

TENMA 72-9165

INSTRUCTION MANUAL

MULTI-TESTER

6 IN 1

SOUND LEVEL

LIGHT

HUMIDITY

TEMPERATURE

MULTIMETER

Non-contact AC Voltage Test

TABLET OF CONTENTS

1.	INTRODUCTION.....	2
2.	INFORMATION FOR SAFETY.....	3
3.	FEATURES.....	4
4.	SPECIFICATIONS.....	4
5.	PANEL DESCRIPTION.....	10
6.	OPERATING INSTRUCTION.....	12
7.	MAINTENANCE.....	21

1. INTRODUCTION

The 6 in 1 digital multi-tester has been designed to combine the functions of Sound Level Meter, Light Meter, Humidity Meter, Temperature Meter, Non-contact AC Voltage Test Meter, and Digital Multimeter.

It is an ideal multi-function Instrument with scores of practical applications for professional, educational, and home use.

The Sound Level function can be used to measure noise in factories, schools, offices, airports, home, etc., checking acoustics of studios, auditoriums and hi-fi installations.

The Light function is used to measure luminance in the field. It is fully cosine corrected for the angular incidence of light. The light sensitive component used in the meter is a very stable, long life silicon diode.

The Thermometer is for use a semiconductor sensor and K type thermocouple. This operations manual contains general information and specification.

The digital Multimeter perfoRMS AC/DC Voltage, AC/DC Current, Resistance measurement and Audible Continuity, Diode, Temperature test.

2. SAFETY INSTRUCTIONS

This meter has been designed for safe use, but must be operated with caution. The rules listed below must be carefully followed for safe operation.

1. **NEVER** apply voltage or current to the meter that exceeds the specified maximum:

Input Protection Limits	
Function	Maximum Input
V DC or V AC	600VDC/AC RMS
mA AC/DC	500mA 660V fast acting fuse(500mA/660V)
A AC/DC	10A 600V fast acting fuse (10A for 30 seconds max every 15 minutes)
Frequency, Resistance, Capacitance, Duty Cycle, Diode Test, Continuity	600VDC/AC RMS
Temperature	600VDC/AC RMS



Indicates operators must refer to the explanation in this manual.



Indicates terminals at which dangerous voltage maybe present.

3. FEATURES


- 14 functions measure Sound level, Light, Humidity, Temperature, DC Voltage, AC Voltage, DC Current, AC Current, Resistance, Diode and Continuity test.
- 3 4/5 Digital large LCD display with units of Lux, °C, % and dB indication.
- Easy to use with single function switch operating, pocket size and light weight.
- Sound level measures from 35dB to 100dB for C weighting checking with 0.1dB resolution.
- Light measuring levers ranging from 1 lux to 40,000 lux.
- Humidity measurement from 30%RH to 90%RH with 1%RH resolution and fast time response.

4. SPECIFICATIONS

Display: 3 4/5 Digital 4000 counts LCD display with function of Lux, °C, % and dB indication.

Polarity: Automatic, (-) negative polarity indication.

Over-range: "OL" mark indication.

Low battery indication: The "  " is displayed when the battery voltage drops below the operating level.

Measurement rate: 3 times per second, nominal.

Operating environment: :0°C ~40°C (32°F~104°F)

at < 70 % relative humidity.

Storage temperature: -10 °C to 60 °C C (14 °F to 140 °F)

at < 80 % relative humidity.

Power: One standard 9V, NEDA1604 or 6F22 battery.

Dimensions: 170 (H) x 78(W) x 48(D) mm

Weight: Approx: 335g including holster.

Accuracy is given at 18 °C to 28 °C (65 °F to 83 °F),
less than 70 % RH

Sound Level

Measurement range: 35-100dB

Resolution: 0.1dB

Typical instrument frequency range: 30Hz-10kHz

Frequency Weighting: C –weighting

Time Weighting: Fast

Accuracy: ± 5 dB at 94 dB sound level, 1kHz sine wave.

Microphone: Electric condenser microphone.

Light

Measuring Range: 4000, 40,000lux (40,000lux range
reading x10)

Overrate Display: Highest digit of “OL” is displayed .

Accuracy: $\pm 5\%$ reading + 10 digits (calibrated to standard
incandescent lamp at color temperature 2856 k) .

Repeatability: $\pm 2\%$.

Temperature Characteristic: $\pm 0.1\%$ / °C.

