QUANTUM CALCU-LIGHT

OPERATING INSTRUCTIONS

INTRODUCTION

CALCU-LIGHT

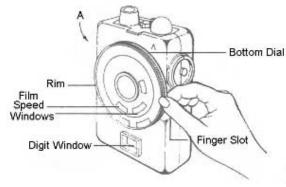
Digital Exposure Meter

You now possess the most significant innovation in photographic light measurement since the introduction of the moving coil meter!

Unlike ordinary light meters, Calcu-Light displays its light readings **digitally** for superior accuracy, ruggedness and clarity. In addition to a digital read-out, Calcu-Light incorporates other innovative features: a Blue enhanced silicon photodiode for fast response and accuracy, and CMOS (Complementary Metal-Oxide Semiconductor) integrated circuit technology for reliability. Calcu-Light's unique LIGHT TURRET is capable of measuring both incident and reflected light. To expand these capabilities, provisions have been made for the addition of accessory attachments.

Calcu-Light is manufactured by Quantum Instruments Incorporated, a high technology company whose expertise in advanced electronic design has made possible this truly remarkable digital exposure meter.

SETTING FILM SPEED



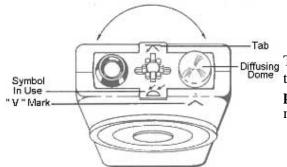
Calcu-Light is calibrated in both ASA and DIN film speed indexes. To set film speed on the calculator dial, first check the appropriate film speed window to see that it is uncovered. If it is covered, rotate the dial rim until film speed is visible. Then insert forefinger into slot on right side of meter, grasp both bottom dial and rim and rotate until the desired film speed setting is in line with the film speed marker.

See Table I (in SPECIFICATIONS section) for intermediate marks on the film speed dial and for ultra-high and ultra-low settings.

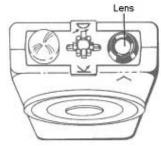
SETTING LIGHT TURRET

Calcu-Light's LIGHT TURRET is capable of measuring either incident or reflected light.

To reverse the LIGHT TURRET position, lift up (using tabs) and rotate until the turret drops securely into the instrument housing. The inverted V on the top of the case indicates whether the white diffusing dome, for the incident light, or the lens, for the reflected light, is in use. Also, symbols for the incident light and reflected light appear on the turret facing the front of the instrument.

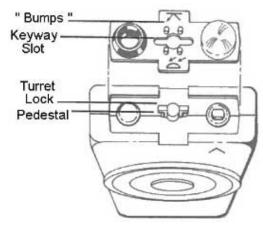


The diffusing dome is used for incident light measurements. Hold the light meter at the subject position and point it **towards the camera position**. An incident light measurement covers 180 degrees and measures the amount of light received by the subject.



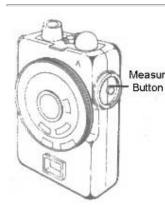
To make a reflected light \succeq measurement, point the instrument **towards the subject**. A reflected light measurement covers a 30 degree field of view and measures the amount of light reflected by the subject towards the camera.

REMOVING LIGHT TURRET



Calcu-Light's LIGHT TURRET is removable to allow for improvements and accessories as they become available. Pull the TURRET LOCK up and rotate it over the keyway slot. The LIGHT TURRET is now free. To replace, set the TURRET LOCK on top of the small pedestal in the housing so the keyway clears it as the LIGHT TURRET is replaced. Pull up and rotate the TURRET LOCK 90 degrees over the four "bumps" on the LIGHT TURRET.

TAKING A LIGHT MEASUREMENT

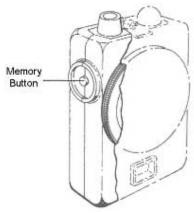


Point Calcu-Light in the desired direction and **press** the MEASURE button on the right side of the instrument. **Hold until two digits appear**. Each time the MEASURE button is pressed one light measurement is taken.

Turn the dial rim to the digital number obtained - use the pointer in the incident light window or the reflected light window, depending upon the type of measurement taken. The digits on the dial are marked **0..3..6..9** etc. Dot markings correspond to intermediate digits (**0** 1 2 **3** 4 5 **6** etc.)

The calculator dials now show all the possible shutter, lens and movie (CINE) settings for the digital light value indicated. Correct Exposure Value (Ev) numbers also appear in the window marked Ev. The major (line) markings are one stop, or Ev, apart. Intermediate (dot) markings are 1/3 stop from major line markings. See Tables II and III in SPECIFICATIONS section for exact designations of dot markings.

