

TENMA®



Digital Bench Multimeter










Model: 72-8715

IMPORTANT SAFETY INFORMATION

Please read these instructions carefully before use and retain for future reference.

- This meter is designed to meet IEC61010-1, 61010-2-032, and 61010-2-033 in Pollution Degree 2, Measurement Category (CAT I 1000V, CAT II 600V, CAT III 300V) and double Insulation.
- When using electrical appliances basic safety precautions should always be followed.
- Please operate according to this manual, otherwise the protection provided by the device will be impaired or fail.
- There are no user-serviceable parts in this product. Refer servicing to qualified personnel.
- Use only the test leads supplied or the protection may be impaired.
- Check the test leads, probe and case insulation condition before using. If you find any breakage, damage or abnormality, or you consider the device is broken, stop using the device immediately.
- When using the test probes, keep your fingers behind the finger protection rings.
- Ensure all inputs are less than the range selected otherwise it may cause electrical shock or meter damage.
- Take caution when voltages are above 60V DC and 30V AC rms.
- Do not use the meter with the battery or fuse covers removed.
- Do not adjust the range selector during measurement.
- Replace the batteries as soon as the low battery indicator appears on the display.
- Remove dead batteries from the meter or if it is not going to be used for a long time.
- Never mix old and new batteries together, or different types of batteries.
- Never dispose of batteries in a fire, or attempt to recharge ordinary batteries.
- Before replacing the battery, turn off the meter and disconnect all the test probes
- To prolong battery life turn off the meter after use.






ELECTRICAL SYMBOLS GUIDE

 AC or DC	 Ground	 Double insulated
 Warning	 Low battery	 Continuity test
 Diode test	 Capacitance test	 Fuse

WHAT'S INCLUDED

- Bench type digital multimeter.
- Operating manual.
- Power supply unit.
- Alligator clips (1 pair).
- Multi purpose socket.
- Test leads (1 pair).

FUNCTIONS

Range Selector Positions	Function
V 	AC and DC voltage measurement
	Continuity test
	Diode test
Ω	Resistance/continuity measurement
	Capacitance test
Hz	Frequency measurement
F	Capacitance measurement
°C	Temperature in celsius
hFE	Transistor test
A 	AC or DC current measurement

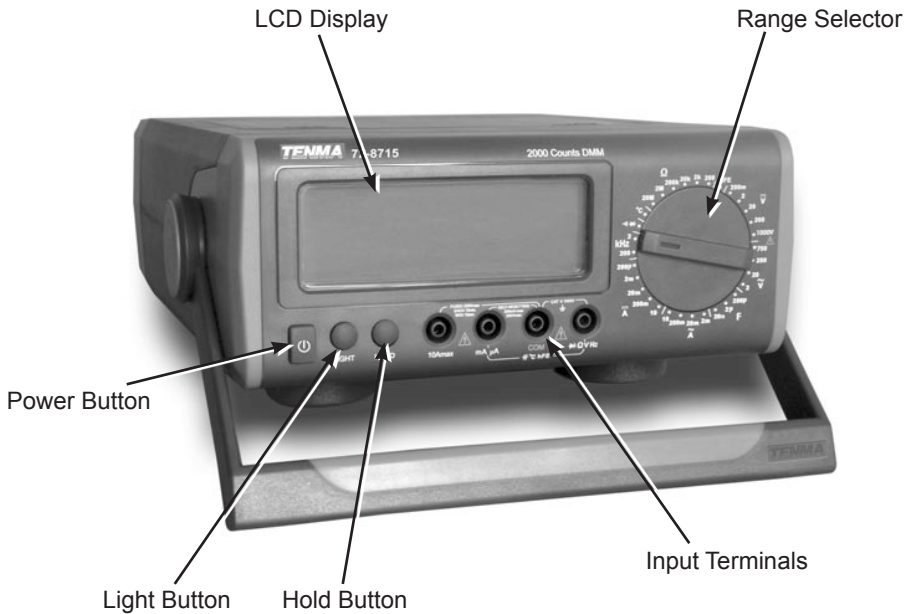
Function buttons	Operation performed
POWER	Turn the power on and off
LIGHT	Turn display back light on and off
HOLD	To enter or exit range hold in any mode

