

**MODEL 3D-600 V2.0**  
**ERYTHEMA UV & UVA INTENSITY METER**  
*INSTRUCTION MANUAL*

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## GENERAL DESCRIPTION

This digital meter measures 2 characteristics of ultraviolet radiation emitted from the Liquid Light Guides (LLG) of the Multiport Solar Ultraviolet Simulator.

When UV radiation (UVR) is incident on the Sunburning Ultraviolet (SUV) detector an accurate intensity of the sunburning effect of radiation with wavelengths as short as 270nm is measured. The intensity of the sunburning radiation is measured in Minimal Erythema Doses (MEDs) per minute.

With UVR striking the UVA detector an intensity in joules per minute is measured.

The meter has an analog output so SUV or UVA intensity can be continuously recorded.

An intensity hold and automatic shut off are other functions of the 3D-600 meter.

## MEANING OF THE METER READING

Skin sensitivity for sunburn varies widely. An erythema dose of 1.0 will produce a minimum erythema (reddening) for fair Caucasians (type II skin) on skin areas not ordinarily subjected to UVR. A dose of  $21 \pm 3 \text{ mJ/cm}^2$  at 297nm is a minimal erythema dose\*.

The relative effect of different wavelengths in producing erythema is the same for all people. This relative spectral effectiveness is shown by the Erythema Action Spectrum curve in Figure 1. What varies between people is the absolute values of the radiant energy required to produce erythema. The meter's spectral sensitivity is like that of the skin's erythema action spectrum and its absolute sensitivity corresponds to that of type II skin; a very fair person may require half as much energy to sunburn and a very dark skinned person 5 to 10 times more energy.

The other UVR characteristic which can be determined is the power in the UVA band. This band extends from 320-400nm. It has a weak erythemogenic effect but can cause pigmentation in competent skin. It is also involved in photoallergies and phototoxicities.

Since there are a variety of biologic action spectra in the UVA region the readout is not in terms of any particular action spectrum, as it is for the erythema detector, but is in terms of the total energy in the UVA band.

## OPERATING MODES

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\* Ref.: J. Parrish et al. *Photochemistry and Photobiology*, vol. 36, p. 188

## ***SUV***

To turn the meter on and take readings, use the brass SUV detector and press the SUV button on the front panel. The displayed intensity has the units MED/MIN. A maximum reading of 19.99 MED/MIN can be displayed. The green flashing LED above the button indicates the SUV detector is active.

## ***UVA***

To turn on the meter and activate the aluminum UVA detector press the UVA button. The displayed intensity has the units J/MIN. A maximum reading of 19.99 J/MIN can be displayed. The green flashing LED above the button indicates the UVA detector is active.

Both detectors can not read simultaneously. You can switch between either detector at any time by selecting that detector.

## ***Hold***

Pressing the HOLD button at any time the meter is turned on will freeze the current reading. The enunciator **HOLD** will appear on the left hand side of the LED display. To release the reading press the HOLD button once again and the display will be updated to the current intensity. Pressing the SUV or UVA button will also reset the HOLD function.

Turning the meter off resets the HOLD status and the last reading will not be retained. The HOLD function operates the same way for both the SUV and UVA detectors.

The HOLD function is useful if the detector needs to be in a place where the display can not be read. Once the detector is in place press the HOLD button. You can now move the detector and meter to a position where you can read the display. The automatic shut off is still operative when the HOLD function is active.

## ***Off/automatic shut off***

Turn the meter off by pressing the OFF button.

The meter will shut itself off after eight minutes if the UV intensity is below about 3.2 MED/MIN or 3.2 J/MIN. This helps extend battery life if the meter is accidentally left on. If the meter is to continuously read low intensity levels the automatic shut off can be disabled by removing JP3. See Figure 3 for JP3 location.

## DETECTORS

The SUV detector is brass. It's spectral response is shown in figure 1 along with the erythema action spectrum.

