OPERATION MANUAL

TH2825/A LCR Meter

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Chapter 1 General Introduction

Thank you for purchasing our product. The contents of the shipment should be as listed in the packing list. If the contents are incomplete, if there is mechanical damage or defect, or if the instrument does not pass the power-on self tests, please notify our company.

1.1 Foreword

TH2825A is a precision LCR meter with high speed, good stability, and wide measurement range. Controlled by a 16 bits MPU, TH2825A can be used for evaluating LCR components, materials and semiconductor devices over a wide range of frequencies (50 Hz to 100 kHz) and test signal levels (0.01V to 1.00V). With its powerful function, excellent performance, perspicuous LCD display and easy menu operation, TH2825A is suitable for high speed measurement need on product line and high accuracy and stability measurement need in laboratory. By using the Handler interface, IEEE488 interface (optional), and RS232C interface, TH2825A can easily be used for automatic test system and computer remote control.

The instrument provides variable test conditions, typical conditions are as follows:

- ***Basic accuracy:*** 0.1%
- ***Test signal frequency***

  10 typical frequency points available from 50 Hz to 100 kHz: 50Hz, 60Hz, 100Hz, 120Hz, 1kHz, 10kHz, 20kHz, 40kHz, 50kHz, 100kHz.
- ***Test signal level***

  Programmable signal level from 0.01 V to 1.00 V in 0.01 V resolutions.
- ***Measurement speed***

  Fast, Medium and Slow measurement speed can be selected, and ultrahigh speed test performance of 15ms/time, can improve the working efficiency effectively.
- ***Constant selectable source resistance***

  25 Ω or 100Ω
- DC bias

DC bias voltage and current are available.

- ***Test signal monitor:***The actual test signal exerted on the DUT is different from the programming setup due to the partial pressure between the tested impedance and source impedance, and the instrument can display the voltage exerted on the DUT and the actual current flowing the DUT
- ***Correction function***

  The OPEN, SHORT correction for correcting the stray admittance, the residual impedance, and the other errors can be performed. The correction function has two kinds of correction methods. In one method the open and short correction can be performed at all of the frequency points, and in the other method the open, short correction can be performed at the frequency points you specify.

TH2825A provides 3 display modes and 2 kinds of sorting modes:

- ***Direct:*** The actual measurement results are displayed.

  Absolute deviation (ΔABS): The difference between the measured value of the DUT and a previously stored reference value are displayed.

  Percentage deviation (Δ%): The difference between the measured value of the DUT and a previously stored reference value are displayed as a percentage of the reference value.
- ***Component sorting:*** two sorting modes, absolute deviation and percent deviation can be used.

  Instrument can set 8 bin main parameter limit, 1 bin sub parameter limit, and can output 8 pass bin, 1 secondary parameter fail bin and 1 fail bin signal.
- ***Component comparison:***:Two comparison modes, absolute deviation and percent deviation can be used.

  The instrument can set main parameter limit, subparameter limit, and the pass or fail message of main and sub parameters can be output.

TH2825A provides several communication interfaces which make it easy to output the measurement results to other equipments (for example computers), or build an automatic test system.

- ***RS232C interface:*** RS232C interface makes it easy to communicate with other equipments. You can set the measurement functions and input the parameters through RS232C interface instead of keyboard on front panel.
- ***IEEE488 interface (optional):*** IEEE488 interface helps instrument to build

an automatic test system with computer and other measurement instruments. Command of RS232C and IEEE488 interfaces are programmed in the format of common SCPI.

- ***HANDLER interface:*** By using the handler interface, the instrument can easily be combined with a component handler, and a system controller to fully automate component testing, sorting, and quality control data processing.

TH2825A has the file function to store the set parameters, limit parameters and list sweep parameters as a file in the internal nonvolatile memory, so that the setups can be easily reloaded, and the default file will be automatically reloaded when TH2825A is turned on.

1.2 Operating Conditions

1.2.1 Power requirements

Voltage: 220V (1±10%)

Frequency: 50Hz/60Hz (1±5%)

Power: <50VA

1.2.2 Operating temperature and humidity

Temperature: 0°C～40°C

Humidity: <90%RH

1.2.3 Warm-up time

More than 20 minutes after the instrument is turned on.

1.2.4 Notices

- Please do not operate the instrument in the place that is vibrative, dusty, under direct sunlight, or where there is corrosive air.
- 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.
- Please store the instrument in the place where temperature is between 5℃ and 40℃, humidity is less than 85% RH. If the instrument will not be put in use for a time, please have it properly packed with its original box or a similar box for storing.

- Don’t turn on and off the instrument frequently, doing so will lead to the loss of the calibrated data and the data saved by users.

1.3 Dimensions & Weight

Dimensions: 350×110×340 (mm^3)
Weight: approx. 4kg

1.4 Safety Summary

The following general safety precautions must be observed during all phases of operation, service, and repair of this instrument.

- Ground the instrument

To avoid electric shock hazard, the instrument chassis and cabinet must be connected to a safety earth ground by the supplied power cable with earth blade.

- DO NOT operate in an explosive atmosphere

Do not operate the instrument in the presence of flammable gasses or fumes. Operation of any electrical instrument in such an environment constitutes a definite safety hazard.

- Keep the instrument away from live circuits

Operator can not remove instrument’s cover. Component replacement and internal adjustments must be made by qualified maintenance personnel. Do not replace components with the power cable connected. Under certain conditions, dangerous voltages may exist even with the power cable removed. To avoid injuries, always disconnect power and discharge circuits before touching them.

- DO NOT attempt service or adjustment alone

Do not attempt internal service or adjustment unless another person, capable of rendering first aid and resuscitation, is present.

- DO NOT substitute parts or modify instrument

Because of the danger of introducing additional hazards, do not install substitute parts or perform unauthorized modifications to the instrument. Return the instrument to our Sales and Service Office for service and repair to ensure that

safety features are maintained.

1.5 Electromagnetic Compatibility

This product has been designed and tested to the requirements of the Electromagnetic Compatibility (EMC) Directive. To use a properly shielded cable or shielded coaxial cable to connect each of the ports to their respective controllers, peripherals, equipments or devices may ensure to meet the requirements.

1.6 Symbols and Abbreviations

ABS	absolute
ADDR	address
ALCZ	auto LCZ
ASCII	American Standard Code for Information Interchange
AUX	auxiliary
BIASM	bias mode
BINn	bin number
COMP	compare
Cs	equivalent serial capacitance
Cp	equivalent parallel capacitance
D	dissipation factor
DCL	device clear
DCHR	discharge
DCR	DC resistance
DELIM	delimiter
DIR	direct
DUT	device under test
EXT	external
EOM	end of measurement
EOI	end or identify
ESR	equivalent serial resistance
FREQ	frequency

GTL	go to local
GET	group execution trigger
GPIB	general-purpose interface Bus
HDL	Handler interface
IDX	index
IFC	interface clear
INT	internal
KBEEP	kep beep
KLOCK	key lock
L2A	primary inductance by 2-wire measurement
L2B	secondary inductance by 2-wire measurement
LCD	liquid crystal display
LCR	inductance, capacitance, resistance
LCZ	inductance, capacitance, impedance
Lk	leakage inductance
Lp	equivalent parallel inductance
Ls	equivalent serial inductance
M	mutual inductance
MAN	manual
N	turns ratio
NOM	nominal value
PARA A	parameter A
PARA B	parameter B
PER	percentage
PHI	primary high
PLO	primary low
Q	quality factor
R	resistance, real part of impedance
R2	DC resistance by 2-wire measurement
RMT	remote control
Rs	equivalent serial resistance
RS	recommendation standard
Rp	equivalent parallel resistance
SCPI	standard command of programmable instruments
SDC	selected device clear

SEC	secondary parameter
SMD	surface mount devices
SREJ	secondary reject
SRES	source resistor
TRGEG	trigger edge
TRIG	trigger
X	reactance, imaginary part of impedance
Z	impedance
θ	phase angle
4TP	4-terminal pair

Chapter 2 Panel Introductions

2.1 A Tour of Front Panel

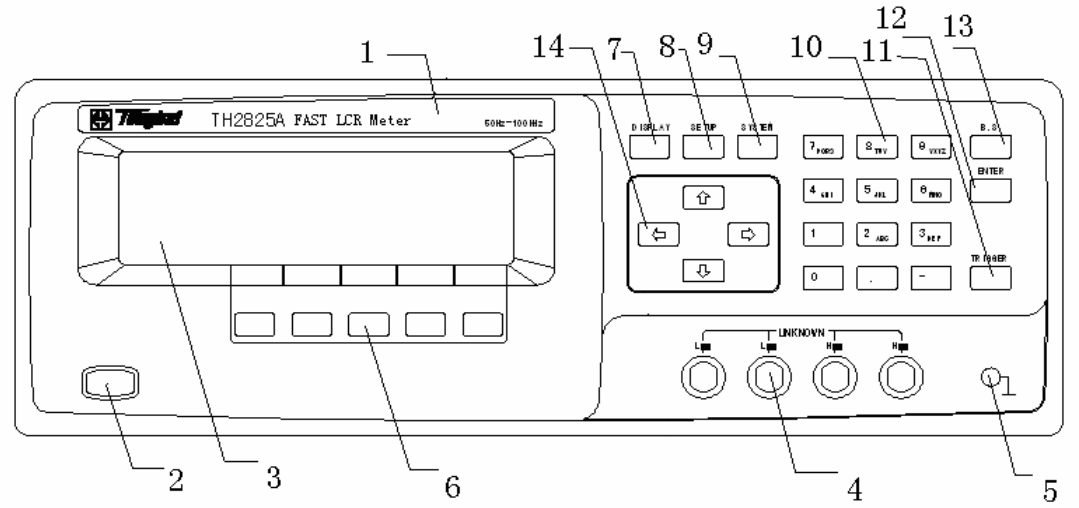


Figure 3-1 Front panel overview

1) Brand and Model

The registered brand of our company and model of the instrument are printed.

2) Power on/off

Power on/off switch. In the “I” position all operating voltages are applied to the instrument. In the “O” position NO operating voltages are applied to the instrument.

3) LCD

240×64 dot-matrix Liquid Crystal Display (LCD) displays measurement results, test conditions, etc.

4) UNKNOWN terminals ⚠

These are the UNKNOWN Terminals used to connect a four-terminal pair test fixture or test leads for measuring the device under test.

HD(H_{CUR}): High current drive

HS (H_{POT}): High potential sense

LS (L_{POT}): Low potential sense

LD (L_{CUR}): Low current drive

5) Frame terminal ⚠

This is the FRAME Terminal which is tied to the instrument's chassis and which can be used for measurements that require guarding.

6) Soft keys

The functions of five keys are not fixed; there are different functions in different menus. Five soft keys are used to select control and parameter functions. The current function of each soft key is accordingly displayed in the soft key area at the bottom of LCD.

7) DISPLAY menu key

Press DISPLAY menu key to enter the ***Meas Display*** page.

8) SETUP menu key

Press SETUP menu key to enter the ***Meas Setup*** page.

9) SYSTEM menu key

Press SYSTEM menu key to enter the ***System Config*** page.

10) Number keys

The NUMBER keys are composed of the digits 0 to 9, a period ., a minus sign -, number keys are used to enter numeric data into the TH2825A.

11) TRIGGER key

This is the TRIGGER key used to manually trigger the TH2825A when it is set to the Manual Trigger mode

12) ENTER key

Confirm the input digits

13) B.S. key

BACKSPACE Delete the digit or character input by fault

14) Cursor keys

The CURSOR arrow keys are used to control the cursor to move from field to field on the LCD display page. The selected control parameter is displayed with an inverse video image of the original field.

2.2 A Tour of Rear Panel

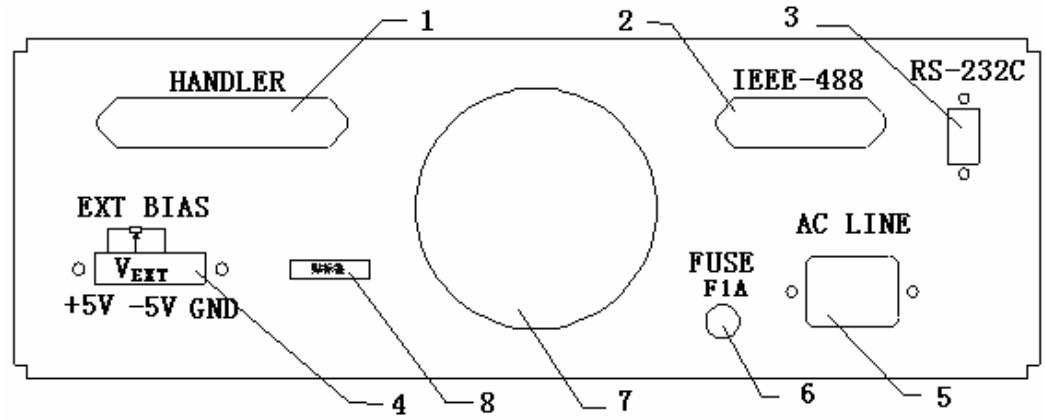


Figure 2-2 Rear panel overview

1) HANDLER interface connector

The HANDLER interface connector is used when operation with a component handler to fully automate component testing, sorting, and quality control data processing.

2) IEEE488 (GPIB) interface connector (Optional)

It provides the General Purpose Interface Bus which connects the instrument and the outer equipment. All parameter set as well as the order can be set and obtained by computer to realize the remoted control to the instrument.

3) RS232C interface connector

The RS232C interface connector is used when operating on the serial interface.

4) Bias voltage monitoring terminal

Internally equipped with adjustable -5V～+5V bias voltage, the instrument can monitor actual bias voltage through DC bias meter.

5) LINE input receptacle

AC power cord receptacle.

6) Fuse holder

Fuse holder for TH2825A line fuse, 220Vac, 1A.

7) Fan

8) Name plate

Name plate is used to provide the information of date, model, lot number and manufacturer etc.

★ Figure2-2 Notes:：

Notes: The calculating formula of bias voltage is listed as below

$$V_{DC} = \frac{R2}{R1 + R2} \times 10V - 5V$$

V_{DC}： Bias voltage value

R1，R2： External resistance value (can be replaced by a potentiometer)

R1：The resistance between +5V and V_{EXT}

R2: The resistance between -5V and V_{EXT}

☞**Note**： User can test the voltage value between V_{EXT} and GND directly to monitor the added voltage value by using multimeter or oscilloscope

☞**Note**： The adjustable range of external bias voltage is -5V～+5V

Display Area Definition

The display area on the LCD is divided into the areas show in Figure 3-3.

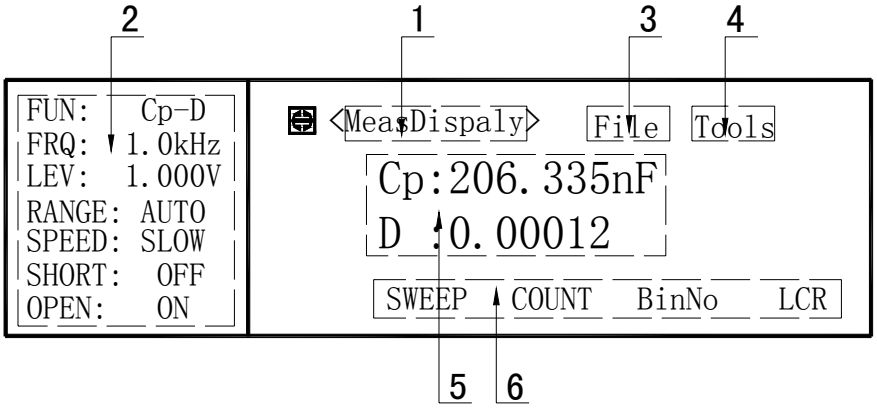


Figure 2-3. Display Area Definition

2.3 Display Page Area

1) Display page menu area

   In this area, the name of the current page is displayed

2) Measurement parameter area

   Some parameter settings applied in measurement is diplayed

3) File menu area

   The load or storage of file can be executed

4) Tool menu area

   The special functions of some display page can be executed using this menu

5) Measurement result display area

   The measurement result of DUT is displayed

6) Softkey function area

   The function of softkey in the current menu or some parameter of setting state is displyed

2.4 Summary of Pages

MeasDisplay

This display page provides the information of measurement results, and

some control settings are entered from this page. TH2825A measures the DUT from this page, and displays the measurement results in large or normal size characters. This display page is the default display page when TH2825A is turned on.

BinNo. Disp

This display page provides the information of bin sorting result, the measurement results, and comparator function on/off settings. The TH2825A measures the DUT from this page. The bin number is displayed in large characters, and the measurement results are displayed in normal size characters.

Bin Count

This display page provides the limit table's conditions, and the comparator's bin counter results. The TH2825A can measure the DUT from this page, but the measurement results will not be displayed.

List Sweep

This display page provides the list sweep measurement results, and selection of the sweep mode (STEP/SEQ). The TH2825A measures the DUT based on the list sweep conditions in the *List Setup* page. The current measuring point in the list sweep points is displayed in an inverse video image of the original field. The list sweep point cannot be set from this page. You must use the *List Setup* page to set the list sweep points.

Meas Setup

This display page provides all of the measurement control settings. TH2825A can not perform a measurement from this page, and the measurement result can not be displayed on this page. When you want to measure the DUT using the control settings on this page, use one of the display pages from DISPLAY menu key.

User Correction

This display page provides the correction function. The correction function should be used to measure the DUT accurately. OPEN/SHORT

correction, OPEN/SHORT/LOAD correction are available in this page. TH2825A can not perform a measurement from this page, and the measurement result can not be displayed on this page.

Limit Table

This display page provides the limit table settings for bin sorting. TH2825A doesn't perform measurement from this page. To see the comparison results, either the ***BinNo. Disp*** page or the ***Bin Count*** page should be used.

List Setup

This display page provides the control settings for the List Sweep measurement function. TH2825A doesn't measure the DUT from this page. To measure the DUT using the list sweep function, the ***List Sweep*** page should be used.

System Config

This display page provides the system information and control settings, such as LCD contrast adjustment, PASSWORD, and GPIB ADDRESS etc.

File List

This display page provides the file list information including file name, maximum files, used files etc. You can load, rename and delete a file from this page.

Self Test

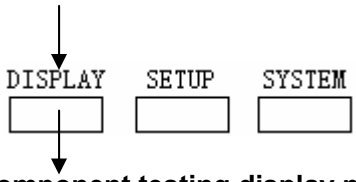
This display page cannot be used by users.

System Debug

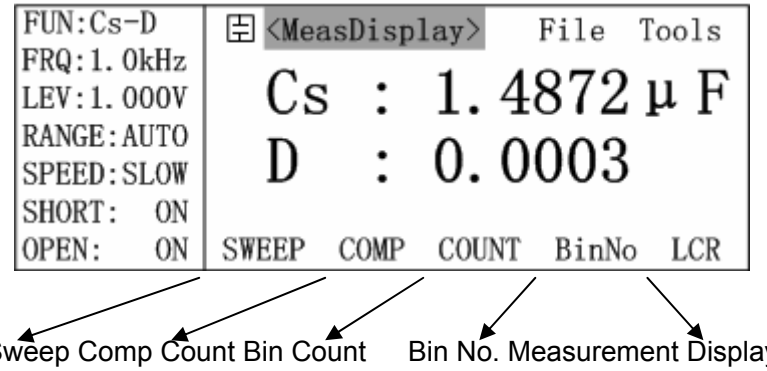
This display page cannot be used by users.

2.5 Flow chart of each page

1. DISPLAY menu page



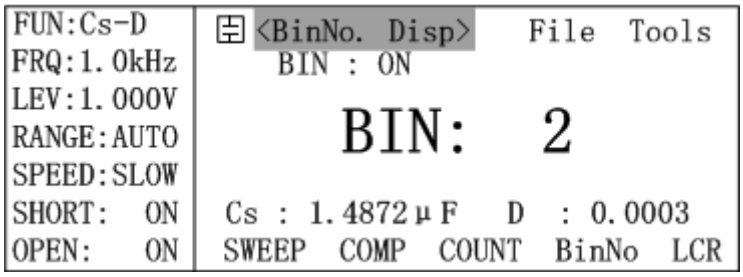
Component testing display page



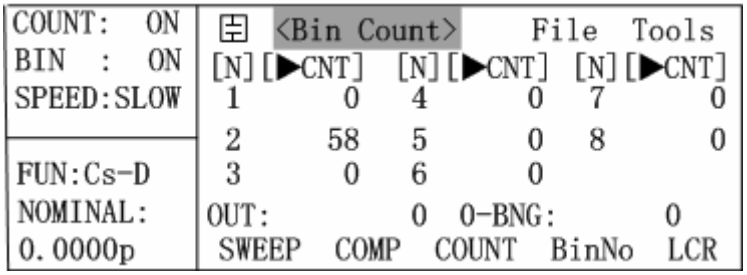
List Sweep Comp Count Bin Count Bin No. Measurement Display

☞**NOTE**：The List Sweep display is only forTH2825, there is no such a cue "SWEEP" in TH2825。

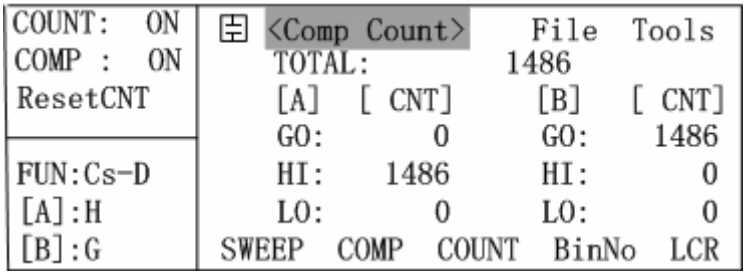
Bin No. display：



Bin Count display：



Comp Count display：



List Sweep display：（only for TH2825A）

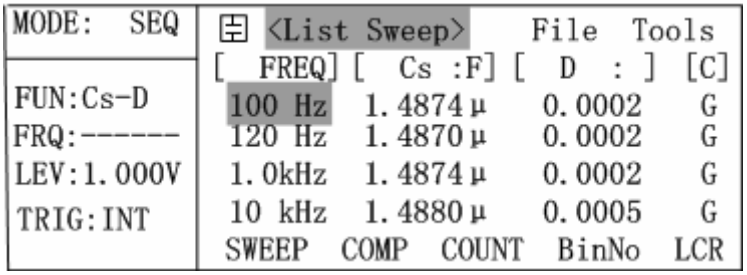
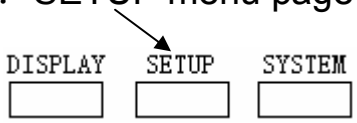
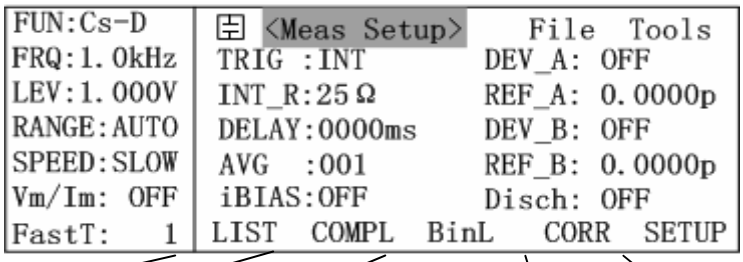


Figure2-4 DISPLAY Menu

2. SETUP menu page



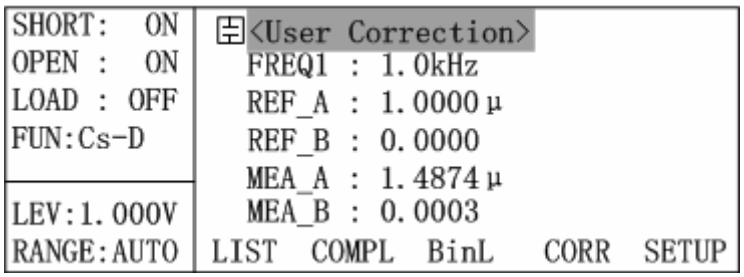
Measurement Setup display：



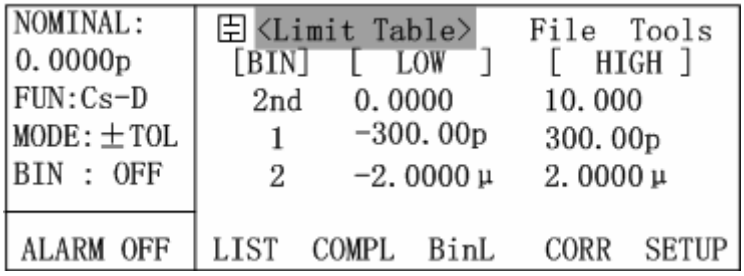
List Sweep CompSetup Limit Table Correction Measurement Setting

☞**Note**：The List Sweep display is only forTH2825, there is no such a cue "SWEEP"in TH2825。

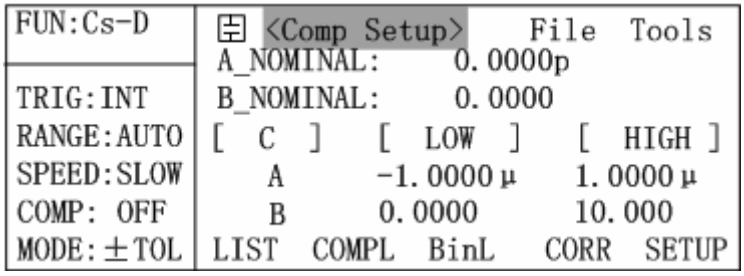
User correction display：



Bin Limit List setup display：



Comp Limit setup display：



List Sweep setup display：（only for TH2825A）

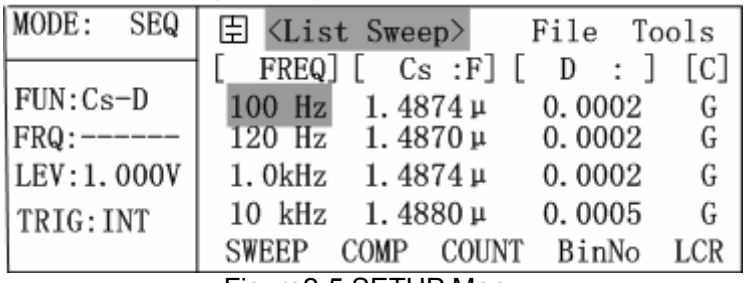
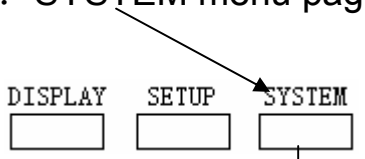
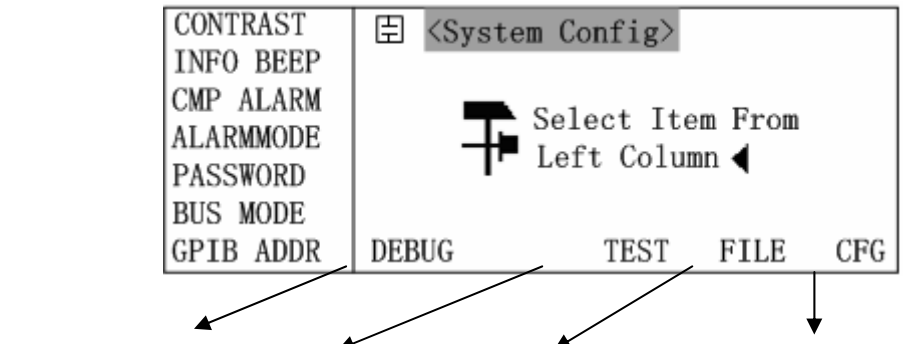


Figure2-5 SETUP Menu

3. SYSTEM menu page



System Setup display：



Deliberation page Test page File list page System configuration page

Files List display ：

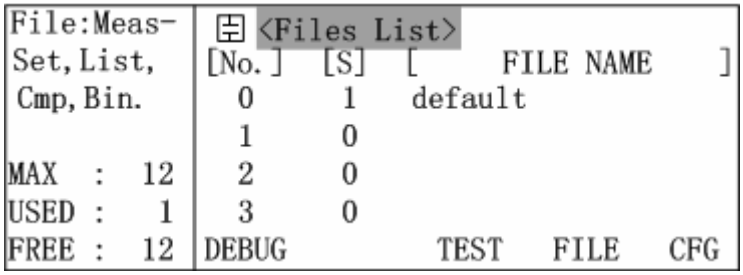


Figure2-6 SYSTEM Menu

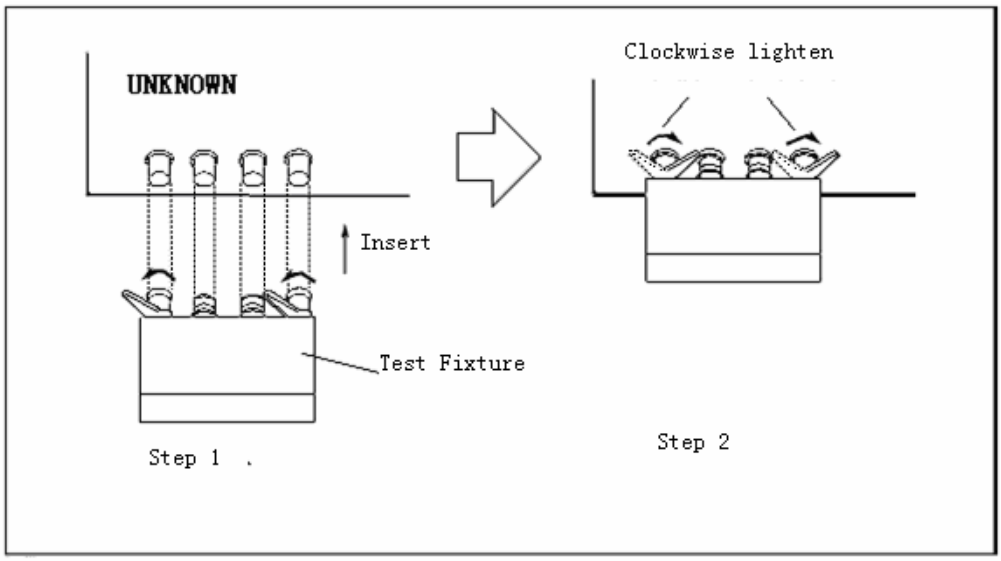
Measurement display：Not open to user；
Calibration display：Not open to user

Chapter 3 Operation Instructions

3.1 Basic operation

The basic operation is listed as below:

- Connection



Fugure3-1 Connection Display

- Display the needed page using the keys from main menu and software together（refer to §2.5）
- Move the cursor to the area needing setup using the direction keys

As the figure listed below，the cursor has moved to 1.0kHz after two operations of direction keys.

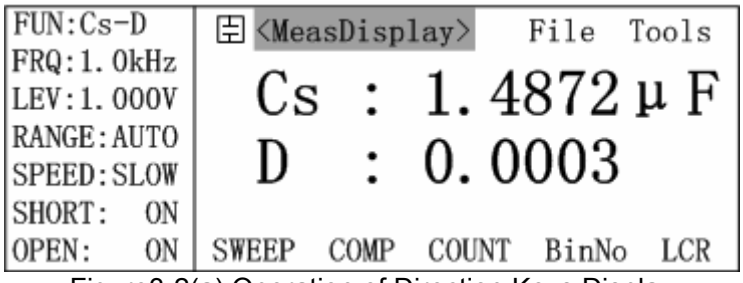


Figure3-2(a) Operation of Direction Keys Display

STEP1：Press left key ⇦，the cursor moves from “<MeasDisplay>” to “C”；

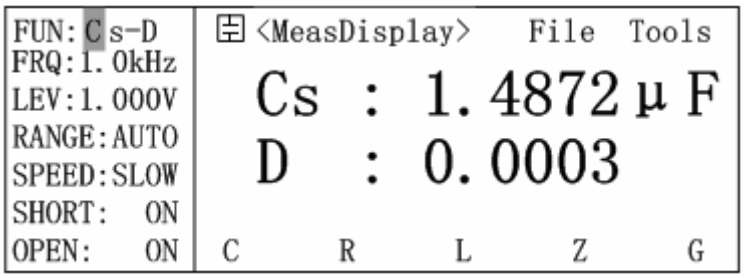


Figure3-2(b) Operation of Direction Keys Display

Step 2：Press upward key [⇩]，the cursor moves from “C” to “1.0kHz”；

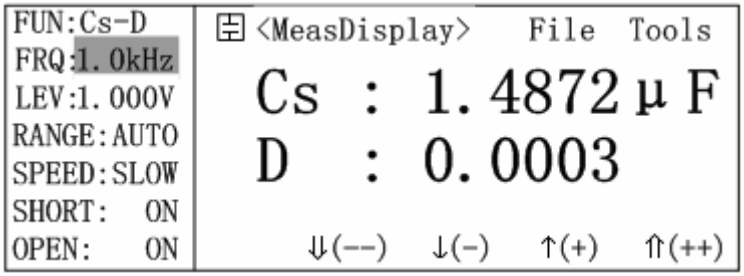


Figure3-2(c) Operation of Direction Keys Display

- When the cursor has moved to the desired area, you can choose the soft keys which correspond to the software function area to change the direction. If the number input can be supported in the area of reverse video, then the numeric keys or [ENTER] can be used to input the data.
- As figure 3-2（c）shows that，the cursor has moved to 1.0kHz， if press soft key “S1”in figure3-3，then the inverse area will display 10 kHz。

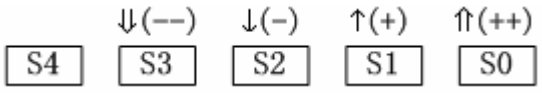


Figure3-3 Soft key display

- When using numeric keys, the softkey display area will become some useful unit softkeys, it means that the use of the soft keys can achieve the same effect that input the corresponding units plus pressing [ENTE]. When [ENTER] is used directly，the data will be input with default unit, for instance: Ω，V，H .etc

3.2 Brief operating instruction

3.2.1 Component measurement display

Press the key [DISPLAY] to enter the MeasDisplay where the measurement results can be displayed by large character or small character. Meanwhile, some

measurement control parameters can also be displayed, the parameters includes FUN、FRQ、LEV、RANGE、SPEED；as well as some function state SHORT、OPEN、File、Tools. If the monitor function is open, then the Vm and Im of measured component can be displayed in monitoring area. If the COMP or BIN is open, then the comparison result will be displayed firstly, and the Vm or Im will not be displayed

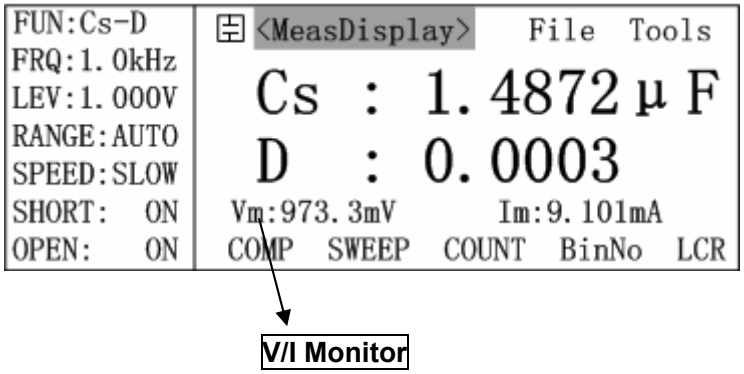


Figure3-4 MeasDisplay with the Monitoring Function

3.2.1.1 <MeasDisplay>

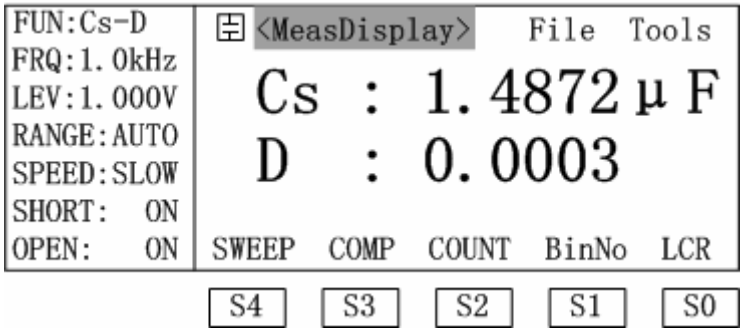


Figure3-5 MeasDisplay

When the cursor is on <MeasDisplay>, the softkeys and function which can be operated is shown as the figure below：

Soft keys	S0-LCR switch to MeasDisplay S1-BinNo switch to BinNo Display； S2-COUNT switch to BinCount Display S3-COMP switch to Comparision Display； S4-SWEEPswitch to List Sweep Display（only for

	TH2825A）.

