ONMEAS®

Rev.A3

AT5330/20/10

Multi-channel Battery Meter



User's Guide

Scan QR code for operation video

Safety Notice

⚠Warning⚠Danger: If any of the following abnormal conditions occurs, stop operation immediately and disconnect the power cord. Contact the Onmeas sales department immediately for repair. Otherwise, a fire may occur or the operator may be exposed to a potential electric shock hazard.

- The instrument operates abnormally.
- The instrument produces abnormal noise, odor, smoke, or flashes during operation.
- The instrument generates high temperature or electric shock during operation.
- The power cord, power switch, or power socket is damaged.
- Foreign matter or liquid has entered the instrument.

Safety Information

⚠Warning⚠Danger: To avoid possible electric shock and ensure personal safety, follow the guidelines below during operation.

Disclaimer	Please read the following safety information carefully before using the instrument. Onmeas assumes no liability for any personal injury or property damage caused by the user's failure to comply with the following provisions.
Instrument Grounding	To prevent electric shock hazard, connect the power ground wire properly.
Do Not Use the Instrument in Explosive Gas Atmospheres	Do not use the instrument in an environment containing flammable or explosive gases, vapors, or excessive dust. Using any electronic equipment in such an environment poses a risk to personal safety.
Do Not Open the Instrument Case	Non-professional maintenance personnel must not open the instrument enclosure in an attempt to repair the instrument. Charge that has not been fully discharged may remain inside the instrument for some time after it is switched off, which may cause an electric shock hazard to persons.
Do Not Use a Damaged Instrument	If the instrument has been damaged, the hazards are unpredictable. Disconnect the power cord, do not use the instrument again, and do not attempt to repair it yourself.
Do Not Use a Malfunctioning Instrument	If the instrument is not operating normally, the hazards are unpredictable. Disconnect the power cord, do not use the instrument again, and do not attempt to repair it yourself.
Do Not Use the Instrument Beyond the Methods Specified in This Manual	Beyond the specified scope, the protective measures provided by the instrument will become ineffective.

Limited Warranty and Limitation of Liability

Onmeas Ltd. (hereinafter referred to as Onmeas) warrants that every AT5330 you purchase is fully compliant in terms of quality and metrology. This warranty does not cover the fuse, nor damage caused by negligence, misuse, contamination, accident, or abnormal conditions of use. This warranty applies only to the original purchaser and is not transferable.

From the date of shipment, Onmeas provides one-year free warranty, which also covers the VFD or LCD. If damage is caused by improper operation of the user during the ninety-day exchange period, the exchange terms become void. If the instrument is damaged due to improper operation of the user during the one-year free warranty period, the repair costs shall be borne by the user. After one year and until the end of the instrument's service life, Onmeas will provide repairs on a chargeable basis. For replacement of the VFD or LCD, the cost will be charged at the current cost price.

If the product is found damaged, please contact Onmeas to obtain information and approval for return or exchange. Then send the product to the dealer for return or exchange. Be sure to state the cause of the product damage, and prepay the postage and insurance to the destination. For repair or replacement of a product within the warranty period, Onmeas will bear the return shipping costs. For repair of a product not under warranty, Onmeas will estimate the repair cost and carry out the repair only after obtaining your consent; all costs arising from the repair shall be borne by the user, including the return shipping costs.

This warranty is the only warranty provided by Onmeas and is your sole and exclusive remedy. Beyond this, there are no other express or implied warranties (including fitness for a particular purpose), and all other warranties are expressly disclaimed. Neither Onmeas nor any of its agents has made any oral or written representation to establish a warranty or to expand the scope of this warranty in any way. Onmeas assumes no liability for any special, indirect, incidental, or consequential damage or loss (including loss of data) arising from any cause beyond the scope of the specifications. If any provision of this warranty conflicts with local regulations, or if a particular jurisdiction does not permit the exclusion or limitation of implied warranties, local regulations shall prevail, and therefore such provision may not apply to you. However, the ruling on such a provision does not affect the validity and enforceability of the other provisions.

People's Republic of China
Jiangsu Province
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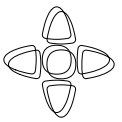
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1.Installation and Setup Guide



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

- Main Functions Packing List
- Power Requirements
- Operating Environment
- Cleaning

1.1 Packing List

Before formally using the instrument, please first:

1. Check the product appearance for damage, scratches or other defects;
2. Check the instrument accessories against the packing list for any missing items.

If there is damage or missing accessories, contact the Onmeas instrument sales department or your dealer immediately.

1.2 Power Requirements

The AT5330 can only be used under the following power conditions:

Voltage: 85VAC~250VAC

Frequency: 50Hz/60Hz (1±10%)



Warning: To prevent electric shock hazard, connect the power ground wire properly

If the user replaces the power cord, make sure that the ground of the power cord is reliably connected.

1.3 Operating Environment

The AT5330 must be used under the following environmental conditions:

Temperature: 0°C~55°C,

Humidity: below 70%RH at 23°C

1.4 Cleaning

To prevent electric shock hazard, disconnect the power cord before cleaning.

Use a clean cloth moistened with a small amount of clean water to clean the enclosure and panel.

Do not clean the interior of the instrument.

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

1.5 Instrument Handle

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

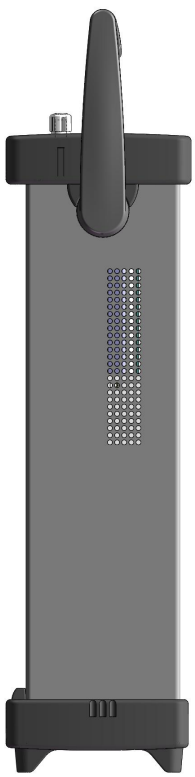
Figure 1- 1 Instrument Handle (Schematic; the panel drawing differs from the actual unit)



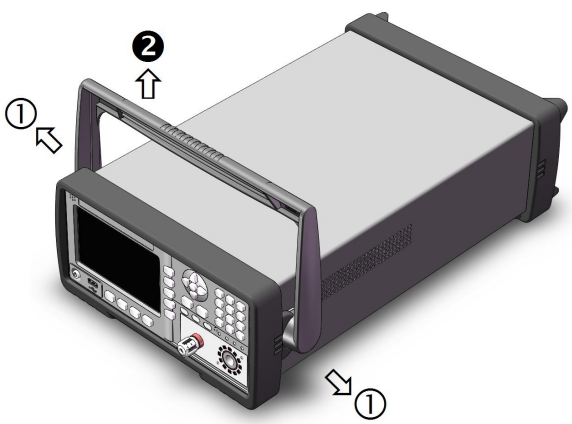
Viewing position 1 [Hold both sides of the handle with both hands and pull it gently outward until it can rotate freely, then switch to viewing position 2]



Viewing position 2 [Hold both sides of the handle with both hands and pull it gently outward until it can rotate freely, then switch to the carrying position]

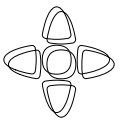


Carrying position



Position for removing the handle. (Pull at both sides ① until the handle is removed.)

2.Overview



In this chapter you will learn the following:

- Introduction
- Main Features

2.1 Introduction

Thank you for purchasing the AT5330 multi-channel battery meter.

The AT5330 multi-channel battery meter is a micro bench-top instrument for fully automatic real-time testing, controlled by a high-performance 32-bit ARM microprocessor. It can scan-test the internal resistance and voltage of 30 channels of batteries. The instrument measures resistance of 0.001mΩ~3kΩ,

The instrument can test the resistances of 30 different batteries in a mixed scan; each channel has an independent comparator setting, and the comparator results of the 30 channels can be output time-divisionally through the Handler interface.

The instrument comes standard with an RS-232 interface, an RS-485 interface, a USB communication interface and a Handler interface.

The computer remote-control commands are compatible with SCPI (Standard Commands for Programmable Instruments) and the MODBUS (RTU) protocol, efficiently accomplishing remote control and data acquisition.

Reference:  For complete technical specifications, refer to the Specifications chapter.

2.2 Main Features

2.2.1 Range

Resistance: tested in 6 ranges; measures AC resistance of 0.001mΩ~3kΩ.
Voltage: tested in 2 ranges; measures DC voltage of 0.0001V~60.000V.
Manual ranging.

2.2.2 Test Speed

The instrument provides 3 speeds: slow, medium and fast.

With all channels on:

Slow: 4s/30 channels

Medium: 3s/30 channels

Fast: 2s/30 channels

2.2.3 Trigger Mode

Internal and external triggering.

2.2.4 Basic Accuracy

Resistance: slow and medium: 0.5% fast: 1%

Voltage: slow: 0.01%, medium and fast: 0.1%

2.2.5 Calibration Function

Full-range short-circuit automatic or manual zeroing.

2.2.6 Comparator Function (Sorting Function)

The comparison result of each channel is output time-divisionally.

2.2.7 System Settings

1. Keyboard lock function
2. Administrator and user accounts, and a password can be set for the administrator

2.2.8 Interfaces

RS-232, RS485 and USB232 remote control:

Supports a maximum baud rate of 115200bps, is compatible with the SCPI protocol, and supports ASCII transmission.

Supports the Modbus (RTU) communication protocol.

Handler interface

Input/output ports with full optocoupler isolation and built-in pull-up resistors.

No external power supply required.

Inputs: trigger signal

Outputs: all sorting comparison result signals; channel EOM signal output and the overall measurement synchronization signal (EOM).

