OPERATION MANUAL

U2831 Precision LCR meter

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Contents

Announcement

The description of the manual may not cover all contents of the instrument, and our company is subject to change and to improve the performance, function, inner structure, appearance, accessory and package of the instrument without notice. If there is puzzle caused by inconsistency of manual and instrument, then users can contact with our company by the address on the cover.

Thanks for choosing our products. Before use, please locate the items listed in **Package Contents(Page III)** to ensure that **NOTHING IS MISSING**. If in the case that any items are missing, please contact an authorized agency immediately.

It is **NECESSARY** to read this manual carefully before proper use of U2831 series LCR meter.

Please consult to superior or contact authorized agency if any further questions are met.

Warranty

This instrument product is warranted against defects in material and workmanship for a period of two years from the date of shipment. Other items such as test fixtures, test cables are warranted for 90 days from the date of shipment. During the warranty period, we will, at our option, either repair or replace products which prove to be defective.

For warranty service or repair, this product must be returned to a service facility designated by EUCOL. Purchaser shall prepay shipping charges to EUCOL and EUCOL shall pay for the return of the product to Buyer. However, Buyer shall pay all shipping charges, duties, taxes, and any other charges for products returned to EUCOL from another country.

Limitation of Warranty

This warranty does not apply to defects resulting from improper or inadequate maintenance and care by Buyer, Buyer-supplied software or interfacing, unauthorized modification or misuse, operation outside of the environmental specifications for the product, or improper site preparation or maintenance.

No other warranty is expressed or implied. EUCOL specially disclaims the implied warranties of merchantability and fitness for a particular use.

EUCOL's responsibility to repair or replace defective products is the sole and exclusive remedy provided to the customer for breach of this warranty. EUCOL shall not be liable for any direct, indirect, special, incidental, or consequential damages, whether based on contract, tort, or any other legal theories.

Package Contents

U2831 series are equipped with the following contents：

Serial Number	Name	Quantity
1	U2831 series LCR meter	1
2	Instruction manual	1
3	U26011 Four-terminal Kelvin test clip leads	1

Please locate them from the original packaging to ensure nothing is missing. If in the case that an item is missing, please contact EUCOL or relevant distributor immediately.

Chapter 1 Out of Box Audit

When receive the instrument, some inspections are necessary, and the condition must be understood and available before installing the instrument.

1.1 To Inspect the package

Inspect the shipping container for damage after unpacking it. It is not recommended to power on the instrument in the case of a damaged container.

1.2 Power connection

1) Power-supplying voltage range: 99~242Vac. Being related with the power setup on the rear panel.
2) Power-supplying frequency range: 47~63Hz.
3) Power-supplying power range: less than 20VA.
4) Power supplying input phase line L, zero line N, ground lead E should be as same as the power cord of the instrument.
5) After careful design, the instrument can reduce the clutter jamming caused by AC power terminal input, however, it should be used under the environment with low-noise. Please install power filter if being unavoidable.

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Warning: In order to prevent users and instruments from being hurt by leakage, it is necessary for users to guarantee the ground line of supply power being reliably grounded.

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1.3 Fuse

The instrument has installed fuse, so operators should use the installed fuse of our company.

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Warning: Please ensure that the location of fuse is consistent with power-supplying voltage range before charging.

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
1.4 Environment

1) Please do not operate the instrument in the place that is vibrative, dusty, under direct sunlight or where there is corrosive air.

2) The normal working temperature is 0℃～40℃, relative humidity ≤75%, so the

3) The instrument shall be used under the above condition to guarantee the accuracy. In order to keep good airiness, please don't obstruct the left and right airiness holes to make the instrument maintain the accuracy.

4) Although the instrument has been specially designed for reducing the noise caused by AC power, a place with low noise is still recommended. If this cannot be arranged, please make sure to use power filter for the instrument.

5) Storage temperature is between 5℃ and 40℃, humidity is less than 85%RH. If the instrument will not be put in use in a few days, please have it properly packed with its

6) The instrument, especially the test cable should be far from strong electro-magnetic field, to avoid jammings on measurement.

1.5 Use of Test Fixture

Please use the accessory test fixture or cable, **the test fixture made by users or from other companys may cause incorrect measurement results**. The test fixture or cable should be kept clean, as well as the pin of DUT, thus to guarantee good connection between DUT and fixtures.
Connect the fixture or cable to four test terminals Hcur, Hpot, Lcur, Lpot on the front panel.

As for the DUT with shielding shell, connect shielding layer or ground "⊥".

Note: When test fixture or cable has not being installed, the instrument will display unstable test results.

1.6 Warm-up

1) To guarantee an accurate measurement, the warm-up time needs to be longer than 15min.
2) Please do not turn on and off instrument frequently, in order to avoid inner data fluster.

1.7 Other features

1) Power: consumption power≤20VA.
2) Dimension (W*H*D): 235mm*105mm*345mm
3) Weight: About 3.25kg.

Chapter 2 Introduction

In this chapter, the basic operation features of U2831 are described. Please read the content carefully before using U2831 instruments, thus users can learn the operation of U2831.

2.1 Introduction to front panel

Figure 2-1 shows the front panel of U2831.

1) Brand and model
   Brand and model
2) LCD
   480*272 colorful TFT LCD displays measurement results and conditions.
3) [MEAS]
   Press this key to enter into the display page of measurement display.
4) CURSOR
   This key is used to move the cursor on the LCD displayed page. When the cursor moves to a zone, the corresponding zone will be lightened.
5) [SET]
   Press this key to enter into the setup page of measurement setup.
6) Numerical keys
   These keys are used to input data to the instrument. The key consists of numerical keys [0] to [9], decimal point [.] and [+/-] key.
7) [DC BIAS]
   Press this key to allow or ban the DC bias output. [DC BIAS] is up, means DC bias output is available；press [DC BIAS] again，[DC BIAS] turns off，means DC bias output is banned. The key has no function when there is no DC BIAS page.
8) [LOCK/LOCAL]
   Press this key, the buzzer will beep, which means the function of current panel is

3

locked. Press it again, it will be off, which means discharging the lock status. If the password function is ON, it means correct password is necessary when discharging the key-lock, or the key cannot be unlocked.

9) [CLEAR]

Execute the calibration operation. Press this key to execute OPEN/SHORT calibration.

10) POWER

Power switch

11) USB HOST interface

Connect a flash disk so as to save or use a specified file.

12) [TRIG]

When the trigger mode is set to MAN mode, press this key to trigger the instrument.

13) Test terminals (UNKNOWN)

4-teminal test pair are used to connect 4-terminal test fixture or cable to measure DUT. The 4 terminals are respectively as follows: Hcur, Hpot, Lpot and Lcur.

14) Soft keys

Five soft keys are used to select parameters. The corresponding function of each soft key has been displayed on its left (the right part of LCD). The function definition varies with different pages.

2.2 Introduction to rear panel

Figure 2-2 shows the rear panel of U2831.
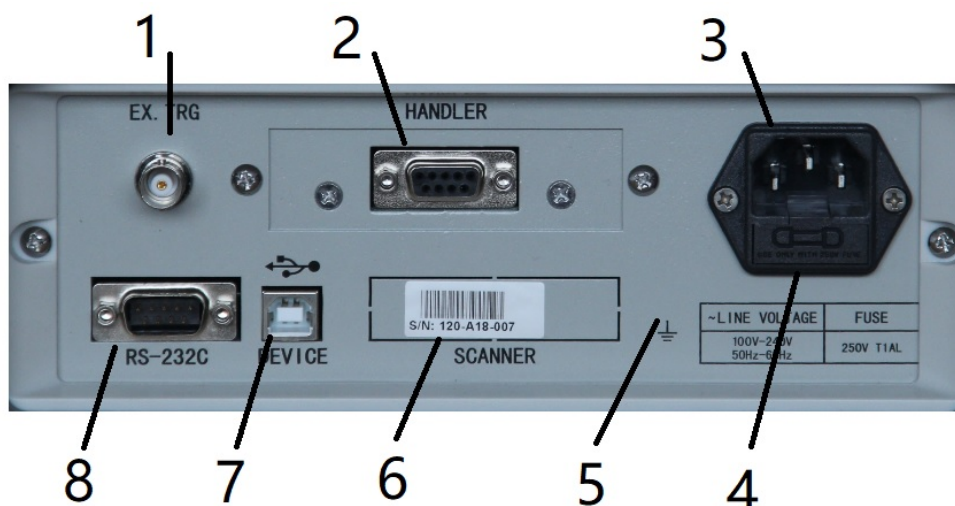
1) External trigger interface
   Handler interface is used to realize the sorting output of test results.
2) HANDLER interface
   Handler interface is used to realize the sorting output of test results.
3) Power socket
   Input AC power.
4) Fuse base
   Being used to install power fuse, protect instrument.

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Warning: Be sure that the direction of fuse is accordant with power-supply voltage range before charging.

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5) Ground terminal
   The ground terminal is connected with instrument casing, being available for protecting or shielding ground connection.
6) Serial number
   Information about production date, instrument number and manufacturer etc..
7) USB DEVICE interface
   The tester can communicate with PC through the USB DEVICE interface.
8) RS232 interface
   Series communication interface can realize the communication with PC.

2.3 Introduction to display zone

U2831 applies a 65k, 4.3-inch TFT display. The display screen is divided into the following zones:
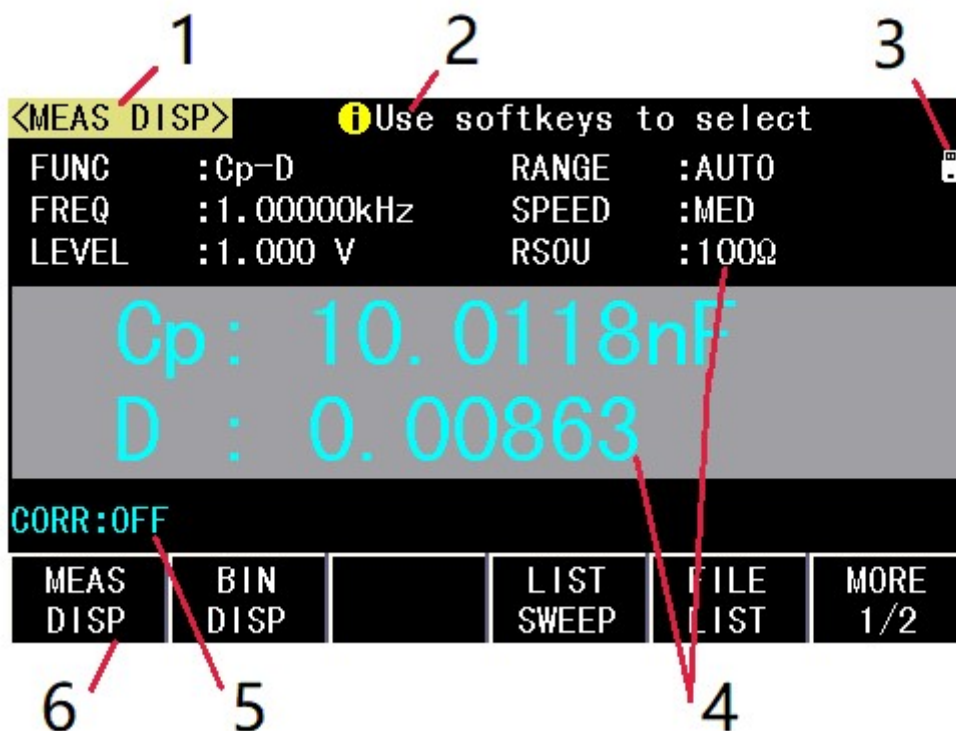
Figure 2-3 display zones

1) Display page name
    Indicate the name of the currently displayed page.
2) Help
    In this zone, information about system and user data input is displayed.
3) System icon zone
    In this zone, display the system status:
    █   U disk is connected
    ▱   Romot control status.
    🔒   Keyboard locked.
    ⬤   Data recording status.
4) Test result/ condition display zone
    In this zone, test result information and current condition are displayed.
5) Correction information
    Display the current correction status.
6) Soft keys
    The zone is used to display the function definition of soft key. The definition of soft key can be different as the difference of cursor's direction in the zone.

2.4 Main menu keys and corresponding displayed pages

2.4.1 [MEAS DISP]

Press this key-**[MEAS DISP]** to enter into the LCR measurement display page, the following soft keys will be displayed in the soft key zone.
<MEAS DISP>
<BIN DISP>
<LIST SWEEP>
<FILE LIST>
<MORE 1/2>
<D.P.FIX A>
<D.P.FIX B>
<DISP OFF ON>
<EASY>
<START SAVE CSV>
<MORE 2/2>

2.4.2 [MEAS SETUP]

Press this key-**[MEAS SETUP]**, the following soft keys will be displayed in the soft key zone on the LCR measurement setup page.
<MEAS SETUP>
<LIMIT TABLE>
<CORRECTION>
<LIST SETUP>
<FILE LIST>
<MORE 1/2>
<SYSTEM SETUP>
<RESET SETTING>
<START SAVE CSV>
<MORE 2/2>

2.5 Basic Operation

Basic operation of U2831 is as follows:
■   Use menu keys ([MEAS], [SET]) and soft keys to select the desired page.

■ Use cursor keys ([←][→]) to move the cursor to the desired zone. When the cursor moves to a specified zone, the zone will become reverse expression.

■ The soft key functions corresponding to the current zone of the cursor will be displayed in the soft key zone. Users can select and use the desired key. Numeric keys, [BACKSPACE] and [ENTER] are used to input data.

When a numeric key is pressed down, the usable unit soft key will be displayed in the soft key zone. users can choose a unit soft key or press [ENTER] to end data inputting. When [ENTER] is used to terminate data inputting, the unit of data will be set to a default unit, such as Hz, V or A. For example, the default unit for frequency is Hz.

2.6 Start the instrument

Plug in 3-line power cord.

Caution: Keep the power-supply voltage and frequency conform to above specifications. Power input phase line L, zero line N, ground line E should be the same as that of the instrument.

