TENMA®

Model 72-7755

Operating Manual

Modern Digital Multi-Purpose Meter

Tenma Test Equipment
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Table of Contents

Overview

This Operating Manual covers information on safety and cautions. Please read the relevant information carefully and observe all the warnings and notes strictly.

⚠ Warning
To avoid electric shock or personal injury, read the "Safety Information" and "Rules for Safe Operation" carefully before using the Meter.

This Digital Multimeter (hereafter referred to as "the Meter") has autorange and manual range options and dual display, with maximum reading 3999 displayed in 40 analogue bars.

In addition to the conventional measuring functions, there is new breakthrough in frequency test with maximum range of 400 MHz. RS232C standard serial port is equipped with this Meter for easy connection with computer to realize macro recording and monitoring and capture of transient dynamic data, displaying change of waveform during the measurement, providing data and evidence to engineering technicians for scientific research. This is also a highly applied digital multimeter of high performance with full input protection and display backlight.

Unpacking Inspection

Open the package case and take out the Meter. Check the following items carefully to see any missing or damaged part:

Item	Description	Qty
1	Operating Manual	1 piece
2	Test Lead	1 pair
3	Test Clip	1 pair
4	Point Contact Temperature Probe	1 piece
5	9V Battery (NEDA 1604, 6F22 or 006P) (installed)	1 piece
6	RS232C Interface Cable	1 piece
7	CD-ROM (Installation Guide & Computer Interface Software)	1 piece
8	Holster	1 piece
9	Tilt Stand	1 piece

In the event you find any missing or damage, please contact your dealer immediately.

Safety Information

In this manual, a **Warning** identifies conditions and actions that pose hazards to the user, or may damage the Meter or the equipment under test.

CE Version: The Meter complies with the standards IEC61010 -1:in pollution degree 2, overvoltage category CAT III 1000V, CAT IV 600V and double insulation .
UL Version: The Meter complies with the standards UL61010B-1, in pollution degree 2, overvoltage category CAT II 1000V and double insulation.

CAT. II: local classification of CAT. II electronic equipment, portable units. Its transient overvoltage shall be less than that of CAT. III.

CAT. III: Distribution level, fixed installation, with smaller transient overvoltages than CAT. IV.

CAT IV: Primary supply level, overhead lines, cablesystems etc.

Rules For Safe Operation (1)

⚠ **Warning**

To avoid possible electric shock or personal injury, and to avoid possible damage to the Meter or to the equipment under test, adhere to the following rules:

- **Do not use this Meter in the event you find the test lead or insulation of the case obviously broken, or you believe this Meter being malfunctioned.**
- **When using the test leads, keep your fingers behind the finger guards.**
- **Do not impose any effective voltage over 1000V on the terminal and earth of the Meter to prevent electric shock and damage to the Meter.**
- **When the using Meter at an effective voltage over 60V DC or 30V AC, special care should be taken for there is danger of electric shock.**
- **Do not operate the Meter with the case (or part of the case) removed; there is danger of electric shock.**
- **When replacing fuse or battery, the test leads should be disconnected from the tested circuit and switch should be turned to off before opening the case.**
- **Identical nominal fuse of quick response must be used for replacement of a broken fuse.**
- **The rotary switch should be placed in the proper position and no change of range shall be made during measurement is conducted to prevent damage of the Meter.**
- **The internal circuit of the Meter shall not be altered at will to avoid damage of the Meter and any accident.**
- **Replace the battery as soon as the battery indicator * 🔋 * appears. With a low battery, the Meter might produce false readings that can lead to electric shock and personal injury.**

Rules For Safe Operation (2)

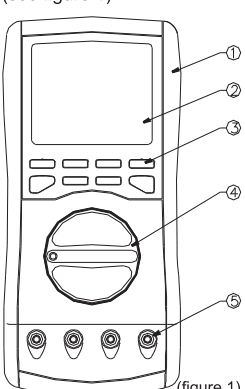
- Soft cloth and neutral detergent should be used to clean the surface of the Meter when servicing. No abrasive and solvent should be used to prevent the surface of the Meter from corrosion, damage and accident.
- Do not use the Meter in an environment of high temperature and humidity. Particularly not to put the Meter in a humid condition for storage. The performance of the Meter may deteriorate after dampened.
- Use the proper terminals, function, and range for your measurements.
- The Meter is suitable for indoor use.
- Turn off the Meter when it is not in use and take out the batter when not using ofr a long time.
- Periodically check the battery as it may leak after some time.If leakage is apparent,the battery should be immediately replaced to prevent damage.

International Electrical Symbols

~	AC (Alternating Current).
⎓	DC (Direct Current).
≂	AC or DC.
⏚	Ground.
⧈	Double Insulated.
⚠	Warning. Refer to the Operating Manual.
	Low Battery.
•))	Continuity Test.
⊣◁	Diode.
⊣⊢	Capacitance Test.
	Fuse.
CE	Conforms to Standards of European Union.

