UV POWERMAP ™ *and UV MAP PLUS* ™

UV Intensity & Temperature Measurement Systems

with

POWERVIEW ™

Application Software

OPERATOR'S MANUAL

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Table of Contents

List of Illustrations

List of Tables

1. UV PowerMAP and UV MAP Plus Description

Introduction

UV PowerMAP and UV MAP Plus are advanced UV radiometers that measure energy, irradiance, and temperature in UV curing systems. These units are excellent tools for the research and development of UV curing processes in a laboratory environment.

These curing processes easily translate to the production environment after the production curing systems are evaluated. Feedback from the UV PowerMAP or UV MAP Plus helps in maintaining process efficiency and product quality by providing the quantitative data necessary to apply statistical process and quality controls.

The UV PowerMAP measures UV energy and UV irradiance in four wavelength ranges: UVA (320-390nm), UVB (280-320nm), UVC (250-260nm), and UVV (395-445nm). The UV MAP Plus measures one single wavelength range. Both units record temperature.

After a measurement is taken, the data is transferred to a computer. There, it is presented in graphical and tabular forms for analysis. The measurement data is characteristic of the same UV energy and irradiance that would be impinged on an actual work piece exposed to a UV curing process.

Figure 1. UV PowerMAP and UV MAP Plus

Theory Of Operation

Figure 2 shows the block diagram of the UV PowerMAP and UV MAP Plus for UV light measurement and temperature plotting.

UV Light Measurement

The radiometer is comprised of two assemblies - the UV Data Collector (UDC) and the Detachable Optics Block (DOB). When exposed to a UV light source, light radiation of all wavelengths impinges on the optics. The optical stacks, each a series of attenuators, filters, and diffusers, block the visible and infrared spectra and pass the UV channels of interest to photodetectors. Each photodetector converts each channel's light energy to a current that is proportional to its intensity. This current is converted to a voltage, digitized, processed, and stored in the UDC. The data is then transferred to a computer for subsequent analysis.

Temperature Plotting

Temperature is measured through a J type thermocouple probe. This input is connected directly to circuits for conditioning and amplification. The resulting analog voltage is digitized and processed in the same manner as the UV data.

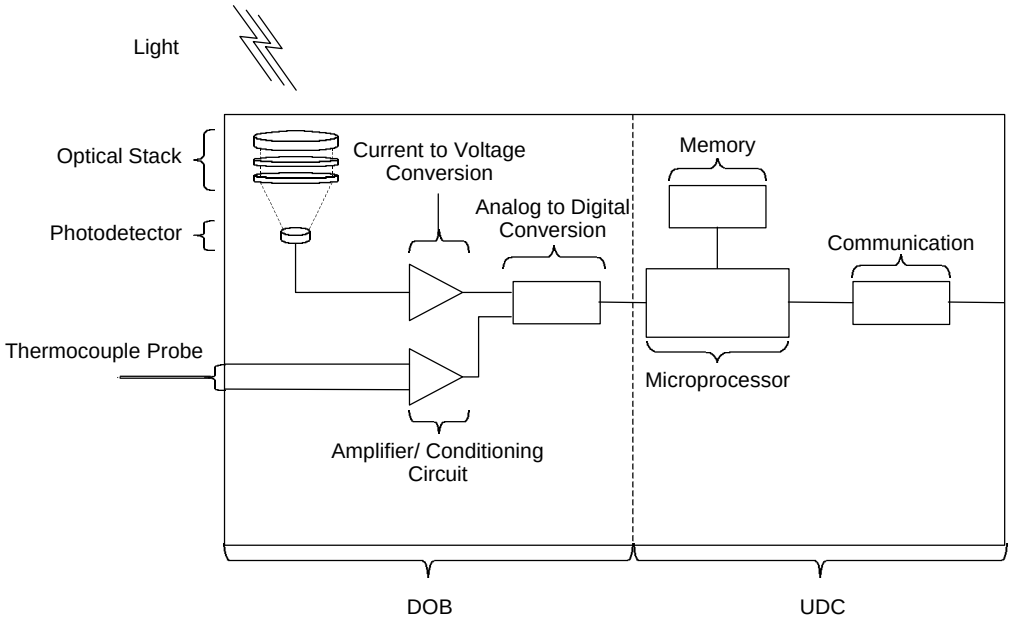
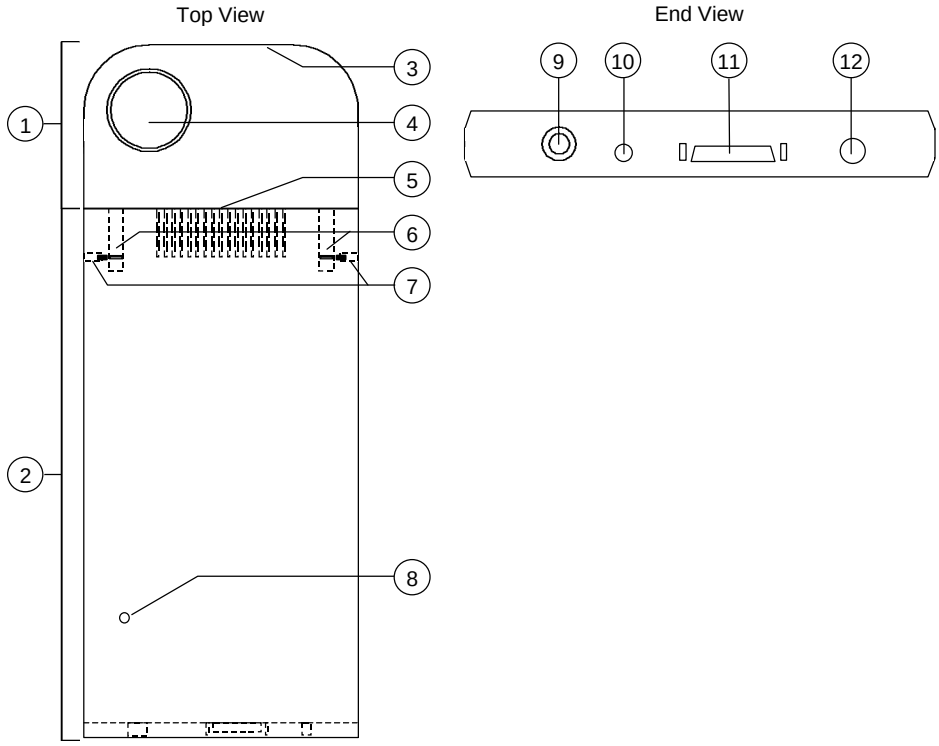


Figure 2. UV PowerMAP and UV MAP Plus block diagram

Controls, Connections, and Indicators

The physical features, controls, connectors, and indicators of the assembled radiometer are shown in Figure 3.



#	**Name**	**Description**
1	Detachable Optics Block (DOB)	Contains optics and A/D conversion circuits
2	UV Data Collector (UDC)	Processes readings and configurations in digital form
3	Thermocouple Jack	Jack for J type thermocouple connector
4	Optics	Optical input to the DOB
5	Interface Pins	Electrically connect DOB to UDC
6	Connecting Pins	Mechanically connect DOB to UDC
7	Set Screws	Secure connecting pins in UDC
8	Audible Alarm	Audible feedback and alarms
9	Charging Jack	Jack for battery charger plug
10	LED Indicator	Visual feedback of unit status and alarms
11	Input/ Output (I/O) Port	Jack for radiometer-to-PC interface cable
12	Pushbutton	Main operating switch (Functions described in text)

Figure 3. UV PowerMAP and UV MAP Plus top and end views

2. Preparation For Use

The conventions used in this manual are listed below, followed by the procedure to prepare the radiometer for first-time use.

Manual Conventions

Cautionary symbols used in this manual are as follows:

 Warning  Caution  Ultraviolet Radiation  Electrostatic Discharge

WARNING statements identify conditions or practices that could result in personal injury or loss of life.

CAUTION statements identify conditions or practices that could result in damage to the equipment or other property.

Notes to the operator appear throughout this manual to aid in operation.

Equipment control and indicator names appear in all capital letters. Descriptors are in small case. For example: “GET CONFIG button”.

Equipment controls and indicators that are unmarked have their first letters capitalized only (e.g. Optics Head).

Equipment Markings

The UV Data Collector and the Optics Heads of the UV PowerMAP and UV MAP Plus are serialized independently. Their serial numbers are etched into the sides of their cases.

The Optics Heads have calibration labels affixed to them. The calibration labels appear as in Figure 4, below.

