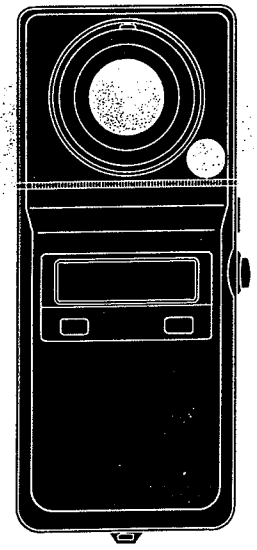
MINOLTA

ILLUMINANCE METER T-1H



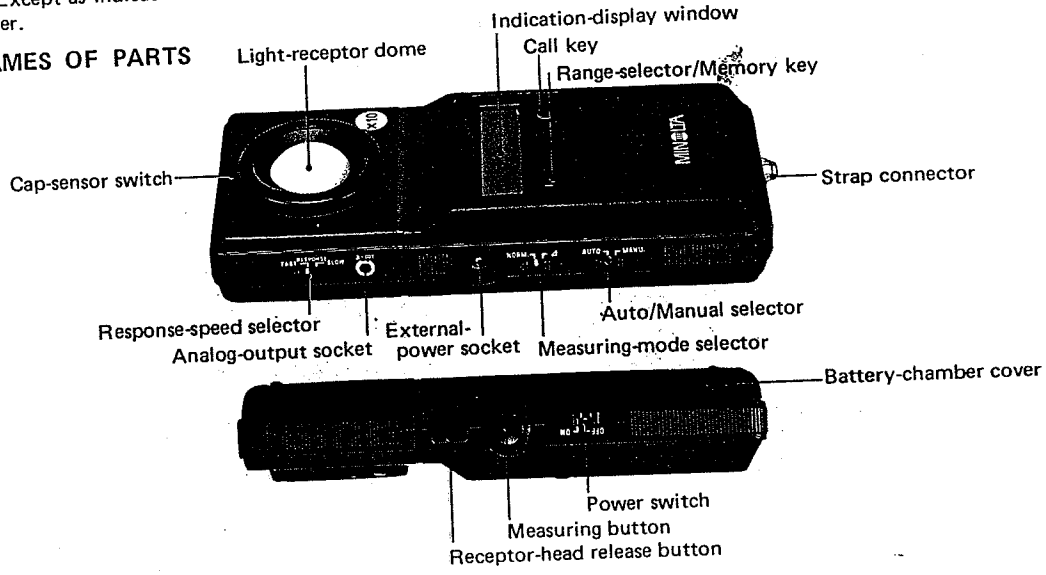
INSTRUCTION MANUAL

E

Sensitivity of Minolta Illuminance Meter T-1H is adjusted to one-tenth that of the Minolta Illuminance Meter to give it a higher measuring range: 0.1 to 999,000 lx (or 3,000,000 lx by analog output) or 0.01 to 99,900 fcd (or 300,000 fcd), compared with the Illuminance Meter's 0.01 to 99,900 lx (or 3000,000 lx by analog output) range.

Except as indicated below, operation and specifications are exactly the same as for the Illuminance Meter.

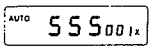
NAMES OF PARTS



OPERATION

Read the actual value for illuminance, illuminance deviation, and integrated illuminance by multiplying the displayed value by ten:

Displayed value x 10 = actual value

Ex:  x 10 = 555,000 lx

The integrating time (in hours) is read directly as displayed.

SPECIFICATIONS

Measuring range: Illuminance 0.1 — 999,000 lx (0.1 — 3,000,000 lx*)
0.01 — 99,900 fcd (0.01 — 300,000 fcd*)
*Analog-output ranges
5 ranges for both Auto and Manual
Integrated illuminance 0.1 — 9,990,000 lx·h
0.01 — 999,000 fcd·h
Infinite Integration
Integrating time (in hours) 0.01 — 999 h
Infinite Integration

Display range	Actual range
0.01 — 9.99 lx	0.1 — 99.9 lx
0.1 — 99.9 lx	1 — 999 lx
1 — 999 lx	10 — 9,990 lx
10 — 9,990 lx	100 — 99,900 lx
100 — 99,900 lx	1,000 — 999,000 lx
0.001 — 0.999 fcd	0.01 — 9.99 fcd
0.01 — 9.99 fcd	0.1 — 99.9 fcd
0.1 — 99.9 fcd	1 — 999 fcd
1 — 999 fcd	10 — 9,990 fcd
10 — 9,990 fcd	100 — 99,900 fcd

Specifications subject to change without notice

MINOLTA

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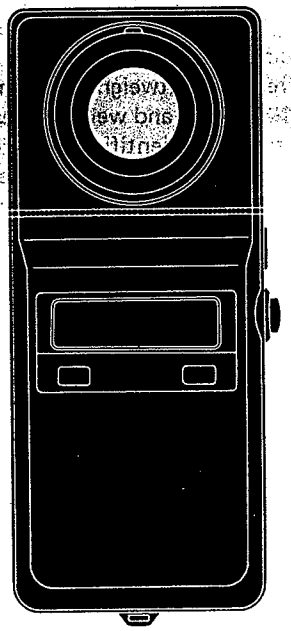
MINOLTA

ILLUMINANCE METER



INSTRUCTION MANUAL E

The Minolta Illuminance Meter represents the latest state-of-the-art from a name known for superior light metering technology. Its extrasensitive silicon photocell insures the most accurate reading of light values, and its liquid crystal digital display is operated with split-second precision by microcomputer controls. Additionally, the Minolta Illuminance Meter is extremely lightweight and compact: it measures 170 x 72 x 33mm (6-11/16 x 2-13/16 x 1-3/16 in.) and weights a scant 220g. (7-3/4 oz.). It has a great deal of use in both industrial and scientific applications: measuring the lighting of road signs, parks, shopping centers, lighting equipment, plants, hospitals, gymnasiums and athletic facilities, etc., in addition to tremendous versatility in school, laboratory and environmental control uses.