Functional Structure (see figure 1)

① Front Case
② LCD Display
③ Functional Buttons
④ Rotary Switch
⑤ Input Terminals



(figure 1)

Rotary Switch

The following table provides information about rotary switch positions.

Rotary Switch Position	Function
V≂	AC or DC Voltage Measurement.
•))Ω	Continuity Test or Resistance.
⊣▷⊢	Diode Test.
⊣(⊢	Capacitance Measurement.
Hz	Frequency Measurement.
°C	Temperature in Celsius.
°F	Temperature in Fahrenheit.
μA≂	AC or DC Current Measurement from 0.1μA to 4000μA.
mA≂	AC or DC Current Measurement from 0.01mA to 400.0mA.
A≂	AC or DC Current Measurement from 0.01A to 10.00A.

Functional Buttons (1)

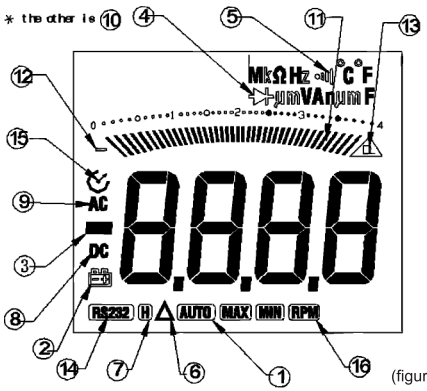
Below table indicated for information about the functional button operations.

Button	Function	Operation Performed
POWER	Power Switch	Turn the power on and off.
	Continuity Test	Turn the continuity buzzer on and off.
	DC or AC Test Switch	Toggle between DC or AC voltage and current test.
MAX MIN	Maximum and Minimum Display	Starts recording of maximum and minimum values. Steps the display through high (MAX), low (MIN) and present readings at any mode.
	Disable Auto Power Off	Press **MAX MIN** when turning on the Meter to disable auto power off feature.
RANGE	Manual or Auto Range Selection	1. Press **RANGE** to enter the manual ranging mode. Manually selecting a range causes the Meter to exit the Hold and MAX MIN modes. 2. Press **RANGE** to step through the ranges available for the selected function. 3. Press and hold **RANGE** for 1 second to return to autoranging.

Functional Buttons (2)

HOLD	Data Holding	Press **HOLD** to enter and exit the Hold mode in any mode.
	Full Screen Display	Press **HOLD** when turning on the Meter to keep full icons display.
REL Δ	Relative Value Test	Press **REL Δ** to enter and exit the REL mode in any mode.
RS232C	Serial Port	Turn on or off the serial port interface without changing the original setting.
☼	Display Backlight	Press ☼ once to turn the display backlight on .It will automatically turn off in 15 seconds.

Display Symbols (1) (see figure 2)



(figure 2)

Number	Symbol	Meaning
①	Auto	The Meter is in the auto range mode in which the Meter automatically selects the range with the best resolution.
②		The battery is low. **⚠Warning: To avoid false readings, which could lead to possible electric shock or personal injury, replace the battery as soon as the battery indicator appears.**
③		Indicates negative reading.
④		Test of diode.
⑤		The continuity buzzer is on.

Display Symbols (2) (see figure 2)

⑥	Δ	The relative value mode is on to display the stored value minus the present value.
⑦	H	Data hold is active.
⑧	**DC**	Indicator for DC voltage or current.
⑨	**AC**	Indicator for AC voltage or current. The displayed value is the mean value.
⑩	**Ω, kΩ, MΩ**	Ω: Ohm. The unit of resistance. kΩ: kilohm. 1 x 10^3 or 1000 ohms. MΩ: Megohm. 1 x 10^6 or 1,000,000 ohms.
	Hz, kHz, MHz	Hz: Hertz. The unit of frequency. kHz: Kilohertz. 1 x 10^3 or 1000 hertz. MHz: Meghertz. 1 x 10^6 or 1,000,000 hertz.
	V, mV	V: Volts. The unit of voltage. mV: Millivolt. 1 x 10^{-3} or 0.001 volts.
	A, mA	A: Amperes (amps). The unit of current. mA: Milliamp. 1 x 10^{-3} or 0.001 amperes.

