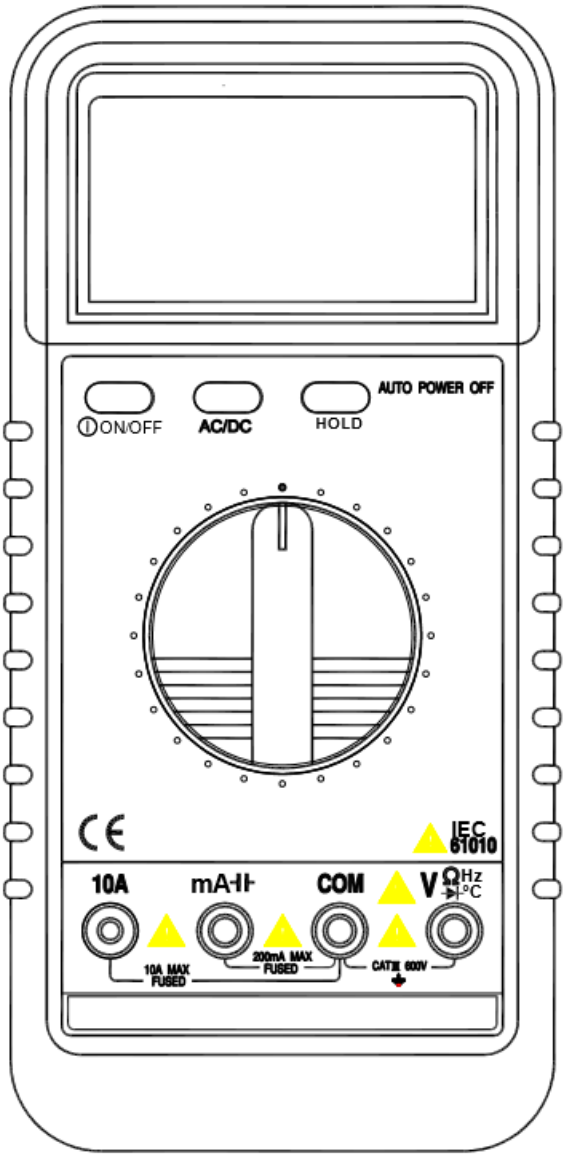
# DIGITAL MULTIMETER




# USER'S MANUAL

# CONTENTS

# 1. SAFETY INFORMATION

This multimeter has been designed according to IEC61010 concerning electronic measuring instruments with an overvoltage category ( CAT III 600V) and pollution 2.

Follow all safety and operating instructions to ensure that the meter is used safely and is kept in good operating condition.

## 1.1 PRELIMINARY

※ When using this meter, the user must observe all normal safety rules concerning:

— Protection against the dangers of electrical current.

— Protection of the meter against misuse.

※ Full compliance with safety standards can be guaranteed only if used with test leads supplied. If necessary, they must be replaced with the same model or same electronic ratings. Measuring leads must be in good condition.

## 1.2 DURING USE

※ Never exceed the protection limit values indicated in specifications for each range of measurement.

※ When the meter is linked to measurement circuit, do not touch unused terminals.

※ When the value scale to be measured is unknown beforehand, set the range selector at the highest position.

※ Before rotating the range selector to change

functions, disconnect test leads from the circuit under test.

※ When carrying out measurements on TV or switching power circuits, always remember that there may be high amplitude voltages pulses at test points which can damage the meter.

※ Never perform resistance measurements on live circuits.

※ Always be careful when working with voltages above 60V dc or 30V ac rms. Keep fingers behind the probe barriers while measuring.

## 1.3 SYMBOLS

 Important safety information, refer to the operating manual.

 Dangerous voltage may be present.

 Earth ground

 Double insulation (Protection class Ⅱ)

## 1.4 MAINTENANCE

※ Before opening the meter, always disconnect test leads from all sources of electric current.

※ For continue protection against fire, replace fuse only with the specified voltage and current ratings:
F1: 250mA/600V F2: 10A/600V

※ If any faults or abnormalities are observed, the meter can not be used any more and it has to be

checked out.