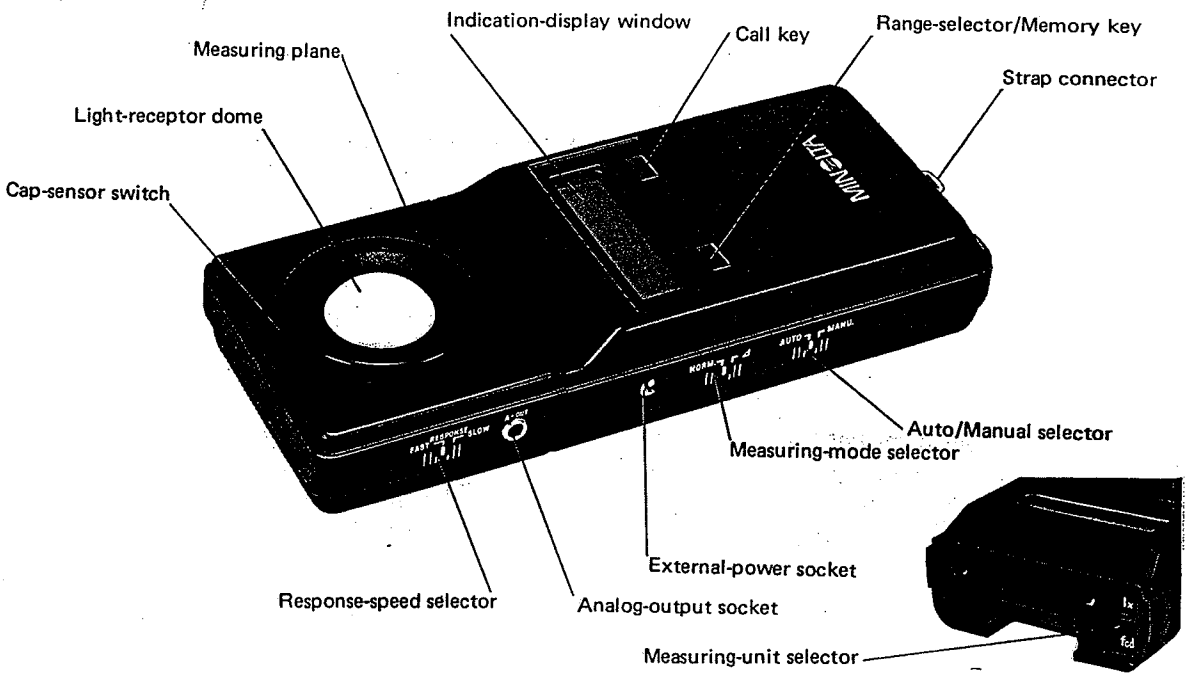
Before using this meter for the first time, please read this manual carefully while installing batteries and handling and acquainting yourself with the parts and features of your Minolta Illuminance Meter.

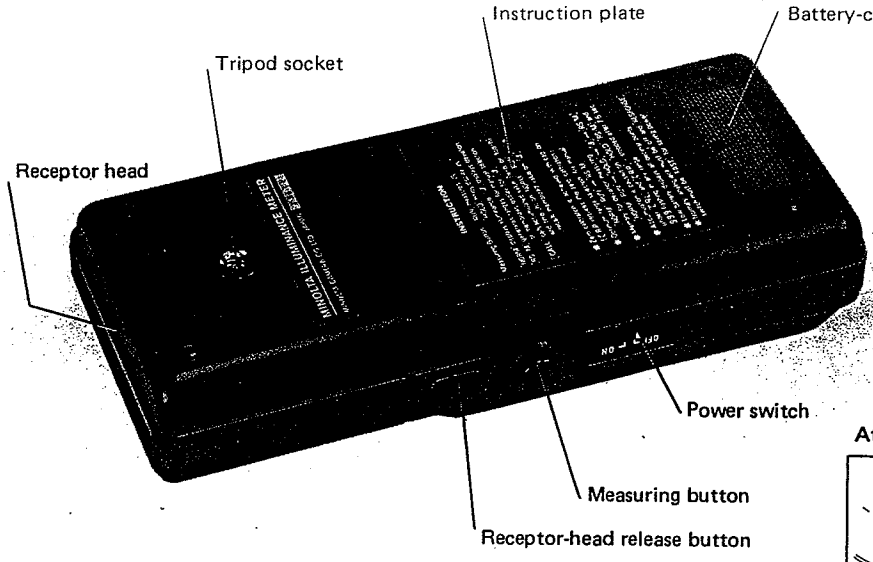
CAUTION

It is advisable not to use the meter where it may be subject to temperatures higher than 40°C, or lower than −10°C.

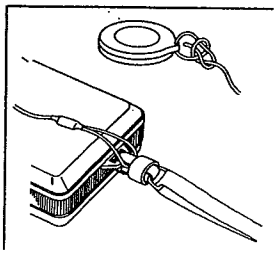
CONTENTS

NAMES OF PARTS





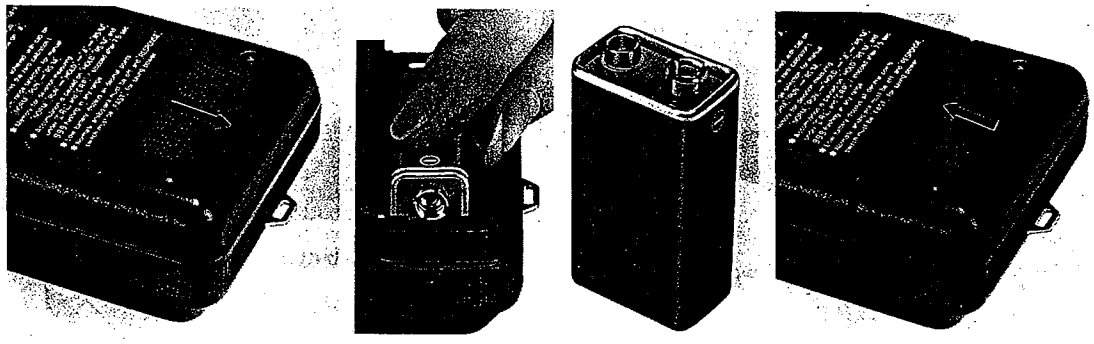
Attaching cap and strap



4 PREPARATION AND BASICS

Installing battery

1. With the power switch in the "OFF" position, remove the battery-chamber cover by pressing down on it and sliding it in the direction of the arrow.
2. Insert a 9-volt "transistor" battery (Eveready 216 or equivalent), making sure the minus (–) terminal is positioned upward as illustrated inside the battery chamber. Insert the bottom of the battery into the chamber first.
3. Replace the battery-chamber cover by carefully realigning and sliding it towards the meter body until it snaps securely into place.

