

UNI-T®

Instruments.uni-trend.com



User Manual

UTR2810+ Series LCR Meter

V1.0

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Preface

Thank you for purchasing this product. In order to use this product safely and correctly, please read this manual thoroughly, especially the safety notes.

After reading this manual, it is recommended to keep the manual at an easily accessible place, preferably close to the device, for future reference.

Copyright Information

UNI-T products are protected by patent rights in China and other countries, including issued and pending patents. Uni-Trend reserves the rights to any product specification and pricing changes.

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Warranty Service

The instrument has a warranty period of one year from the date of purchase. If the instrument is damaged due to improper operation by the user during the warranty period, the maintenance fee and the costs caused by the maintenance shall be borne by the user, and the instrument shall be maintained by the company for life.

If the original purchaser sells or transfers the product to a third party within one year from the date of purchase of the product, the warranty period of one year shall be from the date of the original purchase from UNI-T or an authorized UNI-T distributor. Power cords, accessories and fuses, etc. are not included in this warranty.

If the product is proved to be defective within the warranty period, UNI-T reserves the rights to either repair the defective product without charging of parts and labor, or exchange the defected product to a working equivalent product (determined by UNI-T). Replacement parts, modules and products may be brand new, or perform at the same specifications as brand new products. All original parts, modules, or products which were defective become the property of UNI-T.

The "customer" refers to the individual or entity that is declared in the guarantee. In order to obtain the warranty service, "customer" must inform the defects within the applicable warranty period to UNI-T, and perform appropriate arrangements for the warranty service.

The customer shall be responsible for packing and shipping the defective products to the individual or entity that is declared in the guarantee. In order to obtain the warranty service, customer must inform the defects within the applicable warranty period to UNI-T, and perform appropriate arrangements for the warranty service. The customer shall be responsible for packing and shipping the defective products to the designated maintenance center of UNI-T, pay the shipping cost, and provide a copy of the purchase receipt of the original purchaser. If the products is shipped domestically to the purchase receipt of the original purchaser. If the product is shipped to the location of the UNI-T service center, UNI-T shall pay the return shipping fee. If the product is sent to any other location, the customer shall be responsible for all shipping, duties, taxes, and any other expenses.



Guarantee Limit

This warranty shall not apply to any defects, malfunction or damages caused by accidental, machine parts' wear and tear, using outside the product's specifications, improper use, and improper or lacking of maintenance. UNI-T under the provisions of this warranty has no obligation to provide the following services:

- a. Any repair damage caused by the installation, repair, or maintenance of the product by non UNI-T service representatives;
- b. Any damage caused by improper use or connection to an incompatible device;
- c. Any damage or malfunction caused by the use of a power source not provided by UNI-T;
- d. Any maintenance on altered or integrated products (if such alteration or integration leads to an increase in time or difficulty of product maintenance).

This warranty is written by UNI-T for this product and it is used to substitute any other express or implied warranties. UNI-T and its distributors do not offer any implied warranties for merchantability or applicability purposes. For violation of this guarantee, UNI-T is responsible for the repair or replacement of defective products as the only and complete remedy available to customers. Regardless of whether UNI-T and its distributors are informed that any indirect, special, incidental, or consequential damage may occur, the UNI-T and its distributors shall not be responsible for any of these damages.











Safety Instructions






WarningDanger: To avoid possible electric shock and personal safety problem, please follow the instructions below.

Disclaimer	Please read the following safety information carefully before starting to use the instrument. Uni-Trend will not be responsible for the personal safety and property damage caused by the user's failure to comply with the following terms.
Instrument Grounding	To prevent the risk of electric shock, please connect the power ground wire.
Operating Voltage	Ensure that the operating voltage of the electric supply does not exceed 10% of the rated range, to avoid dangerous damage to the instrument.
Instrument Connecting line	Select the proper electric wire to connect the load and the power under test, make sure the capacity of the wires can withstand the maximum short-circuit current without overheating.

Input Voltage	Before connecting the device, observe all marks on the instrument. The instrument supports AC110V and 220V input. Before turning on the power supply, check whether the conversion switch of the programmable voltage tester matches the input power supply and ensure that the fuse is installed properly. Otherwise, the programmable voltage tester may be damaged.
DO NOT use the instrument in an explosive atmosphere	Do not use the instrument in flammable and explosive gas, steam or dusty environment. The use of any electronic equipment in such an environment is a risk to personal safety.
DO NOT open the outer shell of the instrument	Non-professional maintenance personnel should not open the outer shell of the instrument to try to repair the instrument. The undischarged charge still exists for a period of time after the instrument is turned off, which may cause electric shock.
DO NOT use instruments that work abnormally	If the instrument does not work properly and its danger is unpredictable, please disconnect the power cord, do not use it, and do not try to repair it yourself.
DO NOT use the instrument beyond the way specified in this user manual	If it exceeds the range, the protective measures provided by the instrument will become invalid. It's strictly prohibited that connect the instrument to life support system or any other equipment with safety requirements.
DO NOT install substitutes or perform unauthorized changes	To ensure the safety of programmable pressure tester, please do not install substitute parts or perform any unauthorized modifications. To avoid risks, do not use the instrument when the cover is removed or loose.

Safety Symbol

	Direct current		Null line or central line
	Alternating current		Live line
	Both direct and alternating current		Power on
	Three phase alternatin		Power off
	Grounding		Backup power

	Protective grounding		Ground terminal for chassis
	Signal grounding		Warning
	Danger		

Environment-Friendly Use Period (EFUP)



This product contains certain hazardous substances and can be used safely during its environmental-friendly use period (EFUP) of 40 years, as shown in the symbol on the left. If the specified time is exceeded, the product should be recovered.

Waste Electrical and Electronic Equipment (WEEE) Instruction 2002/96/EC



Do not dispose the product and its accessories in trash bin.

If the following abnormal conditions occurs, please terminate the operation and disconnect the power cable immediately. Contact the sales department of UNI-T for repair immediately. Failure to do so will result in fire or potential electrocution hazard to operators.

- The instrument is abnormal operation.
- Abnormal noise, smell, smoke or flash occurs during operating the instrument.
- During operation, the instrument generates high temperature or electric shock.
- Power line, switch or socket is damaged.
- An impurity or liquid flows into the instrument

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1. Before Use

Thank you for purchasing UNI-T product! Please read this chapter carefully before use.
In this chapter you will learn the following:

- Out of box audit
 - Requirements of power supply
 - Choice of power supply and fuse
 - Operating environment
 - Perform test clips
 - Preheat and continuous operating hours
 - Other characteristics
-

1.1 Out of Box Audit

Check with packing list to confirm that accessories has no loss. If there have any problem, please contact with our company.

1.2 Requirements of Power Supply

- (1) voltage range: 198V ~ 242V or 99V ~ 121V
- (2) frequency range: 47.5 Hz ~ 63 Hz
- (3) power range: $\leq 20\text{VA}$
- (4) Power input phase wire L, zero line N, ground line E should be corresponding to the power plug of the instrument.
- (5) The instrument has designed to reduce waveform jamming caused by AC power input. However, it should still be used in a low-noise environment as far as possible. If this cannot be avoided, please install a power filter.



WARNING: To prevent electric shock, please connect the ground wire of the power supply. If the power cable is replaced, ensure that the ground of the power cable is properly connected.

1.3 Choice of Power and Fuse

UTR2810+ Series has 110V and 220V AC input version, the fuse specification is as below:

110V $\pm 10\%$ T0.5mA

220V $\pm 10\%$ T0.25mA

1.4 Operating Environment

- (1) Do not use the instrument in dust, shaking, direct sunlight and etchant gas environment.
- (2) Please use the instrument in operating temperature $0^{\circ}\text{C} \sim 40^{\circ}\text{C}$, relative humidity $\leq 75\%$, to ensure the accuracy of measurement
- (3) The instrument has designed to reduce waveform jamming caused by AC power input. However, it should still be used in a low-noise environment as far as possible. If this cannot be avoided, please install a power filter.
- (4) If the instrument is not used for long time, please store it in an original packing box or a similar box in ventilated room with temperature of $5^{\circ}\text{C} \sim 40^{\circ}\text{C}$ and relative humidity less than 85%RH. The air should not contain harmful corrosion and avoid direct sunlight.
- (5) When the instrument connecting with the test object throught the testing wire, it should keep away from the strong electromagnetic field to avoid interference to the measurement..

1.5 Kelvin Clips or Test Fixtures

Please use the equipment test fixtures or test clips, the test fixtures or test clips made by user or other companies may casuse incorrect measurement results. The test fixtures, test clips and the pins of the device under test should be kept clean to ensure that the connecting in good condition.

Connect the test fixture or test clip to the four test ends of Hcur, Hpot, Lcur and Lpot on the front panel of the instrument. For the object under test with a shielding shell, the shielding layer can be connected to the instrument "┐".

1.6 Preheat and Continous Operating Hour

In order to guarantee the accuracy of measurement, the preheating time should not less than 15 minute; Operating hour should be less than 16 hours.

1.7 Other Characteristics

- (1) Poewer Consumption: $\leq 20\text{VA}$
- (2) Dimension (W*H*D) : 267*174*88mm
- (3) Weight: about 2.15kg;

2. Introduction of Panel

In this chapter you will learn the following:

- Front Panel
- Rear Panel
- Display Area

2.1 Front Panel

The front panel of UTR2810E+, see the Figure 2-1.

