Hantek

HT2810C series

LCR Meter

User Manual

202512

Warranties and Declarations

Copyright

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Product certification

Hantek certified the series LCR meter to meet China's national industry standards and has passed the CE certification.

Contact us

If you have any questions when using the products of Qingdao Hantek Electronic Co., LTD., you can obtain service and support through the following ways:
Email: service@hantek.com, support@hantek.com
Website: http://www.hantek.com

Contents

Figures

Tables

1 Safety Requirement

1.1 Summary of General Security

Read the following safety precautions carefully to avoid injury and to prevent damage to this product or any product connected. To avoid possible dangers, please use this product in accordance with the regulations.

- **Only professionally authorized personnel can perform repairs.**
- **Use the right power cable.**

  Use the power cable approved by the country in which the product is used only.
- **Do not operate with the cover open.**

  Do not run the product with the cover or panel open.
- **Avoid circuit exposure.**

  Do not touch exposed connectors and components after power is switched on.
- **Do not operate if the product is suspected to be faulty.**

  If you suspect that the product has been damaged, please ask qualified maintenance personnel to check it.
- **Maintain proper ventilation.**
- **Do not operate in a humid environment.**
- **Do not operate in inflammable or explosive environment.**
- **Please keep the product surface clean and dry.**

Warning:

Equipment that meets Class A requirements may not provide adequate protection for broadcast services in residential environments.

1.2 Safety Guidelines

To ensure the safe operation of the instrument, please adhere to the following guidelines:

- **Protective measures such as avoiding direct sunlight, preventing water and moisture ingress, shielding from electromagnetic radiation, and guarding against dust and explosions should be observed when using this instrument.**
- **Before use, please read and understand the warnings and safety information**

provided in this manual.

- **Operate the instrument only in accordance with the functional methods specified in the manual.**
- **When measuring components in a circuit, ensure that the circuit is powered off and all capacitors on the circuit are discharged before measurement.**
- **Prior to measurement, discharge any charged components, such as capacitors.**

1.3 Security Terms and Signs

Security terms in this manual:

Warning:

Indicates that the operation may not cause immediate damage to you.

Note:

Indicates that the operation may cause damage to the product or other property.

Safety terms on products:

Warning:

Indicates a potential hazard may be caused to you if you do not perform this operation.

Safety signs on the product:

Hazardous Voltage

Safety Warning

1.4 Measurement Category

Measurement category

This instrument can be used for measurement under class I.

Warning:

This instrument is only allowed to be used in the specified measurement class.

Measurement class definition

- **Class I refers to measurements taken on a circuit not directly connected to the main power supply.** For example, measurements made on circuits that are not exported from a main power supply, especially from a protected (internal) main power supply. In the latter case, the instantaneous stress will change. Therefore,

the user should understand the instantaneous capacity of the instrument.

- **Class II refers to measurements taken on a circuit directly connected to low-voltage instruments.** For example, measurements made on household appliances, portable tools, and similar equipment.
- **Class III refers to measurements taken on construction equipment.** For example, measurements made on switchboards, circuit breakers, circuits (including cables, busbars, junction boxes, switches, sockets) in fixed equipment, as well as equipment for industrial use and certain other equipment (for example, fixed motors permanently connected to fixed instruments).
- **Class IV refers to measurements taken at the source of low-voltage equipment.** For example, measurements made on electricity meters, primary overcurrent protection equipment, and pulse control units.

1.5 Ventilation Requirement

To ensure adequate ventilation, when using the instrument on a workbench or in a rack, maintain a clearance of at least 10 cm on both sides, above, and behind it.

Note:

Insufficient ventilation may cause the instrument to overheat, leading to damage to the instrument. Ensure proper ventilation during use.

1.6 Working Environment

Normal operating temperature for the instrument: 0°C to 40°C; operating humidity: 15% to 85% RH.

Warning:

To avoid short circuit or electric shock, do not operate the device in a damp environment.

Altitude

Operating: below 2 km
Non-operating: below 15 km

Installation (Overvoltage) Category

This product is powered by mains conforming to installation (overvoltage) category II.

Warning:

Ensure that no overvoltage (e.g. from lightning) reaches the product. Otherwise, the operator may be in danger of receiving electric shock.

Installation (Overvoltage) Category Definitions

Installation (overvoltage) category I refers to signal level which is applicable to

equipment measurement terminals connected to the source circuit. Among these terminals, precautions are done to limit the transient voltage to a low level. Installation (overvoltage) category II refers to the local power distribution level which is applicable to equipment connected to the AC line (AC power).

Pollution Degree

Pollution Degree 2

Pollution Degree Definition

- **Pollution Degree 1:** No pollution or only dry, nonconductive pollution occurs. The pollution has no effect. For example, a clean room or air-conditioned office environment.
- **Pollution Degree 2:** Normally only nonconductive pollution occurs. Temporary conductivity caused by condensation is to be expected. For example, indoor environment.
- **Pollution Degree 3:** Conductive pollution or dry nonconductive pollution that becomes conductive due to condensation occurs. To be found in industrial environment or construction sites (harsh environments). For example, sheltered outdoor environment.
- **Pollution Degree 4:** The pollution generates persistent conductivity caused by conductive dust, rain, or snow. For example, outdoor areas.

Security level

Class 1 - Grounded products

1.7 Environmental Considerations

The following symbols indicate that the product complies with the requirements of WEEE Directive 2002/96/EC.

Equipment recovery:

Producing the device requires the extraction and use of natural resources. Some substances contained in the equipment may be harmful to the environment or human health if the product is not disposed of properly. In order to avoid the release of harmful substances into the environment and reduce the use of natural resources, it is recommended that appropriate methods be used to recycle this product to ensure that most of the materials can be correctly reused.

2 Product Features

Product Features

- Automatic identification of component types.
- Maximum test signal frequency: 100 kHz.
- Test level: 100 – 2000 mVrms.
- Internal bias voltage: 0 - 1500 mV.
- Supports DC resistance and electrolytic capacitor measurement.
- Basic accuracy: 0.1%.
- Supports open-circuit and short-circuit correction.
- Data hold and data logging functions.
- 4.3-inch LCD display with support for Chinese and English interfaces.
- Standard interfaces: USB HOST, USB DEVICE, LAN, RS232/485, Handler.
- Supports SCPI communication protocol.
- Handler interface with support for comparator sorting.

3 Document Overview

This document describes how to quickly understand the front and back panels, user interfaces, and basic operation methods of the instrument.

Tip:

The latest version of this manual can be downloaded at (http://www.hantek.com).

Document number:

202512

Software version:

Software upgrade may change or increase product functionalities, please pay attention to Hantek website for the latest version.

Document format conventions:

1 Virtual keys and main interface icons

Use **[name]** to represent virtual keys and main interface icons. For example, **[Utility]** is for 

.

2 Menu

Use "menu text (bold) + color" to represent a label or a menu option. For example, **I/O** means to click the "I/O" option on the current operation interface to enter the function configuration menu of "I/O".

3 Operation steps

Use "->" to represent the next step. For example, **[Utility] ->** **Language** means click **Utility** label before clicking **Language** menu.

4 Quick Start

4.1 General Inspection

Check the shipping package

After receiving the oscilloscope, please follow the following steps to check the instrument: Check whether there is any damage caused by transportation: If the packaging cartons or protective foam pads are seriously damaged, please keep them until the whole machine and accessories pass the electrical and mechanical testing.

Check the accessories

The details of the accessories are provided in Appendix A: Accessories at the end of the user manual. If you find any accessory missing or damaged, please contact the dealer responsible for this business.

Check the machine

If you find the instrument is damaged, not working properly, or unable to pass the performance test, please contact the dealer responsible for this business.

4.2 Appearance and Dimension

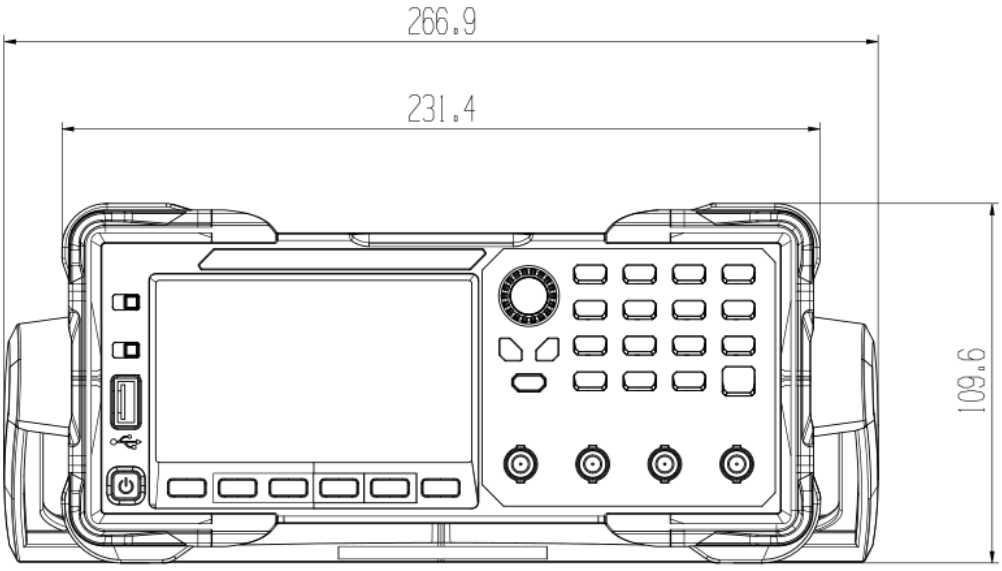


Figure 4.1 Front view

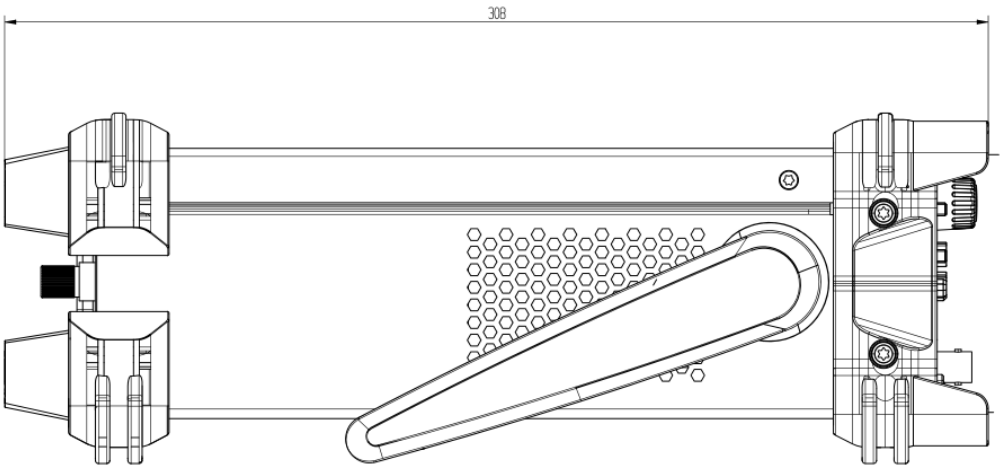


Figure 4.2 Side view

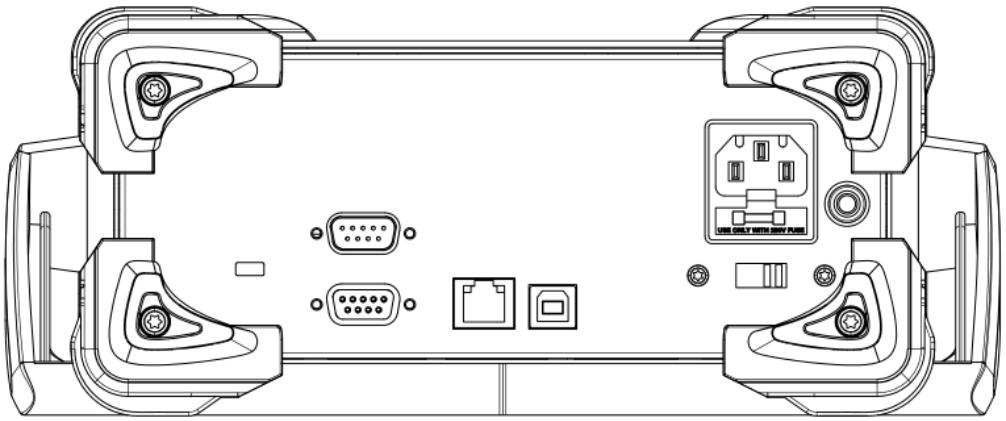


Figure 4.3 Rear view

4.3 Preparation before Use

1. To Connect to AC Power

Power Supply Input Voltage: AC 110V / 220V (switchable)
Frequency: 50Hz / 60Hz / 400Hz
Please connect this product to a power source using the power cable provided in the accessory pack.

Warning:

Before connecting to power, you must ensure the voltage selector switch is set to the position that exactly matches the local supply voltage (110V or 220V). Never switch the voltage setting while the unit is powered on. Failure to follow this instruction may cause equipment damage, fire, or electric shock hazard.

2. Frequency Compatibility Note

The input frequency of the instrument must match the power supply system frequency (50Hz, 60Hz, or 400Hz). Connecting to a power source with an incompatible frequency may affect measurement accuracy or damage internal components.

