

INSTRUCTION MANUAL
LUMINANCE METER

BM-9A

Rev.10

INTRODUCTION

Thank you so much for your purchasing our TOPCON TECHNOHOUSE Luminance meter BM-9A series.

The BM-9A series is high sensitivity and wide range luminance meter. Difference between measured value and reference data can be measured by using Keyboard with easy.

This manual describes an outline, basic operation procedure and specifications regarding the Luminance meter BM-9A. Read this instruction manual carefully before using this instrument.

HANDLING PRECAUTIONS

- Be sure to use the designated AC adapter for this instrument. The use of any AC adapter which is not designated herein may result in failures. The input power voltage is AC 100V to 240V, and its frequency is 50Hz or 60Hz.
- Be sure to turn off the power switch before connecting/disconnecting the detector unit and/or USB, AC adapter.
- Do not bring any radio communication unit such as transceivers, etc. close to this instrument. This may cause the readout to be unstable.
- Do not use this instrument in an area with a lot of dust, very high humidity and possibly corrosive gases.
- Do not use this instrument in an area where the ambient temperature changes rapidly. This instrument has a built-in temperature compensation circuit, but in some cases, stable measurements may not be possible under an environment with a rapidly changing temperature.
- Do not subject to strong shock caused by falling, etc. to this instrument, and do not use or store the instrument in or on a place with continuous vibration. This instrument contains precision components which may be damaged under such conditions.
- The instrument can operate within a temperature range from 0°C to +40°C.
- Do not store the instrument at a place having a temperature either of more than +60°C or less than -20°C.
- Remove the battery to avoid leakage and store the instrument when unused for a month or more.
- When the object lens has got dirty, any measurement error may occur. Wipe off the detector with a dry cloth.
- The instrument case is made of plastic. Do not wipe with any chemicals (acetone, thinner, etc.). Do not bring it near any place whose temperature exceeds 60°C.
- To maintain required measurement accuracy, calibrate this instrument at least once a year. Contact your dealer or TOPCON TECHNOHOUSE to request a calibration test.
- On calibration, the correction factors memorized in this instrument are deleted. Conduct back-up recording of necessary measured data before requesting calibration.
- When the power switch is turned on, the battery is consumed because the instrument repeatedly conducts measurement for as long as the turning on the power. Please turn off the power switch for power saving when you do not use it.
- For energy saving, when the unit will not be used for an extended period of time, unplug the power plug from the socket.
- Keep the instrument away from water and liquid. This instrument is not water-resistant.

- This instrument is made of recyclable materials. When you dispose of this instrument, please consign this instrument to recycle dealer.

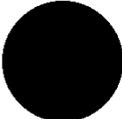
SAFETY INDICATIONS

Warnings and Cautions are indicated on this instrument and in the instruction manual to prevent injury to users and others, prevent damage to property or the like, and to ensure safe use of this instrument. After fully understanding the following indications and symbols, carefully read the section "Safety Precautions," and observe all precautions.

Display	Meaning of display
 Warning	This display indicates that incorrect handling with disregard for this display may cause danger resulting in death or severe injury.
 Caution	This display indicates that incorrect handling with disregard for this display may cause accidents resulting in injury ^{*1} , or damage to property ^{*2} .

*1: This refers to injury such as burns, electric shock or the like that does not require hospitalization or long-term medical attention.

*2: Damage to property means considerable damage to a building, furniture, livestock or pets.

Diagram	Meaning of display
	This icon indicates Prohibition. Specific content is expressed with words or an image located close to the icon.
	This icon indicates Mandatory Action. Specific content is expressed with words or an image located close to the icon.
	This indicates Hazard Alert (Warning). Specific content is expressed with words or an image located close to the icon.

SAFETY PRECAUTIONS

Warning



Prohibited

Do not use this instrument near flammable or combustible gases (gasoline, etc.).

Failure to do so might cause fire.



Prohibited

Keep the instrument away from water and liquid.

Doing so might cause fire or electric shock.



Prohibited

Do not disassemble or modify this instrument.

Doing so might cause fire or electric shock.



Mandatory

Be sure to use the authorized AC adapter.

AC adapter malfunctions may result in fire or electric shock.



Prohibited

Do not disassemble the AC adapter.

Doing so might cause fire or electric shock.



Mandatory

Remove dust or moisture from the AC adapter plug.

Failure to do so might cause fire.



Mandatory

If you notice strange noise, smell or smoke from this instrument, immediately turn the instrument OFF and unplug the AC adapter from the power outlet.

Continued use of this instrument in this state might cause fire.

Contact your dealer or Topcon Technohouse Corporation.

Caution



Prohibited

Insert the batteries with current polarity position.

Otherwise, battery leakage may occur, resulting in personal injury or product failure.



Prohibited

Do not place this instrument on an unstable stand or uneven surface.

Failure to do so might cause the instrument to fall or tip over.



Prohibited

Do not bring any goods with a static charge near to ESD mark.

Otherwise, it may cause failures or incorrect measurements.



Mandatory

Use only specified screws when using the tripod.

Do not tighten the screws any more necessary. Doing so might cause internal breakage.

DISCLAIMER

- TOPCON TECHNOHOUSE accepts no responsibility for any damages resulting from fires, earthquakes, deeds of any third party and other accidents, as well as damages caused by the user's intentional or negligent actions, erroneous usage and other usage of the instrument under abnormal conditions.
- TOPCON TECHNOHOUSE accepts no responsibility for any incidental damages such as loss of business and discontinuance of business caused by use or out of commission of this instrument.
- TOPCON TECHNOHOUSE accepts no responsibility for any damages caused by use other than that instructed in the instruction manual.
- TOPCON TECHNOHOUSE accepts no responsibility for any damages caused by erroneous equipment behavior due to use in combination with other equipment or apparatus.

USER MAINTENANCE

Conduct maintenance work only as instructed in this manual. Never conduct any other maintenance work which is to be done by our service staff for safety and maintaining performance. The following maintenance work can be carried out by the user. The details of maintenance work are indicated in this manual.

Cleaning of body and lens

Remove dirt on the body cover and lens with a soft cloth with thin mild detergent, and then wipe the detergent off with a dry, soft cloth.

Do not use solvents such as thinner, benzene or acetone. Such products may change the surface color.

If the dust that accumulates on the surface of the lens, please blow it off with a blower dust of the lens surface. Dust adheres to the lens, you may want to influence the measurement result.

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NOTATIONS IN THIS MANUAL

The following notational conventions are used in this manual:

Notation	Description
[CALL] , [Δ]	Means a menu title shown on a keyboard and the display of the instrument.
 ' '	Indicates a text referred to in this manual.
 " "	Indicates other instruction manual to be referred to.
 Request	Explains matters to be acknowledged or to be considered for the operation of this instrument.
 Memo	Explains matters to be referred to or to be useful for the operation of this instrument.

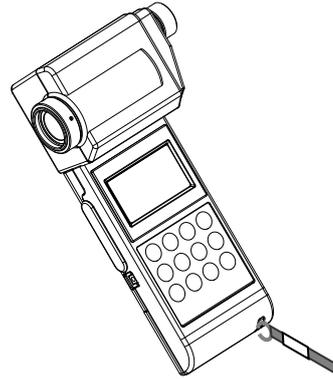
1. BEFORE USE

1.1 CHECK OF MAIN BODY AND ACCESSORIES

Check that all the following items are included.

If not complete, please contact your dealer or TOPCON TECHNOHOUSE.

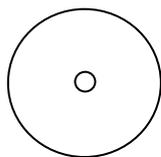
- Instrument 1
Three type of detector unit are available.
(Option)
 - Measuring Angle 2° : BM-9A20D
 - Measuring Angle 1° : BM-9A10D
 - Measuring Angle 0.2° : BM-9A02D



BM-9A

Accessories

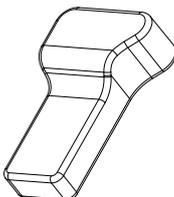
- USB Driver / instruction manual / Measurement program(CD-ROM) 1
- Quick manual 1
- Leather case 1
- Analog output plug 1
- USB2.0 cabel 1.5m 1



