Supply Enclosure	NEMA Type-12 cabinet housing electrical hardware, instruments and PLC control/monitor
Text Display	Screen used to view PLC Controller/Monitor data
UV-C	Specific UV area of the light spectrum (200 – 280 nm) UV Dose Indicates amount of UV light
UV Intensity	Indicates the strength of UV light
UV Output	Amount of UV light emitted from a UV lamp
UVT	Ultraviolet Transmissibility how far UV-C light travels through water
UV Sensor	Sensing-probe installed on the UV vessel to measure UV intensity-UV light wavelength 254nm
UV System	Entire UV System that includes the Power Supply Enclosure and UV Vessel
UV Vessel	Wet portion of the UV System consists of: quartz sleeve(s), UV lamp(s), vessel, and valve(s)

## SECTION 2: HEALTH AND SAFETY PRECAUTIONS

### Safety Symbols



Caution



High Voltage



Sharp Object



Recycle



Warning



Chemical (Corrosive)



Protective Eye wear (UV Light)

## SAFETY INSTRUCTIONS

### IMPORTANT SAFETY INSTRUCTIONS PLEASE READ PRIOR TO INSTALLATION AND OPERATION

Strictly follow the instructions within this manual to ensure the health and safety of both, yourself and the UV system. The installation, operation and maintenance of the Bioshield® Commercial UV System can only be carried out after reading and understanding the information contained in this manual.

The installation of the UV system must be carried out in accordance with local regulations and codes.



**WARNING:** Water and electricity can be a dangerous combination. Help us ensure your safety. **READ AND FOLLOW ALL SAFETY INSTRUCTIONS.**



**DANGER:** UV lamps and quartz sleeves are fragile and if broken and handled incorrectly may cause serious injury.



**IMPORTANT: READ AND OBSERVE ALL IMPORTANT NOTICES AND LABELS ON THE UNIT. REMOVAL OF PRODUCT LABEL WILL VOID WARRANTY!**



**IMPORTANT:** For your safety the quartz sleeve and/or the UV lamp in this product may have been broken or damaged during shipping. It is **ESSENTIAL** that the unit be **CAREFULLY INSPECTED BEFORE CONNECTING TO ELECTRIC POWER.**



**WARNING: DO NOT** exceed listed pressure rating for unit.



**DANGER:** To avoid possible electric shock special care should be taken since water is employed in the use of the UV System. For each of the following situations, do not attempt repairs yourself. Call Pentair customer service department at (800) 831-7133.



**DANGER:** If the unit falls into the water, **DO NOT REACH FOR IT!** First unplug it and then retrieve it. If the internal electrical components of the unit get wet, unplug the unit immediately.



**WARNING:** This product should not be used on pools that use bromine for sanitization. The use of UV light or ozone in bromine-sanitized pools may induce the formation of bromate, a possible human carcinogen.



**WARNING:** If a sleeve nut is removed when there is dynamic water pressure inside the UV system, the lamp sleeve will eject from the end plate with enough force to cause personal injury.



**DANGER:** If the unit shows any sign of water leakage, immediately unplug it from the power source.



**DANGER: DO NOT** operate this unit if it has a damaged cord or plug, if it is malfunctioning, or if it has been dropped or damaged in any manner.



**IMPORTANT:** Close supervision is necessary when any appliance is used by or near children; this UV system is no exception.



**IMPORTANT:** Always unplug the unit from the electrical outlet when it's not in use, before servicing, cleaning or removing parts. Never yank the cord to pull the plug from the outlet. Grasp the plug and pull to disconnect.



**IMPORTANT:** Each UV system is designed for a specific water-pressure. **DO NOT** use the UV system for any application other than its intended use. The use of attachments not recommended or sold by Pentair may cause unsafe conditions and possibly void any warranty.



**IMPORTANT:** Only (3) three wire grounded cables suitable for outdoor use should be used to connect this unit. If joining cables for outdoor use, a suitable watertight cable connector must be used. Care should be taken to arrange the cord so that it will not be tripped over or pulled. If in doubt consult a qualified electrician.



**IMPORTANT:** Only operate the UV system when it is properly maintained and in good working order.



**IMPORTANT: DO NOT** modify the UV system without authorization from Pentair.



**DANGER: BLUE-LIGHT HAZARD** Ultraviolet light will cause serious damage to your eyes and skin! **DO NOT** handle or stare at an operating UV lamp. UV lamps become hot during operation, **DO NOT** handle them during operation.

## SECTION 2: HEALTH AND SAFETY PRECAUTIONS

### HAZARDOUS SITUATIONS & APPROPRIATE ACTIONS

SITUATION	LOCATION	HAZARD	ACTIONS
Lamp or Quartz Sleeve Removal	UV Vessel	Burn	Isolate UV system from water source, shutdown system using external On/ Off switch and lock-out disconnect from input power source.
Broken Quartz Sleeves/ UV Lamps	UV Vessel	Sharp Object	Handle quartz sleeves and UV lamps with extreme care, wear clean cotton gloves.
UV Lamp Replacement	UV Vessel	Blue-Light Hazard	DO NOT operate UV lamps outside the UV vessel, wear protective eye wear against ultraviolet light.
Drain UV Vessel	UV Vessel	Pressure	Isolate UV system from water source and shutdown system using external On/Off switch and lock-out/disconnect from input power source. Open valves carefully to relieve pressure and drain the UV Vessel.
Vessel Cleaning	UV Vessel	Corrosive/ Chemical	Isolate the UV vessel and secure against unauthorized operation. Wear appropriate protection equipment. No smoking or food allowed.
Electrical Work	UV System	Electrical Shock	Shutdown system using the UV system's external On/ Off switch and lock-out/disconnect from input power source. All electrical work should be carried out by authorized and qualified personnel only.

## SECTION 3: INSTALLATION

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### Pre-Installation Inspection

#### Purpose

To familiarize the installer/operator with the UV Systems™ Commercial Lines' components, to assure proper delivery of all the system's components and to inspect each component for shipping damages.

#### Frequency

To be conducted prior to installation.

#### Parts and Required Equipment

- Adjustable Wrench or 1.5" Socket
- Box Cutter
- Hammer/Nail Remover
- Flashlight



During pre-installation there is a general risk due to load.



Quartz Sleeves and UV Lamps are fragile and potentially dangerous if broken. Handle with care.

#### Procedure

**NOTE:** Vessel diameters up to 8" are shipped with their quartz sleeves assembled. Vessel diameters 10" and larger are shipped with their quartz sleeves packaged separately.

**NOTE:** UV Lamp(s) are shipped in a separate package either inside the vessel crate or separately.

1. Unpack and inspect vessel for shipping damage. A box cutter or hammer/nail remover may be needed to unpack the UV System.
2. Conduct an internal, visual inspection of models shipped with their quartz sleeves assembled. A flashlight will help with the internal inspection.

#### The UV System consists of:

- Quartz Sleeve Module (QSM) Faceplate (assembled on Vessel)
- QSM Faceplate Gasket (assembled on Vessel)
- UV Intensity Sensor (PLC models only)
- Temperature Sensor
- Quartz Sleeve Retainer Nut (one for each quartz sleeve)
- Quartz Sleeve Gasket (one for each quartz sleeve retainer nut)
- Drain Valve Assembly
- Quartz Sleeve (one for each UV Lamp)
- UV Lamp(s)
- Vessel
- Bolt(s) (assembled on Vessel)
- Nut(s) (assembled on Vessel)
- Washer(s) (assembled on Vessel)
- 4-Pin Connector(s) (attached to lamp cables)

## SECTION 3: INSTALLATION

### UV Vessel Installation

#### Purpose

Proper installation of the UV Vessel achieves expected results and ensures safe operation.

#### Frequency

Required with new construction, retro-fit or replacement of outdated equipment.

#### Parts and Required Equipment

- Socket Wrenches
- Adjustable Wrenches
- Set of Slotted and Phillips Head Screwdrivers
- Lifting Equipment with Slings
- Vessel Mounting Brackets
- Required Isolation Valves
- Plumbing Components
- Personal Safety Equipment



**WARNING:** If a sleeve nut is removed when there is dynamic water pressure inside the UV system, the lamp sleeve will eject from the end plate with enough force to cause personal injury.



General risk due to load.



General risk due to pressurized piping or UV Vessel.



Quartz Sleeves are fragile and potentially dangerous if broken. Handle with care.

### Procedure

**IMPORTANT:** The installation of the UV system must be carried out in accordance with local regulations and codes.

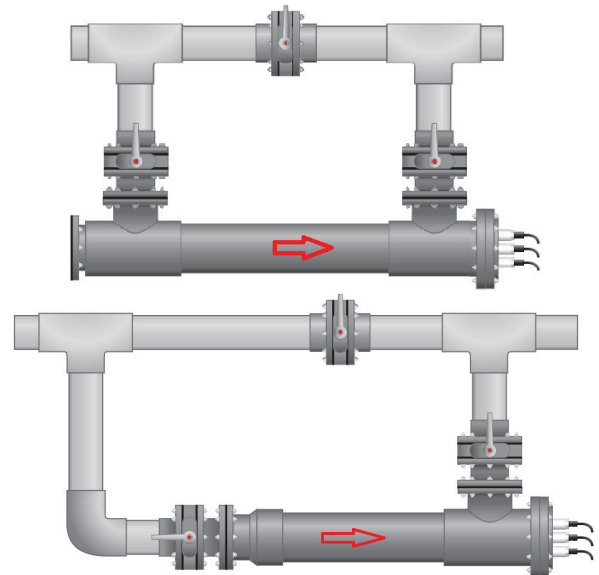
1. Install the UV system after the mechanical filtration.
2. Install inlet and outlet isolation valves (to be supplied by others).
3. Install UV vessel mounting brackets if required (to be supplied by others).

**NOTE:** A 46" clearance for both Vertical Series and CLP4 Series models is required for lamp and quartz sleeve removal.

A 76" clearance for CLP6 Series models is required for lamp and quartz sleeve removal.

### Horizontal Installation

Horizontal installation requires the vessel outlet port to face upwards, allowing trapped air to escape. If installed on a "by-pass filter loop" or isolated using valves, an automatic air bleed system is required. **Failure to remove trapped air can result in rupture or heat damage to the vessel.**

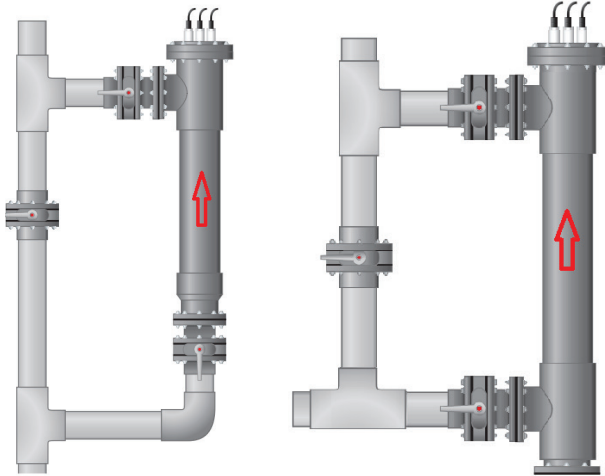




## SECTION 3: INSTALLATION

### Vertical Installation

Vertical installation requires the bottom port to be used as the vessel's inlet and the port closest to the electrical end to be used as the outlet; allowing trapped air to escape. If installed on a "by-pass filter loop" or isolated using valves, an automatic air bleed system is required. Failure to remove trapped air can result in rupture or heat damage to the vessel.



