UT511

Operating Manual

Insulation Resistance Tester

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 pc
2	One-plug test lead to one alligator	1 pair
3	Two-plug test lead to one alligator	1 pc
4	1.5V Battery (R14 or LR14)	8 pcs
5	Tool Box	1 pc
6	Power adaptor (optionally, available at extra cost)	1 pc

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

Safety Information

This Meter complies with EN 61010-1:2010 measurement requirement: Pollution Degree 2, measurement category CAT III 600V, CAT II 1000V and Double Insulation

CAT II (measurement category): Test and measuring circuits connected directly to utilization points (socket outlets and similar points) of the low-voltage MAINS installation.

CAT III (measurement category): Test and measuring circuits connected to the distribution part of the building’s low-voltage MAINS installation.

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** alerts users to avoid electric shock.

⚠ **Caution** identifies conditions and actions that may damage the Meter and affect accurate measurement.

⚠ 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.

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

⚠ Warning

- **Do not use the Meter if it is damaged or metal part is exposed. Look for cracks or missing plastic.**
- **Be careful when working above 33Vrms, 46.7Vac rms and 60Vdc. Such voltages pose a shock hazard.**
- **Discharge all loading of circuit under test after measuring high voltage.**
- **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

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

- **When servicing the Meter, use only only the test leads and power adaptor with the same model number or identical electrical specifications.**
- **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.**
- **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

	Risk of electric shock
	Equipment protected throughout by DOUBLE INSULATION or REINFORECD INSULATION
	Direct current
	Alternating current
	Grounding
	Caution
	Low Battery Indication
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 shown on the upper left corner of the display. Please refer to Table 3 for detailed 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.
	8.6V~9.0V. It means the battery is almost 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

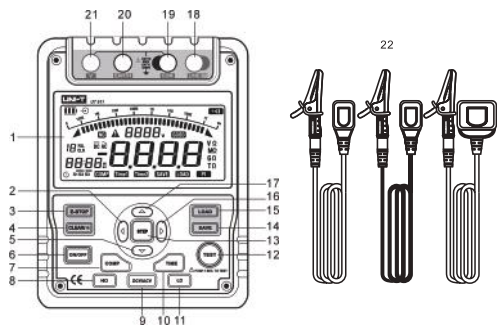

Figure 1. The Meter Front Structure

Table 4. Meter Front Description

1	LCD	12	Test Button
2	◀ Arrow Button	13	Step Button
3	Emergency stop	14	Data Store Button.
4	Data Clear the Display Backlight Button,	15	Data Recall Button
5	▼ Arrow Button	16	▶ Arrow Button
6	On/Off Button	17	▲ Arrow Button
7	Compare Button	18	LINE: Resistance input terminal
8	Insulation Resistance Button	19	COM: Voltage input terminal
9	Voltage Measurement	20	EARTH: Resistance input terminal
10	Timer Button.	21	V: Voltage input terminal
11	Low Resistance Measurement Button	22	Testing leads

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

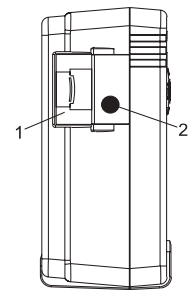

Figure 2. The Meter Side Structure (Side View)

Table 5. Meter Side Description

1	Safety Shutter
2	Power adaptor Input Terminal

Display

Table 6 and Figure 3 describe the display.

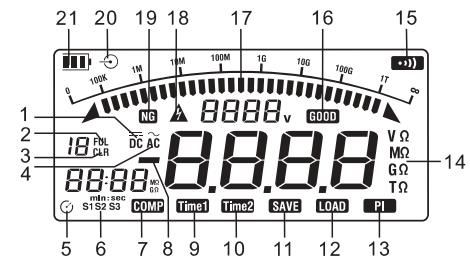

Figure 3. Display

Table 6. Display Description

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

Key Functions

Table 7. Key Description

ON/OFF	Turn on or off the Meter. Press and hold the button for 1 second to turn the Meter on.
CLEAR/☼	Short press to clear the stored data,long press 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	● Press once to recall the first stored value. ● Press again to exit Load feature. ● Load feature can only be used when there is no high voltage output.
▲	● Under insulation resistance measurement mode: press to select previous voltage range. ● Under load mode: press to recall the previous stored value.
▼	● Under insulation resistance measurement mode: press to select next voltage range. ● Under load mode: press to recall the next stored value.
◀	● When setting the timer 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. ● When compare function is enabled for insulation resistance measurement, press to decrement a resistance comparing value. ● After polarization index measurement, press to display polarization index, TIME 2 and TIME 1 insulation resistance values in sequence.
▶	● When seting the timer 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. ● When compare function is enabled for insulation resistance measurement, press to increment a resistance comparing value. ● After polarization index measurement, press to display polarization index, TIME 2 and TIME 1 insulation resistance values in sequence.
STEP	Press to display S1→S2→S3 in sequence. ● When the Meter is under timed measurement or polarization index measurement: ➢ S1 means increment of 1, then each press of ▶ increase 1 or ◀ decrease 1. ➢ S2 means increment of 10, then each press of ▶ increase 10 or ◀ decrease 10. ➢ S3 means increment of 30, then each press of ▶ increase 30 or ◀ decrease 30. ● When the Meter is under compare mode: ➢ S1 means increment of 1, then each press of ▶ increase 1 or ◀ decrease 1. ➢ S2 means increment of 10, then each press of ▶ increase 10 or ◀ decrease 10. ➢ S3 means increment of 100, then each press of ▶ increase 100 or ◀ decrease 100.
COMP	Set a pass / fail limit for insulation tests. The default value is 100MΩ
TIME	Pres to step through continuous , timed and polarization index measurements in sequence.
TEST	Press to turn on/off the output of insulation resistance test voltage.
Ho	Press to initiate insulation resistance measurement
Lo	Press to initiate low resistance measurement
DVC /ACV	Press to initiate voltage measurement
E-STOP	Emergency stop button. Press this button when the Meter crashes down. and cannot turn off the power.

