Aquafine Logic®

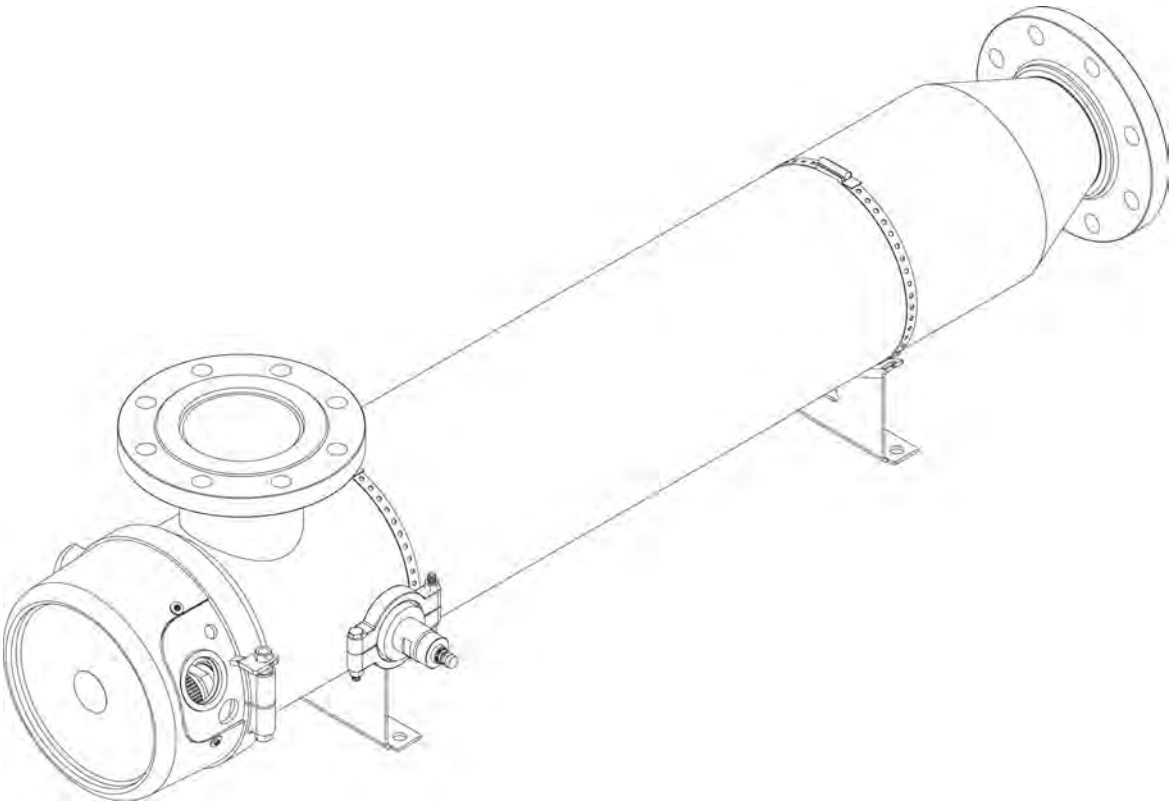
AS Series
Automatic and Non-Wiping Systems

Operation and Maintenance

User Manual

Original Instructions

Edition 11



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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

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.

Table of Contents

Section 1 Specifications

Specifications are subject to change without notice.

UV Chamber	
Material	316L stainless steel
Maximum Weight (dry)	39 kgs (85 lbs)
Maximum Weight (wet)	85 kgs (162 lbs)
I/O Connection	Refer to Layout Drawing
Ambient Relative Humidity	10% to 80% non-condensing
Water Temperature	1°C to 40°C (34°F to 104°F)
Ambient Operating Air Temperature	1°C to 40°C (34°F to 104°F)
Operating pressure (maximum)	10 bar (150 psi)
Hydrostatic pressure test (maximum)	1.5 times Operating pressure
UV Lamp and Lamp Sleeve	
UV Lamp body type	165W input, GA40T6 amalgam, low pressure
UV Lamp overall length	1003 mm (39.5 in.)
Lamp Sleeve bolt	Torque: 10.1 N.m (90 lbf.in)
UV Sensor	
Supply voltage power	24 VDC (12-30 VDC) from the CPP
Maximum operating temperature	50 °C (122 °F)
Maximum Upset Temperature	40 °C (104°F), 24 hours maximum upset duration (UV Sensor must be removed above 40 °C (104°F) i.e. during hot water sanitization.
Control Power Panel (CPP)	
Enclosure rating and material	Refer to Component Label for enclosure rating and material
Lamp Driver	Electronic, one (1) Lamp Driver drives two (2) UV Lamps
Lamp Driver total harmonic distortion	Less than 5% in normal operation range
Weight	Refer to Component Label
Automatic Mechanical Wiping System (AMWS)	
Supply voltage power	208/220/230 VAC
Motor type	1/8 horsepower
System Certification	
UL and CE available	

** This product is intended for use with appropriate residual levels of EPA registered disinfecting chemicals. Specific residual levels of EPA registered disinfecting chemicals may be required by the regulatory agency having authority.*

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

⚠ DANGER
Indicates a potentially or imminently hazardous situation which, if not avoided, will result in death or serious injury.

⚠ WARNING
Indicates a potentially or imminently hazardous situation which, if not avoided, could result in death or serious injury.

⚠ CAUTION
Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE
Indicates a situation that is not related to personal injury.

2.2 Precautionary Labels

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

	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. ***Note:*** *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.*
	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 the components of the system have been exposed to biohazardous waste and / or bioaerosols.

	This symbol indicates a load lifting hazard.
	This symbol indicates a potential overhead crush hazard.
	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 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 the equipment should be secured with a safety device / hook.
	This symbol indicates a safety glasses with side protection is required for protection against UV exposure.
	This symbol indicates a UV rated full face shield is required. Faces shields are to be worn with safety glasses or safety goggles.
	This symbol indicates gloves must be worn.
	This symbol indicates safety boots must be worn.
	This symbol indicates a hard hat must be worn.
	This symbol indicates the operator must read all available documentation to perform required procedures.

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.

⚠ DANGER

Arc Flash and Shock Hazard - Live Electrical Circuit Present. Hazardous Voltage.

- Failure to follow these instructions will result in electrical shock, injury or death from electrocution.
- Devices inside this equipment contain stored energy.
- NEVER work inside this equipment until at least 5 (five) minutes after disconnecting main power to allow stored energy to dissipate.
- Lockout tag out all sources of power before performing any inspection, repair, or maintenance. ***There may be more than one source of power!***

⚠ DANGER

Shock Hazard.

- 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.

⚠ DANGER

Pressurized Device - Impalement Hazard.

- Failure to follow these instructions will result in serious injury or death due to forcible ejection of materials from UV Chamber.
- ALWAYS follow lockout tag out procedures.
- NEVER perform any physical inspection, repair, maintenance or service on UV Chamber unless UV Chamber has been isolated, depressurized and open to atmosphere. Where UV Chambers are interconnected in series and vertically stacked, only the top UV Chamber must be open to atmosphere.

  Exception: *Performing Reference Sensor check in compliance with "Install or Remove a Reference Sensor" in* ***Operation and Maintenance Manual****.*
- NEVER pressurize UV Chamber without Service End Cap properly installed.
- 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.
- ***If a leak is observed, depressurize immediately, drain, repair and retest.***

⚠ 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 12 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.

⚠ CAUTION

Slip and Fall Hazard.

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

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.

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 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.

NOTICE

The **Aquafine Logic®** inactivates Escherichia coli (E. coli) and fecal coliform.

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.

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 70 dB(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.

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
AMWS	Automatic Mechanical Wiping System
BPL	Lamp Driver Power Level
CCB	Communication Control Board (microprocessor)
COMM	Communications
CPP	Control Power Panel
HMI	Human Machine Interface
pcs	Pieces
Qty	Quantity
UV	Ultraviolet

3.4 System Overview

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

Figure 1 shows the UV Chamber components.

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.

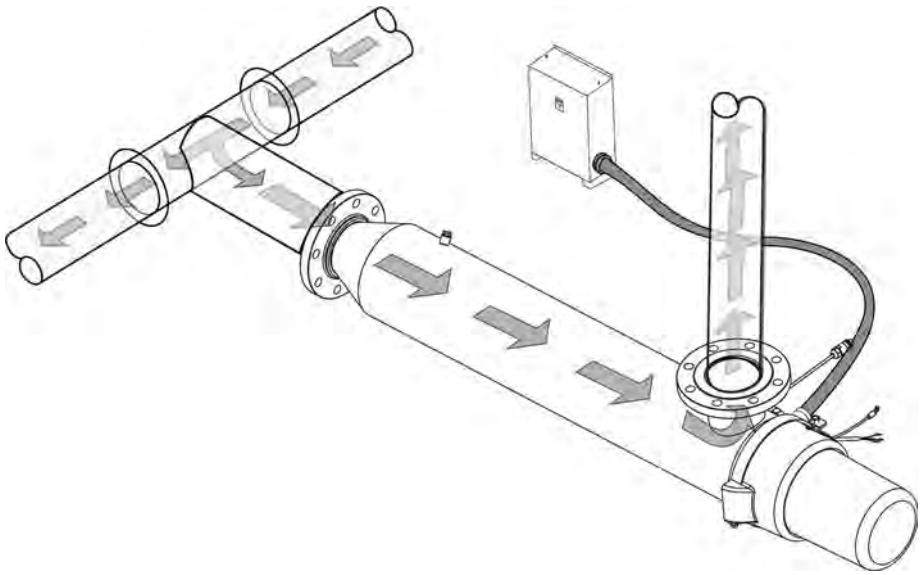


Figure 1 UV System

⚠ 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 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 the system are described in this section.

1. Identify and deactivate the main isolating device of each energy source:
   -  Electrical Energy (Incoming Power)
   -  Water Pressure (Potential Energy)
   -  Thermal (Thermal Energy)
   -  UV Light (Radiation Energy)
2.  Disconnect all electrical equipment from power:
   - Unplug 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.
5. Disconnect electrical power to pumps and compressors.
6. Ensure that the hydraulic lines are not pressurized.
7. Secure moving parts to avoid unintended movement.

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 volt 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. Ensure that the hydraulic lines are not pressurized.
4. Try to start the de-energized equipment.

4.2 Remove the Lockout Tag Out

When the work is finished, 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.
3. Clean up the work area.

Section 5 Shipment and Storage

5.1 Shipping Contents

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

5.2 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.

5.3 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 more than 15 ºC (60 ºF) for a period of 24 hours.

Storage area conditions:

- Ambient air temperature between -40 ºC to 55 ºC (-40 ºF to 130 ºF)
- 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 300 mm (12 inches) above the ground or as appropriate to prevent damage from 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.

5.4 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 6 Installation

⚠ 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.

6.1 Tools and Materials

Symbols	Description	Symbols	Description
	Lifting straps (properly sized and rated for equipment load)		Drill with bits
	Level		Tape measure
	Gasket (by others)		Adjustable wrench

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

6.2 Pre-Installation

- When preparing the site for installation, allow for valves, drain and bypass as part of your plumbing circuit.
- The Inlet/Outlet connections on the UV Chamber or manifolds are the main connection points. It is recommended that valve bypass lines be incorporated in supply lines to facilitate maintenance in the event partial or the complete unit must be taken out of service. Always follow Lockout Tag Out procedures during all partial or complete maintenance procedures.
- Connecting or attached piping to the UV System should be supported to avoid any undue load bearing strain on the UV Chamber. Limit overhead piping load to 10.9kgs (24lbs) per flange for 3inch; 23kgs (50 lbs) for 4inch; 34 kgs (75lbs) for 6inch. or above. Additional bracing and supports must be installed on any additional piping and valves to reduce the stress on the UV Chamber and manifold Inlet/Outlet connections.
- Allow sufficient air space for the air vents, a minimum of 30cm (12inches) around the sides of the panel, (or greater if required per local code) for sufficient cooling of the inner electronic components.
- Allow 183cm (72 inches) at the service end of the UV Chamber for removal of the UV Lamps and Lamp Sleeves and 23cm (9 inches) at the sensor port(s) for removal of the UV Sensor. At the opposite end, allow 92cm (36 inches) clearance for maintenance.
- If the 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.
- 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 and to the internal electrical components.
- Remove the plastic dowel placed inside the UV Chamber, used for securing the baffle during shipping.

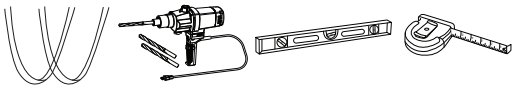
- Protect the equipment from the environment. Do not expose the equipment to direct water spray.
- The UV System does not introduce any chemical residue within the water, it is desirable to install the UV Chamber as close as possible to the point-of-use to avoid potential recontamination by discharge pipes, fitting, etc.

6.2.1 CPP

Prerequisites:

- Clear area where CPP will be installed.
- Apply Lockout tag out devices as necessary. Refer to Section 4.1.

Tools:



Materials:

- Mounting hardware (by others).

Procedure:

1. Connect lifting straps to lifting lugs on CPP and lift the CPP into position.
2. Drill holes in concrete for all the anchor bolts. Refer to anchor bolt manufacturer specifications for hole size.

Note: *CPP can be mounted on a frame if required.*

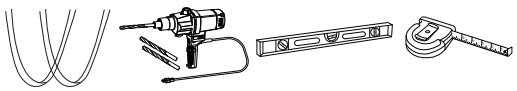
3. Install anchor bolts as specified by customer's civil engineering drawings.
4. Level the CPP top to bottom and front to back.
5. Secure the anchor bolts hardware and torque to manufacturer’s specifications. Remove lifting straps.

6.2.2 UV Chamber

Prerequisites:

- Clear area where the UV Chamber will be installed.

Tools:



Materials:

- Mounting hardware (by others)

Procedure:

1. Position a lifting strap around each of the UV Chamber mounting brackets (between the flange and the bracket). Center the lifting straps around the UV Chamber. Bring the two lifting straps above the UV Chamber and connect as required to a crane. Use a crane to lift the UV Chamber into position. The UV Chamber can be installed in either a horizontal or a vertical position. Refer to Section 6.2.5.

Note: *Avoid trapping air, ensure the outlet is oriented vertically. On vertically mounted units a venting kit is supplied.*

2. Install a flange gasket at the inlet and outlet flanges of the UV Chamber (if applicable).
3. Loosely install the flange mounting hardware or sanitary clamp to the UV Chamber inlet and outlet flange to the plant piping. The provided mounting brackets on the UV Chamber can be mounted to pipe supports (by others) if available.

   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.*

4. Level the UV Chamber from front to back (horizontal), top to bottom (vertical).
5. Secure the mounting hardware or sanitary clamp and torque to manufacturer's specifications.
6. Remove the lifting straps.
7. Install Air Vent if required.
8. Connect the UV Chamber drain to plant piping as required.

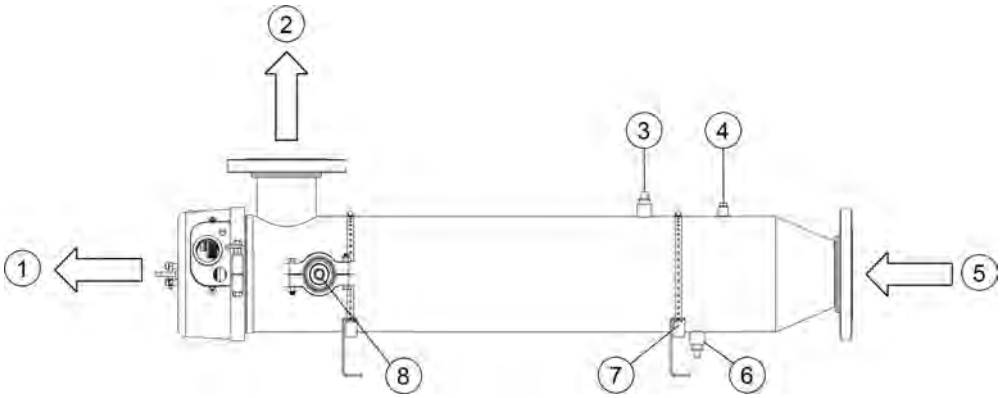


Figure 2 UV Chamber

1	Clearance for UV Lamp replacement	**5**	Inlet
2	Outlet	**6**	Drain
3	Cleaning Port	**7**	UV Chamber Mounting Bracket
4	Pressure Relief Valve Port	**8**	UV Sensor

6.2.3 Electrical Connections

Prerequisites:

- Apply lockout tag out devices as necessary. Refer to Section 4.1.
- Install the CPP. Refer to Section 6.2.1.
- Install the UV Chamber. Refer to Section 6.2.2.
- Remove the Service End Cap. Refer to Section 9.6.

Tools:

Materials:

- Electrical Drawings (supplied with the system)

Procedure:

1. Connect the CPP to the UV Chamber. 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.
2. Connect the lamp socket to the corresponding UV Lamp.
3. Provide AC power to the CPP matching voltage and power specifications on the serial label of the system.
4. Complete Hydrostatic Test. Refer to Section 6.2.4.

6.2.4 Hydrostatic Test

Prerequisites:

- Complete Electrical Connections. Refer to Section 6.2.3.
- Remove UV Lamps (if installed). Refer to Section 9.7.2.
- Inspect condition of sleeves for visible cracks or damage. Replace if necessary.
- Make sure the drain valve is closed.

Materials:

Procedure:

1. Slowly fill the UV Chamber with water.
   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 9.4.
   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 9.4.
4. Install the UV Lamps. Refer to Section 9.7.2
5. Install the Service End Cap. Refer to Section 9.6

6.2.5 Acceptable UV Chamber Installation Orientations

Horizontal Installation:

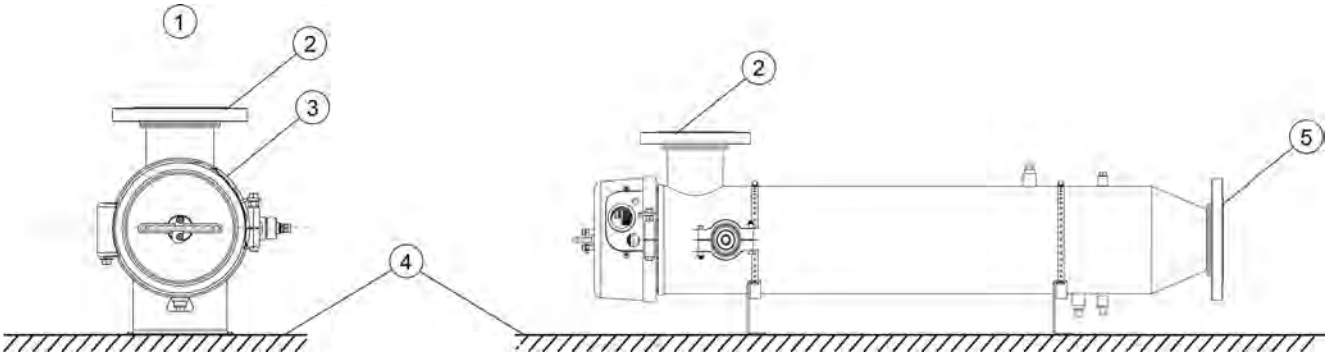


Figure 3 Horizontal Installation

1	Only Allowable Orientation 12:00	**4**	Floor
2	Outlet Flange	**5**	Inlet Flange
3	End Cap		

Note: *The only allowable outlet flange orientation is directly up (12 o'clock, from service entrance side).*

Vertical Installation

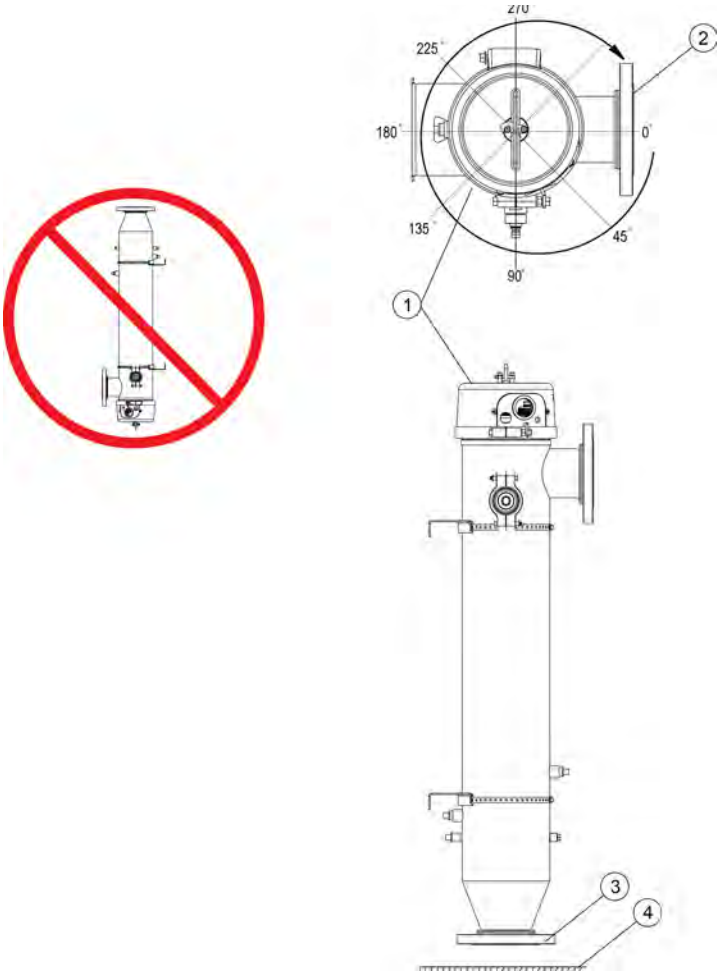


Figure 4 Vertical Installation

1	Service End Cap	**3**	Inlet Flange
2	Outlet Flange	**4**	Floor

Notes: *1) Outlet flange orientation angle currently shown at 0.*

2) Inlet flange must not be installed at top.

3)*Vertical installations require an air vent.*

Section 7 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.

7.1 Pre-start Checklist

NOTICE

DO NOT operate the UV System until the UV Chamber is completely filled with water.

To prevent alarm conditions, overheating or equipment damage, process water 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.

Make sure that:

- The UV Chamber is fully assembled—all cables, UV Lamps and the UV Sensor are installed.
- The wiper motor is attached - ***applies to systems with Automatic Wiping only.***
- The service end cap is attached and fastened with supplied hardware.
- There is water in the UV Chamber.
- There are no water leaks in the UV Chamber.
- The air vent (if applicable) is operating correctly.
- The drainage or water bypass provisions are followed until UV system starts.

7.2 Startup the UV System from SCADA

Prerequisite:

Pre-start Checklist. Refer to Section 7.1.

Startup overview:

The UV System is configured to enable on/off control of the system through SCADA communications.

Startup procedure:

1. The plant SCADA:
   - Does not allow flow in the UV Chamber.
   - Ensures that there are no critical alarms present in the UV System.
   - Sets the Turn On UV Chamber bit.
2. The UV System control logic (Microprocessor Board):
   - Sets the UV Chamber to Warming state.
   - Sets the UV System Warming bit.
   - Sets the power level at 100%.
   - Does not register any alarm until a 20-second startup timer has expired. This prevents false alarms during system startup. In addition, most alarms have individual delay timers associated with them.

3. When warming is complete, and no major or critical alarms are present, the UV System:
   - Sets the UV System Online bit.
   - Clears the UV System Warming bit.
4. The plant:
   - Resolves any active alarms.
   - Allows flow through the UV Chamber.
5. For Pacing systems, the UV System will adjust the UV lamp power.

7.3 Startup the UV System from Local

Prerequisite:

Pre-start Checklist. Refer to Section 7.1.

Startup Overview:

The UV System is configured to enable on/off control of the system through the local CPP interface.

Startup Procedure:

1. The plant:
   - Ensures there are no Critical Alarms present on the UV System.
   - Does not allow flow during startup.
   - Changes the UV System Operation Mode from REMOTE to LOCAL. Refer to Section 8.2.6.
2. The UV System control logic (Microprocessor Board):
   - Sets the UV Chamber to Warming state.
   - Displays the warm up status with countdown timer display on microprocessor interface.
   - Sets the power level at 100%.
   - Does not register any alarm until a 20-second startup timer has expired. This prevents false alarms during system startup. In addition, most alarms have individual delay timers associated with them.
3. When warming is complete, and no major or critical alarms are present, the UV System:
   - Shows “System On-Line” on the microprocessor user interface.
4. The plant:
   - Resolves any active alarms.
   - Allows flow through the UV Chamber.
5. For Pacing systems, the UV System will adjust the UV lamp power.

7.4 Startup the UV System from Remote

Prerequisite:

Pre-start Checklist. Refer to Section 7.1.

Startup overview:

The UV System is configured to enable on/off control of the system through Digital Inputs or Digital Outputs.

Startup procedure:

1. The plant:
   - Ensures there are no Critical Alarms present on the UV System.
   - Does not allow flow during startup.
   - Energizes the Remote On/Off digital input signal.

2. The UV System control logic (Microprocessor Board):
   - Sets the UV Chamber to the Warming state.
   - Energizes the UV System Warming digital output signal (configuration optional).
   - Sets the power level at 100%.
   - Does not register any alarm until a 20-second startup timer has expired. This prevents false alarms during system startup. In addition, most alarms have individual delay timers associated with them.
3. When warming is complete and no major or critical alarms are present, the UV System:
   - Energizes the UV System Online digital output signal (configuration optional).
   - De-energizes the UV System Warming digital output signal (configuration optional).
4. The plant:
   - Resolves any active alarms.
   - Allows flow through the UV Chamber.
5. For Pacing systems, the UV System will adjust the UV lamp power.

7.5 Shutdown the UV System from SCADA

Prerequisite:

Pre-start Checklist. Refer to Section 7.1.

Shutdown procedure:

1. The plant:
   - Stops process flow through UV Chamber.
   - Clears the “Turn On UV Chamber” bit.
2. The UV System:
   - Clears the UV System Online bit.

7.6 Shutdown the UV System from Local

Prerequisite:

Pre-start Checklist. Refer to Section 7.1.

Shutdown procedure:

1. The plant:
   - Stops process flow through the UV Chamber.
2. The Operator changes the UV System Operation Mode from LOCAL to REMOTE. Refer to Section 8.2.6.
3. The UV System:
   - Changes the status from Online to Shutdown.

7.7 Shutdown the UV System from Remote

Prerequisite:

Pre-start Checklist. Refer to Section 7.1.

Shutdown procedure:

1. The plant:
   - Stops process flow through the UV Chamber
   - De-energizes the Remote On/Off digital input signal.
2. The UV System:
   - Changes the status from Online to 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

The HMI 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.

A Communication Control Board (CCB) and HMI user interface is located on the door of the Control Power Panel (CPP). The CCB monitors the UV Chamber and the HMI user interface provides system status, alarms and control for the UV Chamber.

If the CPP loses power, the control program is retained in memory.

The HMI user interface has a rechargeable battery that takes approximately 48 hours to charge fully and when fully charged will retain the time and date for up to 30 days when powered down. If the system has been powered down for longer than 30 days the time and date will need to be set again on startup. See Section 8.7 for instructions on setting the time and date.

8.1 HMI User Interface

The HMI user interface on the CPP is a touchscreen HMI that is programmed with custom screens. To go through the different screens, push the buttons on the screen. Refer to Figure 5.

Figure 5 HMI User interface

The HMI user interface has two levels of user access: operator-level and technician-level. A user with operator-level access cannot view all the screens that a user with technician-level access can. Operator level requires no log in or password and is the default level.

8.2 Home Screen

The Home Screen is the main system overview screen and is designed to provide all necessary information.

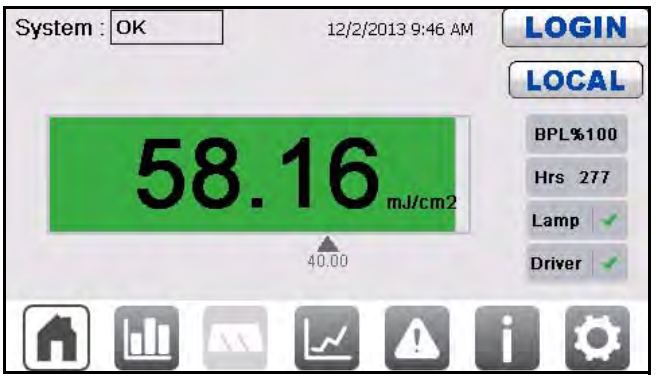


Figure 6 Home Screen

8.2.1 Navigation Bar

Figure 7 Navigation Bar

The navigation bar allows the user to navigate between the different sections of the HMI application and is available on most screens.

The currently active screen will be indicated by the grey on white icon. All others will be white on grey.

NOTICE

If Automatic Wiping is not available, the navigation icon for the wiper screen will be greyed out as shown in the above picture.

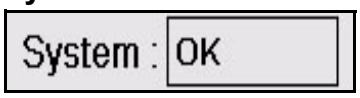
If an alarm is present, the Alarms Screen icon will change color to indicate the severity of the currently active alarms.


No Alarms.


Minor Alarm(s) active.


Major Alarm(s) active.

8.2.2 System Status



The System Status indicator tells the operator what system conditions are currently present and is available on most screens.

The different System Status are:

- **OK** - Lamps are ON, warm-up is complete, no Major or Critical alarms are present. Will display as grey.
- **STANDBY** - Lamps are OFF and no Critical alarms are present. System is ready to start. Will display as green.
- **WARMING** - Lamps are ON, System is not yet ready to treat water. Will display as yellow.
- **ALARM** - An alarm is present. Will display as red.
- **REFERENCE CHECK** - Low UV Intensity Alarms and Low Dose/RED Alarms are currently masked to allow a reference sensor check procedure. Will display as yellow.

8.2.3 Bar Graph

The Bar Graph shows the current:

- Dose for DP Systems or UVI for all other Systems

The pointer shows the current Major Alarm setpoint for the bar graph.

NOTICE

If an alarm is present, the bar graph will change color to indicate the severity of the currently active alarms.

