User's Manual

9920 Series

Insulation Resistance Meter

2015-6-1

Version V1.0

Introduction

Thank you for purchasing 9920 insulation resistance meter. To obtain maximum performance from this product, please read this manual first before operation, and keep it handy for future reference

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Registered trademarks

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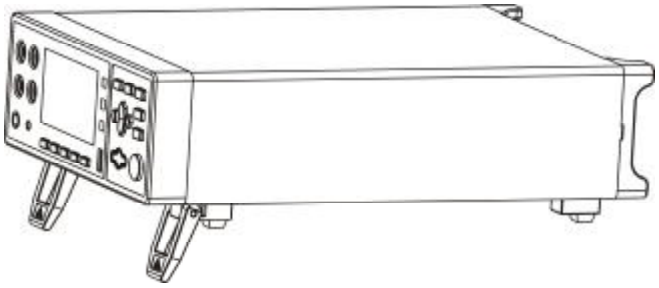
Checking Packing Contents

When receiving instrument, please check carefully to ensure that the instrument is not damaged during transit. In addition, special inspections of accessories, panel switches and connectors are required. If the instrument is found to be damaged or it fails to operate as described in the user manual, please contact us.

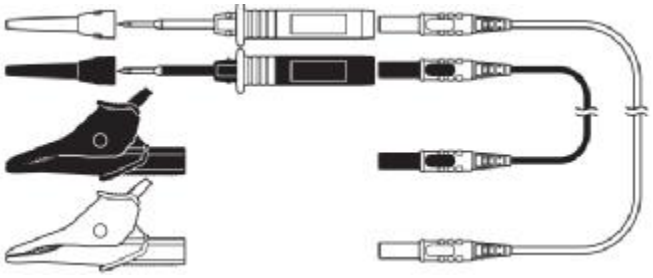
To transport this instrument, use the original packaging and wrap it in a double carton. Damage during transit is not covered by the warranty.

Checking Packing List:

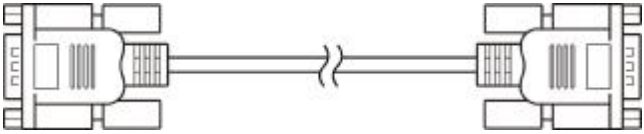
	Item No.	Qt
1	9920 Insulation Resistance Meter	1
2	User Manual	1
3	CD	1
4	RS232 Communication Cable	1
5	Test leads	1
6	AC power cord	1



9920 Insulation Resistance Meter



9331 Test leads



9800 RS232 Communication Cable

Safety Notes

The instrument is designed to comply with the IEC 61010 safety standard and has been thoroughly tested for safety prior to shipment. However, if it is used improperly, it may cause injury or death and damage the instrument. Be sure to read through this manual and its precautions before use. Our company does not assume any responsibility for accidents and injuries caused by defects in the instrument itself.

Safety Signs

This manual marks the relevant signs for safe operation of the instrument. In order to ensure the safety of the instrument and its users, please read the following safety signs and operating precautions carefully before use.

The sign ⚠his manual is particularly important and should be rea⚠refully before using the machine.

Stands for DC (Direct Current).

Stands for fuse

Stands for earth terminal

Accuracy

We use the f.s. (full scale), rdg. (reading) and dgt. (resolution) values to define the measurement tolerances, which have the following meanings:

f.s. (Maximum display value or measurement range)

This is usually the maximum display value. In the instrument, this indicates the currently used range.

rdg.(Reading or displayed value)

The value currently being measured and the value indicated on the measuring instrument.

dgt.(Resolution)

The smallest displayable unit on a digital measuring instrument, i.e., the input value that causes the digital display to show a "1".

Usage Notes

Installation Environment

- **Operating temperature and humidity:**
  0 to 40 ° C, below 80% RH (no condensation)

- **Temperature and humidity range that can ensure accuracy:**
  23 ± 5°C，below 80% RH (no condensation)

- **To avoid malfunction or damage to the instrument, do not place the tester in the following situations:**
- **Places where the sun is shining directly at high temperatures**

- **It will splash to the place where the liquid temperature is high and condensation occurs.**

- **Exposed to dusty places**

- **Locations where corrosive or explosive gases are flooded**

- **Locations with strong electromagnetic fields and electromagnetic radiation**

- **Places where mechanical vibration is frequent**

Checking before use

Before using this instrument, verify that the operation is normal and that there is no damage during storage or transportation. If you find any damage, please contact us.

	**Before using the instrument, make sure that the AC power cord and test leads are well insulated and whether there are conductors are exposed. If a similar situation occurs, there is a danger of electric shock when using this instrument. Please contact us.**

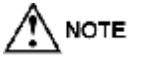
Handling Precautions

	**There are high pressure and high temperature parts inside the instrument during operation, in order to avoid electric shock, do not disassemble instrument electronic enclosure.**
	**To avoid damage to the instrument, physical shock should be prevented when handling and operating the instrument. Special care should be taken to prevent the instrument from falling.**
	**Be sure to turn the power off after using it.**

Measurement considerations

DANGER	**To avoid electric shock and short circuit, the following procedures must be observed:** **Do not wet the instrument or use wet hands for operating it.** **Do not modify or disassemble it yourself. Otherwise, it may cause electric shock or other accidents.**
NOTE	**Do not place the device on unstable pedestals or in inclined places. Failure to do so may result in injury or host malfunction due to falling or tipping over.** **• To prevent damage to the instrument, avoid vibration and collision during handling and use. Pay particular attention to collisions caused by falling.** **• To avoid damage to the instrument, do not connect the measurement terminals to the EX.SW terminal, EX.I/O terminal, or communication terminal.**

Handling leads and cables

	**To prevent an electric shock, do not short-circuit the top of the test leads and the lines with voltage.**
	**• When testing, for your safety, please use the instrument's own test leads option.** **• To avoid damaging test leads, do not bend or stretch the test leads.** **• The probe at the front of the test leads is sharp, taking care not to be scratched.** **• To avoid damage to the test leads, do not take the cables while you are plugging or unplugging the test leads. Hold the connectors.**

Chapter 1 Overview

1.1 Introduction

9920 Insulation Tester is an instrument that tests the insulation resistance of components and equipment. Using the constant voltage test method, the voltage output range is 25~1000 V, and the maximum output current is 1.8mA. Meanwhile, it has contact abnormality detection function and short circuit abnormality test function, the fastest test speed is up to 50ms.

The output interface standard of this insulation tester has external output port (EX.I/O), RS-232C interface, Ethernet interface (LAN), analog output port (ANALOG OUTPUT) and U disk interface. The 9920 is suitable for use in the field of different connection requirements, including production and inspection lines as well as laboratories.

1.2 Characteristics

□ Exterior

- 3.5-inch high-resolution TFT LCD display, easy to operate
- Compact and powerful

□ Test voltage source

- Test high voltage source using switching power supply principle
- Maximum constant current 1.8mA output
- Voltage adjustment range 25~1000 V, in step 1V

□ Test speed

- Minimum test cycle takes only 50ms

□ Four-terminal test

- The instrument can detect test leads anomalies
- The instrument can detect the abnormal contact of the

measured object (avoid open circuit misjudgment)

□ Short circuit detection

• The instrument effectively detects short-circuit conditions and avoids direct application of high-voltage breakdown products.

□ Rich interface

• External I / O port

• RS-232C interface

• Ethernet interface

• Analog output interface

• U disk interface

□ Automatic discharge

• The instrument will automatically discharge after the test is over

• Fast, efficient and reliable with contactless constant current discharge

□ Powered by

• 100~256 V wide power supply

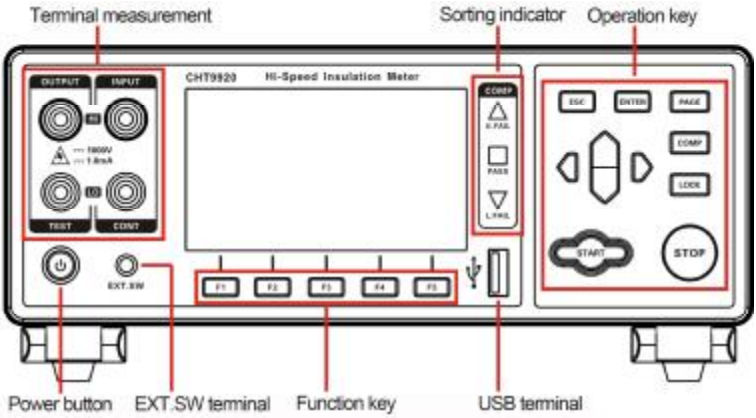
• Power frequency 50Hz/60Hz automatic identification

• Maximum power consumption 15W

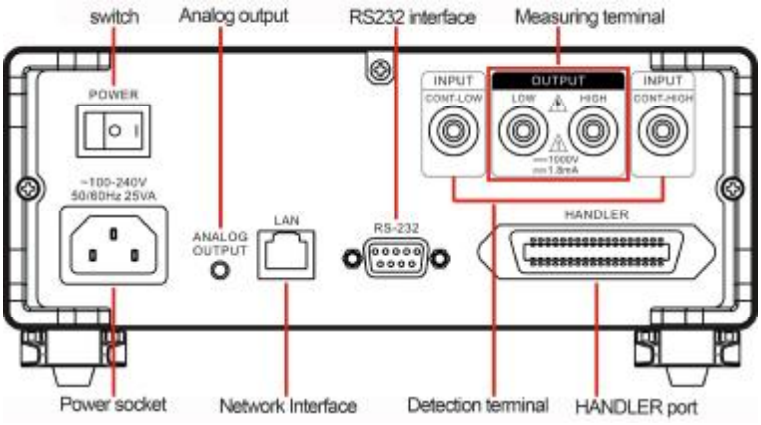
1.3 Component Names and Operation

Overview

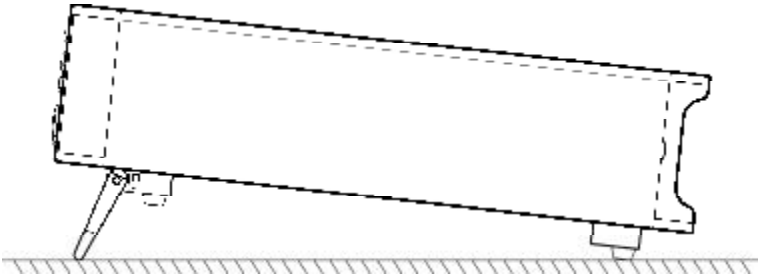
Front Panel



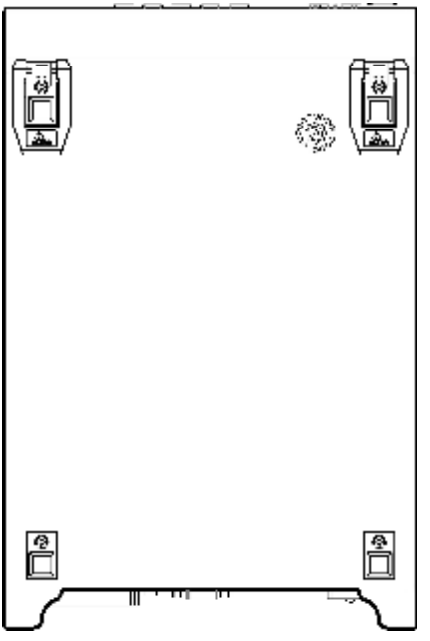
Rear Panel



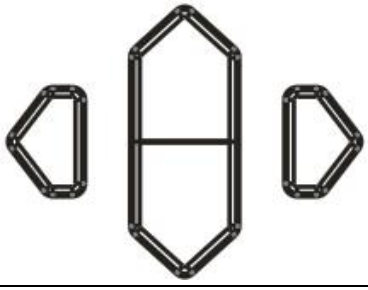
Side View



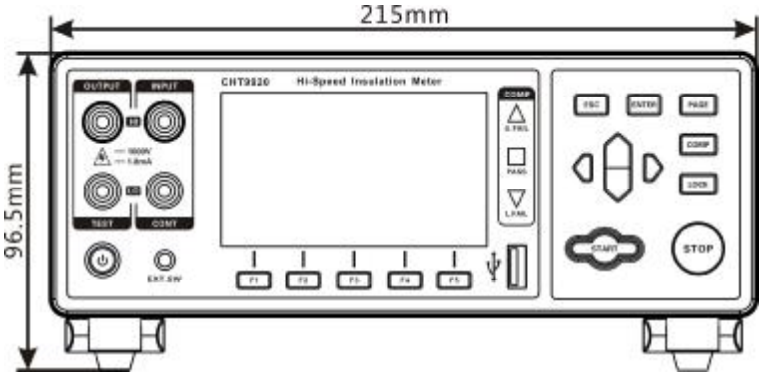
Bottom

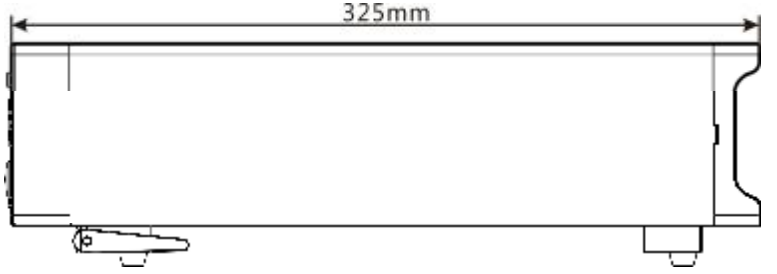


Keys	Description
	**Function key F1**
	**Function key F2**
	**Function key F3**
	**Function key F4**
	**Function key F5**
	**Function key Escape**
	**Function key Enter**
	**[Page Switch] Switch [Test Page] <-> [Setup Page] <-> [Save Page] <-> [Communication SetUP Page] <-> [Version Information Page] <-> [Calibration Page]**
	**Comparator on/off button**

	**Lock key** **Press [LOCK] button, the other buttons on the lock page are invalid. Press the resume button function again.**
	**[Test start button], in the test stop state, press [Test start button], there will be test voltage output at the output terminal.**
	**[Test stop button], during the test, the button flashes the warning, press [Test stop button], the test is terminated.**
	**[Direction key] for selecting menu items or set up values**

