



Instrument
Markets

UVKEY™ User's Guide



Radiometer Optimized for UVC Germicidal Applications

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UVKEY™

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Electronic Instrumentation and Technology, LLC, (EIT LLC) Leesburg, Virginia**

For ease of reading in this manual, the stylized UVKEY is written as UVKey

Made in the USA

Specifications are subject to change

UVKey Introduction / About EIT® LLC

UVKey Introduction

The EIT UVKey was developed to address germicidal UV measurement.

Targeted applications for the UVKey include:

- Hospitals & Medical offices
- Long term care facilities
- Research labs
- Source suppliers

The UVKey combines EIT's 44 years of electronic design with EIT's 37 years of UV measurement experience in a small easy to use radiometer. The UVKey is a small electro-optical solution with a display that provides numerical values so the user does not have to rely on color interpretation or the counting of the number of diodes illuminated.



Figure 1: EIT Manufacturing Facility, Leesburg, VA

About EIT

Founded in 1977, EIT provides contract electronic manufacturing & engineering services for medical, industrial, analytical instrument, telecommunications and aerospace customers from multiple facilities in Virginia and New Hampshire. EIT LLC designs, manufactures, sells, supports and services EIT radiometers and on-line measurement systems for industrial UV curing applications utilizing UV LED and Broadband (mercury) arc, microwave and spot sources. EIT has sold over 100,000 UV measurement solutions for these industrial applications.

Germicidal Overview

Shortwave ultraviolet (UV) energy in the UVC (200-280 nm) region has been used for disinfection for well over one hundred years. The UVC energy causes a dimer or molecular lesion to the DNA (thymine, cytosine) and RNA (uracil, cytosine) building blocks or base pairs in the bacteria or virus. This dimer or molecular lesion does not allow the bacteria or virus to replicate itself which ultimately leads to an inactivation and reduction in their numbers.

Based on the application, shortwave germicidal UVC is often part of an overall strategy to reduce the number, presence and transmission of bacteria and viruses. UV is used to supplement filtration, disinfecting solutions, wipes and other methods used to reduce their numbers.

UV is line of sight and the UV must reach the bacteria or virus to inactivate it.

The effectiveness of the UV is dependent on:

- **Wavelength:** This is determined by the source type with mercury-based UV systems currently the most common. The UVKey response is designed and optimized for mercury-based sources emitting UV at 253.7 nm.
- **Power/Irradiance (Intensity):** Irradiance is the “brightness” or output power of the UV source. Irradiance is measured in Watts (W/cm^2) per square centimeter. Other units sometimes used are milli (mW/cm^2) or micro ($\mu W/cm^2$). Irradiance is sometimes also called intensity.
- **Energy/Dose (Energy Density):** For germicidal applications, Dose is the time integration of the intensity. One Watt for One Second = One Joule. The user will need to determine the minimum dose (J/cm^2) needed for their application or target bacteria/virus.

UVKey™ Product Overview

UVKey features include:

- Optimized for mercury-based UV germicidal applications
- Battery powered, microprocessor based, electro-optical instrument
- Provides an accurate *numerical* display of the dose (milliJoules/cm² or Joules/cm²) with NIST traceable calibration
- Easy to Use with Single Button Operation
- Small and Lightweight; Germicidal UVC Spectral Response of 245-265 nm
- Once the UVKey is initialized, it can take accurate, unlimited measurements over a six-month period
- Unit displays battery and calibration status
- The UVKey is sealed to protect it dust and fluid splashes
- The UVKey is RoHS3 compliant

