User's Guide
用户手册

Rev. A

Firmware Description:
Applicable to main program RevA1 and above versions

AT529 series

Battery tester

Changzhou Applent Instruments Ltd
Building 14, No. 9 Caoxi Road, Wujin District,
Changzhou City, Jiangsu Province
Phone: 0519-88805550
http://www.anbai.cn
Sales Service Email: sales@applent.com
Technical support email: tech@applent.com
© 2005-2024 Applent Instruments Ltd

ONMEAS®

Rev.B0

AT529 series

Battery Meter



User's Guide

Scan QR code for operation video

Safety instructions

⚠Warning ⚠danger: When you notice any abnormal situations, please immediately terminate the operation and disconnect the power cord. Immediately contact the sales department of applent Technology for repairs. Otherwise, it will cause a fire or pose a potential risk of electric shock to the operator.

- Abnormal instrument operation.
- The instrument generates abnormal noise, odor, smoke, or flash during operation.
- During operation, the instrument generates high temperature or electric shock.
- Damaged power cord, power switch, or power socket.
- Impurities or liquids flow into the instrument.

security information

⚠Warning ⚠danger: To avoid possible electric shock and personal safety, please follow the following guidelines for operation.

Disclaimers	Before starting to use the instrument, users should carefully read the following safety information. applent Technology will not be responsible for any personal safety and property damage caused by the user's failure to comply with the following terms.
Instrument grounding	To prevent the risk of electric shock, please connect the power ground wire properly.
Impossible Using instruments in explosive gas environments	Do not use the instrument in environments with flammable and explosive gases, vapors, or high levels of dust. Using any electronic device in such an environment is a risk to personal safety.
Impossible Open the instrument casing	Non professional maintenance personnel are not allowed to open the instrument casing in order to attempt to repair the instrument. The instrument still has an unreleased charge for a period of time after shutdown, which may pose a risk of electric shock to personnel.
Don't Using damaged instruments	If the instrument has been damaged, its danger will be unpredictable. Please disconnect the power cord, do not use it again, and do not attempt to repair it yourself.
Don't Using instruments with abnormal working conditions	If the instrument is not working properly and its danger is unpredictable, please disconnect the power cord, do not use it again, and do not attempt to repair it on your own.
Don't Using the instrument in a way that exceeds the instructions specified in this manual	Beyond the range, the protective measures provided by the instrument will be ineffective.

Limited Warranty and Scope of Liability

Changzhou applent Instruments Ltd. (hereinafter referred to as Applent) guarantees that every AT529 you purchase is completely qualified in terms of quality and measurement. This guarantee does not include fuses or damage caused by negligence, misuse, contamination, accidental or abnormal use. This guarantee only applies to the original purchaser and is non transferable.

From the date of shipment, Applent provides a ninety (90) day warranty and a two-year free warranty, which also includes VFD or LCD. During the ninety day warranty period, if damage is caused by improper user operation, the warranty terms will terminate. During the two-year warranty period, if the instrument is damaged due to improper operation by the user, the maintenance cost shall be borne by the user. Two years from now until the instrument panel is fully functional, Applent will provide maintenance on a fee basis. For the replacement of VFD or LCD, the cost will be charged at the current cost price.

If any damage is found to the product, please contact Applent for information on agreeing to return or replace it. Afterwards, please send this product to the seller for return or exchange. Please make sure to explain the cause of product damage, and prepay postage and insurance to the destination. For the repair or replacement of products within the warranty period, Applent will be responsible for the shipping cost of the return mail. For the repair of non warranty products, Applent will estimate the repair cost and only proceed with the repair with your consent. All costs incurred by the repair will be borne by the user, including shipping costs for return shipping.

This guarantee is the only one provided by Applent and also the only compensation for you. Apart from this, there are no express or implied warranties (including warranties of fitness for a particular purpose), and all other warranties are expressly denied. Applent or other agents have not made any verbal or written representations to establish a warranty or expand the scope of this warranty in any way. Applent shall not be responsible for any special, indirect, incidental or consequential damages or losses (including loss of information) caused by any reasons outside the specification range. If any provision conflicts with local regulations or is excluded or restricted due to certain judicial provisions that do not allow implied warranties, local regulations shall prevail, and therefore this provision may not apply to you. But the ruling of this clause does not affect the validity and enforce ability of other clauses.

People's Republic of China
Jiangsu Province
Changzhou applent Instruments Ltd
October 2009
Rev.A3

catalogue

Safety Notice 2
Security Information 2
Limited Warranty and Scope of Liability 3
Catalogue 4
Catalogue of Illustrations 8
Table of Contents 9
1. Installation and setup wizard 10
1.1 Packing List 10
1.2 Power Requirements 10
1.3 Operating Environment 10
1.4 Cleaning 10
1.5 Battery Replacement 11
1.6 Adjusting Support 11
2. Overview 12
2.1 Introduction 12
2.2 Main Functions 13
2.2.1 Testing frequency 13
2.2.2 Range 13
2.2.3 Testing speed 13
2.2.4 Trigger Method 13
2.2.5 Basic Accuracy 13
2.2.6 Maximum Reading 13
2.2.7 Calibration function 13
2.2.8 System Settings 13
2.2.9 Interface 13
3. Start 14
3.1 Understanding the Front Panel 14
3.1.1 Front panel description 14
3.2 Front Panel 14
3.2.1 Interface Panel 15
3.3 Using an External Power Supply 15
3.3.1 Battery charging function 15
3.4 Power on 15
3.5 Connection of Test End 15
3.5.1 Test Fixtures and Cables 16
4. [Measures] Measurement Display Page 17
4.1 <Measurement Display>Page 17
4.1.1 Measurement [Function] 17
4.1.2 【 R-Range 】 18
4.1.3 【 V-Range 】 19
4.1.4 [Trigger] Method 20
5. [Setup] Page 21
5.1 Settings Page 21
5.1.1 Measurement [Function] 21
5.1.2 【 R-Range 】 22
5.1.3 【 V-Range 】 23

5.1.4 [Trigger] Method ····· 24
5.1.5 [Monitoring] Parameters ····· 24
5.2 File Management ····· 24
5.2.1 【 Startup Call 】 ····· 25
5.2.2 [Auto Save] ····· 25
5.2.3 [File 0]~[File 9] ····· 25
6. User calibration ····· 26
6.1 Short circuit clearing ····· 26
7. Comparator Settings ····· 29
7.1.1 [Sound] Settings ····· 29
7.1.2 Comparator Settings ····· 29
7.1.3 [nominal value] Input ····· 30
7.1.4 【 Lower Limit 】 and 【 Upper Limit 】 Settings ····· 30
8. Data recording and statistics ····· 31
8.1 Setting the Data Record Cache ····· 31
8.2 Data recording function ····· 31
8.2.1 Starting Recording ····· 31
8.2.2 Stop Recording ····· 32
8.2.3 Saving Data to USB Disk ····· 33
8.2.4 Sending Data to Computers ····· 36
9. System Configuration ····· 37
9.1 System Configuration Page ····· 37
9.1.1 Changing System Language [LANGUAGE] ····· 37
9.1.2 Modification of Date and Time ····· 37
9.1.3 Account Settings ····· 38
9.1.4 [Button Sound] Setting ····· 38
9.1.5 [Trigger Light] Setting ····· 39
9.1.6 [Backlight Brightness] Setting ····· 39
9.1.7 [Automatic Shutdown] Time Setting ····· 39
9.1.8 About 【 USB-VCOM 】 Settings ····· 39
9.1.9 Regarding [Communication Protocol] ····· 39
9.1.10 SCPI [End], [Instruction Handshake], [Error Code] Settings ····· 39
9.1. 11SCPI 【 Result Sending 】 Method ····· 40
9.1.12 Setting [Data Cache] for Data Records ····· 41
9.1.13 [Factory Settings] ····· 41
9.2 System Information Page ····· 41
10. Remote Communication ····· 43
10. 1USB-VCOM Interface ····· 43
10.1.1 Enabling USB Function in the Instrument ····· 43
10.1.2 Installing Drivers on a Computer ····· 43
10.2 Communication Protocol ····· 46
11. SCPI Command Reference ····· 47
11.1 Handshake Protocol ····· 47
11.2 End symbol ····· 47
11.3 Command string parsing ····· 47
11.3.1 Command parsing rules ····· 48
11.3.2 Symbol conventions and definitions ····· 48
11.3.3 Command Tree Structure ····· 48

11.4 Command and Parameters 48
11.4.1 commend 48
11.4.2 Parameters 48
11.4.3 Delimiter 49
11.4.4 Error Code 49
11. 5Display Page 50
11.5.1 DISPlay: 50
11.5.2 DISPlay: 50
11. 6FUNCTION measurement function subsystem 50
11.6.1 FUNCTION measurement parameter settings 50
11.6.2 FUNCtion: MONitor monitoring parameter settings 51
11.7 Resistance Setting Subsystem 51
11.7.1 Resistance: RANGe Resistance Range Setting 51
11.7.2 Resistance: RANGe: No Resistance Range Number Setting 51
11.7.3 Resistance: RANGe: MODE Setting Resistance Comparison Method 51
11.7.4 Resistance: LiMiT Setting Resistance Limit 52
11.7.5 Resistance: LiMiT: STATe Resistance Comparator Status Setting 52
11.7.6 Resistance: LiMiT: MODE Resistance Comparison Method 52
11.7.7 Resistance: LiMiT: NOMinal Resistance nominal value setting 53
11.7.8 Resistance: LiMiT: SEQ Resistance Direct Reading Limit 53
11.7.9 Resistance: LiMiT: ABS Resistance Absolute Limit 53
11.7.10 Resistance: LiMiT: PER Resistance percentage upper and lower limits 54
11.8 Voltage Setting Subsystem 54
11.8.1 Voltage: RANGe Voltage Range Setting 54
11.8.2 Voltage: RANGE: No Resistance Range Number Setting 54
11.8.3 VOLTage: RANGE: 55
11.8.4 Voltage: LiMiT Setting Resistance Limit 55
11.8.5 Voltage: LiMiT: STATe Voltage Comparator Status Setting 55
11.8.6 Voltage: LiMiT: MODE Resistance Comparison Method 55
11.8.7 Voltage: LiMiT: NOMinal Resistance nominal value setting 56
11.8.8 Voltage: LiMiT: SEQ Voltage Direct Reading Limit 56
11.8.9 Voltage: LiMiT: ABS Voltage Absolute Limit 56
11.8.10 Voltage: LiMiT: PER Voltage percentage upper and lower limits 56
11. 9AUTorange automatic range subsystem * 56
11.9.1 AUTorange automatic range setting * 57
11.10 ADJust Clearing Subsystem 57
11.10. 1ADJust: Clear Cancel Zeroing 57
11.10. 2ADJust execution reset 57
11.11 CALCalate operator system 57
11.11.1 CALPlate: LIMit: STATe comparator main switch setting * 58
11.11.2 CALPlate: LIMit: BEEPer Sound Settings 58
11.11.3 CALPlate: LIMit: Resistance: MODE Resistance Comparison Method * 58
11.11.4 CALPlate: LIMit: Resistance: UPPer Resistance Upper Limit Setting * 58
11.11.5 CALPlate: LIMit: Resistance: Lower Resistance Lower Limit Setting * 58
11.11.6 CALPlate: LIMit: Resistance: REFerence Resistance nominal value setting * 59
11.11.7 CALPlate: LIMit: Resistance: PERCent Resistance percentage limit * 60

11.11.8 CALPlate: LIMit: VOLTAGE: MODE Voltage Comparison Method * 60
11.11.9 : CALCalate: LIMit: VOLTage: UPPer Voltage Upper Limit Setting * 60
11.11.10 : CALCalate: LIMit: VOLTage: LOWER Voltage Lower Limit Setting * 61
11.11.11 : CALCalate: LIMit: VOLTage: REFerence Voltage nominal value setting * 61
11.11.12 : CALPlate: LIMit: VOLTAGE: PERCENT Voltage percentage limit * 61
11.11.13 : CALCalate: LIMit: ABS Voltage Absolute Deviation Comparison Method * 62
11.12 LOGger (MEMory) subsystem 62
11.12.1 LOGger [: STATe] or MEMory [: STATe] data recording and statistical mode 62
11.12.2 LOGger: START or MEMory: START Data Record Start 62
11.12.3 LOGger: SIZE or MEMory: SIZE data record buffer size setting 63
11.12.4 LOGger: COUNT? Or MEMory: COUNT? total number of recorded data buffers is 63
11.12.5 LOGger: DATA? Or MEMory: DATA? Data buffer data 63
11.13 SYSTem subsystem 63
11.13.1 SYSTem: LANGUAGE System Language 64
11.13.2 SYSTem: TIME system time setting 64
11.13.3 SYSTem: KEYLock or SYSTem: KLOCK keyboard lock settings 64
11.13.4 SYSTem: CODE error code returns 64
11.13.5 SYSTem: BEEPer button tone 64
11.13.6 SYSTem: SHAKHand or SYSTem: HEADER communication handshake command (data header return) 65
11.13.7 SYSTem: Result test result sending 65
11.13.8 SYSTem: DATAout test result sending * 65
11.13.9 SYSTem: Backup saves measurement parameters to the current file * 65
11.13.10 SYSTem: RESet factory settings 65
11.14 TRIGGer subsystem 65
11.14.1 TRIGGer [: IMMediate] 66
11.14. 2TRIGGer: 66
11.15 FETCh and READ subsystems 66
11.15.1 FETCH? Or READ? Obtaining measurement data 66
11.15.2 FETCh: Full? Or READ: Full? Obtaining complete measurement data 66
11.16 Correction subsystem 67
11.16.1 Correction: 67
11.17 FILE (MMEM) subsystem 67
11.17.1 File: SAVE Save 67
11.17.2 File: Load Reading 67
11.17.3 File: DELete Delete specified file 67
11.18 IDN? Subsystem 67
11.19 ERRor subsystem 68
11.20 SAV subsystem 68
12. Specifications 69
12.1 Technical Indicators 69
12.2 General Specifications 70
12.3 Environmental Requirements 70

Catalogue of Illustrations

Figure 11 Replacing Battery 11
Figure 12 Support Position 11
Figure 31 Front Panel 14
Figure 32 Interface Panel Function Description 15
Figure - 33 Charging indicator light, displayed in blue during charging 15
Figure - 34 Connection Test End 16
Figure 41 <Measurement Display>Page 17
Figure 51 <Settings>Page 21
Figure 52 <File Management>Page 25
Figure 61 <User Calibration>Page 26
Figure 62 Preparing to Zero 26
Figure - 63 Correct Short Circuit Method 27
Figure - 64 Correct Short Circuit Method 27
Figure 71 [Comparator Settings] Page 29
Figure 82 Starting recording 32
Figure - 83 is recording 32
Figure - 84 Record Stop or Buffer Full 33
Figure - 85 Data folder 33
Figure 86 Opening Record File in Excel 34
Figure 91 <System Configuration>Page 37
Figure 92 Factory default settings 41
Figure 93 <System Information>Page 42
Figure 111 Command Tree Structure 48
Figure 112DISPlay Subsystem Tree 50
Figure 113FUNCTION Subsystem Tree 50
Figure - 114 Resistance Subsystem Tree 51
Figure 115VOLTAGE Subsystem Tree 54
Figure 116CALCurate Subsystem Tree 57
Figure - 117 LOGger (MEMory) subsystem tree 62
Figure 118SYSTem Subsystem Tree 63
Figure - 119 TRIGGer subsystem tree 65
Figure 1110FETCh? Subsystem Tree 66
Figure 1111READ? Subsystem Tree 66
Figure - 1112 SYSTem subsystem tree 67
Figure 1113FILE (MMEM) subsystem tree 67

Table of contents

Table - 1 Test Range Description 18
Table - 2 Range Change Range 19
Table - 3 Test Range Description 19
Table - 1 Test Range Description 22
Table - 2 Test Range Description 23
Table - 1 Resistance Index 69
Table - 2 Voltage Indicators 70

1. Installation and Settings Wizard



Thank you for purchasing our company's products! Please read this chapter carefully before use. In this chapter, you will learn about the following:

- Main Function Packing List
- Power requirements
- Operating environment
- clean

1.1 Packing list

Before officially using the instrument, please first:
1. Check the appearance of the product for any damage, scratches, or other defects;
2. Check whether the instrument accessories are lost by referring to the instrument packing list.

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

1.2 Power requirements

The instrument can only use our company's dedicated AC power adapter ATL909 and lithium battery ATL804.
AC power adapter:
Voltage: 85VAC~250VAC
Frequency: 50Hz~400Hz



Warning: To prevent the risk of electric shock, please connect the power ground wire properly

The instrument is equipped with a Type-C interface, but usually the USB on the computer cannot provide enough power to charge the instrument. Therefore, this interface is only used for USB communication and cannot be used for charging.

1.3 Operating environment

AT529 must be used under the following environmental conditions:

Temperature: 0C°-55C°,
Humidity: less than 70% RH at 23C°
Altitude: 0-2000 meters

1.4 clean

To prevent the risk of electric shock, please unplug the adapter plug before cleaning. There is a lithium battery compartment on the back of the instrument. Please use a clean cloth dipped in a little water to clean the outer shell and panel. Do not clean the interior of the instrument.

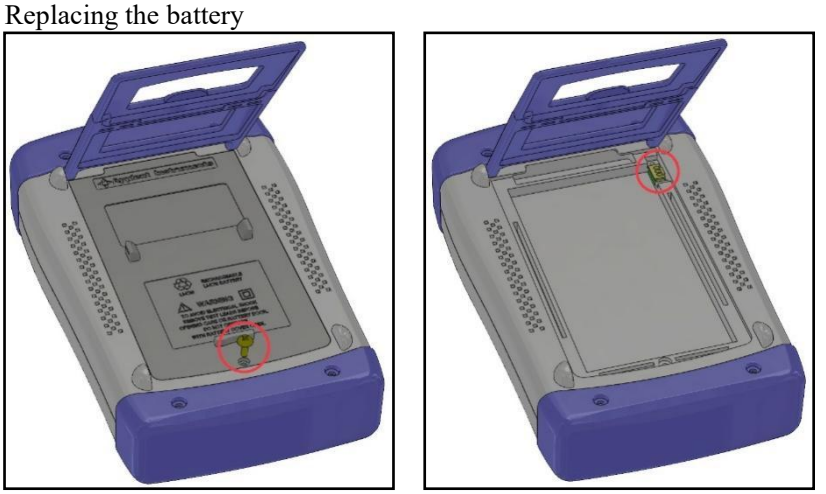


Attention: **Do not** use solvents (such as alcohol or gasoline) to clean the instrument.

1.5 Replacing the battery

The instrument is equipped with a rechargeable lithium battery. For transportation safety, the battery was **not** installed in the instrument's battery compartment when leaving the factory. When using the instrument or replacing the battery for the first time, please follow the following steps

Figure - 1 Replacing the battery

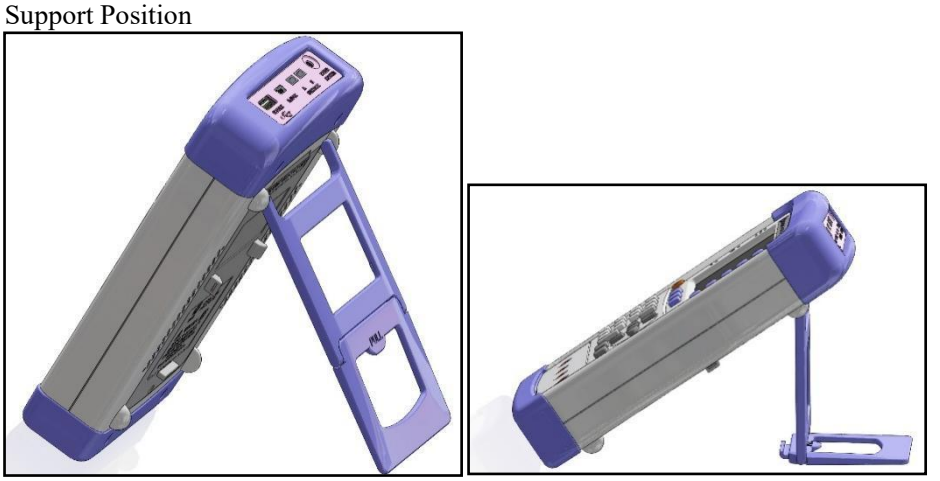


1. Use a screwdriver to loosen the screw on the battery cover and remove the battery cover.
2. If replacing the battery, please remove the plug from the old battery and insert the plug from the new battery, paying attention to the direction of the plug.
3. Insert the new battery into the battery compartment, cover the battery cover, and tighten the screws.

