

# 用户手册

## User's Guide

### Rev.A2

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

# AT5800

## Comprehensive battery tester



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## 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

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The People's Republic of China (PRC)  
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Changzhou Applent Instruments LTD  
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|                                                        |           |
|--------------------------------------------------------|-----------|
| SAFETY SUMMARY .....                                   | 2         |
| CERTIFICATION, LIMITED & LIMITATION OF LIABILITY ..... | 3         |
| <b>1. INSTALLATION AND SETUP WIZARD .....</b>          | <b>9</b>  |
| 1.1 PACKING LIST .....                                 | 9         |
| 1.2 POWER SUPPLY REQUIREMENTS .....                    | 9         |
| 1.3 OPERATING ENVIRONMENT .....                        | 9         |
| 1.4 CLEANING .....                                     | 9         |
| 1.5 INSTRUMENT HANDLE .....                            | 10        |
| <b>2. OVERVIEW .....</b>                               | <b>11</b> |
| 2.1 INTRODUCTION .....                                 | 11        |
| 2.2 MAIN SPECIFICATIONS .....                          | 11        |
| 2.3 THE MAIN FUNCTION .....                            | 12        |
| 2.3.1 Test frequency .....                             | 12        |
| 2.3.2 measuring range .....                            | 12        |
| 2.3.3 Trigger mode .....                               | 12        |
| 2.3.4 Calibration function .....                       | 12        |
| 2.3.5 System settings .....                            | 12        |
| 2.3.6 Interface .....                                  | 12        |
| <b>3. START .....</b>                                  | <b>13</b> |
| 3.1 FRONT PANEL .....                                  | 13        |
| 3.2 REAR PANEL .....                                   | 14        |
| <b>4. [MEAS] MEASUREMENT DISPLAY .....</b>             | <b>15</b> |
| 4.1 < COMPREHENSIVE TEST > PAGE .....                  | 15        |
| 4.1.1 【Type】 .....                                     | 15        |
| 4.1.2 【Capacity】 .....                                 | 16        |
| 4.1.3 【Group】 .....                                    | 16        |
| 4.1.4 【Configuration】 .....                            | 16        |
| 4.1.5 【Voltage】 .....                                  | 16        |
| 4.1.6 【Step-count】 .....                               | 17        |
| 4.2 < GROUP CONFIGURATION >PAGE .....                  | 17        |
| 4.2.1 【Battery voltage】 .....                          | 17        |
| 4.2.2 【Battery capacity】 .....                         | 18        |
| 4.2.3 【Voltage range】 .....                            | 18        |
| 4.2.4 【Resistance range】 .....                         | 18        |
| 4.2.5 【Continuously】 .....                             | 18        |
| 4.2.6 【Load range】 .....                               | 19        |
| 4.2.7 【Step-count】 .....                               | 19        |
| 4.2.8 【Test function】 .....                            | 19        |
| 4.2.9 【Upper resistance limit】 .....                   | 20        |
| 4.2.10 【Lower resistance limit】 .....                  | 20        |
| 4.3 < GROUP TEST RESULTS >PAGE .....                   | 20        |
| 4.4 < VOLTAGE INTERNAL RESISTANCE TEST > PAGE .....    | 21        |
| 4.4.1 【Short circuit clearing】 .....                   | 21        |
| 4.4.2 【Resistance range】 .....                         | 22        |
| 4.4.3 【Voltage range】 .....                            | 23        |
| 4.4.4 【Upper resistance limit】 .....                   | 23        |
| 4.4.5 【Lower resistance limit】 .....                   | 23        |

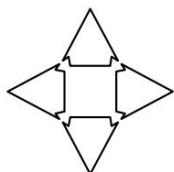
|        |                                      |    |
|--------|--------------------------------------|----|
| 4.4.6  | <b>【Upper voltage limit】</b>         | 23 |
| 4.4.7  | <b>【Lower voltage limit】</b>         | 23 |
| 4.5    | < DC LOAD TEST > PAGE                | 24 |
| 4.5.1  | <b>【Model】</b>                       | 24 |
| 4.5.2  | <b>【Upper voltage limit setting】</b> | 26 |
| 4.5.3  | <b>【Current upper limit setting】</b> | 26 |
| 4.5.4  | <b>【Upper power limit setting】</b>   | 26 |
| 4.5.5  | <b>【Parameter setting】</b>           | 26 |
| 4.6    | < DC POWER TEST > PAGE               | 27 |
| 4.6.1  | <b>【Voltage setting】</b>             | 27 |
| 4.6.2  | <b>【Current setting】</b>             | 27 |
| 4.7    | < BATTERY CAPACITY TEST > PAGE       | 27 |
| 4.7.1  | <b>【Document】</b>                    | 28 |
| 4.7.2  | <b>【Set up】</b>                      | 28 |
| 4.8    | < FILE > PAGE                        | 29 |
| 4.8.1  | <b>【Battery type】</b>                | 29 |
| 4.8.2  | <b>【Battery voltage】</b>             | 29 |
| 4.8.3  | <b>【Battery capacity】</b>            | 29 |
| 4.8.4  | <b>【Charging voltage】</b>            | 30 |
| 4.8.5  | <b>【Charging current】</b>            | 30 |
| 4.8.6  | <b>【Discharging current】</b>         | 30 |
| 4.8.7  | <b>【Cutoff voltage】</b>              | 30 |
| 4.8.8  | <b>【Predischarge】</b>                | 30 |
| 4.8.9  | <b>【Cycles】</b>                      | 31 |
| 5.     | <b>[SETUP] SETTING DISPLAY</b>       | 32 |
| 5.1    | < SET UP > PAGE                      | 32 |
| 5.1.1  | <b>【Resistance range】</b>            | 32 |
| 5.1.2  | <b>【Voltage range】</b>               | 33 |
| 5.1.3  | <b>【Upper resistance limit】</b>      | 33 |
| 5.1.4  | <b>【Lower resistance limit】</b>      | 33 |
| 5.1.5  | <b>【Upper voltage limit】</b>         | 33 |
| 5.1.6  | <b>【Lower voltage limit】</b>         | 33 |
| 5.1.7  | <b>【Load mode】</b>                   | 33 |
| 5.1.8  | <b>【Load voltage】</b>                | 34 |
| 5.1.9  | <b>【Load current】</b>                | 34 |
| 5.1.10 | <b>【Load power】</b>                  | 34 |
| 5.1.11 | <b>【Power supply voltage】</b>        | 34 |
| 5.1.12 | <b>【Supply current】</b>              | 34 |
| 5.1.13 | <b>【Touch off】</b>                   | 34 |
| 5.1.14 | <b>【Buzzing alarm】</b>               | 35 |
| 5.1.15 | <b>【Unqualified stop】</b>            | 35 |
| 5.1.16 | <b>【Rate】</b>                        | 35 |
| 5.2    | < U DISK SETTINGS > PAGE             | 35 |

|                                                                    |           |
|--------------------------------------------------------------------|-----------|
| <b>6. SYSTEM CONFIGURATION</b>                                     | <b>36</b> |
| 6.1 <SYSTEM CONFIGURATION> PAGE                                    | 36        |
| 6.1.1 <b>【LANGUAGE】</b>                                            | 36        |
| 6.1.2 <b>【DATE】</b> 、 <b>【TIME】</b>                                | 37        |
| 6.1.3 <b>【ACCOUNT】</b> 、 <b>【PASSWORD】</b>                         | 37        |
| 6.1.4 <b>【REMOTE】</b>                                              | 38        |
| 6.1.5 <b>【STATION NO】</b>                                          | 38        |
| 6.1.6 <b>【BAUDRATE】</b>                                            | 38        |
| 6.1.7 <b>【PROTOCOL】</b>                                            | 39        |
| 6.1.8 <b>【SHAKEHAND】</b>                                           | 39        |
| 6.1.9 <b>【RESULT SEND】</b>                                         | 39        |
| 6.2 <SYSTEM INFORMATION>PAGE                                       | 40        |
| <b>7. REMOTE CONTROL</b>                                           | <b>41</b> |
| 7.1 ABOUT RS-232C                                                  | 41        |
| 7.2 ABOUT USB ADAPTER (OPTIONAL)                                   | 42        |
| 7.3 SELECT BAUD RATE                                               | 42        |
| 7.4 SCPI LANGUAGE                                                  | 42        |
| <b>8. SCPI COMMAND REFERENCE</b>                                   | <b>43</b> |
| 8.1 COMMAND STRING PARSING                                         | 43        |
| 8.1.1 <i>Command parsing rules</i>                                 | 43        |
| 8.1.2 <i>Symbol Convention and Definition</i>                      | 43        |
| 8.1.3 <i>Command Tree Structure</i>                                | 44        |
| 8.1.4 <b>COMMAND</b>                                               | 44        |
| 8.1.5 <b>PARAMETERS</b>                                            | 44        |
| 8.1.6 <i>Separator</i>                                             | 45        |
| 8.2 COMMAND REFERENCE                                              | 45        |
| 8.2.1 <b>BASIC subsystem</b>                                       | 45        |
| 8.2.2 <b>GROUP subsystem</b>                                       | 47        |
| 8.2.3 <b>VR subsystem</b>                                          | 55        |
| 8.2.4 <b>DCLOAD subsystem</b>                                      | 57        |
| 8.2.5 <b>DCPOWER Subsystem</b>                                     | 58        |
| 8.2.6 <b>CAPACITY Subsystem</b>                                    | 59        |
| 8.2.7 <b>POWER subsystem</b>                                       | 62        |
| 8.2.8 <b>ERROR subsystem</b>                                       | 62        |
| 8.2.9 <b>IDN subsystem</b>                                         | 62        |
| <b>9. MODBUS(RTU) PROTOCOL</b>                                     | <b>63</b> |
| 9.1 DATA FORMAT                                                    | 63        |
| 9.1.1 <i>Command parsing rules</i>                                 | 63        |
| 9.1.2 <i>CRC-16 Calculation method</i>                             | 64        |
| 9.1.3 <i>Response Frame</i>                                        | 65        |
| 9.1.4 <i>No response</i>                                           | 65        |
| 9.1.5 <i>Error Code</i>                                            | 66        |
| 9.2 FUNCTION CODE                                                  | 66        |
| 9.3 REGISTER                                                       | 66        |
| 9.4 READ OUT MULTIPLE REGISTERS                                    | 67        |
| 9.5 WRITE TO MULTIPLE REGISTERS                                    | 67        |
| 9.6 ECHO TEST                                                      | 68        |
| <b>10. MODBUS(RTU) INSTRUCTION SET</b>                             | <b>70</b> |
| 10.1 REGISTER OVERVIEW                                             | 70        |
| 10.2 BATTERY CAPACITY REGISTER                                     | 73        |
| 10.2.1 <i>Battery capacity test status register <b>【2000】</b></i>  | 73        |
| 10.2.2 <i>Battery capacity file number register <b>【2001】</b></i>  | 74        |
| 10.2.3 <i>Battery capacity Battery type register <b>【2002】</b></i> | 75        |

