Operation Manual

TH2836 Series

Impedance Analyzer

V1.0@202307

Catalog

Chapter 1 Out-of-the-box Installation

This chapter describes some of the checks you must make when you receive the instrument and what you must know and have before you can install and use the instrument.

1.1 Unpacking and Inspection

Thank you for purchasing and using our products, after opening the box, you should first check whether the instrument is damaged because of transportation, we do not recommend you to power up the instrument in the case of damaged appearance.

Confirm according to the packing list, if there is any discrepancy you can contact our company or distributor as soon as possible to maintain your rights and interests.

1.2 Power Connection

Supply voltage range: 100~120Vac or 198~242Vac, related to the rear panel power supply setting.

Power supply frequency range: 47~63Hz.

Power supply range: not less than 130VA.

The power input phase line L, zero-line N and ground line E should be the same as the power plug of this instrument.

This instrument has been carefully designed to minimize spurious interference due to inputs from the AC power supply side, however, it should still be used in as low a noise environment as possible, and if this cannot be avoided, install a power supply filter.

WARNING: In order to prevent leakage of electricity from harming the instrument or people, the user must ensure that the ground wire of the power supply is reliably connected to earth.

1.3 Fuses

The instrument is equipped with a fuse from the factory, and the user should use the fuse provided by our company.

WARNING: Before powering up the unit, note that your fuse location matches the supply voltage range.

1.4 Environment

Please do not use it under dusty, vibration, direct sunlight, or corrosive gas.

The instrument should work normally at a temperature of 0℃ to 40℃ and a relative humidity of ≤75%, so please try to use the instrument under these conditions to ensure the accuracy of the measurement.

This tester is equipped with a heat sink on the left side to prevent the internal temperature from rising. To ensure good ventilation, do not block the left and right ventilation holes to maintain the accuracy of the tester.

This instrument has been carefully designed to minimize spurious interference due to inputs from the AC power supply side, however, it should still be used in as low a noise environment as possible, and if this cannot be avoided, install a power supply filter.

If the instrument is not used for a long time, please store it in the original packing box or similar box in a ventilated room with the temperature of 5℃～40℃ and the relative humidity not more than 85%RH. The air should not contain harmful impurities that corrode the measuring instrument, and it should be avoided from direct sunlight.

The instrument and especially the test leads connected to the part under test should be kept away from strong electromagnetic fields so as not to interfere with the measurement.

1.5 Test Fixture

Please use the test fixture or test cable equipped by our company, user-made or other companies' test fixture or test cable may lead to incorrect measurement results. Instrument test fixtures or test cables should be kept clean, and the pins of the device under test should be kept clean to ensure good contact between the device under test and the fixture.

Connect the test fixture or test cable to the four test terminals Hcur, Hpot, Lcur and Lpot on the front panel of the instrument. For DUTs with shielded enclosures, the shielding can be connected to the ground "⊥" of the instrument.

Note: When no test fixture or test cable is installed, the instrument will display an unstable measurement.

1.6 Preheating

To ensure accurate measurement of the instrument, the power-on warm-up time should be not less than 15 minutes.

Do not switch the instrument on and off frequently as this may cause internal data confusion.

1.7 Safety Requirement

The measuring instrument is a Class I safety instrument.

1.7.1 Electrical Insulation Resistance

Under the reference working conditions, the insulation resistance between the power supply terminals and the shell shall be not less than 50MΩ.

The insulation resistance between the voltage terminals and the enclosure shall be not less than 2MΩ under hot and humid conditions of transportation.

1.7.2 Dielectric Strength

Under the reference working conditions, the power supply terminals and the shell should be able to withstand the frequency of 50Hz, rated voltage of 1.5kV AC voltage, timing 1 minute, there should be no breakdown and flying arc phenomenon.

1.7.3 Leakage Current

Leakage current should be no more than 3.5mA (AC RMS).

1.8 Electromagnetic Compatibility Requirements

Measuring instrument power transient sensitivity Requirements according to GB6833.4.

Measuring instrument conduction sensitivity Requirements according to GB6833.6.

Measuring instrument radiation interference according to the requirements of GB6833.10.

Performance testing

1.9 Other Features of The Instrument

Power consumption: Power consumption ≤80VA

Overall dimensions (W*H*D): 400mm*132mm*385mm

Weight: about 13kg

Chapter 2 Overview

This chapter describes the basic operating characteristics of the TH2836 series instruments. Before using the TH2836 series instruments, please read this chapter in detail so that you can quickly learn the operation of the TH2836 series instruments.

2.1 Front Panel Description

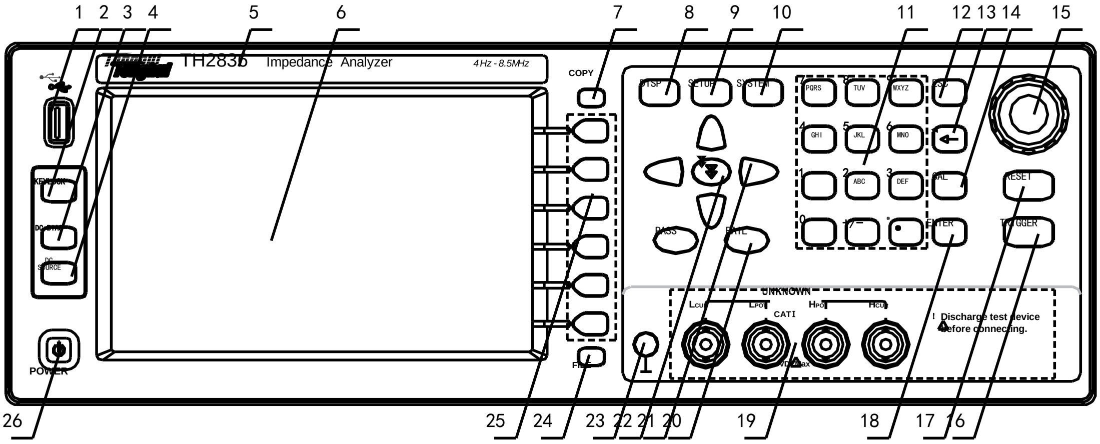


Figure 2-1 Front Panel Description

1. USB HOST interface

Used to connect to USB flash drive storage for file saving and recalling.

2. [KEYLOCK] key

Press the [KEYLOCK] key, the [KEYLOCK] key will be lit, indicating that the current panel key functions are locked; press the [KEYLOCK] key again, the [KEYLOCK] key will go out, indicating that the keypad is unlocked. If the password function is set to "ON", when unlocking the keypad, you need to input the correct password, otherwise you can't unlock the keypad.

The [KEYLOCK] key will be illuminated when the instrument is controlled by HANDLER, USB_Device, LAN port, etc. Pressing the [KEYLOCK] key again, the [KEYLOCK] key will go out, indicating a return to the local unlocked keyboard state.

3. [DC BIAS] key

The [DC BIAS] key is used to allow or disable the DC bias power output. Pressing the [DC BIAS] key illuminates the [DC BIAS] key to allow DC bias output; pressing the [DC BIAS] key again extinguishes the [DC BIAS] key to disable DC bias output. In some non-test screens where bias cannot be added, pressing this key has no response.

4. [DC SOURCE] key

Reserved Functions.

5. Trademarks & Models

Instrument Trademarks and Models

6. LCD liquid crystal display

800x480 color LCD capacitive touch screen display showing measurement results, measurement conditions, etc.

7. [COPY] key

Picture save key, save the current LCD content as a picture to USB memory.

8. [DISP] key

Press the [DISP] key to enter the corresponding test display page of the meter function bridge.

9. [SETUP] key

Press the [SETUP] key to enter the corresponding test setup page of the meter function bridge.

10.[SYSTEM] key

Press the [SYSTEM] key to enter the system setup page.

11. Numeric key

Used to enter data into the instrument. The numeric keys consist of the numeric keys [0] to [9], the decimal [...] and [+/-] keys.

12. [Esc] key

Exit key.

13. [←] key

Backspace key, press this key to delete the last digit of the entered value.

14. [CAL] key

Reserved Functions.

15. Knob with confirmation function

Move the cursor to select and set parameters. The confirmation button function in the center is used to terminate data entry, confirm, and save the data entered by the knob.

16. [Trigger] key

When the instrument trigger mode is set to MAN (manual) mode, the instrument can be triggered manually by pressing this key.

17. [RESET] key

Pressing the [RESET] key terminates scanning only during automatic scanning, and the instrument does not perform any operation on other pages.

18. [Enter] key

The [Enter] key is used to terminate data entry, confirm, and save the data displayed on the input line.

19. Test side (UNKNOWN)

Four-terminal test end for connecting a four-terminal test fixture or test cable to measure the DUT.

Current excitation high end (Hcur);

Voltage sampling high end (Hpot);

Voltage sampling low end (Lpot);

Current excitation low end (Lcur).

20. FAIL/PASS indicator

Test judgment pass/fail LED indication.

21. Cursor keys (CURSOR)

The four cursor keys are used to move the cursor between domains and fields on the LCD display page. When the cursor moves to a domain, the domain is displayed as highlighted on the LCD display.

22. Jump (arrow keys)

Allows the cursor to jump quickly between areas.

23. Enclosure ground terminal

This terminal is connected to the instrument case. It can be used for protective or shielded ground connections.

24. File key (FILE)

This function key is used for quick access to the file management interface.

25. Soft key

Six softkeys are available for selecting controls and parameters, each with a corresponding function definition to the left of the softkey. The softkey definitions change depending on the page displayed.

2.2 Rear Panel Description

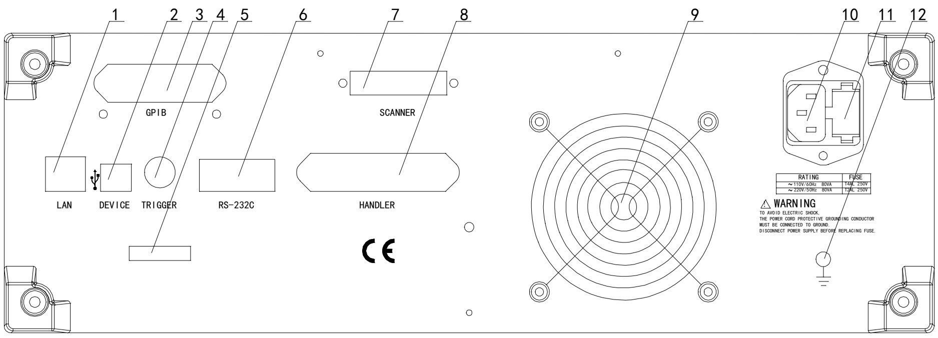


Figure 2-2 Rear Panel Description

1. LAN interface

Network interface to realize the control and communication of the network system.

2. USB DEVICE interface

USB communication interface to realize on-line communication with computer.

3. IEEE-488 (GPIB) interface

GPIB interface for on-line communication with PC.

4. TRIGGER interface

External trigger devices such as foot controls can be connected.

5. Sequence tag

Indicates date of manufacture, instrument number, and manufacturer.

6. RS232C serial interface

Serial communication interface to realize on-line communication with PC.

7. SCANNER interface

Scanning interface (reserved).

8. HANDLER interface

HANDLER interface to realize sorting output of test results.

9. Air vent

Dissipates heat and maintains the normal operating temperature of the instrument.

10. Electric socket

For input of AC power.

11. Fuse holder

Used for installing power fuse to protect the instrument, the direction of replacing the inner core can be switched 110V/220V.

WARNING: Before powering up the unit, note that your fuse location matches the supply voltage range.

12. Enclosure ground terminal

This terminal is connected to the instrument case. It can be used for protective or shielded ground connections.

2.3 Display Area Definition

The TH2836 utilizes a 7-inch capacitive touchscreen. The display is divided into the following display areas, see Figure 2-3.

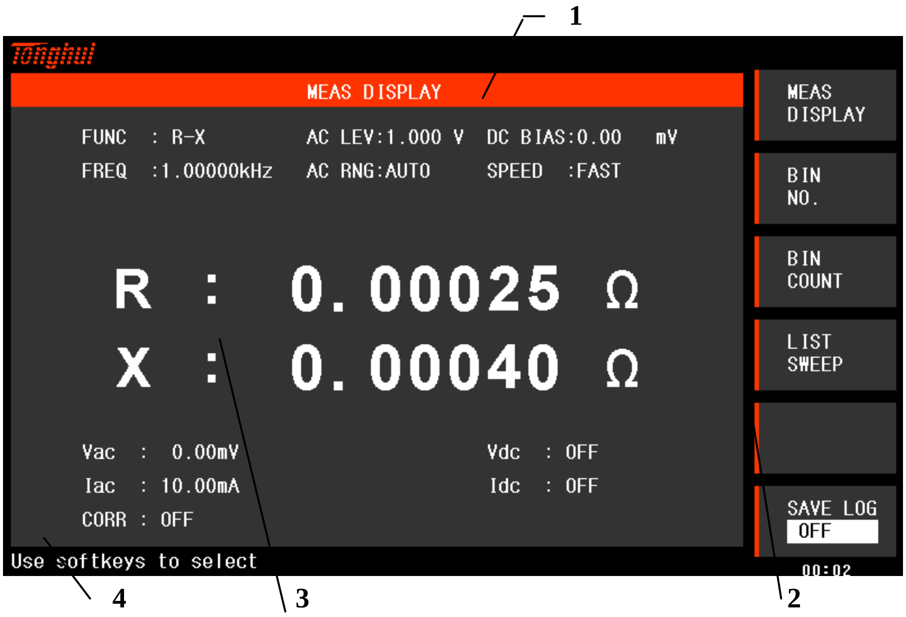


Figure 2-3 Display Area Definition

1. Show page area

This area indicates the name of the current page.

2. Softkey area

This area is used to display the function definitions of the softbuttons. The softbutton definitions have different function definitions depending on the position of the field where the cursor is located.

3. Measurement result/condition display area

This area displays test result information and current test conditions.

4. Assistant display area

This area is used to display system alert messages.

2.4 Main Menu Buttons and Corresponding Displayed Pages

2.4.1 Display Main Menu Key [DISP]

When the bridge function is used, it is used to enter the display page of component measurement. It is mainly about the start button of capacitance, resistance, inductance and impedance measurement function menu, and the function pages of this part are (use "soft key" to select the function of the following pages, the same as below):

<Measurement display>

<Bin number display>

<Bin count>

<List sweep >

<Save log>

2.4.2 Parameter Setting Main Menu Key [SETUP]

When the bridge function is used, it is used to access each of the component test setup screens. The function screens in this section are:

<Test Setup>

<User Correction>

<Limit Setting>

<List Settings→>

<List Parameter Settings>

<List User Correction>

<List Display Settings>

<Tools>

2.4.3 System Setup Main Menu Button [SYSYTEM]

Used to enter the system settings home page. Mainly about the system settings, the start button of the file list function menu. The function pages of this part are:

<System Settings>

<Network Settings>

<Handler Settings>

<Channel Settings>

<Default Settings>

<System Reset>

2.5 Basic Operation

The basic operation of the TH2836 is described below:

Use the menu buttons ([DISP], [SETUP], [SYSTEM]) and soft keys to select the display page desired by the user.

Use the cursor keys ([←][→][↑][↓]) to move the cursor to the field you want to set. When the cursor moves to a field, the field will be highlighted and become indicated by a blue background color. A field is an area where values can be set or changed.

When the knob is in the non-input state, the clockwise and counterclockwise direction corresponding to the function of the [←] [→] key, and the confirmation button in the center of the knob in the position where the cursor can be changed and switched can be input and non-input state. In the input state, the clockwise and counterclockwise directions of the knob can switch the data at the cursor position.

The softkey function corresponding to the field in which the current cursor is located is displayed in the "Softkey Area". Select and press the desired softkey. The numeric keys, [←] and [ENTER] keys are used for data entry.

When a numeric key is pressed, the softkey area displays the unit softkeys that can be used. You can end data entry by pressing the Units softkey or the [ENTER] key. When the [ENTER] key is used to end data entry, the data unit is the default unit for the corresponding domain parameter: Hz, V or A. For example, the default unit for the test frequency is Hz.

2.6 Power on and Power off

Plug in the three-wire power plug. Note: The power supply voltage, frequency and other conditions should be kept in accordance with the above regulations. The power input phase line L, zero-line N, ground line E should be the same as the phase line and zero line on the power plug of this instrument.

Turn on the power, press the power switch on the lower left corner of the front panel, the instrument turns on and the power-on screen is displayed.

If the user has turned on the password protection function, the instrument will ask for the power-on password. According to the screen prompts, enter the power-on password and press the key [ENTER] to enter the main menu screen.

Note: This series of products set the factory power-on password, the factory password is 2836, the use of units can be in the process of use, according to their own needs, reset the password. For details, please refer to 5.1.6 Password.

Chapter 3 [DISP] Functional Module Description

3.1 <Component measurement display> Screen

Press the [DISP] menu key and the <Component Measurement Display> page will be displayed on the screen. As shown in Figure 3-1:

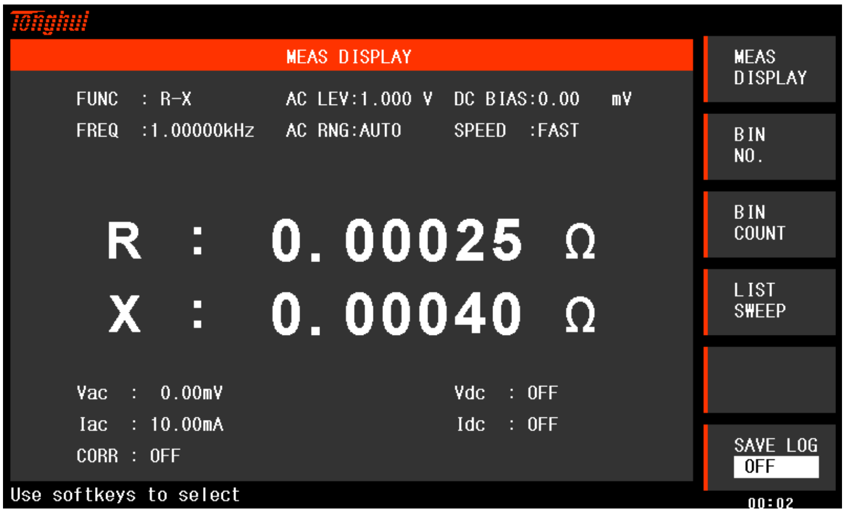


Figure 3-1 <Component Measurement Display> Page

On this page, the test results are displayed in large characters. The following measurement control parameters can be set on this screen.

Test functions (Function)

Test frequency (Frequency)

Test level (AC level) / (DC level)   The latter in the case of the DCR function

Test range (AC range) / (DC range)   The latter in the case of the DCR function

Test speed (Speed)

DC bias (DC Bias)

There are 6 fields on this display page, and they are: Function, Frequency, AC Level/DC Level, AC Range/DC Range, Speed, and DC Bias. Each control function field is described in detail in the following paragraphs.

The following test condition information is displayed in the Measurement results/conditions display area of this display screen. These conditions can be set on the <Measurement Settings> screen or the <User Calibration> screen.

Signal source voltage/current monitoring (Vac, Iac)

DC source voltage/current monitoring (Vdc, Idc)

Open circuit, short circuit, load correction ON/OFF setting state (correction)

3.1.1 Test Function

3.1.1.1 Parameters

The TH2836 can simultaneously measure two parameters of an impedance element in one measurement cycle: one primary parameter and one secondary parameter. The measurable parameters are as follows:

Main Parameter:

|Z|	(modes of impedance)
|Y|	(modes of the conductor)
L	(Inductance)
C	(Capacitance)
R	(Resistance)
G	(Conductance)
DCR	(Direct current resistance)

Subparameters:

D	(Loss factor)
Q	(Quality factor)
Rs	(Equivalent series resistance ESR)
Rp	(Equivalent parallel resistance EPR)
X	(Reactance)
B	(Susceptance)
Ɵ	(Phase angle)
Rd	(DC resistance)

The main parameter and subparameter test results are displayed in two separate lines of large characters. The primary parameter is displayed on the top line and the secondary parameter is displayed on the line below the primary parameter.

3.1.1.2 Setup Steps

Use the cursor keys to move the cursor to the **Function A** field, the following softkeys will be displayed.

Cp-... →

Cs-...→

Lp-...→

Ls-...→

Z-...→

↓

Press Cp-...→ softkey, the following parameter selection will appear, press the corresponding softkey to select the desired parameter, press ← softkey to return to the previous softkey menu.

Cp-D

Cp-Q

Cp-G

Cp-Rp

←

Press the Cs-...→ softkey, the following parameter selection will appear Press the corresponding softkey to select the desired parameter and press the ← softkey to return to the previous softkey menu.

Cs-D

Cs-Q

Cs-Rs

←

Press the Lp-...→ softkey, the following parameter selection will appear Press the corresponding softkey to select the desired parameter and press the ← softkey to return to the previous softkey menu.

Lp-D

Lp-Q

Lp-G

Lp-Rp

Lp-Rd

Lp-Z

←

Press the Ls-...→ softkey, the following parameter selection will appear Press the corresponding softkey to select the desired parameter and press the ← softkey to return to the previous softkey menu.

Ls-D

Ls-Q

Ls-Rs

Ls-Rd

Ls-Z

←

Press the Z-...→ softkey, the following parameter selection will appear Press the corresponding softkey to select the desired parameter and press the ← softkey to return to the previous softkey menu.

Z-d

Z-r

←

Press the ↓ soft key to select the next set of soft keys:

Y-...→

R-...→

G-B

DCR

←

Press the Y-...→ softkey, the following parameter selection will appear Press the corresponding softkey to select the desired parameter and press the ← softkey to return to the previous softkey menu.

Y-d

Y-r

←

Press the R-...→ softkey, the following parameter selection will appear Press the corresponding softkey to select the desired parameter and press the ← softkey to return to the previous softkey menu.

R-X

Rp-Q

Rs-Q

←

Press the G-B soft key to select the desired parameter.

Press the DCR soft key to select the desired parameter.

3.1.2 Test Frequency

The TH2836 has a test frequency range from 4Hz~8.5MHz with a minimum resolution of 0.001Hz.

The TH2836A has a test frequency range of 4Hz~5MHz, and the last digit of the test frequency represents the resolution.

3.1.2.1 Frequency Range

Frequency range (F)	Test Frequency Points	Resolution
4Hz<F<99.999Hz	4.0000Hz, 4.0010Hz 99.999Hz	0.001Hz
100Hz<F<999.99Hz	100.0Hz, 100.01Hz 999.99Hz	0.01Hz
1kHz<F<9.9999kHz	1.000kHz, 1.0001kHz 9.9999kHz	0.1Hz
10kHz<F<99.999kHz	10.00kHz, 10.001kHz 99.999kHz	1Hz
100kHz<F<999.99 kHz	100.0 kHz, 100.01 kHz......999.99 kHz	10Hz
1MHz <F<8.5MHz	1 MHz, 1 MHz......8.5 MHz	100 Hz

Table 3-1

3.1.2.2 Setup Steps:

The TH2836 has two ways of setting the test frequency. One is using the soft keys, and the other is direct entry using the numeric keys.

Use the cursor keys to move the cursor to the **frequency** domain. The following softkeys are displayed in the softkey area of the screen:

Plus ++

This softkey is the frequency increase coarse adjustment key. Each press of this key increases the frequency to 4Hz and then the next 10 times the frequency point. The frequency points that can be set with this softkey are as follows: 4Hz, 100Hz, 1kHz, 10kHz, 100kHz, 1MHz and 8.5MHz.

Plus +

This softkey is the frequency increase fine tuning key. Each press of this key increases the frequency to the next higher frequency point. there are 10 settable frequency points between 10 times the frequency point. The frequency points that can be set with this softkey are as follows (TH2839A up to 5MHz, TH2836 up to 8.5MHz):

4Hz	100Hz	1kHz	10kHz	100kHz	1MHz	5.5MHz
20Hz	120Hz	1.2kHz	12kHz	120kHz	1.2MHz	6MHz
25Hz	150Hz	1.5kHz	15kHz	150kHz	1.5MHz	6.5MHz
30Hz	200Hz	2kHz	20kHz	200kHz	2MHz	7MHz
40Hz	250Hz	2.5kHz	25kHz	250kHz	2.5MHz	7.5MHz
50Hz	300Hz	3kHz	30kHz	300kHz	3MHz	8MHz

60Hz	400Hz	4kHz	40kHz	400kHz	3.5MHz	8.5MHz
80Hz	500Hz	5kHz	50kHz	500kHz	4MHz	
600Hz	6kHz	60kHz	600kHz	4.5MHz		
800Hz	8kHz	80kHz	800kHz	5MHz		

Less -

This softkey is the frequency reduction fine tuning key. Each press of this key reduces the frequency to the next lower frequency point. there are 10 settable frequency points between 10 times the frequency point. The frequency points that can be set with this softkey are the same as plus +.

Less --

This softkey is the frequency reduction coarse adjustment key. Each time this key is pressed, the frequency is reduced to the next 10 times the frequency point. The frequency points that can be set with this softkey are the same as plus ++.

Selecting or setting the test frequency can be done using either the soft keys or the numeric entry keys. When the desired frequency value is entered using the numeric keys, the softkeys display the currently available frequency units (Hz, kHz, or MHz). You can use these units softkeys to enter units and data. When the [ENTER] key is used to enter a frequency, the frequency value unit defaults to Hz.

3.1.3 AC Test Level

The test level of the TH2836 is set at the RMS value of the test sine wave signal. The frequency of the sine wave signal is the test frequency, which is generated by the internal oscillator of the instrument. You can set both the test voltage value and the test current value. The level range TH2836/TH2836A is 5mV~2V (5mV~1V for test frequency over 1MHz). The corresponding current level mode value forms a linear relationship with the internal resistance. (If the test function is DCR, the item is DC level, please refer to the description of the measurement setup interface for specific DC level test parameters)

3.1.3.1 Level Range

Voltage Level	Resolution
5 mVrms~100mVrms	100 μVrms
100 mVrms~1Vrms	1mVrms
1Vrms~2Vrms	10mVrms

Table 3-2

Note: The test current set for TH2836 is the output current value when the DUT is short-circuited. The set test voltage is the output voltage value when the DUT is open circuit.

The TH2836's automatic level control function enables constant voltage or current measurement. The automatic level control function (constant level field) can be set to

ON from the <Measurement Settings> screen. When the automatic level control function is turned on, an "*" sign is displayed after the current level value. For details, refer to the <Measurement Settings> screen.

3.1.3.2 Setup Steps:

The TH2836 has two ways to set the test signal source level. One is to set it using the soft keys and the other is to use the numeric entry keys.

Use the cursor keys to move the cursor to the level field. The following softkeys will be displayed in the softkey area of the screen.

Plus +

Press this softkey to increase the source output level.

Less -

Press this softkey to decrease the signal source output level.

Selecting or setting the test level can be done using either the soft keys or the numeric entry keys. When the desired level value is entered using the numeric keys, the softkey area displays the currently available level units (mV, V, μA, mA, and A). You can use these units softkeys to enter units and data. When the [ENTER] key is used to enter the level value, the level value unit defaults to V or A.

Note: When you need to switch the test level between current and voltage, you must use the value entry keys and the unit's soft key.

3.1.4 Test Range

The test range is selected according to the impedance value of the LCR element under test.

The TH2836 has 15 test ranges: 0.1Ω, 1Ω, 10Ω, 20Ω, 50Ω, 100Ω, 200Ω, 500Ω, 1kΩ, 2kΩ, 5kΩ, 10kΩ, 20kΩ, 50kΩ, 100kΩ.

3.1.4.1 Setup Steps:

Use the cursor keys to move the cursor to the range field and use the soft keys to set the test range. The screen will display the following soft keys.

AUTO This softkey is used to set the range to AUTO mode.

HOLD This softkey is used to switch the range from AUTO mode to HOLD mode. When the range is set to HOLD mode, the range will be locked at the current test range. The current test range will be displayed in the range field of the screen.

Add + This softkey is used to increase the range in range lock (HOLD) mode.

Decrease - This softkey is used to decrease the range in range lock (HOLD) mode.

3.1.5 DC Bias

The TH2836 can provide a built-in DC bias voltage of -40V to +40V.

3.1.5.1 Voltage Range

Set Value		Limit Value
DC Bias	AC Test Signal Level	
Vdc (V)	Vosc (Vrms)	Vosc×√2×1.15 + Vdc×1.002 < 42V
Vdc (V)	Iosc (Arms)	Iosc×√2×115 + Vdc×1.002 < 42V
Idc (A)	Vosc (Vrms)	Vosc×√2×1.15 + Idc×100.2 < 42V
Idc (A)	Iosc (Arms)	Iosc×√2×115 + Idc×100.2 < 42V

Table 3-3

3.1.5.2 Setup Steps

Press the front panel [DCV BIAS] key to allow the set DC bias output. The [DCV BIAS] key is illuminated when the DC bias is allowed to be output.

The TH2836 has two ways to set the DC bias. One is set using the soft keys and the other is using the value entry keys.

Use the cursor keys to move the cursor to the DC bias field. The following softkeys will be displayed in the on-screen softkey area.

Plus +

Press this softkey to increase the DC bias output level.

Less -

Press this softkey to decrease the DC bias output level.

Selecting or setting the DC bias level can be done using either the soft keys or the numeric entry keys. When the desired bias level value is entered using the numeric keys, the softkey area displays the currently available DC bias units (mV, V, μA, mA and A). You can use these units softkeys to enter units and data. When the [ENTER] key is used to enter a bias value, the DC bias value units' default to V or A.

Note: When you need to switch the DC bias level between current and voltage, you must use the value entry keys and the units softkey.

3.1.6 Test Speed

The TH2836 test speed is determined primarily by the following factors:

Integration time (A/D conversion)

Average number of measurements (number of measurements averaged each time)

Measurement delay (time from startup to start of measurement)

Measurement data display time

3.1.6.1 Speed Range

Generally speaking, test results are more stable and accurate when measured at slow speeds. You can choose from 3 test speeds: FAST, MED, and SLOW.

	Measurement Speed	Test Frequency						
		20Hz	100Hz	1kHz	10kHz	100kHz	1MHz	8.5MHz
1	Fast	380ms	100ms	20ms	7.7ms	5.7ms	5.6ms	5.6ms
2	Medium	380ms	180ms	110ms	92ms	89ms	88ms	88ms
3	Slow	480ms	300ms	240ms	230ms	220ms	220ms	220ms

Table 3-4

The test times in the table above are data under the following conditions:

Test function not Ls_Rdc, Lp_Rdc

Ranges are locked ranges.

DC bias voltage level monitoring: Off

DC bias current level monitoring: Off

Trigger delay: 0s

Step delay: 0s

Calibration data:

Automatic level control: off

Average number of times: 1

Calibration off

DC Bias Off

3.1.6.2 Setup Steps:

Use the cursor keys to move the cursor to the **Speed** field to set the test speed and the following softkeys will be displayed in the softkey area of the screen.

Fast speed

Medium speed

Slow speed

3.1.7 Other Functions

The TH2836 test result data is displayed as six digits with a floating decimal point. The decimal point lock function allows the TH2836 to output test results with a fixed decimal point position. This feature can also be used to change the number of digits in the test result display.

3.1.7.1 Setup Steps:

Set the decimal point fixed display method according to the following procedure.

Move the cursor to the primary or secondary parameter in the measurement result display area, and the following softkeys will be displayed in the softkey area of the screen.

Fractional part of a number automatically

Fractional lockout

Add + for small letters

Fractional position minus -

Calligraphic style

Press the softkey Decimal automatically restores the decimal point position of the primary or secondary parameter test result at the corresponding cursor to the default decimal point position.

Press the softkey Decimal Lock to lock the decimal point position of the primary or secondary parameter test result.

Press the soft key to add + to the decimal position, and each time you press it, the last digit of the display will be added. The display digit is increased by one.

Press the softkey Decimal Position minus -, each time you press, the last display digit will be omitted. The display digits are reduced by one.

Press the softkey font to switch the font of the measurement display results, the order of large → small → off rotation, off when not displaying the measurement data, just in front of the main parameters have a test pointer to show the test status.

Note: The decimal point position lock function is automatically canceled to revert to the floating decimal point display in the following cases.

Test function change.

The deviation test method (ABS, %, OFF) is changed during the deviation test.

3.2 <Bin Number Display> Screen

Press the menu key **[DISP]**, and then press the softkey **Bin No. Display** to enter the **<Bin No. Display>** page. In the **<Bin No. Display>** page, the bin number is displayed in large characters, and the current test result is displayed in normal small characters.

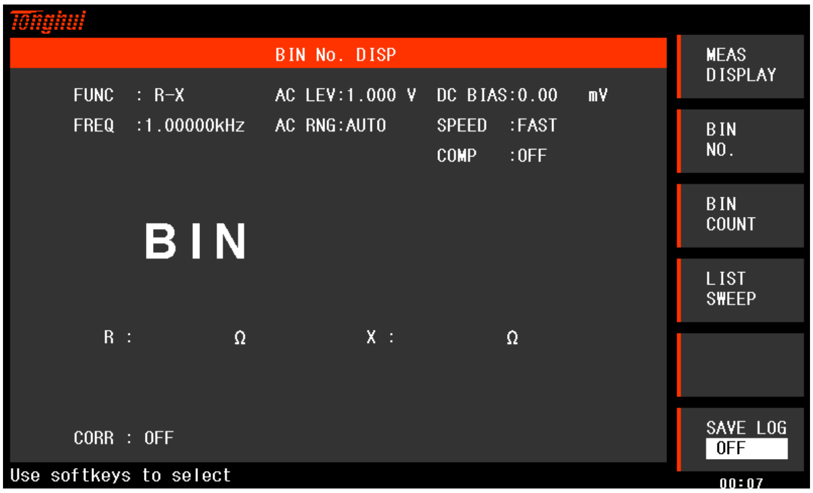


Figure 3-2 <Bin Number Display> Screen

3.2.1 Parameter Settings

Only 1 field is operable on this display page, Compare Function ON/OFF (Compare). Move the cursor to the Compare field and use the softkeys to set the compare function ON (on) or OFF (off).