1.6 Adjusting support

The instrument support has two positions for user convenience: 60 degrees and 45 degrees.
Using a 45 degree position can make the instrument support more stable.
Gently fold the bottom of the support upwards to achieve a 45 degree support position.

Figure - 2 Support Position



2. Summary



In this chapter, you will learn about the following content:

- introduction
- major function

2.1 introduction

Thank you for purchasing the AT529 series handheld battery tester.

The AT529 series uses a high-performance 32-bit ARM microprocessor to control a fully automatic real-time detection handheld battery tester.

The instrument can test a resistance of 0.0001m Ω~3.3k Ω, a DC voltage of 0.00001V~1000.00V (AT529H), a maximum resistance of 33000 display digits, and a maximum voltage of 6 and a half (1200000) display digits. The AT529 series has both high-precision and high-resolution characteristics, providing a resistance accuracy of 0.5% and a voltage accuracy of 0.01%, with the same accuracy as desktop instruments.

The instrument is equipped with a built-in USB-VCOM communication interface, adaptive baud rate, and can quickly and efficiently complete data collection.

The instrument uses applent instrument to enhance the computer remote control command set, compatible with SCPI (Standard Command for Programmable Instrument), and efficiently completes remote control and data acquisition functions.

The newly improved design of AC resistance testing principle can be used for internal resistance testing of almost all batteries, including assembly line inspection of various batteries such as lithium batteries, lead-acid batteries, button batteries, etc.

model	Accuracy	measuring range
AT529	Resistance: 0.5% Voltage: 0.01%	Resistance: 0.0001m Ω~3.3k Ω Voltage: 0.000001~400.0000V
AT529A	Resistance: 0.5% Voltage: 0.01%	Resistance: 0.0001m Ω~3.3k Ω Voltage: 0.000001~200.0000V
AT529B	Resistance: 0.5% Voltage: 0.01%	Resistance: 0.0001m Ω~3.3k Ω Voltage: 0.000001~800.0000V
AT529H	Resistance: 0.5% Voltage: 0.01%	Resistance: 0.0001m Ω~3.3k Ω Voltage: 0.000001~1000.000V

See:

The complete technical specifications can be found in Chapter 10.
The AT529 series cannot perform UPS and fuel cell online measurements.
Need to measure battery function online, please refer to AT525 series.
High pressure fuel cells can only use desktop instruments such as the AT526 series.

2.2 major function

2.2.1 Testing frequency

1kHz, frequency stability: 20ppm

2.2.2 range

Resistance: Tested using 7 ranges, 3m Ω~3k Ω.
Voltage: Use a 3-range test.

Range automatic, manual, and nominal.
Range nominal: The instrument will automatically select the optimal range based on the nominal value.

2.2.3 Test speed

Once per second

2.2.4 Trigger method

Internal and external (including manual and remote triggering).

2.2.5 Basic accuracy

Resistance: 0.5% Voltage: 0.01%

2.2.6 Maximum reading

Resistance: 31000
Voltage: 1200000

2.2.7 Calibration function

Full range short-circuit clearing "0": eliminate the influence of lead resistance and stray voltage.

2.2.8 System settings

1. Sound settings
2. Keyboard lock function
3. Administrators and user accounts can set passwords for administrators

2.2.9 interface

USB-VCOM remote control:
Adaptive baud rate, supports SCPI protocol, ASCII code transmission.

3. Start

In this chapter, you will learn about the following content:

- Introduction to the front panel, including buttons and test terminals.
- Interface panel - introduces power and interface information.
- Power on start - includes the power on self check process, instrument default values, and instrument preheating time.
- Start testing - including how to connect to the testing end.

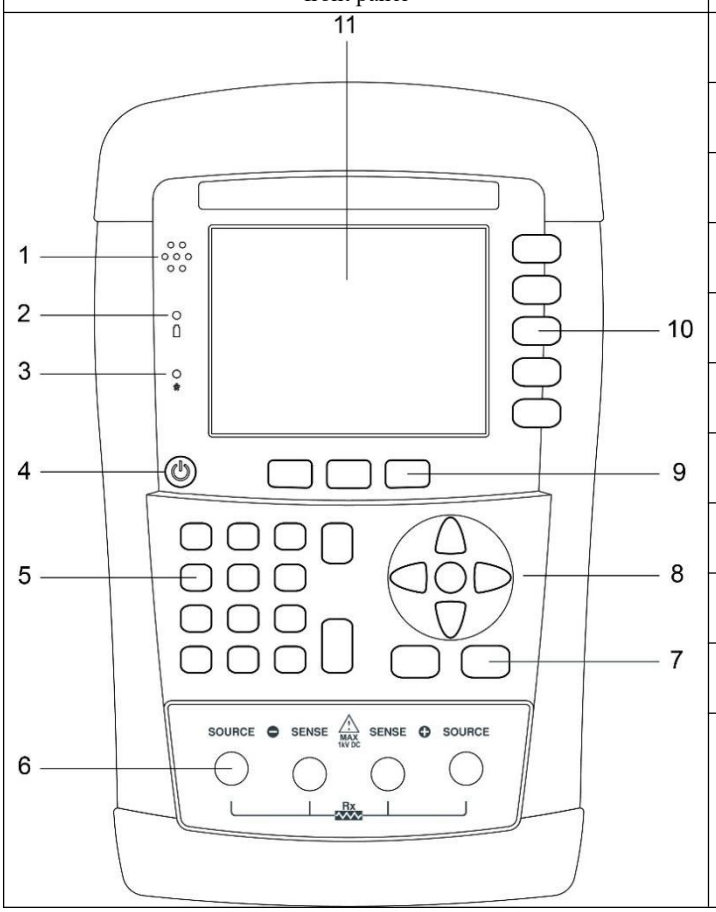
3.1 Understanding the front panel

3.1.1 Front panel description

Figure - 1 Front panel

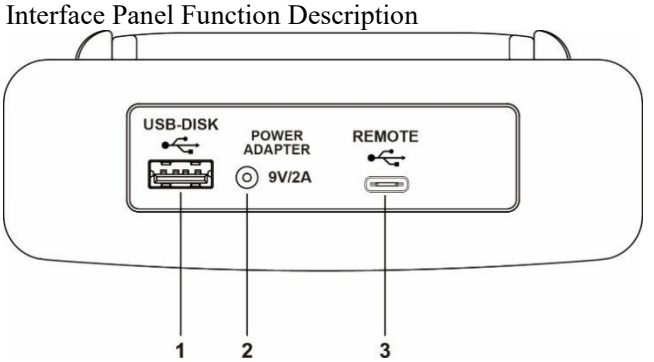
3.2 front panel

Table 3 Front Panel Function Description

front panel	Number	function
	1	Buzzer
	2	Charging indicator light
	3	Trigger indicator light
	4	Power switch
	5	Number keyboard
	6	Testing end
	7	Main page shortcut keys
	8	Cursor keys
	9	Taskbar function keys
	10	Sidebar function keys
	11	LCD display window

3.2.1 Interface panel

Figure - 2 Interface Panel Function Description



1. USB-DISK interface, used to save data.
2. Power adapter socket for power supply and battery charging.
3. USB remote communication interface.

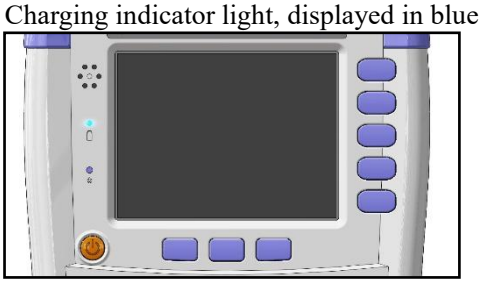
3.3 Using external power supply

The instrument comes standard with a power adapter ATL909.
After inserting an external power source, the instrument will use the external power source for power supply, and the battery circuit will automatically shut down.
In addition to supplying power to the instrument, this power supply also charges the lithium battery inside the instrument, so the power adapter cannot be replaced. It is recommended to use our company's dedicated power supply L909.

3.3.1 Battery charging function

If the battery is not fully charged, after inserting the power adapter, the charging circuit of the instrument will automatically start to charge the internal lithium battery. The built-in indicator light of the instrument power switch will light up, indicating that it is charging.

Figure - 3 Charging indicator light, displayed in blue during charging



Attention!	Charging indicator light, if the battery is charging, this indicator light will light up even if the instrument is turned off.

3.4 Power on

The button is a light touch button. Press the power button for about 3 seconds, and the instrument will start or stop.

3.5 Connection of testing end

The instrument uses four terminal testing to improve accuracy.
Before testing, please insert the testing cable of the instrument into the instrument socket.

Figure - 4 Connection Test End



3.5.1 Test fixtures and cables

According to our company's long-term investigation of users, self-made or other company's testing fixtures or cables may lead to incorrect measurement results. We suggest that you use our company's testing fixtures or testing cables.

To ensure the accuracy that the instrument can achieve, please use the randomly provided "Kelvin" test clip for testing.
Warning: It is strictly prohibited to directly connect AC power sources and voltage sources to the testing end.

4. Measurement display page

The measurement homepage includes the following:

- Related settings on the<Measurement Display>page
- Data recording settings and display

4.1 <MEA DISPLAY>Page

Press the 【 Meas 】 key to enter the 【 Meas Display 】 page.
SCPI Command: **DISP: PAGE MEAS**

The<Meas Display>page is mainly used to display measurement results and sorting results
At the same time, four commonly used functions can be set on this page, including:

- Function - Measure displayed parameters
- Trigger - Internal or remote trigger
- Range - Resistance and voltage range setting and display
- Data Recording and Statistics - Please refer to the "Data Recording and Statistics" section

Figure - 1 Measurement Display Page



4.1.1 Measurement [Function]

SCPI Command: **FUNCTION {RV,Resistance (R),Voltage (V)}**
SCPI Query Command: **FUNC?**

The instrument has three measurement functions:

function	describe
R-V	Simultaneously measuring and displaying resistance and voltage values
R	Only measure and display resistance values
V	Only measure and display voltage values

■ **Steps to set up measurement function:**

Step 1 Press the 【 Meas 】 key to enter the measurement main page;
Step 2 Use the cursor keys to select the [Function] field;
Step 3 Select the measurement function with the right function key.

Function keys	function
R-V	Simultaneously measuring and displaying resistance and voltage values
R	Only measure and display resistance values

V	Only measure and display voltage values

4.1.2 【 R-Range 】

Resistance range setting
SCPI Command: **Resistance: RANGE<0 to 3100>**
SCPI Command: **Resistance: RANGE: No{<Range Number:0-6>, min, max}**
SCPI Command: **RESistance:RANGe:MODE {AUTO,HOLD,NOMinal}**
SCPI Query Command: **RESistance:RANGe?**
SCPI Query Command: **RESistance:RANGe:NO?**
SCPI Query Command: **RESistance:RANGe:MODE?**

The AT529 resistor has 7 ranges, and the range of variation for each range is as follows:

Table 4 Range of Range Changes

Range number	Range name	range
6	3k Ω	0.3200 kΩ to 3.3000 kΩ
5	300 Ω	32.00 Ω ~ 330.00 Ω
4	30 Ω	3.200 Ω ~ 33.000 Ω
3	3 Ω	0.3200 Ω ~ 3.3000 Ω
2	300m Ω	3.200 mΩ ~ 330.00 mΩ
1	30m Ω	3.200 mΩ ~ 33.000 mΩ
0	3m Ω	0.0001mΩ ~ 3.0000 mΩ

There are three range methods:

Table - 1 Test Range Description

Range method	**describe**	**advantage**	**shortcoming**
automatic	The instrument automatically selects the optimal testing range based on the nominal resistance value, and the range number in the range field will be automatically set.	Users do not need any involvement	The automatic range requires a predicted range, and the testing speed will be lower than the manual range method.
Manual	The instrument will always be tested using the user specified range	The testing speed has reached its fastest.	Users need to participate in the selection of range
nominal	The instrument will automatically select the optimal range for testing based on the nominal value.	The best way to conduct sorting tests. Reaching the fastest speed.	Only suitable for sorting testing.

Attention!

If set to NOM mode, the instrument will set the range according to the comparator mode:
When the comparator mode is SEQ, the range will be set according to the upper limit of the comparator;
When the comparator mode is ABS and PER, the range will be set based on the nominal value.

■ **Steps to set the resistance range:**

Step 1 Press the 【 Meas 】 key to enter the measurement page or press the 【 Setup 】 key to enter the settings page;

Step 2 Use the cursor keys to select the 【 R-Range 】 field;

Step 3 Use function keys to select range automatic, manual, or select range

Function keys	**function**
automatic	The instrument will automatically select the range
Manual	The instrument is locked on the current range
nominal	The instrument will select the optimal range based on the nominal value
Add+	Increase the range number and change the range to locked at the same time
Reduce-	Reduce the range number while changing the range to locked

Note! When the range is automatic, the instrument will predict the range at each measurement cycle, so the testing speed will be slightly slower than locking the range. Moreover, frequent range changes during automatic measurement can cause a slowdown in response. The automatic range method is not suitable when using instruments as sorting measurements. For sorting users, please select the nominal range method.

4.1.3 【 V-Range 】

Voltage range setting
SCPI Command: `VOLTage: RANGE<-300 to 300>`
SCPI Command: `VOLTage:RANGe:No {<RANGE NO: 0-2>,min,max}`
SCPI Command: `VOLTage:RANGe:MODE {AUTO,HOLD,NOMinal}`
SCPI Query Command: `VOLTage:RANGe?`
SCPI Query Command: `VOLTage:RANGe:NO?`
SCPI Query Command: `VOLTage:RANGe:MODE?`

The AT529 series voltage has three ranges, and the range of variation for each range is as follows:

Table - 2 Range Change Range

AT529A

Range number	Range name	range
2	200V	0.001V~20.000V
1	80V	0.0001V~80.8000V
0	8V	0.00001~8.08000V

AT529

Range number	Range name	range
2	400V	0.001V~404.000V
1	80V	0.0001V~80.8000V
0	8V	0.00001~8.08000V

AT529B

Range number	Range name	range
2	800V	0.001V~808.000V
1	80V	0.0001V~80.8000V
0	8V	0.00001~8.08000V

AT529H

Range number	Range name	range
2	1000V	0.001V~1100.00V
1	80V	0.0001V~80.8000V
0	8V	0.00001~8.08000V

There are three voltage range methods:

Table - 3 Test Range Description

Range method	**describe**	**advantage**	**shortcoming**
automatic	The instrument automatically selects the optimal testing range based on the nominal voltage value, and the range number in the range field will be automatically set.	Users do not need any involvement	The automatic range requires a predicted range, and the testing speed will be lower than the manual range method.
Manual	The instrument will always be tested using the user specified range	The testing speed has reached its fastest.	Users need to participate in the selection of range
nominal	The instrument will automatically select the optimal range for testing based on the nominal value.	The best way to conduct sorting tests. Reaching the fastest speed.	Only suitable for sorting testing.

■ **Steps to set voltage range:**

Step 1 Press the 【 Meas 】 key to enter the measurement page or press the 【 Setup 】 key to enter the settings page;

Step 2 Use the cursor keys to select the 【 V-Range 】 field;

Step 3 Use function keys to select range automatic, manual, or select range

Function keys	function
automatic	The instrument will automatically select the range
Manual	The instrument is locked on the current range
nominal	The instrument will select the optimal range based on the nominal value
Add+	Increase the range number and change the range to locked at the same time
Reduce-	Reduce the range number while changing the range to locked

4.1.4 [Trigger] Method

SCPI Command: **TRIGGer: Source {INT, EXT}**
SCPI Query Command: **TRIGGer: Source?**

The instrument has two triggering methods:
Internal triggering and remote triggering.

Trigger method	describe
inside	Also known as continuous testing, the trigger signal is continuously tested internally by the instrument according to its inherent cycle
remote	Send command TRG, measure once and return the measured value

■ **Steps to set the triggering method:**

Step 1 Press the 【 Meas 】 key to enter the measurement main page;

Step 2 Use the cursor keys to select the [Trigger] field;

Step 3 Use the function keys to select the triggering method.

Function keys	function
inside	Internal triggering method
remote	Using the USB-VCOM interface for remote command * TRG triggering

5. [Setup] Settings page

In this chapter, you will learn about all measurement related settings

At any time, simply press the [Setup] button and the instrument will enter the settings page.

SCPI Command: `DISP:PAGE SETUP`

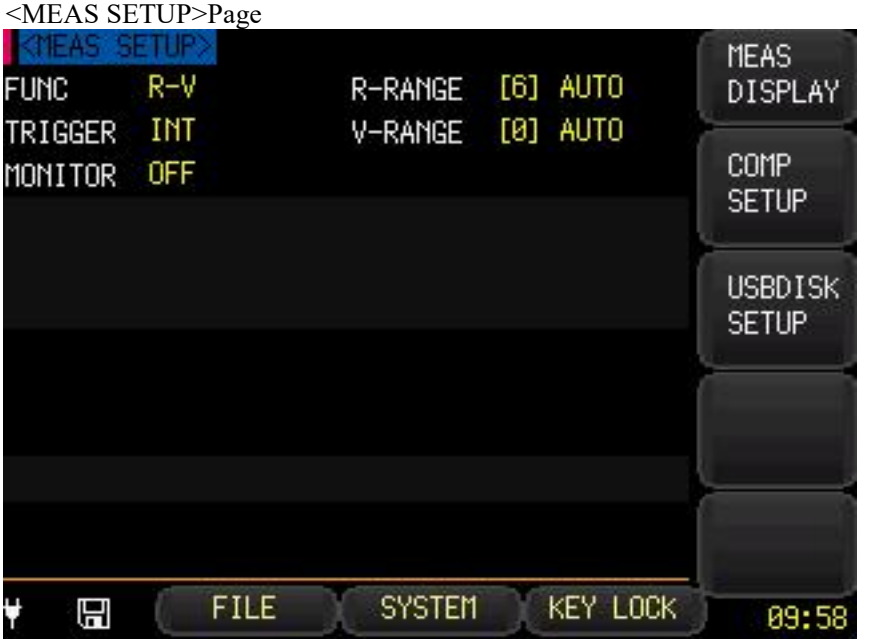
5.1 Settings page

All measurement related settings are operated in the<MEAS SETUP>page.
In the<MEAS SETUP>page, the instrument does not display test results or comparator results, but instrument testing is still ongoing.
These settings include the following parameters:

- Function - Measure functional parameters
- Range - Resistance and Voltage Range
- Trigger - Internal or remote trigger
- Monitoring - Display monitoring parameters

The settings for [Function], [Trigger], and [Range] can also be set on the<Meas Display>page.