Figure 4. UV PowerMAP and UV MAP Plus calibration labels

The calibration labels contain the initials of the calibrating technician, the date of calibration, and the calibration’s expiration date.

The calibration labels have designators for which channels are installed in the Optics Head. For the PowerMAP, all four channels (A, B, C, and V) are indicated. For the UV MAP Plus, the channel installed is shown. All other channels are marked out.

The labels also designate whether the heads are high power or low power. The “H” indicates a high-power unit. “L” indicates a low-power unit. (The “X” is reserved for future use).

Initial Charging

1. Plug the charger into an AC outlet that matches the charger's input ratings. The input ratings are embossed in the charger's case.

> ⚠ WARNING!
> Risk of electric shock. Make certain that the AC outlet is the correct voltage and configuration for the charger. Personal injury and/or damage to the unit may occur if the voltage is incorrect.

2. Insert the charger's plug into the UDC's charging jack.

3. Allow the radiometer to charge for 1 hour.

Installing the Thermocouple Probe

1. Insert the thermocouple probe's pins into the holes in the curved end of the Optics Head.

2. Secure the probe to keep it from catching on any equipment.

PowerView Software Installation

Refer to section 12, "Specifications", for computer minimum requirements.

1. Load the Installation Disk in an available drive.

2. From the Program Manager screen, click on the Start button.

3. Click on Run.

4. Click on Browse.

5. Select the drive where the Installation Disk is located and double click on Setup.exe.

6. A Run dialog will appear with the path and file you selected. Click on OK.

7. Follow the screen prompts to complete the installation.

3. Set Up View

The UV PowerMAP and UV MAP Plus are configured at the factory prior to shipping. These settings can be changed so the user can configure the radiometer for his application. The Set Up view is shown in Figure 5. It is divided into four sections - Map Configuration, Map Clock, Map Status, and PC Set Up.

Map Configuration

1. Attach the Interface Cable to the COM Port to be used and the radiometer's UDC.

2. Start PowerView and select Setup from the TOOLS pull-down menu.

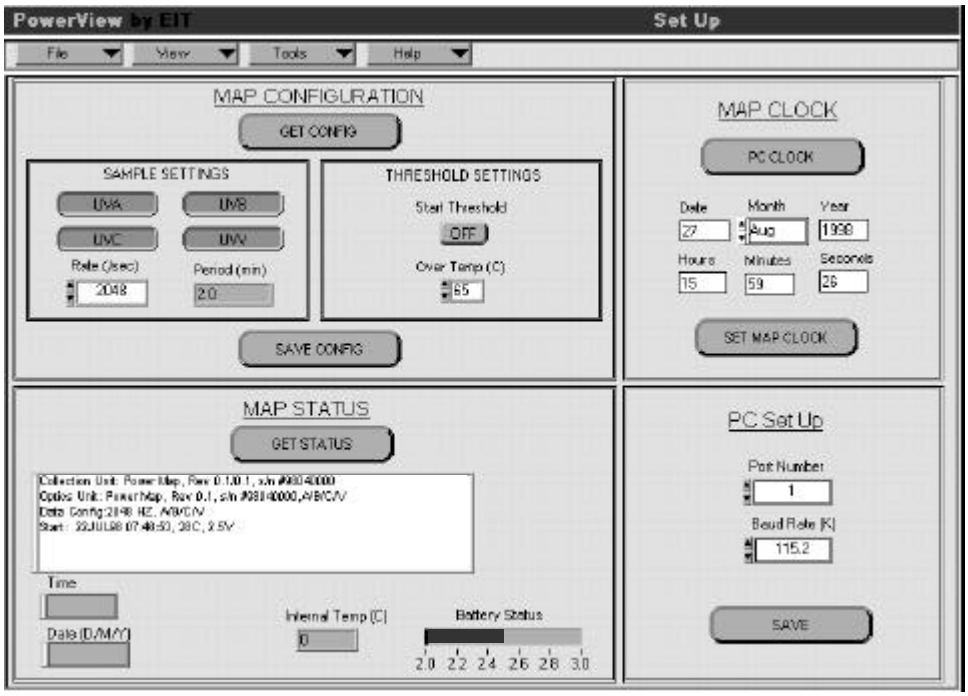


Figure 5. Set Up screen

3. The GET CONFIG button retrieves the radiometer's current configuration. Each enabled UV channel button will be green, disabled ones will be gray. The UV Sample Rate is also displayed.

NOTE: If the radiometer does not respond to the GET CONFIG command, check the PC Setup settings described below.

4. Clicking on a channel's button toggles the channel on or off. For UV MAP Plus, only one channel can be enabled. Verify that the channel enabled is the one on the unit's calibration label.

5. To change the UV Sample Rate, click on the scroll buttons to the left of the box or click on the box and select the desired rate. PowerView automatically calculates and displays the resulting sample period.

6. The THRESHOLD SETTINGS section gives the option of turning the Start Threshold on or off, and setting the temperature limit for the Over Temp alarm. The Start Threshold is used when the operator does not want the unit to

trigger on low-level UV light. It acts as a delay for an application that has a long distance between the beginning of the process and the first UV source. The Over Temp (C) sets the temperature at which the over-temperature alarm will trigger.

7. Click on the SAVE CONFIG button to store the configuration.

Map Clock

This section defaults to and displays the clock settings of the PC. This clock is used to time and date stamp the unit's readings.

1. To manually set the radiometer's clock, toggle the PC Clock button to Manual, and enter the clock settings directly.

2. Store the settings in the radiometer by clicking on the SET MAP CLOCK button.

Map Status

Click on the GET STATUS button to retrieve the unit's information and data configuration. "Collection Unit:" lists the type, firmware revision level, and serial number of the UV Data Collector. "Optics Unit:" lists the same information about the Optics Head and includes the available channels. "Data Config:" lists the sample rate setting and the enabled channels. "Start:" shows the unit's date and time settings, its internal temperature, and its battery voltage.

PC Set Up

NOTE: Refer to the computer's documentation for an available COM port and its baud rate.

1. In the "PC Setup" section, set the Port Number by scrolling up or down, or overwrite the current entry to match the port used.

2. Scroll up or down to select the appropriate Baud Rate in kilobits per second.

3. Click on the SAVE button in the PC Set Up section to store these settings.

4. Basic Operation

After the radiometer is configured for the run, it is disconnected from the PC, then exposed to the UV environment just as the actual product would be. Descriptions of the pushbutton, audible alarm, and LED indicator are given to aid in equipment familiarization.

Pushbutton Operation

A single pushbutton on the unit acts as the main operating switch. Its operation is based on pressing it for a short or long period.

A short press turns the unit on and puts it in standby.

A second short press resets the unit, clears any stored data, and then puts the unit in its run mode.

A long press turns the unit off.

Audible Alarm

The audible alarm gives the operator audible feedback for button presses and error conditions.

Each time the pushbutton is pressed, the audible alarm will give a short “beep”.

When the pushbutton is pressed and held, the audible alarm will beep longer and stop. When the beep stops, release the pushbutton. This turns off the unit.

The audible alarm will “chirp” once approximately every five seconds to indicate a low battery condition. Re-charge the batteries as instructed in section 11, “Routine Maintenance”.

The audible alarm will beep approximately once every 1.5 seconds to indicate an overtemperature condition. (The alarm triggers when the unit’s internal temperature exceeds the Over Temp setting in Set Up view). Allow the unit to cool prior to any further use.

If the audible alarm beeps at a fast rate, an error has been detected. Contact EIT per section 14, “Warranty and Returns”, for further assistance.

LED Indicator

In standby mode, the LED will flash red at about one flash per second. The period (time on) of the LED indicates the memory fill status. As the memory fills, the LED flashes at the same rate, but remains on for a longer period. If the LED remains on, the memory is full.

When the unit is switched to run mode, the LED changes from red to green, and continues to show the memory status.

If the LED flashes red or green at a constant, fast rate with the audible alarm, an error has been detected. Contact EIT per the Warranty and Returns section of this manual for further assistance.

The Basic Data Run

1. From the standby mode, short-press the pushbutton to toggle the radiometer into its run mode. Verify that the memory is not full.

2. Expose the radiometer to the UV source to be measured.

 Ultraviolet Radiation

Risk of exposure to ultraviolet radiation. Although this product is not a source of UV light, it is used in a UV environment. Refer to the UV source’s documentation for recommended protective measures.

 WARNING!

