CHROMA METER

ELMA-1336

INSTRUCTION MANUAL

CONTENTS

Title   **Page**

1. INSTRUCTION

- ❑ The digital Chroma meter is a precision instrument used to measure color coordinate, illuminance and correlated color temperature.
- ❑ It meets CIE photopic spectral response.
- ❑ The Chroma meter is compact, tough and easy to handle owing to its construction.
- ❑ The light sensitive component used in the meter is a very stable, long-life silicone photo diode and spectral response filter.
- ❑ Fully functional for professional requirements.
- ❑ **U.S. Pat. No. Des. 446,135**

2. FEATURES & APPLICATION

- ❑ Triple Display, 4-digit LCD reading.
- ❑ LED Color Bin select function (x,y) or (Tcp, Δuv). (Use CD software)
- ❑ User calibration function.
- ❑ User reference value setting function.
- ❑ Illuminance maximum/minimum measurement function.
- ❑ Data Hold function.
- ❑ Data memory and read function.
- ❑ Data logger function.
- ❑ Auto power off function.
- ❑ USB Interface.

Applications:

- ❑ Measure tristimulus values, chromaticity, color difference, correlated color temperature, and illuminance of light sources.
- ❑ R&D and color inspection of light in a variety of industries such as lamp manufacturers, building and interior design.
- ❑ Set-up projectors for presentation purposes.
- ❑ Adjust color of CRTs, flat panel, and other display devices.
- ❑ Evaluate and control color of light boxes and light booths.

3. SPECIFICATIONS

Display: Triple display 4 digit LCD read out.

Measuring function:

   Tristimulus values: XYZ

   Chromaticity: (Ev, x, y); (Ev, u', v'); (Ev, λd, Pe); (Ev, λd, Pc); (Ev, MAX, MIN).

   Correlated color temperature: (Ev, Tcp, Δuv); (ΔEv, ΔTcp, ΔuvΔ)

   Color difference: (ΔX, ΔY, ΔZ); (ΔEv, Δx, Δy); (ΔEv, Δu', Δv');
                           (ΔEv, Δλd, ΔPe); (ΔEv, Δλd, ΔPc)

Measuring range: 0.1 to 99990 lx, 0.01 to 9999 fc (Chromaticity: 5 lx, 0.5 fcd or
                         above)

Accuracy:

   Ev (Linearity): $\pm$3%rdg$\pm$2dgts

            xy: $\pm$0.02   (800 lx, Standard Illuminant A measured)

Repeatability:

   Ev: $\pm$0.5%rdg$\pm$1dgt

   xy: $\pm$0.003   (800 lx, Standard Illuminant A measured)

Temperature drift: Ev: $\pm$5%rdg$\pm$2dgts, xy: $\pm$0.008

Humidity drift: Ev: $\pm$3%rdg$\pm$2dgts, xy: $\pm$0.005

CIE photopic f '1: $\leqq$8%

Cosine response f$_2$: $\leqq$3%

Measuring Rate: 1 sec

Photosensor: Silicon photocell

Data Memory Capacity: 80 sets. (Direct reading from LCD display)

Data Logger Capacity: microSD CARD 4GB (Maximum 200 blocks)

Operating / Storage Conditions: 0℃ to 50℃<80% RH/-10℃ to 60℃<70% RH

Power Source: 6 pcs AAA size Battery

Battery Life (typical): 50 hours

Photosensor Lead Length: 150 cm (approx.)

Photosensor Dimensions: 92(L) $\times$ 60(W) $\times$ 29(H)mm

Dimension: 150(L) $\times$ 72(W) $\times$ 35(H)mm
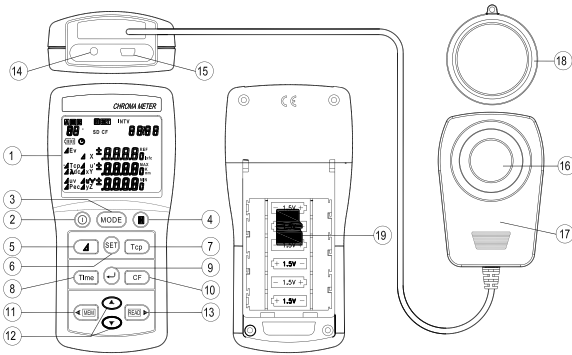
Weight: Meter: 235g, Photosensor: 210g

Accessories: Carrying case, Instruction manual, Battery, CD software, USB cable.

Option Accessories: AC adaptor 9VDC 100mA.

4. PARTS & CONTROLS

4-1 Description of Parts & Control keys

1. LCD Display: Triple 4 digit display with a maximum of 99990 readings and the indicating signs of measured values, unit function symbols and decimal points etc. are displayed.

