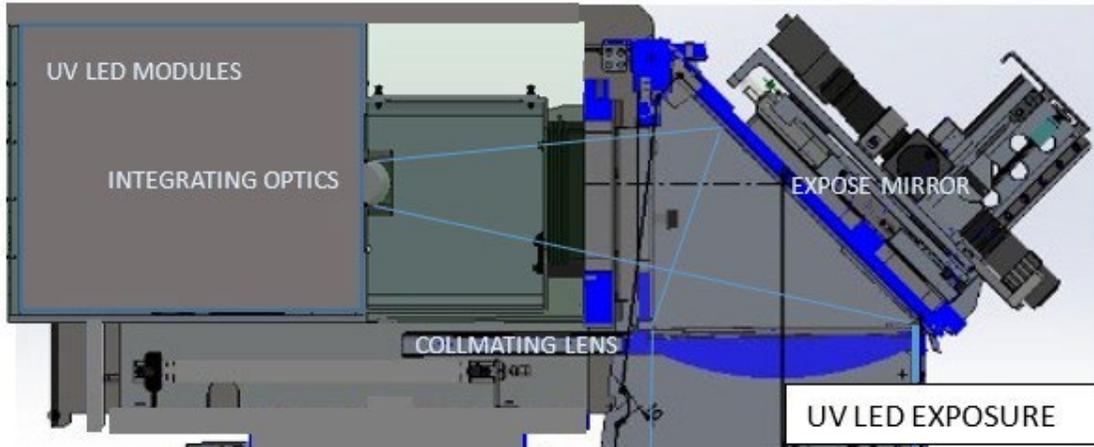


THE NXQ4006 UV LED SYSTEM

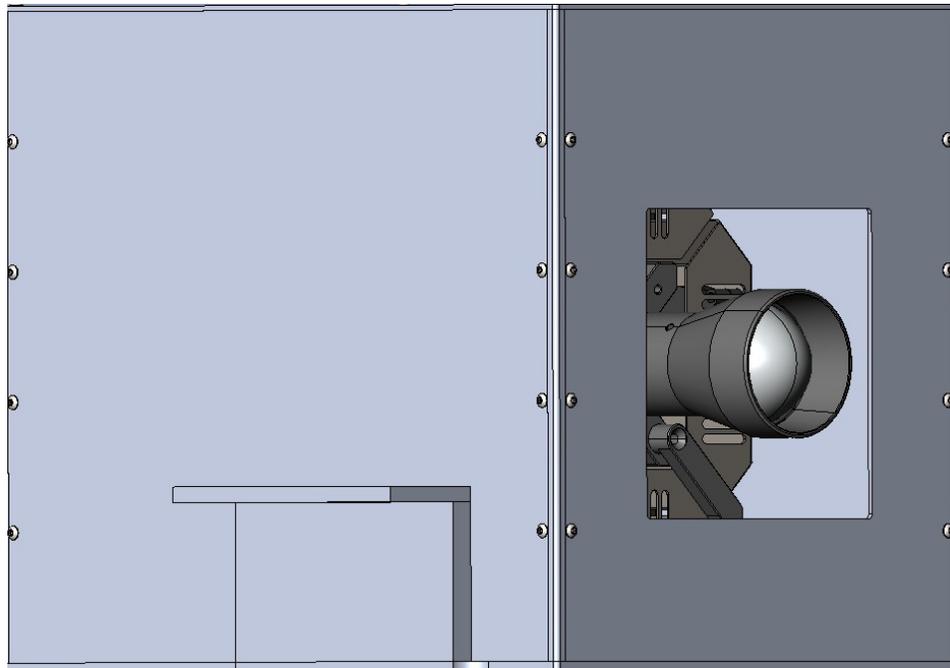
THE NXQ4006 UV LED SYSTEM	1
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OVERVIEW

The UV LED light source exposes a wafer with three wavelengths of UV light. It replaces a mercury arc lamp light source with a more powerful, versatile system with no need for lamp changes.



The UV LED modules are in an enclosure mounted to the NXQ4006 optical head.



ESS (EXPOSURE SUB-SYSTEM)



UV LED LIGHT SOURCE



Liquid Coolant

The UV LED light engines are equipped with an internal liquid cooling system. Check the coolant level at least on a quarterly basis.

Inhibitors are added to the coolant to suppress corrosion. As a preventive maintenance measure, the coolant should be renewed every two years.

COOLING SYSTEM

CSS (CONTROL SUB-SYSTEM)



Coolant Level Sight Glass

UV LED CONTROLLER

SAFETY CONSIDERATIONS

This section highlights the precautionary procedures that must be followed to ensure safe operation of the NXQ4006 UV LED.

UV LED LIGHT SOURCE



UV LED CONTROL UNIT



UV LED LIGHT SOURCE



EXPLOSIVE SURROUNDINGS

This unit is not meant for operation in explosive surroundings.



HUMID SURROUNDINGS

This unit is only intended for use in dry environments.



PROTECTION AGAINST STRONG OPTICAL RADIATION



Mandatory Action!
Wear UV protection goggles

Never look directly at the light exit of the Exposure Subsystem. If a light guide is connected, always be sure the light-emitting end points in the intended direction. Shield the operator and third parties or the light source. To avoid tissue damage, do not expose the unprotected eye or skin to the ultraviolet light. When work under unshielded UV radiation is necessary, wear UV protection goggles, long-sleeved shirt, and gloves.

UVA is a part of natural sunlight (315 - 400 nm) and its most visible effect on human tissue is the tan. As it is not visible, its intensity can be easily underestimated. An overdose of UVA will not cause UV- erythema (sunburn) but heat-erythema, like visible light. UVA may cause biological long-term damage to human tissue.

For safety reasons it must absolutely be avoided to expose the unprotected eye or skin to ultraviolet radiation



DANGER OF FIRE

Never obstruct the light exit of the Exposure Subsystem. If a light guide is connected, do not deposit the light guide on inflammable objects. The intensive radiation may be sufficient to set these objects on fire. Do not use damaged light guides!



COOLANT LEAKAGE

In the unlikely event of leaking coolant avoid direct contact with skin and eyes, as well as inhalation of vapors of the coolant.

Ensure adequate ventilation and remove all sources of ignition. Wear protective clothing (gloves, gowns, goggles) while removing residues with non-combustible absorbent materials.

After contact, wash the skin thoroughly with water and soap and rinse the eye continuously with water for at least 20 minutes. If irritation persists, consult a doctor immediately.

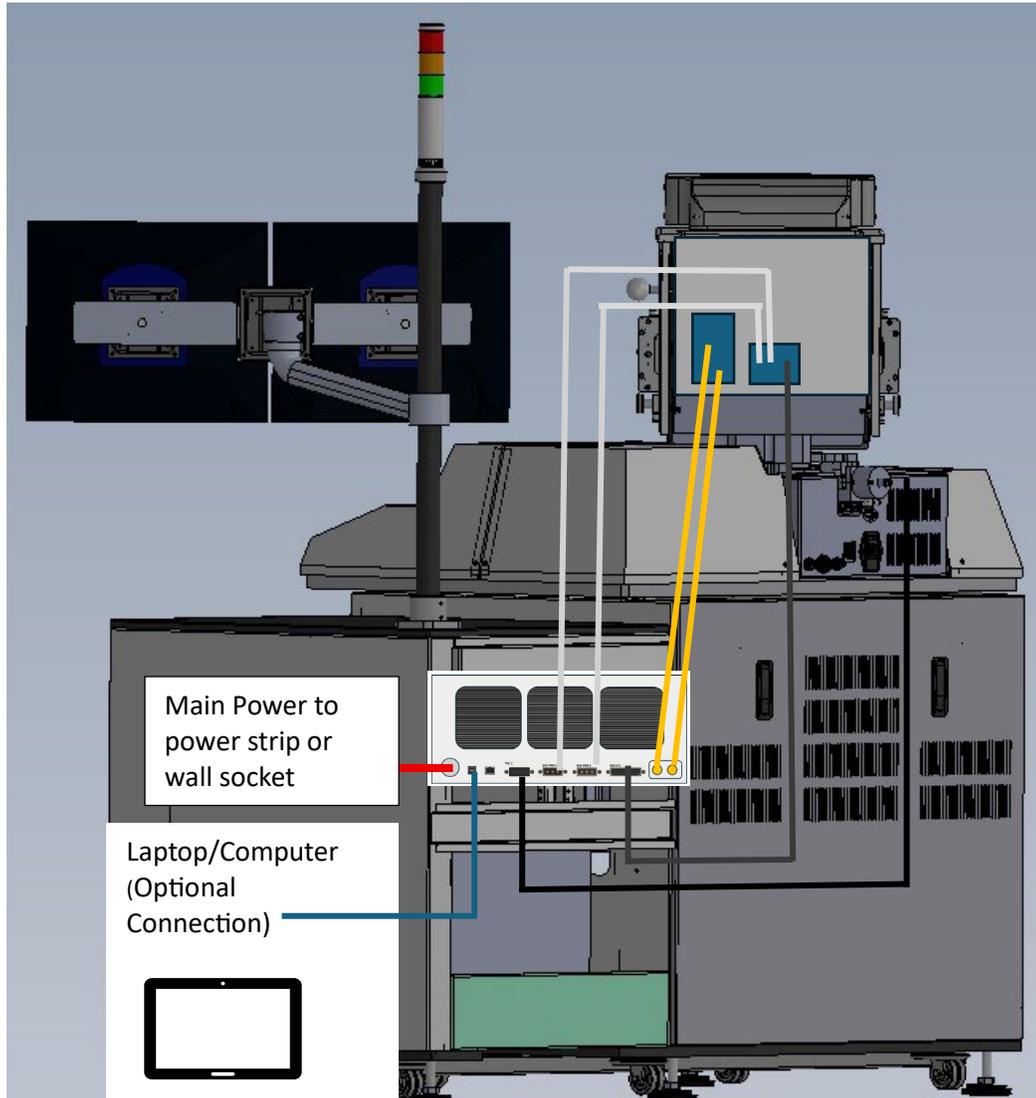


CAUTION, HIGH VOLTAGE

High voltages are present inside the unit. Always disconnect the power cord before opening the unit. All maintenance and service activities should be carried out by trained specialists or be referred to an authorized service facility.

For further details on safety, please refer to the NXQ UV LED or ALE Manual.

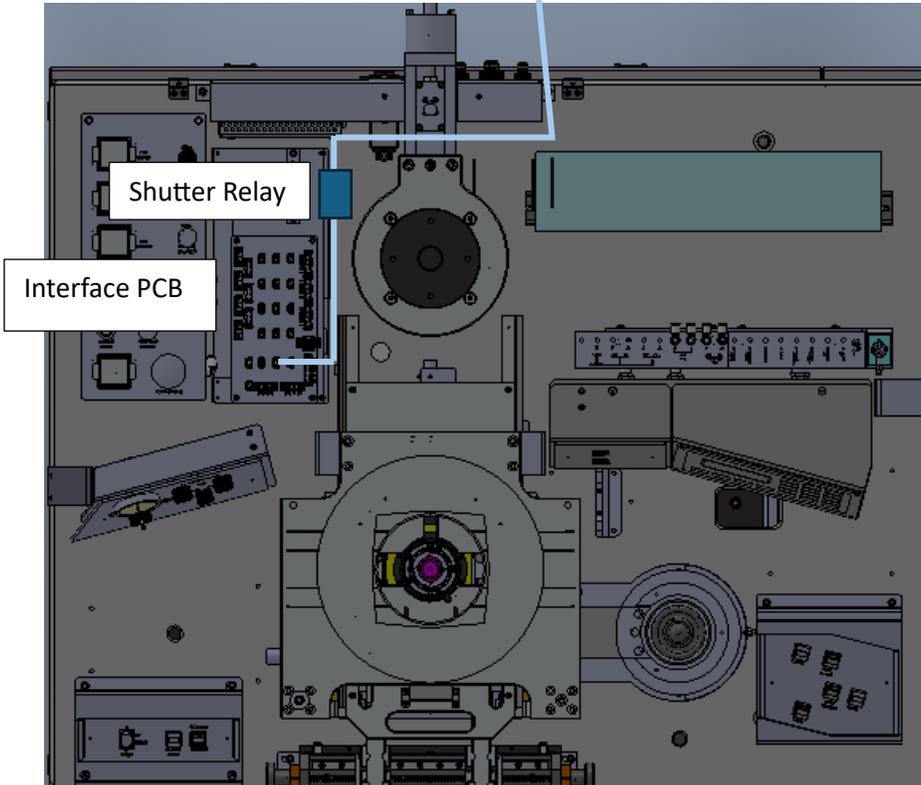
CONNECTIONS



KEY

- Main Power
- ALE Remote Serial Port to remote computer for UVLED power setup
(The connection on the front of the controller can also be used for convenience)
- PLC 1 Connects the interlock and shutter signal to start and stop the UV LED exposure
- ESS Power 1 and 2 Connects power to the UV LED modules
- ESS CTL Connects the controller to the UV LED modules for power control and communication
- Cooling tubes