Photo detector: One silicon photo diode with filter.

Humidity/Temperature

K type temperature Measurement Range:

Range	Resolution	Accuracy
-4°F~+2372°F	1°F	3% of reading \pm 9 digits
-20°C~+1300°C	1°C	3%, \pm 5 digits

Input Impedance: 10M Ω .

Overload Protection: 250VDC or AC RMS. for 400mV range and 250V DC or 250V AC RMS. for other ranges.

Indoor Temperature Range:

Range	Resolution	Accuracy
0°C ~+50°C	0.1°C	3%, \pm 5 digits

Indoor Humidity Range:

Range	Resolution	Accuracy
33%RH~99%RH	1%RH	3%, \pm 5 digits

Input Impedance: 10M Ω .

Overload Protection: 250V DC or AC RMS. for 400mV range and 250V DC or 250V AC RMS. for other ranges

Multimeter

DC Voltage (Auto-ranging)

Range	Resolution	Accuracy
400.0mV	0.1mV	\pm 1.0%, \pm 4 digits
4.000V	1.0mV	
40.00V	10mV	
400.0V	100mV	\pm 1.5%, \pm 4digits
600V	1V	

Input Impedance: 10M Ω .

Overload Protection: 600VDC or AC RMS. for 400mV range and 600V DC or 600V AC RMS. for other ranges.

AC Voltage (Auto-ranging except 400mV)

Range	Resolution	Accuracy
400.0mV	0.1mV	$\pm 1.5\%$, ± 15 digits
4.000V	1.0mV	$\pm 1.0\%$, ± 4 digits
40.00V	10mV	
400.0V	100mV	$\pm 1.5\%$, ± 4 digits
600V	1V	$\pm 2\%$, ± 4 digits

Input Impedance: 10M Ω

Frequency Range: 50 to 400Hz

Maximum Input: 600V DC or 600V AC RMS.

DC Current (Auto-ranging for μ A and mA)

Range	Resolution	Accuracy
400.0 μ A	0.1 μ A	$\pm 1.0\%$, ± 2 digits
4000 μ A	1 μ A	$\pm 1.0\%$, ± 2 digits
400.0mA	100 μ A	$\pm 1.2\%$, ± 2 digits
10.00A	10mA	$\pm 2.0\%$, ± 5 digits

Overload Protection: 500mA /660V and 10A / 600V fuse

Maximum Input: 400mA DC or 400mA AC RMS on μ A / mA ranges,

10A DC or AC RMS on 10A range.

AC Current (Auto-ranging for μA and mA)

Range	Resolution	Accuracy
400.0 μA	0.1 μA	$\pm 1.2\%$ of rdg ± 2 dgts
4000 μA	1 μA	$\pm 1.2\%$ of rdg ± 2 dgts
400.0 mA	100 μA	$\pm 1.5\%$ of rdg ± 2 dgts
10.00 A	10 mA	$\pm 2.0\%$ of rdg ± 5 dgts

Overload Protection: 500 mA /660 V and 10 A / 600 V Fuse

AC Response: 50 Hz to 400 Hz

Maximum Input: 400 mA DC or 400 mA AC RMS on μA / mA ranges, 10 A DC or AC RMS on 10 A range.

Resistance (Auto-ranging)

Range	Resolution	Accuracy
400.0 Ω	0.1 Ω	$\pm 1.5\%$, ± 4 digits
4.000 $\text{k}\Omega$	1 Ω	$\pm 1.5\%$, ± 2 digits
40.00 $\text{k}\Omega$	10 Ω	
400.0 $\text{k}\Omega$	100 Ω	
4.000 $\text{M}\Omega$	10 $\text{k}\Omega$	$\pm 2.0\%$, ± 2 digits
40.00 $\text{M}\Omega$	1 $\text{M}\Omega$	$\pm 2.5\%$, ± 2 digits

Overload Protection: 15 seconds maximum 250 V DC or 250 V AC RMS. on all ranges.

Maximum open circuit voltage: 2.8 V .

