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## Manual CM-9940



## **Caution Symbol**



*Caution :*

- \* Risk of electric shock !

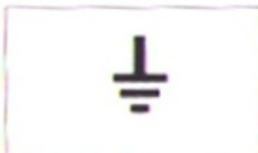


*Caution :*

- \* Do not apply the overload voltage, current to the input terminal !
- \* Remove test leads before open the battery cover !
- \* Cleaning - Only use the dry cloth to clean the plastic case !



- \* Double insulation



- \* Function earth

## **Environment Conditions**

- \* *Jaw Section : CAT III 600 V, 600 A.*
- \* *Terminal : CAT II 600 V.*
- \* *Pollution Degree 2.*
- \* *Altitude up to 2000 meters.*
- \* *Relative humidity 80% max.*

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## 1. FEATURES

- \* Design meet IEC 1010 CATIII 600V safety requirement.
- \* 4000 counts, Auto range & multi-functions.
- \* Measurement for ACA, DCA, ACV, DCV, Ohms, Diode, Hz, Continuity beeper.
- \* Water resistance for the front panel.
- \* Data hold.
- \* Wide ranges ( 600 A, 400 A ) clamp on current measurement both for ACA & DCA.
- \* Overload protection circuit is provided for all range.
- \* LSI circuit provides high reliability and durability.
- \* Pocket & slim housing case, easy carryout.
- \* Compact & heavy duty ABS housing fireproof plastic case.



## 2. SPECIFICATIONS



### 2-1 General Specifications

Display	10.8 mm ( 0.43" ) LCD, 4 digits, Max. indication 5000.
Measurement Range	ACA, DCA, ACV, DCV, Ohms, Diode, Hz, Continuity beeper, Relative.
Polarity	Automatic Switching, " - " indicates negative polarity.
Current Sensor	Hall effect sensor.
Zero adjustment	DCA : Push bottom adjustment. Other ranges : Automatic adjustment.
Over-input	Indication of " 1 " or " -1 ".
Sampling Time	Approx. 0.35 second.
Battery	2 x 1.5V AA ( UM-3 ) batteries.
Operating Temperature	0 °C to 50 °C ( 32 °F to 122 °F ).

Operating Humidity	Less than 80% RH.
Weight	230 g/0.50 LB ( including battery ).
Dimension	HWD : 178 x 64 x 33 mm ( 7.0 x 2.5 x 1.3 inch )
Max. Jaw Open Size	30 mm ( 1.18 inch ) Dia.
Accessories Included	Operation manual..... 1 PC. Test lead (red & black)..... 1 PC.
Optional Accessories & Adapters	Carrying case, Temperature Adapter, Light Adapter, Anemometer Adapter, Pressure Adapter, RH Adapter, Tachometer Adapter, High Voltage Probe.

### 2-2 Electrical Specifications (23± 5 °C)

Function	Range	Resolution	Accuracy	Overload Protection
DC/AC Voltage	400 mV (DC only)	0.1 mV	± ( 0.5 % + 2d )	 AC/DC 600 V.
	4 V	0.001V	DCV:	
	40 V	0.01V	± ( 1 % + 2d )	
	400 V	0.1 V	ACV:	
	600 V	1 V	± ( 1.2 % + 5d )	
DC /AC current	400 A ACA : 0.5 to 400A	0.1 A	± ( 2 % + 5 d )	 AC/DC 600 A
	600 A	1 A	± ( 2 % + 8 d )	
<b>Remark</b>	* Input impedance for ACV & DCV range is 10 Mega ohm. * ACA, ACV specification be tested on sine wave 50/60 Hz.			

Function	Range	Resolution	Accuracy	Overload Protection
Ohms	400 ohm	0.1 ohm	$\pm ( 1 \% + 5 d )$	 AC / DC 400 V
	4 K ohm	1 ohm		
	40 K ohm	10 ohm		
	400 K ohm	100 ohm	$\pm ( 2 \% + 2 d )$	
	4 M ohm	1 K ohm	$\pm ( 3.5 \% + 5d )$	
	40 M ohm	10Kohm		
Frequency ( 5 V )	5 Hz	0.001 Hz	$\pm ( 1 \% + 5 d )$	 AC / DC 250 V
	50 Hz	0.01 Hz		
	500 Hz	0.1 Hz		
	5 KHz	1 Hz		
	50 KHz	0.01 KHz		
	100 KHz	0.1 KHz		
Diode	Short/non conductance, good/defect test.			
Continuity	If measuring resistance is less than 10 ohm, the beeper will sound .			