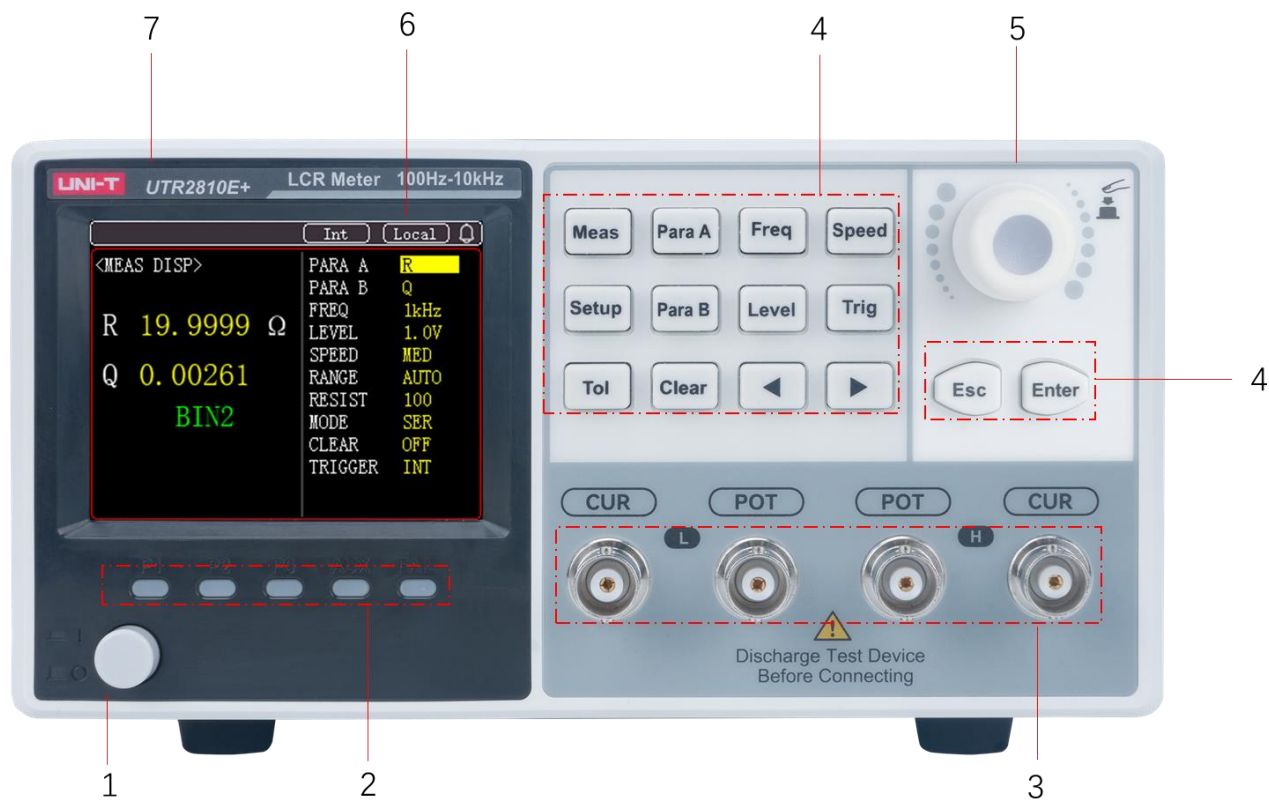


Figure 2-1 Front Panel

No.	Function		Description
1	POWER switch		When the switch is on "1", the power is enabled; When the switch is on "0", the power is disabled
2	Sorting light		P1 P2 P3 AUX NG
3	Test lead		Hcur: current excitation high-end Hpot: voltage pressure high-end Lpot: voltage pressure low-end Lcur: current excitation low-end
4	Button	Measure	Turn to <MEAS DISP> page
		Setup	Turn to <SYSTEM SETTING> page
		Tol	Turn to <COMP SET> page

		Para A	Para A select
		Para B	Para B select
		Clear	Start zero clear
		Freq	Frequency select
		Level	Level select
		◀	Turn cursor to left
		Speed	Speed select
		Trig	Trigger single test
		▶	Turn cursor to right
		ESC	Exit the current page or turn to <MEAS DISP> page
		Enter	Confirm
5	Rotary knob		Select and confirm
6	LCD		Display the information of test result and condition
7	Brand and model name		Brand and model name of the instrument

Table 2-1 Function description of front panel

2.2 Back Panel

The back panel of UTR2810E+, see the Figure 2-2

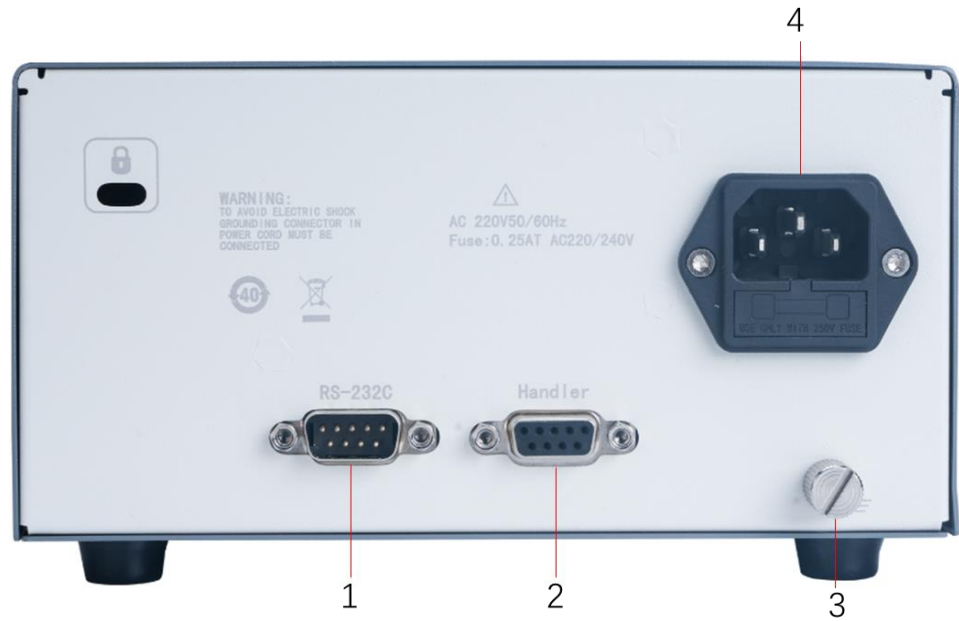


Figure 2-2 Back Panel

No.	Function	Description
1	RS232C serial interface	Serial communication interface
2	Handler interface	Through Handler interface to make up test system and achieve automatic test. The instrument outputs the sub-file comparison results, communication signal and obtains the "start" signal through the interface.
3	Ground lead	The grounding lead is connected with the instrument chassis. It can be used to protect or shield the ground connection.
4	Power spcket	For input AC power(with fuse)

Table 2-2 Function description of panel

2.3 Display Area

The UTR2810E+ display area is divided into the following parts, see Figure 2-3

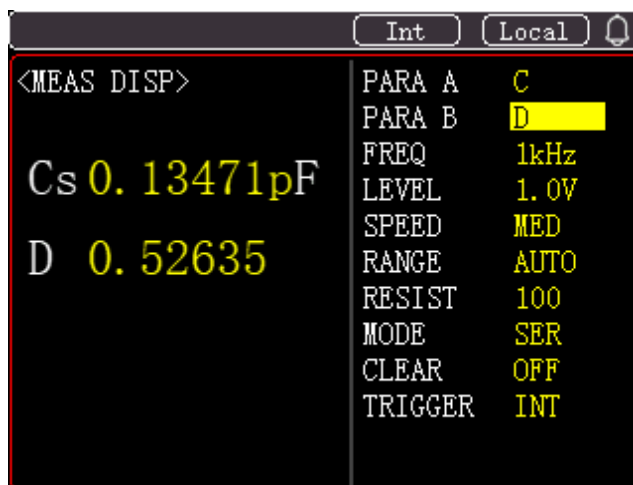


Figure 2-3 Display Area

Long press the [Meas] key, the display area will turn to full screen display, and press [Esc] key will exit the full screen display.



Figure 2-4 Full-screen Display Area

2.3.1 MEAS DISP

Display Primary parameter Z/R/L/C/G/Y

Secondary parameter X/Q/D/R/θ (deg) /θ (rad) /B

2.3.2 SET DISP

(1) Parameter A

- Z: Impedance value measurement
- R: Resistance value measurement
- L: Inductance value measurement
- C: Capacitance value measurement
- G: Conductance value measurement
- Y: Admittance measurement

(2) Parameter B

X: Reactance measurement
Q: Quality factor measurement
D: Loss value measurement
R: Resistance value measurement
 θ (rad) : Phase angle (arc)
 θ (deg) : Phase angle
B: Susceptance value measurement

(3) Frequency

100 Hz: The current measured signal frequency is 100 Hz.
120 Hz: The current measured signal frequency is 120 Hz.
1 kHz: The current measured signal frequency is 1 kHz.
10 kHz: The current measured signal frequency is 10 kHz.

(4) Electrical level

0.1 V: The current measured signal voltage is 0.1 V.
0.3 V: The current measured signal voltage is 0.3 V.
1.0 V: The current measured signal voltage is 1.0 V.

(5) Speed

FAST: Fast speed test
MED: Medium speed

test

SLOW: Slow speed test

(6) Range

AUTO: Automatic range
HOLD: 3/10/30/100/300/1k/3k/10k/30k/100k/300k

(7) Internal Resistance

30 Ω : signal source resistance is 30 Ω .
100 Ω : signal source resistance is 100 Ω .