Capacitance (Auto-ranging)

Range	Resolution	Accuracy
50.00nF	10pF	$\pm 5.0\%$, ± 7 digits
500.0nF	0.1nF	$\pm 3.0\%$, ± 5 digits
5.000 μ F	1nF	$\pm 4.0\%$, ± 5 digits
50.00 μ F	10nF	
100.0 μ F	0.1 μ F	

Input Protection: 600V DC or 600V AC RMS

Frequency (Auto-ranging)

Range	Resolution	Accuracy
5.000Hz	0.001Hz	$\pm 1.2\%$, ± 3 digits
50.00Hz	0.01Hz	
500.0Hz	0.1 Hz	
5.000kHz	1 Hz	
50.00kHz	10Hz	
500.0kHz	100Hz	
10.00MHz	1kHz	$\pm 1.5\%$, ± 4 digits

Sensitivity: $>0.5V$ RMS while $\leq 1MHz$;

Sensitivity: $>3V$ RMS while $>1MHz$;

Input Protection: 250V DC or 250V AC RMS.

Diode and Continuity check

Diode: Test current 1.4mA DC and open circuit voltage 2.8V DC.

Continuity: Built in Buzzer will be sound if the circuit resistance is less than 50Ω.

Overload Protection: maximum 600V DC or 600V AC RMS.

5. PANEL DESCRIPTION

1. **Humidity & Temperature:** Humidity Sensor and Semiconductor Sensor inside for Indoor.

2. **LCD display:** 3 4/5 digits LCD display

3. **Function switch**

4. **V/Hz%/Ω/Cap/ °C**
input jack

5. **COM** input jack

6. **uA/mA** input jack

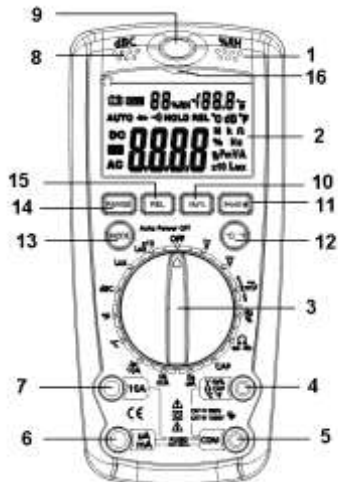
7. **10A** input jack


8. **Microphone:** Electric condenser microphone inside.

9. **Photo Detector:** Long life silicon photo diode inside.

10. **Hz/%** button

The button at AC/DC Voltage measurement and AC/DC Current measurement and Hz% measurement Function is availability



11. **Hold** button
The HOLD function allows the meter to "freeze" a measurement for later reference. Press the HOLD button to "freeze" the reading on the indicator. The "HOLD" message will be appear in the display.
12. **Backlight** button
Press the backlight button for LCD light , again Press the backligh button to exit light mode.
13. **MODE** button
The button to select AC or DC measurement when in A, mA , μ A ,and Ω , ( , •))) ranges.
14. **Range** button
The button to select AC or DC measurement when in Voltage, Ω ranges.
15. **REL** button
The relative measurement feature allows you to make measurements relative to a stored reference value. A reference voltage, current, Capacitor, etc. can be stored and measurements made in comparison to that value. The displayed value is the difference between the reference value and the measured value.
Perform the measurement as described in the operating instructions.
Press the **REL** button to store the reading in the display and the "**REL**" indicator will appear on the display.
The display will now indicate the difference between the stored value and the measured value.
Press the **REL** button to exit the relative mode.
16. **NCV** indicate lamp

6. OPERATING INSTRUCTION

Measuring Sound Level

1. Set the function switch to the green “dB” position.
2. Remove the meter and face the microphone to sound source in a horizontal position.
3. The C-weighting curve is nearly uniform over the frequency range from 30 to 10,000Hz, thus giving an indication of overall Sound level.
4. The Fast response is suitable to measure shout bursts and peak values from sound source.
5. The sound level will be displayed.
6. Note: Strong wind (over 10m/sec.) striking the microphone can cause misreading for measurement in windy locations, a windscreen should be used in front of microphone.

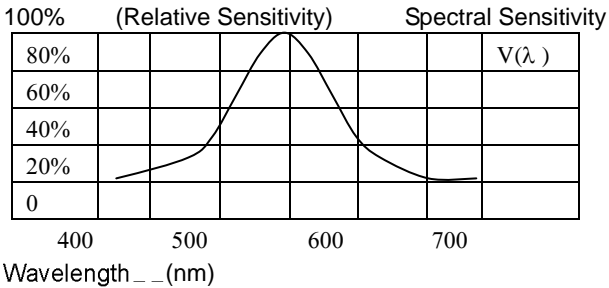
Measuring Humidity

1. Humidity Measurement for indoor:
2. Set the function switch to the ON position.
3. Remove the meter place to the room.
4. Read the %RH in the display for about two hours.