The following test condition information is displayed in the Measurement results/conditions display area on this display screen. These monitor fields look like settable fields, but they cannot be set on this display screen. These fields can be set on the <Measurement Settings> screen, <Component Measurement Display> screen, or <User Calibration> screen.

Test functions (Functions)

Test frequency (Frequency)

Test level (AC level) / (DC level) The latter in the case of the DCR function

Test range (AC range) / (DC range) The latter in the case of the DCR function

Test speed (Speed)

DC bias (DC Bias)

Open circuit, short circuit, load correction ON/OFF setting state (correction)

3.2.2 Comparison Function

The TH2836 has a built-in comparison function that divides the component under test into up to 10 steps (BIN1 through BIN9 and BIN OUT). Nine pairs of primary parameter limits and one pair of secondary parameter file limits can be set. The rules for sorting and PASS/FAIL indication when the compare function is turned on are shown in the table below. When the TH2836 is fitted with the HANDLER interface accessory, the comparison test results can be output to an automatic test system for automatic sorting tests. These limit settings can only be set in the <Limit List Setting> screen. The comparison field on the <Bin number display> screen only allows setting the comparison function ON or OFF.

Comparison open	AUX (subsidiary) ON	AUX (subsidiary) OFF
Qualified main parameters Qualified sub-parameters	BIN1 to BIN9 PASS	BIN1 to BIN9 ASS
Main parameters failure Qualified sub-parameters	BIN OUT ASS	BIN OUT ASS
Qualified main parameters Sub-parameter failure	BIN AUX AIL	BIN OUT AIL
Main parameters failure Sub-parameter failure	BIN OUT AIL	BIN OUT AIL

Table 3-5

3.3 <Bin Count Display> Page

Press the Menu key [DISP], then press the softkey Bin Count to enter the <Bin Count Display> page. The counting value of each Bin is displayed in the <Bin Count Display> page.

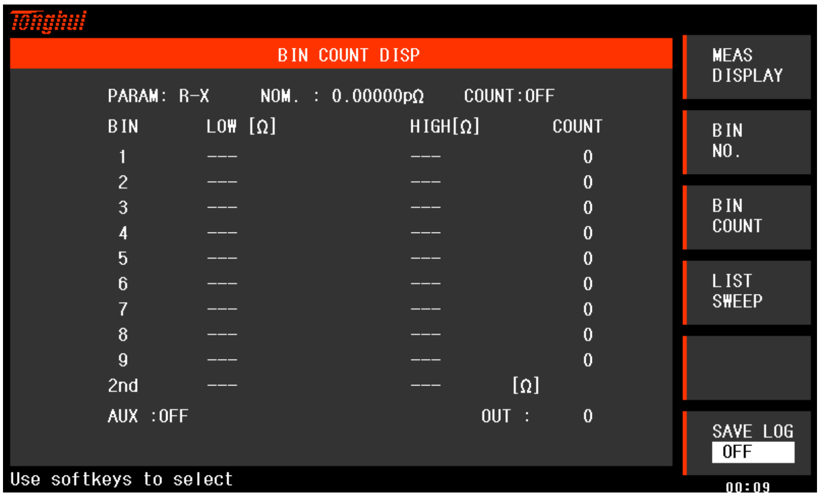


Figure 3-3 <Stall Count Display> Screen

3.3.1 Parameter Settings

This display page has only 1 field that can be operated, the counting function ON/OFF/reset counting. The Bin number of the limit list and the currently measured Bin count value (including the Bin count value of the current overdifferential Bin) are displayed directly below. "2nd" indicates the subparameter limit.

The following test condition information is displayed in the Measurement results/conditions display area on this display screen. These monitor fields look like setting fields, but they cannot be set on this display screen. These monitoring fields can be set on the **<Component test display>** and **<Limit list setting>** screens.

Test parameters (parameter settings are aligned with the primary and secondary parameters)

The alignment of the current "function" parameters, e.g. "Cp-D" is displayed as "D-Cp", indicating that D is currently compared as the primary parameter and Cp as the secondary parameter.

Nominal value (**nominal**)

Monitor the nominal value for bin comparison.

Bin limit value (**upper/lower limit**)

Monitors the upper and lower limit values of the limit list.

Attached bin switch (**attached**)

3.3.2 Setup Steps

Perform the following operations to set the bin count function ON/OFF on the **<Bin Count Display>** screen.

On the <Bin Count Display> screen, move the cursor to the count field. The following softkeys will be displayed in the softkey area of the screen.

ON, press the softkey ON to turn the counting function ON.

OFF, press the softkey OFF to turn the counting function OFF.

Reset count

Press a softkey to reset the count and the screen assistant displays, "Reset count confirmed?". The following softkeys will be displayed in the softkey area.

Yes, press the softkey Yes to reset all bin count values to 0.

No, press the softkey No to cancel the bin count values reset operation.

3.4 <List Sweep Display> Page

Press the Menu Key [DISP] and then press the softkey List Sweep to enter the **<List Sweep Display>** page.

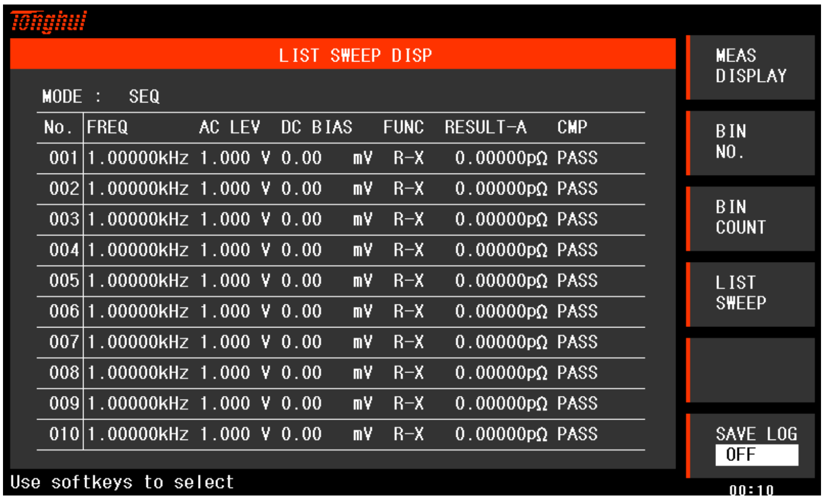


Figure 3-4 <List Sweep Display> Screen

The TH2836 can support up to 10 scan points on the **<List Sweep Display>** page. Each list-sweep test point can have its display parameters set. The test points are automatically scanned, and the test results are compared with their corresponding limit values.

3.4.1 Parameter Settings

There are 2 fields that can be operated on this display page, the scanning method (**mode**), and the list display parameter (**serial number**). The list scan point cannot be set under this screen but can only be set on the **<List Sweep Settings>** screen.

With the cursor in the **Mode** field, use the softkeys to set the scan mode to SEQ (sequential) or STEP (step).

The cursor on the **serial number** can be activated by soft key **page flip** to activate the serial number page switching state, in the activated state press the left and right keys of the panel to switch the display of the remaining parameters.

3.4.2 List Display

Frequency, AC Level, DC Bias, Function, Main Parameter" and "Comparison" are the default display parameters, if you want to display more parameters, you can set them in the list display settings, and the default display parameters can be turned off in the settings.

Frequency: The frequency of the current scan

AC level: AC level parameter of current user scanning

DC bias: DC bias parameter for the current user sweep

Function: Two parameters of the impedance element scanned by the user.

Main parameter: Results of the main parameter scanned by the current user.

Comparison: Comparison result of the current scanning point, "FAIL" means bad, "PASS" means qualified.

Chapter 4 [SETUP] Function Module Description

4.1 <Measurement Settings> Screen

Press the menu key [**SETUP**] to enter the **<Measurement Setup>** page. As Figure 4-1:

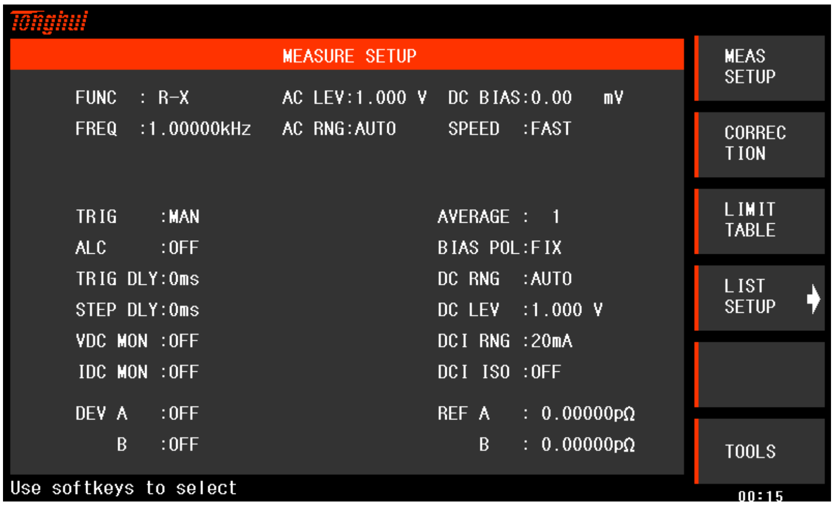


Figure 4-1 <Measurement Settings> Screen

4.1.1 Parameters

The following measurement control parameters can be set on the <**Measurement Settings**> screen.

Test functions (**Functions**)

Test frequency (**Frequency**)

AC test level (**AC level**)

AC test range (**AC range**)

Test speed (**Speed**)

DC bias (DC **Bias**)

Trigger mode (**Triggering**)

Automatic level control (**Constant level**)

Trigger delay time (**Trigger delay**)

Step delay time (**Step delay**)

Average number of times (**Average**)

Automatic bias polarity (**BIAS polarity**)

DC resistance range (**DC range**)

Test voltage for DC resistance (**DC level**)

DC bias range (**DCI range**)

DC bias voltage level monitoring ON/OFF (**VDC monitoring**)

DC bias current level monitoring ON/OFF (**IDC monitoring**)

Bias current isolation ON/OFF (**DCI isolation**)

Deviation test A mode (**Deviation A**)

Deviation test B mode (**Deviation B**)

Deviation test A reference value (**Reference A**)

Deviation test B reference value (**Reference B**)

<The Measurement Settings> screen contains some of the same fields that can be set in the <**Component Measurement Display>** screen, as listed below. These setting fields have been described previously and are not described in this section. Other setting fields in the <Measurement Settings> screen are described in detail in the following paragraphs.

Test functions (**Functions**)

Test frequency (**Frequency**)

Test level (**AC level**) / (**DC level**) The latter in the case of the DCR function.

Test range (**AC range**) / (**DC range**) The latter in the case of the DCR function.

Test speed (**Speed**)

DC bias (**DC Bias**)

4.1.2 Trigger Method

The TH2836 has the following four trigger modes: INT (internal trigger), MAN (manual trigger), EXT (external trigger), and BUS (bus trigger). Move the cursor keys to the **Trigger** field and use the on-screen softkeys to set the instrument to trigger INT (internal), MAN (manual) or EXT (external). If you want to set the instrument to BUS trigger mode, you need to send "**TRIGger:SOURce BUS**" command to the instrument via IEEE488 interface.

INT: TH2836 Continuous repeat test.

MAN: Each time the front panel **[TRIGGER]** key is pressed, the TH2836 performs a test.

EXT: The TH2836 performs one test for each positive pulse of the trigger signal received by the HANDLER interface.

BUS: The TH2836 performs a test every time the IEEE488 interface receives a "**TRIGGER**" command, and the BUS trigger mode cannot be set at the front panel of the instrument.

Note: When a trigger signal is received while the TH2836 is being tested, the trigger signal will be ignored. Therefore, the trigger signal needs to be sent after the TH2836 test is completed.

When the TH2836 needs to be triggered from the optional HANDLER interface, set the triggering method to the EXT method.

4.1.3 Automatic Level Control Function (Constant Level)

The automatic level control function adjusts the actual test level (voltage across the DUT or current flowing through the DUT) to the test level value you set. Use this function to ensure that the test voltage or current across the DUT remains constant. Move the cursor to the **Constant Level** field and use the on-screen soft keys to set the instrument's constant level switch ON or OFF.

When the automatic level control function is used, the test level settable range is limited as follows:

Constant voltage setting range: $5mV_{rms}$ to $1V_{rms}$.

Constant current setting range: $5\mu A_{rms}$ to $10mA_{rms}$.

Note: When the constant level function is active, if the level setting is outside the above range, the constant level function will be automatically set to OFF. the currently set level value is generally used as the non-constant level value.

4.1.4 Trigger Delay

The TH2836 trigger delay refers to the time delay between the instrument being triggered and the start of the measurement. The delay function allows you to set the trigger delay time. When using the list scan test function, the set delay time will be delayed at each scan test point. The trigger delay time can be set from 0s to 60s in 1ms steps. The trigger delay function is useful when the instrument is used in an automatic test system. When the instrument is triggered by the HANDLER interface, the trigger delay time ensures reliable contact between the DUT and the test terminal.

Move the cursor to the **Trigger Delay** field. Use the numeric keys to enter the delay time. When a numeric key is pressed, the unit softkey (msec or sec) is displayed in the softkey area of the screen. These softkeys can be used instead of the [ENTER] key to enter the corresponding delay time.

4.1.5 Step Delay

The step delay of the TH2836 is the delay between the output of the test signal and the time before each measurement.

Move the cursor to the **Step Delay** field. Use the numeric keys to enter the delay time. When a numeric key is pressed, the unit softkey (msec or sec) is displayed in the softkey area of the screen. These softkeys can be used instead of the [ENTER] key to enter the corresponding delay time.

Note: There are two step delays in the DCR measurements because voltages need to be added in both the positive and negative directions, all with two measurement cycles. Similarly, the Ls-Rdc and Lp-Rdc measurements have three test steps, so actually three times the step delay time.

Schematic diagram of trigger delay time and step delay time:

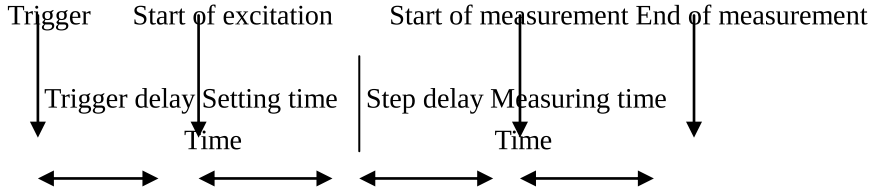


Figure 4-2

(**Note: The setup time in the graph is the preparation time for signal source control, range switching, etc. for instrument measurement)**

4.1.6 DC Bias Level Monitoring Function

The DC bias level monitoring function allows you to monitor the actual voltage currently across the DUT or the bias voltage current value flowing through the DUT. The voltage monitoring value is displayed in the Vdc field on the **Component Measurement Display** screen. The current monitoring value is displayed in the Idc field on the **Component Measurement Display screen**.

Move the cursor to the **VDC monitoring** field and the **IDC monitoring** field and press the on-screen softkey area to set the level monitoring function ON or OFF.

4.1.7 Average Number of Times

The TH2836's averaging function averages the results of 2 or more tests. The number of averages can be set from 1 to 255 in steps of 1.

The average number of times is set in two operation methods:

Move the cursor to the Averaging field and press the following softkey to set the number of times the measurement is averaged.

Add +: This softkey is used to increase the number of measurement averages.

Minus -: This softkey is used to reduce the number of measurement averages.

Use the numeric keys and the [ENTER] key to directly enter the average number of times.

4.1.8 Automatic Bias (BIAS) Polarity

The automatic bias polarity control function is suitable for testing varactor diodes. The TH2836 recognizes the diode's connection state by its internal bias (approximately 1 V) and controls the DC bias polarity internally to reverse bias the diode. When AUTO mode is selected, the DC bias voltage is followed by a "*" indication.

Move the cursor to the **BIAS polarity** field. Press the on-screen softkey area to set the auto-bias polarity function to AUTO or FIX.

For example, when the varactor diode is connected as shown in Figure 4-3, the TH2836 recognizes that the diode is correctly connected and begins to add the DC bias of the specified setting. Conversely, when the varactor diode is connected as shown in Figure 4-4, the TH2836 recognizes that the diode is connected in reverse and adds a DC bias of opposite polarity to the specified setting. This function removes the need to check the polarity of the varactor diode before connecting it to the UNKNOWN terminal.

Note: When the DC bias function is not turned on (OFF) and the auto bias control function is set to AUTO, the auto bias polarity control function is invalid.

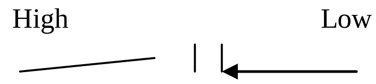


Figure 4-3 Varactor Diode (Normal Polarity)

The bias voltage added to the varactor diode is the same as the set bias voltage (+ on the high side and **-** on the low side).

Results for:

Bias Voltage Setting	Bias voltage for practical applications
1V	1V
10V	10V

Table 4-1

Figure 4-4 Varactor Diode (Opposite Polarity)

The bias voltage added to the varactor diode is the opposite of the set bias voltage (**-** on the high side and + on the low side).

Results for:

Bias Voltage Setting	Bias voltage for practical applications
1V	-1V
10V	-10V

Table 4-2

4.1.9 DC Resistance Range

TH2836 has 13 test ranges: 10Ω, 20Ω, 50Ω,100Ω, 200Ω, 500Ω, 1kΩ, 2kΩ, 5kΩ, 10kΩ, 20kΩ, 50kΩ, 100kΩ.

DCR or Ls-Rdc, DCR in Lp-Rdc measures two cycles for both positive and negative voltage measurements.

Note: When user sets DC range to HOLD, DCI range and AC range are also set to HOLD automatically, when user sets DC range to AUTO, DCI range and AC range are also set to AUTO automatically.

Note: If a DCR measurement is initiated while the DC bias is on, the DC bias is automatically cut off. If the measurement parameters are Lp-Rdc and Ls-Rdc, the DC bias cannot be switched on, otherwise an error message will appear.

DC resistance range setting procedure:

Use the cursor keys to move the cursor to the **DC range** field. The screen will display the following soft keys.

AUTO This softkey is used to set the range to AUTO mode.

HOLD This softkey is used to switch the range from AUTO mode to HOLD mode. When the range is set to HOLD mode, the range will be locked at the current test range. The current test range will be displayed in the range field of the screen.

Add + This softkey is used to increase the range in range lock (HOLD) mode.

Decrease - This softkey is used to decrease the range in range lock (HOLD) mode.

Use the soft keys to set the test range.

4.1.10 DC Resistance Level

Level setting for DC resistance measurement. The range is 100mV to 2V.

DC resistance level resolution:

Voltage Level	Resolution
100 mVrms~1Vrms	100 μVrms
1Vrms~2Vrms	1mVrms

Table 4-3

The TH2836 has two ways to set the DC resistance level. One is set using the soft keys and the other is using the value entry keys.

Use the cursor keys to move the cursor to the **DC Level** field. The following softkeys will be displayed in the softkey area of the screen.

Add +: Press this softkey to increase the DC resistance level.

Minus -: Press this softkey to reduce the DC resistance level.

Selecting or setting the test level can be done using either the soft keys or the numeric entry keys. When the desired level value is entered using the numeric keys, the softkey area displays the currently available level units (mV, V). You can use these units softkeys to enter units and data. When the [ENTER] key is used to enter a level value, the level value unit defaults to V.

4.1.11 DC Bias Current Range

The user can set the DCI range. Make sure the DCI isolated DC bias function is on before setting the DCI range.

Type	Measuring Range				
Standard Configuration	20μA	200μA	2mA	20mA	100mA

Table 4-4

Note: When the user sets the DC range to HOLD, the DCI range and AC range are also automatically set to HOLD, and when the user sets the DC range to AUTO, the DCI range and AC range are also automatically set to AUTO. it is not possible to change the DCI range when the DCI isolation is OFF.

DC bias current range setting procedure:

Use the cursor keys to move the cursor to the **DCI range** field. The screen will display the following soft keys.

AUTO This softkey is used to set the range to AUTO mode.

HOLD This softkey is used to switch the range from AUTO mode to HOLD mode. When the range is set to HOLD mode, the range will be locked at the current test range. The current test range will be displayed in the range field of the screen.

Add + This softkey is used to increase the range in range lock (HOLD) mode.

Decrease - This softkey is used to decrease the range in range lock (HOLD) mode.

Use the soft keys to set the test range.

4.1.12 Bias Current Isolation Function

The bias current isolation function prevents DC current from affecting the test input circuitry.The **DCI isolation** field can be set to have the bias current isolation function ON or OFF.When the bias current isolation function is set to ON, the bias current flowing through the DUT can be up to 100 mA.When the bias current isolation function is set to OFF, the value of the bias current that is allowed to flow through the DUT is as shown in Table 3-1.If the bias current exceeds the value in Table 3-1, the instrument will not be able to test properly. If the bias current flowing through the DUT exceeds the value in Table 3-1, the instrument will not be able to perform a normal test.

Test range	10 Ω	30 Ω	100 Ω	300 Ω	1 kΩ	3 kΩ	10 kΩ	30 Ω	100 kΩ
Maximum current	2 mA	2 mA	2 mA	2 mA	1 mA	300 μA	100 μA	30 μA	10 μA

Table 4-5 Maximum DC Bias Current

Note: The bias current isolation function, when turned on, has an effect on test accuracy. Therefore, the bias current isolation function should be set to OFF when testing high impedance components under low frequency and small bias current conditions.

4.1.13 Deviation and Reference

The deviation test function displays the deviation value instead of the actual test value directly on the screen. The deviation value is equal to the current actual test value minus the pre-set reference value. This function makes it easy to observe the variation of the component parameter under test with respect to temperature, frequency, bias and other conditions. The deviation test function can be used for either the main parameter or the subparameter, or for both the main and subparameters. The instrument provides two deviation test methods as follows:

ΔABS mode (absolute deviation mode)

The currently displayed deviation is the difference between the test value of the measured part and the set reference value. The formula for calculating the ΔABS deviation is as follows:

ΔABS = X-Y

X: Current measured value of the measured part

Y: Pre-set reference value

Δ% method (percentage deviation method)

The currently displayed deviation is the percentage error obtained by dividing the difference between the test value of the measured part and the set reference value by the reference value. The formula for calculating the Δ% deviation is as follows:

Δ% = (X-Y)/Y ×100 [%]

X: Current measured value of the measured part

Y: Pre-set reference value

Deviation test function operation procedure:

Move the cursor to the **Reference A** field to enter the reference value of the main parameter. When the reference element is connected to the tested terminal, press the softkey **Measurement**. the TH2836 tests the reference element, and the test result is automatically entered as the value of reference A. The TH2836 can also be used to enter the reference value of the main parameter by moving the cursor to the Reference A field. Or use the numeric keys to enter the reference value of the main parameter.

Move the cursor to the **Reference B** field to enter the reference value of the subparameter. The method is the same as step 1.

Move the cursor to the **deviation A** field. The soft keys set the deviation mode ABS, % or Off for the main parameter.

Move the cursor to the **deviation B** field. The method is the same as step 3.

4.2 <User Correction> Page

Press the Menu key [SETUP] and press the softkey User Correction to enter the

<User Correction> page.

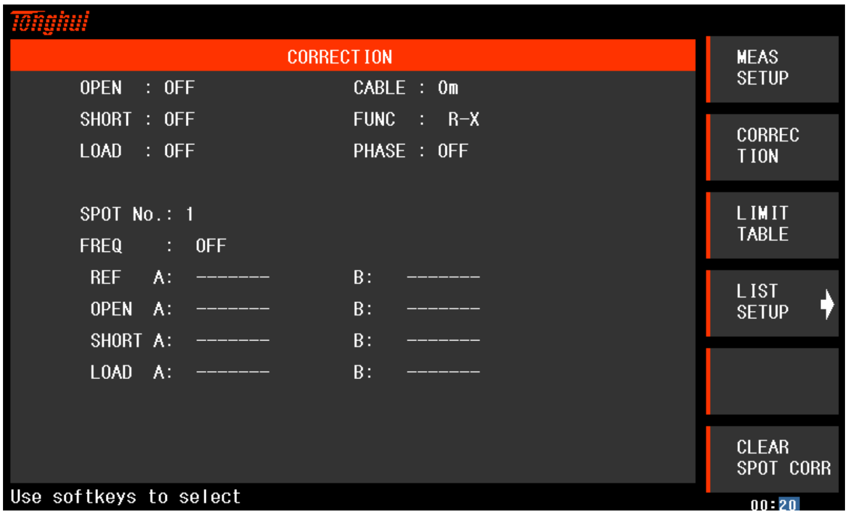


Figure 4-2 <User Correction> Page

4.2.1 Parameters

The open circuit, short circuit, and load correction functions on the **<User Correction>** page can be used to eliminate distributed capacitance, parasitic impedance, and other measurement errors. The TH2836 provides two types of calibration. One is the full frequency open circuit and full frequency short circuit correction for all frequency points using the insertion method. The other is to the current set frequency points open, short circuit and load correction. Single-point frequency correction is available for 201 points. The following measurement control parameter setting fields can be set in the **<User Correction >** page.

Open circuit correction (**Open Circuit**)

Short circuit correction (**Short Circuit**)

Load correction (**Load**)

Cable length selection (**Cable**)

Load correction test function (**Function**)

Calibration point (**Calibration Point**)

Frequency of open circuit, short circuit and load correction (**Frequency**)

Reference values for frequency points (**Reference A**, **Reference B**)

Open circuit value at the frequency point (**Open-circuit A**, **Open-circuit B**)

Short-circuit values at frequency points (**Short-circuit A**, **Short-circuit B**)

Load value at frequency point (**Load A**, **Load B**)

There are 16 fields in this display, they are: User Correction, Open-circuit, Short-circuit, Load, Cable, Function, Correction Point, Frequency, Reference A, Reference B, Open-circuit A, Open-circuit B, Short-circuit A, Short-circuit B, Load A, Load B. Each of the control function fields is explained in detail in the following paragraphs.

The <User Correction > screen displays the following monitor fields in addition to the setting fields described above. The monitor fields are similar to the setting fields, but the monitor fields only provide information display and cannot be set. You can test the load calibration software by selecting it in the frequency setting field.

Actual test results of open circuit correction. (**Open-circuit A**, **Open-circuit B**)

Actual test results of short circuit correction. (**Short-circuit A**, **Short-circuit B**)

Actual test results for load correction. (**Load A**, **Load B**)

Note: The rule for user correction is that if an open or short circuit is open and the measurement frequency corresponding to the point frequency clear is open, the data from the point frequency correction is used in preference.

4.2.2 Open Circuit Correction

The TH2836's open-circuit correction function eliminates errors caused by stray conductance (G, B) in parallel with the component under test. This is shown in Figure 4-3.

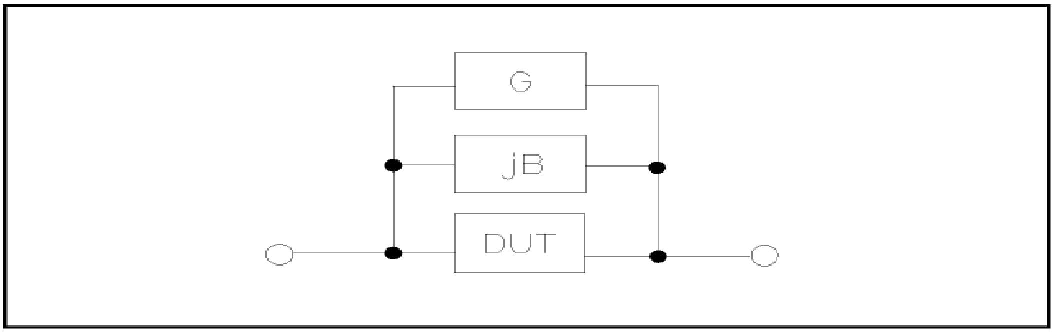


Figure 4-3 Spurious Conductivity

The TH2836 uses the following two methods of open-circuit calibration data:

The TH2836 performs open-circuit calibration tests for all of the following 65 fixed frequency points, regardless of your current set frequency. In addition to the following 65 frequency points, the instrument according to the 65 frequency points of the open-circuit calibration data, using the insertion calculation method can be calculated under all the test frequency corresponding to the open-circuit calibration data of different test ranges. Move the cursor to the **open-circuit** field and use the softkey **Open Circuit Full Frequency Clear** to perform full frequency open circuit clearing. 65 fixed frequency points are shown below TH2836 highest test frequency is 8.5MHz (65 points), TH2836A to 5MHz (58 points), the following take TH2836 as an example.

4 Hz	100 Hz	1 kHz	10 kHz	100 kHz	1.0 MHz	5.5 MHz
20 Hz	120 Hz	1.2 kHz	12 kHz	120 kHz	1.2 MHz	6 MHz

25 Hz	150 Hz	1.5 kHz	15 kHz	150 kHz	1.5 MHz	6.5 MHz
30 Hz	200 Hz	2 kHz	20 kHz	200 kHz	2MHz	7MHz
40 Hz	250 Hz	2.5 kHz	25 kHz	250 kHz	2.5MHz	7.5 MHz
50 Hz	300 Hz	3 kHz	30 kHz	300 kHz	3MHz	8MHz
60 Hz	400 Hz	4 kHz	40 kHz	400 kHz	3.5 MHz	8.5 MHz
80 Hz	500 Hz	5 kHz	50 kHz	500 kHz	4 MHz	
600 Hz	6 kHz	60 kHz	600 kHz	4.5 MHz		
800 Hz	8 kHz	80 kHz	800 kHz	5 MHz		

The TH2836 can be calibrated by setting the calibration **point** in the **Calibration Point** field on the **<User Calibration>** page, and then moving to the **Frequency** field to set the open-circuit calibration frequency. Move the cursor to **the frequency to** use the softkey **Open Circuit Single Frequency Clear** to open circuit correct the set frequency.

Open-circuit correction includes full-frequency open-circuit correction using the insertion calculation method and single-frequency open-circuit correction at the set frequency point. Perform the following steps to perform open-circuit correction for full frequency using the insertion calculation method, and for single-frequency open-circuit correction, refer to the "Load Correction" operating instructions.

Open Circuit Correction Function Method 1 Operating Procedure:

Move the cursor to the **Open Circuit** setting field to connect the test fixture to the test side of the instrument. The fixture is open and not connected to any component under test, the following softkeys are displayed in the softkey area of the screen.

ON

OFF

Open circuit full frequency clearing

DCR open

Press the softkey **Open Circuit Full Frequency Clear** and the TH2836 will measure the open conductance (capacitance and inductance) for 65 frequency points. The open-circuit full-frequency correction takes approximately 30 seconds. During the open-circuit full-frequency correction process, the following softkey is displayed.

Abort: This softkey aborts the current open circuit calibration test operation. The original open-circuit calibration data is retained unchanged.

Press the softkey **DCR open**, the TH2836 will perform the measurement of open circuit resistance under the DC resistance function.

Press the softkey **ON** to make the open-circuit correction valid, and the TH2836 will perform the open-circuit correction calculation in the future test process. If the **frequency** is set to OFF, the open-circuit correction calculation uses the open-circuit correction data of the current frequency calculated by the insertion method. If the **frequency** is set to ON and the current test frequency is equal to the **frequency** domain, the corresponding open-circuit correction data in the **frequency** domain will be used for the open-circuit correction calculation.

Press the softkey **Off** to turn off the open-circuit correction function. The calculation of the open circuit correction will not be performed in future measurements.

4.2.3 Short Circuit Correction

The TH2836's short-circuit correction function eliminates errors caused by parasitic impedances (R, X) in series with the component under test. This is shown in Figure 4-4.

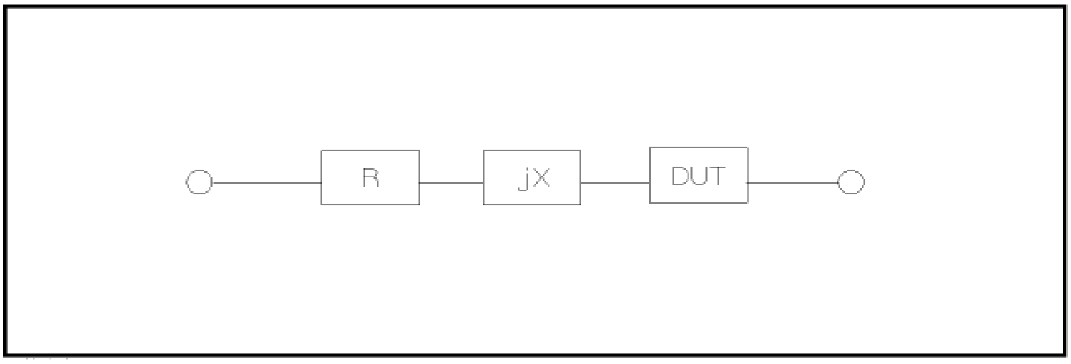


Figure 4-4 Parasitic Impedance

The TH2836 utilizes the following two types of short-circuit correction data, full frequency short-circuits correction and single point short-circuit correction. (TH2836 as an example)

The TH2836 performs short-circuit correction tests on 65 fixed frequency points regardless of the currently set frequency. In addition to the 65 frequency points, the short-circuit correction data of other frequency points will be calculated using the insertion calculation method to calculate the short-circuit correction data of different test frequencies under different ranges. Move the cursor to the **short-circuit** field and use the softkey **Short Circuit Full Frequency Clear** to perform full frequency short-circuit clearing. The 65 fixed frequency points are the same as those described for open-circuit correction, with the TH2836 up to a maximum test frequency of 8.5 MHz (65 points) and the TH2836A to 5 MHz (58 points).

The TH2836 can set the calibration point in the **Calibration Point** field on the **<User Calibration>** page, and then move to the **Frequency** field to set the open-circuit calibration frequency. Move the cursor to **the frequency** and use the softkey **Short Circuit Single Frequency Clear to** short-circuit correct the set frequency.

Short-circuit correction includes full-frequency short-circuit correction using the insertion calculation method and single-frequency short-circuit correction at the set frequency points. Perform the following steps to perform full-frequency short-circuit correction using the insertion calculation method, and single-frequency short-circuit correction as described in the "Load Correction" operation instructions.