Measurement Operation

This section explains how to make measurements.

A. Measuring Voltage

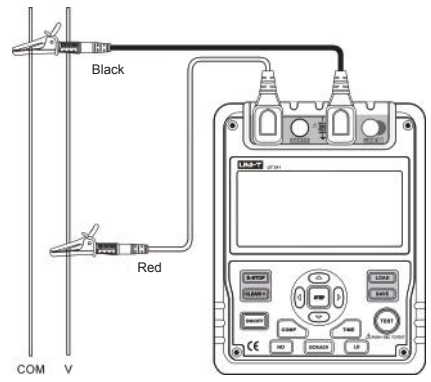

Figure 4. Voltage Measurement

⚠ Caution

- **Special care should be taken when measuring high voltage.**

⚠ Warning

- **To avoid harm to you or damage to the Meter, please do not attempt to measure voltages higher than 1000V DC or 750V AC, although readings may be obtained.**

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

1. 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 negative voltage is present on the red test lead, then “-“ shows on the display.

Note

- 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

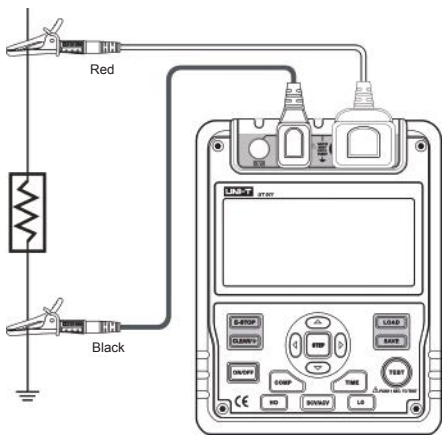

Figure 5. Insulation Resistance Measurement

⚠ Caution

- **When performing insulation resistance tests, remove all power from the circuit to be measured and discharge all the power.**
- **Do not short circuit two test leads under high voltage status.**
- **Do not measure insulation resistance after high voltage output.**
- **Do not measure over 10 seconds when: measuring resistance ＜500kΩ with use of 100V. measuring resistance ＜1MΩ with use of 250V. measuring resistance ＜2MΩ with use of 500V. measuring resistance ＜5MΩ with use of 1000V.**
- **When the measurement is completed, don't touch the circuit as the circuit has already stored capacitance which may cause electric shock.**
- **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.
2. Press ▲ and ▼ button to select of 100V, 250V, 500V or 1000V voltage range.
3. Insert the red test lead into **LINE** and **COM** terminals, and the black test lead into **EARTH** terminal.
4. Connect the red and black alligator clip to the circuit to be measured, positive voltage outputs from **LINE** terminal.
5. Choose below insulation resistance measurement mode.

a) Continuous Measurement

- Press **TIME** button to select continuous mode, there is no timer icon on the LCD.
- Press and hold **TEST** button for 1 second to begin continuous measurement and output test voltage. **TEST** button lights up and ⚠ links at 0.5-second interval.
- Press **TEST** button to end the measurement when it is completed. Then Test button lights off and ⚠ disappear. The insulation resistance value shows on the display.

b) Timed Measurement

- Press **TIME** button to select timed mode, the LCD displays **TIME 1** and ⏻ symbols.
- Press ◄ ►, and **STEP** buttons to set the time (00:05~29:30).
- Then press and hold **TEST** button for 2 seconds to carry out timed measurement. **TIME 1** and ⚠ are displayed and blinked on the LCD on every 0.5 seconds.
- 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

- Press **TIME** button to select timed mode, the LCD displays **TIME 1** and ⏻ symbols.
- Press ◄ ►, and **STEP** buttons to set the time (00:05~29:30).
- Press **TIME** button again. **TIME 2, PI** and ⏻ symbols appear on the LCD.
- Press ◄ ►, and **STEP** buttons to set the time (00:10~30:00).
- Then press and hold **TEST** button for 2 seconds to carry out the measurement.
- **TIME 1** and ⚠ are displayed and blinked on the LCD on every 0.5 seconds before **TIME 1** set time is reached.
- **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 test voltage output will be turned off and the measurement will be automatically stopped. The LCD displays the polarization index reading.
- Press ◄ ►, to step through the polarization index, **TIME 2** and **TIME 2** insulation resistance readings.