3.Getting Started

In this chapter you will learn the following:

- Getting to know the front panel — includes an introduction to the keys and test termi
- Rear panel — introduces the power supply and interface information.
- Power-on startup — includes the power-on self-test process, instrument defaults, instrument warm-up time.
- Starting a test — including how to connect to the test terminals

3.1 Getting to Know the Front Panel

3.1.1 Front Panel Description

Figure 3- 1 Front Panel

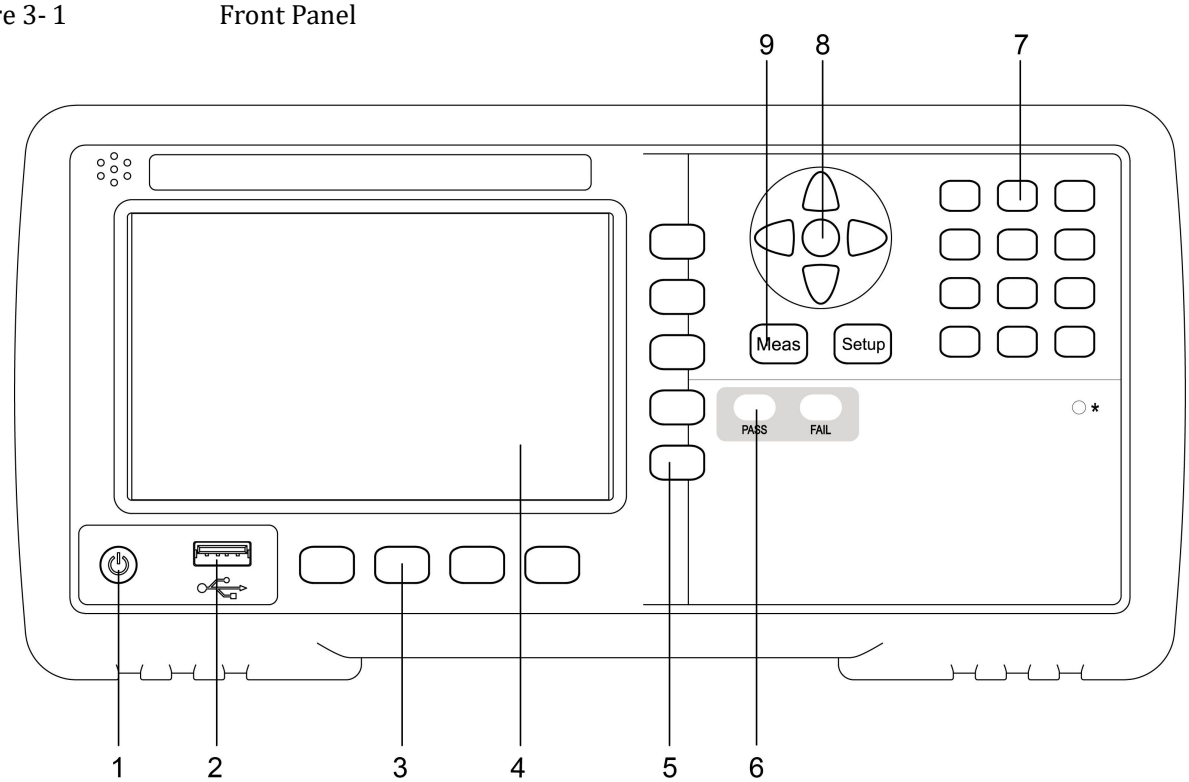


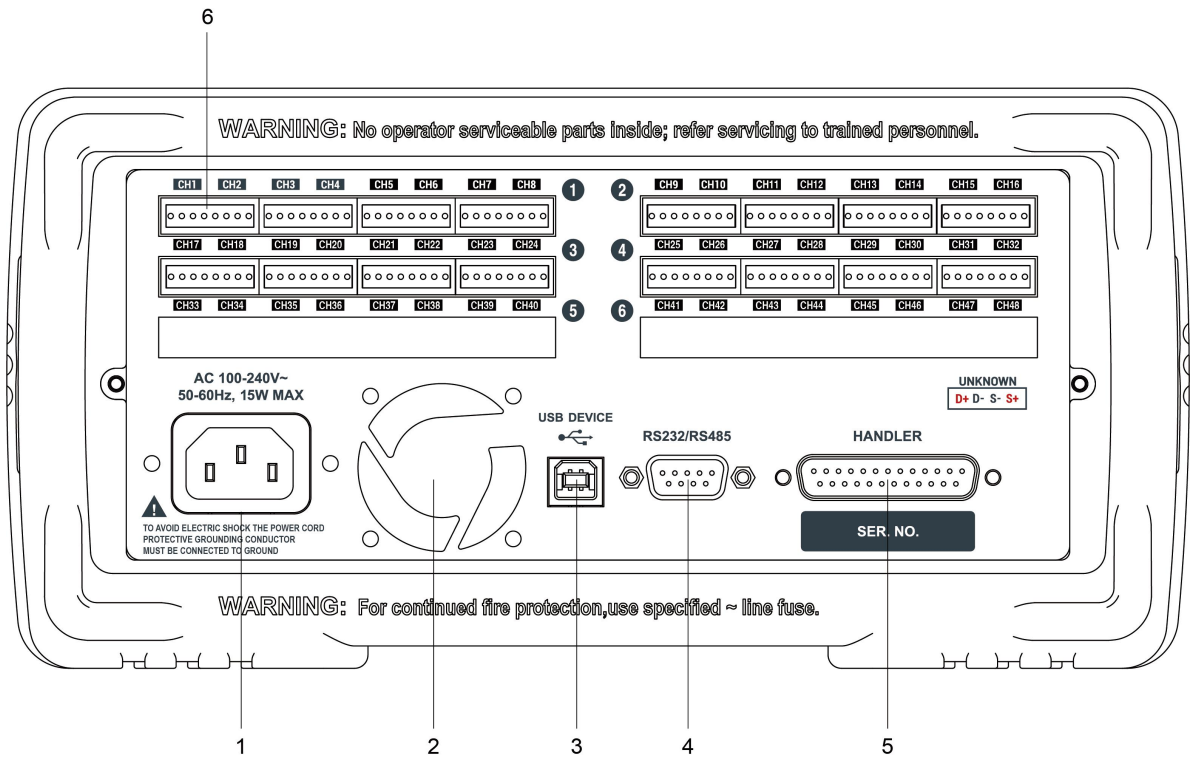
Table 3- 1 Front Panel Function Description

No.	Function
1	Power switch
2	USB disk interface
3	System function keys, including Trigger, keyboard lock, System, etc.
4	5-inch display screen
5	Soft keys

6	PASS/FAIL indicators and trigger indicator
7	Numeric keypad
8	Cursor keys
9	Main function keys: Meas and Setup

3.1.2 Getting to Know the Rear Panel

Figure 3- 2 Rear Panel



1. Power socket
2. Cooling fan
3. USB communication interface
4. RS232C/RS485 interface
5. HANDLER interface
6. Test terminals

3.2 Power-On Startup

3.2.1 Powering On

The key marked “+” at the lower left of the panel is the power switch. The instrument uses a programmable power switch, a tactile electronic switch.
A blue indicator means the instrument power is on.
An orange indicator means standby mode.

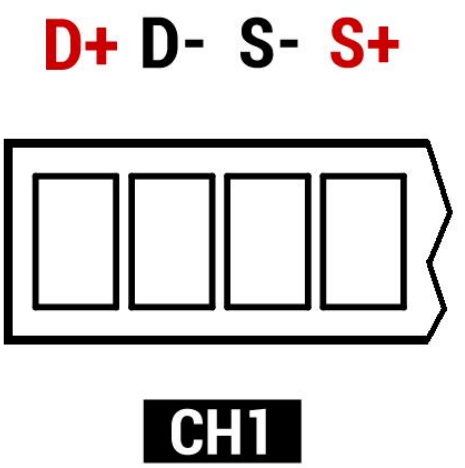
Warm-up time: to achieve the specified accuracy, the instrument needs to warm up for at least 15 minutes.

3.3 Connecting the Test Terminals

The test terminals are on the rear panel. Insert the test plug correctly into the test port in the direction of the slot.

The pin definitions of the test terminal of each channel are as follows:

Figure 3- 3 Test Terminal of Each Channel



Warning: never measure a battery above 60VDC, otherwise the instrument will be damaged.

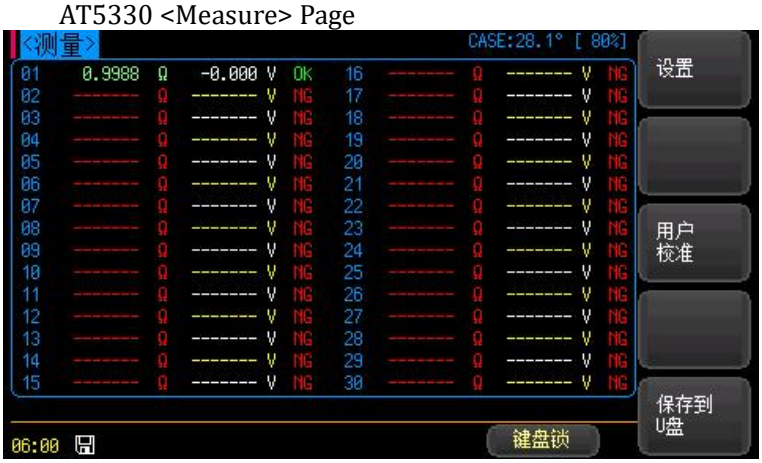
4.[Meas] Page

4.1 <Measure Display> Page

Press the [Meas] key to enter the [Measure Display] page.

There are no settable options on this page.

Figure 4- 1 AT5330 <Measure> Page



The resistance and voltage data and comparison results of the 30 channels in use are displayed on the screen at the same time.

Each channel can be turned off, configured on the <Channel Settings> page.

5.[Setup] Page

In this chapter, you will learn about all of the setting functions:

Measurement Settings

Short-Circuit Zeroing Operation

Comparator Settings

At any time, press the [Setup] key and the instrument will enter the Setup main page.

5.1 Measurement Settings

All settings related to measurement are performed on the <Setup> page.

On the <Setup> page, the instrument does not display test results or comparator results, but testing of the instrument is still in progress.

These settings include the following parameters:

- Function – measurement parameter
- Range – R and V test ranges
- Trigger – trigger mode
- Speed – test speed
- Delay – measurement delay
- Beep Settings

Figure 5- 1 <Setup> Page



5.1.1 Measurement [Function]

The instrument has 3 measurement functions:

Function	Description
R-V	Measures and displays both resistance and voltage values
R	Measures and displays the resistance value only

V	Measures and displays the voltage value only

■ **Steps for setting the measurement function:**

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

Step 2 Use the cursor keys or the touch screen to select the [Function] field;

Step 3 Use the soft keys on the right side of the screen to select the measurement function.

Soft keys	Function
R-V	Measures and displays both resistance and voltage values
R	Measures and displays the resistance value only
V	Measures and displays the voltage value only

5.1.2 [R-Range]

Resistance range setting

The AT5330 resistance has 6 ranges. The variation range of each range is as follows:

Table 5- 1 Range Variation

Range No.	Range name	Range
6	3kΩ	320Ω~3.3kΩ
5	300Ω	32Ω~330Ω
4	30Ω	3.2Ω~33Ω
3	3Ω	320mΩ~3.3Ω
2	300mΩ	32mΩ~ 330mΩ
1	30mΩ	0mΩ~33mΩ

The ranging mode supports manual ranging only

■ **Steps for setting the resistance range:**

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

Step 2 Tap or use the cursor keys to select the [R-Range] field;

Step 3 Use the soft keys to select the range

Soft keys	Function
Increase +	Increases the range number
Decrease -	Decreases the range number

5.1.3 [V-Range]

Voltage range setting

The AT5330 voltage has 2 ranges. The variation range of each range is as follows:

Table 5- 2 Range Variation

Range No.	Range
1	0.001~60V
0	0.0001~6.06V

The voltage ranging mode supports manual ranging only

Table 5- 3 Steps for Setting the Voltage Range

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

Step 2 Tap or use the cursor keys to select the [V-Range] field;

Step 3 Use the soft keys to select the range

Soft keys	Function
Increase +	Increases the range number
Decrease -	Decreases the range number

5.1.4 [Trigger] Mode

The instrument has 2 trigger modes:

Internal triggering and external triggering.

