

3. FUNCTION DESCRIPTION

3.1 General Functions

3.1.1 Misconnection Alarm

The input jacks of the meter are equipped with sound and light alarms against misconnection of test leads.

1. At V, Ω , Hz, \blacktriangleleft , \blacktriangleright ranges:

- 1) The red lights at the "V" and "COM" jacks will be off after the test leads are plugged in.
- 2) The buzzer will sound upon misconnection of the test leads in the "mA" or "10A" jacks to warn the user. At the same time, the lights at the "V" and "COM" jacks will flash to remind the user to plug in the test leads there.

2. At mA, hFE, \blacktriangleleft ranges:

- 1) The red lights at the "mA" and "COM" jacks will be off after the test leads are plugged in.
- 2) The buzzer will sound upon misconnection of the test leads in the "V" or "10A" jacks to warn the user. At the same time, the red lights at the "mA" and "COM" jacks will flash to remind the user to plug in the test leads there.

3. At 10A range:

- 1) The red lights at the "10A" and "COM" jacks will be off after the test leads are plugged in.
- 2) The buzzer will sound upon misconnection of the test leads in the "V" or "mA" jacks to warn the user. At the same time, the lights at the "10A" and "COM" jacks will

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flash to remind the user to plug in the test leads there.

3.1.2 DATA HOLD mode

Data Hold mode makes the meter stop updating the display. Data Hold function can be cancelled by changing the measurement mode, or push **HOLD** key again.

To enter and exit the Data Hold mode:


1. Press **HOLD** key. Fixes the display on the current value, \square is displayed.
2. A second short press returns the meter to normal mode.

3.1.3 Battery Saver

Turn on the meter. And then The Meter will be turned off automatic after approx. 30 minutes.

3.2 Measurement Functions

3.2.1 AC and DC Voltage measurement

 **To avoid electrical shock and/or damage to the instrument, do not attempt to take any voltage measurement that might exceeds 1000Vdc or 750Vac rms.**
To avoid electrical shock and/or damage to the instrument, do not apply more than 1000Vdc or 750Vac rms between the common terminal and the earth ground.

Voltage is the difference in electrical potential between two points.

The polarity of ac (alternating current) voltage varies over time; the polarity of dc (direct current) voltage is constant.

The Meter's DC voltage ranges are 200.00mV, 2.0000V, 20.000V, 200.00V and 1000.0V; AC voltage ranges are 2.0000V, 20.000V, 200.00V and 750.0V.

To measure ac or dc voltage:

1. Set rotary switch to the proper range.


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2. Connect the black and red test leads to the COM and V terminals respectively.
3. Connect the test leads to the circuit being measured
4. Read the displayed value. The polarity of red test lead connection will be indicated when making a DCV measurement.

NOTE:

- Unstable display may occur especially at DC200mV and AC2V ranges, even though you do not put test leads into input terminals, in this case, if an erroneous reading is suspected, short the V terminal and the COM terminal, and make sure the zero display.

3.2.2 Resistance measurement

 **To avoid electrical shock and/or damage to the instrument, disconnect circuit power and discharge all high-voltage capacitors before measuring resistance.**

Resistance is an opposition to current flow.

The unit of resistance is the ohm (Ω).

The Meter's resistance ranges are 200.00 Ω , 2.0000k Ω , 20.000k Ω , 200.00k Ω , 2.0000M Ω , 20.000M Ω and 200.00M Ω .

To measure resistance:

1. Set the rotary switch to proper range.
2. Connect the black and red test leads to the **COM** and **Ω** terminals respectively.
3. Connect the test leads to the circuit being measured and read the displayed value.


Some tips for measuring resistance:

- The measured value of a resistor in a circuit is often different from the resistor's rated value. This is because

the Meter's test current flows through all possible paths between the probe tips.



- In order to ensure the best accuracy in measurement of low resistance, short the test leads before measurement and memory the test probe resistance in mind. This necessary to subtract for the resistance of the test leads.
- The resistance function can produce enough voltage to forward-bias silicon diode or transistor junctions, causing them to conduct. To avoid this, do not use the 2M Ω range for in-circuit resistance measurements.
- On 20M Ω and 200M Ω ranges, the meter may take a few seconds to stabilize reading. This is normal for high resistance measuring.
- When the input is not connected, i.e. at open circuit, the figure "1" will be displayed for the overrange condition.