Display Symbols (3) (see figure 2)

⑩	mF µF nF	F: Farad The unit of capacitance mF: Millifarad. 1 x 10^{-3} or 0.001 farads µF: Microfarad. 1 x 10^{-6} or 0.000001 farads. nF: Nanofarad. 1 x 10^{-9} or 0.000000001 farads.
	°C , °F	°C: Centigrade. The unit of temperature. °F: Fahrenheit. The unit of temperature.
	MAX	Maximum reading.
	MIN	Minimum reading.
⑪	**Analogue Bar Graph**	Provides an analog indication of the present input.
⑫		Polarity indicator for the analogue bar graph display, no display for positive.
⑬	**OL**	The input value is too large for the selected range.
⑭	**RS232**	Data output is in progress.
⑮		Auto power off features is enable. It can be disabled by pressing any one of **RANGE, MAX MIN, REL or RS232C** key when turning on the Meter.
⑯	**RPM**	Revolution measurement. Unit: rev./min.

Manual Ranging and Autoranging

Being in the right measurement range is important.

- In the autorange **(AUTO)** mode, the Meter selects the best range for the input detected.
  This allows you to switch test points without having to reset the range.
- In the manual range **(MANU)** mode, you select the range.
  This allows you to override autorange and lock the Meter in a specific range.

The Meter defaults to the autorange mode in measurement functions that have more than one range. When the Meter is in the autorange mode, Auto is displayed.

To enter and exit the manual range mode:

1. Press **RANGE**.
   The Meter enters the manual range mode and Auto turns off.

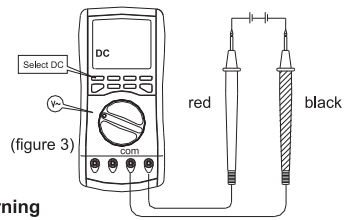
   Each press of **RANGE** increments the range. When the highest range is reached, The Meter wraps to the lowest range.

   NOTE
   If you manually change the measurement range after entering the Hold or MAX MIN recording modes, the Meter exits these modes.

2. To exit the manual range model, press and hold **RANGE** for one second.
   The Meter returns to the autorange mode and Auto is displayed.

Measurement Operation (1)

A. DC Voltage Measurement (see figure 3)



(figure 3)

⚠ Warning

To avoid injury **or damage to the Meter from electric shock, please do not attempt to measure voltages higher than 1000V / 750V TRMS although readings may be obtained.**

The DC Voltage ranges are: 400.0mV, 4.000V, 40.00V, 400.0V and 1000V. To measure DC Voltage, connect the Meter as follows:

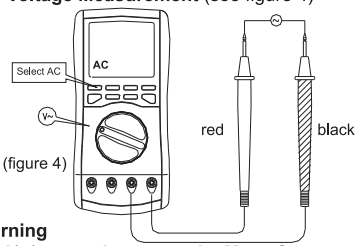
1. Insert the red test lead into the **VΩHz** terminal and the black test lead into the **COM** terminal.
2. Set the rotary switch to **V⎓** and press to select **DC** measurement mode.
3. Connect the test leads across with the object being measured.
   The measured value shows on the display.

In each range, the Meter has an input impedance of 10MΩ. This loading effect can cause measurement errors in high impedance circuits. If the circuit impedance is less than or equal to 10kΩ, the error is negligible (0.1% or less).

When DC voltage measurement has been completed, disconnect the connection between the testing leads and the circuit under test, and remove the testing leads away from the input terminals of the Meter.

Measurement Operation (2)

B. AC Voltage Measurement (see figure 4)



(figure 4)

⚠ Warning

To avoid injury or damage to the Meter from electric shock, please do not attempt to measure voltages higher than 1000V / 750V TRMS although readings may be obtained.

The AC Voltage ranges are: 4.000V, 40.00V, 400.0V and 750V. To measure AC Voltage, connect the Meter as follows:

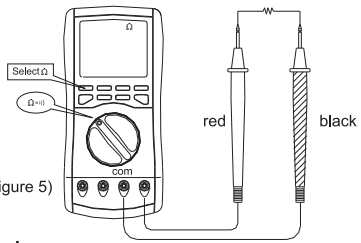
1. Insert the red test lead into the **VΩHz** terminal and the black test lead into the **COM** terminal.
2. Set the rotary switch to **V~** and press to select **AC** measurement mode.
3. Connect the test leads across with the object being measured.
   The measured value shows on the display.

In each range, the Meter has an input impedance of 10MΩ. This loading effect can cause measurement errors in high impedance circuits. If the circuit impedance is less than or equal to 10kΩ, the error is negligible (0.1% or less).

When AC voltage measurement has been completed, disconnect the connection between the testing leads and the circuit under test, and remove the testing leads away from the input terminals of the Meter.

Measurement Operation (3)

C. Measuring Resistance (see figure 5)



(figure 5)

⚠ Warning

To avoid damages to the Meter or to the devices under test, disconnect circuit power and discharge all the high-voltage capacitors before measuring resistance.