2. ⏻ Power Control key: Press this key to turn on or off the meter.

3. MODE key:
   ① Sets the meter into the color measurement mode, and switches the color coordinates.
   ② Press this key to circulate the reading of (Ev, x, y), (Ev, u', v'), (Ev, λd, Pe), (Ev, λd, Pc), (X, Y, Z) and (Ev, MAX, MIN).

4. H key: Press this key momentarilly to freeze or unfreeze the displayed reading.

5. ◢ key:
   ① Sets the meter into color difference measurement mode, and switches the color difference display.
   ② Press this key to circulate the reading of (◢Ev, ◢x, ◢y), (◢Ev, ◢u', ◢v'), (◢Ev, ◢λd, ◢Pe), (◢Ev, ◢λd, ◢Pc), and (◢X, ◢Y, ◢Z).

6. SET key: Press this key to enter the setting mode.
        Press ↵ key to exit this mode.

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SET01 : Measurement illuminance unit lx or fc setting mode.

SET02 : Real time setting mode.

SET03 : Auto datalogging interval time setting mode.

SET04 : Auto-cycle timer datalogging setting mode.

SET05 : No-cycle timer datalogging setting mode.

SET06 : Auto power off time setting mode.

7. Tcp key:

① Sets the meter into color temperature measurement mode.

② Press this key to circulate the reading of (Ev, Tcp, ◢uv) and (◢Ev, ◢Tcp, ◢ uv◢).

8. Time key: Press this key to switch the display of minute : second, day/hour and year˙/.month. The real time will be displayed if the real time setting function was performed, otherwise the elapsed time will be displayed.

9. ↵ key:

① Store the displayed setting value or exit a setting mode.

② Recall the reference value or other for use in measurement.

10. CF key: Use this key to switch use of correction factor ON or OFF, and to set the CF.

11. ◀ MEM key:

① ◀ **key**: In the setting mode, press this key move flashing cursor to left.

② MEM **key**: a). Memory function: Press this key one time to store a measuring value.

b). Press this key for 3 seconds to enter or exit the datalogging mode.

12. ▲ ▼ key: In the setting mode, press this key to increase, decrease the displayed setting.

In the **READ** mode, press this key to increase/decrease the memory location.

13. READ ▶ key:

① ▶ key: In the setting mode, press this key move flashing cursor to right.

② READ **key**:

Read function: Press this key to enter the **READ** mode, then press ▲ or ▼ key to select the desired stored number of data to read. Press ↵ key to exit.

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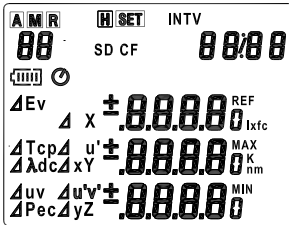**14. AC adaptor socket (9V, 100mA).** ⊖—ⓒ—⊕
15. Micro-USB
16. Photo Detector Receptor Window: The spherical summit of the detector
window is used as the illuminance
reference plane.
17. Tripod mounting: 1/4"-20 unc female thread.
18. Photo Detector Cap.
19. microSD CARD 4GB.

4-2 Description of Display

A : Datalogging mode indication.

M : Disappeared one time store one sets data into the memory.

$\overset{\text{M}}{BB}$: Manual memory address number indication.

$\overset{\text{M}}{FU}$: Manual memory full indication.

R : Read mode indication.

$\overset{\text{R}}{BB}$: Recall manual memory address number indication.

H : Data hold mode indication.

SET : Setting mode indication.

INTV : Datalogging interval time indication.

SD : microSD CARD satus indication.

CF : Correction Factors mode indication.

$BB'/.BB$: Indicates the elapsed date or the real date (year'/.month).

BB/BB : Indicates the elapsed date or the real date (day/hour).

$BB:BB$: Indicates the elapsed time or the real time (minute/second).

(IIIII) : Battery capacity indication.

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⬓ : Low battery indication.
◔ : Auto power off indication.
Ev : Illuminance value indication.

