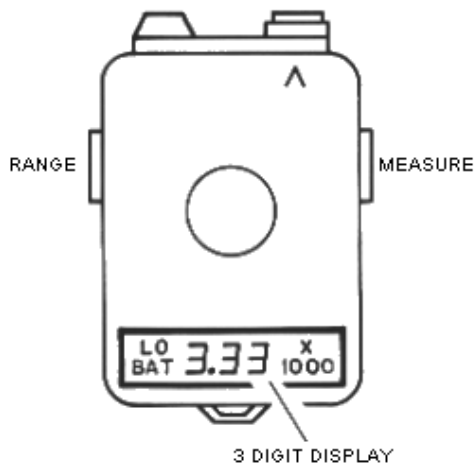


QUANTUM PHOTO-METER LX

OPERATING INSTRUCTIONS

1. INTRODUCTION



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

There are two operating controls: **Measure** for taking a reading, and **Range** to adjust the meter display to the light level being measured.

One **turret** is supplied for two types of measurements. In one position **illuminance** may be measured in units of lux. In the other position **luminance** is measured in units of candela/m².

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.

When **Measure** is released the display **will freeze and show the last reading for about 5 seconds**. This feature allows viewing a reading when taking measurements in difficult viewing situations.

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 $\overset{X}{1000}$ 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 $\overset{X}{1000}$ is quickly recognized as 6,430 since 3 digits always follow a comma. In the same manner, the display 0.43 $\overset{X}{1000}$ becomes 0,430 or just 430. (This reading could have been displayed more accurately on range 2).

RANGE NO.	DISPLAY	MEANING
1	00.1 to 99.0	As Shown
2	001 to 990	As Shown
3	0.01 $\overset{X}{1000}$ to 9.99 $\overset{X}{1000}$	10 to 9990
4	00.1 $\overset{X}{1000}$ to 99.9 $\overset{X}{1000}$	100 to 99900
5	001 $\overset{X}{1000}$ to 999 $\overset{X}{1000}$	1000 to 999000

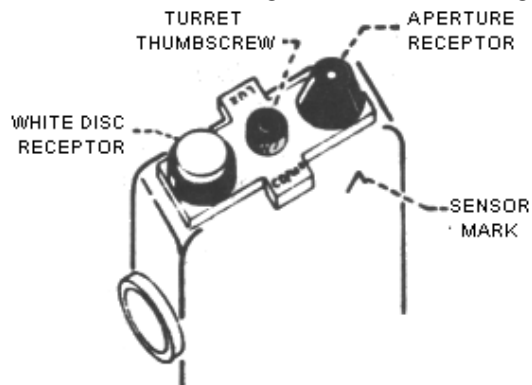
The readings above are in units of lux or candela per square meter, depending upon the turret position.

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

For candela/m² measurements, locate the clear aperture receptor over the sensor.

If you have positioned the turret properly the measurement selected will also be indicated on the turret tab closest to the front of the instrument.

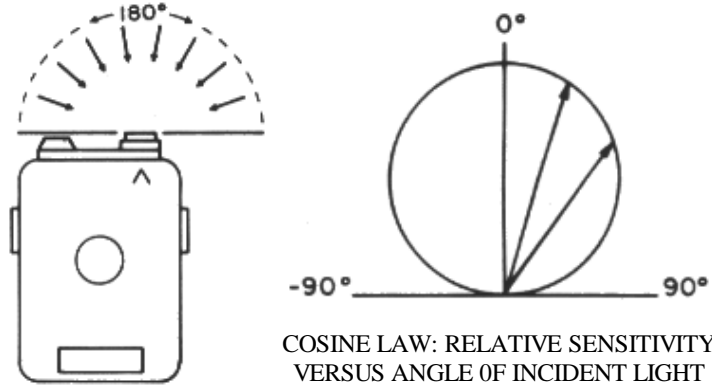
Whichever position of the turret is chosen, the digital display will be calibrated in the corresponding unit of measurement. Proper measuring technique is also necessary for accurate measurements, as discussed next.

5. MEASURING TECHNIQUE

Illuminance - lux

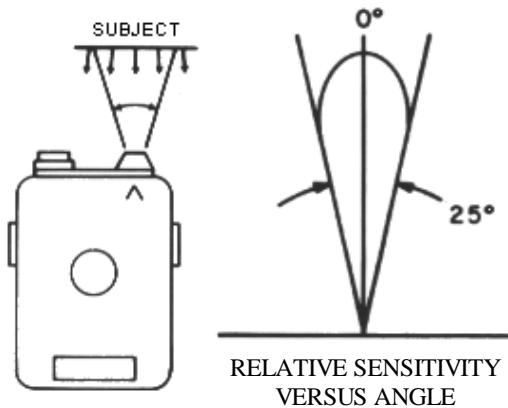
This is the amount of light energy incident upon a surface. The surface is defined by the geometric plane of the white disc. Light sources within the (180°) hemisphere in front of the white disc will be sensed according to the cosine law.

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



Luminance - candela/m²

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. MISCELLANEOUS

Photo-Meters 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 (50 or 60 hz). This variation is not apparent to the human eye, but it will be apparent in readings with Photo-Meters. 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/m^2 (nit) = footlamberts X 3.43

footlamberts = cd/m^2 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 illuminance to obtain candlepower in candela.

candlepower = lux X m^2 = ft. candle X ft.^2

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.

7. BATTERIES

When the batteries are weak the LO BAT signal in the display window will light **after the Measure control is released**. If LO BAT stays lit with the display, change the batteries. If LO BAT lights intermittently it is only a warning.

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 (+ , -).

8. SPECIFICATIONS

Capabilities: Illuminance in lux

Luminance in cd/m^2

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

Range: 00.1 to 999,000.

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: 10 X 7 X 2.5 cm.

Weight: Approx. 110 g.

Supplied with: Case, neck cord, operating instructions.

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 7 - Batteries). The battery check circuits are engaged when **Measure** is released, and until the display goes blank. Other instructions in Section 7 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.