

# HOBILabs



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*Hyperspectral fiber-optic field radiometer with up to four independent channels for measuring plane and scalar irradiance and radiance from 350 to 850 nm with 2.6 nm FWHM resolution. Completely self-contained with programmable controller, data logger, and internal rechargeable batteries. Submersible up to 200 meters and includes depth sensor.*

[Spec Sheet](#)  
[Manual](#)

## Features

- Up to four independent channels (CCD spectrometers) for measuring up to four light-field quantities (irradiance or radiance) nearly simultaneously.
- Measures light-field quantities from 350 to 850 nm with 2.6 nm FWHM resolution with absolute radiometric accuracy

# HydroRad

Multi-Channel HyperSpectral Radiometer

The HydroRad is a revolutionary advance in field radiometers. Competitively priced, the HydroRad includes up to four CCD spectrometers in an acetal plastic pressure housing. The housing and fiber-optic cables are pressure rated to 200 meters and the HydroRad includes an accurate depth sensor. The spectrometers receive light from a specially designed fiber-optic cabling and connector system that is extremely rugged and radiometrically stable. Three types of light collectors can be used to measure plane irradiance, scalar irradiance, and radiance. The complete HydroRad system is calibrated in absolute radiometric units for both in-air and in-water measurements covering the range from 350 to 850 nm with 0.4 nm spectral resolution.



The HydroRad-E1, and -E2 include one embedded planar irradiance collector, as shown at left. HydroRad-E2's also include a collector on a fiber optic cable, which extends from the bottom of the unit..

The HydroRad is completely self-contained and can be operated manually, autonomously, or via an externally connected computer for

of 98%.

- Sophisticated embedded controller is easily programmed for autonomous data collection (e.g., moorings) or communicates with external computer.
- Built-in auto exposure and dark correction plus radiometrically calibrated output.
- Up to 512 MB of nonvolatile flash memory for internal logging.
- Rugged and versatile fiber-optic cables and light collectors provide enormous flexibility for a wide range of environmental applications.
- Submersible to 200 meters and includes accurate depth sensor.

## Applications

- Ocean-color remote sensing - Measure above and in-water remote-sensing reflectance.
- Primary productivity - Measure spectral scalar irradiance in situ.
- Ocean-optical research - Measure profiles of any light-field quantity.
- Environmental monitoring - Easily mounted on moorings and connected to an external controller or can be operated completely autonomously.
- Benthic optical properties - Can be diver operated for measuring the bottom

real-time data collection and display.

A sophisticated embedded controller powered by internal rechargeable batteries (or powered externally if desired) performs all of the functions for operating and collecting data from the spectrometers. The controller is programmed to seek optimal integration times depending on light levels, automatically correct for dark current, and radiometrically calibrate the output data. It has many other sophisticated programming functions for autonomous operation.

The fiber-optic design of this field radiometer offers many advantages over traditional field radiometers. The relatively small light-collectors, for example, can be located away from the HydroRad housing to minimize self-shading and to provide the ability to measure light in a variety of configurations. For remote-sensing applications, we offer two innovative accessories, a fiber-optically tethered buoy for measuring both above surface and below surface irradiance and radiance, and an extendable wand designed specifically for holding the fiber-optic collectors for measuring above water downwelling irradiance and upwelling radiance.

### Base Model Configurations:

HydroRad model numbers, from the HydroRad-1 to the HydroRad-4, indicate how many separate collectors they support, from 1 to 4. An 'E' suffix indicates that one of the collectors is embedded on the HydroRad housing and the remaining ones (if any) are mounted on fiber optic cables. For example, a HydroRad-E1 has one embedded collector, while a HydroRad-E2 has one embedded collector and 1 fiber optic cable, and a HydroRad-4 has 4 fiber optic cables.

| # Channels | # Embedded Channels | # Fiber Optic Channels | Model      |
|------------|---------------------|------------------------|------------|
| 1          | -                   | 1                      | HydroRad-1 |
| 2          | -                   | 2                      | HydroRad-2 |
| 3          | -                   | 3                      | HydroRad-3 |
| 4          | -                   | 4                      | HydroRad-4 |

reflectance and the transmission of light through benthic canopies.

- Any application requiring the measurement of absolute (calibrated) radiometric field quantities with high spectral resolution.

|   |   |   |             |
|---|---|---|-------------|
| 1 | 1 | - | HydroRad-E1 |
| 2 | 1 | 1 | HydroRad-E2 |

Standard embedded collectors are [Planar Irradiance](#). However, [Radiance](#) collectors may be substituted. Standard Fiber Optic Cable length is 3 meters - lengths up to 100 meters are available. Customer should specify collector type for each fiber optic cable.

#### Available Collectors for Fiber Optic Cables:

| Collector Type                        | Notes                                                                                                      |
|---------------------------------------|------------------------------------------------------------------------------------------------------------|
| <a href="#">Planar Irradiance</a>     | Cosine response -- must specify if response should be optimized for either in-air or immersed measurements |
| <a href="#">90° Planar Irradiance</a> | Response perpendicular to cable                                                                            |
| <a href="#">Scalar Irradiance</a>     | 2 collectors and 2 Fiber optic cables required to make measurement                                         |
| <a href="#">Radiance</a>              | 3.2° FOV in air, 2.4° in water                                                                             |
| <a href="#">90° Radiance</a>          | Measures perpendicular to cable                                                                            |