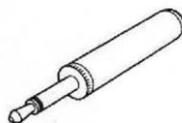
CD-ROM



Quick manual



Leather case



Analog output plug

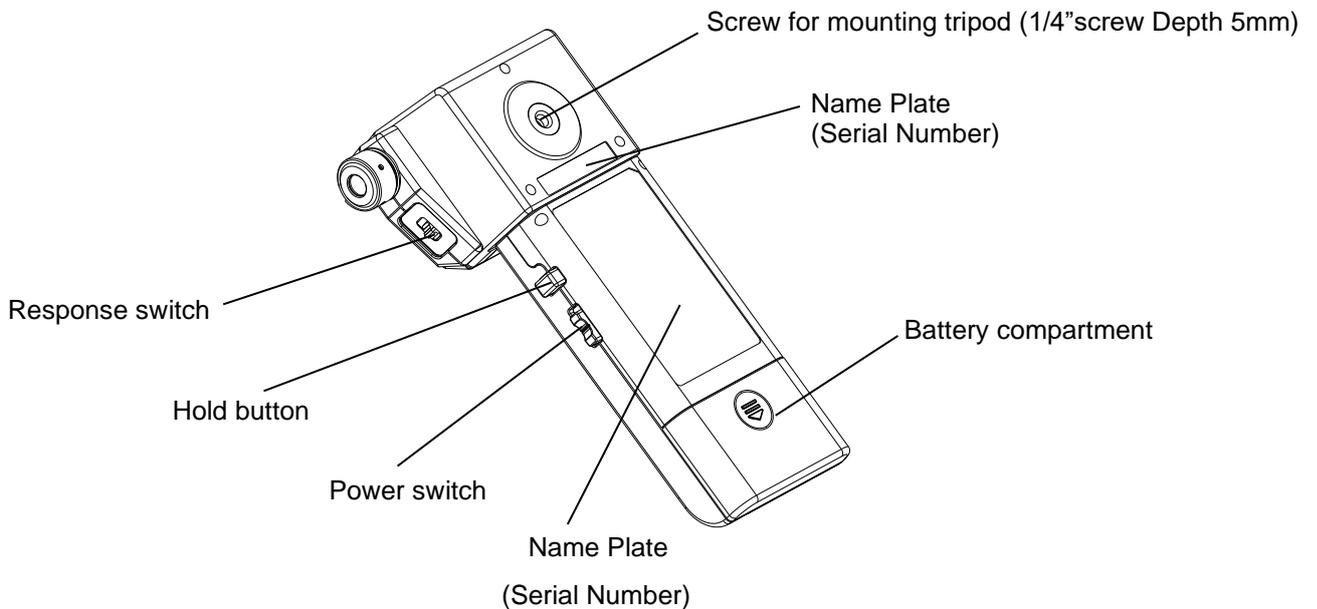
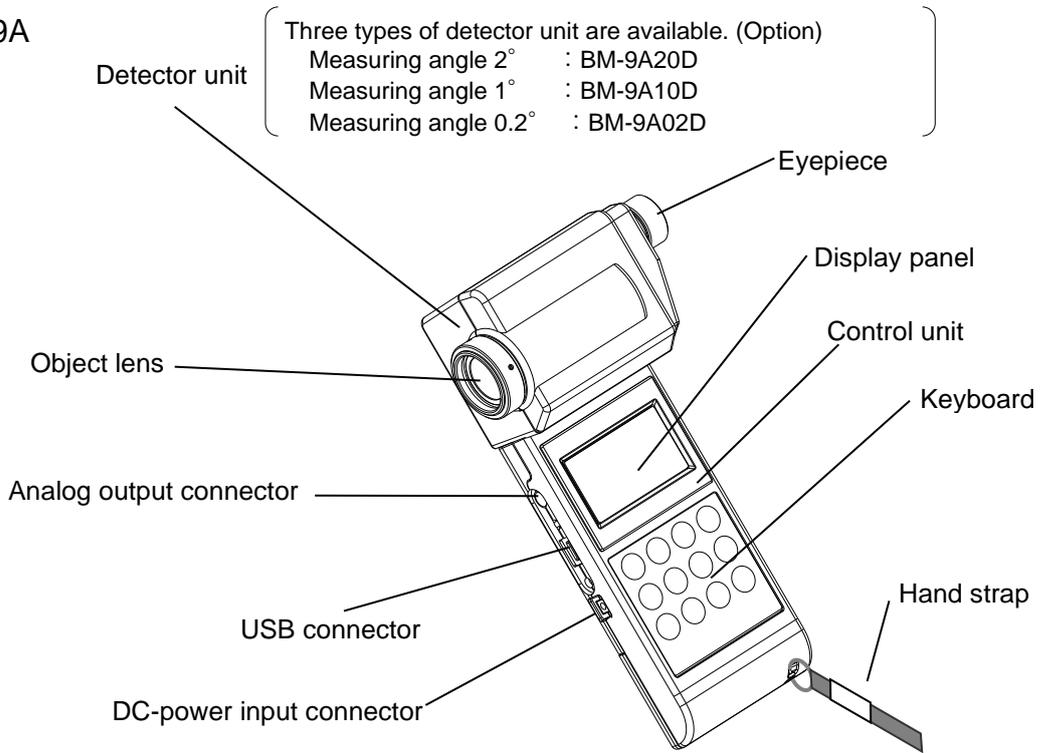


USB cabel

1.2 NAMES AND FUNCTIONS OF PARTS

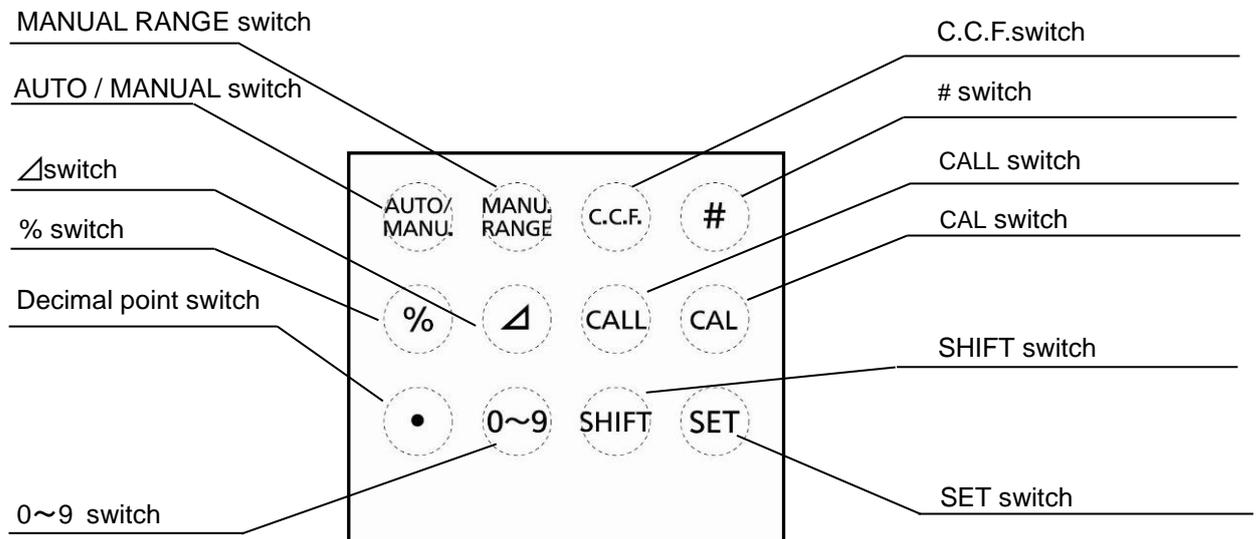
■ Main body

BM-9A

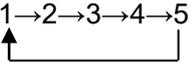


Name	Description																	
Detector unit	The sensor of this instrument.																	
Display panel	Various kinds of information such as measurement and measuring condition is shown on the display panel.																	
Tripod screw	A screw hole to fasten the instrument to a tripod. Specification : 1/4-UNC (depth 5mm)																	
Keyboard	This keyboard is to select functions and to input numeric value.																	
Response switch	The response time can be changed. Select either [FAST] or [SLOW] according to the target light source. <table border="1"> <thead> <tr> <th>Response switch</th> <th>Range</th> <th>Response speed (90%)</th> </tr> </thead> <tbody> <tr> <td rowspan="5">FAST</td> <td>1</td> <td>About 22 ms</td> </tr> <tr> <td>2</td> <td>About 2 ms</td> </tr> <tr> <td>3</td> <td>About 1 ms</td> </tr> <tr> <td>4</td> <td>About 1 ms</td> </tr> <tr> <td>5</td> <td>About 1 ms</td> </tr> <tr> <td>SLOW</td> <td>1 - 5</td> <td>About 1 s or less</td> </tr> </tbody> </table>	Response switch	Range	Response speed (90%)	FAST	1	About 22 ms	2	About 2 ms	3	About 1 ms	4	About 1 ms	5	About 1 ms	SLOW	1 - 5	About 1 s or less
Response switch	Range	Response speed (90%)																
FAST	1	About 22 ms																
	2	About 2 ms																
	3	About 1 ms																
	4	About 1 ms																
	5	About 1 ms																
SLOW	1 - 5	About 1 s or less																
Hold switch	By pushing this hold switch during measurement, Measurement is paused and readout is fixed.																	
Power switch	Power switch for this instrument.																	
USB connector	This connector is used to connect the instrument to PC in remote mode. Connecting PC → '1.3.4 Connecting PC'																	
External power Connector	Connector for designated AC adapter (optional accessory).																	

