

**Instruction Sheet
for the PASCO
Model OS-8020**

High Sensitivity Photometer

Introduction

The PASCO Model OS-8020 High Sensitivity Photometer measures relative intensities of incident light from approximately 0.1 - 1,000 lux. Its features include:

- **Fiber-Optic Probe**— The 70 cm long probe lets you measure intensity with 1 mm spatial resolution. You can, for example, scan a diffraction pattern for accurate intensity versus position measurements. (PASCO carries linear and angular translators that can be used to accurately position the probe.)
- **Variable Sensitivity**— Provides a full scale reading at any light intensity within the range of the instrument.
- **Recorder Output**—The recorder output is proportional to the measured light intensity. Use it to drive external meters, strip chart recorders, etc.

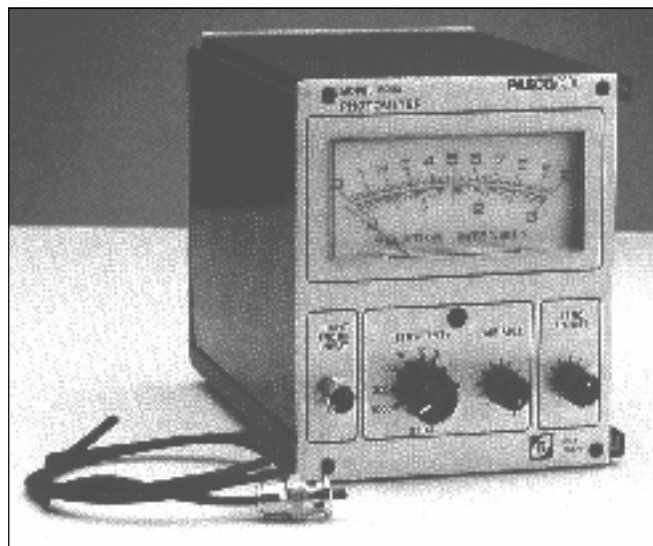
Additional Equipment Recommended:

The following items are available separately, or as components in a complete PASCO optics system. They are not required for using the photometer, but the Translators ensure accurate placement of the fiber optic probe. Both the Linear and the Angular Translator are designed to mount on the PASCO Optics Bench.

- Angular Translator, PASCO Model OS-9106A
- Linear Translator, PASCO Model OS-9104B
- Optics Bench, PASCO Model OS-9103

Setup Procedure

The photometer can be used with or without the fiber-optic probe. When used without the probe, the light must fall directly onto the Light Probe Input connector. When used with the probe, the intensity of the incident light can be sampled over very small areas ($\approx 1 \text{ mm}^2$), providing accurate measurements of intensity versus position. However, measurements without the probe are more sensitive, since the probe restricts the area and intensity of the incident light.



OS-8020 High Sensitivity Photometer with Fiber-Optic Probe

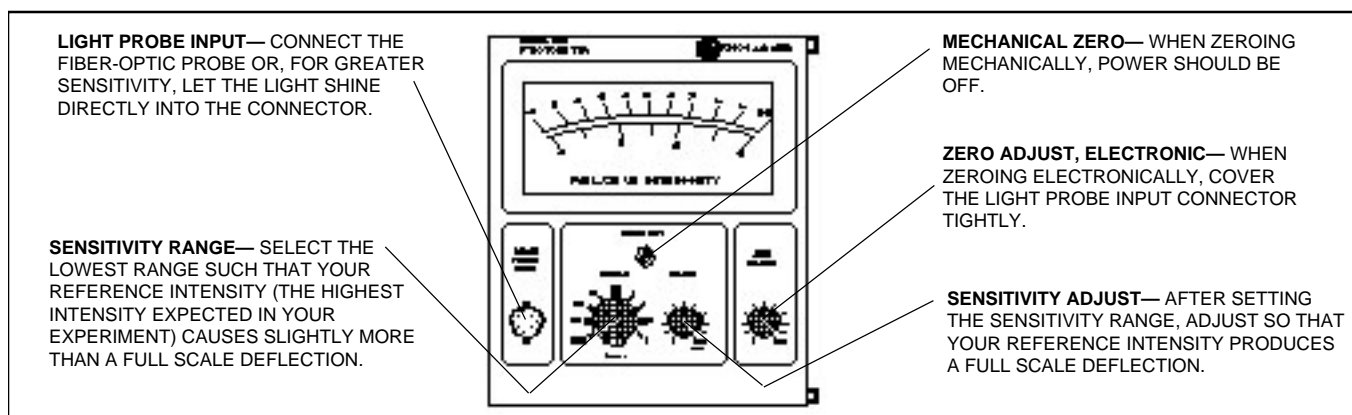
To use the probe, connect the probe to the Light Probe Input connector. Then position the free end of the probe so that the incident light falls directly onto its surface, normal to the plane of the tip.

► **IMPORTANT:** To prolong the life and efficiency of the fiber-optic probe:

- ① Do not bend the probe to a radius of less than 2 inches at any given point (do not coil tighter than a 4" circle).
- ② Do not bend the probe within three inches of either end.
- ③ Take care not to scratch or mar the tip of the probe. If the tip becomes scratched or dirty, clean it by light grinding with a fine grinding stone, or just cut off the tip with a razor blade (be sure that the cut is square).