4. Isolation Valves are necessary for vessel removal and chemical cleaning procedure. It is recommended to install the isolation valves in conjunction with a separate set of, matching size & type, water port connections to the inlet/outlet ports of the vessel. Adding the "double connection" will enable the UV system to be removed from the filtration loop without shutting the total filtration system down. If this installation arrangement is not possible, install the unit in a way that chemical cleaners or freshwater rinse can be drained completely from the vessel without contaminating the process water.

5. The UV System (models w/ diameters of 10" and larger) may have been shipped without their quartz sleeves installed in the vessel, please install now.
6. The vessel is equipped with a 0.5" female threaded drain port for installation of the Drain Valve Assembly. Use thread tape on the threads when installing the drain valve assembly.
7. The vessel is equipped with various sensor ports (UV Intensity and Water Temperature Sensors); additional sensor ports may be included depending on the model or options purchased with the UV System. All sensor ports will be labeled on the vessel based on their respective function. Use thread tape on the threads to create a reliable seal with all sensors. Sensors must be threaded into their respective vessel ports prior to connection to the power supply enclosure to avoid sensor damage from cable twisting.

## SECTION 3: INSTALLATION

### Quartz Sleeve Installation

#### Purpose

To thermally protect the UV lamp and isolate it from water.

#### Frequency

Quartz Sleeve(s) are installed after being inspected/cleaned or damaged. Water quality conditions may warrant more frequent inspection/cleaning. Fouled quartz sleeves absorb UV light and therefore may reduce the UV intensity.

Replace broken quartz sleeve(s).

#### Parts and Required Equipment

- Quartz Sleeve(s)
- Quartz Sleeve Retaining Nut Gasket
- Adjustable Wrench
- Cotton or Silicon Gloves
- Personal Safety Equipment



**WARNING:** If a sleeve nut is removed when there is dynamic water pressure inside the UV system, the lamp sleeve will eject from the end plate with enough force to cause personal injury.



General risk due to electricity.



General risk due to pressurized piping or UV Vessel.



Quartz Sleeves are fragile and potentially dangerous if broken. Handle with care.

#### Procedure

**NOTE:** Use clean cotton or silicon gloves when handling the quartz sleeve(s). Skin oils absorb ultraviolet light and reduce UV intensity.

1. Apply water (wet) or a small amount of water soluble lubricant to the domed-end of the quartz sleeve. Lubricating will aid in inserting the domed-end of the quartz sleeve into the vessel's internal quartz sleeve coupler.
2. Carefully slide the quartz sleeve(s) into the Quartz Sleeve Faceplate's "Quartz Sleeve Module" (QSM) allowing approximately 12" of the quartz sleeve to remain outside the UV vessel.



3. With 12" of the quartz sleeve exposed outside the vessel, carefully place the Quartz Sleeve Rubber Gasket Seal onto the open-end of the quartz sleeve.

Apply water or a small amount of water soluble lubricant onto the end of the quartz sleeve, this will act as a lubricant and will allow you to easily slide the Rubber Gasket onto the quartz sleeve.

The rubber gasket should be flush with the end of the quartz sleeve.



4. As you push the quartz sleeve into the vessel (through the Quartz Sleeve Module) elevate the domed-end of the quartz sleeve by gently pushing down on the open-end approximately 1/2". This will help guide the domed-end of the quartz sleeve into its correct Internal Quartz Sleeve Coupler "Port".

## SECTION 3: INSTALLATION

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5. Finish sliding the remainder of the quartz sleeve into the vessel until the gasket makes contact with the Quartz Sleeve Module.

As you thread and tighten the Quartz Sleeve Retaining Nut onto the Quartz Sleeve Module the Quartz Sleeve Retaining Nut's internal lip will automatically set the quartz sleeve in its proper position.

6. Using the white retaining nut tightening tool included with the UV system or a 1.5" socket or an adjustable wrench, tighten the Quartz Sleeve Retaining Nut until snug (5 ft. • lb.). Over-tightening can break the Quartz Sleeve Module on the faceplate or the quartz sleeve inside the UV vessel.



7. The quartz sleeve is now properly assembled; you are now ready to perform a Water Test See Page 14.

**WARNING:** Servicing while pressurized can cause severe injury.

LOCK OUT source and RELIEVE PRESSURE before servicing.



## SECTION 3: INSTALLATION

### Power Supply Installation

#### Purpose

Power Supply Enclosure is part of the complete Bioshield UV Systems™ Series.

#### Frequency

Required with new construction, retro-fit or replacement of outdated equipment.

#### Parts and Required Equipment

- Set of Slot and Phillips Head Screwdrivers
- Adjustable Wrench
- Pliers
- Wall Struts or Braces
- Supplied Enclosure Mounting Hardware
- Personal Safety Equipment



General risk due to suspended load.



General risk due to electricity.

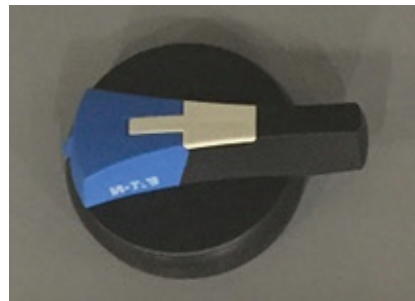


General risk due to pressurized piping or UV Vessel.

#### Procedure

1. Use the supplied enclosure mounting feet if the Power Supply Enclosure is going to be mounted on a wall.
2. Mount the Power Supply Enclosure close to the UV Vessel so that the lamp cables reach between the Power Supply Enclosure and the UV Vessel. The power supply lamp and sensor cables are approximately 20' long to provide an adequate routing length from the power supply enclosure to the UV vessel.
3. The Power Supply Enclosure should be mounted so that the PLC is visible to the operator. The location used for mounting the Power Supply Enclosure should be as dry and cool as possible.

4. The Power Supply Enclosure should be located in a place that provides sufficient weather protection, in the case of outdoor installation. Sufficient space near the cooling fan's intake and exhaust must be provided.
5. The Power Supply Enclosure must be supplied with the correct operating voltage (120/230 VAC). Failure to supply the UV System with the correct operating voltage can damage the ballasts and other electrical hardware. Use only a well-ground electrical circuit.
6. The UV System is equipped with an equipment-grounding conductor and a grounding plug. The grounding plug must be installed and grounded in accordance with all local codes and ordinances. Improper connection of the equipment-grounding conductor can result in electrocution. Check with a qualified electrician or service personnel if you question whether the equipment is properly grounded.
7. Input power to the Power Supply Enclosure is switched on and off using the enclosure's External On/Off switch or Remote On/Off control.



**NOTE:** All UV control enclosures that utilize our PLC should be mounted with considerations to other devices that emit, or are suspected of emitting, any EMI & RFI noise and that any sensors used in conjunction with our PLC should use industry standard procedures to avoid EMI & RFI noise issues.

## SECTION 3: INSTALLATION

### Temperature & UV Intensity Sensor Installation

#### Purpose

To instruct the operator how to properly install the Temperature and UV Intensity Sensors.

#### Frequency

Required with new installation or when servicing the unit during general maintenance.

#### Parts and Required Equipment

- Flare-Nut Wrenches
- Thread Tape
- Personal Safety Equipment



General risk due to electricity.



General risk due to pressurized piping and UV vessel.



General risk due to suspended load.

#### Procedure

1. Install the Temperature and UV Intensity Sensors into their respective port locations as labeled on the vessel using Thread Tape to properly seal the sensor threads in the vessel. To avoid possible sensor damage from cable twisting, **DO NOT** connect the sensor cables to the power supply until after they are installed into the vessel. Leave the sensor cables coiled up close to the sensor during the installation process to allow the cable to rotate as the sensor is being screwed into the vessel. If the cable becomes twisted during the installation process, untwist it before proceeding.
2. Use a flare-nut wrench to carefully tighten the UV sensor and temperature sensor. These components are made of soft polytetrafluoroethylene (PTFE) and can be easily damaged. Leave the sensor cables coiled up close to the sensor during the installation.

3. Once the sensors have been installed into the vessel you can attach cables to their respective connection points located on the bottom of the Power Supply Enclosure.

**WARNING:** *Sensor-cables should be isolated from other electrical devices, preventing electrical interference. UV intensity sensor-cables must also be separated from UV lamp cables to minimize electrical interference.*

**NOTE:** The Temperature Sensor must be installed in the vessel with its water tight connector properly connected to its respective port located on the power supply enclosure. A Temperature Sensor Cable connection interruption will automatically shut down the system.

## SECTION 4: MANDATORY WATER TEST

### Mandatory Water Test

#### Purpose

The Mandatory Water Test identifies a potential quartz sleeve assembly seal failure. During normal UV system operation, a quartz sleeve assembly failure can result in extensive damage to the UV lamp, quartz sleeve and ballast.

#### Frequency

The Mandatory Water Test must be performed after a quartz sleeve/retaining nut gasket inspection/replacement. Quartz

Sleeve inspection/retaining nut gasket replacement must be carried out annually, at minimum.

#### Parts and Required Equipment

- Paper Towels
- Personal Safety Equipment



**WARNING:** If a sleeve nut is removed when there is dynamic water pressure inside the UV system, the lamp sleeve will eject from the end plate with enough force to cause personal injury.



General risk due

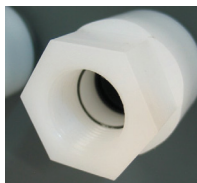


UV Lamps are fragile and potentially dangerous if broken. Handle with care.

#### Procedure

**IMPORTANT:** Failure to perform a water test could lead to unsafe conditions and may void your product's warranties.

1. With the quartz sleeves installed inside the UV vessel, before installation of the UV lamps, perform a water test as explained below. For quartz sleeve removal See Page 24. For installation See Page 7.



2. Thread all sensors into their respective ports on the UV vessel.
3. Place rolled-up paper towels into the Quartz Sleeve Retaining Nuts. During the water test, the paper towels may absorb moisture. The presence of any moisture identifies that a quartz sleeve seal failure (leak) has occurred.



