

770E

DIGITAL MULTIMETER OPERATOR'S MANUAL

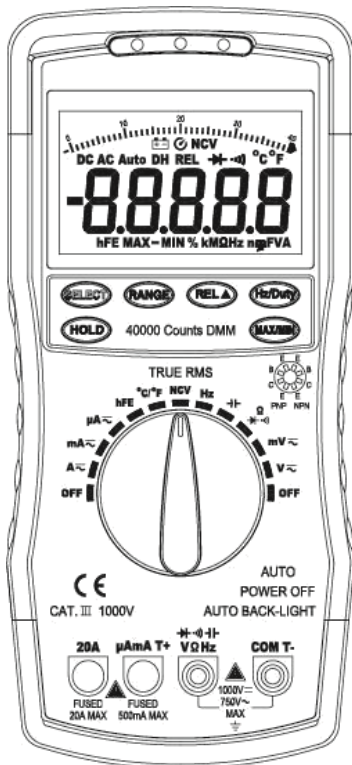


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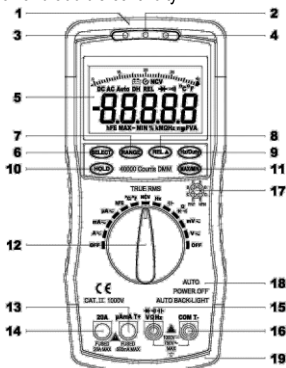
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1. Overview

The multimeter is characterized at slim size, portable, stable performance and anti-dropping capacity. Using 40000 counts digit & analogue bar graph LCD monitor with character 16.5mm high, they offer clear readings. With overall circuitry design centering on large-scale IC A/D converters in conjunction and over-load protection circuit, the meters give excellent performance and exquisite making as a handy utility instrument.

The meters can be used to measure DC & AC voltage, DC & AC current, resistance, capacitor, frequency, duty cycle, temperature, transistor hFE, Non Contact AC Voltage (NCV) detection, positive diode voltage fall and audible continuity.

2. Panel Layout



- ① NCV detection area: Non Contact AC Voltage (NCV) detection area.
- ② **CDS** sensor: The CDS sensor can reaction to the ambient brightness range, then automatically control the LCD backlight to lighten or go out.
- ③ NCV red light: Non Contact AC Voltage (NCV) detection red light.
- ④ NCV green light: Non Contact AC Voltage (NCV) detection green light.
- ⑤ LCD display: 40000 counts digit & analogue bar graph, full function symbol display.
- ⑥ **SELECT** key: This key work on the " Ω \rightarrow \rightarrow \rightarrow " range, press the key to choose resistance, diode or continuity test, on the voltage or current range, change to DC or AC, on the **$^{\circ}\text{C}/^{\circ}\text{F}$** range, change to $^{\circ}\text{C}$ or $^{\circ}\text{F}$ Test; If press and hold SELECT key to power on, "Auto Power Off" function will be disabled.
- ⑦ **RANGE** Key: Press the "RANGE" key, the meter enters manual range mode, press it more than 2 seconds again, return to auto mode.
- ⑧ **REL▲** Key: Press the "REL▲" key, the meter enters relative measuring mode, "REL" is displayed on the LCD and the present reading becomes the reference value and displayed on the display. Relative measurement $\text{REL} \triangle \text{measurement value} - \text{Reference value}$. Press it again to exit.
- ⑨ **Hz/Duty** Key: On "ACV/ACA" or "Hz" range, press the "Hz/Duty" key, you can choose the **Frequency** or **Duty Cycle** measurement.


