Innovative UV Measurement

INSTRUMENT
MARKETS

3DCᴜʀᴇ™ Multi-Dimensional Measurement System

System Installation & Operators Manual

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Introduction

Three Dimensional (3D) UV measurement has previously proven to be a challenge. The EIT Instrument Markets 3DCURE™ Multi -Dimensional Curing Measurement System now enables you to accurately monitor and profile any 3D object with multiple UV radiometers, or sensors. This is done by allowing the user to place UV sensors on the surfaces of complex and irregular shapes associated with 3D objects. The system is perfectly suited for measuring UV energy density and irradiance on the surfaces of 3D objects such as automotive bodywork, SMC and composite assemblies, wood, furniture, and a multitude of other 3D applications.

The 3DCURE™ Multi-Dimensional Curing Measurement System can be configured to measure UV energy density and peak irradiance in four EIT bandwidth ranges depending on which is specified: UVA (320-390nm), UVB (280-320nm), UVC (250-260nm), and UVV (395-445nm). The bandwidths can be intermixed in the same system chain.

The UV 3DCURE™ Multi-Dimensional Curing Measurement System integrates multiple UV sensors with a Data Collection Module (DCM). Sensors are placed at various locations on an object to collect UV energy data within a process system. The measurement system collects data through UV sensors and transmits that data to the DCM. Once UV measurement has taken place, UV energy density and peak irradiance data is transferred to a computer where it is displayed and can be monitored using the Cure_3D™ software.

Figure 1. The 3DCURE™ Multi-Dimensional Curing Measurement System

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System Components

Data Collection Module

The 3DCURE™ System's Data Collection Module (DCM) is a portable, battery powered unit that travels with the sensors as they are exposed to UV energy. Data is transferred to the PC by connecting the DCM to the PC. The DCM's pushbutton controls the primary functions of the system and the LED indicator notifies the user of the system's status.

Figure 2. Data Collection Module (DCM)

Sensors

Each sensor provided is a digital mini-radiometer with a single spectral bandwidth (identified by the decal on the sensor itself). The sensors are round with an optics window in the center. The two flattened insets house the cabling connectors and LED indicators. Necessary cabling is provided to link the sensors to the DCM and other sensors in the system chain.

Figure 3. 3DCURE™ Sensor

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Software

The 3DCURE™ System is provided with Cure_3D™ software. This interface allows you to communicate to the sensors and DCM and display the collected data. Microsoft Active X© controls allow end user manipulation of the data within other programs.

Mounting Hardware

The 3DCURE™ System kit is provided with mounting hardware for the sensors. Other mounting options can also be used (see "Other Mounting Options").

Figure 4.
Sensor Positioner

Sensor Extractor Tool

A spring action clamping tool can used to remove the sensor from the positioner. The tips of the tool fit into the grooves on the recessed section of the sensor above the connectors.

Power Supply

A universal 100-240VAC switching power supply is provided and includes multiple plug adapters for global locations.

Preparations for Use

3DCURE™ DCM Sensor Kit

The DCM unit, sensors, and cabling kit come from the factory packed in its own zippered storage case. The components are ready for use after verifying that the DCM's battery is charged.

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Sensor Installation

The 3DCURE™ sensors can be hard mounted on a 3D part by using the Positioner mounting hardware. This device enables the sensors to be removed from the positioners and then reinserted, providing repeatability of the exact location of the sensor. This method requires drilling a 2.25 inch (5.71cm) round hole in the test fixture. Once the Positioner is inserted into the hole, secure it with the provided screws.

Prior to inserting a sensor into the positioner, the cabling needs to be carefully connected to one or both connectors located on the sides of the unit. Once the cables are connected, insert the sensor unit into the positioner through the top. The retaining ring will hold the sensor securely in place and you will be able to route the cabling either up through the top or down through the bottom of the part.

NOTE:
Ensure that the sensors are inserted with the optic window facing up toward the UV source.

Other Mounting Options

The sensors can also be mounted alternatively on fixture surfaces by using any securing type materials such as adhesive magnetic strips (sensors have a steel back plate), Velcro, tape, etc. In this method, ensure that the sensors are stable in their mounting positions and that the optics window is not covered.

Connecting the Sensors

Once the sensors are mounted, connect the cabling between the sensors in the system chain. Connect the DCM-to-Sensor Cable into the DCM's 9-pin connector, labeled "Sensor Cable". Then, connect the DCM-to-Sensor Cable into the first sensor in the system chain.

NOTE:
Use caution when connecting and disconnecting the cabling to prevent damage. The cables should be inserted or removed by pulling on the connector.