No Alarms.

Minor Alarm(s) active.

Major Alarm(s) active.

8.2.4 System Clock

The system clock shows the current time and date and is available on most screens.

8.2.5 LOGIN Button

The LOGIN button allows the user to change the user access level and is available on most screens. Touching the button will bring up the login dialog pop-up where users can select the desired user access level and enter the required password for that level. The user access will automatically log back out after 5 minutes of inactivity.

Figure 8 Login Screen

8.2.6 Operation Mode Button

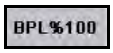
The Operation Mode button allows the user to change the Operation Mode of the system. Touching the button will bring up the Operation Mode pop-up screen.

Touching the desired Operation Mode button will close the pop-up screen and set the system to that Operation Mode if possible. To close the pop-up screen touch the red “X” in the top right of the screen.

Figure 9 Operation Mode Screen

8.2.7 System Information

8.2.7.1 Current Lamp Driver Power



The current Lamp Driver power level. If the UV Lamp power is currently in the latched Run 100% Power override mode, the indicator will show yellow.

In this case, touching the indicator will navigate to the General Settings screen where the Run 100% Power can be switched to OFF if the conditions that caused the override have been remedied.

8.2.7.2 Current Lamp Hours

The current system lamp hours. If the current lamp hours exceed the End Of Lamp Life Hours set point, the indicator will show yellow.

In this case, touching the indicator will navigate to the Counters Settings screen where the hours can be reset once new UV Lamps have been installed.

8.2.7.3 Current Lamp Alarm Status

Lamp Alarm status indicator. If there are UV Lamp faults active, the green check mark will be replaced with a red alarm symbol.

In this case, touching the indicator will open a pop-up dialog with the current active lamp alarms.

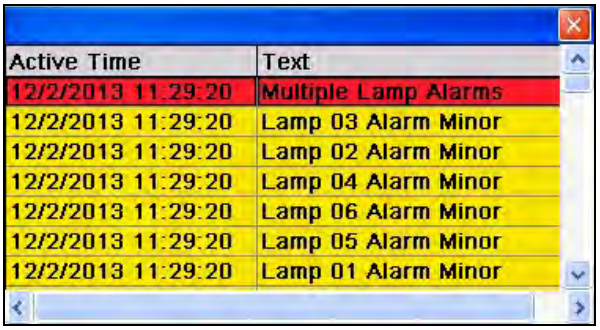


Figure 10 Current Lamp Alarm Status

8.2.7.4 Current Lamp Driver Alarm Status

Lamp Driver Alarm status indicator. If there are Lamp Driver faults active, the green check mark will be replaced with a red alarm symbol.

In this case, touching the indicator will open a pop-up dialog with the current active Lamp Driver alarms.

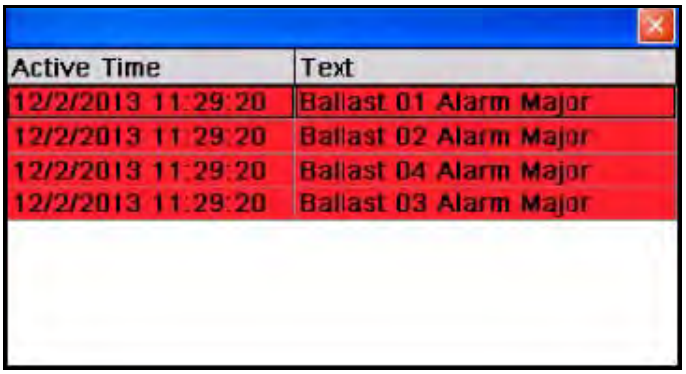


Figure 11 Current Lamp Driver Alarm Status

8.3 Analog Graphs Screen

The Analog Graphs Screen shows the current values of all input signals. This includes signals from Analog Inputs, signals from SCADA and entered signals. Only the signals that are configured for the system will be shown.

The arrows to the side of the graphs show the current alarm set points. The graph will change color based on the alarm level of each signal.

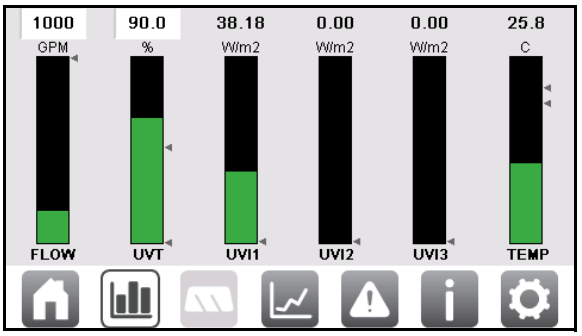


Figure 12 Analog Graphs Screen

NOTICE

If the source for Flow or UVT is set to Entered, the value shown at the top of the graph will be white and the Entered value can be adjusted from this screen.

8.4 Wiper Status Screen

Note: Applies to Automatic Wiping Systems only.

The Wiper Status Screen provides some information and control of the Automatic Wiping System.

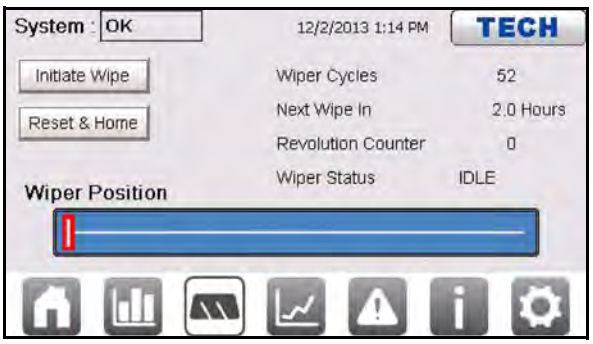


Figure 13 Wiper Status Screen

Initiate Wipe	Initiates a wipe if there are no wiper related alarms regardless of the remaining time until the next automatic wipe
Reset & Home	Resets any wiper related alarms and attempts to move the wiper to the home position.
Wiper Position	Shows a graphic representation of the position of the wiper based on the Revolution Counter.
Wiper Cycles	Shows the number of cycles the wiper has completed since installation. ***Note:*** *Reset the counter at the Counter Settings Screen (Section 8.8.4)*
Next Wipe In	Shows the remaining time until the next scheduled automatic wipe. ***Note:*** *Set the time interval at the Wiper Settings Screen (Section 8.8.3)*
Revolution Counter	Shows the current number of revolutions the wiper has travelled from the park position.

Wiper Status	Shows the current status of the wiper. • IDLE – Wiper is stationary at home position. • EXTENDING – Wiper is currently traveling away from home position. • RETRACTING – Wiper is currently traveling towards home position. • FAULT – Wiper is stationary and has a currently active alarm.

8.5 Trend Screens

The trending screens show a 12 hour history of the UVI, BPL, Flow, UVT and RED or Dose. Only signals that are configured in the system will be available as trend screens.

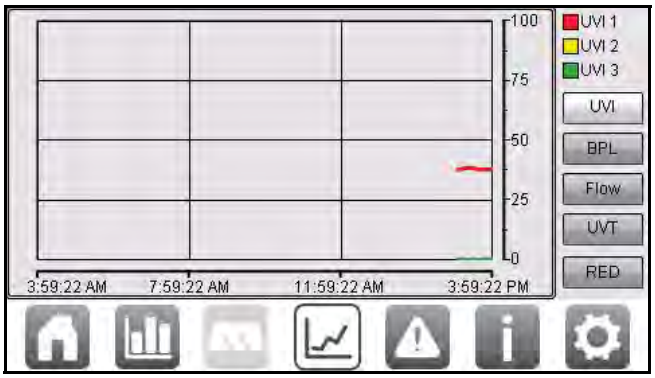


Figure 14 Trend Screen

For Flow and UVI the Y-Axis will be scaled to the 20 mA Full Scale value.

For RED or Dose the Y-Axis will be scaled to 1.5 times the RED or Dose Target.

For UVI, only the number of sensors available will be shown.

8.6 Alarm Screens

8.6.1 Active Alarm Screen

The Active Alarm screen shows only the currently active alarms in the order they occurred.

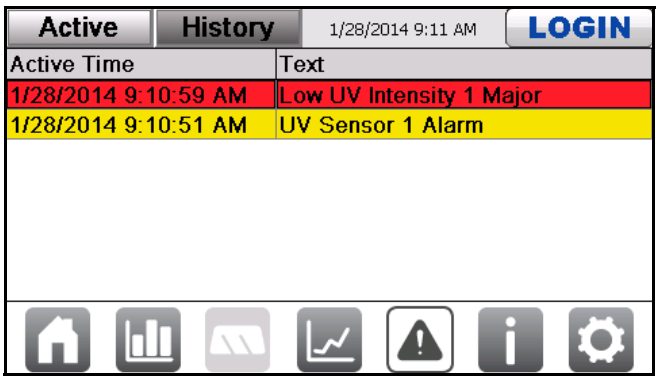


Figure 15 Active Alarm Screen

The alarms are color coded by severity.

Yellow	Minor Alarms	Action should be taken to correct the problem.
Red	Major Alarms	Immediate action is required.
	Critical Alarms	Automatic shutdown of the UV Chamber to prevent possible damage to the equipment.

8.6.2 Alarm History Screen

The Alarm History screen shows the last 100 alarms that are no longer active in the order they were cleared.

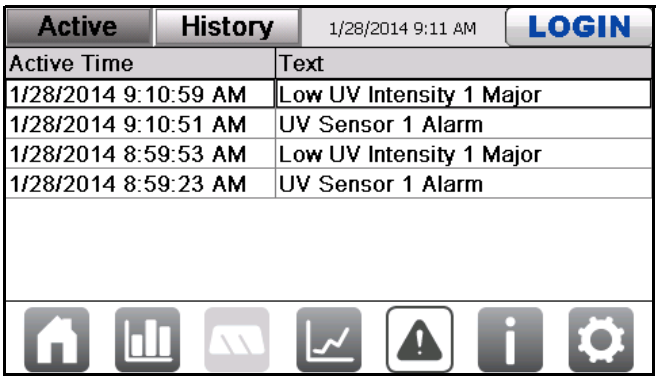
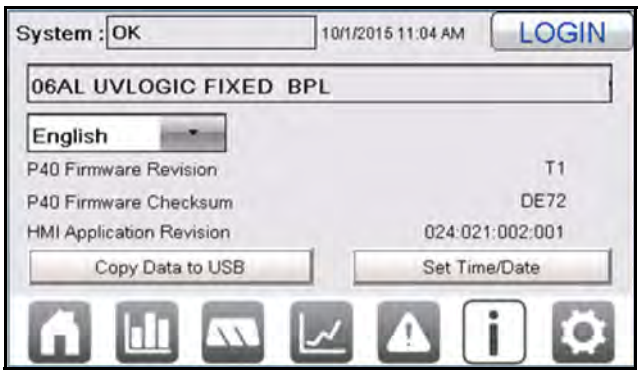


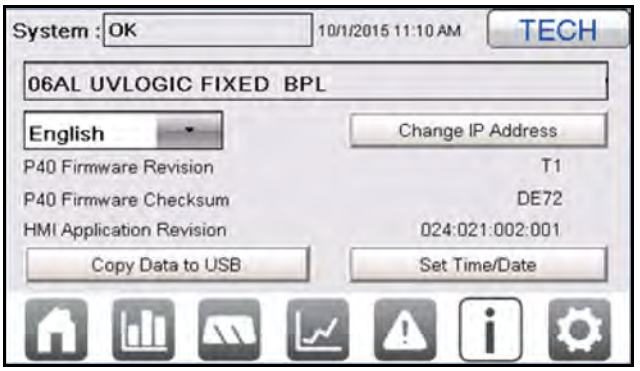
Figure 16 Alarm History Screen

8.7 Information Screen

The Information Screen shows the information about the system and application version that Trojan's Technical Assistance Center (TAC) will need in order to help troubleshoot issues.



Information Screen with General Access



Information Screen with Technician Access

Figure 17 Information Screen

System Type	Describes the UV Chamber size, product line and control methodology.
Language	Allows the user to change the display language for the HMI user interface.
P40 Firmware Revision	Is the application revision of the CCB. Major Revision (Letter). Minor Revision (Number).
P40 Firmware Checksum	Is a verification value for the CCB application.
HMI Application Revision	Is the revision of the HMI user interface application.
Copy Data to USB	Selecting this, pops up the Select Logs to Export screen. This allows the operator to select the range of data logging.
Set Time/Date*	Allows the operator to set the HMI user interface time and date.
Change IP Address	Allows the Operator to set the HMI IP address.

8.7.1 Data Logging

Materials:

- USB Stick

Procedure:

1. Install USB stick into HMI.
2. Navigate to the Information Screen.
3. Select “Copy Data to USB” to show the “Select Data to Export” screen.Refer to Section 8.7.1.1.
4. Select the range of data logging.
5. A completion notification window will pop-up when finished.
6. Remove the USB.

NOTICE

The data is logged every 5 seconds to a 24 hour internal database. Every day at 23:59:30 the internal 24 hour database will be exported to an Excel spreadsheet on an inserted USB memory stick or SD card. The USB stick or SD card must remain inserted in the HMI when this occurs or the previous days data will be lost.

*The HMI user interface has a rechargeable battery that takes approximately 48 hours to charge fully and when fully charged will retain the time and date for up to 30 days when powered down. If the system has been powered down for longer than 30 days the time and date will need to be set again on startup.

8.7.1.1 Export Log Files

Figure 18 Select Logs to Export Screen

1. To Export:
   a. A preset date range → Select either, 1 week, 1 month, 3 months or 1 year.
   b. A custom date range → Select the End Date → Export Range

8.8 Settings Screens

The Settings Screens are divided into two levels of access. General Access screens are available at any time without the need to log in. Technician Access screens require the user to log in using the “TECH” username and password. Refer to Section 8.8.2. Some settings on the General Access screens are not available or are not adjustable without Technician Access.

8.8.1 Settings Menu

The settings menu allows access to the various settings screens. Depending on the level of access some screens may not be available.

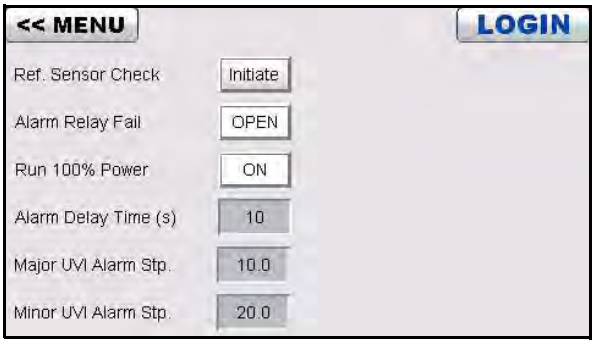
Settings Menu with General Access

Settings Menu with Technician Access

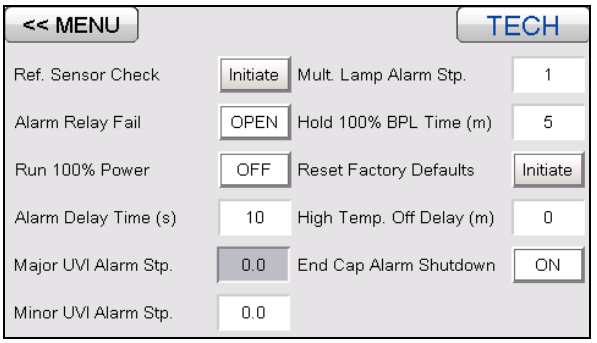
Figure 19 Settings Menu

8.8.2 General Settings Screen

The General Settings screen has settings and buttons that do not fall under one of the other settings categories.



General Settings with General Access



General Settings with Technician Access

Figure 20 General Settings Menu

Reference Sensor Check	Masks UVI Intensity Alarms and Low Dose/RED alarms for 2 minutes to allow a reference sensor check procedure to be performed.
Alarm Relay Fail	Sets the digital alarm output relays active state to open or closed.
Run 100% Power	Overrides BPL to 100%, also used to unlatch BPL override in the event of a Low Dose/RED Major or UV Lamp Fault Major.
Alarm Delay Time	Sets the delay for UV Lamp, Lamp Driver, flow, UVT and valve alarms. (10 to 999 seconds).
Major UVI Alarm Setpoint	A Low UV Major Alarm is triggered when the UVI reading goes below the Low UVI Major alarm setpoint.
Minor UVI Alarm Setpoint	A Low UV Minor Alarm is triggered when the UVI reading goes below the low UVI Minor alarm setpoint. (DVGW only).
End Cap Alarm Shutdown	Enables and disables shutdown the UV System when the End Cap Off Alarm occurs.
Multiple Lamp Alarm Setpoint	Sets the number of UV Lamp faults that must occur before a Multiple UV Lamp Fault Major Alarm alarm occurs (default=1).
Hold 100% BPL Time	Sets the time that the Lamp Driver power level (BPL) stays at 100% power after all Major Alarms are cleared (default=0 minutes). ***Note:*** *This setting does not affect latching 100% BPL when a dose or UV intensity alarm occurs.*

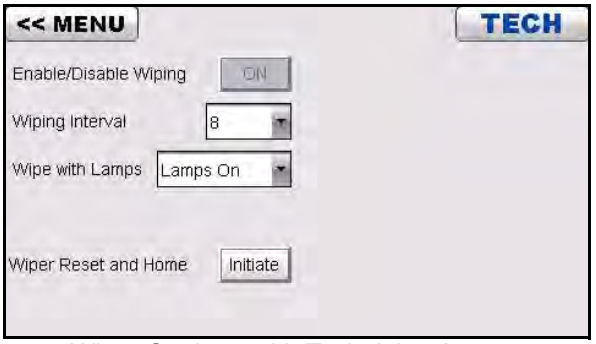
Reset Factory Defaults	Resets the microprocessor user interface settings back to the original factory settings. ***Note:*** *DO NOT reset without authorization from Trojan Technologies.*
High Temperature Off Delay	Sets the High Temperature Off alarm delay—0 to 15 minutes. If set to 0, the UV Lamps turn off immediately when a Hi Temp Critical alarm occurs.

8.8.3 Wiper Settings Screen

Note: *Applies to Automatic Wiping Systems only.*

The Wiper Settings Screen has settings relevant to the Automatic Wiping System.

Wiper Settings with General Access



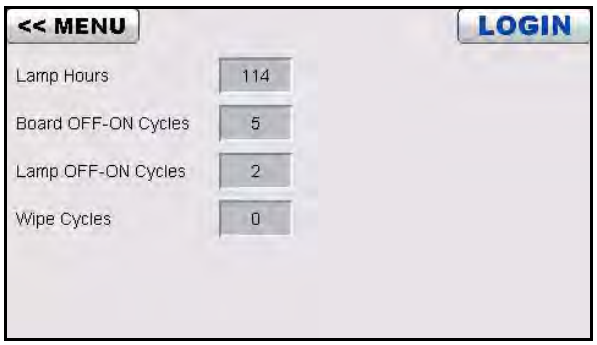
Wiper Settings with Technician Access

Figure 21 Wiper Settings Screen

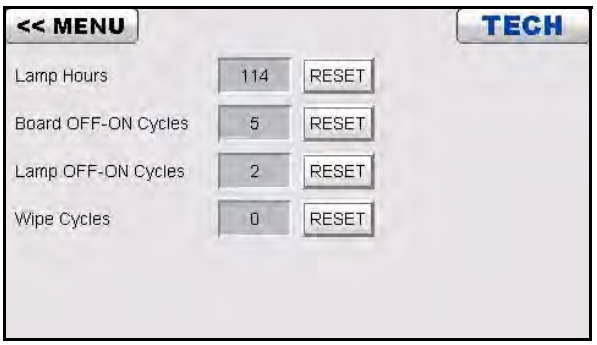
Enable/Disable Wiping	This option is read only and shows if automatic wiping is configured for the unit.
Wiping Interval	Sets the automatic wiper cleaning frequency.
Wipe with Lamps	Selects when wiping is acceptable: • Lamps ON - Wipe only when the UV Lamps are on. • Lamps ON/OFF - Wipe if the UV Lamps are on or off. • Disabled - Disables wiping.
Wiper Reset and Home	Resets any wiper related alarms and attempts to move the wiper to the home position.

8.8.4 Counter Settings Screen

The Counters Settings screen shows various system counters and allows users with Technician access to reset those counters.



Counter Settings with General Access



Counter Settings with Technician Access

Figure 22 Counter Settings Screen

Lamp Hours	The UV Lamp run-time hours for all UV Lamps in the UV Chamber. **RESET** - Resets this counter to zero. ***Note:*** *Do this only after all the UV Lamps in the UV Chamber have been changed. Refer to Section 9.7.2.*

Board OFF-ON Cycles	The counter for the number of times the power to the board has transitioned from OFF to ON. **RESET** - Resets this counter to zero.
Lamp OFF-ON Cycles	The counter for the number of times power to the UV Lamps in the UV Chamber has transitioned from OFF to ON. **RESET** - Resets this counter to zero.
Wipe Cycles*	The counter for the number of successfully completed wipe cycles. **RESET** - Resets this counter to zero. ***Note:*** *Reset if the wiper motor, drive screw and wiper plate are replaced together.* ***For systems with Automatic Wiping System only.**

8.8.5 Analog Input Settings Screen

The Analog Input settings screen allow users with Technician access to configure which analog signals are configured for the 5 available analog input connections.

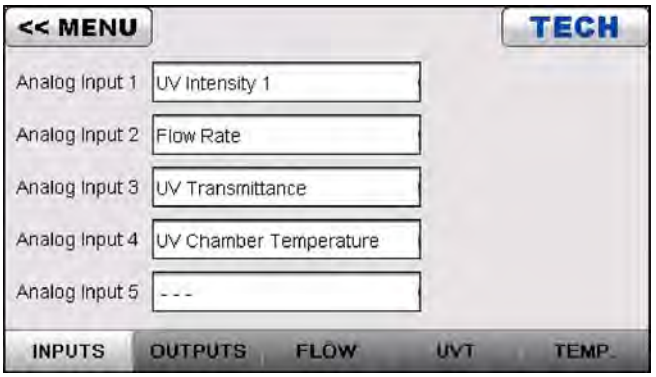


Figure 23 Analog Input Settings Screen

Available Analog Input Signals

- UV Intensity 1
- UV Transmittance
- UV Chamber Temperature
- Valve Position

8.8.6 Analog Output Settings Screen

The Analog Output settings screen allow users with Technician access to configure which analog signals are configured for the available analog output connections.

NOTICE

Analog output signals require the addition of plug in Analog Output Modules. Only 1 Analog Output Module is supplied by default. Up to 3 additional Analog Output Modules can be purchased for a total of 4 Analog Output signals.

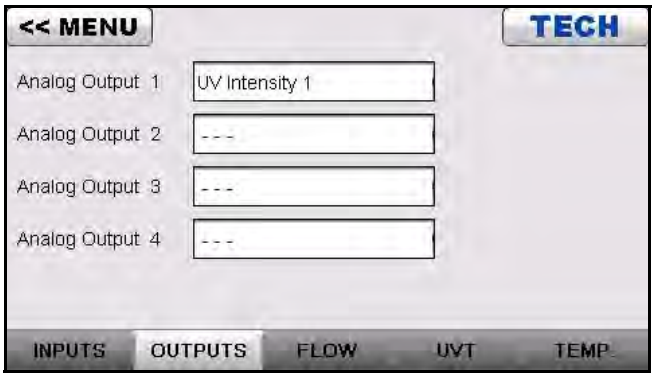


Figure 24 Analog Output Settings Screen

Available Analog Output Signals

- UV Intensity 1
- UV Chamber Temperature
- UV Transmittance
- Valve Position
- Dose Achieved - DoseDP Systems Only
- UV Intensity Lowest

8.8.7 Analog Flow Settings Screen

The Analog Flow Settings screen allows users with Technician access to customize the Flow signal used for pacing and control of the UV System.

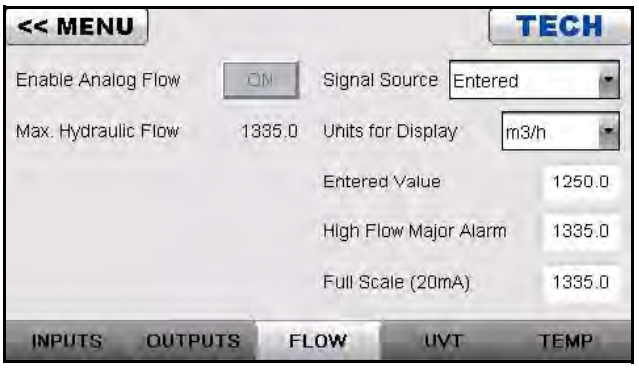


Figure 25 Analog Flow Settings Screen

Enable Analog Flow	This option is read only and shows if a Flow Signal is configured for the system.
Max. Hydraulic Flow	This option is read only and shows the maximum hydraulic flow the UV System has been validated for.
Signal Source	This option sets where the value used for control comes from. The available sources are: • Off -No Flow signal. • Entered - Uses the Entered Value for control. • Live 4-20 mA - Uses the configured Analog Input 4-20 mA signal for Flow Value. • SCADA 4-20 mA - Uses a value sent over SCADA from the Plant SCADA network.
Units for Display	The Flow units that the Flow signal is measured in. Options are: • m^3/h – Cubic Meters per Hour. • m^3/d – Cubic Meters per Day. • USGPM – US Gallons per Minute. • Live 4-20 mA - Uses the configured Analog Input 4-20 mA signal for Flow Value. • USMGD – US Million Gallons per Day. • L/s – Liters per Second.

Entered Value	The static Flow value to be used when Signal Source is configured for Entered. ***Note:*** *This value has no effect when Signal Source is other than "Entered".*
High Flow Major Alarm	The Flow value at which the system will trigger a High Flow Major Alarm.
Full Scale (20 mA)	The 20 mA scaling value to be used when the Signal Source is configured for Live 4-20 mA. This value is determined by the scale of the connected Flow Meter.

8.8.8 Analog UVT Settings Screen

The Analog UVT Settings screen allows users with Technician access to customize the UV Transmittance signal used for pacing and control of the UV System.

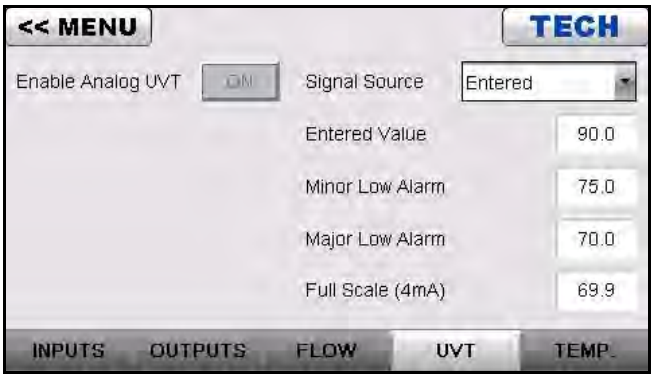


Figure 26 Analog UVT Settings Screen

Enable Analog UVT	This option is read only and shows if a UV Transmittance Signal is configured for the system.
Signal Source	This option sets where the value used for control comes from. The available sources are: • Off -No UVT signal. • Entered - Uses the Entered Value for control. • Live 4-20 mA - Uses the configured Analog Input 4-20 mA signal for UVT Value. • SCADA 4-20 mA - Uses a value sent over SCADA from the Plant SCADA network. • Live Pass Through - Is used to show the value and alarm based on the value but not to use it in control and pacing.
Entered Value	The static UV Transmittance value to be used when Signal Source is configured for Entered. ***Note:*** *This value has no effect when Signal Source is anything other than "Entered".*
Minor Low Alarm	The UVT value at which the system will trigger a Minor Low UVT Alarm.
Major Low Alarm	The UVT value at which the system will trigger a Major Low UVT Alarm.
Full Scale (4 mA)	The 4 mA scaling value to be used when the Signal Source is configured for Live 4-20 mA. This value is determined by the scale of the connected UV Transmittance meter.

8.8.9 UV Chamber Analog Temperature Settings Screen

The Analog Temperature Settings screen allows users with Technician access to customize the UV Chamber Analog Temperature signal used for control of the UV System.

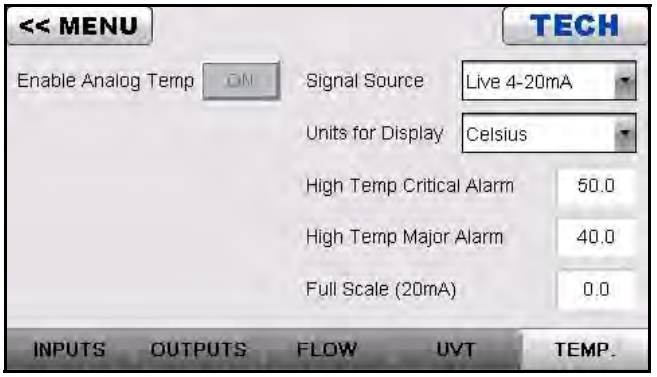


Figure 27 UV Chamber Analog Temperature Settings Screen

Enable Analog Temp.	This option is read only and shows if an Analog Temperature Signal is configured for the system.
Signal Source	This option sets where the value used for control comes from. The available sources are: • Off -No Temperature signal. • Live 4-20 mA - Uses the configured Analog Input 4-20 mA signal for Analog Temperature Value.
Units for Display	Enable temperature units to display in either Celsius and Fahrenheit.
High Temp. Critical Alarm	The Temperature value at which the system will trigger a Critical High Temperature Alarm.
High Temp. Major Alarm	The Temperature value at which the system will trigger a Major High Temperature Alarm.
Full Scale (20 mA)	The 20 mA scaling value to be used when the Signal Source is configured for Live 4-20 mA. This value is determined by the scale of the connected Temperature meter.

8.8.10 Digital Input Settings Screen

The Digital Input settings screen allow users with Technician access to configure which digital signals are configured for the 4 available digital input connections and to Enable/Disable the optional Digital Inputs 1 and 2.

