



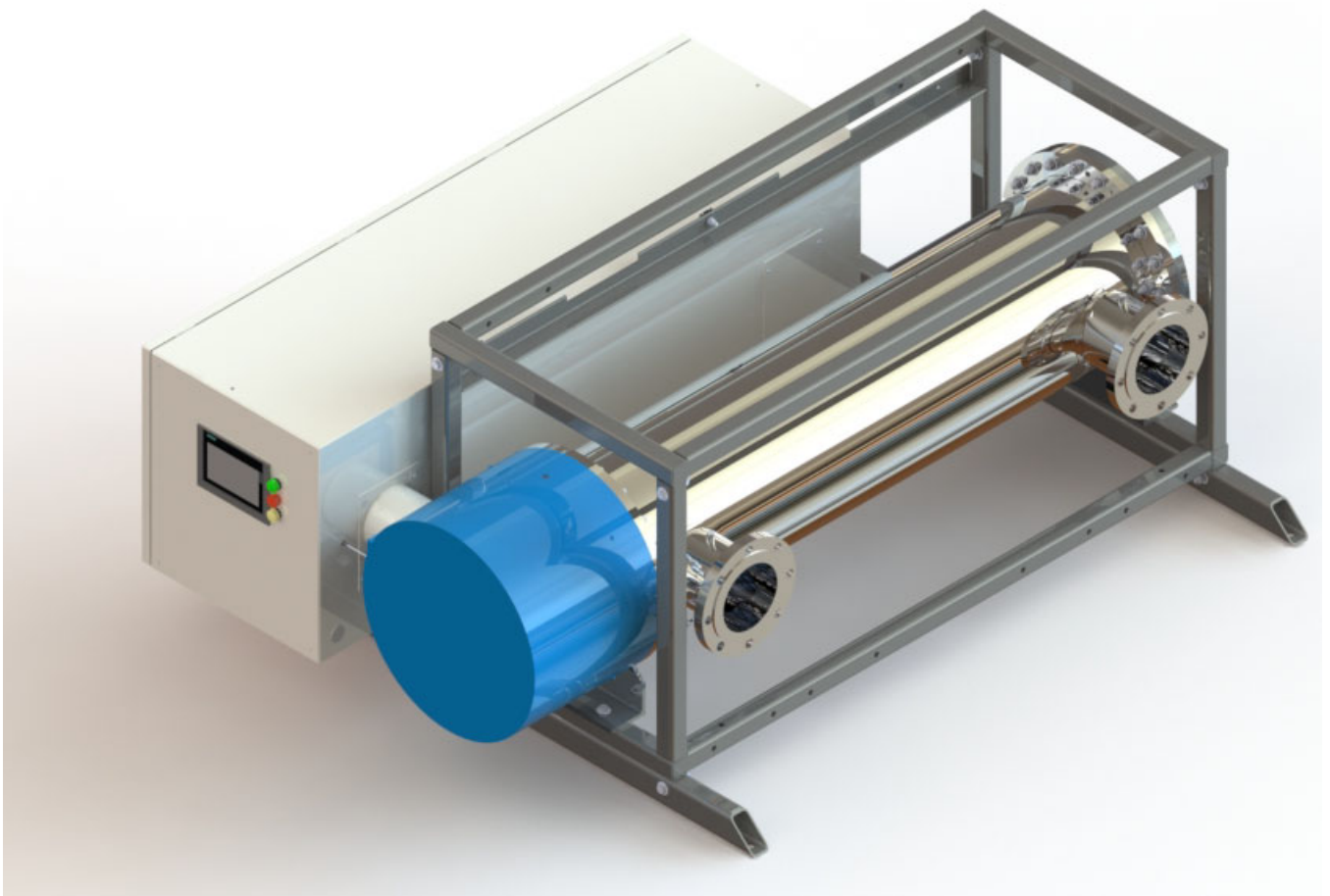
## **Avant™ Series**

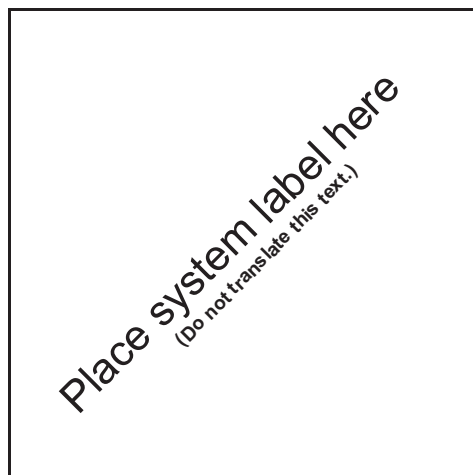
Operation and Maintenance

User Manual

Original Instructions

Edition 5





If you require technical assistance, please contact Aquafine Corporation Technical Support using the contact information below:

Telephone: 1-661-257-4770  
E-mail: [techservice@trojantechnologies.com](mailto:techservice@trojantechnologies.com)

At the time of publishing, the information within this document is current. Due to continuous improvements, we may have future changes and recommendations which will be sent via product bulletins.



<b>Section 1 Specifications</b> .....	7
<b>Section 2 Safety Information</b> .....	9
2.1 Use of Hazard Information .....	9
2.2 Precautionary Labels .....	9
2.3 Safety Precautions .....	11
2.4 Safety Features.....	14
<b>Section 3 General Information</b> .....	15
3.1 Acceptable Noise Levels.....	15
3.2 Patents and Permissions .....	15
3.3 Abbreviations and Acronyms .....	15
3.4 System Overview .....	16
3.4.1 UV Chamber .....	17
3.4.2 Control Power Panel .....	18
3.4.3 Sample Ports.....	18
3.4.4 UVI Sensor (Optional).....	18
<b>Section 4 Lockout Tag Out</b> .....	19
4.1 Lockout Tag Out Procedure .....	19
4.1.1 Equipment Shutdown .....	19
4.1.2 Deactivate Energy Sources.....	19
4.1.3 Lockout Tag Out Energy Sources .....	20
4.1.4 Verify the Lockout .....	20
4.2 Remove the Lockout Tag Out .....	20
<b>Section 5 System Startup and Shutdown</b> .....	21
5.1 Start-Up Procedure .....	21
5.1.1 Pre-Start Checklist: .....	21
5.2 Shutdown Procedure.....	22
5.2.1 UV Unit.....	22
<b>Section 6 Shipment and Storage</b> .....	23
6.1 Shipping Contents.....	23
6.2 How the equipment is shipped.....	23
6.3 Storage requirements before the install .....	23
6.4 Overview of Equipment Connections .....	23
<b>Section 7 Installation</b> .....	25
7.1 Tools and Materials.....	25
7.2 Pre-Installation .....	25
7.3 UV Chamber .....	26
7.3.1 Install UV Chamber without a Skid.....	26
7.3.2 Install UV Chamber with Low Profile Skid Base.....	28
7.3.3 Install UV Chamber with High Profile Skid Base.....	31
7.3.4 Install a Stacked UV Chamber .....	36
7.3.5 Connect Inlet and Outlet Process Piping to the UV Chamber (ANSI Flanges).....	38
7.3.6 Connect Inlet and Outlet Process Piping to the UV Chamber (Sanitary Fitting) .....	38
7.4 Control Power Panel .....	39
7.4.1 Electrical Connections.....	40
7.5 Assemble the UVI Sensor .....	44
7.6 Hydrostatic Test .....	45
<b>Section 8 Operation</b> .....	47
8.1 User Interface.....	47
8.1.1 Color Codes and Icons.....	47
8.1.2 Alarm and Warning Color Codes .....	48
8.1.3 User Interface Navigation Bar .....	48
8.1.4 Login Screen .....	49

## Table of Contents

8.2 System Overview Screen .....	50
8.2.1 System Status Information .....	51
8.2.2 Control Mode Screen.....	51
8.2.3 Local System Control Buttons .....	53
8.2.4 Remote Control Mode Message.....	53
8.3 Lamp Status Screen.....	53
8.3.1 Lamp and Driver Information Screen.....	54
8.3.2 Lamp and Lamp Driver Information .....	55
8.3.3 Reset a Lamp Driver Fault.....	55
8.3.4 Reset Lamp Hours.....	55
8.4 Settings Screen .....	57
8.4.1 Set 100% Relative UVI .....	58
8.4.2 TOC Signal Settings.....	59
8.5 Active Alarms Screen .....	59
8.5.1 Alarm History Screen.....	60
8.6 Information Screen .....	60
8.6.1 Date and Time Screen.....	61
8.6.2 Diagnostic Overview Screen .....	61
<b>Section 9 Maintenance.....</b>	<b>63</b>
9.1 Tools and Materials .....	63
9.2 Maintenance Schedule.....	64
9.3 Depressurize and Drain a UV Chamber.....	65
9.4 Pressurize the UV Chamber.....	66
9.5 Remove and Install the Service End Cap.....	67
9.6 UV Lamp .....	68
9.6.1 Storage Requirements for Used UV Lamps .....	68
9.6.2 Remove and Replace a UV Lamp .....	68
9.7 UVI Sensor.....	71
9.7.1 Remove and Replace a UVI Sensor - TOC.....	71
9.7.2 Remove and Replace a UVI Sensor - Liquid Sugar .....	73
9.8 Lamp and UVI Sensor Sleeve .....	77
9.8.1 Remove and Replace a Sleeve.....	77
9.8.2 Clean a Sleeve .....	81
9.9 UV Chamber End Plate .....	82
9.9.1 Remove and Install the UV Chamber End Plate .....	82
9.9.2 Remove and Replace End Plate O-Ring .....	86
9.10 Baffle Assembly.....	87
9.10.1 Remove and Replace a Baffle Assembly .....	87
9.10.2 Remove and Replace a Sleeve Bushing.....	88
9.10.3 Remove and Replace a Baffle Plate Guide O-Ring.....	89
9.11 Control Power Panel .....	90
9.11.1 Remove and Replace a Lamp Driver .....	90
9.11.2 Air Filters .....	94
9.11.3 Cooling Fan .....	94
9.12 Clean the UV Chamber .....	94
9.13 Clean in Place (CIP).....	94
<b>Section 10 Troubleshooting .....</b>	<b>95</b>
10.1 Alarms .....	95
10.2 Alarm Conditions .....	96
10.3 Non Alarm Conditions .....	98
10.3.1 UV Chamber.....	98
10.3.2 UV Lamp.....	99
10.3.3 Lamp Socket.....	99
10.3.4 UVI Sensor .....	100

# Table of Contents

---

10.3.5 Control Power Panel .....	100
<b>Section 11 Replacement Parts and Accessories .....</b>	<b>101</b>
11.1 UV Lamp and Lamp Sleeve .....	101
11.2 UVI Sensor.....	102
11.3 Systems without UVI Sensor.....	103
11.4 UVI Sensor.....	104
11.5 Baffle Assembly .....	105
11.6 UV Chamber .....	106
11.6.1 Port Plugs - Flanged Connections - TOC Applications .....	107
11.6.2 Port Plugs - Sanitary Ferrule Connections - Liquid Sugar Applications .....	108
11.7 Control Power Panel .....	109
11.8 Miscellaneous .....	109



# Section 1 Specifications

Specifications are subject to change without notice.

<b>General</b>				
Fluid Standard Temperature Range	40°F to 104°F (4°C to 40°C)			
Fluid High Temperature Range (Liquid Sugar Applications only)	40°F to 131°F (4°C to 55°C)			
Ambient Air Temperature	35°F to 95°F (2°C to 35°C)			
Ambient Storage Temperature	-4°F to 104°F (-20°C to 40°C)			
Ambient Relative Humidity	10% to 90%, non-condensing			
<b>Control Power Panel (Skid Mounted)</b>				
Enclosure Rating	UL Type 1 (IP51)			
Material	Painted Carbon Steel			
Dimensions H x W x D in. (cm)	22 x 64 x 21 (56 x 163 x 53)			
Cooling Mechanism	Forced Air and Vent			
Supply Voltage	Refer to Component Label			
<b>Control Power Panel (Standalone)</b>				
Enclosure Rating	UL Type 12 - IP54 (Standard), UL Type 4X - IP55 with fan (Optional)			
Material	Painted Mild Steel Standard (304 Stainless Steel Optional)			
Dimensions H x W x D in. (cm)	65 x 35 x 19 (166 x 90 x 50)			
Cooling Mechanism	Forced Air and Vent			
Supply Voltage	Refer to Component Label			
<b>UV Chamber</b>				
	<b>Model</b>			
Operating Pressure (Maximum)	<b>AVT20 / AVT20-HP</b>	<b>AVT36 / AVT36-HP</b>	<b>AVT44 / AVT44-HP</b>	<b>AVT48 / AVT48-HP</b>
	150 psi (10 bar)			
Material	316L Stainless Steel			
Number of UV Lamps	20	36	44	48
Weight - 1 Stack, no Skid lbs (kgs)	758 (344)	966 (438)	1086 (493)	1234 (560)
Weight - 1 Stack, with Skid lbs (kgs)	1022 (464)	1230 (558)	1350 (612)	1498 (679)
Weight - 2 Stack, with Skid lbs (kgs)	1918 (870)	2334 (1059)	2574 (1168)	2870 (1302)
Weight - 3 Stack, with Skid lbs (kgs)	2814 (1276)	3438 (1559)	3798 (1723)	4242 (1924)
Inlet / Outlet Diameter Size (ANSI)	4"	6"	6"	8"
Maximum Flow Rate* - Standard Quartz	80 - 250 gpm (352.2 - 1100.8 m <sup>3</sup> /hr)			
Maximum Flow Rate* - High Performance Quartz	Contact Aquafine for Sizing			
<i>*Flow Rate at 99% UVT</i>				
<b>UV Lamp</b>				
Type	Low pressure, High output (254 nm or 185 nm, with non-validated or validated options)			
Lamp Sleeve Material	Natural Quartz (Synthetic Quartz Optional)			
<b>Lamp Driver</b>				
Input	207-277 VAC, 50-60Hz			

## Specifications

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<b>UVI Sensor</b>	
Output range	4 to 20 mA current loop (2 wire)
Supply Voltage	24 VDC from the Control Power Panel
Maximum Operational Temperature	131°F (55°C)
Maximum Non Operational Temperature	194°F (90°C)
<b>System Regulatory Compliance</b>	
cULus, CE, UKCA and KC optional	

## Section 2 Safety Information

Please read this entire manual before operating this equipment. Pay attention to all danger, warning and caution statements in this manual. Failure to do so could result in serious personal injury or damage to the equipment.








Make sure that the protection provided by this equipment is not impaired. Do not use or install this equipment in any manner other than that specified in installation manual.

### 2.1 Use of Hazard Information
















<b>⚠ DANGER</b>
Indicates a potentially or imminently hazardous situation which, if not avoided, will result in death or serious injury.
<b>⚠ WARNING</b>
Indicates a potentially or imminently hazardous situation which, if not avoided, could result in death or serious injury.
<b>⚠ CAUTION</b>
Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury.
<b>NOTICE</b>
Indicates a situation that is not related to personal injury.

### 2.2 Precautionary Labels




Read all labels and tags attached to the instrument. Personal injury or damage to the instrument could occur if not observed.

	<p>Electrical equipment marked with this symbol may not be disposed of in European public disposal systems. In conformity with European local and national regulations (EU Directive 2002/96/EC), European electrical equipment users must now return old or end-of life equipment to the Producer for disposal at no charge to the user.</p> <p><b>Note:</b> For recycling, please contact the equipment producer or supplier for instructions on how to return end-of-life equipment, producer-supplied electrical accessories, and all auxiliary items for proper disposal. No equipment is to be returned without authorization. Local recycling programs may be used. For the manufacturer recycling UV Lamp program or producer-supplied electrical accessories and auxiliary items, contact the equipment supplier for proper disposal instructions.</p>
	This symbol indicates there is Mercury present.
	This is the safety alert symbol. Obey all safety messages that follow this symbol to avoid potential injury. When on the equipment, refer to the Operational and Maintenance manual for additional safety information.
	This symbol indicates a risk of electrical shock and/or electrocution exists.
	This symbol indicates the marked item has stored energy. Obey procedures to wait 5 (five) minutes after disconnecting main power, to allow stored energy to dissipate.
	This symbol indicates the marked equipment may contain a component that can eject forcibly. Obey all procedures to safely depressurize.
	This symbol indicates corrosive material. Avoid inhalation, ingestion, or exposure to eyes and skin. Wear appropriate clothing and personal protective equipment.

## Safety Information




	This symbol indicates the components of the system have been exposed to biohazardous waste.
	This symbol indicates a trained and competent lift operator should be used to move the equipment.
	This symbol indicates a body crush hazard. People should stay clear from under overhead loads.
	This symbol indicates surfaces may be slippery and there is a potential fall hazard.
	This symbol indicates there is a potential UV hazard. Proper protection must be worn.
	This symbol indicates the marked item could be hot and should not be touched without care.
	This symbol indicates that there is a potential ozone exposure hazard. Adequate ventilation is required.
	This symbol indicates that there is potential for VERY hot fluid to drain from UV Chamber openings. Allow fluid inside UV Chamber to cool before performing maintenance or service procedures.
	This symbol indicates that there is potential for VERY hot fluid spray from UV Chamber openings. Obey all procedures to safely depressurize. Allow fluid inside UV Chamber to cool before performing maintenance or service procedures.
	This symbol indicates the marked item should not be touched.
	This symbol indicates a risk of electrical shock and/or electrocution exists. All appropriate lockout tag out procedures must be obeyed.
	This symbol indicates to secure the device with a safety device / hook.
 <small>UV-C</small>	This symbol indicates a safety glasses with side protection is required for protection against UV exposure.
 <small>UV-C</small>	This symbol indicates a UV rated full face shield is required. Face shields are to be worn with safety glasses or safety goggles.
	This symbol indicates gloves must be worn.






	<p>This symbol indicates safety boots must be worn.</p>
	<p>This symbol indicates a hard hat must be worn.</p>
	<p>This symbol indicates the operator must read all available documentation to perform required procedures.</p>

## 2.3 Safety Precautions

Read the safety precautions in this section before doing maintenance, service or repair. Obey the instructions in the safety precautions. Failure to follow the instructions in the safety precautions can result in serious injury or death.

<b>⚠ DANGER</b>	
  	<p><b>Arc Flash and Shock Hazard - Live Electrical Circuit Present. Hazardous Voltage.</b></p> <ul style="list-style-type: none"> <li>• Failure to follow these instructions will result in electrical shock, injury or death from electrocution.</li> <li>• Devices inside this equipment contain stored energy.</li> <li>• NEVER work inside this equipment until at least 5 (five) minutes after disconnecting main power to allow stored energy to dissipate.</li> <li>• Lockout tag out all sources of power before performing any inspection, repair, or maintenance. <b><i>There may be more than one source of power!</i></b></li> </ul>

<b>⚠ DANGER</b>	
	<p><b>Shock Hazard.</b></p> <ul style="list-style-type: none"> <li>• Failure to use manufacturer approved parts, including UV Lamps, may result in significant thermal damage to insulation systems which may result in the exposure of live parts.</li> </ul>

<b>⚠ DANGER</b>	
 	<p><b>Pressurized Device - Impalement Hazard.</b></p> <ul style="list-style-type: none"> <li>• Failure to follow these instructions will result in serious injury or death due to forcible ejection of materials from UV Chamber.</li> <li>• ALWAYS follow lockout tag out procedures.</li> <li>• NEVER perform any physical inspection, repair, maintenance or service on UV Chamber unless UV Chamber has been isolated, depressurized and open to atmosphere.</li> <li>• NEVER pressurize UV Chamber without service end cap properly installed.</li> <li>• NEVER stand in front of UV Lamp section while UV Chamber is undergoing a hydrostatic pressure test. Stand to the side of the UV Chamber while looking for leaks.</li> <li>• <b><i>If a leak is observed, depressurize immediately, drain, repair and retest.</i></b></li> </ul>

**⚠ DANGER**



***Inhalation Hazard.***

- Failure to follow these instructions will result in exposure to ozone.
- ALWAYS ensure adequate ventilation.

**⚠ WARNING**



***Personal Injury Hazard.***

- Use of parts not approved by the manufacturer may cause personal injury, damage to the UV system or malfunction of the UV System and may void the manufacturer's warranty.
- Use of UV Lamps and Lamp Drivers, not approved by the manufacturer, will void UL and CE product safety certifications.
- The parts listed in [Section 11](#) are approved by the manufacturer.

**⚠ WARNING**



***Body Crush Hazard.***

- Failure to follow these instructions could result in serious injury or death due to improper lifting procedures, underrated lifting equipment, and moving parts.
- ALWAYS secure with safety device.
- ALWAYS stay clear of elevated loads.
- ALWAYS comply with local safety regulations.

**⚠ WARNING**



***Scald or Burn Hazard.***

- Failure to follow these instructions could result in serious scalds or burns due to exposure to VERY hot fluid.
- Fluid inside UV Chamber may be very hot. Avoid severe burns.
- NEVER touch hot fluid.
- Allow fluid inside UV Chamber to cool before performing maintenance or service procedures.

**⚠ CAUTION**



***UV Light Hazard.***

- Failure to follow these instructions may result in serious burns to unprotected eyes and skin.
- ALWAYS use UV protective gear, including gloves and clothing and face shield, when UV light is present.
- NEVER look directly at illuminated UV Lamp, even with protective gear.
- NEVER illuminate UV Lamp if personnel may be directly exposed to UV light.

**⚠ CAUTION**



**Burn Hazard.**



- Failure to follow these instructions may result in minor or moderate injury due to burns.
- NEVER touch hot surface.
- Allow UV Lamps to cool for a minimum of 10 (ten) minutes before handling.
- If accidental exposure occurs, immediately cool affected area. Consult physician.

**⚠ CAUTION**



**Slip and Fall Hazard.**

- Failure to follow these instructions may result in injuries from a slip and fall.
- ALWAYS ensure safe footing.
- ALWAYS clean up spills promptly.
- ALWAYS comply with site specific safety protocols and procedures.

**NOTICE**



**Mercury Chemical.**

- UV Lamps contain a small amount of mercury in either elemental or bound amalgam state, depending on lamp type. These lamps are similar to fluorescent and compact fluorescent lamps (CFL). Always comply with local regulations governing the disposal of lamps containing mercury and the waste associated with breakage.
- NEVER use a vacuum cleaner to clean up broken lamps containing mercury. Vacuuming could spread mercury-containing powder or vapour.
- Thoroughly collect broken glass and trace amounts of mercury and place into a sealable bag or container. For further reference see the U.S. EPA guidelines <http://www.epa.gov/cfl/cleaning-broken-cfl>.
- If you have further questions about the safe clean-up of mercury containing lamps, contact the Aquafine service support group at [techservice@trojantechnologies.com](mailto:techservice@trojantechnologies.com)

**NOTICE**



**Personal Protective Equipment Required.**

- ALWAYS use appropriate eye, hand, and foot protection.
- ALWAYS wear UV-C safety glasses when around equipment or a UV-C faceshield with safety glasses or safety goggles when inspecting open running equipment.
- ALWAYS follow plant safety procedures and protocols.
- ALWAYS take all necessary precautions when working around, operating, or working on this equipment, if contamination of components is expected within this application due to effluent biological or chemical contaminants.

**NOTICE**



Only competent personnel should undertake operation, repairs, maintenance, or servicing of equipment described in this manual. Maintain the continuity of the lockout tag out between shifts. If you do not understand the information or procedure explanations in this manual, STOP and contact your Service Provider for assistance.

## Safety Information

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### NOTICE

The **Aquafine Avant** breaks down trace levels of ozone, chlorine and total organic carbon.

The **Aquafine Avant LS** system inactivates Alicyclobacillus, Salmonella and Escherichia coli (E. coli).

### NOTICE

The product has only the approvals listed and the registrations, certificates and declarations officially provided with the product. The usage of this product in an application for which it is not permitted is not approved by the manufacturer.



**WARNING:** This product can expose you to chemicals including phthalates, which is known to the State of California to cause cancer, and mercury, which is known to the State of California to cause birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

**Notes:** 1) *Dispose of contaminated parts/components as per country requirements.*

2) *Refer to the Safety Data Sheets for accidental exposure to materials.*

## 2.4 Safety Features

The UV System has safety features that prevent personal injury:

- Service End Cap - The electrical power supplied to all lamp holders is turned off when the service end cap is removed.
- Door disconnect switch - A disconnect switch removes power to the UV System.

## Section 3 General Information

The information in this manual has been carefully checked and is believed to be accurate. However, the manufacturer assumes no responsibility for any inaccuracies that may be contained in this manual. In no event will the manufacturer be liable for direct, indirect, special, incidental or consequential damages resulting from any defect or omission in this manual, even if advised of the possibility of such damages. In the interest of continued product development, the manufacturer reserves the right to make improvements in this manual and the products it describes at any time, without notice or obligation.

### 3.1 Acceptable Noise Levels

The airborne noise emissions, A-weighted emission sound pressure level, is not more than 70dB(A).

### 3.2 Patents and Permissions

The products described in this document may be protected by one or more patents in The United States of America, Canada and/or other countries. For a list of patents owned by Trojan Technologies, go to:

[www.trojantechnologies.com/patents](http://www.trojantechnologies.com/patents).

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### 3.3 Abbreviations and Acronyms

Table 1 describes the abbreviations and acronyms included in this manual.

**Table 1 Abbreviations and Acronyms**

Abbreviation/Acronym	Description
AC	Alternating Current
AO	Analog Output
CE	Conformité Européenne (European Conformity)
CPP	Control Power Panel
cULus	Underwriters Laboratories Listed to Canadian and USA standards
ELCB	Earth Leakage Circuit Breaker
EOL	End of Life
EPDM	Ethylene Propylene Diene Monomer
FKM	Fluorocarbon based fluoroelastomer material
HMI	Human Machine Interface
HP	High Performance
KC	Korea Certification
lbf.ft	Pounds force foot
lbf.in	Pounds force inch
LOA	Lamp Out Alert
LS	Liquid Sugar
N.m	Newton metre
psi	pounds per square inch
TOC	Total Organic Carbon
UKCA	UK Conformity Assessed
UV	Ultraviolet
UVI	Ultraviolet Intensity

### 3.4 System Overview

The system is a pressurized UV Chamber that uses high-output low pressure UV Lamps.

Figure 1 shows the components for a TOC UV System. These systems have ANSI flange inlet/outlet connections.

Figure 2 shows the components for a Liquid Sugar UV System. These systems have sanitary fitting inlet/outlet connections.

One Control Power Panel (CPP) provides the power distribution for one UV Chamber and controls the UV Chamber through a microprocessor user interface. Refer to Section 8.

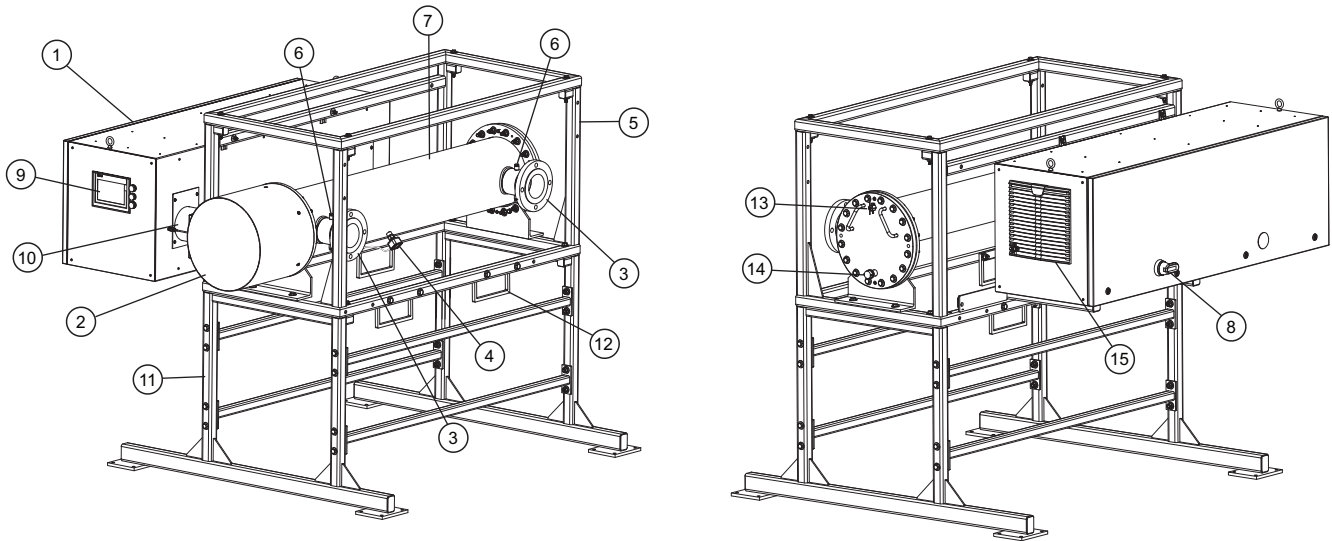


Figure 1 UV System with ANSI Flange Option - 1 UV Chamber Stack, Skidded

1 Control Power Panel (CPP) (Clearance required - <a href="#">Section 7.4</a> )	2 Service End Cap (Clearance required - <a href="#">Section 7.2</a> )
3 Inlet/Outlet Connections	4 UVI Sensor (Optional) ( <a href="#">Section 3.4.4</a> )
5 UV Chamber Support Frame (Optional)	6 Sample Port
7 UV Chamber	8 Disconnect Handle
9 Human Machine Interface	10 Wireway
11 Skid Frame Base* (Optional)	12 Fork Lift Slots
13 UV Chamber Vent port	14 Drain Connection
15 CPP Vent	

\*High Profile Skid Frame Base shown.

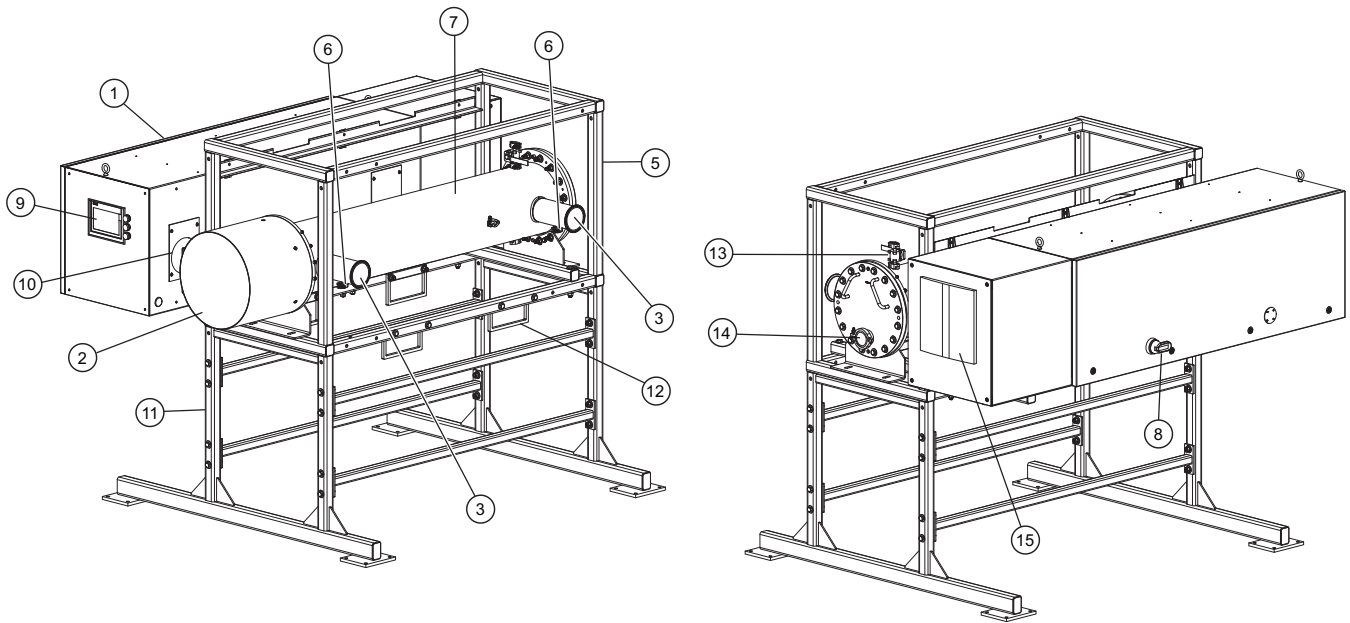


Figure 2 UV System with Sanitary Flange Option - 1 UV Chamber Stack, Skidded

1 Control Power Panel (CPP) (Clearance required - <a href="#">Section 7.4</a> )	2 Service End Cap (Clearance required - <a href="#">Section 7.2</a> )
3 Inlet/Outlet Connections	4 UVI Sensor (end plate mounted, not shown) ( <a href="#">Section 3.4.4</a> )
5 UV Chamber Support Frame (Optional)	6 Sample Port
7 UV Chamber	8 Disconnect Handle
9 Human Machine Interface	10 Wireway
11 Skid Frame Base* (Optional)	12 Fork Lift Slots
13 UV Chamber Vent port	14 Drain Connection
15 CPP Vent	

\*High Profile Skid Frame Base shown.

**3.4.1 UV Chamber**

The UV Chamber contains the UV Lamps and Lamp Sleeves.

## General Information

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### 3.4.2 Control Power Panel

The CPP contains the Lamp Drivers that power and control the UV Lamps.

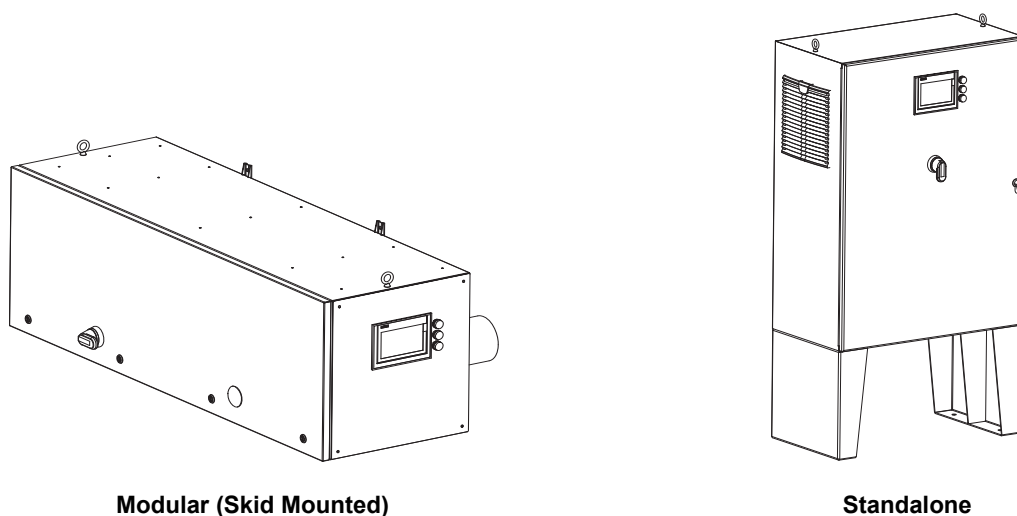


Figure 3 Control Power Panel

### 3.4.3 Sample Ports

Two optional ports are available for obtaining fluid samples pre-and post UV Chamber.

### 3.4.4 UVI Sensor (Optional)

The UVI Sensor measures UV Lamp Intensity.



# Section 4 Lockout Tag Out

## ⚠ DANGER



Obey all warning and caution statements. Refer to [Section 2](#).

Read and understand the Operation and Maintenance Manual before operating this equipment. Read all user documentation before performing operations, inspections, repair, or maintenance on this equipment.



Only competent personnel should undertake operation, repairs, maintenance, or servicing of equipment described in this section of the manual. If you do not understand the information or procedure explanations in this manual, STOP and contact your Service Provider for assistance.

The procedure in [Section 4.1](#) is the minimum lockout requirement. Use additional precautions, as needed. Obey all site-specific protocols.

### 4.1 Lockout Tag Out Procedure

#### 4.1.1 Equipment Shutdown






Contact the plant manager or shift supervisor for help regarding equipment location and identification.


1. Ensure that no hazards will be created by equipment shutdown.
2. Shut down all equipment that will need lockout tag out.
3. Ensure that all moving parts come to a complete stop.


#### 4.1.2 Deactivate Energy Sources

A hazardous energy source is any energy source that can cause serious personal injury or death. The potential hazardous energy sources in this manual are:

1. Identify and deactivate the main isolating device of each energy source:

-  Electrical Energy (Incoming Power)
-  Fluid Pressure (Potential Energy)
-  Thermal (Thermal Energy)
-  UV Light (Radiation Energy)
-  Mechanical (Kinetic Energy)

2.  Disconnect all electrical equipment from power:
  - Disconnect all electrical equipment
  - Power off and disconnect electrical power to hard-wired equipment

3.  Dissipate stored electrical energy in capacitors.
4. Close all shut-off valves.

## Lockout Tag Out

---

### 4.1.3 Lockout Tag Out Energy Sources



1. Use a multi-lock scissor adaptor to lockout each energy source.
2. Attach a completed lockout tag. Include the required information:
  - Person and company applying the lockout
  - Reason for the lockout
  - Date of the lockout
3. Apply a personal lock.

### 4.1.4 Verify the Lockout



1. Ensure that the meter is working correctly with a test before and after measuring the de-energized source:
  - a. Test the voltmeter to a known, energized 24 VAC/120 VAC source.
  - b. Use the same voltmeter to test the locked-out energy sources to verify that there is no voltage.
  - c. Test the voltmeter again to a known, energized 24 VAC/120 VAC source.
2. Ensure that the stored energy sources have dissipated.
3. Try to start the de-energized equipment and verify that it does not start.

## 4.2 Remove the Lockout Tag Out

When the work is finished and the system has been restored to full operational condition, including closing all enclosure doors, the lockout tag out can be removed.

1. Ensure that no hazards will be created by removal of the lockout.
2. Obey manufacturer's instructions and safe work procedures to energize and start the equipment.

# Section 5 System Startup and Shutdown

## ⚠ DANGER



Obey all warning and caution statements. Refer to [Section 2](#).

Read and understand this manual before operating this equipment. Read all user documentation before performing operations, inspections, repair, or maintenance on this equipment.



Only competent personnel should undertake operation, repairs, maintenance, or servicing of equipment described in this section of the manual. If you do not understand the information or procedure explanations in this manual, STOP and contact your Service Provider for assistance.

## NOTICE

Do not operate the UV System until the UV Chamber is completely filled with process fluid.

To prevent alarm conditions, overheating or equipment damage, process fluid level and flow in the UV Chamber must be established and maintained at all times when UV Lamps are in operation. Follow all provided site-specific instructions about automatic or manual power to operate the system.

## 5.1 Start-Up Procedure

### 5.1.1 Pre-Start Checklist:

1. UV Chamber should be filled with process fluid to be treated. The flow of fluid for the initial filing should not exceed 50 GPM (3.15 L/s). Failure to comply may result in Lamp Sleeve breakage. Ensure there are no system leaks and no piping connection leaks.
2. Check for complete assembly:
  - UV Chamber is fully assembled.
  - Make sure that drainage and by-pass provisions are ready.
  - UV Lamps and Lamp Sleeves are fully assembled and installed.
  - **For TOC Systems:** If supplied, installation of UVI Sensor is complete, otherwise port is plugged.
  - **For Liquid Sugar Systems:** If supplied, installation of the UVI Sensor and Sensor Sleeve is complete.
  - There is fluid in the UV Chamber.
  - There are no leaks in the UV Chamber.
  - The Service End Cap is fastened and secure at the end of the UV Chamber
  - Verify all incoming power connections conductors, including the ground conductor, are properly terminated.
  - Verify that the primary over-current protection device and circuit breaker are in the closed position.
  - Turn the main power disconnect switch to the “ON” position. The enclosure fans, Control Power Panel display screens and the Lamp Drivers will be energized.
3. For Local ON/OFF control:
  - At the CPP HMI → Verify mode on 'Settings 1' screen is set to 'LOCAL'. From 'System Overview' screen under 'Lamps Control', press the On/Off control pushbutton to set the system to the desired state. Refer to [Section 8](#).
4. For Remote - Input ON/OFF control:
  - At the CPP HMI → Verify mode on 'Settings 1' screen is set to 'Remote - Input'. These terminals require only a contact closure to operate the remote relay. When the controller is set to “Remote - Input” operation, the closure at these terminals will “START/STOP” the system from a remote location.

## System Startup and Shutdown

---

5. For Remote - SCADA ON/OFF control:

- At the CPP HMI → Verify mode on 'Settings 1' screen is set to 'Remote - SCADA'. The system then requires only a single signal to start/stop the system. Turn on the signal to start the system from a remote plant controller.

*Note: Refer to the SCADA signal list in the Controls Philosophy document for signal definitions.*

## 5.2 Shutdown Procedure

### 5.2.1 UV Unit

1. The Plant:

Stop the process flow through the UV Chamber as per site specific protocols.

2. For Local ON/OFF control:

- At the CPP HMI → Press the On/Off pushbutton under Lamp Control to power off the UV Lamps. Refer to [Section 8](#).

3. For Remote - Input ON/OFF control:

- These terminals require only a contact closure to operate the remote relay. When the controller is set to "Remote - Input" operation, the closure at these terminals will "START/STOP" the system from a remote location.

4. For Remote - SCADA ON/OFF control:

- Turn off the signal to stop the system from a remote plant controller.

*Note: Refer to the SCADA signal list in the Controls Philosophy document for signal definitions.*

5. At the CPP → Turn the local disconnect switch to the OFF position.

# Section 6 Shipment and Storage

---

## 6.1 Shipping Contents

The system consists of two major components, the UV Chamber and the Control Power Panel. Some components may be disconnected at the UV Chamber for shipment.

## 6.2 How the equipment is shipped

The system is delivered to the site by truck. System components are packed in wooden crates labeled with the component name. Other labels identify components which are fragile or breakable and components which must be kept dry.

To prepare for installation, remove only the shipping straps and bolts that secure the panel to the pallet.

## 6.3 Storage requirements before the install

The manufacturer recommends indoor storage of the system equipment. The equipment should be stored in a dry warehouse. Heating is not necessary during storage. However, before system start up, the equipment must be warmed to greater than 60°F (15°C) for a period of 24 hours.

Storage area conditions:

- Ambient air temperature between -4°F to 104°F (-20°C to 40°C)
- Relative humidity from 10% to 90%, non-condensing
- Free from dust and dirt ingress
- Must not contain corrosive or explosive gases
- Free from salt air
- Vermin free

If indoor storage is not possible, the panel may be stored outdoors, with additional conditions:

- Equipment is stored on high ground that is not susceptible to flooding.
- Equipment is elevated a minimum of 12 inches (300 mm) above the ground or as appropriate to prevent flooding.
- Equipment is completely covered with waterproof tarps to prevent exposure to the elements (e.g., rain, snow, sand, dust etc.). Tarps must be tight fitting, attached securely and examined regularly. Water and snow accumulation should be removed regularly.
- Equipment stored in crates should not be exposed to direct sunlight.
- Equipment can be stored in sea containers.