(8) Mode

SER: Series equivalent circuit
PAR: Parallel equivalent circuit

(9) Clear

ON: turn on
OFF: turn off

(10) Trigger Mode

INT: internal trigger
MAN: manual trigger
EXT: external trigger
BUS: bus trigger

3. Operating Instruction

In this chapter you will learn the following:

- Boot up
- First function operating
- Second function operating

3.1 Boot up

- 1) Press 【POWER】 button to boot up the instrument.
- 2) Enter test state after delay, see Figure 3-1, the actual situation may different.

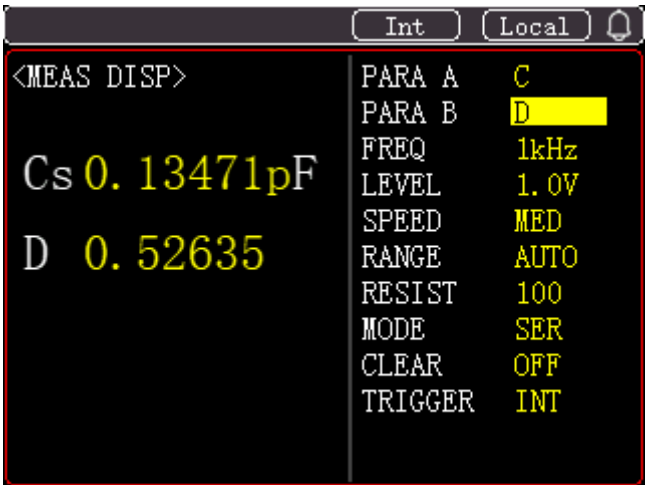


Figure 3-1 Test Mode

3.2 Measurement Parameter Setting

Use 【direction key】 or 【rotary knob】 to move the cursor to the parameter to be test, press 【rotary knob】 or 【ENTER】 to enter parameter setting, use 【direction key】 or 【rotary knob】 to select the corresponding parameter, and then press 【rotary knob】 or 【ENTER】 to confirm the setting.

In addition, press 【PARAA】 can quickly cursor location to parameter A, press 【PARAB】 can quickly cursor location to parameter B.

3.2.1 Parameter A/B

Classification	Function	Description
Parameter A (primary parameter)	L	Inductance value
	C	Capacitance
	R	Resistance value
	Z	Impedance value
	G	Conductance value

	Y	Admittance value
Parameter B (secondary parameter)	D	Loss factor
	Q	Quality factor
	θ (deg)	Phase angle
	θ (rad)	Phase angle(arc)
	B	Susceptance value
	X	Reactance value
	R	Resistance value

The UTR2810E+/2811E+ can simultaneously measure two different parameter combinations of the measured impedance in one test cycle. The primary and secondary parameters are as follows:

Z is positive value, L/C/R has positive and negative value.

When C measuring, the primary parameter display "-", the actual device under test is inductive;

When L measuring, the primary parameter display "-", the actual device under test is capacitive;

When R measuring, if R appears R "-", it because over clear, please do clear operating correctly.

UTR2810E+/2811E+ provides 42 measurement parameter combinations: primary and secondary parameter

Parameter A/B combination	Description
L-Q	Simultaneous measure and display inductance value and quality factor
C-D	Simultaneous measure and display capacitance and loss factor
R-X	Simultaneous measure and display resistance and reactance value
Z-B	Simultaneous measure and display impedance and susceptance value
Y- θ (deg)	Simultaneous measure and display admittance value and phase angle
G- θ (deg)	Simultaneous measure and display conductance value and phase angle(arc)
Y-R	Simultaneous measure and display conductance and resistance value

3.2.2 Frequency

UTR2810E+/2811E+ provides 4 common test frequency: 100 Hz, 120 Hz, 1 kHz and 10 kHz.

Frequency	Description
100 Hz	test frequency is 100Hz

120 Hz	test frequency is 120Hz
1 kHz	test frequency is 1 kHz
10 kHz	test frequency is 10 kHz

3.2.3 Electrical Level

UTR2810E+/2811E+ provides 3 common test signal voltage: 0.1V, 0.3V and 1.0V. The current test signal voltage will display in the the signal voltage indication area below the LCD.

Press the [Level] key to switch the electrical level.

Electrical Level	Description
0.1V	Test signal voltage is 0.1V
0.3V	Test signal voltage is 0.3V
1.0V	Test signal voltage is 1.0V

3.2.4 Speed

UTR2810E+/2811E+ provides three test mode FAST, MED and SLOW. In general, the slower the test speed, the more stable and accurate the test results.

Press the [Speed] key to switch the speed.

FAST: 43ms

MED: 185ms

SLOW: 350ms

Speed	Description
FAST	About 23.2 times per second
MED	About 5.4 times per second
SLOW	About 2.8 times per second

3.2.5 Range

UTR2810E+/2811E+ provides 12 range 3Ω, 10Ω, 30Ω, 100Ω, 300Ω, 1kΩ, 3kΩ, 10kΩ, 30k, 100kΩ, 300kΩ and Auto. The effective measuring range of each range is shown below.

No.	Range	Effective measurement range
0	300 kΩ	300kΩ-99.9999MΩ
1	100 kΩ	100kΩ-300kΩ
2	30 kΩ	30kΩ-100kΩ
3	10 kΩ	10kΩ-30kΩ
4	3kΩ	3kΩ-10kΩ
5	1kΩ	1kΩ-3kΩ
6	300Ω	300Ω-1kΩ
7	100Ω	100Ω-300Ω
8	30Ω	30Ω-100Ω
9	10Ω	10Ω-30Ω
10	3Ω	10μΩ-10Ω
11	Auto	10μΩ-99.9999MΩ

1. If the range is auto, the instrument will make range prediction at each measurement period, so the test speed will be slower than the locking range. Change the range frequently will reduce response. In general, automatic range is not suitable for sorting measurement.
The nominal rang is for sorting measurement.
2. The overload mark "----" will be displayed when the size of the test element exceeds the test range or exceeds the display range of the instrument when the range is maintained.

3.2.6 Internal Resistance

UTR2810E+/2811E+ provides 30Ω and 100Ω signal source internal resistance. In the same test voltage, select different signal source internal resistance will get different test current. The test results will be different if the measured part is sensitive to the test current. The instrument provides two kinds of different signal source internal resistance, which can be convenient for users to compare the test results with other instrument manufacturers at home and abroad.

Internal Resistance	Description
30Ω	The current signal source internal resistance is 30Ω
100Ω	The current signal source internal resistance is 100Ω

3.2.7 Mode

UTR2810E+/2811E+ can SER or PAR two equivalent circuit to measuring L, C, or R.

(1) The choice of capacitance equivalent circuit

Small capacity corresponds to high impedance value, and the influence of parallel resistance is greater than series resistance. At this point the series resistance compared to the impedance of the capacitor is very small, it can be negligible. Therefore, the parallel equivalent method should be selected for measurement.

On the contrary, large capacity corresponds to low impedance value, and the parallel resistance compared to impedance of the capacitor is very large, it can be negligible. The influence of series resistance is greater than parallel resistance. Therefore, the series equivalent method should be selected for measurement.

Generally speaking, capacitive equivalent circuits can select by the rule

When the choice is greater than 10kΩ, select parallel mode

When the choice is less than 10kΩ, select series mode

Between the above impedance, use an appropriate equivalent circuit as recommended by the component manufacturer.

(2) The choice of inductance equivalent circuit

Large inductance corresponds to high impedance value, and the influence of parallel resistance is greater than series resistance. Therefore, the parallel equivalent method is more suitable for measurement.

On the contrary, small inductance corresponds to low impedance value, the influence of the series resistance to inductance is more important. Therefore, the series equivalent method is more suitable for measurement.

Generally speaking, inductance equivalent circuits can select by the rule

When the choice is greater than 10kΩ, select parallel mode

When the choice is less than 10kΩ, select series mode

Between the above impedance, use an appropriate equivalent circuit as recommended by the component manufacturer.

Mode	Description
SER	Series equivalent circuit
PAR	Parallel equivalent circuit

3.2.8 Clear

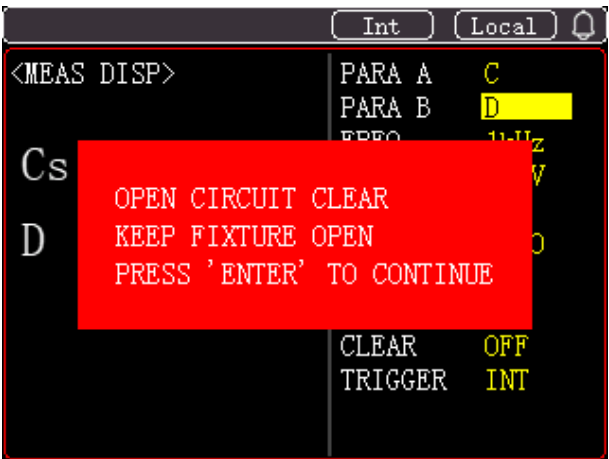
UTR2810E+/2811E+ open-circuit clearing function can eliminate the influence of stray capacitance and stray admittance (G,B) in parallel with the measured component; The short circuit clearing function eliminates the influence of residual impedance, such as lead resistance or lead inductance in series with the measured component.