The resistance ranges are: 400.0Ω, 4.000kΩ, 40.00kΩ, 400.0kΩ, 4.000MΩ and 40.00MΩ. To measure resistance, connect the Meter as follows:

1. Insert the red test lead into the **⊣⊢VΩHz** terminal and the black test lead into the **COM** terminal.
2. Set the rotary switch to Ω•)) and press •)) to select Ω measurement mode.
3. Connect the test leads across with the object being measured.
   The measured value shows on the display.

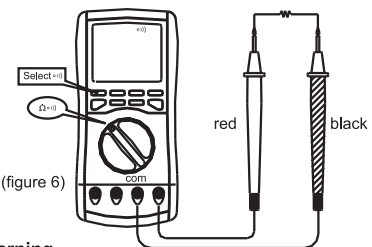
The test leads can add 0.1Ω to 0.2Ω of error to resistance measurement. To obtain precision readings in low-resistance measurement, that is the range of 400.0Ω, short-circuit the input terminals beforehand, using the relative measurement function button **REL△** to automatically subtract the value measured when the test leads are short-circuited from the reading.

Measurement Operation (4)

For high-resistance measurement (>1MΩ), it normally requires several seconds to obtain a stable reading.

When resistance measurement has been completed, disconnect the connection between the testing leads and the circuit under test, and remove the testing leads away from the input terminals of the Meter.

D. Testing for Continuity (see figure 6)



(figure 6)

⚠Warning

To avoid damage to the Meter or to the devices under test, disconnect circuit power and discharge all the high-voltage capacitors before testing for continuity.

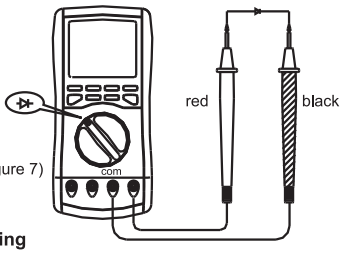
To test for continuity, connect the Meter as below:

1. Insert the red test lead into the **→|– VΩHz** terminal and the black test lead into the **COM** terminal.
2. Set the rotary switch to **Ω•))** and press **•))≈** to select **•))** measurement mode.
3. The buzzer sounds if the resistance of a circuit under test is less than 40Ω.

When continuity testing has been completed, disconnect the connection between the testing leads and the circuit under test, and remove the testing leads away from the input terminals of the Meter.

Measurement Operation (5)

E. Testing Diode (see figure 7)



(figure 7)

⚠Warning

To avoid possible damage to the Meter and to the device under test, disconnect circuit power and discharge all high-voltage capacitors before testing diodes.

Use the diode test to check diodes, transistors, and other semiconductor devices. The diode test sends a current through the semiconductor junction, then measures the voltage drop across the junction. A good silicon junction drops between 0.5V and 0.8V.

To test a diode out of a circuit, connect the Meter as follows:

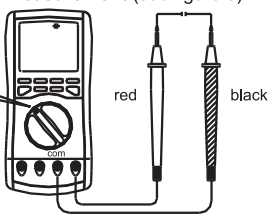
1. Insert the red test lead into the →|←**VΩHz** terminal and the black test lead into the **COM** terminal.
2. Set the rotary switch to →|←.
3. Connect the test leads across with the object being measured.
   The measured value shows on the display.

Connect the test leads to the proper terminals as said above to avoid error display. The LCD will display ***OL*** indicating open-circuit for wrong connection. The unit of diode is Volt (V), displaying the positive-connection voltage-drop value.

Measurement Operation (6)

When diode testing has been completed, disconnect the connection between the test leads and the circuit under test, and move the test leads away from the input terminals of the Meter.

F. Capacitance Measurement (see figure 8)



(figure 8)

⚠Warning

To avoid damage to the Meter or to the equipment under test, disconnect circuit power and discharge all high-voltage capacitors before measuring capacitance. Use the DC Voltage function to confirm that the capacitor is discharged.

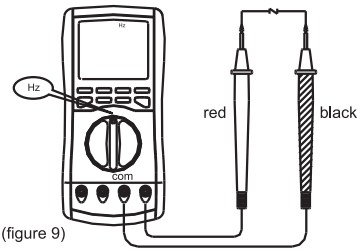
The Meter's capacitance ranges are: 4.000nF, 40.00nF, 400.0nF, 4.000μF, 40.00μF, 400.0μF, 4.000mF and 40.00mF. To measure capacitance, connect the Meter as follows:

1. Insert the red test lead or the red test clip into the **VΩHz** terminal and the black test lead or black test clip into the **COM** terminal.
2. Set the rotary switch to ⊣⊢.
3. Connect the test leads or the test clips across with the object being measured.
   The measured value shows on the display.

When capacitance measurement has been completed, disconnect the connection between the testing leads and the circuit under test and remove the testing leads away from the input terminals of the Meter.