|                                                                     |    |
|---------------------------------------------------------------------|----|
| 10.2.4 Battery nominal voltage register <b>【2003】</b> .....         | 75 |
| 10.2.5 Battery nominal capacity state register <b>【2005】</b> .....  | 76 |
| 10.2.6 Battery charging voltage register <b>【2007】</b> .....        | 76 |
| 10.2.7 Battery charge current register <b>【2009】</b> .....          | 77 |
| 10.2.8 Battery discharge current register <b>【200B】</b> .....       | 77 |
| 10.2.9 Battery cutoff voltage register <b>【200D】</b> .....          | 78 |
| 10.2.10 Battery capacity pre-discharge register <b>【2010】</b> ..... | 78 |
| 10.2.11 Battery capacity cycle number register <b>【2011】</b> .....  | 79 |
| 10.2.12 Battery Capacity test result register <b>【2012】</b> .....   | 79 |
| 10.3 VOLTAGE INTERNAL RESISTANCE TEST REGISTER .....                | 80 |
| 10.3.1 Resistance range mode register <b>【2100】</b> .....           | 80 |
| 10.3.2 Resistance range number register <b>【2101】</b> .....         | 80 |
| 10.3.3 Voltage-range mode register <b>【2102】</b> .....              | 81 |
| 10.3.4 Voltage and range number register <b>【2103】</b> .....        | 81 |
| 10.3.5 Upper resistance limit register <b>【2104】</b> .....          | 82 |
| 10.3.6 Lower resistance register <b>【2106】</b> .....                | 82 |
| 10.3.7 Upper-voltage limit register <b>【2108】</b> .....             | 83 |
| 10.3.8 Lower-voltage limit register <b>【210A】</b> .....             | 83 |
| 10.3.9 Resistance test result register <b>【210C】</b> .....          | 84 |
| 10.3.10 Voltage test result register <b>【210E】</b> .....            | 84 |
| 10.4 THE DC LOAD TEST REGISTER .....                                | 84 |
| 10.4.1 Load test status register <b>【2200】</b> .....                | 84 |
| 10.4.2 Load test mode register <b>【2201】</b> .....                  | 85 |
| 10.4.3 Upper-voltage limit register <b>【2202】</b> .....             | 85 |
| 10.4.4 Current upper limit register <b>【2204】</b> .....             | 86 |
| 10.4.5 Power limit register <b>【2206】</b> .....                     | 86 |
| 10.4.6 Voltage setting value register <b>【2208】</b> .....           | 87 |
| 10.4.7 Current setting point register <b>【220A】</b> .....           | 87 |
| 10.4.8 The Power Setpoint register <b>【220C】</b> .....              | 88 |
| 10.4.9 Resistance setpoint register <b>【220E】</b> .....             | 88 |
| 10.4.10 Voltage result register <b>【2210】</b> .....                 | 89 |
| 10.4.11 Current result register <b>【2212】</b> .....                 | 89 |
| 10.4.12 Power result register <b>【2214】</b> .....                   | 89 |
| 10.4.13 Resistance result register <b>【2216】</b> .....              | 90 |
| 10.5 THE DC POWER SUPPLY TEST REGISTER .....                        | 90 |
| 10.5.1 Power supply test status register <b>【2300】</b> .....        | 90 |
| 10.5.2 Voltage output register <b>【2302】</b> .....                  | 90 |
| 10.5.3 Current output register <b>【2304】</b> .....                  | 91 |
| 10.5.4 Voltage result register <b>【2306】</b> .....                  | 91 |
| 10.5.5 Current result register <b>【2308】</b> .....                  | 92 |
| 10.5.6 Power result register <b>【230A】</b> .....                    | 92 |
| 10.5.7 Resistance result register <b>【230C】</b> .....               | 92 |

|                                                                      |            |
|----------------------------------------------------------------------|------------|
| 10.6 INTEGRATED TEST REGISTER .....                                  | 93         |
| 10.6.1 Integrated test status register 【2400】 .....                  | 93         |
| 10.6.2 Group test file register 【2401】 .....                         | 93         |
| 10.6.3 Group test battery type register 【2402】 .....                 | 94         |
| 10.6.4 Nominal voltage value register 【2404】 .....                   | 94         |
| 10.6.5 Nominal capacity value register 【2408】 .....                  | 95         |
| 10.6.6 Group test mode register 【240A】 .....                         | 95         |
| 10.6.7 Group test total step number register 【240B】 .....            | 96         |
| 10.6.8 The Group tests the current step number register 【240C】 ..... | 96         |
| 10.6.9 Charge voltage value register 【2410】 .....                    | 97         |
| 10.6.10 Start the current value register 【2412】 .....                | 97         |
| 10.6.11 Cut-off current value register 【2414】 .....                  | 98         |
| 10.6.12 Stepper current value register 【2416】 .....                  | 98         |
| 10.6.13 The cluster test time register 【2418】 .....                  | 99         |
| 10.6.14 Upper voltage limit register 【241A】 .....                    | 99         |
| 10.6.15 Lower voltage limit register 【241C】 .....                    | 100        |
| 10.6.16 Current limit register 【241E】 .....                          | 100        |
| 10.6.17 Current down-limit register 【2420】 .....                     | 101        |
| 10.6.18 Upper resistance limit register 【2422】 .....                 | 101        |
| 10.6.19 Resistance lower limit register 【2424】 .....                 | 102        |
| 10.6.20 Upper time limit register 【2426】 .....                       | 103        |
| 10.6.21 Time lower limit register 【2428】 .....                       | 103        |
| 10.6.22 Voltage-range mode register 【242A】 .....                     | 104        |
| 10.6.23 Voltage and range number register 【242B】 .....               | 104        |
| 10.6.24 Resistance range mode register 【242C】 .....                  | 105        |
| 10.6.25 Resistance range number register 【242D】 .....                | 105        |
| 10.6.26 The cluster test function register 【242E】 .....              | 106        |
| 10.6.27 Voltage result register 【2430】 .....                         | 106        |
| 10.6.28 Current result register 【2432】 .....                         | 106        |
| 10.6.29 Resistance result register 【2434】 .....                      | 107        |
| 10.6.30 Time result register 【2436】 .....                            | 107        |
| 10.7 BASE SETTING OF THE REGISTER .....                              | 107        |
| 10.7.1 Integrated test status register 【3000】 .....                  | 107        |
| 10.7.2 The buzzer register 【3001】 .....                              | 108        |
| 10.7.3 Unqualified stop register 【3002】 .....                        | 108        |
| <b>11. PROCESSOR (HANDLER) INTERFACE .....</b>                       | <b>109</b> |
| 11.1 HANDLER(PLC)INTERFACE .....                                     | 109        |
| <b>12. SPECIFICATIONS .....</b>                                      | <b>110</b> |
| 12.1 QUALIFICATION .....                                             | 110        |
| 12.2 GENERAL REQUIREMENTS .....                                      | 110        |
| 12.3 ENVIRONMENTAL REQUIREMENTS .....                                | 110        |
| 12.4 PHYSICAL DIMENSION .....                                        | 111        |

# 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°C ~ 55°C,

Humidity: less than 70%RH at 23°C

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.

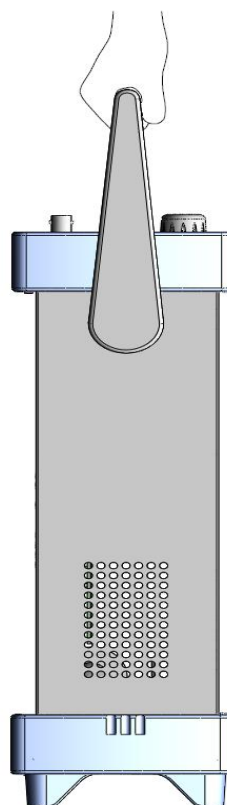
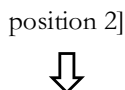
## 1.5 Instrument handle

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)

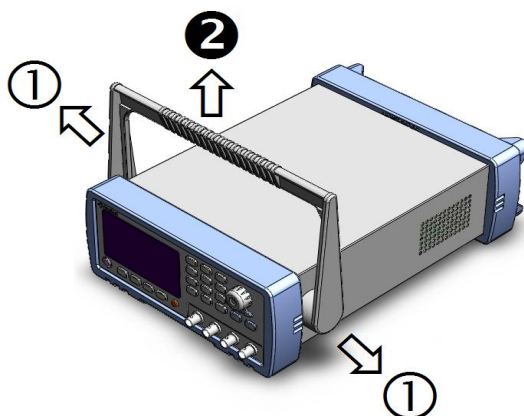


Visible position 1 [ Hold both sides of the handle with both hands at the same time, gently pull to both sides until it can rotate freely, and then switch to visible position 2]



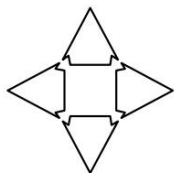
Handheld position

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 ]



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%<br>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, 3M $\omega$  ~ 300 $\omega$ .

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

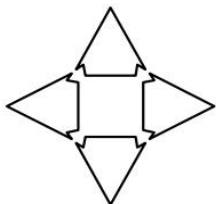
All optocoupler isolation, input and output ports with built-in pull-up resistors.