Function Key	Function
OFF	Turn off
ON	Turn on

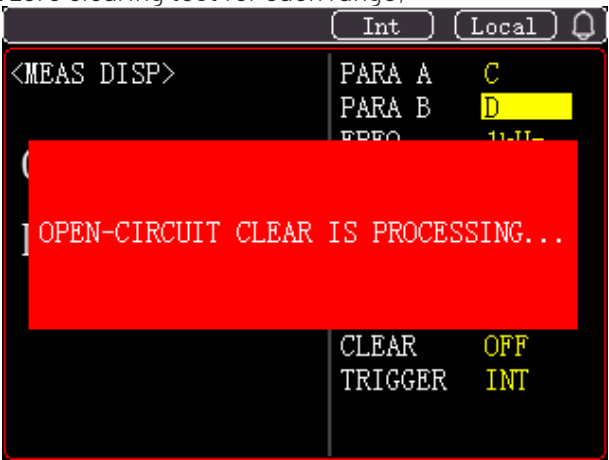
Set **【Clear】** to ON, the test result is the data after zero clearing; Set it to off, the test result is the data before zero clearing.

■ Method of Zero Clearing
Open-circuit zero clearing

- Step 1 Press **【CLEAR】** key to enter zero clearing interface;
- Step 2 LCD displays information“keep fixture open”;

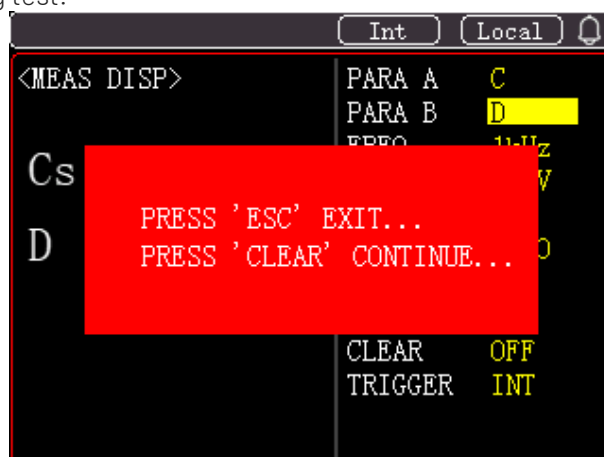


- Step 3 Press **【ENTER】** key to execute open-circuit zero clearing. LCD displays information “open-circuit clear is processing”; the instrument will automatically scans open - circuit zero clearing test for each range;

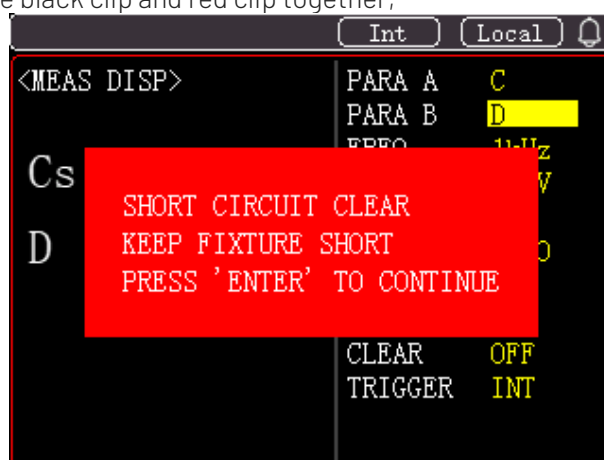


- Step 4 After that, LCD displays information “press ESC exit; press CLEAR continue”; press **【CLEAR】** to continuing to zero clearing; This step is completed, which means open-circuit zero clearing is completed. It can be escape or continue the short-circuit zero

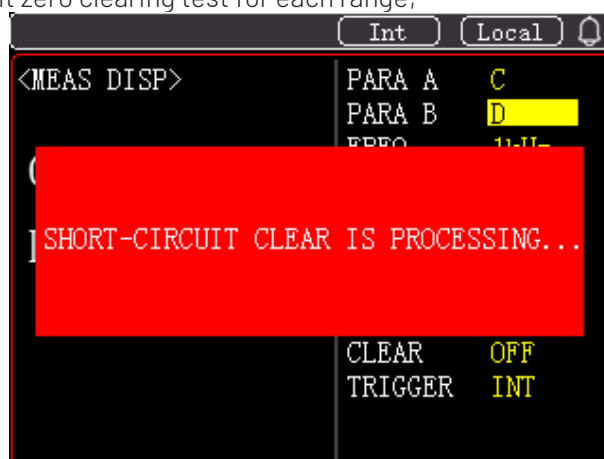
clearing test.



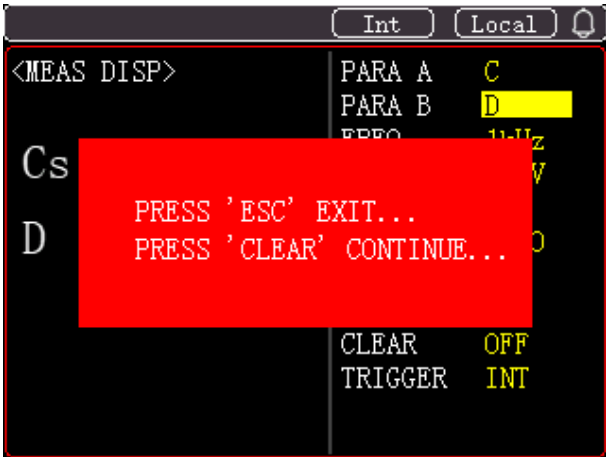
- Step 5** LCD displays information "keep fixture short"; If the instrument need to do short circuit zero clearing, connect the short-circuit plate to the test fixture, or connect the test wire black clip and red clip together;



- Step 6** Press **【ENTER】** key to start the short circuit zero clearing. LCD displays information "short-circuit clear is processing"; the instrument will automatically scan short circuit zero clearing test for each range;



- Step 7** After that, LCD displays" press ESC EXIT ; press CLEAR continue". This step is completed, which means short circuit zero clearing is completed. It can be escape or continue the open-circuit zero clearing test again.



- 1) After the instrument the zero clearing is done, the test condition is changed (replace test fixture, test clip, temperature and humidity environment), the instrument should do zero clearing again.
- 2) During zero clearing, press **【ESC】** key to escape the current test and return the test state, the original zero clearing data remains unchanged.
- 3) During short zero clearing, it may occasionally occur "FAIL", in this case, the low resistance short circuit (the test wire clip or the short-circuit plate) may not be used or the contact is not reliable. It should connect to short circuit and then perform the zero clearing again.
- 4) Zero clearing data will store in nonvolatile memory. Under the same test conditions, the instrument does not need to zero clear.
- 5) The instrument will automatically select open-circuit or short circuit zero clearing. "QUIT" will be displayed in the display area if there are components on the test terminal or the instrument is in faulty.

3.2.9 Trigger Setup

UTR2810E+/2811E+ have four trigger modes: INT、MAN、EXT and BUS.

Trigger Mode	Description
INT	Internal trigger mode is also called continuous test. Trigger signal will continuous test by the instrument accordance with the inherent period.
MAN	Manula trigger mode, each time 【Trig】 key is pressed ,the instrument will perform a test period and it will be in a waiting state at othe times.
EXT	External trigger mode, when the instrument received a rising edge pulse from Handler interface on the back panel, the instrument will perform a test period and it will be in a waiting state at othe times. Please refer to Handler interface.
BUS	Bus trigger mode, when the instrument received RS232 trigger command, the instrument will perform a test period and it will be in a waiting state at other times. Press ESC to exit.

3.3 System Setup

Press **【Setup】**key to enter system setup interface, setting method is the similar to measurement parameter setting.

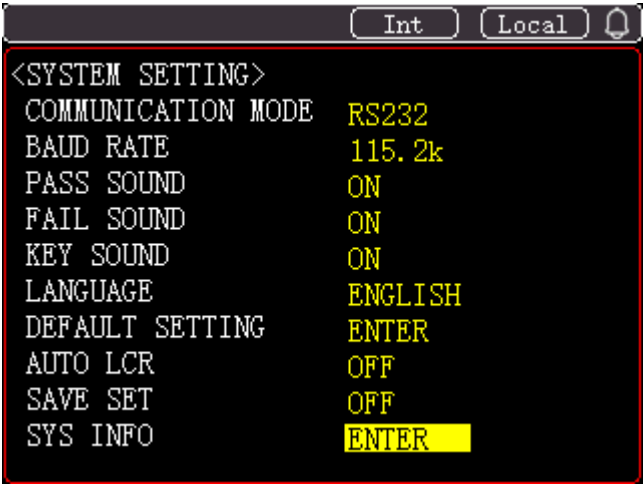


Figure 3-2 System Setting

3.3.1 Communication Mode

UTR2810E+ provides RS232 communication interface to communicate with PC , all panel key function can be used and inquire the test state and sampling test result of the instrument through this interface. (UTR2811E+ can't support this setting because it does not contain RS232 interface.)

3.3.2 Baud Rate

Baud rate is the data transmission rate on the RS232 communication bus. UTR2810E+ supports five common baud rates: 9600bps, 38400bps, 57600bps, 115200bps.(UTR2811E+ can't support this setting because it does not contain RS232 interface.)

Baud Rate	Description
1200	Transmit data 1200 bits per second
9600	Transmit data 9600 bits per second
38400	Transmit data 38400 bits per second
57600	Transmit data 57600 bits per second
115200	Transmit data 115200 bits per second

3.3.3 Qualified Beeper

UTR2810E+/2811E+ can set the qualified beeper.

Qualified Beeper	Description
ON	Turn on
OFF	Turn off

3.3.4 Unqualified Beeper

UTR2810E+/2811E+ can set the unqualified beeper.

Unqualified Beeper	Description
ON	Turn on
OFF	Turn off

3.3.5 Key Sound

UTR2810E+/2811E+ can set the key sound.

Key Sound	Description
ON	Turn on
OFF	Turn off

3.3.6 LANGUAGE

UTR2810E+/2811E+ can set the language.