Measurement Operation (7)

G. Frequency or Revolution Measurement (see figure 9)



(figure 9)

The measurement ranges are: 4.000kHz, 40.00kHz, 400.0kHz, 4.000MHz, 40.00MHz and 400.0MHz. To measure frequency, connect the Meter as follows:

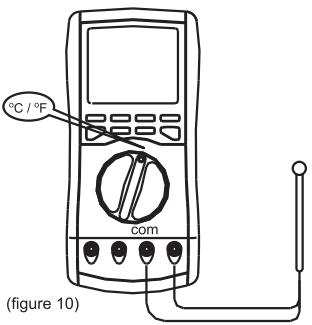
1. Insert the red test lead into the **⊣⊢VΩHz** terminal and the black test lead into the **COM** terminal.
2. Set the rotary switch to **Hz**.
3. Connect the test leads across with the object being measured.
   The measured value shows on the display.

Press •))) to toggle between frequency measurement **Hz** and revolution measurement **RPM** mode. Connect the Meter as above mentioned. The revolution measurement range is: 40.00k RPM; although higher ranges can be displayed, they are of little or no practical use.

When **Hz** or **RPM** measurement has been completed, disconnect the connection between the testing leads and the circuit under test, and remove the testing leads away from the input terminals of the Meter.

Measurement Operation (8)

H. Temperature Measurement (see figure 10)



(figure 10)

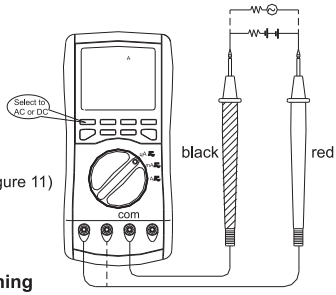
The **°C** measurement range is -40°C~1000°C while **°F** measurement range is -40°F~1832°F. To measure temperature, connect the Meter as follows:

1. Insert the red temperature probe into the **→|←VΩHz** terminal and the black temperature probe into the **COM** terminal.
2. Set the rotary switch to **°C** or **°F**.
3. Place the temperature probe to the object being measured.
   The measured value shows on the display.

The Meter's LCD automatically displays the temperature value inside the Meter when there is no temperature probe connection.

Measurement Operation (9)

I. DC or AC Current Measurement (see figure 11)



(figure 11)

⚠Warning

Never attempt an in-circuit current measurement where the open-circuit voltage between the circuit and ground is greater than 250V.
If the fuse burns out during measurement, the Meter may be damaged or the operator may be injured.
Use proper terminals, function, and range for the measurement. When the testing leads are connected to the current terminals, do not parallel them across any circuit.

The current measurement has 3 measurement positions on the rotary switch: μA, mA and A. The μA has a 400.0μA and 4000μA range, with auto ranging; the mA has a 40.00mA and 400.0mA range, with auto ranging; 10A position has only a 10.00A range.

To measure current, do the following:

1 Turn off power to the circuit. Discharge all high-voltage capacitors.
2 Insert the red test lead into the **μA, mA** or **10A** terminal and the black test lead into the **COM** terminal.
Use the 10A terminal and **A≂** range if the current value to be tested is an unknown.

Measurement Operation (10)

3. Set the rotary switch to **µA⎓**, **mA⎓**, or **A⎓.**
4. The Meter defaults to DC current measurement mode. To toggle between DC and AC current measurement function, press •ıl) ⎓ . AC current is displayed as an mean value (calibrated against sine wave effective value).
5. Break the current path to be tested. Connect the red test lead to the more positive side of the break and the black test lead to the more negative side of the break.
6. Turn on power to the circuit.
   The measured value shows on the display.

For safety sake, the measuring time for high current should be less than 10 seconds for each measurement and the interval time between 2 measurements should be greater than 15 minutes.

When current measurement has been completed, disconnect the connection between the testing leads and the circuit under test, and remove the testing leads away from the input terminals of the Meter.

Operation of Hold Mode

⚠ Warning
To avoid possibility of electric shock, do not use Hold mode to determine if circuits are without power. The Hold mode will not capture unstable or noisy readings.

The Hold mode is applicable to all measurement functions.

- Press **HOLD** to enter Hold mode; the Meter beeps.
- Press **HOLD** again or **RANGE** or turn the rotary switch to exit Hold mode; the Meter beeps.
- In Hold mode, [H] is displayed.
- The Meter beeps when the selected range is overloaded or a positive result is obtained from continuity test, whether it is under the Hold mode or not.
- If you are in MAX MIN recording when **HOLD** is selected, Hold interrupts the function. The display does not update, but recorded readings are not erased. Press **HOLD** again to resume recording.
- Enabling Hold function in auto ranging mode makes the Meter switch to manual mode.

MAX MIN Recording Mode

MAX MIN recording mode captures and stores the maximum and minimum input value detected.

To use the MAX MIN mode as follows:

- Press **MAX MIN** to display the highest reading (MAX is shown on display).
- Press **MAX MIN** again to display the lowest reading (MIN is shown on display).
- Press **MAX MIN** again to display the present reading (MAX MIN is flashing on display).

