SAFE WATER TECHNOLOGIES, INC.

INSTALLATION, OPERATION, MAINTENANCE MANUAL

IH SERIES RETROFIT KIT

ULTRAVIOLET WATER TREATMENT SYSTEM

APRIL 2020

RETROFIT KIT COMPONENTS

(Parts shown vary from kit to kit and may be different according to Model.)

New Heads – Since outdated standard output lamps will be replaced with modern high output lamps with a long life coating, fewer lamps will be needed. Fewer lamps will require new heads for proper lamp spacing. Heads are direct bolt on replacements and will match OEM heads in size and bolt spacing.
New Head Gaskets
New Head Bolts, Nuts, and Lock Washers
New Compression Nuts, Caps, and O-rings

New High Output Lamps and Sleeves

New Lamp Leads

New Enclosure – An entire new enclosure with On/Off Switch, Elapsed Runtime Meter, Lamp Operational LEDs. 304 SS Enclosure (left) or Polycarbonate Enclosure (right) available (dependent on kit selection).

Optional: Monitoring Station for UV Intensity and High Heat Shutoff

TABLE OF CONTENTS

SAFETY INSTRUCTIONS

In order to protect end users and operators from injury, safety precautions must be followed. This Installation, Operation, and Maintenance (IOM) Manual outlines important safety issues.

1) INFORMATION

Please read this manual prior to installing, starting up, and operating the equipment. The equipment uses the latest in UV technology, and has been designed to make operation and maintenance easy.

The quality of the liquid entering the UV system needs to be monitored. Based on water quality, the UV system will need to be cleaned on a periodic basis. Maintenance of the UV system will require replacement parts. It is suggested that key spare and replacement parts be kept on hand. For best operation, always use manufacturer recommended replacement parts. Other replacement parts could result in damage to the system and void the warranty.

2) INSTALLATION

Qualified professionals (contractors, plumbers, electricians) should install the mechanical and electrical components to code as per the engineering documents.

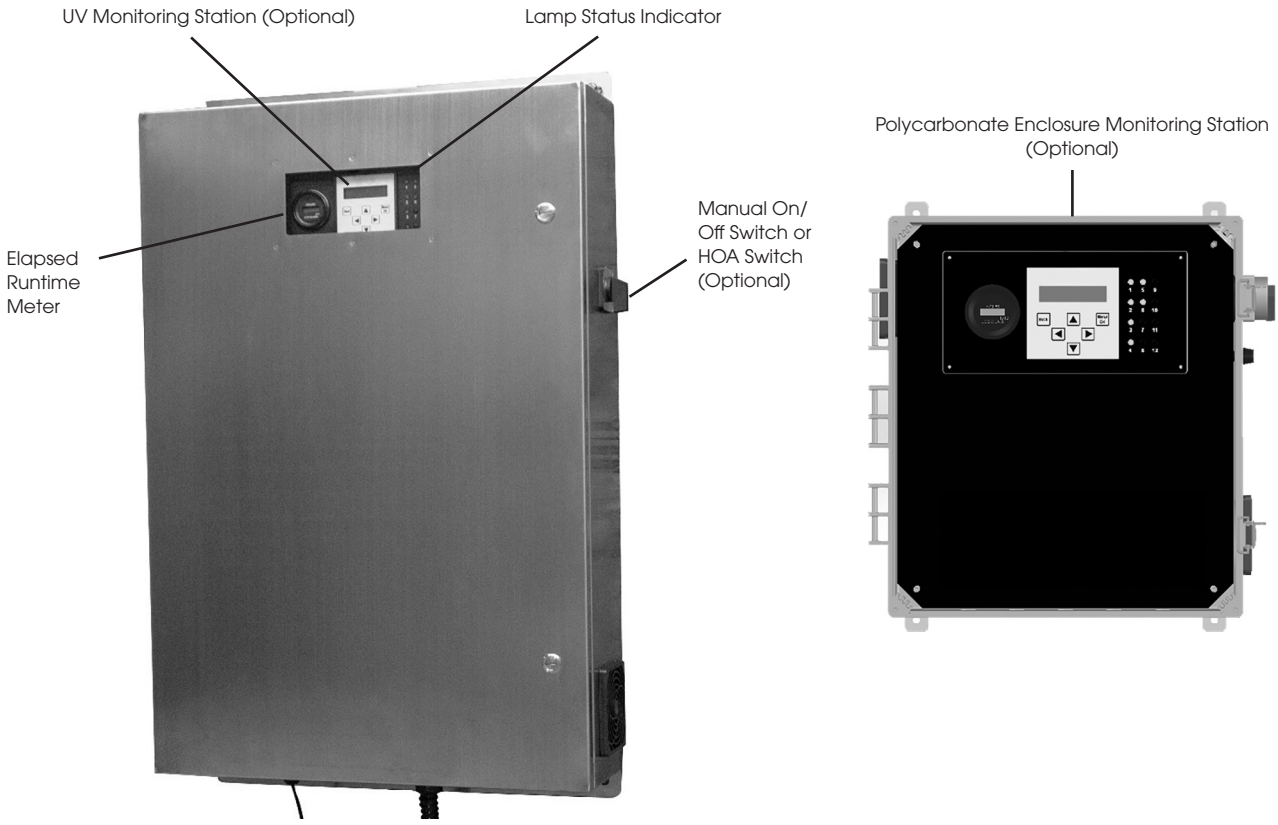
a) Electronic Control Center (ECC)

The ECC is designed to be remote mounted within 4 to 6 feet of the chamber. Prior to final placement, ensure that the supplied cable lengths (8 ft.) are adequate to reach between the ECC and the chamber.

The ECC requires clean power. Information on voltage and cycle will be on the wiring diagram inside the ECC cover. Equipment should be kept off lines where there are surges or brownouts. Always disconnect power before servicing the system.

The ECC will contain the ballasts and other electrical controls. The ECC will display operation status such as individual lamp status indicators, elapsed runtime meter (ERTM), and optional UV Monitoring Station. The Monitoring Station is capable of monitoring total runtime hours, lamp runtime hours, lamp intensity, relative UV percentage, temperature, and in some models, real-time dosage.

The ECC is equipped with a manual on/off switch for standard models. The optional HOA (Hands Off Auto) switch enables you to remotely power on/off your UV system.



NOTE: Always make sure you disconnect power before working on electrical components.

WIRING YOUR UNIT

The ECC is designed to be remote mounted within 4 to 6 feet of the chamber. Prior to final placement, ensure that the supplied cable lengths (8 ft.) are adequate to reach between the ECC and the chamber. Make sure power to the equipment matches the voltage requirements of the system. Make sure the system is properly grounded. For complete wiring instructions, see the wiring diagram inside the electrical enclosure.

TO PROVIDE POWER TO THE ELECTRICAL ENCLOSURE FOR 120V (POLYCARBONATE ENCLOSURE)

Make sure power to the equipment matches the voltage requirements of the system. Make sure the system is properly grounded. Plug the power cord into the appropriate outlet.

TO PROVIDE POWER TO THE ELECTRICAL ENCLOSURE (STAINLESS STEEL ENCLOSURE FOR AMALGAM MODELS)

1. To make installation easy, first remove the wire duct cover to install the incoming power wires.

2. Locate the power connection point and install your incoming 120V power wires to the breaker.

3. Connect the ground wire to the ground bar.

4. Make sure the new control panel is securely mounted and all cables are long enough to be connected to the vessel and control panel.