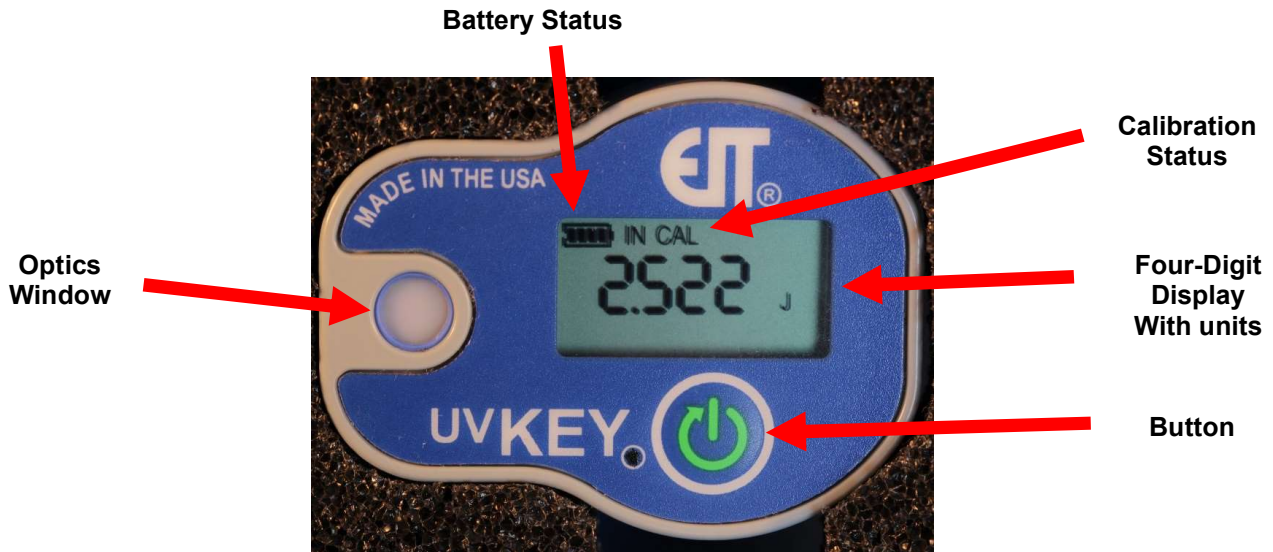


Figure 2: UVKey Optics & Display Side



Figure 3: UVKey Back Side



Figure 4: UVKey Port

The port pictured in Figure 4 is for factory use only. It is NOT intended to transfer data or 'charge' the unit.

Handling and Safety Precautions



Ultra Violet (UV) Radiation

- The EIT UVKey is a measurement instrument and is **NOT** a source of UV radiation or radioactivity.
- **The UVKey is used in an environment where UV radiation is present and Personal Protective Equipment (PPE) should be worn to protect the eyes and skin.**
- Do not modify the UV source equipment and leave all installed shielding, guards, lockouts and safety sensors/devices in place.
- Refer to your owner's manual for more information on your UV Source.

The UVKey housing is sealed to protect against dust and fluid splashes. It is not intended to be submerged or subjected to body fluids. For cleaning, only isopropyl alcohol (IPA) or water should be used. See the Maintenance Guidelines on Page 11 for proper care and cleaning of the optics, display and housing.

The UVKey should be stored in the shipping box (Figure 5) or another secure container when it is not being used to measure UV.



Figure 5: UVKey stored in shipping box

Quick Start Guide

A UVKey Quick Start Guide is supplied with each unit.

The UVKey Quick Start Guide can be followed once the unit has been turned on as shown in Figure 6 below.



Figure 6: UVKey ready to be initialized

Operation:

The UVKey has been designed to be easy to use and operate. The Operation Section expands on the information summarized on the Quick Start Guide.

1. UVKey BUTTON OPERATION

The UVKey is operated with a single button as shown in Figure 2.

There are three distinct button presses used to operate the UVKey.

Each button press requires the release of the button for the action to be accepted.

- A **SHORT PRESS** is defined as a 0.05-1.0 second press and it displays the current reading
- A **LONG PRESS** is defined as a 1.0-8.0 second press and it resets the current reading to zero
- An **EXTRA LONG PRESS** is defined as a press greater than 8.0 seconds. The **EXTRA LONG PRESS** is used to Initialize the unit prior to its first use.

2. **INITIALIZE PRIOR TO USE:** When shipped, UVKey is in an off state. To enable the UVKey to take measurements, the unit needs to be initialized. Turn the unit on by pressing the Button. Once on, press and hold the Button for 8 seconds (**EXTRA LONG PRESS**). During initialization, the firmware version will be briefly displayed (Figure 7). Initializing the unit will start the calibration validity timer. The unit remains on (Figure 8) and ready to collect data.



Figure 7: UVKey Firmware Version



Figure 8: Initialized UVKey ready to collect data

3. **MEASUREMENT:** The UVKey collects and displays the UV dose from the exposure in milliJoules or Joules/cm² depending on the value.