4. Inspect all piping connections to the UV Vessel and confirm that valves are in their correct position prior to start-up.
5. With satisfactory piping and valve inspection, operate the UV system. Allow water to flow through the UV Vessel for no less than fifteen minutes.
6. After fifteen minutes of flowing water through the UV vessel, remove the paper towel from each Quartz Sleeve Retaining Nut and inspect closely for ANY sign of moisture. If leaks are detected, shut the system down and re-install any quartz sleeve with an inadequate seal. For quartz sleeve removal/installation See Page 24 and 7.
7. If no leaks were detected you are now ready to install the UV Lamp(s). See Page 15.

**WARNING:** Servicing while pressurized can cause severe injury.

LOCK OUT source and RELIEVE PRESSURE before servicing.



## SECTION 5: UV LAMP INSTALLATION

### Purpose

To instruct the operator how to properly install the UV lamp(s).

### Frequency

Lamp installation in new unit or lamp replacement change-out (after every 12,000 hours of continual operation).

### Parts and Required Equipment

- UV Lamp(s)
- Wire Cutters
- Adjustable Wrenches
- Cotton or Silicon Gloves
- Personal Safety Equipment



General risk due to electricity.



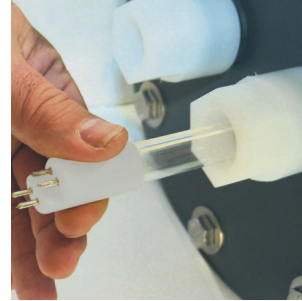
UV Lamps are fragile and potentially dangerous if broken. Handle with care.

### Procedure

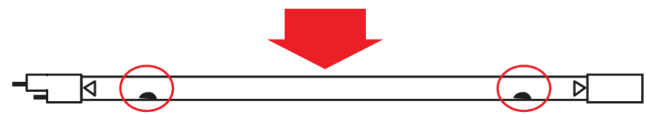
**IMPORTANT:** Before installing the UV Lamp(s) a **MANDATORY WATER TEST** must be performed. See Page 14.

**NOTE:** Use clean cotton or silicon gloves when handling the UV lamp(s). Skin oils absorb ultraviolet light and reduce UV intensity. Skin oils may also lead to premature lamp failure.

1. Gently slide the UV Lamp into the Quartz Sleeve Retaining Nut leaving 6" of the UV lamp exposed.

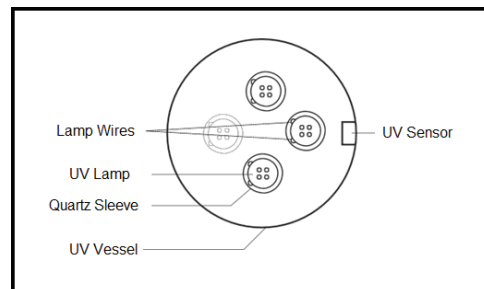


**IMPORTANT: INSTALL LAMPS WITH AMALGAM SPOT IN DOWN POSITION!**

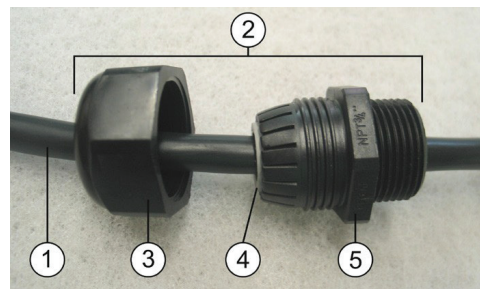


**NOTE:** Lower wattage amalgam lamps contain a single mass of amalgam while higher wattage amalgam lamps contain multiple masses of amalgam.

**NOTE:** When installing the lamp into the quartz sleeve position that is monitored by the UV Intensity Sensor, it is important to make sure the lamp wires that run the length of the lamp are not facing the sensor. See diagram at right for the proper lamp placement



**NOTE:** Each Lamp cable (1) is equipped with a Water Tight Connector (2). This cable adapter is made up of three components: Nut (3), Rubber Gasket (4) and Male-Threaded Body (5).

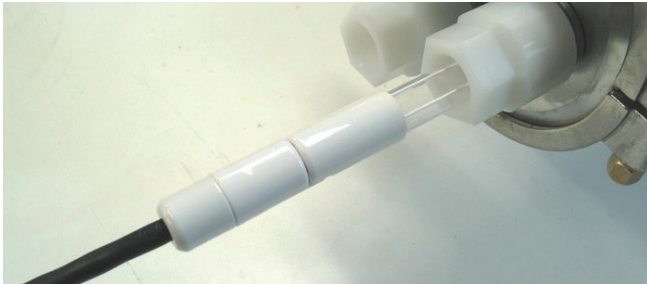


## SECTION 5: UV LAMP INSTALLATION

2. Loosen (not remove) the lamp Water Tight Connector nut (3) to release tension on the lamp cable allowing the cable to slide freely through the adapter. This will allow the male-threaded body (5) portion of the lamp Water Tight Connector to be threaded into the white quartz sleeve retaining nut without twisting the lamp cable (after lamp installation).

3. With the UV lamp installed inside the quartz sleeve and six inches exposed, attached the lamp cable's stepped 4-Pin Connector on to the four pins of the UV lamp.

4. With the lamp cable/lamp connection complete gently slide the remainder of the lamp w/ cable through the Quartz Sleeve Retaining Nut and into the quartz sleeve. With the lamp now inside the quartz sleeve, gently continue to push the lamp (w/ connected lamp cable) into the quartz sleeve until it stops, then pull out 1/2" of the lamp cable. This will position the lamp properly inside the quartz sleeve avoiding heat damage to the Quartz Sleeve Module Faceplate and Quartz Sleeve Module.



5. With the UV lamp in its correct position inside the quartz sleeve, thread the water tight connector into the Quartz Sleeve Retaining Nut.



6. With the "black" Water Tight Connector threaded into the Quartz Sleeve Retaining Nut, tighten the Cable Adapter Nut (3) to create a watertight seal on the lamp's cable. Take care not to bend or damage the Water Tight Connector's "gasket prongs" during this process.



7. The UV lamp is now properly installed.



## SECTION 5: UV LAMP INSTALLATION

### Lamp Field Safety Cover Installation

#### Purpose

To instruct the operator how to properly install the Lamp Field Safety Cover.

#### Frequency

Required anytime the lamp field is accessed.

#### Parts and Required Equipment

- Lamp Field Safety Cover
- Pliers
- Personal Safety Equipment



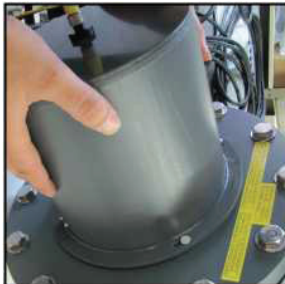
General risk due to electricity.

#### Procedure

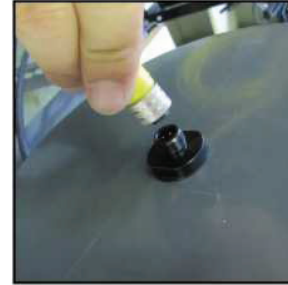
1. With the UV lamps and lamp cables installed hand loosen the four Safety Cover Retaining Screws from the QSM Faceplate so they have approximately 3/8" of clearance between the head of the screw and the QSM Faceplate.



2. The Lamp Field Safety Cover uses a twist-lock attachment method that can only be installed one way. Take the cover assembly with the cable slot facing downward and align the four slotted keyways on the cover's flange face with the retaining screws on the QSM Faceplate. Then place the cover over the screws and turn counterclockwise to engage the retaining screws.



3. Once the cover is in place, tighten the four Retaining Screws down until the cover is snugly held in place.
4. With the cover installed on the vessel, connect the Lamp Field Safety Cover cable that is attached to the power supply to the connector that is located on the end of the Safety Cover.



**NOTE:** The Lamp Field Safety Cover must be installed onto the vessel with its respective cable, located on the Power Supply Enclosure, properly connected to its respective port on the Safety Cover. Removing the Lamp Field Safety Cover or the cable connection will automatically shut off the UV system's lamp field and generate an alarm signal.

## SECTION 6: COMMISSIONING

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### Start-Up

#### Purpose

This section contains the necessary steps required to prepare the Bioshield® Commercial UV System for proper operation.

#### Frequency

Required with new construction, retro-fit or replacement of outdated equipment.

#### Parts and Required Equipment

- Personal Safety Equipment



General risk due to pressurized piping and UV Vessel!



General risk due to electricity!



Hydraulic shock (water hammer) may occur as a result of improper use of valve(s) or trapped air inside the vessel. Hydraulic shock and trapped air can damage the vessel.



Trapped air or no-flow situations may damage the vessel and/or the UV lamps due to overheating.

### Procedure

1. Confirm that all personnel operating this UV system have thoroughly reviewed these instructions prior to operating.
2. Remove all dirt/debris from power supply enclosure, vessel and installation area resulting from installation activities.
3. Inspect all plumbing connections and immediate plumbing network to ensure safe start-up.
4. Inspect the vessel's Quartz Sleeve Module Faceplate to ensure proper assembly.
5. Inspect quartz sleeve assemblies (Quartz Sleeve Retaining Nuts) confirming that they are tight.
6. Inspect Power Supply Enclosure, confirm that it has been mounted properly and input power is in accordance with local ordinances and codes.
7. Inspect all sensors ensuring that the probes are properly installed in the vessel and Water Tight Connectors are properly connected to their respective Power Supply Enclosure ports.
8. Verify that a successful Leak Test has been completed. See Page 14 for instructions.

## SECTION 7: OPERATION

### PLC (Programmable Logic Control) Power Supply

#### Operation

The operation of the Bioshield® Commercial UV System may only be carried out by authorized personnel. The personnel responsible for the operation of this system must read and understand this Section, Section 2 (Health & Safety Precautions), and strictly comply with all relevant rules for accident prevention and local health and safety regulations.

Check all relevant safety measures before you switch on the UV system.

#### Operating Modes

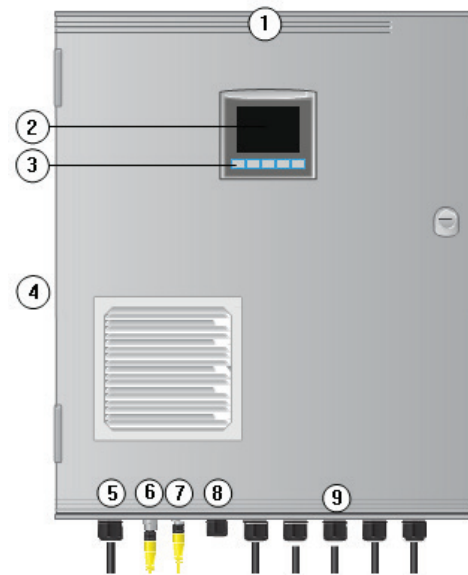
Generally, the UV system is operated in “LOCAL” mode. An optional, discrete input circuit is provided to allow for either “LOCAL/REMOTE” or “LOCAL” mode. If this option has been ordered there are two terminal blocks (brown) located inside the Power Supply Enclosure. The UV system is supplied with both the brown terminals jumped together as the default “ON” setting. To operate the UV system in the “REMOTE” mode, the “Factory-Installed Jumper” must be removed. Both the brown terminals need to be wired to an external switch (not included) capable of handling 120/230-volt AC @ 1-amp.