5. Use the nuts provided to attach the lamp harness bracket to the cylinder flange using the existing bolts.

6. Close and secure the panel door.

7. Make sure the power switch is in the "off" position.

8. Plug in the new control panel.

9. Turn on the power.

10. If your replacement control panel is equipped with the UV Monitoring Station option, refer to the sensor probe installation and monitor calibration procedures in the operation and monitoring section of the manual.

11. If your replacement control panel is equipped with a high heat shutoff, the Monitoring Station has been programmed based on the sensor type included in your system with the required proper settings. Refer to the temperature sensor in the operation and monitoring section of the manual for any questions or further instructions to setup or adjust these settings.

b) Lamp Head Plate and Gasket Installation

Note: Not all retrofit kits come with new lamp head plates.

First, remove the old lamp head plate from both ends of the treatment chamber. Your retrofit kit is included with new gaskets, nuts, and bolts to attach the new lamp head plate. Install the new head gaskets and then the lamp head plate.

To install, the top lamp (#1) needs to be aligned on the top and in the center of the cylinder in order to align with the sensor port. There is only one lamp hole that will align properly. It can be identified as the one where the head mounting bolts are on an equidistant arc to the center of the lamp hole. Make sure you align the lamp head plate correctly before you screw the nuts and bolts on. Failure to install correctly will cause the sensor probe to malfunction. Only one lamp should be under the sensor port. See the following photo for the correct lamp head alignment.

Lamp Head Plate Alignment

The side of the lamp head plate with one lamp must be aligned on the top and in the center with the inlet/outlet flange of the cylinder in order to align with the sensor port. There is only one lamp hole that will align properly. It can be identified as the one where the head mounting bolts are on an equidistant arc to the center of the lamp hole.

Once alignment is correct, secure the lamp head plate using the new nuts and bolts included with your kit. It is recommended to use a crisscross pattern to tighten the nuts. This is similar to putting a tire on a car. Bolts should be torqued to 25 foot pounds.

Repeat the process on the opposite side of the treatment chamber.

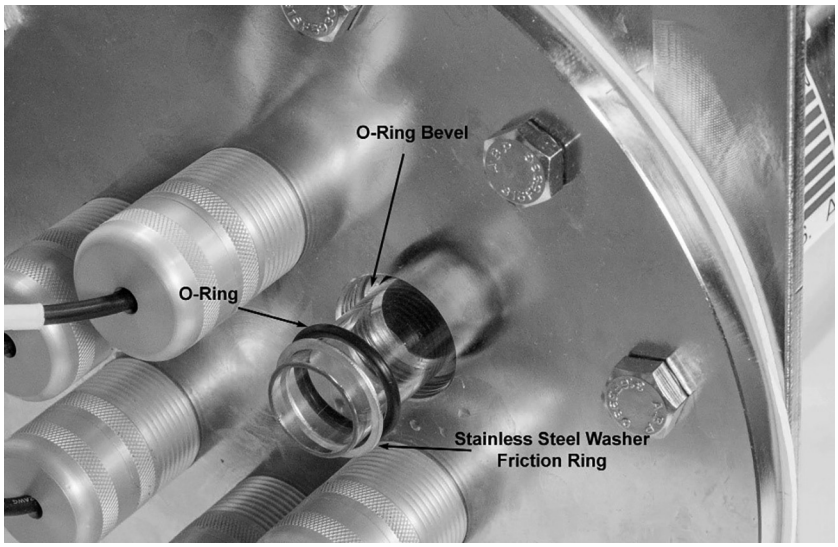
c) Quartz Sleeve Installation for Open Ended Sleeves

When working on this task a single operator is appropriate.

The quartz sleeves seal by using a compression nut, a stainless steel washer, an o-ring, and a compression nut cap. This task requires no tools. Use cloth gloves to handle the quartz sleeves and UV lamps to avoid putting fingerprints on the sleeves and lamps.

First, the quartz sleeve needs to be inserted into the lamp head plate gradually and securely through to the other end. As the quartz sleeve approaches the opposite end, make sure you guide the sleeve all the way through. It is suggested that a finger or a dowel may be used to catch the end of the quartz.

Once through, make sure that each end of the quartz sleeve protrudes the same amount on both sides. Before sliding the o-ring on, it is suggested to lubricate both the o-ring and the sleeve making it slippery. Then slide an o-ring over each end of the sleeve. Once the o-rings are on, place the stainless steel washers on each end.



The compression fittings should first be hand tightened and the process needs to be completed for each quartz sleeve. **Do NOT install the UV lamp at this time.**

Do not use a wrench to tighten the compression nuts. Doing so can crack the quartz sleeves and cause leakage. A compression nut tool has been provided with the system to further tighten the compression nuts.

Compression Nut Tool

Once secure and once all other ports are closed, it is time to pressurize the system to look for any leaks at the compression seals. Slowly fill the vessel with water. Prevent any onrush of water or water hammer as this may damage the sleeves. Also ensure that the UV lamps have not been placed in the vessel. In the event of a water hammer, the quartz sleeve(s) may break and if the lamps are already installed, they too could break.

Once pressurized, let stand for 10 minutes and inspect the seals. If any are found to be leaking, stop the water, release the pressure, drain the system, and then redo the leaking seals. Use the included strap wrench and tighten the compression nut 1/4 turn. Once redone, run the pressurization test and ensure that all seals are not leaking.

d) Lamp and Lamp Harness Bracket Installation

NOTE: Use cloth gloves to handle UV lamps to avoid putting fingerprints on the lamps.

The electrical path for each lamp is identified and carried through the whole electrical system. Each lamp harness is numbered. The LED on the electrical enclosure for lamp one corresponds to lamp one in the UV treatment chamber.

For systems equipped with an umbilical you will need to install the lamp harness bracket. You will need the two additional nuts included in your retrofit kit. Attach the lamp harness bracket to the back side of the lamp head plate and secure with the two additional nuts.

Once the lamp harness bracket is secured, the UV lamps can be installed.

Insert the lamp into the quartz sleeve and slowly slide in, blank end first, pin end last. Leave the lamp protruding out of the sleeve far enough to be able to push the lamp connector onto the lamp. Make sure the lamp connector is firmly pushed onto the lamp base leaving no space between the connector and base. **Failure to push the lamp connector all the way onto the base may allow electrical arcing to occur between the pins, overheating the lamp and possibly causing a fire.**

Feed the lamp into the sleeve and screw on the compression nut caps. Repeat for each lamp. The caps hold the lamp harness in place and prevent exposure to UV radiation.

e) Sensor Probe Installation
(For Optional Monitoring Station)

For models equipped with the Monitoring Station, a sensor probe, sensor port fitting, and sensor cable will need to be installed on the UV chamber. The sensor fitting and sensor probe contain an o-ring to ensure a watertight seal. To install, first attach the sensor fitting to the sensor port on the UV cylinder chamber. Slide the sensor probe through the fitting and secure. Then attach the sensor cable to the sensor port.