X, Y, Z : Tristimulus values indication.
x, y : Chromaticity coordinates values indication.
u', v' : Uniform chromaticity coordinates values indication.
Tcp : Correlated color temperature value indication.
λd : Dominant wavelength value indication.
λc : Complementary wavelength value indication.
◢uv : Duv, closest distance from the planckian locus value indication.
Pc : Colorimetric purity value indication.
Pe : Excitation purity value indication.
◢X, ◢Y, ◢Z : Tristimulus values color difference indication.
◢Ev : Illuminance value difference indication.
◢x, ◢y : Chromaticity coordinates values color difference indication.
◢u', ◢v' : Uniform chromaticity coordinates values color difference indication.
◢u'v' : $\Delta u'v' = \sqrt{(\Delta u')^2 + (\Delta v')^2}$, Color difference distance value indication.
◢λd : Dominant wavelength value difference indication.
◢Pe : Excitation purity value difference indication.
◢Pc : Colorimetric purity value difference indication.
◢Tcp : Correlated color temperature value difference indication.
◢uv◢ : ◢Duv, closest distance from the planckian locus value difference indication.
REF : Reference color values indication.
lx, fc : Illuminance units.
MAX : Illuminance maximum value indication.
MIN : Illuminance minimum value indication.
K : Correlated color temperature unit.
nm : Wavelength unit.
2Er0 CAL CAPS : When power on, the letters to indicate that zero calibration is in progress. This calibration need to attach the photo detector cap.
SE⌐0 UCAL CAbS : If no attach the photo detector cap then power on, the letters to indicate that zero calibration can not progress.

5. OPERATING INSTRUCTIONS

Zero Adjustment

The meter performs zero adjustment automatically when the power comes on. This adjustment need to attach the photo detector cap.

5-1 Selecting Illuminance Unit lx or fc

1. Press the ⏻ key to turn on the meter.
2. Press **SET** key, the annunciator "SET 01" and "**Unlt**" are displayed.
3. Press ▲ or ▼ key to select "**lx**" or "**fc**" unit.
4. Press ↵ key to store the desired measure unit.
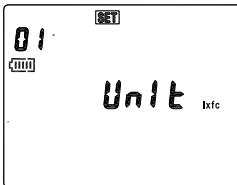
### 5-2 Taking Color Measurements

When taking measurements, be careful to hold the photo detector so that the receptor window is clear of shadows (such as your own shadow) and reflected light.

1. Press the ⏻ key to turn on the meter.
2. Remove the photo detector cap and aim the receptor at the light source you want to measure.
3. Press **MODE** key to enter the color measurement mode.
4. Press **MODE** key again to cycle switch displaying the (Ev, x, y) → (Ev, u', v') → (Ev, λd, Pe) → (Ev, λd, Pc) → (X, Y, Z) → (Ev, MAX, MIN) reading.

In the (Ev, MAX, MIN) display mode, press ↵ key to restart the illuminance maximum and minimum reading function, the maximum and minimum values are then reset to the present reading.

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5. Press $\boxed{H}$ key, if the displayed value need to be hold. In $\boxed{H}$ mode, press **MODE** key to cycle switch display the other measured values and press **Time** key to display the held date and time. Press $\boxed{H}$ key again to exit the data hold mode.
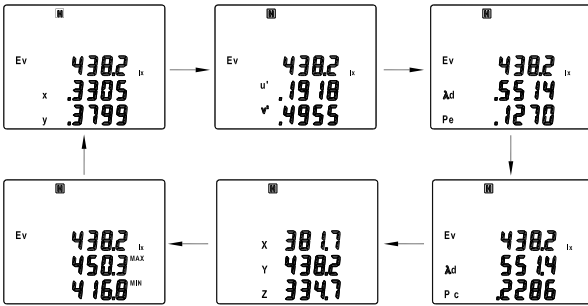
Low – Light Alert

If the measured illuminance is less than about 5 lx (0.5 fc), the following values on the display will blink to alert you of this condition: x, y, u', v', λd, Pe, Pc, Tcp, ⊿uv, ⊿Tcp, ⊿uv⊿, ⊿x, ⊿y, ⊿u', ⊿v', ⊿u'v', ⊿λd, ⊿Pe and ⊿Pc. The blinking display lets you know that the illuminance is low.

Over Alert

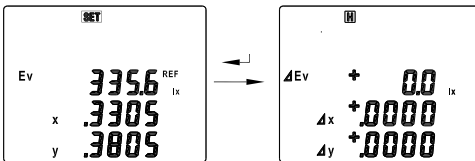If any of the measured values, X, Y or Z exceeds 99,990, the display will show a blinking "**OL**".

5-3 Taking Color Difference Measurement

The meter display calculated values that are based on to measure the difference between the sample color and a target color.

5-3-1 Using a measurement result as the target

1. Measure the color of a source as described under step **5-2**.

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2. When the display shows measurement result that you feel are satisfactory for use as your target values, press **H** key to hold these results.

3. Press ◢ key to enter the color difference measurement mode. If you have previously set a target, the display shows the difference between the new measurement and this previously set target.