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

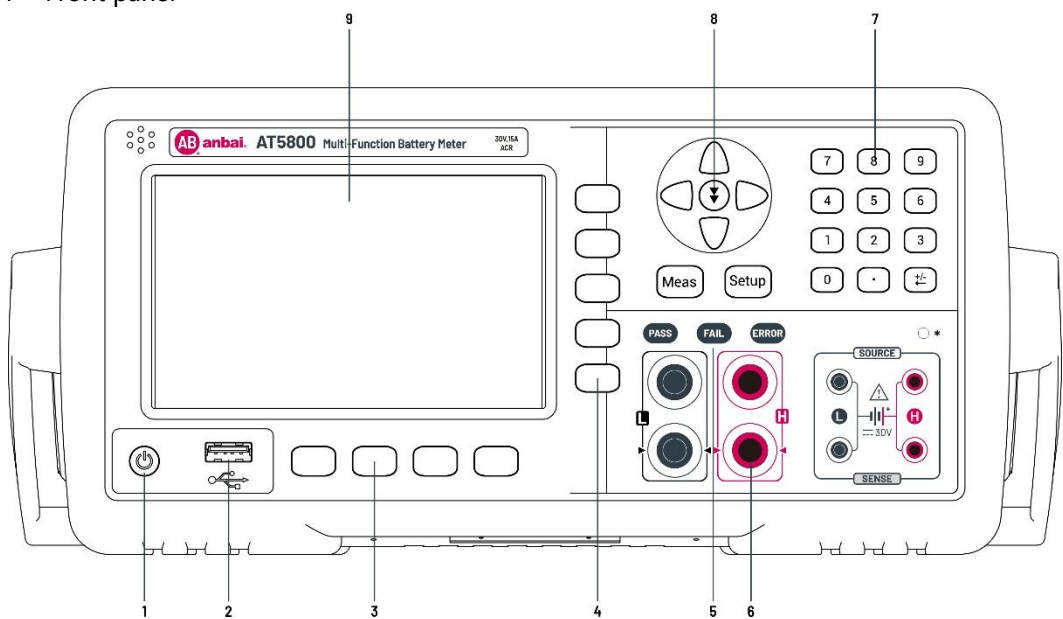


chart 3- 1 Front panel function description

| No. | Function                                                                                                                                                                                        |
|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1   | Power switch. Touch button<br>⚠ 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

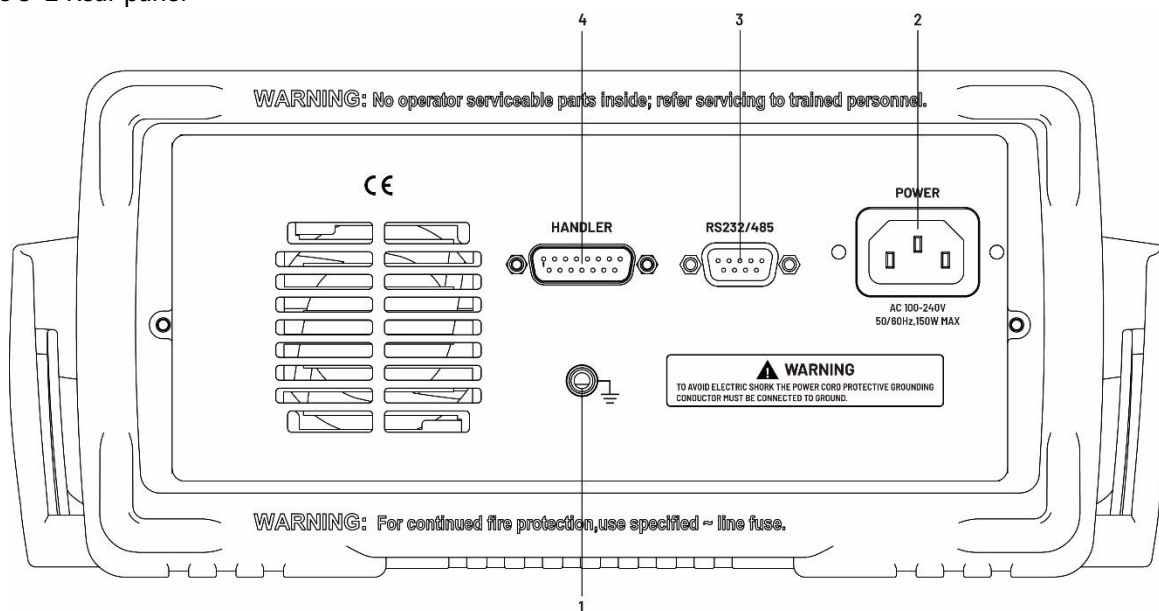
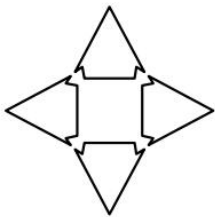


Chart 3- 2 Function description of rear panel

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

# 4.[Meas] Measurement display



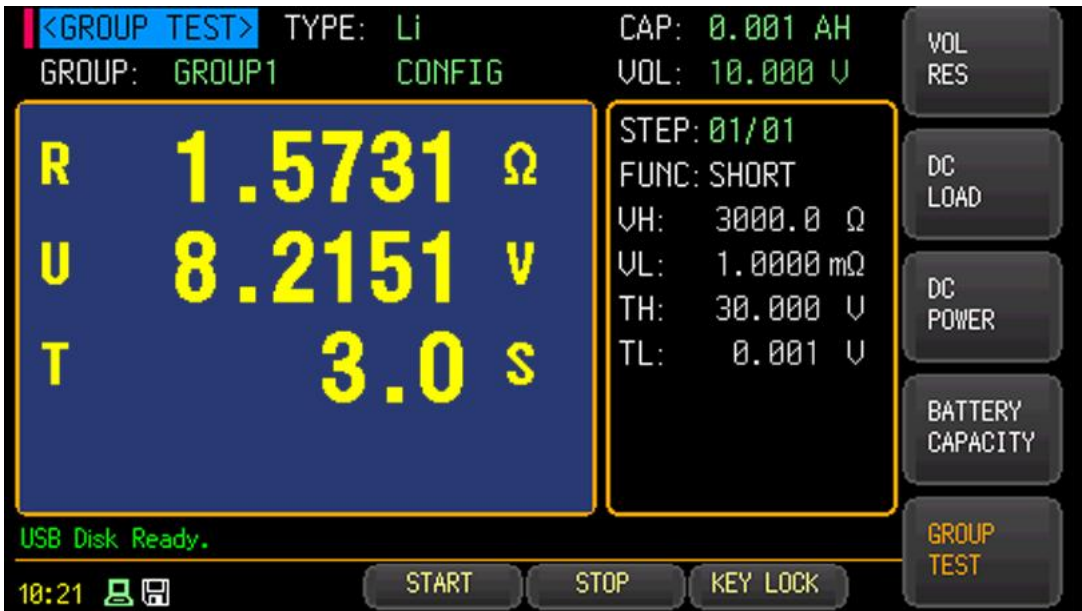
You will learn all the measurement display functions in this chapter:

- < 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

|               |                                                                                                                 |
|---------------|-----------------------------------------------------------------------------------------------------------------|
| <b>Step 1</b> | Press the [Meas] shortcut key, and select [Group Test] in the sidebar to enter the < Comprehensive Test > page. |
| <b>Step 2</b> | Use the cursor keys to select the [0.001AH] field.                                                              |
| <b>Step 3</b> | 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

|               |                                                                                                                 |                          |
|---------------|-----------------------------------------------------------------------------------------------------------------|--------------------------|
| <b>Step 1</b> | Press the [Meas] shortcut key, and select [Group Test] in the sidebar to enter the < Comprehensive Test > page. |                          |
| <b>Step 2</b> | Use the cursor keys to select the [Group 1] field.                                                              |                          |
| <b>Step 3</b> | 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

|               |                                                                                                                 |                                                |
|---------------|-----------------------------------------------------------------------------------------------------------------|------------------------------------------------|
| <b>Step 1</b> | Press the [Meas] shortcut key, and select [Group Test] in the sidebar to enter the < Comprehensive Test > page. |                                                |
| <b>Step 2</b> | Use the cursor keys to select the [Configuration] field.                                                        |                                                |
| <b>Step 3</b> | 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.

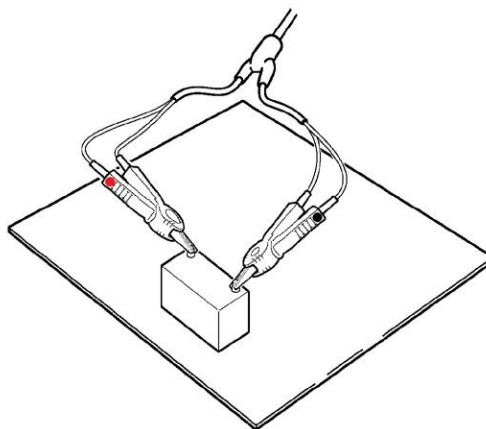
Picture 4- 4 < vol res test > page



#### 4.4.1 【Short clear】

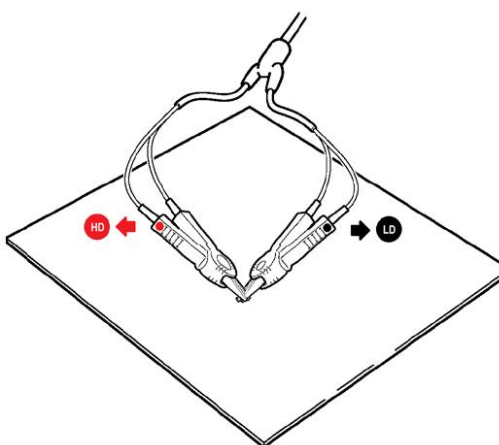
■To set short circuit clearing

|        |                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                  |
|--------|----------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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.                                                                                                                                                                                                                                                                                                                                                                  |

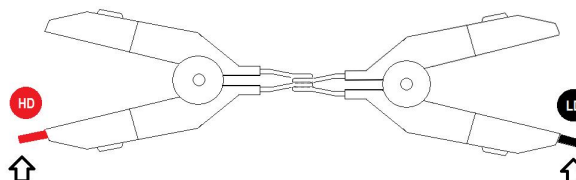


Be sure to keep the same position when resetting, especially in the range of  $30\text{m}\Omega$  and below.

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.