※ Never use the meter unless the back cover is in place and fastened fully.

※ To clean the meter, use a damp cloth and mild detergent only, do not use abrasives or solvents on it.

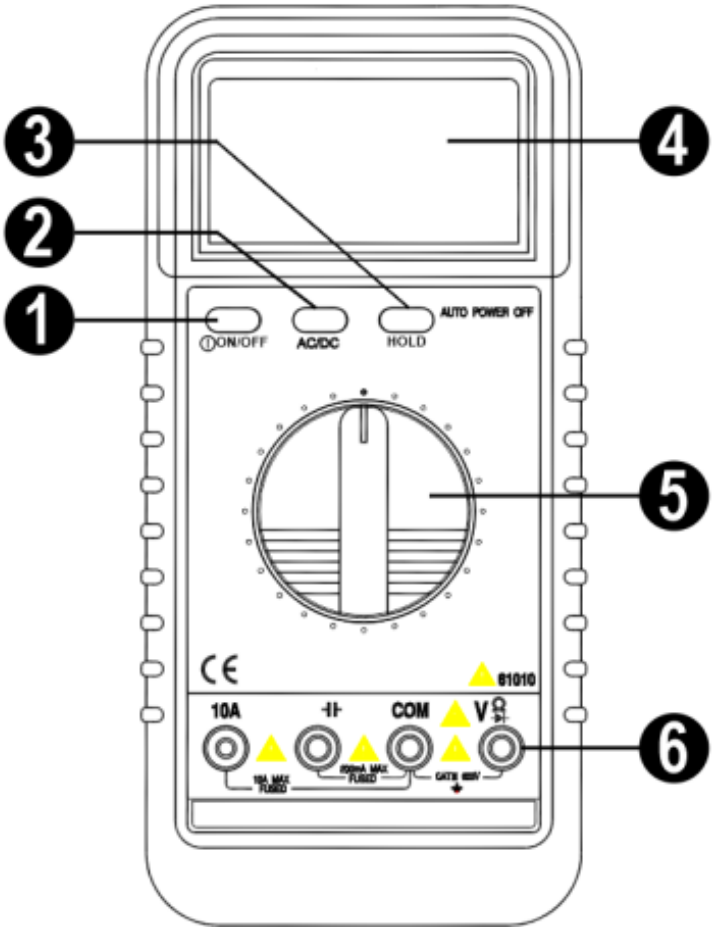
## 2. DESCRIPTION

This meter is a portable professional measuring instrument with 3 1/2 digit LCD, capable of performing functions:

— DC and AC voltage measurement
— DC and AC current measurement
— Resistance measurement
— Capacitance measurement
— Diode and continuity test
— Temperature measurement
— Frequency measurement

**NAMES OF COMPONENTS**

1 Power switch button
2 AC/DC select button
3 Hold function button
4 LCD display
5 Rotary switch
6 Input jacks




## 2.1 FUNCTION AND RANGE SELECTOR

There are 10 functions and 24 ranges provided. A rotary switch is used to select functions as well as ranges.

## 2.2 POWER SWITCH

A push - push switch is used to turn the meter on or off. To extend the battery life, Auto Power - Off function is provided (Optional). The meter will be turned off automatically within around 30 minutes. To turn on the meter again, Push the power switch to release it and then push it once more.

### 2.3 INPUT JACKS

This meter has four input jacks that are protected against overload to the limits. During use, connect the black test lead to the COM jack and red test lead as shown below:

| Function | Red lead connection | Input limits |
|---|---|---|
| 200mV | V/Ω/Hz | 250Vdc or rms ac |
| V⎓/V~ | V/Ω/Hz | 600Vdc or rms ac (sine) |
| Ω/Hz/•))) /⊣▶⊢/℃ | V/Ω/Hz/⊣▶⊢/℃ | 250Vdc or rms ac |
| ⊣⊢ | uA/mA | 250Vdc or rms ac |
| uAmA ⎓/~ | uA/mA | 200mA dc or rms continuous |
| 10A⎓/~ | 10A | 10A for 15 seconds maximum each 10min |

## 3. OPERATING INSTRUCTION

### 3.1 MEASURING VOLTAGE

1. Connect the black test lead to the COM jack and the red test lead to the V/Ω/Hz/⊣▶⊢/℃ jack.
2. Set the rotary switch at the desired V range position and connect test leads across the source or load under measurement.(If you want to measure AC source, please press the AC/DC select button, until the AC symbol show on LCD; If you want to measure DC source, please press the AC/DC select button, until the AC symbol disappear on LCD.)
3. Read LCD display.
4. When only the figure“1” is displayed, it indicates

overrange situation and the higher range has to be selected.

