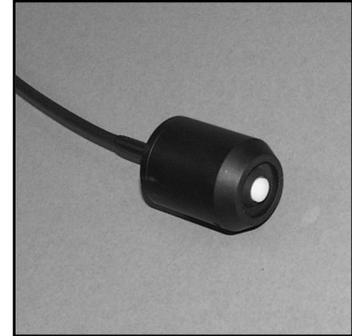


Photosynthetically Active Radiation (PAR) Smart Sensor (Part # S-LIA-M003)

The Photosynthetically Active Radiation (PAR) smart sensor is designed to work with the HOBO® Weather Station logger. The smart sensor has a plug-in modular connector that allows it to be added easily to a HOBO Weather Station. All calibration parameters are stored inside the smart sensor, which automatically communicates configuration information to the logger without any programming, calibration, or extensive user setup.



| Specifications | PAR Smart Sensor |
|--|--|
| Measurement Range | 0 to 2500 $\mu\text{mol}/\text{m}^2/\text{sec}$, wavelengths 400 to 700 nm (see Figure 1) |
| Accuracy | $\pm 5 \mu\text{mol}/\text{m}^2/\text{sec}$ or $\pm 5\%$, whichever is greater in sunlight. Additional temperature induced error $\pm 0.75 \mu\text{mol}/\text{m}^2/\text{sec}/^\circ\text{C}$ from $+25^\circ\text{C}$ ($0.42 \mu\text{mol}/\text{m}^2/\text{sec}/^\circ\text{F}$ from $+77^\circ\text{F}$) |
| Angular Accuracy | Cosine corrected 0 to 80 degrees from vertical; Azimuth Error $< 2\%$ error at 45 degrees from vertical, 360 degree rotation |
| Resolution | 2.5 $\mu\text{mol}/\text{m}^2/\text{sec}$ |
| Drift | $< \pm 2\%$ per year |
| Calibration | Factory recalibration available |
| Operating Temperature Range | -40° to $+75^\circ\text{C}$ (-40° to $+167^\circ\text{F}$) |
| Environmental Rating | Weatherproof |
| Housing | Anodized aluminum housing with acrylic diffuser and O-ring seal |
| Dimensions | 4.1 cm height x 3.2 cm diameter (1 5/8 x 1 1/4 in) |
| Weight | 120 g (4 oz) |
| Bits per Sample | 10 |
| Number of Data Channels * | 1 |
| Measurement Averaging Option | Yes |
| Cable Length Available | 3.0 m (9.8 ft) |
| Length of Smart Sensor Network Cable * | 3.0 m (9.8 ft) |
| Part Number | S-LIA-M003 |
| Ⓒ Specification | This product meets CE specification EN61326 criterion C for ESD, criterion C for Radiated Immunity, criterion B for Fast Transient, criterion A for Conducted Immunity, and criterion A for Power Frequency Magnetic Fields. To minimize measurement errors due to ambient RF, use the shortest possible probe cable length and keep the probe cable as far as possible from other cables. |

* A single HOBO Weather Station can accommodate 15 data channels and up to 100 m (328 ft) of smart sensor cable (the digital communications portion of the sensor cables).

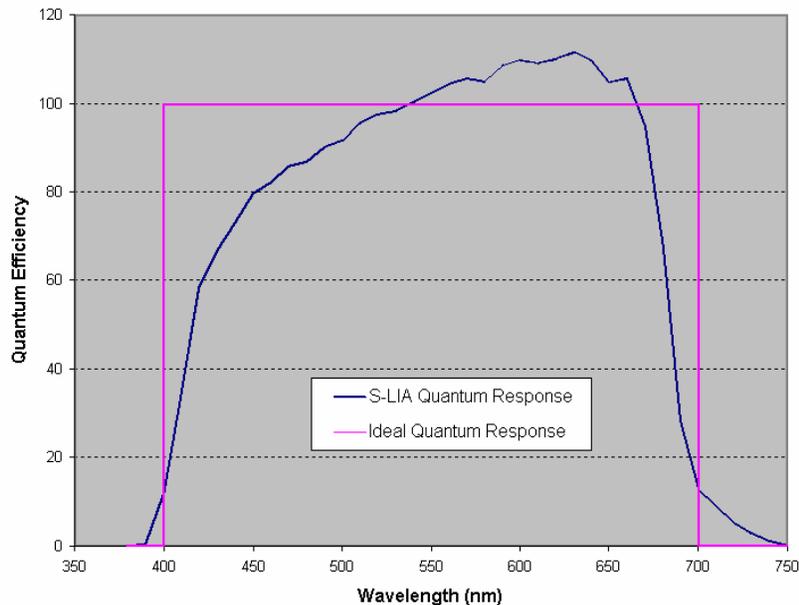


Figure 1: PAR Smart Sensor Typical Quantum Response

Note: The PAR smart sensor is designed to detect photons between 400-700 nm in wavelength. Ideally the sensor would count photons with equal efficiency between 400-700 nm and no photons would be counted outside this range. However, in reality, this sensor undercounts photons between 400-550 nm and between 670-700 nm, and it over counts photons between 550-670 nm. In most applications (where the sensor is used in natural sunlight) the error is not significant.