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Computer Setup

The Cure_3D™ software needs to be installed and configured properly to work with the 3DCᴜʀᴇ™ System. Configuration is done via the Set Up screen within the Cure_3D™ software (see "Software Configuration" below). When adding additional sensors to your system for the first time, the sensor serial number must be added to the sensor list.

Software Installation

1. Insert the Cure_3D™ software CD-Rom into your CD-Rom drive.

    If "Auto Run" is set to "On" for your CD drive, the program will begin loading automatically. Click on the 'Finish' and/or 'Next' buttons until installation is complete.

    If "Auto Run" is not turned on, follow the steps below:

2. Click on the Start button on your Windows toolbar.
3. Click on Run.
4. Click on Browse.
5. Select the drive where the CD Installation Disk is located.
6. Select the setup.exe file and double-click it.
7. Follow the on screen prompts by clicking on the 'Finish' and/or 'Next' buttons until installation is complete.

Sensor Software Configuration

1. Connect the DCM via the 9-pin cable to the associated port on your PC and the connection labeled "PC Cable" on the DCM.
2. Start the Cure_3D™ software program from the Start menu on your desktop or by clicking on the Cure_3D™ icon on your desktop.
3. Click on the "Set Up" button on the Cure_3D™ screen.
4. The "Unit S/N" table may have up to 32 entries. Eight are visible in the "Unit S/N" column at one time. The position indicator on the side of the fields shows the location in the table of the top entry in that column. Entering "0" in the position indicator returns the column to the top of the table. Sensor data will be reported in the order the sensors appear in the table. The sensors do not need to be in any particular order.
5. Enter the serial numbers of your sensors (as indicated on the face of the sensor) into the "Unit S/N" fields of the Software interface.

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6. Select the serial communications port for your computer.
7. Click on "Exit" to save your entries or exit without changing.
8. On the Data Collection Screen, the serial numbers entered will now appear, and the correct setup can be verified by connecting the sensor string to the DCM, then clicking on the LED button that corresponds with each sensor. A yellow LED on the sensor will illuminate.

NOTE:
When adding additional sensors to the system for the first time, repeat this section

Figure 5. Software Set Up Screen

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Operation

Once the system and the software are properly installed and configured, the system is ready to perform data collection. The pushbutton on the DCM acts as the main switch for the DCM.

To activate the unit and to toggle through each mode, press the pushbutton. The LED will indicate the mode in which the unit is operating.

Standby Mode

Standby Mode is indicated by a continuous RED LED. The system is in Standby Mode before or after data collection is activated. In Standby Mode, the system will transfer the last collected sensor data to your PC when requested.

>   *A flashing RED LED indicates that a sensor listed in the Serial Number file is not connected in the chain.

Run Mode

Run mode is indicated by a continuously GREEN LED. The system is in Run Mode when the sensor chain is active. Once entered into this mode, total UV energy and peak intensity data is being collected.

>   *A flashing GREEN LED indicates that a sensor listed in the Serial Number file is not connected in the chain.

When the unit transitions from Standby to Run Mode, all previous accumulated sensor data is reset. Upon transition from Run to Standby Mode, sensor data is accumulated and ready to be transferred to the PC for viewing.

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Operation Instructions, Step-by-Step

1. Install the sensors and connect them together in a daisy chain using the sensor-to-sensor cables.

2. Connect the DCM-to-Sensor cable to the first sensor in the system chain, and to the 9-pin connector on the DCM, labeled "Sensor Cable".

3. Turn on the DCM unit by pressing the pushbutton, which will also return it from Sleep Mode (LED will be red).

4. Press the pushbutton to enter Run mode (LED will be Green).

5. After exposure to the UV lamp system, press the pushbutton to send data from the sensors to the DCM and place the unit in Standby Mode. The LED will be RED.

6. The DCM can be disconnected from the system chain and brought to the PC for data transfer.

7. Connect the DCM via the 9-pin cable to the associated port on your PC and the connection labeled "PC Cable" on the DCM.