MEMORY

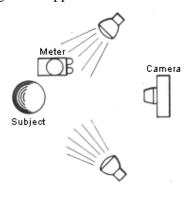


Calcu-Light automatically remembers the last light reading taken. To recall this reading, press the MEMORY button on the left side of the instrument. The light value indicated will not be changed by pressing the MEMORY button.

The display is easily seen in bright sunlight by either directly facing the sun or turning your back to it.

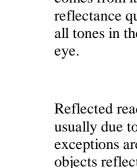
EXPOSURE MEASUREMENTS

Photographic light readings fall into two general categories: incident and reflected. Each type of reading has its own advantages and applications.



Camera

Incident readings measure the amount of light received by a subject. A diffusing dome on the instrument gathers light from the 180 degree hemisphere in front of it. The center of the diffusing dome should be pointed towards the camera, from the subject position.



Incident readings are precise because they measure light as it comes from its source. The readings are not fooled by the reflectance qualities of the subject. The resulting exposure places all tones in the final picture more or less as they appear to the eye.

Reflected readings measure light coming **from** the subject, usually due to reflections of incident light. (The obvious exceptions are self-emitting subjects such as light bulbs.) Since objects reflect light in widely varying degrees, reflected readings vary correspondingly for different parts of the same scene. However, a reflected reading of an 18% grey card (defined as the average tone of a scene) will yield the same exposure as an incident light reading.

Reflected readings are useful when the photographer wishes to emphasize a particular part of a scene. By measuring only the brighter tones, for example, that particular segment of the scene will be reproduced in full detail while the darker areas fall into shadow. In all cases remember the meter "assumes" that any tone it reads is middle grey, and it gives an exposure that will render the tone as middle grey.

Reflected readings are essential for objects for which an incident light measurement is impossible or impractical: light bulbs, the sun, the moon, etc. They are also useful for determining contrast and tonal variations in scenes. To compare the brightness between two readings, subtract one from the other. The result is in 1/3 stops. Divide by three to get whole stop differences in light values.

When you need a reflected light reading, remember that Calcu-Light measures over a 30 degree cone. Get as close to your subject as you can, without blocking the light.

Similarly, always stand out of the way of light sources, or behind your subject, for incident light readings.

For backlit subjects, incident light measurements are ideal. The light source behind the subject will not be measured because the diffusing dome will not intercept light from it. The dome will measure light from the hemisphere in front of the subject - due to the secondary sources and reflections.

COMPENSATIONS

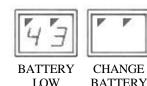
Remember to compensate for the filters you use on your camera!

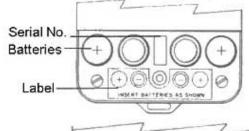
Reciprocity effects of film must be taken into account for unusual exposures. Generally, film exposures faster than 1/1000 second or longer than one second do not follow the normal exposure formulas. Such exposures must be increased to obtain satisfactory results. The amount of increase varies with the type of film used, and this information is usually available from the manufacturer of the film.

It is always advisable to recalibrate your camera to your exposure meter when you change equipment. Take a roll of film as you normally do and develop as usual. Critically analyze your results and make the necessary adjustments (usually in film speed rating) to obtain the best results.

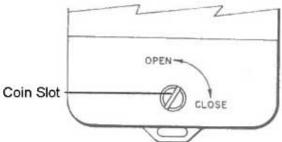
BATTERIES

When batteries begin to fail, Calcu-Light provides an automatic signal - two dots appear **above** the digits in the display window when the MEASURE button is pressed. However, Calcu-Light will continue to give accurate results until the dots appear **before** the digits appear.





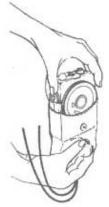
To change the batteries, insert a coin in the slotted screw of the battery door and turn counter clockwise until completely loose. Remove the door and replace the four batteries **observing proper polarity** according to the label inside the battery compartment. To prevent a poor connection, **handle the batteries with tissue paper**. Otherwise, the acid from your fingertips may corrode the battery contacts.



Close the battery door and turn the screw clockwise until the door is tightly and properly fitted. Push the MEASURE button to see that the display lights brightly and the low battery indicators are out. If the indicators appear, wipe the batteries and electrical contacts with tissue paper to remove grease or dirt.