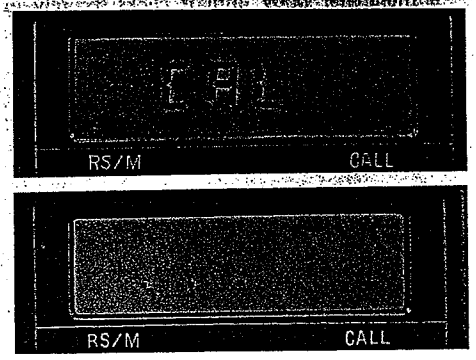


Checking battery

1. Cover the light-receptor dome with its cap and move the power switch to "ON". The letters "CAL" should appear in the indication-display window, if not, the battery should be replaced.
2. If after "CAL" appears the display goes blank or if three decimal points appear, the battery should be replaced. The appearance of any other figures indicate sufficient battery strength.

NOTE

- When not in use, meter should be turned off.
- If the meter is not to be used for two or more weeks, it is advisable to remove the battery.
- Battery life is approx. 100 hours in the "FAST" mode, and 30 hours in the "SLOW" mode (see p. 7).



Selecting measuring units

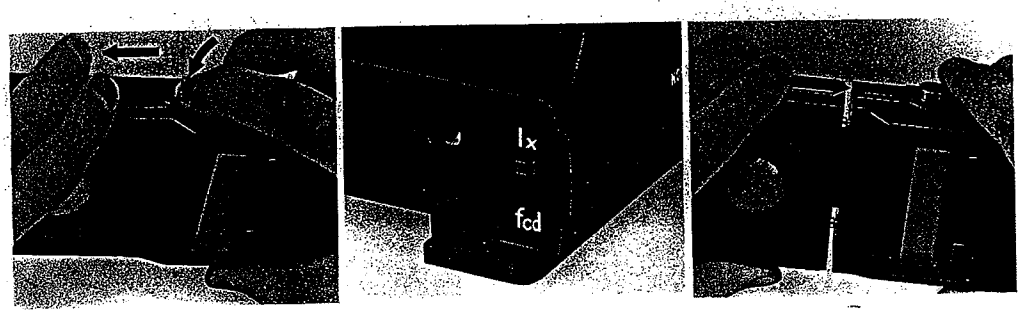
The Minolta Illuminance Meter allows you to take readings in either Lux (lx.) or Footcandle (fcd) units. To set the meter for the desired measuring units, proceed as follows:

1. Depress receptor-head release button and pull receptor head straight out and away from the meter body as shown.
2. Set the measuring-unit selector to the desired position (lx. or fcd) and replace the receptor head by pressing it all the way into the meter body until it clicks securely in place.

Once set, the meter will show the selected measuring unit in the indication-display window.

NOTE

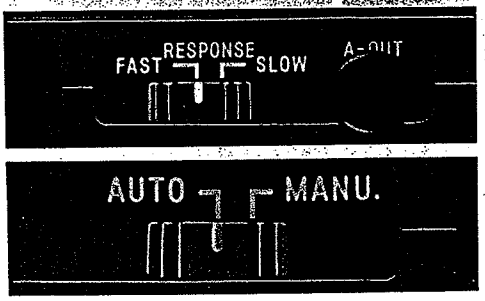
- When the receptor head is separated from the meter body, be careful that the connection pins are not damaged or handled.
- Receptor head can be installed in only one position, never force it into the meter body.



Selecting response speed

For the measurement of continuous light sources, such as, daylight, fluorescent, etc., the response-speed selector should be set at the "FAST" position. At this setting the response time of the meter is 1msec. (0.001 sec.), and the meter can be used in either the automatic or manual mode.

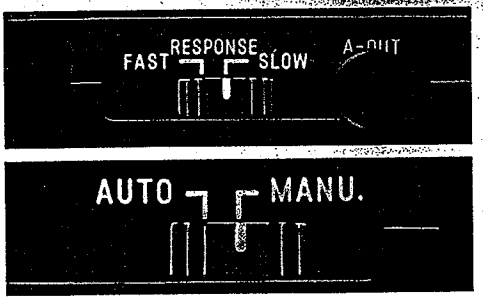
For noncontinuous light sources, such as, movie projectors, video projectors, or television monitors, the response-speed selector should be set at the "SLOW" position. Response time of the meter will be 1,000msec. (1 sec.), and the meter should only be used in the manual mode.



If the "SLOW" setting is used in the automatic mode for the measurement of noncontinuous light sources, the figures displayed may be fractionated or stopped at a reading which may be incorrect data. In this case, move the auto/manual selector to "MANU." position and select a suitable range by pressing the range-selector/memory key.

NOTE

Do not set meter at the "SLOW" position except for the measurement of non-continuous light sources in order to avoid wasting the battery-life.