SHUTTER AND INTERLOCK ASSEMBLY



Interface PCB



Shutter Relay



UV Controller

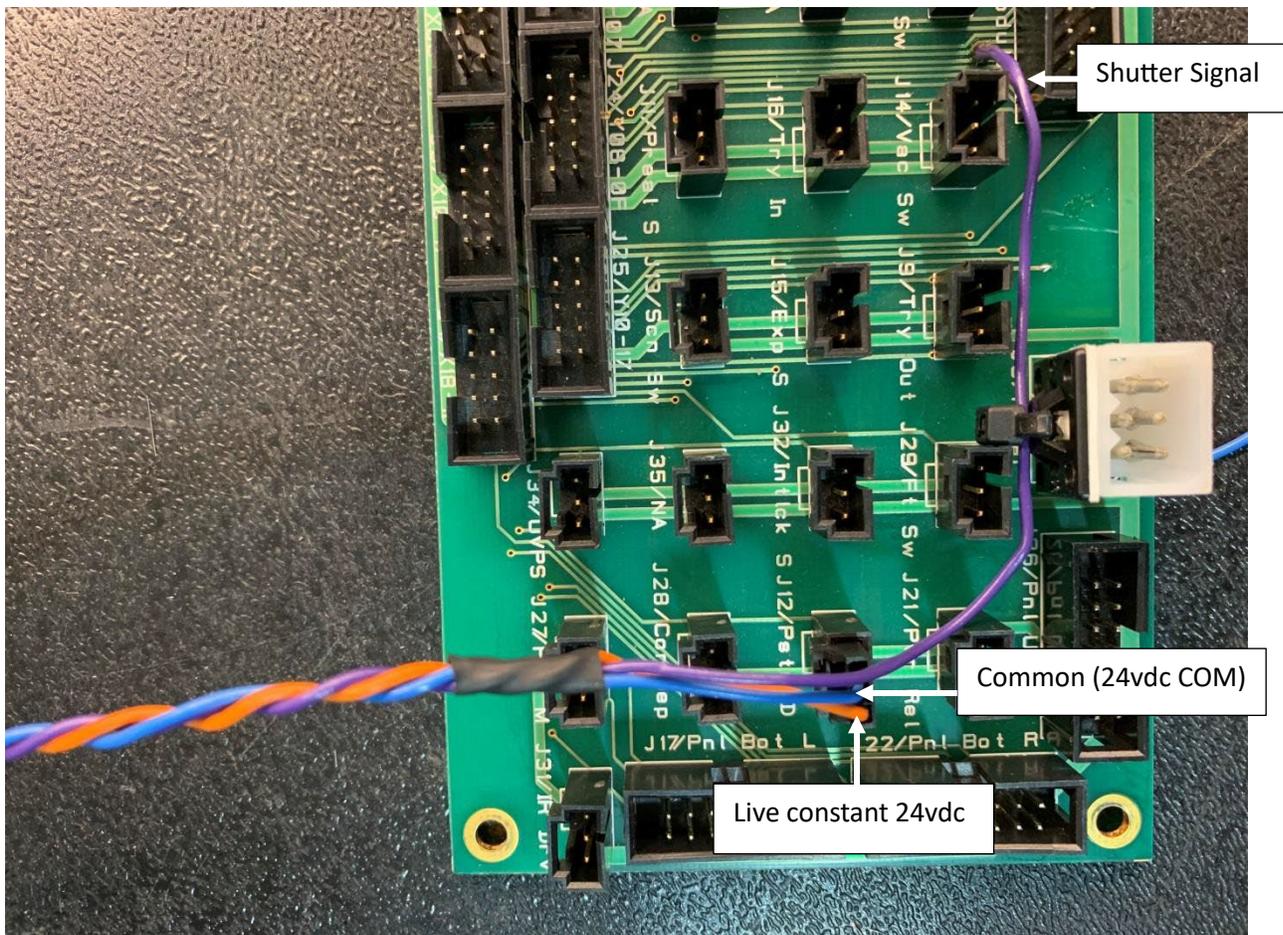
The UV LED unit has a digital interlock that acts as a safety feature. To turn off the interlock, the UV LED 24 VDC must be supplied to the UV LED engine.

The NXQ4006 aligner must be ON for the UV LED to operate.

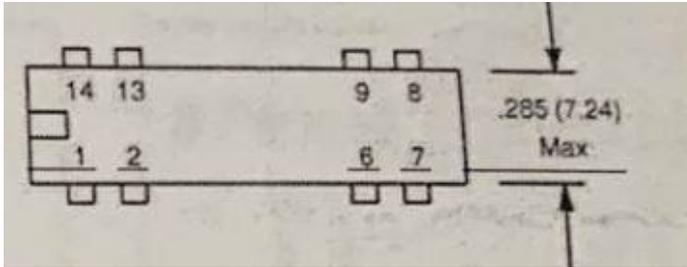
For the NXQ4006, the 24VDC is taken from J17, the same location is used to get the common.

The signal for the shutter (UV LED exposure start/stop) is obtained from pin J18 pin 2.

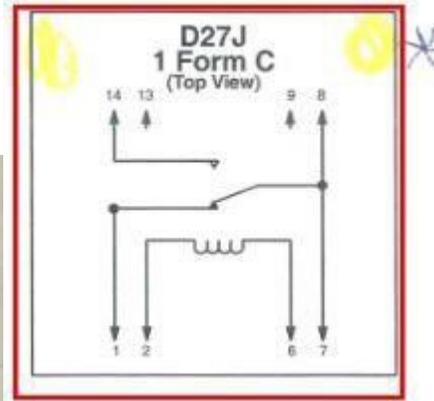
The signal that controls the solenoid is inverted in nature (24 VDC means the valve is closed and 0 VDC means the valve is open). Due to this, a general-purpose DIP DC reed relay is required to invert the signals.



Interface PCB wiring for UV LED start/stop exposure control and aligner power interlock.

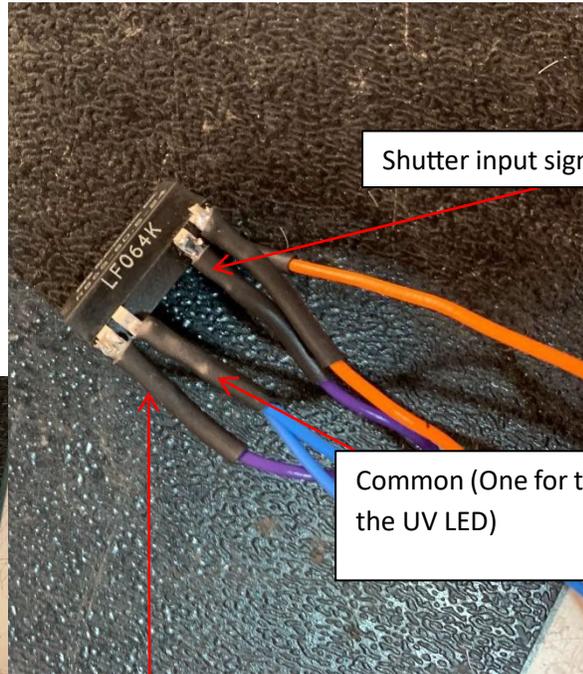
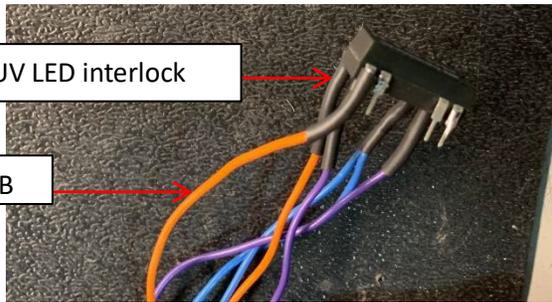


(a)



(b)

DIP DC reed relay (NxQ Part Number 4110-0012) (a). Outline for the DIP DC relay (b).



Shutter input signal from PCB

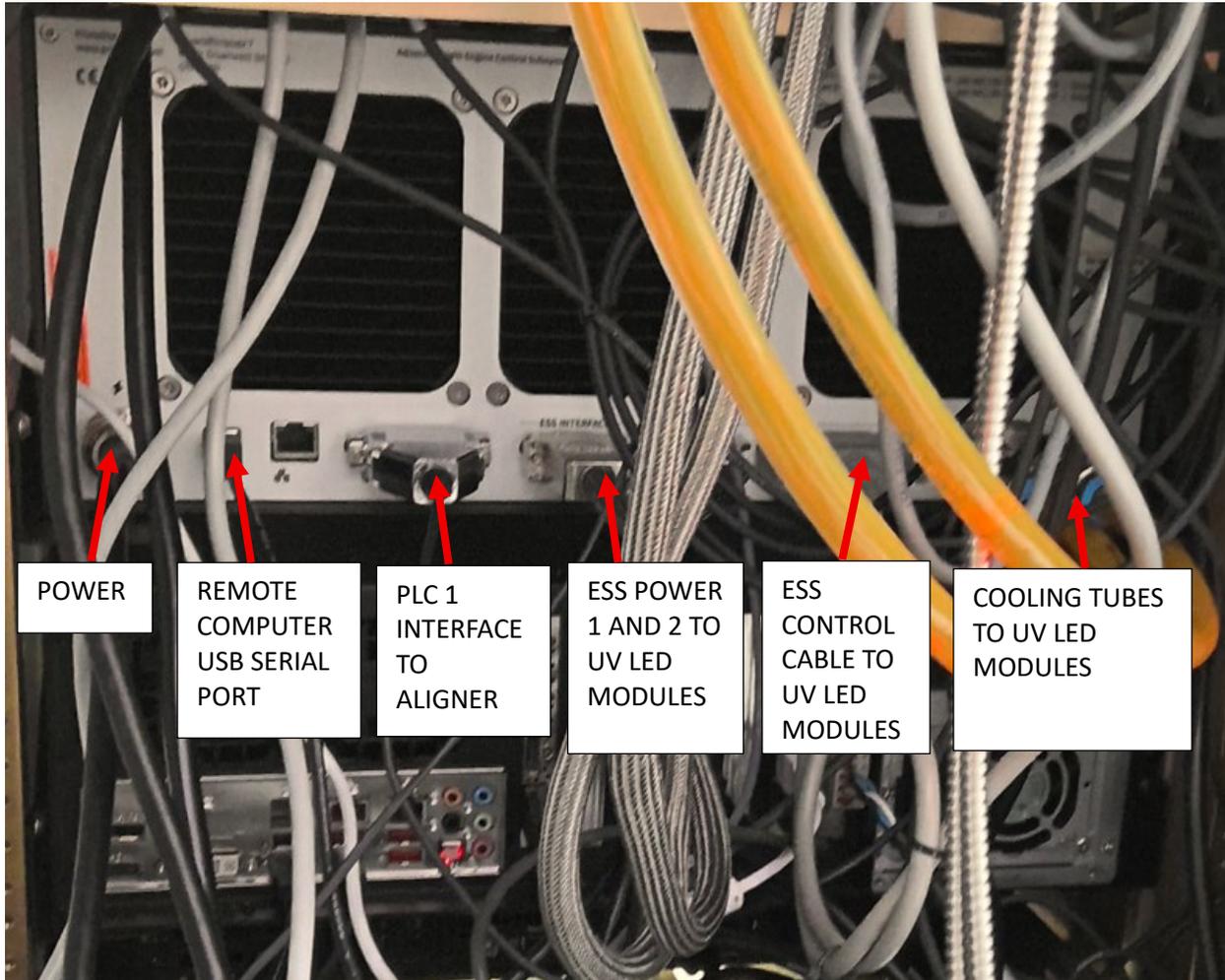
24 VDC going to UV LED interlock

24 VDC from PCB

Common (One for the DIP and one for the UV LED)

Inverted shutter signal going to the UV LED Engine

BACK PANEL CONNECTIONS



FRONT PANEL CONNECTION



ALE REMOTE CONNECTION TO REMOTE COMPUTER FOR UV LED SETUP

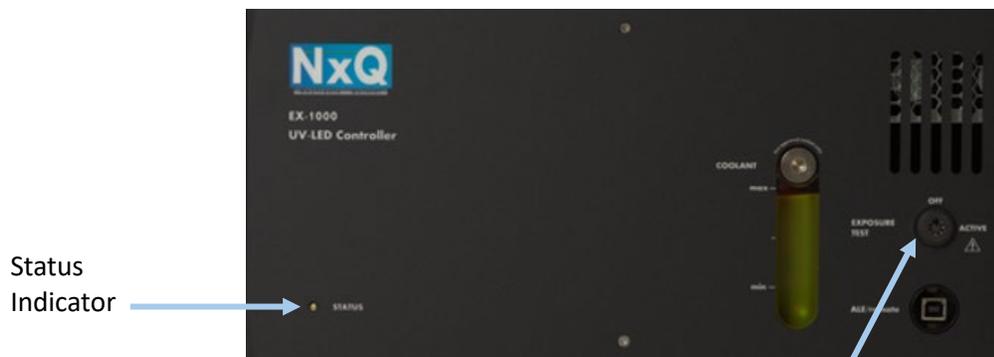
CONTROLS

NOTE: STARTING THE UV LED ENGINE AND CHECKING INTENSITY AND UNIFORMITY IS A MAINTENANCE TASK!

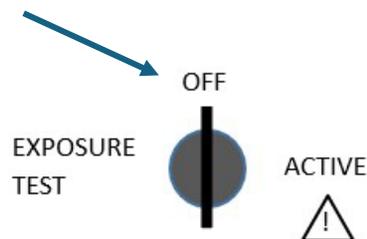
DO NOT START EXPOSURE OR CHECK UV INTENSITY WITHOUT A COMPLETE UNDERSTANDING OF THE UV LED SYSTEM!

KEYSWITCH

The UV LED controller is always ON whenever the main power is connected. This was done at installation. The control module STATUS LED indicator should be GREEN.



THE KEYSWITCH MUST BE IN THE OFF POSITION FOR NORMAL OPERATION.



CAUTION: IF THE KEYSWITCH IS TURNED TO THE EXPOSURE TEST POSITION, THE UV LED WILL TURN ON UNTIL THE KEYSWITCH IS TURNED OFF!

DO NOT LEAVE THE CONTROLLER IN THIS CONDITION. TURN THE KEY TO THE OFF POSITION AND REMOVE IT.

The UV LED power for each LED module is set by the ALE REMOTE application with a laptop. The LED modules are started and stopped by the NXQ4006 or the ALE application. There is no need to turn the LED on with the Exposure Test switch unless it is for maintenance testing purposes.