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This instruction sheet written/edited by:



Photometer Controls

Operation

- ① **Zero the Meter Mechanically:** Before plugging in the photometer, use a small screwdriver to adjust the Mechanical Zero screw (see illustration, above) so that the meter reads zero.
- ② **Connect the Power:** Plug the power cord into a standard 115 VAC, 60 Hz power outlet (or 220 VAC, 50 Hz if indicated on the back panel of the photometer).
- ③ **Zero the Meter Electronically:** Cover the Light Probe Input connector so that no light reaches the sensor. A good technique is to place a rubber cork tightly over the input connector. A finger over the connector will not shut out the light effectively enough. With the input connector covered, set the Sensitivity Range switch to the most sensitive range (.1), and turn the Zero Adjust knob until the meter reads zero. The instrument is now zeroed on all ranges. Now turn the Sensitivity Range switch to the highest range (1000).
- ④ **Measuring Relative Intensities:** When using the photometer, intensity measurements are always made relative to some established reference value. If you are measuring the intensity of light after it passes through a polarizer, for example, first measure the intensity for a particular orientation of the polarizer (usually, but not necessarily, the orientation producing a maximum intensity of light). Then adjust the Sensitivity Range and Sensitivity Adjust so that the meter reads 10 (full scale). Now measure the intensity for different orientations of the polarizer. These subsequent measurements can be recorded as a percentage of the original measurement. For example, if the meter reads 6.5, record the intensity as 65% of the reference value.

In general, to use the photometer to measure relative intensities:

- Arrange the photometer to measure your reference intensity, usually the maximum intensity of light that you expect to measure.
- Turn the Sensitivity Range switch clockwise to the lowest range for which the photometer reads beyond full scale.
- Turn the Sensitivity Adjust knob counterclockwise until the meter reads exactly 10 (full scale).
- Now—without touching the Sensitivity Adjust knob—arrange the photometer to measure the other intensities you wish to measure. Read the intensities as a percentage of the original measurement.

► NOTES:

- After measuring your reference intensity, you can still use the Sensitivity Range switch to change the range of the measurement. Just take into account the effect on the reading, as you would for any measuring instrument. For example, if the Sensitivity Range switch were set to 100 when the reference source was measured, and then switched to 30, you would use the 0 - 3 scale and read your value as 0 - 30%.
- The photometer reading is proportional to the energy of the light that falls on its photovoltaic cell, which is in turn proportional to the intensity of the incident light and to the area of the cell that is illuminated. Therefore, for accurate and consistent results, the incident light should fall directly onto the Light Probe Input connector or onto the end of the fiber-optic probe, with a zero degree angle of incidence.

⑤ **Output to a Recorder or External Meter:** A pair of banana plug terminals are located on the back panel of the photometer. These jacks provide a voltage that is proportional to the meter reading. The output for a full scale meter reading is between 140 mV and 10 V at up to 1 mA, depending on the range selection. The recorder output voltage is independent of the setting of the Sensitivity Adjust knob.

Absolute Intensity Measurements

The High Sensitivity Photometer is most effectively used for relative intensity measurements. However, accurate absolute measurements in units of lux can be made, subject to the following considerations.

- The selenium cell in the PASCO photometers does not have a corrected photopic response. The instrument is calibrated to a 2700°K tungsten filament lamp, such as is used in the OS-9102C Incandescent Light Source, and will indicate the correct intensity only for that source. If other light sources are used, absolute intensity measurements will be approximate only. Accurate relative intensity measurements can be made with any light source.
- Intensity readings are dependent on the total light energy striking the selenium cell, as well as on the spectrum of that light. Therefore, for accurate absolute measurements, the light must be incident

on the full area of the selenium cell. This means that the light must fall with normal incidence directly into the Light Probe Input Connector. The light beam must be broad enough to cover the full area of the connector, and the intensity of the light must be uniform over the full area that strikes the connector.

- The fiber-optic probe restricts both the area and the intensity of the light that reaches the selenium cell. Therefore, when using the fiber-optic probe, only relative measurements can be accurately made.

Specifications

Sensitivity— approximately 0.1 to 1,000 Lux full scale in 1x and 3x ranges. Using the Sensitivity Adjust knob, any input within the dynamic range of the instrument can be used to provide a full scale reading. When photometer sensitivity is varied using the Range switch, measurements are proportional to the range setting, but only if the Sensitivity Adjust knob remains unmoved between measurements.