- ⑩ **HOLD** key: Press the "HOLD" key to lock display value, and the "DH" sign will appear on the display, press it again to exit.
- ⑪ **MAX/MIN** key: Press the "MAX/MIN" key to lock **MAX** or **MIN** value, and the "MAX" or "MIN" sign will appear on the display, press it over 2 seconds to exit.
- ⑫ Rotary Switch: Use this switch to select functions and ranges.
- ⑬ **μAmAT+**: μAmA and Temperature "+" Input Jack
- ⑭ **20A**: 20A Input Jack
- ⑮ **VΩHz**: V/Hz/Ω Input Jack
- ⑯ **COMT-**: COM and Temperature "-" Input Jack
- ⑰ Transistor hFE test Input Jack
- ⑱ Crust of meter
- ⑲ Protective casing

3. Safety Information


3-1 The meter is designed according to IEC-1010 concerning electronic measuring instruments with an over-voltage category 1000V (CAT III) and pollution 2.

3-2 Follow all safety and operating instructions to ensure that the meter is used safely and is kept in good operating condition.

3-3 safety symbols:

 Important safety information, refer to the operating manual.

 Dangerous voltage may be present.

 Double insulation (protection Class II)

4. Special Cautions for Operation

4-1 The meters can be safe only according to standard procedures when used in conjunction with the supplied test leads. To replace damaged test leads with only the same model or same electric specifications.

4-2 To avoid risk of electric shock, do not use the meters before the cover is in place.

4-3 The range switch should be right position for the testing.

4-4 To avoid electric shock and damaging the instruments, the input signals are forbidden to exceed the specified limits.

4-5 When measuring TV set or switched power, attention should be paid to the possible pulses that may bring destruction to the circuit.

4-6 Range switch position is forbidden to be changed at random during measurement.

4-7 Take caution against shock in the course of measuring voltage higher than DC 60V & AC 30V.

4-8 Protection fuse should be replaced only with same type and same specification.

4-9 After operation is finished, set function switch at OFF to save battery power.

4-10 If the meter is without usage for long time, take out battery to avoid damage by battery leakage.

5. General specifications

5-1 Max Voltage between input terminal and Earth Ground: CAT III 000V

5-2 Over-range Indication: display "OL" for the significant digit.

5-3 Automatic display of negative polarity "-".

5-4 Low Battery Indication: "E" displayed.

5-5 Max LCD display: 40000 counts digit & analogue bar graph.

5-6 Auto range & Manual range control

5-7 Auto Power Off: When measurement exceeds 15 minutes without switching mode and pressing key, the meter will switch to standby mode. Press any key to exit standby mode. When restart the system, press and hold **SELECT** key to disable auto power off.

5-8 Auto LCD backlight

5-9 Fuse protection: 500mA/500V Fast Fuse, 20A/500V Fast Fuse

5-10 Power supply: 9V 6F22 battery.

5-11 Operating temperature: 0°C~40°C (max. 80% RH).

5-12 Storage temperature: -20°C~60°C (max. 90% RH).

6. Testing specifications

6-1 DC Voltage

Range	Resolution	Accuracy
40mV	1 μ V	$\pm(0.5\%$ of rdg + 5 digits)
400mV	10 μ V	$\pm(0.05\%$ of rdg + 2 digits)
4V	100 μ V	
40V	1mV	
400V	10mV	
1000V	100mV	$\pm(0.05\%$ of rdg + 5 digits)

-- Impedance: 10M Ω , More than 100M Ω on 40mV/400mV range

-- Overload protection: 1000V DC or 750V AC rms

6-2 AC Voltage (True RMS)

Range	Resolution	Accuracy
40mV	1 μ V	$\pm(1.0\%$ of rdg + 10 digits)
400mV	10 μ V	$\pm(0.8\%$ of rdg + 10 digits)
4V	100 μ V	
40V	1mV	
400V	10mV	
750V	100mV	$\pm(1.2\%$ of rdg + 10 digits)

-- Impedance: 10M Ω , More than 100M Ω on 40mV/400mV range

-- Overload protection: 1000V DC or 750V AC rms

-- Frequency Range: 40 to 1kHz

6-3 DC Current

Range	Resolution	Accuracy
400 μ A	0.01 μ A	$\pm(1.0\%$ of rdg + 5 digits)
4000 μ A	0.1 μ A	
40mA	1 μ A	
400mA	10 μ A	
4A	100 μ A	$\pm(1.2\%$ of rdg + 10 digits)
20A	1mA	