3. Turn-on Checkout

When the machine is properly plugged into a power source and the product is energized, press the power button located at the lower-left corner of the front panel to start the instrument. To shut down the instrument while it is powered on, press the power button.

4. Warm Up

- To ensure accurate measurement, the instrument should undergo a warm-up period of no less than 30 minutes after power-on.
- Avoid frequent power cycling to prevent potential disruption of internal data.

Test Fixture:

Please use the test fixture provided by our company. The test fixture and the pins of the device under test should be kept clean to ensure good contact between the tested device and the test fixture.
Connect the test fixture to the four test terminals on the front panel of the instrument: H FORCE, H SENSE, L SENSE, L FORCE. For the DUT with a shielding enclosure, the shielding layer can be connected to the grounding terminal on the front panel. The H FORCE and H SENSE terminals should be connected to the red clips, while the L SENSE and L FORCE terminals should be connected to the black clips.

4.4 Front Panel Overview

Figure 4.4 Front panel

Table 4.1 Front Panel Description

No.	Description
1	Power button
2	USB HOST Interface
3	**[?]** key, retrieve system information
4	**[P]** key, retrieve default setting
5	LCD display
6	Left and right arrow keys; 【Enter】key;
7	Multifunctional knob
8	Basic function keys
9	Menu soft keys, used for confirming the selection of menu items
10	Four-terminal test port, used to connect the four-terminal test fixture or test cable to measure the device under test.
11	Machine support frame

4.5 Front Panel Key Overview

: **[?]** key, used to display system information, which is exactly the same as the function described in the System Information section.

: **[P]** key, used to invoke the default settings, which are exactly the same as the functions described in the Default Settings section.


: Left and right arrow keys, used to control the movement of the cursor.

: **[Enter]** key, used to confirm after inputting numerical values or selecting parameters setting.

: **[SHIFT]** key, when pressed, it will set the basic function keys to the numeric keypad function.

: **[TRIG]** key, when the trigger source is BUS, it can be triggered using the TRIG

or SCPI command.

 : 1. After pressing, the keyboard will be locked and all keys will be invalid.
2. If the key is pressed after pressing the **[SHIFT]** key, it will switch the instrument from the remote mode to the local mode.

4.6 Rear Panel Overview

Figure 4.5 Rear panel

Table 4.2 Rear Panel Description

No.	Description
1	AC Power cord connector and fuse holder
2	Voltage selector
3	USB device interface, establish communication with the computer.
4	LAN interface
5	RS232/485 interface
6	Handler interface, carry out the sorting and output of the test results.
7	The grounding terminal of the casing. The terminal is connected to the casing of the instrument. It can be used for protection or shielding of the grounding connection.

4.7 User Interface

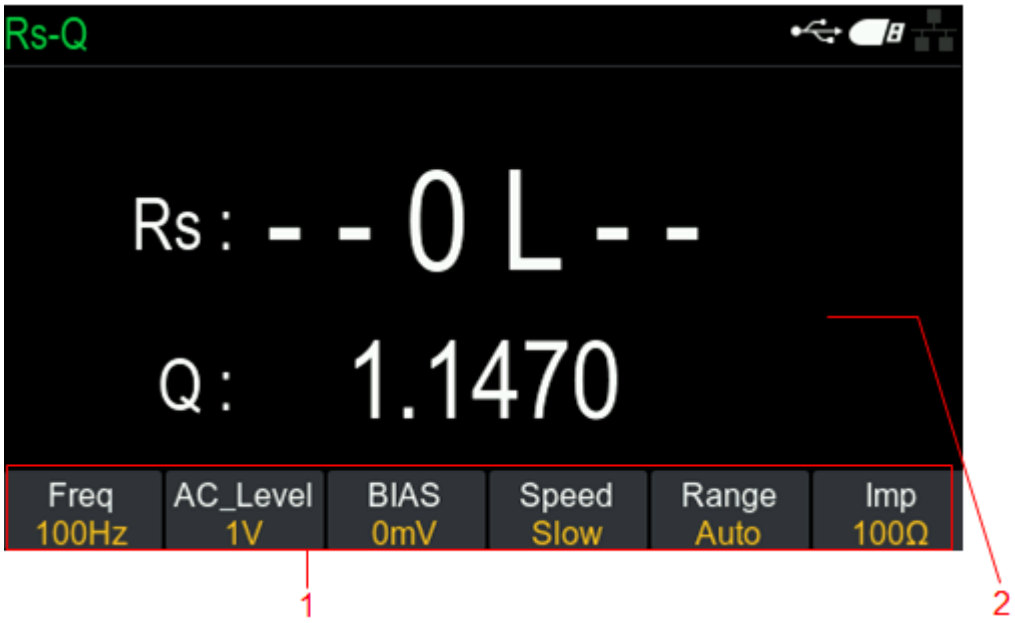


Figure 4.6 User interface

1. **Soft key menu/submenu area:**

   This area is used to display the function definitions of the soft keys. The default interface is shown in the above picture. The definitions of the soft key menu vary depending on the key and have different functions.

2. **Measurement results show the area:**

   This area displays the test result information, including the main parameters and secondary parameters.

4.8 Usage of the Numeric Keypad

The settings for some parameters of this product (such as frequency, level, offset, etc.) can be done through digital keyboard input.

- Press the **[SHIFT]** key, and the "Shift" indicator will appear in the middle of the top of the screen.
- Press and hold the soft key corresponding to the menu until a digital input box appears, then release the button.
- Press the left and right arrow keys  to move the cursor position. Input the specific numbers by pressing the numeric keypad and press the **[Enter]** key to confirm, or adjust the values using the knob and press the **[Enter]** key to confirm.

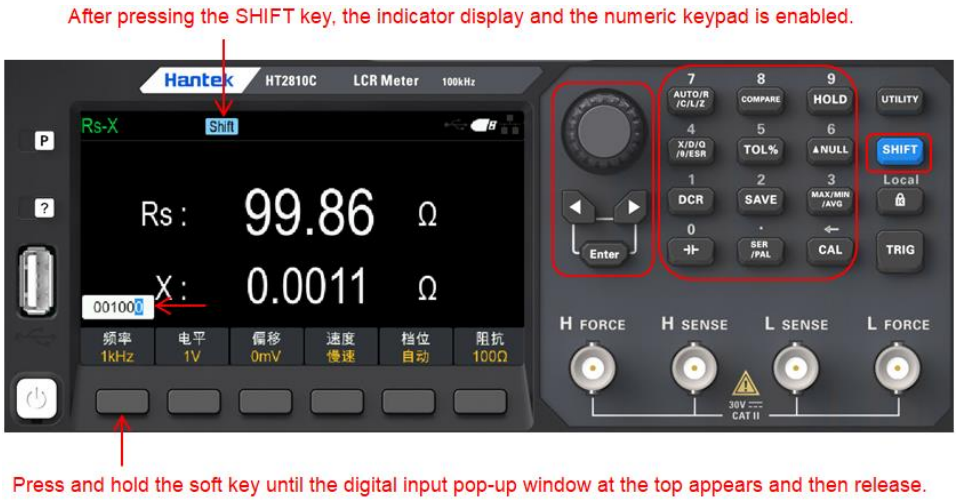


Figure 4.7 Numeric keypad

On the numeric keypad, you can also perform the following operations:

- : Backspace key, user can delete the input parameter values.
- : Input decimal point.

5 Operation Instruction

5.1 Test Parameter

5.1.1 Main Parameters

The main parameters include Auto, R (Resistor), C (Capacitor), L (Inductor), and Z (Impedance).
When the main parameter is set to Auto, the instrument will automatically determine whether the measurement is L, C or R based on the measurement data. At this time, the secondary parameters cannot be set and are fixed as R-X, C-D, and L-Q. The equivalent model automatically switches according to the measurement data.
Press the **[AUTO/R/L/C/Z]** key to sequentially switch the main parameters (R, C, L, Z, and AUTO).

5.1.2 Secondary Parameters

The secondary parameters include X (reactance), D (loss factor), Q (quality factor), θ (phase angle), and ESR (series equivalent resistance).
Press the **[X/D/Q/θ/ESR]** key to switch the sub-parameters (X, D, Q, θ, ESR) in sequence.

5.1.3 Equivalent Circuit Mode

The equivalent models include s (series) and p (parallel) types.
The actual inductors, capacitors, and resistors are not ideal pure reactance or resistance elements. They are often presented in the form of a composite impedance element in series or parallel. We consider this element equivalent to a simple series or parallel model for measurement and calculation.
Choosing the appropriate equivalent mode is beneficial for achieving better measurement results. Generally speaking, low-impedance elements (such as those below 100Ω) are suitable for series equivalent; high-impedance elements (such as those above 10kΩ) are suitable for parallel equivalent; those in between have relatively little impact on the measurement results.
Press the **[SER/PAL]** key to switch the equivalent mode (s, p).

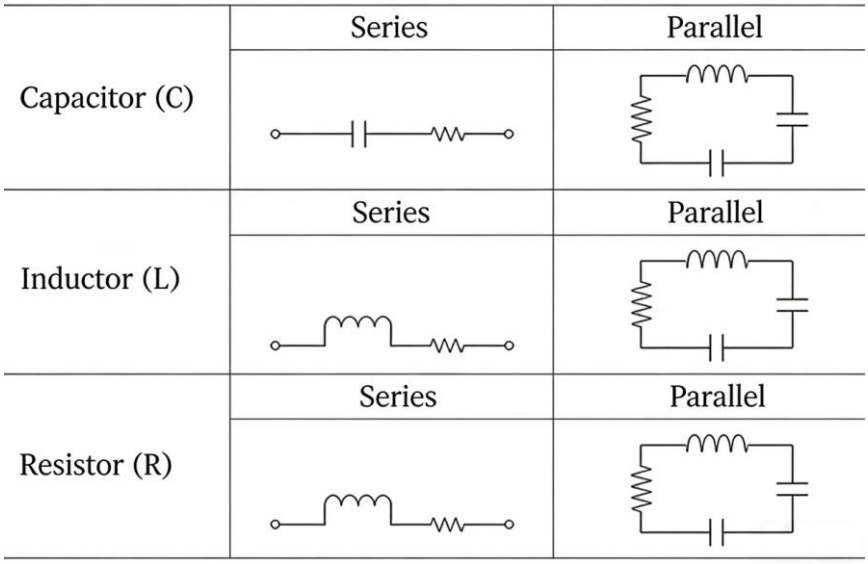


Figure 5.1 SER/PAL circuit

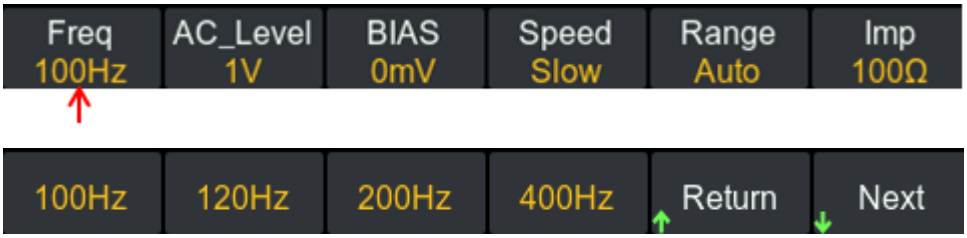
Note: Generally, low-impedance components are modeled using series equivalent circuits, while high-impedance components are modeled using parallel equivalent circuits.

5.1.4 Test Frequency

The LCR measures the component under test (DUT) by applying an AC test signal to it. The frequency is one of the main parameters of the AC signal source. Due to the non-ideal nature of the component and the existence of distributed parameters, as well as the influence of the distribution parameters of the test terminals and test lines, different measurement results may occur for the same component when using different test frequencies. Therefore, an appropriate frequency should be selected before measurement.

There are three methods to set the test frequency:

Method 1: On the default user interface, press **Frequency** soft key to enter the Frequency sub-menu. Select the desired frequency value, press the soft key below the selected frequency value to confirm, and press the **Next Page** soft key to navigate through the pages.



Method 2: On the default user interface, keep pressing the **Frequency** soft key until the input pop-up window appears, then release it. You can move the cursor position using the left and right arrow keys, and adjust the value at the current cursor position by

rotating the knob. Press the **[Enter]** key to confirm. The unit is Hz.