4. Press **SET** key to enter the **SET** mode, the annunciator "**SET REF**" and the measurement result that you held at step 2 above now blink on the display. If you wish to cancel without store the blinking values as your new target, press **SET** key again.

5. Press ↵ key to store the measured value into the target memory, so that they become the current target values. The displayed values accordingly change "**+0.0**" (Where the number of digits on each line varies according the display mode), since the measured values and target values are now identical.

6. Press **H** key again to exit **Hold** mode and back to the color difference measurement mode. In this mode, you can review the target values at any time by holding down the ↵ key. The values remain on the screen until you release the key.

```
     SET                              H
Ev  335.6 REF          ◢Ev  +  0.0 lx
         lx              ◢x  +.0000
  x  .3305               ◢y  +.0000
  y  .3005
```

5-3-2 Manually keying in the target values

   Note that the dominant wavelength, the excitation purity and the colorimetric purity cannot be used to set the target value.

1. Press **MODE** key to select the desired (Ev, x, y), (Ev, u', v') or (X, Y, Z) display mode.

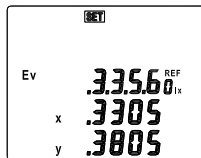2. Press ◢ key to enter the color difference measurements mode.

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3. Press **SET** key to enter the setting target values mode, the annunciator "SET REF" and the previously set target values are displayed. If no target is currently set, the display shows o's for all parameters.

   The first line one or more decimal points blinking.

4. Press ▲ and ▼ key to select the desired decimal point location. If the set target value does not have a set decimal point, all four of the line's decimal points blink.

5. Using ◄ and ► key, position the cursor on the all parameters element to adjust.

6. Using ▲ and ▼ key to change the selected parameter element value.

7. You can cancel the entry procedure by pressing the **SET** key.

8. Recheck you entries to be sure that they are correct, and then press ↵ key to store them, so that they become the target value.

   You can view the currently set target by press ↵ key.

   If any of the values you have entered are outside of permissible range of the corresponding parameter, the display shows "**ErrA**", and then returns to the beginning of the **SET** mode. Reenter the values.

5-3-3 Taking the color difference measurement

1. Aim the receptor at the light source you want to measure. The display shows the color difference measurement results.

2. Press ⊿ key to cycle switch displaying the (⊿Ev, ⊿x, ⊿y) → (⊿Ev, ⊿u', ⊿v') → (⊿Ev, ⊿λd, ⊿Pe) → (⊿Ev, ⊿λd, ⊿Pc) → (⊿X, ⊿Y, ⊿Z) readings.

3. Press H key, if the displayed value need to be hold. In H mode, press **MODE** key and ⊿ key to cycle switch display the other measured values, press **Time** key to display the held date and time and holding down the ↵

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key to review the target values. Press H key again to exit the data hold

mode.
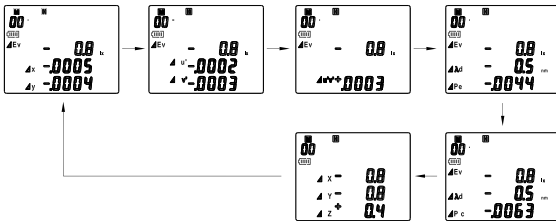
5-4 Measuring the Correlated Color Temperature

5-4-1 Taking correlated color temperature measurements

1. Press the ⏻ key to turn on the meter.
2. Remove the photo detector cap and aim the receptor at the light source you
   want to measure.
3. Press **Tcp** key to enter the correlate color temperature measurement mode.
   The display shows the measurement results.

The meter can display color temperature values from 2300 to 20000K.

The meter can display ◢uv values up to (but no including) 0.1.

If either the temperature reading or the ◢uv value is outside the display range,
the meter will blinking for both values.
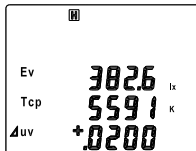
5-4-2 Taking correlated color temperature difference measurements

The meter display calculated values that are based on to measure the
difference between the sample and a target correlated color temperature.

5-4-2-1 Using a measurement result as the target

1. Measure the correlated color temperature of a source as descibed under

step 5-4-1.

2. When the display shows measurement result that you feel are satisfactory for use as your target values, press [H] key to hold these results.

3. Press **Tcp** key to enter the correlated color temperature difference measurement mode. If you have previously set a target, the display shows the difference between the new measurement and this previously set target.

4. Press **SET** key to enter the **SET** mode, the annunciator "[SET] REF" and the measurement result that you held at step 2 above now blink on the display. If you wish to cancel without store the blinking values as your new target, press **SET** key again.