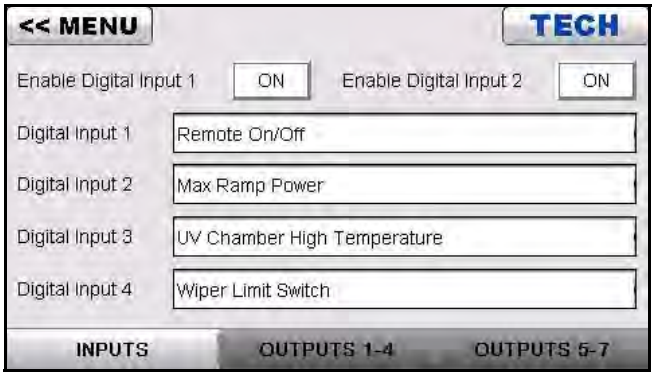


Figure 28 Digital Input Settings Screen

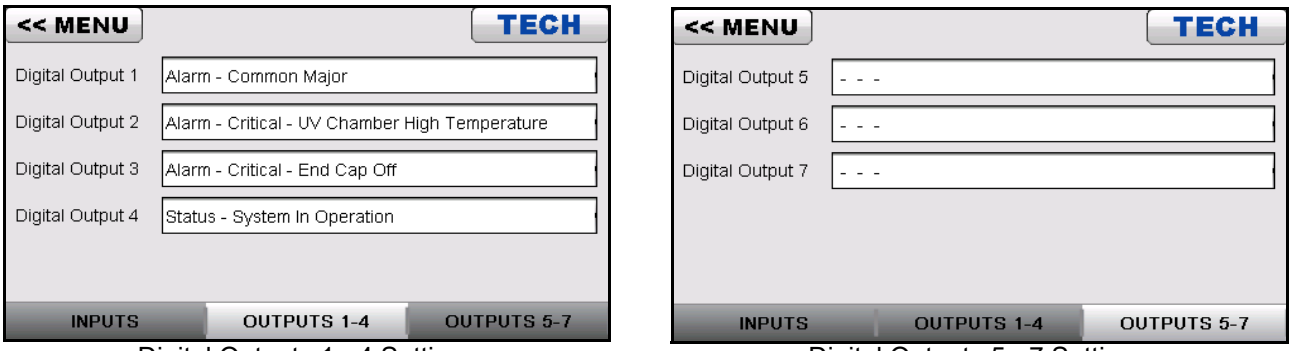
Available Digital Input Signals

- Remote On/Off
- Max (Maximum) Ramp Power
- Wiper Limit Switch*
- UV Chamber High Temperature
- End Cap Limit SW (Switch) SW
- Wipe Now Remote*

**For systems with Automatic Wiping System only.*

8.8.11 Digital Output Settings Screens (1 – 4 and 5 – 7)

The two Digital Output settings screens allow users with Technician access to configure which digital signals are configured for the 7 available digital output connections.



Digital Outputs 1 - 4 Settings

Digital Outputs 5 - 7 Settings

Figure 29 Digital Output Settings Screens

8.8.12 Communications Settings Screen

The Communications Settings screen allows a user with Technician access to configure SCADA communications.

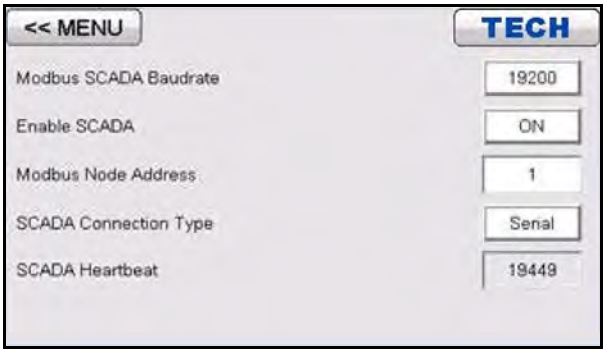


Figure 30 Communications Settings Screen

Modbus SCADA Baudrate	The serial baudrate to be used by SCADA (9600 or 19200).
Enable SCADA	Enables/Disables SCADA.
Modbus Node Address	Modbus Node Address for SCADA.
SCADA Connection Type	Choose from Serial or Ethernet. This setting is dependent on which SCADA add-on card for the P40 is installed.
SCADA Heartbeat	Shows the value of the SCADA Heartbeat register.

Section 9 Maintenance

DANGER

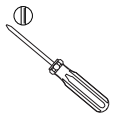
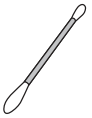
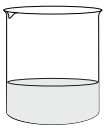
Obey all warning and caution statements. Refer to Section 2.

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. Tasks that require UV Chamber disassembly are described in Section 11.2.2. Refer to Section 12 for replacement part numbers.

9.1 Tools and Materials

Symbols	Description	Symbols	Description
	Screwdriver - Slotted		Screwdriver - Phillips
	Nut Driver		Lint Free Cloth
	Wrench - Adjustable		Hex Key
	Cotton Swab		Wrench - Open Ended
	Clean Water		Wrench - Socket
	Isopropyl Alcohol		Mild acidic solution (for example, ActiClean Gel™) or approved by Trojan Service, food grade cleaner

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 2 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.

Table 2 Preventive Maintenance Schedule

System component	Maintenance requirement	Monthly	Semi-Annually	Annually	12,000 hours	As needed
Lamp Sleeves	Inspect a representative sample (i.e. 10%) of lamp sleeves (Section 9.8.1). • Check the Lamp Sleeve O-Rings for UV decay and brittle parts. Replace the Lamp Sleeve O-Rings as needed. • Remove any condensation inside the Lamp Sleeves. • Inspect the Lamp Sleeves for physical damage. • Inspect for build-up on the Lamp Sleeves.	X				
	If there is physical damage to a lamp sleeve, replace the lamp sleeve (Section 9.8.1).					X
	If there is build-up on any of the lamp sleeves inspected, clean all the lamp sleeves (Section 9.8.3). While the lamp sleeve are removed, inspect all the lamp sleeve O-rings. Replace the lamp sleeve O-rings as needed.					X
Lamp Sleeve O-rings	Inspect all Lamp Sleeve O-Rings for wear or when the Lamp Sleeves are removed (Section 9.8.2).			X		
	Replace Lamp Sleeve O-Rings if worn (Section 9.8.1).					X
UV Lamps	Inspect the UV Lamps and UV Lamp pins (Section 9.7.2).			X		
	Replace all the UV Lamps when an End of Lamp Life alarm occurs (Section 9.7.2).				X	
	If a UV Lamp fails inspection or burns out, replace the UV Lamp (Section 9.7.2).					X
UV Sensor	Clean the UV Sensor (Section 9.9.1).	X				
	Replace the UV Sensor (Section 9.9.1).					X
CPP	Replace the air filter (Section 9.11.3).	X				
	Replace a Lamp Driver (Section 9.11.2).					X
Gear Motor	Replace the gear motor (Section 9.10.2).					X
Wiper Revolution Proximity Sensor	Replace the wiper revolution proximity sensor (Section 9.10.3).					X
Wiper Seals and Wiper Seal Holders	Replace the wiper seals and wiper seal holders(Section 10.3.6) * Applies to Wiping Systems only			X		

9.3 Legend

The symbols in the following table will be used in this Section to define the wiping option provided. Follow the instructions that correspond to the supplied system.

Symbol	Description
A	Automatic Wiping Option
N	Non-wiping Option

9.4 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:

- Shutdown the UV System. Refer to Section 7.5 and Section 7.6.
- Apply lockout tag out devices as necessary. Refer to Section 4.1.
- The drainage or water bypass provisions are followed until UV system starts.

Materials:

Procedure:

1. Stand off to the side of the end plate. Open the drain valve, as the water level drops, the UV System will depressurize.
2. To verify that the UV Chamber has been depressurized, open the pressure relief valve on the UV Chamber.
   a. If water is discharging from the pressure relief valve then pressure has not been removed from the UV Chamber.
   b. If water is not discharging from the pressure relief valve, the pressure has been removed from the UV Chamber.
3. To Depressurize only, close the drain valve.
4. To Depressurize and drain, keep drain valve open until the UV Chamber is empty.
5. When service is complete, assemble the prerequisites in the reverse order of disassembly.

9.5 Pressurize a UV Chamber

Prerequisites:

- Shutdown the UV System. Refer to Section 7.5 and Section 7.6.
- Apply lockout tag out devices as necessary. Refer to Section 4.1.
- The drainage or water bypass provisions are followed until UV system starts.
- Remove the UV Lamps. Refer to Section 9.7.2.
- Inspect condition of the lamp sleeves, ensure no visible cracks or damage. Replace if necessary.
- Make sure the drain valve is closed.

Materials:

Procedure:

1. Slowly fill the UV Chamber with water.
   a. Stand off to the side of the end plate 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 9.4.
   b. Fix the leaks.
   c. Fill the UV Chamber and do a pressure test. Check for leaks.
3. If leaks are not found, depressurize the UV Chamber. Refer to Section 9.4.
4. Install the UV Lamps. Refer to Section 9.7.2.

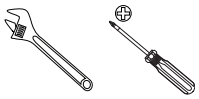
9.6 Remove and Install the Service End Cap

The service end cap must be removed before any maintenance, service or repair task can be done.

Prerequisites:

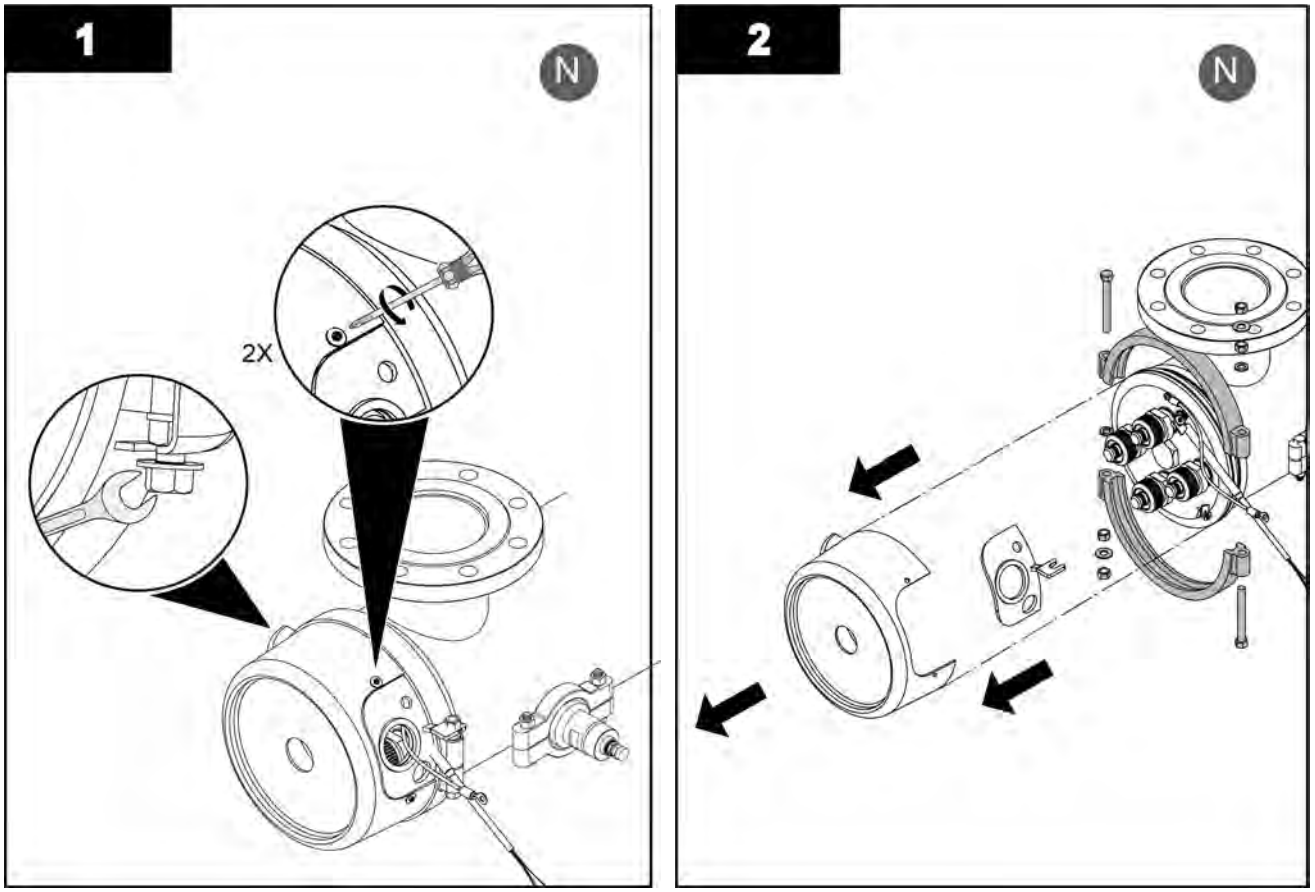
- Shutdown the UV System. Refer to Section 7.5 and Section 7.7.
- Apply lockout tag out devices as necessary. Refer to Section 4.1.
- Depressurize the UV Chamber. Refer to Section 9.4.

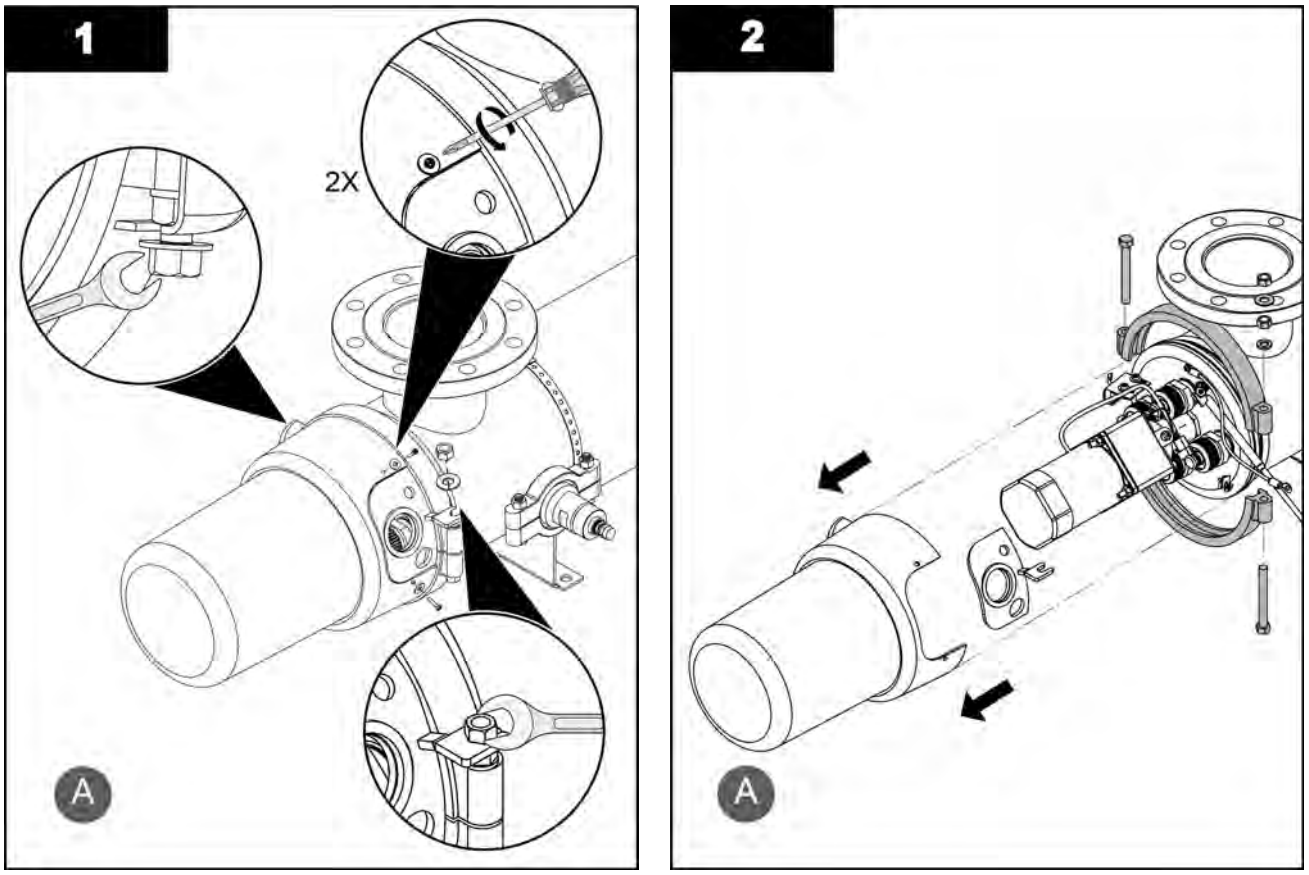
Tools:



Materials:

Remove:





3. To install a service end cap, do the illustrated steps in the opposite direction.
4. When service is complete, assembly the prerequisites in the reverse order of disassembly.

9.7 UV Lamps

UV lamps contain mercury (Section 2).

9.7.1 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 re-cycler may have specific procedures and UV lamp storage requirements. Consult with a UV lamp re-cycler to determine all applicable policies.

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

9.7.2 Remove and Replace the UV Lamp

Remove and inspect UV Lamps as a part of scheduled maintenance and when a UV Lamp status alarm occurs. Replace a UV Lamp for every 12,000 hours (an End of Lamp Life alarm occurs) or when the UV Lamp fails inspection.

Prerequisites:

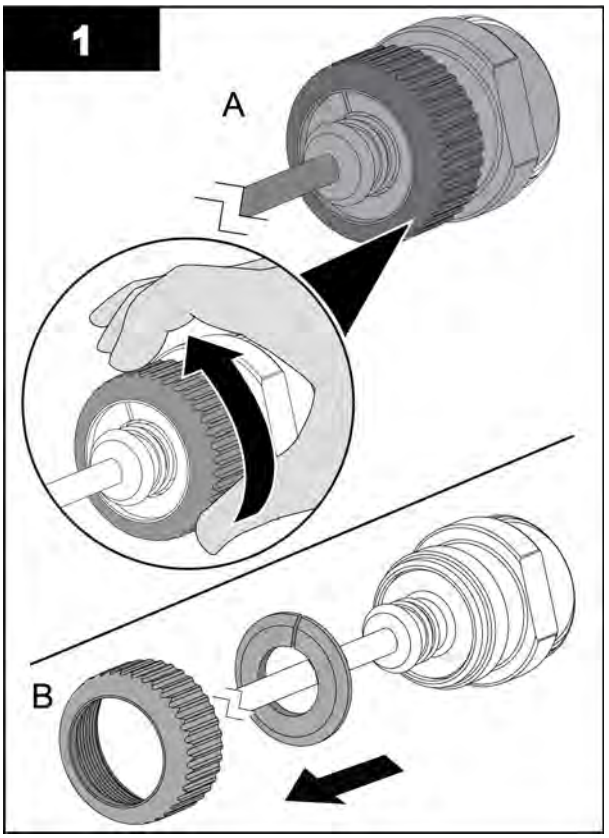
- Shutdown the UV System. Refer to Section 7.5 andSection 7.6.
- Apply lockout tag out devices as necessary. Refer to Section 4.1.
- Depressurize the UV Chamber. Refer to Section 9.4.
- Wait ten minutes to allow UV lamps to cool.
- Remove the Service End Cap. Refer to Section 9.6.
- If necessary, remove the gear motor assembly. Refer to Section 9.10.1.- ***Applies to Automatic Wiping Systems only.***

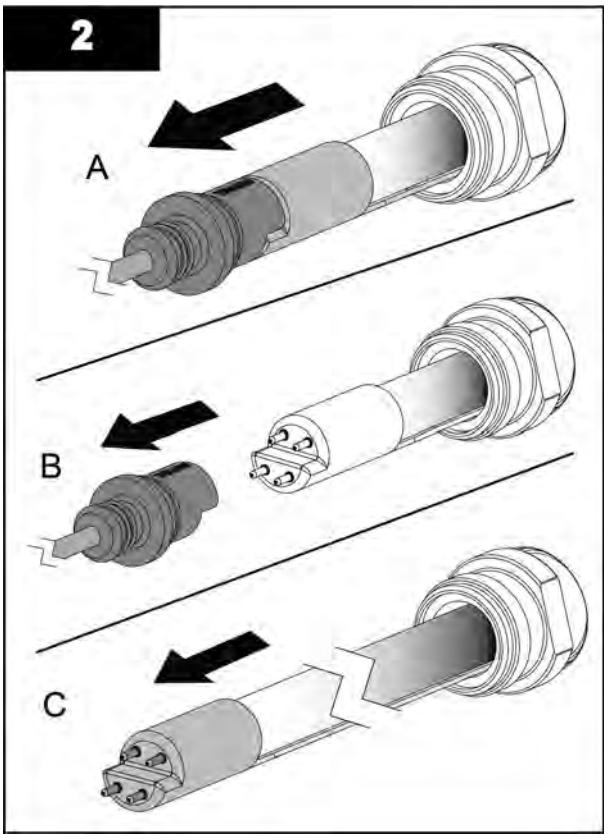
Materials:

- UV lamp

Procedure:

Remove:

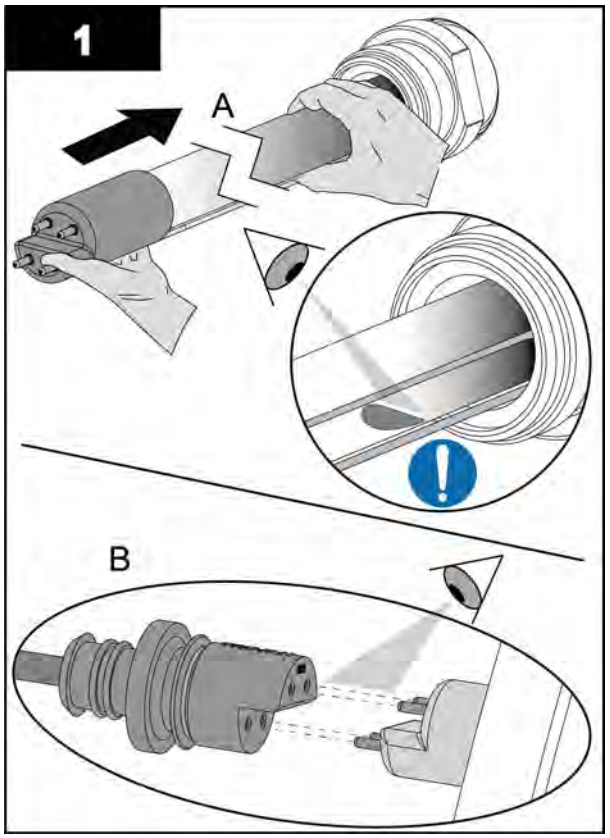


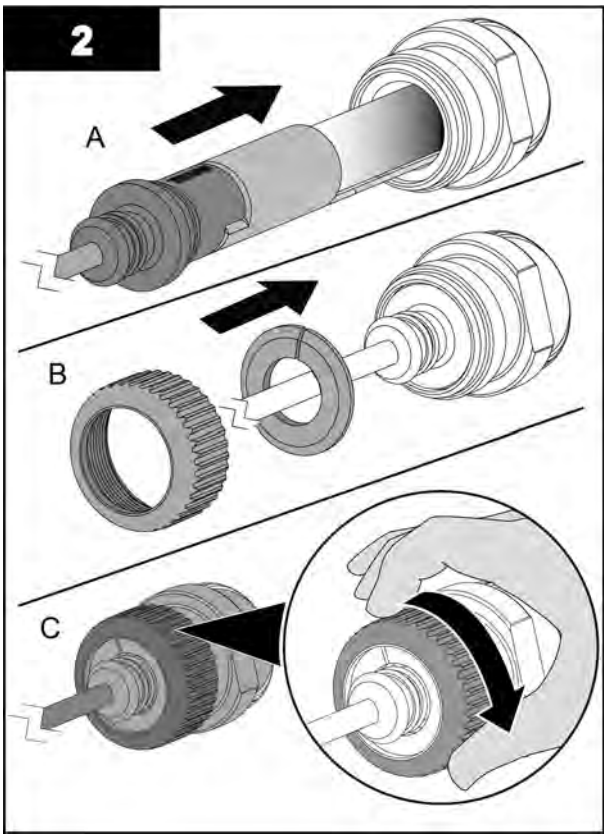


Note: *Ensure that the spring remains inside the Lamp Sleeve.*

3. Inspect the UV Lamp pins for:
   - Evidence of overheating
   - Moisture
   - Displaced or bent pins
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.

Install:





Notes: *1) Always support the UV Lamp with clean, cotton gloved hands.*
2) Align the UV Lamp so that the amalgam spot is on the bottom.

Note: *Hand tighten the cap compression nut.*

3. Dispose of the old UV lamp, as per local regulations.
4. Reset Lamp Hours. Refer to Section 8.8.4.
5. When service is complete, assemble the prerequisites in the reverse order of the disassembly.

9.8 Lamp Sleeves

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

NOTICE

Use caution and apply only 10.1 N.m (90 lbf.in) of torque to the lamp sleeve bolt. Excessive torque will crack the lamp sleeve. Low torque may result in water leakage into the service end cap. Use only the provided lamp Sleeve Bolt Tool.

9.8.1 Remove and Replace the Lamp Sleeves and Lamp Sleeve O-rings

Prerequisites:

- Remove a UV Lamp. Refer to Section 9.7.2.

Tools:

- Lamp Sleeve Removal Tool
- Sleeve Bolt Socket
- 3/8-in. drive torque wrench, 10.1 N.m (90 lbf.in)

Materials:

- Lamp Sleeve - if required
- Lamp Sleeve O-Ring(s)
- Sleeve Bolt cushion ring(s)

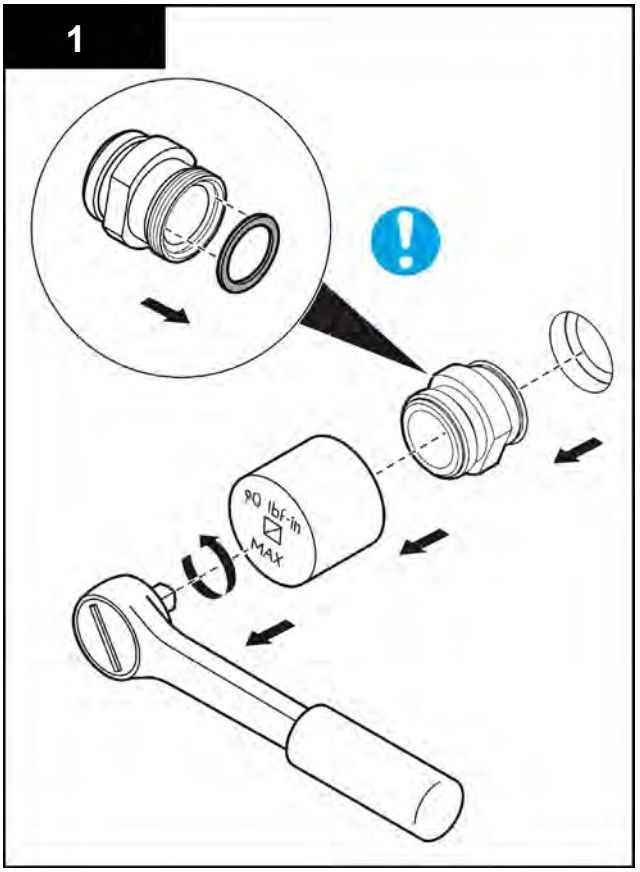
Procedure:

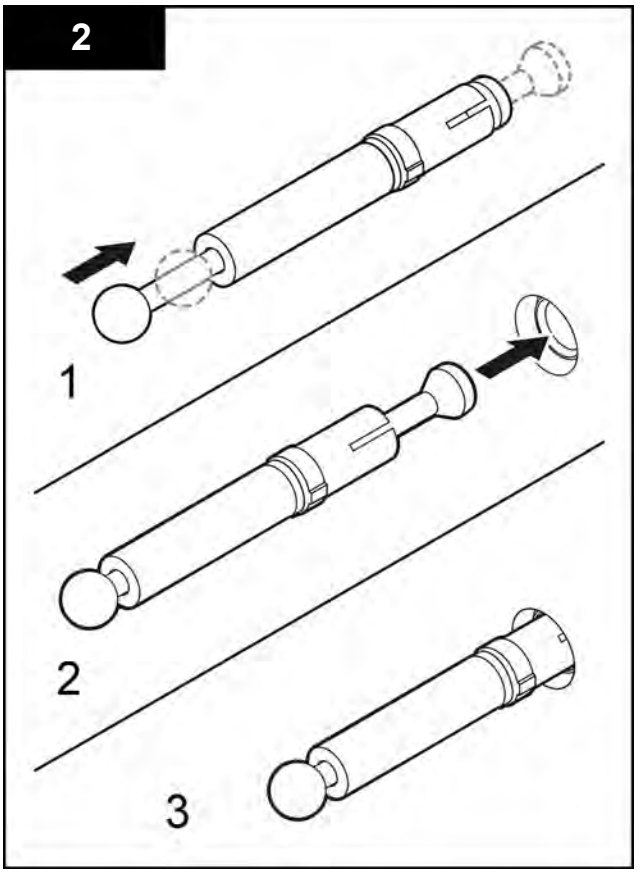
NOTICE

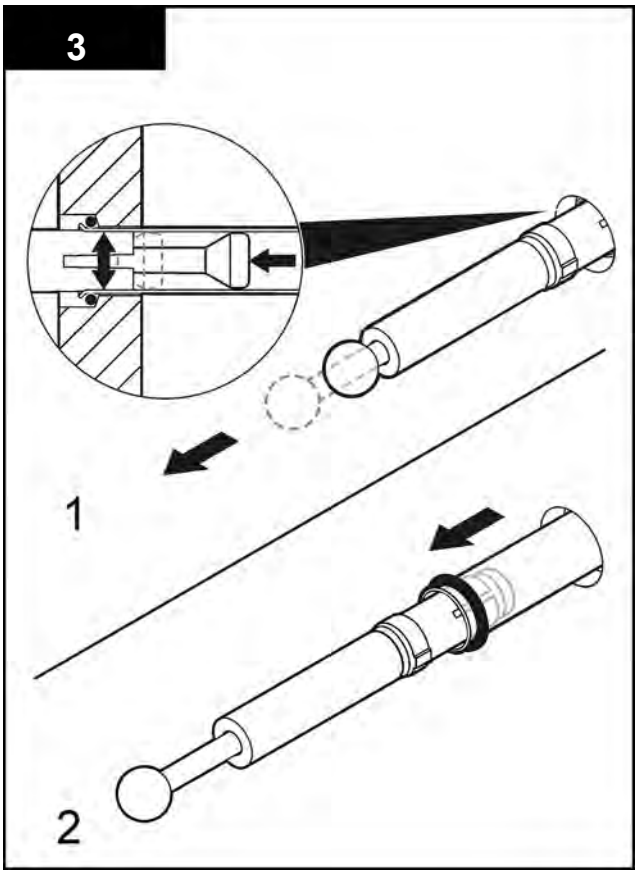
To prevent Lamp Sleeve damage during removal, be sure to keep the Lamp Sleeve level and perpendicular to the end plate. Physical damage to Lamp Sleeves indicates a possible serious condition in the UV Chamber. Full service of the UV Chamber may be needed.