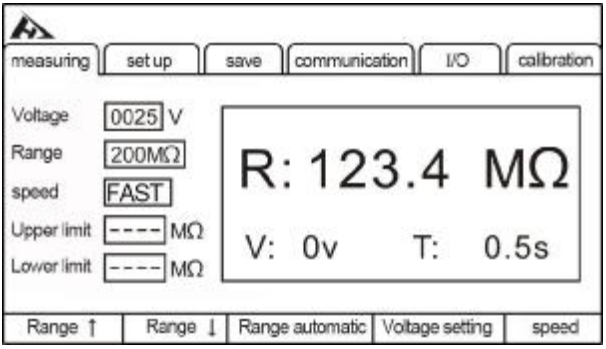
1.4 Dimension



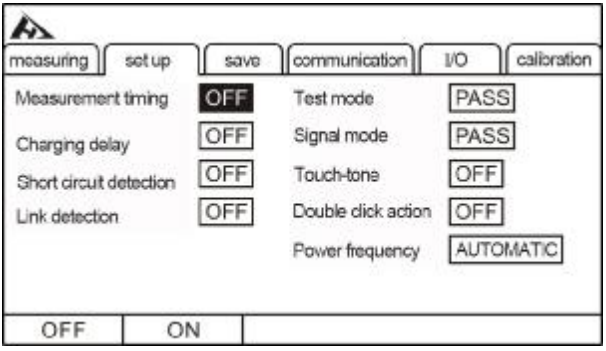


1.5 Screen Composition

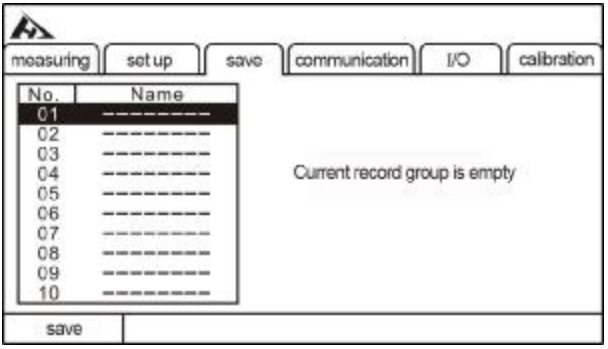
Measurement Display



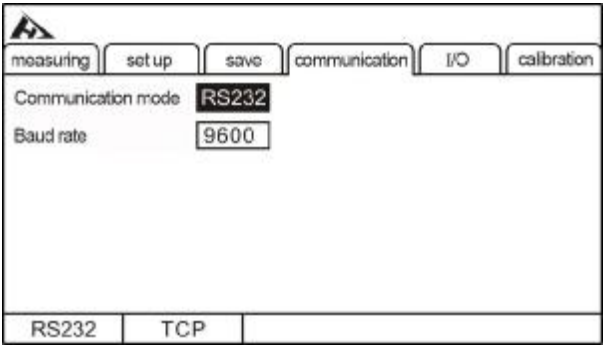
Parameter setting page



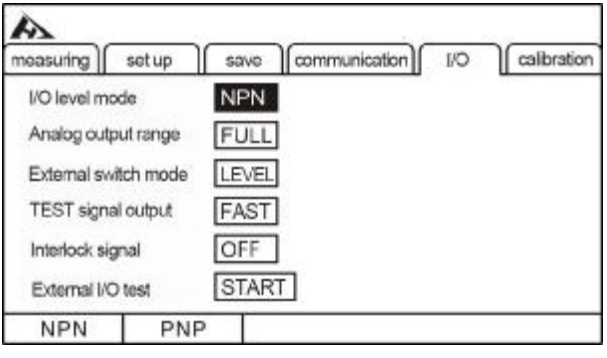
Set parameter save page



Communication page



I/O page

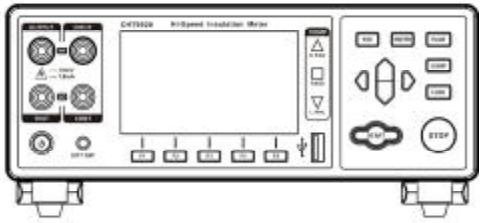


Chapter 2 Preparing for Measurement

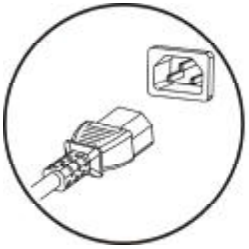
2.1 Measurement Process Overview

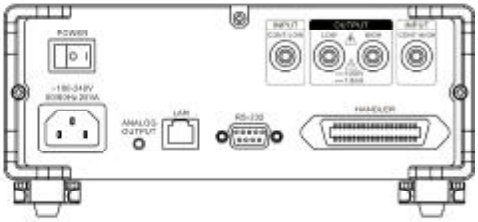
The instrument is kept power off, the following steps are taken to prepare for testing.

1. **Turn off the instrument and connect the test leads.**



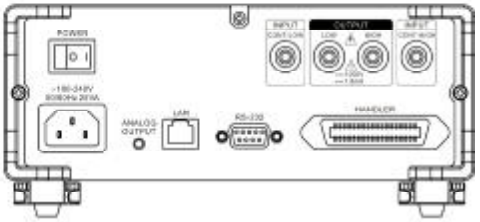
2. **Plug AC power cord into the mains outlet**





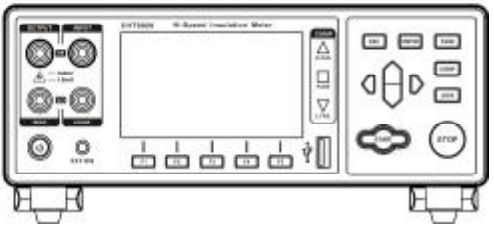
Ensure that the power cord is well grounded, which is conducive to the stability of the test.

3. **Turn on the power at back of instrument.**



At the time being, internal power of the instrument has been turned on and the instrument is in standby mode.

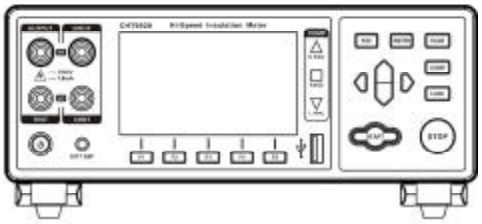
4. **Press and hold POWER button on panel to turn on the power.**



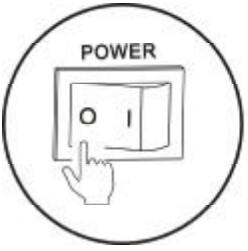
When instrument is in the standby mode, POWER button at panel light is red, long press POWER button, the power is turned on, the screen is lit, and light of button at panel turns green.

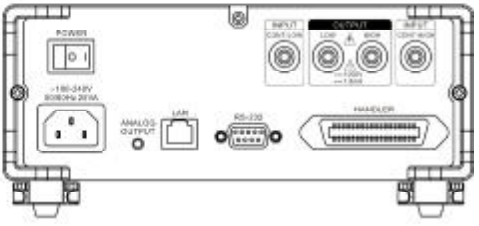
5. **Setting measurement parameters (Refer to section 2.2 for details)**

6. **Start to test**

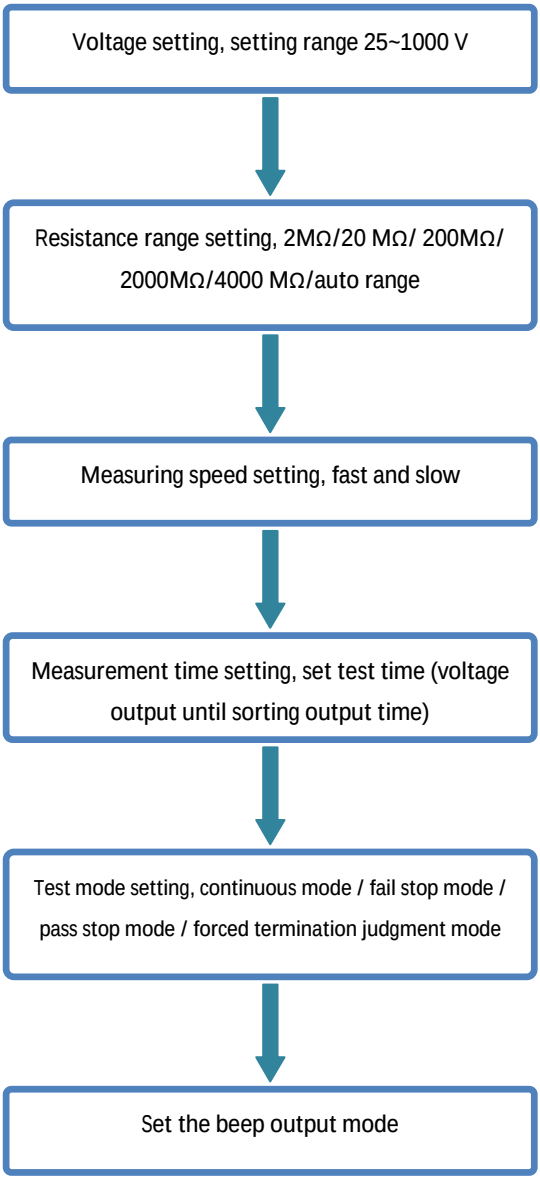


***7.* Complete test, turn off the power**





2.2 Basic parameter setting process



2.3 Pre-measurement Inspection

Before using the instrument, inspect it to verify that no damage has occurred during storage or transportation and it operates normally. If you find any damage, contact us.

Instrument and peripheral checking

Inspection item	Action
Is there any damage or a crack in the instrument? Are the internal circuits exposed?	If any damage is found, do not use it. Return it for repair.
Is there any dust or contamination, such as pieces of metal, on any terminals?	If dust or contamination is adhered to a terminal, clean the terminal with a swab.
Is the test lead coating broken or is the metal exposed?	If the coating of a test lead is broken, the measured value may become unstable or have an error. It is recommended to replace the intact wire.

Power-on checking

Inspection item	Action
After turn on the power on at the back of the instrument, check whether instrument **POWER** button lit or not?	Return the instrument for repair, if the **POWER** button is not lit.
When power is turned on, does the entire display turn on? the model name and measurement screen are displayed normally?	If the screen does not behave like this, the instrument may be damaged internally. Return it for repair.

2.4 Test leads Connection Method

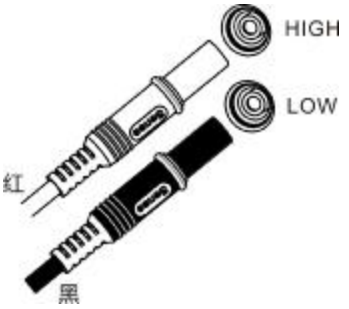
WARNING

- The test leads port is sharp, taking care not to be scratched.
- For safety reasons, test leads supplied with the instrument should be used.
- To avoid electric shock, make sure the test leads are properly connected

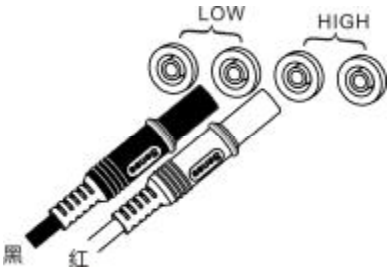
There are two ways to test, one is a two-terminal test and the other is a four-terminal test. The four-terminal test is used to discriminate test errors caused by test connection line abnormalities or test connection abnormalities.

Connection Method of 2-wire Test Leads

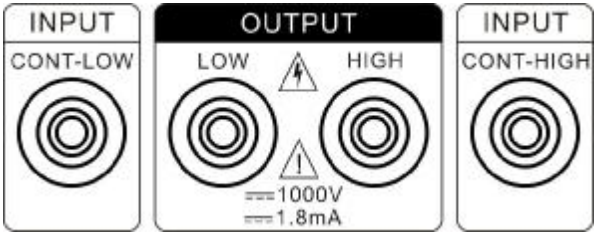
1. Front panel connection

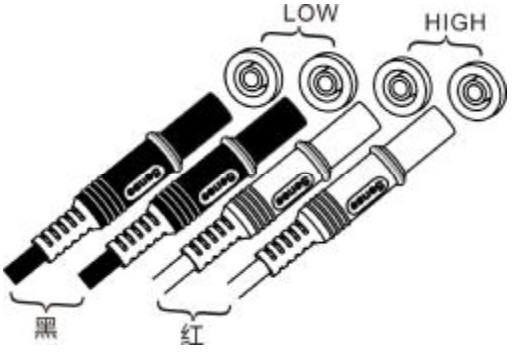


2. Rear Panel Connection



Connection Method of 4-wire Test Leads





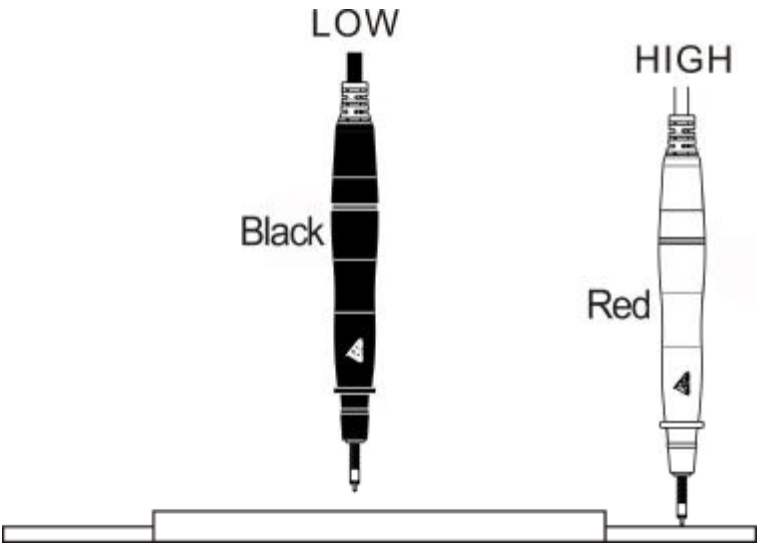
2.4.1 Four-wire Abnormalities Detection Principle

The four-terminal test method here is not the Kelvin test method described in the low resistance. The insulation resistance test does not

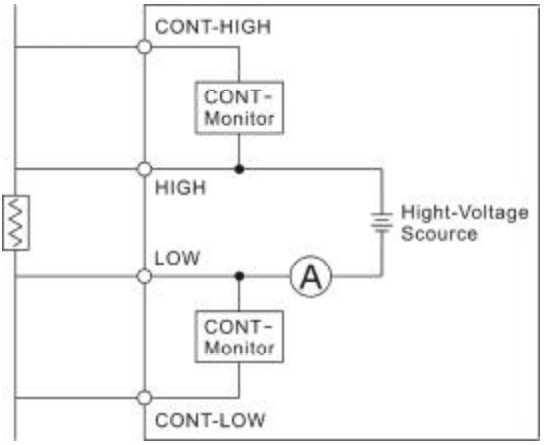
require an additional test lead because the measured resistance is much larger than the contact resistance and the test leads resistance. The two extra lines here are for abnormalities detection.

In the case of insulation testing, it is often judged at the lower limit. When the insulation resistance exceeds the lower limit, the insulation is judged to be acceptable. When the following conditions occur in the 2-wire test, the measured insulation resistance is large, and it is prone to misjudgment. As shown below:

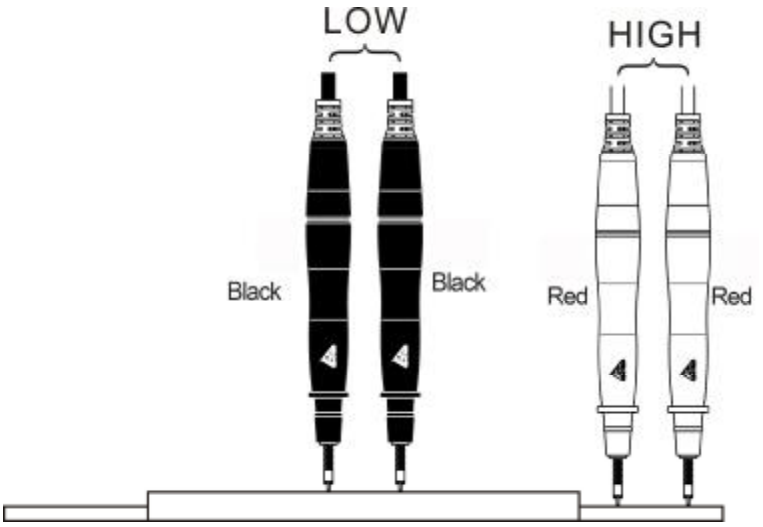
- **The test leads and the device under test are not in contact with each other.**
- **Test lead is broken and disconnected**



The schematic diagram of the 4-wire test is as follows:



An open circuit monitoring circuit (CONT-Monitor) between the CONT-LOW terminal and the LOW terminal is used to determine whether the CONT-LOW terminal and the LOW terminal are in contact with the measured object. The same is true for the CONT-HIGH and HIGH terminals.

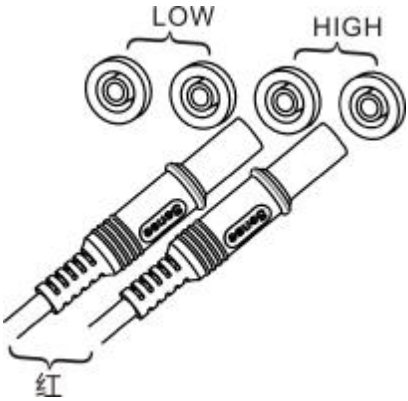


2.4.2 Determine whether the abnormality detection (contact abnormality detection) function is normal

LOW terminal abnormal detection judgment

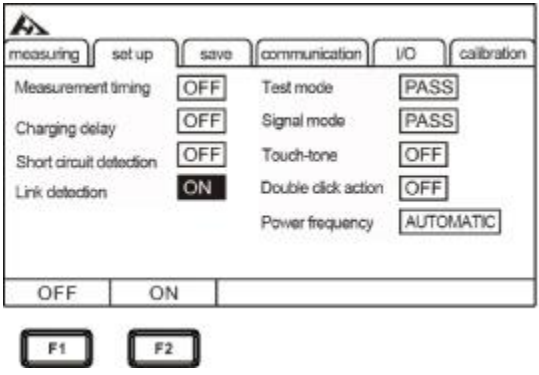
The following takes the LOW terminal contact detection function as an example. The steps are as follows:

1. **Insert the terminal to be detected by the HIGH terminal, so that the LOW terminal to be detected is kept open.**



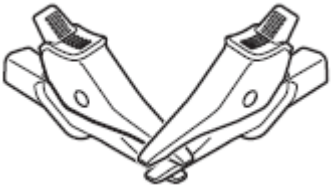
2. **Turn on the power**

3. **Turn on the anomaly detection function**

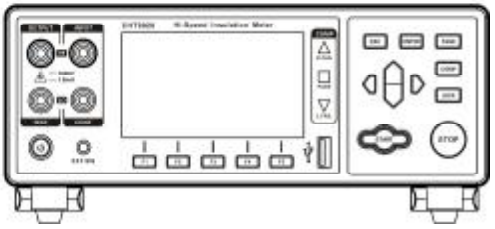


Press the up,down, left and right keys to select the menu item to be set.