3.2.3 Diode Test

 **To avoid electrical shock and/or damage to the instrument, disconnect circuit power and discharge all high-voltage capacitors before testing diodes.**

Use the diode test to check diodes, and other semiconductor devices. The diode test sends a current through the semiconductor junction, and 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:

1. Set the rotary switch to  range.
2. Connect the black and red test leads to the **COM** and  terminals respectively.
3. For forward-bias readings on any semiconductor component, place the red test lead on the

component's anode and place the black test lead on the component's cathode.

4. The meter will show the approx. forward voltage of the diode. If the test lead connection is reversed, only figure "1" displayed.


In a circuit, a good diode should still produce a forward bias reading of 0.5V to 0.8V; however, the reverse-bias reading can vary depending on the resistance of other pathways between the probe tips.

3.2.4 Continuity Check

⚠ To avoid electrical shock and/or damage to the instrument, disconnect circuit power and discharge all high-voltage capacitors before testing for Continuity.

Continuity is a complete path for current flow. The beeper sounds if a circuit is complete. These brief contacts cause the Meter to emit a short beep.

To test for continuity:

1. Set the rotary switch to  range.
2. Press the yellow key twice to activate Continuity Check.
3. Connect the black and red test leads to the COM and Ω terminals respectively.
4. Connect the test leads to the resistance in the circuit being measured.
5. When the test lead to the circuit is below approx. 50 Ω , a continuous beeping will indicate it.

Note:

- Continuity test is available to check open/short of the circuit.

3.2.5 Capacitance measurement


⚠ To avoid electrical shock and/or damage to the instrument, disconnect circuit power and discharge all high-voltage capacitors before measuring capacitance. Use the dc voltage function to confirm that the capacitor is discharged.

Capacitance is the ability of a component to store an electrical charge.

The unit of capacitance is the farad (F). Most capacitors are in the nanofarad to microfarad range.

The Meter's capacitance ranges are 20.000nF, 200.00nF, 2.0000 μ F, 20.000 μ F, and 200.00 μ F.

To measure capacitance:

1. Set the rotary switch to proper range.
2. Connect the black and red test leads to the **COM** and  terminals respectively (or you can measure the capacitance by using the special Multi-Function Socket).
3. Connect the test leads to the capacitor being measured and read the displayed value.

Some tips for measuring capacitance:

- The meter may take a few seconds to stabilize reading. This is normal for high capacitance measuring.
- To improve the accuracy of measurements less than 20nF, subtract the residual capacitance of the Meter and leads.

3.2.6 Transistor measurement

⚠ To avoid electrical shock and/or damage to the instrument, do not apply more than 250Vdc or 250Vac rms between the hFE terminal and the COM terminal.

1. Set the rotary switch to **hFE** range.
2. Connect the “com” plug and “+” plug of the special multi-function socket to the **COM** and **hFE** terminals.
3. Determine whether the transistor to be tested is NPN or PNP type and locate the Emitter, Base and Collector leads.
4. Insert leads of the transistor into proper holes of the special multi-function socket.
5. The meter will show the approx. hFE value.

3.2.7 Frequency measurement

⚠ Do not measure Frequency on high voltage (>380V) to avoid electrical shock hazard and/or damage to the instrument.

Frequency is the number of cycles a voltage or current signal completes each second.

To measure frequency:

1. Set the rotary switch to 20kHz range.
2. Connect the black and red test leads to the **COM** and **Hz** terminals respectively.
3. Connect the test leads to the circuit being measured
4. Read the displayed value.

3.2.8 Current measurement

⚠ To avoid damage to the Meter or injury if the fuse blows, never attempt an in-circuit current measurement where the open-circuit potential to earth is greater than 250V.
To avoid damage to the meter, check the meter's fuse before proceeding. Use the proper terminals, function, and range for your measurement. Never place the test leads in parallel with a circuit or component when the leads are plugged into the current terminals.

Current is the flow of electrons through a conductor.

The Meter's DC current ranges are 2.0000mA, 200.00mA and 10.000A; AC current ranges are 2.0000mA, 200.00mA and 10.000A.

