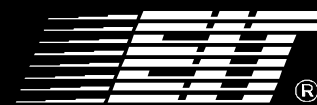


# Advanced UV Intensity and Temperature Measurement Systems

## UV POWERMAP® and UV MAP PLUS™

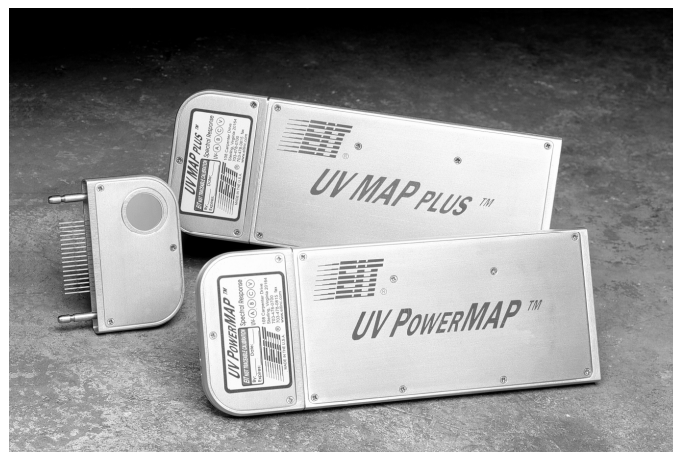


### Features and Benefits

- **UV PowerMAP®** - measures peak power density and total energy density in **four** spectral regions: UVA, UVB, UVC, and UVV
- **UV MAP Plus™** - measures the peak power density and total energy density for any **one** channel
- Collection and storage of up to 1 million data points for accurate UV and temperature mapping in your system
- Collected data displayed in graphical and tabular forms in the PowerView™ software package
- Ultra-fast, user-adjustable sampling rate - up to 2048 samples/second - ensures high resolution even at high speeds
- Detachable Optics Head - allows the use of different optics heads with the Data Collection Unit to minimize downtime during re-calibration
- Offset optics for easy measurement at conveyor edge
- Type J thermocouple records temperatures from 0-500°C
- Low, narrow profile to allow access to most curing applications
- Rugged aluminum chassis and stainless steel case

### Applications

- Measure the performance of the entire UV process from the beginning of the system to the end
- Evaluate lamp focus, reflector focus, and reflector efficiency in one spectral region with the UV MAP Plus and all four regions with the UV PowerMAP
- Compare reflector materials and shapes, wavelength-specific degradation, and uniformity over time *or* to other systems
- Compare spectral output, degradation, and uniformity of one or more UV lamps
- Measure and document substrate temperatures during the cure process to prevent damage to temperature-sensitive materials
- Track and store data for statistical quality control, regulation compliance, or historical comparisons
- Print run data to attach to work orders, reports, or ISO and FDA audits
- Archive measurement data to track system performance over time



### Introduction

EIT's UV PowerMAP and UV MAP Plus are advanced measurement systems that measure and store UV energy, UV irradiance, and temperature information derived from their optics and thermocouple probes in UV curing processes. The UV PowerMAP simultaneously measures all four UV channels while the UV MAP Plus measures one channel.

The information is transferred to a PC where it is presented in graph and data format for viewing and analysis. The information is characteristic of the same energy and irradiance that would be impinged on an actual work piece passing through the curing process.

The UV PowerMAP and the UV MAP Plus are the ultimate tools for developing, monitoring, and maintaining UV curing processes. UV formulators, raw material suppliers, and equipment suppliers can take advantage of the UV PowerMAP's ability to measure all four UV channels to develop processes that are easily transferred from a laboratory to a production environment. The UV MAP Plus monitors the one UV channel specified (A, B, C, or V) when it is ordered. The UV MAP Plus was designed more for use on a production floor, and it is an economical alternative to the UV PowerMAP. With the PowerView software, the UV PowerMAP and the UV MAP Plus offer far greater resolution, data sampling, data storage, and data manipulation than previously available in mapping systems.