3.2.1.2 File

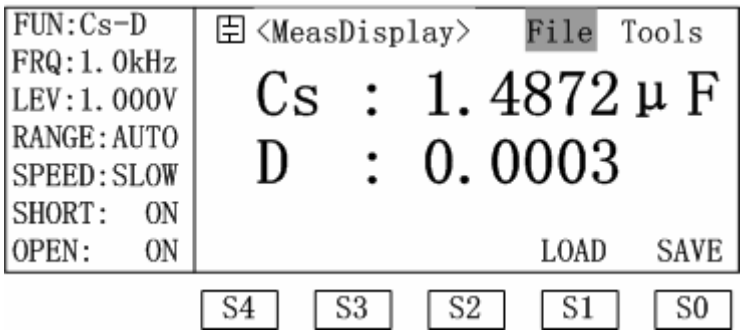


Figure3-6 File Display

When the cursor is on File, the softkeys and function which can be operated is shown as the figure below：

Softkeys		S0	set the current status as saving a file
		S1	load a file, and invoke a saved parameter setup

The function can also be operated in BinNo Display, Bin Count Display, List Sweep display, Comp Display, Measurement Setup, Bin Limit List Setup, List Sweep Setup, Comp Limit Setup.

3.2.1.3 Tools

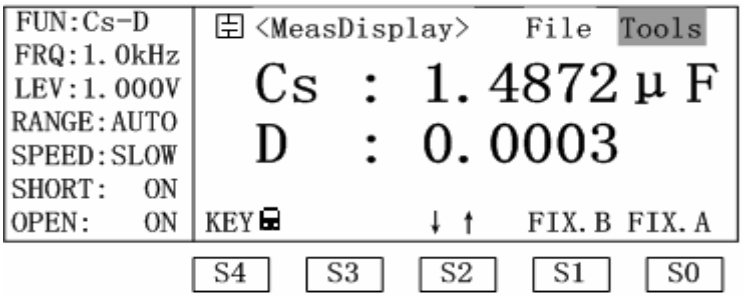


Figure3-7 Tools Display

When the cursor is on Tools, the soft keys and function which can be operated is shown as the figure below：

Softkeys	S0 Lock the arithmetic point of primary parameter and adjust the effective display digit of it S1 Lock the arithmetic point of secondary parameter and adjust the effective display digit of it; S2 Change the character of measurement result, the refresh speed of small character is faster than that of large character； S4 Lock the keyboard, after pressing, the message “KeyLocked!” will be displayed. In quantity measurement and the machinery sorting system, locking the keyboard can prevent the set parameter and status being modified unwittingly. The display of key locked is shown as figure3-8

☞Note：The lock of arithmetic point can also affect other measurement display

☞Note：If the measurement parameter is changed, then the lock mode will be cancelled automatically.

☞Note：In quantity measurement, the use of arithmetic point lock function can reduce the redundant digits, as well as the times of jitter, thus it’s very convenient to read the data.

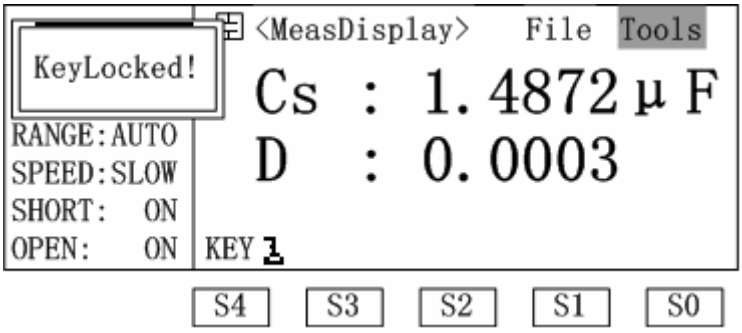


Figure3-8 Keyboard Locked Display

At this moment, any other keys can not be used except the unblock key, so if you want to unblock, just press S4 then the keyboard can be used again. If you set the password to unblock, then there is an input frame, so only inputting the correct password can unblock the keyboard, or you can press ESC to quit the unblock.

☞Note：The default password of TH2825/TH2825A is：2825。

★ Important Note：Please be cautious to use the Password Lock function, if

you forget the password of the instrument, please sent it to our company to unblock the password

3.2.1.4 FUN (Measurement parameter)

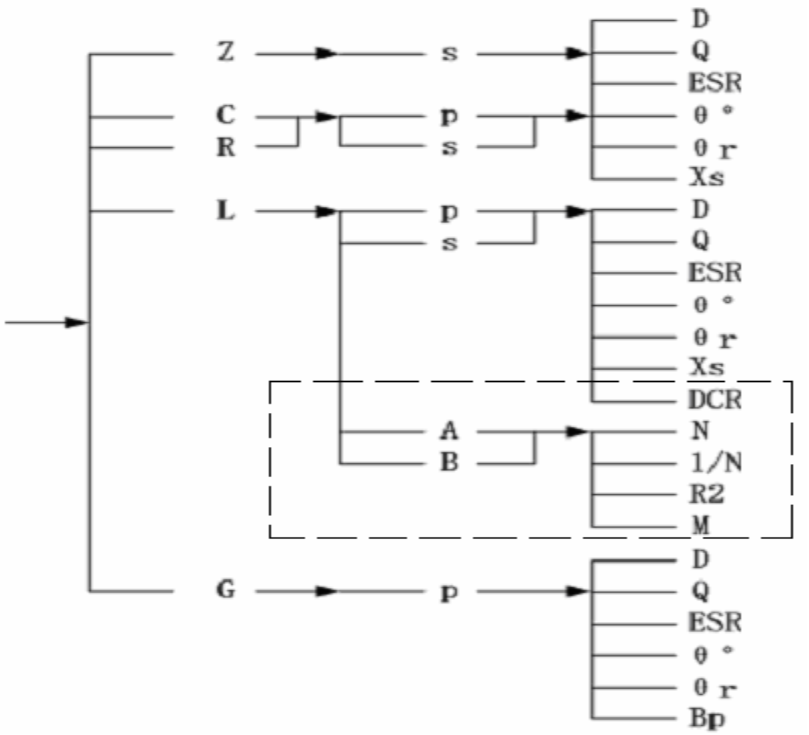


Figure3-9（a） Types of FUN

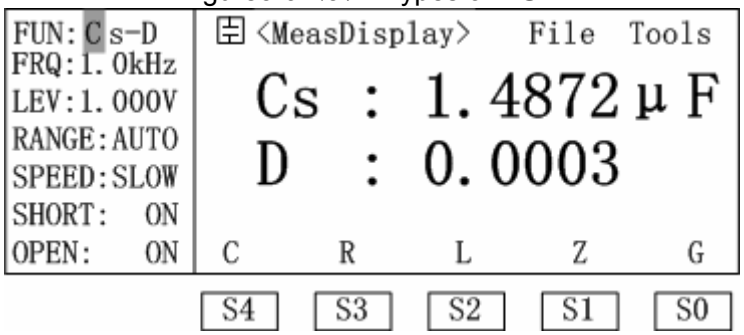


Figure3-9（b） The Setup of FUN Measurement Parameter

Soft keys	S0 The setup of testing the primary parameter is G，the parameter becomes Gp-θ° automatically； S1 The setup of testing the primary parameter is Z，the parameter becomes Zs-θ automatically； S2 The setup of testing the primary parameter is L，the

	parameter becomes Ls-Q automatically； S3 The setup of testing the primary parameter is R，the parameter becomes Rs-Xs automatically； S4 The setup of testing the primary parameter is C，the parameter becomes Cp-D automatically。

☞Note：In figure 3-9（a）the parameters contained in dashed frame are limited in TH2825A；

☞Note：There are at most 3 steps before finishing setting the function，take Cs-D for example：

1.Cs-D，The setup of primary parameter C

2.Cs-D，The selection of measuring equivalent method including series and parallel

3.Cs-D，The setup of secondary parameter D

The function can be set in Measurement Setup as well as Bin Limit Setup.

3.2.1.5 FRQ

Move the cursor to FRQ area using direction keys，then use the soft keys to modify or select.

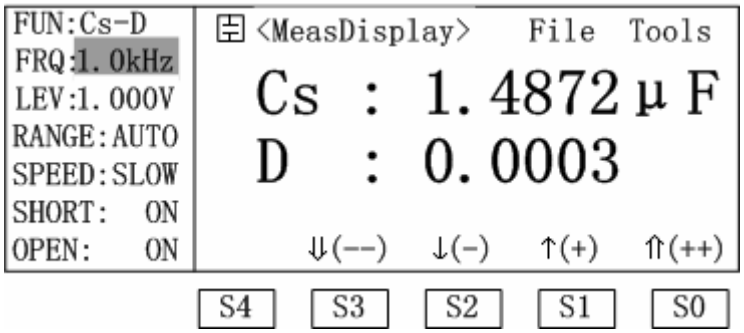


Figure3-10 FRQ Setup

There are 10 frequency points:：50Hz、60Hz、100Hz、120Hz、1kHz、10kHz、20kHz、40kHz、50kHz、100kHz. The setup of frequency can only be modified by soft keys.。

Soft keys	S0 The fast turning of frequency，increase fast S1 The meticulous turning of frequency；ten frequency points increase by sequence

	S2 The meticulous turning of frequency， ten frequency points decrease by sequence； S3 The fast turning of frequency，decrease fast。

The function can also be set in measurement setup

3.2.1.6 LEV

Move the cursor to LEV area by using direction keys，then use the soft keys to modify and select.

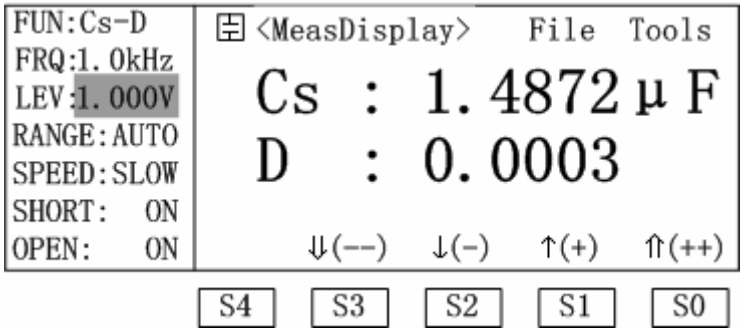


Figure3-11 Measurement Level Setup

LEV sets the virtual value testing sine wave generated by inner oscillator，all levels with the range from 0.01V～0.2V（1mV as the stepper）and 0.2V～1.00V（10mV as the stepper） can be set。

Softkeys	S0 The fast turning of level，within the range between 0.2V～1V, the data increases with the stepper of 0.1V, within the range between 10mV～199mV, the data increases with the stepper of 10mV； S1 The meticulous turning of level，within the range between 0.2V～1V, the data increases with the stepper of 10mV, within the range between 10mV～199mV, the data increases with the stepper of 1mV； S2 The meticulous turning of level，within the range between 0.2V～1V, the data decreases with the stepper of 10mV, within the range between 10mV～199mV, the data decreases with the stepper of 1mV；

	S3 The fast turning of level，within the range between 0.2V～1V, the data decreases with the stepper of 0.1V, within the range between 10mV～199mV, the data decreases with the stepper of 10mV；
Numeric keys	The level between 0.01V～1Vcan be input directly by numerical keys. When some key is pressed, the soft key function area displays the unit-selection automatically，which is shown as figure 3-12 。 S0 Select “mV” as the unit； S1Select“V”as the unit； S4 Cancel the input of level； Or you can press ENTER to affirm the input of numbers, the default unit is “V”。

Figure3-12 Selection of the Unit of Testing Level

The function can also be set in Measurement Setup.

3.2.1.7 RANGE

Move the cursor to RANGE area using direction keys，then use the soft keys to modify and select.

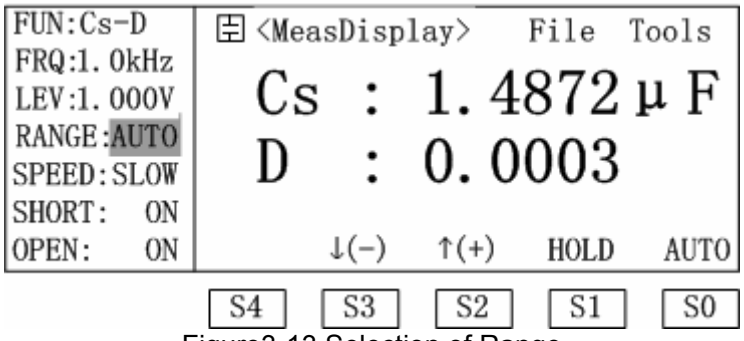


Figure3-13 Selection of Range

Softkeys	S0 Select the range automatically； S1 Fix the range manually, then use arrow key to adjust S2 The range bin can be adjusted by sequence

	according to the direction of large impedance. S3 The range bin can be adjusted by sequence according to the direction of small impedance. The range bin can be sorted as 1MΩ、100kΩ、10kΩ、1kΩ、100Ω、10Ω、1Ω、100mΩ, totally 8 bins.

The function can also be set in Measurement Setup, and in Comp Display, Comp Limit Setup, the operation on S0、S1 can be executed（auto/fixed selection of range）。

☞Note：Within 50Hz～1kHz the range can be selected to 1MΩ bin at most；

Within 10kHz、20kHz, the range can be selected to 100kΩbin at most；

Within 40kHz～100kHzthe range can only be selected to 10kΩbin at most.

3.2.1.8 SPEED

Move the cursor to SPEEDarea using direction keys，then use the soft keys to select.

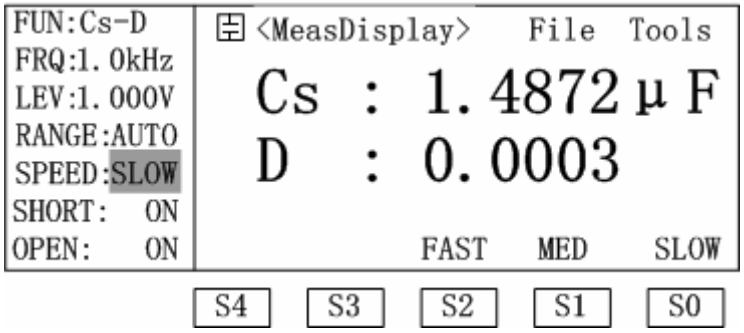


Figure3-14 Selection of Measurement Speed

Soft keys	S0Select the slow-speed measurement, the data is quite stable； S1 Select the middle-speed measurement, the data is stable； S2Select the fast-speed measurement。

The function can also be set in Comp Display, Measurement Setup, and CompLimit Setup

3.2.1.9 SHORT (Short Correction)

Move the cursor to SPEED area using direction keys，then use the softkeys to operate.

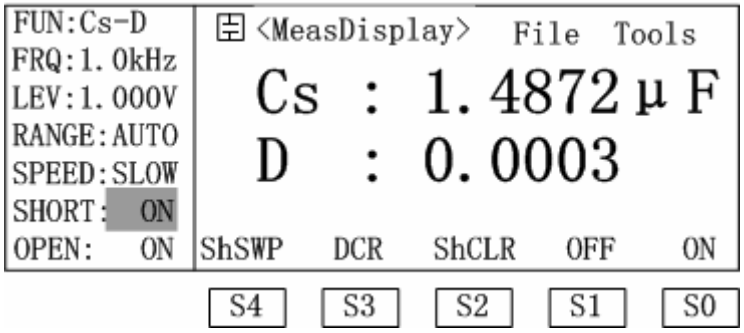


Figure3-15（a） Setup of Short Correction

Soft keys	S0 Open the short calibration S1 Cose the short calibration S2 Single-channel short correction S3 DCR direct-current resistance short reset;（only for TH2825A） S4 All-channel short correction（TH2825Acontains DCR short correction）。

In the process of reset，“soft keys ”will display：

Figure3-15（b） Cancel the Correction Operation Figure

Now, press S4， The operation of correction is interrupted

The short correction is used to clear the influence caused by test fixture, test cable, inner contact impedance as well as the lead-impedance.

3.2.1.10 OPEN

Move the cursor to OPEN area by using direction keys，then use the soft keys to operate.

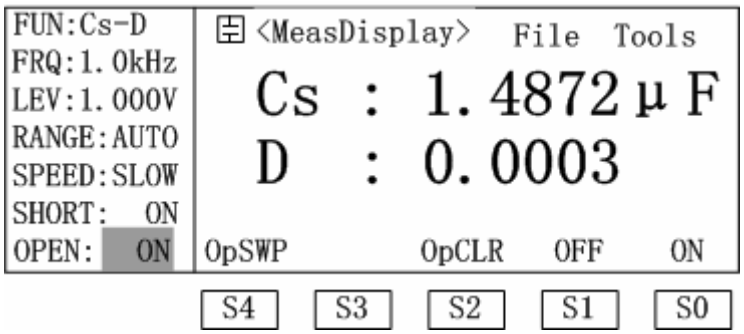


Figure3-16 Setup of Open Correction

Softkeys	S0 Open the open calibration S1 Close the open calibration S2 Single-channel open correction S4 All-channel open correction

The procedure of open correction can be interrupted, refer to Figure3-15（b）。

3.2.2 Bin No. Display

3.2.2.1 <BinNo.Disp>page switch

Press DISPLAY in the panel , then press softkey S1 to enter the page。More details in§3.2.1.1。

3.2.2.2 Tools

There is only a function of keyboard locked, please refer to the introduction of§3.2.1.3 Measure Display。

3.2.2.3 BIN

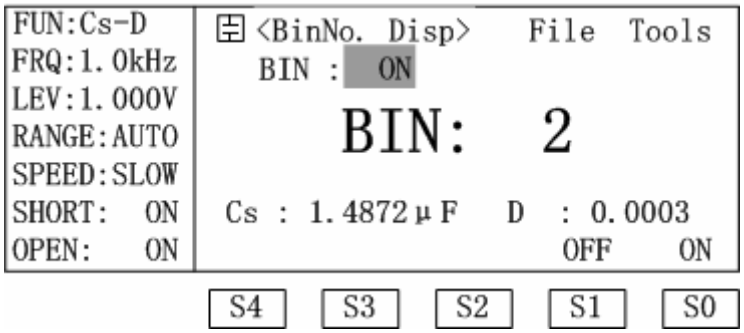


Figure3-17 Switch of Comparator

Softkeys	S0 Open bin comparator S1 Close bin comparator

The function can be set in BinCountDisplay, Bin Limit List Setup

3.2.3 Bin Count Display

3.2.3.1 <Bin Count>page switch

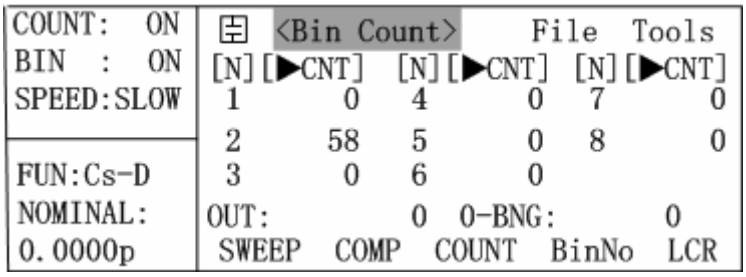


Figure3-18 Bin Count Display

Press DISPLAY in the panel, then press S2 to enter the page. More details in §3.2.1.1.

There are 8 qualified bin counts:“1”、“2”、“3”、“4”、“5”、“6”、“7”、“8”，“OUT”means the unqualified count（If one of the primary parameter and secondary parameter is unqualified, it will start to account），“0-BNG”is the unqualified bin count of secondary parameter.

3.2.3.2 Tools

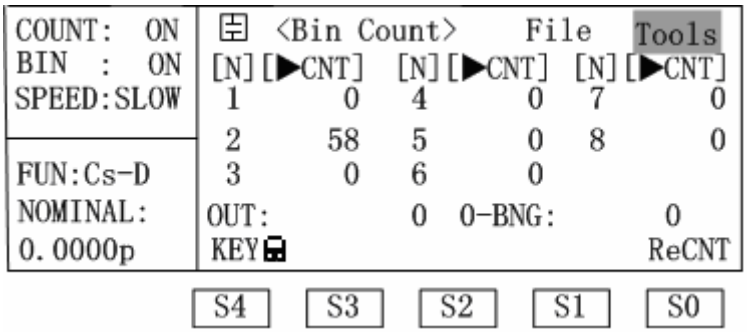


Figure3-19 Tools Setup of Bin Count

Softkeys	S0 Bin count correction； S4 Function of keyboard locked，refer to the introduction of tools in §3.2.1.3

3.2.3.3 COUNT

The function can also be set in<Comp Count>.

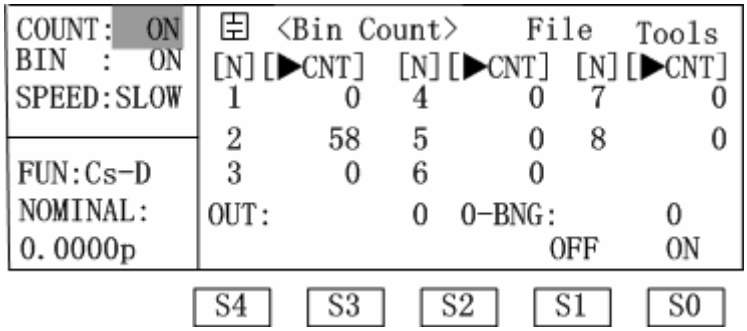


Figure3-20 Setup of Count Switch

Softkeys	S0 The count is open, and count is allowed When BIN opens, bin counts When COMP opens，comparator counts； S1 Count is closed ， count is disallowed

3.2.4 Comp Display

3.2.4.1 <Comp Count>page switch

Press DISPLAY in the panel, then press softkey S3 to enter the page。More details in§3.2.1.1。

3.2.4.2 Comp

The function can be set in Comp Limit Setup §3.2.9.4（<Comp Setup>）

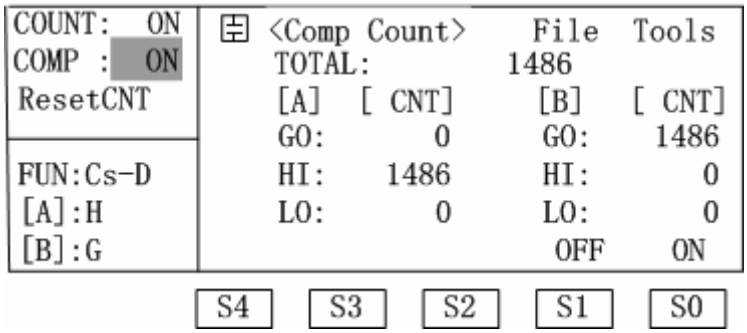


Figure3-21 Setup of Comparator Switch

Softkeys	S0 Open comparator； S1 Close comparator.

3.2.4.3 ResetCNT

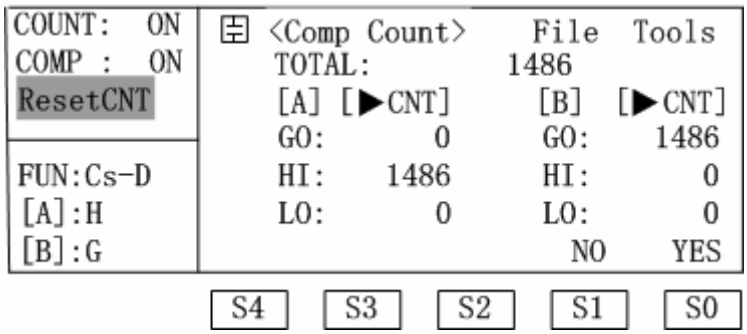


Figure3-22 Setup of Counter Correction

Softkeys	S0 Correct all compare counters on this page; S1 No correction operation。

3.2.5 List Sweep Display

The function is only for TH2825A.

3.2.5.1 <List Sweep> page switch

Press DISPLAY in the panel, then press soft key S4 to enter the page. More details in §3.2.1.1。

3.2.5.2 Mode

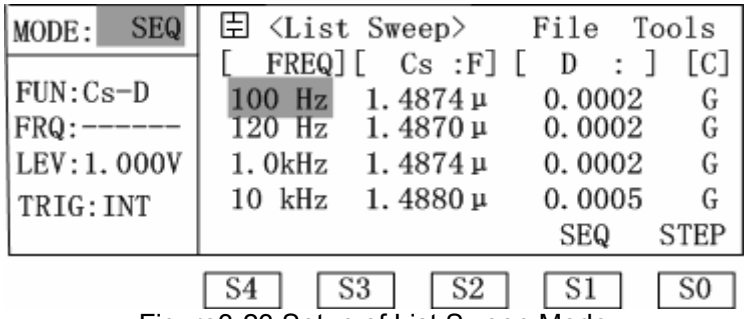


Figure3-23 Setup of List Sweep Mode

Softkeys	S0 Unit step mode, after each trigger, the instrument will test the next sweep point automatically; S1 Continious mode，after each trigger, the instrument will test the sweep period automatically。

Attention：In the inner trigger mode, list sweep will continuously test circularly

3.2.6 Measurement setup

Press SETUPon the panel, then enter the page of Meas Setup where the control parameters can be set, the control parameter includes: FUN、FRQ、LEV、RANGE、SPEED；as well as some function status:Vm/Im、iBIAS、TRIG、INT_R、DELAY、AVG、FastT、Disch、DEV_A、REV_A、DEV_B、REV_B, and the setting function by soft keys

3.2.6.1 <Meas Setup>

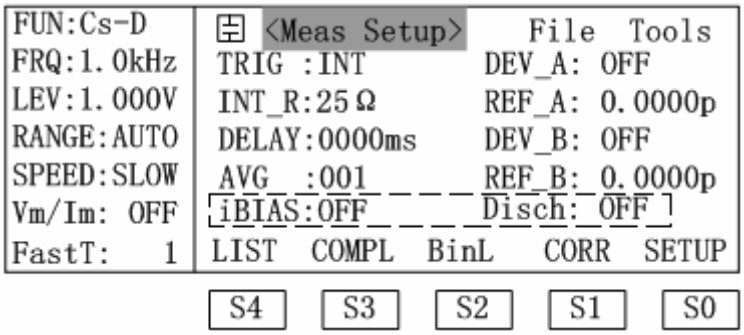


Figure3-24 Meas Setup

Softkeys	S0-SETUP Switch to Measurement Setup； S1-CORR Switch to the use-correction； S2-BinL Switch to the Bin Limit List Setup； S3-COMPL Switch to the Comp Limit Setup； S4-LIST Switch to List Sweep Setup(only for TH2825A）。

☞Note：The setup in dashed frame of Figure3-24 is only for TH2825A，The meaning of dashed frame of each figure in this chapter are same.

3.2.6.2 Tools

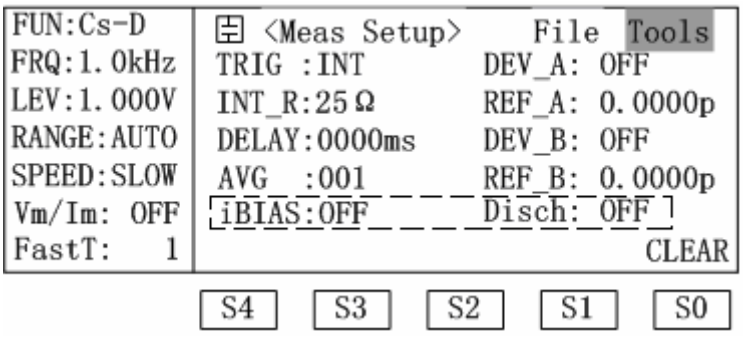


Figure3-25 Tools of Measurement Setup

Softkeys	S0 The message “Confirm:Clear All?” displays on the screen，as well as two options：YesandNo，if press Yes，all parameters in Measurement Setup will recover the default settings.

3.2.6.3 FUN、FRQ、LEV、RANGE、SPEED

Please refer to §3.2.1.4，§3.2.1.5，§3.2.1.6，§3.2.1.7，§3.2.1.8 respectively。

3.2.6.4 Vm/Im

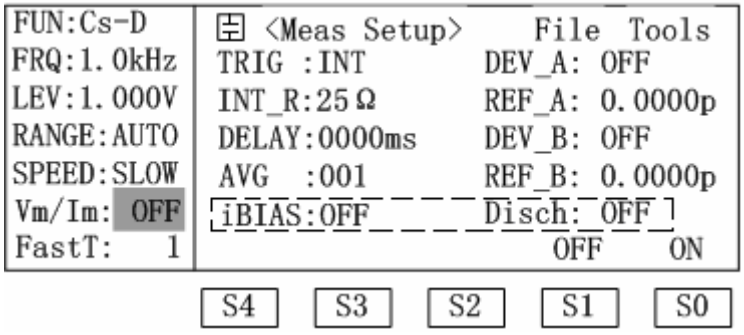


Figure3-26 Setup of Voltage/Current Monitor

Softkeys	S0open **Vm/Im**； S1close **Vm/Im**.

3.2.6.5 FastT

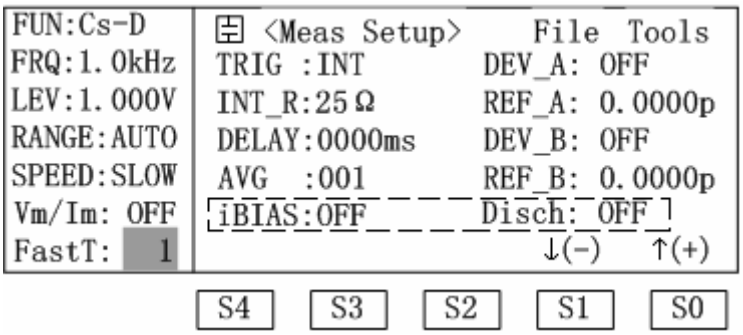


Figure3-27 Setup of Testing Period

Softkeys	S0 Testing period increases with the stepper of 1； S1 Testing period decreases with the stepper of 1.

☞Note：The function is only aimed at the fast testing to decide the sampling period of each measurement. The adjustable range is between 1～8. The default value is 1, the less of the testing times, the faster of the speed, but the stability will reduce, conversely, the more of the measurement times, the slower of the measurement speed, but the stability will improve.

3.2.6.6 TRIG

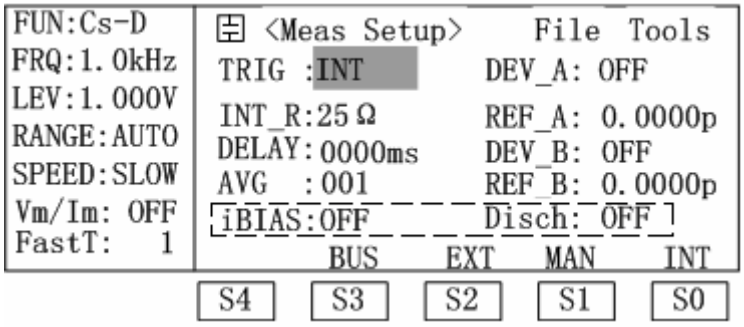


Figure3-28 Setup of Triggering Mode

Softkeys	S0 Internal trigger, which is generated automatically from the inner， so the measurement can last continuously.； S1Manual trigger，pressing TRIGGER of the front panel can lead to triggering a measurement； S2External trigger，input a negative pulse with the

	width more than 1μs from the HANDLER interface board and the rising edge forms the trigger. S3Bus trigger，send the order of bus trigger to the instrument through RS-232C or GPIB interface

3.2.6.7 INT_R

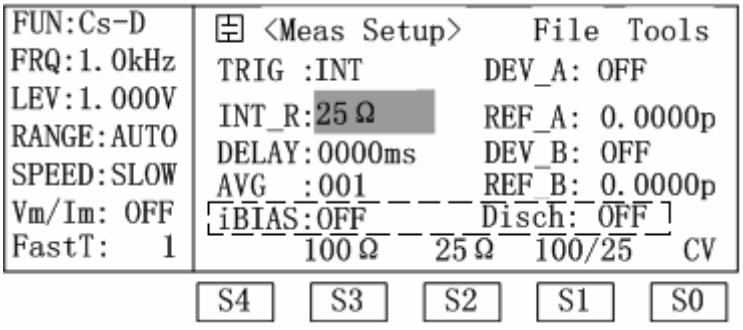


Figure3-29 Setup of Output Impedance

Softkeys	S0CVconstant-voltage mode； S1100Ω/25Ωauto registration mode； S225Ω； S3100Ω。

After setting LEV，in the impedance mode of 100Ω、25Ω、100Ω/25Ω, Is flowing through DUT is decided by the impedance Zx=Rx+jXx and source impedance Rs，that is ：

$$Is = \frac{LEV}{|Rs + Rx + jXx|}$$

In the CV（constant voltage）mode，current Is is only related to the impedance of DUT，that is ：

$$Is = \frac{LEV}{|Rx + jXx|}$$

☞Note：In the CV mode, the load impedance can not be too small. Our indexes to guarantee the capacitance of 30μF can be tested with the constant voltage 1V under the frequency of1kHz，that mean s |Zx| of DUT must satisfy the formula below：

$$|Zx| \geq \frac{1}{wC} = \frac{1}{2\pi \times 1kHz \times 30\mu F} = 5.3\Omega$$

The DUT with the impedance less than 5.3Ω can not be tested in the CV mode.