4. **Short circuit HIGHT terminal and CONT-HIGH terminal test clip**



5. **Perform measurements**

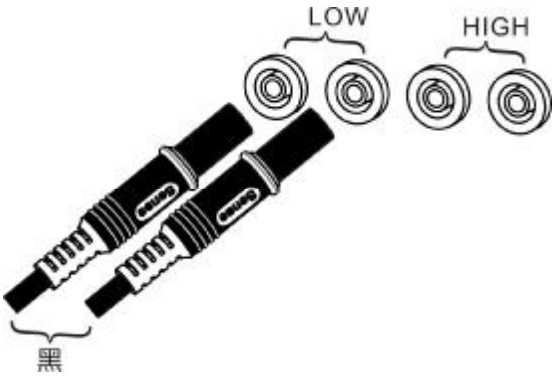


6. **Anomaly detection error occurs**

HIGH terminal abnormality detection

Similarly, to judge whether the abnormal detection of the HIGH terminal works, the same reason is as long as the test clip is inserted at the LOW terminal, the LOW terminal and the CONT-LOW terminal clip are short-circuited, the HIGH terminal keep the open circuit, the abnormality detection function is turned on, the test is performed, and the result is judged.

1. **Insert the terminal to be detected at the LOW terminal, so that the HIGH terminal to be detected is saved open.**



2. **Turn on the power**

（**Omit**）

3. **Turn on the anomaly detection function**

（**Omit**）

4. **Short circuit LOW terminal and CONT-LOW terminal test clip**

（**Omit**）

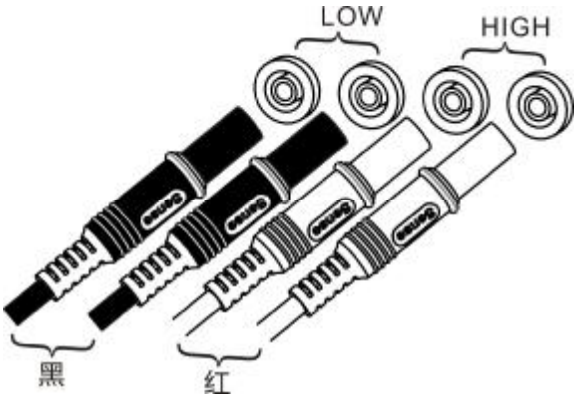
5. **Perform measurements**

（**Omit**）

6. **Anomaly detection error occurs**

Open circuit abnormality detection

1. **Insert the terminal to be detected at the LOW terminal, so that the HIGH terminal to be detected is saved open.**



2. **Turn on the power**

（**Omit**）

3. **Turn on the anomaly detection function**

（**Omit**）

4. **Short circuit LOW terminal and CONT-LOW terminal test clip, short circuit HIGH terminal and HIGH-HIGH terminal test clip**

5. **Perform measurements**

（**Omit**）

6. **Anomaly detection error occurs**

Chapter 3 Basic Settings

For safety, read this chapter before performing measurements.

Note:

During the test, except for the [STOP] key, all other keys are invalid. Users must wait for the end of the test, or press the [STOP] key, send a test stop command to force the test to terminate, and terminate the test process before setting the instrument.

3.1 Set Test Voltage

Users can select between auto range and manual range.

Note:

Since the current is steadily flowing to the object to be measured up to 1 A at the time of auto-ranging or when it is set to 30 mΩ or less, a maximum of 2 W of power may be applied. When users are concerned about the following problems due to the measurement of current, select a smaller measurement current range.

- The object to be tested is blown (fuse, air pump)
- The measured object is hot and the resistance value changes.
- The object to be measured is magnetized and the inductance changes.

If the power of the measured object is within the measurement scope of each range, the power is the resistance value × (measuring current) 2 . When the measurement range is exceeded, the maximum open circuit voltage × measurement current may be reached.

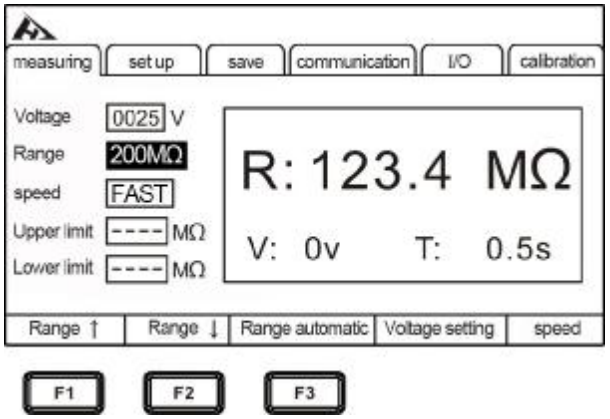
Please connect the measured object after confirming the range.

* At the moment of connection to the object under test, a transient inrush current of up to 5 A will flow.

(Stabilization time: about 1 ms for pure resistance)

3.2 Set the Test Range

The range setting is divided into manual range and automatic range. In auto range, instrument automatically selects an appropriate range to test based on the value of the measured resistance.



Manual Range Setting:

In the measurement page, press [F1] or [F2] key to switch the range. Even if the auto range function is turned on, the manual range switch is also valid (when the auto range is turned on, the auto range function is automatically turned off when the range is manually switched).

Range：

2MΩ ↔ 20MΩ ↔ 200MΩ ↔ 2000MΩ ↔ 4000MΩ

Auto Range Setting:

In the measurement page, press [F3] key to switch the auto range. When set to auto range, the [AUTO] mark lights and [AUTO] mark is not displayed when the auto range function is turned off.

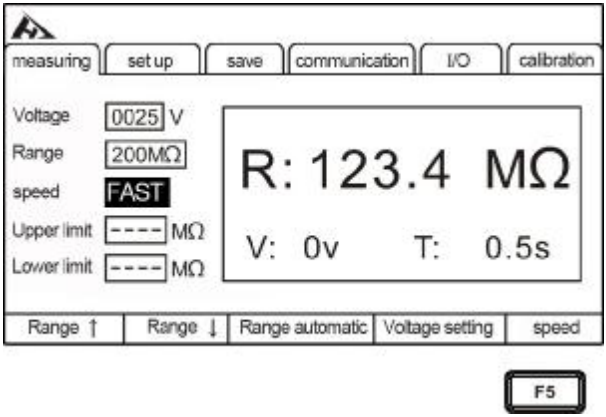
Note:

- **If the range is changed while the auto range is ON, the auto range is automatically canceled and the manual range is changed.**
- **If the comparator function is set to ON, the range is fixed and cannot be changed. To change the range, set the comparator function to OFF or change the range in the comparator settings.**
- **The auto range may become unstable due to the measured object. In this case, manually specify the range or extend the delay time. For the test accuracy of each range, refer to "Resistance Measurement Accuracy".**

3.3 Set Test Speed

Press [Speed] key on the test page to switch the current test speed. The fast sampling rate (the rate from the start of sampling until the sorting and display output) is 50ms, and the slow test rate is 500ms.

In the test environment, when the electric field interference is relatively large, or the test is difficult to stabilize, it is recommended to use the slow test.



Note:

- **When the abnormality detection function is turned on, the fast sampling rate is extended to 100ms, and the slow sampling rate keeps 500ms.**
- **If the sampling period is 500ms during the slow sampling rate test, if the test cycle setting is less than the sampling period of 500ms, the test result is not displayed. This is required to set the test cycle time to be longer than the sampling period.**

3.4 Measurement Timing Setting

The measurement timing refers to the time during which the test voltage output until the FAIL/PASS sort signal is output.

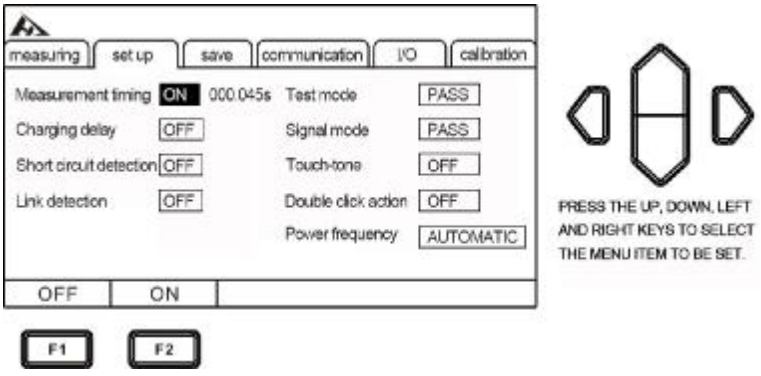
Measurement Timing Time = Charging Timing Time + Measurement Time

Time range setting: 0.045s~999.9s

Display form: countdown display

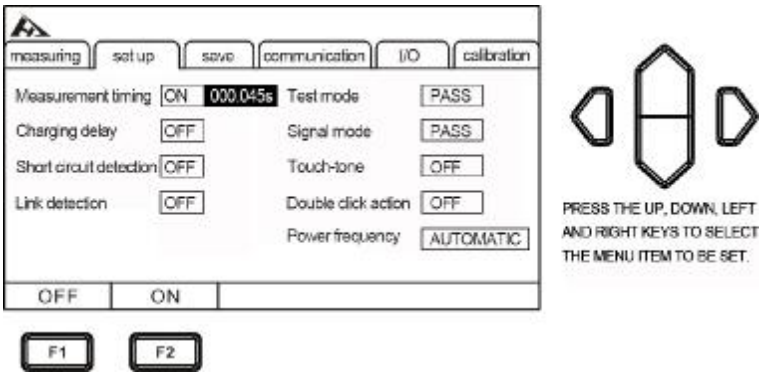
***1.* Select parameter setting page**

***2.* Select related menu items**



Menu item	Meaning
[OFF]	**Test timing is turned off, after the test starts until a forced termination is encountered**
[ON]	**Turn on the test timing function, the test will not be terminated until the timing is up after the test starts.**

***2.* Delay time value setting**

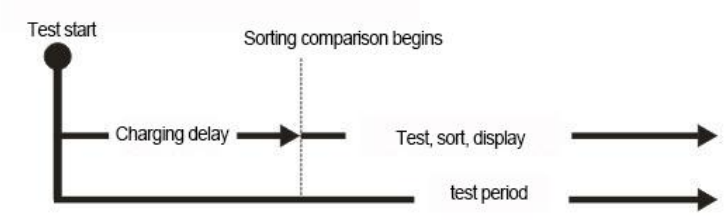


note:

- **When the test time is less than the sampling period, the test results are not displayed.**
- **When the test time is less than the span switching time at the auto range status, the result will not be displayed.**
- **When testing a capacitive load, when the component under test is not fully charged, the charging current is relatively large and the measured result will be less than the normal value. This is the user's need to adjust the test time or charge delay time according to the capacity (see section 3.5).**

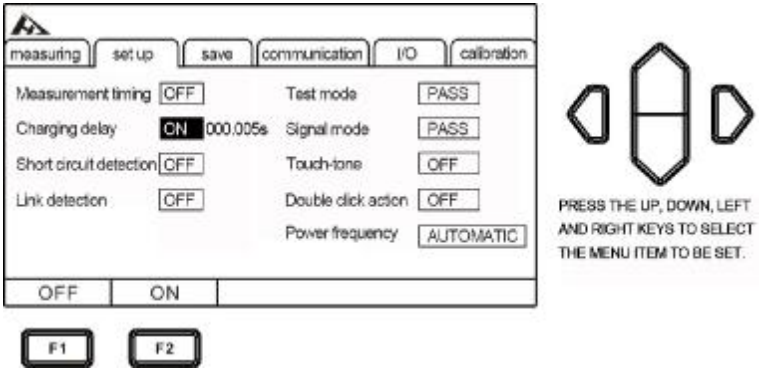
3.5 Charging Delay Setting

The charging delay is the period of time during which the voltage is pre-outputted before the test actually begins. This time is included throughout the test cycle. The charging delay is mainly used to test the capacitive component. Before testing the capacitive component under test, the capacitor must be fully charged first, otherwise the current passing through the device under test is not the leakage current, but the charging current. The measured insulation resistance value is also not the true insulation resistance value.



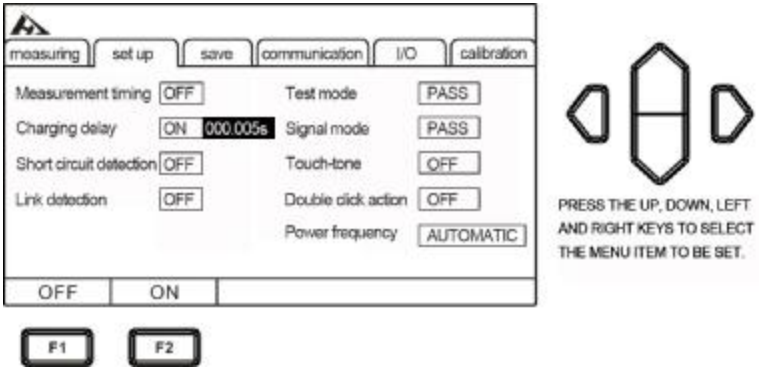
1. Select parameter setting page

2. Select related menu items



Menu item	Meaning
[OFF]	**Turn off the charging delay function**
[ON]	**Turn on the charging delay function, the setting range is 5ms~999.9s**

3. Set the charging delay time



Note:

- **The charge delay time is determined by the capacity of the component under test.**
- **When the capacity of the device under test is large, users can set the charge delay to [OFF] state to test it, and see how long the full charge time is, then set the delay time.**

3.6 Comparator Function

3.6.1 Sorting result signal output mode

When comparator function is turned on, the instrument provides 3 types of alarm outputs:

1. **Panel LED light alarm**

Test value> upper limit value (lower limit sorting)

Within the qualified range

Test value < lower limit (upper limit sort)

2. **Sound alarm**

Refer to (Chapter 3.7) for this function.

3. **External IO port, signal output**

Refer to (Chapter 6.1) for this function.