Press and hold **MAX MIN** for over 1 second to erase stored measurements and exit. The Meter stays in the selected range.

In MAX MIN recording, press **HOLD** to interrupt recording (stored readings are not erased), press **HOLD** again to resume recording. When recording is interrupted, the maximum, minimum and present values are locked on the digital display, but the analogue display continues to be active.

MAX MIN mode can be nested in REL mode. The Meter displays the maximum or the minimum value relative to the present measurement value when **MAX MIN** is pressed in REL mode.

The Use of Relative Value Mode

The REL mode applies to all measurement functions. It subtracts a stored value from the present measurement value and displays the result.

For instance, if the stored value is 20.0V and the present measurement value is 22.0V, the reading would be 2.0V. If a new measurement value is equal to the stored value then display 0.0V.

To enter or exit REL mode:

- Use **RANGE** to select the range before selecting **REL△**. If measurement range change manually after **REL△** is selected, the Meter exits the REL mode.
- Press **REL△** to enter REL mode, auto ranging turns off, and the present measurement range is locked.
- Press **REL△** again to display the stored value.
- Press and hold **REL△** again for longer than 1 second or turn the rotary switch to reset the stored value and exit REL mode.

Pressing **HOLD** in REL mode makes the Meter stop updating. Pressing **HOLD** again to resume updating.

Analogue Bar Graph Display

The analogue bar graph Functions similar the needle in a traditional analogue meter. It refreshes 30 times a sec, which is 10 times faster than that of digital display and is applied to zero adjustment and observation of rapidly changing signal that make digital display hard to read.

The analogue display is divided into 4 scales and composed of 41 segments; of which the full-range value corresponds to the full-range value of the measurement range that has been selected. The polarity of the measured value is displayed on the left of the analogue display: positive polarity is not displayed, while negative polarity is identified with a "-" sign on the left of the analogue display. For example, when 40V range is selected, the full-range value of the analogue display is 40V, and as the full range is uniformly divided into 4 grades, each grade denotes 10V; If the input is 40V, the high-lighted bar-shape will be at the position indicated by the number 4; if the input is * 40V, a "-" sign will appear on the left of the analogue display.

There is no analogue displaying value during the capacitance measurement. Also, when 4mF or 40mF range is selected, a long measuring time is expected and the analogue display will show the capacitor*s discharge process.

Turning on the Display Backlight

⚠ **Warning**
In order to avoid the hazard arising from mistaken readings in insufficient light or poor vision, please use Backlight function.

- Press ☼ to turn on the display backlight and it will automatically off after about 15 seconds.
- Press and hold ☼ to keep the display backlight on. The display backlight will last for about 15 seconds and then off automatically after releasing the button.

Full Icons Display

If the Meter is turned on with **HOLD** being pressed on, the LCD will display all the icons and maintain this mode until the LCD enters normal display mode when the **HOLD** is pressed again.

Sleep Mode

To preserve battery life, the Meter automatically turns off if you do not turn the rotary switch or press any button for 30 minutes. The buzzer beeps before turning off.

The Meter can be activated by turning the rotary switch or pressing any button, it will display the last measurement value before it entered sleep mode. However, in the °C or °F mode and then enter sleep mode, pressing •))) can not activate the Meter.

If the Meter is activated by turning the rotary switch, it will start from the switch selected function.

To disable the Sleep Mode function, press any one of the **MAX MIN**, **RANGE**, **REL**Δ, or **RS232C** while turning on the Meter.

RS232C Button

Press **RS232C** button to enter or exit data output mode.

In RS232C serial port data output mode, if the Meter is under the HOLD, MAX MIN, REL operations, the Meter will display the corresponding operation's data. However, the serial port output the instantaneous data from the input terminals.

In RS232C serial port data output mode, Sleep Mode function will be disabled.

POWER Button

The **POWER** button is a self-lock switch use to turn on or off the power of the Meter.

General Specification

- Maximum Voltage between any Terminals and Ground : 1000V rms.
- ⚠Fused Protection for **µAmA** Input Terminal : 1A,250V fast type glass fuse,ϕ5x20mm.
- ⚠Fused Protection for **10A** Input Terminal : 10A,250V fast type glass fuse, ϕ5x20mm.
- Maximum Display : 3999, updates 5/second.
- Temperature : Operating: 5°C to +40°C (41°F to +104°F). Storage: -10°C to +50°C (14 °F to +122°F).
- Relative Humidity : < 80% @ 5°C - 31°C; < 50% @ 31°C - 40°C.
- Altitude : Operating:2000 m. Storage: 10000 m.
- Battery Type : One piece of 9V NEDA1604 or 6F22 or 006P.
- Low Battery : Display .
- Dimensions (HxWxL) : 195 x 90 x 39 mm.
- Weight : Approximate 550g (battery included).
- Continuity Test : 2.5kHz.
- Certificate : CE /UL

This meter is suitable for indoor use.