3.2.6.8 DELAY

Trigger delay means the period from receiving the trigger signal to begin testing. In the List Sweep Measurement, the delay exists before each sweep point begins to test. The range of trigger delay is 0ms～9999m with the stepper of 1ms.

Delay is mostly used to obtain the time synchrony and the measurement rhythm in the measurement status. For example, in the machinery sorting system when DUT is in the ready state, it means the trigger signal has arrived; now it is necessary to set a suitable delay.

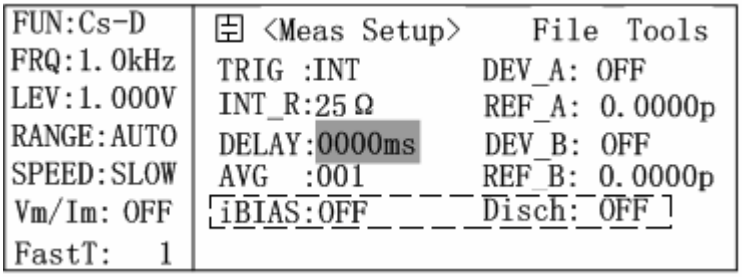


Figure3-30（a） Delay Setup

The delay is input by numeric keys, the figure below displays the page after entering 1:

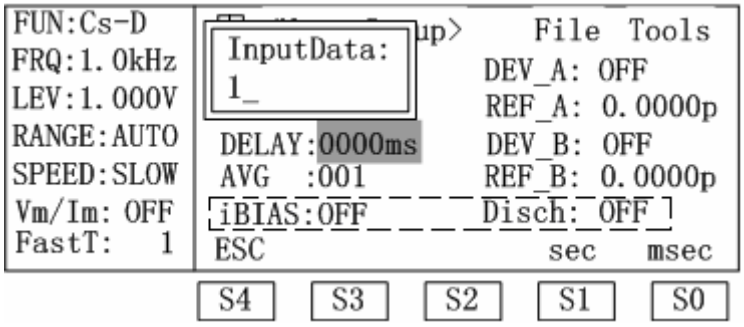


Figure3-30（b）Delay Input

Softkeys	S0 Select the input time with the unit of millisecond,; S1 Select the input time with the unit of second，or press ENTER to affirm the number input，and the direct defaulting is second; S4 Cancel the delay input。

3.2.6.9 AVG

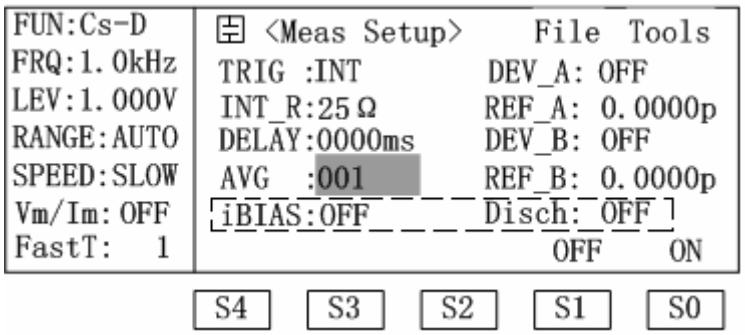


Figure3-31 Setup of Average Times

Softkeys	S0 The use of AVG is allowed； S1 The use of AVG is disallowed.

The evaluation of “AVG” is a kind of digital filter，“time” is the depth of filter, the aim of which is to consider the average result as the current measurement value after several measurements, by doing so, the stability and reliability of the result can be improved. The setting range of average time is 1～255 with the stepper of 1，and input with digits, confirmed by ENTER. After inputting the digits the instrument will allow to use the average time automatically.

3.2.6.10 iBIAS

The function in this chapter is only for TH2825A.

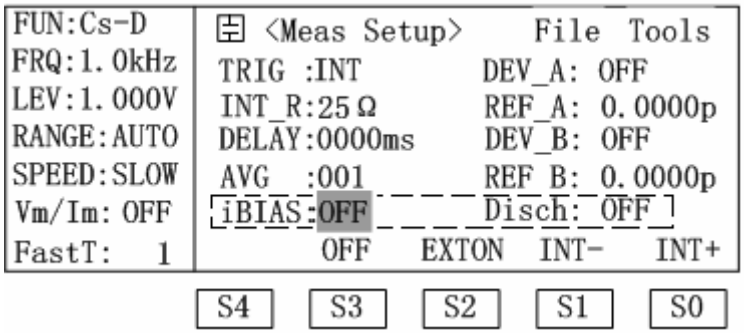


Figure3-32 Setup of **iBIAS**

Softkeys	S0 Internal positive bias，the inner of the instrument provides the bias of +1.75V； S1 Internal negative bias，the inner of the instrument provides the bias of -1.75V S2 External bias； S3 Close the bias mode。

☞Note：In the external bias mode, the inner of instrument provides a bias source Vs of ±5V, then user carries out the partial pressure to Vs through the external resistance R1、R2 from the rear panel，the calculating method to evaluate the bias is：

$$V_{DC} = \frac{R2}{R1 + R2} \times 10V - 5V$$

VDC： Bias voltage value；
R1，R2： External adjustable resistance(can be replaced by a potentiometer.)；

R1：The resistance between +5VandV$_{EXT}$；

R2: The resistance between -5VandV$_{EXT}$。

More details can be referred in §2.2

☞Note：When using the bias mode, opening the discharge mode will improve the accuracy of measurement, but will increase the measurement time. The discharge mode can be referred in§3.2.6.13。

☞Note：When the measurement parameter or impedance changes to CV，the bias mode will close automatically.

☞Note：When the instrument lies in the status below, the use of bias mode is forbidden. The message “BIASV Forbidden!!!” will display on the screen。

Status1：The impedance mode is CV，refer to §3.2.6.7；

Status2：The measurement parameters DCR or transformer parameter, refer to §3.2.1.4

☞Note：Under common circumstance, the Max. range is 100Ω in the bias voltage mode；Only when the testing primary parameter is capacitance C, then the selection of range can not be limited.

3.2.6.11 DEV_A/ DEV_B

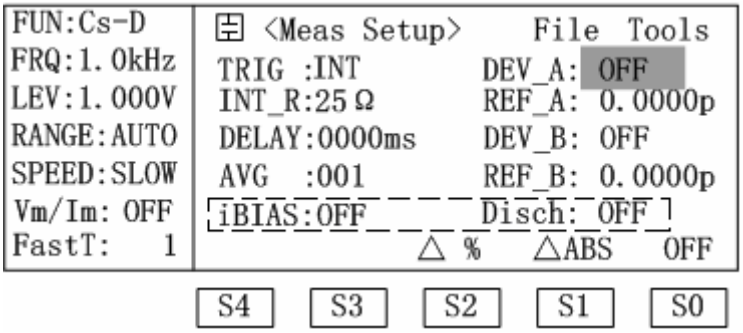


Figure3-33 Setup of the Primary Parameter Deviation Mode

Softkeys	S0 Close the deviation mode； S1 Absolute deviation display； S2 Percentage deviation display。

☞Note： Deviation function is that the actual measurement value and the reference value inputs and displays as a result of deviation operation, the primary and secondary parameters can perform the deviation processing.

△ABS（absolute deviation display），the formula is：△ABS = X-Y，

△%（percentage deviation display），the formula is ：△% = （X-Y）/Y*100%，

X means the measurement value of DUT，Y means the set reference value, refer to §3.2.6.12.

☞Note：Bin comparator and comparator always compare the actual measurement value, which means that it has nothing to do with the deviation operation. So when you use the bin comparator and comparator, you'd better close the deviation display mode in order to avoid confusing

☞Note：TH2825Alist Sweep Comparator makes sweep comparison by applying the result of deviation operation, which means it relates to the deviation operation.

3.2.6.12 REF_A/ REF_B

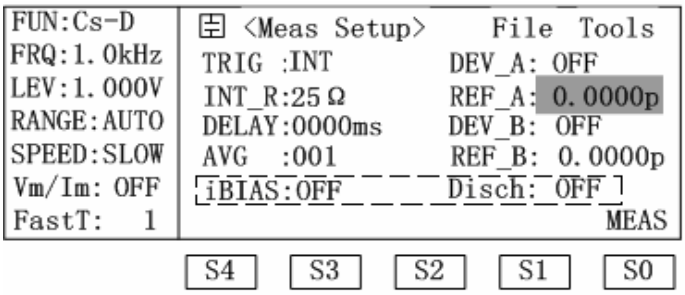


Figure3-34 Setup of the Primary Parameter Deviation

Softkeys	S0 Test only once，and save the measurement result as the reference value。

When using the deviation mode, the deviation reference value needs setting. The deviation reference value can be input by numeric keys or by operating softkeys to test and the measurement result can be set as the reference value automatically, the reference value is the Y in §3.2.6.11.

3.2.6.13 Disch

The function is only for TH2825A.

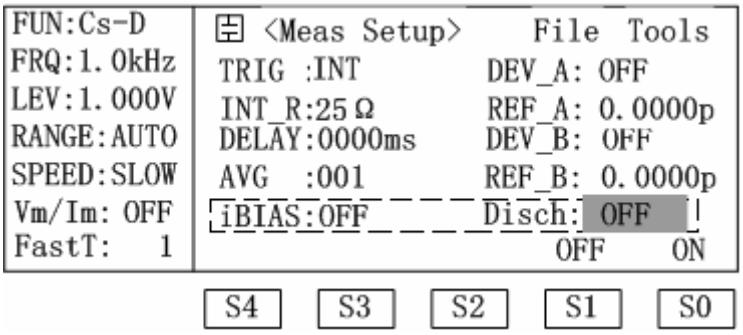


Figure3-35 Discharge Setup

Softkeys	S0 Open the discharge mode； S1 Close the discharge mode。

3.2.7 User Correction

☞Note：If you want to use the function, please read the contents in this chapter briefly.

☞Note：The instrument has been calibrated carefully before distribution, so don't use or open the function of load modification without special need. If the function is actually needed, please confirm the reliability of the operation in order to prevent the calibration of errors to bring unnecessary doubt.

☞Note：If the incorrect testing is caused because of the calibration of errors, please attempt to close each calibration function one by one.

3.2.7.1 <User Correction>page switch

Press SETUP in the panel, then press soft key S1 to enter the page. More details in §3.2.6.1。

3.2.7.2 SHORT、OPEN

The reset operation can be referred to §3.2.1.9、§3.2.1.10.

☞Note：The reset function in this page includes: sweep open and short zeroing, and the open and short zeroing of 3 frequency points whose setting is in §3.2.7.5.

3.2.7.3 LOAD

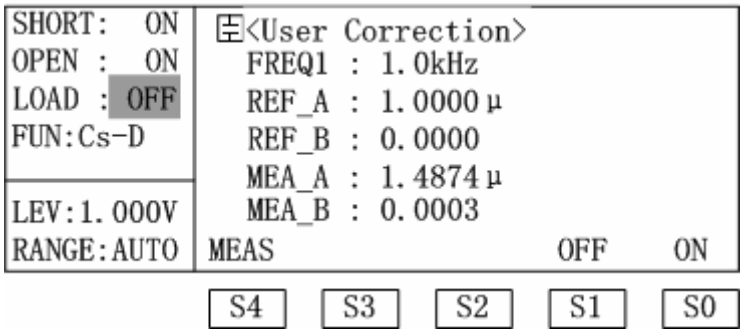


Figure3-36（a） Setup of load calibration

Softkeys	S0 open load calibration； S1 close load calibration S4 test and get the testing value MEA_A,MEA_B。

After pressing S4 the measurement status is shown as the figure below:

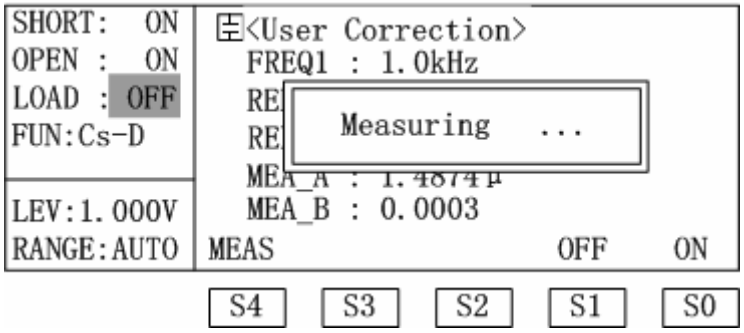


Figure3-36（b） Measurement of Load Calibration

The formula of load calibration coefficient is：

$$Kc = \frac{Zref}{Zmea}$$

Kc ： Load calibration coefficient；

Zref： Reference impedance value calculated by REF_A、REF_B input by user；

Zmea： Impedance testing value calculated by MEA_A、MEA_B according to the measurement in Figure3-36（b）。

☞Note：When using the load calibration function, the OPEN、SHORT of normal measurement status should correspond with measurement status of Figure3-36（b），or the measurement result will be wrong.

3.2.7.4 FUN

The operation of parameter setup refers to §3.2.1.4.

☞Note：The two parts of the measurement parameter in this page can confirm the only impedance.

3.2.7.5 FREQn

The setup of 3 frequency points can be divided into two steps。

Step1：Select the unset frequency point；

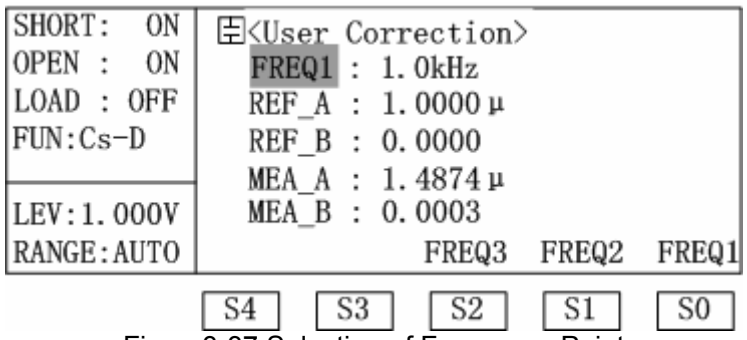


Figure3-37 Selection of Frequency Point

Softkeys	S0 Select frequency point 1（FREQ1）; S1 Select frequency point 2（FREQ2）; S2 Select frequency point 3（FREQ3）。

Step 2：Set the selected frequency point。

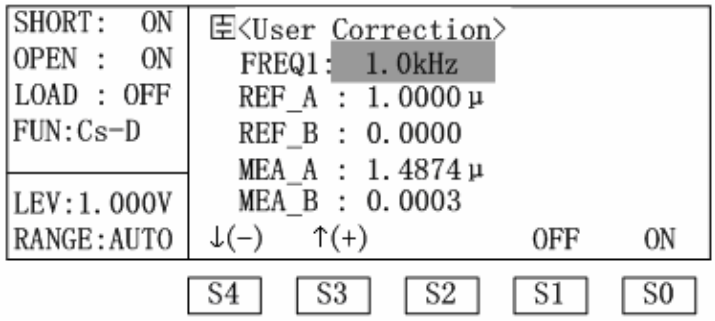


Figure3-38 Setup of Frequency Point

Softkeys	S0 Open frequency point; S1 Close frequency point; S3 On the premise of opening the frequency point, the frequency increases; S4 On the premise of opening the frequency point, the frequency decreases.

3.2.7.6 REF_A/ REF_B

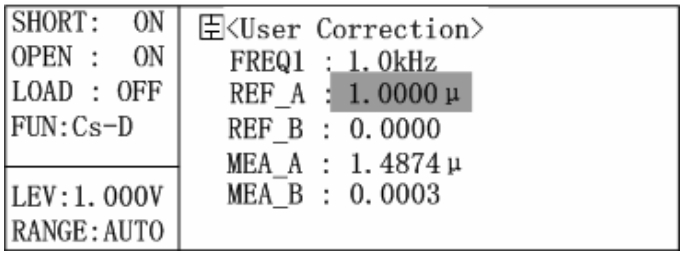


Figure3-39 Setup of Primary Parameter Reference Main Parameter

☞Note：The reference of primary and secondary parameter must be input by digits correctly.

3.2.7.7 The correct flow of using load modification function

Step1：Select the needful load modification parameter, refer to §3.2.7.4.

Step2：Select the frequency point needing calibration, refer to §3.2.7.5.

Step3：Input the reference value of main and secondary parameter，refer to §3.2.7.6。

Step4：User zeroing （SHORT、OPEN），refer to §3.2.7.2。

Step5：Test to obtain the value of MEA_Aand MEA_B，then open the switch of load calibration, refer to §3.2.7.3.

3.2.8 Bin Limit List Setup

3.2.8.1 <Limit Table> page switch

Press SETUPin the panel, then press soft key S2to enter the page. More details in §3.2.6.1.

3.2.8.2 NOMINAL

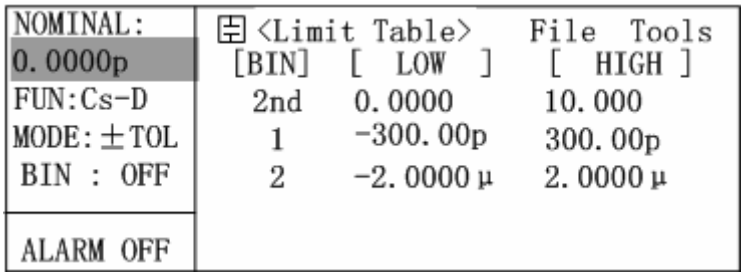


Figure3-40 Setup of Nominal Value of Primary Parameter

☞Note：The nominal value of primary parameter can be input by numeric keys, please confirm if the value is correct, because it will affect the result of bin comparator directly.

3.2.8.3 FUN

Refer to §3.2.1.4.

3.2.8.4 MODE

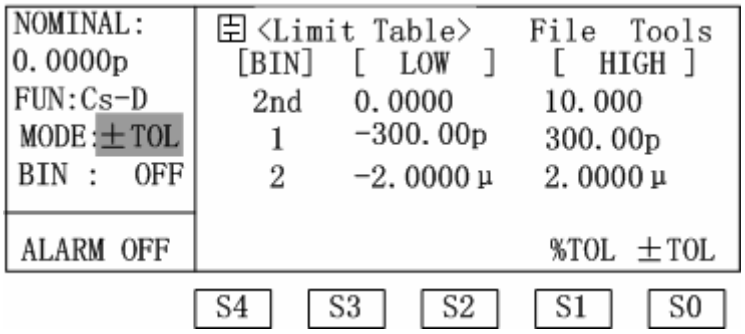


Figure3-41 Setup of Primary Parameter Limit Tolerance Mode

Softkeys	S0 The limit of parameter adopts the absolute deviation mode； S1 The limit of parameter adopts the percentage relative deviation mode

☞NOTE：The limit of secondary parameter adopts the direct reading deviation mode constantly.

3.2.8.5 BIN

Refer to §3.2.2.3.This switch can open or close the bin comparator.

3.2.8.6 LOW/HIGH

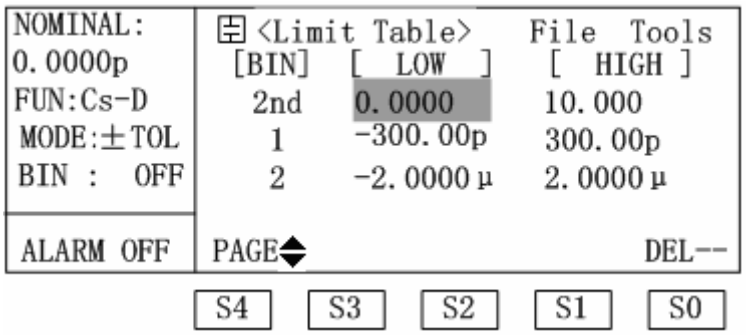


Figure3-42 Setup of Low Limit

Softkeys	S0 Delete the setting limit of this line; S4 Turn the page to set other bin limits.

☞Note：Input limit value by numeric key。

“2nd”is the setup of secondary parameter, the limit of secondary parameter adopts the direct reading deviation mode constantly. For example： if the setup range is 0~1.5，measurement value of secondary parameter is 1.2（in the range of setup）it means qualification, if measurement value of secondary parameter is 1.55（out of the range）it means unqualification。

There are 8 bins of parameter setup：“1”、“2”、“3”、“4”、“5”、“6”、“7”、“8” ，which can be achieved by turning “PAGE”.

☞Note：The low/high relationship between bin direction and limit tables listed below：

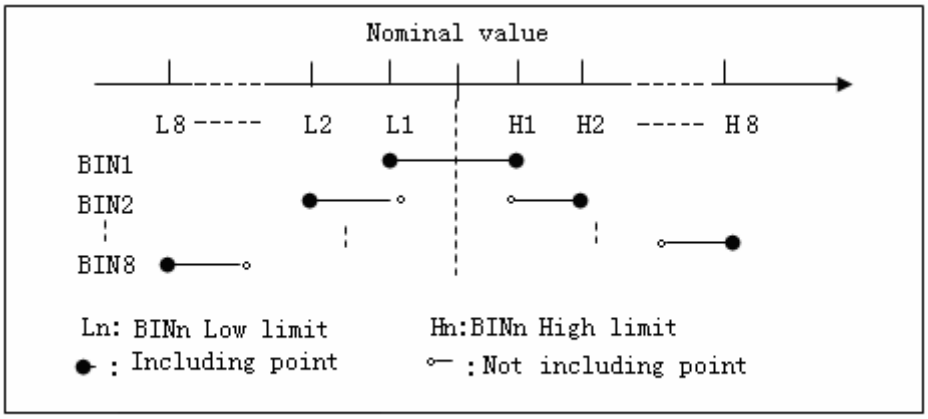


Figure3-43 Bin and Limit

Multi-bin selection is for primary parameter, and when setting the limit table,

the arrangement from BIN1-BIN8 should hold the principle that the range increases from narrower to wider. If BIN1 has the widest limit, then all qualified DUTs will be selected into BIN1，so the setup after BIN1will lose the significance. In limit table, if the lower limit is greater than the upper limit the warning information “Warning：Low>High” will display，thus the instrument will not select the DUT into this bin.

☞Note：The procedure and result of comparison can be shown as the Figure below：

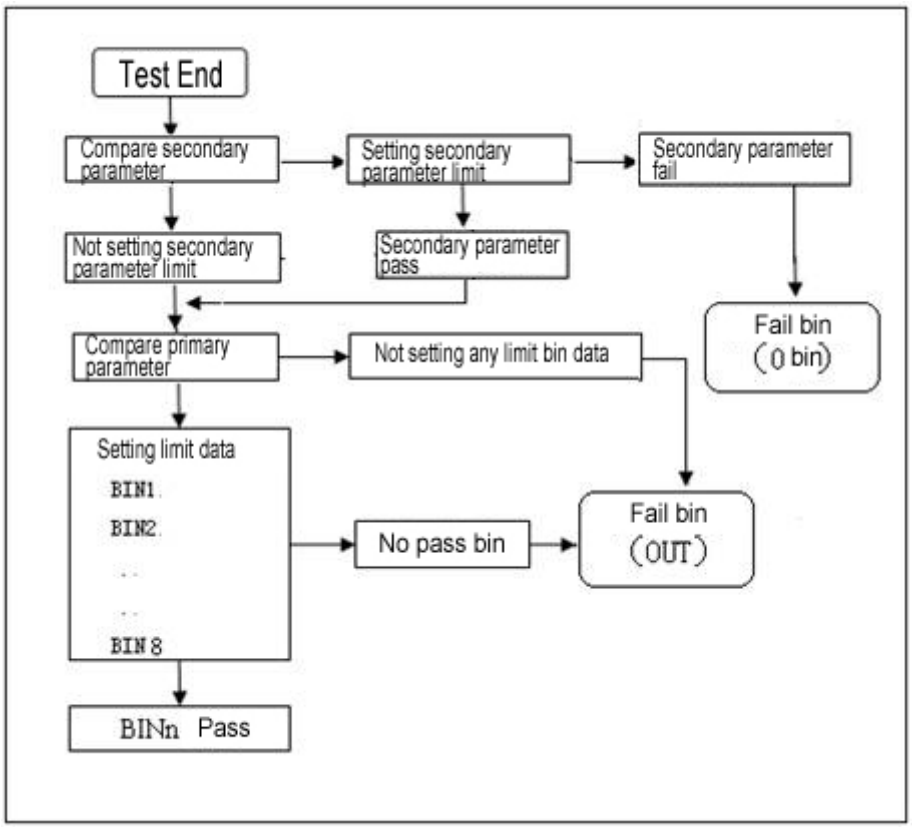


Figure3-44 Figure of the Function of Bin Comparator

3.2.8.7 Tools

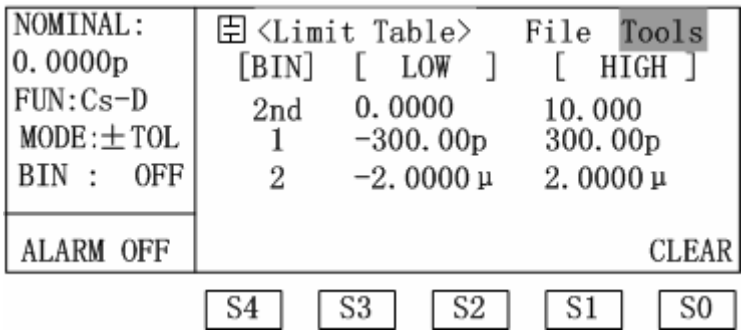


Figure3-45 Setup of the Tools in Bin Limit

Softkeys	S0 Delete all set limits.

3.2.9 Comp Limit Setup

3.2.9.1 <Comp Setup>page switch

Press SETUP in the panel, then press soft key S3 to enter the page. More details in §3.2.6.1

3.2.9.2 A/B_NOMINAL

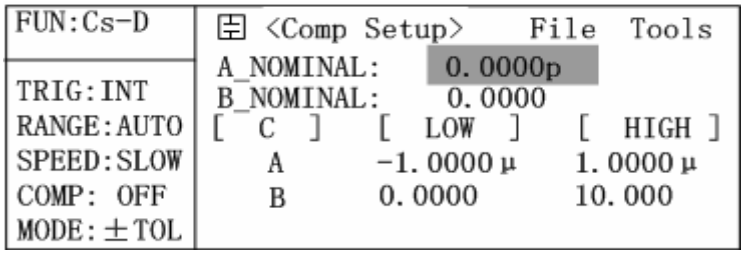


Figure3-46 Setup of the Primary Parameter Nominal Value of CompCount

☞Note：Input the nominal value of main and secondary parameters，please confirm if the nominal value is correct, because it will influence the result of CompCount.

3.2.9.3 LOW/HIGH

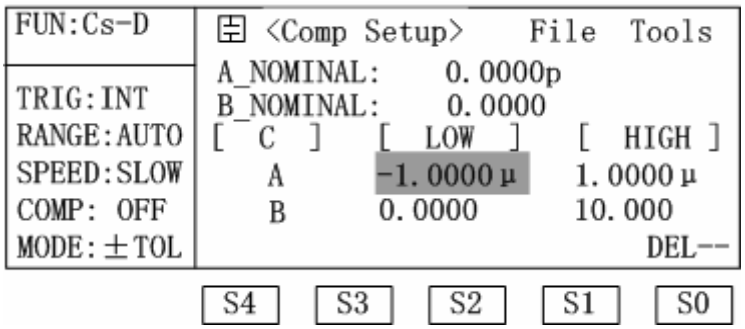


Figure3-47 Setup of Primary Parameter Limit

Softkeys	S0 Delete the setup of the lower and upper limits

☞NOTE：“A” is the setup of primary parameter and “B” is the setup of secondary parameter。The limit is input by numeric key. The primary parameter can select absolute deviation and percentage relative deviation，but secondary parameter is input with the absolute deviation method constantly。

In limit setup, if the lower limit is larger than the upper limit, the warning message “Warning：Low>High” will display，thus DUT is selected as L（low）or H(high)

3.2.9.4 Other setups

TRIG（trigger mode）refer to §3.2.6.6；

RANGE（measurement range）refer to §3.2.1.7，Here, the RANGE can only be set as auto/fixed range；

SPEED（measurement speed）refer to §3.2.1.8；

COMP（comparator switch）refer to §3.2.4.2.

MODE（primary parameter tolerance mode）refer to §3.2.8.4。

3.2.10 List Sweep Setup

The function is only for TH2825A.

3.2.10.1 <List Setup>page switch

Press SETUP in the panel, and then press softkey S4 to enter this page. more details in §3.2.6.1.

☞Note：Please pay attention to the points below about the List Sweep Comparator：

1) If set the lower and upper limits, then the comparison result will be IN （qualified） forever；
2) If set the lower limit only, then the measurement result which is equivalent to the selective result or greater than it will be IN；
3) If set the upper limit only, then the measurement result which is equivalent to the selective result or less than it will be IN；
4) If the lower limit set larger than upper limit, there will be warning information “Warning：Low>High”，the result will certainly be unqualified L（low）or H（high）；
5) The List Sweep Comparator is related with display mode（direct reading、△ABS、△%），the instrument makes comparison with display value after deviation processing，because the setup of list sweep limit doesn’t provides the nominal value；
6) If set the percentage deviation display, the input limit data also becomes percentage data and display with percentage.

☞Note：In the list sweep measurement, because of the frequent switch of testing status points(especially in fast measurement)，it is necessary to set a suitable delay to stabilize the circuit and get the stable measurement value. The setup of delay can be referred to §3.2.6.8。

3.2.10.2 List

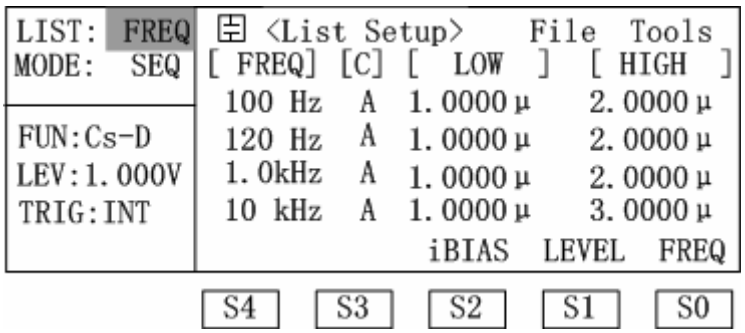


Figure3-48 Setup of Sweep Parameter

Softkeys	S0 The sweep parameter is set as FREQ S2 The sweep parameter is set as LEVEL； S3 The sweep parameter is set as iBIAS。

☞Note：Only after cleaning out all data in Sweep Limit List, the setup can be finished. Data-clean is in §3.2.10.5.

MODE

There are unit step and continuum mode, the operation can be referred to §3.2.5.2.

3.2.10.4 Setup of Sweep Limit List Parameter

First, select List（sweep parameter），take the FREQ for example to operate。

Step 1：set the sweep frequency point，TH2825A provides 4 sweep points；

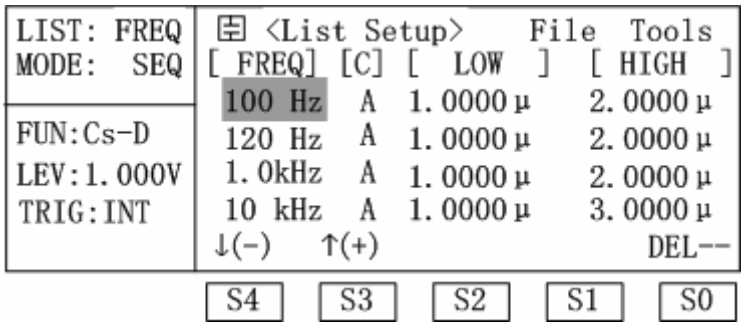


Figure3-49 Setup of Frequency Point

Softkeys	S0 Delete the frequency point including all setups in it； S3Frequency point increases； S4Frequency point decreases.

☞Note：When the LIST (sweep parameter)selects LEVEL and IBIAS，the frequency point is input by numeric key.

Step 2：Set the sweep primary parameter/secondary parameter；

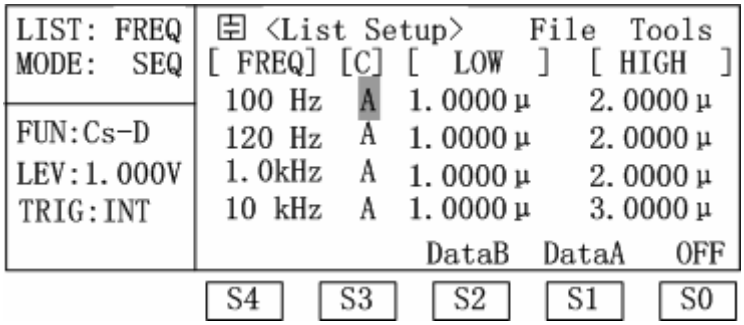


Figure3-50 Setup of Sweep Primary parameter/Secondary parameter

Softkeys	S0 Don't compare the measurement result of the sweep point, meanwhile, the sweep point can't be input upper/low limit.； S1 Sweep the primary parameter； S2 Sweep the secondary parameter.

Step 3：Set upper/lower limit by numeric key。

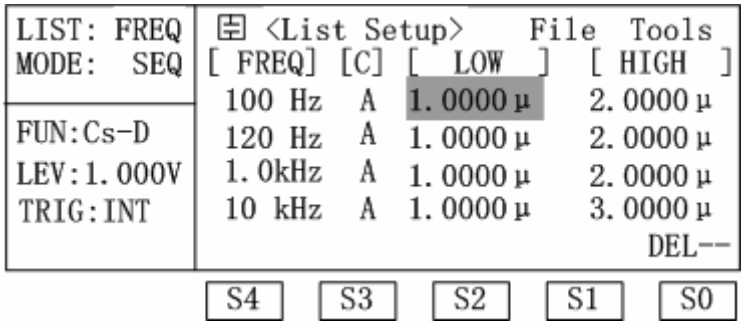


Figure3-51 Lower Limit Setup of Sweep List

Softkeys	S0 Delete the setup of frequency point on this line.

3.2.10.5 Tools

Delete all limits set on this page, operation can be referred to§3.2.8.7.