CONTROLLING THE UVLED

The UV LED modules are set and controlled by the ALE REMOTE application.

ALE REMOTE

All control and monitoring features of an ALE/1C unit may be accessed via USB by an external PC, using the ALE/remote client software.

Connect the laptop computer to the ALE Remote connection on the front panel of the controller with the USB interface cable.



Click on the ALE-Remote icon on the desktop.



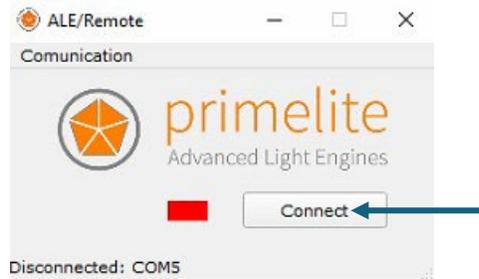
The program will open to the communication screen.



Here we see the COM Port has been set to COM 5.

This was done at the time of machine installation. Your COM Port may be different.

Click on Connect.

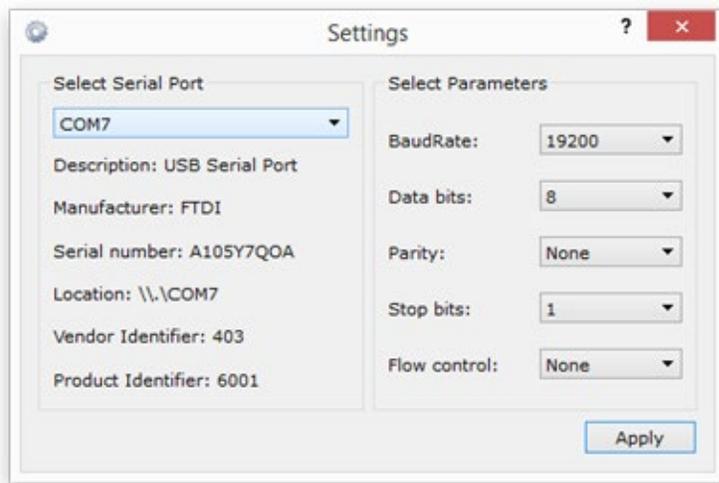


The UV LED controller will connect.



If it does not connect, make sure the cable is connected properly and then go to the COM Port in Device Manager on your computer and check the settings.

It should match the baud rate, etc. of the UV LED controller.



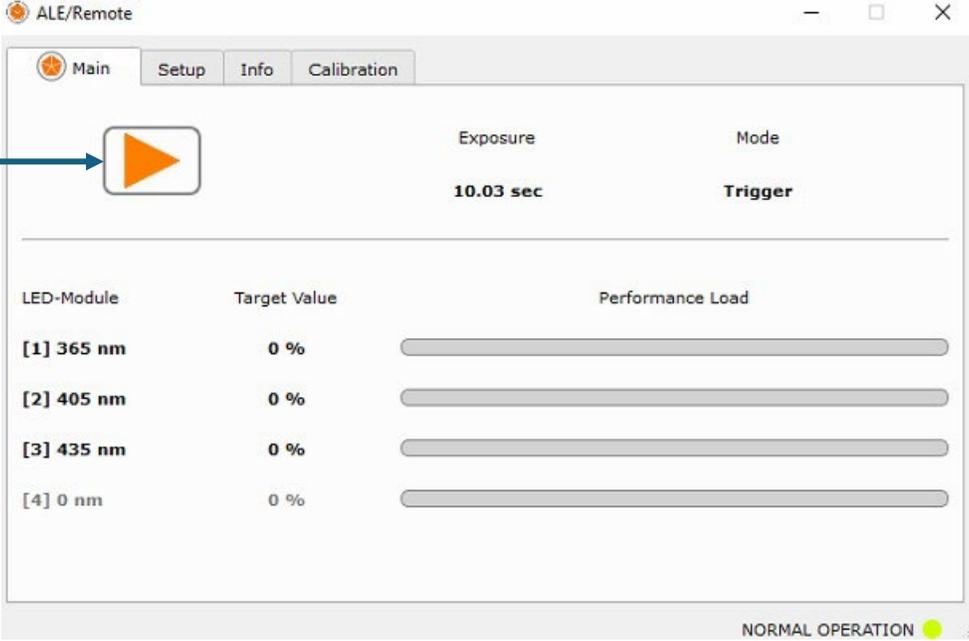
Once the remote computer is connected to the UV LED controller, you will be able to control the UV LED modules and get status information.

There are three views (tabs) or screens of the system:

MAIN TAB

In the MAIN TAB you may start or stop an exposure with the  and  buttons.

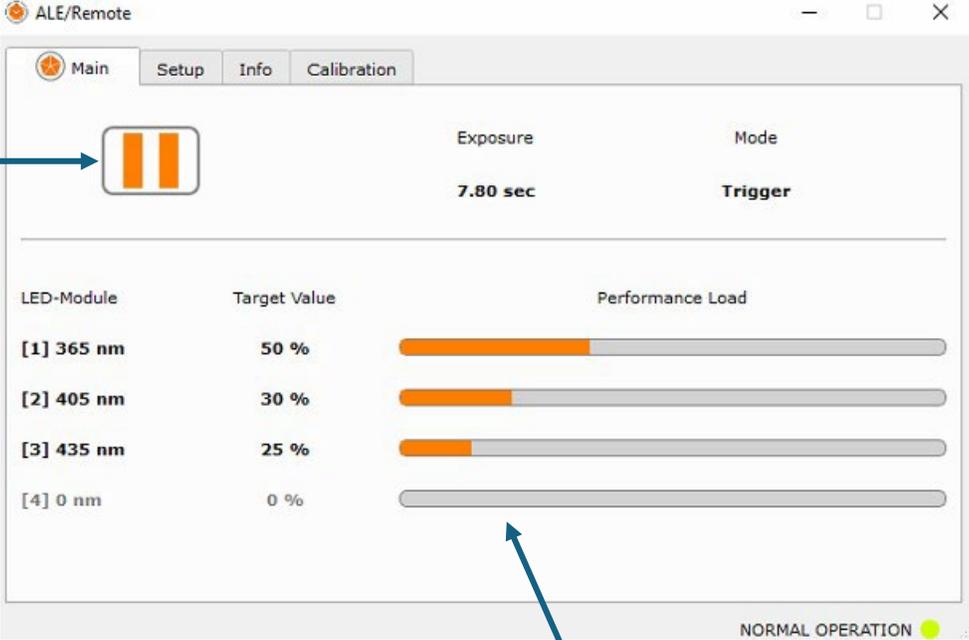
Also, basic information on the status of installed LED modules is shown in real time.



The screenshot shows the 'Main' tab of the ALE/Remote software. A blue arrow labeled 'START' points to a play button icon. The interface displays the following information:

LED-Module	Target Value	Performance Load
[1] 365 nm	0 %	<div style="width: 0%;"></div>
[2] 405 nm	0 %	<div style="width: 0%;"></div>
[3] 435 nm	0 %	<div style="width: 0%;"></div>
[4] 0 nm	0 %	<div style="width: 0%;"></div>

Exposure: 10.03 sec
Mode: Trigger
NORMAL OPERATION 



The screenshot shows the 'Main' tab of the ALE/Remote software. A blue arrow labeled 'STOP' points to a stop button icon. The interface displays the following information:

LED-Module	Target Value	Performance Load
[1] 365 nm	50 %	<div style="width: 50%;"></div>
[2] 405 nm	30 %	<div style="width: 30%;"></div>
[3] 435 nm	25 %	<div style="width: 25%;"></div>
[4] 0 nm	0 %	<div style="width: 0%;"></div>

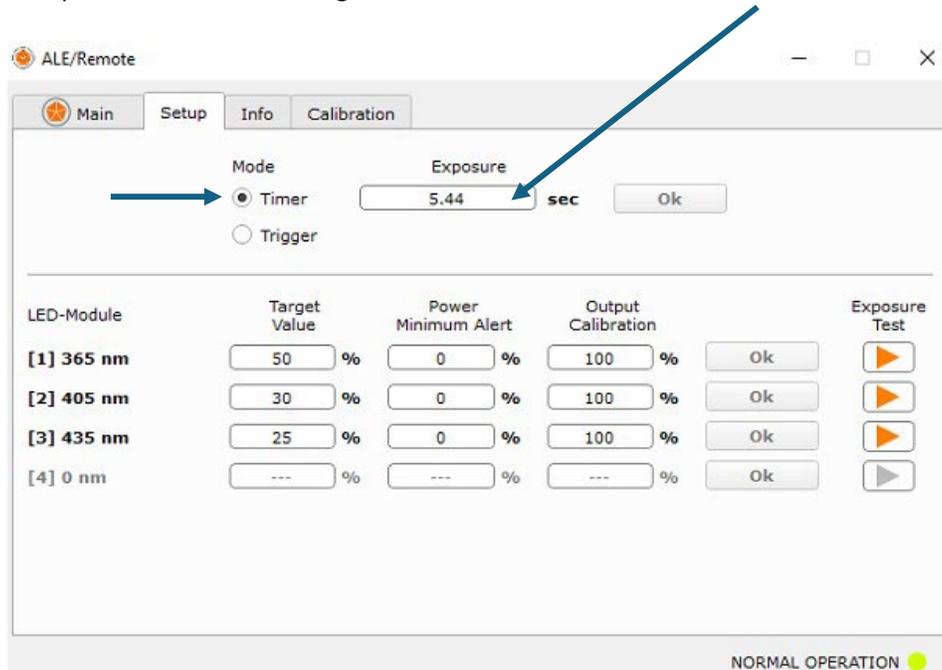
Exposure: 7.80 sec
Mode: Trigger
NORMAL OPERATION 

Pressing the start button will activate the UV LED modules. The LED power is displayed in real time.

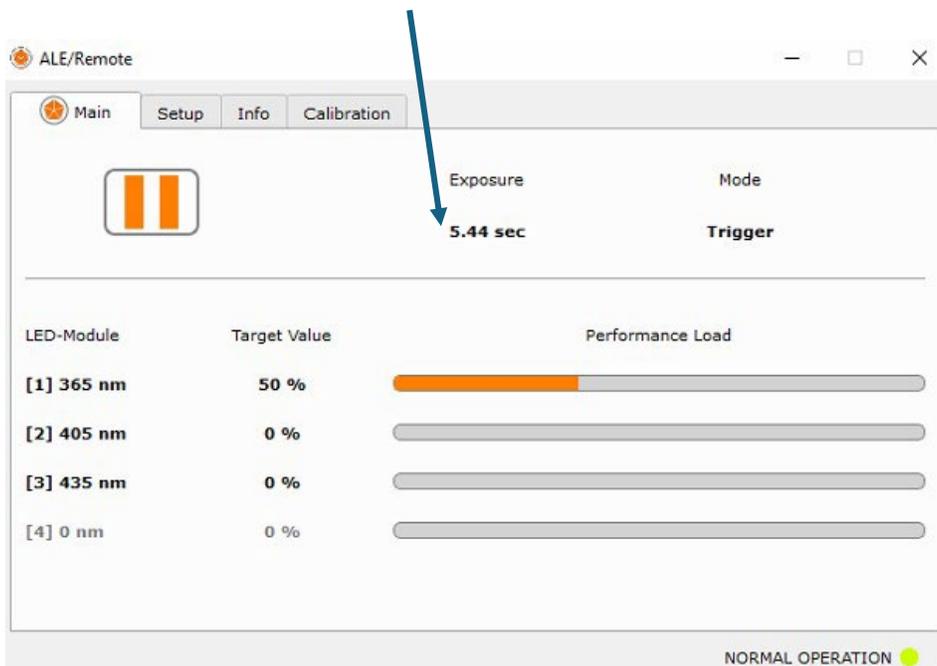
SETUP TAB

In the SETUP TAB you may select the operation MODE (Timer or Trigger) of the system and enter individual settings for each LED Module.

TIMER MODE: Exposure starts with a single manual command. The desired EXPOSURE time must be set.



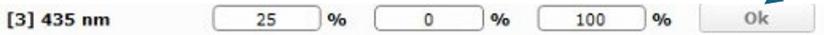
When activated the LED's will be ON for the time set in the EXPOSURE field.



NOTE: AFTER ANY CHANGE IN A FIELD, THE OK BUTTON WILL CHANGE TO **BOLD PRINT**.

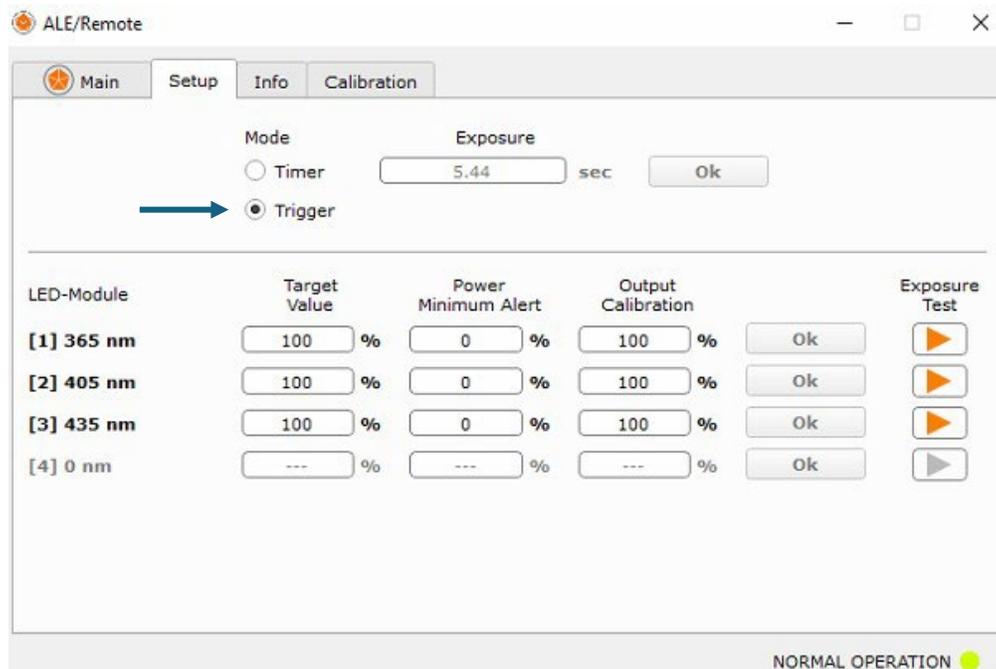


TO SET THE VALUE, PRESS THE OK BUTTON. THE OK BUTTON WILL GRAY OUT.