To measure current:

1. Turn off the power of the measured circuit. Discharge all the high voltage capacitors.
2. Set the rotary switch to the proper range.
3. Connect the black test lead to the COM terminal and the red test leads to the mA terminal for a maximum of 200mA. For a maximum of 10A, move the red test lead to the 10A terminal.
4. Break the circuit path to be tested.
 Connect the black test lead to the more negative side of the break; connect the red test lead to the more positive side of the break. (Reversing the leads will give a negative reading, but will not damage the Meter.)
5. Turn on the power of the measured circuit, and then read the display. Be sure to note the measurement units at the right side of the display (mA or A). When only the figure "1" displayed, it indicates overrange situation and the higher range has to be selected.
6. Turn off the power of the measured circuit and discharge all the high voltage capacitors. Remove the test leads and recover the measured circuit.

4 TECHNICAL SPECIFICATIONS

4.1 GENERAL SPECIFICATIONS


- Environment conditions:
 - 1000V CAT. II and 600V CAT. III
 - Pollution degree: 2
 - Altitude < 2000m
 - Operating temperature:
 - 0~40°C, 32°F~122°F (<80% RH, <10°C noncondensing)

Storage temperature:

-10~60 °C, 14°F~140°F (<70% RH, battery removed)

- Temperature Coefficient:
0.1×(specified accuracy) / °C (<18°C or >28°C)
- MAX. Voltage between terminals and earth ground:
750V AC rms or 1000V DC.
- Fuse Protection: mA: Resettable fuse (F400mA/250V)
- Sample Rate: 3 times/sec for digital data.
- Display: 4 1/2 digits LCD display. Automatic indication of functions and symbols.
- Over Range indication: LCD will display "1".
- Low battery indication:

The "⊖" is displayed when the battery is under the proper operation range.

- Polarity indication: "-" displayed automatically.
- Power source: 9V 
- Battery type: NEDA 1604, 6F22, or 006P.
- Dimensions: 195(L)×92(W)×55(H) mm.
- Weight: 380g. Approx. (battery included).

4.2 Measurement specifications

Accuracy is specified for one year after calibration, at operating temperatures of 18 °C to 28 °C, with relative humidity at 0% to 75%.

Accuracy specifications take the form of: ±(% of Reading + Number of Least Significant Digits)

4.2.1 DC Voltage

Range	Resolution	Accuracy
200mV	0.01mV	±(0.05% of rdg + 5 digit)
2V	0.1mV	±(0.1% of rdg + 5 digit)
20V	1mV	
200V	10mV	
1000V	0.1V	±(0.15% of rdg + 5 digits)

Input impedance: 10MΩ

Max. input voltage: 250Vdc or ac rms for 200mV range and 1000Vdc or 750V ac rms for other ranges,

4.2.2 AC Voltage

Range	Resolution	Accuracy (50~60Hz)
2V	0.1mV	±(0.5% of rdg + 15 digits)
20V	1mV	±(0.8% of rdg + 15 digits)
200V	10mV	
750V	0.1V	±(1.0% of rdg + 15 digits)

Range	Resolution	Accuracy (50~60Hz)
2V	0.1mV	±(1.0% of rdg + 15 digits)
20V	1mV	±(1.0% of rdg + 50 digits)
200V	10mV	
750V	0.1V	±(1.2% of rdg + 50 digits)

Input impedance: 10MΩ

Max. input voltage: 250Vdc or ac rms for 200mV range and 1000Vdc or 750V ac rms for other ranges,

Frequency Range: 40Hz-400Hz

Response: Average, calibrated in rms of sine wave

4.2.3 Frequency

Range	Resolution	Accuracy
20kHz	1 Hz	±(1.5% of rdg + 15 digits)

Overload protection: 250V dc or 250V ac rms.


Input Voltage range: 200mV-10V ac rms

4.2.4 Resistance

Range	Resolution	Accuracy
200Ω	0.01Ω	±(0.5% of rdg + 10 digits)
2kΩ	0.1Ω	±(0.5% of rdg + 5 digits)
20kΩ	1Ω	
200kΩ	10Ω	
2MΩ	100Ω	
20MΩ	1kΩ	
200MΩ	10KΩ	±[5.0% of rdg + 20 digits]


Overload protection: 2500V dc or 250Vac rms.
Open Circuit Voltage: Less than 700mV.

4.2.5 Diode

Range	Resolution	Function
	0.1mV	Display read approx. forward voltage of diode

Forward DC Current: approx. 1mA
Reversed DC Voltage: approx. 1.5V
Overload protection: 250Vdc or 250Vac rms.

4.2.6 Audible continuity

Range	Continuity beeper
	≤50Ω

Open circuit voltage: Less than 700mV.
Overload protection: 250Vdc or 250Vac rms.

