LIGHTING
Tool Kit

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Purpose

Does your workplace have the right amount of light for optimal working conditions? The amount of light in a workplace can greatly influence employee health and productivity.

A building's lighting performance includes both electrical and solar light sources within a space and affects everything from comfort and safety, to energy costs and user productivity. Lighting is typically expected to be within a certain range of lumens (intensity) and quality for a given space and task. Ideal lighting design typically involves balancing light sources, costs, quality, and heat gains while avoiding issues of glare and over- or under-lit areas.

Typical uses include:

- Lighting Level Analysis
- Daylighting w/ Electric Lighting
- Glare & Daylight Glare Probability

Meet the Tools

01.
Light Meter

The EA33 is a compact and rugged high intensity light meter. It can be used to determeine if a space is too bright or dim. This light meter can store up to 50 measurements.

02.
Luminance Meter

Compact, lightweight, easy-to-use SLR luminance meter with a wide measuring range. This device measures the light reflected off of surfaces, often called glare. This measurement can be used to determine if a surface needs to be shaded for comfortable use.

03.
Light Meter + Datalogger

This battery powered light meter is similar to the EA33 but is equipped with an SD card. This device can be used to measure how bright a room is across the course of one or more days.

04.
Laser Distance Meter

Extech's DT60M uses a visible laser to measure distances up to 196ft (60m). It can be used calculate area, volume, and indirect measurements. This device is used in concert with other devices and to measure daylighting.

Using The Kit

Typical Uses

Typical uses for this kit include lighting analysis, daylighting with electric lighting, and glare probability.

Which Tools First and Why

It is recommended that the Extech SDL400 light-meter is used first since this tool is also a datalogger and can be left to collect data over time while other tools are being used. The remaining tools can be used in any order.

Best time for Data Recording?

When evaluating artificial lighting systems, it is best to record at night or in the very early or late hours when sunlight is not present. These times are also convenient since occupancy is lower. If the recording must be taken in the day, close all blinds and shades to reduce sunlight as much as possible. The Extech EA33 light meter also has the ability to account for ambient light, however this requires the ability to turn lights on and off. The Konica luminance meter is an exception to this since it needs glare from sunlight

Tips and Tricks

Remember to step away from the light meters or to hold it out at arms length to avoid shadows falling across the sensor. Also, bring a notebook. While some devices have built in storage, others need manual data recording. A notebook is also great for taking notes on specific areas or topics.

FAQs

WHAT IS DAYLIGHT HARVESTING?

Daylight Harvesting is the controlled admission of natural light (sunlight) into a building for the purpose of reducing electric lighting and energy (kWh).

WHAT'S THE DIFFERENCE BETWEEN A FOOT-CANDLE AND A LUMEN?

A foot-candle is a non-SI unit of illuminance or light intensity. The foot-candle is defined as one lumen per square foot. The lumen is the SI derivative of luminous flux, a measure of the total quantity of visible light emitted by a source per unit of time.

HOW MANY FOOT-CANDLES SHOULD I HAVE IN MY SPACE?

Most lighting recommended levels are presented in a range and come from multiple sources, however, the IDL recommends consulting the IES Standards (Illuminating Engineering Society).

WHERE SHOULD I PLACE THE LIGHT METER?

The work plane height is between 30 and 36 inches from the ground, which is approximately the height of an average table. You should place the light meter on a flat surface within this height from the ground.

HOW MANY MEASUREMENTS SHOULD I TAKE?

You should take multiple measurements in the same area to obtain an average reading of illumination for the area. In addition, changing the lighting conditions is also useful in understanding how light effects a space, i.e. blinds closed, open, or rotated.

Extech EA33
Light Meter

Measures: LUX/FC
Range: 40m/131ft
Run Time: Instant
Compatible: N/A

Key

A. Light Measurement Display
B. Timer Display
C. TIME Button
D. HOLD Button
E. Unit of Measurement (Fc/Lux)
F. Enter Button
G. Luminous Intensity (cd) / Comparator Button
H. READ / Right Arrow Button
I. Up / Down Arrow Buttons
J. Light Sensor
K. Left Arrow/ Memory Button
L. Relative / Percent Button
M. Average Button
N. Power ON / OFF Button
O. Set Button
P. Average Reading Tally Display

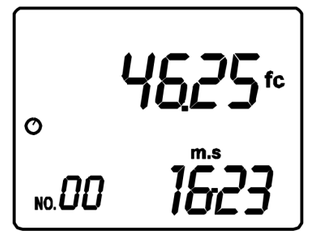
Basic Operation

1. With the sensor cover on, press the power button to turn the meter on. The meter will perform a short self-test.

2. Remove the senors protective cap and place the sensor in the area to be measured. Measurement surface should be approximately 36 in off the floor (average table height).

3. Press the LUX/FC button to select the desired units of measure. Step back from light meter at least 3 feet while measurements are being taken. The light meter is sensitive and any movements or shadows will effect the readings.

4. Read the light level on the display. If the measurement is out of range, an “OL” indication will appear.



Operation Modes

In addition to the normal mode of operation where light level is measured, there are 5 special modes, listed below. Each mode is explained in the subsequent section of this manual. The SET button is used to access the modes. The number on the lower left of the LCD (after the SET button is pressed) represents the mode currently selected. Use the down arrow key to scroll to the desired mode.

Mode	Name of Mode	Description
SET 01	Stray + Light	Cancels out stray light from light under test
SET 02	Time - Hold	Meter measures while timer counts down. Reading is held on LCD when counter = 0
SET 03	rtC	Set the day and time for internal clock
SET 04	Int	Lumen-seconds, Lux-hour, and Fc-hour measurements
SET 05	COMP	Measurements are compared to high and low limits

MODE 1- Stray Light Inhibit

1. Turn on the desired light source and face the meter sensor towards this source (the stray light source should be on also). Remove light sensor cap.
2. Press the SET key; "SET' and 'STRAY + LIGHT' will appear at the center of the LCD and '01' will appear on the lower left of the LCD (as show to right).
3. Press the ENTER key ↵. The measurement at this point consists of the primary AND the stray light sources (LIGHT + STRAY).
4. Press ENTER to store this value. STRAY will appear on the display.
5. Turn off the primary light source.
6. Press the ENTER key again to store only the stray light source.
7. The meter will now compute and display the light level for only the desired light source. 'LIGHT' and 'DH' (Data Hold) will also appear on the display.
8. Press the ENTER key to exit this mode.

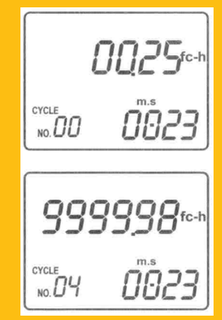
MODE 2- Elapsed Timer with Hold

1. Press the SET key; 'SET01'will display on the LCD.
2. Press the down arrow key to change the 'SET02' parameter. 'TIME-HOLD' will appear on the display.
3. Press the ENTER key to call up the timer.
4. Use the up/down arrow keys to set the desired seconds.
5. Press the ENTER key to program the number of minutes.
6. Use the up/down arrow keys to set the number of minutes.
7. Press the ENTER key to start the countdown timer. When the timer counts down, the last reading will be held on the display.
8. Press the ENTER key to exit this mode.