THE SETTING IS STORED AND WILL CONTROL THE UV LED AT THE NEXT POWER CYCLE.

TRIGGER MODE: Exposure starts and lasts as long as the manual command  is present.



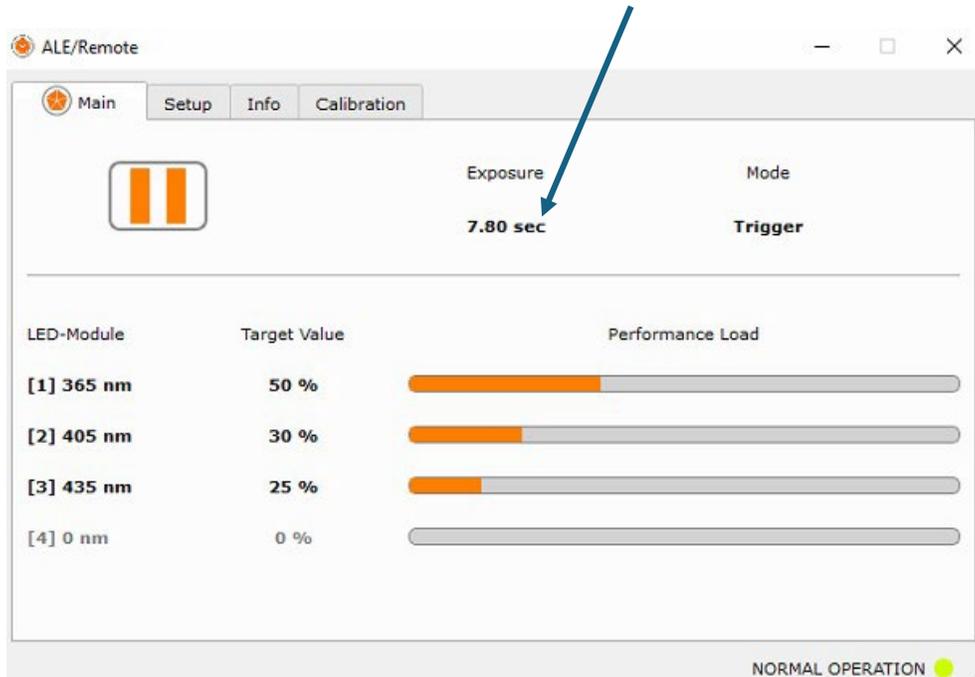
When the START arrow button is pressed, the UV LEDs will stay ON until the STOP button is pressed.

CAUTION: PLEASE MAKE SURE TO TURN THE UV LEDS OFF AGAIN IF TRIGGER MODE IS USED!



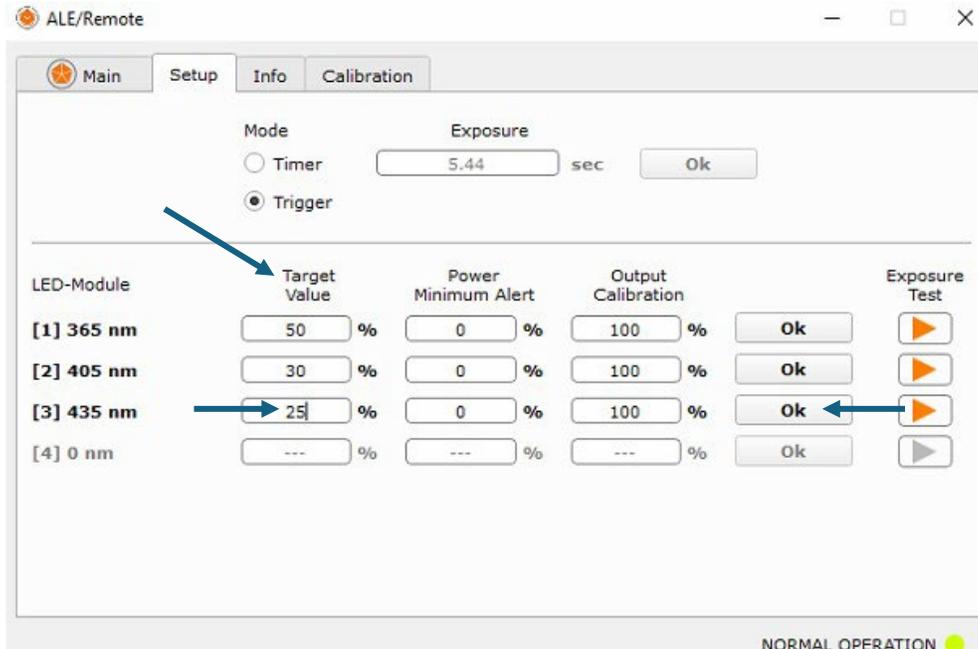
If the LED modules are left on for an extended period, an error will occur and they will be shut down, but it is unsafe to leave them on indefinitely and can shorten the life of the modules.

Turn the UV LED off if power is seen in the Main Screen when not reading exposure intensity. The TOTAL TIME of the Trigger exposure is displayed after turning the LED OFF.



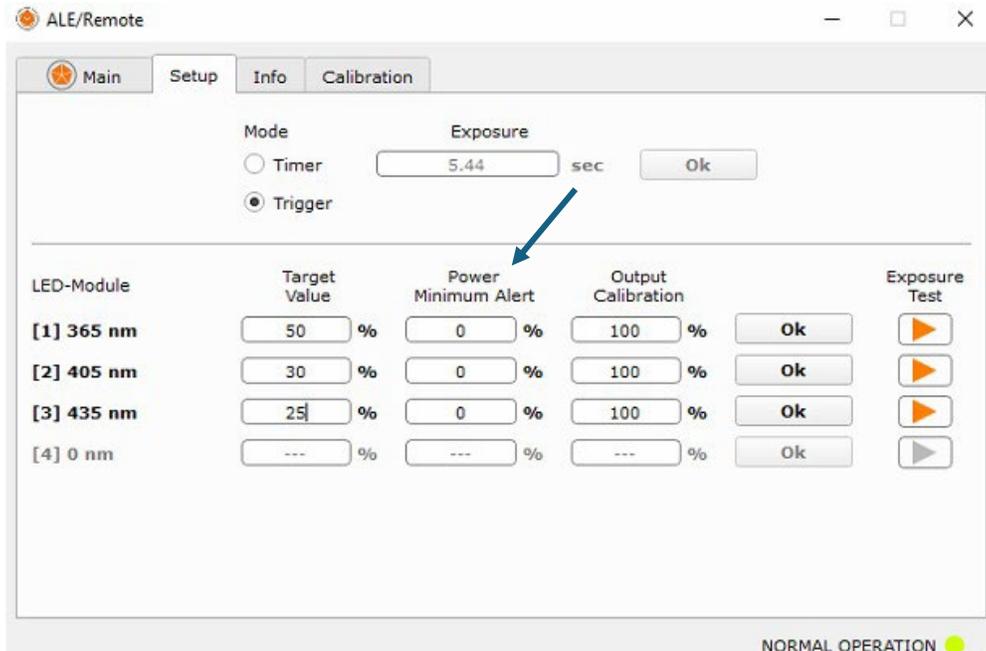
For each installed LED Module, a POWER TARGET VALUE may be set individually.

Type in the values and press OK.

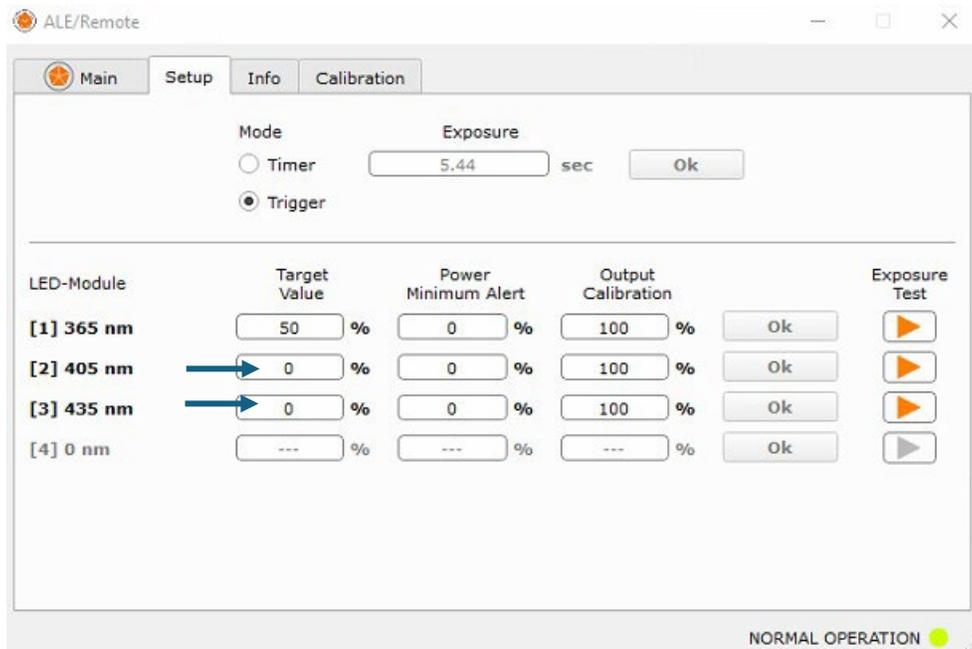


All settings are instantly auto corrected to values within tolerance of currently installed LED Modules.

Additionally, a minimum output power threshold may be defined for each installed LED-Module. After a threshold is reached, the unit will automatically generate a System Warning (POWER MINIMUM ALERT).

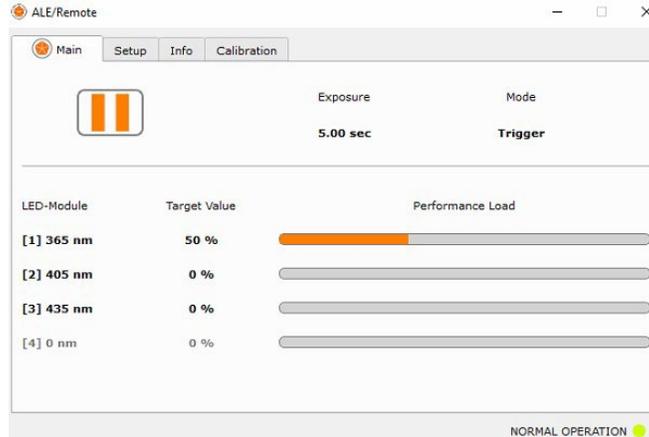
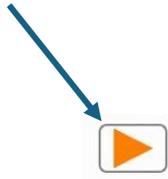


To activate an individual LED module, reduce the other LED modules to zero power in the Setup Tab and activate them in the Main Tab.



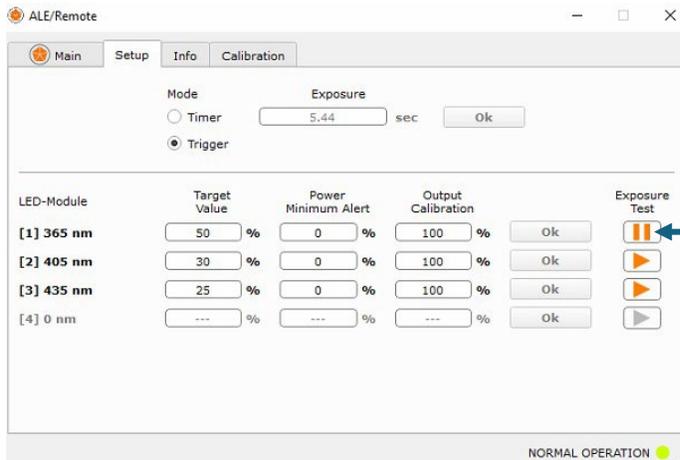
(Press the OK button after a setting change if the font becomes BOLD).

Activate the selected LED(s) in the Main Tab.

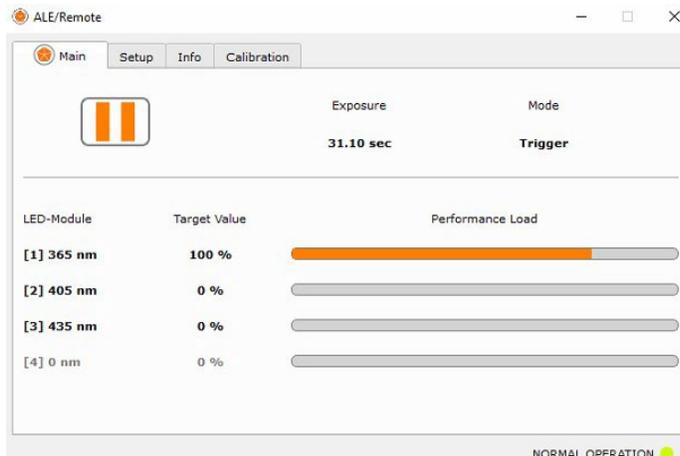


NOTE: Activating the LED in the SETUP Tab is NOT recommended. It is not intended for checking power or intensity.

For instance, selecting the start button in the Setup Tab will result in a power of 100%, no matter what the target setting.