3.6.2 Sorting Mode

There are 3 sorting modes: [upper limit sorting] / [lower limit sorting] / [upper and lower limit sorting]

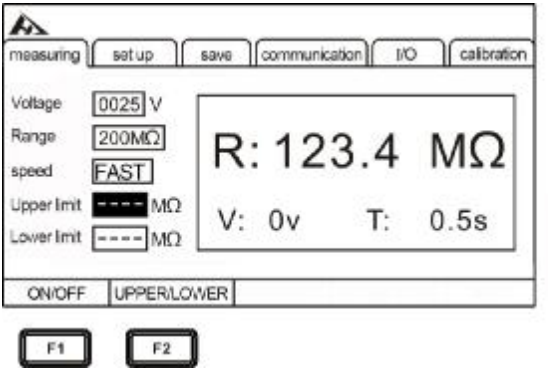
Example:

Sorting mode	upper limit value	lower limit value	GD	NG
upper limit sorting	100M	-----	<100M	≤100M
lower limit sorting	-----	10M	>10M	≥ 10M
upper and lower limit sorting	100M	10M	10M< test value <100M	test value≥100M Or test value≤10M

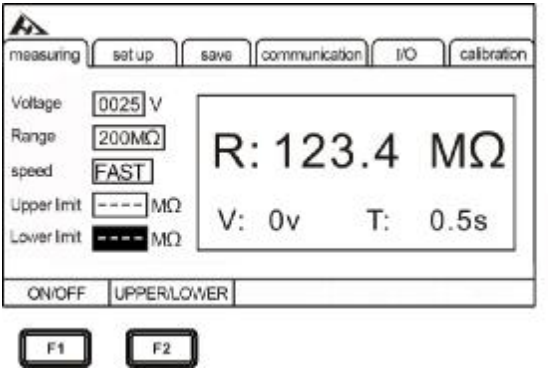
Setting method：

Sorting mode	Setting method
[upper limit sorting]	Upper limit turned on, input value is valid, lower limit is turned off（----）
[lower limit sorting]	Lower limit turned on, input value is valid, upper limit is turned off （----）
[upper and lower limit sorting]	Both the upper and lower limit input values are valid

Turn on upper limit valid



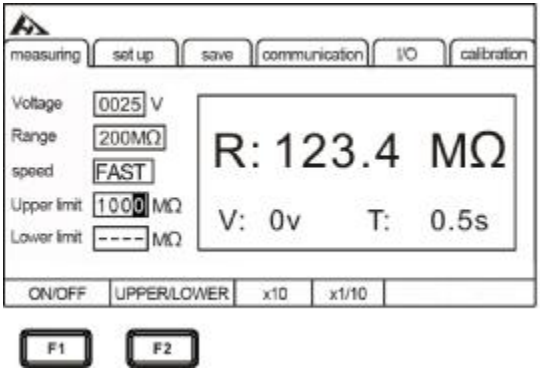
Turn on lower limit valid



3.6.3 Set Upper and Lower Limits and Sorting Mode

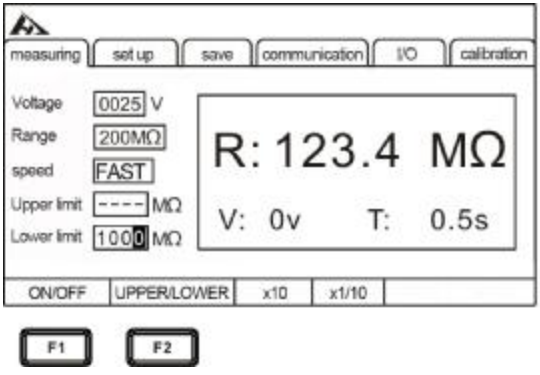
When the upper limit comparison mode is turned on

1. **Upper limit setting**



Press the up, down, left and right keys to set

2. **Lower limit setting**



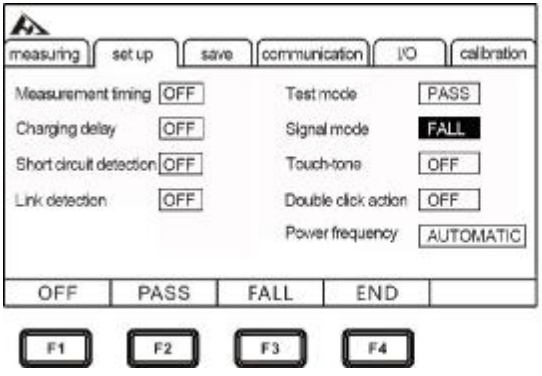
Press the up, down, left and right keys to set

3.7 Beep Mode of Sorting Result

1. **Select parameter setting page**

Press the [PAGE] key to select the parameter setting page

***2.* Select relevant menu items**



Menu item	Meaning
[OFF]	Sorting alarm off When the test fails After the test is over
[PASS]	Alarm when test is GD
[FAIL]	Alarm when test is NG
[END]	Alarm after test is completed

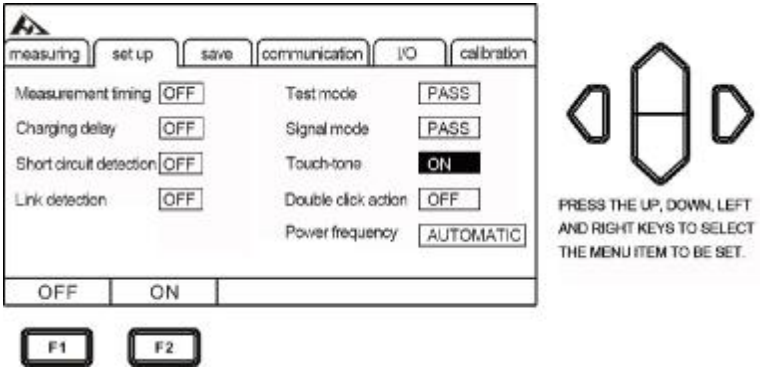
Note:

• When the test value and sorting value are out of range and cannot be judged effectively [L.FAIL] and [F.FAIL] are lit at the same time.

3.8 Key Tone Switch

***1.* Select parameter setting page**

***2.* Select related menu items**

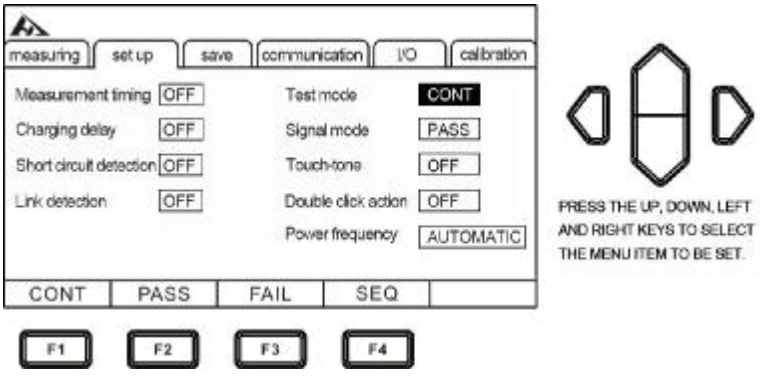


Menu item	Meaning
[OFF]	**Key Tone OFF**
[ON]	**Key Tone ON**

3.9 Test Mode Setting

***1.* Select parameter setting page**

***2.* Select related menu items**

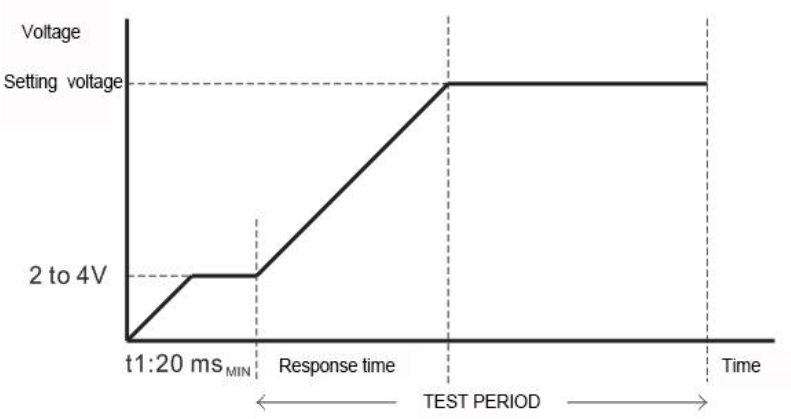


Menu item	Meaning
[CONT]	**Under this mode, after each sampling is finished, there is a sorting output until the test period is reached and the test ends.**
[PASS]	**Under this mode, the test continues until [PASS] signal is outputted.**
[FAIL]	**Under this mode, the test continues until [FAIL] signal is outputted.**
[SEQ]	**Under this mode, the test continues until the [STOP] button is pressed or the test end command is received.**

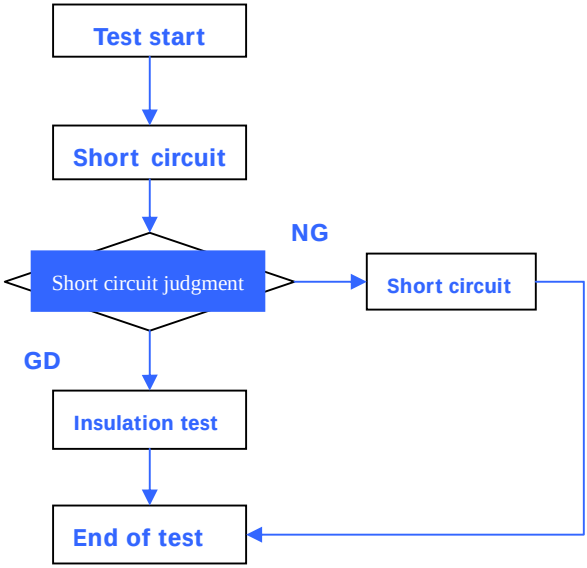
3.10 Short Circuit Detection Function

The short-circuit detection function is used to pre-determine whether there is a short circuit in the device under test before the insulation test. The high voltage of the test output may burn out the metal that causes the short circuit. If users wants to avoid this, the short circuit detection function can be used. The short-circuit detection voltage is about 2~4V. When the device under test is a capacitive load, there is also a charging time. There are two modes for

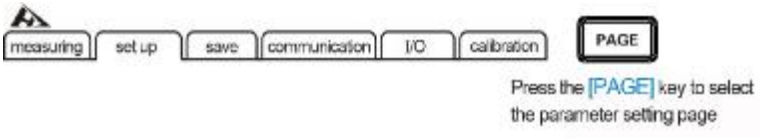
setting the charging time. One is the automatic mode, by monitoring voltage changes at two ends of the device under test to determine if the charge is full. The other mode is a fixed charging time.



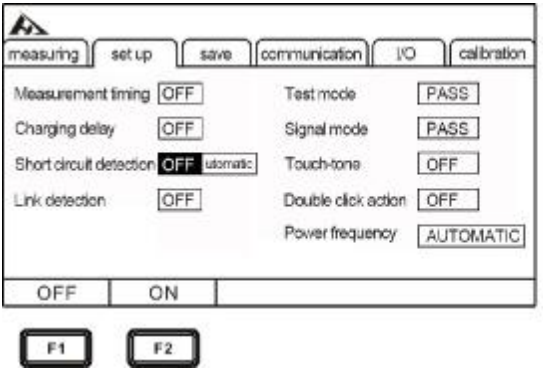
Test timing diagram



1. **Select parameter setting page**



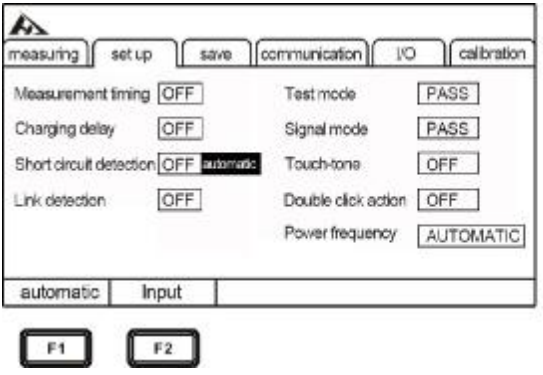
2. **Select related menu items**



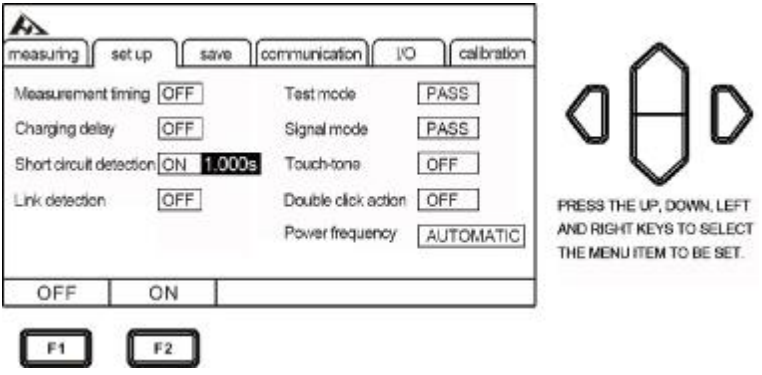
Menu item	Meaning
[OFF]	**Turn off the short circuit detection function**
[ON]	**Turn on the short circuit detection function**

3. **Select related menu items**

Short circuit detection automatic timing mode



Short circuit detection timing mode



Note:

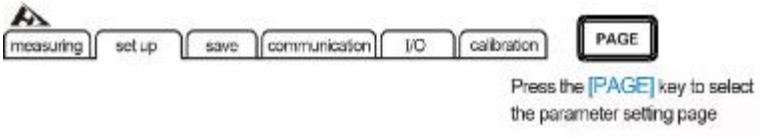
When the test leads or terminals connected to the object under test are in poor contact, unstable measurement values may be displayed.

3.11 Double Click Trigger Function

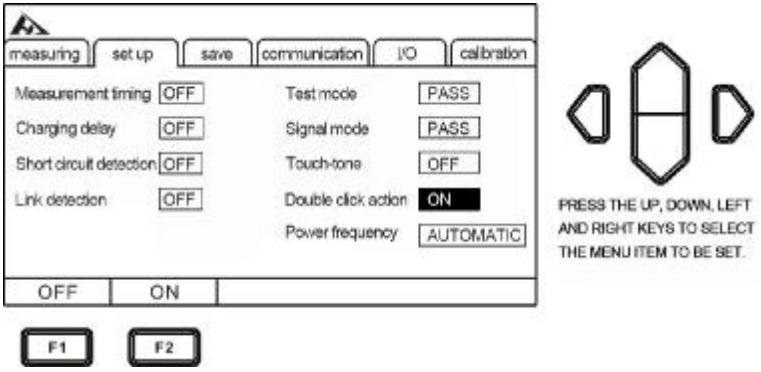
The double-click action function is limited to the trigger test, in order to prevent high-voltage electric shock accidents caused by false triggers. When set to double-click, users must press [STOP] key once and then press [START] key to trigger the test.

Setup

1. **Select parameter setting page**



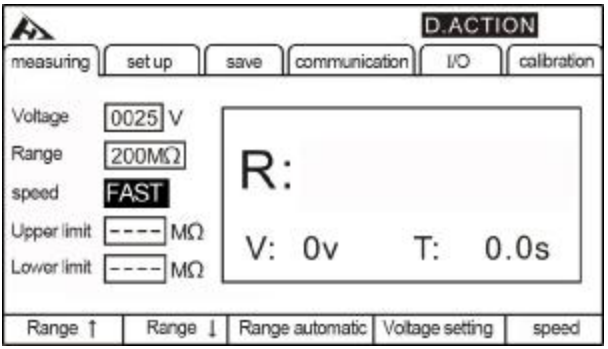
2. **Select related menu items**

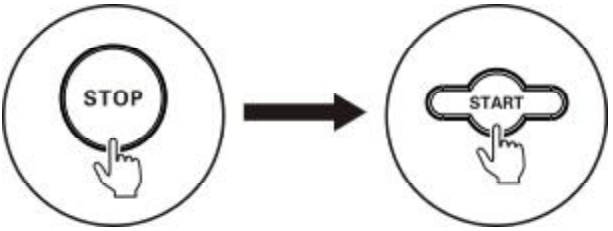


Menu item	Meaning
[OFF]	Turn off double click function
[ON]	Turn on double click function

Trigger step after the double-click function is turned on

After the double-click function is turned on, the measurement page displays [D.ACTION]





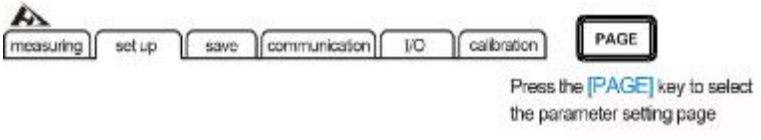
Under the test termination state, when the double-click function is turned on, users must first press [STOP] key and then press [START] key to trigger the test. With the double-click function turned off, users can press [START] key to start the test.

3.12 Power Frequency Setting

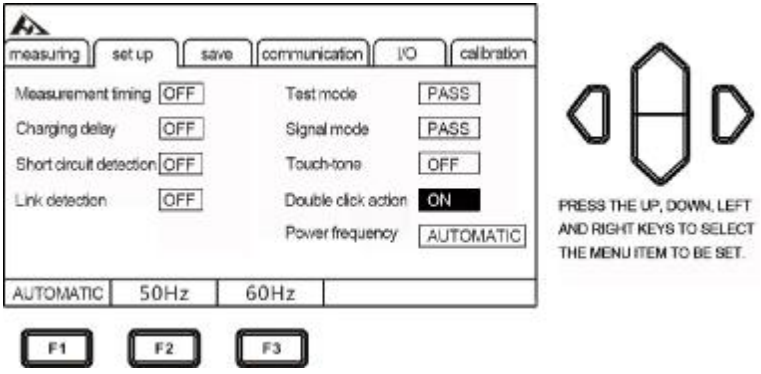
There are 3 power modes, [50Hz] / [60Hz] / [AUTO]. The correct power frequency setting can effectively filter out noise caused by the power supply frequency. If the power frequency is set incorrectly, it may cause unstable measurement.

