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UNI-T®

Model UT90B: OPERATING MANUAL

Overview

This Operating Manual covers information on safety and cautions. Please read the relevant information carefully and observe all the **Warnings** and **Notes** strictly.



Warning

To avoid electric shock or personal injury, read the "Safety Information" and "Rules for Safe Operation" carefully before using the Meter.

The **Model UT90B** (hereafter referred to as "the Meter") is a 1999 counts 3 1/2 digits multimeter with stabilized functions, safe design, and reliable performance.

In addition to the conventional measuring function, such as DC/AC voltage, DC/AC current, resistance, diode and continuity, it is equipped with advanced design of charging power through 220V AC or 12-36V AC/DC or solar energy. With such design, the Meter can be used without battery, therefore it will not cause chemical pollution. This is also a highly applied digital electrical tester of good performance with full icons display LCD, overload protection and streamline outlook.



Model UT90B: OPERATING MANUAL

Unpacking Inspection

Open the package case and take out the Meter. Check the following items carefully to see any missing or damaged part:

Item	Description	Qty
1	English Operating Manual	1 piece
2	Test Lead	1 pair
3	Holster	1 piece

In the event you find any missing or damage, please contact your dealer immediately.

Safety Information

This Meter complies with standards IEC61010: in pollution degree 2, overvoltage category (CAT. II 1000V, CAT. III 600V) and double insulation.

Use the Meter only as specified in this operating manual, otherwise the protection provided by the Meter may be impaired.

In this manual, a **Warning** identifies conditions and actions that pose hazards to the user, or may damage the Meter or the equipment under test.

A **Note** identifies the information that user should pay attention on.


International electrical symbols used on the Meter and in this Operating Manual are explained on page 8.

Rules For Safe Operation (1)



Warning









To avoid possible electric shock or personal injury, and to avoid possible damage to the Meter or to the equipment under test, adhere to the following rules:

- 1 Before using the Meter inspect the case. Do not use the Meter if it is damaged or the case (or part of the case) is removed. Look for cracks or missing plastic. Pay attention to the insulation around the connectors.
- 1 Inspect the test leads for damaged insulation or exposed metal. Check the test leads for continuity. Replace damaged test leads with identical model number or electrical specifications before using the Meter.
- 1 When using the test leads, keep your fingers behind the finger guards.
- 1 Do not apply more than the rated voltage, as marked on the Meter, between the terminals or between any terminal and grounding.
- 1 When the Meter working at an effective voltage over 60V in DC or 30V in AC, special care should be taken for there is danger of electric shock.
- 1 Use the proper terminals, function, and range for your measurements.
- 1 The rotary switch should be placed in the right position and no any changeover of range shall be made during measurement is conducted to prevent damage of the Meter.
- 1 Disconnect circuit power and discharge all high-voltage capacitors before testing current, resistance, diodes or continuity.
- 1 Replace the battery as soon as the battery indicator  appears. With a low battery, the Meter might produce false readings that can lead to electric shock and personal injury.

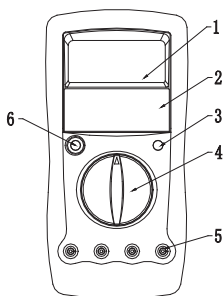
Rules For Safe Operation (2)

- 1 **When servicing the Meter, use only the same model number or identical electrical specifications replacement parts.**
- 1 **The internal circuit of the Meter shall not be altered at will to avoid damage of the Meter and any accident.**
- 1 **Soft cloth and mild detergent should be used to clean the surface of the Meter when servicing. No abrasive and solvent should be used to prevent the surface of the Meter from corrosion, damage and accident.**
- 1 **Turn off the Meter when it is not in use.**
- 1 **Do not use or store the Meter in an environment of high temperature, humidity, explosive, inflammable and strong magnetic field. The performance of the Meter may deteriorate after dampened.**
- 1 **The Meter is suitable for indoor use.**

International Electrical Symbols

	AC (Alternating Current).
	DC (Direct Current).
	Grounding.
	Double Insulated.
	Deficiency of Power.
	Fuse
	Warning. Refer to the Operating Manual.
	Conforms to Standards of European Union.