Do not use these buttons to turn on individual LEDs.



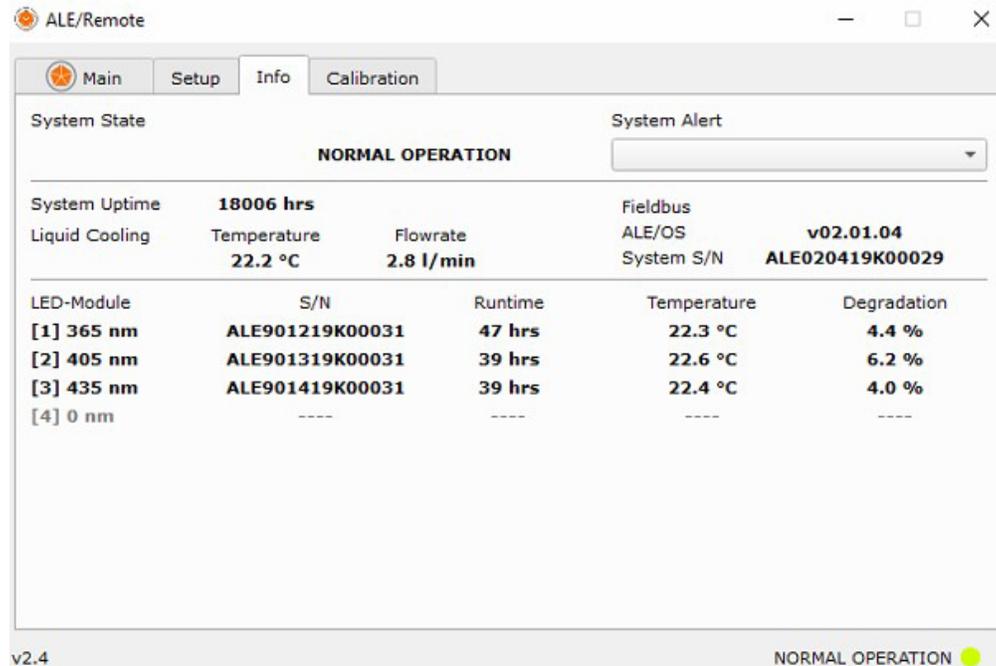
The power will not be correct. It will usually go to 100% power no matter what the Target Value is.

INFO TAB

General information on the system and installed LED modules may be obtained from the INFO TAB.

The system information comprises system alerts, overall system operating hours, cooling circuit parameters, software version and serial number of the unit.

An overview of all installed LED-Modules shows individual serial numbers, runtime, temperature and level of degradation.



The screenshot displays the 'INFO' tab of the ALE/Remote software. The window title is 'ALE/Remote'. The interface includes tabs for 'Main', 'Setup', 'Info', and 'Calibration'. The 'System State' is 'NORMAL OPERATION'. The 'System Alert' dropdown is empty. Key system metrics are shown: System Uptime (18006 hrs), Liquid Cooling Temperature (22.2 °C), Flowrate (2.8 l/min), Fieldbus ALE/OS (v02.01.04), and System S/N (ALE020419K00029). A table lists four LED modules with their serial numbers, runtime, temperature, and degradation levels.

LED-Module	S/N	Runtime	Temperature	Degradation
[1] 365 nm	ALE901219K00031	47 hrs	22.3 °C	4.4 %
[2] 405 nm	ALE901319K00031	39 hrs	22.6 °C	6.2 %
[3] 435 nm	ALE901419K00031	39 hrs	22.4 °C	4.0 %
[4] 0 nm	----	----	----	----

At the bottom left, the version is 'v2.4'. At the bottom right, the status is 'NORMAL OPERATION' with a green indicator light.

All critical hardware components inside ALE/1C units are permanently monitored. There are four defined system conditions:

[NO] Normal Operation [SW] System Warning:
Reversible Condition / Continued Operation

[RF] Runtime Failure:
Reversible Condition / Aborted Operation

[SM] System Malfunction:
Irreversible Condition / Aborted Operation

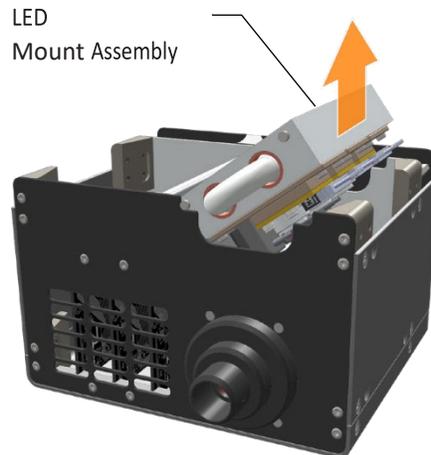
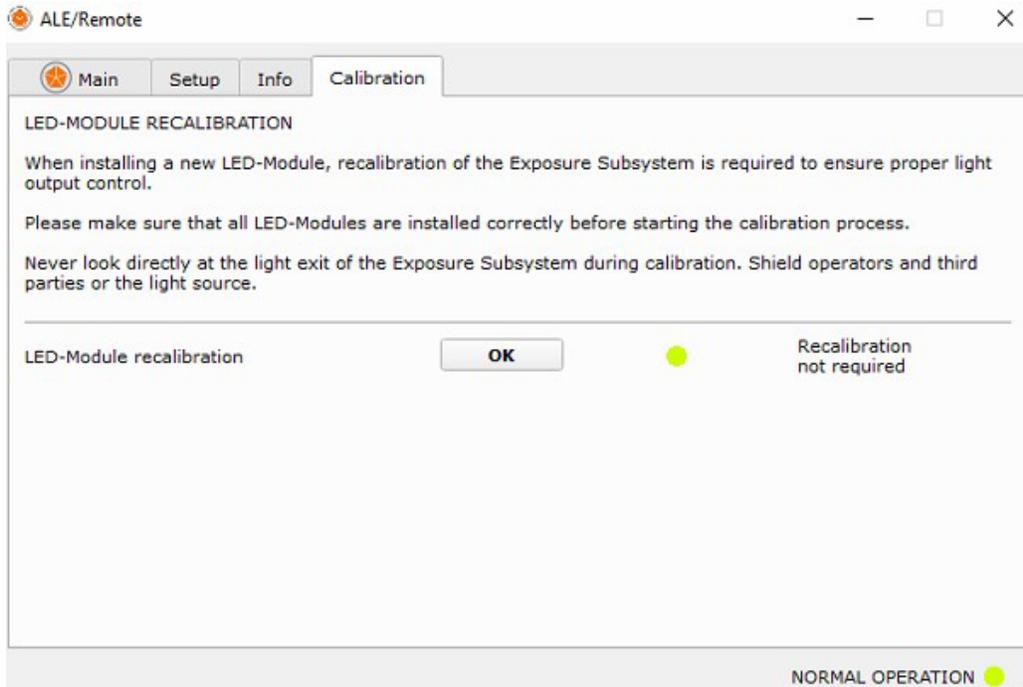
System Warnings are preventive maintenance alerts. Corrective actions should be taken as soon as possible.

Runtime failures prevent the unit from further operation. Switch the unit off and take corrective action. Hereafter, normal operation should be possible again.

SYSTEM CONDITION	SYSTEM ALERT	CORRECTIVE ACTION
[SW]	Coolant: Low flow	Renew coolant
	LED: High temp.	Reduce LED power setting (Service life compromised if temperature exceeds 55°C)
	LED: Prev. maint. notification	Prepare for LED-Module replacement
[RF]	Coolant: Over temp.	Check max. operating temperature Check clearance for cooling air openings
	Cooling Air: Over temp.	Check max. operating temperature. Check clearance of cooling air openings
	LED: Config. failure	Replace LED-Module and contact service partner
	LED: Failure	Replace LED-Module and contact service partner
	LED: Over temp.	Reduce LED power setting
	LED: Power min. alert	Replace LED-Module
	LED-Module: Bad checksum	Replace LED-Module and contact service partner
	LED-Module: Incompatible	Replace LED-Module and contact service partner
	LED-Module: Inconsistent derating	Replace LED-Module and contact service partner
	LED-Module: Light sensor failure	Replace LED-Module and contact service partner
	LED-Module: No factory calibration	Replace LED-Module and contact service partner
	LED-Module: No factory set-up	Replace LED-Module and contact service partner
	LED-Module: Temp. sensor failure	Replace LED-Module and contact service partner
	LED-Driver: Over temp.	Check max. operating temperature. Check clearance of cooling air openings
	LED-Driver: Undervoltage	Contact service partner
[SM]	Coolant: No flow	Contact service partner
	Cooling Circuit: Failure	Contact service partner
	Fan: Failure	Contact service partner
	Hardware: Failure	Contact service partner
	LED-Driver: Offline	Contact service partner
	Pump: Failure	Contact service partner
	System-Bus: Failure	Contact service partner

CALIBRATION

CALIBRATION is only required when an LED module has been replaced.



When the OK button is pressed, the unit will run through the power from minimum to maximum and check the intensity of the LED with the internal sensor of the module. This will provide basic power/intensity calibration for the installed module.

NOTE: DURING NORMAL OPERATION, THE INTENSITY IS READ BY THE INTERNAL SENSOR WHEN THE LED MODULES FIRST TURN ON. THE CONTROLLER WILL TRY TO MAINTAIN THIS INTENSITY THROUGHOUT THE EXPOSURE.

SETTING UV LED INTENSITY

There are three possible models of UV LED light source for the NXQ4006:

1. STANDARD UV LED
2. HIGH POWER UV LED (Polychromatic)
3. HIGH POWER UV LED (I-line only)

The UV light is created by LED modules that can be configured in different ways according to wafer process requirements.

The UV wavelengths are created by I-Line (365nm), h-line (405nm) and g-line (436nm) LED modules. The modules can produce a single wavelength or a blended combination of wavelengths depending on the relative power of each module.

The LED light source may also have only type of module as in the case of the High Power I-Line model or it may have all three modules as in the case of the Polychromatic Standard or High Power unit.

Generally, the UV light is configured to be I-LINE or BROADBAND. I-line is similar to the light produced by a mercury arc lamp with an I-line filter to pass only the 365nm wavelength. Broadband light is similar to the full spectrum of a mercury arc lamp.

The intensity at the wafer is read by an external LIGHT METER. The most common light meter probes are 365nm and 405nm. The I-line probe reads a narrow band at the 365nm wavelength. The broadband probe is designed to read a part of all the wavelengths around 405nm and includes some of the 365nm and 436nm, so the overall intensity is higher.

This is a chart of the relative intensity produced by the UV LED light sources in the NXQ4006.

UV LED INTENSITY CHART

SL No.	LED type	Broad Band (mw/cm ²)		I Line (mw/cm ²)	
		Max Power	Min Power	Max Power	Min Power
1	Standard Unit One 365 One 405 One 435	75	14	30	3
2	High Power (Polychromatic) Two 365 One 405 One 435	155	31	65	13
3	High Power (I – line only) Four 365			120	24

The chart below shows the physical LED configuration in each of the possible UV LED light sources.

LED CONFIG IN MCU	PHYSICAL CONFIGURATION	RECIPE PULL-DOWN MENU	SLIDER CONTROL
3 LED Broadband	One 365nm, one 405nm, one 435nm LED	I-Line, Broadband, Blended (with Advanced LED selected in the MCU). I-Line recipe: activates only the I-Line LED. Broadband recipe: activates all the LEDs. Blended recipe: activates only the LEDs selected with the check boxes in the Blended settings screen.	I-Line recipe: single slider for 365nm LED. Broadband recipe: single slider for all LEDs. Blended recipe: individual sliders for each LED.
4 LED I-Line	Four 365nm LEDs	I-Line, Blended (with Advanced LED selected in the MCU). I-Line recipe: activates all the LEDs. Blended recipe: activates only the LEDs selected with the check boxes in the Blended settings screen.	I-Line recipe: single slider for all LEDs. Blended recipe: individual sliders for each LED.
4 LED Broadband	Two 365nm, one 405nm, one 435nm	I-Line, Broadband, Blended (with Advanced LED selected in the MCU). I-Line recipe: activates only the I-Line LEDs. Broadband recipe: activates all the LEDs. Blended recipe: activates only the LEDs selected with the check boxes in the Blended settings screen.	I-Line recipe: single slider for 365nm LEDs. Broadband recipe: single slider for all LEDs. Blended recipe: individual sliders for each LED.

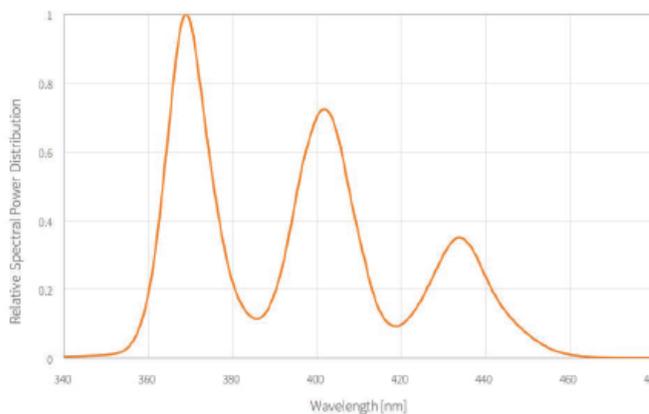
For instance, if your machine has a 3 LED Broadband light source, you may choose to activate ONLY the I-Line (365nm) wavelength LED or ALL the LEDs and set the relative power of each wavelength individually.

Often the UV wavelengths used will be BROADBAND. That is the normal spectrum of a UV lamp with peaks in the 365nm, 405nm and 436nm wavelengths. Most photoresists are designed to respond to a broadband light source. A preconfigured set of LEDs create a broadband UV light. Either a 365nm or 405nm probe is used to read the intensity at the wafer. This is the standard ALE broadband setup.