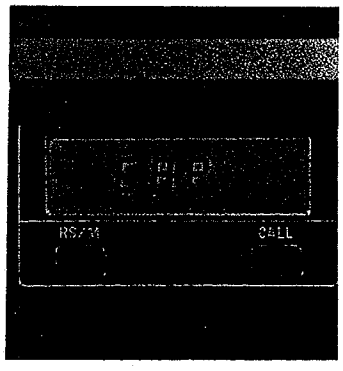


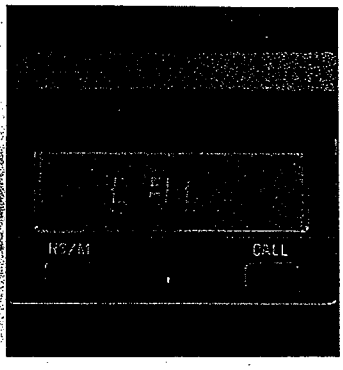
Zero-level adjustment

Before the meter can be used it must be calibrated to zero-level. The meter's cap must be in place over the light-receptor dome to calibrate the meter. If the power switch is turned on without the cap in place, the word "CAP" will appear in the indication-display window. After the cap is in place, the letters "CAL" (calibration) will be displayed.

Approximately three seconds later "CAL" will disappear, indicating zero-level adjustment has occurred. Cap can now be removed, and readings made.

Zero-level adjustment can be done at any time without affecting any of the meter's functions.

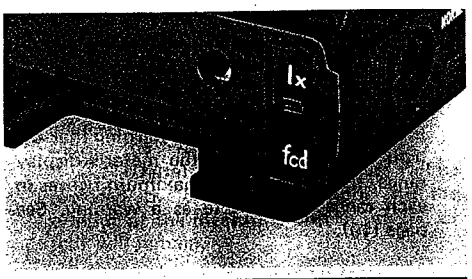


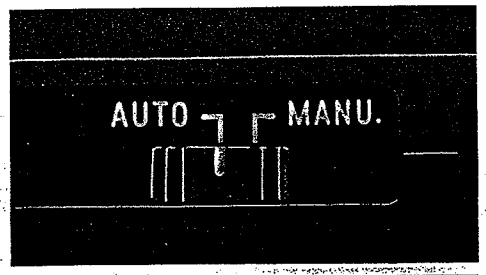


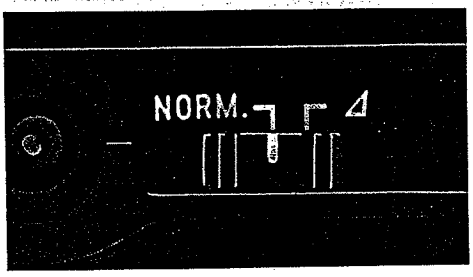
OPERATION

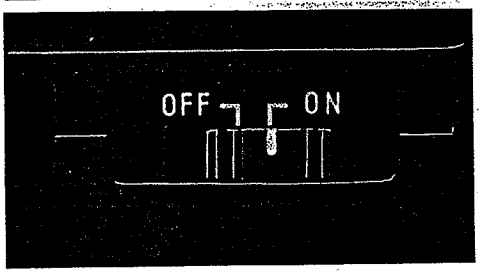
(Under normal continuous light source)

1. Select and set desired measuring unit (p. 6).
2. Set measuring-mode selector to "NORM".
3. Set auto/manual selector to "AUTO".
4. Turn power switch to "ON", and calibrate for zero-level (p. 8).

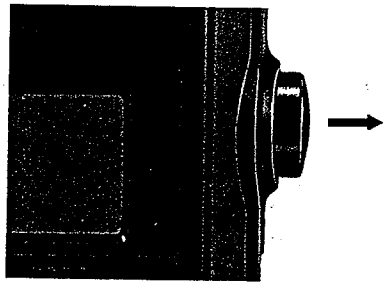








5. Press the measuring button so it is in the "RUN" position, as illustrated here and on the back of the meter.
6. Place the meter where you wish to measure, and the correct illuminance data will be shown in the indication-display window. Pressing the measuring button in will lock and hold the last meter reading.



NOTE

- If you begin taking measurement immediately after zero-level adjustment under extremely bright conditions, it takes approx. 2.5 sec. before figures will be displayed.
- In auto mode, if the illuminance of the light source being measured is higher than 100,000 lux or 10,000 footcandles the figures in the display window, 99,900 lx. or 9,990 fcd, will pulsate as a warning that the light source is beyond the meter's display range. In manual mode, maximum figures in each range will pulsate as a warning. See page (19).

MEASURING ILLUMINANCE DEVIATION

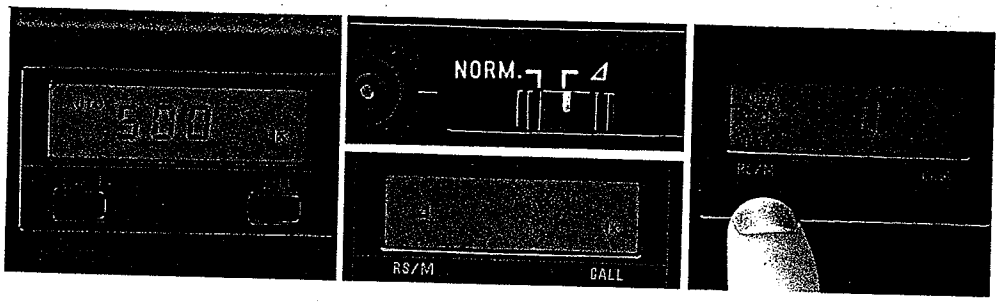
To measure the illuminance deviation between two or more light sources, or positions, you must take an initial measurement and input it to the meter's memory as a standard. This is done as follows:

1. Take your reading as explained in the previous "OPERATION" section, and hold the displayed figure by pressing the measuring button.
2. Move the measuring-mode selector to " Δ " (Delta). The displayed figure will be replaced by the " Δ " symbol and the symbol of the measuring unit in use (lx. or fcd) will remain.

NOTE

If there is data already in the memory, the remainder of that figure will also be displayed.

3. Press the range-selector/memory key, and if "0" is displayed, your reading has been inputed to the memory.
4. Press the measuring button so it is in the "RUN" position, and place the meter where you wish to measure.

