HT3563 Battery Internal Resistance Meter

User Manual

Contents

Introduction

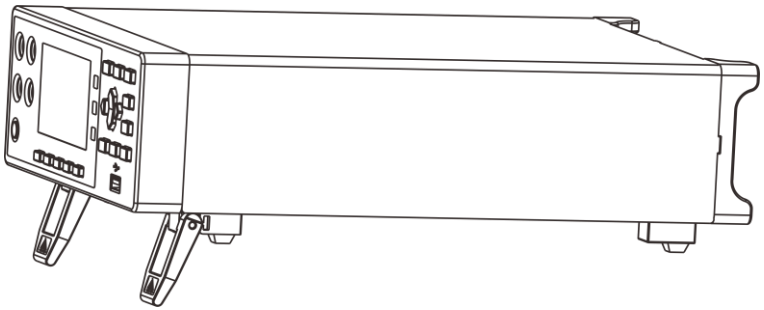
Thank you for purchasing HT3563 Battery Tester. To obtain maximum performance from this product, please read this manual first, and keep it handy for future reference.

Checking Package Contents

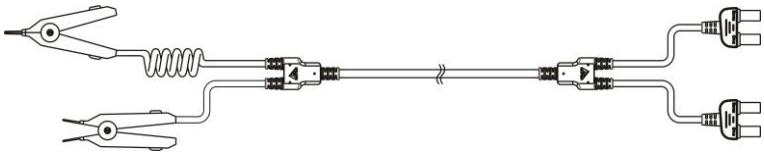
When receiving instrument, please check carefully to ensure that the instrument is not damaged during transit. In addition, special inspections of accessories, panel switches and connectors are required. If the instrument is found to be damaged or it fails to operate as described in the user manual,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

Check the standard package contents as follows

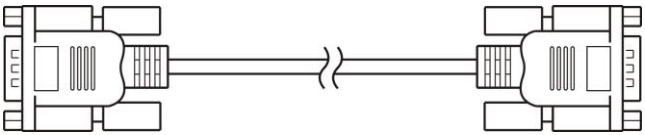
No.	Item	Quantity
1	3563 Battery Tester	1
2	Test cable	1
3	RS232 communication cable	1
4	Power cord	1
5	User Manual	1



3563 Battery Tester



9363A Test cable



9800 RS232 communication cable

Safety Notes

The instrument is designed to conform to IEC 61010 Safety Standards where applicable.

This manual contains information and warnings essential for safe operation of the instrument and for maintaining it in a safe operating condition.
Mishandling or misuse of this instrument could result in damage to the instrument, injury or death. Ensure that you are competent to use this instrument and fully understand the dangers that may be associated with the area that you are working within and ensure that you read the usage notes within this manual before using the instrument.

Before using the instrument.

Check that the insulation of the test leads is not damaged in any way and no metal parts are exposed. Using the instrument under such conditions could result in damage to the instrument, system under test or result in electric shock accident, or injury. If the test leads are damaged in any way then the leads must be replaced with a new set before proceeding.

Environmental Considerations and General Inspection

Operating & Storage

- ✧ Operating temperature and humidity ranges
  0°C to 40°C 80%RH or less (no condensation)
- ✧ Storage temperature and humidity ranges

23 ±5°C 80%RH or less (no condensation)

Do not use the instrument in inappropriate locations that may cause damage to the instrument or present danger to the user.
Avoid the following locations.

- ✧ Exposure to high temperature and high humidity environments.
- ✧ Exposure to the elements including direct sunlight, rain, snow and frost.
- ✧ Exposure to corrosive or combustible gases.
- ✧ Exposure to water, oil, chemicals, or solvents.
- ✧ Exposure to dusty environments of all types.

Checking before use

Before using the instrument for the first time check that no damage occurred during storage or shipping. If you suspect that there are problems then contact your supplier or HOPETECH support.

Before using the instrument.

Check that the insulation of the test leads is not damaged in any way and no metal parts are exposed. Using the instrument under such conditions could result in damage to the instrument, system under test or result in electric shock accident, or injury. If the test leads are damaged in any way then the leads must be replaced with a new set before proceeding.

Test Lead

Only use test lead supplied with your unit or subsequently approved for use with this tester.

Chapter I Overview

1.1 Introduction

3563 is a high-precision wide range, high-performance microprocessor-controlled battery resistance tester. The internal resistance range is 3 mΩ~3 kΩ, the minimum resolution is 0.1μΩ, the maximum display is 32000. Voltage range is 6 V~60 V, minimum resolution 10μV, maximum display 600000.

3563 series of instruments support multi-channel scanning test function, by adding our company's multi-channel scanning tester, you can simultaneously scan and measure multi-channel battery.

RS232/RS485/LAN, instrument has three communication interfaces and two communication instruction protocols. The instrument uses SCPI(Standard Command for Programmable Instrument) when using Ethernet and RS232 communications. When using RS485 communication, the instrument uses MODEBUS instruction protocol. Users can efficiently complete remote control and data acquisition functions and instrument networking.

3563 can be used to test a variety of lithium batteries, nickel-hydrogen batteries, nickel-cadmium batteries, button batteries, columnar batteries, soft-pack and so on.

1.2 Performance characteristics

Appearance

- ✧ Display using 3.5-inch high-resolution TFT screen display, simple operation
- ✧ Small fuselage, powerful

Excellent test performance

- ✧ 0.1μΩ minimum resolution of internal resistance
- ✧ 10μV minimum resolution of voltage

Rapid testing

- ✧ A minimum test cycle of ms 8.6

Four-terminal test

- ✧ High precision measurement of low internal resistance

Rich interface configuration

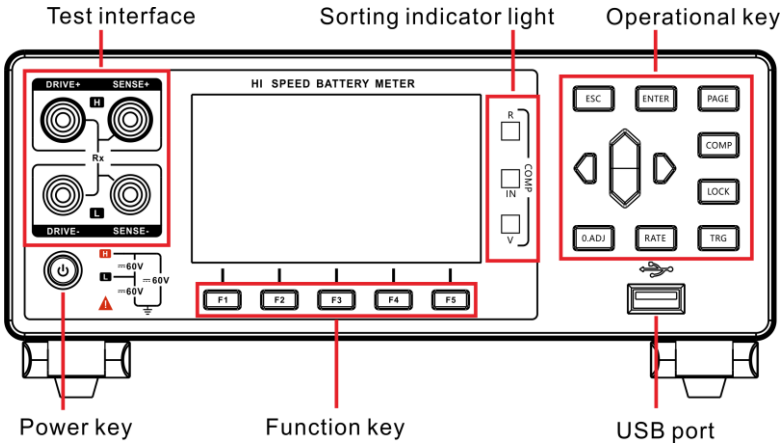
- ✧ HANDLER interface
- ✧ RS-232 interface
- ✧ RS-485 interface
- ✧ Ethernet interface
- ✧ U disk interface

Power supply

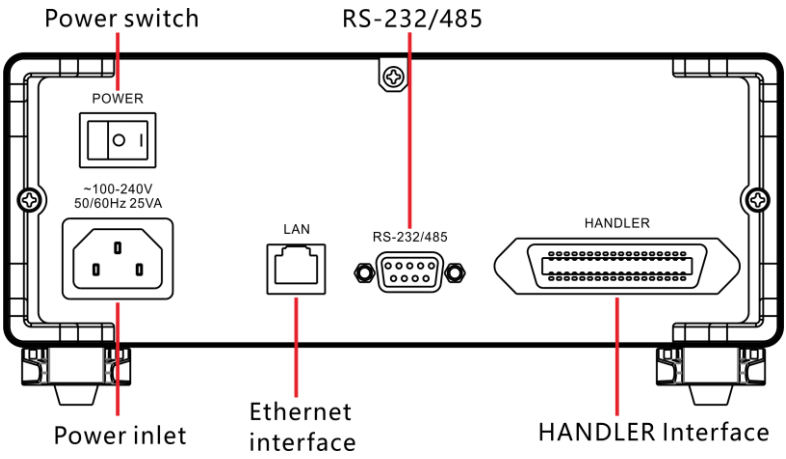
- ✧ Power supply 100~256 V
- ✧ 50 Hz/60Hz power supply
- ✧ 10 W maximum power consumption

1.3 Names of sections and summary of operations

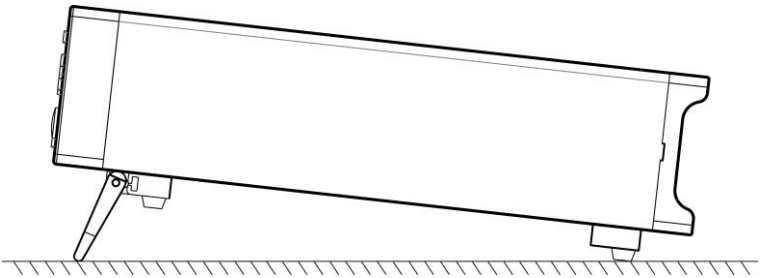
Positive



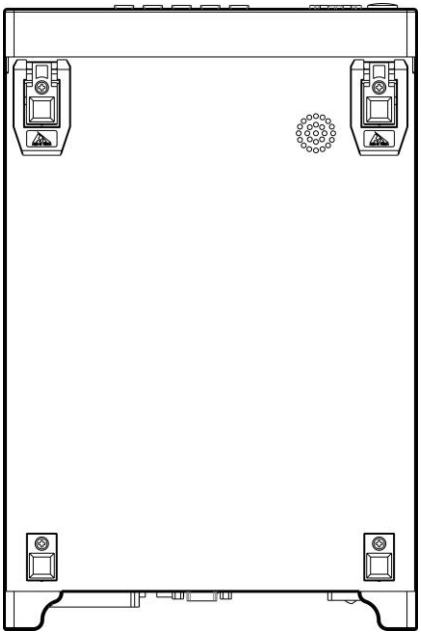
Back view



Side



Bottom

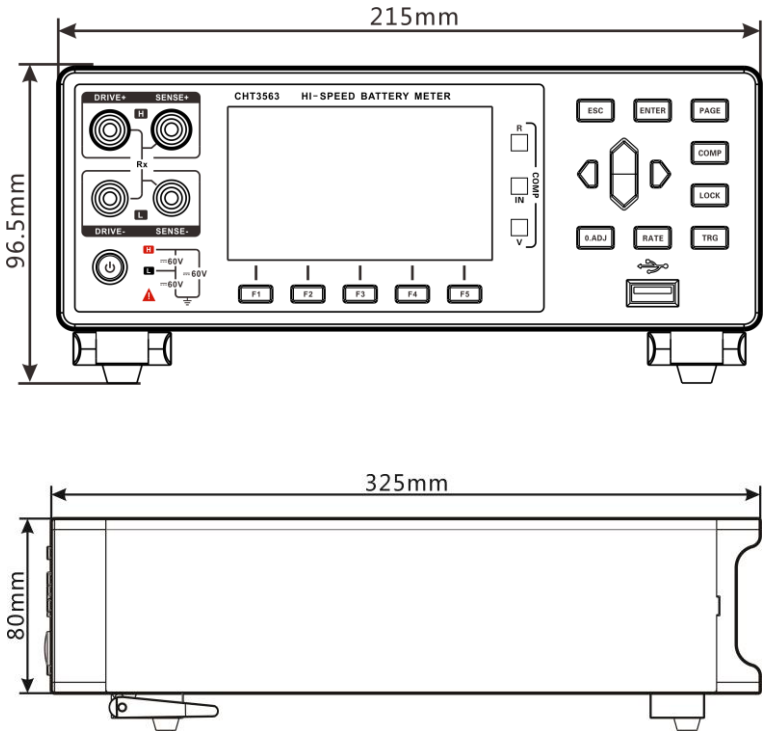


Front View & Functional Buttons

	Functional key F1
	Functional key F2
	Functional key F3
	Functional key F4
	Functional key F5
	Function exit key
	Function determination key
	[Page Switching Key] Switching [Test page]<->[Comparator page]<-> [Setting page] <-> [File page]
	comparator on/off key
	key lock key, short press [LOCK] key, lock page other key failure, long press can release lock

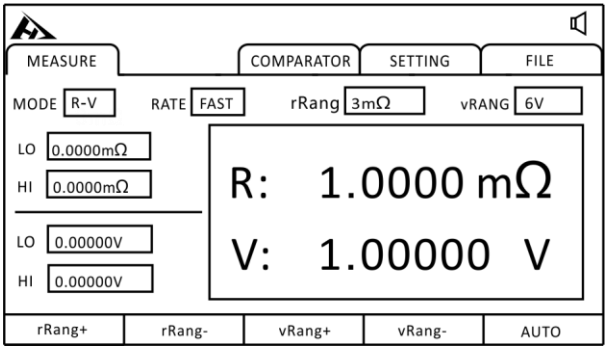
	[0.ADJ key], zeroing.
	[Speed key], set measurement rate.
	[Trigger key], single-trigger test of the instrument in manual trigger mode.
	[Direction key], used to select menu items or set values.

