

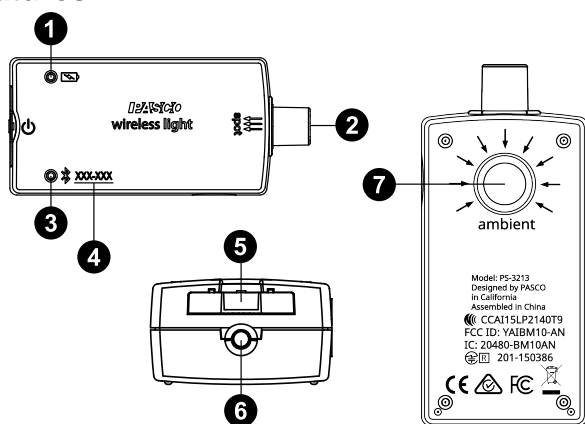
# Wireless Light Sensor (PS-3213)

## Introduction

The Wireless Light Sensor is a coin cell battery-powered wireless sensor that connects to a computer or tablet device through Bluetooth. The sensor measures light through two apertures. The Spot Light Aperture measures red-green-blue (RGB) and white light. The Ambient Light Aperture measures illuminance (measured in lux, or lumens per square meter), Photosynthetically Active Radiation (PAR) in sunlight, and solar irradiance (in watts per square meter). The Ambient Light Aperture also measures ultraviolet A (UVA) and ultraviolet B (UVB), allowing ultraviolet index (UVI) to be calculated.

Either PASCO Capstone or SPARKvue is used to display and analyze the measurements from the sensor. The sensor also supports remote data logging for long term experiments; for more information on this, see the PASCO Capstone or SPARKvue online help. Since each sensor has a unique device ID number, more than one can be connected to a computer or tablet at the same time.

## Features



### 1 Battery Status LED

Indicates the battery level of the sensor by blinking red at low power.

### 2 Spot Light Aperture

Used to measure red, green, blue, and white light.

### 3 Bluetooth Status LED

Indicates the status of the sensor's Bluetooth connection.

Bluetooth LED	Status
Red blink	Ready to pair
Green blink	Connected
Yellow blink	Logging data

For information on remote data logging, see the PASCO Capstone or SPARKvue online help.

### 4 Device ID number

Use this to identify the sensor when connecting via Bluetooth.

### 5 Battery drawer

Holds the coin cell battery that powers the sensor.

### 6 ON button

Press to turn the sensor on. Press and briefly hold to turn the sensor off. Note that the sensor automatically turns itself off after several minutes of inactivity if not connected.

### 7 Ambient Light Aperture

Used to measure UVA and UVB.

## Get the software

You can use the sensor with SPARKvue or PASCO Capstone software. If you're not sure which to use, visit [pasco.com/products/guides/software-comparison](https://www.pasco.com/products/guides/software-comparison).

SPARKvue is available as a free app for Chromebook, iOS, and Android devices. We offer a free trial of SPARKvue and Capstone for Windows and Mac. To get the software, go to [pasco.com/downloads](https://www.pasco.com/downloads) or search for **SPARKvue** in your device's app store.

If you have installed the software previously, check that you have the latest update:

### SPARKvue

Go to Main Menu  > **Check for Updates**

### PASCO Capstone

Go to **Help** > **Check for Updates**.

## Check for a firmware update

### SPARKvue

1. Press the power button until the LEDs turn on.
2. Open SPARKvue.
3. Select **Sensor Data** on the Welcome Screen.



4. From the list of available devices, select the sensor that matches your sensor's device ID. A notification appears if a firmware update is available. Click **Yes** to update the firmware.
5. Close SPARKvue when the update is complete.

### PASCO Capstone

1. Press and hold the power button until the LEDs turn on.
2. Open PASCO Capstone.
3. Click **Hardware Setup**.



4. From the list of available devices, select the sensor that matches your sensor's device ID. A notification appears if a firmware update is available. Click **Yes** to update the firmware.
5. Close Capstone when the update is complete.


## Set up the software

### SPARKvue

#### Connecting the sensor to a tablet or computer:


1. Turn on the Wireless Light Sensor. Check to make sure the Bluetooth Status LED is blinking red.
2. Open SPARKvue, then click **Sensor Data**.
3. From the list of available wireless devices on the left, select the device which matches the device ID printed on your Wireless Light Sensor.

#### Collecting data:



1. Select the measurements you intend to record from the **Select Measurements for Templates** menu by clicking the check box next to the relevant measurements' names.
2. Click **Graph** in the **Templates** section to open the Experiment Screen. The graph's axes will auto-populate with the selected measurements.
3. Click **Start**  to begin recording data.

### PASCO Capstone

#### Connecting the sensor to a computer:

1. Turn on the Wireless Light Sensor. Check to make sure the Bluetooth Status LED is blinking red.
2. Open Capstone, then click **Hardware Setup**  in the **Tools** palette.
3. From the list of **Available Wireless Devices**, click the device which matches the device ID printed on your Wireless Light Sensor.

