UNI-T UT593, UT595 Multi Functional Electrical Measuring Instrument Instruction Manual

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Overview

UT593/UT595 is a multifunction digital safety testing instrument, designed with combination of large-scale integrated analog & digital circuits and micro-processor chip. It mainly measures RCD, line/loop impedance, continuity, insulation resistance, DC and AC voltage, phase sequence, featuring versatile functionality, higher accuracy, stable performance and ease of use. The instrument is widely used to measure RCD, insulation and earth connections for various equipment's, and an ideal tool for testing, inspection and maintenance badly needed for various electric devices and RCDs.

Safety Information

The Tester is designed, manufactured and tested according to IEC61010 safety standard. The manual include safety information related to safe use of the Tester. Please strictly follow the safety items and read the following instructions before use.

⚠ Warning

- Please read and understand the manual before using the Tester.
- Use the Tester as specified in the manual and keep it for future reference.
- Please note that misuse during tests might cause personal injury or damage to the Tester.

⚠ on the Tester alerts users to use the Tester properly, please refer to the manual for details.

⚠	**Danger**	Specifies conditions and actions that may cause severe or fatal hazards.
⚠	**Warning**	Alerts users to avoid electric shock.
⚠	**Caution**	Specifies conditions and actions that may damage the Tester or affect accurate measurement.

⚠ Danger

- Do not measure around any inflammables, sparkle may cause potential explosion.
- Do not operate the Tester if its surface is wet or the operator's hands are wet.
- Do not touch conductive part of test leads during measurement.
- Do not measure with the battery cover opened.
- Do not touch the circuits under test when measuring insulation resistance and RCD

⚠ Warning

- Stop using the Tester if any anomaly happens. E.g. the Tester is damaged or shows exposed metal.
- Take extreme caution when working with voltages higher than 33Vrms, 46.7acrms or 70Vdc, for it may pose electric shock.
- The electric storage present in tested circuits must be released after finishing high- resistance measurement.
- Do not replace the battery if the Tester is under wet status.
- Make sure all test leads are firmly secured to input terminals of the Tester.
- Turn off the Tester before opening the battery cover.

Caution

- If it is necessary to replace test leads or power adaptor, use only the same model with same electrical specifications.
- When low battery indicator() shows, do not use the Tester. Take the battery if not used for a long time.
- Do not store or use the Tester around high-temperature, high humidity, flammables, explosives and electromagnetic environments.
- Clean the Tester's casing with soft cloth dampened with water or mild detergent. No abrasives or solvents are allowed.
- Dry the Tester before storing it if it is wet.

Electrical Symbols

⚠	Danger of possible electric shock
⧈	Double insulation or reinforced insulation
V⎓	DC
V~	AC
⏚	Grounding

Technical Specifications

- Accuracy: ±(a% of reading + b digits), calibration per year.
- Ambient temperature: 23+ /- 5 C
- Ambient humidity: 45~75% RH

RCD Test

Test Current	10 mA I 30mA I 100mA I 300mA I 500mA
Operational Voltage	Voltage: 220± 10% Frequency: 45Hz-65Hz
Test Current Accuracy	I △n, 21 △n and 51 △n: (0%+10%)
	1/21 △n :-10%-0%
Trip Time	1/21 △n scope: OmS-2000mS 11 △n scope: OmS-500mS (Select Timer Function) 11 △n scope: OmS-300mS 2*1 △n scope: OmS-200mS (Select Timer Function) 2*1 An scope: OmS-150mS 5*1 △n scope: OmS-40mS Note: 21 △n measurement is only applicable to UT 595
Trip Time Accuracy	± (5%+5)
Trip Current Range	1/21 △n -1.1'1 △n (total 7 test points)
Trip Current Accuracy	± 10%

Loop Impedance Measurement

Operating Voltage (L – N)	Voltage: 195V-440V , Frequency: 45Hz-65Hz
Test Current& Time	20A/20ms
Measuring Scope	0.050-20000
Measuring Ranges	0.050-1.99 0
	2.00 —19.90
	200 —20000
Accuracy	+ (5%+5)
Resolution	Minimum 0.01 Ω
Prospective Short Current	OKA-26KA

Non-Trip Loop Impedance Measurement

Operating Voltage (L – E)	Voltage: 220V±10%, Frequency: 45Hz~65Hz
Test Current	20A
Display Range	0.010~20000
Measuring Scope	1.000~20000
Measuring Ranges	1.000-1.990
	2.00-19.90
	200-2000Ω
Accuracy	±5%±12d+ Noise Margin (1.00~1.99)±5%±5d (2.0~19.9)
Resolution	Minimum 0.01Ω
Prospective Fault Current	0KA~26KA

