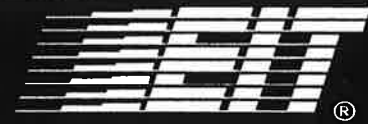


# UV Intensity and Temperature Measuring/Plotting System UVIMAP®



## Features

- Measures UV and temperature in conveyORIZED and stationary systems
- Battery powered instrument
- Switch selectable UV and temperature ranges
- Automatic plotting - instant data review
- PC compatible - detailed off line review and analysis
- Battery powered printer

## Applications

- Process development
- UV source evaluation
- Reflector characterization
- UV uniformity mapping
- Max temperature/UV intensity determination
- Total energy - radiometry
- Substrate temperature analysis

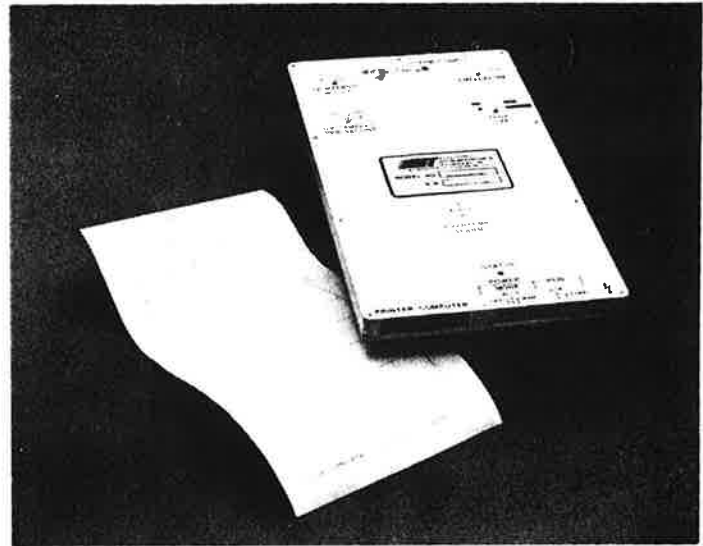
## Introduction

Measurement of ultraviolet intensity and temperature inside a UV system has always been a difficult, if not impossible, task. For example, UV cured products are often exposed to UV light in a conveyORIZED, multilamp system which produces intense UV radiation and temperatures of several hundred degrees. It is often desirable to determine the UV intensity, total energy and product temperature during its passage through the system. Such data in the past has been very difficult to obtain because of mechanical inaccessibility, high temperature and intense UV.

## General Description

UVIMAP®, a member of EIT's family of UV measurement and control instruments, makes UV and temperature measurement simple and straightforward. The small, battery-powered instrument can be placed directly into the curing environment where it measures UV intensity and temperature as a function of time. The resulting measurements are digitized and stored within the instrument. Upon completion of a measurement run, the instrument can be connected to a separate, self-contained, thermal printer which automatically plots the results.

The instrument can also transfer its data to an IBM compatible personal computer where the data is available in tabular form. The data may be printed in hard copy form and may also be stored on floppy or hard disk in database format. The complete system provides a convenient means of measuring, storing and providing hard copy UV and temperature data. The system also provides the means for a data base and graphs for future analysis of the UV process.



## Technical Description

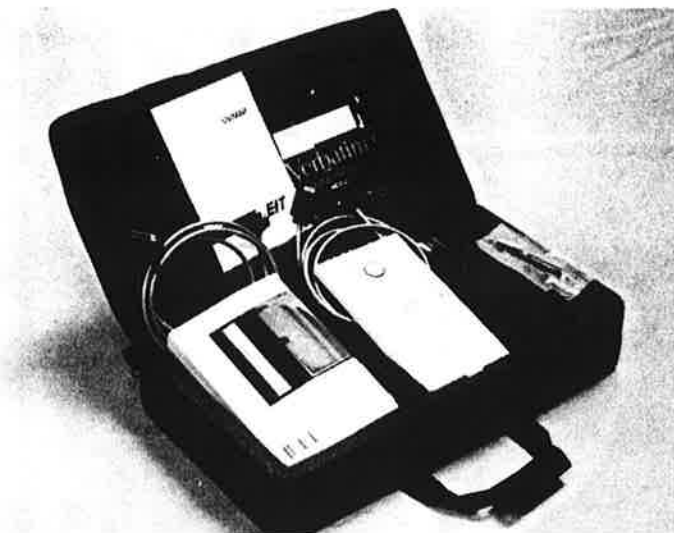
The measuring instrument is housed in a specially fabricated fiberglass/aluminum housing measuring 9 1/8 x 5 x 1/2 inches, designed to withstand high temperatures for short periods. It contains a UV filter-sensor combination which provides the same very high opto-electronic performance which is provided by other EIT instruments. The filter-sensor measures UV radiation incident on the top surface of the package. The sensor output is then digitized and stored in Random Access Memory (RAM) under microprocessor control. Up to 4000 UV and 2000 temperature measurements can be stored. Upon completion of a measurement cycle, the instrument can be connected to the printer or to an IBM PC compatible computer where the data can be presented in tabular form and/or stored on floppy or hard disk.