Press the power switch at the left corner on the front panel and then a boot screen will appear which displays our company logo.

If the password protection function is on, users are required to input the password and then press [ENTER] to enter into the page of main menu.

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Note: The instrument has a **default password: 123456**. In users' practical use, users can change it and set their own ones. Please see <SYSTEM> section for more information.

Chapter 3 Introduction to [MEAS DISPLAY]

3.1 <MEAS DISPLAY>

Press [MEAS], the <MEAS DISP> page will be displayed on screen as shown in the following figure.

On this page, the test result is displayed. The measurement control parameters can be set in this page:

- Test function (FUNC)
- Test frequency (FREQ)
- Test level (LEVEL)
- Test range (RANGE)
- Test speed (SPEED)
- Output impedance(RSOU)

There are 6 zones in this page: FUN, FREQ, LEVEL, RANG, SPEED, RSOU. The details will be discussed later.

The test result/ condition display zone shows the information about test condition. These conditions can be set on <Meas Setup> page or <Correction> page.

- Signal source voltage/ current monitor (**Vm, Im**)
- Open, short correction ON/OFF status (**CORR**)

3.1.1 Test function

In a measurement period, U2831 can test two parameters for an impedance component. Parameters that can be tested are as follows:

Primary parameters

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

Secondary Parameters

- D   (Dissipation factor)
- Q   (Quality factor)
- Rs   (Equivalent Series Resistance ESR)
- Rp   (Equivalent Parallel Resistance)
- X   (Reactance)
- B   (Admittance)
- θ   (Phase Angle)

Test results of primary and secondary parameters are respectively displayed in two lines in the form of upper-case characters. The primary parameter displays in the upper line while the secondary parameter displays in the lower line.

Operation steps for setting test function:

1) Move the cursor to FUNC zone, the following soft keys will be displayed on the screen.

   - Cp—…▼
   - Cs—…▼
   - Lp—…▼
   - Ls—…▼
   - Z—…▼
   - Y—…▼

2) Press the soft key corresponding to Cp—…▼, the following parameters will be shown for users' choices.

   - Cp-D
   - Cp-Q
   - Cp-G
   - Cp-Rp
   - RETURN

Press the soft key corresponding to users' desired parameters. Then press RETURN to return to upper soft key menu.

3) Press Cs—…▼, the following parameters will be shown for users' choices.

   - Cs-D
   - Cs-Q
   - Cs-Rs

- RETURN

Press the soft key corresponding to users' desired parameters. Then press RETURN to return to upper soft key menu.

4) Press Lp—...▼, the following parameters will be shown for users' choices.
- Lp-D
- Lp-Q
- Lp-G
- Lp-Rp
- Lp-DCR
- RETURN

Press the soft key corresponding to users' desired parameters. Then press RETURN to return to upper soft key menu.

5) Press Ls—...▼, the following parameters will be shown for users' choices.
- Ls-D
- Ls-Q
- Ls-Rs
- DCR
- Ls-DCR
- RETURN

Press the soft key corresponding to users' desired parameters. Then press RETURN to return to upper soft key menu.

6) Press Z—...▼, the following parameters will be shown for users' choices.
- Z-θr
- Z-θº
- R-X
- Rp-Q
- Rs-Q
- RETURN

Press the soft key corresponding to users' desired parameters. Then press RETURN to return to upper soft key menu.

7) Press Y—...▼, another group of soft keys will be shown.
- Y—θr
- Y—θº
- G—B
- RETURN

Press the soft key corresponding to users' desired parameters. Then press RETURN to return to upper soft key menu.

3.1.2 Test range

Measurement range should be selected in accordance with the impedance value of the tested LCR component.

U2831 has 5 AC measurement ranges: 30Ω, 100Ω, 1kΩ, 10kΩ and 100kΩ.

When the output impedance is selected as 30Ω and 50Ω, U2831 has 6 AC measurement

ranges: 10Ω, 30Ω, 100Ω, 1kΩ, 10kΩ and 100kΩ.

Operation steps for setting test range:

1) Move the cursor to the range zone, the following soft keys will be displayed:
   - AUTO The soft key is used to set the range mode to AUTO.
   - HOLD The soft key is used to switch the AUTO mode to the HOLD mode. When the range mode is set to HOLD, the range will be locked in the current measurement range. The current measurement range will be displayed in the range zone.
   - ↑(+) The soft key is used to increase the range under HOLD mode.
   - ↓(-)   The soft key is used to decrease the range under HOLD mode.

2) Use soft keys to set measurement range.

3.1.3 Test frequency

The measurement range of U2831 ranges from 50Hz to 200kHz, total 37 frequency points.

Operation steps for setting test frequency:

U2831 provides two methods to set measurement frequency. The first one is to use soft keys and the other one is to input data by using numeric keys.

1) Move the cursor to the **FREQ** zone, the following soft keys will be displayed.
   - ↑(++)
     This is a coarse adjustment soft key used to increase the frequency. Press this key, the frequency will change as the following sequence: 50Hz, 100Hz, 1kHz, 10kHz, 100kHz, 200kHz.
   - ↑(+)
     This is a fine adjustment soft key used to increase the frequency. Press this key, the frequency will switch between the following ones:

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

   - ↓(-)
     This is a fine adjustment soft key used to decrease the frequency. The selectable frequencies are the same as that of ↓(-).
   - ↓(--)
     This is a coarse adjustment soft key used to decrease the frequency. The selectable frequencies are the same as that of ↓(--).

2) Use soft keys or numeric keys to select or set frequency. When using numeric keys to

input the required frequency value, the soft key displays the available frequency units (Hz and kHz). users can use unit soft key to input unit and data. When using [ENTER] to input frequency, the default unit is Hz.

3.1.4 Test level

The measurement level of U2831 can be set from 10mV to 2.0V with the resolution of 10mV.

Operation steps for setting test level:

U2831 provides two methods to set the level of test signal source. The first one is to use soft keys, while the second one is to input data by numeric keys.

1) Move the cursor to LEVEL, the following soft keys will be displayed.
   - ↑(++)
     This is a coarse adjustment soft key used to increase the level of test signal source.
   - ↑(+)
     This is a fine adjustment soft key used to increase the level of test signal source.
   - ↓(-)
     This is a fine adjustment soft key used to decrease the level of test signal source.
   - ↓(--)
     This is a coarse adjustment soft key used to decrease the level of test signal source.
2) Soft or numeric keys are used to select or set the test level. When numeric keys are used to input the desired level, the available units (mV, V,uA,mA,A) will be displayed in the soft key zone. Users can use these unit keys to input unit and data.

3.1.5 Test speed

The test speed of U2831 is determined by the following factors:
- Integration time (A/D conversion)
- Average times (average test times per each test)
- Measurement delay (from startup to the start of measurement)
- Display time of test results

users can select test mode as FAST, MED or SLOW. Generally, the test result is more stable and accurate in SLOW test mode.

Operation steps for setting test speed:

1) Move the cursor to SPEED, the following soft keys will be displayed:
   - FAST
   - MED
   - SLOW
2) Use above soft keys to set the test speed.

3.1.6 Output Impedance

The output impedance of U2831 can be set as 30Ω,50Ω and 100Ω.

Operation steps for setting output impedance:
3) Move the cursor to <u>RSOU</u>, the following soft keys will be displayed:
   - 100Ω
   - 50Ω
   - 30Ω
4) Use above soft keys to set the output impedance.

3.1.7 Tools

The test result of U2831 is displayed as 6 floating-point digits. Decimal point lock function can make U2831 output the test result in fixed way. Meanwhile this function can change the displayed count of test result. This displayed result can be selected to be shown in large character or small character.

Operation steps for tools

Set the display mode of decimal point in fixed mode according to the following operation steps. Also the character size of test result can be set.

1) Press **MORE1/2**, the following soft keys will be displayed:
   - **D.P.FIX A**
   - **D.P. FIX B**
   - **DISP OFF ON**
   - **EASY**
   - **START SAVE CSV**
2) Press **D.P.FIX A** to lock the decimal location of primary parameter TEST result. When the decimal location is locked,"▲" is displayed. Press **D.P.FIX A** once，the last digit will be deleted, and the displayed digit will be reduced by one.
3) Press **D.P.FIX B** to lock the decimal location of secondary parameter TEST result. When the decimal location is locked,"▲" is displayed. Press **D.P.FIX B** once，the last digit will be deleted, and the displayed digit will be reduced by one.
4) Press **EASY** to display the test results on easy operation page. On the easy operation page, the numeric keys(1 to 9) is response 9 measurement setup.
5) Press **DISP OFF ON** to close/open the display of the test results.

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NOTE: Under the following circumstance, the function of decimal lock will be cancelled automatically to recover to floating decimal point status.
- **Test function is changed.**

In deviation test, the deviation test mode (ΔABS, Δ%, OFF) is changed.

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3.2 <BIN DISP>

Press **[MEAS]** firstly and then the **BIN DISP** soft key to enter into <BIN DISP> display page. On this page, bin NO. is displayed in upper-case character while the test result, in lower-case character.

```
<BIN DISP>        ⓘUdisk is installed
FUNC:Cp-D     NOM.   : 0.00000pF        📼
    BIN   LOW [F]    HIGH[F]    COUNT
     1    9.00000n   11.0000n    0
     2    ───────    ───────     0
     3    ───────    ───────     0
    2nd   0.00000    0.00500    [ ]
   REJECT      AUX:OFF        OUT:0
          BIN:  1
CORR:OFF      Cp: 9.99700nF    D : 0.00312
┌─────────┬─────────┬────┬─────────┬─────────┬─────────┐
│  MEAS   │   BIN   │    │  LIST   │  FILE   │  MORE   │
│  DISP   │  DISP   │    │ SWEEP   │  LIST   │  1/2    │
└─────────┴─────────┴────┴─────────┴─────────┴─────────┘
```

The following control parameters can be set on <**BIN DISP**>.

■   Measurement display page(**MEAS DISP**)
■   Bin display page(**BIN DISP**)
■   List sweep display page(**LIST SWEEP**)
■   File list display page(**FILE LIST**)
■   Next page(**MORE 1/2**)

Press **MORE 1/2** soft key the following soft keys will be displayed:

■   Count function ON/OFF (**COUNTE OFF ON**)
■   Compare function ON/OFF (**COMP OFF ON**)
■   Counter reset(**RESET COUNT**)
■   start to save data(**START SAVE CSV**)
■   Return(**MORE 2/2**)

The following test result/ condition can be displayed in this page but cannot be set in this page. Users can set them on the **<LIMIT TABLE >** page.

■   Nominal value (NOM)
■   Bin limit value (HIGH/ LOW)

3.2.1 Comparator function

U2831 has an inserted compare function which can divide DUT to up to 4 bins (from BIN1 to BIN3 and BIN OUT). Users can set 3 pairs of primary parameter limit and one pair of secondary bin limit. If the primary parameter of DUT is within the range of the bin limit but

the secondary parameter is outside of the bin limit, the DUT will be sorted into the auxiliary bin. When U2831 has installed an HANDLER interface, the compare result will be output into the automatic test system and further realizing auto-sorting test. These limits can only be set on the <**LIMIT TABLE** > page. Users can set the compare function to ON or OFF in the **TOOL** zone.

Operation steps for compare function and bin count function:

1) On <BIN DISP> page, press **MORE 1/2** soft key, the following soft keys will be displayed.
   - COUNT OFF ON
   - COMP OFF ON
   - RESET COUNT
2) Press the soft key **COUNT OFF ON** to set the bin counter as ON or OFF.
3) Press the soft key **COMP OFF ON** to set the compare function as ON or OFF.
4) Press the soft key **RESET COUNT**, "Info: Sure clear bin counter?" will be displayed in the help zone. Then the following soft keys will be displayed.
- **YES**
- **NO**
5) Press the soft key **YES** to reset all bin counts to 0.
6) Press the soft key **NO** to cancel the reset operation.

3.2.2 BIN

This zone shows the bin number of the limit list.

3.2.3 HIGH/LOW

This zone shows the high and the low limits of the limit list.

3.2.4 COUNT

This zone shows the count value of the current bin.

3.2.5 AUX

This zone shows the count value of the auxiliary bin.

3.2.6 OUT

This zone shows the count value of the out bin.

3.3 <LIST SWEEP DISP>

Up to 100 test frequencies, test levels or DC bias can be set on this page. Users can set the high and the low limits for each list-sweep test point. Auto sweep test will be made on these test points. And their test results will be compared with their limits.

Press down the menu key **[MEAS]** and then the soft key **LIST SWEEP** to enter into the **<LIST SWEEP>** page, shown as below.

```
<LIST SWEEP>        ⓘUse softkeys to select
SWEEP MODE:SEQ              FAIL MODE:CONTINUE    ▯
No.  FUNC  FREQ[Hz]  LEV[V]  BIAS[x]  RESULT     COMP
*1   Cp    1.00000k  1.000            100.883nF  PASS
 2   ESR   10.0000k  1.000            2.35203 Ω  PASS
 3   OFF
 4   OFF
 5   OFF
 6   OFF
 7   OFF
 8   OFF
 9   OFF
10   OFF
  MEAS  │  BIN  │       │  LIST   │  FILE  │  MORE
  DISP  │  DISP │       │  SWEEP  │  LIST  │  1/2
```

Test points will be automatically tested in a scanning mode. Meanwhile, comparison will be made between test results and limit values. In the process of list sweep test, "*****" denotes the current sweep test point. The following control parameters can be set on <**LIST SWEEP** >.

■   Sweep mode (**SWEEP MODE**)

■   Fail mode(**FAIL MODE**)

There are 2 zones on this page: **LIST SWEEP DISP** and **mode**. List sweep points cannot be set on this page but can be set on <**LIST SWEEP SETUP**>.