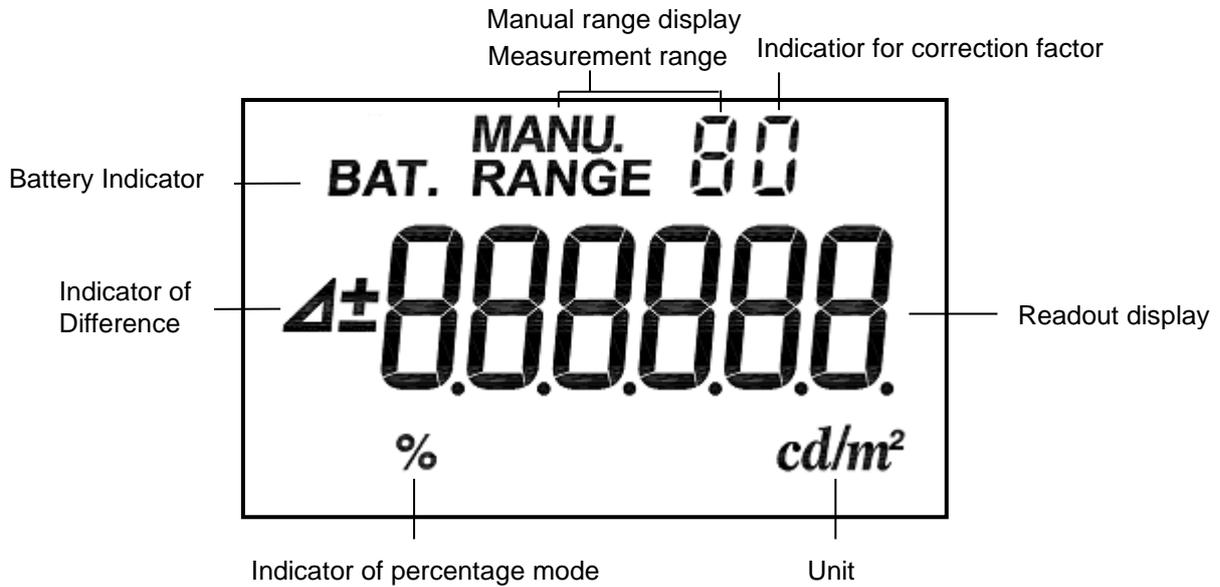
Names and functions of keyboard



The function of each switch is as follows:

Switch	Description
[AUTO/MANU.] Auto/Manual	Switch for selection between [AUTO] and [MANU]. [AUTO]: Optimum measurement range is automatically selected according to luminance level. [MANU.]: Measurement range is manually set. Display range  '2.4 Measurement Range and Resolution'
[MANU. RANGE] Manual Range	Changes the measurement range to the next manually. Measurement range are switched in turn as follows;  Display range  '2.4 Measurement Range and Resolution'
[C.C.F.] Color Correction Factor	Sets and confirms the value of the correction factor in correction factor mode. The BM-9A can memorize one correction factor data.
[#]	Unassigned
[%]	Displays percentage of the measured value to the reference data. Or use this switch to set the reference data.
[Δ]	Displays difference between the measured value and the reference data. Or use this switch to set the reference data.
[CALL]	During Percentage or Difference mode, Press this switch for 3 seconds to display reference data.
[CAL] Calibration	Starts zero-adjustment. Zero-adjustment keeps the sensitivity of the detector stable condition. Each time you turn on power of the instrument, zero-adjustment automatically starts, so you do not need to press [CAL] switch.
[●]	Use this switch to set decimal point, when you enter reference data in the percentage and the difference mode or when you enter correction factor
[0 - 9]	Use this switch to increment the numerical value when you enter reference data in the percentage and the difference mode or when you enter correction factor.
[SHIFT]	Use this switch to shift the cursor to down digit when you enter reference data in the percentage and the difference mode or when you enter correction factor.
[SET]	Use this switch to confirm the reference data in the percentage and the difference mode, or in correction factor setting.

■ Names of parts on display screen



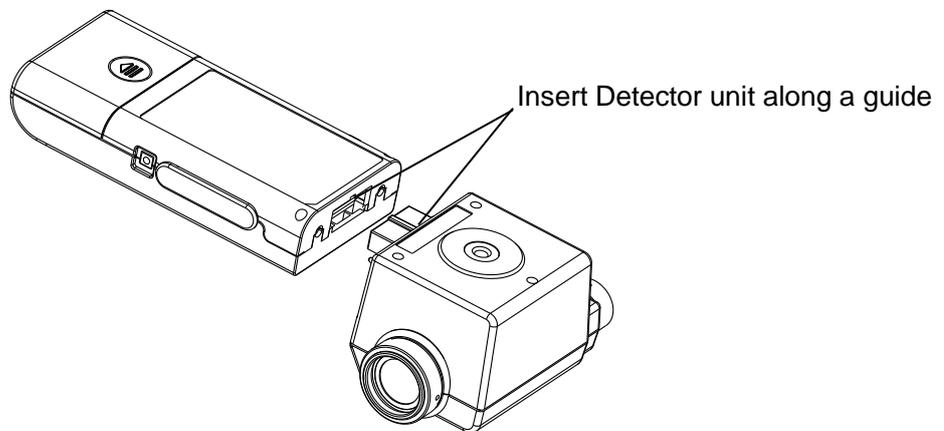
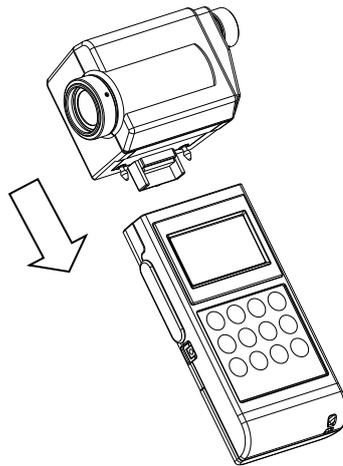
Displayed letters	Description
[BAT.]	Appears when battery capacity is low. Replace batteries as soon as possible when this letter appears.
[MANU.]	Appears during operating zero-adjustment and manual range mode.
Measurement range	Shows the currently used range.
[0]	Lighting on during correction factor setting. Blinking when correction factor is active.
[Δ]	Appears during the difference mode or the reference data entry.
[±]	Either [+] or [-] appears to indicate the difference between the measured value and the reference data.
Measurement display	Displays readout.
[%]	Appears during the percentage mode or the reference data entry.
[cd/m ²]	Unit for luminance.

1.3 PREPARATION

1.3.1 HOW TO MOUNT THE DETECTOR UNIT

Push in the detector along with the connector guide in the arrow direction.

Be sure to turn off the power switch before connecting/disconnecting the detector unit.



1.3.2 HOW TO INSERT A BATTERY

Two AA batteries are required.

Those for operation check do not attach at the time of shipment.

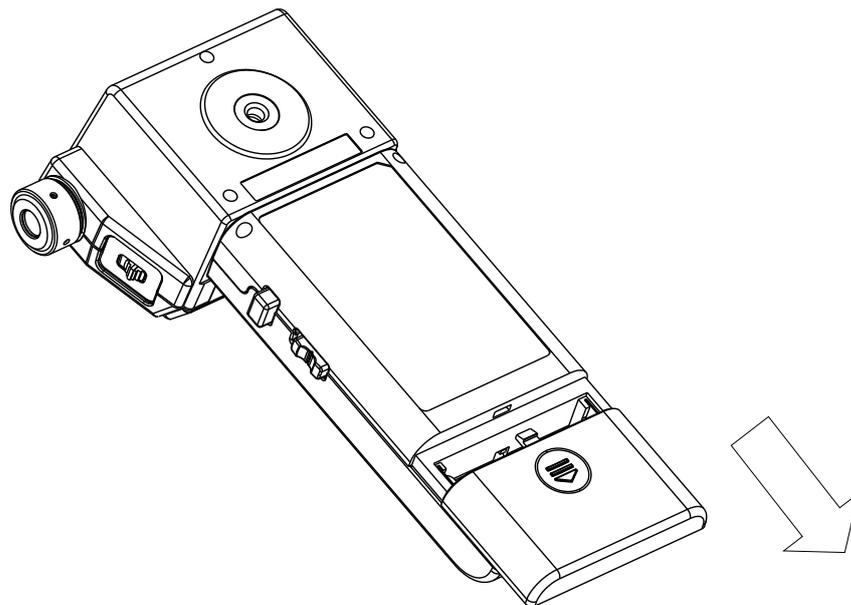
Purchase those at your dealer.

- 1 Turn the power switch off and uncover the battery compartment.
- 2 Insert a battery according to a polar indication shown on the battery compartment.
- 3 Mount the battery compartment.

Battery life at room temperature

	Not using USB	Using USB
Battery life	70 hours or more	35 hour or more

(Using alkaline cell)



1.3.3 CONNECTION OF AC ADAPTER (Separately sold optional accessory)



Compulsory

Only use the designated AC adapter.

Unapproved AC adapters may cause fire or electric shock.



Compulsory

Be sure to remove dust and water at the plug and receptacle for the AC adapter.

Otherwise, it may cause fire.



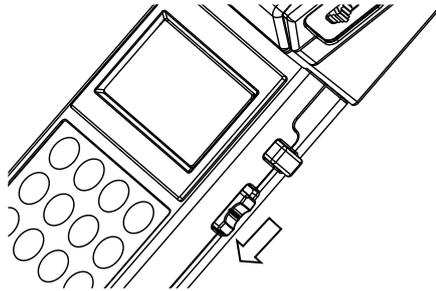
Prohibition

Do not remove or insert the plug with wet hands.

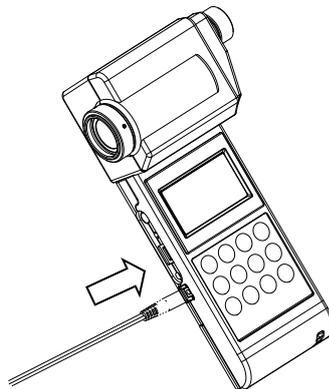
Otherwise, it may cause electric shock.