## 6.4 Overview of Equipment Connections

Refer to the general layout drawings provided by the manufacturer. If the supplied layout drawings do not match the site conditions, contact the manufacturer for assistance.



# Section 7 Installation

## ⚠ DANGER



Obey all warning and caution statements. Refer to [Section 2](#).


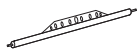

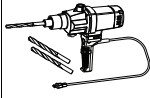




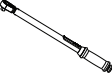



Read and understand this manual before operating this equipment. Read all user documentation before performing operations, inspections, repair, or maintenance on this equipment.



Only competent personnel should undertake operation, repairs, maintenance, or servicing of equipment described in this section of the manual. If you do not understand the information or procedure explanations in this manual, STOP and contact your Service Provider for assistance.

## 7.1 Tools and Materials

The following is a list of tools needed to install the UV System.

Symbols	Description	Symbols	Description
	Lifting straps (properly sized and rated for equipment load)		Spreader Bar (properly sized and rated for equipment load)
	Drill - Concrete Hammer		Drill with bits
	Level		Tape measure
	Wrench - Socket		Wrench - Adjustable
	Wrench - Torque		Wrench
	Philips Screwdriver		Anti Seize

All Aquafine products are carefully inspected and tested before shipment from our plant. Upon delivery, check the packaging and equipment for damage that occurred during shipment.

## 7.2 Pre-Installation

- When preparing the site for installation, allow for valves, drain and bypass as part of your plumbing circuit.
- It is recommended to have a provision to bypass and isolate the UV Chamber from flow, to allow for UV Chamber shutdown for maintenance and/or service purposes.
- Connecting pipes to the UV System should be supported, to avoid any undue strain on the UV Chamber.  
**Note:** *The UV System should not bear any load of the attached piping.*
- For CPP side and front clearance ([Figure 3](#)) refer to local codes for local minimum requirements.
- Allow for sufficient service access around the UV Chamber.

UV Lamp Length	Service Area Clearance ( <a href="#">Figure 1</a> )
60 inch	72 inches (1830 mm)

## Installation

6. If your piping system is subject to impulse pressure resulting in “water hammer” condition, a surge tank or other means must be provided to remove this condition; otherwise the extreme momentary pressure may rupture and fracture the Lamp Sleeves.
7. Avoid locations that experience vibration within proximity of heavy equipment or from erratic pumps. Excessive vibration from other equipment can cause damage to UV Lamps within the UV Chamber.

### 7.3 UV Chamber

The UV Chamber may be installed with or without a skid.

#### Installations without a skid

The UV Chamber is required to be supported by piping supports provided by others ([Section 7.3.1](#)). The Control Power Panel is required to be floor mounted ([Section 7.4](#)).

#### Installations with a Skid

The UV Chamber and the Control Power Panel are supported by the supplied skid. Skids are capable of stacking one (1), two (2) or three (3) UV Chambers and Control Power Panels high ([Section 7.3.4](#)). The base skid provided may be either Low Profile ([Section 7.3.2](#)) or High Profile ([Section 7.3.3](#)).

All valves, manifold piping and connection piping to be supplied by others.

**Note:** The UV Chamber and Control Power Panel module will be preassembled onto the skid prior to shipment.

## NOTICE

### FOR LIQUID SUGAR APPLICATIONS

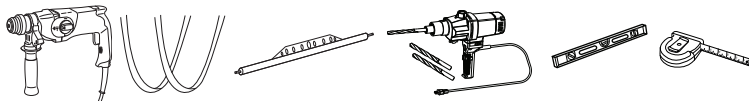
Good Manufacturing Practice (GMP) requires a thorough cleaning of food contact surfaces. Ensure all wetted surfaces in the UV Chamber are cleaned and sanitized in accordance with the facility standard operating procedures and / or local regulatory requirements.

#### 7.3.1 Install UV Chamber without a Skid

##### Prerequisites:

- Clear the area where the UV Chamber will be installed.
- Remove UVI Sensor if lifting straps interfere with the UVI Sensor Assembly. Refer to [Section 9.7.1](#) - **applies to TOC systems only.**

##### Tools:



##### Materials:

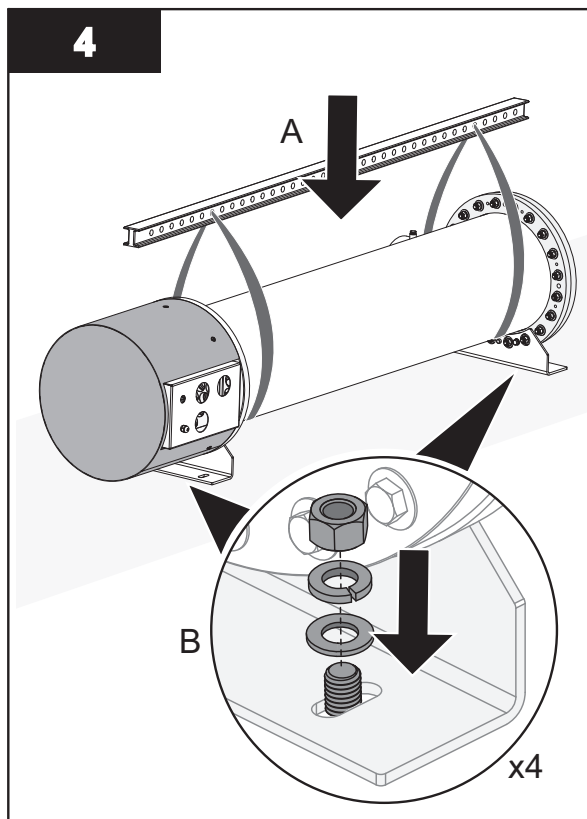
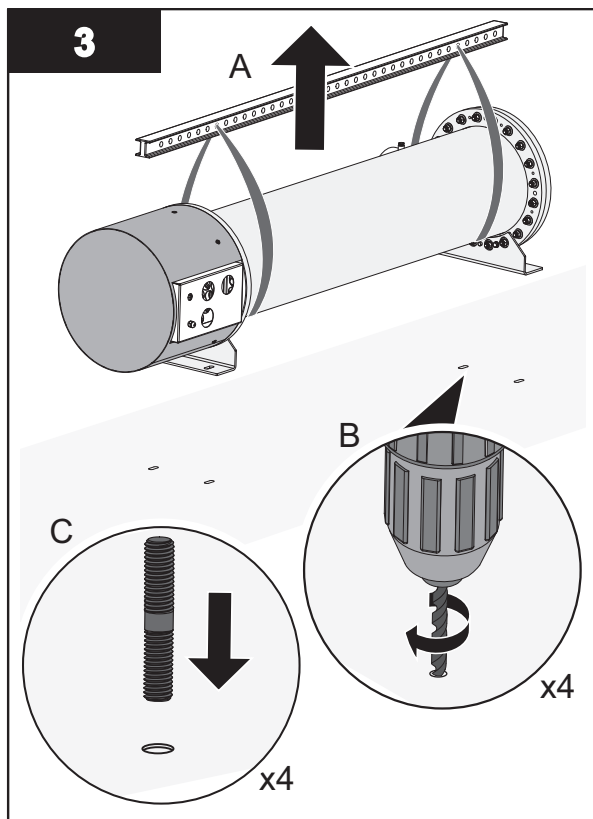
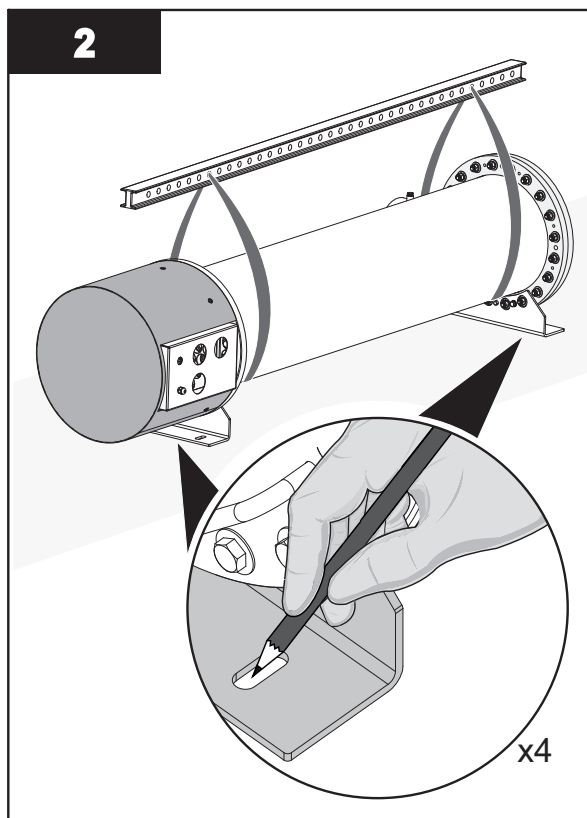
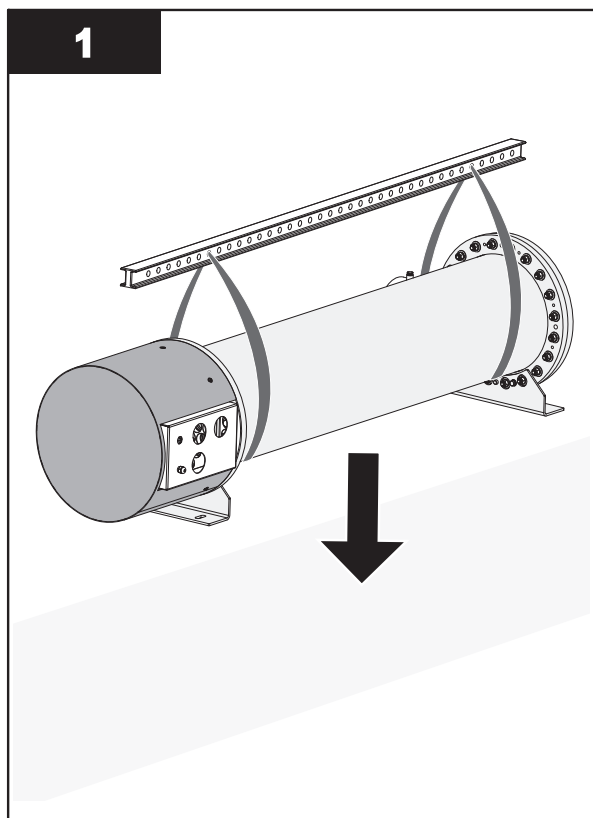


- Anchoring hardware (by others)
- Shims, if required (by others)

##### Procedure:







**Note:** Loosely install the mounting hardware.

5. Level the UV Chamber from side to side and front to back (horizontal).
6. Tighten the mounting hardware.
7. Remove the lifting straps.

## Installation

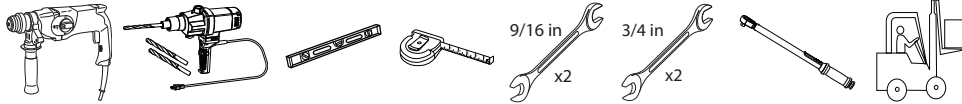
8. Install UVI Sensor, if previously removed. Refer to [Section 9.7.1](#) - *applies to TOC systems only*.
9. Connect UV Chamber Inlet and Outlet to Plant process piping:
  - For UV Chamber with ANSI Flanges, refer to [Section 7.3.5](#).
  - For UV Chamber with Sanitary Flanges, refer to [Section 7.3.6](#).

### 7.3.2 Install UV Chamber with Low Profile Skid Base

#### Prerequisites:

- Clear the area where the UV Chamber will be installed

#### Tools:

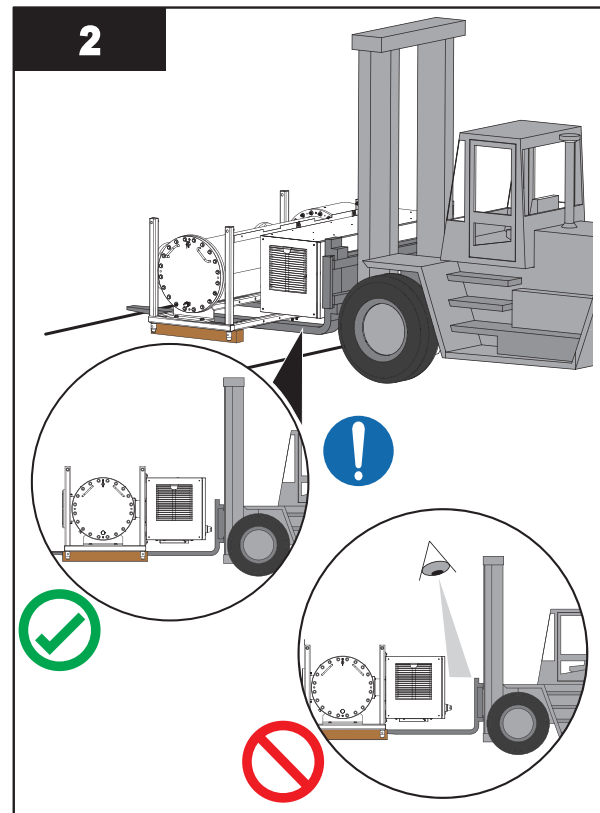
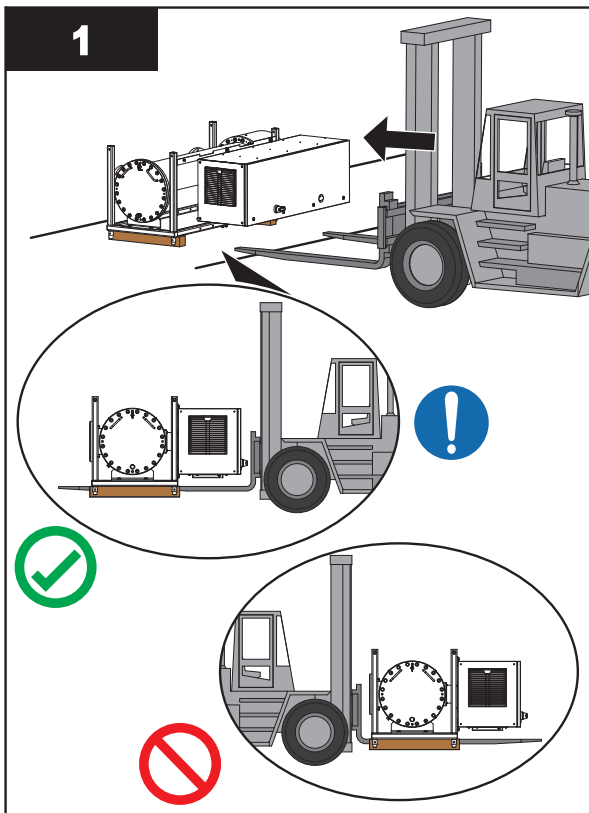


#### Materials:

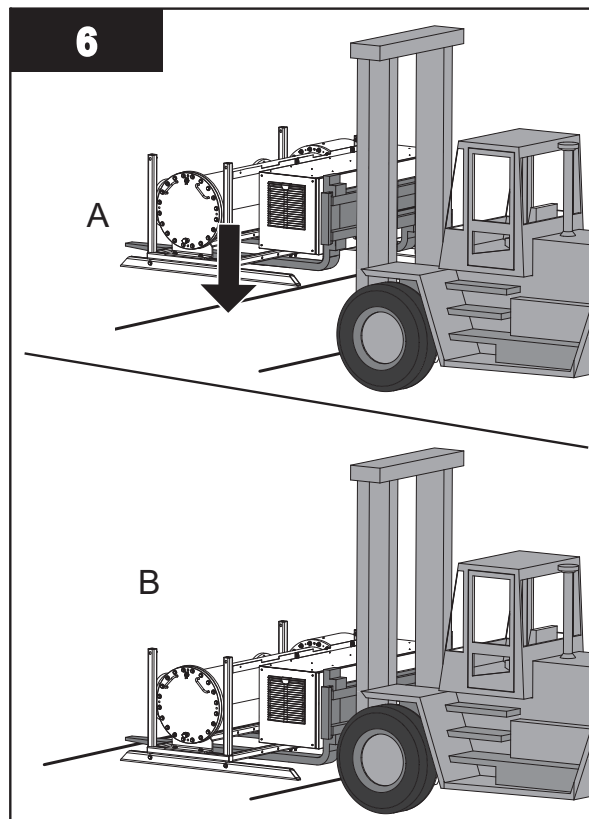
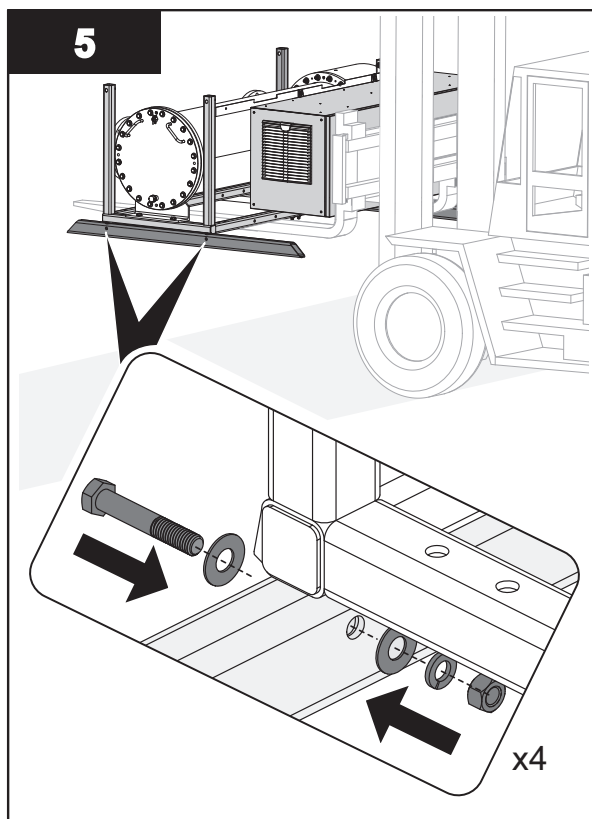
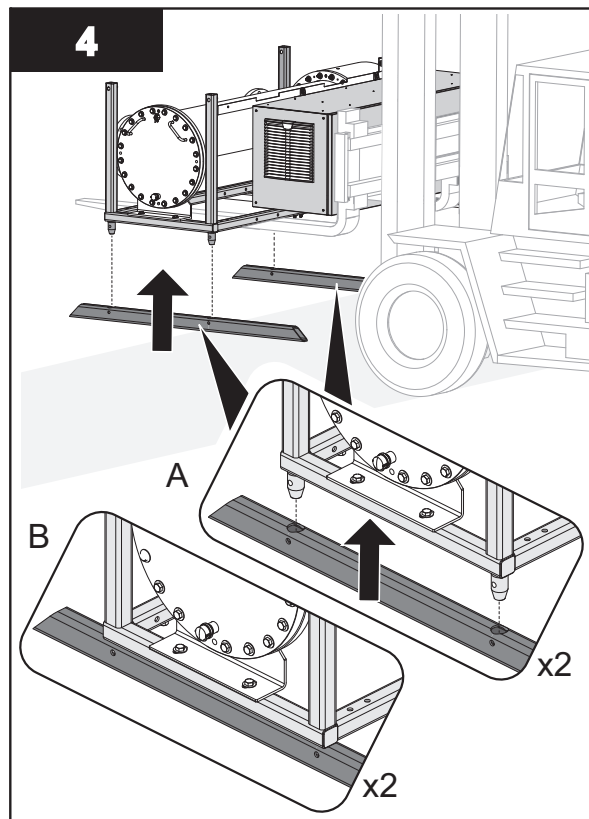
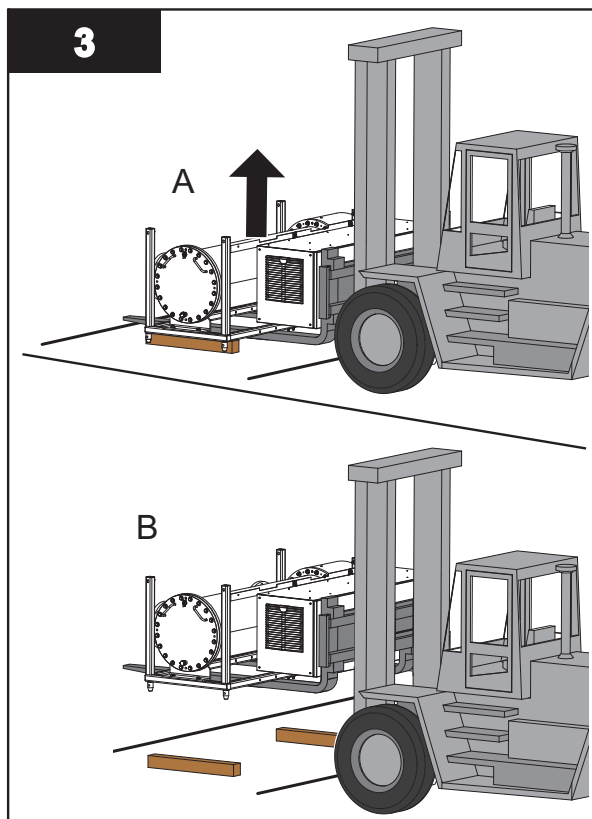


- Anchoring hardware (by others)
- Skid Mounting and Assembly Hardware (provided)
- Shims, if required (by others)

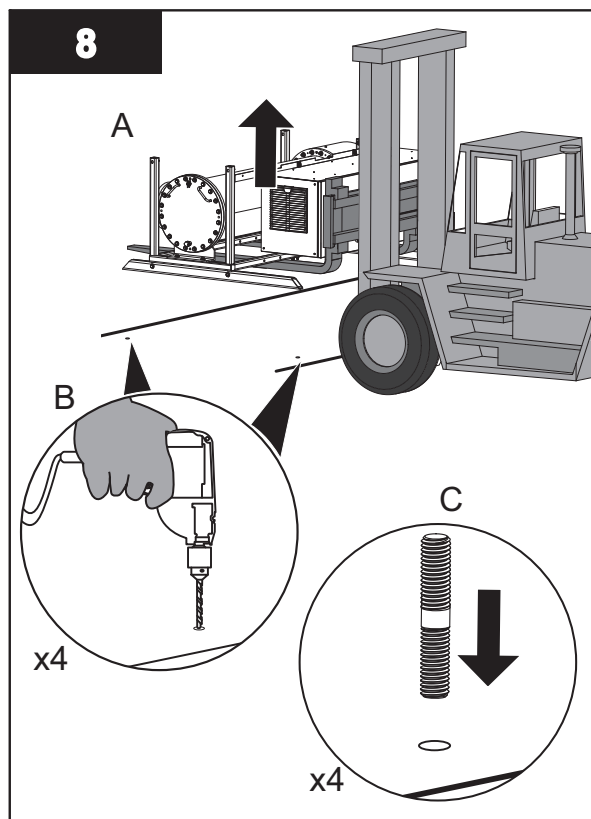
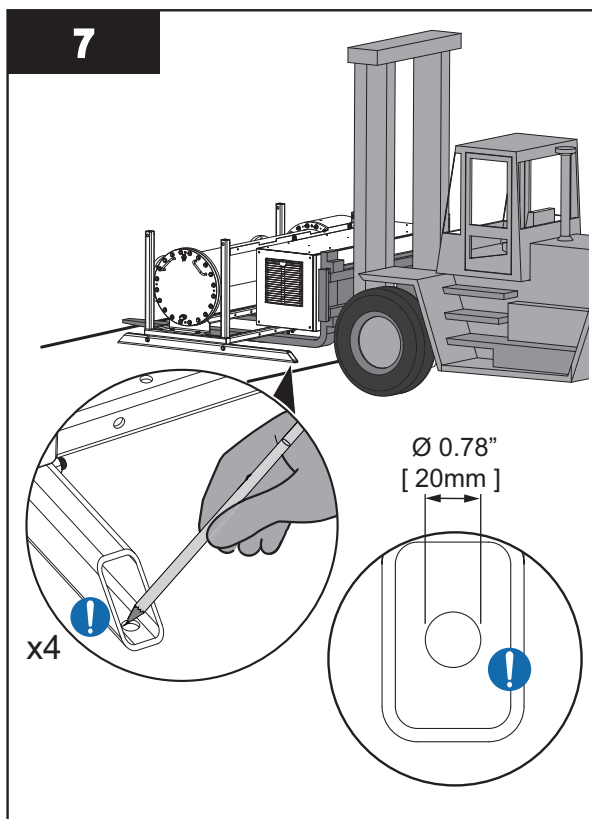
#### Procedure:



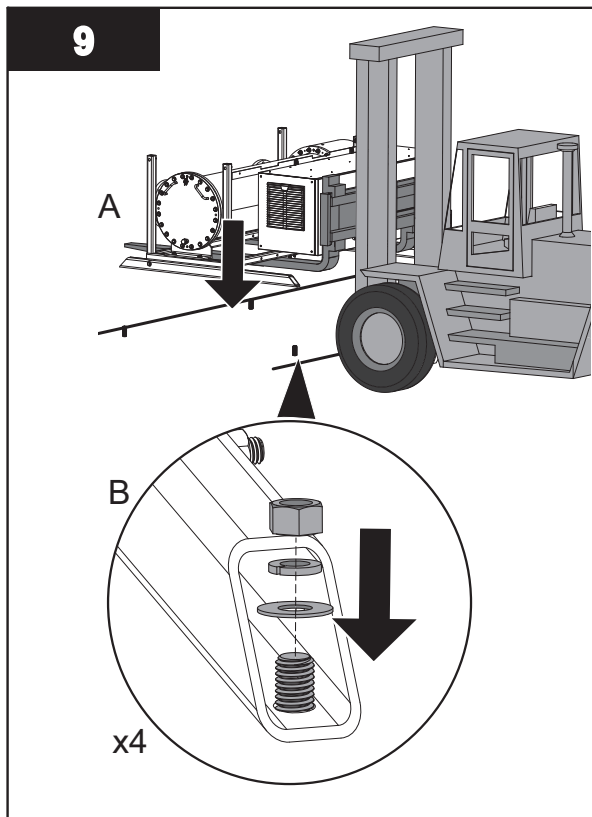
**Note:** Center the fork lift with the skid to balance the load.



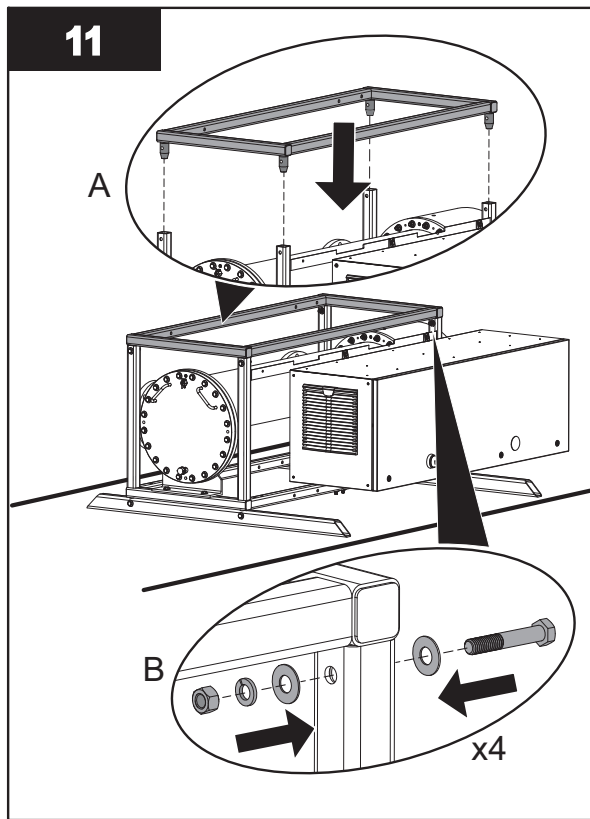
*Note: Move UV Chamber Skid to the final installation location.*



**Note:** Temporarily move the UV Chamber Skid away from the work area.



**10.** If a UV Chamber is required to be stacked onto the base assembly, go to [Section 7.3.4](#) and if not, proceed to Step 11.



12. Connect UV Chamber Inlet and Outlet to Plant process piping:

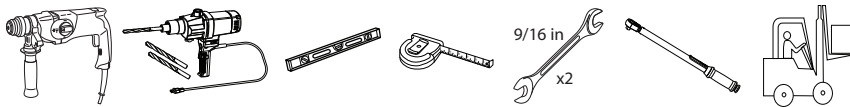
- For UV Chamber with ANSI Flanges, refer to [Section 7.3.5](#).
- For UV Chamber with Sanitary Flanges, refer to [Section 7.3.6](#).

### 7.3.3 Install UV Chamber with High Profile Skid Base

**Prerequisites:**

- Clear area where the UV Chamber will be installed

**Tools:**



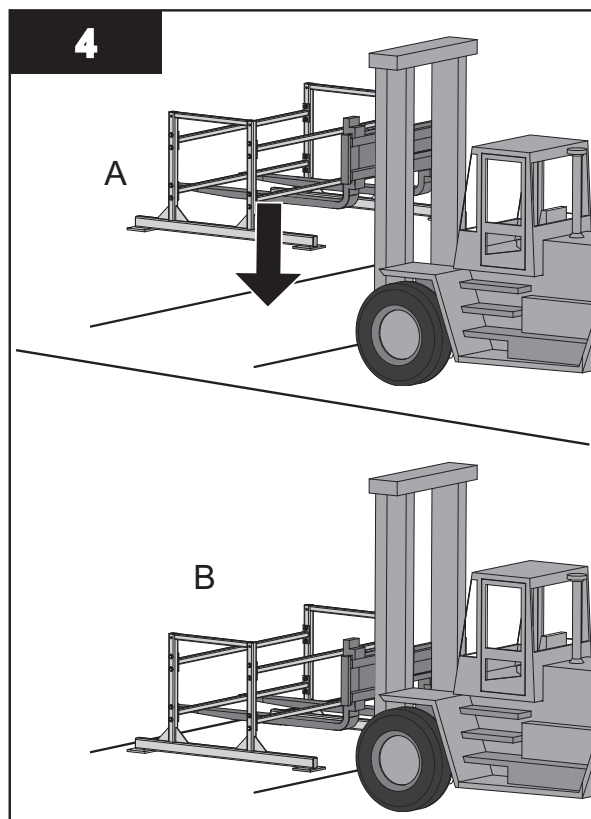
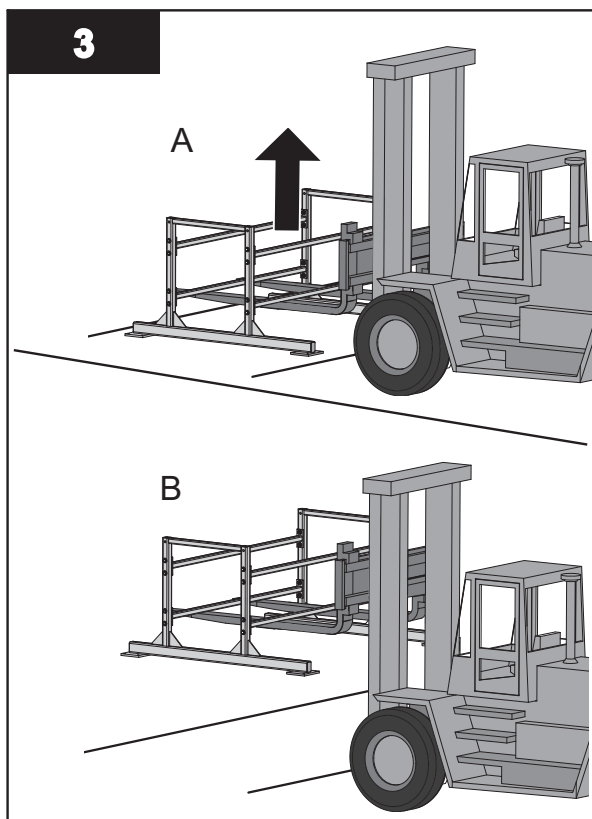
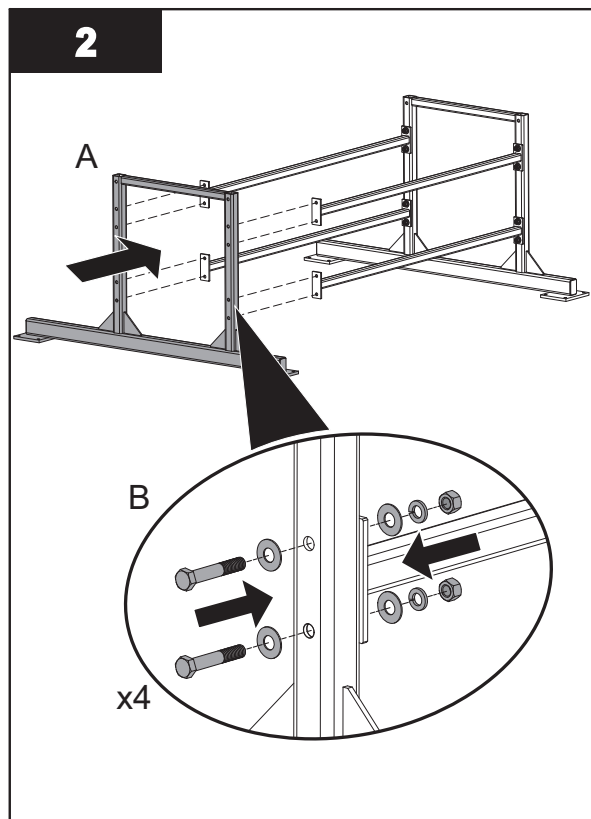
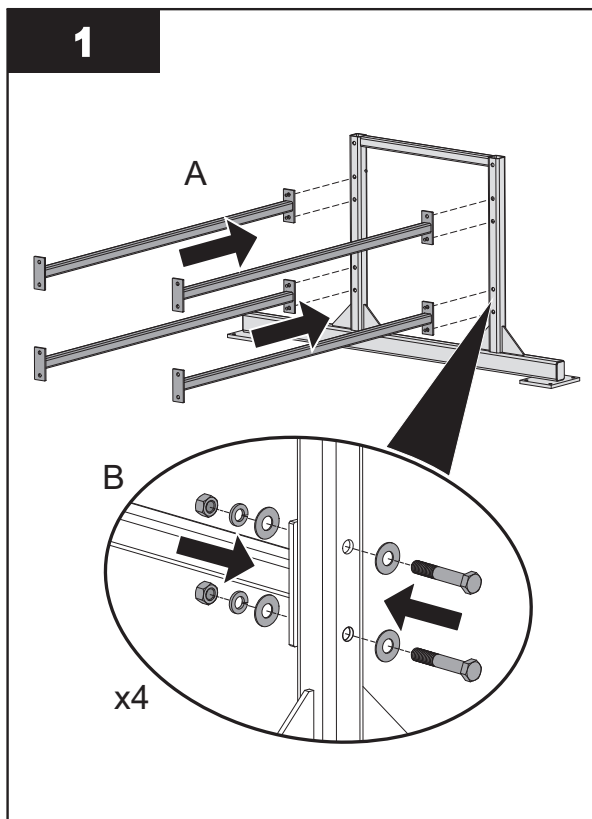
**Materials:**



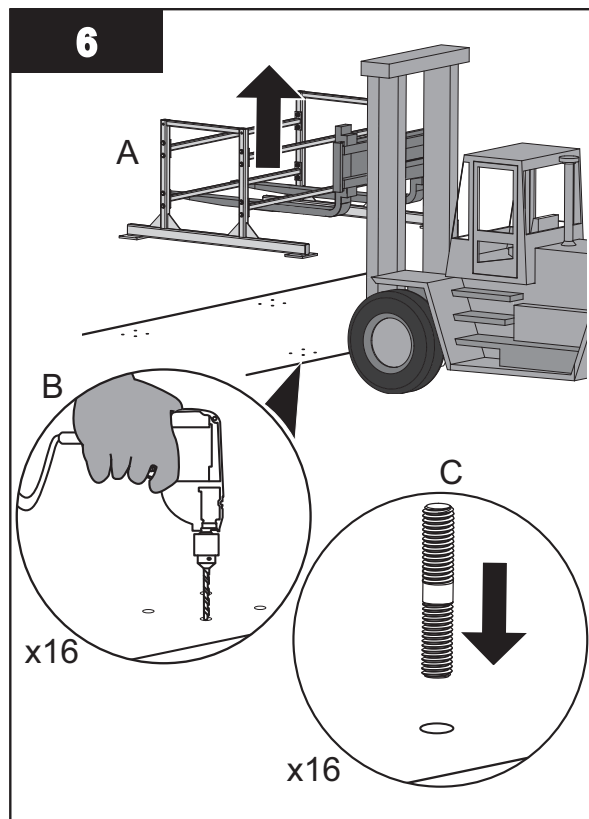
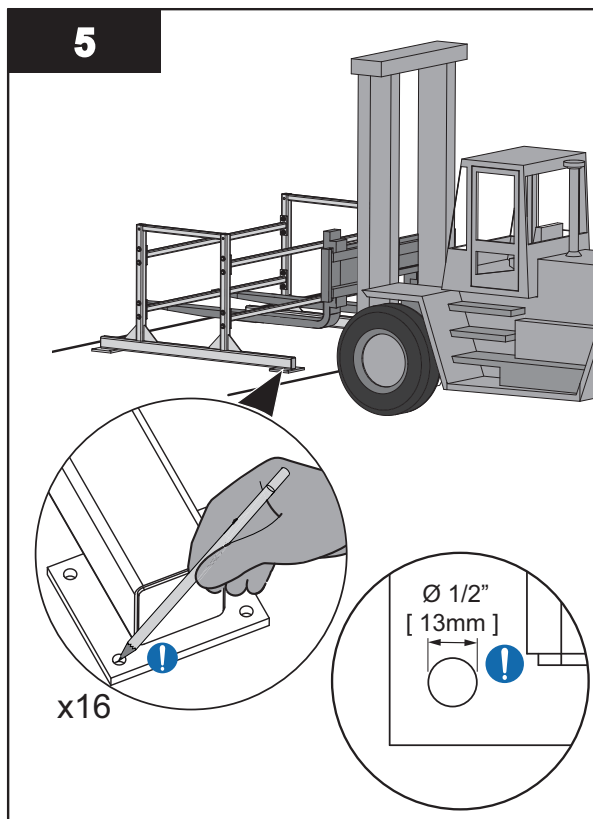
- Anchoring hardware (by others)
- Skid Mounting and Assembly Hardware (provided)
- Shims, if required (by others)

**Procedure:**

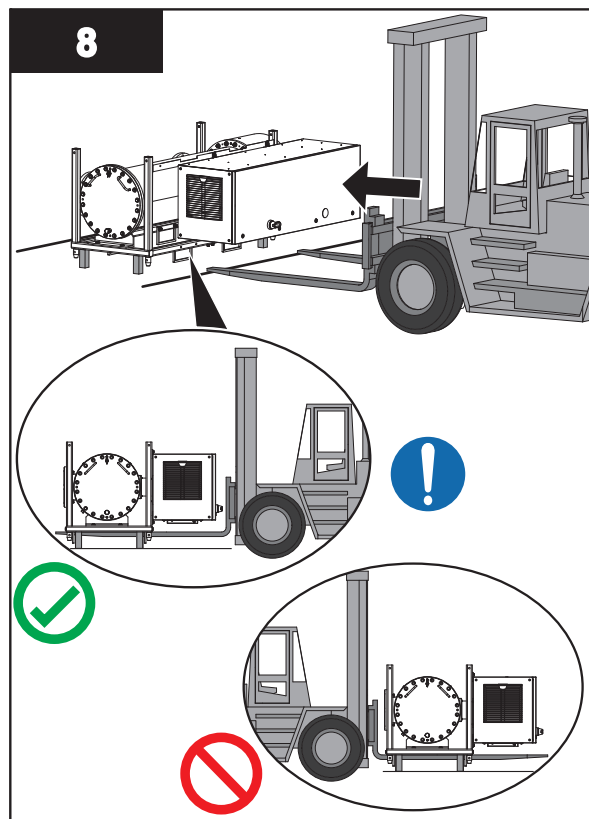
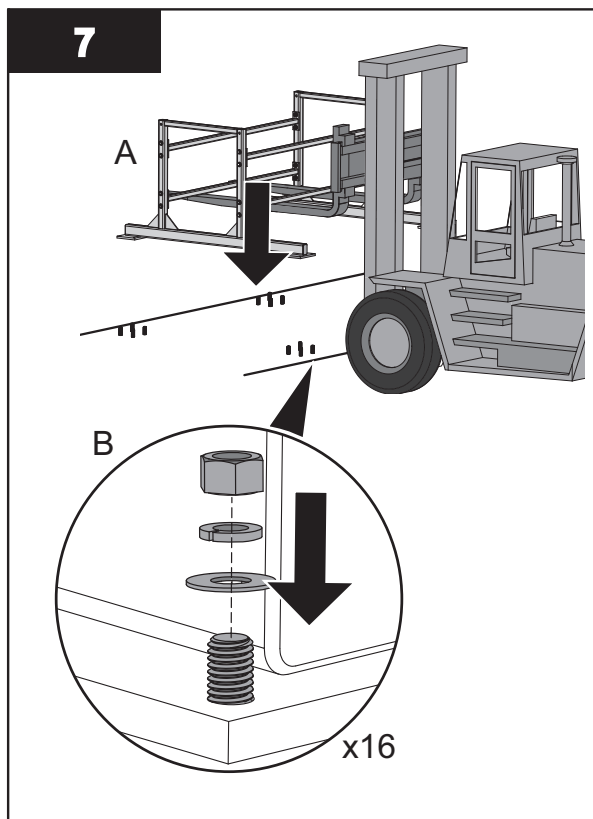