The case of the PowerMAP may be hot. Be careful when removing the radiometer from extended or heat-intensive runs.

3. Upon removal from the UV environment, short-press the button to put the unit back into standby.

4. Connect the unit to the computer with the cable provided.

5. Transfer View

The run data is uploaded into the PowerView software through the Transfer View screen (Figure 6).

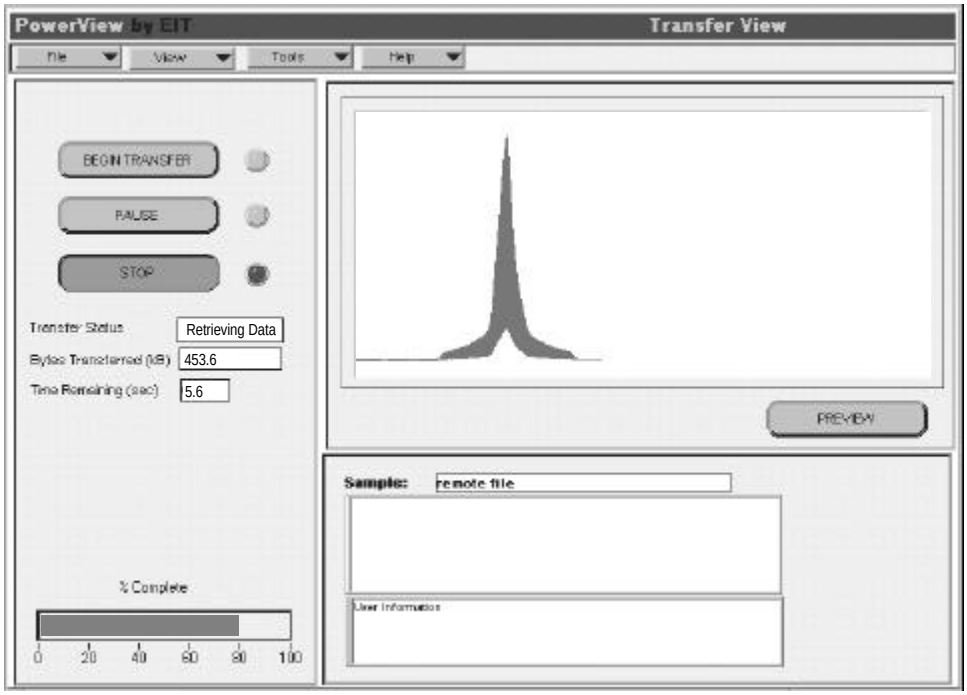


Figure 6. Transfer View screen

Uploading Data

1. Connect the unit to the COM port of the computer using the interface cable provided.

2. From the VIEW pull-down list, click on TRANSFER.

3. Click on the BEGIN TRANSFER button to start the upload. The transfer can be paused by clicking on PAUSE, or halted by clicking on STOP. (Halting the transfer allows the data already transferred to be stored). The Transfer Status, Bytes Transferred, Time Remaining, and % Complete show the transfer's progress.

4. In the right side of the screen, click on the PREVIEW button for a preliminary view of the plot. After the transfer is complete, a detailed look at the plot is available in the Graph View screen.

5. The Unit Configuration and User Information are displayed in the bottom right of the Transfer View screen. The Unit Configuration loads from the radiometer and cannot be edited. User Information, such as UV system identification and test conditions, can be entered at this time.

6. Graph View

After the plot is uploaded, it is viewed by selecting Graph View from the View pull-down menu.

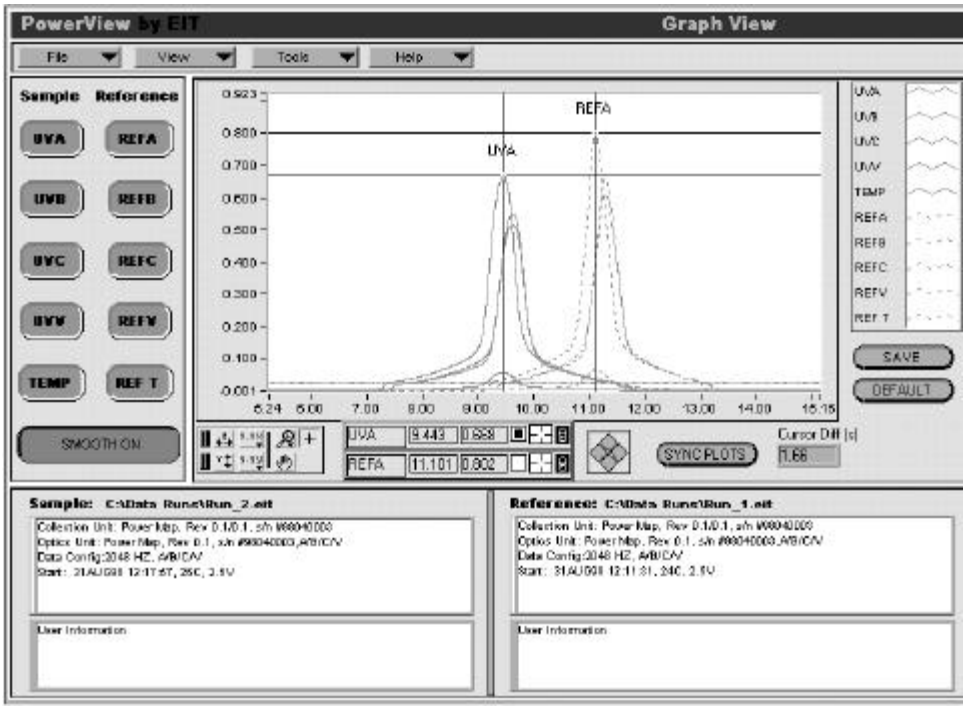


Figure 7. Graph View screen

Channel Display

In the upper left corner of the Graph View screen, the Sample and Reference buttons control which active channels - channels that were enabled during the run - will be displayed. Click on these buttons to toggle the display of the channels.

NOTE: The UVB and UVC peaks are shifted in relation to the UVA and UVV peaks due to the spacing of the sensors in the Optics Head.

Smooth On/Off

The SMOOTH ON/OFF button is located directly below the channel display buttons. Its function is described in detail in section 7, Data View.

Click on the SMOOTH ON/OFF button to toggle the smoothing on or off. The button color and name change to indicate whether it is on.

Channel Options

The table in the upper right corner of the screen lists the channels that were enabled for the run. Disabled channels are listed “N/A”.

Click on the channel name for a menu of channel options. The menu structure is shown in Figure 8.

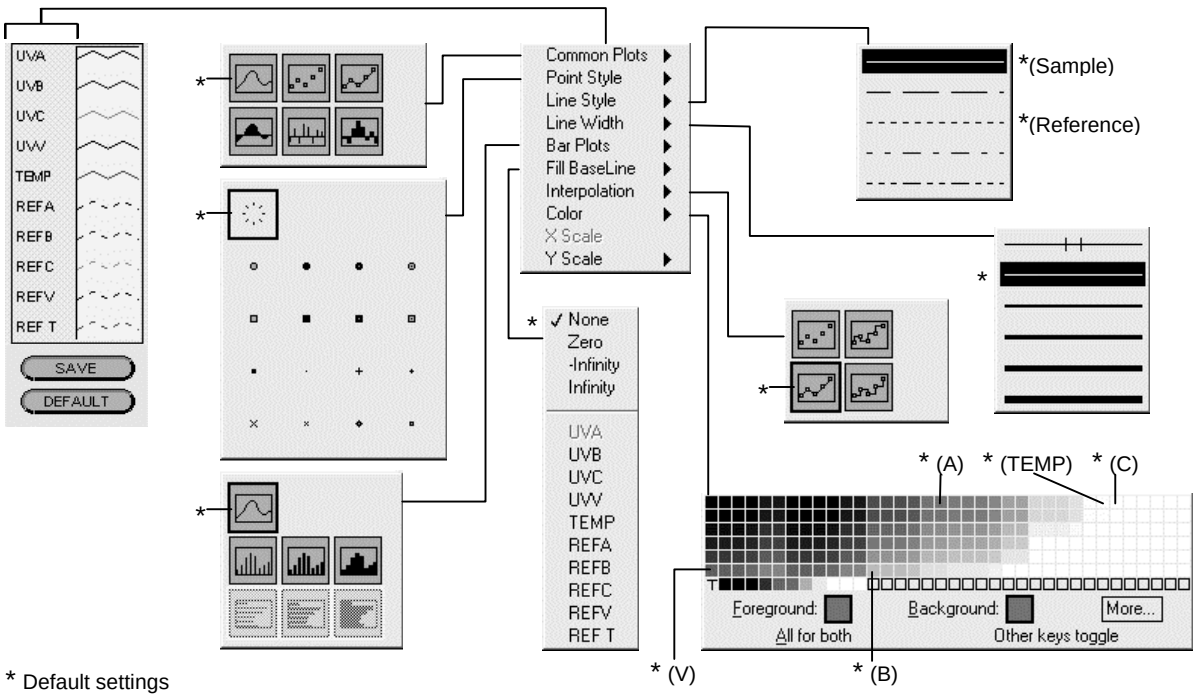


Figure 8. Channel Option menu structure

To change the color and/or appearance of a trace in the plot, click on the trace's name and choose the desired options from the pop-up menus.