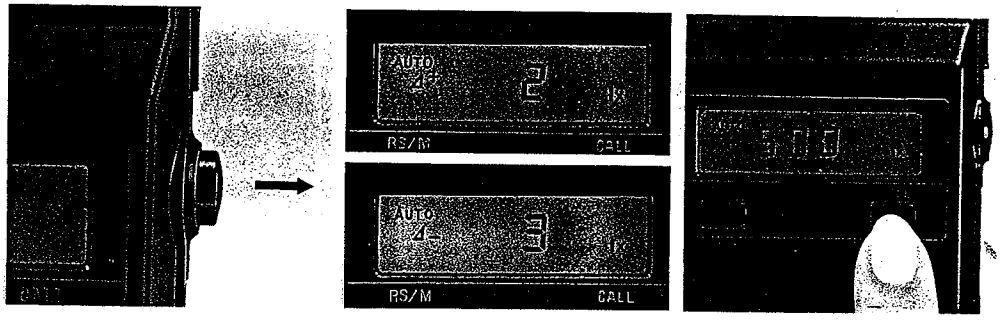


The meter will now display the illuminance deviation in plus (+) or minus (—) figures of the selected measuring units. If for example, your initial reading inputed to the memory was 500 lx. and the display now shows " Δ " +2 lx., it indicates that the current reading is 2 lx. brighter than the initial reading. Conversely, if the displayed number is preceded by a minus (—) sign, it indicates an illuminance level lower than the initial memorized reading.

The upper and lower range of the meter's indication display will depend on the figure which has been inputed to the memory. The lower, or minus (—) range of the display cannot be greater than the figure inputed to the memory, and upper or plus (+) range will be the maximum display range less the inputed memory figure. For example, if the memory figure is 500 lx., than the meter's display range will be from —500 lx. to +99,400 lx. (99,900 —500).

NOTE

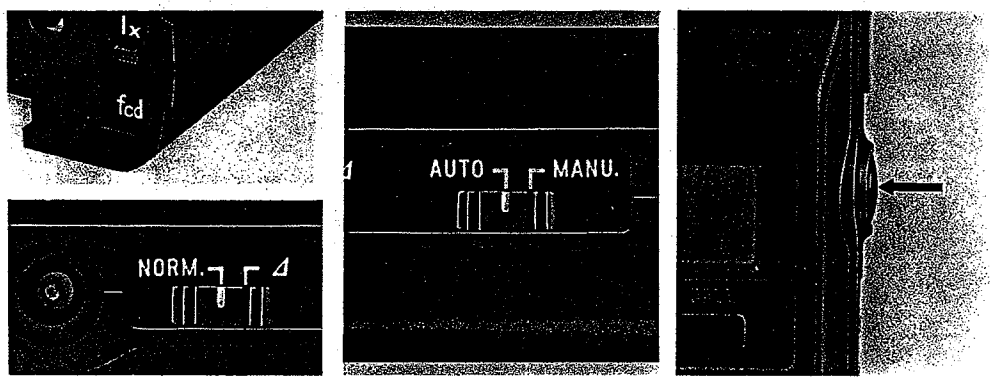
To display the initial reading inputed to the memory, press and hold down the call key.



INTEGRATING ILLUMINANCE FUNCTION

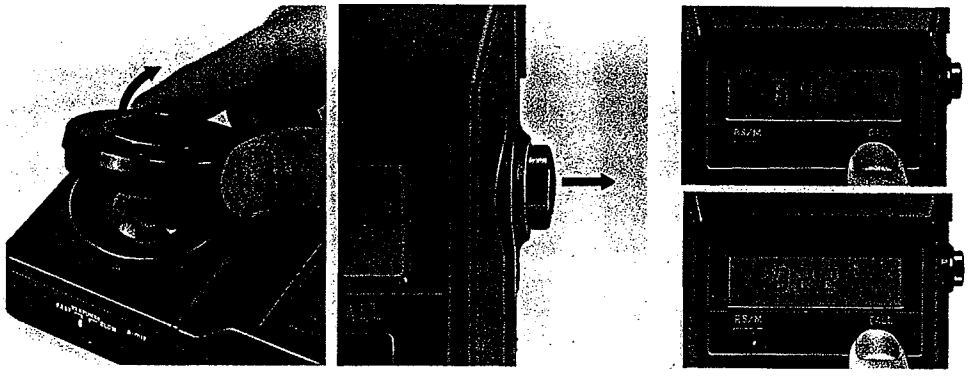
To obtain the integrated illuminance (lx.h or fcd·h) and the integrating hour (h), proceed as follows:

1. Select desired measuring units (lx. or fcd).
2. Set the measuring-mode selector to "NORM".
3. Switch the auto/manual selector to "AUTO".
4. Press the measuring button so it is in the "HOLD" position.



5. Move the power switch to "ON", and adjust the meter to zero-level.
6. Place the meter where you wish to make your measurement, remove the cap and release the measuring button so it is in "RUN" position.

The meter will begin normal illuminance measurement, and integrated illuminance calculations will start. To display the integrated illuminance and integrating hour, press and hold down the call key. The integrated illuminance and integrating hour will be displayed one after the other, repeatedly, as long as the call key is pressed. When the call key is released, normal illuminance measurement continuous.

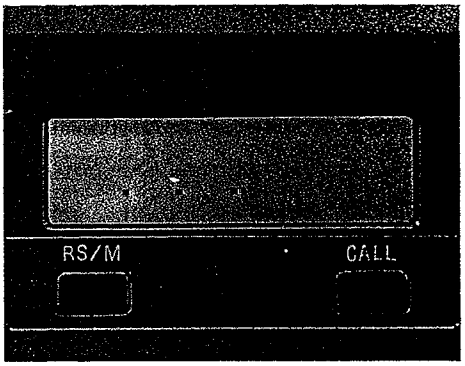


Whenever the meter is operating, integrating calculations are being made. (Except when the measuring button is in the "HOLD" position, when the range-selector/memory key is pressed, or whenever "CAP" or "CAL" is displayed.) Integrating calculations have no limit, and are finished only when an illuminance level higher than meter's capacity is measured for more than 7.5 seconds, or if battery strength falls below minimum level. If either of these situations occur, the integrating-hour symbol (h) will pulsate when the call key is depressed to advise you the integrating calculation has finished.