OPERATING PARAMETERS

- Ambient temperature : 0°C ~ 40°C.
- Relative humidity : ≤75% @ 0°C ~ 30°C, ≤50% @ 30°C ~ 40°C
- Maximum operating altitude 2000m
- Maximum Display : Digital: 1999
- Measurement Speed : Updates 2-3 times/second
- Polarity display : Automatic

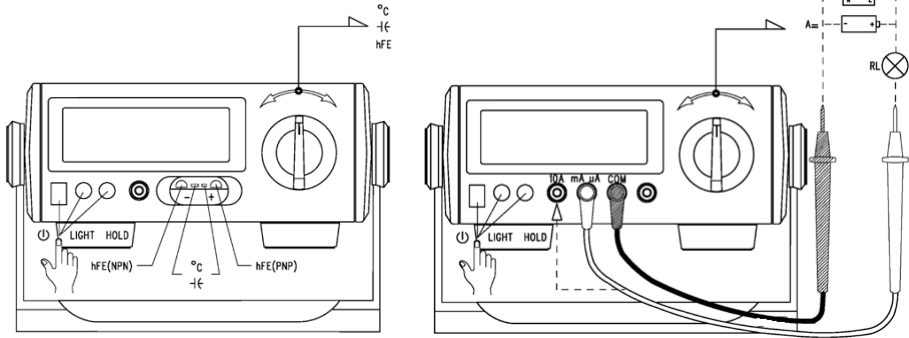
UNITS OF MEASUREMENT

mV,V	Unit of Voltage: The millivolt, volt
μA, mA, A	Unit of current: Microampere, milliampere, ampere
Ω, kΩ, MΩ	Unit of electrical resistance: Ohm, thousand ohms, trillion ohm
nF, μF	Unit of electrical capacity: Accepts the farad, the microfarad
kHz	Unit of Frequency: KiloHertz
°C	Unit of Temperature: Degree Celsius
β	Factor Unit of Triode enlargement: Times



Symbol	Terminal input	Explanation
V_{DC}	V \leftrightarrow COM	DC Voltage Measurement
V_{\sim}	V \leftrightarrow COM	AC Voltage Measurement
Ω	V \leftrightarrow COM	Resistance Measurement
$\rightarrow $ \rightarrow	V \leftrightarrow COM	Diode / Continuity Buzzer Measurement
kHz	V \leftrightarrow COM	Frequency Measurement
A_{DC}	mA μ A \leftrightarrow COM	mA/ μ A DC Current Measurement
	10A \leftrightarrow COM	A DC Current Measurement
A_{\sim}	mA μ A \leftrightarrow COM	mA/ μ A AC Current Measurement
	10A \leftrightarrow COM	A AC Current Measurement
F	V \leftrightarrow mA μ A (Use Multi-Purpose Socket)	Capacitance Measurement
$^{\circ}\text{C}$	V \leftrightarrow mA μ A (Use Multi-Purpose Socket)	Temperature Measurement
hFE	V \leftrightarrow mA μ A (Use Multi-Purpose Socket)	Triode Enlargement Factor Measurement

OPERATION



DC or AC Voltage Measurement

Warning: To avoid personal injury, or damage to the meter from electric shock, please do not attempt to measure voltages higher than 1000V although readings may be obtained.

To measure DC/AC voltage, connect the meter as follows:

- Insert the red test lead into the V terminal and the black test lead into the COM terminal.
- Set the rotary switch to $V\text{---}$ to select DC measurement mode.
- Set the rotary switch to $V\sim$ to select AC measurement mode.
- Connect the test leads across with the object being measured. The measured value shows on the display.
- When DC/AC voltage measurement has been completed, disconnect the connection between the test leads and the circuit under test.

Note: In each range, the meter has an input impedance of 10M Ω . This loading effect can cause measurement errors in high impedance circuits. If the circuit impedance is less than or equal to 10k Ω , the error is negligible (0.1% or less).