When used with its printer, the UVIMAP automatically annotates and plots the data. Before plotting the measurement data, the Total (integrated) UV energy, Peak value of UV intensity, Average UV intensity, UV sample rate, Peak value of temperature, and the number of sample points are summarized and printed.

## Simplified Operation

The instrument features controls to provide maximum operating flexibility, making it ideally suited for many different applications. A Sample Rate Select switch provides user selectable data sample rates of 5, 10, 20 and 40 samples per second. A Range switch provides full scale UV inputs from 0.1W/cm<sup>2</sup> to 5W/cm<sup>2</sup> for high power units and from 5mW/cm<sup>2</sup> to 100mW/cm<sup>2</sup> for low power units. The Temperature Range switch provides 4 full scale temperature ranges from 0° to 50°, 100°, 200° and 400°C.

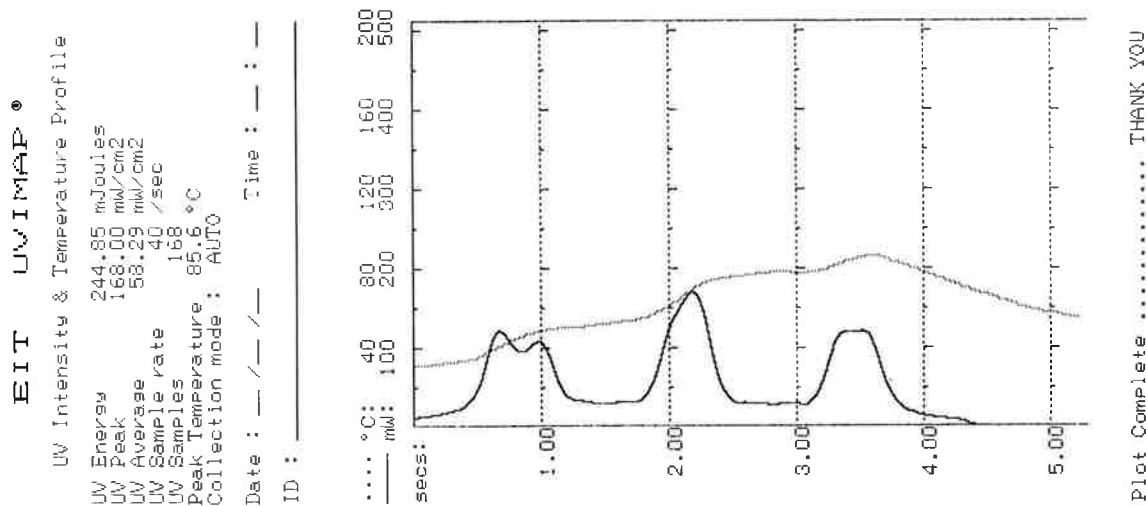
Plotting step size permits plotting each data point on 0.35mm to 2.8mm distances between points, effectively compressing or expanding the data. Power/Mode and Start/Stop allow the instrument to collect data manually or automatically after crossing a preset UV threshold value. The interface cable hooked up to this instrument determines whether the data is to be plotted or transferred to a PC.