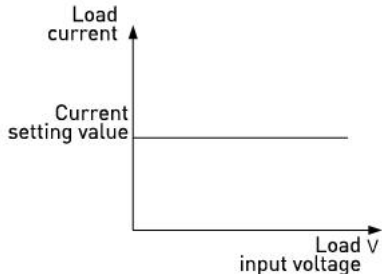
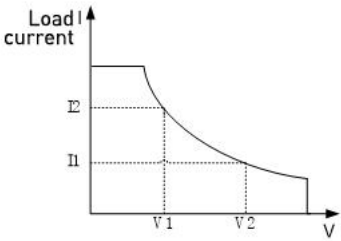
Picture 4-5 < DC Load Test > Page



### 4.5.1 【Model】

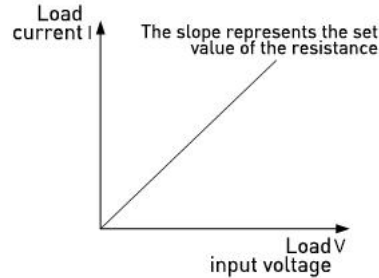
■ To set the test mode

|        |                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------|--------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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                                                                                       | <p>Set the constant voltage working mode [constant voltage]<br/>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.</p> <p>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).</p> |

|  |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|--|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  |                     | <p>When <math>V\text{-MAX} &gt; 18\text{V}</math>, the decimal point shall be kept to 3 digits;<br/> When <math>V\text{-MAX} \leq 18\text{V}</math>, the decimal point shall be kept to 4 digits;</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|  | Constant current    | <p>Set the constant current working mode [constant current]<br/> In the constant current mode, no matter whether the input voltage changes or not, the electronic load always consumes constant current.</p> <p>If your tested power supply is a constant voltage source, it is recommended to use the constant current mode.</p>  <p>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).<br/> When <math>I\text{-MAX} &gt; 3\text{A}</math>, the decimal point shall be kept to 3 digits;<br/> When <math>I\text{-max} \leq 3\text{A}</math>, the decimal point shall be kept to 4 digits;</p>                  |
|  | Fixed power         | <p>Set the constant power working mode [constant power]<br/> In the fixed power mode, the electronic load always consumes constant power.</p> <p>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.</p> <p>According to the formula: <math>P=V \times I</math>, if the input voltage <math>V</math> increases, the current <math>I</math> will be forced to decrease to keep the power</p>  <p>constant.</p> <p>The maximum number of digits of power input is 5, and the decimal places are reserved for 3 digits.</p> |
|  | Constant resistance | <p>Set the constant resistance working mode [constant resistance]<br/> In the mode of constant resistance, the electronic load is equivalent to a constant resistance.</p> <p>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</p>                                                                                                                                                                                                                                                                                                                                                                          |

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] shortcut 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】

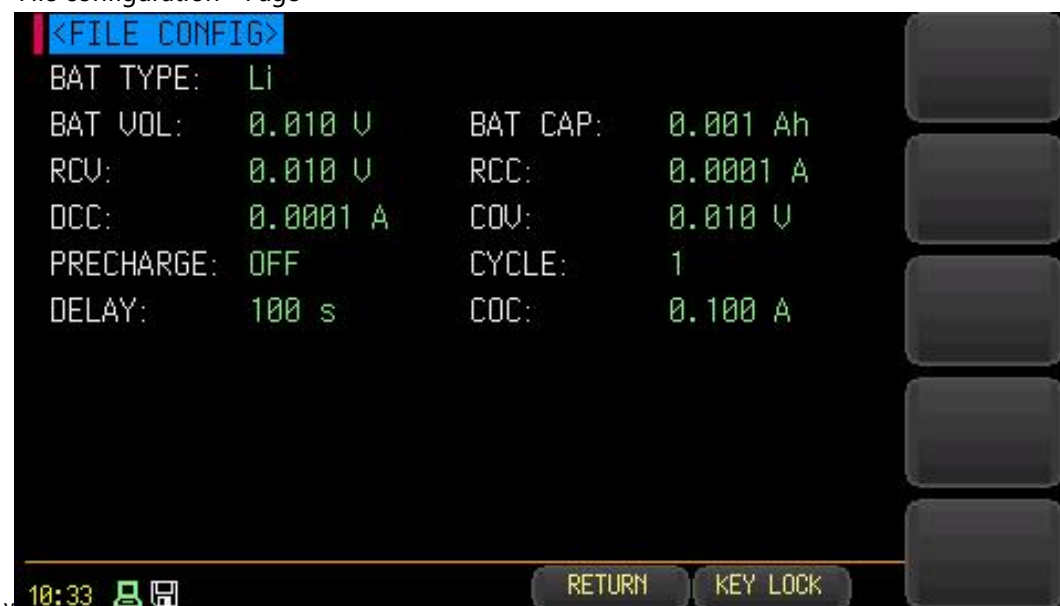
##### ■ To set the file configuration

|        |                                                                                                                         |                                                   |
|--------|-------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|
| 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 [Enter] 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 [Enter] 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 [Enter] 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 [Enter] 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. |
|--|------|---------------------------------------------------------------------------|

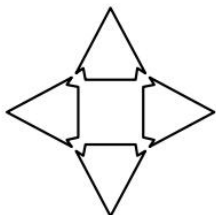
#### 4.8.9 【Cycles】

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.<br>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.<br>Current range: 0.0001~5.000A |

### 5.1.13 【Touch off】

■To set the 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.         |

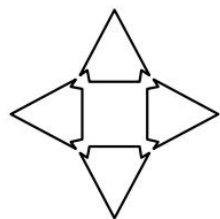
### 5.1.16 【Rate】

■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

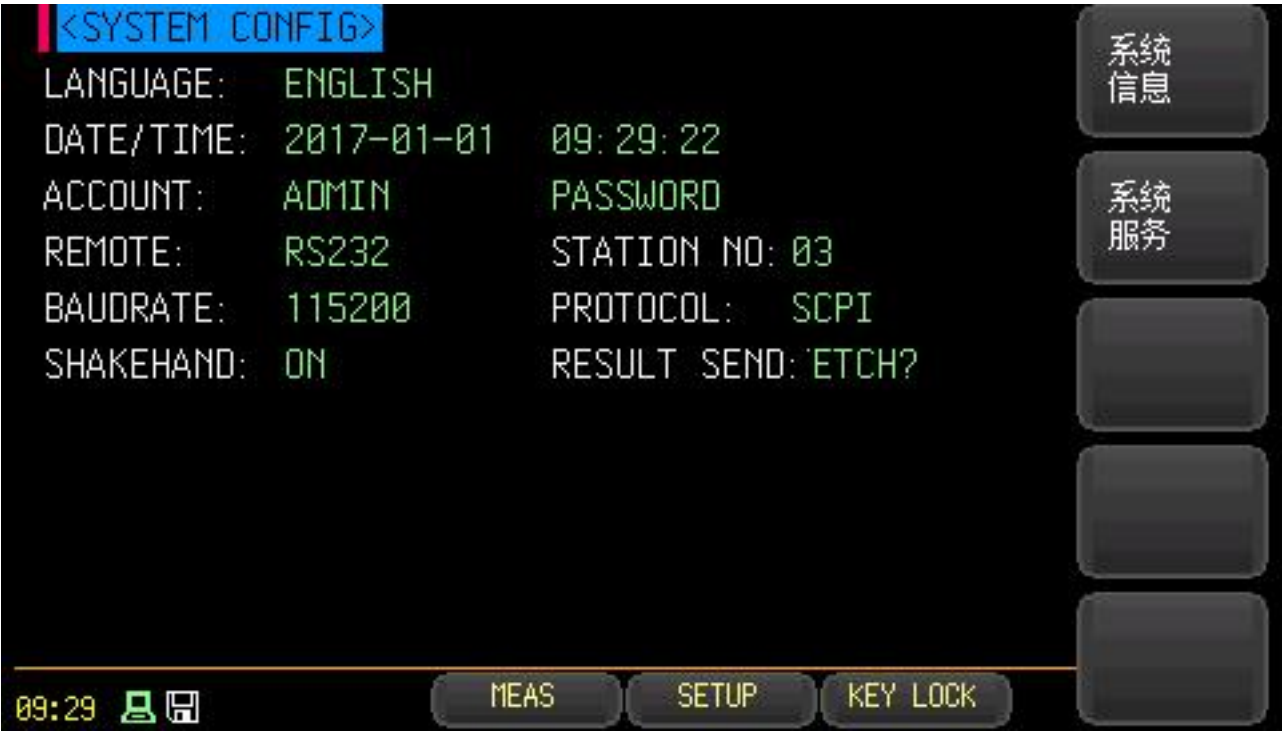
# 6.System configuration



- 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.  |

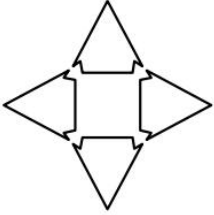
## 6.2 <SYSTEM INFORMATION>Page

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

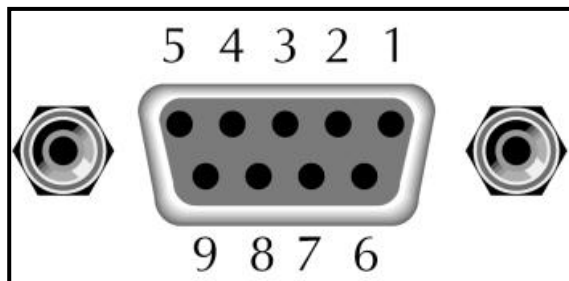


Chart 7- 1 RS-232 Connector pin

| 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

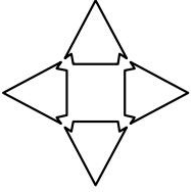
Standard Command (SCPI) for Fully Programmable Instruments



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

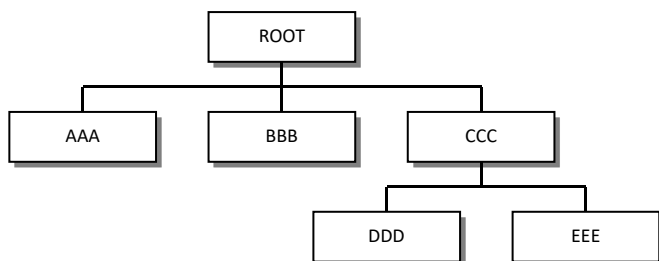
Some symbols are used in this chapter. These symbols are not part of the command tree, but only for better understanding of the command string.

- <> 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<br>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     | <b>BASIC:FUNC &lt;group,load,power,cap,vr&gt;</b>                                                                                         |
| Parameter          | group: synthetic test<br>load: DC load test<br>power: DC power test<br>cap: Battery capacity test<br>vr: Voltage internal resistance test |
| Take for example   | SEND > BASIC:FUNC group<NL> // Set test mode to comprehensive test.                                                                       |
| Query syntax       | <b>BASIC:FUNC?</b>                                                                                                                        |
| Respond to queries | <b>&lt; group,load,power,cap,vr &gt;&lt;NL&gt;</b>                                                                                        |
| Take for example   | SEND > BASIC:FUNC?<NL><br>RECEIVE > group<NL>                                                                                             |

### 8.2.1.2 BASIC:RAET

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

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

### 8.2.1.3 BASIC:BEEP

BASIC :BEEP Used to set the response.