8. Start the Cure_3D™ software.

9. Transfer data from the DCM to the PC by clicking the GET DATA button on the software interface.

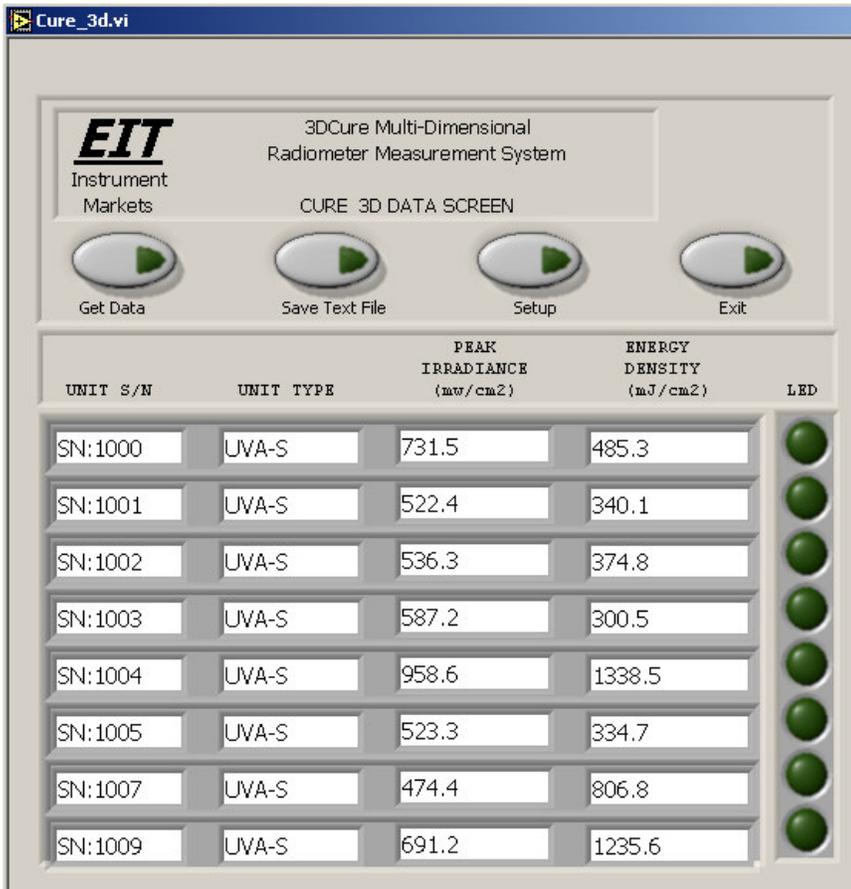10. Press the pushbutton to return the unit to Sleep Mode.

Figure 6. Software Data Collection Screen (Functions Listed Below)

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Data Collection Screen Functions

1. GET DATA: Click this button to transfer the collected data from the DCM to the Cure_3D™ software data collection screen. Collected data will appear in the Irradiance and Energy columns.

    *NOTE: When taking a reading "NaN" will appear in the Irradiance and Energy columns if a sensor is not connected or not included in the current chain, or is malfunctioning.

2. SAVE TEXT FILE: Click this button to save the collected data displayed on the screen. The file will be saved in the "3DCure" folder with a default extension of .txt.

3. SET UP: Click this button to enter the Set Up screen and to indicate the Software Version Number.

4. EXIT: Click this button to exit and close the Cure_3D™ software.

5. UNIT S/N: Serial number of the sensor.

6. UNIT TYPE: The bandwidth of the sensor-UVA, UVB, UVC, UVV. An extension is added to indicate the dynamic range of each sensor, and is by –S (Standard), -H (High), or –L (Low).

<div align="center">

NOTE:

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The bandwidth is stored in the sensor and will be displayed in the table after the first readings are made by clicking on the "GET DATA" button.

7. LED: When connected to a PC, clicking on the LED button will activate the associated sensor LED, providing a visible indication of the sensor's location.

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Maintenance/Battery/Calibration

Battery Charging

The NiMH battery in the DCM will normally allow 60 minutes of continuous measurement with up to 32 sensors when fully charged. When not in Run Mode and with the 100-240V charger connected, the battery will fully recharge in approximately 1 hour.

Calibration

Each sensor is calibrated and serialized upon initial production. EIT Instrument Markets recommends calibration every 6 months.

Carefully pack the 3D sensors in the provided 3DCURE™ storage case or in ESD-safe material and return to:

EIT-IM
108 Carpenter Drive
Sterling VA, 20164 USA
Attention: Calibration Department

Include your company name, address, phone number, fax number, and e-mail address on your shipping documents. EIT Instrument Markets will contact you if any additional information is needed

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Specifications

Sensors	Up to a maximum of 32 can be accommodated
Bandwidth (sensors)	UVA (320-390nm), UVB (280-320nm), UVC (250-260nm), and UVV (395-445nm).
Resolution	1 part in 10,000, with standard range set at 2W.
Sample Rate	Effective sample rate of 32 samples per second.
Sensor Size	1.75" diameter (4.5cm) by 0.5 H (1.27cm)
Data Collection Module Size	4.5"L (11.43cm) x 2.75"W 7.0cm) x 0.8"H 2.03cm)
Range:	Standard or Optional Low Power or High Power range available. Standard Range: 20mW-2W Low Power: 2mW-200mW High Power: 200mW-2W (Note - High Power range not available for UVC)
Battery	Rechargeable NiMH
Case	Zippered Case with separate sensor pouch.

Warranty and Returns

New Product Warranty

EIT Instrument Markets warrants that all goods described in this manual (except consumables) shall be free from defects in material and workmanship. Such defects must become apparent within six months after delivery of the goods to the buyer.