Accuracy Specification (1)

Accuracy: ±(a% reading + b digits), guarantee for 1 year.
Operating temperature: 23°C ± 5°C.
Relative humidity: <80%.

A. DC Voltage

Range	Resolution	Accuracy	Overload Protection
400mV	100μV	±(0.8%+3)	1000V DC 750V AC
4V	1mV	±(0.8%+1)	
40V	10mV		
400V	100mV		
1000V	1V	±(1%+3)	

Remarks: Input impedance ⩾10MΩ.

B. AC Voltage

Range	Resolution	Accuracy	Overload Protection
4V	1mV	±(1%+5)	1000V DC 750V AC
40V	10mV		
400V	100mV		
750V	1V	±(1.2%+5)	

Remarks:

- Input impedance ⩾10MΩ.
- Displays effective value of sine wave (mean value response).
- Frequency response 40Hz~400Hz.

Accuracy Specification (2)

C. Resistance & Continuity Test

Range	Resolution	Accuracy	Overload Protection
400Ω	0.1Ω	±(1.2%+2)	600Vp
4kΩ	1Ω	±(1%+2)	
40kΩ	10Ω		
400kΩ	100Ω		
4MΩ	1kΩ	±(1.2%+2)	
40MΩ	10kΩ	±(1.5%+2)	
Continuity test	0.1Ω	≤40Ω	

Remarks:

- **400Ω ~ 40MΩ Range:**
  Open circuit voltage approx.3V.
- **Continuity Test:**
  Buzzer beeps continuous.

D. Diode Test

Range	Resolution	Overload Protection
Diode	1mV	600Vp

Remarks:

- Open circuit voltage approximate 3V.
- Displays approximate forward voltage drop.

Accuracy Specification (3)

E. Capacitance

Range	Resolution	Accuracy	Overload Protection
4nF	1pF	Measure at REL mode. ±(4%+10)	600Vp
40nF	10pF	±(4%+3)	
400nF	100pF		
4μF	1nF		
40μF	10nF		
400μF	100nF		
4mF	1μF	±(5%+10)	
40mF	10μF		

Remarks:

- **40mF Range:**
  Reading is only for reference purpose.

F. Frequency

Range	Resolution	Accuracy	Overload Protection
4kHz	1Hz	±(0.1%+3)	600Vp
40kHz	10Hz		
400kHz	100Hz		
4MHz	1kHz		
40MHz	10kHz		
400MHz	100kHz		

Remarks:

- Input sensitivity:
  ⩽40MHz: ⩽200mV rms;
  ⩽100MHz: ⩽1V rms;
  ⩾100MHz: Reference value only.

Accuracy Specification (4)

G. Resolution

Range	Resolution	Accuracy	Overload Protection
40kRPM	10RPM	±(0.1%+3)	600Vp

Remarks:
RPM / frequency transducer needed.

H. Temperature

Range	Resolution	Accuracy	
-40°C~1000°C	1°C	-40°C~0°C	±(3%+4)
		0°C~400°C	±(1%+3)
		400°C~1000°C	±(2%+10)
-40°F~1832°F	1°F	-40°F~32°F	±(3%+4)
		32°F~752°F	±(1%+4)
		752°F~1832°F	±2.5%

Remarks:
- Overload Protection: 600Vp.

I. DC Current

Range	Resolution	Accuracy	Overload Protection
400μA	100nA	±(1%+2)	1A,250V fast type glass fuse, Φ5x20mm.
4000μA	1μA		
40mA	10μA	±(1.2%+3)	
400mA	100μA		
10A	10mA	±(1.5%+5)	10A,250V fast type glass fuse, Φ5x20mm.

Remarks:
- **10A Range:**
  For continuous measurement ⩽10 seconds and interval not less than 15 minutes.

Accuracy Specification (5)

J. AC Current

Range	Resolution	Accuracy	Overload Protection
400μA	100nA	±(1.5%+5)	1A,250V fast type glass fuse, ϕ5x20mm.
4000μA	1μA		
40mA	10μA	±(2%+5)	
400mA	100μA		
10A	10mA	±(2.5%+5)	10A,250V fast type glass fuse,ϕ5x20mm.

Remarks:

- **400μA ~ 400mA Range:**
  Displays effective value of sine wave (mean value response).
- **10A Range:**
  For continuous measurement ⩽10 seconds and interval not less than 15 minutes.
- Frequency response: 40Hz ~ 400Hz.

Maintenance (1)

This section provides basic maintenance information including battery and fuse replacement instruction.

