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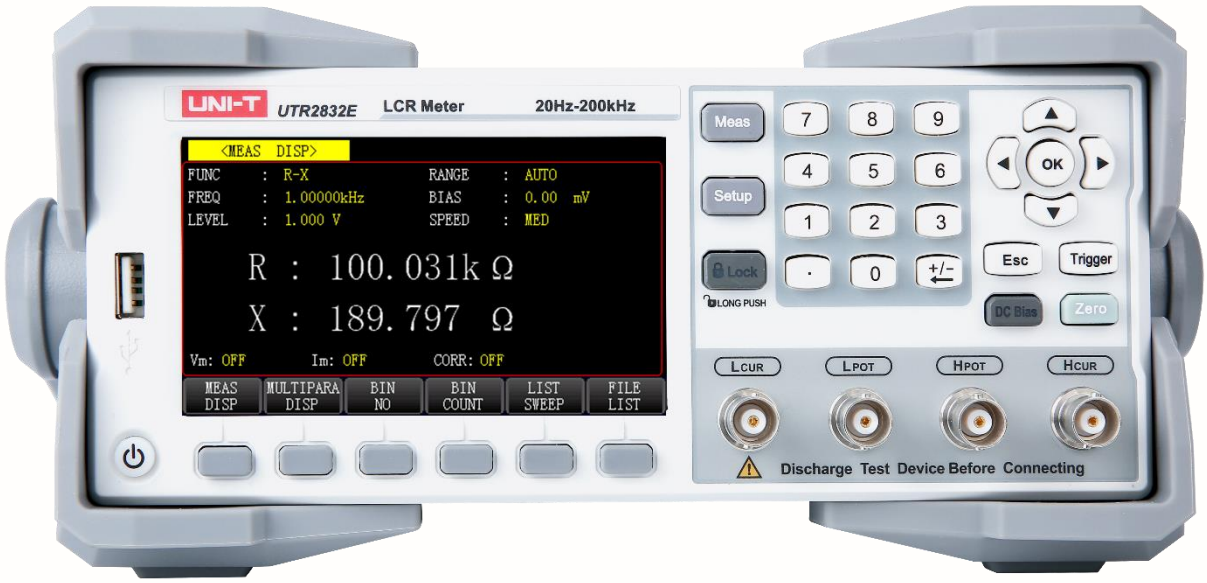

User's Manual

UTR2830 Series Digital LCR Meter

Foreword

Dear Users,

Hello! Thank you for choosing this brand new UNI - T instrument. In order to use this instrument safely and correctly, please read this manual thoroughly, especially the Safety Requirements part.

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

Warranty Service

If the original purchaser sells or transfers the product to a third party within three year from the date of purchase of the product, the warranty period of three year shall be from the date of the original purchase from UNI - T or an authorized UNI - T distributor. Probe, 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 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.

This warranty shall not apply to any defects or damages caused by accidental, machine parts' wear and

tear, improper use, and improper or lack 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 repair damage caused by improper use or connection to an incompatible device.

c) Any damage or malfunction caused by the use of a power source which does not conform to the requirements of this manual.

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 merchant ability or applicability purposes.

For violation of this guarantee, regardless of whether UNI - T and its distributors are informed that any indirect, special, incidental, or consequential damage may occur, UNI - T and its distributors shall not be responsible for any of the damages.

Trademark

UNI - T is the registered trademark of Uni - Trend Technology (China) Co., Ltd.

Statement

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

This manual includes safety requirements, installment and the operation of UTR2830 series digital LCR meter.

2. Safety Requirements

This section contains information and warnings that must be followed to keep the instrument operating under safety conditions. In addition, user should also follow the common safety procedures.

Safety Precautions		
Warning	Please follow the following guidelines to avoid possible electric shock and risk to personal safety.	
	Users must follow the following conventional safety precautions in operation, service and maintenance of this device. UNI - T will not be liable for any personal safety and property loss caused by the user's failure to follow the following safety precautions. This device is designed for professional users and responsible organizations for measurement purposes. Do not use this device in any way not specified by the manufacturer. This device is only for indoor use unless otherwise specified in the product manual.	
Safety Statement		
Warning	"Warning" indicates the presence of a hazard. It reminds users to pay attention to a certain operation process, operation method or similar. Personal injury or death may occur if the rules in the "Warning" statement are not properly executed or observed. Do not proceed to the next step until you fully understand and meet the conditions stated in the "Warning" statement.	
Caution	"Caution" indicates the presence of a hazard. It reminds users to pay attention to a certain operation process, operation method or similar. Product damage or loss of important data may occur if the rules in the "Caution" statement are not properly executed or observed. Do not proceed to the next step until you fully understand and meet the conditions stated in the "Caution" statement.	
Note	"Note" indicates important information. It reminds users to pay attention to procedures, methods and conditions, etc. The contents of the "Note" should be highlighted if necessary.	
Safety Sign		
	Danger	It indicates possible danger of electric shock, which may cause personal injury or death.
	Warning	It indicates that you should be careful to avoid personal injury or product damage.

	Caution	It indicates possible danger, which may cause damage to this device or other equipment if you fail to follow a certain procedure or condition. If the "Caution" sign is present, all conditions must be met before you proceed to operation.
	Note	It indicates potential problems, which may cause failure of this device if you fail to follow a certain procedure or condition. If the "Note" sign is present, all conditions must be met before this device will function properly.
	AC	Alternating current of device. Please check the region's voltage range.
	DC	Direct current device. Please check the region's voltage range.
	Grounding	Frame and chassis grounding terminal
	Grounding	Protective grounding terminal
	OFF	Main power off
	ON	Main power on
	Power Supply	Standby power supply: when the power switch is turned off, this device is not completely disconnected from the AC power supply.
CAT I		Secondary electrical circuit connected to wall sockets through transformers or similar equipment, such as electronic instruments and electronic equipment; electronic equipment with protective measures, and any high - voltage and low - voltage circuits, such as the copier in the office.
CAT II		Primary electrical circuit of the electrical equipment connected to the indoor socket via the power cord, such as mobile tools, home appliances, etc. Household appliances, portable tools (e.g. electric drill), household sockets, sockets more than 10 meters away from CAT III circuit or sockets more than 20 meters away from CAT IV circuit.
CAT III		Primary circuit of large equipment directly connected to the distribution board and circuit between the distribution board and the socket (three - phase distributor circuit includes a single commercial lighting circuit). Fixed equipment, such as multi - phase motor and multi - phase fuse box; lighting equipment and lines inside large buildings; machine tools and power distribution boards at industrial sites (workshops).
CAT IV		Three - phase public power unit and outdoor power supply line equipment. Equipment designed to "initial connection", such as power distribution system of power station, power instrument, front - end overload protection, and any outdoor transmission line.
	Certification	CE indicates a registered trademark of EU
	Certification	UKCA indicates a registered trademark of UK

	Certification	ETL indicates a registered trademark of Intertek.
	Waste	This product complies with the marking requirements of WEEE Directive (2002/96/EC). This additional label indicates that this electrical / electronic product must not be discarded in household waste.
	EFUP	This environment - friendly use period (EFUP) mark indicates that dangerous or toxic substances will not leak or cause damage within this indicated time period. The environment - friendly use period of this product is 40 years, during which it can be used safely. Upon expiration of this period, it should enter the recycling system.
Safety Requirements		
Warning		
Preparation before use		Please connect this device to AC power supply with the power cable provided. The AC input voltage of the line reaches the rated value of this device. See the product manual for specific rated value. The line voltage switch of this device matches the line voltage; The line voltage of the line fuse of this device is correct.
Check all terminal rated values		Please check all rated values and marking instructions on the product to avoid fire and impact of excessive current. Please consult the product manual for detailed rated values before connection.
Use the power cord properly		You can only use the special power cord for the instrument approved by the local and state standards. Please check whether the insulation layer of the cord is damaged or the cord is exposed, and test whether the cord is conductive. If the cord is damaged, please replace it before using the instrument.
Instrument Grounding		To avoid electric shock, the grounding conductor must be connected to the ground. This product is grounded through the grounding conductor of the power supply. Please be sure to ground this product before it is powered on.
AC power supply		Please use the AC power supply specified for this device. Please use the power cord approved by your country and confirm that the insulation layer is not damaged.
Electrostatic prevention		This device may be damaged by static electricity, so it should be tested in the anti - static area if possible. Before the power cable is connected to this device, the internal and external conductors should be grounded briefly to release static electricity. The protection grade of this device is 4 kV for contact discharge and 8 kV for air discharge.
Measurement accessories		Measurement accessories are of lower class, which are definitely not applicable to main power supply measurement, CAT II, CAT III or CAT IV circuit measurement.
Use the input / output port of this device properly		Please use the input / output ports provided by this device in a properly manner. Do not load any input signal at the output port of this device. Do not load any signal that does not reach the rated value at the input port

	of this device. The probe or other connection accessories should be effectively grounded to avoid product damage or abnormal function. Please refer to the product manual for the rated value of the input / output port of this device.
Power fuse	Please use power fuse of specified specification. If the fuse needs to be replaced, it must be replaced with another one that meets the specified specifications by the maintenance personnel authorized by UNI - T.
Disassembly and cleaning	There are no components available to operators inside. Do not remove the protective cover. Maintenance must be carried out by qualified personnel.
Service environment	This device should be used indoors in a clean and dry environment with ambient temperature from 0℃ to 40℃. Do not use this device in explosive, dusty or humid air.
Do not operate in humid environment	Do not use this device in a humid environment to avoid the risk of internal short circuit or electric shock.
Do not operate in flammable and explosive environment	Do not use this device in a flammable and explosive environment to avoid product damage or personal injury.
Caution	
Abnormality	If this device may be faulty, please contact the authorized maintenance personnel of UNI - T for testing. Any maintenance, adjustment or parts replacement must be done by the relevant personnel of UNI - T.
Cooling	Do not block the ventilation holes at the side and back of this device; Do not allow any external objects to enter this device via ventilation holes; Please ensure adequate ventilation, and leave a gap of at least 15 cm on both sides, front and back of this device.
Safe transportation	Please transport this device safely to prevent it from sliding, which may damage the buttons, knobs or interfaces on the instrument panel.
Proper ventilation	Poor ventilation will cause the device temperature to rise, thus causing damage to this device. Please keep proper ventilation during use, and regularly check the vents and fans.
Keep clean and dry	Please take actions to avoid dust or moisture in the air affecting the performance of this device. Please keep the product surface clean and dry.
Note	
Calibration	The recommended calibration period is one year. Calibration should only be carried out by qualified personnel.

3. Product Overview

UTR2830 series digital LCR meter is a new generation of low - frequency component measurement instruments; with the feature of small size, light weight, modern appearance, easy to operate and test stability. It can meet the needs of quality assurance for production line, incoming inspection and automated production, laboratory testing.

This instrument adopts 4.3 inch true color LCD, full numeric keyboard. With the real - time operation system, it makes the display clearer and easier to operate. In addition, this instrument uses the softkey to control the power switch instead of traditional mechanical power switch.

3.1 Measurement Application

Passive component

Impedance evaluation of capacitors, inductors, magnetic cores, resistors, piezoelectric devices, transformers, chip assemblies and network components, etc.

Other component

Impedance evaluation of printed circuit boards, relays, switches, cables, batteries, etc.

3.2 Accuracy of Instrument

Model		UTR2830E	UTR2832E	UTR2833E
Display screen		4.3 TFT LCD 480×272	4.3 TFT LCD 480×272	4.3 TFT LCD 480×272
Frequency of test signal frequency	Test frequency	20Hz ~ 100kHz (± 0.02%) (continuous frequency point)	20Hz ~ 200kHz(± 0.02%) (continuous frequency point)	20Hz ~ 300kHz(± 0.02%) (continuous frequency point)
	Minimum resolution	100mHz	100mHz	100mHz
Accuracy		LCRZ 0.05%, DCR 0.1%	LCRZ 0.05%, DCR 0.1%	LCRZ 0.05%, DCR 0.1%
AC level	Voltage range of test signal	10mVrms - 2Vrms	10mVrms - 2Vrms	10mVrms - 2Vrms
	Minimum resolution of voltage	10mV	10mV	10mV

	Accuracy	10% x the set voltage + 2mV	10% x the set voltage + 2mV	10% x the set voltage + 2mV
	Current range of test signal	100μArms - 20mArms	100μArms - 20mArms	100μArms - 20mArms
	Minimum resolution of current	0.1mA	0.1mA	0.1mA
DC level	Voltage range of test signal	1V	50mV – 2V	50mV – 2V
Internal resistance of AC	ISO ON	100Ω	100Ω	100Ω
	ISO OFF	30Ω / 50Ω / 100Ω	30Ω / 50Ω / 100Ω	30Ω / 50Ω / 100Ω
DC bias voltage	Range of Voltage / Current	- -	0V – ± 5V	0V – ± 5V
	Resolution	- -	1mV	1mV
	Accuracy of voltage	- -	1% x the set voltage + 5mV	1% x the set voltage + 5mV
Internal resistance of DCR		100Ω	100Ω	100Ω
Testing parameter		L, C, R, |Z|, D, Q, |Y|, G, X, θd, θr, RDC, Vm, Im, △%		
Testing speed (ms/time)		Fast speed: 12.5ms; Medium speed: 83ms; Slow speed: 167ms		
Display range		Display range: R, X, |Z|: 0.00001 Ω ~ 99.9999MΩ; G, B, |Y|: 0.00001μS ~ 99.9999S; L: 0.00001uH ~ 99.9999kH; C: 0.00001pF ~ 9.99999F; D: 0.00001 ~ 9.99999; Q: 0.00001 ~ 99999.9; θd: - 179.999° ~ 179.999 °; θr: - 3.14159 ~ 3.14159; DCR: 0.00001Ω ~ 999.999MΩ; Δ %: - 999.999% ~ 999.999%		
V/I monitoring		√		
Test lead		5 - end		
Zero clearing		Open - circuit, short - circuit, load		
List sweep		201 counts, scanning parameter: test frequency, AC voltage, AC current, DC BIAS voltage, DC BIAS current		
Equivalent circuit		Serial connection, parallel connection		
Picture scanning analysis		- -		
Range mode		Auto, Hold		
Trigger mode		Internal, manual, external, bus		
Average number		1~255		
Mathematical operation		Direct reading, △ABS, △%		
Delay		Trigger delay, step delay: 0 - 60.000s, step by 1 ms		

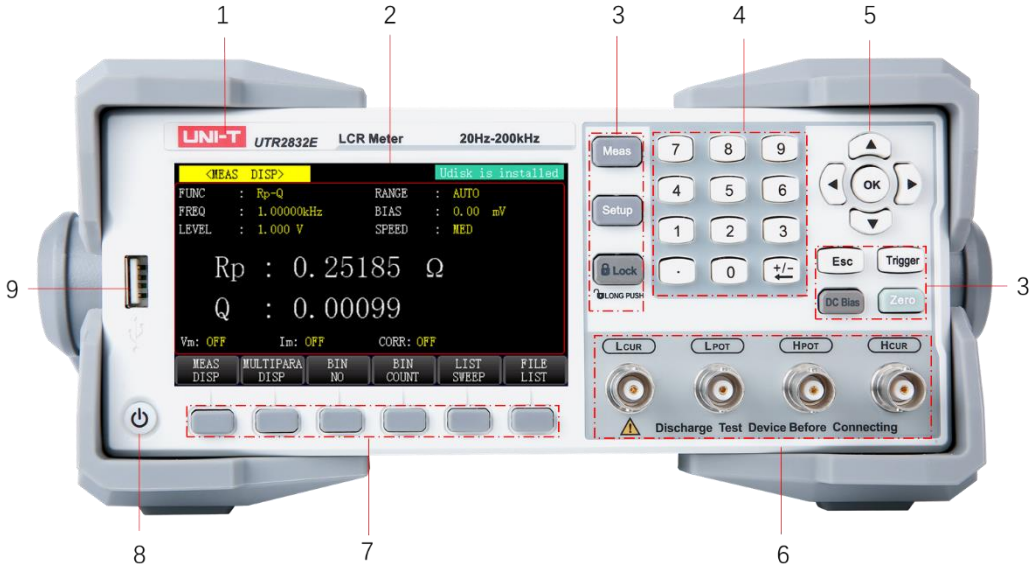
Comparator	10 BIN sorting, BIN1 - BIN9, NG, AUX, BIN count, PASS, FALL display with LED on the front panel
Storage	Internal: 100 sets of instrument built-in test setup files, results of 201 test USB: setup file, BMP, CSV data file
Interface	RS232, HANDLER, USB HOST, USB DEVICE, Network port
Judgment function	PASS / FAIL
Size	350*215*88mm
Weight	4.65 kg
Other function	L - RDC concurrent testing, soft power switch, one - key screenshot, data record

3.3 Main Features

- 4.3 inch TFT - LCD, concise operation panel
- Test frequency: 20Hz - 300kHz
- Basic accuracy: 0.05%
- Testing speed: 12.5 ms/time
- Internal resistance: 30 Ω, 50 Ω, 100 Ω
- 10 BIN sorting, count, PASS/FAIL
- Soft power switch
- Multiple interfaces, supports SCPI

4. Panel Overview

4.1 Front Panel



No.	Name	Description
1	Nameplate	Product model and description
2	Display screen	4.3 inch TFT - LCD
3	Function key	[Meas]: Measurement page [Setup]: Measurement setup page and system setup page [Lock]: Lock key (long press to unlock/lock) [Esc]: Exit key [Trigger]: When the trigger mode is set to MAN (manual) mode, press this key to trigger the instrument by manual. [DC Bias]: Press the [DC Bias] key to allow/forbid DC bias power output of 0 - 50mA/5V. When the [DC Bias] key pressed, it will light up, indicating that DC bias output is allowed; press this key again, it will be extinguished, indicating that DC bias output is forbidden. In some non - test screens where DC BIAS cannot be added, Press this button will not respond. When the test function is DCR, Lp - Rd and Ls - Rd, this key has no function. [Zero]: Zero clearing key
4	Numerical keyboard	Numeric key: input data +/−: If it is in the first position of the input data, then it is a symbol selection. Otherwise, it is equivalent to the backspace key, which can delete

		the last digit.
5	Arrow and OK key	[Arrow] key: Move the cursor between the field of LCD page. Long press the right arrow key, will print screen and the screen will be saved in the U disk. [OK] key: Confirm key
6	Test terminal	4-test terminal used to connect four terminal of test fixtures or test cables to test the DUT It can connect to Hcur, Hpot, Lpot and Lcur.
7	Functional key of screen	Different page has different function
8	Power switch	Turn on/off the instrument
9	USB HOST	Connect to USB to save and load the file, screenshot and save measured data

4.2 Real Panel

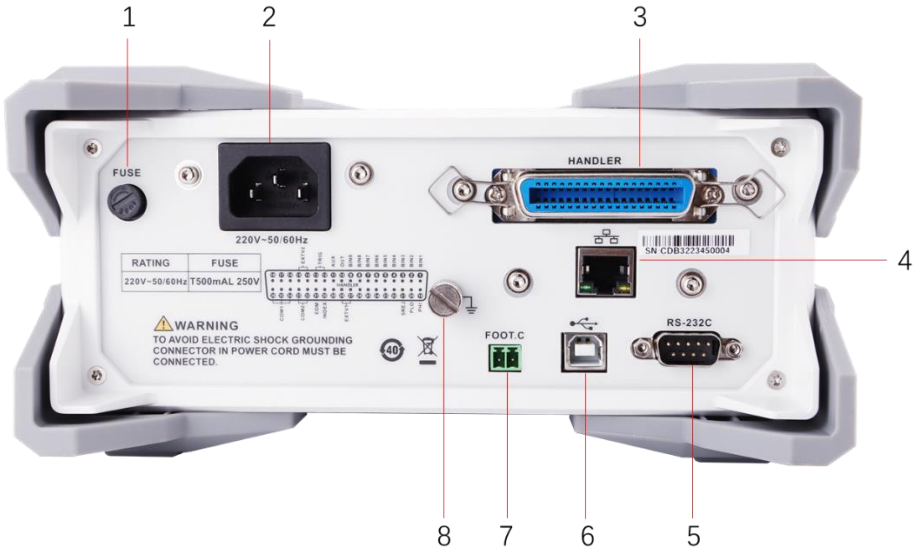


Figure 4 - 2 Rear Panel of LCR

No.	Name	Description
1	Fuse	110V slow-blow fuse 1AT/250V; 220V slow-blow fuse 0.5A/250V
2	AC 220/110V power socket	AC power socket
3	HANDLER interface	HANDLER for sorting output of test result
4	LAN interface	LAN interface for remote control
5	RS232 interface	External communication interface for remote control
6	USB HOST	USB HOST for remote control
7	3.81 plug-in terminal	Footswitch ON/OFF
8	Ground terminal	Ground connection

5.Inspection and Installment

5.1 Packing List

Before using the instrument, please check

1. Whether the appearance is broken, scratch or other defective.
2. Whether the accessories is loss according to the packing list.

If the instrument is broke or the accessories is loss, please contact UNI - T sales department or distributor for service.

5.2 Power Requirement

This instrument can be used under Class II overvoltage. Do not use the instrument under Class III and IV overvoltage.

Before enabling the power, make sure that the power voltage and the fuse are match with the voltage of AC SELECTOR switch on the rear panel.

Input voltage	Frequency range	Fuse (slow - blow)	Power supply
110 V	47 - 63Hz	1 A	Not less than 80 VA
220 V		0.5 A	

Warning: To prevent from the electric shock, please connect the power supply ground cable. If the user changes the power supply cable, make sure that the ground cable of the power supply cable is securely connected.

5.3 Operating Environment

UTR2830 series is recommended for use under the following environmental conditions.