MODE 3- Real Time Clock Setting

1. Press the SET key; 'SET01' will display on the LCD.
2. Press the down arrow key twice to select the SET03' parameter. 'ftc' will appear on the lower right of the LCD.
3. Press the ENTER key to enter the edit mode for 'seconds'.
4. Use the up/down arrow key to program the 'seconds'.
5. Repeat the previous two steps for the minutes, hours, and day settings.
6. Press the ENTER key when finished.
7. Use the TIME key to toggle between minutes-seconds (m-s) and day-hour (D-H) views.

MODE 4- Integral Illuminance Mode



1. Press the SET key; 'SET01' will appear on the display.
2. Press the down arrow key three times to select the 'SET04' mode. 'int' will appear on the LCD.
3. Press the ENTER key to start the Integral Illuminance measurement. The meter will set the first measurement as a reference. The 'lx-h' or 'Fc-h' display icon will appear and the timer will start (the cycle number appears on the lower left of the LCD).
4. If measurements exceed the reference value, the display will freeze and the'+' symbol will appear. Note that the timer will also halt.
5. The maximum indication of integral illuminance is 999999. When this maximum is exceeded, the integration number (Cycle no. at lower left of LCD) can be checked. The maximum number of integration cycles is 99.
6. Press the ENTER key to exit this mode of operation.

MODE 5- Comparator Mode

1. Press the SET key; 'SET01' will appear on the display.
2. Press the down arrow key four times to select the 'SET05' parameter. 'COMP' appears.
3. Press the ENTER key to enter the Comparator setting mode.
4. Press the down arrow key to select the desired unit of measure (Lux or Fc).
5. Press ENTER key to begin setting the measurement range.
6. Use the down arrow to select the desired range.
7. Press the ENTER key to begin setting the Comparator HIGH limit value. The '+' symbol will appear.
8. Use the up/down arrow keys to set the high limit value.
9. Press ENTER to begin setting the Comparator LOW limit value. The minus symbol will appear.
10. Use the up/down arrow keys to set the desired LOW limit value.
11. Press ENTER to complete the Comparator setup.
12. Press and hold the cd/COMP key for three seconds to activate the Comparator .
13. Now if a measurement exceeds the high limit, the plus sign will appear. If the low limit is exceeded, the minus sign will appear. An audible beep will sound when a limit has been reached.
14. Press the ENTER key to exit the Comparator mode.

Averaging Your Measurements

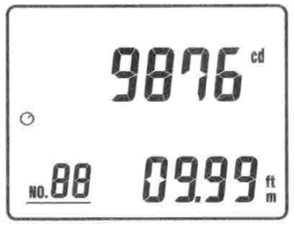
Illuminance is the amount of visible light incident upon a specific surface area. Since the EA33 sensor area is small, the Average Mode can be used to measure the illuminance of larger surface areas. Up to 99 points can be averaged.

1. Press the AVG key. The 'AVG' display icon will appear.
2. Press the MEM key to store a reading. The display at the lower left will keep a running tally of the reading recorded.
3. Press the READ key to perform the average calculation. The average value will be displayed and held on the LCD.
4. Pressing the MEM key at this point allows the meter to continuously average subsequent illuminance readings (the display will only show an average value).
5. Use the READ button to toggle between this continuous average display and the normal measurement display.
6. Press the ENTER key to exit.

Measuring Luminous Intensity

Luminous intensity is the measurement of light from a source at a known distance from the sensor. The unit of measure is candela (cd).

*You will need to determine the distance from the light source to the light sensor before you begin with the following steps.



1. Press the cd/COMP key to begin. The annunciator 'm' for meters (for Lux measurements) or 'ft' for feet (for fc measurements) will appear on the display.
2. Use the up/down arrow keys to set the distance from the light source to the light sensor. The distance range is 0.01 to 99.99 meters or feet.
3. The measurements must be made in a dark room or in a room with no stray light.
4. The distance between the sensor and light source must be at least 10 times the size of the light source.
5. Press the ENTER key to perform the luminous intensity measurement. The 'cd' (for candela) units icon will appear along with the reading.
6. Press the ENTER key again to exit.

Data Record + Recall

Memory Clear

1. Turn off the meter.
2. Press and hold the MEM key while turning on the meter. Release the MEM key when the display reads 'CLr' indicating that the memory banks have been cleared (erased).

Reading Stored Records

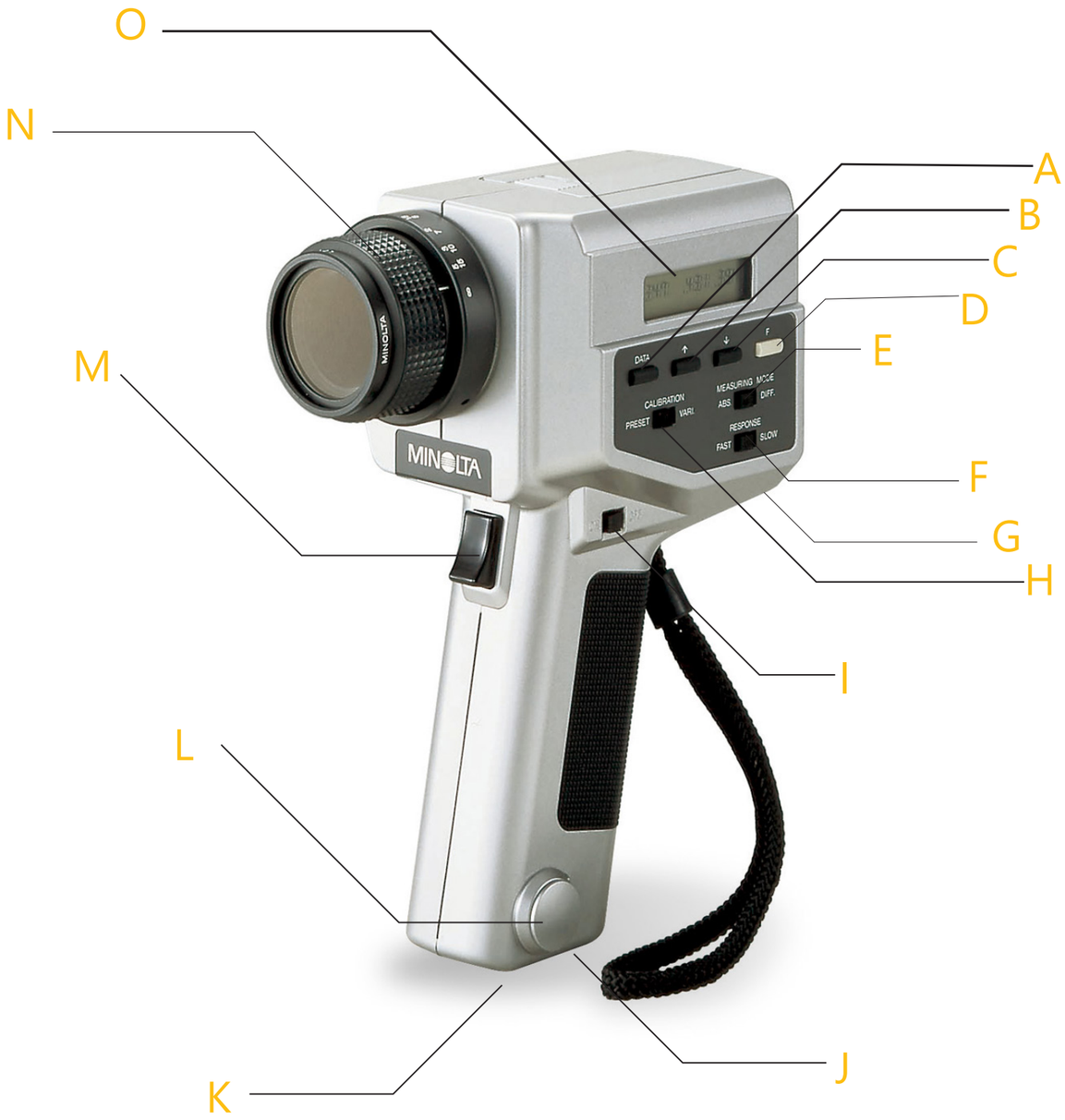
1. Press the READ key to enter the memory recall mode. The display will show 'R' and the address number for the displayed data point.
2. Use the up/down arrow keys to scroll through the stored readings.
3. Press the ENTER key to exit this mode of operation.