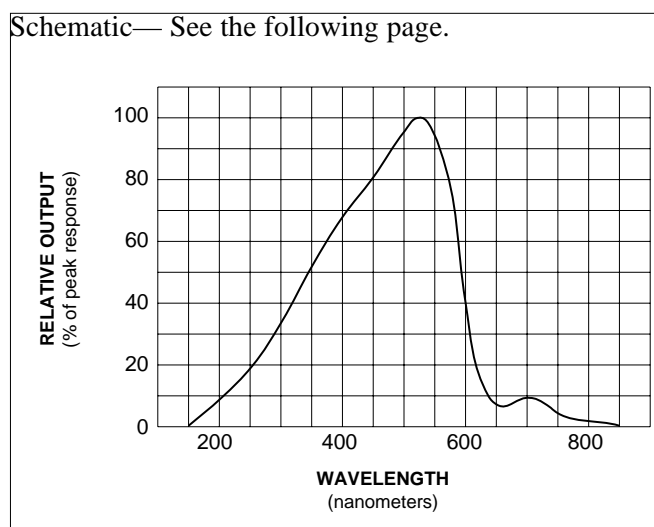
Meter— 8 cm scale length with 0 - 10 and 0 - 3 graduations.

Output— 140 mV at 1 mA. Banana jack connections on rear panel.

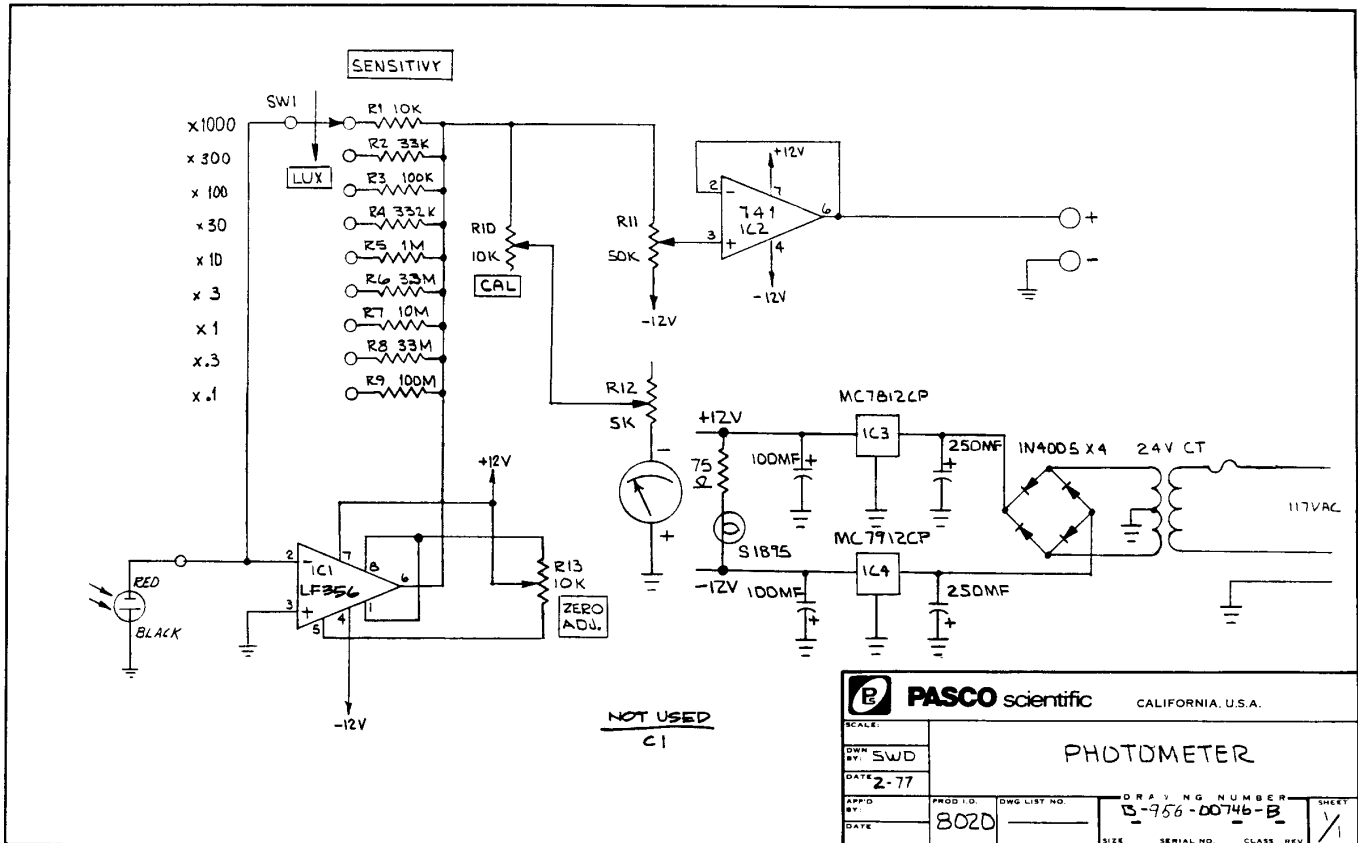
Spectral Response— Typical selenium cell response (see below).

Controls— Sensitivity Range, Sensitivity Adjust, Zero Adjust

Schematic— See the following page.



Spectral Response



SCHEMATIC
OS-8020 High Sensitivity Photometer
(Drawing # B-956-00746-B)

Limited Warranty

PASCO scientific warrants this 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. This 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 manufac-

turing 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.