Sensor Fitting
1 inch GHT

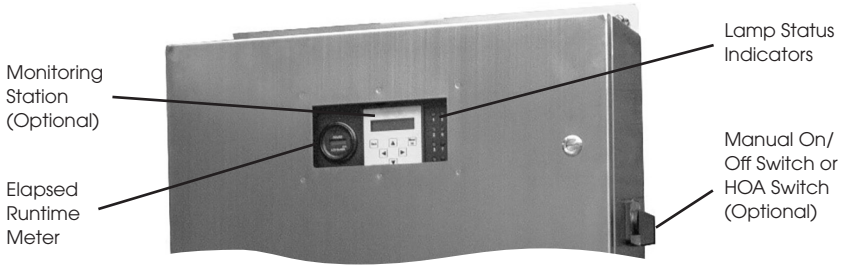
Sensor Probe

Sensor Probe and Sensor Fitting
Assembled

3) ELECTRONIC CONTROL CENTER (ECC) OPERATION AND MONITORING

The ECC will be the focal point for system operation and monitoring.

Do not exceed three ON/OFF cycles in a 24-hour period. Excessive cycling of the UV system will reduce the EOL (End of Life) output and/or cause premature aging of the UV lamps.



a) On/Off Switch

The on/off switch controls the electrical power to the UV system, manually.

Hands Off Auto (HOA) Switch—Optional

This is an optional feature and is for models equipped with the HOA switch. Make sure the switch is wired as specified in the wiring diagram inside the ECC cover.

- For Long Systems—To operate remotely, turn the HOA switch to the "2" position.
- For Short Systems—To operate remotely, turn the HOA switch to the "Auto" position.

b) Lamp Status

The ECC will display each individual lamp status indicator in the form of light emitting diodes (LEDs) located on the display plate behind the window on the front door. The LEDs glow green when the lamp is on. An extinguished LED indicates a possible lamp problem.

If the LED goes off, then it may mean that a lamp is no longer functioning. However, it may indicate a problem with the LED, the lamp's corresponding ballast, or a problem located within the lamp holder.

c) Runtime Monitoring

A digital non-resettable time meter has been integrated into the display plate of the ECC. This elapsed runtime meter (ERTM) tracks operational hours on the system as a whole. It does not track individual lamp run hours nor does it indicate when to service. The runtime meter is a tool to help track running hours to help operators know when it is time to change lamps.

Operators should keep tracking logs in order to know when it is time to change lamps (see last page of this manual). Lamps need to be changed every 10,000 hours (one year). UV lamps lose intensity over time and the system is designed to provide proper dosage up to 10,000 hours of lamp life. Running the lamps more than 10,000 hours could result in improper UV dosage.

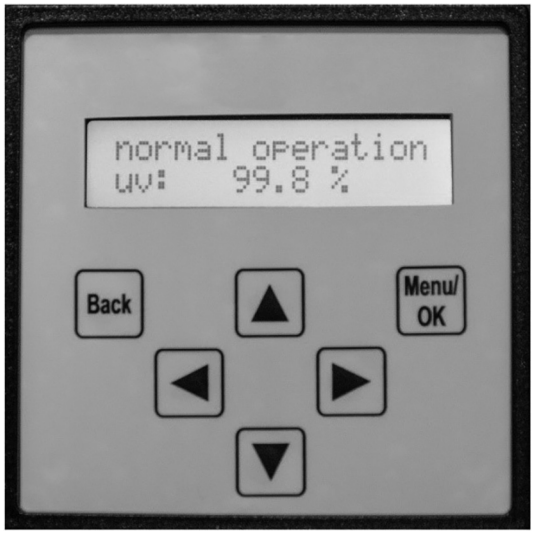
d) Monitoring Station (Optional)

The Monitoring Station is capable of monitoring total runtime hours, lamp runtime hours, lamp intensity, relative UV percentage, temperature, and in some models, real-time dosage.

4) MONITORING STATION OPERATION

a) General System Information

The UV Monitoring Station is an industry leading system to monitor many aspects of your ultraviolet unit's performance. Monitoring system performance to ensure the required UV radiation is being generated is key to providing proper disinfection. The Monitoring Station is composed of the monitoring terminal and a multipurpose sensor probe.



The monitoring terminal is a self-contained unit that monitors signals from the sensor probe and offers a real-time digital readout of several vital aspects on the performance of the UV system. The front panel contains the operational buttons and a two line display with multicolored backlights for the display of measured values and the operating states. The terminal is capable of monitoring total runtime hours, lamp runtime hours, lamp intensity, relative UV percentage, temperature, and in some models, real-time dosage.

Wetted Sensor Probe

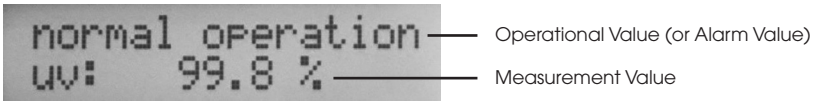
Non-Wetted Sensor Probe and Viewing Window

The monitoring terminal receives signals from one of two sensor probes (model dependent). Depending on the model, the system is either fitted with a wetted sensor or fitted with a non-wetted sensor and viewing window. PVC models use the non-wetted sensor probe and viewing window.

b) Monitoring Station Display

NOTE: For a complete menu of all monitor functions, please refer to the Monitoring Station Display Flow Chart in this manual.

The Monitoring Station display consists of two lines. The top line displays the Operational/Alarm Value and the bottom line displays the Measurement Value. The background of the display will change colors and is dependent on the system's current operating condition.



1. Operational Line Display

Under normal operating conditions, the Operational Line Display will read "normal operation" and the background color is blue.

There is a UV pre-alarm setting. Under pre-alarm conditions, the Operational Line Display will read "uv pre-alarm" and the background color will turn yellow-green.

There are various alarm settings available. Under alarm conditions, the Operational Line Display will read "(appropriate) alarm" (be it UV alarm, temp alarm, or lamp lifetime alarm) and the display background color will turn red.

2. Measurement Value Display

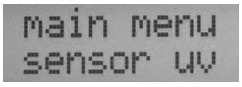
The Measurement Value Display is shown under the Operational Line Display and shows the value of the measurement currently being displayed.

3. Display Navigation

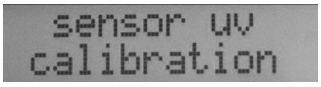
The monitoring terminal is controlled by using the navigational buttons on the front display. These buttons include: Back, Menu/Ok, and directional arrows. To begin navigation, press the Menu/OK button, then use the up and down arrows to scroll through the various categories. All navigational arrows allow the user to scroll or input specific values. The back button will take you back to the previous menu option.

For a complete list of all menu functions, refer to the Monitoring Station Display Flow Chart.

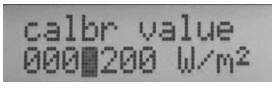
Please note that when you select a category from the main menu, the top line of the display will read main menu and the bottom line will display the sub-menu option chosen.



Once you select a sub-menu option, the display will now place that sub-menu value on the top line with the sub-categories to choose from on the bottom line.



Once you choose a sub-category, the display will place that sub-category on the top line with the different options to chose from on the bottom line.



4. Display Scrolling

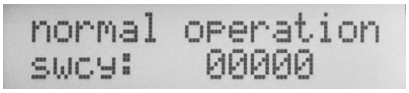
The Monitoring Station display continuously scrolls through the various operations and appear in the following order:

1) Total Hours
2) Switching Cycles
3) UV Percentage
4) Lamp Intensity in W/m²
5) Temperature in °F or °C
6) Lamp Lifetime Hours

1) Total Hours—(all:)

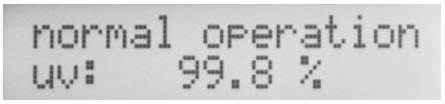
Display shows total runtime hours.