Manual Data Record

1. Each time the MEM key is pressed with the meter turned on, a data record is recorded. The display will show 'M' and an audible tone will sound.
2. The counter on the lower left of the LCD will show the number of stored readings.
3. The total memory size is 50 records.

Konica LS-110

Surface Luminance Meter



Measures: LUX/FC

Range

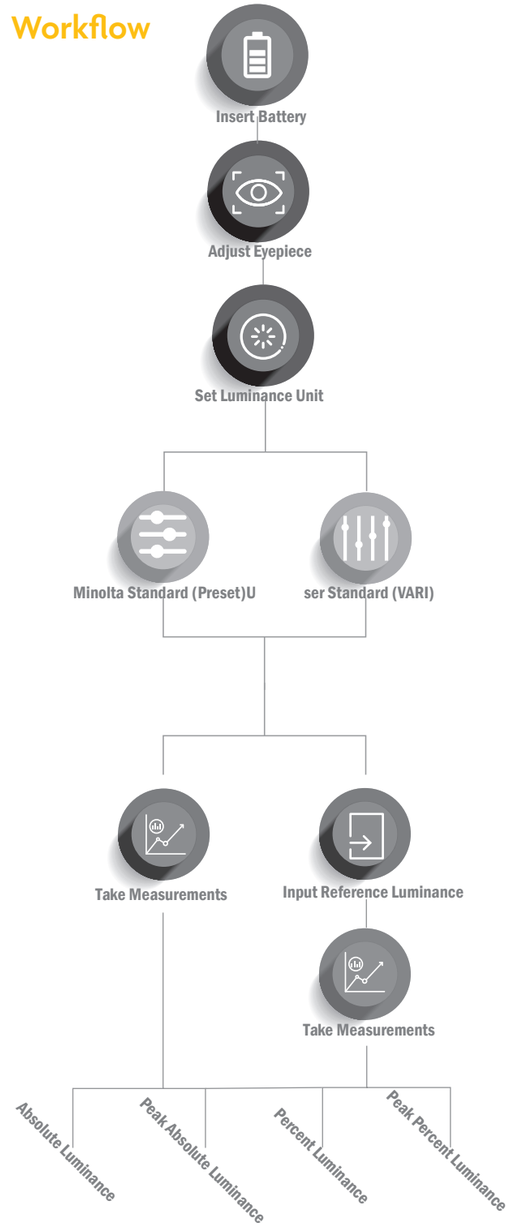
Run Time: Instant

Compatible: N/A

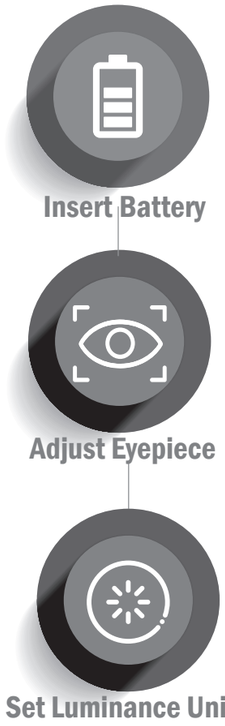
Key

A. Data Control Key
B. PEAK/CONT. Key
C. Increase Key
D. F Key
E. MEASURING MODE Selector Switch
F. RESPONSE Speed Selector Switch
G. Focal-Plane Indication
H. CALIBRATION Selector Switch
I. Power Switch
J. Tripod Switch
K. Luminance-Unit Selector Switch
L. Data-Output Terminal
M. Measuring Switch
N. Distance Scale
O. External Display

Workflow

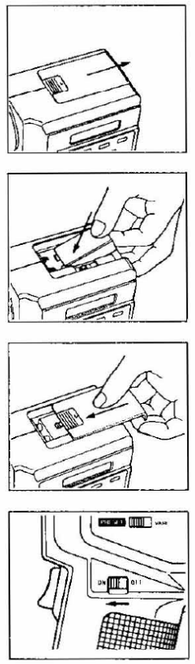


Measurement Preparation



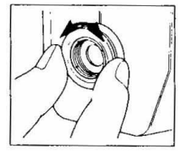
1 Insert the Battery

First, check that the power switch is OFF. Remove the battery-chamber cover by pressing down and pushing in the direction of the arrow. Insert the battery, terminal end first. Replace the cover. Turn the POWER switch on and wait for metering-mode information to appear on the display.



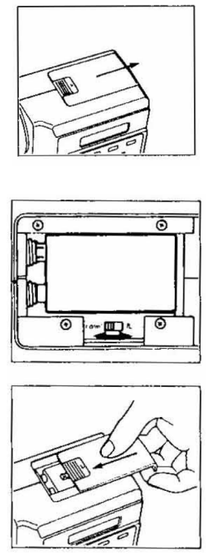
2 Adjust the Eyepiece

Remove the lens cap by pulling and the eyepiece cap by turning. Adjust the eyepiece by turning the eyepiece frame until the 1/3° measurement area indication is sharp in the viewfinder.