*Note: Move the skid to the final installation location.*

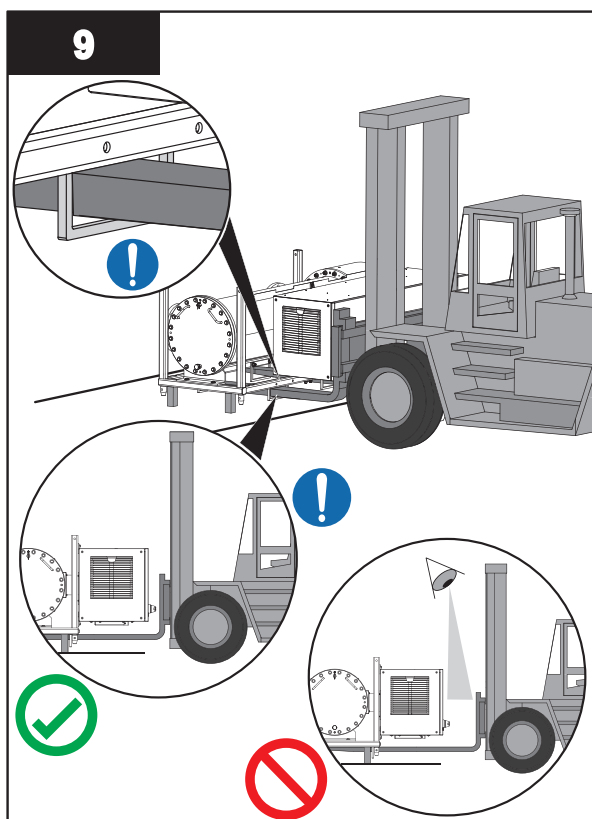


**Note:** Temporarily move the skid away from the work area.

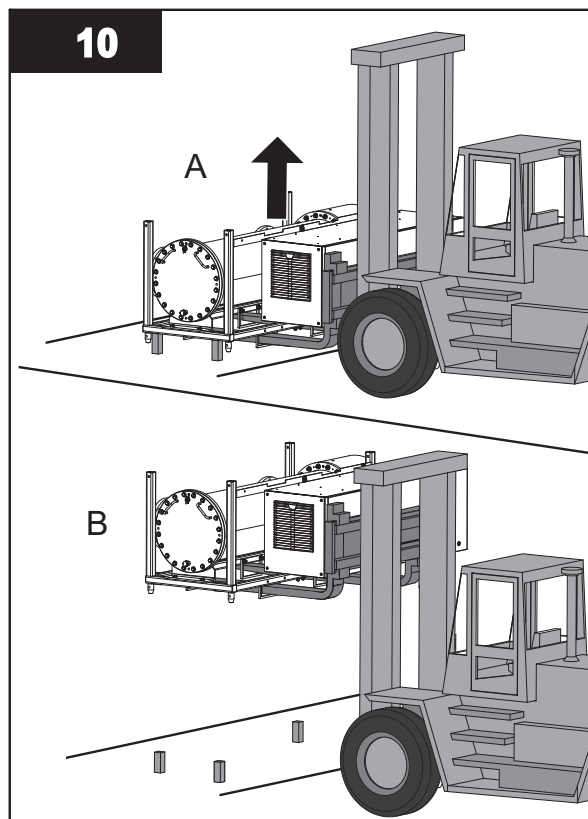




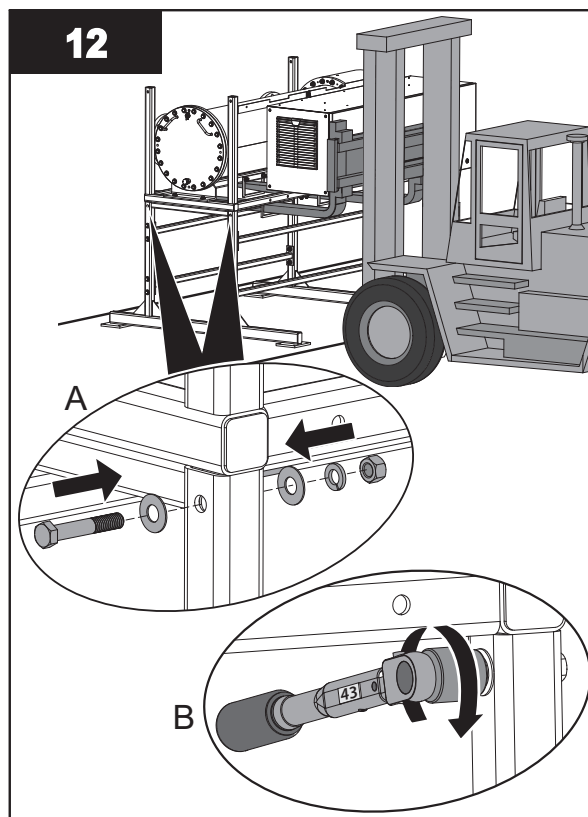
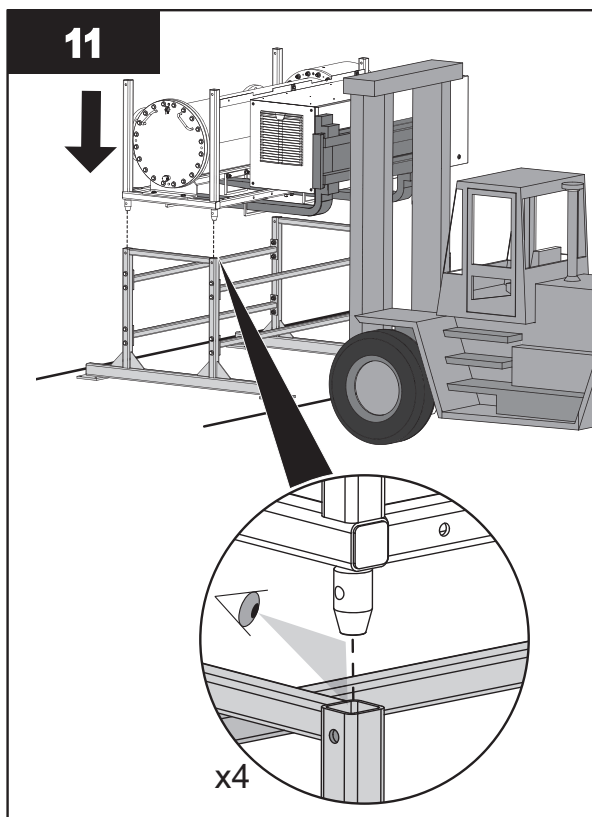
# Installation



**Note:** Ensure that the fork tines are fully seated in the slots on the skid assembly.

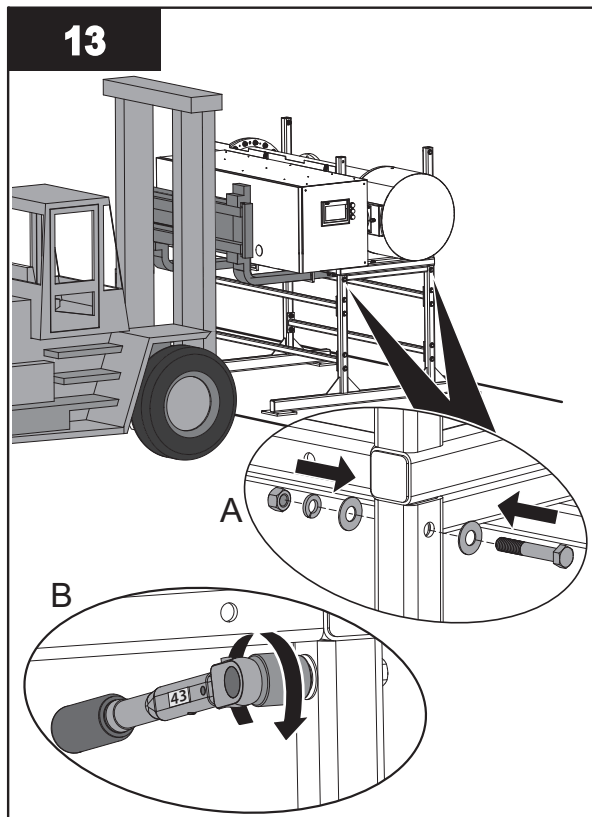


**Note:** Move UV Chamber Skid to the final installation location.



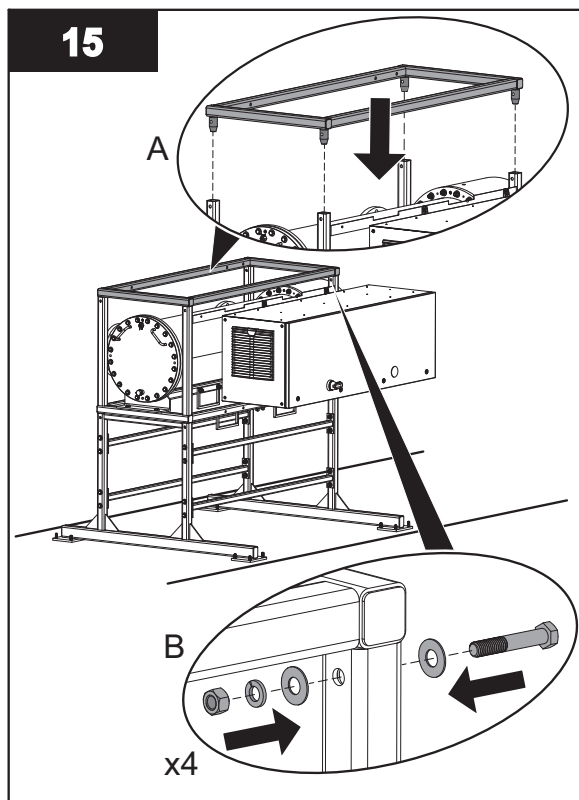
**Note:** Torque the bolts to 58 N.m (43 lbf.ft).





*Note: Torque the bolts to 58 N.m (43 lbf.ft).*

**14.** If a UV Chamber is required to be stacked onto the base assembly, go to [Section 7.3.4](#) and if not, proceed to Step 15.



## Installation

16. Connect UV Chamber Inlet and Outlet to Plant process piping:

- For UV Chamber with ANSI Flanges, refer to [Section 7.3.5](#).
- For UV Chamber with Sanitary Flanges, refer to [Section 7.3.6](#).

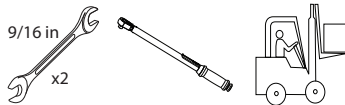
### 7.3.4 Install a Stacked UV Chamber

#### Prerequisites:

- Install a UV Chamber with a Low Profile Skid Base. Refer to [Section 7.3.2](#).  
OR
- Install a UV Chamber with a High Profile Skid Base. Refer to [Section 7.3.3](#).

**Note:** The procedure below shows the Stacked UV Chamber installed on a Low Profile Skid Base for illustration purposes, the procedure will be the same for a High Profile Skid Base.

#### Tools:

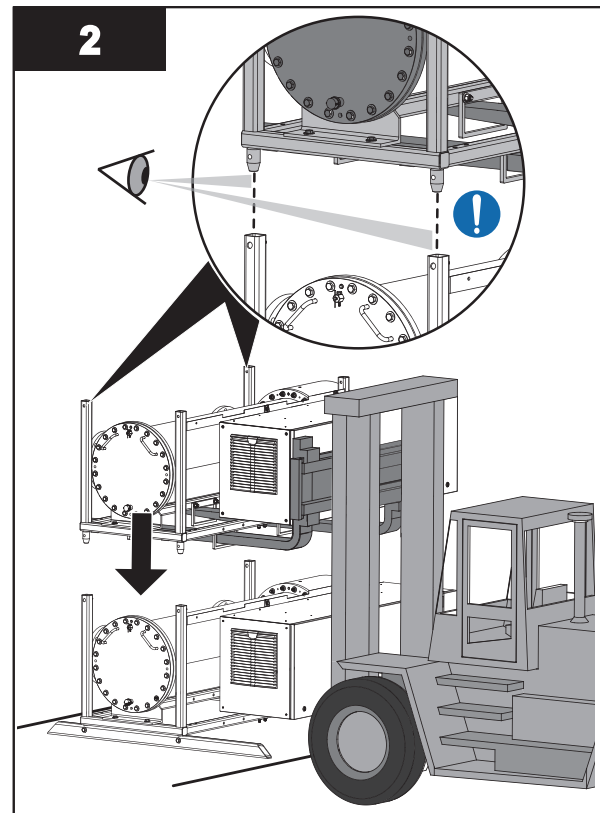
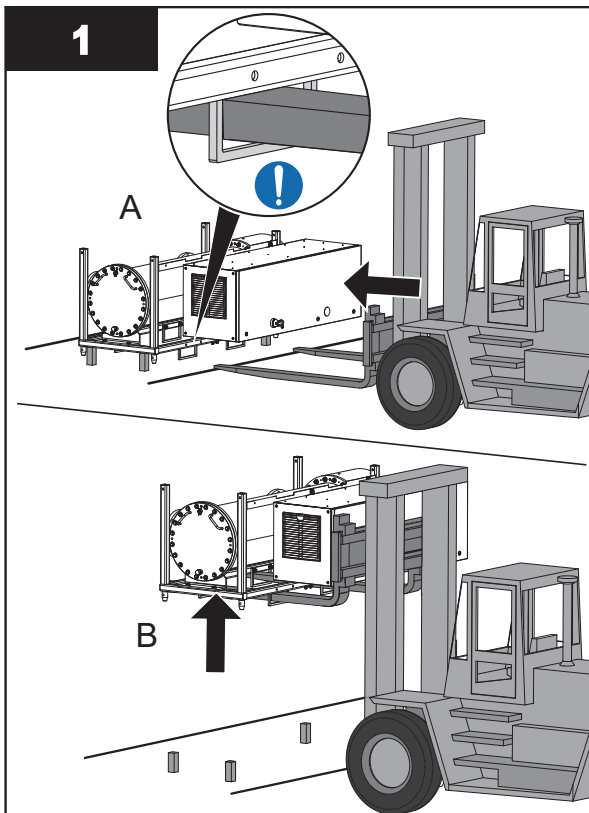


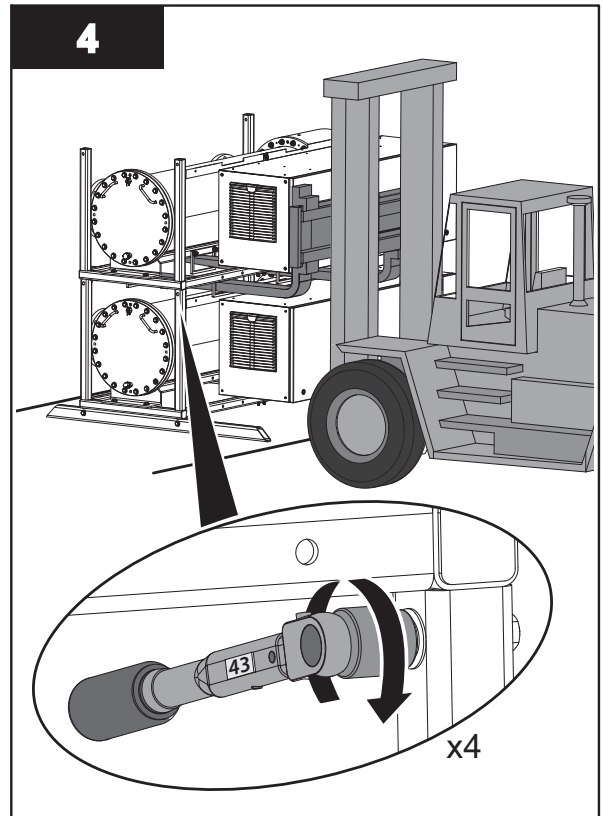
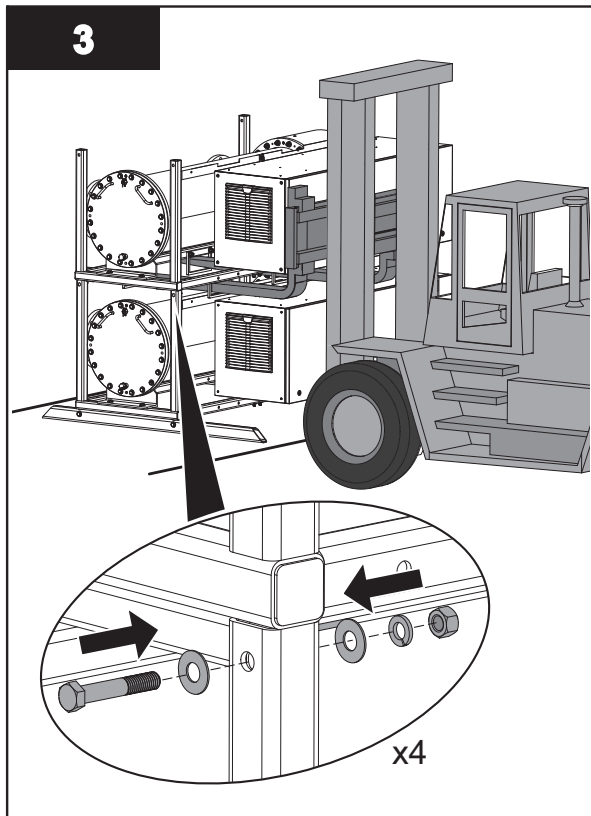
#### Materials:



- Skid Mounting and Assembly Hardware (provided)
- Shims, if required (by others)

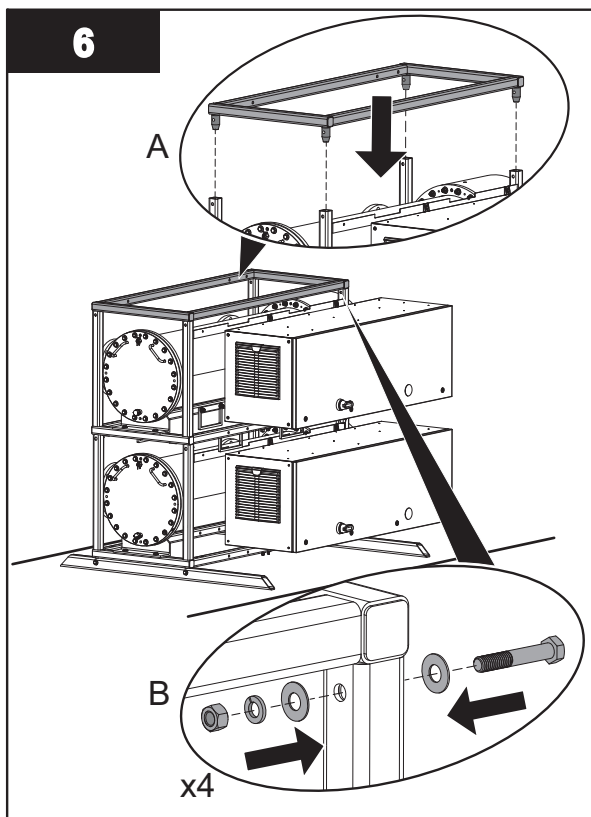
#### Procedure:





**Note:** Torque the bolts to 58 N.m (43 lbf.ft).

5. If additional UV Chambers are required to be stacked, repeat steps 1, 2, 3 and 4 in this procedure. If there are no additional stacked UV Chambers to be stacked, proceed to Step 6.



## Installation

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### 7. Connect UV Chamber Inlet and Outlet to Plant process piping:

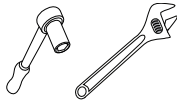
- For UV Chamber with ANSI Flanges, refer to [Section 7.3.5](#).
- For UV Chamber with Sanitary Flanges, refer to [Section 7.3.6](#).

### 7.3.5 Connect Inlet and Outlet Process Piping to the UV Chamber (ANSI Flanges)

#### Prerequisites:

- Install the UV Chamber(s).
- Remove the blue Flange Gasket Covers located on the inlet and outlet flanges.
- Clean and inspect inlet and outlet connections for any damage (i.e. scratches, nicks, gouges and burrs)

#### Tools:



#### Materials:



- Bolts and hardware (by others)
- Gaskets x 2 (by others)

#### Procedure:

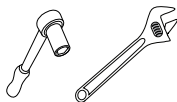
1. Install gasket on UV Chamber inlet connection.
2. Apply anti-seize lubricant and install bolts.
3. Tighten bolts to bolt manufacturers torque recommendation.
4. Repeats steps 1-3 for the UV Chamber outlet connection.

### 7.3.6 Connect Inlet and Outlet Process Piping to the UV Chamber (Sanitary Fitting)

#### Prerequisites:

- Install the UV Chamber(s).
- Clean and inspect inlet and outlet connections for any damage (i.e. scratches, nicks, gouges and burrs)

#### Tools:



#### Materials:



- Sanitary Flange Clamps (by others)

#### Procedure:

1. Loosely install the sanitary clamp on the UV Chamber inlet flange to the plant inlet supply piping.

**Note:** The UV Chamber will not bear the load of process piping or other equipment. Make sure all piping is properly supported independent of the UV Chamber.

2. Repeat step 1 for the outlet piping.
3. Level the UV Chamber from front to back.

**Note:** The UV Chamber must be installed such that it remains full of process fluid at all times during operation and must be mounted level to ensure it drains properly when service is required.

4. Secure the sanitary clamp and torque to the manufacturer's specifications.

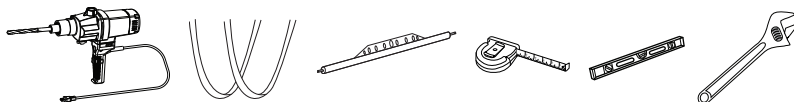
## 7.4 Control Power Panel

**Note:** This procedure only applies to UV Chambers without a skid.

### Prerequisites:

- Clear area where CPP will be installed.

### Tools:

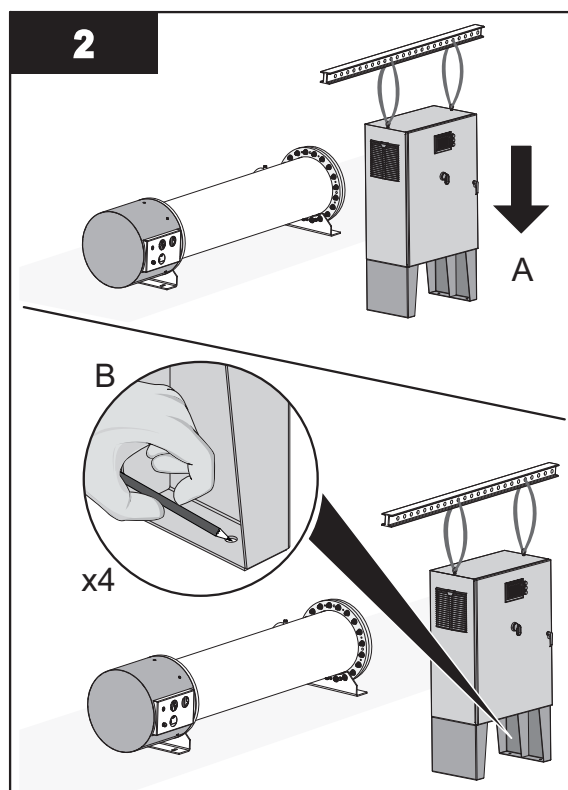
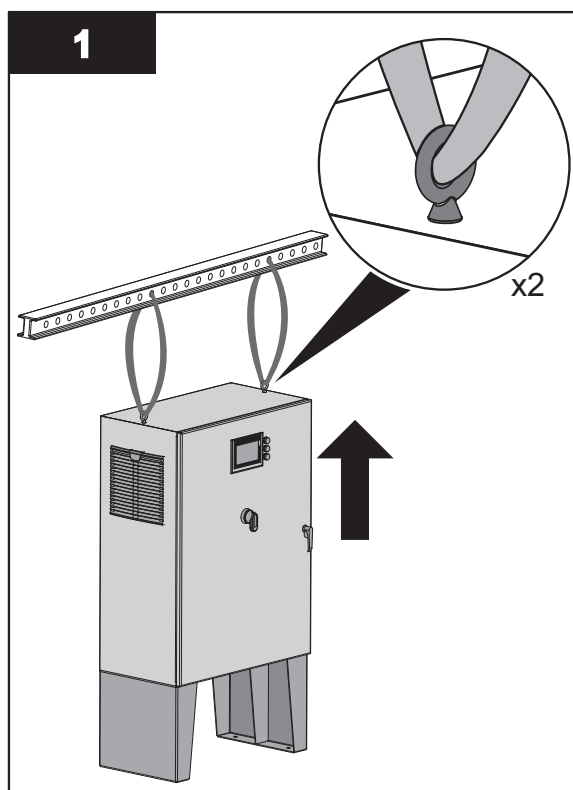


### Materials:

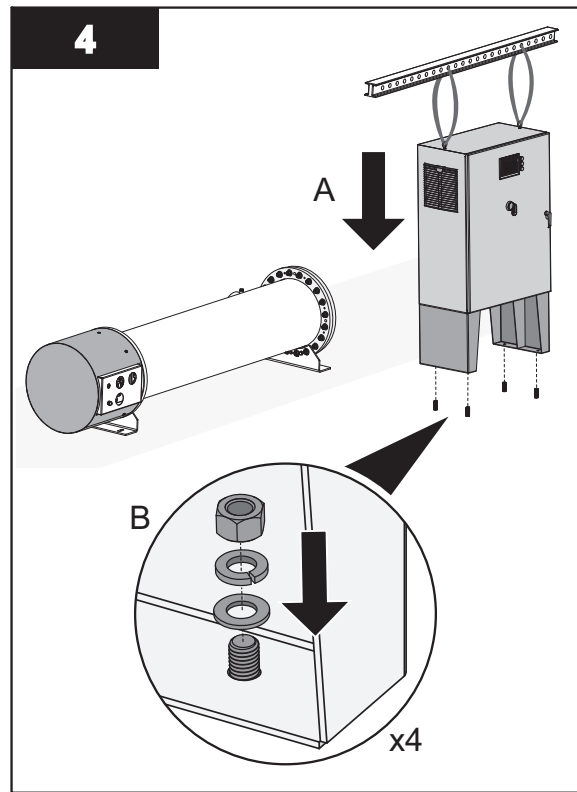
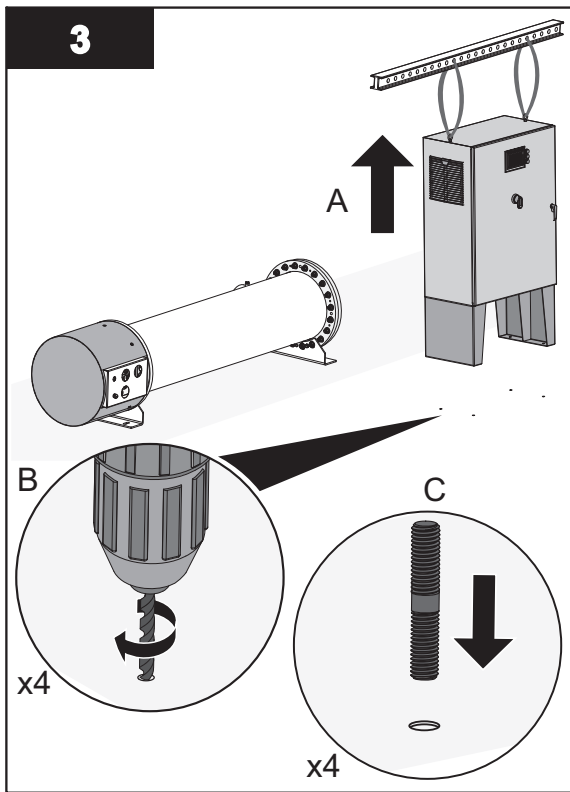


- Mounting hardware

### Procedure:



**Note:** The CPP requires a minimum of 12 inches (305mm) each side of the Control Power Panel to allow for adequate air movement.



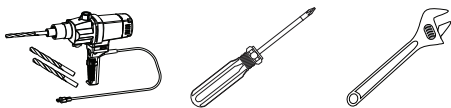
## 7.4.1 Electrical Connections

### Prerequisites:



- Apply lockout tag out devices as necessary. Refer to [Section 4](#).
- Install the UV Chamber(s) - with or without skid. Refer to [Section 7.3](#).
- Install the CPP (for standalone CPP only). Refer to [Section 7.4](#).
- Remove the Service End Cap. Refer to [Section 9.5](#).

### Tools:



### Materials:

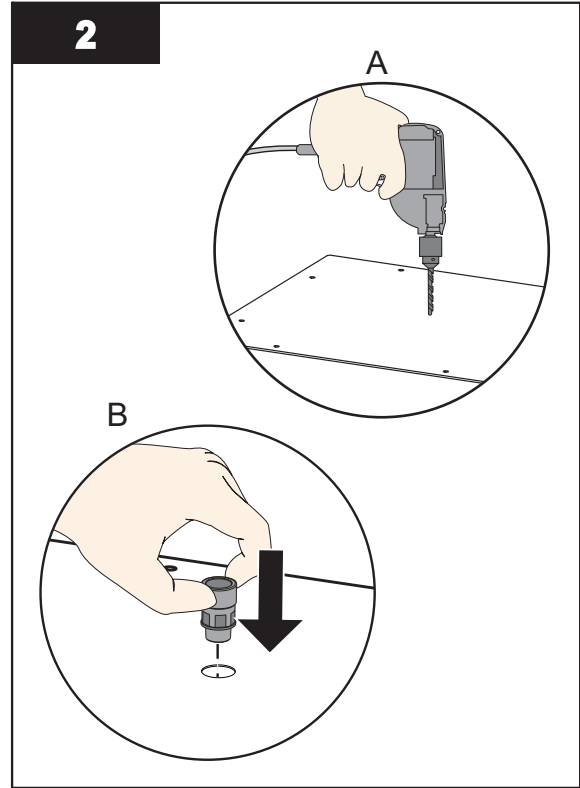
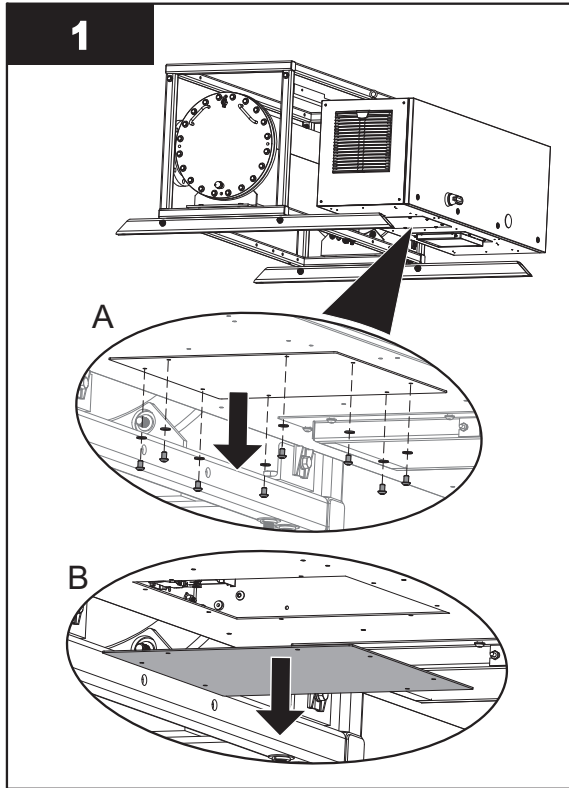


- Electrical Drawings (supplied with the system)
- Cable or Wiring Conduit (by others) - Remote CPP only
- Strain Relief – for incoming power (by others)

### Procedure:

**Note:** The CPP provided will be either Local to the Skid or Remote to the Skid. Follow the appropriate instruction below.

7.4.1.1 Local CPP



**Note:** All openings created on the cabinets **MUST** be filled with equipment marked with the same type rating as the enclosure.

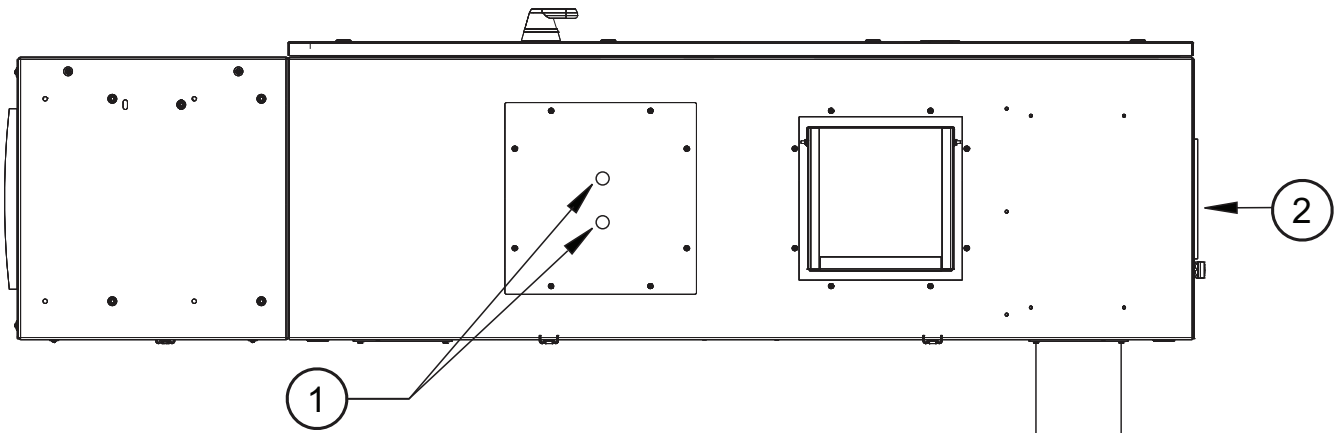


Figure 4 Control Power Panel, Bottom view

1 Cutout for Customer Signal Conduit	2 Front of Control Power Panel (HMI side)
--------------------------------------	---

**Note:** All openings created on the cabinets **MUST** be filled with equipment marked with the same type rating as the enclosure.

3. Route and terminate AC power to the CPP, matching voltage and power specifications on the serial label of the system. Refer to the wiring diagram to match wire tag numbers.
4. Repeat steps for remaining CPP's.

# Installation

## 7.4.1.2 Remote CPP

### 7.4.1.2.1 Connect Power from bottom of CPP

1. Remove port plug, and install a strain relief into conduit cutout locations.

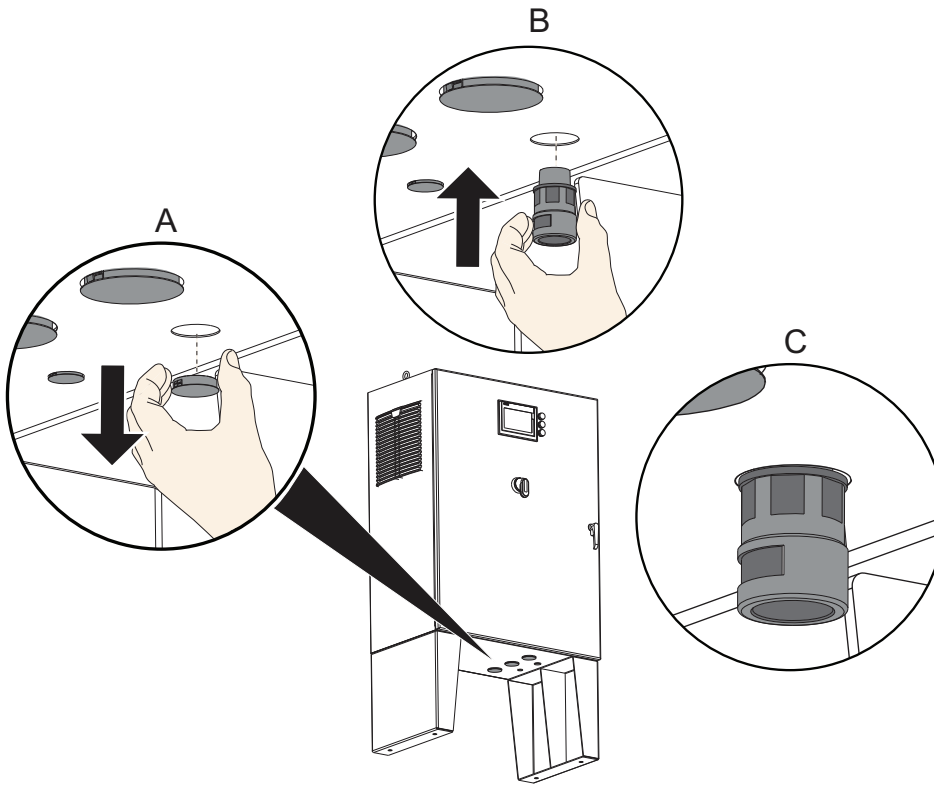


Figure 5 Control Power Panel

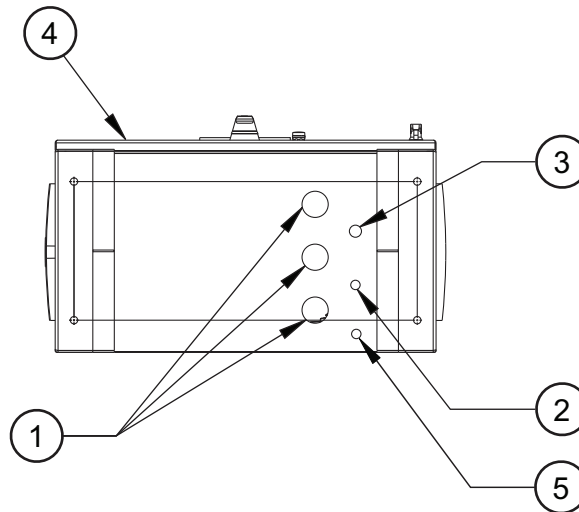


Figure 6 Control Power Panel, Bottom view

1 Cutout for Lamp Cable Conduit	2 Cutout for Instrumentation Wire Conduit
3 Cutout for Customer Signal Conduit	4 Front of Control Power Panel (door)
5 Cutout for Customer Signal Conduit	

**Notes:** 1) All openings created on the cabinets **MUST** be filled with equipment marked with the same type rating as the enclosure.

2) Unused conduit cutouts to remain sealed with supplied port plugs.



2. Route and terminate AC power to the CPP, matching voltage and power specifications on the serial label of the system. Refer to the wiring diagram to match wire tag numbers. Make sure ground wire is connected to the UV System as per the electrical diagrams.
3. Connect the Lamp Cables to the CPP. The individual lamp connectors are numbered with wire tags for convenient connection; match these numbers to their corresponding number on the UV Chamber end plate.
4. Instrument wiring should reference appropriate wiring diagram. Instrument wiring is based upon customer requirements and installed options. Should your requirements differ, contact your local Aquafine representative or Aquafine Customer Service.

#### 7.4.1.2.2 Connect Power from the top of CPP

1. Drill a hole in the top of the Control Power Panel and install a strain relief.

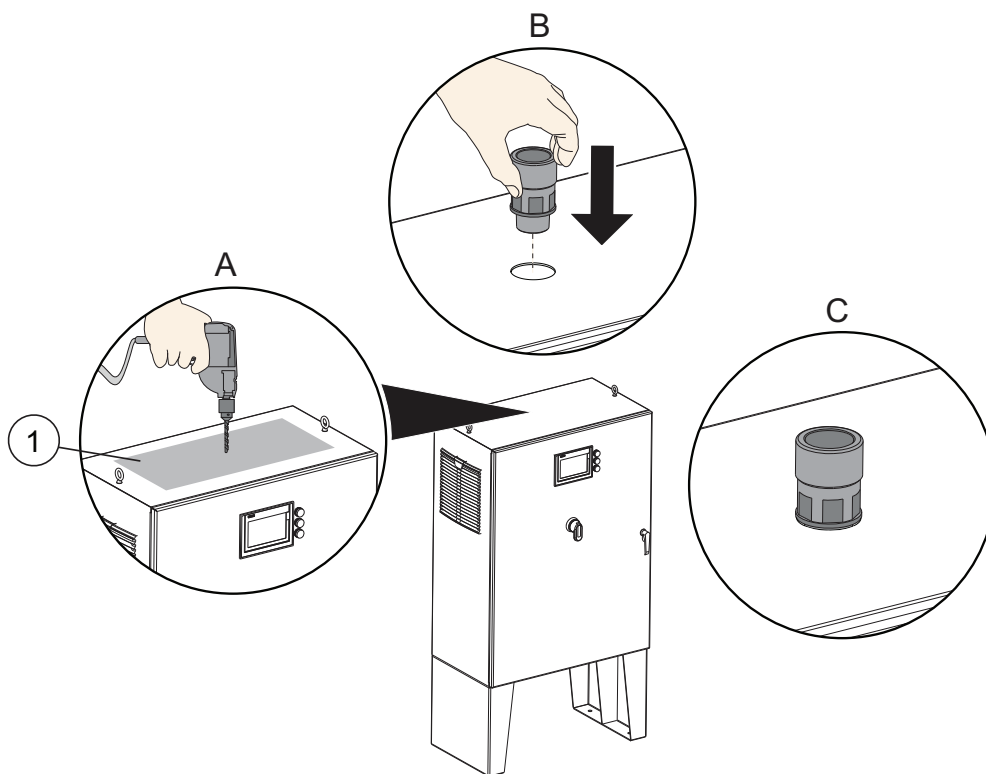


Figure 7 Control Power Panel, Top view

**1** Top of Control Power Panel, cutout location

**Notes:** 1) All openings created on the cabinets **MUST** be filled with equipment marked with the same type rating as the enclosure

2) Unused conduit cutouts on the bottom of the panel to remain sealed with supplied port plugs.

2. Route and terminate AC power to the CPP, matching voltage and power specifications on the serial label of the system. Refer to the wiring diagram to match wire tag numbers. Make sure ground wire is connected to the UV System as per the electrical diagrams.
3. Connect the Lamp Cables to the CPP. The individual lamp connectors are numbered with wire tags for convenient connection; match these numbers to their corresponding number on the UV Chamber end plate.
4. Instrument wiring should reference appropriate wiring diagram. Instrument wiring is based upon customer requirements and installed options. Should your requirements differ, contact your local Aquafine representative or Aquafine Customer Service.

### 7.5 Assemble the UVI Sensor

*Note: Applies to Liquid Sugar applications only.*

**Prerequisites:**

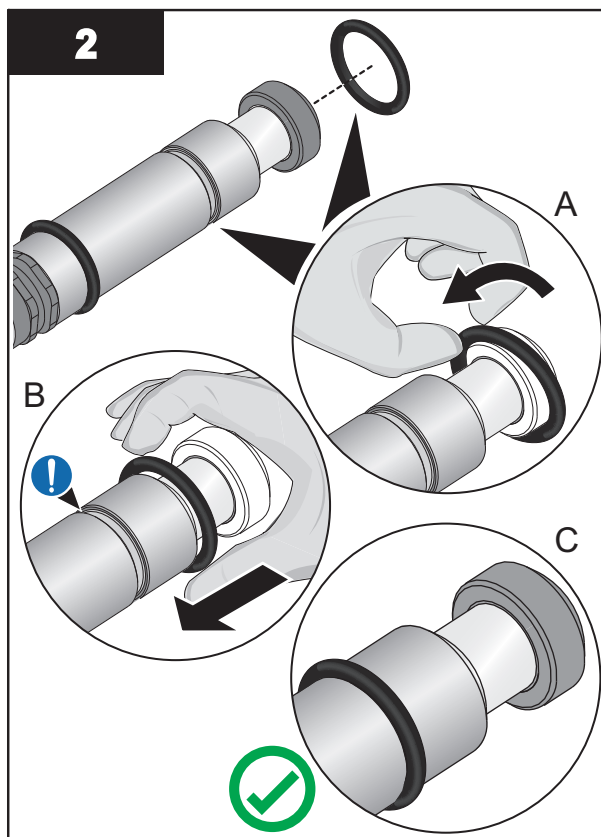
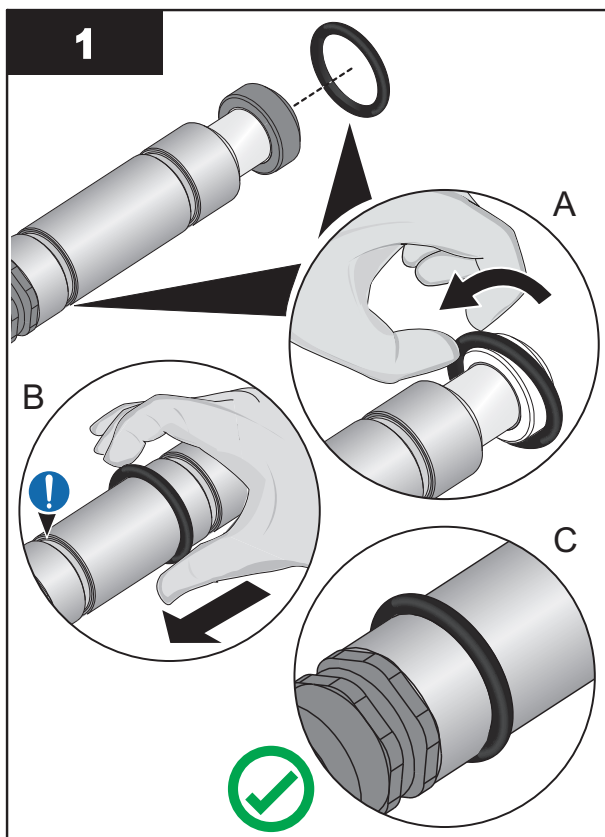
- Remove the UVI Sensor from the plastic bag.