-- Overload protection: 500mA/500V Fast Fuse, 20A/500V Fast Fuse, 20A up to 10 seconds

6-4 AC Current (True RMS)

Range	Resolution	Accuracy
400 μ A	0.01 μ A	$\pm(1.2\%$ of rdg + 10 digits)
4000 μ A	0.1 μ A	
40mA	1 μ A	
400mA	10 μ A	
4A	100 μ A	$\pm(1.5\%$ of rdg + 10 digits)
20A	1mA	

-- Overload protection: 500mA/500V Fast Fuse, 20A/500V Fast Fuse, 20A up to 10 seconds

-- Frequency Range: 40 to 400Hz

6-5 Resistance

Range	Resolution	Accuracy
400 Ω	0.01 Ω	$\pm(1.0\%$ of rdg + 10 digits)
4k Ω	0.1 Ω	$\pm(0.2\%$ of rdg + 10 digits)
40k Ω	1 Ω	
400k Ω	10 Ω	
4M Ω	100 Ω	
40M Ω	1k Ω	$\pm(0.5\%$ of rdg + 10 digits)

-- Overload protection: 500V DC or AC rms

6-6 Capacitance

Range	Accuracy	Resolution
9.999nF	$\pm(5.0\%$ of rdg + 10 digits)	1pF
99.99nF	$\pm(3.0\%$ of rdg + 10 digits)	10pF
999.9nF	$\pm(2.5\%$ of rdg + 5 digits)	100pF
9.999 μ F		1nF
99.99 μ F	$\pm(5.0\%$ of rdg + 10 digits)	10nF
999.9 μ F	$\pm(10.0\%$ of rdg + 20 digits)	100nF
9.999mF		1 μ F
99.99mF		10 μ F

-- Overload protection: 500V DC or AC rms

6-7 Frequency

Range	Accuracy	Resolution
9.999Hz	$\pm (0.1\%$ of rdg + 5 digits)	0.001Hz
99.99Hz		0.01Hz
999.9Hz		0.1Hz
9.999kHz		1Hz
99.99kHz		10Hz
999.9kHz		100Hz
9.999MHz		1kHz

-- Sensitivity: sine wave 0.6V rms (9.999MHz: 1.5V rms)

-- Overload protection: 500V DC or AC rms

6-8 Duty cycle

0.1%~99.9%: \pm (2.0% of rdg + 2 digits), Frequency lower than 10kHz

-- Sensitivity: sine wave 0.6V rms

-- Overload protection: 500V DC or AC rms



6-9 Temperature

Range	Accuracy		Resolution
°C	-20~150 °C 150~1000 °C	\pm (3 °C 3digits) \pm (3% of rdg + 3digits)	0.1 °C
°F	-4~302 °F 302~1832 °F	\pm (5 °F 5digits) \pm (3% of rdg + 5digits)	0.1 °F

-- NiCr-NiSi K-type sensor

-- Overload protection: 500mA/500V Fast Fuse

6-10 Diode and Audible continuity test

Range	Description	Test Condition
	Display read approximately forward voltage of diode	Forward DC current approx. 1.5mA Reversed DC voltage approx. 3.2V
	Built-in buzzer sounds if resistance is less than 50Ω	Open circuit voltage approx. 1V

Overload protection: 500V DC or AC rms

6-11 Transistor hFE test

Test range: 0-1000

I_b=10μA, V_{ce}=1.8V Approx.


6-12 Non Contact AC Voltage (NCV) detection


Test voltage range: 90V~1000V AC rms

The NCV red light and green light will light up alternately together with sound.

7. Operating instructions

7-1 Attention before operation

7-1-1 Check battery. When the battery voltage drop below proper operation range, the "" symbol will appear on the LCD display and the battery need to be changed.