Trigger Mode	Description
Internal	Also called continuous testing: the trigger signal is generated inside the instrument, and tests are performed continuously at a fixed period.
External	External triggering supports 3 input methods: Manual triggering: each press of the [Trig] key executes one measurement cycle; at other times the instrument is in a waiting state. PLC triggering: upon receiving a rising-edge pulse from the Handler interface on the rear panel, the instrument executes one measurement cycle. At other times it is in a waiting state. Refer to the Handler interface. Remote triggering: upon receiving an RS232 trigger command, the instrument executes one measurement cycle; at other times it is in a waiting state.

- Steps for setting the trigger mode:

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

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

Step 3 Use the soft keys to select the trigger mode.

Soft keys	Function
Internal	Internal trigger mode
External	External trigger mode

5.1.5 Test [Speed]

The instrument provides 3 test speeds (slow, medium and fast). The slower the speed, the more accurate and stable the test results.

With all channels on, the sampling times are as follows:

Slow: 4s/30 channels

Medium: 3s/30 channels

Fast: 2s/30 channels

- Steps for setting the test speed:

Step 1 Press [Setup] to enter the Setup page;

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

Step 3 Use the soft keys to select

Soft keys	Function
Slow	4s/30 channels
Medium	3s/30 channels
Fast	2s/30 channels

5.1.6 [Delay]

The user can set the channel-switch delay to increase the settling time of each channel switch.

Steps for setting the delay:

Step 1 Press [Setup] to enter the Setup page;

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

Step 3 Enter the time with the numeric keypad

Soft keys	Function
Off	The delay function is off

5.1.7 [Beep] Settings

The beeper can be set to off, PASS beep or FAIL beep.

PASS beep: when all channels pass, the beeper sounds for 0.5s.

FAIL beep: as long as any channel fails, the beeper sounds for 0.5s.

Steps for setting the beeper:

Step 1 Press [Setup] to enter the Setup page;

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

Step 3 Enter the time with the numeric keypad

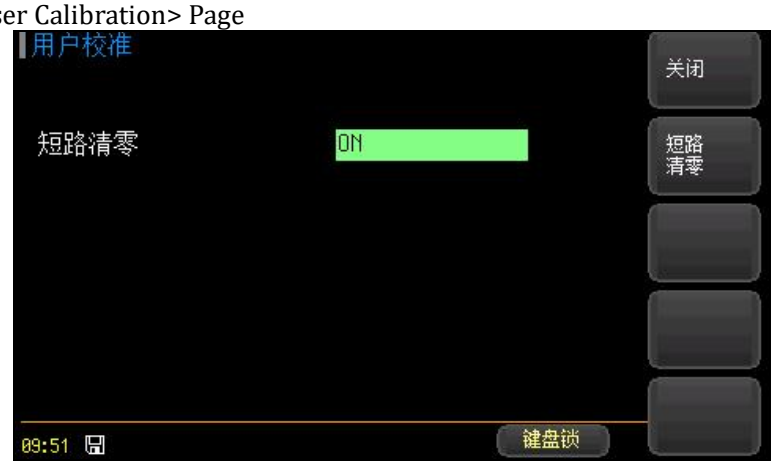
Soft keys	Function
Off	The delay function is off
PASS	When all channels pass, the beeper sounds for 0.5s
FAIL	As long as any channel fails, the beeper sounds for 0.5s

5.2 User Calibration

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

Press the [Meas] or [Setup] key, then use a soft key or the touch screen to select [User Calibration] to enter the user calibration page.

Figure 5- 2 <User Calibration> Page



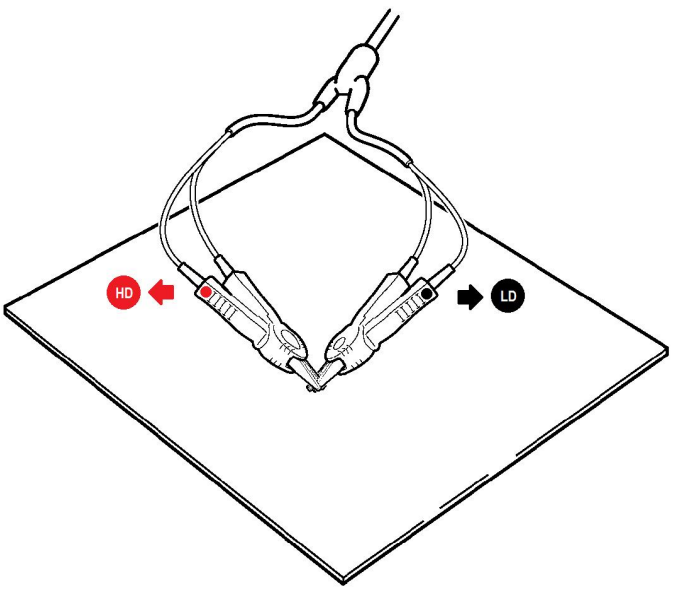
Before testing, be sure to perform short-circuit zeroing once to remove the stray resistance and bias voltage caused by the test leads and environmental factors.

Short-circuit zeroing must be performed to achieve the specified technical specifications.

Since the instrument performs multi-channel scanning measurement with a shared internal measuring circuit, only channel 1 is zeroed.

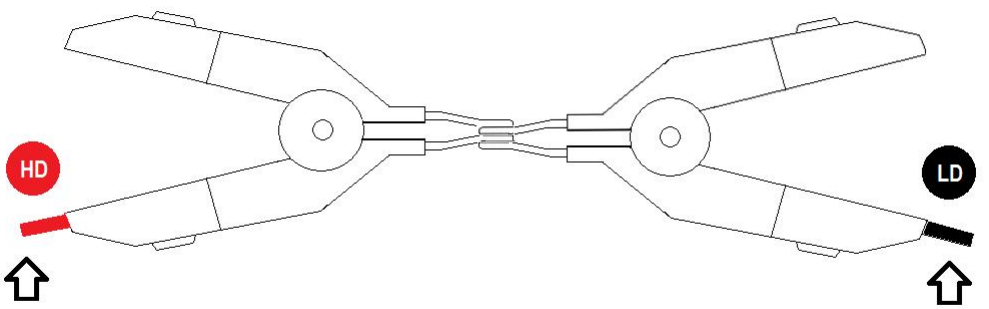
5.2.1 Short-Circuit Zeroing

Figure 5- 3 Correct Shorting Method



Before zeroing, first short the test clips as follows

Figure 5- 4 Correct Shorting Method



■ **Short-circuit zeroing method**

Step 1 Press the [Meas] key to enter the measurement page, then tap [User Calibration] to enter the user calibration page

Step 2 Use the arrow keys or the touch screen to select the [SHORT TEST] field

Step 3 If it was previously off (OFF), tap [On].

Soft keys	Function
On	

Step 4 New soft keys will then be shown:

Soft keys	Function
Off	Turns off short-circuit zeroing; the zeroing value is not used during testing.

Short-Circuit Zeroing	Performs short-circuit zeroing

Step 5 Returns to the settings page after zeroing completes

5.3 Manual Zero Value Entry

With many channels, zeroing one by one is tedious; the instrument also supports manual zero entry.

Figure 5- 5 Zeroing Correction



Note:
1. Once zero correction is enabled, the zeroing function is cancelled
2. Displayed value = Vx − zero value

5.3.1 Example

The following example uses the measurement value of the first channel.

1. With zero correction disabled, the measured value is 67.44mΩ:

At this time the channel number is shown in blue

Figure 5- 6 Zero Correction Disabled



2. Zero correction enabled, and the compensation value of channel 1 is 10mΩ



3. After zero correction is enabled:

   measured value = 67.69 – 10.00 = 57.69mΩ



Note that after zero correction the channel number is shown in yellow.

6.Comparator Settings

Press the [Setup] key, then press the [Resistance Comparator] or [Voltage Comparator] soft key to open the corresponding <Comparator Settings> page.

The comparator limits of all channels can be set uniformly or individually.

To make full use of the comparator, the instrument has a built-in Handler interface for outputting the bin comparison results to relays, PLCs or industrial computers.

6.1 Resistance Comparator

Figure 6- 1 <Comparator Settings> Page

Uniform setting:



Independent setting:



6.1.1 [Resistance Comparator] Switch

- Steps for turning the resistance comparator on or off:

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

  Step 2 Press the [Resistance Comparator] key to enter the <Resistance Comparator> page;

Step 3 Use the cursor keys to select the [Resistance Comparator] field;

Step 4 Use the soft keys to select

Soft keys	Function
Off	Turns off the resistance comparator
On	Turns on the resistance comparator

6.1.2 Comparison [Mode]

The resistance comparator has 2 setting modes:

- Uniform setting
- Independent setting

Uniform setting: the comparator upper/lower limits of all channels use the CH1 settings.

Independent setting: the comparator of each channel is set independently.

■ Steps for setting the comparison mode:

Step 1 Enter the <Resistance Comparator Settings> page

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

Step 3 Use the soft keys to select

Soft keys	Function
Uniform setting	
Independent setting	

6.2 Voltage Comparator

Figure 6- 2 <Voltage Comparator Settings> Page

Uniform setting:



Independent setting:



6.2.1 [Voltage Comparator] Switch

- Steps for turning the voltage comparator on or off:

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

Step 2 Press the [Voltage Comparator] key to enter the <Voltage Comparator> page;

Step 3 Use the cursor keys to select the [Voltage Comparator] field;

Step 4 Use the soft keys to select

Soft keys	Function
Off	Turns off the voltage comparator
On	Turns on the voltage comparator

6.2.2 Comparison [Mode]

The voltage comparator has 2 setting modes:

- Uniform setting
- Independent setting

Uniform setting: the comparator upper/lower limits of all channels use the CH1 settings.

Independent setting: the comparator of each channel is set independently.

- Steps for setting the comparison mode:

Step 1 Enter the <Comparator Settings> page

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

Step 3 Use the soft keys to select

Soft keys	Function
Uniform setting	
Independent setting	

7. System Configuration

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

System Configuration Page
System Information Page
System Service Page

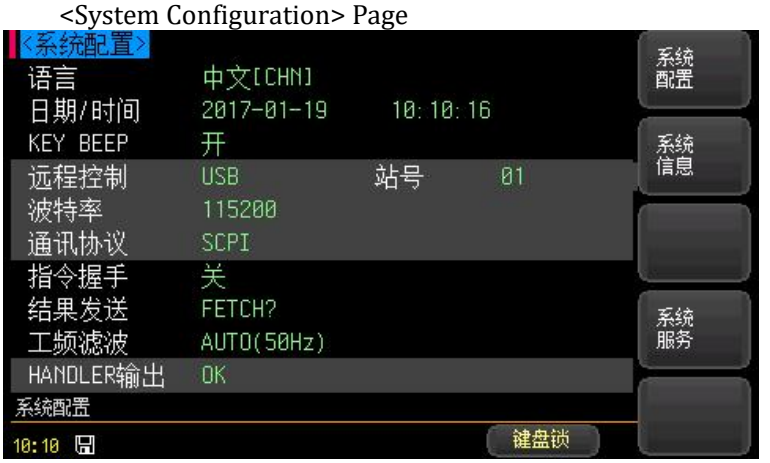
At any time, as long as you press the [Meas] or [Setup] key, the [System] key appears at the very bottom of the main page.

