用户手册

User's Guide

Rev.A2

Firmware description:
Applicable to the main program RevA1.0 and above

AT5800

Comprehensive battery tester

Applent Instruments Ltd.
Building 14,No.9, Caoxi Road,Wujin District,
Changzhou City, Jiangsu Province, China
Tel：0519-88805550
Fax：0519-86922220
http://www.anbai.cn
Sales email: sales@applent.com
Technical support email: tech@applent.com

Safety Summary

Warning Dangerour:

The following general safety precautions must be observed during all phases of operation, service, and repair of this instrument. Failure to comply with these precautions or with specific WARNINGS elsewhere in this manual may impair the protection provided by the equipment. In addition it violates safety standards of design, manufacture, and intended use of the instrument.

Disclaimer	The Applent Instruments assumes no liability for the customer's failure to comply with these requirements.
Ground The Instrument	To avoid electric shock hazard, the instrument chassis and cabinet must be connected to a safety earth ground by the supplied power cable with earth blade.
DO NOT Operate In An Explosive Atmosphere	Do not operate the instrument in the presence of inflammable gasses or fumes. Operation of any electrical instrument in such an environment constitutes a definite safety hazard.
Keep away from live circuit	Operating personnel must not remove instrument covers. Component replacement and internal adjustments must be made by qualified maintenance personnel. Do not replace components with the power cable connected. Under certain conditions, dangerous voltages may exist even with the power cable removed. To avoid injuries, always disconnect power and discharge circuits before touching them.
Operations not included in the manual are forbidden	The protection measurements will be failure while beyond the scope.
	Warning: TO AVOIDE INSTRUMENT DAMAGED, PLEASE DO NOT PUT DC VOLT OR CURRENT IN THE TESR TERMINAL MAKE SURE THE CAPACITOR IS DISCHARGED BEFORE TESTING

Safety Sign:

Provide double insulation or reinforced insulation protection

Waste Electrical and Electronic Equipment (WEEE) order 2002/96/EC

Do not dispose of in trash cans

CERTIFIACTION, LIMITED & LIMITATION OF LIABILITY

Changzhou Applent Instruments LTD. (hereinafter referred to as Applent) guarantees that each instrument you buy is fully qualified in quality and measurement. This guarantee does not include fuse and cause cover Damage caused by accidental, misuse, pollution, accidental or abnormal use. This warranty applies only to the original purchaser and is not transferable.

From the date of shipment, Applent provides two years of free warranty, this guarantee also includes VFD or LCD. During the warranty period, the instrument is damaged due to improper operation by the user, and the maintenance cost shall be borne by the user. In two years until the life of the instrument, Applent will provide maintenance at a fee. For the VFD or LCD replacement, the fee is charged at the current cost price.

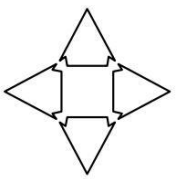
If you find any damage to the product, please contact Applent and communicate to return or replace it, and then send the product to the seller for return and replacement. Please be sure to explain the cause of the product damage and advance the postage and insurance premium to the destination. For the repair or replacement of the products during the warranty period, Applent will be responsible for the transportation costs of the return mail. For the repair of non-warranty products, Applent will evaluate the maintenance costs and repair the products only with your consent. All costs incurred by the repair will be borne by the user, including the transportation costs returned.

This warranty is the only warranty provided by Applent and the only compensation to you, without any express or implied warranty (including the adaptability of a special purpose) and specifically denying all other warranties. Applent or any other distributor does not have any oral or written representation used to establish a warranty or in any way to extend the scope of this warranty. Applent shall not be responsible for any special, indirect, incidental or subsequent damage, loss (including loss of data) caused by any reason outside the scope of the specifications. If one of these clauses contradicts the local regulations, mainly the local regulations, so this clause may not apply to you, but the ruling of this clause does not affect the validity and enforceability of the other provisions.

The People's Republic of China (PRC)
Jiangsu Province
Changzhou Applent Instruments LTD
May 2014
Rev.C0

Contents

1.Installation and Setup Wizard



Thank you for purchasing our products! Please read this chapter carefully before using it. The following introduction mainly takes AT5800 as an example.

In this chapter, you will learn the following:

- Packing list
- Power requirement
- Operating environment
- Wash
- Instrument handle

1.1 Packing list

Before using the instrument, please first:

1. Check whether the appearance of the product is damaged, scratched or not;
2. Check the instrument accessories against the instrument packing list for loss.

If there is any damage or insufficient accessories, please contact the sales department or seller of Applent Instruments immediately.

1.2 Power supply requirements

The AT5800 tester can only be used under the following power supply conditions:

Voltage: 200V-240VAC

Frequency: 47.5-52.5Hz

Power: 120VA max

Warning: To prevent the danger of electric shock, please connect the power ground wire.
If the user changes the power cord, make sure that the ground of the power cord is reliably connected.

1.3 Operating environment

AT5800 must be used under the following environmental conditions:

Temperature: 0℃ ~ 55℃,

Humidity: less than 70%RH at 23℃

Altitude: 0~2000 meters.

1.4 Cleaning

Do not clean the inside of the instrument.

Note: Do not use solvents (alcohol or gasoline, etc.) to clean the instrument.

Please use a clean cloth dipped in a little water to clean the shell and panel.

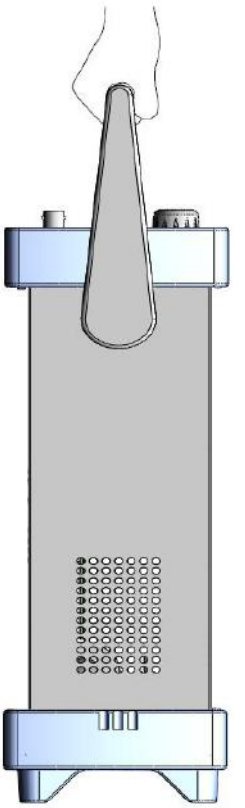
1.5 Instrument handle

The handle of the instrument can be adjusted. Hold both sides of the handle with both hands, gently pull to both sides, and then rotate the handle. The handle can be adjusted to four positions, as shown in the following figure:

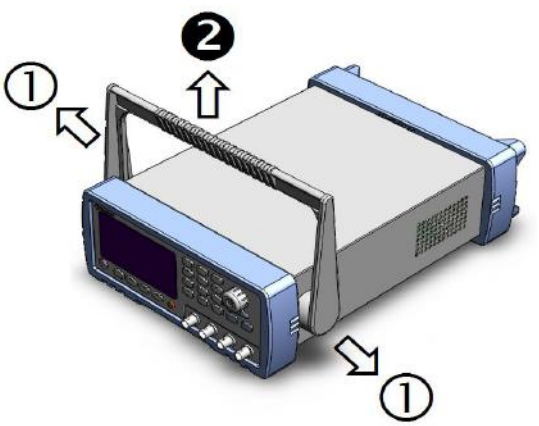
Picture 1- 1 Handle of the instrument (schematic diagram, panel figure is inconsistent with the actual situation)

Visible position 1 [Hold both sides of the handle with both hands at the same time, gently pull to both sides until it can rotate freely, and then switch to visible position 2]

Visible position 2 [Hold both sides of the handle with both hands, gently pull to both sides until it can rotate freely, and then switch to the hand-held position]

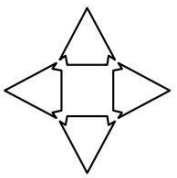


Handheld position



Remove the handle position.(Pull to both sides ① until the handle is removed.)

2.Overview



You will learn the following in this chapter:

- Introduction
- Main specifications

2.1 Introduction

Thank you for purchasing AT5800 comprehensive safety tester.

AT5800 comprehensive safety tester is controlled by high-performance ARM microprocessor, which has excellent speed and performance. Five test functions are provided: programmable DC power supply, DC electronic load, battery internal resistance test, battery capacity test and comprehensive test.

You can use the built-in file editor of the instrument or RS232 interface to edit the comprehensive test list and complete the efficient test. The instrument can realize data acquisition, analysis and printing through computer software.

Support USB disk storage to store sampling data in real time.

2.2 Main specifications

AT5800 series technical specifications, including the basic technical indicators of the instrument and the allowable range of instrument testing. These specifications can be achieved when the instrument leaves the factory.

AC internal resistance test range	Resistance test range	0.0001mΩ~300Ω，0.5%
	Test range of voltage	0.00001~80.0000V，0.01%
Internal programmable power supply	Output maximum voltage	30V（0.05%，±6dgt)
	Output maximum current	5A（0.3%，±6dgt)
	Ripple voltage	5mVrms
	Ripple current	5mA
	Load adjustment rate	<1%
Internal programmable DC load	Test range of voltage	0~30.000V，0.05%
	Test range of current	0~3.0000，0.1% 0~15.000，0.2%
	Over-current measurement Range	0.001~15.000A，
	Maximum continuous power	100W
DC internal resistance test	0~1000mΩ	
Battery capacity test	0.001~9999.9AH	

2.3 The main function

2.3.1 Test frequency

1kHz, frequency stability： 20ppm

2.3.2 measuring range

Battery internal resistance test:
Resistance: use 6-range test, 3Mω ~ 300ω.
Voltage: 80VDC
Automatic and manual range.

DC load:
Current: 2-range test, 3A~15A.
Voltage: 30V

2.3.3 Trigger mode

Internal and external (including manual and remote triggering)

2.3.4 Calibration function

Battery internal resistance test:
Clear "0" for full range short circuit: eliminate the influence of lead resistance and stray voltage.

2.3.5 System settings

1. Buzzing alarm settings
2. Keyboard locking function
3. Administrator and user account, and password can be set for administrator.

2.3.6 Interface

RS232 remote control
Support the baud rate of 115200bps, compatible with SCPI protocol and MODBUS protocol.
Handler interface
All optocoupler isolation, input and output ports with built-in pull-up resistors.
Support internal 5V and external maximum 35V power supply.
Input: trigger signal.
Output: sorting result signal and measuring synchronization signal.

3.Start

You will learn the following in this chapter:

- Front panel and rear panel.
- Connection of test end.

3.1 Front panel

Picture 3- 1 Front panel

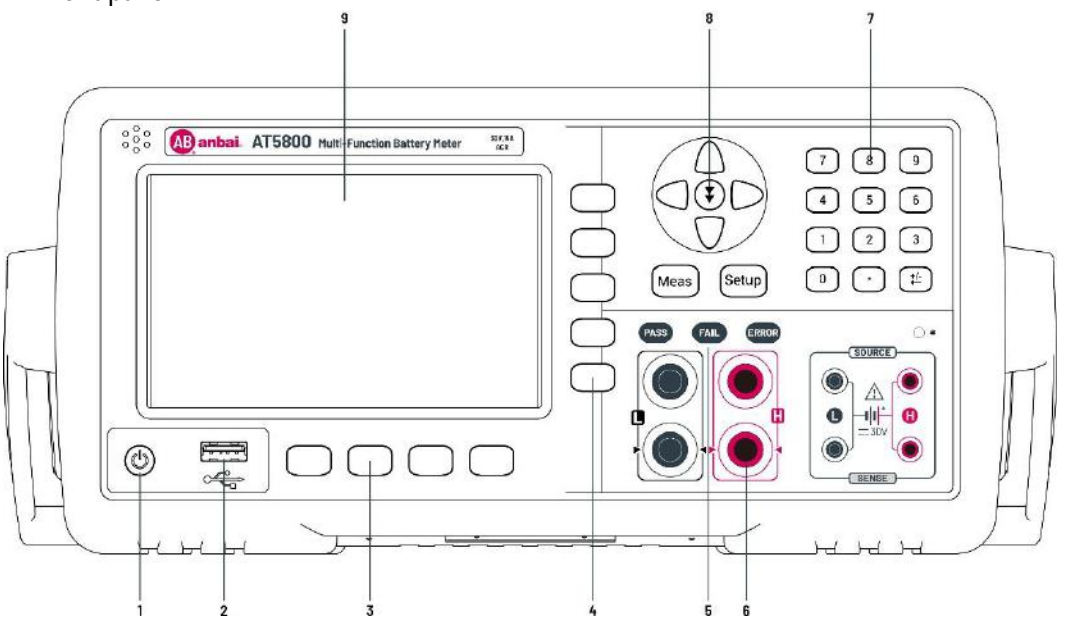


chart 3- 1 Front panel function description

No.	Function
1	Power switch. Touch button ⚠ Warning: In order to ensure the stable operation of the instrument, the instrument needs to wait 10 seconds after shutdown before being allowed to start again.
2	USB Disk interface
3	Functional key
4	Sidebar function keys
5	Status lamp
6	Test port
7	Numeric keyboard
8	Direction key
9	liquid crystal display

3.2 **Rear panel**

Picture 3-2 Rear panel

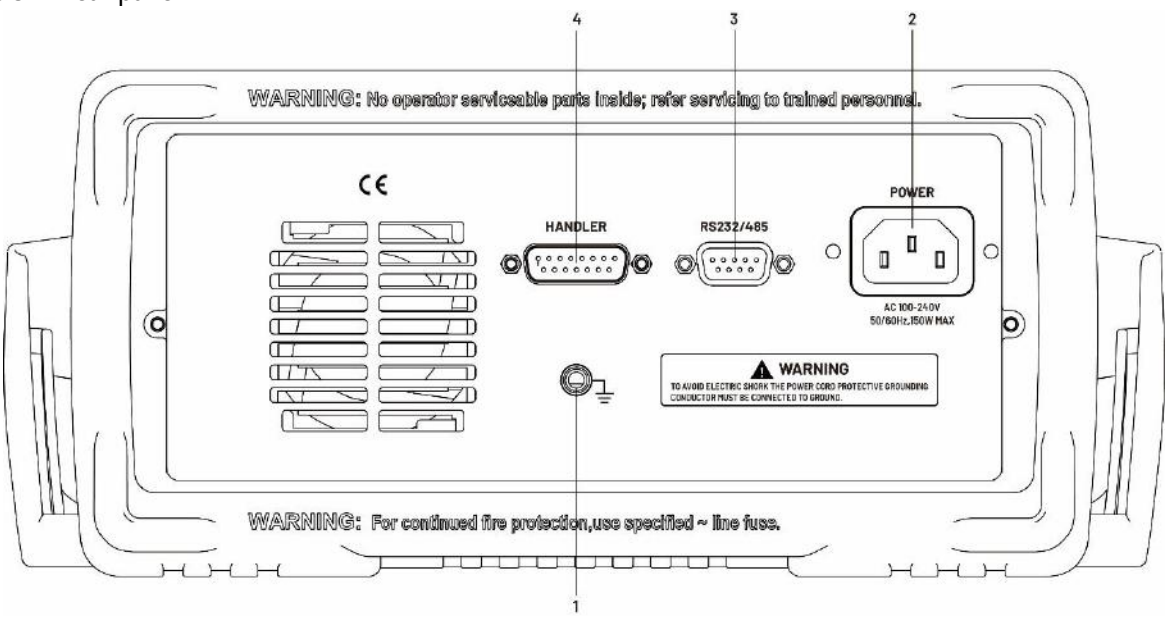


Chart 3- 2 Function description of rear panel

No.	Function
1	Grounding column
2	~220V Ac power input
3	RS232/485 communication port
4	HANDLER interface

4.[Meas] Measurement display

You will learn all the measurement display functions in this chapter:

- < Comprehensive test > page
- < Group configuration > page
- < Group test results > page
- < Comprehensive test results > page
- < Voltage internal resistance test > page
- < DC load test > page
- < DC power supply test > page
- < Battery capacity test > page

4.1 < Comprehensive test > page

No matter what page you are on, just press the [Meas] shortcut key and select [Group Test] in the sidebar to enter the < Comprehensive Test > page.
The < comprehensive test > page mainly carries out comprehensive function tests, including battery activation, voltage internal resistance, charging test, overcharge test, DC internal resistance, load test, overdischarge test, short circuit test and recovery test.

Picture 4-1 < Comprehensive test > page

4.1.1 【Type】

■To set the battery type

First	Press the [Meas] shortcut key, and select [Group Test] in the sidebar to enter the < Comprehensive Test > page.	
Second	Use the cursor keys to select the [Lithium Battery] field.	
Third	Select using function keys.	
	Functional key	Function
	Lithium battery	Set the test battery type as lithium battery.

	Nickel-hydrogen battery	Set the test battery type to Ni-MH battery.
	Nickel-cadmium/nicad battery	Set the test battery type as nickel-chromium battery.
	Lead-acid cell	Set the test battery type to lead-acid battery.

4.1.2 【Capacity】

■To set the nominal capacity of the battery

Step 1	Press the [Meas] shortcut key, and select [Group Test] in the sidebar to enter the < Comprehensive Test > page.
Step 2	Use the cursor keys to select the [0.001AH] field.
Step 3	Use the numeric keypad to enter the nominal capacity value of the battery.

4.1.3 【Group】

The instrument supports 10 test groups.

■To set up a test group

Step 1	Press the [Meas] shortcut key, and select [Group Test] in the sidebar to enter the < Comprehensive Test > page.	
Step 2	Use the cursor keys to select the [Group 1] field.	
Step 3	Select using function keys.	
	Functional key	Function
	Group 1	Set the test group to 01
	Group 2	Set the test group to 02
	.....	.....
	Group 10	Set the test group to 10

4.1.4 【Configuration】

■To set up a group configuration

Step 1	Press the [Meas] shortcut key, and select [Group Test] in the sidebar to enter the < Comprehensive Test > page.	
Step 2	Use the cursor keys to select the [Configuration] field.	
Step 3	Select using function keys.	
	Functional key	Function
	Parameter configuration	Enter the setting page of group parameters.
	test result	Enter the group test result display page.
	Step number setting	Set the maximum test step of the group.
	reset	Restore the current group to factory settings.

4.1.5 【Voltage】

■To set the nominal voltage of the battery

Step 1	Press the [Meas] shortcut key, and select [Group Test] in the sidebar to enter the < Comprehensive Test > page.
Step 2	Use the cursor keys to select the [10.000V] field.

Step 3	Use the numeric keypad to enter the nominal voltage value of the battery.

4.1.6 【Step-count】

■Set the step of the current step.

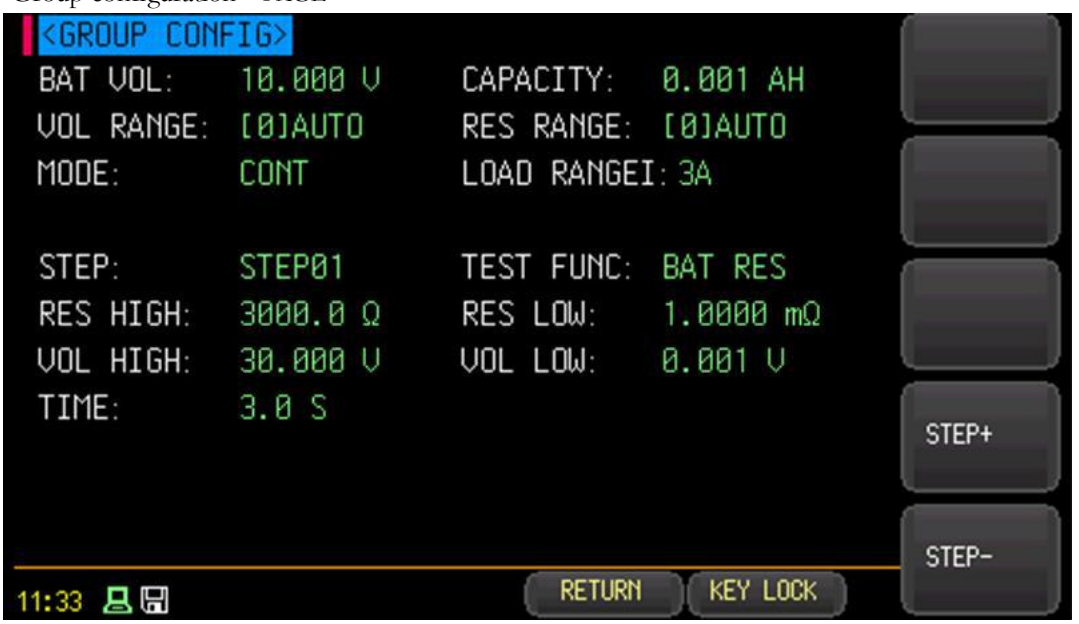
Step 1	Press the [Meas] shortcut key, and select [Group Test] in the sidebar to enter the < Comprehensive Test > page.	
Step 2	Use the cursor keys to select the [01/09] field.	
Step 3	Select using function keys.	
	Functional key	Function
	Last step	Select the previous test item of the current step.
	Next step	Select the next test item of the current step.

4.2 < Group configuration >PAGE

On which page, just press the [Meas] shortcut key, select [Comprehensive Test] in the sidebar, and enter the < Comprehensive Test > page. Use the cursor key to select the [Configuration] field, and press the function key [Parameter Configuration] to enter the < Group Configuration > page.

In the < Group configuration > page, you can set up 10 kinds of test function combinations, which support 20 steps in total.

Picture 4-2 < Group configuration >PAGE



4.2.1 【Battery voltage】

■To set the nominal voltage of the battery

Step 1	Press the**[Meas]**shortcut key, select **[Group Test]** in the sidebar to enter the **< Comprehensive Test >** page, use the cursor to select the **[Configuration]** field, and press the function key **[Parameter Configuration]** to enter the**[Group Configuration]** page.
Step 2	Use the cursor keys to select the [10.000V] field.
Step 3	Use the numeric keypad to enter the nominal voltage value of the battery.

4.2.2 【Battery capacity】

■To set the nominal capacity of the battery

Step 1	Press the**[Meas]**shortcut key, select **[Group Test]** in the sidebar to enter the **< Comprehensive Test >** page, use the cursor to select the **[Configuration]** field, and press the function key **[Parameter Configuration]** to enter the**[Group Configuration]** page.
Step 2	Use the cursor keys to select the [0.001AH] field.
Step 3	Use the numeric keypad to enter the nominal capacity value of the battery.

4.2.3 【Voltage range】

■To set the voltage range

Step 1	Press the**[Meas]**shortcut key, select **[Group Test]** in the sidebar to enter the **< Comprehensive Test >** page, use the cursor to select the **[Configuration]** field, and press the function key **[Parameter Configuration]** to enter the**[Group Configuration]** page.	
Step 2	Use the cursor keys to select the [[0] Auto] field.	
Step 3	Select using function keys.	
	Functional key	Function
	Automatic measuring range	The instrument will automatically select the range.
	Manual range	The instrument is locked in the current range.
	Increase+	Increase the range number and change the range to lock.
	Reduce-	Decrease the quantum number and change the quantum to lock.

4.2.4 【Resistance range】

■To set the resistance range

Step 1	Press the**[Meas]**shortcut key, select **[Group Test]** in the sidebar to enter the **< Comprehensive Test >** page, use the cursor to select the **[Configuration]** field, and press the function key **[Parameter Configuration]** to enter the**[Group Configuration]** page.	
Step 2	Use the cursor keys to select the [[0] Auto] field.	
Step 3	Select using function keys.	
	Functional key	Function
	Automatic measuring range	The instrument will automatically select the range.
	Manual range	The instrument is locked in the current range.
	Increase+	Increase the range number and change the range to lock.
	Reduce-	Decrease the quantum number and change the quantum to lock.

4.2.5 【Continuously】

■To set the group test mode

Step 1	Press the**[Meas]**shortcut key, select **[Group Test]** in the sidebar to enter the **< Comprehensive Test >** page, use the cursor to select the **[Configuration]** field, and press the function key **[Parameter Configuration]** to enter the**[Group Configuration]** page.

Step 2	Use the cursor keys to select the [Continuous] field	
Step 3	Select using function keys.	
	Functional key	Function
	Continuously	Group tests are automatically performed in the set order.
	One step	The group test is suspended after the current step, and a trigger signal is needed to perform the next test.

4.2.6 【Load range】

■To set the group test mode

Step 1	Press the**[Meas]**shortcut key, select **[Group Test]** in the sidebar to enter the **< Comprehensive Test >** page, use the cursor to select the **[Configuration]** field, and press the function key **[Parameter Configuration]** to enter the**[Group Configuration]** page.	
Step 2	Use the cursor keys to select the [Load Range] field.	
Step 3	Select using function keys.	
	Functional key	Function
	Continuously	Group tests are automatically performed in the set order.
	One step	The group test is suspended after the current step, and a trigger signal is needed to perform the next test.

4.2.7 【Step-count】

■Set the step of the current step.

Step 1	Press the**[Meas]**shortcut key, select **[Group Test]** in the sidebar to enter the **< Comprehensive Test >** page, use the cursor to select the **[Configuration]** field, and press the function key **[Parameter Configuration]** to enter the**[Group Configuration]** page.	
Step 2	Use the cursor keys to select the [Step 01] field.	
Step 3	Select using function keys.	
	Functional key	Function
	Last step	Select the previous test step.
	Next step	Select the next test step.