LANGUAGE	Description
Chinese	Display Chinese interface
ENGLISH	Display English interface

3.3.7 Default Setting

The default setting of UTR2810E+/2811E+, this setting can return to the factory setting (only for system setting).

3.3.8 Auto LCR

Auto LCR setup of UTR2810E+/2811E+ is an automatic component identification function. According to the property of components to auto select inductance, capacity or resistance parameters to display.

The inductance parameter is automatically set to L-Q;

The capacitor parameter is automatically set to C-D;

The resistance parameter is automatically set to R-X.

Auto LCR	Description
ON	Turn on
OFF	Turn off

3.3.9 Save Setting

Save setting of UTR2810E+/2811E+, after this function is turned on, the measurement setting parameters will be automatically called next boot; System configuration parameter; Data and setup of sorting setting.

Save Setting	Description
ON	Turn on auto save
OFF	Turn off auto save

3.3.10 View System Information

After view the system information, press **【ENTER】** or **【ESC】** to exit the system information interface.

3.4 Sorting Setup

Deviation mode is used to control the display way of the result, deviation display is to show the difference

between measured value and reference value. It is used for observing test result with different test conditions or environmental conditions. And it can also be used to observing the test result when sorting the measurement (set the deviation display mode and deviation reference to consistent with the deviation tolerances mode and the nominal value).

Press **【TOL】** to enter sorting setting, the setting method is the same with measurement parameter setting.

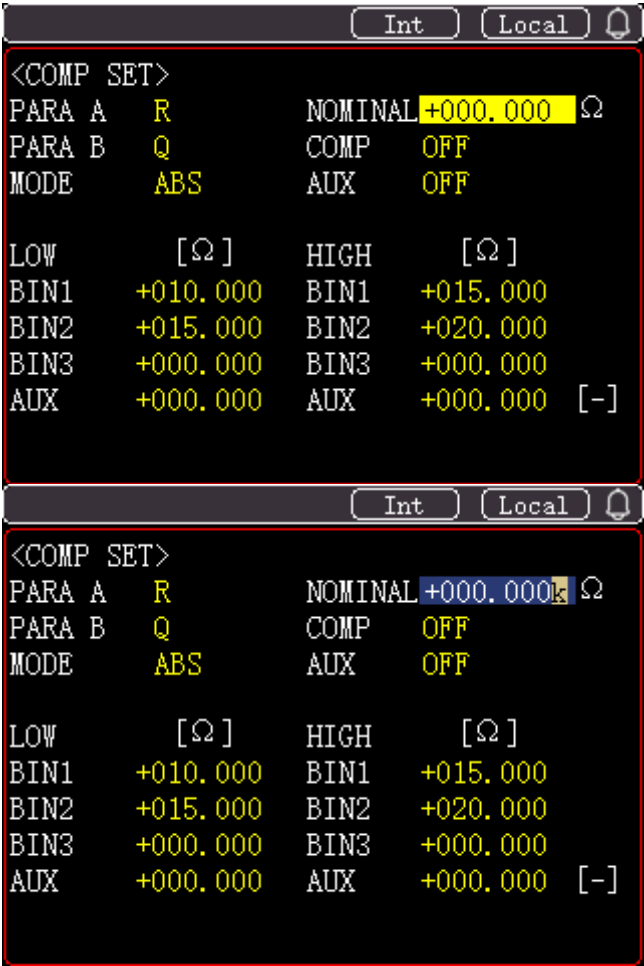


Figure 3-3 Sorting Interface

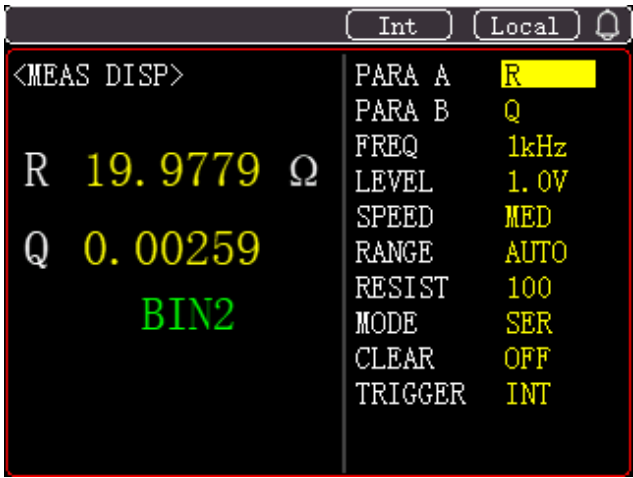


Figure 3-4 Sorting Result

3.4.1 Parameter A/B Setup

Set parameter A/B of UTR2810E+/2811E+ in the main interface, it will keep the settings.

3.4.2 Nominal Value Setup

The nominal value of primary parameter of UTR2810E+/2811E+ can separate set and save.

3.4.3 Comparison Function

The inner comparison of UTR2810E+/2811E+ are allowed to set 3 sets of the limit of primary parameter and 1 set of the limit of secondary parameter. The measured element can be divided into 5 levels (NG, BIN1, BIN2, BIN3 and AUX). When the primary parameter use the comparison function, it should turn on **【Comparsion】** switch, this function is only charge for the sorting judgement of primary parameter; When the secondary parameter use comparison function, it should turn on **【Auxiliary】** switch, this function is only charge for the sorting judgement of secondary parameter.

Comparison/Auxiliary	Function
ON	Turn on comparsion function
OFF	Turn off comparsion function

3.4.4 Comparison Mode

UTR2810E+/2811E+ provides 3 comparsion modes: SEQ, ABS and % (percentage deviation) , the latter two are collectively referred to as tolerance mode (TOL) .

TOL: set the deviation of the nomial value to be the limit of comparison;

SEQ: set the test range as the limit of comparison, the limit of comparsion must order from small to large.

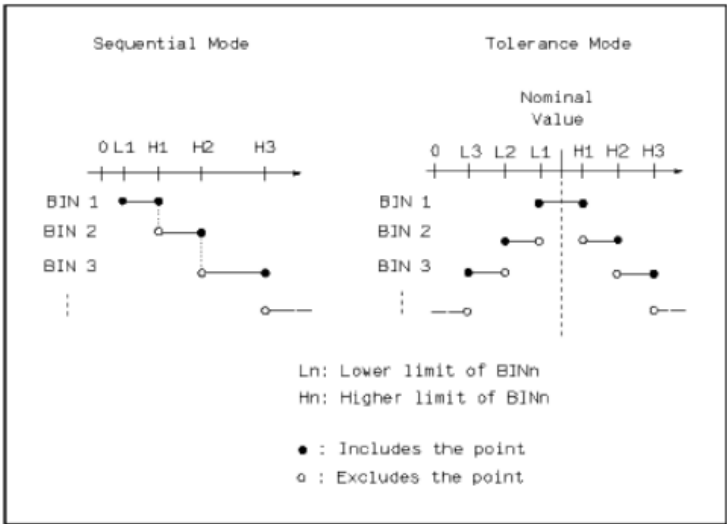


Figure 3-5 Tolerance Mode and Sequence Mode

■ ABS display mode

$$ABS = X - Y$$

X is the test value of the current

measured part

Y is the setting nominal value

■ % (Percentage Deviation)

$$\% = (X - Y) / Y \times 100[\%]$$

X is the test value of the current measured part

Y is the setting nominal value

Comparison Mode	Description
SEQ	Sequency mode
ABS	Absoulate deviation mode
%	Percentage deviation mode

3.4.5 【Upper Limit】 , 【Lower Limit】 Parameter Setting

UTR2810E+/2811E+ can set 3 sets of the upper/lower limit of primary parameter, 1 set of the limit value of secondary parameter. The upper limit of each level should greater than the lower limit, otherwise, UTR2810E+/2811E will not select any components into the grade.

- 1) The primary parameter A set nominal value, comparsion mode to compare; Secondary parameter B in the auxiliary mode, compare between the lower limit and the upper limit. There are two independent comparator, it should turn on the switch respectively. The switch turned on at the same time, and qualified at the same time, report BIN1/BIN2/BIN3; If one fails, report NG.

4. Instruction of Handler Interface

In this chapter you will learn the following:

- Brief Introduction
- Operating Instruction

4.1 Brief Introduction

UTR2810E+ provides Handler interface , this interface is used for outputs sorting result of the instrument.

When the instrument is used in the automatic component sorting test system, the interface provides the contact signal with the system and the sorting result output signal. As shown in Table 4-1, contact signal include /TRIG(start signal) , /IDX(AD end of transition) , /EOM(end of all measurement); Sorting result include qualified grade /BIN1, /BIN2, /BIN3, auxiliary grade/AUX, and unqualified grade/NG.

Using these signal, the instrument can be easily integrated with the system controller into an automatic test system for component testing, sorting and quality control, therefore improving the production efficiency.

Name	Signal	Circuit Characteristic
/BIN1	Qualified signal	<div><div></div> Inner pull-up resistor</div> <div><div></div> Collector output</div> <div><div></div> Low level valid</div> <div><div></div> Photocoupling</div>
/BIN2		
/BIN3		
/NG	Unqualified signal	
/AUX	Auxiliary signal	
/EOM	End of all measurement	
/TRIG	Start signal	Pulse width≥1μs, rising edge trigger, low level drive current about 5-10mA.

Table 4-1 Handler Interface

4.2 Operating Instruction

4.2.1 Definitio of signal line

HANDLER interface has three modes： Comparison output, control input and output.