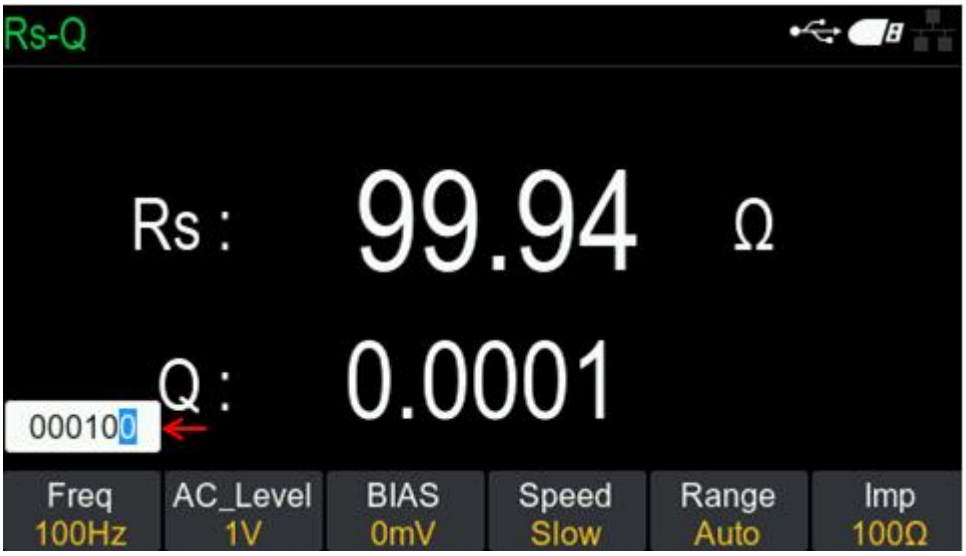


Figure 5.2 Frequency setting-1

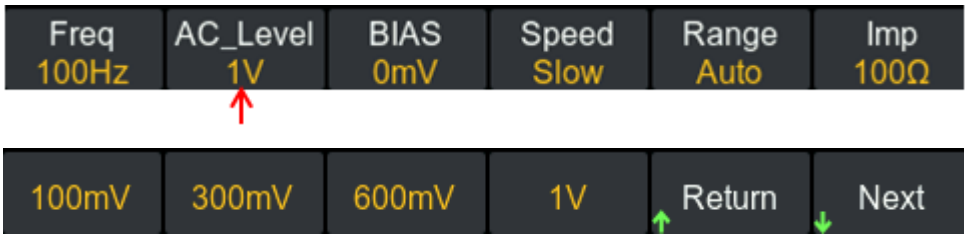
Method 3: On the user default interface, keep pressing the **Frequency** soft key until the input pop-up window appears, then release it. You can input the value using the numeric keypad, please refer to Usage of the Numeric Keypad for details. The unit is Hz.

Figure 5.3 Frequency setting-2

5.1.5 Test Level

There are three methods to set the test level:

Method 1: On the default user interface, press **AC_Level** soft key to enter the Level sub-menu. Select the desired AC_Level value, press the soft key below the selected frequency value to confirm, and press the **Next Page** soft key to navigate through the pages.



Method 2: On the default user interface, keep pressing the **AC_Level** soft key until the input pop-up window appears, then release it. You can move the cursor position using the left and right arrow keys, and adjust the value at the current cursor position by rotating the knob. Press the **[Enter]** key to confirm. The unit is mV.

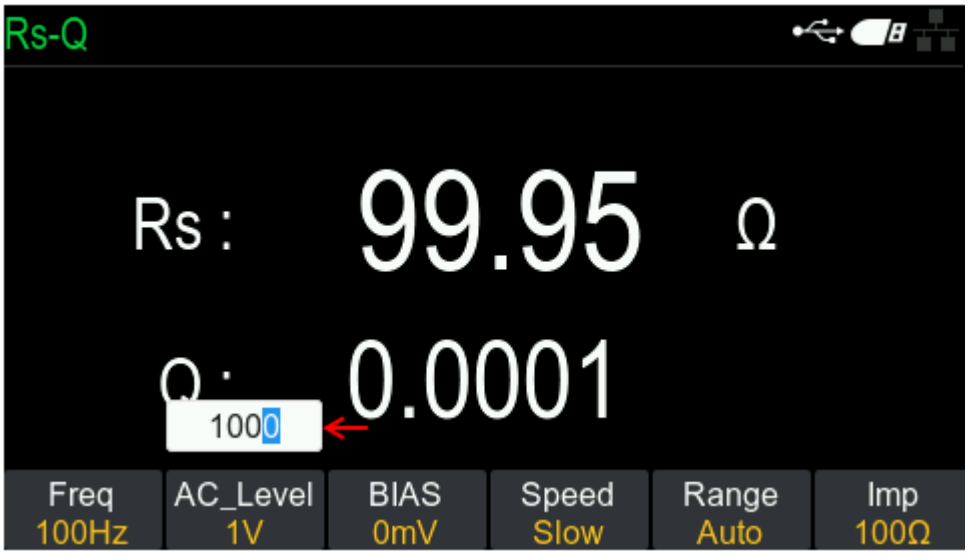


Figure 5.4 AC_Level setting-2

Method 3: On the user default interface, keep pressing the **AC_Level** soft key until the input pop-up window appears, then release it. You can input the value using the numeric keypad, please refer to Usage of the Numeric Keypad for details. The unit is mV.

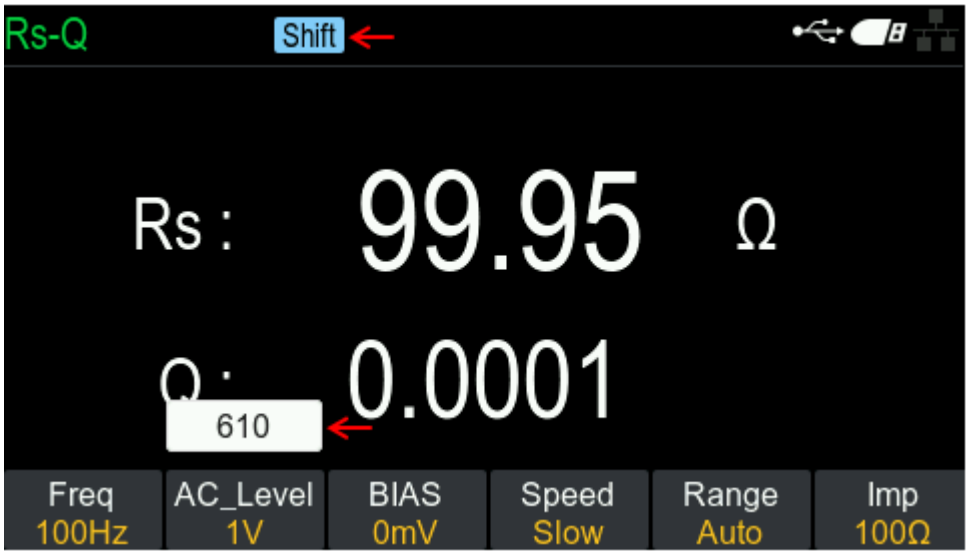


Figure 5.5 AC_Level setting-2

5.1.6 BIAS

There are two methods to set the test signal offset(BIAS):

Method 1: On the default user interface, press the **BIAS** soft key and the input pop-up window appears. You can move the cursor position using the left and right arrow keys, and adjust the value at the current cursor position by rotating the knob. Press the **[Enter]** key to confirm. The unit is mV.
Method 2: On the user default interface, press the **BIAS** soft key and the input pop-up window appears. You can input the value using the numeric keypad, please refer to the Usage of the Numeric Keypad for details. The unit is mV.

5.1.7 Test Speed

On the user default interface, press the **Speed** soft key to enter the Speed sub-menu, which displays "Slow", "Middle" and "Fast". Press the menu soft key to confirm, and press the **Return** soft key to return to the default interface.

5.1.8 Test Range

The instrument's range can be set to automatic or a specific value. When the gear is set to automatic, the instrument will automatically adjust to the appropriate gear based on the impedance of the device to be measured for the measurement; when a specific value is selected, the range will remain fixed at the current gear and will not change. It is generally recommended to use the automatic gear.

Method for setting the range:

In the default user interface, press the soft key corresponding to the **Range** menu to

enter the Range sub-menu. You can select the gear type (4.7Ω, 15Ω, 47Ω, 150Ω, 470Ω, 1.5kΩ, 4.7kΩ, 15kΩ, 47kΩ, 150kΩ, Automatic). Press the menu soft key to confirm, and press the **Return** soft key to return to the default interface.

5.1.9 Output Impedance

The output impedance is the output impedance of the excitation source. This instrument offers two options: 30Ω and 100Ω. The default value is 100Ω.
When testing inductance, in order to compare data with other models of testers, it is necessary to ensure the same output resistance value.
In the default user interface, press the **Impedance** soft key to enter the impedance selection sub-menu, where you can select the output impedance (30Ω, 100Ω).

5.2 DCR Mode

Press the **[DCR]** key to enter DC resistance measurement mode, and press the key again to exit. The interface is as shown in the figure below. In DCR mode, frequency, level, and offset cannot be changed.
The DCR mode is used to measure the DC impedance of coils, transformers.

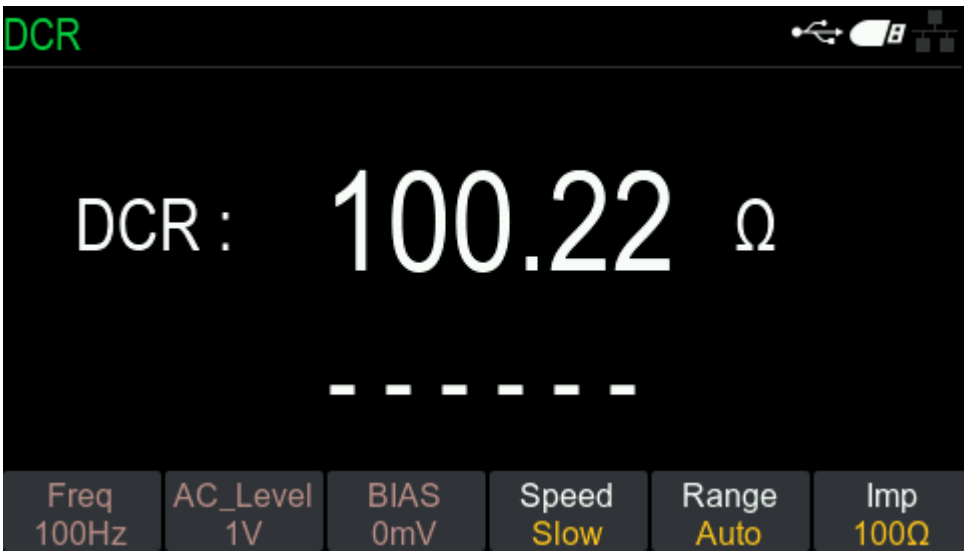


Figure 5.6 DCR mode

5.3 Electrolytic Capacitor Test Mode

Press the key to enter the electrolytic capacitor mode, and press the key again to exit. In electrolytic capacitor mode, the level and offset cannot be changed. The interface is as shown in the figure below.

Figure 5.7 Electrolytic capacitor mode

Note: When measuring electrolytic capacitors, please pay attention to the connection polarity of the component. The red test clip should be connected to the positive terminal of the electrolytic capacitor, and the black test clip should be connected to the negative terminal.

5.4 Deviation Value Test Function

On the measurement display interface, press the **[△NULL]** key to make the difference function enable/unable. The word "Null" will be displayed at the top of the interface. When the difference function is enabled, the instrument records the primary parameter value measured at the moment of activation as the reference value. The primary parameter display will then show the difference between the current measurement value and the reference value. The interface is shown in the figure below.

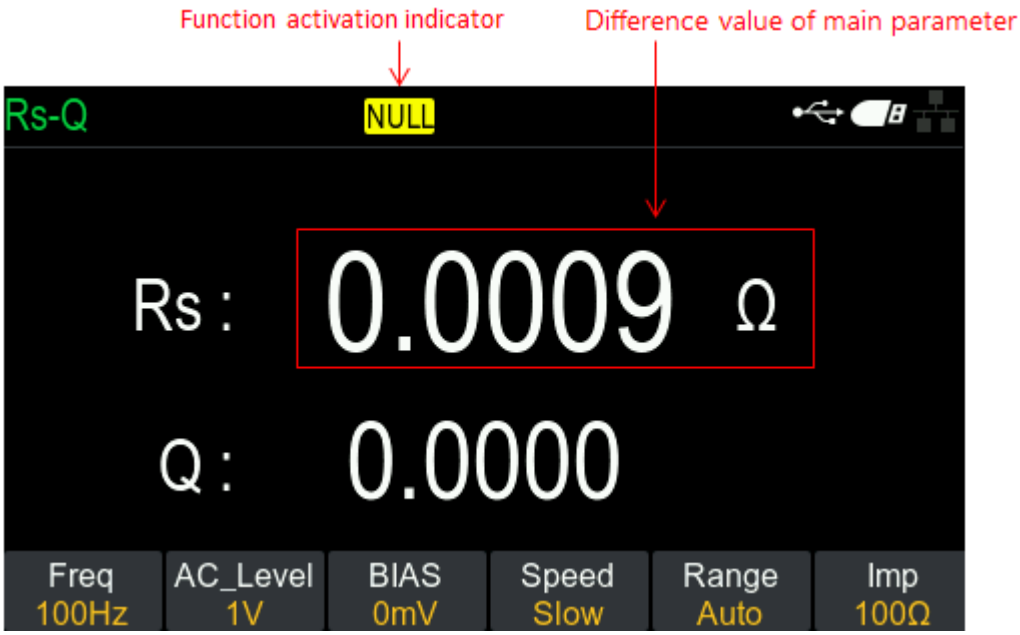


Figure 5.8 Deviation value test

5.5 Data Hold Function

Press the **[HOLD]** key to activate the data hold function. As shown in the figure below, the letter "H" is displayed in the upper right corner of the interface, and the measured data remains unchanged. Press the **[HOLD]** key again to deactivate the data hold function.