The Meter Structure (see figure 1)














(figure 1)

- ① LCD Display.
- ② Solar Panel.
- ③ Impedance Changeover Button.
- ④ Rotary Switch.
- ⑤ Input Terminals.
- ⑥ Power Button.


Rotary Switch

Below table indicated for information about the rotary switch positions.

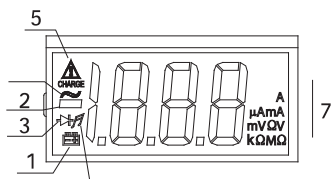
Rotary Switch Position	Function
V 	DC voltage measurement.
V 	AC voltage measurement.
A 	AC Current Measurement Range from 0.1μA to 10A
A 	DC Current Measurement Range from 0.1μA to 10A
 	 : Diode test.
	 : Continuity test.
Ω	Resistance measurement.
CHARGE	<ul style="list-style-type: none"> ● 230V  MAX: Charge at 220VAC. ● 12-36V  : Charge at 12-36V .

Functional Buttons

Below table indicated for information about the functional button operations.

AC	voltage measurement.
	Turn the power on and off.
LOW imp. Impedance changeover between 400k Ω 10M Ω and 400k Ω	

Display Symbols(1) (see figure 2)



(figure 2)

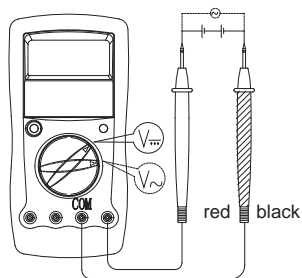
No.	Symbol	Meaning
1		The battery is low. ⚠Warning: To avoid false readings, which could lead to possible electric shock or personal injury, replace the battery as soon as the battery indicator appears.
2		Indicates negative reading.
3		Test of diode.
4		The continuity buzzer is on.
5		Charge indicator.
6		Indicator for AC voltage or current. The displayed value is the mean value.

Display Symbols(2) (see figure 2)

No.	Symbol	Meaning
7	$\Omega, k\Omega, M\Omega$	Ω : Ohm. The unit of resistance. $k\Omega$: kilohm. 1×10^3 or 1000 ohms. $M\Omega$: Megaohm. 1×10^6 or 1,000,000 ohms.
	mV, V	V: Volts. The unit of voltage. mV: Millivolt. 1×10^{-3} or 0.001 volts.
	$\mu A, mA, A$	A: Amperes (amps). The unit of current. mA: Milliamp. 1×10^{-3} or 0.001 amperes. μA : Microamp. 1×10^{-6} or 0.000001 amperes.

Measurement Operation(1)

A.DC & AC Voltage Measurement (see figure 3)



(figure 3)

⚠ Warning

To avoid harms to you or damages to the Meter from electric shock, please do not attempt to measure voltages higher than 1000V DC/750V AC although readings may be obtained.

Impedance Changeover Button turn on time must be ≤ 3 seconds. To avoid damages to the Meter, please do not attempt to press the Impedance Changeover Button when the measured voltage is higher than 250V.

The DC voltage ranges are: 200.0mV, 2.000V, 20.00V, 200.0V and 1000V.

The AC voltage ranges are: 2.000V, 20.00V, 200.0V and 750.0V.

To measure DC & AC voltage, connect the Meter as follows:

Measurement Operation(2)

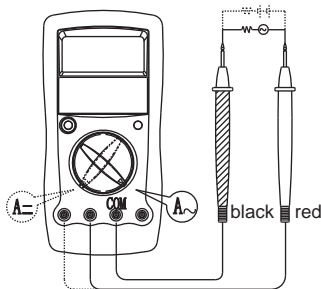
1. Insert the red test lead into the **VΩ** terminal and the black test lead into the **COM** terminal.
2. Set the rotary switch to an appropriate measurement position in **V_{DC}** or **V_{AC}**.
3. Connect the test leads across with the object being measured.