Short circuit correction function operation procedure:

Connect the test fixture to the test end of the instrument, and the test fixture clamps the shorting chip to perform the shorting operation. Move the cursor to the **short circuit** setting field and the following soft keys are displayed in the soft key area of the screen.

ON

OFF

Short-circuit full frequency clearing

DCR short circuit

Press the softkey Short Circuit Full Frequency Clear, the TH2836 will measure the short circuit parasitic impedance (resistance and reactance) for 65 frequency points. The short-circuit full-frequency correction takes about 30 seconds. During the short-circuit full-frequency correction process, the screen displays the following softkey.

Abort: This softkey aborts the current short-circuit calibration test operation. The original short-circuit calibration data is retained unchanged.

Press the softkey **DCR Short Circuit**, the TH2836 will perform the measurement of the short circuit resistance of the DC resistance function.

Press the softkey **ON** to make the short-circuit correction valid, and the TH2836 will perform the short-circuit correction calculation in the future test process. If the frequency setting is OFF, the short-circuit correction calculation uses the short-circuit correction data of the current frequency calculated by the insertion method. If the frequency is set to ON, and at the same time the current test frequency is equal to the frequency in the **frequency** domain of the point frequency clearing, the short-circuit correction data of the frequency will be used for the short-circuit correction calculation.

Press the softkey **Off** to turn off the short-circuit correction function. The short-circuit correction calculation will not be performed in future measurements.

4.2.4 Load Correction

The load correction function of the TH2836 utilizes the transfer coefficient between the actual test value and the standard reference value at the set frequency point to eliminate other test errors. This means that open circuit, short circuit and load corrections can be performed at the set frequency point. The set frequency point can be set in the **frequency** setting field. The standard reference value can be set in the **reference A** and **reference B** setting fields. Before setting the standard reference value, the test function for the standard value must be set in the **function** field. When the cursor moves to **frequency**, the screen displays the softkey **Load Correction**. Press the **Load Correction** softkey to perform a load correction test on the standard.

When load calibration is performed, the reference value of the standard device must be entered beforehand. The test parameters for the reference value should be consistent with the set load correction test function.

The Load Correction function utilizes the transfer coefficient between the actual test value and the standard reference value at the set frequency point to eliminate other test errors. The Load Correction test function is only used to calculate the transfer coefficient.

Load Correction Function Operation Procedure:

Move the cursor to the **frequency** setting field. The screen will display the following soft keys.

On : Press this softkey to make the open/short/load correction test data valid at the current set frequency.

Off : Press this softkey invalidates the open/short/load correction test data at the current set frequency.

Open Single Frequency Clear: Press this softkey to perform an open correction test on the frequency.

Short Circuit Single Frequency Clear: Press this softkey to perform a short circuit correction test on the frequency.

Load Correction: Press this softkey to perform a load correction test on the frequency.

Press the softkey **On** and the Frequency Setting field displays the originally set open/short/load correction frequency.

Use the numeric keys to enter the calibration frequency. When any of the numeric keys is pressed, the available frequency unit softkeys (**Hz**, **kHz** and **MHz**) are displayed in the softkey area of the screen. You can therefore use these softkeys instead of the **[ENTER]** key to enter the calibration frequency. When the **[ENTER]** key is used to enter the calibration frequency, the data defaults to the unit of Hz.

Prepare a measurement standard device and set the functional parameters to be measured by the standard device.

Move the cursor to the **reference A** setting field of the set frequency and use the numeric keys and the units softkey to enter the reference value of the primary parameter of the standard device. Move the cursor to the **reference B** setting field of the set frequency and use the numeric keys and the units soft key to enter the reference value of the secondary parameter of the standard device.

Move the cursor to the corresponding **frequency** setting field and connect the standard device to the test fixture.

Press the softkey **Load Calibration** and the instrument performs a load calibration. The actual test results of the standard device are displayed in the **Load A** and **Load B** monitor fields.

Move the cursor to the **load** setting field. Press the softkey **On** to perform a load correction calculation for the set frequency point during each subsequent measurement.

4.2.5 Cable

Currently available cable lengths are 0m, 1m, 2m, the instrument comes with 0m, 1m cable calibration data, 2m cable calibration data, need to be customized.

4.2.6 Single-point User Calibration

Single-point user correction means open/short/load correction for user-specified frequency points. The correction point can be set by software or keypad digital input in the range of 1~201.

Single-point calibration setup procedure:

Use the cursor keys to move the cursor to the **correction point** field. The screen will display the following soft keys.

Add + + This softkey is used to increase the correction point value in increments of 10.

Add + This softkey is used to increase the correction point value in increments of 1.

Decrease - This softkey is used to decrease the correction point value in steps of 1.

Decrease -- This softkey is used to decrease the correction point value in steps of 10.

Use the cursor keys to move the cursor to the **frequency** domain.

Open: Make the open/short/load correction test data valid at the current set frequency.

OFF: Invalidate the open/short/load correction test data at the current set frequency.

Open Circuit Single Frequency Clear: Press this softkey to perform an open-circuit correction test on the frequency.

Short Circuit Single Frequency Clear: Press this softkey to perform a short circuit correction test on the frequency.

Load Correction: Press this softkey to perform a load correction test on the frequency.

Use the numeric keys to enter the calibration frequency. When any of the numeric keys is pressed, the available frequency unit softkeys (**Hz**, **kHz**, and **MHz**) are displayed in the softkey area of the screen. You can therefore use these softkeys instead of the [ENTER] key to enter the calibration frequency. When the [ENTER] key is used to enter the calibration frequency, the data is defaulted to Hz. You can also enter the frequency in the OFF state and update the frequency at that point, and you can only refresh the updated frequency value after the ON state.

4.2.7 Clear Correction Data

Press the softkey to enter the Clear Correction Data selection.

After entering the Clear Correction Data selection, the softkey menu displays **Yes** and **No** choices. Selecting **Yes** begins the process of clearing all user calibration data for 201 points. There is a prompt in the message field.

4.3 <Limit Table Settings> Screen

Press the Menu key [SETUP], then press the softkey Limit Setting to enter the **<Limit Table Setting>** page.

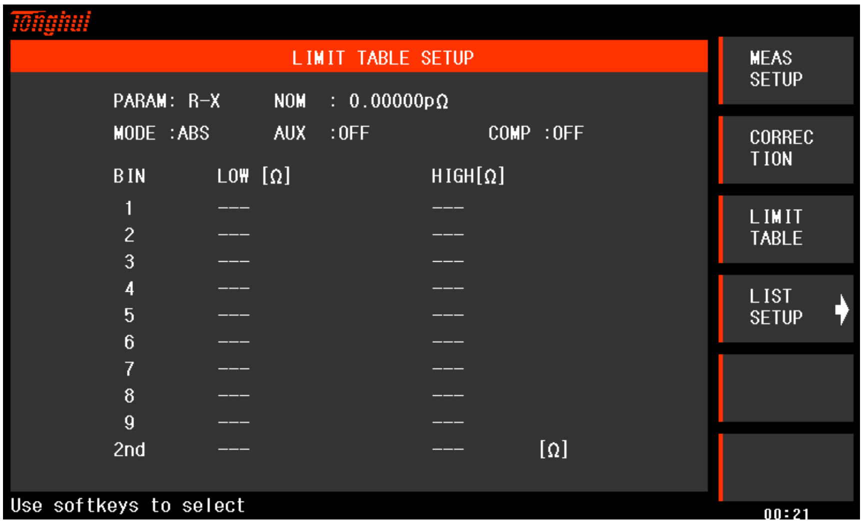


Figure 4-5 <Limit Table Settings> Screen

This page allows you to set up the instrument's comparator function. The TH2836 can set up to 9 step limits for the main parameter as well as one step limit value for the subparameter. The measured result can be sorted into up to 10 steps (BIN1 to BIN9 and BIN OUT). If the primary parameter of the part under test is within the limits of BIN1 to BIN9, but the secondary parameter is not within the limits, the part under test is sorted into the subsidiary files. The comparison function is particularly useful when the TH2836 is fitted with a HANDLER interface and used in automatic test sorting systems. The following limit parameters for the comparison function can only be set in the **<Limit Table Setting>** screen.

Test parameters (**PARAM**)

Comparison of functional limit modes (**MODE**)

Nominal value (**NOM**)

Auxiliary bin ON/OFF (**AUX**)

Comparison function ON/OFF (**COM**)

Lower limit value of each Bin (**LOW**)

Upper limit value of each Bin (**HIGH**)

4.3.1 Adjust Parameters

The parameter swap function swaps the primary and secondary parameters in the **parameter** setting field. For example, when the test parameter is: Cp-D, the parameter swap function will change the test parameter to: D-Cp. In this case, D can be set to 9 pairs of comparison limits, while Cp can be set to 1 pair of comparison limits.

Move the cursor to the **parameter** setting field and press the softkey **Adjust Parameter** to swap the main parameter with the subparameter. You can also press the softkey **Adjust Parameter** to swap the main parameter with the subparameter and return to the original setting.

4.3.2 Comparison Function Limit Mode

The Compare function provides the following two modes for setting the main parameter limits. As shown in Figure 4-6.

Tolerance method

In the tolerance method, the deviation value from the nominal value (the nominal value is set in the **nominal** field) is set as the comparison limit value. There are two ways of deviation values: one is percentage deviation, and the other is absolute value deviation.

Continuous mode

In the continuous mode, the test value range is used as the comparison limit value. Comparison limit values must be set in order from smallest to largest.

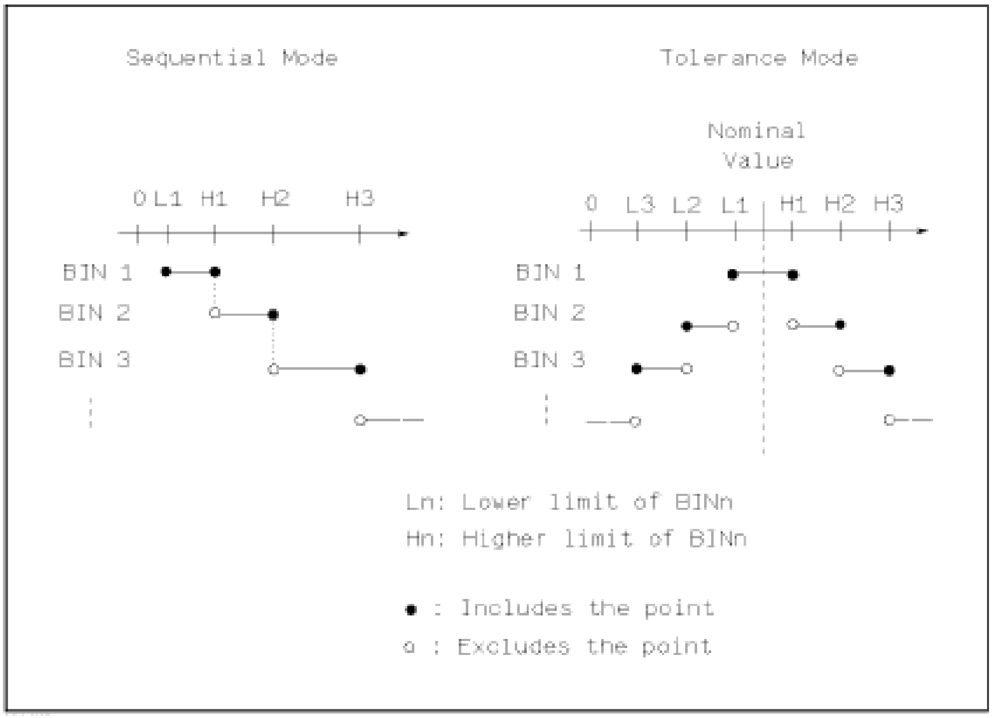


Figure 4-6 Tolerance and Continuous Methods

Note: When setting the limit values for the tolerance method, the error ranges must be set from smallest to largest. If BIN1 is set with the largest error range, then all measured parts will be sorted into the BIN1 slot. In the tolerance mode, the lower limit does not have to be smaller than the nominal value and the upper limit does not have to be larger than the nominal value. There can be discontinuity between the limit ranges of each Bin, or there can be overlapping ranges.

Move the cursor to the **mode** setting field and select the corresponding softkey to set the limit mode: **% TOL** (tolerance mode for percentage deviation), **ABS TOL** (tolerance mode for absolute deviation) or **SEQ MODE** (continuous mode).

4.3.3 Nominal Value Setting

When the tolerance mode is selected as the limit mode for the main parameter, the nominal value needs to be set. The nominal value can be set arbitrarily within the instrument display range.

When the continuous mode is selected as the limit mode for the main parameter, the nominal value can be set. However, it is not necessary to use the nominal value in the continuous mode.

Move the cursor to the **nominal** setting field. Use the numeric keys to enter the nominal value. When data is entered, the subscript softkeys (**p**, **n**, **μ**, **m**, **k**, **M**, ***1**) can be used instead of the [ENTER] key to enter the nominal value. When a nominal value is entered using the [ENTER] key, the nominal value unit defaults to the same unit as the last nominal value entered. When the softkey ***1** is pressed to enter the nominal value, the nominal value selects F, H or Ω as the default unit according to the main parameter.

4.3.4 Comparator Function ON/OFF

The TH2836 can be programmed with 9 Bin limits for the primary parameter and one Bin limit value for the secondary parameter. Test results can be sorted into up to 10 bins (BIN1 to BIN9 and BIN OUT). The comparison function is particularly useful when the TH2836 is fitted with a HANDLER interface and used in automatic test sorting systems.

Move the cursor to the **Compare** Settings field and the on-screen softkeys set the compare function to ON (on) or OFF (off)

4.3.5 Subsidiary Bin ON/OFF

When subparameters need to be binned, set the limit values of the subparameters in the **upper** and **lower** setting fields of 2nd. Move the cursor to the **subparameter** setting field, and the on-screen softkey area sets **the subparameter** function to ON (on) or OFF (off).

For subparameter binning, there are three cases described below:

The upper and lower limit values of the subparameters are not set on the **<Limit List Settings>** screen.

The upper and lower limit values of the subparameter have been set in the **<Limit List Setting>** screen. However, the **Subsidiary Bin** function is set to OFF, so that only devices whose subparameters are qualified can have their main parameters sorted according to the sorting limits. If the subparameters do not pass, even if their main parameters are within the set limits, all of them are sorted into the BIN OUT file.

The upper and lower limit values of the secondary parameters have been set in the **<Limit List Setting>** screen. At the same time, the **Subsidiary Bin** function is set to ON; if the main parameter is not within the set limit range, it is sorted into the BIN OUT Bin. If the main parameter of the DUT is within the limit range, but its secondary parameter is not, the DUT will be sorted into the subsidiary file.

Note: When only the lower limit value is set for the subparameter, and the subsidiary bin is set to ON, if the DUT's main parameter is within the limit setting range and the subparameter value is less than or equal to the subparameter's lower limit value, the DUT is sorted into the slave. Similarly, when only the upper limit is set for the subparameter, the subsidiary bin is set to ON, and if the DUT's main parameter is within the limit setting range and the subparameter value is greater than or equal to the subparameter's upper limit value, the DUT is sorted into the slave slot.

4.3.6 Upper and Lower Limits

The TH2836 can be programmed with 9 Bin limits for the primary parameter and one Bin limit value for the secondary parameter. Test results can be sorted into up to 10 bins (BIN1 to BIN9 and BIN OUT). These upper and lower limits for the main parameters can be set in the **upper** and **lower** setting fields for BIN1 to BIN9. The upper and lower limits of the secondary parameters can be set in the **upper** and **lower** setting fields of 2nd.

Upper and lower limit setting procedure:

First set the test **parameters** for the comparison function, the **nominal** value, and the limit **mode** of the main parameter.

Move the cursor to the **lower limit** setting field of file 1. If you select the tolerance method perform steps 3 through 5; if you select the continuous method perform steps 6 through 9.

Use the numeric keys to enter the **lower limit** value of Bin 1 in the **lower limit** setting field of Bin 1. When the data is entered, the subscript softkeys (**p**, **n**, **μ**, **m**, **k**, **M**, ***1**) can be used to enter the limit value instead of the **[ENTER]** key. When limit values are entered using the **[ENTER]** key, the limit value units' default to the same units as the last limit entry. When the softkey ***1 is** pressed, the limit value has F, H or Ω as the default unit. After entering the limit value of Bin 1 in the **lower limit** field of Bin 1, the lower limit of Bin 1 is automatically set to **-** (absolute value limit) and the upper limit of Bin 1 is automatically set to + (absolute value limit).

The cursor automatically jumps to the **lower limit** setting field for Bin 2. Repeat step 3 until the limit value for Bin 9 is entered. The cursor will then automatically jump to the **lower limit** setting field for 2nd.

After entering the lower limit value of the subparameter, the cursor will automatically jump to the **upper limit** setting field of 2nd. Enter the upper limit value of the subparameter.

Use the numeric keys to enter the **lower limit** value of Bin 1 in the **lower limit** setting field of Bin 1. When the data is entered, the subscript softkeys (**p**, **n**, **μ**, **m**, **k**, **M**, ***1**) can be used to enter the limit value instead of the **[ENTER]** key. When limit values are entered using the **[ENTER]** key, the limit value units' default to the same units as the last limit entry. When the softkey ***1 is** pressed, the limit value has F, H, or Ω as the default unit.

After entering the lower limit value of Bin 1, the cursor automatically jumps to the **upper limit** setting field of Bin 1. Enter the upper limit value of Bin 1.

The cursor will automatically jump to the **upper limit** setting field of Bin 2. This is because the lower limit of Bin 2 is equal to the upper limit of Bin 1 in the continuous mode. Enter the upper limit of Bin 2.

Repeat step 8 until the upper limit of Bin 9 is entered. The cursor will then automatically jump to the **lower limit** setting field for 2nd. Enter the lower limit value of the subparameter. The cursor will automatically jump to the **upper limit** setting field of 2nd. Enter the upper limit value of the subparameter.

When the cursor is at the **upper limit**, **upper limit** position and in non-data entry status, the software provides Clear Row and Clear Table functions. Clear Row is to clear the upper and lower limit data of the row where the cursor is currently located, while Clear Table function is to clear all data in the whole limit setting list, including 1~9 files and 2nd data.

4.4 <List Sweep Settings> Screen

Press the menu key **[SETUP]**, and then press the softkey **List Setting→** to enter the list scanning lower menu, corresponding to the three pages of List Parameter Setting, List User Correction and List Display Setting. List Scan provides up to 10 scanning points, supporting single channel and multi-channel, each scanning point can be set to the full parameters and channel points, unlike traditional instruments that can only be set to different frequencies/levels/currents/bias currents/bias voltages/a parameter for scanning tests.

4.4.1 List Parameter Setting

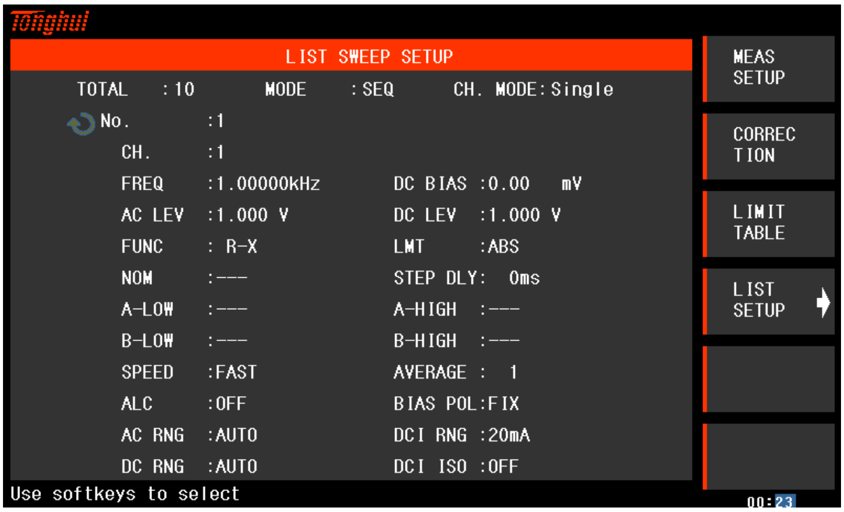


Figure 4-7 <List Sweep Settings>

The following list sweep parameter parameters can be set on the **<List Parameter Settings>** screen.

Total number of scanning points (**Scanning Points**): selectable range 1 to 10 points, forced to start from the 1st scanning point. Points can be entered via the numeric keypad when the cursor is on the number of scanned points. Clear All Scanned Points Software function is to restore the data of all scanned points to the default settings.

Scanning mode (**Scanning Mode**): For scanning mode menu, please refer to **<List Scanning Display>** of the 3.4.1 Parameter Settings for the description of the contents of the Scan Mode.

Channel mode (**Channel Mode**): Support single and multiple channels (up to 8 channels).

Scan points (**Scan Points**): Used to select scan point increase, decrease, insert or clear operations.

Scanning channel (**Channel**): Used in multi-channel mode to test with different channels.

Test functions (**Functions**)

Test frequency (**frequency**)

AC test level (**AC level**)

AC test range (**AC range**)

Test speed (**Speed**)

DC bias (DC **Bias**)

Automatic level control (**Constant Level**)

Step delay time (**Step Delay**): the delay time used for each scanning step measurement is completed to the next scanning measurement, mainly used to connect the external bias source (such as TH1778) to add bias current, to adapt to the external bias source and the need to set the delay time. (**Note:** and the delay time of the measurement setting interface is totalized)

Average number of times (**Average**)

Automatic bias polarity (**BIAS Polarity**)

DC resistance range (**DC Range**)

DC resistance voltage (**DC Level**)

DC bias range (**DCI Range**)

Bias current isolation ON/OFF (**DCI Isolation**)

Nominal value (**Nominal**): Standard value used for sorting of measured parts.

Limit judgment mode (**Limit Mode**): Tolerance mode ABS TOL for absolute deviation and tolerance mode % TOL for percentage deviation.

Main Parameter Upper Limit (A **Upper Limit**): Set the upper limit of the Main parameter.

Main Parameter Upper Limit (A **Lower Limit**): Set the lower limit of the Main parameter.

Sub-parameter upper limit (B **Upper Limit**): Set the upper limit of the sub-parameter.

Sub-parameter upper limit (B **Lower Limit**): Set the lower limit of the sub-parameter.

Frequency, DC Bias, AC Level, DC Level, Function, Speed, Average, AC Range, DC Range, DCI Range, DCI Isolation are the same as in the 4.1 Measurement Setting Page

4.4.2 List User Correction

Used for user calibration during list scanning. Open circuit, short circuit and load corrections can be made for each sweep point. The method is the same as 4.2 <User Correction> page.

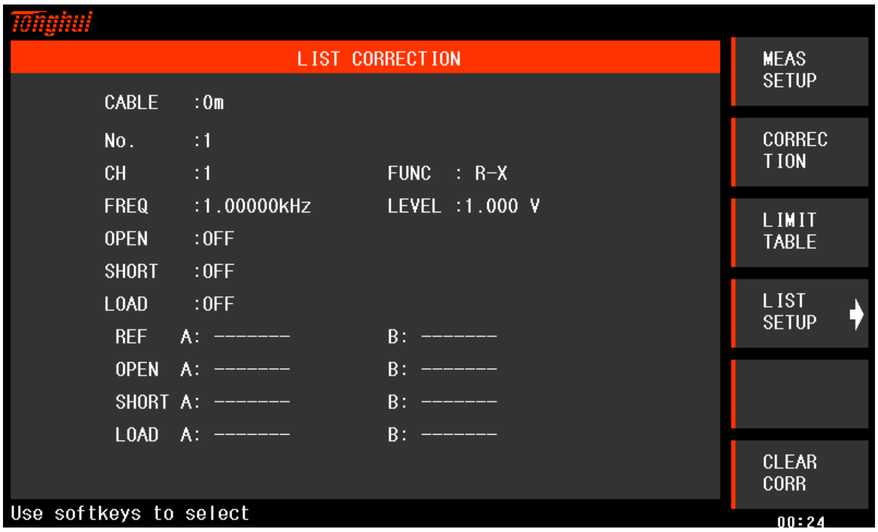


Figure 4-8 <List Sweep Settings>

4.4.3 List Display Settings

In List Scan Setup, the setup options for each scanning point can be displayed on the List Scan page, and you can set the order in which the parameters are displayed, as well as turn the display parameters on or off.

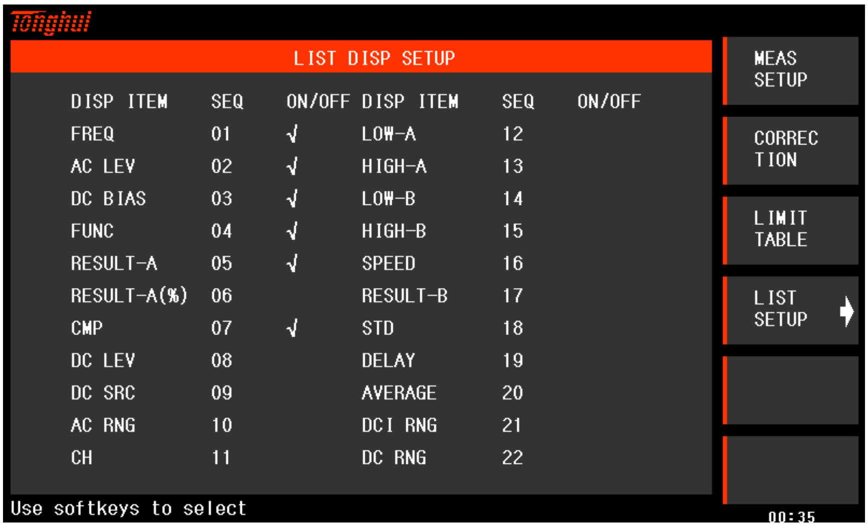


Figure 4-9 <List Display Settings>

Chapter 5 [SYASTEM] Function Module Description and File Management

5.1 <System Settings> Page

Press the Menu Key [SYSTEM] to enter the **<System Setup>** page.

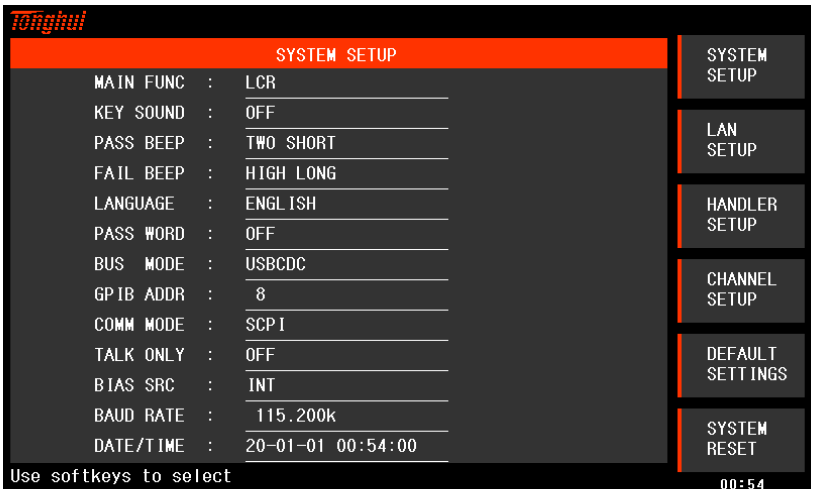


Figure 5-1 <System Settings>

The **<System Setup>** page displays most of the system setup menus, including Meter Functions, Key Signal, Qualified Signal, Bad Signal, Display Language, Password, Bus Mode, GPIB Address, Speak Only, Bias Source, Baud Rate, Date/Time, and so on. The parameters in the system setup page are automatically saved after setting, and the next power on will be the last data set before the last power off.

5.1.1 Meter Functions

This area is used to control and display the current instrument function (bridge only).

5.1.2 Key Signal

This area is used to control the sound on/off for the keys. Move the cursor to the **key signal** area. On-Screen Softkeys Area press the softkey **ON** to turn on the key signal. Press the softkey **Close** to turn off the key signal.

5.1.3 Qualified Signal

This area is used to control and display the alarm audible mode when the instrument's measurement comparison results in a passing grade.

Move the cursor to the **Qualified Signal** field. The following softkeys are displayed in the softkey area of the screen.

High and Long: This softkey is used to select a high and long alarm sound.

HIGH SHORT: This softkey is used to select a high and short alarm sound.

LOW LONG: This softkey is used to select a low and long alarm sound.

Two Short: This softkey is used to select a sound of two low and short alarms.

OFF: This softkey is used to select not to sound the alarm.

5.1.4 Bad Signal

This area is used to control and display the alarm signal mode when the instrument's measurement comparison results in a defective product. The setting refers to the pass alarm.

5.1.5 Display Language

This area is used to control and display the current instrument operating language mode. Move the cursor to the **Display Language** field: **English** this softkey is used to select the English operating language, or **Chinese** this softkey is used to select the Chinese operating language.

5.1.6 Password

This area shows the current password protection mode.

Password setting procedure:

Move the cursor to the password field. The following softkeys are displayed in the softkey area of the screen.

Off: This softkey is used to turn off password protection.

Lock SysteM: This softkey is used to turn on password protection, including file protection and power-on passwords, and unlock protection for KEYLOCK status.

Lock File: This softkey is used for user's file protection.

Modify Password: This softkey is used to modify the password. The operation is as follows, press the key **Modify Password** to screen prompts to enter a new password, entered by the keyboard, the screen prompts to confirm the new password, repeat the new password, so that the password modification is complete.

Lock SETUP: This softkey is used to measure the protection of the Setup page.

Note: The factory default password is 2836

5.1.7 Bus Method

The bus method is used to select whether the instrument uses RS232C, GPIB, LAN, USBTMC, or USBBCDC.

Note: Our GPIB option must be installed to support GPIB mode.

5.1.8 GPIB Address

This area is used to control and display the current GPIB interface bus address of the instrument.

Bus address setting procedure:

Move the cursor to the GPIB address field. The following softkeys are displayed in the softkey area of the screen.

Add +: This softkey is used to increase the bus address of the unit.

Minus -: This softkey is used to decrease the bus address of the unit.

5.1.9 Talk Only (Talk Only)

The talk-only function is used to control the instrument to send measurement results to the bus for each measurement via its RS232C, GPIB, LAN, USBTMC or USBBCDC interface. When the talk-only function is ON the instrument will not accept control from the PC.

Move the cursor to the **Talk Only** field. On-Screen Soft Key Area press the soft key **ON** to turn on the talk-only feature. Press the softkey **Off** to turn off the talk-only feature.

5.1.10 Bias Source

The bias source function is used to select the DC bias source used by the instrument.:

INT mode

DC bias voltage source (-40V ~ +40V) and DC bias current source (-100mA ~ 100mA) are standard in the instrument.

TH1778

Can be connected to TH1778 bias source, supports up to six TH1778 connected to a maximum of 120A bias current.

Note: Our TH1778 instrument must be connected to support this mode.

5.1.11 Baud Rate

Baud Rate is used to select the baud rate for the instrument's RS232 interface. The instrument can select from 9.600k to 115.200k.

Baud rate setting procedure:

Move the cursor to the **Baud Rate** field. The following softkeys are displayed in the softkey area of the screen.

Add +: This softkey is used to increase the baud rate of the unit.

Minus -: This softkey is used to decrease the baud rate of the unit.

5.1.12 Time

When moving to the time area, you can modify the system time.

5.2 <Network Settings> Page

Press the menu key **[SYSTEM]**, then press the softkey **Network Settings** to enter the **<Network Settings>** page.

You can set up the network port communication by plugging in the network cable at the rear panel. The <Network Setting> page allows you to set up the menu: DCHP, IP address, subnet mask, gateway and TCP/IP port number. The parameters in the network setting page are automatically saved after setting, and the next time you turn on the computer, it will be the last data set before the last power off.

DHCP: The accessed networking device (router or switch) supports the automatic IP assignment function. screen soft key area Press the soft key **to turn on** the function, press the soft key **to turn off** to turn off the function.

IP address, subnet mask, gateway, TCP/IP port number: move the cursor to its field and enter it by the keyboard to complete the setting.

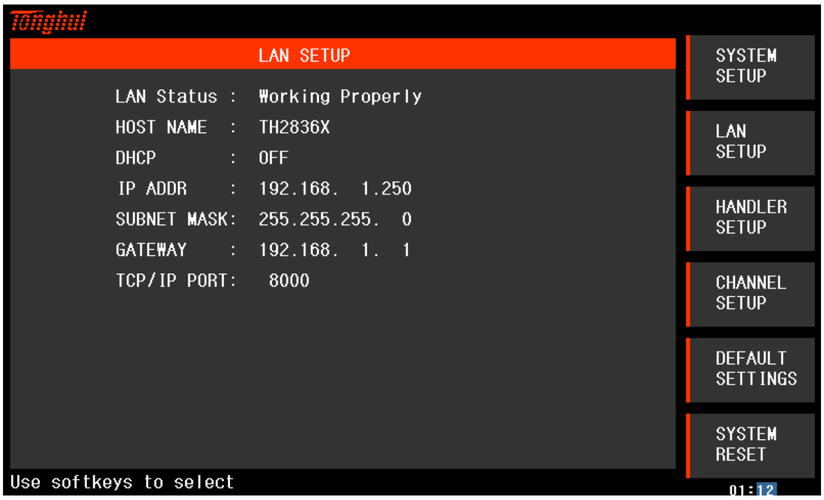


Figure 5-2 <Network Settings>

5.3 <HANDLER settings> Page

The TH2836 series testers provide users with a Handler interface, which is mainly used for the output of sorting results. When the instrument is used in an automatic component sorting test system, the interface provides the contact signal with the system and the sorting result output signal. The sort result output corresponds to the 10-position output of the comparator, and the Handler interface is designed to be flexible, so that all output signal states are defined according to the requirements of the application using different operating programs.