If you are not sure about the current power supply frequency, select [AUTO] option. After the [AUTO] option is selected, it must be activated after it is restarted.

***1.* Select parameter setting page**



***2.* Select related menu items**



Note:

When power frequency is under [AUTO], sometimes Causes power frequency to automatically capture failure due to environmental noise, which leads to unstable measurement. In this case it is recommended to manually select the power frequency.

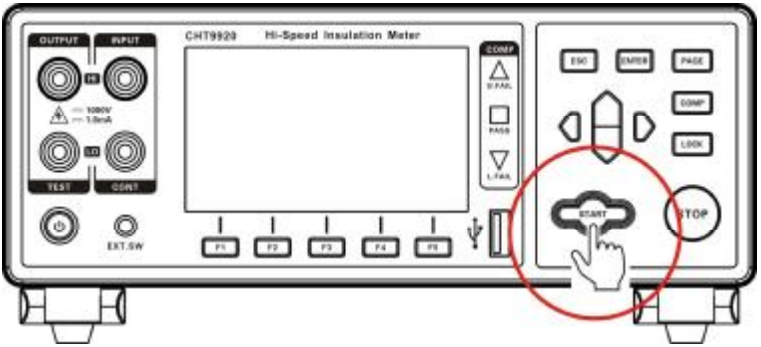
Chapter 4 Measurement

This chapter provides a phased description of the functions used for proper measurement, including the start of the test phase, the test phase, the test display phase, the test completion phase, and the discharge phase.

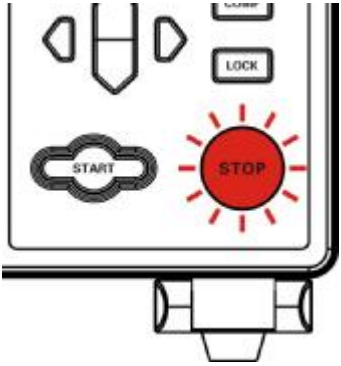
4.1 Start Test

1. **Set the relevant parameters**

2. **Press [START] key to trigger the test**



3. **Test starts, test terminal output voltage, [STOP] key flash**



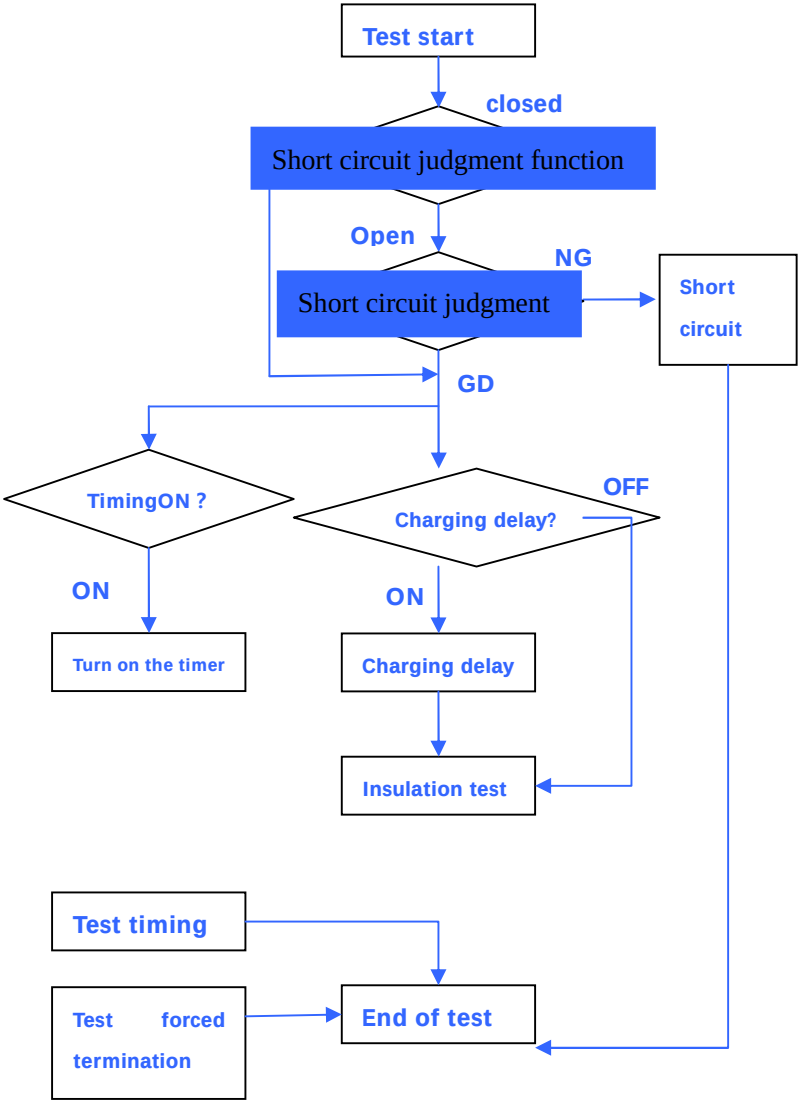
Trigger mode	Meaning
Manual trigger	Manually press [START] to trigger the test
External IO trigger	Trigger test by external EXT.IO terminal START signal
External command trigger	Trigger test by RS232, LAN port command
EXT.SW port trigger	Trigger test through the panel's external trigger switch

note:

- **Users cannot start another test again when the test has not ended.**
- **When the STOP signal of the EX.I/O port is LOW, the test cannot be triggered.**
- **The test cannot be triggered when the InterLock signal of the EX.I/O port is LOW**

4.2 Testing Process

The following is the process during the test:



1. **After the test starts, if the short circuit judgment function is turned on, the short circuit detection will be performed first. If the short circuit phenomenon is detected, the test is terminated. If the short-circuit detection function is not turned on, it will enter the charging delay phase directly, and the test timer will start.**
2. **Once the test timer is turned on, the test screen will display [T: Remaining time], and the measurement countdown will start. Regardless of the state of the program execution, the test will be terminated as soon as the timer expires.**
3. **When the charging delay is turned on, the test page displays the [Delay] mark. When the charging time is up, the test is entered and the port outputs the test voltage.**
4. **During the entire test process, if users press [STOP] key or other forced termination test command or signal (see Section 4.4 Terminate Test), the test is terminated.**
5. **If the test does not encounter a forced termination, press the established test mode and terminate the test when the condition is met. (See Section 4.4 Terminating the Test)**

When the test is started, the test port outputs the test voltage. Please pay attention to the bare metal of the test leads fixture and there is a danger of electric shock!

4.3 Measured Value Display

The following is the test range. Once the following range is exceeded, OVER.F is displayed (over the range) And UNDER.F (under the range).

Test voltage and range:

Test voltage	Resistance range	Display range (Ω)	Resolution (Ω)
25V≤ V < 100V	2MΩ	0.000~4.000M	0.001M
	20MΩ	1.90M~40.00M	0.01M
	200MΩ	19.0M~400.0M	0.1M
100V≤V < 500V	2MΩ	0.000~4.000M	0.001M
	20MΩ	1.90M~40.00M	0.01M
	200MΩ	19.0M~400.0M	0.1M
	2000MΩ	190M~4000M	1M
500V≤V≤ 1000V	2MΩ	0.000~4.000M	0.001M
	20MΩ	1.90M~40.00M	0.01M
	200MΩ	19.0M~400.0M	0.1M
	4000MΩ	190M~9990M	1M

4.4 Test Termination

There are two ways to terminate the test, one is forced termination and the other is automatic termination.

Force mode can be terminated at any stage of the test when a forced termination of a test command or signal is encountered. There are four modes classified by trigger mode as follows:

Trigger mode	Meaning
Manual termination	Manually press [STOP] to terminate the test
External IO termination	Terminate test via external EXT.IO signal port
External command termination	Terminate test by RS232, LAN port command
EXT.SW port trigger	Terminate the test via the panel's external trigger switch

Automatic termination. When the test mode is selected, the test is terminated when the test and sorting meet the established termination conditions during the test.

Classified by test mode as follows:

Automatic test mode	Meaning
CONT mode	Continuous measurement until the test time is up
FAIL STOP mode	Test stops when testing to FAIL sorting
PASS STOP mode	Test stops when testing to PASS sorting
SEQ mode	When EXT.IO signal STOP signal is low, t terminated

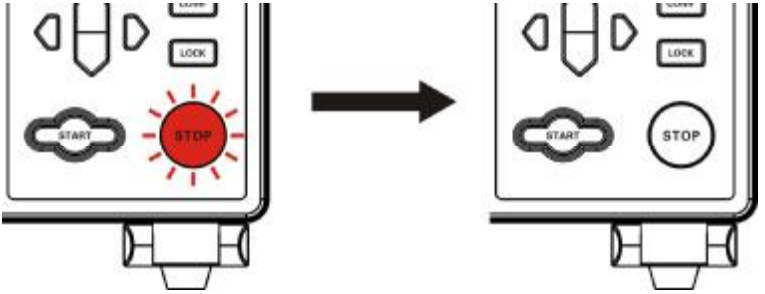
Once the test is terminated, the test terminal high voltage

stops output, the voltage of the test port may remain high due to the capacitive characteristics of the device under test, and the STOP indicator will continue to flash.

4.5 Automatic Discharge

When the test is terminated, discharge function is automatically turned on. Constant current discharge is performed in accordance with a load of 10 mA.

When the amount of charge accumulated in the capacitive load is relatively large, the discharge time response increases. When the test port is discharged to a voltage lower than 10V, the [STOP] warning light goes out.



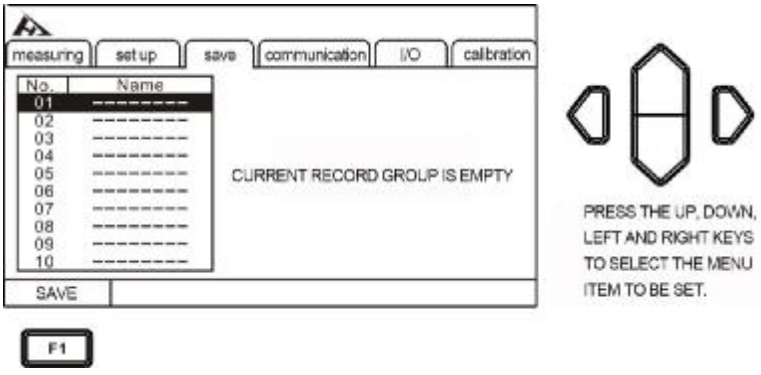
At the end of the test, when the component under test is suddenly taken away, there may be an electric charge remaining on the device under test, and there is a danger of electric shock!

Chapter 5 Measurement Setting Save

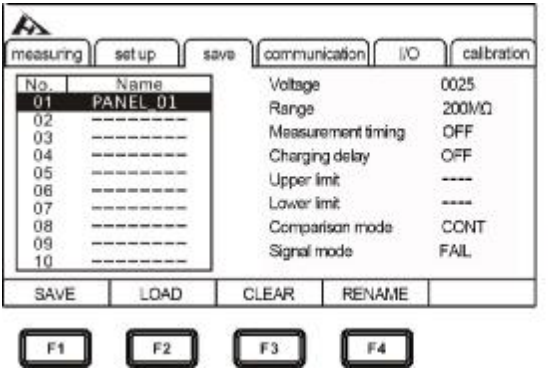
All measurement conditions can be saved, retrieved or deleted in the format of files. Press [PAGE] to enter the measurement setting save page.

After entering this page, pressing up and down keys, users can refer to the saved record, users can also make performing of save, load, clear and rename the current record.

5.1 Save Measurement Setting

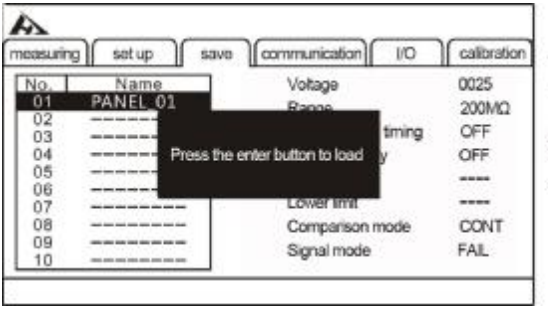


Use up and down keys to view current settings, press Save key to save the current settings.



Press the up, down, left and right keys to select the menu item to be set.

5.2 Retrieve Measurement Setting

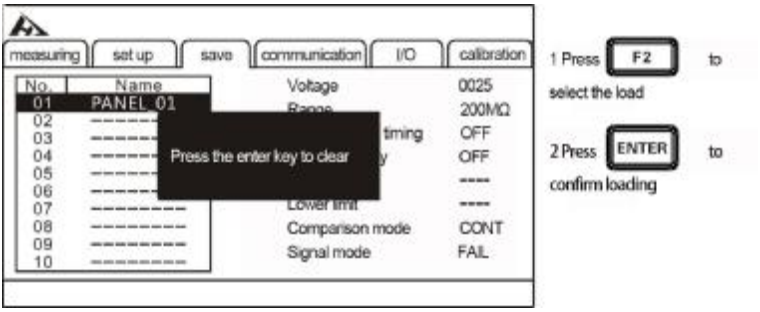


1 Press F2 to select the load

2 Press ENTER to confirm loading

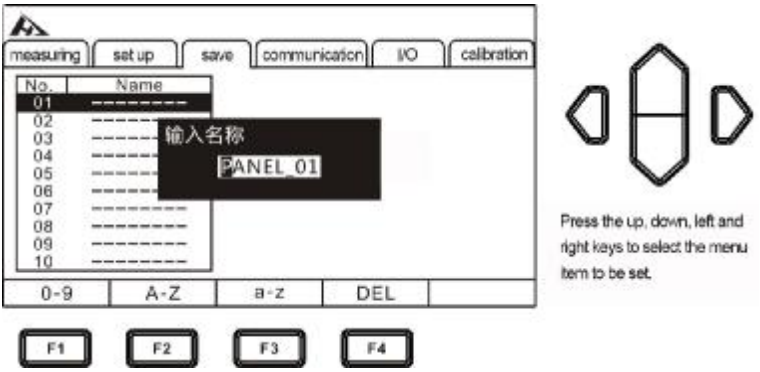
Use up and down keys to view the current settings, press Load key to retrieve the current settings.

5.3 Delete Measurement Setting



Use up and down keys to view the current settings, press Clear key to delete the current settings.

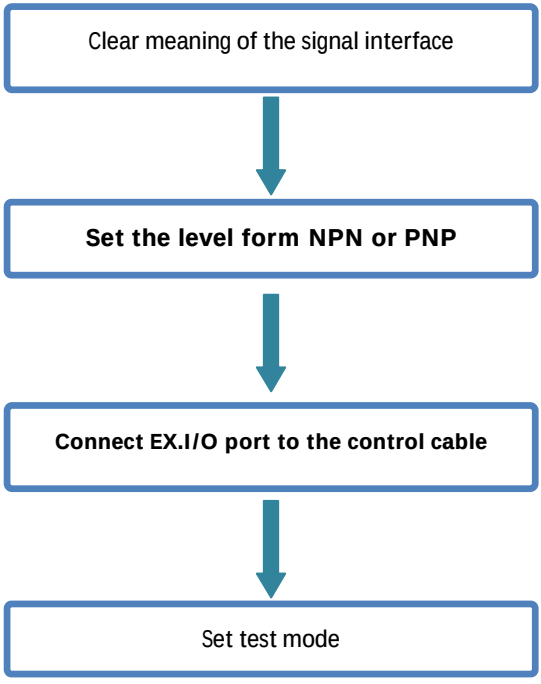
5.4 Rename Measurement Setting



Use up and down keys to view the current settings, press Rename key to revise the current file name.

