

QUANTUM CALCU-LIGHT X

OPERATING INSTRUCTIONS

1. INTRODUCTION

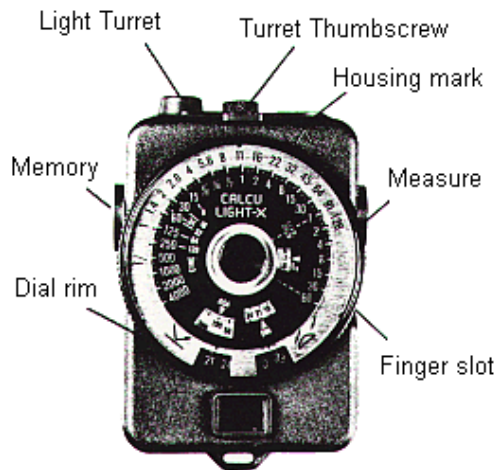




Diagram 1

This manual is your guide to operating the Calcu-Light. Please read it completely to fully benefit from the unique capabilities of your instrument.

Refer to diagram 1 throughout this manual. There are two switch controls, **MEASURE** and **MEMORY**. A **LIGHT TURRET** rotates to enable either the incident or reflected light measurement mode. A calculator dial provides f-stop, film speed, shutter speed, exposure value (Ev) and cine (frames-per-second) values.

2. SETTING FILM SPEED




First, rotate the outer dial rim until the reflected  and incident  symbols lie on either side of the digital display window. This exposes the film speed dial, in the finger slot, on the right hand side of Calcu-Light.

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

See specifications for the exact designations of film speed "dot" markings.

3. SETTING AND REMOVING LIGHT TURRETS

The standard Calcu-Light turret rotates to take either 30° reflected light or 180° incident light measurements. To change the mode, loosen the turret thumbscrew approximately 4 or 5 turns. Lift and rotate the turret and tighten the screw.

The selected mode is indicated by whichever turret symbol, reflected  or incident  lies at the front (dial side) of Calcu-Light. A mark on the instrument housing  serves as a reminder of the mode. The white dome for incident light, the lens for reflected light.

The techniques of incident and reflected light measurements are covered in Section 5.



To remove the turret turn the thumbscrew counterclockwise until it is free. Any of the accessory turrets described in section 8 can now be mounted onto Calcu-Light.

4. TAKING A LIGHT MEASUREMENT

Point Calcu-Light in the desired direction and press the **MEASURE** control. A reading will appear in the display

window. Continue to hold the measure control to obtain updated readings.

Calcu-Light automatically remembers the last light reading taken. To recall this reading press the **MEMORY** control. The digital light value indicated will not be changed by pressing **MEMORY**.


Set the digital reading obtained into the dial by turning the dial rim. Use the incident  window or the reflected  window pointer corresponding to the mode selected. The calculator dials should 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.

All line markings on the dials are for one Ev, or stop, apart. Dot markings are 1/3 Ev increments, or 1/3 stop each. The digital numbers of Calcu-Light are also a sequence of 1/3 stop increments of light value.

Sections 7 and 10 give more detailed information about the digital and dial readouts.


5. EXPOSURE MEASUREMENT

Photographic light readings taken with Calcu-Light are categorized as reflected or incident light measurements. The system accessory attachments described in Section 8 provide for special types of measurements within those two categories.

Incident readings measure the light received by the subject from the (180°) hemisphere in front of the subject (towards the camera). To take the reading, use the diffusing dome of the light turret by mounting it over the  mark on the instrument. Hold Calcu-Light at the subject position and point the center of the diffusing dome towards the camera position.

Be sure to avoid blocking any light sources. Take your reading and set the dials as previously described.

An incident reading is reliable and accurate because it is a measurement of light from its source, before it is reflected and modified by the subject. The reading is not affected by the subject's color, tone or other reflectance qualities. The resulting exposure places tones in the final picture (more or less) as they appear to the eye.

Reflected light readings, on the other hand, are essential for either convenience or special applications. They measure light reflected by a subject in a specific direction. To take a reading use the lens of the turret by mounting it over the  mark on the instrument. Point Calcu-Light towards the subject from the direction of the camera. You may measure the subject up close or from far away, but do not block the light sources. Take your reading and set the dials as previously described.

A reflected light reading is calibrated to an average tone, defined as 18% grey. A reflected reading of an 18% grey card will result in the same exposure as an incident reading of the light source. And, the subject will be rendered as 18% grey in the final print.

A reflected reading of any subject results in an exposure that tends to render that subject as an "average" tone. That is why reflected readings of predominately bright, or dark, subjects do not generally yield the best exposures. They must be interpreted and modified. For general purposes incident readings are preferred.

Reflected light readings, however, are essential when the subject position is inaccessible for incident readings, and when the subject is itself a light source. They are useful for contrast and zone measurements to within 1/3 of a zone, or stop.

6. BATTERIES

When the batteries are weak two dots appear above the digits in the Calcu-Light display when **MEASURE** is pressed. When they first appear there is still enough power for many readings. When they appear before the digits appear, the batteries must be changed.

To do so, remove the battery door by turning the battery door screw counterclockwise with a coin. Handle the new batteries with tissue paper. Insert them and observe proper polarity. Replace the battery door and tighten the screw.

Press **MEASURE**. If the battery indicators appear, wipe the battery contacts with tissue paper to remove grease or dirt. Occasionally, new batteries must be used for a short time before the indicators will turn off.