### 3.2 MEASURING CURRENT

1. Connect the black test lead to the COM jack and the red test lead to the mA jack for a maximum of 200mA. For a maximum of 10A, move the red lead to the 10A jack.
2. Set the rotary switch at desired A range position and connect test leads in series with the load under measurement. (If you want to measure AC source, please press the AC/DC select button, until the AC symbol show on LCD; If you want to measure DC source, please press the AC/DC select button, until the AC symbol disappear on LCD.)
3. Read LCD display.
4. When only the figure “1” displayed, it indicates overrange situation and the higher range has to be selected.

### 3.3 MEASURING FREQUENCY

1. Connect the black test leads to the COM jack and the red test lead to the V/Ω/Hz/⊣▶⊢/℃ jack.
2. Set the rotary switch at Hz position and connect test leads across the source or load under measurement.

**NOTE:**

1. Reading is possible at input voltages above 10Vrms, but the accuracy is not guaranteed.
2. In noisy environment, it is preferable to use shield

cable for measuring small signal.

### 3.4 MEASURING RESISTANCE

1. Connect the black test lead to the COM jack and the red test lead to the V/Ω/Hz/⊣▶⊢/℃ jack. ( NOTE :The polarity of red lead connection is positive“＋”)
2. Set the rotary switch at desired Ω range position and connect test leads across the resistance under measurement. Read LCD display.

NOTE:

1. For resistance above 1MΩ, the meter may take a few seconds to stabilize reading.
2. When the input is not connected, i.e. at open circuit, the figure “1” will be displayed for the overrange condition.
3. When checking in - circuit resistance, be sure the circuit under test has all power removed and all capacitors are full discharged.
4. At 200MΩ range display is 10 counts when test leads are shorted. These counts have to be subtracted from measuring results. For example, when measuring 100MΩ resistance, the reading will be 101.0 and the correct measuring result should be 101.0 － 1.0 = 100.0 MΩ.

### 3.5 MEASURING CAPACITANCE

1. Set the rotary switch at desired ⊣⊢ range position.
2. Before measure capacitor, be sure that the capacitor has been discharged fully.

3. Connect the red test lead to the mA terminal, the black test lead to the COM terminal.

### 3.6 TESTING DIODE

1. Connect the black test lead to the COM jack and the red test lead to the V/Ω/Hz/→|←/℃ jack. ( NOTE: The polarity of red lead connection is positive “ + ” ) 2. Set the rotary switch at →|← position and connect the red lead to the anode, the black lead to the cathode of the diode under testing. The meter will show the approx. Forward voltage drop of the diode. If the lead connection is reversed, only figure“1”will be displayed.

### 3.7 CONTINUITY TEST

1. Connect the black test lead to the COM jack and the red test lead to the V/Ω/Hz/→|←/℃ jack.
2. Set the rotary switch at •)|) position and connect test leads across two points of the circuit under testing. If continuity exists ( i.e. resistance less than about 70Ω ), built – in buzzer will sound.

### 3.8 MEASURING TEMPERATURE

1. Set the rotary switch at ℃ position and the LCD display will show the ambient temperature.
2. Insert “K” type thermocouple probe to the V terminal and COM terminal. Read LCD display.

# 4. SPECIFICATIONS

Accuracy is specified for a period of one year after calibration and at 18°C to 28°C (64°F to 82°F) with relative humidity to 80%.

Accuracy specifications are given as:

± % of reading ± number of least significant digits.