3.2.11 System Config Page

Press SYSTEM in the panel, then enter the page of System Config，the setup of system and measurement control parameter includes CONTRAST、INFO

BEEP、CMP ALARM、ALARMMODE、PASSWORD、BUS MODE、GPIB ADDR、EOS CODE、HANDLER、ENDDELAY as well as each setting function by softkeys.

3.2.11.1 <System Config> page switch

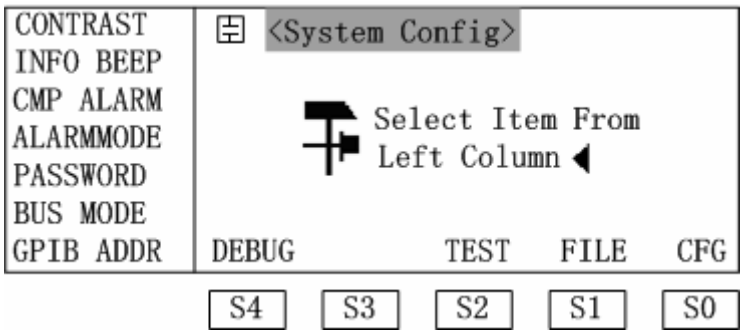


Figure3-52 System Config

Softkeys	S0-CFG System Config page; S1-FILE file list page; S2-TEST test page，the functions of this page are not used for users; S4-DEBUG deliberation page，the functions of this page are not used for users.

3.2.11.2 CONTRAST

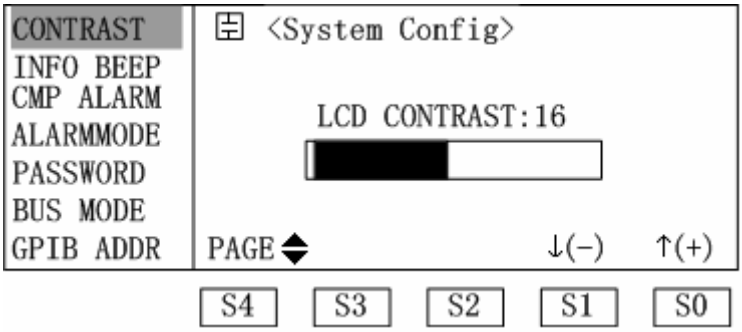


Figure3-53 Adjustment of LCD Contrast

Softkeys	S0 The increase of LCD contrast，the brighter of display; S1 Decrease of LCD contrast，the darker of display; S4Page-turning, turn to the system configuration on the next page.

3.2.11.3 INFO BEEP

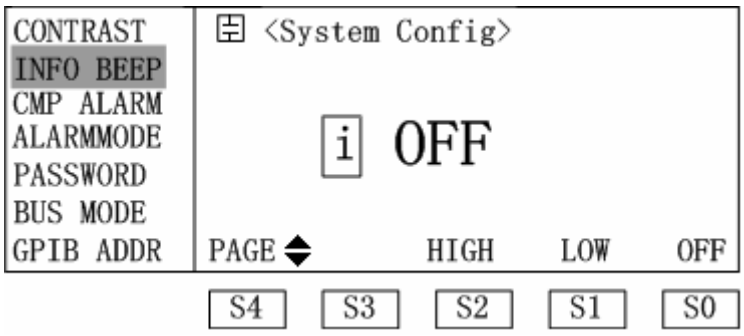


Figure3-54 Setup of INFO BEEP

Softkeys	S0 Silence; S1 Low volume; S2 High volume; S4 Page-turning, turn to the system configuration on the next page.

3.2.11.4 CMP ALARM

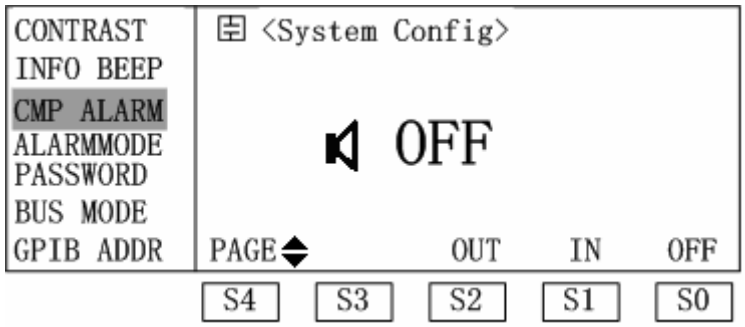


Figure3-55 Setup of CMP ALARM

Softkeys	S0 Close the CMP Alarm; S1 Alarm when the product is qualified; S2 Alarm when the product is unqualified; S4 Page-turning, turn to the system configuration on the next page.

3.2.11.5 ALARMMODE

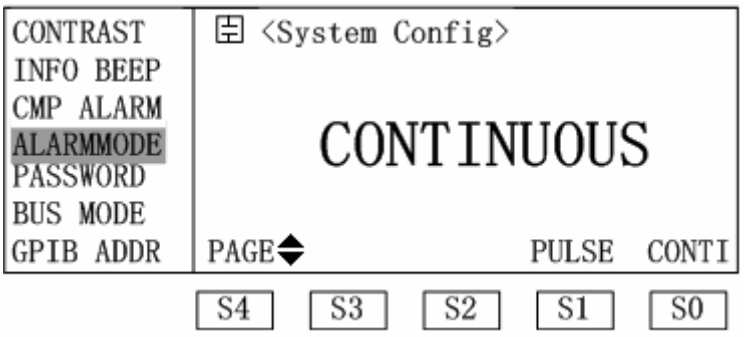


Figure3-56 Setup of Alarm Mode

Softkeys	S0 Tweet in continuous way; S1 Tweet in pulse way; S4 Page-turning, turn to the system configuration on the next page.

3.2.11.6 PASSWORD

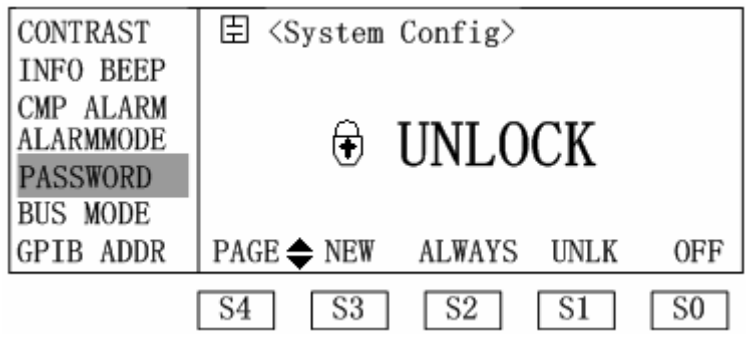


Figure3-57 Setup of Password

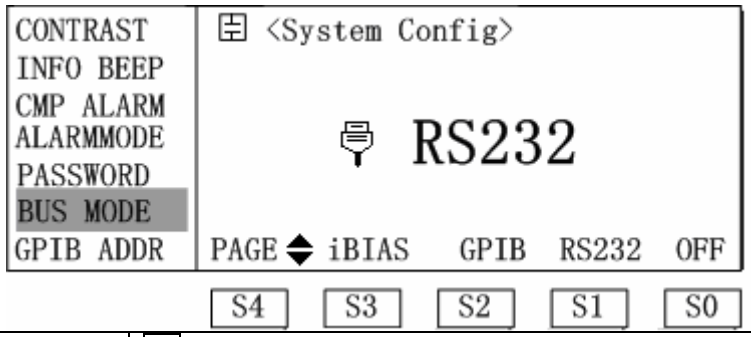
Softkeys	S0 Close the password protection，password is needed when opening and unlock the instrument; S1 UNLOCK，only set the password protection of unlock, no password protection when opening the instrument; S2 Set password protection when opening and unlocking the instrument; S3 Set a new password; S4 Page-turning, turn to the system configuration on the next page.

☞Note：The default password of TH2825/TH2825A is：2825.

☞Note：Precedence level of setting password：ALWAYS > UNLK > OFF.

When the user sets from high level to low level，the password should be input firstly, then the setup can be modified. For example, if the previous setup is UNLK，there will be a password frame when the user wants to set OFF. On the contrast, the password is not needed when setting to the high level.

3.2.11.7 BUS MODE



Softkeys	S0 Close bus mode； S1 Select the standard RS232C interface which can be connected with a computer； S2 The setup can only be available after buying and installing GPIB interface card. The GPIB interface makes the communication with computer faster and more reliable and can also form a multi-instrument measurement system conveniently； S3 When serial interface is used to control program-controlled bias current source； S4 Page-turning, turn to the system configuration on the next page.

3.2.11.8 GPIB ADDR

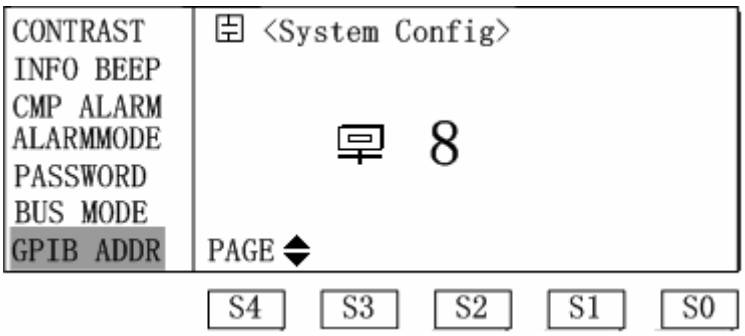


Figure3-59 Setup of GPIB ADD

Softkeys	S4 Page-turning, turn to the system configuration on the next page.

☞Note：The default address is 8，user can input any add from 0～30 by numeric key.

3.2.11.9 EOS CODE

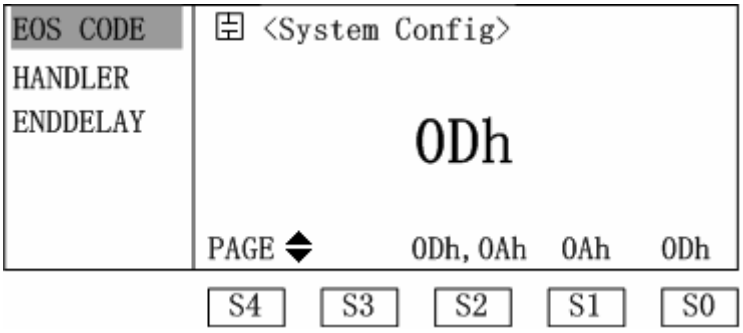


Figure3-60 EOS CODE

Softkeys	S0 Select the EOS CODE is ASCII code: 0DH，which is“\r”； S1 Select the EOS CODE is ASCII code 0AH，which is“\n”； S2 Select the EOS CODE is ASCII code 0DH+0AH，which is “\r\n”； S4 Page-turning, turn to the system configuration on the next page.

3.2.11.10 HANDLER

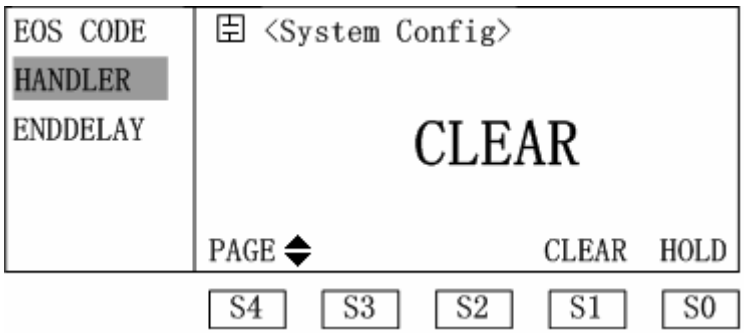


Figure3-61 Setup of HANDLER Mode

Softkeys	S0 Select HOLD mode，the selectable input signal can last until the refresh of next measurement； S1 Select CLEAR mode， the input signal of last measurement is cleared out before testing； S4 Page-turning, turn to the system configuration on the next page.

3.2.11.11 ENDDELAY

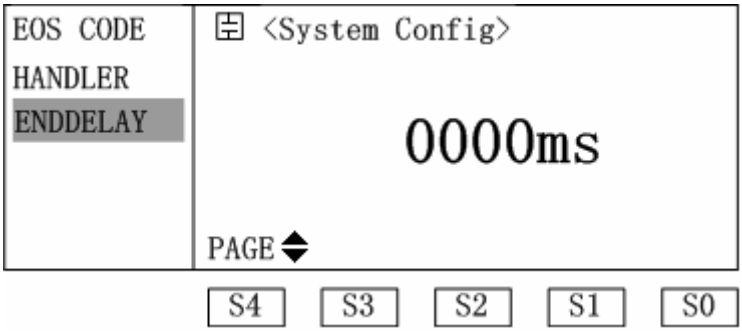


Figure3-62 Setup of ENDDELAY

Softkeys	S4 Page-turning, turn to the system configuration on the next page.

☞Note：set the ENDDELAY from 0～9999ms；

The setup is based on a finished measurement, if the impulse width of sorting results sent by HANDLER is too narrow for user, then suitable delay needs to be added, which can help the user response to the machinery sorting immediately.

3.2.12File List

3.2.12.1 <Files List>page switch

Press SYSTEM in the panel, then press softkey S1 to enter the page. More details in §3.2.11.1.

3.2.12.2 File operation

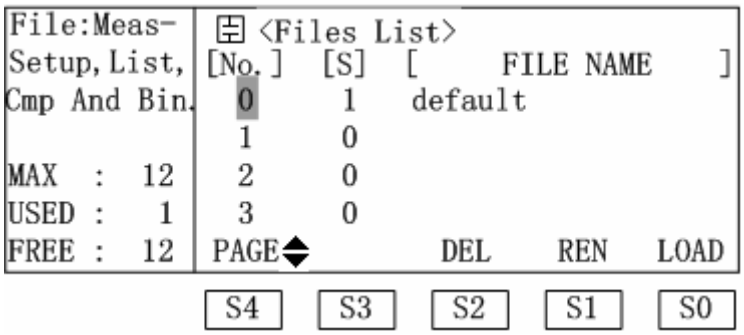


Figure3-63 File Operation

Softkeys	S0 Load the corresponding file； S1 Rename the file； S2 Delete the file； S4 Page-turing，there are 12 files saved in the instrument, only 4 files can be displayed each time, so the use of such function can display other files.

☞Note： “MAX” in the left display area means the maximum storage, the instrument can support 12 files at most，“USED” means the used storage，“FREE” means more files can be saved.

☞**NOTE：When opening , the instrument loads file“0”automatically, so if the user wants to modify and customize initial status, just set all kinds of information about status well and save as file‘0’**

Chapter 4 Correct Measurement of Components

4.1 Measurement of common-used components

1. ⚠Use the power correctly, press the power switch.
2. Select the useful measurement parameter, if necessary, select the suitable equivalent mode , especially when Q or D is closer to 1, or there will be greater deviation in the testing result
3. Select the useful measurement frequency and suitable measurement level.
4. Set other control parameters needed to be modified.
5. Connect the suitable test fixture or cable. The instrument accessories are TH26005test fixture and TH26004 4-terminal test cable，and the optional accessories are TH26006axial fixture core, TH26005 test axial lead component，and TH27009 SMD test tweezers.
6. Warm-up time: more than 20min.
7. Short zeroing by connecting the gilded shorting plate TH2600 and test fixture or cable.
8. Open zeroing by taking out the shorting plate.
9. The instrument begins to test after the DUT being connected with test terminal.

   ⚠ **Warning：Please don't exert voltage or current to the test terminal, in order to avoid damaging the instrument;**

   ⚠ **Warning：Before testing the charge component（capacitor），please discharge first then continue to test！**

4.1.1 Equivalent mode

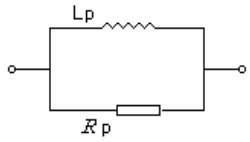
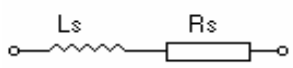
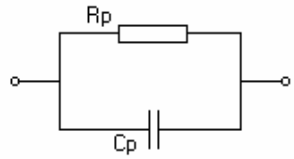
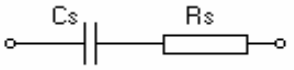
Series and parallel

Actual inductance, capacitance and resistance are not the ideal pure resistance or resistance components, but appear as a complex impedance component in the

form of series or parallel. According to the series /parallel equivalent circuit, the instrument calculates the desired value. Different equivalent circuits lead to different results due to the different components.

Two equivalent circuits can be transformed with a certain formula， just as what the table below shows. But Q and D, no matter in which manner, are the same.

Figure 4-1 L、C series/parallel transformation table

Circuit form		Dissipation D	Transformation of equivalent mode
L		D=2πFLp/Rp=1/Q	Ls=Lp/(1+D^2) Rs=RpD^2/(1+D^2)
		D=Rs/2πFLs=1/Q	Lp=(1+D^2)Ls Rp=(1+D^2)Rs/D^2
C		D=1/2πFCpRp=1/Q	Cs=(1+D^2)Cp Rs=RpD^2/(1+D^2)
		D=2πFCsRs=1/Q	Cp=Cs/(1+D^2) Rp=Rs(1+D^2)/D^2

The Definition of Q、D、Xs is：Q=Xs/Rs，D=Rs/Xs，Xs=1/2πFCs=2πFLs

Note：In component parameter，suffix s means series equivalence，p means parallel equivalence

Generally, for low-value impedance components（high-value capacitor and low-value inductance）, the series equivalent circuit is adopted, on the contrast, for high-value impedance components（low-value capacitor and high-value inductance）, the parallel equivalent circuit is adopted.

Meanwhile, the actual circumstance of using the components should be considered to decide the equivalent circuit. For instance, when capacitor is used in wave filtering, the series equivalent circuit is adopted, but in LC oscillating circuit, the parallel equivalent circuit is adopted.

4.2 Correct Connection of DUT

4.2.1 DUT Connection

There are four pairs of test terminals in the instrument, including high terminal

of current driveHC、low terminal of current drive LC、high terminal of voltage test HP、low terminal of voltage testLP and corresponding shielding terminal of each testing terminal.

Each testing terminal contains shielding layer, and the goal of shielding is to weaken the influence on the earth scattering capacitor and bring the electromagnetic interference down. At the moment of testing, HC、HP and LC、Lpshould be connected in the lead of DUT to make a complete 4-terminaltesting and reduce the influence on the testing result(especially the dissipation measurement).especially when testing the low impedance components, it is necessary to connect the testing terminals HP、LP with the end-lead of components to prevent the lead resistance to be added the untested impedance. The connection principle Is that what HP、Lptest is the actual existed voltage of DUT.

In other words, HC、HP and LP、Lc had better be connected with the end-lead of DUT, or there will be more deviations.

If the contact point and lead resistance Rlead is far smaller than untested impedance（example：Rlead<Zx/1000, the precise demand is no higher than 0.1%）, then the HC、HP and LC、LP can be connected with two terminals of the DUT （2-termina measurement）after being connected together。

In the testing of high precision, it is better to use test fixture than testing lead(Kelvin test fixture).under the 10kHZ frequency, Kelvin test clip leads has a better measurement result, but over 10kHZ, it is difficult to meet the demand of measurement. Because in the higher frequency, the change of clearance between the leads can change the scattering capacitance and inductance of test terminal directly and while testing leads are very difficult to be fixed; and testing leads can lead to other test deviation easily.

So when testing with a high frequency, it is possible to use the test fixture. If the condition is limited, when correct the instrument, the status of test leads should correspond with that of testing, as well as, using the User Load Correction to compensate the additional deviation of test leads.

No matter using test fixture or Kelvin test clip leads offered by instrument, or using the user-made fixture, the demands below should be met：

1. Distribution impedance must be reduced to the smallest，especially when

testing high impedance components

2. Contact impedance must reduce to the smallest。
3. The test terminal is needed to form a complete 4-terminal test.
4. Short and open can be executed among the contact points. short zeroing and open zeroing can easily reduce the influence of distribution impedance in test fixture on measurement。As for open zeroing, the test terminal must be the same with DUT connection, desperate with the same distance. As for the short correction, the shorting plate with low-impedance must be connected among the terminals, or connect HC with LC directly，as well as HP and LP，finally connect the two groups together.

ⓘ**Attention**：When the DUT is a polarity component, before testing, the “hot end” should be connected with the terminal of HC、HP，while “cool end” should be connected with the terminal of LC、LP in front panel. Please discharge first to avoid the damage of the instrument when testing the polarity component.

4.2.2 Eliminate the influence of scattering impedance

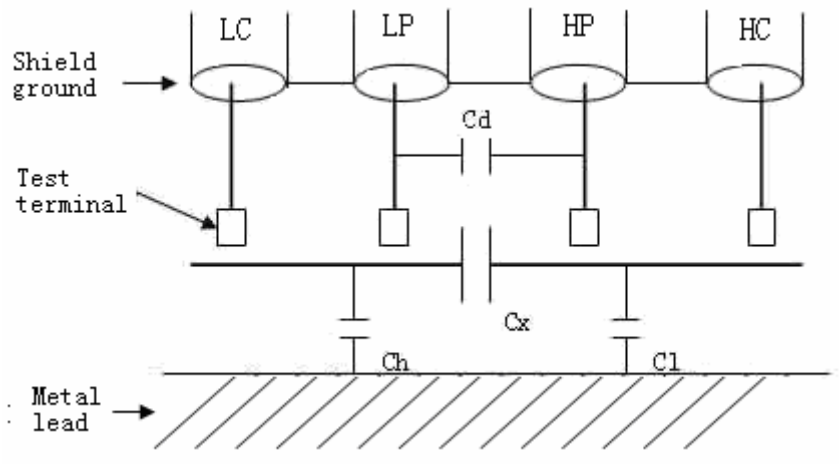


Figure4-1 Diagram of the Influence of Scattering Capacitor

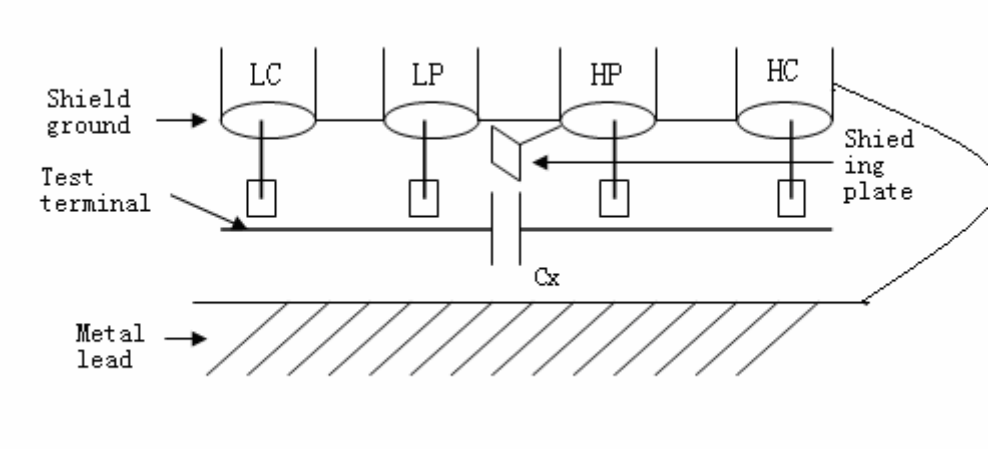


Figure4-2 Diagram of the Method to Eliminate the Influence of Scattering Capacitor

When the DUT is high impedance(for example: small capacitor)，influence of scattering capacitor can't be ignored. Figure4-1 is an example using 4-terminal test, in this figure，Cd and Cx is parallel. When the conducted plate is under the DUT, capacitor Ch connects with Cl in series then connects with Cx in parallel，so , it will lead to deviation of testing result. Put a grounded conductor on the high and low terminal, then Cd can reach the smallest，meanwhile, if connect the grounded terminal with the under conducted plate，the influence of Ch、Cl will be eliminated.

When the DUT is low impedance（for example: small inductance、big comparator） .There is strong current flowing through HC and LC， so electromagnetic coupling between becomes main source of the test deviation except the influence which the test terminal contacts the resistance. If the electromagnetic coupling can't be eliminated well, the measurement result will be influenced unexpectedly. Generally speaking, contact resistance influences the resistance from test impedance, while the electromagnetic coupling influences the reactance from test impudence. The HC、LC can be lead to the DUT with the mode of twisted-pair , thus the magnetic field generated by them can counteract reciprocally, and it will help reduce the influence of the electromagnetic coupling on the measurement.

4.3 Measurement of Inductor and Transformer

ⓘAttention：Please read the contents in this chapter briefly in order to test the inductor or transformer accurately and reliably.

4.3.1 The correct measurement of inductor

Inductor is made up of a magnetic core surrounded by leads and the character of which is based on the material magnetic core. The air can be the simplest material to make inductor. But the inductance amount and the permance rate forms a direct ratio relation, the permance rate of air is extremely small, so the air is in adverse to making the inductor due to the volume and efficiency. The common used materials are ferrite, permalloy and ferroferrite.etc

The majority of inductance amount of inductor changes a lot when using different test frequencies and test signal level. The inductance amount of a inductor with magnetic core is influenced by permance rate **μ**. The magnetic inductance intensity of the magnetic core changes as the change of magnetic inductance intensity generated by the current through inductance coil, and the varied relations can be described by magnetization curve.，Figure4-3 is a classical magnetization curve of inductance coil.

When exert a static magnetic field, the magnetic inductance intensity: B increases as the magnetic inductance intensity: H (forms a direct ratio with the flown current) dose. Inductance amount **L∝, B=μH,** Figure4-4 shows a relation curve about B、H、L.

In the area where the initial permance rate is next to origin of coordinates, the magnetic inductance intensity increases slowly, so the inductance amount is a little bit small here when the inductor works. Then the inductance amount increases as the increase of the current through the inductor. When the magnetic core is beyond the saturation point, the inductance amount will decreases greatly as the decrease of the current, under such circumstance, the test signal has generated the distortion and the reading stability becomes worse that the jitter digits increase. On the other hand, the loss of magnetic core will increase obviously in the high-frequency area, which depends on the material and structure of the magnetia core.

All in all, the measurement result of the inductor will change a lot as

the difference of measurement signal and frequency.

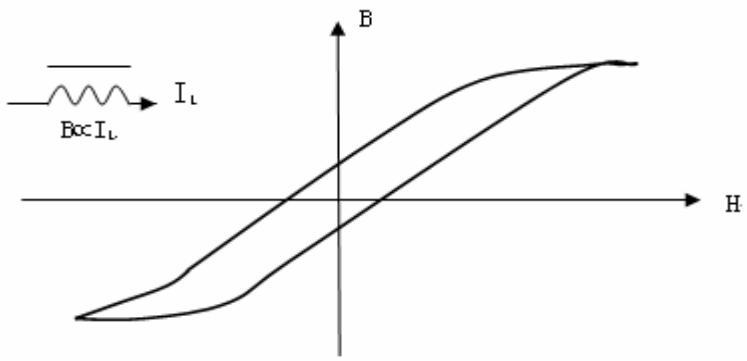


Figure4-3 Magnetization Curve of Magnetic Core-inductor

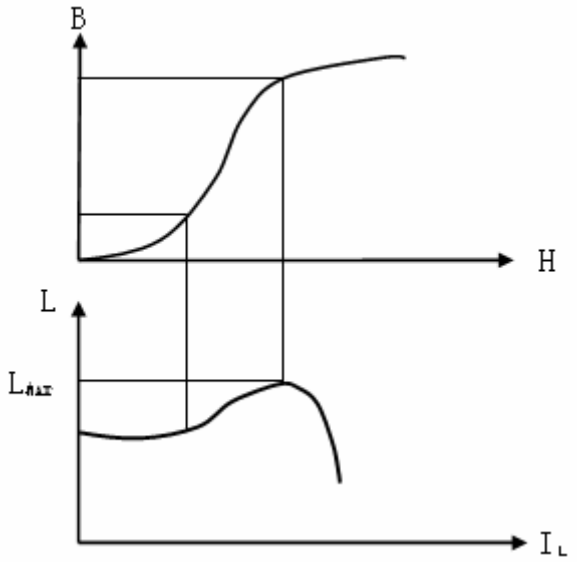


Figure4-4 Mutual Relationship between Magnetic Field Intensity and Inductance Amount

Generally speaking, the measurement of inductor adopts the small test current (small test level) as much as possible。Due to the differences of different measurement signals, the use of different instruments will cause the different measurement results, which mainly depends on the input voltage and essential resistance of signal source

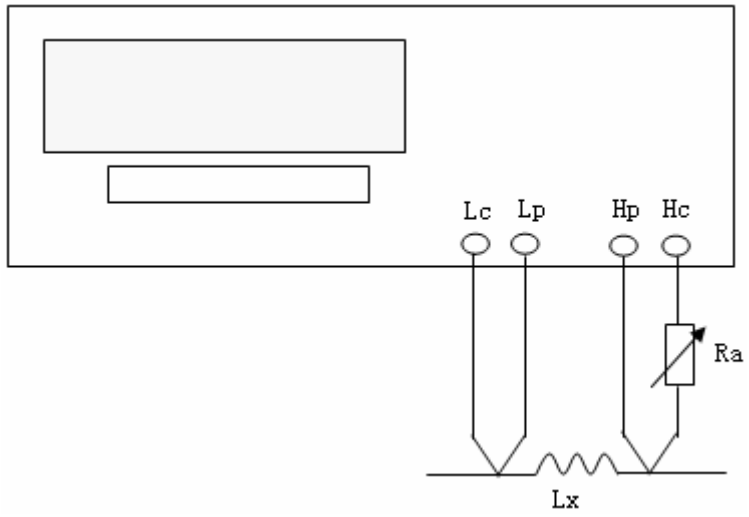


Figure4-5 Signal Source Essential Resistance Adjustment Diagram

The instrument provides the test level of 10mvB_{rmsB}-1VB_{rmsB}，the essential resistance of signal source can select 25Ω and 100Ω。

Two methods to adjust the tested current：

1.When the untested inductor is connected with the test terminal, open the Vm/Im monitoring switch，set the essential resistance, and select a suitable level to make the tested current available.

2. User can adopt the method of Figure4-5 to adjust the essential resistance of signal source to meet the demand of test current, thus to achieve the consistency of different test results. In the figure above, the adjustable potentiometer is Ra，to make the current become a demanded value, the Ra can be replaced as a fixed resistance, this method can help adjust the consistency of different tests.

When exert a high test signal to the untested inductor, the accurate measurement can not be achieved in some specific frequency, the reason is that the non line-shape of iron core material leads to the distortion of the current in the test signal, so in order to reduce the effect of it, the level of test signal should be reduced.

The character about the DC superposition of inductor

Magnetic inductor(transformer) is more applied in power circuit and filter circuit, ripple、noise and interference suppression. In such an application, certain working current must flow in the inductor and the test method to analog this application is the so-called superposition **DC test.** In Figure4-6, different

superposition current has the different corresponding inductance amounts that are the feature of **DC** superposition. High-conductivity magnetism saturation inductor has the prominent character of **DC** superposition.

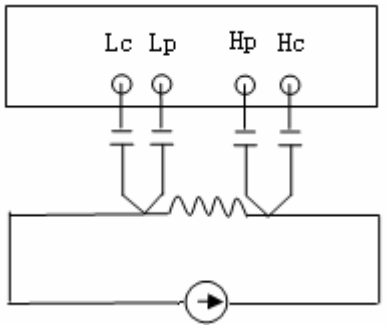


Figure4-6 Usage of External Bias Current Source Superposition Test

TH2825/TH2825A doesn't have the function of internal biasing，so it is necessary to use the external bias current source for the superposition test. The current source should have a larger AC impedance to reduce the test deviation. In Figure4-6，the equivalent parallel impedance affects the test precision directly.

The current source may affect the test signal, and the charge and discharge of isolated capacitance may cause the shaving of measurement signal as well, so it will affect the stability of superposition test, and the measurement speed will be slower as the change of measurement range. The adoption of range lock can reduce the influence to the least. Refer to the introduction about Range in 3.2.1.7

The use of the professional inductance superposition test bias current source as TH1773 can simplify the connection and usage and provide the protective measures of shock resistance, isolation measures, as well as the precision assurance within an effective range.

☞**Note：** TH2825A can control TH1773 directly using the provided List Sweep function；

TH2825isnot available to control TH1773.

Attention the influence of test fixture on inductor test

Test fixture is made up of metal material, so when the metal material is closer to the inductor, leakage flux from it forms whirlpool inside the metal material. The size of the whirlpool is related to the size and shape of the metal, the difference of the size causes the different test results. Meanwhile, the metal can change the flux in the inductor, and the inductor is changed as a result.

So, when testing the inductor, the DUT should be far from metal as

possible

Precision about testing value of Q。

Generally speaking, if the LCR test instrument adopts V/I （voltage/current）,the rest precision of Q is not too high, especially when testing the high Q value. The value of Q is obtained after calculating, for example, Q=X/R=1/D，if value of is 100，the proportion of value of R in the impedance is smaller, then，the slight change of R will cause the greater change of Q，if R changes 0．1% it means D changes 0．001，then value of Q will change from 100 to 91 or 111.

4.3.2 Correct measurement of transformer

The function in this section is only for TH2825A.

The transformer measurement can be used by cooperating with the test fixture our company provides.

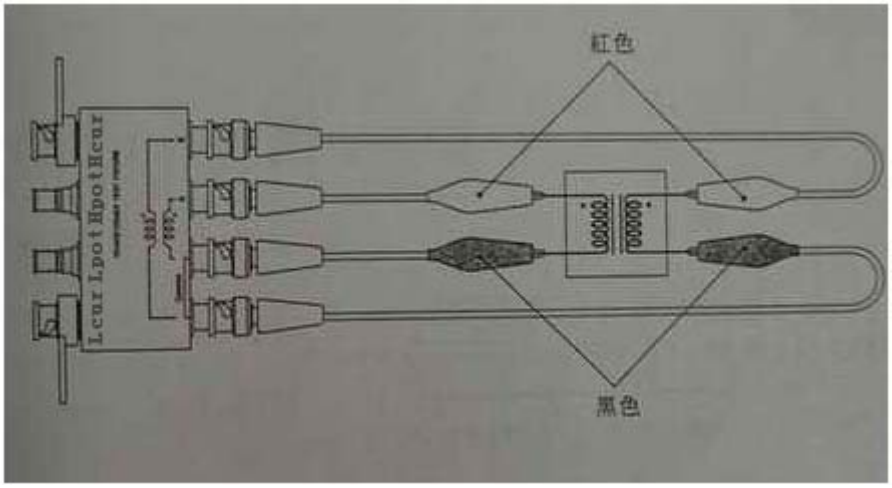


Figure4-7 Correct Connection of Transformer

4.3.3 Test parameter

Primary parameter：

LA：2-terminal inductance amount of winding A.