Once the channels are set, click on the SAVE button to store the settings. Click on the DEFAULT button to restore the trace options to the original factory settings.

Graph View Controls

An important feature of PowerView is its ability to simultaneously compare two runs in its Graph View screen. The Graph View controls are located under the graph area, and appear as shown in Figure 9. Scaling, Zoom, Cursor, Plot Overlay, and Position are the major sections of the Graph View controls. A list of their descriptions follows.

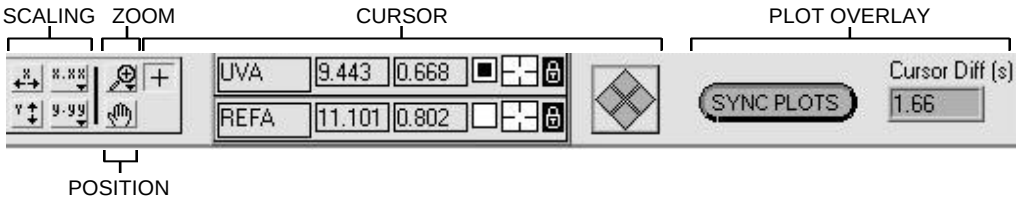


Figure 9. Graph View controls

Scaling Controls

When a plot is transferred or opened, PowerView automatically sets the X and Y axes to fit the plot in the viewing area. The first two pairs of controls are used to scale and format these axes.

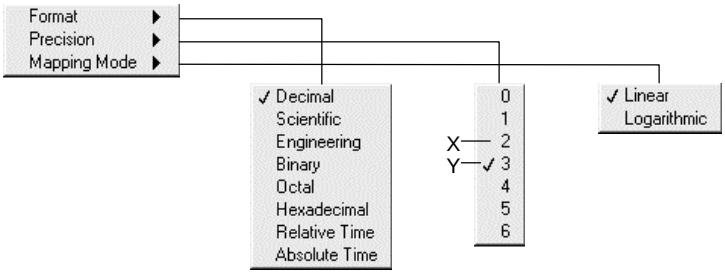
Auto Scale

Sets the plot horizontally and/or vertically to fit the entire plot in the viewable area. These are used mostly for aborting zoom functions.

X, Y Axis Scale

Activates a pop-up menu to change the Format, Precision, or Mapping Mode of the X or Y axis (Figure 10).

"Format" changes the presentation of the axis numbering.
"Precision" sets the number of decimal places in the axis numbering.
"Mapping Mode" scales the axis either linearly or logarithmically.



(Default settings shown).

Figure 10. X and Y Scale menu structure

Zoom Controls

These controls are in a pop-up activated by the Zoom control. When a zoom function is selected, the mouse pointer changes to a magnifying glass.

Zoom

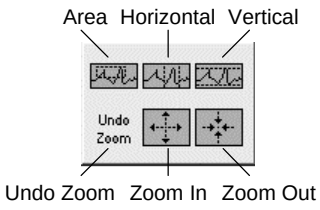


Figure 11. Zoom controls

Area, Horizontal, - Vertical zoom — Select the type desired, then click and drag the pointer to define the zoom area (dashed lines will border the area). The zoom occurs when the mouse button is released.

Undo Zoom - Undoes the last zoom performed.

Zoom In, Out - Provide repeated zooming in or out, respectively.

Plot Position Control

The operator can move the plot through the viewing area using the Plot Position control.

Plot Position  When selected, the pointer changes to a hand. Click and drag the pointer to move the plot across the viewable area.

Cursor Controls

Cursor measurement lets the operator make absolute and relative measurements to analyze run data.

Cursor  When the Cursor control is active, the pointer will appear as a cross hatch that changes when placed on a cursor. Click and drag the cursor to the location desired.

Cursor Name 

UV(X) - The sample cursor label, REF(X) - The reference cursor label. The label changes between UVA, UVB, UVC, and UVV or REFA, REFB, REFC, and REFV, respectively, to reflect the trace to which the cursor is currently, or was previously, snapped or locked. If the trace is turned off, the label will say "OFF".

X Position 

Displays the horizontal coordinate of the cursor. Whether the cursor is locked or free, the user can edit the coordinate to place the cursor horizontally. (The Y Position box does not update for a new vertical position until the cursor is adjusted with the Cursor control, or the user goes to another screen and returns).

Y Position 

Displays the vertical coordinate of the cursor. With the cursor lock set to “Free” (see Cursor Lock, below), the user can edit the coordinate to manually place the cursor.

Fine On/Off 
Toggles the Fine Adjust control for the cursor. A black box indicates the Fine Adjust is enabled. If both cursors have this enabled, they will adjust simultaneously.

Cursor Option 
Activates pop-up menu to change the cursor appearance, show/hide the cursor name, or locate the cursor (Figure 12).

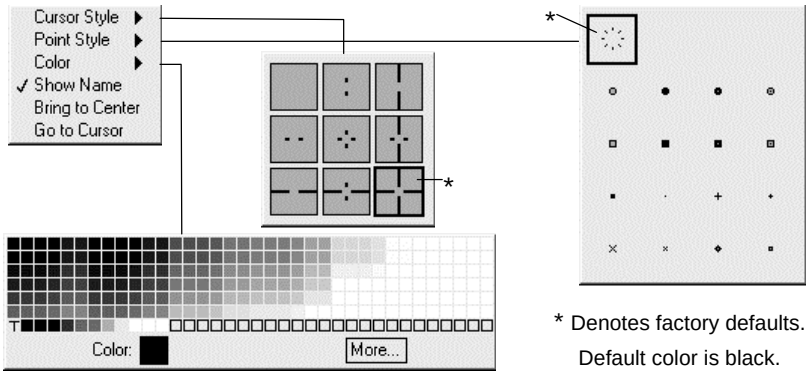


Figure 12. Cursor menu structure

Cursor Lock

Activates pop-up menu (Figure 13) to select free or locked cursor movement.

When “Free” is selected, the cursor(s) can be placed anywhere in the viewing area.

“Snap to point” attaches the cursor to a trace in the following way:

Click and drag the cursor’s horizontal axis to move up and down between adjacent traces.

Click and drag the cursor’s vertical axis to move the cursor back and forth along the selected trace.

“Lock to plot” works the same as “Snap to point”, except the cursor cannot jump to an adjacent trace.

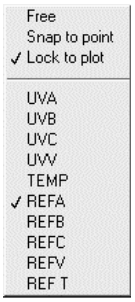


Figure 13. Cursor lock menu

Fine Adjust

When enabled (see Fine On/Off, above), the cursor is moved slightly up, down, left, or right by clicking on the appropriate diamond. When the Fine Adjust is enabled for both cursors, it moves them simultaneously.

Plot Overlay Controls

SYNC PLOTS

The SYNC PLOTS button is used to overlay two points in the plot area by horizontally aligning the Reference and Sample cursors.

Cursor Diff(s)

The distance between the Reference and Sample cursors.

Overlaying two separate plots is described in the following example (see Figure 14).

Move the cursors to the two points to overlay. In this example, the UV(X) cursor is placed on the Sample plot's peak and the REF(X) cursor is placed on the Reference plot's peak.

Click on SYNC PLOTS. A pop-up will appear with two options: "Adjust by 1.66 Sec." and "Reset to 0 Offset". Note that the 1.66 seconds is shown in the Cursor Diff(s) box.

Click on "Adjust by 1.66 Sec." to overlay the Sample cursor on the Reference cursor. Click on the "Reset to 0 Offset" button to reverse this function.