DC or AC Current Measurement

Warning: Before connecting the meter in series with the circuit under test, be sure power the circuit is off. If the fuse burns out during measurement, the meter may be damaged and there is risk of personal injury to the operator.

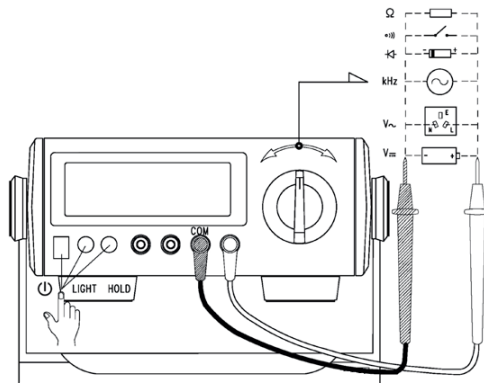
Use correct terminals, function, and range for the measurement. When the test leads are connected to the current terminals, do not connect in parallel across any circuit.

To measure current, do the following:

- Insert the red test lead into the mA μ A terminal and the black test lead into the COM terminal.
- Set the rotary switch to an appropriate measurement position in $\mu A\text{---}$, $mA\text{---}$ or $A\sim$ to select AC or DC measurement mode.
- Connect the test leads in series with the object being measured. The measured value shows on the display.

Note: If the value of current to be measured is unknown, use the maximum measurement position, and reduce the range step by step until a satisfactory reading is obtained.

- When current measurement is complete, disconnect the test leads from the circuit under test.



Warning: To avoid damage to the meter or to the devices under test, disconnect circuit power and discharge all the high-voltage capacitors before measuring resistance. To avoid possible injury, please do not attempt to input voltages higher than 60V DC or 30V AC.

Measuring Resistance.

To measure resistance, connect the meter as follows:

- Insert the red test lead into the Ω terminal and the black test lead into the COM terminal.
- Set the rotary switch to select Ω measurement mode.
- Connect the test leads across with the object being measured. The measured value shows on the display.

Note: When measuring low resistances, the test leads and internal wiring will add approximately $0.1 \sim 0.2\Omega$ of error. To obtain accurate readings in low-resistance, short-circuit the test lead beforehand and record the reading obtained, call this reading as X. Then use the equation: measured resistance value (Y) – (X) = accurate readings of resistance.

- If reading with shorted test leads is not $< 0.2\Omega$, check for loose test leads or possible incorrect function selection.
- When measuring high resistance ($>1M\Omega$), it is normal to take several seconds to obtain a stable reading.
- The LCD displays OL indicating open-circuit or the resistor value is higher than the maximum range of the meter.
- When resistance measurement has been completed, disconnect the connection between the test leads and the circuit under test.

Continuity Test

To test for continuity, connect the meter as below:

- Insert the red test lead into the Ω terminal and the black test lead into the COM terminal.
- Set the rotary switch to \rightarrow to select continuity measurement mode.
- Connect the test lead across with the object being measured. The buzzer sounds if the resistance of a circuit under test is $<10\Omega$, the circuit is in good condition.
- The measured value shows on the display and the unit is Ω .
- When continuity testing has been completed, disconnect the connection between the test leads and the circuit under test.

Diode Test

Perform the diode test to check diodes, transistors, 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, connect the meter as follows:

- Insert the red test lead into terminal and the black test lead into the COM terminal.
- Set the rotary switch to \rightarrow to select diode test measurement mode.
- For forward voltage drop 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. The measured value shows on the display.
- Note Connect the test leads to the proper terminals as said above to avoid error display.
- The LCD will display OL indicating diode being tested is open or polarity is reversed. The unit of diode is Volt (V), displaying the forward voltage drop readings.
- Open circuit voltage is around 2.7V.
- When diode testing is completed, disconnect the test leads from the device under test.

Capacitance Measurement

To measure capacitance, connect the meter as follows:

- Use the multi-purpose socket and connect to the V and mA μ A terminals.
- Set the rotary switch to \leftarrow F.
- Connect the test leads across with the object being measured. The measured value shows on the display.
- When measuring capacitance values larger than 600 μ F, it is normal for the meter to require some time to stabilize.
- The LCD displays OL indicating the tested capacitor is shorted or it exceeds the maximum range.
- When capacitance measurement has been completed, disconnect the test leads from the device under test.