3 Set Luminance Unit

Select the desired measuring unit by following the steps below by removing the battery-chamber cover and adjust the luminance-unit selector switch to the desired setting. This meter can measure luminance in cd/m² or fL. Replace the battery-chamber cover.



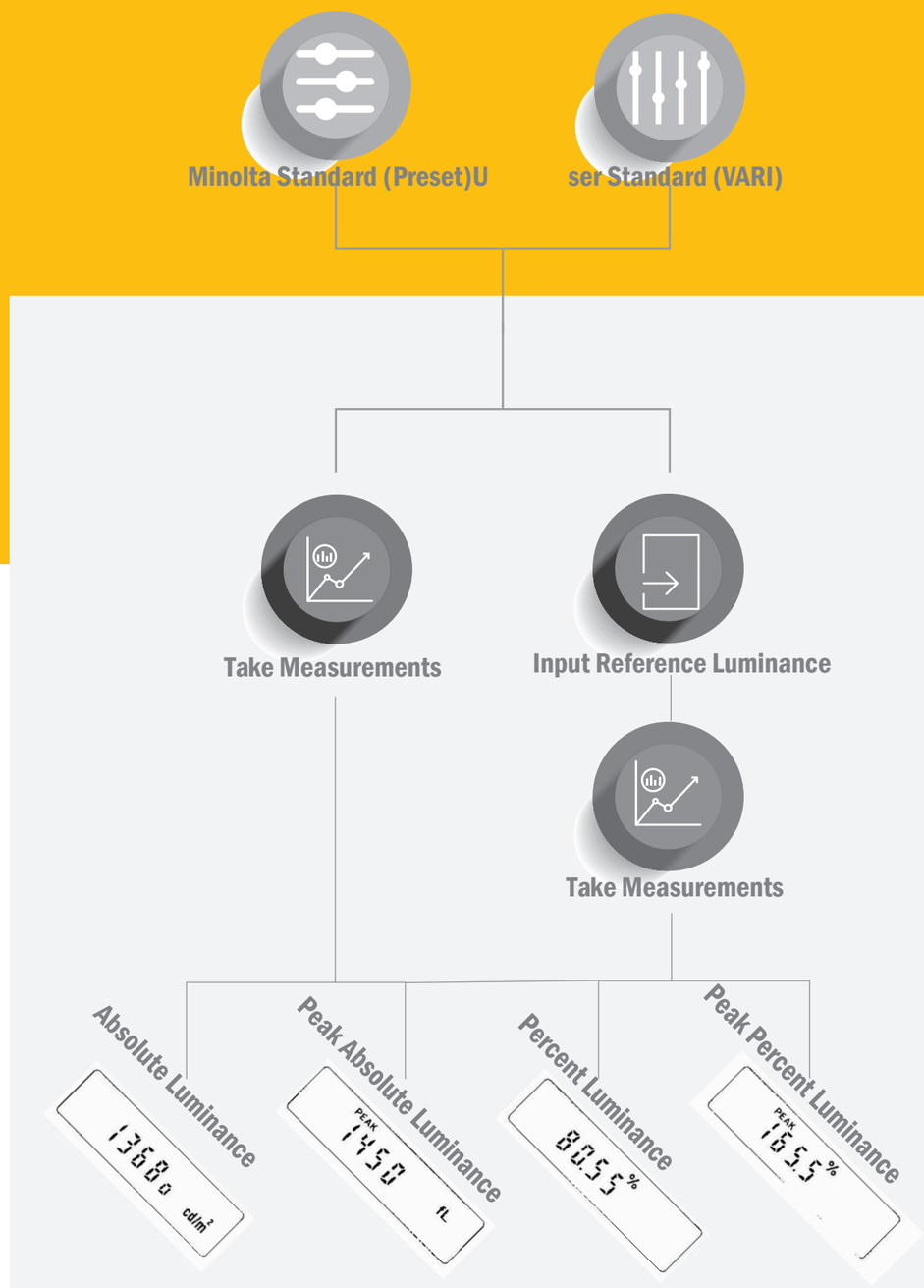
Operation Modes

Minolta Standard (Recommended)

The preset position of the calibration selector switch can be used when measuring most subjects. This position automatically calibrates the meter to the Minolta standard. It is not necessary for the user to calibrate the meter when the CALIBRATION selector switch is at PRESET.

User Standard (VARI)

The VARI. position allows the user to calibrate the meter to any subject desired. It can be used to calibrate the meter to another standard subject for which the luminance is known, or when using a color-correction factor. Skip to page 28 to set up VARI calibration.



ABSOLUTE MEASUREMENTS

The luminance meter can be used to measure the luminance of a wide variety of light sources and reflective surfaces by following the steps below

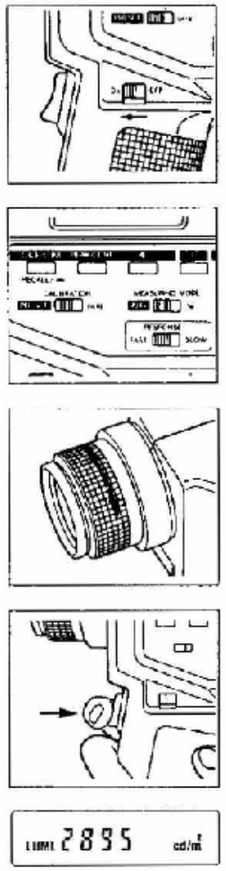
1. Slide the POWER switch on.

2. Set the CALIBRATION selector switch to PRESET and the MEASURING MODE selector switch to ABS. Check that RESPONSE speed and luminance unit selector switches are in their desired positions.

3. If "PEAK" appears in the display, the meter is set to peak mode. To set the meter to continuous mode, press and hold [F], then press [P/C] "PEAK" will be removed from the display. If "C.C.F." appears in the display, the meter is set for measurements with color-correction factor, Press and hold [F] and then press [RCL/▲] until only "LUMI" appears in the display.

4. Aim the meter at the standard subject and turn the focusing ring until the subject appear sharp.

5. Pull the measuring trigger and hold it until the luminance value appears in the viewfinder display (approximately 2 seconds at FAST response speed or 4 seconds at SLOW response speed). The luminance value will also appear in the external display, as shown at right. When the data-display mode is set to CONT, the luminance value appears continuously with a period of approximately 2 second at FAST response speed or 1.6 seconds at SLOW response speed.