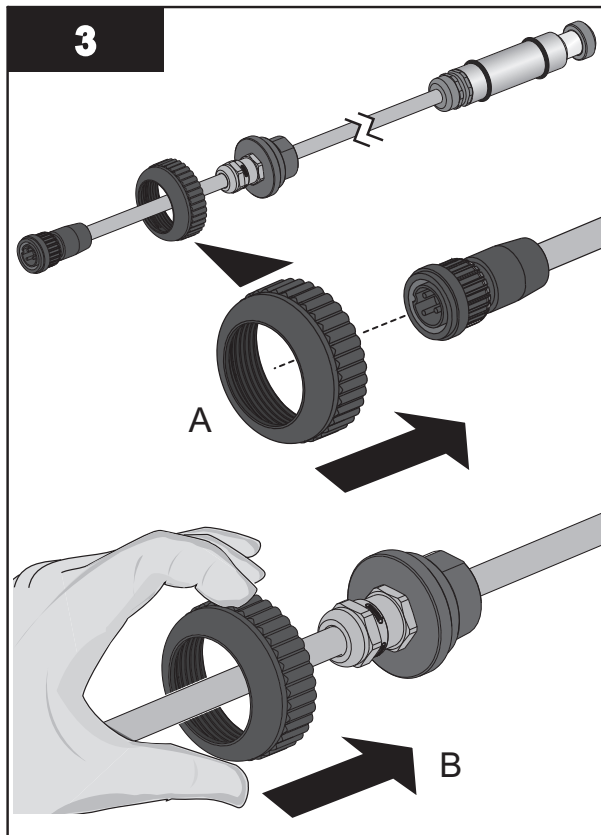
*Note: Wear clean cotton or rubber gloves to handle the UVI Sensor. DO NOT contaminate the UVI Sensor window.*

**Materials:**



**Procedure:**





4. Set the UVI Sensor aside.

## 7.6 Hydrostatic Test

### Prerequisites:



- Complete Electrical Connections. Refer to [Section 7.4.1](#).
- Remove UV Lamps (if installed). Refer to [Section 9.6.2](#).
- Remove UVI Sensor. Refer to [Section 9.7.2](#) - **applies to Liquid Sugar systems only**.
- Inspect condition of sleeves for visible cracks or damage. Replace if necessary.
- Make sure the drain valve is closed.

### Materials:



### Procedure:



1. Fill the UV Chamber with process fluid.
  - a. Stand off to the side and make sure the area is clear of all plant personnel.
  - b. Pressurize the UV Chamber. Refer to [Section 9.4](#).
  - c. Check for leaks.
  - d. Wait twenty minutes.
2. If leaks are found:
  - a. Depressurize and drain the UV Chamber. Refer to [Section 9.3](#).
  - b. Fix the leaks.
  - c. Fill the UV Chamber and do a pressure test. Check for leaks.
3. If there are no leaks, depressurize the UV Chamber. Refer to [Section 9.3](#).
4. Install the UV Lamps. Refer to [Section 9.6.2](#).
5. Install the UVI Sensor. Refer to [Section 9.7.2](#) - *applies to Liquid Sugar systems only*.
6. Install the Service End Cap. Refer to [Section 9.5](#).

# Section 8 Operation

## ⚠ DANGER



Obey all warning and caution statements. Refer to [Section 2](#).

Read and understand this manual before operating this equipment. Read all user documentation before performing operations, inspections, repair, or maintenance on this equipment.



Only competent personnel should undertake operation, repairs, maintenance, or servicing of equipment described in this section of the manual. If you do not understand the information or procedure explanations in this manual, STOP and contact your Service Provider for assistance.

## NOTICE

The Microprocessor user interface screens on the CPP vary with the system configuration. The screens described in this section of the manual may not be the same as the screens shown on the CPP.

### 8.1 User Interface

The Control Power Panel (CPP) contains the control program for the associated UV Chamber. Depending on the UV System configuration, there may be more than one CPP per site. The CPP is configured at the factory with inputs and outputs as required for each system. The manufacturer configures the functionality of each of the signals in the control strategy. Daily operation includes monitoring the system functions and may occasionally require the operator to manually initiate or control processes.

#### 8.1.1 Color Codes and Icons



The User Interface Screens utilize the following color codes within all user screens.

Text Color	Background	Definition
White	Black	Represents static text or numeric data that is unable to be changed by an operator at the current security level.
Black	White	Represents an active button or numeric entry field that will either change the currently displayed screen, or will allow entry of numeric data.

Icon	Text Color	Background			Description
		Color	Gradient	Solid	
	Black	Light Grey	✓	X	Selectable button that will open a pop-up screen or initiate an action.
	Black	Yellow	X	✓	Currently selected option
	Black	Green	X	✓	
	Black	Blue	✓	X	Selectable button that will reset a fault.
	Black	White	X	✓	Return to previous screen.
	--	--	--	--	Indicates that the lamps are warming up.
	White	Red	X	✓	Alarm - Control Action will be taken.

### 8.1.2 Alarm and Warning Color Codes

The Alarm and Warning indicators are found in the navigation bar. When there is a new alarm or warning, the icon will flash until the user navigates to the Alarm Screen to view the current alarm or warning.

Icon	Icon Color	Definition
	White	Indicates that there are no active warnings or alarms.
	Red	Indicates that there is an active alarm.

### 8.1.3 User Interface Navigation Bar







The Navigation Bar allows the user to navigate between the different sections of the HMI application.



Figure 8 Navigation Bar

The currently active screen will be indicated by an icon with black background. All others will have white backgrounds.

Table 2 User Interface Navigation

Icon	Screen	Description	Refer:
	System Overview "Home"	The Home Screen is the main System Overview Screen and is designed to provide key system operation information	<a href="#">Section 8.2</a>
	Lamp Status	Displays status of the UV Lamps. From this screen, reset lamp hours and view Lamp and Lamp Driver information.	<a href="#">Section 8.3</a>
	Settings	Allows user to adjust system configuration settings. <b>Note:</b> Setting adjustment is restricted depending on user level login access.	<a href="#">Section 8.4</a>
	Alarms	Displays the current active alarms and allows access to reset alarms. Allows access to Alarm History Screen.	<a href="#">Section 8.5</a>
	Alarm History	Displays the last 256 Historical Alarms	<a href="#">Section 8.5.1</a>
	Information	Allows access to general system information, and set date and time.	<a href="#">Section 8.6</a>

## 8.1.4 Login Screen

**Note:** Make sure to log out before leaving the HMI. Push "Logout".

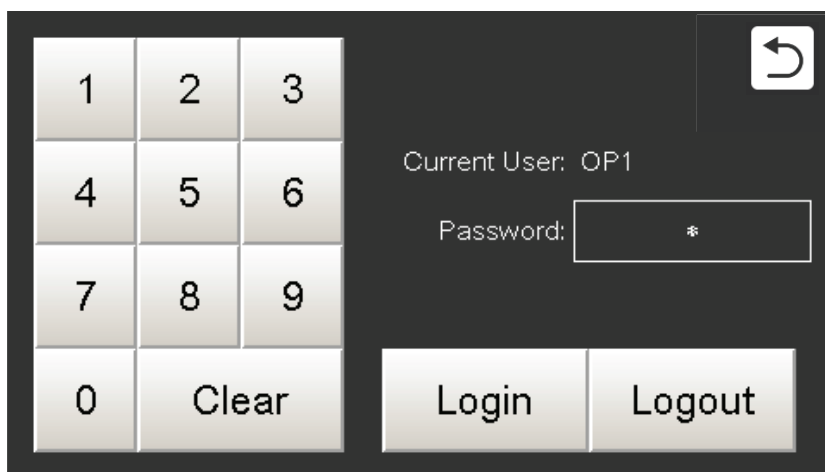


Figure 9 Login Screen

### To Login:

1. Press the Login Button in the top right hand corner on any of the main screens.
2. Enter the password.
3. Press Login.

### Login Security Levels:

- Not logged in - Screens are display only
- Operator Access - OP (password - 11111)
- Technician Access - OP1 (access provided to approved trained personnel)

## 8.2 System Overview Screen

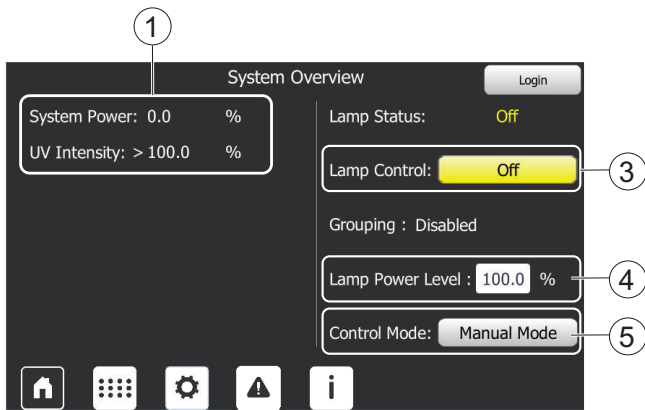


Figure 10 System Overview Local Mode, TOC Application

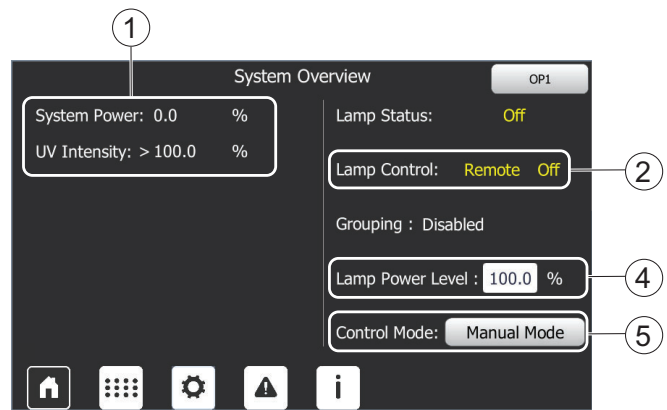


Figure 11 System Overview Remote - Input Mode, TOC Application

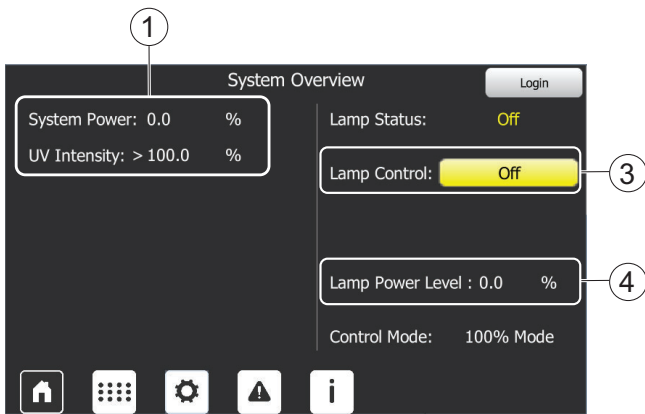


Figure 12 System Overview Local Mode, Non-TOC Application

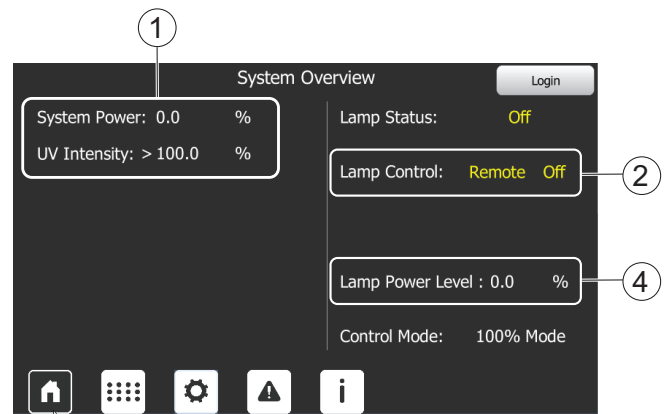


Figure 13 System Overview Remote - Input Mode, Non-TOC Application

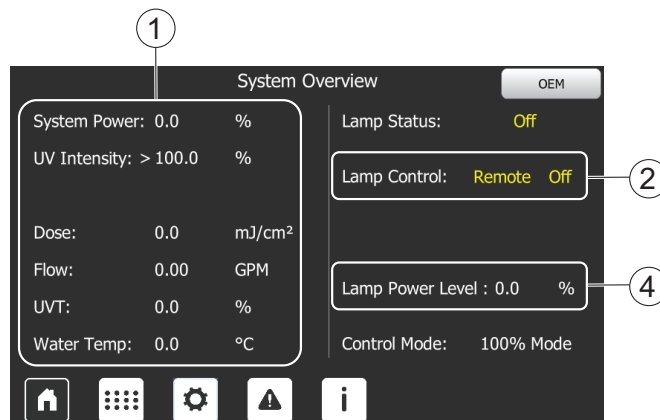



Figure 14 System Overview Remote - Input Mode, Non-TOC Application with Theoretical Dose Option

Item	Description	Refer to:
1	System Status Information	Displays status information about the UV System. <a href="#">Section 8.2.1</a>



Item		Description	Refer to:
2	Remote System Control Message	Displays Remote Command status. <b>Note:</b> Only visible when System Setting "Mode" is set to "Remote - Input" or "Remote - SCADA".	<a href="#">Section 8.2.4</a>
3	Local System Control Buttons	Select to manually turn on/off the UV System. <b>Note:</b> Only visible when System Setting "Mode" is set to "Local".	<a href="#">Section 8.2.3</a>
4	Lamp Power Level	Displays the current Lamp Power Level % set.	--
5	Control Mode	Select to open Control Mode Screen. Allows user to change control mode. <b>Note:</b> Always visible.	<a href="#">Section 8.2.2</a>

### 8.2.1 System Status Information

Text	Option/Range	Description/Action
Lamp Status	On	Display - UV Lamps are powered on
	On 	Display - UV Lamps are powered on, and warming
	Off	Display - UV Lamps are powered off
Control Mode	100% Mode	Displays the current selected system control mode
	Manual	
Grouping	Enabled	Displays the current grouping selection. Refer to <a href="#">Section 8.2.2.1</a>
	Disabled	
System Power (%)	60 - 100	Displays the current UV System power as a percentage of the total available power with all lamps operating at 100% power. System Power is decreased when lamps are off, or if lamp power level is less than 100%.
UV Intensity (%)	0 - 100%	Displays the current measured UV Intensity value from the UV Intensity sensor as a percentage. <b>Note:</b> System should be operating under normal operating conditions (flow, temperature) with new lamps and clean quartz sleeves.
TOC Actual (ppb)	0.10 - 999.9	Displays the current measured TOC value from the TOC sensor.

### 8.2.2 Control Mode Screen

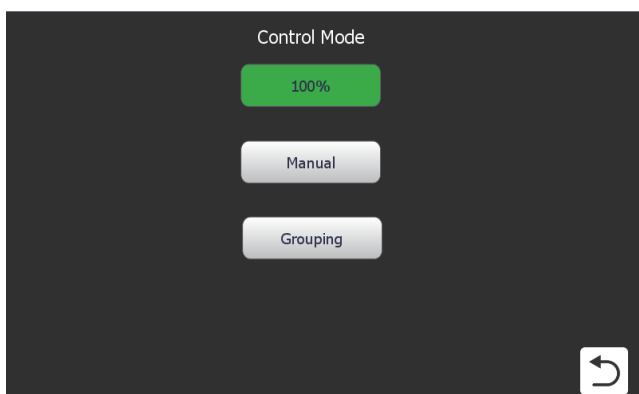


Figure 15 Control Mode Screen - 100%

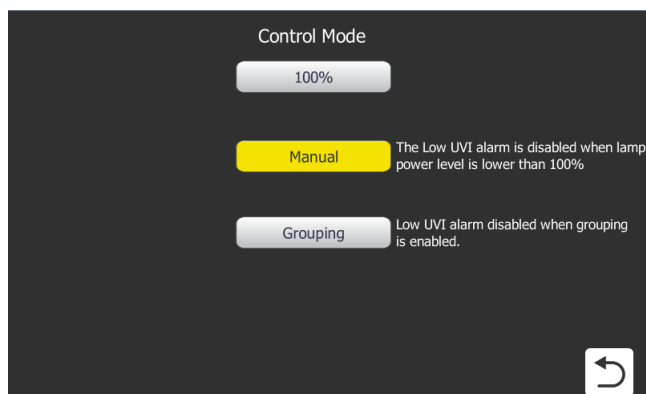


Figure 16 Control Mode Screen - Manual

Control Mode Option	Description
100%	All UV Lamps in UV System will power on and operate at 100% power.

## Operation

Control Mode Option	Description
Manual	All UV Lamps in UV System will power on and operate at the entered system power level. <b>Note:</b> "The Low UVI alarm is disabled when lamp power level is lower than 100%" message is only visible when the system is configured with a UVI Sensor.
Grouping	<b>Enabled:</b> Available with 100% or Manual Control Mode enabled. A preset group of UV Lamps in the UV Chamber will be powered on while the remaining group of UV Lamps in the UV Chamber will be powered off. The preset grouping options are available on the HMI screen. <b>Disabled:</b> All of the UV Lamps in the UV Chamber will be powered On or Off together and will operate at the same power level.

### Change the Control Mode

1. System Overview Screen → Select the Control Mode Button → Select a control mode → Press the Return button when finished.

### 8.2.2.1 Grouping Settings

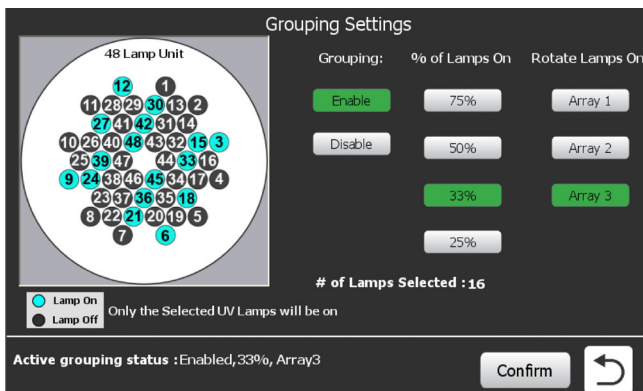


Figure 17 Grouping Settings (Enabled)

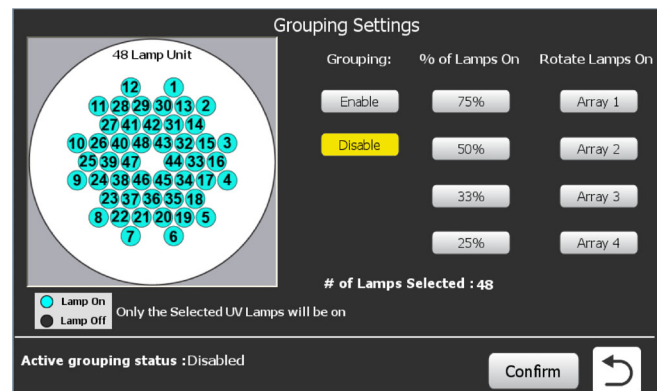


Figure 18 Grouping Settings (Disabled)

#### Enable or Disable Grouping

1. Set the control mode to either 100% or Manual (refer to [Figure 15](#) and [Figure 16](#)).
2. Select the Grouping button (refer to [Figure 15](#) and [Figure 16](#)) to open the Grouping Settings Screen.
3. Select 'Enable' to enable Grouping or 'Disable' to disable Grouping.
4. Select the 'Confirm' button to accept the change.

#### Assign grouping:

1. Set the control mode to either 100% or Manual (refer to [Figure 15](#) and [Figure 16](#)).
2. Select the Grouping button (refer to [Figure 15](#) and [Figure 16](#)) to open the Grouping Settings Screen.
3. Enable Grouping → Select 'Enable'.
4. Select the % of Lamps on (i.e. 25%, 33%, 50% or 75%).
5. Select the Rotate Lamps On array (Array 1, Array 2 etc.).

**Notes:** 1) The number of array options vary by '% of Lamps On' selection.

2) The lamp array graphic will dynamically update, displaying which UV Lamps will be powered 'On' (cyan) and which UV Lamps will be powered 'Off' (dark grey).

6. Select the 'Confirm' button to confirm 'Grouping Settings'.
  - a. Select 'No' to reject the changes and return to the Grouping Settings Screen.
  - b. Select 'Yes' to accept the changes.
7. Select the Return button when assignments are confirmed to return to the Control Mode Screen.

### 8.2.3 Local System Control Buttons

The Local System Control Buttons will only be visible when the System Setting "Mode" is set to "Local".

Item	Button	Description
Local System Control	On/Off	Manually turn on or off the UV System. The displayed button text indicates the current state of the control command (on or off)

### 8.2.4 Remote Control Mode Message

The Remote Control Mode Message will only be visible when the System Setting "Mode" is set to "Remote - Input" or "Remote - SCADA".

Message:	Displays when:
Remote On	The system is in "Remote - Input" Control Mode, and the discrete input run signal is on, or the system is in "Remote - SCADA" and the designated signal from SCADA is on.
Remote Off	The system is in "Remote - Input" Control Mode, and the discrete input run signal is off, or the system is in "Remote - SCADA" and the designated signal from SCADA is off.

## 8.3 Lamp Status Screen

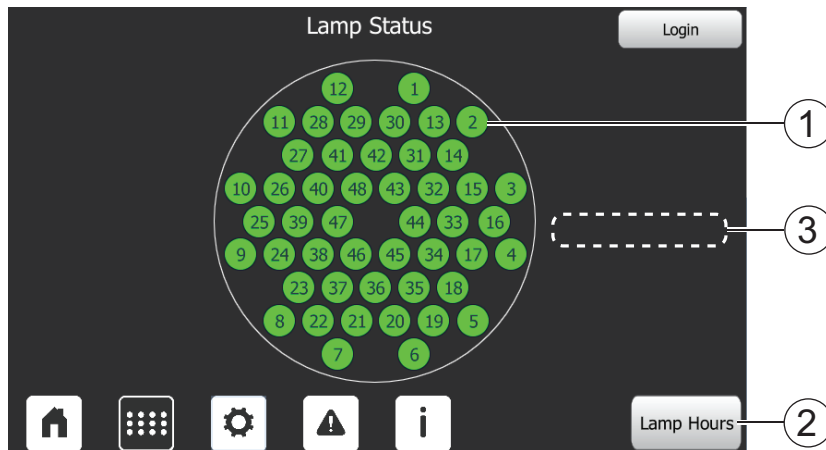


Figure 3 Lamp Status Screen

Item	Button/Icon	Color	Description/Action	Refer:
1		Grey	UV Lamp is off. Select icon to open Lamp and Driver Information Screen	<a href="#">Section 8.3.1</a>
		Green	UV Lamp is on and healthy. Select icon to open Lamp and Driver Information Screen	<a href="#">Section 8.3.1</a>
		Red	UV Lamp is unhealthy. Select icon to open Lamp and Driver Information Screen	<a href="#">Section 8.3.1</a>

## Operation

Item	Button/Icon	Color	Description/Action	Refer:	
2	Lamp Hours Screen	Lamp Hours	--	Select to access the Lamp Hours Screen.	<a href="#">Section 8.3.4</a>
3	Lamp Hours Approaching End of Life Notification	--	--	The Lamp Hours Approaching End of Life notification will be visible when a UV Lamp runtime has reached 8,200 runtime hours and will remain in place until the UV Lamp is replaced. It is recommended to order a new UV Lamp at this time.	--

### 8.3.1 Lamp and Driver Information Screen

**Note:** This screen is displayed by pressing on any UV Lamp icon on the Lamp Status screen ([Figure 3](#)).

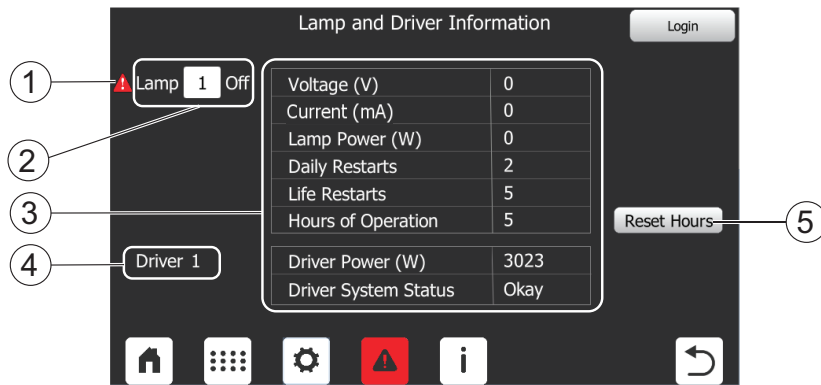


Figure 4 Lamp and Driver Information Screen - Active Lamp Fault Condition

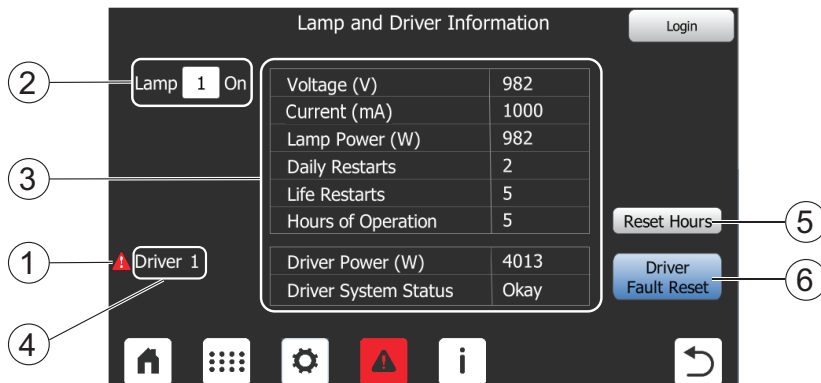


Figure 5 Lamp and Driver Information Screen - Active Lamp Driver Fault Condition

Item	Definition/Action	Refer:
1	Alarm Notification <b>Note:</b> UV Lamps will only display alarms, Lamp Drivers will display alarms and warnings.	<a href="#">Section 8.1.2</a>
2	Lamp Number / Status Displays the status for the selected UV Lamp (i.e On or Off) To select a different UV Lamp, enter the required Lamp Number into the numeric entry field.	--
3	Lamp and Lamp Driver Information Displays information for the selected UV Lamp and Lamp Driver.	<a href="#">Section 8.3.2</a>
4	Lamp Driver Identification Displays the Lamp Driver identification number for the selected UV Lamp.	--

Item		Definition/Action	Refer:
5	Reset Hours Button	Select to reset lamp hours for the selected UV Lamp.	<a href="#">Section 8.3.4</a>
6	Driver Fault Reset Button	Select to reset a fault for the selected Lamp Driver. <b>Note:</b> The button is visible only when there is an active driver fault.	<a href="#">Section 8.3.3</a>

### 8.3.2 Lamp and Lamp Driver Information

Text	Definition
Voltage	Displays the Lamp Voltage (V) for the selected UV Lamp. The status is provided by Lamp Driver.
Current	Displays the Lamp Current (mA) for the selected UV Lamp. The status is provided by Lamp Driver.
Lamp Power	Displays the Lamp Power in Watts (W) for the selected UV Lamp. The status is provided by the Lamp Driver.
Daily Restarts	Displays the total number of daily restarts for the selected UV Lamp. The value is calculated in the PLC.
Life Restarts	Displays the total number of restarts over the lifetime of the selected UV Lamp. The value is calculated in the PLC.
Hours of Operation	Displays the total hours of operation for the selected UV Lamp. The value is calculated in the PLC.
Driver Power	Displays the current Lamp Driver Power in Watts (W). The status is provided by Lamp Driver.
Driver System Status	Okay - Driver is healthy
	Error - Driver is faulted, message triggered by a system level Driver Fault.

### 8.3.3 Reset a Lamp Driver Fault

1. Lamp Status Screen → Select a UV Lamp associated with the faulted driver.
2. Lamp and Driver Information Screen → Press Driver Fault Reset.

### 8.3.4 Reset Lamp Hours

Individual Lamp Hours may be reset from either the Lamp and Driver Information Screen ([Section 8.3.1](#)) or from the Lamp Hours Screen ([Figure 6](#)). “Reset all Lamp Hours” is reset from the Lamp Hours Screen only.

**Note:** The Daily and Life Restarts for the selected UV Lamp(s) will be reset when Lamp Hours are reset.

#### Reset lamp hours from the Lamp and Driver Information Screen:

1. Lamp and Driver Information Screen → Select the 'Reset Hours' button.
2. Reset Hours Confirmation Pop-Up Screen → Select 'Yes' to reset the hours or 'No' to cancel.

## Reset lamp hours from the Lamp Hours Screen:

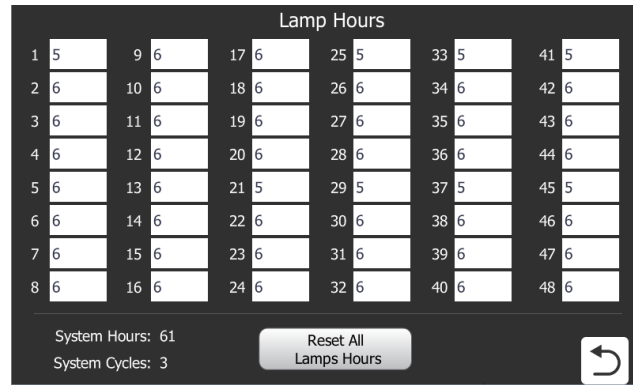


Figure 6 Lamp Hours Screen

### Reset Hours for Individual Lamp

1. Lamp Status Screen → Select the 'Lamp Hours' Button.
2. Lamp Hours Screen → Select the white enterable field beside the UV Lamp number to be reset to zero (0).
3. Reset Hours for Lamp # Confirmation Pop-Up Screen → Select 'Yes' to reset the hours or 'No' to cancel.

### Reset All Lamp Hours

1. Lamp Status Screen → Select the 'Lamp Hours' Button
2. Lamp Hours Screen → Select the 'Reset All Lamp Hours' Button
3. Reset Hours for All Lamps Confirmation Pop-Up Screen → Select 'Yes' to reset the hours or 'No' to cancel.

### System Hours

Displays the total UV System runtime.

**Note:** UV Lamps will need to be replaced every 9000 hours of operation (i.e. replace at 9000 hours, again at 18000 hours and so on).

### System Cycles

Displays the total count of on/off cycles for the system.

## 8.4 Settings Screen

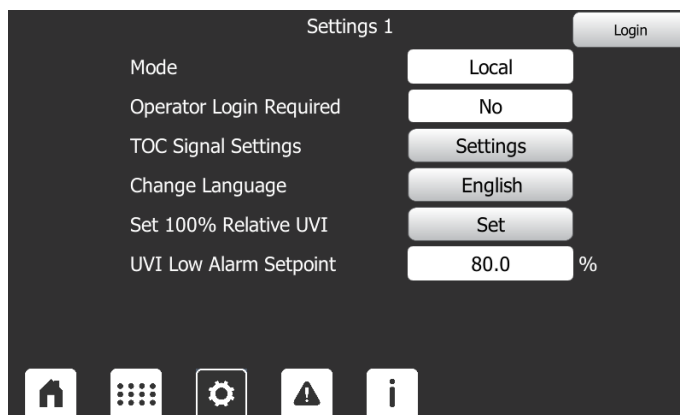


Figure 7 Settings Screen

Parameters	Unit/Range	Description
Mode	Remote - Input	The UV System is set to be remotely controlled and operated using a discrete input.
	Remote - SCADA	The UV System is set to be remotely controlled and operated using the SCADA signal. <b>Note:</b> Refer to the SCADA list contained within the Controls Philosophy.
	Local	The UV System is set to be locally controlled and operated
Operator Login Required	Yes	Operator login is required to view and change parameters at the OP1 login security level.
	No	Operation login is not required to view and change parameters at the OP1 login security level.
TOC Signal Settings	Settings	Select to modify TOC Signal Settings. ( <a href="#">Section 8.4.2</a> )
Change Language	English	Select from a list of available HMI Language options
Set 100% Relative UVI	Set	Select to set the 100% UVI value to the current output of the lamps. <b>Note:</b> This should be performed when lamps are replaced and the system has all lamps on at 100% power.
UVI Low Alarm Setpoint	0-100%	The UVI % below which the "UV Intensity Low" alarm is triggered.

### Change Settings Screen parameters:

1. Select the white text box → Enter the value on the pop up → Enter

### 8.4.1 Set 100% Relative UVI

**Note:** This process is to be performed after replacing the UV Lamp(s) in the UV Chamber.

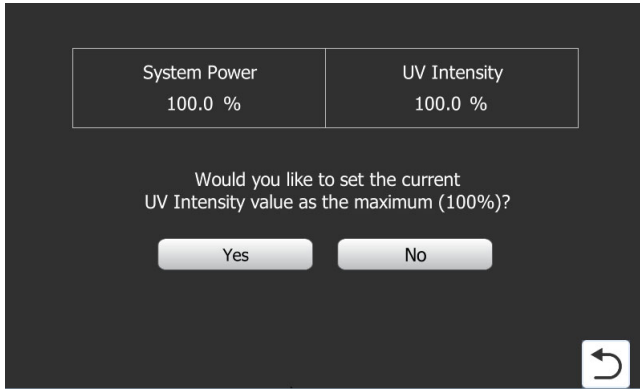


Figure 8 Set 100% Relative UVI

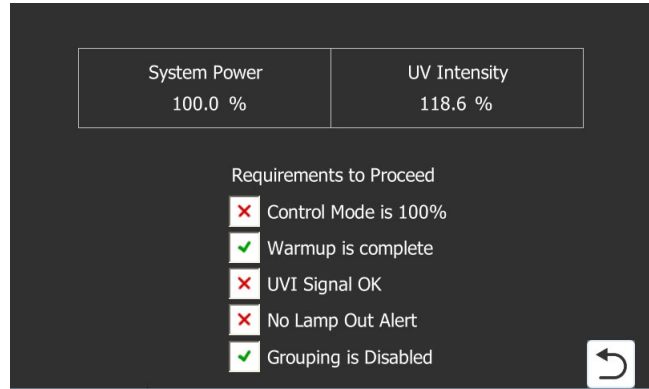


Figure 9 UVI Sensor Calibration Requirements

Parameter	Option / Range	Description
System Power	0% - 100%	Displays the current UV System Power Level
UV Intensity	%	Displays the scaled UV Intensity value

Text/Button	Description
Calibration Requirements	<p>All calibration requirements must be met before the UVI Sensor calibration can be performed.</p> <ul style="list-style-type: none"> <li>Control Mode is 100%</li> <li>Warmup is complete</li> <li>UVI Signal OK</li> <li>No Lamp Out Alert</li> <li>Grouping is Disabled</li> </ul> <p><b>Note:</b> If all Calibration Requirements are met, this information will not display.</p>
✓	Calibration requirement is achieved.
✗	Calibration requirement is not achieved. Resolve the requirement.
Yes/No Buttons	Buttons are visible when all requirements are met.

**When all Requirements are achieved:**

1. Wait for values to stabilize.
2. Press the "Yes" button to confirm.

**When all Calibration Requirements are not achieved:**

1. Resolve all unmet calibration requirements.
2. Wait for values to stabilize.
3. Press the "Yes" button to confirm.



## 8.4.2 TOC Signal Settings

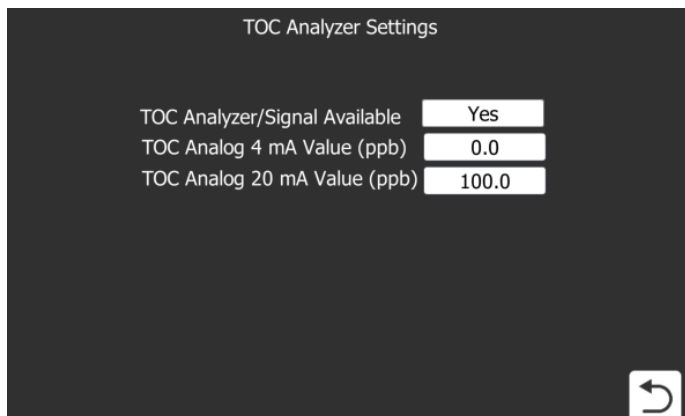


Figure 10 TOC Signal Settings

Parameters	Unit/Range	Description
TOC Analyzer / Signal Available	Yes	A TOC Analyzer / Signal is available and connected to the UV System controller.
	No	A TOC Analyzer / Signal is not available or connected to the UV System controller.
TOC Analog 4mA Value	ppb	Minimum scale (4mA) calibration value used to measure the TOC through the UV System.
TOC Analog 20mA Value	ppb	Maximum scale (20mA) calibration value used to measure the TOC through the UV System.

## 8.5 Active Alarms Screen



The Alarm Screen shows the most recent alarms in the order they occurred, older alarms will be overwritten when the buffer is full.

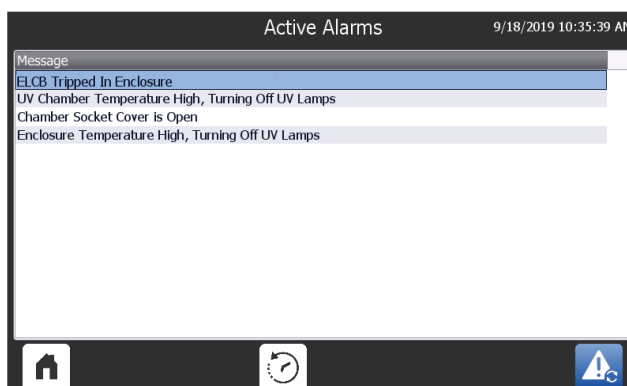



Figure 11 Active Alarms Screen

### Reset a Latched Alarm

1. Resolve the cause of the latched alarm
2. Active Alarms Screen → Press the Fault Reset Button 

**Note:** Fault Reset button is visible only when there is an alarm.

### Reset a Non-Latched Alarm

1. Resolve the cause of the alarm. Once the cause is removed, the alarm will clear automatically.

### 8.5.1 Alarm History Screen



The Alarm History Screen displays all the alarms that have occurred in the system with a date/time stamp.

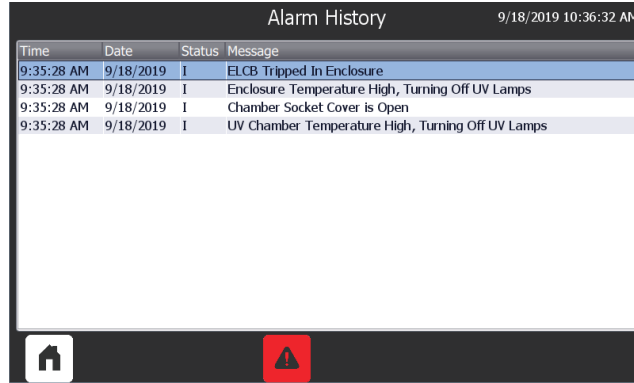



Figure 12 Alarm History Screen

#### Alarm Status

Alarm Status	Description
I	Indicates an incoming alarm event.
I/O	Indicates an outgoing alarm event ((i.e. the alarm is no longer active).

#### Active Alarms

The Alarm Icon  will flash red on all main screens when active alarms are present.

### 8.6 Information Screen

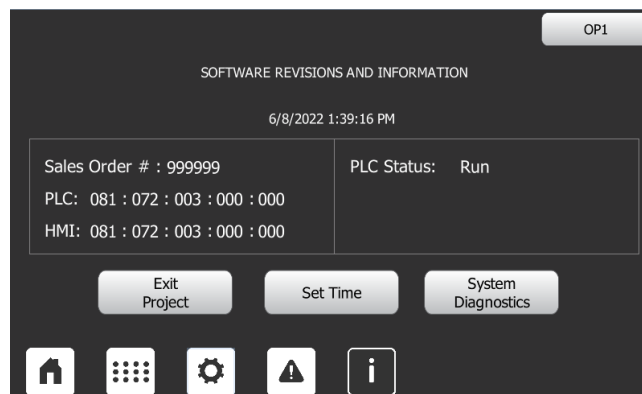


Figure 13 Information Screen

Item	Text	Description
Date / Time	--	Displays current set date and time
Sales Order	#####	Displays Aquafine Sales Order Number. This number helps Aquafine Technical Support reference information about the provided system.
PLC	###:###:###:###:###	Displays the PLC Software Version

Item	Text	Description
HMI	###:###:###:###:###	Displays the HMI Software Version
PLC Status	Run	PLC is in RUN mode.
	Stop	PLC is in STOP mode. The program is not being executed.

Button	Description	Refer:
Exit Project	Select to exit UV System user interface to view and adjust Control Panel settings. <i>Note: Visible when logged in as OP1 or higher.</i>	--
Set Time	Set local date and time.	<a href="#">Section 8.6.1</a>
System Diagnostics	Select to view PLC diagnostics. <i>Note: Visible when logged in as OP1 or higher.</i>	<a href="#">Section 8.6.2</a>

### 8.6.1 Date and Time Screen

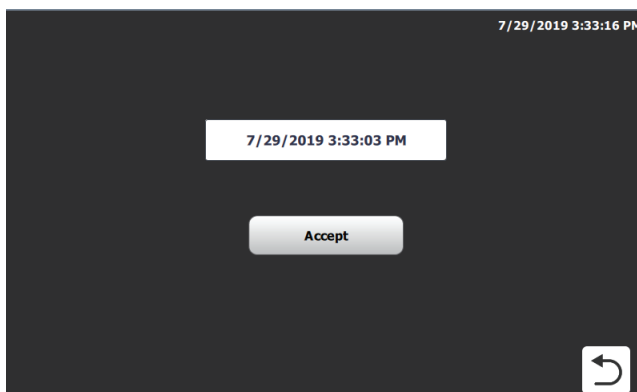


Figure 14 Date and Time Screen

#### Set Date and Time

1. Select the white text box → Enter the value on the pop up → Accept

### 8.6.2 Diagnostic Overview Screen

The Diagnostic Overview Screen allows the user to see the PLC status and process steps. This screen is used to assist with troubleshooting a failure in the automation system (i.e. a PLC or HMI error).