3.3.1 Sweep mode

The list sweep function of U2831 can make automatic sweep test for up to 100 points' test frequencies, test levels or DC bias. Two sweep modes are available on U2831: SEQ and STEP. In SEQ mode, each press of [**TRIG**] will direct U2831 to automatically test all list sweep test points. In STEP mode, each press of [**TRIG**] will direct U2831 to test one list sweep point.

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NOTE: When the trigger mode is set to INT, sweep test modes of SEQ and STEP will not be controlled by [**TRIG**].

When the trigger mode is set to MAN, [**TRIG**] can be used to trigger the list sweep test.

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Operation steps for setting the list sweep mode:

Set the sweep mode on the <**LIST SWEEP**> page as **SEQ** or **STEP**.

1) On the < **LIST SWEEP** > page, move the cursor to the <u>**SWEEP MODE**</u> zone, the following soft keys will be displayed:
   - **SEQ**
   - **STEP**

2) Press **SEQ** to set the sweep mode as sequential sweep test mode.

3) Press **STEP** to set the sweep mode as single step sweep test mode.

Operation steps for setting the list sweep fail mode:

Set the sweep fail mode on the <**LIST SWEEP**> page as **STOP** or **CONTINUE**.

4) On the < **LIST SWEEP** > page, move the cursor to the <u>**FAIL MODE**</u> zone, the following soft keys will be displayed:
   - **STOP**
   - **CONTINUE**
   - **PAUSE**
   - **RETRY**

3.3.2 FREQ (Hz)

This zone shows the currently swept parameter mode and its unit. What are right below this item are parameters of the sweep list.

3.3.3 RESULT

This zone is the currently swept Function parameter and its unit. What are right below this item are the sweep results.

3.3.4 COMP (Compare)

This zone indicates the compare results of the currently swept points. L means the result is lower than the standard and H is higher than the standard, while blank is medium.

3.4 <MEAS SETUP>

Press **[SET]** to enter into the **<MEAS SETUP>** page shown as below:

```
<MEAS SETUP>    ℹ️Use softkeys to select
 FUNC    :Cp-D         RANGE   :AUTO         💾
 FREQ    :1.00000kHz   SPEED   :MED
 LEVEL   :1.000 V      RSOU    :100Ω
 TRIG    :INT          AVG     :1
 TRIG DLY:0ms          MON 1   :OFF
 AUTO LCR:OFF          MON 2   :OFF
 DEV A   :OFF          REF A   : 0.00000pF
 DEV B   :OFF          REF B   : 0.00000
 STEP DLY:0ms          DC BIAS :0.000 V

  MEAS   | LIMIT | CORR- | LIST  | FILE  | MORE
  SETUP  | TABLE | ECTION| SETUP | LIST  | 1/2
```

In this page, the following control parameters can be set. (Items in parenthesis can be set)

■ Test function (**FUNC**)
■ Test frequency (**FREQ**)
■ Test level (**LEVEL**)
■ Test range **(RANGE**)
■ Test speed (**SPEED**)
■ Output Impedance (**RSOU**)
■ Trigger Mode (**TRIG**)
■ Trig Delay Time (**TRIG DLY**)
■ Average times (**AVG**)
■ Auto LCR Function(**AUTO LCR**)
■ Voltage Level Monitor ON/ OFF (**MON 1**)
■ Current Level Monitor ON/ OFF (**MON 2**)
■ Deviation Test Mode A (**DEV A**)
■ Deviation Test Reference Value A (**REF A**)
■ Deviation Test Mode B (**DEV B**)
■ Deviation Test Reference Value B (**REF B**)
■ Step Delay Time (**STEP DLY**)
■ DC Bias source (**DC BIAS**)

Some zones listed below are as same as that on <MEAS DISP> page, so it is not necessary to introduce in this section, but others will be introduced briefly in the following sections.

■ Test function (**FUNC**)
■ Test frequency (**FREQ**)
■ Test level (**LEVEL**)
■ Test range **(RANGE**)
■ Test speed (**SPEED**)
■ Output Impedance(**RSOU**)

3.4.1 Trigger mode

There are 4 trigger modes on U2831: INT, MAN, EXT and DUT.

When the trigger mode is set as INT, U2831 will make sequential and repeated tests.

When the trigger mode is set as MAN, press [TRG] once, U2831 will make one test.

When the trigger mode is set as EXT, once the HANDLER interface receives a positive impulse, U2831 will execute one measurement.

When the trigger mode is set as DUT, once the test fixture receives a component, U2831 will execute one measurement.

When the trigger mode is set as BUS, once the IEEE 488 interface receives a TRIGGER command, U2831 will execute a test. The BUS mode cannot be set on the front panel.

_____

Note: In the process of testing, when U2831 receives a trigger signal, it will be ignored. So the trigger signal should be sent after the test is done.

When optional HANDLER interface triggers U2831, the trigger mode is set as EXT.

_____

Operation steps for the trigger mode setup

Execute the operation of other trigger modes except BUS trigger. If BUS trigger mode is necessary, then use IEEE4888 interface to send **TRIGger:SOURce BUS** command.

1) Move the cursor to the **TRIG** zone, the following soft keys will be displayed:
   - **INT**
   - **MAN**
   - **EXT**
   - **DUT**
2) Use above soft keys to set the trigger mode.

3.4.2 Average

The AVERAGE function can calculate the average value of two or more test results. The average times can be set from 1 to 255 with an increase or decrease of 1.

Operation steps for setting test average times.

1) Move the cursor to the **AVG** zone, the following soft keys are displayed.
   - ↑(+)

     This key is used to increase the average times.
   - ↓(-)

     This key is used to decrease the average times.
2) Use above soft keys to set the average times or use numeric keys and [**ENTER**] input average times directly.

3.4.3 Monitor function

The   monitor function can monitor the real voltage across DUT or real current through DUT. The monitored voltage value is displayed in **Vm** zone on **<MEAS DISP>** page while the monitored current value is in **Im** zone. The monitor function can also monitor the test parameter of L, C, R, Z, Y, D, Q, θ, X, G and B.

_____

Note: The correction function can influence the level monitor function, so when the correction data changes the level monitor value will change. When the correction is switched between OPEN or SHOR, the level monitor value will be influenced as well

_____

Operation steps for setting the monitor function
Execute the following operation steps to set the level monitor function as ON or OFF.
1)   Move the cursor to **MON 1** or **MON 2** zone, the following soft keys will be displayed.
   - **OFF**
   - **V**
   - **I**
   - **MORE 1/5**
2)   Select and press a softkey to set monitor function. If the softkey users need is not displayed on the page，press More 1/5 to display the following softkeys.
   - **Ls**
   - **Lp**
   - **Cs**
   - **Cp**
   - **MORE 2/5**
3)   Select and press a softkey to set monitor function. If the softkey users need is not displayed on the page，press More 2/5 to display the following softkeys.
   - **Rs**
   - **Rp**
   - **R**
   - **ESR**
   - **MORE 3/5**
4)   Select and press a softkey to set monitor function. If the softkey users need is not displayed on the page，press More 3/5 to display the following softkeys.

   - **D**
   - **Q**
   - **Y**
   - **G**
   - **B**
   - **MORE 4/5**
5)   Select and press a softkey to set monitor function. If the softkey users need is not displayed on the page，press More 4/5 to display the following softkeys.

- **Z**
- **θr**
- **θº**
- **X**
- **MORE 5/5**

3.4.4 Delay time

U2831 trigger delay means the delay time from triggering to test-start. Delay function can set the trigger delay time. The range of the trigger delay time can be set from 0s to 60s with 1ms as the resolution. The trigger delay function is great useful when the instrument is applied in an auto test system. When the instrument is triggered by HANDLER interface, the trigger delay time can ensure DUT and test terminal has a reliable contact.

Operation steps for setting the delay function

Execute the following steps to set the measurement delay time.

1) Move the cursor to the **TRIG DLY** zone.
3) the following soft keys are displayed.
   - ↑(+) and ↑(++)

     This key is used to increase the trigger delay times.
   - ↓(-) and ↓(--)

     This key is used to decrease the trigger delay times.
4) Use above soft keys to set the delay times or Use numeric keys to input delay time. After pressing a numeric key, the following unit keys will be displayed. These soft keys can replace **[ENTER]** to input delay time.
   - **ms**
   - **s**

3.4.5 Output impedance

U2831 provides four output impedances for users' choices: 100 Ω, 50 Ω and 30 Ω. When testing inductance, it is necessary to input the same output impedance so as to make data comparison with other instruments.

Operation steps for setting output impedance

Execute the following operations to set output impedance

1) Move the cursor to the **RSOU** zone, the following soft keys will be displayed.
   - **100 Ω**
   - **50 Ω**
   - **30 Ω**
2) Press **100Ω** to select the output impedance as 100Ω. Press **30Ω** to select the output impedance as 30Ω.

3.4.6 Deviation test function

The deviation test function can make the deviation value (instead of real test value) be directly displayed on the screen. The deviation value is equivalent to the real test value subtracting the pre-set reference value. This function brings great convenience to observe variations of component parameters with temperature, frequency, bias. Bias test function can be used for primary or secondary parameter or primary and secondary parameters meanwhile. The instrument provides two deviation test modes as below:

■ ΔABS (Absolute Deviation mode)

The deviation currently displayed is the difference between the test value of the DUT and the preset reference value. The formula of calculating ΔABS is as below:

ΔABS=X-Y

Where, X is the test value of DUT

Y is the preset reference value.

■ Δ% (Percentage deviation mode)

The deviation currently displayed is the percentage of the difference between the test value of DUT and the preset reference value divided by the reference value. Its calculating formula is as below:

Δ%=(X-Y)/Y*100[%]

Where, X is the test value of DUT.

Y is the preset reference value.

Operation steps for setting deviation test function

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

■ **MEAS**

When the reference component is connected with the test terminal, users are supposed to press **MEAS**. Then U2831 will test the reference component and the test result will be automatically input as the value of **REF A**.

2) Use **MEAS** or numeric keys to input the reference value of primary parameter.

3) Move the cursor to the **REF B** to input the reference value of the secondary parameter, the following soft key will be displayed.

■ **MEAS**

When the reference component is connected to the test terminal, users are supposed to press **MEAS**. Then U2831 will test the reference component and the test result will be automatically input as the value of **REF B**.

4) Use MEAS or numeric keys to input the reference value of the secondary parameter. If the reference values of primary and secondary parameters have been set in steps 2), users can skip this step.

5) Move the cursor to the **DEV A** zone, the following soft keys will be displayed:

■ **OFF**

■ **ΔABS**

■ **Δ%**

6) Use above soft keys to set the deviation mode of the primary parameter.

7) Move the cursor to the **DEV B** zone, the following soft keys will be displayed.

- **OFF**
- **ΔABS**
- **Δ%**

8) Use above soft keys to set the deviation mode of the secondary parameter.

3.4.7 DC bias

U2831 provides internal DC bias voltage from -5V to +5V.

Operation steps for setting DC bias:

U2831 provides two methods to set the DC bias. The first one is to use soft keys, while the second one is to input data by numeric keys.

1) Move the cursor to **DC BIAS**, the following soft keys will be displayed.

- ↑(+) and ↑(++)

    This soft key is used to increase the output level of DC bias.

- ↓(-) and ↓(--)

    This soft keys is used to decrease the output level of DC bias.

2) Soft or numeric keys can be used to select or set the DC bias source. When numeric soft keys are used to input the desired bias level, the available units ((mV, V, μA, mA and A) will be displayed in the soft key zone. Users can use these soft keys to input unit or data. When [ENTER] is used to terminate the input of bias value, the default unit is V or A.

_____

NOTE: When users need to switch the DC bias level between current and voltage, numeric keys and unit soft keys must be used.

_____

Press the [BIAS] key on the front panel to allow the output of DC bias. When DC bias is permitted to output, the [BIAS] key will be lighted.

3.5 <LIMIT TABLE>

Press **[SET]** and then **LIMIT TABLE** to enter into the **<LIMIT TABLE>** page as the following figure shown.

Compare function can be set on this page. U2831 can set 3 bin limits of primary parameters and one of secondary parameters. The tested result can be divided into up to 4 bins (BIN 1 to BIN 3 and BIN OUT). If the primary parameter of DUT is within the limit range from BIN1 to BIN3, but the secondary parameter is out of the limit range, in this case the DUT will be sorted into aux bin. When U2831 installs the HANDLER interface and it is used in automatic sorting system, the compare function will be especially useful. The following limit parameter of compare function only be set on **<LIMIT TABLE>** page.

- Test parameter (**FUNC**)
- Limit mode of compare function (**MODE**)
- Nominal value (**NOM**)
- Auxiliary bin ON/OFF (**AUX**)
- Compare function ON/OFF (**COMP**)
- Low limit of each bin (**LOW**)
- High limit of each bin (**HIGH**)

3.5.1 Swap parameter

The swap parameter function can swap the primary and the secondary parameter in **SWAP**. For example, when the test parameter is Cp-D, the swap parameter function can change the test parameter as D-Cp. Then users can set 3 pairs of compare limits for D, but only 1 pair of compare limit can be set for Cp.

Operation steps for the swap parameter function

Execute the following operations to swap the primary and the secondary parameters.

1) Move the cursor to **FUNC**, the following soft key will be displayed.
   - **SWAP**

2) Press **SWAP** to swap the primary and the secondary parameters.

3) Press **SWAP** to swap the primary and the secondary parameter, which is to recover the formal setup.

3.5.2 Limit modes of compare function

Compare functions has two limit setup modes for primary parameters as shown in figure 3-1.

■ Tolerance mode

Under tolerance mode, set the deviation value of the nominal one (be set in the **NOM** zone) as the compare limit value. Deviation value has two modes: percentage deviation and absolute deviation.