Procedure for connection of the AC adapter to this instrument is as follows:

- 1 Be sure that the power switch of this instrument is turned to OFF.



- 2 Insert the connector of the AC adapter to the instrument.



- 3 Insert the plug of the AC adapter to the receptacle.

1.3.4 CONNECTING TO PC

To use this instrument with a PC, use a standard accessory USB2.0 cable (Cable Type: A connector – mini B connector) to connect to the PC.



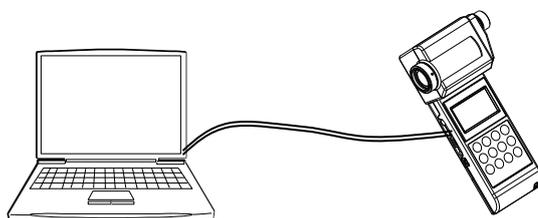
Memo

- For connection to a PC, refer to your PC manual as well.

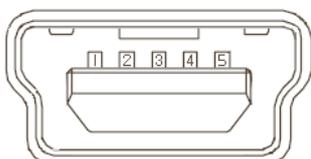


Request

- Never plug any connectors in or out while the instrument power is on.



■ Connector Pin Assignment



Mini USB connector

B type female (5 pin)

Instrument side

Pin No.	Signal
1	VBUS
2	D-
3	D+
4	GND
5	GND

■ Communication parameters

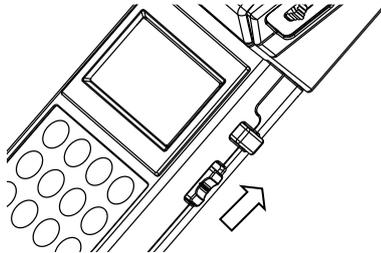
This instrument conducts USB communications through a virtual COM port. When you prepare your own communication programs the following communication parameters should be set.

Communication parameters

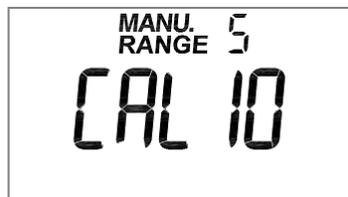
Baud rate	38400
Data length	7
Parity	ODD (odd number)
Spread bit	1

1.3.5 HOW TO TURN POWER ON/OFF

- 1 Push the power switch to the ON position to turn on power.



- 2 When BM-9A10D is attached to the display unit, the mark [CAL10] is displayed and the zero-adjustment starts.



The mark is difference from current attached Detector unit

- [CAL20] : BM-9A20D is attached
- [CAL10] : BM-9A10D is attached
- [CAL02] : BM-9A02D is attached

- 3 After zero-adjustment complete, the current measured value appears.

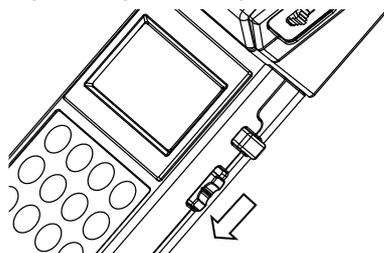


- Response switch can be selectable before and after zero-adjustment.
Response switch  '2.2 Setting Response Switch'
- The time required to complete zero adjustment differs depending on the setting of the response switch. FAST: about 15 seconds; SLOW: about 50 seconds.
- No Cap is required in Zero adjustment.



- Do not change Response switch during zero-adjustment operation.

- 4 To turn off power, push the power switch to the OFF position.

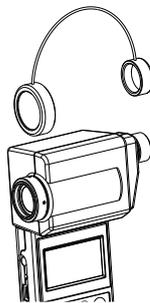


2. MEASUREMENTS PROCEDURES

2.1 COLLIMATION OF THE MEASUREMENT OBJECT

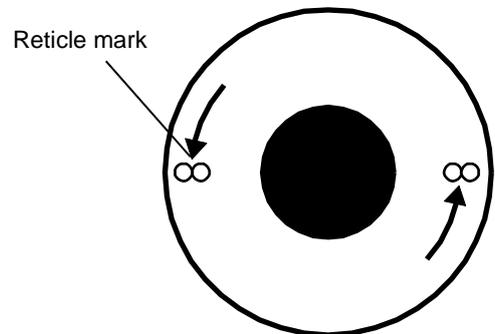
 <p>Prohibited</p>	<p>Do not look directly at bright lights such as the sun or light bulb filaments. Doing so might damage your eyes.</p>
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- 1 Remove the cap from the objective lens and the eyepiece.



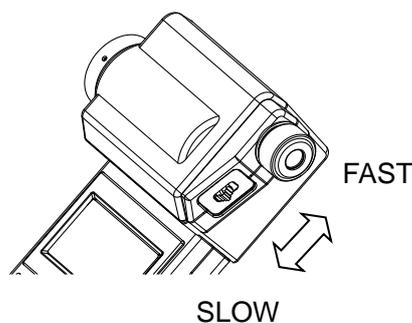
- 2 Look into the eyepiece, and turn the diopter adjustment ring of the eyepiece so that the reticle marks are clearly seen in the view finder.

- 3 Collimate the measurement object, and turn the focus ring of the objective lens to adjust the focus on the measurement object.



2.2 SETTING RESPONSE SWITCH

Changes the response switch FAST or SLOW suited to light source.



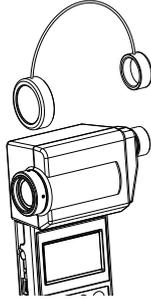
- FAST : for general light source
SLOW : for flicker light source

2.3 LUMINANCE MEASUREMENT

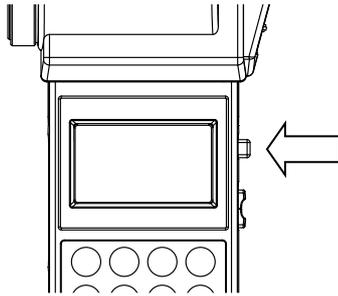
- 1 The instrument will be ready for measurement automatically after turning on the power and zero-adjustment.

2.3.1 AUTO-RANGE MEASUREMENT

- 1 Remove the cap and start measurement.



- 2 The readout appears on the panel. When the readout is stabilized, read the value.
Turn on the HOLD switch, and the readout will be held.

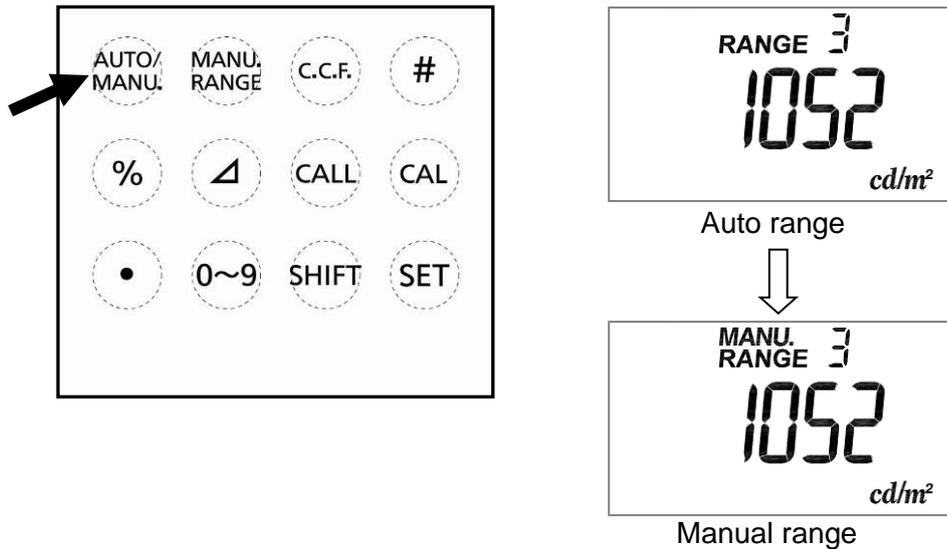


- 3 Turn off the HOLD switch, and restart measurement.

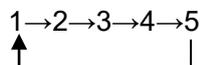
2.3.2 MANUAL-RANGE MEASUREMENT

- 1 Remove the cap and start measurement.
- 2 Push the [AUTO/MANU.] switch on the keyboard.

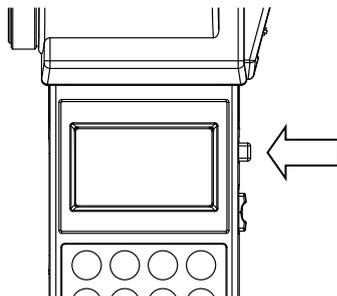
The system switches to manual range.



- 3 Pushing the [MANU. RANGE] switch to advance to the range as follows:



- 4 A measured value appears in the display, read the value when it becomes stable.
To fix the readout, Press the hold switch to ON.



- 5 For continuous measurement, set the hold switch to OFF, and restart measurement.