1.4 Dimensions

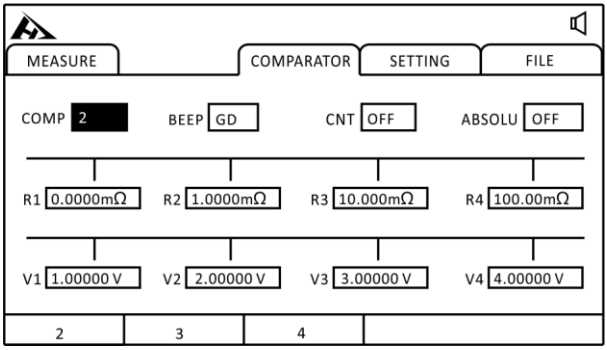


1.5 Page composition

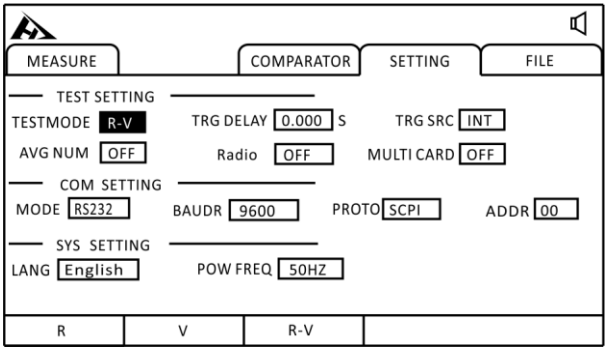
Measurement page



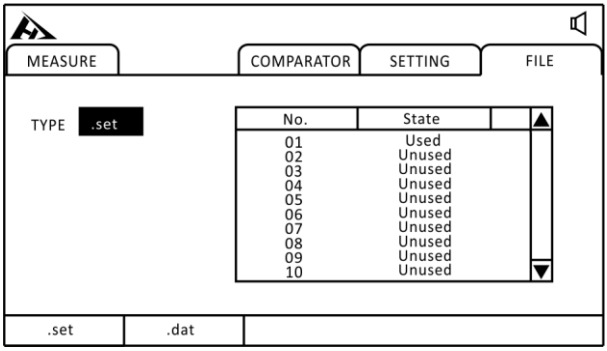
Comparator page



Setting page



File page

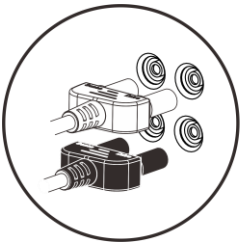


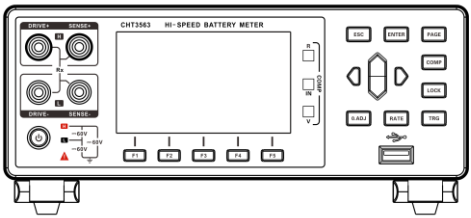
Chapter II Preparation Before Testing

2.1 Test flow preview

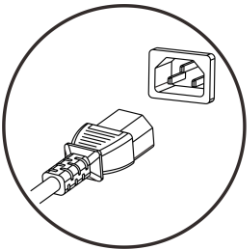
The instrument remains in the power off state, follow the following steps to prepare before testing.

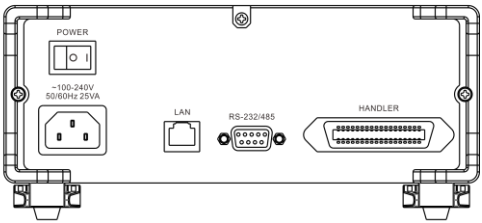
1. turn off instrument power, connect test line





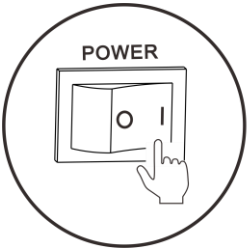
2. insert power cord

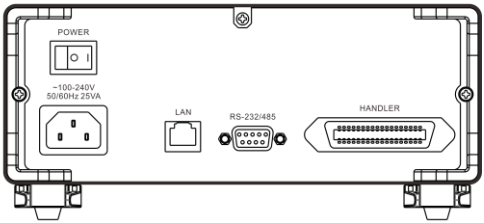




Ensure that the power line grounding is good, conducive to the stability of the test.

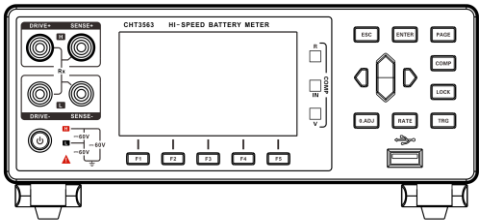
3. turn the power at the end of the instrument on





At this time, the internal power supply of the instrument has been connected, the instrument is in standby state.

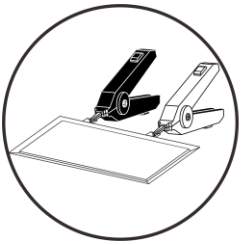
4. press panel power button to turn on power

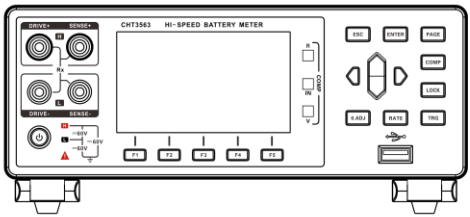


When in standby state, the panel power key lamp is red, press panel power key, power on, screen lit, panel key lamp turned green.

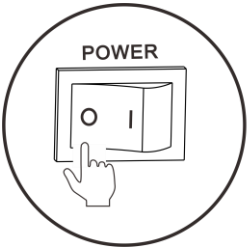
5. setting test parameters (see section 3.1 for details)

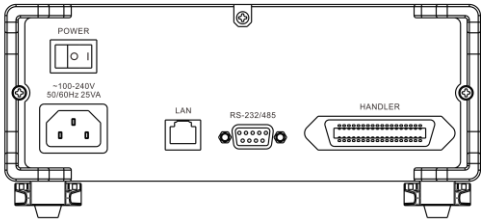
6. testing



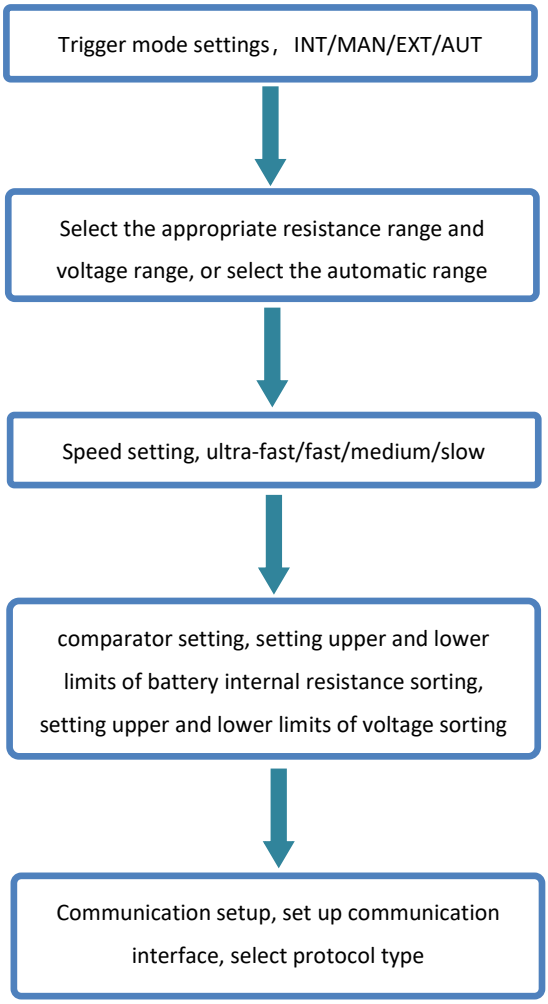


7. test is over, power off





2.2 Basic parameter setting process



2.3 Inspection before measurement

Before use, please confirm that there is no failure caused by preservation and transportation, and then use after checking and confirming the operation. If you confirm that there is a fault, please contact our sales network.

Confirmation of this instrument and peripheral equipment

Inspection projects	Processing methods
Is this instrument damaged or cracked? Is the internal circuit exposed?	Do not use it when it is damaged, please send it for repair.
Is metal sheet attached to the terminal and other garbage?	When attached, please wipe it with cotton swabs.
Is the outer skin of the test line damaged or metal exposed?	In case of damage, the measurement value may be unstable or error. It is recommended to replace the wire without damage.

Confirmation of power on

Inspection projects	Processing methods
After the instrument tail power switch is turned on, observe whether the instrument panel power key lamp turns on?	Please confirm that the key lamp is on standby, otherwise please send it to repair.
When the power is turned on, is the screen all lit, and is the measurement screen normal?	Different display, may be the internal failure of this instrument, please send repair.

2.4 Method for connecting test lines

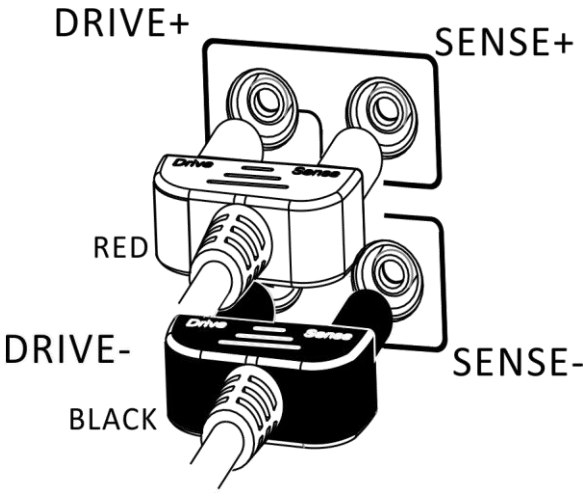
Warning

• The test line port is sharp, be careful not to be scratched.

• For safety, the test line attached to the instrument should be used.

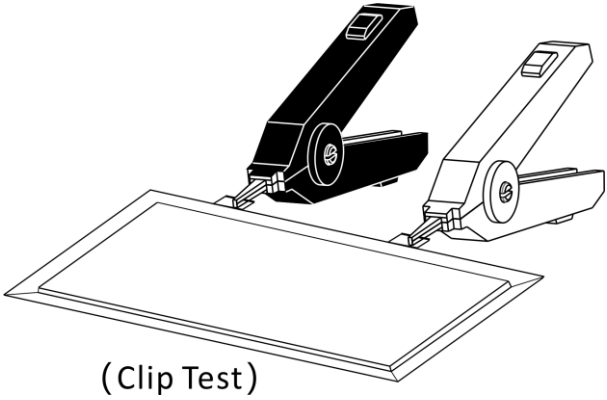
• To avoid electric shock, ensure that the test line is properly connected

Front Panel Link



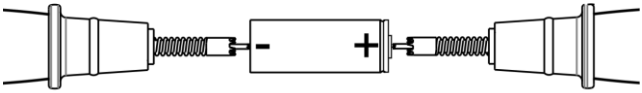
test line connection

1.9363- A test clip test line (test soft pack battery)



(Clip Test)

2.9363- B test probe test line



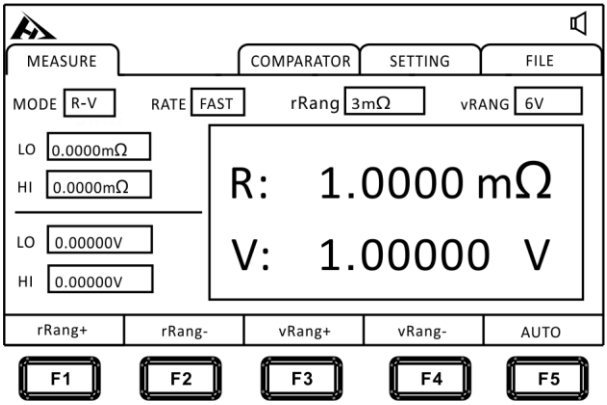
(Probe Test)

Chapter III Basic Provisions

In order to use this instrument correctly, read this chapter before testing.

3.1 Set Test Range

Range setting is divided into manual range and automatic range. The automatic range instrument automatically selects a suitable range according to the battery under test.



Manual range settings:

At the measurement interface, press the F1]-[F4] key to switch the range. Even when the automatic range function is turned on, the manual range switching is effective (when the automatic range is turned on, the automatic range function will automatically turn off when the manual range is switched on).

Internal resistance range:

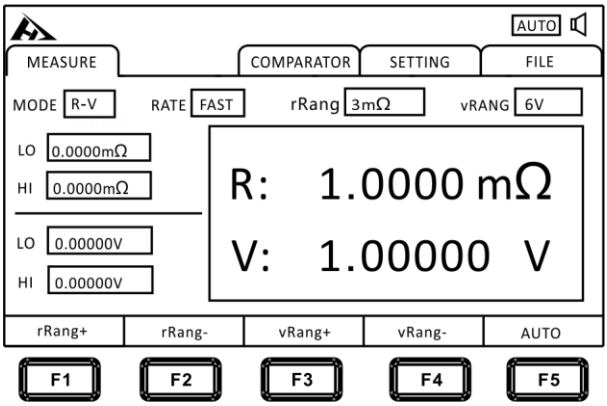
3mΩ↔30mΩ↔300mΩ↔3Ω ↔30Ω↔300Ω↔3KΩ

Voltage Range:

6V ↔ 60V

Automatic range setting:

At the measurement interface, press the [F5] key to switch the automatic range. When set to automatic range, [AUTO] mark lights up, turn off automatic range function, [AUTO] mark does not show.

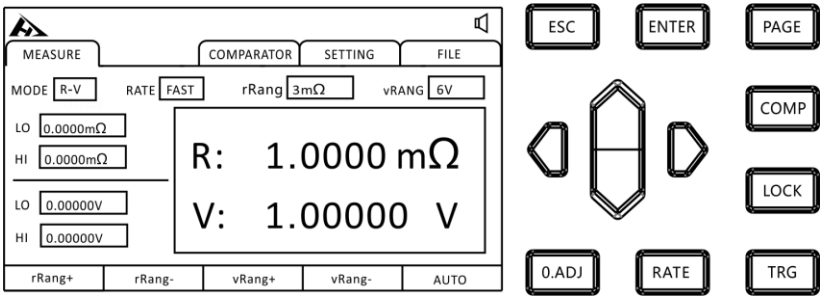


Note:

- If the range is changed in the state of automatic range opening, the automatic range is automatically removed and changed to manual range.
- The automatic range may become unstable because of the object under test. At this point, specify the range or extend the delay manually. For the test accuracy of each range, please refer to the "Measurement accuracy Table ".

3.2 Set Test Speed

Press the [RATE] key on the test page to switch the current test speed. The ultra-fast sampling period is 100 times per second, the fast sampling period is 50 times per second, the medium speed sampling period is 20 times per second, and the slow sampling period is 3 times per second.