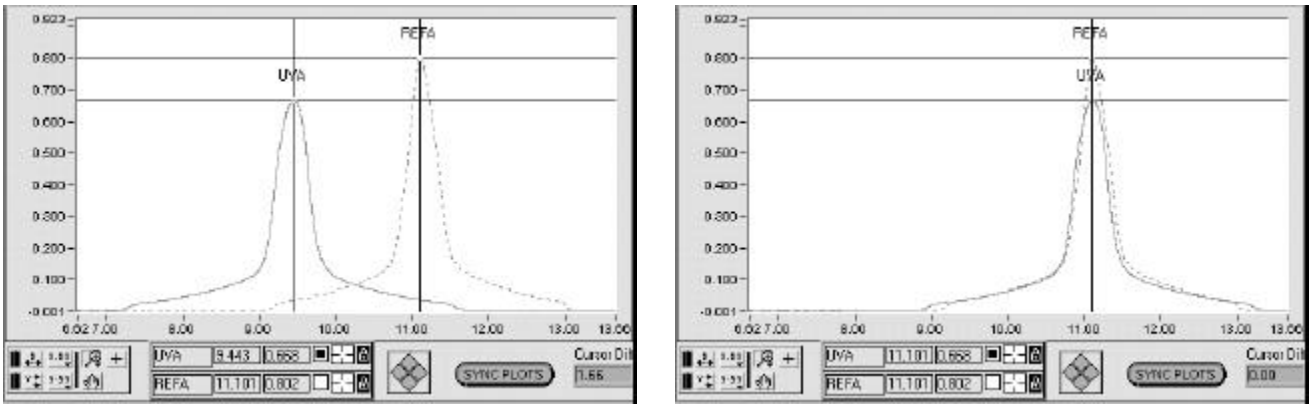


Figure 14. Overlaying two traces

Separating two overlapped plots is described in this example, shown in Figure 15.

Place the UV(X) cursor to the right of the Sample trace (solid line) and the REF(X) cursor to the left of the Reference trace (dashed line).

Click on SYNC PLOTS and click on "Adjust by -3.00 Sec". When the UV(X) cursor moves left and the REF(X) cursor moves right, the traces are shifted outward. Now they can be viewed individually.

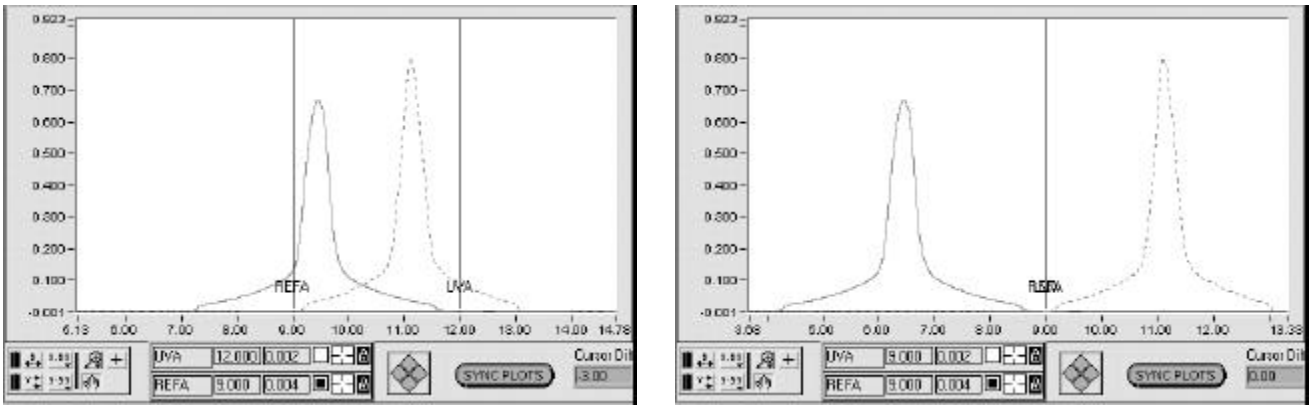


Figure 15. Separating two traces

Sample

The upper block of the Sample section shows the unit identification and certain test conditions for the sample plot. First, it lists the Collection Unit name, firmware revision, and serial number. Secondly, it lists the same information for the Optics Unit plus the UV channels installed in it. Next, the Data Config(uration) gives the sample rate and which UV channels were enabled for the run. Lastly, the start date and time stamp for the run are displayed, along with the unit's internal temperature and battery voltage. All the information in this part of the Sample section is automatically generated by the unit and cannot be edited. The lower block can be edited and is used for comments such as lamp settings, line speed, materials used, or lot numbers to the data file.

Reference

The upper block of the Reference section shows the unit identification and certain test conditions for the reference plot. First, it lists the Collection Unit name, firmware revision, and serial number. Secondly, it lists the same information for the Optics Unit plus the UV channels installed in it. Next, the Data Config(uration) gives the sample rate and which UV channels were enabled for the run. Lastly, the start date and time stamp for the run are displayed, along with the unit's internal temperature and battery voltage. All the information in this part of the Reference section is automatically generated by the unit and cannot be edited. The lower block can be edited and is used for comments such as lamp settings, line speed, materials used, or lot numbers to the data file.

7. Data View

The Data View screen displays the UV and temperature readings for the active channels numerically. It has five main sections - Total Energy Density / Average Temp, Peak Power Density / Peak Temp, a section containing Smooth, Cursor, and Threshold controls, a Sample section, and a Reference section.

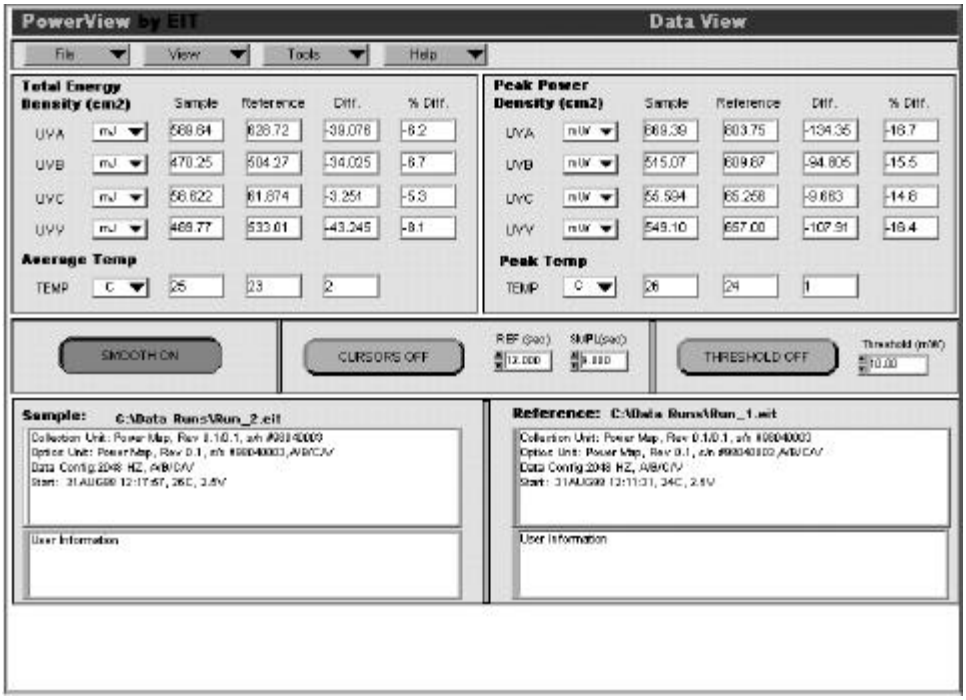


Figure 16. Data View screen

Total Energy Density

The Total Energy Density readings are shown in Joules/cm^2. These readings represent the calculation of power density over time - the mathematical integral under the plot curve. The Average Temp is the mathematical integral under the temperature curve.

1. Click on the J/mJ button to toggle between Joules/cm^2 and milliJoules/cm^2.

2. Click on the C/F/K button to change the Average Temp scale between Centigrade, Fahrenheit, and Kelvin scales.

3. The Sample, Ref., Diff., and %Diff. columns list the energy densities and temperature for the sample plot and reference plot, the numerical difference between them (Sample - Reference = Diff.), and the difference as a percentage ([Diff. ÷ Reference] X 100 = %Diff.). PowerView does not calculate the %Diff. for Average Temp.

Peak Power Density

The Peak Power Density readings are shown in Watts/cm^2. These readings represent the peak intensity of each channel measured. The Peak Temp is the highest temperature recorded for the run.