### PLC

#### Enclosure

#### Features

1. PLC Power Enclosure
2. 3.5” Color Touch-Screen
3. Shortcut Buttons (only available on Advanced PLC)
4. External On/Off Switch
5. Main Power Cable
6. Temperature Sensor
7. UV Intensity Sensor
8. Lamp Field Safety Cover Cable
9. Lamp/Power Cables



### PLC Control Descriptions

#### Total Operating Hours Meter

The measurement is in 1-hour increments and may be reset by the operator via the Alarms Tab.

#### Lamp Status & Lamp Life Monitor

An inactive lamp will trigger an alarm which can be identified in the Alarms Tab. The alarm may be reset but will continue to activate every twenty-four (24) hours until the lamp is replaced and the SETUP individual lamp reset is completed.

#### Power Supply Enclosure Temperature Monitor

The temperature monitor is used to protect the electronics within the UV system panel from overheating. The enclosure temperature alarm will be triggered above 120° F and will shut down the lamp field. The PLC must be powered off to reset the system and to restore lamp field operation.

#### UV Vessel Water Temperature Monitor

The UV Vessel Water Temperature Monitor is used to protect the vessel from overheating due to a no or low-flow condition. The temperature alarm will be triggered above 140°F and will shut down the lamp field. The PLC must be powered off to reset the system and to restore lamp field operation.

## SECTION 7: OPERATION

### UV Intensity Sensor

The PLC monitoring system displays the UV intensity as a function of percent (0%-100%); this UV intensity measurement is a relative power measurement of the UV energy inside the vessel and not a measurement of UV dose. The relative UV intensity (power) must be calibrated and will be performed once the system has been in service for 100 hours.

### Lamp Field Safety Cover

On all NSF-50 certified units there is a safety cap that covers the electrical cables to the lamps. Removing the Lamp Field Safety Cover or a cable connection interruption will automatically shut off the UV system's lamp field and generate an alarm signal.

### Alarm Relays

A discrete output relay(s) circuit is provided to allow for alarm signal of any of the following monitored conditions: General Alarm, enclosure over temperature, low UV intensity, vessel water over-temperature, end of lamp life, and lamp failure.

### 4-20 Milliamp Output

The 4-20 mA Output sends out the UV Intensity measurement to an external recording device.

### PLC Touch Screen Display

The Touch Screen Display is used to present information to the operator as well as serving as a command interface. The microprocessor performs various functions that include intercepting operator commands and updating displayed data. In addition, the software trends UV intensity, lamp operation and current hours.

### Touch Screen Tabs and Functions

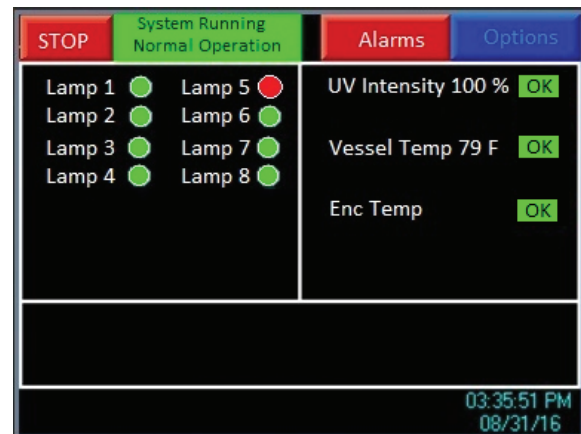
- **Alarms:** Current triggered alarms and acknowledge button
- **Status:** Lamp condition and hours
- **Options:** Reset Lamp Timers, View UV Intensity Chart and Change Time and Date.

### Status (Main) Display

**Lamp Status:** Lamps will be displayed with a status indicator to the right. Green for "Lamp ON" and red for "Lamp OFF".

**UV Intensity:** The status indicator to the right of the % will turn red once UV Intensity drops below 70%.

**Enclosure Temp:** The status indicator to the right will turn red once the internal enclosure temperature rises above 120°F.



## SECTION 7: OPERATION

### Options Display

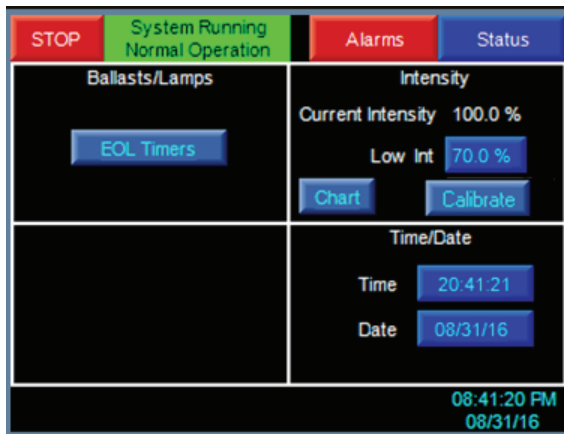
**Ballasts/Lamps:** The “EOL Timers” button allows the user to reset the lamps once a lamp exchange is performed.

**Intensity:** The button to the right of “Low Int” allows the user to change the alarm setting. 70% is the recommended lowest alarm setting.

**Chart:** The “Chart” button allows the user to view the Intensity history.

**Calibrate:** PLC will perform an automatic calibration after 100 hours of operation.

**Time/Date:** The button to the right of “Time” allows the user to change the time of day. The button to the right of “Date” allows the user to change the month, day and year.



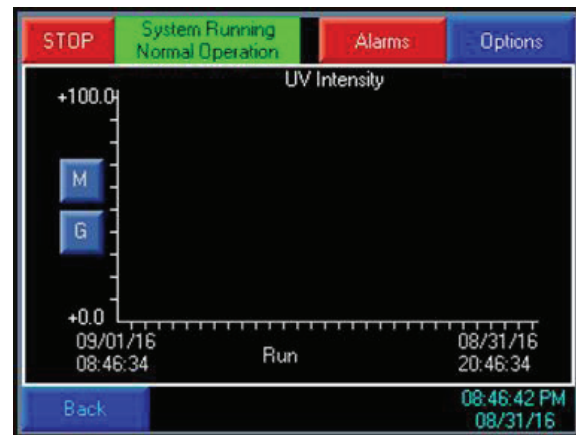
### EOL Timers Display

**Reset All:** Allows the user to reset all timers for the lamps.

**Reset #:** Allows the user to reset individual lamps.



**Intensity:** The UV Intensity trends every day allowing the user to proactively determine when a lamp change out will be required. The UV Intensity trend can also be saved to an SD card for record keeping.

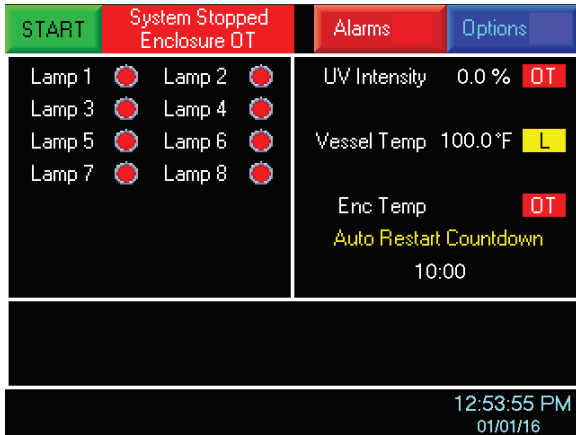


## SECTION 7: OPERATION

### Alarms

The main display will alert when an alarm is active. Press the “Alarms” button.

The Alarm menu allows the user to view active alarms and log past alarms.



“ESC” button will bring the user to the main display.

“Reset” button will clear the alarm but if the alarm is still active, the alarm will engage again.

“Refresh” button will clear the alarms from the screen.



Select alarm and press the “Magnifier Glass”, to the right under “Details”.

Press the “Ack” button to reset the alarm.



## SECTION 8: MAINTENANCE

### Routine Inspection

The following are required routine maintenance actions:

- A. Daily inspection of the Bioshield® Commercial UV System's Power Supply Enclosure control panel to confirm that the unit is operating satisfactorily (lamp operation).
- B. Daily visual inspection of the UV vessel and piping for leaks.
- C. Monthly inspection for damage/corrosion.
- D. Annual vessel interior inspection/cleaning.
- E. Biannual quartz sleeve inspection/cleaning.
- F. Replace the UV Lamp & Retaining Nut Gasket after 12,000 hours of cumulative operation.
- G. Clean or replace the Cooling Fan Filter Mat monthly, or more frequently in dusty environments.
- H. When the lamps are replaced, calibrate the UV Intensity Sensor.



**DANGER:** Pressurized water may be a hazard.

Obey all site-specific safety protocols.

Always remove static AND dynamic water pressure from the UV reactor before doing any maintenance task.

Apply Lockout/Tagout as necessary to prevent unexpected exposure to high water pressure or projectiles tejecting from the end plate.

When removing a lamp nut or sleeve nut, always stand to the side of the end plate of the UV reactor until the first lamp sleeve bolt cup nut is removed to avoid the potential for personal injury. Do this even when system has been depressurized as a secondary precaution.

### UV Lamp Replacement

#### Lamp Removal

#### Purpose

To replace expired UV lamp(s)

#### Frequency

A complete set of UV lamps must be replaced after 12,000 hours of cumulative use (manufacturer's suggested useful lamp life rating) or when the UV Intensity is lower than the PLC threshold value.

#### Parts and Equipment Required

- UV Lamp(s)
- Adjustable Wrench

- Wire Cutters
- Clean Cotton or Silicon Gloves
- Personal Safety Equipment



General risk due to pressurized piping and UV vessel!



General risk due to electricity!



DO NOT operate UV Lamp(s) outside of the vessel. UV light may cause severe irritation/damage to eyes and skin.



UV lamp(s) become hot during operation. Handle with care.



**WARNING:** If a sleeve nut is removed when there is dynamic water pressure inside the UV system, the lamp sleeve will eject from the end plate with enough force to cause personal injury.



UV Lamps are fragile and potentially dangerous if broken. Handle with care.

### Procedure

Read and understand this chapter prior to performing lamp change-out



**DO NOT ALLOW WHITE QUARTZSLEEVE ADAPTER NUT TO LOOSEN.**

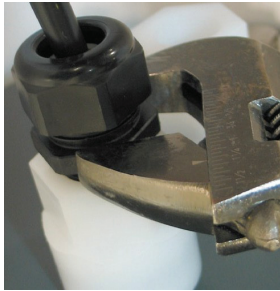
**NOTE:** Use clean cotton or silicon gloves when handling the UV lamp(s). Skin oils absorb ultraviolet light and reduce UV intensity. Skin oils may also lead to premature lamp failure.