4.2.7 Transistor

Range	Description	Test Condition
hFE	Display read approx. HFE value (0-1000) of transistor under test (all type).	Base Current approx. 10 μ A, Vce approx. 2.8V.

Overload protection: Resettable fuse (F400mA/250V).

4.2.8 Capacitance

Range	Resolution	Accuracy
20nF	1pF	±(4.0% of rdg + 20 digits)
200nF	10pF	
2.0uF	0.1nF	
20.0uF	1nF	
200.0uF	10nF	

Overload protection: Resettable fuse (F400mA/250V).

4.2.9 DC Current

Range	Resolution	Accuracy
2mA	0.1μA	±(0.5% of rdg + 10 digits)
200mA	10μA	
10A	1mA	±(2.0% of rdg + 20 digits)

Overload protection: Resettable fuse (F400mA/250V). 10A range: F10A/250V fuse

Max. input current: 200mA dc or 200mA ac rms for mA range, 10A dc or 10A ac rms for 10A ranges.

For measurements>5A, 4 minutes maximum ON to measure 10 minutes OFF; Above 10A unspecified.

4.2.10 AC Current

Range	Resolution	Accuracy
2mA	0.1μA	±(0.8% of rdg + 20 digits)
200mA	10μA	±(1.2% of rdg + 20 digits)
10A	1mA	±(2.5% of rdg + 50 digits)

Overload protection: Resettable fuse (F400mA/250V). 10A range: F10A/250V fuse

Max. input current: 200mA dc or 200mA ac rms for mA range, 10A dc or 10A ac rms for 10A ranges.

For measurements>5A, 4 minutes maximum ON to measure 10 minutes OFF; Above 10A unspecified.

Frequency Range: 40Hz-400Hz

Response: Average, calibrated in rms of sine wave

5. MAINTENANCE

Do not attempt to repair or service your Meter unless you are qualified to do so and have the relevant calibration, performance test, and service information.

5.1 General Maintenance

⚠ To avoid electrical shock or damage to the meter, do not get water inside the case. Remove the test leads and any input signals before opening the case

Periodically wipe the case with a damp cloth and mild detergent. Do not use abrasives or solvents.

Dirt or moisture in the terminals can affect readings.

To clean the terminals:

- Turn the meter off and remove all test leads.
- Shake out any dirt that may be in the terminals.
- Soak a new swab with a cleaning and oiling agent (such as WD-40).
- Work the swab around in each terminal. The oiling agent insulates the terminals from moisture-related contamination.

5.2 Battery replacement

⚠ To avoid false readings, which could lead to possible electric shock or personal injury, replace the battery as soon as the battery indicator (🔋) appears.
Before replacing the battery, disconnect test leads and/or any connectors from any circuit under test, turn the meter off and remove test leads from the input terminals.

To replace the battery (see Figure 2.):

- Turn the meter off.
- Disconnect test leads and/or any connectors from the terminals.

- Use a screwdriver to unscrew the two screws secured on the battery cover.
- Take out the battery cover from the meter.
- Remove the used batteries.
- Replace with the new 9V batteries (6F22).
- Rejoin the battery cover and secure by the two screws.

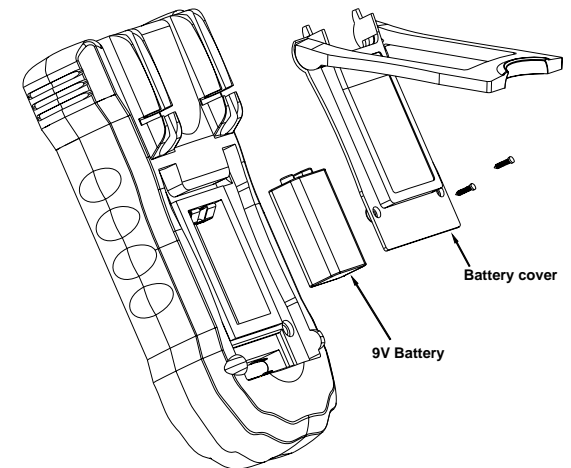


Figure 2. Battery and Fuse Replacement

⚠ CAUTION

Using this appliance in an environment with a strong radiated radio-frequency electromagnetic field (approx. 3V/m), may influence its measuring accuracy. The measuring result can be strongly deviating from the actual value.

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