7.1 System Configuration Page

Press the [SYTEM] key to enter the <System Configuration> page.

All settings on the <System Configuration> page are automatically saved in the system and automatically loaded at the next power-on.

Figure 7- 1 <System Configuration> Page



7.1.1 Changing the System Language [LANGUAGE]

The instrument supports two languages: Chinese and English.

- Steps for changing the language

Step 1 Enter the <System Configuration> page

Step 2 Use the cursor keys to select [LANGUAGE].

Step 3 Use the soft keys to select the language:

Soft keys	Function
Chinese [CHN]	
ENGLISH	English

7.1.2 Setting the Date and Time

The instrument uses a 24-hour clock.

- To change the date:

Step 1 Enter the <System Configuration> page

Step 2 Use the cursor keys to select the [Date] field.

Step 3 Use the soft keys to set the date:

Soft keys	Function
Year+	+1 year
Year-	-1 year
Month+	+1 month
Day+	+1 day
Day-	-1 day

- To change the clock:

Step 1 Enter the <System Configuration> page

Step 2 Use the cursor keys to select the [Clock] field.

Step 3 Use the soft keys to set the clock:

Soft keys	Function
Hour+	+1 hour
Hour-	-1 hour
Minute+	+1 minute
Minute-	-1 minute
Second+	+1 second
Second-	-1 second

7.1.3 [KEY BEEP] Key Tone Setting

The key tone setting allows a PASS beep, a FAIL beep, or turning the beeper off.

- Set the beep

Step 1 Enter the <System Configuration> page

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

Step 3 Use the soft keys to select

Soft keys	Function
Off	The beeper is turned off
PASS beep	The beeper sounds when the sorting result is pass (GD).
FAIL beep	The beeper sounds when the sorting result is fail (NG).

7.1.4 [Remote Control] Setting

The instrument has a built-in RS-232 interface, an RS485 interface and a USB communication interface. The instrument supports only one of them at a time; [Remote Control] allows selecting one.

If the RS232 interface is selected, plug the communication cable into the RS-232/RS485 interface on the rear panel of the instrument, using pins P2, P3 and P5 of the DB9 port.

If the RS485 interface is selected, plug the communication cable into the RS-232/RS485 interface on the rear panel of the instrument, using pins P8 and P9 of the DB9 port.

If the USB interface is selected, plug the communication cable into the USB interface on the rear panel of the instrument.

- **Selecting the remote communication interface type**

Step 1 Enter the <System Configuration> page

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

Step 3 Use the soft keys to select

Soft keys	Function
RS232	RS-232 interface
USB	USB communication interface
RS485	RS-485 interface

7.1.5 [Baud Rate] Setting

The instrument has a built-in RS-232 interface. When the instrument senses a signal change on the RS-232 interface, it immediately communicates with the host computer at the set baud rate, and the keyboard is locked at the same time.

To ensure correct communication, confirm that the baud rate is set correctly; the host computer and the instrument cannot communicate correctly if their baud rates are different.

The RS-232 interface of the instrument is programmed using the SCPI language.

The RS-232, RS-485 and USB configurations are as follows:

- Data bits: 8 bits
- Stop bits: 1 bit
- Parity: None
- Baud rate: configurable

Set the baud rate:

Step 1 Enter the <System Configuration> page

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

Step 3 Use the soft keys to select

Soft keys	Function
9600	
19200	
38400	
57600	
115200	For connection to a PC, this baud rate is recommended.

7.1.6 [Communication Protocol] Selection

The instrument supports 2 communication protocols: SCPI and Modbus (RTU). SCPI is usually more convenient for communication with computers, while the Modbus protocol is easier to use for communication with industrial control equipment such as PLCs.

Selecting the communication protocol:

Step 1 Enter the <System Configuration> page

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

Step 3 Use the soft keys to select

Soft keys	Function
SCPI	
Modbus	

7.1.7 Modbus [Station No.] Selection

If the Modbus (RTU) protocol is used, the station address of this instrument must be set properly.

Selecting the Modbus station number:

Step 1 Enter the <System Configuration> page

Step 2 Use the cursor keys to select the [Station No.] field;

Step 3 Use the soft keys to select

Soft keys	Function
00	Broadcast
01	
02	
03	
04	
05	
06	
07	
08	
09	
10	
11	
12	
13	
14	
15	

To facilitate operating multiple identical instruments simultaneously, the instrument allows station number 00 for broadcast communication. When communicating via station number 00, the instrument only receives commands and cannot return a response code.

7.1.8 Communication [Command Handshake] Switch

The instrument supports the RS232 command handshake.

When the Command Handshake is turned on, all commands sent by the host computer to the instrument are returned to the host computer unchanged, and data is returned only afterwards.

When the Command Handshake is turned off, commands sent by the host computer to the instrument are processed immediately.

Steps for setting the Command Handshake:

Step 1 Enter the <System Configuration> page

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

Step 3 Use the soft keys to select

Soft keys	Function
Off	The Command Handshake is not used. Unless there are special requirements, set the Command Handshake to Off.
On	

7.1.9 SCPI [Result Send] Mode

The instrument supports automatically sending data to the host computer. After each test is completed, the data is automatically sent to the host computer without the host computer sending the FETCH? command.

After each test, the instrument sends the test result and the comparator result to the host; for the format refer to the FETCh? subsystem.

Steps for setting [Result Sending]:

Step 1 Enter the <System Configuration> page

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

Step 3 Use the soft keys to select

Soft keys	Function
FETCH	Use the command FETCH? to obtain all measurement data
Auto	Automatically sent to the host computer after each test is completed

7.1.10 [Power-Line Filter] Selection

The measurement stability of the instrument depends on the power-line frequency. Select it according to the local power-line frequency; if uncertain, select AUTO and the instrument will set the local power-line frequency automatically.

Selecting the power-line filter:

Step 1 Enter the <System Configuration> page

Step 2 Use the cursor keys to select the [Power-Line Filter] field;

Step 3 Use the soft keys to select

Soft keys	Function
AUTO	Automatic setting
50Hz	Sets the 50Hz power-line frequency; the power-line frequency in China is 50Hz
60Hz	Sets the 60Hz power-line frequency

7.1.11 [HANDLER Output] Selection

The channel output signal of the instrument can be set to OK or NG output; the default is NG output low level.

HANDLER output setting:

Step 1 Enter the <System Configuration> page

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

Step 3 Use the soft keys to select

Soft keys	Function
NG	Low level on NG
OK	Low level on OK

8.Handler Interface

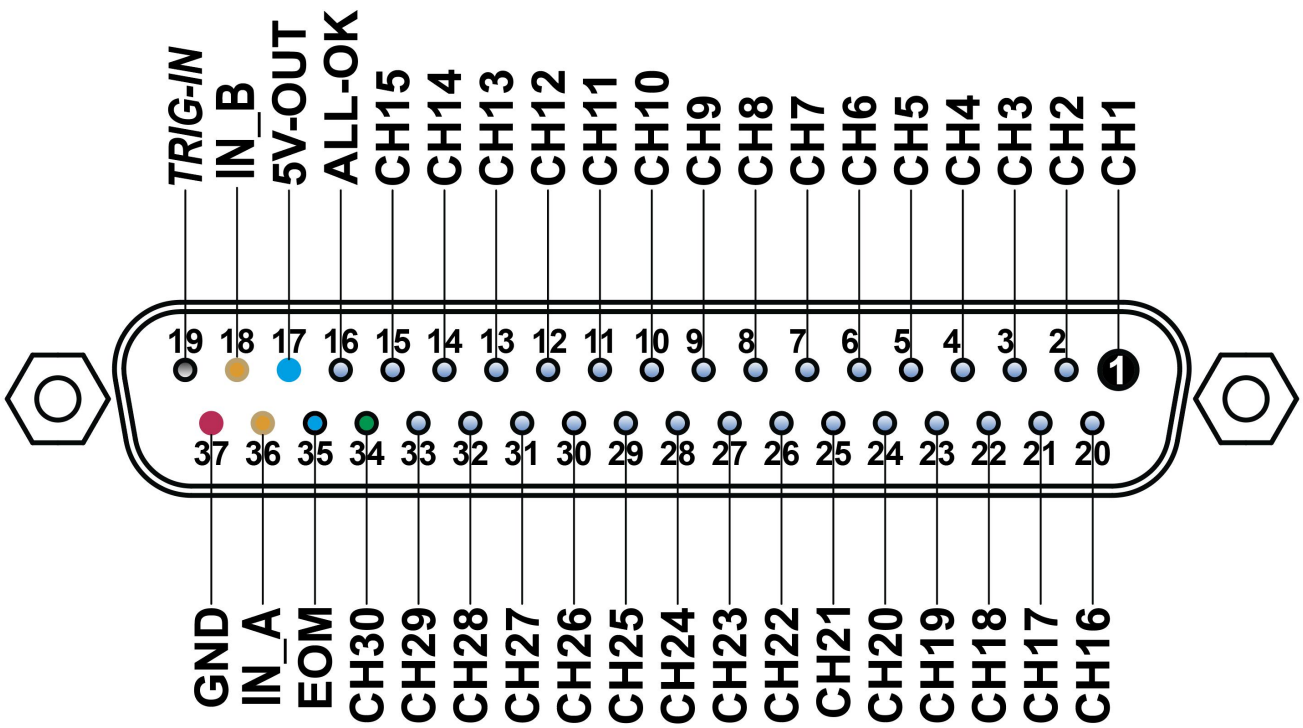
You will learn about the following:

- Terminals
- How to Connect and Interface Schematics

The instrument provides a full-featured Handler interface, including 30-channel sorting outputs, time-division EOM (end-of-test) signals, the TRIG (external trigger start) input and other signals. Through this interface, the instrument can easily implement automatic control together with the user’ s system control components.

