BROAD SPECTRUM LIGHT SENSOR

thumbscrew
with washer

shutter bracket

CI-6630
Light Sensor

cable with DIN
connectors

to computer
interface

Introduction

The sensing element of the Broad Spectrum Light Sensor (CI-6630) uses a thermopile as a detecting element. Thermopile detectors are voltage-generating devices that act like a miniature array of thermocouples. The thermopile is a high output, thin film, silicon-based device which has 48 thermopile junctions. The active or "hot" junctions are blackened to efficiently absorb radiation. The reference or "cold" junctions are maintained at the ambient temperature of the detector.

The blackening material used on the "hot" junctions is capable of absorbing radiant energy from the ultra violet to the far infrared range. To limit the spectral sensitivity, optical filters and windows may be placed in front of the detector. The window installed in the Broad Spectrum Light Sensor's detector is BaF_2, which has a spectral response from 300 to 10,000 nanometers. The hermetically-sealed detector is heat treated and filled with argon gas to improve long-term stability.

The absorption of radiation by the blackened area causes a temperature rise in the "hot" junctions, as compared to the "cold" junctions of the thermopile. This temperature difference across the thermocouple junction causes the detector to generate a positive voltage. If the active or "hot" junction cools to a temperature less than the reference or "cold" junction, the voltage output becomes negative.

The output of the thermopile detector is presented to a gain selectable amplifier. The GAIN switch on the top of the sensor is used to change the signal output (voltage) of the sensor in experiments where the output signal is too low, such as in dim light conditions, or when the signal is too high, such as in bright light conditions.

Equipment included:

- Broad Spectrum Light Sensor (CI-6630)
- 1/4-20 X .375" thumbscrew (617-008) with 0.250 I.D. washer (615-011)
- Shutter bracket (648-06954)
- 8-pin connector cable (514-06329)

Additional equipment required:

- *ScienceWorkshop®* computer interface
- DataStudio® software (version 1.8.5 or higher)

Using the Shutter Bracket with the Sensor

The spring-loaded shutter bracket keeps extraneous radiated energy from heating the sensing element either before or during measurements. The tab on the front edge of the shutter bracket is for ensuring constant spacing between the sensing element and a hot object, such as when performing comparative radiant energy measurements.

Attach the shutter bracket to the Infrared Sensor unit, with the included thumbscrew and washer, as shown in Figure 1. Do not over tighten the thumbscrew.
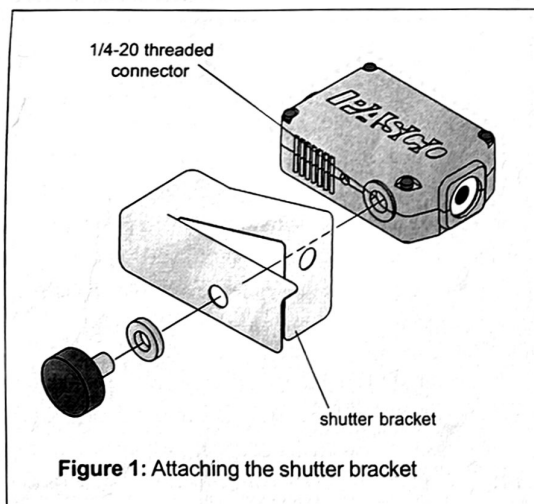
Figure 1: Attaching the shutter bracket

Mounting the Sensor to Experimental Apparatus

Use the 1/4-20 threaded connector on the bottom of the sensor box to secure the Broad Spectrum Light Sensor to an experimental apparatus (Figure 2). The alignment hole is for holding an alignment pin, which is included on some PASCO products.
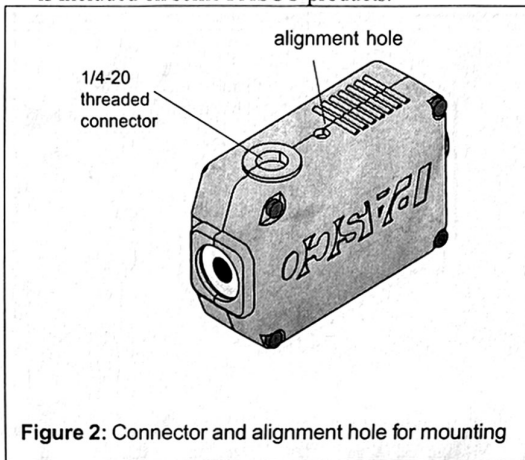
Figure 2: Connector and alignment hole for mounting