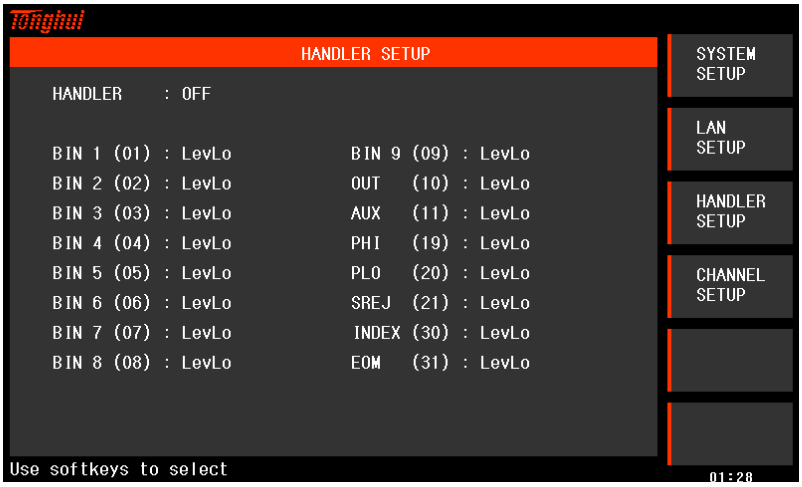


Figure 5-3 <HANDLER Settings>

Move the cursor HANDLER field and press the key [ON] to turn on the HANDLER function.

Move the cursor to the pin to be set so that Off Low, Off High, Level Low, Level High, Pulse High, Pulse Low are active.

5.3.1 Signal Line Definition

The HANDLER interface uses three types of signals: comparison output, control input and control output. The signal lines for the file comparison function and the list scan comparison function are defined as different comparison output signals and control input signals, respectively.

5.3.1.1 Bin Comparison Function

Compare the output signals:

/BIN1~/BIN9, /AUX, /OUT, /PHI (primary reference high), /PLO (primary reference low), /SREJ (secondary reference failure). See Figure 5-4

Control output signal:

/INDEX (analog measurement completion signal), /EOM (valid signal for end of measurement and comparison data), /ALARM (instrument power-down signal).

Control input signal:

/EXT.TRIG (external trigger signal, pulse width ≥ 1μs) and /Keylock (keyboard lock).

The signal assignments and brief descriptions of the above contacts are shown in Table 5-1 and Figure 5-5, and the timing diagrams are illustrated in Figure 5-6.

Pin Number	Signal Name	Description
1	/BIN1	Graded results
2	/BIN2	All /BIN (stall signal) outputs are open

3 4 5 6 7 8 9 10 11	/BIN3 /BIN4 /BIN5 /BIN6 /BIN7 /BIN8 /BIN9 /OUT /AUX	collector outputs.
12 13	/EXT.TRIG	External Trigger: When the trigger mode is set to EXT.TRIG (external trigger), the TH2836 is triggered by a rising edge pulse signal added to this pin.
14 15	EXT.DCV2	External DC voltage 2: DC power supply pin for signals (/EXT_TRIG, /KeyLock; /ALARM, /INDEX, /EOM) that are optically coupled to the instrument.
16 17 18	+5V	The instrument's internal power supply +5V: Generally, it is not recommended to use the internal power supply of the instrument, if you must use it, please make sure the current used is less than 0.3A and keep the signal line away from interference sources.
19	/PHI	The main parameter is high: The measurements are larger than the upper limit values in BIN1 through BIN9. (See Figure 5-3.)
20	/PLO	The main parameter is low: The measurements are smaller than the lower limit values in BIN1 through BIN9. (See Figure 5-3.)
21	/SREJ	Sub-parameters failed: Measurements are not within the upper and lower limits of the subparameter. (See figure 5-3.)
22 23 24	NC NC NC	No connection.
25	/KEY LOCK	When this line is active, all front panel function keys of the TH2836 are locked out of action.

27 28	EXT.DCV1	External DC voltage 1: Pull-up DC power supply pin for signals (/BIN-/BIN9, /AUX, /OUT, /PHI, /PLO, /SREJ) that are optically coupled to the instrument.
29	/ALARM	When a power-down occurs, /ALARM is active.
30	/INDEX	The /INDEX signal is valid when the analog measurement is complete and the TH2836 can be connected to the next device under test (DUT) at the UNKNOWN test terminal. However, the comparison result signal is not valid until /EOM is valid. (See Figure 5-5.)
31	/EOM	End Of Measurement: This signal is valid when the measured data and comparison results are valid. (See Figure 5-5.)
32,33	COM2	Reference ground used for external power supply EXTV2
34,35,36	COM1	Reference ground used for external power supply EXTV1

Table 5-1 Signal Assignment Table of Contacts for Phase Comparison Function

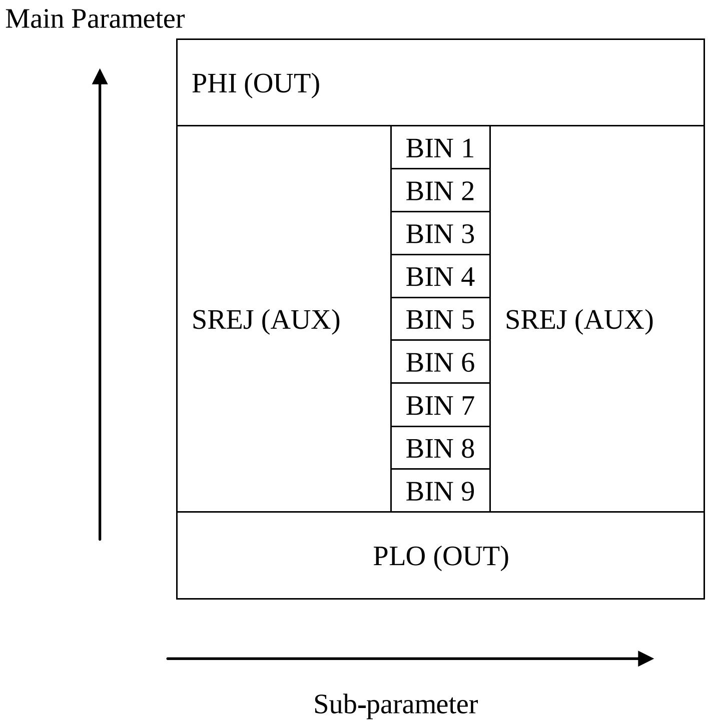


Figure 5-4 Example of Assigned Areas for Bin Comparison Function /PHI, /PLO, /SREJ Signals

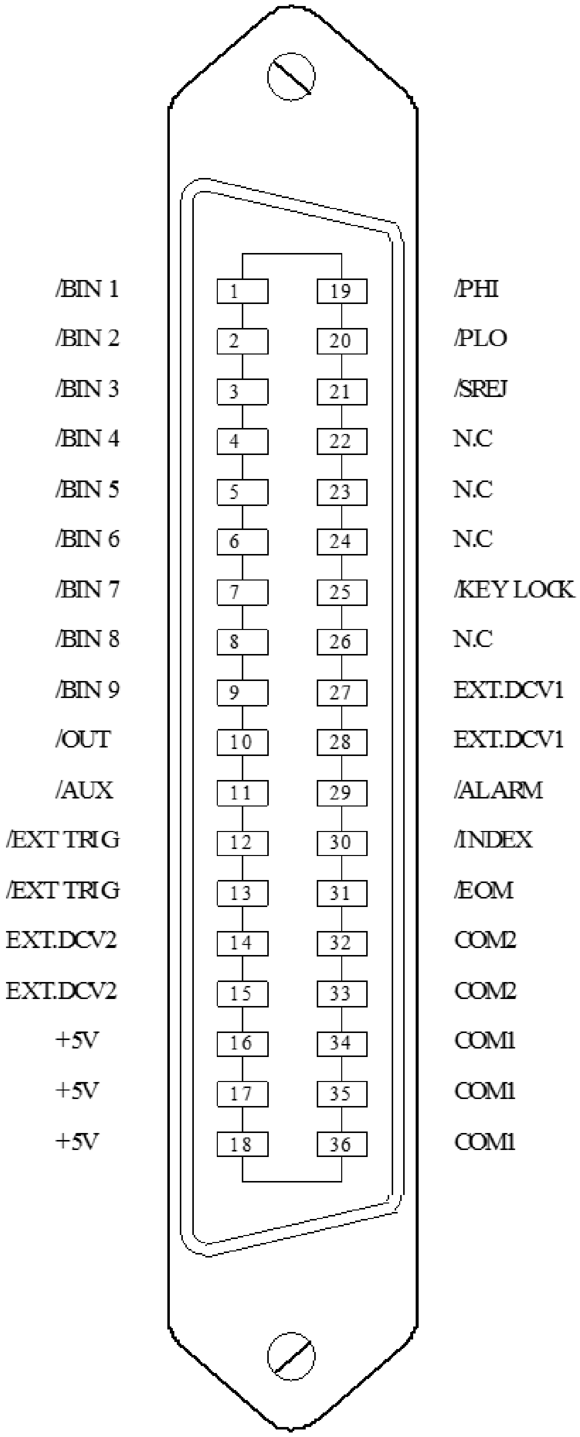


Figure 5-5 HANDLER Connection Interface Pin Definitions

Note: In the figure, /BIN1~/BIN9, /OUT, /AUX, /PHI, /PLO and /SREJ correspond to the signal condition in the list scanning comparison function and Bin ratio.

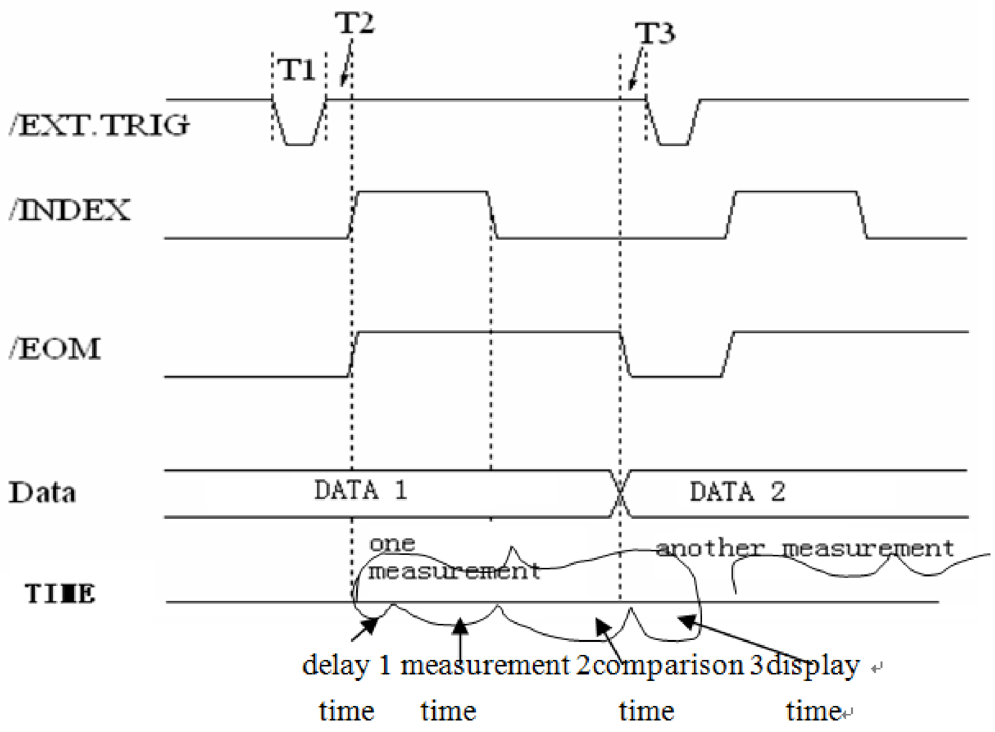


Figure 5-6 Timing Diagram

Time	Minimum Value	Maximum Value
T1 Trigger pulse width	1us	
T2 Measurement start delay time	200us	Display time[3] + 200us
T3 /Trigger wait time after EOM output	0us	

Table 5-2 Timing

Refer to the TH2836 operating instructions for measurement times.

Typical comparison times are about 1ms.

Typical display times for each display page are listed below:

Component measurement display page (MEAS DISPLAY): Approx. 8ms.

BIN NO. DISPLAY: Approx. 5ms.

BIN COUNT DISPLAY: Approx. 0.5ms

5.3.1.2 List Scanning Comparison Function

The list scan compare function signal definition is different from the definition in the file compare function. The definitions are shown below:

Compare the output signals:

The /BIN1 - /BIN9 and /OUT signals are indicated as IN/OUT (Pass or Fail) discriminations for each scan point. See Figure 4. /AUX signals indicate a PASS/FAIL discrimination, (one or more failures in the list during a scan). These signals are output when a scan measurement is completed.

Control Output Signal

/INDEX (analog measurement completion signal) and /EOM (end of measurement signal).

When /INDEX and /EOM are in effect, the timing is as follows: (different from the file comparison function)

Continuous scan mode (SEQ sweep mode):

The /INDEX signal is declared valid when the analog measurement of the last scan point step is completed. The /EOM signal is declared valid when all comparison results are valid after the entire list scan measurement is completed.

Single step sweep mode (STEP sweep mode):

The /INDEX signal is declared valid after the completion of the analog measurement at each scan point. The /EOM signal is declared valid after each measurement step and the comparison is completed.

The signal contact assignment and brief description of the list scan function can be found in Table 5-3 and Figure 5-5 (the pin definition of the list scan comparison function is the same as the definition of the file comparison function), and the timing diagram is shown in Figure 5-8.

Pin Number	Signal Name	Description
1 2 3 4 5 6 7 8 9 10	/BIN1 /BIN2 /BIN3 /BIN4 /BIN5 /BIN6 /BIN7 /BIN8 /BIN9 /OUT	Scanning point 1 is out of limits. Scanning point 2 exceeds the limits. Scanning point 3 exceeds the limits. Scanning point 4 is out of limits. Scanning point 5 exceeds the limits. Scanning point 6 is out of limits. Scanning point 7 is out of limits. Scanning point 8 is out of limits. Scanning point 9 exceeds the limits. Scanning point 10 is out of limits.
11	/AUX	When one or more failures are in the list / AUX is declared valid.
30	/INDEX	Continuous Scanning Mode (SEQ): The /INDEX signal is declared valid when the analog measurement of the last scan point is completed, at which time the UNKNOWN test end of the TH2836 can be connected to the next device under test (DUT). However, the comparison result signal is not valid until /EOM is valid. (See Figure 5.) Single-step scanning mode (STEP): The /INDEX signal is declared valid after the completion of the analog measurement for each scan point. However, the comparison result signal is not valid until /EOM is valid. (see Figure 5)

31	/EOM	End of measurement: Continuous Scanning Mode (SEQ): The /EOM signal is declared valid when the entire list scan measurement has been completed and all comparison results are valid. (See figure 5.) Single-step scanning mode (STEP): The /EOM signal is declared valid after declared valid after each scan point measurement is completed and all comparison results are valid. The comparison result signal is not valid until the /EOM is valid for the last scan point step (see Figure 5).
Else		Definitions are the same as for the compare function. Can be found in Table 2

Table 5-3 List Scan Comparison Function Contact Assignment Table

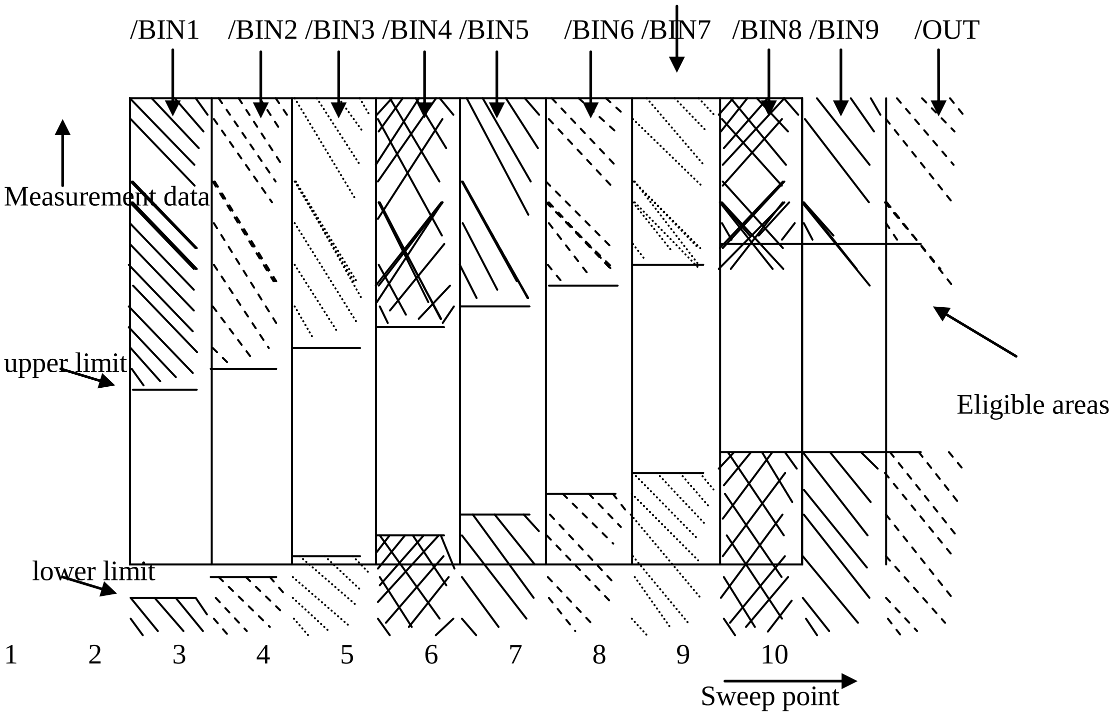


Figure 5-7 Example of Signal Area for List Scan Compare Function

Sequential Sweep Mode **(SEQ SWEEP MODE):**

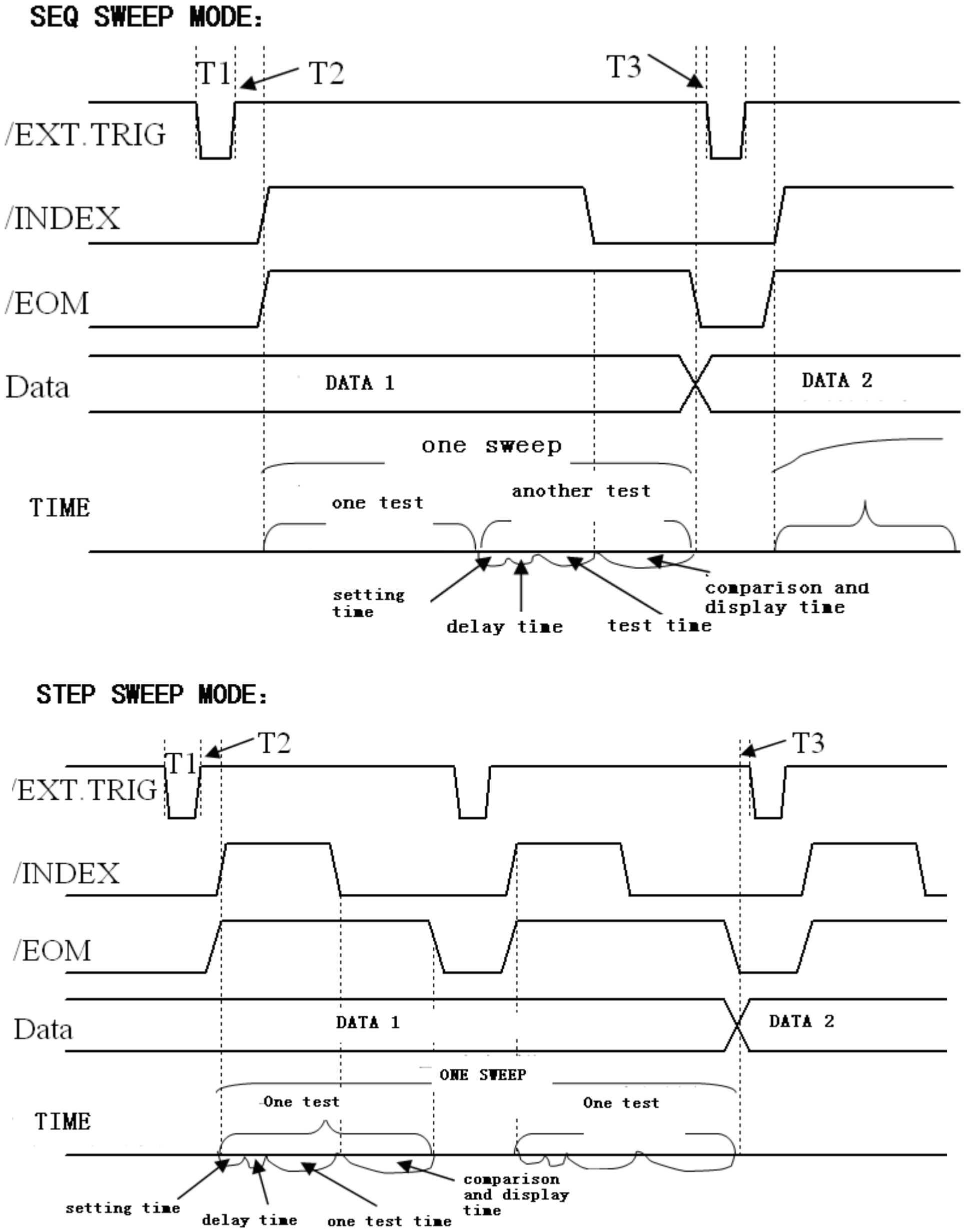


Figure 5-8 Timing Illustration

Notes:

The setup time includes the calibration data switching time.

Comparison and display time is about 4.5ms.

T1, T2, T3 See Figure 5-6.

5.3.2 Electrical Characteristics

As mentioned earlier, some of the signals in the compare function and the list scan compare function have different meanings. However, the electrical characteristics of these signals are the same in both operations, and thus the following description is equally appropriate for the file comparison function and the list scanning function.

DC Isolated Outputs Each DC output (pins 1 through 16) is isolated by an open collector optocoupler output. Each line output voltage is set by a pull-up resistor on the HANDLER interface board. The pull-up resistor is connected to the internal supply voltage (+5V) or to the external supply voltage (EXTV: +5V) via a jumper.

The electrical characteristics of the DC isolated outputs are categorized into two types, see Table 4.

Output Signal	Output Rated Voltage		Maximum Current	Circuit Reference Ground
	LOW	HIGH		
Comparison signal /BIN1 - /BIN9 /AUX /OUT /PHI /PLO	≤0.5V	+5V--+24V	6mA	Internal pull-up voltage: TH2839 ground External Voltage (EXTV1): COM1
Control signal /INDEX /EOM /ALARM	≤0.5V	+5V--+24V	5mA	Internal pull-up voltage: TH2839 ground External voltage (EXTV2): COM2

Table 5-4 Electrical Characteristics of DC Isolated Outputs

5.3.3 HANDLER Interface Board Circuits

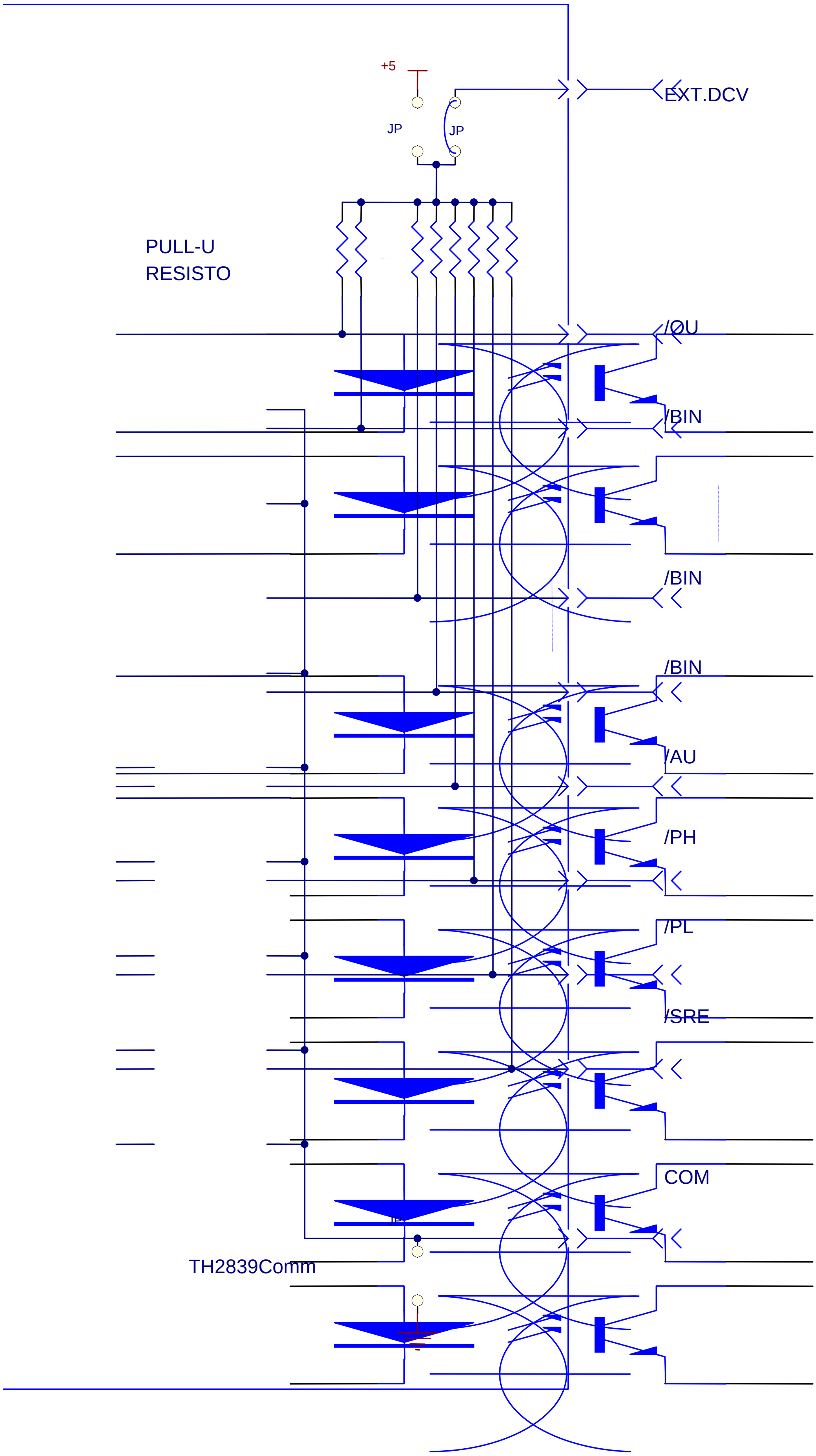


Figure 5-9 Comparison Result Signal Output Circuit

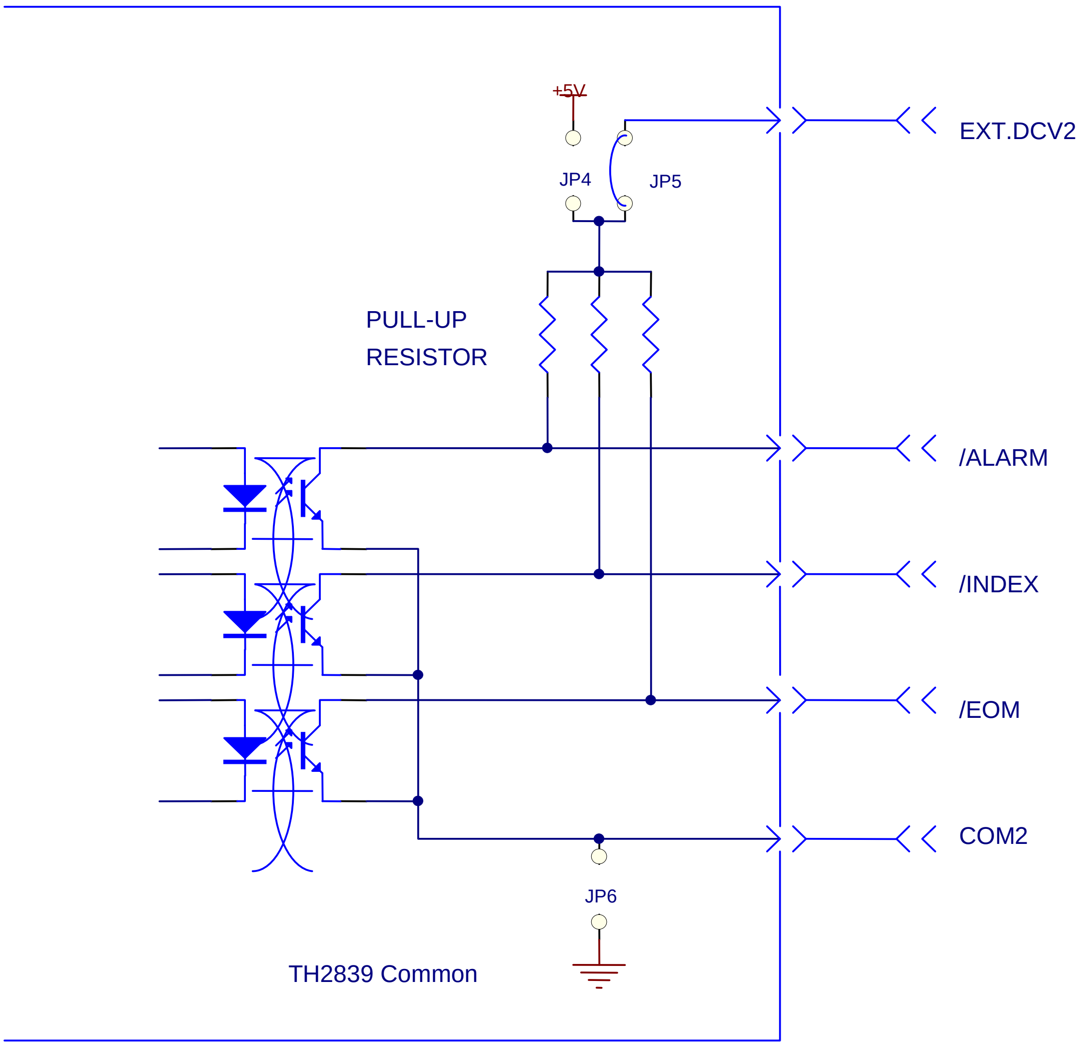


Figure 5-10 Control Signal Output Circuit

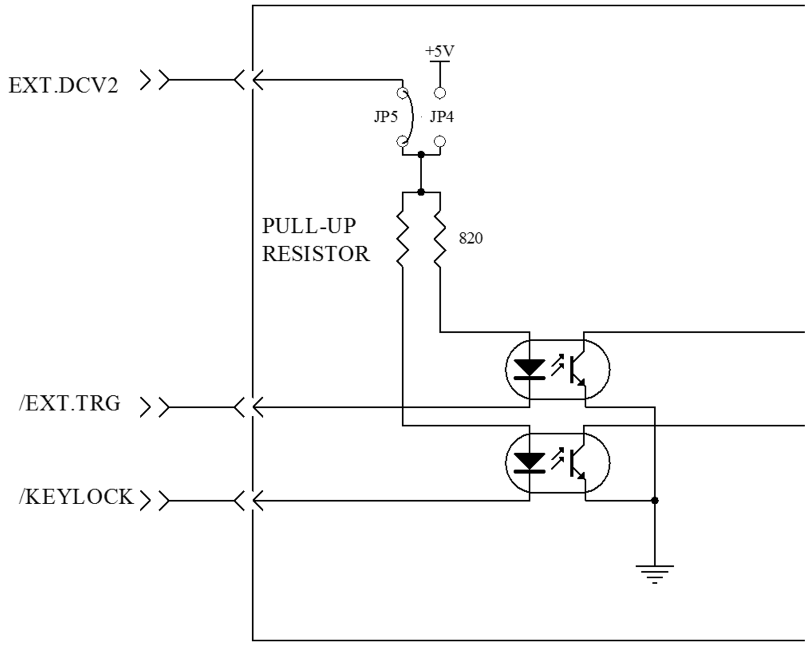


Figure 5-11 Control Signal Input Circuit

5.3.4 Comparison Function Operation

After installing the HANDLER interface board, use the HANDLER interface to set the limit list to use the compare function or set the list scan list to use the list scan compare function. Then set the HANDLER interface to enable OUTPUT/INPUT signals. The following procedure shows how to use the HANDLER interface's compare function or list scan compare function.

Comparison Function Setting Procedure

Press [**SETUP**] and then press the softkey Limit Setting to enter the **<Limit List Setting>** page.

The <Limit list setting> menu sets the nominal value of the Bin count and the Bin limit, and the details can be found in the corresponding section. 4.3 <Limit list setting> screen.

Move the cursor to comparison place, then press the softkey [ON], then the comparison function is turned on.

Press [**DISP**] to enter the **<Component Measurement Display>** page, and then select the bin number display or bin counting softkey to enter the corresponding page to measure the DUT; in this step, users can refer to the [**DISPLAY**] menu key description to set the counting, subsidiary, and other functions of the DUT.

Note: Comparison function ON/OFF (On/Off) setting can also be set in the **<Bin Count Display>** screen.

Steps to set up the list scanning comparison function

Press the key [SETUP] and then press the softkey List Setup to enter the **<List Scan Setup>** page.

Set the scanning mode, scanning frequency point, reference amount and upper and lower limits in the **<List Scan Settings>** menu, see the [DISP] menu key description for details.

Press the [DISP] key and then press the List Display soft key to enter the **<List Scan Display>** page, the description of this page can be referred to 3.4 <List Scan Display> page menu key description.

Note: Use the HANDLER interface to increase the measurement speed method.

The range is locked to the range of the largest capacitance you can possibly measure. For example, if you measure up to 10uF, first, put 10uF for the instrument to automatically select the range to measure, and then lock this range.

On the **<Measurement Settings>** screen, make Monitor V: OFF and Monitor I: OFF.

Put it on the **<Bin Count Display>** page to test it.

