



PUV-2500

A wide-dynamic range profiling radiometer for measuring downwelling UV irradiance.

Biospherical Instruments Inc. PUV-2500 Profiling Ultraviolet Radiometer system is designed to make measurements of vertical profiling of UV and PAR (Photosynthetically Active Radiation -- 400-700 nm) irradiance underwater to 350 meters. The instrument combines UV optimized irradiance and radiance optics, a high-speed data acquisition system, and advanced electronics in a compact, rugged design.

The PUV-2500 measures downwelling cosine irradiance, pressure/depth, and water temperature. The standard optical configuration uses 7 highly stable solid-state filter-photodetectors with center wavelengths at 305, 313, 320, 340, 380, 395 nm, PAR for measurements of downwelling irradiance and a single photodetector for measurements of chlorophyll upwelling Natural Fluorescence. Optionally, the PUV-2500 can be ordered featuring 8 wavebands of downwelling irradiance alone, without upwelling Natural Fluorescence capability.

The PUV-2500 utilizes our new Windows®-based, PROFILER operating and data-acquisition software. This custom software offers full-color graphical display with multiple, user-selected channels and allows a high degree of interaction and customization. This software stores collected data in a Microsoft Access® database format, which simplifies their export to other applications.



Key Features

Measures seven (or optionally 8) wavebands of downwelling irradiance in the ultraviolet, broadband PAR (400-700 nm) and upwelling natural fluorescence from chlorophyll

Includes sensors for measurement of pressure/depth (350 m maximum) and water temperature

Uses specialized highly stable, UV solid-state sensors with optimized interference filters

Radiometrically matching surface instrument (PUV-2510) is also available

Compact design is battery-powered and ideal for hand deployment from a small craft

Features

Highly versatile because of its small size and lightweight design, the PUV-2500 can be used in traditional vertical profiling mode (surrounded by a lowering frame and supported by its own cable) or, by employing our new free-fall design option, in free-descent mode. The optional free-fall system allows the researcher to “kite” the instrument away from the vessel, thereby avoiding problems caused by ship shadow.

The instrument is shipped with a rechargeable battery-powered deckbox, AC adapter/charger, and Windows®-based software. Accessories—including a stainless-steel lowering frame, free-fall deployment system and underwater cables—must be ordered separately.

PUV-2510 Surface Radiometer

A typical PUV-2500 system often includes a PUV-2510 reference radiometer. The PUV-2510 is a downwelling surface irradiance sensor designed to radiometrically match the underwater instrument, but optimized for use in air. Operating together, the two instruments may be compared to monitor PUV performance for interference from shadows cast by boats or clouds and to assist in the development of atmospheric corrections. This instrument is not temperature regulated, however it may be deployed separately for short-term measurement of UV-PAR surface irradiance.



The PUV-2510 may be used as a surface reference for the PUV-2500 or as a stand-alone UV-PAR surface instrument

Calibration

Optical calibrations are performed in accordance with the methods outlined by the National Institute of Standards and Technology (NIST), National Bureau of Standards (U.S.) Technical Note 594-13 and NBS Special Publication 250-20.



The PUV-2500 may be deployed by hand or overhead crane.



PUV System Electronics Specifications

Microcontroller: High performance PIC17C756 CMOS microcontroller
Featuring 8bit, 18.432MHz frequency, internal 16K non-volatile EEPROM

Data Acquisition: A high accuracy 16 bit ADC with a PGA input yielding a 10 VFS and 1.3 μV LSB

The microprocessor enables auto zero and gain corrections for the A/D and PGA

A set of internal voltage references are also used in calibrations

32 channel multiplexer selects analog signals from up to 8 photodetectors, temperature, pressure and tilt/yaw sensors

Real time data averaging can be selected from 17Hz to 1 hour

Photodetector Preamps: Each detector is individually amplified by an electrometer grade FET Op Amp with variable gain. The available gains (100,000 V/A, 30^6 V/A and 10^{10} V/A) cover 10 decades of light levels with minimum detectable signals of less than 10 femptoAmps.

System Data Rate: user adjustable with maximum rate of 20 Hz and 57600 Baud

Channel Sampling Time: scan time is typically 15msec when reading including additional processing time, all heads are synchronized to start scans within 500 μsec \pm 175 nsec

Optional Sensors: dual-axis instrument inclinometer

PRR-2500 Optical Specifications

Irradiance Array

Standard Wavelengths: 305, 313, 320, 340, 380, 395, PAR, Lu(chl)

Optional Wavelengths: *Consult factory for availability.*

Bandwidth: 10 nm FWHM standard except 305 (controlled by atmospheric ozone cutoff)

Filter Photodetectors: 7 Ed wavelengths standard; 1 Lu natural fluorescence standard