Environmental Condition	
Operating condition	0 ℃～40 ℃, 20 %～80 % RH. (no condensation)
Accuracy range	23 ℃ ±5 ℃, 30 %～65 % RH.
Storage condition	-10 ℃～60 ℃, 80 % RH.
Operating altitude	≤ 2000 meters

1. Do not use the instrument under the environment of dust, shaking, direct sunlight and corrosion gas.
2. The heat sink is installed on the rear panel, which is prevent the internal temperature from rising. To ensure good ventilation, do not block the left and right ventilation holes to maintain the accuracy of the instrument.
3. This instrument is designed to minimize spurious interference caused by inputs from the AC power supply. However, it should be used in as low a noise environment as possible, and if this cannot be avoided, a power supply filter should be fitted.
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℃～40℃ and relative humidity less than 85 % RH. The air should not contain harmful corrosion and avoid direct sunlight.
5. The instrument, especially test leads connected to the DUT should be kept away from strong electromagnetic fields in order to avoid interference with the measurement.

5.4 Cleaning

To prevent from the electric shock, pull out the power cable before cleaning.

Use clean cloth with slight water to wipe outer shell and panel and keep it dry. Avoid water enters the instrument.

Do not clean the internal of the instrument.

 Caution: Do not use solvent (alcohol or gasoline) to clean instrument.

5.5 Handle

Handle is adjustable and can adjust to four positions, hold two sides of the handle to pull or rotate as shown in the following figure.

Figure 5 - 1 Original Position

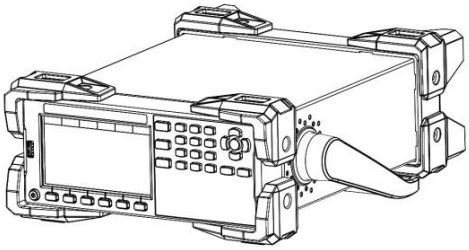


Figure 5 - 2 Test Position

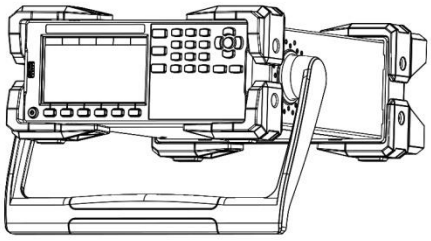


Figure 5 - 3 Remove Handle

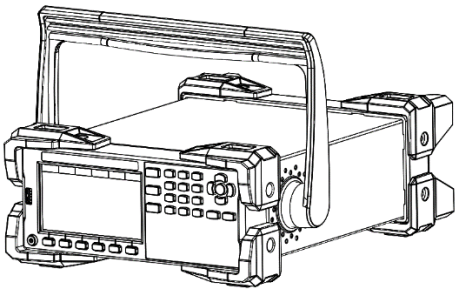


Figure 5 - 4 Lift Position

5.6 Routine Inspection

To avoid accident, please check the instrument as follows.

1. The input power is conform to the specification, the power supply of the instrument is configured correctly.
2. The instrument should be securely connect to the ground.
3. The DUT should be sound, no crack, break and damage.

6. [Meas] Menu

6.1 <MEAS DISP> Page

UTR2830 series adopts 4.3 inch LCD, the display content is shown in the following Figure 2 - 3.

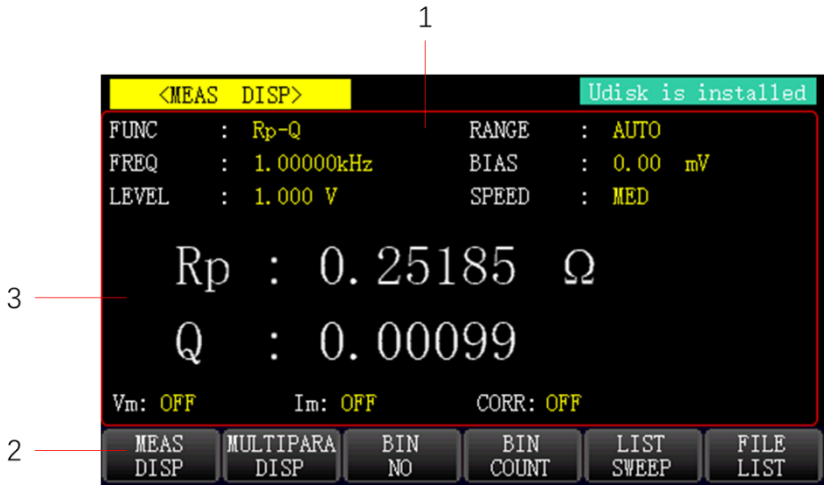


Figure 2 - 3 Display content

No.	Name	Description
1	Display area	This area indicates the name of the current page
2	Softkey area	This area indicates the function of softkey, the function of softkey will change with the cursor position.
3	Test result / Test condition	This area displays the test result and test condition.

On this page, the test result will be displayed in big character. The following parameter can be set on this page.

- Test function (FUNC)
- Test frequency (FREQ)
- Test level (LEVEL)
- Test range (RANGE)
- DC bias (BIAS)
- Test speed (SPEED)

The display page has 6 fields of FUNC, FREQ, LEVEL, RANGE, BIAS and SPEED. Each function will be described in the following paragraphs. On this page, the test result/test condition will be displayed. These conditions can be set on the page of <MEAS SETUP> or <CORRECTION>.

- Signal source voltage / current monitoring (Vm,Im)
- Open - circuit, short - circuit, load correction ON/OFF (CORRECTION)

6.1.1 Test Function

UTR2830 series can simultaneously measure two resistances (one primary parameter and one secondary parameter) in one test. Parameters that can be tested are as follows.

Primary parameter

- |Z| (Module of impedance)
- |Y| (Module of admittance)
- L (Inductance)
- C (Capacitance)
- R (Resistance)
- G (Conductance)
- DCR (DC resistance)

Secondary parameter

- D (Loss factor)
- Q (Quality factor)
- Rs (ESR: equivalent series resistance)
- Rp (EPR: equivalent parallel resistance)
- Rd (DC resistance)
- X (Reactance)
- B (Susceptance)
- θ (Phase angle)

The test result of the primary and secondary parameter will be displayed in big character in two lines. The primary parameter is displayed at the higher line and the secondary parameter is in the under line.

Operating step of test function

1) Move the cursor to the FUNC field and the softkey will be displayed, the corresponding sub - menu is as follows.

Softkey	Sub - menu
Cp - ...▼	Cp - D Cp - Q Cp - G Cp - Rp Return
Cs - ...▼	Cs - D Cs - Q Cs - Rs Return
Lp - ...▼	Lp - D Lp - Q Lp - G Lp - Rp Lp - DCR Return
Ls - ..▼DCR..▼	Ls - D Ls - Q Ls - Rs DCR Ls - DCR Return
Z - ..▼R - ..▼	Z - r Z - d R - x Rp - Q RS - Q Return
Y - ..▼G - ..▼	Y - r Y - d G - B Return

2) Press the softkey to select the parameter and press the Return key to go back to the previous menu.

6.1.2 Test Range

The test range is selected based on to the impedance of LCR to be measured.

UTR2830 series has 10 AC testing ranges, 3 Ω, 10 Ω, 30 Ω, 100 Ω, 300 Ω, 1 kΩ, 3 kΩ, 10 kΩ, 30 kΩ and 100 kΩ.

UTR2830 series has DCR testing ranges, 1 Ω, 3 Ω, 10 Ω, 30 Ω, 100 Ω, 300 Ω, 1 kΩ, 3 kΩ, 10 kΩ, 30 kΩ and 100 kΩ.

Operating step of test range

1) Move the cursor to the RANGE field, the following soft keys will be displayed.
   - Auto This softkey is used to set the range to AUTO mode.
   - Lock This softkey is used to switch the range mode from AUTO to HOLD (lock).
     The range will be locked at the currently testing range and it will be displayed in the RANGE field.
   - ↓ (-) This softkey is used to increase the range under the HOLD mode.
   - ↑ (+) This softkey is used to decrease the range under the HOLD mode.
2) Use the softkey to set the test range.

6.1.3 Test Frequency

The test frequency range of UTR2830 series is from 20Hz to 300kHz, and the resolution is 0.01Hz. The specific test frequency can refer to the following table. When the test function is set to DCR, the FREQ field displays "- - - -".

Model	Frequency range
UTR2830E	20Hz - 100kHz
UTR2832E	20Hz - 200kHz
UTR2833E	20Hz - 300kHz

Operating step of test frequency

UTR2830 series has two method to set the test frequency. Use the softkey to set the test range or using the numeric key to direct input the test range.

1) Move the cursor to the FREQ field, the following soft keys will be displayed.

- ↑ ↑ (++)

  This softkey is the coarse adjustment key for increasing frequency. Each time the key is pressed, the frequency increases in one of the six typical frequency points in the table below. The frequency points that can be set with this softkey are as follows.

Model	Frequency point
UTR2830E	20Hz, 100Hz, 1kHz, 10kHz, 100kHz
UTR2832E	20Hz, 100Hz, 1kHz, 10kHz, 100kHz, 200kHz
UTR2833E	20Hz, 100Hz, 1kHz, 10kHz, 100kHz, 200kHz, 300kHz

- ↑ (+)

  This softkey is the fine adjustment key for increasing frequency. Each time the key is pressed, the frequency will increase to the next higher frequency point. The frequency points that can be set with this softkey are as follows.

  20Hz, 25Hz, 30Hz, 40Hz, 50Hz, 60Hz, 75Hz.

  100Hz, 120Hz, 150Hz, 200Hz, 250Hz, 300Hz, 400Hz, 500Hz, 600Hz, 750Hz.

  1kHz, 1.2kHz, 1.5kHz, 2kHz, 2.5kHz, 3kHz, 4kHz, 5kHz, 6kHz, 7.5kHz.

  10kHz, 12kHz, 15kHz, 20kHz, 25kHz, 30kHz, 40kHz, 50kHz, 60kHz, 75kHz

  100kHz, 120kHz, 150kHz, 200kHz, 300kHz

UTR2830E/UTR2832E has different frequency range. It automatically determine the range according to the minimum and maximum frequency.

- ↓ (-)

  This softkey is the fine adjustment key for decreasing frequency. Each time the key is pressed, the frequency will decrease to the next lower frequency point.

  The frequency points that can be set with this softkey are as ↑ (+).

- ↓ ↓ (--)

  This softkey is the coarse adjustment key for increasing frequency. Each time the key is pressed, the frequency increases in one of the six typical frequency points in the table above.

  The frequency points that can be set with this softkey are as ↑ ↑ (++).

2) Use the softkey or numeric input key to select or set the test frequency. When using the numeric input key to enter the frequency, the sofkey displays the current frequency unit (Hz,kHz, mHz). The user can use these unit softkeys to enter unit and data.

6.1.4 Test Level

The test level of UTR2830 series is set by the effective value of sine wave signal. The frequency of sine wave signal is the test frequency, it produced by the internal oscillator of the instrument. The measurement voltage and current can both be set. The output impedance of UTR2830 series can select 30 Ω, 50 Ω and 100Ω. The range of test level is 50 mV - 2 V. When it is current input mode, the maximum current is equal to the maximum level divided by the internal resistance of source.

Note: *The measurement current set by UTR2830 series, which is the output current when the measured terminal is short - circuit. The measurement voltage set by UTR2830 series, which is the output voltage when the measured terminal is open - circuit.*

The automatic level control of UTR2830 series can realize constant voltage measurement or constant current measurement. The automatic level control function can be set in the <MEAS SETUP> page, set the <Constant level> to ON.

When the automatic level control is enabled, an icon "*" will appear after the current level.

Operating step of test level

UTR2830 series has two method to set the test level. Use the softkey to set the test level or using the numeric key to direct input the test range.

1) Move the cursor to the LEVEL, the following soft keys will be displayed.
   - ↑ (+)

     Press this softkey to increase the output level of signal source.
   - ↓ (-)

     Press this softkey to decrease the output level of signal source.
2) Use the softkey or numeric input key to select or set the test level. When using the numeric input key to enter the level, the sofkey displays the current level unit (mV, V, μA, mA and A). The user can use these unit softkeys to enter unit and data.

Note: If you need to switch the test level between the current and voltage, it must use the numeric input key and unit softkey.

6.1.5 DC Bias

UTR2832E provides the built-in DC bias voltage of - 1.5 V ~ +1.5 V (internal resistance 30 Ω), - 2.5 V ~ +2.5 V (internal resistance 50 Ω), - 5V ~ +5V (internal resistance 100 Ω). UTR2830E does not have this function. When the test function is set to DCR, the BIAS field displays "- - - -".

Operating step of DC bias

UTR2830 series has two method to set the test level. Use the softkey to set the DC bias or using the numeric key to direct input the test range.

1) Move the cursor to the BIAS field, the following soft keys will be displayed.
   - ↑ (+)

   Press this softkey to increase the output level of DC bias.
   - ↓ (-)

   Press this softkey to decrease the output level of DC bias.
2) Use the softkey or numeric input key to select or set the level of DC bias. When using the numeric input key to enter the level, the sofkey displays the current level unit (mV, V, μA, mA and A). The user can use these unit softkeys to enter unit and data. When using the [ENTER] key to set the bias, the unit of DC bias is V or A by default.

Note: *If you need to switch the* test *level between the current and voltage, it must use the numeric input key and unit softkey.*

Press the [DC Bias] key on the front panel to output the set DC bias. When the DC bias is allow to output, the [DC Bias] key will light up.

6.1.6 Test Speed

The test speed of UTR2830 series is determined by the following factors.

- Integral time (A/D conversion)
- Average time (average test times per each test)
- Measurement delay (the test time from enabling to starting)

- Display time of test results

In general, the test result is more stable and accurate in slow speed. The test speed can select FAST (fast), MED (medium), SLOW (slow).

Operating step of test speed

1) Move the cursor to the SPEED field, the following soft keys will be displayed.

- FAST
- MED
- SLOW

2) Selecting the above softkey to set the test speed to FAST (fast), MED (medium), SLOW (slow).

6.2 <BIN NO. DISP> Page

Press the [Meas] key and then press the softkey BIN NO. at the bottom of the screen to enter the <BIN NO. DISP> page. BIN NO is displayed in large character, the current test result is displayed in small character on the <BIN NO.> page, as shown in Figure 6 - 2 - 1.

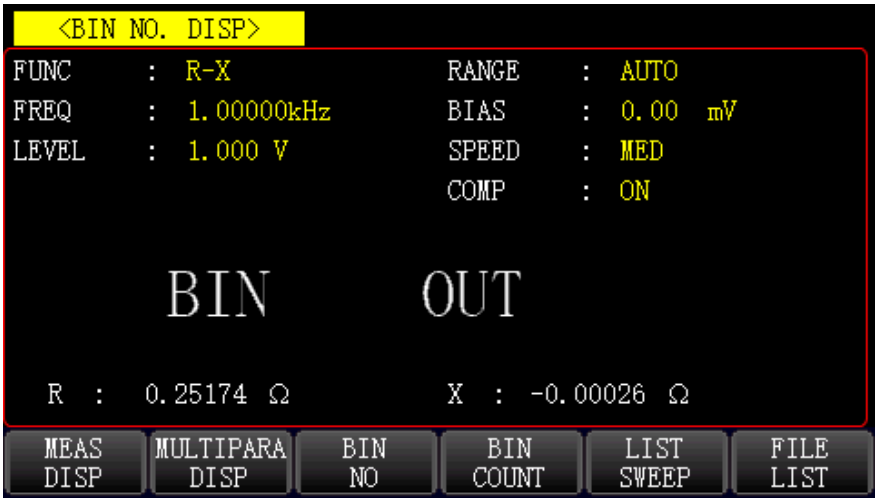


Figure 6 - 2 - 1

The following measurement parameter can set on the <BIN NO. DISP> page.

- Comparator ON/OFF (COMP)

The <BIN NO. DISP> page displays two fields of BIN NO. and COMP. Each control function field will be described in detail in the following paragraphs. The following test condition information is displayed in the test result/conditions area. These monitor fields look like settable fields, but they cannot be set on this page. These monitoring field can be set on the <MEAS SETUP>, <MEAS DISP> or <CORRECTION>

page.

- Test function (FUNC A)
- Test frequency (FREQ)
- Test level (LEVEL)
- Test range (RANGE)
- Test speed (SPEED)
- DC bias (BIAS)
- Open - circuit, short - circuit, load correction ON/OFF (CORRECTION)

6.2.1 Comparator

UTR2830 series built-in comparator function divides the DUT to 10 BIN (BIN1 to BIN9 and BIN OUT). It can set the limit of 9 set of primary parameter and one pair of secondary parameter. When the comparator function is enabled (ON), the indicating rule of sorting and PASS/FAIL will display in the following table. When UTR2830 series installs an attachment of HANDLER interface, the comparator result can output to the automatic test system, so as to realize the automatic sorting test. These limit settings can only be set on the <LIMIT SETUP> page. Turn on/off the comparator function in the COMP field.

Comparator ON	AUX ON	AUX OFF
Primary parameter PASS Secondary parameter PASS	BIN1～BIN9 PASS	BIN1～BIN9 PASS
Primary parameter FAIL Secondary parameter PASS	BIN AUTO FAIL	BIN1～BIN9 FAIL
Primary parameter PASS Secondary parameter FAIL	BIN AUX PASS	BIN OUT FAIL
Primary parameter FAIL Secondary parameter FAIL	BIN AUTO PASS	BIN AUTO FAIL

Operating step of comparator

1) Move the cursor to the COMP filed, the following soft key will be displayed.

- ON
- OFF

2) Use the softkey to turn on/off the comparator function.

6.3 <BIN COUNT DISP> Page

Press the [Meas] key and press the softkey [BIN NO] at the bottom of the screen to enter the <BIN COUNT DISP> page. The <BIN COUNT DISP> page displays the number of each BIN, as shown in Figure 6 - 3 - 1.

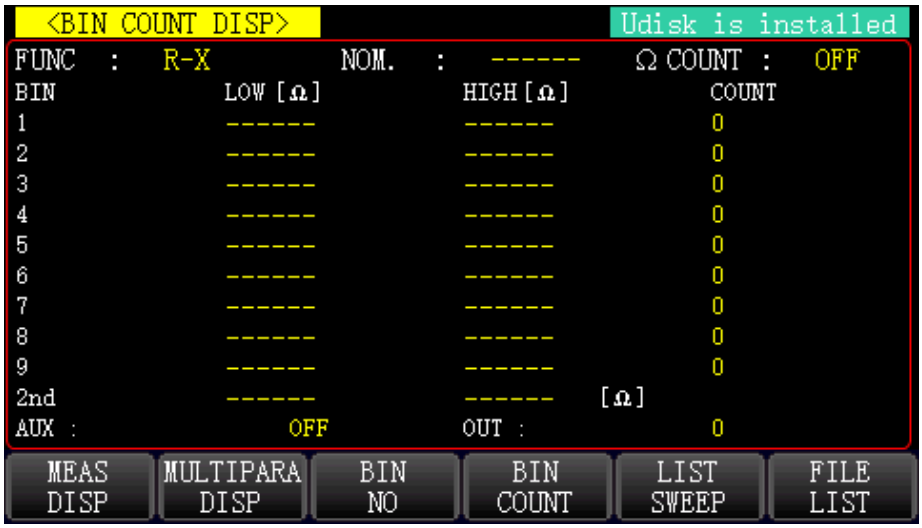


Figure 6 - 3 - 1

The following parameter can set on the <BIN COUNT DISP> page.

- Count function ON/OFF(BIN COUNT)

The <BIN COUNT DISP> page displays two fields of BIN COUNT DISP and COUNT. Each control function field is described will be described in detail in the following paragraphs. The following test condition information is displayed in the test result/conditions area. These monitor fields look like settable fields, but they cannot be set on this page. These monitoring field can be set on the <LIMIT LIST> page.

Function	Primary parameter and secondary parameter
Nominal	The nominal for BIN comparing
Scale (BIN)	The BIN number of limit list; "2nd" represents the limit of secondary parameter
Lower limit (LOW)	The lower limit of BIN
Higher limit (HIGH)	The higher limit of BIN
Count (COUNT)	The current measured BIN count
Auxiliary (AUX)	BIN count of AUX BIN
OUT	BIN count of OUT BIN

Operating step of BIN COUNT

Turn on/off the count function on the <BIN COUNT DISP> page.

1) Move the cursor to the COUNT field on the <BIN COUNT DISP> page, the following soft keys will be displayed.
   - OFF
   - ON
   - Reset
2) Use the softkey ON to turn on the count function.
3) Use the softkey OFF to turn off the count function.
4) Use the softkey Reset to directly clear the count.

6.4 <LIST SWEEP DISP> Page

Press the [Meas] key and press the softkey [LIST SWEEP] to enter the <LIST SWEEP DISP> page, as shown in Figure 6 - 4 - 1.

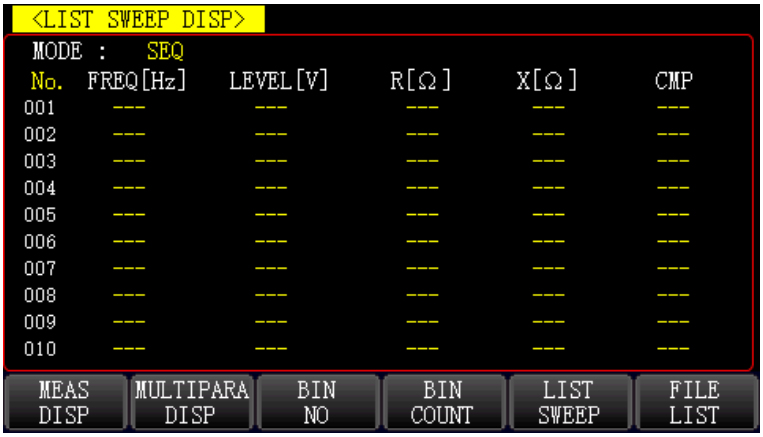


Figure 6 - 4 - 1

Test points on this page will be automatically scanned and tested, and the test results will be compared with the limit values. During the list sweep test, an icon "*" on the left side indicates the current scanning test point. The following parameter can be set on the <LIST SWEEP> page.