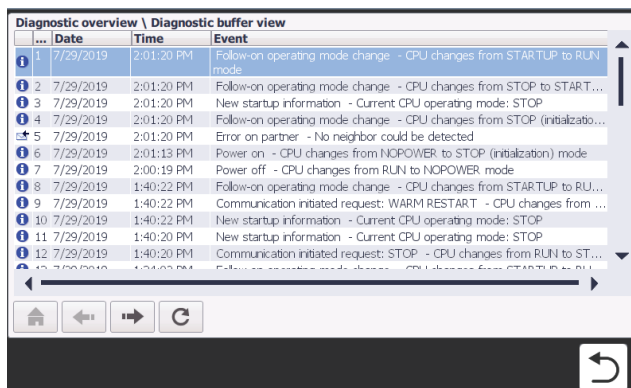


Figure 15 Diagnostic Overview Screen



# Section 9 Maintenance

## ⚠ DANGER



Obey all warning and caution statements. Refer to [Section 2](#).

Read and understand this manual before operating this equipment. Read all user documentation before performing operations, inspections, repair, or maintenance on this equipment.

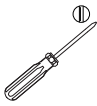














Only competent personnel should undertake operation, repairs, maintenance, or servicing of equipment described in this section of the manual. If you do not understand the information or procedure explanations in this manual, STOP and contact your Service Provider for assistance.

The tasks and safety information described in this section of the manual are external to the UV Chamber.

Refer to [Section 11](#) for replacement part numbers.

### 9.1 Tools and Materials

Symbols	Description	Symbols	Description
	Screwdriver		Philips Screwdriver
	Wrench - Adjustable		Wrench - Torque
	Clean Water		Mild Acidic Solution (for example, ActiClean® Gel) or approved by Aquafine Service, food grade cleaner
	Isopropyl Alcohol		Lint Free Cloth (Kimwipes®)
	Cotton Swab		Sleeve Bolt Removal Tool
	Sleeve Removal Tool		Wrench
	Spray Bottle		

## 9.2 Maintenance Schedule

Scheduled maintenance and inspections can extend the life of the system and prevent problems. Routine maintenance may include partial disassembly to access components for cleaning and visual evaluation. [Table 3](#) shows the maintenance schedule. During any maintenance activity, the manufacturer recommends inspection of all components that can be seen. Some of the preventative maintenance tasks may also need to be done to remove a condition that caused a system alarm. Refer to [Figure 1](#) and [Figure 2](#) for components that are accessible for maintenance.

Remember, always using genuine Aquafine parts keeps your warranty and regulatory certifications valid (cULus, CE, UKCA and KC).

**Table 3 Preventive Maintenance Schedule**

System component	Maintenance requirement	Weekly	Monthly	Semi-Annually	Annually	Every 2 years	9000 hours	On removal	As needed
CPP	Visually inspect the air filter for signs of debris or film. Replace filters as needed ( <a href="#">Section 9.11.2</a> ).	X							
	Check cooling fan air inlet and outlet for signs of build-up and replace air filters if necessary ( <a href="#">Section 9.11.3</a> ).		X						X
UV Lamps	Replace UV Lamps ( <a href="#">Section 9.6.2</a> )						X		
Lamp Sleeves	Remove a representative sample (i.e. 10%) of Lamp Sleeves ( <a href="#">Section 9.8.1</a> )								
	<ul style="list-style-type: none"> <li>Check the Lamp Sleeve O-Rings and Sleeve Bolt Washers for UV decay and brittle parts. Replace O-Rings and washers as needed.</li> <li>Remove any condensation inside the Lamp Sleeve</li> <li>Inspect Lamp Sleeves for physical damage</li> <li>Inspect for build-up on the Lamp Sleeves</li> </ul>			X					X <sup>3</sup>
	Clean the Lamp Sleeves ( <a href="#">Section 9.8.2</a> )				X			X	X
	Replace Lamp Sleeve ( <a href="#">Section 9.8.1</a> )				X				X
	Replace Lamp Sleeve O-Ring ( <a href="#">Section 9.8.1</a> , Step 5)				X			X	
	Inspect Sleeve Bolts for signs of fluid leakage.		X						
UVI Sensor <sup>1</sup>	Clean the UVI Sensor ( <a href="#">Section 9.7.2</a> , Step 3)			X				X	
	Replace the UVI Sensor ( <a href="#">Section 9.7.2</a> )								X
	Inspect UVI Sensor O-Rings for UV decay and brittle parts. Replace O-Rings as needed.							X	
	Replace the UVI Sensor O-Rings ( <a href="#">Section 9.7.2.1</a> ).				X				
UVI Sensor <sup>2</sup>	Clean the UVI Sensor ( <a href="#">Section 9.7.1</a> , Step 2)			X				X	
	Replace UVI Sensor ( <a href="#">Section 9.7.1</a> )								X
	Inspect UVI Sensor O-Rings for UV decay and brittle parts. Replace O-Rings as needed.				X			X	

Table 3 Preventive Maintenance Schedule (continued)

System component	Maintenance requirement	Weekly	Monthly	Semi-Annually	Annually	Every 2 years	9000 hours	On removal	As needed
UVI Sensor Sleeve <sup>1</sup>	Remove the UVI Sensor Sleeve ( <a href="#">Section 9.8.1</a> ) <ul style="list-style-type: none"> <li>Check the Sleeve O-Ring and Sleeve Bolt Washer for UV decay and brittle parts. Replace O-Ring and washer as needed.</li> <li>Remove any condensation inside the Sensor Sleeve</li> <li>Inspect Sensor Sleeve for physical damage</li> <li>Inspect for build-up on the Sensor Sleeve</li> </ul>			X					X <sup>3</sup>
	Clean the Sensor Sleeve ( <a href="#">Section 9.8.2</a> )				X			X	X
	Replace UVI Sensor Sleeve ( <a href="#">Section 9.8.1</a> )				X				X
	Replace UVI Sensor Sleeve O-Ring ( <a href="#">Section 9.8.1</a> , Step 5)				X			X	
	Inspect Sleeve Bolt for signs of fluid leakage.		X						
UVI Sensor Plug <sup>2</sup>	Inspect UVI Sensor Plug O-Rings for UV decay and brittle parts. Replace O-Rings as needed.				X				
UV Chamber	Inspect End Plate O-Rings for UV decay and brittle parts. Replace as needed ( <a href="#">Section 9.9.2</a> )					X		X	X

<sup>1</sup> Applies to Liquid Sugar applications only.

<sup>2</sup> Applies to TOC applications only.

<sup>3</sup> Frequency may need to be increased or decreased depending on fluid quality. Refer to your facility's Clean in Place (CIP) process.

### 9.3 Depressurize and Drain a UV Chamber

The manufacturer recommends that the UV Chamber be depressurized and drained before any maintenance, service or repair task is done. Failure to depressurize and drain the UV Chamber can result in serious injury or death. Always follow all site-specific safety protocols and procedures. Refer to [Section 2](#).

#### Prerequisites:



- Shut down the UV System. Refer to [Section 5](#) as needed.
- Apply lockout tag out devices as necessary. Refer to [Section 4](#).
- The drainage or fluid bypass provisions are followed until UV system starts.

#### Materials:



## Maintenance

---

### Procedure:



1. Stand off to the side of the end plate, open the vent valve and then the drain valve, as the process fluid level drops, the UV System will depressurize.
2. To depressurize only, open the vent valve.
3. Keep drain valve open until the UV Chamber is empty.
4. When service is complete, assemble the prerequisites in the reverse order of disassembly.

## 9.4 Pressurize the UV Chamber

### Prerequisites:



- Remove UV Lamps (if installed). Refer to [Section 9.6.2](#).
- Remove UVI Sensor. Refer to [Section 9.7.2](#) - *applies to Liquid Sugar systems only*.
- Inspect condition of sleeves for visible cracks or damage. Replace if necessary.
- Make sure the drain valve is closed.

### Materials:



### Procedure:



1. Fill the UV Chamber with process fluid.
  - a. Stand off to the side and make sure the area is clear of all plant personnel.
  - b. Pressurize the UV Chamber.
  - c. Check for leaks.
  - d. Wait twenty minutes.
2. If leaks are found:
  - a. Depressurize and drain the UV Chamber. Refer to [Section 9.3](#).
  - b. Fix the leaks.
  - c. Fill the UV Chamber and do a pressure test. Check for leaks.
3. If there are no leaks, depressurize the UV Chamber. Refer to [Section 9.3](#).
4. Install the UV Lamps. Refer to [Section 9.6.2](#).
5. Install the UVI Sensor. Refer to [Section 9.7.2](#) - *applies to Liquid Sugar systems only*.
6. Install the Service End Cap. Refer to [Section 9.5](#).



## 9.5 Remove and Install the Service End Cap

**Prerequisites:**



- Shut down the UV System. Refer to [Section 5](#) as needed.
- Apply lockout tag out devices as necessary. Refer to [Section 4](#).
- Depressurize the UV Chamber. Refer to [Section 9.3](#).

**Tools:**



**Materials:**

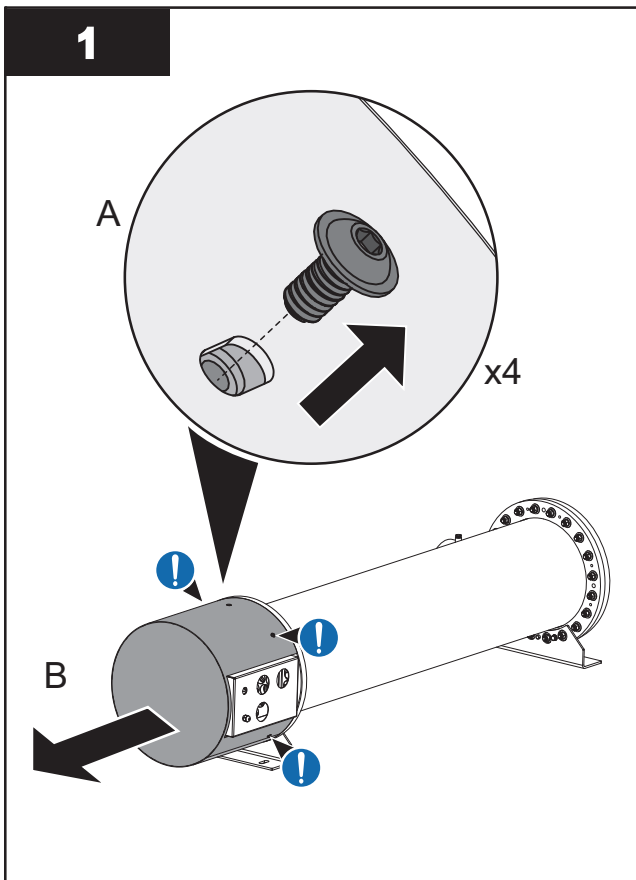


**Procedure:**

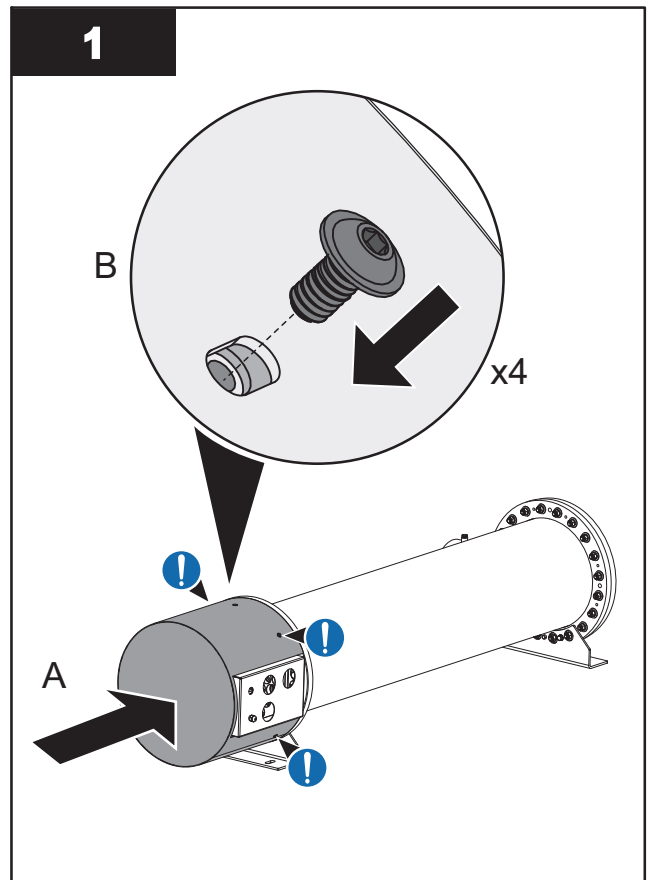


*Note: An ozone inhalation hazard may be present on TOC Systems, adequate ventilation is required.*

**Remove:**



**Install:**



When service is complete, assemble the prerequisites in the reverse order of disassembly.

### 9.6 UV Lamp



UV lamps contain mercury ([Section 2](#)).

UV Lamps are made of quartz tubing and are breakable. Do not strike, bend or apply pressure or it will break. Discard UV Lamps appropriately. Follow all local regulations.

#### 9.6.1 Storage Requirements for Used UV Lamps

Put used UV lamps into the replacement UV lamp shipping container, or a similar container. It is preferable that the original packing materials be used where possible, or materials adequate to prevent breakage during storage and transportation.

Boxes of used UV lamps should be labeled as such and stored in a location where the potential for accidental breakage is minimized.

A UV lamp recycler may have specific procedures and UV lamp storage requirements. Consult with a UV lamp recycler to determine all applicable policies.

This component contains Mercury. Dispose according to Local, State, or Federal Laws.

#### 9.6.2 Remove and Replace a UV Lamp

Inspect a UV Lamp as part of scheduled maintenance and when a UV Lamp status alarm occurs.

Replace a UV Lamp for every 9,000 hours (a Lamps Expired alarm occurs) or when the UV Lamp fails inspection.

### NOTICE

Failure to replace UV Lamps for every 9000 hours of runtime may cause the equipment to fail. With intermittent use, in no case should the UV Lamps be used for more than 24 months, regardless of number of hours of operation, due to normal operational degradation.

#### Prerequisites:



- Shut down the UV System. Refer to [Section 5](#) as needed.
- Apply lockout tag out devices as necessary. Refer to [Section 4](#).
- Depressurize the UV Chamber, and stand off to the side. Refer to [Section 9.3](#).
- Wait minimum ten (10) minutes to allow UV Lamps to cool.
- Remove the Service End Cap. Refer to [Section 9.5](#).

#### Materials:

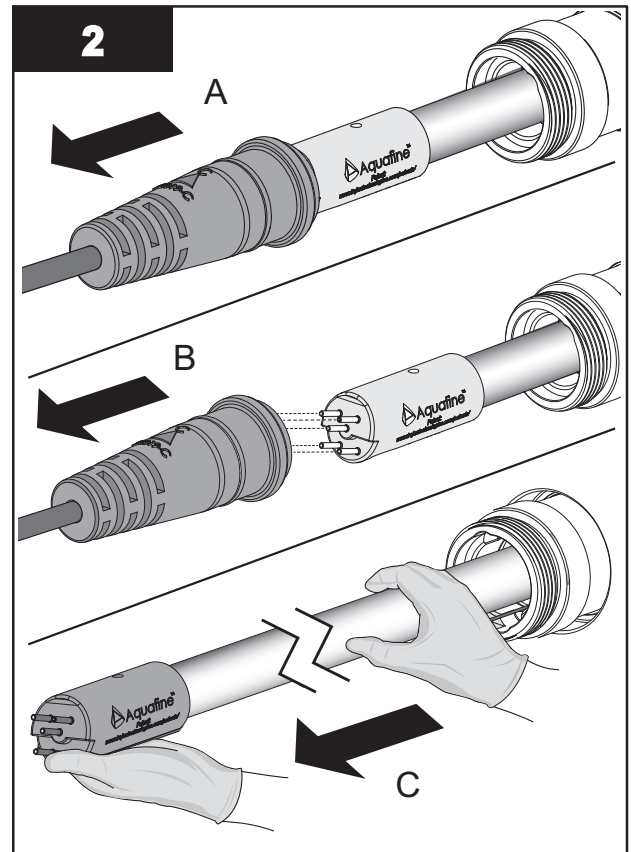
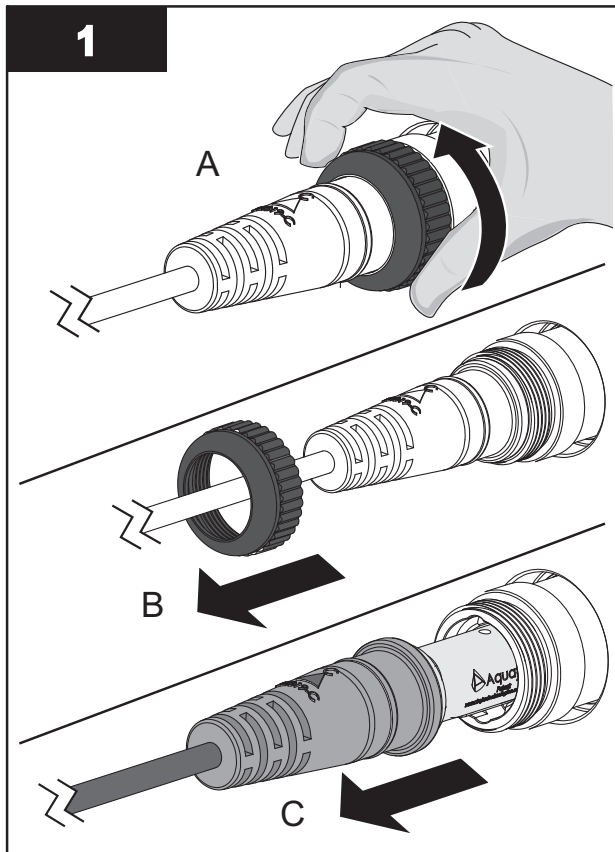


- UV Lamp

**Note:** Use clean lint free cotton gloves to handle UV Lamps.

## Procedure:

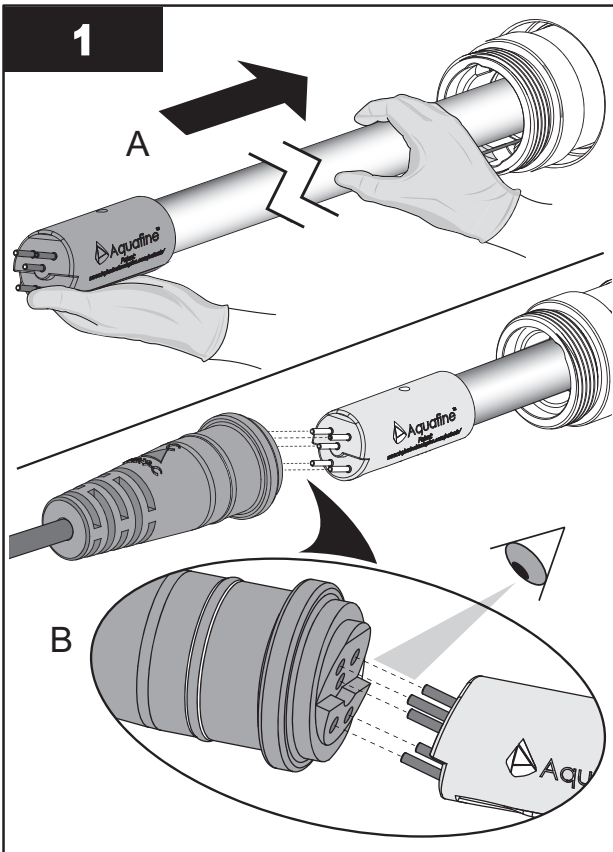
## Remove:



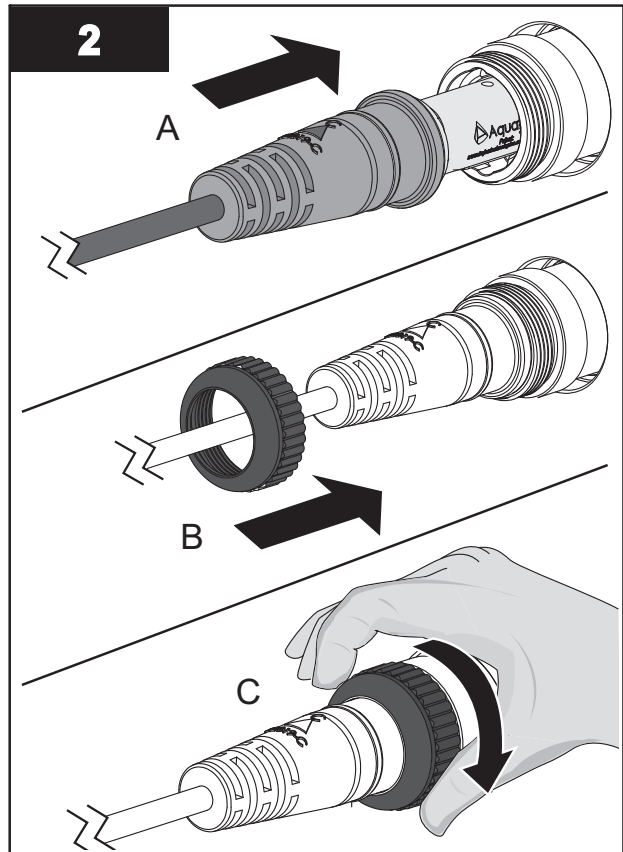
3. Inspect the UV Lamp pins for:
  - Evidence of overheating
  - Moisture
  - Displaced or bent pins (pins are angled at 10 degrees)
4. Inspect the UV Lamp for:
  - Cracks or breaks, loose ceramic ends.
5. If the conditions listed are:
  - Present, replace the UV Lamp.
  - Not present, reinstall the UV Lamp.

## Maintenance

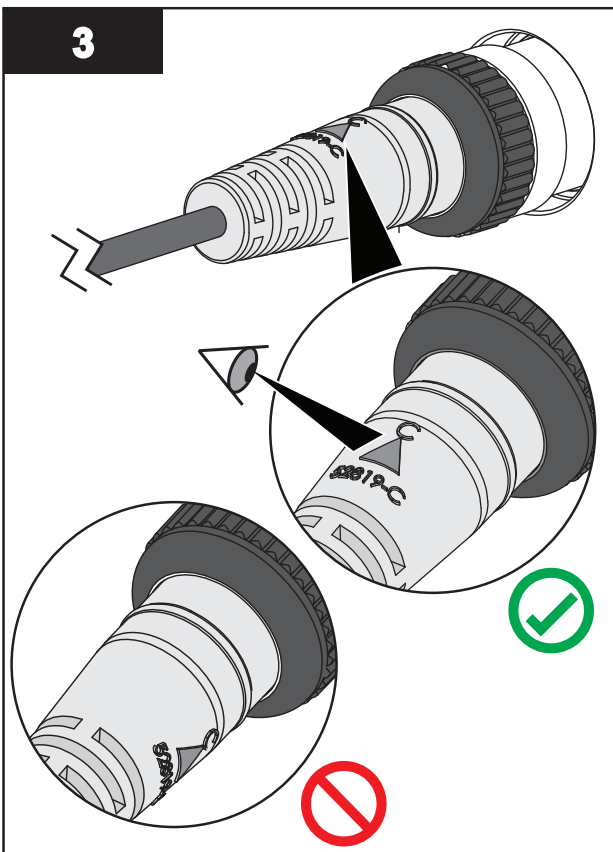
Install:



**Note:** Always support the UV Lamp with lint free cotton gloved hands.



**Note:** Hand tighten the cap compression nut.



**Note:** The arrow must be positioned at the top of the Lamp Port.

**Post-requisites:**

- Reset the Lamp Hours when installing a new UV Lamp ([Section 8.3.4](#)).

## 9.7 UVI Sensor

Depending on system application, the UVI Sensor design and installation procedure varies. Follow the appropriate procedure in this section.

- **For TOC applications**, the UVI Sensor is UV Chamber body mounted. Refer to [Section 9.7.1](#) for removal and replacement procedure.
- **For Liquid Sugar applications**, the UVI Sensor is End Plate mounted. Refer to [Section 9.7.2](#) for removal and replacement procedure.

### 9.7.1 Remove and Replace a UVI Sensor - TOC

*Note: Applies to TOC applications only.*

**Prerequisites:**



- Shut down the UV System. Refer to [Section 5](#) as needed.
- Apply lockout tag out devices as necessary. Refer to [Section 4](#).
- Depressurize and drain the UV Chamber. Refer to [Section 9.3](#).

**Tools:**



**Materials:**

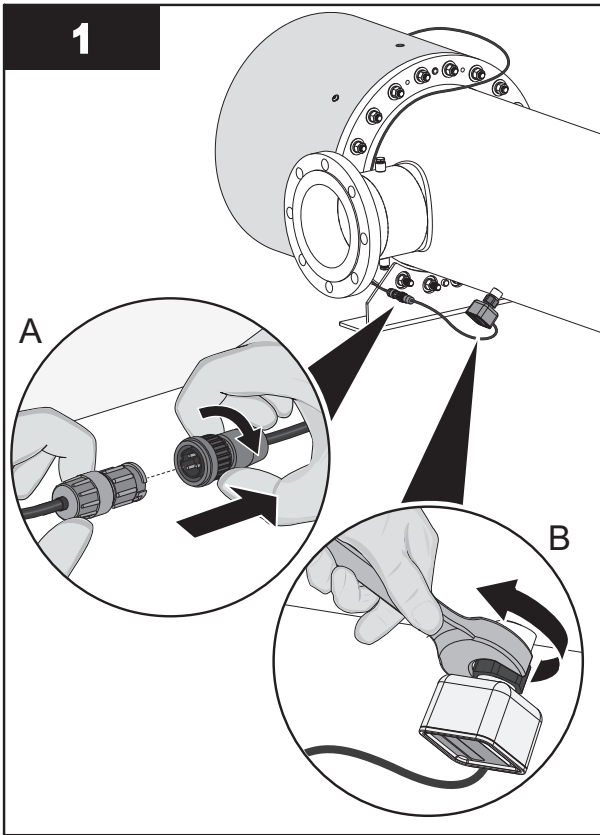


- New UVI Sensor (if required)

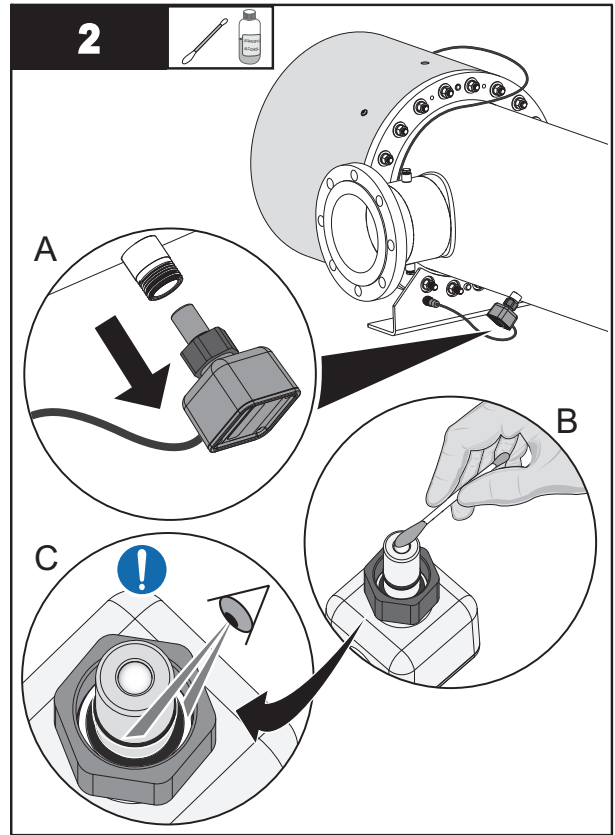
**Procedure:**

# Maintenance

## Remove:

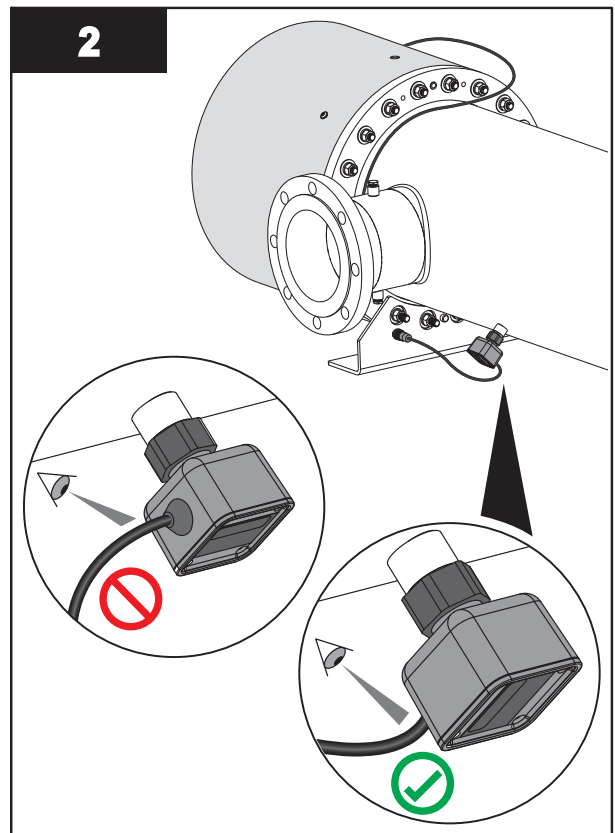
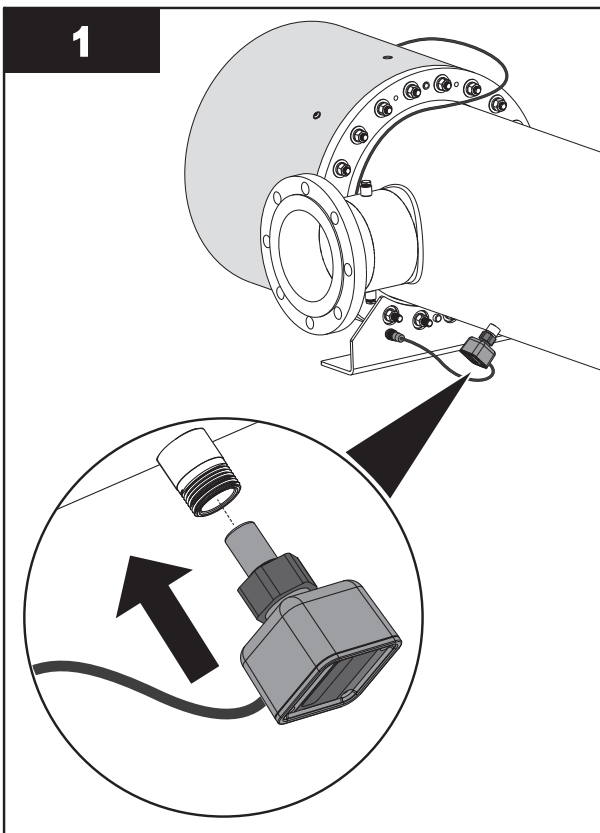


**Note:** Loosen the nut securing the UVI Sensor.

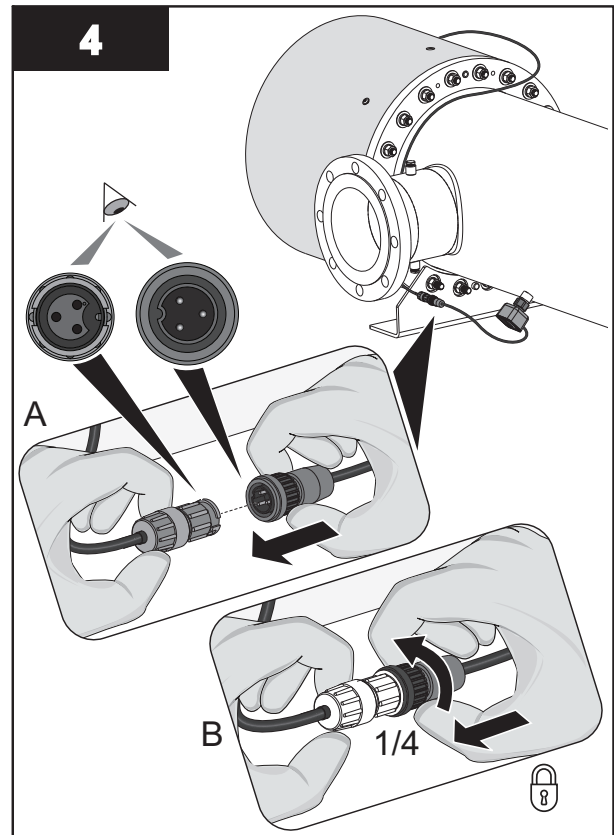
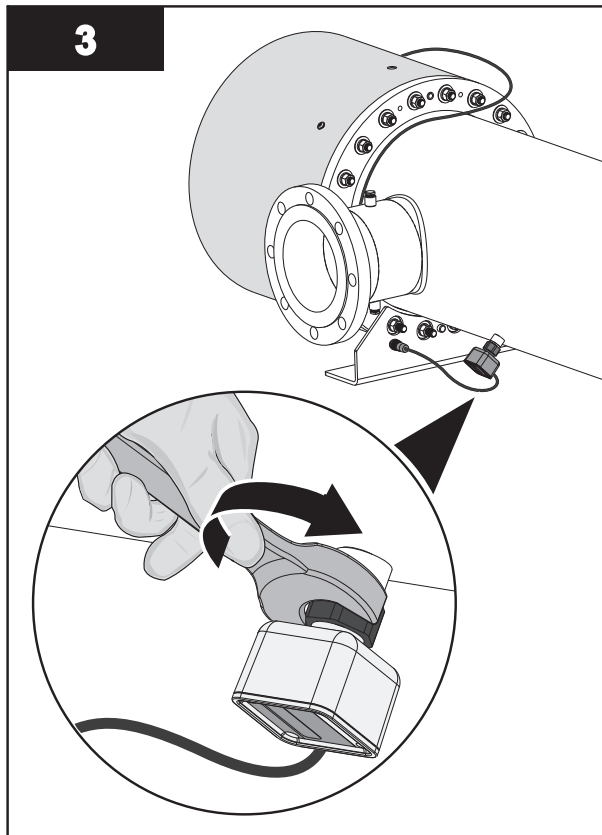


**Note:** Inspect O-rings for signs of UV decay or brittle parts. Replace if necessary.

## Install:



**Note:** Orientate the UVI Sensor to position the cable at the bottom as shown.



**Note:** Tighten the nut to 40 N.m (29.5 lbf.ft) to secure the UVI Sensor.

### 9.7.2 Remove and Replace a UVI Sensor - Liquid Sugar

**Note:** Applies to Liquid Sugar applications only.

#### Prerequisites:



- Shut down the UV System. Refer to [Section 5](#) as needed.
- Apply lockout tag out devices as necessary. Refer to [Section 4](#).
- Depressurize the UV Chamber, and stand off to the side. Refer to [Section 9.3](#).
- Wait ten (10) minutes to allow UVI Sensor to cool.
- Remove the Service End Cap. Refer to [Section 9.5](#).

#### Materials:



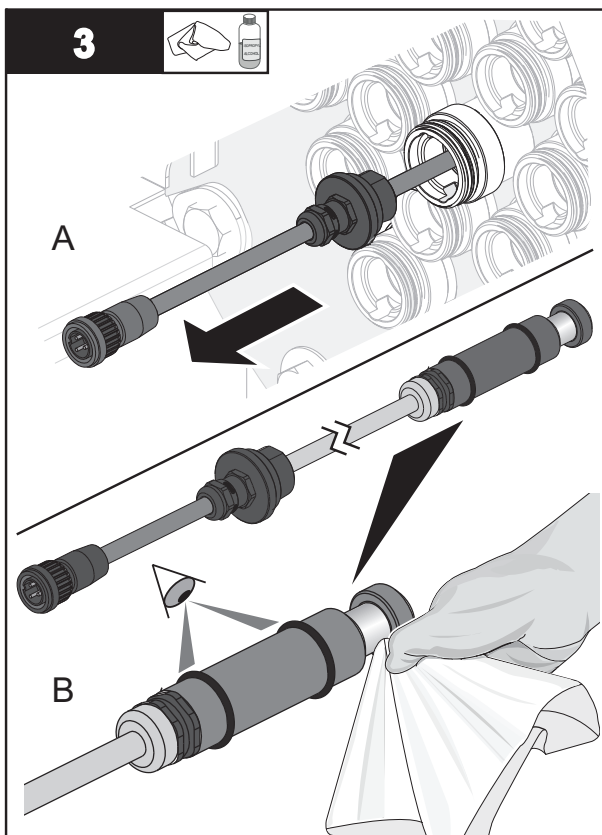
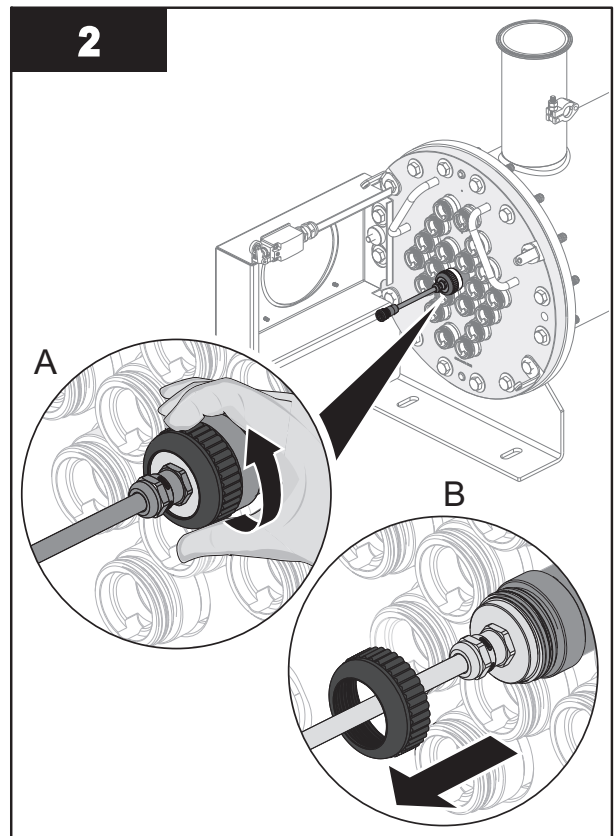
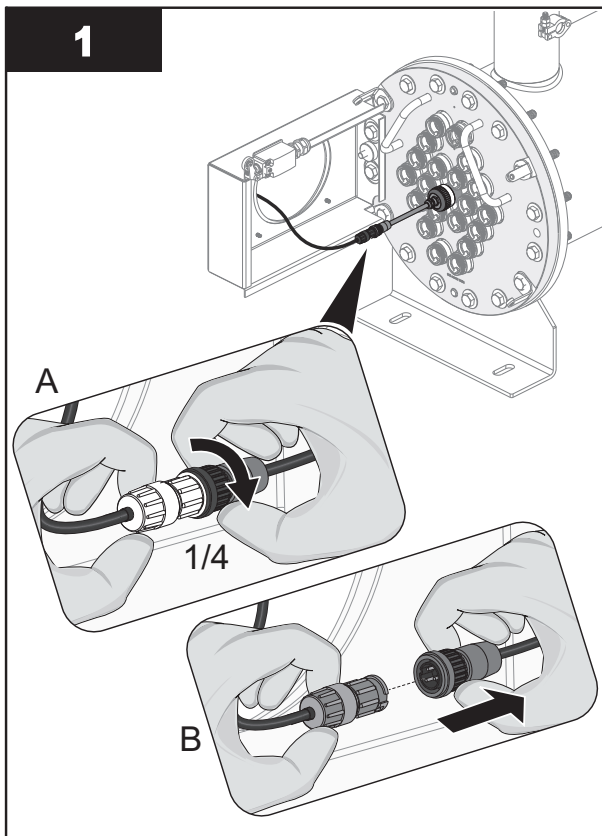
- New UVI Sensor (if required)



# Maintenance

## Procedure:

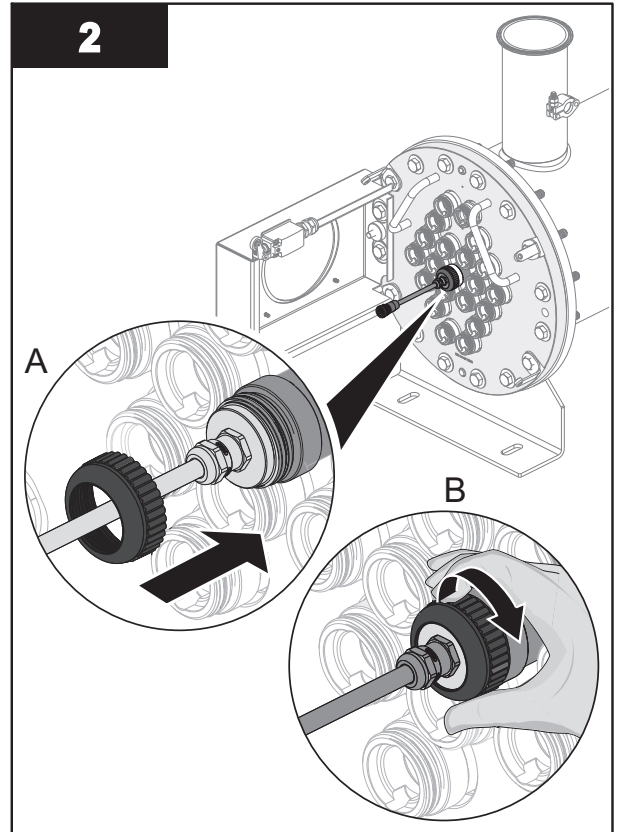
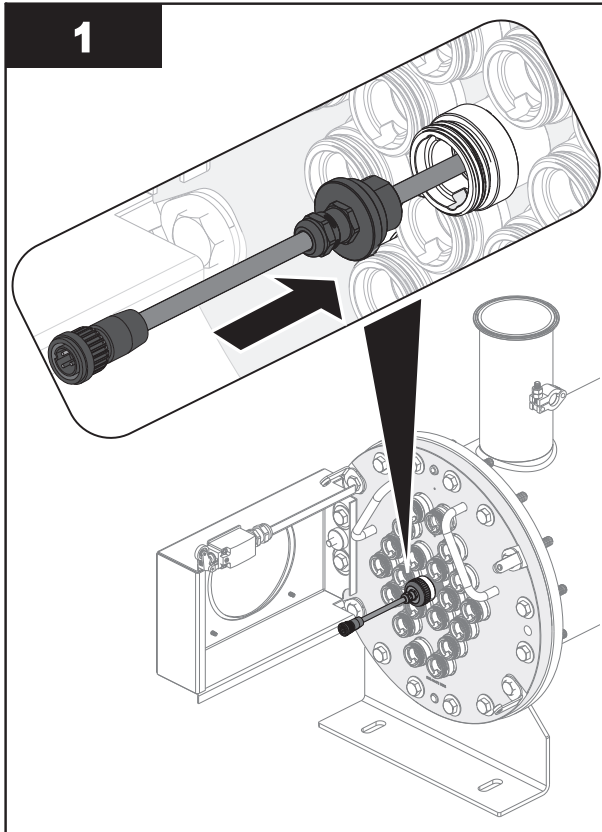
### Remove:



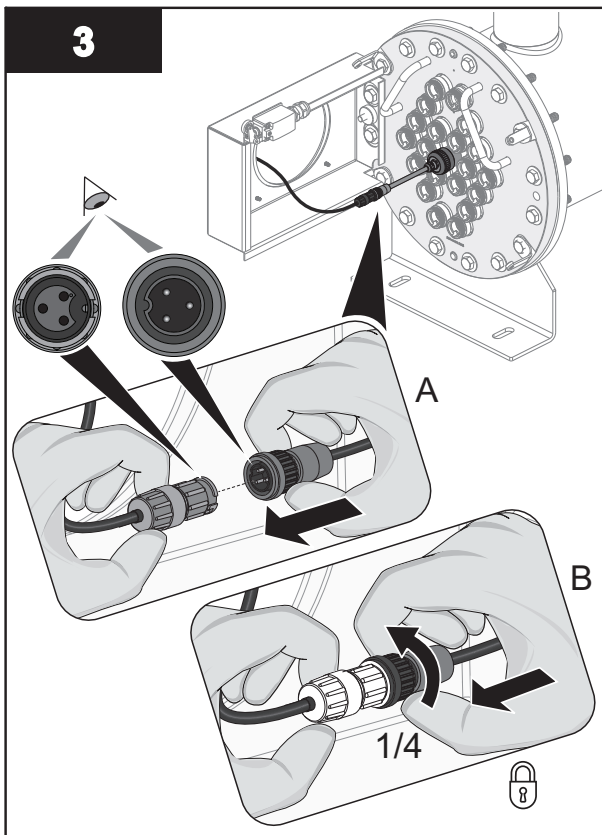
**Note:** Inspect O-rings for signs of UV decay or brittle parts. Replace if necessary.