*Remark :*

*\* Spec. tested under the environment RF Field Strength less than 3 V/M & frequency less than the 30 MHz only.*

### 3. FRONT PANEL DESCRIPTION

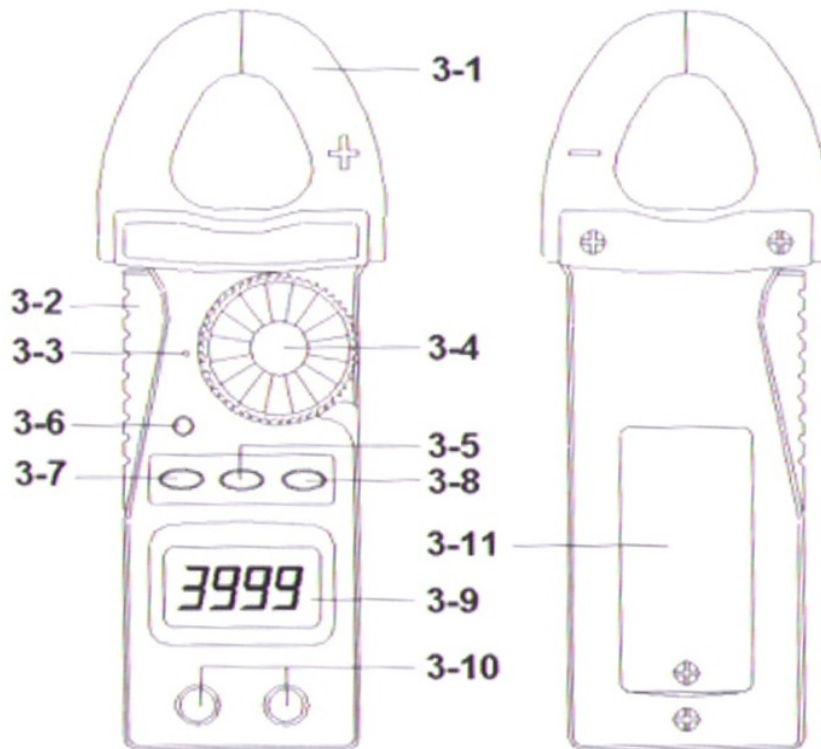


Fig. 1

- 3-1 Current Sense Jaws
- 3-2 Trigger
- 3-3 Function Indicator
- 3-4 Function rotary switch
- 3-5 Range button
- 3-6 Hold button
- 3-7 FUNC. button ( Function button )
- 3-8 Relative button ( REL. button )
- 3-9 Display
- 3-10 Input terminal
- 3-11 Battery compartment/Cover





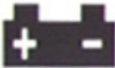
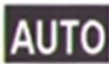



## 4. PRECAUTIONS & PREPARATIONS FOR MEASUREMENT

- 1) Ensure that the DC 1.5V x 2 batteries are connected with the right polarity and placed in the battery compartment correctly.
- 2) Place the Red & Black Test Leads into the proper input terminal before making measurement.
- 3) Remove either of the test leads from the circuit when changing the measurement range.
- 4) Except operate the " Data Hold " function, it should cancel the " Data Hold " function, otherwise the display reading will freeze permanently.
- 5) Do not exceed the maximum rated voltage to the input terminal.
- 6) Always switching the " Function Rotary Switch " to the " Off " position when the instrument is not operation.
- 7) Remove the battery if the instrument is not to be used in a long period of time.
- 8) Though the most ranges build the overload protection circuit, however it is prohibited to apply any voltage to input terminal when making the measurement.
- 9) The water resistance structure is apply for the front panel only. Do not throw the instrument into water, otherwise the meter will be damaged permanently.
- 10) For safety consideration, when change the new test leads, it should use the replace test leads that already approval of " CATIII-600V " at least.