Chapter 6 EX.I/O 口 (Handler)

The EXT.I / O terminals on the rear panel of the instrument support external control, provide output for test and comparison judgment signals, and accept input START and STOP signals. All signals use optocouplers. All input/output signals can be configured to (NPN) or (PNP) levels via the instrument panel settings. Understanding the internal circuit structure and paying attention to safety issues will help to better connect the control system.



6.1 EX.I/O Terminal and Signal

In this section, users will learn about the connection and introduction of EXT I/O.

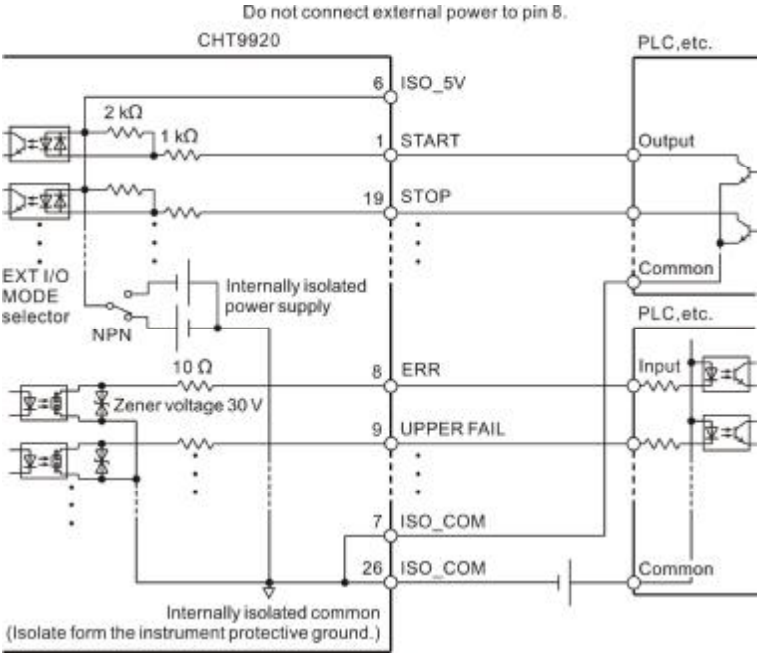
Do not plug or unplug EXT I/O ports during testing

Do not connect the IO port to test terminal

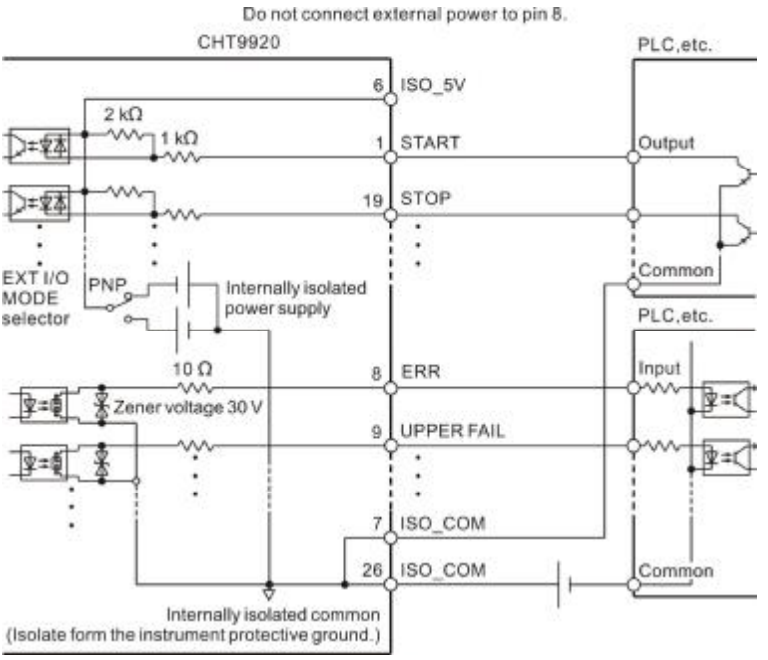
6.1.1 Level Mode Setting

Switching signal level mode NPN (source current mode) and PNP (trap current mode)

NPN Wiring Method

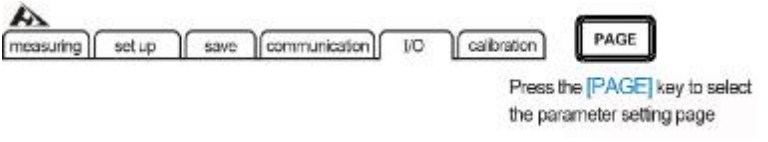


PNP Wiring Method

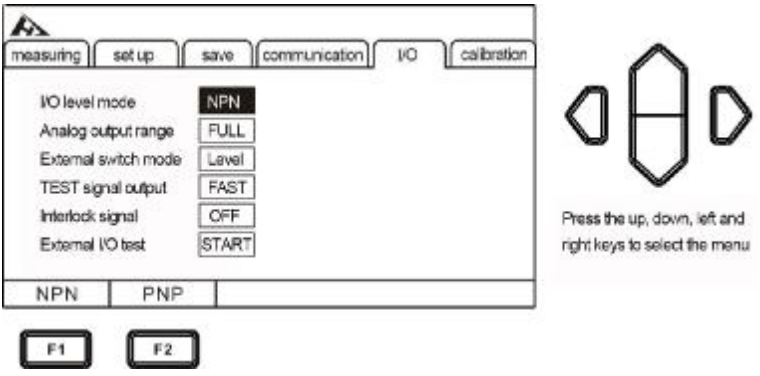


Level Setting

1. **Select IO page**



2. **Select IO level mode**

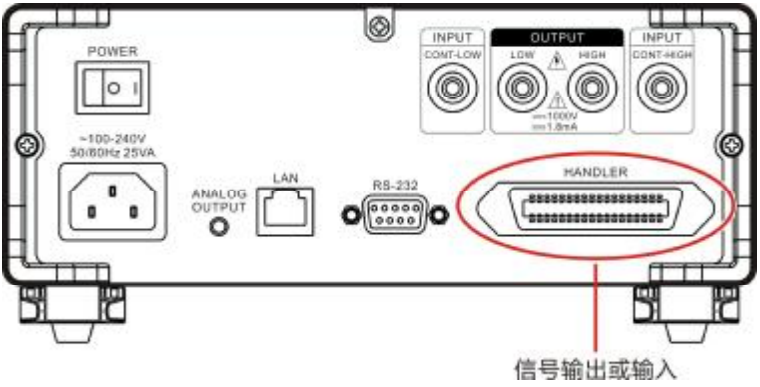


6.1.2 Port Signal Details

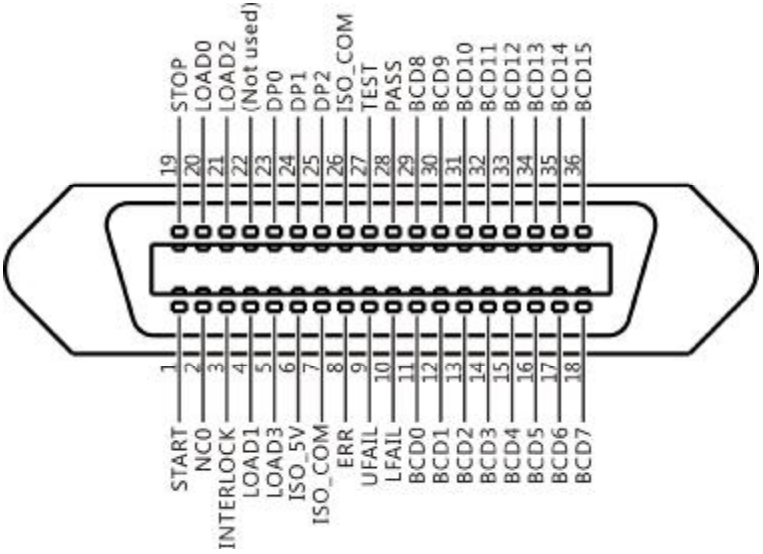
Port and Signal Description

The EX.I/O port connector uses the D-SUB female terminal of the 36-PIN pin.

Figure:



Port Details



(**Instrument side**)

PIN	Signal	Function	I/O	Logical mode
1	START	Start test	I	Edge trigger
2	--	--	--	--
3	INTERLOCK	Interlock signal	I	Level
4	LOAD1	Measurement setup record selection	I	Level
5	LOAD3	Measurement setup record selection	I	Level
6	ISO_5V	Isolated Power 5V	O	--
7	ISO_COM	Isolated power ground	O	--
8	ERR	Connection abnormality, short	O	Level

		circuit abnormality, open circuit abnormality		
9	UFAIL	Over range sorting	O	Level
10	LFAIL	Under range sorting	O	Level
11	BCD0	BCD code	O	Level
12	BCD1	BCD code	O	Level
13	BCD2	BCD code	O	Level
14	BCD3	BCD code	O	Level
15	BCD4	BCD code	O	Level
16	BCD5	BCD code	O	Level
17	BCD6	BCD code	O	Level
18	BCD7	BCD code	O	Level
19	STOP	Terminate test	I	Edge trigger
20	LOAD0	Measurement setup record selection	I	Level
21	LOAD2	Measurement setup record selection	I	Level
22	--	--	--	--
23	DP0	BCD Decimal point	O	Level
24	DP1	BCD Decimal point	O	Level
25	DP2	BCD Decimal point	O	Level
26	ISO_COM	Isolated power ground	O	--
27	TEST	In testing	O	Level
28	PASS	PASS sorting	O	Level
29	BCD8	BCD code	O	Level
30	BCD9	BCD code	O	Level
31	BCD10	BCD code	O	Level
32	BCD11	BCD code	O	Level
33	BCD12	BCD code	O	Level
34	BCD13	BCD code	O	Level

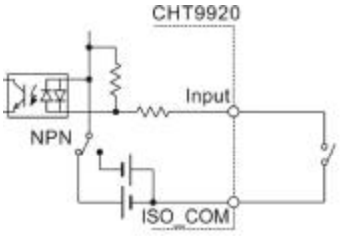
35	BCD14	BCD code	O	Level
36	BCD15	BCD code	O	Level

6.1.3 Port Signal Connection

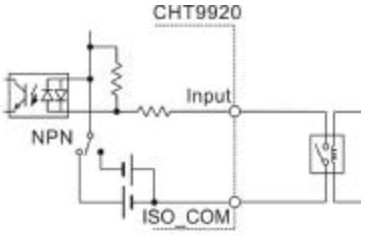
Electrical Performance Parameter

Input signal	Input type	Optocoupler input
	ON	Internal conduction current is more than 4mA and the voltage drop is up to 1V.
	OFF	Input current is less than 100μA
Output signal	Output type	Optocoupler output, open drain output
	Maximum load voltage	30V DC_{MAX}
	Maximum output circuit	50mA/channel
	Output voltage drop	1V_{MIN}（under condition of 50mA）
Internal isolated current source	Rated voltage	+5V（NPN mode），-5V（PNP mode）
	Rated current	100mA
	Isolation status	Isolated from internal circuitry, floating

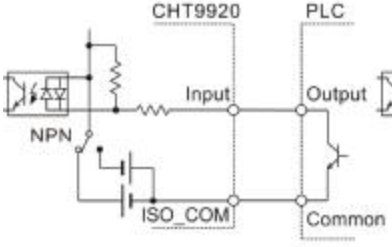
Input Circuit Connection



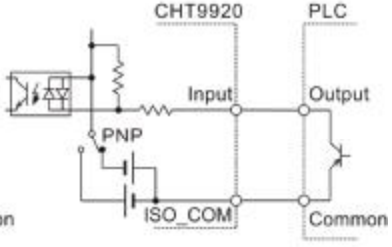
开关输入



继电器输入

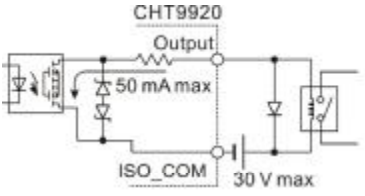


PLC 的 NPN 输出

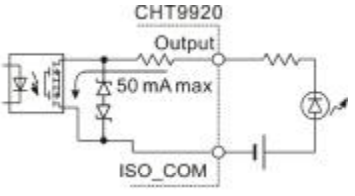


PLC的PNP输出

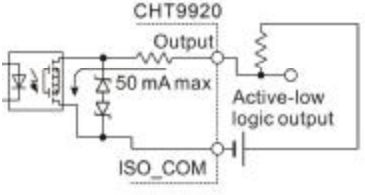
Output Circuit Connection



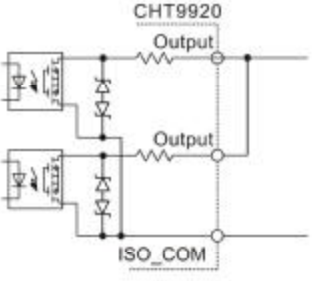
驱动继电器



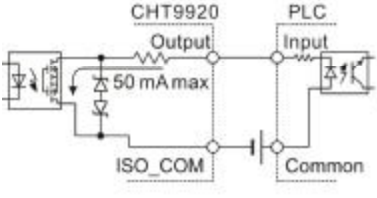
驱动 LED 灯



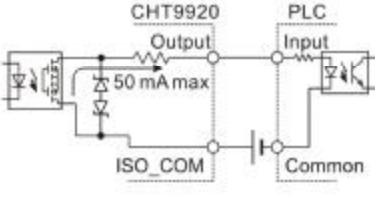
逻辑电平输出



电平或运算



PLC 的 PN 输入



PLC 的 NP 输入

6.2 Working Mode and Timing Chart

The following four test modes are described: continuous mode, PASS stop mode, FAIL stop mode, and forced termination judgment mode.

Under either mode, the test is triggered as soon as the test voltage changes, and the instrument will automatically delay the test for 200ms for trigger test.

There are two ways to change the voltage:

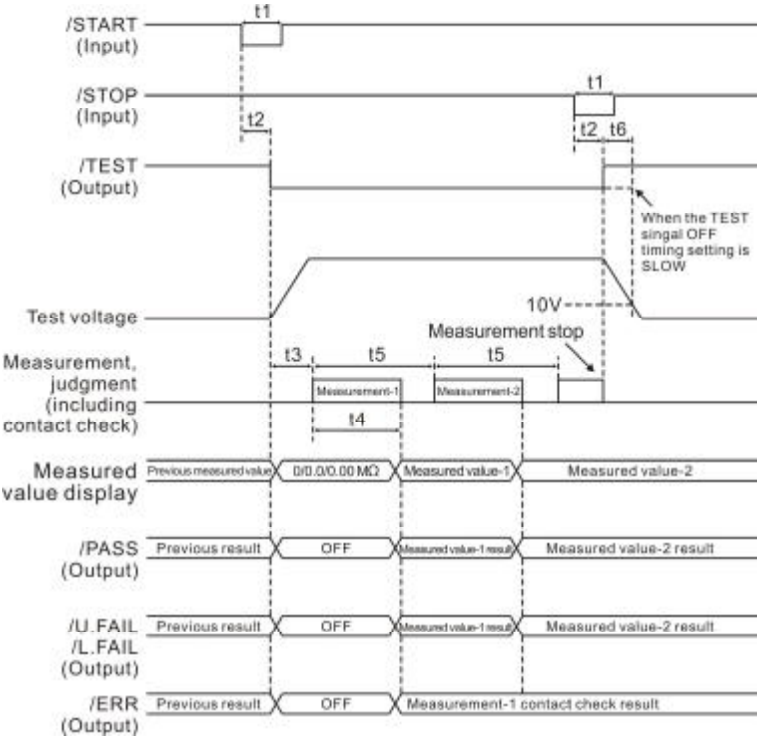
- LOAD0~LOAD3 of EX.I/O port select different test setting records
- Test voltage setting command sent by RS232 or LAN interface

6.2.1 Continuous Mode (measurement timing OFF)

When the measurement timer is set to [OFF], the test can be turned on by the START signal of the EX.I/O port, and the test is terminated by the STOP signal.