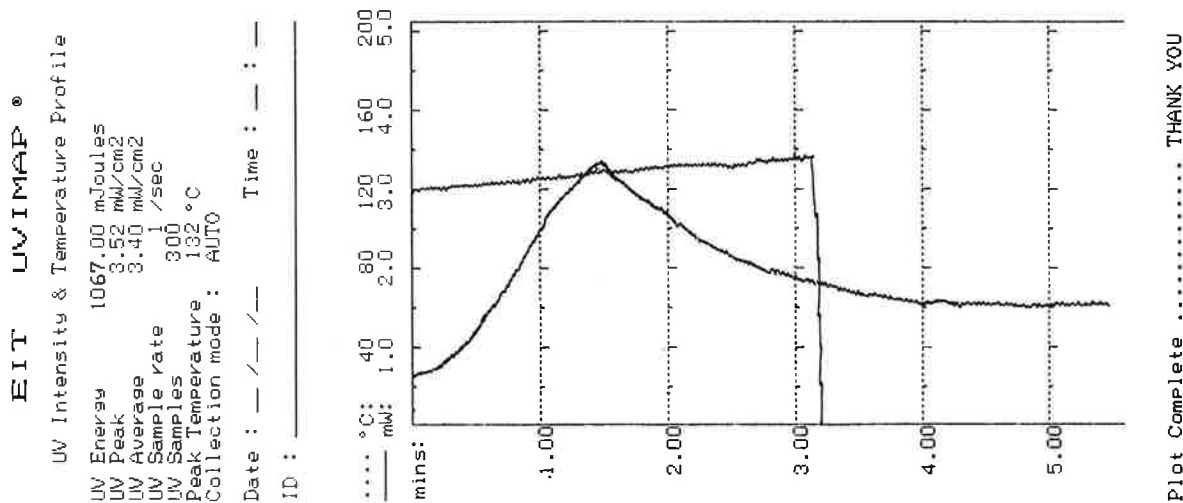
**Figure 2. Equipment supplied with UVIMAP.**

**Rechargeable Batteries**

The instrument is powered by rechargeable batteries and will operate for six hours without recharge. The instrument is provided with a special battery charger which will recharge instrument batteries in 14 hours maximum. The printer is powered from 120VAC, 60Hz or 240VAC, 50Hz, to be specified at time of order. The printer also operates on rechargeable Ni-Cad batteries.



**Figure 3. UV/Temperature profile of conveyORIZED system**



**Figure 4. UV/Temperature profile of stationary systems.**

*Note: Graphs were truncated to fit space allowed. Time axis is always in seconds, not minutes.*

## Applications

UVIMAP provides the capability of measuring and plotting previously unobtainable UV intensity and temperature data. Some typical applications are:

**Characterizations of Curing Conditions** - Figure 3 shows UV intensity and temperature profiles seen by a printed circuit board as it traversed a 3 lamp, 200W/inch UV curing system. Note that peak UV intensity was about 170mW/cm<sup>2</sup> and that lamp #2 was sharply focused. Lamp #1 is defocused as evidenced by the dual peaks. Also, note the deteriorated reflectivity of lamp #3 as indicated by the rounded peak. None of these conditions could be determined by the unaided eye. Peak temperature at the top surface of the board was 85.6°C. Measurement of material surface temperature provides the ability to avoid thermal damage to the material during UV processing.

**Resin Curing** - Figure 4 shows UV intensity/temperature

history of a 0.005" polyester-UV curable resin - 0.005" polyester sandwich. The sandwich was placed under a UV fluorescent lamp and the UVIMAP thermocouple placed in the resin. The UV lamp output rose to a maximum of approximately 3.5 mW/cm<sup>2</sup>. Initial resin temperature was about 23°C and peaked to a maximum of about 132°C after about 1 minute. The lamp was extinguished after 3 minutes. However, polymerization, as evidenced by a continued temperature rise, had been completed 1.5 minutes earlier. Such information provides a valuable insight into the curing process.

These examples are but two of the many applications of UVIMAP in determining curing and temperature conditions in UV processes. A demonstration of UVIMAP can be arranged through your local EIT representative or by calling the manufacturer.