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

### 8.2.1.4 BASIC:UFS

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

|                |                                 |
|----------------|---------------------------------|
| Command syntax | <b>BASIC:UFS &lt;on,off&gt;</b> |
|----------------|---------------------------------|

|                    |                                                                                              |
|--------------------|----------------------------------------------------------------------------------------------|
| parameter          | On: Turn on unqualified stop test function.<br>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><br>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<br>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<br>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><br>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    |
|                    | Float4                                                  | 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     | <b>GROUP:FILE &lt; group1,group2,group3,...,group10 &gt;</b>                       |
| Parameter          | Group1: Group 1<br>Group2: Group 2<br>...<br>Group3: Group 10                      |
| Take for example   | SEND> group:file group1<NL>// Set the comprehensive test group as the first group. |
| Query syntax       | <b>GROUP:FILE?</b>                                                                 |
| Respond to queries | <b>&lt; group,group2,group3,...,group10 &gt;&lt;NL&gt;</b>                         |
| Take for example   | SEND> GROUP:FILE?<NL><br>RECEIVE> group1<NL>                                       |

## 8.2.2.4 GROUP:TYPE

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

|                |                                              |
|----------------|----------------------------------------------|
| Command syntax | <b>GROUP:TYPE &lt; Li,NiMH,NiCD,SLA &gt;</b> |
| parameter      | <b>Li: Lithium battery</b>                   |

|                    |                                                                                                             |
|--------------------|-------------------------------------------------------------------------------------------------------------|
|                    | <b>NiMH:</b> Nickel-hydrogen battery<br><b>NiCD:</b> Nickel cadmium batteries<br><b>SLA:</b> 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><br>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><br>RECEIVE> 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><br>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<br>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><br>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><br>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.<br>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><br>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><br>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.<br>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><br>RECEIVE> auto<NL>                                                                                                    |

### 8.2.2.12 GROUP:TOTAL

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

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

### 8.2.2.13 GROUP:STEP

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

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

### 8.2.2.14 GROUP:SET0

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

|                  |                                                                                     |
|------------------|-------------------------------------------------------------------------------------|
| Command syntax   | <b>GROUP:SET0 &lt; step &gt;</b>                                                    |
| Parameter        | <b>step:</b> The number of steps to be configured for comprehensive testing.        |
| Take for example | <b>SEND&gt; group:set0 1&lt;NL&gt;</b> // 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   | <b>GROUP:SET1 &lt; step, vol, cur, time, vh, vl &gt;</b>                                                                                                                                                                                                                                                                           |
| Parameter        | <b>step:</b> The number of steps to be configured for comprehensive testing.<br><b>vol:</b> Activation voltage value<br><b>cur:</b> Activation current value<br><b>time:</b> TestTime<br><b>vh:</b> Comparator voltage upper limit<br><b>vl:</b> Comparator voltage lower limit                                                    |
| Take for example | <b>SEND&gt; group:set1 2,9.000, 0.1000,10.0,8.800,8.5000&lt;NL&gt;</b><br>//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 | <b>GROUP:SET2 &lt; step, rh, rl, vh, vl, time &gt;</b> |
|----------------|--------------------------------------------------------|

|                  |                                                                                                                                                                                                                                                                                                                            |
|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Parameter        | <p><b>step:</b> The number of steps to be configured for comprehensive testing.</p> <p><b>rh:</b> Comparator resistance upper limit</p> <p><b>rl:</b> Comparator resistance lower limit</p> <p><b>vh:</b> Comparator voltage upper limit</p> <p><b>vl:</b> Comparator voltage lower limit</p> <p><b>time:</b> TestTime</p> |
| Take for example | <pre>SEND&gt; group:set2 3,1.0000, 0.1000,8.800,8.5000, 10.0&lt;NL&gt; // 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.</pre>         |

### 8.2.2.17 GROUP:SET3

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

|                  |                                                                                                                                                                                                                                                                                                  |
|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Command syntax   | <b>GROUP:SET3 &lt; step, vol,cur,time,vh,vl &gt;</b>                                                                                                                                                                                                                                             |
| Parameter        | <p><b>step:</b> The number of steps to be configured for comprehensive testing.</p> <p><b>vol:</b> Charging voltage value</p> <p><b>cur:</b> Charging current</p> <p><b>time:</b> TestTime</p> <p><b>vh:</b> Comparator voltage upper limit</p> <p><b>vl:</b> Comparator voltage lower limit</p> |
| Take for example | <pre>SEND&gt; group:set3 4,9.000, 0.1000,10.0,8.800,8.5000&lt;NL&gt; // 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.</pre>                   |

### 8.2.2.18 GROUP:SET4

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

|                |                                                                                                                                                                                                                                                                                                                                                                                        |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Command syntax | <b>GROUP:SET4</b><br><b>&lt; step, startcur,stopcur,stepcur,vol,steptime,ih,il &gt;</b>                                                                                                                                                                                                                                                                                                |
| Parameter      | <p><b>step:</b> The number of steps to be configured for comprehensive testing.</p> <p><b>startcur:</b> Initial current</p> <p><b>stopcur:</b> Cut-off current</p> <p><b>stepcur:</b> Stepping current</p> <p><b>vol:</b> Magnitude of voltage</p> <p><b>steptime:</b> Step time</p> <p><b>ih:</b> Comparator current upper limit</p> <p><b>il:</b> Comparator current lower limit</p> |
| Example        | <pre>SEND&gt; group:set4 5, 1.0, 2.0,0.1,1.0, 1.7,1.6&lt;NL&gt; // 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.</pre>                                                                 |

### 8.2.2.19 GROUP:SET5

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

|                         |                                                                                                                                                                                                                                                                                                                                                                   |
|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Command syntax</b>   | <b>GROUP:SET5 &lt; step, cur,time,vh,vl,rh,rl &gt;</b>                                                                                                                                                                                                                                                                                                            |
| <b>Parameter</b>        | <b>step:</b> The number of steps to be configured for comprehensive testing.<br><b>Cur:</b> On-load current of battery<br><b>Time:</b> battery loading time<br><b>Vh:</b> Upper limit of comparator voltage<br><b>Vl:</b> Lower limit of comparator voltage<br><b>Rh:</b> upper limit of comparator resistance<br><b>Rl:</b> lower limit of comparator resistance |
| <b>Take for example</b> | <pre>SEND&gt; group:set5 6,1.0, 1.0,8.800,8.5000,1.0,0.7&lt;NL&gt; //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.</pre>                                        |

### 8.2.2.20 GROUP:SET6

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

|                         |                                                                                                                                                                                                                                     |
|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Command syntax</b>   | <b>GROUP:SET6 &lt; step, cur,time,vh,vl &gt;</b>                                                                                                                                                                                    |
| <b>Parameter</b>        | <b>step:</b> The number of steps to be configured for comprehensive testing.<br><b>cur:</b> Load current<br><b>time:</b> TestTime<br><b>vh:</b> Comparator voltage upper limit<br><b>vl:</b> Comparator voltage lower limit         |
| <b>Take for example</b> | <pre>SEND&gt; group:set6 7, 1.0, 10.0,8.1,8.0&lt;NL&gt; //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.</pre> |

### 8.2.2.21 GROUP:SET7

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

|                         |                                                                                                                                                                                                                                                                                                                                                                                                     |
|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Command syntax</b>   | <b>GROUP:SET7<br/>&lt; step, startcur,stopcur,stepcur,steptime,ih,il, th,tl &gt;</b>                                                                                                                                                                                                                                                                                                                |
| <b>Parameter</b>        | <b>step:</b> The number of steps to be configured for comprehensive testing.<br><b>startcur:</b> Initial current<br><b>stopcur:</b> Cut-off current<br><b>stepcur:</b> Stepping current<br><b>steptime:</b> Step time<br><b>ih:</b> Comparator current upper limit<br><b>il:</b> Comparator current lower limit<br><b>th:</b> Comparator time upper limit<br><b>tl:</b> Comparator time lower limit |
| <b>Take for example</b> | <pre>SEND&gt; group:set7 8, 1.0, 2.0,0.1,0.001, 1.7,1.6, &lt;NL&gt; //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</pre>                                                                                                                                                                                         |

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        | <p>step: The number of steps to be configured for comprehensive testing.</p> <p>time: TestTime</p> <p>vh: Comparator voltage upper limit</p> <p>vl: Comparator voltage lower limit</p> <p>th: Comparator time upper limit</p> <p>tl: Comparator time lower limit</p>                                                                     |
| Take for example | <pre>SEND&gt; group:set8 9, 0.001, 0.1,0.001,0.0005, 0.0001&lt;NL&gt; //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.</pre> |

### 8.2.2.23 GROUP:SET9

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

|                  |                                                                                                                                                                                                                                                  |
|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Command syntax   | GROUP:SET9<br>< step, vol,cur,time,vh,vl >                                                                                                                                                                                                       |
| Parameter        | <p>step: The number of steps to be configured for comprehensive testing.</p> <p>vol: charging voltage</p> <p>cur: Load current</p> <p>time: TestTime</p> <p>vh: Comparator voltage upper limit</p> <p>vl: Comparator voltage lower limit</p>     |
| Take for example | <pre>SEND&gt; group:set9 10, 9.0, 1.0,10.0,8.8, 8.7&lt;NL&gt; //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.</pre> |

### 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 | <p>Empty: &lt;step&gt;,"null"</p> <p>Activate battery: &lt;step&gt;,"act",&lt;vol&gt;,&lt;cur&gt;,&lt;time&gt;,&lt;vh&gt;,&lt;vl&gt;</p> <p>Voltage internal resistance:<br/>&lt;step&gt;,"vr",&lt;rh&gt;,&lt;rl&gt;,&lt;vh&gt;,&lt;vl&gt;,&lt;time&gt;</p> <p>Charging test: &lt;step&gt;,"chg",&lt;vol&gt;,&lt;cur&gt;,&lt;time&gt;,&lt;vh&gt;,&lt;vl&gt;</p> <p>Overcharge test: &lt;step&gt;,"oc",&lt;startcur&gt;,&lt;stopcur&gt;,&lt;stepcur&gt;,&lt;time&gt;,&lt;vh&gt;,&lt;vl&gt;</p> |