Note:

• When the measurement delay is set, the sampling period becomes slower.

• test time contains ADC sampling, sorting output and display time.

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

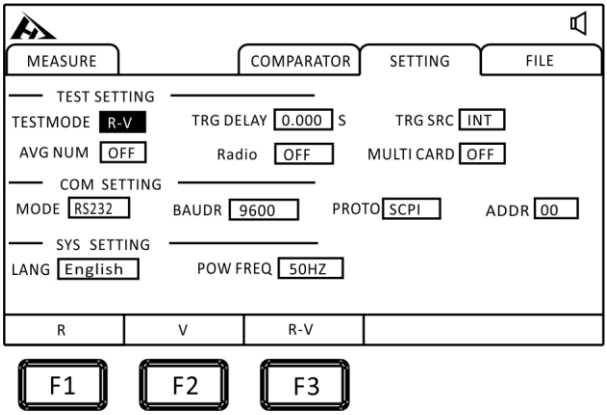
3.3 Test Mode Settings

Click the [PAGE] key on the test page to switch to the settings page.

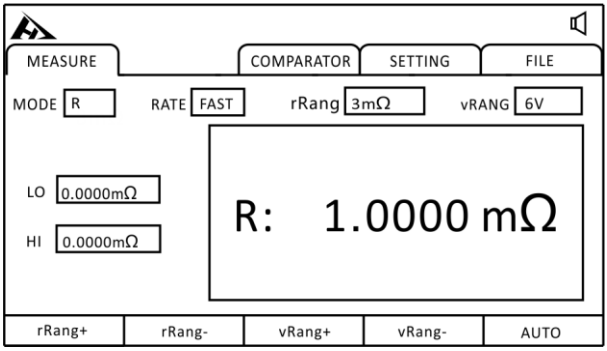
1. Select Parameter Settings Interface

Press the [PAGE] key to select Parameter setting page

2. select relevant menu items



Press [F1] set R mode, test and display resistance only (as shown below); press [F2] set V mode, test and display voltage only; press [F3] select R-V mode, test and display voltage and resistance at the same time.



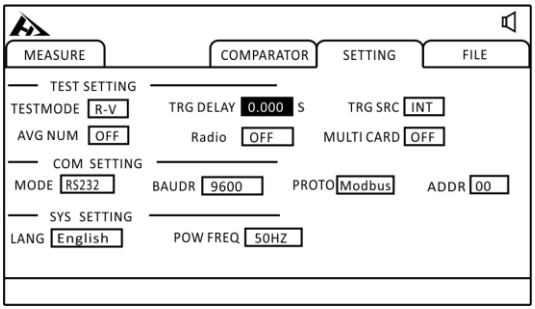
3.4 Trigger delay setting

Set trigger delay and adjust measurement stability time. By using this function, even if the contact of the object under test is unstable, the measurement can be started after the internal circuit is stable.

1. Select Parameter Settings Interface

Press the [PAGE] key to select Parameter setting page

2. select relevant menu items



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

Press the [ENTER] key to enter the setting, press the upper and lower keys to set the number, if the delay time is increased, the display update of the measured value will become slower.

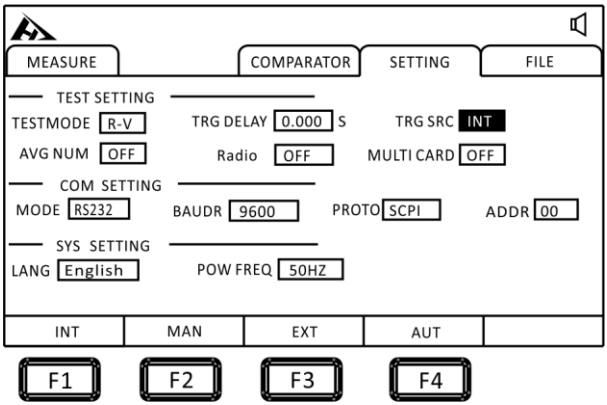
3.5 Set test trigger source

The user can select internal trigger / manual trigger / external trigger / automatic trigger.

1. Select Parameter Settings Interface

Press the [PAGE] key to select Parameter setting page

2. select relevant menu items



Menu Item	Meaning
[INT]	Internal trigger (instrument internal cycle trigger test)
[EXT]	External trigger (external IO port signal trigger, see Chapter 7)
[MAN]	manually triggered (press panel TRG key to trigger a test)
[AUT]	Automatic testing (automatic determination of whether tested parts are connected and tested)

3.6 Average number of times

Average processing and display of multiple measurements. By using this function, the beat of the measured value can be reduced and the interference can be suppressed.

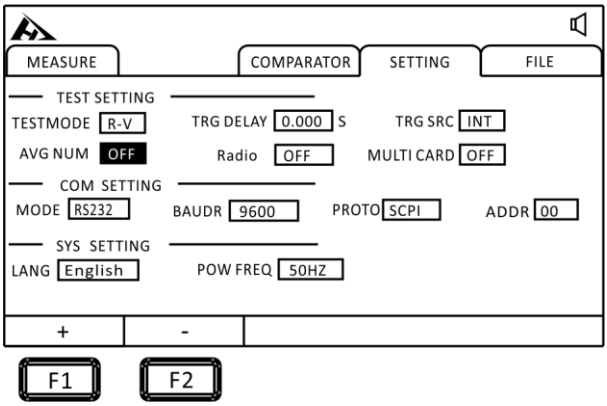
Average number of times:

OFF ↔ 2 ↔ 3 ↔ …↔ 15↔16

1. Select Parameter Settings Interface

Press the [PAGE] key to select Parameter setting page

2. select relevant menu items



Add or subtract the average number of times by F1][F2] or turn off the average number of times.

Menu Item	Meaning
[OFF]	Average number function off
[2]	Take 2 averages to show
[3]	Take 3 averages to show
[...]	Take 4~14 averages to show
[15]	Take 15 averages and show
[16]	Take 16 averages and show

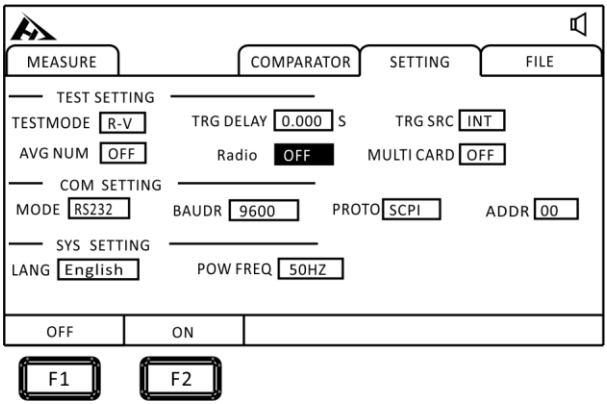
3.7 Broadcast Mode Settings

When broadcast mode is in ON state, test data will be automatically uploaded to the communication side in all trigger modes, and test data will not be uploaded in OFF state.

1. Select Parameter Settings Interface

Press the [PAGE] key to select Parameter setting page

2. select relevant menu items



Press[F1] to turn off broadcast mode and press [F2] to turn on broadcast mode.

3. Format of uploaded data

The multiplex test function is off and the data format is:

Resistance, voltage

±□□□.□□□E-3, ±□□□.□□□E-0

After the multiplex test is opened, the data format is:

Resistance, voltage, channel number

±□□□.□□□E-3, ±□□□.□□□E-0, N

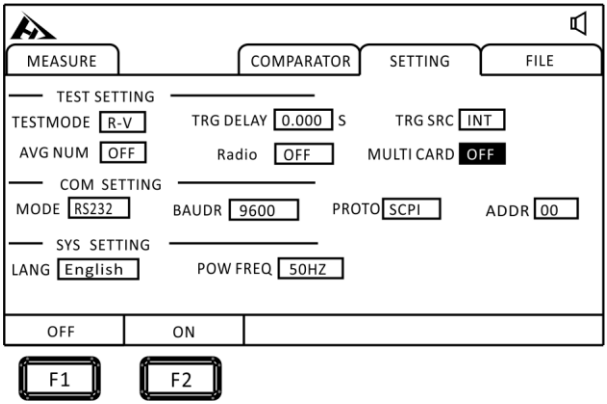
3.8 Multiple test settings

The multiplex test switch is mainly used to connect the multiplex scanning test equipment. When the tester needs to connect the multiplex scanner, it is turned on and closed when it is not needed. The instrument will turn on the external power supply for the scanner, and the data uploaded after the broadcast mode is turned on will automatically add the current channel number.

1. Select Parameter Settings Interface

Press the [PAGE] key to select Parameter setting page

2. select relevant menu items



press [F1][F2] to close or open the multiplex test.

3.9 System settings

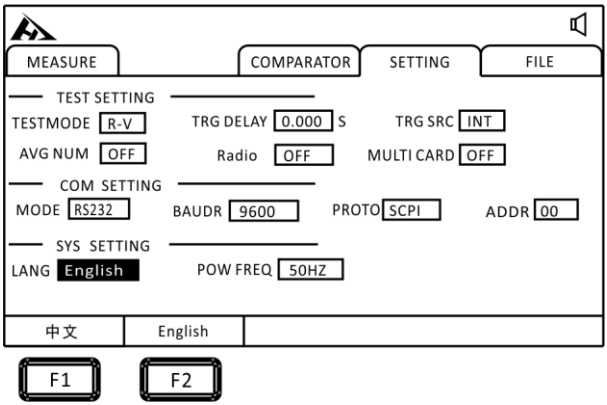
3.9.1 Language settings

The instrument provides two language options, Chinese and English. Meet the needs of international customers.

1. Select Parameter Settings Interface

Press the [PAGE] key to select Parameter setting page

2. Select the relevant menu item



Click [F1][F2] to select the Chinese or English interface.

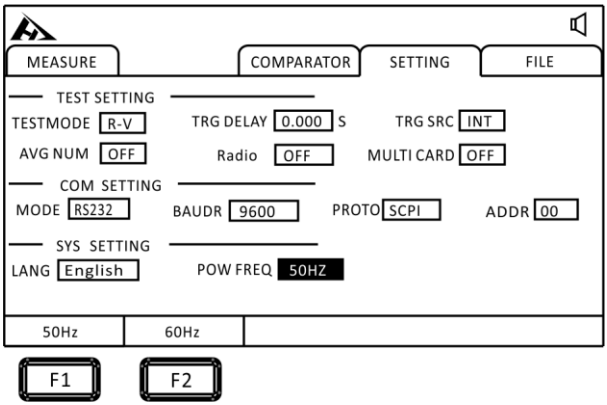
3.9.2 Power frequency settings

The power supply has 50 Hz and 60 Hz to choose. The correct setting of power frequency is helpful to resist external interference and improve the test accuracy of the instrument.

1. Select Parameter Settings Interface

Press the [PAGE] key to select Parameter setting page

2. select relevant menu items



Press [F1][F2] to select a power frequency of 50 Hz or 60 Hz.

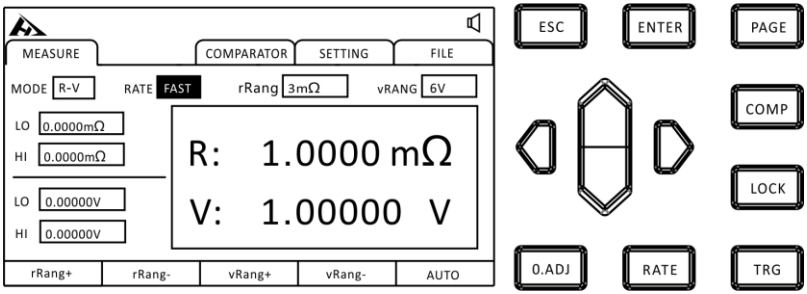
Chapter IV Comparator Settings

The instrument has the function of comparison and sorting, and the quality of the test product can be compared and sorted according to the set value.

4.1 Comparator function

4.1.1 Open compare mode

Press the [COMP] key to turn on or off the comparator.

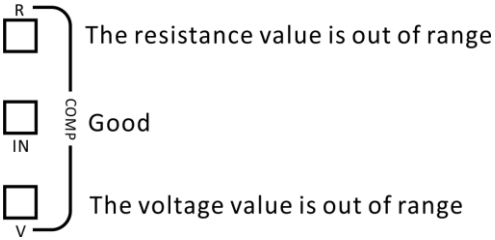


After the comparator is turned on, the current measured voltage value and resistance value will be compared with the upper and lower of the comparator, and then the sorting results will be output through the HANDLER interface.

4.1.2 Comparison of Results Signal Output Mode

When the comparator function is turned on, the instrument provides three alarm outputs:

1. panel LED light alarm



Voltage, internal resistance is not within the range, display red light V and red light R. Green light IN with both internal resistance and voltage.

2. sound alarm

See (Section 4.3).

3. External I/O port, signal output

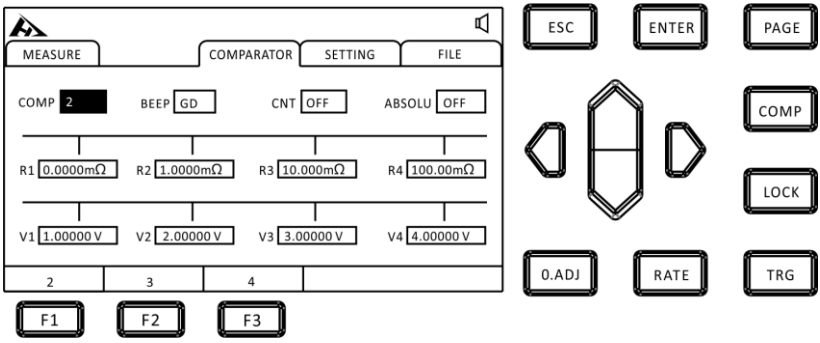
See (section 7.1).

4.2 Sorting function settings

4.2.1 Select the comparator settings interface

Press the [PAGE] key to select COMPARATOR page

4.2.2 Select the relevant menu item



Select the sorting item and press [F1][F2][F3] to select 2/3/4 comparison mode.