- A **LONG PRESS** will zero the current reading. The unit is always ready to collect data.
- **The UVKey is used in an environment where UV radiation is present and Personal Protective Equipment (PPE) should be worn to protect the eyes and skin.**
- After exposure to your UV source, the dose will be shown on the UVKey display
- The display automatically moves the units and decimal point so carefully note the numbers and units
- Exposure values below 1 Joule (0.001-999.9 mJ/cm²) will be shown in milliJoules (mJ/cm²)
- Exposure values above 1 Joule (1.000-999.9 J/cm²) will be shown in Joules (J/cm²)
- See Figures 9, 10 & 11 below for actual display values



Figure 9



Figure 10



Figure 11

Figure 9: Display showing 8.642 mJ/cm²

Figure 10: Display showing 269.2 mJ/cm²

Figure 11: Display showing 2.522 J/cm²

ENERGY PRESENT SYMBOL

When the UVKey detects UV Energy above the threshold (approximately $15 \mu\text{W}/\text{cm}^2$), the **ENERGY PRESENT SYMBOL** (Figure 12) in the upper right corner of the display is shown. This indicates that UV radiation is present and Personal Protective Equipment (PPE) should be worn to protect the eyes and skin.

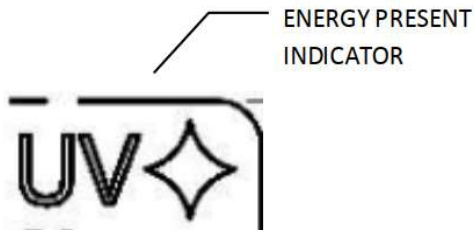


Figure 12: ENERGY PRESENT SYMBOL

4. **UVKey CALIBRATION STATUS AND TIMER:** The UVKey has been designed to provide accurate values for the period specified in Appendix A. The UVKey will display **IN CAL** (IN CALIBRATION) as shown in Figure 13 when the calibration is current.



Figure 13: Display showing IN CAL

The UVKey will display **CAL EXP** (CALIBRATION EXPIRED) as shown in Figure 14 when the calibration is expired. The UV values collected when **CAL EXP** is displayed are not guaranteed to be accurate.



Figure 14: Display showing CAL EXP (Calibration Expired)

5. **UVKey BATTERY/BATTERY STATUS:** The UVKey battery has a permanent battery that has selected to provide sufficient power over calibration interval. The UVKey is sealed to IP67 standards during the manufacturing process and the battery is not accessible. The battery is permanent and is not replaced or recharged.

The **BATTERY STATUS** symbol (Figure 13) has four bars that correspond to the remaining battery life.

The display will show 0 bars with no numeric indication "----" when the battery no longer provides sufficient power to take a reading.

Applications

The UVKey is lightweight and can easily be attached in a variety of locations in the area that will be treated with UV. EIT recommends using multiple measurement points to ensure that the proper UV exposure is reached throughout the area being treated.

The unit could be attached by:

- **Double Sided Sticky Tape**
- **Threaded Adaptor/Insert:** The UVKey has a threaded (thread 256, maximum length 0.080") that will allow the UVKey to attach to mounting accessories. See Figure 16 below

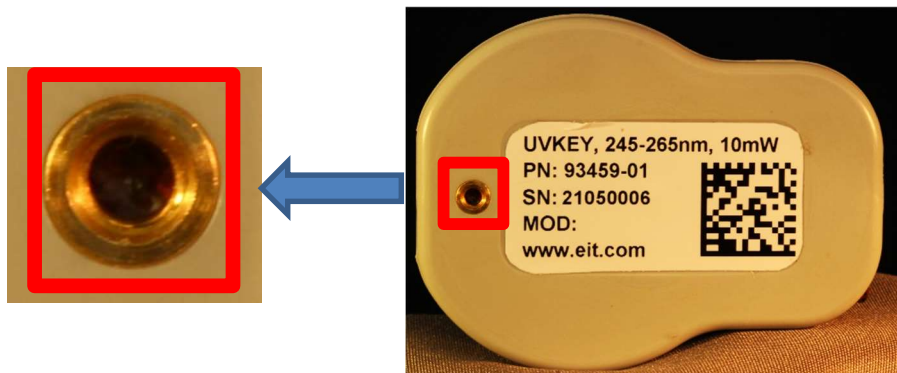


Figure 16: Threaded Adaptor on the UVKey back side

Maintenance

The Following Guidelines are recommended for UVKey maintenance

General

- Follow your established safety procedures to handle UVKey units that may have been exposed to pathogens and/or patient fluids
- Store the UVKey in a dry environment when it is not actively measuring UV
- Establish a contaminant-free area for cleaning and gather the necessary supplies
- The customer assumes all responsibility for damage to their EIT instrument because of improper fluid or chemical contact with the UVKey
- Please read the SDS/MSDS for any chemical used in the cleaning of the UV Key and to take necessary precautions.