5.4 <Channel Settings> Screen

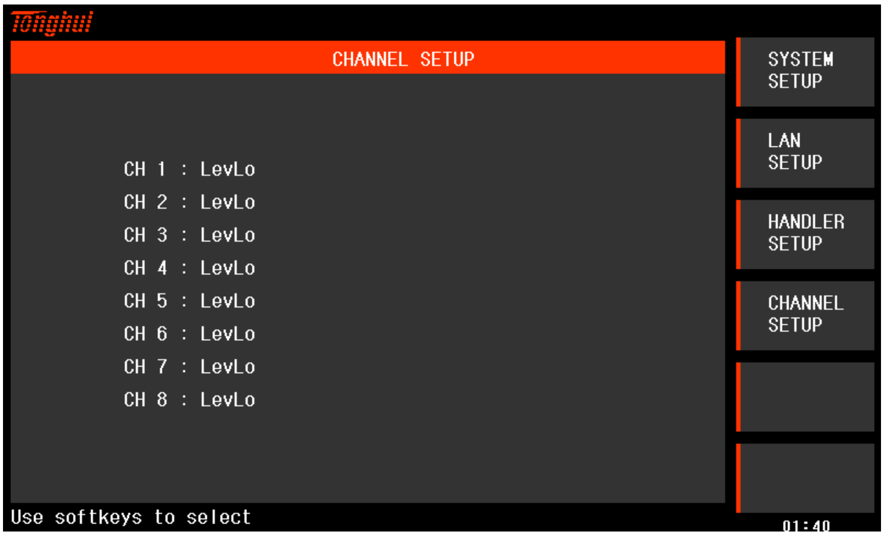


Figure 5-12 <Channel Settings> Page

Move the cursor value each channel and set it to be active low or high level.

5.5 <File Management>

TH2836 series instruments can store the parameters set by the user in the form of a file in the internal non-volatile memory of the instrument. When the same settings are to be used the next time, the user does not need to reset these parameters, but only needs to load the corresponding file, and the parameters set last time can be obtained, which improves the production efficiency.

Press the softkey File Management to access the **<File Management>** function page. As shown in the figure:

Figure 5-13 <LCR File List> Page

5.5.1 Single Component Setup File (*.STA)

The instrument can save up to 40 different single-group component setting files (*.STA files) internally, and the external storage USB flash disk can display/operate 500 different single-group component setting files (Note: the USB flash disk is optional).

In the File Management menu on the following screen, the following data will be saved or loaded as a file called *.STA file.

Control setting parameters on the <Measurement settings> screen

Test function

Test frequency

AC level

AC range

Test speed

Voltage bias

DC bias

Trigger method

Constant level

Trigger delay time

Step delay time

Average number of times

BIAS polarity

DC range

DC level

DCI isolation

VDC monitoring

IDC monitoring

Bias current isolation ON/OFF

Deviation test A mode

Deviation test B mode

Deviation test A reference value

Deviation test B reference value

Control setting parameters on the <Bin Count Display> screen

Bin Count (Count/No Count)

Control setting parameters on the <Limit List Setting> screen

Test function (Alignment parameters)

Nominal value (reference value)

Comparison method (%-TOL/ABS-TOL/SEQ-MODE)

Subsidiary bin (ON/OFF)

Comparison function (ON/OFF)

Upper and lower limit values for each bin

Control setting parameters on the <List Scan Settings> screen

List scanning method (SEQ/STEP)

List scanning parameters (frequency/level/bias, etc.)

Test points for all scanning parameters

Upper and lower limits of primary and secondary parameters for all test points, and sorting modes

Current display page format

5.5.2 USB Flash Drive Management Performance

As mentioned above, the TH2836 comes standard with a USB HOST interface, which allows you to use an external USB flash drive as a storage media, thus breaking through the storage limit of 40 sets of set files inside the instrument and allowing you to copy these files to IBM PCs with USB ports or compatible desktops and laptops, thus achieving unlimited expansion.

The TH2836 supports USB mass storage devices (USB flash drives) with the following performance:

USB 1.0/1.1 compliant

Capacity: 32MB/256MB/2GB/4GB

File format: FAT16, FAT32 (formatted with Microsoft Windows OS)

5.5.3 Document Management Operations

Finding an existing file

Turn the knob switch or [↑], [↓], you can turn to see one by one; with [←], [→] button, you can turn to see page by page.

Press the softkey File Name Lookup, enter the name character, and then press the key [ENTER] to look up the file name directly.

Press the softkey File Serial Number Search, enter the number, and then press the key [ENTER] to jump directly to the file with that serial number.

Follow the steps below to save the control setup parameters to a file.

Set all control setting parameters for the desired page.

Press key [FILE] to move the cursor to the file location to be saved in the file list. (Or directly enter the file serial number and press key [ENTER]).

Press the soft key Save.

Pressing the softkey No will cancel the current save operation and return to step 2; press the softkey Yes, the assistant line will display: "LCR File Name:"

Use the numeric keys to enter the current file name, press the [ENTER] key, and the TH2836 saves the current control setup parameters with that file name.

Follow the steps below to load the control setup parameters from a file.

Press the key [FILE] to move the cursor to the location of the file to be loaded in the file list. (Or directly enter the serial number of the file and press key [ENTER]).

Press the soft key **Load** and the screen will display the following soft keys. Pressing the softkey **No** will cancel the current load operation and return to step 1. Pressing the softkey **Yes** will load the currently selected file. The TH2836 also returns to the Component Measurement Display page.

Follow the steps below to copy a file to a USB flash drive.

Assuming that internal file serial number 2 is copied to an external storage flash drive

Press the key FILE, move the cursor to the location of the file to be copied in the file list, and press the [ENTER] key to select it. (Multiple files can be selected)

Press Copy to E: to copy the file to the instrument's external storage USB flash drive (**note:** make sure your USB flash drive meets the criteria described in this section and is not write-protected)

When copying a file, a progress bar indicates the current progress of copying. When the progress bar disappears, the file copying operation is completed.

Figure 5-14 Progress Chart

Chapter 6 Perform LCR Measurement Operations and Examples

6.1 " Clear Zero" Calibration Operation

To perform a zeroing operation (open/short circuit correction is required to prevent stray impedance from affecting measurement accuracy), the user can use either of the following two zer oing methods.

6.1.1 Full Frequency Clearing:

Press the menu key [SETUP] and then press the softkey User Calibration, the instrument will be displayed as the <User Calibration> page.

Move the cursor to the **open circuit** area. Keep the test fixture open, press the key open full frequency clear to execute the open circuit correction, and wait until the status message prompt area shows that the open circuit correction is complete.

Press the key ON to turn on the instrument's open-circuit calibration function.

Insert the shorting tab (TH26010) into the test fixture.

Move the cursor to the **short circuit** area. Press the key Short Circuit Full Frequency Clear to perform the short circuit correction and wait until the status message prompt area indicates that the short circuit correction is complete.

Press the key On to turn on the instrument's short-circuit calibration function.

Move the cursor to the **Load** area. Press the key Off to turn off the instrument's load calibration function.

Move the cursor to the **Frequency** area. Press the key Off to turn off the dot frequency clearing function of the frequency.

6.1.2 Point Frequency Zeroing

Assume that the user is now using a test frequency of 5.5kHz (which is better for individual frequency tests).

Press the menu key [SETUP] and then press the softkey User Calibration, the instrument will be displayed as the <User Calibration> page.

Move the cursor to the **open circuit** area. Press the key On to turn on the instrument's open-circuit correction function.

Move the cursor to the **short circuit** area. Press the key On to turn on the short-circuit correction function of the instrument.

Move the cursor to the **Load** area. Press the key Off to turn off the load calibration function of the instrument.

Move the cursor to the **correction point** area. The correction point can be selected.

Move the cursor to the **Frequency** area. Press the key ON to turn on the dot frequency clearing function of the frequency.

Press the keys [5] [...] [5], 5.5 will be displayed in the cursor area of the screen and the software area will show the available units (Hz, kHz, and MHz). Press the key kHz. Then the **frequency** area will be changed to 5.5000 kHz (same as the test frequency).

Keep the test fixture open, press the softkey Open Single Frequency Clear to execute the open circuit correction.

Insert the shorting tab (TH26010) into the fixture. Press the softkey Short Circuit Single Frequency Clear to perform the short circuit correction.

6.2 Correct Connection with Component Under Test

The instrument has four pairs of test terminals, HCUR (high current sampling Hc), LCUR (low current sampling Lc), HPOT (high voltage sampling Hp), LPOT (low voltage sampling Lp), and a shield corresponding to each test terminal.

The purpose of using the shielded end is to minimize the effect of stray capacitance to ground and reduce electromagnetic interference. Measurement of Hc, Hp and Lc, Lp should be connected on the component leads under test to form a complete four-terminal measurement, in order to minimize the impact of the leads and connection points on the test results (especially loss measurement). In particular, when testing low-impedance components, the voltage sampling end Hp, Lp should be connected to the component lead end, in order to prevent the lead resistance to join the measured impedance, and the principle of its connection is that the voltage detected by Hp, Lp should be the voltage that actually exists on the measured part.

In other words, it is better that Hc, Hp and Lp, Lc do not connect before connecting to the lead end of the component under test, otherwise it will increase the test error.

If the contact and lead resistance Rlead is much smaller than the measured impedance (e.g. Rlead < Zx/1000, with a required error impact of less than 0.1%), then Hc, Hp, and Lp, Lc can be connected together and then connected to both ends of the component to be measured (two-ended measurement).

When making some measurements that require high accuracy, it is much better to use a measurement jig than a test lead (the Kelvin jig that comes with the instrument). Kelvin test lead can have good measurement results when testing at 10kHz frequency, but beyond 10kHz frequency, Kelvin test lead is difficult to meet the test requirements. Because at high frequencies, the change of the gap between the wires directly changes the stray capacitance and inductance at the test end, and it is always difficult to fix the test leads.

Therefore, the test fixture should be used as much as possible for measurements at higher frequencies, and if it is not possible to use the test fixture due to conditions, the state of the test line when the instrument is zeroed should be as consistent as possible with that of the test.

Whether using the test fixture or Kelvin test cable provided with the instrument or the user's own fixture, the following requirements should be met:

Distributed impedance must be minimized, especially when measuring high impedance components.

Contact resistance must be minimized.

The contacts must short-circuit and open-circuit capable. Short-circuit and open-circuit clearances "0" can easily minimize the influence of the distributed impedance of the test fixture on the measurement. For open-circuit clear "0", the test ends should be separated by the same distance as when the DUT is connected. For short-circuit clear "0", a low-impedance shorting plate should be connected between the test ends, or so that Hc and Lc are directly connected, and Hp and Lp are directly connected, and then the two are connected together.

Note: When the component under test is a polarized device, before testing, please note that the "high potential terminal" should be connected to the terminal labeled as "+" or Hc, Hp on the front panel, and the "low potential terminal" should be connected to the terminal labeled as "-" or Lc, Lp on the front panel.

Warning: When measuring polarized components, please discharge them first to avoid damaging the instrument.

6.3 Elimination of Spurious Impedance

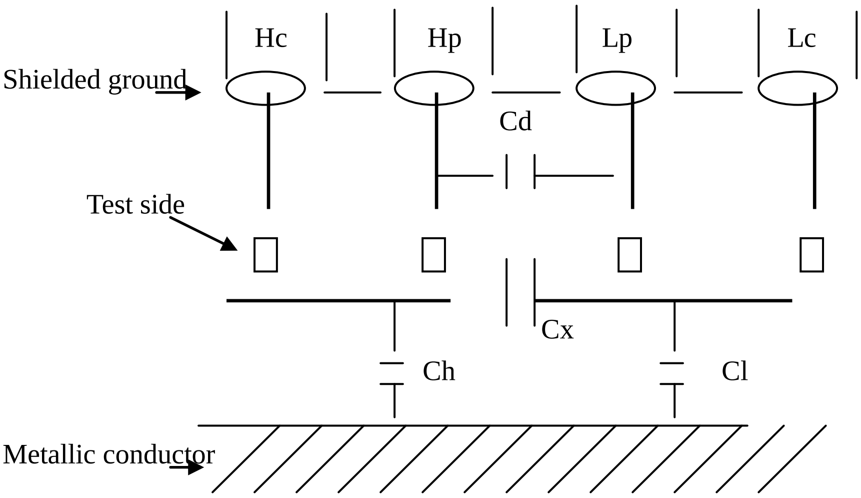


Figure 6-1 Schematic diagram of the effect of stray capacitance

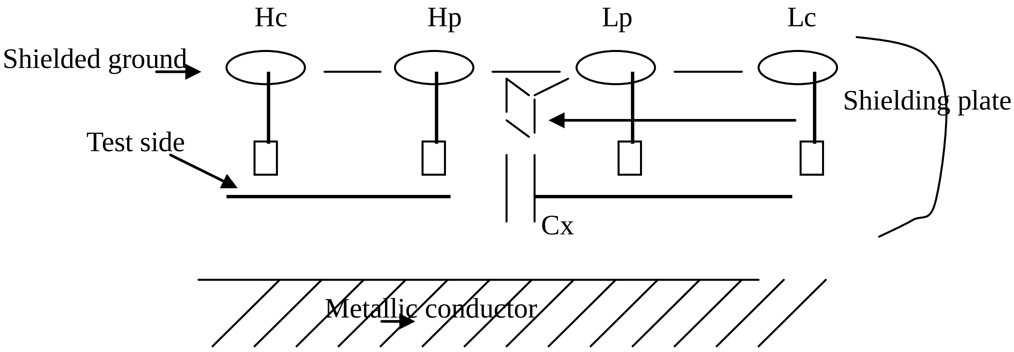


Figure 6-2 Schematic diagram of the method of eliminating the effect of stray capacitance

When the DUT is high impedance (e.g., small capacitance), the effect of stray capacitance cannot be ignored. Figure 5-1 shows an example of using a four-terminal measurement of the DUT, in which Cd is connected in parallel with Cx, and when there is a conductor plate located under the DUT, the capacitance Ch is connected in series with Cl and then in parallel with Cx, which will cause errors in the measurement results. By placing a grounded conductor between the high and low ends of the test, Cd can be minimized, and the effect of Ch and Cl will be eliminated if the ground terminal is connected to the conductor plate below.

When the measured part is low impedance (such as small inductance, large capacitance), due to the measurement line Hc, Lc on the larger current flow, in addition to the impact of the contact resistance of the test end, the **electromagnetic coupling between the measurement line has become the main source of measurement error**, not well eliminated coupling will have an unexpected impact on the test results. Generally speaking, contact resistance affects the resistance part of the test impedance, and electromagnetic coupling affects the reactance part of the test impedance. The test end can be connected using a **four-terminal pair**, so that the current flowing in Hc, Lc and its shielded ends flow in equal size and opposite direction, so that the magnetic field generated by each other to cancel each other, and better eliminate the effect of mutual inductive coupling on the test results.

6.4 Example of Test Inductor Operation

Example: The test conditions are as follows:

Function: Ls-Q

Frequency: 5.5kHz

Level: 1.5Vrms

Internal resistance: 100Ω

The steps are as follows:

To turn on the power, see 2.6 Powering on and off .

Basic parameter setting.

Press the menu key [DISP] to make the TH2836 display to the **<Component Measurement Display>** page.

Use the knob, move the cursor to the **function** area, which is currently displayed as Cp-D. At this time, Cp-...→, Cs-...→, Lp-...→, Ls-...→, Z-...→, and ↓ will be displayed on the right side of the screen in the softkey area.

Press key Ls-...→. Ls-D, Ls-Q, Ls-Rs, Ls-Rd, Ls-Z will be displayed.

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

Move the cursor to the **frequency** area. This area is currently displayed as 1.0000kHz.

Press the keys [5] [...] [5], 5.5 will be displayed in the cursor area of the screen and the softkey area will show the available units (Hz, kHz, and MHz). Press the key kHz. The **frequency** area will be changed to 5.5000 kHz.

Move the cursor to the level area. This area is currently displayed as 1.000V.

Press the keys [1] [...] [5]. 1.5 will be displayed in the cursor area of the screen and the softkey area will show the available units (mV, V, uA, mA and A). Press the key [ENTER]. Then the **level** area will change to 1.5V.

Press the menu key [SETUP] to go to the **<Measurement Setup**> page.

Attach the test fixture (TH26005) to the test end of the TH2836.

Perform the zeroing operation (open/short circuit correction is required to prevent stray impedance from affecting the measurement accuracy), (see this chapter 6.1.2 Point Frequency Zeroing).

Insert the inductor under test into the test fixture and execute the measurement operation.

Press the menu key [DISP] to make the TH2836 display to the <Component Measurement Display> page. The instrument will test continuously and display the test results in large letters in the center of the page.

If you find that the test results are clearly incorrect, do the following:

Check that the inductor under test is reliably connected to the test fixture.

Check that the test fixture is reliably connected to the test end of the instrument.

Re-perform a reliable open/short circuit correction.

Note: When the user is using the sweep open/short circuit correction, the point frequency correction function must be selected as OFF, refer to 6.1 "Zero" Correction Operation.

6.5 Multi-frequency List Scanning Capacitor Operation Example

The test conditions are as follows:

Function: Cp-D

Level: 1Vrms

Other parameters are listed below:

Frequency	Comparison Parameters	Lower Limit	Upper Limit
1kHz	Cp (capacity)	325.0nF	333.0nF
10kHz	D (dissipation)	0.0001	0.0003
100kHz	D (dissipation)	0.0060	0.0100

Signal: HIGH LONG

Alarm mode: OUT (when out of tolerance)

The steps are as follows:

To turn on the power, see 2.6 Powering on and off .

Basic parameter setting.

Press key [DISP] to make the TH2836 display to the <Component Measurement Display> page. The current **function** area is shown as Cp-D and the **level** area is shown as 1.000 V.

Press the key [SETUP] to make the instrument display to the <Measurement Setup> page, the key List Setup, and then the key List Parameter Setup to make the TH2836 display to the <List Scan Setup> page.

Move the cursor to the **scan point** area and press key [1] to select Set Scan Point 1.

Move the cursor to the **frequency** area and press the key [1], 1 will be displayed in the cursor area of the screen and the softkey area will show the available units (Hz, kHz, and MHz). Press the key kHz. This area will be changed to 1.0000 kHz.

Move the cursor to the **function** area, which is currently displayed as R-X. At this time, Cp-...→, Cs-...→, Lp-...→, Ls-...→, Z-...→, and ↓ will be displayed in the softkey area on the right side of the screen.

Press key Cp-...→. Cp-D, Cp-Q, Cp-G, Cp-Rp will be displayed. Press key Cp-D to select the Cp-D test function.

Move the cursor to the **A lower limit** area, this area is currently displayed as ----. Press the keys [3] [2] [5], 325 will be displayed in the cursor area of the screen and the softkey area will show the available units (p, n, μ, m, k). Press the key n. Then this area will be changed to 325.000n.

Move the cursor to the **A upper limit** area, this area is currently displayed as ----. Press key [3][3][3], 333 will be displayed in the status message prompt area and the softkey area will show the available units (p, n, μ, m, k). Press the key n. Then this area will be changed to 333.000n, and the cursor automatically moves to the parameter area for scan point 2.

Move the cursor to the **scan point** area and press key [2] to select Set Scan Point 2.

Move the cursor to the **frequency** area and press the key [10], 10 will be displayed in the cursor area of the screen and the softkey area will show the available units (Hz, kHz, and MHz). Press the key kHz. This area will be changed to 10.0000k.

Move the cursor to the **B lower limit** area, currently this area is displayed as ----. Press the keys [0] [.] [0][0][0][1], 0.0001 will be displayed in the cursor area of the screen and the soft key area will show the available units (p, n, μ, m, k). Press the key

[ENTER]. (or key [1][0][0], 100 will be displayed in the status message prompt area, and the softkey area will display the available units (p, n, µ, m, k). Press the key µ. Then this area will change to 100.000µ.

Move the cursor to the **upper B limit** area, currently this area is displayed as ----. Press the keys [0] [.] [0][0][0][3], 0.0003 will be displayed in the cursor area of the screen and the soft key area will show the available units (p, n, µ, m, k). Press the key [ENTER]. The area changes to 300.000µ and the cursor automatically moves to the parameter area of scan point 3. (Or press key [3][0][0]. 100 will be displayed in the status message prompt area and the softkey area will show the available units (p, n, µ, m, k). Press the key µ. Then this area will change to 300.000µ.

Enter the 100 kHz, B upper and lower limits of 0.0060 and 0.0100 for the 3rd scan point in sequence similar to steps 7-10 above.

Alarm Settings:

Press the key [SYSTEM] to make the TH2836 display to the <System Setup> page.

Move the cursor to the **bad signal** area. This area is currently displayed as high length.

Attach the test fixture (TH26005) to the test end of the TH2839. Perform the zeroing operation (Open/short circuit correction is required to prevent stray impedance from affecting the measurement accuracy. (See this chapter) 6.1.1 **Full Frequency Zeroing**)

Insert the capacitor under test into the test fixture and perform the measurement.

Press the key [DISP], then press the key List Scan to make the TH2839 display to the <List Scan Display> page. The instrument will continuously scan the test and display the test and comparison results on the page and sound an alarm when the comparison result is H (upper overrun) or L (lower overrun).

If you find that the test results are clearly incorrect, do the following:

Check that the device under test is reliably connected to the test fixture.

Check that the test fixture is reliably connected to the test end of the instrument.

Re-perform a reliable open/short circuit correction.

Note: When the user is using the sweep open/short circuit correction, the point frequency correction function must be selected as OFF, refer to 6.1 "Zero" Correction Operation.

6.6 Comparator Setting Example

TH2836 provides a relatively complete comparator function, can be convenient for production line component measurement and identification and incoming and outgoing inspection, standard configuration of the HANDLER interface makes it suitable for automatic sorting measurement system.

The concepts and specific operation of comparators are described in detail in the previous chapter, so here are two examples of setups.

6.6.1 Capacitor Sorting

Capacitor Model: 0805CG271

Basic requirements: capacity is divided into two grades, J grade and K grade, capacity qualified loss failed in addition to filing.

Measurement parameters: frequency 100kHz, level 1Vrms, slow speed, alarm on failure, external trigger.

Sorting parameters: J -4.6% ~ +4.8%, K -9% ~ +10%, loss tgδ < 0.15%

The parameters to be set for this example are shown in the table below:

Main parameters (FUN1)	Cp
Sub-parameter (FUN2)	D
Frequency (FRQ)	100kHz
Level (LEV)	1V
Speed (SPEED)	SLOW
Attachment Bin switch (AUX)	ON
Main Parameter Tolerance Mode (MODE)	%TOL (Percentage Tolerance Option)
Nominal (NOMINAL)	270pF
First Bin lower limit (BIN1 LOW)	-4.6%
First Bin upper limit (BIN1 HIGH)	4.8%
Second Bin lower limit (BIN2 LOW)	-9%
BIN2 HIGH	10%
Sub-parameter lower limit (2nd LOW)	0.0000
Sub-parameter lower limit (2nd HIGH)	0.0015
Trigger mode (TRIG)	EXT (external)
Alarm mode (CMP ALARM)	Adverse effects (high length)

Table 6-1 Parameters

Note 1: Because it is a small capacitor, its 100kHz impedance is greater than 1kΩ, so we choose the parallel equivalent method.

Note 2: When any of the capacity files passes but the loss fails, another file is processed, so the susidiary file is opened and categorized as AUX file. If AUX is closed, the whole file will be recognized as unqualified if the loss fails.

Note 3: Since the given upper and lower limits are based on a percentage deviation from the 270pF nominal value, %TOL percentage mode is selected for the main parameter.

The steps are as follows:

On the **<Component Measurement Display>** page, select Cp-D and set the frequency, level, speed, etc.

Press the [SETUP] menu key to enter the Measurement Setup page (Meas Setup) and change the trigger mode to EXT (External Trigger).

Press LIMIT to enter the Limit List Setup page (Limit Table) to set the nominal value, main parameter tolerance mode, upper/lower limit parameters, comparator switch, and subsidiary Bin switch:

Press the [SYSTEM] menu key to enter the System Configuration page (System Config), find the bad signal item, and set it to high length.

Press [DISP] to return to the Component Measurement display page when the setting is complete.

6.7 Example of Load Calibration Operation

Assumption: The user is now using the following test conditions:

Frequency: 100kHz

Cp standard value: 11nF

D standard value: 0.0005

The steps are as follows:

Press the key [SETUP] and press the softkey User Calibration. The instrument is displayed as the <User Calibration> page.

Move the cursor to the **open circuit** area. Press the key ON to turn on the instrument's open-circuit correction function.

Move the cursor to the **short circuit** area. Press the key ON to turn on the short-circuit correction function of the instrument.

Move the cursor to the **load** area. Press the key ON to turn on the load calibration function of the instrument.

Move the cursor to the **function** area, which is currently displayed as Cp-D. At this time, Cp-...→, Cs-...→, Lp-...→, Ls-...→, Z-...→, and ↓ will be displayed in the softkey area on the right side of the screen.

Press key Cp-D to select the Cp-D parameter.

Move the cursor to the **frequency** area. Press the key ON to turn on the dot frequency correction function of the frequency.

Press key [1][0][0], 100 will be displayed in the cursor area of the screen and the software area will show the available units (Hz, kHz, and MHz). Press the key kHz. Change the **frequency** area to 100.000 kHz (the same as the test frequency).

Move the cursor to the **reference A:** area. Press key [1][1], 11 will be displayed in the cursor area of the screen and the software area will show the available units (p, n, μ, m, k). Press the key n. Then this area will change to 11.0000nF.

Move the cursor to the **reference B:** area. Press the key [0] [.] [0][0][0][5], 0.0005 will be displayed in the cursor area of the screen and the software area will show the available units (p, n, μ, m, k). Press the key [ENTER]. Then this area will change to 0.00050.

Move the cursor to the **Calibration Point** to select the calibration point.

Move the cursor to the **frequency** area again. Keep the test fixture open so that hands or other sources of interference are away from the test fixture. Press the softkey Open Circuit Single Frequency Clear to perform an open circuit correction.

Insert the shorting tab (TH26010) into the test fixture so that the shorting tab makes reliable contact with the test fixture's reed. Press the softkey Short Circuit Single Frequency Clear to execute the short circuit correction.

Insert the user's standard capacitor into the test fixture so that the pins of the standard capacitor make reliable contact with the reeds of the test fixture. Press the softkey Load Calibration to perform load calibration.

Notes:

The software version of the instrument may be inconsistent, which can cause the instrument to display softkey information and status information that is inconsistent with this book but should not affect the user's understanding.

Load correction is only valid for devices of the same specification, and load correction must be redone after changing specifications.

Chapter 7 Performance & Testing

7.1 measurement Function

7.1.1 Measurement Parameters and Symbols

C: Capacitance L: Inductance

R: Resistance Z: Impedance Y: Admittance

X: Reactance B: Susceptance G: Conductance

D: Loss θ: Phase Angle Q: Quality Factor

DCR: DC Resistance

Mathematical operations: Absolute deviation ΔABS and percentage deviation Δ% of the measured value from a programmable nominal value.

Main Parameter	Z, Y	L, C	R	G
Subparameter	θ (deg angle),θ (rad radians)	D, Q, R_S, R_P, G, Rdc	X	B

Table 7-1 Parameter combinations

Note: DCR has no measurement combinations.

7.1.2 Equivalence Mode

Series, parallel

7.1.3 Range

Automatic, manual (hold, increase, decrease)

7.1.4 Trigger

Internal, external, manual (see 4.1.2 Trigger mode)

Internal: Measurement is continuously performed on the measured part and the results are output and displayed.

Manual: Press the "TRIGGER" key on the panel, the instrument carries out a measurement and displays the result output, which is normally in the waiting state.

External: After the instrument's HANDLER interface receives the "start" signal from the outside, it performs a measurement and outputs the result, and then enters the wait state again.

7.1.5 Delay Time

Delay time: the time between the measurement trigger and the start of the measurement. 0-60 seconds programmable in 1ms steps.

7.1.6 Test End Connection Method

Use four end-pair measurements.

Hcur: Current Sampling High-End Lcur: Current Sampling Low-End

Hpot: Voltage Sampling High-End Lpot: Voltage Sampling Low-End

7.1.7 Measurement Speed (at frequency >= 10 kHz)

Fast: Approx. 130 times/second (7.7ms/time)

Medium: Approx. 11 times/second (92ms/time)

Slow: Approx. 4 times/second (230ms/time)

Medium and fast speeds are measured at frequency less than 10kHz at a reduced speed.

7.1.8 Average Times

1~255, programmable.

7.1.9 Number of Display Bits

6 digits, maximum display number 999999

7.2 Test Signal

7.2.1 Test Signal Frequency

The test signal is a sine wave, frequency accuracy: 0.01%.

Test frequency range:

20Hz to 5MHz (TH2836A)

20Hz to 8.5MHz (TH2836)

Minimum resolution: 0.01Hz

7.2.2 Signal Mode

Normal: Set the test voltage on the measurement display page. The voltage at the measurement end may be smaller than the set voltage during measurement depending on the impedance of the measured part.

Constant level: The internal level is automatically adjusted so that the voltage on the DUT is the same as the set voltage.

7.2.3 Test Signal Level

	Mode	Range	accuracy	Step
Voltage	Normal Constant Pressure	5mVRMS-2VRMS 10mVRMS-1VRMS	±(10% x setpoint + 2mV) ±(6% x setpoint + 2mV)	100µV
Current	Normal Constant Current	50µARMS -20mARMS 100µARMS -10mARMS	±(10% x setpoint + 10µARMS) ±(6% x setpoint + 10µARMS)	1µA

Table 7-2 Test Signal Level

7.2.4 Output Impedance

100Ω±2%

7.2.5 Test Signal Level Monitor

Mode	Range	Frequency	Accuracy
Voltage	5mVRMS - 2VRMS	≤1MHz	±(5% x reading + 0.5mVrms)
	5mVRMS - 1VRMS	>1MHz	±(10% x reading + 0.5mV)
Current	50µARMS - 20mARMS	≤1MHz	± (5% x reading + 5µA)
	50µARMS - 10mARMS	>1MHz	± (10% x reading + 5µA)

Table 7-3 Test Signal Level Monitor

7.2.6 Maximum Range of Measurement Display

Parameters	Measurement Display Range
L, Lk	0.00001µH ~ 99.9999kH
C	0.00001pF ~ 9.99999F
Z, R, X, DCR	0.00001Ω ~ 99.9999MΩ
Y, B, G	0.00001µs ~ 99.9999S
D	0.00001 - 9.99999
Q	0.00001 - 99999.9
θ	Deg -179.999 °~ 179.999 ° Rad -3.14159 ~ 3.14159

Table 7-4 Measurement Display Range

7.2.7 DC Bias Voltage Source

0V~ ±40V Minimum resolution: 0.5mV, Accuracy: 1% x set voltage +5mV.

0mA~ ±100mA Minimum resolution: 5µA, Accuracy: 5% x set voltage +50µA.

7.3 Measurement Accuracy

Measurement accuracy encompasses measurement stability, temperature coefficient, linearity, measurement repeatability and calibration interpolation error. Measurement accuracy of the instrument must be checked under the following conditions:

Power-on warm-up time: ≥ 30 minutes

Test cable length: 0m, 1m, 2m, 4m.

Correct open and short circuit clearing "0" after warm-up.

DC bias in "OFF" position

Instrument ranges work in "AUTO" to select the correct measuring range.

7.3.1 Parameter Accuracy

The accuracy Ae of │Z│, │Y│, L, C, R, X, G, B is expressed by the following equation:

Ae = ±[A + (Ka + Kaa + Kb ×Kbb + Kc) ×100 + Kd] ×Ke [%]

Ka: Impedance proportionality factor (see table A)

Kaa: Cable length factor (see table B)

Kb: Impedance proportionality factor (see table A)

Kbb: Cable length factor (see table C)

Kc: Calibration interpolation factor (see table D)

Kd: Cable length factor (see table F)

Ke: Temperature factor (see table G)

C, X, B Accuracy Conditions of Use:

Dx (D measurement) ≤ 0.1

R, G accuracy conditions of use: Qx (Q measured value) ≤ 0.1.

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

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

The accuracy of G can only be used in the combination of G-B measurements.

7.3.1.1 D Accuracy

D The accuracy De is given by the following equation:

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

The above equation is used only if Dx ≤ 0.1.

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

7.3.1.2 Q Accuracy

The Q accuracy is given by the following equation:

$$Qe = \pm\frac{Q_x{}^2 \times D_e}{1 \mu Q_x \times D_e}$$

Here, Qx is the measured value of Q being measured and De is the accuracy of D.

This accuracy was used at Qx ×De < 1.

7.3.1.3 θ Accuracy

The θ accuracy is given by the following equation:

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

$$\theta e = \frac{A_e}{100} \quad [rad] \text{ (radians)}$$

7.3.1.4 G Accuracy

When Dx (measured D value) ≤ 0.1

The G accuracy is given by the following equation:

Ge = Bx+De [S]

$$Bx = 2\pi fCx = \frac{1}{2\pi f L_x}$$

Here, Bx is the value of B under test [S], Cx is the value of C under test [F], Lx is the value of L under test [H], De is the accuracy of D, and f is the test frequency.

The above G accuracy is only used in the combination of Cp-G and Lp-G measurements.

7.3.1.5 Rp Accuracy

When Dx (measured D value) ≤ 0.1

The Rp accuracy is given by the following equation:

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

Here, Rpx is the value of the measured Rp [S].

Dx is the value of the measured D [F].

De is the accuracy of D.

7.3.1.6 Rs Accuracy

When Dx (measured D value) ≤ 0.1

The Rs accuracy is given by the following equation:

Rse = Xx×De [Ω]

$$Xx = 2\pi fLx = \frac{1}{2\pi f C_x}$$

Here, Xx is the value of X under test [S], Cx is the value of C under test [F], Lx is the value of L under test [H], De is the accuracy of D, and f is the test frequency.