7-1-2 Pay attention to the "" besides the input jack which shows that the input voltage or current should be within the specified value.

7-1-3 The range switch should be positioned to the desired range for measurement before operation.

7-2 Measuring DC & AC Voltage

7-2-1 Set the rotary switch at the desired “mV \sim ” or “V \sim ” range position, it shows symbol for testing DC voltage, if you want to test AC voltage, push “SELECT” button switch.

7-2-2 Connect the black test lead to **COMT-** jack and the red to **V Ω Hz** jack.

7-2-3 Connect test leads across the source or load under measurement.

7-2-4 You can get reading from LCD. The polarity of the red lead connection will be indicated along with the DC voltage value.

NOTE:

1. “ Δ ” means you can't input the voltage more than 1000V DC or 750V AC, it's possible to show higher voltage, but it may destroy the inner circuit or pose a shock.

2. Be cautious against shock when measuring high Voltage.

7-3 Measuring DC & AC Current

7-3-1 Set the rotary switch at the desired “uA \sim ” & “mA \sim ” & “A \sim ” range position, it shows symbol for testing DC current, if you want to test AC current, push “SELECT” button switch.

7-3-2 Connect the black test lead to **COMT-** jack and the red to the **μ AmAT+** jack for a maximum 400mA current, for a maximum 4A or 20A current, move the red lead to the **20A** jack.

7-3-3 Connect test leads in series with the load under measurement.

7-3-4 You can get reading from LCD. The polarity of the red lead connection will be indicated along with the DC current value.

NOTE:

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

2. When only “OL” is displayed, it indicates over-range situation and the higher range has to be selected.

3. “ Δ ” means the socket mA's maximum current is 500mA and 20A's maximum current is 20A, over 500mA or 20A current can be protected by the fast fuse.

4. On the 20A range, the measuring time should be less than 10 seconds to prevent precision from affecting by circuit heating.

7-4 Measuring Resistance

7-4-1 Set the rotary switch at the desired “ Ω \rightarrow \rightarrow ” range position.

7-4-2 Connect the black test lead to **COMT-** jack and the red to **V Ω Hz** jack.

7-4-3 Connect test leads across the resistance under measurement.

7-4-4 You can get reading from LCD.

NOTE: Max. input overload: 500V rms < 10sec

1. For measuring resistance above 1M Ω , the meter may take a few seconds to get stable reading.

2. When the input is not connected, i.e. at open circuit, the figure ‘OL’ will be displayed for the

over-range condition.

3. When checking in-circuit resistance, be sure the circuit under test has all power removed and that all capacitors have been discharged fully.

7-5 Measuring Capacitance

7-5-1 Set the rotary switch at the desired " \rightarrow " range position.

7-5-2 Connect the black test lead to **COMT-** jack and the red to **VΩHz** jack.

7-5-3 Connect test leads across the capacitance under measurement.

7-5-4 You can get reading from LCD.

NOTE: Max. input overload: 500V rms < 10sec

1. Capacitors should be discharged before being tested.
2. When testing large capacitance, it will take longer time before the final indication (For 100uF~99.99mF range, it will take about 10 seconds).
3. When testing small capacitance ($\leq 1\mu\text{F}$), to assure the measurement accuracy, first press "REL▲", then go on measuring.

7-6 Measuring Frequency & Duty cycle

7-6-1 Set the rotary switch at the desired "**Hz**" range position.

7-6-2 Connect the black test lead to **COMT-** jack and the red to **VΩHz** jack.

7-6-3 Push "**Hz/Duty**" key to choose **Frequency** or **Duty cycle** test.

7-6-4 Connect the probe across the source or load under measurement.

7-6-5 You can get reading from LCD.

7-7 Measuring Temperature

7-7-1 Set the rotary switch at the desired "**°C/°F**" range position, push "SELECT" to choose **°C** or **°F** measurement.

7-7-2 Connect the black banana plug of the sensor to **COMT-** jack and the red banana plug to the **μAmAT+** jack.