#### Collecting data:

1. Double-click or drag the **Graph**  icon in the **Displays** palette to create a new blank graph display.
2. To assign measurements to the graph's axes, click each **<Select Measurement>** box and select an appropriate measurement from the list.
3. Click **Record**  to begin collecting data.

## Measurements

The Spot sensor measures relative light levels in red, green, blue, and white. The Ambient sensor measures relative light levels in red, green, blue, white, UVA, and UVB. Note that the software does not report red, green, blue, or white from the Ambient Light Aperture.

#### Spot Light Sensor:

Measurement	Range of Values
White (count)	0 to 65,535
Red* (%)	0 to 100
Green* (%)	0 to 100
Blue* (%)	0 to 100

\*As a percentage of the total light detected by the Spot Light Sensor

#### Ambient Light Sensor:

Measurement	Range of Values
UVA (count)	0 to 65,535
UVB (count)	0 to 65,535
UV Index	0 to 12 (typical in daylight)
Illuminance* (lux)	0 to 131,000
Solar Irradiance* (W/m <sup>2</sup> )	0 to 1,362
Solar PAR* (μmol/m <sup>2</sup> /s)	0 to 2,400

\*Based on solar radiance

### Definitions of measurements

**UVA:** Ultraviolet A refers to ultraviolet radiation with wavelengths between 315 and 400 nm.

**UVB:** Ultraviolet B refers to ultraviolet radiation with wavelengths between 290 and 320 nm; this range comprises less than 1% of the ultraviolet radiation that reaches Earth.

**UV Index:** The ultraviolet index, or UV index, measures the potential for skin damage by exposure to sunlight at a given location. A low number means less risk than a higher number.

**Illuminance:** This refers to the total luminous flux incident on a surface per unit area. It is used as a measure of how much the incident light illuminates the surface. Illuminance is measured in *lux*, or lumens per square meter.

**Irradiance:** In radiometry, irradiance is the radiant flux (power) received by a surface per unit area. The SI unit of irradiance is the watt per square meter (W/m<sup>2</sup>).

**PAR (Photosynthetically Active Radiation):** This designates the spectral range, or *wave band*, of solar radiation from 400 to 700 nm that photosynthetic organisms are able to use in the process of photosynthesis. This spectral region corresponds closely with the range of light visible to the human eye.

### Light Sensor response curves

The sensor's *relative responsivity* for a given wavelength refers to a ratio of the current produced in the sensor in response to light of this wavelength from an LED of a specific color to the current produced in response to the same wavelength from a clear LED. The graph in Figure 1 shows normalized Relative Responsivity versus Wavelength (in nm) for red, green, blue, and clear LEDs.

The approximate wavelength ranges at half-max are:

- Red: 580 to 650 nm
- Green: 510 to 580 nm
- Blue: 400 to 510 nm

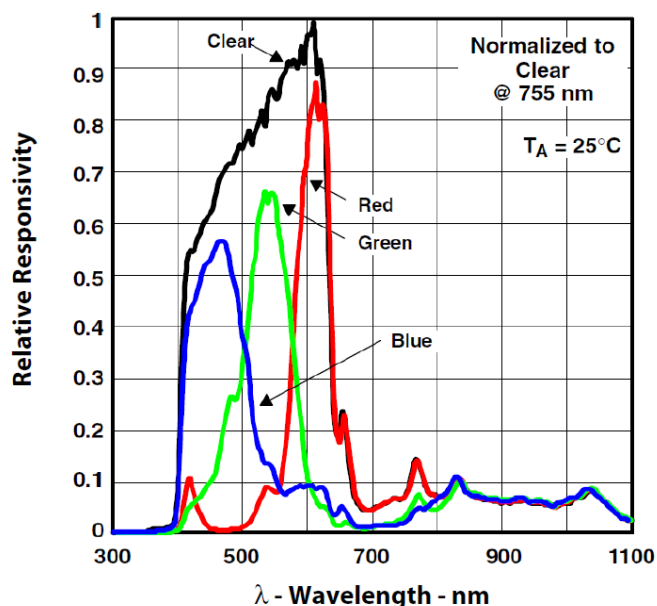


Figure 1. Response curves for red, green, blue, and unfiltered light for the Spot sensor.

## Troubleshooting

- If the Wireless Light Sensor loses Bluetooth connection and will not reconnect, try cycling the ON button. Press and briefly hold the button until the status LEDs blink in sequence, then release the button. Start the sensor in the usual way.
- If the sensor stops communicating with the computer software or tablet application, try restarting the software or application.
- If the problem persists, press and hold the ON button for 10 seconds, then release. Start the sensor in the usual way.
- If the above steps do not fix the problem, turn Bluetooth off and back on for your computer or tablet, then retry.