- Comparison output signal:

/BIN1, /BIN2, /BIN3, /NG, /AUX. Comparsion output signal generation see Figure 4-1.
- Control output signal:

/EOM (end of measurement and comparison of valid data signals)
- Control inutput signal:

/TRIG(external trigger mode)

Note： "/"before signal name is presents that the signal is valid in low level.

Figure of Comparison and Auxiliary Function

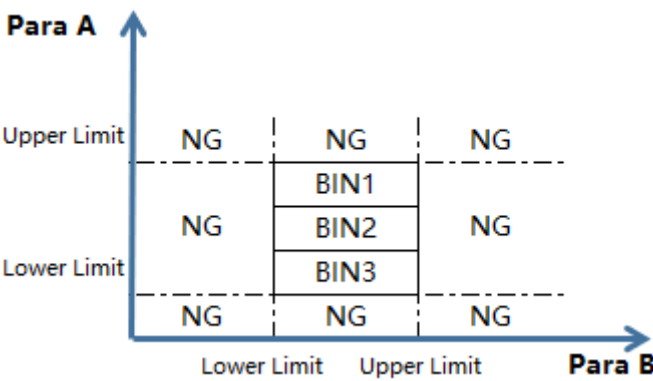


Figure 4-1 Example of Turn on Comparison and Auxiliary Function at the same time

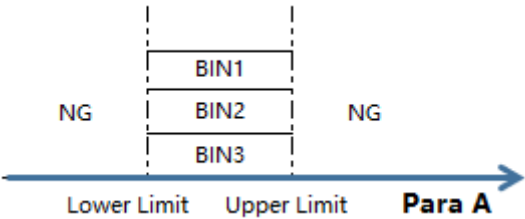


Figure 4-2 Example of Turn on Comparison Function

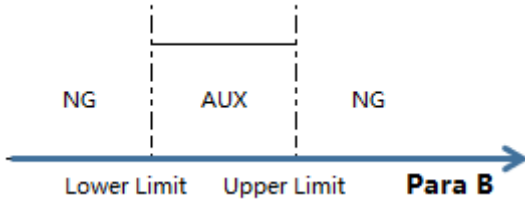


Figure 4-3 Example of Turn on Auxiliary Function

4.2.2 Connection terminal and Signal

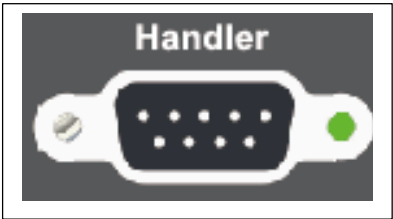


Figure 4-4 Handler Interface

See Table 4-2 and Figure 4-4 for pin assignment and brief introduction, sequency chart see Figure 4-5.

Pin Numbe	Signal Name	Description
-----------	-------------	-------------

r		
1	/BIN1	Output sorting judgement results.
2	/BIN2	All signals are collector outputs with built-in pull-up resistors. Pull-up power can select internal and external power EXTV. Built-in pull-up resistance is 4.7kΩ.
3	/BIN3	
4	/NG	
5	/AUX	
6	/TRIG	Falling edge will trigger the instrument measurement.
7	EXTV	External DC power for the sorting interface signal.
8	/EOM	End Of Measurement: The signal is valid when the measurement data and comparison results are valid
9	COM	Reference ground of external power EXTV

Table 4-2

Definition of Handler Interface

Pin

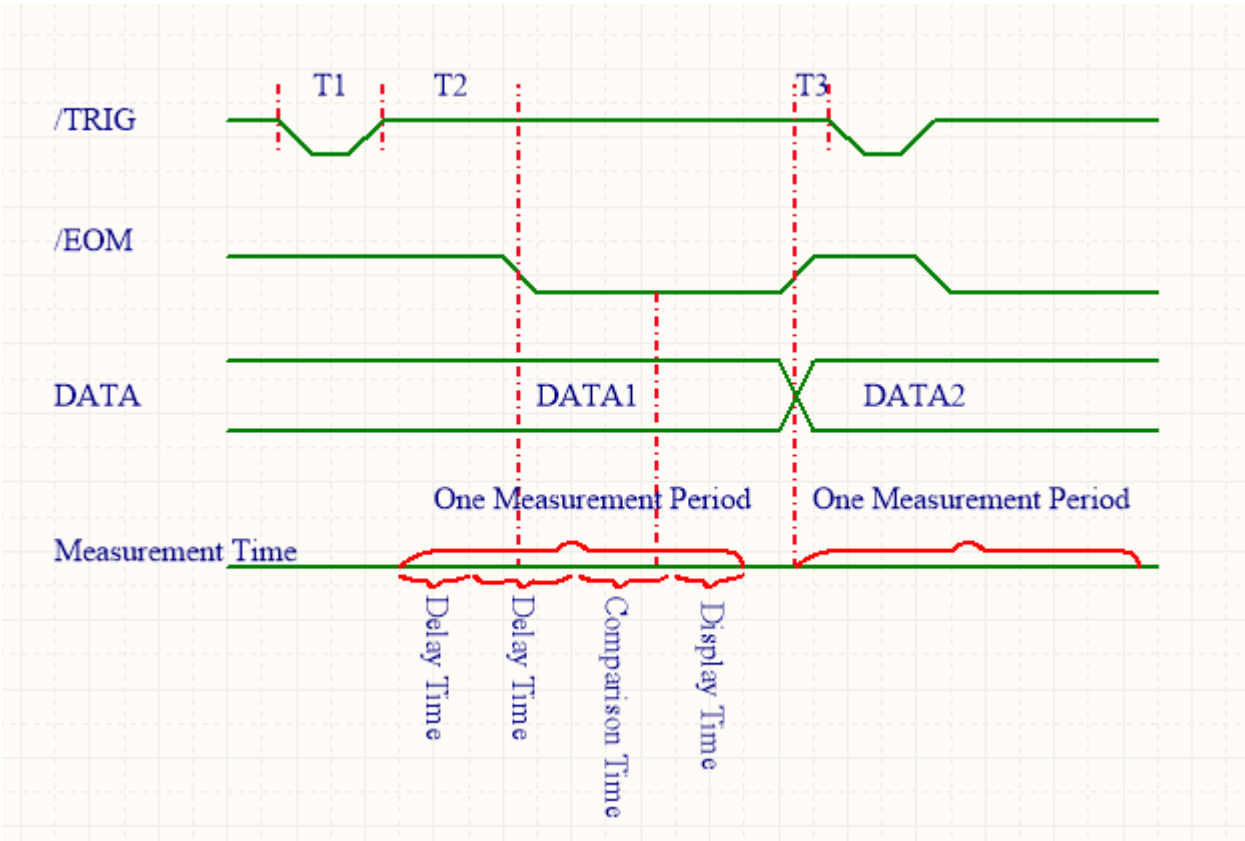


Figure 4-5 Sequence Chart of Handler Interface

4.2.3 Electrical Characteristic

Each DC output (pin 1-6) is isolated by open collector photocouplers. Output voltage of each line is decided by pull-up voltage of Handler interface. The pull-up voltage is provided by the external voltage (EXTV: +5V to +24V).

Electrical characteristic of DC isolated output see Table 4-3.

Output Signal	Output the rated voltage		The maximum current	Reference ground of circuit
	Low level	High level		
/BIN1- /BIN3 /AUX /NG /EOM	≤0.5V	+5V~ +24V	6mA	Built-in pull-up voltage: the 仪 instrument reference ground of external voltage (EXTV) : COM

Table 4-3 Electrical Characteristic of DC Isolated Output

Sorting Signal Simplified Diagram see Figure 4-6

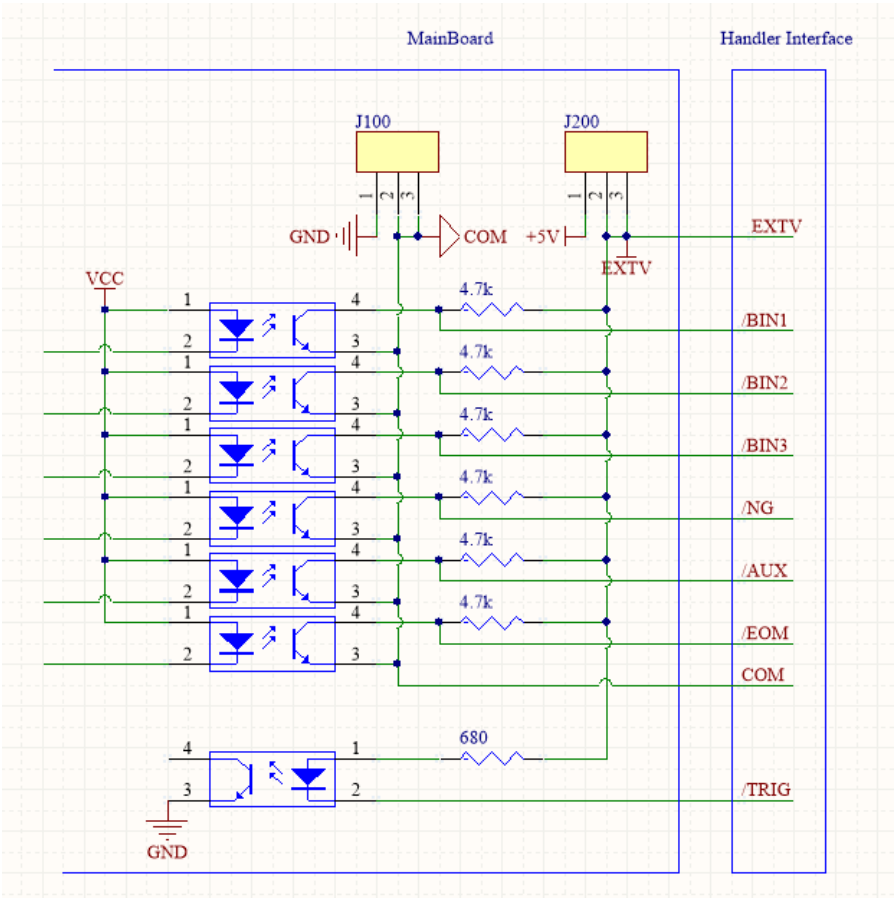


Figure 4-6 Sorting Signal Simplified Diagram

■ Use external power supply (factory default) : 2 of J200 connected with 3 of J200; 2 of J100 connected with 3 of J100.