- Scanning mode (MODE)

The <LIST SWEEP> page displays three fields of LIST SWEEP, MODE and No. The list scanning point cannot be set on this page, it can only be set on the <LIST SWEEP> page.

6.4.1 List Sweep

UTR2830 series list sweep function allows automatic sweep test of up to 201 points of test frequency, test level or DC bias. UTR2830 series has two list sweep mode, continuous (SEQ) and single step (STEP). In the continuous (SEQ) mode, each time the **[Trigger]** key is pressed, all list sweep testing point will be automatically tested once. In the single step (STEP) mode, each time the **[Trigger]** key is pressed, only one testing point is tested.

Note: *When the trigger mode is INT (internal trigger), the list sweep mode of SEQ and STEP are not controlled by the **[Trigger]** key. When the trigger mode is MAN (manual trigger), the list sweep mode can enable by the **[Trigger]** key.*

Operating steps of list sweep

The list sweep mode of continuous (SEQ) and single step (STEP) can be set on the **<LIST SWEEP>** page.

1) Move the cursor to the **MODE** field on the **<LIST SWEEP>** page, the following soft keys will be displayed.
   - **Continuous (SEQ)**
   - **Single step (STEP)**
2) Press the softkey **SEQ** to select the scanning mode of continuous - - - SEQ.
3) Press the softkey **STEP** to select the scanning mode of single step - - - STEP.

Mode	Scanning mode: continuous (SEQ) or single step (STEP)
Frequency (FREQ)	Test frequency
Level (LEVEL)	Test level
Primary parameter (R)	The primary parameter of measurement page
Secondary parameter (X)	The secondary parameter of measurement page
Comparator (COMP)	The comparator result: "L" indicates that the comparator result is over the lower limit; "H" indicates that the comparator result is over the higher limit; " " indicates that the comparator result does not over the higher limit and not over the lower limit.

6.5 <MULTIPARA DISP> Page

Press the menu key [Meas] and Press the softkey <MULTIPARA DISP> to enter the <MULTIPARA DISP> page. Press the menu key [Meas] on the <MULTIPARA DISP> page to go back to the <MEAS DISP> page, as shown in Figure 6 - 5 - 1.

Figure 6 - 5 - 1

On this page, four parameters can be tested and displayed at the same time. The following parameter can be set on the <MULTIPARA DISP> page.

- Test frequency
- Test level
- Internal resistance of signal source
- Range
- Test delay
- Test speed
- Bias
- Open - circuit zeroing clearing
- Short - circuit zeroing clearing

The specific setups and operating flows are the same as those on the page of <MEAS DISP>, <MEAS SETUP>, and <CORRECTION>.

When the cursor is on < MULTIPARA DISP >, you can press the soft key [MULTIPARA SETUP] to enter the < MULTIPARA SETUP > screen.

When the cursor is on the < MULTIPARA SETUP > screen, you can press the soft key to return to the < MULTIPARA DISP > screen.

In < MULTIPARA SETUP > screen, below parameter could be set.

- Mode (Comparator mode)
- Param (Parameter, R, Cp...)
- Nom (Nominal Value)
- Low (Lower Limit)
- High (Higher Limit)

6.5.1 Mode

Move the cursor to the Mode field, the following soft keys will be displayed.

- %TOL
- ABS TOL

Use the soft keys to set the mode to % or ABS

6.5.2 Param

It is used to choose the measurement parameters, such as R, X, Z, G, etc.

6.5.3 NOM

This is used to enter the nominal value of the object under test. Users can move the cursor to the nominal column, enter the nominal value of the measured object with the numeric keypad, and the soft key area displays the available rate units (p, n, u, m, *1, k), each rate unit has a rate of 1000. The measurement mode has fixed units on the right of the cursor input area. Press ESC to exit the input process.

6.5.4 LOW and HIGH

Higher limit and Lower limit columns are used to enter the higher limit and lower limit range of the measured value. Users can move the cursor to the higher or lower limit column and enter the higher or lower limit with the numeric keypad. The soft key area displays the available rate units (p, n, u, m, *1, k). Each rate unit has a rate of 1000. The current higher and lower limit units are displayed to the right of the cursor input area.

When the mode is percentage (%), the unit of higher limit and lower limit is %.

When the mode is absolute value (ABS), the higher and lower bound units are related to the measurement mode currently in use.

Note: The higher and lower limits can be entered into negative numbers via the numeric keypad.

6.5.5 Comparator Function

Percentage(%): Compared as a percentage of the difference between the measured value and the nominal value of the part under test,

That is, $\%=\frac{X-Y}{Y}\times 100\%$

Where :X is the measured value of the current component to be measured

Y is the set nominal value.

When %> Higher limit, HI is displayed on the right side of the measured value of the measured component in this measurement mode on the < MULTIPARA DISP> interface, indicating that the higher limit is exceeded.

When %< lower limit, the < MULTIPARA DISP> interface displays LO on the right of the measured value of the measured component in this measurement mode, indicating that the value is lower than the higher limit.

When the lower limit is <%< higher limit, the < Multi-Parameter Display > screen displays PASS to the right of the measured value of the measured component in this measurement mode, indicating that the value is within the higher and lower limits.

Absolute value (ABS): The measured value of the part under test is subtracted from the nominal value before comparison.

That is, ABS =X-Y

Where :X is the measured value of the current component to be measured.

Y is the set nominal value.

When ABS> Higher limit, HI is displayed on the right side of the measured value of the measured component in this measurement mode on the < MULTIPARA DISP > interface, indicating that the higher limit is exceeded.

When ABS< lower limit, LO is displayed on the < MULTIPARA DISP > screen to the right of the measured value of the measured component in this measurement mode, indicating that it is lower than the higher limit.

When the lower limit is <ABS< higher limit, the < MULTIPARA DISP > screen displays PASS to the right

of the measured value of the measured component in this measurement mode, indicating that it is within the higher and lower limits.

6.6 <MEAS SETUP> Page

Press the menu key [SETUP] to enter the <MEAS SETUP> page.

Note: The [SETUP] key is the common key for <MEAS SETUP> and <SYSTEM SETUP>. Press the [SETUP] key to step through the two pages, as shown in Figure 6 - 6 - 1.

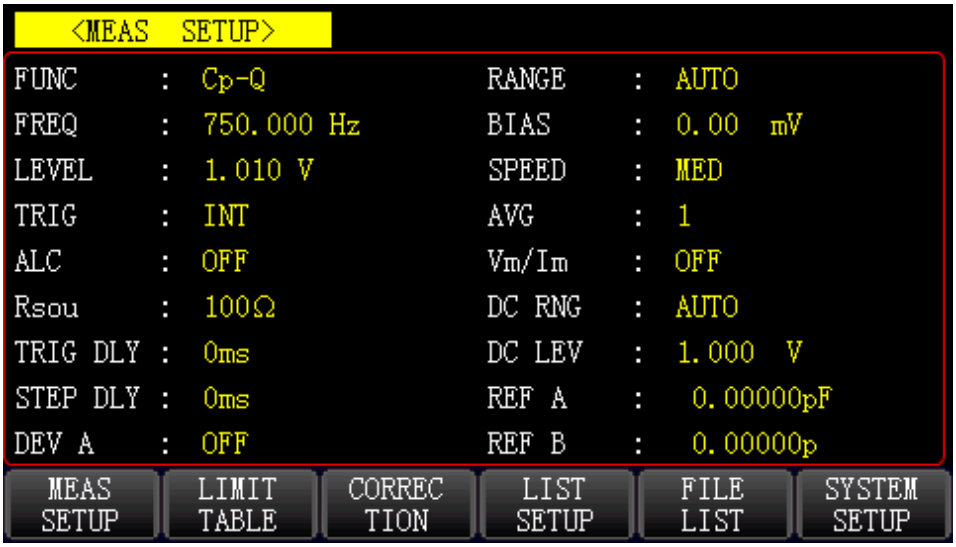


Figure 6 - 6 - 1

The following parameters can be set on the <MEAS SETUP> page (the setting field is included in brackets).

- Test function (FUNC)
- Test frequency (FREQ)
- Test level (LEVEL)
- Test range (RANGE)
- DC bias (BIAS)
- Test speed (SPEED)
- Trigger mode (TRIG)
- Automatic level control (ALC)
- Output resistance (Rsou)
- Average number (AVG)
- Voltage/Current monitor ON/OFF (Vm/Im)

- Trigger delay (TRIG DLY)
- Step delay (STEP DLY)
- DC resistance range (DC RNG)
- DC resistance level (DC LEV)
- Deviation test A (DEV A)
- Deviation test (DEV B)
- Reference value of deviation test A (REF A)
- Reference value of deviation test B (REF B)

Note: DEV B *will be hidden in the softkey menu, Move the cursor to its position to display the* DEV B *menu and all the contents move up one line.*

Some set field on the **<MEAS SETUP>** page are the same as on the **<MEAS DISP>** page, as listed in the following. These set fields have been described previously and will not be described in this section. Other set filed on the **<MEAS SETUP>** page is described as follows.

- Test function (FUNC)
- Test frequency (FREQ)
- Test level (LEVEL)
- Test range (RANGE)
- Test speed (SPEED)
- DC bias (BIAS)

6.6.1 Trigger

UTR2830 series has four trigger mode: INT (internal trigger), MAN (manual trigger), EXT (external trigger) and BUS (bus trigger).
When the trigger mode is INT (internal trigger), UTR2830 series will perform continuous repeat test.
When the trigger mode is MAN (manual trigger), UTR2830 series will perform one test when each time press the **[TRIGGER]** key.
When the trigger mode is EXT (external trigger), UTR2830 series will perform one test when HANDLER interface receives a trigger signal of positive pulse.

When the trigger mode is BUS (bus trigger), UTR2830 series will perform one test when IEEE488 port receives the command of "TRIGGER" every time.

BUS trigger mode cannot be set on the front panel of the instrument.

Note: *When UTR2830 series is being tested, if it receives a trigger signal, which will be ignored. Thus, the trigger signal should be sent after the test is completed.*

If UTR2830 need to be triggered at HANDLER interface, the trigger mode should set to EXT.

Operating steps of trigger mode

Using the following steps to set the trigger mode, except BUS trigger mode. If the instrument is set to BUS trigger mode, it should send the command "TRIGger:SOURce BUS" through IEEE488 port.

1) Move the cursor to the TRIG field, the following soft keys will be displayed.
   - Internal (INI)
   - Manual (MAN)
   - External (EXT)
   - Bus (BUS)
2) Use the above softkey to set the trigger mode to INT (internal trigger), MAN (manual trigger), EXT (external trigger) or BUS (bus trigger).

6.6.2 Level

The automatic level control function can adjust the actual measured level (the voltage at both ends of the DUT or the current of the DUT) to customized measured level. This function can ensure that the test voltage or current at both ends of the DUT is kept constant.

When using the automatic level control function, the range of Test level should be set as follow.

Constant voltage: 10 mVrms to 1 Vrms

Constant current: 100 μArms to 10 mArms

Note: *When the constant level is enabled, if the level is over the above range, the constant level will automatically set to OFF. The currently set level value is generally used as a non - constant level.*

Operating steps of automatic level control

Executing the following steps to turn on/off the constant level function.

1) Move the cursor to the ALC (automatic level control) field, the following soft keys will be displayed.
   - ON
   - OFF
2) Press the sofkey ON to turn on the automatic level control function.
3) Press the sofkey OFF to turn on the automatic level control function.

Note: The automatic level function of UTR2830E is force to OFF.

6.6.3 Average

The average function can average the test results of two times or multiple times. The range of average number is 1~255, step by 1.

Operating steps of average number

1) Move the cursor to the AVG field, the following soft keys will be displayed.
   - ↑ (+)

     Press this softkey to increase the measured average time.
   - ↓ (-)

     Press this softkey to decrease the measured average time.
2) Use the above softkey to set the measured average time.

6.6.4 V/I Monitor

The V/I monitor function can observe the actual voltage and the actual current at both ends of the DUT. The voltage monitor is displayed at the Vm field on the <MEAS DISP> page. The current monitor is displayed at the Im field on the <MEAS DISP> page.

Note: *The correction function will affect V/I monitor function. Therefore, V/I monitor data will change with the correction data. The state of correction function, open - circuit/short - circuit/load will also affect V/I monitor data.*

Operating steps of V/I Monitor

Executing the following steps to turn on/off the V/I Monitoring.

1) Move the cursor to the Vm/Im (Monitor field, the following soft keys will be displayed.
   - ON
   - OFF
2) Use the softkey ON to turn on the V/I Monitoring. Press the softkey OFF to turn off the V/I Monitoring.

6.6.5 Trigger Delay

Trigger delay refers to the delay time between when the instrument being triggered and when the measurement starts. The delay function is used to set the trigger delay time. When using the list sweep function, the trigger delay of each scanning point will set to the set delay time.
The range of trigger delay time is 0 s~60 s, step with 1 ms. The trigger delay is very useful when the instrument is used under the automatic test system. When the instrument is generated by HANDLER interface, the trigger delay can ensure that the DUT is reliably connected to the test terminal.

Operating steps of trigger delay

1) Move the cursor to the TRIG DLY field.
2) Using the numeric key to enter the delay time, the unit softkey will appear when a numeric key is pressed.
   - msec
   - sec

6.6.6 Step Delay

The step delay refers to the delay time between when the instrument starts to output the drive signal and when the measurement starts. The delay function is used to set the step delay time. The range of step delay time is 0 s~60 s, step with 1 ms. When the instrument measures the parameter of DCR or Rd, such as Lp - Rd, when two drive signals are used alternately to measure inductive devices, ensuring the accuracy of the measurement is a very important function.

Operating steps of trigger delay

1) Move the cursor to the Step DLY field.
2) Using the numeric key to enter the step time, the unit softkey will appear when a numeric key is pressed.
   - msec
   - sec

6.6.7 Internal Resistance

UTR2830 series provides three internal resistance of 100 Ω, 50 Ω and 30 Ω. During the test, it is important to ensure that the same internal resistance value is available in order to compare the data with other testers.

Note: *The default internal resistance is 100 Ω when using bias output.*

Operating steps of internal resistance

1) Move the cursor to the INI (internal) field, the following soft keys will be displayed.
   - 100 Ω
   - 50 Ω
   - 30 Ω
2) Press the corresponding softkey to select the internal resistance to 100 Ω, 50 Ω or 30 Ω.

6.6.8 DC Range

The DC resistance range can set separately. The specified range is the same as LCR range and the setting method is the same as range.

6.6.9 DC Level

The DC level is fixed 1 V, it cannot be changed. The DC level of UTR2832E is 50 mV - 2 V, and the resolution is 1 mV.

Operating steps of DC level

1) Move the cursor to the DC LEV field.
2) Using the numeric key to enter the level, the unit softkey will appear when a numeric key is pressed.

- mV
- V

3) When the number is input, Press the unit softkey mV or V to automatically convert to the final level value.

6.6.10 Deviation and Reference

The deviation test displays the deviation value directly on the screen instead of the actual test value. The deviation value is equal to the actual test value minus the preset reference value. This function allows you to easily observe the variation of the measured component parameters with respect to temperature, frequency, bias, etc. The deviation test function can be used in the primary parameter or secondary parameter, or both.

The instrument provides two deviation test methods as follows.

- ΔABS (absolute deviation)

  The currently displayed deviation is the difference between the measured value of the DUT and the set reference value.

  ΔABS formula: $\Delta ABS = X - Y$

  In here, X: the measured value of the current the DUT

  Y: the preset reference value

- Δ% (percentage deviation)

  The currently displayed deviation is the percentage error that the difference between the measured value of the DUT and the set reference value divides by the reference value.

  Δ% formula: $\Delta\% = (X - Y)/Y \times 100[\%]$

  In here, X: the measured value of the current the DUT

  Y: the preset reference value

Operating steps of deviation test

1) Move the cursor to the REF A field to enter the reference value of the primary parameter, the following soft key will be displayed.

   - MEAS

2) When the reference component is connect to the test terminal, Press the softkey MEAS to

perform the test. The measured test is automatically entered as the value for Reference A.

3) Use the softkey MEAS or using the numeric key to enter the reference value of the primary parameter.
4) Move the cursor to the REF B field to enter the reference value of the secondary parameter, the following soft key will be displayed.
   - MEAS
5) When the reference component is connect to the test terminal, Press the softkey MEAS to perform the test. The measured test is automatically entered as the value for Reference B.
6) Use the softkey MEAS or using the numeric key to enter the reference value of the secondary parameter. This step can be skipped if the primary and secondary parameters have already been set by Press the softkey MEAS softkey in step 2.
7) Move the cursor to the DEV A field, the following soft keys will be displayed.
   - ABS
   - %
   - OFF
8) Use the above softkey to set the deviation method for the primary parameter.
   1) Move the cursor to the to the DEV B field, the following soft keys will be displayed.
   - ABS
   - %
   - OFF
9) Use the above softkey to set the deviation method for the secondary parameter.

6.7 <CORRECTION> Page

Press the menu key [SETP] and Press the softkey Correction to enter the **<Correction>** page, as shown in Figure 6 - 7 - 1.

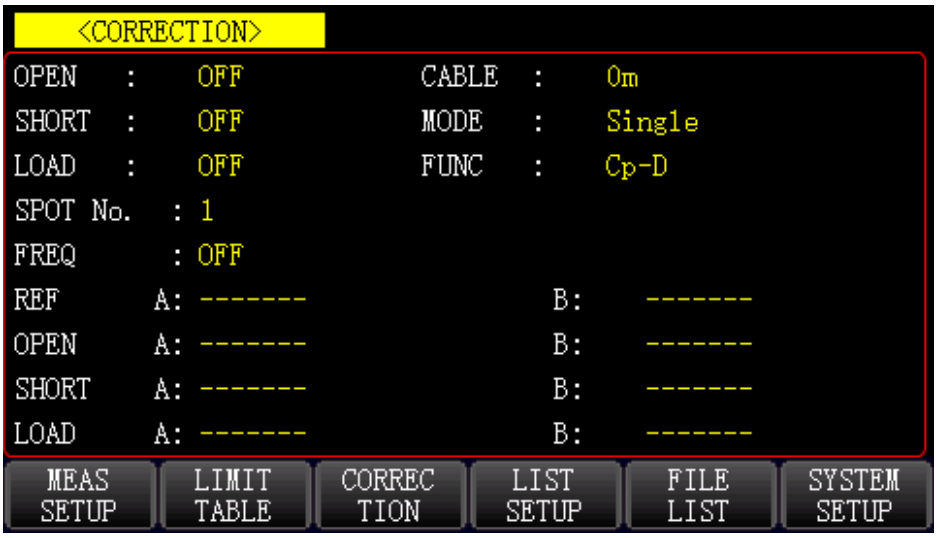


Figure 6 - 7 - 1

Open - circuit, short - circuit and load correction on the **<Correction>** page can be used to eliminate the distributed capacitance, spurious impedance and other measurement errors.

UTR2830 series provides two correction modes, the first one is executing open and short correction on all frequency points by interpolation method; the other one is executing open, short and load correction for the currently set frequency point. It has 10 correction points. The following measurement control parameter can be set on the **<Correction>** page.

- Open - circuit correction (OPEN)
- Short - circuit correction (SHORT)
- Load correction (LOAD)
- Cable length (CABLE)
- Single correction mode (MODE)(only single path is supported at present)
- Load correction test (FUNC)
- Correction point (SPOT NO.)

- Frequency of open - circuit, short - circuit and load correction (FREQ)
- Reference value of frequency point (REF A, REF B)
- Open - circuit value of frequency point (OPEN A, OPEN B)
- Short - circuit value of frequency point (SHORT A, SHORT B)
- Load value of frequency point (LOAD A, LOAD B)

The **<Correction>** page has 16 field of Correction, OPEN, SHORT, LOAD, CABLE, MODE, FUNC, SPOT NO., FREQ, REF A, REF B, OPEN A, OPEN B, SHORT A,SHORT B, LOAD A and LOAD B. Each control function

field will be described in detail in the following paragraphs.

Besides above the setting fields, the **<Correction>** page is also display the following monitor field.

The monitor fields are similar with the setting fields, but the monitor fields only provides information display and cannot be set. LOAD correction software can be selected in the FREQ field for testing.

- Actual test result of open - circuit correction (OPEN A, OPEN B)
- Actual test result of short - circuit correction (SHORT A, SHORT B)
- Actual test result of load correction (LOAD A, LOAD B)

Note: *The rule of user calibration is that if the open or short circuit is ON and the measurement frequency corresponding to the point frequency clearing is ON, the data of point frequency correction will be used at first.*

6.7.1 Open-circuit Correction

The open - circuit correction function of UTR2830 series can eliminate the error caused by the stray admittance (G, B) parallel - connected with the DUT, as shown in Figure 6 - 7 - 1.

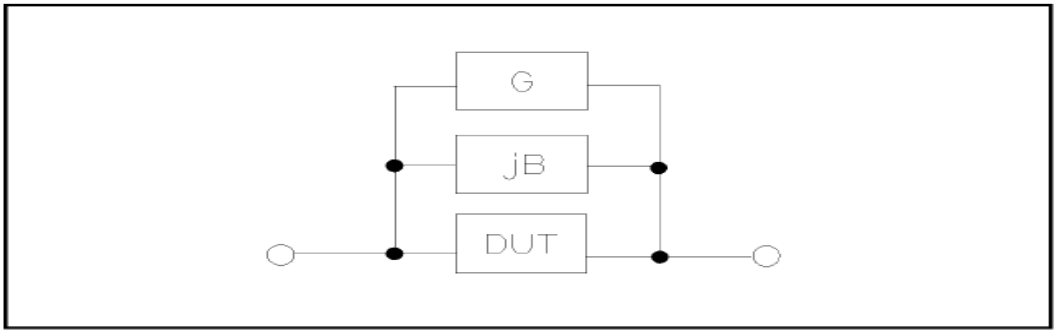


Figure 6 - 7 - 1 Spurious Admittance

UTR2830 series adopts the following two kinds of open - circuit correction data.