4.2.8 【Test function】

■To set up a function

Step 1	Press the**[Meas]**shortcut key, select **[Group Test]** in the sidebar to enter the **< Comprehensive Test >** page, use the cursor to select the **[Configuration]** field, and press the function key **[Parameter Configuration]** to enter the**[Group Configuration]** page.	
Step 2	Use the cursor keys to select the [Battery Internal Resistance] field.	
Step 3	Select using function keys.	
	Functional key	Function
	empty	Set the test function of the current step to null.
	Activate battery	Set the test function of the current step to battery activation.
	Battery internal resistance	Set the test function of the current step to the battery internal resistance.
	Charging test	Set the test function of the current step to charge test.
	Overcharge test	Set the test function of the current step to overcharge test.

	DC internal resistance	Set the test function of the current step to DC internal resistance.
	Discharge test	Set the test function of the current step to discharge test.
	Overdischarge test	Set the test function of the current step to over-discharge test.
	Short circuit test	Set the test function of the current step to short circuit test.
	Recovery test	Set the test function of the current step to recovery test.

* Other steps are set as above.

4.2.9 【Upper resistance limit】

■To set the upper resistance limit

Step 1	Press the**[Meas]**shortcut key, select **[Group Test]** in the sidebar to enter the **< Comprehensive Test >** page, use the cursor to select the **[Configuration]** field, and press the function key **[Parameter Configuration]** to enter the**[Group Configuration]** page.
Step 2	Use the cursor keys to select the [3000.0Ω] field.
Step 3	Use the numeric keypad to enter the set upper resistance value.

* Please refer to the above operation for setting other parameters.

4.2.10 【Lower resistance limit】

■To set the lower resistance limit

Step 1	Press the**[Meas]**shortcut key, select **[Group Test]** in the sidebar to enter the **< Comprehensive Test >** page, use the cursor to select the **[Configuration]** field, and press the function key **[Parameter Configuration]** to enter the**[Group Configuration]** page.
Step 2	Use the cursor keys to select the [1.0000 mΩ] field.
Step 3	Use the numeric keypad to enter the set lower resistance value.

* Please refer to the above operation for setting other parameters.

4.3 < Group result >PAGE

On which page, just press the**[Meas]**shortcut key, select **[Comprehensive Test]** in the sidebar, and enter the **< Comprehensive Test >** page. Use the cursor key to select the **[Configuration]** field, and press the function key **[Test Results]** to enter the **< Group Result>** page.

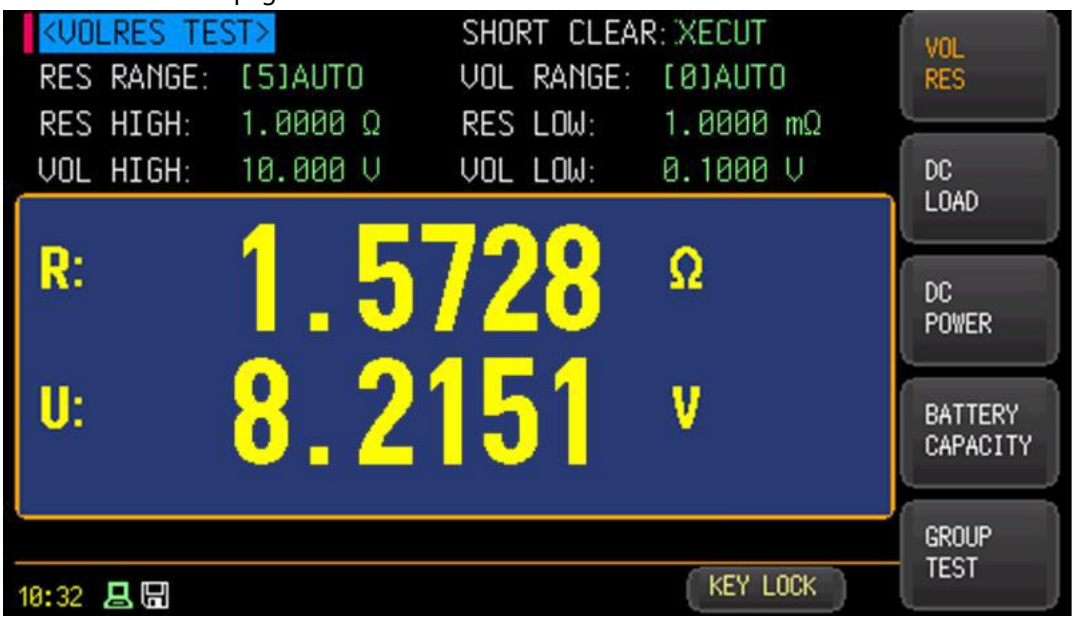
On the **< Group Result >** page, you can view the test results of each step of the group test.

Picture 4-3 < Group Result > page

4.4 < VOLRES TEST > page

On which page, just press the [Meas] shortcut key and select [Voltage Internal Resistance] in the sidebar to enter the < Vol Res Test > page.

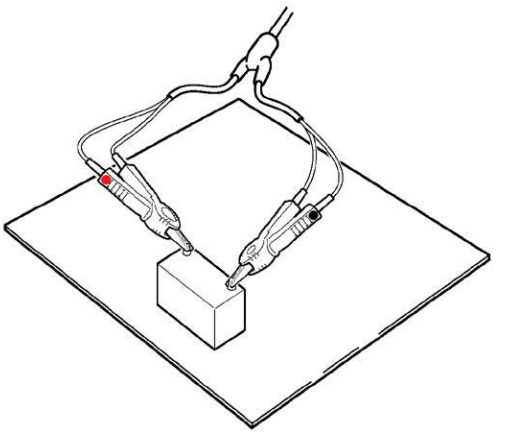
Picture 4- 4 < vol res test > page



4.4.1 【Short clear】

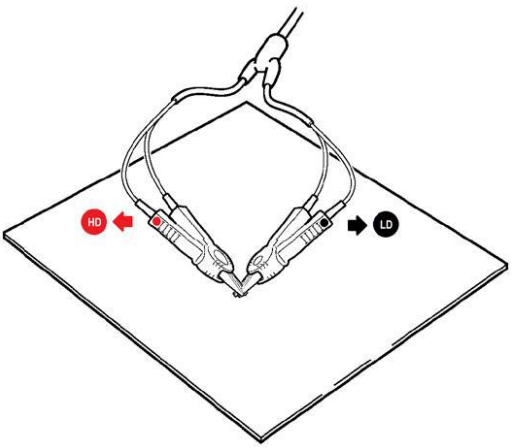
■To set short circuit clearing

Step 1	Press the [Meas] shortcut key, and select [Voltage Internal Resistance] in the sidebar to enter the < Vol Res Test > page.	
Step 2	Use the cursor keys to select the [short clear] field.	
Step 3	Select using function keys.	
	Functional key	Function
	Short circuit clearing	When the measured resistance value is very small (3MΩ and 30mΩ range), the voltage signal generated after the test current flows through the resistance will be very weak (only a few mV at the maximum), so the position, length and shape of the test wire will all affect the measurement. Usually, where we measure, we also need to clear it at the corresponding position.
		Ready to clear.

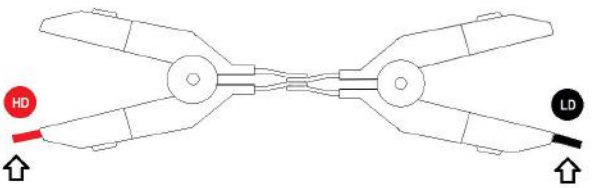


Be sure to keep the same position when resetting, especially in the range of 30mΩ and below.

Correct short circuit method



Before resetting, please short the test clamp in the following way.



4.4.2 【Resistance range】

■To set the resistance range

Step 1	Press the [Meas] shortcut key, and select [Voltage Internal Resistance] in the sidebar to enter the < Vol Res Test > page.	
Step 2	Use the cursor keys to select the [[3] Auto] field.	
Step 3	Select using function keys.	
	functional key	function
	Automatic measuring range	The instrument will automatically select the range.
	Manual range	The instrument is locked in the current range.
	Increase+	Increase the range number and change the range to lock.
	Reduce-	Decrease the quantum number and change the quantum to lock.

4.4.3 【Voltage range】

■To set the voltage range

Step 1	Press the [Meas] shortcut key, and select [Voltage Internal Resistance] in the sidebar to enter the < Vol Res Test > page.	
Step 2	Use the cursor keys to select the [[1] Auto] field.	
Step 3	Select using function keys.	
	functional key	function
	Automatic measuring range	The instrument will automatically select the range.
	Manual range	The instrument is locked in the current range.
	Increase+	Increase the range number and change the range to lock.
	Reduce-	Decrease the quantum number and change the quantum to lock.

4.4.4 【Upper resistance limit】

■To set the upper resistance limit

Step 1	Press the [Meas] shortcut key, and select [Voltage Internal Resistance] in the sidebar to enter the < Vol Res Test > page.
Step 2	Use the cursor keys to select the [1.0000Ω] field.
Step 3	Use the numeric keypad to enter the set upper resistance value.

4.4.5 【Lower resistance limit】

■To set the lower resistance limit

Step 1	Press the [Meas] shortcut key, and select [Voltage Internal Resistance] in the sidebar to enter the < Voltage Internal Resistance Test > page.
Step 2	Use the cursor keys to select the [1.0000 mΩ] field.
Step 3	Use the numeric keypad to enter the set lower resistance value.

4.4.6 【Upper voltage limit】

■To set the upper resistance limit

Step 1	Press the [Meas] shortcut key, and select [Voltage Internal Resistance] in the sidebar to enter the < Vol Res Test > page.
Step 2	Use the cursor keys to select the [10.000V] field.
Step 3	Use the numeric keypad to enter the set upper voltage limit.

4.4.7 【Lower voltage limit】

■To set the lower voltage limit

Step 1	Press the [Meas] shortcut key, and select [Voltage Internal Resistance] in the sidebar to enter the < Vol Res Test > page.
Step 2	Use the cursor keys to select the [0.1000V] field.
Step 3	Use the numeric keypad to enter the set voltage lower limit value.

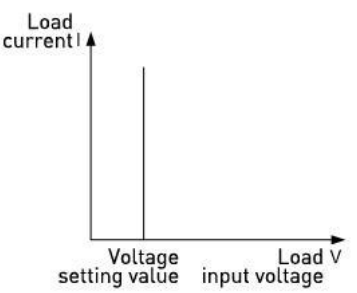
4.5 < Dc load test > page

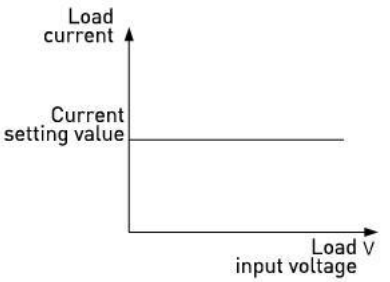
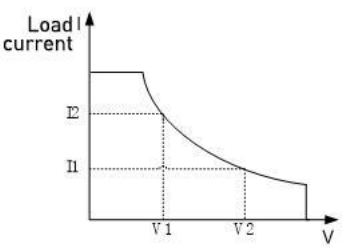
No matter what page you are on, just press the [Meas] shortcut key and select [DC Load] in the sidebar to enter the < DC Load Test > page.

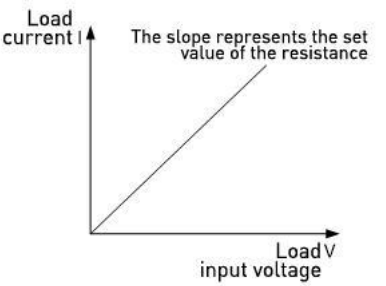
Picture 4-5 < DC Load Test > Page

4.5.1 【Model】

■ To set the test mode

Step 1	Press the [Meas] shortcut key, and select [DC Load] in the sidebar to enter the < DC Load Test > page.	
Step 2	Use the cursor keys to select the [Constant Current] field.	
Step 3	Select using function keys.	
	functional key	function
	Constant voltage	Set the constant voltage working mode [constant voltage] In constant voltage mode, the electronic load always consumes enough current to keep the input voltage of the load constant. If your tested power supply is[a constant current source], it can work effectively by using the constant voltage  mode. The maximum number of digits of the input voltage is 5, but the decimal places will be different depending on the value of the maximum protection voltage (V-MAX).

		When V-MAX > 18V, the decimal point shall be kept to 3 digits; When V-MAX ≤ 18V, the decimal point shall be kept to 4 digits;
	Constant current	Set the constant current working mode [constant current] In the constant current mode, no matter whether the input voltage changes or not, the electronic load always consumes constant current. If your tested power supply is a constant voltage source, it is recommended to use the constant current mode.  The maximum number of digits of the input current is 5, but the number of decimal places will be different depending on the value of the maximum protection current (I-MAX). When I-MAX > 3A, the decimal point shall be kept to 3 digits; When I-max ≤ 3A, the decimal point shall be kept to 4 digits;
	Fixed power	Set the constant power working mode [constant power] In the fixed power mode, the electronic load always consumes constant power. The constant power mode can effectively simulate the constant voltage source, but the test of the constant current source may not achieve the expected effect. It is more effective to use the constant voltage mode for the test of the constant current source. According to the formula: P=V×I, if the input voltage V increases, the current I will be forced to decrease to keep the power  constant. The maximum number of digits of power input is 5, and the decimal places are reserved for 3 digits.
	Constant resistance	Set the constant resistance working mode [constant resistance] In the mode of constant resistance, the electronic load is equivalent to a constant resistance. Constant resistance mode can effectively simulate the constant voltage source, but the test of constant current source may not achieve the expected effect. Because the constant current power supply has a feedback circuit with constant holding current, the

		load can't work, and the electronic load is always in the process of oscillation adjustment, so it can't be stable. The most effective test method for the constant current source is to use the constant voltage mode. According to the formula: R=V/I, if the input voltage V increases, the current I will be forced to increase to keep the resistance  constant. The maximum number of digits of the input resistor is 5, and the decimal digits are reserved for 3.

4.5.2 【Upper voltage limit setting】

■To set the upper voltage limit

Step 1	Press the [Meas] shortcut key, and select [DC Load] in the sidebar to enter the < DC Load Test > page.
Step 2	Use the cursor keys to select the [30.000V] field.
Step 3	Use the numeric keypad to enter the set upper voltage limit.

4.5.3 【Current upper limit setting】

■To set the upper current limit

Step 1	Press the [Meas] shortcut key, and select [DC Load] in the sidebar to enter the < DC Load Test > page.
Step 2	Use the cursor keys to select the [15.000A] field.
Step 3	Use the numeric keypad to enter the set current upper limit value.

4.5.4 【Upper power limit setting】

■To set the upper power limit

Step 1	Press the [Meas] shortcut key, and select [DC Load] in the sidebar to enter the < DC Load Test > page.
Step 2	Use the cursor keys to select the [100.0W] field.
Step 3	Use the numeric keypad to enter the set upper power limit.

4.5.5 【Parameter setting】

■To set parameter settings

Step 1	Press the [Meas] shortcut key, and select [DC Load] in the sidebar to enter the < DC Load Test > page.
Step 2	Use the cursor keys to select the [0.1000A] field.
Step 3	Use the numeric keypad to input the set current value.

4.6 < DCPower Test > Page

No matter what page you are on, just press the [Meas] shmortcut key and select [DC Power] in the sidebar to enter the < DC Power Test > page.

Picture 4- 6 < DC Power Test > Page

4.6.1 【Voltage setting】

■To set the voltage

Step 1	Press the [Meas] shortcut key, and select [DC Power Supply] in the sidebar to enter the < DC Power Test > page.
Step 2	Use the cursor keys to select the [9.000V] field.
Step 3	Use the numeric keypad to enter the set voltage value. Voltage range: 0.001~30.000V

4.6.2 【Current setting】

■To set the current

Step 1	Press the [Meas] shortcut key, and select [DC Power Supply] in the sidebar to enter the < DC Power Test > page.
Step 2	Use the cursor keys to select the [0.2000A] field.
Step 3	Use the numeric keypad to enter the set current upper limit value. Current range: 0.0001~5.000A

4.7 < Battery capacity test > page

No matter what page you are on, just press the [Meas] shortcut key and select [Battery Capacity] in the sidebar to enter the < Battery Capacity > page.

Picture 4-7 < Battery capacity >Page

4.7.1 【Document】

- To set up a file

Step 1	Press the [Meas] shortcut key and select [Battery Capacity] in the sidebar to enter the < Battery Capacity Test > page.	
Step 2	Use the cursor keys to select the [File 2] field.	
Step 3	Select using function keys.	
	functional key	Function
	File 1	Select parameter setting file 1.
	File 2	Select parameter setting file 1.
	.....	
	File 10	Select parameter setting file 10

4.7.2 【Set up】

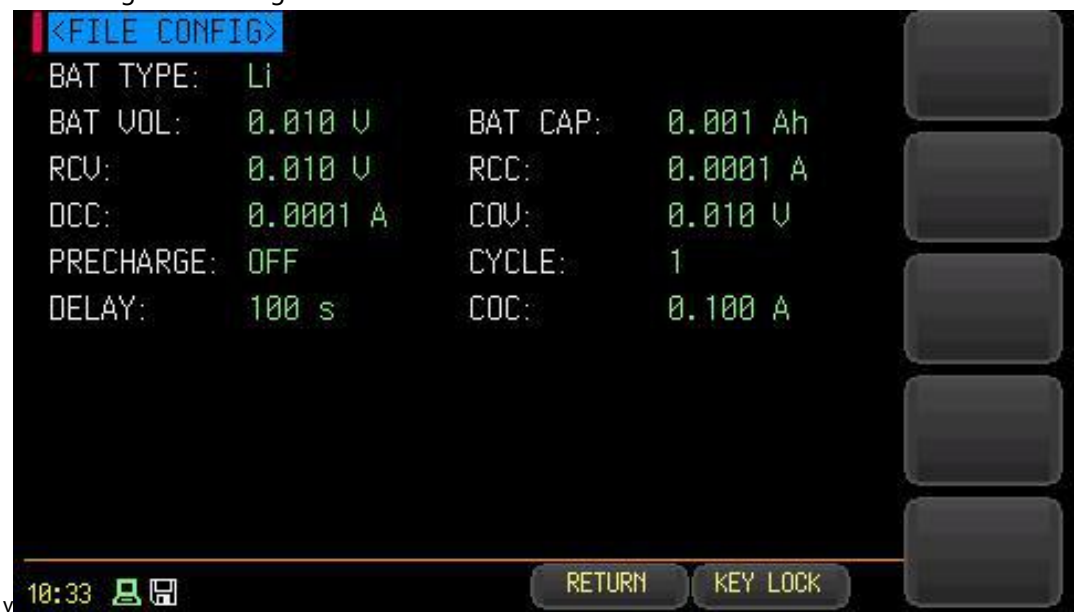
- To set the file configuration

Step 1	Press the [Meas] shortcut key and select [Battery Capacity] in the sidebar to enter the < Battery Capacity Test > page.	
Step 2	Use the cursor keys to select the [Configuration] field.	
Step 3	Select using function keys.	
	Functional key	Function
	Deploy	Enter the file parameter setting page.
	Reset	The current file is restored to factory settings.

4.8 < File > page

No matter what page you are on, just press the Meas shortcut key, select Battery Capacity in the sidebar, and enter the < Battery Capacity Test > page. Use the cursor keys to select the [Configuration] field, and press the function key [Configuration] to enter the < File Configuration > page.

Picture 4-8 < File configuration >Page



4.8.1 【Battery type】

Battery type setting.

■ To set the battery type

Step 1	Press the [Meas] shortcut key, select [Battery Capacity] in the sidebar, and enter the < Battery Capacity Test > page. Use the cursor keys to select the [Configuration] field, and press the function key [Configuration] to enter the < File Configuration > page.	
Step 2	Use the cursor keys to select the [Lithium Battery] field.	
Step 3	Select using function keys.	
	Functional key	Function
	Lithium Battery	Test battery type and select lithium battery.
	Nickel-Hydrogen battery	Choose Ni-MH battery for testing battery type.
	Nickel Cadmium batteries	Choose Ni-Cr battery for testing battery type.
	Lead-acid cell	Select lead-acid battery for testing battery type.

4.8.2 【Battery voltage】

Battery voltage setting.

■To set the battery voltage

Step 1	Press the [Meas] shortcut key, select [Battery Capacity] in the sidebar, and enter the < Battery Capacity Test > page. Use the cursor keys to select the [Configuration] field, and press the function key [Configuration] to enter the < File Configuration > page.
Step 2	Use the cursor keys to select the [Battery Voltage] field.
Step 3	Use the numeric keypad to input the set voltage value, and then press [Ente] to finish setting. Voltage range: 0.0~30.000V

4.8.3 【Battery capacity】

Battery capacity setting.

■To set the battery capacity

Step 1	Press the [Meas] shortcut key, select [Battery Capacity] in the sidebar, and enter the < Battery Capacity Test > page. Use the cursor keys to select the [Configuration] field, and press the function key [Configuration] to enter the < File Configuration > page.
Step 2	Use the cursor keys to select the [Battery Capacity] field.
Step 3	Use the numeric keypad to input the set voltage value, and then press [Enter] to finish setting. Voltage range: 0.001~9999.9AH

4.8.4 【Charging voltage】

Charging voltage setting.

■Setting the charging voltage

Step 1	Press the [Meas] shortcut key, select [Battery Capacity] in the sidebar, and enter the < Battery Capacity Test > page. Use the cursor keys to select the [Configuration] field, and press the function key [Configuration] to enter the < File Configuration > page.
Step 2	Use the cursor keys to select the [Charging Voltage] field.
Step 3	Use the numeric keypad to input the set voltage value, and then press [Ente] to finish setting. Voltage range: 0.0~30.000V

4.8.5 【Charging current】

Charging current setting.

■To set the charging current

Step 1	Press the [Meas] shortcut key, select [Battery Capacity] in the sidebar, and enter the < Battery Capacity Test > page. Use the cursor keys to select the [Configuration] field, and press the function key [Configuration] to enter the < File Configuration > page.
Step 2	Use the cursor keys to select the [Charging Current] field.
Step 3	Use the numeric keypad to input the set voltage value, and then press [Ente] to finish setting. Voltage range: 0.0~5.1000A

4.8.6 【Discharging current】

Discharge current setting.

■Setting the discharge current

Step 1	Press the [Meas] shortcut key, select [Battery Capacity] in the sidebar, and enter the < Battery Capacity Test > page. Use the cursor keys to select the [Configuration] field, and press the function key [Configuration] to enter the < File Configuration > page.
Step 2	Use the cursor keys to select the [Discharge Current] field.
Step 3	Use the numeric keypad to input the set voltage value, and then press [Ente] to finish setting. Voltage range: 0.0~15.000A

4.8.7 【Cutoff voltage】

Cut-off voltage setting.

■To set the cut-off voltage

Step 1	Press the [Meas] shortcut key, select [Battery Capacity] in the sidebar, and enter the < Battery Capacity Test > page. Use the cursor keys to select the [Configuration] field, and press the function key [Configuration] to enter the < File Configuration > page.
Step 2	Use the cursor keys to select the [cut-off voltage] field.
Step 3	Use the numeric keypad to input the set voltage value, and then press [Ente] to finish setting. Voltage range: 0.0~30.000V

4.8.8 【Predischarge】

Pre-discharge mode setting.

■ To set the pre-discharge mode

Step 1	Press the [Meas] shortcut key, select [Battery Capacity] in the sidebar, and enter the < Battery Capacity Test > page. Use the cursor keys to select the [Configuration] field, and press the function key [Configuration] to enter the < File Configuration > page.	
Step 2	Use the cursor keys to select the [Pre-discharge] field.	
Step 3	Select using function keys.	
	Functional key	Function
	Close	When closing the battery capacity test, discharge the battery first.

	Open	When the battery capacity test is turned on, discharge the battery first.

4.8.9 【Cycles】

Cycle number setting.

■ To set the number of cycles

Step 1	Press the [Setup] shortcut key to enter the < function setting > page, select [leak test] as the test mode, and press the [Meas] shortcut key to enter the < leak test > page.	
Step 2	Use the cursor keys to select the [Cycle Times] field.	
Step 3	Select using function keys.	
	Functional key	Function
	Enter the cycle value.	Set the number of cycles of capacitance test.