■ Sequential mode

Under sequential mode, the range of the test value is the compare limit value. The compare limit value should be set in the order from small to large.
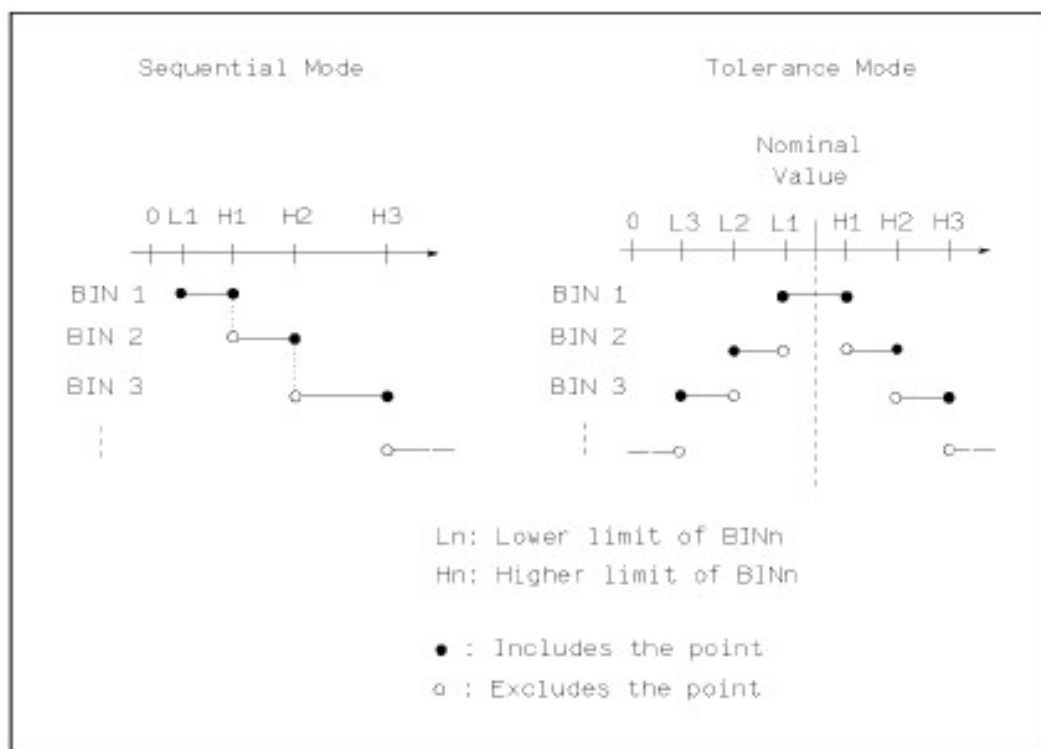
Figure 3-1 Tolerance mode and Sequential mode

_____

Note: When setting limit values 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 DUT will sort into BIN 1.

Under tolerance mode, the low limit is not necessary to be smaller than the nominal value and the high limit is not necessary to be greater than the nominal value. The limit range of each bin can be discontinues or overlapped.

_____

Operation steps for setting the limit mode of the compare function

1) Move the cursor to the **MODE** zone, the following soft keys will be displayed.

   ■ **%TOL**

   This soft key is used to set the limit mode as the percent tolerance mode.

   ■ **ABS TOL**

   This soft key is used to set the limit mode as the absolute tolerance mode.

   ■ **SEQ**

   This soft key is used to set the limit mode as sequential mode.

2) Use above soft keys to set the limit mode.

3.5.3 Set nominal value of tolerance mode

When the tolerance mode is selected as the limit mode of the primary parameter, it is necessary to set the nominal value. The nominal value can be any ones within the display range.

When the sequential mode is selected as the limit mode the primary parameter, the nominal value can be set, but it is not necessary to use it under this mode.

Operation steps for setting the nominal value

1) Move the cursor to **NOM**.

2) Use numeric keys to input nominal value. After inputting the data, the following soft keys (**p**, **n**, **µ**, **m**, **k**, **M**, ***1**) can replace the **[ENTER]** key to input the nominal value. Press ***1** to input nominal value, the instrument will select F, H or Ω as the default unit of the nominal value according to primary parameter.

3.5.4 Comparator function ON/OFF

U2831 can set 3 bin limits of primary parameters and 1 bin limit of secondary parameters. The tested results can be sorted into 4 bins (BIN 1 to BIN 3 and BIN OUT) at most. If the primary parameter of DUT is within the limit range from BIN 1 to BIN 3, but the secondary parameter is out of the limit range, in this case the DUT will be sorted into aux bin. When U2831 installs the HANDLER interface and it is used in the automatic sorting system, the compare function will be especially useful.

Operation steps for setting the compare function ON/OFF

1) Move the cursor to **COMP**, the following soft keys will be displayed.

   ■ **ON**

   ■ **OFF**

2) Use above soft keys to set the compare function as ON or OFF.

3.5.5 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 2nd.

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

■ On **<LIMIT TABLE >** page, no low / high limit of the secondary parameters has been set.

■ On **< LIMIT TABLE >** page, the low/high limit of secondary parameters has been set but **AUX BIN** function is set as OFF.

In this case, only those components whose secondary parameters are qualified can perform primary parameter sorting according to sorting limits. If the secondary parameters are unqualified and the corresponding primary parameters are within limit ranges, those components will be sorted into BIN OUT.

■ On <**LIMIT TABLE**> page, the low/high limit of the secondary parameters has been set and the **AUX BIN** function is set as ON.

If the primary parameter is out of the limit range, it is sorted into BIN OUT. If the primary parameter of DUT is within the limit range but its secondary parameter is out of the limit range, the DUT will be sorted into the AUX BIN.

_____

Note: When the secondary parameter only has low limit and the auxiliary bin is set as ON, if the primary parameter of DUT is within the limit range and the secondary parameter is smaller than or equal to its low limit, the DUT will be sorted into the auxiliary bin. When the secondary parameter only has high limit and the auxiliary bin is set as ON, if the primary parameter of DUT is within the limit range and the secondary parameter is greater than or equal to its high limit, the DUT will be sorted into the auxiliary bin.

_____

Operation steps for setting the auxiliary bin function ON/OFF
1) Move the cursor to **AUX**, the following soft keys will be displayed.
    ■ **ON**
    ■ **OFF**
2) Use above soft keys to set the auxiliary function as ON or OFF.

3.5.6 HIGH/LOW

U2831 can set bin limits of 3 primary parameters and one secondary parameter. The test results can be sorted into 4 bins at most (BIN 1 to BIN 9 and BIN OUT). The high/low limits of primary parameters can be set in high limit and low limit of bins from BIN 1 to BIN 3. The limit of the secondary parameter can be set in **HIGH** and **LOW** of 2nd.

Operation steps for setting high/low limit
Execute the following steps to set sorting limits.
1) Set **FUNC** and **NOM** in the compare function menu and the limit **MODE** of the primary parameter.
2) Move the cursor to Low limit of BIN 1. If users select percent tolerance mode, the following operation steps should be from step 3 to step 6; if users select absolute tolerance mode and sequential mode, the following operation steps should be from step 7 to step 11.
3) Use numeric keys to input low limit value in Low limit. After inputting the data, users can use (**m**, **k**, ***1**) to replace **[ENTER]** to input the limit value. After inputting limit value in

LOW of BIN 1, the low limit of BIN 1 will be automatically set as – (absolute limit) and the high limit will be + (absolute limit).

4) The cursor will automatically move to **LOW** of BIN 2. Repeat step 3 until the limits of BIN 3 are input. Then the cursor will automatically move **LOW**of 2nd.

5) After inputting the low limit of the secondary parameter, the cursor will automatically move to **HIGH** of 2nd.

6) Input the high limit of the secondary parameter.

7) In Low limit of BIN 1, use numeric keys to input the low limit. After inputting the data, users can use (**p**, **n**, **µ**, **m**, **k**, **M**, ***1**) to replace **[ENTER]** to input the limit value. When [ENTER] or ***1** is used to input the limit value, the default unit is F, H or Ω.

8) After inputting the low limit of BIN 1, the cursor will automatically move to **HIGH** of BIN 1. Input the high limit of BIN 1.

9) The cursor will automatically move **HIGH** of BIN 2. For the limit mode is sequential mode, the low limit of BIN 2 will be the high limit of BIN 1. Input the high limit of BIN 2.

10) Repeat step 9 until the high limit of BIN 9 is input. Then the cursor will automatically move to **LOW** of 2nd. Input the low limit of the secondary parameter.

11) The cursor will automatically move to **HIGH** of 2nd. Input the high limit of the secondary parameter.

3.6 <CORRECTION>

Open and short correction can be used to eliminate the distribution capacitance, spurious impedance and other measurement errors. U2831 provides two correction modes: the first one is executing open and short correction on the <MEAS DISP> page; the other one is executing open, short and load correction on the <CORRECTION>page.

Press **[SET]** to select **CORRECTION** to enter into the **<CORRECTION>** page.
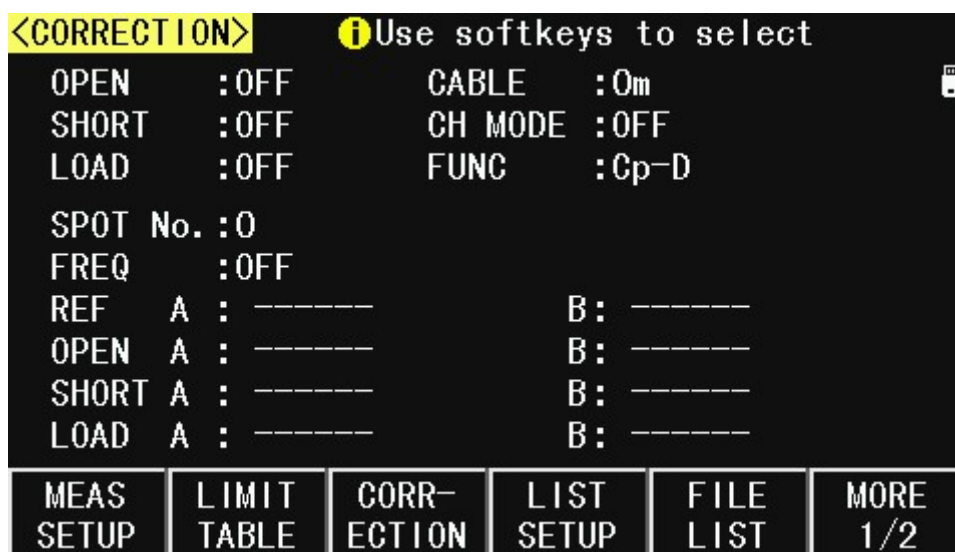
Open, short and load correction on the **<CORRECTION>** page can be used to eliminate the distribution capacitance, spurious impedance and other measurement errors. U2831

provides two correction modes: the first one is executing open and short correction on all frequency points through interpolation method; the other one is executing open, short and load correction on the frequency point currently set.

There are 16 zones on this page: **Correction**, **Open**, **Short**, **Load**, **Cable**, **CH Mode**, **Func**, **SPOT NO.**, **FREQ**, **REF A**, **REF B**, **OPEN A**, **OPEN B**, **SHORT A**, **SHORT B**, **LOAD A**, **LOAD B**. Each control function zone will be introduced in the following paragraphs.

Besides above setting zones, the <CORRECTION> page will also display the following monitoring zones. The monitoring zones are similar with the setting zones, but the monitoring zones can only provide reference information and users cannot change state or parameter of these zones.

The following measurement control parameters can be set on the **<Correction>** page.

■ Open correction (**OPEN**)

■ Short correction (**SHORT**)

■ Load correction (**LOAD**)

■ Cable length selection (**CABLE**)

■ Single/ multiple correction mode selection (**CH MODE**)

■ Frequency points of OPEN, SHOR and LOAD (**SPOT NO.**,**FREQ**)

■ Reference values of load correction (**REF A**, **REF B**)

■ Real test results of the load correction (**LOAD A**, **LOAD B**)

The real test results of load correction can be tested on **SPOT NO. 0** to **SPOT NO. 9**. Channels of the current multiple correction mode can be set through the multiple-channel sweep interface or IEEE 488 interface.

3.6.1 OPEN

The open correction function of U2831 can eliminate the error caused by the stray admittance (G, B) parallel-connected with DUT, shown as figure 3-2.
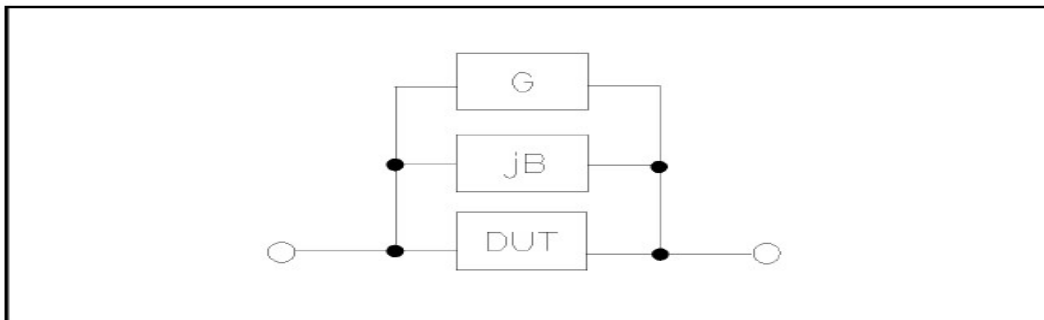
Figure 3-2 Stray Admittance

U2831 adopts the following two kinds of open correction data:

■ U2831 will automatically make open correction test on 41 fixed frequency points no matter what the currently set frequency is. Based on the open correction data of the following 41 frequencies, the instrument can calculate all open correction data of different test ranges which corresponds to all test frequencies. Move the cursor to **OPEN** and then used **SWEEP OPEN** to execute full frequency open correction.

20 Hz	100 Hz	1 kHz	10 kHz	100 kHz
25 Hz	120 Hz	1.2 kHz	12 kHz	120 kHz

30 Hz	150 Hz	1.5 kHz	15 kHz	150 kHz
40 Hz	200 Hz	2 kHz	20 kHz	200 kHz
50 Hz	250 Hz	2.5 kHz	25 kHz	
60 Hz	300 Hz	3 kHz	30 kHz	
80 Hz	400 Hz	4 kHz	40 kHz	
	500 Hz	5 kHz	50 kHz	
	600 Hz	6 kHz	60 kHz	
	800 Hz	8 kHz	80 kHz	

■ 10 open correction frequencies can be set in **SOPT NO.** and **FREQ** on **<CORRECTION>**: Move the cursor to **SPOT NO.** and then use the **INCR++**,**INCR+**,**DECR-**,**DECR--** soft key to set the 10 points frequencies respectively.