The luminance meter can be set to display the peak measurements taken during the time that the measuring trigger was held. Peak measurements may now be taken in ABS or % measuring modes, in PRESET or VARI calibration, and with or without a color-correction factor by following the measuring procedure given in the appropriate section of this manual. To set the meter to peak mode:

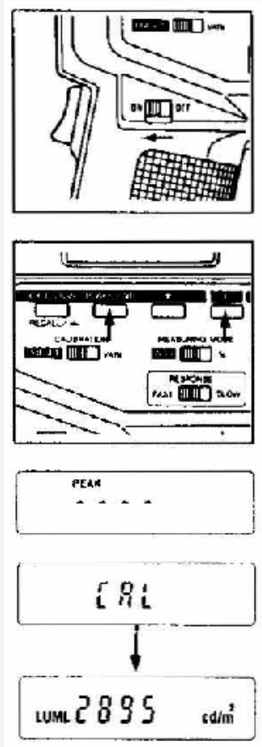
PEAK MEASUREMENTS

1 Slide the POWER switch on.

2 Press and hold [F] and press [P/C] to set the meter to peak mode; the display at right will appear.

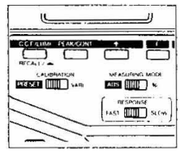
3 When both keys are released, the display will show "CAL" for a few seconds and then will revert to the measurements display.

4 Peak measurements may now be taken in ABS or % measuring modes, in PRESET or VARI calibration, and with or without a color-correction factor by following the measuring procedure given in the appropriate section of this manual.



Input Reference Luminance

1. Check that calibration, response speed, and luminance-unit selector are set to the desired positions. If “PEAK” appears in the display, the meter is set to peak mode. To set the meter to continuous mode, press and hold [F] and press [P/C]. “PEAK will be removed from the display. If “C.C.F.” appears in the display, meter is set for measurements with color-correction factor, Press and hold [F] and press [RCL▲] until only “LUMI” appears in the display.

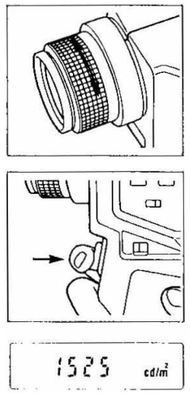


The reference luminance may be measured or set directly. If a suitable reference subject is available, start with step 3 below. If the reference luminance is known and no suitable subject is available, set MEASURING MODE selector switch to % and start with step 7 below.

2. Set the MEASURING MODE selector switch to ABS.

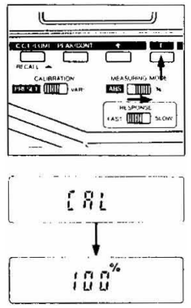
3. Aim at the subject and turn the focusing ring until the subject appears sharp.

4. Pull the measuring trigger and hold it until the luminance value in the viewfinder display (approximately 2 seconds at FAST response speed or 4 seconds at SLOW speed). The luminance value will also be shown in the external display.



When the data-display mode is CONT, the luminance value appears continuously with a period of approximately 1 second at FAST response speed, or at 1.6 at SLOW response speed.

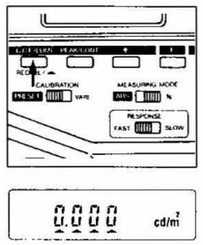
5. Press and hold [F] and slide the MEASURING MODE selector switch to %,. The display will read “CAL” for a moment while the luminance value is stored in memory, and then will read ‘100%’ to show that the value has been correctly memorized.



The luminance meter is now ready to take percent luminance measurement based on the measured reference subject. If it is necessary to adjust these values, continue with step 6 on the following page.

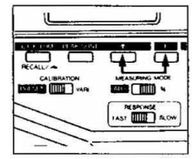
6. Press [RCL▲]. Previously set reference luminance data will appear in the external display, as shown to the right. If no reference luminance data was previously set, the displayed value will be “00.00”.

7. Press [RCL▲] again. Cursors will appear only under the multipliers positions, as shown to the right.

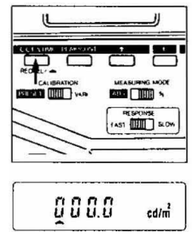


Input Reference Luminance (cont.)

8. Set decimal-point or multiplier if necessary by pressing and holding and pressing [F] [↑]. Decimal-point position and multiplier will change as shown below each time [↑] is pressed while [F] is held down.



9. Press [RCL▲] again. The cursor will move to the first digit (from left) of the numerical value, as shown at right.



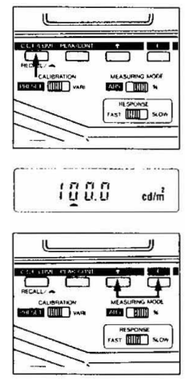
10. Set reference data of first digit by pressing and holding [F] and pressing [↑]. The value of digit can be set between 0 and 9. The value is increased by one each time [↑] is pressed while [F] is held down; increases continuously if both keys are held down. When the value reaches 9. it will return to 0.

11. Press [RCL▲] again. The cursor will move one digit to the right.

12. Set the reference luminance data of digit by pressing and holding [F] and pressing [↑].

13. Repeat steps 12 and 11 to set third digit, and again to set fourth digit of reference luminance data.

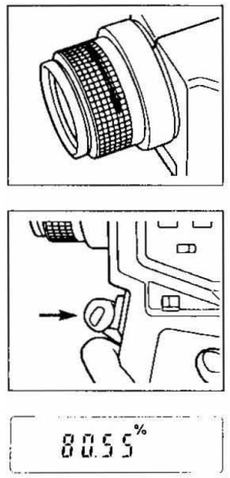
14. To store this data in memory, press and hold [F], slide MEASURING MODE selector switch from % to ABS, and back to %. The display will read “CAL” for a moment while the reference luminance data is stored in memory , and then will revert to the measurement display.



The luminance meter is now ready to take percent luminance measurement based on the measured reference data in memory.

Taking Measurements

1. Slide power switch to ON.
2. Set the MEASURING MODE selector switch to % and check that CALIBRATION, RESPONSE speed, and luminance-unit selector switches are set to the desired positions. If “PEAK” appears in the display, meter is set to peak mode. To set meter to continuous mode, press and hold [F] and [P/C] “PEAK” will be removed from the display.
3. Aim the luminance meter at the subject and turn the focusing ring until the subject appears sharp.
4. Pull the measuring trigger and hold it in until the percent luminance value appears in the viewfinder display (approximately 2 seconds at FAST response speed or 4 seconds at SLOW response speed). The percent luminance value will also be shown in the external display.



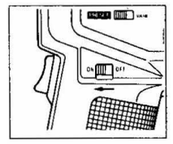
When the display mode is CONT., the luminance value appears continuously with a period of approximately 1 second at FAST response speed or 1.6 seconds at SLOW response speed.

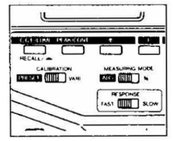
Measurements w/ Vari. Calibration

Vari. calibration mode is used when the user wishes to calibrate the meter to another subject for which the luminance is known. Follow the steps on page 29 to calibrate your meter to your desired subject, and then return to pages 24-27 for instructions on taking measurements in your desired measurement mode.

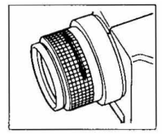
Setting VARI. Calibration

1 Slide the POWER switch to ON. Set the CALIBRATION selector switch to PRESET and the MEASURING MODE selector switch to ABS. Check that RESPONSE speed and luminance-unit selector switched are in the desired position.