## 5. MEASURING PROCEDURE

### 5-1 Symbols & units of display

Symbols / Units	Descriptions
	Appears when selecting DCV or DCA mode.
	Appears when selecting ACV & ACA mode.
	Appears when the " Data hold " function is operated.
	Appears when the " Relative " ( DCA zero ) function is operated.
	Battery voltage is under the low condition already.
	Appears when operating the " Automatic range " mode.
	Appears when the " Continuity beeper " is operated.
mV, V	Units for voltage measurements.
$\Omega$ , K $\Omega$ , M $\Omega$	Units for resistance measurements.
	Appears when the " Diode " function is operated.
	Appears when measuring a DCV or DCA value is negative.
A	Units for " Current " measurement.
Hz, KHz	Units for " Frequency " measurement.

### **5-2 DCV, ACV Measurement**



- 1) Connect BLACK test lead into " COM " terminal.
- 2) Connect RED test lead into " V " terminal.
- 3) If measure " DCV ", select the " Function rotary switch " ( 3-4, Fig. 1 ) to the " V " position then push the " FUNC. button " ( 3-7, Fig. 1 ) for display show "  " .
- 4) If measure " ACV ", select the " Function rotary switch " ( 3-4, Fig. 1 ) to the " V " position then push the " FUNC. button " ( 3-7, Fig. 1 ) for display show "  " .
- 5) When LCD show the " AUTO " marker, the meter is under the " auto range " mode. Meter will select the suitable measurement range automatically.
- 6) Under the operation of " auto range " mode, push the " Range button " ( 3-5 Fig. 1 ) will hold the range.

### **5-3 Resistance Measurement**



- 1) Connect BLACK test lead into " COM " terminal.
- 2) Connect RED test lead into "  $\Omega$  " terminal.
- 3) Select the " Function rotary switch " ( 3-4, Fig. 1 ) to the "  $\Omega$  " position then push the " FUNC. button " ( 3-7, Fig. 1 ) for display show "  $\Omega$  " .
- 4) When LCD show the " AUTO " marker, the meter is under the " auto range " mode., the meter will select the suitable measurement range automatically.
- 5) Under the operation of " auto range " mode, push the " Range button " ( 3-5 Fig. 1 ) will hold the range.

### **5-4 Continuity Check**

- 1) Connect BLACK test lead into " COM" terminal.
- 2) Connect RED test lead into "  $\Omega$  " terminal.
- 3) Select the " Function rotary switch " ( 3-4, Fig. 1 ) to the

- "  " position then push the " FUNC. button " ( 3-7, Fig. 1 ) for display show "  ".
- 4) when the resistance value is less than 10 ohm, the beeper sound will be generated.

### 5-5 Diode Test

- 1) Connect BLACK test lead into " COM " terminal.
- 2) Connect RED test lead into " V " terminal.
- 3) Select the " Function rotary switch " ( 3-4, Fig. 1 ) to the "  " position then push the " FUNC. button " ( 3-7, Fig. 1 ) for display show "  ".
- 4) a. When connected with polarity as shown in Fig. 2, a forward current flow is established and the approx. Diode Forward Voltage (VF) value in volt will appears on the display reading. If the diode under test is defective, ".000 " or near ".000 " value ( short circuit ) or " 1 " ( open circuit ) will be displayed.

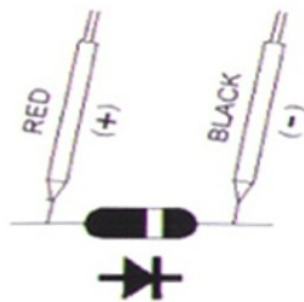


Fig. 2

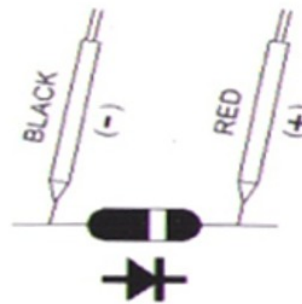



Fig. 3

- b. When connected as shown in Fig. 3, a reverse check on the diode is made. If the diode under test is good, " 1 " will be displayed. If the diode under test is defective, ".000 " or other numbers will be displayed. Proper diode testing should include both steps a. and b. above.


### **5-6 AC Current Measurement**

- 1) Select the " Function rotary switch " ( 3-4, Fig. 1 ) to the " 600A " position then push the " FUNC. button " ( 3-7, Fig. 1 ) for display show "  ".
- 2) Press the " Trigger " ( 3-2, fig. 1 ) to open the " Current Sensor Jaws " ( 3-1, Fig. 1 ) & clamp on the measure conductor only.
- 3) When LCD show the " AUTO " marker, the meter is under the " auto range " mode. Meter will select the suitable measurement range automatically.
- 4) Under the operation of " auto range " mode, push the " Range button " ( 3-5 Fig. 1 ) will hold the range.