|                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                  | <code>&lt;steptime&gt;,&lt;ih&gt;,&lt;il&gt;</code><br>DC internal resistance:<br><code>&lt;step&gt;,"dr",&lt;cur&gt;,&lt;time&gt;,&lt;vh&gt;,&lt;vl&gt;,&lt;rh&gt;,&lt;rl&gt;</code><br>Discharge test: <code>&lt;step&gt;,"dcg",&lt;cur&gt;,&lt;time&gt;,&lt;vh&gt;,&lt;vl&gt;</code><br>Overdischarge test:<br><code>&lt;step&gt;,"odc",&lt;startcur&gt;,&lt;stopcur&gt;,&lt;stepcur&gt;,&lt;steptime&gt;,&lt;ih&gt;,&lt;il&gt;,&lt;th&gt;,&lt;tl&gt;</code><br>Short circuit test: <code>&lt;step&gt;,"sht",&lt;time&gt;,&lt;vh&gt;,&lt;vl&gt;,&lt;th&gt;,&lt;tl&gt;</code><br>Recovery test: <code>&lt;step&gt;,"rst",&lt;vol&gt;,&lt;cur&gt;,&lt;time&gt;,&lt;vh&gt;,&lt;vl&gt;</code> |
| Take for example | SEND> GROUP:SET? 2<br>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<br>Command tree | :FETCH  | <res>,<vol>     |
|                    | :VNO    | <range>         |
|                    | :VMODE  | <auto,hold>     |
|                    | :RNO    | <range>         |
|                    | :RMODE  | <auto,hold>     |
|                    | :RLIMIT | <rhight>,<rlow> |
|                    | :VLIMIT | <vhight>,<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><br>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><br>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.<br>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><br>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><br>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<br>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><br>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<br>low: Lower resistance limit                                                            |
| Take for example   | SEND> VR:RLIMIT 1.0,0.9<NL> // Set the upper limit of resistance to 1.0 $\Omega$ and the lower limit to 0.9 $\Omega$ . |
| Query syntax       | VR:RLIMIT?                                                                                                             |
| Respond to queries | < high >,< low ><NL>                                                                                                   |
| Take for example   | SEND> VR:RLIMIT?<NL><br>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<br>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><br>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         | :STATE | <on,off>                  |
| Command tree | :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<br>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><br>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><br>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<br>cc: Constant current<br>cp: Fixed power<br>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><br>RECEIVE > cc<NL>                                                  |

#### 8.2.4.4 LOAD:LIMIT

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

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

#### 8.2.4.5 LOAD:VALUE

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

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

### 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

|                           |               |                                                          |
|---------------------------|---------------|----------------------------------------------------------|
| <b>Power Command tree</b> | <b>:STATE</b> | <b>&lt;on,off&gt;</b>                                    |
|                           | <b>:FETCH</b> | <b>&lt;vol&gt;,&lt;cur&gt;,&lt;power&gt;,&lt;res&gt;</b> |
|                           | <b>:VALUE</b> | <b>&lt;vol&gt;,&lt;cur&gt;</b>                           |

#### 8.2.5.1 POWER:STATE

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

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

#### 8.2.5.2 POWER:FETCH

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

|              |                     |
|--------------|---------------------|
| Query syntax | <b>POWER:FETCH?</b> |
|--------------|---------------------|

|                   |                                                                                                    |
|-------------------|----------------------------------------------------------------------------------------------------|
| Respond to querie | <code>&lt;vol&gt;,&lt;cur&gt;,&lt;power&gt;,&lt;res&gt;</code>                                     |
| Take for example  | <pre>SEND &gt; POWER:FETCH?&lt;NL&gt; RECEIVE&gt; 8.8e+00,5.0e-01,4.4e+00,1.76e+01&lt;NL&gt;</pre> |

### 8.2.5.3 POWER:VALUE

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

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

## 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<br>Command tree | <code>:STATE</code> | <code>&lt;on,off&gt;</code>                 |
|                     | <code>:FETCH</code> | <code>&lt;cap&gt;</code>                    |
|                     | <code>:FILE</code>  | <code>&lt;file1,file2,...,file10&gt;</code> |
|                     | <code>:TYPE</code>  | <code>&lt;Li,NiMH,NiCD,SLA&gt;</code>       |
|                     | <code>:VOL</code>   | <code>&lt;float&gt;</code>                  |
|                     | <code>:CAP</code>   | <code>&lt;float&gt;</code>                  |
|                     | <code>:RCV</code>   | <code>&lt;float&gt;</code>                  |
|                     | <code>:RCC</code>   | <code>&lt;float&gt;</code>                  |
|                     | <code>:DCC</code>   | <code>&lt;float&gt;</code>                  |
|                     | <code>:COV</code>   | <code>&lt;float&gt;</code>                  |
|                     | <code>:PC</code>    | <code>&lt;on,off&gt;</code>                 |
|                     | <code>:CYCLE</code> | <code>&lt;int&gt;</code>                    |

### 8.2.6.1 CAP:STATE

CAP:STATE Used to set battery capacity test status.

|                   |                                                                                       |
|-------------------|---------------------------------------------------------------------------------------|
| Command syntax    | <code>CAP:STATE &lt; on,off &gt;</code>                                               |
| Parameter         | <p><code>On</code>: Start the test</p> <p><code>Off</code>: Stop testing</p>          |
| Take for example  | <code>SEND &gt; CAP:state on&lt;NL&gt; // Set the instrument to start testing.</code> |
| Query syntax      | <code>CAP:STATE?</code>                                                               |
| Respond to querie | <code>&lt; on,off &gt;&lt;NL&gt;</code>                                               |
| Take for example  | <pre>SEND &gt; CAP:STATE?&lt;NL&gt; RECEIVE&gt; on&lt;NL&gt;</pre>                    |

### 8.2.6.2 CAP:FETCH

CAP:FETCH Used to obtain battery capacity test results.

|                   |                                                                                   |
|-------------------|-----------------------------------------------------------------------------------|
| Query syntax      | <code>CAP:FETCH?</code>                                                           |
| Respond to querie | <code>&lt;cap&gt;</code>                                                          |
| Take for example  | <pre>SEND &gt; CAP:FETCH?&lt;NL&gt; RECEIVE&gt; 1.0e-01&lt;NL&gt; //unit AH</pre> |

### 8.2.6.3 CAP:FILE

CAP:FILE Select the file for battery capacity test.

|                   |                                                                                                  |
|-------------------|--------------------------------------------------------------------------------------------------|
| Command syntax    | <b>CAP:FILE &lt; file1,file2,...,file10 &gt;</b>                                                 |
| Parameter         | <b>File1</b><br><b>File2</b><br>...<br><b>File10</b>                                             |
| Take for example  | <b>SEND &gt; CAP:FILE file1&lt;NL&gt; // Set parameters of battery capacity test call file 1</b> |
| Query syntax      | <b>CAP:FILE?</b>                                                                                 |
| Respond to querie | <b>&lt; file1,file2,...,file10 &gt;&lt;NL&gt;</b>                                                |
| Take for example  | <b>SEND &gt; CAP:FILE?&lt;NL&gt;</b><br><b>RECEIVE&gt; file1&lt;NL&gt;</b>                       |

### 8.2.6.4 CAP:TYPE

CAP:TYPE Used to set the type of battery.

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

### 8.2.6.5 CAP:VOL

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

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

### 8.2.6.6 CAP:CAP

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

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

### 8.2.6.7 CAP:RCV

CAP:RCV Used to set the battery charging voltage.

|                   |                                                                            |
|-------------------|----------------------------------------------------------------------------|
| Command syntax    | <b>CAP:RCV &lt; float &gt;</b>                                             |
| Parameter         | <b>Float : charging voltage</b>                                            |
| Take for example  | <b>SEND &gt; CAP:RCV 9.0&lt;NL&gt; // Set the charging voltage to 9.0V</b> |
| Query syntax      | <b>CAP:RCV?</b>                                                            |
| Respond to querie | <b>&lt; float &gt;&lt;NL&gt;</b>                                           |
| Take for example  | <b>SEND &gt; CAP:RCV?&lt;NL&gt;<br/>RECEIVE&gt; 9.0e+00&lt;NL&gt;</b>      |

### 8.2.6.8 CAP:RCC

CAP:RCC Used to set the battery charging current.

|                   |                                                                            |
|-------------------|----------------------------------------------------------------------------|
| Command syntax    | <b>CAP:RCC &lt; float &gt;</b>                                             |
| Parameter         | <b>Float : charging current</b>                                            |
| Take for example  | <b>SEND &gt; CAP:RCC 1.0&lt;NL&gt; // Set the charging current to 1.0A</b> |
| Query syntax      | <b>CAP:RCC?</b>                                                            |
| Respond to querie | <b>&lt; float &gt;&lt;NL&gt;</b>                                           |
| Take for example  | <b>SEND &gt; CAP:RCC?&lt;NL&gt;<br/>RECEIVE&gt; 1.0e+00&lt;NL&gt;</b>      |

### 8.2.6.9 CAP:DCC

CAP:DCC Used to set the battery discharge current.

|                   |                                                                             |
|-------------------|-----------------------------------------------------------------------------|
| Command syntax    | <b>CAP:DCC &lt; float &gt;</b>                                              |
| Parameter         | <b>Float : discharging current</b>                                          |
| Take for example  | <b>SEND &gt; CAP:DCC 1.0&lt;NL&gt; // Set the discharge current to 1.0A</b> |
| Query syntax      | <b>CAP:DCC?</b>                                                             |
| Respond to querie | <b>&lt; float &gt;&lt;NL&gt;</b>                                            |
| Take for example  | <b>SEND &gt; CAP:DCC?&lt;NL&gt;<br/>RECEIVE&gt; 1.0e+00&lt;NL&gt;</b>       |

### 8.2.6.10 CAP:COV

CAP:COV Used to set the battery cutoff voltage.

|                   |                                                                                  |
|-------------------|----------------------------------------------------------------------------------|
| Command syntax    | <b>CAP:COV &lt; float &gt;</b>                                                   |
| Parameter         | <b>Float : cutoff voltage</b>                                                    |
| Take for example  | <b>SEND &gt; CAP:COV 8.0&lt;NL&gt; // Set the battery cutoff voltage to 8.0V</b> |
| Query syntax      | <b>CAP:COV?</b>                                                                  |
| Respond to querie | <b>&lt; float &gt;&lt;NL&gt;</b>                                                 |
| Take for example  | <b>SEND &gt; CAP:COV?&lt;NL&gt;<br/>RECEIVE&gt; 8.0e+00&lt;NL&gt;</b>            |

### 8.2.6.11 CAP:PC

CAP:PC Used to set battery pre-discharge.

|                  |                                                                                            |
|------------------|--------------------------------------------------------------------------------------------|
| Command syntax   | <b>CAP:PC &lt; on,off &gt;</b>                                                             |
| Parameter        | <b>On: Turn on the pre-discharge function<br/>Off: Turn off the pre-discharge function</b> |
| Take for example | <b>SEND &gt; CAP:PC on&lt;NL&gt; // Set battery pre-discharge on</b>                       |
| Query syntax     | <b>CAP:PC?</b>                                                                             |

|                  |                                         |
|------------------|-----------------------------------------|
| Respond to query | < on, off > <NL>                        |
| Take for example | SEND > CAP:PC? <NL><br>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 query | < int > <NL>                                                         |
| Take for example | SEND > CAP:CYCLE? <NL><br>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<br>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