1. Click on the W/mW button to toggle between Watts/cm^2 and milliWatts/cm^2.

2. Click on the C/F/K button to change the Peak Temp scale between Centigrade, Fahrenheit, and Kelvin scales.

3. The Sample, Ref., Diff., and % Diff. columns list the peak power densities and temperature for the sample plot and reference plot, the numerical difference between them (Sample - Reference = Diff.), and the difference as a percentage ([Diff. ÷ Reference] X 100 = %Diff.). PowerView does not calculate the %Diff. for Peak Temp.

Smooth On/Off

In the power supply of many UV lamps, an AC voltage - at twice the line frequency - actually powers the lamp. This causes the lamp output to cycle at that frequency.

Because of the higher sampling rates of the UV PowerMAP and UV MAP Plus, this cycling appears in Graph View as an AC waveform.

The smoothing function is a fourth-order, low-pass filter with a corner frequency of 20 Hz. It removes the AC waveform from the Graph View display and Data View calculations to make the plot more readable. The control's name and color indicate whether the function is on or off.

Cursors On/Off

The Cursors On/Off control toggles the cursors on for measuring different areas of the plot. When the cursors are turned on, only the section of the plot between the cursors is measured.

The two boxes to the right of the Cursors control show the horizontal (X) coordinates of the UV(X) and REF(X) cursors. These are used to adjust the horizontal position of the cursors from within Data View.

Figure 17 shows the cursors being used for comparing the peak power densities of two different runs. The runs shown are from the same UV source, but the Sample run was taken with the source raised approximately one inch.

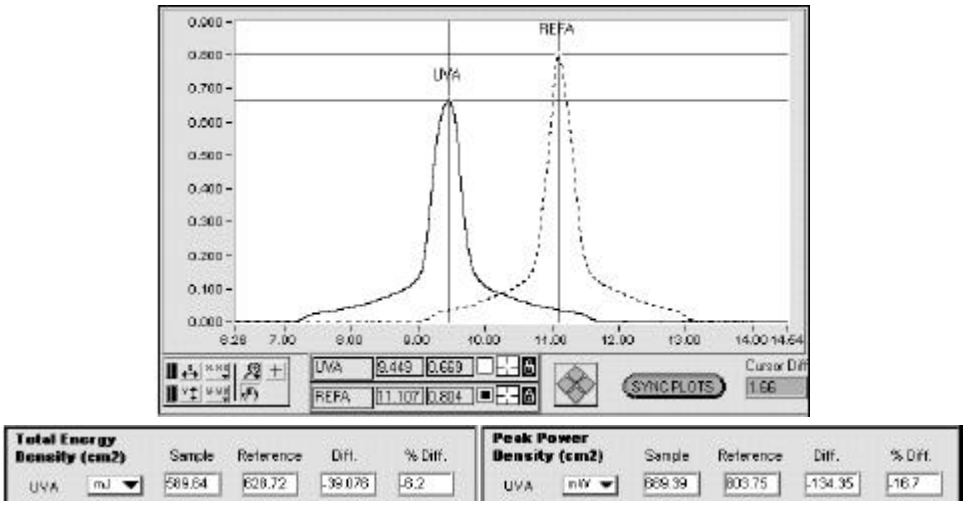


Figure 17. Peak comparisons

With the UVA and REFA cursors on their respective peaks, the difference between the two peaks can be seen in the Y Coordinate boxes (0.804 and 0.669).

To see the measurement more accurately, go to the Data View screen. It will appear as in the bottom of Figure 17.

Note that the Peak Power Density of the Sample trace is about the same as the Y coordinate of the UVA cursor. The same is true for the Reference trace and REFA cursor. The “Diff.” column shows the difference between the readings (Sample - Reference = Diff.). The %Diff. column shows the difference as a percentage ([Diff. ÷ Reference] X 100 = %Diff.).

With the cursors on, the Total Energy Density, Peak Power Density, and Temperature readings are taken from between the cursors. Figure 18, below, shows the UV(X) cursor locked to the sample UVA trace. The Reference traces are off, so the REF(X) cursor is labeled "OFF". The shaded area on the plot is the Total Energy Density between the cursors. The Peak Power Density is at the OFF cursor, the highest point between the cursors.

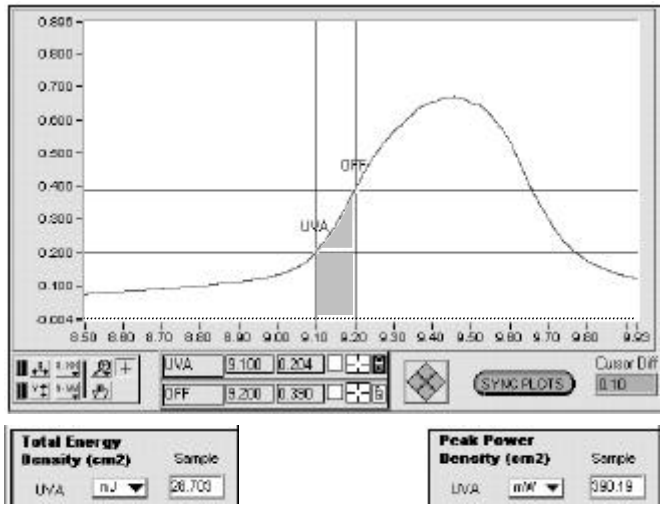


Figure 18. Cursor measurement - single trace (1)

Figure 19 shows the cursors on either side of a peak. In this case, the Total Energy Density is still the shaded area, but the Peak Power Density is the highest point on the trace, not the OFF cursor position.

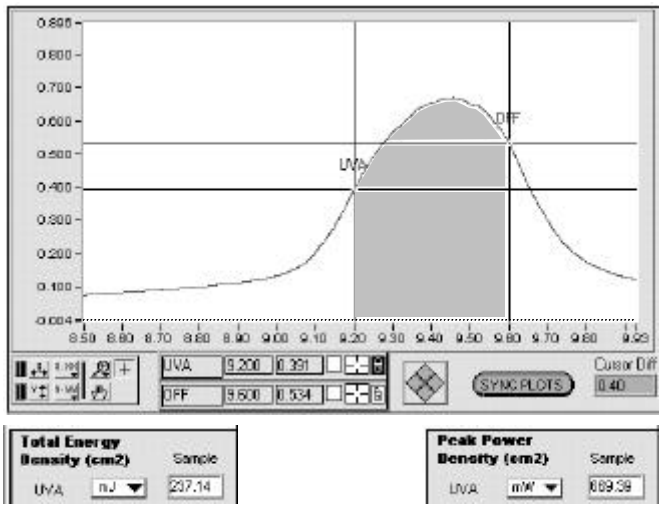


Figure 19. Cursor measurement - single trace (2)

Threshold On/Off

The Threshold function changes the total energy density in Data View to remove low-level light from the calculations.

This threshold is defined as an on/off trigger point. When the peak power density is higher than the Threshold setting, the energy density calculation starts. When the peak power density is lower than the Threshold setting, the energy density calculation stops. Thresholds are often used to remove random noise from total energy density readings.

To set the Threshold, click on the Threshold On/Off button. Adjust the threshold using the Threshold (mW) control to the right. Type in the desired setting, or click on the increment/decrement arrows.

The following example describes how the Threshold function works.

Figure 20 shows a UVA trace with both cursors on it. (The cursors do not have to be on. They are used in this example for clarity). The Total Energy Density reading and the Threshold setting are shown below the plot.

With the cursors on and the threshold off, the total energy density is 1.874 mJ/cm^2, the shaded area under the curve.

Figure 21 is the same plot with the threshold on and set to 10.00 mW. When the power density reaches 10.00 mW, the UVA is measured from 0.00 mW/cm^2 up. The shaded area now represents 1.002 mJ/cm^2, roughly half the previous reading.

Note that the Peak Power Density does not change regardless of any threshold setting.