Install:



**Note:** Hand tighten the cap compression nut to secure the UVI Sensor.



## 9.7.2.1 Remove and Replace UVI Sensor O-Rings

*Note: Applies to Liquid Sugar applications only.*

**Prerequisites:**



- Remove the UVI Sensor. Refer to [Section 9.7.2](#).

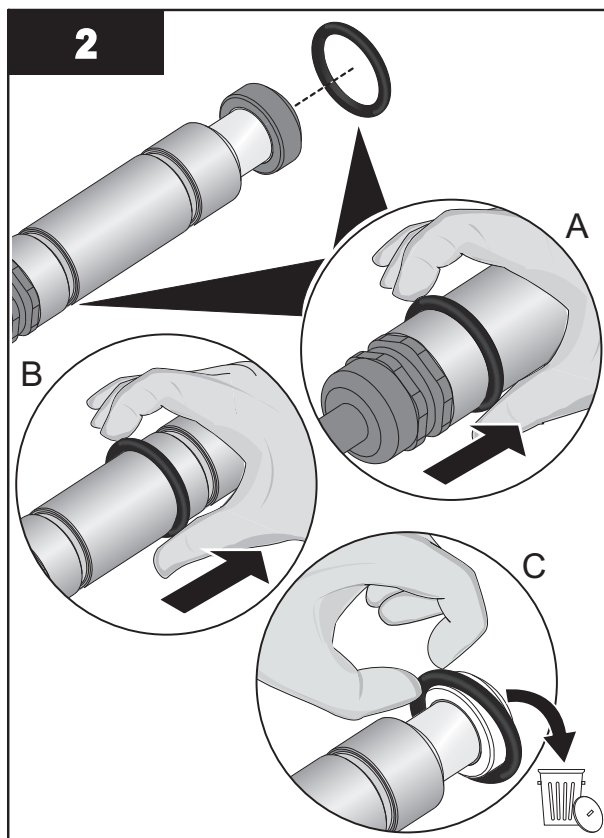
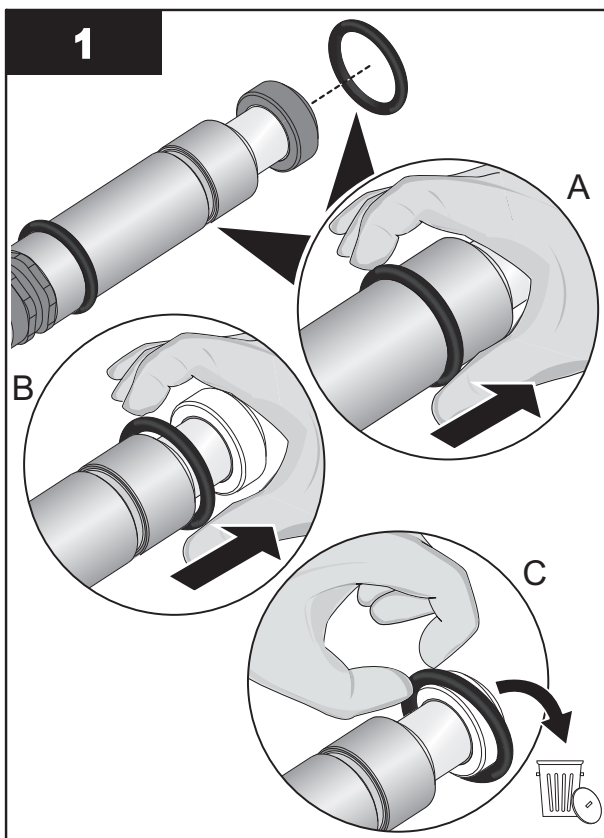
**Materials:**



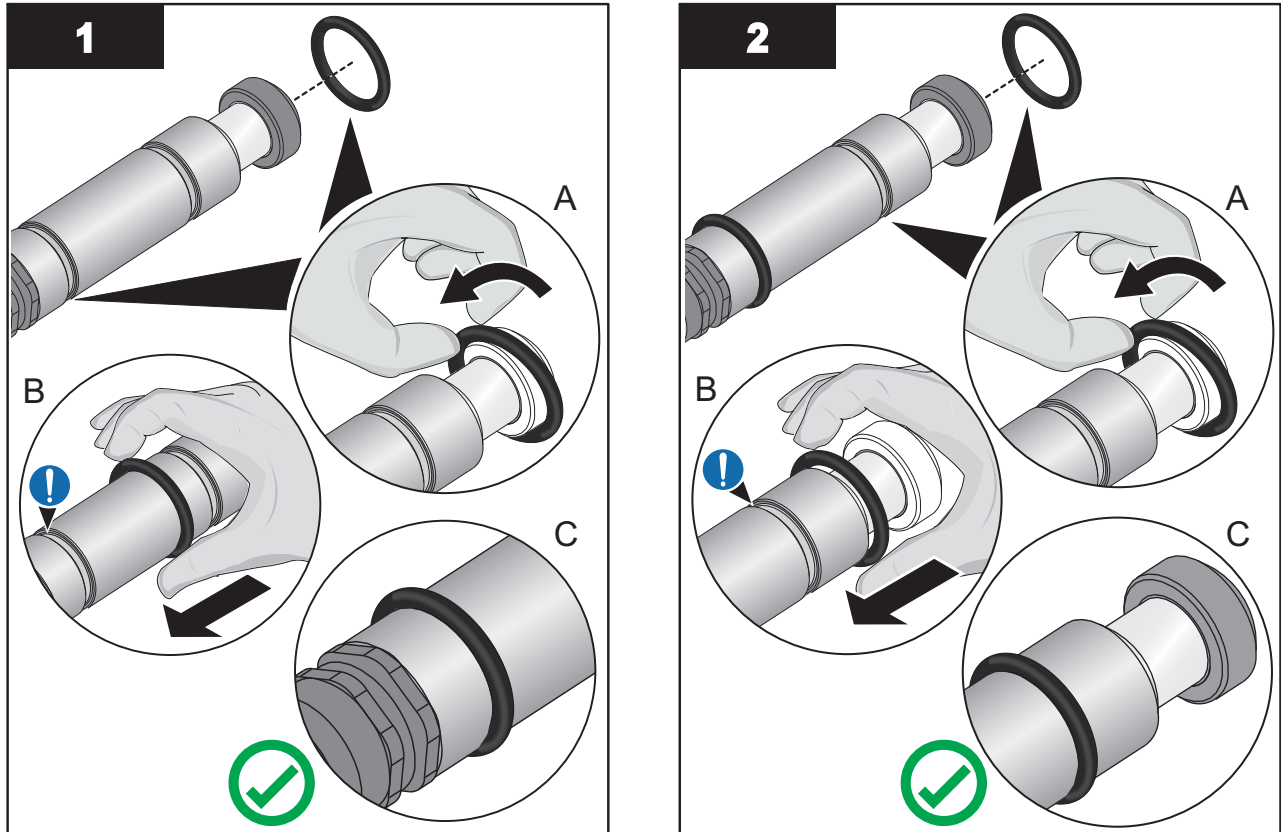
- New UVI Sensor O-Rings

**Procedure:**

**Remove O-Rings:**



## Install O-Rings:



## 9.8 Lamp and UVI Sensor Sleeve



Lamp and UVI Sensor Sleeves are made of quartz tubing and are breakable. Do not strike, bend or apply pressure or it will break. Discard Lamp and UVI Sensor Sleeves appropriately. Follow all local regulations.

### 9.8.1 Remove and Replace a Sleeve

Inspect the Sleeves and Sleeve O-Rings as a part of scheduled maintenance or when a UVI Low alarm occurs.

Replace a Sleeve if buildup cannot be removed, or when the Sleeve shows signs of damage, such as cracks and chips.

#### Prerequisites:



- Shut down the UV System. Refer to [Section 5](#) as needed.
- Apply lockout tag out devices as necessary. Refer to [Section 4](#).
- Depressurize and drain the UV Chamber, and stand off to the side. Refer to [Section 9.3](#).
- Wait ten (10) minutes to allow UV Lamps to cool.
- Allow residual fluid inside of UV Chamber to cool - **applies to Liquid Sugar applications only**.
- Remove the Service End Cap. Refer to [Section 9.5](#).

## Maintenance

- **For Lamp Sleeves** - Remove the UV Lamp. Refer to [Section 9.6.2](#).
- **For UVI Sensor Sleeve** - Remove the UVI Sensor. Refer to [Section 9.7.2](#) - *applies to Liquid Sugar applications only.*

### Tools:



### Materials:



- Lamp Sleeve (if required)
- UVI Sensor Sleeve (if required)
- Sleeve Bolt Washer
- Lamp or UVI Sensor Sleeve O-Rings

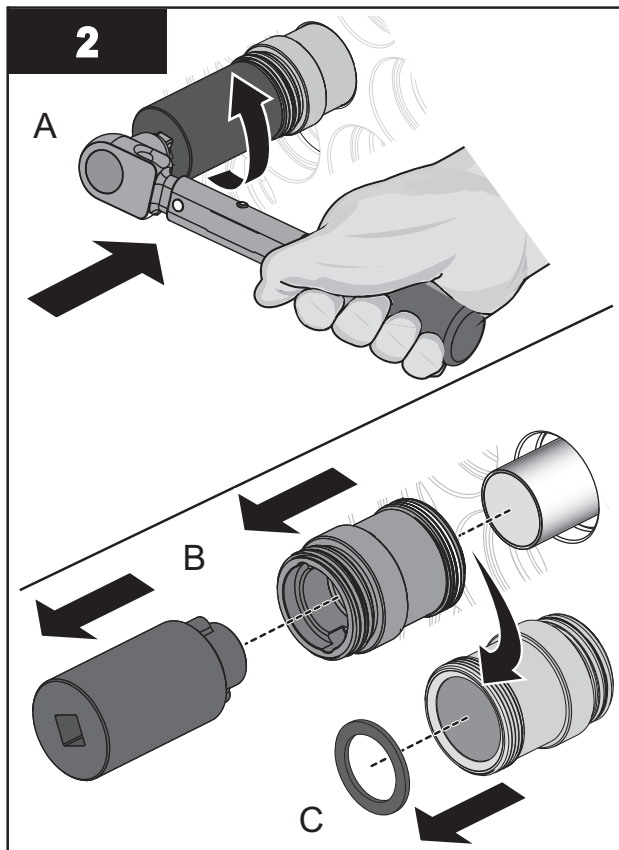
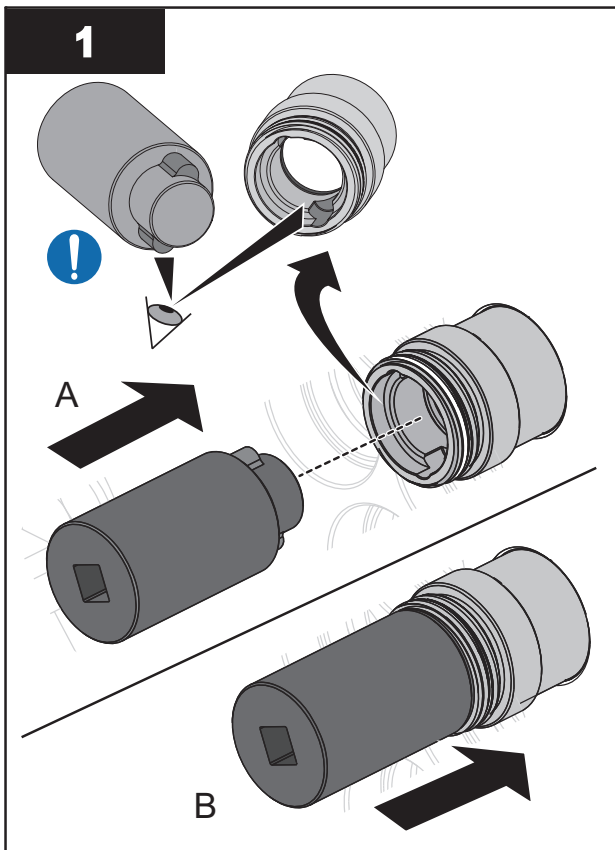
### Procedure:

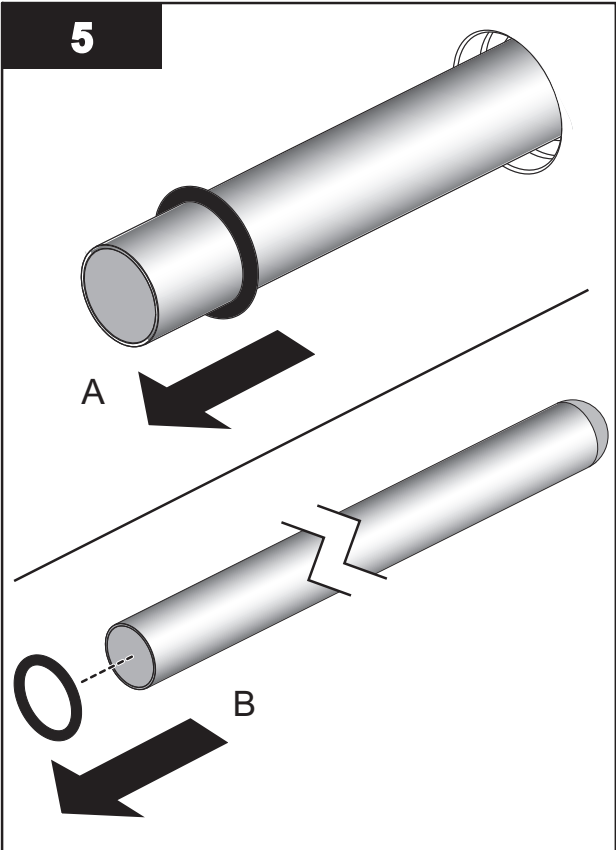
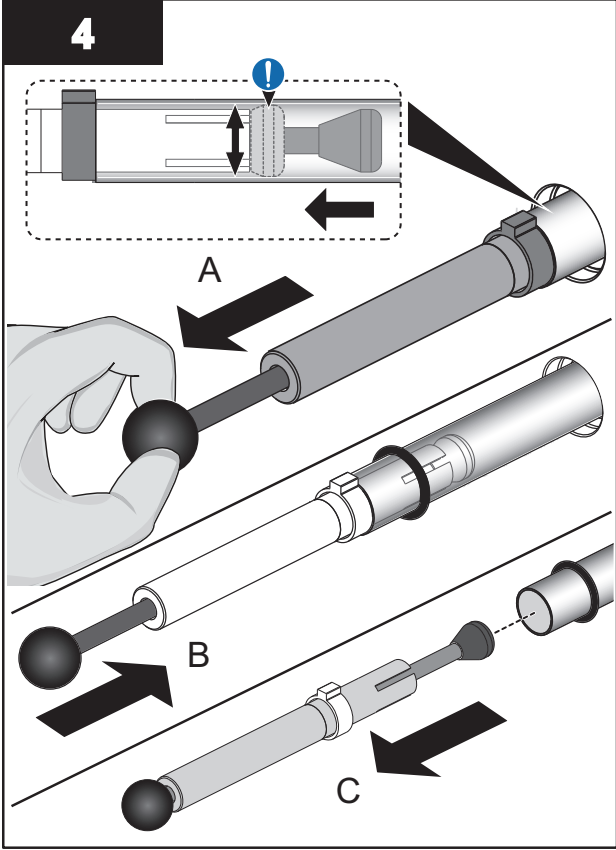
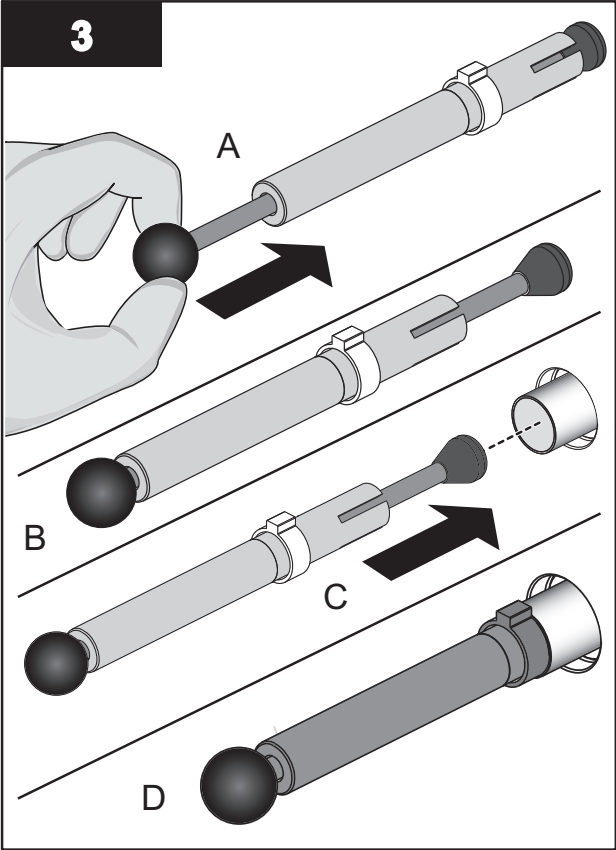
## NOTICE

To prevent Sleeve damage during removal, be sure to keep the Sleeve level and perpendicular to the end plate. Physical damage to Sleeves indicates a possible serious condition in the UV Chamber. Full service of the UV Chamber may be needed.

Use caution and apply only 11.3 N.m (100 lbf.in) of torque to the Sleeve bolt. Excessive torque will crack the Sleeve. Low torque may result in fluid leakage into the service end cap. Use only the provided Sleeve Bolt Removal Tool.

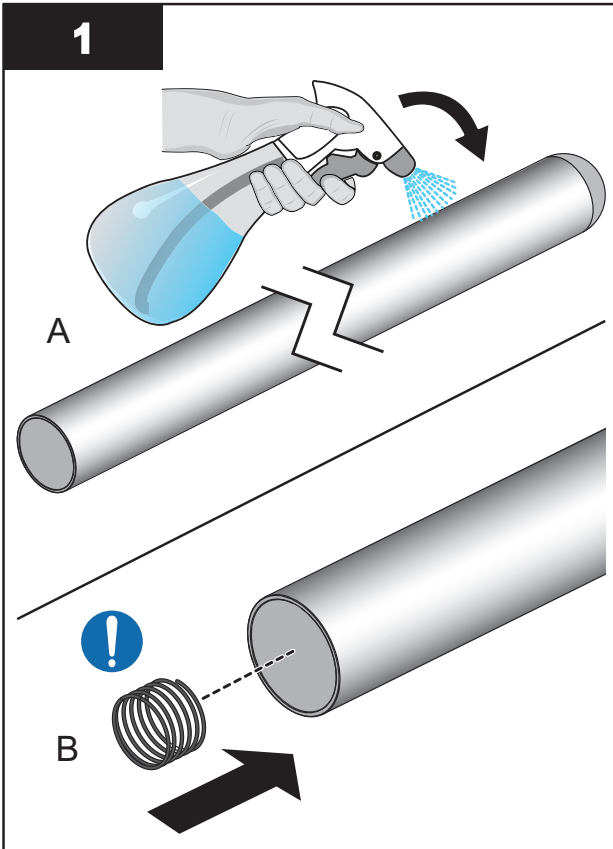
### Remove:



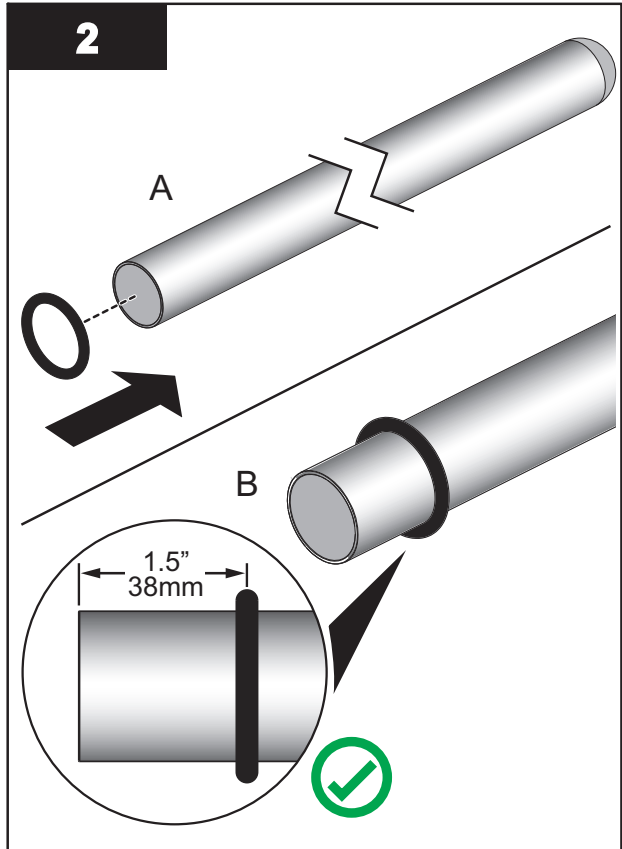


# Maintenance

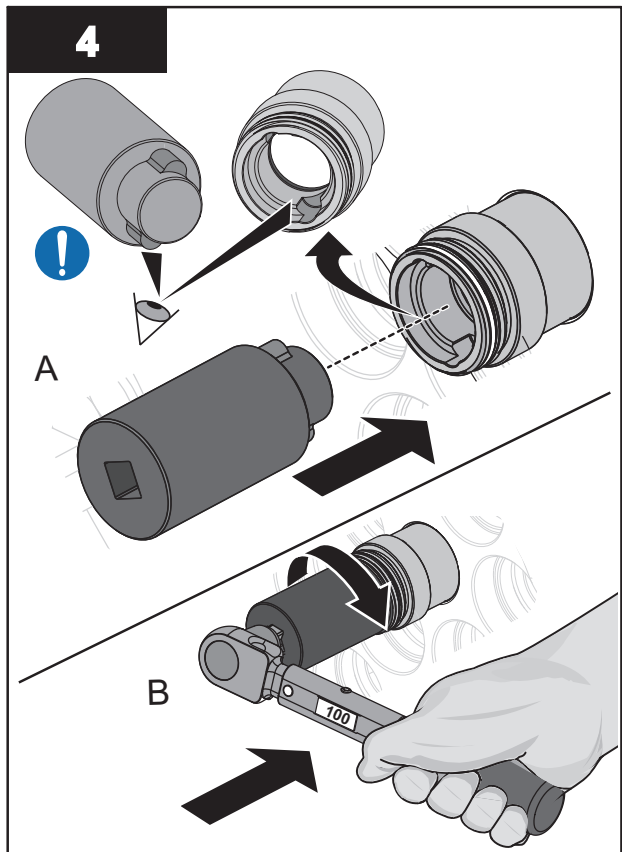
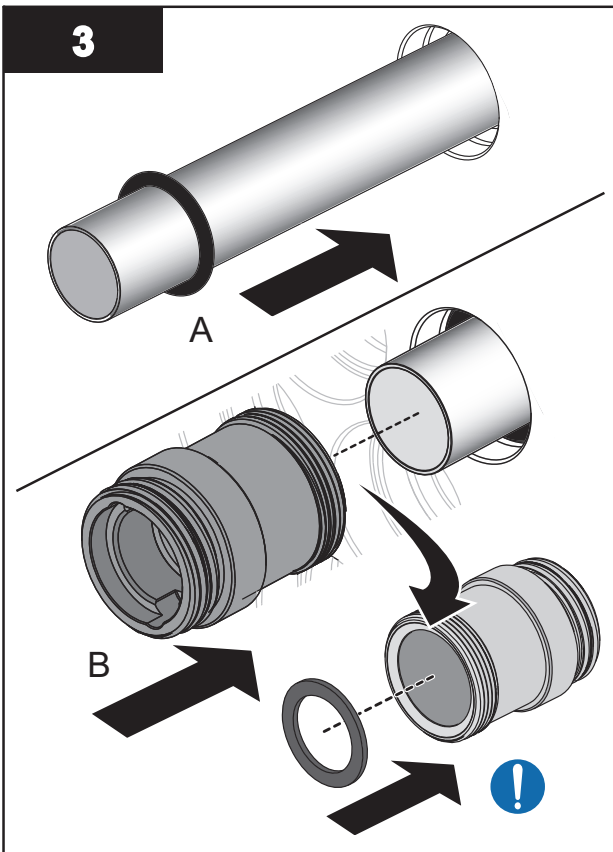
## Install:



**Notes:** 1) Verify that compression spring is in the Lamp Sleeve.  
2) If installing UVI Sensor Sleeve, skip step B.



**Note:** Ensure the O-Ring is installed at 1.5" (38 mm) from the open end of the Sleeve.



**Note:** Torque the Sleeve Bolt to 11.3 N.m (100 lbf.in).



## 9.8.2 Clean a Sleeve

Clean all Sleeves manually if there is buildup on any of the inspected Sleeves.

### NOTICE

Do not use abrasive materials to clean a Sleeve. Abrasive materials will scratch and cause damage to the Sleeve.

Keep water and debris out of the Sleeves. Moisture can cause build-up in the Sleeves and corrosion of the lamp shunt and pins, which results in shorter UV Lamp life. Use a lint-free cloth to remove water or debris.

Build-up on the Sleeves decreases the amount of UV light, and can result in higher UV Lamp temperatures and decreased UV Lamp efficiency.

Only use Aquafine Corporation approved cleaning solutions on the Sleeves. Use of unapproved chemicals may result in damage to the equipment. For a list of approved cleaning solutions refer to [Table 4](#).

**Table 4 Approved Cleaning Solutions and Dilution Ratio**

Solution	Dilution
ActiClean® Gel	Not Required
20% Phosphoric Acid	2 parts water to 1 part acid
40% Phosphoric Acid	5 parts water to 1 part acid
75% Phosphoric Acid	10 parts water to 1 part acid
80% Phosphoric Acid	12 parts water to 1 part acid

#### Prerequisites:

- Remove the Lamp and/or UVI Sensor Sleeve. Refer to [Section 9.8.1](#).

#### Materials:



#### Procedure:



- Refer to [Table 4](#) for approved cleaning solutions and dilution ratios. Mix the solution thoroughly. Use pH indicator strips to make sure that pH is between 1.0-1.5. The solution is effective in cleaning sleeves when the pH is less than 3.0. Above pH 3.0, the cleaning solution should be replaced.
- Clean the sleeve with an approved cleaning solution and a lint-free cloth. Wipe up and down the length of the sleeve. Do not wipe across or around the sleeve. Wipe until all the build-up on the sleeve is removed.
- Rinse the sleeve fully with clean distilled water.
- Allow the sleeve to air-dry. Make sure the sleeve is completely dry on the inside and outside before installation.

**Notes:** 1) Sleeves may look clean when wet.

2) A completely clean sleeve will have the clarity of a new, unused sleeve.

- When service is complete, assemble the prerequisites in the reverse order of the disassembly.

## 9.9 UV Chamber End Plate

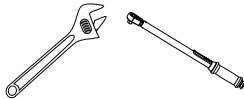
### 9.9.1 Remove and Install the UV Chamber End Plate

**Prerequisites:**



- Shut down the UV System. Refer to [Section 5](#).
- Apply lockout tag out devices as necessary. Refer to [Section 4](#).
- Depressurize and drain the UV Chamber. Refer to [Section 9.3](#).
- Allow residual fluid inside of UV Chamber to cool - ***applies to Liquid Sugar applications only.***
- Remove Service End Cap. Refer to [Section 9.5](#).
- Remove the UV Lamps. Refer to [Section 9.6.2](#).
- Remove the UVI Sensor. Refer to [Section 9.7.2](#) - ***applies to Liquid Sugar applications only.***
- Remove the Sleeves. Refer to [Section 9.8.1](#).
- Disconnect the Temperature Switch.
- Disconnect the Ground Wire.

**Tools:**



**Materials:**

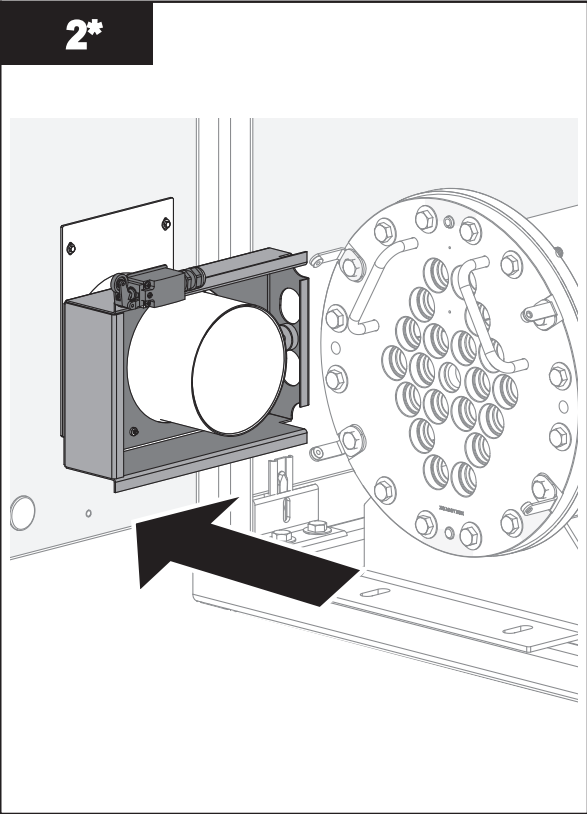
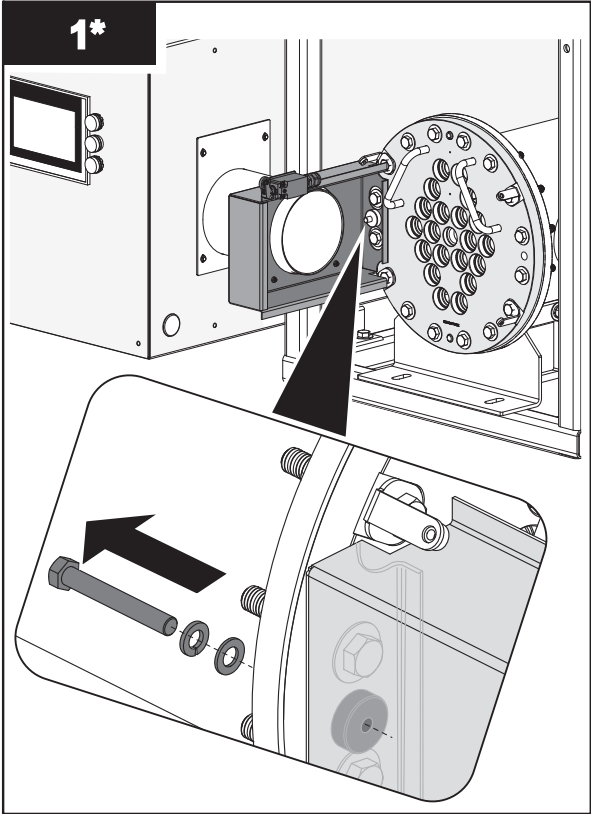


**Procedure:**

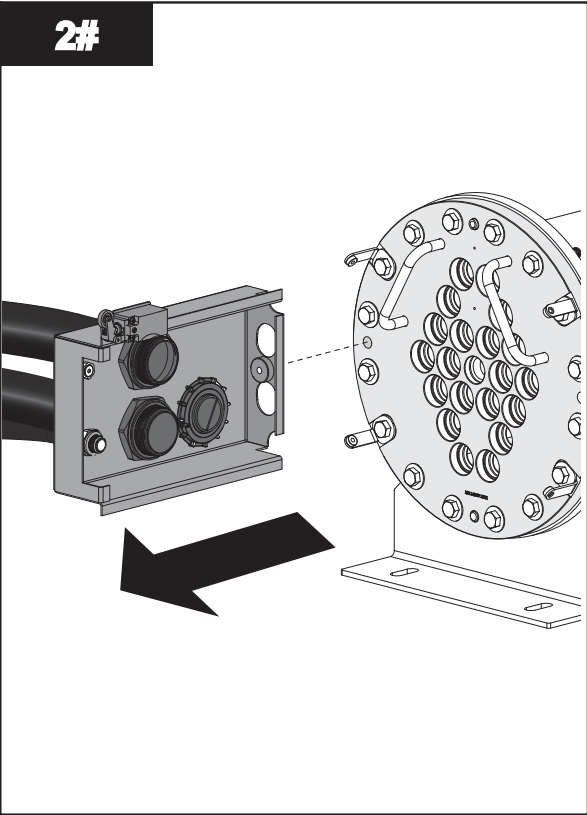
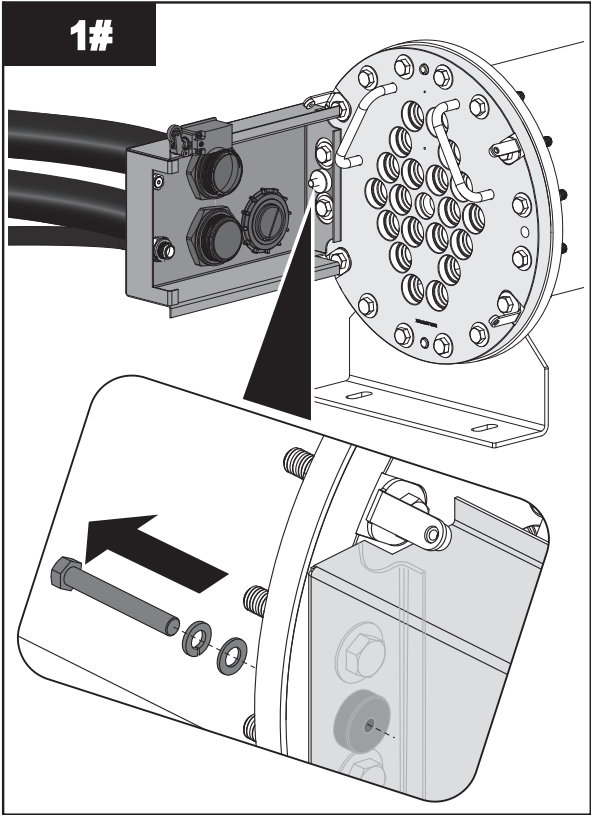
- \* Tasks performed on UV Systems with Skid mounted CPP.
- # Tasks performed on UV Systems with Standalone CPP.

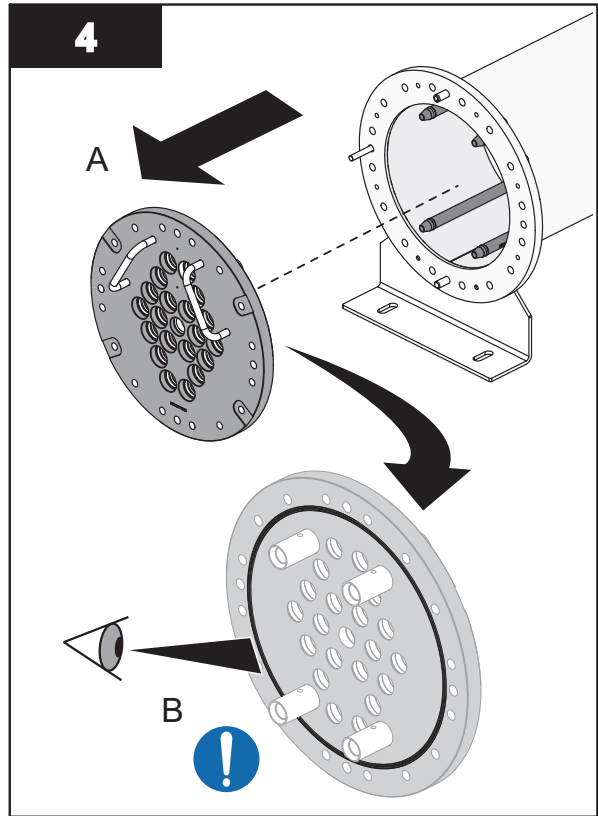
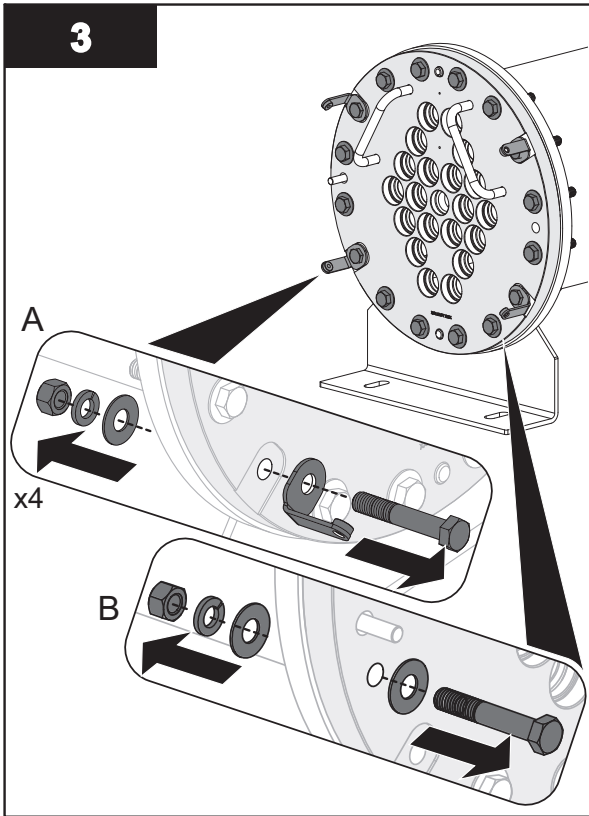


Remove:



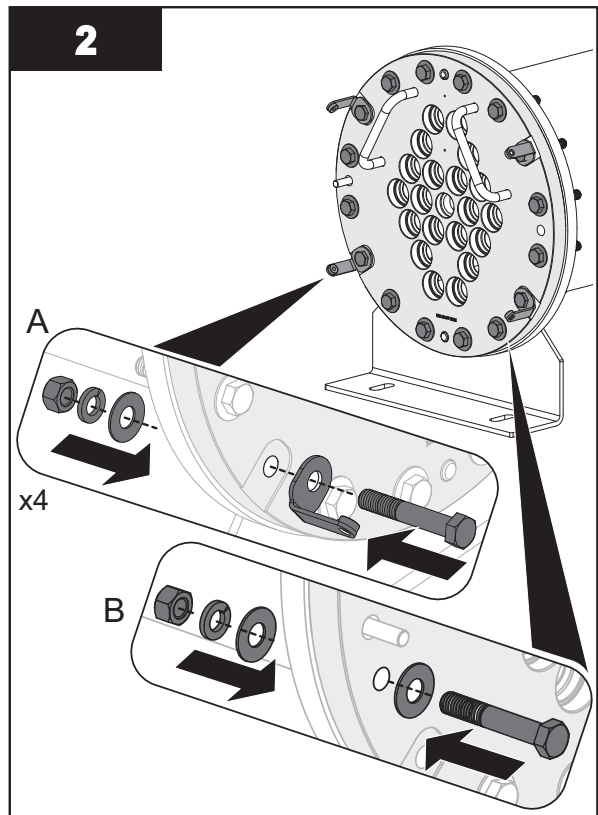
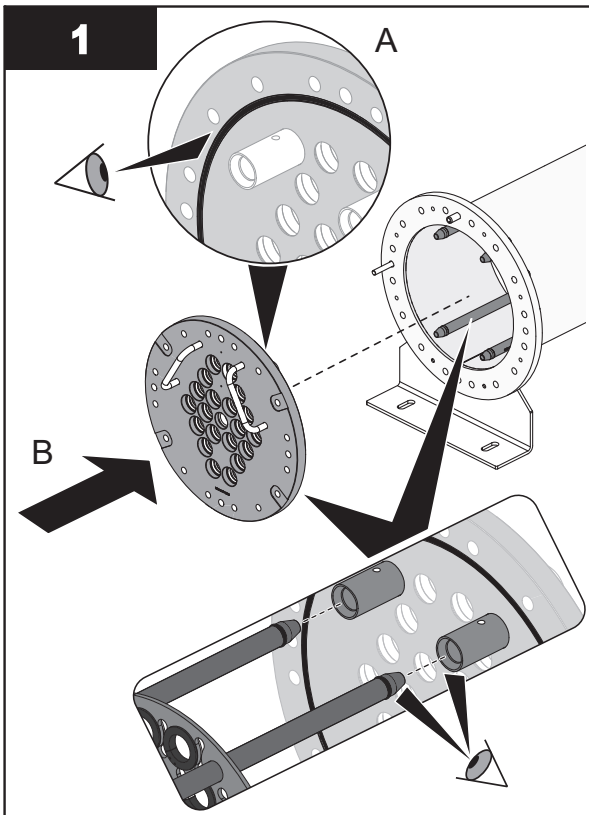
Note: Slide the Junction Box away from the UV Chamber End Plate.





