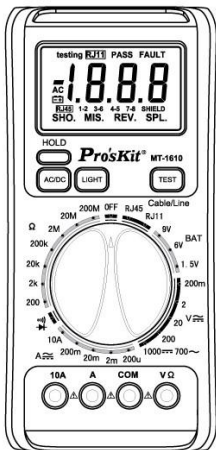


# MT-1610

## 3 IN 1 NETWORK DIGITAL MULTIMETER



### User's Manual

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## 1. SAFETY INFORMATION

### **WARNING**

To ensure safe operation, and in order to exploit to the full functionality of the meter, please follow the directions in this section carefully.

This multimeter has been designed according to IEC-1010 concerning electronic measuring instruments with an over voltage category CAT II 1000V, CAT III 600V and pollution 2.

With proper use and care, the digital multimeter will give you years of satisfactory service.

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

### **1.1 PRELIMINARY**

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

- Protection against the danger of electrical attack
- Protection of the meter against misuse

1.1.2 When the meter is delivered, check if it has been damaged in transit.

1.1.3 When harsh preservation or shipping conditions caused, inspect and confirm this meter without delay.

1.1.4 Test leads must be in good condition. Before using, verify that the insulation on test leads is not damaged and/or the leads wire is not exposed.

1.1.5 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 the same class.

## **1.2 DURING USE**

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

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

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

1.2.4 Before rotating the range selector to change functions, disconnect test leads from the circuit


under test.

1.2.5 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.

1.2.6 Never perform resistance measurements on live circuits.

1.2.7 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.

 Conforms to European Union Directive


 Earth ground

### **1.4 MAINTENANCE**

1.4.1 Please do not attempt to adjust or repair the meter by removing the rear case while voltage is being applied. A technician who fully understands danger involved should only carry out such actions.

1.4.2 Before opening the case of the meter, always

disconnect test leads from all sources of electric current.

1.4.3 To avoid the wrong reading causing electricity attack, when the meter displays “”, you must change the battery.

1.4.4 For continue protection against fire, replace fuse only with the specified voltage and current ratings: F 250mA/250V (quick acting).

1.4.5 Do not use abrasives or solvents on the meter, use a damp cloth and mild detergent only.

1.4.6 ALWAYS set the power switch to the OFF position when the meter is not in use.

1.4.7 If the meter is to be stored for a long period of time, the batteries should be removed to prevent damage to the unit.

## **2. DESCRIPTION**

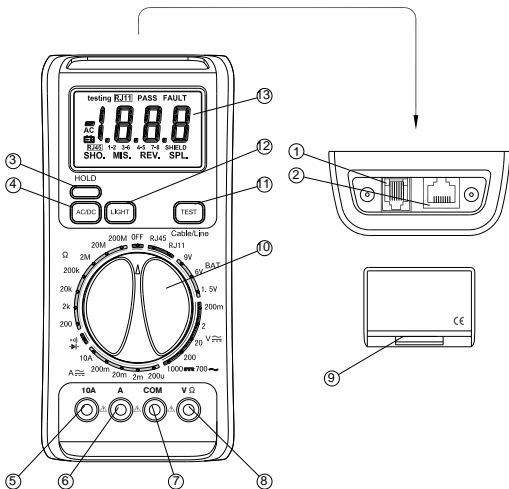
The 3 in 1 digital multi-tester has been designed to combine the functions of Digital Multimeter, Telephone Line Tester and Network Cable Tester.

- DC voltage measurement, 5 ranges from 200mV to 1000V
- AC voltage measurement, 5 ranges from 200mV to 700V
- DC/AC current measurement, 5 ranges from 200 $\mu$ A to 10A
- Resistance measurement, 7 ranges from 200 $\Omega$  to 200M $\Omega$
- Diode test
- Audible continuity test
- Battery test: 1.5/6/9V
- Telephone Line test (RJ11)
- Network Cable test (RJ45)

### **Names of components**

- ① RJ11 test jack
- ② RJ45 test jack
- ③ Data hold key (only for multimeter)
- ④ AC/DC switch key
- ⑤ - ⑧ input jacks

- ⑨ RJ45 jack ( Remote )
- ⑩ Function/range select rotary switch
- ⑪ Cable test key/Resent
- ⑫ Back light key
- ⑬ LCD display





### **3. OPERATING INSTRUCTION**

#### **3.1 MEASURING VOLTAGE**

3.1.1 Connect the black test lead to the COM jack and the red test lead to the  $V/\Omega$  jack.

3.1.2 Set the rotary switch at the desired "V" range position and connect test leads across the source or load under measurement.

3.1.3 Put down the "AC/DC" when measuring the voltage. Meter will be transformed between DC and AC range.

3.1.4 If you need data hold when measuring, you can put on "HOLD", it will hold the reading; if you put the button again, data hold will not continue.