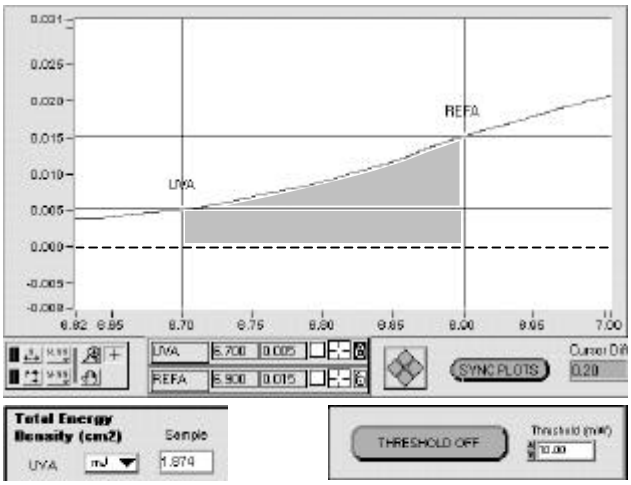


Figure 20. UVA Plot without Threshold

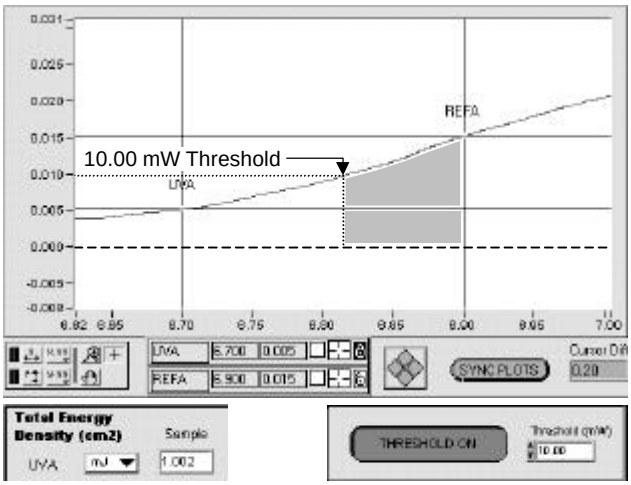


Figure 21. UVA Plot with 10.00 mW Threshold

Sample

The upper block of the Sample section shows the unit identification and certain test conditions for the sample plot. First, it lists the Collection Unit name, firmware revision, and serial number. Secondly, it lists the same information for the Optics Unit plus the UV channels installed in it. Next, the Data Config(uration) gives the sample rate and which UV channels were enabled for the run. Lastly, the start date and time stamp for the run are displayed, along with the unit's internal temperature and battery voltage. All the information in this part of the Sample section is automatically generated by the unit and cannot be edited.

The lower block can be edited and is used for comments such as lamp settings, line speed, materials used, or lot numbers to the data file.

Reference

The upper block of the Reference section shows the unit identification and certain test conditions for the reference plot. First, it lists the Collection Unit name, firmware revision, and serial number. Secondly, it lists the same information for the Optics Unit plus the UV channels installed in it. Next, the Data Config(uration) gives the sample rate and which UV channels were enabled for the run. Lastly, the start date and time stamp for the run are displayed, along with the unit's internal temperature and battery voltage. All the information in this part of the Reference section is automatically generated by the unit and cannot be edited.

The lower block can be edited and is used for comments such as lamp settings, line speed, materials used, or lot numbers to the data file.

8. Manipulating Files in PowerView

Clicking on the FILE button opens a pull-down list for manipulating files.

Opening Files

When OPEN is selected, a pop-up will ask whether to open the file as a Sample or Reference plot. Check the appropriate box or click on Exit to abort.

A file can also be opened to replace an open Sample or Reference file. The new file is displayed and the other file is closed.

NOTE: A run must be saved as a file before another file is opened on top of it. Otherwise, the run data will be lost.

Closing Files

To close a file, click on CLOSE. A pop-up will ask which file to close (Sample or Reference). Select a file or click on Exit to abort.

NOTE: A run must be saved as a file before closing it or the run data will be lost.

Saving Files

To save a run as a file, click on SAVE. A pop-up will ask whether to save the run as a Sample or Reference file.

1. Check the appropriate box or click on Exit to abort.
2. Enter a name for the file before the numeric suffix. (The suffix appears as "_x" where x is a number that automatically increments with each file save on that day).
3. PowerView gives a default extension (.eit) to files saved in it. Do not change this extension.
4. Click on SAVE to save the file or CANCEL to abort.

Exporting Files

Files can be exported into spreadsheets from PowerView as follows.

1. Click on the File pull-down menu and select Export.
2. A File Export dialog will appear. Select which file (Sample or Reference) to export. An Enter Filename dialog will appear.
3. Select a location for the file.
4. PowerView defaults to the file's current name. It can be changed if desired. If the file already exists, you will be prompted whether to overwrite the existing file.
5. PowerView defaults to a Custom Pattern (*.txt) file type. Do not change the file type.
6. Click on Save. The data run file is now a tab-delimited text file, which can be imported into a spreadsheet program.

Printing Data

Click on PRINT to print the current screen to your active default printer.

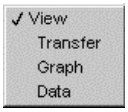
Exiting PowerView

Save any unsaved data runs before exiting. Otherwise, they will be lost.

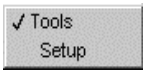
Click on EXIT to close the PowerView application.

Switching Views

Click on the View button for a pull-down list of the Transfer, Graph, and Data views. Select the view desired.

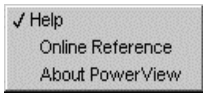


For Setup View, click on the Tools button and select Setup.



Online Help

Click on the Help button to access the Online Help or to view the PowerView version level and copyright information.



Year 2000 Compliance

Year 2000 Compliance implies that the date change from ’99 to ’00 will not affect date-sensitive, numerical calculations.

Although dates can be entered as user information to identify a data run in PowerView, they are not involved in any calculations, and in no way affect measurement results.

9. Basic Applications

Evaluating UV Lamp Output

The trace in the Graph View screen allows you to compare the peak UV intensity of each lamp in a multi-lamp curing system. If you expect similar peak intensities from each bulb in a multi-lamp system you will be able to very clearly see when one bulb is not performing as well as the others. PowerView software allows you to save the information from a lamp system - when the bulbs are new and reflectors are clean - as a reference for comparison with future readings. UV PowerMAP allows you to profile and compare the output in the four spectral channels that it measures. UV MAP Plus does the same on one specific channel.

Focusing Lamps

The shape of the trace in Graph View can indicate whether a lamp is focused. A non-uniform or jagged curve indicates that the bulb is not physically located at the reflector’s focus. The trace will also allow you to compare reflector materials, reflector shapes, and wavelength specific degradation over time or with other systems.

Monitoring Temperature

Many substrates and compounds used in UV curing will deteriorate or undergo physical change when subjected to excessive temperatures. High infrared temperatures accompany the UV in many curing systems. Temperature measurement helps you maintain the balance between getting the necessary amount of UV and exceeding the temperature range of the product. Temperature results from the thermocouple are best utilized if the thermocouple can be placed on the same plane as the optical window on the Optics Head.

10. Discussion on Sample Rates

NOTE: This discussion uses the UV PowerMAP as an example. Comparisons for the UV MAP Plus can be drawn from this discussion as well.

Technological improvements allow the UV PowerMAP to sample much faster and store more information than radiometers designed just a few years ago. Earlier radiometers had sample rates up to 160 samples per second (S/s) and could store a maximum of 6000 UV and temperature data points. The UV PowerMAP has a maximum sample rate of 2048 S/s and can store up to 180,000 data points in its memory.

In PowerView's Setup screen, the user enables or disables any of the four UV channels in the UV PowerMAP (A, B, C, or V). The user also selects a sample rate from 128 to 2048 S/s. As the channels and sample rate are set, the maximum sample time is displayed in minutes. Faster sample rates and more enabled channels will fill the unit's memory faster, decreasing the time available to take data. With the fastest sample rate set and all four channels enabled, the maximum sample time is 1.4 minutes.

Higher sample rates can cause some differences in readings. First, the increased number of instantaneous measurements yields a higher integral resolution. The measurement curve is sharper and more defined, thus increasing the total energy density reading.

Secondly, the peak power density is more accurately measured. The variance when measuring peak power density is a function of the sample rate and the sample period under the focal point of the lamp. Table 1 shows the comparison between UV Power Puck (at 25 S/s) and a UV PowerMAP (at 1024 and 2048 S/s). For the purpose of this comparison, we assume the UV lamp has a 0.75-inch focal plane and the conveyor has a constant speed of 400 feet per minute. Similar calculations can be made for any system if the focal plane and conveyor speed are known.

Calculation	Power Puck @ 25 S/s	UV PowerMAP @ 1024 S/s	UV PowerMAP @ 2048 S/s
Conversion from feet/min to in/sec	400 feet/minute = 80 inches/second	400 feet/minute = 80 inches/second	400 feet/minute = 80 inches/second
Samples/inch unit can measure	25 samples ÷ 80 in. = 0.3125 samples/in.	1024 samples ÷ 80 in. = 12.8 samples/in.	2048 samples ÷ 80 in. = 25.6 samples/in.
Samples measured under the focal plane	0.3125 x 0.75 = 0.2344 Samples	12.8 x 0.75 = 9.6 Samples	25.6 x 0.75 = 19.2 Samples

Table 1. Sample rate comparisons.