Operation steps of open correction function

1) Move the cursor to OPEN, the following soft keys will be displayed:

■ **ON**

■ **OFF**

■ **SWEEP OPEN**

■ **DCR OPEN**

2) Connect test fixture to test terminal. The fixture is open and not connecting to any DUT.

3) Press **SWEEP OPEN,** U2831 will test the open admittance (capacitance and inductance) under 41 frequencies. It will take about 75 seconds to finish the open full-frequency correction. In the process of correction , the following soft key will be displayed:

   ■ **CANCEL**

   This soft key can be used to terminate the current open correction operation and reserve the formal open correction data.

4) Press **ON** to turn on the function of open-circuit correction, then U2831 will perform open-circuit correction calculation in the later testing process. IF SPOT FREQ is set as OFF, the open-circuit correction data of the current frequency will be calculated by imbedding algorithm. When SPOT FREQ is set as ON, the value of the current test frequency will be that of SOPT FREQ, in this case, the open correction data of SPOT FREQ will be used to the calculation of open correction.

5) Press **OFF** to turn off the open correction function. In later measurement, no open correction calculation will be taken.

3.6.2 SHORT

The short correction function of U2831 can eliminate the error caused by spurious inductance (R, X) in serial with DUT as shown in figure 3-3.
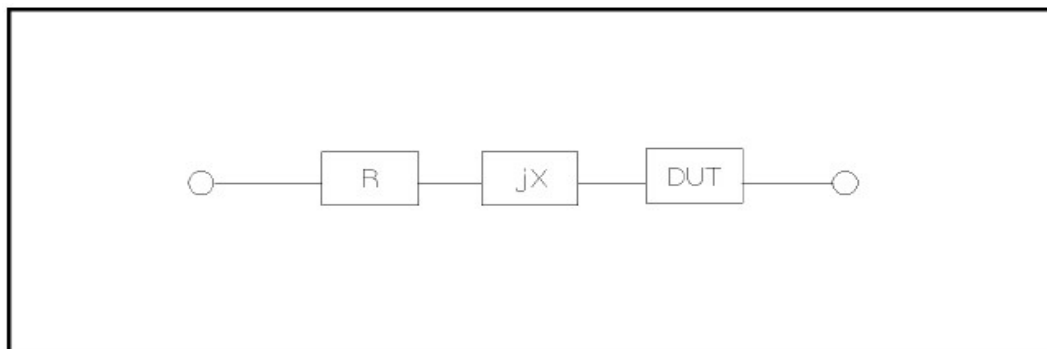
Figure 3-3 Spurious Inductance

U2831 adopts two kinds of short correction data.

■ Whatever the current frequency is, U2831 will execute short correction test on the 41 fixed frequency points. Except the 41 frequencies, the instrument will adopt imbedding algorithm to calculate the short correction data of different test frequencies which correspond to different ranges. Move the cursor to the **SHORT** zone, and then use the **SWEEP SHORT** soft key to execute full frequency open correction. The 41 fixed frequencies are the same as that in open correction.

■ U2831 can set 10 short correction frequencies in the **SPOT NO.** and **FREQ** zone on the **<CORRECTION>** page. Move the cursor to **SPOT NO.** and **FREQ**, and then use **SPOT SHORT** to short correct the set frequencies.

Operation steps of short correction function

Short correction includes full frequency short correction which adopts imbedding algorithm and single frequency short correction on 10 frequencies. Operate following steps to make short correction. The single frequency short correction can refer to "Load correction".

1) Move the cursor to the **SHORT** zone, the following soft keys will be displayed:
   ■ **ON**
   ■ **OFF**
   ■ **SWEEP SHORT**
   ■ **DCR SHORT**

2) Connect the test fixture to the test ports. Short the test fixture by using short plate.

3) Press the **SWEEP SHORT** soft key, U2831 will test the short spurious impedances (resistance and reactance) of 41 frequencies. Short full frequency correction takes about 75 seconds and in this process, the following soft keys will be displayed.
   ■ **CANCEL**
   This soft key can be used to cancel the current short correction operation and reserve the formal open correction data.

4) Press **ON** to validate the short correction function. U2831 will make short correction calculation in latter test. If SPOT FREQ is set as OFF, the short correction function will calculate the short correction data of the current frequency. If SPOT FREQ is set as ON and the current frequency is SPOT FREQ, the short correction data of SPOT FREQ will be used in the calculation of the short correction.

5) Press **OFF** to turn off the short correction function. In latter test, no short correction calculation will be performed.

3.6.3 LOAD

By using transport coefficient between the real test value and the standard reference value at the preset frequency (**SPOT NO.**), the load correction of U2831 can eliminate the test error. It is obvious that open, short, and load correction can be performed at preset frequencies. The 10 preset frequencies can be set in the setup zones of **SPOT NO.**. The standard reference values can be set in the setup zones of **REF A** and **REF B**. The standard test function must be set in the **Func** zone before setting standard reference value. When the cursor moves to FREQ, the **MEAS LOAD** soft key will be displayed. Press **MEAS LOAD** to perform the load correction test.

Operation steps for setting load correction

According to the following steps, perform open/ short/ load correction test at preset frequencies.

1) Move the cursor to **SPOT NO.**, the following soft keys will be displayed:
   - ↑(++)
     This is a coarse adjustment soft key used to increase series number of frequency.
   - ↑(+)
     This is a fine adjustment soft key used to increase series number of frequency.
   - ↓(-)
     This is a fine adjustment soft key used to decrease series number of frequency.
   - ↓(--)
     This is a coarse adjustment soft key used to decrease series number of frequency.

2) Use soft keys or numeric keys to select or set frequency spot. When using numeric keys to input the required frequency spot, the soft key displays the available units (ENTERT,ESC). users can use unit soft key or [ENTER] to input data.

3) Move the cursor to **FREQ**, the following soft keys will be displayed:
   - **ON**
     Press this soft key to make the open/short/load correction data be available.
   - **OFF**
     Press the soft key to make the open/short/load correction data be unavailable.
   - **SPOT OPEN**
     Press this soft key to execute open correction at SPOT FREQ.
   - **SPOT SHORT**
     Press this soft key to execute short correction at SPOT FREQ.
   - **MEAS LOAD**
     Press this soft key to execute the load correction at SPOT FREQ.

4) Press the soft key **ON**, the original preset open/short/load correction frequency is displayed on the frequency setting zone.

5) Use numeric keys to input the correction frequency. After pressing any numeric keys, the available unit keys (**Hz**, **kHz**) will be displayed on the soft key zone and these soft keys can replace the **[TRG]** key to input correction frequency. When the **[TRG]** key is used to input correction frequency, the default unit is Hz.

6) Connect the test fixture to the test terminal.

7) Open the test fixture.

8) Press **SPOT OPEN** to perform open correction at the current set frequency. The test result (G, B) of the open correction test will be displayed in **OPEN A** and **OPEN B** line.

9) Short the test fixture.

10) Press **SPOT SHORT** to perform short correction at preset frequency. The test result (R, X) of the short correction will be displayed in **SHORT A** and **SHORT B** line.

11) Prepare a standard test component.

12) Move the cursor to **FUNC**.

13) Set the function parameters required to be set.

14) Move the cursor to **REF A**.

15) Use numeric keys and unit keys to input the primary reference values of the standard component.

16) Move the cursor to **REF B**.

17) Use numeric keys and unit keys to input the secondary reference value of the standard component.

18) Move the cursor to the corresponding **FREQ.**.

19) Connect the standard component to the test fixture.

20) Press **MEAS LOAD**, the instrument will execute a load correction. The real test results of the standard component will be displayed in **LOAD A** and **LOAD B**.

21) Move the cursor to **LOAD**.

22) Press **ON** to perform load correction calculation at preset frequencies in latter measurements.

3.6.4 Load correction test function

When performing load correction, the reference value of the standard component is required to be input in advance. The test parameters of reference value should conform with the preset load correction test function.

Load correction function adopts the transport coefficient between the real 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.

Operation steps for setting load correction test function

Refer to section 3.6.3.

3.6.5 Cable length selection

The available cable length is 0m, 1m, 2m and 4m.

3.6.6 Single/ multi correction mode

Refer to the instruction of the scanting optional interface.

3.6.7 Open/Short correction on <MEAS DISP> page

Operation steps of open correction function

1) On <MEAS DISP> page, press the key **[CLR]**, the following soft keys will be displayed:

■ **SPOT OPEN**

■ **SWEEP OPEN**

■ **OPEN OFF ON**

■ **MORE 1/2**

2) Connect test fixture to test terminal. The fixture is open and not connecting to any DUT.

3) Press **SPOT OPEN**, U2831 will make open correction on the current frequency.

4) Press **SWEEP OPEN**, U2831 will test the open admittance (capacitance and inductance) under 37 frequencies. It will take about 20 seconds to finish the open full-frequency correction. In the process of correction , the following soft key will be displayed:

■ **CANCEL**

This soft key can be used to terminate the current open correction operation and reserve the formal open correction data.

5) Press **OPEN OFF ON** to turn ON/OFF the function of open-circuit correction, If ON, U2831 will perform open-circuit correction calculation in the later testing process. If OFF, no open correction calculation will be taken in later measurement.

Operation steps of short correction function

1) On <MEAS DISP> page, press the key **[CLR]**, the following soft keys will be displayed:

■ **SPOT OPEN**

■ **SWEEP OPEN**

■ **OPEN OFF ON**

■ **MORE 1/2**

2) Press the soft key MORE 1/2, the following softkeys will be displayed:

■ **SPOT SHORT**

■ **SWEEP SHORT**

■ **SHORT OFF ON**

■ **MORE 2/2**

3) Connect the test fixture to the test ports. Short the test fixture by using short plate.

4) Press **SPOT SHORT**, U2831 will make short correction on the current frequency.

5) Press the **SWEEP SHORT** soft key, U2831 will test the short spurious impedances (resistance and reactance) of 37 frequencies. Short full frequency correction takes about 20 seconds and in this process, the following soft keys will be displayed.

■ **CANCEL**

This soft key can be used to cancel the current short correction operation and reserve the formal open correction data.

Press **SHORT OFF ON** to turn ON/OFF the short correction function. If ON,U2831 will make short correction calculation in latter test. If OFF, no short correction calculation will be performed in later test.

3.7 <LIST SETUP>

Press **[SET]** and then **LIST SETUP** to enter into the **<LIST SETUP>** page as shown below.

The list sweep function of U2831 can perform auto sweep test for the test frequency, test level or bias voltage of 100 points. On **<LIST SETUP>** page, the following list sweep parameters can be set.

■ Sweep mode (**SWEEP MODE**)

■ Sweep parameter setup (frequency **[Hz]**, level **[V]**, level **[I]**, bias **[V]**, bias **[I]**)

■ Sweep test point setup (sweep point)

■ Selection of limit parameter (**LMT**)

■ High/low limit (**HIGH**, **LOW**)

3.7.1 MODE and FAIL MODE

Mode and Fail mode menu is the same as the mode on <List sweep display> page.

3.7.2 Test parameter

Sweep parameters can be: frequency [Hz], level **[V]**, level **[I]**, bias **[V]**, bias **[I]**.

Operation steps for setting test parameter

1) Move the cursor the table to perform the setup of each sweep parameter: **LEV[V]** and **BIAS[x]**; the following soft keys will be displayed.
   - LEVEL [V]
   - LEVEL [A]
   - BIAS [V]
   - BIAS [A]
2) Press one of above soft keys to select the list sweep parameter.

3.7.3 Sweep parameter setup

Move the cursor to the table to perform the setup of each sweep parameter: **FREQ (HZ)**, **LMT**, **HIGH** and **LOW**. Use numeric keys on the front panel to input the data of test frequency/level/bias and high/low limit used to compare, as well as the selected primary/secondary use to compare. After setting, if some inputs are unnecessary, users can execute the function of "OFF" in the soft key zone to delete the corresponding value.

In the bottom of the **LMT** zone, parameter A indicates that the primary parameters of the measurement result are use to compare with the high and low limits of the table. Parameter B indicates that the secondary parameters of the measurement result are used to compare with the high and low limits of the table. "---" means no compare.

