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## Introduction

Uni-Trend Model UT511 insulation resistance tester (hereafter, "the Meter") is a handheld instrument designed primarily to make resistance/ insulation resistance measurement.

## Unpacking the Meter

The Meter includes the following items:

Table 1. Unpacking Inspection

Item	Description	Qty
1	English Operating Manual	1 piece
2	One plug test lead to one alligator 2 piec	
3	Two plugs test lead to one	1 piece
	alligator	
4	1.5V Battery (R14 or LR14)	8 pieces
5	Tool Box	1 piece
6	Power adaptor (optionally,	1 piece
	available at extra cost)	

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

## **Safety Information**

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

CAT II: Local level, appliance, PORTABLE EQUIPMENT etc., with smaller transient voltage overvoltages than CAT. III

CAT III: Distribution level, fixed installation, with smaller transient overvoltages than CAT. IV

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



**Danger** identifies conditions and actions that pose hazard(s) to the user.

Warning identifies avoiding electric shock.

Caution identifies conditions and actions that may damage the Meter and carrying out accurate measurement.

International electrical symbols used on the Meter and in this Operating Manual are explained on page 4~5.

## ▲ Danger

Use of instrument in a manual not specifed by the manufactuer may impair safety features/ protection provided by the equipment. Read the following safety information carefully before using or servicing the instrument.

- 1 Do not apply more than 1000VDC or 750V AC.
- 1 Do not use the Meter around explosive gas, vapor or dust.
- 1 Do not use the Meter in a wet environment.
- 1 When using the test leads, keep your figures away from the lead contacts. Keep your figures behind the finger guards on the leads.
- 1 Do not use the Meter with any parts or cover removed.
- 1 When carrying out insulation measurement, do not contact the circuit under test.

## A Warning

- 1 Do not use the Meter if it is damaged or metal part is exposed. Look for cracks or missing plastic.
- 1 Be careful when working above 30V rms, 42V ac rms and 60V DC. Such voltages pose a shock hazard.
- 1 Discharge all loading of circuit under test after measuring high voltage.
- 1 Do not change battery when the Meter is in wet environment.
- Place test leads in proper input terminals. Make sure all the test leads are firmly connected to the Meter's input terminals. Make sure the Meter is turned off when opening the battery compartment.

## ▲ Caution

1 When performing resistance tests, remove all power from the circuit to be measured and discharge all the power.

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- 1 When servicing the Meter, use only the same model number or identical electrical specifications of test leads and power adaptor.
- Do not use the Meter if the battery indicator
   ( →) shows a battery empty condition. Take the battery out from the Meter if it is not used for a long time.
- 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 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.

Dry the Meter before storing if it is wet.

## International Electrical Symbols

International symbols on the Meter and in this manual are explained in Table 2.

#### Table 2. International Electrical Symbols

<u>\$</u>	Risk of electric shock	
	Equipment protected by double or	
	reinforced insulation.	
•••	DC Measurement	
~	AC Measurement	
놑	Grounding	
Â	See Manual	
	Empty of Built-In Battery	
CE	Conforms to Standards of European Union	

## **Battery Saver (Sleep Mode)**

The Meter enters the Sleep Mode and blanks the display if there is no button press for 15 minutes. This is done to conserve battery power. The Meter comes out of Sleep Mode when **ON/OFF** button is pressed two times.

The 15 minutes timer is disabled during any insulation resistance measurement. The time period starts immediately following any measurement.

## **Battery Indication**

There is a battery indicator shows on the display upper left hand corner. Below Table 3 is the explanation:

Table 3. Battery Indication

Battery Indicator	Battery Voltage	
	8.5V or less. It means the battery is	
	empty, don't use the Meter as it cannot	
	guarantee accuracy.	
<b>I</b>	8.6V~9.0V. It means the battery is nearly	
	empty, replacing battery is necessary.	
	Accuracy will not be affected.	
	9.1V~10.2V	
	10.3V or more	