The measured value shows on the display.

Note

- 1 When DC/AC voltage measurement has been completed, disconnect the connection between the testing leads and the circuit under test.
- 1 In each range, the Meter has an input impedance of $10M\Omega$. This loading effect can cause measurement errors in high impedance circuits. If the circuit impedance is less than or equal to $10k\Omega$, the error is negligible (0.1% or less).

B.AC & DC Current Measurement (see figure 4)



(figure 4)

Measurement Operation(3)

Warning





Never attempt an in-circuit current measurement where the open-circuit voltage between the circuit and ground is greater than 60V.

If the fuse burns out during measurement, the Meter may be damaged or the operator himself may be hurt. Use proper terminals, function, and range for the measurement. When the testing leads are connected to the current terminals, do not parallel them across any circuit.

The measurement ranges of AC current are: 200.0 μ A, 2.000mA, 20.00mA, 200.0mA and 10.00A.

The measurement ranges of DC current are: 200.0 μ A, 2.000mA, 20.00mA, 200.0mA and 10.00A.

To measure current, do the following:

1. Turn off power to the circuit. Discharge all high-voltage capacitors.
2. Insert the red test lead into the μ A mA or 10A terminal and the black test lead into the COM terminal.
Use the 10A terminal and 10A  or 10A  range if the current value to be tested is an unknown.
3. Set the rotary switch to an appropriate measurement position in A  range or A .
4. AC current is displayed as an effective value of since wave (mean value response).
5. Break the current path to be tested. Connect the red test lead to the more positive side of the break and the black test lead to the more negative side of the break.
6. Turn on power to the circuit.
The measured value shows on the display.

Measurement Operation(4)

Note

- 1 For safety sake, the measuring time for high current should be less than 10 seconds for each measurement and the interval time between 2 measurements should be greater than 15 minutes.
- 1 When AC/DC current measurement has been completed, disconnect the connection between the testing leads and the circuit under test.

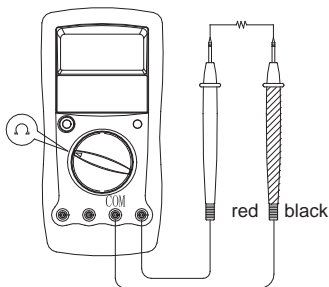
C.Test for Diodes & Continuity

Warning

To avoid possible damage to the Meter and to the device under test, disconnect circuit power and discharge all high-voltage capacitors before testing diodes and continuity.

To avoid harms to you, never attempt to measure voltages higher than 60V DC/30V AC.

Testing Diodes (see figure 5)



(figure 5)

Measurement Operation(5)

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

1. Insert the red test lead into the **V Ω - \rightarrow** terminal and the black test lead into the **COM** terminal.
2. Set the rotary switch to **\rightarrow \overline{A}** .
3. 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.

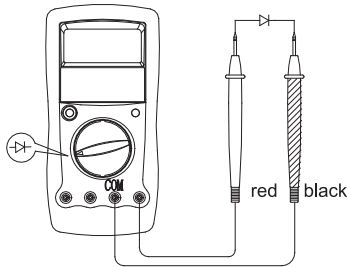
The measured value shows on the display.

Note

- In a circuit, a good diode should still produce a forward voltage drop reading of 0.5V to 0.8V; however, the reverse voltage drop reading can vary depending on the resistance of other pathways between the probe tips.
- Connect the test leads to the proper terminals as said above to avoid error display. The LCD will display **1** indicating open-circuit for wrong connection. The unit of diode is Volt (V), displaying the positive-connection voltage-drop value.
- When diode testing has been completed, disconnect the connection between the testing leads and the circuit under test.