5. Press ↵ key to store the measured value into the target memory, so that they become the current target values. The displayed values accordingly change "+0.0" (Where the number of digits on each line varies according the display mode), since the measured values and target values are now identical.

6. Press [H] key again to exit Hold mode and back to the correlated color temperature difference measurement mode. In this mode, you can review the target values at any time by holding down the ↵ key. The values remain on the screen until you release the key.
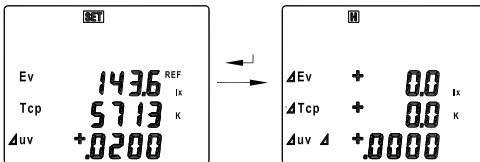
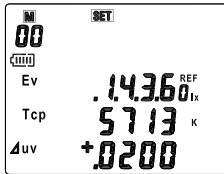### 5-4-2-2 Manually keying in the target values

1. Press **Tcp** key to enter the correlate color temperature measurement mode. The display shows the measurement results.

2. Press **Tcp** key again to enter the correlate color temperature difference measurement mode.

3. Press **SET** key to enter the setting **target values** mode, the annunciators "[SET] REF" and the previously set target values are displayed. If no target is currently set, the display shows o's for all parameters.

The first line one or more decimal points blinking.

4. Press ▲ and ▼ key to select the desired decimal point, location. If the set target value does not have a set decimal point, all four of the line's decimal points blink.

5. Using ◀ and ▶ key, position the cursor on the all parameters element to adjust.

6. Using ▲ and ▼ key to change the selected parameter element value.

7. You can cancel the entry procedure by pressing the **SET** key.

8. Recheck you entries to be sure that they are correct, and then press ↵ key to store them, so that they become the target value.

   You can view the currently set target by press ↵ key.

   If any of the values you have entered are outside of permissible range of the corresponding parameter, the display shows "**ErrA**", and then returns to the beginning of the **SET** mode. Reenter the values.


5-4-2-3 Taking the correlated color temperature difference measurements

1. Aim the receptor at the light source you want to measure. The display shows the correlate color temperature difference measurement results.

2. Press **Tcp** key to cycle switch displaying the (⊿Ev, ⊿Tcp, ⊿uv⊿) and (Ev, Tcp, ∆uv) reading.

3. Press 𝐇 key, if the displayed value need to be hold. In 𝐇 mode, press **Tcp** key to cycle display the other measured values, press **Time** key to display the held date and time and holding down the ↵ key to review the

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target values.

Press **H** key again to exit the the data hold mode.
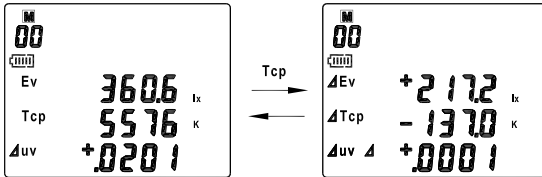
5-5 Using the Correction Factors (CF)

5-5-1 Using CF correction

The CF 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 values is known, to precisely standardize meters to the same subject.

After setting the CF, you can use the **CF** key to switch use of CF correction ON or OFF.

5-5-2 Setting the CF values

You set the CF in two stages: First you measure a light source whose output values are known, and then you key in the known values. The meter calculates the CF based on the difference between the measured values and the keyed-in values.

1. Measure the light source

① Press **MODE** key to move to the (Ev, x, y) display mode. The CF can only be set while the display is showing the (Ev, x, y) color coordinates.

② Aim the receptor at the light source you want to measure.

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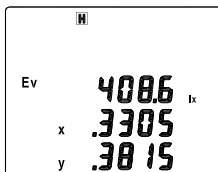
③ When the display shows measurement result are stable, press H key to hold these results.

2. Enter the know values

① Press **CF** key to enter the **CF** mode.

② Press **SET** key, the display shows the measurement results obtained at step 1 – ③ above. If **CF** values are already set, the display shows the corrected results.

The first line one or more decimal points blinking.

The meter is now ready for you to manually enter the known values.

③ Press ▲ and ▼ key to select the desired decimal point location. If the set known value does not have a set decimal point all four of the line's decimal points bling.

④ Using ◄ and ► key, position the cursor on the all parameters element to adjust.

⑤ Using ▲ and ▼ key to change the selected parameter element value.

⑥ You can cancel the entry procedure by pressing the **SET** key.

⑦ Recheck you entries to be sure that they are right, and then press ↵ key to store them.

The meter computes the **CF** values by comparing your entered values with the held measurement values.

If any of the computed **CF** values is lower than 0.0001 or higher than 10.0000, the meter display shows "**ErrA**", and then returns to the beginning of the **SET** mode.