All integrating data is shown in three columns, and the minimum illuminance unit is 0.01 lx.h (36 lx. sec.) or .001 fcd•h (3.6 fcd sec.). The minimum integrating-hour unit is 0.01 h (36 sec.).

Any AC-adapter or battery charger 9 volt standard output or below can be used to power the meter. However, if only three decimal points appear in the indication-display window when the meter is switched on, power is too low. Never use a power source higher than 9 volts, as this will damage the meter.

When connecting an external-power source to the meter, make sure the meter's power switch is in the "OFF" position.



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CONTINUOUS MEASUREMENT OF ILLUMINANCE WITH AN ANALOG RECORDER

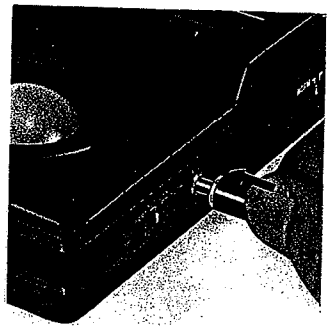
Operation of the Minolta Illuminance Meter when used with an analog recorder is as follows:

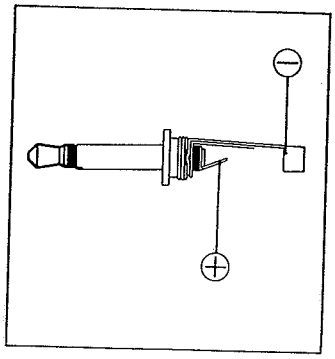
1. Insert the recorder's connection plug into the meter's analog-output socket. A plug of the proper size has been included with the meter, and it or any similar type of plug should be wired as shown below.
2. Select desired measuring units (p. 6).
3. Set the measuring-mode selector to "NORM".
4. Set the response-speed selector according to the light source to be measured (p. 7).
5. Set the sensitivity of the recorder according to the illuminance to be measured.

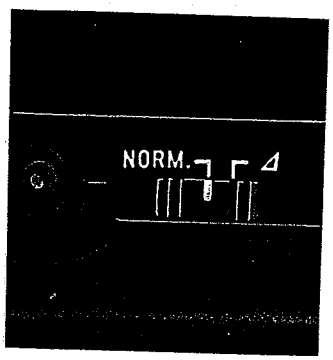
NOTE

- The analog signal of the meter is corrected to 1mv/1 digit and the maximum output voltage is 3V (3000mV).

6. Place the cap on the light-receptor dome, move the power switch to "ON", and allow the meter to adjust itself to zero-level.







7. When "CAL" desappears and figures (0±1 digit) are displayed, set the auto/manual selector to "MANU" and push the range-selector/memory key to choose the suitable range for the illuminance to be measured.

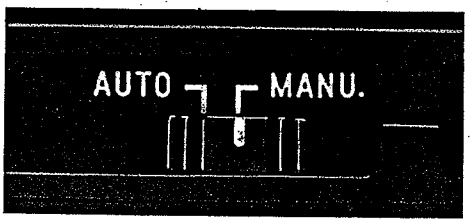
NOTE

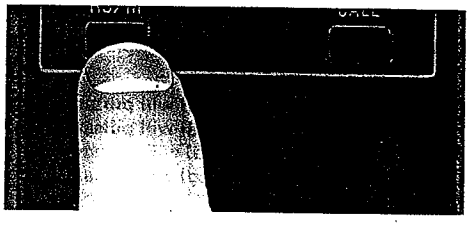
- If measuring button is in "HOLD" position, auto/manual selector does not function.

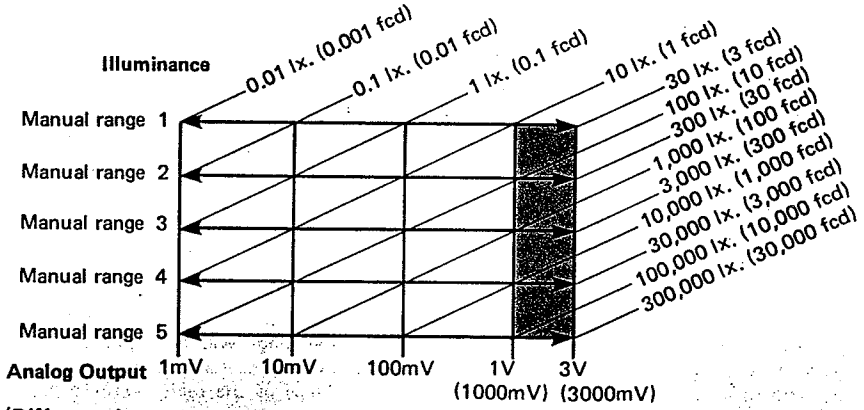
8. Press the measuring button in so that it is in "HOLD" position.
9. Adjust the zero level of the recorder so that the analog signal of the meter corresponds to the zero level of the recorder.
10. Remove the cap and release the measuring button so it is in "RUN" position. An analog signal which corresponds to the illuminance will be generated, and continuous measurements will be recorded on the recorder.

NOTE

- The meter should be set to manual when using an analog recorder, as sudden changes of the output signal in auto mode will cause incorrect readings.
- When the meter is switched on in the manual mode, the range set will cover from 10 to 9990 lx. (1 — 999 fcd); however, if the meter is switched from "AUTO" to "MANU", the range will be applicable to the last recording at the auto range.
- The actual range of the meter exceeds the display which is shown in the indication-display window. The range of analog measurements is shown on the next page.







(Difference between measurement output voltage and zero-level voltage)

■ The figures in the display window will pulsate, when the light level is beyond the meter's display range and the integrating calculation will be finished after 7.5 sec.

Manual range 1 9.99 lx. (.999 fcd) will pulsate when the illuminance is 10 lx. (1 fcd) or more.
Manual range 2 99.9 lx. (9.99 fcd) will pulsate when the illuminance is 100 lx. (10 fcd) or more.
Manual range 3 999 lx. (99.9 fcd) will pulsate when the illuminance is 1000 lx. (100 fcd) or more.
Manual range 4 ,9990 lx. (999 fcd) will pulsate when the illuminance is 10,000 lx. (1,000 fcd) or more.
Manual range 5 99900 lx. (9990 fcd) will pulsate when the illuminance is 100,000 lx. (10,000 fcd) or more.