UVKey Optics

- Visually examine the instrument to determine if it needs cleaning.
- Avoid cleaning the optics with anything dry or abrasive (such as a cloth, towel or clothing).
- Any contamination (fingerprints, oils from your hands, lint, dust, or other fluids) on the optics window can alter the UV values reported.
- Carefully remove any loose particles from the optics
 - EIT suggests a handheld air bulb available from camera stores
 - Very low-pressure instrument grade” (filtered, oil free) air can also be used
 - Blowing air from your lips or using “canned air” is not recommended due to the risk of contamination
- Clean the optics using isopropyl alcohol (IPA) or water and a lint free cotton swab
 - Use multiple swabs. The first IPA or water moistened swab is used to gently apply the solution in a circular motion.
 - Rotate the swab between your fingers as you work your way around the optics window in a circular fashion to clean the optics. Use an additional ‘wet’ swab if additional cleaning is needed.
 - To prevent contamination, do not ‘double-dip’ and place a used swab back into the IPA or water.
 - Use a second clean swab in a gentle circular rotating motion to dry the IPA or water on the optics.
 - Stop when most of the IPA or water has been absorbed by the swab and properly dispose of the used swabs

WARNING: Do not use Acetone, Methanol or Ethanol to clean the UVKey Optics, Case or Display

Additional Tips

- Do not use IPA with detergents or other additives.
- Consider a dedicated and labeled IPA dispenser to avoid cross contamination from other activities.
- Use lint free cotton swabs and if you see streaking, consider another brand of cotton swab as the adhesive used to hold the cotton to the applicator stick may be dissolved by the IPA.
- If you elect to use IPA wipes, make sure they do not contain detergents or additives. Wear gloves to prevent the transfer of oils from your fingers to the optics if using wipes.

UVKey Case & Display

- Follow your established safety procedures if the UVKey is exposed to blood or patient fluids
- Use isopropyl alcohol or water and a soft cloth to clean the case of the UVKey
- Do not open the UVKey housing. There are no user-serviceable parts inside the unit.

UVKey Display

- Use a soft lint free cloth to clean the display.

Appendix A UVKey™ Product Specifications

Feature	Description
Full Scale Operating Range	10 mW/cm ²
Resolution	1 μW/cm ²
Threshold	15 μW/cm ² (Approximately)
Displayed Energy Value	Exposure values below 1 Joule (0.001-999.9 mJ/cm ²) will be shown in milliJoules (mJ/cm ²) Exposure values above 1 Joule (1.000-999.9 J/cm ²) will be shown in Joules (J/cm ²)
Spectral Response	245-265 nm minimum Spectral out of band blocking of Optical Density (OD) > 4 average
Spatial Response	Approximately Lambertian (Cosine)
Accuracy	Typically, ± 5% or better; ± 10% of reading plus ±0.2% of full scale
Repeatability	Typically, better than 0.5%; <1% maximum
Calibration	Calibration on low pressure mercury source, NIST Traceable
Sample Rate	1 Hz (One reading/second)
Display-Interface	Single button operation 4 Digit LCD display of energy in mJ/cm ² or J/cm ² , floating decimal point
Operating Life Time	6 Months from user initialization of UVKey
Shelf Life	1 Month
Calibration Period	6 Month (recommended) or 500 Joules/cm ² (maximum)
Operating Temperature Range	+10°C - +50°C
Storage Temperature Range	-30°C - +70°C
Dimensions	Unit size 2.0" x 1.5" x 0.5" (50.8 x 38.1 x 12.7 mm)
Environmental	The UVKey case has an Ingress Protection (IP) rating of IP 67 which provides dust ingress and water spray from any direction
Weight	0.7 oz. (19.8 grams)
Battery	Lithium Manganese Dioxide non-rechargeable
Materials (Case)	Thermoplastic polymer. IP67 sealed
Electronics	The UVKey is RoHS3 compliant

Designed and Manufactured in the USA

EIT LLC reserves the right to make improvements and specifications are subject to change without notice