5. [Setup] Setting display

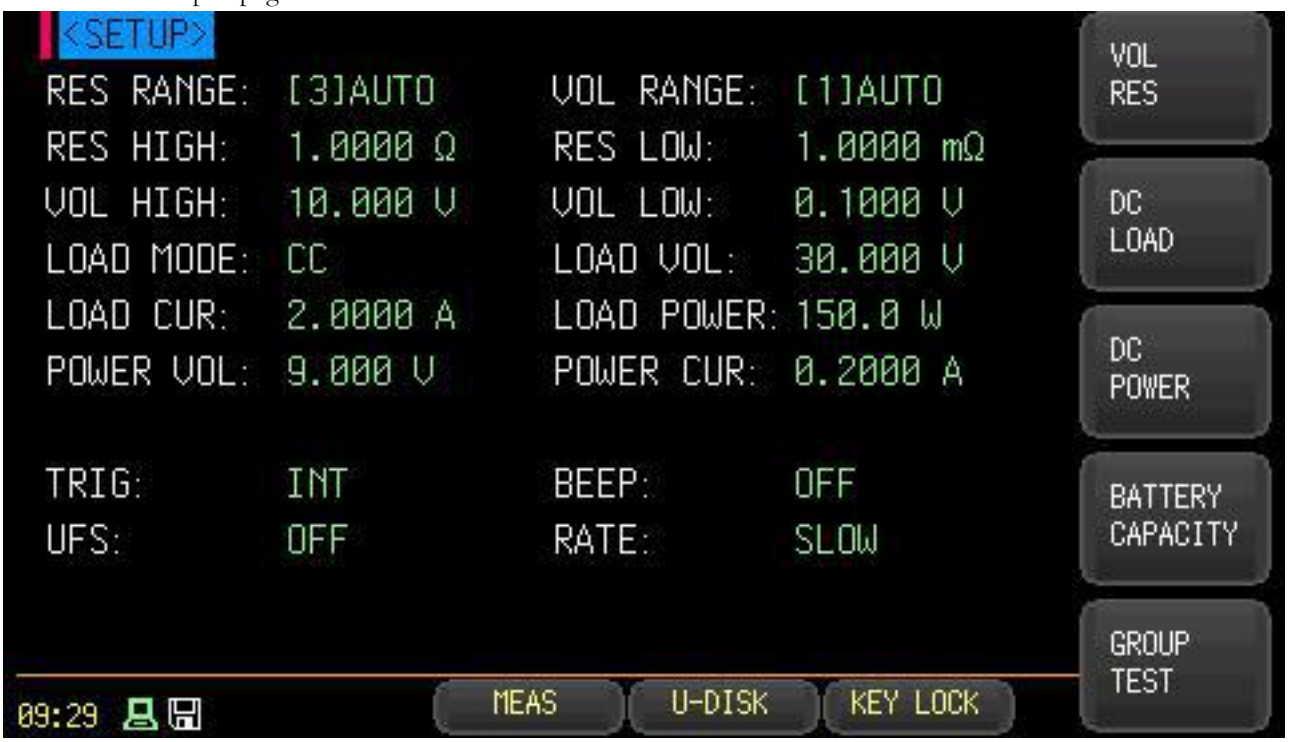
You will learn all the setup functions in this chapter.:

- < set display > page
- < U disk settings > page

5.1 < Set up> page

At any time, just press the [Setup] shortcut key to enter the < Function Settings > page.。

Picture 5-1 < Set up > page



5.1.1 【Resistance range】

■To set the resistance range

Step 1	Press the [Setup] shortcut key to the < Function Settings > page.	
Step 2	Use the cursor keys to select the [[0] Auto] field.	
Step 3	Select using function keys.	
	functional key	function
	Automatic measuring range	The instrument will automatically select the range.
	Manual range	The instrument is locked in the current range.
	Increase+	Increase the range number and change the range to lock.
	Reduce-	Decrease the quantum number and change the quantum to lock.

5.1.2 【Voltage range】

■To set the voltage range

Step 1	Press the [Setup] shortcut key to the < Function Settings > page.	
Step 2	Use the cursor keys to select the [[1] Auto] field.	
Step 3	Select using function keys.	
	functional key	function
	Automatic measuring range	The instrument will automatically select the range.
	Manual range	The instrument is locked in the current range.
	Increase+	Increase the range number and change the range to lock.
	Reduce-	Decrease the quantum number and change the quantum to lock.

5.1.3 【Upper resistance limit】

■To set the upper resistance limit

Step 1	Press the [Setup] shortcut key to the < Function Settings > page.
Step 2	Use the cursor keys to select the [1.0000Ω] field.
Step 3	Use the numeric keypad to enter the set upper resistance value.

5.1.4 【Lower resistance limit】

■To set the lower resistance limit

Step 1	Press the [Setup] shortcut key to the < Function Settings > page.
Step 2	Use the cursor keys to select the [1.0000 mΩ] field.
Step 3	Use the numeric keypad to enter the set lower resistance value.

5.1.5 【Upper voltage limit】

■To set the upper resistance limit

Step 1	Press the [Setup] shortcut key to the < Function Settings > page.
Step 2	Use the cursor keys to select the [10.000V] field.
Step 3	Use the numeric keypad to enter the set upper voltage limit.

5.1.6 【Lower voltage limit】

■To set the lower voltage limit

Step 1	Press the [Setup] shortcut key to the < Function Settings > page.
Step 2	Use the cursor keys to select the [0.1000V] field.
Step 3	Use the numeric keypad to enter the set voltage lower limit value.

5.1.7 【Load mode】

■ To set the test mode

Step 1	Press the [Setup] shortcut key to the < Function Settings > page.	
Step 2	Use the cursor keys to select the [Constant Current] field.	
Step 3	Select using function keys.	
	Functional key	Function
	Constant voltage	Set the constant voltage working mode [constant voltage]
	Constant current	Set the constant current working mode [constant current]

	Fixed power	Set the constant power working mode [constant power]
	Constant resistance	Set the constant resistance working mode [constant resistance]

5.1.8 【Load voltage】

■To set the upper voltage limit

Step 1	Press the [Setup] shortcut key to the < Function Settings > page.
Step 2	Use the cursor keys to select the [30.000V] field.
Step 3	Use the numeric keypad to enter the set upper voltage limit.

5.1.9 【Load current】

■To set the upper current limit

Step 1	Press the [Setup] shortcut key to the < Function Settings > page.
Step 2	Use the cursor keys to select the [15.000A] field.
Step 3	Use the numeric keypad to enter the set current upper limit value.

5.1.10 【Load power】

■To set the upper power limit

Step 1	Press the [Setup] shortcut key to the < Function Settings > page.
Step 2	Use the cursor keys to select the [100.0W] field.
Step 3	Use the numeric keypad to enter the set upper power limit.

5.1.11 【Power supply voltage】

■To set the voltage

Step 1	Press the [Setup] shortcut key to the < Function Settings > page.
Step 2	Use the cursor keys to select the [9.000V] field.
Step 3	Use the numeric keypad to enter the set voltage value. Voltage range: 0.001~30.000V

5.1.12 【Supply current】

■To set the current

Step 1	Press the [Setup] shortcut key to the < Function Settings > page.
Step 2	Use the cursor keys to select the [0.2000A] field.
Step 3	Use the numeric keypad to enter the set current upper limit value. Current range: 0.0001~5.000A

5.1.13 【Touch off】

■To set he trigger steps.

Step 1	Press the [Setup] shortcut key to enter the main page of < Function Settings >	
Step 2	Use the cursor keys to select the [Internal] field;	
Step 3	Select using function keys.	
	Functional key	Function
	Inside	Use internal trigger
	External	Use external trigger
	Remote	Use remote trigger

5.1.14 【Buzzing alarm】

■To set the response

Step 1	Press the [Setup] shortcut key to enter the main page of < Function Settings >	
Step 2	Use the cursor keys to select the [Close] field;	
Step 3	Select using function keys.	
	Functional key	Function
	Close	Turn off buzzer.
	Open	Turn on buzzer.

5.1.15 【Unqualified stop】

■To set the unqualified stop switch

Step 1	Press the [Setup] shortcut key to enter the main page of < Function Settings >	
Step 2	Use the cursor keys to select the [Close] field;	
Step 3	Select using function keys.	
	Functional key	Function
	Close	In the comprehensive test process, continue the test in the step where the test of the tested object fails.
	Open	During the comprehensive test, stop the test in the step where the test of the tested object fails.

5.1.16 【Rate】

■To set the sampling rate

Step 1	Press the [Setup] shortcut key to enter the main page of < Function Settings >	
Step 2	Use the cursor keys to select the [Slow Speed] field;	
Step 3	Select using function keys.	
	Functional key	Function
	Low speed	Set the sampling rate of voltage internal resistance test function to slow.
	Fast	Set the sampling rate of voltage internal resistance test function to fast.

5.2 < U disk settings > page

6.System configuration

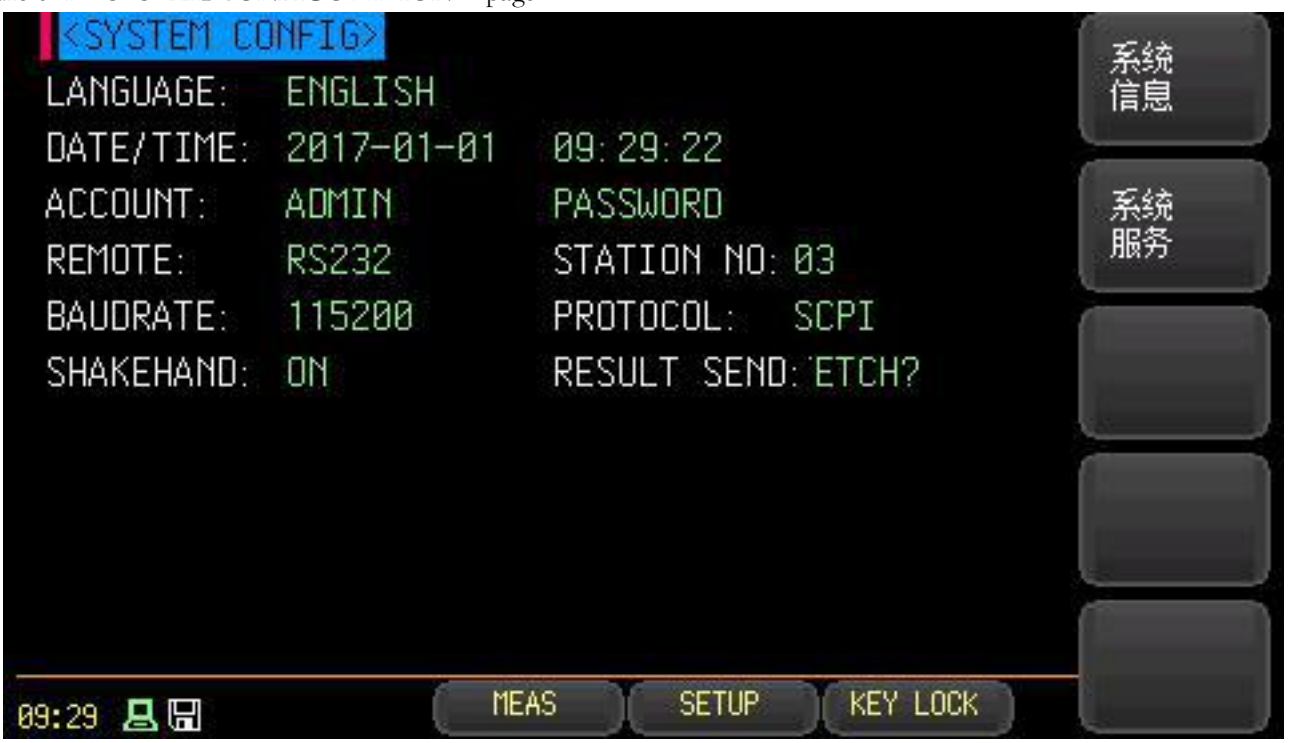
You will learn about the system configuration of the instrument in this chapter.:

- System configuration page
- System information page
- Service page

6.1 < SYSTEM CONFIGURATION> page

At any time, just press the [SYSTEM] shortcut key to enter the < SYSTEM CONFIGURATION > page.

Picture 6-1 < SYSTEM CONFIGURATION > page



6.1.1 【LANGUAGE】

■Setting language steps:

Step 1	Press the [system] shortcut key to enter the < system configuration > page	
Step 2	Use the cursor keys to select the [Language] field.	
Step 3	Use the sidebar function keys to set the language.	
	Functional key	Function
	Chinese (CHS)	Set the instrument as Chinese operation interface.
	ENGLISH	Set the instrument as English operation interface.

6.1.2 【DATE】、【TIME】

■Set date step:

Step 1	Press the [system] shortcut key to enter the < system configuration > page	
Step 2	Use the cursor keys to select the [Date] field.	
Step 3	Use the sidebar function keys to set the date.	
	Functional key	Function
	Years+	+1 year
	Year-	-1 year
	Yue+	+January
	Month-	-January
	Day+	+1 day
	Day-	-1st

■Set time step:

Step 1	Press the [system] shortcut key to enter the < system configuration > page	
Step 2	Use the cursor keys to select the [Time] field.	
Step 3	Use the sidebar function keys to set the time.	
	Functional key	Function
	Time+	+1 hour
	When-	-1 hour
	Fen+	+1 minute
	Divide-	-1 minute
	Second+	+1 second
	Second-	-1 second.

Note: If the internal battery power is insufficient, the clock will stop running, and a new battery needs to be replaced.

6.1.3 【ACCOUNT】、【PASSWORD】

The instrument has two modes to choose from.:

- Administrator–except the [System Services] page, other functions are open to administrators.
- User–users can operate other functions except [System Services] page.

■Setting account number steps:

Step 1	Press the [system] shortcut key to enter the < system configuration > page	
Step 2	Use the cursor keys to select the [account number] field.	
Step 3	Use the sidebar function keys to change the account number.	
	Functional key	Function
	administrator	Except the < System Services > page, other functions are open to administrators.
	user	Except the [System Services] page, users of other functions can operate, and the set data will not be saved.

■Setting administrator password steps:

Step 1	Press the [system] shortcut key to enter the < system configuration > page	
Step 2	Use the cursor keys to select the [password] field.	
Step 3	Use the sidebar function keys to set the password.	
	Functional key	Function
	Change password	Enter a numeric password of up to 9 digits. The password only includes numbers and symbols. If you forget your password, please call our sales department.
	Delete password	Administrators will not be password protected.

6.1.4 【REMOTE】

■To set up remote communication:

Step 1	Press the [system] shortcut key to enter the < system configuration > page	
Step 2	Use the cursor keys to select the [Remote Settings] field.	
Step 3	Select using the sidebar function keys.	
	Functional key	Function
	RS232	RS232 interface

6.1.5 【STATION NO】

■To set the station number:

Step 1	Press the [system] shortcut key to enter the < system configuration > page	
Step 2	Use the cursor keys to select the [StationNo.] field.	
Step 3	Select using the sidebar function keys.	
	Functional key	Function
	01	
	02	
	.....	
	20	

In order to facilitate the simultaneous operation of multiple identical instruments, the instruments are allowed to use station number 00 for broadcast communication, and station number 00 is used for communication. The instruments only receive instructions, but cannot return response codes.

6.1.6 【BAUDRATE】

■To set baud rate:

Step 1	Press the [system] shortcut key to enter the < system configuration > page	
Step 2	Use the cursor keys to select the [Baud Rate] field.	
Step 3	Use the sidebar function keys to change the baud rate.	
	Functional key	Function

	9600	If you use a communication converter with optocoupler isolation, please use this baud rate.
	19200	
	38400	
	57600	
	115200	It is recommended that you use this high-speed baud rate to communicate with the host computer.

6.1.7 【PROTOCOL】

■Steps to set communication protocol:

Step 1	Press the [system] shortcut key to enter the < system configuration > page	
Step 2	Use the cursor keys to select the [Communication Protocol] field.	
Step 3	Use the sidebar function keys to set the language.	
	Functional key	Function
	SCPI	
	MODBUS	

6.1.8 【SHAKEHAND】

■To set instruction handshake:

Step 1	Press the [system] shortcut key to enter the < system configuration > page	
Step 2	Use the cursor keys to select the [instruction handshake] field.	
Step 3	Use the sidebar function keys to set the language.	
	Functional key	Function
	open	After the handshake is turned on, all instructions sent by the host to the instrument will be returned to the host as they are, and then the data will be returned.
	close	After the handshake is closed, the instructions sent by the host to the instrument will be processed immediately.

6.1.9 【RESULT SEND】

■To set up the sending of results:

Step 1	Press the [system] shortcut key to enter the < system configuration > page	
Step 2	Use the cursor keys to select the [Send Result] field.	
Step 3	Use the sidebar function keys to set the language.	
	Functional key	Function
	FETCH	Use the command FETCH? Get all measurement data.
	AUTO	Automatically sent to the host after each test.

6.2 <SYSTEM INFORMATION>Page

At any time, just press the [System] shortcut key to enter the < System Configuration > page, and then press the [System Information] function key in the sidebar to enter the < System Information > page.

Picture 6-2 System information page

7.Remote control

This chapter provides the following contents

- About RS-232C
- About USB Transfer box
- Select baud rate.
- About SCPI

7.1 About RS-232C

The RS-232 interface that you can connect to a controller (such as PC and PLC) uses the Applent RS-232 DB-9 serial communication line, and the serial port uses the RS-232 standard of sending (TXD), receiving (RXD) and signal ground (GND) lines. Hardware handshake CTS and RTS lines are not used.

Note:
Only the DB -9 cable of Applent (not modem) can be used.
The cable length should not exceed 2m.

Picture 7-1 RS-232 connection port on the instrument

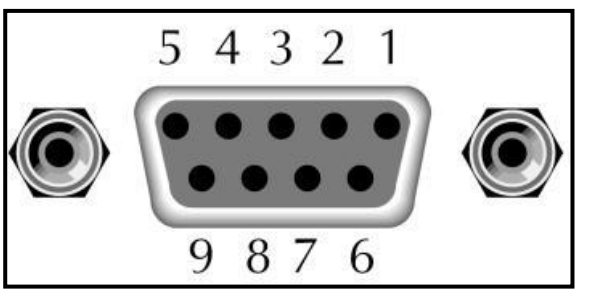


Chart 7- 1 RS-232 Connector pin

NAME	DB-25	DB-9	NOTE
DCD	8	1	NC
RXD	3	2	Data sending end
TXD	2	3	Data receiving end
DTR	20	4	NC
GND	7	5	Earth wire
DSR	6	6	NC
RTS	4	7	NC
CTS	5	8	NC

Make sure the controller is connected to the AT5800 and uses these settings.
Use of RS-232 interface to transmit data:
8 data bits,
1 stop bit,
There are no parity bits.

7.2 About USB adapter (optional)

The USB adapter allows the AT5800 to connect to the USB port on your PC.

Note:
Please install USB- serial driver and then use USB serial interface.
The USB adapter of Applent is ATN2.

Picture 7- 2 USB adapter ATN2

7.3 Select baud rate

Before you can send the RS-232 command to control the AT5800 through the built-in RS-232 controller, you must configure the baud rate of RS-232.
The RS-232 interface of AT5800 uses SCPI language.
Configuration of RS-232
RS-232 is configured as follows:
Data bits: 8-bit
Stop bit: 1-bit
Check digit: none

Set baud rate

Step 1. Please press the [Setup] key
Step 2. Use the cursor keys to select [BAUD].
Step 3. Use function keys to select baud rate.

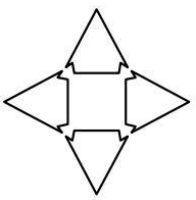
Functional key	Function
9600	
19200	
38400	
57600	
115200	Recommend

7.4 SCPI language

Standard Command (SCPI) for Fully Programmable Instruments

Note:
AT5800 only supports SCPI language.

8.SCPI Command reference



This chapter contains the reference information of SCPI commands for programming AT5800.

- Command Parser-Know some rules of command parser.
- Command and parameters-writing rules of command line.
- Command reference.

This chapter provides all SCPI commands used by the instrument, through which all functions of the instrument can be completely controlled.

8.1 Command string parsing

The host can send a series of commands to the instrument, and the instrument command parser starts parsing after catching the terminator (\n) or the overflow of the input buffer.

For example: Legitimate command string:

AAA:BBB CCC;DDD EEE;:FFF

The instrument parser is responsible for parsing and executing all commands, and you must first know the parsing rules before writing the program.

8.1.1 Command parsing rules

1. The command parser only parses and responds to ASCII code data.
2. SCPI command string must take NL ('\ NL(' \n' ASCII 0x0A) as the terminator, and the command parser will only start executing the command string after receiving the terminator or buffer overflow.
3. If the instruction handshake is turned on, the command parser immediately sends a character back to the host after receiving it, and the host can only continue to send the next character after receiving this returned character.
4. After the command parser parses the error, it immediately terminates parsing, and the current command is invalid.
5. After the command parser parses the query command, it terminates the parsing of this command string, and then the string is ignored.
6. The parsing of command string by command parser is case-insensitive.
7. Command parser supports command abbreviation. See the following sections for abbreviation specifications.

8.1.2 Symbol Convention and Definition

Some symbols are used in this chapter. These symbols are not part of the command tree, but only for better understanding of the command string.

<> The text in angle brackets indicates the parameters of this command.

[ ] The text in square brackets indicates optional commands.

{} When curly braces contain several parameter items, it means that only one item can be selected.

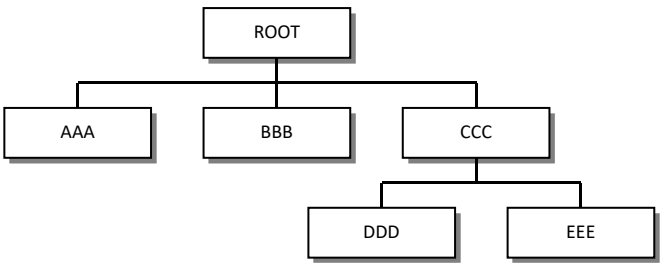
( ) The abbreviated form of the parameter is placed in parentheses.

Abbreviated form of uppercase command.

8.1.3 Command Tree Structure

If SCPI command adopts tree structure, it can be down to three levels (note: the command parser of this instrument can parse any level down), and the highest level here is called subsystem command. Only when a subsystem command is selected, the subordinate command is valid. SCPI uses a colon (:) to separate the high-level command from the low-level command.

Picture 8- 1 Command tree structure



For example ROOT:CCC:DDD PPP

ROOT Subsystem command
CCC Secondary
DDD Third stage
PPP parameter

Command and parameters

A command tree consists of commands and [parameters], separated by a space (ASCII: 20H).

For example AAA:BBB 1.234

COMMAND [PARAMETER]

8.1.4 COMMAND

The command word can be a long command format or an abbreviated form. Using the long format is convenient for engineers to better understand the meaning of the command string. Abbreviated forms are suitable for writing.

8.1.5 PARAMETERS

- Command word command, no parameters.

  Example：AAA:BBB
- Parameters can be in the form of strings, and their abbreviation rules still follow the "command abbreviation rules" in the previous section.。

  Example：AAA:BBB CCC
- Parameters can be numeric.
  - *<integer>* integer 123，+123， -123
  - *<float>* floating-point number

    1. <fixfloat>：Floating point number：1.23，-1.23
    2. <Sciloat>：Scientific counting floating point number：1.23E+4，+1.23e-4
    3. <mpfloat>: Floating-point number represented by multiplying power：1.23k，1.23M，1.23G，1.23u

Chart 8- 1 Abbreviation of magnification

Numerical value	Magnifying power
1E18 (EXA)	EX
1E15 (PETA)	PE
1E12 (TERA)	T
1E9 (GIGA)	G

1E6 (MEGA)	MA
1E3 (KILO)	K
1E-3 (MILLI)	M
1E-6 (MICRO)	U
1E-9 (NANO)	N
1E-12 (PICO)	P
1E-15 (PEMTO)	F
1E-18 (ATTO)	A

Note: The magnification is not case sensitive, and its writing is different from the standard name.

8.1.6 Separator

The instrument parser only accepts the allowed separator, and the other separator command parser will generate an "Invalid separator" error. These delimiters include:

; Semicolon, used to separate two commands.

Example: AAA:BBB 100.0;CCC:DDD

: Colon, used to separate the command tree, or to restart the command tree.

Example: AAA:BBB:CCC 123.4;:DDD:EEE 567.8

? Question mark, used for querying.

Example: AAA?

□ Spaces are used to separate parameters.。

Example: AAA:BBB□1.234

The host can send a series of commands to the instrument, and the instrument command parser starts parsing after catching the terminator (\n) or the overflow of the input buffer.

EXAMPLE: Legitimate command string:

AAA:BBB CCC;DDD EEE;:FFF

The instrument parser is responsible for parsing and executing all commands, and you must first know the parsing rules before writing the program.

8.2 Command Reference

All commands are interpreted in the order of subsystem commands, and all subsystems are listed below.

- BASIC Setup subsystem
- VR Voltage internal resistance testing subsystem
- LOAD DC load test subsystem
- POWER DC power supply test subsystem
- CAP Battery capacity testing subsystem
- GROUP Group test subsystem
- ERROR Error subsystem
- IDN? Query subsystem

8.2.1 BASIC subsystem

BASIC Subsystem is used to set the basic settings of the instrument.

Chart 8- 2 BASIC Command tree

BASIC Command tree	**:FUNC**	**{group,load,power,cap,vr}**
	:RATE	**{slow,fast}**
	:UFS	**{on,off}**
	:BEEP	**{off,ng,gd}**

8.2.1.1 BASIC:FUNC

BASIC:FUNC Used to set test mode.