Comparative pattern :2 grades

1. Separation Conditions and Results Relationship

Conditions	Results
R1 ≤ Current resistance ≤ R2	R_IN
Current resistance < R1	R_LO
Current resistance > R2	R_HI
V1 ≤ Current voltage value ≤ V2	V_IN
Current voltage value < V1	V_LO
Current voltage value > V2	V_HI

Example: select comparison function open, COMP set to 2 grades, the current comparator value set to the following:

Lower limit of resistance R1	Resistance upper limit R2
80 mΩ	120 mΩ
Lower voltage V1	Voltage ceiling V2
1.45V	1.55V

2. sorting results table

Battery	Internal	Voltage	Sorting results
1	100 mΩ	1.40 V	R_IN V_LO NG
2	100 mΩ	1.50 V	R_IN V_IN GD
3	100 mΩ	1.60 V	R_IN V_HI NG
4	60 mΩ	1.40 V	R_LO V_LO NG
5	60 mΩ	1.50 V	R_LO V_IN NG
6	60 mΩ	1.60V	R_LO V_HI NG
7	150 mΩ	1.40 V	R_HI V_LO NG
8	150 mΩ	1.50 V	R_HI V_IN NG
9	150 mΩ	1.60 V	R_HI V_HI NG

Comparative pattern :3 grades

1. Separation Conditions and Results Relationship

Conditions	Results
R1 ≤ Current resistance < R2	R_P1
R2 ≤ Current resistance ≤ R3	R_P2
Current resistance < R1 or Current resistance > R3	R_NG
V1 ≤ Current voltage value < V2	V_P1
V2 ≤ Current voltage value ≤ V3	V_P2
Current voltage value < V1 or Current voltage value > V3	V_NG

Example: select comparison function open, COMP set to 3 grades, the current comparator value set to the following:

Resistance lower limit R1	Resistance upper limit R2	Resistance upper limit R3
80 mΩ	120 mΩ	160 mΩ
Lower voltage V1	Voltage upper limit V2	Voltage upper limit V3
1.40V	1.50 V	1.60 V

2. sorting results table

Battery	Internal	Voltage	Sorting results
1	60 mΩ	1.30 V	R_NG V_NG NG
2	90mΩ	1.45 V	R_P1 V_P1 GD
3	130mΩ	1.55 V	R_P2 V_P2 GD
4	180 mΩ	1.70 V	R_NG V_NG NG

Note: abnormal measurement is detected and no sorting signal is output.

Comparative pattern : 4 grades

1. Separation Conditions and Results Relationship

Conditions	Results
R1 ≤ Current resistance < R2	R_P1
R2 ≤ Current resistance < R3	R_P2
R3 ≤ Current resistance ≤ R4	R_P3
Current resistance < R1 or Current resistance > R4	R_NG
V1 ≤ Current voltage value < V2	V_P1
V2 ≤ Current voltage value < V3	V_P2
V3 ≤ Current voltage value ≤ V4	V_P3
Current voltage value < V1 or Current voltage value > V4	V_NG

Example: select comparison function open, COMP set to 4 grades sorting, the current comparator value set to the following.

Resistance lower limit R1	Resistance upper limit R2	Resistance upper limit R3	Resistance upper limit R4
80 mΩ	100 mΩ	120 mΩ	140 mΩ
Lower voltage V1	Voltage upper limit V2	Voltage upper limit V3	Voltage upper limit V4
1.40V	1.50 V	1.60 V	1.70 V

2. sorting results table

Battery	Internal	Voltage	Sorting results
1	60 mΩ	1.30 V	R_NG V_NG NG
2	90mΩ	1.45 V	R_P1 V_P1 GD
3	110mΩ	1.55 V	R_P2 V_P2 GD
4	130mΩ	1.65 V	R_P3 V_P3 GD
5	150mΩ	1.75V	R_NG V_NG NG

Note:

Abnormal measurement detected, no sorting signal output

4.3 Response mode settings

After the instrument comparator opens or selects the output test result, the instrument response mode can be selected.

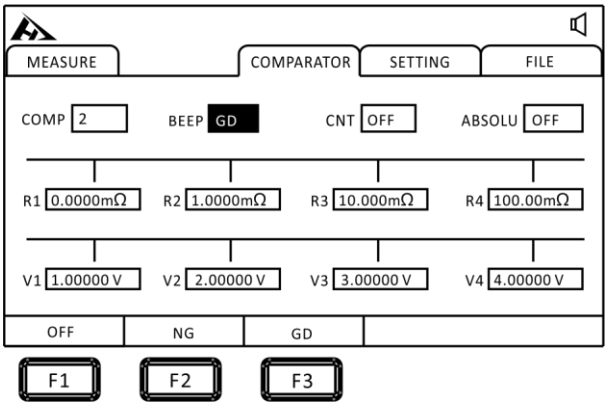
Sound mode:

OFF ↔ Qualified ↔ Unqualified

1. Select Comparator Settings Interface

Press the [PAGE] key to select COMPARATOR page

2. select relevant menu items



Menu Item	Meaning
[OFF]	Sorting signal closed
[NG]	Sound when unqualified
[GD]	Sound when qualified

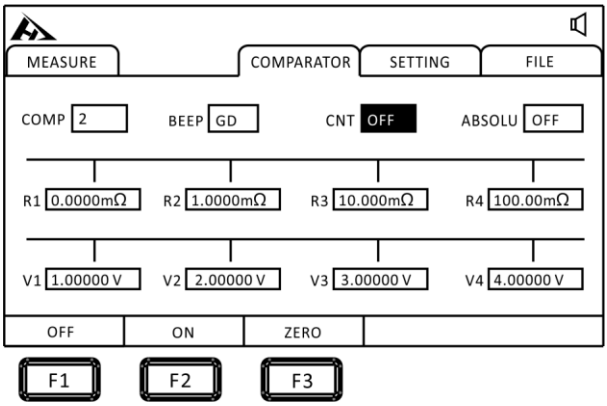
4.4 Count settings

When the instrument comparator is turned on, the count is set to ON, when the machine counts the range of the test results.

1. Select Comparator Settings Interface

Press the [PAGE] key to select COMPARATOR page

2. select relevant menu items



Press [F1][F2] to turn off and turn on the sorting count function, press [F3] to clear the count value.

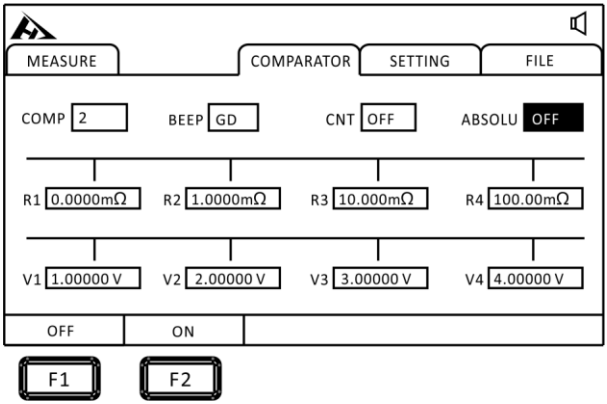
4.5 Absolute set

The tester provides the function of absolute value, compares and selects the test results after absolute value operation.

1. Select Comparator Settings Interface

Press the [PAGE] key to select COMPARATOR page

2. select relevant menu items



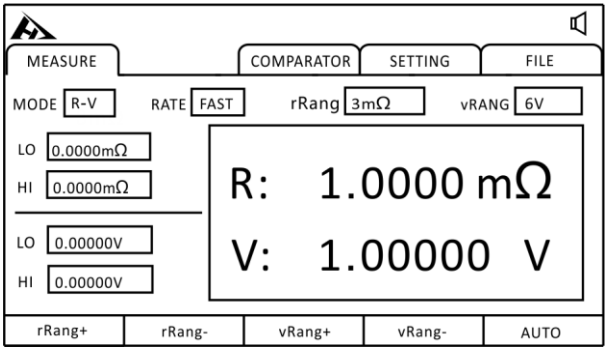
Press[F1][F2] to turn off and turn on the absolute value function.

Chapter V Measurement

This chapter describes the functions used for correct measurement in stages, including startup settings, range scope, protection function startup.

5.1 Start-up test

1. set the relevant parameters.
2. Connect the test line correctly.
3. Test started.



Trigger mode	Meaning
Internal trigger (INT)	Automatic trigger test inside instrument
External trigger (EXT)	Trigger test by external EXT IO TRG signal
Manual trigger (MAN)	Manually press the [TRG]、RS232、LAN port instruction to trigger the test
Automatic trigger (AUT)	Automatically judge the parts to be tested and test them

Note:

- You can not restart another test before the test is over.
- When the EOC signal of the EX.I/O port is LOW, the test can not be triggered.

5.2 Measured value display

The following is the test range, and if the following range is exceeded, display (------), test current and range:

Impedance measurement

Resistance Range	Measuring current	Maximum display value	Resolution (Ω)
3mΩ	100mA	3.2000mΩ	0.1μΩ
30mΩ	100mA	32.000mΩ	1μΩ
300mΩ	10mA	320.00mΩ	10μΩ
3Ω	1mA	3.2000Ω	100μΩ
30Ω	100uA	32.000Ω	1mΩ
300Ω	10uA	320.00Ω	10mΩ
3kΩ	10uA	3.2000kΩ	100mΩ

Voltage measurement

Range	Maximum display value	Resolution
6V	±6.00000V	10uV
60V	±60.000V	100uV

5.3 Zeroing

Please zero in the following cases. (Resistors below 3%± f.s. can be removed for each range)

- ✧ Residual display due to electromotive force, etc
- ✧ Replacement of 4 terminal test lines
- ✧ Abnormal test value
- ✧ Changes in ambient temperature and humidity

Note:

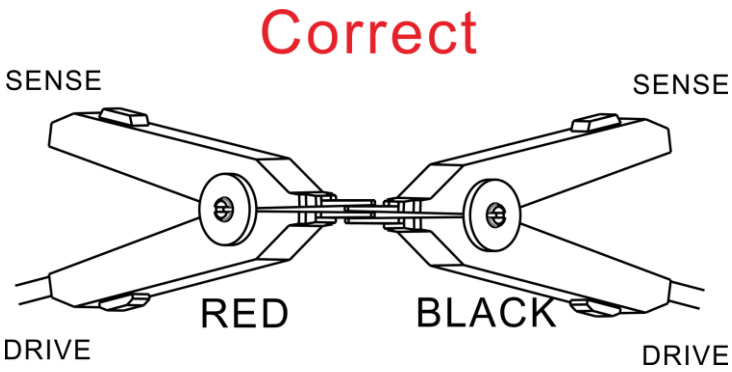
- ✧ After zeroing, if the ambient temperature changes or the test line changes, zero again.
- ✧ Please zero in all ranges used. When manual range, zero is adjusted only under the current range; when automatic range, zero is adjusted for all ranges.
- ✧ If a resistance is measured smaller than the resistance value at zero, the measured value is negative.

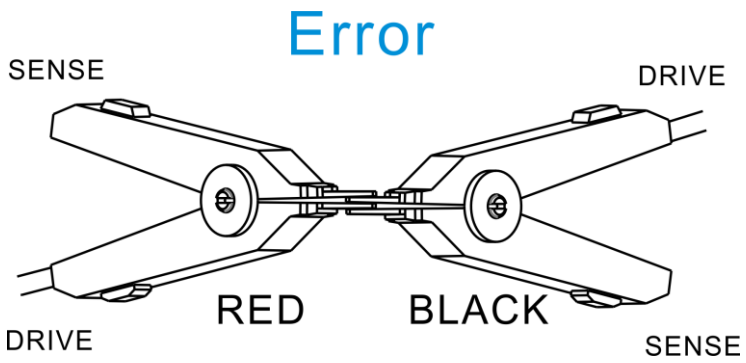
Example: connect 1 mΩ resistance under 300 mΩ range and zero. After zeroing, if short circuit, show -1 mΩ.

Implementation of zero

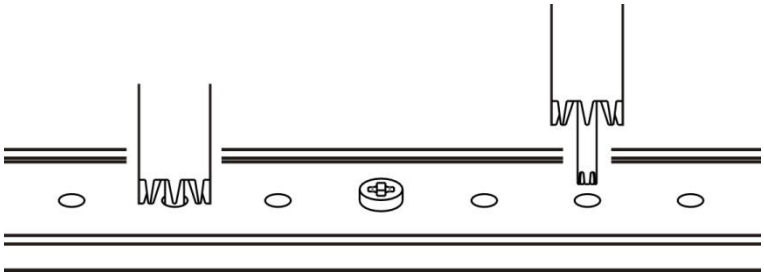
1. short circuit test line

9363- A test clamp test line





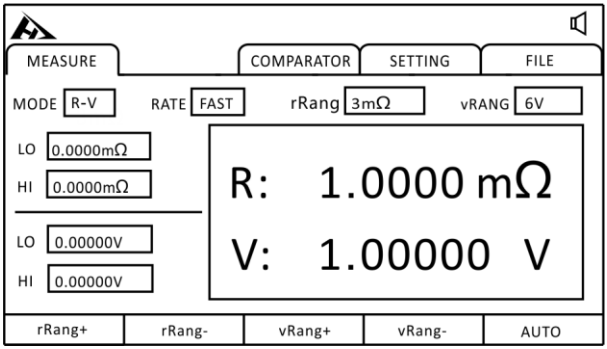
9363- B probe test line



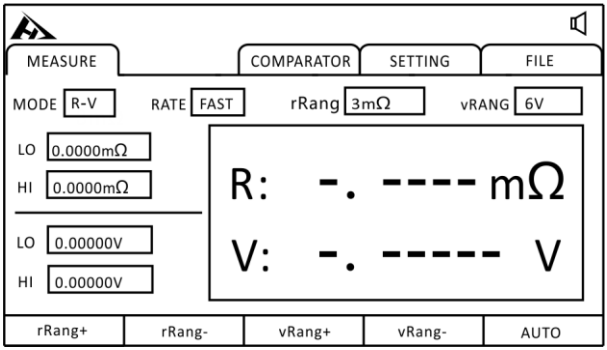
2. confirm measurement within ±50% f.s of value.