Chapter 4 SYSTEM and FILE

4.1 <SYSTEM>

Press **[SET]** to enter into the **<SYST SETUP>** page shown as below.

```
<SYST SETUP>    ⓘUse softkeys to select
SKIN     :BLACK        BUS MODE:RS232C      🖴
LANGUAGE:ENGLISH       BAUDRATE:9600
ALM VOL :HIGH          FETCH   :QUERY
PASS ALM:OFF           LOAD SET:LAST
FAIL ALM:SHORT         HDL EDGE:RISE
KEYSOUND:ON            HDL OUT :HOLD
PASSWORD:OFF           HDL DLY :0ms
SAVE TYP:BMP           BUS ADDR:8
DATE:2010-01-01        MULTI   :OFF
TIME:02:25:35
┌────────┬────────┬────────┬────────┬────────┬────────┐
│ SYSTEM │ SYSTEM │FIRMWARE│ SYSTEM │ FILE   │ MORE   │
│ SETUP  │ INFO   │ UPDATE │ TEST   │ LIST   │ 1/2    │
└────────┴────────┴────────┴────────┴────────┴────────┘
```
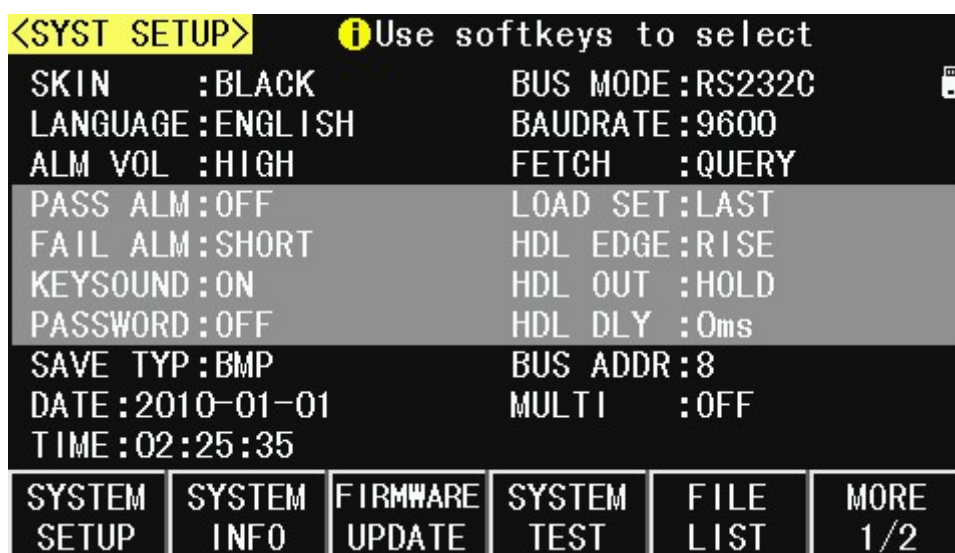
On this page, most system setup items are displayed, such as instrument skin, language, PASS alarm, FAIL alarm, password, bus mode, GPIB address, baud rate, data/time.

4.1.1 SKIN

The function of this zone is to set the theme of display.
Operation steps for setting the theme of display
1) Move the cursor to **SKIN**, the following soft keys will be displayed.
   ■ **GRAY**
   ■ **BLACK**
   ■ **BLUE**
   ■ **CYAN**
2) Use above soft keys to select the theme of display.

4.1.2 LANGUAGE

This zone is used to control and display the current language mode of the operating instrument.
Operation steps for setting language
1) Move the cursor to Language, the following soft keys will be displayed.
   ■ English
   This soft key is used to select English as the operation language.

■   中文

This soft key is used to select Chinese as the operation language.

4.1.3 PASS ALARM

This zone is used to control and display the beep mode when the test result is qualified.

Operation steps for setting PASS ALARM

1)   Move the cursor to **PASS ALARM**, the following soft keys will be displayed.

   ■   **OFF**

   This soft key is used to set the pass beep function OFF.

   ■   **LONG**

   This soft key is used to select long beep.

   ■   **SHORT**

   This soft key is used to select short beep.

   ■   **TWO SHT**

   This soft key is used to select two low and short beeps.

4.1.4 FAIL ALARM

This zone is used to control and display the beep mode as **FAIL ALARM** when the test result is unqualified.

Operation steps for setting FAIL ALARM

1)   Move the cursor to **FAIL ALARM**, the following soft keys will be displayed.

   ■   **OFF**

   This soft key is used to set the fail beep function OFF.

   ■   **LONG**

   This soft key is used to select long beep.

   ■   **SHORT**

   This soft key is used to select short beep.

   ■   **TWO SHT**

   This soft key is used to select two low and short beeps.

4.1.5 KEY SOUND

Operation steps for setting key sound

1)   Move the cursor to **KEY SOUND**, the following soft keys will be displayed.

   ■   **OFF**

   ■   **ON**

2)   Use above soft keys to turn OFF/ON the key sound.

4.1.6 PASSWORD

This zone is used to display the password –protection mode.

Operation steps for setting the password

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

■   OFF

This soft key is used to turn off the password protection mode.

■   KEYLOCK

This soft key is used to protect unlock keyboard.

■   SYSTEM

This soft key is used to turn on the password protection function including file protection and starting up password.

■   FILE

This soft key is used to protect users' files.

■   MODIFY

This soft key is used to modify the password. The operation steps are as follows:

Press MODIFY to input a new password. After inputting, a prompt information will appear on the screen to prompt users to confirm the new password. Input the new password again till the modification finishes.

_____

Note: The default password is 123456.

_____

4.1.7 SAVE TYPE

Operation steps for setting the type of files

1)   Move the cursor to **SAVE TYPE**, the following soft keys will be displayed.

■   CSV

■   GIF

■   BMP

■   PNG

2)   Use above soft keys to select the type of files.

4.1.8 BUS MODE

This mode is used to select RS232C, USBTMC or USBCDC.

Operation steps for setting bus mode

1)   Move the cursor to **BUS MODE**, the following soft keys will be displayed.

■   RS232C

■   USBTMC

■   USBCDC

2)   Use above soft keys to select the required interface bus.

_____

Note: GPIB optional must be installed before GPIB mode is available.

_____

4.1.9 BAUD RATE

Baud rate is used select the baud rate of the RS232C interface. The available baud rate of this instrument is from 4.800k to 115.200k.
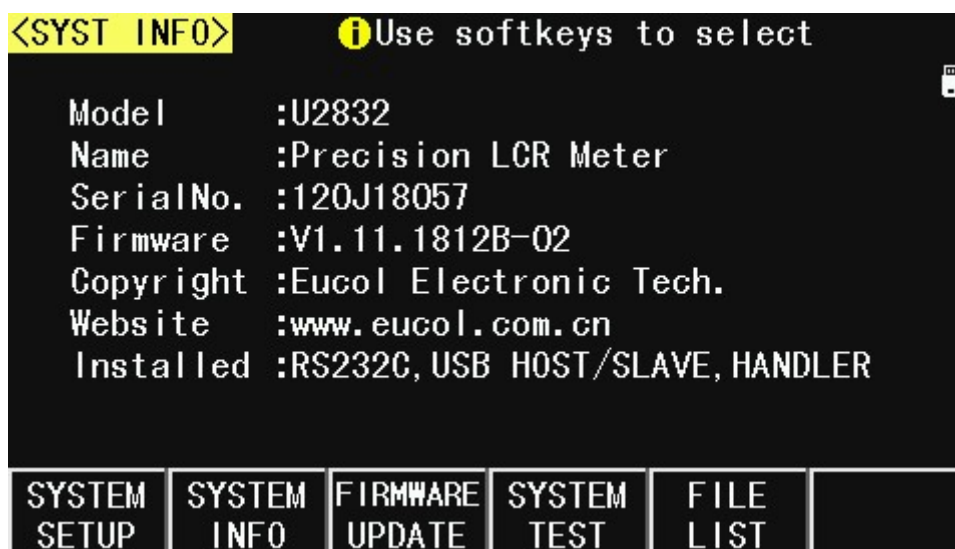
Operation steps for setting the baud rate

1)   Move the cursor to **BAUD RATE**, the following soft keys will be displayed.
    - **1200**
    - **9600**
    - **19200**
    - **38400**
    - **115200**
2)   Use above soft key is to set the baud rate.

4.1.10   DATE/TIME

When move to the time zone, users can set the date and time of the instrument.

4.1.11   SYSTEM INFORMATION

Press **SYSTEM INFO** enter into the **<SYSTEM INFO>** page shown as below.

```
<SYST INFO>      ⓘUse softkeys to select
                                                          🖴

   Model      :U2832
   Name       :Precision LCR Meter
   SerialNo.  :120J18057
   Firmware   :V1.11.1812B-02
   Copyright  :Eucol Electronic Tech.
   Website    :www.eucol.com.cn
   Installed  :RS232C,USB HOST/SLAVE,HANDLER


 SYSTEM   SYSTEM  FIRMWARE  SYSTEM    FILE
 SETUP     INFO   UPDATE     TEST     LIST
```


4.1.12   FIRMWARE UPDATE

1)   Press **FIRMWARE UPDTE** enter into the **<FIRMWARE UPDATE>** page shown as
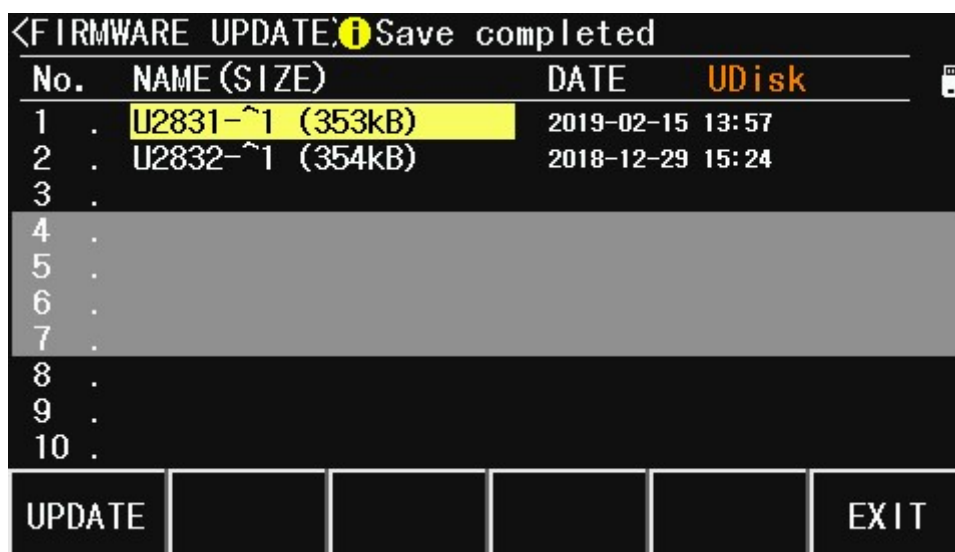
below.

2) Press **UPDTE**, the following soft keys will be displayed.
   - **YES**
   - **NO**
3) Press **YES** soft key to update the firmware of the instrument.

4.1.13   SYSTEM TEST

Press **SYSTEM TEST** enter into the **<SYSTEM TEST>** page shown as below.
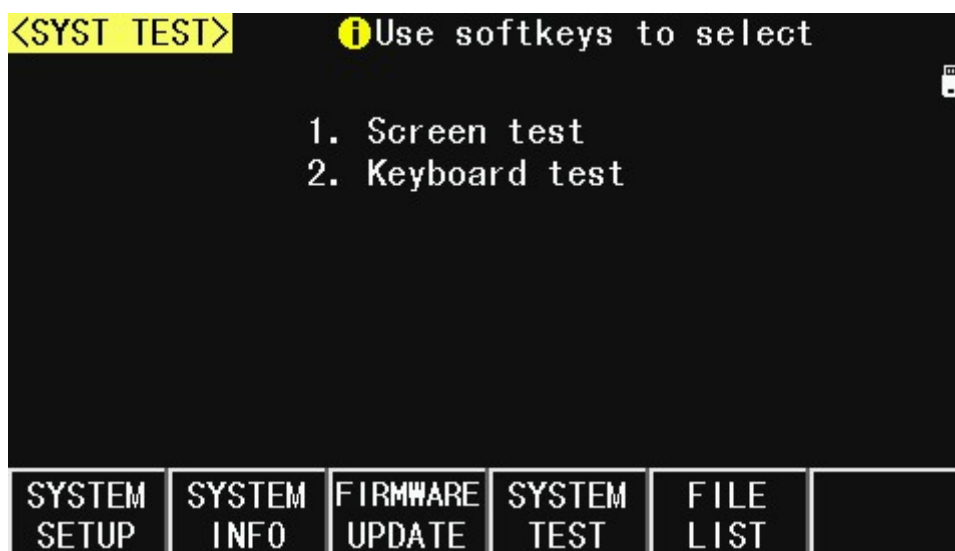
4.2   <FILE>

U2831 instrument can save the user-set parameter to the nonvolatile memory in the form of file, so when use the same setting next time users can load a corresponding file to obtain the parameter set and used last time. By doing so, it can save the time of setting parameter and improve the production efficiency. The file manage function of the transformer scanning

will be described in the part of transformer test setting.

Press [FILE] to enter into the file manage page, shown as below.

4.2.1 Setup file for single-group component (*.EST)

100 groups of different single groups of component set file (*.EST) can be saved in the instrument, but the *.EST file with the number more than 100 should be saved in a flash.

Use **FILE** function on the following File menus, the following data will be saved or loaded in the form of file, which are called *.EST file.

■ Control and setting parameter on <MEAS SETUP> page
    □ FUNC
    □ FREQ
    □ LEVEL
    □ RANGE
    □ SPEED
    □ TRIGG
    □ ALC
    □ DELAY
    □ Rsou
    □ AVG
    □ Vm
    □ Im
    □ DEV A
    □ DEV B
    □ REF A
    □ REF B
■ Control and set parameters on <BIN DISP> page
    □ BIN COUNT (ON/OFF)
■ Control and set parameter on <LIMIT SETUP> page
    □ PARAM (swap parameter)

- □   NOM
- □   MODE (%-TOL/ABS-TOL/SEQ-MODE)
- □   AUX (ON/OFF)
- □   COM (ON/OFF)
- □   High and low limits of each bin

4.2.2 flash manage performance

As described above, U2831 has a standard configuration of USB HOST interface, so a flash drive can be used as the memory media. In this condition, it breaks the memory limit of 100 groups of *.EST files. Meanwhile those files can be copied to IBM PC or compatible desk-top computer, laptop with USB interface to reach the infinite extension.

U2831 supports the USB memory devices as below:

- ■   Meet the USB 1.0/1.1 standard
- ■   Capacity: 32MB/64MB/128MB/256MB
- ■   File format: FAT32(Format the USB memory on Microsoft Windows operation system)

4.2.3 Operation steps for file management

A.   Save the following control and setting parameters to a file by the following steps
1)   Select and set all control and setting parameters on the desired page.
2)   Press [FILE], the following soft keys will be displayed.
   - ■   **LOAD**
   - ■   **SAVE**
   - ■   **DELETE**
   - ■   **COPY**
   - ■   **RENAME**
   - ■   **EXIT**
3)   In the file list, move the cursor to the file-saved position or input the file number directly.
4)   Press **SAVE**, the following soft keys and "File name：" will be displayed.
- ■   **ESC**
5)   Press **ESC** to cancel the current save operation and return step 2.
6)   Use numeric keys to input the current file name and press [ENTER]. Then U2831 will save the control and setting parameters as a file in this name.