Command syntax	BASIC:FUNC <group,load,power,cap,vr>
Parameter	group: synthetic test load: DC load test power: DC power test cap: Battery capacity test vr: Voltage internal resistance test
Take for example	SEND > BASIC:FUNC group<NL>// Set test mode to comprehensive test.
Query syntax	BASIC:FUNC?
Respond to queries	< group,load,power,cap,vr ><NL>
Take for example	SEND > BASIC:FUNC?<NL> SEND > group<NL>

8.2.1.2 BASIC:RAET

BASIC:RATE Used to set the sampling rate of voltage internal resistance test mode.

Command syntax	BAISC:RATE <slow,fast>
Parameter	Slow: Slow acquisition speed Fast: Fast acquisition speed
Take for example	SEND> BASIC:RATE slow<NL> // Set the instrument to collect slowly.
Query syntax	BASIC:RATE?
Respond to queries	<slow,fast><NL>
Take for example	SEND> BASIC:RATE?<NL> RECEIVE > slow<NL>

8.2.1.3 BASIC:BEEP

BASIC :BEEP Used to set the response.

Command syntax	BASIC:BEEP <off,NG,GD>
Parameter	Off: Turn off the sound and turn on. NG: Unqualified response GD: Qualified response
Take for example	SEND> BASIC:BEEP off<NL> //Set the response off.
Query syntax	BAISC:BEEP?
Respond to queries	<off,NG,GD><NL>
Take for example	SEND > BASIC:BEEP?<NL> RECEIVE> off<NL>

8.2.1.4 BASIC:UFS

BASIC :UFS Used to set the comprehensive test unqualified stop.

Command syntax	BASIC:UFS <on,off>

parameter	On: Turn on unqualified stop test function. Off: Turn off unqualified stop test function.
take for example	SEND > BASIC:UFS off<NL> //Set unqualified stop close.
Query syntax	BAISC:UFS?
Respond to queries	<on,off><NL>
take for example	SEND > BASIC:UFS?<NL> RECEIVE > off<NL>

8.2.2 GROUP subsystem

GROUP The subsystem is used to set the instrument comprehensive test settings.

Chart 8- 3 GROUP Command **tree**

Group Command tree	:STATE	{on,off}
	:FETCH	<int>,<string>,<int>,<float>,<float>,<float>,<float>
	:FILE	{file1,file2,file3,…,group10}
	:TYPE	{li,NiMH,NiCD,SLA}
	:VOL	<float>
	:CAP	<float>
	:MODE	{cont,step}
	:VNO	<range>
	:VMODE	{auto,hold}
	:RNO	<range>
	:RMODE	{auto,hold}
	:TOTAL	<int>
	:STEP	<int>
	:SET0	<step>
	:SET1	<step>,<vol>,<cur>,<time>,<vh>,<vl>
	:SET2	<step>,<rh>,<rl>,<vh>,<vl>,<time>
	:SET3	<step>,<vol>,<cur>,<time>,<vh>,<vl>
	:SET4	<step>,<startcur>,<stopcur>,<stepcur>,<vol>,<steptime>,<ih>,<il>
	:SET5	<step>,<cur>,<time>,<vh>,<vl>,<rh>,<rl>
	:SET6	<step>,<cur>,<time>,<vh>,<vl>
	:SET7	<step>,<startcur>,<stopcur>,<stepcur>,<steptime>,<ih>,<il>,<th>,<tl>
	:SET8	<step>,<time>,<vh>,<vl>,<th>,<tl>
	:SET9	<step>,<vol>,<cur>,<time>,<vh>,<vl>
	:SET	<step>,<float>

8.2.2.1 GROUP:STATE

GROUP:STATE Used to set the comprehensive test status.

Command syntax	GROUP:GROUP < on,off >
Parameter	On: Start the test Off: Stop testing
Take for example	SEND> group:state on<NL>//Set the instrument to start testing.
Query syntax	GROUP:STATE?
Respond to queries	< on,off ><NL>
Take for example	SEND> GROUP:STATE?<NL> RECEIVE> on<NL>

8.2.2.2 GROUP:FETCH

GROUP:FETCH Used to obtain comprehensive test results.

Query syntax	GROUP:FETCH?									
Respond to queries	<int>,<func>,<comp>,<float1>,<float2>,<float3>,<float4>									
Parameter	Int	>0 Time = number of steps 0=空								
	Func	NL	Empty							
		ACT	Battery activation test							
		VR	Voltage internal resistance test							
		CRG	Battery charging test							
		OC	Battery overcharge test							
		DR	DC internal resistance test							
		DC	Battery discharge test							
		ODC	Battery over-discharge test							
		SHT	Short circuit test							
		RST	Battery recovery test							
	Comp	Current step comparator status (0: pass, 1: fail)								
		NL	ACT	VR	CRG	OC	DR	DC	ODC	SHT	RST
	Float1	empty	voltage	voltage	voltage	voltage	voltage	voltage	voltage	voltage	voltage
	Float2	empty	electric current	electric resistance	electric current	electric current	electric current	electric current	electric current	electric current	electric current
	Float3	empty	at fixed time	at fixed time	at fixed time	at fixed time	electric resistance	at fixed time	at fixed time	at fixed time	at fixed time
	Flaot4	empty	empty	empty	empty	empty	at fixed time	empty	empty	empty	empty
Example	SEND> GROUP:FETCH?<NL> RECEIVE> 0, ACT,0,1.0e+01,5.0e-01,5.0e-01,0<NL>									

8.2.2.3 GROUP:FILE

GROUP:FILE Used to set the comprehensive test group number.

Command syntax	GROUP:FILE < group1,group2,group3,…,group10 >
Parameter	Group1: Group 1 Group2: Group 2 。。。 Group3: Group 10
Take for example	SEND> group:file group1<NL>// Set the comprehensive test group as the first group.
Query syntax	GROUP:FILE?
Respond to queries	< group,group2,group3,…,group10 ><NL>
Take for example	SEND> GROUP:FILE?<NL> RECEIVE> group1<NL>

8.2.2.4 GROUP:TYPE

GROUP:TYPE Used to set the comprehensive test battery type.

Command syntax	GROUP:TYPE < Li,NiMH,NiCD,SLA >
parameter	Li: Lithium battery

	NiMH: Nickel-hydrogen battery NiCD: Nickel cadmium batteries SLA: Lead-acid cell
Example	SEND> group:type Li<NL>// Set the comprehensive test battery type as lithium battery.
Query syntax	GROUP:TYPE?
Respond to queries	< Li,NiMH,NiCD,SLA ><NL>
Take for example	SEND> GROUP:TYPE?<NL> RECEIVE> Li<NL>

8.2.2.5 GROUP:VOL

GROUP:VOL Used to set the nominal voltage of comprehensive test.

Command syntax	GROUP:VOL < float >
Parameter	float: Test the nominal voltage value of the battery
Take for example	SEND> group:vol 10.000<NL>// Set the battery nominal voltage to 10.000V
Query syntax	GROUP:VOL?
Respond to queries	< float ><NL>
Take for example	SEND> GROUP:VOL?<NL> SEND> 1.0e+01<NL>

8.2.2.6 GROUP:CAP

GROUP:CAP Used to set the nominal capacity of comprehensive test.

Command syntax	GROUP:CAP < float >
Parameter	Float: Test the nominal capacity of the battery.
Take for example	SEND> group:cap 0.1000<NL>// Set the nominal capacity of the battery to 0.1AH
Query syntax	GROUP:CAP?
Respond to queries	< float ><NL>
Take for example	SEND> GROUP:CAP?<NL> RECEIVE> 1.0e-01<NL>

8.2.2.7 GROUP:MODE

GROUP:MODE Used to set comprehensive test mode.

Command syntax	GROUP:MODE < cont,step >
Parameter	cont: Continuous test mode step: Single-step test mode
Take for example	SEND> group:mode cont<NL>// Set the group test mode to continuous mode.
Query syntax	GROUP:MODE?
Respond to queries	< cont,step ><NL>
Take for example	SEND> GROUP:MODE?<NL> RECEIVE> cont<NL>

8.2.2.8 GROUP:VNO

GROUP:VNO Used to set the comprehensive test voltage range number

Command syntax	GROUP:VNO < int >

Parameter	int：Test the voltage range number comprehensively, and automatically switch the voltage range mode to HOLD mode after setting the range number.
Take for example	SEND> group:vno 1<NL>// Set the voltage range to 1 range.
Query syntax	GROUP:VNO?
Respond to queries	< int ><NL>
Take for example	SEND> GROUP:VNO?<NL> RECEIVE> 1<NL>

8.2.2.9 GROUP:VMODE

GROUP:VMODE Used to set the comprehensive test voltage range mode.

Command syntax	GROUP:VMODE < auto,hold >
Parameter	auto: Comprehensive test voltage range is AUTO mode. hold: Comprehensive test voltage range is HOLD mode.
Take for example	SEND> group:vmode auto<NL>// Set the automatic voltage range mode.
Query syntax	GROUP:VMODE?
Respond to queries	< auto,hold ><NL>
Take for example	SEND> GROUP:VMODE?<NL> RECEIVE> auto<NL>

8.2.2.10 GROUP:RNO

GROUP:RNO Used to set the comprehensive test resistance range number.

Command syntax	GROUP:RNO < int >
Parameter	int: Test the resistance range number comprehensively. After setting the range number, the resistance range mode will automatically switch to HOLD mode.
Take for example	SEND> group:rno 1<NL>// Set the resistance range to 1 range.
Query syntax	GROUP:RNO?
Respond to queries	< int ><NL>
Take for example	SEND> GROUP:RNO?<NL> RECEIVE> 1<NL>

8.2.2.11 GROUP:RMODE

GROUP:RMODE Used to set the comprehensive test resistance range mode.

Command syntax	GROUP:RMODE < auto,hold >
Parameter	auto: The measuring range of comprehensive resistance is AUTO mode. hold: The measuring range of the comprehensive resistance is HOLD mode.
Take for example	SEND> group:rmode auto<NL>// Set the resistance range automatic mode.
Query syntax	GROUP:RMODE?
Respond to queries	< auto,hold ><NL>
Take for example	SEND> GROUP:RMODE?<NL> RECEIVE> auto<NL>

8.2.2.12 GROUP:TOTAL

GROUP:TOTAL Used to set the total test steps of comprehensive test.

Command syntax	GROUP:TOTAL < int >
Parameter	int: Total test steps of comprehensive test
Take for example	SEND> group:total 9<NL>// Set the total number of comprehensive test steps to 9.
Query syntax	GROUP:TOTAL?
Respond to queries	< int ><NL>
Ttake for example	SEND> GROUP:TOTAL?<NL> RECEIVE> 9.0e+00<NL>

8.2.2.13 GROUP:STEP

GROUP:STEP Used to set the current step of comprehensive test.

Command syntax	GROUP:STEP < int >
parameter	int: Set the current step of comprehensive test.
Take for example	SEND> group:step 1<NL>// Set the current step of comprehensive test to 1.
Query syntax	GROUP:STEP?
Respond to queries	< int ><NL>
Take for example	SEND> GROUP:STEP?<NL> RECEIVE> 1.0e+00<NL>

8.2.2.14 GROUP:SET0

GROUP:SET0 Parameter used to set the comprehensive test function to [empty]

Command syntax	GROUP:SET0 < step >
Parameter	step: The number of steps to be configured for comprehensive testing.
Take for example	SEND> group:set0 1<NL>// Set step 1 of comprehensive test to NULL.

8.2.2.15 GROUP:SET1

GROUP:SET1 Parameters used to set the comprehensive test function as [Battery Activation]

Command syntax	GROUP:SET1 < step, vol,cur,time,vh,vl >
Parameter	step: The number of steps to be configured for comprehensive testing. vol: Activation voltage value cur: Activation current value time: TestTime vh: Comparator voltage upper limit vl: Comparator voltage lower limit
Take for example	SEND> group:set1 2,9.000, 0.1000,10.0,8.800,8.5000<NL> // Set the comprehensive test step 2 as battery activation, with the activation voltage of 9.000V, the activation current of 0.1000A, the test time of 10 seconds, the upper voltage limit of the comparator of 8.8V and the lower voltage limit of 8.5V.

8.2.2.16 GROUP:SET2

GROUP:SET2 Used to set the comprehensive test function as [voltage internal resistance] parameter.

Command syntax	GROUP:SET2 < step, rh,rl,vh,vl,time >

Parameter	step: The number of steps to be configured for comprehensive testing. rh: Comparator resistance upper limit rl: Comparator resistance lower limit vh: Comparator voltage upper limit vl: Comparator voltage lower limit time: TestTime
Take for example	SEND> group:set2 3,1.0000, 0.1000,8.800,8.5000, 10.0<NL> // Set the comprehensive test step 3 as the voltage internal resistance, the upper resistance 1.000Ω, the lower resistance 0.1000Ω, the upper voltage of the comparator 8.8V, the lower voltage 8.5V, and the test time 10.0 seconds.

8.2.2.17 GROUP:SET3

GROUP:SET3 Parameters used to set the comprehensive test function as [Charging Test]

Command syntax	GROUP:SET3 < step, vol,cur,time,vh,vl >
Parameter	step: The number of steps to be configured for comprehensive testing. vol: Charging voltage valuecur time: TestTime vh: Comparator voltage upper limit vl: Comparator voltage lower limit
Take for example	SEND> group:set3 4,9.000, 0.1000,10.0,8.800,8.5000<NL> // Set the comprehensive test step 4 as battery activation, charging voltage 9.000V, charging current 0.1000A, test time 10 seconds, comparator voltage upper limit 8.8V, voltage lower limit 8.5V.

8.2.2.18 GROUP:SET4

GROUP:SET4 Parameters used to set the comprehensive test function as [overcharge test]

Command syntax	GROUP:SET4 < step, startcur,stopcur,stepcur,vol,steptime,ih,il >
Parameter	step: The number of steps to be configured for comprehensive testing. startcur: Initial current stopcur: Cut-off current stepcur: Stepping current vol: Magnitude of voltage steptime: Step time ih: Comparator current upper limit il: Comparator current lower limit
Example	SEND> group:set4 5, 1.0, 2.0,0.1,1.0, 1.7,1.6<NL> // Set comprehensive test step 5 as overcharge test, with initial current of 1.0A, end current of 2.0A, step current of 0.1A, step time of 1.0 seconds, upper limit of protection current of 1.7A and lower limit of protection current of 1.6A.

8.2.2.19 GROUP:SET5

GROUP:SET5 Used to set the parameter of [DC internal resistance] for comprehensive test function.

Command syntax	**GROUP:SET5 < step, cur,time,vh,vl,rh,rl >**
Parameter	**step: The number of steps to be configured for comprehensive testing.** **Cur: On-load current of battery** **Time: battery loading time** **Vh: Upper limit of comparator voltage** **Vl: Lower limit of comparator voltage** **Rh: upper limit of comparator resistance** **Rl: lower limit of comparator resistance**
Take for example	**SEND> group:set5 6,1.0, 1.0,8.800,8.5000,1.0,0.7*<NL>*** **//Set the comprehensive test step 6 as DC internal resistance, on-load current of 1.0A, on-load time of 1.0 seconds, upper voltage limit of 8.8V, lower voltage limit of 8.5V, upper resistance limit of 1.0Ω and lower resistance limit of 0.7Ω.**

8.2.2.20 GROUP:SET6

GROUP:SET6 Parameters used to set the comprehensive test function as [discharge test]

Command syntax	**GROUP:SET6 < step, cur,time,vh,vl >**
Parameter	**step: The number of steps to be configured for comprehensive testing.** **cur: Load current** **time: TestTime** **vh: Comparator voltage upper limit** **vl: Comparator voltage lower limit**
Take for example	**SEND> group:set6 7, 1.0, 10.0,8.1,8.0*<NL>*** **//Set comprehensive test step 7 as discharge test, with load current of 1.0A, test time of 10.0 seconds, upper voltage limit of 8.1V and lower voltage limit of 8.0V.**

8.2.2.21 GROUP:SET7

GROUP:SET7 Parameters used to set the comprehensive test function as [Overdischarge Test]

Command syntax	**GROUP:SET7** **< step, startcur,stopcur,stepcur,steptime,ih,il, th,tl >**
Parameter	**step: The number of steps to be configured for comprehensive testing.** **startcur: Initial current** **stopcur: Cut-off current** **stepcur: Stepping current** **steptime: Step time** **ih: Comparator current upper limit** **il: Comparator current lower limit** **th: Comparator time upper limit** **tl: Comparator time lower limit**
Take for example	**SEND> group:set7 8, 1.0, 2.0,0.1,0.001, 1.7,1.6, *<NL>*** **//Set comprehensive test step 8 as overcharge test, with initial current of 1.0A, end current of 2.0A, step current of 0.1A, step**

	time of 1ms, upper limit of protection current of 1.7A, lower limit of protection current of 1.6A, upper limit of protection time of 10.0ms and lower limit of protection time of 8.0ms.

8.2.2.22 GROUP:SET8

GROUP:SET8 Parameters used to set the comprehensive test function as [short circuit test]

Command syntax	GROUP:SET8 < step, time,vh,vl,th,tl >
Parameter	step: The number of steps to be configured for comprehensive testing. time: TestTime vh: Comparator voltage upper limit vl: Comparator voltage lower limit th: Comparator time upper limit tl: Comparator time lower limit
Take for example	SEND> group:set8 9, 0.001, 0.1,0.001,0.0005, 0.0001<NL> //Set comprehensive test step 9 as short-circuit test, with test time of 1.0ms, upper limit of protection voltage of 0.1V, lower limit of protection voltage of 0.001V, upper limit of protection time of 0.5ms and lower limit of protection time of 0.1ms.

8.2.2.23 GROUP:SET9

GROUP:SET9 Parameters used to set the comprehensive test function as [Recovery Test]

Command syntax	GROUP:SET9 < step, vol,cur,time,vh,vl >
Parameter	step: The number of steps to be configured for comprehensive testing. vol: charging voltage cur: Load current time: TestTime vh: Comparator voltage upper limit vl: Comparator voltage lower limit
Take for example	SEND> group:set9 10, 9.0, 1.0,10.0,8.8, 8.7<NL> //Set comprehensive test step 10 as overcharge test, charging voltage 9.0V, charging current 1.0A, charging time 10s, upper voltage limit 8.8V and lower voltage limit 8.7v.

8.2.2.24 GROUP:SET?

GROUP:SET? Get the parameters of each step of comprehensive test.

Query syntax	GROUP:SET? <step>
Respond to queries	Empty: <step>,"null" Activate battery: <step>,"act",<vol>,<cur>,<time>,<vh>,<vl> Voltage internal resistance: <step>,"vr",<rh>,<rl>,<vh>,<vl>,<time> Charging test: <step>,"chg",<vol>,<cur>,<time>,<vh>,<vl> Overcharge test: <step>,"oc",<startcur>,<stopcur>,<stepcur>,

	<steptime>,<ih>,<il> DC internal resistance: <step>,"dr",<cur>,<time>,<vh>,<vl>,<rh>,<rl> Discharge test: <step>,"dcg",<cur>,<time>,<vh>,<vl> Overdischarge test: <step>,"odc",<startcur>,<stopcur>,<stepcur>, <steptime>,<ih>,<il>,<th>,<tl> Short circuit test: <step>,"sht",<time>,<vh>,<vl>,<th>,<tl> Recovery test: <step>,"rst",<vol>,<cur>,<time>,<vh>,<vl>
Take for example	SEND> GROUP:SET? 2 RECEIVE> 2,act,9.0e+00,1.0e+00,1.0e+01,8.8e+00,8.7e+00

8.2.3 VR subsystem

The voltage internal resistance subsystem is used to set the instrument VOLRES settings.

Chart 8- 4 VR Command tree

VR Command tree	:FETCH	<res>,<vol>
	:VNO	<range>
	:VMODE	<auto,hold>
	:RNO	<range>
	:RMODE	<auto,hold>
	:RLIMIT	<rhigh>,<rlow>
	:VLIMIT	<vhigh>,<vlow>

8.2.3.1 VR:FETCH

VR:FETCH Used to obtain the voltage internal resistance test result.

Query syntax	VR:FETCH?
Respond to queries	<res>,<vol>
Take for example	send> VR:FETCH?<NL> RECEIVE> 1.0e-01,9.0e+00<NL>

8.2.3.2 VR:VNO

VR:VNO Used to set the voltage range number of voltage internal resistance test.

Command syntax	VR:VNO < int >
Parameter	Int: voltage range number. After setting the range number, the voltage range mode will be automatically switched to HOLD mode.
Take for example	发送> VR:VNO 1<NL> //Set the voltage range number to 1.
Query syntax	VR:VNO?
Respond to queries	< int ><NL>
Take for example	SEND> VR:VNO?<NL> RECEIVE> 1<NL>

8.2.3.3 VR:VMODE

VR:VMODE Used to set the voltage range mode for voltage internal resistance test.

Command syntax	VR:VMODE < auto,hold >
Parameter	auto: The voltage range is AUTO mode. hold: The voltage range is HOLD mode.
Take for example	send> VR:VMODE auto<NL> //Set the voltage range to automatic mode.
Query syntax	VR:VMODE?

Respond to queries	< auto,hold ><NL>
Take for example	SEND> VR:VMODE?<NL> RECEIVE> auto<NL>

8.2.3.4 VR:RNO

VR:RNO Used to set the resistance range number of voltage internal resistance test.

Command syntax	VR:RNO < int >
Parameter	int: Resistance range number, after setting the range number, the resistance range mode is automatically switched to HOLD mode.
Take for example	SEND> VR:RNO 1<NL> //Set the resistance range number to 1.
Query syntax	VR:RNO?
Respond to queries	< int ><NL>
Take for example	SEND> VR:RNO?<NL> RECEIVE> 1<NL>

8.2.3.5 VR:RMODE

VR:RMODE Used to set the resistance range mode for voltage internal resistance test.

Command syntax	VR:VMODE < auto,hold >
Parameter	auto: The resistance range is AUTO mode hold: The resistance range is in HOLD mode.
Take for example	SEND> VR:RMODE auto<NL> //Set the resistance range to automatic mode.
Query syntax	VR:RMODE?
Respond to queries	< auto,hold ><NL>
Take for example	SEND> VR:RMODE?<NL> RECEIVE> auto<NL>

8.2.3.6 VR:RLIMIT

VR:RLIMIT Used to set the upper and lower resistance limits of voltage internal resistance.

Command syntax	VR:RLIMIT < high >,< low >
Parameter	High: Upper resistance limit low: Lower resistance limit
Take for example	SEND> VR:RLIMIT 1.0,0.9<NL> //Set the upper limit of resistance to 1.0Ωand the lower limit to 0.9Ω.
Query syntax	VR:RLIMIT?
Respond to queries	< high >,< low ><NL>
Take for example	SEND> VR:RLIMIT?<NL> RECEIVE> 1.0e+00,9.0e-01<NL>

8.2.3.7 VR:VLIMIT

vR:VLIMIT Used to set the upper and lower voltage limits of voltage internal resistance.

Command syntax	VR:VLIMIT < high >,< low >
Parameter	High: Upper voltage limit low: Lower voltage limit
Take for example	SEND> VR:VLIMIT 9.0,8.5<NL> //Set the upper voltage limit to 9.0V and the lower voltage limit to 8.5V
Query syntax	VR:VLIMIT?

Respond to queries	< high >,< low ><NL>
Take for example	SEND> VR:VLIMIT?<NL> RECEIVE> 9.0e+00,8.5e+00<NL>

8.2.4 DCLOAD subsystem

DC LOAD The subsystem is used to set the DC load test settings of the instrument.

Chart 8- 5 DCLOAD Command tree

Load Command tree	:STATE	<on,off>
	:FETCH	<vol>,<cur>,<power>,<res>
	:MODE	<cv,cc,cp,cr>
	:LIMIT	<vmax>,<imax>,<pmax>
	:VALUE	<mode>,<float>

8.2.4.1 LOAD:STATE

LOAD:STATE Used to set DC load test status.

Command syntax	LOAD:STATE < on,off >
Parameter	On: Start the test Off: Stop testing
Take for example	SEND> load:state on<NL>//Set the instrument to start testing.
Query syntax	LOAD:STATE?
Respond to queries	< on,off ><NL>
Take for example	SEND> LOAD:STATE?<NL> RECEIVE> on<NL>

8.2.4.2 LOAD:FETCH

LOAD:FETCH Used to obtain DC load test results.

Command syntax	LOAD:FETCH?
Respond to queries	<vol>,<cur>,<power>,<res>
Take for example	SEND> LOAD:FETCH?<NL> RECEIVE> 8.8e+00,5.0e-01,4.4e+00,1.76e+01<NL>

8.2.4.3 LOAD:MODE

LOAD:MODE Used to set the DC load test mode.

Command syntax	LOAD:MODE < cv,cc,cpc,cr >
Parameter	cv: Constant voltage cc: Constant current cp: Fixed power cr: Constant resistance
Take for example	SEND > LOAD:MODE cc<NL> //Set the load mode to constant current mode.
Query syntax	LOAD:MODE?
Respond to queries	< cv,cc,cp,cr ><NL>
Take for example	SEND > LOAD:MODE?<NL> RECEIVE > cc<NL>

8.2.4.4 LOAD:LIMIT

LOAD:LIMIT Used to set the comparator date of DC load.