⚠ Warning
Do not attempt to repair or service your Meter unless you are qualified to do so and have the relevant calibration, performance test, and service information.

A. General Service

- Periodically wipe the case with a damp cloth and mild detergent. Do not use abrasives or solvents.
- To clean the terminals with cotton bar with detergent, as dirt or moisture in the terminals can affect readings.
- Turn off the power of the Meter when it is not in use and take out the battery when not using for a long time.
- Do not store the Meter in a place of humidity, high temperature and strong magnetic field.

Maintenance (2)

B. Testing the Fuses

⚠ Warning
To avoid electrical shock or personal injury, remove the test leads and any input signals before replacing the battery or fuse.
To prevent damage or injury, install ONLY replacement fuses with identical amperage, voltage, and speed ratings.

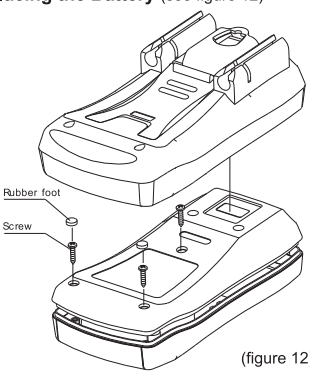
To test the fuse:

1. Set the rotary switch to Ω•)) and select •)) by pressing •))~.
2. Plug a test lead into the terminal →|←VΩHz and connect the probe tip to the **10A** terminal.
   - If the Meter beeps, the fuse is good.
   - If the display shows OL (overvoltage), replace the fuse.

If the Meter does not work while the fuse is all right, send it to your dealer for repair.

Maintenance (3)

C. Replacing the Battery (see figure 12)



(figure 12)

⚠ Warning
To avoid false readings, which could lead to possible electric shock or personal injury, replace the battery as soon as the battery indicator appears.

To replace the battery:

1. Press the **POWER** to turn the Meter off and remove all connections from the terminals.
2. Remove the 2 rubber foots and then 3 screws from the case bottom, and separate the case top from the case bottom.
3. Remove the battery from the battery compartment.
4. Replace the battery with a new 9V battery (NEDA1604, 6F22 or 006P)
5. Rejoin the case bottom and case top, and reinstall the 3 screws and 2 rubber feet.

Maintenance (4)

D. Replacing the Fuses (see figure 12)

⚠ Warning
To avoid electrical shock, arc blast, personal injury or damage to the Meter, use specified fuses ONLY in accordance with the following procedure.

To replace the Meter's fuse:

1. Press the **POWER** to turn the Meter off and remove all connections from the terminals.
2. Remove the 2 rubber feet and 3 screws from the case bottom, and separate the case top from the case bottom.
3. Remove the 4 screws fixing the PCB on the input terminals, gently take apart the PCB and reverse it.
4. Remove the fuse by gently prying one end loose, then take out the fuse from its bracket.
5. Install ONLY replacement fuses with the identical type and specification as follows and make sure the fuse is fixed firmly in the bracket.

   Fuse 1: 1A,250V fast type glass fuse,ϕ5x20mm.

   Fuse 2: 10A,250V fast type glass fuse,ϕ5x20mm.

6. Rejoin the PCB and the case top, and reinstall the 4 screws.
7. Rejoin the case bottom and case top, and reinstall the 3 screws and 2 rubber feet.

Replacement of the fuses is seldom required. Burning of a fuse always results from improper operation.

RS232C Serial Port (1)

A. RS232C Port Cable

The Meter		Computer			
D-sub 9 Pin Male		D-sub 9 Pin Female	D-sub 25 Pin Female	Pin Name	Remark
2	·····	2	3	RX	Receiving Data
3	·····	3	2	TX	Transmitting Data
4	·····	4	20	DTR	Data Terminal Ready
5	·····	5	7	GND	Grounding
6	·····	6	6	DSR	Data Set Ready
7	·····	7	4	RTS	Request To Send
8	·····	8	5	CTS	Clear To Send

B. Setting of RS232C Serial Ports

Default of RS232C serial port for communication is set as:

Baud Rate	2400
Start bit	1 (always 0)
Stop bit	1 (always 1)
Data bits	7
Parity Odd	

RS232C Serial Port (2)

C. System Requirements for Installing serial **Interface Program**

To use the serial **Interface Program**, you need the following hardware and software:

- An IBM PC or equivalent computer with 80486 or higher processor and 800 x 600 pixel or better monitor.
- Microsoft Windows 95 or above.
- At least 8 MB of RAM.
- At least 8 MB free space in hard drive.
- Can access to a local or network CD-ROM.
- A free serial port.
- A mouse or other pointing device supported by Windows.

Please refer to the included CD-ROM ***Installation Guide & Computer Interface Software*** for installing and operating instructions of the serial **Interface Program**.

~ END ~

This operating manual is subject to change without notice.

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