Measurement Operation(6)

Testing Continuity (see figure 6)



(figure 6)

To test for continuity, connect the Meter as below:

1. Insert the red test lead into the $V\Omega$ \rightarrow terminal and the black test lead into the **COM** terminal.
2. Set the rotary switch to \rightarrow ∇ .
3. Parallel connect the test leads across with the circuit being measured.
4. The buzzer does not sound if the circuit is disconnected with resistance value is $> 100\Omega$.

The buzzer sounds continuously if the circuit is in good condition with resistance value $\leq 10\Omega$.

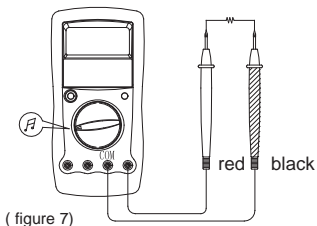
The nearest circuit resistance value shows on the display, the unit is Ω .

Note

- The LCD displays **1** indicating the circuit being tested is open.
- When continuity testing has been completed, disconnect the connection between the testing leads and the circuit under test.

Measurement Operation(7)

D. Resistance Measurement (see figure7)



Warning

To avoid damages to the Meter or to the devices under test, disconnect circuit power and discharge all the high-voltage capacitors before measuring resistance.

To avoid harms to you, never attempt to measure voltages higher than 60V DC/30V AC.

The resistance ranges are: 200.0 Ω , 2.000k Ω , 20.00k Ω , 200.0k Ω , 2.000M Ω and 20.00M Ω .

To measure resistance, connect the Meter as follows:

1. Insert the red test lead into the **V Ω** terminal and the black test lead into the **COM** terminal.
2. Set the rotary switch to Ω .
3. Parallel connect the test leads across with the object being measured.
4. The measured value shows on the display.

Note

- 1 The LCD displays 1 indicating open-circuit for the tested resistor or the resistor value is overload.
- 1 The test leads can add 0.1 Ω to 0.2 Ω of error to

Measurement Operation(8)

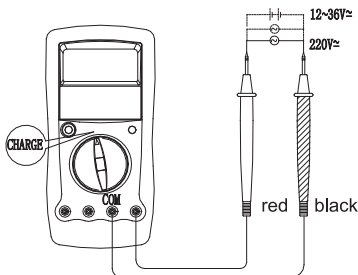
resistance measurement. To obtain precision readings in low-resistance measurement, that is the range of 200.0Ω , short-circuit the input terminals beforehand and record the reading obtained (called this reading as X). (X) is the additional resistance from the test lead.

Then use the equation:
measured resistance value (Y) (X) = precision readings of resistance.

- When the resistance reading $\geq 0.5\Omega$ in the short-circuit condition, please check for loose test leads or other reasons.
- For high-resistance measurement ($>1M\Omega$), it is normal taking several seconds to obtain a stable reading, and it is better to choose shorter test lead.
- When resistance measurement has been completed, disconnect the connection between the testing leads and the circuit under test.


Measurement Operation(9)

E.Power Charging (see figure 8)



(figure 8)


Warning

Start charging as soon as the power indicator  appears. With a low battery, the Meter might produce false readings that can lead to electric shock and personal injury.

To avoid damage to the Meter, please do not attempt to changeover the rotary switch during charging.


To set up charging as follows:

● Charge at 220V AC

1. Insert the red test lead into the $V\Omega$ terminal and the black test lead into the COM terminal.
2. Set the rotary switch to **230V~ MAX.**
3. Insert the test leads probe tip into the 220V AC power supply respectively.
4.  CHARGE shows on the display.
5. The charging time is around 5 mins. Take the DC Voltage range as an example, the continuous working time is ≥ 90 mins.

Measurement Operation(10)

● Charge at 12-36V \approx

1. Insert the red test lead into the $V\Omega\rightarrow$ terminal and the black test lead into the **COM** terminal.
2. Set the rotary switch to **12-36V \approx** .
3. Place the test leads/probe tip onto the 12-36V \approx power supply respectively.
4.  **CHARGE** shows on the display.
5. The charging time is around 5 mins. Take the DC Voltage range as an example, the continuous working time is ≥ 90 mins

● Charge by Solar Power

Charging through the solar panel from sunshine.