Command syntax	LOAD:LIMIT < vmax >,< imax >,<pmax>
Parameter	vmax: Upper voltage limit imax: Current upper limit pmax: Upper power limit
Take for example	SEND > LOAD:LIMIT 30.0,15.0,100.0<NL> // Set the voltage limit to 30.0V, current limit to 15.0A and power limit to 100.0W
Query syntax	LOAD:LIMIT?
Respond to queries	< vmax >,< imax >,< pmax ><NL>
Take for example	SEND > LOAD:LIMIT?<NL> RECEIVE > 3.0e+01,1.5e+01,1.00e+02<NL>

8.2.4.5 LOAD:VALUE

LOAD:VALUE Used to set the Parameter data of DC load

Command syntax	LOAD:VALUE <mode>,< value >
Parameter	Mode: Load mode Value: Load Parameter
Take for example	SEND > LOAD:VALUE cc,0.6<NL> // Set the Parameter of constant current mode to 0.6A
Query syntax	LOAD:VALUE?
Respond to querie	< vset >,< iset >,< pset >,< rset ><NL>
Take for example	SEND > LOAD:VALUE?<NL> RECEIVE > 9.0e+00,6.0e-01,1.0e+01,1.0e+02<NL>

8.2.5 DCPOWER Subsystem

DCPOWER The subsystem is used to set the DC power settings of the instrument.

Chart 8- 5 DCPOWER Command tree

Power Command tree	:STATE	<on,off>
	:FETCH	<vol>,<cur>,<power>,<res>
	:VALUE	<vol>,<cur>

8.2.5.1 POWER:STATE

POWER:STATE Used to set the DC power supply test status.

Command syntax	POWER:STATE < on,off >
Parameter	On: Start the test Off: Stop testing
Take for example	SEND > POWER:state on<NL>//Set the instrument.Start the test
Query syntax	POWER:STATE?
Respond to querie	< on,off ><NL>
Take for example	SEND > POWER:STATE?<NL> RECEIVE> on<NL>

8.2.5.2 POWER:FETCH

POWER:FETCH Used to obtain DC power supply test results.

Query syntax	POWER:FETCH?

Respond to querie	<vol>,<cur>,<power>,<res>
Take for example	SEND > POWER:FETCH?<NL> RECEIVE> 8.8e+00,5.0e-01,4.4e+00,1.76e+01<NL>

8.2.5.3 POWER:VALUE

POWER:VALUE Used to set the Parameter value of DC power supply

Command syntax	POWER:VALUE <vol>,<cur>
Parameter	vol: Output voltage cur: Output current
Take for example	SEND > POWER:VALUE 9.0,1.0<NL> //Set the power supply Parameter to a voltage of 9.0V and a current of 1.0A
Query syntax	POWER:VALUE?
Respond to querie	< vol >,< cur >,< power >,< res ><NL>
Take for example	SEND > POWER:VALUE?<NL> RECEIVE> 9.0e+00,1.0e+00,9.0e+00,9.0e+00<NL>

8.2.6 CAPACITY Subsystem

CAPACITY The subsystem is used to set the instrument battery capacity test settings.

Chart 8- 6 CAPACITY Command tree

Cap Command tree	:STATE	<on,off>
	:FETCH	<cap>
	:FILE	<file1,file2,…,file10>
	:TYPE	<Li,NiMH,NiCD,SLA>
	:VOL	<float>
	:CAP	<float>
	:RCV	<float>
	:RCC	<float>
	:DCC	<float>
	:COV	<float>
	:PC	<on,off>
	:CYCLE	<int>

8.2.6.1 CAP:STATE

CAP:STATE Used to set battery capacity test status.

Command syntax	CAP:STATE < on,off >
Parameter	On: Start the test Off: Stop testing
Take for example	SEND > CAP:state on<NL>//Set the instrument to start testing.
Query syntax	CAP:STATE?
Respond to querie	< on,off ><NL>
Take for example	SEND > CAP:STATE?<NL> RECEIVE> on<NL>

8.2.6.2 CAP:FETCH

CAP:FETCH Used to obtain battery capacity test results.

Query syntax	CAP:FETCH?
Respond to querie	<cap>
Take for example	SEND > CAP:FETCH?<NL> RECEIVE> 1.0e-01<NL> //unit AH

8.2.6.3 CAP:FILE

CAP:FILE Select the file for battery capacity test.

Command syntax	CAP:FILE < file1,file2,…,file10 >
Parameter	File1 File2 … File10
Take for example	SEND > CAP:FILE file1<NL> // Set parameters of battery capacity test call file 1
Query syntax	CAP:FILE?
Respond to querie	< file1,file2,…,file10 ><NL>
Take for example	SEND > CAP:FILE?<NL> RECEIVE> file1<NL>

8.2.6.4 CAP:TYPE

CAP:TYPE Used to set the type of battery.

Command syntax	CAP:TYPE < Li,NiMH,NiCD,SLA >
Parameter	Li: Lithium battery NiMH: Nickel-hydrogen battery NiCD: Nickel cadmium batteries SLA: Lead-acid cell
Take for example	SEND > CAP:TYPE Li<NL> // Set the battery type to lithium battery.
Query syntax	CAP:TYPE?
Respond to querie	< Li,NiMH,NiCD,SLA ><NL>
Take for example	SEND > CAP:TYPE?<NL> RECEIVE> Li<NL>

8.2.6.5 CAP:VOL

CAP:VOL Used to set the nominal voltage value of the battery.

Command syntax	CAP:VOL < float >
Parameter	Float : Nominal voltage of the tested battery
Take for example	SEND > CAP:VOL 9.0<NL> // Set the nominal voltage of the battery to 9.0V
Query syntax	CAP:VOL?
Respond to querie	< float ><NL>
Take for example	SEND > CAP:VOL?<NL> RECEIVE> 9.0e+00<NL>

8.2.6.6 CAP:CAP

CAP:CAP Used to set the nominal capacity of the battery.

Command syntax	CAP:CAP < float >
Parameter	Float : Nominal capacity of tested battery
Take for example	SEND > CAP:CAP 0.1<NL> // Set the nominal capacity of the battery to 0.1AH
Query syntax	CAP:CAP?
Respond to querie	< float ><NL>
Take for example	SEND > CAP:CAP?<NL> RECEIVE> 1.0e-01<NL>

8.2.6.7 CAP:RCV

CAP:RCV Used to set the battery charging voltage.

Command syntax	**CAP:RCV < float >**
Parameter	**Float : charging voltage**
Take for example	**SEND > CAP:RCV 9.0<NL> // Set the charging voltage to 9.0V**
Query syntax	**CAP:RCV?**
Respond to querie	**< float ><NL>**
Take for example	**SEND > CAP:RCV?<NL>** **RECEIVE> 9.0e+00<NL>**

8.2.6.8 CAP:RCC

CAP:RCC Used to set the battery charging current.

Command syntax	**CAP:RCC < float >**
Parameter	**Float : charging current**
Take for example	**SEND > CAP:RCC 1.0<NL> // Set the charging current to 1.0A**
Query syntax	**CAP:RCC?**
Respond to querie	**< float ><NL>**
Take for example	**SEND > CAP:RCC?<NL>** **RECEIVE> 1.0e+00<NL>**

8.2.6.9 CAP:DCC

CAP:DCC Used to set the battery discharge current.

Command syntax	**CAP:DCC < float >**
Parameter	**Float : discharging current**
Take for example	**SEND > CAP:DCC 1.0<NL> // Set the discharge current to 1.0A**
Query syntax	**CAP:DCC?**
Respond to querie	**< float ><NL>**
Take for example	**SEND > CAP:DCC?<NL>** **RECEIVE> 1.0e+00<NL>**

8.2.6.10 CAP:COV

CAP:COV Used to set the battery cutoff voltage.

Command syntax	**CAP:COV < float >**
Parameter	**Float : cutoff voltage**
Take for example	**SEND > CAP:COV 8.0<NL> // Set the battery cutoff voltage to 8.0V**
Query syntax	**CAP:COV?**
Respond to querie	**< float ><NL>**
Take for example	**SEND > CAP:COV?<NL>** **RECEIVE> 8.0e+00<NL>**

8.2.6.11 CAP:PC

CAP:PC Used to set battery pre-discharge.

Command syntax	**CAP:PC < on,off >**
Parameter	**On: Turn on the pre-discharge function** **Off: Turn off the pre-discharge function**
Take for example	**SEND > CAP:PC on<NL> // Set battery pre-discharge on**
Query syntax	**CAP:PC?**

Respond to querie	< on,off ><NL>
Take for example	SEND > CAP:PC?<NL> RECEIVE> on<NL>

8.2.6.12 CAP:CYCLE

CAP:CYCLE Used to set the number of battery capacity test cycles.

Command syntax	CAP:CYCLE < int >
Parameter	int : Cycles
Take for example	SEND > CAP:CYCLE 1<NL> // Set the battery capacity test cycle once.
Query syntax	CAP: CYCLE?
Respond to querie	< int ><NL>
Take for example	SEND > CAP:CYCLE?<NL> RECEIVE> 1<NL>

8.2.7 POWER subsystem

POWER The subsystem is used to set the power test settings.

Chart 8- 8 POWER Command tree

Power Command tree	:VOL	<level>
	:FREQ	<50Hz,60Hz>
	:ILIMIT	<high>,<low>
	:PLIMIT	<high>,<low>
	:TIME	<time>
	:DELAY	<delay>
	:FETCH	<vol>,<cur>,<power>,<pf>

8.2.8 ERROR subsystem

ERRor Error information returned by subsystem

Query syntax	ERROR?
Respond to querie	Error string
Take for example	SEND > ERR?<NL> RECEIVE> no error<NL>

8.2.9 IDN subsystem

IDN? Used to query the instrument ID number

Query syntax	IDN? Or *IDN?
Respond to querie	<MODEL>,<Revision>,<SN>,< Manufacturer>

9.Modbus(RTU) protocol

This chapter includes the following aspects.

- Data format---Understand Modbus communication format
- Function-writing rules of command line
- Variable region
- function code

This chapter provides all SCPI commands used by the instrument, through which all functions of the instrument can be completely controlled.

9.1 Data format

We follow Modbus(RTU) communication protocol, and the instrument will respond to the instructions of the upper computer and return the standard response frame.

See: You can contact the sales department of our company to obtain the communication test tool of Applent Instrument, which contains Modbus communication debugging method. Includes CRC-16 calculator and floating-point number, which is converted into Modbus floating-point number format.

9.1.1 Command parsing rules

Picture.9-1-1 Modbus Instruction frame

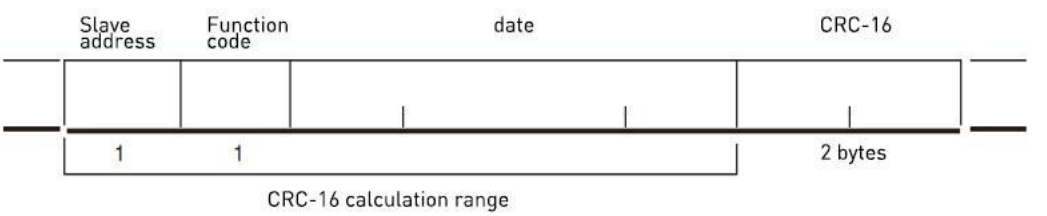


Chart 9- 1 Instruction frame description

	A squelch interval of at least 3.5 characters is required.
Address of slave station	1 byte Modbus can support 00~0x63 slave stations. Specify 00 when broadcasting uniformly. In the instrument without RS485 option, the default slave address is 0x01
Function code	1 byte 0x03：Read out multiple registers 0x04：=03H，do not use 0x06：Write to a single register, which can be replaced by 10H. 0x08: Echo test (only for debugging) 0x10：Write to multiple registers
data	Specify the register address, number and content.
CRC-16	2 bytes, low bits first CyclicRedundancy Check Calculate all the data from the station address to the end of the data to

	obtain the CRC16 check code.
	A squelch interval of at least 3.5 characters is required.

9.1.2 CRC-16 Calculation method

1 Set the initial value of CRC-16 register to 0xFFFF。

2 XOR the CRC-16 register and the first byte of information, and return the calculation result to the CRC register.

3 Fill the MSB with 0, and shift the CRC register by 1 bit to the right.

4 If the bit shifted from the LSB is "0", repeat step (3) (processing the next shift).If the bit shifted from the LSB is "1", please operate the CRC register and 0xA001 with XOR and return the result to the CRC register.

5 Repeat steps (3) and (4) until 8 bits are moved.

6 If the information processing is not finished, the CRC register and the next byte of information will be XOR, and will be returned to the CRC register, which will be repeated from step (3).。

7 Append the calculated result (the value of CRC register) to the information from the lower byte.

The following is a CRC calculation function in VB language:

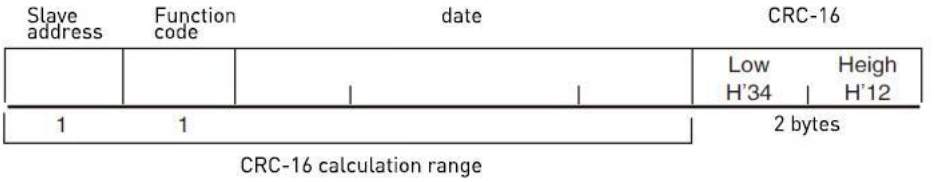
```
Function CRC16(data() As Byte) As Byte()
    Dim CRC16Lo As Byte, CRC16Hi As Byte   'CRC register
    Dim CL As Byte, CH As Byte       'polynomial code &HA001
    Dim SaveHi As Byte, SaveLo As Byte
    Dim i As Integer
    Dim flag As Integer
    CRC16Lo = &HFF
    CRC16Hi = &HFF
    CL = &H1
    CH = &HA0
    For i = 0 To UBound(data)
        CRC16Lo = CRC16Lo Xor data(i) 'Each data is XOR with CRC register.
        For flag = 0 To 7
            SaveHi = CRC16Hi
            SaveLo = CRC16Lo
            CRC16Hi = CRC16Hi \ 2     'The high bit is shifted to the right by one bit.
            CRC16Lo = CRC16Lo \ 2     'Move the lower bit to the right by one bit.
            If ((SaveHi And &H1) = &H1) Then 'If the last bit of the upper byte is 1
                CRC16Lo = CRC16Lo Or &H80   'Then the lower byte is shifted to the right,
followed by 1 in front.
            End If            'Otherwise, zero will be added automatically.
            If ((SaveLo And &H1) = &H1) Then 'If LSB is 1, XOR with polynomial code.
                CRC16Hi = CRC16Hi Xor CH
                CRC16Lo = CRC16Lo Xor CL
            End If
        Next flag
    Next i
    Dim ReturnData(1) As Byte
    ReturnData(0) = CRC16Hi      'CRC high position
    ReturnData(1) = CRC16Lo      'CRC low post
    CRC16 = ReturnData
    End Function
```

Refer to:

My company's "Applent Instrument Communication Testing Tool" contains Modbus communication debugging methods. Includes CRC-16 calculator.。

The calculate CRC-16 data needs to be append to that end of the instruction frame, Take for example: 1234H:

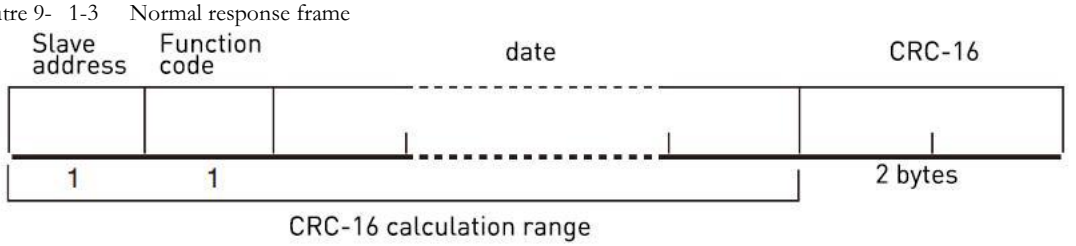
Picture 9- 1-2 Modbus Additional CRC-16 value



9.1.3 Response Frame

Unless it is an instruction broadcast by 00H slave station address, other slave station address instruments will return a response frame.

Picutre 9- 1-3 Normal response frame



Picture 9- 1 Abnormal response frame

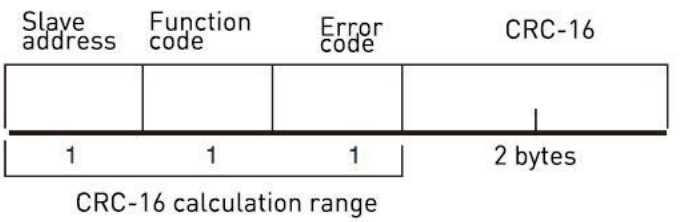


Chart 9- 2 Description of abnormal response frame

Address of slave station	1byte Return from the station address as it is
Function code	1 byte Function code of instruction frame OR BIT7（0x80），Take for example：0x03 ^ 0x80 = 0x83
Error code	Abnormal code： 0x01 Code error（The function code is not supported） 0x02 Register error（Register does not exist） 0x03 Data error 0x04 Execution error
CRC-16	2 bytes, with lower bits first. CyclicRedundancy Check Calculate all the data from the station address to the end of the data to obtain the CRC16 check code.

9.1.4 No response

Under the following circumstances, the instrument will not do any processing or respond, resulting in communication timeout.

1. The slave address is wrong.
2. Transmission error.

3. CRC-16 error
4. Wrong number of digits，Take for example：function code 0x03　Total digits must be 8，While the number of bits received is less than 8 or more than 8 bytes.
5. When the slave station address is 0x00, it represents the broadcast address, and the instrument does not respond.

9.1.5 Error Code

Chart 9- 3 Description error code

Error code	Name	Illustration	Priority
0x01	Code error	Function code does not exist.	1
0x02	Register error	Register does not exist.	2
0x03	Data error	Wrong number of registers or bytes.	3
0x04	Execution error	The data is illegal, and the written data is not within the allowed range.	4

9.2 Function code

The instrument only supports the following function codes, and other function codes will respond to error frames.

Chart 9- 4 Function code

Function code	Name	Illustration
0x03	Read out multiple registers	Read out data of a plurality of consecutive registers.
0x04	Same as 0x03	Use 0x03 instead.
0x08	Echo test	RECEIVE the data of is returned
0x10	Write to multiple registers	Write to multiple consecutive registers

9.3 Register

The number of registers in the instrument is 2-byte mode, that is, 2 bytes must be written at a time，Take for example：The register for speed is 0x3002，the data is 2 bytes, and the value must be written in 0x0001.

Data：

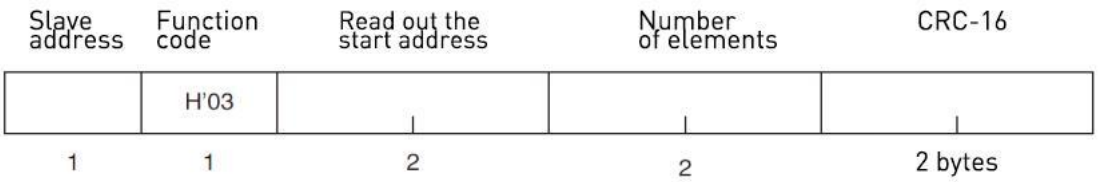
The instrument supports the following numerical values：

1. One register, double-byte (16-bit) integer，Take for example：0x64 → 00 64
2. Two register，four byte (32 bit) integer，Take for example：0x12345678 → 12 34 56 78
3. Two register, four-byte (32-bit) single-precision floating point number, 3.14 → 40 48 F5 C3

Refer to：My company's "Applent Instrument Communication Testing Tool" contains Modbus communication debugging methods. Includes floating-point converter.

9.4 Read out multiple registers

Picture 9- 4-1 Read out multiple registers（0x03）

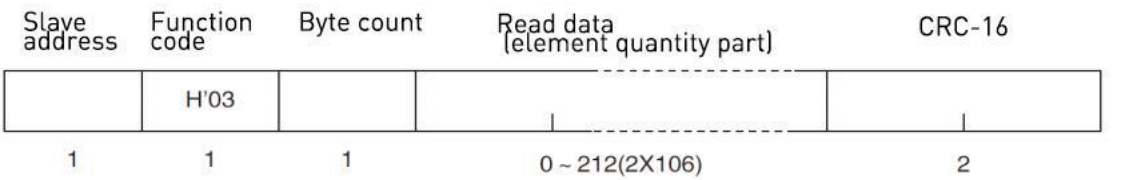


The function codes of the read-out registers are 0x03.

Chart 9- 5 Read out multiple registers

Parameter	Name	Illustration
	Address of slave station	When no RS485 address is specified, the default value is 01.
0x03	Function code	
	Start address	Register start address, please refer to Modbus instruction set.
	Number of read registers 0001~006A（106）	Number of consecutive registers read. Please refer to Modbus instruction set to ensure that these register addresses exist, otherwise an error frame will be returned.
CRC-16	Check code	

Picture 9-4-2 Read out the response frame of multiple registers (0x03)



Parameter	Name	Illustration
	Address of slave station	Return as is
0x03 0x83	Function code	No abnormality：0x03 Error code：0x83
	Number of bytes	=Number of registersx2 Take for example：One register return 02
	Data	Read data
CRC-16	Check code	

9.5 Write to multiple registers

Picture 9-5-1 Write to multiple registers（0x10）

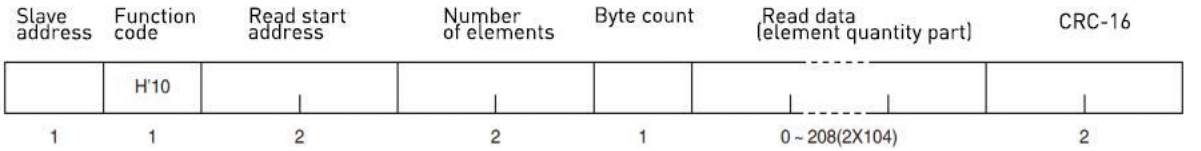
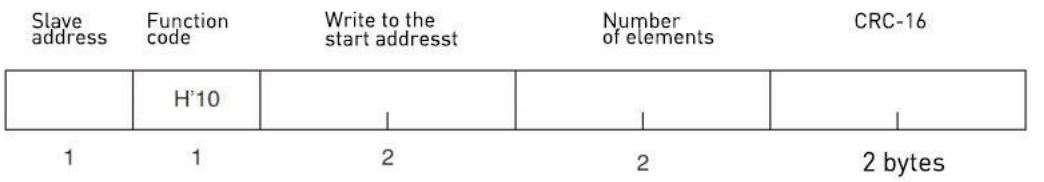


Chart 9- 6 Write to multiple registers

Parameter	Name	Illustration
	Address of slave station	When no RS485 address is specified, the default value is 01.
0x10	Function code	
	Start address	Register start address, please refer to Modbus instruction set.
	Write to multiple register 0001~0068（104）	Number of consecutive registers read. Please refer to Modbus instruction set to ensure that these register addresses exist, otherwise an error frame will be returned.
	Number of bytes	=Number of registers x2
CRC-16	check code	

Picture 9- 5-2 Write multiple registers (0x03) response frame



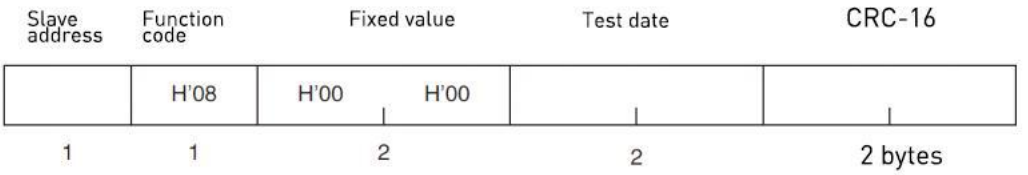
Parameter	Name	Illustration
	Address of slave station	Return as is
0x10 Or 0x90	Function code	No abnormality：0x10 Error code：0x90
	Start address	
	Number of registers	
	CRC-16 check code	

9.6 Echo test

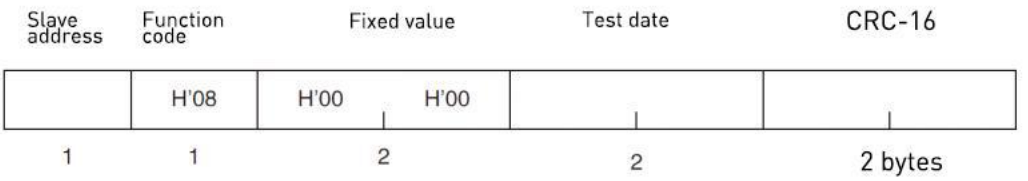
Echo test function code 0x08，Used for debugging Modbus.