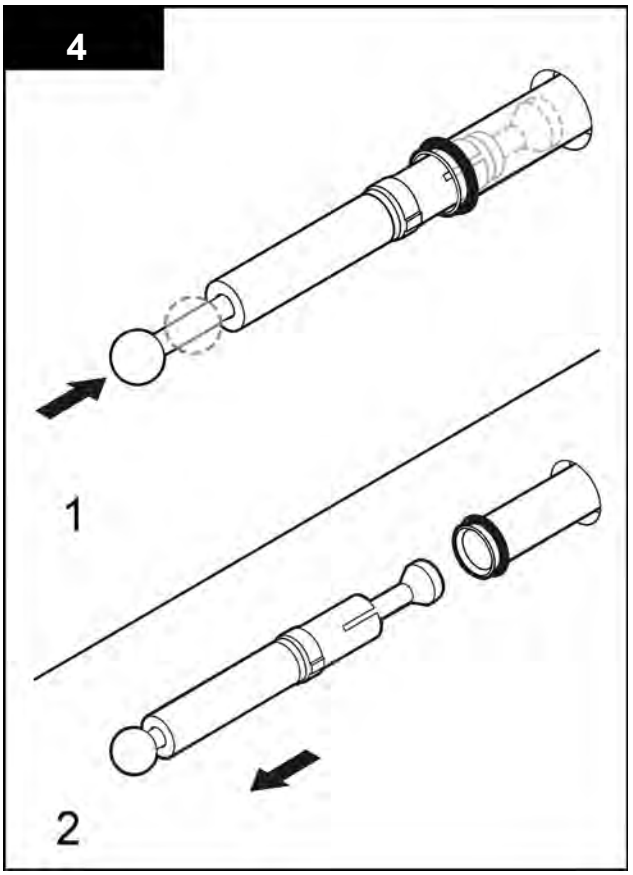
Replace the Sleeve Bolt cushion ring whenever the Sleeve Bolt is removed or the pressure seal is broken.

Remove:



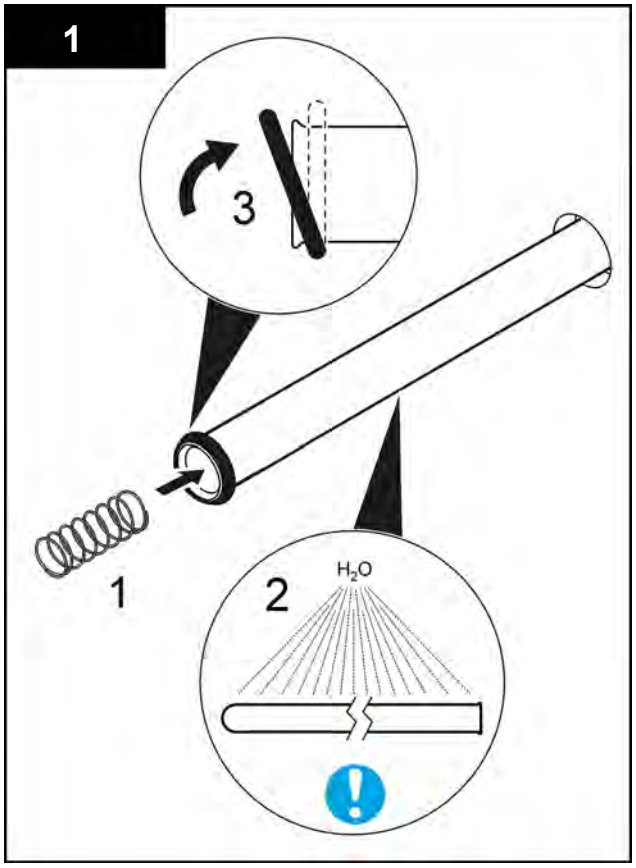


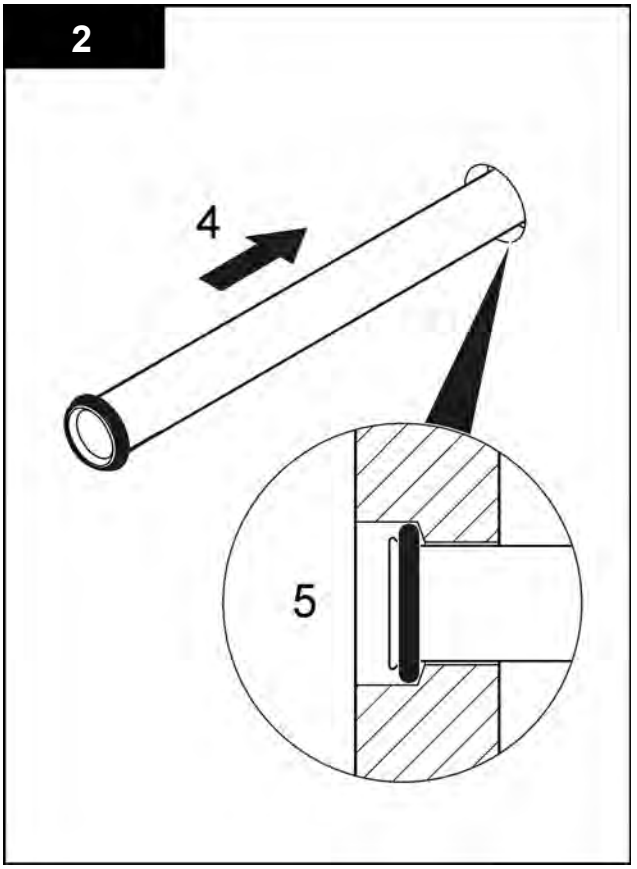


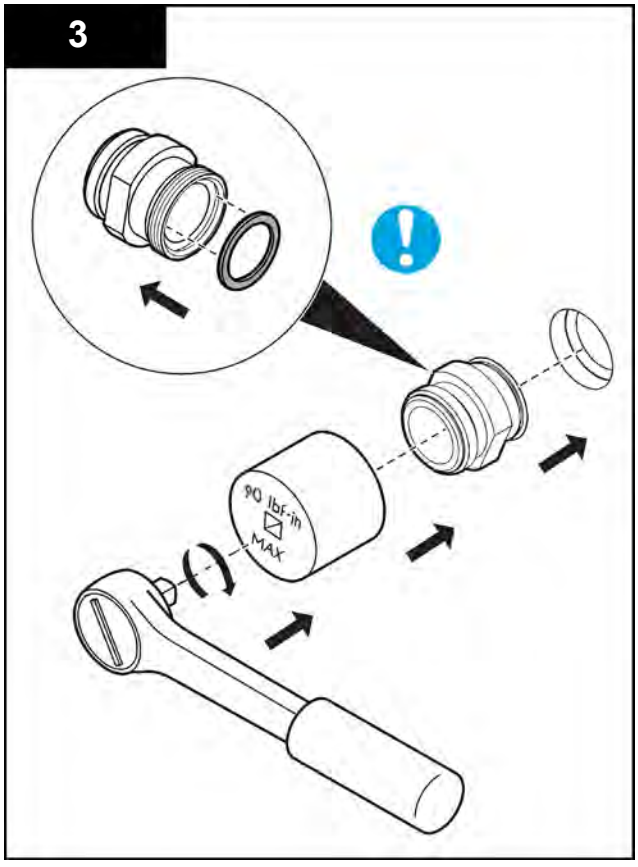


Note: *Inspect the Lamp Sleeve, Lamp Sleeve O-Ring (Section 9.8.2).*

Install:







9.8.2 Inspect the Lamp Sleeves and Lamp Sleeve O-rings

Inspect the Lamp Sleeves and Lamp Sleeve O-Rings as a part of scheduled maintenance, when a UV Intensity Low alarm occurs or a Dose/RED Low alarm occurs.

Prerequisites:

- Remove Lamp Sleeves and Lamp Sleeve O-Rings. Refer to Section 9.8.1.

Tools:

- Lamp Sleeve Removal Tool
- Sleeve Bolt Socket
- 3/8-in. drive torque wrench, 10.1 N.m (90 lbf.in)

Materials:

- Lamp Sleeve - if required
- Lamp Sleeve O-Ring(s)
- Sleeve Bolt cushion ring(s)

Procedure:

1. Inspect the Lamp Sleeves for:
   - Scratches, fractures or other physical damage. If there is physical damage to the lamp sleeves, remove all the lamp sleeves for inspection and replace the lamp sleeves with physical damage. Refer to Section 9.8.2.
   - Excessive build-up. If the inspection sample shows excessive build-up, remove all of the lamp sleeves for manual cleaning. Refer to Section 9.8.3.
   - Excessive build-up, service the Automatic Wiping System. Refer to Section 9.10.
2. Replace any Lamp Sleeve O-Rings that are worn.
3. If the Lamp Sleeves do not have excessive buildup or physical damage, go to the next step.
4. Install the Lamp Sleeve. Refer to Section 9.8.1.

   Note: *Replace the lamp sleeve bolt cushion ring (placed inside the lamp sleeve bolt groove) whenever the lamp sleeve bolt is removed or the pressure seal is broken.*
5. Do a pressure test to check for leaks. Refer to Section 9.5
6. If there are no leaks, depressurize the UV Chamber. Refer to Section 9.4.

   Note: *Draining the UV Chamber is not necessary.*
7. When service is complete, assemble the prerequisites in the reverse order of the disassembly.

9.8.3 Clean the Lamp Sleeves Manually

NOTICE

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

Keep water and debris out of the Lamp Sleeves. Moisture can cause build-up in the Lamp 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 Lamp Sleeves decreases the amount of UV light, and can result in higher UV Lamp temperatures and decreased UV Lamp efficiency.

Only use Trojan Technologies approved cleaning solutions on the Lamp and Sensor Sleeves. Use of unapproved chemicals may result in damage to the equipment. For a list of approved cleaning solutions refer to Table 3.

Table 3 Approved Cleaning Solutions and Dilutions Ratio's

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

Prerequisites:

- Remove Lamp Sleeves. Refer to Section 9.8.1.

Materials:

Procedure:

1. Clean the Lamp Sleeve with a mild acidic solution and a lint-free cloth. Move the cloth up and down the Lamp Sleeve.

   Note: *Clean up spills to avoid slipping and dispose ActiClean Gel as per site and country protocol.*

2. Rinse the Lamp Sleeve with clean water.
3. When service is complete, assemble the prerequisites in the reverse order of disassembly.

9.9 UV Sensor

9.9.1 Remove and Replace the UV Sensor and Sensor Window

Replace a UV Sensor when the UV Sensor is damaged or when UVI alarms occur that are not caused by UV lamp failure . Clean the UV Sensor as part of scheduled monthly maintenance or when a low UV alarm occurs.

Prerequisites:

- Depressurize and drain the UV Chamber. Refer to Section 9.4.

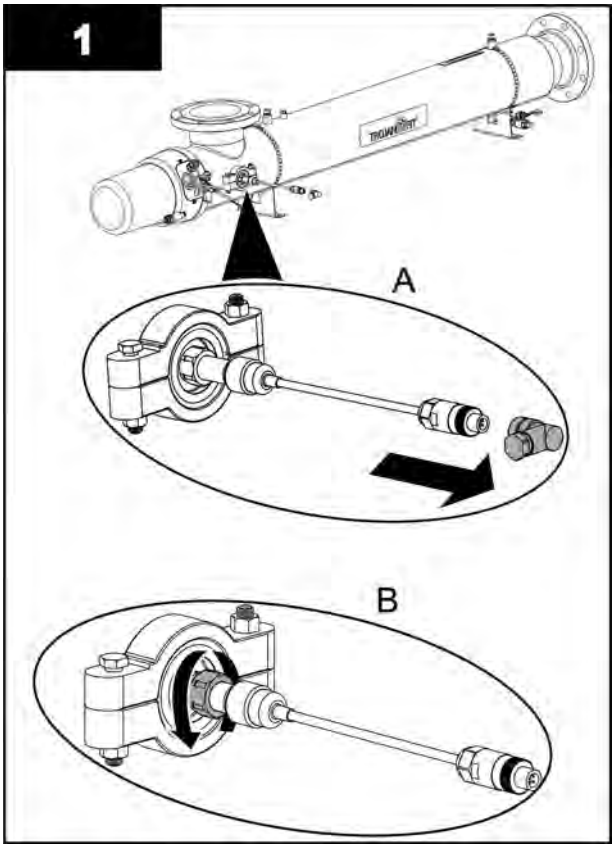
Tools:

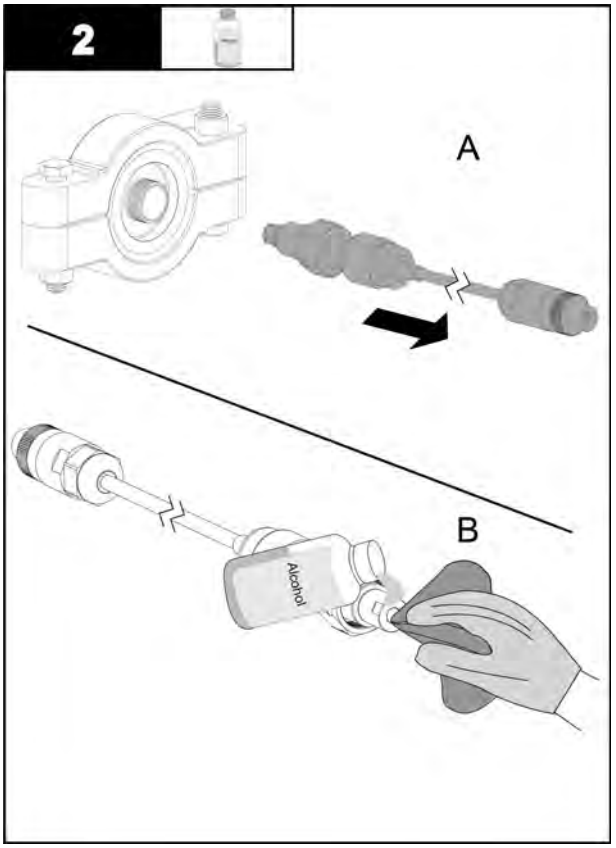
Materials:

- UV Sensor O-ring
- UV Sensor

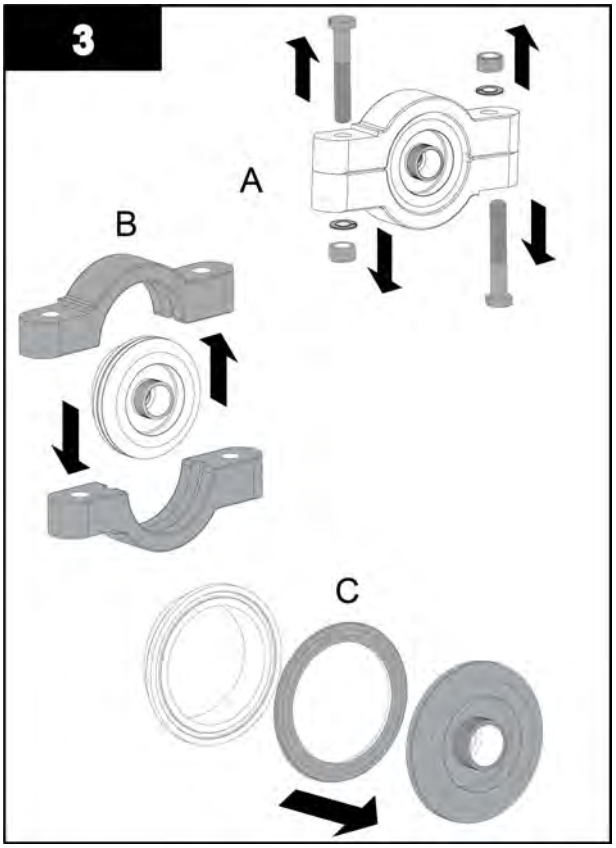
Procedure:

Remove and Clean the UV Sensor:





Note: *If water is draining at a high rate from the sensor port the UV Chamber is not fully drained. Drain UV Chamber completely before continuing.*



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

9.10 Automatic Mechanical Wiper System (AMWS)

Note: *Applies to Automatic Wiping Systems only.*

9.10.1 Remove the Gear Motor Assembly

Remove the gear motor assembly as necessary to access UV lamps and lamp sleeves that are located behind the gear motor assembly.

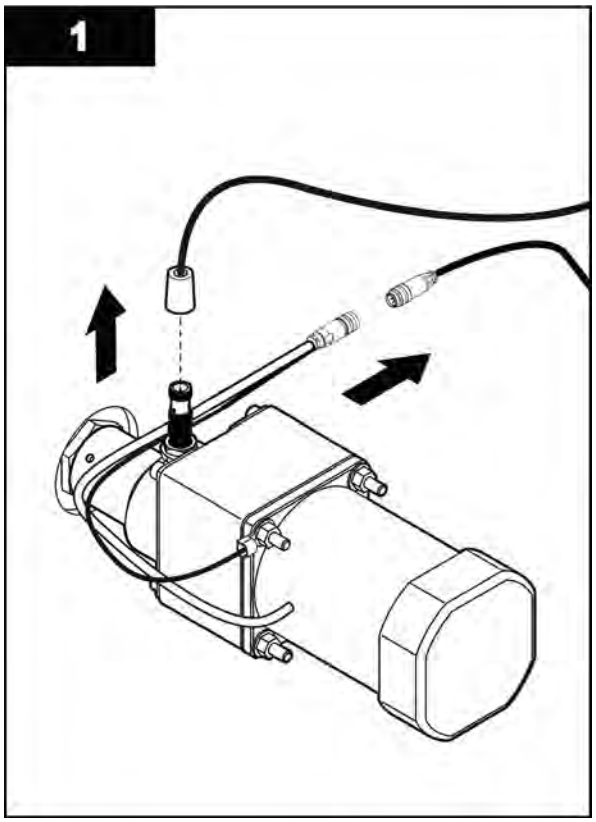
Prerequisites:

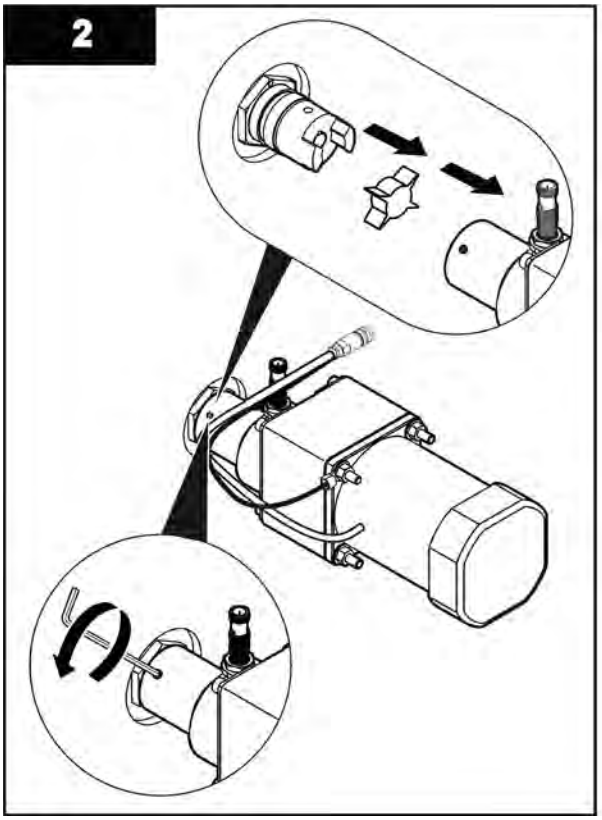
- Remove the Service End Cap. Refer to Section 9.6.

Tools:

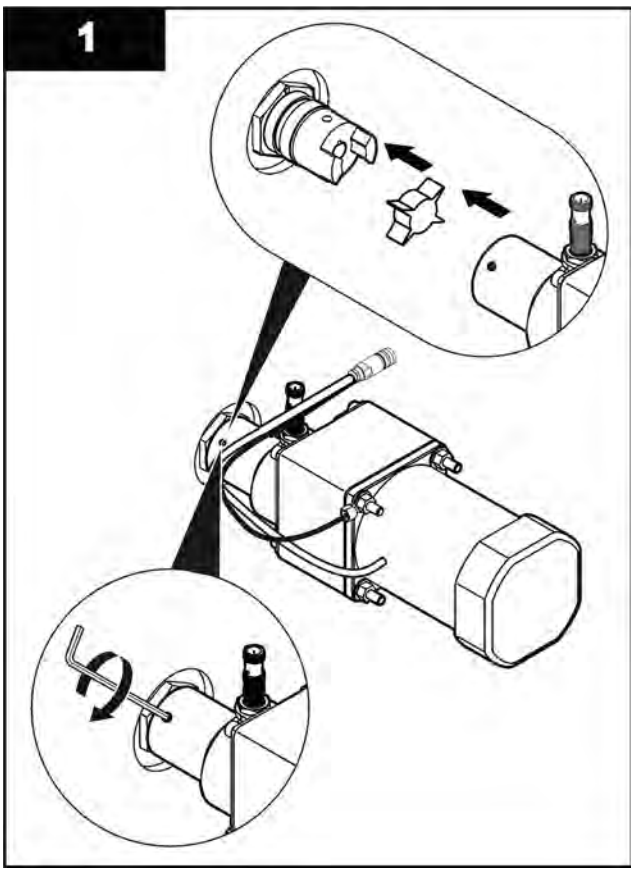
Materials:

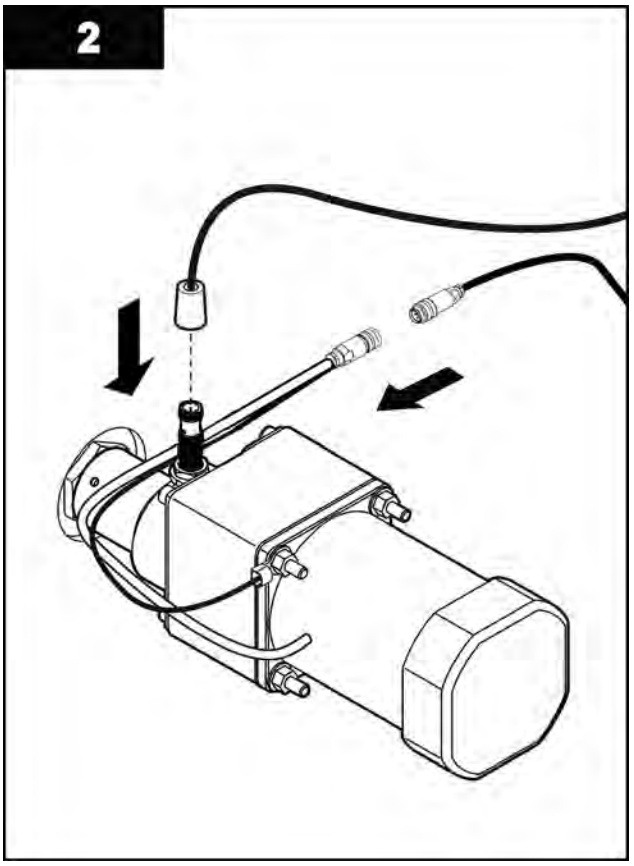
Remove:





Install:





Post-requisites:

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

9.10.2 Replace the Gear Motor

Replace the gear motor when it can no longer turn the drive shaft to move the wiper plates.

Prerequisites:

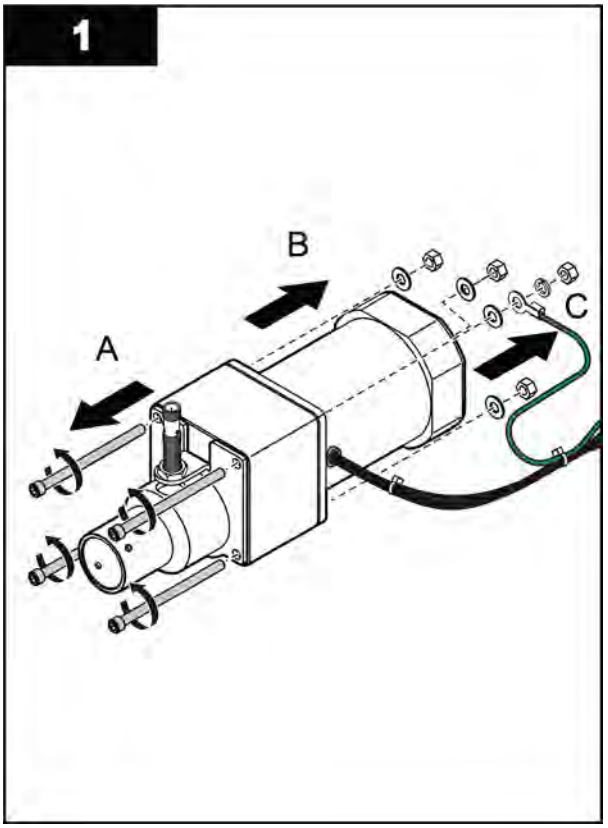
- Remove the gear motor assembly. Refer to Section 9.10.1.

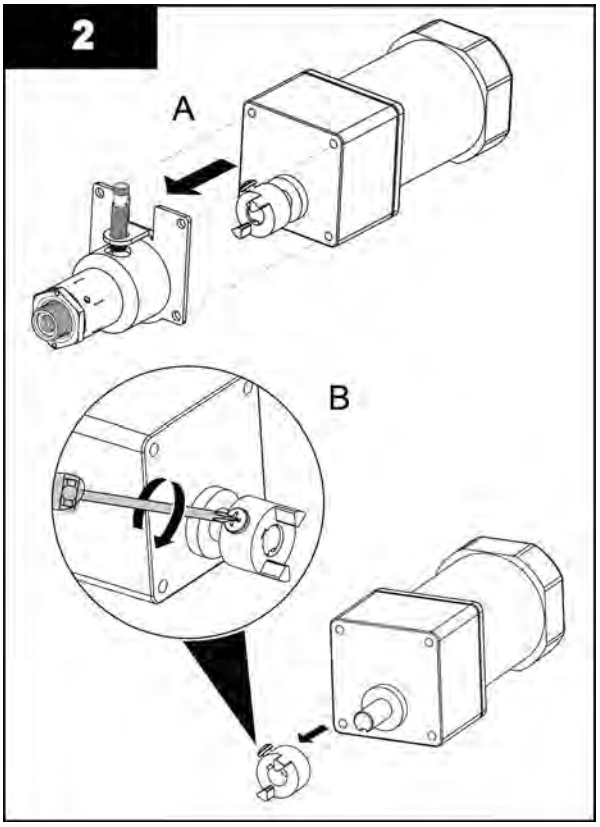
Tools:

Materials:

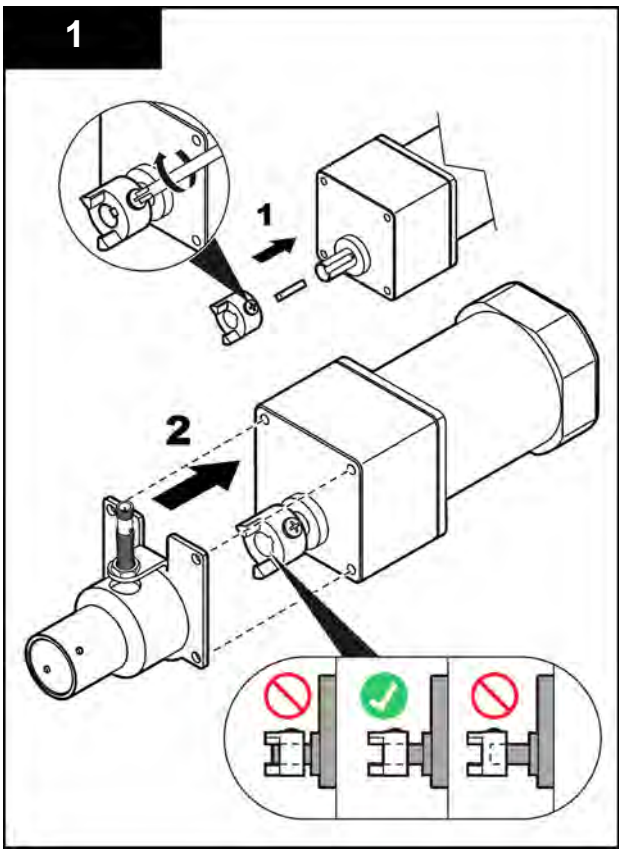
- Gear motor

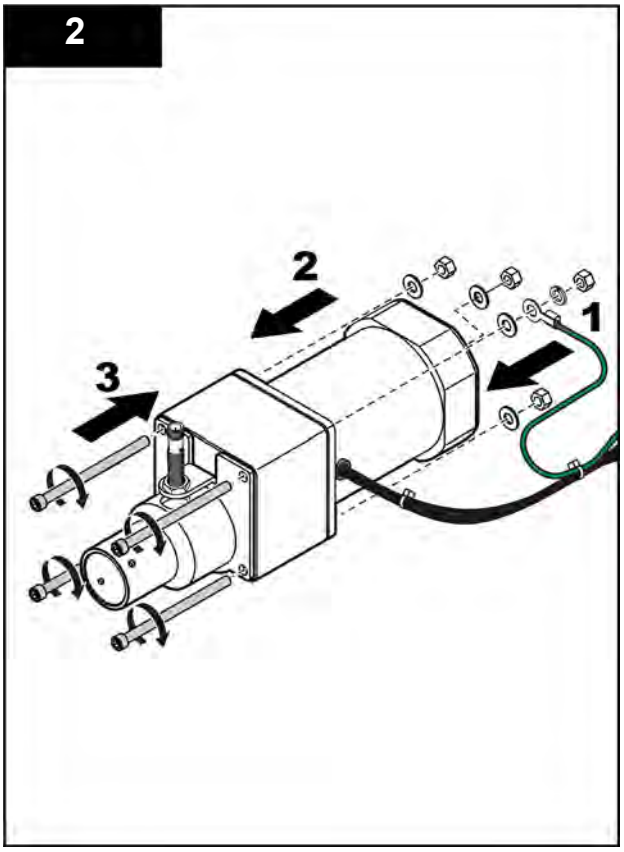
Remove:





Install:





- Turn the drive shaft coupler so that the wiper revolution proximity UV Sensor has enough clearance to rotate freely (approximately 0.050" or 1.25mm).
- When service is complete, assemble the prerequisites in the reverse order of the disassembly.

