



# Photosynthetically Active Radiation Continuous Monitoring System

## New from YSI

Photosynthetically Active Radiation (PAR) is defined as the radiation in the 400-700 nm waveband. PAR irradiance includes the *in vitro* absorption band widths of chlorophyll a, b and c, the pigments contained within the cytoplasm of blue-green bacteria, and the chloroplasts of plants (including phytoplankton) that capture light energy for photosynthesis. Measurement of PAR, and specifically Photosynthetic Photon Flux Density (PPFD), is recognized as essential to understanding the input, transfer and fate of energy within aquatic systems.

LI-COR radiation sensors have long been the standard for irradiance sensing in terrestrial and aquatic environments. However, until recently, biological and inert fouling have limited PAR/PPFD measurements in aquatic systems to manual profiling or short-term deployments of  $2\pi$  (i.e., LI190SZ or LI200SA) and  $4\pi$  (LI193SA) LI-COR sensors. Aquatic investigators have agreed that the ability to measure PAR/PPFD for extended periods in conjunction with temperature, dissolved oxygen (DO), pH, conductivity, salinity, depth (or level), chlorophyll and turbidity, would provide tremendous insight to the health and response of aquatic systems. In response to this need, Application Engineers at Endeco/YSI have developed an extended deployment wiped PAR/PPFD sensor system.

The Endeco/YSI Wiped PAR sensor system combines the proven accuracy and reliability of LI-COR's  $2\pi$  radiation sensors with the unprecedented reliability of YSI wiped sensor technology (Figures 1 and 2).



Figure 2. A YSI PAR wiped sensor system prior to deployment

Field studies such as those performed by Virginia Institute of Marine Science (VIMS), National Estuarine Research Reserve, the National Park Service and the USGS demonstrate that the Endeco/YSI Wiped PAR sensor system prevents fouling of the LI-COR sensors, even in high fouling environments (Figure 3). Figure 4 presents PPFD data from two PAR sensors deployed by VIMS using the 6600EDS wiped PAR system. The wiper was disabled on one the lower sensor and enabled on the upper sensor. Data depict the remarkable advantage of the Endeco/YSI Wiped PAR system. Compare the physical condition of these sensors after a 8-day deployment (Figures 5 and 6).

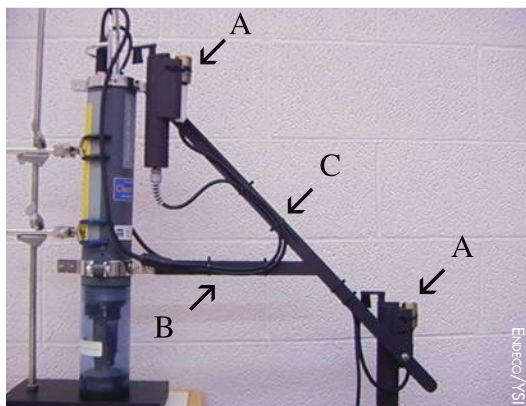


Figure 1. YSI 6600EDS with PAR sensor system. Depicted are  $2\pi$  LI-COR sensors and wiper assemblies (A), boom (B) and adjustable sensor suspension arm (C).



Figure 3. YSI 6600EDS with wiped PAR sensor system after retrieval from deployment. Note the heavy fouling of the sonde in contrast with the clean PAR sensor head.

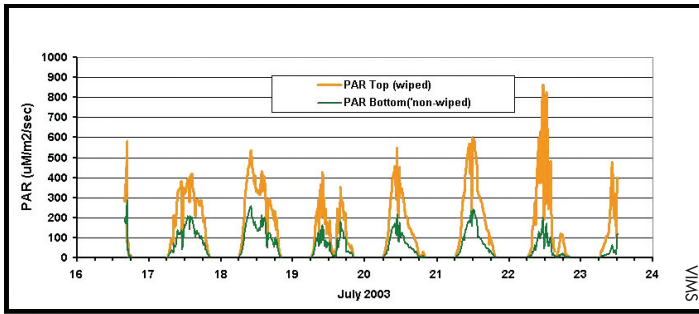


Figure 4. Data from two PAR sensors deployed for 8 days. The upper sensor was wiped and lower sensor was not.

The Endeco/YSI Wiped PAR system provides accurate measurement of PAR/PPFD for several weeks or months (duration is dependent upon power source and measurement intervals selected). The standard configuration allows the end-user to position the PAR sensors 0.5 m apart and in such a manner as to avoid shading. Additional 5 and 10 meter interface cables are available to facilitate remote sensor deployment.

The Wiped PAR system is seamlessly integrated with the 6600EDS sonde and utilizes two ISE ports. Each LI-COR PAR sensor can be individually configured by Endeco/YSI MA with an internal circuit to have variable sensitivities. After sensitivity configuration, the outputs of the sensors are fed into the main sonde through ISE ports, and given parameter headings in the standard logging and report applications. PAR data can be reported in millivolts or  $\mu\text{moles}/\text{sec}/\text{m}^2$ .

Integrating the Wiped PAR system through the 6600 ISE ports allows for the simultaneous measurement, logging and transmission of temperature, DO, pH, conductivity, salinity, turbidity, chlorophyll, depth (or level), and oxidation/reduction potential (ORP). The system can be used for profiling, deployed for unattended monitoring or connected to a data collection platform (DCP), for continuous monitoring and real-time data acquisition.

**Important Note:** The Wiped PAR system can be specified in any new 6600 sonde purchase or retrofitted to existing 6600 instruments. The PAR option can be delivered with or without the LI-COR 192 SA sensors for those customers who already own LI-COR sensors. In addition, standard 6600 sondes can be upgraded to the 6600EDS Extended Deployment configuration during a PAR conversion. The 6600EDS with Wiped PAR is an integrated system provided by Endeco/YSI.

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Figure 5. Wiped PAR sensor after 8-day deployment.



Figure 6. Non-wiped PAR sensor after 8-day deployment.