## **The Meter Structure**

Below Figure 1 and Table 4 shows the Meter front structure and description

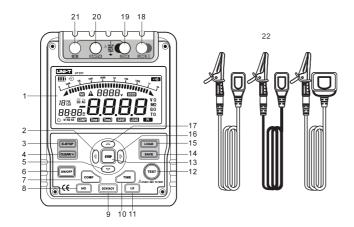


Figure 1. The Meter Front Structure

## Table 4. Meter Front Description

1	LCD	12	Test Button
2	2 ◀ Scroll Button 13 Step Button		Step Button
3	Emergency stop	14	Data Store Button.
4	Data Clear the	15	Data Recall Button
	Display Backlight		
	Button,		
5	Down Button	16	Scroll Button
6	On/Off Button	17	▲ Up Button
7	Compare Button 18 LINE: Resistance		LINE: Resistance
			input terminal
8	Insulation Resistance		COM: Voltage input
	Button		terminal
9	Voltages	20	EARTH: Resistance
	measurement Button		input terminal
10	Timer Button.	21	V: Voltage input
			terminal
11	Low Resistance	22	Testing leads
	measurement Button		



Below Figure 2 and Table 5 shows the Meter side structure and description

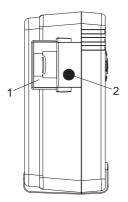


Figure 2. The Meter Side Structure (Side View)

Table 5. Meter Side Description

1	Safety Shutter
2	Power adaptor Input Terminal

## Display

Table 6 and Figure 3 describe the display.

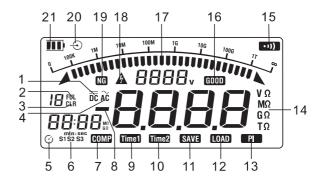


Figure 3. Display

Number	Meaning	Number	Meaning	
1	Indicator for DC voltage	12	Data recall is on	
2	Indicator for data store full	13	Indicator for polarization index	
3	3 Indicator for clearing 14 Unit symbols		Unit symbols	
4	4 Indicator for AC voltage 15 The continuity buzzer is on		The continuity buzzer is on	
5	5 Indicator for timer 16 Compare feature pass		Compare feature pass	
6	Step symbol         17         Analogue bar graph		Analogue bar graph	
7	Indicates selected pass/fail compare	18	Risk of electric shock	
	value			
8	8 Indicates for negative reading 19 Compare feature fail		Compare feature fail	
9	9 Timer 1 symbol 20 Indicator for power adaptor		Indicator for power adaptor	
10	Timer 2 symbol	21	Battery life indicator	
11	Data store is on			

Table 6. Display Description



## **Key Functions**

[	1		
ON/OFF	Turn on or off the Meter. Press and hold		
	the button for 1 second to turn the Meter		
	on.		
CLEAR/ 🔆	Press to clear the stored data, Push 1		
	SEC to turn on and off the display		
	backlight.		
SAVE	Press to store the current measurement		
	value. The maximum number of stored		
	reading is 18. When the stored readings		
	memory is full, the Meter shows FULL		
	and stop storing. Press CLEAR to clear		
	the stored value in order to store the		
	next measurement value.		
LOAD	1 Press once to recall the first stored		
	value.		
	1 Press again to exit Load feature.		
	1 Load feature can only be used when		
	there is no high voltage output.		

## Table 7. Key Description

	1	Under insulation resistance measurement mode: press to select one voltage range up.
	1	Under load mode: press to recall the previous stored value.
▼	1	Under insulation resistance measurement mode: press to select one voltage range down.
	1	Under load mode: press to recall the next stored value.
•	1	When set the timer duration for the measurement of insulation resistance or polarization index, press to decrement the time. The maximum length of time is 30 minutes, the Meter will automatically carry out measurement.

•	<ol> <li>When compare feature measuring insulation resistance, press to decrement a resistance comparing value.</li> <li>After polarization index measurement, press to display polarization index, TIME 2 insulation resistance value and TIME 1 insulation resistance</li> </ol>	► STEP	1   F   s
	value in sequence.		1
	<ol> <li>When set the timer duration for the measurement of insulation resistance or polarization index, press to increment the time. The maximum length of time is 30 minutes, the Meter will automatically carry out measurement.</li> <li>When use the compare feature measuring insulation resistance, press to increment a resistance comparing value.</li> </ol>		

## Table 7. Key Description

	<ol> <li>After polarization index measurement, press to display polarization index, TIME 2 insulation resistance value and TIME 1 insulation resistance value in sequence.</li> </ol>
STEP	<ul> <li>Press to display S1→S2→S3 in sequence.</li> <li>1 When the Meter is under timed measurement or polarization index measurement:</li> <li>&gt; S1 means increment of 1, then each press of &gt; increase 1 or &lt; decrease 1.</li> <li>&gt; S2 means increment of 10, then each press of &gt; increase 10 or &lt; decrease 10.</li> <li>&gt; S3 means increment of 30, then each press of &gt; increase 30 or &lt; decrease 30.</li> </ul>



