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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 scale making the measured value to be seen clearly and indicating the trend of changing quickly.

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.

Model UT70B: OPERATING MANUAL

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 Meter working at an effective voltage over 60V in DC or 30V in 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 right position and no any changeover 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)

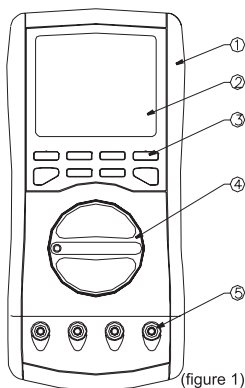
- **Soft cloth and neutral detergent should be used to clean the surface of the Meter when servicing. No abrasive and solvent should be used to prevent the surface of the Meter from corrosion, damage and accident.**
- **Do not use the Meter in an environment of high temperature and humidity. Particularly 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 battery when not using for a long time.**
- **Constantly check the battery as it may leak when it has been using for some time, replace the battery as soon as leaking appears. A leaking battery will damage the Meter.**

International Electrical Symbols

~	AC (Alternating Current).
⋮	DC (Direct Current).
~	AC or DC.
⏏	Grounding.
□	Double Insulated.
⚠	Warning. Refer to the Operating Manual.
🔋	Deficiency of Built-In 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

Below table indicated for information about the rotary switch positions.





Rotary Switch Position	Function
$V \sim$	AC or DC Voltage Measurement.
$\bullet \rightarrow \Omega$	Continuity Test or Resistance.
$\rightarrow \leftarrow$	Diode Test.
$\rightarrow \leftarrow$	Capacitance Measurement.
Hz	Frequency Measurement.
$^{\circ}C$	Temperature in Celsius.
$^{\circ}F$	Temperature in Fahrenheit.
$\mu A \sim$	AC or DC Current Measurement from 0.1 μA to 4000 μA .
mA \sim	AC or DC Current Measurement from 0.01mA to 400.0mA.
A \sim	AC or DC Current Measurement from 0.01A to 10.00A.

Functional Buttons (1)

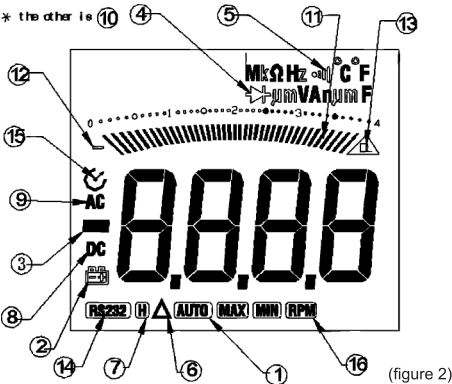
Below table indicated for information about the functional button operations.

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	<ol style="list-style-type: none"> 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 	Relative Value Test	Press REL  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 and it shall shut off in 15 seconds later.

Display Symbols (1) (see figure 2)




Number	Symbol	Meaning
①		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. k Ω : kilohm. 1×10^3 or 1000 ohms. M Ω : Megohm. 1×10^6 or 1,000,000 ohms.
	Hz, kHz, MHz	Hz: Hertz. The unit of frequency. kHz: Kilohertz. 1×10^3 or 1000 hertz. MHz: Megahertz. 1×10^6 or 1,000,000 hertz.
	V, mV	V: Volts. The unit of voltage. mV: Millivolt. 1×10^{-3} or 0.001 volts.
	A, mA	A: Amperes (amps). The unit of current. mA: Milliamp. 1×10^{-3} or 0.001 amperes.

Display Symbols (3) (see figure 2)

⑩	mF μ F nF	<p>F: Farad The unit of capacitance</p> <p>mF: Millifarad. 1×10^{-3} or 0.001 farads</p> <p>μF: Microfarad. 1×10^{-6} or 0.000001 farads.</p> <p>nF: Nanofarad. 1×10^{-9} or 0.000000001 farads.</p>
	$^{\circ}\text{C}$, $^{\circ}\text{F}$	<p>$^{\circ}\text{C}$: Centigrade. The unit of temperature.</p> <p>$^{\circ}\text{F}$: Fahrenheit. The unit of temperature.</p>
	MAX	Maximum reading.
	MIN	Minimum reading.
⑪	Analogue Bar Graph	Provides an analog indication of the present input, quick response.
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	<p>Revolution measurement.</p> <p>Unit: rev./min.</p>

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.

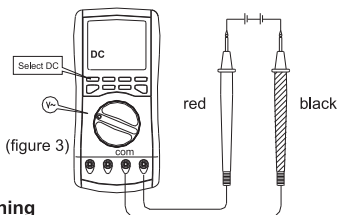
NOTE

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)



Warning

To avoid harms to you or damages 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 **DC** to select **DC** measurement mode.
3. Connect the test leads across with the object being measured.