UTR2810E+ has sorting function, UTR2811E+ has not sorting function.

5. RS232 Serial Interface

In this chapter you will learn the following:

- Introduction of RS-232 interface

- UTR2810E+ serial interface
- Connect to computer
- Serial port parameter
- Key points of programming

The instrument uses an RS-232 interface (standard) to communicate with the computer for all instrument functions. Through standard SCPI commands, user can also easily compile a variety of acquisition systems suitable for their own.

5.1 Introduction of RS-232C Interface

RS-232 is the widely used serial communication standard, it's also called asynchronous serial communication standard. RS-232 is used to realize data communication between computers and peripherals. RS is an abbreviation for "Recommended Standard", 232 is the standard number, this is a standard officially published by EIA in 1969, which stipulates that one data line is transmitted one at a time.

The configuration of most serial ports is usually not strictly based on the RS-232 standard: 25 core connector are used on each port (the current computer is basically use 9 core connector). The common RS-232 signal table see Table 5-1.

Signal	Symbol	Pin number of 25 core connector	Pin number of 9 core connector
Request to Send	RTS	4	7
Clear to Send	CTS	5	8
Data Set Ready	DSR	6	6
Data Carrier Detection	DCD	8	1
Data Terminal Ready	DTR	20	4
Transmitted Data	TXD	2	3
Received Data	RXD	3	2
GND	GND	7	5

Table 5-1 RS-232 Common Signal

5.2 UTR2810E+ Serial Interface

Serial ports of UTR2810E+ is not strictly based on the RS-232 standard , it's just provide a smallest simplified subset, see Table 5-2.

Signal	Symbol	Pin number of 9 core connector
Transmitted Data	TXD	3
Received Data	RXD	2
GND	GND	5

Table 5-2 UTR2810E+ Serial Signal

RS232C connector uses 9 core pin DB socket , sequence of pin see Figure 5-1



Figure 5-1 Back View of RS232C Connector



- Suggestion:
- 1. To avoid electrical shock, turn off the power supply when removing or inserting the connector.
 - 2. To avoid damage the device, do not short circuit output terminal or the chassis.

5.3 Connect to Computer

Refer to Figure 5-2, the pin definition of the UTR2810E+ is different from the pin definition of the 9 core connector used by computer. User can use dual-core shielded wire to made three-wire connecting cable (length should less than 1.5m) as shown in the picture or buy the serial port cable of UTR2810E+ from Uni-trend company. When self-made cable connecting to the computer, pay attention to the right connecting, the computer side should short circuit with 4, 6 pin, 7, 8 pin.

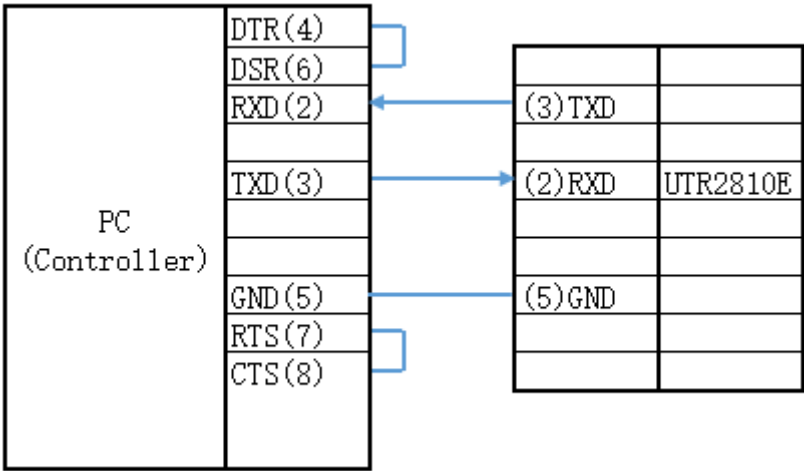


Figure 5-2 Instrument connect with Computer

5.4 Serial Port Parameter

Serial port parameter of UTR2810E+ see Table 5-3:

TransmissionMode	Full duplex asynchronous communication with start and stop bit
Baud Rate	9600 bps
Data Bit	8 bit
Stop Bit	1 bit
Parity Bit	None
End Character	NL (line character, ASCII code 10)
Connector	DB9 core

Table 5-3 Serial Port Parameter

5.5 Key Points of Programming

Because UTR2810E+ does not use hardware communication, and RS232C serial communication is simple to use. Therefore reduce the possible data loss or data error phenomenn, communication software should be compiled strictly comply with the following requirements:

- 1) The host computer transmit command by ASCII code with NL (newline character, ASCII code is 10)as the end character. UTR2810E+ will perform the command when received the end character.

- 2) Once UTR2810E+ perform inquiry command, the query result will be sent immediately, regardless of whether the current command string has been executed completely. Therefore, a command string can inquire multiple times, but the host computer should have a corresponding number of read result operation. This protocol is recommends that a command string only contain one query.
- 3) Query result send by ASCII code string with NL(newline character, ASCII code is 10) as the end character.
- 4) UTR2810E+ sends the query result continuously(interval of 1ms), the host computer should remain the ready state, otherwise, data may be lost.
- 5) For some bus command which need a longer time to complete, such as zero clearing. The host computer should be voluntary waiting or synchronize the execution of the previous command by response to the user's keyboard input confirmation. To avoid the next command being ignored or error when command execution.
- 6) The communication software programed by DOS application software should running in the pure DOS environment which provides serial port, not in the WINDOWS environment.

Notices: If the host computer cannot receive the return data of the instrument, user can use the following methods to figure out:

1. If the software handshake is disabled, please refer to <system setup> to enable it.
 2. If the serial port shows connection error, please check the cable connecting condition.
 3. If the communication format of advanced language program occurs error, please check whether the format is right and baud rate is the same as the instrument.
 4. If the the instrument is parsing the last command and the host computer cannot receive the response, try again later.
- <If the problem still cannot resolved, please consult with UNI-T after-sale engineer.>
-

5.6 End Character

The instrument provides three end characters:

LF(hexadecimal: 0x0A)

CR(hexadecimal: 0x0D)

CR+LF(hexadecimal: 0x0D 0x0A)

End character can select in the system configuration page, the factory default is CR+LF.

5.7 SCPI Language

SCPI-Standard Commands for Programmable Instruments is the common command set to test instrument adopt by UNI-T instrument. SCPI also known as TMSL-Test and Measurement System Language, which develop based on IEEE488.2 by Agilent Technologies. It has been widely used by manufacturers of test equipment.

The built-in command parser is responsible for analysis the user's command format. The command parser complies with the SCPI protocol but is not completely the same, so please read "UTR2810E+ SCPI command reference" carefully before start.

UTR2810E+ has RS232 interface, UTR2811E+ has no RS232 interface.

6. General Characteristic Index

In this chapter you will learn the following:

- Measurement Parameter
 - Equivalent Circuit
 - Range
 - Trigger Mode
 - Test Terminal Mode
 - Test Speed
 - Basic Accuracy
 - Test Signal Frequency
 - Test Signal Level
 - Output Impedance
 - Test Display Range
 - Clear
 - Comparison Mode
 - Hold Range
 - Beeper
 - RS232 Port
 - HANDLER Port
-

6.1 Measurment Parameter

1. Primary Parameter:

- L: Inductance
- C: Capacitance
- R: Resistance
- Z: Impedance
- G: Conductance
- Y: Admittance

2. Secondary Parameter:

- D: Loss
- Q: Quality factor
- X: Reactance
- θ (deg) : Phase angle
- θ (rad) : Phase angle (radian)
- B: Electrical susceptance
- R: Resistance

3. Measurment parameter combination (there are 42 kinds of arbitrary combination of primary and secondary parameters, which are not listed here)

- L-Q
- C-D
- R-Q
- Z-Q

6.2 Equivalent Mode

- SER: series

■ PAR:parallel

The inductance, capacitance, resistance is not ideal pure reactance or resistance component, so they need to form in series or parallel to be a complex impedance component. The instrument will calculate its required value according to the series or parallel equivalent circuit, different equivalent circuit will get different results.

The two of equivalent circuit can transfer by the formula showed as Table 6-1. Regardless of the equivalent, it is the same for Q and D.