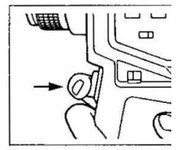


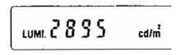


2 Aim the meter at a standard subject and turn focusing ring until the subjects appears.

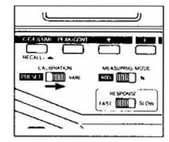


3 Pull the measuring trigger and hold it until the luminance value appears in the viewfinder display (approximately 2 seconds at FAST response speed and 4 seconds at SLOW response speed). The luminance value will also appear in the external display, as shown at right.

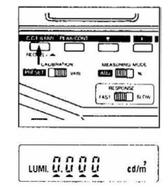




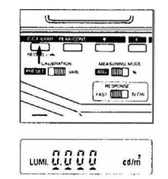
4 Slide CALIBRATION selector switch from PRESET to VARI. If "C.C.F." appears in the display, meter is set for measurements with a color correction factor. Press and hold F key and press RCL/▲ until only "LUMI" appears in the display.



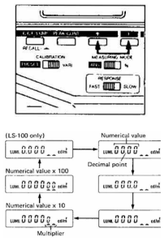
5 Press RCL/▲, Previously set calibration data will appear in the external display, as shown at right. If no calibration data was previously set, the displayed value will be "00.00".



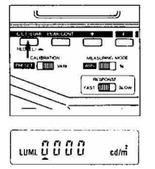
6 Press RCL/▲ again. Cursors will appear only under the multiplier positions, as shown at right.



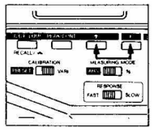
7 Set decimal-point or multiplier if necessary by pressing and holding F and pressing ↑. Decimal-point position and multiplier will change as shown below each time ↑ is pressed while F is held down.



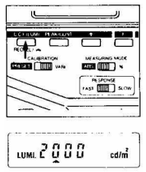
8 Press RCL/▲ again. The cursor will move to the first digit (from left) of the numerical value, as shown at right.



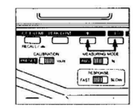
9 Set calibration data of first digit by pressing and holding F and pressing ↑. The value of digit can be set between 0 and 9. The value is increased by one each time ↑ is pressed while F is held down, and increases continuously if both keys are held down.



10 Press RCL/▲ again. The cursor will move one digit to the right.

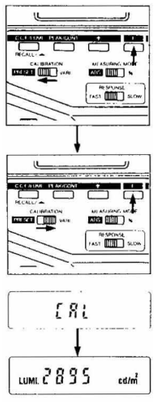


11 Set calibration data of digit by pressing and holding F and pressing ↑



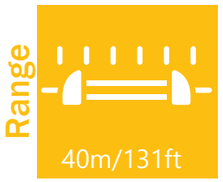
12 Repeat steps 10 and 11 to set third digit, and again to set fourth digit of calibration data.

12 To store the calibration data in memory, press and hold F and slide the CALIBRATION selector switch from VARI. to PRESET and back to VARI. The external display will shows "CAL" for a moment as the calibration data is stored, and then it will change to a measurements display showing the stored calibration data.



Extech SDL400

Light Meter + Datalogger



Key

A. Light Meter Sensor Input Plug
B. Measurement Reading
C. Temperature Units
D. HOLD and Backlight Key
E. MAX-MIN Key
F. SET and Clock Key
G. ENTER and LOG Key
H. PC Jack
I. Reset Button
J. Power Adapter
K. Light Sensor Dome
L. Down/FUNCTION/ ZERO Key
M. Up/ UNIT/ ZERO Key
N. Power ON/OFF Key
O. Thermocouple type/ Light Units
P. Temperature Input Jack

Zero Adjustments

Basic Operation

1. Connect the light sensor to the top of the meter. Leave the sensors cover on for now.
2. Power on the meter by holding the power button for at least 1.5 sec.
3. Select the light measurement mode by pressing and holding the FUNCTION button for at least 1.5 seconds. The LIGHT icon indicates the Light Meter mode.
4. Select the desired unit of measure LUX or FOOT candles by pressing and holding the UNIT button for at least 1.5 seconds.
5. Place the sensor on a surface with the domed area facing the light source under test. Remove the cover from the light sensor dome and step away from the meter to allow for accurate readings.
6. Read the measurement on the meter's LCD.
7. This instrument measures light intensity in LUX or FOOT candle measurement units.

Measurement Preparation

Set Up

1. Press and hold the SET button for at least 1.5 seconds to access the Setup menu.

2. Press the SET button momentarily to step through the available parameters. The parameter type is shown on the bottom of the LCD and the current selection for that type is shown above it.

3. When a parameter is displayed that is to be changed, use the arrow keys to change the setting. Press the ENTER button to confirm a change.

4. Press and hold the SET button for at least 1.5 seconds to exit the Setup mode. Note that the meter automatically switches out of the Setup mode if no key is pressed within 7 seconds.

5. The available Setup parameters are listed below. Additional detailed information is provided below this list:

    - **dAtE** Set the clock (Year/Month/Date; Hours/ Minutes/Seconds)
    - **SP-t** Set the datalogger sampling rate (Hours/ Minutes/Seconds)
    - **PoFF** Automatic power-off management (Enable or disable the auto-power off function)

Measurement Considerations

To zero the light meter display, simply press and hold both arrow keys for at least 1.5 seconds. This is typically done with the protective sensor cover installed to ensure that a complete absence of light displays a zero reading.

Range Considerations

Place the sensor on a surface, or hold in hand, with the domed area facing the light source under test. The light sensor is dome shaped to accommodate light reaching it from various angles.

Data Analysis

This battery powered light meter records data in an Excel format on an SD card. Relative measurements are possible with an offset adjustment feature.

Sensor Limitations

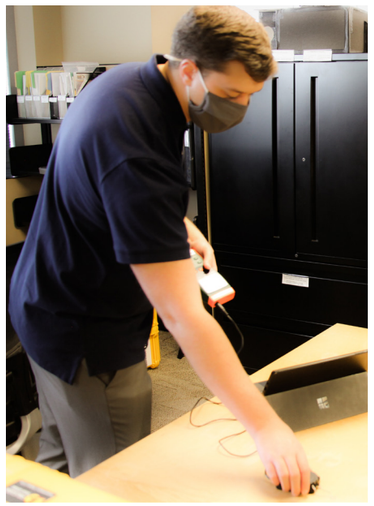
Fc Range 200, 2000, 10 kFc 0.1Fc ±4% rdg
Lux Range 2000, 20k, 100kLux 1Lux ±% rdg
Range is limited to 40m (131’), 60m (197’), or 100m (328’).

Data Record + Recall

Manual Datalogging

Manually log up to 99 readings onto an SD card via botton press.