8.1 Terminal Blocks and Signals

Figure 8- 1 Terminal Block



- Output terminals (all signals are active low)

Table 8- 1 Output Pin Definitions

Pin	Name	Description
1	CH1-OK	0:OK
2	CH2-OK	0:OK
3	CH3-OK	0:OK
4	CH4-OK	0:OK

5	CH5-OK	0:OK
6	CH6-OK	0:OK
7	CH7-OK	0:OK
8	CH8-OK	0:OK
9	CH9-OK	0:OK
10	CH10-OK	0:OK
11	CH11-OK	0:OK
12	CH12-OK	0:OK
13	CH13-OK	0:OK
14	CH14-OK	0:OK
15	CH15-OK	0:OK
16	**ALL-OK**	**0:OK**
20	CH16-OK	0:OK
21	CH17-OK	0:OK
22	CH18-OK	0:OK
23	CH19-OK	0:OK
24	CH20-OK	0:OK
25	CH21-OK	0:OK
26	CH22-OK	0:OK
27	CH23-OK	0:OK
28	CH24-OK	0:OK
29	CH25-OK	0:OK
30	CH26-OK	0:OK
31	CH27-OK	0:OK
32	CH28-OK	0:OK
33	CH29-OK	0:OK
34	CH30-OK	0:OK
35	**EOM**	**0: measurement complete, 1: measuring**

- Input terminals

Table 8- 2 Input Pin Definitions

Pin	Name	Description
18	IN_B	Input terminal B
19	TRIG-IN	Trigger input terminal, rising-edge triggered
36	IN_A	Input terminal A

For R, V and RV functions:

IN_B	IN_A	Description
0	0	RV
0	1	R
1	0	V
1	1	Invalid

- Power terminals

Table 8- 3 Power Pin Definitions

Pin	Name	Description
37	COM/GND	PLC common ground

8.2 Connection Methods

- The instrument has a built-in fully isolated power supply; there is no need to provide the power positive terminal externally.

Please connect the external power supply to the following pins at the same time:

Pin 37: external power COM terminal

Pin 17: floating.

8.2.1 Using the Internal Power Supply



When the load power is unknown or uncertain, do not use the internal power supply;**Do Not**otherwise the instrument will not work properly.

For known low-power applications, you can use the internal power supply, but it may degrade the interference immunity of the instrument.

Internal power supply: 5V, max. 0.5A.

Using the internal power supply:

17: VCC (5V)

37: GND

8.2.2 Electrical Parameters

Output signal: Darlington collector output with built-in pull-up resistors. Optocoupler isolated. Active low.

Max. voltage: 30VDC, with a built-in 30V clamping circuit.

Input signal: Optocoupler isolated. Active low.

Max. current: 50mA



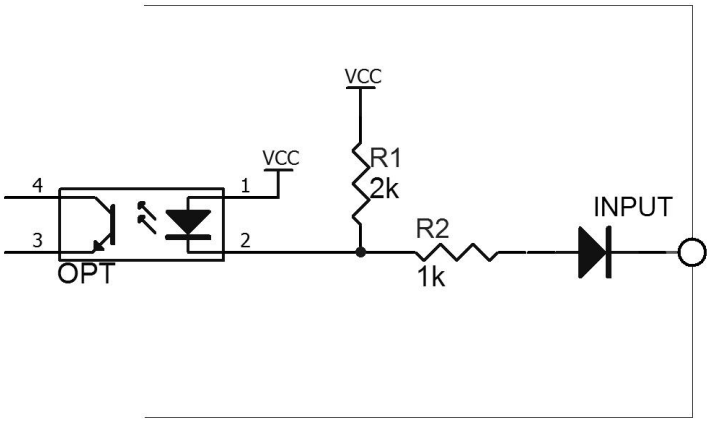
Note: To avoid damaging the interface, do not allow the power supply voltage to exceed the power requirements.

To avoid damaging the interface, wire the connections after the instrument is turned off.

The instrument uses Darlington-driven outputs that can drive low-power relays and signal relays; a reverse diode is already integrated inside the instrument.

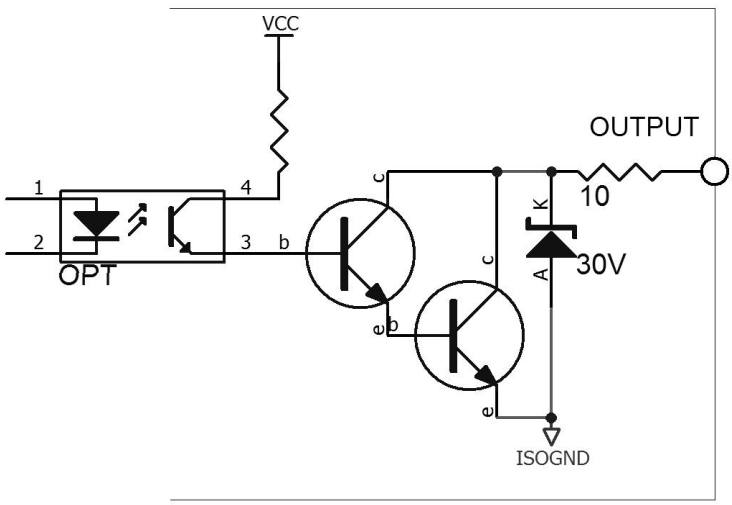
8.2.3 Input Circuit Schematic

Figure 8- 2 Input Circuit Schematic (Trig)



8.2.4 Output Circuit Schematic

Figure 8- 3 Output Circuit Schematic



8.2.5 Input Circuit Connection Methods

Figure 8- 4 Connection to a Switch

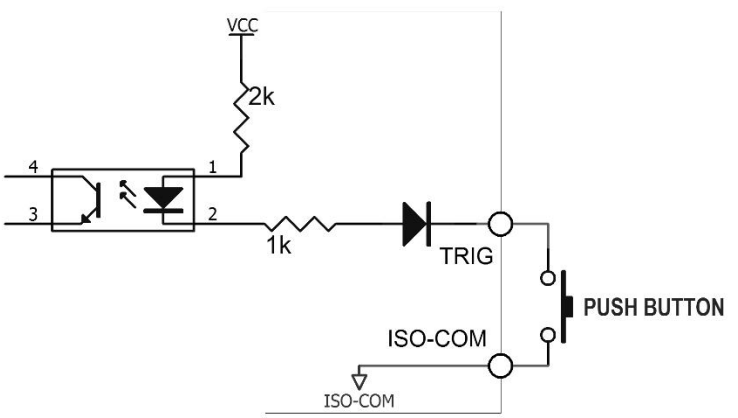


Figure 8- 5 Control Using a Relay

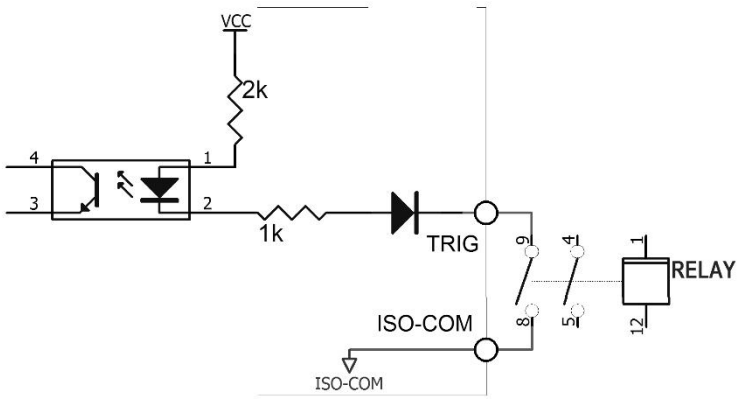


Figure 8- 6 Control Using a PLC Negative Common Terminal

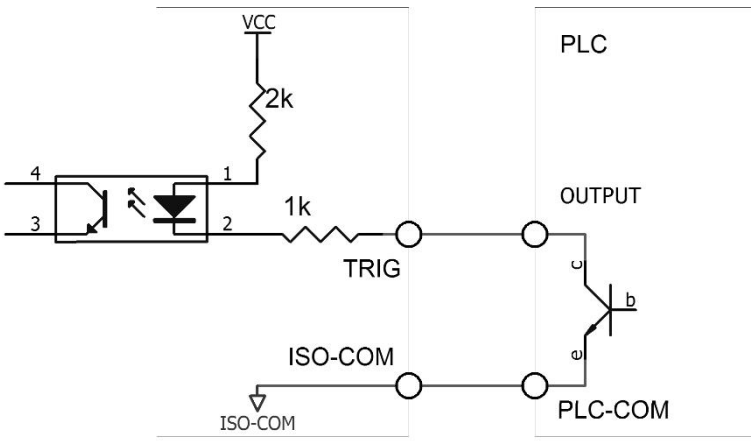
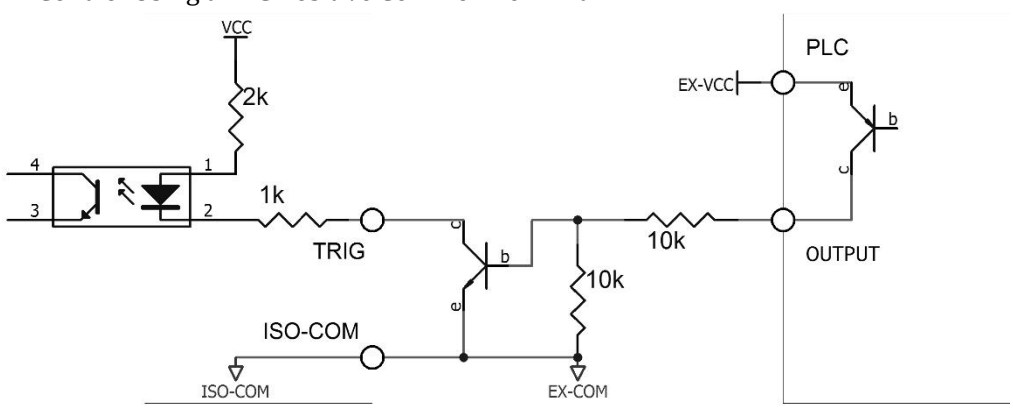