Standard Lithography Setup

3 NUV-LEDs (365, 405, and 435 nm)¹

Broad band lithography applications using i-, h-, and g-line in the semiconductor industry

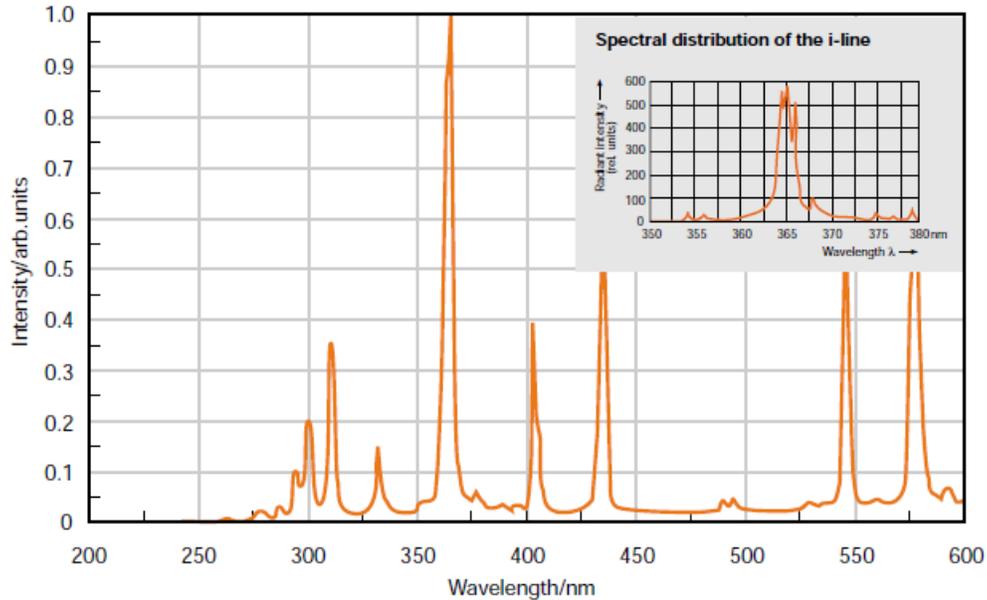


¹ CWL of emitters: 367.5±2.5 nm, 387.5±2.5 nm, 402.5±2.5 nm, and 435.0±2.5 nm
² Full spectrum measured; deviation of ±10% possible;

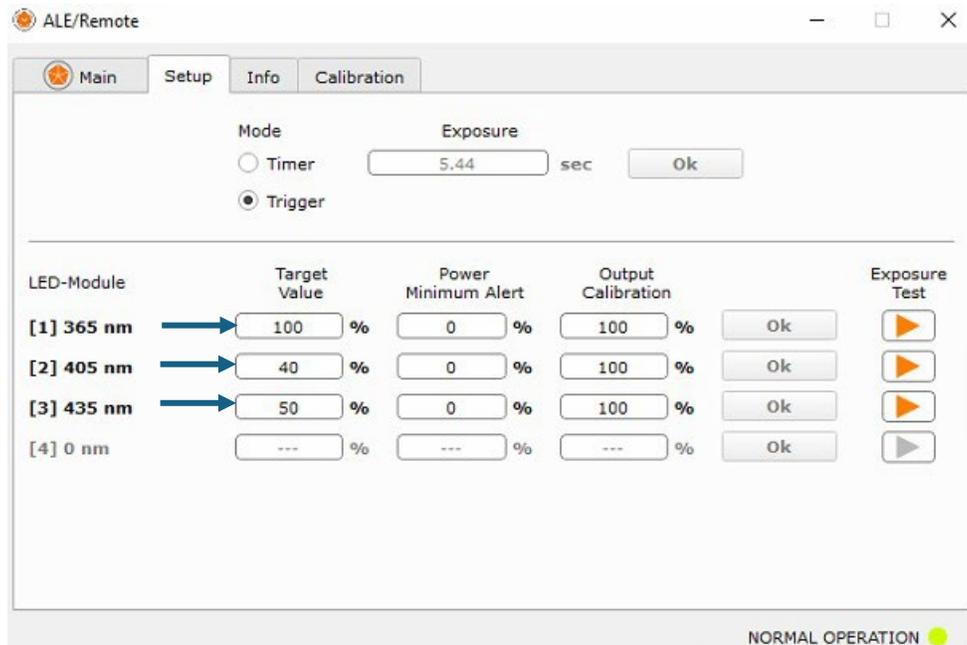
SIMULATING A STANDARD I-LINE LAMP

To reproduce a standard I-Line mercury arc lamp, the relative intensities of each wavelength must be set.

This is the relative intensity (spectral distribution) chart for the I-line OSRAM lamp used in NXQ systems with a mercury arc source:



To simulate this distribution in ALE you would set the Target Values to:



The target values can be set to any power as long as they keep the same relative power. For example, 365nm = 70%, 405nm = 28%, 435nm = 35%.

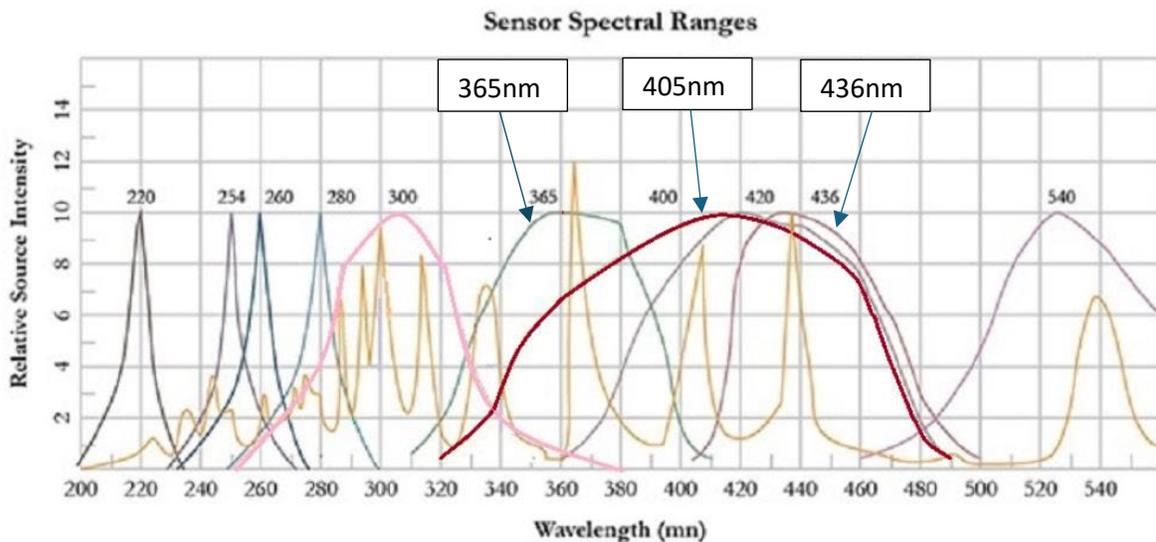
Setting the UV LED to match a mercury arc source does not mean that this setup will produce the best printing. Usually, I-Line alone or 365nm with some 405nm will result in better resolution. It depends on the photoresist used and other process factors.

NOTE: PROBE SENSORS HAVE DIFFERENT BANDWIDTHS.

The 365nm and 436nm probes are relatively narrow bandwidth.

The 405nm probe is the traditional broadband photoresist probe, so it responds of all the wavelengths.

This is why the 405nm probe usually reads twice as high as the 365nm probe even though the 365nm is the most intense wavelength in the I-Line lamp spectrum.



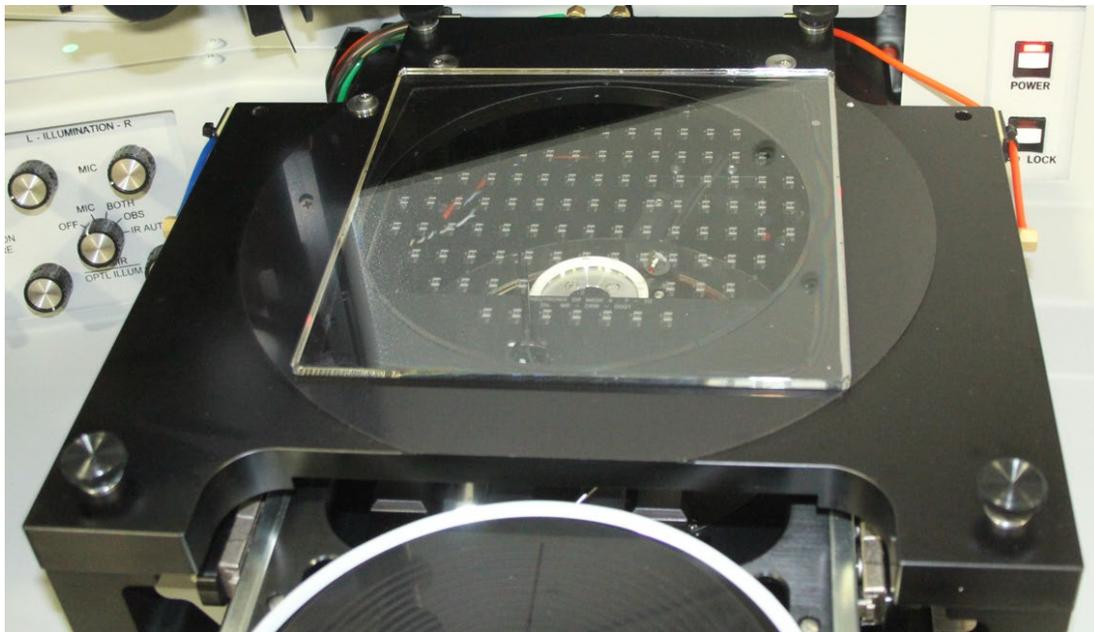
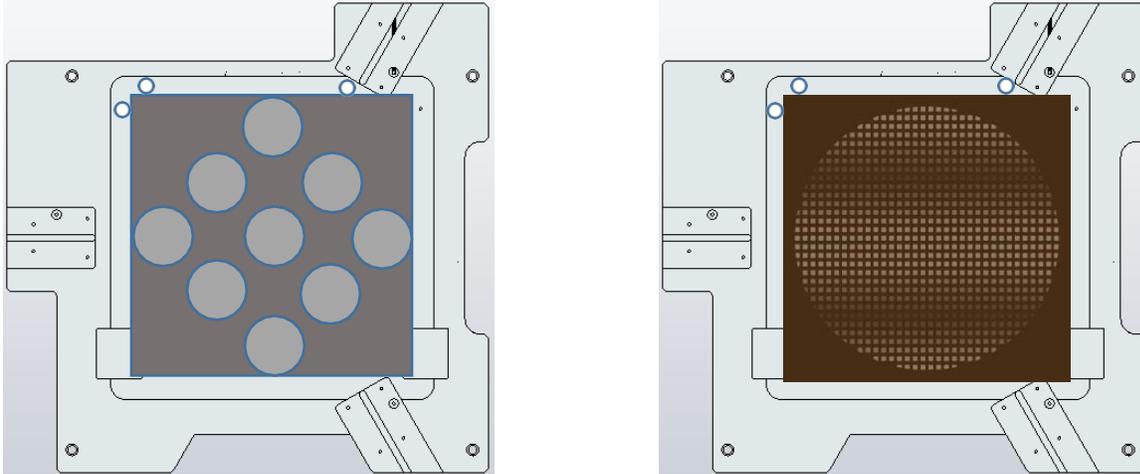
It is always a good idea to note the probe serial number when checking and recording the LED intensity.

The probes and meter may be sent NXQ for calibration, if necessary. It is part of a regular process equipment calibration requirement for some users.

READING INTENSITY

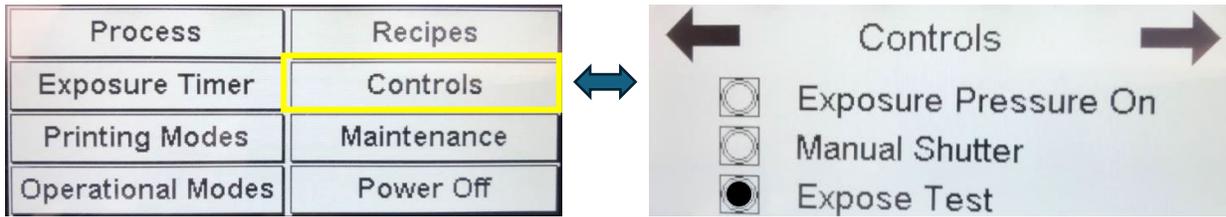
The UV LED intensity is read with a UV LIGHT METER.

Place the EXPOSE TEST PLATE or TEST MASK on the Maskholder and press the MASK VAC button to lock it down.

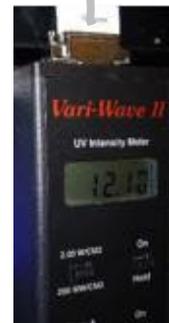
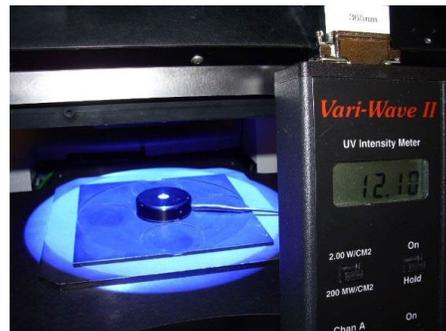
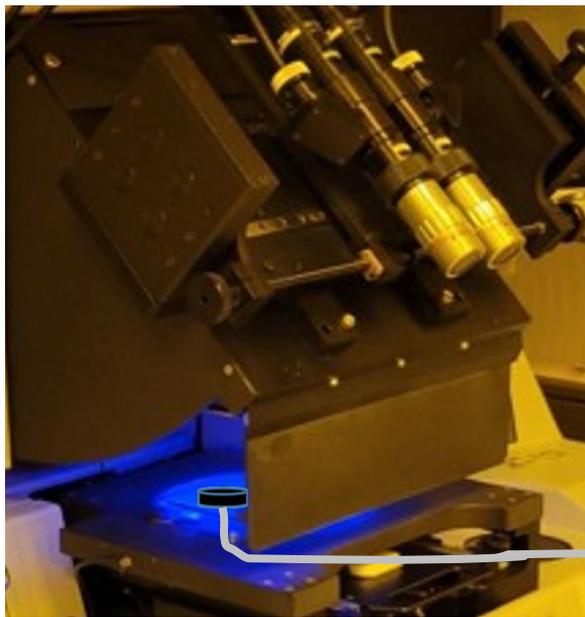


A blank mask or old mask is best because the light meter probe may scratch a good mask.