## 4.1 GENERAL

MAXIMUM VOLTAGE BETWEEN TERMINALS AND EARTH GROUND:

600V DC or 600 rms AC (sine)

FUSE PROTECTION:

mA: F 250mA/600V  10A: F 10A/600V

POWER SUPPLY: 9V battery, NEDA 1604 or 6F22

DISPLAY: LCD, 1999 counts MAX, updates 2-3/sec

MEASURING METHOD: Dual - slope integration A/D converter

OVERRANGE INDICATION:

"1" figure only on the display

POLARITY INDICATION:

"–" displayed for negative polarity

LOW BATTERY INDICATION: "  " displayed

OPERATING TEMPERATURE:

0°C to 40°C (32°F to 104°F)

STORAGE TEMPERATURE:

-10°C to 50°C (14°F to 122°F)

DIMENSION: 91×189×31.5mm

WEIGHT: 310g (including battery)

### 4.2 AC VOLTAGE

| Range | Resolution | Accuracy |
|---|---|---|
| 200mV | 0.1mV | ± 1.2 % of rdg ± 3 digit |
| 2V | 1mV | ± 0. 8 % of rdg ± 3 digit |
| 20V | 10mV | ± 0. 8 % of rdg ± 3 digit |
| 200V | 100mV | ± 0. 8 % of rdg ± 3 digit |
| 600V | 1V | ± 1.2 % of rdg ± 2 digits |

.Input impedance: 10MΩ

Frequency range: 40Hz to 400Hz

Response: average, calibrated in rms of sine wave

### 4.3 DC VOLTAGE

| Range | Resolution | Accuracy |
|---|---|---|
| 200mV | 0.1mV | ± 0. 5 % of rdg ± 1 digit |
| 2V | 1mV | ± 0. 5 % of rdg ± 1 digit |
| 20V | 10mV | ± 0. 5 % of rdg ± 1 digit |
| 200V | 100mV | ± 0. 5 % of rdg ± 1 digit |
| 600V | 1V | ± 0.8 % of rdg ± 2 digits |

Input Impedance: 10MΩ

### 4.4 AC CURRENT

| Range | Resolution | Accuracy |
|---|---|---|
| 200μA | 0.1μA | ± 1.0 % ± 3 |
| 2mA | 1μA | ± 1.0 % ± 3 |
| 20mA | 10μA | ± 1.0 % ± 3 |
| 200mA | 100μA | ± 1.8 % ± 3 |
| 10A | 10mA | ± 3.0 % ± 7 |

Frequency Range: 40Hz to 400Hz
Response: Average, calibrated in rms of sine wave

### 4.5 DC CURRENT

| Range | Resolution | Accuracy |
|---|---|---|
| 200μA | 0.1μA | ± 0. 8 % ± 1 |
| 2mA | 1μA | ± 0. 8 % ± 1 |
| 20mA | 10μA | ± 0. 8 % ± 1 |
| 200mA | 100μA | ± 1.5 % ± 5 |
| 10A | 10mA | ± 2.0 % ± 5 |

### 4.6 CAPACITANCE

| Range | Resolution | Accuracy |
|---|---|---|
| 2nF | 1pF | ± 4.0% ± 20 |
| 20nF | 10pF | |
| 200nF | 100pF | |
| 20μF | 10nF | |
| 100μF | 100nF | |

### 4.7 FREQUENCY

| Range | Resolution | Accuracy |
|---|---|---|
| 20kHz | 10Hz | ± 1.5 % ± 10 |

Sensitivity: 200mV rms and input no more 10V rms.

### 4.8 RESISTANCE

| Range | Resolution | Accuracy |
|---|---|---|
| 200Ω | 0.01Ω | ± 0.8 % ± 3 |
| 2KΩ | 0.1Ω | ± 0.8 % ± 1 |

| | | |
|---|---|---|
| 20KΩ | 1Ω | ± 0.8 % ± 1 |
| 200KΩ | 10Ω | ± 0.8 % ± 1 |
| 2MΩ | 100Ω | ± 0.8 % ± 1 |
| 20MΩ | 1KΩ | ± 1.8 % ± 2 |
| 200MΩ | 10KΩ | ± 5.0 % of (rdg-10digits) ± 10 |

Note: On 200MΩ range, if short input, display will read 1MΩ, this 1MΩ should be subtracted from measurement results.