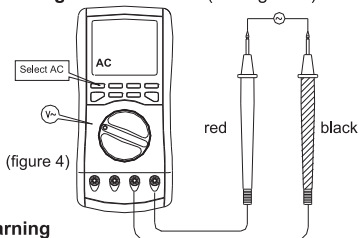
The measured value shows on the display.

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)



Warning

To avoid harms to you or damages 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 $\rightarrow V\Omega Hz$ terminal and the black test lead into the **COM** terminal.
2. Set the rotary switch to $V\sim$ and press $\bullet \sim$ to select **AC** measurement mode.
3. Connect the test leads across with the object being measured.

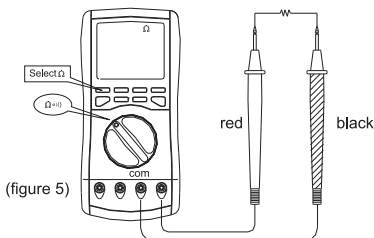
The measured value shows on the display.

In each range, the Meter has an input impedance of $10M\Omega$. This loading effect can cause measurement errors in high impedance circuits. If the circuit impedance is less than or equal to $10k\Omega$, 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)



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 **Ω** to select Ω measurement mode.
3. Connect the test leads across with the object being measured.

The measured value shows on the display.

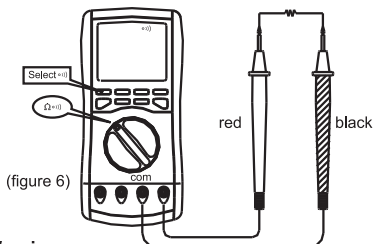
The test leads can add 0.1Ω to 0.2Ω of error to resistance measurement. To obtain precision readings in low-resistance measurement, that is the range of 400.0Ω, short-circuit the input terminals beforehand, using the relative measurement function button **REL** to automatically subtract the value measured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

Measurement Operation (4)

For high-resistance measurement ($>1\text{M}\Omega$), it is normal that it will take 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)



Warning

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

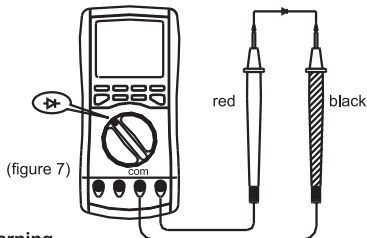
To test for continuity, connect the Meter as below:

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 **SELECT** to select **Ω** 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)



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 $\rightarrow V\Omega Hz$ terminal and the black test lead into the **COM** terminal.
2. Set the rotary switch to \rightarrow .
3. Connect the test leads across with the object being measured.

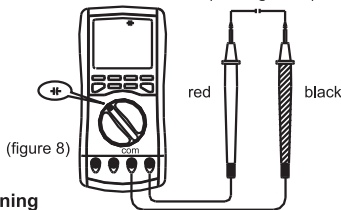
The measured value shows on the display.

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 testing leads and the circuit under test, and remove the testing leads away from the input terminals of the Meter.

F. Capacitance Measurement (see 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:

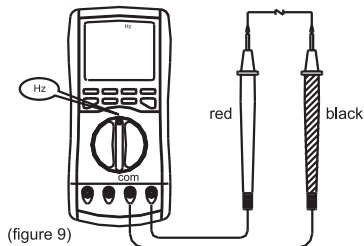
1. Insert the red test lead or the red test clip into the **VΩHz** terminal and the black test lead or black test clip into the **COM** terminal.
2. Set the rotary switch to **C**.
3. Connect the test leads or the test clips across with the object being measured.

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)



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.

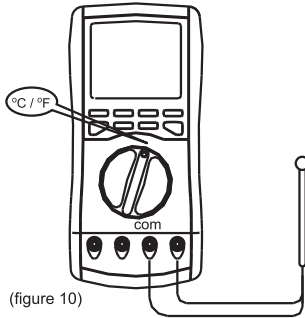
The measured value shows on the display.

Press **Hz/RPM** 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)



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:

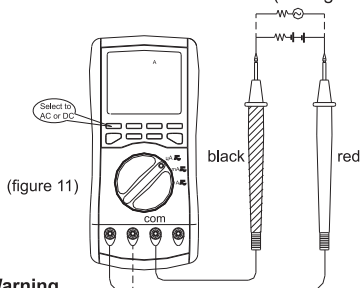
1. Insert the red temperature probe into the **VΩHz** terminal and the black temperature probe into the **COM** terminal.
2. Set the rotary switch to °C or °F.
3. Place the temperature probe to the object being measured.

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)



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 himself may be hurt. 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 $400.0\mu\text{A}$ and $4000\mu\text{A}$ 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.