Continuity Test

Rated Voltage	About 5.0V
Measuring Scope	0.01 Ω ~ 200Ω
Test current	0.00~2.00Ω: >200mA
Accuracy	0.01Ω ~200Ω: ± (2%+5)

Insulation Resistance Measurement

Rated Voltage	250V	500V	1000V
Measuring Ranges	250V Range: 0.05 MΩ-250MΩ 500V Range: 0.05 MΩ-500MΩ 1000V Range: 0.05 Mv-1000MΩ		
Open Circuit Voltage	DC 250V 10%	DC 500V 10%	DC 1000V±10%
Rated Test Current	At 250 KΩ, 0.9mA-1.1mA	At 500 KΩ, 0.9mA-1.1mA	At 1 MΩ, 0.9mA-1.1mA
Short-Circuit Current	<1.8mA		
Accuracy	0.05MΩ-1000MΩ:	± (5%+5)	

Voltage Measurement

	DC voltage	AC voltage
Measuring Range	± 0 V —+ 440V	OV-440V(50/60Hz) <10V: for reference only.
Special Function	Automatic identification for AC voltage and DC voltage	
Resolution	1V	
Accuracy	±(2%+3)	

Frequency Measurement

Measuring Range	20Hz~100Hz
Resolution	1Hz
Accuracy	Only for reference

Phase Rotation Test

Operating Voltage	Three-phase AC voltage 100V~440V, frequency: 45Hz~65Hz;
Test Result	Phase sequence: L1 L2 L3 forward rotation; L1 L3 L2 reversed rotation
Detect Open Phase	Any open phase among L1, L2, L3 will be displayed on LCD

- Display: LCD, display count: 9999
- Low Battery Indication: displays 
- Over-Load Indication: " over-limited value"(e.g.: 500MΩ)
- Auto Ranging
- Unit Display: Simultaneously display function and electrical units symbols
- Release Voltage Automatically
- Working Conditions: 0℃~40℃/Humidity:≤85%
- Storage Conditions: -20℃~60℃/Humidity:≤90%
- Current Consumption: around 50mA (at Max.1000V output voltage)(normally status at 10mA)
- Safety: CATIII 300V, Pollution Degree 2 as per IEC61010
- Dimensions: 210mm(L)×175mm(W)×90mm(D)
- Weight: 1kg (including battery)
- Power: Alkaline battery 1.5V (AA) ×8pcs
- Accessories: Test leads, alkaline battery 1.5V (AA) ×8pcs, operating manual, carrying bag

Tester Description

1. LCD Display
2. Function Buttons F1, F2, F3, F4
3. TEST Button
4. Rotary Switch
5. Input Terminal to Test Lead (Black)
6. Input Terminal to Test Lead (Red) Or to specified test lead
7. Input Terminal to Test Lead (Green)