You can view **CF** values by pressing **CF** key to enter **CF** mode and hold down the ↵ key. The values remain on the screen until you release the key.

If any of the values you have entered are outside of permissible range of the corresponding parameter, the display shows "**ErrA**", and then returns to the beginning of the **SET** mode. Reenter the values.

If you attempt to set y such that $y < 1 - 6.98x$, the meter display shows "**ErrA**", and returns to the beginning of the **SET** mode. Reenter the values.
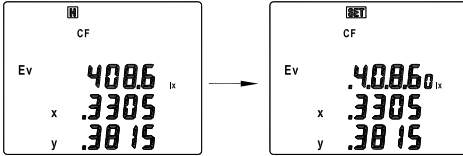
5-5-3 Applying CF correction to measurements

1. Press **CF** key, the display now shows the CF-corrected results, the annunciator "**CF**" is displayed.
2. Press **CF** key again to exit the **CF** mode and uncorrected measurements are displayed.

   If you wish to clear the stored **CF** values, return to the procedure described under step 5-5-2 and manually input o's into all columns.
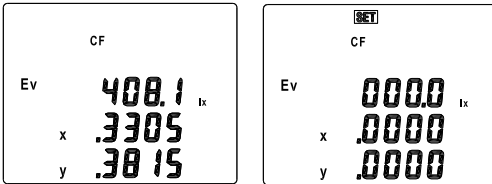
## 5-6 Manual Data Memory and Read Operations

5-6-1 To memorize the reading

1. Press **MEM** key each time will store one set of the measured value to the memory. At this moment, LCD will show the "**M**" mark and the memory address number. Total memory size is 80 sets.
2. When the memory is full, LCD will show "**M FU**" mark.
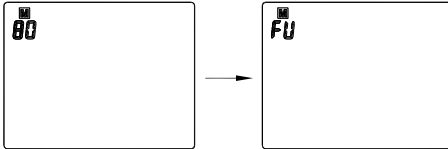
5-6-2 To recall the memorize data

1. Press READ key to enter the **READ** mode, the LCD will show " R " mark and the memory address number.

2. Press ▲ or ▼ key to select the desired memory address number data for display.

3. Press **MODE** key, ⊿ key or **Tcp** key to cycle switch display the other measured values.

4. Press **Time** key to display the stored date and time.

5. Press ↵ key to exit.
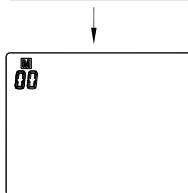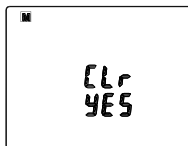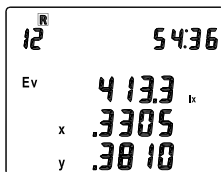
5-6-3 To clear the manual memorized data

1. Press the ⏻ key to turn off the meter.

2. Press and hold down **MEM** key then press the ⏻ key to turn on the meter, LCD will show "**M CLr no**" mark.

3. Press ▲ key to select "**YES**" or press ▼ key to select "**no**" , then press ↵ key to exit.
   If you select "**YES**" the memorized data will be cleared.

5-7 Setting the Auto Power Off Time

1. Press **SET** key six times to change the setting mode to "**SET** **06**", the annunciator "⏱ **APO**" is displayed and to enter the auto power off time setting mode, the previouslu auto power off time and two flicking digits (minute) are displayed.

2. Press ▲ and ▼ key to set the desired minute from 00 to 50 minutes, if set to 0 minutes will disable the auto power off function.

3. Press ↵ key to store the auto power off time and exit.
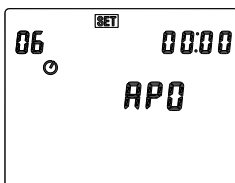
5-8 Setting the Real-Time

The meter internal clock is used in the display and for time-stamping recorded measurements.

1. Press **SET** key two times to change the setting mode to "**SET 02**", the flicking first number of year are displayed.

2. Using ◄ and ► keys, position the cursor on the date or time element to adjust.

3. Use ▲ and ▼ keys to change the selected date or time element value.

4. Press ↵ key to complete the action.

year / month   day/hour   minute:second
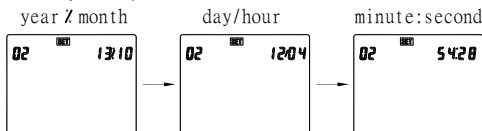
5-9 Auto Datalogging

Only microSD CARD 4GB can be used.

1. Clear the auto memorized data

① Press the ⏻ key to turn off the meter.

② Press and hold down **READ** key then press the ⏻ key to turn on the meter, LCD will show "**A SD CLr no**" mark.

