

**DIGITAL MULTIMETER**

**OPERATOR'S**

**INSTRUCTION MANUAL**

## **SAFETY INFORMATION**

This multimeter has been designed according to IEC -1010 concerning electronic measuring instruments with an overvoltage category (CAT II) and pollution 2.

Follow all safety and operating instructions to ensure that the meter is used safely and is kept in good operating condition. Full compliance with safety standards can be guaranteed only with test leads supplied. If necessary, they must be replaced with the type specified in this manual.

## **SAFETY SYMBOLS**



Important safety information, refer to the operating manual.



Dangerous voltage may be present.



Earth ground.



Double insulation (Protection class II).

## **MAINTENANCE**

- Before Opening the case, always disconnect test leads from all energized circuits.
- For continue protection against fire; replace fuse only with the specified voltage and current ratings:  
F 200mA/250V(Quick Acting)
- Never use the meter unless the back cover is in place and fastened completely.
- Do not use abrasives or solvents on the meter. To clean it using a damp cloth and mild detergent only.

## **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.
- Never use the meter to measure voltages that might exceed 1000V DC or 700V AC above earth ground in category II installations.

- 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.
- Always is careful when working with voltages above 60V dc or 30V ac rms. Keep fingers behind the probe barriers while measuring.
- Before attempting to insert transistors for testing, always be sure that test leads have been disconnected from any measurement circuits.
- Components should not be connected to the hFE socket when making voltage measurements with test leads.
- Never perform resistance measurements on live circuits.

## **GENERAL DESCRIPTION**


The meter is a handheld 3 1/2 digital multimeter for measuring DC and AC Voltage, DC and AC current, Resistance, Diode, Transistor, frequency, temperature, capacitance and Continuity Test with battery operated. The Back light of display is optional.

## **SPECIFICATIONS**

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

### **GENERAL**

Maximum voltage between terminals and earth ground	:1000VDC or 700VAC
Fuse protection	:F 200mA/250V
Power	:9V battery, NEDA 1604 or 6F22
Display	:LCD, 1999 counts, updates 2-3/ sec.
Measuring method	:Dual-slope integration A/D converter
Overrange Indication	:Only figure "1" on the display
Poladty indication	: "-" displayed for negative polarity
Operating Environment	:0 to 40°C

Storage temperature : -10 °C to 50°C  
 Low battery indication :  appears on the display  
 Size : 31.5mm X91mm X189mm  
 Weight : Approx. 280g.

**DC VOLTAGE**

Range	Resolution	Accuracy
200mV	100 μ V	±(0.5%+2)
2V	1mV	
20V	10mV	
200V	100mV	
1000V	1V	±(0.8%+2)

Overload Protection: 250V rms, For 200mv range and 1000V dc or rms. ac for other ranges.

**AC VOLTAGE**

Range	Resolution	Accuracy
200mV	100 μ V	±(1.2%+3)
2V	1mV	±(0.8%+3)
20V	10mV	
200V	100mV	
700V	1V	±(1.2%+3)

Overload Protection: 250V rms, For 200mv range and 1000V dc or rms. ac for other ranges.

Frequency range: 40Hz to 400Hz. Response: Average responding, calibrated in rms. Of a sine wave.

**DC CURRENT**

Range	Resolution	Accuracy
2mA	1 μ A	±(1.2%+2)
20mA	10 μ A	
200mA	100 μ A	±(1.4%+2)
20A	10mA	±(2.0%+2)

Overload Protection: 250V dc or rms. ac.

Overload Protection: F 200mA/250V fuse. (20A range unfused)

## AC CURRENT

Range	Resolution	Accuracy
2mA	1 $\mu$ A	$\pm(1.2\%+3)$
20mA	10 $\mu$ A	
200mA	100 $\mu$ A	$\pm(1.8\%+3)$
20A	10mA	$\pm(3.0\%+7)$

Overload Protection: 250V dc or rms. ac for all ranges.  
Frequency range: 40Hz to 400Hz. Response: Average responding, calibrated in rms. Of a sine wave.

## RESISTANCE

Range	Resolution	Accuracy
200 $\Omega$	0.1 $\Omega$	$\pm(1.0\%+2)$
2k $\Omega$	1 $\Omega$	$\pm(0.8\%+2)$
20k $\Omega$	10 $\Omega$	
200k $\Omega$	100 $\Omega$	
2M $\Omega$	1k $\Omega$	
20M $\Omega$	10k $\Omega$	$\pm(1.2\%+2)$
200M $\Omega$	100k $\Omega$	$\pm(5.0\%+10)$

Maximum Open circuit Voltage: 3.2V

Overload Protection: 250V dc or rms. ac for all ranges

## FREQUENCY

Range	Resolution	Accuracy
20kHz	10Hz	$\pm(2.0\%+5)$
200kHz	100Hz	$\pm(1.5\%+5)$

## TEMPERATURE

Range	Resolution	Accuracy		
		-20 $^{\circ}$ C to 0 $^{\circ}$ C	0 $^{\circ}$ C to 400 $^{\circ}$ C	400 $^{\circ}$ C to 1000 $^{\circ}$ C
-20 $^{\circ}$ C to 1000 $^{\circ}$ C	1 $^{\circ}$ C	$\pm 5.0\%$ of rdg $\pm 4$ digits	$\pm 1.0\%$ of rdg $\pm 3$ digits	$\pm 2.0\%$ of rdg

## CAPACITANCE

Range	Resolution	Accuracy
2nF	1pF	$\pm (4.0\%+5)$
20nF	10pF	
200nF	100pF	
2 $\mu$ F	1nF	
200 $\mu$ F	100nF	
2000 $\mu$ F	1000nF	$\pm (4 +10)$

### NCV test (non-contact voltage detection)

Turn the rotary switch to NCV position, and place the top of the meter approach the conductor. If the meter detects the AC voltage, the indicators for signal density (high, medium and low) will be on in accordance with the detected density, while the beeper will sounds alarms at different frequencies.