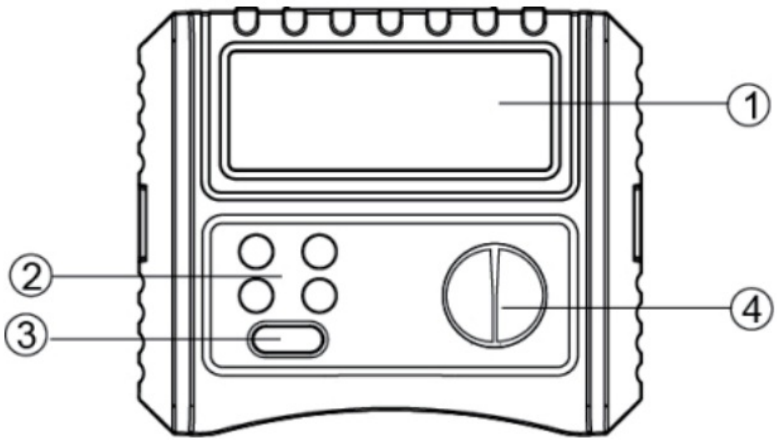


Figure 1

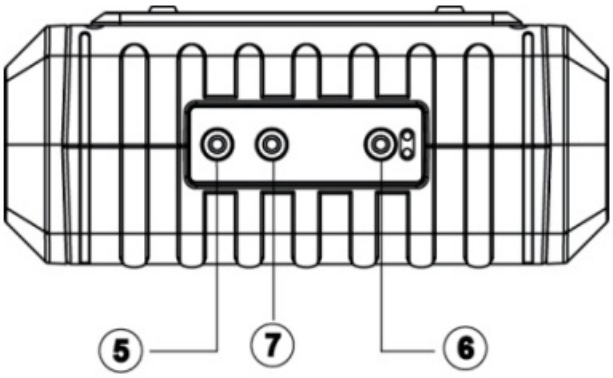


Figure 2

Rotary Switch

1. Phase Rotation: Detest Phase sequence
2. Volts: Measure Voltage/Frequency
3. 250V: Measure Insulation Resistance
4. 500V: Measure Insulation Resistance
5. 1000V: Measure Insulation Resistance
6. Ω: Continuity with Test Current up to 200mA;
7. OFF;
8. Loop/PSC/Zs/Ze:Measure Loop/Line Impedance, Prospective Fault current, Prospec -tive Short Current.
9. Auto: Automatically Test RCD;
10. ×1/2: Measure RCD Trip Time at ×1/2 Rated Current
11. ×1: Measure RCD Trip Time at ×1 Rated Current
12. ×2: Measure RCD Trip Time at ×2 Rated Current(for UT595 Only)
13. ×5: Measure RCD Trip Time at ×5 Rated Current
14. Ramp: Measure RCD Trip Current

Preparations before Measurement

If low battery indicator shows on the upper left part of LCD after turning on the Tester, it indicates the battery falls low, please replace the battery time.

Low Battery Indicator	Battery Voltage
	≤7V

Testing for Continuity

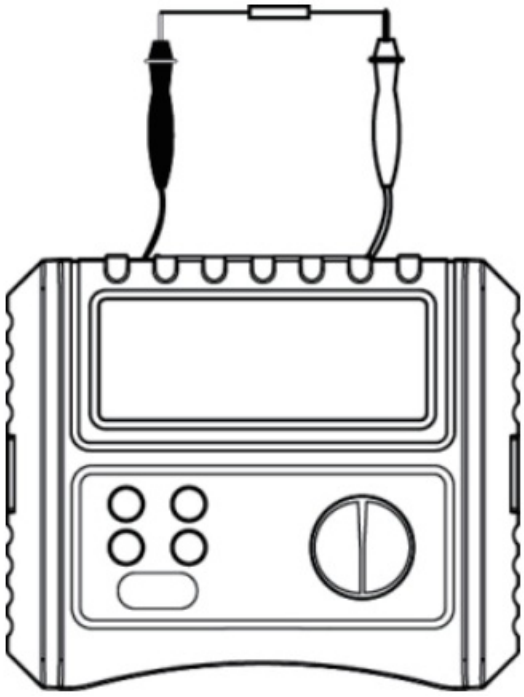


Figure 3

To test for continuity:

1. Discharge totally the tested circuits and keep them completely separated from the power supply before test.
2. Insert red lead or specific TEST-marked test lead into red input terminal and black test lead to black terminal.
3. Connect red and black alligators or test probes to the circuit under test.
4. Turn the rotary switch to Ω position, then press TEST button to begin. Refer to Figure 3 for details.

Understanding F1-F4 Buttons:

F1	F2	F3	F4
Buzzer and backlight	Test lock	ZERO	Invalid

- **F1:** Long press F1 for about 2 seconds to turn on/off the backlight; short press to turn on/off 20 Ω compare function and LCD will show buzzer indicator, the buzzer will alarm if the measured resistance is 20Ω.
- **F2:** Press to turn on/off TEST LOCKED function. When it is necessary to take a long -time measurement, press F2 to enable the function, lock indicator shows on LCD, you then just need to press TEST down once, release it and the Tester will take measurements continuously.
  Press TEST again to stop the measurements. To disable the function, press F2 again or turn the rotary switch to other functions. F3: Press to zero the test leads. First short-circuit two test leads, and then long press
- **F3** to reset the display to 0.00Ω, “ZERO” will show on LCD, indicating the operation completes

⚠ Caution

- To ensure an accurate test, please perform the zeroing before test

- Do not test on live objects
- Before the test starts, the Tester will automatically display the voltage between two input terminals if this voltage is 30V, and TEST button will be inhibited.