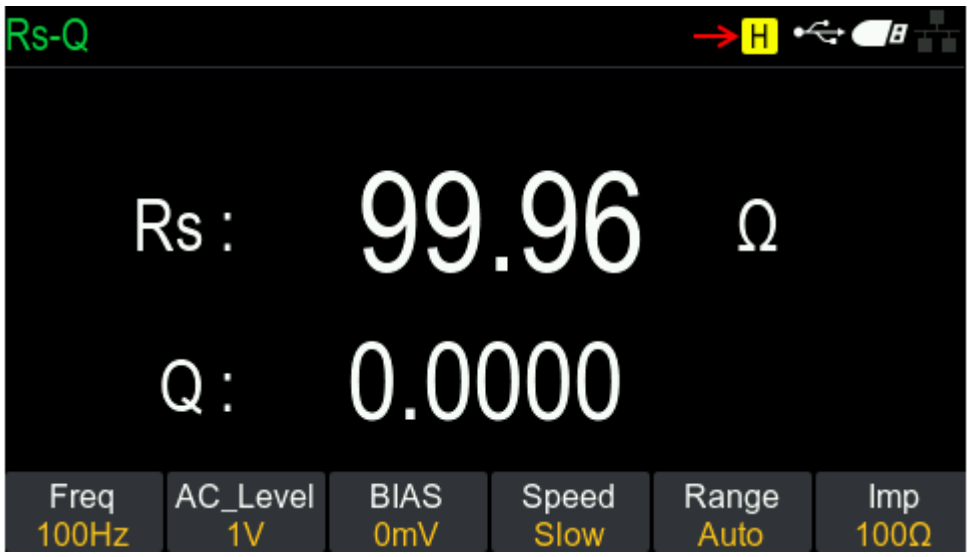


Figure 5.9 Data hold function

5.6 Data Record Function

Press the **[MAX/MIN/AVG]** key to activate the data logging function. A pop-up window will appear in the upper right corner of the display area. Press the [MAX/MIN/AVG] key again to deactivate the data logging function. The interface is shown in the figure below.

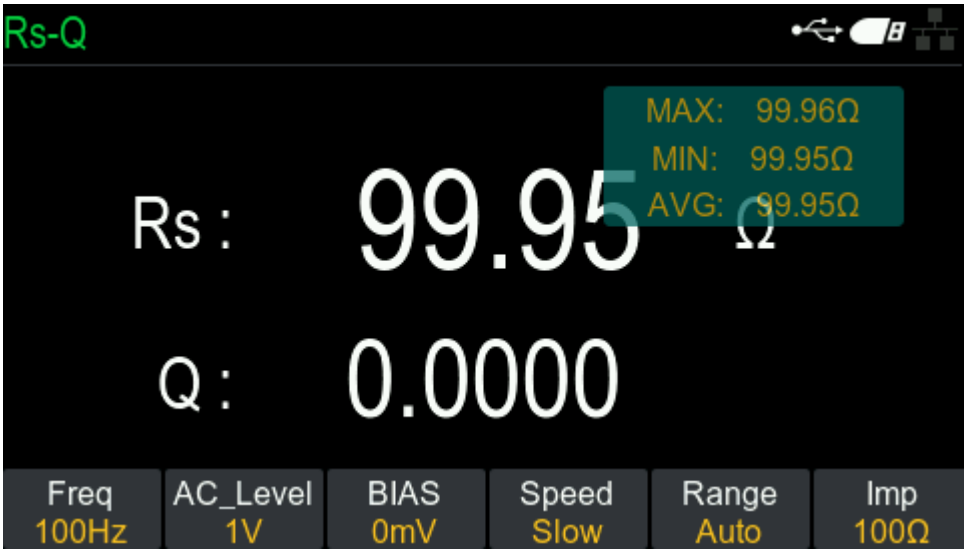


Figure 5.10 Data record function

5.7 Comparator Function

The comparator function facilitates the measurement and discrimination of components on the production line, as well as incoming and outgoing inspection. When used in conjunction with the Handler interface, it is well-suited for automatic sorting and measurement systems.

5.7.1 Parameters Setting

Press the **[COMPARE]** key to open the pop-up window for comparison settings. Press the **[SHIFT]** key to enable the numeric keypad functions. Enter the nominal value using the numeric keys and confirm by pressing the **[Enter]** key.
Press the right direction key to move the cursor to the comparison switch slider, then press the **[Enter]** key to enable the comparator function.
Use the left and right direction keys to move the cursor to the upper and lower limit settings. Input the specific values using the numeric keys and confirm by pressing the **[Enter]** key.
Press the **[COMPARE]** key again to close the comparison settings pop-up window.
Note: To save the currently set values, press the **[Save]** key to bring up the Save/Recall menu and save the settings. Saved settings will not be lost after power-off.

5.7.2 BIN

The instrument provides five sorting grades (BIN:1, BIN:2, BIN:3, BIN:AUX, BIN:OUT). The sorting process is illustrated in the diagram below. In the diagram, **P** represents the primary parameter of the measurement result, **Pn_L** represents the lower limit of the primary parameter for grade n (n=1,2,3), **Pn_H** represents the upper limit of the primary parameter for grade n (n=1,2,3), **2nd** represents the secondary parameter measurement result, **2nd_L** represents the lower limit of the secondary parameter, and **2nd_H** represents the upper limit of the secondary parameter.

If the primary parameter meets the criteria for Grade 1 and the secondary parameter passes, the sorting result is **BIN:1**.

If the primary parameter does not meet Grade 1 but meets Grade 2, and the secondary parameter passes, the sorting result is **BIN:2**.

If the primary parameter does not meet Grades 1 or 2 but meets Grade 3, and the secondary parameter passes, the sorting result is **BIN:3**.

If the primary parameter does not meet Grades 1, 2, or 3, the sorting result is **BIN:OUT**.

If the primary parameter meets any one of Grades 1, 2, or 3, but the secondary parameter fails, the sorting result is **BIN:AUX**.

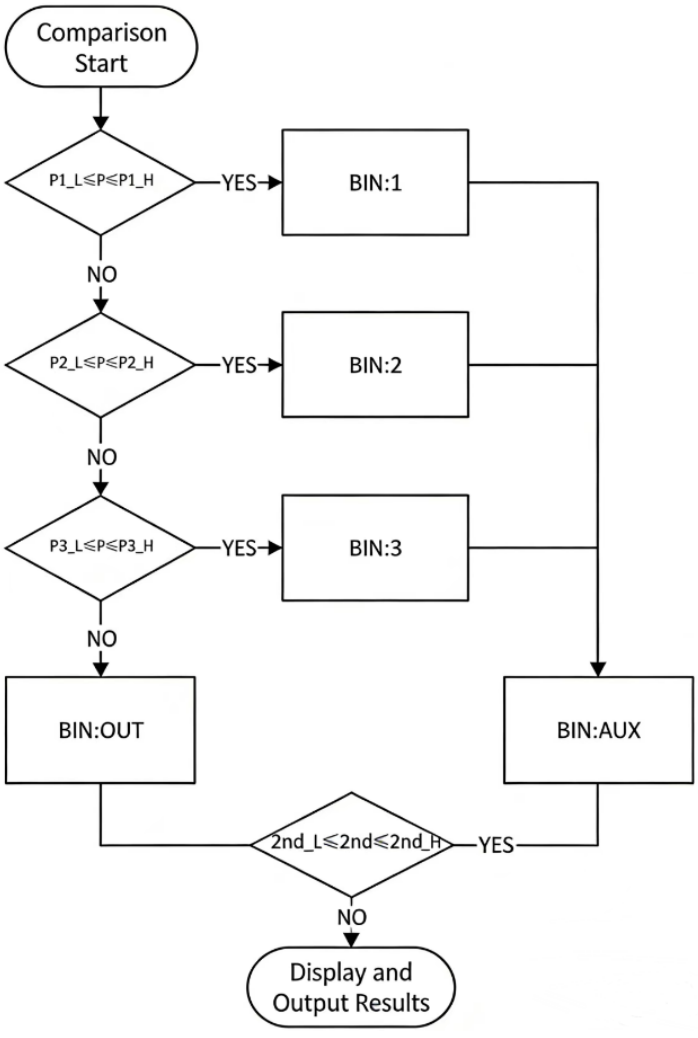


Figure 5.11 Comparator sorting grades flow chart

When the comparator is enabled, the sorting result is displayed on the measurement interface, as shown in the figure below.

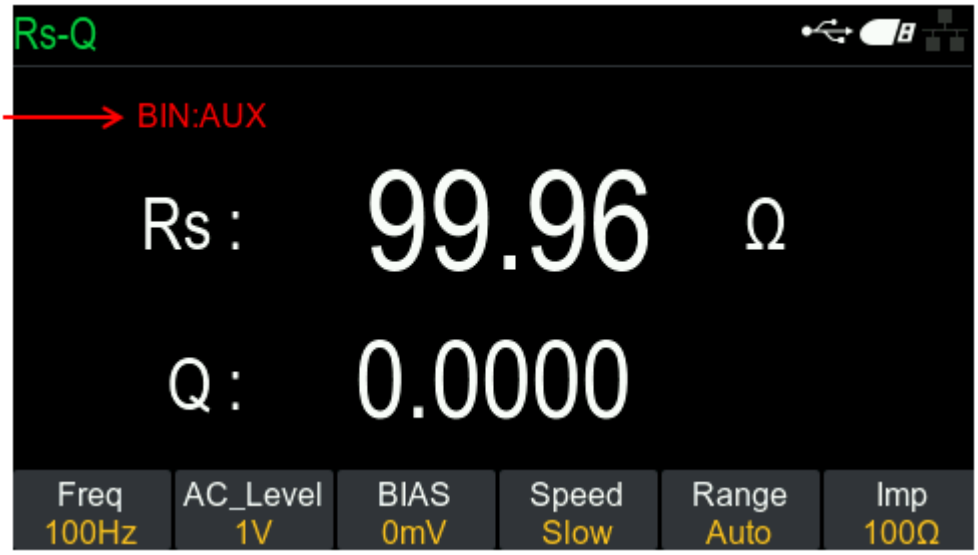


Figure 5.12 Comparator sorting grades result

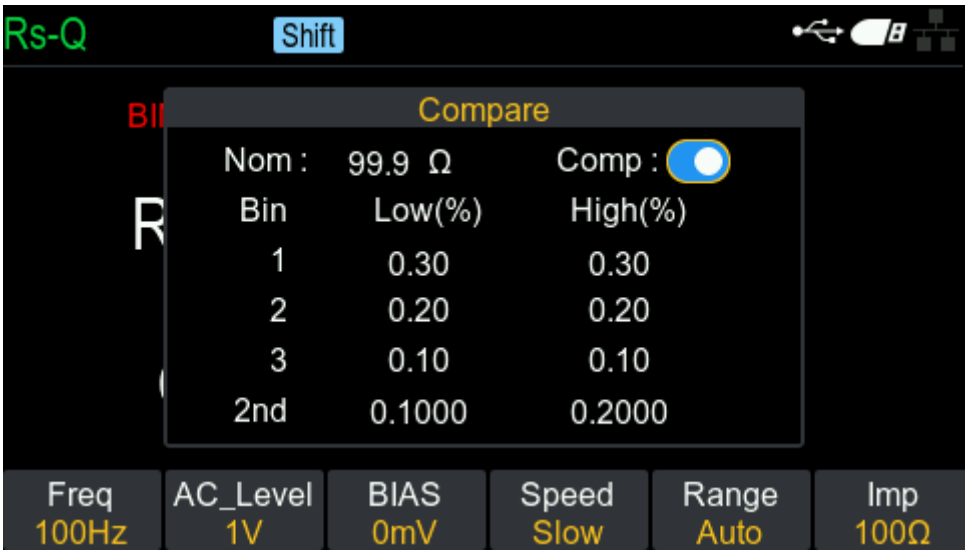


Figure 5.13 Comparator parameter setting

Lower Limit of Main Parameter (%): The displayed value is negative, with the minus sign "-" omitted.

If the sorting result is range of BIN:1, BIN:2, BIN:3, or BIN:AUX grade, the buzzer will prompt according to the "Pass Audio Indication" setting in the system configuration. If the sorting result is BIN:OUT, the buzzer will prompt according to the "Fail Audio Indication" setting in the system configuration.

The sorting grades result is output via the Handler interface.

5.8 Correction Function

Open and short circuit correction are used to eliminate measurement errors introduced by the parasitic parameters of the instrument and test fixtures. Generally, open circuit calibration is performed before measuring large impedances, and short circuit calibration is performed before measuring small impedances. For accurate measurements, it is recommended to perform both open and short circuit calibrations prior to measurement.

5.8.1 Open Correction

Connect test fixture to test terminal. The fixture is open and not connecting to any DUT. Please keep it more than 10 centimeters away from the human body and any interference sources.

Then press the **[CAL]** key, select the **Open** soft key to perform open correction. A pop-up window for open correction will appear, as shown in the figure below. After correction is complete, the pop-up window will close and return automatically.