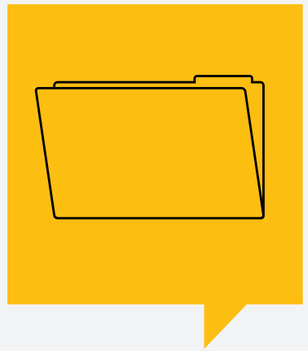
1. Set the sampling rate to '0' seconds as described in the Setup Mode section.
2. Press and hold the LOG button for at least 1.5 seconds and the lower portion of the display will show P-n (n=memory position number 1-99).
3. Momentarily press the LOG button to store a reading. The REC icon will flash each time a data point is stored.
4. Use the UP and DOWN buttons to select one of the 99 data memory positions in which to record.
5. To exit the manual datalogging mode, press and hold the LOG button for at least 1.5 seconds. The Pn icon will switch off.



Automatic Datalogging

Automatically log data onto an SD memory card where the number of data points is virtually limited only by the card size. Readings are logged at a rate specified by the user.

1. Select the sampling rate in the Setup Mode (refer to Setup Mode section) to a value other than zero.
2. Press and hold the LOG button for at least 1.5 seconds. The meter will flash REC icon at the selected sampling rate indicating that readings are now being automatically recorded to the SD card.
3. Pause the datalogger by pressing the LOG button momentarily. The REC icon will stop flashing and the sample rate will display for a short time. To resume logging simply press the LOG button again momentarily.
4. To terminate the datalogging session press and hold the LOG button for at least 1.5 seconds.
5. When an SD card is used for the first time a folder is created on the card and named 'LXB01'. Up to 99 spreadsheet documents (each with 30,000 readings) can be sorted in this folder.
6. When datalogging begins, a new spreadsheet document named 'LXB01001.xls' is created on the SD card in the LXB01 folder. The data recorded will be placed in the LXB01001.xls document until 30,000 readings are reached.
7. If the measurement session exceeds 30,000 readings, a new documents will be created called LXB01002.xls. This method continues for up to 99 documents.



SD Card Information

- Insert an SD card (from 1G size up to 16G) into the SD card slot at the bottom of the meter. The card must be inserted with the front of the card (label side) facing toward the rear of the meter.
- If the SD card is being used for the first time it is recommended that the card be formatted and the logger's clock set to allows for accurate date/ time stamping during data logging sessions. Refer to the Setup Mode section for SD card formatting and time/date setting instructions.

Card to PC Transfer

- Complete your datalogging session as detailed on the previous page. Hint: for the first few tests, simply record a small amount of test data. This is to ensure that the datalogging process is well understood before commuting to critical, large-scale datalogging.
- With the meter switched OFF, remove the SD card.
- Plug the SD Card directly into a PC SD card reader. If the PC does not have an SD card slot, use an SD card adapter (available at most outlets where computer accessories are sold).
- Power on the PC and run a spreadsheet software program. Open the saved documents in the spreadsheet software program (see example spreadsheet data screen at right).

Spreadsheet data example

	A	B	C	D	E
1	Position	Date	Time	Value	Unit
2					
3	1	2014/06/08	15:00:00	600	LUX
4	2	2014/06/08	15:00:01	600	LUX
5	3	2014/06/08	15:00:02	600	LUX
6	4	2014/06/08	15:00:03	600	LUX
7	5	2014/06/08	15:00:04	600	LUX
8	6	2014/06/08	15:00:05	600	LUX
9	7	2014/06/08	15:00:06	600	LUX
10	8	2014/06/08	15:00:07	600	LUX
11	9	2014/06/08	15:00:08	600	LUX
12	10	2014/06/08	15:00:09	600	LUX
13	11	2014/06/08	15:00:10	600	LUX
14	12	2014/06/08	15:00:11	600	LUX
15	13	2014/06/08	15:00:12	600	LUX
16	14	2014/06/08	15:00:13	600	LUX
17	15	2014/06/08	15:00:14	600	LUX

Extech DT60M
Laser Distance Meter

Measures: Distance

Range: 0-196 ft

Run Time: Instant

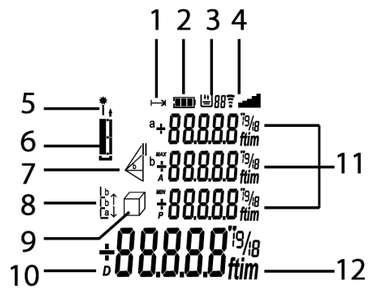
Compatible: N/A

Meter Key

A. Level
B. Indirect Measurements
   - Press 1x: Single Pythagorean Mode
   - Press 2x: Double Pythagorean Mode
   - Press 3x: Double Pythagorean- partial height
C. Subtract
D. Short Press: Select units
E. Short Press: clear Display; Long Press: Power OFF
F. Short Press: Measurement edge selection; Long Press: Backlight ON/OFF
G. Add
H. Short Press: Area/Volume Mode; Long Press to 1st beep: Stakeout Mode
I. Short Press: Datalogger Moder (Press CLR to exit); Long Press: open Program Menu
J. Short Press: Power ON; Short Press: Laser ON; Short Press: Single distance measurement; Long Press: continuous Measurement
K. Sensor Beam
L. Laser Pointer

Display Key

1. Length Measurement Mode
2. Battery Status
3. Datalogger Icon and Memory Location
4. Signal Strength Icon
5. Laser Point Default Mode
6. Edge Reference (from top or bottom of meter)
7. Indirect Measurements (Single, Double, and Double [partial height] Pythagorean mode)
8. Stakeout Mode
9. Area/Volume Mode
10. Primary/Summary Display Line
11. Auxiliary Display lines 1 (top), 2, and 3
12. Units of Measure



Measurement Preparation

Measurement Considerations

For best results:

- Choose a target that is flat, hard, and smooth
- Use a section of cardboard or similar material if the target size needs to be increased
- If taking measurements outdoors, range will be limited depending on intensity of light and other environmental factors
- Meter will not measure through glass, liquid, or styrofoam
- Replace the battery if the battery icon flashes

Range Considerations

Range is limited to 60 M (197'). At night or dusk, if the target is in shadow, the measuring range without target plate is increased. Use a target plate to increase the range during daylight or if the target has poor reflection properties. In unfavorable conditions such as intense sunlight, poor reflective surfaces, or high temperatures, distance readings over 10m (33') can increase by ±0.15mm/m (±0.0018in/ft).

Target Considerations

Measurement errors can occur when measuring towards colorless liquids, dust free glass, styrofoam, or similar semi permeable surfaces. Aiming at high gloss surfaces may deflect the laser beam and lead to measurement errors. For non reflective and dark surfaces, the measuring time may increase.