Remarks:

- Indicator $\square 8V \square$ on the display is rated charge voltage (comparative value)
- When power charging has been completed, disconnect the connection between the testing leads and the supply power.

The Impedance Changeover Button

Warning

To avoid damages to the Meter, do not use this Button when the measured voltage is higher than 250V. The turning on time of this Button must be less than 3 seconds.






To changeover the input impedance as follows:

- Press **LOW imp. 400k Ω** down to switch from 10M Ω to 400k Ω .
- Set free this button, the Meter defaults to 10M Ω .

The POWER Button

This is a self-lock switch use to turn on or off the power of the Meter.

General Specifications(1)

- Maximum Voltage between any terminals and grounding: Refer to different range input protection voltage.
-  Fuse Protection of μA mA terminal : 315mA, 250V, fast type, \varnothing 5x20mm
-  Fuse Protection of 10A terminal : 10A, 250V, fast type, \varnothing 5x20mm
- Measurement Speed : Updates 2-3 times /second.
- Maximum Display : 1999.
- Temperature : Operating: 0°C~40°C(32°F ~104°F).
Storage: -10°C~50°C(14°F ~122°F).
- Relative Humidity : \leq 75% @ 0°C to below 30°C;
 \leq 50% @ 30°C to 40°C.
- Altitude : Operating : 2000m.
Storage: 10000m.
- Power : Charge at 220VAC/50Hz/
0.35W or 12-36V  or solar panel.
- Electro-Magnetic : When it is under 1V/m frequency:
total accuracy = assigned accuracy + 5% of the range.
When it is over 1V/m frequency: there is no assigned accuracy.
- Battery Deficiency : Display  .
- Negative reading : Display  .
- Overloading: Display 1.
- Equipped with full icons display.
- Manual ranging.
- Polarity: Automatically display.
- Dimensions (HxWxL) : 179 x 88 x 39mm.
- Weight : 380g. (including holster and battery)

General Specifications(2)

- I Safety/Compliances : IEC61010: CAT. II 1000V,
CAT. III 600V overvoltage
and double insulation
standard.
- I Certification : **CE**

Accuracy Specification(1)

Accuracy: \pm (a% reading + b digits), guarantee for 1 year.

Operating temperature: 23°C~5°C.

Relative humidity: <75%.

Temperature coefficient: 0.1 x (specified accuracy) / 1°C.

A.DC Voltage

Range	Resolution	Accuracy	Overload Protection
200mV	0.1mV	$\pm(0.5\%+2)$	230VAC
2V	1mV		1000V DC or 750V AC continuous.
20V	10mV		
200V	100mV		
1000V	1V	$\pm(0.8\%+3)$	

Remark: Input impedance: 10M Ω

B.AC Voltage

Range	Resolution	Accuracy	Overload Protection
2V	1mV	40~100Hz: $\pm(0.8\%+5)$ 100~400Hz: $\pm(1.0\%+10)$	1000V DC or 750V AC continuous.
20V	10mV		
200V	100mV		
750V	1V	40~100Hz: $\pm(1.0\%+5)$ 100~400Hz: $\pm(1.0\%+10)$	

Remarks:

- 1 **Input impedance:** 10M Ω .
- 1 **Frequency response:** 40Hz~400Hz.
- 1 Display effective value of sine wave (mean value response).

Accuracy Specification(2)

C. AC Current

Range	Resolution	Accuracy	Overload Protection
200 μ A	0.1 μ A	40~100Hz: $\pm(1.2\%+5)$ 100~400Hz: $\pm(1.2\%+10)$	Fuse 315mA, 250V, fast type, \varnothing 5x20mm
2mA	1 μ A		
20mA	10 μ A		
200mA	0.1mA		
10A	10mA	40~100Hz: $\pm(2.0\%+5)$ 100~400Hz: $\pm(2.0\%+10)$	Fuse 10A, 250V, fast type, \varnothing 5x20mm

Remarks:

- Frequency response: 40Hz \square 400Hz.
- **At 10A Range:**
For continuous measurement \leq 10 seconds and interval not less than 15 minutes.
- It is displayed as an effective value of sine wave (mean value response).