2.4 MEASUREMENT RANGE AND RESOLUTION

AUTO-RANGE

(unit cd/m²)

Measuring Field	Range	1	2	3	4	5
2° (BM-9A 20D)	Measurement Range	0.01 ~ 28.00	15.0 ~ 280.0	150 ~ 2,800	1,500 ~ 28,000	15,000 ~ 280,000
	Resolution	0.01	0.1	1	10	100
1° (BM-9A 10D)	Measurement Range	0.1 ~ 280.0	150 ~ 2,800	1,500 ~ 28,000	15,000 ~ 280,000	150,000 ~ 2,800,000
	Resolution	0.1	1	10	100	1000
0.2° (BM-9A 02D)	Measurement Range	1 ~ 2,800	1,500 ~ 28,000	15,000 ~ 280,000	150,000 ~ 2,800,000	1,500,000 ~ 28,000,000
	Resolution	1	10	100	1,000	10,000

MANUAL-RANGE

(unit cd/m²)

Measuring Field	Range	1	2	3	4	5
2° (BM-9A 20D)	Measurement Range	0.01 ~ 28.00	0.1 ~ 280.0	1 ~ 2,800	10 ~ 28,000	100 ~ 280,000
	Resolution	0.01	0.1	1	10	100
1° (BM-9A 10D)	Measurement Range	0.1 ~ 280.0	1 ~ 2,800	10 ~ 28,000	100 ~ 280,000	1,000 ~ 2,800,000
	Resolution	0.1	1	10	100	1,000
0.2° (BM-9A 02D)	Measurement Range	1 ~ 2,800	10 ~ 28,000	100 ~ 280,000	1,000 ~ 2,800,000	10,000 ~ 28,000,000
	Resolution	1	10	100	1,000	10,000



Memo

- An error [E5] appears when measured value exceeds each measurement range.
- [0] appears when measured value is smaller than the resolution in each range.
- When the number of display digit is larger than 6 digit, the values are expressed in exponential notation.

Example : "1234000" is expressed as "1.234E6".

2.5 COLOR CORRECTION FACTOR (C.C.F.)

Entered C.C.F. is multiplied by the measured value.
(C.C.F. : Color Correction Factor)

Readout = Measured value × Color Correction factor

- How to use Correction factor (C.C.F.)

- 1 Press [C.C.F.] switch during luminance measurement.
- 2 When correction factor is active, the [0] mark is blinking on the right side of the Range data. Readout is values multiplied by measured value and correction factor.



- How to release correction factor (C.C.F.)

- 1 Press [C.C.F.] switch during Luminance measurement
- 2 When correction factor is not active, the [0] mark disappears on the right side of Range data. The readout is measured value not multiplied by the correction factor.



Memo

- When you enter too large values as correction factor and readout is over measurement range, an error [E5] appears.
- The correction factor data you entered is stored in memory even after turning off the power.

Numerical entry → '3.1 CORRECTION FACTOR SETTING'

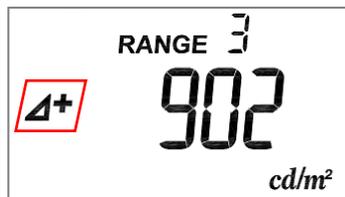
2.6 DIFFERENCE (Δ mode)

The difference between measured value and reference data is displayed.

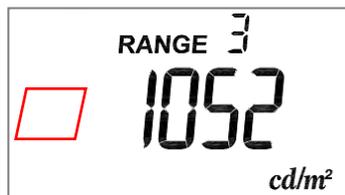
Readout = Difference = (Measured value \times Correction factor) - Reference data

※When correction factor setting is not active, correction factor is ignored.

- 1 Press [Δ] switch during luminance measurement.
- 2 In the difference mode, the [Δ] mark appears on the left side of the display. The value on the display is a difference between the measured value and the reference data.



- 3 Press [Δ] switch again to return luminance measurement.
- 4 [Δ] mark disappears.



Memo

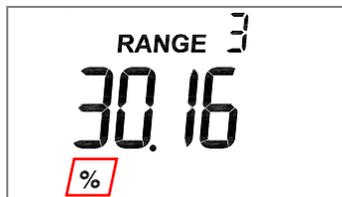
- When reference data is not entered, reference data entry screen appears after pressing [Δ] switch.
- The reference data is common between for the difference and the percentage mode. So enter the reference data for either mode.

2.7 PERCENTAGE MODE (% mode)

Percentage of current measured value to the reference data is displayed.
Press [%] switch to return to luminance measurement mode.

Readout = Percentage= ((Measured value × Correction factor) / Reference data) × 100
※When correction factor is not active, correction factor is ignored.

- 1 Press [%] switch during luminance measurement.
- 2 The [%] mark appears on the down side of display. The readout is percentage of the measured value to the reference data.



- 3 Press [%] switch again to return to luminance measurement mode.
- 4 The [%] mark on the down side of display disappears.



Memo

- Display range is from 0.001 to 9,999.
- When the reference data is not entered, reference data entry screen appears after pressing [%] switch.
- The reference data is common between for the difference and the percentage mode. So enter the reference data for either mode.

2.8 ZERO ADJUSTMENT (CAL)

Press [CAL] switch to start Zero adjustment. (CAL : Calibration)

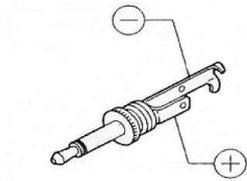


Memo

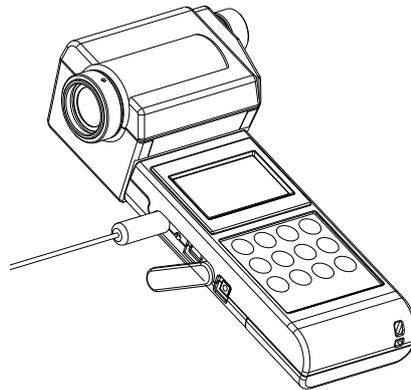
- Zero adjustment starts automatically after turning on power.
- Zero adjustment can be conducted regardless of whether the response switch is set to FAST or SLOW.
- The Duration of zero adjustment vary from response switch setting.
FAST : About 15 sec SLOW : About 50 sec
- Cap is not required for zero adjustment.

2.9 HOW TO USE THE ANALOG OUTPUT CONNECTOR

- 1 The analog output plug has a polarity as shown in the figure. Connect the analog output plug with a shield line by soldering and connect it with an outer recorder.



- 2 Insert the analog output plug into the analog output connector.
The output impedance of the instrument is not more than 100 ohm.



Memo

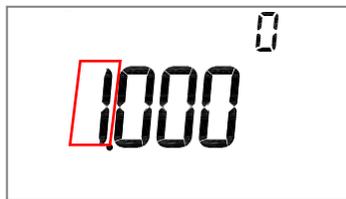
- The analog output voltage is calibrated to 2.800V at peak. The resolution varies depending on the range.
- The maximum output voltage is up to 3 V in manual range. Therefore, with analog output and manual range, values exceeding the readout on the display can be measured. For example, when you use Range 1, the instrument can measure the luminance from 0.01 to 30cd/m². An error [E4] appears on the display when measured value exceeds measurement range.

3. SETTING PROCEDURES

3.1 CORRECTION FACTOR SETTING

How to enter correction factor (ex: entering 30.20 as correction factor)

- 1 Press [C.C.F.] switch for several seconds.
- 2 The digit at the left end is blinking and the [0] mark appears on the top of display, and Correction factor entry is available.



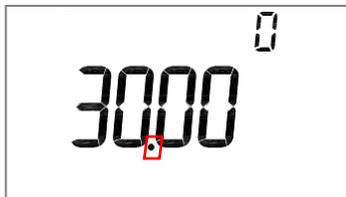
- 3 Change the value by pressing [0~9] switch several times



- 4 Press [SHIFT] switch and the second left digit is blinking.



- 5 Press [•] switch to enter decimal point.



- 6 Press [SET] switch to confirm the entry.

Blinking is stop and correction factor which you entered is displayed for 3 seconds.



- 7 Correction factor entry is completed and then returning to luminance measurement. When correction factor is active, readout is the value multiplied measured value and correction factor.

Color correction factor applied  '2.5 COLOR CORRECTION FACTOR'



Memo

- Valid range of correction factor is from 0.001 to 1,000.
- When measured value exceeds measurement range due to too large correction factor, an error [E5] appears.
- An error [E7] appears when you enter [0] as correction factor.
- Correction factor is stored in memory even after turning off the power.

3.2 REFERENCE DATA SETTING

Set the reference data for the difference and the percentage mode.

The reference data is common between for the difference and the percentage.

When the reference data is not entered, the reference data entry screen appears after pushing [Δ] switch or [%] switch.



Memo

- When there is no reference data, [0000] appears and the reference data entry screen is available.

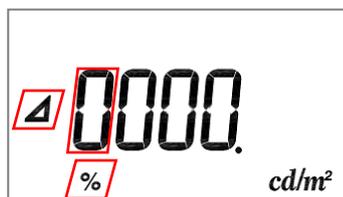
3.2.1 PROCEDURE FOR REFERENCE DATA ENTRY

- Enter specified value as reference data (ex: entry of 150.0)

1 Press [Δ] switch or [%] switch.

2 Reference data entry is available and the digit at the left end is blinking.

When you press [Δ] switch at step, [Δ] mark appears on the display. When you press [%] switch, [%] mark appears.