Figure - 1 <MEAS SETUP>Page



5.1.1 Measurement [Function]

SCPI Command: `FUNCtion {RV,RESistance(R),VOLTage(V)}`
SCPI Query Command: `FUNC?`

The instrument has three measurement functions:

function	describe
R-V	Simultaneously measuring and displaying resistance and voltage values
R	Only measure and display resistance values
V	Only measure and display voltage values

■ **Steps to set up measurement function:**

Step 1 Press the 【 Meas 】 key to enter the measurement main page;
Step 2 Use the cursor keys to select the [Function] field;
Step 3 Select the measurement function with the right function key.

Function keys	function

R-V	Simultaneously measuring and displaying resistance and voltage values
R	Only measure and display resistance values
V	Only measure and display voltage values

5.1.2 【 R-Range 】

Resistance range setting
SCPI Command: **Resistance: RANGE<0 to 3100>**
SCPI Command: **RESistance:RANGe:No {<range No: 0-6>,min,max}**
SCPI Command: **RESistance:RANGe:MODE {AUTO,HOLD,NOMinal}**
SCPI Query Command:**RESistance:RANGe?**
SCPI Query Command:**RESistance:RANGe:NO?**
SCPI Query Command: **RESistance:RANGe:MODE?**

The AT529 resistor has 7 ranges, and the range of variation for each range is as follows:

Table 5 Range of Range Changes

Range number	Range name	range
6	3k Ω	0.3200 kΩ to 3.3000 kΩ
5	300 Ω	32.00 Ω~330.00 Ω
4	30 Ω	3.200 Ω~33.000 Ω
3	3 Ω	0.3200 Ω~3.3000 Ω
2	300m Ω	3.200 mΩ~330.00 mΩ
1	30m Ω	3.200 mΩ ~ 33.000 mΩ
0	3m Ω	0.0001mΩ~3.0000 mΩ

There are three range methods:

Table - 1 Test Range Description

Range method	**describe**	**advantage**	**shortcoming**
automatic	The instrument automatically selects the optimal testing range based on the nominal resistance value, and the range number in the range field will be automatically set.	Users do not need any involvement	The automatic range requires a predicted range, and the testing speed will be lower than the manual range method.
Manual	The instrument will always be tested using the user specified range	The testing speed has reached its fastest.	Users need to participate in the selection of range
nominal	The instrument will automatically select the optimal range for testing based on the nominal value.	The best way to conduct sorting tests. Reaching the fastest speed.	Only suitable for sorting testing.

Attention!

If set to NOM mode, the instrument will set the range according to the comparator mode:
When the comparator mode is SEQ, the range will be set according to the upper limit of the comparator;
When the comparator mode is ABS and PER, the range will be set based on the nominal value.

■ **Steps to set the resistance range:**

Step 1 Press the 【 Meas 】 key to enter the measurement page or press the 【 Setup 】 key to enter the settings page;

Step 2 Use the cursor keys to select the 【 R-Range 】 field;

Step 3 Use function keys to select range automatic, manual, or select range

Function keys	**function**
automatic	The instrument will automatically select the range
Manual	The instrument is locked on the current range
nominal	The instrument will select the optimal range based on the nominal value
Add+	Increase the range number and change the range to locked at the same time
Reduce-	Reduce the range number while changing the range to locked

Note! When the range is automatic, the instrument will predict the range at each measurement cycle, so the testing speed will be slightly slower than locking the range. Moreover, frequent range changes during automatic measurement can cause a slowdown in response. The automatic range method is not suitable when using instruments as sorting measurements.
For sorting users, please select the nominal range method.

5.1.3 【 V-Range 】

Voltage range setting
SCPI Command: **VOLTage: RANGE<-300 to 300>**
SCPI Command: **VOLTage: RANGE: No {<Range Number: 0-2>, min, max}**
SCPI Command: **VOLTage: RANGE: MODE {AUTO, HOLD, NOMinal}**
SCPI Query Command: **VOLTage: RANGE?**
SCPI Query Command: **VOLTage: RANGE: NO?**
SCPI Query Command: **VOLTage: RANGE: MODE?**

The AT529 series voltage has three ranges, and the range of variation for each range is as follows:

Table 5 Range of Range Changes

AT529A

Range number	Range name	range
two	200V	0.001V~20.000V
one	80V	0.0001V~80.8000V
0	8V	0.00001~8.08000V

AT529

Range number	Range name	range
two	400V	0.001V~404.000V
one	80V	0.0001V~80.8000V
0	8V	0.00001~8.08000V

AT529B

Range number	Range name	range
two	800V	0.001V~808.000V
one	80V	0.0001V~80.8000V
0	8V	0.00001~8.08000V

AT529H

Range number	Range name	range
two	1000V	0.001V~1100.00V
one	80V	0.0001V~80.8000V
0	8V	0.00001~8.08000V

There are three voltage range methods:

Table - 2 Test Range Description

Range method	**describe**	**advantage**	**shortcoming**
automatic	The instrument automatically selects the optimal testing range based on the nominal voltage value, and the range number in the range field will be automatically set.	Users do not need any involvement	The automatic range requires a predicted range, and the testing speed will be lower than the manual range method.
Manual	The instrument will always be tested using the user specified range	The testing speed has reached its fastest.	Users need to participate in the selection of range
nominal	The instrument will automatically select the optimal range for testing based on the nominal value.	The best way to conduct sorting tests. Reaching the fastest speed.	Only suitable for sorting testing.

■ **Steps to set voltage range:**

Step 1 Press the 【 Meas 】 key to enter the measurement page or press the 【 Setup 】 key to enter the settings page;

Step 2 Use the cursor keys to select the 【 V-Range 】 field;

Step 3 Use function keys to select range automatic, manual, or select range

Function keys	function
automatic	The instrument will automatically select the range
Manual	The instrument is locked on the current range
nominal	The instrument will select the optimal range based on the nominal value
Add+	Increase the range number and change the range to locked at the same time
Reduce-	Reduce the range number while changing the range to locked

5.1.4 [Trigger] Method

SCPI Command: **TRIGGer: Source {INT, EXT}**
SCPI Query Command: **TRIGGer: Source?**

The instrument has two triggering methods:
Internal triggering and remote triggering.

Trigger method	describe
inside	Also known as continuous testing, the trigger signal is continuously tested internally by the instrument according to its inherent cycle
remote	Send command TRG, measure once and return the measured value

■ **Steps to set the triggering method:**

Step 1 Press the 【 Meas 】 key to enter the measurement main page;

Step 2 Use the cursor keys to select the [Trigger] field;

Step 3 Use the function keys to select the triggering method.

Function keys	function
inside	Internal triggering method
remote	Using the USB-VCOM interface for remote command * TRG triggering

5.1.5 [Monitoring] Parameters

SCPI Command: **FUNCTION: MONitor {OFF, RABS, RPER, VABS, VPER}**
SCPI Command: **FUNCtion: MONitor?**
The instrument can monitor one parameter while measuring the main and secondary parameters.

The additional monitoring parameters will not increase the processing time of the instrument.
The default value of the instrument is "off".

Note: As the monitoring parameters are related to the nominal value, once the monitoring parameters are turned on, the screen will display the "nominal value" field, which is the same as the "nominal value" on the "Comparator Settings" page. It is necessary to input the nominal value.

■ **Steps to set monitoring parameters**

Step 1 Press the [Setup] key to enter the settings main page;

Step 2 Use the cursor keys to select the [Monitor] field;

Step 3 Use function keys to select

Function keys	function
shut	Monitoring parameters turned off
R Δ	Absolute deviation value of resistance (R Δ = Rx - Rnom)
R%	Relative deviation value of resistance (R%=(Rx Rnom)/Rnom * 100)
V Δ	Absolute deviation value of resistance (V Δ = Vx - Vnom)
V%	Relative deviation value of resistance (R%=(Vx Vnom)/Vnom * 100)

Among them,
Rx is the measured resistance value, and Rnom is the nominal resistance value
Vx is the measured voltage value, Vnom is the nominal voltage value

5.2 File Management

Press the bottom function key [FILE] to enter the<FILE>page.
File management allows users to save settings to 10 files for easy reading when booting up or changing

specifications.

On the File Management page, you can set the following content:

- [AUTO RECALL] - Specify the file to be called upon upon startup
- [AUTO SAVE] - Allow modified parameters to be saved in real-time in the current file
- [FILE] - Specify to save, read, or delete files.

Figure - 2 <FILE>Page



5.2.1 [AUTO RECALL]

The startup call option can specify the file to be called at startup.

■ **Steps to set up Auto recall:**

Step 1 Enter the<FILE>page

Step 2 Use the cursor keys to select the 【 AUTO RECALL 】 field;

Step 3 Use function keys to select

Function keys	function
File 0	Setting values for boot loading file 0
Current file	Start up and load the settings for the current file number

5.2.2 [Auto Save]

When the auto save option allows, the parameters set by the user will be automatically saved to the current file.

■ **To set up automatic saving:**

Step 1 Enter the<File >page

Step 2 Use the cursor keys to select the [Auto Save] field;

Step 3 Use function keys to select

Function keys	function
allow	The parameters set by the user will be automatically saved to the current file
prohibit	The parameters set by the user can only be manually saved by the user in the file, otherwise they will be lost during the next power on.

5.2.3 [File 0]~[File 9]

Users can specify 10 files from 0 to 9 for saving, loading, and deleting.

■ **Steps for setting up files:**

Step 1 Enter the<File>page

Step 2 Use the cursor keys to select the fields from [File 0] to [File 9];

Step 3 Use function keys to select

Function keys	function
preserve	Save all settings to the current file
read	Read the parameters of the file into the system
delete	The file data will be deleted

6. User Calibration

In this chapter, you will learn how to perform user calibration.

Press the 【 Meas 】 key, then select 【 SHORT TEST 】 on the right function key to enter the user calibration page.
SCPI Command: **DISP: PAGE** **CSET**

Figure - 1 <SHORT TEST>Page



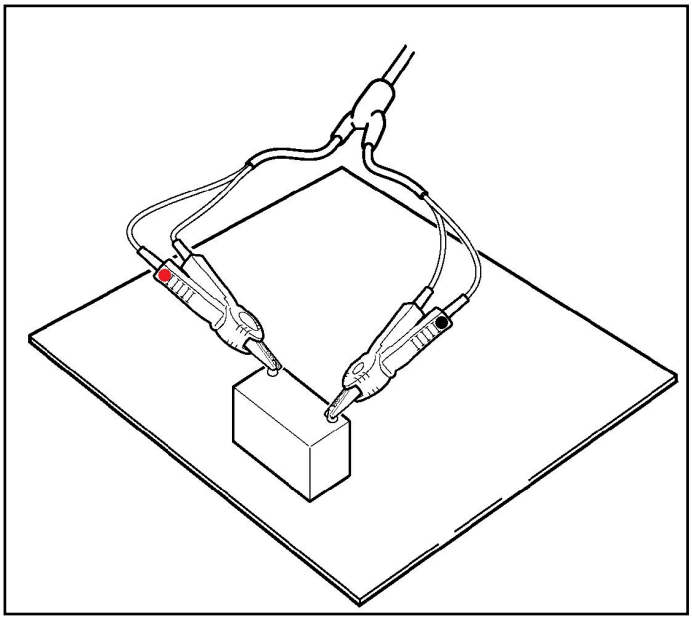
Before testing, please make sure to perform a short circuit reset to remove stray resistance and bias caused by the test line and external environmental factors.
In order to achieve the specified technical specifications of the instrument, it is necessary to perform a short circuit reset.

In addition to executing on the user calibration page, short circuit zeroing can also be achieved through the following methods:
Using communication command: **ADJust**

6.1 Short circuit reset

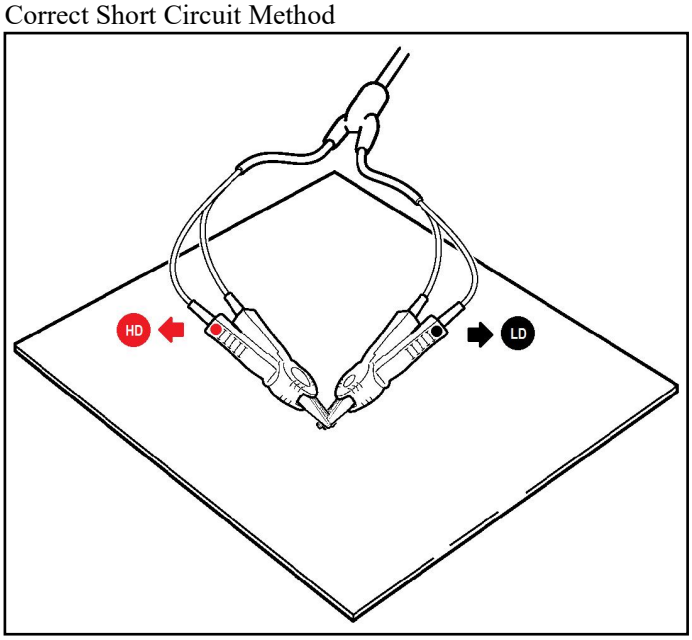
Due to the very small measurement resistance (in the range of 3m Ω and 30m Ω), the voltage signal generated by the test current flowing through the resistance will be very weak (only a few mV at most), so the position, length, and shape of the test line have an impact on the measurement. Usually, we also need to reset at the corresponding position where we measure.
For example:
During measurement:

Figure 6 Preparing to Zero



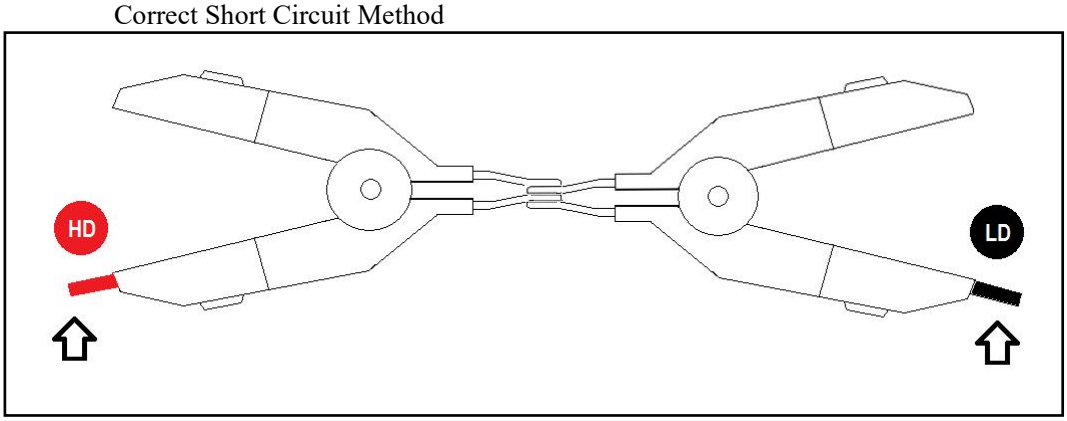
When resetting, it is important to ensure that the position remains consistent, especially in the range of 30m Ω and below.

Figure - 2 Correct Short Circuit Method



Before resetting, please first short-circuit the test clip according to the following method

Figure - 3 Correct Short Circuit Method



■ **The method of clearing short circuits to zero**

Step 1 Press the 【 Meas 】 key to enter the measurement page, then select 【SHORT TEST】 to enter the user calibration page

Step 2 Select the 【 SHORT TEST 】 field with the arrow keys

Step 3 If it was previously in the OFF state, please select 【 Open 】.

Function keys	**function**
open	

Step 4 Afterwards, new function keys will be displayed:

Function keys	**function**
close	Turn off short circuit reset, and the reset value is not used during testing.
Short circuit reset	Perform short circuit reset

Step 5 After resetting, return to the settings page

7. Comparator settings

In this chapter, you will learn about the comparator setting function:

- Sound settings
- Resistance/voltage comparator on/off

Press the 【 Meas 】 or 【 Setup 】 key, then select 【 COMP SETUP】 on the right function key to enter the user calibration page.

SCPI Command: **DISPlay: PAGE BSET**

Figure 7 [COMP SETUP] Page



7.1.1 [BEEP] Settings

SCPI Command: **CALC: LIMITED: BEEP {OFF, IN (PASS), HL (FAIL)}**

SCPI Query Command: **CALC: LIMITED: BEEP?**

The sound function is only effective when the comparator function is turned on.

The sound setting allows for qualified sound, unqualified sound, or turned off sound.

■ **Set up BEEP**

Step 1 Enter the<Meas Display>page

Step 2 Use the cursor keys to select the [BEEP] field;

Step 3 Use function keys to select

Function keys	function
shut	The sound has been turned off
Qualified response	When the sorting result is passed, the buzzer will sound.
Unqualified sound	When the sorting result is FAIL, the buzzer will sound.

7.1.2 Comparator settings

SCPI Command: **Resistance: LMT<lower, upper>**

SCPI Command: **VOLTAGE: LMT<lower, upper>**

The instrument can compare resistance and voltage simultaneously or separately.

There are three comparison methods to choose from:

Absolute value comparison（ Δ）

Percentage comparison（ Δ%）
Sequential Comparison (SEQ)

Absolute valueΔ =measured value - nominal value
PercentageΔ%=(measured value - nominal value)/nominal value x 100%
Direct reading value comparison uses direct reading measurement values to compare with the upper and lower limit range of the gear, so there is no need for nominal values to participate in the calculation.

■ **Steps to set up a comparator:**

Step 1 Enter the<SETUP>page
Step 2 Use the cursor keys to select the 【 R-COMP 】 or 【 V-COMP 】 fields;
Step 3 Use function keys to select

Function keys	function
close	The comparator for the current parameter is turned off
absolute value Δ	Switch the comparator to absolute value comparison mode
Relative valueΔ%	Switch the comparator to relative value comparison mode
Direct reading value SEQ	Switch the comparator to direct read value comparison mode

7.1.3 [nominal value] input

SCPI Command: **Resistance: LiMiT: NOMineral<float>**
SCPI Command: **VOLTAGE: LiMiT: NOMineral<float>**

The comparison method between absolute and relative values must enter the nominal value. The direct reading value comparison method does not involve the nominal value in the calculation, but in the [nominal] range mode, the nominal value of the resistance will participate in the range selection. Therefore, in the [nominal] range, regardless of the comparison method, the correct nominal value of the resistance needs to be entered.

■ **Enter nominal value:**

Step 1 Enter the<Settings>page
Step 2 Use the cursor keys to select the 【 Resistance nominal 】 or 【 Voltage nominal 】 fields;
Step 3 Use numeric keys to input data, and use function keys to select units.

7.1.4 Lower and Upper Limit Settings

SCPI Command: **Resistance: LMT<lower, upper>**
SCPI Command: **VOLTAGE: LMT<lower, upper>**

■ **Input limit value**

Step 1 Enter the Comparator page
Step 2 Use the cursor keys to select the 【 Resistance Lower Limit 】 or 【 Voltage Lower Limit 】 fields;
Step 3 Using the numeric keypad to input data
The relative valueΔ% method does not require selecting a unit multiplier. Please enter a percentage ratio.
ΔPlease use the function keys to select units for the absolute value and direct reading value SEQ methods.
Step 4 Use the cursor keys to select 【 Resistance Upper Limit 】 and 【 Resistance Lower Limit 】;
Step 5 Using the numeric keypad to input data
Step 6 Repeat 2-5 to complete the data input for other files.

notes The instrument shares the same storage space for three comparison methods, so it is necessary to reset the comparator data after switching the comparison methods.

8. Data recording and statistics

In this chapter, you will learn how to activate the data recording function and how to perform statistics.

The instrument allows recording of measurement data and performing statistical calculations. The data recording function can only be run and displayed on the<Measurement Display>page.

8.1 Set data record cache

SCPI Command: **LOGger:SIZE {<1-10000>, max}**

The instrument has a data recording function, which can record 10000 sets of data and perform statistical calculations.