D. DC Current

Range	Resolution	Accuracy	Overload Protection
200 μ A	0.1 μ A	$\pm(1.0\%+2)$	Fuse 315mA, 250V, fast type, \varnothing 5x20mm
2mA	1 μ A		
20mA	10 μ A		
200mA	0.1mA		
10A	10mA	$\pm(1.2\%+5)$	Fuse 10A, 250V, fast type, \varnothing 5x20mm

Remarks:

- **At 10A Range:**
For continuous measurement \leq 10 seconds and interval not less than 15 minutes.

Accuracy Specification(3)

E. Diodes & Continuity Test

Range	Resolution	Overload Protection
\rightarrow	1mV	230V rms
\mathcal{A}	1 Ω	

Remarks:

- **At \rightarrow Range:**
Open circuit voltage approximate 3V.
- **At \mathcal{A} Range:**
Open circuit voltage approximate 3V.
The buzzer does not sound when the resistance value is $>100\Omega$. The circuit is disconnected.
The buzzer sounds continuously when the resistance value is $\leq 10\Omega$. The circuit is in good condition.

F. Resistance

Range	Resolution	Accuracy	Overload Protection
200 Ω	0.1 Ω	$\pm(0.8\%+3)$ + short-circuit the input terminals	230V rms
2k Ω	1 Ω	$\pm(0.8\%+3)$	
20k Ω	10 Ω		
200k Ω	100 Ω		
2M Ω	1k Ω		
20M Ω	10k Ω	$\pm(1.2\%+5)$	

Remarks:

Open circuit voltage approximate 3V.

Maintenance(1)

This section provides basic maintenance information including battery and fuse replacement instruction.

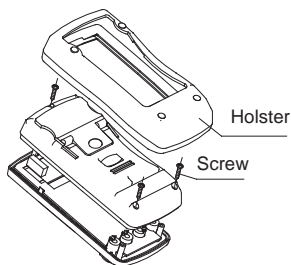
Warning

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. To avoid electrical shock or damage to the Meter, do not get water inside the case.

A. General Service

- 1 Periodically wipe the case with a damp cloth and mild detergent. Do not use abrasives or solvents.
- 1 To clean the terminals with cotton bar with detergent, as dirt or moisture in the terminals can affect readings.
- 1 Turn the Meter off when it is not in use and take out the battery when not using for a long time.
- 1 Do not store the Meter in a place of humidity, high temperature, explosive, inflammable and strong magnetic field.

B.Replacing the Fuses (see figure 9)



(figure 9)

Maintenance(2)



Warning

To avoid electrical shock or arc blast, or personal injury or damage to the Meter, use specified fuses ONLY in accordance with the following procedure.

To replace the Meter's fuse:

1. Turn the Meter off.
2. Remove the holster from the Meter.
3. Remove all connections from the Meter's terminals.
4. Remove the 3 screws from the case bottom, and separate the case top from the case bottom.
5. Remove the fuse by gently prying one end loose, then take out the fuse from its bracket.
6. Install ONLY replacement fuses with the identical type and specification as follows and make sure the fuse is fixed firmly in the bracket.
Fuse 1: 10A, 250V, fast type, $\phi 5 \times 20$ mm.
Fuse 2: 315mA, 250V, fast type, $\phi 5 \times 20$ mm.
7. Rejoin the case bottom and case top, and reinstall the 3 screws.

Replacement of the fuses is seldom required. Burning of a fuse always results from improper operation.

**** END ****

This operating manual is subject to change without notice.

UNI-T[®]

Model UT90B: OPERATING MANUAL

UNI-T®

Model UT90B: OPERATING MANUAL

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