1. Turn off the Power Supply Enclosure with the External ON/OFF Switch and unplug the UV system from the electrical outlet.
2. With an adjustable wrench loosen (not remove) the Lamp Cable Adapter Nut that will allow the complete Water Tight Connector fitting to be unthreaded from the Quartz Sleeve Retaining Nut without twisting the lamp cable.



## SECTION 8: MAINTENANCE

3. Unthread the Water Tight Connector Fitting from the Quartz Sleeve Adapter Nut.



4. Carefully slide the lamp cable's adapter fitting and lamp out of the quartz sleeve (through the Quartz Sleeve Retaining Nut). With part of the UV lamp outside of the vessel, disconnect the lamp cable's 4-Pin Connector from the UV lamp. Use caution connecting/ disconnecting UV lamps in vessels mounted vertically. To prevent breakage, be careful not to drop the UV lamps into the quartz sleeve(s). UV Lamps may be hot, handle with care.



5. With the lamp disconnected from the 4-Pin Connector, carefully slide the lamp out of the quartz sleeve and place in a safe location to avoid breakage



### UV Lamp Recycling

Disposal of fluorescent bulbs and other mercury-containing bulbs are regulated under the Resource Conservation and Recovery Act, the Universal Waste Rule and Subtitle C of the hazardous waste regulations. Refer to <http://www3.epa.gov/epawaste/hazard/wastetypes/universal/lamps/> to learn more about proper lamp disposal.

### Lamp Installation

See Page 15 for UV Lamp installation procedure.

### Quartz Sleeve

#### Quartz Sleeve Removal

##### Purpose

To inspect or replace broken quartz sleeve(s) in order to maintain required/expected UV intensity.

##### Frequency

Quartz Sleeve(s) should be removed, inspected and cleaned at least once annually (water quality conditions may warrant more frequent inspections/cleaning). Fouled quartz sleeves absorb UV light and therefore may reduce the UV intensity.

#### Parts and Equipment Required

- Quartz Sleeve(s)
- Quartz Sleeve Retaining Nut Gasket
- Adjustable Wrench
- Clean Cotton or Silicon Gloves
- Personal Safety Equipment
- White Retaining Nut Tightening Tool (provided with the UV system)



General risk due to pressurized piping and UV vessel!



General risk due to electricity!



Quartz Sleeves are fragile and potentially dangerous if broken. Handle with care.

**WARNING:** Servicing while pressurized can cause severe injury.

LOCK OUT source and RELIEVE PRESSURE before servicing.



#### Procedure

1. Turn off the Power Supply Enclosure with the External ON/OFF Switch and unplug the UV system from the electrical outlet.
2. Drain the vessel completely.
3. Remove UV lamp(s). See Page 23 for instructions.



## SECTION 8: MAINTENANCE

4. Using the white retaining nut tightening tool included with the UV system, unthread the Quartz Sleeve Retaining Nut from the male-threaded Quartz Sleeve Module located on the QSM Faceplate. Once the Quartz Sleeve Retaining Nut is unthreaded the open-end of the quartz sleeve will be exposed.



5. Wearing clean cotton or silicon gloves gently slide the quartz sleeve from the UV vessel. **DO NOT use pliers or any tools that may break the quartz sleeve.**



6. Remove the Quartz Sleeve Gasket and continue removing the quartz sleeves until all are removed from the vessel. Place quartz sleeves on a safe, level surface to avoid breakage.



7. Inspect all quartz sleeves for cracks, chips and scaling. If required, clean the quartz sleeve(s). See Page 23 Quartz Sleeve Cleaning. Replace damaged (cracked, chipped) quartz sleeves.

**!** **WARNING:** If a sleeve nut is removed when there is dynamic water pressure inside the UV system, the lamp sleeve will eject from the end plate with enough force to cause personal injury.

**WARNING:** Servicing while pressurized can cause severe injury.

LOCK OUT source and RELIEVE PRESSURE before servicing.



### Quartz Sleeve Cleaning

#### Purpose

To manually check and clean quartz sleeve(s).

#### Frequency

When required, at least once annually.

#### Parts and Equipment Required

- Cleaning Solution of Muriatic Acid and Water (1:4 ratio)
- Acid-Proof Bucket
- Clean Cloth
- Acid-Proof Drop Cloth
- Acid-Resistant Gloves
- MSDS Sheet
- Personal Protective Equipment

**!** General risk due to pressurized piping and UV vessel!

**!** General risk due to caustic cleaning agent!

**!** Quartz Sleeves are fragile and potentially dangerous if broken. Handle with care.

## SECTION 8: MAINTENANCE



### First Aid Measures:

In case of skin exposure, to cleaning agent, remove by washing with soap and water immediately.

In case of eye exposure to cleaning agent wash eyes for several minutes with water and contact a physician immediately.

In case of ingestion of cleaning agent contact physician immediately.

### Procedure

1. See Page 24 for quartz sleeve removal instructions.
2. Inspect quartz sleeve and clean as needed with a soft, clean cloth and mild dish detergent.
3. For calcium deposits use muriatic acid to dissolve/clean deposits. See next page for procedure.
4. Rinse quartz sleeve thoroughly with clean freshwater.
5. See Page 10 for quartz sleeve installation instructions.

### Quartz Sleeve Installation

See Page 10 for quartz sleeve installation procedure.

### UV Vessel Cleaning

#### Purpose

Over a period of time, dissolved matter can build up on the surface of the quartz sleeves and the interior of the vessel affecting the efficiency of the UV process. Due to fouling, the available intensity will decrease continuously until the quartz sleeves are cleaned.

**NOTE:** The use of the optional wiping system merely helps to decrease the frequency of the manual cleaning cycle.

Please be aware that such a decrease also may be caused by aging of the UV lamps or changes in the water quality (UV transmission). Repeat of visual inspections of the UV Sensor or of some example quartz sleeves will help to determine the necessary cleaning intervals needed. The removal of this build-up (calcium, etc.) can be carried out with a cleaning pump. Pentair recommends the use of muriatic acid to chemically clean the quartz sleeves. Materials within the vessel chamber are highly resistant against this acid.

### Frequency

When necessary.

### Parts and Equipment Required

- Cleaning Solution of Muriatic Acid and Freshwater (1:4 ratio)
- Acid-Resistant Transfer Pump
- Acid-Resistant Hose (used to transfer the cleaner from the container to the UV vessel)
- Fittings to connect to vessel
- Acid-Resistant Bucket
- Clean Cloth
- Acid-Resistant Drop Cloth
- Acid-Resistant Gloves
- MSDS Sheet
- Personal Safety Equipment



General risk due to pressurized piping and UV vessel!



General risk due to caustic cleaning agent!



Quartz Sleeves are fragile and potentially dangerous if broken. Handle with care.



**WARNING:** If a sleeve nut is removed when there is dynamic water pressure inside the UV system, the lamp sleeve will eject from the end plate with enough force to cause personal injury.



### First Aid Measures:

In case of skin exposure, to cleaning agent remove, by washing with soap and water immediately.

In case of eye exposure to cleaning agent wash eyes for several minutes with water and contact a physician immediately.

In case of ingestion of cleaning agent contact physician immediately.

## SECTION 8: MAINTENANCE

### Procedure

1. With the quartz sleeves still installed in the UV vessel, turn off the Power Supply Enclosure with the External ON/OFF Switch and unplug the UV system from the electrical outlet.
  2. Isolate the UV vessel from the water flow using the required isolation valves and drain the vessel completely.
  3. Clear the work area and layout protective drop cloths under the UV vessel.
  4. Set up the acid transfer pump and attach the acid input hose to the vessel's water drain valve.
  5. Attach an acid return/overflow hose to the UV vessel's upper auxiliary service port and route it back to the acid-resistant bucket. This will be used as the Acid Overflow Recovery Bucket.
  6. Using the acid-resistant bucket as an acid supply container, create a chemical solution of one part muriatic acid to four parts water (1:4 acid-to-water ratios).
- IMPORTANT:** When creating the chemical solution, always introduce the acid to the water and introduce the acid as close to the waterline as possible. This helps prevent acid-to-skin contact resulting from unnecessary splashing.
7. With all of the hoses attached to the UV vessel and the acid transfer pump attached to the acid supply container, pump acid into the UV vessel until full.
  8. Once the UV vessel has been filled with acid, allow the acid to remain in the vessel for 30 minutes.
  9. Disconnect the acid transfer pump's vessel feed hose from the transfer pump and use this hose to drain the acid from the UV vessel through the vessel's drain valve and into an acid-resistant bucket.
  10. After all of the acid has been drained from the UV vessel and the cleaning procedure completed, rinse the vessel chamber thoroughly to avoid process water from coming in contact with the cleaning agent. The rinse water may be taken from a water tap with the help of a hose and filled and drained through the unit's drain valve port.
  11. Neutralize old cleaning agent with bases, e.g. sodium hydroxide solution, sodium carbonate solution in compliance with all relevant rules for accident prevention and local regulations.

### UV Vessel Disassembly

**WARNING:** Servicing while pressurized can cause severe injury.

LOCK OUT source and RELIEVE PRESSURE before servicing.



### Purpose

To disassemble the vessel for internal inspection.

### Frequency

UV vessel disassembly is only required if a problem has taken place, such as, quartz sleeve breakage. It is recommended that the QSM (Quartz Sleeve Module) Faceplate only be removed if necessary.

### Parts and Equipment Required

- Adjustable and Torque Wrenches
- Socket Wrenches
- Clean Cotton or Silicon Gloves
- Flashlight
- Personal Safety Equipment



General risk due to pressurized piping and UV vessel!



Quartz Sleeves and UV lamps are fragile and potentially dangerous if broken. Handle with care.

### Procedure

**IMPORTANT:** DO NOT Attempt to remove the QSM Faceplate with the quartz sleeves assembled. ALL lamps and quartz sleeves MUST be removed before disassembling the QSM Faceplate from the UV vessel.

1. Turn off the Power Supply Enclosure with the External ON/OFF Switch and unplug the UV system from the electrical outlet.
2. Redirect water flow from the vessel using isolation valves and drain the vessel completely.
3. Remove UV lamp(s). See Page 23 for removal instructions.
4. Remove quartz sleeve(s). See Page 24 removal instructions.

## SECTION 8: MAINTENANCE

5. With the vessel completely drained and the UV lamps and quartz sleeves removed, loosen the QSM Faceplate bolts in a diametric sequence. Continue until all hardware is removed.



6. With fastening hardware removed, pull the QSM Faceplate from the UV vessel.
7. Clean out the inside of the UV vessel using a mild dish detergent and rinse thoroughly with clean freshwater.
8. Thoroughly clean the mating surfaces of both the QSM Faceplate and the UV Vessel.