#### *Remark :*

*No ACA signal input, if the display show few counts ( lesss than 0.5 A, such as 0.2 A, 0.3 A... ), it is normal & not effecting the measurement value.*

### **5-7 DC Current Measurement**

- 1) Select the " Function rotary switch " ( 3-4, Fig. 1 ) to the " 600A " position then push the " FUNC. button " ( 3-7, Fig. 1 ) for display show "  ".
- 2) Press the " Trigger " ( 3-2, fig. 1 ) to open the " Current Sensor Jaws " ( 3-1, Fig. 1 ) & clamp on the measure conductor only.
- 3) When LCD show the " AUTO " marker, the meter is under the " auto range " mode. Meter will select the suitable measurement range automatically.
- 4) Under the operation of " auto range " mode, push the " Range button " ( 3-5, Fig. 1 ) will hold the range.

### **ZERO consideration of DCA measurement**

Under above auto mode DCA measurement, no signal input ( not measuring current ), if LCD show certain digits, it is normal.

However we recommend :

- 1) If the zero value less than 1 A, it may ignore it if for the general operation,
- 2) **For the precisely measurement or the " DCA zero value " large than 1A, then please execute the " DCA ZERO " procedures as :**
  - \* **Push the " REL. button " ( 3-8, Fig. 1 ), the " AUTO " indicator will disappear instead of the " REL. " mark. In the same time, display will change to zero value.**
  - \* **After push the " REL. button ", the meter will under the manual mode ( not auto range ). If intend change the DCA range ( 400A to 600A, or 600A to 400A ), then should push the " Range button " ( 3-5, Fig. 1 ).**

### ***5-8 Frequency Measurement***

- 1) Connect BLACK test lead into " COM " terminal.
- 2) Connect RED test lead into " V " terminal.
- 3) Select the " Function rotary switch " ( 3-4, Fig. 1 ) to the " Hz " position, LCD will show the mark of " Hz " .
- 4) For the FREQUENCY measurement, the meter is always under the " auto range " mode, it will select the suitable measurement range automatically.

### ***5-9 Relative Measurement***

- 1) During the measurement of ACV, ACA, DCV, DCA & ohm, the circuit will memorize the last measured values if push the " REL. button " ( 3-8, Fig. 1 ) at once, then LCD will show zero value & a " REL. " indicator.
- 2) The input measured values will deduct last measured values " automatically, then show those new value on the display.
- 3) It will release the Relative Measurement function if push the REL. button at once again, at same time the " REL ." marker will disappear.

### ***5-10 Data Hold Operation***


- 1) During the measurement, pushing the " Hold button " ( 3-6, Fig. 1 ) once a while will freeze the measured value & the LCD will indicate " HOLD " symbol.
- 2) Push the " Hold Button " again to release the data hold function.

## 6. MAINTENANCE

### 6-1 Battery replacement



**Caution : *Remove test leads before opening the battery cover !***

- 1) When the LCD display showing the mark of "  ", it is necessary to replace the battery, However in-spec. measurement may still be made for several hours after " Low battery indicator " appears before the instrument become inaccurate.
- 2) Open the screw of " Battery Cover " by screwdriver, then move the battery.
- 3) Replace with 1.5 V x 2 batteries ( AA, UM3 type ) and reinstate the cover.