When the measured value is not shown, please confirm that the wiring of the test line is correct.

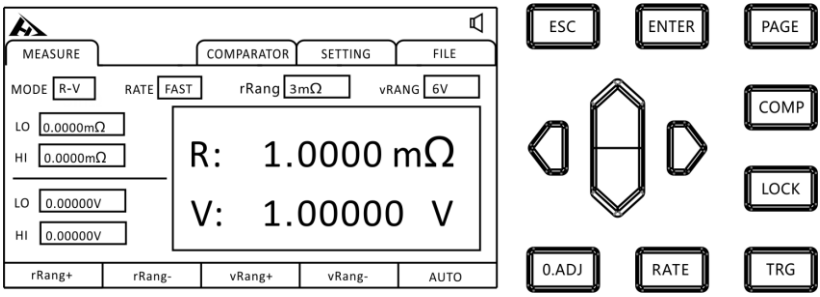
The following picture shows the correct connection:



The following picture shows the wrong connection:



3. Zeroing



After clamping the test clip or press the pen, Click [O.ADJ], Prompt zeroing will be executed, Press the ENTER] key to zero, Press the [ESC] key to stop clearing.

4. zero after implementation

Zero setting success, will display zero success icon in the middle of the display measurement screen, and then return to the measurement interface. Zero setting failure, display zero clearance failure icon, return to the measurement interface.

Zero failure

If zero can not be adjusted, it may be that the measured value before

zero adjustment exceeds the 3%± full range of each range, or is in an abnormal state of test. Please do the correct wiring again and reset the zero. When the resistance value of self-made cable is high, please reduce the wiring resistance because it can not be adjusted to zero.

Note:

When the zero adjustment fails, the zero adjustment of the current range is lifted.

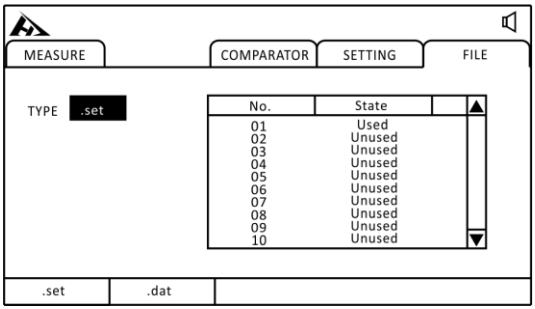
Chapter VI Preservation of Measurement Panel

All measurement conditions can be saved, retrieved, or deleted as files.

Press the [PAGE] key to select FILE page

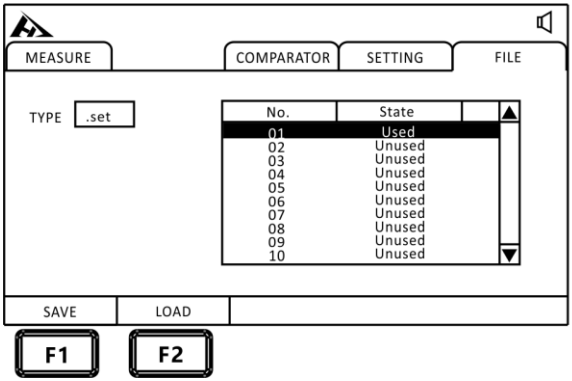
After entering the interface, press the upper and lower keys, you can view the data save records, you can save, load, clear the current records and other operations.

6.1 Save Panel Settings



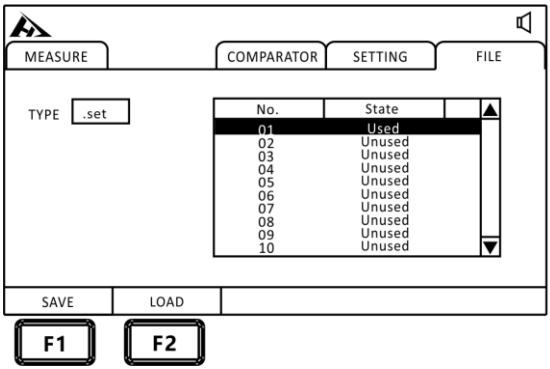
Press up, down, left and right keys to select the menu item to set

Browse the current settings with the upper and lower keys and press [F1] to save the current settings. A total of 30 sets of test settings can be saved. Convenient for different products to quickly switch settings.



Press [F1] to save the parameters to the selected file.

6.2 Call measurement settings



F2

Press [F2] to load the saved parameters

Browse the current settings with the upper and lower keys and press the F2 load key to adjust the current settings.

6.3 Save measurement data settings

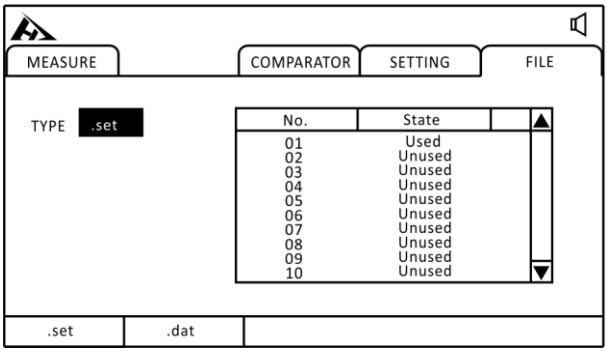
If you open the save data in trigger mode other than INT mode, the test data will be saved to the machine in order, a total of 15 files can be saved, each file can save 400 sets of test data.

1. Select File Settings Interface

PAGE

Press the [PAGE] key to select FILE page

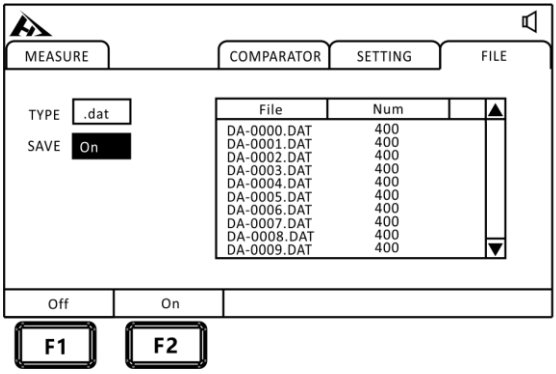
2. select relevant menu items



F2

Press [F2] to File save page

3. Open Data Save Function

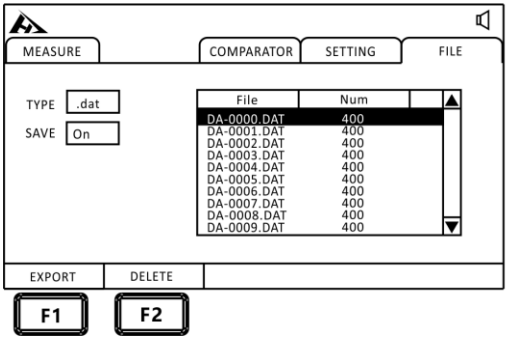


F2

Press [F2] to start saveing data except for INT trigger mode

6.4 Save Measurement Data Export

Insert the U disk to export the data group you need to view to the U disk. And on the computer with parsing software exported to the format you need.

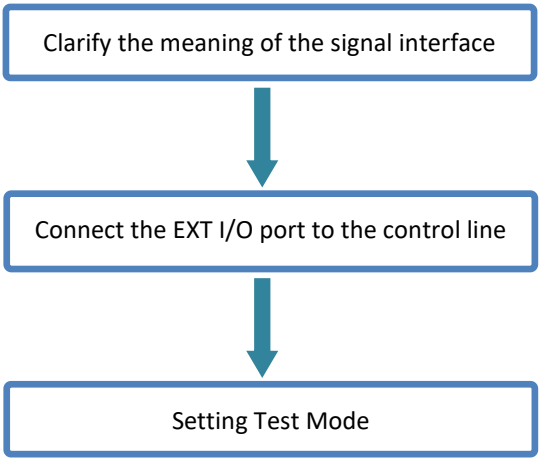


F1 F2

Press [F1] to export the selected data to the U disk. Press the [F2] key to delete the selected data.

CHAPTER VII EXT I/O Interface（Handler）

The EXT I /O terminals on the rear panel of the instrument support external control, provide the output of the test and comparison judgment signal, and accept the input TRG signal. All signals use an optical coupler. Through the instrument panel setting, understanding the internal circuit structure and paying attention to safety matters is conducive to better connection control system.

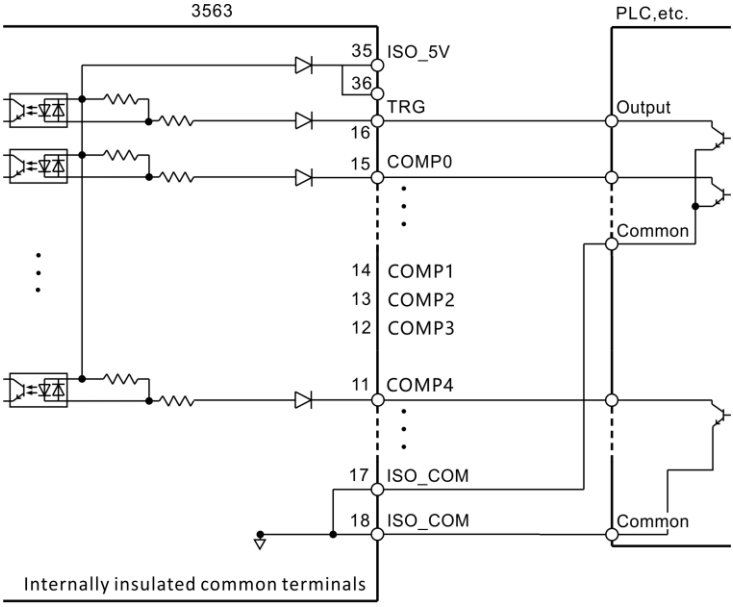


7.1 EXT I/O ports and signals

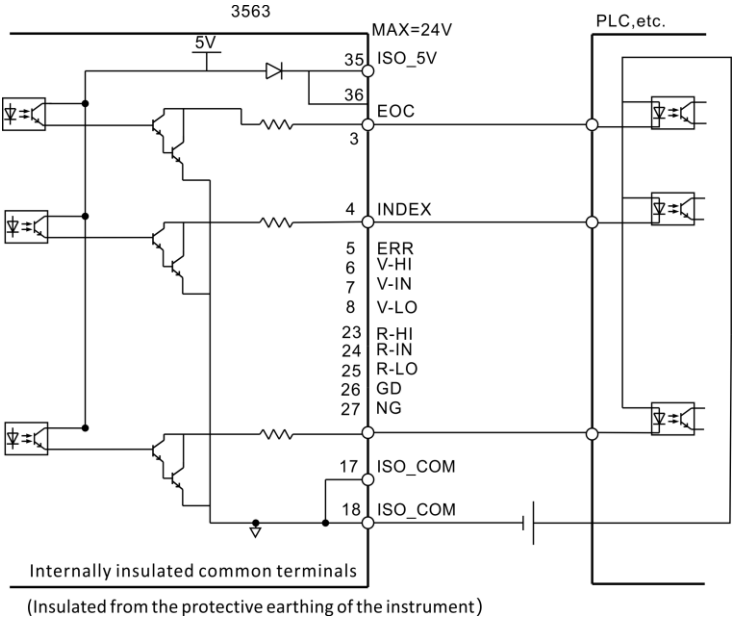
During this section, you will learn about the connection and introduction of the EXT I/O.

Do not plug EXT I/O ports during testing
Do not connect IO port to test end

Input schematic diagram



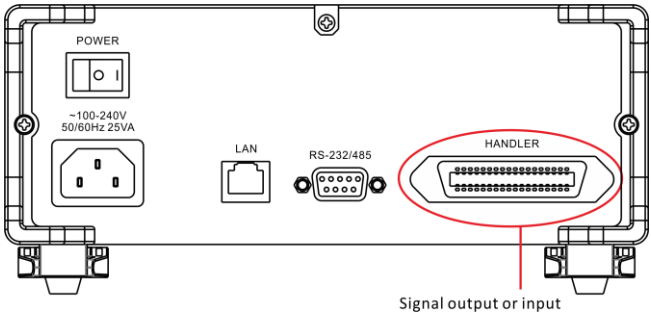
Output schematic diagram



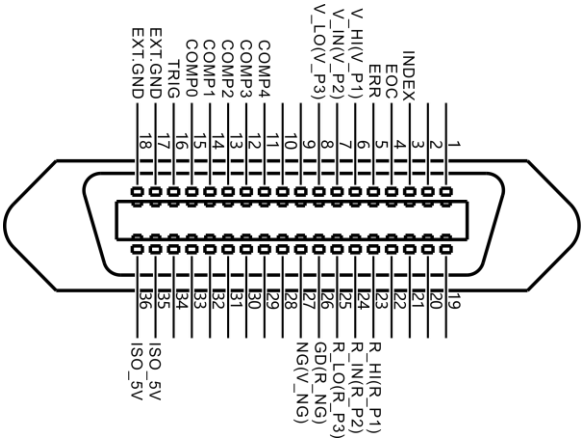
7.1.1 Port signal details

Port and signal description

The EXT I/O port connector adopts the D-SUB bus terminal of 36- PIN foot.