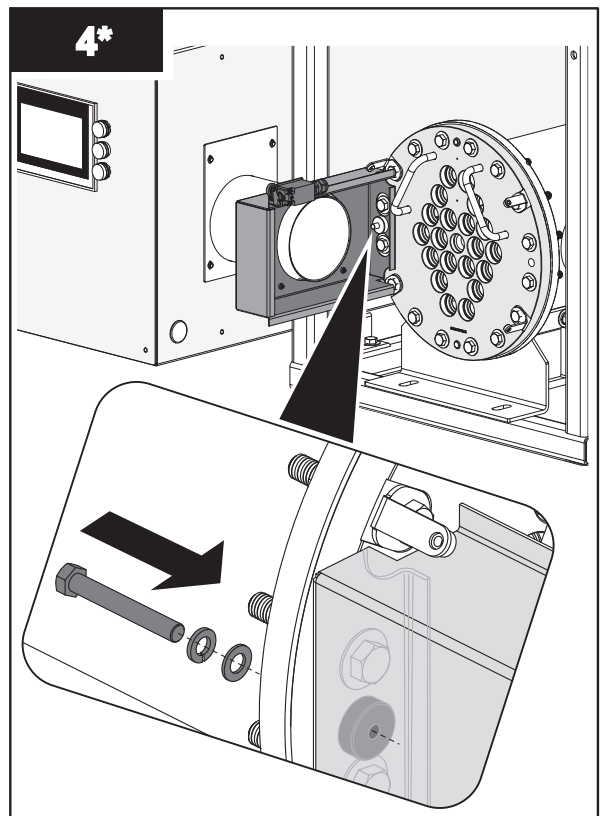
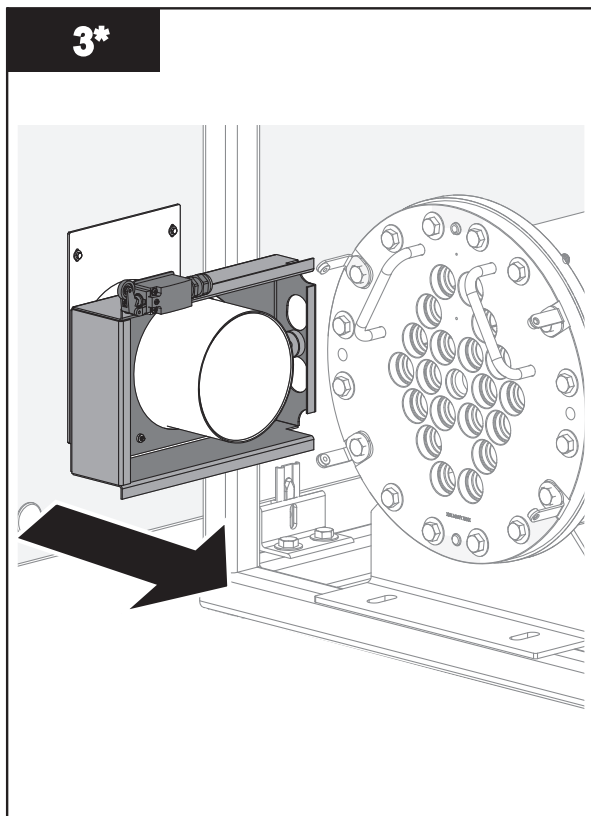
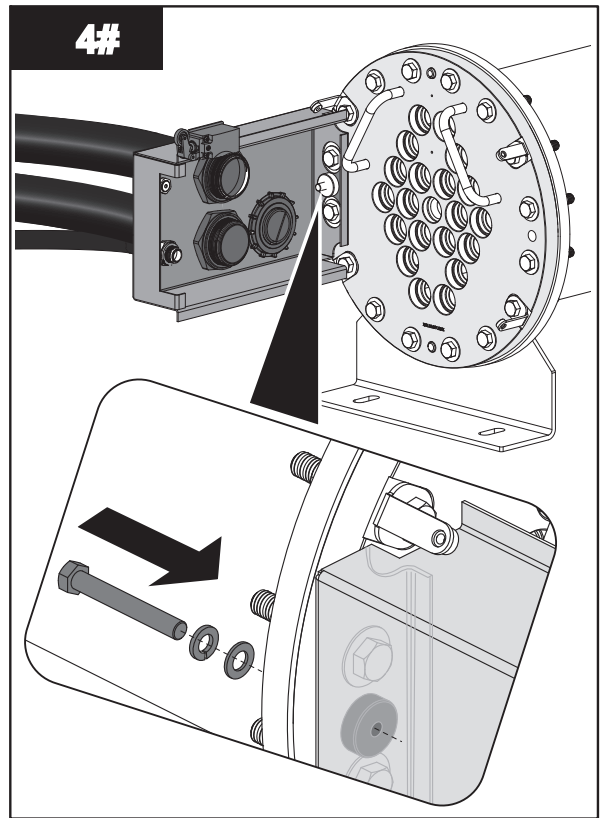
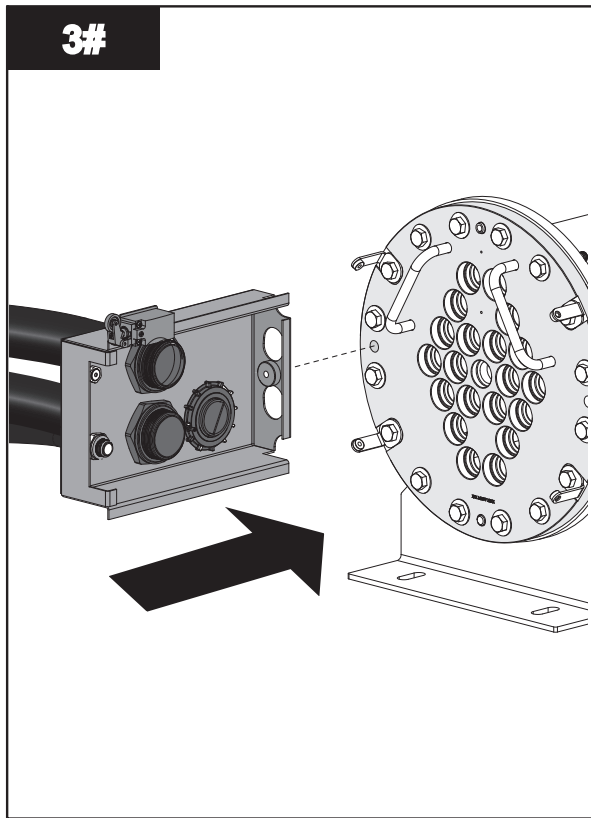
**Note:** Inspect the End Plate O-Ring for signs of damage, cracks or wear. Replace if required. Refer to [Section 9.9.2](#).

**Install:**



- Notes:**
- 1) Make sure the End Plate O-Ring is properly seated in the groove before installing the UV Chamber End Plate.
  - 2) Make sure that the O-Ring does not pinch when installing the UV Chamber End Plate.
  - 3) Align the Baffle Plate Guide Rods with the locator sockets on the front UV Chamber End Plate.

**Note:** Torque the bolts in a star pattern to 58.3 N.m (43 lbf.ft).



**Note:** Slide the Junction Box towards the UV Chamber End Plate.

5. When service is complete, assemble the prerequisites in the reverse order of the disassembly.

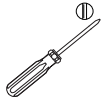
### 9.9.2 Remove and Replace End Plate O-Ring

**Prerequisites:**



- Remove the UV Chamber End Plate. Refer to [Section 9.9.1](#).

**Tools:**



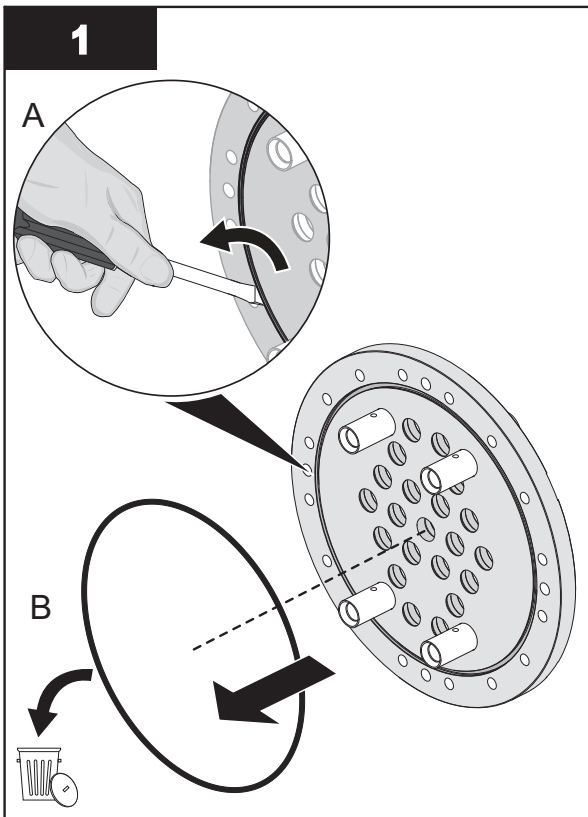
**Materials:**



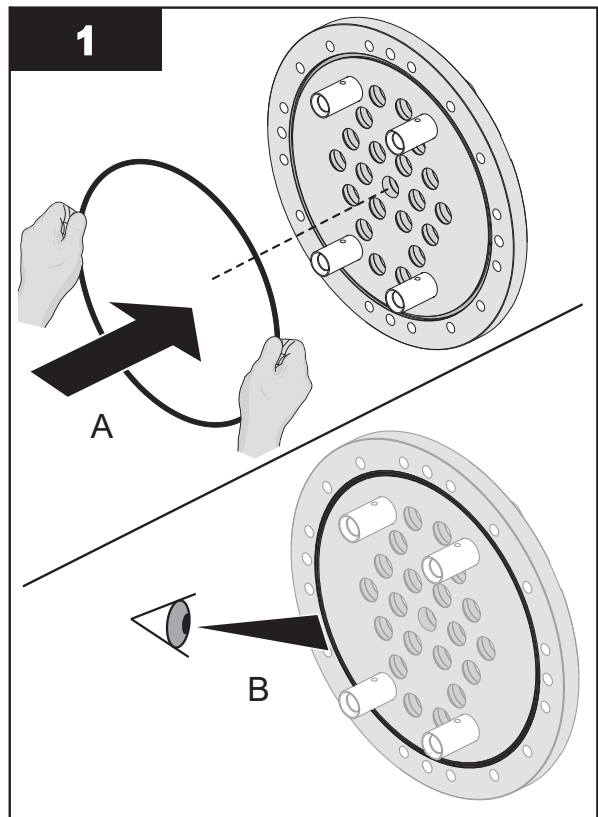
- New End Plate O-Ring

**Procedure:**

**Remove:**



**Install:**



**Note:** Make sure the End Plate O-Ring is properly seated in the groove.

## 9.10 Baffle Assembly

### 9.10.1 Remove and Replace a Baffle Assembly

Prerequisites:



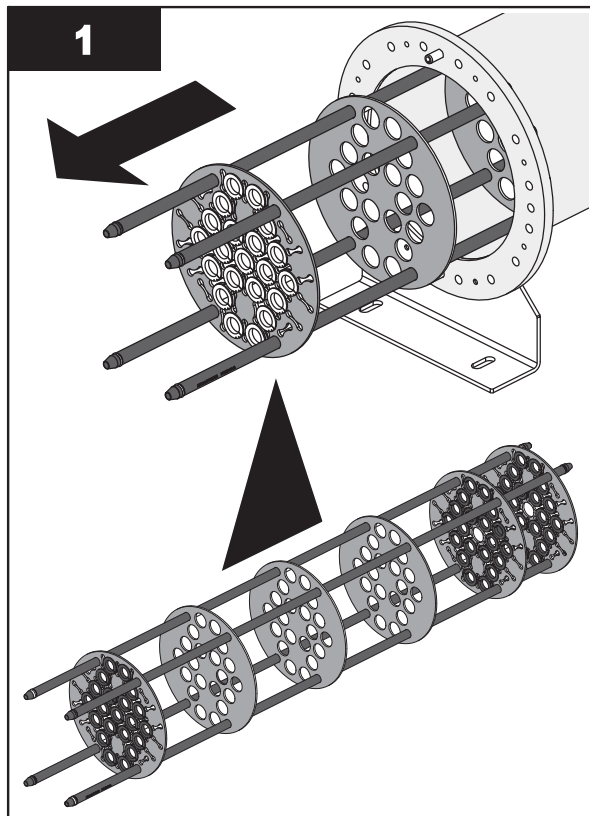
- Remove the UV Chamber End Plate. Refer to [Section 9.9.1](#).

Materials:



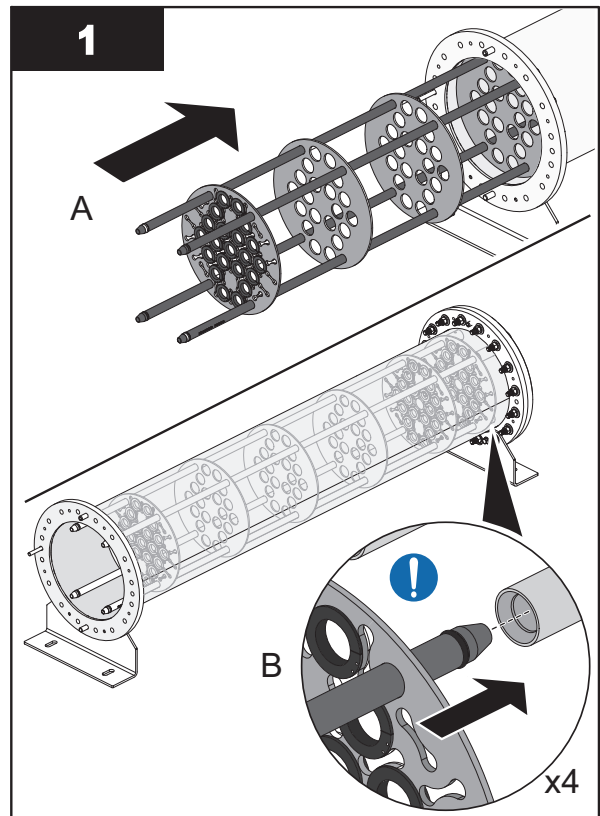
Procedure:

Remove:



**Note:** Remove the Baffle Assembly slowly and evenly.

Install:



**Note:** Align the Baffle Plate Guide Rods with the locator sockets on the rear UV Chamber End Plate.

- When service is complete, assemble the prerequisites in the reverse order of the disassembly.

### 9.10.2 Remove and Replace a Sleeve Bushing

Prerequisites:



- Remove Baffle Assembly. Refer to [Section 9.10.1](#).

Tools:



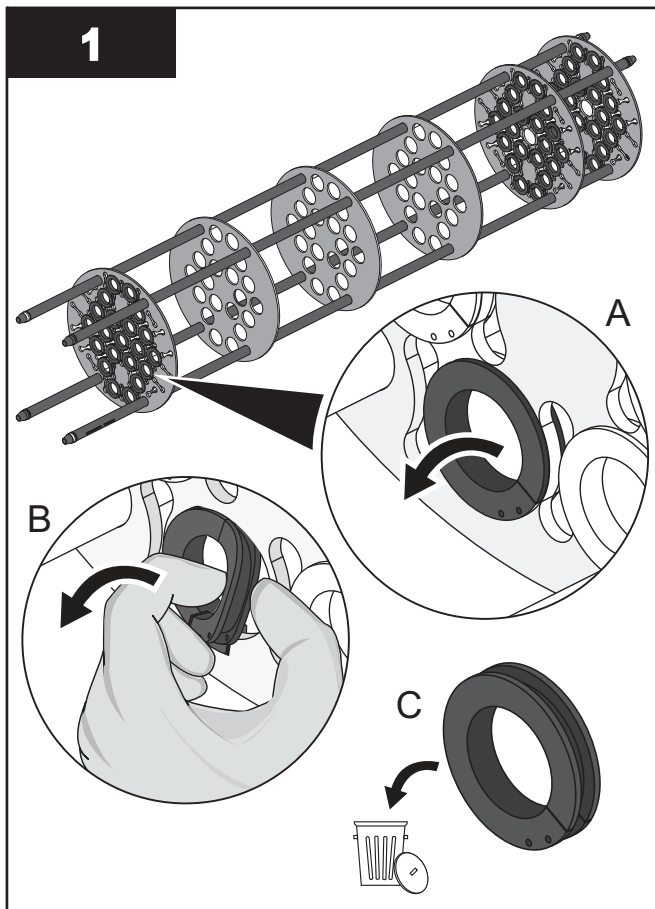
Materials:



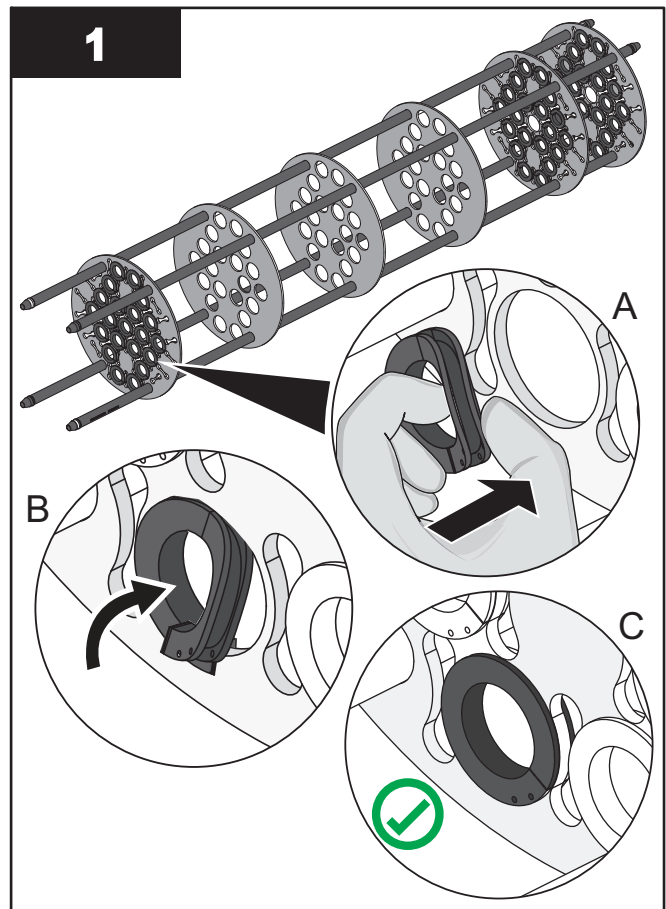
- New Sleeve Bushing

Procedure:

Remove:



Install:





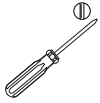
### 9.10.3 Remove and Replace a Baffle Plate Guide O-Ring

Prerequisites:



- Remove Baffle Assembly. Refer to [Section 9.10.1](#).

Tools:



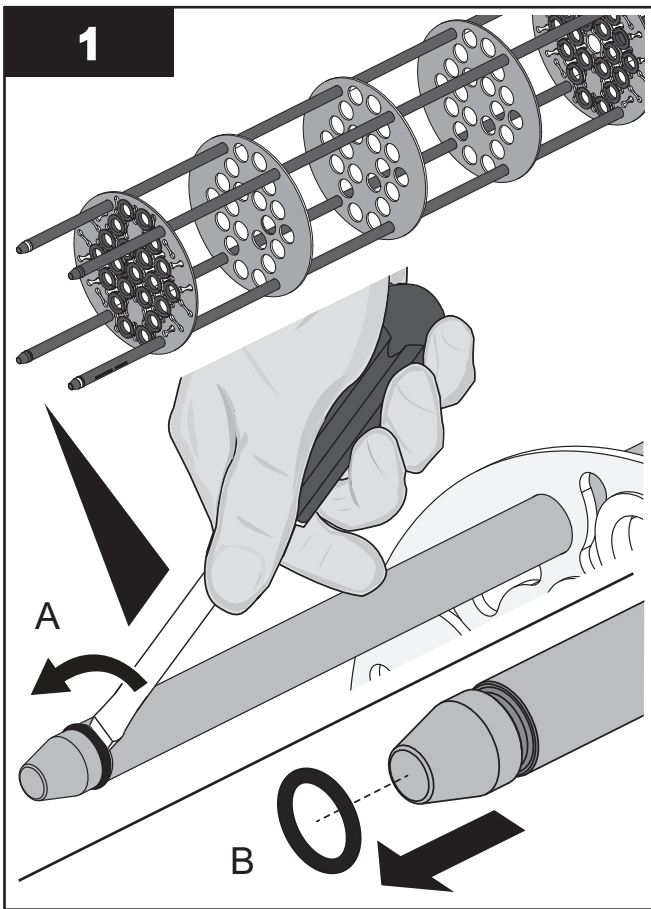
Materials:



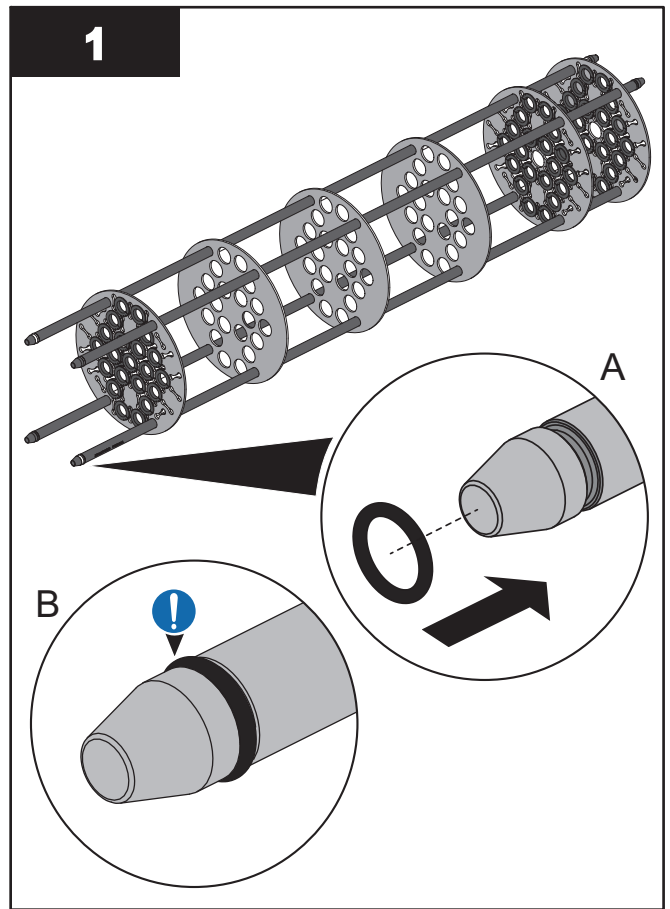
- New Baffle Plate Guide O-Ring

Procedure:

Remove O-Ring:



Install O-Ring:



### 9.11 Control Power Panel

#### 9.11.1 Remove and Replace a Lamp Driver

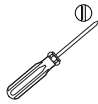
Replace a Lamp Driver when a Lamp Driver failure alarm occurs.

**Prerequisites:**



- Shut down the UV System. Refer to [Section 5](#).
- Apply lockout tag out devices as necessary. Refer to [Section 4](#).
- Wait 5 (five) minutes to allow stored energy to dissipate.
- Record the number that is selected on each rotary switch on the Lamp Driver (address switches).

**Tools:**



**Materials:**



- New Lamp Driver
- Wiring Diagram

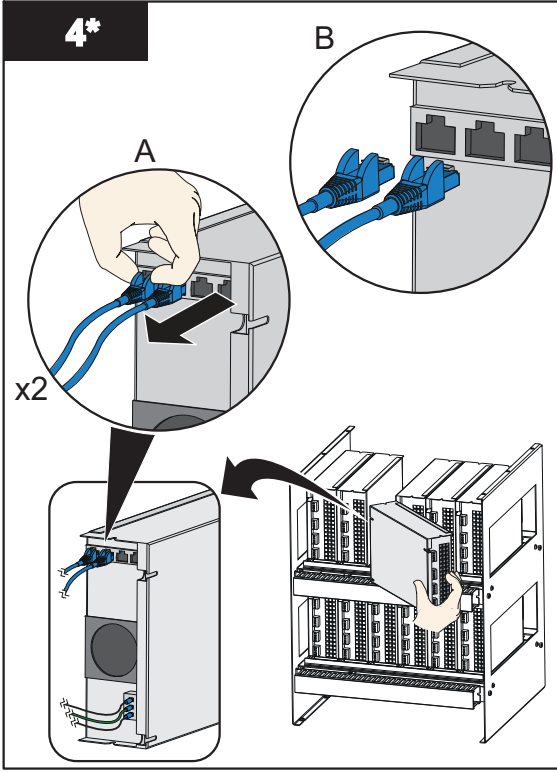
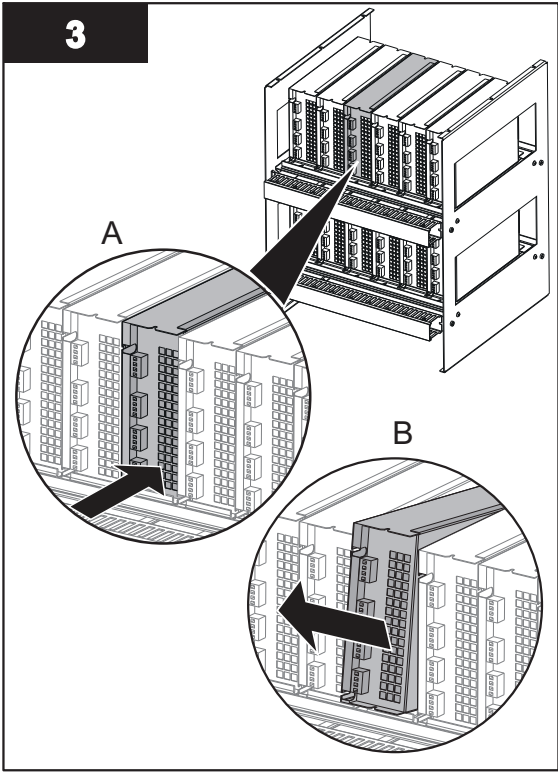
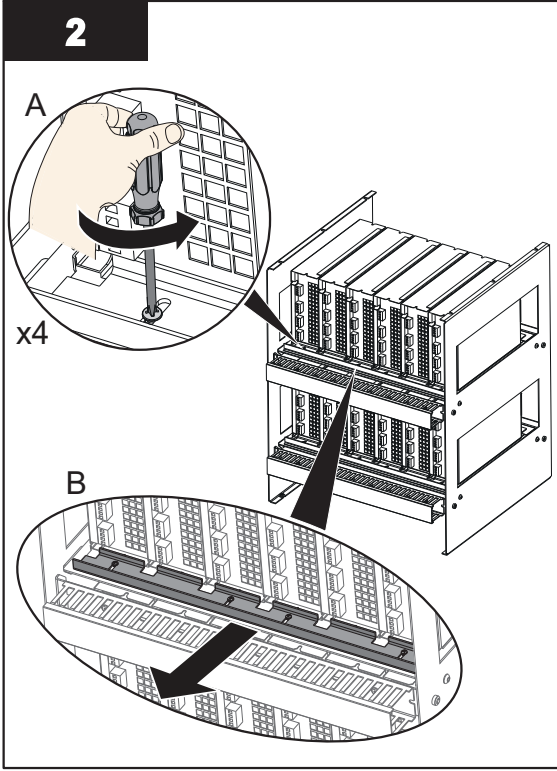
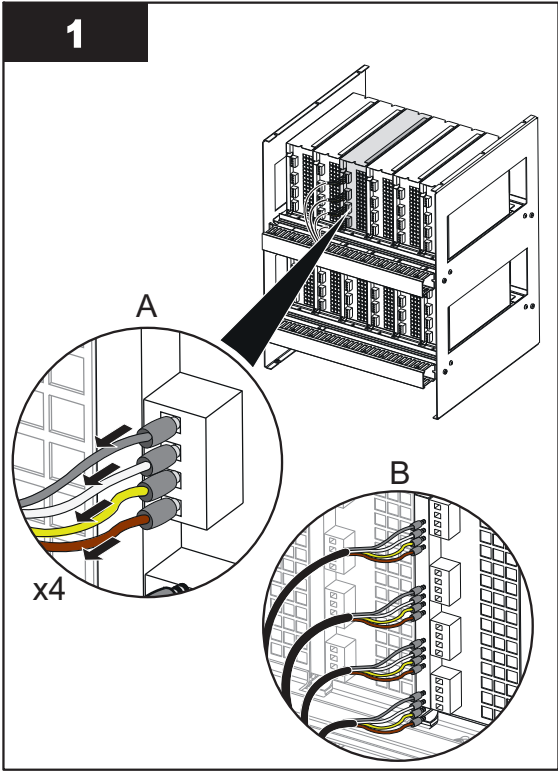
**Procedure:**

\* Tasks performed on all except the last Lamp Driver in series.

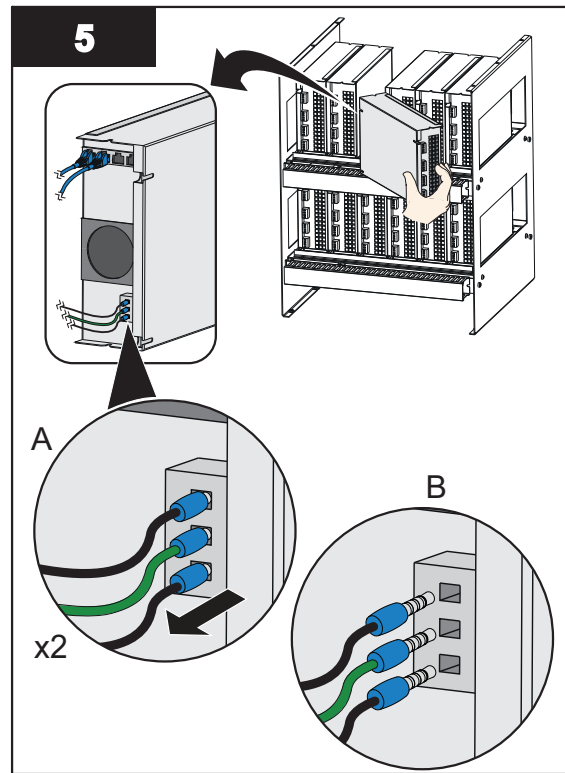
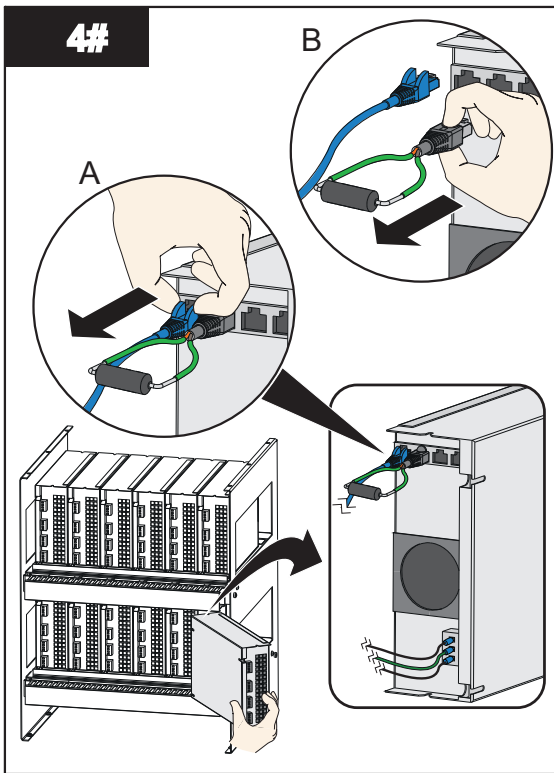
# Tasks performed on the last Lamp Driver in series.



Remove:

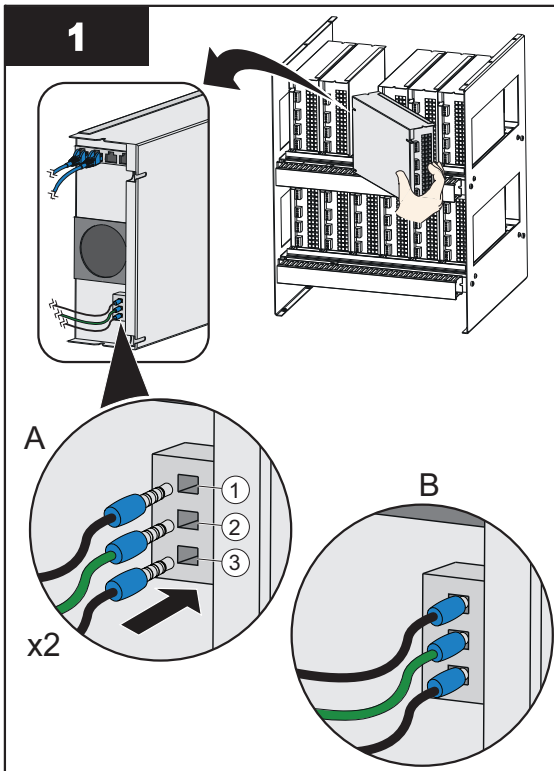


Note: Disconnect the Ethernet cables from the Lamp Driver.

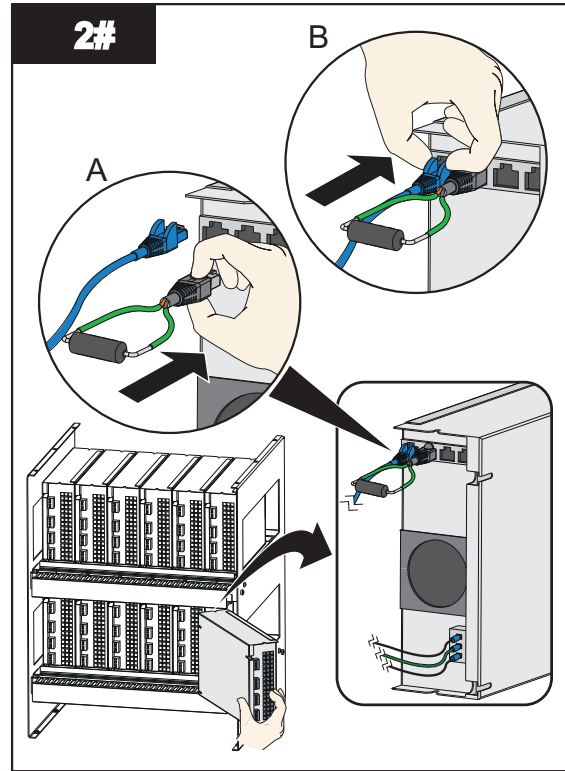


**Note:** Disconnect the Ethernet cable and terminating resistor from the Lamp Driver.

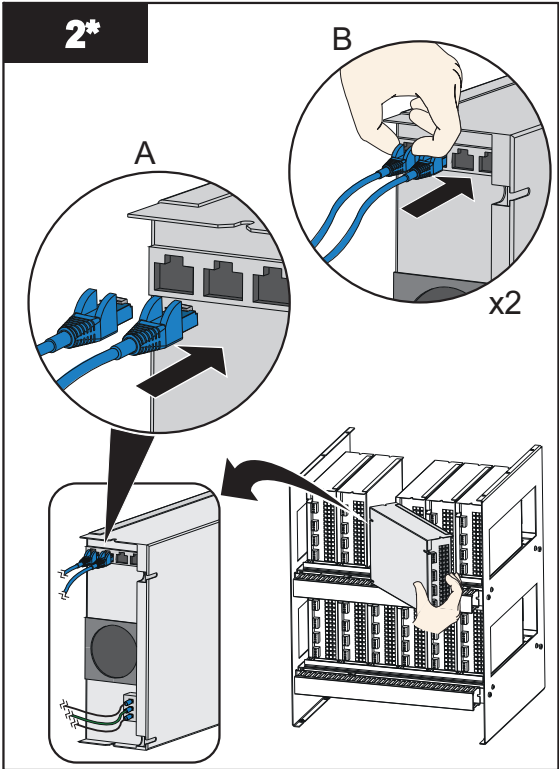
**Install:**



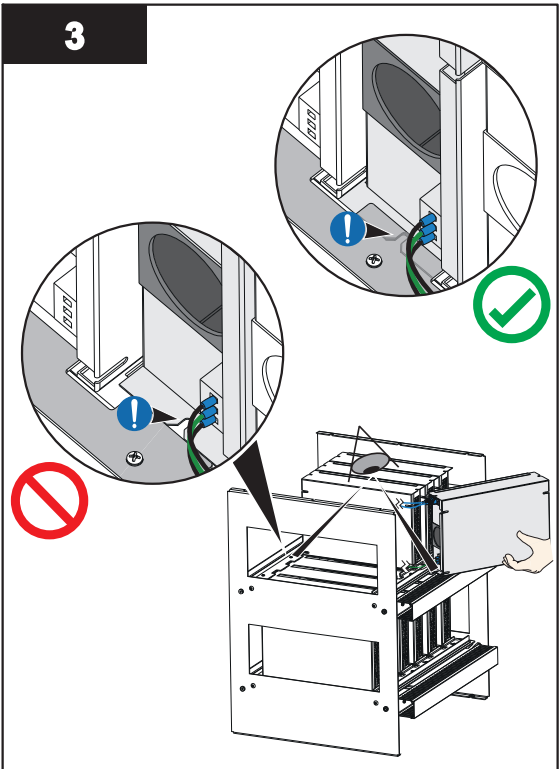
**Note:** Install wires in order. 1=Neutral, 2 = Ground, 3 = Line.



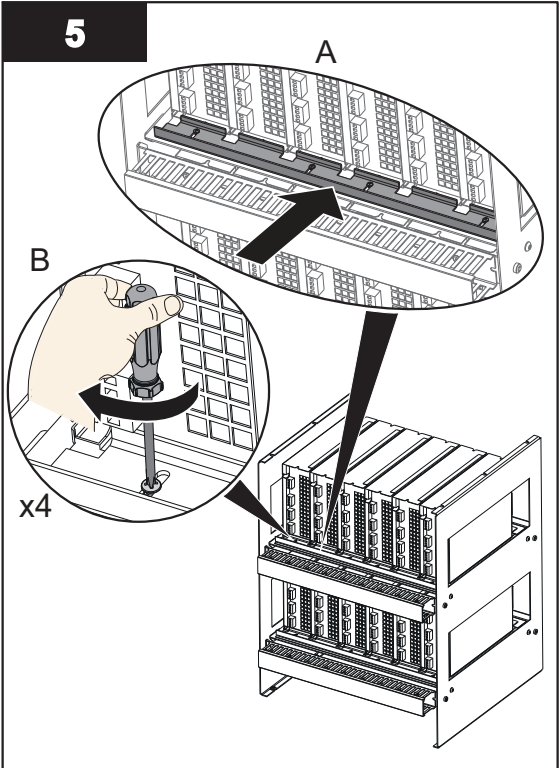
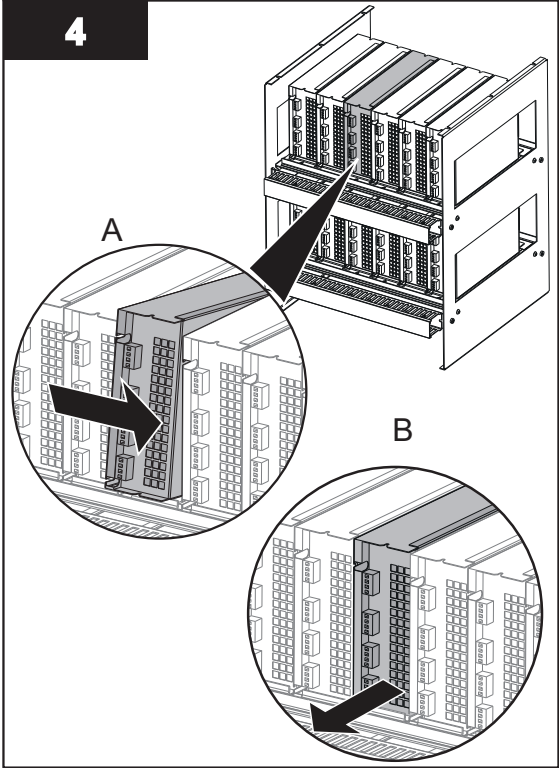
**Note:** Connect the Ethernet cable and terminating resistor to the Lamp Driver.

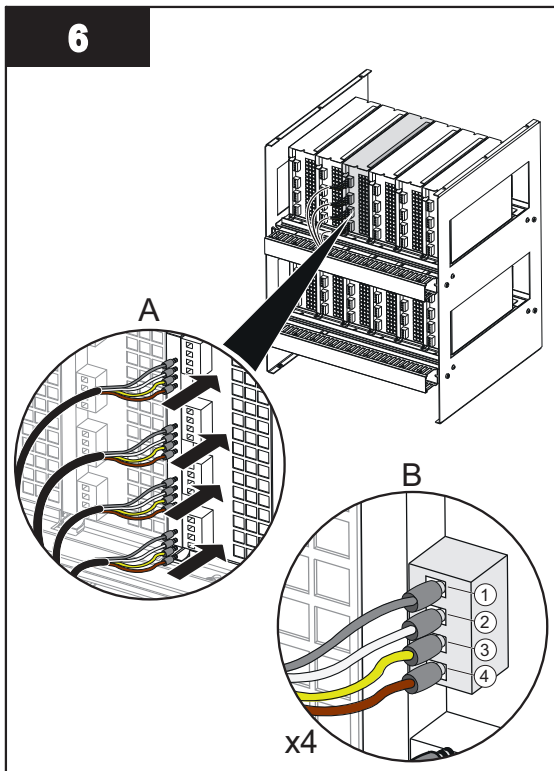


**Note:** Connect the Ethernet cables to the Lamp Driver.



**Note:** Make sure the notched tab on the backside of the Lamp Driver is fully seated under the mounting bar tab.





**Note:** Install wires in order. 1 = Grey Wire, 2 = White Wire, 3 = Yellow Wire, 4 = Brown Wire

7. Change the Rotary Switch addresses on the new Lamp Driver to match the addresses on the removed Lamp Driver.
8. Repeat steps for other Lamp Drivers if required.

When service is complete, assemble the prerequisites in the reverse order of the disassembly.