### 4.9 TEMPERATURE

| Range | Resolution | Accuracy |
|---|---|---|
| -20°C ~ 0°C | 1°C | ± 5.0 % ± 4 |
| 0°C ~ 400°C | | ± 1.0 % ± 3 |
| 400°C ~ 1000°C | | ± 2.0 % |

## 5. ACCESSORIES

### 5.1 SUPPLIED WITH THE MULTIMETER

Test leads Electric Rating 1000V, 10A 1 couple
Battery 9V NEDA 1604 or 6F22 1 pcs
Operating Manual 1 pcs
Holster 1 pcs
OPTIONAL ACCESSORY: “k” thermocouple

### 5.2 HOW TO USE THE HOLSTER

The holster is used to protest the meter and to make the measurement more comfortable, it comes with tow

stands installed together. The figure shows how to use the holster to:

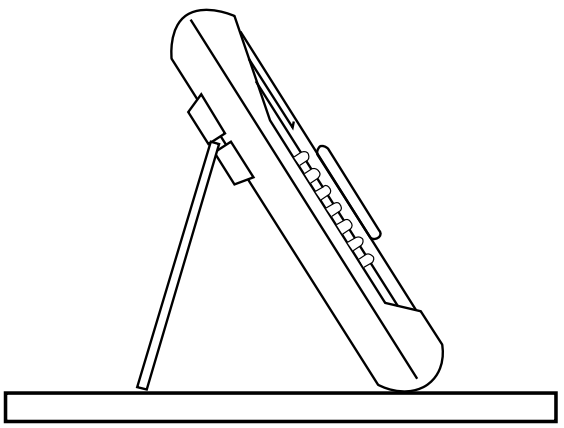
A: Support the meter with a standard angle.

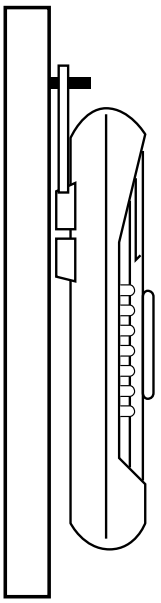
B: Support the meter with a small angle using the little stand

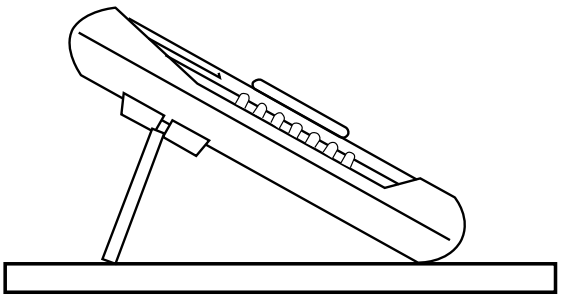
C: Hang the meter on the wall using the little stand.

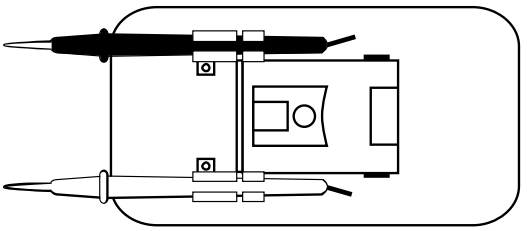
Take the little stand off from the back side of the large and insert it into holes located upper on the holster.

D. hold test leads









# 6. BATTERY & FUSE REPLACEMENT

If the sign "  " appears on the LCD display, it indicates that battery should be replaced.

Remove screws on the back cover and open the case. Replace the exhausted battery with a new one.

Fuse rarely need replacement and blow almost always as a result of the operator's error. Open the case as mentioned above, and then take the PCB out from the front cover. Replace the new fuse with same ratings.

 WARNING

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

For protection against fire, replace fuse only with specified ratings:

F1: 250mA/600V (quick acting)

F2: 10A/600V (quick acting)