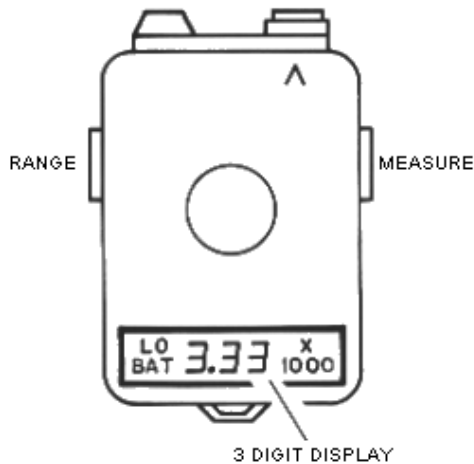


QUANTUM PHOTO-METER 1 & 2

OPERATING INSTRUCTIONS

1. INTRODUCTION



This manual describes operation of Quantum's Photo-Meter 1 and Photo-Meter 2. Please read it completely to understand the capabilities of your instrument.

There are two operating controls: **Measure** for taking a reading, and **Range** to get the most accurate light reading possible.

One **turret** is supplied for two types of measurements. In one position **illuminance** (incident light) may be measured in units of footcandles. In the other position **luminance** (reflected light in some cases) is measured in units of footlamberts.

Additional accessory turrets, that are part of the Photo-Meter system, may be fitted to the instrument.

2. MEASURE CONTROL

Depress and hold this control (right side of meter) to turn the meter on and display a light reading. If you fail to obtain a reading, depress the **Range** control repeatedly until numbers appear in the display. (Hold the **Measure** control in when doing this in order to see the result in the display).

The display may show the following signals:

DISPLAY	DESCRIPTION	SIGNIFICANCE
...	Three decimal points only displayed	Overrange reading. Adjust Range .
000,001 or 01	Zero or very low reading	Underrange reading. Adjust Range .
9.62 X 1000	Good reading (X 1000 will light up)	Display reads in 1,000's, i.e., 9,620 (footlamberts or footcandles).
LO BAT 9.62	Good reading (LO BAT will light up)	Change batteries soon.

3. RANGE CONTROL

This control sets the readout range of the digital display. Each time **Range** is depressed the meter reads the next higher range, until it reaches the highest range. Then the **Range** control will recycle the meter to the lowest (most sensitive) range.

The table below explains how the ranges work. The arrows signify the action when **Range** is depressed.

When the **X**
1000 indicator is lit in the display, the reading is shown in thousands. In that case, the decimal point

becomes the "comma" in the number. For example, a display of $6.43 \frac{X}{1000}$ is quickly recognized as 6,430 since 3 digits always follow a comma. In the same manner, the display $0.43 \frac{X}{1000}$ becomes 0,430 or just 430. (This reading could have been displayed more accurately on range 3).

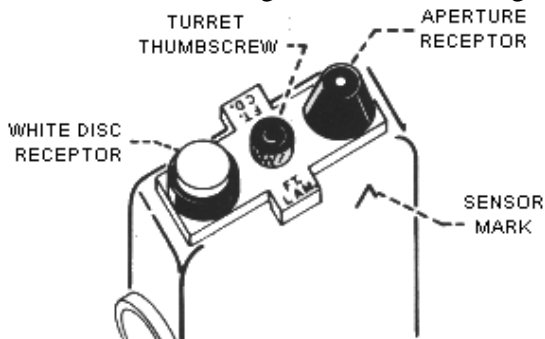
Range No.	Display	Meaning
1	0.01 to 9.99	As shown
2	00.1 to 99.1	As shown
3	001 to 999	As shown
4	0.01 $\frac{X}{1000}$ to 9.99 $\frac{X}{1000}$	10 to 9,990
5	00.1 $\frac{X}{1000}$ to 99.9 $\frac{X}{1000}$	100 to 99,900

The readings above are in units of footcandles or footlamberts, depending upon the turret position. Once a range is selected the meter will maintain that range whether **Measure** is depressed or not. (**Measure** need not be depressed to change ranges). No damage will occur if the meter is switched to a sensitive range under strong illumination.

Since there are 5 ranges, depressing **Range 4** times in quick succession has the effect of selecting the next more sensitive range.