LB：2-terminal inductance amount of winding B.

Secondary parameter：

R2：Direct current resistance（DCR）of main parameter winding, as LB-R2，then

R2 means the DCR of winding B.

N：ratio of transformer winding， as LB-N，then N means the ratio of

$$\frac{\text{Turns of winding B}}{\text{Turns of winding A}}$$

As LA-N， N means the ratio of.

$$\frac{\text{Turns of winding A}}{\text{Turns of winding B}}$$

1/N：Count down of N.

M：Mutual inductance.

☞**Note：**

1. In the general transformer test, primary parameter sets as LB；

2. When the winding of transformer is different, the side of more windings connects with B terminal（Hcur）, the one of fewer windings connects with terminal A（Hpot）.

4.4 Correct measurement of capacitor

4.4.1 The frequency relativity of capacitor

All components have the frequency reliability, those which the frequency reliability is small, stability is high and the loss is small; can be the standard capacitors, for instance, air- capacitor. While the frequency of some capacitors will change quickly as the change of frequency, for instance, aluminum electrolysis capacitor.

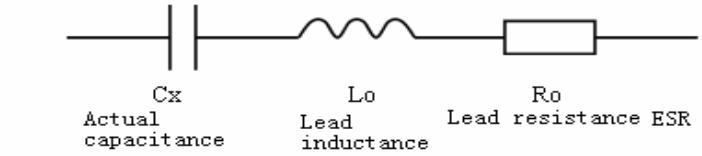


Figure4-8 equivalent circuit of capacitor

The figure above shows the actual equivalent circuit of capacitor，based on the figure, the change curve of impedance and frequency has formed in figure 4-9.

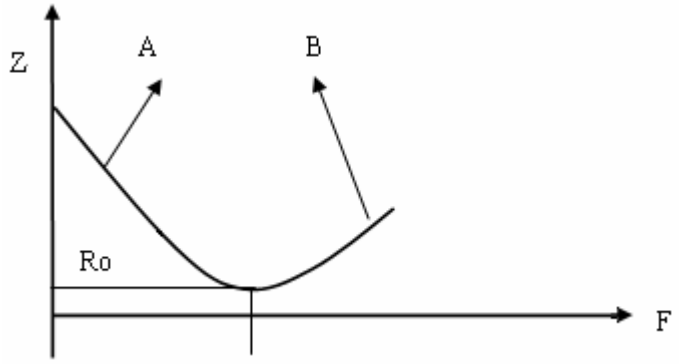


Figure4-9 change curve of Z-F

In figure4-9，curve A is mainly decided by Cx， Ro is the resonance point，the corresponding frequency fB_{0B} is called the self-resonance frequency of capacitor. curve B is mainly decided by Lo，it is clear that, as the increase of frequency, the comparator transforms from the character of capacitance to that of inductance。

In high-frequency test （for example 100kHz）, all capacitors may produce quite different results due to the unsuitable methods. So when the capacitor operates the high-frequency test, factors below should be paid attention to when the capacitor operates the high-frequency test:

A. suitable test fixture is available（for instance: TH26001, TH26005 or TH26006），

the test cable is not available；

B. 20min later, short zeroing and open zeroing begin， TH26010 gilded shorting plate is adopted to operate the short zeroing.
C. Zeroing must be restarted after the change of measurement environment；
D. Pins must be inserted to root when the capacitor inserts into the test fixture；

4.4.2 The accurate measurement about small dissipation (for example mica capacitor).

Theoretically，the value of D is positive constantly，when the instrument tests

the dissipation D，the value of D maybe negative（within the allowed range），if D displays as -0.0001, the methods below can be adopted to test such a low dissipation.

The component whose dissipation is known and the impedance is very close to DUT)can be adopted as a reference, and the actual dissipation had better be extremely small, then the correct dissipation undown testing can be calculated as below：

$$D_X = D_2 - (D_1 - D_S)$$

In this formula，D_X actual value of test component

D_2 displayed value of test component

D_1 displayed value of reference component

D_S actual value of reference component (as the value is extremely small, it can be considered as 0)

4.4.3 Level reliability of capacitor

As previously mentioned, the inductor has an influence on the size of test signal, and some parameters of capacitor can also change as the change of test level. The test level has the most influence on the test result of ceramic capacitor, especially the high K capacitor, especially the capacitor with high K, so when testing this kind of capacitor, it is necessary to confirm that in what level the capacitor can make a measurement.

4.4.4 Measurement of SMD capacitor

With the more demands of the device-miniaturization，SMD capacitor is applied widely. Our company provides the specific test fixture TH26009, the best fixture of testing SMD components currently, to test the SMD capacitor.。

There are no leads in SMD component, so its ESR (Equivalent Serial Resistance) is too small, generally, in this measurement, the parallel equivalent mode is adopted. For the capacitor over 1uF（for instance, sheet mode electrolytic capacitor）, the series equivalent mode is recommded.

When testing the SMD device with micro capacitance, please be attention to

the open correction of fixture. In the open circuit, it is necessary to adjust the distance of open correction as the width of SMD device, or there will be unsuitable correction deviation. If there is a 1mm loss, then there may be a 0.02pF deviation of distributed capacitance.

Chapter 5 Performance measurement

5.1 Measurement range

Figure5-1 Measurement Range of All Parameters

parameter	Range
Capacitance C	0.001pF ~ 1.9999F
impedance |Z|；resistance R，DCR，R2；reactance X	0.01mΩ ~ 99.99MΩ
Dissipation factor D	0.0001 ~ 9999
Quality factor Q	0.0001 ~ 9999
Conductance G；susceptance B	0.0001μS ～ 999.99 S
inductance L，LA，LB；mutual inductance M	0.001μH~99.999 kH
Phase angle θ	REG：-180.00°~+180.00° RAD：-π~+π
Cylinder number rate N，1/N	0.001~9999.9

5.2 Measurement time

Please refer to Figure5-2 from the measurement beginning, analogy sampling, calculation to the measurement time of Bin or Comp signal input.（FastT is set as 1，please refer to 3.2.6.5）

Figure5-2 Measurement time

Item	Fast speed	Middle speed	Slow speed
4-terminal measurement （not including DCR）	20mS 30mS(50Hz、60Hz)	60mS	295mS

4-terminal measurement （ DCR included）	180mS	280mS	600mS
2-terminal measurement L2-M	40mS 60mS(50Hz、60Hz)	117mS	560mS
2-terminal measurement L2-N、L2-1/N	50mS 85mS(50Hz、60Hz)	145mS	550mS 780mS(f<1kHz)
2-terminal measurement L2-R2	180mS	280mS	600mS

☞**Note**：L2 means LA and Lbin the setup of measurement parameter FUN .
The time above is based on the Range Hold, small character display, level monitor switch being OFF、essential resistance not being the status of constant voltage, external bias voltage switch being OFF, so if the status above changes, then a certain calculation and processing time should be added.

5.3 Accuracy

Measurement accuracy includes the deviations of measurement stability, temperature coefficient, degree of linearity and measurement repeatability.etc

The inspection of measurement accuracy must be made from the conditions below：

a) Warm-up time：≥ 20 Min。

b) Correct open and short correction after warming up

c) Select the correct measurement range when the instrument works at “AUTO”.

5.3.1 Accuracy of｜Z｜，L，C，R，X

The accuracy Ae[%]of |Z|，L，C，R，X,G,B,DCR can be expressed as the formula below：

When $|Z_x|$ > 100Ω

$A_{e..} = \pm[K_A+K_B\times K_V\times|Z_x|/Z_S+ K_L/|Z_x|+ |Z_x|/K_F]\times K_C$ [%]

（formula 5-1）

When $|Z_x|$ or DCR ≤ 100Ω

$A_{e..} = \pm [K_A+K_B\times K_V\times Z_S/|Z_x|+ K_L/|Z_x|+ |Z_x|/K_F]\times K_C$ [%]

（formula 5-2）

In the formula：

K_A、K_B： Basic measurement accuracy factor (in Figure5-3)

K_V：Measurement level factor（in Figure5-7 and Figure5-8）

KB_{LB}：Cable length factor（in Figure5-4）

K_F：Measurement frequency factor（in Figure5-5）

KB_{cB}：Temperature factor (in Figure5-6)

$|Z_x|$：Impedance testing value of DUT

Z_S：Current range impedance value，in Figure5-3

When testing L，C，R，X,G,B,DCR，transform the measurement value to impedance value $|Z_x|$,and operate as the formulas above。

The applied condition of accuracy L，C，X，B：DB_{xB}（D measurement value）≤0.1；

When DB_{xB}≥0.1， accuracy factor AB_{eB} should be mulNotelied by $\sqrt{1+D_x^2}$

the applied condition of accuracy R，G：QB_{xB}（Q testing value）≤0.1

when QB_{xB}≥0.1， accuracy factor AB_{eB} should be mulNotelied by $\sqrt{1+Q_x^2}$

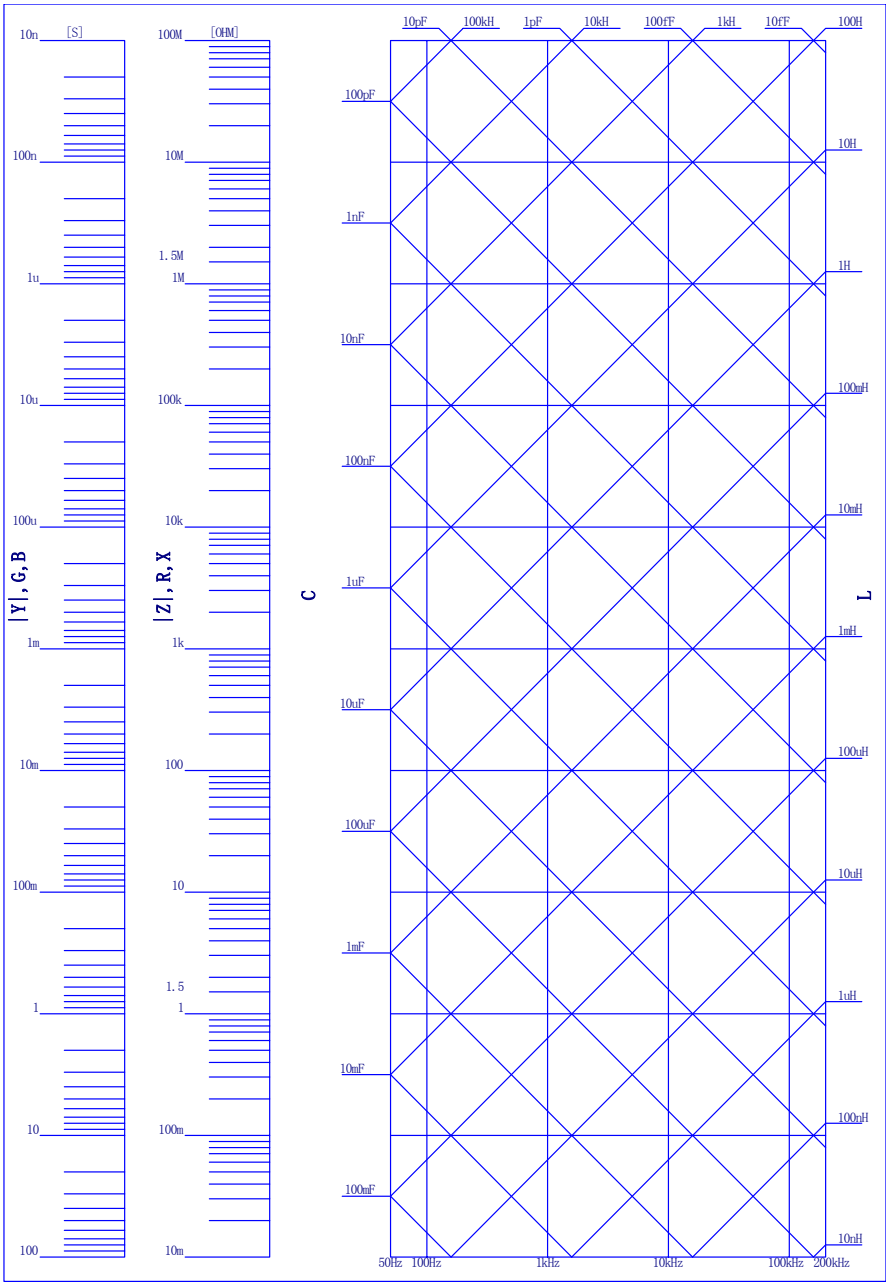


Figure 5-1 Impedance Transform Figure

Figure5-3 measurement accuracy parameter factor K_A、K_B

$\|Z_x\|$	Z_S	K_A [%]（fast/ mid、 slow） K_B [%]（fast/ mid、slow）								
		Test signal frequency								
		DC	50/60Hz	100/120Hz	1 kHz	10 kHz	20 kHz	40 kHz	50 kHz	100 kHz
1MΩ ≤|Zx|≤ 100MΩ	**1MΩ**	0.85/ 0.85 0.075/ 0.025	0.65/ 0. 25 0.075/ 0.025[1]	0.48/ 0.15 0.075/ 0.025[1]	0.13/ 0.1 0.04/ 0.02	0.48/ 0.48 0.04[3]/ 0.02[3]	1.9/1.9 0.12[3]/ 0.06[3]			
100kΩ ≤|Zx|< 1MΩ	**100kΩ**	0.85/ 0.85 0.055/ 0.02	0.65/ 0.25 0.055/ 0.02[2]	0.48/ 0.15 0.055/ 0.02[2]	0.13/ 0.095 0.02/ 0.01	0.36/ 0.36 0.02[3]/ 0.015[3]	1.4/1.4 0.05[3]/ 0.03[3]	1.15[4]/1.15[4] 0.11[4]/ 0.1[4]	1.15[4]/1.15[4] 0.11[4]/ 0.1[4]	1.15[4]/ 1.15[4] 0.11[4]/ 0.1[4]
10kΩ ≤|Zx|< 100kΩ	**10kΩ**				0.11/ 0.09 0.02/ 0.01	0.16/ 0.16 0.02/ 0.015	0.8/ 0.8 0.05/ 0.03			
1kΩ ≤|Zx|< 10kΩ	**1kΩ**						0.7/ 0.7 0.05/ 0.03	1.12/ 1.12 0.11/ 0.1	1.12/ 1.12 0.11/ 0.1	1.12/ 1.12 0.11/ 0.1
100Ω < |Zx|<1kΩ	**100Ω**									
10Ω < |Zx|≤ 100Ω	**100Ω**						0.5/ 0.5 0.05/ 0.03	0.83/ 0.83 0.11/ 0.1	0.83/ 0.83 0.11/ 0.1	0.83/ 0.83 0.11/ 0.1
1Ω < |Zx|≤ 10Ω	**10Ω**		0.7/ 0.4 0.055/ 0.02	0.5/ 0.17 0.055/ 0.02	0.13/ 0.12 0.02/ 0.01	0.2/ 0.2 0.02/ 0.15	0.6/ 0.6 0.05/ 0.03	0.97/ 0.97 0.11/ 0.1	0.97/ 0.97 0.11/ 0.1	0.97/ 0.97 0.11/ 0.1
100mΩ < |Zx|≤ 1Ω	**1Ω**	0.85/ 0.85 0.09/ 0.02	0.65/ 0.65 0.09/ 0.02	0.5/ 0.4 0.09/ 0.02	0.4/ 0.4 0.03/ 0.01	0.4/ 0.4 0.03/ 0.015				
1mΩ ≤ |Zx|≤ 100mΩ	**100mΩ**	0.85/ 0.85 0.29/ 0.1	0.65/ 0.65 0.29/ 0.1	0.5/ 0.4 0.29/ 0.1	0.4/ 0.4 0.095/ 0.03	0.4/ 0.4 0.075/ 0.03	0.6/ 0.6 0.14/ 0.06	0.97/ 0.97 0.14/ 0.1	0.97/ 0.97 0.14/ 0.1	0.97/ 0.97 0.14/ 0.1

In the figure

Note 1：When open the external bias switch DC Bias，0.075/0.045

Note 2：When open the external bias switch DC Bias，0.055/0.040

Note 3：When the length of measurement cable is 1 m or 2 m，it needs to be mulNotelied by the adjustable coefficient

1 m：× 2.5

2 m：× 4

The measurement frequency is 10kHz、20kHz，when $|Z_x| \geq 100k\Omega$，the value of Z_S is 100kΩ all the time。

Note 4：The measurement frequency i40kHz、50kHz、100kHz，when $|Z_x| \geq 10k\Omega$，the value of Z_S is 10kΩ all the time.

Figure5-4 Cable Length Factor K_L

Cable length	K_L					
	Test frequency					
	DC，fm<1kHz	1kHz	10kHz	20kHz	40/50kHz	100kHz
0m	0.0002Ω	0.0045Ω	0.025Ω	0.05Ω	0.15Ω	0.25Ω
1m	0.01Ω	0.0165Ω	0.075Ω	0.15Ω	0.45Ω	0.75Ω
2m	0.018Ω	0.0285Ω	0.125Ω	0.25Ω	—	—
4m	0.034Ω	0.0525Ω	—	—	—	—

In the figure，fm is the measurement signal frequency [kHz]。

Figure5-5 Test Frequency Factor K_F

K_F					
Test frequency					
DC，fm<1kHz	1kHz	10kHz	20kHz	40/50kHz	100kHz
$2.8\times10^{8}\Omega$	$2.8\times10^{7}\Omega$	$2.8\times10^{6}\Omega$	$1.4\times10^{6}\Omega$	$5.6\times10^{5}\Omega$	$2.8\times10^{5}\Omega$

Figure5-6 Temperature Factor K_c

Temperature（℃）	0	8	18	28	38	45
KB_c	4	2	1	2	4	

When the measurement level V_{OSC} is 50mV,100mV,250mV,500mV, 1V，the value of K_V is shown as the following Figure.

Figure5-7 Basic accuracy level amendment coefficient

$\|Z_x\|$	K_V
$1M\Omega \leq \|Z_x\| \leq 100M\Omega$	1（@1V）；5（@500mV）；10（@250mV）；25（@100mV）；50（@50mV）
$100k\Omega \leq \|Z_x\| < 1M\Omega$	1（@1V）；2（@500mV）；4（@250mV）；8（@100mV）；15（@50mV）
$10k\Omega \leq \|Z_x\| < 100k\Omega$	
$1k\Omega \leq \|Z_x\| < 10k\Omega$	1（@1V） 1（@500mV） 2（@250mV） 5（@100mV） 10（@50mV）
$100\Omega < \|Z_x\| < 1k\Omega$	
$10\Omega < \|Z_x\| \leq 100\Omega$	
$1\Omega < \|Z_x\| \leq 10\Omega$	
$100m\Omega < \|Z_x\| \leq 1\Omega$	

1mΩ ≤ $\|Z_x\|$≤ 100mΩ	1（@1V）；2（@500mV）

When the test level V_{OSC} is not 50mV,100mV,250mV,500mV, 1V，A in formula 5-1 is still needed to be mulNotelied by level amendment coefficient A_C in the following figure，the value of K_V can be referred to the value under the relative classical level in the figure5-7.

Figure5-8 Atypical Level Test Point Amendment Coefficient

Test signal voltage V_{OSC}	**value point of K_V**	**Accuracy** amendment coefficient **A_C**
20mV≤V_{OSC}<50mV	@50mV	(50/ V_{OSC}[mV])
50mV<V_{OSC}<100mV	@100mV	(100/ V_{OSC}[mV])
100mV<V_{OSC}<250mV	@250mV	(250/ V_{OSC}[mV])
250mV<V_{OSC}<500mV	@500mV	(500/ V_{OSC}[mV])
500mV<V_{OSC}<1V	@1V	(1000/ V_{OSC}[mV])

5.3.2 Dissipation factor D accuracy

The accuracy of D is determined by the formula below

$$D_e = \pm\frac{A_e}{100} \qquad \text{（formualr5-3)}$$

only when D_x≤0.1, theformula above is availabe。

when D_x>0.1，D_e must be mulNotelied by (1+D_x)

5.3.3 Quality factor Q accuracy

The accuracy of Q is determined by the formula below：

$$QB_{eB} = \pm\frac{Q_x \times D_e}{1 \mp Q_x \times D_e} \qquad \text{（formula 5-4）}$$

Where，QB_{Xb} is the value of tested Q。

DB_{eB} is the accuracy of D

Applied condition QB_{xB}×DB_{eB}<1

5.3.4 Phase angleθ accuracy

The accuracy of θ is determined by the formula below：

$$\theta e = \frac{180}{\pi} \times \frac{A_e}{100} \quad \text{[deg]} \qquad \text{（formula 5-5）}$$

5.3.5 R_P accuracy

When D_x（value of tested D）≤0.1

the accuracy of $R_p$is determined by the formula below：

$$R_p = \pm \frac{R_{px} \times D_e}{D_x \mp D_e} \quad [\Omega] \quad \text{（formula 5-6）}$$

Here ， $R_{px}$is the value of tested R_p[Ω].

$D_x$is the value of tested D.

$D_e$is the accuracy of D.

5.3.6 R_S accuracy

When D_x（value of tested D）≤0.1

the accuracy of $R_s$is determined by the formula below：

$$R_{se} = X_x \times D_e \quad [\Omega] \quad \text{（formular 5-7）}$$

$$X_x = 2\pi f L_x = \frac{1}{2\pi f C_x} \quad \text{（formula 5-8）}$$

Where，$X_x$is the value of testedX [S].

$C_x$is the value of testedC [F].

$L_x$is the value of testedL [H].

D_e is the accuracy of D

F the test frequency

5.3.7 Other function reference

- Test signal frequency

0.02%

- Test level

±（10%×set value+10 mV）

- Signal source essential resistance

essential resistance is 25Ω： 25Ω ± 10%

essential resistance is 100Ω： 100Ω ± 10%

essential resistance is 25Ω/100Ω：25Ω ± 10%（≤1 Ω range）

100Ω ± 10%（≥10Ω range）

constant voltage CV：10Ω ± 20%

- level detection

±[AB_{eB} +1+（V_{OSC}×0.1+10 mV）/ V_{OSC}]%

- L2（means LA、LB）、M、R2、N test accuracy

The parameter of the transformer in TH2825A adopts the double-line measurement; the accuracy

measurement range not listed in the instrument can be referred to the following formula to the accuracy

Accuracy of L2

（$L2_e$）

$$L2_e = A_e + (L2_L/L2_X + L2_X/L2_H) \times 100 \quad [\%]$$

And $L2_X$ is the test value of L2 [H].

Figure5-9 L2 test low-terminal yielding point value

$L2_L$		
Length of cable	Test frequency f	
	f <1kHz	f≥1kHz
0m	20 μH	2 μH
1m,2m,4m	200 μH	20 μH

Figure5-10 L2 test high-terminal yielding point value

$L2_H$						
f <1kHz	1kHz	10kHz	20kHz	40kHz	50kHz	100kHz
200 k H	2.5 k H	25 H	6.25 H	0.625H	0.5 H	0.25 H

1. Accuracy of M（M_e）

$M_e = L2_e + K_B \times (L2_X/M_X - 1)$ [%]

M_X is the test value of M[H]；

$L2_X$ is the main turn test value of L2 [H]；

K_B can be referred to Figure5-3

2. Accuracy of R2（$R2_e$）

$R2_e = A_e + 100 \times R_L/R2_X$ [%]

$R2_X$ is the test value of R2 [Ω]。

Figure5-11 cable length factor in testing R2

Length of cable	R_L
0 m	250 mΩ
1 m	500 mΩ
2 m	750 mΩ
4 m	1250 mΩ

3. Accuracy of N（N_e）

$N_e = K_F + 100 \times L2_L/L2_X + (K_G + 100 \times K_H/L2_X) \times Ar \times N_X$ [%]

N_X is the test value of N。

$L2_L$ can be referred to Figure5-9，Ar can be referred to Figure5-15 ；

K_F、K_G、K_H is listed in the following table。

Figure5-12 Basic test accuracy factor of N 1-K_F

K_F							
Test speed	Test frequency						
	50/60Hz	100/120Hz	1kHz	10kHz	20kHz	40/50kHz	100kHz
Fast speed	1.0%	0.7%	0.3%	0.35%	0.7%	0.9%	1.1%
Mid/slow speed	0.5%	0.35%	0.3%	0.35%	0.7%	0.9%	1.1%

Figure5-13 Basic measurement accuracy factor of N_e 2-K_G

K_G 注							
Test speed	Test frequency f						
	50/60Hz	100/120Hz	1kHz	10kHz	20kHz	40/50kHz	100kHz
Fast speed	0.07%	0.055%	0.02%	0.02%	0.05%	0.07%	0.11%
Mid/slow speed	0.04%	0.02%	0.01%	0.015%	0.03%	0.04%	0.1%

Note：If the test level is not 1V，K_G needs to be mulNotelied by the following coefficient：

500 mV: ×1；250 mV: ×2；100 mV: ×3；50 mV: ×6

In the figure above, the test length is 0m，or if the cable increase by 1m，and K_G increase by 0.01 .

Figure5-14 Basic Measurement Accuracy Factor of N_e 3

K_H 注							
Test speed	Test frequency						
	50/60Hz	100/120Hz	1kHz	10kHz	20kHz	40/50kHz	100kHz
Fast speed	0.5 mH	90 μH	7 μH	0.7 μH	0.5 μH	0.4 μH	0.2 μH
mid/slow speed	0.25 mH	35 μH	3.5 μH	0.5 μH	0.3 μH	0.4 μH	0.2 μH

Note：If the test level is not 1V，K_G needs to be mulNotelied by the following coefficient：

500 mV: ×1；250 mV: ×2；100 mV: ×3；50 mV: ×6

Figure5-15 Atypical Level Test Point Amendment Coefficient

Test signal voltage V_{OSC}	Accuracy amendment coefficient Ar
$20mV \le V_{OSC} \le 50mV$	$(50/ V_{OSC}[mV]) \times 6$
$50mV < V_{OSC} \le 100mV$	$(100/ V_{OSC}[mV]) \times 3$
$100mV < V_{OSC} \le 250mV$	$(250/ V_{OSC}[mV]) \times 2$
$250mV < V_{OSC} \le 500mV$	$(500/ V_{OSC}[mV])$
$500mV < V_{OSC} \le 1V$	$(1000/ V_{OSC}[mV])$

5.4 Performance Measurement

All tests must be executed under the conditions listed in 1.2. Only the index test of main part is listed in this test. According to the indexes in this manual, the other parameters not listed can be tested by user in the prescribed conditions. If the test result is beyond the index range, please sent the instrument to the professional maintenance or our company.

5.4.1 Components and devices in performance test

Figure5-16 Components and devices in performance test

Ordinal number	Name of device		specification
1	Standard capacitor	100pF	0.02％ dissipation D is known
		1000pF	
		10000pF	
		10nF	
		0.1uF	
		1uF	
2	AD Standard resistor	10Ω	0.02％
		100Ω	
		1kΩ	
		10kΩ	
		100kΩ	
3	Standard inductor	100μH	0.02％
		1mH	
		10mH	
		100mH	
4	Cymometer		（0～1000）MHz
5	Digit multimeter		0.5％

5.4.2 Function inspection

All function keys, display、and terminals can work normally, and each function is accurate.

5.4.3 Test signal level accuracy measurement

Set the digit multimeter in the AC voltage range, and connect a test bar with HD terminal and the other with earth terminal. the level is changed as: 50mV、100mV、250mV、0.5V，1V and the reading should meet the demand of§5.3.7.

5.4.4 Frequency accuracy measurement

Connect the ground terminal of cymometer with that of the instrument, and the test terminal is connected with the HC terminal of instrument. The frequency is changed as：50Hz、100Hz、1kHz、10kHz、100kHz，the reading should meet the demand of §5.3.7.

5.4.5 Accuracy measurement of capacitance C and dissipation D

Function C_p-D

Test frequency 100Hz 1 kHz 10 kHz 100 kHz

Level 1V

Range AUTO

Biasing none

Speed slow

Short and open correction before testing. Connect the standard capacitor 100pF、1000pF、10000pF、10nF、0.1uF、1uF，then change the frequency，the deviation capacitance C between reading and standard value should be in the deviation range ruled in §5.3.1，dissipation D should be in the deviation range ruled in §5.3.2.

5.4.6 Accuracy test of inductance L

Function L_s-Q

Test frequency 100Hz 1kHz 10kHz 100kHz

Level 1V

Range AUTO

Biasing none

Speed slow

Short and open correction before testing. Connect the standard inductor 100μH、1mH、10mH、100mH，then change the frequency，the deviation capacitance C between reading and standard value should be in the deviation range ruled in §5.3.1.

5.4.7 Accuracy test of impedance Z

Function Z-θr

Test frequency	100Hz 1kHz 10kHz 100kHz
Level	1V
Range	AUTO
Biasing	none
Speed	slow

Chapter 6 Remote Control

TH2825A has the RS232C serial interface and the parallel GPIB (optional) interface. Both interfaces can be used to remotely control TH2825A, but they can not be used at the same time. The two interfaces share the same program commands, but they have different hardware configurations and different communication protocols. This chapter provides the information about the two interfaces and how to use the interfaces.

6.1 RS232C Interface Instruction

The RS232C interface can be used to remotely control the TH2825A, and it also can be used to control the DC current bias source manufactured by our company. The instrument provides abundant programmed commands. All operations from the front panel can be performed by a computer via the serial interface.

6.1.1 RS232C Interface Introduction

RS232C Standard, which is now widely used as the serial communication standard, is also called as asynchronous serial communication standard. It is used to realize the data communication between computers, or between computer and peripheral. RS is an abbreviation of Recommend Standard, 232 is a standard number; this standard was promulgated by EIA in 1969 which rules that the data is transformed through a data line with one bit per time. The configuration of most serial interfaces neither is nor based on the RS-232 standard strictly: use 25-pin "D" connector (9-pin connector in IMAT). The common RS-232 signals are listed as follows

Function	Code	25 Pin Connector Pin Number	9 Pin Connector Pin Number
Request To Send	RTS	4	7
Clear To Send	CTS	5	8
Data Set Ready	DSR	6	6

Data Carrier Detect	DCD	8	1
Data Terminal Ready	DTR	20	4
Transmitted Data	TXD	3	3
Received Data	RXD	2	2
Signal Ground Common	GND	7	5

As the same as the most serial interfaces in the world, the serial interface of this instrument is not based on the RS-232 strictly, TH2825A only uses the smallest subset of the RS232C standard, the signal are listed as follows.

Function	Code	9 Pin Connector Pin Number
Transmitted Data	TXD	3
Received Data	RXD	2
Signal Ground Common	GND	5

It is the simplest and cheapest way to use the serial interface communication

ⓘ **The serial interface pin definition of this instrument is the same as that of standard 9 bin RS232C connector**

TH2825A's RS232 interface ADOPTS adopts 9-bin DB socket, the order of bin is shown as follows.

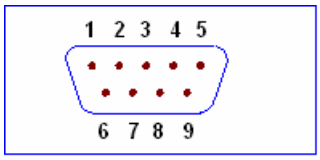


Figure 6-1 RS 232 Interface Bin

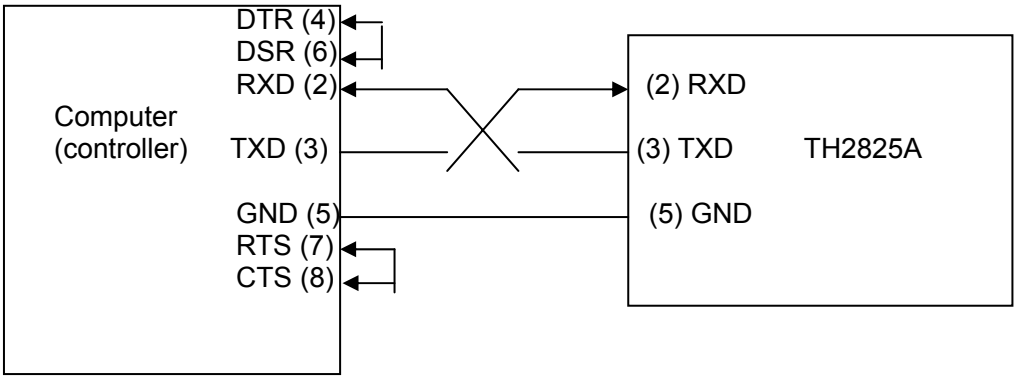
The standard DB 9-pin aperture socket can be connected with it

⚠ **Warning: In order to avoid the electric impact, please turn off the power when connecting and disconnecting the connector**

⚠ **Please don't short connect with the output terminal at will or with case in order to avoid the damage of devices.**

6.1.2 Communication with a computer

- Diagram of connection to a controller.



There may be some difference between TH2825A's RS232 interface and a standard RS232C interface. You can make the connection cable by yourself according the diagram or order one from our company.

Note: Pin 4 and 6, pin 7 and 8 are shorted respectively at the end of controller.

- When the RS232C interface is used to communicate with a controller, RS232 bus mode should be selected as follows.
    1) Press SYSTEM menu key, the ***System Config*** page will be displayed.
    2) Move the cursor to the ***BusMode*** field.
    3) Press RS232 to select the bus mode to RS232 bus mode.

- Serial Interface Specifications

Transmission mode	full-duplex asynchronous communication including start bit and stop bit
Baud Rate	9600 bps
Date Bits	8 Bits
Stop Bits	1 Bit
Parity Bit	None
Endof Sequence	NL (ASCII Code 10)
Tie mode	Software
Connector	DB9

- Software Protocol

When only three lines are used to connect with two interfaces, there will be errors of over speed. When the computer works faster than the instrument, without the hardware data transformation, then the computer may send another bite to the instrument, which causes the loss of information before the instrument reads out the information from the serial interface input register,.

There is no hardware communication connection in RE232 interface, so in order to reduce the loss of data or errors of data, please refer to the contents below when making computer communication software.

1) Command string syntax and format are described in chapter7 " command reference"

2) When the controller sends a command string to the instrument, send "AA" first, then send the command string immediately after receiving "CC" sent back by the instrument the procedure will last until the character transmission is over. If the controller cannot receive the character sent back by TH2825A, the reasons may be as follows.
   A. The serial interface is not connected correctly.
   B. Check if the RS232 function is turned on and TALK ONLY function is turned off.
   C. When TH2825A is executing a bus command, TH2825A will not accept any character through the serial interface at the same time and the character sent by controller will be ignored. In order to keep the integrity of the command, host computer should resend "AA"
3) The controller sends the command using the ASCII code with NL as the end character. TH2825A executes the command after the end character NL is received.