- UTR2830 series executes open - circuit correction test for 39 fixed frequency points within 20Hz – 100kHz, no matter what the currently set frequency is. Move the cursor to the OPEN field and then use the softkey MEAS OPEN to execute open circuit correction for all frequency points.

Note: *UTR2832E executes open - circuit correction test for 41 fixed frequency points within 20Hz - 200kHz. Except 41 fixed frequency points, the open - circuit correction data of other frequency points will be calculated using the interpolation calculation method for different*

test frequency at different ranges.

- UTR2830 series can set 10 open - circuit correction frequency point in the FREQ and SPOT NO. field on the <Correction> page. Move the cursor to the FREQ, and then use the softkey MEAS OPEN to execute open - circuit correction for the currently set frequency respectively.

Operating steps of open - circuit correction

Open - circuit correction includes two methods, the first one is open - circuit correction for all frequency points by interpolation method; the other is single correction for the set frequency point. The following steps are executing open - circuit correction for all frequency points by interpolation method. The operation method of open - circuit correction on single frequency, please refer to "load correction".

1) Move the cursor to the OPEN field, the following soft keys will be displayed.
   - OFF
   - ON
   - MEAS OPEN
   - DCR OPEN
2) Connect test fixture to the test terminal. The fixture is open - circuit, indicating that not connect to any the DUT.
3) Press the softkey MEAS OPEN, UTR2830 series will measure open - circuit admittance (capacitance and inductance) on 39 frequency points. It requires 50 seconds to complete open - circuit full frequency correction.
4) Press the softkey DCR OPEN, UTR2830 series will measure open - circuit resistance under the DC resistance function.
5) Press the softkey ON to enable the open - circuit correction, UTR2830 series will perform open - circuit correction calculation in the following test process. If the frequency is set to OFF, the open - circuit correction data of the current frequency will be calculated by interpolation method. If the frequency is set to ON, the value of current test frequency is equal to the frequency, in this case, the open - circuit correction data of frequency will be used to the calculation of open - circuit correction.
6) Press the softkey OFF to disable the open - circuit correction. The open - circuit correction will

not be executed in the following measurement.

6.7.2 Short-circuit Correction

The short - circuit correction function of UTR2830 series can eliminate the error caused by spurious inductance (R, X) in serial with the DUT, as shown in Figure 6 - 7 - 2.

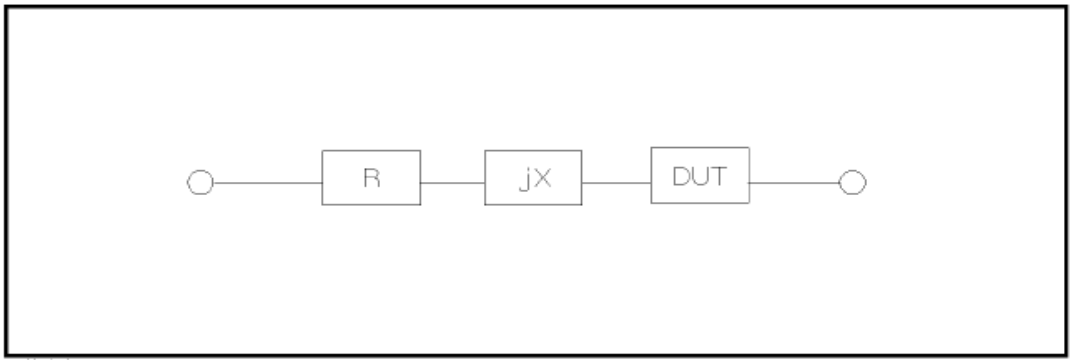


Figure 6 - 7 - 2 Spurious Inductance

UTR2830 series adopts the following two kinds of open - circuit correction data.

- UTR2830 series executes open - circuit correction test for 39 fixed frequency points within 20Hz – 100kHz, no matter what the currently set frequency is. Move the cursor to the SHORT field and then use the softkey MEAS SHORT to execute open circuit correction for all frequency points. 39 fixed frequency points are similar with the open - circuit above.

Note: *UTR2832E executes open - circuit correction test for 41 fixed frequency points within 20Hz - 200kHz. Except 41 fixed frequency points, the short - circuit correction data of other frequency points will be calculated using the interpolation calculation method for different test frequency at different ranges.*

- UTR2830 series can set 10 open - circuit correction frequency point in the FREQ and SPOT NO. field on the <Correction> page. Move the cursor to the FREQ, and then use the softkey MEAS SHORT to execute short - circuit correction for the currently set frequency respectively.

Operating steps of short - circuit correction

Short - circuit correction includes two methods, the first one is open - circuit correction for all

frequency points by interpolation method; the other is single correction for the set two frequency points.

The following steps are executing short - circuit correction for all frequency points by interpolation method. The operation method of short - circuit correction on single frequency, please refer to "load correction".

1) Move the cursor to the SHORT field, the following soft keys will be displayed.
   - OFF
   - ON
   - MEAS SHORT
   - DCR SHORT
2) Connect test fixture to the test terminal. The fixture is short circuited by short - circuit plate.
3) Press the softkey MEAS SHORT, UTR2830 series will measure short - circuit impedances (resistance and reactance) on 39 frequency points. It requires 50 seconds to complete short - circuit full frequency correction.
4) Press the softkey DCR SHORT, UTR2830 series will measure short - circuit resistance under the DC resistance function.
5) Press the softkey ON to enable the short - circuit correction, UTR2830 series will perform short - circuit correction calculation in the following test process. If the frequency is set to OFF, the short - circuit correction data of the current frequency will be calculated by interpolation method. If the frequency is set to ON, the value of current test frequency is equal to the frequency, in this case, the short - circuit correction data of frequency will be used to the calculation of short - circuit correction.
6) Press the softkey OFF to disable the short - circuit correction. The short - circuit correction will not be executed in the following measurement.

6.7.3 Load Correction

The load correction uses the transport coefficient between the actual test value and standard reference value that set on the SPOT NO. to eliminate other test errors. It follows that the FREQ can be set on the SPOT NO. to perform open - circuit, short - circuit and load correction.

10 frequency points can be set on the SPOT NO. , frequency can be set on the FREQ. The standard

reference can be set on the REF A AND REF B.

Before set the standard reference, the test function of reference should be set on the FREQ at first.

When the cursor moves to the cursor to the FREQ, the softkey MEAS LOAD will be displayed, and then press this softkey to perform the load correction test.

Operating steps of load correction

1) Move the cursor to the FREQ field, the following softkey will be displayed.
   - ON

     Open - circuit, short - circuit and load correction data are available at the currently set frequency when this softkey is pressed.
   - OFF

     Open - circuit, short - circuit and load correction data are invalid at the currently set frequency when this softkey is pressed.
   - MEAS OPEN

     Press this softkey to perform an open - circuit correction on the frequency.
   - MEAS SHORT

     Press this softkey to perform a short - circuit correction on the frequency.
   - MEAS LOAD

     Press this softkey to perform a load correction on the frequency.
2) Press the softkey ON, the FREQ field will display the preset frequency of the open - circuit, short - circuit and load correction.
3) Use the numeric key to enter the correction frequency, when any number key is pressed, the frequency unit softkey will be displayed (Hz, kHz and mHz).
4) Connect the test fixture to the test terminal.
5) Set the test fixture to open circuit.
6) Press the softkey MEAS OPEN to perform open - circuit correction at the currently set frequency. The test result (G, B) will display in the help line (the bottom line).
7) Move the cursor to the OPEN field.
8) Press the softkey ON to perform the open - circuit correction calculation at preset frequency in latter measurements.
9) Move the cursor to the FREQ field to set the required correction frequency.

10) Set the test fixture to short circuit.
11) Press the softkey MEAS SHORT to perform short - circuit correction at the currently set frequency. The test result (R, X) will display in the help line (the bottom line).
12) Move the cursor to the SHORT field.
13) Press the softkey ON to perform the short - circuit correction calculation at preset frequency in latter measurements.
14) Prepare a standard component.
15) Move the cursor to the FUNC field.
16) Set function parameter for the standard component.
17) Move the cursor to the REF A field.
18) Press the numeric key and unit softkey to enter the reference value of primary parameter for the standard component.
19) Move the cursor to the REF B field to the right side of REF A.
20) Press the numeric key and unit softkey to enter the reference value of secondary parameter for the standard component.
21) Move the cursor to the FREQ field.
22) Connect the standard component to the test fixture.
23) Press the softkey MEAS LOAD to perform a load correction, the test result will display in the monitor field of MEAS A and MEAS B.
24) Move the cursor to the LOAD field.
25) Press the softkey ON to perform the load correction calculation at preset frequency in latter measurements.

6.7.4 Test Function

When performing load correction, the reference value of the standard component must be entered in advance. The test parameters of reference value should be the same as the preset load correction test function.

Load correction function adopts the transport coefficient between the actual test value of preset frequency and the standard reference value to eliminate the test error. Load correction function is only available for calculating transport coefficient.

6.7.5 Point-frequency Correction

The instrument provides 10 point - frequency zero clearing function. The specific steps refer to 8.1.2 load calibration process. Firstly, select the calibration point and then move the cursor to FREQ, select ON and enter the corresponding frequency. Press MEAS SHORT to perform short - circuit correction at preset frequency. Press MEAS OPEN to perform open - circuit correction at the current set frequency.

6.7.6 Cable Length

The available cable length is 0 m.

6.8 <LIMIT SETUP> Page

Press the menu key [Setup], and then press LIMIT SETUP key to enter the <LIMIT SETUP> page, as shown in Figure 6 - 8 - 1.

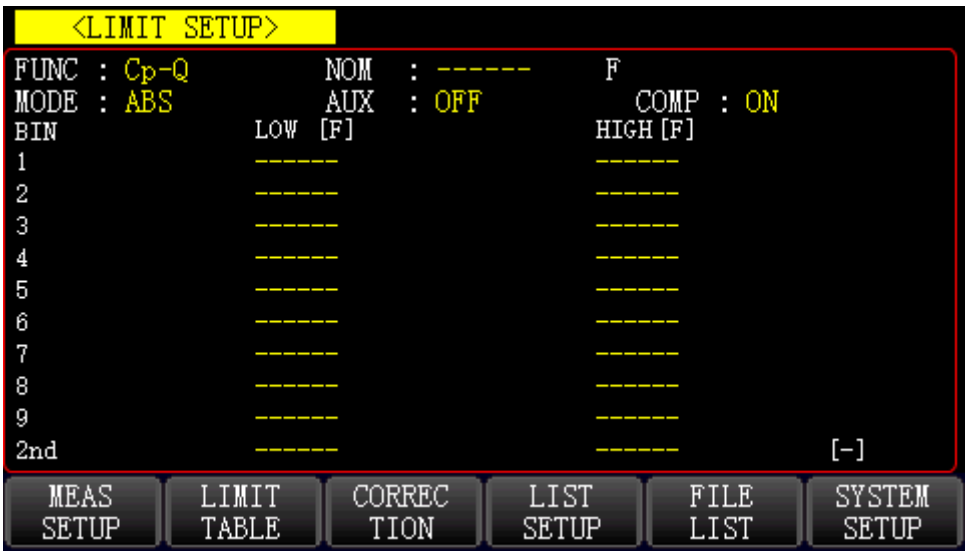


Figure 6 - 8 - 1

Comparator function can be set on this page. UTR2830 series can set 9 bin limits of primary parameters and one of secondary parameters. The tested result can be divided into up to 10 bins (BIN 1 to BIN 9 and BIN OUT). If the primary parameter of the DUT is within the limit range from BIN1 to BIN9, but the secondary parameter is out of the limit range, in this case the DUT will be sorted into aux bin.

When UTR2830 installs the HANDLER interface and it is used in automatic sorting system, the compare function will be especially useful. The following limit parameter of comparator function can only be set on <LIMIT SETUP> page.

- Test function (FUNC)
- Limit mode of comparator function (MODE)
- Nominal value (NOM)
- Auxiliary bin ON/OFF (AUX)
- Comparator function ON/OFF (COMP)
- Lower limit of each bin (LOW)
- Higher limit of each bin (HIGH)

6.8.1 Swap Parameter (function)

The swap parameter can exchange the primary parameter and secondary parameter in the FUNC field. For example, when the test function is Cp - D, the swap parameter function can change the test parameter to D - Cp, in this case, D can set 9 pairs of compare limits, and Cp can set 1 pair of compare limits.

Operating steps of exchanging parameter

1) Move the cursor to the PARAM field, the following soft key will be displayed.
   - SWAP PARAM
2) Press the softkey SWAP PARAM to exchange the primary parameter and secondary parameter.
3) Press the softkey SWAP PARAM again to reset the setting.

6.8.2 Limit Mode of Comparator

Comparator function has two limit setup modes for primary parameters, as shown in Figure 6 - 8 - 2.

- Tolerance mode

  In the tolerance mode, set the deviation value of the nominal (that set in the NOM field) as the compare limit value. Deviation value has two modes: percentage deviation and absolute deviation.

- Sequential mode

In the sequential mode, set the test range as the compare limit value. The compare limit must be set in the order from small to large.

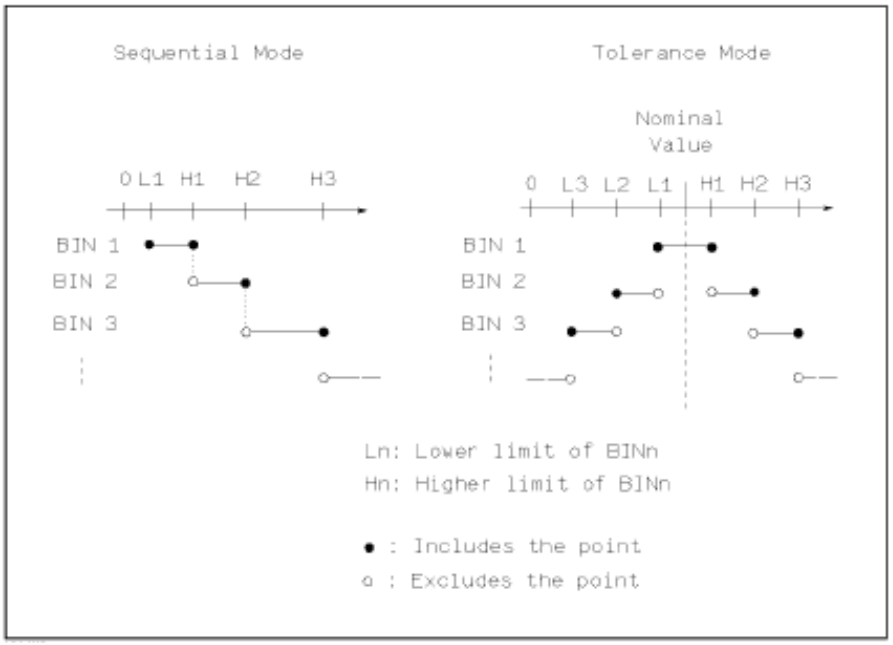


Figure 6 - 8 - 2 Tolerance and Sequential Mode

Note: *When set the limit value of tolerance mode, the error range should be set in the order from small to large. If the error range of BIN1 is the largest one, then all the DUT will sort into BIN 1. In the tolerance mode, the low limit is not necessary to be smaller than the nominal value and the high limit is not necessary to be larger than the nominal value. The limit range of each bin can be discontinues or overlapped.*

Operating steps of comparator function

1) Move the cursor to the MODE field, the following soft key will be displayed.

- % TOL

This softkey is used to set the limit mode to the tolerance mode of percentage deviation.

- ABS TOL

This softkey is used to set the limit mode to the tolerance mode of absolute deviation.

- SEQ MODE

This softkey is used to set the limit mode to the sequential mode.

2) Use above softkey to set the limit mode.

6.8.3 Nominal

When the tolerance mode is selected as the limit mode for the primary parameter, it is necessary to set the nominal value. The nominal value can be set in any display area that within the display range. When the sequential mode is selected as the limit mode for the primary parameter, the nominal value can be set, but it is not necessary to use it under this mode.

Operating steps of nominal

1) Move the cursor to the NOM field.
2) Use the numeric key to enter the nominal, when the data is entered, press the softkey (p, n, μ, m, *1, k) to enter the nominal. When select the softkey *1 to enter the nominal, the nominal value will select the default unit F, H or Ω according to the primary parameter.

6.8.4 Comparator Function (ON/OFF)

UTR2830 series can set 9 bin limits of primary parameters and 1 bin limit of secondary parameters. The test results can be sorted into 10 bins (BIN 1 to BIN 9 and BIN OUT) at most. If the primary parameter of the DUT is within the limit range from BIN 1 to BIN 9, but the secondary parameter is out of the limit range, in this case the DUT will be sorted into AUX bin. UTR2830 series installs the HANDLER interface, when it is used in the automatic sorting system, the compare function is very useful.

Operating steps of comparator function (ON/OFF)

1) Move the cursor to the COMP field, the following soft key will be displayed.
   - OFF
   - ON
2) Use above softkey to set the comparator function ON/OFF.

6.8.5 Auxiliary Bin (ON/OFF)

When it is necessary to sort the secondary parameters, the limits of the secondary parameter can be set in HIGH and LOW of the 2nd.

Three cases may occur in the process of secondary parameter sorting.

- On the <LIMIT SETUP> page, the higher/lower limit of the secondary parameter is not set.
- On the <LIMIT SETUP> page, the higher/lower limit of the secondary parameter is set but AUX is set to OFF. In this case, only components with qualified secondary parameters can be sorted according to the sorting limits of the primary parameters. If the secondary parameter is unqualified, even the primary parameter is within the limit range, those components will be sorted to BIN OUT.
- On the <LIMIT SETUP> page, the higher/lower limit of the secondary parameter is set and AUX is set to ON. If the primary parameter is out of the limit range, it will be sorted to BIN OUT. If the primary parameter of the DUT is within the limit range, but the secondary parameter is out of the limit range, the DUT will be sorted to BIN OUT.

Note: *When the lower limit of secondary parameter is set and AUX is set to ON, if the primary parameter of the DUT is within the limit range, the secondary parameter is less than or equal to the lower limit of secondary parameter, the DUT will be sorted to AUX bin.*
When the higher limit of secondary parameter is set and AUX is set to ON, if the primary parameter of the DUT is within the limit range, the secondary parameter is greater than or equal to the higher limit of secondary parameter, the DUT will be sorted to AUX bin.

Operating steps of auxiliary bin (ON/OFF)

1) Move the cursor to the AUX field, the following soft key will be displayed.
   - OFF
   - ON
2) Use above softkey to set the auxiliary bin ON/OFF.

6.8.6 Higher/Lower Limit

UTR2830 series can set 9 bin limits of primary parameters and 1 bin limit of secondary parameters. The test results can be sorted into 10 bins (BIN 1 to BIN 9 and BIN OUT) at most.
The higher/lower limit of primary parameter can be set in HIGH and LOW field of BIN 1 to BIN 9. The higher/lower limit of secondary parameter can be set in HIGH and LOW field of the 2nd.

Operating steps of higher/lower limit

1) Set PARAM and NOM in the comparator menu and the limit MODE of the primary parameter.
2) Move the cursor to the LOW field of BIN 1, if the tolerance mode is selected, the following step 3 to step 6 will be executed; if the sequential mode is selected, the following step 7 to step 11 will be executed.
3) In the LOW field of BIN 1, use the numeric key to enter the lower limit of BIN 1. After the data is entered, use the softkey (p, n, μ, m, *1, k) to confirm the input data. When the softkey *1 is pressed, the default unit of limit will be F, H or Ω. When the lower limit of BIN 1 is set in the LOW field, the lower limit of BIN 1 will automatically set to -(absolute limit) and the higher limit of BIN 1 will be +(absolute limit).
4) The cursor will automatically move to the LOW field of BIN 2. Repeat the step 3, until the limit of BIN 9 is set. Then the cursor will automatically move to the LOW field of the 2nd.
5) When the lower limit of secondary parameter is set, the cursor will automatically move to the HIGH field of the 2nd.
6) Enter the higher limit of secondary parameter.
7) In the LOW field of BIN 1, use the numeric key to enter the lower limit of BIN 1. After the data is entered, use the softkey (p, n, μ, m, *1, k) to confirm the input data. When the softkey *1 is pressed, the default unit of limit will be F, H or Ω.
8) When the lower limit of BIN 1 is set, the cursor will automatically move to the HIGH field of BIN 1. Enter the higher limit of BIN 1.
9) The cursor will automatically move to the HIGH field of BIN 2. Due to the sequential mode, the lower limit of BIN 2 is equal to the higher limit of BIN 1. Enter the higher limit of BIN 2.
10) Repeat the step 9, until the higher limit of BIN 9 is set. After that, the cursor will automatically move to the LOW field of the 2nd. Enter the lower limit of secondary parameter.
11) The cursor will automatically move to the HIGH field of the 2nd. Enter the higher limit of secondary parameter.

6.9 <LIST SWEEP SETUP> Page

Press the menu key [SETUP], and then press the softkey LIST SETUP to enter the <LIST SWEEP SETUP> page, as shown in Figure 6 - 9 - 1.

Figure 6 - 9 - 1

The list sweep function of UTR2830 series can perform the automatic sweep test for the test frequency, test level or bias voltage of 201 points.

The following sweep parameters can be set on the **<LIST SWEEP SETUP>** page.

- Sweep mode (MODE)
- Sweep parameter (FREQ[Hz], LEVEL[V], LEVEL[A], BIAS[V], BIAS[A])
- Sweep test point (NO.)
- Limit selection (LMT)
- Higher/lower limit (HIGH, LOW)

6.9.1 Mode

The mode menu is the same as the mode on the **<LIST SWEEP DISP>** page.