Measuring Insulation Resistance

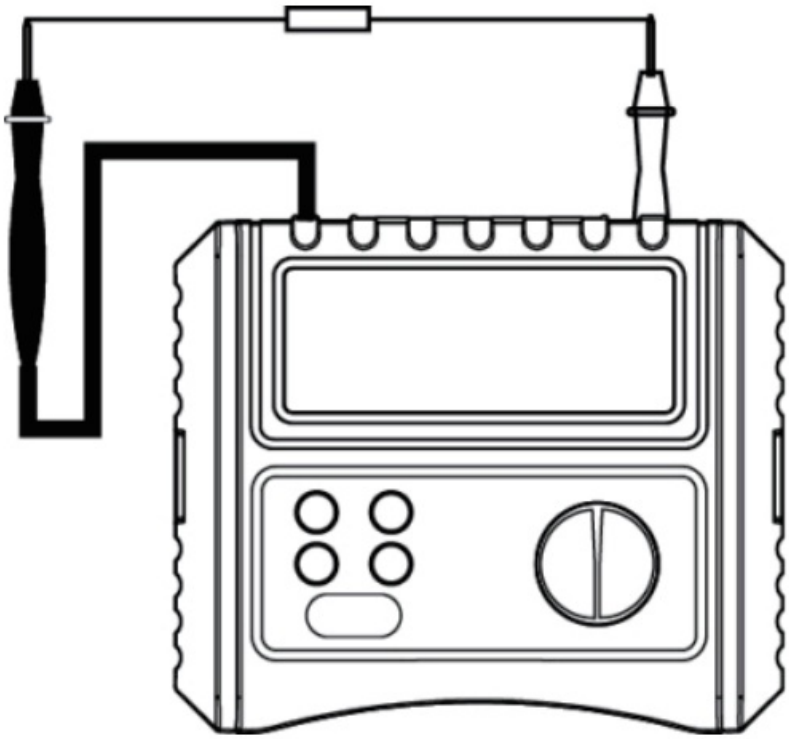


Figure 4

To measure insulation resistance:

1. Discharge totally the tested circuits and keep them completely separated from the power supply before test.
2. Insert red lead or specific TEST-marked test lead into red input terminal and black test lead to black terminal.
3. Connect red and black alligators or test probes to the circuit under test.
4. Turn the rotary switch to “Insulation” position and select proper test voltage, then press TEST button to start

Understanding F1-F4 Buttons:

F1	F2	F3	F4
Buzzer and backlight	Test lock	ZERO	Invalid

- **F1**: Long press F1 for about 2 seconds to turn on/off the backlight; short press to turn on/off 2 MΩ compare function. The buzzer will alarm if the measured resistance is 2MΩ.
- **F2**: Press to turn on/off TEST LOCKED function. When it is necessary to take a long- time measurement, press F2 to enable the function, lock indicator shows on LCD, you then just need to press TEST down once, release it and the Tester will take measurements continuously.

Press TEST again to stop the measurements. To disable the function, press F2 again or turn the rotary switch to other functions.

⚠ Caution

- Make sure the test circuits are de-energized before measurement. Do not measureany live electrical devices or lines.
- Before the test starts, the Tester will automatically display the voltage between two input terminals if this voltage is 30V, and TEST button will be inhibited.
- Do not measure with the battery cover opened.
- Do not short-circuit two test leads under high- voltage output status or measure insu -lation resistance after the high-voltage has already been output.

Measuring Voltage/Frequency

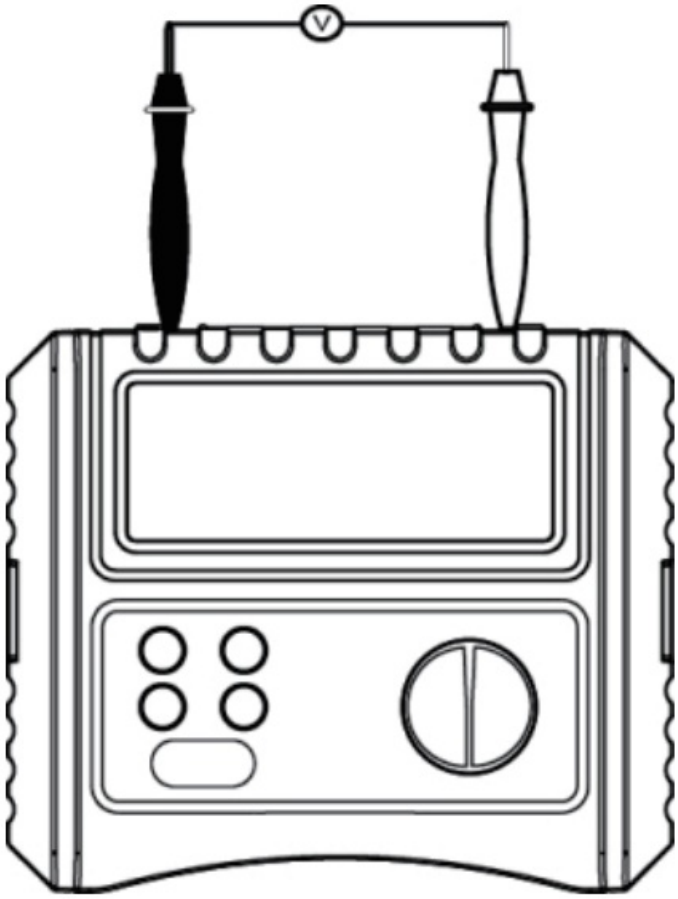


Figure 5

To measure voltage/frequency:

