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: 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.[1]

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™, or CBL™. Here is the general procedure to follow when using the Light Sensor with a graphing calculator:

1. Load a data-collection program onto your calculator:
2. Use the calculator-to-calculator link cable to connect the interface to the TI graphing calculator using the I/O ports located on each unit. Be sure to push both plugs in firmly.
3. Connect the Light Sensor to any of the analog ports on the interface. In most cases, Channel 1 is used.
4. Start the data-collection program. The Light Sensor will be identified automatically.[2]
5. You are now ready to collect data.

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

[2] If your system does not support auto-ID, choose SETUP and set up an experiment.

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.[3]
4. You are now ready to collect data.

Specifications

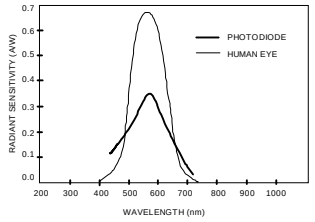
Resolution:

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 or CBL:
0–600 lux: 0.8 lux
0–6000 lux: 8 lux
0–150000 lux: 200 lux

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.



Spectral Response of the Hamamatsu S1133 Photodiode

The switch on the box is used to select the range. If the voltage from the sensor reaches the 2.8-volt maximum, you need to switch to a less sensitive range. If the voltage is very small or 0, you need to select a more sensitive range.

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

[3] If your sensor does not auto-ID, tap Setup and set up an experiment.

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. **Note:** If you have an earlier version of Logger *Pro*, a free upgrade to Logger *Pro* 2.2.1 is available from our web site.
3. Any version of the DataMate program (with LabPro or CBL 2) has stored calibrations for this sensor.
4. Any version of the PHYSICS or CHEMBIO programs (for CBL), version 4/1/00 or newer, have stored calibrations for this sensor. Go to our web site, www.vernier.com, to download a current version.

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 in either of two ways. One method requires a calibrated light meter and is similar to the procedure used to calibrate any other Vernier probe. The other method requires no extra equipment and is based on the known sensitivity of the Light Sensor. Whichever calibration procedure you use, 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.

Calibration with no extra equipment:

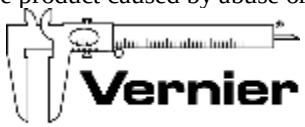
This calibration method uses the predetermined sensitivity of the photodiode to simulate a two-point calibration. Follow the instructions on the screen and in the manual to begin calibration. The input should be named "Illuminance," and the units should be "lux." The first of the two calibration points is the voltage when the sensor is covered and completely in the dark. This should be very close to 0 volts. For the second point, place the sensor in enough light to produce at least 1 volt, but not so bright that the maximum voltage (2.8 volts) is exceeded. Use this situation as the second calibration point. To calculate the illuminance, use the equation below that corresponds to the switch setting:

0–600 lux range	illuminance (lux) = voltage / 5.0×10^{-3}
0–6000 lux range	illuminance (lux) = voltage / 4.5×10^{-4}
0–150,000 lux range	illuminance (lux) = voltage / 2.0×10^{-5}

This calculation gives you the illuminance corresponding to the voltage change. It uses the known sensitivity of the unit for the particular range switch setting. Enter this for the second calibration point. Save the calibration file on disk. Use a name for the calibration file which indicates the setting of the range switch.

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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