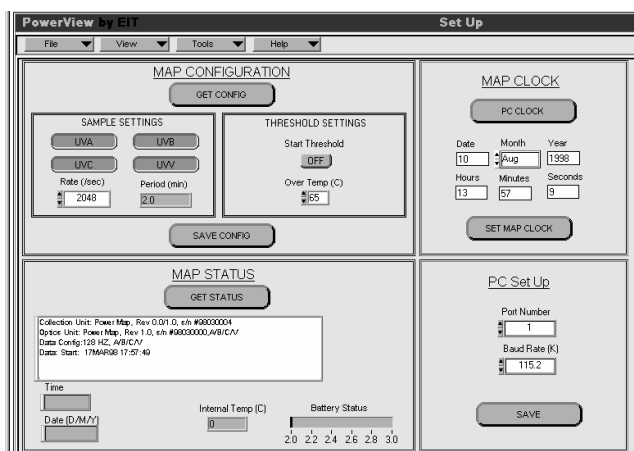
Variables such as reflector materials, reflector shapes, wavelength-specific reflector degradation and uniformity, and lamp focus can be documented. Companies using multi-lamp curing systems and those that are using different spectral lamps within a system will find these radiometers indispensable.

The UV PowerMAP and UV MAP Plus systems are composed of a data collection unit, detachable optic measurement head, and PowerView software package. The units measure UV energy in Joules/cm<sup>2</sup> and UV irradiance in Watts/cm<sup>2</sup>. With PowerView, UV sample rates are adjusted from 128 to 2048 samples per second to match resolution and information requirements.

PowerView uploads and displays the collected UV system data, unit configurations, and time/date stamps. This data is saved as a computer file that can be manipulated, customized, and exported into a spreadsheet by the user so the entire UV system can be evaluated.

## Operation

The UV PowerMAP and UV MAP Plus are initially configured at the factory before they are shipped. Settings are easily viewed and changed in a Setup screen in PowerView. In Setup, the user can set the unit's configuration to best match the lamp system and get the desired data. The channels that are enabled, the time and date settings, port settings, and the UV sample rate are easily changed with the click of a mouse. The unit's maximum sample rate of 2048 samples/second and its ability to store up to 1 million data points ensures accurate and sharp resolution - even at high speeds.

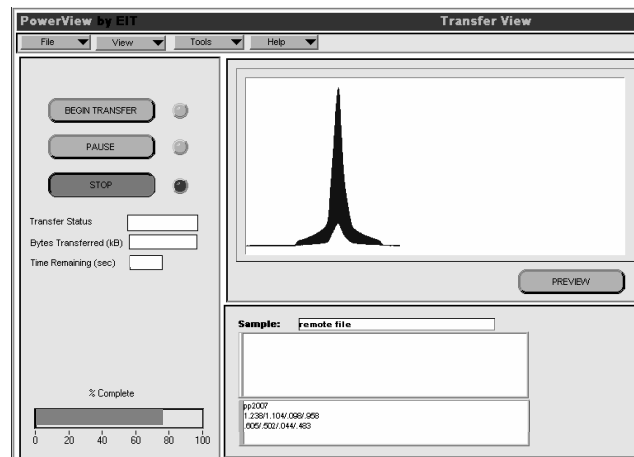


Setup View

The user inserts the unit into a stationary or conveyORIZED UV process for data collection in the same manner that an actual work piece would be inserted. The unit's low, narrow profile of only 0.5"H x 3.5"W allows usage in a wide range of demanding physical environments. The unit's optics are offset so it can collect data at the ends of the bulbs where lamp degradation tends to occur first.

Upon exiting from the curing environment, the unit is connected to a PC serial port via cable so that the "run" information can be uploaded into the PowerView application software.

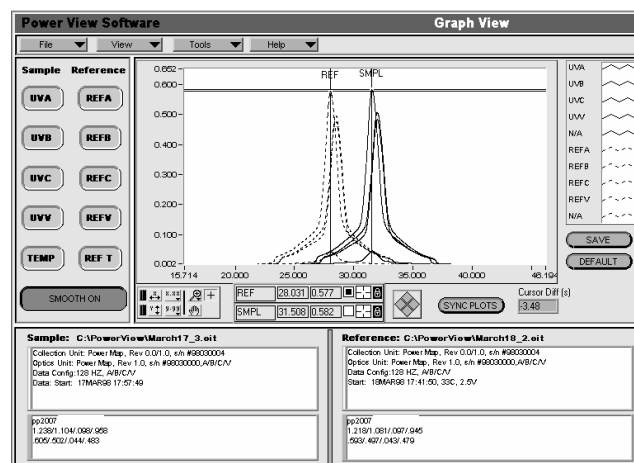
The data transfer is initiated in PowerView's Transfer View screen, where the unit configuration and transfer progress are displayed. The user can enter information such as line speed, amp readings, lamp settings, types of bulbs, and any other information relevant to the run. The user can also see a preliminary view of the plot. A detailed look at the plot is available after the transfer is complete.



