

# Light Sensor

## (Order Code LS-BTA or LS-DIN)

The Light Sensor can be used for measurements of light intensity in a variety of situations.



- Perform inverse square light intensity experiments using a point source of light.
- Conduct polarized filter studies.
- Demonstrate the flicker of fluorescent lamps and other lamps.
- Carry out solar energy studies.
- Perform reflectivity studies.
- Study light intensity in various parts of a house or school.
- Use it as part of a study of plant growth to measure light intensity.

**NOTE:** This product is to be used for educational purposes only. It is not appropriate for industrial, medical, research, or commercial applications.

## Using the Light Sensor with a Computer

This sensor can be used with a computer and any of the following lab interfaces: Vernier LabPro®, Go!®Link, Universal Lab Interface, or Serial Box Interface.

1. Connect the Light Sensor, interface, and computer.
2. Start the *Logger Pro*® or *Logger Lite*® software.
3. The program will automatically identify the Light Sensor, and you are ready to collect data.<sup>1</sup>

## Using the Light Sensor with TI Graphing Calculators

This sensor can be used with a TI graphing calculator and any of the following lab interfaces: LabPro, CBL 2™, and Vernier EasyLink®. Here is the general procedure to follow when using the Light Sensor with a graphing calculator:

1. Connect the data-collection interface to the graphing calculator.
2. Connect the Light Sensor to any of the analog ports on the interface or to EasyLink.
3. Start the EasyData or DataMate App—the application you choose to use depends on your calculator and interface. See the chart for more information.

Calculator	Interface	Data Collection Program
TI-84 Plus Family	EasyLink	EasyData
	LabPro or CBL 2	EasyData (recommended) or DataMate
TI-83 Plus Family	LabPro or CBL 2	EasyData (recommended) or DataMate
All Others (TI-73, TI-83, TI-86, TI-89, TI-92 and Voyage 200)	LabPro or CBL 2	DataMate

4. The Light Sensor will be identified automatically<sup>2</sup>, and you are ready to collect data.

If the data-collection application is not on your calculator, use the following instructions to load it onto the calculator.

- **EasyData App**—This program may already be installed on your calculator. Check to see that it is EasyData version 2.0 or newer. If it is not installed or is an older version, it can be downloaded to your computer from the Vernier web site, [www.vernier.com/easy/easydata.html](http://www.vernier.com/easy/easydata.html). It can then be transferred from the computer to the calculator using TI-Connect and a TI unit-to-computer cable or TI-GRAPH LINK cable. See the Vernier web site, [www.vernier.com/calc/software/index.html](http://www.vernier.com/calc/software/index.html) for more information on the App and Program Transfer Guidebook.
- **DataMate program**—This program can be transferred directly from LabPro or CBL 2 to the TI graphing calculator. Use the calculator-to-calculator link cable to connect the two devices. Put the calculator into Receive mode, and then press the Transfer button on the interface.

## Using the Light Sensor with a Palm Powered Handheld

1. Connect the Palm Powered handheld, LabPro, and the Light Sensor.
2. Start Data Pro.
3. Tap New, or choose New from the Data Pro menu. Tap New again. The Light Sensor will be identified automatically.<sup>3</sup>
4. You are now ready to collect data.

## Specifications

Resolution:

<sup>1</sup> If your system does not support auto-ID, open an experiment file in *Logger Pro*, and you are ready to collect data.

<sup>2</sup> If your system does not support auto-ID, choose SETUP and then Other Sensors. See the EasyData Guidebook for information on setting up a sensor manually, [www2.vernier.com/manuals/easydata\\_guidebook.pdf](http://www2.vernier.com/manuals/easydata_guidebook.pdf)

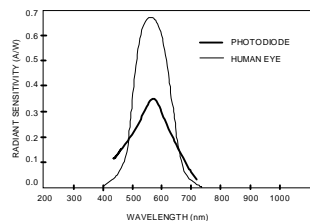
<sup>3</sup> If your sensor does not auto-ID, tap Setup and set up an experiment.

with LabPro, Go!Link, ULI, or Serial Box Interface:

- 0–600 lux: 0.2 lux
- 0–6000 lux: 2 lux
- 0–150000 lux: 50 lux

with CBL 2:

- 0–600 lux: 0.8 lux
- 0–6000 lux: 8 lux
- 0–150000 lux: 200 lux



Spectral Response of the Hamamatsu S1133 Photodiode

### How the Light Sensor Works

The sensor uses a Hamamatsu S1133 silicon photodiode. It produces a voltage which is proportional to light intensity. The spectral response approximates the response of the human eye as shown in this diagram.

The switch on the box is used to select the range. If the reading from the sensor reaches the maximum for the selected ranges, you need to switch to a less sensitive range. If the reading is very small or 0, you need to select a more sensitive range.

- The 0–600 lux range is the most sensitive range, and is useful for low levels of illumination.
- The 0–6000 lux range is a good general purpose range for indoor light levels.
- The 0–150,000 lux range is used mainly for measurements in sunlight.

This sensor is equipped with auto-ID circuitry. When used with LabPro, Go!Link, EasyLink, or CBL 2, the data-collection software identifies the sensor and uses pre-defined parameters to configure an experiment appropriate to the recognized sensor.

### Do I Need to Calibrate the Light Sensor? No.

You should not have to perform a new calibration when using the Light Sensor in the classroom. We have set the sensor to match our stored calibration before shipping it. You can simply use the appropriate calibration file that is stored in your data-collection program from Vernier in any of these ways:

1. If you ordered the LS-BTA version of the sensor, and you are using it with a LabPro, Go!Link, or CBL 2 interface, then a calibration (in lux) is automatically loaded when the Light Sensor is connected.
2. If you are using Logger Pro software (version 2.0 or newer) on a computer, open an experiment file for the Light Sensor and its stored calibration will be loaded at the same time.
3. Any version of the DataMate program (with LabPro or CBL 2) has stored calibrations for this sensor.

Stored Calibration Values for the Light Sensor

- |            |                    |                   |
|------------|--------------------|-------------------|
| 0–600 lux  | slope = 154 lux/V  | intercept = 0 lux |
| 0–6000 lux | slope = 1692 lux/V | intercept = 0 lux |

0–150000 lux slope = 38424 lux/V intercept = 0 lux

In most cases, you can simply load an experiment file that is designed for use with the Light Sensor and calibration is taken care of. Different calibration files are provided for each of the three switch settings. Be sure to load the file that matches the switch setting you are using.

In other cases, you can use this sensor without calibration, reading just voltage. Note that for this sensor, voltage is always proportional to light intensity. If you want to calibrate the Light Sensor yourself, you can do so. Using a calibrated light meter and is similar to the procedure used to calibrate any other Vernier probe. Make sure the switch on the Light Sensor box is set to the correct range. If you want to calibrate more than one range, you will need to repeat the following procedure and treat each range as a separate probe.

### Calibration using another light meter

This calibration method is easy if you have a calibrated light meter. You simply do a standard two-point calibration as described in the data collection program manual using two different light levels, both measured with your calibrated, hand-held light meter. The input should be named “Illuminance” and the units should be “lux”. Save the experiment file on disk. Use a name for the calibration file that indicates the setting of the range switch, such as: LS600 or LS6000. You will need to have the switch set to the correct range whenever you reload your experiment file.

### Warranty

Vernier warrants this product to be free from defects in materials and workmanship for a period of five years from the date of shipment to the customer. This warranty does not cover damage to the product caused by abuse or improper use.



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