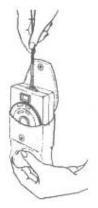
The Calcu-Light batteries are designed to last approximately one year with average use. To conserve power, light the display for as short a time as possible. When taking light measurements, push the MEASURE button for only one second, or until the display lights, then release. To recall the light value, push the MEMORY button.

USING THE CARRYING CASE



To have Calcu-Light available at all times, use the neck strap supplied with the instrument. The neck strap and carrying case can be utilized in two ways.

For use as a holster, attach the case loop to a belt or other convenient location. Insert Calcu-Light into the case TURRET first. To remove, pull the neck strap and squeeze a lower corner of the case. To wear the case on the neckstrap, feed the strap through the hole in the bottom of the case and insert Calcu-Light bottom first. Remove by pushing and squeezing a lower corner of the case.



Avoid pulling on the spring loaded LIGHT TURRET when removing the instrument from its case.

CARE OF YOUR CALCU-LIGHT

Always avoid storing photographic equipment and supplies in hot or humid environments. Particularly, avoid storage in closed automobiles (or compartments, trunks etc.) on hot days.

On very cold days, the low battery indicators of Calcu-Light may light. Usually this is a temporary condition and can be ignored if the indicators go out at room temperature.

Avoid scratching the diffusing dome, lens, or digital display window. If they must be cleaned, use a soft cotton ball or swab with soap and water. Do not rub - gently brush away dirt.

CALIBRATED MEASUREMENTS

Calcu-Light is a precision instrument that can be used for calibrated light measurements. Table IV represents the nominal values of illuminance (incident light) and luminance (reflected light) for Calcu-Light. The accuracy is within plus or minus one digit or better.

Because a footcandle meter should have a flat diffusing screen, the footcandle values in Table IV are intended for measurements of direct light beams (arc lamps, spots) and for general lighting surveys only. The hemispherical diffuser of Calcu-Light, however, is optimum for photographic measurements, where the subjects are usually three dimensional and illuminated from many directions (sun, sky, reflections, etc.). The footlambert values (for the reflected light mode) represent the average brightness (or luminance) over the 30 degree measuring cone of Calcu-Light. A measurement of a surface of uniform brightness gives the specific footlambert value for that surface.

TABLE IV

Digits	Incident Light (Foot- candles)	Reflected Light (Foot- lamberts)									
1	.031	.045	17	1.3	1.8	33	51	73	49	2000	2900
2	.039	.056	18	1.6	2.3	34	64	92	50	2600	3700
3	.050	.071	19	2.0	2.9	35	81	115	51	3300	4700
4	.062	.089	20	2.5	3.6	36	100	145	52	4100	5900
5	.079	.11	21	3.2	4.5	37	130	180	53	5200	7300
6	.10	.14	22	4.0	5.7	38	160	230	54	6500	9300
7	.13	.18	23	5.0	7.2	39	200	290	55	8200	11,700
8	.16	.23	24	6.3	9.1	40	260	370	56	10,300	14,800
9	.20	.28	25	8.0	11.5	41	320	460	57	13,000	18,600

10	.25	.36	26	10	14.4	42	2	400	580	5	8	16,000	23,500
11	.31	.45	27	13	18	43	3	500	730	5	9	20,000	29,500
12	.40	.57	28	16	23	44	1	650	920	6	О	26,000	37,000
13	.50	.72	29	20	29	4:	5	800	1150	6	1	33,000	47,000
14	.63	.90	30	25	36	40	5	1000	1450	6	2	41,000	59,000
15	.79	1.1	31	32	46	4′	7	1300	1850	6	3	52,000	74,000
16	1.0	1.4	32	40	58	48	3	1600	2300	6	4	66,000	94,000

Note:

Multiply footcandles by 10.8 to convert to lux.

Multiply footlamberts by 3.48 to convert to nits.

PROBLEMS AND SOLUTIONS

The following is a list of possible cures for any difficulties you may encounter when using Calcu-Light.

1. Digits read only 00, or are inconsistent:

- A) Hold the MEASURE button until the digits light (about one second). Be sure LIGHT TURRET is not blocked.
- B) It may be too dark to make a reading.

2. Digits light dimly and dots light above digits:

Batteries are poorly connected, improperly installed, or require replacement.

3. Two readings of same scene differ by one or two digits:

There is nothing wrong. Calcu-Light measures precisely in 1/3 stop increments. Slight changes in position or lighting are detected. Also, fluorescent lamps emit light with variable intensity. This symptom tells you to shoot slower than 1/125 sec. under fluorescent lights.