1. Set the rotary switch to Volts ,Connect as shown in Figure 5:
2. Insert red test lead into “Red” input terminal and black test lead into “Black” terminal.
3. Connect red & black alligator clips or probes firmly to tested circuits. The Tester will automatically identify AC/DC voltage and show measured voltage and frequency readings on the LCD. Or connect as shown in Figure 7:
4. Insert three connectors of specified one-plug test leads to three input terminals of the Tester (red to red, green to green, black to black).
5. Insert the plug of the test leads into the socket of test circuits, the Tester will automatically identify AC/DC

voltage and show measured voltage and frequency readings on the LCD

Understanding F1-F4 Buttons:

F1	F2	F3	F4
Buzzer and backlight	Test lock	ZERO	Invalid

- F1: Long press F1 for 2 seconds to turn on/off the backlight.
- F2, F3,F4: all are invalid. TEST is invalid too.

⚠ Caution

- Do not input voltage higher than 440V or 440Vrms. It may be possible to display the voltage value, but it may pose hazard to the Tester.
- To avoid electric shock, please take extreme caution when working with high voltage.
- Remove the test leads away from tested circuits and disconnect them from the input terminals of the Tester after completing the measurements.
- Do not measure with the battery cover opened.

Detecting Phase Sequence

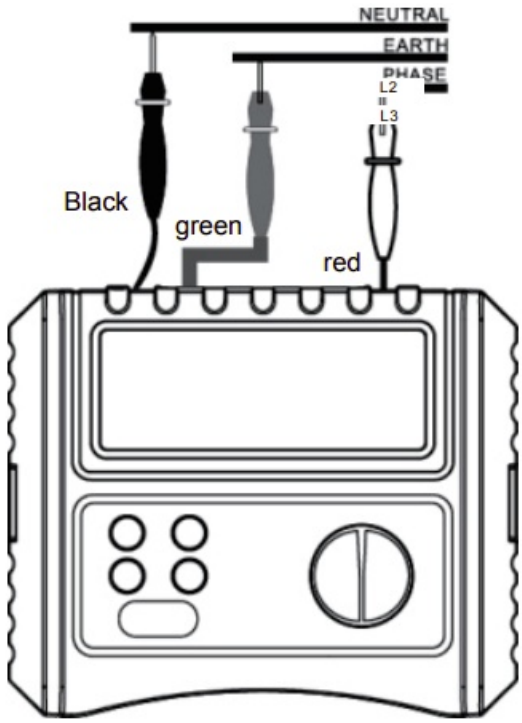


Figure 6

To Detect Phase Sequence:

1. Turn the rotary switch to Phase Rotation position.
2. Insert three connectors of three test leads into input terminals of the Tester(red to red, green to green, black to black).

3. Then connect three test leads into three-phase AC system(black to L1, green to L2, red to L3, refer to Figure 6 for details), after that, the Tester will indicate the phase sequence and open phase result on LCD.

Understanding F1-F4 Buttons:

F1	F2	F3	F4
Buzzer and backlight	Test lock	Invalid	Invalid

- **F1**: Long press for 2 seconds to turn on/off the backlight.
- **F2**, F3, F4: all are invalid; TEST button is invalid too.

⚠ Caution

- Do not input voltage higher than 440V or 440Vrms. It may be possible to display the voltage value, but it may pose hazard to the Tester.
- To avoid electric shock, please take extreme caution when working with high voltage.
- Remove the test leads away from tested circuits and disconnect them from the input terminals of the Tester after completing the measurements.
- Do not measure with the battery cover opened.