2) Switching Cycles—(swcy:)



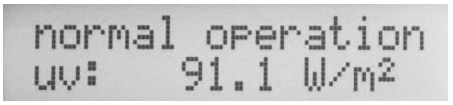
Display shows the number of on/off cycles during lamp lifetime.

3) UV Percentage—(uv:)



Display shows relative UV intensity compared to a new lamp.

4) Lamp Intensity—(uv:)



Display shows lamp intensity in W/m².

5) Temperature—(temp:)

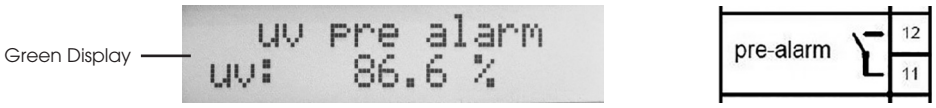
Display shows UV unit temperature in °F or °C.

6) Lifetime Hours—(lt:)

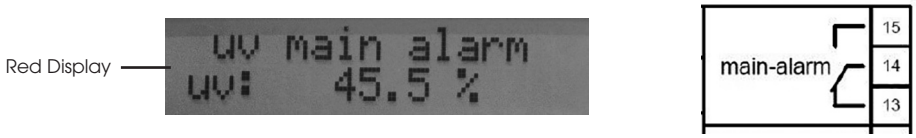
Displays lamp hours since last lamp change-out.

c) Monitoring Station Operation

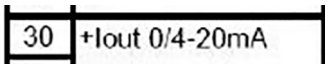
The Monitoring Station uses a multipurpose sensor probe that will monitor both UV output and unit temperature. UV light output measured from Lamp #1 by the UV sensor probe is transmitted to the monitoring terminal, where it is processed and used to display lamp intensity in watts per square meter (W/m^2). Additionally the terminal will display UV intensity as a percentage value from 0 to 100%. There are two alarms associated with UV intensity, a pre-alarm to warn when UV intensity is nearing the alarm value, and a main alarm when the intensity has fallen below a safe level. There is a relay associated with each alarm mode for remote signaling or control.



When new lamps are installed, the terminal needs to be calibrated to show the UV intensity at 100%. As the lamps age and UV intensity falls, the UV display will reflect the lowered UV intensity. When the UV intensity falls to the pre-alarm level (88%), the display will indicate a "UV Pre-Alarm" and the display background color will change from blue to yellow-green. There is also a 5A 250V relay for the pre-alarm condition that can be programmed to be either normally open or normally closed with dry contacts that will switch states when the UV pre-alarm is activated.



If the UV intensity falls below the main alarm level (85%), the display will indicate a "UV Main Alarm" and the display background color will change to red. There is also a 5A 250V relay with normally open, common, and normally closed dry contacts for the alarm condition that will switch states when the UV main alarm is activated.



The monitoring terminal also has a 4-20mA output for remote monitoring of the UV intensity signal.

1. Sensor Setup

The monitoring terminal can be used with several different sensors and as such, proper settings need to be entered for the sensor type. This will be done by the manufacturer before the unit is shipped, but instructions are included here in case settings are lost or erroneously set to default.

1) Input

The type of input for the sensor needs to be entered. Follow these menu prompts:

Main Menu > sensor uv > input > (Uin1)

2) Calibration

Calibration is covered in the next section "Initial Calibration." Skip calibration for now.

3) Unit

The unit for lamp intensity needs to be entered. Follow these menu prompts:

Main Menu > sensor uv > unit > (W/m²)

4) Offset

Offset is not needed in most cases. If your unit needs an offset, see page 19 "Offset" for directions.

2. Initial Calibration

The monitoring terminal displays UV intensity in real time. Measured UV intensity is affected by lamp aging, water quality, sleeve conditions, and sensor window conditions. As a result, UV intensity is an indicator of not only lamp conditions, but also a change in water quality, or fouling of sleeves and other UV transmission parts.

The monitoring terminal can only be calibrated when the power switch is in the ON position and the lamps are operational. Lamps must warm up for three minutes prior to any calibration. (See caution below as this process may possibly take longer.) When performing initial calibration, the lamps must be new.

The sensor probe has a diode that is sensitive to UV light. The greater the intensity of the lamp, the larger the signal sent out from the probe will be. The monitoring terminal will convert this signal to a real time measurement of intensity in W/m². The value displayed on the terminal is dependent on the wattage of the lamp and the distance of the lamp from the sensor. The sensor probe is highly accurate and the measurement is in real time. Lamp intensity can vary with temperature and other conditions so expect some fluctuation in the value as you are viewing the display.

CAUTION: Depending on your specific water conditions, the lamp may only reach 95 to 99% of full intensity in the three minute warm up period. It is recommended to monitor the lamp's intensity for a while as it is possible for this process to take as long as an hour to reach full intensity.

The sensor probes are calibrated and serialized for traceability. Your UV system is equipped with one of two types of sensor probes; the wetted sensor (P/N SNSR0004) or the non-wetted sensor and viewing window (P/N SNSR0005). First, determine which sensor probe is used in your unit for the proper calibration value. PVC models use the non-wetted sensor probe and viewing window. If your system is equipped with the non-wetted sensor probe and viewing window the sensor probe can be replaced without depressurizing the unit.

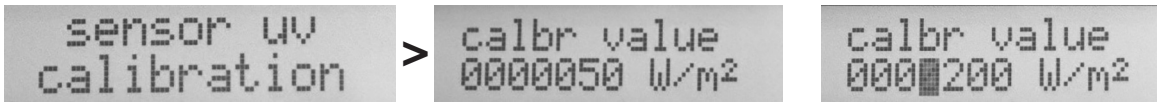
Wetted Sensor Probe

Non-Wetted Sensor Probe and Viewing Window

Calibration Values
Wetted sensor probe = 50W/m²
Non-wetted sensor probe = 200W/m²

To calibrate the UV Monitoring Station, it is necessary to tell the Monitoring Station the calibration value of the sensor being used. Use the following prompts to set the calibration value:

Press Menu/OK > scroll up/down to sensor UV > press (OK) > scroll up/down to calibration > press (OK) > calibration value.



Wetted Sensor Enter 50

Non-wetted Sensor Enter 200

1) Set the proper calibration by using the arrows to enter the value for your specific sensor (50 or 200 W/m²).

2) Next enter the value of the lamp intensity equivalent to 100% by the following prompts:

Press Menu/OK > Equivalent=100%.

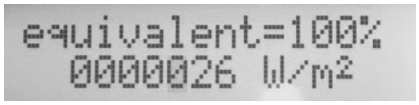


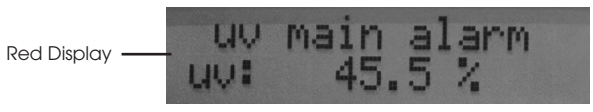
Photo shown is for representational purposes.

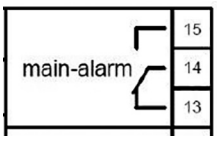
Once the equivalent is set, press the Back button twice to return to the main menu. Your UV Monitoring Station is now calibrated and the UV percentage should read at or near 100%.

3. Recalibration at 100 hours
UV lamps lose intensity at a higher rate than normal before they stabilize at around 100 hours. Recalibrate the Equivalent=100% at the end of 100 hours as per the instructions above.