4) TH2825A sends information under following two conditions. The first is when a character is received normally; TH2825A will send the character back as response. The second is when a query command is received; TH2825A will send the query response information.
5) Once a query command is received, TH2825A will send the query

response information immediately even if the whole command has not been executed. So if the command includes two queries, the controller should read the query responses twice. One query is recommended to be included in a single command.

6) Query result is sent by ASCII code, and the EOS CODE is the terminal character

7) Several query responses will be sent continuously with 1ms interval. The controller should be ready to receive the responses; otherwise the response information will be lost.

8) After query, the result should be read clearly(receiving the EOS CODE means the end), in order to avoid the conflict between the query and send-back

9) For some commands that will take a long time to execute, for example Correction command, the controller should keep waiting to avoid the next command being lost when TH2825A is executing the former command.

10) The communication software made by the DOS application software, then it should run under the DOS environment supporting serial interface, if run under Windows, it will cause errors due to the different managing method to serial interface.

6.1.3 Communication with inductance bias current

Function is this part is only for TH2825A。

When using the external programmable bias current source（TH1773），the bias current superposition sweep test can be made. The instrument is connected by RS232C interface and RS232Cof bias current source，in order to help the LCR meter control the biasing current source directly.

RS232C interface of programmable bias current source is the same as this instrument in the hardware and definition of bin, please be attention that the 2 bin and 3 bin must be connected with mutual cross which is shown as follow。

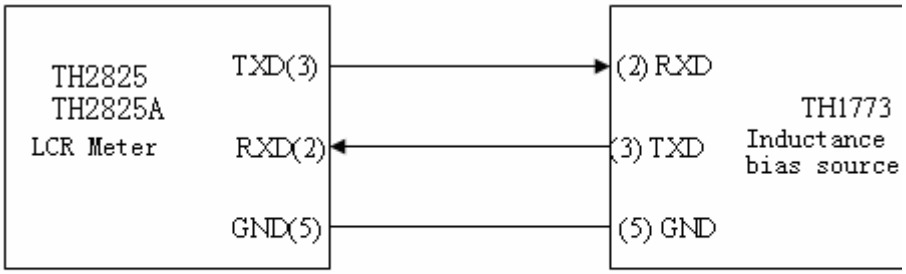


Figure 6-3 Connection Diagram of TH2825/TH2825A and Bias Current Source

User can make a 3-line connection cable (with the length less than 1.5m) by using double-bin shield line as the diagram or order one from our company, buy standard DB9 cable

ⓘ**Note**：Both terminals using 9-bin DB aperture plug

Step ：

⑴ Only when the instrument works on the list sweep page, the bias current source can be controlled, there is no such a function on other pages, so the bias current sweep test function needs to be firstly mastered.

⑵ Connect the instrument with serial interface with the cable above.

⑶ Set the Bus Mode to iBIAS：

press SYSTEM menu key→（CFG soft key）→move cursor to BusMode→iBIAS soft key。

⑷ Set the serial interface of bias current source（TH1773）to ByLCR（more details in the instruction book）。

⑸ In the list sweep mode, set the sweep function and data of iBIAS，back to the List Sweep Measurement page, then the bias current sweep test can be started.

☞**Note**：In bias current sweep test, it is necessary to set the suitable test delay, which is good for testing again after inductance stabilizes；

☞**Note**：Set unit setup sweep mode or continuous sweep mode according to the demands

☞**Note**：In bias current sweep test，it is better to set manual trigger mode. Start bias current and test by pressing TRIGGER in the panel, or use the external trigger, connect the bin switch to HANDLER interface to start measurement.

6.2 GPIB Interface Introduction

6.2.1 GPIB Bus

IEEE488（GPIB）general-used parallel bus interface is a general intelligent instrument bus interface standard. IEEE is the abbreviation of **Institute of Electrical and Electronics Engineers**，488is the standard number. Through this interface, the communication between computer and other intelligent instruments can be collected, as well as an auto test system can be composed conveniently with other test instrument. In the same bus, many test instruments can be connected simultaneously. In this instrument, the IEEE488.2standard is adopted, and the interface board can be selected and bought by user. The control instruction system is open, so user can use the computer operation interface, also can write a program based on this system to achieve the goal. The control instruction system supports most function that is to say; all function can be operated on controlling the computer to realize the remote control.

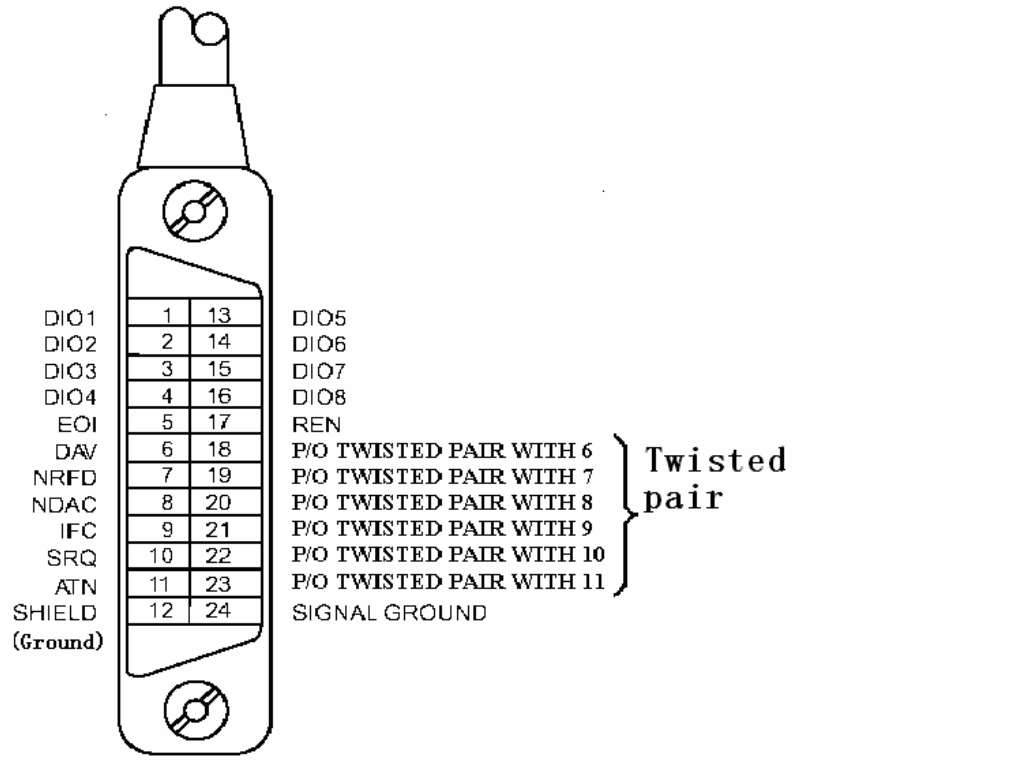


Figure 6-4 GPIB Structure Diagram of Connector Assembly/pin

When using GPIB system, the points below should be paid attention to:

- The total length of cable in one bus system must be less than or equal to two meters times the number of devices connected on the bus (the GPIB controller counts as one device) and the total length of cable must not exceed 20 meters.
- A maximum of 15 devices can be connected in one bus system.
- There are no restrictions on how the cables are connected together. However, it is recommended that no more than four piggyback connectors be stacked together on any one device. GPIB cable connection mode-1

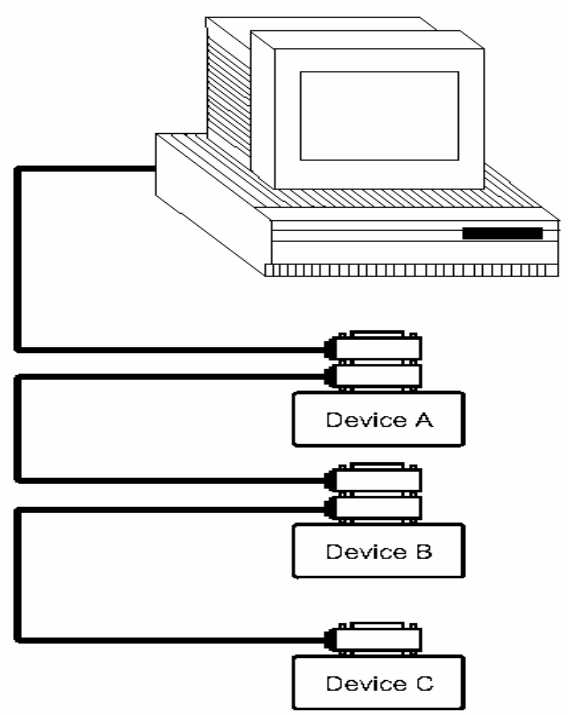


Figure 6-5 Double-piggyback Connector Superposition

GPIB cable connection mode-2

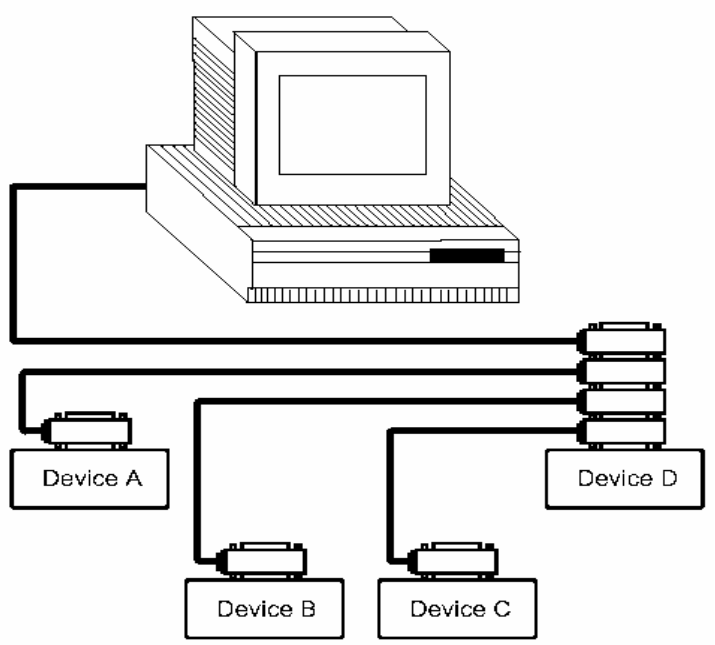


Figure 6-6 4-piggyback Connector Superposition

6.2.2 GPIB interface functions

TH2825A's GPIB functions are listed in the following table.

Code	Function
SH1	Complete Source Handshake capability
AH1	Complete Acceptor Handshake capability
T3	Basic Talker; Talk-Only; unaddressed if MLA; no serial poll
L3	Basic Listener; unaddressed if MTA; no Listen Only
RL1	Remote/Local capability
DC1	Device Clear capability
DT1	Device Trigger capability
C0	No Controller capability
E1	Drivers are open-collector

6.2.3 GPIB addressing

TH2825A's GPIB address is stored in non-volatile memory and can be set to any address from 0 to 30 by front panel key entry in the System Config page. When TH2825A is shipped from the factory, the default GPIB address is 8. For more information, refer to “§3.211.8 GPIB Address”.

Chapter 7 Command reference

There are two types of command：GPIB sharing command and SCPI(standard command ofprogrammable instrument) command. GPIB sharing command is defined by IEEE488.2-1987，these commands are available in all devices, but TH2825/TH2825Adosen't support all sharing commands. SCPI command is a tree structure.

7.1 Sharing command instruction

1. *RST

Function：restart the instrument。

2. *IDN？

Function：query the information about 4 field（ separated by comma）。

Send-back value：company，model, version number

Example： TH2825A 为"TongHui,2825A，LCR-TURNS，Ver0.1.2006"；

TH2825 为"TongHui,2825，LCR，Ver0.1.2006".

3. *TRG

Function：in the bus trigger mode, the instrument is trigger tested once, and input the test result into the bumper, the send-back result can be referred to FETCh？command in §7.4.7。

4. *SAV

Parameter：<numeric_value>[，'filename']

Function：Save file

Instruction：<numeric_value> is the file ordinal number from 0~11。

'filename'is the saved file name，which can be expressed with ASCII character less than 18，please be attention to use single quotes to bracket the file name. If there is no appointed file name, the instrument is named with <Unnamed>。

Example： ：SAV 1，'TH2825'

Attention：There is no clue when the existed file records are covered.

5. ***RCL**

Parameter：<numeric_value>

Function：Load the existed file records

Instruction：<numeric_value> is the file ordinal number from 0~11.

Example： ：RCL 1

7.2 SCPI Order structure

All SCPI orders in TH2825A can be viewed completely in the table below.

Table 7-1 SCPI Command Table

command	parameter	Note
:ABORt		No question
:CALCulate{1|2}		
:FORMat	{REAL|MLINear|CP|CS|LP|LS|RP|IMAGinary|PHASe|D|Q|REAL|LP|INV}	
:LIMit		
:BEEPer		
:CONDition	{FAIL|PASS}	
[:STATe]	{0|1}	
:FAIL?		Question only
:LOWer		
[:DATA]	<numeric_value>	
:STATe	{0|1}	
:STATe	{0|1}	
:UPPer		
[:DATA]	<numeric_value>	
:STATe	{0|1}	
:MATH		
:EXPRession		
:CATalog?		Question only
:NAME	{DEV|PCNT}	
:PATH?		Question only
:CALCulate{3|4}		
:MATH		
:STATe	{0|1}	
:BINning		
:UPPer		
:BIN{1~8}	{?| ,<numeric_value>}	
:AUX	<numeric_value>	
:LOWer		
:BIN{1~8}	{?| ,<numeric_value>}	
:AUX	<numeric_value>	
:NOMInal	<numeric_value>	
:STATe	{0 | 1}	
:RESUlt?		Question only
:LIST		
:FREQuency	<sweep point>[,<sweep point> *]	
:VOLTage	<sweep point>[,<sweep point> *]	
:BIAS	<sweep point>[,<sweep point> *]	
:MODE	{ SEQuence | STEPped }	

:BAND{1~4}	A[,<low limit n>,<high limit n>]	
	B	
	OFF	
:FETCh?		

Table 7-1 SCPI Command Table（continue）

command	parameter	Note
:DATA		
[:DATA]	{REF1|REF2},<numeric_value>	
[:DATA]?	{REF1|REF2|IMON|VMON}	Question only
:DISPlay		
[:WINDow]		
:TEXT1		
:PAGE	<numeric_value>	
:TEXT2		
:PAGE	<numeric_value>	
:INITiate		
:CONTinuous	{0 | 1}	No question
[:IMMediate]		No question
:AVERage		
:COUN t	<numeric_value>	
[:STATe]	{0 | 1}	
:CORRection		
:CKIT		
:STNdard3	<numeric_value>,<numeric_value> ,<numeric_value>,<numeric_value>	
:COLLect		
[:ACQuire]	STANdard{1 | 2 | 3}	No question
:METHod	{REFL2 | REFL3}	
:DATA ?	STANdard{1 | 2 | 3}	Question only
[:STATe]	{0|1}	
:FIMPedance		
:APERture	<numeric_value>[MS | S]	
:RANGe		
:AUTO	{0|1}	
[:Upper]	<numeric_value>[MOHM|OHM|KOHM|MAOHM]	
:FUNCtion		
:CONCurrent	{0,1}	Only for TH2825A
:COUNt?		Question only
[:ON]	<sensor_function>	
:SOURce		
:FREQuency		
:CW	<numeric_value>[HZ | KHZ]	
:VOLTage		
[:LEVel]		
[:IMMediate]		
[:AMPLitude]	<numeric_value>[MV | V]	
:OFFSet	<numeric_value>[MV | V]	
:SOURce	{INTernal | EXTernal}	
:DISch	{0 | 1}	
:TRIGger		
:DELay	<numeric_value>[MS | S]	
[:IMMediate]		No question
:SOURce	{BUS | EXTernal | MANual | INTernal}	

Figure 7-1 SCPI Command Table（continue）

command	parameter	Note
:FORMat		
[:DATA]	{AScii}	
:SYSTem		
:BEEPer		
[:IMMediate]		No question
:KLOCk	{0 | 1}	
:PRESet		No question
:VERSion ?		Question only
:CONSt	{ 100/25 | 100 | 25 | CV }	
: INTEgration	<numeric_value>	
:ALARm	{ PULSe | CONTinuous }	
:HANDler	{ CLEAr | HOLD }	
:ENDdelay	<numeric_value>	

7.2.1 Order structure instruction

The top of tree structure order is root command, or called root。The specified path can help reach to the bottom order.

Command ending character：order input ending character, for example NL（line break ，ASCIIcode is 10）。

Colon（:）：Colon is the command level, which means entering the next level of command.

Semicolon（;）：semicolon means begin a mulNotele command.

interrogation（?）：interrogation means query。

Comma（,）：Comma is break of multi-parameter

Space（ ）：Space is the break of command and parameter

Quote mark（‘’）：Single quotes means the content quoted by original sample, and the command analyze program doesn’t process on it

Asterisk（*）：The command after asterisk is the sharing command.

Figure 7-1 expresses how to reach to the bottom order by using colon and semicolon.

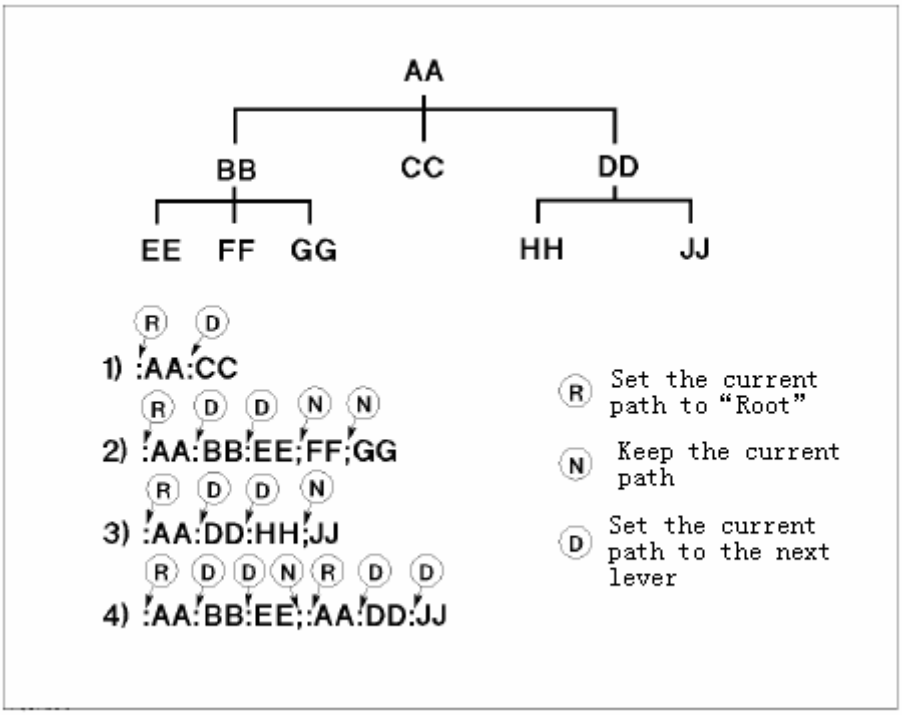


Figure 7-1 Correct Usage of Colon and Semicolon

According to the figure above，if send command

：AA：BB：EE；FF；GG

which is equal to sending three commands as below?

：AA：BB：EE

：AA：BB：FF

：AA：BB：GG

7.3 Order syntax

- Sharing command syntax

There is no tree structure of SCPI command sharing command in sharing command, so no matter in which level, the command can be sent directly.

- The letters are not case sensitive
- Ending character

There are three kinds of ending character： [CARRIAGE RETURN]（0Dh）、 [NEW LINE]（0Ah）and [CARRIAGE RETURN]（0Dh）+[NEW LINE]（0Ah）。

7.4 SCPI order instruction

7.4.1 ABORt order system

1. ：ABORt

parameter：None

Send-back value：None

Function：Breakout the processing system instantly, and reset the trigger system.

7.4.2 CALCulate order system

1. ：CALCulate1：FORMat

Parameter：{ REAL | MLINear | CP | CS | LP | LS | RP }

Send-back value：{ REAL | BP | MLINear | CP | CS | LP | LS | RP }

Function：set or query the current test main parameter。

Instruction：REAL real number part（being resistance under the series equivalent mode，being conductance under the parallel equivalent mode）

MLIN ear	absolute value of impedance
CP	equivalent parallel capacitance
CS	equivalent series capacitance
LP	equivalent parallel inductance
LS	equivalent series inductance
RP	equivalent parallel capacitance

2. ：CALCulate2：FORMat

Parameter：{ IMAGinary | PHASe | D | Q | REAL | LP | INV }

Send-back value：{ IMAGinary | PHASe | D | Q | REAL | LP | INV }

Function：set and query the current test secondaryparameter set or query the current subparameter。

Instruction：IMAGinary imaginary number part（being reactance under the series eqivalent mode，being susceptance under the parallel equivalent mode）

PHASe	phase
D	dissipation factor
Q	quality factor

Table 7-2 Test Parameter Selection

parameter	SENS：FUNC：ON	CALC1：FORM	CALC2：FORM
Z-θ R-X	'FIMPedance'	MLINear REAL	PHASe IMAGinary
Cp-D Cp-Q	'FADMittance'	CP	D Q
Cs-D Cs-Q Cs-Rs	'FIMPedance'	CS	D Q REAL
Lp-D Lp-Q	'FADMittance'	LP	D Q
Ls-D Ls-Q Ls-Rs	'FIMPedance'	LS	D Q REAL
Ls-DCR Lp-DCR	'FIMPedance'，'FRESistance'	LS LP	REAL REAL
LB-N LB-1/N LB-M LB-R2	'IMPedance'，'VOLTage：AC' 'IMPedance'，'VOLTage：AC' 'IMPedance'，'FADMittance' 'IMPedance'，'RESistance'	LS	REAL INV LP REAL

3. ：CALCulate{1|2}：LIMit：BEEPer：CONDition

Parameter：{FAIL | PASS }

Send-back value：none

Function：definition of buzzer output。

Instrunction：FAIL behavior when the comparing result is OUT（unqualified）

PASS behavior when the comparing result is IN（qualified）

4. ：CALCulate{1|2}：LIMit：BEEPer[：STATe]

Parameter：{ OFF（0）| ON（1）}

Send-back value：{ 0 | 1 }

Function：Set or query if the buzzer works.

Instrunction：OFF（0） close buzzer

ON（1） startup buzzer（default is PASS behavior）

5. ：CALCulate{1|2}：LIMit：FAIL?

Send-back value：{ 0 | 1 }

Function：Query the result of the main and secondary parameter sorted by comparator if unqualified.

Instrunction：0 qualified

1 unqualified（including no behavior of comparator）

6. ：CALCulate{1|2}：LIMit：LOWer[：DATA]

Parameter：{ low limit value | MAXimum | MINimum }

Send-back value：low limit value，format is〈NR1〉

Function：set or query the low limit value；

Instrunction：low limit value must be between -9.9999E14~9.9999E14，and can use MAXimum（9.9999E14） or MINimum（-9.9999E14）directly

Note：when querying the low limit of main(secondary) parameter，if there is no low limit setup of comparator main(secondary) parameter，the send-back value is 9.9e+37。

7. ：CALCulate{1|2}：LIMit：STATe

Parameter：{ OFF（0）| ON（1）}

Send-back value：{ 0 | 1 }

Function：set or query the function of comparator if works。

Instrunction：OFF（0） close comparator function

ON（1） setup the comparator function

8. ：CALCulate{1|2}：LIMit：UPPer[：DATA]

Parameter：{ upper limit value | MAXimum | MINimum }

Send-back value：upper limit value，format is〈NR1〉

Function：set or query upper limit value；

Instrunction：upper limit value must be between -9.9999E14~9.9999E14，and can use MAXimum（9.9999E14）or MINimum（-9.9999E14）directly

Note：when querying the upper limit of main(secondary) parameter，if there is no upper limit setup of comparator main(secondary) parameter，the send-back value is 9.9e+37。

9. ：CALCulate{1|2}：MATH：EXPRession：CATalog?

Parameter：None

Send-back value：DEV，PCNT（absolute value of deviation，percentage of deviation）

Function：set back the parameter used with CALCulate{1|2}：MATH：EXPRession：NAME order。

10. ：CALCulate{1|2}：MATH：EXPRession：NAME

Parameter：{ DEV | PCNT }

Send-back value：{ DEV | PCNT }

Function：set or query the representation way of the upper/low limit value of comparator limit,，DEV is absolute deviation，and PCNTis percentage deviation。

Note：the secondary parameter is constantly compared with the form of absolute deviation, so the send-back value of secondary parameter is“DEV”。

11. ：CALCulate{1|2}：PATH？

Parameter：None

Send-back value：FORM、MATH、LIM

Function：Send back CALCulate subsystem based on the order of carrying out the CALCulate subsystem

12. ：CALCulate{3|4}：MATH：STATe

Parameter：{ OFF（0）| ON（1）}

Send-back value：{ 0 | 1 }

Function：set or query if open Vm/Im（voltage/current monitor）function。

Instrunction：CALCulate3　　set current（Im）

CALCulate4　　set voltage（Vm）

OFF（0）　　close

ON（1）　　open

7.4.3 BINning

：BINning：UPPer：BIN{ 1~8 }

Parameter：{ ？| ，<numeric_value> }

Send-back value：{ every upper limit value of BIN }

Function：setup every upper limit value of BIN. If set upper limitof BIN2 to be 99，then use

BINning：UPPer：BIN2，99；

When querying，then use

BINning：UPPer：BIN2？

1. ：BINning：UPPer：AUX

Parameter：{ upper limit value of secondaryparameter }

Send-back value：{ upper limit value of secondary parameter }

Function：set the value of 2nd—HIGH on the page of Bin Limit List，that is the upper limit value of secondary parameter.

2. ：BINning：LOWer：BIN{ 1~8 }

Parameter：{ ？| ，<numeric_value> }

Send-back value：{ every low limit value of BIN }

Function：setup every low limit value of BIN。

3. ：BINning：LOWer：AUX

Parameter：{ upper limit value of secondary parameter }

Send-back value：{ upper limit value of secondary parameter }

Function：set the value of 2nd—LOW on the page of Bin Limit List，that is the low limit value of secondary parameter.

4. ：BINning：NOMInal

Parameter：{ nominal value of primary parameter }

Send-back value：{ nominal value of primary parameter }

Function：set or query NOMINALvalue of BinComp，that is the nominal value of primary parameter

5. ：BINning：STATe

Parameter：{ OFF（0）| ON（1）}

Send-back value：{ 0 | 1 }

Function：set if the BinComp is open。

Instrunction：OFF（0） close bin comparator

ON（1） open bin comparator

6. ：BINning：RESUlt?

Parameter：None

Send-back value：{ result of bin comparator（+0~+9）}

Function：query the result of bin compare。If the bin comparator is closed or the compare result of secondaryparameter is unqualified, +0；is output, if the result is OUT，+9 is output.

Note ：the bin compare can only be carried out on the page of component measurement display, bin number display, and bin count, so if it is carried out the order on another pages, the send-back value can’t be obtained.

7.4.4 LIST order system

1. ：LIST：FREQuency <sweep point>[，<sweep point>*]

Parameter：<sweep point>[，<sweep point>*]

Send-back value：<sweep point>[，<sweep point>*]

Function：set and query the frequency point of list sweep

Instruction：in this command <sweep point>is the frequency value，its format can be referred to §7.4.11 SOURceorder system

：SOURce：FREQuency[：CW]command parameter formation；

*some parts mean the repeated setups，this instrument can provide 4sweep points at most。

Note ：if some item in list doesn’t set data，then send-back value is“9.9e+37”；if sweep parameter item is not frequency，the send-back result is the error information “Data corrupt”.

2. ：LIST：VOLTage <sweep point>[，<sweep point>]

Parameter：<sweep point>[，<sweep point>*]

Send-back value：<sweep point>[，<sweep point>*]

Function：Set and query level points of list sweep

Instruction：In this command, <sweep point>is the level value, its format can be referred to§7.4.11 SOURce order system

：SOURce：VOLTage[:LEVel][:IMMediate][:AMPLitude] command parameter formation；

* some parts mean the repeated setups，this instrument can provide 4sweep points at most。

Note ：if some item in list doesn’t set data，then send-back value is“9.9e+37”；if sweep parameter item is not level，the send-back result is the error information “Data corrupt”。

：LIST：BIAS <sweep point >[，<sweep point>]

Parameter：<sweep point>[，<sweep point>*]

Send-back value：<sweep point>[，<sweep point>*]

Function：set and query external bias current points of list sweep

Instruction：in this command,<sweep point>is the bias current value，parameter formation, for instance“4e-2”,means 40mA.

* some parts mean the repeated setups，this instrument can provide 4sweep points at most。

Note ：if some item in list doesn’t set data，then send-back value is“9.9e+37”,then send-back value is“9.9e+37”；if sweep parameter item is not frequency，the send-back result is the error information “Data corrupt”。

：LIST：MODE

Parameter：{ SEQuence | STEPped }

Send-back value：{ SEQuence | STEPped }

Function：Set or query list sweep mode

Instruction：SEQuence continue mode

STEPped unit step mode

3. ：LIST：BAND{1~4}

Parameter：{ A[,<low limit >,<high limit >] | B[,<low limit >,<high limit >] | OFF }

Send-back value：{ A[,<low limit >,<high limit >] | B[,<low limit >,<high limit >] | 9.9e+37 }

Function：set or query the limit data of list sweep points。

Instruction：A use the primary parameter of test result to compare with upper/low limit

B use the secondary parameter of test result to compare with upper/low limit

< low limit > NR1，NR2 or NR3 data format or parameter with the suffix of ma，k，m，u，n，，can be the low limit data

< high limit > NR1，NR2 or NR3 data format or parameter with the suffix of ma，k，m，u，n，，can be the upper limit data

7.4.5 DATA order system

1. ：DATA [：DATA] REF{1|2}，numeric_value

Parameter：{ COMPARE nominal value of primary and secondary parameter }

Send-back value：None

Function：set the nominal value of main and secondary parameter in COMPARE mode。If set the nominal value of main to be 10，secondary parameter to be 1，then use

：DATA[：DATA] REF1，10

：DATA[：DATA] REF2，1

2. ：DATA [：DATA] ?

Parameter：{ REF1 | REF2 | IMON | VMON }

Send-back value：queried relative magnitude

Function：query REF1（compare A_NOMINAL value on the page of limit setup, that is parameter nominal value）

query REF2（compare B_NOMINALvalue on the page of limit setup, that is secondaryparameter nominal value）

query IMON（the monitor value of current in testing）

query VMON（the monitor value of voltage in testing）

Example： ：DATA？REF1

Note：if the function of Vm/Im is OFF，which means voltage/current monitoring function is closed，send-back value of VMON、IMON is 0.

7.4.6 DISPlay order system

1. ：DISPlay[：WINDow]：TEXT1：PAGE

Parameter：{ 1 | 2 | 3 | 4 | 5 }

Send-back value：{ 1 | 2 | 3 | 4 | 5 }

Function：Set or the query measurement setup page

Instruction: 1 component test display page

2 bin number display page

3 bin count display page

4 compare display page

5 list sweep display page

2. ：DISPlay[：WINDow]：TEXT2：PAGE

Parameter：{ 1 | 2 | 3 | 4 | 5 }

Send-back value：{ 1 | 2 | 3 | 4 | 5 }

Function：Set or query the measurement setup page

Instruction: 1 measurement setup page

2 user correction page

3 bin limit list setup page

4 compare limit setup page

5 list sweep setup page

7.4.7 FETCh？Order system

1. ：FETCh？

Parameter：None

Send-back value：<STATE>，<DATA1>，<DATA2>，（<CMP1>，<CMP2>）/（<BIN>）

Function：retake the input result of trigger, on the page of non-measurement, the trigger is ignored, and the send-back test result is “3，9.9E37，9.9E37”。

Instruction：<STATE> test status：0——normal；1——over load（bin error）；2——DUT not being contacted 3——non measurement page

<DATT1> primary parameter test value

<DATA2> secondary parameter test value

if comparator works，there will be output below：

<CMP1> primary parameter compares result

<CMP2> secondary parameter compares result

0 the parameter isn’t compared

1 test value is qualified

2 test values is over high

4 test values is over low

if comparator works，there will be output below：

<BIN> sorting result

0 secondary parameter FAIL

1~8 primary and secondary parameter PASS

9 primary parameterFAIL

7.4.8 FORMat order system

1. ：FORMat[：DATA]

Parameter：{ ASCii }

Send-back value：ASK

Function：set or query the data formation of transforming value

7.4.9 INITiate Oder system

1. ：INITiate：CONTinuous

Parameter：{ OFF（0）| ON（1）}

Send-back value：{ 0 | 1 }

Function：set or query if trigger the system continuously。

Instruction：0 Don’t trigger system unconsciously，after carrying out the command setup, the trigger mode will change to bus trigger automatically，

1 trigger system continuously

2. ：INITiate[：IMMediate]

Parameter：None

Send-back value：None

Function：Leave the instrument from idles status, after finishing a trigger test, then the instrument will be back to the trigger status

7.4.10 [：SENSe] oder system

1. [：SENSe]：AVERage：COUNt

Parameter：{ 1~255 }

Send-back value：{ 1~255}

Function：Set or query the average time

2. [：SENSe]：AVERage[：STATe]

Parameter：{ OFF（0）| ON（1）}

Send-back value：{ 0 | 1 }

Function：set or query if the average time is open.