The data statistics function can be enabled separately, and can only be set after the data recording function is enabled.

Figure - 1: Enabling data recording on the system settings page



Steps to set up [Data Record]:

Step 1 Enter the<System Config>page

Step 2 Use the cursor keys to select the [Data Record] field;

Step 3 Can be selected using function keys

Function keys	function
OFF	The data recording function is turned off. After closing, the [Record] field will not appear on the<Meas Display>page.
MAX	Turn on the data recording function and set the data recording buffer to a maximum of 10000 groups. After activation, the [Record] field will appear at the top of the<Meas Display>page.

Step 4 You can also directly use the numeric keypad to enter the desired buffer size.

For example: 100<Enter>Set the buffer size to 100 groups.

After input, the [Record] field will appear at the top of the<Meas Display>page.

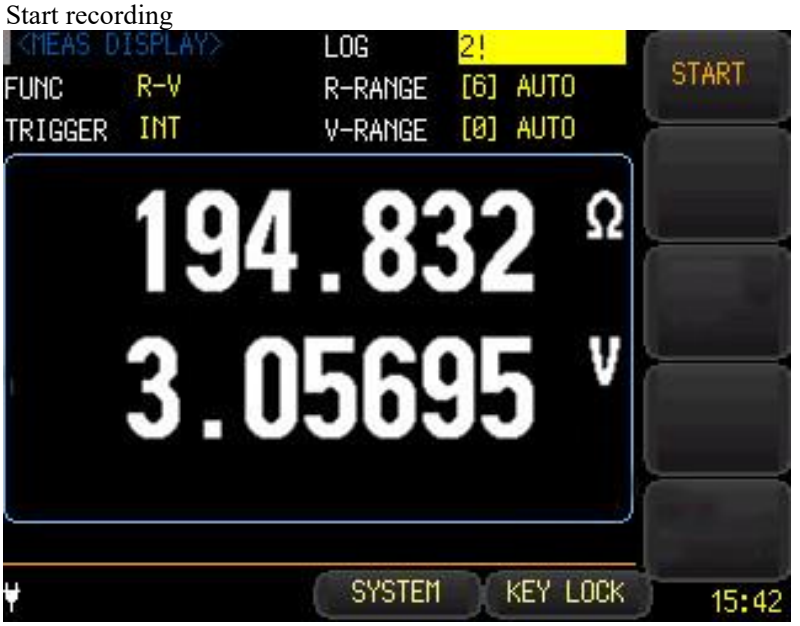
8.2 Data recording function

Through the data recording function, measurement data can be stored in real-time in the instrument buffer, which can be sent to the computer through a communication interface or directly saved in CSV format text to a USB disk.

8.2.1 Start recording

After the data recording function is enabled, the recording field will be displayed on the<Meas Display>page:

Figure 8 Start recording



The method of initiating data recording is different between internal triggering and external triggering:

1. When the triggering method is internal:
   a. Use the function key [START LOG] to start continuous recording.
   b. Use the SCPI command **LOG: START ON** to start continuous recording.
2. When the triggering method is external, data recording automatically starts:
   a. Use the TRIGGER key on the front panel to perform a recording once.
   b. Use the HANDLER external trigger input port to execute a record once.
   c. Use the SCPI instruction **TRIGGER** or **TRG to** execute a record once.

notes

Once data recording is started, the measurement page will be locked and cannot be switched to other pages. In the external triggering state, before switching to other pages, data recording must also be closed. If switching from other pages to the<Meas Display>page, data recording will automatically start.

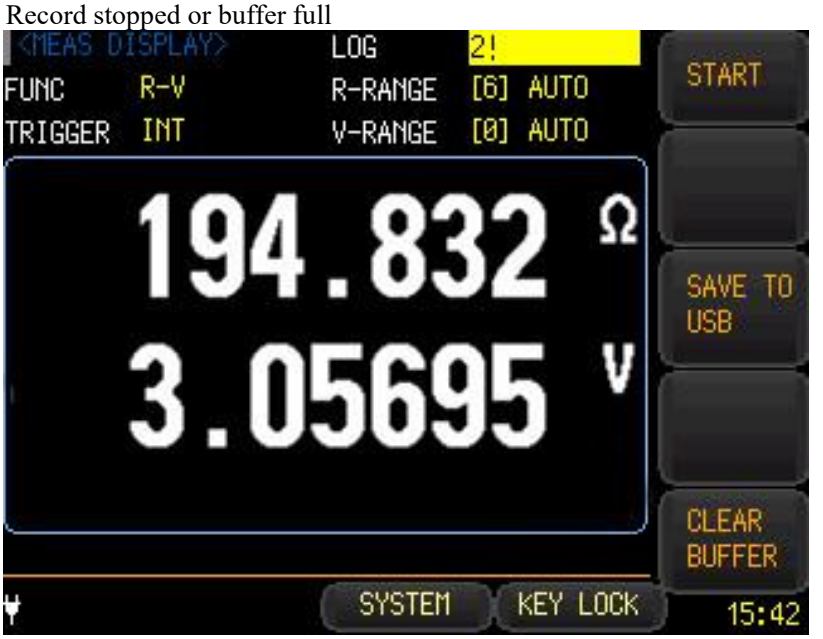
8.2.2 stop recording

After the automatic start of data recording, you can use the function keys to stop the current recording at any time or use the SCPI command **LOG: START OFF to** stop recording.

Figure - 2 is currently being recorded



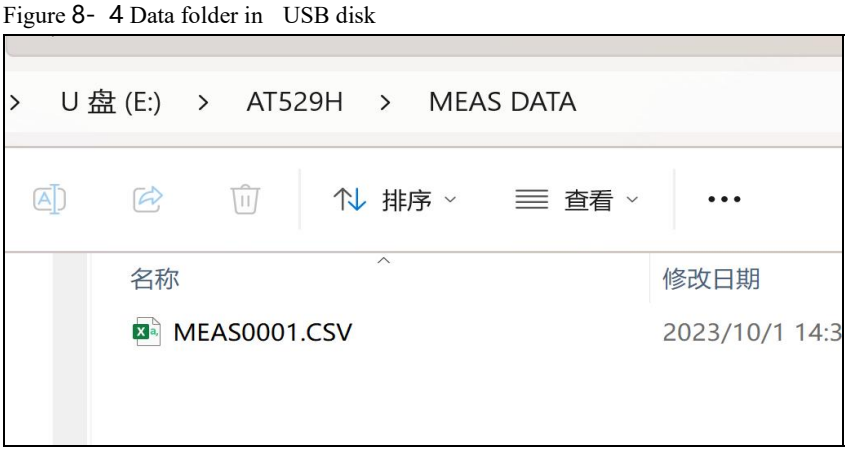
Figure - 3 Record stopped or buffer full



8.2.3 Save data to USB disk

After data recording is enabled, data can be saved to a USB disk at any time.
The data files are usually located in the MEAS DATA folder of the model folder.

Figure 8- 4 Data folder in USB disk



The saved file is in CSV format text.

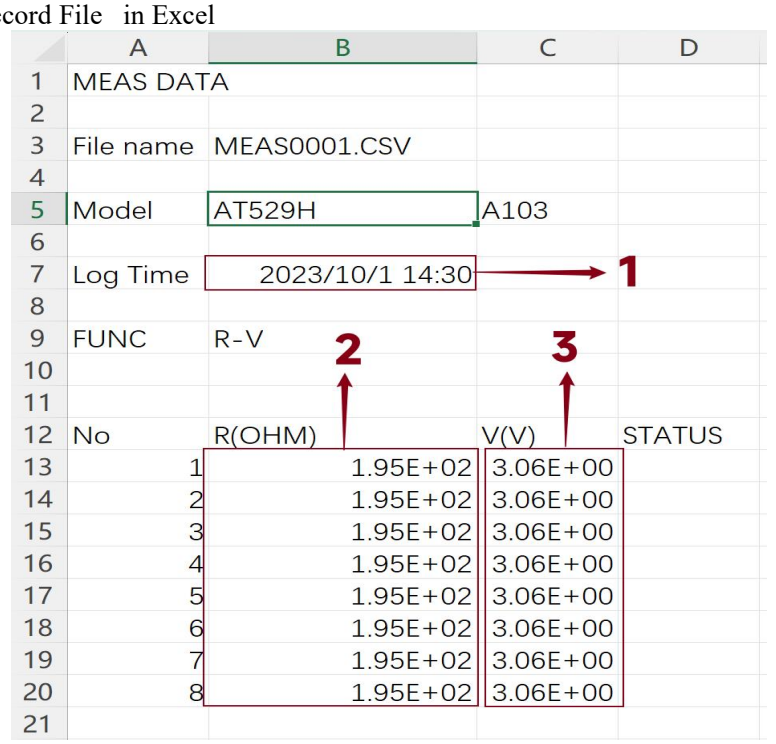
In the Windows operating system, open a file using a text editor:

Line number	File content	explain
one	"MEAS DATA"	
two		Empty row
three	"File name", "MEAS0001. CSV"	file name
four		Empty row
five	"Model", "AT529H", "A103"	Model and version
six		Empty row
seven	"Log Time", "2023-10-01 14:30:15"	start time
eight		Empty row
nine	FUNC, R-V	Measurement parameters
ten		Empty row
eleven	"No", "R (OHM)", "V (V)"	Data serial number, resistance value, voltage value
twelve	1.+194.88E+0,+3.05697E+0,	data
thirteen	2.+194.80E+0,+3.05699E+0,	

fourteen	3.+194.67E+0,+3.05723E+0,	
fifteen	4.+194.67E+0,+3.05719E+0,	
sixteen	5,+194.67E+0,+3.05729E+0,	
seventeen	6,+194.52E+0,+3.05718E+0,	
eighteen	7,+194.72E+0,+3.05715E+0,	
nineteen	8,+194.88E+0,+3.05717E+0,	
twenty		End line, blank line

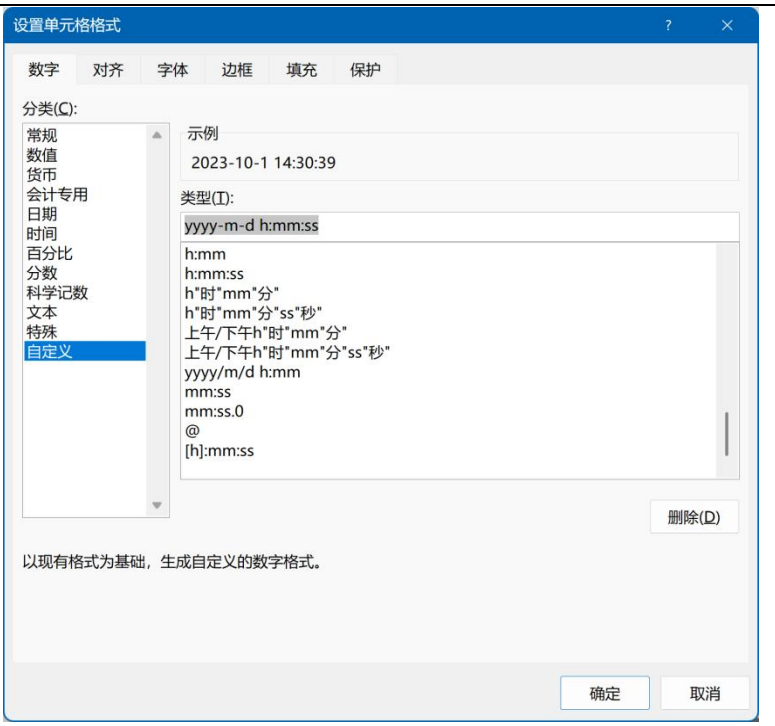
In the Windows operating system, open a file using Excel:

Figure - 5 Open Record File in Excel

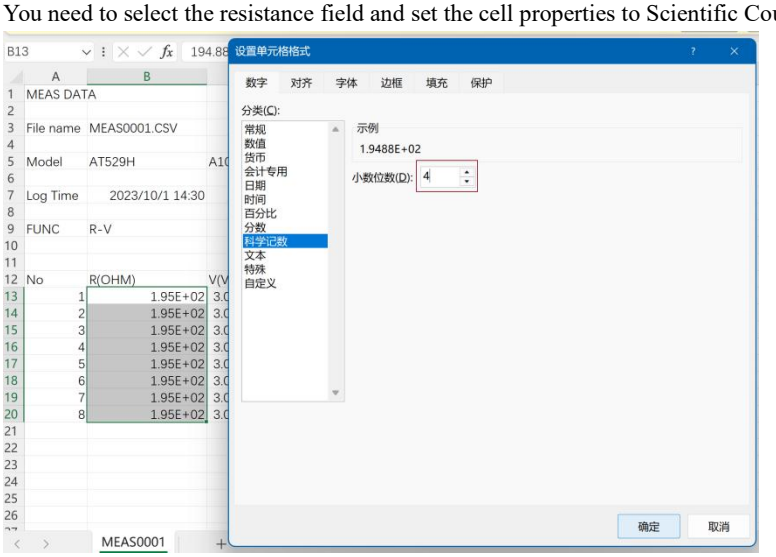


Due to default formatting issues in Excel, it is necessary to `correctly` modify cell properties in order to display data correctly

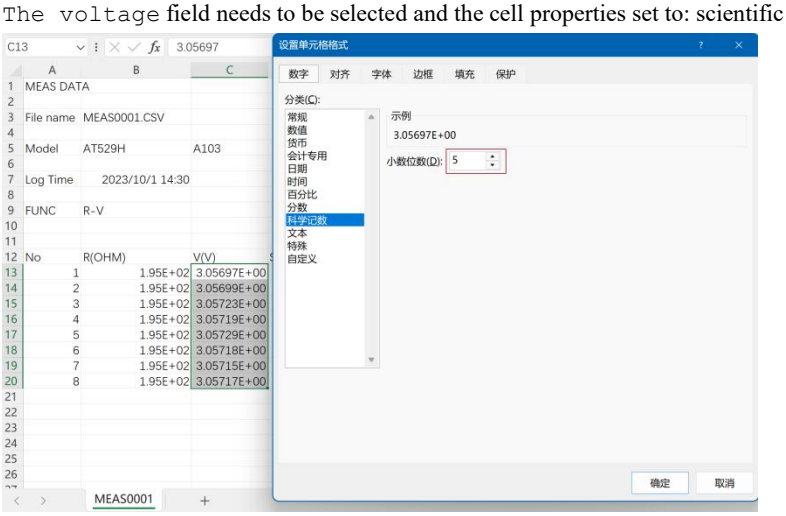
`1.` Time field `7B` needs to be modified to the following format: **yyyy m-d h: mm: ss**



2. You need to select the resistance field and set the cell properties to Scientific Count with 4 decimal places



3. The voltage field needs to be selected and the cell properties set to: scientific count, 5 decimal places



Adjusted Excel spreadsheet:

	A	B	C	D	E
1	MEAS DATA				
2					
3	File name	MEAS0001.CSV			
4					
5	Model	AT529H	A103		
6					
7	Log Time	2023/10/1 14:30			
8					
9	FUNC	R-V			
10					
11					
12	No	R(OHM)	V(V)	STATUS	
13	1	1.95E+02	3.05697E+00		
14	2	1.95E+02	3.05699E+00		
15	3	1.95E+02	3.05723E+00		
16	4	1.95E+02	3.05719E+00		
17	5	1.95E+02	3.05729E+00		
18	6	1.95E+02	3.05718E+00		
19	7	1.95E+02	3.05715E+00		
20	8	1.95E+02	3.05717E+00		
21					

8.2.4 Send data to computer

Through the SCPI command, all or individual data stored in the buffer can be sent to the computer. For detailed instructions, please refer to the SCPI command reference - Logger subsystem section.

9. system configuration

In this chapter, you will learn about the system configuration of the instrument:

- System Configuration Page
- System Information Page

At any time, simply press the【 Meas 】or【 Setup 】key, and the【 System 】key will appear at the bottom of the main page.

SCPI Command: **DISP: PAGE** **SYSTEM**

9.1 System Configuration Page

On the main page of Meas or Setup, press System to enter the System Configuration page.

All settings on the system configuration page will be automatically saved in the system and loaded on the next boot.

Figure 9 System Configuration Page



9.1.1 Change system language 【 LANGUAGE 】

SCPI Command: **SYSTem: LANGUAGE {ENGLISH, CHINESE, EN, CN}**

The instrument supports both Chinese and English languages.

■ **To change the language**

Step 1 Enter the<System Config>page

Step 2 Use the cursor keys to select 【 LANGUAGE 】.

Step 3 Use function keys to select language:

Function keys	function
Chinese [CHN]	
ENGLISH	English

9.1.2 Modify date and time

SCPI Command: **SYSTem: TIME<YEAR>,<MONTH>,<DAY>,<HOUR>,<MINITE>,<SEC>**

SCPI Query Command: **SYSTem: TIME?**

The instrument uses a 24-hour clock.

■ **Change date:**

Step 1 Enter the<System Config>page
Step 2 Use the cursor keys to select the [Date] field.
Step 3 Set date using function keys:

Function keys	function
年+	+1 年
Year-	-1 year
月+	+1 月
日+	+1 日
Daily-	-1 day

■ **Change clock:**

Step 1 Enter the<System Config>page
Step 2 Use the cursor keys to select the [Clock] field.
Step 3 Use function keys to set the clock:

Function keys	function
时+	+1 hour
Time-	-1 hour
分+	+1 minute
Minute-	-1 minute
秒+	+1 秒
Seconds-	-1 second

9.1.3 Account Settings

The instrument has two user modes to choose from:

- Administrator - Except for the System Services page, all other functions are open to administrators, and the parameters set by the administrator are saved in the system memory after a delay of 5 seconds for easy loading after the next boot.
- Users - Except for the System Services and File pages, users can operate other functions, and the data modified by users will be restored to the values set by the administrator after the next boot.

■ **Change account:**

Step 1 Enter the<System Config>page
Step 2 Use the cursor keys to select the [Account] field.
Step 3 Use function keys to change:

Function keys	function
administrators	All functions except for the System Services page are open If you forget your password, please call our company's sales department.
user	Except for the functions on the System Services and File pages that can be operated, the set data cannot be saved.

■ **Administrator password settings:**

Step 1 Enter the<System Config>page
Step 2 Use the cursor keys to select the [Account] field.
Step 3 Use function keys to select:

Function keys	function
Change password	Enter a password with up to 9 digits, which only includes numbers and symbols.
Delete password	Administrators will not be password protected

9.1.4 [Button Sound] Settings

SCPI Command: **SYSTEM: BEEP {OFF (0), ON (1)}**
SCPI Query Command: **SYSTem: BEEPer?**

■ **Set button tone**

Step 1 Enter the<System Config>page
Step 2 Use the cursor keys to select the [Key Sound] field;
Step 3 Use function keys to select

Function keys	function

close	Button tone off
open	Key tone on

9.1.5 [Trigger Light] Settings

When measuring, the blue trigger light (*) will indicate the measurement status of the instrument, and this indicator light can be turned off.

■ **Turn off trigger light**

Step 1 Enter the<System Config>page
Step 2 Use the cursor keys to select the [Trigger Light] field;
Step 3 Use function keys to select

Function keys	function
close	Trigger light off
open	Trigger light on

9.1.6 Backlight brightness setting

The darker the backlight, the lower the power consumption of the instrument and the longer the usage time. This instrument is equipped with two types of backlight to meet different power consumption requirements.

■ **Select remote communication interface type**

Step 1 Enter the<System Config>page
Step 2 Use the cursor keys to select the Backlight Brightness field;
Step 3 Use function keys to select

Function keys	function
50%	Backlight 50%, darker
100%	Backlight fully on, high power consumption.