Press Expose Test in Controls. The Expose Mirror will lift.



Place the probe in the center of the expose test plate or mask.



UV Intensity Meter Probe

Select the probe for the desired wavelength. The probe can be 365nm, 405nm or 436nm.

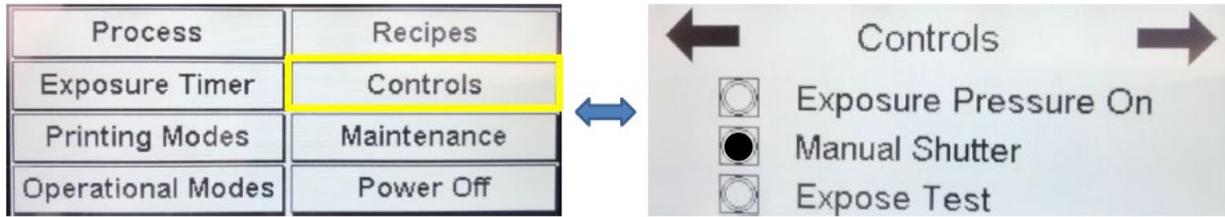
UV Intensity Meter



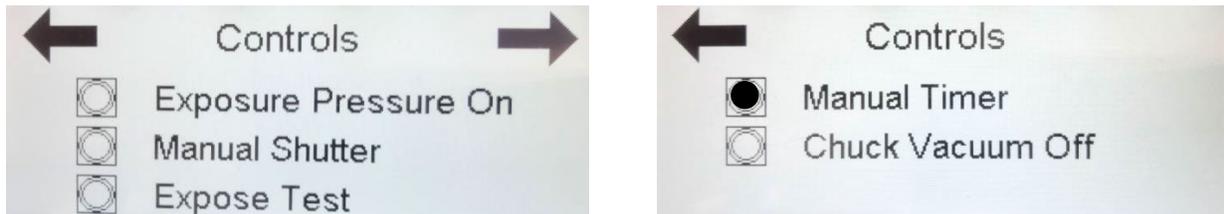
If testing with ALE, you can start exposure with the  button. It is usually a good idea to choose the TIMER mode and set the Exposure Time to 5 seconds (long enough to read and record a good meter reading). This also takes away the chance of accidentally leaving the LED on too long.



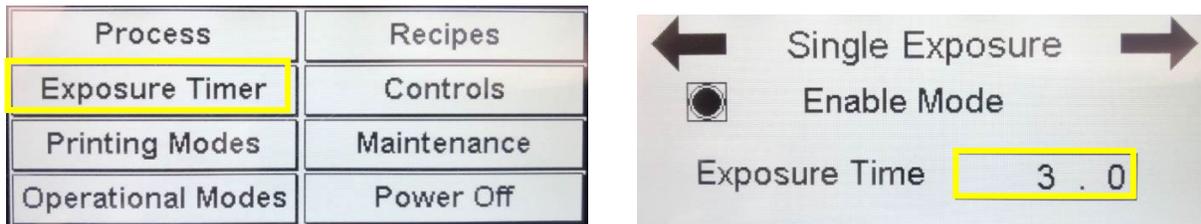
To activate the UV LED within the NXQ4006 program, select MANUAL SHUTTER for a TRIGGER mode.



Select MANUAL TIMER for a TIMER mode.

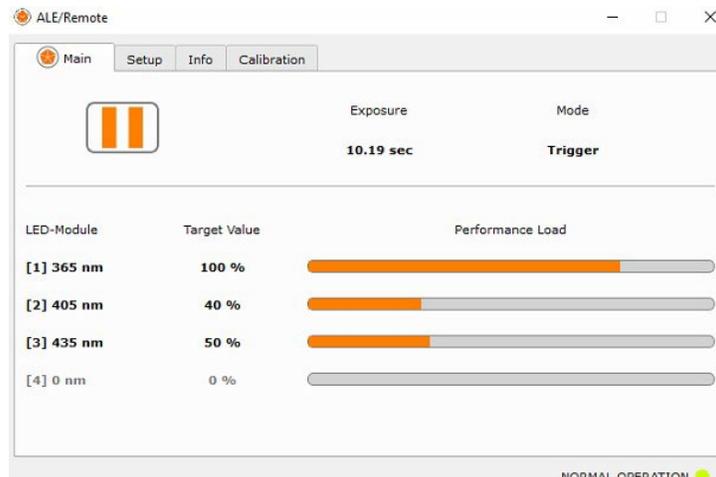


The UV LED will turn ON for the time set in the EXPOSURE TIMER recipe when Manual Timer is selected.



Always check the relative power and intensity of the UV LEDs in ALE before printing wafers so you know that all the settings are correct when MANUAL SHUTTER or MANUAL TIMER are used.

This will ensure that the UV light is correct during exposure in the NXQ4006 wafer process cycle.



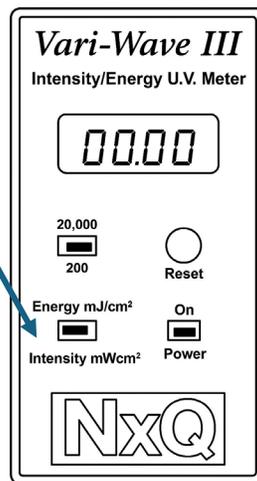
READING DOSE

DOSE is the total UV light energy exposing the photoresist during the wafer process.

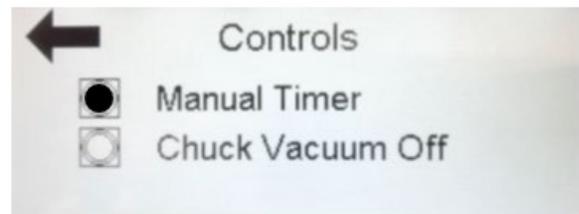
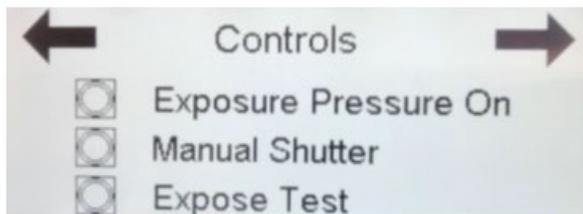
I (Intensity in milliwatts/square centimeter) x T (Time in seconds) = E (Exposure Energy in millijoules/square centimeter)

Example: $12 \text{ mw/cm}^2 \times 5 \text{ seconds} = 60 \text{ mj/cm}^2$

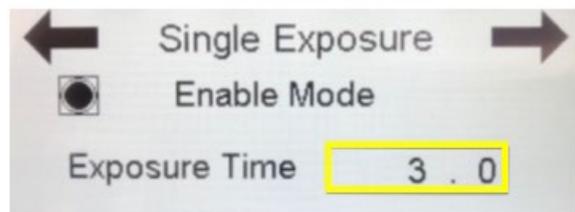
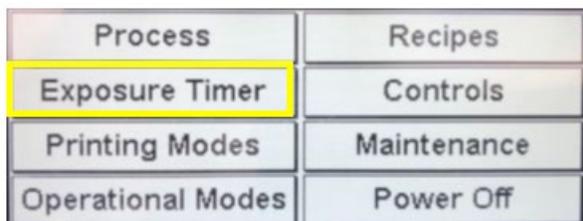
To test the dose, a DOSE LIGHT METER is used. The NXQ VARI-WAVE III LIGHT METER can switch between reading Intensity or Dose.



To read dose, use the MANUAL TIMER in CONTROLS.



The EXPOSURE TIME is set in the EXPOSURE TIMER recipe.



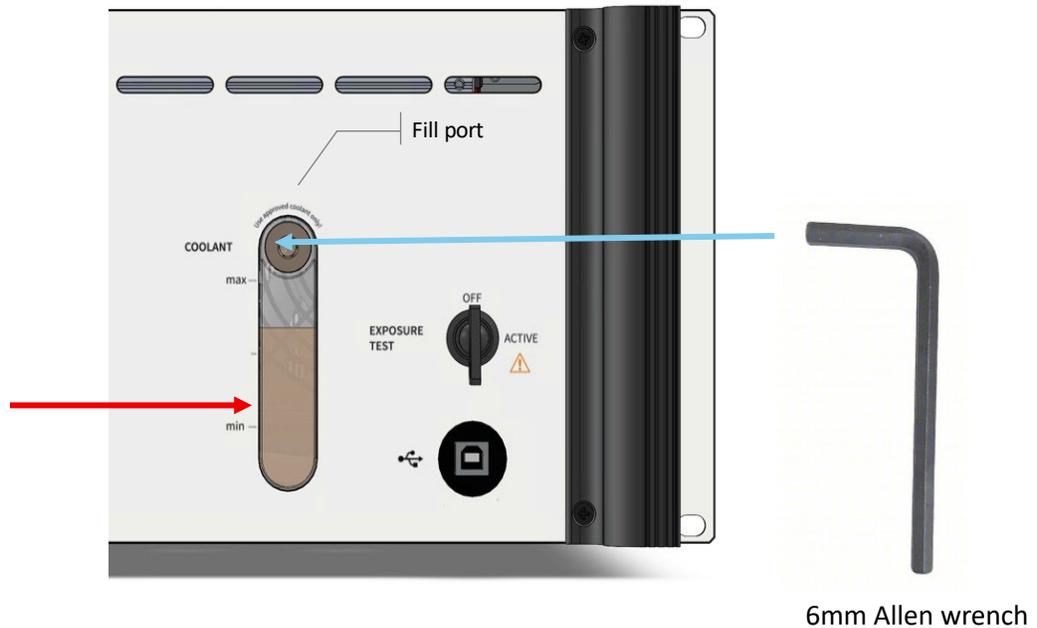
The correct dose can be achieved by changing the Exposure Time or LED power (Target Value) in ALE.

UV LED MAINTENANCE

COOLANT LEVEL



THE COOLANT MUST ALWAYS BE ABOVE THE MINIMUM LEVEL OF THE SIGHT GLASS!



Check this on at least a quarterly basis. A monthly check is best.

To top off the fluid, open the FILL PORT with a 6mm Allen wrench and fill with NXQ/Primelite Coolant using a cleanroom plastic squeeze bottle.



It will help to cut the nozzle about ¼ inch from the tip to allow more flow.

REPLACING THE COOLANT AND FLOW SENSOR

NOTE: IT IS RECOMMENDED TO REPLACE THE COOLANT EVERY TWO YEARS.

STEP 1: DRAIN THE COOLANT FROM THE CONTROLLER.

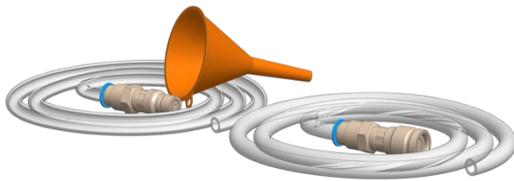
Precautions

Always disconnect the power cord before working on the unit. All maintenance and service activities should be carried out by trained specialists or be referred to an authorized service facility.

NXQ liquid coolant contains ~75% distilled water, ~25% ethylene glycol, and <1% inhibitors. Wear protective clothing (gloves, gown, goggles) when working on the internal liquid cooling system of the unit. In case of contact, wash skin thoroughly with soap and water and rinse eyes continuously with water for at least 20 minutes. If irritation persists, seek medical attention immediately.

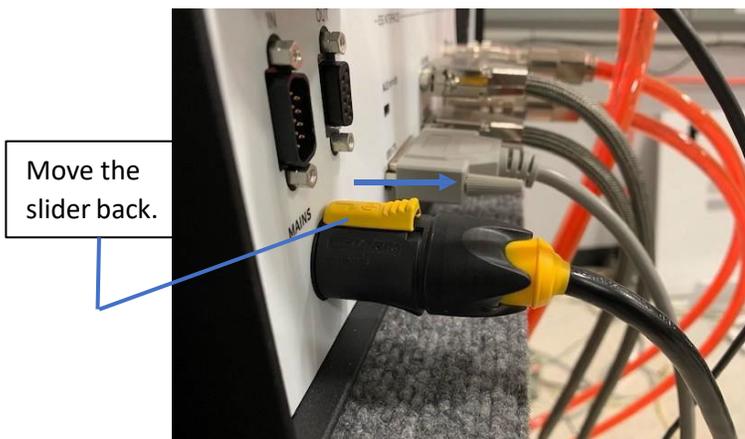
Contents of Coolant Refill Kit

The ALE CSS Coolant Refill Kit contains two 1 m drain hoses, a 100 ml funnel, and two 250 ml bottles of Primelite liquid coolant.



1. Preparing the unit to empty the coolant circuit.

Provide an empty container (>1 l) for drained coolant. Disconnect the power cord from the Control Subsystem (CSS). Disconnect the supply hose from the CSS coolant outlet.



Move the slider back and rotate the AC connector CCW to remove the power from the system.