7.3.1.7 Accuracy Factor

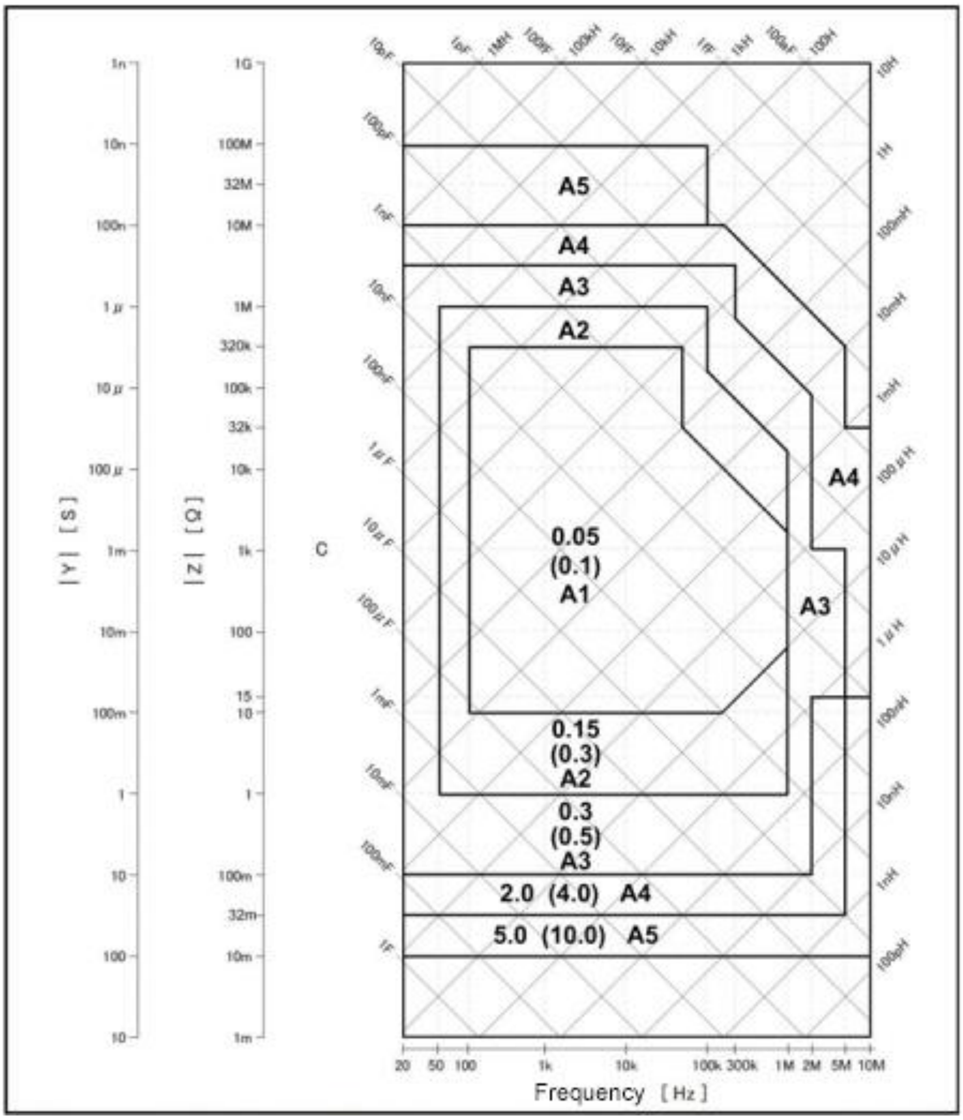


Figure 7-1 Basic Accuracy A (1 of 2)

In Figure 7-1, on the boundary line, the smaller value is selected.

An example of the basic accuracy A value selection method is shown below:

0.05 ---- When 0.3Vrms ≤ Vs ≤ 1Vrms, the measurement speed is the A-value of the medium and slow speed.

(0.1) ---- When 0.3Vrms ≤ Vs ≤ 1Vrms, the measurement speed is the A-value of the fast speed.

A1 ---- When Vs<0.3Vrms or Vs>1Vrms, use Figure 6-4 to find the corresponding A1, A2, A3, and A4 values.

Here, Vs is the test signal voltage.

The following table lists the A-values corresponding to different test voltages at fast, medium, and slow speeds. Use Figure 6-4 to find the value of Alt when Alt is not specified.

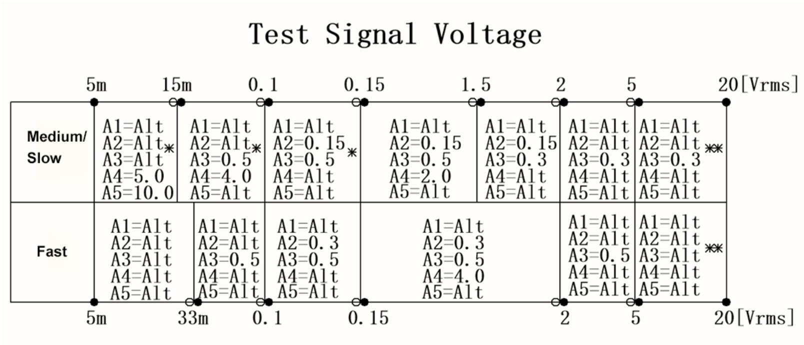


Table 7-1 Basic Accuracy

Notes:

100Hz ≤ f_m < 300Hz, A value is the value in the above table multiplied by 2.

f_m <100Hz, A value is the value in the above table multiplied by 2.5.

A value plus 0.15 when all the following measurement conditions are met:

Test frequency: 100Hz < fm ≤ 10MHz

Test signal voltage: $5V_{rms} < V_s \leq 2V_{rms}$

DUT: Inductor, $|Z_m|$ <200Ω ($|Z_m|$: DUT impedance)

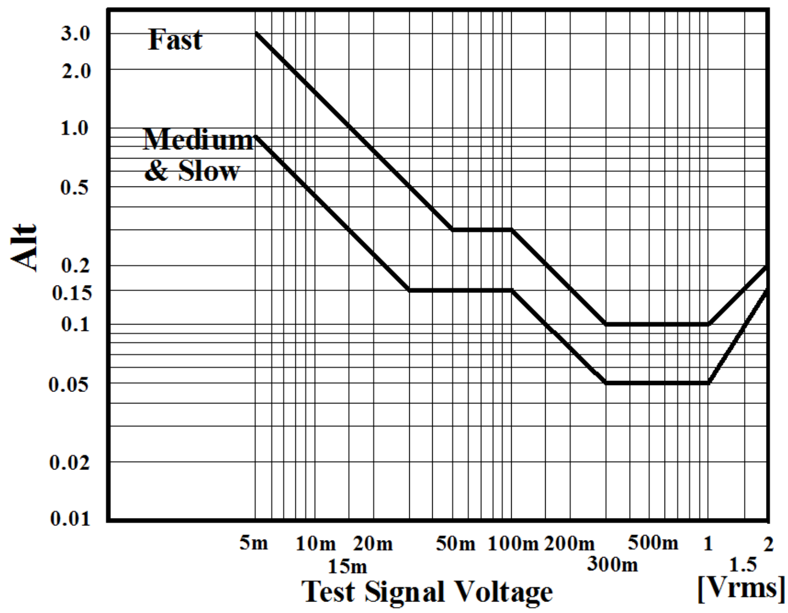


Figure 7-2 Basic Accuracy A (2 of 2)

K_a and K_b are the low impedance and high impedance increase factors, respectively. K_a is negligible when the impedance is greater than 500 Ω, and K_b is negligible when the impedance is less than 500 Ω.

Speed	Frequency	Ka	Kb
Medium	fm<100Hz	$(\frac{1\times10^{-3}}{\lvert Z_m\rvert})(1+\frac{200}{V_s})(1+\sqrt{\frac{100}{f_m}})$	$\lvert Z_m\rvert(1\times10^{-9})(1+\frac{70}{V_s})(1+\sqrt{\frac{100}{f_m}})$
	100Hz≤fm≤100kHz	$(\frac{1\times10^{-3}}{\lvert Z_m\rvert})(1+\frac{200}{V_s})$	$\lvert Z_m\rvert(1\times10^{-9})(1+\frac{70}{V_s})$
	100kHz<fm≤300kHz	$(\frac{1\times10^{-3}}{\lvert Z_m\rvert})(2+\frac{200}{V_s})$	$\lvert Z_m\rvert(3\times10^{-9})(1+\frac{70}{V_s})$
	300kHz<fm≤10MHz	$(\frac{1\times10^{-3}}{\lvert Z_m\rvert})(3+\frac{200}{V_s}+\frac{V_s^2}{10^8})$	$\lvert Z_m\rvert(10\times10^{-9})(1+\frac{70}{V_s})$
Fast	fm<100Hz	$(\frac{2.5\times10^{-3}}{\lvert Z_m\rvert})(1+\frac{400}{V_s})(1+\sqrt{\frac{100}{f_m}})$	$\lvert Z_m\rvert(2\times10^{-9})(1+\frac{100}{V_s})(1+\sqrt{\frac{100}{f_m}})$
	100Hz≤fm≤100kHz	$(\frac{2.5\times10^{-3}}{\lvert Z_m\rvert})(1+\frac{400}{V_s})$	$\lvert Z_m\rvert(2\times10^{-9})(1+\frac{100}{V_s})$
	100kHz<fm≤300kHz	$(\frac{2.5\times10^{-3}}{\lvert Z_m\rvert})(2+\frac{400}{V_s})$	$\lvert Z_m\rvert(6\times10^{-9})(1+\frac{100}{V_s})$
	300kHz<fm≤10MHz	$(\frac{2.5\times10^{-3}}{\lvert Z_m\rvert})(3+\frac{400}{V_s}+\frac{V_s^2}{10^8})$	$\lvert Z_m\rvert(20\times10^{-9})(1+\frac{100}{V_s})$
fm: Test frequency [Hz] │Zm│: Impedance of the measured part [Ω] Vs: Test signal voltage [mVrms]			

Table 7-2 Impedance proportionality factors Ka, Kb

Kaa is negligible when the impedance is greater than 500 Ω.

Test Signal Voltage	Cable length			
	0m	1m	2m	4m
≤2V_{rms}	0	0	$Ka/2$	Ka
>2V_{rms}	0	$\frac{2\times10^{-3}\times f_m{}^2}{\lvert Z_m\rvert}$	$\frac{(1+5\times f_m{}^2)\times10^{-3}}{\lvert Z_m\rvert}$	$\frac{(2+10\times f_m{}^2)\times10^{-3}}{\lvert Z_m\rvert}$
fm: Test frequency [Hz] │Zm│: Impedance of the measured part [Ω] Ka: impedance proportionality factor				

Table 7-3 Cable Length Factor Kaa

Test Signal Frequency	Cable Length			
	0m	1m	2m	4m
fm≤100kHz	1	1+5×fm	1+10×fm	1+20×fm
100kHz<fm≤300kHz	1	1+2×fm	1+4×fm	1+8×fm
300kHz<fm≤10MHz	1	1+0.5×fm	1+1×fm	1+2×fm
fm: Test frequency [MHz]				

Table 7-4 Cable Length Factor Kbb

Test Frequency	Kc
Direct Calibration Frequency (see table E)	0
Other Frequency	0.0003

Table 7-5 Calibration Interpolation Factors Kc

		4	20	25	30	40	50	60	80	[Hz]
00	20	150	200	250	300	400	500	600	800	[Hz]
1	1.2	1.5	2	2.5	3	4	5	6	8	[kHz]
10	12	15	20	25	30	40	50	60	80	[kHz]
100	120	150	200	250	300	400	500	600	800	[kHz]
1	1.2	1.5	2	2.5	3	3.5	4	4.5	5	[MHz]
5.5	6	6.5	7	7.5	8	8.5				[MHz]

Table 7-6 Direct Calibration Frequency (65 frequency points total**)**

(58 dots up to 5MHz for TH2836A, 65 dots for TH2836)

Test Signal Level	Cable Length		
	1m	2m	4m
≤2V_{rms}	2.5 x 10^{-4} (1 + 50 x f_m)	5 x 10^{-4} (1 + 50 x f_m)	1 x 10^{-3} (1 + 50 x f_m)
f_m: Test frequency [MHz]			

Table 7-7 Cable Length Factor K_d

Temperature (℃)	5	8	18	28	38

K_e	6	4	2	1	2	4

Table 7-8 Temperature Factor K_e

7.3.1.8 DC Resistance DCR Accuracy

A (1+R_x /5MΩ+16mΩ/R_x) [%] ±0.2mΩ

A = 0.25 at medium and slow speed

A = 0.5 at fast speed

Here, Rx is the measured resistance.

7.3.2 Measurement Time

Measurement time (ms) (DC bias OFF)

	Measuremet Speed	Test Frequency						
		20Hz	100Hz	1kHz	10kHz	100kHz	1MHz	8.5MHz
1	Fast	380	100	20	7.7	5.7	5.6	5.6
2	Medium	380	180	110	92	89	88	88
3	Slow	480	300	240	230	220	220	220

Table 7-9 Measurement Time

7.4 Performance Test

7.4.1 Operating Conditions

Each test shall be performed on (see 1.7 Safety requirements) under reference operating conditions. This test is only included in the main part of the instrument indicators. Other parts are not included, such as the test of transformer parameters, etc., the user can according to the indicators listed in this manual in the specified conditions of the test. The performance test should work under the preheating conditions specified in Chapter 1.

7.4.2 Test Apparatus and Equipment

Serial Number	Instrument Name		Technical Requirement
1	Standard capacitor	100pF	0.02% Loss D is known
		1000pF	
		10000pF	
		10nF	
		0.1uF	
		1uF	
2	AC Standard Resistor	10Ω	0.02%
		100Ω	
		1kΩ	
		10kΩ	
		100kΩ	

3	DC Standard Resistor	0.1Ω	0.02%
		1Ω	
		10Ω	
		100Ω	
		1kΩ	
		10kΩ	
		100kΩ	
4	Standard Inductor	100μH	0.02%
		1mH	
		10mH	
		100mH	
5	Frequency Meter		(0-1000) MHz
6	Digital Multimeter		0.5%
7	Insulation Resistance Meter		500V Class 10
8	Pressure Leakage Tester		0.25kW (0~500) V

Table 7-10 Test Apparatus and Equipment

7.4.3 Functional Check

The instrument's function keys, displays, terminals, etc. should work normally and the functions are correct.

7.4.4 Test Signal Level

Use a high-frequency millivoltmeter and a detector probe, with the detector probe connected to the H_{CUR} terminal of the meter and the ground wire of the test probe connected to ground. Change the level to: 10mV, 20mV, 100mV, 200mV, 1V, 2V, and the readings should be in accordance with the requirements of this chapter on test signal level.

7.4.5 Frequency

Connect the frequency meter ground terminal to the ground terminal of the instrument. Connect the test terminal of the frequency meter to the test terminal H_{CUR} of the capacitance meter. Change the frequency to: 20Hz, 100Hz, 1kHz, 10kHz, 100kHz, 200kHz,300kHz, 1MHz, 8.5MHz. The readings of the frequency meter should be in accordance with the requirements of this chapter on the frequency of the test signal.

7.4.6 Measurement Accuracy

Measuring instrument measurement parameters are more, the basic measurement parameters are R, L, C, D, the rest of the parameters can be from the above parameters everywhere, so the accuracy measurement is mainly on R, L, C, D measurement.

7.4.7 Capacitance C, Loss D Accuracy

Function Cp-D

Test frequency 100Hz 1kHz 10kHz 100kHz (separate tests)

Level 1V

Range AUTO

Bias 0V

Speed Slow

Short-circuit and open-circuit clearing should be performed before testing. Connect the standard capacitor 100pF, 1000pF, 10nF, 0.1uF, 1uF, change the frequency, the error between the instrument reading and the standard value of the capacitance C should be within the permissible error range specified in this chapter on the accuracy of C, and the loss D should be within the permissible error range specified in this chapter on the accuracy of D.

7.4.8 Inductance L Accuracy

Test conditions:

Function Ls-Q

Test Frequency 100Hz 1kHz Separate Tests

Level 1V

Range AUTO

Bias 0V

Speed Slow

Short circuit and open circuit clearing should be performed before testing. Connect to a standard inductor 100μH, 1mH, 10mH, 100mH, change the frequency, the error between the instrument reading and the standard value should be within the permissible error limits specified in this chapter on L accuracy.

7.4.9 Impedance Z Accuracy

Test conditions:

Function Z-θ

Test frequency 100Hz 1kHz 10kHz 100kHz (separate tests)

Level 1V

Range AUTO

Bias 0V

Speed Slow

Short-circuit and open-circuit clearing should be performed before testing. Connect the AC standard resistor 10Ω, 100Ω, 1kΩ, 10kΩ, 100kΩ, change the frequency, the error between the instrument reading and the standard value should be within the permissible error specified in this chapter on |Z|accuracy within the range.

7.4.10 DC Resistance DCR Accuracy

Test conditions:

Function	DCR
Test frequency	-----
Levels	-----
Range	AUTO
Bias	-----
Speed	Slow

Short-circuit clearing should be performed before testing. Connect the DC standard resistor 0.1Ω, 1Ω, 10Ω, 100Ω, 1kΩ, 10kΩ, 100kΩ, the instrument reading and the error between the instrument reading and the standard value should be within the permissible error range specified in this chapter on the accuracy of the DCR.

Chapter 8 Command Reference

8.1 SCPI subsystem commands

●DISPlay	●ORESister	●TRIGger	●CORRection
●FREQuency	●BIAS	●INITiate	●COMParator
●VOLTage	●FUNCtion	●FETCh?	●Mass MEMory
●CURRent	●LIST	●ABORT	

Inquiries can be made on the Company's website at www.tonghui.com.cn.

SCPI (Standard Commands for Programmable Instruments) is an ASCII-based instrument command language for test and measurement instruments. SCPI commands are based on a hierarchical structure (also known as a tree system). In this system, related commands are grouped under a common node or root so that subsystems are formed.

According to the command syntax, most commands (and some arguments) are represented by a mixture of upper- and lower-case letters. Upper case letters indicate abbreviated commands. For shorter program lines, you can send commands in abbreviated format. For better program readability, you can send commands in a longer format.

Note: In order to avoid misunderstanding of instruction abbreviations, try to avoid too many abbreviations optional in instruction descriptions, most instruction descriptions will be described directly in abbreviated form.

Note: Command syntax conventions:

The curly brackets ({ }) contain the parameter options for the given command string. The curly brackets are not sent with the command string.

The vertical bar (|) separates multiple parameter selections for a given command string. The pointed brackets (<>) in the second example indicate that a value must be specified for the bracketed argument. Some syntax elements (such as nodes and arguments) are enclosed in square brackets ([ ]). This means that the element is optional and can be omitted. The pointed brackets are not sent with the command string. If no value is specified for an optional parameter, the instrument selects the default value.

NR1: Integer, e.g. 123.

NR2: Fixed point, e.g. 12.3.

NR3: Floating point number, e.g. 12.3E+5.

NL: carriage return, integer 10.

^END: The EOI (end-of-instance) signal for the IEEE-488 bus.

8.1.1 DISPlay Subsystem

The DISPlay subsystem command set is mainly used to set the display page of the instrument and to inversely query the current page by character?

Command Tree:

```
DISPlay ──┬──── :PAGE   MEASurement
          │              BNUMber
          │              BCOunt
          │              LIST
          │              MSETup
          │              CSETup
          │              LTABle
          │              LSETup
          │              LCORR
          │              LDISP
          │              SYSTem
          │              FLISt
          │              HDLS
          │              CHSE
          ├── :LINE    "<string>"
          │   :RFONt     LARGe
          └──            TINY
                         OFF
```

8.1.1.1 DISPlay:PAGE

Description：Sets the display page of the instrument, character? can query the current page.

Command syntax: DISPlay:PAGE <page name>

Query syntax: DISPlay:PAGE?

Query return: <page name><NL^END>

Parameter <page name>:

MEASurement Sets display page to: Component measurement display.

BNUMber Sets the display page to: Bin number display.

BCOunt Sets the display page to: Bin count display.

LIST Sets the display page to: List scanning display.

MSETup Sets the display page to: Measurement settings.

CSETup Sets the display page to: User calibration function.

LTABle Sets the display page to: Limit table setting.

LSETup Sets the display page to: List scanning settings.

LCORR Sets the display page to: List user correction.

LDISP Sets the display page to: List display settings.

SYSTem Sets the display page to: System setup page.

FLISt Sets the display page to: File list.

HDLS Sets the display page to: HANDLER setting page.

CHSE Sets the display page to: Channel setting page.

Example:

WrtCmd("DISP:PAGE MEAS").

Sets the display page to the component measurement display.

WrtCmd("DISP:PAGE?")

Returns MEAS, indicating that the current display page is the component measurement.

8.1.1.2 DISPlay:LINE

Description：Used to set the current measurement topic of the instrument, which can be a substring of up to 16 characters, character? can query the current measurement topic. The string can be saved as a file name when saving.

Command syntax: DISPlay:LINE "<string>"

Query syntax: DISPlay:LINE?

Query return: <string><NL^END>

Parameter <string>:

ASCII strings (up to 16)

Example:

WrtCmd("DISP:LINE "resistor meas"");;

Sets the instrument's current measurement theme to Resistor meas.

WrtCmd("DISP:LINE?").

Returns Resistor meas, indicating that the current measurement theme is Resistor meas.

8.1.1.3 DISPlay:ResultFONt

Description: Sets the instrument's current measurement result font. Font? Can query the current measurement result font.

Command syntax: DISPlay:RFONt <font>

Query syntax: DISPlay:RFONt?

Query return:<font><NL^END>

Parameter <font>:

LARGe: Measurement results are displayed in large font for about 12ms at a time.

TINY: Measurement results are displayed in small font for about 5ms at a time.

OFF: Measurement results are not displayed but can be read from the bus.

Example:

WrtCmd("DISP:RFON LARG").

Sets the instrument's current measurement result font to large font size.

WrtCmd("DISP:RFON?");

Returns LARG, indicating that the current measurement result font is large.

8.1.2 FREQuency Subsystem

Description：Used to set the measurement frequency of the instrument, character? can query the current measurement frequency.

Command syntax: FREQuency <value> / MIN / MAX

Query syntax: FREQuency?

Query return: <NR3><NL^END>

Parameters:

<value>: Parameters of NR1, NR2, NR3 data format with Hz, kHz, or MHz suffix.

MIN: Sets the measurement frequency to a minimum value of 20 Hz.

MAX: Sets the measurement frequency to the maximum value (maximum 8.5 MHz for TH2836, 5 MHz for TH2836A).

Example:

WrtCmd("FREQ 1KHZ").

Sets the measurement frequency to 1000Hz.

WrtCmd("FREQ?").

Returns 1K, indicating that the current measurement frequency is 1000Hz.

8.1.3 VOLTage Subsystem

Description：Used to set the measurement level voltage of the instrument, character? can query the current measurement level voltage.

Command syntax: VOLTage <value> / MIN / MAX

Query syntax: VOLTage?

Query return: <NR3><NL^END>

Parameters:

<value>: Parameters for NR1, NR2, NR3 data format plus V suffix.

MIN: Sets the measurement level voltage to 5mV.

MAX: Sets the measurement level voltage to 2V.

Example:

WrtCmd("VOLT 1V").

Sets the measurement level voltage to 1V.

WrtCmd("VOLT?").

Returns 1V, indicating that the current measurement level voltage is 1V.

8.1.4 CURRent Subsystem

Description：Used to set the measurement level current of the instrument, character? can query the current measurement level current.

Command syntax: CURRent <value> / MIN / MAX

Query syntax: CURRent?

Query return: <NR3><NL^END>

Parameters:

<value>: NR1, NR2, NR3 parameters according to format plus MA suffix.

MIN: Sets the measurement level current to 50 μA.

MAX: Sets the measurement level current to 20mA.

Example:

WrtCmd("CURR 1MA").

Sets the measurement level current to 1mA.

WrtCmd("CURR?").

Returns 1MA, indicating that the current measurement level current is 1mA.

8.1.5 AMPLitude subsystem

Description：Used to set the automatic level control (ALC) switch of the instrument, character? can query the current status of the automatic level control (ALC) switch.

Command syntax: AMPLitude:ALC ON / OFF / 1 / 0

Query syntax: AMPLitude:ALC?

Query return: <NR1><NL^END>

Parameters:

Character 1 is equivalent to ON.

Character 0 is equivalent to OFF.

Example:

WrtCmd("AMPL:ALC 0").

Sets the instrument's automatic level control function OFF.

WrtCmd("AMPL:ALC?");

Returns 0, indicating that the current automatic level control function is OFF.

8.1.6 OUTPut Subsystem

Description：Used to set the instrument's DC 50mA/5V bias current source DC isolation function on or off, character? can query the current bias source DC isolation function switch.

Command syntax: OUTPut:DC:ISOLation ON / OFF / 1 / 0

Query syntax: OUTPut:DC:ISOLation?

Query return: <NR1> <NL^END>

Parameters:

Character 1 is equivalent to ON.

Character 0 is equivalent to OFF.

Example:

WrtCmd("OUTP:DC:ISOL 0");

Sets the instrument's bias source DC isolation function OFF.

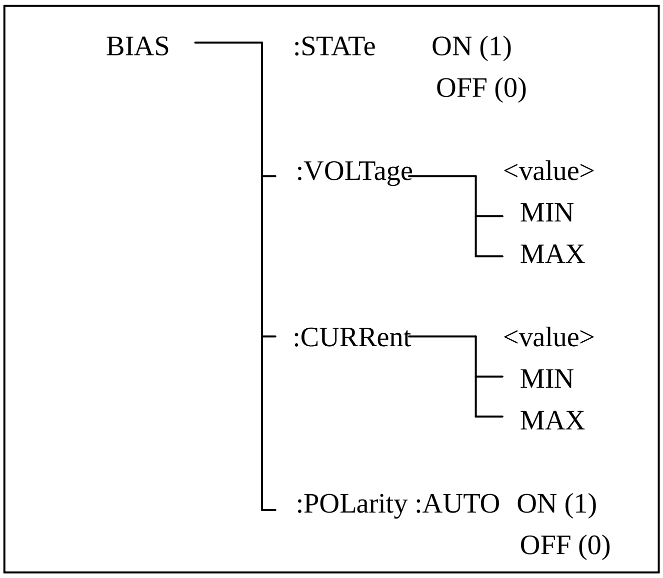
WrtCmd("OUTP:DC:ISOL?");

Returns 0, indicating that the current bias source DC isolation function is OFF.

8.1.7 BIAS Subsystem

The BIAS subsystem command set is mainly used to set the internal bias voltage of the instrument, bias switch.

Command Tree:



8.1.7.1 BIAS:STATe

Description：Used to set the bias switch of the instrument, character? can query the current bias switch.

Command syntax: BIAS:STATe ON / OFF / 1 / 0

Query syntax: BIAS:STATe?

Query return: <NR1><NL^END>

Parameters:

Character 1 is equivalent to ON.

Character 0 is equivalent to OFF.

Example:

WrtCmd("BIAS:STAT 0").

Sets the instrument's bias function OFF.

WrtCmd("BIAS:STAT?");

Returns 0, indicating that the current isolation function is OFF.

8.1.7.2 BIAS:VOLTage

Description：Sets the internal bias voltage of the instrument, character? can query the current bias voltage.

Command syntax: BIAS:VOLTage <value> / MIN / MAX

Query syntax: BIAS:VOLTage?

Query return: <NR3><NL^END>

Parameters:

<value>: NR1, NR2, NR3 according to the format.

MIN: Sets the measurement bias voltage to -40V.

MAX: Sets the measurement bias voltage to 40V.

Example:

WrtCmd("BIAS:VOLT MIN").

Sets the instrument's DC bias voltage to -40V.

WrtCmd("BIAS:VOLT?");

Returns 1V, indicating that the current measured DC bias voltage is 1V.

8.1.7.3 BIAS:CURRent

Description：Sets the bias current of the instrument, character? can query the current bias current.

Command syntax: BIAS: CURRent <value> / MIN / MAX

Query syntax: BIAS: CURRent?

Query return: <NR3><NL^END>

Parameters:

<value>: NR1, NR2, NR3 according to the format.

MIN: Sets the measurement bias current to -100mA.

MAX: Sets the measurement bias current to 100mA.

Example:

WrtCmd("BIAS:CURR MIN").

Sets the DC bias current of the instrument to 0A.

WrtCmd("BIAS:CURR?").

Returns 0A, indicating that the current DC bias current is 0A.

8.1.7.4 BIAS:POLarity

DESCRIPTION: Sets the signal polarity of the instrument's bias current.

Command syntax: BIAS:POLarity:AUTO ON / OFF / 1 / 0

Parameters:

Character 1 is equivalent to ON.

Character 0 is equivalent to OFF, which is equivalent to FIX.

Example:

WrtCmd("BIAS:POL:AUTO 1");

Sets the DC bias polarity of the instrument to AUTO.

8.1.8 FUNCtion subsystem

The FUNCtion subsystem command set is used to set measurement "functions", ranges, DC current and voltage monitoring switches, mode selection for deviation display, nominal settings, etc.

Command Tree:

FUNCtion :IMPedance CPD
CPQ
CPG
CPRP
CSD
CSQ
CSRS
LPQ
LPD
LPG
LPRP
LPRD
LPZ
LSD
LSQ
LSRS
LSRD
LSZ
RX
RSQ
RPQ
ZTD
ZTR
GB
YTD
YTR
DCR

:RANGe <value>
:AUTO ON (1)
OFF (0)

:Source MONitor :VDC ON (1)
OFF (0)
:IDC ON (1)
OFF (0)

:DEV1 :MODE ABSolute
2 PERcent
OFF
:REFerence <value>
:FILL

:StepDELay <value>
MIN
MAX

:DCResistance <value>
: AUTO ON (1)

OFF (0)

8.1.8.1 FUNCtion:IMPedance

Description: Sets the "Function" parameter of the instrument, character? can query the current "function" parameter.

Command syntax: FUNCtion:IMPedance <function>

Query syntax: FUNCtion:IMPedance?

Query return: <function><NL^END>.

Parameters <function>:

CPD	Sets "Function" to Cp-D.
LPRP	Sets "Function" as Lp-Rp.
CPQ	Sets "Function" to Cp-Q.
LSD	Sets "Function" to Ls-D.
CPG	Sets "Function" to Cp-G.
LSQ	Sets the "Function" to Ls-Q.
CPRP	Sets the "Function" to Cp-Rp.
LSRS	Sets "Function" as Ls-Rs.
CSD	Sets "Function" to Cs-D.
RX	Sets "Function" to R-X.
CSQ	Sets "Function" to Cs-Q.
ZTD	Sets "Function" to Z-θ°.
CSRS	Sets "Function" to Cs-Rs.
ZTR	Sets the "function" to Z-θr.
LPQ	Sets the "Function" to Lp-Q.
GB	Sets "Function" to G-B.
LPD	Sets "Function" to Lp-D.
YTD	Sets "Function" to Y-θ°.
LPG	Sets "Function" to Lp-G.
YTR	Sets the "Function" to Y-θr.
LPRD	Sets "Function" as Lp-Rd.
RPQ	Sets "Function" as Rp-Q.
LSRD	Sets "Function" as Ls-Rd.

RSQ	Sets the "Function" to Rs-Q.
LSZ	Sets "Function" to Ls-Z.
LPZ	Sets the "Function" to Lp-Z.
DCR	Sets the "Function" to DCR.

Example:

WrtCmd("FUNC:IMP RX").

Used to set the instrument's "Function" parameter to R-X.

WrtCmd("FUNC:IMP?").

Returns R-X, indicating that the current instrument "function" parameter is R-X.

8.1.8.2 FUNCtion:IMPedance:RANGe

Description：Sets the range of the instrument, character? can query the current range parameter.

Command syntax: FUNCtion:IMPedance:RANGe <value>

Query syntax: FUNCtion:IMPedance:RANGe?

Query return: <value><NL^END>

Parameter <value>:

The impedance magnitude of the measured component can be set as a parameter in NR1, NR2, NR3 data format plus OHM, KOHM suffix.

The query returns when it can be:

0.1	1	10	20	50	100
200	500	1000	2000	5000	
10000	20000	50000	100000		

Example:

WrtCmd("FUNC:IMP:RANG 1KOHM");

Sets the range of the instrument to 1kΩ.

WrtCmd("FUNC:IMP:RANG?");

Returns 1, indicating that the current range of the instrument is 1Ω.

8.1.8.3 FUNCtion:IMPedance:RANGe:AUTO

Description：Sets the range auto selection mode of the instrument, character? can query the current range status.

Command syntax: FUNCtion:IMPedance:RANGe:AUTO ON / OFF / 1 / 0

Query syntax: FUNCtion:IMPedance:RANGe:AUTO?

Query return: <NR1><NL^END>

Parameters:

Character 1 is equivalent to ON.

Character 0 is equivalent to OFF, which is equivalent to FIX.

Example:

WrtCmd("FUNC:IMP:RANG:AUTO ON");

Sets the range of the instrument to automatic.

WrtCmd("FUNC:IMP:RANG:AUTO?");

Returns 1, indicating that the current range state is auto.

8.1.8.4 FUNCtion: DCResistance::RANGe

Description: Sets the range of the instrument, character? can query the current range parameter.

Command syntax: FUNCtion:DCResistance:RANGe <value>

Query syntax: FUNCtion:DCResistance:RANGe?

Query return: <value><NL^END>

Parameter <value>:

The impedance magnitude of the measured component can be set as a parameter in NR1, NR2, NR3 data format plus OHM, KOHM suffix.

The query returns when it can be:

0.1	1	10	20	50	100
200	500	1000	2000	5000	
10000	20000	50000	100000		

Example:

WrtCmd("FUNC:DCR:RANG 1KOHM");

Sets the range of the instrument to 1kΩ.

WrtCmd("FUNC:DCR:RANG?");

Returns 1, indicating that the current range of the instrument is 1Ω.

8.1.8.5 FUNCtion:DCResistance:RANGe:AUTO

Description：Sets the range auto selection mode of the instrument, character? can query the current range status.

Command syntax: FUNCtion:DCResistance:RANGe:AUTO ON / OFF / 1 / 0

Query syntax: FUNCtion:DCResistance:RANGe:AUTO?

Query return: <NR1><NL^END>

Parameters:

Character 1 is equivalent to ON.

Character 0 is equivalent to OFF, which is equivalent to FIX.

Example:

WrtCmd("FUNC:DCR:RANG:AUTO ON");

Sets the range of the instrument to automatic.

WrtCmd("FUNC:DCR:RANG:AUTO?");

Returns 1, indicating that the current range state is auto.

8.1.8.6 FUNCtion:Source MONitor:VDC

Description：Sets the DC voltage monitoring switch of the instrument, character? can query the current status of DC voltage monitoring switch.

Command syntax:

FUNCtion:SMONitor:VDC ON / OFF / 1 / 0

Query syntax: FUNCtion:SMONitor:VDC?