STEP	<ol> <li>When the Meter is under compare mode:</li> </ol>	
	<ul> <li>S1 means increment of 1, then each press of ▶ increase 1 or ◄ decrease 1.</li> <li>S2 means increment of 10, then each press of ▶ increase 10 or ◄ decrease 10.</li> <li>S3 means increment of 100, then each press of ▶ increase 100 or ◄ decrease 100.</li> </ul>	
COMP	Set a pass / fail limit for insulation tests. The default value is $100M\Omega$	
TIME	Pres to step through continuous measurement, timed measurement and polarization index measurement in sequence.	
TEST	Press to stop or start an insulation resistance test	
Но	Press to initiate insulation resistance measurement	

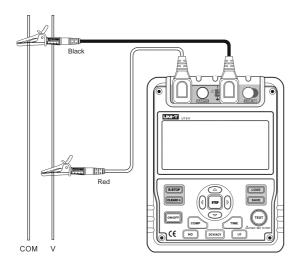
Table 7. Key Description

Lo	Press to initiate low resistance measurement
DVC /ACV	Pres to initiate voltages measurement
E-STOP	Emergency stop button. Press this button when the Meter is hang and cannot turn off the power.

## **Measurement Operation**

Below section explains how to make measurements.

## A. Measuring Voltages



### Figure 4. Voltages Measurement



Special care should be taken when measuring high voltage.

## \land Warning

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

To measure voltages, set up the Meter as Figure 4 and do the following:

- Press DCV or ACV button to select DC voltage or AC voltage measurement
- 2. Insert the red test lead into the V terminal and the black test lead into the COM terminal.
- 3. Connect the red and black alligator clip to the circuit to be measured.
- 4. During measurement, when the red test lead is negative voltage, then "-" shows on the display.



## Note

1 When voltage measurement has been completed, disconnect the connection between the testing leads and the circuit under test and remove testing leads away from the input terminals of the Meter.

## **B.** Measuring Insulation Resistance

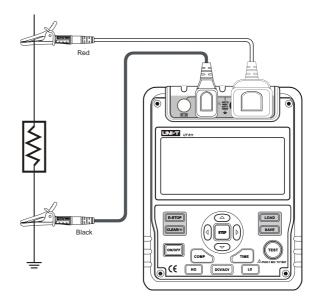


Figure 5. Insulation Resistance Measurement

## ▲ Caution

- 1 When performing insulation resistance tests, remove all power from the circuit to be measured and discharge all the power.
- 1 Do not short circuit two test leads under high voltage status.
- 1 Do not measure insulation resistance after high voltage output.
- $\begin{array}{ll} \textbf{Do not measure over 10 seconds when:}\\ \textbf{100V measure resistance lower than 500k} \Omega\\ \textbf{250V measure resistance lower than 1M} \Omega\\ \textbf{500V measure resistance lower than 2M} \Omega\\ \textbf{1000V measure resistance lower than 5M} \Omega\\ \end{array}$
- <sup>1</sup> When the measurement is completed, don't touch the circuit as the circuit has already stored capacitance which may cause electric shock.
- <sup>1</sup> Don't touch the test leads even after it has been removed from the circuit until voltages are all released.

To measure insulation resistance, set up the Meter as Figure 5 and do the following:

- 1. Press **HO** button to select insulation resistance measurement.
- Press ▲ and ▼ button to select voltages of 100V, 250V, 500V or 1000V.
- 3. Insert the red test lead into the LINE terminal and the black test lead into EARTH terminal.
- 4. Connect the red and black alligator clip to the circuit to be measured, positive voltage output from **LINE** terminal.
- 5. Choose below insulation resistance measurement mode.

## a) Continuous Measurement

- 1 Press **TIME** button to select continuous measurement mode, there is no timer icon on the LCD.

 Press TEST button to close the insulation resistance measurement voltage when measurement is completed. TEST button lights off A, disappears. The LCD shows the current insulation resistance measurement value.

## b) Timed Measurement

- 1 Press **TIME** button to select timed measurement mode, the LCD displays **TIME 1** and **(b)** symbols.
- 1 Press  $\triangleleft$  >, and STEP buttons to set the time (00:05~29:30).
- 1 Then press and hold **TEST** button for 1 second to carry out timed measurement. **TIME 1** and ▲ are displayed and blinked on the LCD on every 0.5 seconds.
- 1 When the set time is reached, the insulation resistance measurement voltage will be closed and the measurement will be automatically stopped. The LCD displays the insulation resistance reading.