Note: The Meter displays a fixed value which is the value of the meters own internal circuitry. To ensure accuracy, it is necessary to subtract this value from the displayed value when measuring small capacitors.

Frequency Measurement

Warning: To avoid the risk of personal injury, do not attempt to measure frequency with voltage higher than 30V RMS.

To measure frequency, connect the meter as follows:

- Insert the red test lead into the Hz terminal and the black test lead into the COM terminal.
- Set the rotary switch to Hz to select Frequency measurement mode.
- Connect the test leads across with the object being measured. The measured value shows on the display.
- When frequency measurement is complete, disconnect the test leads from the circuit under test.

Temperature Measurement

To measure temperature, connect the meter as follows:

- Set the rotary switch to °C to measure degree celsius temperature.
- Insert the multi-purpose socket into the corresponding Hz and COM terminal.
- Insert the temperature probe to the corresponding input terminal of the multi-purpose socket. Take care to ensure that proper polarity is observed when connecting to this socket.
- Place the temperature probe to the object being measured. The measured value shows on the display after few seconds.
- The included point contact temperature probe can only be used under 230°C.
- For any measurement higher than that, the rod type temperature probe must be used instead.
- When temperature measurement has been completed, disconnect the connection between the temperature probe, multi-purpose socket and the circuit under test and remove the multi-purpose socket from the input terminal.

Note

The testing environment must be between 18°C to 28°C to ensure accuracy especially when measuring low temperature. Different reading may be obtained when testing room environment under short or open circuit situation, then short-circuited reading shall be considered as the correct reading.

Measuring Transistor

To measure transistor, connect the meter as follows:

- Insert the multi-purpose socket into the μAmA and Hz input terminal.
- Set the rotary switch to hFE.
- Insert the NPN or PNP type transistor to be tested into the corresponding input terminals of the multipurpose socket.
- The measured nearest transistor value shows on the display.
- When transistor measurement has been completed, remove the tested transistor from the multi-purpose socket and remove the multi-purpose socket from the input terminal.



Turning on the Display Backlight

Warning: In order to avoid the hazard arising from mistaken readings in low light situations, please use display backlight function.

- Press LIGHT button to turn the display backlight on.
- Press LIGHT button again to turn the display backlight off.
- When using the AC power, the display backlight always stays on.

SPECIFICATION

DC Voltage			
Range	Resolution	Accuracy	Overload Protection
200mV	0.1mV	$\pm(0.5\%+2)$	1000V Input impedance: $\sim 10M\Omega$
2V	1mV		
20V	10mV		
200V	100mV		
1000V	1V	$\pm(0.8\%+3)$	
AC Voltage			
2V	1mV	$\pm(0.8\%+3)$	750V Input impedance: $\sim 10M\Omega$ Frequency: 45Hz to 400Hz Display True RMS
20V	10mV		
200V	100mV		
1000V	1V		
DC Current			
200 μ A	0.1 μ A	$\pm (0.8\%+2)$	Fuse 500mA, 250V fast type, f5x20mm
2mA	1 μ A		
20mA	10 μ A		
200mA	0.1mA		
10A	10mA	$\pm (2.0\%+4)$	Fuse 10A, 250V fast type, f5x20mm.
AC Current			
2mA	1 μ A	$\pm (1.0\%+3)$	Fuse 500mA, 250V, fast type, 5x20mm.
20mA	10 μ A		
200mA	0.1mA		
10A	10mA	$\pm (2.5\%+5)$	Fuse 10A, 250V, fast type, 5x20mm.