Instruction：0 no matter what the value of average time is, average test isn't made

1 allowing average test

3. [：SENSe]：CORRection：CKIT：STNdard3

Parameter：<numeric_value>,<numeric_value>,<numeric_value>,<numeric_value>

Send-back value：<numeric_value>,<numeric_value>,<numeric_value>

Function：Set or query the load correction reference value

Instruction： Set and query of this command is a little bit different

set parameter：<numeric_value>,<numeric_value>,<numeric_value>,<numeric_value>

which represent accordingly：primary parameter reference value，secondary parameter reference value，frequency，the N point（N=1，2，3）；

when querying， use command "[:SENSe]:CORRection:CKIT:STANdard3 ?N"， the send-back value of instrument represents accordingly：primary parameter reference value，secondary parameter reference value，frequency。

4. [：SENSe]：CORRection：COLLect[：ACQuire]：STANdard{1~3}

Parameter：{ 1 | 2 | 3 }

Send-back value：None

Function：carry out OPEN、SHORT、LOAD modification program

Instruction：1 OPEN（open zeroing），only being carried out on the page of component measurement and user correction

2 SHORT（short zeroing），only being carried out on the page of component measurement and user correction

3 LOAD（load correction），only being carried out on the page of user correction

5. [：SENSe]：CORRection：COLLect：METHod

Parameter：{ REFL2 | REFL3 | OFF（0）}

Send-back value：{ REFL2 | REFL3 | 0 }

Function：Set or query the modification way of testing deviation

Instruction：REFL2 OPEN/SHORTmodification

REFL3 LOAD modification

0 no modification

6. [：SENSe]：CORRection：DATA？STANdard

Parameter：{ 1 | 2 | 3 }

Send-back value：OPEN | SHORT | LOAD modification value

Function：Query modification value

Instruction：STANdard1 is OPEN modification value，that is G、B

STANdard2 is SHORT modification value，that is R、X

STANdard3 is LOAD modification value，being a complex coefficient, if the current frequency isn't modified, the send-back value is "9.9e+37,9.9e+37"

7. [：SENSe]：CORRection[：STATe]

Parameter：{ OFF（0） | ON（1）}

Send-back value：{ 0 | 1 }

Function：Set or query OPEN and SHORT

instruction：0 close OPEN and SHORT modification way

1 open OPEN and SHORT modification way

8. [：SENSe]：FIMPedance：APERture

Parameter：{ 0.025（fast）（short）| 0.065（med）（medium）| 0.500（slow）（long）}

Send-back value：{ 0.025 | 0.065 | 0.500 }

Function：Set or query test speed

Instruction：0.025（fast）（short） fast-speed measurement

0.065（med）（medium） mid-speed measurement

0.500（slow）（long） slow-speed measurement

9. [：SENSe]：FIMPedance：RANGe：AUTO

Parameter：{ OFF（0）| ON（1）}

Send-back value：{ 0 | 1 }

Function：set or query if the range auto bin-sorting mode is open。

Instruction：0 range fixed mode（HOLD）

1 range auto mode（AUTO）

10. [：SENSe]：FIMPedance：RANGe[：UPPer]

Parameter：{ range bin value | UP | DOWN }

Unit：{ MOHM | OHM | KOHM | MAOHM }

Send-back value：Range bin value

Function：set or query test bin.

Instruction：UP bin range increases

DOWN bin range reduces

Bin value is 1M（below 1kHz）、100k（below 20kHz）、10k、1k、100、10、1 and 0.1ohm

Totally 8 bins

Table 7-3 selection of test range

Bin value	Set-parameter format 1	Set-parameterform2	Send-back value format
1Mohm	1MA	1000000	1.000000e+06
100kohm	100K	100000	1.000000e+05
10kohm	10K	10000	1.000000e+04
1kohm	1K	1000	1.000000e+03
100ohm	100	100	1.000000e+02
10ohm	10	10	1.000000e+01
1ohm	1	1	1.000000e+00
0.1ohm	100M	0.1	1.000000e-01

11. [：SENSe]：FUNCtion:CONCurrent

This function is only for TH2825A。

Parameter：{ OFF（0）| ON（1）}

Send-back value：{ 0 | 1 }

Function：set or query if carrying out the transformer test。[：SENSE]：FUNCtion[：ON] and ：CALCulate{ 1 | 2 }：FORMat are needed to use together。

Instruction ：OFF（0） 2-test function is unallowed，only a test function is allowed

ON（1） 2-test function is allowed

12. [：SENSe]：FUNCtion[：ON]

Parameter：As the following table

Send-back value：As the following table

Function：set or query circuit test equivalent mode.

Table 7-4 Set or Query Circuit Test Equivalent Mode

When [：SENSe]：FUNCtion：CONCurrent is OFF（the following functions are only forTH2825A）	
‘FIMPedance’	Impedance test（equivalent series circuit）
‘FADMittance’	Admittance test（equivalent parallel circuit）
When [：SENSe]：FUNCtion：CONCurrent is ON（the following functions are only TH2825A）	
‘FIMPedance’，‘FRESistance’	DCR test（equivalent series circuit）
‘FADMittance’，‘FRESistance’	DCR test（equivalent pallel circuit）
‘IMPedance’,‘VOLTage：AC’	Transformer cylinder number rate test

‘IMPedance’，‘FADMittance’	Transformer mutual inductance rate test
‘IMPedance’，‘RESistance’	Transformer DC resistence test

7.4.11 SOURce order system

1. ：SOURce：FREQuency[：CW]

Parameter：Test frequency

Unit ：{ HZ | KHZ }

Send-back value：Test frequency

Function：set or query the current test frequency。

Instruction ：the test frequency is 50Hz、60Hz、100Hz、120Hz、1kHz、10kHz、20kHz、40kHz、50kHz、100kHz.

Table 7-5 Selection of Test Frequency

Frequency point	Set-format 1	Set-format 2	Set-format 3	Send-back value format
50Hz	5.0e+1	50	50Hz	5.000000e+01
60Hz	6.0e+1	60	60Hz	6.000000e+01
100Hz	1.0e+2	100	100Hz	1.000000e+02
120Hz	1.2e+2	120	120Hz	1.200000e+02
1kHz	1.0e+3	1000	1KHz	1.000000e+03
10kHz	1.0e+4	10000	10KHz	1.000000e+04
20kHz	2.0e+4	20000	20KHz	2.000000e+04
40kHz	4.0e+4	40000	40KHz	4.000000e+04
50kHz	5.0e+4	50000	50KHz	5.000000e+04
100kHz	1.0e+5	100000	100KHz	1.000000e+05

2. ：SOURce：VOLTage[:LEVel][:IMMediate][:AMPLitude]

Parameter：test voltage

Unit：{ mV | V }，the default is V if the unit isn’t written.

Send-back value：test voltage，example:1.000000e+00 means 1V.

Function：set or query the current test voltage。

Instruction：the range of test voltage is 0.01~1V，between 0.2~1V, the stepper is 10mV，between 0.01~0.2V, the stepper is 1mV.

3. ：SOURce：VOLTage[:LEVel][:IMMediate]：OFFSet

Parameter：{ -2 | 0 | 2 }

Send-back value：{ -2 | 0 | 2 | EXT }

Function：Set or query the additional internal bias voltage value.

Instruction：-2 add internal bias voltage-1.75V，that is INT-

0 not add internal bias voltage，that is OFF

2 add internal bias voltage 1.75V，that is INT+

EXT instrument is in the external bias voltage mode, so there is no send-back value of internal bias voltage.

4. ：SOURce：VOLTage[:LEVel][:IMMediate]：OFFSet：SOURce

parameter：{ INTernal | EXTernal }

send-back value：{ INTernal | EXTernal }

function：Set and query if the internal or external bias voltage is added.

Instruction：INTernal internal bias voltage mode

EXTernal external bias voltage mode

5. ：SOURce：VOLTage[:LEVel][:IMMediate]：OFFSet：DISch

Parameter：{ OFF（0）| ON（1）}

Send-back value：{ 0 | 1 }

Function：Set and query if the discharge switch is started

Instruction：OFF（0） close discharge switch

ON（1） open discharge switch

7.4.12 TRIGger order system

1. ：TRIGger：DELay

Parameter：trigger delay time.

Unit：{ MS | S }，the default is S if there is no unit.

Send-back value：trigger delay time，example:1.000000e+00 means1S.

Function：set or query trigger delay time.

Instruction：The set-range of trigger delay time is 0~9999MS

2. ：TRIGger[：IMMediate]

Parameter：None

Send-back value：None

Function：Trigger one test

3. ：TRIGger：SOURce

Parameter：{ BUS | EXTernal | MANual | INTernal }

Send-back value：{ BUS | EXTernal | MANual | INTernal }

Function：Set and query trigger mode

Instruction：BUS bus trigger

EXTernal external trigger

MANual manual trigger

INTernal internal trigger

7.4.13 SYSTem order system

1. ：SYSTem：BEEPer[：IMMediate]

Parameter：None

Send-back value：None

Function：Buzzer sounds once immediately

2. ：SYSTem：KLOCk

Parameter：{ OFF（0）| ON（1）}

Send-back value：{ 0 | 1 }

Function：set and query if the key is locked。

Instruction：OFF（0） the key is unlocked

ON（1） the key is locked

3. ：SYSTem：PRESet

Parameter：None

Send-back value：None

Function：Reset to the default status.

4. ：SYSTem：VERSion?

Parameter：None

Send-back value：Version number

Function：Query the version number.

5. ：SYSTem：CONSt

Parameter：{ 100/25 | 100 | 25 | CV }

Send-back value：{ 100/25 | 100 | 25 | CV }

Function：Set and query essential resistance

6. ：SYSTem：INTEgration

Parameter：{ 1~8 }

Send-back value：{ 1~8 }

Function：test period selection function，which determines the sampling period each time in fast test,

the range is 1~8。

7. ：SYSTem：ALARm

Parameter：{ PULSe | CONTinuous }

Send-back value：{ PULSe | CONTinuous }

Function：select the sound of buzzer is PULSe or CONTinuous， which is used in the function of comparator and bin comparator.

8. ：SYSTem：HANDler

Parameter：{ CLEAr | HOLD }

Send-back value：{ CLEAr | HOLD }

Function：Set and query if the sorting result is cleared or changes until the next input result changes.

9. ：SYSTem：ENDdelay

Parameter：test ending delay time.

Unit：{ MS | S }，the default is S, if there is no unit.

Send-back value：test ending delay time，example:1.000000e+00 means 1S.

Function：set or query test ending delay time。

Instruction：The set-range of test ending delay time is 0~9999MS

7.5 Error information

The bus command sent to the instrument may include error command , syntax or incorrect parameter. The command string is analyzed and processed simultaneously, if there is a error, the error information will be displayed and the command analysis is stopped, so in a command string, the content after error will be ignored.

The table below is about the common error information in the bus, and the error information will be displayed in the pop-up window.

Error information	Instruction
Unknow Message!	Unrecognized command, mainly due to the error command-spelling
Syntax Error!	Due to incorrect syntax characters Example：":TRIG:IMM" is written as":TRIG IMM"（IMM is the selectable trigger command，not the parameter of TRIG）。
Data Error!	The data is overrun or unsupported data. For example：":SOUR:VOLT 1.5V"，1.5V is over the set-range of instrument
Error Parameter.	Unrecognized command parameter。For example："*RCL T"，T is not the correct parameter of *RCL command.
Error Suffix.	Unmatched unit and magnification.etc
DataToo Long!	Example: data parameter contains more than 20 characters，file name is over characters.。
Cannot Executed!	In the current status, the command can't be processed, for example, send the frequency control command in frequency list sweep test.
Record Not Exist!	The record of loaded file is not existed.

In the process of exsecuting the bus command, there are some normal prompt message, which can't affect the run of subsequent command，mainly includes：

prompt message	instruction
Save Progress..	It means a set-file is being saved.
Query Updated!	In GPIB bus, data output from bumper hasn't been read out, and the new query has been made

Chapter 8 Sorting interface instruction

8.1 Basic information

The instrument provides user a powerful Handler interface which is used to output the sorting result. When in the auto component sorting test system, the interface provides connection signal with the system and sorting result output signal. There are 3 connection signals: TRIG(test starts), IDX(AD transformation ends), EOM(all tests finish). Sorting result can output pass or fail signal. By using these signals, the instrument can process text, sorting and quality control of the device with auto test system made up of system controller conveniently, so as to improve the production efficiency.

Table 8-1 HANDLER Interface Specification

Output signal： input of built-in pull-up resistor collector, low level is available，photoelectricity insulation Output distinguishment： Bin compare function：pass bin（BIN1-8），fail bin signal（primary parameter is higher or lower，primary or secondary parameter is fail, both primary and secondary are fail） Comparator function：pass, fail（pull-up、pull-low） IDX：A/Dtransformation ends EOM：all tests finishes, display time excluded Input signal：photoelectricity insulation TRIG：external trigger，impulse width ≥1μs，rising edge trigger，low level driving current is about 5-10mA

8.2 Operation instruction

The information in this chapter includes: interface signal line, description of electric feature, and necessary points about the use of Handler interface。

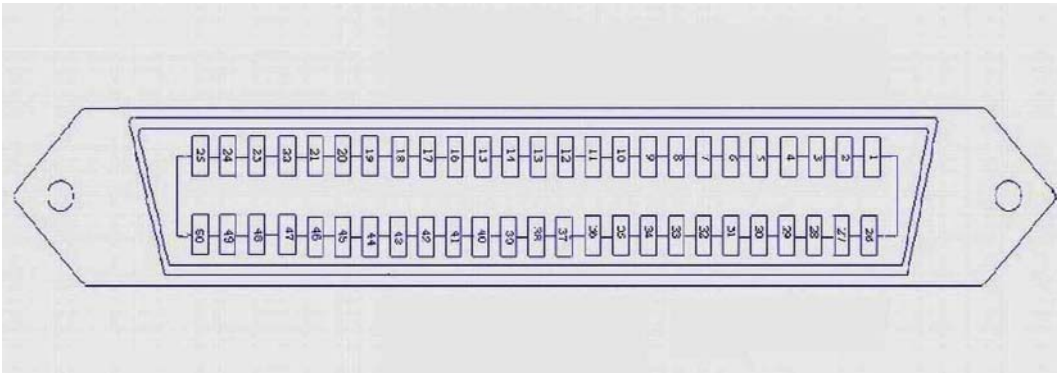


Figure 8-1 HANDLER Interface Pin Diagram

8.2.1 Definition of signal line

HANDLER interface adopts three signals：Compare output, control input and output. There are different definitions of bin compare function, compare function and list sweep in the signal line.

8.2.1.1 Signal line of bin compare function（BIN）

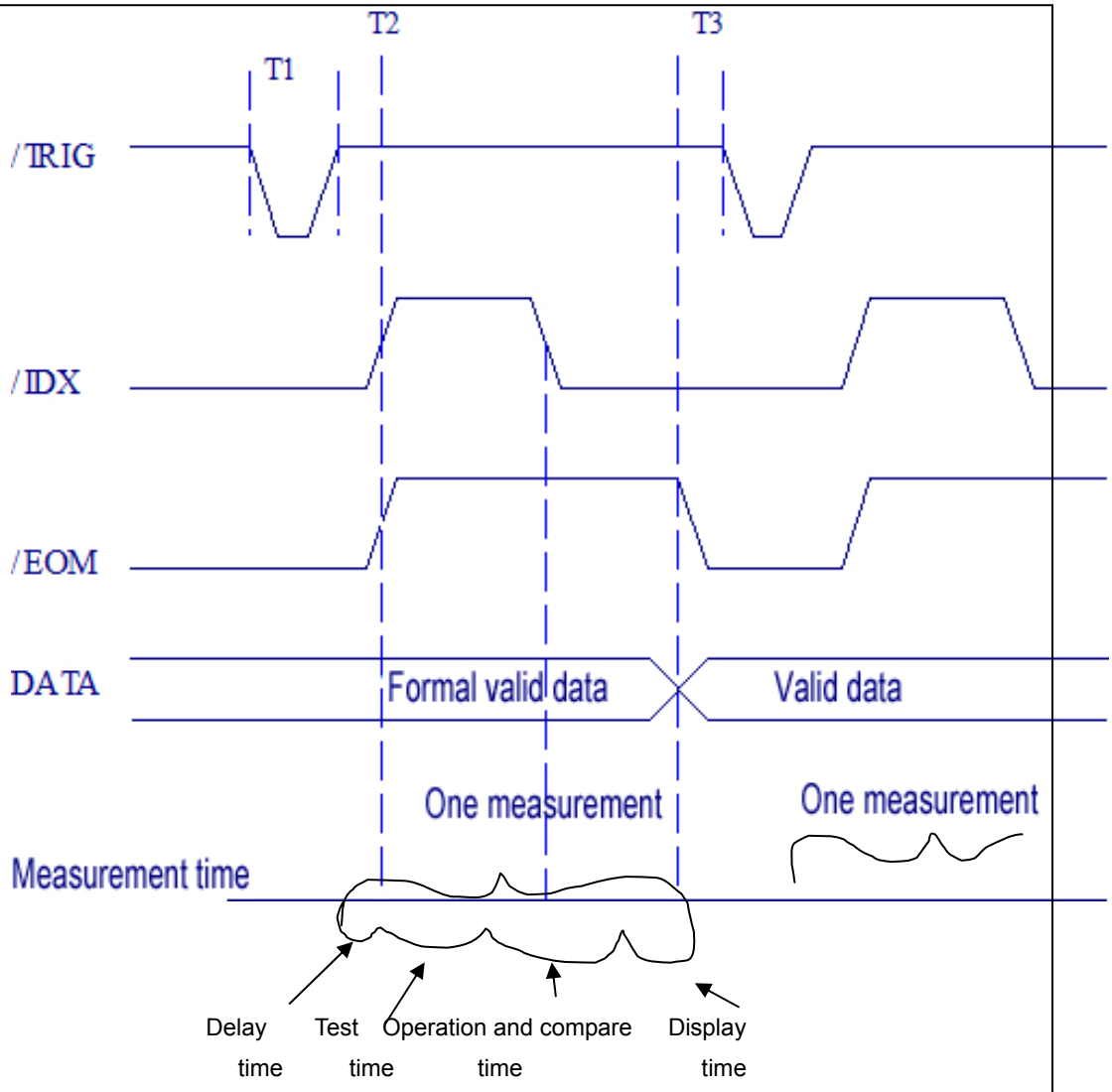
☞**Note**：“/”in front of signal name means the signal is available on the low level.

Definition of compare function signal line can be referred to the table below

Table 8-2 Signal Definition When HANDLER is in the bin compare function

Pin number	Signal name	Description
1-2	EXV1	External DC voltage，the range of accepted voltage is 5V~24V
17-18	NC	Unused
19	/TRIG	External signal input。 When the trigger mode is（EXT），the rising edge of the signal triggers test
20-21	EXV2	External DC current，the range of accepted voltage is 5V~24V
24-25	VCC	Internal DC current is +5V
26-27	COM1	When the sorting output signal uses internal power, grounded line will be connected with COM1
28(3)	/BIN8	Sort the 8th bin，primary parameter test value is in the BIN8 set range
29(4)	/BIN3	Sort the 3rd bin，primary parameter test value is in the BIN3set range
30(5)	/BIN7	Sort the 7th bin, primary parameter test value is in the BIN7set range
31(6)	/BIN5	Sort the 5th bin，primary parameter is in the BIN5 set range

32(7)	/BIN2	Sort the 2nd bin，primary parameter test value is in the BIN2 set range
33(8)	/BIN6	Sort the 6th bin，primary parameter is in the BIN6 set range
34(9)	/BIN0	Sort the 0th bin，secondary parameter test value is over upper and low limit setup （secondary parameter out-of-tolerance）
35(10)	/BIN1	Sort the 1st bin，primary parameter test value is in the BIN1 set range
36(11)	/BIN4	Sort the 4th bin，primary parameter test value is in the BIN4 set range
37(12)	NC	Unused
38(13)	/BOUT	Sort OUT bin，primary parameter test value is not in the set range of all bins（primary parameter out-of-tolerance）
39(14)	/BPHI	Primary parameter up outoftolerance
40(15)	/BPLO	primary parameter down out-of-tolerance
41(16)	/BPNG	Primary or secondary parameter is fail
42	NC	Unused
43(22)	/IDX	After A/D/ transformation, IDX signal is available。Which can be used to drive the next component to untested position, while the test result can be available after /EOM being available（figure8-2）
44(23)	/EOM	All tests finish，display after /EOM being available。（figure 8-2）
45-46	COM2	When the control signal uses the internal power, grounded line will be connected with COM2
47-48	NC	Unused
49-50	GND	Connect with case



Time	Min	Max
T1 trigger impulse width	1us	---
T2 test start delay time	200us	display time+ 200us
T3 trigger after /EOM input Waiting time	0us	---

Note 1：Operating and compare time is about 6ms;

Note 2：Reference display time on different test pages is listed as below：

Component measurement display page（MeasDisplay）：

Big character time is about 5ms，small character time is about 2ms；

If monitoring function is open,3ms is added

Bin number display page（BinNo. Disp） ：About 2ms;

Bin count display page（Bin Count）：About 3ms

Table 8-2 BinComp and comparator function signal output timing sequence diagram

8.2.1.2 Signal line of comparator function（COMP）

☞**Note：** "/"in front of signal name means the signal is available on the low level.

Definition of compare function signal line can be referred to the table below

Table 8-3 Signal Definition when HANDLER is in the comparator function

Pin number	Signal name	Description
1-2	EXV1	External DC voltage，the range of accepted voltage is 5V~24V
11 12 14 15 17 18	NC	Unused
19	/TRIG	External signal input. When the trigger mode is（EXT），the rising edge of the signal triggers test
20-21	EXV2	External DC current，the range of accepted voltage is 5V~24V
24-25	VCC	Internal DC current is +5V
26-27	COM1	When the sorting output signal uses internal power, grounded line will be connected with COM1
28(3)	/AHI	Primary parameter test value is high （primary parameter is up out-of-tolerance）
29(4)	/AGO	Primary parameter test value is in the set range （primary parameter is up-pass）
30(5)	/ALO	Primary parameter is low （primary parameter is down out-of-tolerance）
31(6)	/BHI	Secondary parameter test value is high （secondary parameter is up out-of-tolerance）
32(7)	/BGO	Secondary parameter test value is in the set range （secondaryparameter is up-pass）
33(8)	/BLO	Secondary parameter test value is low （secondary parameter is down out-of-tolerance ）
34(9)	/BNG	secondaryparameter is out of set range

		（secondaryparameter is fail）
35(10)	/GO	Primary and secondary parameters test value is in the set range （both parameters are pass）
36-37	NC	Unused
38(13)	/ANG	Primary parameter is out of set range （primary parameter is fail）
39-40	NC	Unused
41(16)	/NG	Primary or secondary parameter is fail （one of the two parameters is fail）
42	NC	Unused
43	/IDX	After A/D/ transformation, the next DUT can be moved to untested position,
44	/EOM	All tests finish，display after /EOM being available。（figure 8-2）
45-46	COM2	When the control signal uses the internal power, grounded line will be connected with COM2
47-48	NC	Unused
49-50	GND	Connect with case

Comparator timing sequence reference bin comparator timing sequence diagram（in figure8-2）。

8.2.1.3 Signal line of List Sweep （SWEEP）

Function in this chapter is only for TH2825A.

☞**Note**：“/”in front of signal name means the signal is available on the low level.

Definition of sweep function signal line can be referred to the table below.

Table 8-4 signal definition when HANDLER is in the sweep function

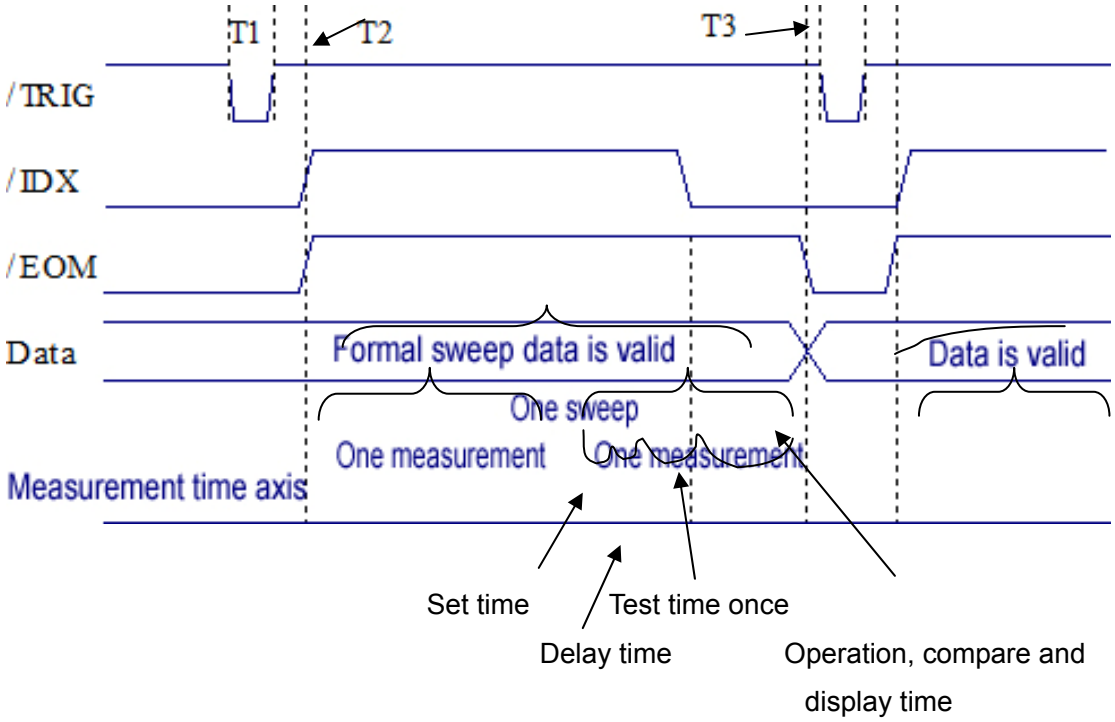
Pin number	Signal name	Description
1-2	EXV1	External DC voltage，the range of accepted voltage is 5V~24V
17-18	NC	Unused
19	/TRIG	External signal input。 When the trigger mode is（EXT），the rising edge of the signal triggers

		test
20-21	EXV2	External DC current，the range of accepted voltage is 5V~24V
24-25	VCC	Internal DC current is +5V
26-27	COM1	When the sorting output signal uses internal power, grounded line will be connected with COM1
28(3)	/H3	The 3rd sweep point test result is higher than the set range — sweep point3 is up out-of-tolerance
29(4)	/G2	The 2nd sweep point test result is in the set range —sweep point 2 is passed
30(5)	/H2	The 2nd sweep point test result is higher than the set range — sweep point 2 is up out-of-tolerance
31(6)	/G4	The 4th sweep point test result is in the set range — sweep point 4 is passed
32(7)	/G1	The 1st sweep point test result is in the set range — sweep point 1 is passed
33(8)	/H1	The 1st sweep point test result is higher than the set range — sweep point 1 is up out-of-tolerance
34(9)	/L4	The 4th sweep point test result is higher than the set range — sweep point 4 is down out-of-tolerance
35(10)	/GO	All sweep point test results are out of the set range—4 sweep points are passed
36(11)	/G3	The 3rd sweep point test result is in the set range — sweep point 3 is passed
37(12)	/L1	The 1st sweep point test result is lower than the set range — sweep point 1 is down out-of-tolerance
38(13)	/H4	The 4th sweep point test result is lower than the set range — sweep point 4 is up out-of-tolerance
39(14)	/L2	The 2nd sweep point test result is lower than the set range — sweep point 2 is down out-of-tolerance
40(15)	/L3	The 3rd sweep point test result is lower than the set range — sweep point3 is down out-of-tolerance
41(16)	/NG	One of the sweep point test result is out of the set range，the signal will be built
42	NC	Unused
43(22)	/IDX	Sequence Sweep Mode（SEQ）：when the AD transformation of the

		last sweep point in a sweep period finishes, /IDX is announced to be available。Then the next one can be connected with UNKNOWN terminal，but the test result can be output until /EOM is available. Step sweep mode（SETP）：when the AD transformation of the every sweep point in a sweep period finishes, /IDX is bounced to be available, which means the instrument can be ready to the next step，and can accept the next sweep trigger signal.
44(23)	/EOM	Test end signal Sequence Sweep Mode（SEQ）：when the AD transformation of the last sweep point in a sweep period finishes(both operation compare and display)，/EOM is announced to be available，and the compare result is output（in figure8-3） Step sweep mode（STEP）：when the AD transformation of every sweep point in a sweep period finishes(both operation compare and display)，/EOM is announced to be available，but the compare result can be output until /EOM signal is available.（in figure8-3）
45-46	COM2	When the control signal uses the internal power, grounded line will be connected with COM2
47-48	NC	Unused
49-50	GND	Connect with case

HANDLER interface signal output timing sequence diagram in list sweep：

（SEQ SWEEP MODE）：



（STEP SWEEP MODE）：

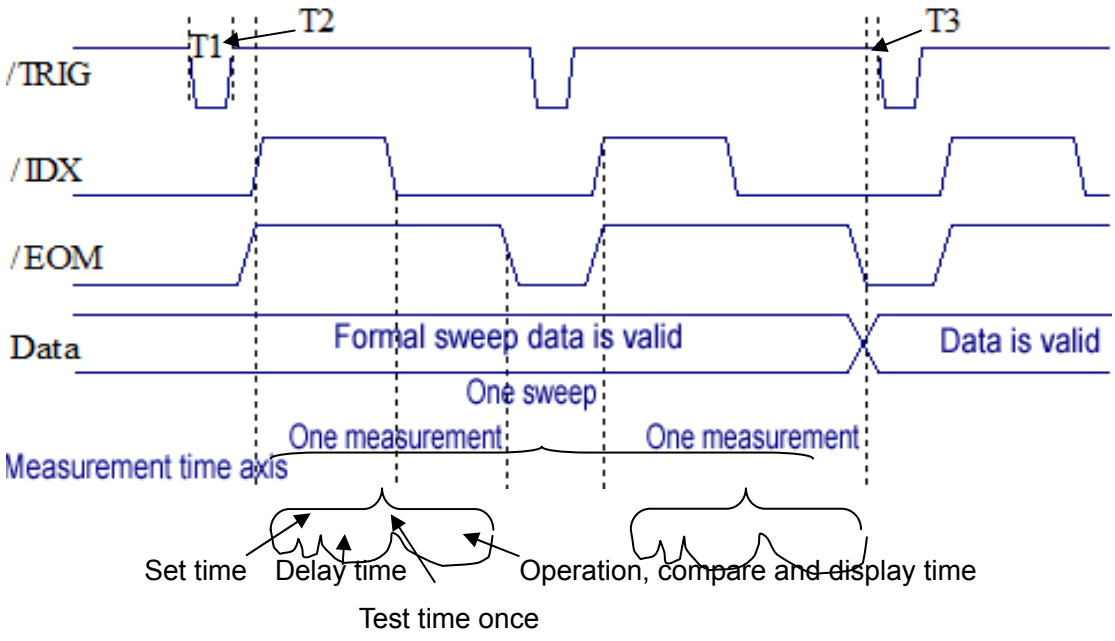


Figure 8-3 List sweep Signal Output Timing Sequence Diagram

Instruction：

1. Set time includes correct data switch time；
2. Operation, compare and display time is about 5ms; T1,T2,T3 in figure8-2.

8.3 Electrical feature

As mentioned before, there are some different signal meanings in bin compare function and comparator function, but the electrical features of the two operations are the same, so the description below can also be used in bin compare function and comparator function.

8.3.1 DC insulation output

Table 8-5 DC Insulation Output Electrical Feature

Output signal	Output rated voltage		Max current	Circuit reference ground
	Low level	High level		
Bin compare signal： /BIN1 - /BIN8 /BIN0 /BOUT /BPHI、 /BPLO /BPNG Comparator signal： /AHI、/ALO /AGO /BHI、/BLO /BGO /NG、/ANG、/BNG	≤0.5V	+5V～ +24V	6mA	Internal pull-up voltage： Instrument reference ground（GND） External voltage（EXV1）： COM1
Control signal /IDX /EOM	≤0.5V	+5V～ +24V	6mA	Internal pull-up voltage： Instrument referenceground（GND） External voltage

				（EXV2）： COM2

When use the external power，the control and sorting signal can adopt different power，EXV1/COM1is the power of sorting output signal，EXV2/COM2 is the power of control signal，the same power can also be available for sure.