9.1.7 Automatic shutdown time setting

In the battery powered state, if no buttons or USB events occur, the instrument will start counting down at the time set for automatic shutdown, and will automatically shut down to save power when the set time is reached.

Step 1 Enter the<System Config>page
Step 2 Use the cursor keys to select the "Auto Shutdown" field;
Step 3 Use function keys to select

Function keys	function
5 minutes	
15 minutes	
30 minutes	
60 minutes	
close	Deactivate automatic critical functions

9.1.8 About USB-VCOM settings

The USB-VCOM built-in in the instrument does not require any virtual serial port settings, including baud rate, and the instrument adapts all serial port parameters.
The USB-VCOM of the instrument follows the communication rate of USB2.0 to communicate with the PC.

9.1.9 About [Communication Protocol]

The instrument USB-VCOM communicates with the computer using the SCPI protocol.

9.1.10 SCPI [End], [Instruction handshake], [Error code] settings

The instrument RS-232 is programmed using SCPI language.
To use the SCPI protocol, please first set up SCPI related settings.
End symbol: There must be an end symbol in the communication command between the instrument and the host to facilitate mutual recognition of the end of the command.
The instrument supports three types of terminators:

End symbol	ASCII name	ASCII hexadecimal	Byte count	explain
LF (0x0A)	Line breaks	0x0A	1 byte	Instrument default
CR (0x0D)	Carriage return	0x0D	1 byte	
CR+LF	Enter+line break	1st byte 0x0D	2 bytes	

		2nd byte 0x0A		
NUL (0x00)	Null character	0x00	1 byte	

Command handshake:
After the command handshake is opened, all instructions sent by the host to the instrument will be returned to the host in their original form before returning data.
After the command handshake is turned off, the instructions sent by the host to the instrument will be immediately processed.
SCPI Command: **SYSTem: SHAKHand {ON, OFF, 0,1}**
SCPI Query Command: **SYSTem: SHAKHand?**

Error code:
SCPI Command: **SYSTem: CODE {ON, OFF, 0,1}**
SCPI Query Command: **SYSTem: CODE?**

After the error code is opened, the instrument will return the error code after receiving the command. If it is a query instruction, an error code will only be returned if the instruction is incorrect.
After the error code is turned off, the host can send the command ERR? Query the error code generated by the previous instruction execution.

■ **Set ending character**

Step 1 Enter the<System Config>page
Step 2 Use the cursor keys to select the 【 End 】 field;
Step 3 Use function keys to select

Function keys	function
LF (0x0A)	Line breaks
CR (0x0D)	Carriage return
CR+LF	Carriage return+line feed

■ **Steps to set command handshake:**

Step 1 Enter the<System Config>page
Step 2 Use the cursor keys to select the Command Handshake field;
Step 3 Use function keys to select

Function keys	function
shut	Do not use command handshake. No special requirements, please set the command handshake to off.
open	

■ **Steps for setting error codes:**

Step 1 Enter the<System Config>page
Step 2 Use the cursor keys to select the [Error Code] field;
Step 3 Use function keys to select

Function keys	function
shut	The error code is not automatically returned.
open	Error code returns an execution error code after executing a single line instruction.

9.1.11 SCPI 【 Result Sending 】 Method

SCPI Command: **SYSTem: Result {FETCH, AUTO}**
SCPI Query Command: **SYST: Result?**

The instrument supports the function of automatically sending data to the host. After each test is completed, the data will be automatically sent to the host without the host needing to send a FETCH? Instructions.
After each test is completed, the instrument sends the test results and comparator results to the host. Please refer to Fetch for the format? Subsystem.

Steps to set 【 Result Sending 】:

Step 1 Enter the<System Config>page
Step 2 Use the cursor keys to select the 【 Result Sending 】 field;

Step 3 Use function keys to select

Function keys	function
FETCH	Using the command FETCH? Obtain all measurement data
automatic	Automatically send to the host after each test is completed

9.1.12 Set [Data Cache] for data records

The instrument has a data recording function, which can record 10000 sets of data and save them to a temporary cache.
These data can be sent to the computer through a communication interface, or directly saved in CSV format text to a USB disk.

Steps to set data record cache size:

Step 1 Enter the<System Config>page

Step 2 Use the cursor keys to select the [Data Cache] field;

Step 3 You can use function keys to select, or directly press the number keys to input.

Function keys	function
Maximum value	Turn on the data recording function and set the data recording buffer to a maximum of 10000 groups.

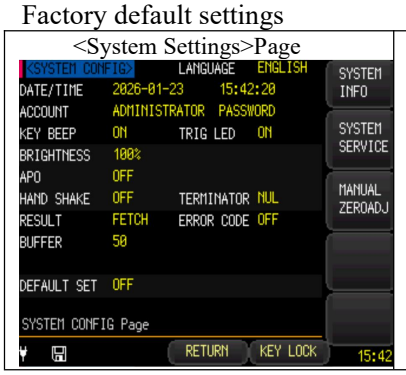
Step 4 You can also directly use the numeric keypad to enter the desired buffer size.
For example: 100<Enter>Set the buffer size to 100 groups.

9.1.13 [Factory settings]

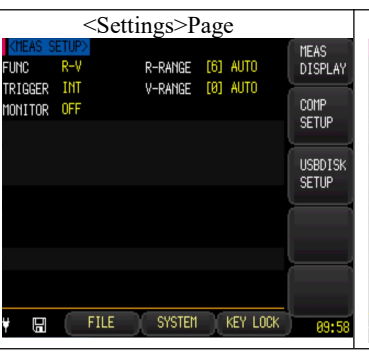
After executing the factory settings, all settings of the instrument will be restored to the preset parameters at the factory, including:

Figure - 1 Factory default settings

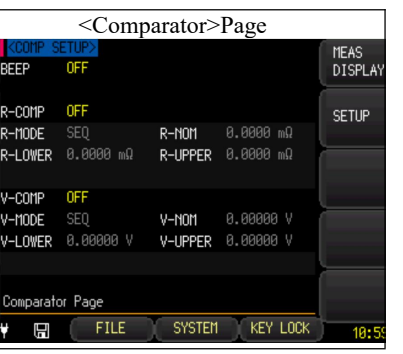
<System Settings>Page



<Settings>Page



<Comparator>Page



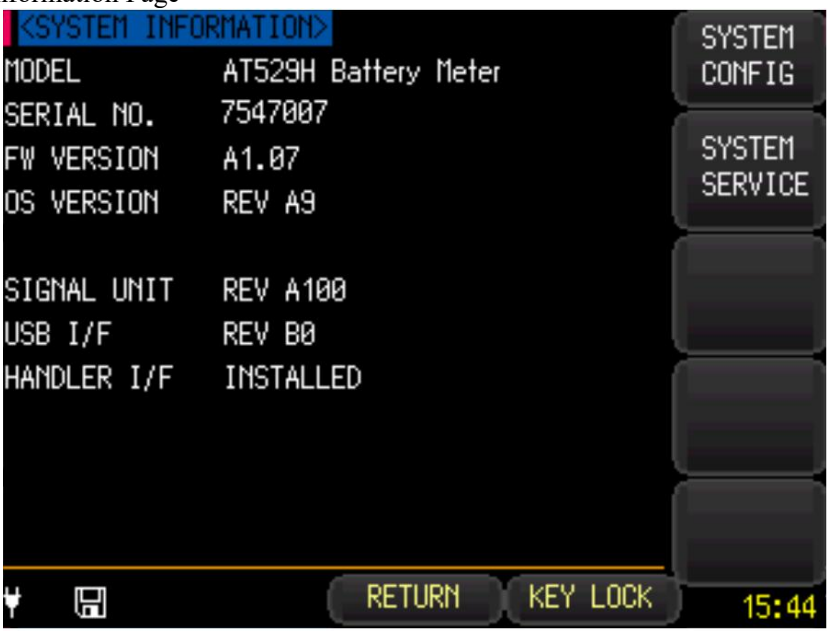
9.2 System Information Page

Press 【 Meas 】 or 【 Setup 】 to enter the main page, press the 【 System 】 key in the bottom taskbar, enter the 【 System Config】 page, and press the function keys to select 【 System Information 】.

SCPI Command: **DISP: PAGE** **SYSTEM INFO**

There are no user configurable options on the system information page.

Figure - 2 System Information Page



10. Remote communication

You will learn the following:

- Introduction to RS-232 interface
- RS-232 connection.
- Select the baud rate.
- Software protocol.

The instrument uses a USB interface (standard configuration) to communicate with the computer, and uses a virtual serial port to complete all instrument functions. Through the standard SCPI command, users can also easily develop various collection systems that are suitable for themselves.

10.1 USB-VCOM interface

On some newer computers and laptops, the RS232 interface has been removed and requires the use of a USB interface for communication. In order to simplify communication and programming on the upper computer, the instrument will have a built-in USB interface virtualized as a serial port, which can be directly used in the computer to communicate with the instrument through this RS232 port. This virtual port can achieve the same functions as RS232, and the communication speed is no longer limited to baud rate, but uses USB2.0 full speed transmission.

10.1.1 Enable USB function in the instrument

The USB function of the instrument is always on, without the need to set any parameters, plug and play.

Note! The built-in lithium battery of the instrument has a high charging current, and the USB interface on the computer usually cannot provide a high current to charge the lithium battery. Therefore, the USB TYPE-C interface is only for communication use.

10.1.2 Installing Drivers on a Computer

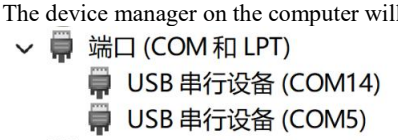
The USB interface requires the installation of drivers on the computer to function properly.

Steps to install USB driver:

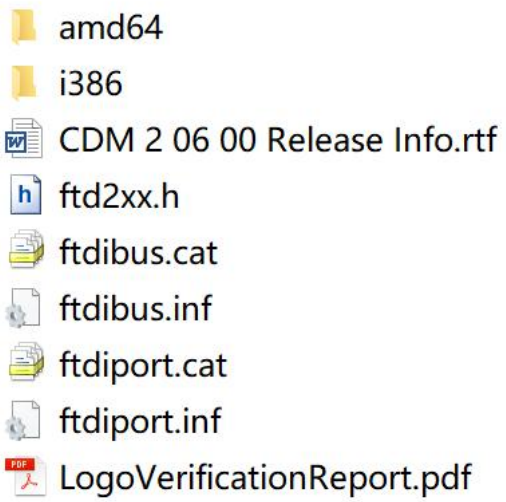
Step 1 Insert the USB TYPE-C cable into the computer and instrument separately:



Step 2 The device manager on the computer will automatically retrieve USB serial devices



Step 3 Insert the randomly included CD-ROM.
The folder is:
FTDI Driver



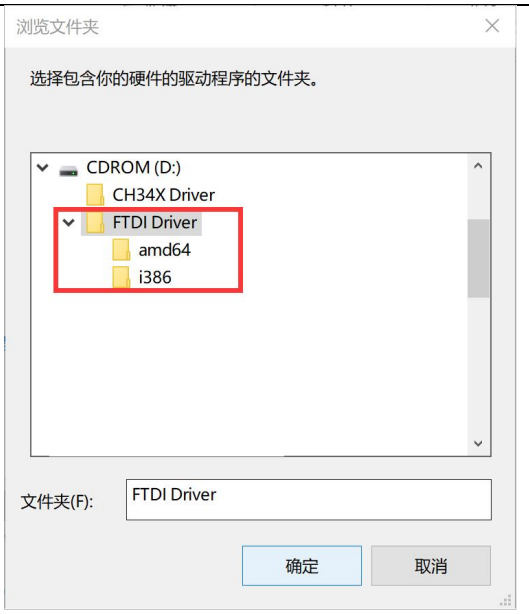
Step 4 Right click on USB Serial Port with the mouse
Select: Update driver:



Choose to **browse my computer to find driver software**

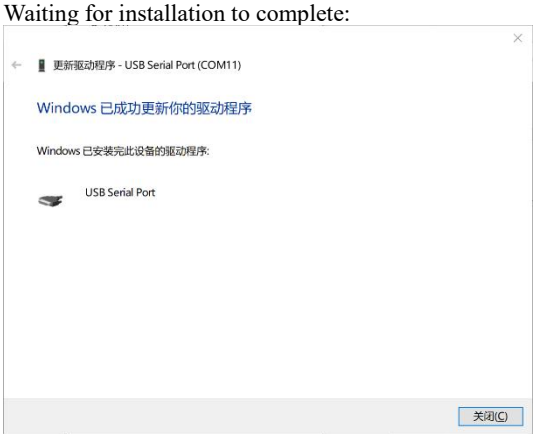
Step 5 Select browse on the pop-up window that follows:





Select the CDROM drive letter and click on FTDI Driver.

Step 6 Waiting for installation to complete:



Step 7



Step 8 The driver installation is now complete on Windows 10.
But installing drivers on older operating systems such as Windows XP may require repeating the steps starting from step 2 again to fully complete.
You need to record this port number, which needs to be used during programming.

At this point, all SCPI instructions and Modbus instructions can be operated through this port.

10.2 Communication protocol

The instrument supports the SCPI communication protocol.
SCPI protocol:
SCPI stands for Standard commands for Programmable Instruments in English. The SCPI protocol defines a standard syntax and commands for controlling programmable testing and measuring instruments. The SCPI command uses ASCII string transfer and is passed to the instrument through the physical transport layer. The command consists of a series of keywords, some of which also need to include parameters. In the protocol, the command is specified in the following form: CONFigure. In use, it is possible to write the full name or only abbreviations containing uppercase letters. The instrument's feedback on query commands is also in ASCII code. In fact, for simple applications such as PLC, it is only necessary to translate the instructions into HEX bytes and then transfer them by byte to use.

11. SCPI Command Reference

This chapter includes the following aspects:

- Command Parser - Understand some rules of command parsers.
- Command Grammar - Writing Rules for Command Lines
- Query syntax - Writing rules for query commands
- Query Response - Format of Query Response
- Command reference

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

11.1 handshake protocol

In order to reduce the possibility of data loss or errors in communication, the instrument can enable software handshake. Advanced language software engineers should strictly follow the following handshake protocol to develop computer communication software:

- The instrument command parser only accepts ASCII format, and the command response also returns ASCII code.
- **The command string sent by the host must end with a terminator, and the instrument command parser only starts executing the command string after receiving the terminator**.
- The instrument can set command handshake: `After receiving each character`, the instrument immediately sends that character back to the host. The host can only continue sending the next character after receiving this feedback character.

Tip: If the host cannot receive the data returned by the instrument, you can try the following methods to solve it:

1. The software handshake has been turned off. Please refer to the<System Settings>page of the instrument to turn it on.
2. Serial port connection failure, please check the cable connection.
3. The communication format of the high-level language program on the computer is incorrect. Please try to check if the serial port number, communication format are correct, and the baud rate is the same as the instrument settings.
4. If the instrument is parsing the last command and the host cannot receive the instrument's response, please try again later.

<The problem still cannot be solved, please consult applent Instrument's technical engineer immediately>

11.2 End symbol

The instrument supports four types of terminators:
LF (hexadecimal: 0x0A)
CR (hexadecimal: 0x0D)
CR+LF (hexadecimal: 0x0D 0x0A)
NUL (hexadecimal: 0x00)

The ending symbol can be selected in the system configuration page, and the instrument defaults to LF at the factory.

Attention:
The instrument allows commands sent by the host to be without a terminator, but it is recommended to add a terminator at the end of the command, otherwise it will cause an increase in timeout waiting after receiving each command (depending on the baud rate, the timeout of the command is between 10ms and 50ms).

11.3 Command string parsing

The host can send a series of commands to the instrument, and the instrument command parser starts parsing after

capturing the terminator (\ n) or overflow of the input buffer.

For example: Legitimate command string:

AAA: BBB CCC; DDD EEE;: FFF

The instrument command parser is responsible for parsing and executing all commands, and before writing a program, you must first have an understanding of its parsing rules.

11.3.1 Command parsing rules

1. The command parser only parses and responds to ASCII code data.
2. **The SCPI command string must end with NL ('\ n' ASCII 0x0A)**, and the command parser only starts executing the command string after receiving the end or buffer overflow.
3. If the command handshake is opened, the command parser immediately sends back a character to the host after receiving it, and the host can only continue sending the next character after receiving the returned character.
4. The command parser terminates parsing immediately upon detecting an error, and the current instruction is invalidated.
5. The command parser terminates the current command string parsing after parsing the query command, and the string is ignored thereafter.
6. The command parser is not case sensitive in parsing command strings.
7. The command parser supports command abbreviations, and the abbreviation specifications can be found in subsequent chapters.

11.3.2 Symbol conventions and definitions

This chapter uses some symbols that are not part of the command tree, but rather for better understanding of command strings.

The text in angle brackets represents the parameters of the command

The text in square brackets represents optional commands

When curly braces contain several parameter items, it indicates that only one item can be selected from them.

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

The abbreviated form of uppercase command.

11.3.3 Command Tree Structure

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

Figure 11 Command Tree Structure

Example explanation

ROOT: CCC: DDD ppp

ROOT subsystem command

CCC Level 2

DDD Level 3

Ppp parameters

11.4 Command and Parameters

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

Example explanation

AAA: BBB 1.234

Command [parameter]

11.4.1 command

Command words can be in long command format or abbreviated form, and using long format facilitates engineers to better understand the meaning of command strings; Abbreviations are suitable for writing.

11.4.2 parameter

- Single command word command with no parameters.

  For example: AAA: BBB
- Parameters can be in string form, and their abbreviation rules still follow the "Command Abbreviation Rules" in the previous section.

For example: AAA: BBB 1.23

■ Parameters can be in numerical form

- *<integer>* integers 123, +123 , -123
- *<float>* Floating point number

1.<fixfloat>: Fixed point floating-point number: 1.23, -1.23

2.<Sciloat>: Scientific notation floating point number: 1.23E+4,+1.23e-4

3.<mpfloat>: Floating point numbers represented by multiples: 1.23k, 1.23M, 1.23G, 1.23u

Table 11 Abbreviations for magnification

numerical value	Multiplier
1E18 (EXA)	EX
1E15 (PETA)	PE
1E12 (TERA)	T
1E9 (GIGA)	G
1E6 (MEGA)	**MA (special attention)**
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

Tip: The magnification is not case sensitive and is written differently from the standard name.

11.4.3 Delimiter

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

; A semicolon is used to separate two commands.
For example: AAA: BBB 100.0; CCC: DDD

: Colon, used to separate the command tree or to restart the command tree.
For example: AAA: BBB: CCC 123.4;: DDD: EEE 567.8

? Question mark, used for querying.
For example: AAA?

A space is used to separate parameters.
For example: AAA: BBB □ 1.234

11.4.4 Error code

The instrument will temporarily store the processing results of each received instruction in a buffer, and can be processed through ERR before sending the next instruction? Command to obtain status. If the error code function is enabled in the system configuration, the instrument will automatically return the processing result after processing the command.

Table 112SCPI Error Codes

Error code	explain	explain
*E00	NO ERROR	No errors
*E01	BAD COMMAND	command error
*E02	Arameter error	Parameter error
*E03	MISSING PAYTER	Missing parameters, Instruction with parameters, no parameters provided
*E04	Input BUFFER Overrun	Receive buffer overflow, instrument maximum buffer is 1000 bytes
*E05	SYNTAX ERROR	Grammar error
*E06	INVALID SEPARATOR	Invalid delimiter
*E07	INVALID Multiplier	Invalid multiplier unit
*E08	BAD NUMERIC DATA	Numerical error
*E09	Value TOO LONG	The value is too long, the numerical parameter exceeds 20 bytes
*E10	INVALID COMMAND	Invalid command, command is invalid under specific conditions

*E11	UNKNOWN ERROR	Other unknown errors besides the above ones

11.5 Display Page Subsystem

The DISPlay subsystem can be used to switch between different display pages or display a string of text on the page prompt bar.