Another difference with a higher sample rate appears in the Graph View of the system profile. Most UV lamp systems have power sources that cycle the lamps on and off many times per second. The PowerMAP can actually detect and record this cycling. To reduce the effects of this sensitivity on the plot, the Graph View and Data View screens contain a SMOOTH BUTTON. The SMOOTH BUTTON filters and minimizes these effects to make the profile more readable.

11. Routine Maintenance

Routine maintenance is performed by the user as required. It consists of battery charging, cleaning, removing/installing the Optics Head, and returning the unit for calibration.

Battery Charging

1. Plug the charger into an AC outlet that matches the charger's input ratings. The input ratings are embossed in the charger's case.

>  WARNING!
> Risk of electric shock. Make certain that the AC outlet is the correct voltage and configuration for the charger. Personal injury and/or damage to the unit may occur if the voltage is incorrect.

2. Insert the charger's plug into the UDC's charging jack.

3. Allow the radiometer to charge for 1 hour.

Cleaning

- Optics - Clean the mirrored surface of the optics with a cotton swab and acetone.
- Case - Clean the case of the radiometer using a soft cloth and isopropyl alcohol.
- Thermocouple - Clean the thermocouple probe tip with a soft cloth and acetone as needed.

DOB Removal and Installation

>  ESD Sensitive Device
> The gold pins on the DOB connect directly to circuitry that is sensitive to electrostatic discharge. Personnel should follow proper ESD handling procedures when installing or removing the DOB.

1. TURN OFF THE UV DATA COLLECTOR (UDC) PRIOR TO REMOVING OR INSTALLING THE DETACHABLE OPTICS BLOCK (DOB). Press and hold the pushbutton until the UDC turns off.

2. Using the 1/16" hex driver provided, loosen the setscrews in the sides of the UDC.

3. Carefully pull the Optics Head off the UDC.

4. Put the Optics Head in the transport case provided or equivalent ESD-safe packaging for storage or transportation.

5. To re-install the Optics Head, align its mechanical alignment pins with their holes in the UDC.

6. Making sure that all of the gold pins are aligned with their respective holes, push the Optics Head and the UDC together.

7. Re-tighten the setscrews.

Calibration

UV Process Supply, Inc. recommends that the Optics Head be calibrated every six months.

The calibration expiration date is located on the calibration label on the optics head.

The only item that has to be returned for calibration is the Optics Head. A second Optics Head can be used with the UDC while the first Optics Head is being calibrated. Refer to the preceding instructions for Optics Head removal and installation.

After the Optics Head is removed, carefully pack it in ESD –safe material and return it to:

UV Process Supply
1229 W. Cortland St.
Chicago, IL 60614

A Return Material Authorization number is needed when shipping the unit back for calibration. Call 1-773-248-0099 to obtain this number prior to return. Clearly print the RMA # on the outside of the package.

12. Specifications

Electrical Specifications	
Configuration	2 part: Detachable Optics Head and UV Data Collector (UDC)
	Optics Head: Supports optics to measure 4 spectral regions
	UDC: 256 bytes non-volatile memory
UV Ranges	High Power: UVA, B, V- 200mW/cm^2 to 20W/cm^2; UVC- 20mW/cm^2 to 2W/cm^2
	Low Power: UVA, B, V- 2mW/cm^2 to 200mW/cm^2; UVC- 1mW/cm^2 to 100mW/cm^2
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^{o}C Maximum (Thermocouple range determined by thermocouple wire used. 250^{o}C thermocouple wire supplied with unit.); Sample rate: 32 samples per second
UV Sample Rates	User-settable: 128, 256, 512, 1024, or 2048 samples per second
UV Sample Period	Maximum of 1 hour, determined by configuration
Operating Temperature Range	0-70^{o}C; overtemperature alarm settable from 0-65^{o}C; default setting is 65^{o}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^{o}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.
Communication to PC	
Format	RS232 Serial Port
Speed	User-settable: 9600, 19200, 38400, 57600, or 115200 baud
PowerView Software	
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 or Windows 98 operating system
Interface	Windows-based fully graphical interface
Mechanical Specifications	
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 are subject to change.

Table 2. Electrical and mechanical specifications

Spectral Response Curves

The Spectral Response Curves for the four UV channels are shown in Figure 22 below. The UV PowerMAP has all four channels, the UV MAP Plus has only one channel.

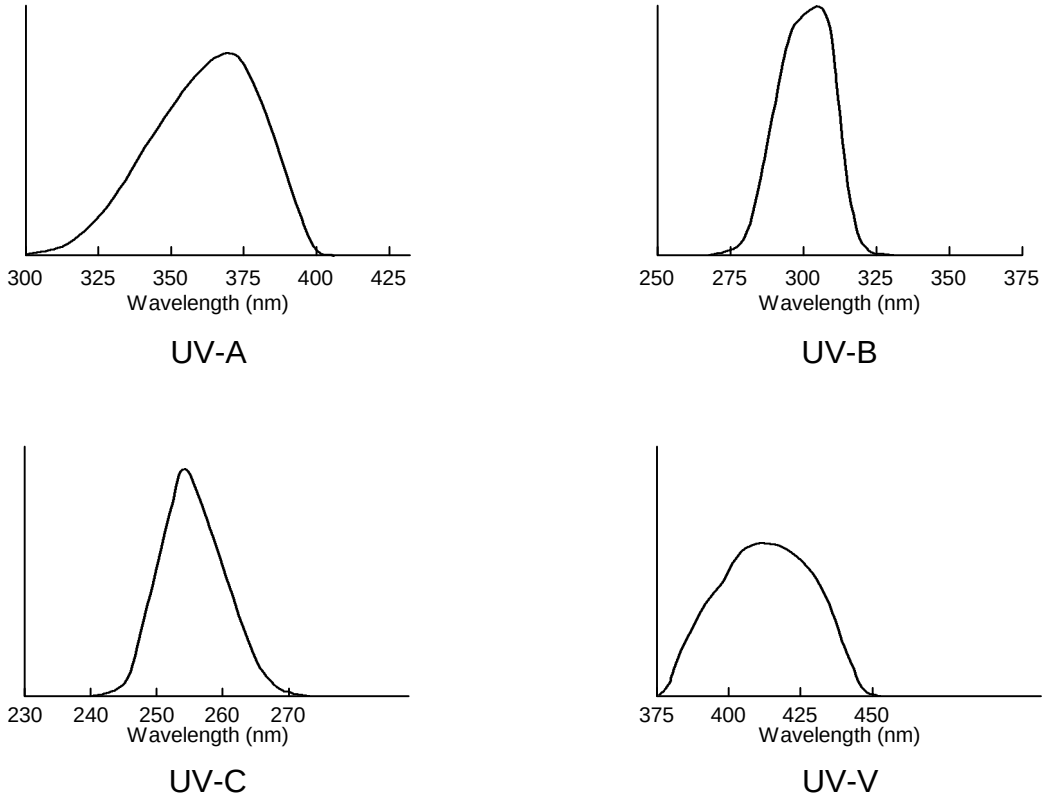


Figure 22. Spectral response curves

Optics Locations

The locations of the optics for each UV channel are shown in Figure 23. The UV PowerMAP has all four channels, the UV MAP Plus has only one channel.

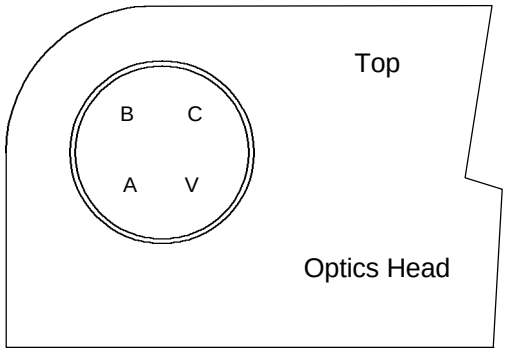


Figure 23. UV channel locations

13. Standard Accessories

These accessories are included in the UV PowerMAP or UV MAP Plus set.

PowerView Software
Battery charger, 110 Volt or 240 Volt
Computer interface cable (2 - part)
Thermocouple probe
Carrying Case
Hex Key
Optics Head Transport Case
Quick Reference Card
Operator's Manual

Optics Heads and standard accessories are available for individual sale.
Contact UV Process Supply for ordering information.