Figure 8- 7 Control Using a PLC Positive Common Terminal



8.2.6 Output Circuit Connection Methods

Figure 8- 8 Controlling a Relay

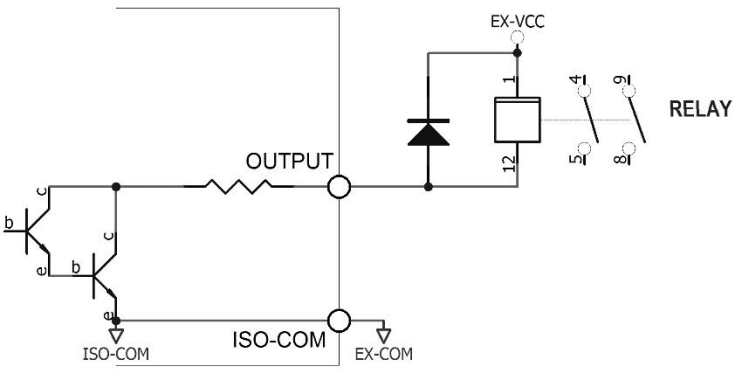


Figure 8- 9 Controlling an LED or Optocoupler

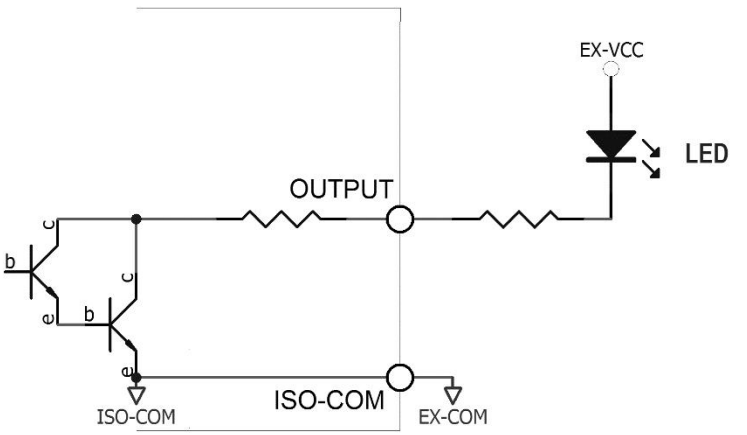


Figure 8- 10 Negative-Logic Output

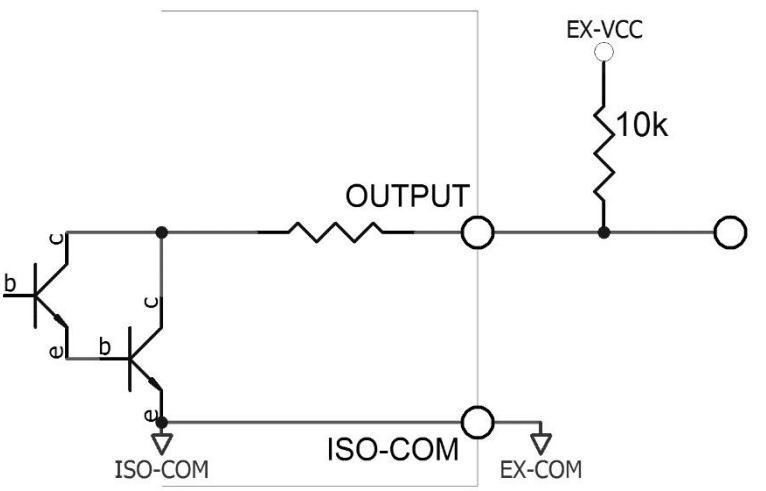


Figure 8- 11 Two Ports Forming a Logic-OR Circuit

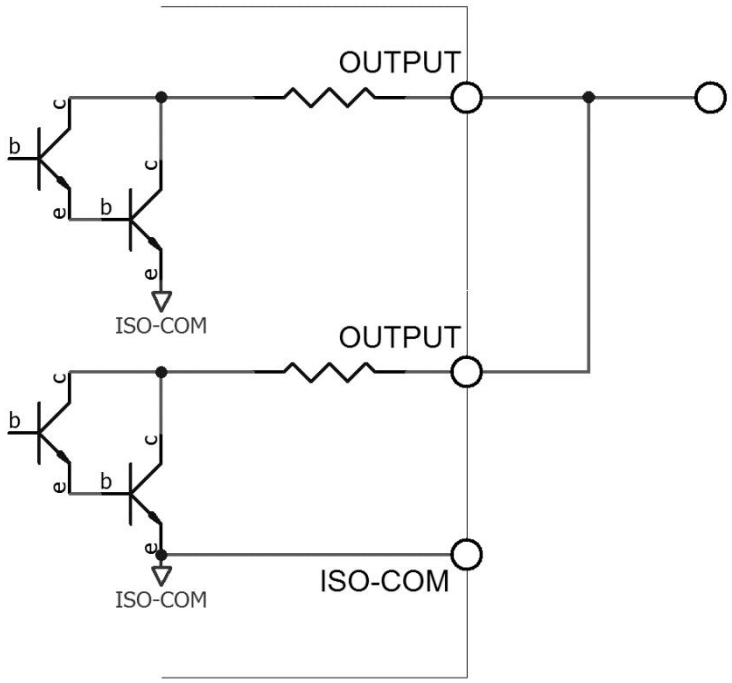


Figure 8- 12 Output to a PLC Negative Common Terminal

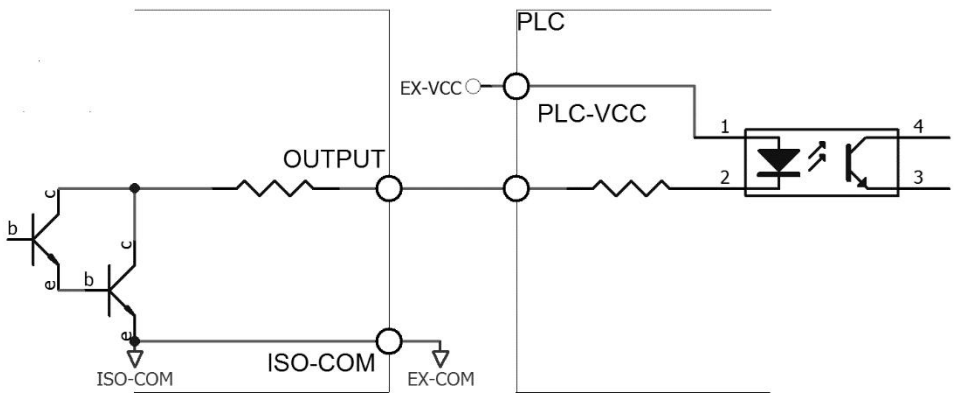
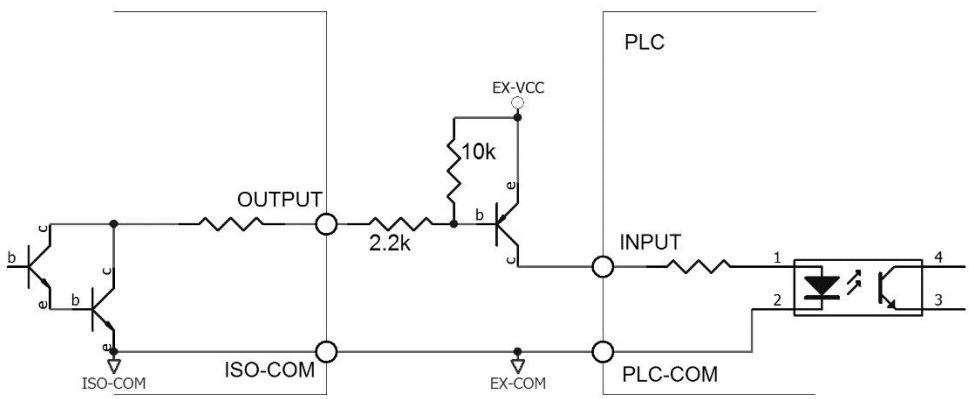


Figure 8- 13 Output to a PLC Positive Common Terminal



8.3 Timing Table

Figure 8- 14 Timing Table

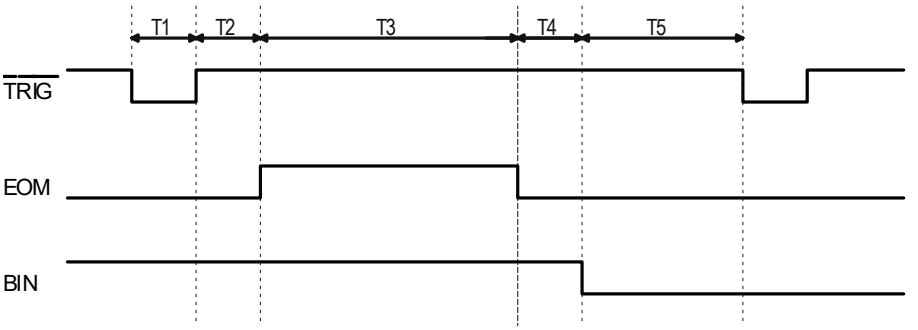


Table 8- 4 Time Table

Description			Minimum
T1	Trigger pulse width		1ms
T2	Measurement cycle	Trigger delay	<10 μ s
T3		Measurement time	Depends on settings
T4		BIN output delay	200 μ s
T5	Waiting time after trigger		0s

9. Remote Communication

You will learn about the following:

- About the RS-232 Interface
- RS-232 connection.
- Selecting the baud rate.
- Software protocol.

The instrument uses the RS-232 interface (standard configuration) to communicate with a computer and perform all instrument functions. With standard SCPI commands, users can also conveniently develop various data acquisition systems of their own.

9.1 RS-232C

RS-232 is a serial communication standard widely used today, also called the asynchronous serial communication standard, used for data communication between computers and between computers and peripherals. RS is the English abbreviation of "Recommended Standard" (recommended standard), and 232 is the standard number. This standard was officially published in 1969 by the Electronic Industries Association (EIA) of the United States; it specifies that data is transmitted one bit at a time over a single data line.

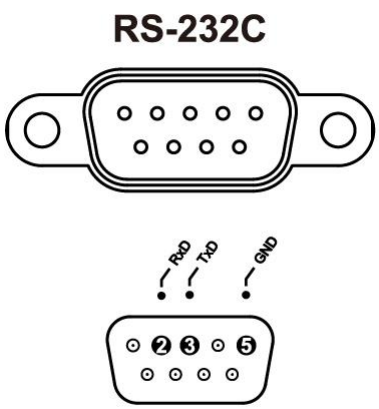
Most serial port configurations are usually not strictly based on the RS-232 standard: a 25-pin connector is used on each port (today's computers mostly use a 9-pin connector). The most commonly used RS-232 signals are shown in the following table:

Table 9- 1 Minimum Subset of the RS-232 Standard

Signal	Symbol	9-pin connector pin number
Transmitted data	TXD	2
Received data	RXD	3
Ground	GND	5

9.1.1 RS232C Interface

Figure 9- 1 RS-232 Interface on the Rear Panel [Male]



Recommendation: To avoid electric shock, turn off the power of the instrument when plugging or unplugging connectors.

■ Default communication settings of the instrument:

Transmission mode: Full-duplex asynchronous communication with start and stop bits

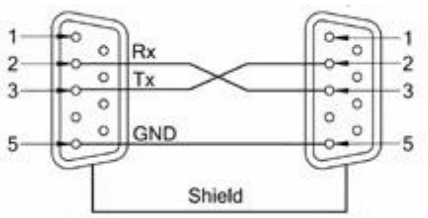
Data bits: 8 bits

Stop bits: 1 bit

Parity: None

9.1.2 Connection Methods

Figure 9- 2 RS-232 Interface on the Rear Panel [Male]



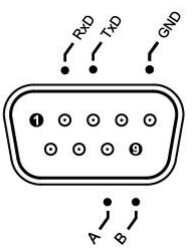
The RS-232 serial interface can be interconnected with the serial interface of a controller (e.g. a personal computer or an industrial computer) through a 2-3 crossed DB-9 cable. Communication protocol

9.2 RS485 Interface

From instrument version Rev C1.02, the instrument comes standard with an RS485 interface. RS485 is a communication interface supporting multi-instrument communication: one host can be connected in parallel with multiple slaves.