Tips:
PI = 3-minute ~ 10-minute resistance/30-second ~ 1-minute resistance

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

d) Compare Function

- 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. or you can set up to the maximum resistance allowed with test voltage.
- Press and hold **TEST** button for 1 second to carry out the measurement.
- The **NG** symbol will display if the insulation resistance value is smaller than compare value. Otherwise **GOOD** symbol will be displayed.

C. Measuring Low Resistance

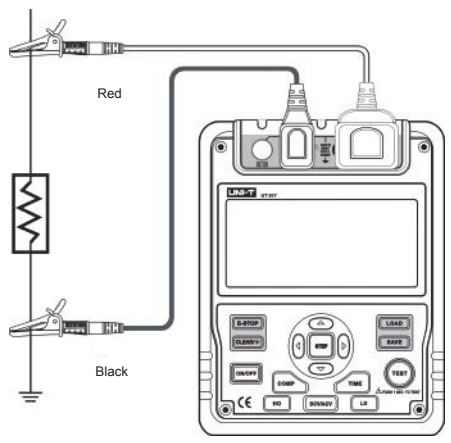

Figure 6. Low Resistance Measurement

⚠ Caution

- **When performing 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 30Ω, the buzzer sounds.
4. This range can test LED diode. Connect the anode LED diode to the red test lead and the cathode to the black one, the LED diode will light up if it is good. If the LED diode does not light up, it means it is damaged.

Using Power Adaptor

Refer to Figure 7 for the use of power adaptor.

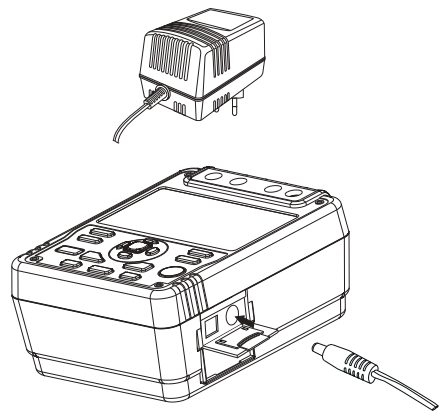

Figure 7. Using Power Adaptor

1. Open the side safey shutter, then you will see there is a power adaptor input terminal.
2. Make sure the Meter is powered off and Insert the UT511 power adaptor to the input terminal.
3. It is highly recommended to take out all the batteries when you are using the power adaptor.
4. Make sure the Meter is powered 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 the supplied power adaptor SA48-150060EU from our company, otherwise it will be dangerous.

Maintenance

This section provides basic maintenance information including battery 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.

A. General Service

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

B. Replacing the Battery

⚠ Warning

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

⚠ Caution

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

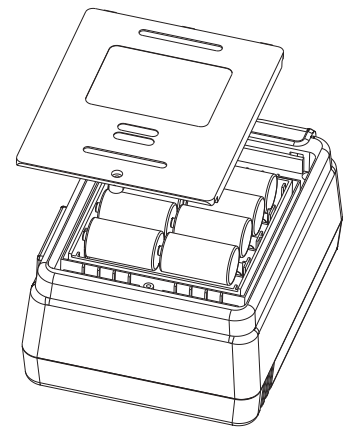

Figure 8. Battery Replacement

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

- Turn the Meter to OFF and remove all connections from the terminals.
- Remove the screw from the battery compartment, and separate the battery compartment from the case bottom.
- There are 8pcs of 1.5V (R14) carbon battteries in the meter, except this, it can support 1.5V (LR14) alkaline batteries and the specified power adaptor supplied by our company.
- 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

General Specifications

Display (LCD)	Digital: 9999 counts Analog bar graph.
Display Backlight	Bright backlight for clear readings in poorly lighted areas.
Autorange	The Meter automatically selects best range
Warning	⚠ and red light will on.
Test Voltage	Automatically source the voltage
COMP Measurement	Use the Compare function to set a pass/fail compare level for the insulation measurements.
PI Measurement	Preset the timer for two points and the Meter will carry out the measurement automatically.
Overloading	Display **OL** on insulation resistance range
Battery Indicator	Display
Icon Display	Equips with function and battery indicator icons.
Current Consumption	Maximum: around 90mA Average: around 20mA
Operating Temperature	0℃~40℃ (32℉~104℉)
Storage Temperature	-20℃~60℃ (-4℉~140℉)
Relative Humidity	≤ 85% @ 0 ℃~40℃ below; ≤ 90% @ -20℃~60℃:
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)

Accuracy Specifications

Accuracy: ±([% of reading] + [number of least significant digits), guarantee for 1 year.
Operating temperature: 18℃ ~28℃
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 100~500MΩ	0.5MΩ~99.9MΩ 100~999MΩ 1.00~1.99GΩ	1MΩ~99.9MΩ 100~999MΩ 1.00~3.99GΩ	2MΩ~99.9MΩ 100~999MΩ 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@1MΩ
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 less than 5M Ω, the testing time cannot exceed 10 seconds.

C. Low Resistance Measurement

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

END

This operating manual is subject to change without notice.