7-7-3 Put the sensor probe into the temperature field under measurement.

7-7-4 You can get reading from LCD.

NOTE:

1. The accessory of the meter WRNM-010 type contact thermocouple limit temperature is 250 °C (300 °F shortly), please use special probe for test higher temperature.
2. Please don't change the thermocouple at will, otherwise we can't guarantee to measure accuracy.
3. Please don't importing the voltage in the temperature function.

7-8 Diode & Audible continuity Testing

7-8-1 Set the rotary switch at the "**Ω → 🔔**" range position, push "SELECT" to choose **Diode** or **Audible continuity** measurement.

7-8-2 Connect the black test lead to **COMT-** jack and the red to **VΩHz** jack.

7-8-3 On **diode** range, connect the test leads across the diode under measurement, display

shows the approx. forward voltage of this diode.

7-8-4 On **Audible continuity** range, connect the test leads to two point of circuit, if the resistance is lower than approx. 50Ω , the buzzer sounds.

NOTE: Make sure the power is cut off and all capacitors need to be discharged under this measurement.

7-9 Transistor hFE Test

7-9-1 Set the rotary switch at the desired "hFE" range position.

7-9-2 Determine whether the transistor is NPN or PNP and locate the Emitter, Base and Collector leads. Insert the leads into the proper holes in the socket on the front panel.

7-9-3 You can get reading of the approximate hFE value from LCD.

NOTE: Don't connect an external voltage to measuring terminals.

7-10 Non Contact AC Voltage detection

7-10-1 Set the rotary switch at the desired "NCV" range position, the NCV green LED light will light up.

7-10-2 Hold the Meter so that the meter's top is vertically and horizontally centered and contacting the conductor, when the live voltage $\geq 90V$ AC rms, the NCV red LED light and green LED light will light up alternately together with sound.


NOTE:

1. Even without LED indication, the voltage may still exist. Do not rely on non-contact voltage detector to determine the presence of voltage wire. Detection operation may be subject to socket design, insulation thickness and different type and other factors.

2. When the meter input terminals presence voltage, due to the influence of presence voltage, voltage sensing indicator may also be bright.

3. Keep the meter away from electrical noise sources during the tests, i.e., florescent lights, dimmable lights, motors, etc.. These sources can trigger Non-Contact AC Voltage detection function and invalidate the test.

8. Battery replacement

8-1 When the battery voltage drop below proper operation range the  symbol will appear on the LCD display and the battery need to be changed.

8-2 Before changing the battery, set the selector switch to "OFF" position and remove the test leads from the terminals. Open the cover of the battery cabinet by a screwdriver.

8-3 Replace the old battery with the same type battery (9V 6F22).

8-4 Close the cover of the battery cabinet and fasten the screw.

9. Fuse replacement

9-1 This meter is provided with a 500mA/500V fast fuse to protect the temperature test and the current measuring circuits which measure up to 400mA, with a 20A/500V fuse to protect the 20A range.

9-2 Ensure the meter is not connected to any external circuit, set the selector switch to "OFF"

position and remove the test leads from the terminals. Open the cover of the battery cabinet by a screwdriver.

9-3 Replace the old fuse with the same type and rating: 6×30mm 500mA/500V fast fuse or 6×30mm 20A/500V fast fuse.

9-4 Close the cover of the battery cabinet and fasten the screw.

10. Maintenance

10-1 You must replace the test leads if the lead is exposed, and should adopt the leads with the same specifications as origin.

10-2 Use only moist fabric or small amount of detergent but not chemical solution for cleaning.

10-3 Do not use the meter before the back cover is properly closed and screw secured. Upon any abnormality, stop operation immediately and send the meter for maintenance.

10-4 Please take out the battery when not using for a long time.

11. Accessories

[1] Test Leads: electric rating 1000V 20A

[2] "K" type thermocouple sensor probe

[3] Operator's Manual



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