4. Monitoring Station Alarms

1) UV Main Alarm



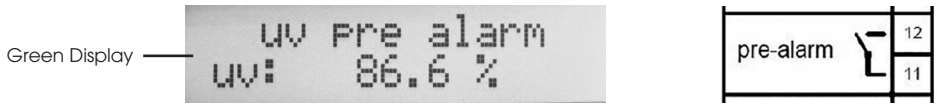


As a standard, all units are sized to a UV lamp end of lamp life at 85% of original intensity and conforms to common industry standards and practices for UV units with lamps that have a long life coating. Therefore, the UV main alarm is set to alarm at 85% of original measured intensity. If the UV intensity falls below 85%, the unit is in danger of not producing the stated dosage for the flowrate and water type. When the UV intensity falls below the alarm set point, the operational line display will read "UV Main Alarm" and the

background color of the display will turn red to indicate the alarm condition. In addition, the dry contacts on the main alarm relay will change states.

There are special cases where the UV main alarm may be set at a different value, but these will be the exception rather than the rule and an addendum will be added to the Owner's Manual.

2) UV Pre-alarm



The UV pre-alarm is set to alarm when the UV intensity falls below 88%. The purpose of the pre-alarm is to give warning that a main alarm condition is possible soon and action should be taken to avoid the alarm condition. When the UV intensity falls below the pre-alarm set point, the operational line display will read "UV Pre Alarm" and the background color of the display will turn yellow-green to indicate the alarm condition. In addition, the dry contacts on the pre-alarm relay will change from NO to NC or from NC to NO, depending on user programming preference.

3) Lifetime Alarm

The lifetime alarm monitors lamp operating hours. UV lamps are generally replaced at the end of 10,000 hours, or 415 days. The lifetime alarm is set for 10,000 hours. If the lamps are changed every 10,000 hours, lamp intensity should not have fallen below 88% and the unit should not fall into an alarm state or a pre-alarm state due to lamp intensity. When the UV intensity falls below the alarm set point, the operational line display will read "Lifetime Alarm" and the background color of the display will turn red to indicate the alarm condition.

4) Monitoring Station Alarm Calibration

Warm-up Delay

UV lamps need to warm up to operating temperature in order to produce full UV intensity. The warm-up delay is set to 180 seconds (3 minutes). The Monitoring Station will not go into an alarm or pre-alarm state for three minutes to allow the lamps to come up to full intensity. The UV pre-alarm is factory set to 88% and should not need to be changed. To change the warm-up delay, follow these menu prompts:

Main menu > alarm > OK > warm-up delay > OK > (0(off)-900s) (Default Value=(180s))

UV Pre-Alarm

The main alarm cannot be set higher than the pre-alarm. For this reason, it is best to set the UV pre-alarm first in case the pre-alarm value is showing a value less than the main alarm. The UV pre-alarm is factory set to 88% and should not need to be changed. There is also a UV pre-alarm delay. The UV pre-alarm delay is to keep the pre-alarm from cycling back and forth in cases where the UV intensity is on the pre-alarm threshold. The UV pre-alarm delay is factory set to 180 seconds (3 minutes) and should not need

to be changed. To change the UV pre-alarm or the pre-alarm delay, follow these menu prompts:

Main menu > alarm > uv pre-alarm > (0(off)-100%) (Default Value=(88%)) > uv pre al delay > (0(off)–240s) (Default Value=(180s))

UV Pre-alarm Relay

The UV pre-alarm has a two position dry contact relay that is programmable to Normally Open (NO) or Normally Closed (NC) according to user needs. To program the UV pre-alarm relay to Normally Open or Normally Closed, follow these menu prompts:

Main menu > alarm > relais pre-alarm > (NO-NC)

UV Main Alarm

The UV main alarm is factory set to 85%, which is end of lamp life for dosage calculations and should not be changed. There is also a UV alarm delay. The UV alarm delay is to keep the UV alarm from cycling back and forth in cases where the UV intensity is on the UV main alarm threshold. The UV alarm delay is factory set to 180 seconds (3 minutes) and should not need to be changed. To change the UV main alarm or the main alarm delay, follow these menu prompts:

Main menu > alarm > uv main alarm > (0(off)-100%) (Default Value=(85%)) > uv main al delay (0(off)–240s) (Default Value= (180s))

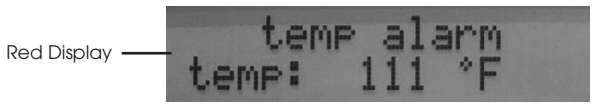
Lifetime Alarm

The lifetime alarm is factory set to 10,000 hours which is considered end of lamp life. Changing lamps at the recommended interval should prevent the unit from going into UV pre-alarm state or UV main alarm state due solely to intensity falloff of the UV lamp. To change the lifetime alarm, follow these menu prompts:

Main menu > alarm > lifetime alarm > (0(off)-30,000h) (Default Value=(10000h))

d) Temperature Sensor

The monitoring terminal is capable of sensing unit temperature when used with the multipurpose sensor probes. UV lamps have a certain operational temperature range, depending on the lamp type. Operation outside the normal operating range will result in reduced UV intensity. The purpose of the temperature sensor is to shut the unit off and alarm in case of an overheating condition that can result in reduced UV intensity or risk of fire.



1. Temperature Sensor Setup

The monitoring terminal can be used with several different sensors and as such, proper settings need to be entered for the sensor type. This will be done by the manufacturer before the unit is shipped, but instructions are included here in case settings are lost or erroneously set to default.

2. **Activation**
   The temperature function needs to be activated. Follow these menu prompts:

   Main Menu > sensor temp > activate > (on)

3. **Input**
   The type of input for the sensor needs to be entered. Follow these menu prompts:

   Main Menu > sensor temp > input > (Uin2)

4. **Unit**
   The unit for temperature needs to be entered. Follow these menu prompts:

   Main Menu > sensor temp > unit > (°C-°F)

5. **End Value Calibration**
   To calibrate end value, follow these menu prompts:

   Main Menu > sensor temp > calibration > (140°C or 284°F)

6. **Offset**
   To calibrate offset, follow these menu prompts:

   Main Menu > sensor temp > offset > (-60°C or -76°F)

7. **Temperature Alarm Calibration**

   1) **Temperature Alarm for UV Lamps**

      Standard Output and High Output Lamps
      There are three settings involved with the temperature alarm calibration: the alarm setting, the hysteresis setting, and the delay. The temperature alarm setting for high output lamps and standard output lamps is factory set for 105°F (40°C). This alarm setting value is the point where the monitoring terminal goes into alarm state, changing the state of relais3. The hysteresis setting controls the point at which the relay returns to the normal state. The temp alarm hys is set to 10°F (6°C). If the temperature at the sensor probe rises to 105°F (40°C), power will be shut off to the lamps and the run time meter, but not to the monitor. Because the lamps are shut off, UV intensity will be 0% and the unit will also go into UV main alarm state. If the 4-20mA output for remote monitoring is used, the UV reading at the remote location will be 0%. When the sensor probe cools to 95°F (34°C), the unit will switch back on. There is also a temperature alarm delay. The temperature alarm delay is to keep the temperature alarm from cycling back and forth in cases where the unit temperature is on the temperature threshold. The temperature alarm delay is factory set to 180 seconds (3 minutes) and should not need to be changed.