Auto mode (lx.)

Display range	0.01~99900 lx.				
Capability of minimum display	Display range				
	0.01~9.99 lx.	0.1~99.9 lx.	1~999 lx.	10~9990 lx.	100~99900 lx.
	0.01 lx.	0.1 lx.	1 lx.	10 lx.	100 lx.
Under-range at the indication-display window	If less than 0.01 lx., 0.00 lx. will be displayed.				
Over-range at the indication-display window.					If more than 100,000 lx., 99,900 lx. will pulsate.

Auto mode (fcd)

Display range	0.001~9990 fcd				
Capability of minimum display	Display range				
	0.001~.999 fcd	0.01~9.99 fcd	0.1~99.9 fcd	1~999 fcd	10~9990 fcd
	0.001 fcd	0.01 fcd	0.1 fcd	1 fcd	10 fcd
Under-range at the indication-display window	If less than 0.001 fcd, .000 fcd will be displayed.				
Over-range at the indication-display window.					If more than 10,000 fcd, 9.990 fcd will pulsate.

Manual mode (lx.)

Manual range	1	2	3	4	5
Display range	0.01~9.99 lx.	0.1~99.9 lx.	1~999 lx.	10~9990 lx.	100~99900 lx.
Capability of minimum display	0.01 lx.	0.1 lx.	1 lx.	10 lx.	100 lx.
Under-range at the indication-display window.	If less than 0.01 lx., 0.00 lx. will be displayed.	If less than 0.1 lx., 0.0 lx. will be displayed.	If less than 1 lx., 0 lx. will be displayed.	If less than 10 lx., 00 lx. will be displayed.	If less than 100 lx., 000 lx. will be displayed.
Over-range at the indication-display window.	If more than 10 lx., 9.99 lx. will pulsate.	If more than 100 lx., 99.9 lx. will pulsate.	If more than 1000 lx., 999 lx. will pulsate.	If more than 10000 lx., 9990 lx. will pulsate	If more than 10000 lx., 99900 lx. will pulsate.

Manual mode (fcd)

Manual range	1	2	3	4	5
Display range	0.001~0.999 fcd	0.01~9.99 fcd	0.1~99.9 fcd	1~999 fcd	10~9990 fcd
Capability of minimum display	0.001 fcd	0.01 fcd	0.1 fcd	1 fcd	10 fcd
Under-range at the indication-display window.	If less than 0.001 fcd, .000 fcd will be displayed.	If less than 0.01 fcd, 0.00 fcd will be displayed.	If less than 0.1 fcd, 0.0 fcd. will be displayed.	If less than 1 fcd, 0 fcd. will be displayed.	If less than 10 fcd, 00 fcd will be displayed.
Over-range at the indication-display window.	If more than 1 fcd, .999 fcd will pulsate.	If more than 10 fcd, 9.99 fcd will pulsate.	If more than 100 fcd, 99.9 fcd will pulsate.	If more than 1000 fcd, 999 fcd will pulsate.	If more than 10000 fcd, 9990 fcd will pulsate.

NOTE

The integrating function of the meter does not operate when used in over-nominal range (p. 15).

Other operational notes

1. Use a recorder with an input resistance of not less than 1MΩ. Output resistance of this meter is 10KΩ, so aberration will be less than 1% with a recorder output resistance 1MΩ or more.
2. Output signal is corrected to 1mV/1 digit.
3. Maximum output voltage is 3V (3000mV), so you can measure up to 3000 counts in any range.
4. Always make sure the three figures in the meter's display window are equivalent to the analog-output voltage (1mV — 3000mV).
5. When using the optional accessory Adapter Cord, keep it away from relay switches or motors, which can produce noise it and aberration of measurement.

Adapter Cord

MA-1 (2m or 6.6ft.)
MA-2 (1m or 3.3ft.)
MA-3 (5m or 16.4ft.)
MA-4 (10m or 32.8ft.)

These very convenient Minolta Adapter Cords are used to measure in otherwise inaccessible positions. To use this accessory, connect the adapter cord between the recepter head and the rest of meter body.

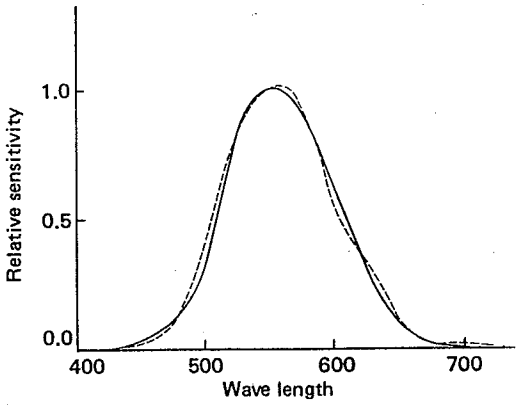
24 SPECTRAL RESPONSE

The chart below depicts the spectral response of the Minolta Illuminance Meter, which falls within ±2 percent of the C.I.E. (Commission Internationale de l'Eclairage) relative photopic luminosity curve.

$$C = \frac{\sum_{\lambda=\lambda_1}^{\lambda_2} V(\lambda)}{\sum_{\lambda=400}^{760} E(\lambda)\cdot V(\lambda)} \times \frac{\sum_{\lambda=400}^{760} E(\lambda)\cdot S(\lambda)}{\sum_{\lambda=\lambda_1}^{\lambda_2} S(\lambda)}$$

$E(\lambda)$: 2854°K Black body radiant emitance
$S(\lambda)$: Spectral response of the meter unit.
$V(\lambda)$: Photopic relative luminous efficiency function.