Note:

- 1: Voltage may still remain in the absence of any indication. The operator shall not rely on non-contact voltage detector to check the presence of voltage. The detection operation may be affected by various factors, including socket design, insulation thickness and type
2. When the voltage is input into the meter's input terminal, the voltage sensor LED may be on as a result of induced voltage.
3. External sources of interference (like flashlight and motor) may trigger non-contact voltage detection.

### Live line test

1. Turn the rotary switch to the position Live.
2. Connect the test lead in red to V input socket.
3. When a single test lead is inserted into jack L of power socket or approaches a live conductor, if the meter detects AC voltage, the meter's indicator for the intensity (high, medium and low) of induced voltage signal will be on and the beeper sounds alarms for different intensities.

## **OPERATING INSTRUCTIONS**

### **DC VOLTAGE MEASUREMENT**

1. Connect the red test lead to the "V.  $\Omega$  .mA" jack and the black lead to the "COM" jack.
2. Set rotary switch at desired DCV position. If the voltage to be measured is not known beforehand, set range switch at the highest range position and then reduce it until satisfactory resolution is obtained.
3. Connect test leads across the source or load being measured.
4. Read voltage value on the LCD display along with the polarity of the red lead connection.

### **CURRENT MEASUREMENT**

1. Connect the red test lead to the "mA" jack and the black test lead to "COM" jack. (For measurements between 200mA and 20A, remove red lead to "20A" jack.)
2. Set the rotary switch at desired DCA position.
3. Open the circuit in which the current is to be measured and connect test leads in series with the circuit.
4. Read current value on LCD display along with the polarity of red lead connection.

### **AC VOLTAGE MEASUREMENT**

1. Connect the red test lead to "V.  $\Omega$  " jack and the black testlead to the "COM" jack.
2. Set the rotary switch at desired ACV position.
3. Connect test leads across the source or load being measured.
4. Read voltage value on the LCD display.

### **RESISTANCE MEASUREMENT**

1. Connect the red test lead to "V.  $\Omega$  " jack and black test lead to the "COM" jack'. (The polarity of red lead is positive "+" )
2. Set the rotary switch at desired "  $\Omega$  " range position.

3. Connect test leads across the resistor to be measured and read LCD display.
4. If the resistance being measured is connected to a circuit, turn off power and discharge all capacitors before applying test probes.

### **DIODE TEST**

1. Connect the red test lead to "V.  $\Omega$ " jack and the black test lead to the "COM" jack. (The polarity of red lead is positive "+").
2. Set the rotary switch at " $\rightarrow \nabla +$ " position.
3. Connect the red test lead to the anode of the diode to be tested and the black test lead to the cathode of the diode. The approx, forward voltage drop of the diode will be displayed. If the connection is reversed. Only figure "1" will be shown.

### **TRANSISTOR TEST**

1. Set the rotary switch at "hFE" position.
2. Determine whether the transistor under testing is NPN or PNP and locate the emitter, base and collector leads. Insert the leads into proper holes of the hFE socket on the front panel.
3. Read the approximate hFE value at the test condition of base current  $10 \mu A$  and  $V_{ce} 3V$ .

### **NOTE:**

To avoid electrical shock, remove test leads from measurement circuits before testing a transistor.

### **AUDIBLE CONTINUITY TEST**

1. Connect red test lead to "V,  $\Omega$ ", black test lead to "COM"
2. Set range switch to ")))" Position.
3. Connect test leads to two points of circuit to be tested. If continuity exists, built-in buzzer will sound.



## **MEASURING TEMPERATURE**

1. Set the rotary switch at TEMP Position and the LCD display will show the current environment temperature.
2. Connect the K type thermoelectric couple to "V  $\Omega$  mA $^{\circ}$ C " and "COM" jacks.
3. The display will read Temperature Value $^{\circ}$ C

## **MEASURING FREQUENCY**

1. Connect the black test lead to the COM jack and the red test lead to the V  $\Omega$  Hz jack.
2. Set the rotary switch at kHz 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.

## **MEASURING CAPACITANCE**


1. Set the rotary switch at desired F position.
2. Before inserting capacitor under measurement into capacitance testing socket, be sure that the capacitor has been discharged fully.
3. When measuring capacitors with shorter leads, a testing adapter is provided with the meter into the capacitance testing socket on the front panel to continue measurements.
4. When testing large capacitances, note that there will be a certain time lag before the final indication.



## **WARNING**

To avoid electric shock, be sure the capacitor measuring adapter has been removed before changing to another function measurement.

## **BATTERY & FUSE REPLACEMENT**

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

Fuses rarely need replacement and blow almost always as a result of operator's error.

To replace battery & fuse (200mA/250V) remove the 2 screws in the bottom of the case. Simply remove the old, and replace with a new one.

Be careful to observe battery polarity.



## **WARNING**

Before attempting to open the case, always be sure that test leads have been disconnected from measurement circuits.

Close case and tighten screws completely before using the meter to avoid electrical shock hazard.

## **ACCESSORIES**

- Operator's instruction manual
- Set of test leads
- Gift box
- 9 volt battery. NEDA 1604 6F22 006P type
- Holster (option)

**FOR THE FUNCTION OF THE PRODUCTS, SEE THE PANEL OF THE DIGITAL MULTIMETERS OF ALL TYPES.**