Filter Type: Custom low-fluorescence design, 5 cavity interference filters

Cosine Collector: Teflon®-covered quartz

Angular Response: \pm 2% from 0° to 65°; \pm 10% from 65° to 85°

Out-of-band Rejection: 1×10^{-6}

Typical Saturation: $10^5 \mu\text{Wcm}^{-2}\text{nm}^{-1}$

Noise Equivalent Irradiance: $10^{-5} \mu\text{Wcm}^{-2}\text{nm}^{-1}$

Radiance Detector

Filter Photodetectors: 1 wavelength standard

Detectors: Custom 13 mm² silicon photodiodes

Filter Type: Custom low-fluorescence interference

Out-of-band Rejection: 1×10^{-6}

Typical Saturation: $10^3 \mu\text{Wcm}^{-2}\text{nm}^{-1}\text{sr}^{-1}$

Noise Equivalent Radiance: $10^{-6} \mu\text{Wcm}^{-2}\text{nm}^{-1}\text{sr}^{-1}$

PUV-2500 Physical

Diameter: 10.2 cm **Length:** 40.5 cm

Depth Range: 350 m (recommended max. operating)

Materials: PET plastic housing; plastic fins (optional); stainless steel lowering frame

Weight: 3.2 kg in air, near neutral in water (without fins)

Temperature Rating: -50°C to 50°C

Typical Performance: Terminal velocity and attitude within 2 m; free-fall orientation less than 2° tilt

PUV Deckbox

Microprocessor: A separate PIC17C756 CMOS microcontroller is used to translate the high level PC program commands to individual head commands, buffer the high volume of data transmitted from the heads and provide exact timing of data collection between heads

Battery Power: Rechargeable 12-V gel cell battery; LED indicator light for low battery voltage

AC Adapter/Charger: 90-240 VAC, 50-60 Hz

Output: Single COM port for both instruments (PUV-2500 and PUV-2510)

Cables

Deckbox: RS-232 serial interface

Instruments: Custom 6-conductor, shielded cable with a braided polyester jacket and internal Kevlar® strength members. This cable is rated at 450kg and may be ordered in custom lengths to 300 meters.

PUV-2510 Surface Reference

Optical Specifications: matching the PUV-2500 except cosine collector geometry is optimized for use in air.

Diameter: 10.2 cm **Length:** 35.6 cm

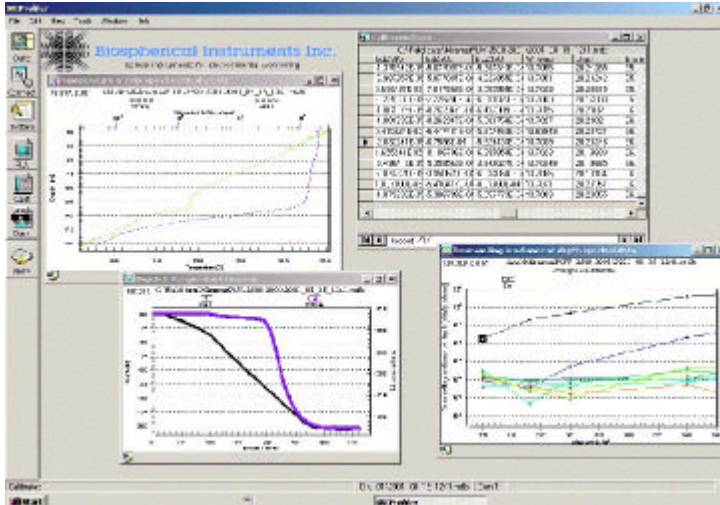
Materials: Aluminum housing

Weight: 3.4 kg in air

Temperature Rating: -10°C to 50°C

*Specifications subject to change without notice

BSI's Profiler software allows the user to select and process different regions of the dataset. Using interactive zooming, you can select minimum data limits to avoid cluttered displays (as shown below).



The data are stored in Microsoft Access data tables for compatibility with a wide variety of software and ease of post-processing.

Software

The PUV-2500 utilizes our new Windows®-based, PROFILER operating and data-acquisition software. Profiler is fully compatible with Windows 98, NT, ME, 2000 or XP, allowing the host PC to acquire and display data in real time. This custom software offers full-color graphical display with multiple, user-selected channels and allows a high degree of interaction and customization. This software includes user-specified configurations to speed, profile setup. When profiling, the user can view three plots (Time, Profile, and Spectral Plots), as well as a live-channel display and a large, easy-to-read instrument depth, inclination, and record number display. The software allows the user to annotate plots, such as to mark the beginning or end of an upcast or downcast or to define dark segments, facilitating dark corrections.

Biospherical Instruments Inc.

5340 Riley Street

San Diego CA 92110, USA

Phone: (619) 686-1888

Fax: 619-686-1887

E-mail: sales@biospherical.com

URL: www.biospherical.com

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