$\lambda_1 \sim \lambda_2$ (nm)	C
400 ~ 760	0.98 ~ 1.02
450 ~ 500	0.60 ~ 1.40
500 ~ 550	0.90 ~ 1.10
550 ~ 600	0.90 ~ 1.10
600 ~ 650	0.80 ~ 1.20
650 ~ 700	0.50 ~ 1.50



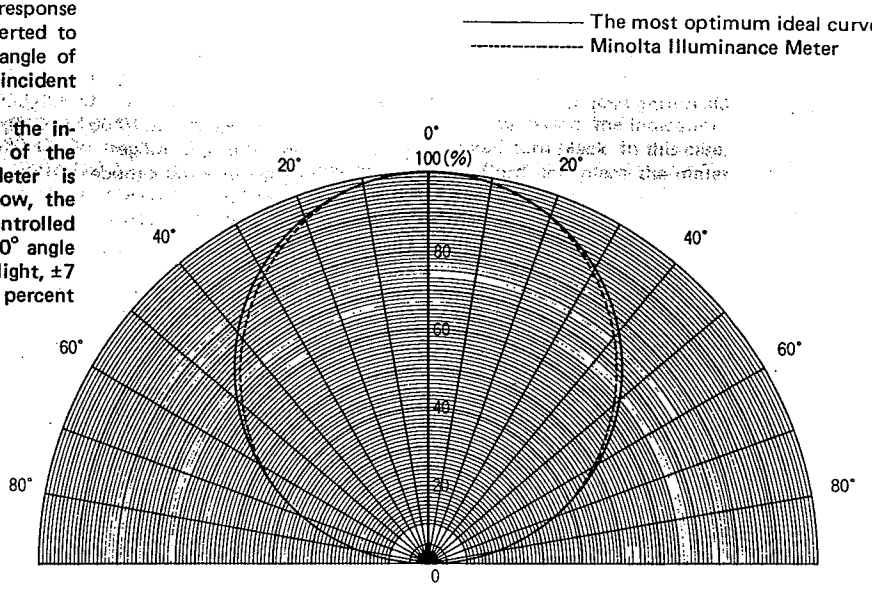
------- Minolta Illuminance Meter
—— C.I.E. relative photopic luminosity curve

INCIDENT LIGHT VALUE CONTROL

Lean light value at the measuring plane can be converted to the cosine curve of the regular light value. Thus, the spectral response of the light can be converted to the cosine curve of the angle of the acceptance of the incident light.

The characteristics of the incident light acceptance of the Minolta Illuminance Meter is shown at the graph below, the difference of which is controlled to be ±2 percent at the 30° angle of acceptance of incident light, ±7 percent at 60°, and ±25 percent at 80°.

Incident light valve control



SPECIFICATION

Type:	Multi-function illuminance meter with microprocessor and liquid-crystal display for continuous and flickering light sources
Receptor:	Silicon photocell; receptor head detachable
Spectral response:	400 to 760mm within ±2% (integrated) of C.I.E. photopic luminosity curve
Acceptance-angle error:	Within ±2% at 30°, ±7% at 60°, ±25% at 80° of ideal curve
Response speed:	"FAST" setting: 1 msec. (0.001 sec.); "SLOW" setting: 1 sec.
Measuring functions:	Illuminance in lux (lx) or footcandles (fcd); integrated illuminance in lux-hours (lx·h) or footcandle-hours (fcd·h); integration time in hours (h)
Measuring ranges:	Illuminance: 0.01 to 99,900 lx (0.01 to 300,000 lx*) 0.001 to 9,990 fcd (0.001 to 300,000 fcd*) * analog-output ranges 5 ranges in Manual mode
	Integrated illuminance: 0.01 to 999,000 lx·h 0.001 to 99,900 fcd·h Infinite integration
Accuracy:	±2% of C.I.E. standard, ±1 digit in last changing display position
Analog output:	1 mv per digit; 3v at maximum reading; 10 kilo ohms impedance
Power source:	One self-contained 9v battery (Eveready 216 or equivalent) or external 9v 7mA DC current
Accessories:	Included with unit: Receptor cap, web neck strap, analog-output plug, belt case Available optionally: Adapter Cord MA-1 (2m or 6.6ft.), MA-2 (1m or 3.3ft.), MA-3 (5m or 16.4ft.) and MA-4 (10m or 32.8ft.)
Dimensions:	170 x 72 x 33mm (6-11/16 x 2-13/16 x 1-5/16 in.)
Weight:	220g (7-3/4 oz.) without battery

Specifications subject to change without notice

- Do not press on or damage the indication-display window.
- Do not subject the meter to shocks or vibration, especially at the time of zero-level adjustment.
- The meter should never be placed or left in the glove compartment or other places in motor vehicle or elswhere in which it may be subject to temperatures higher than 55°C, or lower than −20°C. Do not store it in humid places, or near corrosive chemicals.
- When the meter is to be stored, place it in its original packaging, and put in an air-tight container with an appropriate amount of dehumidifying agent, such as sillica gel.
- Never attempt to disassemble the unit. Any repairs necessary should be undertaken only by an authorized Minolta service facility.
- The Illuminance Meter is designed for use at temperatures between 50° and −10°C. If the unit becomes hotter or colder than this, operation will be more or less unsatisfactory, and it may be permanently damaged. Particular care should be taken not to leave the meter in sunlight or near sources of heat such strong lights, etc.
- The meter body may be wiped with a silicone-treated cloth to clean it:. Do not allow alcohol or chemicals of any other kind to touch its surface.
- If the meter is not to be used for two or more weeks, it is advisable to remove the battery.
- If the meter is left or placed in direct sunlight for any long period, the indication-display window will turn black. In this case, use the Adapter Cord and place the meter body away from the light.

STATEMENT OF FCC COMPLIANCE

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1)This device may not cause harmful interference, and (2)this device must accept any interference received, including interference that may cause undesired operation. Change or modifications not approved by the party responsible for compliance could void the user's authority to operate the equipment. This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:
Reorient or relocate the receiving antenna.

Increase the separation between the equipment and receiver.

Connect the equipment into an outlet on a circuit different from that to which the receiver is connected. Consult the dealer or an experienced radio/TV technician for help.