More details about the electrical feature can be referred to figure 8-4 and figure 8-5。

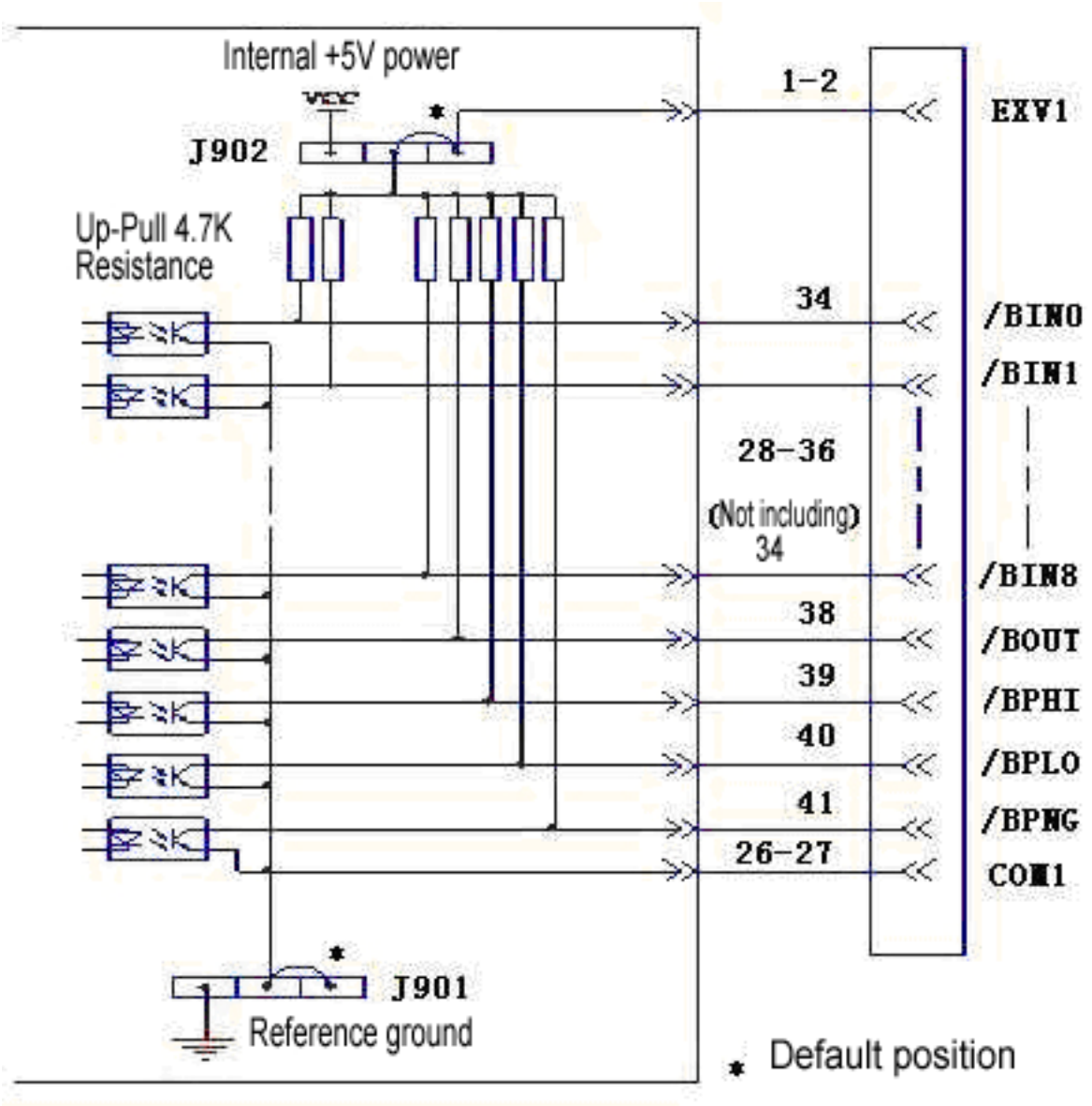


Figure8-4 Bin compare（sorting）Output Signal Simplified Diagram

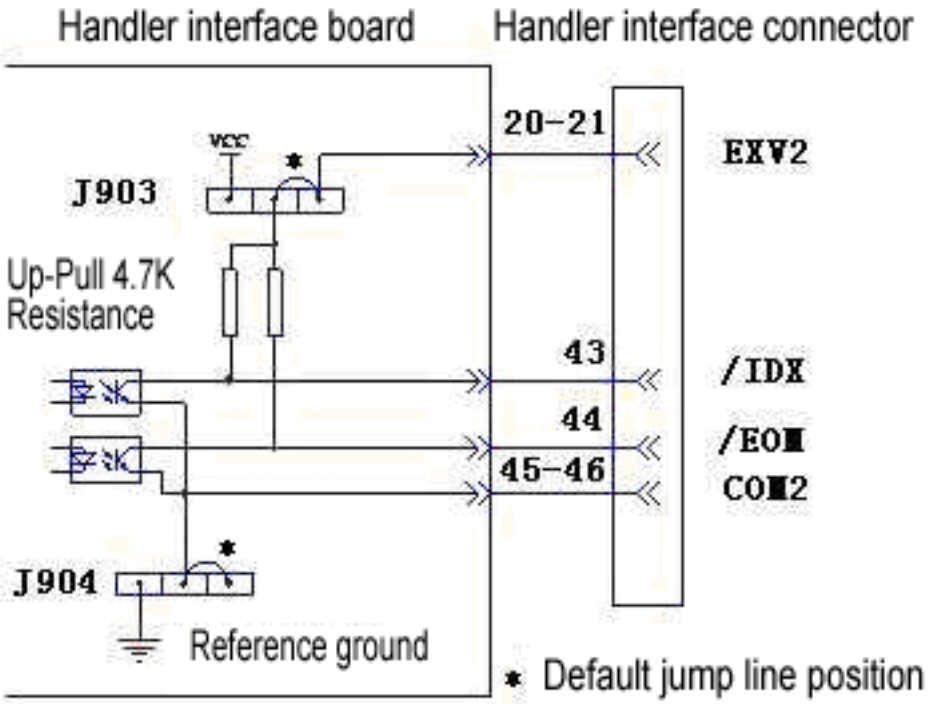


Figure 8-5 Control Signal Simplified Diagram

8.3.2 DC insulation input

/TRIG signal（19pins）is connected to the negative pole of LEDin the optical couple，the instrument is triggered on the rising edge of /TRIG signal。negative pole of LED can be driven by internal 5V DC voltage，as well as by external DC voltage EXV2（ adopt the same power of control output signal）。

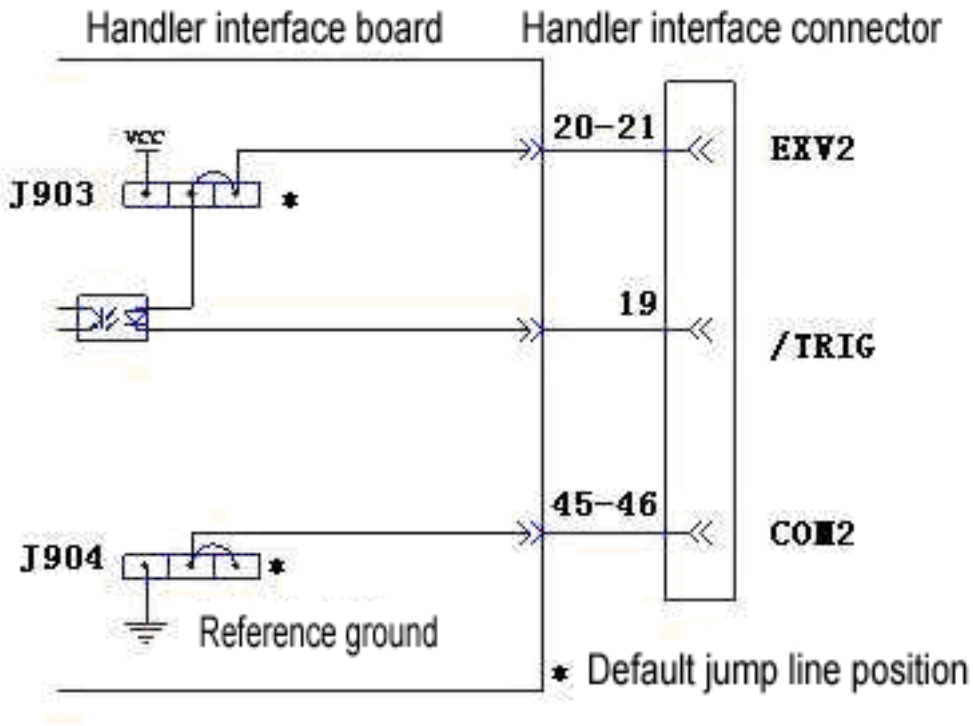


Figure 8-6 HANDLER Interface Trigger Input Signal Simplified Diagram

ⓘAttention：In order to drive optical couple，/TRIG signal must have the current driving ability of 5-10mAin the low level；meanwhile, suitable de-dithering processing is needed to avoid the error trigger，

☞Note：When the control circuit uses internal power, it is necessary to connect the jointed-ground of COM2 return circuit with the reference ground，and meanwhile set wire jumperJ904, thus can make COM2 connected with GND directly。

8.4 Setup of HANDLER interface board wire jumper

The wire jumper on the HANDLER interface board is used to select internal or external power to be

adopted in output and control signal and select current limiting resistance of trigger signal based on the selection of power and voltage. Table 8-6 is a description about every wire jumper（J901-J904）as the figure belo

Warning ：⚠

Make sure the power is off and put out the plug, before open the box to change the wire jumper setup，

Wait a few minutes; operate until the discharge in the capacitor is over

☞**Note**：In figure 8-6 and 8-7，“N”means the default setup of wire jumper

table 8-6 wire jumper setup on the HANDLER interface board

Wire jumper		Description	Signal
Num.	**position**		
J901	Left	DC output of sorting signal is non-insulated，COM1is connected with the reference ground.	Bin compare signal： /BIN1 - /BIN8， /BIN0，/BOUT， /BPHI，/BPLO， /BPNG comparator signal： /AHI ， /AGO ， /ALO，/BHI， /BGO，/BLO， /BNG，/ANG， /NG list sweep signal： /G1 - /G4， /H1 - /H4， /L1 - /L4， /GO，/NG
	Right (N)	DC output of sorting signal is insulated	
J902	Left	Sorting output signal pull-up power is internal DC voltage source VCC(+5V)，set **J901** synchronously to the left to make the reference ground output from COM1.	
	Right (N)	Sorting output signal pull-up power is external DC voltage EXV1(5V-24V)。	
J903	Left (N)	Control signal uses the external DC voltage EXV2 (5V-24V)。	Control signal： /IDX /EOM /TRIG
	Right	Sorting output signal pull-up power is internal DC voltage source VCC(+5V)，set **J901** synchronously to the left to make the reference ground output from COM1.	
J904	Left	Control signal DC input/output is non-insulated，COM2 is connected with the reference ground.	
	Right (N)	Control signal DC input/output is insulated。	

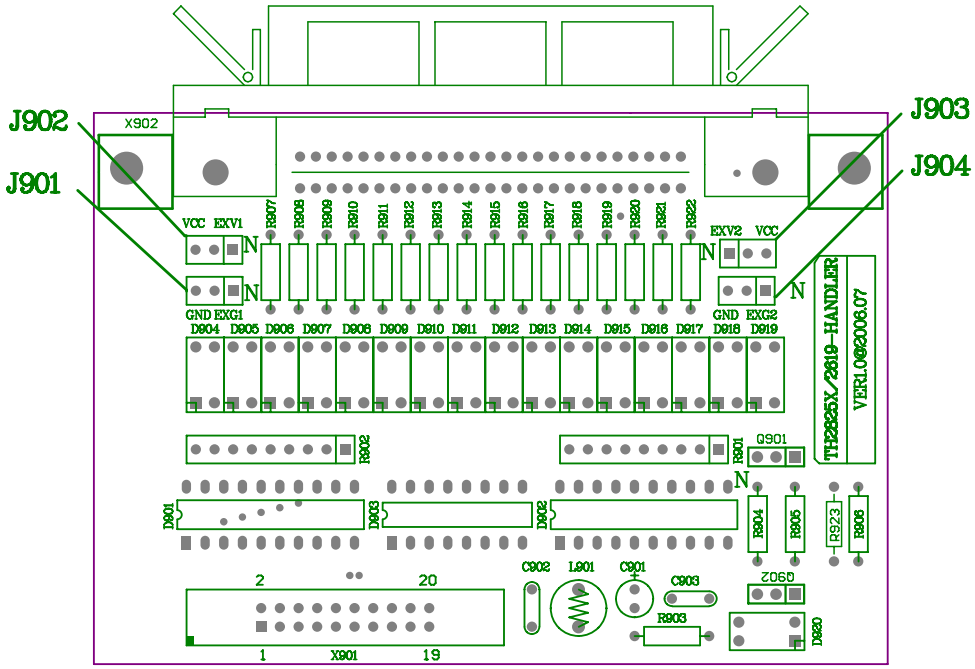


Table 8-7 Position of wire jumper on the HANDLER board

8.5 HANDLER interface operation

After HANDLER interface board being built，the HANDLER interface can be used。Before operation，set the limit list as the bin comparator or compare limit list as comparator function or list sweep parameter to use the list sweep function. Please refer to the instruction of chapter 9 about operation step.

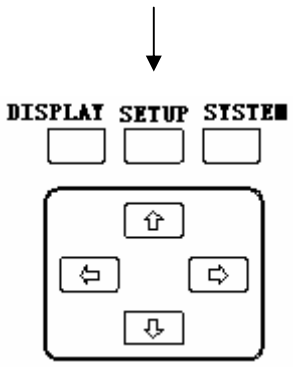
Chapter 9 Operation illustration of main function

9.1 The usage of bin compare function

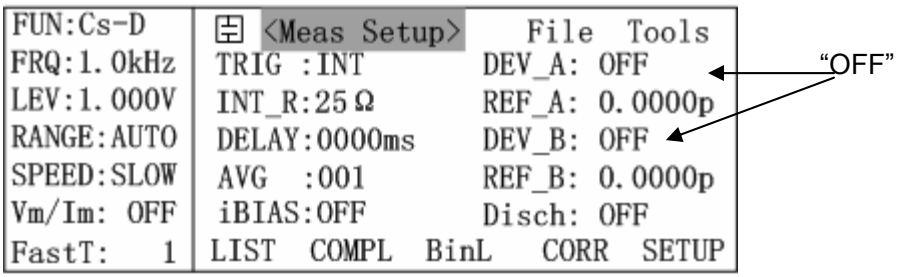
1. Set test conditions first, for instance: parameter, frequency, level, and speed.etc
2. Press SETUP menu key，the external trigger is adopted when using HANDLERinterface，and in TRIG area, the trigger mode is set as“**EXT**”。meanwhile, check if the deviation display is closed（**DEV_A，DEV_B**）。
3. Cursor is set back to<Meas Setup>，press soft key LIMIT，then enter the limit list setup page.
4. Set primary parameter nominal value，and bin upper and lower limit of primary or secondary parameter.
5. Open bin comparator switch（BIN）
6. Press DISPLAY menu key，then enter the component test display page（MeasDisplay），in order to use the bin compare function(sorting), select a suitable test page：BinNo or COUNT。
7. Bin sorting is a volume production of the same product, which is suitable to test the locked range.
8. Save the current setup as a file, so it can be loaded directly in the next measurement.
9. In order to avoid the unintentional change of setup，the keyboard can be locked.

Operation process

Step 1：Press SETUP menu key

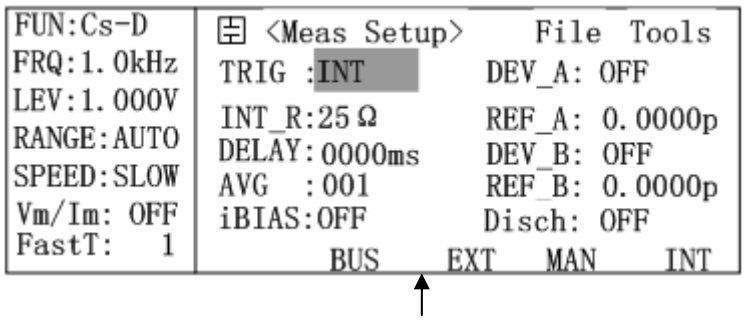


Step 2：The display is changed to test setup page, shown as the figure below, attention if DEV_A，DEV_B is OFF



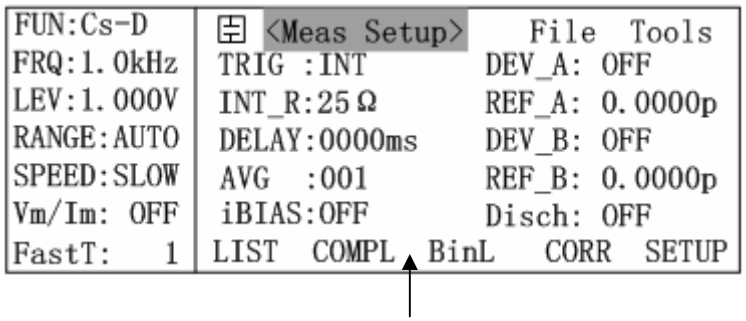
Step 3：

1. Move the cursor to TRIG area, press EXT soft key，trigger mode is changed to external trigger；



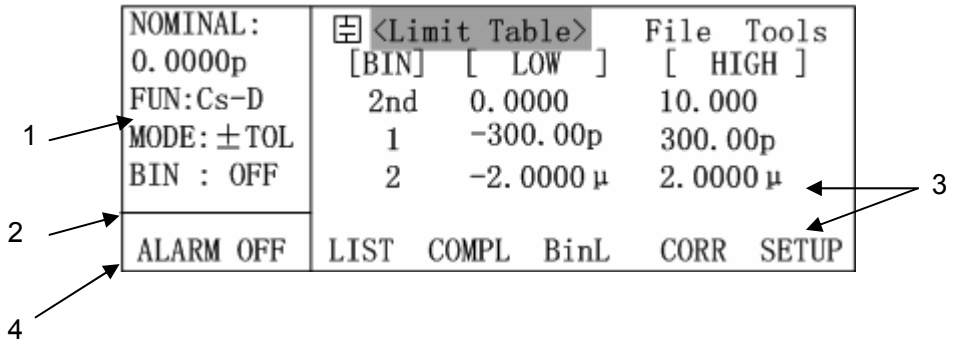
2. Cursor is back to<Meas Setup>，the instrument displays as the step2.

Step 4：after the cursor is recoiled，press LIMITsoft key

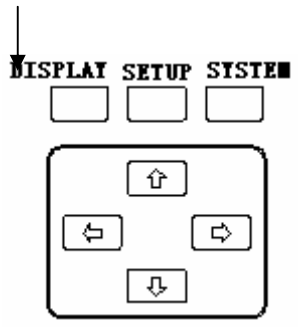


Step 5：Enter bin limit list setup page

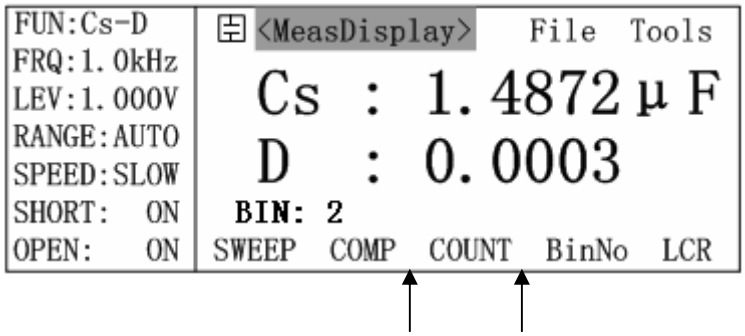
1. Set the main parameter as nominal value（NOMINAL)；(set by numerical key)；
2. Select bin mode （MODE） to be “±TOL” or “%TOL”；
3. Set high and low limit of main and secondary parameters（et by numerical key)；
4. Open BIN to“ON”。


NOMINAL:
0.0000p
FUN:Cs-D
MODE:±TOL
BIN : OFF
ALARM OFF
<Limit Table>
File Tools
[BIN] [LOW] [HIGH]
2nd 0.0000 10.000
1 -300.00p 300.00p
2 -2.0000μ 2.0000μ
LIST COMPL BinL CORR SETUP
1
2
3
4

Step 6：Press DISPLAY menu key



Step 7：It starts to sort after the display is changed to component test display page, or select BinNo or COUNT again。



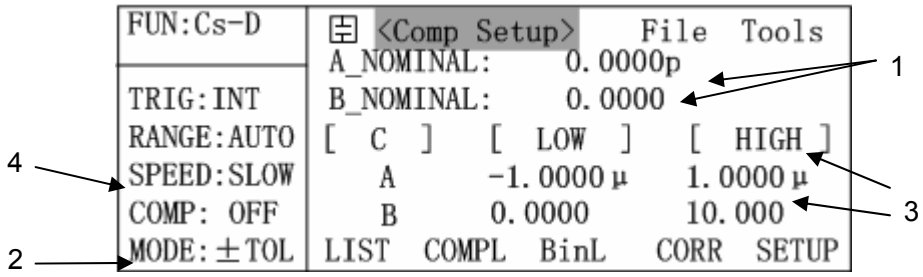
9.2 The usage of comparator function

1. Set test conditions first, for instance: test parameter, frequency, level, and speed.etc
2. Press SETUP menu key，the external trigger is adopted when using HANDLERinterface，and in TRIG area, the trigger mode is set as“**EXT**”. Meanwhile, check if the deviation display is closed（**DEV_A，DEV_B**）.
3. Cursor is set back to<Meas Setup>，press soft key COMPSET，then enter the limit list setup page.
4. Set primary parameter nominal value，and bin upper and lower limit of primary or secondary parameter.
5. Open bin comparator switch（COMP）
6. Press DISPLAY menu key，then enter the component test display page（MeasDisplay），in order to use the bin compare function(sorting), select a suitable test page：COMP。
7. The comparator function is for a volume production of the same product, which is suitable to test the locked range.
8. Save the current setup as a file, so it can be loaded directly in the next measurement.

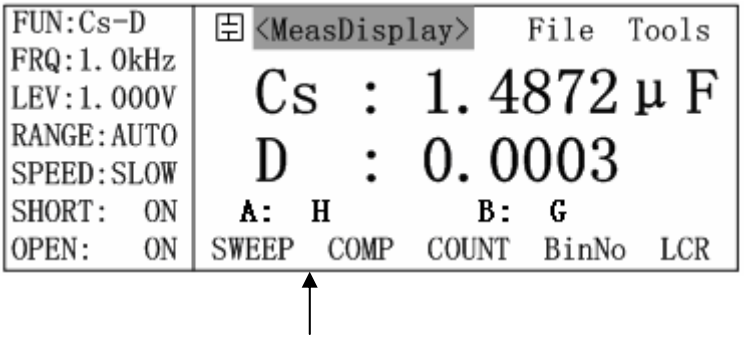
9. In order to avoid the unintentional change of setup，the keyboard can be locked.

Operation process：（the process of bin comparator function is not described any more, introduce the compare limit setup page directly）

1. Enter compare limit setup page，set nominal value of A_NOMINAL、B_NOMINAL；
2. Set compare mode MODE；
3. The upper and lower limit of primary and secondary parameters can be modified by numerical keys
4. Open COMP to“ON”.



Comparator function can be used after entering component test page, or press COMP soft key to use this function。



9.3 The usage of list sweep function

1. Set test conditions first, for instance: test parameter, frequency, level, and speed.etc
2. Press SETUP menu key，the external trigger is adopted when using HANDLERinterface，and in TRIG area, the trigger mode is set as“**EXT**”。meanwhile, check if the deviation display is closed（**DEV_A，DEV_B**）。
3. Cursor is set back to<Meas Setup>，press soft key LIST，then enter the bin limit list setup page.
4. Set the type of sweep parameter，if there is limit data of some type of sweep parameter in the list，all limit data is first needed to be cleared out, Tools on this page can be adopted，or move the cursor to DEL—。
5. Set sweep points and corresponding low and high limits。
6. Press DISPLAY menu key，enter component test display page（MeasDisplay）, in order to use the list sweep function, test page：SWEEP can be selected。
7. Save the current setup as a file, so it can be loaded directly in the next measurement.

10. In order to avoid the unintentional change of setup，the keyboard can be locked.

List sweep parameter setup can be referred to§3.2.10.4。

9.4 The usage of communication function

This chapter mainly introduces the usage of main parameter setup order in SCPI order

9.4.1 Select test page

Order：：DISPlay[：WINDow]：TEXT1：PAGE

Example： Select bin number display page

Usage： :DISP:TEXT1:PAGE 2

9.4.2 Select test parameter

Order：[：SENSe]：FUNCtion：CONCurrent

[：SENSe]：FUNCtion[：ON]

：CALCulate{1 | 2}：FORMat

: sens: func 'fimp';:calc1:form real;:calc2:form imag;

Table 9-1 Select Test Parameter Command

Example	Usage ofTH2825A	Usage of TH2825
Select test parameter to be Cp-D	:FUNC:CONC OFF :FUNC ‘FADM’ :CALC1:FORM CP :CALC2:FORM D	:FUNC ‘FADM’ :CALC1:FORM CP :CALC2:FORM D
Select test parameter to be Rs-Xs	:FUNC:CONC OFF :FUNC ‘FIMP’ :CALC1:FORM REAL :CALC2:FORM IMAG	:FUNC ‘FIMP’ :CALC1:FORM REAL :CALC2:FORM IMAG
Select test parameter to be Ls-Q	:FUNC:CONC OFF :FUNC ‘FIMP’ :CALC1:FORM Ls :CALC2:FORM Q	:FUNC ‘FIMP’ :CALC1:FORM Ls :CALC2:FORM Q
Select test parameter to be	:FUNC:CONC OFF	:FUNC ‘FIMP’

Zs-θ°	:FUNC 'FIMP' :CALC1:FORM MLIN :CALC2:FORM PHAS	:CALC1:FORM MLIN :CALC2:FORM PHAS
Select test parameter to be Gp-Bp	:FUNC:CONC OFF :FUNC 'FADM' :CALC1:FORM REAL :CALC2:FORM IMAG	:FUNC 'FADM' :CALC1:FORM REAL :CALC2:FORM IMAG
Select test parameter to be Ls-DCR	:FUNC:CONC ON :FUNC 'FIMP', 'FRES' :CALC1:FORM LS :CALC2:FORM REAL	——
Select test parameter to be LB-1/N	:FUNC:CONC ON :FUNC 'IMP', 'VOLT:AC' :CALC1:FORM LS :CALC2:FORM INV	
Select test parameter to be LB-N	:FUNC:CONC ON :FUNC 'IMP', 'VOLT:AC' :CALC1:FORM LS :CALC2:FORM REAL	
Select test parameter to be LB-M	:FUNC:CONC ON :FUNC 'IMP', 'FADM' :CALC1:FORM LS :CALC2:FORM LP	
Select test parameter to be LB-DCR	:FUNC:CONC ON :FUNC 'IMP', 'RES' :CALC1:FORM LS :CALC2:FORM REAL	

9.4.3 Select test frequency

Order：：SOURce：FREQuency[：CW]

Table 9-2 Select Test Frequency Command

Example	Usage
Select test frequency to be 100Hz	:SOUR:FREQ 100Hz

Select test frequency to be 120Hz	:SOUR:FREQ 120Hz
Select test frequency to be 1kHz	:SOUR:FREQ 1kHz

9.4.4 Select test level

Order：：SOURce：VOLTage[:LEVel][:IMMediate][:AMPLitude]

Example： Select test level to be 0.5V

Usage： :SOUR:VOLT 0.5

9.4.5 Select test range and mode

Order：[：SENSe]：FIMPedance：RANGe：AUTO

[：SENSe]：FIMPedance：RANGe[：UPPer]

Example： select range 100Ω

Usage： :FIMP:RANG:AUTO OFF

:FIMP:RANG 100

9.4.6 Select test speed

Order：[：SENSe]：FIMPedance：APERture

Example： Select rapid mode

Usage： :FIMP:APER 0.025

9.4.7 Select trigger mode

Order：：TRIGger：SOURce

Example： Select external trigger mode

Usage： :TRIG:SOUR EXT

9.4.8 Select internal resistance

Order：：SYSTem：CONSt

Example： Select internal resistance of 25Ω

Usage： :SYST:CONS 25

9.4.9 Trigger delay setup

Order： ：TRIGger：DELay

Example： Delay 100mS

Usage： :TRIG:DEL 100ms

9.4.10 Test end delay setup

Order： ：SYSTem：ENDdelay

Example： Delay 10mS

Usage： :SYST:END 10ms

9.4.11 Average setup

Order： [：SENSe]：AVERage[：STATe]

[：SENSe]：AVERage：COUNt

Example： set average to be 20

Usage： :AVER:COUN 20

9.4.12 Fast speed test period setup

Order： ：SYSTem：INTEgration

Example： Set fast test period to be 4

Usage： :SYST:INTE 4

9.4.13 Bin compare setup（LIMIT）

Order： ：BINning：NOMInal

：CALCulate{1|2}：MATH：EXPRession：NAME

：BINning：LOWer：AUX

：BINning：UPPer：AUX

：BINning：LOWer：BIN{ 1~8 }

：BINning：UPPer：BIN{ 1~8 }

：BINning：STATe

Example： set main parameter nominal value to be1μF；main parameter 2nd bin high/low limit±to be 10%；secondaryparameter low limit to be 0，high limit to be 10；open compare switch

Usage： :BIN:NOMI 1u

:CALC1:MATH:EXPR:NAME PCNT

:BIN:LOW:BIN2,-10

:BIN:UPP:BIN2,10

:BIN:LOW:AUX,0

:BIN:UPP:AUX,10

:BIN:STAT ON

9.4.14 Comparator setup（COMPSET）

Order： ：DATA [：DATA] REF{1|2}，numeric_value

：CALCulate{1|2}：MATH：EXPRession：NAME

：CALCulate{1|2}：LIMit：LOWer[：DATA]

：CALCulate{1|2}：LIMit：UPPer[：DATA]

：CALCulate{1|2}：LIMit：STATe

Example： Set primary parameter nominal value to be 1μF，secondary parameter nominal value to be 5；

Set primary parameter high/low limit to be ±10%；secondary parameter lower limit to be 1，high limit to be 3；

Open comparator switch

。

Usage： :DATA REF1,1u

:DATA REF2,5

:CALC1:MATH:EXPR:NAME PCNT

:CALC1:LIM:LOW -10

:CALC1:LIM:UPP 10

:CALC2:LIM:LOW 1

:CALC2:LIM:UPP 3

:CALC1:LIM:STAT ON

9.4.15 list sweep setup

Order： ：LIST：FREQuency <sweep point>[，<sweep point>*]

：LIST：MODE

：LIST：BAND {1~4}

Example： Set sweep parameter to be frequency，continuous sweep，parameters of 4 sweep points are listed as follow：

sweep point1：100Hz，compare primary parameter，lower limit is 1μF，upper limit is 2μF；

sweep point 2：120Hz，compare primary parameter，lower limit is1μF，upper limit is 2.1μF；

sweep point 3：1KHz，compare secondary parameter，lower limit is 0，upper limit is 5；

sweep point 4：10KHz，compare secondary parameter，lower rlimit is 3，upper limit is 9；

Usage： :list: mode seq

:list:freq 100hz,120hz,1khz,10khz

:list:band1 a,1u,2u

:list:band2 a,1u,2.1u

:list:band3 b,0,5

:list:band4 b,3,9

9.4.16 Setup of buzzer in compare output

Order： ：CALCulate{1|2}：LIMit：BEEPer[：STATe]

：CALCulate{1|2}：LIMit：BEEPer：CONDition

：SYSTem：ALARm

Example： set buzzer implise alarm in FAIL

Usage：:CALC1:LIM:BEEP ON

:CALC1:LIM:BEEP:COND FAIL

:SYST:ALAR PULS

Chapter 10 Packing and warranty

10.1 Packing

There is a packing list attached when the instrument is distributed so the configuration of accessory and material are based on the packing list. After the user receives it, please check up as the packing list，if there is an omission，please contact with our company or management department。

Table 10-1 packing reference

serial No.	Name	quantity
1	TH2825A or TH2825 LCR digit meter	1
2	TH26011 Kelvin test clip leads	1
3	TH26005 test fixture	1
4	TH26010 Gilded shorting plate	1
5	TH26038transformer test fixture（only for TH2825A）	1
6	3-terminal power line	1
7	1A fuse	2
8	Operation manual	1
9	certification	1
10	Test report	1
11	Warranty card	1

☞**Note：According to the demand**， user can purchase the options：（more information on our web site）

TH2825-HANDLER interface connection cable TH2825/A-IEEE-488interface

TH26005&TH26006 axial fixture TH26009 SMDtest tweezer

10.2 Warranty

Length of warranty：The length of warranty is 2 year calculated from the date of shipment and the Warranty card is needed. During the period，the maintenance fee is paid by the user due to the fault of operation, and our company provides the lifetime warranty.

The instrument should be maintained by professional technician, please don't replace the components without authorization. After maintenance, the instrument should be measured and calibrated again to avoid affecting the test precision。As for the blind maintenance, the damage caused by replacing the components of the instrument is out of the warranty range, so the user has to bear the maintenance fee.

The instrument should be avoided sun and wet，and correct use of the instrument is described in 1.2.

If the instrument will not be put in use for a time, please have it properly packed with its original box.

Appendix 1 Common-used function index

category	name	Display code	Function description	Referred chapter
Test main setup	Test parameter	FUN	Select test parameter and circuit form to be series or parallel by softkey	§3.2.1.4
	Test frequency	FRQ	Select different test frequency by softkey	§3.2.1.5
	Test level	LEV	Select different test levels by softkey or numerical key	§3.2.1.6
	Range mode	RANGE	Control auto selection range or test in a certain range by soft key	§3.2.1.7
	Test speed	SPEED	Select test speed by softkey	§3.2.1.8
	Short zeroing	SHORT	Clear up the influence of short distribution parameter on test	§3.2.1.9
	Open zeroing	OPEN	Clear up the influence of open distribution parameter on test	§3.2.1.10
Test additional setup	Current/voltage monitor	Vm/Im	Open monitor function by soft key, thus can monitor the actual distribution voltage and flowed current value	§3.2.6.4
	Sampling period	FastT	Select signal sampling period of fast test by soft key	§3.2.6.5
	Trigger switch	TRIG	Select different trigger modes by softkey	§3.2.6.6
	Signal source internal resistance	INT_R	Select different signal source internal resistance modes by softkey	§3.2.6.7
	Trigger delay	DELAY	Input effective trigger to the test data by numerical key	§3.2.6.8
	Average times	AVG	Input average test times by numerical key	§3.2.6.9
	Bias voltage	iBIAS	Select different bias voltage modes by softkey	§3.2.6.10
	Deviation mode	DEV_A DEV_ B	Select deviation display mode of main and secondary parameters by soft key, the deviation can only determines display ,having nothing	§3.2.6.11

			to do with compare sorting	
	Deviation reference value	REV_A REV_B	Operate softkey to Obtain deviation reference value automatically by test or operate numerical key to input deviation reference value of main and secondary parameters	§3.2.6.12
	Discharge setup	Disch	Select open by softkey, in superposition bias signal, the accumulated voltage on the test terminal can be discharged instantly, so as to improve the test stability	§3.2.6.13
Limit setup	Bin limit parameter setup	Limit Table	Adopt direction key to select parameter, and adopt numerical key to input parameter or delete a group of parameter	§3.2.8
	Comparator parameter setup	Comp Setup	Adopt direction key to select parameter, and adopt numerical key to input parameter or delete a group of parameter	§3.2.9
	List sweep parameter setup	List Sweep	Use the soft key to select parameter, sweep mode, test parameter based on the list, and adopt numerical key to input limit of test parameter, or use the softkey to delete a group of limit value	§3.2.10
Correction	Correction	User Correction	Realize function of short zeroing, open zeroing and load correction by softkey or numerical key	§3.2.7

Category	Name	Display code	Function description	Reference chapter
System setup	liquid-crys-tal contrast	CONTRAST	Operate the softkey to select	§3.2.11.2
	Alarm prompting sound	INFO BEEP	Operate the softkey to select volume and prompting sound	§3.2.11.3
	Output alarm signal selection	CMP ALARM	Operate the softkey to select the alarm mode: pass alarm, fail alarm and close	§3.2.11.4
	Alarm mode	ALARM MODE	Operate the softkey to select continuous and interruption mode	§3.2.11.5
	Password mode	PASSWORD	Operate the softkey to select password-protection mode, or use numerical key to change the password	§3.2.11.6
	Bus mode	BUS MODE	Operate softkey to determine the bus mode of external communication	§3.2.11.7
	GPIB address	GPIB ADDR	Input GPIB parallel address of IEEE488 interface	§3.2.11.8
	Instrument output data end code	EOS CODE	Operate softkey to select GPIB of IEEE488 and output end code of RS232	§3.2.11.9
	HANDLERin terface signal mode	HANDLER	Operate the softkey to select sorting signal mode of HANDLER interface：Hold to the next refresh and clear mode.	§3.2.11.10
	Test end delay	ENDDELAY	Input the delay after measurement finishes by numerical key to adjust the impulse width of sorting result	§3.2.11.11
Additional function	Save and load of file	File	Operate the direction key to select File page, then operate the softkey to load and save the file	§3.2.1.2
	File manage-ment	File List	Select File List page from System Config to load rename and delete file	§3.2.12
	Tool	Tools	Operate direction key to select Tools page to realize the special function of relative page	§3.2.1.3 §3.2.2.2 §3.2.3.2 §3.2.6.2

				§3.2.8.7 **§3.2.10.5**