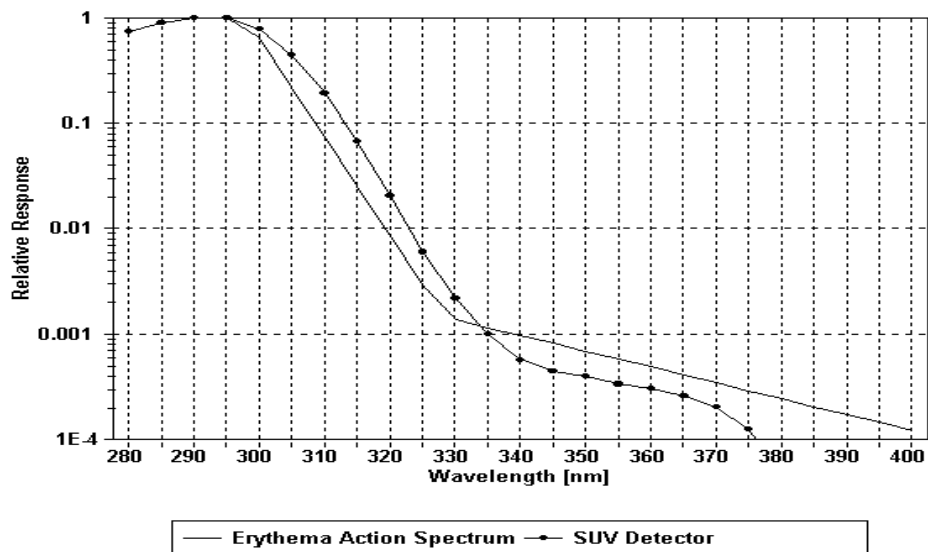


Figure 1. Erythema Action Spectrum vs Typical SUV Detector

The UVA detector is aluminum. The typical spectral response is shown in figure 2.

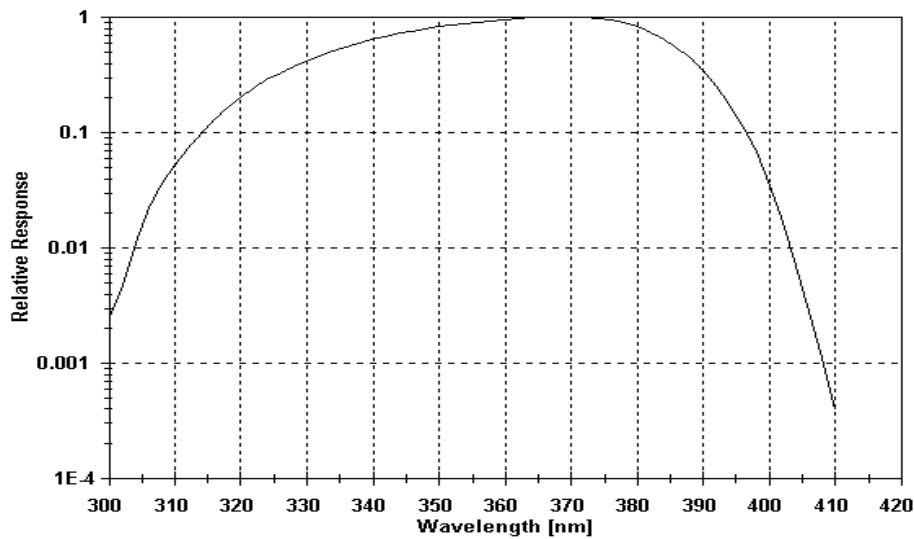


Figure 2. Typical UVA detector Response

The detectors slip over the output end of each LLG. Each detector has its own extension cable.

**The detectors are not waterproof and should be protected from moisture.**

## BATTERY REPLACEMENT

The meter is powered by a standard 9 volt Alkaline battery. In the event the **BAT** enunciator appears on the LCD, replace the battery. To replace, remove the detectors from the meter. Using the supplied 0.050 inch allen wrench remove the two button head allen screws on the top of the case. Separate the top and bottom covers. Remove the battery from the battery cradle and replace it. Hold the bottom cover in one hand and the top cover in the other hand. Insert the grove on the bottom edge of the top case into its mating grove on the bottom case. Make certain the analog output jack aligns with its hole on the bottom cover. Press the top cover down on the bottom cover and replace the screws.

## ANALOG OUTPUT

An analog output is provided at the bottom of the meter. This allows the user to continuously monitor and record the intensity irradiated on the active detector. Recording can be accomplished by a strip chart recorder or an A/D card connected to a computer. Plug the supplied 0.141 inch phone plug into the analog output jack. The red lead is positive and the black lead is negative. The calibration factor for the analog output is 0.1[Volt/(MED/MIN)] or 0.1[Volt/(J/MIN)].

## SPECIFICATIONS

### *Detectors*

#### SUV

Spectral Response	Figure 1
Output	Amps (Calibrated as matched set with meter)
Connector	BNC bulkhead mount jack
Operating Temperature	-10 to +60° C

#### UVA

Spectral Response	Figure 2
Output	Amps (Calibrated as matched set with meter)
Connector	BNC bulkhead mount jack
Operating Temperature	-10 to +60° C

#### Meter

SUV Readout range	0...19.99 MED/MIN
UVB Readout range	0...19.99 J/MIN

Resolution	0.01 MED/MIN or J/MIN
Display	LCD 3 1/2 digit
Operating Temperature	0 to +50° C
Analog Output	0.1[Volt/(MED/MIN)] or 0.1[Volt/(J/MIN)]
Analog Output connector	.141 Miniature Phone Plug
Power consumption	< 300uA
Power by	9 volt Battery