Resistance			
Range	Resolution	Accuracy	Overload Protection
200Ω	0.1Ω	± (0.8%+3)	250V rms
2kΩ	0.001kΩ		
20kΩ	0.01kΩ		
200kΩ	0.1kΩ		
2MΩ	0.001MΩ		
20MΩ	0.01MΩ	± (1.2%+5)	
200MΩ			
Capacitance			
20nF	10pF	± (4%+3)	250V rms
2μF	1nF		
200μF	100nF	± (5%+5)	
Frequency			
2kHz	1Hz	± (1.5%+5)	250V rms
200kHz	100Hz		
Temperature			
°C	1°C	-40°C to -20°C	-(8%+5)
		>20°C to 0°C	±(1.2%+4)
		>0°C to 100°C	±(1.2%+4)
		>100°C to 1000°C	±(2.5%+10)
			250V rms
Continuity Test			
Range	Resolution	Overload Protection	Remarks
	1Ω	250V rms	Open circuit voltage approximate 3V. When circuit disconnected with resistance value >100Ω buzzer does not sound. When circuit is in good connection with resistance value 10Ω buzzer sounds continuously
Diode Test			
	1mV	250V rms	Open circuit voltage approximate 3V.
Transistor			
hFE	1β	Fuse 500mA, 250V fast type, 5x20mm	Vce 2.5V, Ibo 10μA 1000β MAX

MAINTENANCE


Cleaning

- Periodically wipe the case with damp cloth and mild detergent. Do not use abrasives or solvents for cleaning.
- Clean the measurement probe tips occasionally, as dirt on the probes can affect reading accuracy.

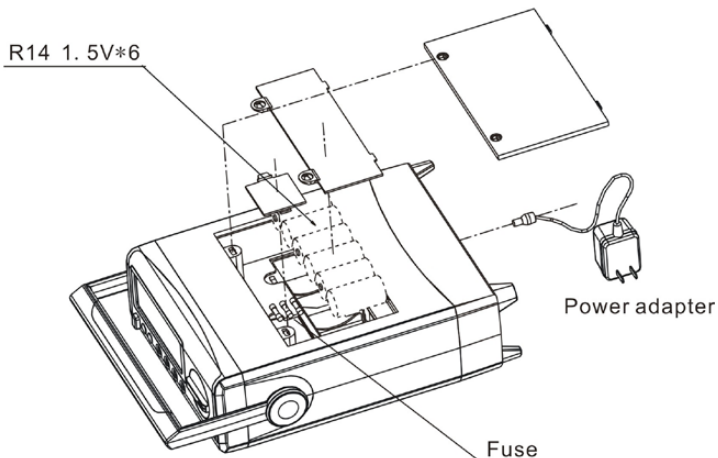
Replacing the fuses

- Press the POWER button to turn the meter off, disconnect the power cord and remove all connections from the terminals.
- Open the accessories compartment at the top of the front cover, then open the fuse compartment to replace fuses. Remove the fuse by gently prying it loose from its holder. Install the replacement fuse.
- Use ONLY replacement fuses with the identical type and specification as follows and make sure the fuse is inserted firmly in the holder.
- Fuse 1: 250mA, 250V, fast type, 5x20mm (AC220V)
- Fuse 2: 10A, 250V, fast type, 5x20 mm (A)
- Fuse 3: 250mA, 250V, auto recovery, 5x20 mm (μ A, mA)
- Fuse 4: 500mA, 250V, fast type, 5x20 mm (hFE)

Replacing the Battery

Warning: To avoid false readings, replace the battery as soon as the battery indicator “” appears when using battery to power on the meter.

- Press the POWER to turn the meter off and remove all connections from the terminals.
- Open the accessories compartment at the top of the front case.
- Open the battery compartment inside the accessories compartment.
- Remove all the batteries from the battery compartment.
- Replace the battery with new 6pcs of 1.5V battery (R14).
- Refit the battery compartment cover and also the accessories compartment cover.





INFORMATION ON WASTE DISPOSAL FOR CONSUMERS OF ELECTRICAL & ELECTRONIC EQUIPMENT

These symbols indicate that separate collection of Waste Electrical and Electronic Equipment (WEEE) or waste batteries is required. Do not dispose of these items with general household waste. Separate for the treatment, recovery and recycling of the materials used. Waste batteries can be returned to any waste battery recycling point which are provided by most battery retailers. Contact your local authority for details of the battery and WEEE recycling schemes available in your area.