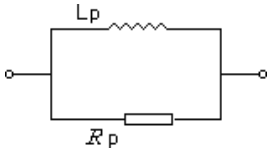
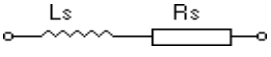
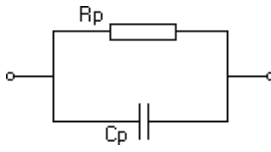
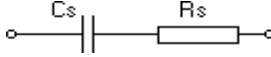
Circuit Format		Loss D	Equivalent Circuit conversion
L		$D=2 \quad FLp/Rp=1/Q$	$Ls=Lp/(1+D^2)$ $Rs=RpD^2/(1+D^2)$
		$D=Rs/2 \quad FLs=1/Q$	$Lp=(1+D^2)Ls$ $Rp=(1+D^2)Rs/D^2$
C		$D=1/2 \quad FCpRp=1/Q$	$Cs=(1+D^2)Cp$ $Rs=RpD^2/(1+D^2)$
		$D=2 \quad FCsRs=1/Q$	$Cp=Cs/(1+D^2)$ $Rp=Rs(1+D^2)/D^2$

Table 6-1 Equivalent Circuit Conversion

Notices:

- 1. The definition of Q、D、Xs: $Q=Xs/Rs$, $D=Rs/Xs$, $Xs=1/2\pi FCs=2\pi FLs$
- 2. In component parameters, the subscript S represents series equivalent and p represents parallel equivalent

6.3 Range

When UTR2810E+/2811E in 30Ω/100Ω source internal resistance, there are 11 range 3Ω, 10Ω, 30Ω, 100Ω, 300Ω, 1kΩ, 3kΩ, 10kΩ, 30kΩ, 100kΩ and 300kΩ.

6.4 Trigger Mode

UTR2810E+ provides internal, external, bus and manual trigger mode.

Trigger Mode	Function
Internal	The trigger signal is automatically generated within the instrument so that measurement can be continuously.
External	When Handler port received the "start" signal from the external, it will generate a measurement.
Bus	When RS232 port received the bus trigger command will

	generate a measurement.
Maunal	Press[Trig] key to start a test.

Table 6-2 Trigger Mode

6.5 Test Terminal Mode

Four-terminal test:

- Hcur: current excitation high end;
- Hpot: voltage sampling high end;
- Lpot: voltage sampling low end;
- Lcur: current excitation low end.

6.6 Test Speed

Test frequency, integral time, component size, display mode, rang mode and comparsion all these will affect test spee.

UTR2810E+/2811E provides thress test modes FAST , MED and SLOW . In general, the slower the test speed, the more stable and accurate the test results .

Speed	Time (S)
FAST	20
MED	6.25
SLOW	3

Table 6-3 Test Speed

6.7 Basic Accuracy

Type	Accuracy
C	$0.1\% (1 + C_x/C_{max} + C_{min}/C_x) \times (1 + D_x) \times (1 + k_s + k_v + k_f) \times k_e$
L	$0.1\% (1 + L_x/L_{max} + L_{min}/L_x) \times (1 + 1/Q_x) \times (1 + k_s + k_v + k_f) \times k_e$
Z	$0.1\% (1 + Z_x/Z_{max} + Z_{min}/Z_x) \times (1 + k_s + k_v + k_f) \times k_e$
R	$0.1\% (1 + R_x/R_{max} + R_{min}/R_x) \times (1 + Q_x) \times (1 + k_s + k_v + k_f) \times k_e$
D	$0.0010 (1 + Z_x/Z_{max} + Z_{min}/Z_x) \times (1 + D_x + D_x^2) \times (1 + k_s + k_v + k_f) \times k_e$
Q	$0.0015 (1 + Z_x/Z_{max} + Z_{min}/Z_x) \times (Q_x + 1/Q_x) \times (1 + k_s + k_v + k_f) \times k_e$

Table 6-4 Basic Accuracy

Notices:

- 1、 D, Q is absoult error, other is relative erro $D_x = 1/Q_x$;
- 2、 The subscript x is the measured value of this parameter, the subscript max is the maximum value and min is the minimum value;
- 3、 k_s is speed factor, k_v is voltage factor, k_f if frequency factor, k_e

In
and Max
the

is temperature factor(see Table 6-7) ;

the Min
range,

4、In order to ensure the measurement accuracy, accuracy calibration should under the current measurement condition, test tool to perform the stable open-circuit zero clearing;

5、Guarantee of accuracy: 1 year

measurement value can guarantee the accuracy, outside the Min and Max range, the measurement value is for reference only.

6.7.1 Maximum and Minimum Value of Measurement Parameter Affecting Accuracy

Parameter	Frequency			
	100Hz	120Hz	1kHz	10kHz
Cmax	800μF	667μF	80μF	8μF
Cmin	1500pF	1250pF	150pF	15pF
Lmax	1590H	1325H	159H	15.9H
Lmin	3.2mH	2.6mH	0.32mH	0.032mH
Zmax/ max	1MΩ			
Zmin/ Rmin	1.59Ω			

Table 6-5 Maximum and Minimum Value of Measurement Parameter Affecting Accuracy

6.7.2 Affecting Speed Error Factor ks

Slow, medium speed: ks=0

Fast speed: ks=10

6.7.3 Test Level Error Factor kv

Test level, test level V(effective value) set by the instrument, the unit is mV.

Test Level	Error factor kv
1V	0
0.3V	1
0.1V	4

Table6-6 Test Level Error Factor kv

6.7.4 Test Frequency Error Factor kf

f = 100Hz, 120Hz ,1kHz; kf=0;

f = 10kHz; kf=0.5

6.7.5 Test Temperature Error Factor k_t

Temperature (°C)	5		8	18	28	38
Ke	5	4	2	1	2	4

Table 6-7 Temperature factor k_t

6.8 Test Signal Frequency

UTR2810E+/2811E+ provides four common test frequency: 100 Hz, 120 Hz, 1 kHz and 10 kHz.

Frequency accuracy: 0.02%

6.9 Test Signal Level

- 0.1 Vrms±10%
- 0.3 Vrms±10%
- 1.0 Vrms±10%

6.10 Output Impedance

- 30Ω±5%
- 100Ω±5%

6.11 Test Display Range

Parameter	Test Range
R, X, Z	0.00001Ω ~ 99.9999MΩ
G, B, Y	0.01nS ~ 999.999S
L	0.00001μH ~ 9999.99H
C	0.00001pF ~ 9999.99mF
D	0.00001 ~ 9.99999;
Q	0.00001 ~ 99999.9;
θ(deg)	-179.999° ~ 179.999°
θ(rad)	-3.14159 ~ 3.14159

Table 6-8 Test Display Range

6.12 Clear Function

UTR2810E+/2811E+ open-circuit zero clearing function can eliminate the influence of stray admittance (G, B), such as stray capacitance in parallel with the measured component; Short circuit zero clearing function eliminates the influence of residual impedance, such as lead resistance or lead inductance in series with the component under test.

6.13 Comparison Function

The inner comparison of UTR2810E+/2811E+ are allowed to set 3 sets of the limit of primary parameter and 1 set of the limit of secondary parameter. The measured element can be divided into 5 levels (NG, BIN1, BIN2, BIN3 and AUX). When the primary and secondary parameter of the

measured component are judged independently, both are opened at the same time, and the test results are passed, then it will show qualified.

The comparison function is useful when using the Handler port to set UTR2810E+ for automatic sorting system.

6.14 Beeper

- OFF turn off beeper
- ON turn on beeper

6.15 Range Hold

AUTO Range: the instrument automatically select the test range

Range Hold: the instrument will remain in one range to perform testing

6.16 RS232 Interface

Use simplified RS232 standard, not support hardware contact function

Transmite baud rate: 115200, 57600, 38400, 9600

The maximum transmit distance: 15m

Communication command is in SCPI format, and all commands and data on the bus are transmitted by ASCII code.

6.17 HANDLER Interface

Acceptable trigger signal (/TRIG)

Output comparsion signal (/NG, /BIN1, /BIN2, /BUN3, /AUX)

Output control signal (/EOM)

Output Optoelectronic isolation whe logical low level is valid

Built-in pull-up resistor use external power supply by default

7. Appendix

7.1 Appendix A Maintenance and Cleaning

(1) General maintenance

Keep the instrument away from the direct sunlight.

Caution

Keep sprays, liquids and solvents away from the instrument or probe to avoid damaging the instrument or probe.

(2) Cleaning

Check the instrument frequently according to the operating condition. Follow these steps to clean the external surface of the instrument:

- a. Please use a soft cloth to wipe the dust outside the instrument.
 - b. When cleaning the LCD screen, please pay attention and protect the transparent LCD screen.
 - c. When cleaning the dust screen, use a screwdriver to remove the screws of the dust cover and then remove the dust screen. After cleaning, install the dust screen in sequence.
 - d. Please disconnect the power supply, then wipe the instrument with a damp but not dripping soft cloth.
- Do not use any abrasive chemical cleaning agent on the instrument or probes.

Warning

Please confirm that the instrument is completely dry before use, to avoid electrical shorts or even personal injury caused by moisture.

7.2 Appendix B Warranty Overview

UNI-T (UNI-TREND TECHNOLOGY (CHINA) CO., LTD.) ensures the production and sale of products, from authorized dealer's delivery date of three years, without any defects in materials and workmanship. If the product is proven to be defective within this period, UNI-T will repair or replace the product in accordance with the detailed provisions of the warranty.

To arrange for repair or acquire warranty form, please contact the nearest UNI-T sales and repair department.

In addition to permit provided by this summary or other applicable insurance guarantee, UNI-T does not provide any other explicit or implied guarantee, including but not limited to the product trading and special purpose for any implied warranties.

In any case, UNI-T does not bear any responsibility for indirect, special, or consequential loss.

7.3 Appendix C Contact Us

If the use of this product has caused any inconvenience, if you in mainland China you can contact UNI-T company directly.

Service support: 8am to 5.30pm (UTC+8), Monday to Friday or via email. Our email address is infosh@uni-trend.com.cn

For product support outside mainland China, please contact your local UNI-T distributor or sales center. Many UNI-T products have the option of extending the warranty and calibration period, please contact your local UNI-T dealer or sales center.

To obtain the address list of our service centers, please visit our website at URL: <http://www.uni-trend.com>