9.10.3 Replace the Wiper Revolution Proximity Sensor

Replace the wiper revolution proximity sensor when a wiper home alarm occurs and the wiper revolution proximity sensor has failed.

Prerequisites:

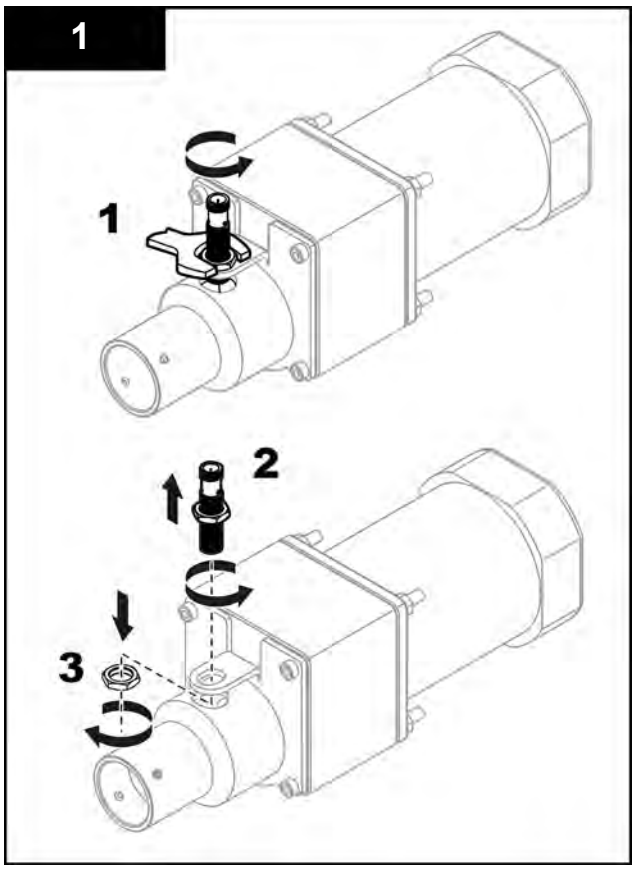
- Remove the gear motor assembly. Refer to Section 9.10.1.

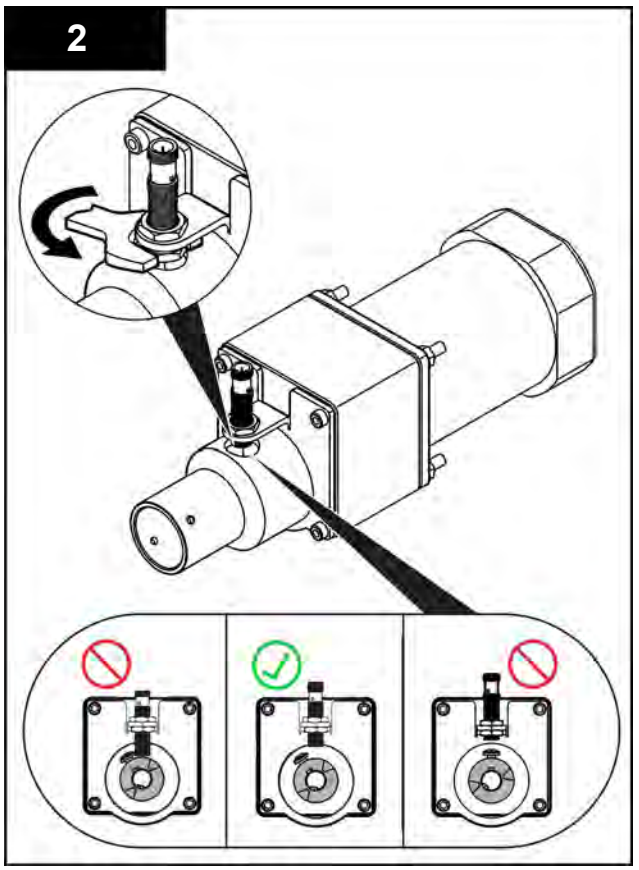
Tools:

Materials:

- Revolution proximity sensor

Replace:





- Turn the drive shaft coupler so that the wiper revolution proximity sensor has enough clearance to rotate freely.
- When service is complete, assemble the prerequisites in the reverse order of the disassembly.

9.11 Control Power Panel (CPP)

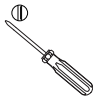
9.11.1 Open the CPP Enclosure

Open the CPP enclosure to replace lamp drivers or the air filter.

Prerequisites:

- Shutdown the UV System. Refer to Section 7.5 or Section 7.6 as needed.
- Apply lockout tag out devices as necessary. Refer to Section 4.1.
- Wait five minutes to allow stored energy to dissipate.

Tools:



Materials:

Procedure:

1. Turn the CPP disconnect switch to off (horizontal) to turn power off to the CPP. Apply lockout tag out as necessary to prevent unexpected exposure to high voltage.
2. Use a screwdriver on 1/4 turn to open the CPP door.

9.11.2 Replace a Lamp Driver

Replace a lamp driver when a lamp driver failure alarm occurs.

Prerequisites:

- Open the CPP enclosure. Refer to Section 9.11.1.

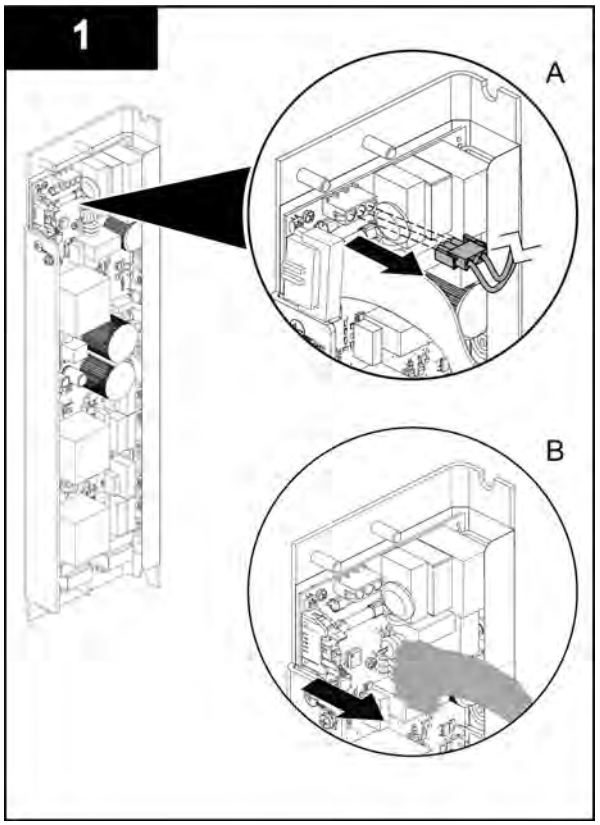
Tools:

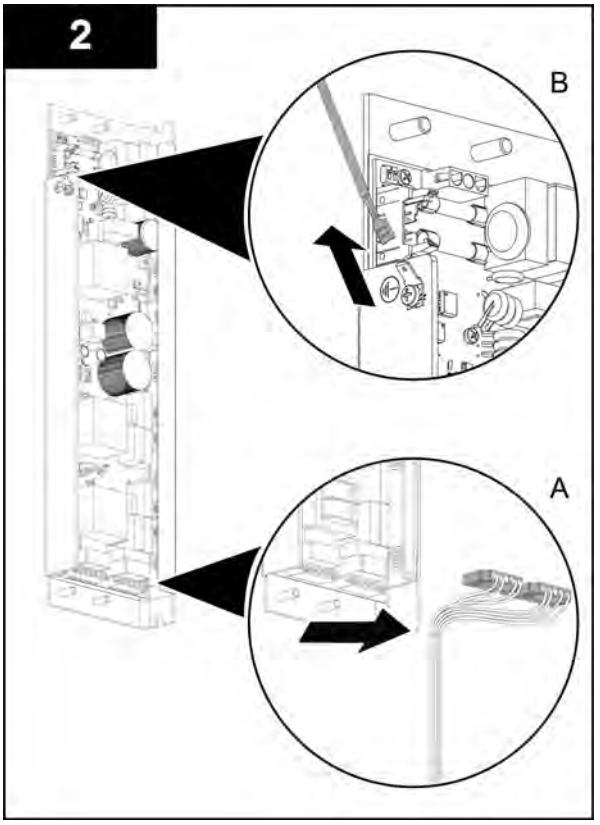
Materials:

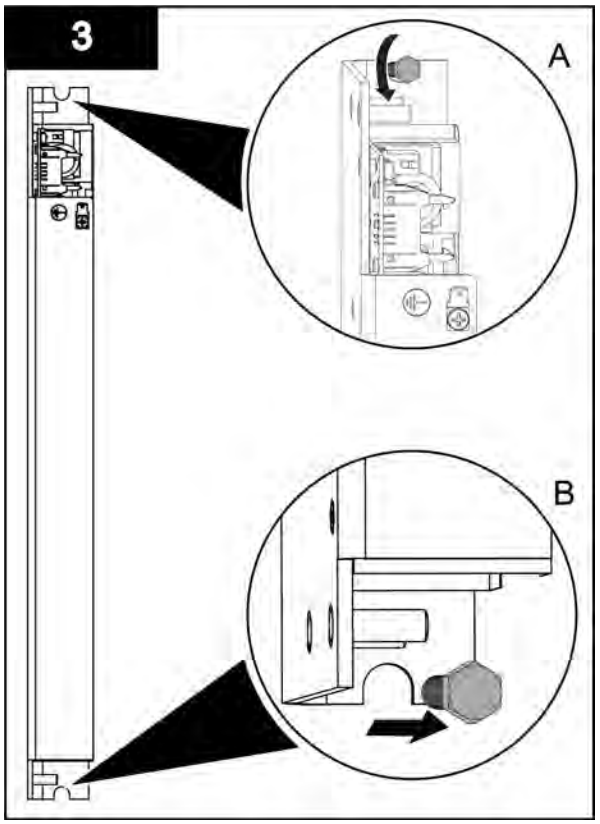
- Lamp driver

Procedure:

Remove:

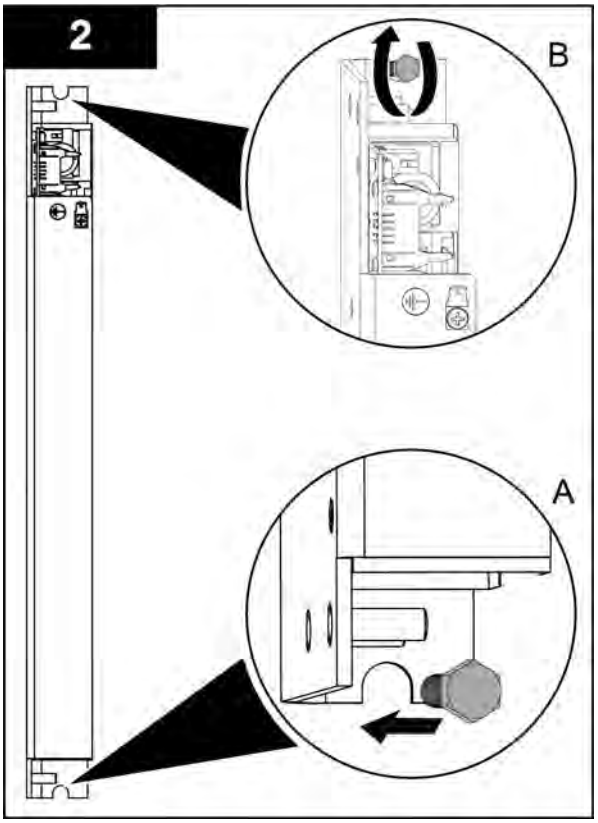


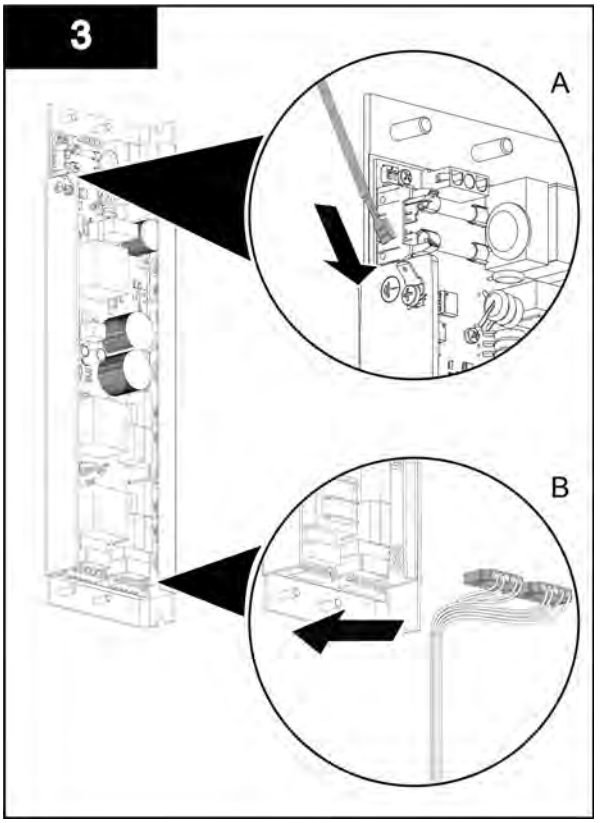


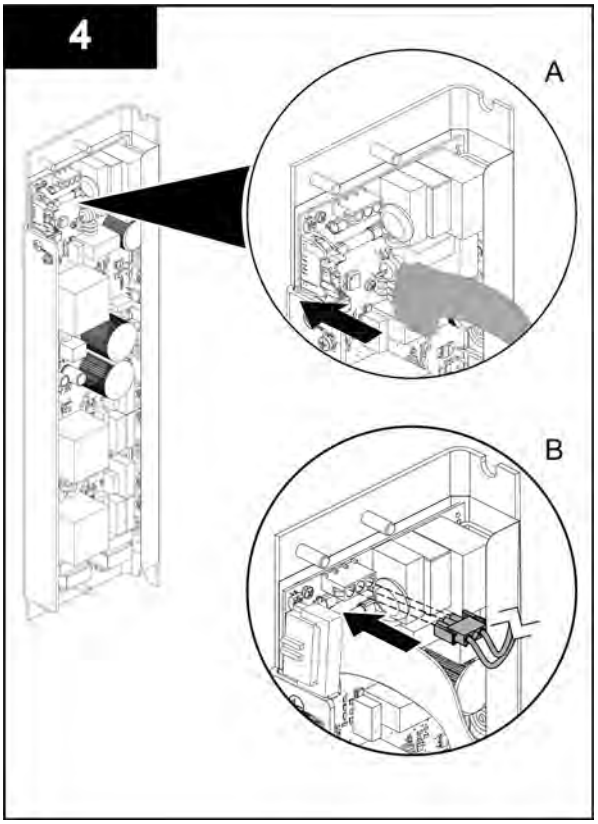


Replace:

1. Set the DIP switches on the new lamp driver to match the settings on the old lamp driver.







9.11.3 Replace the CPP Air Filter

Replace the air filter as part of regular maintenance or when the air filter is dirty.

Prerequisites:

- Open the CPP enclosure. Refer to Section 9.11.1.

Materials:

- New air filter

Procedure:

1. Slide the old air filter out and replace with the new one. Follow all local regulations for filter disposal.

Section 10 Service and Repair

DANGER	
	Obey all warning and caution statements. Refer to Section 2. Read and understand this 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 tasks and safety information described in this section of the manual require major disassembly of the UV Chamber to access internal components.

Routine scheduled maintenance tasks that do not need access to the inside of the UV Chamber are described in detail in this manual.

Service tasks include regularly scheduled inspections and replacements that must be done while the UV Chamber is open and disassembled. Refer to Section 10.3.1 for the service schedule.

Repair tasks are the result of major wear and damage, and may require disassembly of the UV lamp holder assembly.

10.1 Tools and Materials

Symbols	Description	Symbols	Description
	Wrench - Torque		Wrench - Adjustable
	Water - Soapy		Hex Key
	Screwdriver - Phillips		Pliers - Needlenose
	Wrench		Rubber Hammer
	Wrench - Socket		Loctite® 242

10.2 Legend

The symbols in the following table will be used in this Section to define the wiping option provided. Follow the instructions that correspond to the supplied system.

Symbol	Description	Symbol	Description
A	Automatic Wiping Option	N	Non-wiping Option

10.3 Service

10.3.1 Service Schedule

Inspect all system components during disassembly to determine whether repair is needed. Allow approximately 8 hours to complete service tasks.

Table 4 shows areas that need regular inspection. Table 5 shows scheduled service tasks that are done annually.

Table 4 Inspections

Applies to:		Component	Look for:
N	A		
✓	✓	Sanitary Gasket	Leaking at the sanitary flange Signs of wear, cracking or brittleness
✓	✓	UV Chamber	Excessive sediment build-up, which may indicate a systemic issue
	✓	Drive Nut	Worn threads or signs of damage
	✓	Wiper Plate	Bent plates or warped support rods, buildup
	✓	Drive Screw	Worn or dirty threads
✓	✓	Stop Plate	Bent or warped stop plate; build-up

Table 5 Annual Service

Applies to:		Component	Clean	Replace
N	A			
✓	✓	Sanitary Gasket	—	Section 10.3.2
✓	✓	UV Chamber	Section 10.3.2	—
✓	✓	Sleeve Holder Bushings and Wear Pads	—	Replace if signs of wear are visible, or every 2 years, which ever comes first. Section 10.3.5
	✓	Wiper Seals and Wiper Seal Holders	—	Replace if signs of wear are visible, or every 2 years, which ever comes first. Section 10.3.6
	✓	Bearing Housing and Bearing Housing O-ring	—	Replace bearing housing O-ring annually.Section 10.3.7
✓	✓	Stop Plate	As needed	If bent or otherwise damaged;Section 10.4.1
	✓	Wiper Plate	As needed	If bent or otherwise damaged;Section 10.4.2
	✓	Drive Nut	As needed	If the driver nuts are worn; Section 10.4.2
	✓	Drive Shaft	As needed	if threads are visibly worn or other signs of wear or damage are visible on the drive shaft; Section 10.4.3

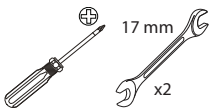
10.3.2 Open the UV Chamber

The UV Chamber must be open with the UV lamp holder assembly removed to do service tasks.

Prerequisites:

- Shutdown the UV system. Refer to Section 7.
- Apply Lockout Tag Out devices as necessary. Refer to Section 4.1.
- Depressurize and drain the UV Chamber, and stand off to the side. Refer to Section 9.4.
- Wait ten minutes to allow UV Lamps to cool.
- Remove the Service End Cap. Refer to Section 9.6.
- Remove the Gear Motor assembly (Automatic Wiping Systems Only). Refer to Section 9.10.1.
- Remove the UV Lamps. Refer to Section 9.7.2.
- Remove the Lamp Sleeves. Refer to Section 9.8.1.

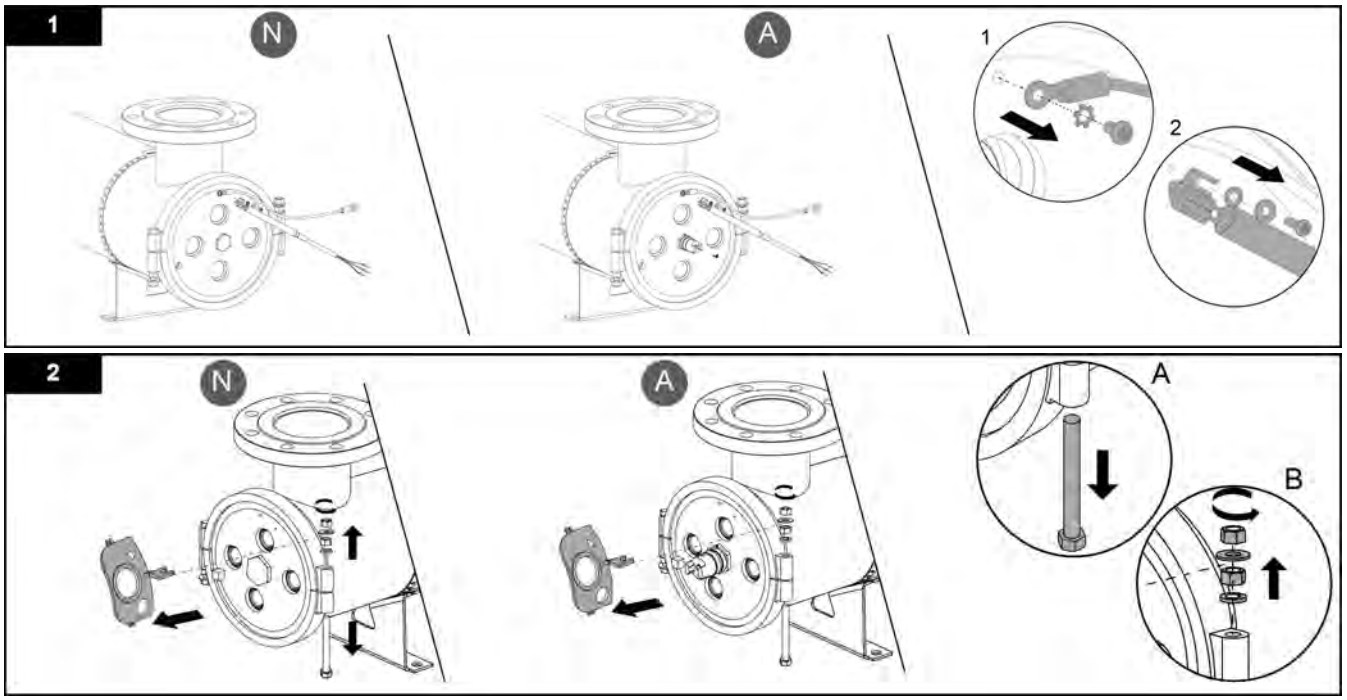
Tools:

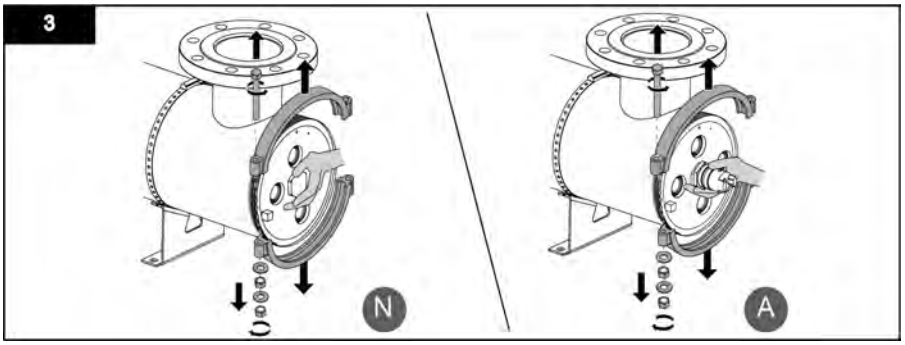


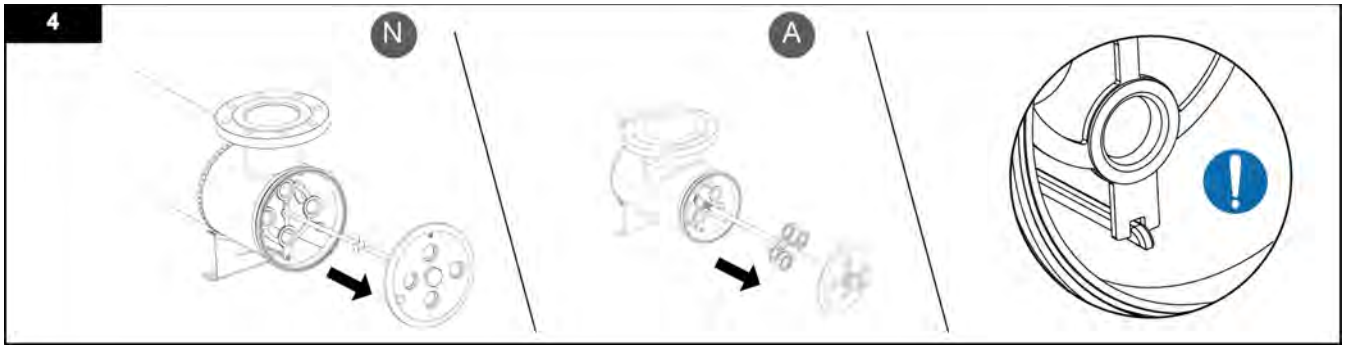
Materials:

Note: *The End Cap Limit Switch is not shown for clarity in the following procedure.*

Procedure:







Note: *Guide rod is not applicable on systems with sanitary flanges.*

The UV Chamber and internal components are now accessible for cleaning and service.