## c) Polarization Index (PI) Measurement

- 1 Press **TIME** button to select timed measurement mode, the LCD displays **TIME 1** and **U** symbols.
- Press ◀ ►, and STEP buttons to set the time (00:05~29:30).
- 1 Press **TIME** button again. **TIME 2**, **PI** and **U** symbols appear on the LCD.
- Press ◀ ►, and STEP buttons to set the time (00:10~30:00).
- 1 Then press and hold **TEST** button for 1 second to carry out timed measurement.
- 1 **TIME 1** and *▲* are displayed and blinked on the LCD on every 0.5 seconds before **TIME 1** set time is reached.
- 1 **TIME 2** and ▲ are displayed and blinked on the LCD on every 0.5 seconds before **TIME 2** set time is reached.
- When the two set time are reached, the insulation resistance measurement voltage will be closed and the measurement will be automatically stopped. The LCD displays the polarization index reading.

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 Press ◀ ►, to set through the polarization index, TIME 2 insulation resistance reading and TIME 2 insulation resistance reading.

Information:

PI = 3 minutes ~10 minutes reading / 30 second ~1 minutes reading

PI	4 or more	4~2	2.0~1.0	1.0 or less
Standard	The best	Good	Warning	Bad

## d) Compare Function

- 1 Press **COMP** button to select compare feature. **COMP** symbol displays on the LCD.
- Press ◀ ►, and STEP buttons to set the compare value. The minimum value is 1M The maximum value is the maximum tested voltage allowable measurement value.
- 1 Press and hold **TEST** button for 1 second to carry out the measurement.
- 1 The **NG** symbol will display if the insulation resistance value is smaller than resistance value. Otherwise **GOOD** symbol will be displayed.

## C. Low Resistance Measurement

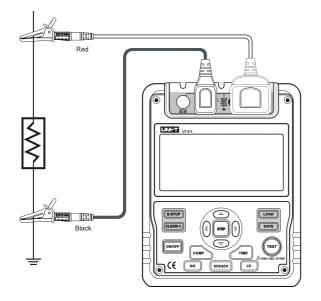


Figure 6. Low Resistance Measurement

## ▲ Caution

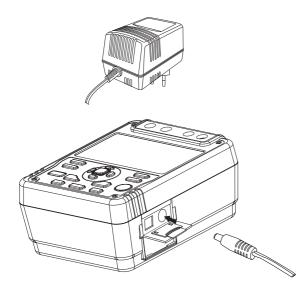
1 When performing insulation resistance tests, remove all power from the circuit to be measured and discharge all the power.

To measure low resistance, set up the Meter as Figure 6 and do the following:

- 1. Press **LO** button to select low resistance measurement..
- 2. Insert the red test lead into the LINE terminal and the black test lead into EARTH terminal.
- 3. Connect the red and black alligator clip to the circuit to be measured. When the resistance is less than 30 the buzzer sounds.
- 4. This range can test LED diode. Connect the anode LED diode to the red test lead, the LED diode will light up if it is good. If the LED diode does not light up, it means it is damaged.

## The Use of Power Adaptor

The use of power adaptor, see figure 7



1. Open the side safey shutter, then you will see there is a power adaptor input terminal.

- 2. Make sure the Meter is power off and Insert the UT511 power adaptor to the input terminal.
- 3. It is highly recommed to take out all the batteries when you are using the power adaptor.
- Make sure the Meter is power off when you disconnect the UT511 power adaptor from the Meter. (Input voltage 230VAC, Frequency 50/60Hz, Input current 50mA, Output voltage DC 15V, MAX current 600mA)

## ▲ Caution

If you want to choose power adaptor for power supply, please use special power adaptor SA48-150060EU which supported by our company, otherwise it will be dangerous.

Figure 7. The Use of Power Adaptor

## Maintenance

This section provides basic maintenance information including battery replacement instruction.

## \land 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.

## 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 to OFF when it is not in use.
- 1 Take out the battery when it is not using for a long time.
- 1 Do not use or store the Meter in a place of humidity, high temperature, explosive, inflammable and strong magnetic field.
- 1 If the Meter is wet, dry it before use.

## **B.** Replacing the Battery

## \land Warning

To avoid electric shock, remove all the test leads from the Meter when replacing the batteries.