③ Press ▲ to select "**YES**" or press ▼ key to select "**no**".

④ If you select "**YES**", press ↵ key to perform clear the auto memorized data, the "**dEL**" mark is displayed, when the "**dEL**" mark is disappeared, the clear work is finished. If no SD CARD in the meter, the "**Sd Err**" mark is displayed 2 seconds then exit.
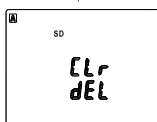
2. Interval time setting

① Press **SET** key three times to change the setting mode to "SET 03", the annunciator "**INTV**" and the flicking first number of minute are displayed.

② Press ◄ and ► keys, position the cursor on the time element to adjust.

③ Use ▲ and ▼ keys to change the selected time element value.

④ Press ↵ key to complete the action.
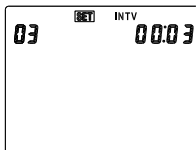
3. Auto data memory
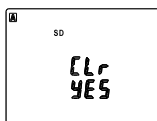
① Press **MEM** key for 3 seconds to record data automatically.

The annunciator "A" and "**SD**"are displayed, when the "M" mark disappeared one time, one set of reading is stored to the memory.

② If no SD CARD in the meter, the "**Sd Err**" mark is displayed 2 seconds then exit.

③ During this mode, press ↵ key to display the interal time and press H key to pause and resume the measurement and data memory.

④ If memory is full, the "**Sd FULL**" mark is displayed.

⑤ Press MEM key for 3 seconds to exit.

The maximum capacity is 4GB.

4. Download the recording data to PC connect the USB cable to PC and the meter.

5-10 Auto-Cycle Timer Datalogging

The auto cycle timer means the start time and the record time is valid in the everyday.

1. Perform setting the Real-Time. (refer to 5-8)

2. Press **SET** key four times change the setting mode to "SET 04", to enter the Start-Time setting mode, the annunciator "**StAt**" and the flicking number of hour "/BB" are displayed.

3. Using ◄ and ► keys, position the cursor on the time element to adjust.

4. Use ▲ and ▼ keys to setting the selected time element value.

5. Press ↵ key to stored the start time and to enter the Record-Time setting mode, the "**rECt**" mark and flicking number of hour "/BB" are displayed.
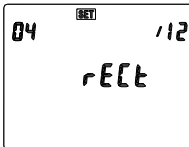
6. Repeat step 3 and 4 to complete the record-time setting.

7. Press ↵ key to stored the record time and to enter the Interval-Time setting mode, the "**INTV**" mark and the flicking number of minute are displayed.

```
 04      INTV  0 1:00

         rECt
```

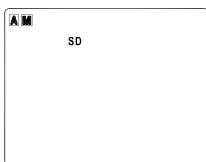8. Repeat step 3 and 4 to complete the interval time setting.

9. Press ↵ key to stored the interval time and to enter the ON/OFF selecting *mode.*

```
 04      SET

         rECt
         OFF
```
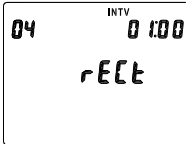
10. Press ▲ or ▼ key to select "**on**" or "**OFF**".

11. If select "**OFF**" then press ↵ key to exit.

12. If select "**on**" then press ↵ key to complete the action and to enter the auto-cycle timer datalogging mode, the "A" mark is flick displayed.

13. In this datalogging mode if Auto-power off function is enabled, the meter will enter a battery saver mode if a key is not pressed. In the battery saver mode will shutdown circuits not necessary, including the display.

14. When the start time is reached, the "A" mark is stop flick and the "**SD**" mark is displayed. When the "M" mark disappeared one time means one set of data has been memorized.
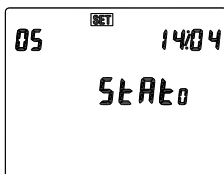
```
┌─────────────────────────┐
│ A M                     │
│            SD           │
│                         │
│                         │
│                         │
│                         │
└─────────────────────────┘
```

15. If no SD CARD in the meter, the "**Sd Err**" mark is displayed 2 seconds then exit.

16. If memory is full, the "**Sd FULL**" mark is displayed.

17. During this mode, press ↵ key to review the start-time, record-time and interval-time.

18. Press "**MEM**" key for 3 seconds to exit.
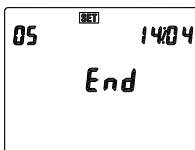
   The maximum capacity is 4GB.

5-11 No-Cycle Timer Datalogging

   The no cycle timer means the start-time and the end-time is valid only one time.