6.9.2 Test Parameter

The test parameter can be **FREQ[Hz]**, **LEVEL[V]**(voltage level), **LEVEL[A]**(current level), **BIAS[V]**(bias voltage) or **BIAS[A]**(current level).

UTR2830 series provides two parameters to sweep and set, but the two parameters should be different and set.

Operating steps of test parameter

1) Move the cursor to the line under the MODE field, the following softkeys will be displayed.

- FREQ[Hz]
- LEVEL[V]
- LEVEL[A]
- BIAS[V]
- BIAS[A]

2) Press one of the softkey to select the list sweep parameter.

6.9.3 Sweep Parameter

Move the cursor to the list to set each sweep parameter, which is to set FREQ(Hz), LMT, HIGH, and LOW in the list. Use the numeric key to enter the frequency/level/bias data, the higher/lower limit of each parameter to be compared the selected primary/secondary parameter to be compared. When the setting is completed, press "Delete" line in the softkey area can delete the value of selected line. The parameter "A" under LMT, which indicating the test results of primary parameter are compare with the higher/lower limit in the list. The parameter "B" indicates that the test results of secondary parameter are compare with the higher/lower limit in the list. " - - - "means no compare. The "softkey area" has the corresponding option. When the softkey LMT DATA A is pressed, "A" will appear in the LMT area. When the softkey LMT DATA B is pressed, "B" will appear in the LMT area. When the softkey OFF is pressed, the higher/lower limit of previous line will appear in the LMT area will be cleared and display " - - - ".

7. [SYSTEM] and [FILE LIST>

7.1 <SYSTEM SETUP> Page

Press the menu key [SETUP], and then press the [SYSTEM SETUP] to enter the <SYSTEM SETUP> page, as shown in Figure 7 - 1 - 1.

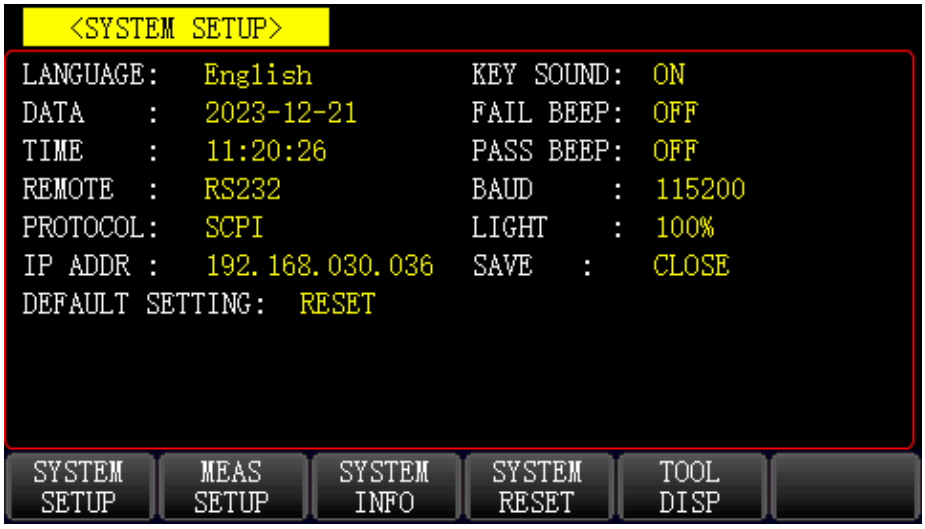


Figure 7 - 1 - 1

System parameter of language, data, time, communication mode, communication protocol, IP address, key sound, FAIL beeper, PASS beeper, baud rate and backlight can be set on this page.

Note: *The setting will be saved automatically after all the parameter is set on the <SYSTEM SETUP> page.*

7.1.1 PASS Beep

This function is used to control and display the beep mode when the compared result is qualified.

Operating step of PASS Beep

1) Move the cursor to the PASS Beep field, the following soft key will be displayed.

- HIGH LONG

  This softkey is used to select a high and long beep.

- HIGH SHORT

  This softkey is used to select a high and short beep.

- OFF

This softkey is used to turn off this function.

7.1.2 FAIL Beep

This function is used to control and display the beep mode when the compared result is unqualified.

Operating step of FAIL Beep

1) Move the cursor to the FAIL Beep field, the following soft key will be displayed.

- HIGH LONG

This softkey is used to select a high and long beep.

- HIGH SHORT

This softkey is used to select a high and short beep.

- OFF

This softkey is used to turn off this function.

7.1.3 Language

This function is used to control and display the language mode.

Operating step of language

1) Move the cursor to the LANGUAGE field, the following soft key will be displayed.

- English

This softkey is used to select the system language as English.

- Chinese

This softkey is used to select the system language as simplified Chinese.

7.1.4 Communication Mode

This function is used to select the communication mode to RS232, LAN or USBCDC.

Operating step of communication mode

1) Move the cursor to the REMOTE field, the following soft key will be displayed.

- RS232
- LAN
- USBCDC

2) Press the softkey to select the bus interface.

7.1.5 Communication Protocol

The instrument supports SCPI.

7.1.6 IP Address

The instrument is communicating with the higher computer via IP address.

7.1.7 Key Sound

This function is used to turn on/off the key sound.

Operating step of key sound

1) Move the cursor to the KEY SOUND field, the following soft key will be displayed.
   - ON
   - OFF
2) Press the softkey to turn on/off the key sound.

7.2 <FILE LIST> Page

UTR2830 series can save the user - defined parameter as the file to the nonvolatile memory of the instrument. If the user need to use the same settings, this function is useful for loading the file to restore the previous settings. Thus, it can significantly improve production efficiency by reducing setup time of parameter.

On the <MEAS DISP> and <MEAS SETUP> page, press the softkey [FILE LIST] to enter the <FILE LIST> page, as shown in Figure 7 - 2 - 1.

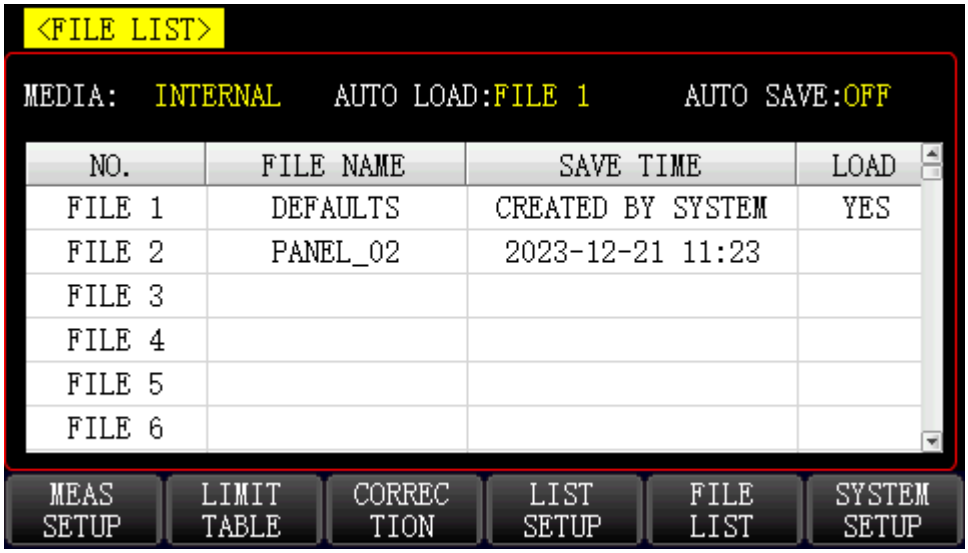


Figure 7 - 2 - 1

7.2.1 Setup File of PASS Beep Single - group Component PASS Beep (*.STA)

The instrument can only save 100 groups of different single - group components setup files (*.STA). External storage USB can display/operate 20 groups of different single - group components setup files (note: USB is an optional accessory). Page, the following data can be saved or loaded with the file format.

On the [FILE LIST] page, the following data can be saved or loaded with the file format, it called *.STA file.

- Setup parameter on the <MEAS SETUP> page
  - Test function
  - Test frequency
  - Test level
  - Test range
  - Test speed
  - Bias voltage
  - Bias current
  - Trigger mode
  - Auto level control
  - Trigger delay
  - Step delay

- DC range
- DC level
- Output resistance
- Average times
- Voltage level monitor ON/OFF
- Current level monitor ON/OFF
- Deviation test mode A
- Deviation test mode B
- Reference value of deviation test A
- Reference value of deviation test B

- Setup parameter on the <BIN NO. DISP> page
  - BIN NO. (ON/OFF)
- Setup parameter on the <LIMIT SETUP> page
  - Test function (SWAP PARAM)
  - Nominal (reference value)
  - Compare mode (% - TOL/ABS - TOL/SEQ - MODE)
  - AUX (ON/OFF)
  - Compare mode (ON/OFF)
  - Higher/lower limit of each bin
- Setup parameter on the <LIST SWEEP SETUP> page
  - List sweep mode (SEQ/STEP)
  - List sweep parameter (frequency/level/bias)
  - Test points of all list sweep parameter
  - Higher/lower limit of all test points, including the limit parameter (LIMIT - DATA A/LIMIT - DATA B)
- Format of the current page

7.2.2 USB

UTR2830 series is equipped with USB HOST interface, so the external USB can be the storage medium and it breaks the memory limit of 100 groups. The file can be copied to IBM PC or compatible desk - top

computer, laptop with USB interface.

UTR2830 supports USB with the following conditions.

- Standard: USB 1.0/1.1
- Capacity: less than 128GB
- File format: FAT16, FAT32 (use Microsoft Windows to formatting)

7.2.3 File Manage

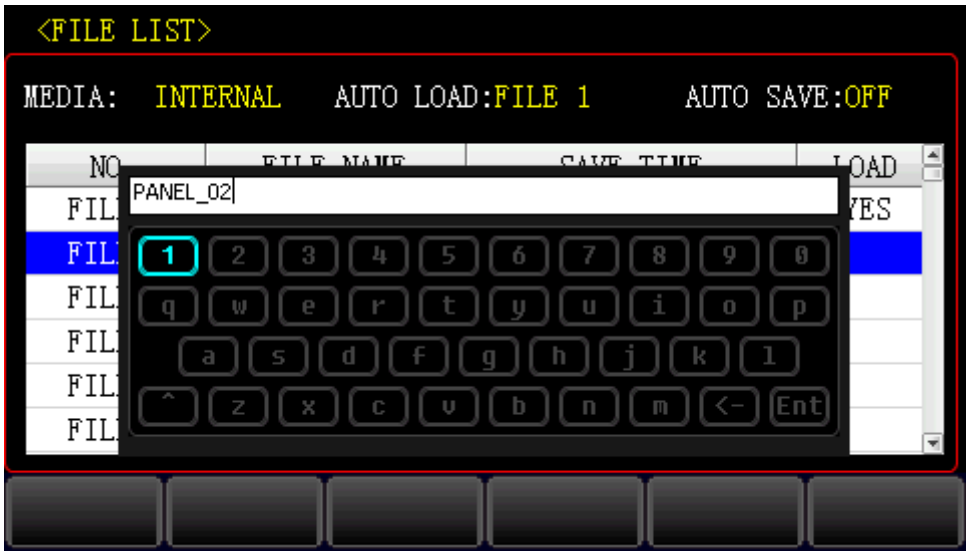
Operating steps of file manage

A. Search an existed file

1) Rotate the rotary knob to check the file one by one, it will automatically turn page at the end of page.
2) Press the arrow keys [◀], [▶] to turn page.

B. Save the setup parameter to a file

1) Rotate the rotary knob to move the cursor to the file to be saved.
2) Press the softkey SAVE to save the file, a hint will appear "The data is being saved..." After that, the hint will disappear.
3) When the file is saved, press the softkey RENAME to edit the file name.



C. Load the setup parameter from a file

1) Rotate the rotary knob to move the cursor to the file to be loaded.

2) Press the softkey LOAD, the selected file will be loaded. Meanwhile, UTR2830 will return to the <MEAS DISP> page.

D. Copy a file to USB

1) It assume that move the internal file 2 to external storage USB.
2) Press the softkey FILE MANAGE, the following softkeys will be displayed.
   - LOAD
   - SAVE
   - DELETE
   - COPY to E:
   - FIND
   - EXTERNAL FILE
3) Move the cursor to the copied file, press the [ENTER] to confirm (it can select multiple files).
4) Press the softkey COPY to E:, the file will copy to the external storage USB.
5) During the process, the progress bar shows the rate of progress. When the copy is completed, the progress bar will be disappeared.

Note: *Please make sure that USB meet the condition on the above and USB is not write - protected.*

8. LCR Measurement and Example

8.1 Correction Operation

8.1.1 Sweep Correction

1) Press the menu key [SETUP], and then press the softkey CORRECTION to enter the <CORRECTION> page.
2) Move the cursor to the OPEN field, the sofkey ON, OFF, MEAS OPEN and DCR OPEN will be displayed.
3) Keep the test fixture in open - circuit state, press the softkey MEAS OPEN to execute open - circuit correction until a hint shows that open - circuit correction is completed.

4) Press the softkey ON to turn on open - circuit correction.
5) Insert the short - circuit plate to the test fixture.
6) Move the cursor to the **SHORT** field, the sofkey ON, OFF, MEAS SHORT and DCR SHORT will be displayed.
7) Press the softkey DCR SHORT to execute short - circuit correction until a hint shows that short - circuit correction is completed.
8) Press the softkey ON to turn on open short - circuit correction.
9) Move the cursor to the **LOAD** field, the sofkey OFF, ON will be displayed.
10) Press the softkey OFF to turn off load correction.
11) Move the cursor to the FREQ field, the sofkey ON, OFF, MEAS OPEN, MEAS SHOR and LOAD will be displayed.
12) Press the softkey OFF to turn off point - frequency correction.

8.1.2 Point - frequency Correction (for single frequency)

It assume that the test frequency is 5kHz.

1) Press the menu key [SETUP] and then press the softkey CORRECTION to enter the <CORRECTION> page.
2) Move the cursor to the **OPEN** field, the sofkey ON, OFF and MEAS OPEN will be displayed.
3) Press the softkey ON to turn on the open - circuit correction.
4) Move the cursor to the **SHORT** field, the sofkey ON, OFF and MEAS SHORT will be displayed.
5) Press the softkey ON to turn on the short - circuit correction.
6) Move the cursor to the to the **LOAD** field, the sofkey OFF, ON will be displayed.
7) Press the softkey OFF to turn off load correction.
8) Move the cursor to the SPOT NO. to select the correction point.
9) Move the cursor to the FREQ field, the sofkey ON, OFF, MEAS OPEN, MEAS SHOR and LOAD will be displayed.
10) Press the softkey ON to turn on point - frequency correction.
11) Press the softkey [5], it displays on the cursor area and the unit softkey (Hz,kHz and mHz) will be displayed. Press the softkeykHz, the FREQ field will turn to 5.0000kHz (the same as test frequency).

12) Keep the test fixture in open - circuit state, press the softkey MEAS OPEN to execute open - circuit correction.

13) Insert the short - circuit plate to the test fixture.

14) Press the softkey MEAS SHORT to execute the short - circuit correction.

8.2 Correct Connection of DUT

The instrument has 4 pairs of test terminal: H_{CUR} (high - end of current sampling Hc), L_{CUR} (low - end of current sampling Lc), H_{POT} (high - end of voltage sampling Hp), L_{POT} (low - end of voltage sampling Lp) and shielding terminal of each test terminal.

The shielding terminal is used to reduce the effect of stray capacitance and electromagnetic interference. During the test, Hc, Hp and Lc, Lp should be connected with the DUT lead to form a whole 4 - terminal measurement, thus reducing the effect of the lead and the connecting point on the test results (especially the loss measurement).

When measuring low impedance components, Hp, Lp should be connected to the lead terminal to prevent the lead resistance from adding to the impedance being measured. The connection principle is that the detected voltage of Hp, Lp should be the actual existed voltage on the DUT.

In other words, Hc, Hp and Lp, Lc should not be connected before connecting to the DUT, otherwise, the measurement error will increase.

If the contact point and Rlead (lead resistance) are much smaller than the impedance to be measured (e.g. Rlead<Zx/1000, the accuracy must be less than 0.1%), Hc, Hp and Lp, Lc can be connected together and then connected to both ends of the DUT (two - terminal measurement).

If the contact point and Rlead (lead resistance) is far less than the impedance to be measured (for example, Rlead<Zx/1000, the accuracy error is required to be less than 0.1%), Hc, Hp and Lp, Lc can be connected together and then connect to the both ends of the DUT (two - terminal measurement).

It is recommended to use a test fixture instead a test wire (attached Kelvin fixture) for some high precision measurements. When Kelvin test lead is used under 10kHz, it can get a better test result. But when the frequency is higher than 10kHz, Kelvin test lead is hard to meet the test requirement. In high frequency, the change of space between the leads will directly change the stray capacitance and inductance on test terminals, while the test lead is not easy to fix in one position. So, it is better to use the test fixture when measuring the high frequency. If the test fixture is not available or cannot be used, the condition of test lead under correction should be the same as the state under measurement.

Whether using the test fixture provided by the instrument or the test cable Kelvin test lead or the user - defined fixture, the following requirements should be met.

1. Distribution impedance must be reduced to the minimum. Especially, when measuring the high impedance components.
2. Contact resistance must be reduced to the minimum.
3. Short - circuit and open - circuit must be available between contact points. Open - circuit and short - circuit correction can easily reduce the effect of distribution impedance of the test fixture on measurement.
   For open - circuit correction, the space between test terminals should be the same with that when they connects with the DUT.
   For short - circuit correction, the short - circuit plate of low impedance should be connected

between test terminals or directly connect Hc with Lc, Hp with Lp, and then connect the two together.

Note: *When the DUT is a polarity component, before measuring, the high potential terminal should be connected to the terminal with mark "+", "Hc" or "Hp" and the low terminal should be connected to the terminal with mark "-", "Lc" or "Lp".*

Warning: Before measuring, please discharge the tested polarity component so as to avoid the damage to the instrument.

8.3 Eliminate Effect of Spurious Resistance

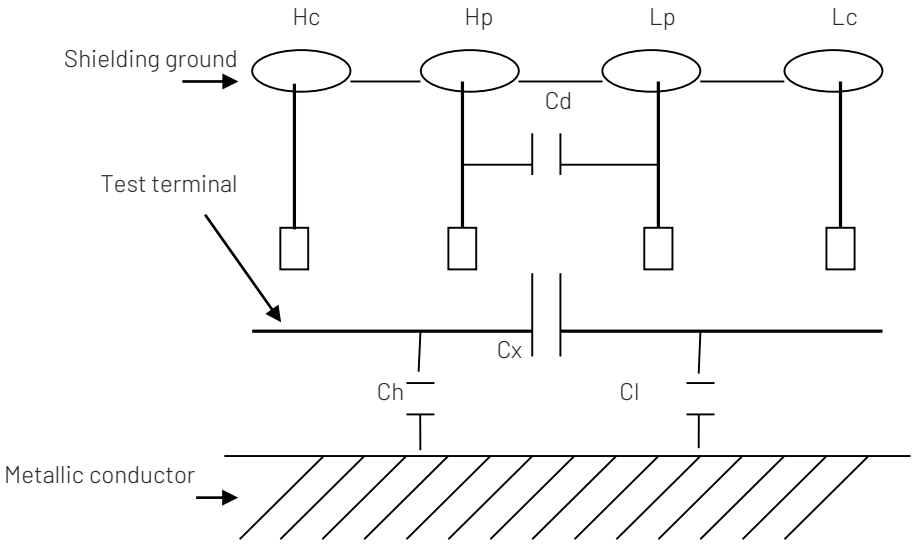


Figure 8 - 3 - 1 Effect of Stray Capacitance

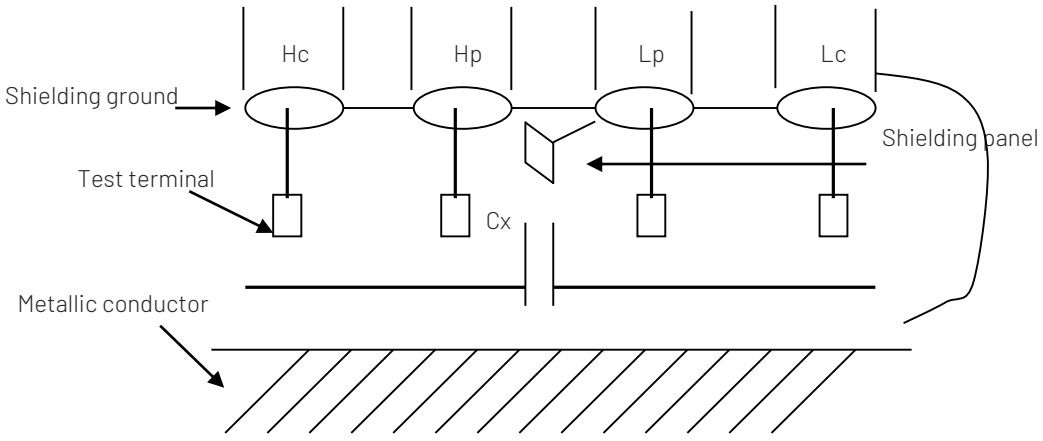


Figure 8 - 3 - 2 Eliminate the Effect of Stray Capacitance

When the DUT is high impedance (such as small capacitance), the effect of stray capacitance cannot be ignored. Figure 8 - 3 - 1 is an example of 4 terminal pair measurement. In this figure, Cd is connected with Cx in a parallel way. When a conductance plate is positioned under the DUT, capacitance Ch

connect with Cx in parallel and then connect with Cl in series, the test result will occur error if connected by this way. If a ground conductor is installed between high and low terminals, Cd can be reduced to the minimum. Meanwhile, if the ground terminal is connected to the conductance plate, the effect of Ch and Cl will be eliminated.

When the DUT is low impedance (such as small inductance, large capacitance), a large current will flow through test leads Hc and Lc.