Inside this Package

- PAR Smart Sensor

Mounting

Accessories

- Light Sensor Mounting Bracket (part # M-LBA)
- Light Sensor Level (part # M-LLA)

Mounting Bracket

It is recommended that you mount the PAR smart sensor with the light sensor bracket on a pole or tripod (see Figure 2). To mount the PAR smart sensor using the bracket:

1. Attach the light sensor bracket to a 1¼ inch - 1⁵/₈ inch pole with the provided U-bolts. **Note:** The light sensor bracket can also be mounted on a flat, vertical surface using four screws.
2. Position the light sensor on top of the light sensor bracket with its cable running through the slot in the bracket.
3. Using the two screws supplied, attach the sensor to the bracket through the two holes on either side of the slot. **Note:** Do not completely tighten the screws until you level the light sensor.
4. Position the bracket so it faces toward the equator, minimizing the chance of shading.

PAR Smart Sensor

5. Mount the light sensor bracket on the mast with the two U-bolt assemblies, mounting it high enough on the mast to avoid the possibility of shading the light sensor. **Note:** If you mount the light sensor above eye level, it is recommended that you use a step ladder or other secure platform when leveling the sensor so that you can clearly view the light sensor level (Onset Part # M-LLA).

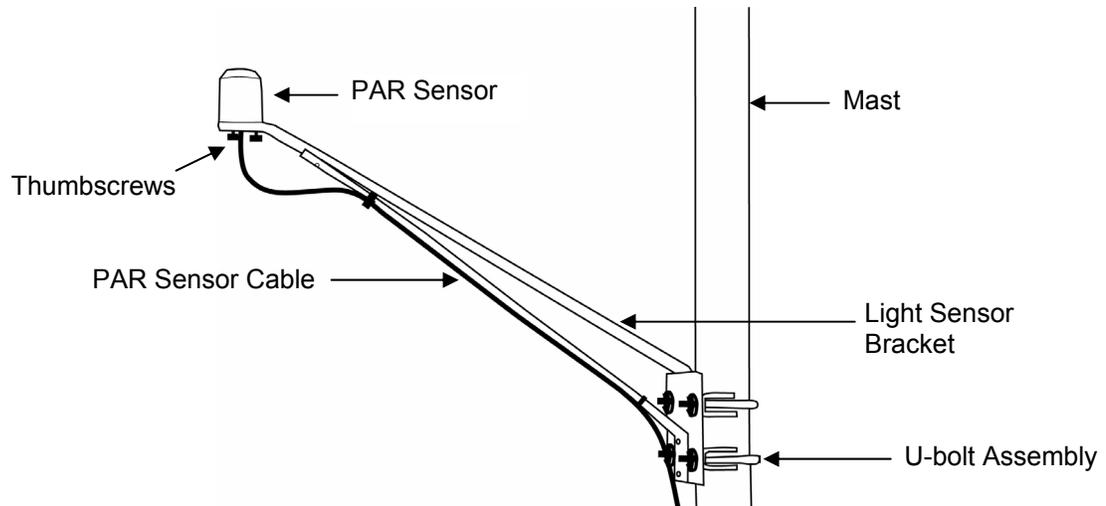


Figure 2: PAR Smart Sensor Bracket Mounting

6. Make sure the screws holding the sensor to the mounting bracket are loose.
7. Place the light sensor level on the light sensor.
8. Adjust the height of the thumbscrews to level the sensor (start with the thumbscrews protruding about 1/16 inch from the bracket).
9. Once the sensor is near level, tighten the Phillips head screws.
10. Check the light sensor level and repeat above steps if necessary (see Figure 3).
11. When the light sensor is level, remove the light sensor level from the light sensor.

