

# Quantum Light Meters

## PRODUCT MANUAL

Item # 3415F, 3415FQF, 3415FSE, 3415FXSE



**daphic scientific**

environmental research & monitoring equipment

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Thank you for purchasing a LightScout® Light Meter. This manual describes the features and operation of the following meters:

3415F Quantum Light Meter (Solar Calibration)

3415FQF Quantum and Foot-Candle Meter

3415FSE Dual Solar/Electric Quantum Meter

3415FXSE External Sensor Solar/Electric Quantum Meter

Read it thoroughly to ensure proper and effective use. For customer support, or to place an order, call

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# METER OPERATION

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1. Turn the dial clockwise to the “ON” position. Dual mode meters (3415FQF, 3415FSE, 3415FXSE) have two “on” settings, one to either side of “OFF”.
2. Hold the meter (or for the 3415FXSE, the sensor) vertical for accurate readings.
3. Turn the meter off after use to conserve battery power.
4. The external sensor for the 3415FXSE meter is designed to enable attachment to a rod (or yardstick) for ease of measurement in or above the canopy.

# CHANGING THE BATTERY

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The LightScout Light meters use a standard 9V battery. To change the battery:

1. Remove the two screws on the back of the meter.
2. Lift the back from the bottom of the meter.
3. Remove the old battery from the connector, and snap the new battery in its place. Set the battery into the front half of the case.
4. Connect the front and back of the case at the top (by the sensor).
5. Close the case and tighten the two screws.

# PAR LIGHT

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Photosynthesis is driven primarily by photos of light with wavelengths between 400 and 700 nanometers, which is referred to as Photosynthetically Active Radiation, or PAR light. Because a quantum is the amount of energy possessed by a photon, PAR light is sometimes labeled quantum light. The intensity of PAR light is referred to as Photosynthetic Photon Flux Density (PPFD), which is measured in units of  $\mu\text{mol m}^{-2}\text{s}^{-1}$  (the number of photons, in units of micromoles, striking an area one meter square each second). Quantum Light Meters are calibrated to display PPFD.

LightScout Quantum Light Meters are calibrated for sunlight. Due to differences in the spectrum generated by artificial lights, the following adjustments must be made in the value shown on a sunlight-calibrated meter:

Fluorescent: reads 8% high, so multiply the display by 0.92.

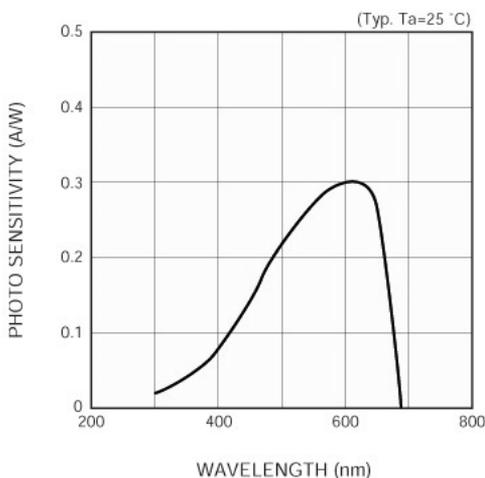
Metal Halide: reads 6% high, so multiply the display by 0.94.

High Pressure Sodium: 0% error—no adjustment needed.

Sunlight: 0% error—no adjustment needed.

Note that the 3415FSE and 3415FXSE meters display accurate readings for fluorescent lights when set to “Electric”.

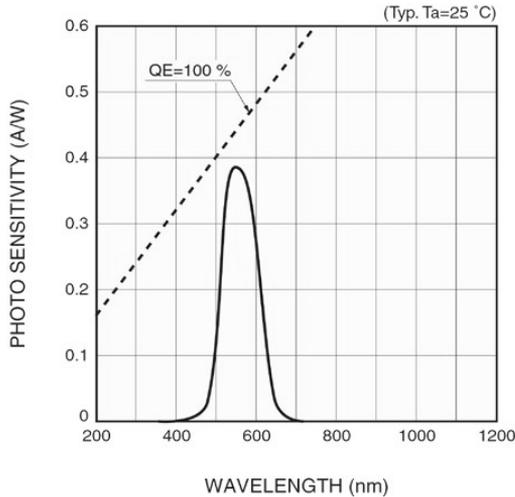
The chart below displays the spectral response of the Quantum Light Meters.



# FOOT-CANDLES

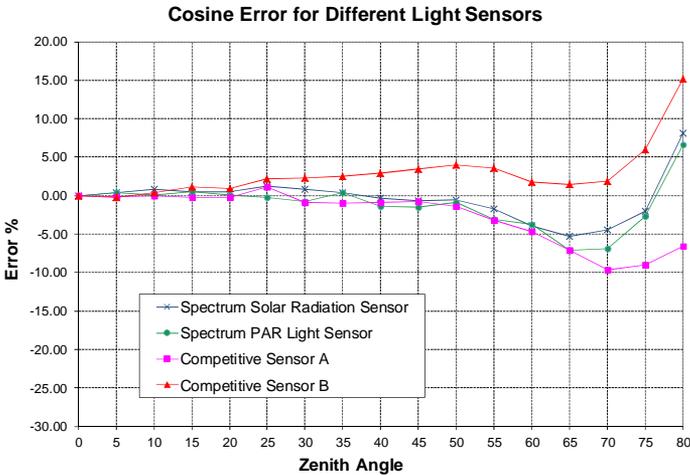
Foot-Candle meters measure light intensity as perceived by the human eye. The eye perceives light of approximately 560 nm most strongly, with perception half that at 500 and 600 nm.

The meters display values in the range 0-1999. This must be multiplied by 10 to obtain Foot-Candles, so the meter range is 0-19,990 Foot-Candles. Since 1 Foot-Candle is equivalent to approximately 10.8 lux, multiplying the meter reading by 108 will compute lux.



# COSINE CORRECTION

Because the detected light intensity is dependent on the angle of the incoming rays, the sensor must be constructed to minimize this error. This is called cosine correction because the radiant intensity of the incident light is dependent on the cosine of the angle between the sun and an imaginary vertical line extending from the ground. The PAR light sensor is designed to give accurate readings over a wide range of solar position. This is accomplished by recessing the photodiode and building a protective diffuser that scatters the light in such a way that the sensor output is accurate. The following chart shows the cosine response error as a function of the solar angle. This error compares favorably with other commercially available sensors.



# SPECIFICATIONS

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<b>Range</b>	0-1999 $\mu\text{mol}/\text{m}^2\text{s}$ , $\pm 5\%$ 0-19,990 foot-candles, $\pm 5\%$
<b>Cosine Correction</b>	$\pm 3\%$ at $45^\circ$ $\pm 7\%$ at $80^\circ$

# WARRANTY

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This product is warranted to be free from defects in material or workmanship for one year from the date of purchase. During the warranty period Spectrum will, at its option, either repair or replace products that prove to be defective. This warranty does not cover damage due to improper installation or use, lightning, negligence, accident, or unauthorized modifications, or to incidental or consequential damages beyond the Spectrum product. Before returning a failed unit, you must obtain a Returned Materials Authorization (RMA) from Spectrum. Spectrum is not responsible for any package that is returned without a valid RMA number or for the loss of the package by any shipping company.



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