Port Details



(Instrument end)

Power supply terminal

Serial number	Terminal name	Meaning
17	EXT.GND	isolated signal ground (user power ground)
18		
35	ISO_5V	Isolation 5 V Power output
36		

Comparison of output signals

3	INDEX	Sampling End Signal
4	EOC	Test completion signal (busy signal)
5	ERR	Abnormal measurement error output
26	GD(R_NG)	Pass output of two-stage sorting comparator Unqualified output of third and fourth grade sorting resistors
27	NG(V_NG)	Unqualified output of two-stage sorting comparator 3rd and 4th file sorting compare voltage unqualified output
6	V_HI(V_P1)	Super-output of two-stage sorting comparison voltage(Unqualified) Grade 3 and Grade 4 Separation and Comparison Voltage First Class Output
7	V_IN(V_P2)	two-stage sorting compare voltage qualified output 3rd and 4th grade sorting compare voltage second class output
8	V_LO(V_P3)	Over-output of two-stage sorting comparison voltage(Unqualified) 3rd and 4th grade sorting compare voltage 3rd grade output
23	R_HI(R_P1)	Super-output of the second-grade sorting resistance(Unqualified) 3rd and 4th grade sorting resistance first class output
24	R_IN(R_P2)	Second Class Sorting Comparative Resistance Qualified Output 3rd and 4th grade sorting comparative resistance second class output
25	R_LO(R_P3)	Super output of second-grade sorting and comparison resistance (Unqualified) 3rd and 4th grade compare resistance 3rd grade output

External control signal input

15	Comp 0	Comparator record selector. Optional file 1~30.
14	Comp 1	
13	Comp 2	
12	Comp 3	
11	Comp 4	
16	Trig	Test Trigger.

Comparator Record Selection Table

COMP 4-0	Record number	COMP 4-0	Record number	COMP 4-0	Record number	COMP 4-0	Record number
11111	No change	10111	8	01111	16	00111	24
11110	1	10110	9	01110	17	00110	25
11101	2	10101	10	01101	18	00101	26
11100	3	10100	11	01100	19	00100	27
11011	4	10011	12	01011	20	00011	28
11010	5	10010	13	01010	21	00010	29
11001	6	10001	14	01001	22	00001	30
11000	7	10000	15	01000	23	00000	No change

Note: in order to avoid damaging the interface, do not exceed the power supply requirements.

In order to avoid damage to the interface, please connect after the instrument is closed.

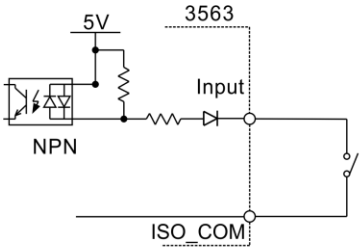
If the output signal user is used to control the relay, the relay must use a reverse energy release diode.

7.1.2 Port Signal Connection Mode

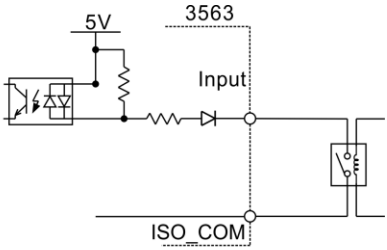
Electrical performance parameters

Isolation power output:	4.8~5.3 VDC
	100 mA. maximum output current
Output signal:	the optocoupler isolation band drives the chip.
	Maximum load voltage 30 V.
	Maximum output current :50 mA.
Input signal:	Photoelectric isolation.
	Low level valid.
	Maximum current :50 mA.

Input circuit connection

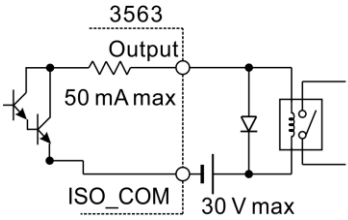


Switched input

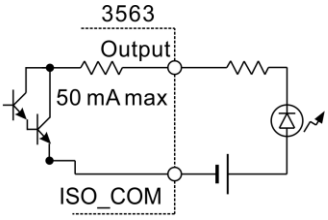


Relay input

Output circuit connection



Driving relay



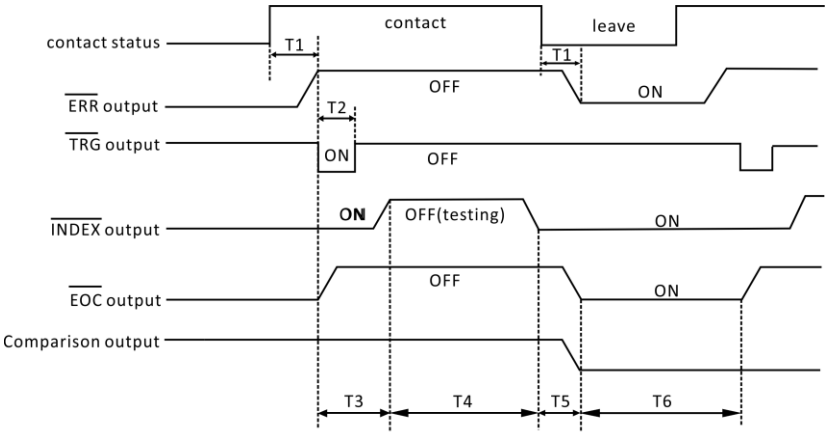
Driving LED Light

7.2 Sequence diagram

Each signal level represents the ON/OFF state of the contact, and the upper horizontal bar represents the low level effective.

7.2.1 Sequence diagram of external trigger

External trigger [EXT] set (I/O output mode to hold)



T1:1.5mS $\overline{\text{ERR}}$ output response time T2:Minimum 0.5ms descent edge trigger

T3:Delay time T4:Minimum 8.6mS(measurement time)

T5:0.5mS operation time T6:Hold until the next trigger

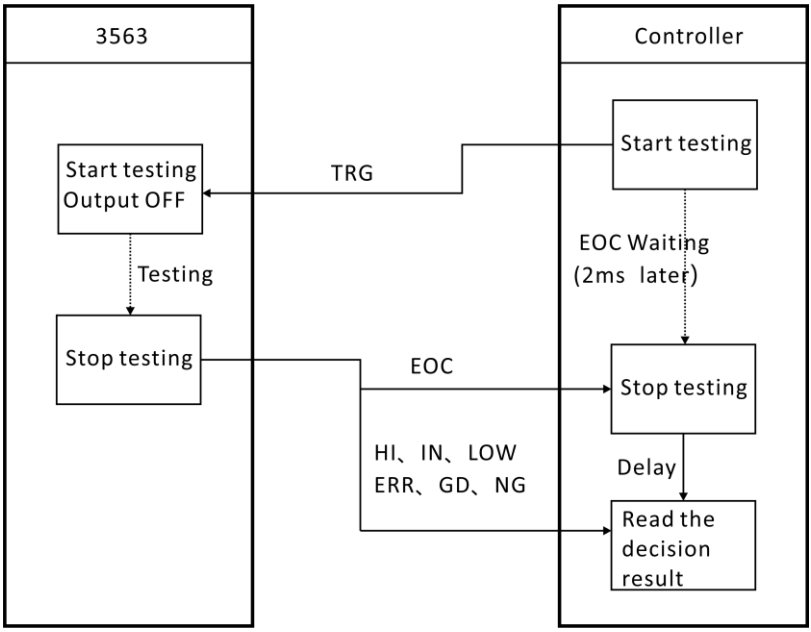
Note: ERR (low) test exception, ERR (low) test is normal.

	Project	Time
T1	ERR output response time	1.5mSMAX
T2	TRG, Signal pulse width	5mSMIN
T3	Time delay	5mSMAX + Measurement delay
T4	ADC sampling time (R-V mode)	Super fast 8.6mS Fast 18mS Medium speed 44mS Slow speed 288mS
T5	Data processing display time	1mSMAX

7.2.2 Read flow when triggered externally

The following is the process from the start of the measurement to the acquisition of the measured value when using an external trigger.

After the instrument determines the result（HI、IN、LOW、ER、GD、NG）, the EOC signal is output immediately. When the response of the controller input circuit is slow, the waiting time is needed from the ON of the detection EOC signal to the reading judgment result.



CHAPTER VIII Communications

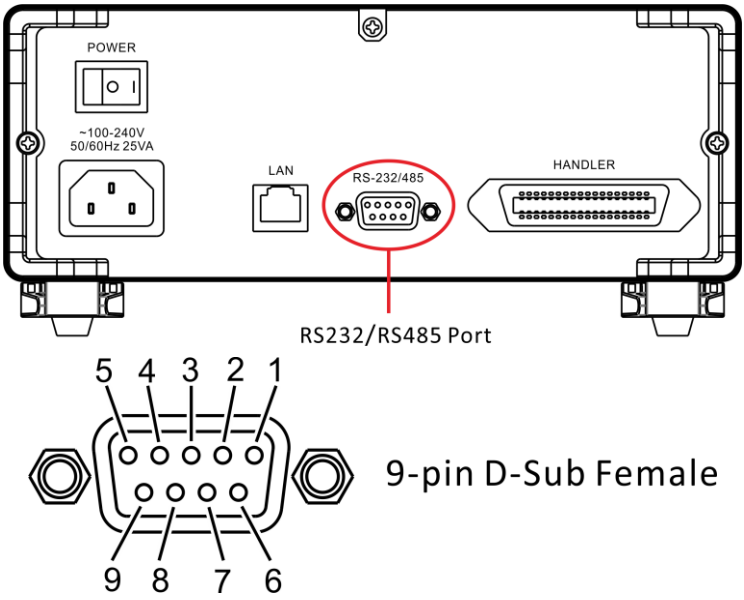
The instrument provides three communication modes, RS232C、RS485、LAN (Ethernet protocol adopts TCP protocol) communication mode. Instruments provide two communication protocols, SCPI、MODBUS. Communication instructions refer to the instruction set in the CD.

It is forbidden to connect the communication port to the test port, otherwise the instrument will be damaged.

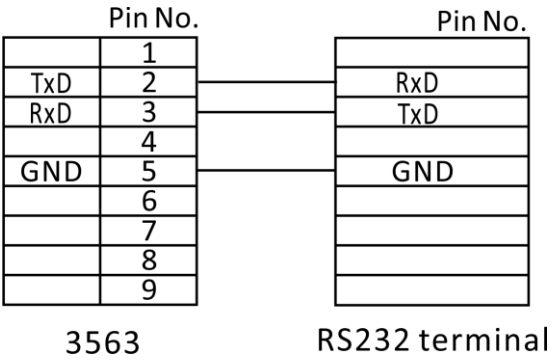
8.1 RS232 Communication Mode

RS232 communication mode adopts 3 line communication mode.