Set conditions:

Measuring timer status	Charging delay	Test end timing
OFF	AUTO，5ms~999.9s	FAST



	Item		Time
T1	START,STOP Signal pulse width		5msMIN
T2	START,STOP Signal detection pulse width		5msMAX
T3	Response time charging delay time		AUTO，5ms~999.9s
T4	sampling time	Contact inspectio：OFF	30ms(FAST),480ms(SLOW)
		Contact inspection :ON	80ms(FAST),480ms(SLOW)
T5	sampling interval	Contact inspectio：OFF	50ms(FAST),500ms(SLOW)
		Contact inspection :ON	100ms(FAST),500ms(SLOW)

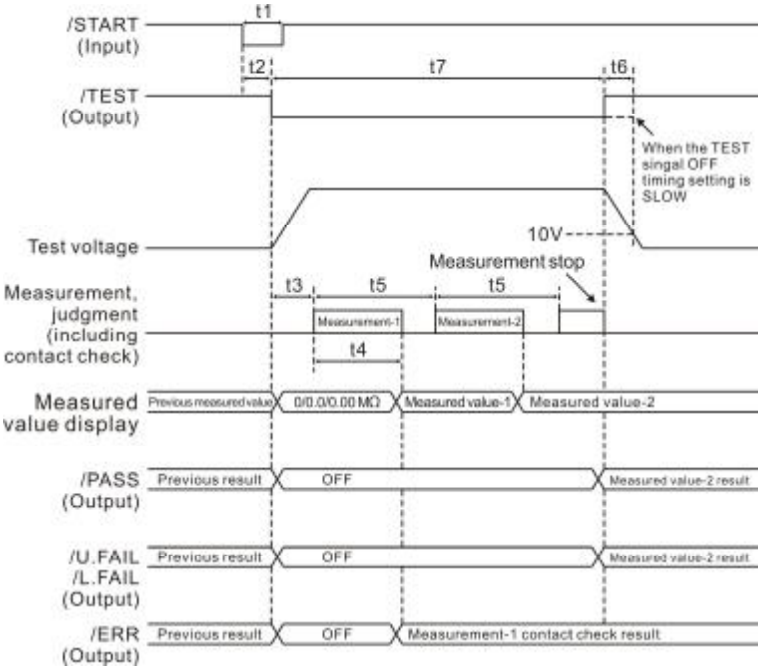
T6	Discharge time（ <10V ）	20msMAX(Pure resistance)

6.2.2 Continuous Mode (measurement timing ON)

When the measurement timer is set to [ON], the test can be turned on by the START signal of the EX.I/O port.

Set conditions:

Measuring timer status	Charging delay	Test end timing
ON, 45ms~999.9s	AUTO，5ms~999.9s	FAST



	Item	Time
T1	START,STOP Signal pulse width	5msMIN
T2	START,STOP Signal detection pulse	5msMAX

	width		
T3	Response time charging delay time		AUTO，5ms~999.9s
T4	sampling time	Contact inspection：OFF	30ms(FAST),480ms(SLOW)
		Contact inspection：ON	80ms(FAST),480ms(SLOW)
T5	sampling interval	Contact inspection：OFF	50ms(FAST),500ms(SLOW)
		Contact inspection：ON	100ms(FAST),500ms(SLOW)
T6	Discharge time（<10V）		20ms$_{MAX}$(Pure resistance)
T7	Measuring timing		45ms~999.9s

6.2.3 Sort PASS STOP Mode

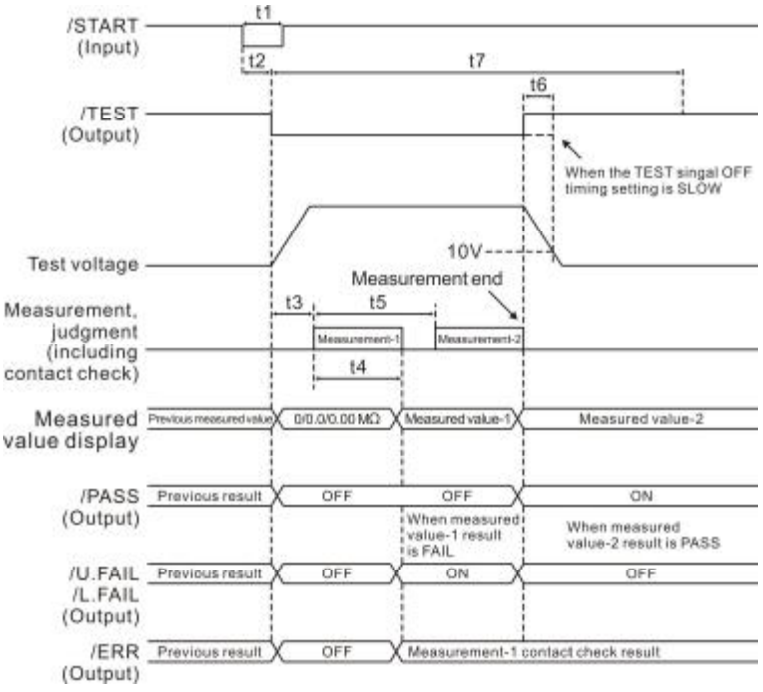
When the measurement timer is set to [ON], the test can be turned on by the START signal of the EX.I/O port.

Set conditions :

Measuring timer status	Charging delay	Test end timing
ON, 45ms~999.9s	AUTO，5ms~999.9s	FAST

Note:

When the measurement timer is in the OFF state, the test continues until the sorting is passed (the comparator makes a PASS judgment).



	Item		Time
T1	START,STOP Signal pulse width		5ms$_{MIN}$
T2	START,STOP Signal detection pulse width		5ms$_{MAX}$
T3	Response time charging delay time		AUTO，5ms~999.9s
T4	sampling time	Contact inspection：OFF	30ms(FAST),480ms(SLOW)
		Contact inspection：ON	80ms(FAST),480ms(SLOW)
T5	sampling interval	Contact inspection：OFF	50ms(FAST),500ms(SLOW)
		Contact inspection：ON	100ms(FAST),500ms(SLOW)
T6	Discharge time（<10V）		20ms$_{MAX}$（Pure resistance）
T7	Measuring timing		45ms~999.9s

6.2.4 Sorting PASS Stop (FAIL STOP) Mode

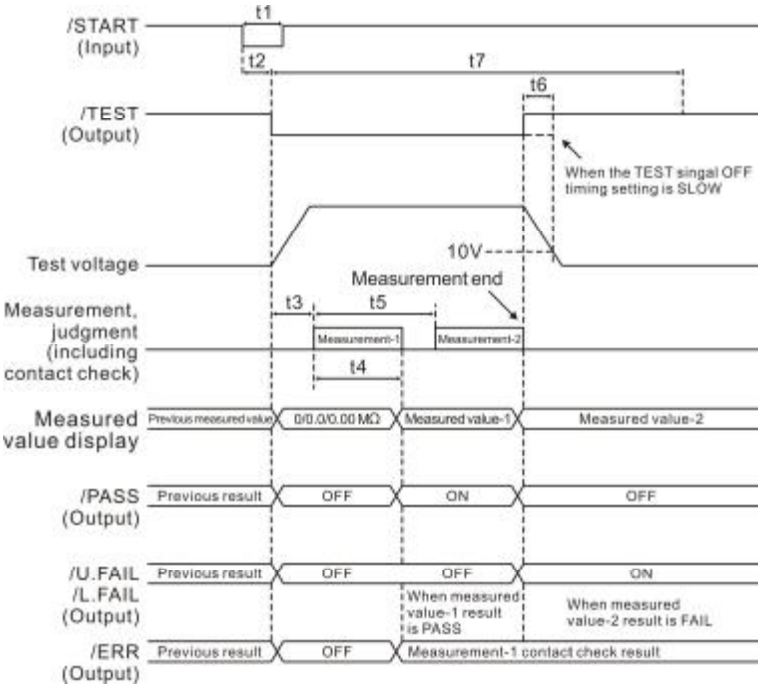
When the measurement timer is set to [ON], the test can be turned on by the START signal of the EX.I/O port.

Set conditions :

Measuring timer status	Charging delay	Test end timing
ON, 45ms~999.9s	AUTO，5ms~999.9s	FAST

Note:

When the measurement timer is OFF, the test continues until the sorting fails (the comparator makes a FAIL judgment).



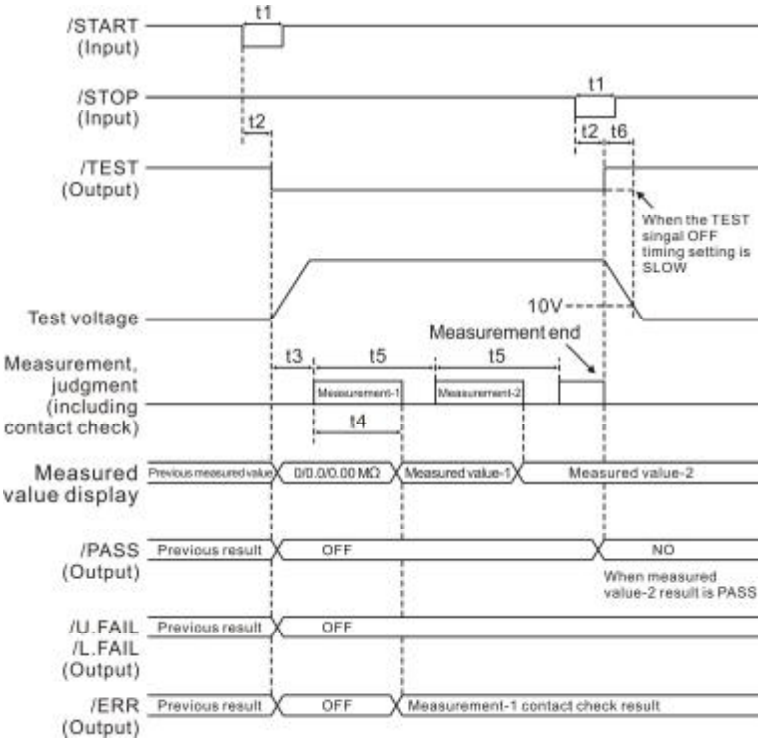
	Item		Time
T1	START,STOP Signal pulse width		5msMIN
T2	START,STOP Signal detection pulse width		5msMAX
T3	Response time charging delay time		AUTO，5ms~999.9s
T4	sampling time	Contact inspection：OFF	30ms(FAST),480ms(SLOW)
		Contact inspection：ON	80ms(FAST),480ms(SLOW)
T5	sampling interval	Contact inspection：OFF	50ms(FAST),500ms(SLOW)
		Contact inspection：ON	100ms(FAST),500ms(SLOW)
T6	Discharge time（<10V）		20msMAX（Pure resistance）
T7	Measuring timing		45ms~999.9s

6.2.5 Forced Termination Judgment Mode

When the measurement timer is set to [OFF], the test can be turned on by the START signal of the EX.I/O port, and the test is terminated by the STOP signal.

Set conditions:

Measuring timer status	Charging delay	Test end timing
OFF	AUTO，5ms~999.9s	FAST

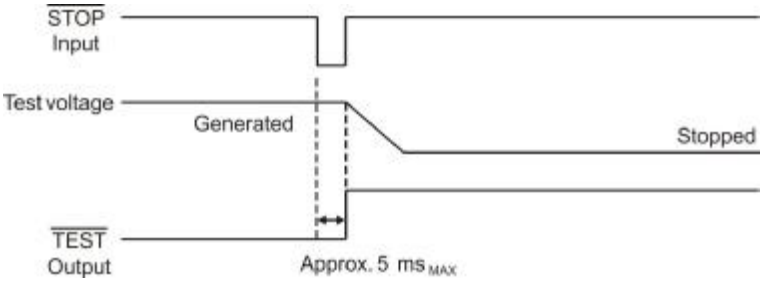


	Item		Time
T1	START,STOP Signal pulse width		5ms$_{MIN}$
T2	START,STOP Signal detection pulse width		5ms$_{MAX}$
T3	Response time charging delay time		AUTO，5ms~999.9s
T4	sampling time	Contact inspection：OFF	30ms(FAST),480ms(SLOW)
		Contact inspection：ON	80ms(FAST),480ms(SLOW)
T5	sampling interval	Contact inspection：OFF	50ms(FAST),500ms(SLOW)
		Contact inspection：ON	100ms(FAST),500ms(SLOW)
T6	Discharge time（<10V）		20ms$_{MAX}$(Pure resistance)
T7	Measuring timing		45ms~999.9s

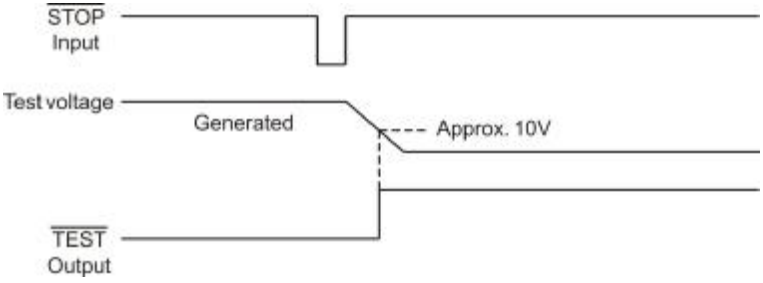
6.3 TEST Signal Stop Delay

There are two kinds of TEST signal termination delays, one is fast termination, and the TEST signal returns to high level immediately after the test ends. The other is a slow termination. After the test is finished, it will not return to the high level until the port voltage is discharged to within 10V.

TEST Quick Termination Mode

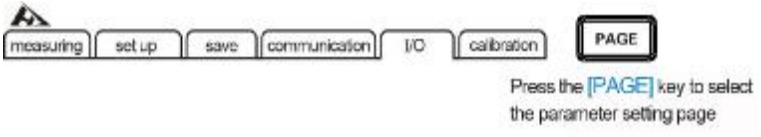


TEST Slow Termination Mode

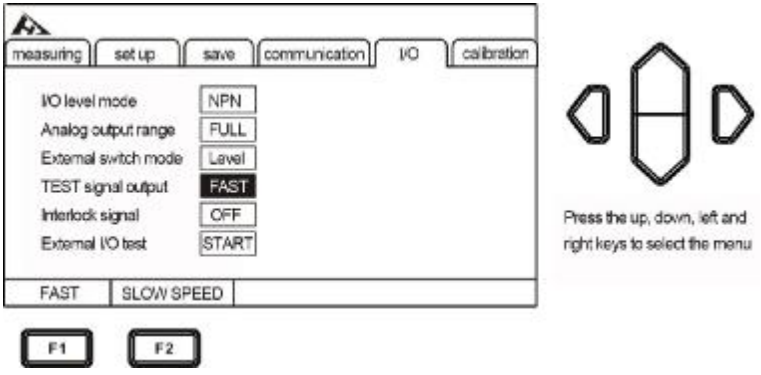


Setting

1. **Select IO page**



2. **Set the TEST signal output to fast or slow**



6.4 INTERLOCK

The INTERLOCK signal is used for interlocking. When the INTERLOCK function is turned on, all external operation functions of the instrument are valid only when the INTERLOCK signal is valid.

Note:

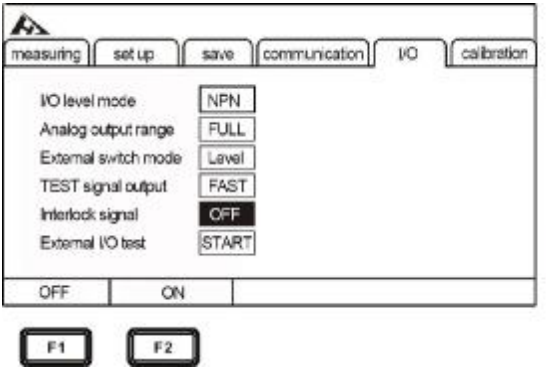
When the INTERLOCK function is turned on, front panel operation and rear panel control, as well as command control failure. Other operations are valid only when the INTERLOCK signal is active.