Figure 112DISPlay subsystem tree

DISPlay	**: PAGE**	**{Measurement, ENLARge, SETUp (MSET), BinSETup (BSET), Correction, CATAlog, SYSTem, SYSTEM INFO (SINF)}**
	LINE	**<string>**

11.5.1 DISPlay: PAGE

DISP: PAGE is used to switch to a specified page.

Command syntax: **DISPlay: PAGE<Page Name>**

Parameters: <Page Name>includes:

Measurement	Display Page
SETUp (MSET)	Settings Page
BinSETup (BSET)	Comparator Settings Page
Correction (CSET)	short circuit reset page
CATAlog (FILE)	file page
SYSTem	System Configuration Page
SystemINFO (SINF)	system information page

For example: Send>**disp : page setup**<NL> //Switch to the settings page

Query syntax: **DISP: PAGE?**

Query response: **<Page Name>Abbreviations**

Meas
Mset
Bset
Cset
Cata
Syst
Sinf

For example: Send>**disp: page?**
Return>**meas**
Send>**disp: page meas; Page?**
Return>**meas**

11.5.2 DISPlay: LINE

DISP: LINE is used to display a string of text in the prompt bar at the bottom of the page. The text can display up to 30 characters and will remain for 10 seconds.

Command syntax: **DISPlay: LINE<*string*>**

Parameters: **<string>**Up to 30 characters

For example: Send>**DISP: LINE "This is a Comment."**

Query syntax: **DISPlay: LINE?**

Query response: On screen prompt bar text, if the prompt bar is empty, it will return NULL.

11.6 FUNCTION measurement function subsystem

Figure 113FUNCTION Subsystem Tree

FUNCTION	**RV, Resistance (R), Voltage (V)**	
	: MON	**{RABS, RPER, VABS, VPER, OFF}**

11.6.1 FUNCTION measurement parameter settings

Command syntax: **FUNCTION {RV, Resistance (R), Voltage (V)}**

Parameters:

RV	resistance and voltage measurement function
Resistance or **R**	only with resistance measurement function
Voltage or **V**	only voltage measurement function

For example: Send>**FUNC RES** //Select resistance measurement function
Send>**FUNC R** //Select resistance measurement function

Send>**FUNC V** //Select voltage measurement function
Send>**FUNC RV** //Select resistance+voltage measurement function

Query syntax: **FUNCTION?**
Query response: **RV**
Resistance
VOLTAGE
For example: Send>**FUNC?**
Reception

11.6.2 FUNCtion: MONitor monitoring parameter settings

Command syntax: **FUNCTION: MONitor {OFF, RABS, RPER, VABS, VPER}**
Parameters: **OFF** monitoring function turned off
Absolute deviation of **RABS** resistance (R Δ) value
RPER `resistance` relative deviation (R%) value
Absolute deviation of **vABS** `voltage` (V Δ) value
Relative deviation (`V%`) value of **vPER** `voltage`
For example: Send>**FUNC: MON RPER** //Monitoring parameter set to relative resistance deviation value (R%)
Query syntax: **FUNCtion: MONitor?**
Query response: **{OFF, RABS, RPER, VABS, VPER}**
For example: Send>**FUNC: MON?**
Receive>**OFF**

11.7 Resistance setting subsystem

Figure - 1 Resistance subsystem tree

Resistance	**RANGE**	**<0~3.1k>**	
		: NO	**{0,1,2,3,4,5,6}**
		: MODE	**{AUTO, NOM, HOLD}**
	: LIMIT	**: DATE**	**{ON, OFF}**
		: MODE	**{SEQ, PER, ABS}**
		: NOMinal	**<float>**
		: SEQ	**<lower>,<upper>**
		: PER	**<lower>,<upper>**
		ABS	**<lower>,<upper>**
		<lower>,<upper>	

11.7.1 Resistance: RANGe Resistance Range Setting

Set the range based on the resistance value.

Command syntax: **`Resistance: RANGe`<0 to 3100>**
Parameters: <0-3100>The resistance value represented by a floating-point number
For example: Send>**: RES: RANG 100E-3** //Select the range of 100m Ω
Send>**: RES: RANG 10m** //Select the range where 10m Ω is located
Query syntax: **`: Resistance`: RANGe?**
Query response: Return to `test` range:
3.0000E-3, 30.000E-3, 300.00E-3, 3.0000E+0, 30.000E+0, 300.00E+0, 3.0000E+3
For example: Send>**RES: RANG?**
Receiving>**300.00E-3**
Sending>**RES: 100m; RANG** // Set the range and query the results
Receiving>**300.00E-3**

11.7.2 Resistance: RANGE: No Resistance range number setting

RES: RANG: NO is used to set the measurement range number

Command syntax: **Resistance: RANGE: No {<Range number>, min, max}**
Parameters: Among them,<range number>**0~6**
Min Min Range=**0**
Max maximum range=**6**
For example: Send>**RES: RANG: NO 3**<NL> //Switch to range 3 (3 Ω)
Query syntax: **RES: RANG: NO?**
Query response: Range numbers **0-6**
For example: Send>**RES: RANGE: NO?**
Return>**5**
Send>**RES: RANGE: NO 2; NO** // Send instructions and query results

Return>**2**

11.7.3 Resistance: RANGE: MODE Set resistance comparison method

RES: RANG: MODE is used to set the range mode

Command syntax: **Resistance: RANGE: MODE {AUTO, HOLD, NOMinal}**

For example: Send>**RES: RANG: MODE AUTO** //Switch to automatic range mode

Query syntax: **RES: RANG: MODE?**

Query response: **{AUTO, HOLD, NOM}**

For example: Send>**RES: RANGE: MODE?**
Return to>**AUTO**
Send>**RES: RANGE: MODE AUTO; MODE** // Send instructions and query results
Return to>**AUTO**

Attention: If set to NOM mode, the instrument will set the range according to the comparator mode:
When the comparator mode is SEQ, the range will be set according to the upper limit of the comparator;
When the comparator mode is ABS and PER, the range will be set based on the nominal value.

11.7.4 Resistance: LiMiT sets the resistance limit

Set the upper and lower limits of resistance under the current comparison method.

Command syntax: **Resistance: LiMiT<lower, upper>**
Resistance: LMT<lower, upper>

Parameters: Lower: upper limit floating-point number
Upper: lower bound floating-point number
The data value corresponds to the current comparison method used, where direct reading comparison (SEQ) and absolute value (ABS) represent the resistance value (Ω), and percentage (PER) represents the percentage ratio (%).

For example: Sending>**RES: LMT 1,10**
Sending>**RES: LMT 10m, 100m**
Sending>**RES: LMT 1e-3, 1e-2**

Query syntax: **Resistance: LiMiT?**

Query response: <lower>,<upper>The current data value corresponds to the upper and lower limits of the current comparison method.
Data format: ± ##### E ±#
The total number of digits for each data is 10, with the first digit being the sign digit and the decimal position not fixed. In order to be compatible with PLC and other devices, the exponential part only uses formats such as E-3 (m), E+0, E+3 (k) to correspond to the multiplier unit value.

For example: Send>RES: LMT?
Receive>+1.0000E-3,+10.0000E-3
Sending>RES: LMT 10m, 12m; LMT?
Receive>+10.000E-3,+12.000E-3

11.7.5 Resistance: LiMiT: STATe Resistance Comparator Status Setting

Resistance comparator on or off setting.

Command syntax: **Resistance: LiMiT: STATe {ON/1, OFF/0}**

For example: Sending>RES: LMT: STAT OFF

Query syntax: **Resistance: LiMiT: STATe?**

Query response: {on, off}

For example: Send>RES: LMT: STAT?
Receive>on

11.7.6 Resistance: LiMiT: MODE Resistance comparison method

Set the voltage comparison method.

Command syntax: **Resistance: LiMiT: MODE {SEQ, PER, ABS}**

Parameters: SEQ: Comparison method for upper and lower limit direct reading
PER: percentage comparison method (relative deviation comparison)
ABS: Absolute deviation comparison (Δ)

For example: Send>RES: LMT: MODE PER //Percentage comparison

Query syntax: **Resistance: LiMiT: MODE?**

Query response: {SEQ, PER, ABS}

For example: Send>RES: LMT: MODE?
Receive>SEQ

11.7.7 Resistance: LiMiT: NOMinal Resistance nominal value setting

Set the nominal value of the resistance, which only participates in the calculation in ABS and PER modes.

Command syntax: **Resistance: LiMiT: NOMinal<float>**

Parameters: Float: nominal floating point number, unit (Ω)

For example: Sending**>RES: LMT: NOM 12.345m**
Sending**>RES: LMT: NOM 12.345e-3**

Query syntax: **Resistance: LiMiT: NOMinal?**

Query response: <float>
Data format: ± ##### E ±#
The total number of digits for each data is 10, with the first digit being the sign digit and the decimal position not fixed. In order to be compatible with PLC and other devices, the index part only uses formats such as E-3, E+0, E+3, etc. to correspond to the unit value.

For example: Send>RES: LIM: NOM?
Receiving>+ 100.00e-3 //100.00m Ω
Sending>RES: LIM: NOM 100.00m; NOM // Set nominal value and query
Receiving>+ 100.00e-3 //100.00m Ω

☛⓪⓪☞⑤⓪⓪☑⑤: If the current resistance range is set to the nominal range (NOM RANGE) and the resistance comparison method is PER or ABS, the resistance range will switch to the optimal range based on the nominal value. However, when the resistance comparison method is SEQ, the range will not be switched based on the nominal value. (During SEQ, the range will be selected based on the upper limit.)

11.7.8 Resistance: LiMiT: SEQ Limit of resistance direct reading value

Set the upper and lower resistance limits for the current direct reading comparison method.

Command syntax: **Resistance: LiMiT: SEQ<lower, upper>**

Parameters: Lower: upper limit floating-point number
Upper: lower bound floating-point number
Set the upper and lower limits for direct reading comparison (SEQ).

For example: Sending**>RES: LMT: SEQ 1m, 10m**
Sending**>RES: LMT: SEQ 1e-3, 10e-3**

Query syntax: **Resistance: LiMiT: SEQ?**

Query response: <lower>,<upper>
Data format: ± ##### E ±##
The total number of digits for each data is 11, with the first digit being the sign digit and the decimal position not fixed. In order to be compatible with PLC and other devices, the index part only uses formats such as E-03, E+00, E+03, etc. to correspond to the unit value.

For example: Send>RES: LMT: SEQ?
Receive>+1.0000e-03,+10.000e-03
Sending>RES: LMT: SEQ 10m, 100m; SEQ // Set nominal value and query
Receiving>+ 100.00e-03 //100.00m Ω

☛⓪⓪☞⑤⓪⓪⑥⑤: CALCalate: LIMit: Resistance: SEQ will forcibly switch the resistance comparison method to SEQ mode. However, CALCurate: LIMit: Resistance: SEQ? The command will not switch comparison methods.

11.7.9 Resistance: LiMiT: Absolute limit of ABS resistance

Set the upper and lower limits of resistance under the current absolute value comparison method.

Command syntax: **Resistance: LiMiT: ABS<lower, upper>**

Parameters: Lower: upper limit floating-point number
Upper: lower bound floating-point number
Set the upper and lower limits for absolute value comparison (ABS).

For example: Sending**>RES: LMT: ABS -1.23m, 1.23m**
Sending**>RES: LMT: ABS -1.23e-3, 12.3e-3**

Query syntax: **Resistance: LiMiT: ABS?**

Query response: <lower>,<upper>
Data format: ± ##### E ±#
The total number of digits for each data is 10, with the first digit being the sign digit and the decimal position not fixed. In order to be compatible with PLC and other devices, the index part only uses formats such as E-03, E+00, E+03 to correspond to the unit value.

For example: Send>RES: LMT: ABS?
Receive>-1.2300e-3,+12.300e-3
Sending>RES: LMT: ABS -1.23m, 12.3m; ABS?
Receive>-1.2300e-3,+12.300e-3

☛00≈⑤0066⑤	CALCalate: LIMit: Resistance: ABS will forcibly switch the resistance comparison method to ABS mode. However,: CALPlate: LIMit: Resistance: ABS? The command will not switch comparison methods.

11.7.10 Resistance: LiMiT: PER Resistance percentage upper and lower limits

Set the upper and lower resistance percentage ratio under the current percentage comparison method.

Command syntax:	**Resistance: LiMiT: PER<lower, upper>**
Parameters:	Lower: upper limit floating-point number Upper: lower bound floating-point number Set the upper and lower percentage ratios for percentage comparison (PER).
For example:	Sending>**RES: LMT: PER -10.1,10.1**
Query syntax:	**Resistance: LiMiT: PER?**
Query response:	<lower>,<upper> Data format: ± ##### E+0 The total number of digits for each data is 10, with the first digit being the sign digit and the decimal position not fixed. In order to be compatible with PLC and other devices, the index part is only in E+0 format.
For example:	Send>RES: LMT: PER? Receive>-10.0000E+0,+10.000E+0 Sending>RES: LMT: PER -10,10; PER // Set and query return Receive>-10.0000E+0,+10.000E+0
☛00≈⑤0066⑤	CALCalate: LIMit: Resistance: PER will forcibly switch the resistance comparison method to PER mode. CALCalate: LIMit: Resistance: PER? The command will not switch comparison methods.

11.8 Voltage Setting Subsystem

Figure 115VOLTAGE Subsystem Tree

VOLTAGE	**RANGE**	**<-300~300>**	
		: NO	**{0,1,2}**
		: MODE	**{AUTO, NOM, HOLD}**
	: LIMIT	**: DATE**	**{ON, OFF}**
		: MODE	**{SEQ, PER, ABS}**
		: NOMinal	**<float>**
		: SEQ	**<lower>,<upper>**
		: PER	**<lower>,<upper>**
		ABS	**<lower>,<upper>**
		<lower>,<upper>	

11.8.1 VOLTage: RANGE voltage range setting

Voltage range setting.

Command syntax:	**VOLTage: RANGE<- MAX to+MAX>** **Among them,** AT529A MAX=200 AT529 MAX=400 AT529B MAX=800 AT529H MAX=1000
Parameters:	<0 MAX>Floating point voltage value represented by floating-point number
For example:	Send>**: VOLT: RANG 10** //Select the range where 10V is located
Query syntax:	**VOLTage: RANGE?**
Query response:	Return to test range: 6.00000E+0, 60.000E+0, 300.000E+0
For example:	Send>**VOLT: RANG?** Receive>**60.000E+0** Send>**VOLT: RANG 3?**

11.8.2 VOLTage: RANGE: No Resistance Range Number Setting

VOLT: RANG: NO is used to set the measurement range number

Command syntax:	**VOLTage: RANGe: No {<0-2>, min, max}**
Parameters:	Among them,<range number>**0-2** **Min Min** Range=**0** **Max** range=**2 (AT529L max=1)**

For example: Send>**VOLT: RANG: NO 1** //Switch to 1 range
Query syntax: **VOLTage: RANGE: NO?**
Query response: Range numbers `0-2`
For example: Send>**VOLT: RANG: NO?**
Return>**1**
Send>**VOLT: RANGE: NO 1; NO** // Send instructions and query results
Return>**1**

11.8.3 VOLTage: RANGE: MODE

VOLT: RANG: MODE is used to set the range mode
Command syntax: **VOLTage: RANGE: MODE {AUTO, HOLD, NOMinal}**
For example: Send>**VOLT: RANG: MODE AUTO** //Switch to automatic range mode
Query syntax: **VOLTage: RANGE: MODE?**
Query response: **{AUTO, HOLD, NOM}**
For example: Send>**VOLT: RANGE: MODE?**
Return to>**AUTO**
Send>**VOLT: RANGE: MODE AUTO; MODE // Send instructions and query results**
Return to>**AUTO**
Attention: If set to NOM mode, the instrument will set the range according to the comparator mode:
When the comparator mode is SEQ, the range will be set according to the upper limit of the comparator;
When the comparator mode is ABS and PER, the range will be set based on the nominal value.

11.8.4 VOLTage: LiMiT Set Resistance Limit

Set the voltage upper and lower limits for the current comparison method.
Command syntax: **VOLTage: LiMiT<lower, upper>**
Parameters: Lower: upper limit floating-point number
Upper: lower bound floating-point number
The data value corresponds to the current comparison method used, where direct reading comparison (SEQ) and absolute value (ABS) represent `voltage` value (V), and percentage (PER) represents `percentage ratio` (%).
For example: Send>**VOLTage: LMT `10,20`**
Query syntax: **VOLTage: LiMiT?**
Query response: <lower>,<upper>The current data value corresponds to the upper and lower limits of the current comparison method.
Data format: `± ###### E+0`
The total number of digits for each data is 11, with the first digit being the sign digit and the decimal position not fixed. In order to be compatible with PLC and other devices, the index part only uses the E+0 format to correspond to the multiplier unit value.
For example: Send>VOLT: LMT?
Receive>`+10.0000E+0,+20.000E+0`
Send>VOLT: LMT `10,20`; LMT?
Receive>`+10.0000E+0,+20.000E+0`

11.8.5 Voltage: LiMiT: STATe voltage comparator status setting

Voltage comparator on or off setting.
Command syntax: **VOLTage: LiMiT: STATe {ON/1, OFF/0}**
For example: Send>`VOLT:` LMT: STAT OFF
Query syntax: **VOLTage: LiMiT: STATe?**
Query response: {on, off}
For example: Send>VOLT: LMT: STAT?
Receive>on

11.8.6 VOLTage: LiMiT: MODE resistor comparison method

Set the voltage comparison method.
Command syntax: **VOLTage: LiMiT: MODE {SEQ, PER, ABS}**
Parameters: SEQ: Comparison method for upper and lower limit direct reading
PER: percentage `comparison method` (relative deviation comparison)
ABS: Absolute deviation comparison （ Δ）
For example: Send>VOLT: `LMT: MODE` PER //Percentage comparison
Query syntax: **VOLTage: LiMiT: MODE?**
Query response: {SEQ, PER, ABS}
For example: Send>VOLT: LMT: MODE?
Receive>SEQ

11.8.7 VOLTage: LiMiT: NOMinal resistor nominal value setting

Set the nominal voltage value, which only participates in the calculation in ABS and PER modes.

Command syntax: **VOLTage: LiMiT: NOMinal<float>**

Parameters: Float: nominal floating point number, unit (V)

For example: Send**>VOLT: LMT: NOM 10.1234**

Query syntax: **VOLTage: LiMiT: NOMinal?**

Query response: <float>

Data format: ± ###### E+0

The total number of digits for each data is 11, with the first digit being the sign digit and the decimal position not fixed. In order to be compatible with PLC and other devices, the index part only uses the E+0 format to correspond to the unit value.

For example: Send>VOLT: LIM: NOM?

Receive>+10.0000E+0 //10.0000

Send>VOLT: LIM: NOM 3.6; NOM // Set nominal value and query

Receive>+3.60000E+0

☛00≈5006: If the current voltage range is set to the nominal range (NOM RANGE) and the voltage comparison method is PER or ABS, the voltage range will switch to the optimal range based on the nominal value.

However, when the voltage comparison method is SEQ, the range will not be switched based on the nominal value. (During SEQ, the range will be selected based on the upper limit.)

11.8.8 VOLTage: LiMiT: SEQ Voltage Direct Reading Limit

Command syntax: **VOLTage: LiMiT: SEQ<lower, upper>**

Parameters: Lower: upper limit floating-point number

Upper: lower bound floating-point number

Set the upper and lower limits for direct reading comparison (SEQ).