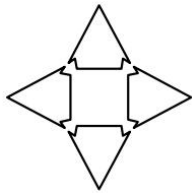
|                  |                                            |
|------------------|--------------------------------------------|
| Query syntax     | ERROR?                                     |
| Respond to query | Error string                               |
| Take for example | SEND > ERR? <NL><br>RECEIVE> no error <NL> |

## 8.2.9 IDN subsystem

IDN? Used to query the instrument ID number

|                  |                                           |
|------------------|-------------------------------------------|
| Query syntax     | IDN? Or *IDN?                             |
| Respond to query | <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

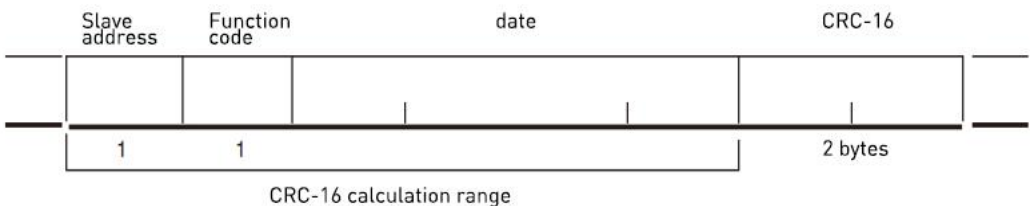


Chart 9- 1 Instruction frame description

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

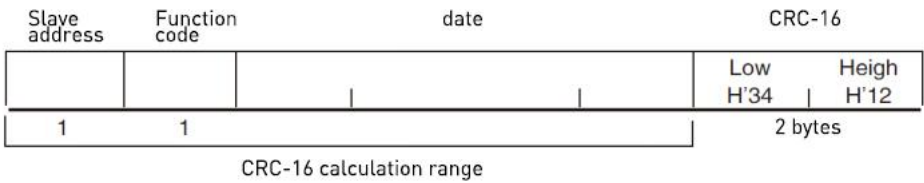
Refer to:



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:

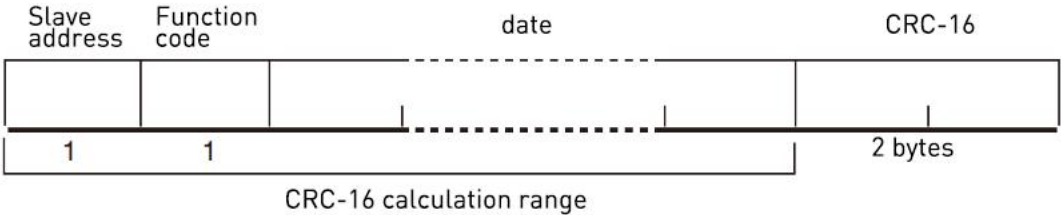
Picture 9- 1-2 Modbus Additional CRC-16 value



### 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.

Picture 9- 1-3 Normal response frame



Picture 9- 1 Abnormal response frame

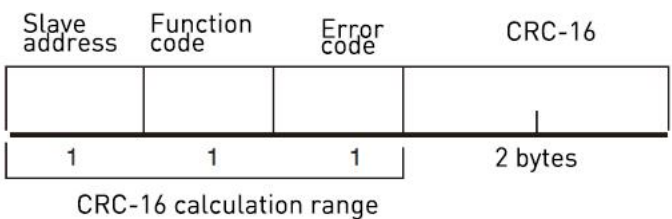


Chart 9- 2 Description of abnormal response frame

|                          |                                                                                                                                                                     |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Address of slave station | 1byte<br>Return from the station address as it is                                                                                                                   |
| Function code            | 1 byte<br>Function code of instruction frame OR BIT7 (0x80) , Take for example: 0x03<br>$\wedge 0x80 = 0x83$                                                        |
| Error code               | Abnormal code:<br>0x01 Code error (The function code is not supported)<br>0x02 Register error (Register does not exist)<br>0x03 Data error<br>0x04 Execution error  |
| CRC-16                   | 2 bytes, with lower bits first.<br>CyclicRedundancy Check<br>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

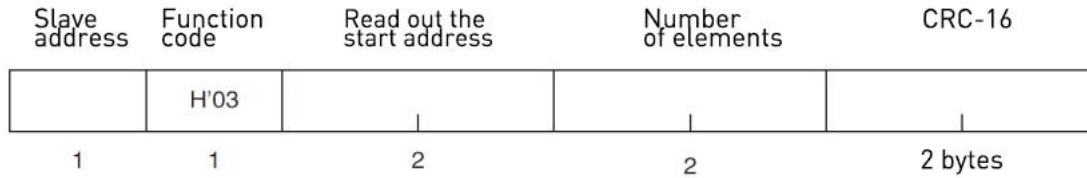
Refer to:



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<br>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)

| Slave address | Function code | Byte count | Read data (element quantity part) | CRC-16 |
|---------------|---------------|------------|-----------------------------------|--------|
|               | H'03          |            |                                   |        |
| 1             | 1             | 1          | 0 ~ 212(2X106)                    | 2      |

| Parameter    | Name                     | Illustration                                                       |
|--------------|--------------------------|--------------------------------------------------------------------|
|              | Address of slave station | Return as is                                                       |
| 0x03<br>0x83 | Function code            | No abnormality: 0x03<br>Error code: 0x83                           |
|              | Number of bytes          | =Number of registersx2<br>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)

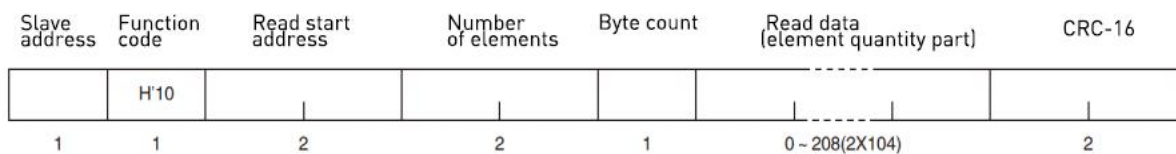
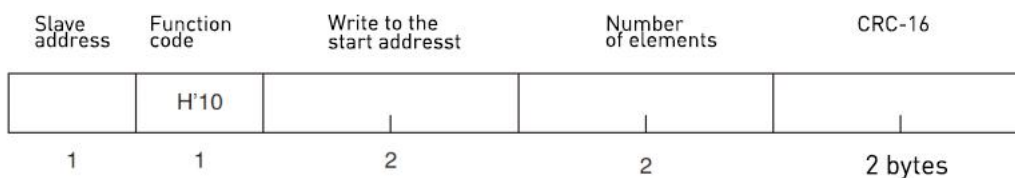


Chart 9- 6 Write to multiple registers

| 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<br>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

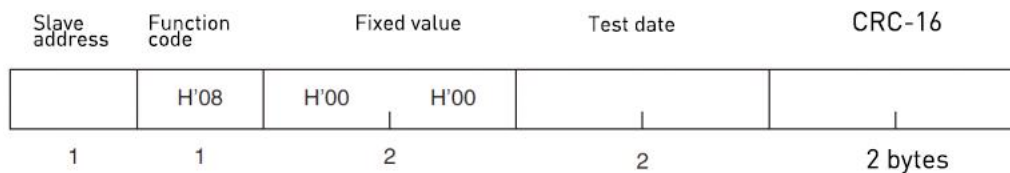
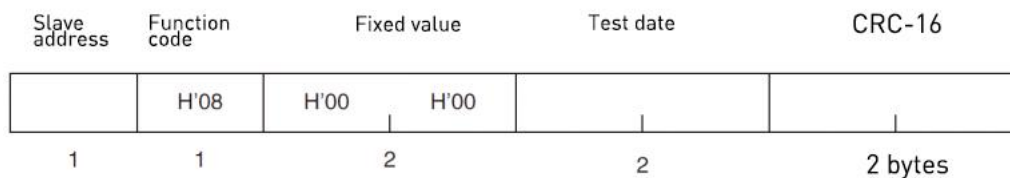


| Parameter       | Name                     | Illustration                             |
|-----------------|--------------------------|------------------------------------------|
|                 | Address of slave station | Return as is                             |
| 0x10<br>Or 0x90 | Function code            | No abnormality: 0x10<br>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        |                                             |

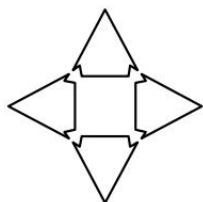
Take for example:

Assume that the test data is 0x1234.:

Instructions: 01 08 00 00 12 34 ED 7C(CRC-16)

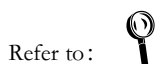
Response: 01 08 00 00 12 34 ED 7C(CRC-16)

# 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                                        |
|------------------------------|---------------------------------|-------------------------------------------------------------------------------------------------------|-----------------------------------------------------|
| <b>Battery capacity test</b> |                                 |                                                                                                       |                                                     |
| 2000                         | Battery capacity test switch    | 0000: Close the test<br>0001: Start the test                                                          | Read and write register, 2-byte integer             |
| 2001                         | Battery capacity file number    | 0000: File 1<br>0001: File 2<br>...<br>0009: File 10                                                  | Read and write register, 2-byte integer             |
| 2002                         | Battery type                    | 0000: Lithium battery<br>0001: NI-MH battery<br>0002: Nickel chromium battery<br>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 predischage             | 0000: Turn off the pre-discharge<br>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<br>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<br>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<br>0001: Start the test                                              | Read and write register, 2-byte integer             |
| 2201                             | Load test mode                    | 0000: Fixed voltage<br>0001: Fixed current<br>0002: Fixed power<br>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<br>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<br>0001: Start the test                                                          | Read and write register, 2-byte integer             |
| 2401           | Group test files                               | 0000: Group 1<br>0001: Group 2<br>...<br>0009: Group 10                                               | Read and write register, 2-byte integer             |
| 2402           | Group set of test battery type                 | 0000: lithium battery<br>0001: NI-MH battery<br>0002: Nickel chromium battery<br>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<br>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<br>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<br>0001: Battery activation<br>0002: Voltage internal resistance<br>0003: Charging test<br>0004: Overcharge test<br>0005: DC internal resistance<br>0006: Discharge test<br>0007: Over-put test<br>0008: Short circuit test<br>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<br>0001: DC load<br>0002: direct-current main<br>0003: battery capacity<br>0004: Group testing                                                                                                                                 | Read and write register, 2-byte integer        |
| 3001           | The buzzer setting                 | 0000: close<br>0001: open                                                                                                                                                                                                                                        | Read and write register, 2-byte integer        |
| 3002           | Disqualified stop                  | 0000: close<br>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: 3DCCCCD = 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: 3DCCCCD = 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 |    |