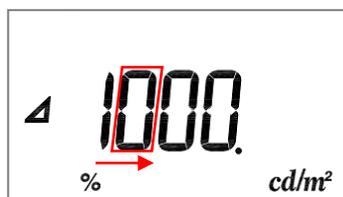


3 Press [0~9] switch to change the figure.

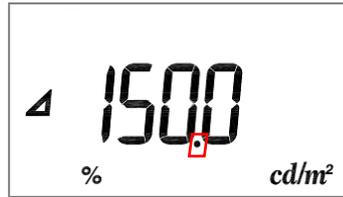


4 Press [SHIFT] switch and the second left digit is blinking.

Change the value by pressing [0~9] switch in the same way.



- 5 Press [•] switch to enter digital point.



- 6 Press [SET] switch to confirm entered value.

Blinking is stop and correction factor which you entered is displayed for 3 seconds.



- 7 Changing to the difference or the percentage mode.

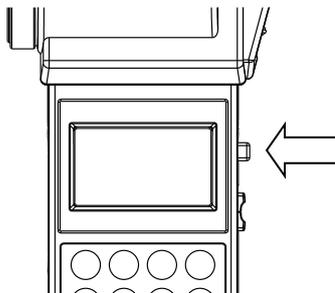
When correction factor is active, readout is multiplied by measured value and correction factor.

Memo

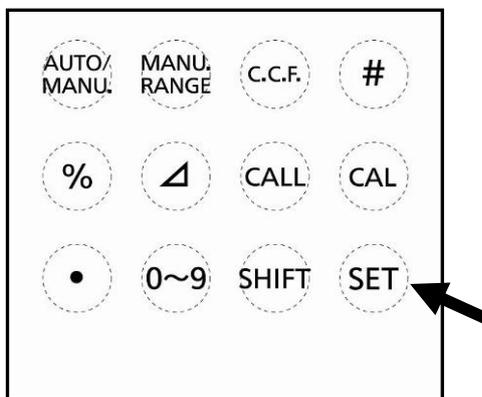
- Press [SHIFT] switch several times to move the digit you want to change. [0] can be entered only at the fifth and sixth digit from the left.
- Valid range of the reference data is from 0.001 to 999,900.
- When you enter [0] as reference data, an error [E7] appears on the display.
- Once the reference data is entered, the reference data can not be changed till turning off the power.
- The reference data is stored in memory till turning off the power.
- The reference data is initialized when turning on power.

- Measured value is used as reference data

- 1 Measure the luminance of the reference light source in luminance measurement mode.
- 2 Press Hold button to fix the readout after readout is stable.



- 3 Press [SET] switch to enter the measured value as the reference data.



- 4 The entered reference data appears for 3 seconds.
- 5 Release Hold switch.
- 6 Press [Δ] switch or [%] switch to go to the difference or the percentage mode.
When correction factor is active, readout is multiplied by correction factor and measured value.

 **Memo**

- Valid range of reference data is from 0.001 to 999,900.
- When you enter [0] as reference data, an error [E7] appears on the display.
- The reference data is stored in memory till turning off the power.
- The reference data is initialized when turning on power.

3.2.2 CHECKING REFERENCE DATA

- 1* Press [Δ] switch or [%] switch to enter the difference or the percentage mode.
- 2* Press [CALL] switch.
- 3* The active reference data is displayed for about 3 seconds, and then returning to the difference or the percentage mode.

4. COMMUNICATION WITH PC

4.1 COMMUNICATION COMMAND

This instrument can communicate with PCs. This chapter describes the commands for creating communication program with the BM-9A on user own.

The following are the communication commands:

Command name	Function
STRn	Selects Auto range or the number of measurement range, and then the instrument return the measured value. n: 0 – 5
CAL	Starts a zero adjustment.
WHO	Reads product name.
VER	Reads software version.
SRL	Reads product serial number.
SCCF_####	Writes correction factor (C.C.F.) into EEPROM of the BM-9A. Enters correction factor with decimal notation #### or #.### or exponent notation #.###E±## Range to enter: 0.001 – 1000
RCCF	Reads correction factor (C.C.F.) #.###E±##
ASCF_#	Activates or inactivates the Color correction factor (C.C.F.) 0 : Inactive 1 : Active
ARCF	Checks whether the color correction factor (C.C.F.) is active or inactive.
ERR	Reads latest error number.

The “_” mark means a space. “####” is a numerical value.

When PC send a communication command to the BM-9A, the BM-9A returns “OK” as a receipt acknowledgment. When the BM-9A receive improper command, the BM-9A returns “NG”.



Memo

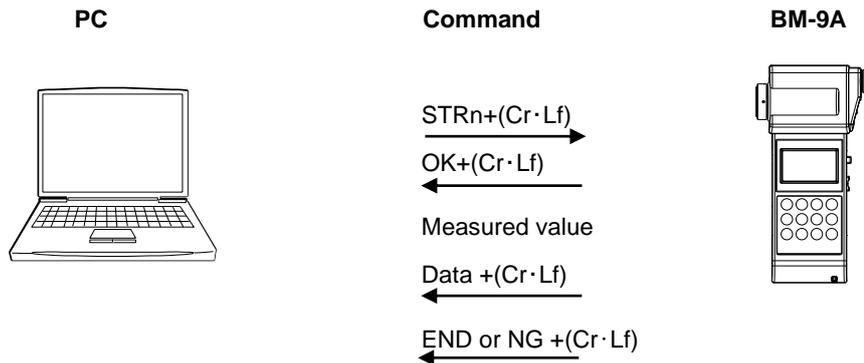
- No command can be accepted during zero adjustment. Send commands after completing the zero adjustment.

4.1.1 STRn COMMAND

When the BM-9A receive this command, the BM-9A returns measured data in a text format.

n: 0 (Auto range)

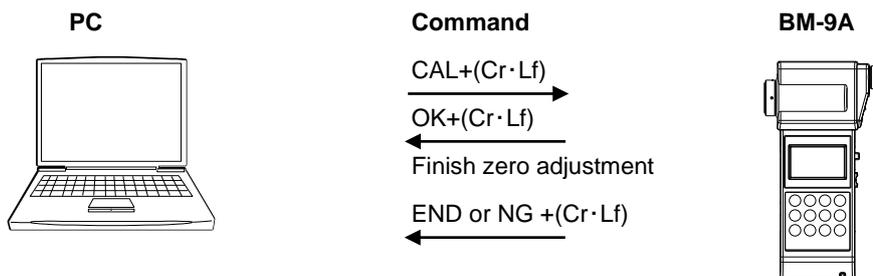
n: 1 – 5 (Manual range)



4.1.2 CAL COMMAND

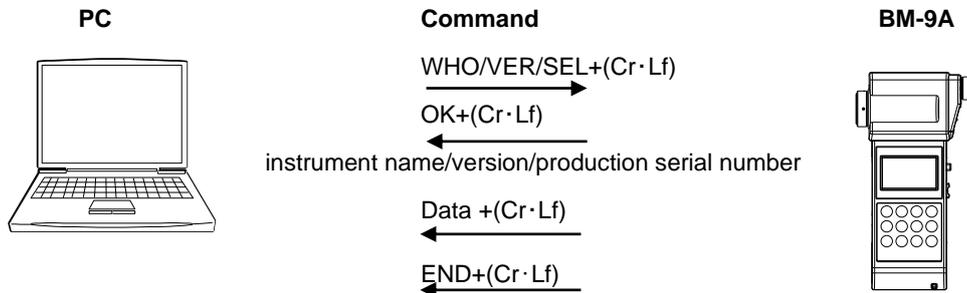
When the BM-9A receive this command, the BM-9A starts zero adjustment.

When BM-9A receives this command during integral luminance measurement, entering reference value, or entering C.C.F, the BM-9A returns "FAILED".



4.1.3 WHO/VER/SRL COMMAND

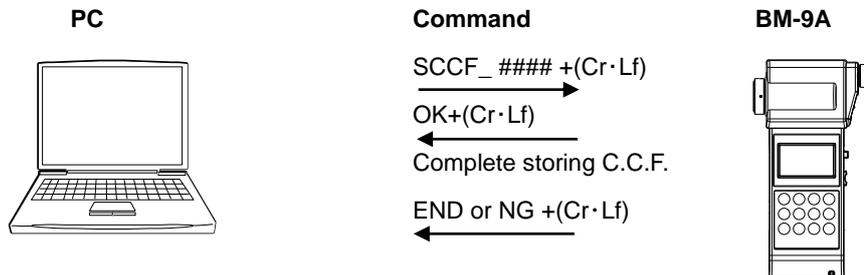
When the BM-9A receive this command, The BM-9A returns the name of this instrument, program version, and production serial number.



4.1.4 SCCF COMMAND

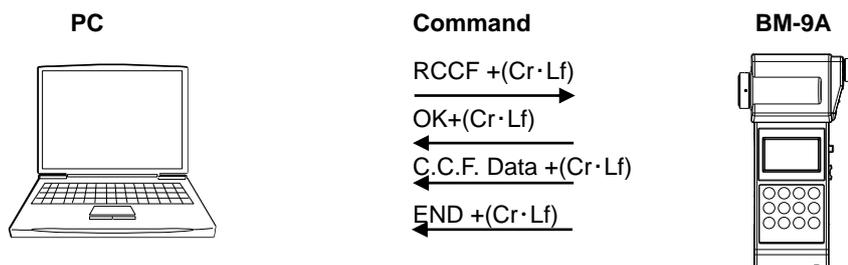
When the BM-9A receives this command, the BM-9A writes C.C.F. into EEPROM of the BM-9A.