3.1.5 When only the figure "1" is displayed, it indicates overrange situation and the higher range has to be selected.

#### **3.2 MEASURING CURRENT**

3.2.1 Connect the black test lead to the COM jack and the red test lead to the A jack for a maximum of 200mA. For a maximum of 10A, move the red lead to the 10A jack.

3.2.2 Set the rotary switch at desired "A" range

position and connect test leads in series with the load under measurement.

3.2.3 Put down the "AC/DC" when measuring the current. Meter will be transformed between DC and AC range.

3.2.4 If you need data hold when measuring, you can put on "HOLD", it will hold the reading; if you put the button again, data hold will not continue.

3.2.5 When only the figure "1" is displayed, it indicates overrange situation and the higher range has to be selected.

### **3.3 TESTING DIODE/CONTINUITY**

3.3.1 Connect the black test lead to the COM jack and the red test lead to the V/ $\Omega$  jack. ( NOTE: The polarity of red lead connection is positive " + ")

3.3.2 Set the rotary switch at  $\blacktriangleright$  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. If continuity exists ( i.e., resistance less than about  $20\Omega$  ), built – in buzzer will sound.

### **3.4 MEASURING RESISTANCE**

3.4.1 Connect the black test lead to the COM jack and the red test lead to the V/ $\Omega$  jack. ( NOTE :The polarity of red lead connection is positive“+”)

3.4.2 Set the rotary switch at desired  $\Omega$  range position and connect test leads across the resistance under measurement. Read LCD display.

#### **NOTE:**

1. For resistance above  $1\text{M}\Omega$ , 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  $200\text{M}\Omega$  range display is 10 counts when test leads are shorted. These counts have to be subtracted from measuring results. For example, when measuring  $100\text{M}\Omega$  resistance, the reading will be 101.0 and the correct measuring result should be  $101.0 - 1.0 = 100.0 \text{ M}\Omega$ .

### 3.5 TESTING BATTERY

3.5.1 Connect the black test lead to the COM jack and the red test lead to the V/ $\Omega$  jack.

3.5.2 Set the rotary switch at the desired “BAT” range position and connect test leads across the battery.

Position	1.5v	6v	9v
load	37 $\Omega$	78 $\Omega$	110 $\Omega$

### 3.6 TESTING Telephone Line (RJ11)

3.6.1 Connect the RJ11 test jack to one end of the telephone line to be tested.

3.6.2 Connect the UAX(Telephone Unit Automatic Exchange) to the other end of the line.

3.6.3 Push “TEST” button to perform test.

### 3.7 TESTING Network Cable (RJ45)

**CAUTION!** DO NOT use on the circuits as it may damage the tester.

- The network tester is suitable for T168A, T568B, 10Base-T and Token Ring.

The Network Cable Tester will check a fault

condition in the above descending order before detecting other fault conditions. The detection and indication of the presence of a fault is handled on a “**one-per-test**” basis. Once a fault is corrected, it is recommended the cable be tested again for other faults.

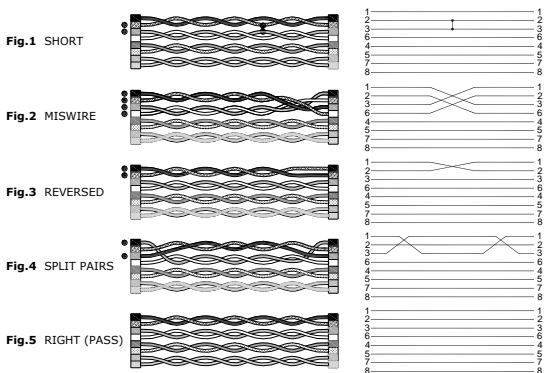
**OPEN** There is no “OPEN” indication. A typical cable may have 2, 3, or 4 pairs. OPENS are displayed as an unlit symbol. The user will determine if a pair is present and continuous or OPEN by comparing the illuminated symbol to the expected number of pairs that should be good.

**SHO.** A short circuit condition exists (see Fig.1).

**MIS.** Indicates the improper assignment of individual wire pairs to pins for the wiring schemes tested (see Fig.2).

**REV.** Reverse wiring means the pin for one wire in a pair is connected to the opposite pin for the pair in the remote jack (see Fig.3).

**SPL.** Split pairs occur when the tip (positive conductor) and ring (negative conductor) of two twisted pairs are interchanged (see Fig.4).



3.7.1 Connect the RJ45 test jack to one end of the cable to be tested.

3.7.2 Connect the remote unit to the other end of the cable.

3.7.3 Push TEST button to perform test. Example: The Cable Fault is a SHORT on Pair 1-2 and Pair 3-6, the LCD status will be as follows:

Pair 1-2, Pair 3-6, Pair 4-5, Pair 7-8, SHIE and SHO will display at the same time.