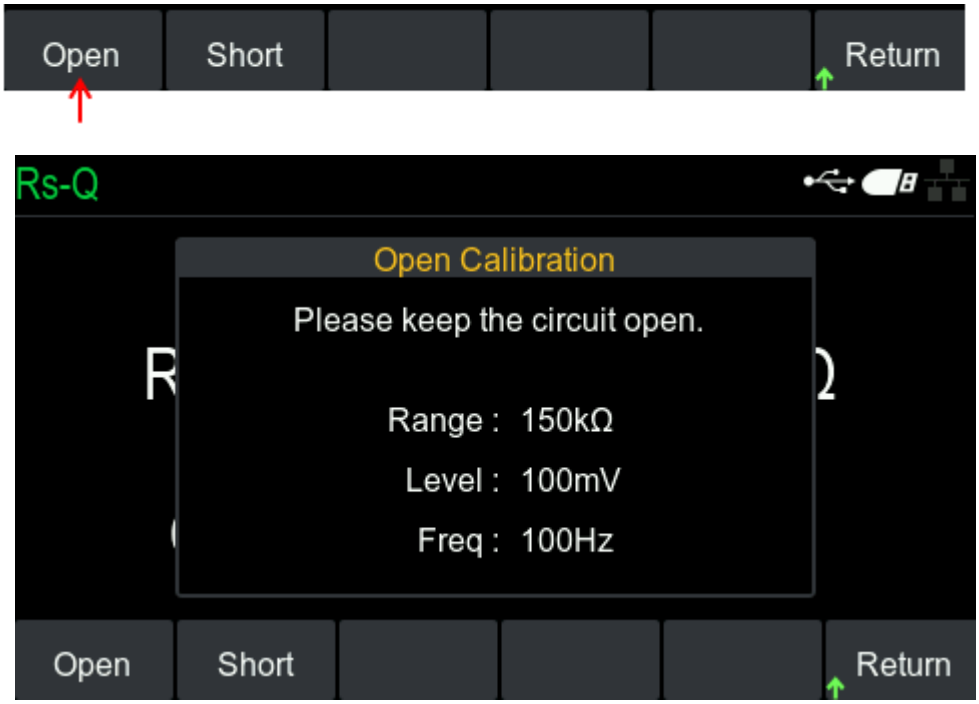


Figure 5.14 Open correction

5.8.2 Short Correction

Connect the test fixture to the test ports. Then connect the red and black clips of the test fixture together to make sure it is short circuit states.

Then press the **[CAL]** key, select the **Short** soft key to perform short correction. A pop-up window for short correction will appear, as shown in the figure below. After correction is complete, the pop-up window will close and return automatically.

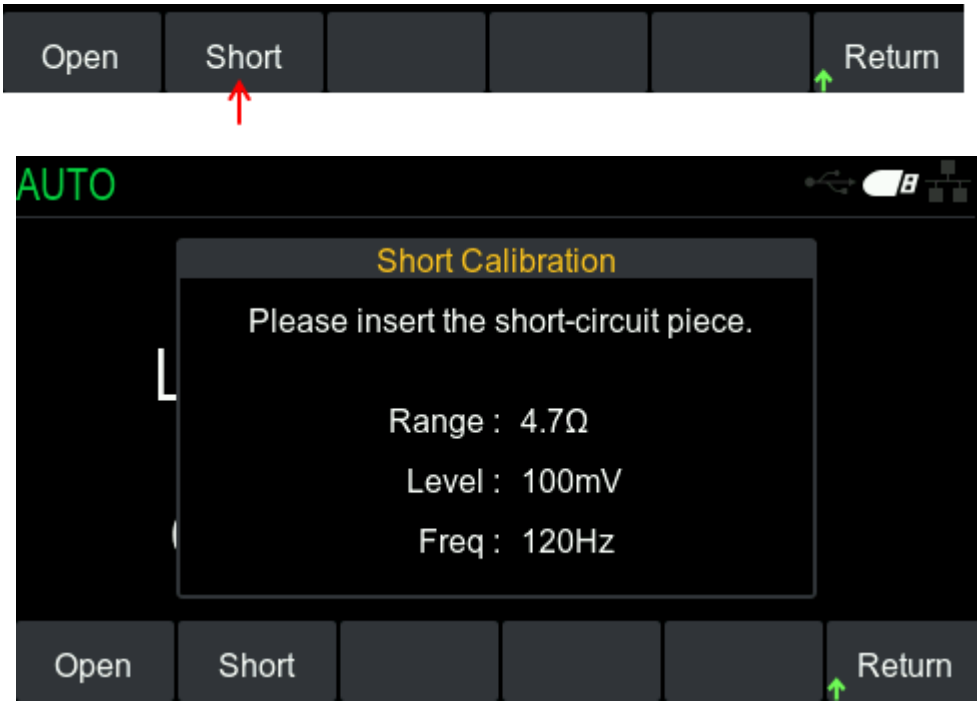
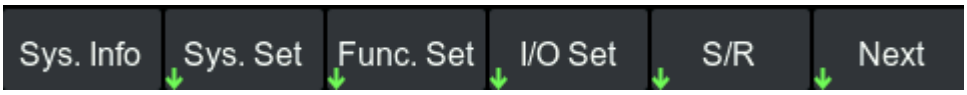


Figure 5.15 Short correction

6 Utility Function

On the measurement display screen, press the **[Utility]** key to enter the utility system interface. Press the **[Utility]** key again to exit the utility system interface. This soft key menu consists of two pages, as shown in the figure below.
Use the **Next** and **Previous** soft keys to navigate between pages.



6.1 System Information

In the utility system interface, press the **Sys. Info** soft key to view details such as the product model, firmware version, hardware version, and serial number. Press the **Sys. Info** soft key again to close the system information pop-up window.

Figure 6.1 System information

6.2 System Setting

In the utility system interface, press the **Sys. Set** soft key to view detailed system information for the product.

Table 6.1 System setting parameters

Parameter	Menu Options
Language	Chinese/English
Sound	On/Off

BackLight	Dimmed / Normal / High
Time Set	Year /Month /Day /Hour /Min /Sec
Update	--

6.2.1 Language

After pressing the **Language** soft key, you can set the language to Chinese or English. Press the **Return** soft key to go back to the previous menu.

6.2.2 Sound

Press the Sound soft key to turn the keypress sound on or off. When enabled, each keypress produces a short beep. When disabled, there is no any sound when press key. This setting controls the beeper feedback for button presses and does not affect other system alert sounds.

6.2.3 Backlight

After pressing the **BackLight** soft key, you can set the backlight brightness to dim, normal or high.

6.2.4 Time Setting

Press the **Time Set** soft key to bring up the time setting pop-up window. Please rotate the rotary knob to position the value input field. The left and right arrow keys can be used to move the cursor. You can input numbers by using the numeric keypad, please refer to Usage of the Numeric Keypad for details, then select the **OK** button and press the **[Enter]** key to confirm.

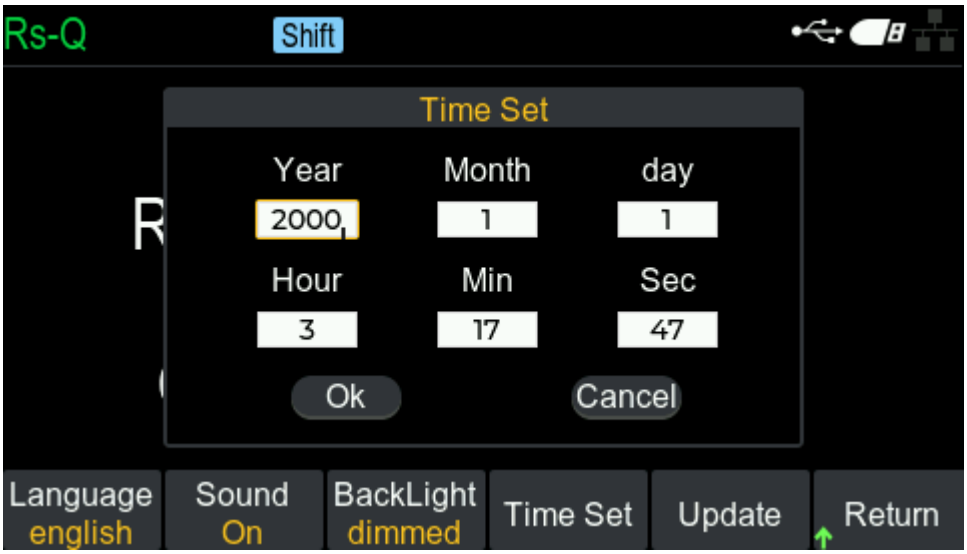


Figure 6.2 Time setting

6.2.5 Update

Please copy the program file in ".bin" format to a USB drive (FAT32). Insert the USB drive into the front panel USB port, then press the **Update** soft key to upgrade. A progress indicator will show during the upgrade process. After the upgrade is complete, the instrument needs to be restarted.

6.3 Trigger

In the utility system interface, press the **Func.Set** soft key to access the trigger mode menu options.

There are three triggering modes: Auto, Bus Trigger and External Trigger.

- When the trigger mode is set to Auto, the instrument automatically initiates measurements.
- When the trigger mode is set to Bus Trigger, remote SCPI commands (TRIGger) or the front panel **[TRIG]** key can be used to trigger measurements.
- When the trigger mode is set to External Trigger, a trigger signal must be applied to the corresponding pin of the HANDLER interface. Each time a negative pulse trigger signal is received, the instrument will conduct a test.

Note: If the instrument is currently performing a test, any incoming trigger signal will be ignored. Therefore, please ensure the trigger signal is sent only after the test is completed. That is to say, external trigger signals received before the EOM signal becomes active will be ignored.

6.4 I/O Setting

In the utility system interface, press the **I/O Set** soft key to set up LAN port or RS232

communication.

6.4.1 LAN Configuration

Press the **LAN** soft key to enter the LAN settings menu.
Press the **LAN Set** soft key to open the network configuration pop-up window, as shown in the figure below.

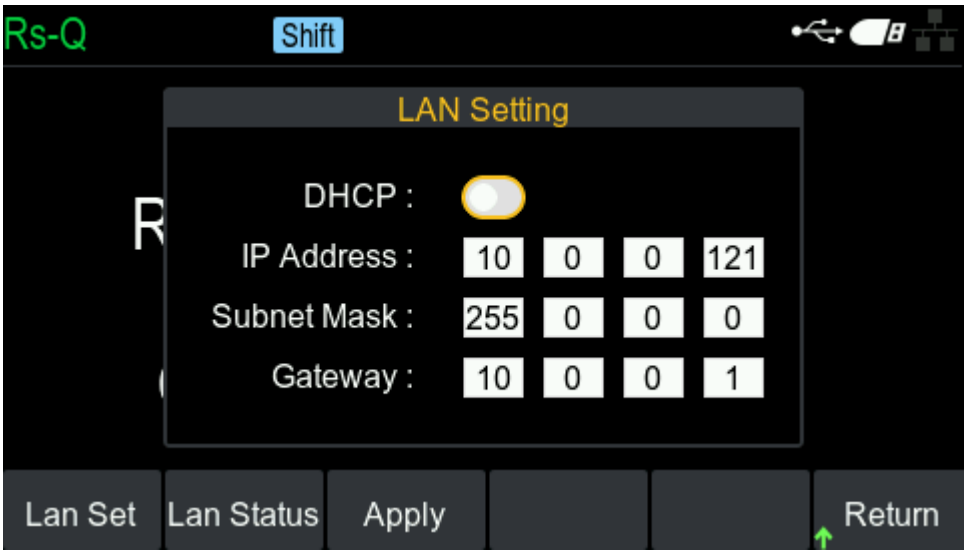


Figure 6.3 LAN setting

You can configure the IP address using DHCP or manual assignment. The abbreviation DHCP stands for Dynamic Host Configuration Protocol, which is used to assign dynamic IP addresses to network devices. With dynamic addressing, the device can have a different IP address each time it connects to the network.

DHCP

When the DHCP function is enabled, the instrument attempts to obtain an IP address from a DHCP server. If a DHCP server is found, it will assign a dynamic IP address, subnet mask, and default gateway to the instrument.

Manual Configuration

When the DHCP function is disabled, a static IP address, subnet mask, and default gateway must be manually configured. Please rotate the rotary knob to position the value input field, use the left and right arrow keys to move the cursor, and use the numeric keypad to enter numbers, please refer to Usage of the Numeric Keypad for details. Then select the **Apply** soft key and press the **[Enter]** key to confirm.
Press **LAN Status** soft key to open the network status pop-up window, where you can view the current network settings, as shown in the figure below. Press the **LAN Status** soft key again to close the pop-up window.

Press **Return** soft key to go back to the previous menu.