**IMPORTANT:** Use a new QSM Faceplate Rubber Gasket when re-assembling the faceplate to the vessel. For replacement parts please refer to Replacement Parts list on Page 31 of this manual.



9. Fit the QSM Faceplate Rubber Gasket onto the alignment posts.

**IMPORTANT:** To properly align the QSM Faceplate, set the #1 lamp position (as stamped on the faceplate, next to the quartz sleeve module) to the 3 O' Clock position when looking at the QSM Faceplate.



10. With the QSM Faceplate loosely aligned, push the QSM Faceplate, with the rubber gasket, in place onto the vessel. Next, loosely install (finger tight) the supplied stainless steel hardware (bolts/washers/nuts).
11. With the hardware loosely installed (finger tight) fine tune the alignment of the #1 lamp position to the 3 O' Clock position. To verify proper alignment install the #1 quartz sleeve as outlined on Page 10. The sleeve should go into its respective port on the quartz sleeve coupler on the opposite end of the unit without difficulty. If when installing the sleeve you find it difficult to get the sleeve to engage in its respective port on the quartz sleeve coupler this is an indication that the #1 lamp position is not aligned properly in the 3 O' Clock position. If this is the case, rotate the QSM Faceplate either clockwise or counterclockwise until the sleeve freely engages its respective port on the quartz sleeve coupler.
12. Once the #1 lamp position is confirmed to be properly aligned, establish uniform pressure over the QSM Faceplate by tightening the bolts in 5 ft. • lb. increments in a diametrically opposed (180°) sequence until the recommended torque is obtained. See recommendations below.

### Flange Bolt Torque Recommendations:

0.5" to 1.5" Flange = 12 ft. • lbs.

2.0" to 4.0" Flange = 25 ft. • lbs

5.0" Flange = 30 ft. • lbs.

6.0" to 8.0" Flange = 40 ft. • lbs

10" Flange = 64 ft. • lbs.

12" Flange = 95 ft. • lbs.

## SECTION 8: MAINTENANCE

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### Cooling Filter

#### Cooling Fan Filter Removal

##### Purpose

The Cooling Fan is equipped with a Filter Mat used to trap airborne particles and dust. This Filter Mat must be routinely inspected and if required, cleaned. A clogged Filter Mat reduces air circulation in and out of the enclosure, potentially allowing electrical hardware to over-heat. If damaged, worn-out or too dirty replace the Filter Mat.

##### Frequency

Minimum every six months, but more routine inspections may be required due to increased airborne dirt/dust.

#### Parts and Equipment Required

- Slotted Screwdriver

##### Procedure

1. Remove Cooling Fan cover to access Filter Mat.
2. Remove Cooling Fan Filter Mat

#### Cooling Fan Filter Cleaning

##### Purpose

Maximize air circulation in and out of the enclosure. If damaged, worn-out or cannot be cleaned replace the Filter Mat. A dirty Filter Mat may cause electronic ballast failure.

##### Frequency

A minimum of every six months, but more routine inspections may be required due to increased airborne dirt/dust.

#### Parts and Equipment Required

- Compressed Air
- Dish Detergent

##### Procedure

Read and understand this chapter prior to cleaning Cooling Fan Filter Mat.

1. Remove dust from mat by blowing it out with compressed air or washing it out with soap and water.
2. Dry mat, or use new replacement filter mat.

#### Cooling Fan Filter Installation

##### Purpose

To install cleaned or new Cooling Fan Filter Mat.

##### Frequency

A minimum of every six months, but more routine inspections may be required due to increased airborne dirt/dust.

#### Parts and Equipment Required

- Slotted Screwdriver

##### Procedure

Read and understand this chapter prior to cleaning Cooling Fan Filter Mat.

1. Place Cooling Fan Filter Mat into fan.
2. Replace fan cover.

## SECTION 9: REPLACEMENT PARTS

Pentair offers several different variants of the Bioshield® Commercial UV System. These variants include several different vessel dimensions, port styles/sizes and controller/monitor options to best fit your individual needs. When contacting us for replacement parts for your UV system, we suggest that you have the UV system's serial number readily available. The serial number can be found on both the Power Supply Enclosure and UV vessel labels.

Identifying the serial number allows us to process your request/order quickly and accurately.

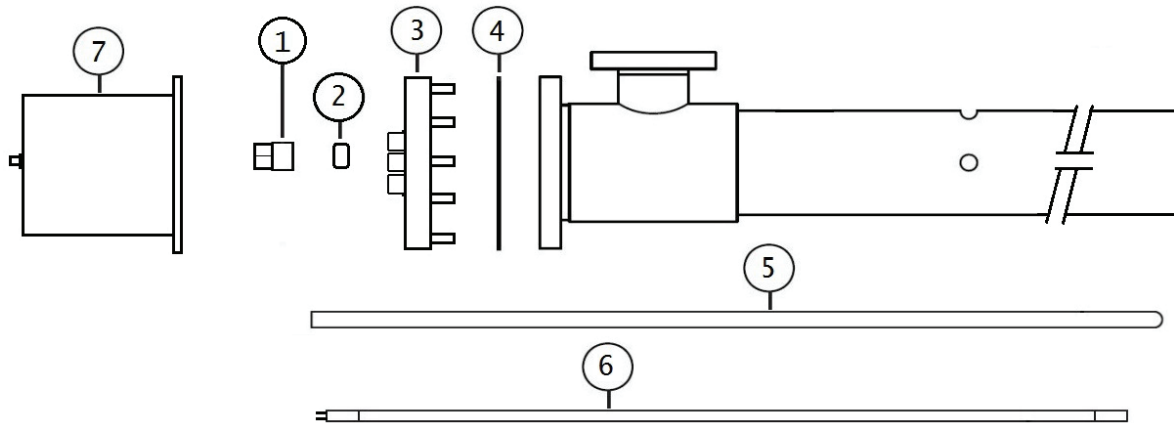
### Quartz Sleeve & UV Lamp Matrix

Bioshield models are available with different size ports and use varying lengths of quartz sleeves. Below we match your unit with the correct quartz sleeve and UV lamp.

BIOSHIELD® VERTICAL SERIES	# of LAMPS	LAMP P/N	QUARTZ SLEEVE P/N	NSF CAP P/N	QUARTZ SLEEVE FACEPLATE P/N	QUARTZ SLEEVE FACEPLATE GASKET P/N
522904, 522917, 522930	1	910029	910039	20424-6	CLPA-1-6BFN	17-060
522905, 522918, 522931	2	910029	910039	20424-6	CLPA-2-6BFN	17-060
522906, 522919, 522932	3	910029	910039	20424-6	CLPA-3-6BFN	17-060
522907, 522920, 522933	3	910029	910039	20424-8-10	CLPA-3-8BFN	17-080
522908, 522921, 522934	4	910029	910039	20424-8-10	CLPA-4-8BFN	17-080
522909, 522922, 522935	5	910029	910039	20424-8-10	CLPA-5-8BFN	17-080
522910, 522923, 522936	6	910029	910041	20424-8-10	CLPA-6-10BFN	17-100
522911, 522924, 522937	7	910029	910041	20424-8-10	CLPA-7-10BFN	17-100
522912, 522925	7	910029	910041	20424-12	CLPA-7-12BFN	17-120
522913, 522926	8	910029	910041	20424-12	CLPA-8-12BFN	17-120

BIOSHIELD® CLP SERIES	# of LAMPS	LAMP P/N	QUARTZ SLEEVE P/N	NSF CAP	QUARTZ SLEEVE FACEPLATE	QUARTZ SLEEVE FACEPLATE GASKET
CLP41A6	1	910029	910039	20424-6	CLPA-1-6BFN	17-060
CLP42A6	2	910029	910039	20424-6	CLPA-2-6BFN	17-060
CLP43A6	3	910029	910039	20424-6	CLPA-3-6BFN	17-060
CLP43A8	3	910029	910041	20424-8-10	CLPA-3-8BFN	17-080
CLP44A8	4	910029	910041	20424-8-10	CLPA-4-8BFN	17-080
CLP45A8	5	910029	910041	20424-8-10	CLPA-5-8BFN	17-080
CLP46A10	6	910029	910041	20424-8-10	CLPA-6-10BFN	17-100
CLP47A10	7	910029	910041	20424-8-10	CLPA-7-10BFN	17-100
CLP61A6	1	910030	910040	20424-6	CLPA-1-6BFN	17-060
CLP62A6	2	910030	910040	20424-6	CLPA-2-6BFN	17-060
CLP63A6	3	910030	910040	20424-6	CLPA-3-6BFN	17-060
CLP63A8	3	910030	910040	20424-8-10	CLPA-3-8BFN	17-080
CLP64A8	4	910030	910040	20424-8-10	CLPA-4-8BFN	17-080
CLP65A8	5	910030	910040	20424-8-10	CLPA-5-8BFN	17-080
CLP66A10	6	910030	910040	20424-8-10	CLPA-6-10BFN	17-100
CLP67A10	7	910030	910040	20424-8-10	CLPA-7-10BFN	17-100
CLP67A12	7	910030	910040	20424-12	CLPA-7-12BFN	17-120
CLP68A12	8	910030	910040	20424-12	CLPA-8-12BFN	17-120
CLP69A14	9	910030	910043	20424-12	CLPA-9-14BFN	17-140
CLP610A16	10	910030	910043	20424-12	CLPA-10-16BFN	17-160

## SECTION 9: REPLACEMENT PARTS



### Replacement Parts List

1. Quartz Sleeve Retainer Nut.....	CL-QSR-28
2. Quartz Sleeve Gasket.....	22004
3. Quartz Sleeve Faceplate (Includes 3, 4, 2, 1).....	(See page 30)
4. Quartz Sleeve Faceplate Gasket .....	(See page 30)
5. Quartz Sleeve .....	(See page 30)
6. UV Lamp .....	(See page 30)
7. Lamp Field Safety Cover.....	(See page 30)

### Not Shown Parts

1. UV Sensor .....	960262
a. UV Sensor – white (pre-5/2018).....	20210-UVS
2. Temperature Sensor .....	960261
a. Temperature Sensor – white (pre-5/2018).....	20217

## SECTION 10: TROUBLESHOOTING

SITUATION	INSPECT FOR
UV system will not function with the External ON/OFF Switch in the "On" position	<ol style="list-style-type: none"> <li>1. No Input Voltage Available</li> <li>2. Temperature Sensor Cable Plug is Interrupted/Defective</li> <li>3. Input Voltage is lower than the Factory Set Threshold</li> </ol>
UV Lamp does not light	<ol style="list-style-type: none"> <li>1. Faulty Contact (four-pin connector/lamp pins)</li> <li>2. Defective Electronic Ballast</li> <li>3. Defective UV Lamp</li> <li>4. Water Damage due to Quartz Sleeve Seal Failure</li> </ol>
UV Intensity Low	<ol style="list-style-type: none"> <li>1. Decreased UV Transmissibility</li> <li>2. UV Lamp reached "End of Life"</li> <li>3. Quartz Sleeve Fouled</li> <li>4. Faulty UV Sensor</li> </ol>
Enclosure Over-Heating	<ol style="list-style-type: none"> <li>1. Ambient Temperature above 145° F</li> <li>2. Defective Thermal Switch</li> <li>3. Cooling Fan Filter Mat needs to be cleaned</li> <li>4. Defective Cooling Fan</li> </ol>
Quartz Sleeve Seal Failure	<ol style="list-style-type: none"> <li>1. Cracked/Broken Quartz Sleeve</li> <li>2. Failed Quartz Sleeve Retaining Nut O-Ring Seal</li> </ol>