### 9.11.2 Air Filters

An air filter is provided for intake fans. The fans are located on the bottom or side of the Control Power Panel. Visually inspect the air filter once a week to see if any debris or film has settled by snapping off the cover and replacing the filter as necessary.

### 9.11.3 Cooling Fan

If equipped, check the CPP while in normal operating mode for airflow at the exhaust ports and that no obstructions are present. If there is diminished or no airflow, replace fan (s) immediately.

### 9.12 Clean the UV Chamber

Use a soft cloth with soap and water or any commercial stainless steel cleaner on the outside of the UV Chamber.

### 9.13 Clean in Place (CIP)

Refer to Document Number **DC0A0601-011** for the Clean in Place procedure.

# Section 10 Troubleshooting

## ⚠ DANGER



Obey all warning and caution statements. Refer to [Section 2](#).

Read and understand this manual before operating this equipment. Read all user documentation before performing operations, inspections, repair, or maintenance on this equipment.



Only competent personnel should undertake operation, repairs, maintenance, or servicing of equipment described in this section of the manual. If you do not understand the information or procedure explanations in this manual, STOP and contact your Service Provider for assistance.

## NOTICE

Injury or damage to the equipment due to improper testing, handling or maintenance will not be covered under the manufacturer's warranty and is the responsibility of the individual performing the troubleshooting. If there is any question about a procedure, contact Aquafine Corporation® before service.

### 10.1 Alarms

Alarm	Description
UV Chamber Temperature High	The UV Chamber Temperature Sensor is mounted on the UV Chamber End Plate. If the UV Chamber End Plate gets too hot, the Sensor shuts down the UV Lamps. Safely check if the chamber is hotter than 120°F (49°C) using a thermometer. The sensor is connected in the Normally Closed configuration.
Chamber End Cap is Open	The Chamber End Cap Sensor confirms that the socket cover is installed properly. When it is not installed properly it will shutdown the UV Lamps. This sensor is connected in the Normally closed configuration.
Enclosure Temperature High	The Enclosure Temperature Sensor is mounted in the Control Power Panel. If the inside of the electrical enclosure gets too hot, the sensor will shut down the UV Lamps. Safely check if the enclosure is hotter than 122°F (50°C) using a thermometer. This sensor is connected in the Normally Closed configuration.
ELCB Tripped in Enclosure	This is an optional sensor. The Earth Leakage Circuit Breaker (ELCB) will shutdown the UV Lamps when triggered. This sensor is connected in the Normally Closed configuration.
Lamp Driver # Fault	The specified Lamp Driver is reporting a fault condition.
Lamp Driver # System Error	The indicated Lamp Driver is reporting a system error.
UV Intensity Low	A discrete alarm that is activated based on the optional UV intensity sensor reading. The alarm is triggered if the UV intensity reading is less than the "UVI Low Alarm Setpoint" ( <a href="#">Figure 7</a> ). The value is different for Standard and High Performance UV Lamps so it is important to use the correct type of UV Lamps in the system.
Lamp Out Alert	The Lamp Out Alert (LOA) is triggered when there are one or more failed UV Lamps required for operation.
TOC Signal Out of Range	Triggered when the TOC signal is out of range.
UVI Signal Out of Range	Triggered when the UVI Signal is out of range.
Lamp Hours Exceed End Of Life	Triggered when one or more UV Lamps have reached their end of useful life. Indicates that it is time to replace the UV Lamp(s).  The 'Hours of Operation' of all UV Lamps can be accessed from the Lamp Hours screen ( <a href="#">Figure 6</a> ).  <b>Note:</b> <i>Continued use of the UV Lamps that have exceeded EOL means the system will no longer be able to perform as expected.</i>
Lamp Driver # Communication Fault	The specified lamp driver is not communicating with the PLC.
<b>Data logging (The data is saved every 10 minutes)</b>	
Chamber Temperature - Alarm	Indicates whether or not there is a Chamber Temperature alarm
ControlMode100%	Indicates if the control mode is set to '100% Mode'
ControlModeManual	Indicates if the control mode is set to 'Manual Mode'



## Troubleshooting

Alarm	Description
ELCB - Alarm	Indicates whether or not there is an ELCB alarm
Enclosure Temperature - Alarm	Indicates that the temperature switch in the enclosure is experiencing temperatures above the allowable limit. The enclosure power will shutdown after 15 minutes if the high temperature condition persists.
End Cap Switch - Alarm	Indicates whether or not there is an End Cap Switch alarm
System Power	Indicates the System Power %
TOCActual	Indicates the TOC actual value as received from the customer
TOCSetPoint	Indicates the TOC set point as set by the customer

## 10.2 Alarm Conditions

Condition	Possible Cause	Possible Solution
Chamber Temperature Sensor	No fluid flow	Safely check if the UV Chamber is hotter than 120°F (49°C) using a thermometer. Ensure there is fluid flowing through the UV Chamber when the UV Lamps are on.
	Installation error	Safely check if the UV Chamber is hotter than 120°F (49°C) using a thermometer. Check if the Chamber Temperature Sensor is installed properly.
	Faulty Sensor or wiring	Verify that there is no damage to the sensor or wiring. Replace if damaged.
Chamber End Cap Sensor	Installation error	Verify that the Service End Cap is installed and positioned correctly.
		Verify that the Chamber Socket Cover Sensor is installed and positioned correctly.
	Faulty Sensor or wiring	Verify that there is no damage to the sensor or wiring. Replace if damaged.
Enclosure Temp Sensor	Loose Wiring	Verify that the wiring is not loose. Tighten if necessary.
	CPP Fan failure	Safely check if the CPP enclosure is hotter than 122°F (50°C) using a thermometer. If it is too hot check if the Fan Breaker is ON and if it is working correctly.
	Installation error	Safely check if the enclosure is hotter than 122°F (50°C) using a thermometer. Check if the Chamber Temperature Sensor is installed and working correctly.
	Faulty Sensor or wiring	Verify that there is no damage to the sensor or wiring. Replace if damaged.
Enclosure ELCB Sensor	There is a wiring error or insulation failure causing the current carrying conductors to come in contact with the electrical enclosure	Check if all the wires insulation is intact and if there are any loose wires in the Control Power Panel.
Lamp Driver Fault Present	Failed Lamp Driver	Inspect the small fan inside the Lamp Driver turns on when the UV Lamp are powered ON. If the fan is off and the Lamp Driver is hot to touch, replace the Lamp Driver ( <a href="#">Section 9.11.1</a> )
Lamp Driver System Errors Present	Lamp Driver is not receiving the correct voltage	Verify that the Lamp Driver is getting the correct voltage per the voltage and power requirements of the Lamp Driver.
	Intake air temperature too high or too low	High enclosure temperatures may cause the Lamp Driver to report ambient temperature faults. Inspect cabinet fans for proper operation.
	Internal heatsink temperature too high	Blocked air outlet or blocked air inlet on Lamp Driver.

Condition	Possible Cause	Possible Solution
UVI Too Low	UV intensity reading is less than the UVI Low alarm setpoint	Check if lamps have reached end of life. Replace all EOL UV Lamps. ( <a href="#">Section 9.6.2</a> )
	Failed UV Lamp(s)	Check if the UV Lamp(s) closest the UV intensity sensor port is off. Replace failed UV Lamp(s). ( <a href="#">Section 9.6.2</a> )
	Lamp and/or UVI Sensor Sleeves are fouled	Remove the Sleeves, inspect the Sleeves for scale or debris buildup. Clean the Sleeves ( <a href="#">Section 9.8.2</a> ).
	Improper Connection	Inspect cable and cable connections for signs of damage or corrosion.
	Process Fluid quality has dropped below design limit	Any changes in process fluid transmittance or quality will cause the UVI sensor reading to change. In some applications where fluid is blended, transmittance properties can change. Resolve upstream process.
	Change in Process Fluid Temperature	UV Output of the lamps is sensitive to the process fluid temperature. The setting of the relative UV Intensity 100% set point should be completed at the typical process fluid temperature for the application. For fluid temperatures < 15°C (< 60°F) a period of up to 48 hours of operation may be required to ensure the UVI Sensor output signal has stabilized prior to setting UV Intensity 100% set point.
	Damaged Parts due to heat	The UVI Sensor will be damaged by heat when temperatures exceed 194°F (90°C).
	Incorrect UV Lamp or Lamp Sleeve type installed.	Always use the same type of UV Lamp and Lamp Sleeve (i.e. Standard and High Performance) as was used when the system was purchased. A software change is required to change the UV Lamp and Lamp Sleeve type. Contact your local Distributor or Aquafine support.
LOA (Lamp Out Alert)	Improper Connection	The socket should be inspected to ensure that the UV Lamp connection is tight and no damage is present.
	Failed UV Lamp(s)	Swap the suspected failed UV Lamp with a known working UV Lamp ( <a href="#">Section 9.6.2</a> ). If the error follows the failed UV Lamp, replace the failed UV Lamp. Refer to the Lamp Status Screen on the HMI ( <a href="#">Section 8.3</a> ).
		Remove the UV Lamp ( <a href="#">Section 9.6.2</a> ). Inspect the Lamp Pins for evidence of overheating, moisture, displaced or bent pins (pins are angled at 10 degrees)
		Remove the UV Lamp ( <a href="#">Section 9.6.2</a> ). Inspect the UV Lamp for cracks, breaks or loose ceramic ends.
	Broken Lamp Sleeves	Replace broken Lamp Sleeve ( <a href="#">Section 9.8.1</a> ). <b>Note:</b> Water can cause the lamp sockets to arc, corrosion on the lamp pins, burning of the Lamp Sockets and damage to the electrical components.
Faulty Lamp Driver	Where 2 (two) consecutive UV Lamps are out, the Lamp Driver may be faulty. Replace faulty Lamp Driver ( <a href="#">Section 9.11.1</a> )	
TOC Signal Fault	TOC signal not present but the setting 'TOC Analyzer Present' is set to 'Yes' on Settings 1 page	If a signal from TOC analyzer is not available then the 'TOC Analyzer Present' should be set to 'No' on Settings 1 page
	Incorrect Wiring	Verify that the sensor is wired as per the drawings
	Scaling error	Verify if the TOC scaling on 'Settings 1' page matches the scaling of the TOC analyzer output
UVI Signal Fault	Incorrect Wiring	Verify that the sensor is wired per the drawings

## Troubleshooting

Condition	Possible Cause	Possible Solution
Lamp Hours EOL	One or more UV Lamps have reached the end of their useful life	Replace all EOL UV Lamps ( <a href="#">Section 9.6.2</a> ). Reset the Lamp Hours ( <a href="#">Section 8.3.4</a> ).
Driver Communication Errors	Wiring connection broken	Verify that the cables joining all the Lamp Drivers are good and the wiring connection from the first Lamp Driver to the last is not broken.
	Terminating resistor missing	Verify that the terminating resistor is present in the last Lamp Driver.
	Connection error between PLC and Lamp Drivers	Verify that the communication cable that connects the PLC and the Lamp Driver is wired according to the drawings.

## 10.3 Non Alarm Conditions

### 10.3.1 UV Chamber

Condition	Possible Cause	Possible Solution	
Leaking	Chamber End Plate O-Ring	Ensure that the end plate O-Ring is installed and positioned correctly. Inspect O-Ring for damage, cracks or wear, replace if required. ( <a href="#">Section 9.9.2</a> )	
	Faulty gasket	Inspect gaskets for signs of damage, wear or deterioration. Replace if required. ( <a href="#">Section 7.3.5</a> )	
	Sleeve Bolt (washer, O-Ring)		Ensure that the Sleeve Bolt Washer is installed and positioned correctly. Inspect washer for damage, cracks or wear, replace if required. ( <a href="#">Section 9.8.1</a> )
			Ensure that the Sleeve O-Ring is installed and positioned correctly. Inspect O-Ring for damage, cracks or wear, replace if required. ( <a href="#">Section 9.8.1</a> )
			Ensure the Sleeve Bolt is tightened to 100 lbf.in (11 N-m). DO NOT overtighten. ( <a href="#">Section 9.8.1</a> )
	Optical Sensor	Ensure that the Optical Sensor is installed and positioned correctly. Ensure the LED on the Sensor is green.	
	UV Chamber pressure exceeds design limit	Depressurize the UV Chamber ( <a href="#">Section 9.3</a> ).	
	Broken Lamp or UVI Sensor Sleeves	Inspect the ends of the Lamp and UVI Sensor Sleeves for cracks or chips. Replace a broken Sleeve. ( <a href="#">Section 9.8.1</a> )	
	Damaged Parts due to heat	Excessive heat can distort the plastic material, resulting in compression of the O-Ring seal. Replace O-Ring(s). ( <a href="#">Section 9.8.1</a> and <a href="#">Section 9.9.2</a> ).	
	Water Hammer	Water hammer pressure can be 5 to 10 times higher than the static pressure of a water system and can cause leaking and/or breakage to Lamp Sleeves. Open shut off valves gradually to fully open state.	



### 10.3.2 UV Lamp

Condition	Possible Cause	Possible Solution
Premature Lamp Failure	Lamp Cycling	Systems in which the UV is turned ON/OFF frequently (more than 3 times) will cause the UV Lamp filament damage.
	Low Electrical Power	The electrical power should be within 5% of the name plate voltage. Small transformers may be required to boost low voltages.
	Improper Electrical Connection	Vibration can cause the electrical connects to become loose. The connection should be inspected and repaired.
	Mechanical Vibration	Vibration from water hammer, pumps, and unsupported piping can cause excess stress to the lamp filament and equipment. Take measure to reduce vibration by controlling flow. Ensure proper connection of all pipings.

### 10.3.3 Lamp Socket

Condition	Possible Cause	Possible Solution
Lamp Socket Burning	Defective Lamp Socket	A defective Lamp Socket can cause a Lamp Socket to fail and burn. Within the Lamp Socket assembly are metallic receptacles. If the receptacles do not make proper contact with the lamp pins, a high resistance short will occur, eventually resulting in heat buildup in the interior of the socket.  Replace Lamp Socket and verify proper connection.
	Corroded Lamp Pins	Corrosion of the lamp pins and socket pins can cause a high resistance short.  Replace UV Lamp ( <a href="#">Section 9.6.2</a> ) and Lamp Socket and verify proper connection.
	Lamp connection	The UV Lamps operate under high voltage. If the lamp pins and socket are not properly engaged, the connection can create an electrical arc, eventually generating enough heat to melt the components.  Replace UV Lamp ( <a href="#">Section 9.6.2</a> ) and Lamp Socket and verify proper connection.
	Faulty Lamp Driver	The Lamp Driver controls the electrical power to the UV Lamps. If there is a problem with the Lamp Driver, which results in UV Lamp flickering or over-powering, damage can be done to the lamp connector assembly.  Replace Lamp Driver ( <a href="#">Section 9.11.1</a> )

## Troubleshooting

### 10.3.4 UVI Sensor

Condition	Possible Cause	Possible Solution
UVI Sensor Reading Declining	Failed UV Lamp(s)	Inspect the UV Lamp. Replace the UV Lamp, if required. ( <a href="#">Section 9.6.2</a> )
	UV Lamps have reached End of Life	Replace the UV Lamp ( <a href="#">Section 9.6.2</a> ) <b>Note:</b> Continued use of the UV Lamps that have exceeded EOL means the system will no longer be able to perform as expected.
	Lamp and/or UVI Sensor Sleeves are fouled	Remove the Sleeves, inspect the Sleeves for scale or debris buildup. Clean the Sleeves ( <a href="#">Section 9.8.2</a> ).
	Sensor Window is Fouled	Clean UVI Sensor Window ( <a href="#">Section 9.7</a> ).
	Process fluid quality has dropped below design limits.	Any changes in fluid transmittance or quality will cause the UVI sensor reading to change. In some applications where fluid is blended, transmittance properties can change. Resolve upstream process.
	Improper Connections	Inspect cable and cable connection for signs of damage or corrosion.
	Damaged Parts due to heat	The UVI Sensor will be damaged by heat when temperatures exceed 194°F (90°C).

### 10.3.5 Control Power Panel

Condition	Possible Cause	Possible Solution
No Display	Power Loss	Check incoming power to CPP.
	Faulty Wiring	Check for faulty, damaged or loose wiring connections.
UV Lamps Will Not Turn ON	Power Loss	Check incoming power to CPP.
	Blown fuse/circuit breaker	Replace fuse or reset circuit breaker after checking for electrical shorts.

# Section 11 Replacement Parts and Accessories

Contact Aquafine Corporation® with the listed information to order replacement parts.

Provide the:

- Product name and model number (refer to the front of this manual)
- Part number and description of the replacement part or accessory

If a replacement part is not listed, contact Aquafine Corporation®.

There are two (2) elastomer types available for use in the UV system. Refer to [Table 5](#) for wetted elastomers types and their intended use. Always refer to site-specific requirements to determine wetted elastomer type required for the provided system.

**Table 5 Wetted Elastomers, Intended Use**

Wetted Elastomer Type	System Application	
	Liquid Sugar	TOC
EPDM - EU1935, FDA	X	
FKM - FDA		X

## 11.1 UV Lamp and Lamp Sleeve

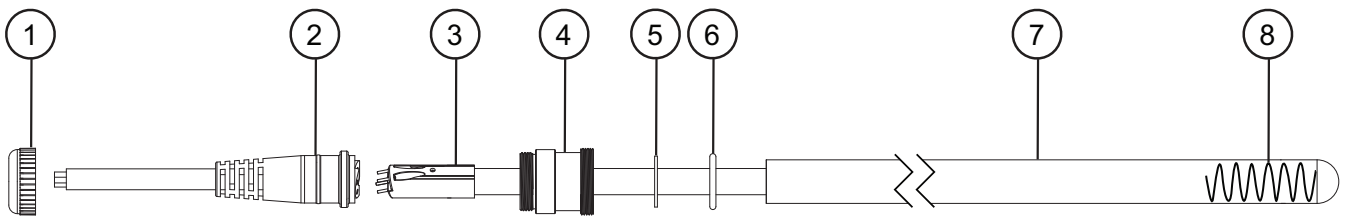


Figure 16 UV Lamp and Lamp Sleeve components

Item	Description	Part Number
1	Sleeve Cup Nut	17489-8
2	Socket Lamp Length, 11 feet Length, 22 feet	52819-4-300-11-080 52819-4-300-22-080
3	<b>System Application: Liquid Sugar</b>	
	<b>UV Lamp, HX 5P, 60" 254nm - Standard</b>	
	Quantity: 1	52885-DS60Z*
	Quantity: 4 pack	52885-DS60Z-04*
	Quantity: 32 pack	52885-DS60Z-32*
	<b>UV Lamp, HX 5P, 60" 254nm - Validated</b>	
	Quantity: 1	52885-DV60Z*
	<b>System Application: TOC</b>	
	<b>UV Lamp, HX 5P 60" 185nm Standard (Natural Quartz)</b>	
	Quantity: 1	52885-TS60N*
Quantity: 4 pack	52885-TS60N-04*	
Quantity: 32 pack	52885-TS60N-32*	
<b>UV Lamp, HX 5P 60" 185nm Standard (Synthetic Quartz)</b>		
Quantity: 1	52885-TS60S*	
Quantity: 4 pack	52885-TS60S-04*	
Quantity: 32 pack	52885-TS60S-32*	

## Replacement Parts and Accessories

Item	Description	Part Number
	<b>UV Lamp, HX 5P 60" 185nm Validated (Natural Quartz)</b> Quantity: 1	52885-TV60N*
	<b>UV Lamp, HX 5P 60" 185nm Validated (Synthetic Quartz)</b> Quantity: 1	52885-TV60S*
4	Sleeve Bolt	52838
5	Sleeve Bolt Washer	53439
6	O-ring, 1 X 1/8 FKM, FDA	002190-214F
	EPDM, EU1935, FDA	002304-214
7	Lamp Sleeve, 60"	
	<b>System Application: Liquid Sugar and TOC</b> Natural Quartz	908116-060
	<b>System Application: TOC</b> Synthetic Quartz	52893
8	Spring	52861

\*This component contains Mercury. Dispose according to Local, State or Federal laws.

**Note:** UV Lamps that have been burned in for a period of 100 hours and measured are validated.

### NOTICE

Always use the same type of UV Lamp and Lamp Sleeve (i.e. Standard or High Performance) as was used when the system was purchased. A software change is required to change the UV Lamp and Lamp Sleeve type. Contact your local Distributor or Aquafine support.

## 11.2 UVI Sensor

**Note:** Applies to TOC applications only.

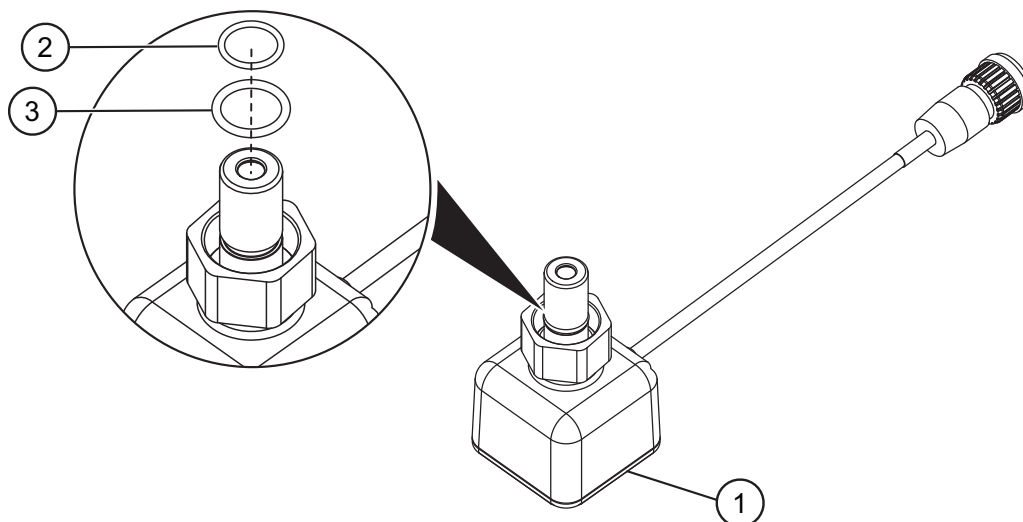


Figure 17 UVI Sensor

Item	Description	Part Number
1	Sensor Assembly	270309R-003
2	O-ring, .426 ID x 0.05, FKM, FDA	002222
3	O-ring, 0.489 ID x 0.07, FKM, FDA	002026

### 11.3 Systems without UVI Sensor

*Note: Applies to TOC applications only.*

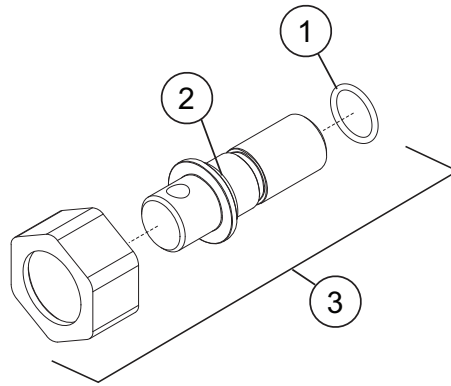


Figure 18 UVI Sensor - Plug Kit

Item	Description	Part Number
1	O-ring, .426ID x 0.05, FKM, FDA	002222
2	O-ring, 1/2 x 1/16, FKM, FDA	002190-014F
3	Sensor Port Plug Kit	52863-V

### 11.4 UVI Sensor

*Note: Applies to Liquid Sugar applications only.*

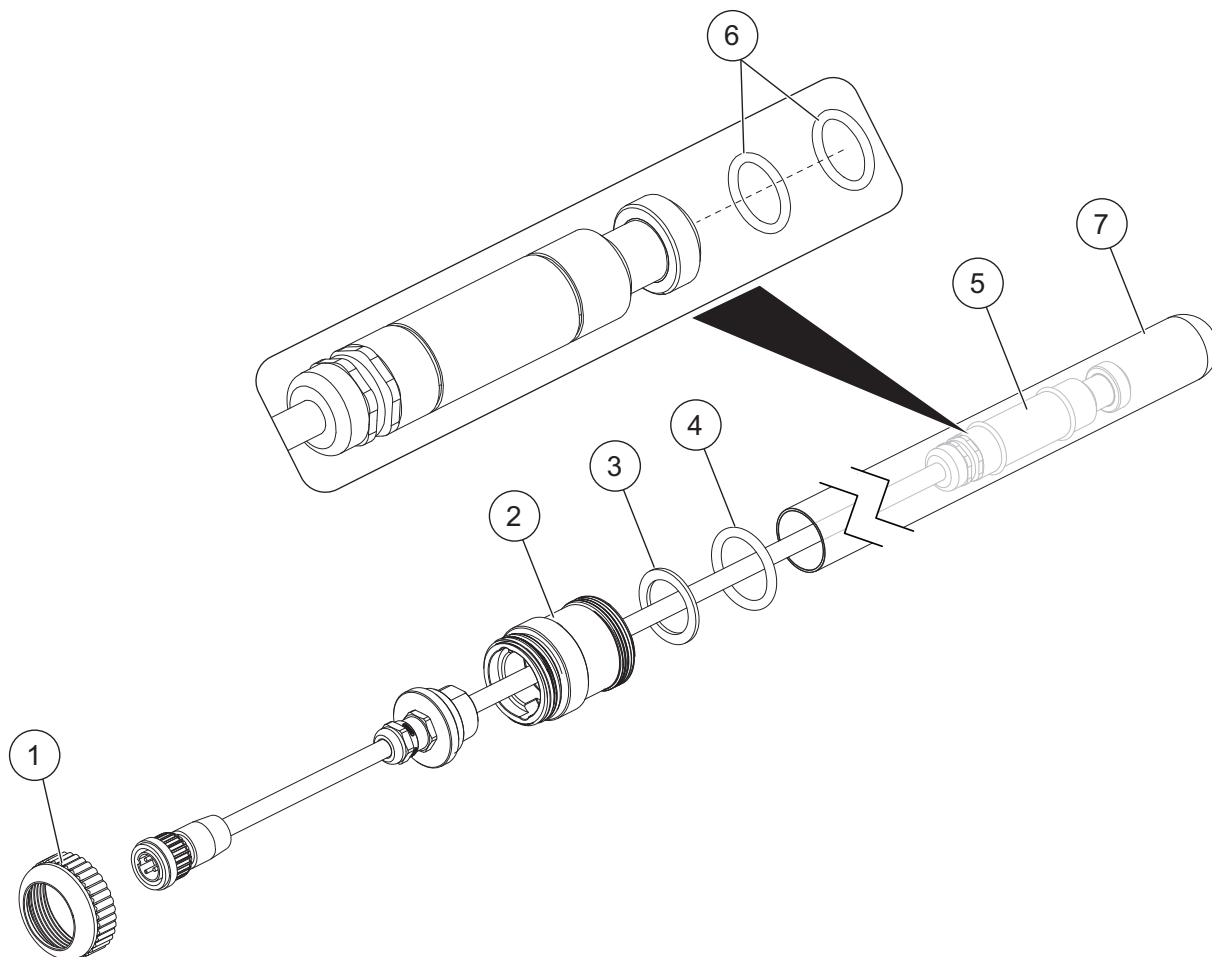


Figure 19 UVI Sensor

Item	Description	Part Number
1	Sleeve Cup Nut	17489-8
2	Sleeve Bolt	52838
3	Sleeve Bolt Washer	53439
4	O-ring, 1 x 1/8, EPDM, EU1935, FDA	002304-214
5	Sensor Assembly	798325
6	O-ring, 1/2 x 1/16, EPDM, EU1935, FDA	002304-014
7	Quartz Sleeve	908116-017

## 11.5 Baffle Assembly

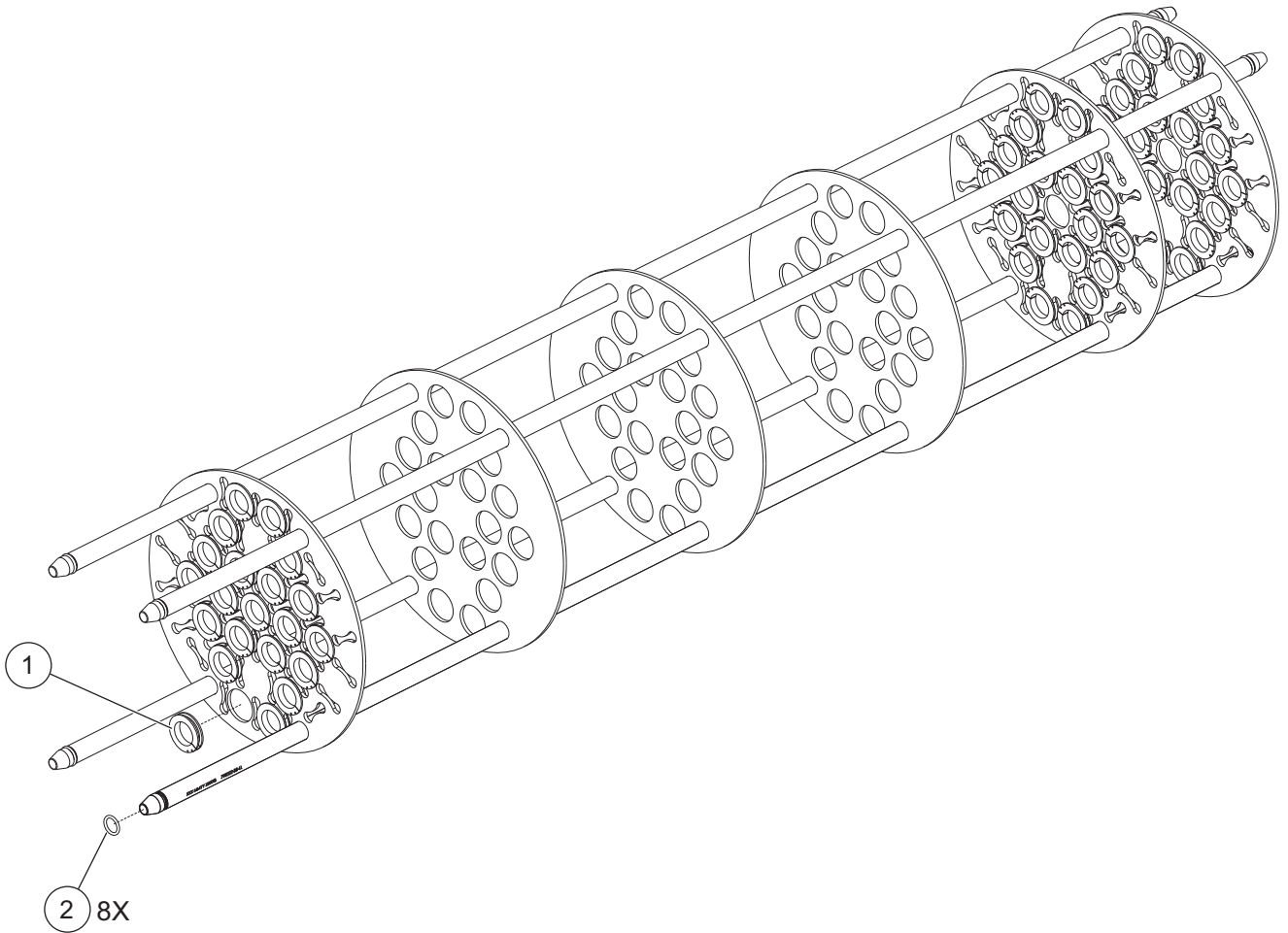


Figure 20 Baffle Assembly

Item	Description	Part Number
1	Sleeve Bushing	798205
2	O-Ring, .605 X .102, FKM, FDA <sup>1</sup>	52796-114
	O-Ring, 5/8 x 3/32, EPDM, EU1935, FDA <sup>1</sup>	002304-114

<sup>1</sup> Refer to [Table 5](#) for wetted elastomer types and their intended use. Always refer to site-specific requirements to determine wetted elastomer type required for the provided system.

### 11.6 UV Chamber

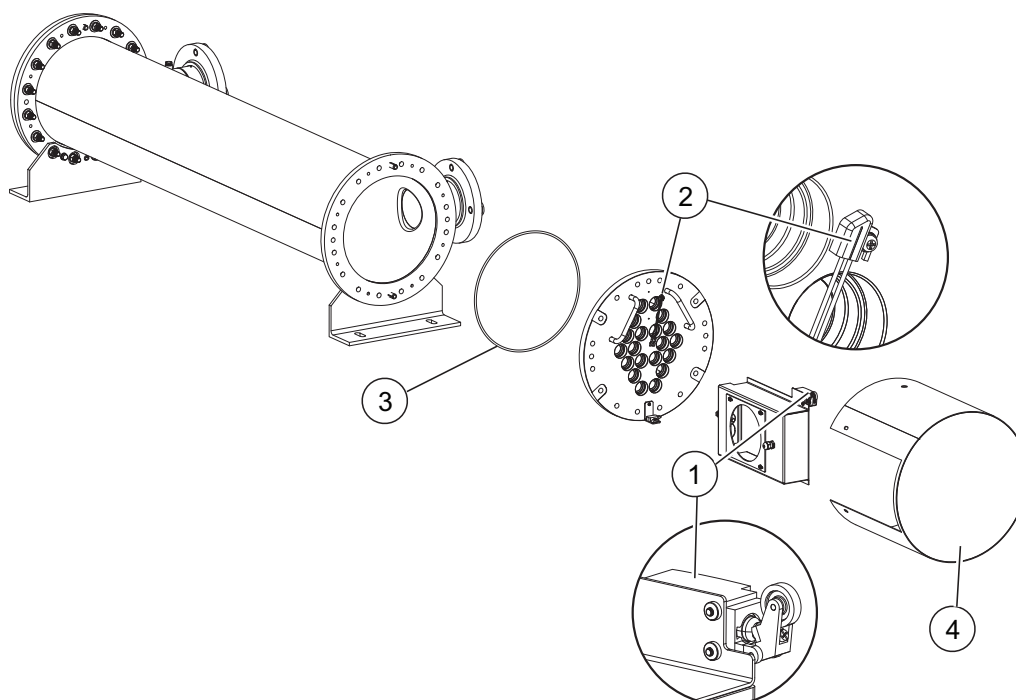


Figure 21 UV Chamber Components

Item	Description	System Model			
		AVT20 / AVT20-HP	AVT36 / AVT36-HP	AVT44 / AVT44-HP	AVT48 / AVT48-HP
		Part Number			
1	Limit Switch	917626-RLVASSY			
2	Temperature Switch, 40C operational temperature	52855			
	Temperature Switch, 55C operational temperature (Liquid Sugar Applications only)	52855-065			
3	O-ring, FKM, FDA <sup>1</sup>	52796-382	52796-384	52796-386	52796-388
	O-ring, EPDM, EU1935, FDA <sup>1</sup>	002304-382	002304-384	002304-386	002304-388
4	Service End Cap Kit	53000-12	53000-14	53000-16	53000-18

<sup>1</sup> Refer to [Table 5](#) for wetted elastomer types and their intended use. Always refer to site-specific requirements to determine wetted elastomer type required for the provided system.



11.6.1 Port Plugs - Flanged Connections - TOC Applications

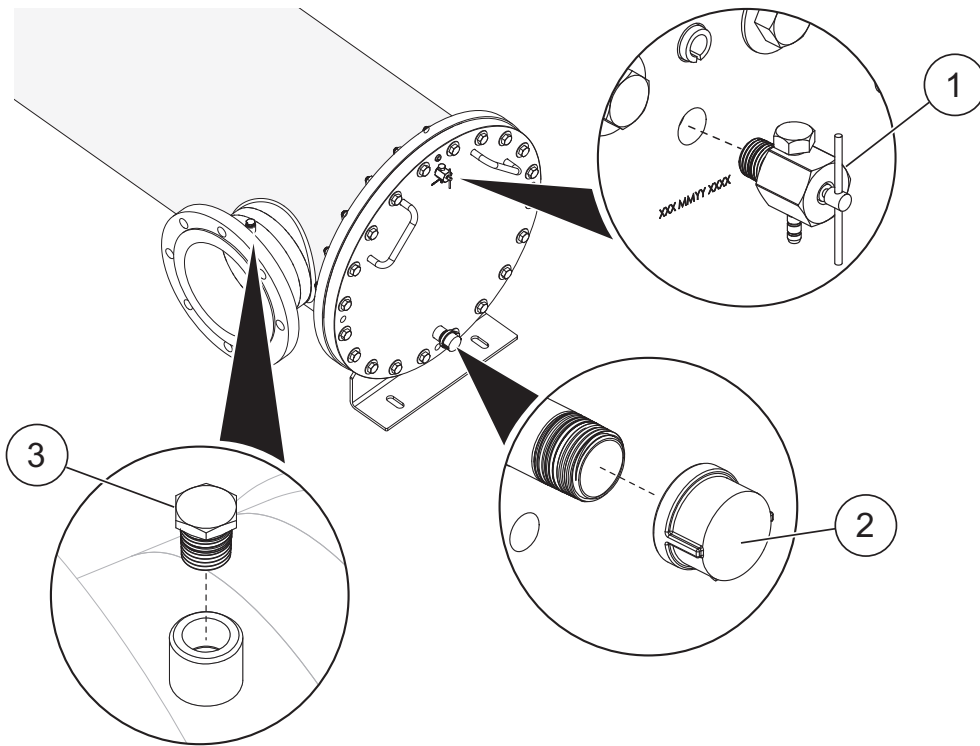


Figure 22 Port Plugs - Flanged Connections

Item	Description	Part Number
1	Valve, Bleed 1/4" MNPT 316	907797-4NBS316
2	Cap, Female 3/4" 316 NPT	53107-1216
3	Sample Port Plug	907782-0422316

11.6.2 Port Plugs - Sanitary Ferrule Connections - Liquid Sugar Applications

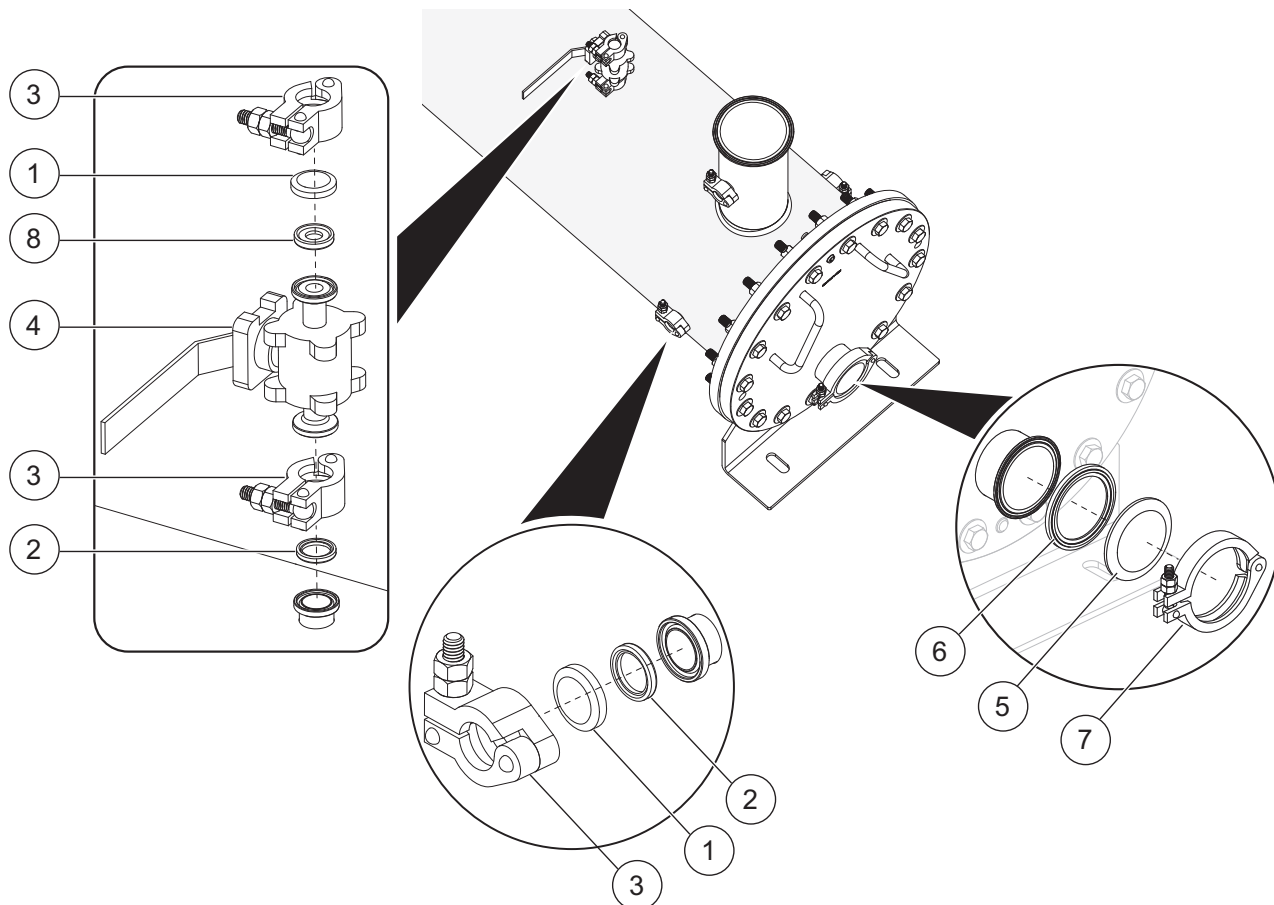


Figure 23 Port Plugs - Sanitary Ferrule Connections

Item	Description	Part Number
1	End Cap, 1/2 & 3/4" Ferrule	793643-001
2	Gasket, Sanitary 3/4"	798291-007
3	Clamp, Sanitary 1/2" & 3/4"	798314
4	Valve, 1/2" Tri-C Ball	798292
5	End Cap, 2-1/2" Ferrule	793643-006
6	Gasket, Sanitary 2.5"	798291-025
7	Clamp, Sanitary 2-1/2" Single Pin Nut	798316
8	Gasket, Sanitary 1/2"	798291-005

## 11.7 Control Power Panel

Refer to Electrical Drawings, Bill of Materials for additional CPP replacement parts.

Item	Description	Part Number
1	Lamp Driver	53126
2	Temperature Sensor Kit (includes Thermostat) Thermostat	52827 53201
3	Cooling Fan, 230VAC 323/353CFM	916850-3243100
4	Cooling Fan Filter, 13" x 13"	916850-3243200
5	Spring Assembly, Gas 60 LB	901711-060
6	Air Filter, 10" x 10" x 1" - Local Panel Only	52984-101001

## 11.8 Miscellaneous

*Note: These components are provided with the system.*

Description	Part Number
Face Shield	906002
Operator Kit (includes 1 Sleeve Removal Tool and 1 Sleeve Bolt Removal Tool)	52929
Sleeve Removal Tool	52923
Sleeve Bolt Removal Tool	52917