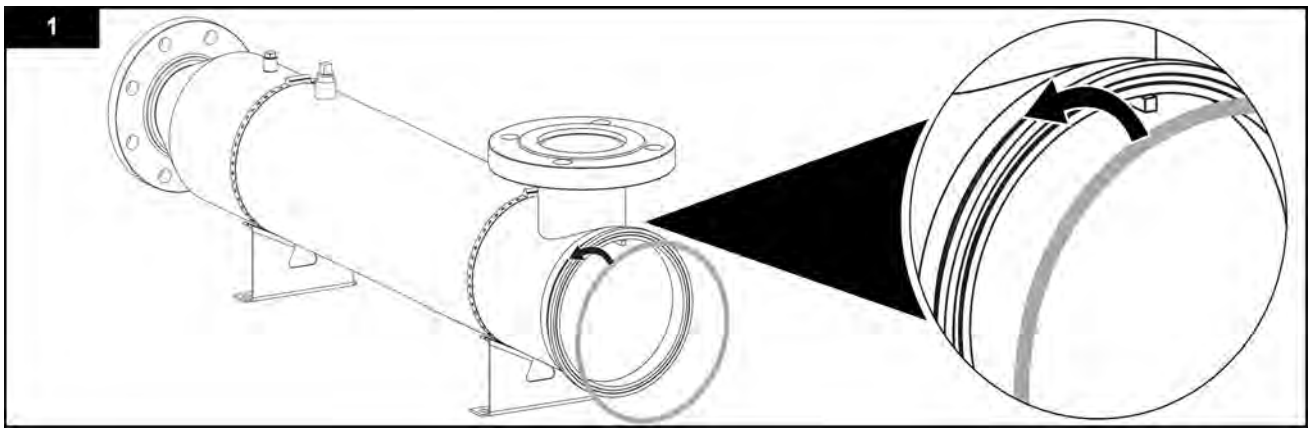
10.3.3 Assemble the UV Chamber

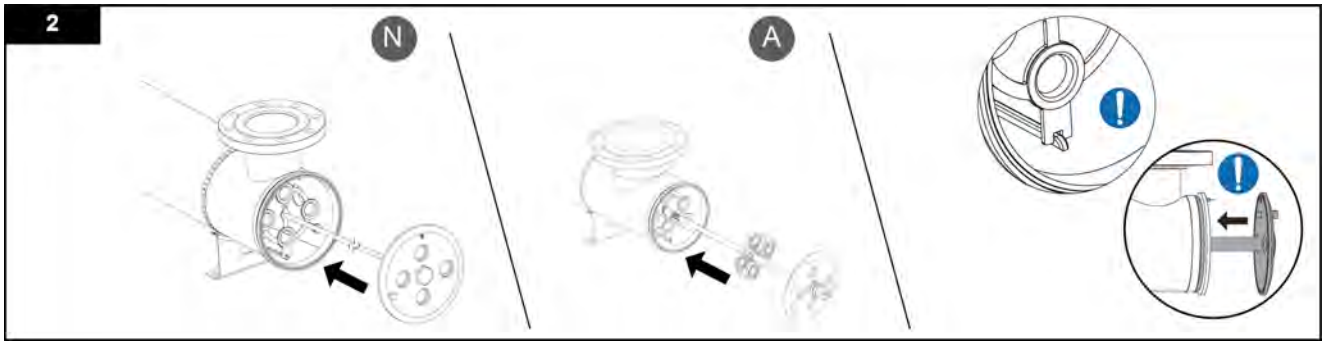
Tools:

Materials:

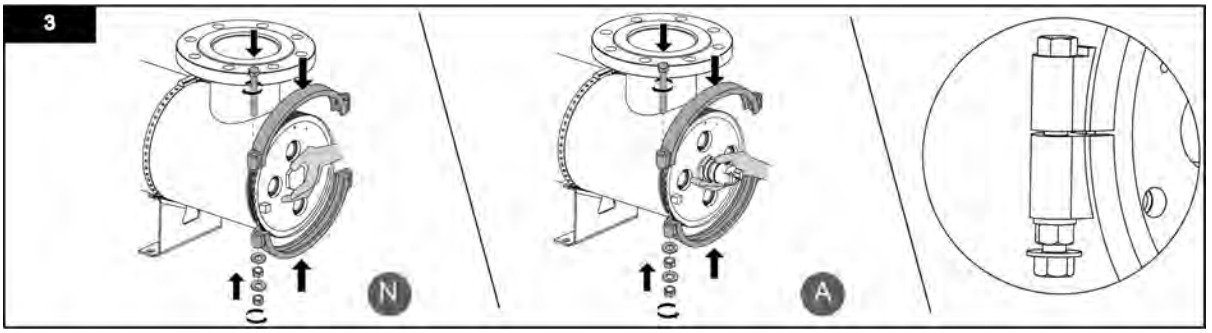
Procedure:

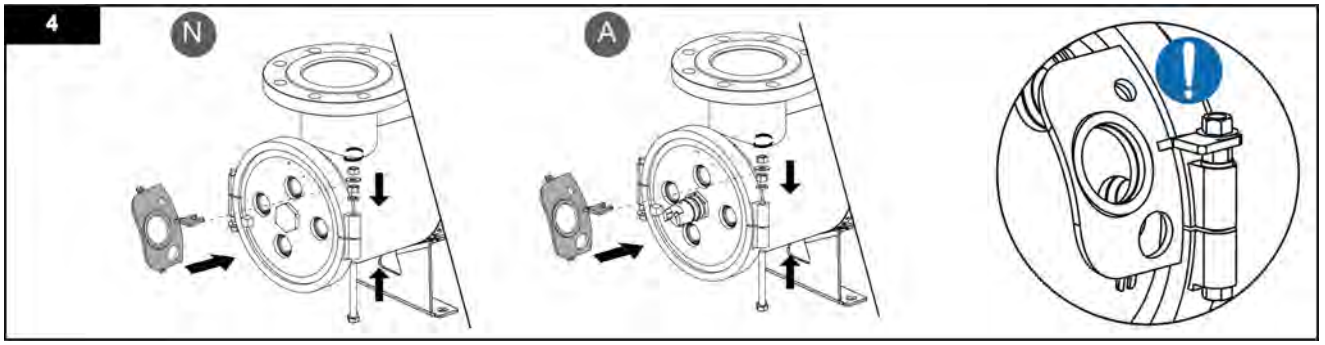
Note: *The End Cap Limit Switch is not shown for clarity in the following procedure*

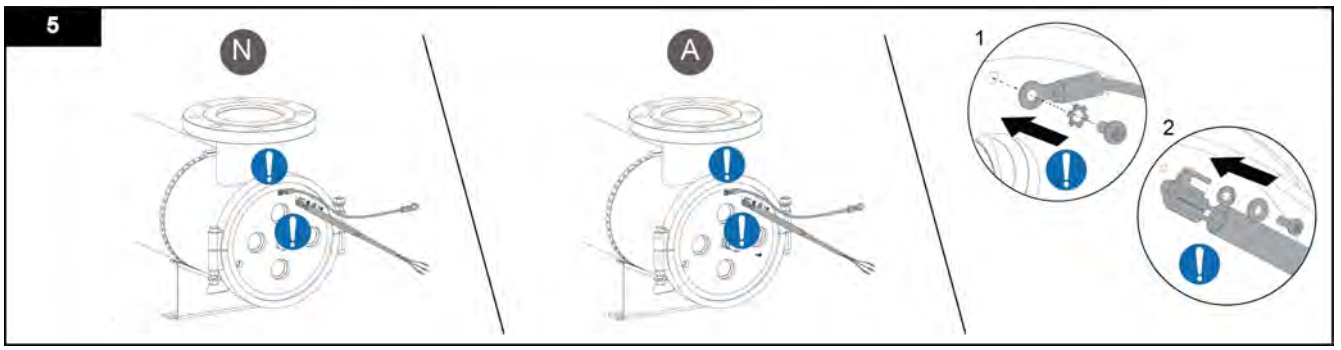




Note: *Guide rod is not applicable on systems with sanitary flanges.*







Post-requisites:

- Install the Lamp Sleeves. Refer to Section 9.8.1.
- Install the UV Lamps. Refer to Section 9.7.2.
- Install the Gear Motor assembly (Automatic Wiping Systems Only). Refer to Section 9.10.1.
- Install the Service End Cap. Refer to Section 9.6.
- Pressurize the UV Chamber, and stand off to the side. Refer to Section 9.5.
- Remove Lockout Tag Out devices as necessary. Refer to Section 4.2.

10.3.4 Clean the UV Chamber Interior

Whenever the UV lamp holder assembly is removed from the UV Chamber, check the interior of the UV Chamber for an excessive build-up of sediment. Excessive buildup is an indication that there may be problems upstream in the treatment facility.

Prerequisites:

- Open the UV Chamber. Refer to Section 10.3.2.

Tools:

- Refer to site-specific procedures

Materials:

- Clean Water

Procedure:

1. Flush the UV Chamber interior with clean water. Refer to site-specific cleaning procedures.
2. When service and repair is complete, assemble the UV Chamber. Refer to Section 10.3.3.

10.3.5 Replace the Sleeve Holder Bushings and Wear Pads

Prerequisites:

- Open the UV Chamber. Refer to Section 10.3.2.

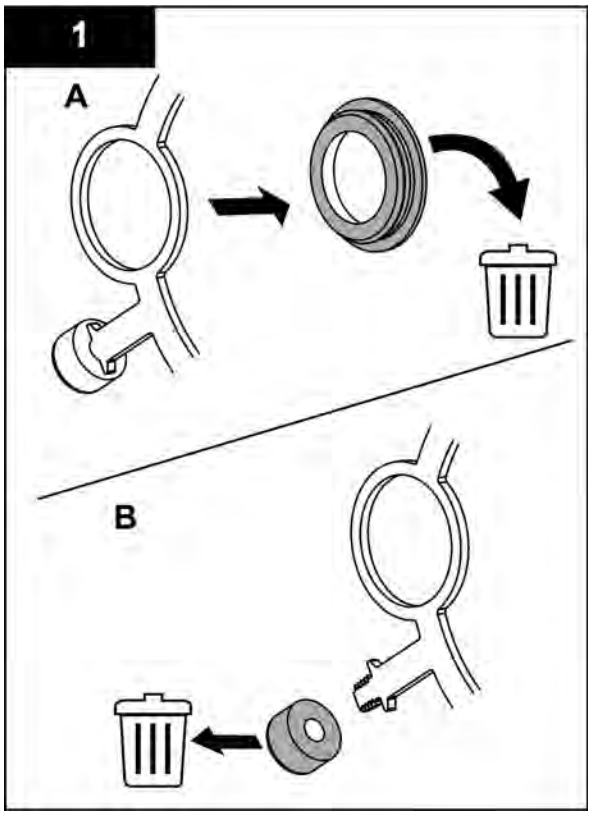
Tools:

Materials:

- Lamp Sleeve Holder Bushings
- Wear Pads

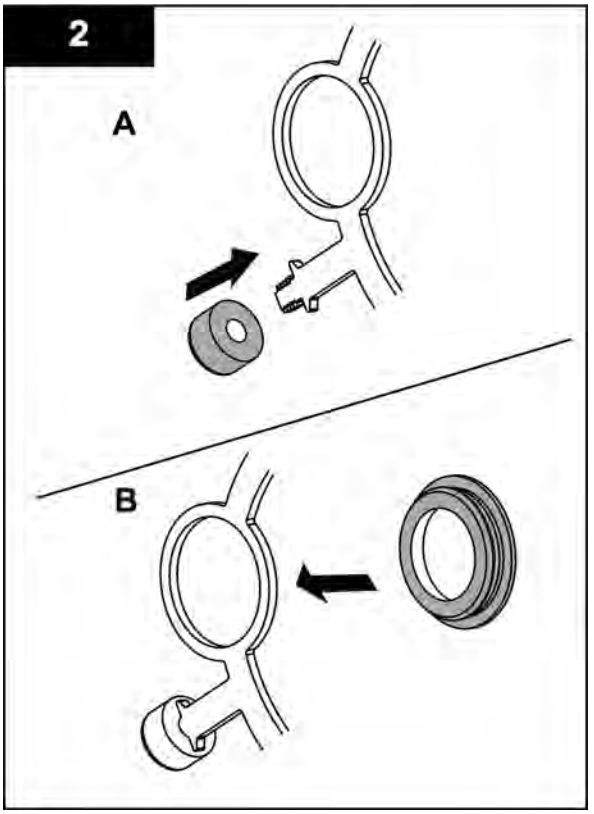
Procedure:

Remove



Note: *Record the orientation of the sleeve holder bushing in the stop plate.*

Replace:



Note: *Insert the new wear pad by gently tapping with a rubber hammer until the wear pad fully seats on the stop plate.*

When service and repair is complete, assemble the UV Chamber. Refer to Section 10.3.3.

10.3.6 Replace the Wiper Seals and Wiper Seal Holders

Note: *Applies to Automatic Wiping Systems only.*

Prerequisites:

- Open the UV Chamber. Refer to Section 10.3.2.

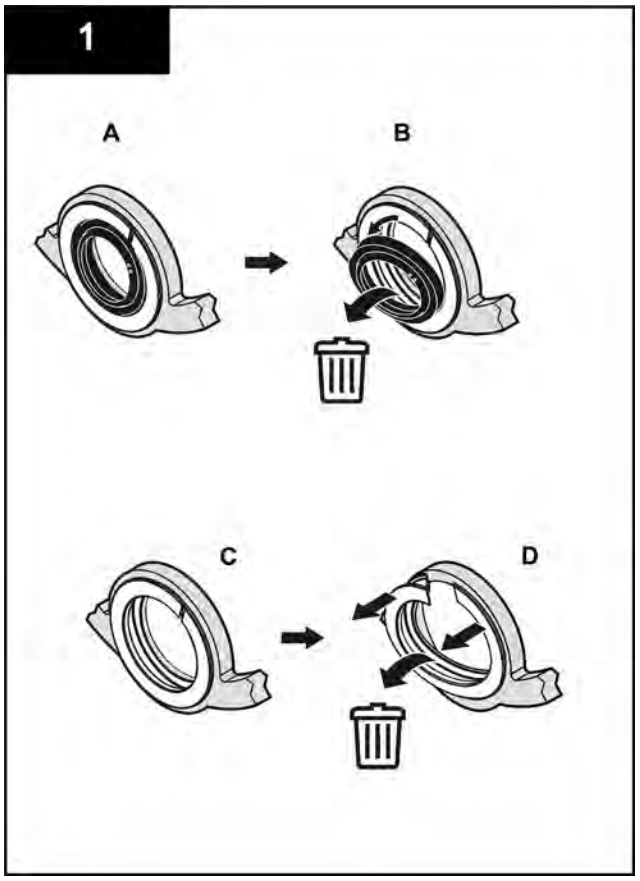
Tools:

Materials:

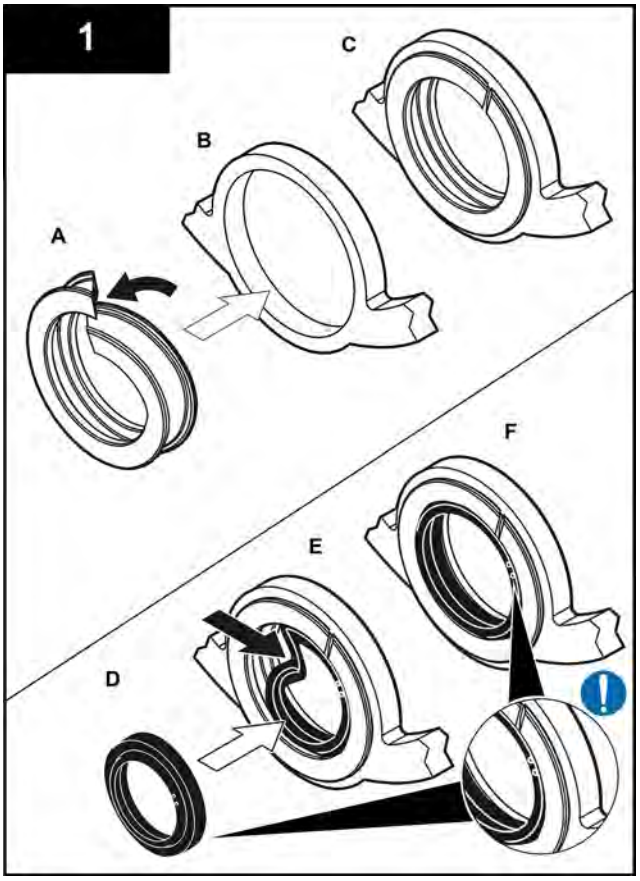
- Lamp Sleeve Wiper Seals
- Lamp Sleeve Wiper Seal Holders

Procedure:

Remove:



Install:



When service and repair is complete, assemble the UV Chamber. Refer to Section 10.3.3.

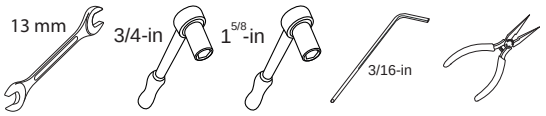
10.3.7 Replace the Bearing Housing and Bearing Housing O-ring*

Note: *Applies to Automatic Wiping Systems only.*

Prerequisites:

- Open the UV Chamber. Refer to Section 10.3.2.

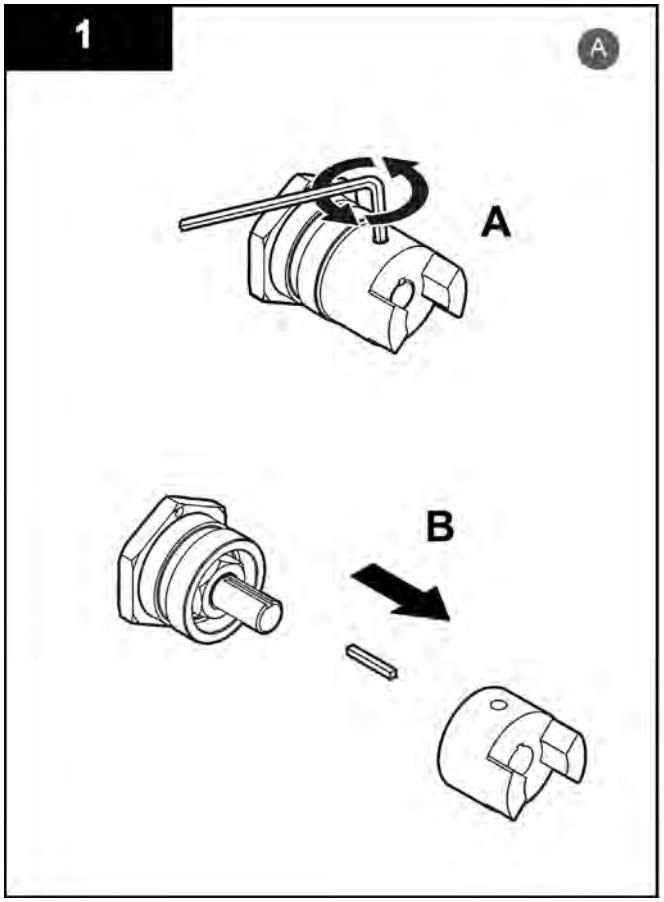
Tools:

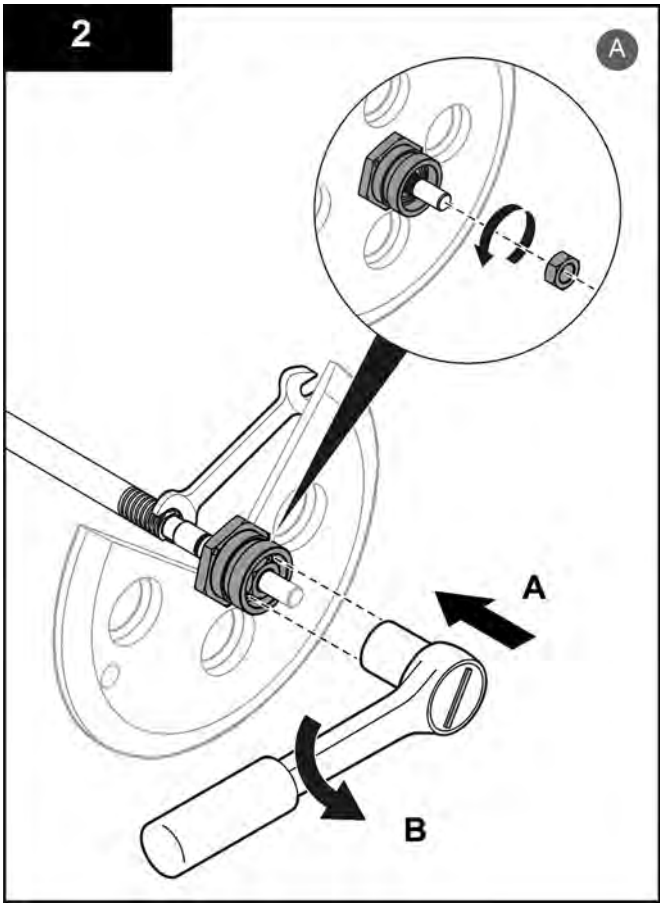


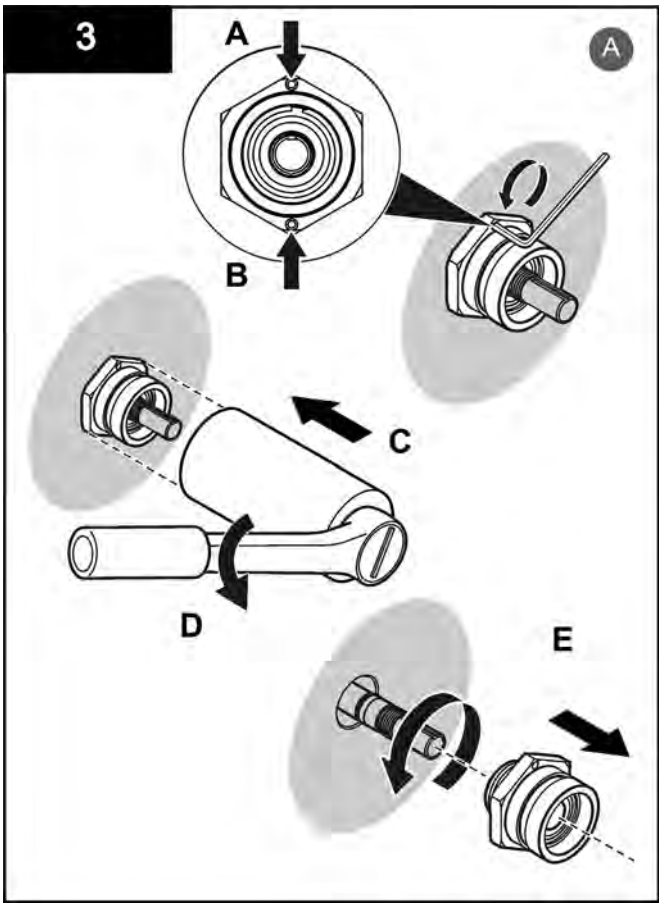
Materials:

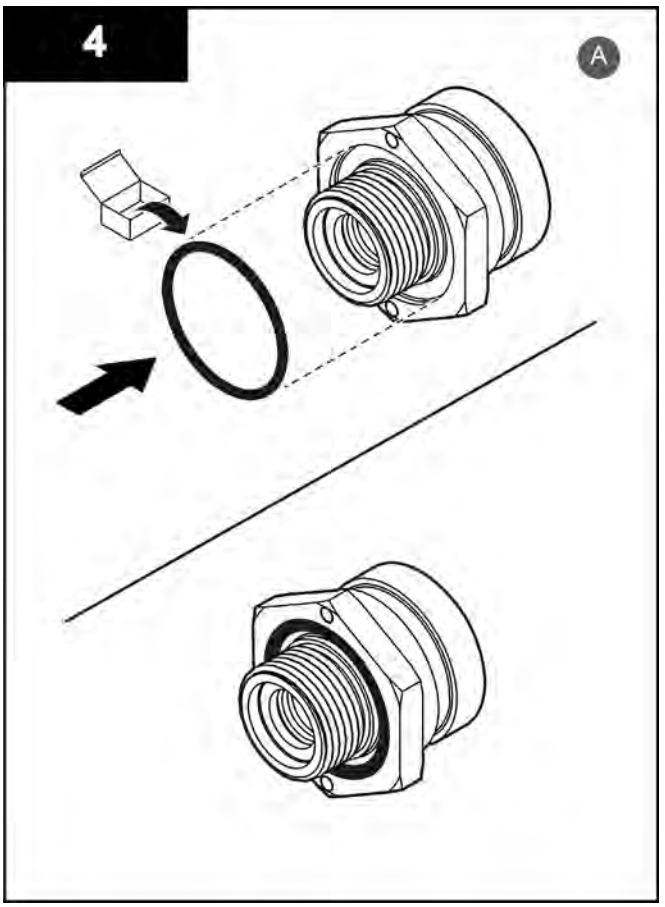
- Bearing Housing Kit
- Bearing Housing O-ring

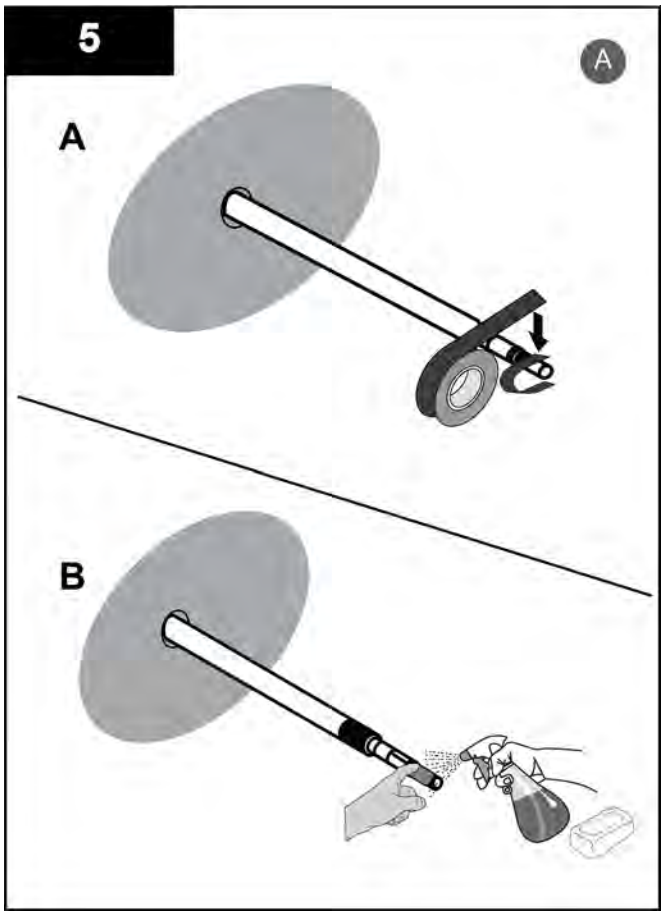
Procedure:


1
A
A
B

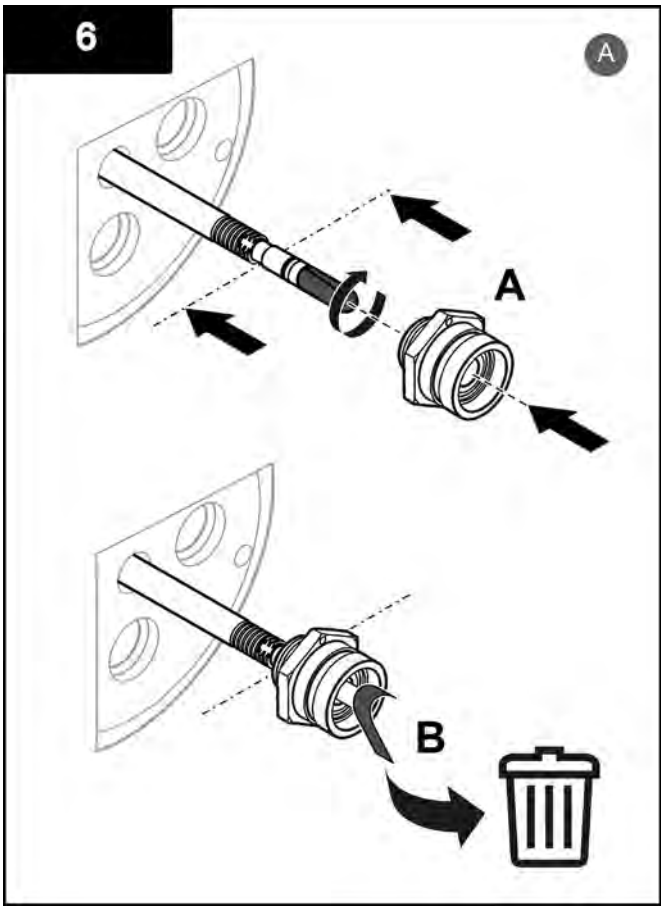

2
A
A
B


3
A
A
B
C
D
E

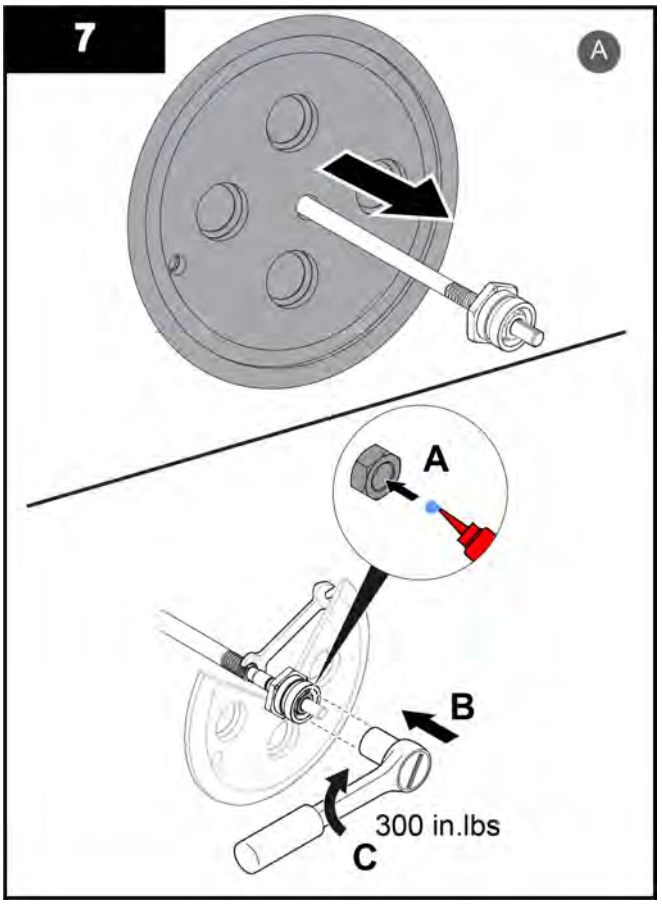

4
A

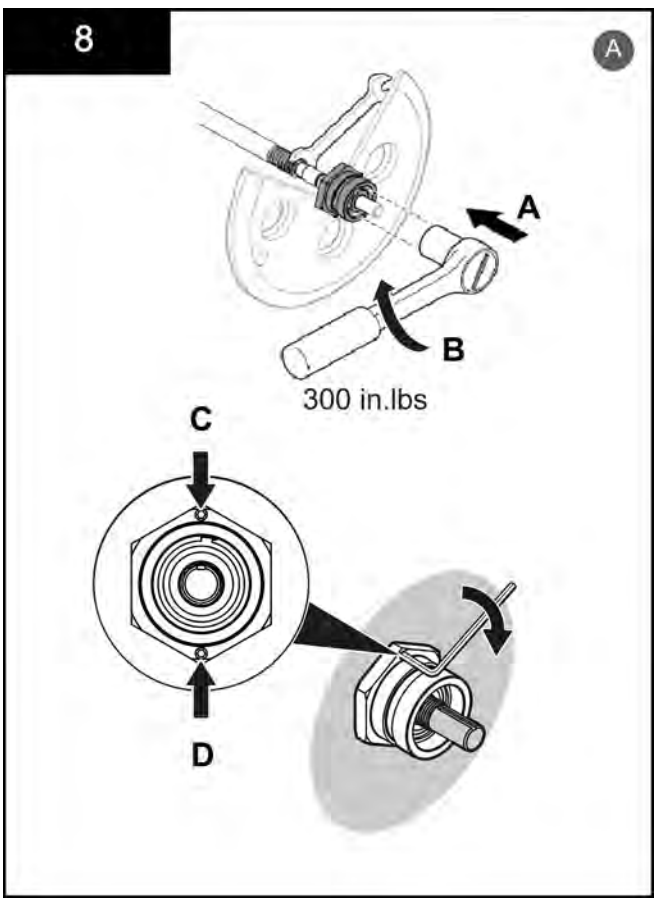


Note: *Apply liquid soap on end of the drive shaft.*



Note: *Remove and dispose of the tape.*





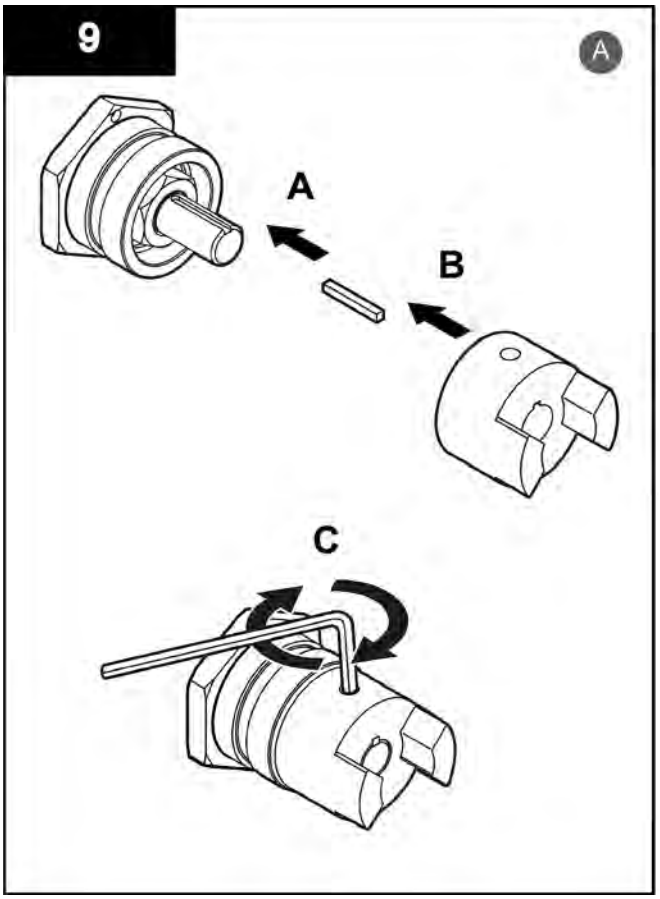


Illustration showing Type 04AS20.