Cold temperatures will sometimes cause the battery voltage to drop and the indicators to turn on. That does not mean, necessarily, that the batteries need to be replaced.

7. CALIBRATED MEASUREMENTS

The digital numbers displayed by Calcu-Light are calibrated illuminance values of lux or footcandles in the incident mode. In the reflected mode they represent luminance values of candela per square meter (nits) or footlamberts. Use the chart supplied for conversion.

When critical measurements of lux or footcandles are called for, use a DX-1 flat diffuser accessory. The dome diffuser of the standard turret measures true illuminance for point sources only, but is superior for photographic exposure measurements.

The readings obtained in the reflected mode are the average luminance values over the 30 degree measuring cone of the standard turret. They are also correct values when using the SX-1 10° spot attachment, or the FOX-1 fiber optic probe.

The accuracy of measurement is plus or minus one digit.

Digits	Footcandles	Footlamberts	Digits	Footcandles	Footlamberts	Digits	Footcandles	Footlamberts	Digits	Footcandles	Footlamberts
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	400	580	58	16,000	23,500
11	.31	.45	27	13	18	43	500	730	59	20,000	29,500
12	.40	.57	28	16	23	44	650	920	60	26,000	37,000
13	.50	.72	29	20	29	45	800	1150	61	33,000	47,000
14	.63	.90	30	25	36	46	1000	1450	62	41,000	59,000
15	.79	1.1	31	32	46	47	1300	1850	63	52,000	74,000
16	1.0	1.4	32	40	58	48	1600	2300	64	66,000	94,000


Note:

Multiply footcandles by 10.8 to convert to lux.

Multiply footlamberts by 3.48 to convert to candela/m².


8. ACCESSORY ATTACHMENTS

SX-1 spot attachment


This attachment measures a 10° angle for reflected light, compared to 30° for the standard reflected mode. No compensations are necessary. Use the reflected  window pointer of the dial.

CFX-1 and 2 filter attachments

These accessories provide for filtered light measurements. The filters supplied are standard photographic types. CFX-1 contains the 80B, 85B, 25A, 8 and 4x (neutral density) filters. CFX-2 comes with the 81A, 82A, 11 and 21 filters. All common filter types are additionally available separately. CFX-1 is the basic set that contains a special turret for mounting the filters.

Now when using a particular filter on a camera, the same type can be mounted on the meter. Filter factors, and their variations due to color temperature of light sources can be dispensed with. Use the reflected  window pointer.

FOX-1 fiber optic probe

This accessory measures reflected light values of 1/8 inch (3mm) diameter areas on focusing screens, ground glass, light tables and other luminant objects. It permits exact readings of scene contrast, and serves as a densitometer for negatives and transparencies with a resolution of 0.1 density units. Use the reflected window  pointer. Additional information is supplied in the FOX-1 instructions.

DX-1 flat diffuser

The purpose of the flat diffuser attachment is to make calibrated illuminance measurements and contrast measurements with studio lighting. Its applications are better described in the CALIBRATED MEASUREMENTS section.

Consult your photographic dealer for recent additions to the Calcu-Light/Calcu-Flash digital light measurement system.

9. PROBLEMS & SOLUTIONS

1. Digits only read 00.

Be sure nothing is blocking the light turret. Also, hold the **MEASURE** control long enough to obtain a reading.

2. Two readings of the same scene differ by one or two digits.

Usually, there is nothing wrong. Calcu-Light measures in precise 1/3 stop increments. Slight changes in position or lighting are detected. If you measure fluorescent lighting you will detect the strobing effect, reminding you to shoot slower than 1/125 second. Use the average of the highest and lowest reading.

3. Battery indicators appear momentarily after MEASURE control is released.

This simply indicates that the battery check circuits function. The batteries are good unless the indicators appear while the **MEASURE** control is pressed.

4. Instrument shows no display.

Be sure the batteries are connected. Clean the contacts and springs if necessary.

10. SPECIFICATIONS

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 undesigned 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 undesigned 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.

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

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.

Contrast Ratio Table

The difference between two digital readings can be converted to the numerical contrast ratio in the chart below.

Digit difference	contrast ratio	Digit difference	contrast ratio
0	0	16	40:1
1	1.3:1	17	50:1
2	1.6:1	18	64:1
3	2:1	19	80:1
4	2.5:1	20	100:1
5	3:1	21	128:1
6	4:1	22	160:1
7	5:1	23	200:1
8	6:1	24	260:1
9	8:1	25	320:1

10	10:1	26	400:1
11	13:1	27	500:1
12	16:1	28	650:1
13	20:1	29	800:1
14	25:1	30	1000:1
15	32:1	.	.

Model: Calcu-Light X

Capabilities: Incident, reflected, and calibrated light measurements.

Readout: Two digit L.E.D. display of light value in a 1/3 Ev sequence, 01 to 64.

Accuracy: 1/3 Ev.

Sensor: Blue enhanced silicon photodiode.

Measuring Range: Ev -3 to Ev 21.3 for ASA 100 film.

Dial Markings: ASA 0.05 to 800,000

DIN -12 to 60

Shutter 1/4000 sec. to 1 hour

F# f / 0.7 to f / -181

Batteries: Mallory MS-76, 10L14, Ray-O-Vac RS-76, RW-82, Eveready 357, A-76, or equivalents.

Size: 10 x 7 x 3 cm. (4 x 2 3/4 x 1 1/8 inches)

Weight: 112 gms. (4 oz.)

Exposure Constants: (A.N.S.I standard 3.49-1971) $k = 3.64$; $c = 25.6$

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.