For example: Send**>VOLT: LMT: SEQ 1.23456,3.45678**

Query syntax: **VOLTage: LiMiT: SEQ?**

Query response: <lower>,<upper>

Data format: ± ####### E+0

The total number of digits for each data is 11, with the first digit being the sign digit and the decimal position not fixed. In order to be compatible with PLC and other devices, the index part is only in E+0 format.

For example: Send>VOLT: LMT: SEQ?

Receive>+1.23456E+0,+3.45678E+0

Send>VOLT: LMT: SEQ 3.5, 4.2; SEQ // Set and query setting values

Receive>+3.50000E+0,+4.20000E+0

☛00≈5006: CALCalate: LIMit: VOLTage: SEQ will forcibly switch the voltage comparison method to SEQ mode.

CALCalate: LIMit: VOLTage: SEQ? The command will not switch comparison methods.

11.8.9 VOLTage: LiMiT: ABS voltage absolute limit

Command syntax: **VOLTage: LiMiT: ABS<lower, upper>**

Parameters: Lower: upper limit floating-point number

Upper: lower bound floating-point number

Set the upper and lower limits for absolute value comparison (ABS).

For example: Send**>VOLTage: LiMiT: ABS -1.2,1.2**

Query syntax: **VOLTage: LiMiT: ABS?**

Query response: <float>,<float>

Data format: ± ####### E+0

The total number of digits for each data is 11, with the first digit being the sign digit and the decimal position not fixed. In order to be compatible with PLC and other devices, the index part is only used in E+00 format.

For example: Send>VOLT: LMT: ABS?

Receive>-1.23456E+0,+1.23456E+0

Send>VOLT: LMT: ABS -12,12; ABS // Set and query setting values

Receive>-12.0000E+0,+12.0000E+0

☛00≈5006: VOLTage: LiMiT: ABS will forcibly switch the voltage comparison mode to ABS mode.

VOLTage: LiMiT: ABS? The command will not switch comparison methods.

11.8.10 VOLTage: LiMiT: PER voltage percentage upper and lower limits

Command syntax: **VOLTage: LiMiT: PER<lower, upper>**

Parameters: Lower: upper limit floating-point number

Upper: lower bound floating-point number
Set the upper and lower percentage ratios for percentage comparison (PER).

For example: Send>: **CALC: LIM: VOLT: PER -1,1**

Query syntax: **VOLTage: LiMiT: PER?**

Query response: <float>,<float>
Data format: ± ###### E+0
The total number of digits for each data is 11, with the first digit being the sign digit and the decimal position not fixed. In order to be compatible with PLC and other devices, the index part only uses the E+00 format to correspond to the unit value.

For example: Send>VOLT: LMT: PER?
Receive>-10.0000E+00,+10.0000E+00
Send>VOLT: LMT: PER -10,10; PER // Set and query setting values
Receive>-10.0000E+00,+10.0000E+00

11.9 AUTorange automatic range subsystem*

(*新设计不建议使用)

11.9.1 AUTorange automatic range setting*

Automatic range setting, this command sets both voltage and resistance range modes simultaneously. Please refer to the RES: RANG: MODE and VOLT: RANG: MODE instructions for setting the range separately.

Command syntax: **AUTorange {1,0, ON, OFF}**

For example: Send>**AUT ON** //Switch to automatic range mode

Query syntax: **AUTorange?**

Query response: **{ON, OFF}**

11.10 ADJust zeroing subsystem

11.10.1 ADJust: Clear Cancel Zero Function

Turn off the reset function.

Command syntax: **ADJust: CLEAR**

For example: Send>: **ADJ: CLEA**

11.10.2 ADJust execution zeroing

Before sending this command, the test clamp must be short circuited.

Command syntax: **ADJust**

Response: {0,1}
0: Zeroing successful
1: Zeroing failed

For example: Send>: **ADJ** //Start zeroing
Received>**0** //successfully cleared to zero

Query syntax: **ADJust?**

Query response: {0,1}
0: Last successful reset to zero
1: Last reset failed

Clearing to zero takes a certain amount of time, and all return values need to wait for a while before they can be returned. Clearing to zero in automatic range takes approximately 6 seconds.

11.11 CALCalate operator system

The CALCurate subsystem is not recommended for use in new designs.

Figure 116CALCurate Subsystem Tree

CALCalate	**: LIMit**	*: DATE*	*{ON, OFF}*	
		BEEPer	**{OFF, HL, IN}**	
		: Resistance	*: MODE*	*{HL, REF, ABS}*
			: UPPer	*Float<integer>*
			LOWer	*<integer>*

			: REFerence	<integer>
			: PERCent	<lower, upper>
		: VOLTAGE	: MODE	{HL, REF, ABS}
			: UPPer	Float<integer>
			LOWer	<integer>
			: REFerence	<integer>
			: PERCent	<lower, upper>
		ABS	{ON (0), OFF (1)}	

11.11.1 CALCalate: LIMit: STATe comparator main switch setting*

(*新设计不建议使用)

Comparator switch setting, this command will simultaneously set the voltage and resistance comparator switch.

Command syntax: **CALCalate: LIMit: STATe {0,1, ON, OFF}**

Parameters: ON (1): Both the resistance comparator and voltage comparator are turned on and set to SEQ mode.
OFF (0): Both the resistance comparator and voltage comparator are turned off.

For example: Send>**CALC: LIM: STAT OFF**

Query syntax: **CALCalate: LIMit: STATe?**

Query response: {ON, OFF}
When the resistance comparator is set to OFF and the voltage comparator is set to OFF, it returns to OFF

For example: Send>CALC: LIM: STAT?
Receive>ON

☛**CALCalate: LIMit: STATe** will turn the voltage and resistance comparators on or off simultaneously. If it is necessary to turn off the resistor or voltage comparator separately, use the **RES: LMT: STATe** and **VOLT: LMT: STATe** commands.

11.11.2 CALCalate: LIMit: BEEPer Sound Settings

Comparator sound setting.

Command syntax: **CALCalate: LIMit: BEEPer {0/OFF, HL/NG/FAIL, IN/OK/PASS)}**

Parameters: 0/OFF: 讯响关闭
HL/NG/FAIL: Unqualified sound, buzzer sounds when unqualified
IN/OK/PASS: Qualified sound, buzzer sounds when qualified

For example: Send>**CALC: LIM: BEEP HL** //Unqualified message
Send>**CALC: LIM: BEEP OK** //qualified message

Query syntax: **CALCalate: LIMit: BEEPer?**

Query response: {OFF, HL, IN}

For example: Send>CALC: LIM: BEEP?
Receive>IN

11.11.3 CALCalate: LIMit: Resistance: MODE Resistance comparison method*

(*新设计不建议使用)

Set the resistance comparison method. This instruction is recommended to use RES: LMT: MODE instead.

Command syntax: **CALCalate: LIMit: Resistance: MODE {HL, REF, ABS}**

Parameters: HL/SEQ: Upper and Lower Limit Direct Reading Comparison Method
REF/PER: percentage comparison method (relative deviation% comparison)
ABS: Absolute deviation comparison (Δ)

For example: Send>**CALC: LIM: RES: MODE HL** //Comparison of upper and lower direct reading values
Send>**CALC: LIM: RES: MODE REF** //Percentage comparison

Query syntax: **CALCalate: LIMit: Resistance: MODE?**

Query response: {HL, REF, ABS}

For example: Send>CALC: LIM: RES: MODE?
Reception>HL

11.11.4 CALCalate: LIMit: Resistance: UPPer Resistance Upper Limit Setting*

(*新设计不建议使用)

It is recommended to use the instruction RES: LMT that supports floating-point input instead.

Command syntax: **CALCalate: LIMit: Resistance: UPPer<0-99999>**

Parameters: <0-99999>: A positive integer value, if it exceeds 99999, it is forced to be 99999, and the symbol is ignored.
Decimals and units are related to the current range:

range	Decimal places	unit	explain
0 (3m Ω)	four	M Ω	12345=1.2345m Ω
1 (30m Ω)	three	M Ω	12345=12.345m Ω
2 (300m Ω)	two	M Ω	12345=123.45m Ω
3 (3 Ω)	four	Ω	12345=1.2345 Ω
4 (30 Ω)	three	Ω	12345=12.345 Ω
5 (300 Ω)	two	Ω	12345=123.45 Ω
6 (3k Ω)	four	Ω	12345=1.2345 Ω

For example: Send**>CALC: LIM: RES: UPPer 12345** //According to the above table, the corresponding value is obtained. When measuring range 1, it represents 1.2345m Ω

Query syntax: **CALCalate: LIMit: Resistance: UPPer?**

Query response: <Positive integer>#####

Maximum of 5 digits, without sign or decimal point

For example: Send>CALC: LIM: RES: UPP?

When receiving>1234 //range 0, it represents 0.1234m Ω

Send>CALC: LIM: RES: UPP 12345; UPP?

When receiving>12345 //range 1, it represents 12.345mΩ

☛❶❶≈⑤❶⓪⑥⑤ The value sent by this command is related to the range. RES: LMT<lower>,<upper>can directly input the actual floating-point value.

CALC: LIM: RES: UPP will set the resistance comparison method to SEQ mode.

11.11.5 CALCalate: LIMit: Resistance: Lower Resistance Lower Limit Setting*

(*新设计不建议使用)

It is recommended to use the instruction RES: LMT that supports floating-point input instead.

Command syntax: **CALCalate: LIMit: Resistance: Lower<0-99999>**

Parameters: <0-99999>: A positive integer value, if it exceeds 99999, it will be forced to be 99999

Decimals and units are related to the current range:

range	Decimal places	unit	explain
1 (3m Ω)	four	M Ω	12345=1.2345m Ω
2 (30m Ω)	three	M Ω	12345=12.345m Ω
3 (300m Ω)	two	M Ω	12345=123.45m Ω
4 (3 Ω)	four	Ω	12345=1.2345 Ω
5 (30 Ω)	three	Ω	12345=12.345 Ω
6 (300 Ω)	two	Ω	12345=123.45 Ω
7 (3k Ω)	four	Ω	12345=1.2345 Ω

For example: Send**>CALC: LIM: RES: LOWer 1000** //According to the above table, the corresponding value is obtained. When the range is 4, it represents 0.1000 Ω

Query syntax: **CALCalate: LIMit: Resistance: Lower?**

Query response: <Positive integer>#####

Total number of digits is 5, without sign or decimal point

For example: Send>: CALC: LIM: RES: LOW?

Receive>1000//Return value varies depending on the range

☛❶❶≈⑤❶⓪⑥⑤ The value sent by this command is related to the range. RES: LMT<lower>,<upper>can directly input the actual floating-point value.

CALC: LIM: RES: UPP will set the resistance comparison method to SEQ mode.

11.11.6 CALCalate: LIMit: Resistance: REFerence Resistance nominal value setting*

(*新设计不建议使用)

It is recommended to use the instruction RES: LMT: NOM that supports floating-point input instead.

Command syntax: **CALCalate: LIMit: REFerence<0-99999>**

Parameters: <0-99999>: A positive integer value, if it exceeds 99999, it will be forced to be 99999

Decimals and units are related to the current range:

range	Decimal places	unit	explain
0 (3m Ω)	four	M Ω	12345=1.2345m Ω
1 (30m Ω)	three	M Ω	12345=12.345m Ω
2 (300m Ω)	two	M Ω	12345=123.45m Ω
3 (3 Ω)	four	Ω	12345=1.2345 Ω
4 (30 Ω)	three	Ω	12345=12.345 Ω
5 (300 Ω)	two	Ω	12345=123.45 Ω
6 (3k Ω)	four	Ω	12345=1.2345 Ω

For example: Send**>: CALC: LIM: REF 10000** //According to the table above, the corresponding value is obtained. When measuring range 4, it represents 1.0000 Ω

Query syntax: **CALCalate: LIMit: Resistance: REFerence?**

Query response: <Positive integer>#####
Total number of digits is 5, without sign or decimal point

For example: Send>: CALC: LIM: RES: REF?
Receive>10000//The return value varies depending on the range, with range 1 representing 1.0000m Ω

11.11.7 CALCalate: LIMit: Resistance: PERCent Resistance percentage limit*

(*新设计不建议使用)

It is recommended to use the instruction RES: LMT: PER that supports floating-point input instead.

Command syntax: **CALCalate: LIMit: Resistance: PERCent<%>**

Parameters: %: Percentage ratio
Set the percentage ratio for percentage comparison (PER).

For example: Send**>: CALC: LIM: RES: PERC 1.1** //Set the percentage limit to -1.1%, 1.1%

Query syntax: **CALCalate: LIMit: Resistance: PERCent?**

Query response: <float>####
The total number of digits is a 4-digit floating-point number, unsigned.

For example: Send>: CALC: LIM: RES: PERC?
Receive>1.100
Send>: CALC: LIM: RES: PERC?
Receive>1.100

CALCalate: LIMit: Resistance: PERC will forcibly switch the voltage comparison mode to PER mode.
CALCalate: LIMit: Resistance: PERC? The command will not switch comparison methods.

11.11.8 CALCalate: LIMit: VOLTage: MODE voltage comparison method*

(*新设计不建议使用)

Set the voltage comparison method. This instruction is recommended to use VOLT: LMT: MODE instead.

Command syntax: **CALCalate: LIMit: VOLTage: MODE {OFF, HL/SEQ, REF/PER, ABS}**

Parameters: OFF: Voltage comparator turned off
HL: Comparison method for upper and lower limit direct reading
REF: Percentage comparison method (relative deviation comparison)
ABS: Absolute deviation comparison (Δ)

For example: Send>: CALC: LIM: VOLT: MODE HL //Comparison of upper and lower direct reading values
Send>: CALC: LIM: VOLT: MODE OFF //Resistance comparator turned off
Send>: CALC: LIM: VOLT: MODE REF //Percentage comparison
Send>: CALC: LIM: VOLT: MODE PER //Percentage comparison

Query syntax: **CALCalate: LIMit: VOLTage: MODE?**

Query response: {OFF, HL, REF, ABS}

For example: Send>: CALC: LIM: VOLT: MODE?
Reception>HL

Note: CALPlate: LIMit: VOLTage: PER will forcibly switch the voltage comparison mode to PER mode.
CALCalate: LIMit: VOLTage: PER? The command will not switch comparison methods.

11.11.9 CALCalate: LIMit: VOLTage: UPPer Voltage Upper Limit Setting*

(*新设计不建议使用)

This instruction is recommended to use VOLT: LMT<lower>,<upper>instead.

Command syntax: **CALCalate: LIMit: VOLTage: UPPer<0-999999>**

Parameters: <0-999999>: A positive integer value. If it exceeds 999999, it is forced to be 999999, and the symbol is ignored.
Decimals and units are related to the current range:

range	Decimal places	explain
0 (8V)	five	123456=1.23456V
1 (80V)	four	123456=12.3456V
2 (400V)	three	123456=123.456V

For example: Send**>: CALC: LIM: VOLT: UPPer 123456** //According to the above table, the corresponding value is obtained. When measuring range 1, it represents 1.23456V

Query syntax: **CALCalate: LIMit: VOLTage: UPPer?**

Query response: <Positive integer>######
The maximum number of digits is 6, without signs or decimal points

For example: Send>: CALC: LIM: VOLT: UP?
When receiving>123456/range 2, it represents 123.456V
Send>: CALC: LIM: VOLT: UPP 12345; UPP?
When receiving>12345 //range 2, it represents 12.345V

☛OO≈⑤O⑥⑤ The value sent by this command is related to the range. VOLT: LMT<lower>,<upper>can directly input the actual floating-point value.
CALC: LIM: VOLT: UPP will set the voltage comparison method to SEQ mode.

11.11.10 CALCalate: LIMit: VOLTage: LOWER Voltage Lower Limit Setting*

(*新设计不建议使用)

This instruction is recommended to use VOLT: LMT<lower>,<upper>instead.

Command syntax: **CALCalate: LIMit: VOLTage: LOWer<0-999999>**

Parameters: <0-999999>: A positive integer value. If it exceeds 999999, it is forced to be 999999, and the symbol is ignored.
Decimals and units are related to the current range:

range	Decimal places	explain
0	five	123456=1.23456V
one	four	123456=12.3456V
two	three	123456=123.456V

For example: Send**>: CALC: LIM: VOLT: LOW 100000** //According to the above table, the corresponding value is obtained. When measuring range 1, it represents 1.00000V

Query syntax: **CALCalate: LIMit: VOLTage: LOWER?**

Query response: <Positive integer>#######
The maximum number of digits is 6, without signs or decimal points

For example: Send>: CALC: LIM: VOLT: LOW?
When receiving>100000 //range 1, it represents 1.00000V

☛OO≈⑤O⑥⑤ The value sent by this command is related to the range. VOLT: LMT<lower>,<upper>can directly input the actual floating-point value.
CALC: LIM: VOLT: LOW will set the voltage comparison method to SEQ mode.

11.11.11 CALCalate: LIMit: VOLTage: REFerence Voltage nominal value setting*

(*新设计不建议使用)

This instruction is recommended to use VOLT: LMT: NOM instead

Command syntax: **CALFormula: LIMit: VOLTage: REFerence<0-999999>**

Parameters: <0-999999>: A positive integer value. If it exceeds 999999, it is forced to be 999999, and the symbol is ignored.
Decimals and units are related to the current range:

range	Decimal places	explain
0	five	123456=1.23456V
one	four	123456=12.3456V
two	three	123456=123.456V

For example: Send**>: CALC: LIM: VOLT: REF 100000** //According to the above table, the corresponding value is obtained. When measuring range 2, it represents 10.0000V

Query syntax: **CALCalate: LIMit: VOLTage: REFerence?**

Query response: <Positive integer>#######
The maximum number of digits is 6, without signs or decimal points

For example: Send>: CALC: LIM: VOLT: REF?
When receiving>100000 //range 2, it represents 10.0000V

11.11.12 CALCalate: LIMit: VOLTAGE: PERCENT Voltage percentage limit*

(*新设计不建议使用)

This instruction is recommended to use VOLT: LMT: PER<lower>,<upper>instead.

Command syntax: **CALPlate: LIMit: VOLTage: PERCent<float>**

Parameters: %: Percentage ratio
Set the percentage ratio for percentage comparison (PER).

For example: Send**>: CALC: LIM: VOLT: PERC 0.3** //Set the percentage limit to -0.3%, 0.3%

Query syntax: **CALCalate: LIMit: VOLT: PERCent?**

Query response: <float>
Unsigned bit, the upper limit value corresponding to the current data value

For example: Send>: CALC: LIM: VOLT: PERC?
Receiving>0.300

☛00≈5000⑥⑤ CALCalate: LIMit: VOLTage: PERC will forcibly switch the voltage comparison mode to PER mode.
CALCalate: LIMit: VOLTage: PERC? The command will not switch comparison methods.

11.11.13 CALCalate: LIMit: ABS voltage absolute deviation comparison method*

(*新设计不建议使用)
This instruction is not recommended. Use the equivalent instruction VOLT: LMT: MODE ABS

Command syntax: **CALCalate: LIMit: ABS {ON (1), OFF (0)}**
Parameters: ON: Set as absolute deviation comparison method
OFF: Set as the relative deviation (percentage) comparison method.
For example: Send**>: CALC: LIM: ABS ON** //Set to ABS comparison method
Query syntax: **CALCalate: LIMit: ABS?**
Query response: {on, off}
On: Absolute deviation method
Off: Other comparison methods (may be OFF, SEQ, or PER)
For example: Send>: CALC: LIM: ABS?
Receive>OFF

☛00≈5000⑥⑤ This command is the same as the VOLT: LMT: MODE ABS function.
This command is only valid for voltage.

11.12 LOGger (MEMory) subsystem

The LOGger (MEMory) subsystem is used to set and read data buffer data.