10.4 Repair

Do repair tasks when:

- Service inspection shows wear
- There is damage to the interior components of the UV Chamber

10.4.1 Replace the Stop Plate

Prerequisites:

- Remove the Lamp Sleeve Holder Bushings and Wear Pads. Refer to Section 10.3.5.

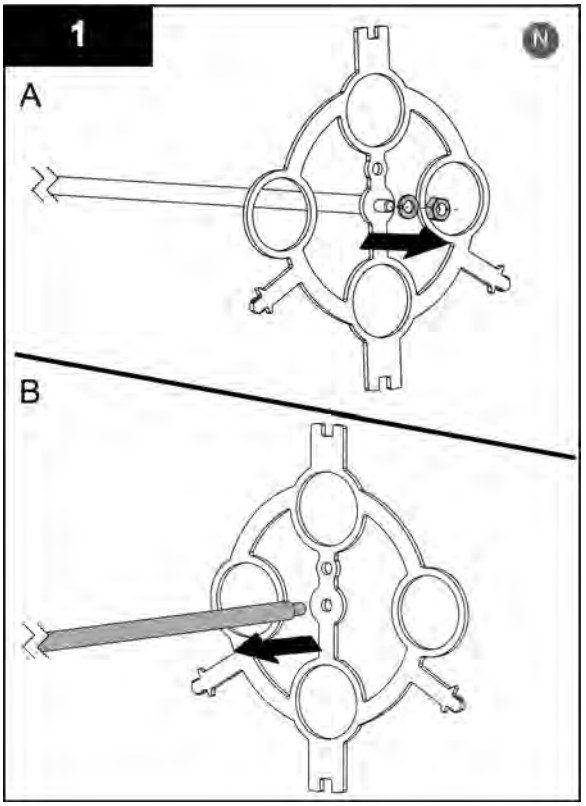
Tools:

Materials:

- New Stop Plate

Procedure:

Remove:



Install:

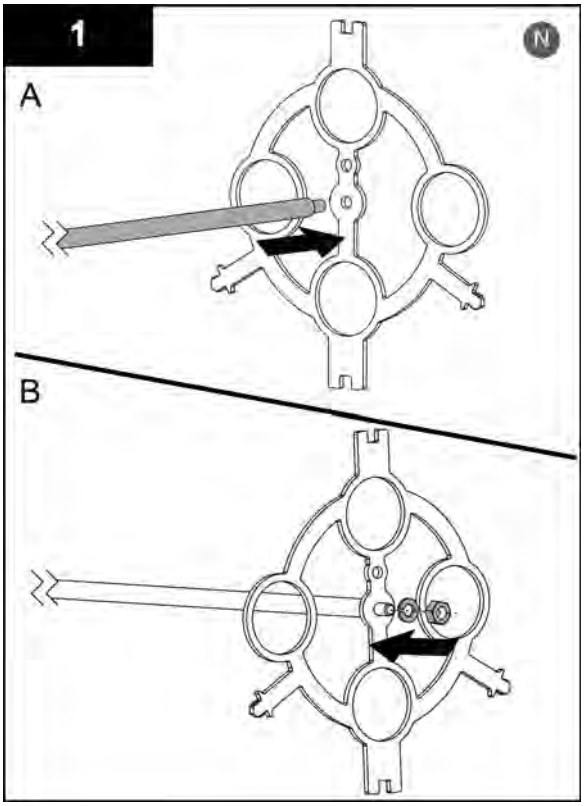
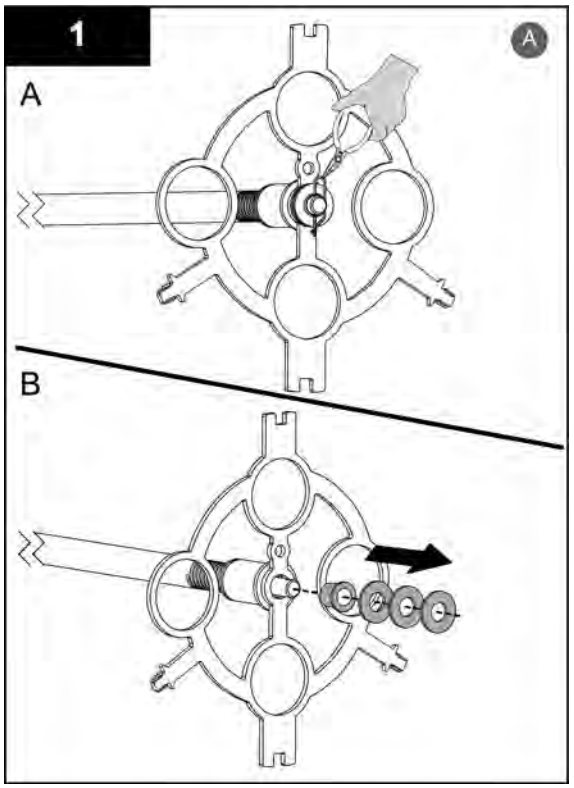
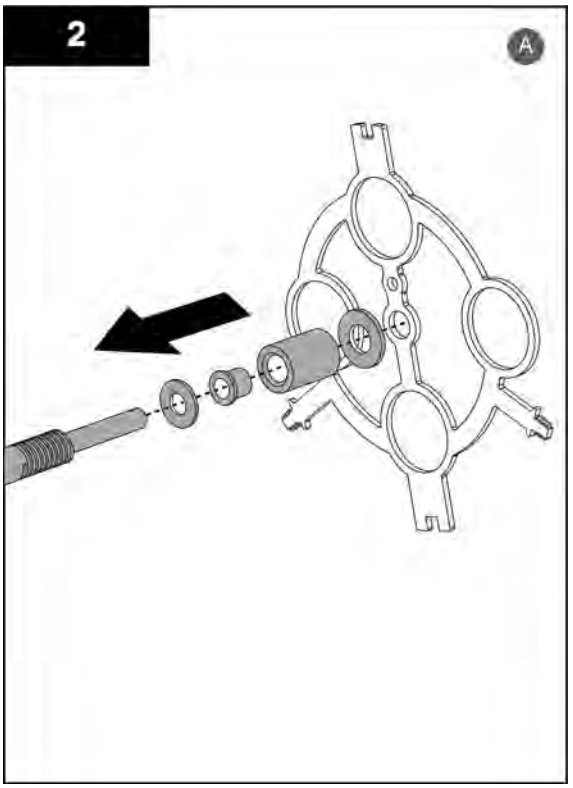


Illustration showing Type 04AS20.

Remove:





Note: *Remove the Cotter Pin using pliers.*

Install:

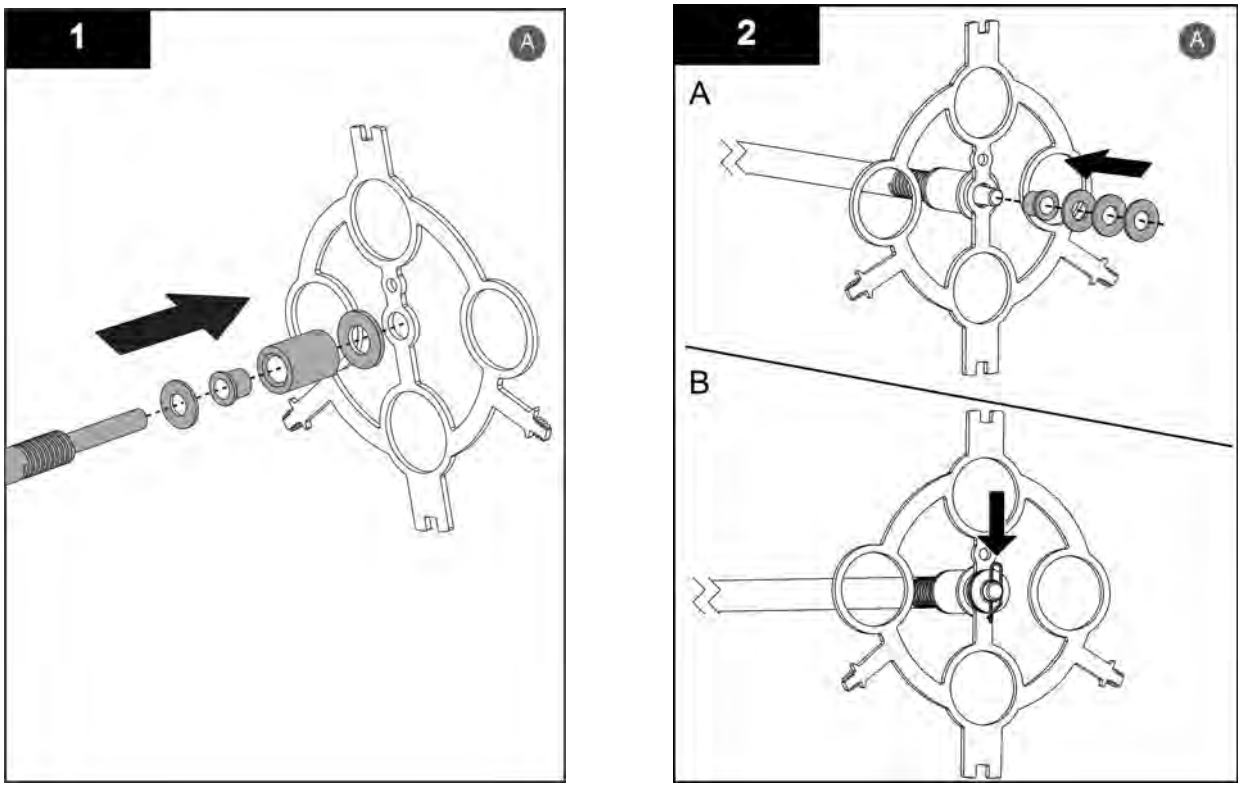


Illustration showing Type 04AS20.

Post-requisites:

- Install the Lamp Sleeve Holder Bushings and Wear Pads. Refer to Section 10.3.5.
- Assemble the UV Chamber. Refer to Section 10.3.3.

10.4.2 Remove and Replace the Wiper Plate

Note: *Applies to Automatic Wiping Systems only.*

Prerequisites:

- Open the UV Chamber. Refer to Section 10.3.2.
- Remove the Stop Plate. Refer to Section 10.4.1.

Tools:

Materials:

- New Wiper Plate
- New Lamp Sleeve Wiper Holder (if required)
- New Drive Nuts (if required)
- New Wiper Seals (if required)

Procedure:

Remove/Replace

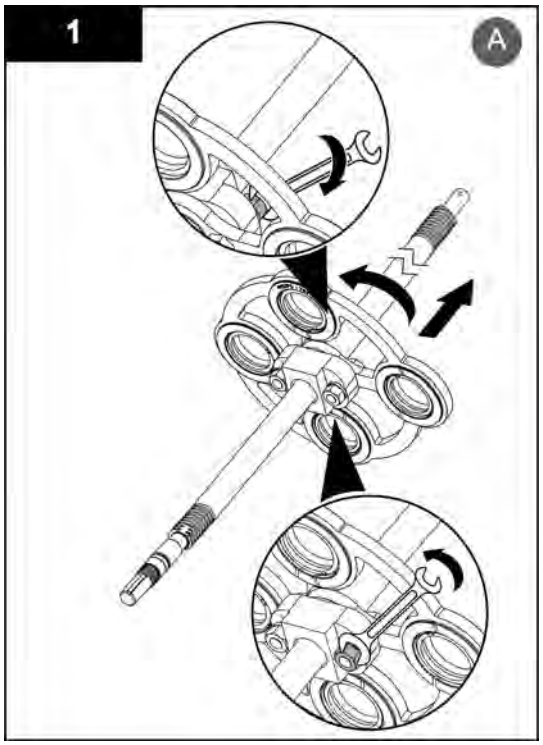
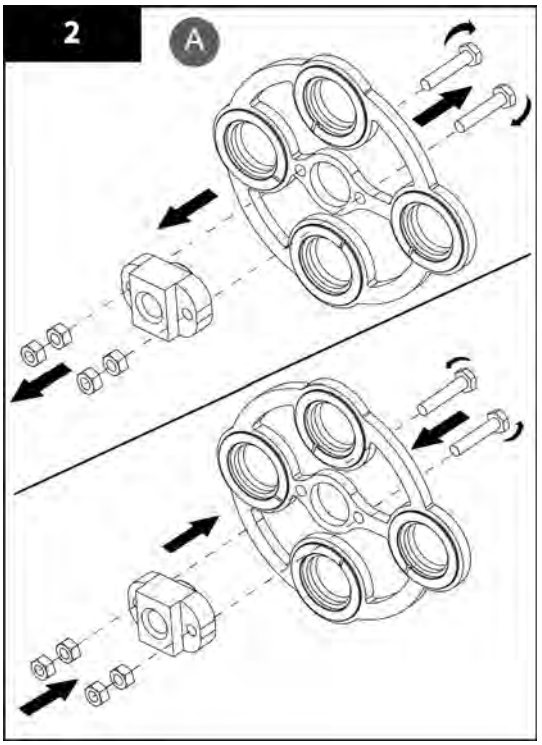
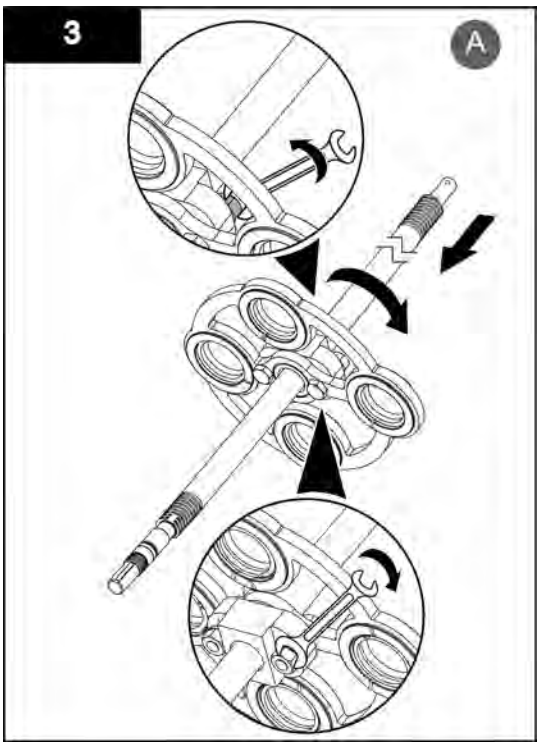


Illustration showing Type 04AS20.



Notes: *1) Install Lamp Sleeve Wiper Holders and Wiper Seals into replacement Wiper Plate (Section 10.3.6).*
2) Inspect the drive nuts for wear on the threads. Replace if required.



Notes: *1) Ensure the drive shaft turns freely by hand after the drive nuts are tightened. Do not tighten the drive nut hardware.*
2) Install the new wiper plate on the drive shaft in original orientation.

10.4.3 Replace the Drive Shaft*

Note: *Applies to Automatic Wiping Systems only.*

Prerequisites:

- Remove the Bearing Housing. Refer to Section 10.3.7.
- Remove the Stop Plate. Refer to Section 10.4.1.
- Remove the Wiper Plate. Refer to Section 10.4.2.

Materials:

- New Drive Shaft
- New Drive Nuts

Procedure:

1. Dispose of the damaged drive shaft as per local requirements.
2. Inspect the drive nuts for wear on the threads. Replace if required.
3. Assemble wiper plate and stop plate components onto a new drive shaft in reverse order of disassembly.
4. When service is complete, assemble the prerequisites in the reverse order of the disassembly.

Section 11 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 Trojan Technologies before service.

11.1 Alarm Conditions

NOTICE

For optimum system performance, resolve every alarm condition as it occurs.

Current active alarms are shown in the active (current) alarms screen, from the most recent alarm to the oldest alarm. When an alarm condition is corrected, the alarm is removed from the list. Delay times for many alarms are user-adjustable.

An archived history of alarms is shown in the alarm history screen. When the buffer is full, the oldest alarm is deleted from the archive.

11.2 CPP Alarms

CPP alarms are divided into three categories: critical, major and minor.

Status items listed in Table 6 indicate that an alarm or alarms in the group are active.

Table 6 Alarm Status Indicators

Common Alarm names and status	Active when	Alarm delay	Control action
System Warming	During 3 minute warm-up	No delay	Alarm relay is "closed circuit". LED is on.
System On-line	After warm-up and there are no alarms	10 seconds	
System In-Operation	After warm-up	No delay	
Common Alarm	Any minor, major or critical alarm is active.	No delay	Alarm relay is configurable for either open or closed circuits.
Common Minor Alarm	Any minor alarm is active.		
Common Major Alarm	Any major alarm is active.		
Low UV Common Minor	Any sensor minor. UV intensity for UV Systems with multiple sensors is active.	10 seconds in operation or 3:10 minutes in startup	
Low UV Common Major	A common major siren. Any major or critical alarm is active.		
Wiper Alarms - Applies to Automatic Wiping Systems only.			
Wiper General Alarm	Any of the three wiper alarms occur in the first 10 seconds of operation or in the first 28 seconds of startup.	No delay	Alarm relay is configurable for either open or closed circuits.

11.2.1 Minor Alarms

When a minor alarm occurs, the UV Chamber remains on-line. Minor alarms show on the CPP and the alarm relays are deactivated. When a minor alarm occurs, take action to correct the problem soon after the alarm occurs. System performance may or may not be compromised. Refer to Table 7 for alarm definitions.

Table 7 Minor Alarms Defined

Minor Alarm name	Active when	Alarm delay	Control action
Low UVT Minor	The UVT value measured is lower than the setpoint.	10 seconds in operation or 3:10 minutes in startup	Alarm relay is configurable for either open or closed circuits.
Valve Open	The minor valve is open greater than the minor alarm setpoint.		
End Of UV lamp Life Hours	The UV lamp has exceeded the end of UV lamp life hours according to the factory-programmed setpoint.	No delay	
UV lamp xx Alarm Minor	UV Lamp Fault Lamp Driver Fault Loss of UV Lamp Fault Signal	Alarm Delay (10s default)	Alarm relay is configurable for either open or closed circuits.
Low UV Intensity[1] Minor	No UV Intensity signal	Alarm Delay (10s default)	Alarm relay is configurable for either open or closed circuits.
Wiper Alarms - Applies to Automatic Wiping Systems only.			
Wiper Revolution	An incomplete wiper cycle occurs. There is a motor failure or mechanical jam. No revolution counts in 1 second.	No delay	Alarm relay is configurable for either open or closed circuits.
Wiper Home Alarm	A wiper failure occurs during a home cycle. There is a motor failure or mechanical jam. No revolution counts in 1 second.		
Wiper Limit Switch Alarm	A limit switch failure occurs in the “closed circuit” position. (Normally “open circuit” LED off.)		
Wiper General Alarm (System with wiper)	Wiper Home Alarm OR Wiper Limit SW Alarm OR Wiper Revolution Alarm	None	Alarm relay is configurable for either open or closed circuits.

11.2.2 Major Alarms

When a major alarm occurs, take immediate action to correct the problem. Make sure that system performance is not compromised. Alarm relays are deactivated. Refer to Table 8 for alarm definitions.

Table 8 Major Alarms Definition

Major Alarm name	Active when	Alarm delay	Control action
Low UV Intensity[1] Major	The UV measured is less than the calculated low UV major alarm setpoint.	10 seconds in operation or 3:10 minutes in startup	Alarm relay is configurable for either open or closed circuits.
Multiple UV lamp Alarms	Multiple UV lamps are not functioning. Factory based set number of 1 or more, that is dependent on the dose required.		
RED Low Major	Multiple lamp Major Fault Lamp driver Fault RED target not met	Lamp or lamp driver Alarm delay OR Dose Alarm Delay OR None	Alarm relay is configurable for either open or closed circuits.
UV Lamp Alarm XX Major	Either: There is no UV lamp function. Power is lost. CPP/CCB communication is lost.	10 seconds in operation or 3:10 minutes in startup	Alarm relay is configurable for either open or closed circuits.
Lamp Driver XX Alarm Major	Either: There is no lamp driver function. Power is lost. CPP/CCB communication is lost.		
High Flow Alarm Major	The flow rate is greater than the major alarm setpoint.	10 seconds in operation or 3:10 minutes in startup	Alarm relay is configurable for either open or closed circuits.
Valve Open Major	The valve is open greater than the major alarm setpoint.		
No Flow Alarm Major	The flow rate signal is not present below 2.0 mA.		
No Valve Data Major	The valve signal is not present below 2.0 mA.		
SCADA Comm.	UV Chamber in SCADA operation mode		

11.2.3 Critical Alarms

When a critical fault occurs, the UV Chamber is set to shutdown. On a critical alarm, the system CPP takes immediate action to prevent damage to the equipment. Take immediate action to make sure that system performance is not compromised. Refer to Table 9 for alarm definitions.

Table 9 Critical Alarm Definitions

Critical alarm name	Active when	Alarm delay	Control action
UV Chamber High Temperature Critical DIGITAL is Standard.[1]	The end plate temperature switch is above 50 °C (122 °F) due to hot water, hot air or low flow rate. A chamber hi temp shutdown delay of 0-15 minutes can be set. This lets operators correct the problem or bring other equipment on-line before the UV lamps are turned off. This alarm clears when the UV Chamber temperature cools below the switch default value of 50 °C (122 °F) ±5 °C/°F. The UV Chamber then restarts.	10 seconds in operation or startup.	Alarm relay is configurable for either open or closed circuits.
End Cap Off Critical	Loss of digital signal	20 seconds	Alarm relay is configurable for either open or closed circuits
Major Hi Temp Setpoint (analog option temp only)	The analog signal is above the setpoint that is set by the user due to hot water, hot air or low flow rate. A chamber hi temp shutdown delay of 0-15 minutes can be set. This lets operators correct the problem or bring other equipment on-line before the UV lamps are turned off. This alarm clears when the UV Chamber temperature cools below the switch default value of 50 °C (122 °F) ±5 °C/°F. The UV Chamber then restarts.	10 seconds in operation or startup.	Alarm relay is configurable for either open or closed circuits

[1] For the Chamber High Temperature Alarm, a Chamber Hi Temp Shutdown delay timer can be set to allow for Operators to correct the problem or bring other equipment on-line.

11.2.4 Standard Inputs and Outputs

UV Sensor	Input	Analog	4-20 mA	System I/O
Alarms (1-7)	Output	Digital	Normally open (NO)	Customer I/O
UV Chamber High Temp Switch (shuts off UV lamps at 50 °C.)	Input	Digital	Voltage sensing input	Customer I/O
End cap limit switch (shuts off UV lamps)	Input	Digital	Voltage sensing input	Customer I/O

11.2.5 Optional Inputs and Outputs

Note: *Optional inputs and outputs cannot typically override standard provided inputs and outputs.*				
Analog (4)	Output	Analog	4-20 mA	System I/O
Remote ON/OFF	Input	Digital	Voltage sensing input	Customer I/O
Wiper Alarms - Applies to Automatic Wiping Systems only.				
Wiper Option – Revolution UV Sensor	Input	Digital	9.4 Hz Pulse	System I/O
Wiper Option – Home Limit Switch	Input	Digital	Normally closed (NC)	System I/O
Wiper Option – Extend (forward)	Output	Digital	Normally open (NO)	System I/O
Wiper Option – Retract (reverse)	Output	Digital	Normally open (NO)	System I/O

11.2.6 Additional Inputs and Outputs

The inputs and outputs in this table are available for custom applications. This list is not intended to cover all options. It is a representative list of options that sites can exercise in order to wire device information in to the UV System. The controller provides a graphical display of the information only. If a signal is brought in, it can be wired out of the system to another as needed. For a specific request, contact the manufacturer. Additional inputs and outputs can not typically override standard provided inputs and outputs.				
Note: *Up to five analog inputs and four analog outputs in total are possible.*				
Flow	Input / Output	Analog	4-20 mA	System and/or customer I/O
UVT	Input / Output	Analog	4-20 mA	System and/or customer I/O
Valve position	Input / Output	Analog	4-20 mA	System and/or customer I/O
UV Chamber high water temperature	Input / Output	Analog	4-20 mA	System and/or customer I/O
RED Value (EPA)	Output	Analog	4-20 mA	System and/or customer I/O

11.3 CPP Communication Control Board Electrical and I/O Details

The CPP communication control board (CCB) is powered by a 24 VDC power supply that is located in the CPP. The CCB is configured using the microprocessor user interface. The user can reset the CCB to the original factory settings.

In addition to standard CPP alarms, optional analog and digital sources can be configured to the CPP microprocessor CCB relays for additional alarms.

11.3.1 Communication Control Board (CCB) - Automatic Wiping Systems

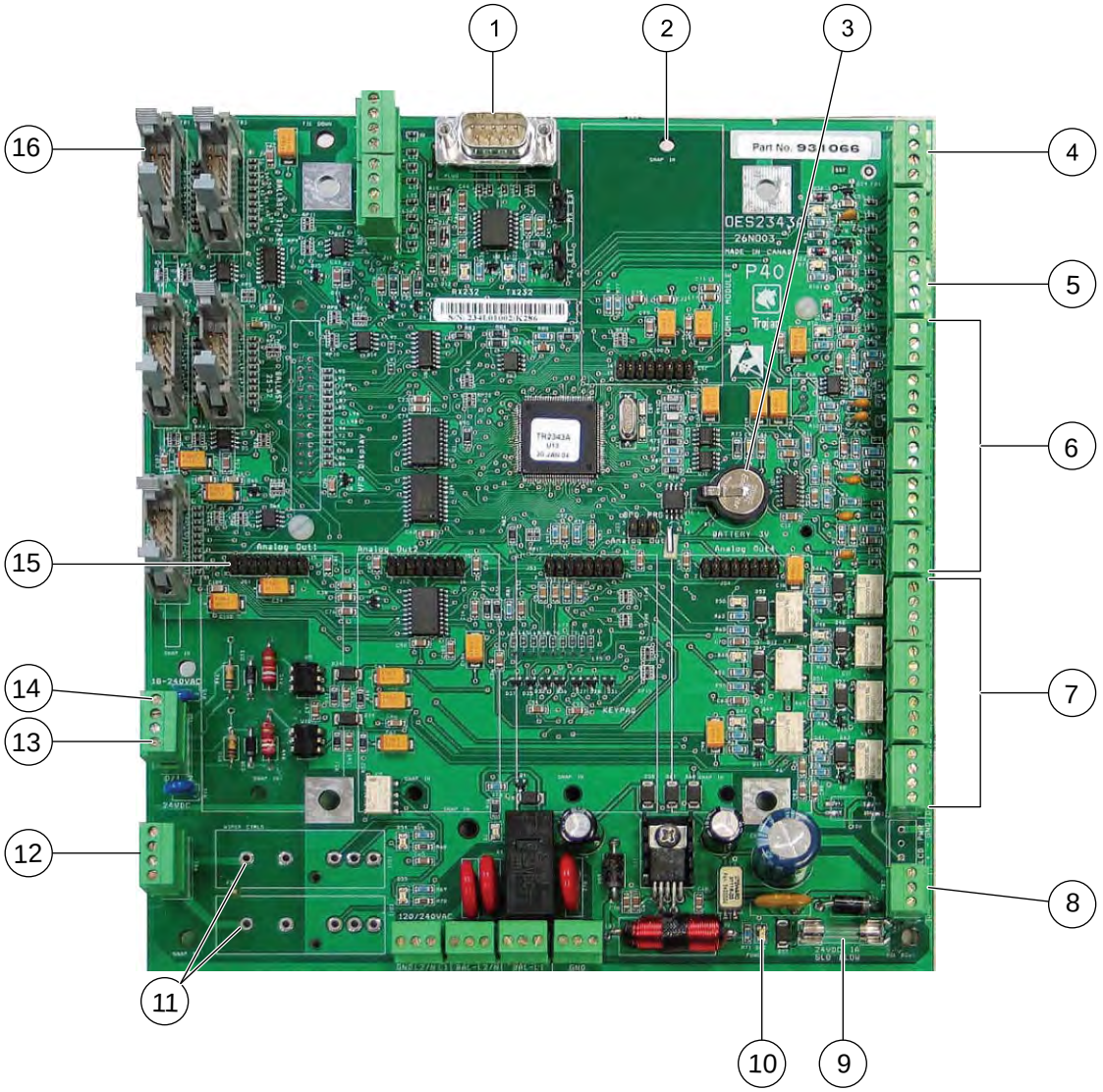


Figure 21 Microprocessor Communication Control Board (CCB)

1	RS232 Communication Port	**9**	Fuse - Slow Blow 1 A
2	SCADA Communication Module Location	**10**	Power Indicator LED
3	Battery, 3 V Lithium CR1220	**11**	Wiper Control Relay Sockets
4	Temperature Switch	**12**	Relay Outputs for Wiper Control
5	Wiper Revolution Sensor	**13**	End Cap attached
6	24 VDC Analog Inputs (5x)	**14**	Remote On/OFF
7	24 VDC Digital Alarm Outputs (7x)	**15**	Analog Output Modules Location (4x)
8	24 VDC Board Input Power	**16**	Lamp Driver Communication Connectors

11.3.2 Communication Control Board (CCB) - Non Wiping Systems

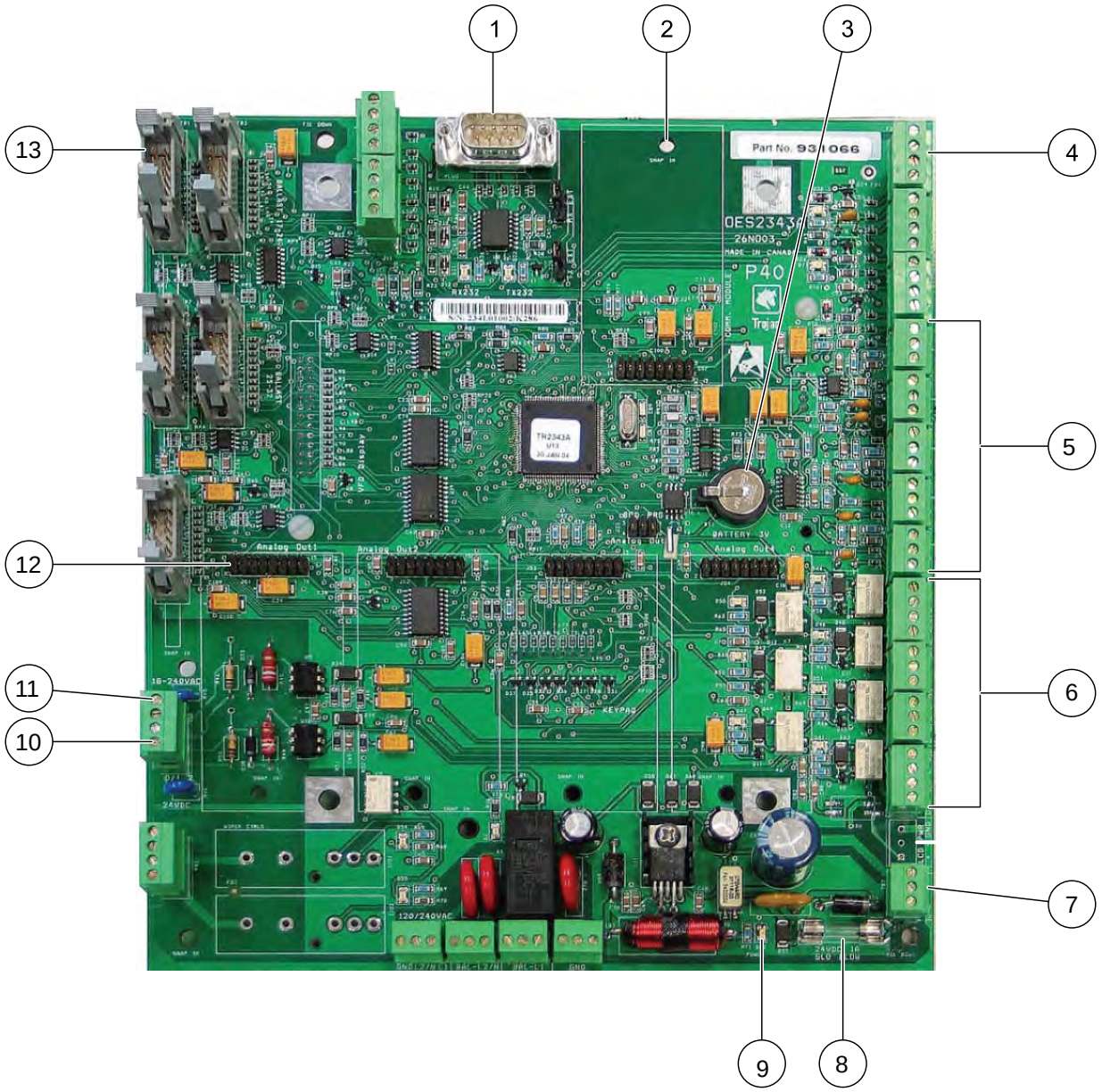


Figure 22 Microprocessor Communication Control Board (CCB)

1	RS232 Communication Port	**8**	Fuse - Slow Blow 1 A
2	SCADA Communication Module Location	**9**	Power indicator LED
3	Battery, 3 V Lithium CR1220	**10**	End Cap attached
4	Temperature Switch	**11**	Remote ON/OFF
5	24 VDC Analog Inputs (5x)	**12**	Analog Output Modules Location (4x)
6	24 VDC Digital Alarm Outputs (7x)	**13**	Lamp Driver Communication Connectors
7	24 VDC Board Input Power		

Section 12 Replacement Parts and Accessories

Contact your Service Provider 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 your Service Provider.