      To reset these values, follow these menu prompts:

      Main Menu > alarm > temp alarm > (105°F (40°C)) > temp alarm hys (10°F(6°C)) > temp alarm delay (180s)

Amalgam Lamps

There are three settings involved with the temperature alarm calibration: the alarm setting, the hysteresis setting, and the delay. The temperature alarm setting is factory set for 170°F (77°C) for stainless steel units. For PVC units, it is set at 105°F (40°C). This alarm setting value is the point where the monitoring terminal goes into alarm state, changing the state of relais3. The hysteresis setting controls the point at which the relay returns to the normal state. The temp alarm hys is set to 10°F (6°C). If the temperature at the sensor probe rises to the alarm setting value, power will be shut off to the lamps and the run time meter, but not to the monitor. Because the lamps are shut off, UV intensity will be 0% and the unit will also go into UV main alarm state. If the 4-20mA output for remote monitoring is used, the UV reading at the remote location will be 0%. When the sensor probe cools to 160°F (71°C), or 95°F (34°C) for PVC units, the unit will switch back on. There is also a temperature alarm delay. The temperature alarm delay is to keep the temperature alarm from cycling back and forth in cases where the unit temperature is on the temperature threshold. The temperature alarm delay is factory set to 180 seconds (3 minutes) and should not need to be changed.

For Stainless Steel Units: To reset these values, follow these menu prompts:

Main Menu > alarm > temp alarm > (170°F (77°C)) > temp alarm hys (10°F (6°C)) > temp alarm delay (180s)

For PVC Units: To reset these values, follow these menu prompts:

Main Menu > alarm > temp alarm > (105°F (40°C))> temp alarm hys (10°F (6°C)) > temp alarm delay (180s)

2) **Temperature Alarm Relay (Relais3)**

The temperature alarm relay is used to turn off the lamps during an overheat condition. The relay will either be used to provide power to the ballasts, or control a power relay coil that powers the ballasts. This relay is set at Normally Open (NO). Changing the relay setting will defeat the temperature monitoring function of the system. The correct relais3 value is NO. To check or reset this value follow these menu prompts:

Main Menu > alarm > relais3 > (NO)

8. **Current Output**

The monitoring terminal is equipped to output a 4-20mA signal for remote monitoring of UV intensity. 20mA is set to reflect a value of 100% and the mode is set to 4-20, so that 4mA represents a value of 0. This value is set by the manufacturer before the unit is shipped, but instructions are included here in case settings are lost or erroneously set to default.

Follow these menu prompts to set maximum value at 100%:

Main Menu > current output > maximum >(100%)

Follow these menu prompts to set mode to 4-20 (4mA=0):

Main Menu > current output > mode > (4-20mA)

e) Lamp Change Out Reset Instructions

Always follow the owner's manual for instructions on changing out your UV lamps. After any lamp change out, a number of settings will need to be reset.

1. **Lifetime Counter**

   The lifetime counter tracks the number of hours on the lamps. When changing lamps, this value needs to be reset. To reset this value, follow these menu prompts:

   Main menu > counter > lifetime > (reset<return>) Use the left arrow to select (<reset>return) and press OK to reset. This will reset lamp hours to 0.

2. **Switching Cycles**

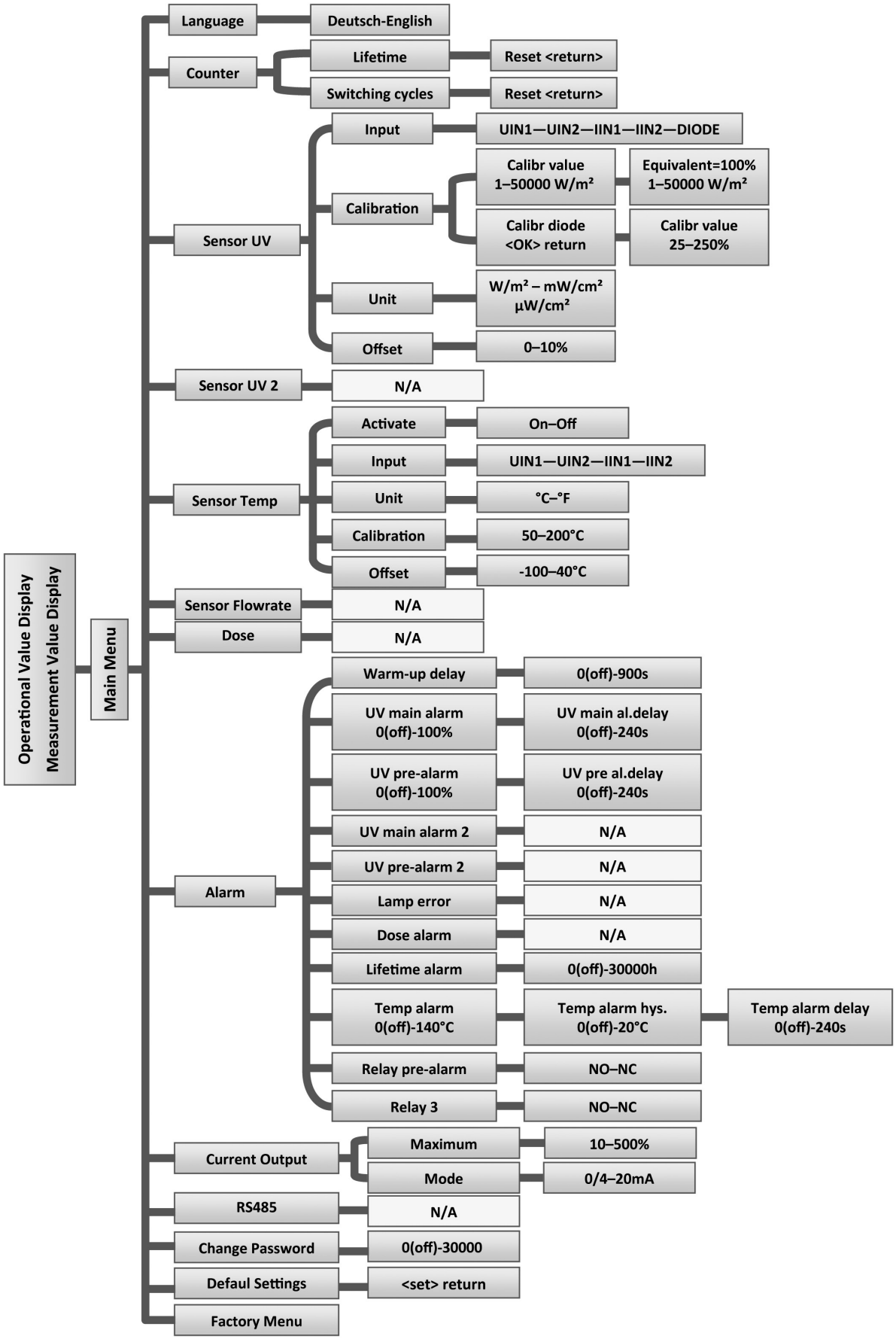
   Switching cycles monitors the number of on/off cycles during the lifetime of the lamps. When lamps are changed, this value needs to be reset to 0. To reset this value, follow these menu prompts:

   Main menu > counter > switching cycles > (reset<return>) Use the left arrow to select (<reset>return) and press OK to reset. This will reset switching cycles to 0.