Transfer View

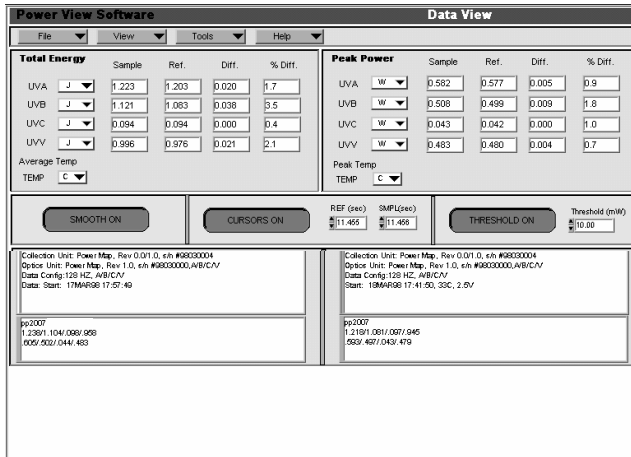
PowerView shows the status of a curing system in a clear, easy to read format. The user can see which lamps and reflectors in a system are well focused and performing most efficiently. PowerView's ability to compare two different runs is one of its most important features. The run data files are referred to as a "Sample" file and a "Reference" file.

PowerView's Graph View screen shows the UV irradiance and temperature data for the runs in graphical form. The user can toggle the display of the temperature and any of the UV channels (for PowerMAP) either on or off. Graph View has a zoom feature to enlarge any portion of the plot, and cursor measurement for detailed analysis. The user can change the appearance or color of a curve, and a data-smoothing filter is available to improve plot viewing.



Graph View

The Data View screen lists the total energy density ( $\text{J}/\text{cm}^2$ ) and the peak power density ( $\text{W}/\text{cm}^2$ ) for each active spectral channel. The average temperature and peak temperature readings collected by the thermocouple are also presented. If two files are open, Data View shows the differences between readings as absolute values and as percentages. Logged information and user-entered information is also displayed for both run files.



Data View

A Type J thermocouple probe is used for substrate temperature measurement. Temperatures from  $0^{\circ}$  to  $500^{\circ}\text{C}$  are recorded at 32 samples per second. This is an important function if curing is taking place on temperature sensitive substrates.

An over-temperature alarm alerts the user when the unit's internal temperature exceeds  $65^{\circ}\text{C}$ . This gives the user time to remove the unit from a thermally hostile environment before it overheats.

The UV PowerMAP and the UV MAP Plus are powered by nickel metal hydride (NiMH) batteries, which can be recharged approximately 500 times before needing replacement. An audible alarm sounds when the batteries need recharging.

Routine maintenance for the units consists of battery charging, cleaning, and returning the optics heads for routine calibration. Recharging is accomplished by a one-hour "quick" charge.

Keeping the optics clean is essential for getting proper measurement results, and it requires only cotton swabs and acetone. The case can be cleaned with isopropyl alcohol and a soft cloth.