Figure - 2 LOGger (MEMory) subsystem tree

LOGger MEMory	**[: STATe]**	**<LOG, STAT>**
	: START	**<ON (1), OFF (0)>**
	: SIZE	**{<1-10000>, max}**
	: COUNT?	**<0-10000>**
	: DATA?	**<1~10000>**

11.12.1 LOGger [: STATe] or MEMory [: STATe] data recording and statistical mode

LOGger: STATe or MEMory: STATe can set data recording (LOG) or data statistics (STAT) modes.

Command syntax: **LOGger [: STATe] {LOG, STAT}**
MEMory [: STATe] {LOG, STAT}
Parameters: LOG: Data recording mode
STAT: Data statistics mode
For example: Send**>LOG: STAT STAT**
Query syntax: **LOGger [: STATe]?**
MEMory [: STATe]?
Query response: {LOG, STAT}
For example: Send>LOG: STAT?
Receive>LOG
Send>LOG?
Receive>LOG

11.12.2 LOGger: START or MEMory: START data recording start

LOGger: START or MEMory: START starts/stops data recording.

Command syntax: **LOGger: START {ON (1), OFF (0)}**
MEMory: START {ON (1), OFF (0)}
Parameters: ON: Start recording
OFF: Stop recording
For example: Send**>LOG: START ON**
Query syntax: **LOGger: START?**
MEMory: START?
Query response: {on, off}
For example: Send>LOG: START?
Receive>OFF

☛00≈5000⑥⑤ This command is only valid when the [Data Recording] function is turned on. Please confirm the status of the [Data Record] on the<System Configuration>page.
If the current page is not on the<Measurement Display>page, this command will automatically switch to

the<Measurement Display>page.

11.12.3 LOGger: SIZE or MEMory: SIZE data record buffer size setting

Command syntax:	**LOGger: SIZE {<1-10000>, max}** **MEMory: SIZE {<1-10000>, max}**
Parameters:	<1-10000>: integer, numbers less than 1 are forced to be 1 Max: The buffer will be set to 10000
For example:	Send**>LOG: SIZE max** Send**>MEM: SIZE 1000**
Query syntax:	**LOGger: SIZE?** **MEMory: STATe?**
Query response:	{1-10000}
For example:	Send>LOG: SIZE 100; SIZE? Receive>100 Send>MEM: SIZE? Receive>200

11.12.4 LOGger: COUNT? Or MEMory: COUNT? The total number of recorded data buffers

Query syntax:	**LOGger: COUNT?** **MEMory: COUNT?**
Query response:	{0~10000} 0 represents an empty buffer
For example:	Send>LOG: COUNT? Receive>10 Send>MEM: COUNT? Receive>0

11.12.5 LOGger: DATA? Or MEMory: DATA? Data buffer data

Query syntax 1:	**LOGger: DATA< 1~10000>** **MEMory: DATA< 1~10000>**
Parameters:	<1-10000>: An integer that is greater than the total number of records in the buffer or less than 1, and returns 0
For example:	Send**>LOG: DATA? one** Receive>1,+123.45E-03,+12.3456E+00
Query syntax 2:	**LOGger: DATA?** **MEMory: DATA?**
Query response:	<COUNT>; 1.<RESISTANCE1>,<VOLTAGE1>; 2.<RESISTANCE2>,<VOLTAGE2>;
For example:	Send>LOG: DATA? Receive>3; 1.+123.45E-03,+12.3456E+00; 2.+123.44E-03,+12.3455E+00; 3.+123.45E-03,+12.3456E+00;
☛❶❶≈⑤❶⓪⑥⑤	*1.* The actual return value does not have a line break, so adding a line break here is for writing convenience. *2.* The total number of digits is 5 and cannot be filled with spaces. *3.* When there are many data records, the return time for data is longer. *4.* When the specified index exceeds the buffer size, the data returns 0.

11.13 SYSTem subsystem

The SYSTem subsystem is used to set system related parameters.
The data set by the SYSTem subsystem will not be saved inside the instrument.

Figure 118SYSTem Subsystem Tree

SYSTem	**LANGUAGE**	**{ENGLISH, CHINESE, EN, CN}**	
	: TIME	**<YEAR>,<MONTH>,<DAY>,<HOUR>,<MINITE>,<SEC>**	
	: KEYLock (KLOC)	**{ON (1), OFF (0)}**	
	: BEEP	**[: DATE]**	**{ON (1), OFF (0)}**
	SHAKEHAND (SHAK)	**{ON (1), OFF (0)}**	

	*HEADER**	*{ON (1), OFF (0)}*
	: CODE	**{ON (1), OFF (0)}**
	*: DATAout**	*{OFF (0), ON (1)}*
	Result	**FETCh, AUTO**
	*: Backup**	

(*新设计不建议使用)

11.13.1 SYSTem: LANGUAGE system language

Instrument language settings.

Command syntax: **SYSTem: LANGUAGE {ENGLISH, CHINESE, EN, CN}**

For example: Send>**SYST: LANG EN** // Set to display in English

Query syntax: **SYSTEM: LANG?**

Query response: **{ENGLISH, CHINESE}**

11.13.2 SYSTem: TIME system time setting

Command syntax: **SYSTem: TIME<YEAR>,<MONTH>,<DAY>,<HOUR>,<MINITE>,<SEC>**

For example: Send>**SYST: TIME 2016,12,30,11,18,31//2016-12-30 11:18:31**

Query syntax: **SYSTem: TIME?**

Query response: **<YEAR>-<MONTH>-<DAY><HOUR>:<MINITE>:<SEC>**

For example: Send>**SYST: TIME?**
Received>**2016-12-30 11:18:31**

11.13.3 SYSTem: KEYLock or SYSTem: KLOCK keyboard lock settings

Command syntax: **SYSTem: KEYLock {ON, OFF, 0,1}**
SYSTem: KLOCK {ON, OFF, 0,1}

For example: Send>**SYST: KEY OFF** //Keyboard unlock

Query syntax: **SYSTem: KEYLock?**
SYSTem: KLOCK?

Query response: **{on, off}**

11.13.4 SYSTem: CODE error code returned

SYSTem: After CODE is enabled, it allows error codes to be returned every time an instruction is received. The corresponding error code is as follows:

Error code	explain
*E00	No error
*E01	Bad command
*E02	Parameter error
*E03	Missing parameter
*E04	Buffer overflow
*E05	Syntax error
*E06	Invalid separator
*E07	Invalid Multiplier
*E08	Numeric data error
*E09	Value too long
*E10	Invalid command
*E11	Unknown error

If the error code function is turned off, the host can send an ERR? Command fetch error code.

Command syntax: **SYSTem: CODE {ON, OFF, 0,1}**

For example: Send>**SYST: CODE ON**

Query syntax: **SYSTem: CODE?**

Query response: **{on, off}**

11.13.5 SYSTem: BEEPer button sound

This command does **not** affect the comparator sound.

Command syntax: **SYSTem: BEEPer {OFF, ON, 0,1}**

Parameters: {OFF, ON, 0,1}

OFF/0: Button sound off
ON/1: Button sound off

For example: Send>**SYST: BEEP OFF**

Query syntax: **SYSTem: BEEPer?**

Query response: **{OFF, ON}**

11.13.6 SYSTem: SHAKHand or SYSTem: HEADER communication handshake command (data header return)

After the communication handshake is enabled, the instrument will return the received instructions to the host in their original form, and then return the data.

Command syntax: **SYSTem: SHAKHand {ON, OFF, 0,1}**
SYSTem: HEADER {ON, OFF, 0,1}

For example: Send>**SYST: SHAK ON**
Send>**SYST: HEAD ON**

Query syntax: **SYSTem: SHAKHand?**
SYSTem: HEADER?

Query response: **{on, off}**

11.13.7 SYSTem: Result test result sending

SYSTem: Result can be set to send data using either automatic or FETCH commands.

Command syntax: **SYSTem: Result {FETCH, AUTO}**

Parameters: FETCH, AUTO
FETCH: Does data need to be fed through the instruction fetch? Only then can it return to the host, and the instrument passively sends.
AUTO: After each test is completed, the data `automatically sends` the test results to the host, and the instrument actively sends them.

For example: Send>**SYST: RES AUTO** // Set to automatic send

Query syntax: **SYST: `Result`?**

Query response: **FETCH, AUTO**

11.13.8 SYSTem: DATAout test result sending*

(*新设计不建议使用)

Both SYSTem: DATAout and SYSTem: Result can set the data sending method to either automatic or FETCH instructions, but the parameters are different.

Command syntax: SYSTem: DATAout {OFF, ON, 0,1}

Parameters: {OFF, ON, 0,1}
OFF/0: Does the data need to be fetch through the instruction? Only then can it return to the host, and the instrument passively sends.
ON/1: After each test is completed, the data `automatically sends` the test results to the host, and the instrument actively sends them.

For example: Send>SYST: DATA ON // Set to auto send

Query syntax: SYST: `DATAout`?

Query response: {OFF, ON}

11.13.9 SYSTem: Backup saves measurement parameters to the current file*

(*新设计不建议使用)

Please refer to the SELECT: SAVE instruction.

Command syntax: **SYSTem: Backup**

For example: Send>**SYST: BackUP**

11.13.10 SYSTem: RESet factory settings

This command will reset all settings to factory settings. This command will not affect calibration data.

Command syntax: **SYSTem: RESet**

For example: Send>**SYST: RESET**//The buzzer beeps twice

11.14 TRIGGer subsystem

Figure - 3 TRIGGer subsystem tree

TRIGGer	**[: IMMediate]**	
	Source	**{INT, EXT}**

TRG (* TRG)	

TRIGGer is used to set the trigger source and generate a trigger.

11.14.1 TRIGGer [: IMMediate]

TRIG [: IMM] generates a trigger when the trigger source is set to BUS, but does not return the data for the trigger test. If you want to return data, you need to use the TRG instruction.

Command syntax: **TRIGGer [IMMediate]**

For example: Send>**TRIG** //The instrument stops after testing once

11.14.2 TRIGGer: Source

TRIG: SOUR is used to set the trigger source.

Command syntax: **TRIGGer: Source {INT, EXT}**

For example: Send>**TRIG: SOR EXT** / Set to external trigger mode.

Query syntax: **TRIGGer: Source?**

Query response: **<INT, EXT>**

11.14.3 TRG

TRG generates a trigger when the trigger source is set to EXT and returns the data for the trigger test.

Command syntax: **TRG**

For example: Send>**TRG** // instrument test once and return complete test data

Return>**_21.993E+0, _2.70088E+0, OK, HI, FAIL, RPER:+2.18930e+04**

//Resistance value, voltage value, resistance range, voltage range, total qualified, monitoring name and value

Attention! If the current page is not on the<Measurement Display>page or the<Full Screen Display>page, this command will first switch to the<Measurement Display>page, then trigger and return data.

11.15 FETCh and READ subsystems

Figure 1110FETCh? Subsystem Tree

FETCh?	*NO NUMBER*
	: Full

Figure 1111READ? Subsystem Tree

READ?	*NO NUMBER*
	: Full

The FETCh and READ subsystems are similar. FETCh returns the previous measurement data, while READ returns the latest measurement data. Therefore, READ waits for a complete measurement cycle before returning the data, and the execution efficiency is slightly lower during slow measurements.

11.15.1 FETCh? Or READ? Obtaining measurement data

FETCh? Used to obtain test data. Before using this command, it is necessary to set the [Result Sending] field on the<System Configuration>page to [FETCH].

FETCh? Instructions and READ? The main test data will be returned.

Query syntax: **FETCh?**

Query response: According to the measurement parameters:

RV:<Resistance>,<Voltage>

R: <Resistance>

V: <Voltage>

For example: Send>**FETC?**

Return>□ □ **22.005E+0,** □ **3.69943E+0**//Resistance value, voltage value

Attention! If the current page is not on the<Measurement Display>page or the<Full Screen Display>page, this command will first switch to the<Measurement Display>page and then return the data.

11.15.2 FETCh: Full? Or READ: Full? Obtain complete measurement data

FETCh: Full? Or READ: Full? Used to obtain complete test data, including measurement data, comparison results, and monitoring data. Before using this command, it is necessary to set the [Result Sending] field on the<System Configuration>page to [FETCH].

Query syntax: **FETCh: Full?**

Query response: <Resistance>,<Voltage>,<Resistance HI/OK/LO>,<Voltage HI, OK, LO>,<PASS/FAIL/WIRE/OPEN>

For example: Send>**FETC: Full?**

Send>**READ: Full?**
Return>□ □ **22.005E+0,** □ **3.69943E+0, --, --,** □ □ □//-- indicates that the comparator is not enabled
Return>□ **21.990E+0,** □ **3.70120E+0, OK, HI, FAIL**//Resistance value, voltage value, resistance level, voltage level, total qualified
Return>□ **21.993E+0,** □ **3.70088E+0, OK, HI, FAIL, RPER:+2.18930e+04**
//Resistance value, voltage value, resistance range, voltage range, total qualified, monitoring name and value

Attention! If the current page is not on the<Measurement Display>page or the<Full Screen Display>page, this command will first switch to the<Measurement Display>page and then return the data.

11.16 Correction subsystem

The Correction subsystem is used to perform a short circuit reset calibration.

Figure - 4 SYSTem subsystem tree

Correct	**: SHORT**	

11.16.1 Correction: SHORT

Query syntax: **Correction: SHORT**
For example: Send> **Correction: SHOR**
Return to> **Short Clear Zero Start**
Return> **PASS**
Note: Before sending commands, be sure to short-circuit the test end.

11.17 FILE (MMEM) subsystem

The FILE (MMEM) subsystem is used to manage files, which can be used to save user parameters to internal flash memory or read flash files into the system.

Figure - 5 FILE (MMEM) subsystem tree

FILE MMEM	**: SAVE**	**<No parameters>or<file numbers 0-9>**
	: Load	**<No parameters>or<file numbers 0-9>**
	: DELette	**<File numbers 0-9>**

11.17.1 File: SAVE Save File

File: SAVE can save the current settings to the current file or a specified file.

Command syntax: **FILE: SAVE**
File: SAVE<File No. 0-9>
For example: Send>**File: SAVE** // Save to the current file
Send>**File: SAVE 1** ///Save to File 1

11.17.2 File: Load Read File

File: Load can read file data into the system.

Command syntax: **FILE: LOAD**
File: Load<File No. 0-9>
For example: Send>**FILE: LOAD** // Read the current file data into the system
Send>**File: SAVE 1** //Read data from file 1 to the system

11.17.3 FILE: DELete Delete specified file

FILE: DELete can delete data from a specified file.

Command syntax: **FILE: DELette<File No. 0-9>**
For example: Send>**File: DELette 1** //Delete File 1
Note: Deleting the current file will not affect the system parameters

11.18 IDN? Subsystems

IDN? The subsystem is used to return the version number of the instrument.

Received IDN? Instruction: The instrument buzzer will beep once, indicating that data has been received and the result has been returned.
Usually, when debugging communication, this command is used for online testing.

Query syntax:	**IDN? Or * IDN?**
Query response:	**<Manufacturer>,<MODEL>,<SN>,<Revision>** Manufacturer, model, serial number, instrument version
For example:	Send>**IDN?** Return to>**Applent Instruments, AT52900000, REV C1.0***//The* instrument buzzer will beep once

11.19 ERRor subsystem

The error subsystem is used to obtain information about the most recent error that occurred

Query syntax:	**ERRor?**
Query response:	**Error string**
For example:	Send>**ERR?** Return>**no error**

The corresponding error code is as follows:

Error code	explain
*E00	No error
*E01	Bad command
*E02	Parameter error
*E03	Missing parameter
*E04	Buffer overflow
*E05	Syntax error
*E06	Invalid separator
*E07	Invalid Multiplier
*E08	Numeric data error
*E09	Value too long
*E10	Invalid command
*E11	Unknown error

11.20 SAV subsystem

The SAV subsystem is used to save all modified settings to the instrument's internal disk.

Query syntax:	**SAV**
Query response:	**OK**
For example:	Send>**SAV** Return>**OK**

12. specifications

You will learn the following:
Technical indicators.
General specifications.
External dimensions.

12.1 Technical indicators

The following data was measured under the following conditions:
Temperature conditions: 23 ℃± 5 ℃
Humidity condition: ≤65% R.H
Zero value adjustment: Short circuit reset before testing
Preheating time:>60 minutes
Calibration time: 12 months

Test current accuracy: 10%
Test current frequency accuracy: 1kHz (1 ± 20Hz), 5ppm
AC resistance index:

Table - 1 Resistance Index

RANGE No	0	one	two	three	four	five	six
RANGE	3m Ω	30m Ω	300m Ω	3 Ω	30 Ω	300 Ω	3k Ω
Maximum Displayed Values	3.1000 m	31.000m	310.00m	three point one zero zero zero	thirty-one	three hundred and ten	three thousand and two hundred
Resolution	zero point one μ Ω	1μΩ	ten μ Ω	one hundred μ Ω	1m Ω	10m Ω	100m Ω
Measured Current	100mA	100mA	10mA	1mA	one hundred μ A	10μA	10μA
ACCURACY	± 0.5% rdg ± 10dgt	± 0.5% rdg ± 5 dgt					
Temperature coefficient	(± 0.05% rdg. ± 1dgt.)/℃	(± 0.05% rdg. ± 0.5 dgt.)/℃					

DC voltage index:

Table - 2 Voltage Indicators

RANGE No		0	one	two
Maximum Displayed Values		± 8.08000	± 80.8000	± 202.000 [AT529A] ± 404.00 【 AT529 】 ± 808.000 【 AT529B 】 ± 1010.000 [AT529H]
Resolution		10μV	one hundred μ V	<=810V: 1mV >810V: 10mV
ACCURACY	SLOW	± 0.01% rdg ± 5dgt		
	MEDIUM	± 0.01% rdg ± 7dgt		
	FAST	± 0.05% rdg ± 7dgt		
	EX.FAST	± 0.1% rdg ± 10dgt		
Temperature coefficient		(± 0.001% rdg. ± 0.5dgt.)/℃		

12.2 General specifications

Screen: TFT-LCD true color display, with a screen size of 3.5 inches.
Test speed: 1 time/second
Range methods: automatic , manual, and nominal
Calibration: Short circuit full range reset
Testing end: Four end testing method
Comparators: ABS, PER , and SEQ
Handler: Resistance HI/IN/LO, voltage HI/IN/LO total unqualified range
Message: Off, qualified, unqualified.
Trigger: Internal and external (manual and remote) triggers.
Interface: USB interface
Programming language: SCPI
Auxiliary function: keyboard lock

12.3 Environmental requirements

Environment: Indicator: Temperature 18 ℃~28 ℃ Humidity ≤65% RH
Operation: Temperature 10 ℃~40 ℃ Humidity 10~80% RH
Storage: Temperature 0 ℃~50 ℃ Humidity 10~90% RH
Power supply: 8.4V, 2200mAH rechargeable lithium battery or 9VDC 2A power adapter
Battery charging time: <3h
Battery working time: >3h @ 50% backlight
Power: Maximum 10VA

External dimensions: 210.76mm x 130.23mm x 37.88mm
Weight: Approximately 1 kilogram.

© Copyright 2005-2024: Changzhou applent Instruments Ltd

Changzhou ONMEAS Instruments Ltd.

#14,No. 9 Caoxi Road, Wujin district, Changzhou, Jiangsu province, China.

400-600-1217

TEL：0519-88805550

https://www.onmeas.com

Sales Service Email: sales@applent.com

Tech Support Email: tech@applent.com

Specifications are subject to change without prior notice.

All are trademarks or registered trademarks of Changzhou Onmeas Instruments Ltd.