3. **Calibration**

   When lamps are changed, calibrate according to initial calibration instructions above. After 100 hours, when lamps have stabilized, recalibrate.

f) Monitoring Station Display Flow Chart



5) MAINTENANCE

Always disconnect power before servicing the system.

a) Lamp Maintenance

Most ultraviolet lamps are rated to provide 10,000 hours of continuous use. After 10,000 hours, the lamp may no longer provide the sufficient amount of 254nm or 185nm that is required for UV output. Therefore, the lamps need to be replaced on a yearly basis. Lamp status should also be checked on a periodic basis by inspecting the LEDs on the ECC.

It is best to always keep spare lamps available in case of emergency needs.

If it becomes necessary to clean the lamp due to dust or fingerprints, the lamps can be cleaned with denatured alcohol. Use cotton gloves and a clean cloth when cleaning the lamps. Wait for lamps to cool before cleaning.

b) Quartz Sleeve Maintenance

FRAGILE: Be careful when handling quartz sleeves! Always use cotton gloves when handling.

In order to ensure proper disinfection, the quartz sleeves need to be inspected, monitored, and maintained. The UV lamps produce heat and UVC output, which may cause certain water characteristics to adhere to and bond on the sleeve, preventing the UVC from reaching the targeted pathogens. This can cause the quartz sleeves to foul. To a great extent, your frequency of cleaning will depend upon the water quality (i.e. amount of minerals present in the liquid). The more minerals present in the water, the more frequently the quartz will require cleaning.

Manual Cleaning

Significant film or debris deposits formed on the quartz sleeves will impair the ability of the ultraviolet rays to penetrate through the quartz and into the water.

A periodic visual inspection of the quartz will be necessary to determine the frequency of cleaning. Initial inspection should take place after thirty (30) days of operation. If the quartz are dirty, shorten the cleaning intervals. If the quartz are clean, lengthen the cleaning intervals.

To clean quartz sleeves, depressurize the unit by first turning off the valves on the inlet and then the outlet of the vessel. Turn off the power to the UV system. Drain the vessel. Disconnect the lamps, allow to cool, and slowly and carefully remove the lamps using clean cotton gloves. Back off the compression quartz gland nuts and remove the o-rings. The quartz sleeves may be cleaned with denatured alcohol. If this is not adequate, a mild non-abrasive cleaner can be used. It is important to use cleaners that leave no residue.

FRAGILE: Be careful when handling quartz.

Whenever the quartz are cleaned, the quartz o-rings should be replaced. Install the quartz sleeves with clean cotton gloves.

c) ECC Maintenance

The Electronic Control Enclosure (ECC) is custom designed with a sealed door and sealed Lexan window kit. It should require little maintenance other than occasional cleaning. A damp cloth, mild detergent, or other stainless steel cleaner may be used to clean the outside of the enclosure.

Routine maintenance should also include checking and cleaning the filters on the air intake fans. Fans have been integrated to keep the electronics cooler to ensure optimum performance. Prior to cleaning the filters, the ECC must be powered down. Once powered down, snap the covers off by hand then remove and wash the filter with warm water. Filter must be dry before reinstalling.

The ECC is not suitable to withstand a hose wash-down or large amounts of water. Any water penetrating the enclosure can lead to damage and possible electrical shock.

d) Sensor Probe Maintenance

For models equipped with the Monitoring Station, a sensor probe, sensor port fitting, and sensor cable has been installed on the UV chamber. The sensor probe contains an o-ring that will need to be replaced periodically. Annual routine maintenance is recommended similar to lamp and quartz maintenance. You must shutdown the system and depressurize the chamber before performing any maintenance.

Detach the sensor cable from the sensor probe and unscrew the probe from the sensor port. Inspect and clean as needed. A buildup can coat the sensor probe eye and failure to clean may result in a false reading. It is recommended to replace the o-ring every three to five years as the o-ring can degrade over time.

Reattach the sensor probe and sensor cable after routine maintenance has been performed.