Query return: <NR1><NL^END>

Parameters:

Character 1 is equivalent to ON.

Character 0 is equivalent to OFF.

Example:

WrtCmd("FUNC:SMON:VDC ON");

The DC voltage monitoring switch "ON" is used to set the instrument.

WrtCmd("FUNC:SMON:VDC?");

Returns 1, indicating that the current DC voltage monitoring switch is "on".

8.1.8.7 FUNCtion:Source MONitor:IAC

Description：Sets the DC current monitor switch of the instrument, character? can query the current DC current monitor switch status.

Command syntax: FUNCtion:SMONitor:IDC ON / OFF / 1 / 0

Query syntax: FUNCtion:SMONitor:IDC?

Query return: <NR1><NL^END>

Parameters:

Character 1 is equivalent to ON.

Character 0 is equivalent to OFF.

Example:

WrtCmd("FUNC:SMON:IDC ON");

Sets the instrument's DC current monitor switch "ON".

WrtCmd("FUNC:SMON:IDC?");

Returns 1, indicating that the DC current monitor switch is currently "on".

8.1.8.8 FUNCtion: DEV<n>:MODE

Description：Sets the deviation measurement mode of the instrument, character? can query the current deviation measurement mode status.

Command syntax: FUNCtion:DEV<n>:MODE ABSolute / PERCent / OFF

Query syntax: FUNCtion:DEV<n>:MODE?

Query return: ABS / PERC / OFF<NL^END>.

Parameters:

ABSolute Absolute value deviation display

PERCent Percentage deviation display

OFF Measured value is directly displayed

<n>: Character 1 indicates setting the deviation mode for the primary parameter, and character 2 indicates setting the deviation mode for the secondary parameter.

Example:

WrtCmd("FUNC:DEV1:MODE ABS");

Sets the deviation mode ABS of the main parameter.

WrtCmd("FUNC:DEV2:MODE?");

Returns ABS, indicating that the current deviation mode of the subparameter is ABS.

8.1.8.9 FUNCtion:DEV<n>:REFerence

Description：Sets the deviation nominal value of the instrument, character? can query the current deviation nominal value.

Command syntax: FUNCtion:DEV<n>:REFerence<value>

Query syntax: FUNCtion:DEV<n>:REFerence?

Query return: <NR3><NL^END>

Parameters:

<value> can be NR1, NR2, NR3 data format.

<n>: Character 1 indicates the setting of the deviation nominal value for the primary parameter, character 2 indicates the setting of the deviation nominal value for the secondary parameter.

Example:

WrtCmd("FUNC:DEV1:REF 10");

Sets the deviation nominal value of the main parameter 10.

WrtCmd("FUNC:DEV2:REF?");

Returns 10, indicating that the current subparameter deviates from the nominal value of 10.

8.1.8.10 FUNCtion:DEV<n>:REFerence:FILL

DESCRIPTION: Sets the deviation nominal value of the instrument, which controls the instrument to measure once and then replicate the primary and secondary parameter results as the deviation nominal value.

Command syntax: FUNCtion:DEV<n>:REFerence:FILL

Parameters:

<n>: either character 1 or character 2 sets the nominal value of the deviation of the primary and secondary parameters.

Example:

WrtCmd("FUNC:DEV1:REF:FILL");

Sets the deviation nominal value of the primary and secondary parameters.

8.1.8.11 FUNCtion:StepDELay

Description：Set the step delay time of the instrument, character? can query the current step delay time parameter.

Command syntax: StepDELay <value> / MIN / MAX

Query syntax: FUNC:SDEL?

Query return: <NR3><NL^END>

Parameters:

<value>: NR1, NR2, NR3 data format, 0-60 second time with 1mS resolution.

MIN: Sets the delay parameter to 0 seconds.

MAX: Sets the delay parameter to 60 seconds.

Example:

WrtCmd("FUNC:SDEL 5S");

Sets the step delay parameter to 5 seconds.

WrtCmd("FUNC:SDEL?").

Returns 5, indicating that the current step delay parameter is 5 seconds.

8.1.9 LIST Subsystem

The LIST subsystem command set is mainly used to set the list scanning measurement function, the scanning point setting, the scanning mode setting, and the scanning comparison limit setting.

The command tree is as follows:

```
LIST ─┬─ :MODE   SEQuence
      │          STEPped
      ├─ :TOTAL <value>
      ├─ :CH ── :MODE  SINGle
      │                MULTi
      ├─ :LENGth   0m
      │            1m
      │            2m
      └─:BAND<n> ─┬─ :CH          <value>
                  ├─ :BIAS ─┬─ :VOLTage   <value>
                  │         └─ :CURRent   <value>
                  ├─ :FREQuency   <value>
                  ├─ :LEVel ─┬─ :AC ─┬─ :VOLTage   <value>
                  │          │       └─ :CURRent   <value>
                  │          └─ :DC ─── :VOLTage   <value>
                  └─ :FUNC    CPD
                              CPQ
                              CPG
                              CPRP
                              CSD
                              CSQ
                              CSRS
                              LPQ
                              LPD
                              LPG
                              LPRP
                              LPRD
                              LPZ
                              LSD
                              LSQ
                              LSRS
                              LSRD
                              LSZ
                              RX
                              RSQ
                              RPQ
                              ZTD
                              ZTR
                              GB
                              YTD
                              YTR
                              DCR
```

```
      ├── :LIMit ──┬── :MODE  ABSolute
      │            │          PERCent
      │            ├── :A ──┬ :LOW         <value>
      │            │        └ :HIGH        <value>
      │            └── :B ──┬ :LOW         <value>
      │                     └ :HIGH        <value>
      ├── :SPEED       FAST
      │                MEDium
      │                SLOW
      ├── :AVeraGe     <value>
      ├── :ALC         ON
      │                OFF
      ├── :POL         AUTO
      │                FIX
      ├── :RANGe ─┬ :AC         AUTO
      │           │                 HOLD
      │           │                 <value>
      │           ├── :DC           AUTO
      │           │                 HOLD
      │           │                 <value>
      │           └── :DCI          AUTO
      │                             HOLD
      │                             <value>
      ├── :ISO         ON
      │                OFF
      ├── :CORRection ─┬ :OPEN ──┐
      │                │         └── :STATe    ON
      │                │                       OFF
      │                ├ :SHORt ─┐
      │                │         └── :STATe    ON
      │                │                       OFF
      │                └ :LOAD ──┬── :STATe    ON
      │                          │             OFF
      │                          └── :REFerence ──┬ :A  <value>
      │                                           └ :B  <value>
      ├── :STD         <value>
      │                STEP1
      ├── :DELay       <value>
      │                MIN
                       MAX
── :DISPlay   :┬ FREQ  <value>
               │       ON
                        OFF
```

:ACLV	<value>
	ON
	OFF
:BIAS	<value>
	ON
:FUNC	<value>
	ON
	OFF
:MAIN	<value>
	ON
	OFF
:MPER	<value>
	ON
	OFF
:COMP	<value>
	ON
	OFF
:DCLV	<value>
	ON
	OFF
:ACRNG	<value>
	ON
	OFF
:CH	<value>
	ON
	OFF
:ALOW	<value>
	ON
	OFF
:AHIGH	<value>
	ON
	OFF
:BLOW	<value>
	ON
	OFF
:BHIGH	<value>
	ON
	OFF
:SPEED	<value>
	ON
	OFF
:SUB	<value>
	ON
	OFF

```
│                         │── :STD       <value>
│                         │              ON
│                         │              OFF
│                         │── :DELAY     <value>
│                         │                 ON
│                         │                 OFF
│                         │── :AVG         <value>
│                         │                 ON
│                         │                 OFF
│                         │── :DCIRNG    <value>
│                         │                 ON
│                         │                 OFF
│                         │── :DCRNG      <value>
│                                           ON
│                                           OFF
│── :RESTart
│── :CLEar  <value>
                  ALL
```

8.1.9.1 LIST:MODE

Description: Sets the instrument list scanning mode. You can query the current instrument list scanning mode.

Command syntax: LIST:MODE SEQuence / STEPped

Query syntax: LIST:MODE?

Query return: SEQ / STEP <NL^END>

Parameters:

SEQuence Sequential mode.

STEPped Single-step mode.

Example:

WrtCmd("LIST:MODE SEQ")

Sets the instrument list scanning mode to continuous mode.

WrtCmd("LIST:MODE?")

Returns SEQ, indicating that the current instrument list scanning mode is continuous mode.

8.1.9.2 LIST:TOTAL

Description: Sets the total number of points scanned for the instrument list. The total number of points currently set can be queried.

Command syntax: LIST:TOTAL <value>

Query syntax: LIST:TOTAL?

Query return: <NR1><NL^END>

Parameter <value>:

NR1 data format in the range 1-10 (inclusive of 1 and 10).

Example:

WrtCmd("LIST:TOTAL 10")

Sets the total number of scanning points to 10.

WrtCmd("LIST:TOTAL?")

Returns 10, indicating that the total number of points currently set is 10.

8.1.9.3 LIST:CH:MODE

Description: Sets the scanning channel mode of the instrument list. The currently set channel mode can be queried.

Command syntax: LIST:CH:MODE SINGle / MULTi

Query syntax: LIST:CH:MODE?

Query return: SING / MULT <NL^END>

Parameters:

SINGle Single Channel Mode

MULTi Multi-Channel Mode

Example:

WrtCmd("LIST: CH:MODE MULT")

Sets the instrument list scanning channel mode to multi-channel mode.

WrtCmd("LIST: CH:MODE?")

Returns MULT, indicating that the currently set channel mode is multichannel mode.

8.1.9.4 LIST:LENGth

Description: Sets the cable length used for instrument list scanning. You can query the cable length currently used.

Command syntax: LIST:LENGth 0m / 1m / 2m

Query syntax: LIST:LENGth?

Query return: 0m / 1m / 2m <NL^END>.

Example:

WrtCmd("LIST:LENGth 1m")

Sets the cable length for instrument list scanning to 1 meter.

WrtCmd("LIST:LENGth?")

Returns 1, indicating that the cable length currently in use is set to 1 meter.

8.1.9.5 LIST:BAND<n>:CH

Description: Sets the channel used for the nth point in the instrument list scanning setup table. You can query the channel used for the nth point in the current table.

Command syntax: LIST:BAND<n>:CH <value>

Query syntax: LIST:BAND<n>:CH?

Query return: <NR1><NL^END>

Parameters:

<n> : nth line scan point, range 1~10 (NR1 format)

<value>: for NR1 data format, range 1~8.

Example:

WrtCmd("LIST:BAND3:CH 2")

The channel used for point 3 in the Setup Instrument List Scan Settings form is channel 2.

WrtCmd("LIST:BAND3:CH?")

Returns 2, indicating that the channel used for point 3 in the current table is channel 2.

8.1.9.6 LIST:BAND<n>:BIAS:VOLTage

Description: Sets the bias voltage of the nth point. The bias voltage of the nth point can be queried.

Command syntax: LIST:BAND<n>:BIAS:VOLTage <value>

Query syntax: LIST:BAND<n>:BIAS:VOLTage?

Query return: <value><NL^END>

Parameters.

<value>: NR1, NR2 or NR3 data format

Example:

WrtCmd("LIST:BAND3:BIAS:VOLTage 2")

Sets the bias voltage at point 3 to 2V.

WrtCmd("LIST:BAND3:BIAS:VOLTage?")

Returns 2, indicating that the current bias voltage at point 3 is 2V.

8.1.9.7 LIST:BAND<n>:BIAS:CURRent

Description: Sets the bias current of the nth point. You can query the bias current of the nth point.

Command syntax: LIST:BAND<n>:BIAS:CURRent <value>

Query syntax: LIST:BAND<n>:BIAS:CURRent?

Query return: <value><NL^END>

Parameters:

<value>: NR1, NR2 or NR3 data format

Example:

WrtCmd("LIST:BAND3:BIAS:CURRent 0.05")

Sets the bias current at point 3 to 0.05A.

WrtCmd("LIST:BAND3:BIAS:CURRent?")

Returns 0.05, indicating that the current bias current at point 3 is 0.05A.

8.1.9.8 LIST:BAND<n>:FREQuency

Description: Sets the test frequency of the nth point. You can query the test frequency of the nth point.

Command syntax: LIST:BAND<n>:FREQuency <value>

Query syntax: LIST:BAND<n>:FREQuency?

Query return: <value><NL^END>

Parameters:

<value>: NR1, NR2 or NR3 data format with or without k or M suffix.

Example:

WrtCmd("LIST:BAND3:FREQuency 10k")

Sets the test frequency for point 3 to 10kHz.

WrtCmd("LIST:BAND3:FREQuency?")

Returns 10, indicating that the current test frequency at point 3 is 10Hz.

8.1.9.9 LIST:BAND<n>:LEVel:AC:VOLTage

Description: Sets the AC voltage of the nth point. The AC voltage of the nth point can be queried.

Command syntax: LIST:BAND<n>:LEVel:AC:VOLTage <value>

Query syntax: LIST:BAND<n>:LEVel:AC:VOLTage?

Query return: <value><NL^END>

Parameters:

<value> : NR1, NR2 or NR3 data format

Example:

WrtCmd("LIST:BAND3:LEVel:AC:VOLTage 1.5")

Sets the AC voltage at point 3 to 1.5V.

WrtCmd("LIST:BAND3:LEVel:AC:VOLTage?")

Returns 1.5, indicating that the current AC voltage at point 3 is 1.5V.

8.1.9.10 LIST:BAND<n>:LEVel:AC:CURRent

Description: Sets the AC current of the nth point. The AC current of the nth point can be queried.

Command syntax: LIST:BAND<n>:LEVel:AC:CURRent <value>

Query syntax: LIST:BAND<n>:LEVel:AC:CURRent?

Query return: <value><NL^END>

Parameters.

<value>: NR1, NR2 or NR3 data format

Example:

WrtCmd("LIST:BAND3:LEVel:AC:CURRent 0.1")

Sets the AC current at point 3 to 0.1A.

WrtCmd("LIST:BAND3:LEVel:AC:CURRent?")

Returns 0.1, indicating that the current AC current at point 3 is 0.1A.

8.1.9.11 LIST:BAND<n>:LEVel:DC:VOLTage

Description: Sets the DC voltage of the nth point. The DC voltage of the nth point can be queried.

Command syntax: LIST:BAND<n>:LEVel:DC:VOLTage <value>

Query syntax: LIST:BAND<n>:LEVel:DC:VOLTage?

Query return: <value><NL^END>

Parameters.

<value>: NR1, NR2 or NR3 data format

Example:

WrtCmd("LIST:BAND3:LEVel:DC:VOLTage 1")

Sets the DC voltage at point 3 to 1V.

WrtCmd("LIST:BAND3:LEVel:DC:VOLTage?")

Returns 1, indicating that the current DC voltage at point n is 1V.

8.1.9.12 LIST:BAND<n>:FUNC

Description: Sets the test function of the nth point. The test function of the nth point can be queried.

Command syntax: LIST:BAND<n>:FUNC <function>

Query syntax: LIST:BAND<n>:FUNC?

Query return: <function><NL^END>.

Parameters <function>:

CPD	Set "Function" to Cp-D	LPRP	Set "Function" to Lp-Rp
CPQ	Set "Function" to Cp-Q	LSD	Set "Function" to Ls-D
CPG	Set "Function" to Cp-G	LSQ	Set "Function" to Ls-Q

CPRP	Set "Function" to Cp-Rp	LSRS	Set "Function" to Ls-Rs
CSD	Set "Function" to Cs-D	RX	Set "Function" to R-X
CSQ	Set "Function" to Cs-Q	ZTD	Set "Function" to Z-θ°
CSRS	Set "Function" to Cs-Rs	ZTR	Set "Function" to Z-θr
LPQ	Set the "Function" to Lp-Q	GB	Set "Function" to G-B
LPD	Set "Function" to Lp-D	YTD	Set "Function" to Y-θ°
LPG	Set "Function" to Lp-G	YTR	Set the "Function" to Y-θr
LPRD	Set the "Function" to Lp-Rd	RPQ	Set "Function" to Rp-Q
LSRD	Set "Function" as Ls-Rd	RSQ	Set "Function" as Rs-Q
LSZ	Set "Function" to Ls-Z	LPZ	Set "Function" to Lp-Z
DCR	Set the "Function" to DCR		

Example:

WrtCmd("LIST:BAND2:FUNC LSQ");

Sets the "Function" parameter in point 2 of the list scan to Ls-Q.

WrtCmd("LIST:BAND2:FUNC?");

Returns Ls-Q, indicating that the current list scanning point 2 "function" parameter is Ls-Q.

8.1.9.13 LIST:BAND<n>:LIMit:MODE

Description: Sets the limit mode of the nth point. The limit mode of the nth point can be queried.

Command syntax: LIST:BAND<n>:LIMit:MODE ABSolute / PERCent

Query syntax: LIST:BAND<n>:LIMit:MODE?

Query return: ABS / PERC <NL^END>.

Parameters:

ABSolute Absolute value deviation

PERCent Percentage deviation

Example:

WrtCmd("LIST:BAND3:LIMit:MODE ABS")

Sets the limit mode for point 3 as an absolute value deviation.

WrtCmd("LIST:BAND3:LIMit:MODE?")

Returns ABS, indicating that the current limit mode for point 3 is absolute deviation.

8.1.9.14 LIST:BAND<n>:LIMit:A:LOW

Description: Sets the lower limit of A at nth point. You can query the lower limit of the nth point A.

Command syntax: LIST:BAND<n>:LIMit:A:LOW <value>

Query syntax: LIST:BAND<n>:LIMit:A:LOW?

Query return: <value><NL^END>

Parameters.

<value>: NR1, NR2 or NR3 data format

Example:

WrtCmd("LIST:BAND3:LIMit:A:LOW 2.5")

Sets the lower limit of parameter A at point 3 to 2.5 Ω (the unit is selected according to the function, e.g. function R-X).

WrtCmd("LIST:BAND3:LIMit:A:LOW?")

Returns 2.5, indicating that the lower limit of parameter A is currently 2.5 Ω at point 3 (the unit is selected according to the function, e.g. function R-X).

8.1.9.15 LIST:BAND<n>:LIMit:A:HIGH

Description: Sets the upper limit of A at nth point. You can query the upper limit of the nth point A.

Command syntax: LIST:BAND<n>:LIMit:A:HIGH <value>

Query syntax: LIST:BAND<n>:LIMit:A:HIGH?

Query return: <value><NL^END>

Parameters:

<value>: NR1, NR2 or NR3 data format

Example:

WrtCmd("LIST:BAND3:LIMit:A:HIGH 5")

Sets the upper limit of parameter A in point 3 to 5 Ω (the unit is selected according to the function, e.g. function R-X).

WrtCmd("LIST:BAND3:LIMit:A:HIGH?")

Returns 5, indicating that the upper limit of the parameter A is currently 5 Ω at point 3 (the unit is selected according to the function, e.g. function R-X)

8.1.9.16 LIST:BAND<n>:LIMit:B:LOW

Description: Sets the lower limit of nth point B. You can query the lower limit of the nth point B.

Command syntax: LIST:BAND<n>:LIMit:B:LOW <value>

Query syntax: LIST:BAND<n>:LIMit:B:LOW?

Query return: <value><NL^END>

Parameters:

<value>: NR1, NR2 or NR3 data format

Example:

WrtCmd("LIST:BAND3:LIMit:B:LOW 1")

Sets the lower limit of subparameter B at point 3 to 1Ω (the unit is selected according to the function, e.g. function Cp-Rp).

WrtCmd("LIST:BAND3:LIMit:B:LOW?")

Returns 1, indicating that the current lower limit of subparameter B at point 3 is 1Ω (ibid.).

8.1.9.17 LIST:BAND<n>:LIMIT:B:HIGH

Description: Sets the upper limit of B at nth point. The upper limit of the nth point B can be queried.

Command syntax: LIST:BAND<n>:LIMit:B:HIGH <value>

Query syntax: LIST:BAND<n>:LIMit:B:HIGH?

Query return: <value><NL^END>

Parameters:

<value>: NR1, NR2 or NR3 data format

Example:

WrtCmd("LIST:BAND3:LIMit:B:HIGH 3")

Sets the upper limit of subparameter B of point 3 to 3Ω (unit selected according to function, e.g. function Cp-Rp).

WrtCmd("LIST:BAND3:LIMit:B:HIGH?")

Returns 3, indicating that the current point 3 subparameter B has an upper limit of 3Ω (ibid).

8.1.9.18 LIST:BAND<n>:SPEED

Description: Sets the test speed of the nth point. The test speed of the nth point can be queried.

Command syntax: LIST:BAND<n>:SPEED FAST / MEDium / SLOW

Query syntax: LIST:BAND<n>:SPEED?

Query return: FAST / MEDium / SLOW <NL^END>

Parameters.

FAST:	Fast 130 times/sec.
MEDium:	Medium 11 times/sec.
SLOW:	Slow 4 times/sec.

Example:

WrtCmd("LIST:BAND3:SPEED MED")

Sets the test speed at point 3 to medium speed.

WrtCmd("LIST:BAND3:SPEED?")

Returns MED, indicating that the current test speed at point 3 is medium speed.

8.1.9.19 LIST:BAND<n>:AVeraGe

Description: Sets the average number of times for the nth point. You can query the average number of times for the nth point.

Command syntax: LIST:BAND<n>:AVeraGe <value>

Query syntax: LIST:BAND3:AVG?

Query return: <value><NL^END>

Parameters:

<value>: NR1 data format, range 1~255.

Example:

WrtCmd("LIST:BAND3:AVG 3")

Sets the average number of times point 3 is 3 times.

WrtCmd("LIST:BAND3:AVG?")

Returns 3, indicating that the current average number of times point 3 is 3.

8.1.9.20 LIST:BAND<n>:ALC

Description: Sets the automatic level control switch of the nth point. You can query the status of the automatic level control switch of the nth point.

Command syntax: LIST:BAND<n>:ALC ON / OFF / 1 / 0

Query syntax: LIST:BAND<n>:ALC?

Query return: <NR1><NL^END>

Parameters:

Character 1 is equivalent to ON.

Character 0 is equivalent to OFF.

Example:

WrtCmd("LIST:BAND2:ALC 1")

Sets the automatic level control for point 2 to ON.

WrtCmd("LIST:BAND2:ALC?")

Returns 1, indicating that the automatic level control is currently on at point 2.

8.1.9.21 LIST:BAND<n>:POL

Description: Sets the signal polarity of the bias current of the nth point. You can query the signal polarity status of the bias current at the nth point.

Command syntax: LIST:BAND<n>:POL AUTO / FIX / 1 / 0

Query syntax: LIST:BAND<n>:POL?

Query return: <NR1><NL^END>

Parameters:

Character 1 is equivalent to AUTO.

Character 0 (equivalent to FIX).

Example:

WrtCmd("LIST:BAND2:POL FIX")

Sets the signal polarity of the bias current at point 2 is fixed.

WrtCmd("LIST:BAND2:POL?")

Returns FIX, indicating that the signal polarity of the current bias current at point 2 is fixed.

8.1.9.22 LIST:BAND<n>:RANGe:AC

Description: Sets the AC range of the nth point. The AC range of the nth point can be queried.

Command syntax: LIST:BAND<n>:RANGe:AC AUTO / HOLD / <value>

Query syntax: LIST:BAND<n>:RANGe:AC?

Query return: <NR1> / <value><NL^END>.

Parameter <value>:

1	10	20	50	100
200	500	1000	2000	5000
10000	20000	50000	100000	

Example:

WrtCmd("LIST:BAND2:RANGe:AC AUTO")

Sets the AC range of point 2 to automatic mode.

WrtCmd("LIST:BAND2:RANGe:AC?")

Returns 10, indicating that the current AC range at point 2 is 10 Ω.

8.1.9.23 LIST:BAND<n>:RANGe:DC

Description: Sets the DC range of the nth point. The DC range of the nth point can be queried.

Command syntax: LIST:BAND<n>:RANGe:DC AUTO / HOLD / <value>

Query syntax: LIST:BAND<n>:RANGe:DC?

Query return: <NR1> / <value><NL^END>.

Parameter <value>:

10	20	50	100	
200	500	1000	2000	5000
10000	20000	50000	100000	

Example:

WrtCmd("LIST:BAND2:RANGe:DC AUTO")

Sets the DC range of point 2 to automatic mode.

WrtCmd("LIST:BAND2:RANGe:DC?")

Return to 10, set the DC range of point 2 to 10Ω.

8.1.9.24 LIST:BAND<n>:RANGe:DCI

Description: Sets the DCI range of the nth point. The DCI range of the nth point can be queried.

Command syntax: LIST:BAND<n>:RANGe:DCI AUTO / HOLD / <value>

Query syntax: LIST:BAND<n>:RANGe:DCI?

Query return: <NR1> / <value><NL^END>.

Range hold time<value><NL^END>

Note: Parameters require DCI isolation to be turned on to continue operation

Parameter <value>:

20uA 200uA 2mA 20mA 100mA

Example:

WrtCmd("LIST:BAND2:RANGe:DC 0.02")

Sets the DCI range of point 2 to 20mA.

WrtCmd("LIST:BAND2:RANGe:DC?")

Returns 0.02, indicating that the current DCI range at point 2 is 20mA.

8.1.9.25 LIST:BAND<n>:ISO

Description: Sets the DCI isolation control switch of the nth point. You can query the status of the DCI isolation switch at point n.

Command syntax: LIST:BAND<n>:ISO ON / OFF / 1 / 0

Query syntax: LIST:BAND<n>:ISO?

Query return: <NR1><NL^END>

Parameters:

Character 1 is equivalent to ON.

Character 0 is equivalent to OFF.

Example:

WrtCmd("LIST:BAND2:ISO 1")

Sets the DCI isolation control for point 2 to ON.

WrtCmd("LIST:BAND2:ISO?")

Returns 1, indicating that the current DCI isolation control at point 2 is ON.

8.1.9.26 LIST:BAND<n>:CORRection:OPEN

Description: Executes the open-circuit clearing action of the nth point, and return the clearing result automatically after the clearing is completed.

Command syntax: LIST:BAND<n>:CORRection:OPEN

Return result: <NR1><NL^END>

Parameters:

Character 1 indicates open circuit clearing success.

Character 0 indicates open circuit clearing failure.

Example:

WrtCmd("LIST:BAND2:CORRection:OPEN")

Returns 1, indicating that the open-circuit clearing action of point 2 is executed and the open-circuit clearing is successful.

8.1.9.27 LIST:BAND<n>:CORRection:OPEN:STATe

Description: Sets the open-circuit correction function of the nth point. You can query the current status of the open-circuit correction function of the nth point.

Command syntax: LIST:BAND<n>:CORRection:OPEN:STATeON / OFF / 1 / 0

Query syntax: LIST:BAND<n>:CORRection:OPEN:STATe?

Query return: <NR1><NL^END>

Parameters:

Character 1 is equivalent to ON.

Character 0 is equivalent to OFF.

Example:

WrtCmd("LIST:BAND2:CORRection:OPEN:STATe 0")

Sets the open-circuit correction function of point 2 to OFF.

WrtCmd("LIST:BAND2:CORRection:OPEN:STATe?")

Returns 0, indicating that the open-circuit correction function at point 2 is currently OFF.

8.1.9.28 LIST:BAND<n>:CORRection:SHORt

Description: Executes the short-circuit clearing action of the nth point. The result will be returned automatically after the zeroing is completed.

Command syntax: LIST:BAND<n>:CORRection:SHORt

Return result: <NR1><NL^END>

Parameters,

Character 1 indicates short-circuit clearing success.

The character 0 indicates short-circuit clearing failure.

Example:

WrtCmd("LIST:BAND2:CORRection:SHORt")

Returns 1, indicating that the short-circuit clearing action in point 2 is executed and the short-circuit clearing is successful.

8.1.9.29 LIST:BAND<n>:CORRection:SHORt:STATe

Description: Sets the short circuit correction function of nth point. You can query the current short-circuit correction function status of the nth point.

Command syntax: LIST:BAND<n>:CORRection:SHORt:STATe ON / OFF / 1 / 0

Query syntax: LIST:BAND<n>:CORRection:SHORt:STATe?

Query return: <NR1><NL^END>

Parameters:

Character 1 is equivalent to ON.

Character 0 is equivalent to OFF.

Example:

WrtCmd("LIST:BAND2:CORRection:SHORt:STATe 0")

Sets the short-circuit correction function at point 2 to OFF.

WrtCmd("LIST:BAND2:CORRection:SHORt:STATe?")

Returns 0, indicating that the short-circuit correction function at point 2 is currently OFF.

8.1.9.30 LIST:BAND<n>:CORRection:LOAD

Description: Performs the load correction action at point n.

Command syntax: LIST:BAND<n>:CORRection:LOAD

Return result: <NR1><NL^END>

Parameters,

Character 1 indicates load calibration success.

The character 0 indicates load correction failure.

Example:

WrtCmd("LIST:BAND2:CORRection:LOAD")

Returns 1, indicating that the load correction action at point 2 is executed and the load correction is successful.

8.1.9.31 LIST:BAND<n>:CORRection:LOAD:STATe

Description: Sets the short circuit correction function of nth point. You can query the current short-circuit correction function status of the nth point.

Command syntax: LIST:BAND<n>:CORRection:LOAD:STATe ON / OFF / 1 / 0

Query syntax: LIST:BAND<n>:CORRection:LOAD:STATe?

Query return: <NR1><NL^END>

Parameters:

Character 1 is equivalent to ON.

Character 0 is equivalent to OFF.

Example:

WrtCmd("LIST:BAND2:CORRection:LOAD:STATe 0")

Sets the load correction function at point 2 to OFF.

WrtCmd("LIST:BAND2:CORRection:LOAD:STATe?")

Returns 0, indicating that the load correction function is currently OFF at point 2.

8.1.9.32 LIST:BAND<n>:CORRection:LOAD:REFerence:A

Description: Sets the reference value of the nth point that the main parameter A participates in load correction. You can query the reference value of the nth point where the main parameter A participates in load correction.

Command syntax: LIST:BAND<n>:CORRection:LOAD:REFerence:A <value>

Query syntax: LIST:BAND<n>:CORRection:LOAD:REFerence:A?

Query return: <value><NL^END>

Parameters:

<value>: NR1, NR2 or NR3 data format

Example:

WrtCmd("LIST:BAND3:CORRection:LOAD:REFerence:A 0.5")

Sets the reference value of the main parameter Cp for participation in load correction at point 3 to 500mF (the unit is selected according to the function, e.g., function Cp-Q).

WrtCmd("LIST:BAND3:CORRection:LOAD:REFerence:A?")

Returns 0.5, indicating that the current reference value of the main parameter Cp at point 3 for participation in the load correction is 500mF (the unit is selected according to the function, e.g. function Cp-Q)

8.1.9.33 LIST:BAND<n>:CORRection:LOAD:REFerence:B

Description: Sets the reference value of the nth point sub parameter B to participate in load correction. You can query the reference value of the main parameter B participating in load correction at the nth point.

Command syntax: LIST:BAND<n>:CORRection:LOAD:REFerence:B <value>

Query syntax: LIST:BAND<n>:CORRection:LOAD:REFerence:B?

Query return:<NR3><NL^END>

Parameters:

<value>: NR1, NR2 or NR3 data format

Example:

WrtCmd("LIST:BAND3:CORRection:LOAD:REFerence:B 2")

Sets the reference value for the participation of the subparameter Q in the load correction at point 3 to 2 (the unit is selected according to the function, e.g. function Cp-Q).

WrtCmd("LIST:BAND3:CORRection:LOAD:REFerence:B?")

Returns 2, indicating that the current reference value for the participation of the subparameter Q in the load correction at point 3 is 2 (the unit is selected according to the function, e.g. function Cp-Q)

8.1.9.34 LIST:BAND<n>:STD

Description: Sets the nominal value of the nth point. The nominal value of the nth point can be queried.

Command syntax: LIST:BAND<n>:STD <value> / STEP1

Query syntax: LIST:BAND<n>:STD?

Query return: <value> / STEP1<NL^END>

Parameters:

<value>: NR1, NR2 or NR3 data format

STEP1: The result measured at point 1 of the list scan is used as the nominal value here.

Example:

WrtCmd("LIST:BAND3:STD 1")

Sets the nominal value of point 3 to 1F (unit selected according to function, e.g. function Cp-Q)

WrtCmd("LIST:BAND3:STD?")

Returns 1, indicating that the current nominal value at point 3 is 1F (units are selected according to function, e.g. function Cp-Q)

8.1.9.35 LIST:BAND<n>: DELay

Description: Sets the step delay time of the nth point. You can query the step delay of the nth point.

Command syntax: LIST:BAND<n>:DELay <value> / MIN / MAX

Query syntax: LIST:BAND<n>:DELay?

Query return: <NR3><NL^END>

Parameters:

<value>: NR1, NR2, NR3 according to the format.

MIN: Sets the step delay time to 0s.

MAX: Sets the setup step delay time to 60s.

Example:

WrtCmd("LIST:BAND3:DELay 2")

Sets the 3rd point step delay to 2 seconds.

WrtCmd("LIST:BAND3:DELay?")

Return 2, can't current point 3 step delay is 2 seconds.

8.1.9.36 LIST:DISPlay

Description: Sets the display settings when the list is scanned.

Command syntax：LIST:DISPlay:<Item> <value> / ON / OFF

Parameters:

<Item> is specified as follows:

FREQ Set display item: Frequency ACLV Set display item: AC level

BIAS Set display items: DC bias FUNC Set display item: Function

MAIN Set display items: Main parameters MPER Set display items: Main parameters (%)

COMP Set display item: Comparison result DCLV Set display item: DC level

ACRNG Set display item: AC range CH Set display item: Channel

ALOW Set display item: A lower limit AHIGH Set display item: A upper limit

BLOW Set display item: B lower limit BHIGH Set display item: B upper limit

SPEED Set display item: Speed SUB Set display item: Sub-parameter

STD Set display item: Nominal value DELAY Set display item: time delay

AVG Set display items: Average DCIRNG Set display item: DCI range

DCRNG Set display item: DC range

<value>: NR1 data format

Query syntax: LIST: DISPlay:<Item>?