Measuring Loop Impedance/Prospective Fault Current

1. Measuring Loop/Line Impedance/RCD/Socket Voltage

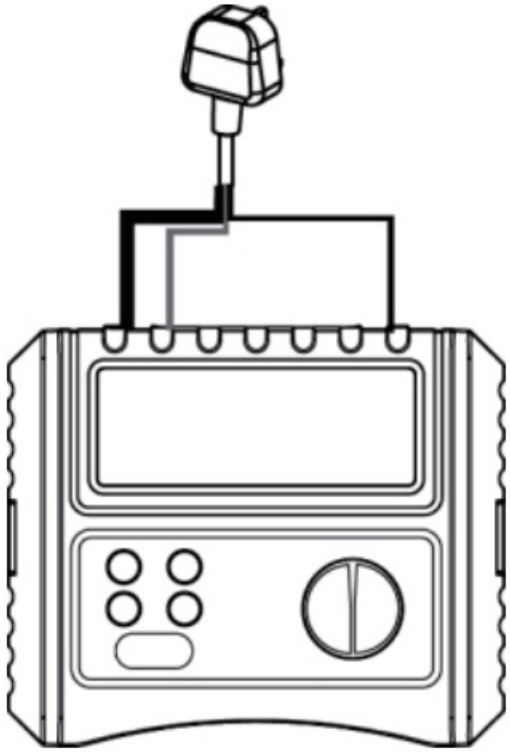


Figure 7

2. Measuring Loop Impedance/ Line (L-N) Impedance

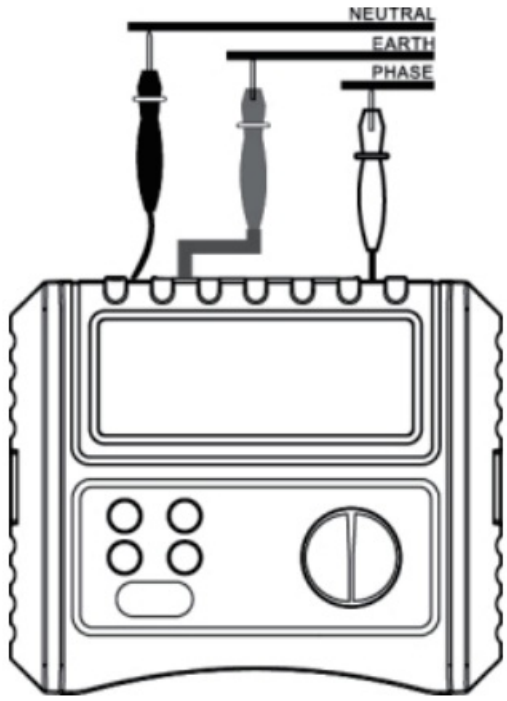


Figure 8

To measure Loop Impedance/ Prospective Fault Current:

1. Turn the rotary switch to LOOP.
2. Insert three connectors of one-plug test leads or three separate test leads into three input terminals of the Tester (red to red, green to green, black to black).
3. Plug the plug into domestic 220V socket or connect the test probes to the tested lines.
4. Press TEST button to start.

Understanding F1-F4 Buttons:

F1	F2	F3	F4
Backlight	Invalid	Invalid	Invalid

F1: Long press F1 for 2 seconds to turn on/off the backlight.
F2, F3, F4: all are invalid

⚠ Caution

- Please make sure domestic 220V in the power socket is normally supplied. If the socket is unable to be powered normally or de-energized, L-PE and L-N icons on lower left part of LCD will flash simultaneously.
- Ensure the socket is properly grounded. If the socket has bad grounding or isn't grounded, L-PE and N-PE icons on lower left part of LCD will flash simultaneously.
- Ensure the neutral terminal of the socket is firmly connected. If the neutral terminal is badly or not connected, L-N and N-PE icons on lower left part of LCD will flash simultaneously.
- Ensure live and neutral terminals of the power socket are not reversely connected when measuring loop impedance/prospective fault current, otherwise L-PE, L-N and N-PE icons on the lower left part of LCD will flash

simultaneously.

- Please take extreme caution when making the measurement, for it is performed under high-voltage status

Measuring Line Impedance/Prospective Short Current

See Figure 7, 8)

To measure Line Impedance/Prospective Short Current:

1. Turn the rotary switch to NO-TRIP position;
2. Insert three connectors of one-plug test leads or three separate test leads into three input terminals of the Tester (red to red, green to green, black to black).(Refer to Figure 6, 7, 8)
3. Plug the plug into domestic 220V socket or connect the test probes to the tested lines.
4. Press TEST button to start.

Understanding F1-F4 Buttons:

F1	F2	F3	F4
Backlight/L-N/L-PE	Not used	Not used	Not used

F1: Long press F1 for 2 seconds to turn on/off the backlight; short press to switch between L-N and L-PE measurements.
F2, F3, F4: all are invalid.