Picture 9-6 Echo test（0x08）

Instruction frame



Response frame

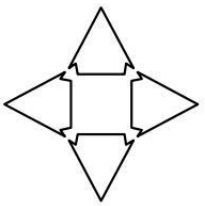


Parameter	Name	Illustration
	Address of slave station	Return as is
0x08	Function code	
	Fixed value	00 00
	Test data	Any numerical value：Take for example 12 34
	CRC-16 check code	

Take for example：

Assume that the test data is 0x1234.：

10. Modbus(RTU) instruction set



You will learn the following in this chapter:

- Register address

Refer to:

Be sure to contact the sales department of our company to obtain the communication test tool of Amber Instrument, which contains Modbus communication debugging method. Includes CRC-16 calculator and floating-point number, which is converted into Modbus floating-point number format.

Note: Unless otherwise specified, the values of instruction and response frames in the following descriptions are hexadecimal data.

10.1 Register overview

The following table contains all register addresses for the instrument, and any address not in the table will return error code 0x02.

Chart 10-1 Register overview

Register address	Name	Data value	Illustration
Battery capacity test			
2000	Battery capacity test switch	0000：Close the test 0001：Start the test	Read and write register, 2-byte integer
2001	Battery capacity file number	0000：File 1 0001：File 2 … 0009：File 10	Read and write register, 2-byte integer
2002	Battery type	0000：Lithium battery 0001：NI-MH battery 0002：Nickel chromium battery 0003：lead-acid cell	Read and write register, 2-byte integer
2003	Battery nominal voltage	4 Byte floating point number	Read and write registers, data occupies 2 registers
2005	Nominal capacity of the battery	4 Byte floating point number	Read and write registers, data occupies 2 registers
2007	Battery charging voltage	4 Byte floating point number	Read and write registers, data occupies 2 registers
2009	Battery charging current	4 Byte floating point number	Read and write registers, data occupies 2 registers
200B	Battery discharge current	4 Byte floating point number	Read and write registers, data occupies 2 registers
200D	Battery cut-off voltage	4 Byte floating point number	Read and write registers, data occupies 2 registers
2010	Battery predischarge	0000：Turn off the pre-discharge 0001：Open the	Read and write register, 2-byte integer

		predischarge	
2011	Number of battery cycles	0001~0x3E7	Read and write register, 2-byte integer
2012	Battery capacity value	4 Byte floating point number	Read-only registers, data occupies 2 registers
Voltage internal resistance test			
2100	Resistance range mode	0000：auto 0001：hold	Read and write register, 2-byte integer
2101	Resistance range number	0000~0005	Read and write register, 2-byte integer
2102	Voltage range	0000：auto 0001：hold	Read and write register, 2-byte integer
2103	Voltage range number	0000~0001	Read and write register, 2-byte integer
2104	Upper limit of resistance	4 Byte floating point number	Read and write registers, data occupies 2 registers
2106	Resistor lower limit	4 Byte floating point number	Read and write registers, data occupies 2 registers
2108	Voltage upper limit	4 Byte floating point number	Read and write registers, data occupies 2 registers
210A	Lower voltage limit	4 Byte floating point number	Read and write registers, data occupies 2 registers
210C	Battery internal resistance value	4 Byte floating point number	Read-only registers, data occupies 2 registers
210E	Battery voltage value	4 Byte floating point number	Read-only registers, data occupies 2 registers
DC load test			
2200	Load test switch	0000：Close the test 0001：Start the test	Read and write register, 2-byte integer
2201	Load test mode	0000：Fixed voltage 0001：Fixed current 0002：Fixed power 0003：Fixed resistance	Read and write register, 2-byte integer
2202	Voltage upper limit	4 Byte floating point number	Read and write registers, data occupies 2 registers
2204	Current upper limit	4 Byte floating point number	Read and write registers, data occupies 2 registers
2206	Power upper limit	4 Byte floating point number	Read and write registers, data occupies 2 registers
2208	Voltage set value	4 Byte floating point number	Read and write registers, data occupies 2 registers
220A	Current setting value	4 Byte floating point number	Read and write registers, data occupies 2 registers
220C	Power set value	4 Byte floating point number	Read and write registers, data occupies 2 registers
220E	Resistor setting value	4 Byte floating point number	Read and write registers, data occupies 2 registers
2210	Load voltage value	4 Byte floating point number	Read-only registers, data occupies 2 registers
2212	Load current value	4 Byte floating point number	Read-only registers, data occupies 2 registers
2214	Load power value	4 Byte floating point number	Read-only registers, data occupies 2 registers
2216	Load resistance value	4 Byte floating point number	Read-only registers, data occupies 2 registers
DC power supply test			
2300	Power test switch	0000：Close the test 0001：Start the test	Read and write register, 2-byte integer
2302	Power supply Output voltage value	4 Byte floating point number	Read and write registers, data occupies 2 registers

2304	Power supply output current value	4 Byte floating point number	Read and write registers, data occupies 2 registers
2306	Power voltage value	4 Byte floating point number	Read-only registers, data occupies 2 registers
2308	Power current value	4 Byte floating point number	Read-only registers, data occupies 2 registers
230A	Power value of power supply	4 Byte floating point number	Read-only registers, data occupies 2 registers
230C	Power resistance value	4 Byte floating point number	Read-only registers, data occupies 2 registers
synthetic test			
2400	Group test switch	0000：Close the test 0001：Start the test	Read and write register, 2-byte integer
2401	Group test files	0000：Group 1 0001：Group 2 … 0009：Group 10	Read and write register, 2-byte integer
2402	Group set of test battery type	0000：lithium battery 0001：NI-MH battery 0002：Nickel chromium battery 0003：Lead-acid cell	Read and write register, 2-byte integer
2404	Group to test for the nominal voltage	4 Byte floating point number	Read and write registers, data occupies 2 registers
2408	Group test for nominal capacity	4 Byte floating point number	Read and write registers, data occupies 2 registers
240A	Group test mode	0000：continuous 0001：single step	Read and write register, 2-byte integer
240B	Total number of cluster test steps	0001~0x14	Read and write register, 2-byte integer
240C	Group to test for the current number of steps	0000~0x13	Read and write register, 2-byte integer
2410	Group to test for the charging voltage	4 Byte floating point number	Read and write registers, data occupies 2 registers
2412	Cluster test for the starting current	4 Byte floating point number	Read and write registers, data occupies 2 registers
2414	Group test cut-off current	4 Byte floating point number	Read and write registers, data occupies 2 registers
2416	Group test for stepping current	4 Byte floating point number	Read and write registers, data occupies 2 registers
2418	Group test time	4 Byte floating point number	Read and write registers, data occupies 2 registers
241A	Upper limit of the cluster test voltage	4 Byte floating point number	Read and write registers, data occupies 2 registers
241C	The lower limit of the cluster test voltage	4 Byte floating point number	Read and write registers, data occupies 2 registers
241E	Upper limit of the cluster test current	4 Byte floating point number	Read and write registers, data occupies 2 registers
2420	Lower limit of the cluster test current	4 Byte floating point number	Read and write registers, data occupies 2 registers
2422	The upper limit of the cluster test resistance	4 Byte floating point number	Read and write registers, data occupies 2 registers
2424	Lower limit of the cluster test resistance	4 Byte floating point number	Read and write registers, data occupies 2 registers
2426	Upper limit of the cluster test time	4 Byte floating point number	Read and write registers, data occupies 2 registers
2428	Lower limit of the cluster testing time	4 Byte floating point number	Read and write registers, data occupies 2 registers
242A	The way that the groups test the	0000：auto	Read and write register, 2-byte integer

	voltage range	0001：hold	
242B	Group test voltage range number	0000~0001	Read and write register, 2-byte integer
242C	Group test resistance range mode	0000：auto 0001：hold	Read and write register, 2-byte integer
242D	Group test resistance range number	0000~0005	Read and write register, 2-byte integer
242E	Group testing function	0000：NULL 0001：Battery activation 0002：Voltage internal resistance 0003：Charging test 0004：Overcharge test 0005：DC internal resistance 0006：Discharge test 0007：Over-put test 0008：Short circuit test 0009：recovery testing	Read and write register, 2-byte integer
2430	Group test voltage value	4 Byte floating point number	Read-only registers, data occupies 2 registers
2432	Group test current value	4 Byte floating point number	Read-only registers, data occupies 2 registers
2434	Group test resistance values	4 Byte floating point number	Read-only registers, data occupies 2 registers
2436	Group test time value	4 Byte floating point number	Read-only registers, data occupies 2 registers
Basic Settings			
3000	Function Settings	0000：Voltage internal resistance 0001：DC load 0002：direct-current main 0003：battery capacity 0004：Group testing	Read and write register, 2-byte integer
3001	The buzzer setting	0000：close 0001：open	Read and write register, 2-byte integer
3002	Disqualified stop	0000：close 0001：open	Read and write register, 2-byte integer

10.2 **Battery capacity register**

10.2.1 Battery capacity test status register【2000】

read-in

1	2	3	4	5	6	7	8	9	10	11
01	**10**	**20**	**00**	**00**	**01**	**02**	**00**	**01**	**46**	**52**
	write	register		Number of registers		byte	data		CRC	

respond:

1	2	3	4	5	6	7	8
01	**10**	**20**	**00**	**00**	**01**	**0A**	**09**
		register		Number of registers		CRC	

From B8 to B9 are the test status data: 0001 = 1 , At this time, the instrument test status is under test.

read and fetch

1	2	3	4	5	6	7	8
01	**03**	**20**	**00**	**00**	**01**	**8F**	**CA**
	read	register		Number of registers		CRC	

respond:

1	2	3	4	5	6	7
01	**03**	**02**	**00**	**01**	**79**	**84**
01	03	byte	data		CRC-16	

10.2.2 Battery capacity file number register【2001】

write in

1	2	3	4	5	6	7	8	9	10	11
01	**10**	**20**	**01**	**00**	**01**	**02**	**00**	**01**	**47**	**83**
	write	register		Number of registers		byte	data		CRC	

respond:

1	2	3	4	5	6	7	8
01	**10**	**20**	**01**	**00**	**01**	**5B**	**C9**
		register		Number of registers		CRC	

From B8 to B9 are the file number data: 0001 = 1 , the file displayed in the instrument is named FILE 1.

Read and fetch

1	2	3	4	5	6	7	8
01	**03**	**20**	**01**	**00**	**01**	**DE**	**0A**
	read	register		Number of registers		CRC	

respond:

1	2	3	4	5	6	7
01	**03**	**02**	**00**	**01**	**79**	**84**
01	03	byte	data		CRC-16	

10.2.3 Battery capacity Battery type register【2002】

Read-in

1	2	3	4	5	6	7	8	9	10	11
01	**10**	**20**	**02**	**00**	**01**	**02**	**00**	**00**	**86**	**70**
	write	register		Number of registers		byte	data		CRC	

respond:

1	2	3	4	5	6	7	8
01	**10**	**20**	**02**	**00**	**01**	**AB**	**C9**
		register		Number of registers		CRC	

From B8 to B9 are the battery type data: 0000 = 0 , at this time, the battery type of the instrument is the lithium battery.

Read and fetch

1	2	3	4	5	6	7	8
01	**03**	**20**	**02**	**00**	**01**	**2E**	**0A**
	read	register		Number of registers		CRC	

respond:

1	2	3	4	5	6	7
01	**03**	**02**	**00**	**00**	**B8**	**44**
01	03	byte	data		CRC-16	

10.2.4 Battery nominal voltage register【2003】

Write in

1	2	3	4	5	6	7	8	9	10	11	12	13
01	**10**	**20**	**03**	**00**	**02**	**04**	**41**	**10**	**00**	**00**	**3F**	**82**
	write	register		Number of registers		byte	data				CRC	

respond:

1	2	3	4	5	6	7	8
01	**10**	**20**	**03**	**00**	**02**	**BA**	**08**
		register		Number of registers		CRC	

From B8 to B11 sets the data for the nominal voltage: 41100000 = 9.0 , at this point, the nominal voltage is set to 9.0V.

Read and fetch

1	2	3	4	5	6	7	8
01	**03**	**20**	**03**	**00**	**02**	**3F**	**CB**
	read	register		Number of registers		CRC	

respond:

1	2	3	4	5	6	7	8	9
01	**03**	**04**	**41**	**10**	**00**	**00**	**EF**	**CA**
01	03	byte	Single precision floating point number				CRC-16	

10.2.5 Battery nominal capacity state register【2005】

Write in

1	2	3	4	5	6	7	8	9	10	11	12	13
01	**10**	**20**	**05**	**00**	**02**	**04**	**3D**	**CC**	**CC**	**CD**	**F3**	**57**
	write	register		Number of registers		byte	data				CRC	

respond:

1	2	3	4	5	6	7	8
01	**10**	**20**	**05**	**00**	**02**	**5A**	**09**
		register		Number of registers		CRC	

From B8 to B11 sets the data for the nominal capacity: 3DCCCCCD = 0.1 , the nominal capacity of the instrument is set to 0.1 AH.

Read and fetch

1	2	3	4	5	6	7	8
01	**03**	**20**	**05**	**00**	**02**	**DF**	**CA**
	read	register		Number of registers		CRC	

respond:

1	2	3	4	5	6	7	8	9
01	**03**	**04**	**3D**	**CC**	**CC**	**CD**	**A3**	**35**
01	03	byte	Single precision floating point number				CRC-16	

10.2.6 Battery charging voltage register【2007】

Write in

1	2	3	4	5	6	7	8	9	10	11	12	13
01	**10**	**20**	**07**	**00**	**02**	**04**	**41**	**10**	**00**	**00**	**3E**	**71**
	write	register		Number of registers		byte	data				CRC	

repond:

1	2	3	4	5	6	7	8
01	**10**	**20**	**07**	**00**	**02**	**FB**	**C9**
		register		Number of registers		CRC	

From B8 to B11 is the charging voltage data: 41100000 = 9.0 , at this time, the instrument charging voltage is set to 9.0V.

Read and fetch

1	2	3	4	5	6	7	8
01	**03**	**20**	**07**	**00**	**02**	**7E**	**0A**
	read	register		Number of registers		CRC	

respond:

1	2	3	4	5	6	7	8	9
01	**03**	**04**	**41**	**10**	**00**	**00**	**EF**	**CA**
01	03	byte	Single precision floating point number				CRC-16	

10.2.7 Battery charge current register【2009】

Write in

1	2	3	4	5	6	7	8	9	10	11	12	13
01	**10**	**20**	**09**	**00**	**02**	**04**	**3F**	**00**	**00**	**00**	**A6**	**10**
	write	register		Number of registers		byte	data				CRC	

respond:

1	2	3	4	5	6	7	8
01	**10**	**20**	**09**	**00**	**02**	**9A**	**0A**
		register		Number of registers		CRC	

From B8 to B11 sets the data for the charging current: 3F000000 = 0.5 , at this time, the instrument charging current is set to 0.5A.

Read and fetch

1	2	3	4	5	6	7	8
01	**03**	**20**	**09**	**00**	**02**	**1F**	**C9**
	read	register		Number of registers		CRC	

respond:

1	2	3	4	5	6	7	8	9
01	**03**	**04**	**3F**	**00**	**00**	**00**	**F6**	**27**
01	03	byte	Single precision floating point number				CRC-16	

10.2.8 Battery discharge current register【200B】

Write in

1	2	3	4	5	6	7	8	9	10	11	12	13
01	**10**	**20**	**0B**	**00**	**02**	**04**	**3F**	**00**	**00**	**00**	**27**	**C9**
	write	register		Number of registers		byte	data				CRC	

respond:

1	2	3	4	5	6	7	8
01	**10**	**20**	**0B**	**00**	**02**	**3B**	**CA**
		register		Number of registers		CRC	

From B8 to B11 are the discharge current setting data: 3F000000 = 0.5 , at this time, the instrument discharge current is set to 0.5A.

Read and fetch

1	2	3	4	5	6	7	8
01	**03**	**20**	**0B**	**00**	**02**	**BE**	**09**
	read	register		Number of registers		CRC	

respond:

1	2	3	4	5	6	7	8	9
01	**03**	**04**	**3F**	**00**	**00**	**00**	**F6**	**27**
01	03	byte	Single precision floating point number				CRC-16	

10.2.9 Battery cutoff voltage register【200D】

Write in

1	2	3	4	5	6	7	8	9	10	11	12	13
01	**10**	**20**	**0D**	**00**	**02**	**04**	**41**	**00**	**00**	**00**	**BF**	**CB**
	write	register		Number of registers		byte	data				CRC	

respond:

1	2	3	4	5	6	7	8
01	**10**	**20**	**0D**	**00**	**02**	**DB**	**CB**
		register		Number of registers		CRC	

From B8 to B11 sets the cut-off voltage data: 41000000 = 8.0 , the instrument cut-off voltage is set at 8.0V.

Read and fetch

1	2	3	4	5	6	7	8
01	**03**	**20**	**0D**	**00**	**02**	**5E**	**08**
	read	register		Number of registers		CRC	

respond:

1	2	3	4	5	6	7	8	9
01	**03**	**04**	**41**	**00**	**00**	**00**	**EE**	**0F**
01	03	byte	Single precision floating point number				CRC-16	

10.2.10 Battery capacity pre-discharge register【2010】

Write in

1	2	3	4	5	6	7	8	9	10	11
01	**10**	**20**	**10**	**00**	**01**	**02**	**00**	**01**	**44**	**C2**
	write	register		Number of registers		byte	data		CRC	

respond:

1	2	3	4	5	6	7	8
01	**10**	**20**	**10**	**00**	**01**	**0B**	**CC**
		register		Number of registers		CRC	

From B8 to B9 are the pre-discharge data: 0001 = 1 , the instrument pre-discharge is set to open.

Read and fetch

1	2	3	4	5	6	7	8
01	**03**	**20**	**10**	**00**	**01**	**8E**	**0F**
	read	register		Number of registers		CRC	

respond:

1	2	3	4	5	6	7
01	**03**	**02**	**00**	**01**	**79**	**84**
01	03	byte	data		CRC-16	

10.2.11 Battery capacity cycle number register【2011】

Write in

1	2	3	4	5	6	7	8	9	10	11
01	**10**	**20**	**11**	**00**	**01**	**02**	**00**	**01**	**45**	**13**
	write	register		Number of registers		byte	data		CRC	

respond:

1	2	3	4	5	6	7	8
01	**10**	**20**	**11**	**00**	**01**	**5A**	**0C**
		register		Number of registers		CRC	

From B8 to B9 are the cycle number data：0001 = 1 , at this time, the instrument cycle number is 1 time.

Read and fetch

1	2	3	4	5	6	7	8
01	**03**	**20**	**11**	**00**	**01**	**DF**	**CF**
	read	register		Number of registers		CRC	

respond:

1	2	3	4	5	6	7
01	**03**	**02**	**00**	**01**	**79**	**84**
01	03	byte	data		CRC-16	

10.2.12 Battery Capacity test result register【2012】

Read and fetch

1	2	3	4	5	6	7	8
01	**03**	**20**	**12**	**00**	**02**	**6F**	**CE**
	read	register		Number of registers		CRC	

respond:

1	2	3	4	5	6	7	8	9
01	**03**	**04**	**3D**	**CC**	**CC**	**CD**	**A3**	**35**
01	03	byte	Single precision floating point number				CRC-16	

From B4 to B7 are the battery capacity data tested：3DCCCCCD = 0.1 , the capacity value was 0.1 AH.

10.3 Voltage internal resistance test register

10.3.1 Resistance range mode register【2100】

Write in

1	2	3	4	5	6	7	8	9	10	11
01	**10**	**21**	**00**	**00**	**01**	**02**	**00**	**00**	**97**	**52**
	write	register		Number of registers		byte	data		CRC	

respond:

1	2	3	4	5	6	7	8
01	**10**	**21**	**00**	**00**	**01**	**0B**	**F5**
		register		Number of registers		CRC	

From B8 to B9 are the resistance range mode data: 0000 = 0 , the resistance range mode is automatic.

Read and fetch

1	2	3	4	5	6	7	8
01	**03**	**21**	**00**	**00**	**01**	**8E**	**36**
	read	register		Number of registers		CRC	

respond:

1	2	3	4	5	6	7
01	**03**	**02**	**00**	**00**	**B8**	**44**
01	03	byte	data		CRC-16	

10.3.2 Resistance range number register【2101】

Write in

1	2	3	4	5	6	7	8	9	10	11
01	**10**	**21**	**01**	**00**	**01**	**02**	**00**	**00**	**96**	**83**
	write	register		Number of registers		byte	data		CRC	

respond:

1	2	3	4	5	6	7	8
01	**10**	**21**	**01**	**00**	**01**	**5A**	**35**
		register		Number of registers		CRC	

From B8 to B9 are the resistance range mode data: 0000 = 0 , the resistance range mode is automatic.

Read and fetch

1	2	3	4	5	6	7	8
01	**03**	**21**	**00**	**00**	**01**	**DF**	**F6**
	read	register		Number of registers		CRC	

respond:

1	2	3	4	5	6	7
01	**03**	**02**	**00**	**00**	**B8**	**44**
01	03	byte	data		CRC-16	

10.3.3 Voltage-range mode register【2102】

Write in

1	2	3	4	5	6	7	8	9	10	11
01	**10**	**21**	**02**	**00**	**01**	**02**	**00**	**00**	**96**	**B0**
	write	register		Number of registers		byte	data		CRC	

respond:

1	2	3	4	5	6	7	8
01	**10**	**21**	**02**	**00**	**01**	**AA**	**35**
		register		Number of registers		CRC	

From B8 to B9 are the voltage range mode data: 0000 = 0 , the voltage range mode is automatic

Read and fetch

1	2	3	4	5	6	7	8
01	**03**	**21**	**02**	**00**	**01**	**2F**	**F6**
	read	register		Number of registers		CRC	

respond:

1	2	3	4	5	6	7
01	**03**	**02**	**00**	**00**	**B8**	**44**
01	03	byte	data		CRC-16	

10.3.4 Voltage and range number register【2103】

Write in

1	2	3	4	5	6	7	8	9	10	11
01	**10**	**21**	**03**	**00**	**01**	**02**	**00**	**00**	**97**	**61**
	write	register		Number of registers		byte	data		CRC	

respond:

1	2	3	4	5	6	7	8
01	**10**	**21**	**03**	**00**	**01**	**FB**	**F5**
		register		Number of registers		CRC	

From B8 to B9 are the voltage range mode data: 0000 = 0 , the voltage range mode is automatic.

Read and fetch

1	2	3	4	5	6	7	8
01	**03**	**21**	**03**	**00**	**01**	**7E**	**36**
	read	register		Number of registers		CRC	

respond:

1	2	3	4	5	6	7
01	**03**	**02**	**00**	**00**	**B8**	**44**
01	03	byte	data		CRC-16	

10.3.5 Upper resistance limit register【2104】

Write in

1	2	3	4	5	6	7	8	9	10	11	12	13
01	**10**	**21**	**04**	**00**	**02**	**04**	**43**	**96**	**00**	**00**	**93**	**A5**
	write	register		Number of registers		byte	data				CRC	

respond:

1	2	3	4	5	6	7	8
01	**10**	**21**	**04**	**00**	**02**	**0A**	**35**
		register		Number of registers		CRC	

From B8 to B11 set data for upper resistance: 43960000 = 300.0 , at this time, the upper resistance limit of the instrument is set to 300.0Ω.

Read and fetch:

1	2	3	4	5	6	7	8
01	**03**	**21**	**04**	**00**	**02**	**8F**	**F6**
	read	register		Number of registers		CRC	

respond:

1	2	3	4	5	6	7	8	9
01	**03**	**04**	**43**	**96**	**00**	**00**	**0F**	**9B**
01	03	byte	Single precision floating point number				CRC-16	

10.3.6 Lower resistance register【2106】

Write in

1	2	3	4	5	6	7	8	9	10	11	12	13
01	**10**	**21**	**06**	**00**	**02**	**04**	**3A**	**83**	**12**	**6F**	**56**	**68**
	write	register		Number of registers		byte	data				CRC	

respond:

1	2	3	4	5	6	7	8
01	**10**	**21**	**06**	**00**	**02**	**AB**	**F5**
		register		Number of registers		CRC	

From B8-B11 set the data for the lower resistance limit: 3A83126F = 0.001 , the lower limit of the instrument resistance is set to 1mΩ.

Read and fetch:

1	2	3	4	5	6	7	8
01	**03**	**21**	**06**	**00**	**02**	**2E**	**36**
	read	register		Number of registers		CRC	

respond:

1	2	3	4	5	6	7	8	9
01	**03**	**04**	**3A**	**83**	**12**	**6F**	**4B**	**8F**
01	03	byte	Single precision floating point number				CRC-16	

10.3.7 Upper-voltage limit register【2108】

Write in

1	2	3	4	5	6	7	8	9	10	11	12	13
01	**10**	**21**	**08**	**00**	**02**	**04**	**41**	**F0**	**00**	**00**	**72**	**57**
	write	register		Number of registers		byte	data				CRC	

respond:

1	2	3	4	5	6	7	8
01	**10**	**21**	**08**	**00**	**02**	**CA**	**36**
		register		Number of registers		CRC	

From B8 to B11 set the data for the upper voltage limit: 40F00000 = 30.0 , the upper voltage limit of the instrument is set at 30.0V.