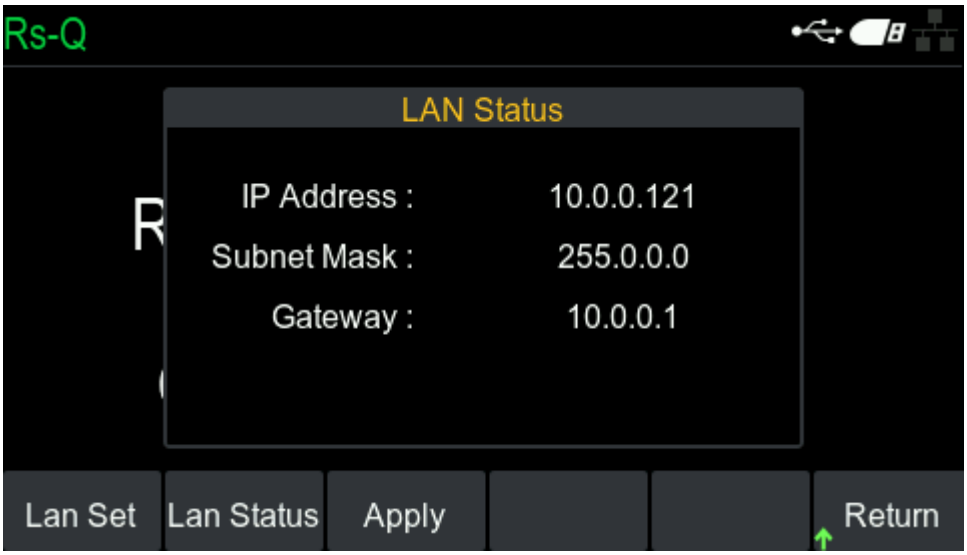


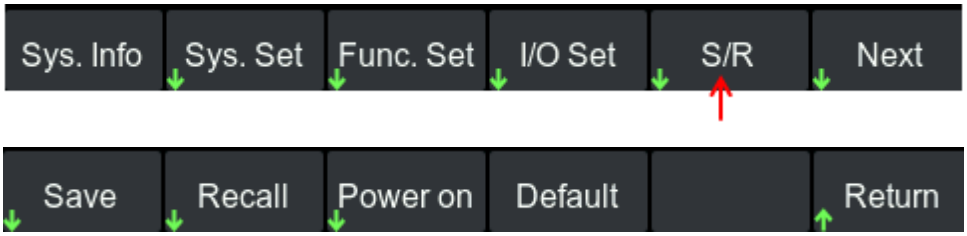
Figure 6.4 LAN status

6.4.2 RS232 Configuration

Press the **RS232** soft key to enter the RS232 settings menu.
Press the Baud Rate soft key to set the desired baud rate. Available options: 4800, 9600, 19200, 38400, 57600, 115200, 230400.
Press the **Flow Ctl** soft key to set flow control as None or RTS/CTS.

7 Save and Recall

Press the **[Utility]** key to open the utility system interface, then press the **S/R** soft key to save or recall the instrument's current configuration parameters.

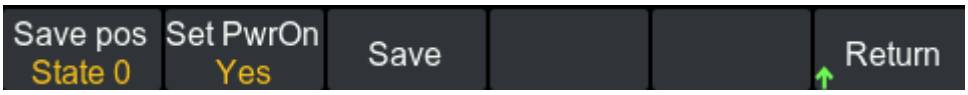


7.1 Save Configuration

Press the **Save -> Save Pos** soft key to select where to save the current configuration parameters.

Press the **SetPwrOn** soft key, if set to "Yes", the instrument will recall the parameters saved in the selected location upon the next startup, if set to "No", the current settings will not be recalled at the next startup.

Press the **Save** soft key to save the current configuration parameters to the selected location. A "Save Success!" pop-up window will then appear.



7.2 Recall Configuration

Press the **Recall -> Recall Pos** soft key to select the corresponding location and recall the desired configuration parameters.

Press the **State X** soft key, then press the **Recall** soft key to load the configuration parameters saved at that position. A "Recall Success!" pop-up window will appear. If no configuration parameters have been saved at State X, pressing the **Recall** soft key will trigger a "Recall Failed!" pop-up notification.

7.3 Power on Setting Status

Press the **Power On** soft key to view which saved configuration position is currently set to be recalled when the instrument starts up.

As shown in the figure below, it indicates that the current startup setting is configured to recall the configuration saved at Position 0.

After pressing the **Power On** soft key, press the **Default/State** X soft key, and then press the **SetPwrOn** soft key to save the configuration parameters at the current position as the startup recall settings.
As shown in the figure below, when Power On Status is set to "State 1", pressing the **SetPwrOn** soft key will trigger a "Save Success!" pop-up notification, indicating that the configuration parameters at Position 1 have been saved as the settings to be recalled during the next startup.

7.4 Default Setting

Press the **Default** soft key to recall the system's default settings.

8 Remote Control

This product can communicate with a PC through the following interfaces:

- Controlled via USB
- Controlled via LAN
- Controlled via RS232/485

For remote control, the IOLibSuite must first be installed on the PC. The IO library version must be compatible with the current computer system.
This section details how to use the IO software to remotely control this product through various interfaces.

Note:

Before connecting the communication cable, please turn off the instrument to avoid damaging its communication interface.

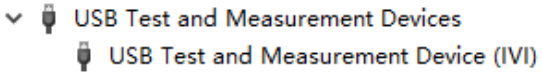
8.1 Remote Control via USB

1. Connect the device

Connect the instrument (USB interface) to the PC (USB HOST interface) using a USB cable.

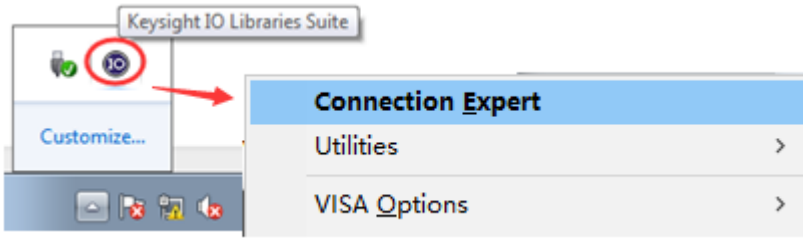
2. Install USB driver

After properly connecting this product to a PC for the first time and powering it on, the PC will automatically install the drivers (Prerequisite: IOLibSuite has been installed on the PC successfully). The Device Manager will display the following:



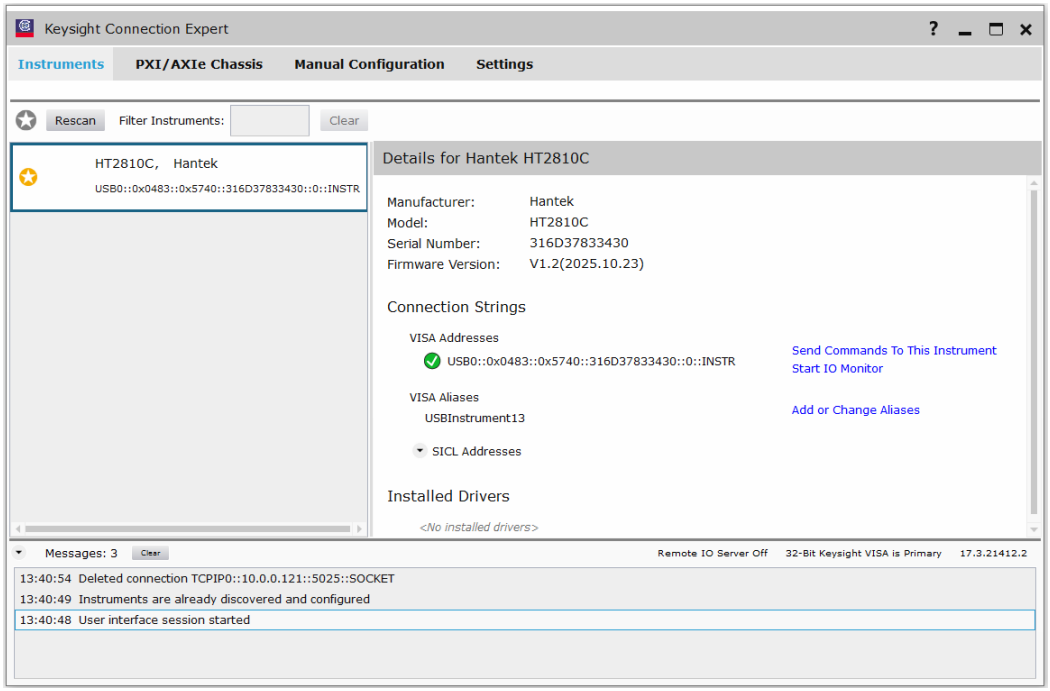
3. Search for device resources

Click the Keysight IO libraries suite icon in the lower right corner of your computer, right-click the mouse, and select "Connection Expert" to open the IO software. The software will automatically search for resources currently connected to the PC via the USB interface. You can also click Rescan to perform search.



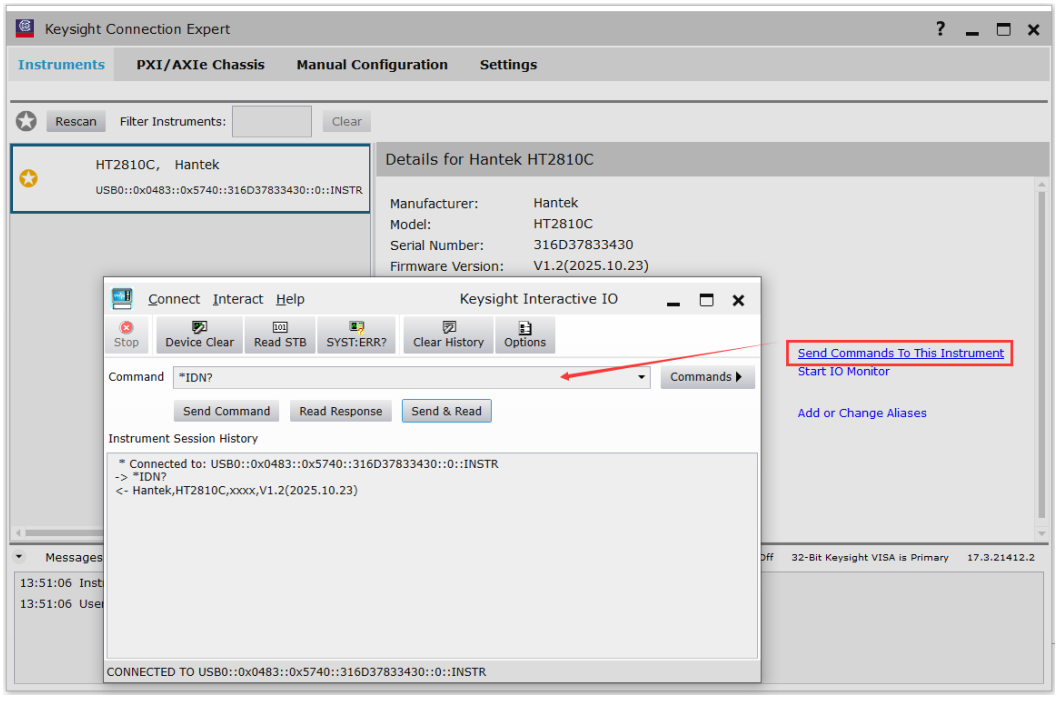
4. View Device Resources

If IO communication is successfully, the product information can be recognized, as shown in the figure below.



5. Control the instrument remotely

In the IO interface, click "Send Commands To This Instrument" or Interactive IO (depending on the IO version), to open the remote command control panel. From there, you can send commands and retrieve data via this panel.



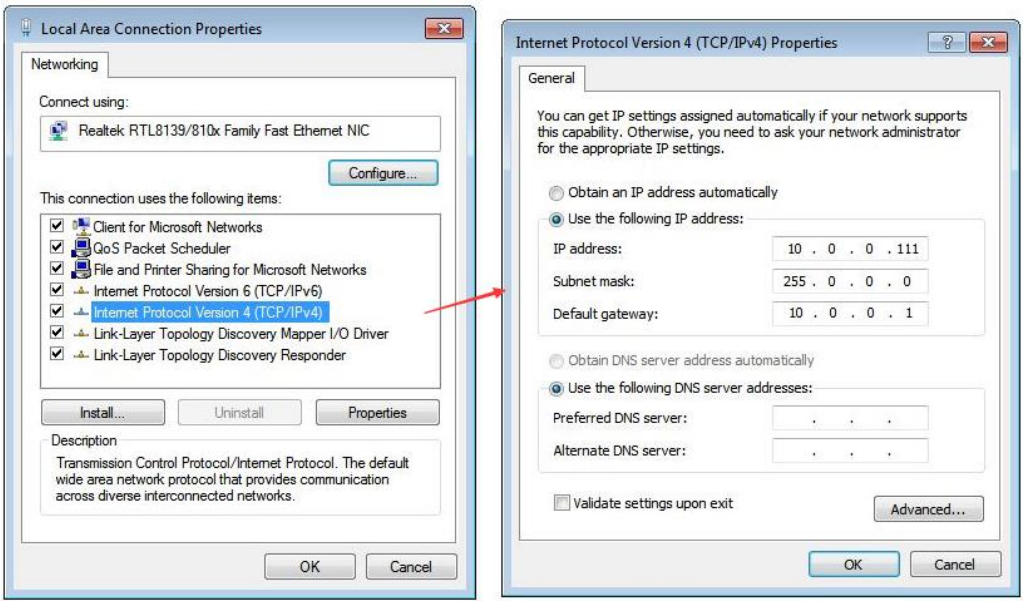
8.2 Remote Control via LAN

1. Connect the device

Connect the oscilloscope to your local area network using a network cable.