Set Up

1. Short press the MEAS key to switch the meter ON.
2. You can select to either have the laser always ON or to have the laser turn ON only when the MEAS key is pressed. Go to the Programming Menu section below for details.
3. The unit automatically switches OFF after three minutes of inactivity. Long Press CLR to switch the unit OFF manually.
4. Press CLR to cancel the last action performed or clear the last data displayed on the screen.
5. Press UNIT to change the unit of measure.
6. Long press to turn the backlight on or off.
7. Short press the reference key to select the top edge or bottom edge reference.

- In the Top mode (2), the displayed reading will represent the distance from the top of the meter to the target.
- In the bottom mode (1), the displayed reading will represent the distance from the bottom of the meter to the target. This is the default mode.

Programming Menu

1. Long press to open the programming menu
2. Use the MAES Button to step through the options
3. Use the (+) (-) keys to make changes
4. Use the MAES button to exit the menu
5. See the table below for the program options

1	ON: OFF:	For distance measurements: Set Laser to default ON/OFF. Use + key to select.
2		For all other measurements: Set Laser to default ON/OFF. Use + key to select.
3	**CAL. 0**	Use +/- keys to offset display by ±7mm
4	**bP. on/oFF**	Use +/- keys to set beeper default ON/OFF
5	**bL. On/oFF**	Use +/- keys to set backlight default ON/OFF
6	**od. On/oFF**	Unused mode

Operation Modes

Distance Measurements

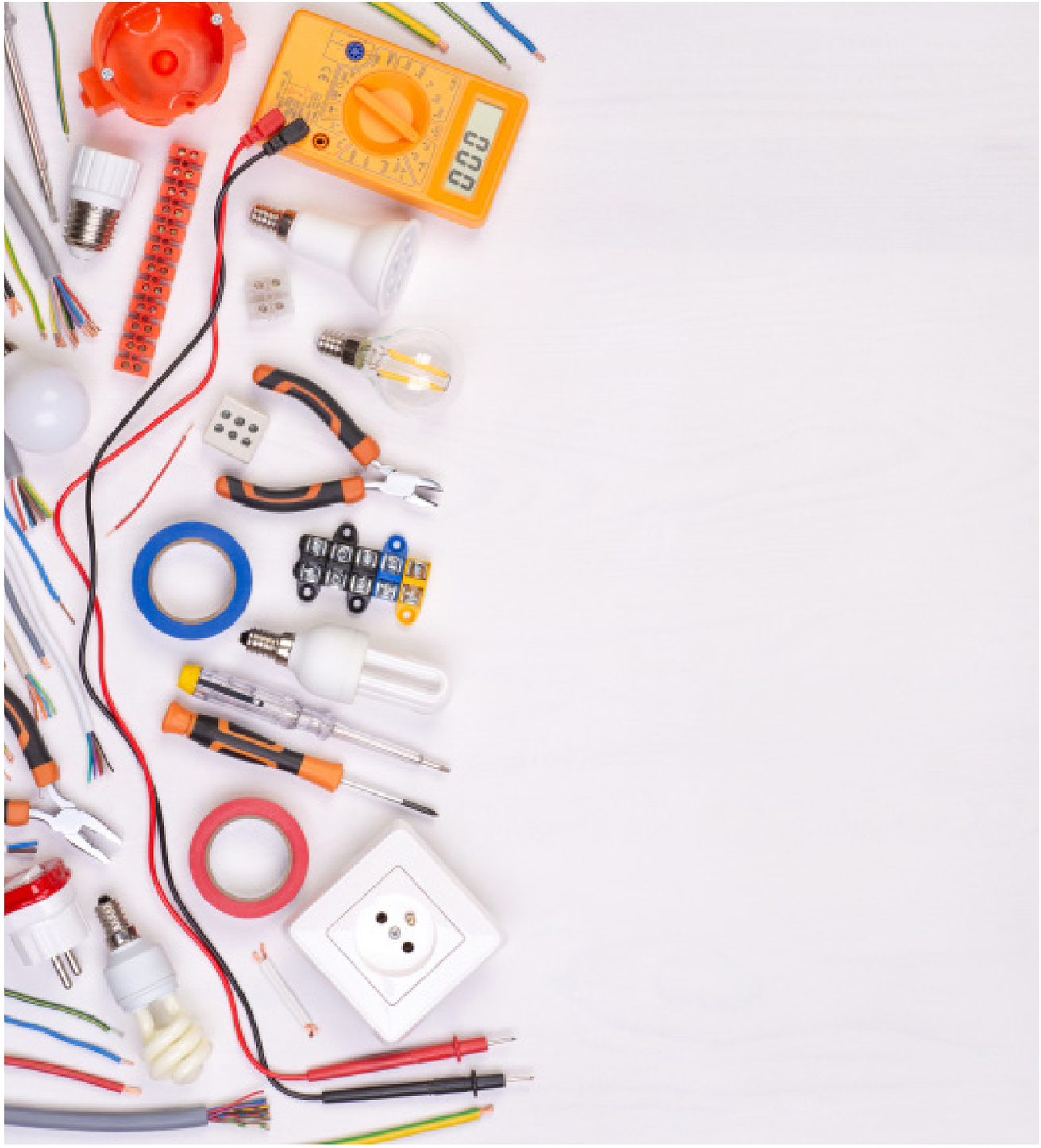
1. Momentarily press the MEASURE key to switch the meter ON; Dashes (---) will appear on the display.
2. If the Laser point is already on, go directly to step 3 below. If the Laser point is not on, short press MEASURE to switch it on.
3. Aim the meter and short press MEASURE to take a reading.
4. The reading will remain on the display until it is cleared with the CLR key (short press) or until the meter is powered off.

Area Measurements

1. Press the MEASURE key to turn the meter on.
2. Press the key firmly once.
3. A parallelogram will appear with its length side flashing indicating that a length measurement is to be taken.
4. Press MEASURE to turn on the laser if it is not already on.
5. Aim the meter and press MEASURE to take the room length measurements.
6. The parallelogram will now appear with its width side flashing indicating that a width measurement is to be taken.
7. Press MEASURE to turn laser on, if it is not already.
8. Press MEASURE to take the room width measurement.
9. Auxiliary display lines 1 and 2 will now show the length and width. The primary display will show the area (in ft^2 or m^2).

Volume Measurements

1. Press the MEASURE key to turn the meter on.
2. Press the key firmly twice.
3. A cube shape will appear with its length flashing indicating that a length measurement is to be taken.
4. Press MEASURE to turn on the laser if it is not already on.
5. Aim the meter and press MEASURE to take the room length measurement.
6. The cube's width will now appear with its width side flashing indicating that a width measurement is to be taken.
7. Press MEASURE to turn laser on, if it is not already.
8. Press MEASURE to take the room width measurement.
6. The cube's height will now be flashing indicating that a height measurement is to be taken.
7. Press MEASURE to turn laser on, if it is not already.
8. Press MEASURE to take the room height measurement.
9. Auxiliary display lines 1 and 2 and 3 will now show the length, width, and height respectively. The primary display (bottom) will show the volume (in ft^3 or m^3).



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