EIT Instrument Markets' liability under this warranty is limited to replacing or repairing the defective goods at our option. EIT Instrument Markets 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 during the warranty period.

EIT Instrument Markets 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, Inc., 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 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 any and all other obligations or liabilities of EIT Instrument Markets. EIT Instrument Markets

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 Instrument Markets, any additional obligation or liability not expressly provided for herein except in writing duly executed by an officer of EIT Instrument Markets.

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 Instrument Markets.

Calibration and Repair Warranty

EIT Instrument Markets will warranty for 90 days from the date of calibration and/or repair the services just performed. This Calibration and Repair Warranty does not apply to nor cover repairs that may otherwise occur to the instrument. Such repairs may be covered under the New Product Warranty based on the age of the instrument.

Returning the Instrument to EIT Instrument Markets

1. **Warranty Repair:**

   Contact EIT Instrument Markets before returning your unit for warranty repair.

   When returning the equipment under warranty, include the cabling, software, and charger sent with the equipment so that EIT Instrument Markets can evaluate the system.

   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 purchaser is responsible for insuring the unit during transportation to EIT Instrument Markets.

   Equipment repaired under warranty will be returned to the user with no charge for the repair or shipping. EIT Instrument Markets will notify

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

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.

1. **Non-Warranty Repair or Instruments Returned for Calibration:**

You do not need to contact EIT Instrument Markets before returning your unit for repair or calibration.

Please return the equipment in the original (or equivalent) packaging to the address provided above in the Warranty Returns section (Specify "Non-Warranty Returns Department"). 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 Instrument Markets.

EIT Instrument Markets will contact you with the needed repairs and the cost of repair before service begins. Repair service on calibrated units includes calibration.

Address for Returning All Instruments to EIT-IM

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

EIT-IM
108 Carpenter Drive
Sterling, VA 20164 USA
Attention: Returns Department

Include your company name, address, telephone number, fax number, and e-mail address on your shipping documents. EIT Instrument Markets will contact you if any additional information is needed.

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Appendix A

Optics Cleaning Instructions

The following guidelines are for cleaning the optical surfaces on EIT instruments. However, EIT cannot have full knowledge of contaminants present in all applications and as a result cannot test for their effects. Therefore, we cannot assume responsibility for damage to customer instruments, which results from following these directions once the warranty period has expired. Also, it is the customer's responsibility to obtain and read the MSDS for any chemical used for cleaning optics, and for taking necessary precautions. EIT makes no claim for the safety of any of these chemicals.

1. LOOK.

   Closely examine the optical surface. If no contaminant is visible, it is best to not clean the instrument. The optics are delicate and handling should be minimized. If contaminants are not visible, cleaning should only be done if:

   a.) It is known that a contaminant has come in contact with the instrument's optics.
   b.) A shift in readings has been observed with the instrument, and the design of the UV system is such that contamination on the radiometer is a possible cause of measurement error.

2. BLOW.

   The next step is to use compressed gas to remove any loose material from the surface of the optics. Loose material, especially silicates and other abrasive components, can cause scratching of the optical surface. The best solution is to use canned dry nitrogen. Tetrafluoroethane-based products commonly known as "dusters" are an acceptable, cost-effective alternative. For these products, care should be taken to avoid making the optic too cold, which will cause condensation on the optic. Also, a rubber air bulb is a simple and effective method for removing loose particles from the window.

   It is best not to blow on the optics with the mouth; various components of saliva are difficult to remove from the optics. It is also advisable to AVOID COMPRESSED (SHOP) AIR because of the difficulty in removing oil from the optical surface.

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Optics Cleaning Instructions, Continued

3. FLOOD.

Apply a liberal amount of solvent to the window. The purpose of the solvent is to loosen the contaminants from the surface, so that surface tension can remove the contaminant in step 4. EIT recommends cleaning the optic once with isopropyl alcohol, and once with acetone for best results. Other suitable solvents include de-ionized water, methyl alcohol, and ethyl alcohol. Customers working with non-polar chemicals may find Methyl-ethyl-ketone (MEK) to be an effective solvent. Customers should avoid using solutions containing detergents.

4. WIPE.

Using a lint-free wipe or a cotton swab, wipe the surface clean. The wipe or swab needs to be thoroughly saturated with the solvent, so the surface tension of the solvent will allow the contaminant to be captured on the wipe, and so the wipe does not abrade the optical surface. Again, users may find it convenient to start again at step 3 with a second solvent.

EIT can provide cleaning advice, assistance, and repair or replacement in cases where these guidelines fail to remove contaminants. These guidelines will help ensure the radiometer user long life and accurate readings from their instrument.