In this case, electromagnetic coupling between test leads becomes the main source of test errors except the influence of the contact resistance on test terminals. In addition to the influence of the contact resistance of the test end, **the electromagnetic coupling between the test lines becomes the main test errors**. If this coupling cannot be eliminated, it will bring unexpected influence on test results. Generally, contact resistance affects the resistance of impedance and electromagnetic affects the reactance of impedance. Test terminals can adopt **4TP** connection method, so that the current flow though Hc and Lc are equal to the current flow through each shielding terminals, and the current in the opposite direction, its magnetic field will be cancelled out. By this way, the effect of mutual inductance on test result can be eliminated

8.4 Application Example of Inductance Measurement

Test condition

Function: Ls - Q

Frequency: 10kHz

Level: 1.2 Vrms

Internal resistance: 100 Ω

Operating steps

1. Turn on the instrument, refer to the chapter of Panel Overview.
2. Set the basic parameter.
   a) Press the menu key **[Meas]** to enter the **<MEAS DISP>** page.
   b) Use rotary knob to move the cursor to the **FUNC** field. This area displays Cp - D, Cp - ...▼, Cs - ...▼, Lp - ...▼, Ls - ...▼DCR..▼, Z - ..▼R - ..▼, Y - ..▼G - ..▼ will be displayed in

the softkey area on the right side of the screen.

c) Press the key Ls - ...▼DCR..▼, Ls - D, Ls - Q, Ls - Rs, DCR, Ls - DCR, Return will be displayed in the softkey area.

d) Press the key Ls - Q to select Ls - Q test function.

e) Move the cursor to the FREQ field, this area displays 1.0000kHz.

f) Press the key [1][0], 10 will be displayed in the cursor area on the center of the screen, and the softkey area displays the unit (Hz,kHz and mHz). Press the keykHz, then the FREQ field will be changed as 10.000kHz.

g) Move the cursor to the LEVEL filed, this area displays 1.000V.

h) Press the key [1][.][2], 1.2 will be displayed in the cursor area on the center of the screen, and the softkey area displays the unit (mV, V, uA, Ma and A). Press the key V, then the LEVEL field will be changed as 1.200V.

i) Press the menu key [SETUP] to enter the <MEAS SETUP> page.

j) Move the cursor to the INI field, 100 Ω, 50 Ω, 30 Ω will be displayed in the softkey area on the right side of the screen.

k) Press the key 100 Ω to select internal resistance of 100 Ω.

3. Connect the test fixture to the test terminal of UTR2830 series.
4. Execute zero clearing (To avoid the influence of stray impedance on measurement accuracy, Open/ Short correction must be operated.)
5. Connect the tested inductance to the test fixture.
6. Execute the test operation.

   Press the key [Meas] to enter the <MEAS DISP> page. The instrument can test continuously and the test result will be displayed in big font on the center of the page.

7. If the test result is obviously incorrect, please check the following items.

   a) Check whether the tested inductance is reliably connect to the test fixture.

   b) Check whether the test fixture is reliably connect to the test terminal of the instrument.

   c) Restart the open - circuit/short - circuit correction.

✱ Note: When the sweep open - circuit/short - circuit correction is used, the point - frequency correction function should be set as OFF. Refer to "Correction Operation" in this chapter.

8.5 Application Example of Testing Capacitance by Multi - frequency List Sweep

Test condition

Function: Cp - D

Level: 1 Vrms

Other parameter is shown in the following table.

Frequency	Compare parameter	Lower limit	Higher limit
1kHz	Cp (capacity)	400.0 nF	420.0 nF
10kHz	D (loss)	0.0001	0.0006
100kHz	D (loss)	0.0030	0.0090

Beep: high long

Alarm mode: OUT

Operating steps

1. Turn on the instrument, refer to the chapter of Panel Overview.
2. Set the basic parameter
   a) Press the key **[Meas]** to enter the **<MEAS DISP>** page.
   b) The **FUNC** field is currently displayed as Cp - D, the **LEVEL** field displays 1.000 V.
   c) Press the key **[SETUP]** to enter the **<MEAS SETUP>** page, MEAS DISP, LIMIT SETUP, CORRECTION, SWEEP SETUP, FILE LIST and SYSTEM SETUP will be displayed in the softkey area.
   d) Press the key SWEEP SETUP to enter the <LIST SWEEP SETUP> page.
   e) Move the cursor to the **SWEEP PARAM** field, this area displays FREQ [Hz].
   f) Press the rotary knob to move the cursor to the LMT field of sweep point 1, this area displays - - -.
   g) Press the key [1], 1 will be displayed in the cursor area on the center of the screen, and the softkey area displays the unit (Hz,kHz and mHz). Press the keykHz, then this area will be changed as 1.0000k.
   h) Press the key [►] to move the cursor to LMT field of sweep point 1, this area displays - - - . LIMIT DATA A, LIMIT DATA B and OFF will be displayed in the softkey area.
   i) Press the key LIMIT DATA A to select the compare primary parameter Cp function, this area displays A.
   j) Press the key [►] to move the cursor to lower field of sweep point 1. Press the key [4][0]

[0], 400 will be displayed in the cursor area on the center of the screen, and the softkey area displays the unit (p, n, μ, m, *1 and k). Press the key n, then this area will be changed as 400.000n.

k) Press the key [►] to move the cursor to higher field of sweep point 1. Press the key [4] [2] [0], 420 will be displayed in the cursor area on the center of the screen, and the softkey area displays the unit (p, n, μ, m, *1 and k). Press the key n, then this area will be changed as 420.000n.

l) Press the key [►] to move the cursor to LMT field of sweep point 2. Press the key [10], 10 be will displayed in the cursor area on the center of the screen, and the softkey area displays the unit (Hz,kHz and mHz). Press the keykHz, then this area will be changed as 10.0000k.

m) Press the key [►] to move the cursor to LMT field of sweep point 2, this area displays - - - . LIMIT DATA A, LIMIT DATA B and OFF will be displayed in the softkey area.

n) Press the key LIMIT DATA B to select the compare secondary parameter D function, this area displays B, and the cursor will automatically move to the lower field of sweep point 2.

o) Press the key [►] to move the cursor to the lower field of sweep point 2, press the key [0] [.] [0] [0] [0] [1], 0.0001 will be displayed in the cursor area on the center of the screen, and the softkey area displays the unit (p, n, μ, m, *1 and k). Press the key *1, then this area will be changed as 100.000μ.

p) Press the key [►] to move the cursor to the lower field of sweep point 2, press the key [0] [.] [0] [0] [0] [6], 0.0006 will be displayed in the cursor area on the center of the screen, and the softkey area displays the unit (p, n, μ, m, *1 and k). Press the key *1, then this area will be changed as 600.000μ.

q) Based on above l - p steps, enter 100kHz, B, 0.0030 and 0.0090 for the 3rd sweep point.

3. Alarm Setting

a) Press the key **[SYSTEM]** to enter the <SYSTEM SETUP> page.

b) Move the cursor to the **FAIL BEEP** field, this area displays HIGH LONG.

4. Connect the test fixture (HY26048A) to the test terminal of UTR2830 series.

5. Execute the test operation.(To avoid the influence of stray impedance on measurement accuracy, Open/ Short correction must be operated.)

6. Connect the tested inductance to the test fixture.
7. Execute the test operation.

   Press the key **[Meas]** and then press the key LIST SWEEP to enter the <LIST SWEEP> page. The instrument can test continuously and the test result and compared result will be displayed on this page. When the compared result is H (over the higher limit) or L (over the lower limit), the beep will make sound.
8. If the test result is obviously incorrect, please check the following items.
   a) Check whether the tested inductance is reliably connect to the test fixture.
   b) Check whether the test fixture is reliably connect to the test terminal of the instrument.
   c) Restart the open - circuit/short - circuit correction.

✱ **Note:** When the sweep open - circuit/short - circuit correction is used, the point - frequency correction function should be set as OFF. Refer to "Correction" operation in this chapter.

8.6 Setup Example of Comparator

UTR2830 series has complete comparator function. It is convenient for component measurement and judging incoming and outgoing quality inspection in production line. Standard configuration of HANDLER interface is suitable for automatic sorting measurement system.

The concept and specific operation of the comparator has been described in the preceding chapter. Here are two setup examples.

8.6.1 Sweep Correction

Capacitor model: 0805CG471

Basic requirements: the capacitance is divided into two bins: BIN J and BIN K. When the capacitance passes and the loss fails, it will be sorted additionally.

Measurement parameter: frequency of 100kHz, level of 1 Vrms, slow speed, FAIL alarm, external trigger

Sorting parameter: BIN J - 3.4% ～ +4.2%. BIN K - 10% ～ +11%. loss tgδ < 0.19%

The parameters needed to be set in this example are listed below.

Primary parameter (FUN1)	Cp
Secondary parameter (FUN2)	D
Frequency (FRQ)	100kHz
Level (LEV)	1V
Speed (SPEED)	SLOW
AUX ON/OFF (AUX)	ON
Tolerance mode of primary parameter (MODE)	%TOL (percentage tolerance mode)
Nominal (NOMINAL)	470 pF
Lower limit of BIN 1 (BIN1 LOW)	- 3.4%
Higher limit of BIN 1 (BIN1 HIGH)	4.2%
Lower limit of BIN 2 (BIN2 LOW)	- 10%
Higher limit of BIN 2 (BIN2 HIGH)	11%
Lower limit of secondary parameter (2nd LOW)	0.0000
Higher limit of secondary parameter (2nd HIGH)	0.0019
Trigger mode (TRIG)	EXT (external)
Beep mode (CMP ALARM)	FAIL beep (high long)

Explanation

1. For small capacitance, due to its impedance of 10kHz is greater than 1 kΩ, so equivalent parallel mode should be selected.
2. When any bin of the capacitance passes but loss fails, it will be sorted additionally, so the auxiliary bin should be set as ON and it will be sorted into AUX BIN. If the AUX BIN is set as OFF, it will be judged the whole as FAIL when loss fails.
3. Because the set higher and lower limit is based on the percentage tolerance of nominal value 2.7nF, the primary parameter should select %TOL percentage mode.

Operating steps

1） Press the key Meas on <MEAS DISP> page, select Cp – D to set the frequency, level and speed.

2） Press the menu key SETUP to enter <MEAS SETUP> page, and then change the trigger mode to EXT (external).

3） Press the menu key SETUP - LMIT SETUP to enter the <LIMIT SETUP> page, and then set the nominal, primary parameter tolerance mode, higher/lower limit, comparator ON/OFF, AUX BIN ON/OFF.

4） Press the menu key SETUP to enter System Config page, set FAIL Beep to HIGH LONG.

5） After the setting is completed, press the key Meas to return to the <MEAS DISP> page.

8.6.2 Load Correction

1. Operating steps

It is assumed that the user uses the test condition as follows.

Frequency: 100kHz Cp standard value: 11nF D standard value: 0.0005

a) Press the key [SETUP], MEAS DISP, LIMIT SETUP, CORRECTION, SWEEP SETUP, FILE LIST and SYSTEM SETUP will be displayed in the softkey area.

b) Press the key CORRECTION to enter the <CORRECTION > page.

c) Move the cursor to the **OPEN** field, OFF, ON, MEAS OPEN and DCR OPEN will be displayed in the softkey area.

d) Press the key ON to turn on open - circuit correction.

e) Move the cursor to the **SHORT** field, OFF, ON, MEAS SHORT and DCR OPEN will be displayed in the softkey area.

f) Press the key ON to turn on short - circuit correction.

g) Move the cursor to the **LOAD** field, OFF, ON will be displayed in the softkey area.

h) Press the key ON o turn on load correction.

i) Move the cursor to the **FUNC** field, this area displays Cp - D, Cp - ...▼, Cs - ...▼, Lp - ...▼, Ls - ...▼DCR..▼, Z - ...▼R - ..▼, Y - ..▼G - ..▼ will be displayed in the softkey area on the right side of the screen.

j) Press the key Cp - D to select the parameter of Cp - D.

k) Move the cursor to the **FREQ** field, ON, OFF, MEAS OPEN, MEAS SHORT and LOAD CORRECTION will be displayed in the softkey area.

l) Press the key ON to turn on the point-frequency correction function.

m) Press the key [1][0][0], 100 will be displayed in the cursor area on the center of the screen, and the softkey area displays the unit (Hz,kHz and mHz). Press the keykHz, then the **FREQ** field will be changed as 100.000kHz (the same as test frequency).

n) Move the cursor to the **REF A** field, press the key [1][1], 11 will be displayed in the cursor area on the center of the screen, and the softkey area displays the unit (p, n, μ, m, *1 and k). Press the key n, then this area will be changed as 11.0000 nF.

o) Move the cursor to the **REF B** field, press the key [0][.][0][0][0][5], 0.0005 will be displayed

in the cursor area on the center of the screen, and the softkey area displays the unit (p, n, μ, m, *1 and k). Press the key [*1], then this area will be changed as 0.00050.

p) Move the cursor to the **FREQ** field, ON, OFF, MEAS OPEN, MEAS SHORT and LOAD CORRECTION will be displayed in the softkey area.

q) Keep the test fixture in open-circuit state, and make sure that operator's hands and other interference source away from the test fixture. Press the key MEAS OPEN to execute the open-circuit correction.

r) Insert the short-circuit plate (TH26010) to the test fixture, and make sure that the short-circuit plate is reliable contact with the plate of the test fixture.

s) Press the key MEAS SHORT to execute the short-circuit correction.

t) Insert the standard resistor to the test fixture, and make sure that the pin of the standard resistor is reliable contact with the plate of the test fixture.

u) Press the key MEAS LOAD to execute the load correction.

2. Note

a) Because the software version of the instrument is different, the softkey and state of the instrument may different that described in this manual. This doesn't affect user's understanding.

b) The load correction is only valid for the device with the same specification. If the specification is changed, it is required to restart the load correction.

9. Performance and Test

9.1 Test Function

9.1.1 Test Parameter and Symbol

C: capacitance	L: inductance	DCR: DC resistance
R: resistance	Z: impedance	Y: admittance
X: reactance	B: susceptance	G: conductance
D: dissipation	θ: phase angle	Q: quality factor

Test combination, 11 measuring parameters are combined in the following table.

Primary parameter	Z, Y	L, C	R	G

Secondary parameter	θ(degree), θ (radian)	D, Q, R_S, R_P, G, Rd	X	B

DCR has no test combination.

Operation between the measurement value and the programmable nominal value: absolute deviation ΔABS and percent deviation Δ%.

9.1.2 Equivalent Mode

Serial connection, parallel connection

9.1.3 Range

Auto, manual(hold, increase, decrease)

9.1.4 Trigger

Internal, external, manual

Internal: continuously test the DUT and output the test result

Manual: press the key "TRIGGER" on the panel to execute one test and output the test result, and then enter the wait state.

External: when HANDLER receives "Start" signal from the external, the instrument will execute one test and output the test result, and then enter the wait state.

9.1.5 Trigger Delay

Delay time: time from trigger to start.
0-60 seconds are step with 1 ms, and it can be programmable.

9.1.6 Connection Method of Test Terminal

UTR2830 series adopts 4 - terminal test method.
Hcur: current sampling high-end Lcur: current sampling low-end
Hpot: voltage sampling high-end Lpot: voltage sampling low-end

9.1.7 Test Speed (Frequency>=10kHz)

Fast: about 80 times/s(12.5 ms/time)

Medium: about 12 times/s (83 ms/time)
Slow: about 6 times/s (167 ms/ time)

When the frequency is lower than 10kHz, the test speed of medium and fast will be decreased.

9.1.8 Average

It can be programmable from 1 - 255.

9.1.9 Display Digit

6 digits, maximum display digit: 999999

9.1.10 Test Signal Frequency

The test signal is sine wave, the accuracy of frequency: 0.01%

Frequency range:
20Hz～100kHz (UTR2830E)
20Hz～200kHz (UTR2832E)
20Hz～300kHz (UTR2833E)

Minimum resolution: 0.01Hz

9.1.11 Signal Mode

Normal: Set the test voltage on the <MEAS DISP> page, when measuring, the voltage at the measurement terminal may be smaller than the set voltage according to the impedance of the DUT.
Constant level: The internal level is automatically adjusted to make the voltage on the tested part consistent with the set voltage.

9.1.12 Test Signal Level

	Mode	Range (internal resistance 100)	Accuracy	Step
Voltage	Normal Constant voltage	10 mVrms - 2 VRMS 10 mVrms - 1 VRMS	± (10%× the set value +2 mV) ± (6%× the set value +2	10 mV

			mV)	
Current	Normal Constant current	100 μArms - 20 mArms 100 μArms - 10 mArms	± (10%× the set value +10 μArms) ± (6%× the set value +10 μArms)	100 μA

9.1.13 Output Impedance

30 Ω, 50 Ω and 100 Ω± 1% are available.

9.1.14 Monitor of Test Signal Level

Mode	Range	Accuracy
Voltage	5 mVrms - 2 VRMS 0.01 mVrms - 5 mVrms	± (3%× reading +0.5 mV) ± (12%× reading +0.1 mV)
Current	50 μArms - 20 mArms 0.001 μArms - 50 μArms	± (3%× reading +5 μA) ± (12%× reading +1 μA)

9.1.15 Maximum Range of Measurement Display

Parameter	Maximum range of measurement display
L, Lk	0.00001 μH ～ 99.999 kH
C	0.00001 pF ～ 9.99999 F
Z, R, X, DCR	0.00001 Ω～ 99.9999 MΩ
Y, B, G	0.00001 μs ～ 99.9999 S
D	0.00001 - 9.99999
Q	0.00001 - 99999.9
θ	Deg - 179.999°～179.999° Rad - 3.14159 ～ 3.14159

9.1.16 DC Bias Voltage

Internal resistance 100 Ω:
0V - ± 5 V, minimum resolution: 1 mV, accuracy: 1% x the set voltage+5 mV
0mA - ± 50 mA, minimum resolution: 10 μA

Internal resistance 30 Ω:
0V - ± 1.5V, minimum resolution: 1 mV, accuracy: 1% x the set voltage+5 mV
0mA - ± 50mA, minimum resolution: 10μA

Measurement Accuracy
Test accuracy includes stability, temperature coefficient, linear degree, test repeatability and calibration interpolation error.

Check the accuracy of instrument should be under the following circumstances.

a. Warm-up time: ≥ 30 mins, test cable length: 0m, 1m
b. Execute the open - circuit/short - circuit correct properly after warming up
c. DC bias sets to "OFF"
d. The range works in "AUTO" to select correct test range

9.1.17 Accuracy of | Z | , | Y | , L, C, R, X, G, B

The accuracy Ae of | Z | , | Y | , L, C, R, X, G and B are expressed as the following formula.

$$A_e = \pm [A + (K_a + K_b + K_c) \times 100 + K_d + K_f] \times K_e [\%]$$

A: basic measurement accuracy (refer to Figure A)
K_a: impedance ratio factor (refer to Table A)
K_b: impedance ratio factor (refer to Table A)
K_c: calibrated interpolation factor (refer to Table B)
K_d: cable length factor (refer to Table D)
K_e: temperature factor (refer to Table E)
Kf: scan fixture modification factor (no add: Kf = 0, add: Kf = 0.2)
Using condition for the accuracy of L, C, X, B: D_x (test value) ≤0.1
Using condition for the accuracy of R, G: Q_x (test value) ≤0.1

When D_x≥0.1, L, C, X, B accuracy factor A_e should be multiplied by $\sqrt{1+D_x^2}$.

When Q_x≥0.1, R, G accuracy factor A_e should be multiplied by $\sqrt{1+Q_x^2}$.

The accuracy of G can only be available in G - B combination.

9.1.18 Accuracy of D

The accuracy of D is given by D_e:

$$D_e = \pm \frac{A_e}{100}$$

The formula is only available when D_x≤0.1.

When D_x>0.1, D_e should be multiplied by (1+D_x).

9.1.19 Accuracy of Q

The accuracy of Q is given by the following formula:

$$Q_e = \pm \frac{Q_x \times D_e}{1 \mu Q_x \times D_e}$$

Here, Q_x is the value of tested Q.

D_e is the accuracy of D.

The above formula should be used when $Q_x \times D_e < 1$.

9.1.20 Accuracy of θ

Accuracy of **θ** is given by the following formula:

$$\theta e = \frac{180}{\pi} \times \frac{A_e}{100} \quad [deg]$$

9.1.21 Accuracy of G

When D_x (tested value of D) ≤ 0.1, the accuracy of G is given by the following formula:

$$G_e = B_x \times D_e \quad [S]$$

$$B_x = 2\pi f C_x = \frac{1}{2\pi f L_x}$$

Here, B_x is tested value of B with the unit [S].

C_x is tested value of C with the unit [F].

L_x is tested value of L with the unit [H].

D_e is the accuracy of D.

F is test frequency.

The accuracy of G can only be available in combination of C_p - G and L_p - G.

9.1.22 Accuracy of Rp

When D_x (tested value) ≤ 0.1, the accuracy of R_p is given by the following formula.

$$R_p = \pm \frac{R_{px} \times D_e}{D_x \mu D_e} \quad [\Omega]$$

Here, R_{px} is tested value of R_p with the unit [S].

D_x is tested value of D with the unit [F].

D_e is the accuracy of D.

9.1.23 Accuracy of Rs

When D_x (tested value) ≤ 0.1, the accuracy of R_s is given by the following formula.

$$R_{se} = X_x \times D_e \quad [\Omega]$$

$$X_x = 2\pi f L_x = \frac{1}{2\pi f C_x}$$

Here, X_x is tested value of X with the unit [S].

C_x is tested value of C with the unit [F].

L_x is tested value of L with the unit [H].

D_e is the accuracy of D.

F is test frequency.