4. Battery indicators (dots) momentarily appear after MEASURE button is released:

This is a sign that battery check circuits are functioning. The batteries are good unless dots appear while MEASURE button is pressed and held down.

SPECIFICATIONS

TABLE I

Intermediate Film Speed Markings

The DIN scale is marked in steps of 3 (0, 3, 6,...48). Intermediate markings (dots) are whole numbers, i.e., **0** 1 2 **3** 4 5 **6** ... etc.

The ASA scale shows only the bold type values listed below. The intermediate values are marked by dots on the dial scale.

0.8 1.0 1.2 **1.6** 2.0 2.4 **3.0** 4 5 **6** 8 10 **12** 16 20 **25** 32 40 **50** 64 80 **100** 125 160 **200** 250 320 **400** 500 640 **800** 1000 1200 **1.6M** 2000 2500 **3.2M** 4000 5000 **6.4M** 8000 10,000 **12M** 16,000 20,000 **25M** 32,000 40,000 **50M**

Ultra-High Film Speed Markings

Use the DIN scale pointer. There are four undesignated line markings to the left of DIN 48. They are DIN 51, 54, 57, 60. These correspond, respectively, to ASA 100,000, 200,000, 400,000, and 800,000.

Ultra-Low Film Markings

Use the ASA scale pointer. There are four undesignated line markings to the right of ASA 0.8. They are ASA 0.4, 0.2, 0.1, 0.05. They correspond, respectively, to DIN -3, -6, -9, and -12.

TABLE II

F-Number Markings

The f # scale is marked with the bold type values below. The intermediate values correspond to the dots on the dial, with the exception of f/0.7 and f/181, which correspond to lines. 0.7 0.8 0.9 **1** 1.1 1.3 **1.4** 1.6 1.8 **2** 2.2 2.5 **2.8** 3.2 3.6 **4** 4.5 5 **5.6** 6.4 7.1 **8** 9 10 **11** 13 14 **16** 18 20 **22** 25 29 **32** 36 40 **45** 51 57 **64** 72 81 **91** 102 114 **128** 144 161 181

TABLE III

Shutter Speed Scale

The shutter speed scale is marked with the bold type values below. Intermediate values correspond to dots on the dial scale.

1/sec. 4000 3000 2500 2000 1600 1250 1000 800 640 500 400 300 250 200 160 125 100 80 60 50 40 30 25 20 15 12 10

Sec. 1/8 1/6 1/5 1/4 1/3 1/2.5 1/2 1/1.6 1/1.3 1 1.2 1.6 2 2.5 3 4 5 6 8 10 12 15 20 25 30 40 50

Min. 1 1.2 1.6 2 2.5 3 4 5 6 8 10 12 15 20 25 30 40 50 60

To obtain frames-per-second for movie work, divide values in 1/sec chart by 2.

Model designation:

Calcu-Light I

Serial number:

Inside battery compartment

Capabilities:

Incident and reflected light readings with photographic exposure calculator dial

Readout:

Two digit light emitting diode (L.E.D.) display. High intensity for outdoor viewing. Range 1-64.

Readout, accuracy:

Plus or minus one digit (1/3 Ev).

F# range:

f/0.7 to f/181 (f/l to f/128 marked)

Shutter speed markings:

1/4000 sec. to 1 hour

Film speed range:

ASA: 0.05 to 800,000 (0.8 to 50,000 marked)

DIN: -12 to 60 (0 to 48 marked)

Exposure value markings:

Ev 9 to Ev 24

Sensitivity:

For ASA 100 film (DIN 15), Ev-3 to Ev 21.3 (incident & reflected)

Batteries:

Four 1.5 volt Silver Oxide button cells.

Recommended types: Mallory MS-76, 10L14; Ray-O-Vac RS-76, RW-22, RW-42; Eveready S-76, 357; Panasonic G-13, W-14

Sensor:

Blue enhanced silicon photodiode. Color corrected. Instant dark to light measurements with full accuracy.

Electronics:

Integrated (CMOS) circuitry.

Memory retention time:

Essentially infinite, or until MEASURE button pressed or batteries changed.

Size:

Overall: 4 x 2 3/4 x 11/8inches (10 x 7 x 3 cm.)

Weight (excluding case): 112 grams (4 ounces)

Exposure constants (A.N.S.I. Standard 3.49-1971):

Reflected light: K=3.64 Incident light: C=25.6