3.7.4 Push TEST button again, Pair 1-2, Pair 3-6 and SHO will display. Continue to Push TEST button, the next pairs will display.

## 4. SPECIFICATIONS

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

### 4.1 GENERAL

MAXIMUM VOLTAGE	1000V DC or 700V AC
FUSE PROTECTION	mA: F 250mA/250V 10A: no
POWER SUPPLY	9V battery, NEDA 1604 or 6F22
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	185x85x44 mm
WEIGHT	360g (including battery )

### 4.2 VOLTAGE

DC VOLTAGE		
Range	Resolution	Accuracy
200mV	0.1mV	± 0.8 % of rdg ± 2 digits
2V	1mV	
20V	10mV	
200V	100mV	
1000V	1V	± 1.2 % of rdg ± 3 digits

AC VOLTAGE		
Range	Resolution	Accuracy
200mV	0.1mV	$\pm 1.2 \% \text{ of rdg} \pm 3 \text{ digits}$
2V	1mV	$\pm 0.8 \% \text{ of rdg} \pm 3 \text{ digits}$
20V	10mV	
200V	100mV	
700V	1V	$\pm 1.2 \% \text{ of rdg} \pm 5 \text{ digits}$

Input Impedance:  $10\text{M}\Omega$

Frequency Range: 40Hz to 400Hz (for AC)

Response : Average, calibrated in rms of sine wave

### 4.3 CURRENT

DC CURRENT		
Range	Resolution	Accuracy
200 $\mu\text{A}$	0.1 $\mu\text{A}$	$\pm 0.8 \% \text{ of rdg} \pm 3 \text{ digits}$
2mA	1 $\mu\text{A}$	
20mA	10 $\mu\text{A}$	
200mA	100 $\mu\text{A}$	$\pm 1.5 \% \text{ of rdg} \pm 2 \text{ digits}$
10A	10mA	$\pm 2.0 \% \text{ of rdg} \pm 5 \text{ digits}$



AC CURRENT		
Range	Resolution	Accuracy
200 $\mu$ A	0.1 $\mu$ A	$\pm 2.0$ % of rdg $\pm 3$ digits
2mA	1 $\mu$ A	$\pm 1.0$ % of rdg $\pm 3$ digits
20mA	10 $\mu$ A	
200mA	100 $\mu$ A	$\pm 1.8$ % of rdg $\pm 3$ digits
10A	10mA	$\pm 3.0$ % of rdg $\pm 5$ digits

Overload Protection: F 250mA/250V fuse for 200 $\mu$ A to 200mA ranges

Frequency Range: 40Hz to 400Hz (for AC)

Response: Average, Calibrated in rms of sine wave

#### 4.4 RESISTANCE

Range	Resolution	Accuracy
200 $\Omega$	0.1 $\Omega$	$\pm 0.8$ % of rdg $\pm 3$ digits
2K $\Omega$	1 $\Omega$	$\pm 0.8$ % of rdg $\pm 2$ digit
20K $\Omega$	10 $\Omega$	$\pm 0.8$ % of rdg $\pm 2$ digit
200K $\Omega$	100 $\Omega$	$\pm 0.8$ % of rdg $\pm 2$ digit
2M $\Omega$	1K $\Omega$	$\pm 0.8$ % of rdg $\pm 2$ digit
20M $\Omega$	10K $\Omega$	$\pm 1.0$ % of rdg $\pm 2$ digit
200M $\Omega$	100K $\Omega$	$\pm 5.0$ % of (rdg-10digits) $\pm 10$ digits

Maximum Open Circuit Voltage: 700mV (3V for

200M $\Omega$  range).

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


Overload Protection: 250V dc or 250V ac rms

#### **4.5 DIODE/CONTINUITY**

Range	Description
Diode	Shows the approximate forward voltage drop
Continuity	Built – in buzzer will sound, if the resistance under test is less than about 20 $\Omega$

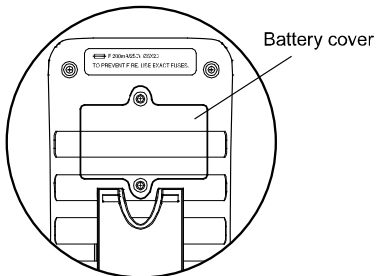
Overload Protection: 250V dc or 250V ac rms

## 5. 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 (see the right photo). 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 blown 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: F 250mA/250V

## **6. ACCESSORIES**

- ① Test Leads: Electric Ratings    one set  
1000V 10A
- ② Battery: 9V, NEDA                    one piece  
1604 or 6F22
- ③ Operating Manual                    one piece