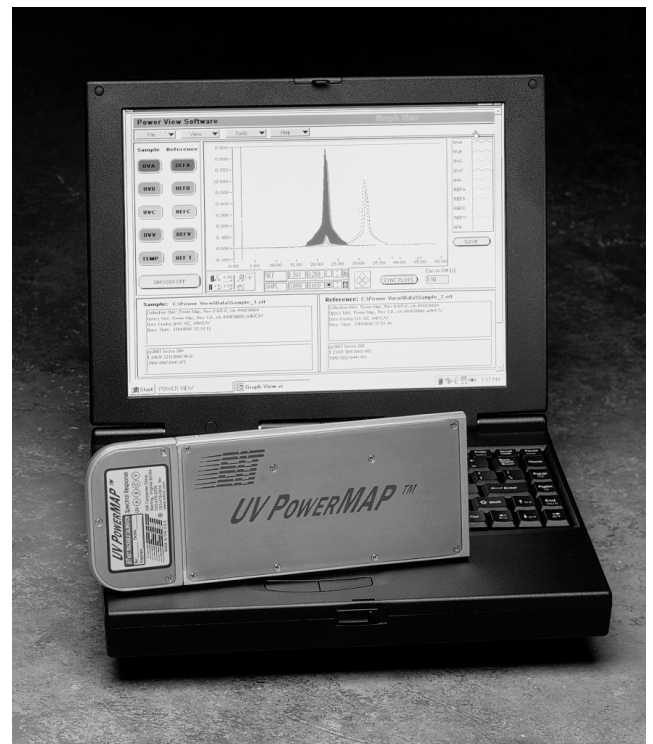
Since the optics head disconnects from the DCU, only the optics head has to be returned for periodic calibration. It is connected to the collection unit by two mechanical pins and a row of electrical contacts, and locked into place by two setscrews. Another optics head may be purchased to avoid down time during recalibration or to upgrade from single to four-channel capability.

## Summary

The UV PowerMAP and the UV MAP Plus have an enormous advantage over other UV measurement instruments on the market. Both allow the user to evaluate the *entire lamp system* to see how well it delivers UV light to the actual cure surface. Focused lamp systems with good reflectors typically cure more efficiently which is important considering that as much as 75% of the energy reaching the cure surface is *reflected energy*.

The collected data allows the user to adjust the curing process to ensure that the UV system is operating at maximum efficiency.

The data that is graphed can be archived for future reference or printed and attached to work orders for ISO or FDA audits. The historical data can be used to make comparisons between current runs and previous runs. UV lamps within a system can be compared to each other, or entirely different UV systems can be analyzed and compared.



## Specifications

<b>Electrical Specifications</b>	
Configuration	2 part: Detachable Optics Head and Data Collection Unit (DCU)
	Optics Head: Supports optics to measure 1 spectral region (UV MAP Plus) or 4 spectral regions (UV PowerMAP)
	DCU: 256 bytes non-volatile memory
UV Ranges	High Power: UVA, B, V- 200mW/cm <sup>2</sup> to 20W/cm <sup>2</sup> ; UVC- 20mW/cm <sup>2</sup> to 2W/cm <sup>2</sup>
	Low Power: UVA, B, V- 2mW/cm <sup>2</sup> to 200mW/cm <sup>2</sup> ; UVC- 1mW/cm <sup>2</sup> to 100mW/cm <sup>2</sup>
Spectral Response	UVA (320-390nm), UVB (280-320nm), UVC (250-260nm), UVV (395-445nm)
UV Accuracy	+/-5% typical, +/- 10% maximum
Temperature Measurement	Type J; Input Range: 500°C Maximum (Thermocouple range determined by thermocouple wire used. 250°C thermocouple wire supplied with unit.); Sample rate: 32 samples per second
UV Sample Rates	User-adjustable from 128 to 2048 samples per second
UV Sample Period	Maximum of 1 hour, determined by configuration
Operating Temperature Range	0-70°C; overtemperature alarm @ 65°C
Unit Operation	One Push Button Switch
Indicators	One Single Tone Audible Indicator; Dual-Color LED (Red/Green)
Battery	Nickel Metal Hydride (NiMH)
Battery Cycles	500 typical
Charging Period	1 hour quick charge at temperatures below 35°C
Charging Adapter	AC input: 100-130VAC, 50/60Hz or 200-240VAC, 50/60Hz DC output: 12 VDC @ 250 mA
Operating Time	Determined by configuration. Guideline: four channels on @ 512 Samples/ second for a 2-minute sample period yields 30+ readings on one charge.
<b>Communication to PC</b>	
Format	RS232 Serial Port
Speed	9600 to 115k baud
<b>PowerView Software</b>	
Minimum Computer Requirements	Pentium 60MHz, 16MB RAM, one serial port, one parallel port; 20MB space available on hard drive; CD-ROM drive or 3.5" HD floppy disc drive; Windows 95 operating system
Interface	Windows-based fully graphical interface
<b>Mechanical Specifications</b>	
Unit Dimensions	3.50"W X 9.0"L X 0.5"D (8.89cm X 22.86cm X 1.27cm)
Weight	20.2 ounces (570 grams)
Materials	Aluminum chassis with stainless steel covers

Specifications subject to change.

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