Appendix B Regulatory Statements

The UVKey was tested and passed each of the following standards:

- FCC Radiated Emissions Part 15.109 ICES-003: 6.2 PASS
- 2014/30/EU: Electromagnetic Compatibility
- IEC 61326-1: 2012



The UVKey is manufactured in the USA

Appendix C Technical Support

Technical Support

Technical support is available through EIT or from the authorized EIT reseller of the UVKey

EIT may be reached via email (uv@eit.com) or phone (703-478-0700) during normal business hours from 7 AM- 4 PM EST

Error Messages

The UVKEY table below contains a list of 4-digit Error Codes and suggested actions. A Button will clear the Error Code.

Error Code	Meaning	Suggested Action
0001	UVKey logged power greater than maximum range.	Unit should be placed further from the source
0002	Internal temperature of the UVKey has exceeded the maximum operating temperature.	Unit should be permitted to cool before starting a new reading
0003	Overtemperature and Over range	Unit should be placed further from the source and be permitted to cool before starting a new reading

UVKey Disposal

UVKey units should be disposed of properly.

The UVKey Unit contains a Lithium Manganese Dioxide type battery.

EIT is not able to accept UVKey units that have been exposed to pathogens or patient fluids

Warranty

The UVKey radiometer is given a one-time calibration before it is shipped from Electronic Instrumentation and Technology LLC (EIT LLC). The UVKey is designed for six months of readings once initialized.

EIT warrants that the UVKey described in this manual shall be free from defects in material and workmanship. Such defects must become apparent within three months after delivery of the goods to the buyer.

Any suspected warranty claim for UVKey must be reported within three months.

EIT's liability under this warranty is limited to replacing or repairing the defective goods at our option. EIT shall provide all materials and labor required to adjust, repair, and/or replace the defective goods at no cost to the buyer only if the defective goods are returned, freight prepaid, to EIT Instrument Markets during the warranty period.

EIT shall be relieved of all obligations and liability under this warranty if:

1. The user operates the device with any accessory, equipment, or part not specifically approved, manufactured, or specified by EIT, unless the buyer furnishes reasonable evidence that such installations were not a cause of the defect. This provision shall not apply to any accessory, equipment, or part that does not affect the proper operation of the device.
2. Upon inspection, the goods show evidence of becoming defective or inoperable due to abuse, mishandling, misuse, accident, alteration, negligence, improper installation, lack of routine maintenance, or other causes beyond our control.
3. The goods have been repaired, altered, or modified by anyone other than EIT authorized personnel.
4. The buyer does not return the defective goods, freight prepaid, to EIT within the applicable warranty period.

There are no warranties that extend beyond the description on the face hereof. This warranty is in lieu of-and is exclusive of-any and all other expressed, implied, or statutory warranties or representations. This exclusion includes merchantability and fitness, as well as all other obligations or liabilities of EIT.

EIT shall not be responsible for consequential damages resulting from malfunctions of the goods described in this manual.

No person, firm, or corporation is authorized to assume for EIT, any additional obligation or liability not expressly provided for herein except in writing duly executed by an officer of EIT.

If any portion of this agreement is invalidated, the remainder of the agreement shall remain in full force and effect.

This warranty shall not apply to any instrument or component not manufactured by EIT.

Returning a UVKey to EIT

EIT is not able to accept any UVKey units that have been exposed to pathogens or patient fluids

An Return Material Authorization is required for EIT to evaluate the unit under warranty.

Please contact EIT at uv@eit.com to obtain a RMA.

Please return the equipment in the original (or equivalent) packaging. You will be responsible for damage incurred from inadequate packaging if the original packaging is not used. The customer is responsible for insuring the unit during transportation to EIT.

Once received, EIT will determine if the issue will be covered under warranty or of the issue is a non-warranty issue

Equipment covered under warranty will be returned to the user with no charge for the repair or shipping.

EIT notify you of any repairs not covered by warranty and their cost prior to performing any work on the equipment.

Ship the unit, freight prepaid, to the address below:

Electronic Instrumentation and Technology (EIT) LLC
Attention: EIT Instrument Markets
309 Kelly's Ford Plaza SE
Leesburg, VA 20175 USA

Be sure to include your contact information and a copy on the RMA in with the unit

EIT Instrument Markets reserves the right to make changes in design at any time without incurring any obligation to install the same on units previously purchased.