1. Perform setting the Real-Time. (refer to 5-8)

2. Press **SET** key five times to change the setting mode to "**SET** **05**" to enter the Start-Time setting mode, the annunciator "**StAto**" and the flicking number of year "$88'.88$". are displayed.

```
┌─────────────────────────┐
│  05      [SET]    14:04  │
│                         │
│         5tAto           │
│                         │
└─────────────────────────┘
```

3. Using ◄ and ► keys, position the cursor on the date or time element to adjust.

4. Use ▲ and ▼ keys to setting the selected date or time element value.

5. Press ↵ key to stored the start time and to enter the End-Time setting mode, the "**End**" mark and flicking number of year "$88'.88$" are displayed.

```
┌─────────────────────────┐
│  05    [SET]      14:04  │
│                          │
│            End           │
│                          │
└─────────────────────────┘
```
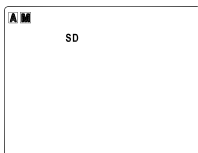
6. Repeat step 3 and 4 to complete the end-time setting.

7. Press ↵ key to stored the End time and to enter the Interval-Time setting mode, the "**INTV**" mark and the flicking number of minute are displayed.

```
┌─────────────────────────┐
│  05    [SET]  INTV       │
│                 01:00    │
│           StAto          │
│                          │
└─────────────────────────┘
```

8. Repeat step 3 and 4 to complete the interval time setting.

9. Press ↵ key to stored the interval time and to enter the ON/OFF selecting mode.

```
┌─────────────────────────┐
│  04    [SET]             │
│                          │
│           StAto          │
│            OFF           │
└─────────────────────────┘
```

10. Press ▲ or ▼ key to select "**on**" or "**OFF**".

11. If select "**OFF**" then press ↵ key to exit.

12. If select "**on**" then press ↵ key to complete the action and to enter the no-cycle timer datalogging mode, the "A" mark is flick displayed.

13. In this datalogging mode if Auto-Power off function is enabled, the meter will enter a battery saver mode if a key is not pressed. In the battery saver mode will shutdown circuits not necessary, including the display.

14. When the start time is reached, the "A" mark is stop flick and the "**SD**" mark is displayed. When the "M" mark disappeared one time means one set of data has been memorized.

```
A M
          SD
```

15. If no SD CARD in the meter, the "**Sd Err**" mark is displayed 2 seconds then exit.

16. If memory is full, the "**Sd FULL**" mark is displayed.

17. During this mode, press ↵ key to review the start-time, end-time and interval-time.

18. When the End-Time is reached, the "**A SD**" mark is disappeared.

19. Press "**MEM**" key for 3 seconds to exit.

The maximum capacity is 4GB.

6. BATTERY CHECK-UP & REPLACEMENT

1. Battery level indicator

Indication	Battery Capacity
▮▮▮▮▮	100% capacity
▮▮▮▮	80% capacity
▮▮▮	60% capacity
▮▮	40% capacity
▮	20% capacity
	Almost empty

2. As the battery power is not sufficient, LCD will display " ⬜ " ; battery replacement of standard AAA-size 6 pcs 1.5V batteries is required.

3. Unscrews the big screw on the back of the meter and remove the battery cover.

4. Disconnect the batteries from the instrument and replace them with standard AAA-size 6 pcs 1.5V batteries and replace the battery cover.

Note : Make sure the battery polarity is installed as indicated.

7. SPECTRAL SENSITIVITY CHARACTERISTIC

The sensor of this instrument together with its filter gives a spectral sensitivity characteristic close to photopic curve Vλ of C.I.E. (INTERNATIONAL COMMISSION ON ILLUMINATION) as described in the following chart.
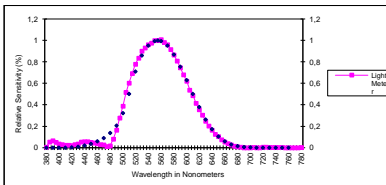
8. MAINTENANCE

1. Take care to keep the receptor window clean and free of scratches. Keep the cap on when the window is not in use.

2. The white plastic disc on the top of the detector should be cleaned with a damp cloth when necessary.

3. Do not store the instrument where temperature or humidity is excessively high.

4. The reference level, as marker on the face plate, is the tip of the photo detector globe.

5. The calibration interval for the photo detector will vary according to operational conditions, but generally the sensitivity decreases in direct proportion to the product of luminous intensity by the operational time. In order to maintain the basic accuracy of the instrument, periodic calibration is recommended.

9. SOFTWARE INSTALLATION and OPERATION

❑ For the detailed instruction, please refer to the content of attached CD-ROM, which has the complete instruction of software operation and relevant information.