Measuring Light

1. Set the function switch to the green “lux” scale and set the range to desired (“lux” or “x10 lux”) range.
2. Remove the meter and face the photo detector to light source in a horizontal position.
3. Read the illuminance nominal from the LCD display.
4. Over-range: If the instrument only display one “1” in the M.S.D. the input signal is too strong, and a higher range should be selected.

- When the measurement is completed. Replace the photo detector from the light source.
- Spectral sensitivity characteristic: To the detector, the applied photo diode with filters makes the spectral sensitivity characteristic almost meet C.I.E. (International Commission on Illumination) photopia curve $V(\lambda)$ as the following chart described.



7. Recommended Illumination:

Locations	Lux
*Office	
Conference, Reception room.	200 ~ 750
Clerical work	700 ~ 1,500
Typing drafting	1000 ~ 2,000
*Factory	
Packing work, Entrance passage	150 ~ 300
Visual work at production line	300 ~ 750
Inspection work	750 ~ 1,500
Electronic parts assembly line	1500 ~ 3,000
*Hotel	
Public room, Cloakroom	100 ~ 200
Reception, Cashier	200 ~ 1,000
*Store	
Indoors Stairs Corridor	150 ~ 200
Show window, Packing table	750 ~ 1,500
Forefront of show window	1500 ~ 3,000
*Hospital	
Sickroom, Warehouse	100 ~ 200
Medical Examination room	300 ~ 750
Operating room	
Emergency Treatment	750 ~ 1,500
*School	
Auditorium, Indoor Gymnasium	100 ~ 300
Class room	200 ~ 750
Laboratory Library Drafting room	500 ~ 1,500

Measuring Temperature

1. Temperature Measurement for Outdoor:
 - ① Set the function switch to the green "0.1 °C" position or "1 °C" position .
 - ② Then the display will show the environment temperature reading value °C directly.
 - ③ Insert the black plug of temperature probe the COM jack and red plug to the " V/Hz%/Ω/Cap/ °C " jack.
 - ④ Touch the end of the temperature sensor to the area or surface of the object to be measured. The display will show the temperature reading value °C directly.

Measuring DC Voltage

1. Insert the black test lead banana to the COM jack and red test lead banana to the "V/Hz%/Ω/Cap/ °C" jack.
2. Set the function switch to the green at DCV ranges to be used and connect test leads connect test leads across the source or load under measurement.
3. Set the function switch at DCmV ranges to be used connect test leads connect test leads across the source or load under measurement.
4. Read LCD display. The polarity of red connection will be indicated when making a DC measurement.
5. Press the **Hz%** button to indicate "**Hz**".
6. Read the frequency in the display.
7. Press the **Hz%** button again to indicate "%".
8. Read the % of duty cycle in the display.

Measuring AC Voltage

1. Insert the black test lead banana to the COM jack and red test lead banana to the “V/Hz%/Ω/Cap/ °C” jack.
2. Set the function switch to the green at AC ranges to be used and connect test leads connect test leads across the source or load under measurement.
3. Read LCD display. The polarity of red connection will be indicated when making a AC measurement.
4. Press the **Hz%** button to indicate “Hz”.
5. Read the frequency in the display.
6. Press the **Hz%** button again to indicate “%”.
7. Read the % of duty cycle in the display.

Measuring DC Current

1. Insert the black test lead banana plug into the negative **COM** jack.
and the red test lead banana plug into the “**μA/mA**” or “**10A**” jack.
2. For current measurements up to 4000μA DC, set the function switch to the **μA** position and insert the red test lead banana plug into the **μA/mA** jack.
3. For current measurements up to 400mA DC, set the function switch to the **mA** position and insert the red test lead banana plug into the **μA/mA** jack..
4. For current measurements up to 10A DC, set the function switch to the yellow **10A** position and insert the red test lead banana plug into the **10A** jack.
5. Press the **MODE** button to indicate “**DC**” on the display.

6. Remove power from the circuit under test, then open up the circuit at the point where you wish to measure current.
7. Touch the black test probe tip to the negative side of the circuit.
Touch the red test probe tip to the positive side of the circuit.
8. Apply power to the circuit.
9. Read the current in the display.