4. MODE OF MEASUREMENT

The turret, on top of the instrument, has two light receptors. The proper receptor is positioned over the light sensor for the desired type of measurement. The positions of the light receptors can be changed by loosening the turret thumbscrew, reversing the turret, and re-tightening the thumbscrew.



For footcandles, the white disc is used. Locate it over the light sensor, whose location is designated by a mark \blacktriangle on the instrument housing.

For footlambert measurements, locate the clear aperture receptor over the sensor.

If you have positioned the turret properly you can read rightside up from the front of the instrument the type of measurement, either FT.CD. or FT. LAM., on the tabs of the turret.

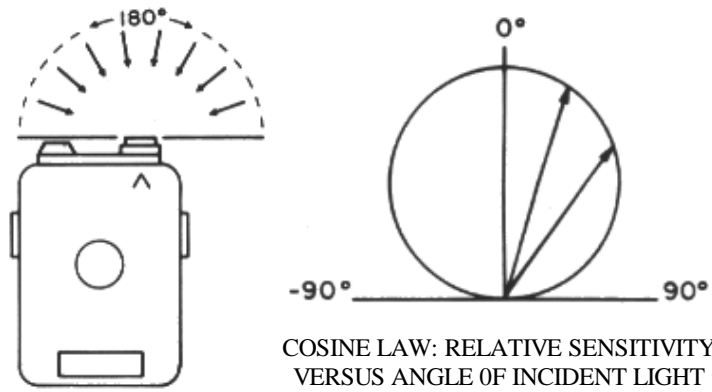
Whichever position of the turret is chosen, the digital display will be calibrated in the corresponding unit of measurement. Proper measuring technique is also necessary for accurate measurements, as discussed next.

5. MEASURING TECHNIQUE

Illuminance - footcandles

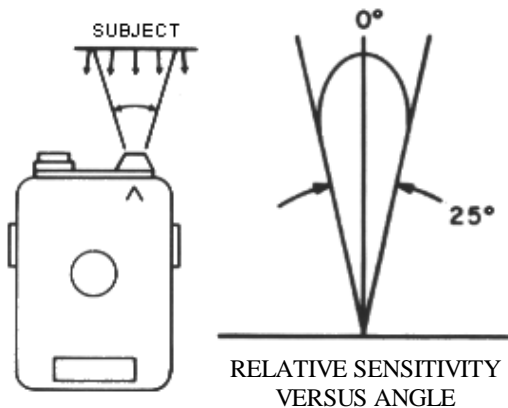
This is the amount of light energy incident upon a surface. The surface is defined by the geometric plane of the white disc. Light sources within the (180°) hemisphere in front of the white disc will be sensed according to the cosine law.

For best accuracy do not block light sources in the 180° hemisphere. The orientation of the white disc for footcandle measurements is designed to minimize the effect of the operator's presence on the reading.



Luminance - footlamberts

Luminance is the photometric brightness of sources or of light reflected from objects. Photo-Meters read the overall luminance in approximately a 25° field of view, as shown.



When attempting luminance readings, avoid casting shadows upon the subjects when those subjects are reflecting objects (i.e. not light sources).

6. USING THE CALCULATOR DIALS (Photo-Meter 2 only)

Film Speed Setting

First rotate the outer dial rim until the FT. LAM. \sphericalangle and FT. CD. ☀ symbols lie on either side of the digital display window.

Next, place your index finger into the slot (on the right hand side of the meter) and your thumb on the dial rim. Squeeze the rim and dial together and turn them. The ASA and DIN numbers will change to new values. If the desired value is not reached, reset the rim to its original position, and again turn the rim and dial.

Camera Settings

Set the digital reading obtained into the outer dial scale by turning the dial rim. Use the FT. CD. ☀ window or FT. LAM. \sphericalangle window pointer corresponding to the mode selected. Remember that FT. CD. corresponds to an incident light reading using the white disc receptor, and FT. LAM. corresponds to a reflected light reading of luminance.

If the digital reading does not correspond exactly to one of the numbered line markings on the dial, set it to the nearest dot or line marking by estimating. (You will still obtain good results because Photo-Meter 2 is much more precise than it needs to be for photography, and each dot on the dials represent just a 1/3 stop change in light intensity).