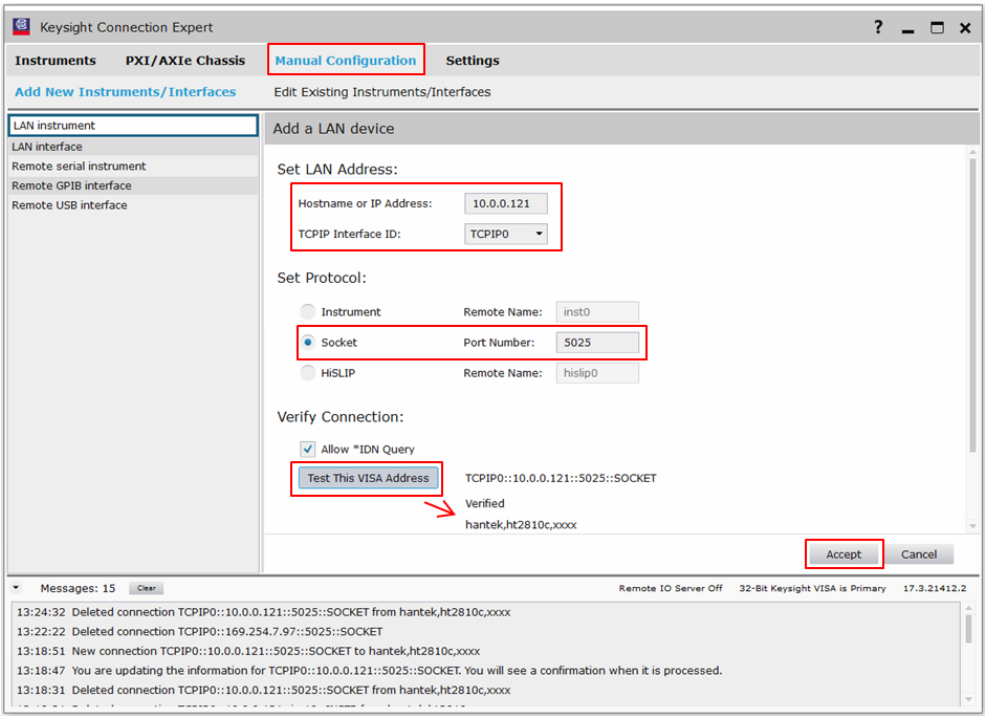
2. Configure network parameters

1) Please refer to LAN Configuration chapter to configure the network parameters of this instrument.
2) Configure the network parameters of the computer to ensure this instrument and the computer are on the same local area network.

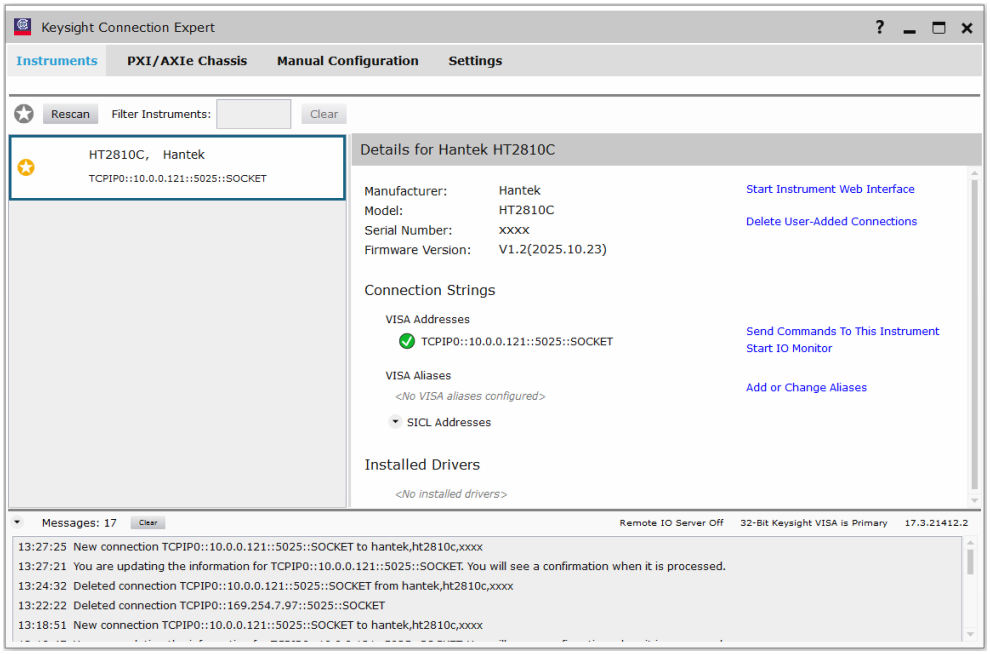


3. Add Device Resources

1) Open IO, select Manual Configuration -> LAN instrument, and input the IP address of this product in the Hostname or IP Address field under Set LAN Address.
2) In Set Protocol, Socket: Port Number: 5025.
3) Click Verify connection: Test This VISA Address. If it is success, the status will show as “Verified”.



4) Click **Accept** button. A new device will automatically be generated in the Instruments section, indicating a successful addition.



4. Control the instrument remotely

In the IO interface, click "Send Commands To This Instrument" or Interactive IO (depending on the IO version), to open the remote command control panel. From there, you can send commands and retrieve data via this panel.

8.3 Remote Control via RS232

1. Connect the device

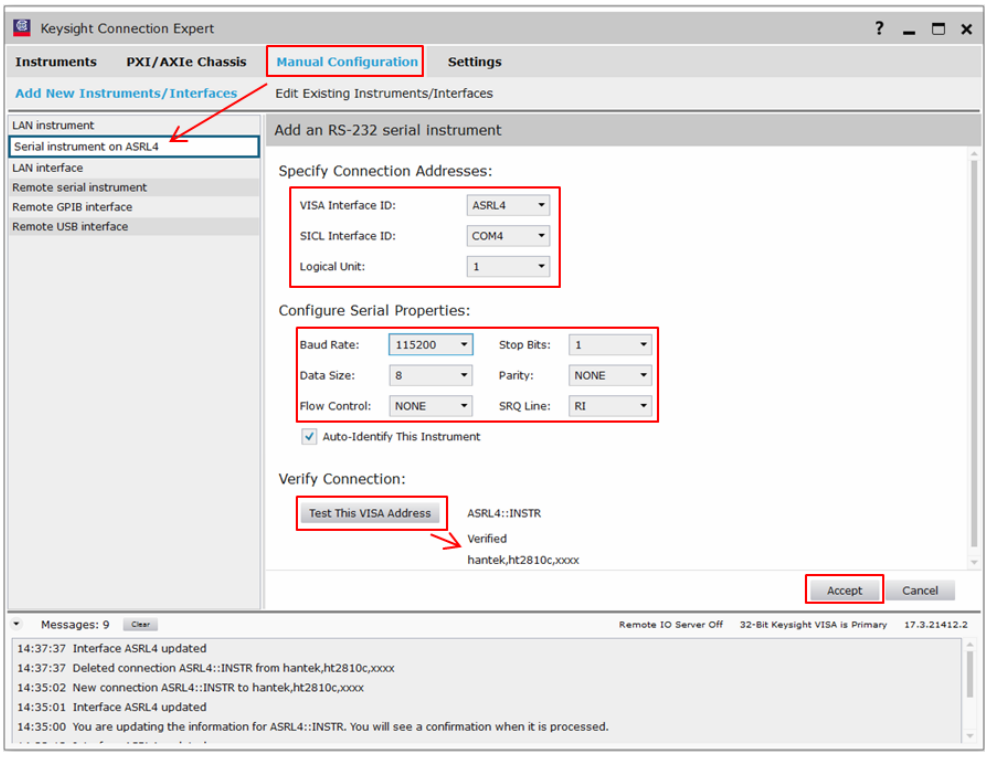
Connect this product (RS232/485 port) to the PC (USB HOST interface) using an RS232 serial cable. For more interface details, refer to the RS232/485 Interface section.

2. Configure parameters

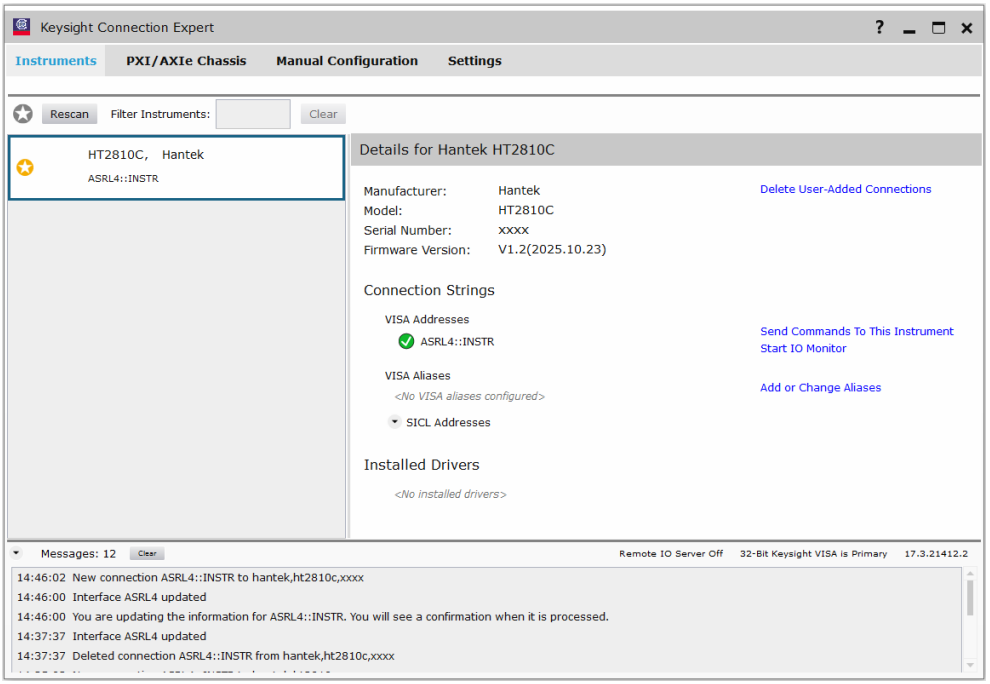
Configure the RS232 parameters of this instrument, For more interface details, refer to the RS232 Configurations section.

3. Add Device Resources

1) Open IO and select Manual Configuration -> Serial instrument on ASRL4. As shown in the reference diagram below, configure parameters such as the baud rate on this interface.
2) Click Verify connection: Test This VISA Address. If it is success, the status will display as “Verified”.



3) Click Accept button. A new device will automatically be generated in the Instruments section, indicating a successful addition.



4. Control the instrument remotely

In the IO interface, click "Send Commands To This Instrument" or Interactive IO (depending on the IO version), to open the remote command control panel. From there, you can send commands and retrieve data via this panel.

9 External Interface Description

9.1 RS232/485 Interface

Using asynchronous serial communication, the interface of this instrument is not strictly based on the RS-232 standard but provides a simplified subset. As shown in the table below, "Transmit data" and "Receive data" are defined relative to this instrument.

Table 9.1 RS232 Pin Introduction

Pin	Abbreviation Identifier	Signal
3	TXD	Transmit data
2	RXD	Receive data
5	GND	GND
8	CTS	Clear-to-send
7	RTS	Request

Table 9.2 RS485 Pin Introduction

Pin	Abbreviation Identifier	Signal
4	A	Positive terminal
9	B	Negative terminal

The connector is a black DB9 female standard socket, with the pin sequence as shown in the figure below:

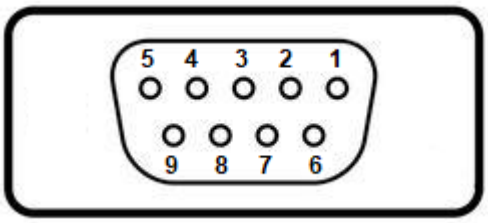


Figure 9.1 RS232/485 pin diagram

Note: To prevent electrical shock, always turn off the power before inserting or removing the connector.

Note: Do not short-circuit the output terminals or allow them to accidentally touch the chassis, as this may damage the components.

9.2 Handler Interface

The benchtop LCR meter provides users with a Handler interface, which supports the output of comparator sorting results and list sweep results.

9.2.1 Technical Description

Output signals: Active-low, open-collector output, opto-couplers isolated.
Input signals: opto-couplers isolated.
The power pin supports a DC supply voltage range of 3 V to 25 V.

9.2.2 Pin Definitions

The Handler interface is DB9 male standard socket. The specific pin definitions and their locations are as shown in the following figure and table.

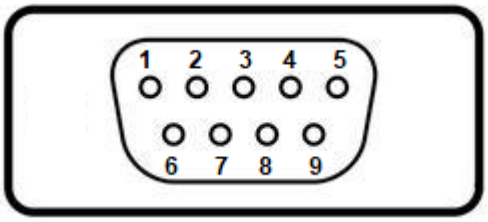


Figure 9.2 Handler interface pin diagram

Table 9.3 Pin Introduction

Pin	Identification	Function	Description
1	BIN1 OUT	Output	Comparator function, binned result output, BIN:1. List scanning function, output of result No. 1. A valid signal is output if the comparison result is H or L.
2	BIN3 OUT	Output	Comparator function, binned result output, BIN:3. List scanning function, output of result No. 3. A valid signal is output if the comparison result is H or L.
3	BIN7 OUT	Output	Comparator function, binned result output, BIN:AUX. List scanning function, output of result No. 7. A valid signal is output if the comparison result is H or L.
4	EXT TRIG IN	Input	External trigger signal input, rising edge trigger. High-level voltage is consistent with the external voltage source.
5	EXT COM1	GND	Reference ground for external DC power supply and output signals.
6	BIN2 OUT	Output	Comparator function, binned result output, BIN:2. List scanning function, output of result No. 2. A valid signal is output if the comparison result is H or L.

7	BIN OUT	Output	Comparator function, binned result output, BIN:OUT. List scanning function, overall comparison result after startup. A valid signal is output if any one of all sequence numbers has a result of H or L.
8	EOM OUT	Output	Measurement completion signal.
9	EXT DC1	Power Input	External DC voltage source input, with reference ground at EXTCOM1.