Measuring AC Current

1. Insert the black test lead banana plug into the negative **COM** jack. and the red test lead banana plug into the “uA/mA” or “10A” jack.
2. For current measurements up to **4000uA AC**, set the function switch to the **uA** position and insert the red test lead banana plug into the **uA/mA** jack.
3. For current measurements up to **400mA AC**, set the function switch to the **mA** position and insert the red test lead banana plug into the **uA/mA** jack
4. For current measurements up to **10A AC**, set the function switch to the yellow **10A** position and insert the red test lead banana plug into the **10A** jack
5. Press the **MODE** button to indicate “**AC**” on the display.
6. Remove power from the circuit under test, then open up the circuit at the point where you wish to measure current.

7. Touch the black test probe tip to the neutral side of the circuit.
Touch the red test probe tip to the “hot” side of the circuit.
8. Apply power to the circuit.
9. Read the current in the display.
10. Press and hold the **Hz%** button to indicate “**Hz**”.
11. Read the frequency in the display.
12. Momentarily press the **Hz%** button again to indicate “**%**”.
13. Read the % duty cycle in the display.
14. Press and hold the **Hz%** button to return to current measurement.




Measuring Capacitance

1. Set the function switch to the green **CAP** position.
2. Insert the black test lead banana plug into the negative **COM** jack and the red test lead banana plug into the “V/Hz%/Ω/Cap/°C” jack. (If value is no zero in the display .Press the **REL** button to zero)
3. Touch the test probe tips across the part under test.
4. Read the capacitance value in the display.
5. The display will indicate the proper decimal point and value.




Measuring Frequency

1. Set the function switch to the Hz position.
2. Insert the black test lead banana plug into the negative (COM) jack
3. Insert the red test lead banana plug into the V/Hz%/Ω/Cap/°C jack.
4. Touch the test probe tips to the circuit under test.
5. Read the frequency in the display.
6. The digital reading will indicate the proper decimal point, symbols (Hz, kHz, MHz) and value.




Measuring Resistance

1. Set the function switch to the green    position.
----- position.
2. Insert the black test lead banana plug into the negative **COM** jack.
Insert the red test lead banana plug into the V/Hz%/Ω/Cap/°C jack.
3. Indicate “OL” “MΩ” on the display.
4. Touch the test probe tips across the circuit or part under test. It is best to disconnect one side of the part under test so the rest of the circuit will not interfere with the resistance reading.
5. Read the resistance in the display.

Measuring Diode

1. Set the function switch to the green Ω   position.
2. Insert the black test lead banana plug into the negative **COM** jack and the red test lead banana plug into the V/Hz%/ Ω /Cap/ $^{\circ}$ C jack.
3. Press the **MODE** button to indicate “  “ and “V” _ _ _ _ on the display.
4. Touch the test probes to the diode under test. Forward voltage will typically indicate 0.400 to 0.700V. Reverse voltage will indicate “**OL**”. Shorted devices will indicate near 0V and an open device will indicate “**OL**” in both polarities.

Audible Continuity Test


1. Set the function switch to the green Ω   position.
2. Insert the black lead banana plug into the negative **COM** jack.
Insert the red test lead banana plug into the V/Hz%/ Ω /Cap/ $^{\circ}$ C jack.
3. Press the **MODE** button to indicate “  ” _ and “ Ω ” on the display
4. Touch the test probe tips to the circuit or wire you wish to check.
5. If the resistance is less than approximately 50 Ω , the audible signal will sound. If the circuit is open, the display will indicate “**OL**”.

Non-contact AC Voltage Test (NCV)

1. Set the function switch to the ON position.
2. Remove the meter and face the NCV detector to ACV source.
3. If source voltage is in 50-1000V the NCV indicator lamp will light.

7. MAINTENANCE

Battery and Fuse Replacement

If the sign “  ” appears on the LCD display, it indicates that the battery should be replaced. Remove screws on the back cover and open the case. Replace the exhausted battery with new batteries. (1 x 9V battery NEDA 1604, 6F22 or equivalent)

Fuse rarely need replacement and blow almost always as a result of the operator's error. Open the case as and replace the blown fuse with ratings specified.

Warning:

Before attempting to open the case, be sure that test leads have been disconnected from measurement circuit to avoid electric shock hazard.

Replace fuse only with specified ratings:

Fuse1: F 10A / 600V fast blow.

Fuse2: F 500mA / 660V fast blow.



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