## A Caution

- 1 Don't mix to use old and new batteries.
- 1 Be careful the polarity is correct when installing batteries.
- 1 Do not use the Meter if the battery indicator ( ) shows a battery empty condition.

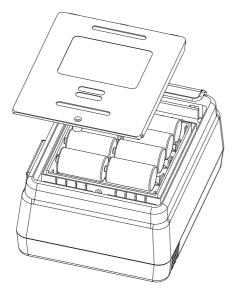


Figure 8. Battery Replacement

Follow Figure 8 and proceed as follows to replace the battery:

- 1 Turn the Meter to OFF and remove all connections from the terminals.
- 1 Remove the screw from the battery compartment, and separate the battery compartment from the case bottom.
- 1 There are 8pcs of 1.5V (R14) carbon battleries in the meter, except this, it can support 1.5V (LR14) alkalescence batteries and the special power apapter which our company provided.
- 1 Rejoin the case bottom and battery compartment, and reinstall the screw.



## Specifications

## **Safety and Compliances**

Certification	CE
Compliances	IEC 61010 CAT.II 1000V, CAT.III 600V overvoltage and double insulation standard

## **Physical Specifications**

Display (LCD)	Digital: 9999 counts Analog bar graph.		
Operating Temperature	0°C~40°C (32°F~104°F)		
Storage Temperature	-20°C~60°C (-4°F~140°F)		
Relative Humidity	≤ 85% @ 0°C~40°C below;		
	≤ 90% @ -20°C~60°C:		
Battery Type	8pcs of 1.5V (R14 or LR14) batteries or DC15V power adaptor. DC15V		
	power adaptor is optionally at extra cost.		
Dimensions (HxW xL)	202 x 155 x 94 mm		
Weight	Approx. 2kg (including battery)		

## **General Specifications**

Range	Auto
Overloading	Display <b>OL</b> on insulation resistance range
Battery Indicator	Display 🔄 🔲 🎹
Icon Display	Equips with function and battery indicator icons.
Current Consumption	Maximum: around 90mA
	Average: around 20mA

## **Feature Summary**

Display Backlight	Bright backlight for clear readings in poorly lighted areas.	
Autorange	The Meter automatically selects best range	
Warning		
Voltage	Auto release voltage	
COMP Measurement Use the Compare function to set a pass/fail compare level for the ins		
measurements.		
PI Measurement	Polarization Index is the ratio of insulation resistance. You can pre-set two point of times and automatically carry out the measurement.	



## **Detailed Accuracy Specifications**

Accuracy:  $\pm$ ([% of reading] + [number of least significant digits), guarantee for 1 year. Operating temperature: 18°C ~28°C

Relative humidity: 45~75%RH

## A. Voltage Measurement

	DC Voltage	AC Voltage
Measurement Range	±30 ~ ±1000V	30V~750V (50/60Hz)
Resolution	1V	
Accuracy	±(2%+3)	30~100V±(2%+5) 100~750V±(2%+3)

## **B. Insulation Resistance Measurement**

Output Voltage	100V	250V	500V	1000V
Display Range	0.1MΩ~99.9MΩ	0.5MΩ~99.9MΩ	1MΩ~99.9MΩ	2ΜΩ~99.9ΜΩ
	100~500MΩ	100~999MΩ	100~999MΩ	100~999MΩ
		1.00~1.99GΩ	1.00~3.99GΩ	1.00~10.00GΩ
Open Circuit Voltage	DC100V + 20%,-0%	DC250V + 20%, -0%	DC 500V + 20%, -0%	DC1000V + 20%, -0%
Test Current	1mA~1.2mA@100kΩ	1mA~1.2mA@250kΩ	1mA~1.2mA@500kΩ	$1mA~1.2mA@1M\Omega$
Short Circuit	Around 2.0mA			
Accuracy	100kΩ to 100MΩ : ±(3%+5) 100MΩ above: ±(5%+5)			

## ▲ Caution

At any output voltage, when the tested resistance is les than 5M $\Omega$ , the testing time cannot exceed 10 seconds.

## **C. Low Resistance Measurement**

Function	Resistance
Measurement Range	0.1Ω~999.9Ω
Resolution	0.1Ω
Accuracy	<u>±(1%+3)</u>
Maximum open circuit voltage	Around 2.8V
Buzzer	Open at less than $30\Omega$
Overload Protection	220V rms/10 seconds



## \*END\*

This operating manual is subject to change without notice.

#### Model UT511: OPERATING MANUAL

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