9.1.24 Accuracy Factor

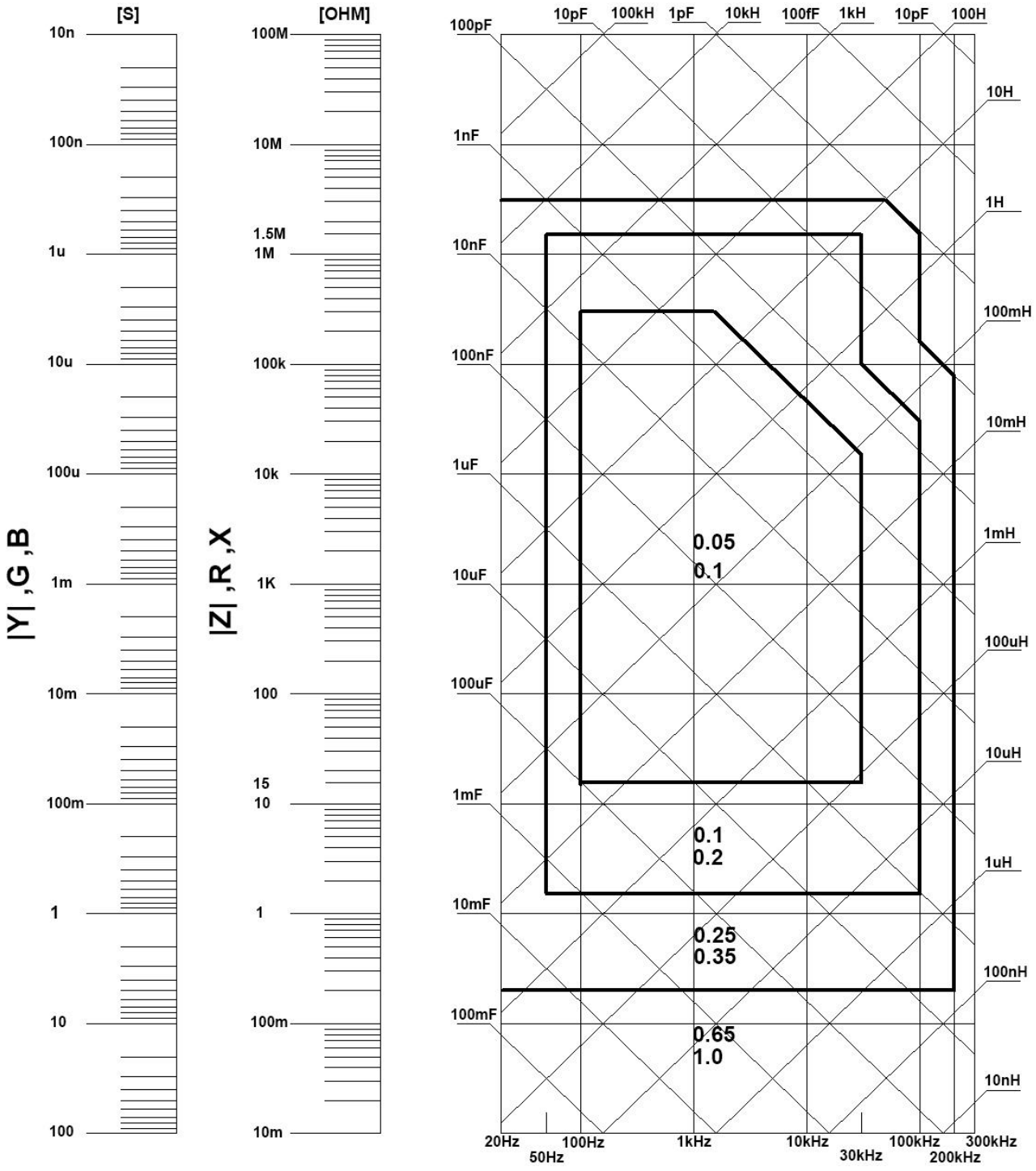


Figure A Basic Measurement Accuracy A

In Figure A, select a smaller value on boundary line.

In Figure A, the basic accuracy can be selected by the following methods.

0.05 - - - - when 0.4 Vrms≤V_s≤1.2 Vrms, the test speed is the slow, medium, fast of A.

0.1 - - - - when 0.4 Vrms≤V_s≤1.2 Vrms, the test speed is fast of A.

When V_s<0.4 Vrms or V_s>1.2 Vrms, the calculation method of A: A is selected according to the currently test speed. A_r(accuracy correction factor)is selected according to the currently test signal voltage (see Figure B). A is multiplied by Ar to obtain the currently basic measurement accuracy A. Here, V_s is test signal voltage.

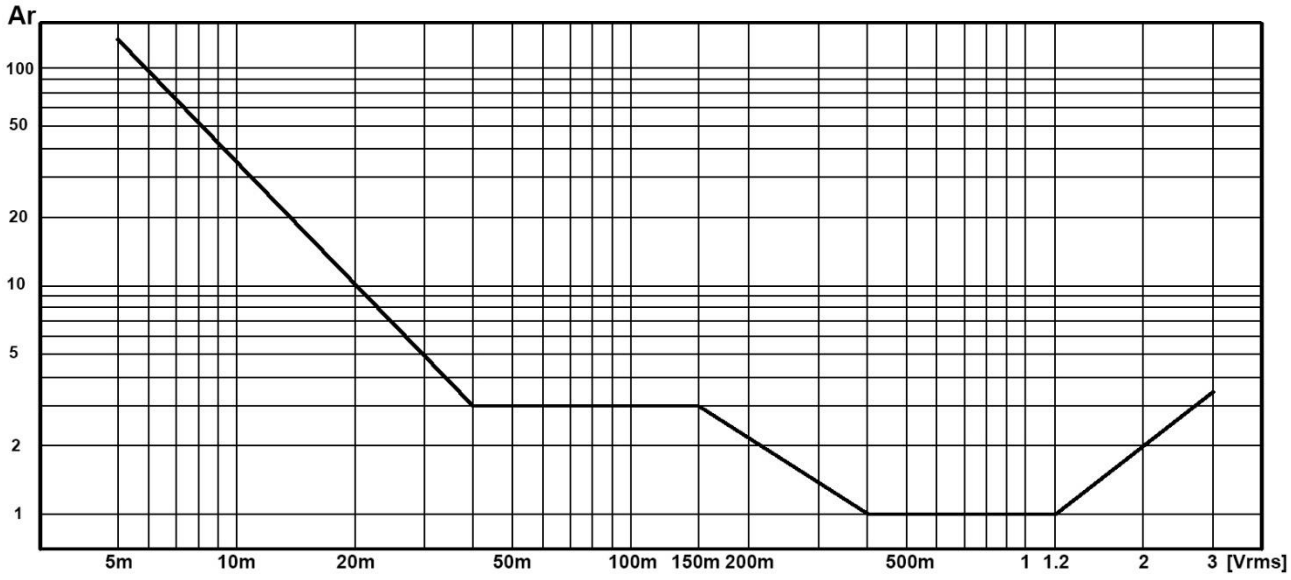


Figure B Basic Accuracy Modification Curve

Table A Impedance Ratio Factor K_a, K_b

Speed	Frequency	K_a	K_b
Medium Slow	f_m< 100Hz	$(\frac{1\times10^{-3}}{\lvert Z_m\rvert})(1+\frac{200}{V_s})(1+\sqrt{\frac{100}{f_m}})$	$\lvert Z_m\rvert(1\times10^{-9})(1+\frac{70}{V_s})(1+\sqrt{\frac{100}{f_m}})$
	100Hz ≤ fm ≤ 100 kHz	$(\frac{1\times10^{-3}}{\lvert Z_m\rvert})(1+\frac{200}{V_s})$	$\lvert Z_m\rvert(1\times10^{-9})(1+\frac{70}{V_s})$
	100 kHz < fm ≤ 200 kHz	$(\frac{1\times10^{-3}}{\lvert Z_m\rvert})(2+\frac{200}{V_s})$	$\lvert Z_m\rvert(3\times10^{-9})(1+\frac{70}{V_s})$
Fast	f_m< 100Hz	$(\frac{2.5\times10^{-3}}{\lvert Z_m\rvert})(1+\frac{400}{V_s})(1+\sqrt{\frac{100}{f_m}})$	$\lvert Z_m\rvert(2\times10^{-9})(1+\frac{100}{V_s})(1+\sqrt{\frac{100}{f_m}})$

	100Hz ≤ fm ≤100 kHz	$(\frac{2.5\times10^{-3}}{\lvert Z_m\rvert})(1+\frac{400}{V_s})$	$\lvert Z_m\rvert(2\times10^{-9})(1+\frac{100}{V_s})$
	100 kHz < fm ≤ 200 kHz	$(\frac{2.5\times10^{-3}}{\lvert Z_m\rvert})(2+\frac{400}{V_s})$	$\lvert Z_m\rvert(6\times10^{-9})(1+\frac{100}{V_s})$

f_m: test frequency with the unit [Hz]
Impedance of the DUT [Ω]
Test signal voltage [mVrms]
When the impedance is smaller than 500 Ω, K_a, K_b is unavailable.
When the impedance is greater than 500 Ω, K_a, K_b is unavailable.

Table B Calibration Interpolation Factor K_c

Test frequency	K_c
Direct calibration frequency	0
Other frequency	0.0003

Table C Direct Calibration Frequency (UTR2832E)

			20	25	30	40	50	60	80	[Hz]
100	120	150	200	250	300	400	500	600	800	[Hz]
1	1.2	1.5	2	2.5	3	4	5	6	8	[kHz]
10	12	15	20	25	30	40	50	60	80	[kHz]
100	120	150	200							[kHz]

(The range of UTR2830E is 20Hz - 100kHz)

Table D Cable Length Factor K_d

Test signal level	Cable length		
	0m	1m	2m
≤1.5 Vrms	0	$2.5\times10^{-4}(1+50\times f_m)$	$5\times10^{-4}(1+50\times f_m)$
>1.5 Vrms	0	$2.5\times10^{-3}(1+16\times f_m)$	$5\times10^{-3}(1+50\times f_m)$
f_m: test frequency [mHz]			

When using the scan fixture, take the correction factor K_d when the cable length is 2m.

Table E Temperature Factor K_e

Temperature (℃)	5	8	18	28	38	
K_e	6	4	2	1	2	4

9.1.25 Accuracy of DCR

A(1+R_x/5MΩ+16MΩ/R_x)[%]±0.2MΩ
In medium, slow speed, A=0.1
In fast speed, A=0.25

Here, R_x is tested resistance.

9.1.26 Accuracy of Lk

The accuracy of inductance L is +0.2%.

9.1.27Safety Requirement

The instrument is I class safety instrument

9.1.28 Insulated Resistance

Under reference working condition, the insulated resistance between power terminal and instrument's outer shell should not be smaller than 50 MΩ.
Under humidity condition, the voltage terminal and instrument's outer shell should not be smaller than 2 MΩ.

9.1.29 Insulation Strength

Under reference working condition, the insulation between the power terminal and the instrument's outer shell should bear an AC voltage (50Hz frequency and 1.5 kV rated voltage) for 1 minute and no breakdown and flashover.

9.1.30 Leakage Current

The leakage current should not be greater than 3.5 mA (AC RMS).

9.1.31 Electromagnetic Compatibility

The power transient sensitivity of measuring apparatus should meet the requirement of GB6833.4.
The conductive sensibility of measuring apparatus should meet the requirement of GB6833.6.
The radiated interference of measuring apparatus should meet the requirement of GB6833.10.

9.2 Performance Test

9.2.1 Operating Condition

All tests should be performed under the working condition listed in Chapter 1. This test is only includes the test of main indexes. Other part is not included, such as transformer test.
The user can perform the test under the specified condition mentioned in this manual. Performance

test should be worked in the warm - up conditions discussed in Chapter 1.

9.2.2 Test Device

No.	Device		Technical requirement
1	Standard resistor	100 pF	0.02 % Loss D is known
		1000 pF	
		10000 pF	
		10 nF	
		0.1 uF	
		1 uF	
2	AC standard resistor	10 Ω	0.02 %
		100 Ω	
		1 kΩ	
		10 kΩ	
		100 kΩ	
3	DC standard resistor	0.1 Ω	0.02 %
		1 Ω	
		10 Ω	
		100 Ω	
		1 kΩ	
		10 kΩ	
		100 kΩ	
4	Standard inductor	100 μH	0.02 %
		1 mH	
		10 mH	
		100 mH	
5	Frequency meter		(0～1000) mHz
6	Digital multimeter		0.5 %
7	Insulated resistance meter		500 V 10 class
8	Hipot Tester		0.25 kW (0～500) V

9.2.3 Function Inspection

The functional key, display and terminal of the instrument should work normally.

9.2.4 Test Signal Level

Put the digital multimeter in AC voltage range, one test cable is connected to HCUR and the other is

connected to ground terminal. Change level as: 100 mV, 300 mV, 1 V, 2 V, the reading should meet the requirement of test signal level in this chapter.

9.2.5 Frequency

The ground terminal of frequency meter is connected to the ground terminal of the instrument. The test terminal of the frequency meter is connected with HCUR. Change the frequency as: 20Hz, 100Hz, 1kHz, 10kHz, 100kHz, 200kHz (maximum of UTR2830E is 100kHz), the reading of frequency meter should meet the requirement of test signal frequency in this chapter.

9.2.6 Measurement Accuracy

Basic parameter are R, L, C, D, so the accuracy test is mainly about R, L, C, D.

9.2.7 Accuracy of C and D

Function: Cp - D

Test frequency: respectively test 100Hz, 1kHz, 10kHz, 100kHz

Level: 1 V

Range: AUTO

Bias: 0 V

Speed: Slow

Before testing, the open - circuit/short - circuit correction should be executed. Connect to standard resistor 100 pF, 1000 pF, 10nF, 0.1uF, 1uF, change the frequency, the capacitance error between the instrument reading and the standard value should within the allowance error range, refer to the accuracy of C in this chapter. D should within the allowance error range, refer to the accuracy of D in this chapter.

9.2.8 Accuracy of L

Test condition

Function: Ls - Q

Test frequency: respectively test 100Hz, 1kHz

Level: 1 V

Range: AUTO

Bias: 0 V

Speed: Slow

Before testing, the open - circuit/short - circuit correction should be executed. Connect to standard inductor 100μH, 1 mH, 10 mH, 100 mH, change the frequency, the error between the instrument reading and the standard value should within the allowance error range, refer to the accuracy of L in this chapter.

9.2.9 Accuracy of Z

Test condition

Function: Z - θ

Test frequency: respectively test 100Hz, 1kHz, 10kHz, 100kHz

Level: 1 V

Range: AUTO

Bias: 0 V

Speed: Slow

Before testing, the open - circuit/short - circuit correction should be executed. Connect to AC standard resistor 10 Ω, 100 Ω, 1 kΩ, 10 kΩ, 100 kΩ, change the frequency, the error between the instrument reading and the standard value should within the allowance error range, refer to the accuracy of |Z| in this chapter.

9.2.10 Accuracy of DCR

Test condition

Function: DCR

Test frequency: - - - - -

Level: - - - - -

Range: AUTO

Bias: - - - - -

Speed: Slow

Before testing, the short - circuit correction should be executed. Connect to DC standard resistor 0.1 Ω, 1 Ω, 10 Ω, 100 Ω, 1 kΩ, 10 kΩ, 100 kΩ, the error between the instrument reading and the standard value should within the allowance error range, refer to the accuracy of DCR in this chapter.

10. Handler Interface

This chapter includes the following contents

- Technical specification
- Operating instruction

The UTR2830 series has the Handler interface. The interface is mainly used for the output of the sorted result. When the instrument is used in the automatic component sorting test system, the interface provides a contact signal with the system and an output signal of sorting results. The sorting result is corresponding to the output of BIN 10. The HANDLER interface is designed to be flexible, when using different operation procedures, the state of all output signal can be defined according to the usage requirements.

10.1 Technical Specification

Table 1 Technical Specification of HANDLER (UTR2830 series)

Output signal: low effective, open collector output, optoelectronic isolation Output judgment signal: BIN comparison: qualified bin, OUT, the state of unqualified List sweep comparison: IN/OUT for every sweep point and pass/fail for all the compared result INDEX: AD conversion ended EOC: one measurement and compare ended Alarm: alarm of instant power failure detection Input signal: optoelectronic isolation Keylock: lock the keyboard on the front panel External trigger: pulse width ≥ 1 μS

10.2 Operating Instruction

10.2.1Introduction

This chapter is to introduce the signal wire of Handler interface and the electrical characteristic.

10.2.2 Definition of Signal Wire

HANDLER interface uses three signal: compare output, control input and control output.

The signal wire of BIN comparison and list sweep comparison is defined to different compare output signal and control input signal.

Signal wire of BIN comparison

- Compare output signal:
  /BIN1 - /BIN9, /AUX, /OUT, /PHI (the primary parameter is high), /PLO (the primary parameter is low), /SREJ (the secondary parameter is unqualified), see Figure 1.
- Control output signal:
  /INDEX (signal of analog test completed), /EOM (signal of test ended and effective compare data), /ALARM (signal of power failure)
- Control input signal:
  /EXT.TRIG (external trigger signal) and /Keylock

The signal distribution and description is shown in Table 2 and Figure 2. The sequence chart is shown in Figure 3.

Table 2 Signal Distribution for BIN Comparison

Pin NO.	Signal name	Description
1	/BIN1	Sorting result All/BIN output are open collector output
2	/BIN2	
3	/BIN3	
4	/BIN4	
5	/BIN5	
6	/BIN6	
7	/BIN7	
8	/BIN8	
9	/BIN9	

10 11	/OUT /AUX	
12 13	/EXT.TRIG	External trigger: When the trigger mode is EXT.TRIG, HY2830 will be triggered by a rising edge pulse signal added to this pin.
14 15	EXT.DCV2	External DC voltage 2: DC power supply pin for optoelectronic coupling signal (/EXT_TRIG, /KeyLock;/ALARM, /INDEX, /EOM)
16 17 18	+5V	Internal power +5V: Generally, it is not recommended to use the internal power supply of the instrument, if you have to use it, please make sure that the current used is less than 0.3A, and keep the signal line away from the interference source.
19	/PHI	The primary parameter is high: The test result is greater than the higher limit in BIN1 to BIN9 (see Figure 1).
20	/PLO	The primary parameter is low: The test result is greater than the lower limit in BIN1 to BIN9 (see Figure 1).
21	/SREJ	The secondary parameter is unqualified: The test result is not within the higher/lower limit (see Figure 1).
22 23 24	NC NC NC	No connection
25	/KEY LOCK	When this line is effective, all functional key of HY2830 on the front panel will be locked.
27 28	EXT.DCV1	External DC voltage 1: the pull-up DC power supply pin for optoelectronic coupling signal (/BIN - /BIN9, /AUX, /OUT, /PHI, /PLO, /SREJ).
29	/ALARM	/ALARM is valid when a power failure occurs.
30	/INDEX	/INDEX can be effective when the analog test of the last sweep point is finished and the UNKNOWN terminal can be connected to next the DUT. However, the comparison signal can be effective until /EOM becomes effective (see Figure 3).
31	/EOM	End Of Measurement: This signal will be effective when the test data and the compared result are effective (see Figure 3).
32,33	COM2	The reference ground for EXTV2 (external power).
34,35,36	COM1	The reference ground for EXTV1 (external power).

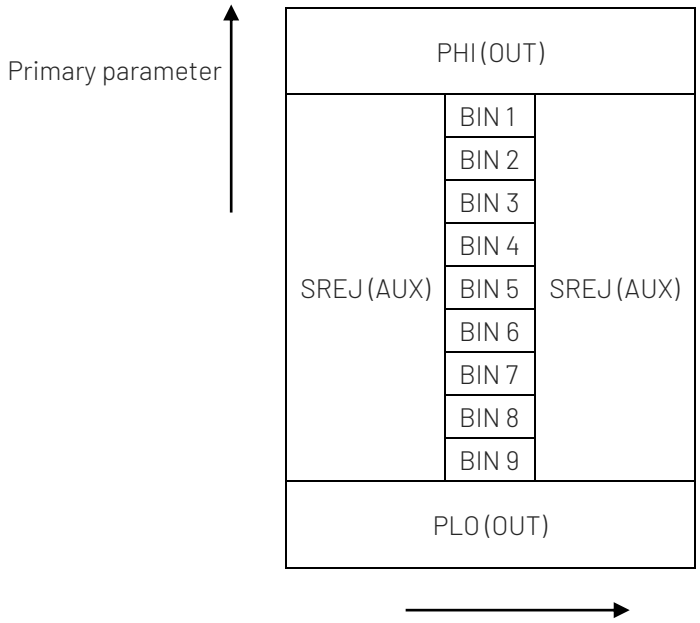


Figure 1 /PHI, /PLO, /SREJ Signal Distribution for BIN Comparator

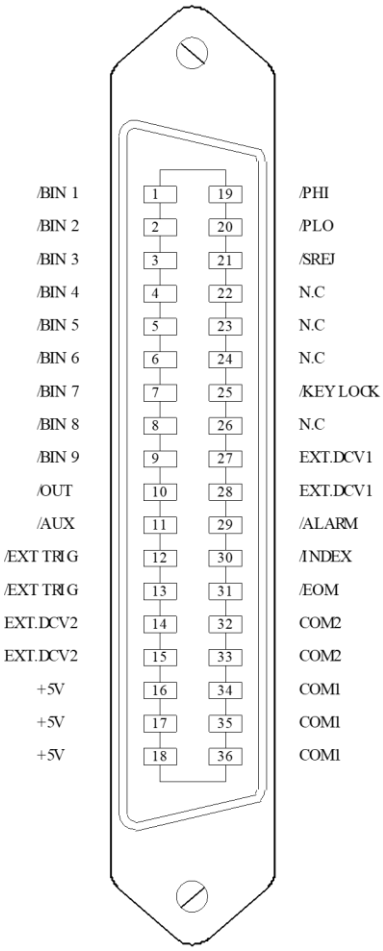


Figure 2 Pin Definition of HANDLER

Note: In this figure, /BIN1 - /BIN9, /OUT, /AUX, /PHI, /PLO and /SREJ in the list sweep comparison is different from that in BIN comparison.