Read and fetch:

1	2	3	4	5	6	7	8
01	**03**	**21**	**08**	**00**	**02**	**4F**	**F5**
	read	register		Number of registers		CRC	

respond:

1	2	3	4	5	6	7	8	9
01	**03**	**04**	**3F**	**00**	**00**	**00**	**EE**	**3C**
01	03	byte	Single precision floating point number				CRC-16	

10.3.8 Lower-voltage limit register【210A】

write

1	2	3	4	5	6	7	8	9	10	11	12	13
01	**10**	**21**	**0A**	**00**	**02**	**04**	**3F**	**80**	**00**	**00**	**EA**	**7D**
	write	register		Number of registers		byte	data				CRC	

respond:

1	2	3	4	5	6	7	8
01	**10**	**21**	**0A**	**00**	**02**	**6B**	**F6**
		register		Number of registers		CRC	

From B8 to B11 sets the data for the lower voltage limit: 3F800000 = 1.0 , the lower voltage limit of the instrument is set to 1.0V.

Read and fetch:

1	2	3	4	5	6	7	8
01	**03**	**21**	**0A**	**00**	**02**	**EE**	**35**
	read	register		Number of registers		CRC	

respond:

1	2	3	4	5	6	7	8	9
01	**03**	**04**	**3F**	**80**	**00**	**00**	**F7**	**CF**
01	03	byte	Single precision floating point number				CRC-16	

10.3.9 Resistance test result register【210C】

Read and fetch:

1	2	3	4	5	6	7	8
01	**03**	**21**	**0C**	**00**	**02**	**0E**	**34**
	read	register		Number of registers		CRC	

respond:

1	2	3	4	5	6	7	8	9
01	**03**	**04**	**3C**	**23**	**D7**	**0A**	**D8**	**5E**
01	03	byte	Single precision floating point number				CRC-16	

From B4 to B7 are the resistance test data tested: 3C23D70A = 0.01 , the resistance value was 0.01Ω.

10.3.10 Voltage test result register【210E】

Read and fetch:

1	2	3	4	5	6	7	8
01	**03**	**21**	**0E**	**00**	**02**	**AF**	**F4**
	read	register		Number of registers		CRC	

respond:

1	2	3	4	5	6	7	8	9
01	**03**	**04**	**41**	**10**	**00**	**00**	**EF**	**CA**
01	03	byte	Single precision floating point number				CRC-16	

From B4 to B7 are the resistance test data tested: 3C23D70A = 0.01 , the resistance value was 0.01Ω.

10.4 The DC load test register

10.4.1 Load test status register【2200】

Write in

1	2	3	4	5	6	7	8	9	10	11
01	**10**	**22**	**00**	**00**	**01**	**02**	**00**	**01**	**65**	**92**
	write	Number of registers		register		byte	data		CRC	

respond:

1	2	3	4	5	6	7	8
01	**10**	**22**	**00**	**00**	**01**	**0B**	**B1**
		register		Number of registers		CRC	

From B8 to B9 are the test status data: 0001 = 1 , at this time, the instrument test status is under test.

Read and fetch:

1	2	3	4	5	6	7	8
01	**03**	**22**	**00**	**00**	**01**	**8E**	**72**
	read	register		Number of registers		CRC	

respond:

1	2	3	4	5	6	7
01	**03**	**02**	**00**	**01**	**79**	**84**
01	03	byte	data		CRC-16	

10.4.2 Load test mode register【2201】

Write in

1	2	3	4	5	6	7	8	9	10	11
01	**10**	**22**	**01**	**00**	**01**	**02**	**00**	**00**	**A5**	**83**
	write	Number of registers		register		byte	data		CRC	

respond:

1	2	3	4	5	6	7	8
01	**10**	**22**	**01**	**00**	**01**	**5A**	**71**
		register		Number of registers		CRC	

From B 8 to B 9 is the test mode: 0000 = 0 , now the instrument test mode is the fixed voltage.

Read and fetch:

1	2	3	4	5	6	7	8
01	**03**	**22**	**01**	**00**	**01**	**DF**	**B2**
	read	register		Number of registers		CRC	

respond:

1	2	3	4	5	6	7
01	**03**	**02**	**00**	**00**	**B8**	**44**
01	03	byte	data		CRC-16	

10.4.3 Upper-voltage limit register【2202】

Write in

1	2	3	4	5	6	7	8	9	10	11	12	13
01	**10**	**22**	**02**	**00**	**02**	**04**	**41**	**F0**	**00**	**00**	**E6**	**D8**
	write	register		Number of registers		byte	data				CRC	

respond:

1	2	3	4	5	6	7	8
01	**10**	**22**	**02**	**00**	**02**	**EA**	**70**
		register		Number of registers		CRC	

From B8 to B11 set the data for the upper voltage limit: 40F00000 = 30.0 , the upper voltage limit of the instrument is set at 30.0V.

Read and fetch:

1	2	3	4	5	6	7	8
01	**03**	**22**	**02**	**00**	**02**	**6F**	**B3**
	read	register		Number of registers		CRC	

respond:

1	2	3	4	5	6	7	8	9
01	**03**	**04**	**41**	**F0**	**00**	**00**	**EE**	**3C**
01	03	byte	Single precision floating point number				CRC-16	

10.4.4 Current upper limit register【2204】

Write in

1	2	3	4	5	6	7	8	9	10	11	12	13
01	**10**	**22**	**04**	**00**	**02**	**04**	**41**	**70**	**00**	**00**	**67**	**1A**
	write	register		Number of registers		byte	data				CRC	

respond:

1	2	3	4	5	6	7	8
01	**10**	**22**	**04**	**00**	**02**	**0A**	**71**
		register		Number of registers		CRC	

From B8 to B11 set the data for the upper current limit: 41700000 = 15.0 , the upper current limit of the instrument is set at 15.0A.

Read and fetch:

1	2	3	4	5	6	7	8
01	**03**	**22**	**04**	**00**	**02**	**8F**	**B2**
	read	register		Number of registers		CRC	

respond:

1	2	3	4	5	6	7	8	9
01	**03**	**04**	**41**	**70**	**00**	**00**	**EF**	**D4**
01	03	byte	Single precision floating point number				CRC-16	

10.4.5 Power limit register【2206】

Write in

1	2	3	4	5	6	7	8	9	10	11	12	13
01	**10**	**22**	**06**	**00**	**02**	**04**	**42**	**C8**	**00**	**00**	**66**	**A2**
	write	register		Number of registers		byte	data				CRC	

respond:

1	2	3	4	5	6	7	8
01	**10**	**22**	**06**	**00**	**02**	**AB**	**B1**
		register		Number of registers		CRC	

From B8 to B11 sets the data for the upper power limit: 42C80000 = 1000.0 , the upper power limit of the instrument is set at 100.0W.

Read and fetch:

1	2	3	4	5	6	7	8
01	**03**	**22**	**06**	**00**	**02**	**2E**	**72**
	read	register		Number of registers		CRC	

respond:

1	2	3	4	5	6	7	8	9
01	**03**	**04**	**42**	**C8**	**00**	**00**	**6F**	**B5**
01	03	byte	Single precision floating point number				CRC-16	

10.4.6 Voltage setting value register【2208】

Write in

1	2	3	4	5	6	7	8	9	10	11	12	13
01	**10**	**22**	**08**	**00**	**02**	**04**	**41**	**F0**	**00**	**00**	**66**	**A7**
	write	register		Number of registers		byte	data				CRC	

respond:

1	2	3	4	5	6	7	8
01	**10**	**22**	**08**	**00**	**02**	**CA**	**72**
		register		Number of registers		CRC	

From B8 to B11 set the data for the load voltage setting value：41F00000 = 30.0 ,the instrument load is 30.0V.

Read and fetch:

1	2	3	4	5	6	7	8
01	**03**	**22**	**08**	**00**	**02**	**4F**	**B1**
	read	register		Number of registers		CRC	

respond:

1	2	3	4	5	6	7	8	9
01	**03**	**04**	**41**	**F0**	**00**	**00**	**EE**	**3C**
01	03	byte	Single precision floating point number				CRC-16	

10.4.7 Current setting point register【220A】

Write in

1	2	3	4	5	6	7	8	9	10	11	12	13
01	**10**	**22**	**0A**	**00**	**02**	**04**	**3F**	**80**	**00**	**00**	**FE**	**8D**
	write	register		Number of registers		byte	data				CRC	

respond:

1	2	3	4	5	6	7	8
01	**10**	**22**	**0A**	**00**	**02**	**6B**	**B2**
		register		Number of registers		CRC	

Frome B8 to B11 sets the data for the load current setting value：3F800000 = 1.0 , the instrument load setting value is 1.0A.

Read and fetch:

1	2	3	4	5	6	7	8
01	**03**	**22**	**0A**	**00**	**02**	**EE**	**71**
	read	register		Number of registers		CRC	

respond:

1	2	3	4	5	6	7	8	9
01	**03**	**04**	**3F**	**80**	**00**	**00**	**F7**	**CF**
01	03	byte	Single precision floating point number				CRC-16	

10.4.8 The Power Setpoint register【220C】

Write in

1	2	3	4	5	6	7	8	9	10	11	12	13
01	**10**	**22**	**0C**	**00**	**02**	**04**	**42**	**C8**	**00**	**00**	**E6**	**DD**
	write	register		Number of registers		byte	data				CRC	

respond:

1	2	3	4	5	6	7	8
01	**10**	**22**	**0C**	**00**	**02**	**8B**	**B3**
		register		Number of registers		CRC	

From B8 to B11 sets the data for the load power setting value: 42C80000 = 100.0 , the instrument load is 100.0W.

Read and fetch:

1	2	3	4	5	6	7	8
01	**03**	**22**	**0C**	**00**	**02**	**0E**	**70**
	read	register		Number of registers		CRC	

respond:

1	2	3	4	5	6	7	8	9
01	**03**	**04**	**42**	**C8**	**00**	**00**	**6F**	**B5**
01	03	byte	Single precision floating point number				CRC-16	

10.4.9 Resistance setpoint register【220E】

Write in

1	2	3	4	5	6	7	8	9	10	11	12	13
01	**10**	**22**	**0E**	**00**	**02**	**04**	**44**	**7A**	**00**	**00**	**C7**	**AB**
	write	register		Number of registers		byte	data				CRC	

respond:

1	2	3	4	5	6	7	8
01	**10**	**22**	**0E**	**00**	**02**	**2A**	**73**
		register		Number of registers		CRC	

From B8 to B11 sets the data for the load resistance settings: 447A0000 = 1000.0 , at this point, the instrument load set value is 1000.0 Ω.

Read and fetch:

1	2	3	4	5	6	7	8
01	**03**	**22**	**0E**	**00**	**02**	**AF**	**B0**
	read	register		Number of registers		CRC	

respond:

1	2	3	4	5	6	7	8	9
01	**03**	**04**	**44**	**7A**	**00**	**00**	**CF**	**1A**
01	03	byte	Single precision floating point number				CRC-16	

10.4.10 Voltage result register【2210】

Read and fetch:

1	2	3	4	5	6	7	8
01	**03**	**22**	**0A**	**00**	**02**	**CF**	**B6**
	read	register		Number of registers		CRC	

respond:

1	2	3	4	5	6	7	8	9
01	**03**	**04**	**41**	**F0**	**00**	**00**	**EE**	**3C**
01	03	byte	Single precision floating point number				CRC-16	

From B4 to B7 are the voltage test data：41F00000 = 30.0 , the voltage value is 30V.

10.4.11 Current result register【2212】

Read and fetch:

1	2	3	4	5	6	7	8
01	**03**	**22**	**12**	**00**	**02**	**6E**	**76**
	read	register		Number of registers		CRC	

respond:

1	2	3	4	5	6	7	8	9
01	**03**	**04**	**3F**	**80**	**00**	**00**	**F7**	**CF**
01	03	byte	Single precision floating point number				CRC-16	

From B4 to B7 are the current test data of the test： 3F800000 = 1.0 , the current value is 1.0A.

10.4.12 Power result register【2214】

Read and fetch:

1	2	3	4	5	6	7	8
01	**03**	**22**	**14**	**00**	**02**	**8E**	**77**
	read	register		Number of registers		CRC	

respond:

1	2	3	4	5	6	7	8	9
01	**03**	**04**	**41**	**20**	**00**	**00**	**EF**	**C5**
01	03	byte	Single precision floating point number				CRC-16	

From B4 to B7 are the power test data tested：41200000 = 10.0 , the power value is set at 10W.

10.4.13 Resistance result register【2216】

Read and fetch:

1	2	3	4	5	6	7	8
01	**03**	**22**	**16**	**00**	**02**	**2F**	**B7**
	read	register		Number of registers		CRC	

respond:

1	2	3	4	5	6	7	8	9
01	**03**	**04**	**41**	**10**	**00**	**00**	**EF**	**CA**
01	03	byte	Single precision floating point number				CRC-16	

From B4 to B7 are the resistance test data tested： 41F00000 = 9.0Ω , the resistance value was 9Ω.

10.5 The DC power supply test register

10.5.1 Power supply test status register【2300】

Write in

1	2	3	4	5	6	7	8	9	10	11
01	**10**	**23**	**00**	**00**	**01**	**02**	**00**	**01**	**75**	**52**
	write	Number of registers		register		byte	data		CRC	

respond:

1	2	3	4	5	6	7	8
01	**10**	**23**	**00**	**00**	**01**	**0A**	**4D**
		register		Number of registers		CRC	

From B8 to B9 are the test status data：0001 = 1 , at this time, the instrument test status is under test.

Read and fetch:

1	2	3	4	5	6	7	8
01	**03**	**23**	**00**	**00**	**01**	**8F**	**8E**
	read	register		Number of registers		CRC	

respond:

1	2	3	4	5	6	7
01	**03**	**02**	**00**	**01**	**79**	**84**
01	03	byte	data		CRC-16	

10.5.2 Voltage output register【2302】

Write in

1	2	3	4	5	6	7	8	9	10	11	12	13
01	**10**	**23**	**02**	**00**	**02**	**04**	**41**	**10**	**00**	**00**	**EA**	**BE**
	write	register		Number of registers		byte	data				CRC	

respond:

1	2	3	4	5	6	7	8
01	**10**	**23**	**02**	**00**	**02**	**EB**	**8C**
		register		Number of registers		CRC	

From B8 to B11 sets the data for the voltage output：41100000 = 9.0 , at this point, the instrument voltage output is set to 9.0V.

Read and fetch:

1	2	3	4	5	6	7	8
01	**03**	**23**	**02**	**00**	**02**	**6E**	**4F**
	read	register		Number of registers		CRC	

respond：

1	2	3	4	5	6	7	8	9
01	**03**	**04**	**41**	**10**	**00**	**00**	**EF**	**CA**
01	03	byte	Single precision floating point number				CRC-16	

10.5.3 Current output register【2304】

Write in

1	2	3	4	5	6	7	8	9	10	11	12	13
01	**10**	**23**	**04**	**00**	**02**	**04**	**3F**	**80**	**00**	**00**	**72**	**91**
	write	register		Number of registers		byte	data				CRC	

respond：

1	2	3	4	5	6	7	8
01	**10**	**23**	**02**	**00**	**02**	**0B**	**8D**
		register		Number of registers		CRC	

From B8 to B11 sets the data for the current output：3F800000 = 1.0 , at this point, the instrument current output is set to 1.0A.

Read and fetch:

1	2	3	4	5	6	7	8
01	**03**	**23**	**04**	**00**	**02**	**8E**	**4E**
	read	register		Number of registers		CRC	

respond：

1	2	3	4	5	6	7	8	9
01	**03**	**04**	**3F**	**80**	**00**	**00**	**F7**	**CF**
01	03	byte	Single precision floating point number				CRC-16	

10.5.4 Voltage result register【2306】

Read and fetch:

1	2	3	4	5	6	7	8
01	**03**	**23**	**06**	**00**	**02**	**2F**	**8E**
	read	register		Number of registers		CRC	

respond:

1	2	3	4	5	6	7	8	9
01	**03**	**04**	**41**	**F0**	**00**	**00**	**EE**	**3C**
01	03	byte	Single precision floating point number				CRC-16	

From B4 to B7 are the voltage test data： 41F00000 = 30.0 ,the voltage value is 30V.

10.5.5 Current result register【2308】

Read and fetch:

1	2	3	4	5	6	7	8
01	**03**	**23**	**08**	**00**	**02**	**4E**	**4D**
	read	register		Number of registers		CRC	

respond:

1	2	3	4	5	6	7	8	9
01	**03**	**04**	**3F**	**80**	**00**	**00**	**F7**	**CF**
01	03	byte	Single precision floating point number				CRC-16	

From B4 to B7 are the current test data of the test： 3F800000 = 1.0 , the current value is 1.0A.

10.5.6 Power result register【230A】

Read and fetch:

1	2	3	4	5	6	7	8
01	**03**	**23**	**0A**	**00**	**02**	**EF**	**8D**
	read	register		Number of registers		CRC	

respond:

1	2	3	4	5	6	7	8	9
01	**03**	**04**	**41**	**20**	**00**	**00**	**EF**	**C5**
01	03	byte	Single precision floating point number				CRC-16	

From B4 to B7 are the power test data tested： 41200000 = 10.0 , the power value is set at 10W.

10.5.7 Resistance result register【230C】

Read and fetch:

1	2	3	4	5	6	7	8
01	**03**	**23**	**0C**	**00**	**02**	**0F**	**8C**
	read	register		Number of registers		CRC	

respond:

1	2	3	4	5	6	7	8	9
01	**03**	**04**	**41**	**10**	**00**	**00**	**EF**	**CA**
01	03	byte	Single precision floating point number				CRC-16	

From B4 to B7 are the resistance test data tested： 41F00000 = 9.0Ω , the resistance value was 9 Ω

10.6 Integrated test register

10.6.1 Integrated test status register【2400】

Write in

1	2	3	4	5	6	7	8	9	10	11
01	**10**	**24**	**00**	**00**	**01**	**02**	**00**	**01**	**03**	**92**
	write	Number of registers		register		byte	data		CRC	

respond:

1	2	3	4	5	6	7	8
01	**10**	**24**	**00**	**00**	**01**	**0B**	**39**
		register		Number of registers		CRC	

From B8 to B9 are the test status data: 0001 = 1 , at this time, the instrument test status is under test.

Read and fetch:

1	2	3	4	5	6	7	8
01	**03**	**24**	**00**	**00**	**01**	**8E**	**FA**
	read	register		Number of registers		CRC	

respond:

1	2	3	4	5	6	7
01	**03**	**02**	**00**	**01**	**79**	**84**
01	03	byte	data		CRC-16	

10.6.2 Group test file register【2401】

Write in

1	2	3	4	5	6	7	8	9	10	11
01	**10**	**24**	**01**	**00**	**01**	**02**	**00**	**01**	**02**	**43**
	write	Number of registers		register		byte	data		CRC	

respond:

1	2	3	4	5	6	7	8
01	**10**	**24**	**00**	**00**	**01**	**0A**	**F9**
		register		Number of registers		CRC	

From B8 to B9 is the file data: 0001 = 1 , at this time, the instrument group test group number is group 2.

Read and fetch:

1	2	3	4	5	6	7	8
01	**03**	**24**	**01**	**00**	**01**	**DF**	**3A**
	read	register		Number of registers		CRC	

respond:

1	2	3	4	5	6	7
01	**03**	**02**	**00**	**01**	**79**	**84**
01	03	byte	data		CRC-16	

10.6.3 Group test battery type register【2402】

Write in

1	2	3	4	5	6	7	8	9	10	11
01	**10**	**24**	**02**	**00**	**01**	**02**	**00**	**00**	**C3**	**B0**
	write	Number of registers		register		byte	data		CRC	

respond:

1	2	3	4	5	6	7	8
01	**10**	**24**	**02**	**00**	**01**	**AA**	**F9**
		register		Number of registers		CRC	

From B8 to B9 are the battery type data: 0000 = 0 , at this time, the instrument group battery type is lithium battery.

Read and fetch:

1	2	3	4	5	6	7	8
01	**03**	**24**	**02**	**00**	**01**	**2F**	**3A**
	read	register		Number of registers		CRC	

respond:

1	2	3	4	5	6	7
01	**03**	**02**	**00**	**00**	**B8**	**44**
01	03	byte	data		CRC-16	

10.6.4 Nominal voltage value register【2404】

write

1	2	3	4	5	6	7	8	9	10	11	12	13
01	**10**	**24**	**04**	**00**	**02**	**04**	**41**	**10**	**00**	**00**	**4C**	**A4**
	write	register		Number of registers		byte	data				CRC	

respond:

1	2	3	4	5	6	7	8
01	**10**	**24**	**04**	**00**	**02**	**0A**	**F9**
		register		Number of registers		CRC	

From B8 to B11 sets the data for the nominal voltage: 41100000 = 9.0 , the nominal voltage of the instrument is set at 9.0V.

Read and fetch:

1	2	3	4	5	6	7	8
01	**03**	**24**	**04**	**00**	**02**	**8F**	**3A**
	read	register		Number of registers		CRC	

respond:

1	2	3	4	5	6	7	8	9
01	**03**	**04**	**41**	**10**	**00**	**00**	**EF**	**CA**
01	03	byte	Single precision floating point number				CRC-16	

10.6.5 Nominal capacity value register【2408】

write

1	2	3	4	5	6	7	8	9	10	11	12	13
01	**10**	**24**	**08**	**00**	**02**	**04**	**3F**	**80**	**00**	**00**	**54**	**F4**
	write	register		Number of registers		byte	data				CRC	

respond:

1	2	3	4	5	6	7	8
01	**10**	**24**	**08**	**00**	**02**	**CA**	**FA**
		register		Number of registers		CRC	

From B8 to B11 sets the data for the nominal capacity: 3F800000 = 1.0 , the nominal capacity of the instrument is then set to 1.0 AH.

Read and fetch:

1	2	3	4	5	6	7	8
01	**03**	**24**	**08**	**00**	**02**	**4F**	**39**
	read	register		Number of registers		CRC	

respond:

1	2	3	4	5	6	7	8	9
01	**03**	**04**	**3F**	**80**	**00**	**00**	**F7**	**CF**
01	03	byte	Single precision floating point number				CRC-16	

10.6.6 Group test mode register【240A】

Write in

1	2	3	4	5	6	7	8	9	10	11
01	**10**	**24**	**0A**	**00**	**01**	**02**	**00**	**00**	**C2**	**F8**
	read	Number of registers		register		byte	data		CRC	

respond:

1	2	3	4	5	6	7	8
01	**10**	**24**	**0A**	**00**	**01**	**2B**	**3B**
		register		Number of registers		CRC	

From B8 to B9 are the data of the cluster test mode: 0000 = 0 , at this time, the instrument cluster test mode is continuous.

Read and fetch:

1	2	3	4	5	6	7	8
01	**03**	**24**	**0A**	**00**	**01**	**AE**	**F8**
	read	register		Number of registers		CRC	

respond:

1	2	3	4	5	6	7
01	**03**	**02**	**00**	**00**	**B8**	**44**
01	03	byte	data		CRC-16	

10.6.7 Group test total step number register【240B】

Write in

1	2	3	4	5	6	7	8	9	10	11
01	**10**	**24**	**0B**	**00**	**01**	**02**	**00**	**09**	**03**	**2F**
	write	Number of registers		register		Byte	data		CRC	

respond:

1	2	3	4	5	6	7	8
01	**10**	**24**	**0B**	**00**	**01**	**7A**	**FB**
		register		Number of registers		CRC	

From B8 to B9 are the data of the total test step count: 0009 = 9 , at this time, the total number of instrument cluster test steps is 9.

Read and fetch:

1	2	3	4	5	6	7	8
01	**03**	**24**	**0B**	**00**	**01**	**FF**	**38**
	read	register		Number of registers		CRC	

respond:

1	2	3	4	5	6	7
01	**03**	**02**	**00**	**09**	**78**	**42**
01	03	byte	data		CRC-16	

10.6.8 The Group tests the current step number register【240C】

Write in

1	2	3	4	5	6	7	8	9	10	11
01	**10**	**24**	**0C**	**00**	**01**	**02**	**00**	**00**	**C2**	**9E**
	write	Number of registers		register		byte	data		CRC	

respond:

1	2	3	4	5	6	7	8
01	**10**	**24**	**0C**	**00**	**01**	**CB**	**3A**
		register		Number of registers		CRC	

From B 8 to B 9 are the current step count data: 0000 = 0 , the current number of steps of the instrument group is step 1.

Read and fetch:

1	2	3	4	5	6	7	8
01	**03**	**24**	**0C**	**00**	**01**	**4E**	**F9**
	rea d	register		Number of registers		CRC	

respond:

1	2	3	4	5	6	7
01	**03**	**02**	**00**	**00**	**B8**	**44**
01	03	byte	data		CRC-16	

10.6.9 Charge voltage value register【2410】

Write in

1	2	3	4	5	6	7	8	9	10	11	12	13
01	**10**	**24**	**10**	**00**	**02**	**04**	**41**	**10**	**00**	**00**	**4C**	**5B**
	write	register		Number of registers		byte	data				CRC	

respond:

1	2	3	4	5	6	7	8
01	**10**	**24**	**10**	**00**	**02**	**4A**	**FD**
		register		Number of registers		CRC	

From B8 to B11 sets the data for the charging voltage: 41100000 = 9.0 , at this time, the instrument charging voltage is set to 9.0V.