⚠ Caution

- Please make sure domestic 220V in the power socket is normally supplied. If the socket is unable to be powered normally or de-energized, L-PE and L-N icons on lower left part of LCD will flash simultaneously.
- Ensure the socket is properly grounded. If the socket has bad grounding or isn't grounded, L-PE and N-PE icons on lower left part of LCD will flash simultaneously.
- Ensure the neutral terminal of the socket is firmly connected. If the neutral terminal is badly or not connected, L-N and N-PE icons on lower left part of LCD will flash simultaneously.
- Ensure live and neutral terminals of the power socket are not reversely connected when measuring line impedance/prospective short current, otherwise L-PE, L-N and N-PE icons on the lower left part of LCD will flash simultaneously.
- Please take extreme caution when making the measurement, for it is performed under high-voltage status.

Taking Auto RCD Tests

(See Figure 7)

To Test RCD Automatically:

1. Turn the rotary switch to AUTO position;

2. Insert three connectors of one-plug test leads into three input terminals of the Tester (red to red, green to green, black to black).(Refer to Figure 7)
3. Plug the plug into domestic 220V socket.
4. Press TEST button to start.

Tips:

Auto RCD Test is designed to measure trip times in one time just by pressing one button down. The Tester will complete all RCD measurements before proceeding into next test. All these test data will be saved in the Tester; pressing F3 can review all the data. RCD measurements are taken in following order.

UT593:

1. 1/2*1 △n/0°
2. 1/2*1 △n/180°
3. 1*1 △n/0°
4. 1*1 △n/180°
5. 5*1 △n/0°
6. 5*1 △n/180°

UT595:

1. 1/2*1△ n/0°
2. 1/2*1 △n/180°
3. 1*1 △n/0°
4. 1*I△n/180°
5. 2*1 △n/0°
6. 2*1 △n/0°
7. 5*1 △n/0°
8. 5*1 △n/180°

Understanding F1-F4 Buttons:

F1	F2	F3	F4
Backlight	AC/DC/time	RCL	I △n

F1: Long press for 2 seconds to turn on/off the backlight.
F2: Press to toggle between RCD types and Timer mode.
RCD Types: AC and DC(full-and half-wave)
Timer: under this mode, press down TEST button and the Tester will count down from 30s to 0s before enabling RCD test;
F3: Press to recall all saved data from the whole test;

F4: Press to select RCD test current.

⚠ Caution

- Please make sure domestic 220V in the power socket is normally supplied. If the socket is unable to be powered normally or de-energized, L-PE and L-N icons on lower left part of LCD will flash simultaneously.
- Ensure the socket is properly grounded. If the socket has bad grounding or isn't grounded, L-PE and N-PE icons on lower left part of LCD will flash simultaneously.
- Ensure the neutral terminal of the socket is firmly connected. If the neutral terminal is badly or not connected, L-N and N-PE icons on lower left part of LCD will flash simultaneously.
- Ensure live and neutral terminals of the power socket are not reversely connected when testing RCD, otherwise L-PE, L-N and N-PE icons on the lower left part of LCD will flash simultaneously.
- Please take extreme caution when taking auto RCD tests, for it is performed under high-voltage status

Taking Regular RCD Tests

(See Figure 7)

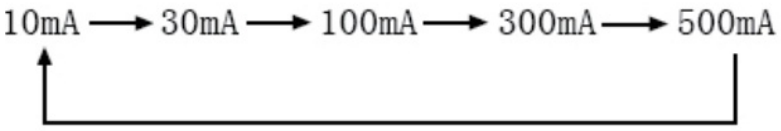
To take regular RCD test:

1. Turn the rotary switch to1/2*I△n, 1*I△n, 2*I△n(for UT595 only) or 5*I△n position;
2. Insert three connectors of one-plug test leads into three input terminals of the Tester (red to red, green to green, black to black).(Refer to Figure 7)
3. Plug the plug into domestic 220V socket.
4. Press TEST button to start.

Understanding F1-F4 Buttons:

F1	F2	F3	F4
Backlight	AC/DC/time	RCL	$I_{\triangle n}$

F1: Long press for 2 seconds to turn on/off the backlight; short press to toggle between 0 /180
F2: Press to toggle between RCD types and Timer mode.
RCD Types: AC and DC (full-and half-wave)
Timer: under this mode, press down TEST button and the Tester will count down from 30s to 0s before enabling RCD test;
F3: invalid
F4: Press to select RCD rated test current, refer to rated options in following order



Tips:
The leakage current will be different depending on the selected current multiplier. Refer to the following table for

detailed relationship.