8.1.1 Interface and Cable



8.1.2 RS232 Connection Mode

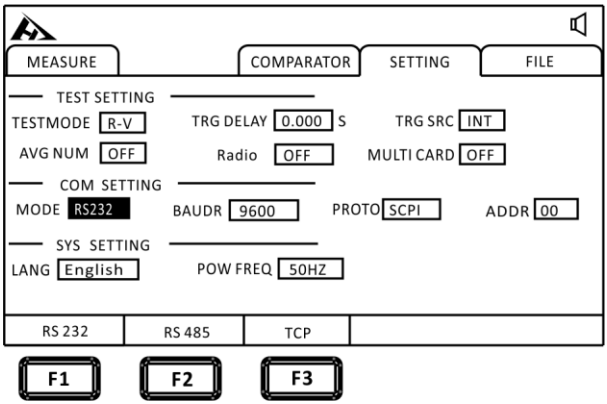


8.1.3 RS232 Communications Settings

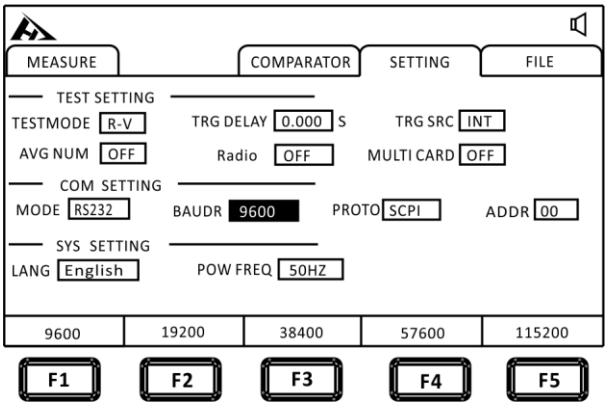
1. select the newsletter page

Press the [PAGE] key to select the Parameter Settings page

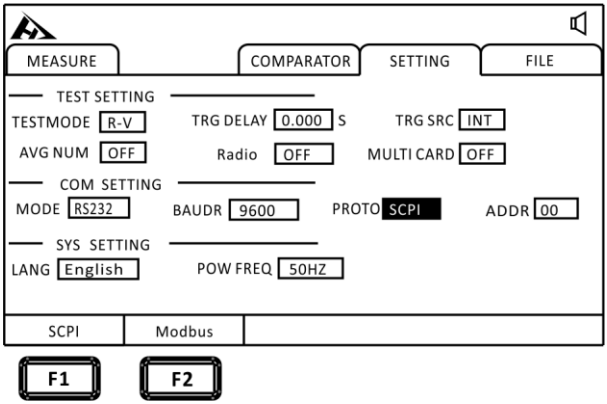
2. choose RS232 communication mode



3. choose the baud rate

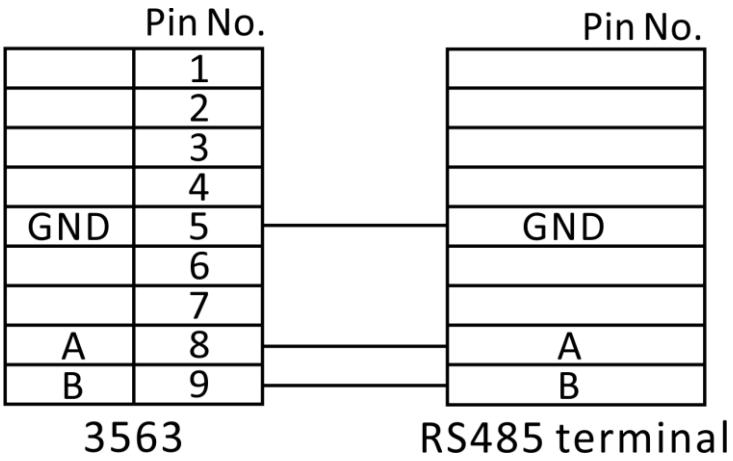


4. Select Communication Protocol



8.2 RS485 Communication Mode

8.2.1 RS485 Connection Mode

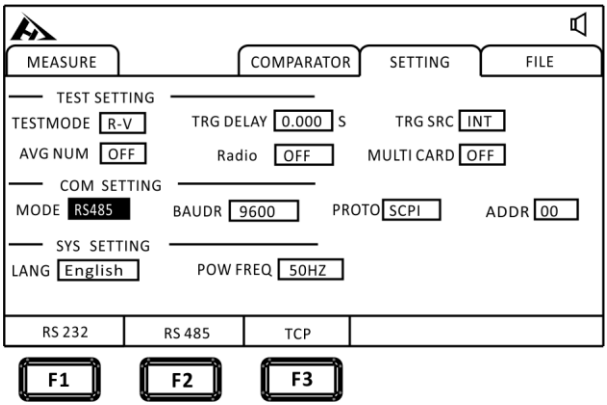


8.2.2 RS485 Communications Settings

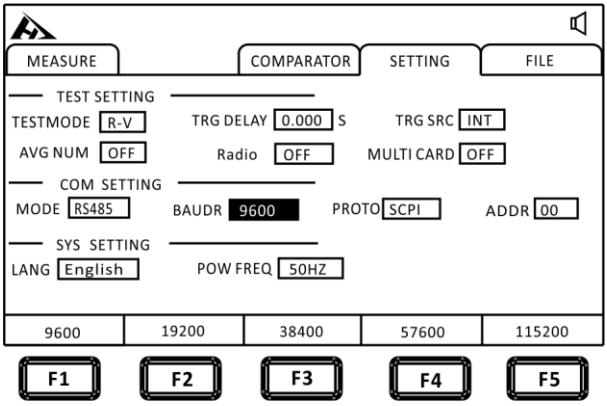
1. select the newsletter page

Press the [PAGE] key to select the Parameter Settings page

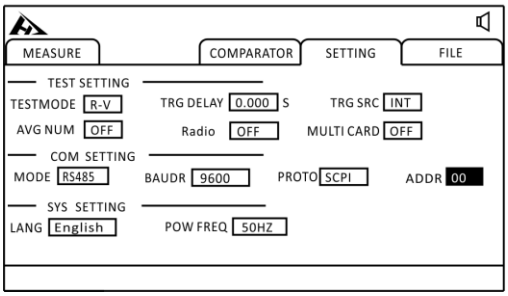
2. choose RS485 communication mode

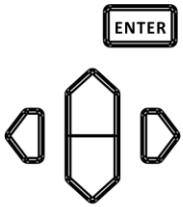


3. choose the baud rate



4. address setting





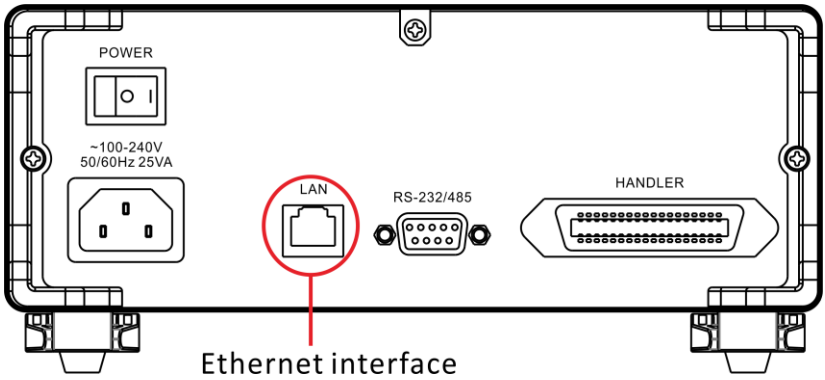
Press [ENTER] to ENTER the Settings and use the up, down, left, and right keys to set the desired address

8.3 LAN Communication Mode

LAN communication adopts TCP protocol communication.

8.3.1 Interface and Cable

Ethernet interface adopts standard RJ45 port, cable adopts more than 5 kinds of network cable.



8.3.2 LAN Connection Mode

Instrument and computer connection

When the instrument and computer are connected, the network wire adopts cross line.

A termination method adopts 568 B standard:

Orange white	Orange	Green white	Blue	Blue White	Green	Brown white	Brown

B termination method adopts 568 A standard:

Green white	Green	Orange white	Blue	Blue White	Orange	Brown white	Brown

Instrument and router connection

When the instrument and router are connected, the network wire is connected directly.

568 B at both ends:

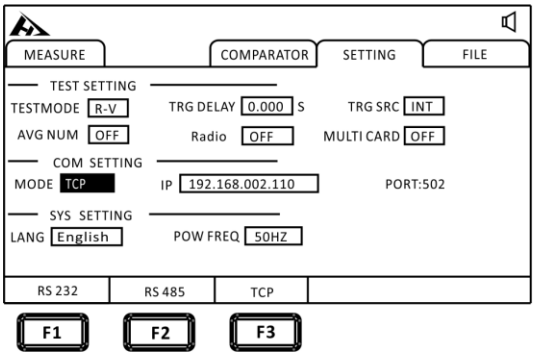
Orange white	Orange	Green white	Blue	Blue White	Green	Brown white	Brown

8.3.3 LAN Communications Settings

1. select the newsletter page

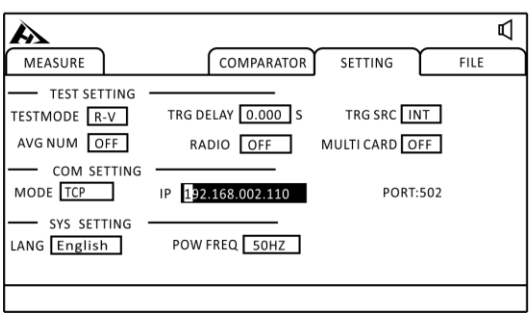
Press the [PAGE] key to select the Parameter Settings page

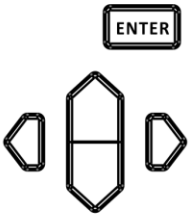
2. choose TCP communication mode



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

3. set the address address

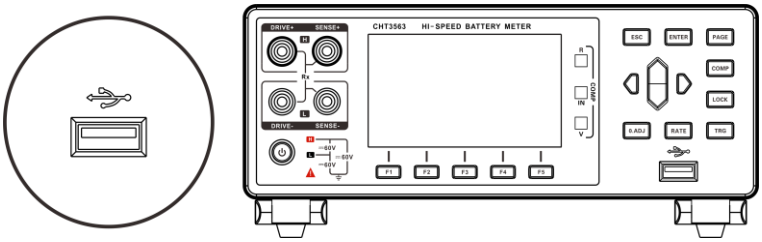




Press [ENTER] to ENTER the Settings, Press up, down, left and right keys to set the value

8.4 USB interface

The front panel of the instrument has a USB interface, which is used as a HOST function, inserted into the U disk for upgrading programs and saving data or settings.



Chapter IX Parameters

9.1 General parameters

General functions:

Measurement function	Voltage, AC resistance test
Scope of testing	Resistors 0.1μΩ to 3 KΩ, voltage 0 V to 60 V
Test speed (MAX) Automatic trigger	Super fast 100 times per second, fast 50 times p second, Medium speed 20/ s, slow 3/ s.
Maximum output current	100mA
Range Overlimit Display	Super range "-------"
Input terminals	Banana plug
Operating key	Rubber bond
Display	3.5 inches TFT
Precision Guarantee Period	1 year
Operating temperature and humidity	0℃ to 40℃ 80% RH below (no condensation)
Storage temperature and humidity	-10℃ to 60℃ 80% RH below (no condensation)
Operating environment	Indoor, highest altitude m 2000
Power supply	Voltage :100 V ~240 V AC Frequency :50 Hz/60Hz
Power consumption	10 W
Size	About 325 mm x 215mm x 96mm
Weight	About 2 kg

9.2 Accuracy

Test conditions for the following indicators:

Temperature: 20±3℃

Humidity: <80%RH

Preheating more than 15 minutes

Calibration within 1 year

Accuracy :±(reading accuracy + range accuracy)

Resistance measurement accuracy:

Range		Maximum reading	Accuracy (slow)	Resolution	Test current
1	3mΩ	3.2000mΩ	0.5%+0.04%FS	0.1μΩ	100mA
2	30mΩ	32.000mΩ	0.5%+0.02%FS	1μΩ	100mA
3	300mΩ	320.00mΩ	0.3%+0.02%FS	10μΩ	10mA
4	3Ω	3.2000 Ω	0.3%+0.02%FS	100μΩ	1mA
5	30Ω	32.000 Ω	0.3%+0.02%FS	1 mΩ	100μA
6	300Ω	320.00 Ω	0.3%+0.02%FS	10 mΩ	10μA
7	3kΩ	3100.0Ω	0.3%+0.02%FS	100 mΩ	10μA

1： measuring current error ± less than 10%.

2：superfast plus 0.02%FS, fast plus 0.01%FS, medium speed plus 0.01% FS.

3： superfast plus 0.1%FS, fast plus 0.04%FS, medium speed plus 0.02%FS. (3 mΩ range)

Voltage measurement accuracy:

Model	Range		Maximum reading	Testing accuracy	Resolution
3563	1	6V	±6.00000V	0.01%+0.001%FS	10μV
	2	60V	±60.0000V	0.01%+0.001%FS	100μV
3563A	1	6V	±6.00000V	0.01%+0.001%FS	10μV
	2	60V	±60.0000V	0.01%+0.001%FS	100μV
	3	300V	±300.000V	0.01%+0.001%FS	1mV

3563B	1	8V	±8.00000V	0.01%+0.001%FS	10μV
	2	80V	±80.0000V	0.01%+0.001%FS	100μV
	3	800V	±800.000V	0.01%+0.001%FS	1mV
3564	1	10V	±10.0000V	0.01%+0.001%FS	100μV
	2	100V	±100.000V	0.01%+0.001%FS	1mV
	3	1000V	±1000.00V	0.01%+0.001%FS	10mV

1. Add 0.002%FS for ultra-fast ,0.001%FS for fast ,0.001%FS for medium speed.
2. Voltage measurement 3563A testable maximum 300 V,3563B testable maximum 800 V, 3564 testable maximum 1000 V.

CHAPTER X SCPI Communication Instructions

10.1 General instructions

Instrument commands are divided into two types: public commands and SCPI(programmable instrument standard commands) commands. Common commands are defined by IEEE488.2-1987 standards and apply to all instrument devices, but this instrument does not support all common commands. SCPI command is tree-like.

1.* IDN? Instruction
Function: Query version number
Examples:
Delivery :* IDN?:
Return: Hopetech,3563,V1.0

2.* TRG
Function: Bus trigger command available when set to bus trigger
Return: resistance value, voltage value (multiplex function off)
Resistance value, voltage value, channel number (multiplex function on)
Example: See FETCH Instruction

3.TRG
Function: bus trigger command, if not bus trigger automatically changed to bus trigger.
Return: resistance value, voltage value (multiplex function off)
Resistance value, voltage value, channel number (multiplex function on)
Example: See FETCH Instruction

10.2 SCPI Instruction Structure

The instruction of tree structure is root command (root command), or root (root). If you want to reach the lower level instruction, you must follow a specific path to reach.

Command Terminator: an end character entered by a command, such as a NL (Newline character, ASCII code 10).

Colon (:): colon is the level of the command, indicating the next level of the command.

semicolon (;): a semicolon indicates the beginning of multiple commands.

Question mark (?): A question mark indicates a query.

Comma (,): Comma is a separator of multiple parameters.

spaces (): spaces are delimiters of commands and parameters.

The following figure shows how to reach lower levels of instruction by using colons, semicolons.

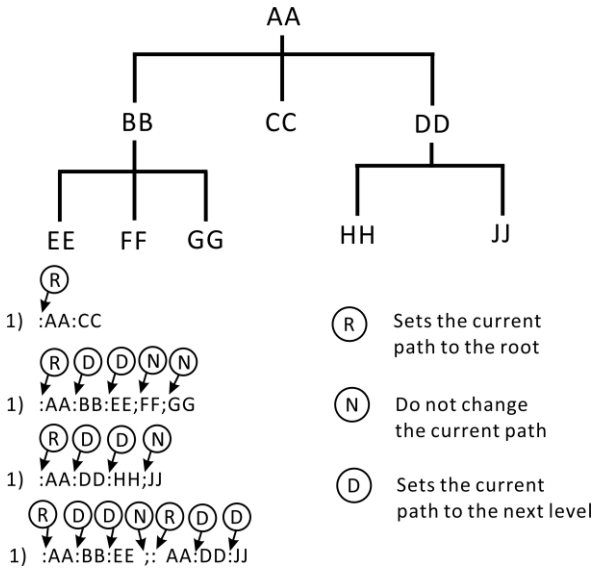


Figure 10.1 SCPI Instruction Tree Structure

10.3 SCPI sub-instruction system

1.: FUNCtion {RV|RES|VOLT}
Function: Set or query test mode
Return: RV,RES,VOLT
Note: RV voltage resistance test function
RES Resistance Test Function
VOLT voltage test function

Example: Set Test Mode
Sending: :FUNCtion RV:
Example: Query Test Mode
Sending: FUNCtion?:
Return: RV

2.: RESistance： RANGe {<numeric_value>}

Function: Set or query resistance range
Returns: numeric, range 0-6

Example: the current range is set to 5 range

Sending: RESistance:RANGe 5:

Example: Ask about the current range

Sending: RESistance:RANGe?