### 6-2 Cleaning



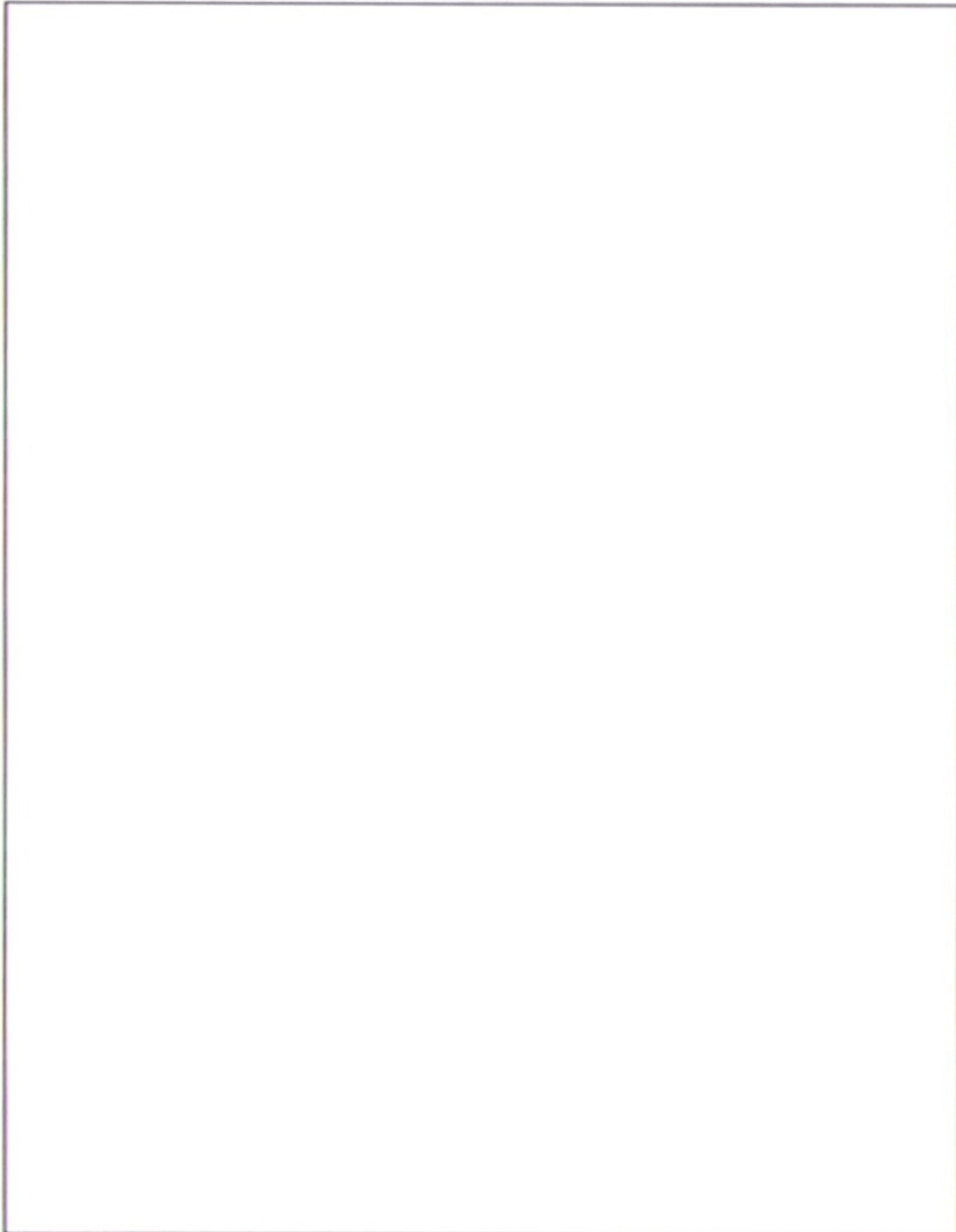
**Caution : *Cleaning - Only use the dry cloth to clean the plastic case !***

## 7. OPTIONAL ACCESSORIES AND ADAPTERS

<i>Item</i>	<i>Model</i>
<i>Carrying Case</i>	<i>CA-52A</i>
<i>Humidity Adapter</i>	<i>HA-702</i>
<i>Light Adapter</i>	<i>LX-02</i>
<i>EMF Adapter</i>	<i>EMF-824</i>
<i>Pressure Adapter</i>	<i>PS-403</i>
<i>Anemometer Adapter</i>	<i>AM-402</i>
<i>Tachometer Adapter</i>	<i>TA-601</i>
<i>Sound Adapter</i>	<i>SL-406</i>
<i>High Voltage Probe</i>	<i>HV-40</i>
<i>Test lead with alligator clips</i>	<i>TL-02AS</i>



## **8. THE ADDRESS OF AFTER SERVICE CENTER**





In this direction will find a vision of the measurement technique:  
<http://www.industrial-needs.com/measuring-instruments.htm>

**NOTE:** "This instrument doesn't have ATEX protection, so it should not be used in potentially explosive atmospheres (powder, flammable gases)."