Adjusting the Gain on the Sensor

The sensor has three gain settings: 1X, 10X and 100X. The gain settings on the sensor, coupled with the user-selectable gain on the *ScienceWorkshop* interface, allow for a very broad range of measurements with the Broad Spectrum Light Sensor. (**Note:** Adjusting the sensor's gain only changes the signal voltage, not the actual light intensity measurement. You can change the gain to a maximum of +/- 10 volts.)
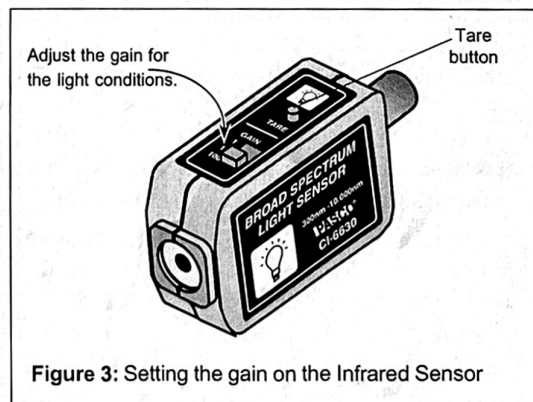
Figure 3: Setting the gain on the Infrared Sensor

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Zeroing the Broad Spectrum Light Sensor

The **TARE** button on the top of the sensor is for zeroing the sensor. Zeroing is particularly useful at high gain settings where small voltage offsets may interfere with measurements.

Collecting Data with the Broad Spectrum Light Sensor

1. Attach the shutter to the sensor and mount the sensor to an experimental apparatus.

2. With the 8-pin cable, connect the Broad Spectrum Light Sensor to any analog channel (A, B, or C) on the *ScienceWorkshop* interface (Figure 4). (**Note:** The sensor also plugs *directly* into any analog channel.)
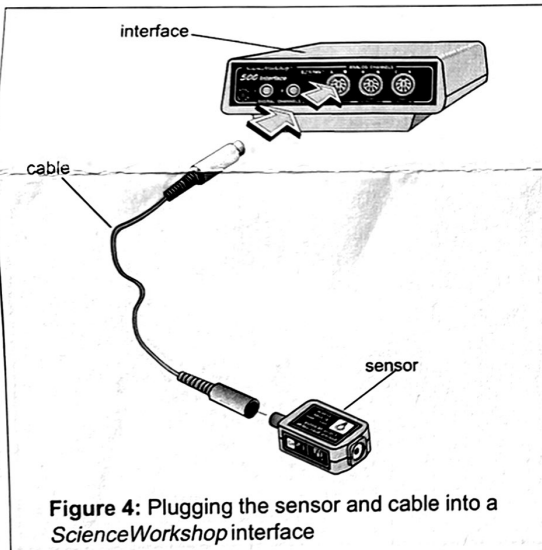

Figure 4: Plugging the sensor and cable into a *ScienceWorkshop* interface

3. In DataStudio, set up your experiment in the Experiment Setup window.

4. Select a gain setting on the sensor box. If you expect the light intensity levels in your experiment to be dim, move the gain switch to either 10x or 100x. If you expect the light intensity levels to be bright, adjust the gain setting to the 1x position.

5. In DataStudio, click the **Start** button to begin collecting data.

Note: This instruction sheet was written assuming that the user has a basic familiarity with DataStudio software. Users can gain basic skills by working through the tutorial in the DataStudio sofware.

Approximate Response of Sensor
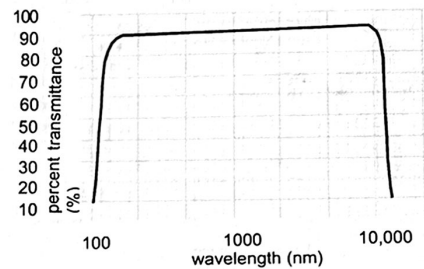
DIN Connector Specifications:

1: analog output (+), -10 to +10 V

2: analog output (-), signal ground

3: (no connection)

4: + 5 V DC power

5: power ground

6: +12 VDC power

7: -12 VDC power

8: (no connection)

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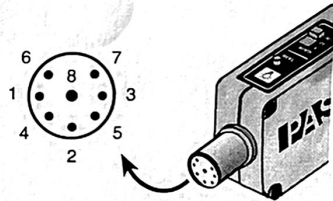
Limited Warranty

PASCO scientific warrants the product to be free from defects in materials and workmanship for a period of one year from the date of shipment to the customer. PASCO will repair or replace, at its option, any part of the product which is deemed to be defective in material or workmanship. The warranty does not cover damage to the product caused by abuse or improper use. Determination of whether a product failure is the result of a manufacturing defect or improper use by the customer shall be made solely by PASCO scientific. Responsibility for the return of equipment for warranty repair belongs to the customer. Equipment must be properly packed to prevent damage and shipped postage or freight prepaid. (Damage caused by improper packing of the equipment for return shipment will not be covered by the warranty.) Shipping costs for returning the equipment after repair will be paid by PASCO scientific.

Address:	PASCO scientific
	10101 Foothills Blvd.
	Roseville, CA 95747-7100
Phone:	(916) 786-3800
FAX:	(916) 786-8905
email:	techsupp@pasco.com
web:	www.pasco.com

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