Query return: <NR3>,<ON/OFF><NL^END>.

Example:

WrtCmd("LIST:DISPlay:MAIN ON")

Displays main parameter results in a list scan.

WrtCmd("LIST:DISPlay:MAIN 3")

Sets the display order of the main parameters to 3. If the display of 1 and 2 is not turned on in front, the display of the main parameters will be in the first column.

WrtCmd("LIST:DISPlay:MAIN?")

Returns 3, ON; indicates that the current display order of the main parameter is 3 and the parameter is displayed. If the display of 1 and 2 is not turned on, the display of the main parameter will be in the first column.

8.1.9.37 LIST:RESTart

DESCRIPTION: Restarts the list scan from point 1.

Command syntax: LIST:RESTart

8.1.9.38 LIST:CLEar:ALL

Description: Clears the setup data for all scanned points.

Command syntax: LIST:CLEar:ALL

8.1.10 APERture Subsystem

Describes the speed used to set the measurement, the average number of times used in the measurement. Characters? Allows you to query the speed of the current measurement, the average number of times used in the measurement.

Command syntax:

APERture FAST / MEDium / SLOW[,<value>]

Query syntax: APERture?

Query return: FAST / MEDium / SLOW[,<NR1>]<NL^END>.

Parameters:

FAST: Fast 130 times per second.

MEDium: Medium 11 times per second.

SLOW: Slow 4 times per second.

<value> 1 to 255 (NR1) average number.

Example:

WrtCmd("APER MED,55").

The measurement speed is set to medium, and the average number of measurements used is 55.

WrtCmd("APER?").

Returns MED,55, indicating that the current measured speed is medium, and the average number of times used in the measurement is 55

8.1.11 TRIGger Subsystem

The TRIGger subsystem command set is used to set the trigger source for the instrument, the delay time after triggering, and to trigger instrument measurements.

Command Tree:

```
TRIGger ──┬── [:IMMediate]
          ├── :SOURce INTernal
          │           EXTernal
          │           BUS
          │           HOLD
          └── :DELay  <value>
                      MIN
                      MAX
```

8.1.11.1 TRIGger:IMMediate

DESCRIPTION: Performs a trigger instrument measurement once.

Command syntax: TRIGger[:IMMediate]

8.1.11.2 TRIGger:SOURce

Description: Sets the trigger source mode of the instrument, character? can query the current trigger source mode.

Command syntax: TRIGger:SOURce INTernal / EXTernal / BUS / HOLD

Query syntax: TRIGger:SOURce?

Query return: INT / EXT / BUS / HOLD<NL^END>

Parameters:

INTernal Automatically triggered by the instrument and is the default setting of the instrument.

EXTernal Triggered by the HANDLER interface.

BUS Triggered by RS232 interface, GPIB interface, USB interface, LAN interface, etc. with command.

HOLD Triggered by pressing TRIGGER at the panel.

Example:

WrtCmd("TRIG:SOUR BUS").

Sets the trigger source mode of the instrument to bus mode.

WrtCmd("TRIG:SOUR?");

Returns BUDS, indicating that the current trigger source mode of the instrument is bus mode.

8.1.11.3 TRIGger:DELay

Description：Sets the delay time after the instrument is triggered, character? can query the current delay time parameter.

Command syntax: TRIGger:DELay <value> / MIN / MAX

Query syntax: TRIGger:DELay?

Query return: <NR3><NL^END>

Parameters:

<value>: NR1, NR2, NR3 According to the format, 0-60 seconds time with 1mS resolution.

MIN: Sets the delay parameter to 0 seconds.

MAX: Sets the delay parameter to 60 seconds.

Example:

WrtCmd("TRIG:DEL 5S").

Sets the delay parameter to 5 seconds.

WrtCmd("TRIG:DEL?");

Returns 5, indicating that the current delay parameter is 5 seconds.

8.1.12 FETCh? Subsystem

The FETCh? subsystem command set is used to have the TH2836 output a measurement.

Command Tree:

```
FETCh ──┬── [:IMP]?
        └── :Source MONitor ──┬── :VAC?
                              └── :IAC?
```

8.1.12.1 FETCh[:IMP]?

DESCRIPTION: Causes the TH2836 to send the result of the last measurement to the TH2836's output buffer.

Query syntax: FETCh[:IMP]?

Example: (last measurement transmitted)

WrtCmd("TRIG:SOUR BUS").

WrtCmd("TRIG").

WrtCmd("FETC?").

The TH2836 provides ASCII codes for result data transfer as follows.

The ASCII data output format in the component measurement display, file number display, and file count display is described below:

SN.NNNNNESNN	,	SN.NNNNNESNN	,	SN	,	SN or SNN	NL^END
<DATA A>		<DATA B>		<Status>		<Bin Number>	

Parameter <DATA A>,<DATA B> Format: <DATA A> (primary parameter measurement data), <DATA B> (secondary parameter measurement data) use the 12-bit ASII code format as follows: SN.NNNNNNESNN (S: +/-, N: 0 to 9, E: Exponent Sign (Exponent Sign))

<Status> format: Using the 2-bit ASCII code feature length format SN (S: +/-, N: 0 to 4), the <Status> data will display the measurement status when the following measurement data is taken.

Status	Description
-1	(No data (in data buffer memory)
0	General measurement Data
+1	Analog bridge imbalance
+2	A/D conversion does not work
+3	Signal source overload
+4	Constant voltage not adjustable

Table 8-1 Status

Note: When <State> is -1, 1 or 2, the measured data is +9.99999E+37. When <State> is 0, 3 or 4, the actual measured data is exceeded.

<Stall number> format: Using 2 to 3 digits of ASCII code characteristic data length SN or SNN (S: +/-, N: 0 to 9), this data displays the result of stall number sorting as shown below:

Data	Sorting Results
0	Exceedingly poor
+1	Bin 1
+2	Bin 2
+3	Bin 3
+4	Bin 4
+5	Bin 5
+6	Bin 6
+7	File 7
+8	Bin 8
+9	File 9

+10	Subsidiary bin

Table 8-2 File Number

Note: The <file number> data will be displayed only when the instrument comparison function is set to ON.

The ASCII data output format in the list scanning display page is shown in Figure 6, and the loop data is substituted for the scanning point number.

[SN.NNNNNESNN] [,] [SN.NNNNNESNN] [,] [SN] [,] [SN NL^END] (repeated with [,])

<DATA A> <DATA B> <Status> <Discrimination>

Parameters <DATA A>,<DATA B>,<Status> are described as above.

<Discrimination> is described as follows: <Input/Output> format, this data displays the result of the list scan comparison function. When the list scan measurement comparison function is turned off (OFF), the <Input/Output> data output result is 0.

<Input/Output> The data output format uses a 2-bit ASCII fixed-length format as follows: SN (S: +/-, N: 0 to 1)

Data	Results
-1	Relatively low
0	Good
+1	Relatively high

able 8-3 Judgment

8.1.12.2 :FETCH:SourceMONitor

- Description: Returns the results of voltage monitoring and current monitoring.

Query Syntax:

:FETCH:SourceMONitor:VAC?

:FETCH:SourceMONitor:IAC?

8.1.13 CORRection Subsystem

The CORRection subsystem command set is used to set the user calibration function, open circuit, short circuit, and load calibration settings.

Command Tree:

CORRection :LENGth <value>

:OPEN :STATe ON (1)

OFF (0)

```
        :SHORt          :STATe      ON (1)
                                    OFF (0)
        :LOAD           :STATe      ON (1)
                                    OFF (0)
                        :TYPE       CPD
                                    CPQ
                                    CPG
                                    CPRP
                                    CSD
                                    CSQ
                                    CSRS
                                    LPQ
                                    LPD
                                    LPG
                                    LPRP
                                    LSD
                                    LSQ
                                    LSRS
                                    RX
                                    ZTD
                                    ZTR
                                    GB
                                    YTD
                                    YTR
        :SPOT<n>        :STATe      ON (1)
                                    OFF (0)
                        :FREQuency <value>
                        :OPEN
                        :SHORt
                        :LOAD       :STANdard <REF.A>, <REF.B>
        :USE            :DATA?
        :CLEAR
```

8.1.13.1 CORRection:LENGth

Description: Sets the calibration cable length of the instrument, character? can query the current set cable length.

Command syntax: CORRection:LENGth <value>

Query syntax: CORRection:LENGth?

Query return: <NR1><NL^END>

The parameter <value> is 0, 1, 2 or 4 plus the suffix unit M.

Example:

WrtCmd("CORR: LENG 1M").

Sets the cable length of the instrument to 1 meter.

WrtCmd("CORR:LENG?");

Returns 1, indicating that the current instrument cable length is 1 meter.

8.1.13.2 CORRection:OPEN

DESCRIPTION: Performs 51 preset test point open circuit calibration data (TH2836 is 51 preset test points).

Command syntax: CORRection:OPEN

8.1.13.3 CORRection:OPEN:STATe

Description: Sets the open-circuit calibration function of the instrument, character? can query the current status of the instrument's open-circuit calibration function.

Command syntax: CORRection:OPEN:STATe ON / OFF / 1 / 0

Query syntax: CORRection:OPEN:STATe?

Query return: <NR1><NL^END>

Parameters:

Character 1 is equivalent to ON and allows open circuit correction.

Character 0 is equivalent to OFF and prohibits open-circuit correction.

Example:

WrtCmd("CORR:OPEN:STAT ON")

Sets the instrument's open-circuit calibration function to ON.

WrtCmd("CORR:OPEN:STAT?")

Returns 1, indicating that the open-circuit correction function of the current instrument is ON.

8.1.13.4 CORRection:SHORt

Description: Performs 51 preset test point short circuit calibration data (TH2836 is 51 preset test points).

Command syntax: CORRection:SHORt

Example: WrtCmd("CORR:SHOR")

8.1.13.5 CORRection:SHORt:STATe

Description: Sets the instrument short-circuit correction function, character? can query the current short-circuit calibration status of the instrument.

Command syntax: CORRection:SHORt:STATe ON / OFF / 1 / 0

Query syntax: CORRection:SHORt:STATe?

Query return: <NR1><NL^END>

Parameters:

Character 1 is equivalent to ON and allows short-circuit correction.

Character 0 is equivalent to OFF and prohibits short-circuit correction.

Example:

WrtCmd("CORR:SHOR:STAT ON")

Sets the instrument's short-circuit calibration function to ON.

WrtCmd("CORR:SHOR:STAT?")

Returns 1, indicating that the short-circuit correction function of the current instrument is ON.

8.1.13.6 CORRection:LOAD:STATe

Description: Sets the instrument load correction function, character? can query the current status of load calibration function.

Command syntax: CORRection:LOAD:STATe ON / OFF / 1 / 0

Query syntax: CORRection:LOAD:STATe?

Query return: <NR1><NL^END>

Parameters:

Character 1 is equivalent to ON and allows for load correction.

Character 0 is equivalent to OFF and disables load correction.

Example:

WrtCmd("CORR:LOAD:STAT ON")

Sets the load correction function of the instrument to ON.

WrtCmd("CORR:LOAD:STAT?")

Returns 1, indicating that the load correction function of the current instrument is

ON.

8.1.13.7 CORRection:LOAD:TYPE

Description: Sets the measured combination parameter function of the instrument load correction, character? can query the current combination parameter type.

Command syntax: CORRection:LOAD:TYPE <function>

Query syntax: CORRection:LOAD:TYPE?

Query return: <function><NL^END>.

Parameters <function>:

CPD	Set "Function" to Cp-D	LPRP	Set "Function" to Lp-Rp
CPQ	Set "Function" to Cp-Q	LSD	Set "Function" to Ls-D
CPG	Set "Function" to Cp-G	LSQ	Set "Function" to Ls-Q
CPRP	Set "Function" to Cp-Rp	LSRS	Set "Function" to Ls-Rs
CSD	Set "Function" to Cs-D	RX	Set "Function" to R-X
CSQ	Set "Function" to Cs-Q	ZTD	Set "Function" to Z-θ°
CSRS	Set "Function" to Cs-Rs	ZTR	Set "Function" to Z-θr
LPQ	Set "Function" to Lp-Q	GB	Set "Function" to G-B
LPD	Set "Function" to Lp-D	YTD	Set "Function" to Y-θ°
LPG	Set "Function" to Lp-G	YTR	Set "Function" to Y-θr

Example:

WrtCmd("CORR:LOAD:TYPE CPD")

Sets the measured combination parameter function for instrument load correction to Cp-D.

WrtCmd("CORR:LOAD:TYPE?")

Returns CPD, indicating that the current instrument load-corrected measured combined parameter function is Cp-D

8.1.13.8 CORRection:SPOT<n>:STATe

Description: Used to set a specific calibration point, character? can query the status of current calibration point.

Command syntax: CORRection:SPOT<n>:STATe ON / OFF / 1 / 0

Query syntax: CORRection:SPOT<n>:STATe?

Query return: <NR1><NL^END>

Parameters:

Character 1 is equivalent to ON.

Character 0 is equivalent to OFF.

<n>: one of 1-10 points

Example:

WrtCmd("CORR:SPOT1:STAT ON")

Sets the calibration function of calibration point 1 to ON.

WrtCmd("CORR:SPOT1:STAT?")

Returns 1, indicating that the calibration function of the current calibration point 1 is turned on.

8.1.13.9 CORRection:SPOT<n>:FREQuency

Description: Sets the frequency of specific calibration point, character? can query the current calibration point frequency.

Command syntax: CORRection:SPOT<n>:FREQuency <value>

Query syntax: CORRection:SPOT<n>:FREQuency?

Query return: <value><NL^END>

Parameters:

<value>: NR1, NR2 or NR3 data format plus HZ, kHZ and MHZ suffix of the parameter. The range should be between 20HZ ~ 8.5MHZ (TH2836), otherwise the return data is wrong.

<n>: 1 - 1 of 10 points

Example:

WrtCmd("CORR:SPOT1:FREQ 2kHZ")

Sets the frequency of calibration point 1 to 2kHz.

WrtCmd("CORR:SPOT1:FREQ?")

Returns 2k, indicating that the current frequency of calibration point 1 is 2kHz.

8.1.13.10 CORRection:SPOT<n>:OPEN

Description: Performs open-circuit calibration for specific calibration points of the instrument.

Command syntax: CORRection:SPOT<n>:OPEN

Parameters:

<n>: one of 10 points

Example:

WrtCmd("CORR:SPOT1:OPEN")

Opens circuit correction for calibration point 1.

8.1.13.11 CORRection:SPOT<n>:SHORt

Description: Performs short-circuit calibration for specific calibration points of the instrument.

Command syntax: CORRection:SPOT<n>:SHORt

Parameters:

<n>: one of 10 points

Example:

WrtCmd("CORR:SPOT1:SHOR");

Performs short-circuit correction for calibration point 1.

8.1.13.12 CORRection:SPOT<n>:LOAD:STANdard

Description: Load calibration for a specific calibration point of the instrument under the standard reference amount. You can query the standard reference amount of the current calibration load calibration of the instrument.

Command syntax: CORRection:SPOT<n>:LOAD:STANdard <REF.A>,<REF.B>

Query syntax: CORRection:SPOT<n>:LOAD:STANdard?

Query return: <REF.A>,<REF.B><NL^END>

Parameters:

<n>: one of 1 to 10 points

<REF.A>: Data format for NR1, NR2 or NR3, standardized reference quantity for the main parameters.

<REF.B>: Data format for NR1, NR2 or NR3, standardized reference quantity for subparameters.

Example:

WrtCmd("CORR:SPOT1:LAOD:STAN 0.0017,2");;

Sets correction point 1 Load correction at standard reference amount A: 1.7 mF, B: 2 (units selected according to function, e.g. function Cp-Q).

WrtCmd("CORR:SPOT1:LAOD:STAN?");;

Returns 0.0017,2, indicating the load correction at the current correction point 1 standard reference A: 1.7mF, B: 2 (units selected according to function, e.g. function Cp-Q).

8.1.13.13 CORRection:USE:DATA?

Description: The query returns 201 calibration point open/short/load calibration measurements.

Query syntax: CORRection:USE:DATA?

Query return:

<open1 A>,<open1 B>,<short1 A>,<short1 B>,<load1 A>,<load1 B>.

<open2 A>,<open2 B>,<short2 A>,<short2 B>,<load2 A>,<load2 B>.

<open3 A>,<open3 B>,<short3 A>,<short3 B>,<load3 A>,<load3 B>.

......,

<open201 A>,<open201 B>,<short201 A>,<short201 B>,<load201 A>,<load201 B>

Parameters:

<open n A> NR3 data format for main parameter open calibration data at calibration point n.

<open n B> NR3 data format for subparameter open correction data at correction point n.

<short n A> NR3 data format for the main parameter short-circuit correction data at correction point n.

<short n B> NR3 data format for subparameter short-circuit correction data at correction point n.

<load n A> NR3 data format for the main parameter load correction data at correction point n.

<load n B> NR3 data format for subparameter load correction data at correction point n.

8.1.13.14 CORRection:CLEar

Description: Clears the calibration data for all calibration points.

Command syntax: CORRection:CLEar

8.1.14 COMParator Subsystem

The COMParator subsystem command set is used to set the file comparator function, including the setting of the compare switch and the setting of the limit list.

Command Tree:

```
COMParator ─┬─ [:STATe]   ON (1)
            │                  OFF (0)
            ├── :MODE Absolute    TOLerance
            │                     Percent TOLerance
            │                     SEQuence
            ├── :TOLerance ─┬─ :NOMinal <value>
            │               └─ :BIN<n> <low limit>,<high limit>
            ├── :SEQuence ── :BIN   <BIN1 low limit>,<BIN1 high limit>, <BIN2
            │                       high limit>, <BIN3 high limit>, <BINn high
            │                       limit>
            ├── :Secondary LIMit <low limit>, <high limit>
            ├── :Auxiliary BIN      ON (1)
            │                       OFF (0)
            ├── :SWAP     ON (1)
            │             OFF (0)
            └── :BIN ──────┬─ :CLEar
                           └─ :COUNt ───┬─ [:STATe]
                                        ├─ :DATA?
                                        └─ :CLEar
```

8.1.14.1 COMParator[:STATe]

Description: Sets the instrument comparison function on or off. You can query the current status of the comparison function.

Command syntax: COMParator[:STATe]ON / OFF / 1 / 0

Query syntax: COMParator[:STATe]?

Query return: <NR1><NL^END>

Parameters:

Character 1 is equivalent to ON.

Character 0 is equivalent to OFF.

Example:

WrtCmd("COMP ON").

Sets comparison function ON.

WrtCmd("COMP?").

Returns 1, indicating that the comparison function is currently ON.

8.1.14.2 COMParator:MODE

Description: Sets the limit mode of instrument compare function, character? can query the limit mode currently set.

Command syntax: COMParator:MODE ATOLerance / PTOLerance / SEQuence

Query syntax: COMParator:MODE?

Query return: ATOL / PTOL / SEQ <NL^END>

Parameters:

ATOLerance Sets absolute error method.

PTOLerance Sets relative error method.

SEQuence Sets sequence method.

Example:

WrtCmd("COMP:MODE ATOL").

Sets the limit method of the instrument's comparison function to the absolute error method.

WrtCmd("COMP:MODE?");

Returns ATOL, indicating that the current instrument comparison function limit mode is the absolute error mode.

8.1.14.3 COMParator:TOLerance:NOMinal

Description: Sets the weighing amount of the error mode of the comparison function (this function is only effective when the limit mode is set as the error mode). It is possible to query the weighing amount of the current instrument with the error mode set.

Command syntax: COMParator:TOLerance:NOMinal <value>

Query syntax: COMParator:TOLerance:NOMinal?

Query return: <value><NL^END>

Parameters:

<value>：NR1, NR2 or NR3 data format weighing quantity.

Example:

WrtCmd("COMP:TOL:NOM 100E-12");

Sets the nominal quantity (main parameter) for the error method of the comparison function to 100pF (unit is selected according to the function, e.g., function Cp-Rp).

WrtCmd("COMP:TOL:NOM?");

Returns 100E-12, indicating that the current nominal quantity (main parameter) for the comparison function error mode is 100pF (units are selected according to the function, e.g. function Cp-Rp).

8.1.14.4 COMParator:TOLerance:BIN<n>

Description: Sets the upper and lower limit values of each step of the error mode of the comparison function (this function is only effective when the limit mode is set as the error mode). You can query the upper and lower limit values of each step of the current instrument setting.

Command syntax: COMParator:TOLerance:BIN<n><low limit>,<high limit>

Query syntax: COMParator:TOLerance:BIN<n>?

Query return: <low limit>,<high limit><NL^END>.

Parameters:

<n>: 1 to 9 (NR1): number of Bin numbers

<low limit>: NR1, NR2 or NR3 format data: lower limit data

<high limit>: NR1, NR2 or NR3 format data: upper limit data

Note: The lower limit data should be smaller than the upper limit data, otherwise an error message is prompted.

Example:

WrtCmd("COMP:TOL:BIN1 -5,5");

Sets Comparison Function Error Mode 1 Lower Limit -5F, Upper Limit 5F (unit selected according to function, e.g., function Cp-Rp).

WrtCmd("COMP:TOL:BIN1?");

Returns -5,5, indicating that the current comparison function error mode 1 Bin lower limit -5F, upper limit 5F (unit based on the function selection, such as function Cp-Rp).

8.1.14.5 COMParator:SEQuence:BIN

Description: Sets the upper and lower limit data for the continuous mode of the comparison function (this function is only effective when the limit mode is set to continuous mode). It is possible to query the value of the upper and lower limits of each Bin currently set by the instrument.

Command syntax: COMParator:SEQuence:BIN <BIN1 low limit>,<BIN1 high limit>,

<BIN2 high limit>,..., <BINn high limit>

Query syntax: COMParator:SEQuence:BIN?

Query return: <BIN1 low limit>,<BIN1 high limit>,<BIN2 high limit>,...,...

<BINn high limit><NL^END>

Parameters:

<BIN1 low limit> NR1, NR2 or NR3 data format, lower limit value for bin 1.

<BIN1 high limit> NR1, NR2 or NR3 data format, upper limit value for bin 1.

<BINn high limit> NR1, NR2 or NR3 data format, upper limit value of file n (n max. 9)

Note: The lower limit is smaller than the upper limit.

Example:

WrtCmd("COMP:SEQ:BIN 10,20,30,40,50");

Sets the lower limit of 10, the upper limit of 20, the upper limit of 30, the upper limit of 40, and the upper limit of 50 in the continuous mode of the comparison function (the unit is selected according to the function, e.g., the function Q-Cp).

WrtCmd("COMP:SEQ:BIN?");

Returns 10,20,30,40,50, indicating that the current comparison function continuous mode 1 lower limit of 10, upper limit of 20, 2 upper limit of 30, 3 upper limit of 40, 4 upper limit of 50 (the unit is selected according to the function, for example, function Q-Cp)

8.1.14.6 COMParator: Secondary LIMit

Description: Sets the upper and lower limit values of the subparameter of the comparison function of the instrument. You can query the current upper and lower limit values of subparameters of the instrument.

Command syntax: COMParator:SLIMit <low limit>,<high limit>

Query syntax: COMParator:SLIMit?

Query return: <low limit>,<high limit><NL^END>.

Parameters:

<low limit>: data in NR1, NR2 or NR3 format, is the lower limit value.

<high limit>: NR1, NR2 or NR3 format data, is the upper limit value.

Note: The upper limit should be greater than the lower limit, otherwise an error message is prompted.

Example:

WrtCmd("COMP:SLIM 0.001,0.002")

Sets the instrument comparison function subparameter lower limit 1mF, upper limit 2mF (the unit is selected according to the function, e.g. function Cp-Rp).

WrtCmd("COMP:SLIM?")

Returns 0.001,0.002, indicating that the current instrument compares the functional subparameters with the lower limit of 1mF and the upper limit of 2mF (the unit is selected according to the function, e.g. function Cp-Rp).

8.1.14.7 COMParator:Auxiliary BIN

Description: Sets Bin counting's subsidiary Bin switch. You can query the current status of the instrument's subsidiary Bin switch.

Command syntax: COMParator:Auxiliary BIN ON / OFF / 1 / 0

Query syntax: COMParator:Auxiliary BIN?

Query return: <NR1><NL^END>

Parameters:

Character 1 is equivalent to ON.

Character 0 is equivalent to OFF.

Example:

WrtCmd("COMP:ABIN ON")

Sets Bin counting's subsidiary Bin to ON.

WrtCmd("COMP:ABIN?")

Returns 1, indicating that the current Bin counting slave Bin is ON.

8.1.14.8 COMParator:SWAP

Description: Sets the switch of main and vice parameter pairwise comparison mode, for example: Function parameter: Cp-D, select: SWAP mode as ON, then the function parameter becomes: D-Cp; at this time, the parameter limit setting of 1~9 Bins becomes setting the upper and lower limits of D, and the 2and Bins set the limit of Cp. That is to say, if ON is selected, the main and secondary parameters will be compared in pairs; on the contrary, if OFF is selected, they will be compared in the original order. You can query the current instrument setting main and vice parameter pairwise comparison mode switching situation.

Command syntax: COMParator:SWAP ON / OFF / 1 / 0

Query syntax: COMParator:SWAP?

Query return: <NR1><NL^END>

Parameters:

Character 1 is equivalent to ON.

Character 0 is equivalent to OFF.

Example:

WrtCmd("COMP:SWAP ON");

Sets the primary and secondary parameter pairwise comparison modes to ON.

WrtCmd("COMP:SWAP?");

Returns 1, indicating that the current primary and secondary parameter pairwise comparison modes are ON.

8.1.14.9 COMParator:BIN:CLEar

Description: Clears the limit list to set the limit setting data for each Bin.

Command syntax: COMParator:BIN:CLEar

8.1.14.10 COMParator:BIN:COUNt[:STATe]

Description: Sets Bin counting function switch (ON/OFF), you can query the Bin counting switch situation of the current instrument.

Command syntax: COMParator:BIN:COUNt[:STATe] ON / OFF / 1 / 0

Query syntax: COMParator:BIN:COUNt[STATe]?

Query return: <NR1><NL^END>

Parameters:

Character 1 is equivalent to ON.

Character 0 is equivalent to OFF, which is equivalent to FIX.

Example:

WrtCmd("COMP:BIN:COUN ON")

Sets Bin counting function to ON.

WrtCmd("COMP:BIN:COUN?")

Returns 1, indicating that the current file counting function is ON.

8.1.14.11 COMParator:BIN:COUNt:DATA

Description: Querys the Bin count comparison result.

Query syntax: COMParator:BIN:COUNt:DATA?

Query return: <BIN1 count>,<BIN2 count>,...,<BIN9 count>,<OUT OF BIN count>, <AUX BIN count><NL^END>.

Parameters:

<BIN1-9 count>: NR1 data format, counting result for 1-9 steps.

<OUT OF BIN count>: NR1 data format, counting result for overdiff file.

<AUX BIN count>: NR1 data format, counting result for subsidiary files.

8.1.14.12 COMParator:BIN COUNt:CLEar

Description: Clears all stall count results.

Command syntax: COMParator:BIN:COUNt:CLEar

8.1.15 Mass MEMory Subsystem

The Mass MEMory subsystem command set is used for file saving and loading.

Command Tree:

```
Mass MEMory  ─┬─ :LOAD ──   :STATe <record number>
              └─ :STORe ──  :STATe <record number>,"<string>"
```

8.1.15.1 MMEMory:LOAD:STATe

Description: Loads a saved file.

Command syntax: MMEMory:LOAD:STATe <value>

Parameters:

<value>: Serial number of the file from 0 to 39 (NR1).

Example:

WrtCmd("MMEM:LOAD:STAT 1");

Loads the document No. 1.

8.1.15.2 MMEMory:STORe:STATe

Description: Saves the current instrument settings to a file.

Command syntax: MMEMory:STOR:STATe <value>,"<string>"

Parameters:

<value>: Serial number of the file from 0 to 39 (NR1).

<string>: ASCII string (up to 16)

Example:

WrtCmd("MMEM:STOR:STAT 1, "Resistor meas"")

Saves the current instrument settings to file #1, file name Resistor meas.

WrtCmd("MMEM:STOR:STAT 1");

Saves the current instrument settings to file #1, stored under the default file name.

8.2 GPIB Common Commands

●*RST	●*TRG	●*IDN	●*TST
●*ESE	●*SRE	●*ESR	●*STB
●*OPC	●*CLS		

8.2.1.1 *RST

Used to reset the instrument.

Command syntax: *RST

8.2.1.2 *TRG

Used to trigger instrument measurements and send the results to the instrument's output buffer.

Command syntax: *TRG

8.2.1.3 *CLS

Used to clear the standard event status register and the service request status register.

Command syntax: *CLS

8.2.1.4 *IDN?

Used to return the ID of the TH2839.

Query syntax: *IDN?

Query return: <manufacturer>,<model>,<firmware>,<HW_version>,<NL^END>.

Parameters:

<manufacturer>: Gives the name of the manufacturer (i.e. Tonghui).

<model>: Gives the machine model (e.g. TH2839).

<firmware>: Gives the software version number (e.g. VER1.0.0).

<HW_version>: Gives the hardware version number (e.g. HardWare Ver A5.0).

Example: WrtCmd("*IDN?").

8.2.1.5 *TST?

The self-test query command is used to perform internal self-test and give the self-test error message report. For TH2836 series products, the result of the query report is usually "0", i.e. no error.

Query syntax: *TST?

Query return: 0<NL^END>

8.2.1.6 *ESE

(Standard Event Status Enable command) The command sets the open bits of standard event status register. The query returns the open bits of standard event status register.

Command syntax: *ESE<value>

Query syntax: *ESE?

Query return: <value><NL^END>

Parameters:

<value>: NR1 format: decimal representation of each bit of the operation status register.

The definition of each byte of the event status register is represented below:

Bit Number	Description
7	Power On (PON) Bit: Power on Status Bit
6	User Request (URQ) Bit: User Request Bit
5	Command Error (EME) Bit: Command Error Bit
4	Execution Error (EXE) Bit: Execution Error Bit
3	Device Dependent Error (DDE) Bit: Device Dependent Error Bit
2	Query Error (QYE) Bit: Query Error Bit
1	Request Control (RQC) Bit: Request Control Bit
0	Operation Complete (OPC) Bit: Operation Complete Bit

8.2.1.7 *SRE

(Service Request Enable command) The command sets the open bits of the status byte register (the status byte register). The query returns the current setting of the status byte register.

Command syntax: *SRE<value>

Query syntax: *SRE?

Query return: <value><NL^END>

Parameters:

<value> is in NR1 format: the decimal representation of each allowed bit of the status byte register.

The status byte register bits are defined as indicated below:

Bit Number	Description
7	Operation Status Register Summary Bit: Operation Status Register Summary Bit
6	RQS (Request Service) Bit: Request Service Bit
5	Standard Event Status Register Summary Bit: Standard Event Status Register Summary Bit
4	MAV (Message Available) Bit: Message Available Bit
3-0	Always 0(zero): Always 0

8.2.1.8 *ESR?

The query returns the contents of the standard event status register.

Query syntax: *ESR?

Query return: <value><NL^END>

Parameters:

<value>: NR1 format: decimal representation of the contents of the standard event status register.

The definitions of each bit of the event status register are indicated below:

Bit Number	Description
7	Power On (PON) Bit: Power ON Status Bit
6	User Request(URQ) Bit: User Request Bit
5	Command Error (EME) Bit: Command Error Bit
4	Execution Error (EXE) Bit: Execution Error Bit
3	Device Dependent Error (DDE) Bit: Device Dependent Error Bit
2	Query Error (QYE) Bit: Query Error Bit
1	Request Control (RQC) Bit: Request Control Bit
0	Operation Complete (OPC) Bit: Operation Complete Bit

8.2.1.9 *STB?

Reads the contents of the service status word register. Execution of this command has no effect on the contents of the status word register.

Query syntax: *STB?

Query return: <value><NL^END>

Parameters:

<value>: NR1 format, decimal representation of the contents of the status word register.

The definitions of each bit of the status word are indicated below:

Bit Number	Description
7	Operation Status Register Summary Bit: Operation Status Register Summary Bit
6	RQS (Request Service) Bit: Request Service Bit
5	Standard Event Status Register Summary Bit: Standard Event Status Register Summary Bit
4	MAV (Message Available) Bit: Message Available Bit
3-0	Always 0(zero): always 0

8.2.1.10 *OPC

It is used to set the standard event status register OPC bit when the TH2836 series instrument has completed measurement of all parameters to be measured. When the instrument has completed all measurements, this command will tell the instrument to set the number in the instrument's output buffer in ASCII form "1", i.e., 49 in decimal.

Command syntax: *OPC

Query syntax: *OPC?

Query return: 1 <NL^END>

Example:

OUTPUT 717; "*OPC"!

It indicates that the OPC bit of the instrument is set when the execution of the previous command operation is completed.

Chapter 9 Appendice

9.1 Warranty

Warranty period: The warranty period of two years shall be calculated from the date of shipment of the instrument purchased from the Company by the user unit, and from the date of shipment of the instrument purchased from the operating department. Warranty should be issued by the instrument warranty card. During the warranty period, if the instrument is damaged due to improper operation by the user, the maintenance cost shall be borne by the user. The company is responsible for the lifetime maintenance of the instrument.

The maintenance of this instrument requires professional and technical personnel to carry out maintenance; maintenance, please do not replace the internal components of the instrument without authorization; maintenance of the instrument, the need to re-measure the calibration, so as not to affect the accuracy of the test. Due to the user blind maintenance, replacement of instrument components caused by damage to the instrument is not covered by the warranty, the user should bear the maintenance costs.

Instruments should be protected from sunlight and humidity and should be used properly in the environment described in 1.4.

When the instrument is not used for a long period of time, it should be sealed in the factory box.

9.2 Instruction manual change record

Instruction manual V1.0.0--2023/07

Company Statement:

What are described in this manual may not be all the contents of the instrument, and Tonghui reserves the right to make improvements and enhancements to the product's performance, functions, internal structure, appearance, accessories, packaging, etc. without further explanation! For any confusion caused by the inconsistency between the manual and the instrument, you may contact our company through the address on the cover.