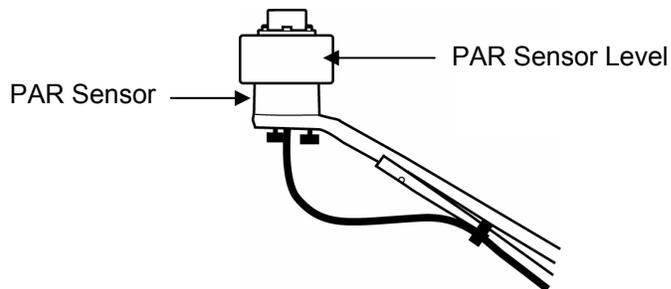


Figure 3: Leveling the PAR Smart Sensor on the Light Sensor Bracket

Specialized Application Mounting

To mount the light sensor using a mounting plate of your own design:

1. Drill two #25 holes 9/16 inches apart, and a 0.31 inch diameter slot in the mounting plate (see Figure 4.). **Note:** The plate should be a thickness of 1/8 inch or less.
2. Slide the sensor through the 0.31 inch diameter slot.
3. Attach the sensor using two 6-32 x 3/8 inch screws and lock washers (not included).

PAR Smart Sensor

4. Shim the sensor as necessary to level it.

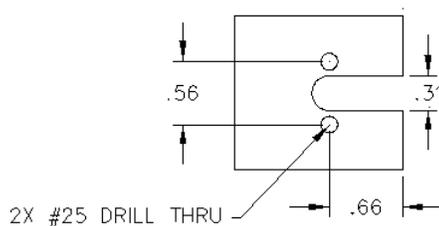


Figure 4: Recommended Mounting Plate Dimensions

Mounting Considerations

- Small errors in alignment can produce significant errors. Be certain that the sensor is mounted level.
- Mount the light sensor where it will not be in a shadow.
- If possible, avoid locating the sensors in dusty locations. Dust, pollen, and salt residue that collect on the top of the sensor can significantly degrade accuracy.
- Refer to the *HOBO Weather Station User's Guide* for more information regarding setting up complete HOBO Weather Stations.

Connecting

To start using the PAR smart sensor, stop the logger and insert the sensor's modular jack into an available port on the logger. If a port is not available, use a 1-to-2 adaptor (Part # S-ADAPT), which allows you to plug two sensors into one port. The next time the HOBO Weather Station is launched it will automatically detect the new sensor. Note that the HOBO Weather Station supports a maximum of 15 data channels; this sensor uses one data channel. Launch the logger and verify that the sensor is functioning correctly. See the *HOBO Weather Station User's Guide* for more details about connecting smart sensors to the HOBO Weather Station.

Operation

The PAR smart sensor supports measurement averaging. When measurement averaging is enabled, data is sampled more frequently than it is logged. The multiple samples are then averaged together and the average value is stored as the data for the interval. For example, if the logging interval is set at 10 minutes and the sampling interval is set at 1 minute, each recorded data point will be the average of 10 measurements. Measurement averaging is useful for reducing noise in the data. It is recommended that you use measurement averaging whenever the PAR smart sensor is used in an area where the light level can vary quickly with respect to the logging interval (for example, under a partial plant canopy or during partly cloudy conditions). Note that fast sampling intervals (less than 1 minute) may significantly reduce battery life. See the *HOBO Weather Station User's Guide* for more details about sensor operation and battery life.

Maintenance

Dust on the sensor will degrade sensor accuracy. Periodically inspect the sensor, and if necessary, gently clean the diffuser with a damp sponge. Do not open the PAR smart sensor as there are no user serviceable parts inside.

Warning: DO NOT use alcohol, organic solvents, abrasives, or strong detergents to clean the diffuser element on the light sensor. The acrylic material used in the light sensors can be crazed by exposure to

PAR Smart Sensor

alcohol or organic solvents. Clean the sensor only with water and/or a mild detergent such as dishwashing soap if necessary. It is recommended that you use vinegar to remove hard water deposits from the diffuser element. Under no circumstances should the smart sensor be immersed in any liquid.

Verifying Sensor Accuracy

It is recommended that you check the accuracy of the PAR smart sensor annually. The PAR smart sensor cannot be user-calibrated. Onset uses precision components to obtain accurate measurements. If the smart sensor is not providing accurate data, then it may be damaged or out of calibration. If you are unsure of the smart sensor's accuracy, you can send it back to Onset for testing and possible re-calibration. Contact Onset or your dealer for a Return Merchandise Authorization (RMA) number before sending it.

Warranty

This product is warranted to be free from defects in material and workmanship for a period of one year from the date of original purchase. During the warranty period Onset will, at its option, either repair or replace products that prove to be defective. This warranty is void if the Onset products have been damaged by customer error or negligence or if there has been an unauthorized modification.

Tune-up Service

Onset will examine and retest this and any other smart sensor.

© 2001–2003 Onset Computer Corporation, all rights reserved.
Onset and HOBO are trademarks of Onset Computer Corporation.

 The CE Marking identifies this product as complying with all relevant directives in the European Union (EU).

Part #: MAN-S-LIA
Document #: 5942-C