The detailed RS485 specification is not the focus of this user manual; refer to https://en.wikipedia.org/wiki/RS-485

The RS485 interface of the instrument shares the same DB9 connector with the RS232 interface:



Pin	Function
8	A
9	B

9.3 USB Interface

On some newer computers and laptops, the RS232 interface has been removed and USB is needed for communication. The instrument has a built-in USB-232 interface; you can virtualize USB as an RS232 port directly on the computer. This virtual port provides the same functions as RS232.

9.3.1 Enabling USB on the Instrument

The [System Settings] page of the instrument has RS232/USB/RS485 options; before using USB communication, set it to USB:

Steps for enabling USB:

Step 1 Enter the <System Configuration> page

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

Step 3 Use the soft keys to select

Soft keys	Function
RS232	DB9 interface enabled
USB	USB interface enabled
RS485	DB9 interface enabled

9.4 Communication Protocol

The instrument supports 2 communication protocols: SCPI and Modbus (RTU).

SCPI Protocol:

It is the abbreviation of the English Standard Commands for Programmable Instruments: SCPI. The SCPI protocol defines a set of standard syntax and commands for controlling programmable test and measurement instruments. SCPI commands are transmitted as ASCII strings and enter the instrument through the physical transport layer. A command consists of a series of keywords, and some commands also need to include parameters. In the protocol, a command is specified in the following form: CONFigure. In use, either the full name or an abbreviation containing only the uppercase letters may be written. The feedback of the instrument to a query command is also ASCII code. In fact, for simple applications (such as a PLC), it is only necessary to translate the commands into HEX bytes and transmit them byte by byte.

Reference: 

The built-in command parser of the instrument is responsible for parsing the various command formats entered by the user. Since the command parser is based on the SCPI protocol but is not fully consistent with SCPI, read the "SCPI Command Reference" chapter carefully before starting work.

Modbus (RTU) Protocol

The Modbus protocol is a general language applied to electronic controllers, and is a bus protocol mainly used in industrial fields. It is the communication standard for industrial control devices such as PLCs and touch screens.

9.5 SCPI Handshake Protocol

Since the instrument uses the minimum subset of the RS-232 standard and does not use hardware handshake signals, the instrument can enable software handshake to reduce possible data loss or data errors during communication. High-level language software

engineers should develop the computer communication software strictly according to the following handshake protocol:

- The command parser of the instrument accepts only ASCII format, and command responses are also returned as ASCII codes.
- **The command string sent by the host computer must end with NL(‘\n’), and the command parser of the instrument starts executing the command string only after receiving the terminator**.
- The instrument can enable command handshake: after receiving each character, the instrument immediately sends that character back to the host computer, and the host computer can continue to send the next character only after receiving this echoed character.

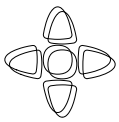


Tip: If the host computer cannot receive the data returned by the instrument, you can try the following methods to resolve the problem:

1. The software handshake is turned off; refer to the <System Settings> page of the instrument to turn it on.
2. Serial port connection fault; check the cable connections.
3. The communication format of the high-level language program on the computer side is incorrect. Try checking whether the serial port number and the communication format are correct, and whether the baud rate is the same as that set on the instrument.
4. If the instrument is parsing the previous command, the host computer cannot receive a response from the instrument either; please wait and try again.

<If the problem still cannot be solved, immediately consult the Onmeas technical engineers>

10. SCPI Command Reference



This chapter includes the following topics:

- Command Parser — understand some rules of the command parser.
- Command Syntax — rules for writing command lines
- Query Syntax — rules for writing query commands
- Query Response — format of the query response
- Command Summary

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

10.1 Command String Parsing

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

Example: Valid command string:

AAA:BBB CCC;DDD EEE;:FFF

The command parser of the instrument is responsible for the parsing and execution of all commands. Before writing a program, you must first understand its parsing rules.

10.1.1 Command Parsing Rules

1. The command parser only parses and responds to ASCII code data.
2. **The SCPI command string must take NL(' \n ' ASCII 0x0A) as its terminator**, and the command parser starts executing the command string only after receiving the terminator or when the buffer overflows.
3. If Command Handshake is enabled, the command parser immediately sends each received character back to the host computer; the host computer can continue to send the next character only after receiving this echoed character.
4. After parsing an error, the command parser immediately terminates parsing and the current command becomes invalid.
5. After parsing a query command, the command parser terminates parsing of the current command string, and the subsequent string is ignored.
6. The command parser is not case-sensitive when parsing command strings.
7. The command parser supports abbreviated command forms; for the abbreviation specifications, refer to the following chapters.

10.1.2 Symbol Conventions and Definitions

This chapter uses some symbols that are not part of the command tree; they are only intended to facilitate a better understanding of command strings.

< > The text in angle brackets indicates the parameter of the command

[ ] The text in square brackets indicates an optional command

{} When the braces enclose several parameter items, it indicates that only one of the items may be selected.

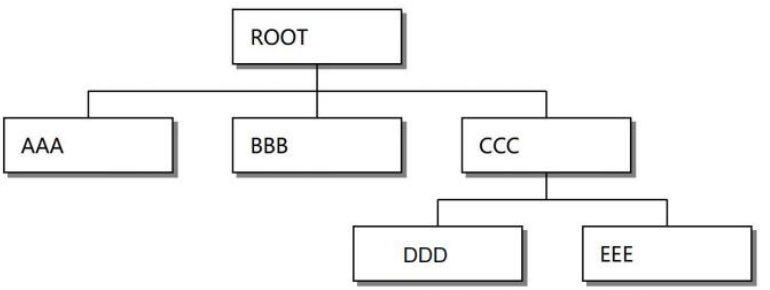
( ) The abbreviated form of a parameter is placed in parentheses.

Uppercase letters The abbreviated form of a command.

10.1.3 Command Tree Structure

SCPI commands use a tree structure that can go down three levels (note: the command parser of this instrument can parse any number of levels); the top level is called the subsystem command. Only after a subsystem command is selected are its subordinate commands valid. SCPI uses the colon (:) to separate high-level and low-level commands.

Figure 10- 1 Command Tree Structure



Example

ROOT:CCC:DDD PPP

ROOT Subsystem command

CCC Second level

DDD Third level

PPP Parameter

10.2 Commands and Parameters

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

Example

AAA:BBB 1.234

Command [Parameters]

10.2.1 Commands

Command words can be in long form or abbreviated form. The long form makes it easier for engineers to understand the meaning of the command string; the abbreviated form is convenient for writing.

10.2.2 Parameters

- A command with a single command word and no parameters.

  Example: AAA:BBB
- The parameter can be in the form of a string, and its abbreviation rules still follow the “command abbreviation rules” in the previous section.

Example: AAA:BBB CCC

■ The parameter can be in numeric form

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

1. <fixfloat>: fixed-point floating-point number: 1.23, -1.23
2. <Scifloat>: floating-point number in scientific notation: 1.23E+4, +1.23e-4
3. <mpfloat>: floating-point number expressed with a multiplier: 1.23k, 1.23M, 1.23G, 1.23u

Table 10- 1 Multiplier Abbreviations

Value	Multiplier
1E18 (EXA)	EX
1E15 (PETA)	PE
1E12 (TERA)	T
1E9 (GIGA)	G
1E6 (MEGA)	MA
1E3 (KILO)	K
1E-3 (MILLI)	M
1E-6 (MICRO)	U
1E-9 (NANO)	N
1E-12 (PICO)	P
1E-15 (PEMTO)	F
1E-18 (ATTO)	A



Tip: The multipliers are not case-sensitive, and their notation differs from the standard names.

10.2.3 Separators

The command parser of the instrument only accepts the permitted separators; for any other separator, the command parser will generate an "Invalid separator(illegal separator)" error. These separators include:

; Semicolon, used to separate two commands.

Example: AAA:BBB 100.0;CCC:DDD

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

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

? Question mark, used for queries.

Example: AAA?

□ Space, used to separate parameters.

Example: AAA:BBB□1.234

10.3 Command Summary

All commands are interpreted in the order of subsystem commands; all subsystems are listed below

- DISPlay — Display subsystem
- FUNCtion — Function subsystem
- CORRection — Correction subsystem
- COMParator — Comparator subsystem
- SYSTem — System subsystem
- TRIGger — Trigger subsystem
- FETCh? — Result acquisition subsystem
- ERRor — Error information subsystem

Common commands:

- IDN? — Instrument information query subsystem
- TRG — Trigger and acquire data

10.4 FUNCtion Subsystem

Figure 10- 2 FUNCtion Subsystem Tree

FUNCtion	**{RV,RESistance(R),VOLTage(V)}**	
	:RRANGE **:RRNG**	**{Range No.: 1~6}**
	:RATE	**{SLOW,MED,FAST}**
	:SCAN	**{<Channel No.>,on,off}**

Parameters set via the FUNCtion subsystem are not saved in the instrument; they must be set again at the next power-on.

10.4.1 FUNCtion Measurement Parameter Setting

Command syntax: **FUNCtion {RV,RESistance(R),VOLTage(V)}**

Parameters:
RV Resistance and voltage measurement function
RESistance or **R** Resistance measurement function only
VOLTage or **V** Voltage measurement function only

Example:
Send> **FUNC RES** //Select the resistance measurement function
Send> **FUNC R** //Select the resistance measurement function
Send> **FUNC V** //Select the voltage measurement function
Send> **FUNC RV** //Select the resistance+voltage measurement function

Query syntax: **FUNCtion?**

Query response:
RV
RESistance
VOLTage

Example:
Send>**FUNC?**
Receive> **RESISTANCE**

10.4.2 FUNCtion:RRANGE (FUNC:RRNG) Setting the Resistance Range

FUNC:RRNG sets the resistance range

Command syntax:
FUNCtion:RRANGE <range No. 1~6>
FUNCtion:RRNG <range No. 1~6>

Parameters:
where <range No.> includes**1~6**
1: 30mΩ
2: 300mΩ
3: 3Ω
4: 30Ω

5: 300Ω
6: 3kΩ

Example: Send> **FUNC:RRNG 5** //Switch to range 5 (300Ω)

Query syntax: **FUNC:RRNG?**

Query response: **Range No. 1~6**

Example: Send> **FUNC:RRNG?**
Return> **5**

10.4.3 FUNCtion:VRANGE (FUNC:VRNG) Setting the Voltage Range

FUNC:VRNG sets the voltage range

Command syntax: **FUNCtion:VRANGE <range No. 0~1>**
FUNCtion:VRNG <range No. 0~1>

Parameters: where <range No.> includes 0~1
1: 6V
2: 60V

Example: Send> **FUNC:VRNG 1** //Switch to range 1 (60V)

Query syntax: **FUNC:VRNG?**

Query response: **Range No. 0~1**

Example: Send> **FUNC:VRNG?**
Return> **1**

10.4.4 FUNCtion:RATE Setting the Speed

FUNC:RATE sets the test speed.