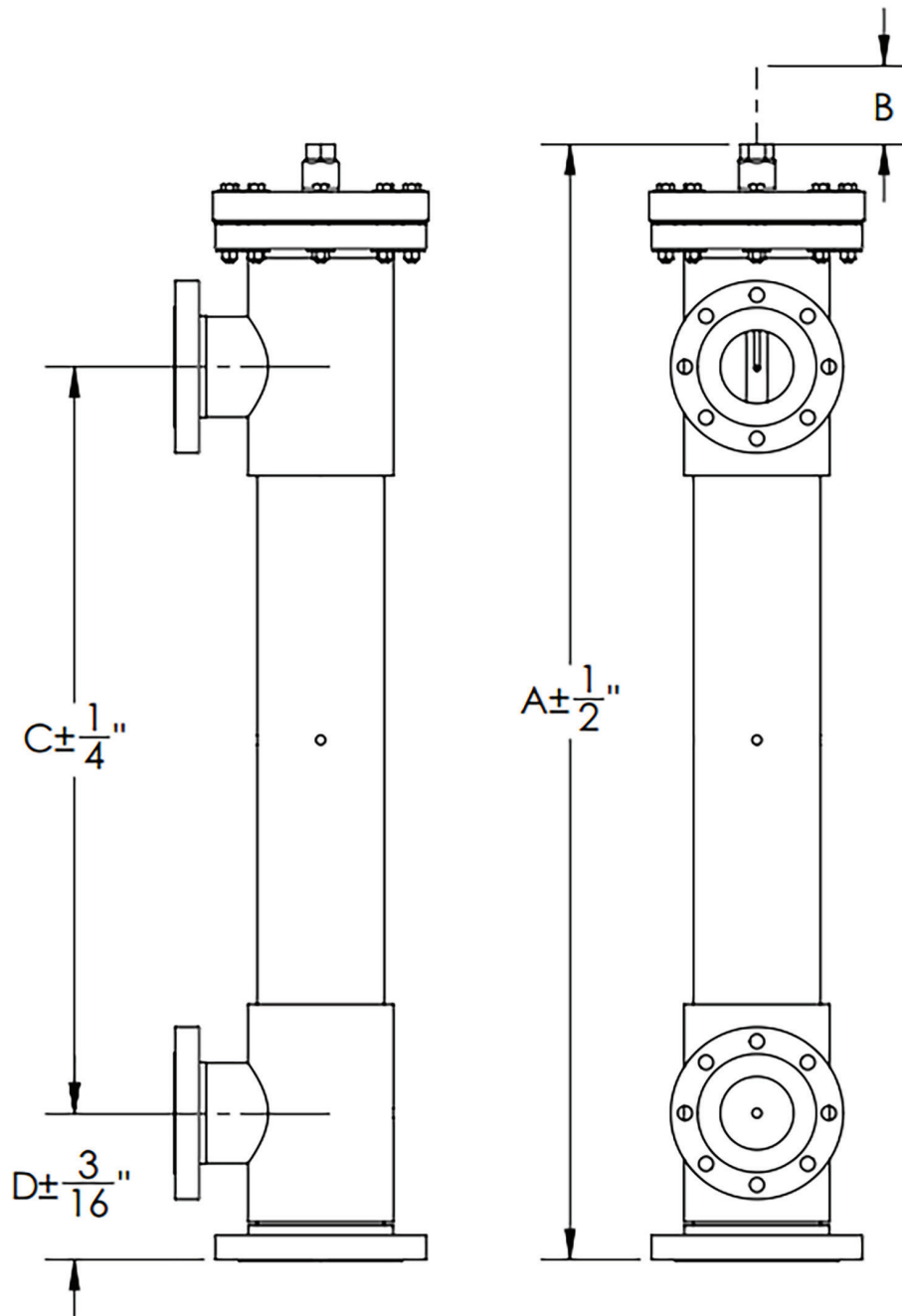




## SECTION 11: SYSTEM SPECIFICATIONS

### Vertical Series Dimensional Drawings

(See next page for dimensional data)



## SECTION 11: SYSTEM SPECIFICATIONS

### Vertical Series Dimensional Drawings

#### Dimensional Data

MODEL	BODY SIZE	I/O PORT FLANGE SIZE	VESSEL DIMENSIONS (in Inches)			
			A	B	C	D
			VESSEL HEIGHT w/ SAFETY COVER	HEIGHT w/ MAINTENANCE CLEARANCE	PORT TO PORT	FLOOR TO INLET
522904, 522905, 522906	6"	2"	61	101	39	6.25
522917, 522918, 522919	6"	3"	62	102	39	6.25
522907, 522908, 522909	8"	3"	68	107	37.75	9.875
522930, 522931, 522932	6"	4"	62	102	39	6.25
522920, 522921, 522922	8"	4"	68	107	37.75	9.875
522910, 522911	10"	4"	74	117	41.875	11.625
522933, 522934, 522935	8"	6"	68	107	37.75	9.875
522923, 522924	10"	6"	74	117	41.875	11.625
522912, 522913	12"	6"	77	120	41.875	13.625
522936, 522937	10"	8"	74	117	41.875	11.625
522925, 522926	12"	8"	77	120	41.875	13.625

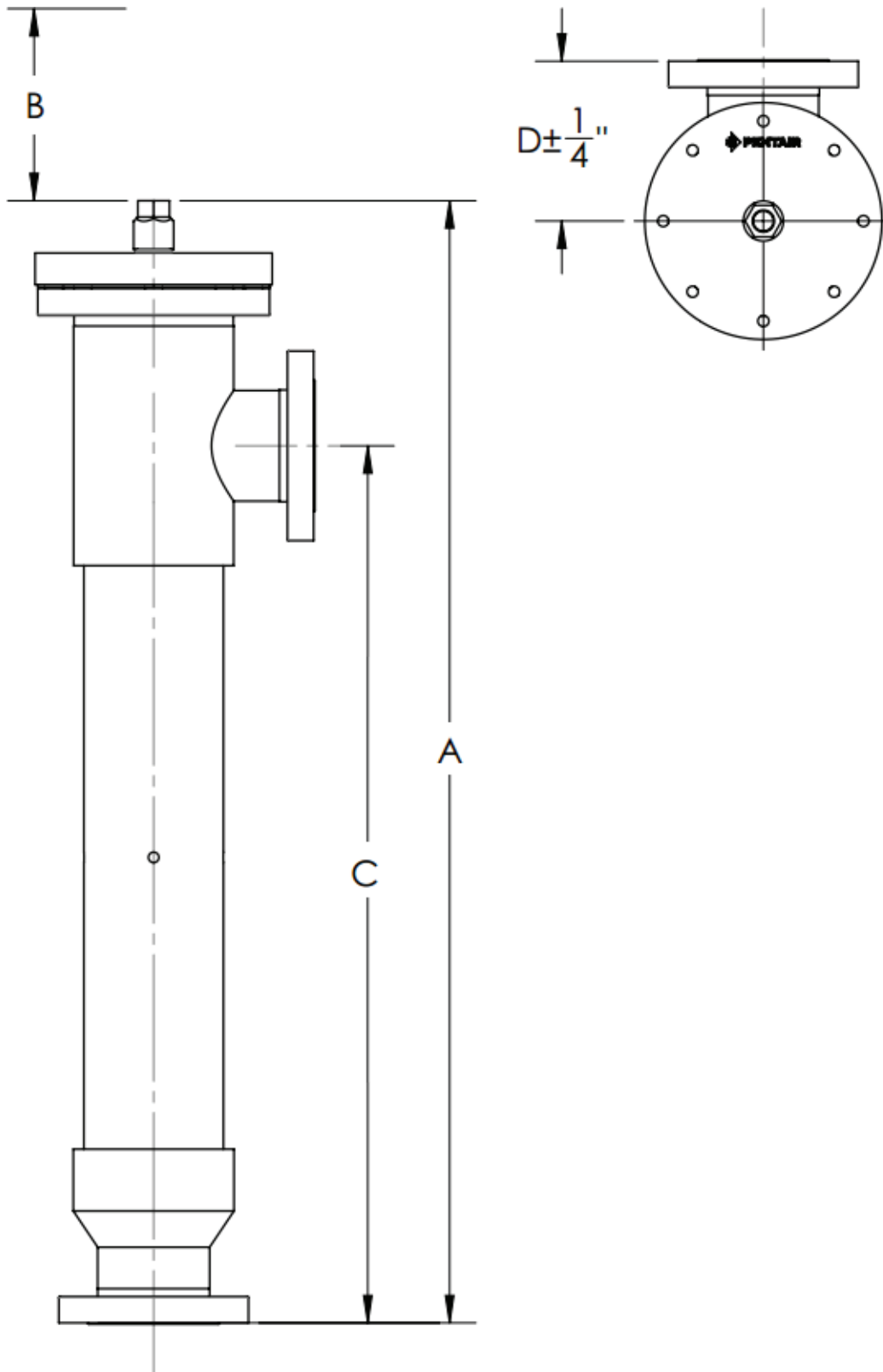
#### Electrical/Hydraulic Data

MODEL	INPUT WATTS	POWER ENCLOSURE DIMENSIONS (H X W X D)	AMPS MAX LOAD @ 120 VAC	MAX PSI	MAX HEAD LOSS PSI
522904, 522917, 522930	130	16" x 14" X 8.4"	2.1	50	3 - PSI
522905, 522918, 522931	260	16" x 14" x 8.4"	3.9	50	3 - PSI
522906, 522919, 522932	390	16" x 14" x 8.4"	5.8	50	3 - PSI
522907, 522920, 522933	390	16" x 14" x 8.4"	5.8	50	3 - PSI
522908, 522921, 522934	520	20.2" x 16.3" x 8.4"	7.5	50	3 - PSI
522909, 522922, 522935	650	24.6" x 20.2" x 10.6"	9.4	50	3 - PSI
522910, 522923, 522936	780	24.6" x 20.2" x 10.6"	11.2	50	3 - PSI
522911, 522924, 522937	910	24.6" x 20.2" x 10.6"	13.3	50	3 - PSI
522912, 522925	910	24.6" x 20.2" x 10.6"	13.3	50	3 - PSI
522913, 522926	1040	30.5" x 24.1" x 12.6"	15.0	50	3 - PSI