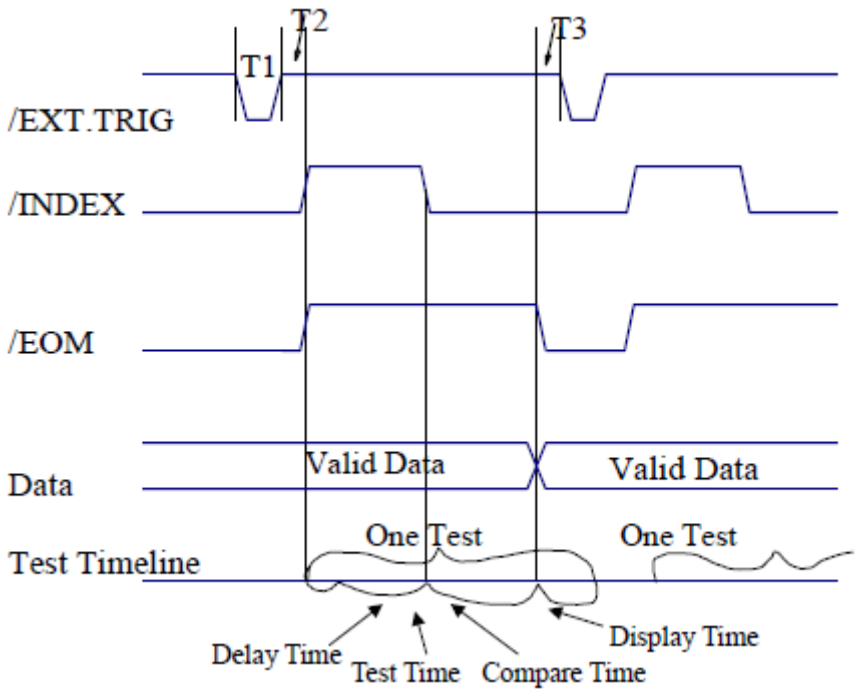


Figure 3 Sequence Chart

Time	Minimum	Maximum
T1: trigger pulse width	1 us	- - -
T2: delay time	200 us	Display time[3] + 200 us
T3: the trigger waiting time after /EOM output	0 us	- - -

1. For the measurement time, please refer to UTR2830 series user's manual;
2. The typical comparison time is approximately 1 ms;
3. The display time for every display page is below:
   MEAS DISPLAY: 8 ms
   BIN NO.DISPLAY: 5 ms
   BIN COUNT DISPLAY: 0.5 ms

Signal wire of list sweep comparison

The definition of list sweep comparison is different from that of the BIN comparison. The definitions of signal wire in list sweep comparison are as follows.

- Compare output signal

  /BIN1 - /BIN9 and /OUT signal indicates the judgment IN/OUT for every sweep points, see Figure 4. /AUX signal indicates PASS/FAIL judgment (One or more failures in the list during one sweep list test). When a sweep test is completed, these signals will be output.

- Control output signal

  /INDEX (signal of analog test finished) and /EOM (signal of the test ended).

When /INDEX and /EOM is effective, the sequence is as follows: (different from BIN comparison)

SEQ sweep mode:

/INDEX is defined as the effective signal when the last sweep point of the analog test is finished.

/EOM is defined as the effective signal when all the test results are effective after every list sweep are finished.

STEP sweep mode:

/INDEX is defined as the effective signal when the every sweep point of the analog test are finished.

/EOM is defined as the effective signal when the test and the comparison of every step are finished.

The pin distribution for list sweep comparison is shown in Table 3 and Figure 2. (The pin definition of the list sweep comparison is the same to that of the BIN comparison). The sequence chart is shown in Figure 5.

Table 3 Pin Distribution for List Sweep Comparison

Pin No.	Signal	Description
1	/BIN1	Sweep point 1 is over the limit
2	/BIN2	Sweep point 2 is over the limit
3	/BIN3	Sweep point 3 is over the limit
4	/BIN4	Sweep point 4 is over the limit
5	/BIN5	Sweep point 5 is over the limit
6	/BIN6	Sweep point 6 is over the limit
7	/BIN7	Sweep point 7 is over the limit
8	/BIN8	Sweep point 8 is over the limit
9	/BIN9	Sweep point 9 is over the limit
10	/OUT	/AUX is defined as the effective signal when one or more failure in the list
11	/AUX	Sweep point 10 is over the limit
30	/INDEX	SEQ: /INDEX can be effective when the analog test of the last sweep point is finished and the UNKNOWN terminal can be connected to next the DUT. However, the comparison signal can be effective until /EOM becomes effective (see Figure 5). STEP: when the analog test of each sweep point is finished, /INDEX can be effective.

		However, the comparison signal can be effective until /EOM becomes effective (see Figure 5).
31	/EOM	Test ended: SEQ: /EOM is defined as the effective signal when all the test results are effective after every list sweep are finished (see Figure 5). STEP: /EOM is defined as the effective signal when the test of every sweep point is finished. The comparison result signal can be effective until /EOM becomes effective (see Figure 5).
Other		The definition is the same as the comparison function, refer to Table 2.

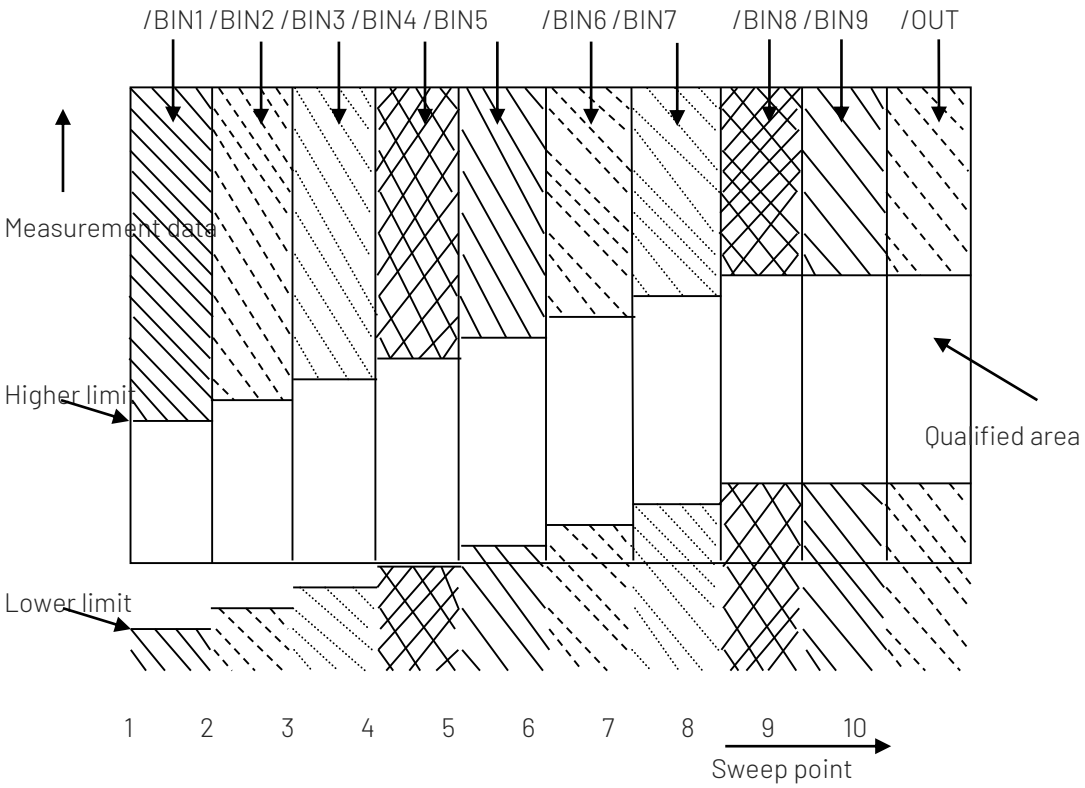
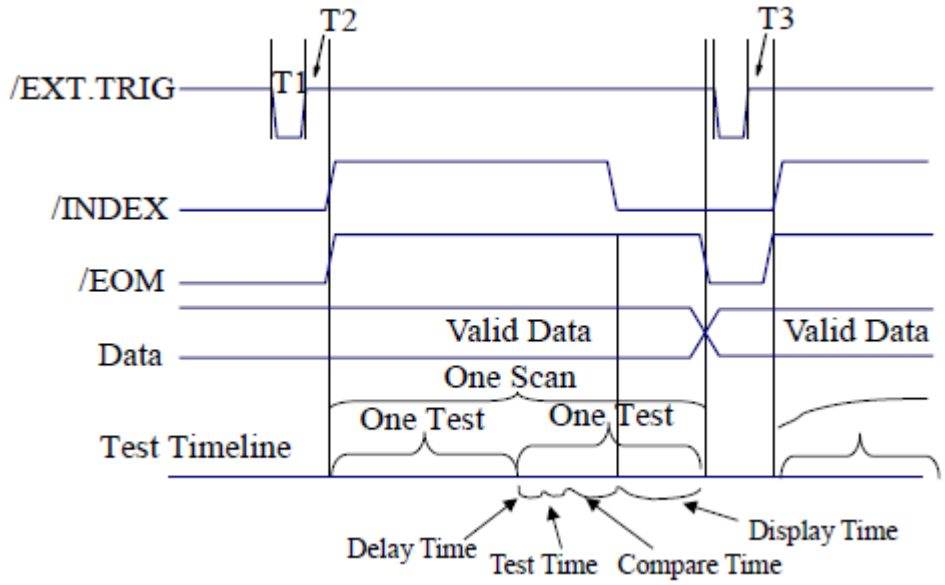


Figure 4 Signal Area of List Sweep Comparison

SEQ SWEEP MODE:



STEP SWEEP MODE:

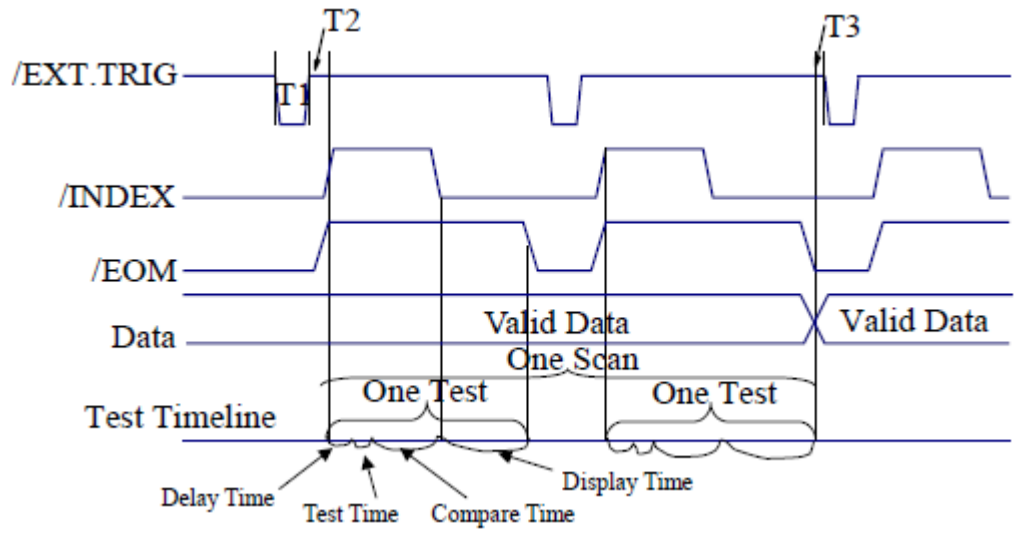


Figure 5 Timing Diagram

Note:
The setup time includes correction data ON/OFF time.
The compare and display time is 4.5 ms approximately. T1, T2, T3 refer to Figure3.

10.2.3 Electrical Feature

As previously mentioned, the signal definition of the comparison and the list sweep comparison are different. But the electrical feature is same. So the description can be applied to BIN comparison and

list sweep comparison.

DC isolation output: DC isolation output (pin1 to pin16) generates the isolation by the optoelectronic coupler with the collector open. The output voltage on every line is set by the pull-up Resistance on the HANDLER interface board. The pull-up resistance is connected to the internal voltage (+5v), or connect to the external voltage (EXTV: +5V) via jumper wire.

The electrical feature of DC isolation output can be divided into 2 types as shown in Table 4.

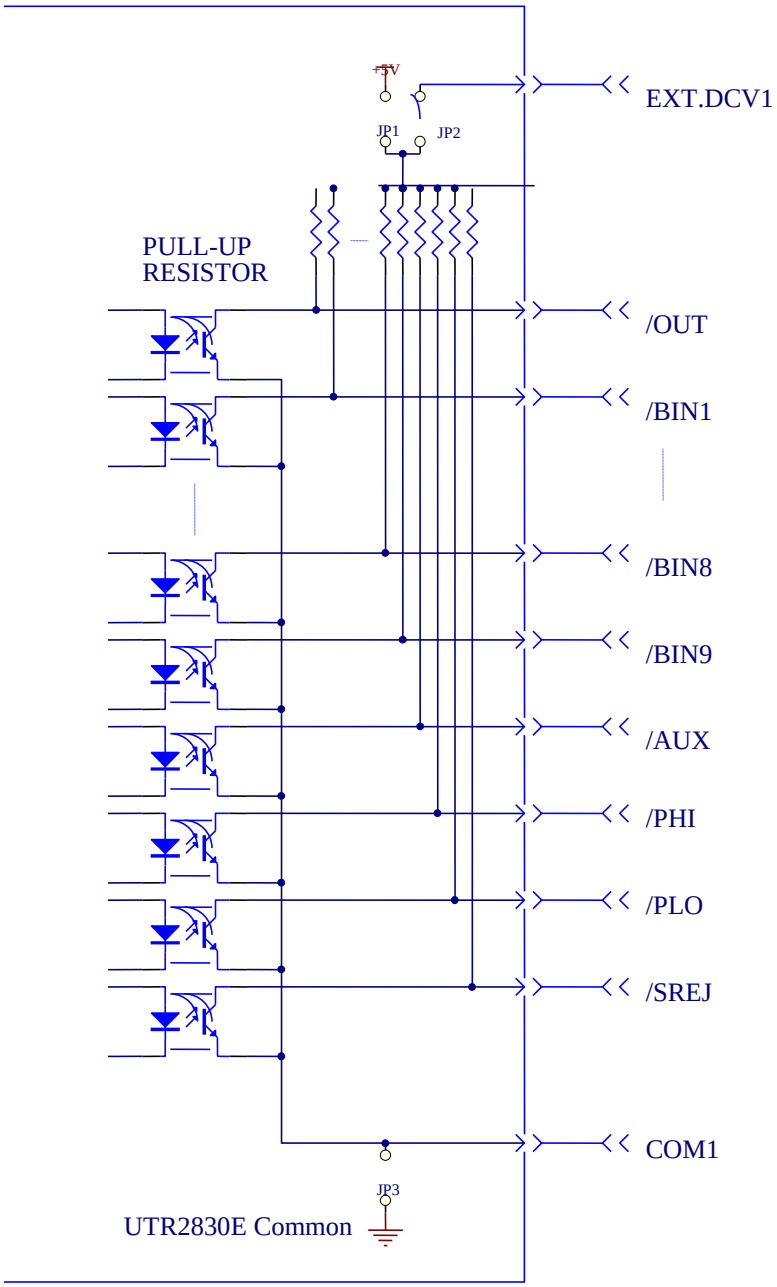
Table 4 Electrical Feature of DC Isolation Output

Output signal	Output rated voltage		Maximum current	Reference ground for circuit
	LOW	HIGH		
Compare signal /BIN1 - /BIN9 /AUX /OUT /PHI /PLO	≤ 0.5 V	+ 5 V - - + 24 V	6 mA	Internal pull-up voltage: HY2830 ground External voltage (EXTV1): COM1
Control signal /INDEX /EOM /ALARM	≤ 0.5 V	+ 5 V - - + 24 V	5 mA	Internal pull-up voltage : HY2830 ground External voltage (EXTV2): COM2

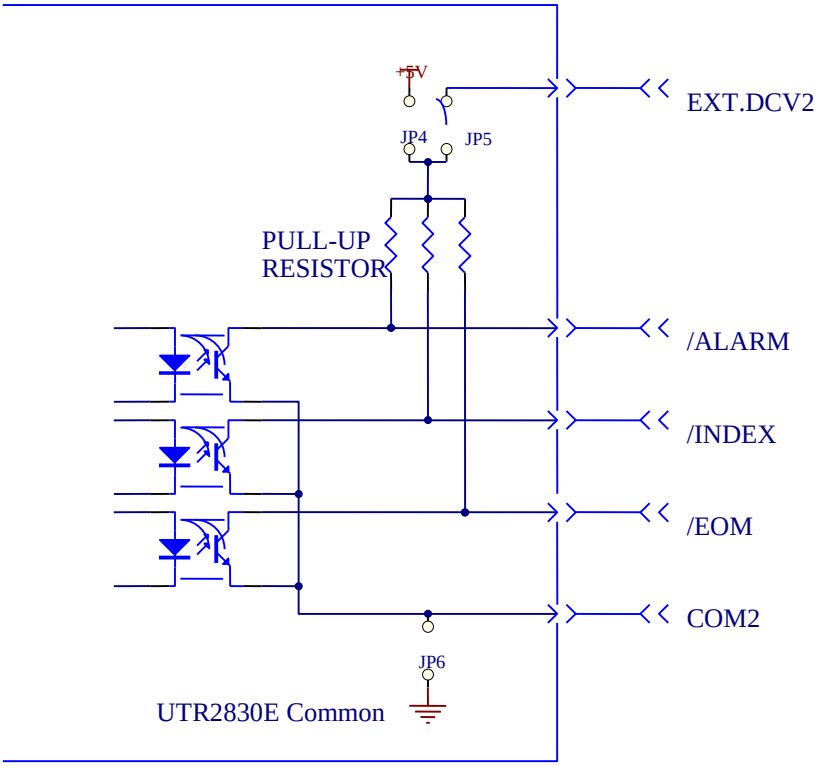
The simplified diagram of output signal can refer to compare signal and control signal.

10.2.4 Board Circuit of HANDLER

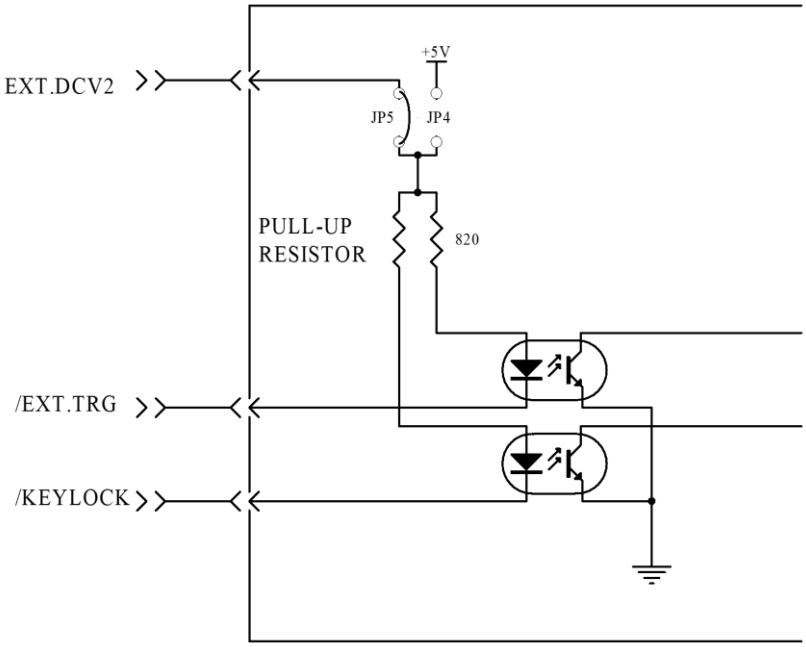
Output circuit of compare result signal



Output circuit of control signal



Input circuit of control signal



10.2.5 Operating Instruction

After HANDLER board circuit is installed, HANDLER can be used to set the limit list for comparison function or set the list sweep for list sweep comparison. And then set HANDLER to OUTPUT/INPUT signal.

Before you use the HANDLER function, you should ensure that your instrument has install the HANDLER interface board.The following procedure will show you how to use the interface comparison and the list sweep comparison.

Operation steps of comparison function

1. Press the key LIMIT SETUP to enter the **<LIMIT LIST SETUP>** page.
2. Set the nominal of BIN NO. and the limits of BIN in **<LIMIT LIST SETUP>** page. Refer to the menu key [**DISP**] to learn more details.
3. Move the cursor to the **COMP** field, the softkey area will display.
   - ON
   - OFF
4. Select the key [ON] to turn on the comparison function.
5. Press the key [**DISP**] to enter <MEAS DISP> page, and then select the key [BIN NO.DISP] or [BIN NO.], the DUT will be tested.
   In this step, the user can refer to the description of the menu key [**DISP**] to set the count and auxiliary of the DUT.

   Note: Comparator ON/OFF can also be set in **<BIN NO. DISP>** page.

Operation steps of list sweep comparison

1. Press the key [LIMIT SETUP] to enter the **<LIMIT LIST SETUP>** page.
2. Set the sweep mode, sweep frequency point, the higher/lower limit of reference in **<LIMIT LIST SETUP>** page. Refer to the menu key [DISP] to learn more details.
3. Press the key [**DISP**] to enter <MEAS DISP> page, and then select the key LIST SWEEP DISP to enter the <**LIST SWEEP DISP>** page, refer to he menu key [DISP] to learn more details.

Note: use HANDLER to improve the test speed

1. Lock the range at the maximum capacitance that can be detected. For example, it is assumed that the maximum capacitance is 10 uF, set the instrument to automatically select the range measurement to test 10 uF and then lock this range.
2. Set Vm: OFF, Im: off on <MEAS SETUP> page.
3. Test the DUT on <BIN NO. DISP> page.

11. Appendix

11.1 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.

11.2 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.

11.3 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 5.30 p.m. (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