9.2.3 Sequence Chart

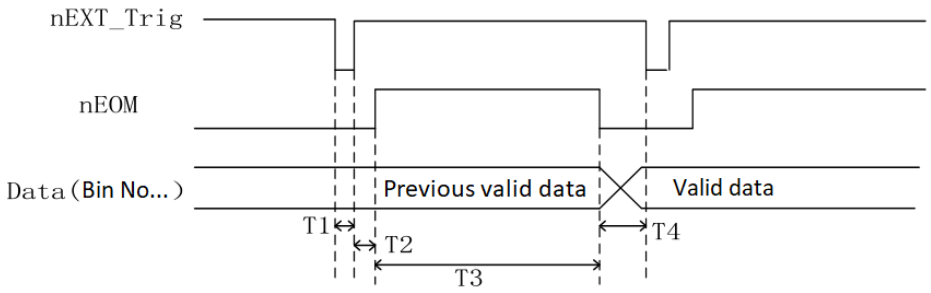


Figure 9.1 Sequence chart

Table 9.4 Sequence explanation

Time	Minimum value	Maximum value
T1	1ms	--
T2	--	One Measurement Time
T3	One Measurement Time	One Measurement Time +1ms
T4	0	--

The value of one measurement time in the table is determined based on the speed setting. For example, in Non-DCR mode at low speed, one measurement time is 0.5S.

10 Basic Specification

10.1 Basic Accuracy

The following data was measured under the following conditions:
Temperature Condition: 23°C ±5°C
Humidity Condition: ≤65% R.H.
Calibration: Please complete the open and short correction prior to testing.
Warm-up Time: >30 minutes
C：0.10%*(1+ Cx/Cmax+ Cmin/Cx)(1+Dx)(1+ks+kv+kf)；
L：0.10%*(1+ Lx/Lmax+ Lmin/Lx)(1+1/Qx)(1+ks+kv+kf)；
Z：0.10%*(1+ Zx/Zmax+ Zmin/Zx)(1+ks+kv+kf)；
R：0.10%*(1+ Rx/Rmax+ Rmin/Rx)(1+Qx)(1+ks+kv+kf)；
D：±0.0010*(1+ Zx/Zmax+ Zmin/Zx)(1+Dx+Dx*Dx)(1+ks+kv+kf)；
Q：±0.0010*(1+ Zx/Zmax+ Zmin/Zx)(Qx+1/Qx)(1+ks+kv+kf)；

Tip:

1. L, C, R, and Z are relative errors; D and Q are absolute errors.
2. The subscript "x" indicates the measured value of that parameter, the subscript "max" indicates the maximum value, and "min" indicates the minimum value.
3. ks is the speed factor, kv is the voltage factor, and kf is the frequency factor.

The maximum and minimum values of measurement parameters that affect accuracy are shown in the table below.

Table 10.1

Frequency (Hz)	100	120	200	400	800	1K	2K	4K	8K
Cmax	15.9	13.25	7.95	3.98	1.99	1.59	0.795	0.398	0.199
Cmin	15.9	13.25	7.95	3.98	1.99	1.59	0.795	0.398	0.199
Lmax	159	132.5	79.5	39.8	19.9	15.9	7.95	3.98	1.99
Lmin	159	132.5	79.5	39.8	19.8	15.9	7.95	3.98	1.99
Z/Rmax	100000								
Z/Rmin	100								
Frequency (Hz)	10K	15K	20K	40K	50K	80K	100K		

Cmax	0.159	0.106	0.0795	0.0398	0.0318	0.0199	0.0159
Cmin	0.159	0.106	0.0795	0.0398	0.0318	0.0199	0.0159
Lmax	1.59	1.06	0.795	0.398	0.318	0.199	0.159
Lmin	1.59	1.06	0.795	0.398	0.318	0.199	0.159
Z/Rmax	100000						
Z/Rmin	100						

Tip: Cmax is measured in μF, Cmin is measured in nF, Lmax is measured in H, Lmin is measured in mH. Zmax/Rmax, Zmin/Rmin are measured in Ω.

Speed factor ks:

Speed Mode	Slow	Middle	Fast
ks	0	1	3

Frequency factor kf:

Frequency(Hz)	100-1K	2K-10K	15K	20K	40K-100K
kf	0	0.5	1		4

Level factor kv:

Level (mV)	100	300	600	1000	1500	2000
kv	9	3	1	0	1	2

10.2 Accuracy Graph

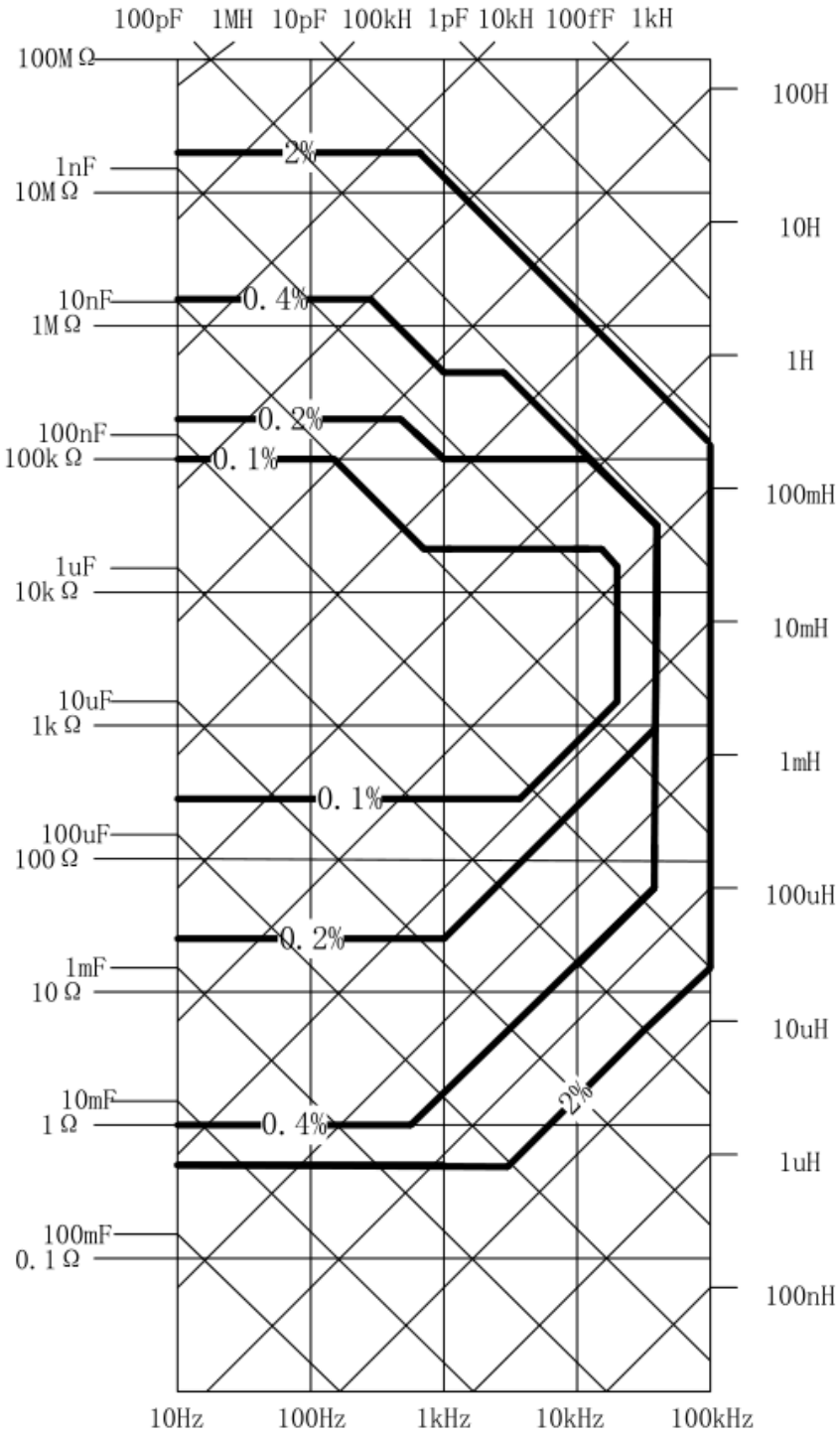


Figure 10.1 Accuracy Graph

Level is 1V, speed mode is Slow

10.3 DCR Accuracy

Table 10.2 Accuracy of DCR

Range	Display Range	Accuracy Re
100MΩ	20.00MΩ~99.99MΩ	10.0%+20 digit
20MΩ	10.00MΩ~20.00MΩ	5.0%+10 digit
10MΩ	1.000kΩ~9.999MΩ	2.0%+5 digit
4MΩ	400.0kΩ~3.9999kΩ	1.2%+3 digit
400kΩ	40.00kΩ~399.99kΩ	0.3%+3 digit
40kΩ	4.000kΩ~39.999kΩ	0.2%+2 digit
4kΩ	400.0Ω~3.9999kΩ	0.1%+2 digit
400Ω	40.00Ω~399.99Ω	0.2%+2 digit
40Ω	4.000Ω~39.999Ω	0.3%+3 digit
4Ω	0.400Ω~3.999Ω	1.0%+5 digit
0.4Ω	0.0000Ω~0.3999Ω	3.0%+10 digit

10.4 Signal Source

Frequency

100Hz-100kHz, ±0.02% read value

Level

100mV-2000mVrms, ±10% read value

BIAS

0mV-1500mV, ±(5% read value + 20mV)

Output Impedance

100Ω/30Ω, ±1%

10.5 Technical Specification

Table 10.3 Technical specification

Test signal frequency	100Hz-100kHz continuously adjustable，1Hz steps	
Display digits	Main Parameter: 5 digits, Second Parameter: 5 digits	
Test Parameter	Main： R/C/ L/Z； Secondary：X/D/Q/θ/ESR	
Parameter display range	R	0.0001Ω - 99.99MΩ
	C	0.001pF – 9999μF
	L	0.001μH - 9999H
Basic accuracy	0.1%	
Display speed	Slow: 2 times/second； Middle: 5 times/second; Fast: 10 times/second;	
AC test signal level (Vrms)	100 - 2000mV continuously adjustable, 1mV steps	
DC bias voltage	0 - 1500mV adjustable, 1mV steps	
Range mode	Auto, Optional special range	
Signal source output impedance	Selectable 30Ω, 100Ω, ±1%	
Correction	Open, Short	
Equivalent circuit	Serial, Parallel	
Trigger mode	Auto, Bus, EXT	
Save/Recall	Setting parameters can be saved internally with 6 sets of positions, which can be recalled by user.	
DCR display range	0.0001Ω ~ 99.99MΩ	
Comparator function	Tolerance range：-100% ~ +100%; 5 bins (BIN:1, BIN:2, BIN:3, BIN:OUT, BIN:AUX)	
Interface	USB HOST, USB DEVICE, LAN, RS232/485, Handler	

Language	Chinese, English
LCD display	Backlight brightness adjustable
Other function	Electrolytic Capacitor Test Mode，Keyboard Lock Function
Operating Environment	0℃-40℃, 15%-85%RH.
Dimensions	Including the sheath: 308*231.5*109.5mm（L*W*H） Not including the sheath: 263.6*213.6*88.6mm（L*W*H）

11 Matters need Attention

11.1 Package

Generally, the instrument is packed in plastic bags along with accessories, spare parts, the operating manual, and the certificate of conformity, all placed in packaging that is dustproof, shockproof, and moisture-proof.

11.2 Transportation

The instrument should be handled with care during transportation and protected from moisture and water.

11.3 Storage

The instrument should be stored in a ventilated room with an ambient temperature of 5℃ to 40℃ and a relative humidity of 15% to 85% RH. The air should not contain any harmful impurities that could corrode the instrument.

11.4 Maintenance and Cleaning

Maintenance:

When storing or placing this product, avoid prolonged direct sunlight exposure on the LCD display.
Prevent water or other liquids from entering the instrument through the test port, buttons, or other seams. If accidental exposure occurs, stop using the instrument immediately and disconnect the power supply and batteries.

Cleaning:

Use a soft cloth dampened with water to clean dust from the product surface, taking care to avoid scratching the surface.

Warning:

To prevent damage to the instrument, do not use any corrosive agents or chemical cleaning solutions.
Before reapplying power, ensure the instrument is completely dry to avoid electrical short circuits or personal injury caused by moisture.

12 Appendix

12.1 Appendix A: Accessories

Standard Accessories	Number
Four-terminal insulation test cable	1
USB cable	1
Power cord	1
Packing list	Includes: Packing list, warranty card and certificate of conformity.

12.2 Appendix B: Warranty summary

Qingdao Hantek Electronic Co., LTD. (hereinafter referred to as Hantek) undertakes that the host and accessories of its production shall be free from any material and process defects during the warranty period.

During the warranty period, if the product is proved to be defective, Hantek will repair or replace the product free of charge. Please refer to the description on Hantek official website for detailed warranty regulations. For repair service or full warranty instructions, please contact Hantek repair center or local offices.

Hantek disclaims warranties, express or implied, other than those provided in this summary or any other applicable warranty card, including, but not limited to, any implied warranties of merchantability and fitness for special purpose. In no event shall Hantek be liable for indirect, special or consequential damages.

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