## About the battery

### Battery usage

Battery life is very important to making the sensor simple and always ready to use. Therefore, like all PASCO wireless products, the Wireless Light Sensor is designed for long battery life. For example, the sensor turns itself off after a few minutes of inactivity to preserve battery life.

The Wireless Light Sensor includes a three volt coin cell battery (CR2032). This battery should provide more than one year of battery life, but the actual amount depends on factors such as the data collection sampling rate.

### Sensor storage

If the sensor will be stored for many months, we recommend that you remove the battery and store it separately to avoid damaging the sensor in case of a battery leak.

## Maximizing battery life

One of the factors that affects battery life is the storage temperature. Therefore, avoid storing the sensor in very cold or very hot environments.

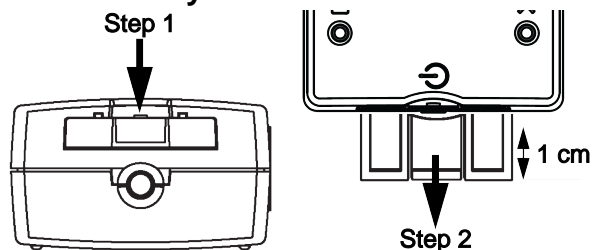
## Battery removal and replacement

If the sensor's Battery Status LED blinks red, the battery may need to be replaced. Replacing the battery involves opening the Battery Drawer on the back of the sensor, removing the old battery, installing a new battery of the same type, and closing the Battery Drawer. The procedure requires a small, thin blade screwdriver (or a fingernail) and a CR2032 three volt battery, such as those provided in the PS-3504 Coin Cell Battery Pack.



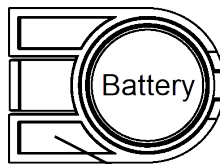
This battery is also commonly available in electronic and commercial stores.

### Open the battery drawer



Hold the sensor with the top side facing up. Use a thin blade screwdriver or a fingernail to push down slightly on the center section of the battery drawer. See Step 1 in the figure above.

Pull the battery drawer out of the sensor about one centimeter. See Step 2 in the figure above.



Battery drawer

Turn the sensor over so the bottom is facing upward. Pull the battery drawer the rest of the way out of the sensor.

Replace the battery with another identical battery.

### Close the battery drawer

Align the battery drawer with the slot on the end of the sensor and push the battery drawer all the way back into the sensor until you hear a click.

The discharged battery must be recycled or disposed of separately from typical household waste. For more information, see the **Battery disposal** guidelines under **Regulatory information**.

## Software help

The SPARKvue and PASCO Capstone Help provide additional information on how to use this product with the software. You can access the help within the software or online.

### SPARKvue

**Software:** Main Menu  > Help

**Online:** [help.pasco.com/sparkvue](http://help.pasco.com/sparkvue)

### PASCO Capstone

**Software:** Help > PASCO Capstone Help

**Online:** [help.pasco.com/capstone](http://help.pasco.com/capstone)

## Specifications and accessories



Visit the product page at [pasco.com/product/PS-3213](http://pasco.com/product/PS-3213) to view the specifications and explore accessories. You can also download experiment files and support documents from the product page.

## Experiment files

Download one of several student-ready activities from the PASCO Experiment Library. Experiments include editable student handouts and teacher notes. Visit [pasco.com/freelabs/PS-3213](http://pasco.com/freelabs/PS-3213).

## Technical support

Need more help? Our knowledgeable and friendly Technical Support staff is ready to answer your questions or walk you through any issues.

-  Chat [pasco.com](http://pasco.com)
-  Phone 1-800-772-8700 x1004 (USA)  
+1 916 462 8384 (outside USA)
-  Email [support@pasco.com](mailto:support@pasco.com)

## Regulatory information

### Limited warranty

For a description of the product warranty, see the Warranty and Returns page at [www.pasco.com/legal](http://www.pasco.com/legal).

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### Product end-of-life disposal



This electronic product is subject to disposal and recycling regulations that vary by country and region.

It is your responsibility to recycle your electronic equipment per your local environmental laws and regulations to ensure that it will be recycled in a manner that protects human health and the environment.

To find out where you can drop off your waste equipment for recycling, please contact your local waste recycle or disposal service, or the place where you purchased the product.

The European Union WEEE (Waste Electronic and Electrical Equipment) symbol on the product or its packaging indicates that this product must not be disposed of in a standard waste container.

### CE statement

This device has been tested and found to comply with the essential requirements and other relevant provisions of the applicable EU Directives.

### FCC statement

This device complies with part 15 of the FCC Rules.

Operation is subject to the following two conditions:

(1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

### Battery disposal



Batteries contain chemicals that, if released, may affect the environment and human health.

Batteries should be collected separately for recycling and recycled at a local hazardous material disposal location adhering to your country and local government regulations.

To find out where you can drop off your waste battery for recycling, please contact your local waste disposal service, or the product representative.

The battery used in this product is marked with the European Union symbol for waste batteries to indicate the need for the separate collection and recycling of batteries.