The calculator dials now show the correct combinations of corresponding shutter speed, lens f-numbers, and cine (frames- per-second) values for the digital light value indicated. Exposure values (Ev) also appear.

7. MISCELLANEOUS

Photo-Meter 1 & 2 are very sensitive instruments that respond to slight changes in illumination. This is especially true when measuring fluorescent lights.

Fluorescent illumination varies in brightness at twice the rate of the AC line frequency (60 hz). This variation is not apparent to the human eye, but it will be apparent in readings with Photo-Meter 1 or 2. A slight drift in the reading of the instruments might indicate the condition of fluorescent illumination. The average of the highest and lowest reading is the effective light value.

Conversion factors are shown below for other units of measurement.

lux = footcandles X 10.8

footcandles = lux X .093

cd/m² (nit) = footlamberts X 3.43

footlamberts = cd/m² X .292

To determine candlepower (luminous intensity) of a light source, measure footcandles at a known distance from the source. Preferably, the distance (d) should be 10 times (or more) greater than the size of the source. Then multiply the square of the distance by footcandles to obtain candlepower in candela.

candlepower = ft.cd. X d²

The amount of candela calculated above is the intensity of light emitted in the direction of the measurement position. It is sometimes called beam candlepower.

Electric lamps are frequently specified in terms of lumens output. This figure is not so useful as beam candlepower for predicting footcandles at the area of interest, since the beam pattern of the lamp is usually not known. Also, lamp housings, reflectors, and lenses can have a great effect on beam candlepower. For detailed definitions of the terms of light measurement you may consult the various books available, including RCA's Electro-Optics Handbook, RCA, Harrison, N.J. 07029, especially Section 2.

8. BATTERIES

When the batteries are weak the LO BAT signal in the display window will be continuously lit from behind when **Measure** is pushed. An intermittent LO BAT signal is not cause to change batteries.

To change batteries, loosen the battery door screw with a coin. Handle the new batteries with tissue paper to avoid corrosion of the contacts. Replacement battery types are listed under Specifications.

Cold temperatures may temporarily cause the battery voltage to drop, thereby lighting LO BAT.

If the instrument will not operate, clean all batteries and contacts as most problems are caused by poor electrical connections. Also observe proper battery polarity (+ , -).

9. SPECIFICATIONS

Models: Photo-Meter 1; Photo-Meter 2

Capabilities: Illuminance (illumination or, incident light in foot-candles),
Luminance (reflected light or brightness in footlamberts).

Readout: Three digit L.E.D. display.

Range: In footcandles or footlamberts, 0.01 to 99,900.

Accuracy: Within 7% of full scale range for 2500°k to 5400°k light sources.

Sensor: Silicon photodiode with photometric filter.

Spectral Response: Close match to the C.I.E. photopic response curve.

Batteries: Type A-76 alkaline button cells, or silver oxide types MS-76, 10L14, RW-42, 357.

Size: 4 x 2 3/4 x 1 1/8 inches.

Weight: Approx. 4 ozs.

Supplied with: Case, neck cord, operating manual.

ADDENDUM

Photo-Meters now are equipped with a "freeze" feature to store readings in the display. Upon releasing the **Measure** control, the display will freeze and show the last reading for about 5 seconds. This feature allows viewing a reading after taking a measurement from a difficult viewing position.

The low battery signal operation has been modified (see Section 8 - Batteries). The battery check circuits are engaged when **Measure** is released, and until the display goes blank. Other instructions in Section 8 about battery signals apply.

A NOTE ON BATTERIES

To insure daily trouble-free performance of your meter, proper care must be given to the batteries and the battery compartment.

1. Clean batteries - use clean tissue paper and rub gently. Handle batteries with tissue paper, not fingers, after cleaning. When meter is left unused for extended period, remove batteries (do not stack).
2. Clean battery contacts use clean tissue paper with alcohol, or pencil eraser. Clean all four contacts at the bottom of the battery compartment.
3. Gently clean all four springs on the battery door.

The above procedures should also be followed before replacing old batteries with new ones and before you return meter to factory for repair, or if batteries appear to be weak.