Return :5

3. :VOLTage:RANGe {0|1|2}
Function: Set or query voltage range
Return :0-2

Example: the current range is set to 1 range
Sending: VOLTage:RANGe 1

Example: Ask about the current range
Sending: VOLTage:RANGe?
Return :1

4. :AUTorange {0|1|OFF|ON}
Function: Automatic setting or query range
Return :0 off ,1 on

Example: automatic range setting
Sending: :AUTorange OFF
Return :0 off ,1 on
Example: Ask about the current range automatically
Sending: :AUTorange?
Return :0

5. :SAMPle:RATE {EX|FAST|MEDium|SLOW}
Function: Set or query sampling rate
Return: FAST fast, MED medium speed, SLOW slow

Example: Setting Sampling Rate
Sending: :SAMPle:RATE OFF
Return :0 off ,1 on
Example: Query Sampling Rate
Sending: :SAMPle:RATE?
Return: SLOW

6. :CALCulate:AVERage:STATe{0|1|OFF|ON}
Function: Set or query if average function is on
Return :0 off ,1 on
Example: Ask if the average function is turned on

Sending: ： :CALCulate:AVERage:STATe?

Return :0

7. :CALCulate:AVERage {<numeric_value>}
Function: Set or query average number of times
Return :2-16

Example: Average number of queries
Sending: :CALCulate:AVERage?
Return :2
Example: Set the average number of times
Sending: :CALCulate:AVERage 5

8. :CALCulate:LIMit:STATe {0|1|OFF|ON}
Function: Sets or queries whether the comparator is on
Return :0 off ,1 on

Example: Query whether the comparator is on
Sending: :CALCulate:LIMit:STATe?
Return :0
Example: Set comparator on
Sending: :CALCulate:LIMit:STATe ON

9. :CALCulate:LIMit:BIN {2|3|4}
Function: Set or Query Comparator number of sorting files
Return :2 Upper and lower sorting ,3 Three-step sorting ,4 Four-step sorting

Example: Query the number of comparators
Sending: :CALCulate:LIMit:BIN?
Return :2
Example: Set the number of comparators
Sending: :CALCulate:LIMit:BIN 2

10. :CALCulate:LIMit:BEEPer {OFF|HL|IN}

Function: Sets or queries the comparator's output
Return: OFF noise off, HL unqualified sound, IN qualified sound

Example: Query comparator output
Sending: :CALCulate:LIMit:BEEPer?
Return: OFF

Example: Set the comparator's output
Sending: :CALCulate:LIMit:BEEPer HL

11. :CALCulate:LIMit:RESistance {1|2|3|4},{<numeric_value>}
Function: Set or query comparator resistance value
Return: <numeric_value>

Example: Set the comparator resistance value 1
Sending: :CALCulate:LIMit:RESistance 1,2e1

Example: Query comparator resistance value 1
Sending: CALCulate:LIMit:RESistance? 1
Return :20.000

12. :CALCulate:LIMit:VOLTage {1|2|3|4},{<numeric_value>}
Function: Set or query comparator voltage values
Return: <numeric_value>

Example: Set comparator voltage value 1
Sending: :CALCulate:LIMit:VOLTage 1,2
Example: Query comparator voltage limit 1
Sending: :CALCulate:LIMit:VOLTage 1
Return :2.00000

13 :SYSTem:LFRequence
Function: Set or query power frequency

Return :50,60
Example: Query Power Frequency
Sending: :SYSTem:LFRequence?
Return :50
Example: set power frequency
Sending: :SYSTem:LFRequence 50

14 :SYSTem:SAVE
Functions: save current test mode, test speed, test range, trigger delay, comparator setting information

15 :SYSTem:LOAD
Functions: load saved test mode, test speed, test range, trigger delay, comparator setting information

16 :TRIGger:SOURce
Function: Set or query trigger source
Return: INT,MAN,EXT,AUT
Example: Set Trigger Source
Sending: :TRIGger:SOURce INT
Example: Query Trigger Source
Sending: :TRIGger:SOURce?
Return: INT

17 :TRIG:DELay
Function: Set or query trigger delay
Return: 0 to 9.999
Example: Set Trigger Delay
Sending: :TRIG:DELay 1
Example: Query Trigger Delay
Sending: :TRIG:DELay?
Return :1

18 :FETCh?

Function: Return test results

When the multiplex is off, returns the format:

ΩV mode return<Resistance value>,<Voltage value>

Ω mode return <Resistance value>,

V mode return <Voltage value>

When the multiplex is turned on, return the format:

ΩV mode return<Resistance value>,<Voltage value>,<N>

Ω mode return <Resistance value>,<N>

V mode return <Voltage value>,<N>

Measuring Resistance Data Format

No.	Range	Normal test value	Super range	Measurement failure
1	3mΩ	±□□.□□□□E-3	±10.0000E+8	±10.0000E+9
2	30mΩ	±□□□.□□□E-3	±100.000E+7	±100.000E+8
3	300mΩ	±□□□□.□□E-3	±1000.00E+6	±1000.00E+7
4	3Ω	±□□.□□□□E+0	±10.0000E+8	±10.0000E+9
5	30Ω	±□□□.□□□E+0	±100.000E+7	±100.000E+8
6	300Ω	±□□□□.□□E+0	±1000.00E+6	±1000.00E+7
7	3000Ω	±□□.□□□□E+3	±10.0000E+8	±10.0000E+9

Measuring Voltage Data Format

No.	Range	Normal test value	Super range	Measurement failure
1	6V	±□.□□□□□E+0	±1.00000E+9	±1000.00E+7
2	60V	±□□.□□□□E+0	±10.0000E+8	±10.0000E+9

Channel Number Data Format

0~99

Chapter XI MODBUS Communications Directive

The communication protocol adopts MODBUS format and RTU mode. That is ,3.5 stop bits as start and end bits. The time between each byte data does not exceed 1.5 stop bits. Select serial port type (Rs232/Rs485) and set the communication baud rate of the instrument to be consistent with the upper computer. Serial communication format: data bit 8 bits, stop bit 1 bit, no hardware handshake.

11.1 Register Overview

11.1.1 Hold register

Name	Address	Value
Test function	0x0001	R:0x0000,V:0x0001, RV:0x0002
Resistance Range	0x0002	0x0000-0x0006
Voltage Range	0x0003	0x0000-0x0002
Automatic Range	0x0004	ON:0x0001, OFF:0x0000
Sampling rate	0x0005	EX:0x0000,FAST:0x0001, MED:0x0002, SLOW:0x0003
Average number	0x0006	0x0001-0x0010
comparator switch	0x0007	ON:0x0001, OFF:0x0000
comparator gear	0x0008	0x0002-0x0004
Comparator noise	0x0009	OFF:0x0000,HL:0x0001, IN:0x0002
Trigger source	0x000A	0x0000-0x0003: INT MAN, EXT, BUS
Trigger delay	0x000B	0-9999
Resistance upper limit 1H	0x000C	IEEE32 format
Resistance upper limit 1L	0x000D	IEEE32 format

Resistance upper limit 2H	0x000E	IEEE32 format
Resistance upper limit 2L	0x000F	IEEE32 format
Resistance upper limit 3H	0x0010	IEEE32 format
Resistance upper limit 3L	0x0011	IEEE32 format
Resistance upper limit 4H	0x0012	IEEE32 format
Resistance upper limit 4L	0x0013	IEEE32 format
Voltage upper limit 1H	0x0014	IEEE32 format
Voltage upper limit 1L	0x0015	IEEE32 format
Voltage upper limit 2H	0x0016	IEEE32 format
Voltage upper limit 2L	0x0017	IEEE32 format
Voltage upper limit 3H	0x0018	IEEE32 format
Voltage upper limit 3L	0x0019	IEEE32 format
Voltage upper limit 4H	0x001A	IEEE32 format
Voltage upper limit 4L	0x001B	IEEE32 format
Zero	0x0020	1: Zero

11.1.2 Input register

Name	Address	Value
Resistance value H	0x1001	IEEE32 floating point format
Resistance value L	0x1002	IEEE32 floating point format
Voltage value H	0x1003	IEEE32 floating point format
Voltage value L	0x1004	IEEE32 floating point format
Resistance measurement results	0x1005	IEEE32 floating point format
Voltage measurement results	0x1006	IEEE32 floating point format

The results show that:

0：OFF　1：IN　2：HI　3：LO

11.2 MODBUS instructions

11.2.1 Read hold register instruction（0x03）

Request frame		
Address code	0x01~0xFF	1 byte
Instruction code	0x03	1 byte
Starting register address		2 bytes
Number of registers		2 bytes
CRC Verification Code		2 bytes

Normal Response Frame		
Address code	0x01~0xFF	1 byte
Instruction code	0x03	1 byte
Number of bytes		1 byte
Input register		n bytes
CRC Verification Code		2 bytes

Abnormal Response Frame		
Address code	0x01~0xFF	1 byte
Exception code	083	1 byte
Error code	01-04	1 byte
CRC Verification Code		2 bytes

Examples:

Read the instrument resistance range + voltage range (instrument address is 01)

Sending: 01 03 0002 0002 65CB

Instrument return: 010304000400017A32

The resistance range of the instrument is 0004 and the voltage range is 0001

11.2.2 Read input register instruction（0x04）

Request frame		
Address code	0x01~0xFF	1 byte
Instruction code	0x04	1 byte
Starting register address		2 bytes
Number of registers		2 bytes
CRC Verification Code		2 bytes

Normal Response Frame		
Address code	0x01~0xFF	1 byte
Instruction code	0x04	1 byte
Number of bytes		1 byte
Input register		n bytes
CRC Verification Code		2 bytes

Abnormal Response Frame		
Address code	0x01~0xFF	1 byte
Exception code	084	1 byte
Error code	01-04	1 byte
CRC Verification Code		2 bytes

Examples:

Read the resistance and voltage values tested by the instrument

Sending: 01 04 1001 0004 A4C9

Instrument return: 010408E7D49B3E260A9D3FC98A

A resistance value of 0.304Ω, a voltage of 1.2269

Note: the data returned by the instrument is in IEEE format. Reference is made to the appendix for IEEE format

11.2.3 Write register instructions（0x10）

Request frame		
Address code	0x01~0xFF	1 byte

Instruction code	0x10	1 byte
Starting register address		2 bytes
Number of registers		2 bytes
Number of bytes		1 byte
Register value		N bytes
CRC Verification Code		2 bytes

Normal Response Frame		
Address code	0x01~0xFF	1 byte
Instruction code	0x10	1 byte
Starting address		2 bytes
Number of registers		2 bytes
CRC Verification Code		2 bytes

Abnormal Response Frame		
Address code	0x01~0xFF	1 byte
Exception code	0x90	1 byte
Error code	01-04	1 byte
CRC Verification Code		2 bytes

Examples:

Set instrument resistance range 10 mΩ voltage range 60 V(instrument address 01)

Sending: 01 10 0002 0002 0001 0001 E276

Instrument return: 011000020002E008

Instrument setup successfully

11.2.4 Trigger instrument test instructions（0x74）

Request frame		
Address code	0x01~0xFF	1 byte
Instruction code	0x74	1 byte
CRC Verification Code		2 bytes

Normal Response Frame		
Address code	0x01~0xFF	1 byte
Instruction code	0x74	1 byte
Number of bytes		1 byte
Input register		n byte
CRC Verification Code		2 bytes

Examples:

Read the resistance and voltage values tested by the instrument

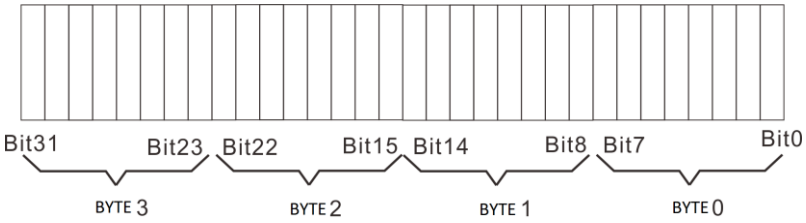
Sending: 01 74 00 07

Instrument return: 017408E7D49B3E260A9D3FC98A

A resistance value of 0.304Ω, a voltage of 1.2269

Appendix: Data representation format for IEEE32 floating-point, signed integers

IEEE32 is the floating point representation developed by the International Electrotechnical Commission, the main thing is to use four bytes to represent floating point numbers, the negative range of the data that can be represented is $-2*2^{128}$~-2^{-127}, 2^{-127}~$2*2^{128}$. As shown below, A high (bit31) symbol bit (0 positive, 1 negative) for a floating point number; bit30-bit23 these eight bits represent the order code of the floating point number (bottom 2), Range 0- FF(hexadecimal), 7 F for order 0, 80 means 1, 7E the order is -1, And so on. bit22-bit0 represents the decimal part of the Mantissa of a floating-point number, the integer part of the Mantissa is always 1.



An example is given to illustrate the representation of IEEE32 floating point numbers, assuming there's a IEEE32 float now, The binary format is 010000101 11001000 00000000 00000000, According to the above rules, the order code should be 10 000 101, or 0X85, The decimal part of the Mantissa is 0.1001 in binary, In decimal ,0.5625, Since the integer portion of the Mantissa is always 1 by default, So the value of the float should be $+1.5625*2^{85-7F}=100$.

Because IEEE32 floating-point numbers can represent a large range of data in only 4 bytes, they are often used in communication to improve communication efficiency. IEEE32 floating-point numbers are used more in binary communication. When a I/O device uses a INTEL company's CPU, it must be sent in bytes 0, byte 1, byte 2, byte 3, whether the I/O device sends a floating point number to the PC device or the PC device to the I/O device. If the I/O device uses the company's

CPU, data, the order of transmission is the opposite. As this is not absolute, it represents only the majority of cases, and when it comes to data formats, the manual for the use of I/O equipment should first prevail.

16-bit and 32-bit signed integers

Six and 32-bit signed integers use the highest bit as the symbol bit ,0 for positive number ,1 for negative number, negative numbers are represented by complement codes, The 16-bit signed integer, for example, should be a complement of 100, that is, a complement of 0X64 is XFF9C.

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This specification is edited and revised by HOPETECH Technology Department, version number V3.6.

If the specification is incorrect or unreasonable, please contact us. Welcome to call for technical consultation.

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