	10mA	30mA	100 mA	300 mA	500Ma
1/2*I △n	■	■	■	■	■
1*I △n	■	■	■	■	■
2*I △n(only for UT595)	■	■	■		
5*I △n	■	■	■		

⚠ Caution

- Please make sure domestic 220V in the power socket is normally supplied. If the socket is unable to be powered normally or de-energized, L-PE and L-N icons on lower left part of LCD will flash simultaneously.
- Ensure the socket is properly grounded. If the socket has bad grounding or isn't grounded, L-PE and N-PE icons on lower left part of LCD will flash simultaneously.
- Ensure the neutral terminal of the socket is firmly connected. If the neutral terminal is badly or not connected, L-N and N-PE icons on lower left part of LCD will flash simultaneously.
- Ensure live and neutral terminals of the power socket are not reversely connected when testing RCD, otherwise L-PE, L-N and N-PE icons on the lower left part of LCD will flash simultaneously.
- Please take extreme caution when taking regular RCD tests, for it is performed under high-voltage status

Measuring RCD Trip Current

See Figure 7)

To measure trip current:

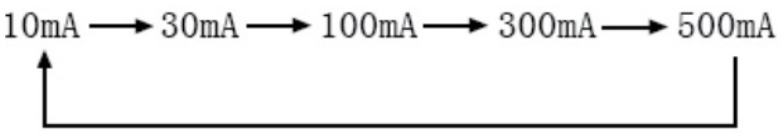
1. Turn the rotary switch to ▲Ramp position.
2. Insert three connectors of one-plug test leads into three input terminals of the Tester (red to red, green to green, black to black).(Refer to Figure 7)
3. Plug the plug into domestic 220V socket.
4. Press TEST button to start.

Understanding F1-F4 Buttons:

F1	F2	F3	F4
Backlight/0 /180	AC/DC/time	Not used	I △ n

F1: Long press for 2 seconds to turn on/off the backlight; short press to toggle between 0 /180
F2: Press to toggle between RCD types and Timer mode.

RCD Types: AC and DC (full-and half-wave)
Timer: under this mode, press down TEST button and the Tester will count down from 30s to 0s before enabling RCD test;
F3: invalid
F4: Press to select RCD rated leakage test current, refer to rated options in following order.



Tips

The leakage current will be different depending on the selected waveform. Refer to the following table for detailed relationship.

	10mA	**30mA**	**100 mA**	**300 mA**	**500Ma**
Full wave	■	■	■	■	■
Half wave	■	■	■	■	

Caution

- Please make sure domestic 220V in the power socket is normally supplied. If the socket is unable to be powered normally or de-energized, L-PE and L-N icons on lower left part of LCD will flash simultaneously.
- Ensure the socket is properly grounded. If the socket has bad grounding or isn't grounded, L-PE and N-PE icons on lower left part of LCD will flash simultaneously.
- Ensure the neutral terminal of the socket is firmly connected. If the neutral terminal is badly or not connected, L-N and N-PE icons on lower left part of LCD will flash simultaneously.
- Ensure live and neutral terminals of the power socket are not reversely connected when testing RCD trip current, otherwise L-PE, L-N and N-PE icons on the lower left part of LCD will flash simultaneously.
- Please take extreme caution when testing RCD trip current, for it is performed under high-voltage status.

Replacing the Battery

Danger

- To avoid electric shock, remove away all test leads from the Tester before replacing the battery.
- Do not measure with the battery cover opened.

Danger

- Do not mix old and new batteries for use.

- When low battery indicator “  ” shows on LCD, please replace the battery timely.

To replace the battery, follow steps as below:

1. Power off the Tester (set the rotary switch to OFF) and remove away the test leads.
2. Unscrew the battery cover, remove the battery cover and replace the batteries with 8pcs new batteries.
3. Screw up the battery and tighten up the screws.

Maintenance & Repair

Cleaning the Casing:

- Clean the Tester surface with soft cloth or sponge dampened with little water.
- To avoid damage to the Tester, do not submerge it into the water.
- Dry the Tester before storing it if it is wet.

Repair:

When it become necessary to calibrate or repair the Tester, please have it serviced by qualified professional personnel or designated service center.

****END****

The manual information is subject to changes without prior notice.

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Documents / Resources

	UNI-T UT593, UT595 Multi Functional Electrical Measuring Instrument [pdf] Instruction Manual UT-595, UT593, UT593 UT595 Multi Functional Electrical Measuring Instrument, UT593 UT595, Multi Functional Electrical Measuring Instrument, Electrical Measuring Instrument, Measuring Instrument, Instrument

References

- User Manual