B.   Load the control and setting parameters from a file by the following steps
1)   Press [FILE], the file list and the following soft keys will be displayed.
   - ■   **LOAD**
   - ■   **SAVE**
   - ■   **DELETE**
   - ■   **COPY**
   - ■   **RENAME**
   - ■   **EXIT**
2)   In the file list, move the cursor to the file-saved position or input the file number directly.
3)   Press **LOAD**, the following soft keys will be displayed.

- **Yes**
- **No**

4) Press **No** to cancel the current load operation and return step 1.

5) Press **Yes** to load the currently selected file. Then U2831 will return the current display page.

C. Copy a file to an U disk by the following steps

1) Assuming that it is necessary to copy internal files 2 and 3 to files 12 and 13 respectively.

2) Press [FILE], the file list and the following soft keys will be displayed.

- **LOAD**
- **SAVE**
- **DELETE**
- **COPY**
- **RENAME**
- **EXIT**

3) Press **COPY** soft key, the help information display "Input source file's No."

4) Using numeric keys to input the source file's position, press [ENTER],the help information display "Input destination file's No."

5) Using numeric keys to input the destination file's position, press [ENTER],the help information display "Input file's nums."

6) Using numeric keys to input the number of files, press [ENTER],the files are copied to the position.

7) If the input file number is greater than the maximum memory number (100 groups of file setting), the instrument will automatically read and write file in a flash automatically. users have to insert a flash to the USB interface, <u>UDISK OK!</u> will be displayed in the file status zone.

_____

NOTE: Please make sure that users' flash meets the standard that described in this chapter and no write-read protection.

Chapter 5 Execute LCR operation and some examples

5.1 Correct connection of DUT

There are 4 pairs of test terminals: Hcur, Hpot, Lpot, Lcur and corresponding shielding terminals of each terminal.

Each terminal contains shielding layer whose function is to reduce the influence of the ground stray capacitance and the interference of the electromagnetic field. In the process of testing, Hcur, Hpot and Lpot, Lcur are supposed to be connected through DUT lead to form a complete 4-terminal measurement, thus reducing the effect of the lead and the connection points on the test results (especially the dissipation measurement). When testing low-ohm components, Hpot, Lpot are supposed to be connected to the lead terminal so as to avoid the impedance being added to the lead impedance and the connection principle is that the Hpot and Lpot test are supposed to be the actual existed voltage on DUT.

In other words, before connecting to DUT, it is not recommended to connect Hcur, Hpot with Lpot, Lcur, for doing this will increase test error.

If the connection point and the lead resistance R lead are far weaker than the tested impedance (for example: Rlead<Zx/1000, the accuracy error is required to be less than 0.1%), before connecting to DUT, it is recommended to connect Hcur, Hpot and Lpot, Lcur (Two terminal test).

In the test with high accuracy requirement, using Kelvin test leads (standard accessory) will gain better results than using test leads. When Kelvin test leads are used under 10kHz, a better measurement result can be obtained. However, when the frequency is higher than 10kHz, it cannot meet the measurement demand. In high frequency, the change of the clearance between test leads will directly change stray capacitance and inductance on test terminals and this problem is unavoidable, because the test leads cannot be fixed in a position.

Therefore, the test fixture should be used as possible in high frequency. If the test fixture is unavailable or cannot be used, the status of test leads should be the same in the processes of correction and test.

No matter the standard Kelvin test fixture or Kelvin test leads or user-made fixture is used, the following requirements should be met.

1. Distribution impedance must be reduced to the Min, especially when testing high impedance components.

2. Contact resistance must be reduced to Min.

3. Short and open must be available between contact points. Open and short correction can easily reduce the influence of distribution impedance of the test fixture on measurement. For open correction, the clearance between test terminals should be the same with that when they connects with DUT. For short correction, the short plate of low impedance should be connected between test terminals. Another way is to directly connect Hc with Lc or Hp with Lp, then connect both.

Note: When the DUT is a polarity component, before testing, 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 testing, please discharge the tested polarity component so as to avoid the damage to the instrument.
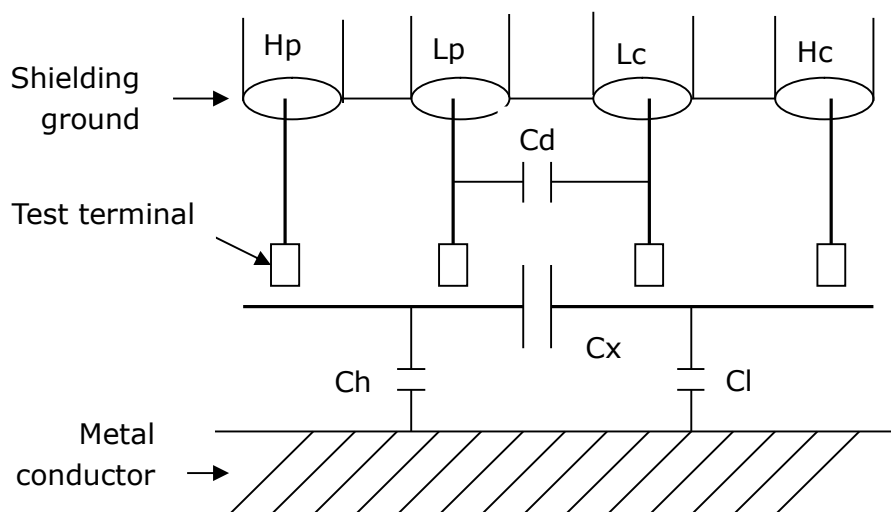
5.2 Eliminate the influence of stray impedance
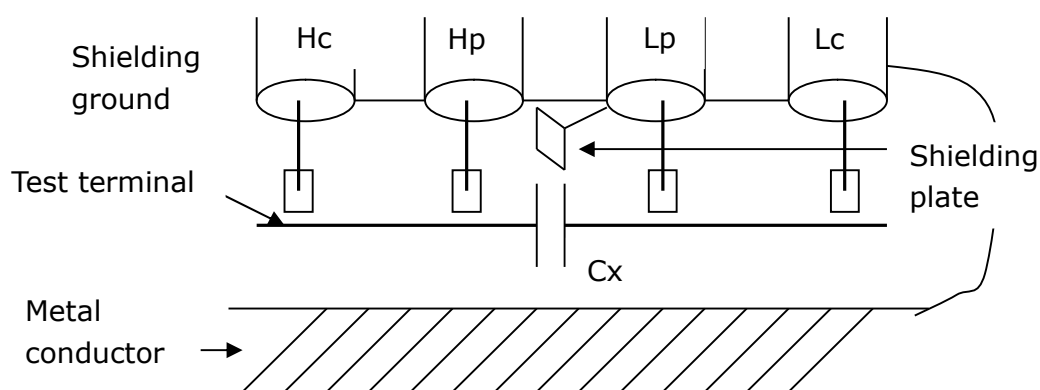

Figure 5-1 Influence of stray capacitance

Figure 5-2   Eliminate the influence of stray capacitance

When the DUT has high impedance(such as small capacitance), the influence of stray capacitance cannot be ignored. Figure 5-1 is an example of the use of 4-terminal pair measurement. In this figure, Cd is connected with Cx in a parallel way and when a conductance plate is positioned under DUT, capacitance Ch will connect with Cx in parallel after connecting with Cl in series and by this way the measurement result will have errors. If a ground conductor is installed between high and low terminals, Cd can be reduced to Min. Meanwhile if the ground terminal is connected to the conductance plate, the influence 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. 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. For 4TP connection, the currents flow through Hc and Lc are equal in value and opposite in direction with those flowing through each shielding terminals. By this way, the magnetic fields produced by these currents can be mutually offset and further eliminate the influence of mutual inductance coupling on test results.

5.3 Operation example for testing inductance with U2831

Test Condition
Function: Ls-Q
Frequency: 5.0kHz
Level: 1.5Vrms
Internal impedance: 100Ω

Operation steps
1) Turn on the instrument.
2) Set basic parameters
    a) Press [MEAS] to enter into the <MEAS DISP> page.
    b) Move the cursor to **FUNC** zone, the current item is displayed as Cp-D.
    c) Press the soft key Ls—…▼, Ls-D, Lp-Q, Ls-Rs, DCR and Ls-DCR will be displayed.
    d) Press Ls-Q to select the Ls-Q function.
    e) Move the cursor to **FREQ**, the current frequency is 1.0000kHz.
    f) Press [5][.][0], +5.0 will be displayed in the prompt information zone at the upper of the screen. The available units Hz, and kHz will be displayed in the soft key zone. Press kHz, the frequency will be changed as 5.000kHz.
    g) Move the cursor to **LEVEL** zone, the current displayed level will be 1.000V.
    h) Press [1][.][5], +1.5 will be displayed in the prompt information zone at the bottom of the screen. The available units mV, V, μA, mA and A will be displayed in the soft key zone. Press [TRG], the level will be changed as 1.5V.
    i) Move the cursor to **RSOU** zone, **30Ω**, **50Ω** and **100Ω** will be displayed in the soft key zone.
    j) Press **100Ω** to select 100Ω as the signal internal impedance.
3) Connect the test fixture (U26004) to the test terminals of U2831.
4) Execute correction (To avoid the influence of stray impedance on measurement accuracy, Open/ Short correction must be operated).
5) Mount the tested inductance to the test fixture.
6) Execute test operation.
Press [MEAS] to enter into the <MEAS DISP> page. The instrument can test continuously and the test result will be displayed in upper case character in the center of the page, shown as below:

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

a) Check the tested inductance is in good connection with the test fixture or not.

b) Check the test fixture is in good connection with the test terminals of the instrument or not.

c) Redo the open/short correction.

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

Chapter 6 Performance and Test

6.1 Test function

6.1.1 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

6.1.2 Test combination

Parameters described above are combined in the following modes:

Primary parameter	Z，Y	L，C	R	G
Secondary parameter	θ（deg phase），θ（rad radian）	D, Q, R_S, R_P, G	X	B

6.1.3 Mathematical operation

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

6.1.4 Equivalent mode

Series and parallel

6.1.5 Range

Auto, Manual (Hold, increase and decrease)

6.1.6 Trigger

Internal, external and manual

Internal: Test DUT constantly and display the result

Manual: Press TRIGGER to test once then the result will be displayed.

External: After HANDLER receiving "start" signal， perform a measurement and output test result.

6.1.7 Delay time

Delay time: time from trigger to start. 0 to 60s are programmable with a resolution of 1ms.

6.1.8 Connection modes of test terminals

U2831 adopts 4-terminal test method.
HD(Hcur): current sample high terminal
LD(Lcur): Current sample low terminal
HS(Hpot)：voltage sample high terminal
LS(Lpot): Voltage sample low terminal

6.1.9 Test speed (Frequency>=10kHz)

Fast：about 40 times/s（27ms/time）
Medium：about 10 times/s（90ms/time）
Slow：about 3 times/s（300ms/time）
The fast and middle speed will be slow down when frequency <10kHz.

6.1.10   Average

Be programmable from 1 to 255.

6.1.11   Display digit

6 digits, max. displayed digit: 999999

6.2   Test signal

6.2.1 Test signal frequency

Test signal is sine wave, accuracy：0.01％
Frequency range：50Hz～200kHz

6.2.2 Signal mode

Normal: When testing, on measurement display page, voltage across test terminals may be smaller than preset voltage.
Constant level: The auto adjustment of internal level makes the voltage of DUT accordant with preset voltage.

6.2.3 Test signal level

	Mode	Range	Accuracy	Resolution
Voltage	Normal	10mV$_{RMS}$—2V$_{RMS}$	±（10%×preset value+2mV）	10mV

6.2.4 Output impedance

30Ω, 50Ω and 100Ω are selectable.

6.2.5 Monitor for test signal level

Mode	Range	Accuracy
Voltage	10mV$_{RMS}$—2V$_{RMS}$	±（3%×reading+0.5mV）
Current	50μA$_{RMS}$—20mA$_{RMS}$	±（3%×reading +5μA）

6.2.6 Maximum measurement display range

Parameter	Measurement display range
L	0.00001μH ～ 99.9999kH
C	0.00001pF ～ 9.99999F
Z、R、X	0.00001Ω～ 99.9999MΩ
Y、B、G	0.00001μs ～ 99.9999S
D	0.00001 — 9.99999
Q	0.00001 — 99999.9
θ	Deg -179.999°～179.999° Rad -3.14159 ～ 3.14159
DCR	0.1mΩ～ 999.999MΩ

6.3 Measurement accuracy

Test accuracy includes stability、temperature coefficient、linear degree、test repeatability and calibration inter-error.

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

    a.   warm-up time：≥ 30 min

    b.   cable：0m，1m

    c.   correct open and short correction after warming up

    d.   DC bias is in the position of "OFF"

    e.   The range works in "AUTO" to select correct test range

6.3.1 Accuracies 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：

Aₑ = ±[A+（Kₐ+Kᵦ+K_c）×100+ K_d +K_f]×Kₑ [%]

A： basic test accuracy（figure A）

Kₐ：impedance rate factor（table A）

Kᵦ：impedance rate factor（table A）

K_c：calibrated inter-factor（table B）

K_d：cable length factor（table D）

Kₑ：temperature factor（table E）

Kf：scan fixture modification factor（no add：Kf = 0, add：Kf = 0.2）

L, C, X, B accuracy using condition：D_x（Test value）≤0.1

R, G accuracy using condition：Q_x（Q test value）≤0.1

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

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

Accuracy of G can only be available in G-B combination

6.3.2 Accuracy of D

The accuracy of D is given by Dₑ：

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

The formula is only available when D_x≤0.1.

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

6.3.3 Accuracy of Q

The accuracy of Q is given by the formula below：

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

Where，Q_x is the value of the tested Q.