From 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 |
|    | 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 |    |

### 10.6.9 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       | 1<br>2 | 00                  | 02 | 04   | 3D | CC   | CC | C<br>D | 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: 3DCCCCD = 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         |
|-----------|-----------|-----------|---------------------|-----------|-----------|-----------|-----------|
| <b>01</b> | <b>03</b> | <b>24</b> | <b>1E</b>           | <b>00</b> | <b>02</b> | <b>AE</b> | <b>FD</b> |
|           | read      | register  | Number of registers |           | CRC       |           |           |

respond:

| 1         | 2         | 3         | 4                                      | 5         | 6         | 7         | 8         | 9         |
|-----------|-----------|-----------|----------------------------------------|-----------|-----------|-----------|-----------|-----------|
| <b>01</b> | <b>03</b> | <b>04</b> | <b>40</b>                              | <b>A0</b> | <b>00</b> | <b>00</b> | <b>EF</b> | <b>D4</b> |
| 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        |
|-----------|-----------|-----------|---------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| <b>01</b> | <b>10</b> | <b>24</b> | <b>20</b>           | <b>00</b> | <b>02</b> | <b>04</b> | <b>3D</b> | <b>CC</b> | <b>CC</b> | <b>CD</b> | <b>03</b> | <b>B0</b> |
|           | write     | register  | Number of registers |           | byte      | data      |           |           |           | CRC       |           |           |

respond:

| 1         | 2         | 3         | 4                   | 5         | 6         | 7         | 8         |
|-----------|-----------|-----------|---------------------|-----------|-----------|-----------|-----------|
| <b>01</b> | <b>10</b> | <b>24</b> | <b>20</b>           | <b>00</b> | <b>02</b> | <b>4A</b> | <b>F2</b> |
|           |           | register  | Number of registers |           |           | CRC       |           |

From B8 to B11 set the data for the lower current limit: 3DCCCCD = 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         |
|-----------|-----------|-----------|---------------------|-----------|-----------|-----------|-----------|
| <b>01</b> | <b>03</b> | <b>24</b> | <b>20</b>           | <b>00</b> | <b>02</b> | <b>CF</b> | <b>31</b> |
|           | read      | register  | Number of registers |           |           | CRC       |           |

respond:

| 1         | 2         | 3         | 4                                      | 5         | 6         | 7         | 8         | 9         |
|-----------|-----------|-----------|----------------------------------------|-----------|-----------|-----------|-----------|-----------|
| <b>01</b> | <b>03</b> | <b>04</b> | <b>3D</b>                              | <b>CC</b> | <b>CC</b> | <b>CD</b> | <b>A3</b> | <b>35</b> |
| 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        |
|-----------|-----------|-----------|---------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| <b>01</b> | <b>10</b> | <b>24</b> | <b>22</b>           | <b>00</b> | <b>02</b> | <b>04</b> | <b>43</b> | <b>96</b> | <b>00</b> | <b>00</b> | <b>2E</b> | <b>C7</b> |
|           | 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  $300.0 \Omega$ .

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  $1m \Omega$ .

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        |
| <b>01</b> | <b>10</b> | <b>24</b> | <b>2C</b>           | <b>00</b> | <b>01</b> | <b>02</b> | <b>00</b> | <b>00</b> | <b>C5</b> | <b>FE</b> |
|           | write     | register  | Number of registers |           | byte      | data      |           | CRC       |           |           |

respond:

|           |           |           |                     |           |           |           |           |
|-----------|-----------|-----------|---------------------|-----------|-----------|-----------|-----------|
| 1         | 2         | 3         | 4                   | 5         | 6         | 7         | 8         |
| <b>01</b> | <b>10</b> | <b>24</b> | <b>2C</b>           | <b>00</b> | <b>01</b> | <b>CA</b> | <b>F0</b> |
|           |           | 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         |
| <b>01</b> | <b>03</b> | <b>24</b> | <b>2C</b>           | <b>00</b> | <b>01</b> | <b>4F</b> | <b>33</b> |
|           | read      | register  | Number of registers |           |           | CRC       |           |

respond:

|           |           |           |           |           |           |           |
|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| 1         | 2         | 3         | 4         | 5         | 6         | 7         |
| <b>01</b> | <b>03</b> | <b>02</b> | <b>00</b> | <b>00</b> | <b>B8</b> | <b>44</b> |
| 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        |
| <b>01</b> | <b>10</b> | <b>24</b> | <b>2D</b>           | <b>00</b> | <b>01</b> | <b>02</b> | <b>00</b> | <b>00</b> | <b>C4</b> | <b>2F</b> |
|           | write     | register  | Number of registers |           |           | byte      | data      |           | CRC       |           |

respond:

|           |           |           |                     |           |           |           |           |
|-----------|-----------|-----------|---------------------|-----------|-----------|-----------|-----------|
| 1         | 2         | 3         | 4                   | 5         | 6         | 7         | 8         |
| <b>01</b> | <b>10</b> | <b>24</b> | <b>2D</b>           | <b>00</b> | <b>01</b> | <b>9B</b> | <b>30</b> |
|           |           | 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         |
| <b>01</b> | <b>03</b> | <b>24</b> | <b>2D</b>           | <b>00</b> | <b>01</b> | <b>1E</b> | <b>F3</b> |
|           | read      | register  | Number of registers |           |           | CRC       |           |

respond:

|           |           |           |           |           |           |           |
|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| 1         | 2         | 3         | 4         | 5         | 6         | 7         |
| <b>01</b> | <b>03</b> | <b>02</b> | <b>00</b> | <b>00</b> | <b>B8</b> | <b>44</b> |
| 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.

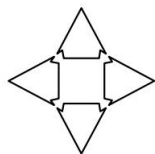
Read and fetch

|    |      |          |    |                     |    |     |    |
|----|------|----------|----|---------------------|----|-----|----|
| 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

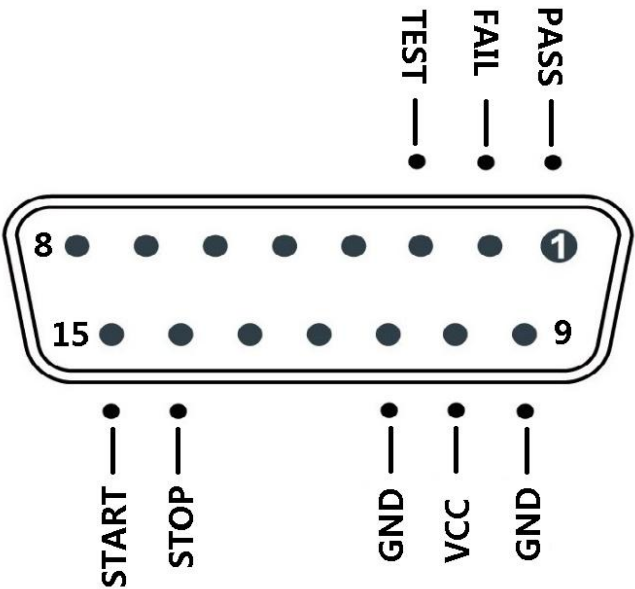
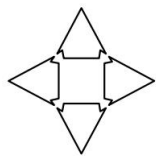


Chart 11-1 Pon of PLC port

| 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 :  $23^{\circ}\text{C} \pm 5^{\circ}\text{C}$
- Humidity conditions:  $\leq 65\%$  R.H.
- Zero value adjustment: short circuit and zero before test
- preheating time:  $> 60$  minutes
- Calibration time: 12 months

Test the current accuracy: 10%

Test the current frequency accuracy:  $1\text{kHz}(1 \pm 20\text{Hz}), 5\text{ppm}$

### 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  $18^{\circ}\text{C} \sim 28^{\circ}\text{C}$  humidity  $< 65\%$  RH

Operation: temperature  $10^{\circ}\text{C} \sim 40^{\circ}\text{C}$  humidity  $10 \sim 80\%$  RH

Storage: temperature  $0^{\circ}\text{C} \sim 50^{\circ}\text{C}$  humidity  $10 \sim 90\%$  RH

source: 200VAC~240VAC

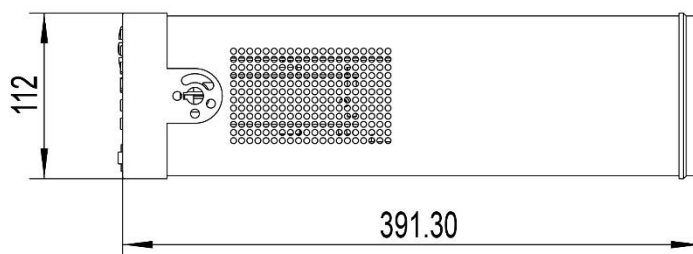
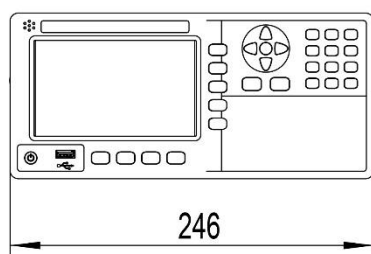
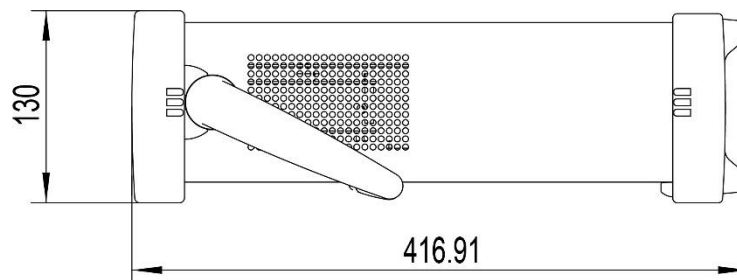
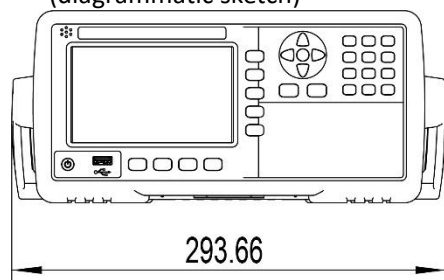
fuse: 250V 1ASlow melting

power: maximum 120VA

weight: about 5 kg

## 12.4 Physical dimension

(diagrammatic sketch)



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-AT5800 user's manual-

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