Valid values range from 0.001 to 1000.



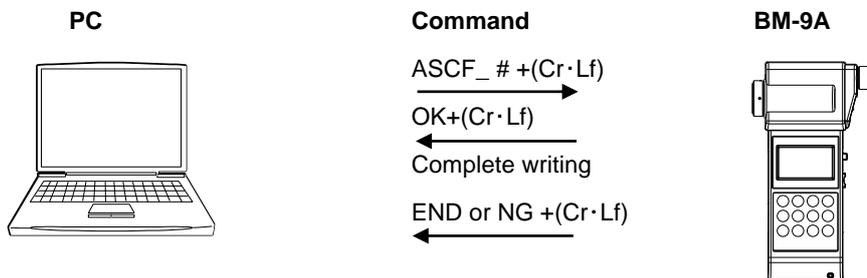
4.1.5 RCCF COMMAND

When the BM-9A receive this command, BM-9A returns C.C.F. data.



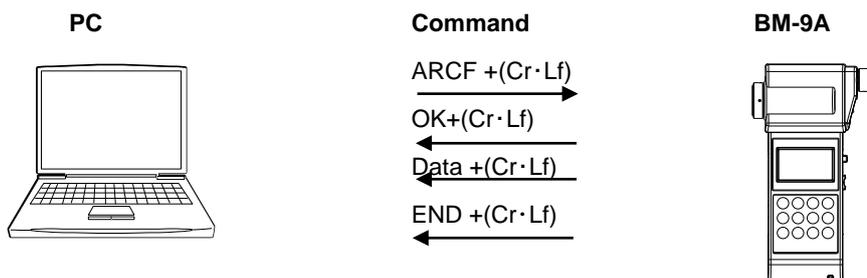
4.1.6 ASCF COMMAND

This command activates or inactivates Color correction factor (C.C.F.).



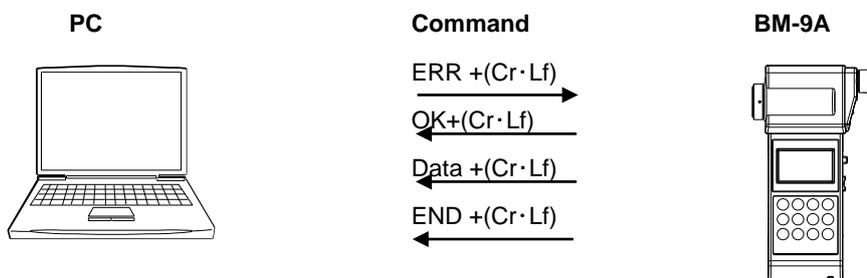
4.1.7 ARCF COMMAND

When the BM-9A receive this command, the BM-9A return a status about whether color correction factor (C.C.F.) is active or inactive.



4.1.8 ERR COMMAND

When the BM-9A receive this command, the BM-9A returns latest error number.



4.2 OUTPUT FORMAT

4.2.1 OUTPUT FORMAT FOR REMOTE MEASUREMENTS

Output format list

Name of command	Format type
STRn	#.###E±##_R#UC Measured value_Range Unit Resolution in the output format is the same as that in display unit. R# measns measurementne range. UC means "Unit Cd/m ² "
WHO	BM-9A02D or BM9A10D or BM-9A20D The name of currenty attached detector.
VER	### Software version.
SRL	##### Displays production serial number in 8 digits
RCCF	###E±## Displayed correction factor with exponent
ARCF	# 0 : C.C.F is inactive 1 : C.C.F is active
ERR	# Error code number.

The mark "_" means a space. "####" is a numerical value.

4.3 USB DRIVER

System requirement

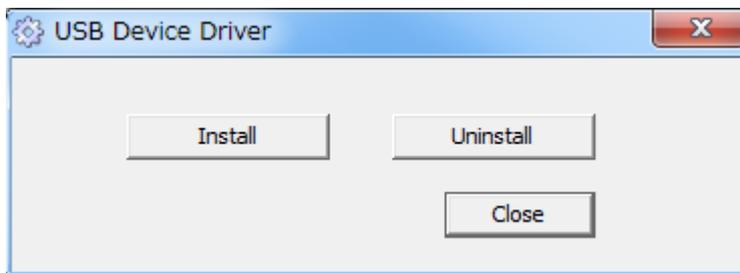
Windows® 10 Professional or higher (32bit/64bit)

Windows® 11 Professional or higher (64bit)

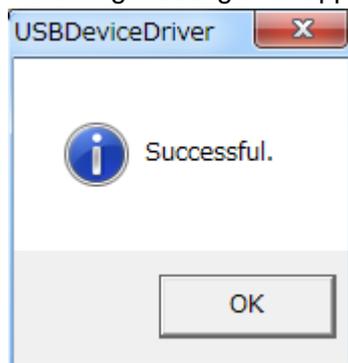
※Windows is a registered trademark of Microsoft Corp. in the US.

The following describes the procedure for installing the USB drive into PCs.

- 1 Insert the CD-ROM supplied with the BM-9A into CD-ROM drive.
- 2 Select [USBDeviceDriver.exe] in the [Driver] folder in the CD-ROM drive, right-click and click [Run as administrator].
- 3 Following dialog will appear.



- 4 Click [Install] button.
- 5 Following message will appear after completing driver install. Click [OK] button.



- 6 Click [Finish] button to finish.

 Memo

To uninstall, click [Uninstall] button for step 4 above.

 Memo

The following 2 types of drivers are installed.

- Serial converter
- Serial port

5. ERROR MESSAGE

5.1 INSTRUMENT ERROR CODE

Error Code	Explanation	Action
E1	The instrument can not recognize the detector unit.	Check if the detector unit is connected to the display unit correctly. If no problems are found, contact your dealer or Topcon Technohouse.
E2 E3	Zero adjustment cannot be complete.	Check if the detector unit is connected to the display unit correctly. If no problems are found, contact your dealer or Topcon Technohouse.
E4 E5	Measured values exceed measurable range.	Check if the measurement range is appropriate. When using manual range, change the measurement range to upper range. When C.C.F. is On, set Off of C.C.F..
E6	The instruments fail to write or read data.	Contact your dealer or Topcon Technohouse.
E7 E8	Values you entered are not valid.	Check if entered value is appropriate.
E9	Error in calculation. Over 9,999% in percentage mode or reference data is not entered.	There might be large difference between measured value and reference data. Or reference data is not entered.
E10	System error happens.	Turn off and then on the power of the instrument. Contact your dealer or Topcon Technohouse.

- If an error message is still displayed even after you take above action, repair may be required. Contact TOPCON TECHNOHOUSE or the dealer where you purchased this instrument.

5.2 COMMUNICATION ERROR CODE

When an error occurs on the instrument, which communicate with PC, following error messages is sent to your PC.

Error Code	Explanation	Action
1	The instrument can not recognize detector unit.	Check if the detector unit is connected to the display unit correctly. If no problems are found, contact your dealer or Topcon Technohouse.
2 3	Zero adjustment cannot be complete.	Check if the detector unit is connected to the display unit correctly. If no problems are found, contact your dealer or Topcon Technohouse.
4 5	Measured values exceed measurable range.	Check if the measurement range is appropriate. When using manual range, change the measurement range to upper range. When C.C.F is On, set Off of C.C.F..
6	The instruments fail to write or read data.	Contact your dealer or Topcon Technohouse.
7 8	Values you entered are not valid.	Check if entered value is appropriate.
9	Error in calculation. Over 9,999% in percentage mode or reference data is not entered	There might be large different between the measured value and the reference data. Or reference data is not entered.
10	System error happens.	Turn off and then on the power of the instrument. Contact your dealer or Topcon Technohouse.