Setting

1. **Select IO page**

Press the [PAGE] key to select the parameter setting page

2. **Turn on the INTERLOCK function**

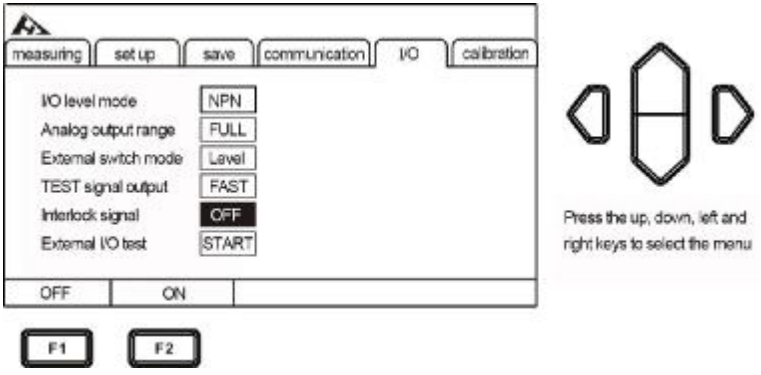


Press the up, down, left and right keys to select the menu

3. **Turn off the INTERLOCK function**

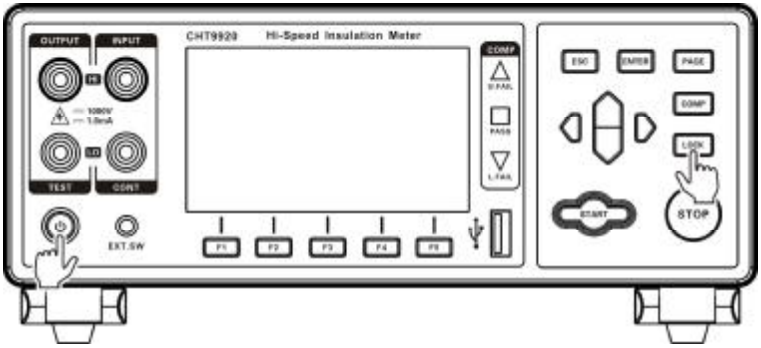
Method 1

When the INTERLOCK function is turned on, one way to turn off the INTERLOCK is to keep the INTERLOCK signal of the EX.I/O port valid while the panel turns off the interlock signal and the other fails.



Method 2

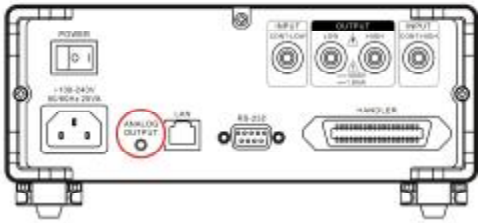
After power off, press [POWER] + [LOCK] to unlock.



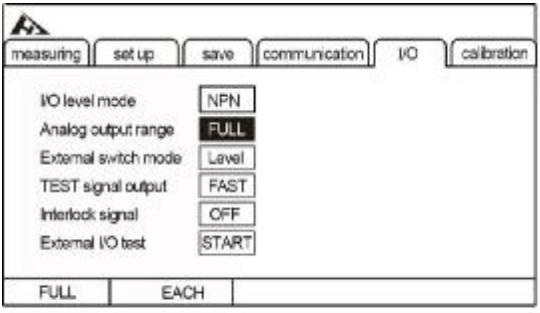
6.5 Analog Output

The analog output port of the instrument outputs the result with an analog quantity. After each test is completed, the output 0~4V analog voltage value corresponds to the test result. There are two types of voltage output, one is full-range output; the other is component output.

Do not connect the analog output port to the test port, otherwise the instrument will be damaged.



Set the output type



Press the up, down, left and right keys to select the menu

Full range output

Test Voltage	Resistance Range	Output Analog Voltage
25V ≤ V < 100V	0.000MΩ~200.0MΩ	0V ~ 4V
100V ≤ V < 500V	0.000MΩ~2000MΩ	0V ~ 4V
500V ≤ V < 1000V	0.000MΩ~4000MΩ	0V ~ 4V
25V ≤ V < 1000V	Over.F	4V
	Under.F	0V

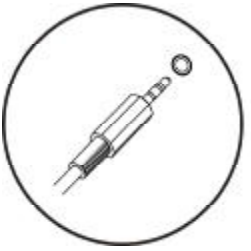
Component Output

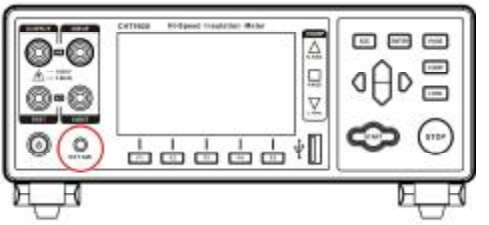
Range	Resistance Range	Output Analog Voltage
2MΩ	0.000MΩ~2.000MΩ	0V ~ 4V
20MΩ	1.90MΩ~20.00MΩ	0.38V ~ 4V
200MΩ	19.0MΩ~200.0MΩ	0.38V ~ 4V
2000MΩ	190MΩ~2000MΩ	0.38V ~ 4V
4000MΩ 25V ≤ V < 1000V	190MΩ~4000MΩ	0.38V ~ 4V
All resistance ranges	Over.F	4V
	Under.F	0V

6.6 External Switch Control

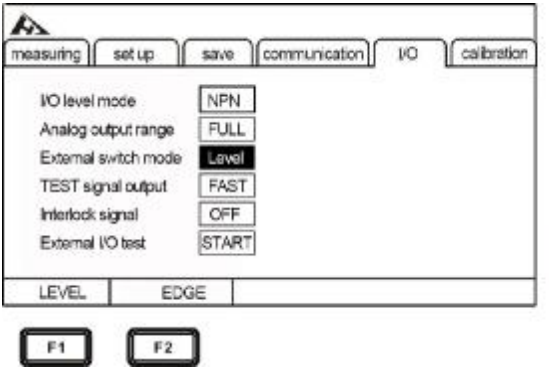
The external switch (EXT.SW) is used to trigger the test or terminate the test. The external switch can be configured as two signals: one is level. The other is the edge.

Do not connect the external switch port to the test this will damage the instrument.





Set level



Press the up, down, left and right keys to select the menu

Chapter 7 Communication

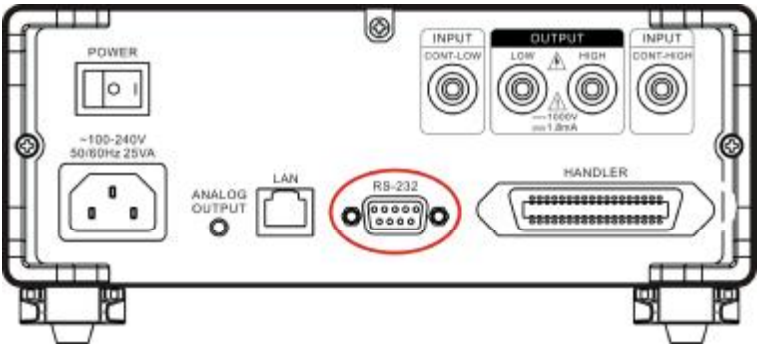
There are two communication modes, one is RS232C communication, the other is LAN (network protocol uses TCP protocol) communication mode. Both modes of the communication protocol use the SCPI protocol.

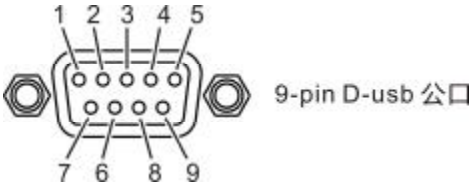
Do not connect the communication port to the test port, as this will damage the instrument.

7.1 RS232C Communication Method

The RS232C communication method uses 3-wire communication.

Interface and cable



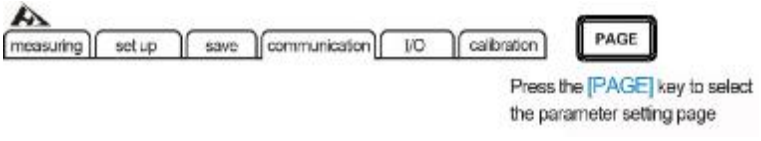


Connection Method

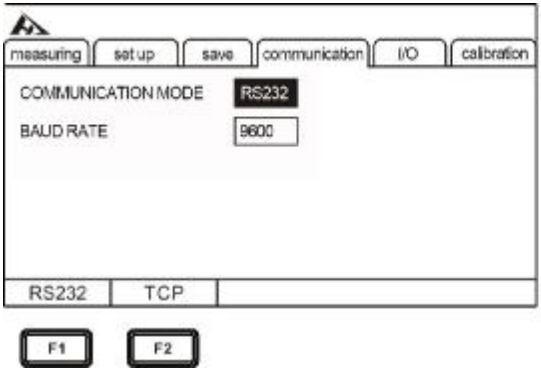
Pin No.		Pin No.	
	1		1
TxD	2	RxD	2
RxD	3	TxD	3
	4		4
GND	5	GND	5
	6		6
	7		7
	8		8
	9		9
仪器		电脑	

Setting

1. **Select the communication page**

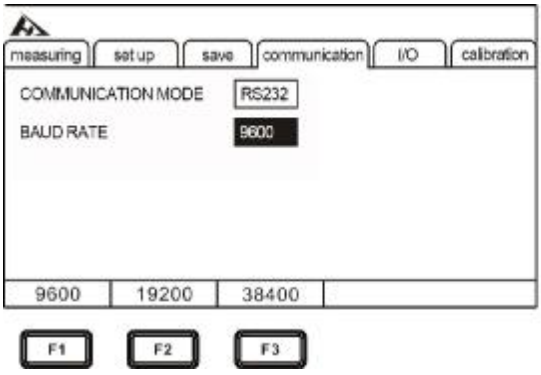


2. **Select RS232 communication mode**



Press the up, down, left and right keys to select the menu item to be set.

***3.* Select communication baud rate**



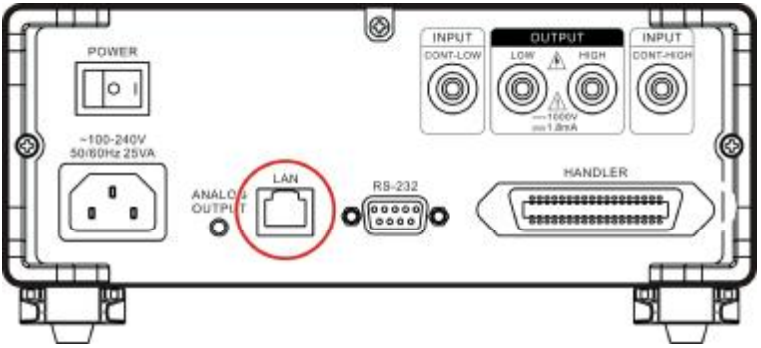
Press the up, down, left and right keys to select the menu item to be set.

7.2 LAN Communication Method

LAN port communication uses TCP protocol communication.

Interface and cable

The Ethernet interface uses the standard RJ45 port, and the cable uses Category 5 for the Internet cable.



Connection Method

Instrument and computer connection

When the instrument is connected to the computer, the network cable uses a crossover cable.

A termination method uses 568B standard:

Orange white	Orange	Green white	Blue	Blue white	Green	Gray white	Gray

B termination method uses 568A standard:

Green white	Green	Green white	Blue	Blue white	Orange	Gray white	Gray

Instrument and router connection

When the instrument is connected to the router, the network cable is directly connected.

568B standard is adopted at both ends:

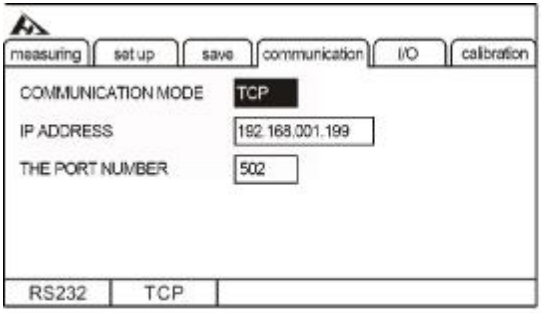
Orange white	Orange	Green white	Blue	Blue white	Green	Gray white	Gray

Setting

1. Select the communication page

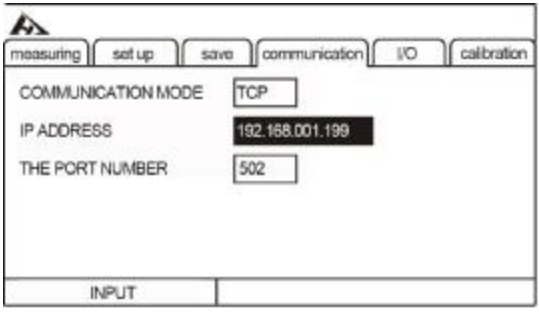
Press the [PAGE] key to select the parameter setting page

2. Select TCP communication mode



Press the up, down, left and right keys to select the menu item to be set.

3. Set the IP address



Press the up, down, left and right keys to set

Chapter 9 Parameter

9.1 General Parameters

General function :

Parameter	**Insulation resistance**
Measuring Range	**0Ω ~ 4000M Ω （5 ranges）**
Test voltage	**0~1000V DC**
Maximum Output Current	**1.8mA**
Connection Exception Display	**High-voltage open-circuit "ContHi", low-voltage open-circuit "ContLo", and output terminal open circuit "ContHL"**
Short Circuit Abnormal Display	**"SHORT"**
Range Over Limit Display	**Under range "UNDE.F", over range" OVER.F"**
Max Discharge Current	**10mA**
Max input voltage	**1100V DC**
Maximum Test Capacitance	**1μF (The measured object capacity exceeds 1μ may cause unstable test)**
Input Terminal	**Banana plug**
Operation Key	**Rubber key**
Display	**3.5寸TFT**
Precision Guarantee Period	**1 year**
Operating Temperature and Humidity	**0℃~40℃ 80%RH以下(No condensation)**
Storage Temperature and Humidity	**-10℃~60℃ 80%RH以下(No condensation)**
Operating Environment	**Indoor, highest altitude 2000 m**
Power Supply	**Voltage：100V ~ 240V AC Frequency：50Hz/60Hz**

Power Consumption	**15VA**
Size	**Approx. 325mm x 215mm x 96 mm**
Weight	**About 2 KG**

Clock :

Characteristic	**24 Hour clock** **Automatic adjustment time**
Accuracy	**About +/-4 minutes / month**
Other Characteristics	**Internal backup lithium battery** **Battery life: about 2 years**

9.2 Accuracy

The following indicators test conditions:

Temperature: 20±3°C

Humidity: <80%RH

Warm-up time > 15 minutes

Calibration time: 1 year

Voltage output :

Voltage output range	**25V~1000V DC**
Voltage output accuracy	**1%±2V**
Voltage resolution	**1V**
Voltage readback accuracy	**2%±1V**
Maximum charging current	**1.8mA**
Short circuit test current	**2mA**

Range display :

Test Voltage	Resistance Range	Display Range (Ω)	Resolution (Ω)
25V≤ V < 100V	2MΩ	0.000~4.000M	0.001M
	20MΩ	1.90M~40.00M	0.01M
	200MΩ	19.0M~400.0M	0.1M
100V≤V < 500V	2MΩ	0.000~4.000M	0.001M
	20MΩ	1.90M~40.00M	0.01M
	200MΩ	19.0M~400.0M	0.1M
	2000MΩ	190M~4000M	1M
500V≤V≤ 1000V	2MΩ	0.000~4.000M	0.001M
	20MΩ	1.90M~40.00M	0.01M
	200MΩ	19.0M~400.0M	0.1M
	4000MΩ	190M~9990M	1M

Resistance measurement accuracy :

Test Voltage	Range	Basic Accuracy
25V≤ V < 100V	0.000 MΩ to 2.000 MΩ	±2% rdg. ±5 dgt.
	1.90 MΩ to 20.00 MΩ	±2% rdg. ±5 dgt.
	19.0 MΩ to 200.0 MΩ	±5% rdg. ±5 dgt.
100V≤V < 500V	0.000 MΩ to 2.000 MΩ	±2% rdg. ±5 dgt.
	1.90 MΩ to 20.00 MΩ	±2% rdg. ±5 dgt.
	19.0 MΩ to 200.0 MΩ	±5% rdg. ±5 dgt.
500V≤V≤ 1000V	0.000 MΩ to 2.000 MΩ	±2% rdg. ±5 dgt.
	1.90 MΩ to 20.00 MΩ	±2% rdg. ±5 dgt.
	19.0 MΩ to 200.0 MΩ	±2% rdg. ±5 dgt.
	190 MΩ to 4000 MΩ	±5% rdg. ±5 dgt.
	4010 MΩ to 9990 MΩ	±25% rdg.