12.1 UV Lamp and Lamp Sleeve

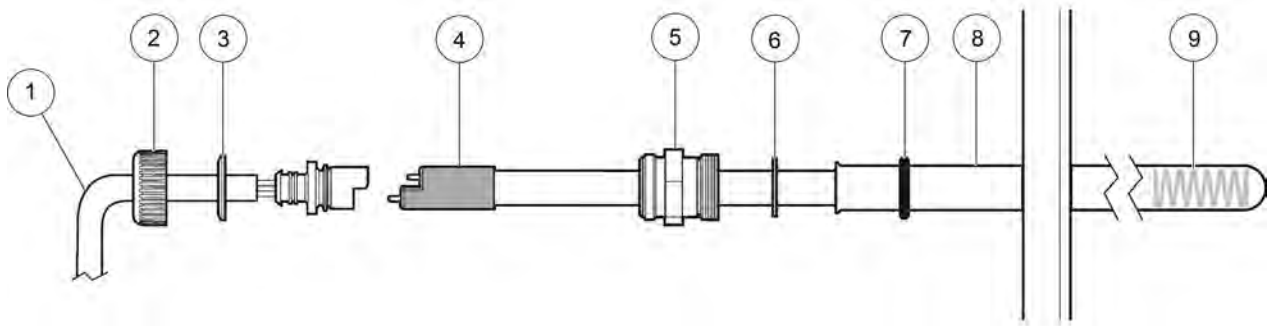


Figure 23 UV Lamp and Lamp Sleeve components

Component	Description	Part Number	Package Qty
1	Lamp Power Cable		
	17 ft (4.5 m)	792718-1175	1 pcs
	28 ft (7.5 m)	792718-1275	1 pcs
	52 ft (15 m)	792718-1525	1 pcs
	79 ft (23 m)	792718-1775	1 pcs
2	Lamp Sleeve Cup Nut	316148P	10 pcs
3	Lamp Sleeve Cup Nut Washer	793859P	10 pcs
4	UV Lamp*	793010	1 pcs
5	Sleeve Bolt, Lamp Sleeve	795750	1 pcs
6	Sleeve Bolt Washer	792931P	10 pcs
7	O-Ring, Lamp Sleeve	002333-215	1 pcs
8	Lamp Sleeve, UV Lamp	792934	1 pcs
9	Compression Spring	796054	1 pcs

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

12.2 UV Sensor

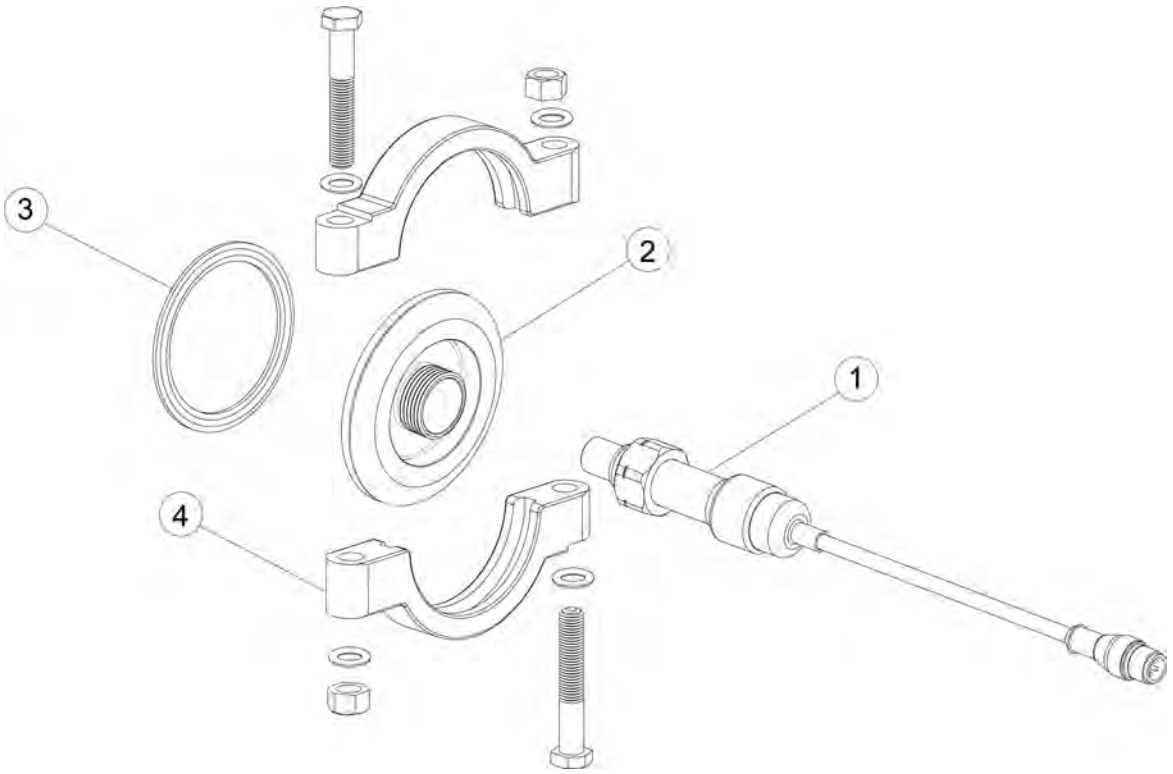


Figure 24 UV Sensor components

Component	Description	Part Number	Package Qty
1	UV Sensor	793200-014	1 pcs
2	Adapter, Sensor	794287	1 pcs
3	Gasket, Sanitary 2 in.	002285-020	1 pcs
4	Clamp, Sanitary BLT 2 in.	013213-200	1 pcs

12.3 Non Wipe Kit

Note: *For Non-Wiping Systems only.*

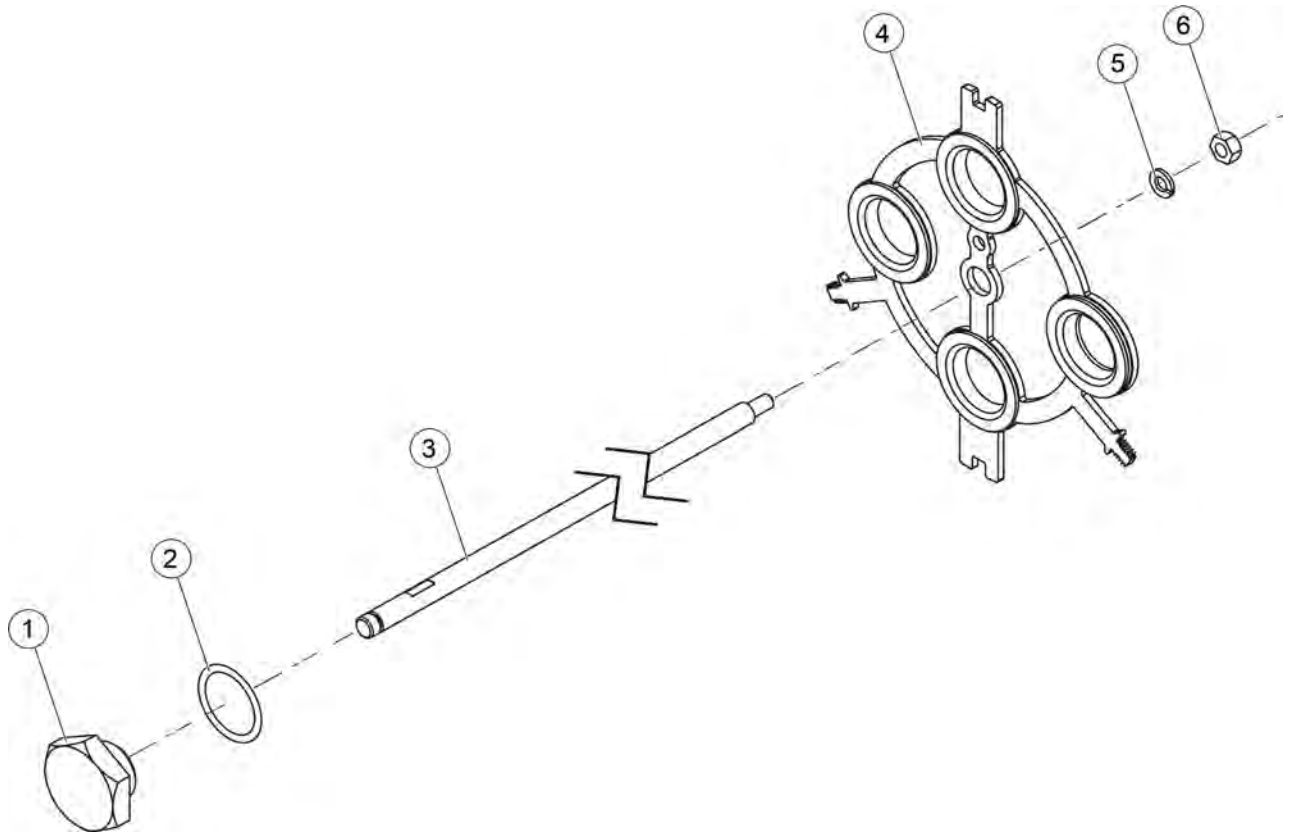


Figure 25 Non Wipe Kit

Component	Description	Part Number	Package Qty
1	Plug, 1/4in Thread Hex 316 SST	794225-001	1 pcs
2	O-Ring, 1-3/16 x 3/32	002333-123	1 pcs
3	Rod, Lamp Holder	794682-002	1 pcs
4	Stop Plate	Refer to Section 12.6	--
5	Washer, 1/4 Splitlock 316 SST	010035P	100 pcs
6	Nut, 1/4-20 UNC Hex 316 SST	011017P	100 pcs

12.4 Gear Motor Drive

Note: *For Automatic Wiping Systems only.*

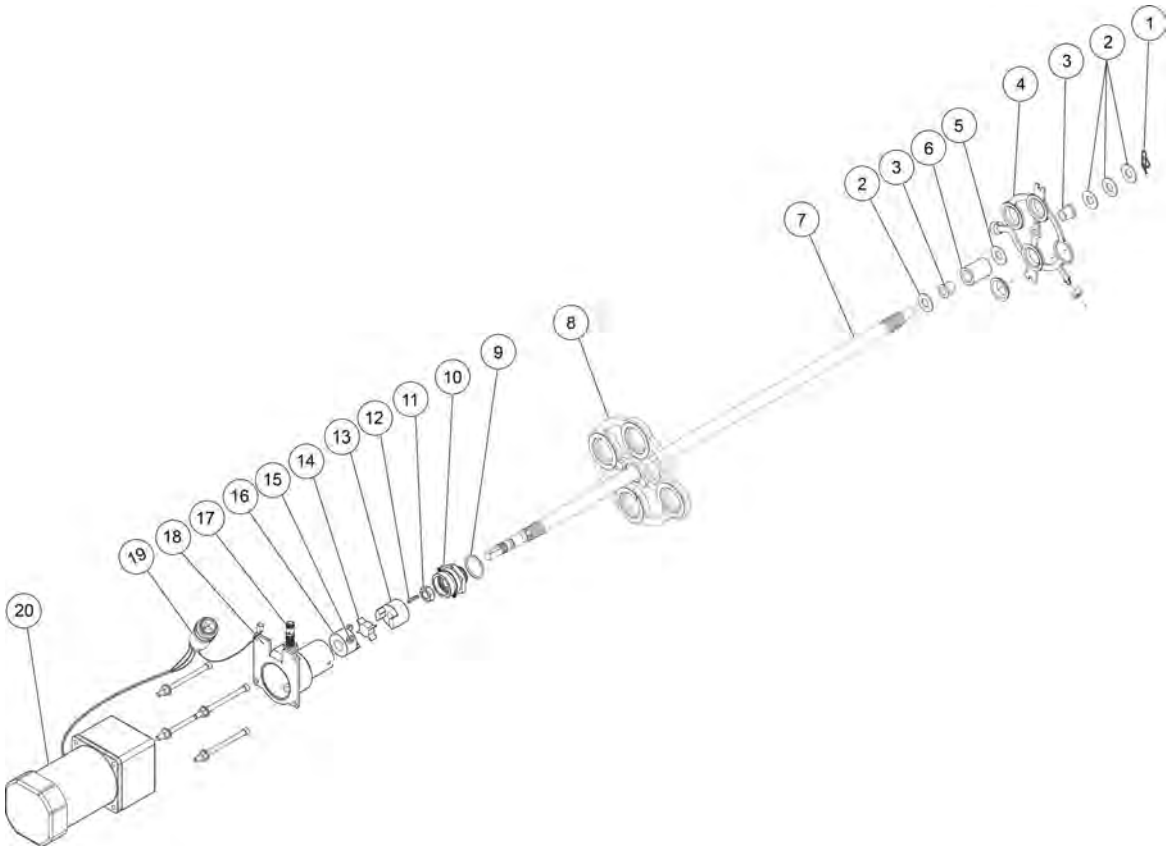


Figure 26 Gear Motor Drive components

Component	Description	Part Number	Package Qty
1	Cotter pin, 3/8-in SST	013207P	10 pcs
2	Washer, 3/8" Flat 316 SST	010026P	100 pcs
3	Flange Bushing	798123-001	1 pcs
4	Stop Plate	Refer to Section 12.6	--
5	Washer, 1/2" Flat 316 SST	012003P	100 pcs
6	Spring	795819	1 pcs
7	Rod, wiper	794915-003	1 pcs
8	Wiper Assembly	Refer to Section 12.5	--
9	O-Ring, bearing housing	002333-123	1 pcs
10	Bearing Housing Kit	794872	1 pcs
11	Retaining Nut	011051-04AMF316P	100 pcs
12	Square Key, 3/32 x 3/4 in.	820682-0648	1 pcs
13	Coupler, 7/16 in.	794909-001	1 pcs
14	Coupler, spider	794909-003	1 pcs
15	Screw, 1/4-20 x 3/8 in. pan head	010077P	100 pcs
16	Coupler, 5/8 in.	794909-002	1 pcs
17	Inductive Proximity Sensor	914172-050	1 pcs
18	Motor Mount	795788	1 pcs

Component	Description	Part Number	Package Qty
19	Wiper Motor Power Connector	916774-1521326	1 pcs
20	Gear Motor, 3:1 gear ratio	792949	1 pcs

12.5 Lamp Sleeve Wiping System

Note: *For Automatic Wiping Systems only.*

Automatic Wiping

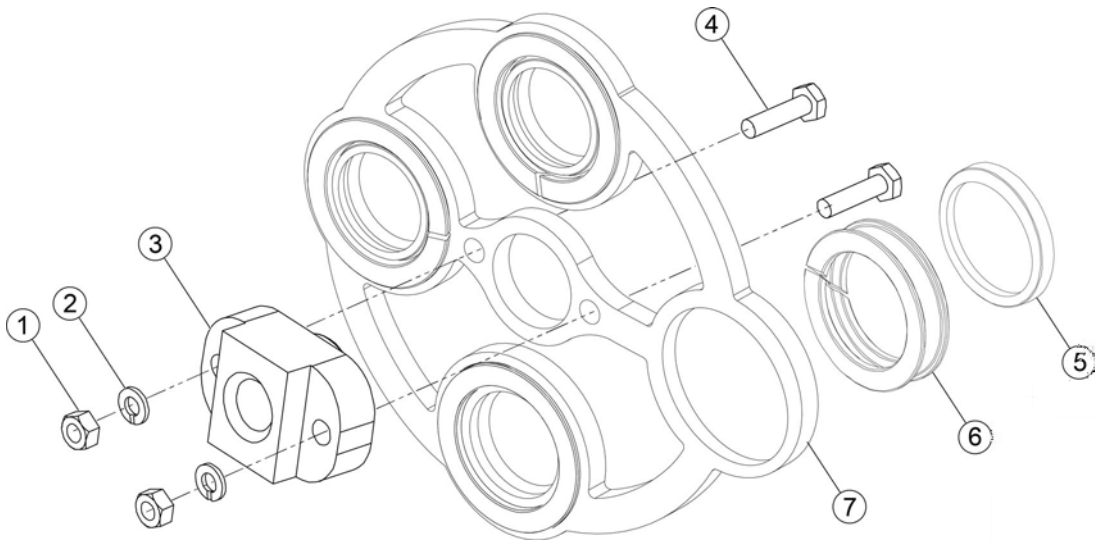


Figure 27 Automatic Wipe Components

Component	Description	Part Number	Package Qty
1	Nut, 1/4-20 UNC, 316 SST	011017P	100 pcs
2	Washer, 1/4” Splitlock 316 SST	010035P	100 pcs
3	Drive Nut	794375	1 pcs
4	Bolt, 1/4-20 x 1.00” Hex 316 SST	010140P	50 pcs
5	Wiper Seal	795853	1 pcs
6	Holder, Lamp Sleeve Wiper	794917	1 pcs
7	Wiper Plate		
	03AS20	794178-101	1 pcs
	04AS20	794178-102	1 pcs
	06AS20	794178-103	1 pcs
	08AS20	794178-104	1 pcs

Illustration showing Type 04AS20.

12.6 Stop Plate

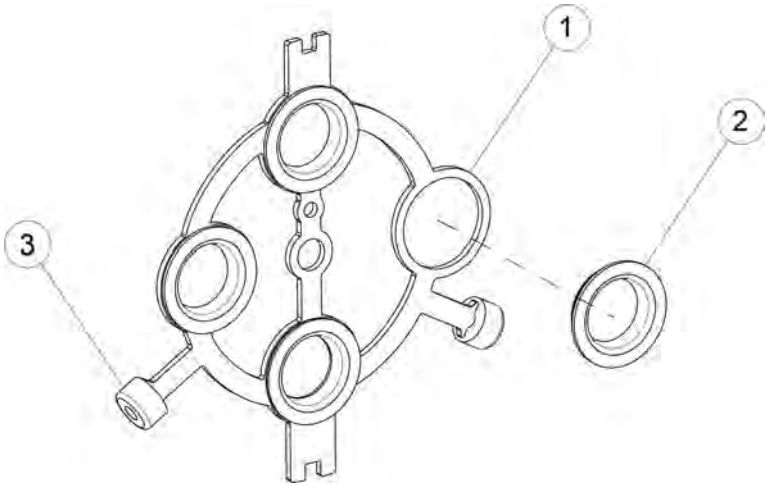


Figure 28 Stop Plate components

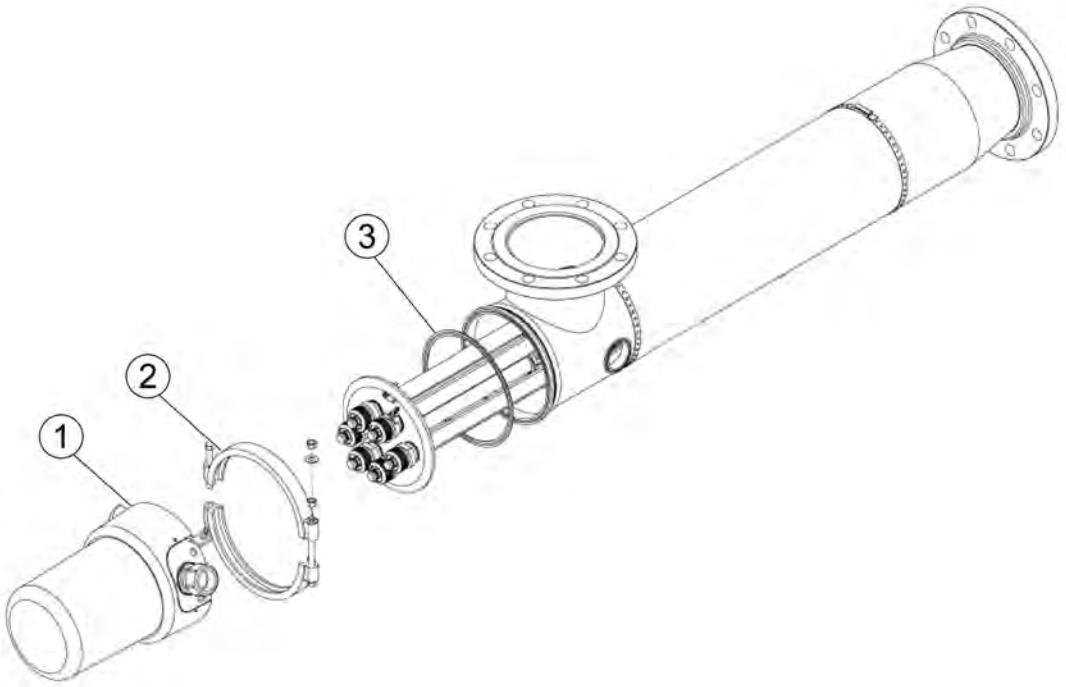
		System Model							
		03AS20 AW*	03AS20 NW*	04AS20 AW*	04AS20 NW*	06AS20 AW*	06AS20 NW*	08AS20 AW*	08AS20 NW*
Component	**Description**	**Part Number**							**Package Qty**
1	Stop Plate	794875-001	794875-002	794875-003	794875-004	794875-005	794875-006	794875-007	794875-008	1 pcs
2	Lamp Sleeve Holder Bushing	792942P							10 pcs
3	Wear Pad	792916P							10 pcs

Illustration showing Type 04AS20.

*AW = Automatic Wipe
*NW = Non Wipe

12.7 UV Chamber

Automatic Wiping



Non-Wiping

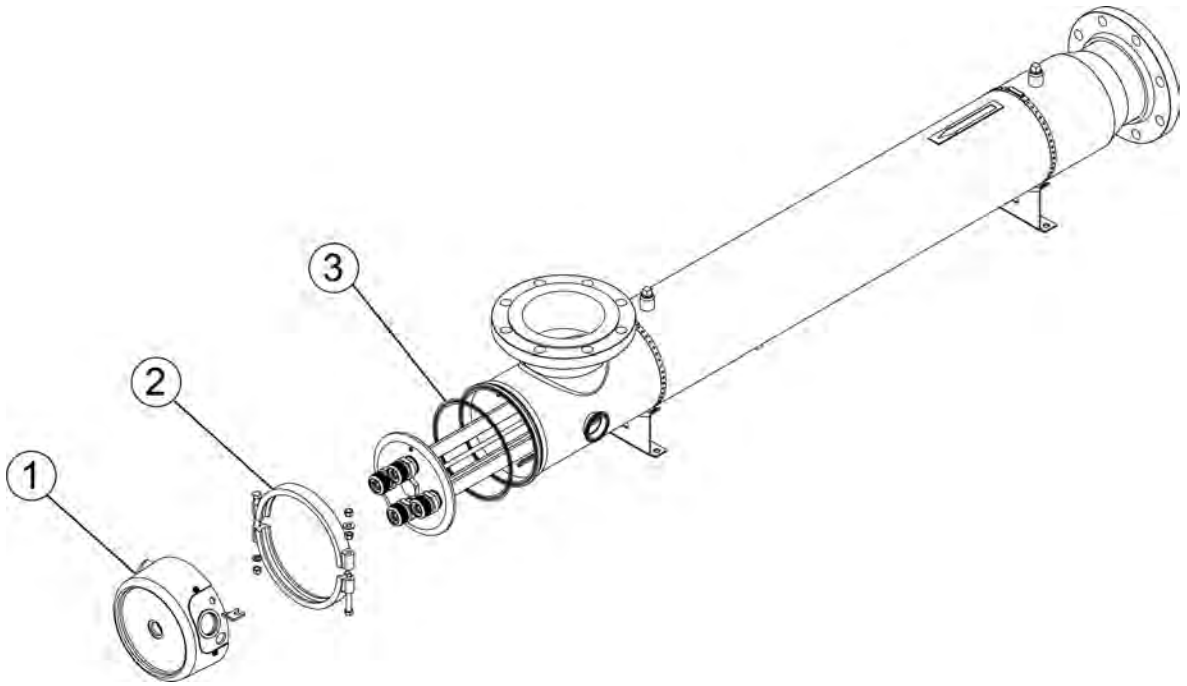


Figure 29 UV Chamber

Component	Description	Part Number	Package Qty
1	Service End Cap		
	Non Wipe - No Air Vent Kit installed	700222-005	1 pcs
	Non Wipe - Vertical Air Vent Kit installed	700222-006	1 pcs
	Non Wipe - Horizontal Air Vent Kit installed		
	Automatic Wipe - No Air Vent Kit installed	700222-002	1 pcs
	Automatic Wipe - Vertical Air Vent Kit installed	700222-004	1 pcs
	Automatic Wipe - Horizontal Air Vent Kit installed		
2	Clamp, Sanitary	798161-020	1 pcs
3	Gasket, Sanitary	002285-080	1 pcs

12.8 CPP Components

Description	Part Number	Package Qty
Power supply, 24 VDC (for the CCB)	916051-310	1 pcs
Lamp driver, electronic	917067	1 pcs
Board, UV microprocessor communication control board	931066-003	1 pcs
Board, P40 Ethernet/IP	931122-001	1 pcs
Board, P40 Ethernet Modbus TCP	931122-002	1 pcs
Board, P40 Ethernet Profinet	931122-003	1 pcs
Microprocessor Modbus RTU RS485 circuit board	931080-001	1 pcs
Microprocessor analog output circuit board	931067	1 pcs

12.9 Miscellaneous Components

Description	Part Number	Package Qty
Temperature Sensor Assembly	798037	1 pcs
Temperature Switch		
4.5m Length	795761-2175	1 pcs
7.5m Length	795761-2275	1 pcs
15m Length	795761-2525	1 pcs
23m Length	795761-2775	1 pcs
Air Vent Kit, Vertical Installation	794261-003	1 pcs