Dₑ is the accuracy of D

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

6.3.4 Accuracy of θ

The accuracy of **θ** is given by the formula below：

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

6.3.5 Accuracy of G

When Dx (tested value of D)≤0.1

The accuracy of G is given by the formula below：

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

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

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

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

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

D_e is the accuracy of D.

F is test frequency.

The accuracy of G is only available in C_p-G and L_p-G combination

6.3.6 Accuracy of Rp

when D_x（value of tested D）≤0.1

The accuracy of R_p is given by the formula below：

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

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

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

D_e is the accuracy of D.

6.3.7 The accuracy of Rs

when D_x（value of tested D）≤0.1

The accuracy of R_s is given by the formula below：

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

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

Where, X_x is the value of test X with the unit [S].
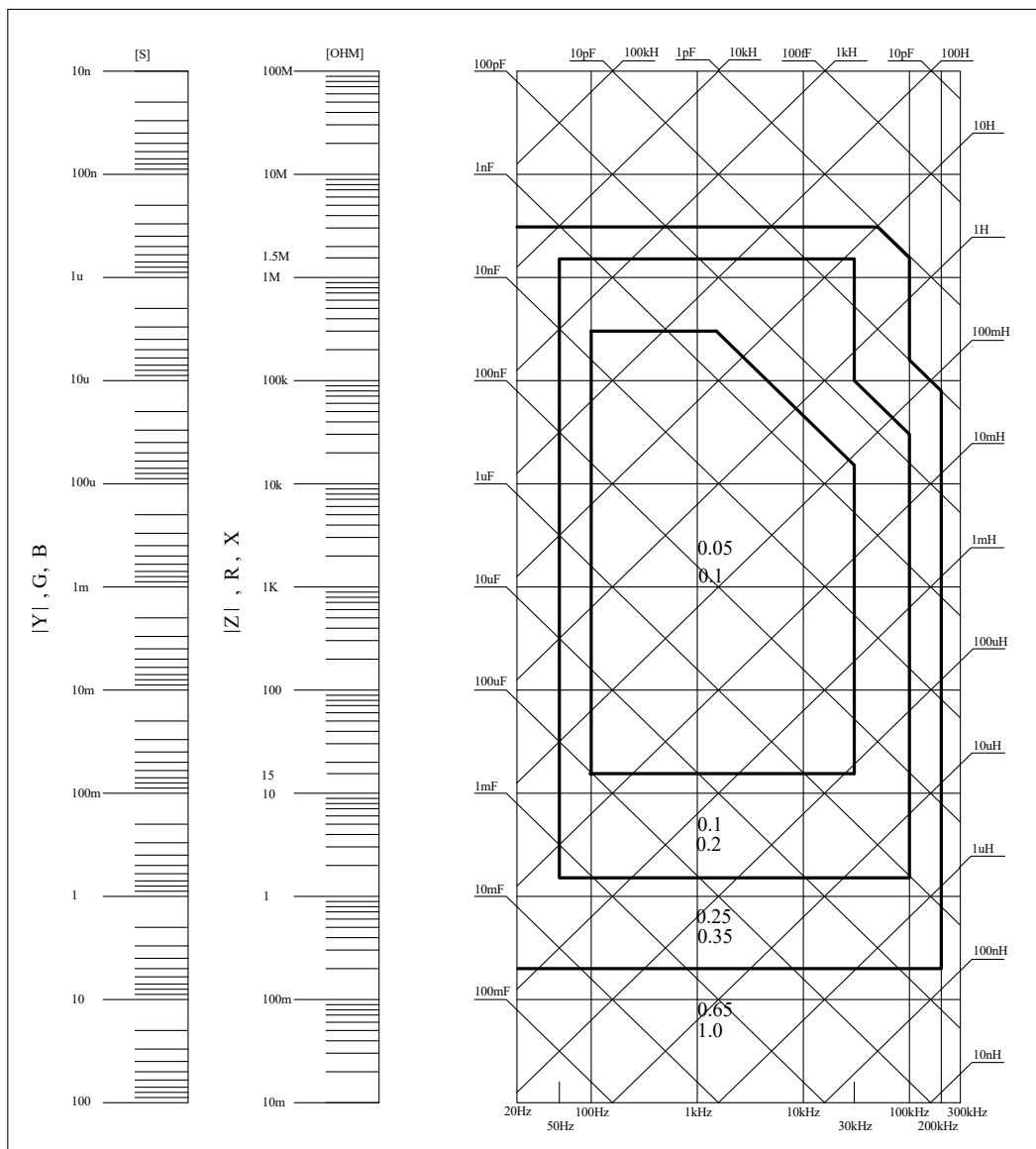
C_x is the value of test C with the unit [F].

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

D_e is the accuracy of D

F is test frequency

6.3.8 Accuracy factor

Figure A shows the basic measurement accuracy A.

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

In this figure, the basic accuracy value A can be obtained by the following methods:

0.1---When $0.4V_{rms} \leq V_s \leq 1.2V_{rms}$, the test speed is the value A of medium, slow and fast.

0.2---When $0.4V_{rms} \leq V_s \leq 1.2V_{rms}$, the test speed is the value A.

When $V_s < 0.4V_{rms}$ or $V_s > 1.2V_{rms}$, the calculation method of value A is as the following steps:

    1.   Obtain A according to the current measurement speed;

    2.   According to the current test signal voltage to select the accuracy modification coefficient A_r (refer to figure B), the current basic measurement accuracy A is obtained by multiplying A got in step 1 with A_r.

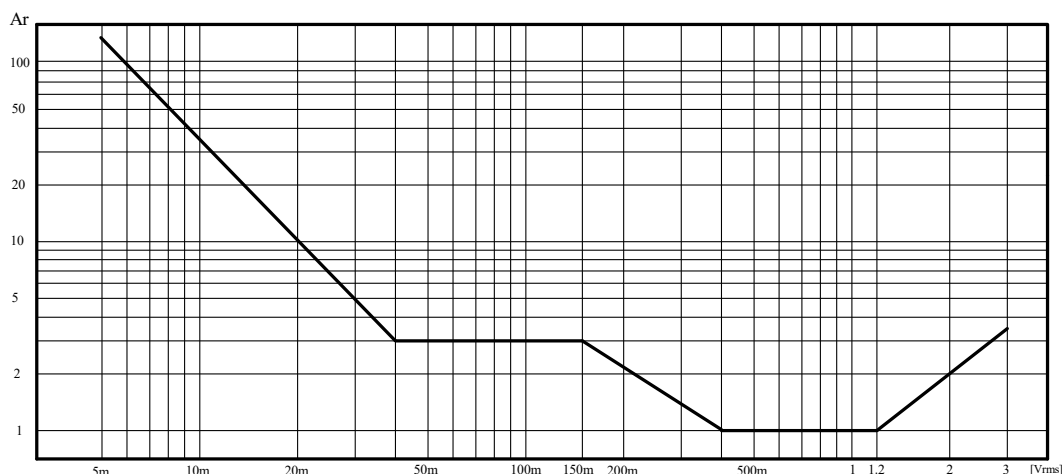Figure B is the basic accuracy modification curve, where V_s is the test signal voltage.

Table A   Impedance rate factors: K_a, K_b

Speed	Frequency	K_a	K_b
Medium Slow	$f_m<100Hz$	$(\frac{1\times10^{-3}}{|Z_m|})(1+\frac{200}{V_s})(1+\sqrt{\frac{100}{f_m}})$	$|Z_m|(1\times10^{-9})(1+\frac{70}{V_s})(1+\sqrt{\frac{100}{f_m}})$
	$100Hz\leq f_m \leq100kHz$	$(\frac{1\times10^{-3}}{|Z_m|})(1+\frac{200}{V_s})$	$|Z_m|(1\times10^{-9})(1+\frac{70}{V_s})$
	$100kHz<f_m \leq200kHz$	$(\frac{1\times10^{-3}}{|Z_m|})(2+\frac{200}{V_s})$	$|Z_m|(3\times10^{-9})(1+\frac{70}{V_s})$
Fast	$f_m<100Hz$	$(\frac{2.5\times10^{-3}}{|Z_m|})(1+\frac{400}{V_s})(1+\sqrt{\frac{100}{f_m}})$	$|Z_m|(2\times10^{-9})(1+\frac{100}{V_s})(1+\sqrt{\frac{100}{f_m}})$
	$100Hz\leq f_m \leq100kHz$	$(\frac{2.5\times10^{-3}}{|Z_m|})(1+\frac{400}{V_s})$	$|Z_m|(2\times10^{-9})(1+\frac{100}{V_s})$
	$100kHz<f_m \leq200kHz$	$(\frac{2.5\times10^{-3}}{|Z_m|})(2+\frac{400}{V_s})$	$|Z_m|(6\times10^{-9})(1+\frac{100}{V_s})$

Where, f_m is the test frequency and the unit is [Hz].

The unit of the tested impedance is [Ω].

The unit of the test signal voltage is [mV$_{rms}$].

When the impedance is smaller than 500Ω, K_a, K_b is unavailable.

When the impedance is greater than 500Ω, K_a, K_b is unavailable.

Table B calibrated interpolating factor K_C

Test frequency	K_c
Direct calibrated frequency	0
Other frequency	0.0003

Table C Direct Calibrated frequency

			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]

There are 43 frequencies in table C, there is no 250kHz and 300kHz in U2831.

Table D Cable length factor K_d

Test signal level	Cable length		
	0m	1m	2m
≤1.5V$_{rms}$	0	$2.5×10^{-4}$（$1+50×f_m$）	$5×10^{-4}$（$1+50×f_m$）
>1.5V$_{rms}$	0	$2.5×10^{-3}$（$1+16×f_m$）	$5×10^{-3}$（$1+50×f_m$）
f_m: test frequency [MHz]			

Table E   Temperature factor K_e

Temperature（°C）	0-8	8-18	18-28	28-38	38-48
K_e	4	2	1	2	4

6.3.9 Accuracy of DCR

$A(1+R_x/5MΩ+16mΩ/R_x)[\%]$ ±0.2mΩ

When the instrument is in Middle and slow speed，A=0.25

In Fast speed, A=0.5

Where, R_x is the tested resistance.

6.4 Safety requirement

The instrument is the Ⅰ class safety instrument.

6.4.1 Insulation resistance

Under reference working condition，the insulation resistance between power terminal and instrument jacket should not be smaller than50MΩ.

Under humility condition, the insulation resistance between voltage terminal and instrument jacket should not be smaller than 2 MΩ.

6.4.2 Insulation intensity

Under reference working condition, the insulation between the power terminal and the

instrument jacket should bear an AC voltage (50Hz frequency and 1.5kV rated voltage) for 1 minute and there is no breakdown and flashover.

6.4.3 Leakage current

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

6.5   Electromagnetic compatibility

■   Transient sensitivity, based on the requirement of GB6833.4.
■   Conductive sensibility, based on the requirement of GB6833.6.
■   Radiated interference, based on the requirement of GB6833.10.

6.6   Performance test

6.6.1 Working condition

All tests should be performed under the working condition listed in Chapter 1. In this part, only the main indexes are listed. Users can make test under the specified condition mentioned in this manual. Performance test can be worked in the warm up conditions discussed in Chapter 1.

6.6.2 The used instruments and devices

No.	Instrument and Device		Specification
1	Standard capacitor	100pF	0.02％ D is known
		1000pF	
		10000pF	
		10nF	
		0.1uF	
		1uF	
2	AC standard resistor	10Ω	0.02％
		100Ω	
		1kΩ	
		10kΩ	
		100kΩ	
3	DC standard resistor	0.1Ω	0.02％
		1Ω	
		10Ω	
		100Ω	
		1kΩ	
		10kΩ	
		100kΩ	
4	Standard inductor	100μH	0.02%
		1mH	
		10mH	
		100mH	
5	Frequency counter		（0～1000）MHz
6	Digital Multimeter		0.5％
7	Insulation resistance meter		500V 10 levels
8	Hipot Tester		0.25kW （0～500）V

6.6.3 Function check

Ensure function keys, displayer and terminal etc. can work normally.

6.6.4 Test signal level

Adjust multimeter in AC voltage range, where one test cable is connected to H_{CUR} and the other is connected to ground terminal. Change level as: 10mV, 20mV, 100mV, 200mV, 1V, 2V, the reading should meet the demand of test signal level in this chapter.

6.6.5 Frequency

Connect frequency meter to ground terminal. The test terminal of the frequency meter is connected with $H_{CUR.}$ Change the frequency as: 20Hz, 100Hz, 1kHz, 10kHz, 100kHz, 200kHz. The reading of frequency meter should meet the demand of the test signal frequency in this chapter.

6.6.6 Measurement accuracy

Basic parameters are R, L, C and D，so measurement accuracy is mainly about   R, L, C and D.

6.6.7 Accuracy of C and D

Function C_p-D
Test frequency   100Hz   1kHz   10kHz   100kHz   Test respectively
Level   1V
Range   AUTO
Bias   0V
Speed   Slow

Open and short correction should be made before testing. Connect standard capacitors: 100pF, 1000pF, 10nF, 0.1uF, 1uF and change the frequency. The error capacitance C between reading and nominal value should be in the range ruled in this chapter, dissipation D should be in the range ruled in this chapter.

6.6.8 Accuracy of L

Test condition:
Function L_s-Q
Test frequency   100Hz   1kHz   10kHz   100kHz   Test respectively
Level   1V
Range   AUTO
Bias   0V
Speed   Slow

Open and short correction should be made before testing. Connect standard inductors: 100μH, 1mH, 10mH, 100mH and change the frequency. The error between reading and nominal value should be in the range ruled in this chapter.

6.6.9 Accuracy of Z

Test condition:

Function   Z-θ

Test frequency   100Hz   1kHz   10kHz   100kHz   Test respectively

Level   1V

Range   AUTO

Bias   0V

Speed   Slow

Open and short correction should be made before testing. Connect standard AC resistors: 10Ω, 100Ω, 1kΩ, 10kΩ, 100kΩ and change the frequency. The error between reading and nominal value should be in the range ruled in this chapter.