#### Available Pressure Sensor Configurations:

| Sensor (psia) | Max Depth Reading (m) | Resolution (m) | Temperature Drift (m) | Max Rated Depth (m) |
|---------------|-----------------------|----------------|-----------------------|---------------------|
| 50            | 24                    | 0.01           | 0.17                  | 65                  |
| 200           | 127                   | 0.05           | 0.68                  | 200                 |
| 300           | 195                   | 0.08           | 1.03                  | 200                 |
| None          | For surface-use only  |                |                       |                     |

#### Other Options:

| Option       | Available Configurations                                                      |
|--------------|-------------------------------------------------------------------------------|
| Memory       | 64MB(Standard), 128MB, 256MB, 512MB                                           |
| Shutter Port | Required for long-term mooring use with <a href="#">HydroShutters</a>         |
| Slave Port   | Required for Daisy-chaining another HydroRad                                  |
| Cage         | Rectangular cage protect instrument and enables user-configurable mounting of |

|                  |                                                                                                   |
|------------------|---------------------------------------------------------------------------------------------------|
|                  | collectors on fiber optic cables.                                                                 |
| Deployment Cable | Electronic cable, available any length up to 200 meters long, with or without strain relief eyes. |

#### Standard Application Configurations:

| To Measure                                                                                             | Select<br>(see Below)                                          |
|--------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|
| Downwelling irradiance on deck                                                                         | <a href="#">Surface Reference Radiometer</a>                   |
| Remote-sensing reflectance, with upwelling radaince measured in either air or shallow water depths     | <a href="#">Remote Sensing Reflectance Radiometer</a>          |
| Downwelling irradiance and Kd throughout the ocean photic zone                                         | <a href="#">Profiling Irradiance Radiometer</a>                |
| Radiance reflectance throughout the ocean photic zone                                                  | <a href="#">Profiling Reflectance Radiometer</a>               |
| Spectrally available radiation and flourescence throughout the photic zone                             | <a href="#">Scalar Irradiance Radiometer</a>                   |
| Irradiance reflectance throughout the ocean photic zone                                                | <a href="#">Irradiance Reflectance Radiometer</a>              |
| Bottom reflectance at near-bottom depths                                                               | <a href="#">Benthic Irradiance Reflectance Radiometer</a>      |
| Irradiance and radiance reflectance throughout the ocean photic zone                                   | <a href="#">Radiance and Irradiance Reflectance Radiometer</a> |
| Irradiance reflectance and spectrally available radiation and flourescence throughout the photic zone. | <a href="#">Irradiance Reflectance and Scalar Irradiance</a>   |

|                                                                                                                    |                                                                      |
|--------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|
|                                                                                                                    | <a href="#">Radiometer</a>                                           |
| Downwelling irradiance on deck, measured simultaneously with radiance reflectance throughout the ocean photic zone | <a href="#">Surface and Profiling Reflectance Radiometer Package</a> |

#### Standard Pre-Configured HydroRads:

| Configuration                                  | Specifications                                                                                                                                                                                                        |
|------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Surface Reference Radiometer                   | HydroRad-E1 with air-optimized <a href="#">Planar Irradiance</a> collector, slave port, and no pressure sensor                                                                                                        |
| Remote Sensing Reflectance Radiometer          | HydroRad-E2 with air-optimized <a href="#">Planar Irradiance</a> collector, <a href="#">Radiance</a> collector on 3 meter fiber optic cable, and no pressure sensor                                                   |
| Profiling Irradiance Radiometer                | HydroRad-E1 with immersion-optimized <a href="#">Planar Irradiance</a> collector, and 300 psi pressure sensor                                                                                                         |
| Profiling Reflectance Radiometer               | HydroRad-2 with immersion-optimized <a href="#">Planar Irradiance</a> collector on 3 meter fiber optic, <a href="#">Radiance</a> collector on 3 meter fiber optic cable, and 300 psi pressure sensor.                 |
| Scalar Irradiance Radiometer                   | HydroRad-2 with pair of <a href="#">Scalar Irradiance</a> collectors on 3 meter fiber optic cables, and 300 psi pressure sensor.                                                                                      |
| Irradiance Reflectance Radiometer              | HydroRad-2 with pair of immersion-optimized <a href="#">Planar Irradiance</a> collectors on 3 meter fiber optic cables, and 300 psi pressure sensor.                                                                  |
| Benthic Irradiance Reflectance Radiometer      | HydroRad-2 with pair of immersion-optimized <a href="#">90° Planar Irradiance</a> collectors on 3 meter fiber optic cables, and 50 psi pressure sensor.                                                               |
| Radiance and Irradiance Reflectance Radiometer | HydroRad-3 with pair of immersion-optimized <a href="#">Planar Irradiance</a> collectors on 3 meter fiber optic cables, <a href="#">Radiance</a> collector on 3 meter fiber optic cable, and 300 psi pressure sensor. |
|                                                |                                                                                                                                                                                                                       |

|                                                                         |                                                                                                                                                                                                                                                        |
|-------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Irradiance<br>Reflectance<br>and Scalar<br>Irradiance<br>Radiometer     | HydroRad-4 with pair of immersion-<br>optimized <a href="#">Planar Irradiance</a> collectors on 3<br>meter fiber optic cables, pair of <a href="#">Scalar<br/>Irradiance</a> collectors on 3 meter fiber optic<br>cables, and 300 psi pressure sensor. |
| Surface and<br>Profiling<br>Reflectance<br>Radiometer<br><i>Package</i> | <a href="#">Surface Reference Radiometer</a> (see above),<br><a href="#">Profiling Reflectance Radiometer</a> (see<br>above), one cage, and 200 meter<br>deployment cable with strain relief eyes.                                                     |