2. Empty the coolant circuit.

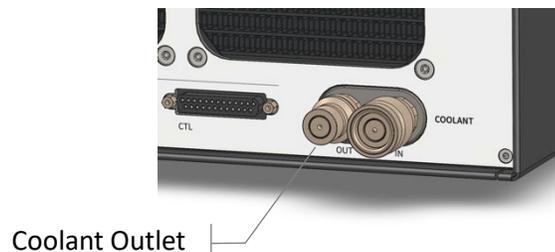
Place the empty container beneath the Exposure Subsystem (ESS) and CSS.

Securely place the open ends of the drain hoses into the empty container.

Connect the first drain hose to the coolant supply hose of the ESS.

Connect the second drain hose to the CSS coolant outlet. The coolant should now be flowing out of the system.

Wait until the coolant flow stops. Disconnect both drain hoses.



3. Empty the Control Subsystem (CSS).

Disconnect all coolant supply hoses from the CSS.

Securely place the open end of the first drain hose into the empty container.

Connect the first drain hose to the CSS coolant outlet.

Connect the second drain hose to the CSS coolant inlet, ensuring its open end is higher than the CSS.

Coolant should be flowing out of the system when the second drain hose is connected.

Wait until the coolant flow stops.

Legacy Control Subsystems: Reverse arrangement of both drain hoses to start coolant flow.

STEP 2: REMOVE THE TOP COVER OF THE CONTROLLER.

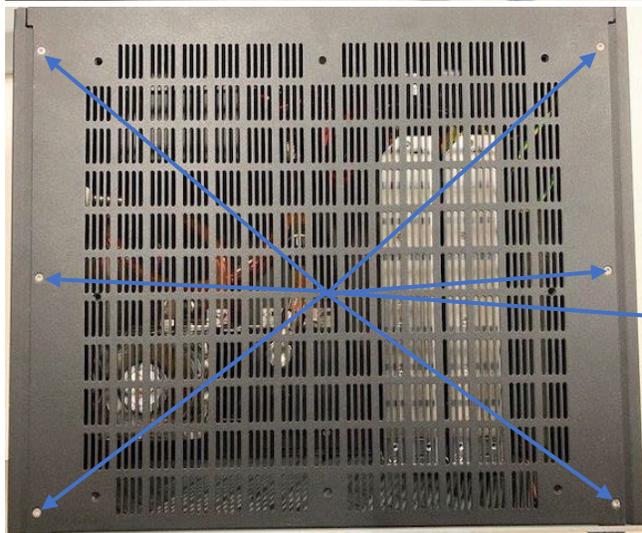
To remove the top cover, remove the M3 screws shown below.

A Torx T9 drive style Allen key is required to perform this task.



Screw to remove

(a)



(b)

Screws to remove.



Screw to remove.

(c)

Images showing the location of the screws, that must be removed to remove the top cover. (a) Front view of the control box. (b) Top view of the control box. (c) Rear view of the control box.

STEP 3: REMOVE THE COOLANT RESERVOIR CAP

Once all the screws mentioned in Step II have been removed, the top cover will come out with ease.

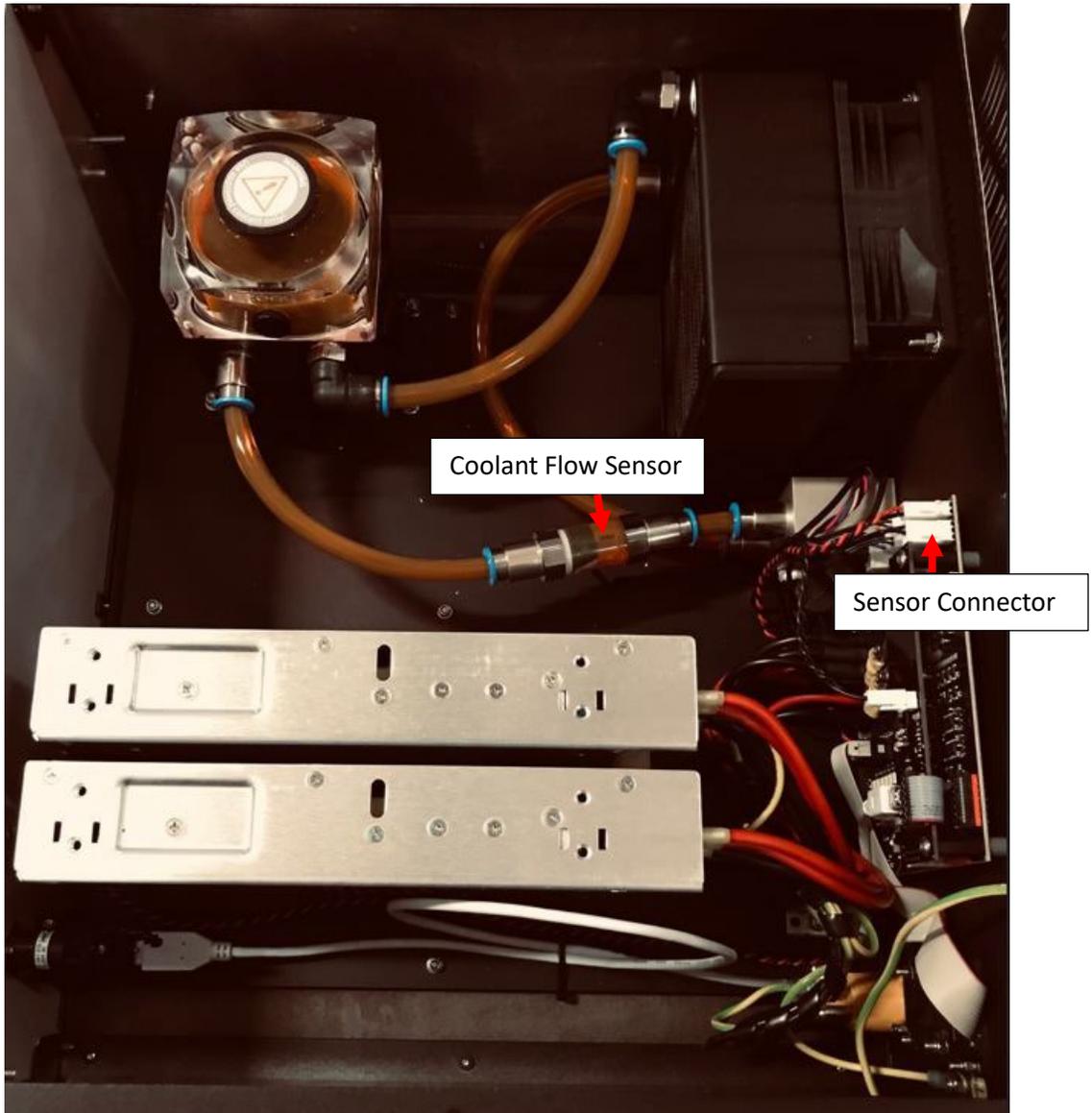
Once the top cover is removed, the coolant reservoir is located in the bottom left corner (when seen from above).

Rotate the reservoir cap CCW to remove it.



Make sure the tubes are cleared of fluid and clean up any spilled coolant.

STEP 4: REPLACE THE FLOW SENSOR (IF NECESSARY). IT IS RECOMMENDED.



1. Disconnect the sensor electrical connector from the PCB.



2. Remove the hoses from the flow sensor by pushing in the blue inserts and pulling out the hoses.

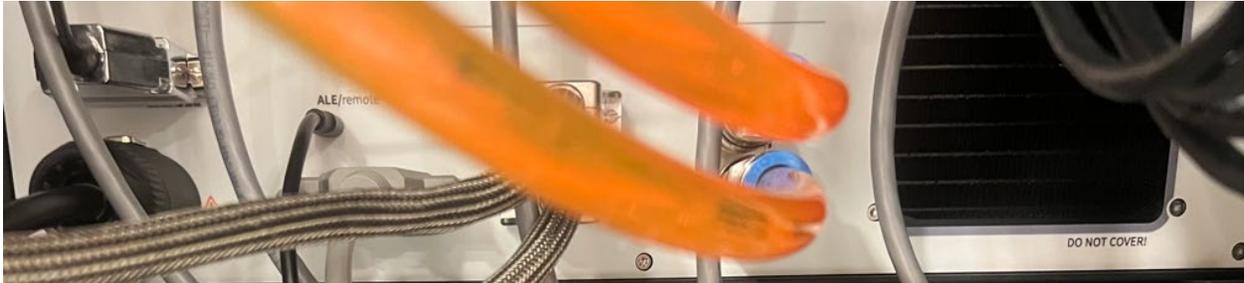


3. Connect the new flow sensor and plug in the connector.

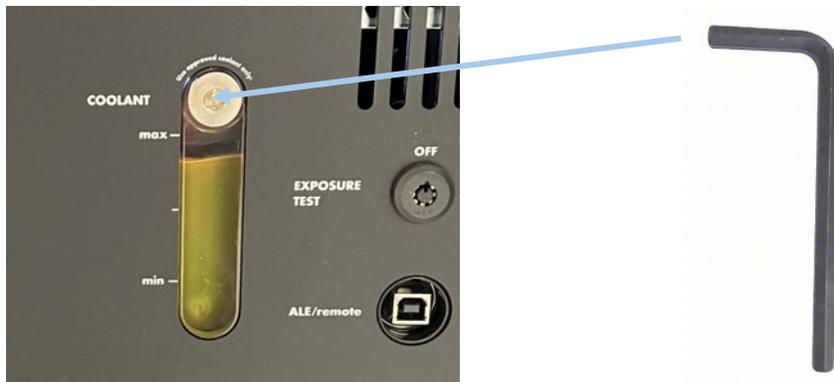


STEP 5: REFILL THE COOLANT.

1. Completely reconnect the CSS and ESS hoses.



2. Open the CSS coolant fill port with a 6 mm Allen key. (For new systems).





(a)



(b)

Fig.: 3: (a) Image showing the coolant reservoir with the cap removed. (b) Image showing the reservoir after coolant refill.

3. Carefully fill 3/4 of the reservoir. Connect the power cord to the unit.

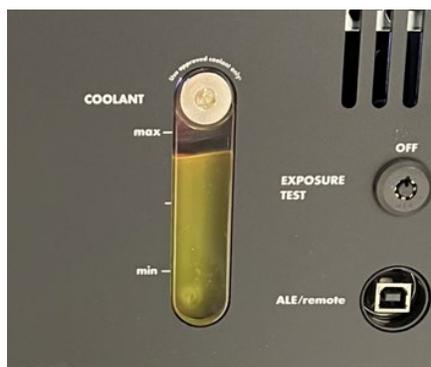
TURN THE UNIT ON AND OFF IMMEDIATELY BEFORE THE RESERVOIR IS EMPTY; THE PUMP MUST NEVER RUN DRY!

If the front LED turns red, please contact NxQ.

4. Repeat the above steps until the coolant level in the reservoir is stable.

After turning the LED on, let it run in standby mode for 5 mins for the coolant to recirculate (DO NOT EXPOSE AT THIS TIME).

Fill the reservoir fully. Tightly close the fill port.



EXCHANGING AN LED MODULE

If an LED module fails or reaches end-of-life, it can be replaced.

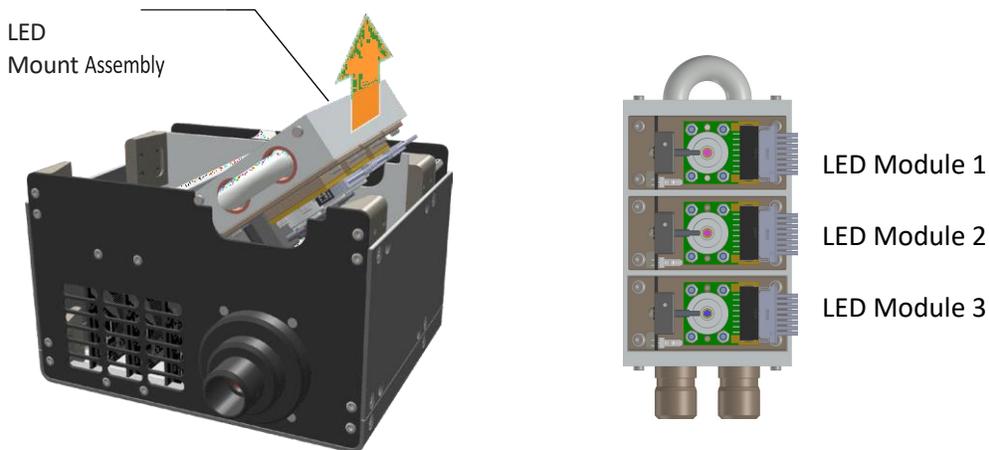


CAUTION: HIGH VOLTAGES ARE PRESENT INSIDE THE UNIT. ALWAYS DISCONNECT THE POWER BEFORE OPENING THE UNIT. ALL MAINTENANCE SHOULD BE CARRIED OUT BY TRAINED SPECIALISTS OR REFERRED TO AN AUTHORIZED SERVICE FACILITY (NXQ).

LED-Modules can be exchanged without the need of special tools. This might be necessary in order to replace degraded LED-Modules.

To access the LED-Modules of ALE/1C units, the LED Mount Assembly must be removed from the ESS.

Follow these steps to do so:



1. Open the four hexalobe bolts of the ESS top cover and remove it.
2. Lift up either side of the LED Mount Assembly and gently disconnect all wiring from each individual LED-Module.
3. Carefully pull the LED Mount Assembly out of the ESS.

LED-Modules can now be removed from the cold plate by unscrewing the four hexalobe bolts.

Reinstall LED-Modules in reversed order: Before reassembly, make sure to evenly apply thermal compound with high conductivity to the cooling surface of each LED-Module. Gently tighten the hexalobe bolts by hand.

Make absolutely sure not to touch or contaminate any of the optical components during the replacement process. All wiring of LED-Modules must be out of the optical path.