Sensor Fitting
1 inch GHT

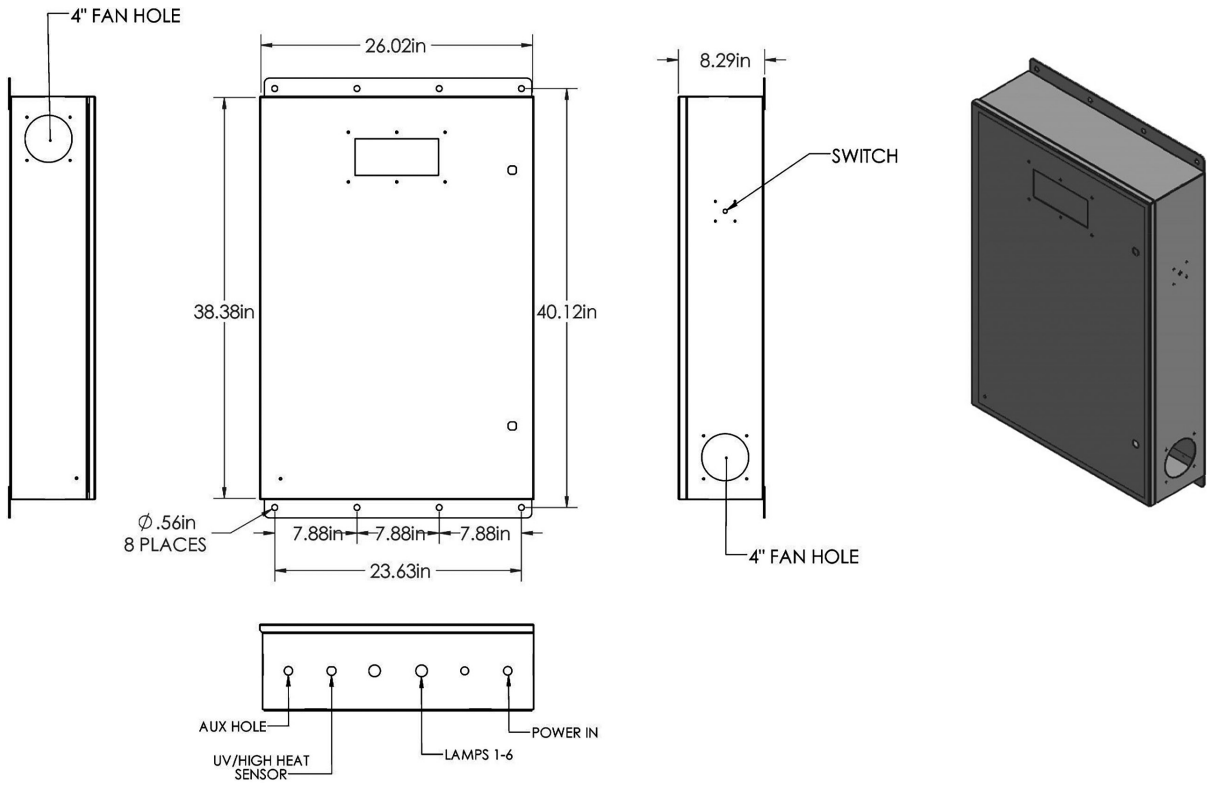
Sensor Probe

Sensor Probe and Sensor Fitting
Assembled

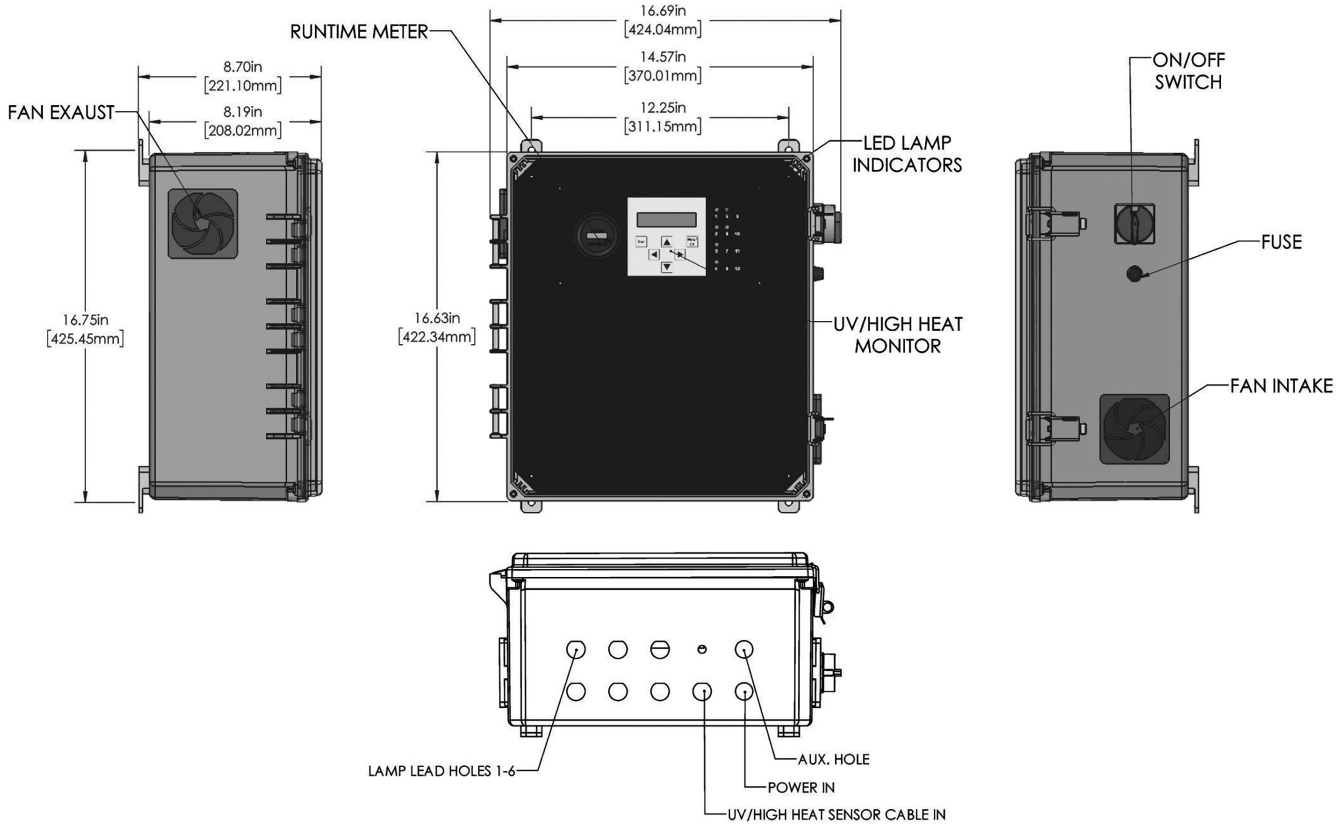
REPLACEMENT PARTS

Part Number	Description
DI-LMPUVL-S IL-GL615704A74G	UV Lamp 254NM, T5, High Output—Short Systems UV Lamp 254NM, T6, Amalgam—Long Systems
DI-QTZO037 IL-QZO531593	Quartz Sleeve, 25mm, Open Ended—Short Systems Quartz Sleeve, 28mm, Open Ended—Long Systems
DI-ORNG0009 IL-ORNG0102	Sleeve O-ring, EPDM for 25mm Sleeves—Short Systems Sleeve O-ring, EPDM for 28mm Sleeves—Long Systems
DI-CN0001 DI-CN0004	Compression Nut—Short Systems Compression Nut—Long Systems
DI-SS1015	Sleeve Washer, Stainless Steel—Long Systems
DI-CN0006	Compression Cap—Short & Long Systems
DI-CN0002 DI-CN0005	Compression Cap with hole for Lamp Harness—Short Systems Compression Cap with hole for Lamp Harness—Long Systems
DI-BLST0034 DI-BLST0003	Ballast 120V 50-60Hz for High Output Lamps—Short Systems Ballast 120V 50-60Hz for Amalgam Lamps—Long Systems
DI-20179B DI-20187C	Gasket for Lamp Head Plate—Short Systems Gasket for Lamp Head Plate—Long Systems

STAINLESS STEEL ENCLOSURE (LONG SYSTEMS) DIMENSIONS



POLYCARBONATE ENCLOSURE (SHORT SYSTEMS) DIMENSIONS



TROUBLESHOOTING

Problem	Recommended Action
UV lamp LED light is out	• Check lamp socket connection. • If lamp is on, replace LED assembly.
UV lamp is out	• Exchange lamp connectors from quesonable lamp to known good lamp. If lamp lights, replace bad lamp. • If the lamp does not light, exchange lamp connectors at enclosure from quesonable ballast to known good ballast. If lamp lights, replace ballast. • Check input voltage. Must be above 120V/60Hz or 220V/50Hz. Install voltage regulator or check for floating neutral at power source.
Short lamp life	• Damper excessive vibration which causes degradation of lamp filaments by checking for poorly connected pipes, erratic or improperly installed pumps, or move the UV equipment to isolate it from vibration. • Consult manufacturer for frequent start/stop requirements (recommend not more than six (6) in 24-hour period).
Leak at quartz end plate	• Inspect the compression nut and o-ring to ensure the nut is tightened and o-ring is sealed properly. • Inspect quartz sleeve. Ensure the quartz sleeve is not cracked. Replace if defective or cracked. • O-rings and gaskets can deteriorate and become damaged over time. Replace o-ring and/or gasket. Note: When replacing end gasket, make sure bolts are torqued to 25 foot-pounds.
Low UV monitor reading (Less than 80% transmission)	• Check water quality. Ensure that color, turbidity, and iron content are within normal parameters. • Verify lamp output. • Ensure input voltage matches requirements. • Replace old or defective lamp(s). • Clean UV sensor lens. • Clean quartz sleeve(s). • If reading is at 0%, ensure UV sensor cable is connected.
Poor bacterial performance	• Replace old or defective lamp(s). • Clean quartz sleeve(s). • Check water quality. Ensure that color, turbidity, and iron content are within normal parameters. • Verify sampling technique. • Verify flow rate. • Ensure proper sample valves are used. • Check for bypass valve contamination.

If questions still remain after completing a troubleshooting procedure, please contact the manufacturer.

MAINTENANCE LOG

You must perform routine maintenance in order to achieve optimum performance levels from your ultraviolet water treatment system. As you perform routine maintenance or necessary service on your system, record the dates in the Maintenance Log below. The "Maintenance" section of the IOM Manual provides instructions for servicing and maintenance procedures.

Model Number:	**Serial Number:**

UV Lamp Replacement (every 365 days)	**Quartz Sleeve Cleaning (as needed)**	**Quartz Sleeve Replacement (every 3 years)**	**O-rings Replacement (with sleeve change)**