Read and fetch:

1	2	3	4	5	6	7	8
01	**03**	**24**	**10**	**00**	**02**	**CF**	**3E**
	read	register		Number of registers		CRC	

respond:

1	2	3	4	5	6	7	8	9
01	**03**	**04**	**41**	**10**	**00**	**00**	**EF**	**CA**
01	03	byte	Single precision floating point number				CRC-16	

10.6.10 Start the current value register【2412】

Write in

1	2	3	4	5	6	7	8	9	10	11	12	13
01	**10**	**24**	**12**	**00**	**02**	**04**	**3D**	**CC**	**CC**	**CD**	**81**	**7D**
	write	register		Number of registers		byte	data				CRC	

respond:

1	2	3	4	5	6	7	8
01	**10**	**24**	**12**	**00**	**02**	**EB**	**3D**
		register		Number of registers		CRC	

From B8 to B11 sets the data for the starting current: 3DCCCCCD = 0.1 , at this point, the instrument starting current is set to 0.1A.

Read and fetch:

1	2	3	4	5	6	7	8
01	**03**	**24**	**12**	**00**	**02**	**6E**	**FE**
	read	register		Number of registers		CRC	

respond:

1	2	3	4	5	6	7	8	9
01	**03**	**04**	**3D**	**CC**	**CC**	**CD**	**A3**	**35**
01	03	byte	Single precision floating point number				CRC-16	

10.6.11 Cut-off current value register【2414】

Write in

1	2	3	4	5	6	7	8	9	10	11	12	13
01	**10**	**24**	**14**	**00**	**02**	**04**	**3F**	**80**	**00**	**00**	**55**	**AD**
	write	register		Number of registers		byte	data				CRC	

respond:

1	2	3	4	5	6	7	8
01	**10**	**24**	**14**	**00**	**02**	**0B**	**3C**
		register		Number of registers		CRC	

From B8 to B11 sets the data for the cut-off current: 41100000 = 9.0 , the instrument cut-off current is set to 1.0A.

Read and fetch:

1	2	3	4	5	6	7	8
01	**03**	**24**	**14**	**00**	**02**	**8E**	**FF**
	read	register		Number of registers		CRC	

respond:

1	2	3	4	5	6	7	8	9
01	**03**	**04**	**3F**	**80**	**00**	**00**	**F7**	**CF**
01	03	byte	Single precision floating point number				CRC-16	

10.6.12 Stepper current value register【2416】

Write in

1	2	3	4	5	6	7	8	9	10	11	12	13
01	**10**	**24**	**16**	**00**	**02**	**04**	**3D**	**CC**	**CC**	**CD**	**80**	**8E**
	write	register		Number of registers		byte	data				CRC	

respond:

1	2	3	4	5	6	7	8
01	**10**	**24**	**16**	**00**	**02**	**AA**	**FC**
		register		Number of registers		CRC	

From B8 to B11 sets the data for the stepping current: 3DCCCCCD = 0.1 , at this time, the instrument stepping current is set to 0.1A.

Read and fetch:

1	2	3	4	5	6	7	8
01	**03**	**24**	**16**	**00**	**02**	**2F**	**3F**
	read	register		Number of registers		CRC	

respond:

1	2	3	4	5	6	7	8	9
01	**03**	**04**	**3D**	**CC**	**CC**	**CD**	**A3**	**35**
01	03	byte	Single precision floating point number				CRC-16	

10.6.13 The cluster test time register【2418】

Write in

1	2	3	4	5	6	7	8	9	10	11	12	13
01	**10**	**24**	**18**	**00**	**02**	**04**	**40**	**A0**	**00**	**00**	**4D**	**E6**
	write	register		Number of registers		byte	data				CRC	

respond:

1	2	3	4	5	6	7	8
01	**10**	**24**	**18**	**00**	**02**	**CB**	**3F**
		register		Number of registers		CRC	

From B8 to B11 sets the data for the test time: 40A00000 = 5.0 , at this time, the instrument test time is set to 5.0S.

Read and fetch:

1	2	3	4	5	6	7	8
01	**03**	**24**	**18**	**00**	**02**	**4E**	**FC**
	read	register		Number of registers		CRC	

respond:

1	2	3	4	5	6	7	8	9
01	**03**	**04**	**40**	**A0**	**00**	**00**	**EF**	**D1**
01	03	byte	Single precision floating point number				CRC-16	

10.6.14 Upper voltage limit register【241A】

Write in

1	2	3	4	5	6	7	8	9	10	11	12	13
01	**10**	**24**	**1A**	**00**	**02**	**04**	**41**	**F0**	**00**	**00**	**CD**	**D2**
	write	register		Number of registers		byte	data				CRC	

respond:

1	2	3	4	5	6	7	8
01	**10**	**24**	**1A**	**00**	**02**	**6A**	**FF**
		register		Number of registers		CRC	

From B8 to B11 set the data for the upper voltage limit: 41F00000 = 30.0 , the upper voltage limit of the instrument is set at 30.0V.

Read and fetch:

1	2	3	4	5	6	7	8
01	**03**	**24**	**1A**	**00**	**02**	**EF**	**3C**
	read	register		Number of registers		CRC	

respond:

1	2	3	4	5	6	7	8	9
01	**03**	**04**	**41**	**F0**	**00**	**00**	**EE**	**3C**
01	03	byte	Single precision floating point number				CRC-16	

10.6.15 Lower voltage limit register【241C】

Write in

1	2	3	4	5	6	7	8	9	10	11	12	13
01	**10**	**24**	**1C**	**00**	**02**	**04**	**3D**	**CC**	**CC**	**CD**	**00**	**F1**
	write	register		Number of registers		byte	data				CRC	

respond:

1	2	3	4	5	6	7	8
01	**10**	**24**	**1C**	**00**	**02**	**8A**	**FE**
		register		Number of registers		CRC	

From B8 to B11 sets the data for the lower voltage limit: 3DCCCCCD = 0.1 , the lower voltage limit of the instrument is set to 0.1V.

Read and fetch:

1	2	3	4	5	6	7	8
01	**03**	**24**	**1C**	**00**	**02**	**0F**	**3D**
	read	register		Number of registers		CRC	

respond:

1	2	3	4	5	6	7	8	9
01	**03**	**04**	**3D**	**CC**	**CC**	**CD**	**A3**	**35**
01	03	byte	Single precision floating point number				CRC-16	

10.6.16 Current limit register【241E】

Write in

1	2	3	4	5	6	7	8	9	10	11	12	13
01	**10**	**24**	**1E**	**00**	**02**	**04**	**40**	**A0**	**00**	**00**	**CD**	**CC**
	write	register		Number of registers		byte	data				CRC	

respond:

1	2	3	4	5	6	7	8
01	**10**	**24**	**1E**	**00**	**02**	**2B**	**3E**
		register		Number of registers		CRC	

From B8 to B11 set the data for the upper current limit: 40A00000 = 5.0 , the upper limit of the instrument current is set to 5.0A.

Read and fetch:

1	2	3	4	5	6	7	8
01	**03**	**24**	**1E**	**00**	**02**	**AE**	**FD**
	read	register		Number of registers		CRC	

respond:

1	2	3	4	5	6	7	8	9
01	**03**	**04**	**40**	**A0**	**00**	**00**	**EF**	**D4**
01	03	byte	Single precision floating point number				CRC-16	

10.6.17 Current down-limit register【2420】

Write in

1	2	3	4	5	6	7	8	9	10	11	12	13
01	**10**	**24**	**20**	**00**	**02**	**04**	**3D**	**CC**	**CC**	**CD**	**03**	**B0**
	write	register		Number of registers		byte	data				CRC	

respond:

1	2	3	4	5	6	7	8
01	**10**	**24**	**20**	**00**	**02**	**4A**	**F2**
		register		Number of registers		CRC	

From B8 to B11 set the data for the lower current limit：3DCCCCCD = 0.1 , the lower current limit of the instrument is set to 0.1A.

Read and fetch:

1	2	3	4	5	6	7	8
01	**03**	**24**	**20**	**00**	**02**	**CF**	**31**
	read	register		Number of registers		CRC	

respond:

1	2	3	4	5	6	7	8	9
01	**03**	**04**	**3D**	**CC**	**CC**	**CD**	**A3**	**35**
01	03	byte	Single precision floating point number				CRC-16	

10.6.18 Upper resistance limit register【2422】

Write in

1	2	3	4	5	6	7	8	9	10	11	12	13
01	**10**	**24**	**22**	**00**	**02**	**04**	**43**	**96**	**00**	**00**	**2E**	**C7**
	write	register		Number of registers		byte	data				CRC	

respond:

1	2	3	4	5	6	7	8
01	**10**	**24**	**22**	**00**	**02**	**EB**	**32**
		register		Number of registers		CRC	

From B8 to B11 set data for upper resistance: 43960000 = 300.0 , at this time, the upper resistance limit of the instrument is set to 300.0 Ω.

Read and fetch

1	2	3	4	5	6	7	8
01	**03**	**24**	**22**	**00**	**02**	**6E**	**F1**
	read	register		Number of registers		CRC	

respond:

1	2	3	4	5	6	7	8	9
01	**03**	**04**	**43**	**96**	**00**	**00**	**0F**	**9B**
01	03	byte	Single precision floating point number				CRC-16	

10.6.19 Resistance lower limit register【2424】

Write in

1	2	3	4	5	6	7	8	9	10	11	12	13
01	**10**	**24**	**24**	**00**	**02**	**04**	**3A**	**83**	**12**	**6F**	**EA**	**F9**
	write	register		Number of registers		byte	data				CRC	

respond:

1	2	3	4	5	6	7	8
01	**10**	**24**	**24**	**00**	**02**	**0B**	**33**
		register		Number of registers		CRC	

From B8-B11 set the data for the lower resistance limit: 3A83126F = 0.001 , The lower limit of the instrument resistance is set to 1m Ω.

Read and fetch

1	2	3	4	5	6	7	8
01	**03**	**24**	**24**	**00**	**02**	**8E**	**F0**
	read	register		Number of registers		CRC	

respond:

1	2	3	4	5	6	7	8	9
01	**03**	**04**	**3A**	**83**	**12**	**6F**	**4B**	**8F**
01	03	byte	Single precision floating point number				CRC-16	

10.6.20 Upper time limit register【2426】

Write in

1	2	3	4	5	6	7	8	9	10	11	12	13
01	**10**	**24**	**26**	**00**	**02**	**04**	**44**	**79**	**F9**	**9A**	**DD**	**8E**
	write	register		Number of registers		byte	data				CRC	

respond:

1	2	3	4	5	6	7	8
01	**10**	**24**	**26**	**00**	**02**	**AA**	**F3**
		register		Number of registers		CRC	

From B8 to B11 sets the data for the upper time limit: 4479F99A = 999.9 , the upper time limit of the instrument is set at 999.9S.

Read and fetch

1	2	3	4	5	6	7	8
01	**03**	**24**	**26**	**00**	**02**	**2F**	**30**
	read	register		Number of registers		CRC	

respond:

1	2	3	4	5	6	7	8	9
01	**03**	**04**	**44**	**79**	**F9**	**9A**	**FD**	**21**
01	03	byte	Single precision floating point number				CRC-16	

10.6.21 Time lower limit register【2428】

Write in

1	2	3	4	5	6	7	8	9	10	11	12	13
01	**10**	**24**	**28**	**00**	**02**	**04**	**3D**	**CC**	**CC**	**CD**	**02**	**16**
	write	register		Number of registers		byte	data				CRC	

respond:

1	2	3	4	5	6	7	8
01	**10**	**24**	**28**	**00**	**02**	**CB**	**30**
		register		Number of registers		CRC	

From B8 to B11 sets the data for the lower time limit: 3DCCCCCD = 0.1 , the lower time limit of the instrument is set to 0.1S.

Read and fetch

1	2	3	4	5	6	7	8
01	**03**	**24**	**28**	**00**	**02**	**4E**	**F3**
	read	register		Number of registers		CRC	

respond:

1	2	3	4	5	6	7	8	9
01	**03**	**04**	**3D**	**CC**	**CC**	**CD**	**A3**	**35**
01	03	byte	Single precision floating point number				CRC-16	

10.6.22 Voltage-range mode register【242A】

Write in

1	2	3	4	5	6	7	8	9	10	11
01	**10**	**24**	**2A**	**00**	**01**	**02**	**00**	**00**	**C5**	**98**
	write	register		Number of registers		byte	data		CRC	

respond:

1	2	3	4	5	6	7	8
01	**10**	**24**	**2A**	**00**	**01**	**2A**	**F1**
		register		Number of registers		CRC	

From B8 to B9 are the voltage range mode data: 0000 = 0 , the voltage range mode is automatic.

Read and fetch

1	2	3	4	5	6	7	8
01	**03**	**24**	**2A**	**00**	**01**	**AF**	**32**
	read	register		Number of registers		CRC	

respond:

1	2	3	4	5	6	7
01	**03**	**02**	**00**	**00**	**B8**	**44**
01	03	byte	data		CRC-16	

10.6.23 Voltage and range number register【242B】

Write in

1	2	3	4	5	6	7	8	9	10	11
01	**10**	**24**	**2B**	**00**	**01**	**02**	**00**	**00**	**C4**	**49**
	write	register		Number of registers		byte	data		CRC	

respond:

1	2	3	4	5	6	7	8
01	**10**	**24**	**2B**	**00**	**01**	**7B**	**31**
		register		Number of registers		CRC	

From B8 to B9 are the voltage range number data: 0000 = 0 , the voltage range number is 0.

Read and fetch

1	2	3	4	5	6	7	8
01	**03**	**24**	**2B**	**00**	**01**	**FE**	**F2**
	read	register		Number of registers		CRC	

respond:

1	2	3	4	5	6	7
01	**03**	**02**	**00**	**00**	**B8**	**44**
01	03	byte	data		CRC-16	

10.6.24 Resistance range mode register【242C】

write

1	2	3	4	5	6	7	8	9	10	11
01	**10**	**24**	**2C**	**00**	**01**	**02**	**00**	**00**	**C5**	**FE**
	write	register		Number of registers		byte	data		CRC	

respond:

1	2	3	4	5	6	7	8
01	**10**	**24**	**2C**	**00**	**01**	**CA**	**F0**
		register		Number of registers		CRC	

From B8 to B9 are the resistance range mode data: 0000 = 0 , the resistance range mode is automatic.

Read and fetch

1	2	3	4	5	6	7	8
01	**03**	**24**	**2C**	**00**	**01**	**4F**	**33**
	read	register		Number of registers		CRC	

respond:

1	2	3	4	5	6	7
01	**03**	**02**	**00**	**00**	**B8**	**44**
01	03	byte	data		CRC-16	

10.6.25 Resistance range number register【242D】

Write in

1	2	3	4	5	6	7	8	9	10	11
01	**10**	**24**	**2D**	**00**	**01**	**02**	**00**	**00**	**C4**	**2F**
	write	register		Number of registers		byte	data		CRC	

respond:

1	2	3	4	5	6	7	8
01	**10**	**24**	**2D**	**00**	**01**	**9B**	**30**
		register		Number of registers		CRC	

From B8 to B9 are the resistance range number data: 0000 = 0 , the resistance range number is 0.

Read and fetch

1	2	3	4	5	6	7	8
01	**03**	**24**	**2D**	**00**	**01**	**1E**	**F3**
	read	register		Number of registers		CRC	

respond:

1	2	3	4	5	6	7
01	**03**	**02**	**00**	**00**	**B8**	**44**
01	03	Byte	data		CRC-16	

10.6.26 The cluster test function register【242E】

Write in

1	2	3	4	5	6	7	8	9	10	11
01	**10**	**24**	**2E**	**00**	**01**	**02**	**00**	**01**	**EE**	**E4**
	write	register		Number of registers		byte	data		CRC	

respond:

1	2	3	4	5	6	7	8
01	**10**	**24**	**2E**	**00**	**01**	**6B**	**30**
		register		Number of registers		CRC	

From B8 to B9 are the cluster test functional data: 0001 = 1 , the current step test function is battery active.

Read and fetch

1	2	3	4	5	6	7	8
01	**03**	**24**	**2E**	**00**	**01**	**EE**	**F3**
	read	register		Number of registers		CRC	

respond:

1	2	3	4	5	6	7
01	**03**	**02**	**00**	**01**	**79**	**84**
01	03	byte	data		CRC-16	

10.6.27 Voltage result register【2430】

Read and fetch

1	2	3	4	5	6	7	8
01	**03**	**24**	**30**	**00**	**02**	**CE**	**F4**
	read	register		Number of registers		CRC	

respond:

1	2	3	4	5	6	7	8	9
01	**03**	**04**	**41**	**F0**	**00**	**00**	**EE**	**3C**
01	03	byte	Single precision floating point number				CRC-16	

From B4 to B7 are the voltage test data: 41F00000 = 30.0 , the voltage value is 30V.

10.6.28 Current result register【2432】

Read and fetch

1	2	3	4	5	6	7	8
01	**03**	**24**	**32**	**00**	**02**	**6F**	**34**
	read	register		Number of registers		CRC	

respond:

1	2	3	4	5	6	7	8	9
01	**03**	**04**	**3F**	**80**	**00**	**00**	**F7**	**CF**
01	03	byte	Single precision floating point number				CRC-16	

From B4 to B7 are the current test data of the test: 3F800000 = 1.0 , the current value is 1.0A.

10.6.29 Resistance result register【2434】

Read and fetch

1	2	3	4	5	6	7	8
01	**03**	**24**	**34**	**00**	**02**	**8F**	**35**
	read	register		Number of registers		CRC	

respond:

1	2	3	4	5	6	7	8	9
01	**03**	**04**	**41**	**20**	**00**	**00**	**EF**	**C5**
01	03	byte	Single precision floating point number				CRC-16	

From B4 to B7 are the resistance test data for the current test step： 41200000 = 10.0 , the power value was set at 10Ω.

10.6.30 Time result register【2436】

Read and fetch

1	2	3	4	5	6	7	8
01	**03**	**24**	**36**	**00**	**02**	**2E**	**F5**
	read	register		Number of registers		CRC	

respond:

1	2	3	4	5	6	7	8	9
01	**03**	**04**	**3F**	**00**	**00**	**00**	**F6**	**27**
01	03	byte	Single precision floating point number				CRC-16	

From B4 to B7 are the time test data for the current step test： 3F000000 = 0.5 , the time value was 0.5S.

10.7 Base setting of the register

10.7.1 Integrated test status register【3000】

Write in

1	2	3	4	5	6	7	8	9	10	11
01	**10**	**30**	**00**	**00**	**01**	**02**	**00**	**00**	**96**	**53**
	write	Number of registers		register		byte	data		CRC	

respond:

1	2	3	4	5	6	7	8
01	**10**	**30**	**00**	**00**	**01**	**0E**	**C9**
		register		Number of registers		CRC	

From B8 to B9 are the test function data：0000 = 0 , at this point, the instrument test function is the battery internal resistance test.

Read and fetch

1	2	3	4	5	6	7	8
01	**03**	**30**	**00**	**00**	**01**	**8B**	**0A**
	read	register		Number of registers		CRC	

respond:

1	2	3	4	5	6	7
01	**03**	**02**	**00**	**00**	**B8**	**44**
01	03	byte	data		CRC-16	

10.7.2 The buzzer register【3001】

Write in

1	2	3	4	5	6	7	8	9	10	11
01	**10**	**30**	**01**	**00**	**01**	**02**	**00**	**01**	**56**	**42**
	write	Number of registers		register		byte	data		CRC	

respond:

1	2	3	4	5	6	7	8
01	**10**	**30**	**01**	**00**	**01**	**5F**	**09**
		register		Number of registers		CRC	

From B8 to B9 are the test function data: 0001 = 1 , at this point, the instrument buzzer is open.

Read and fetch

1	2	3	4	5	6	7	8
01	**03**	**30**	**01**	**00**	**01**	**DA**	**CA**
	read	register		Number of registers		CRC	

respond:

1	2	3	4	5	6	7
01	**03**	**02**	**00**	**00**	**B8**	**44**
01	03	byte	data		CRC-16	

10.7.3 Unqualified stop register【3002】

Write in

1	2	3	4	5	6	7	8	9	10	11
01	**10**	**30**	**02**	**00**	**01**	**02**	**00**	**00**	**56**	**71**
	write	Number of registers		register		byte	data		CRC	

respond:

1	2	3	4	5	6	7	8
01	**10**	**30**	**02**	**00**	**01**	**AF**	**09**
		register		Number of registers		CRC	

From B8 to B9 are the test function data: 0001 = 1 , at this point, the unqualified instrument stop function is turned on.

Read and fetch

1	2	3	4	5	6	7	8
01	**03**	**30**	**02**	**00**	**01**	**2A**	**CA**
	read	register		Number of registers		CRC	

respond:

1	2	3	4	5	6	7
01	**03**	**02**	**00**	**01**	**79**	**84**
01	03	byte	data		CRC-16	

11. Processor (Handler) interface

You will learn about the following in this chapter:

- HANDLER (PLC) interface
- Alarm lamp interface

11.1 HANDLER(PLC)interface

This series tester is equipped with a 15 PIN D connection terminal that provides PLC remote input and output control signal (linked to PLC controller), as shown in the figure. These terminals and the standard 15 PIN D-type are match and must be provided by the user. To achieve optimal results, it is recommended to use the shielding line as a connecting line for the control and output information. In order not to connect the shielding line into a loop and affect the shielding effect, only the shielding network at one end of the shielding line can be grounded.

Picture 11- 1

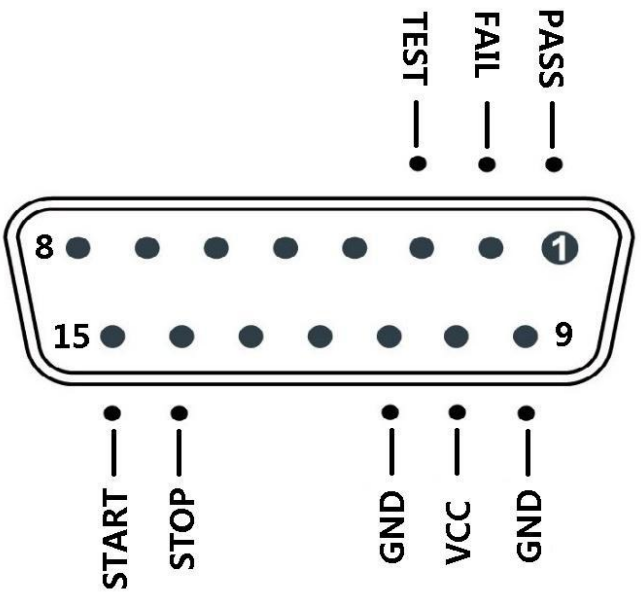
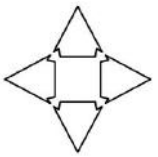


Chart 11-1 Pon of PLC port

Input/output	pin	Name	illustration
signal input	15	START	When the START is shorted with the GND, start the instrument measurement
	14	STOP	The instrument stops when the STOP is shorted to the GND for the measurement
signal output	1	PASS	When the test is qualified, the high level will be output
	2	FAIL	When the test fails, the output is high level
	3	TEST	When starting the test, the high level will be output
External power supply	9	GND	The external negative electrode is grounded
	10	VCC	External power supply
	11	GND	The external negative electrode is grounded

12. specifications



You will learn about the following in this chapter:

- qualification
- general requirements
- physical dimension

12.1 Qualification

The following data are measured under the following conditions:

- temperature condition ： 23℃±5℃
- Humidity conditions：≤65% R.H.
- Zero value adjustment: short circuit and zero before test
- preheating time：>60minutes
- Calibration time: 12 months

Test the current accuracy： 10%

Test the current frequency accuracy：1kHz(1±20Hz),5ppm

12.2 general requirements

screen ： TFT-LCD real color display, with a touch screen, a screen size of 5 inches

calibration： Short circuit full range zero

measuring section： Four-end test

data logging： USB memorizer

beep： Pass, qualified, and unqualified

trigger： Internal, external (manual and remote) triggers

interface ： Processor (Handler) interface

The RS232 interface

programming language ： SCPI 和 Modbus（RTU)

additional function： Keyboard lock

12.3 Environmental requirements

Measuring the environment：

Index: temperature 18℃ ~28℃ humidity <65% RH

Operation: temperature 10℃ ~40℃ humidity 10 ~ 80% RH

Storage: temperature 0℃ ~50℃ humidity 10 ~ 90% RH

source： 200VAC~240VAC

fuse： 250V 1ASlow melting

power： maximum120VA

weight： about 5 kg

12.4 Physical dimension

(diagrammatic sketch)