## SECTION 11: SYSTEM SPECIFICATIONS

### CLP Series Dimensional Drawings

(See next page for dimensional data)



## SECTION 11: SYSTEM SPECIFICATIONS

### CLP Series Dimensional Drawings

#### Dimensional Data

MODEL	BODY SIZE (NPS)	I/O PORT FLANGE SIZE (NPS)	VESSEL DIMENSIONS (INCHES)			
			A	B	C	D
			VESSEL HEIGHT w/ SAFETY COVER	HEIGHT w/ MAINTENANCE CLEARANCE	PORT TO PORT	CENTERLINE TO PORT FLANGE
CLP41A6	6"	2", 3", 4"	53.3	41.6	11.3	47
CLP42A6	6"	2", 3", 4"	53.3	41.6	11.3	47
CLP43A6	6"	2", 3", 4"	53.3	41.6	11.3	47
CLP43A8	8"	3", 4", 6"	58.3	44.2	13.6	51
CLP44A8	8"	3", 4", 6"	58.3	44.2	13.6	51
CLP45A8	8"	3", 4", 6"	58.3	44.2	13.6	51
CLP46A10	10"	6", 8"	59.7	43.4	16	51
CLP47A10	10"	6", 8"	59.7	43.4	16	51
CLP47A12	12"	6", 8"	61.7	46.5	19	51
CLP48A12	12"	6", 8"	61.7	46.5	19	51

CLP61A6	6"	2", 3", 4"	81.8	70.1	11.3	75
CLP62A6	6"	2", 3", 4"	81.8	70.1	11.3	75
CLP63A6	6"	2", 3", 4"	81.8	70.1	11.3	75
CLP63A8	8"	3", 4", 6"	81.8	70.1	11.3	75
CLP64A8	8"	3", 4", 6"	82.5	68.4	13.6	75
CLP65A8	8"	3", 4", 6"	82.5	68.4	13.6	75
CLP66A10	10"	6", 8"	83.9	67.6	16	75
CLP67A10	10"	6", 8"	83.9	67.6	16	75
CLP67A12	12"	6", 8"	85.9	70.7	19	75
CLP68A12	12"	6", 8"	85.9	70.7	19	75
CLP69A14	14"	8", 10", 12"	94.4	72.8	21	80
CLP610A16	16"	10", 12", 14"	95.7	72.4	23.5	80
CLP611A18	18"	97	26	25	80	—
CLP612A20	20"	101	28	27.5	80	—

## SECTION 11: SYSTEM SPECIFICATIONS

### CLP Series Dimensional Drawings

#### Electrical/Hydraulic Data

MODEL	INPUT WATTS	POWER ENCLOSURE DIMENSIONS (H X W X D)	AMPS MAX LOAD @ 120 VAC	MAX PSI	MAX HEAD LOSS PSI
CLP41A6	130	16" x 14" x 8.4"	2.1	100	3 - PSI
CLP42A6	260	16" x 14" x 8.4"	3.9	100	3 - PSI
CLP43A6	390	16" x 14" x 8.4"	5.8	100	3 - PSI
CLP43A8	390	16" x 14" x 8.4"	5.8	100	3 - PSI
CLP44A8	520	20.2" x 16.3" x 8.4"	7.5	100	3 - PSI
CLP45A8	650	24.6" x 20.2" x 10.6"	9.4	100	3 - PSI
CLP46A10	780	24.6" x 20.2" x 10.6"	11.2	75	3 - PSI
CLP47A10	910	24.6" x 20.2" x 10.6"	13.3	75	3 - PSI
CLP47A12	910	24.6" x 20.2" x 10.6"	13.3	50	3 - PSI
CLP48A12	1040	30.5" x 24.1" x 12.6"	15.0	50	3 - PSI

MODEL	INPUT WATTS	POWER ENCLOSURE DIMENSIONS (H X W X D)	AMPS MAX LOAD @ 240 VAC	MAX PSI	MAX HEAD LOSS PSI
CLP61A6	320	24.6" x 20.2" x 10.6"	1.6	100	3 - PSI
CLP62A6	640	24.6" x 20.2" x 10.6"	3.0	100	3 - PSI
CLP63A6	960	24.6" x 20.2" x 10.6"	4.5	100	3 - PSI
CLP63A8	960	24.6" x 20.2" x 10.6"	4.5	100	3 - PSI
CLP64A8	1280	24.6" x 20.2" x 10.6"	6.0	100	3 - PSI
CLP65A8	1600	24.6" x 20.2" x 10.6"	7.5	100	3 - PSI
CLP66A10	1920	30.5" x 24.1" x 12.6"	9.0	75	3 - PSI
CLP67A10	2240	30.5" x 24.1" x 12.6"	11.0	75	3 - PSI
CLP67A12	2240	30.5" x 24.1" x 12.6"	11.0	50	3 - PSI
CLP68A12	2560	30.5" x 24.1" x 12.6"	13.0	50	3 - PSI
CLP69A14	2880	40.35" x 32.48" x 12.64"	14.0	50	3 - PSI
CLP610A16	3200	40.35" x 32.48" x 12.64"	16.0	50	3 - PSI
CLP611A18	3520	40.35" x 32.48" x 12.64"	18.0	50	3-PSI
CLP612A20	3840	40.35" x 32.48" x 12.64"	20.0	50	3-PSI

## SECTION 11: SYSTEM SPECIFICATIONS

### Sizing Chart

MODEL	MAX FLOW RATE (GPM)		TURNOVER RATE (GPM)			
	40 mJ/cm <sup>2</sup>	60 mJ/cm <sup>2</sup>	6 Hours @ 40 mJ/cm <sup>2</sup>	6 Hours @ 60 mJ/cm <sup>2</sup>	8 Hours @ 40 mJ/cm <sup>2</sup>	8 Hours @ 60 mJ/cm <sup>2</sup>
522904, 522917, 522930	62	42	22,320	15,120	29,760	20,160
522905, 522918, 522931	105	70	37,800	25,200	50,400	33,600
522906, 522919, 522932	152	101	54,720	36,360	72,960	48,480
522907, 522920, 522933	225	150	81,000	54,000	108,000	72,000
522908, 522921, 522934	295	196	106,200	70,560	141,600	94,080
522909, 522922, 522935	350	233	126,000	83,880	168,000	111,840
522910, 522923, 522936	500	334	180,000	120,240	240,000	160,320
522911, 522924, 522937	585	390	210,600	140,400	280,800	187,200
522912, 522925	700	467	252,000	168,120	336,000	224,160
522913, 522926	790	525	284,400	189,000	379,200	252,000

CLP41A6	62	42	22,320	15,120	29,760	20,160
CLP42A6	105	70	37,800	25,200	50,400	33,600
CLP43A6	152	101	54,720	36,360	72,960	48,480
CLP43A8	225	150	81,000	54,000	108,000	72,000
CLP44A8	295	196	106,200	70,560	141,600	94,080
CLP45A8	350	233	126,000	83,880	168,000	111,840
CLP46A10	500	334	180,000	120,240	240,000	160,320
CLP47A10	585	390	210,600	140,400	280,800	187,200
CLP47A12	700	467	252,000	168,120	336,000	224,160
CLP48A12	790	525	284,400	189,000	379,200	252,000

CLP61A6	185	123	66,600	44,280	88,800	59,040
CLP62A6	325	216	117,000	77,760	156,000	103,680
CLP63A6	465	310	167,400	111,600	223,200	148,800
CLP63A8	660	438	237,600	157,680	316,800	210,240
CLP64A8	850	566	306,000	203,760	408,000	271,680
CLP65A8	1020	678	367,200	244,080	489,600	325,440
CLP66A10	1470	979	529,200	352,440	705,600	469,920
CLP67A10	1730	1158	622,800	416,880	830,400	555,840
CLP67A12	2080	1385	748,800	498,600	998,400	664,800
CLP68A12	2350	1566	846,000	563,760	1,128,000	751,680
CLP69A14	2870	1912	1,033,200	688,320	1,377,600	917,760
CLP610A16	1690	1127	608,400	405,720	811,200	540,960
CLP611A18	1963	1480	706,680	532,800	942,240	710,400
CLP612A20	2335	1852	840,600	666,720	1,120,800	888,960

## SECTION 12: PRODUCT WARRANTY

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Pentair Water Pool and Spa, Inc. (Pentair) warrants the Bioshield® Commercial UV System to be free from defects in material and/or workmanship for a period of one (1) year from the original date of purchase.

The UV System must be registered at [www.pentairpool.com/support/product-registration.html](http://www.pentairpool.com/support/product-registration.html) and a copy of the sales receipt and an installer's invoice must be provided to Pentair within sixty (60) days of purchase in order to receive the full one (1) year extended warranty.

If product is not registered within sixty (60) days of purchase the UV system will be ineligible for the extended warranty and will only receive a sixty (60) day limited warranty.

### Pentair Warranty Obligations

Should a defect in workmanship and/or material in any part covered by this warranty become evident during the term of the warranty, then upon the customer following the procedures set forth below, Pentair will, at its sole option, repair or replace such part, in lieu of repair.

Pentair is not, however, responsible under this warranty for any cost of shipping or transportation of the product or parts thereof to or from the Technical Service Department. Also, Pentair is not liable for any loss of time, inconvenience, incidental expenses such as telephone calls, labor or material charges incurred in connection with the removal or replacement of the Rebel cleaner, or any other incidental or consequential damages.

The above mentioned warranty is void if the product is repaired or altered in any way by any persons, agents or representatives other than those authorized by Pentair. Reasonable vehicle trip and evaluation charges may be assessed by a Pentair service representative.

**PLEASE NOTE:** Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

### No Other Warranties

To the maximum extent permitted by applicable law, Pentair disclaims all other warranties, expressed or implied, including, but not limited to, implied warranties of merchantability and fitness for a particular purpose, with regard to the product, part(s) and/or any accompanying written materials.

### Procedure for Obtaining Performance

In order to obtain the benefits of this warranty, the consumer who made the original retail purchase must contact the Pentair Technical Service Department as soon as possible after discovery of the product related issue, but in no event later than the expiration date of the respective warranty periods provided herein. Upon receipt of this communication, Pentair will promptly notify the customer of the address to which the product may be shipped. The customer shall then ship the product, freight prepaid, to the address indicated, together with a "RETURN GOODS AUTHORIZATION" form obtained from Technical Service and a brief description of the problems encountered. Unauthorized returns will not be accepted. Freight must be prepaid by customer.

### Warranties or Representations by Others

No third party has any authority to make any warranties or representation concerning Pentair or its products. Accordingly, Pentair is not responsible for any such warranties or representations.

### Other Rights

This warranty gives you specific legal rights and you may also have other rights, which vary from state to state.

### Sole Warranty

Supersedes all previous publications.











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