6. APPENDIX

SPECIFICATIONS AND PERFORMANCE

Measuring field	2°、1°、0.2° Fixed measuring field							
Optical system	Finder : Visual field 5° Objective lens : f = 36mm F2.5							
Measurement range	Measuring field 2°	0.01 ~ 280,000 cd/cm ²						
	Measuring field 1°	0.1 ~ 2,800,000 cd/cm ²						
	Measuring field 0.2°	1 ~ 28,000,000 cd/cm ²						
	Auto-ranging(5 steps)							
Display	6-digit LCD							
Photo detector	Silicon photodiode							
Measuring diameter (Unit : mmφ)	Measuring field	Measuring distance(m)						
		0.35	0.4	0.6	0.8	1	3	5
	2°	9.5	11.2	18.2	25.3	32.3	102	173
	1°	4.70	5.59	9.10	12.7	16.2	51.1	86.1
	0.2°	0.95	1.12	1.82	2.53	3.23	10.2	17.3
※ The values vary a little according to the processing accuracy of the aperture mirror. ※ The measuring distance covers from the objective lens hardware tip to the target.								
Spectral sensitivity characteristics	Within 6% (deviation from the relative luminous efficiency)							
Luminance accuracy	±2% or rdg. ±2digit (Standard light source A, 23°C±3°C, Zero adjustment, Auto-range, Field 2° : 0.1cd/m ² or more, Field 1° : 1.0cd/m ² or more, Field 0.2° : 10cd/m ² or more)							
Repeatability	0.5+1digit、2σ(n10)、Auto range							
Temperature characteristics	With in ±3%(0°C~40°C 23°C as standard)							
Humidity characteristics	Within 3%(85%R.H. or less 60%R.H. as standard)							
Analog signal output	0 – 2800mV / Maximum display value							
Communication parameter	USB (Virtual COM port)							
Power supply	AA battery × 2							
Operating conditions	Temperature: 0 to +40°C Humidity: 85% RH or less							
Dimensions	Approx.191×108×57mm Display unit : Approx. 131×65×28mm Detector unit : Approx. 73×108×57mm							
Weight	Display unit : Approx. 130g (excluding batteries) Detector unit : Approx. 220g							

<p>Republic of Korea</p>	<p>KC:Class A</p>	<p>해당 무선설비는 전파혼신 가능성이 있으므로 인명안전과 관련된 서비스는 할 수 없습니다</p> <p>A급 기기 (업무용 방송통신기자재)</p> <p>이 기기는 업무용(A급) 전자파적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정외의 지역에서 사용하는 것을 목적으로 합니다</p>
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FCC Compliance Information

This device complies with Part 15 of FCC Rules. Operation is subject to the following two conditions:

- (1) the device may not cause interference, and
- (2) the device must accept any interference, including interference that may cause undesired operation of this device.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules.

These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in commercial environment. This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

	<p>EU Battery Directive</p> <p>This symbol is applicable to EU members states only.</p> <p>Battery users must not dispose of batteries as unsorted general waste, but treat properly. If a chemical symbol is printed beneath the symbol shown above, this chemical symbol means that the battery or accumulator contains a heavy metal at a certain concentration. This will be indicated as follows: Hg: mercury(0.0005%), Cd: cadmium(0.002%), Pb: lead(0.004%)</p> <p>These ingredients may be seriously hazardous to human and the global environment.</p>
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COLOR CORRECTION FACTOR

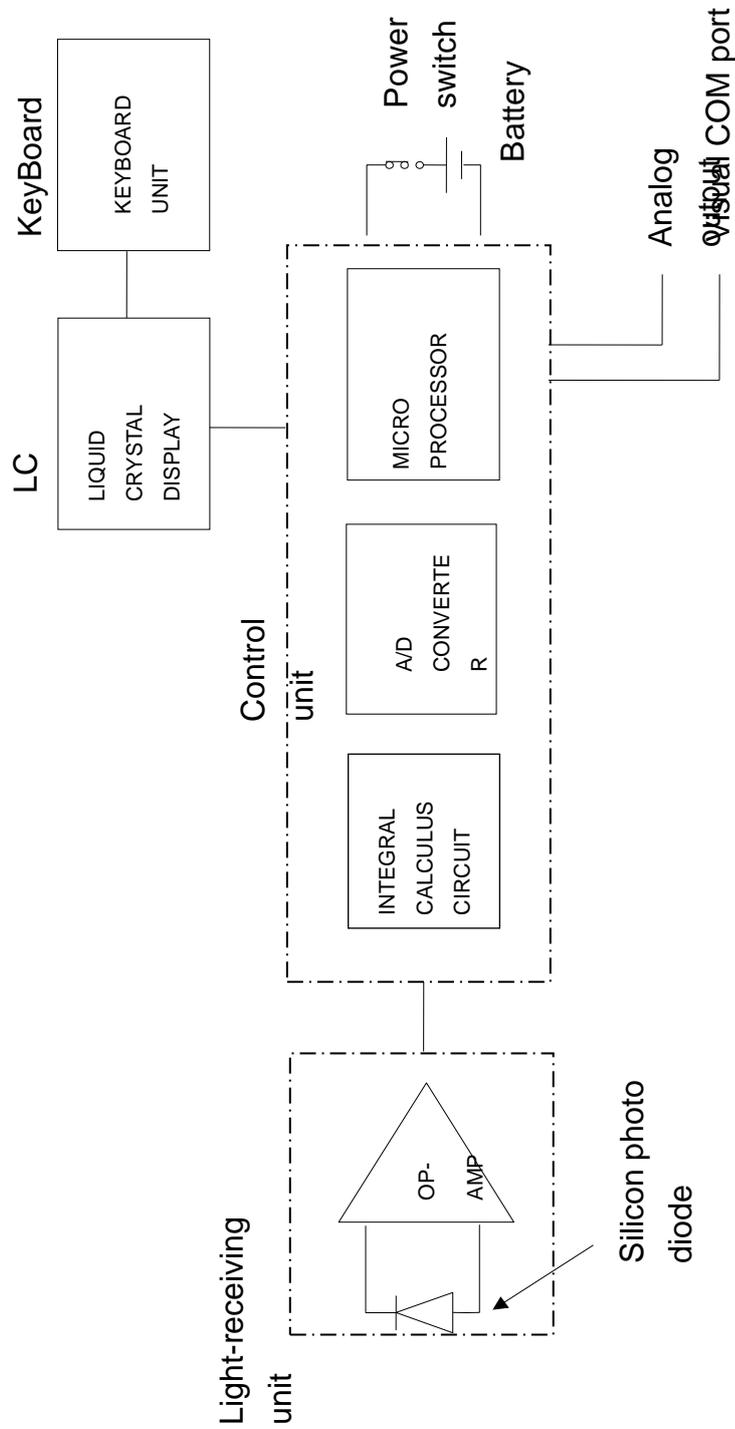
Light Source		Correction factor
Equi-Energy Spectrum	400~760nm	0.985
	450~500nm	0.997
	500~550nm	0.996
	550~600nm	1.001
	600~650nm	0.996
	650~700nm	0.999
Colored Light (Standard Illuminant A)	R-61	1.107
	O-55	1.023
	Y-48	1.013
	G-54	0.993
	B-46	0.996
	T-44	1.003
Lamps	Fluorescent lamp(F6)	0.989
	Fluorescent lamp (F8)	0.989
	Fluorescent lamp(F10)	0.992
	High pressure sodium lamp (NAV-TS70W SUPER)	0.993
	Mercury fluorescent lamp(HF400X)	0.997
	High pressure mercury lamp(H-400)	0.991
Standard illuminant B		0.987
Standard illuminant C		0.981

Memo

- The above data are obtained by a sample of this instrument. There are some differences in the characteristics between the products.

BLOCK DIAGRAM

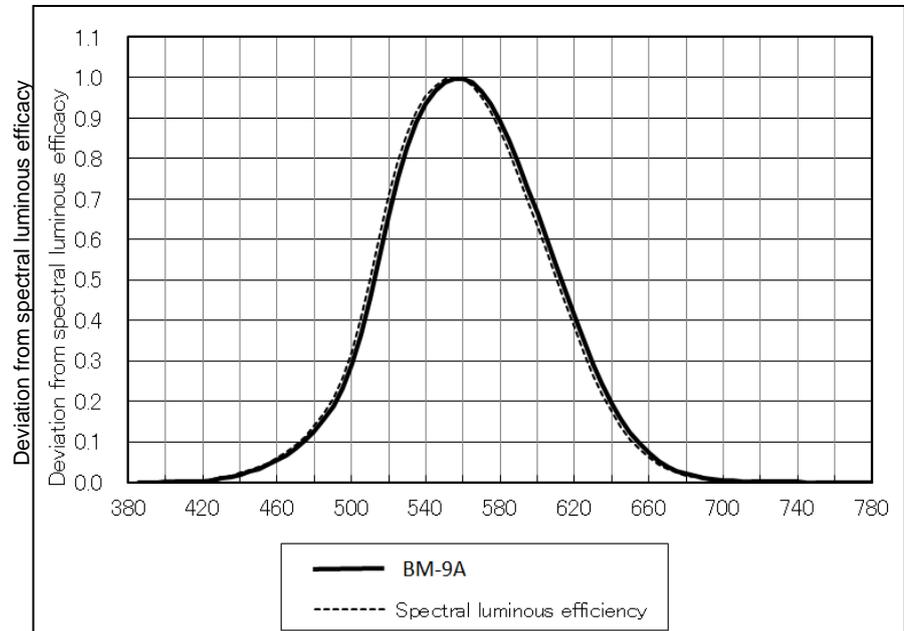
■BM-9A



GRAPH

Deviation from spectral luminous efficacy

■ BM-9A



📄 Memo

- The above data are obtained by a sample of this instrument. There are some differences in the characteristics between the products.

EXPLANATION OF TERMS

Relative Spectral Responsivity Characteristics :

The human eye has the sensitivity to the light with wavelengths ranging from 380nm to 780nm, and has most strong sensitivity at 555nm. (Spectral luminous efficiency) The relative spectral responsivity of the BM-9A closely matches the spectral luminous efficiency. The difference between spectral luminous efficacy and Relative spectral response of the BM-9A is evaluated according to JIS C1609 : 2006.

Color Correction Factor :

A factor is to compensate the difference between the spectral luminous efficiency and the relative spectral responsivity.

The BM-9 can set the color correction factor and correct an instrumental error between multiple instruments.

LUMINANCE METER

BM-9A

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