## Specifications:

### General

UV Ranges	<i>High Power Model:</i> 0.1, 0.5, 1 and 5 W/ cm <sup>2</sup> , switch selectable. <i>Low Power Model:</i> 5, 10, 50 and 100 mW/ cm <sup>2</sup> , switch selectable.
UV Accuracy	±5% typical; ± 10 maximum. (Measurement made on medium pressure linear mercury lamp.)
Temperature Ranges:	0-50°, 100°, 200°, 400° Centigrade; switch selectable
No. of Sample Points	4000 for UV, 2000 for temperature
UV Sample Rate	5, 10, 20, and 40 samples per second, switch selectable
Temperature Sample Rate	½ the selected UV sample rate i.e., 2.5, 5, 10, or 20 samples per second
Spectral Response	Standard ranges are 250-260nm, 280-320nm, 320-390nm, and 395-445nm
Operating Temperature Range	0° to 70° Centigrade internal. External temperatures as high as 500°C can be sustained for 10 seconds or less. Includes an overtemp audio alarm at 75°C internal temp.
Controls	POWER/MODE SWITCH - applies power to unit and selects the data collection mode of AUTO/MANUAL. RUN SWITCH - starts or stops sampling or plotting operation. UV Samples/second - selects the rate at which data is taken and stored in memory. PLOT SIZE - selects spacing between plotted data points on "x" axis, 0.35, 0.7, 1.4 and 2.8mm spacings are available. STATUS INDICATOR - red LED flashes during normal operation, flashes at twice the speed on data collection and turns ON when the battery voltage falls below proper level. Unit will not start with low battery.
Calibration Adjustments	None, set at factory
Recharge Time	14 hours (max)
Operating Time	6 hours between charges
Unit Dimensions	9 1/8 L x 5 W x 1/2 H (inches); 231 L x 127 W x 12.7 H (millimeters)
Weight	Approximately 19 oz. (532g)
Charger	
Output	20 VDC limited to 25mA (Max.) Short circuit proof. Indicator LED: Dark - No charge Medium - Normal charge Bright - Short circuit
Recharge Rate	10mA; 14 hours for completely discharged batteries
Charger Cord	60" long; jack mates with connector in side of UVIMAP
Power Requirements	US/Japanese - 90-130VAC, 50/60 Hz European - 200-240VAC, 50/60 Hz
Power Plug Configuration	US/Japanese - Conventional two prong; supported in wall outlet European - Standard EUROPLUG; supported in wall outlet
Printer	
Type	Thermal (Serial Dot)
Paper	Thermal paper width 112mm TP411-28CL (Seiko) or equivalent
Ni-cad battery capacity	1500 character lines can be printed by recharging for 10 hours at 100 mA
AC adapter	120VAC 60 Hz 220VAC 50 Hz (optional)

**Specifications subject to change**

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### Ordering Information

UVIMAP is specified by "UVIMAP EIT Model UM 365H" for "High Power" (over 100mW/cm<sup>2</sup>) or "UM365L" for "Low Power" (under

100mW/cm<sup>2</sup>). Battery charger and printer voltages must be specified separately.

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### Other EIT Products

- **UVICURE® High Energy UV Integrating Radiometer**—Measures total UV dosage. Displays in Joules/cm<sup>2</sup>. For use in establishing optimum curing energy in UV curing applications.
- **ONLINE UV INTENSITY DISPLAY MODULE**—Continuously monitors a single UV source and provides a digital display of its relative UV output.
- **UV POWER PUCK**—Measures peak intensity and total UV energy of four spectral UV ranges in one pass through the conveyor.
- **SPOTCURE™ UV Intensity Meter**—Measures the intensity emitted by a UV spot curing system, up to 19.99W/cm<sup>2</sup>.
- **DIN RAIL MOUNT UV INTENSITY MONITOR**—Continuously monitors the output of a single UV lamp in convenient DIN rail mount configuration.
- **MULTIBRITE™ 4 Channel UV Monitoring System**—Continuously monitors up to four separate UV sources and provides a digital display of the relative UV output for each source. Local and remote alarms may be set if the output drops below a preset threshold.
- **UVIRAD® Low Energy UV Integrating Radiometer**—Measures UV 320-390 nm in 100 μW/cm<sup>2</sup> to 100 mW/cm<sup>2</sup> range. Display in millijoules/cm<sup>2</sup>. For use in establishing optimum UV exposure in platemaking, primary imaging, and soldermask imaging. Patented.