Command syntax: **FUNCtion:RATE {SLOW,MED,FAST }**

Example: Send> **FUNC:RATE FAST** //Set to fast testing

Query syntax: **FUNC:RATE?**

Query response: **{SLOW,MED,FAST}**

10.4.5 FUNCtion:CHannel Setting the Channel Switch

FUNC:CHannel sets the channel switch.

Command syntax: **FUNCtion:CHannel {ON,OFF,1,0}**

Example: Send> **FUNC:CH 1,ON** //Channel 1 on
Send> **FUNC:CH 2,OFF** //Channel 2 off

Query syntax: **FUNC:CH?**

Query response: **<channel No.>,{1,0}**

Example: Send> **FUNC:CH? 1**
Response> **1,1** //Channel 1 switch on

10.5 COMParator Subsystem

Comparator parameters set via the COMParator subsystem are saved in the system for use at power-on.

The COMP subsystem sets the comparator parameters.

Figure 10- 3 COMParator Subsystem Tree

COMParator	**:Rstate**	**{OFF,ON,0,1}**

	:Vstate	{OFF,ON,0,1}
	:BEEP	{OFF,GD,NG}
	:MODE	{IDENtical, INDEpendent}
	:OUTPut	{NG,OK}
	:BEEP	{OK,NG,OFF(0)}
	:RBIN :VBIN	<Channel No.1~30>, <float Lower Limit>,<float Upper Limit>

10.5.1 COMParator:Rstate

COMP:Rstate turns the comparator on or off.

Command syntax: **COMParator:Rstate {ON,OFF,1,0}**

Example: Send> **COMP:R ON** //Turn on the resistance comparator

Send> **COMP:R 0** //Turn off the resistance comparator

Query syntax: **COMP:R?**

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

10.5.2 COMParator:Vstate

COMP:Vstate turns the comparator on or off.

Command syntax: **COMParator:Vstate {ON,OFF,1,0}**

Example: Send> **COMP:V ON** //Turn on the voltage comparator

Send> **COMP:V 0** //Turn off the voltage comparator

Query syntax: **COMP:V?**

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

10.5.3 COMParator:RMODe

COMP:RMODe sets the resistance comparator mode.

Command syntax: **COMParator:RMODe {IDENtical,INDEpendent}**
IDENtical: uniform setting
INDEpendent: independent setting

Example: Send> **COMP:RMOD IDEN** //Uniform upper/lower limit comparison mode

Query syntax: **COMP:RMODe?**

Query response: **{identical, independent }**

10.5.4 COMParator:VMODe

COMP:VMODe sets the voltage comparator mode.

Command syntax: **COMParator:VMODe {IDENtical,INDEpendent}**

Example: Send> **COMP:VMOD IDEN** //Uniform upper/lower limit comparison mode

Query syntax: **COMP:VMODe?**

Query response: **{identical, independent}**

10.5.5 COMParator:OUTPut

COMP:OUTPut sets the Handler channel signal output mode.

Command syntax: **COMParator:OUTPut {NG,OK}**

Example: Send> **COMP:OUTP OK** //A low-level Handler output signal means pass

Query syntax: **COMP:OUTP?**

Query response: **NG**

10.5.6 COMParator:BEEP

COMP:BEEP sets the beeper.

Command syntax: `COMParator:BEEP {NG,OK,OFF(0)}`

Example:
Send> `COMP:BEEP 0` //Beeper off
Send> `COMP:BEEP OK` //PASS beep

Query syntax: `COMP:BEEP?`

Query response: `OFF`

10.5.7 COMParator:RBIN

COMP:RBIN sets the resistance upper/lower limits of a specified channel.
If the comparison mode is set to uniform setting, only the CH1 upper/lower limits participate in the calculation.

Command syntax: `COMParator:RBIN <channel No. 1~30>,<float lower limit>,<float upper limit>`

Example: Send> `COMP:RBIN 1,10m,100m` //Set the resistance upper/lower limits of channel 1

Query syntax: `COMP:RBIN? <channel No. 1~30>`

Query response: `<scifloat>,<scifloat>`

Example:
Send> `COMP:RBIN? 1`
Return> `+1.000000e-04,+1.000000e-05`

10.5.8 COMParator:VBIN

COMP:VBIN sets the voltage upper/lower limits of a specified channel.

Command syntax: `COMParator:VBIN <channel No. 1~20>,<float lower limit>,<float upper limit>`

Example: Send> `COMP:VBIN 1,10m,100m` //Set the voltage upper/lower limits of channel 1

Query syntax: `COMP:vbin? <channel No. 1~20>`

Query response: `<scifloat>,<scifloat>`

Example:
Send> `COMP:VBIN? 1`
Return> `+3.500000e+00,+3.700000e+00`

10.6 TRIGger Subsystem

Figure 10- 4 TRIGger Subsystem Tree

TRIGger	[:IMMediate]	
	:SOURce	{INT,MAN,EXT,BUS}
TRG	[1~30]	

TRIGger sets the trigger source and generates a trigger.

10.6.1 TRIGger[:IMMediate]

TRIG[:IMM] generates one trigger when the trigger source is set to BUS, but does not return the triggered test data. To return data, use the TRG command.

Command syntax: `TRIGger[IMMediate]`

Example: Send> `TRIG` //The instrument tests once and stops

10.6.2 TRIGger:SOURce

TRIG:SOUR sets the trigger source.

Command syntax: `TRIGger:SOURce {INT,EXT}`

Example: Send> **TRIG:SOUR EXT** //Set to external trigger mode, allowing manual, remote and PLC triggering.

Query syntax: **TRIG:SOUR?**

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

10.6.3 TRG

TRG generates one trigger when the trigger source is set to EXT, and returns the triggered test data.

TRG without parameters scan-measures all channels and returns the data of all channels, separated by semicolons (;).

TRG with a channel number measures the specified channel and returns its measurement data.

Command syntax: **TRG**

Example: Send> **TRG** //The instrument tests once and returns the test data of all channels, each channel separated by a semicolon (;)

Return>

```
01,+1.023400e-02,OK,+1.000000e+10,--;      //Note 1
02,-1.000000e+20,NG,-1.000000e+20,--;      //Note 2
03,+1.000000e+10,NG,+1.000000e+10,--;      //Note 3
……
28,+1.000000e+10,NG,+1.000000e+10,--;
29,+1.000000e+10,NG,+1.000000e+10,--;
30,+1.000000e+10,NG,+1.000000e+10,--
```

Note:

Note 1:

01,+1.023400e-02,OK,+1.000000e+10,--;

01: channel number

+1.023400e-02: resistance value

+1.000000e+10: voltage value; 1E10 means open circuit

Note 2:

-1.000000e+20 **-1E20**means the current channel is off

Note 3:

03,+1.000000e+10,**NG**,+1.000000e+10,**--**

OKmeans (resistance) pass

NGmeans (resistance) fail

--means the (voltage) comparator is off

Command syntax: **TRG <1~30>**

Example: Send> **TRG 1** //The instrument tests channel 1 and returns the test data

Return> 01,+1.023433e-02,OK,+1.000000e+10,--

Send> **TRG 2** //The instrument tests channel 1 and returns the test data

Return> 02,-1.000000e+20,NG,-1.000000e+20,--

10.7 FETCh? Subsystem

FETCh? acquires test data. Unlike TRG, the FETCh? command only acquires data and does not perform a measurement.

Before using this command, set the [Result Send] field on the <System Configuration> page to [FETCH].

The FETCh? command returns the test data of all channels. The data format is the same as TRG.

Figure 10- 5 FETCh? Subsystem Tree

FETCh?	[1~30]

Query syntax: `FETCh?`

Query response: `<R>,{OK,NG},<V>,{OK,NG}`

Example: Send> **FETCh?** //The instrument returns the test data of all channels in the last measurement buffer, each channel separated by a semicolon (;)

Return>

```
01,+1.023400e-02,OK,+1.000000e+10,--;
……
30,+1.000000e+10,NG,+1.000000e+10,--
```

Query syntax: `FETCh? <1~30>`

Example: Send> **FETCh?** 1 //The instrument returns the test data of channel 1 in the last measurement buffer

Return> `01,+1.023400e-02,OK,+1.000000e+10,--`

10.8 SYSTem Subsystem

The SYSTem subsystem is used to set system-related parameters.

Data set with the SYSTem subsystem will not be saved inside the instrument.

Figure 10- 6 SYSTem Subsystem Tree

SYSTem	:LANGuage	{ENGLISH,CHINESE,EN,CN}
	:SENDmode	{FETCH,AUTO}

10.8.1 SYSTem:LANGuage

Sets the instrument language.

Command syntax: `SYSTem:LANGuage {ENGLISH,CHINESE,EN,CN}`

Example: Send> **SYST:LANG EN** //Set to English display

Query syntax: `SYST:LANG?`

Query response: `{ENGLISH,CHINESE}`

10.8.2 SYSTem:TIME System Time Setting

Command syntax: `SYSTem:TIME <YEAR>,<MONTH>,<DAY>,<HOUR>,<MINUTE>,<SECOND>`

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>:<MINUTE>:<SECOND>`

Example: Send> **SYST:TIME?**

Receive> **2020-11-20 08:18:28**

10.8.3 SYSTem:KEYLock or SYSTem:KLOCk Keyboard Lock Setting

Command syntax:

```
SYSTem:KEYLock {ON,OFF,0,1}
SYSTem:KLOCk {ON,OFF,0,1}
```

Example: Send> **SYST:KEYL OFF** //Unlock the keyboard

Query syntax:

```
SYSTem:KEYLock?
SYSTem:KLOCk?
```

Query response: `{on,off}`

10.8.4 SYSTem:BEEPer Key Tone

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

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

Parameters: {OFF,ON,0,1}
OFF/0: key tone off
ON/1: key tone off

Example: Send> **SYST:BEEP OFF**

Query syntax: **SYSTem:BEEPer?**

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

10.8.5 SYSTem:SHAKhand Communication Handshake Command

With the communication handshake on, the instrument echoes the received command back to the host as-is before returning the data.

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

Example: Send> **SYST:SHAK ON**

Query syntax: **SYSTem:SHAKhand?**

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

10.8.6 SYSTem:RESult

SYST:RESult sets the data sending mode: automatic or the FETCH command.

Command syntax: **SYSTem:SENDmode {FETCh,AUTO}**

Example: Send> **SYST:SEND AUTO**//Set to automatic sending

Query syntax: **SYST:SEND?**

Query response: **{FETCH,AUTO}**

10.8.7 SYSTem:PRintSCreen (SYST:PRSC) Copying a Screen Snapshot

The SYSTem:PRintSCreen (SYST:PRSC) command copies a screen snapshot to the USB disk. Make sure the USB disk is ready before sending the command.

Command syntax: **SYSTem:PRintSCreen**
SYST:PRSC

Example: Send> **SYST:PRCS** //Start copying the screen
Return> rc=0 FR_OK

//FR_OK copying complete

10.9 IDN? Subsystem

Figure 10- 7 IDN? Subsystem Tree

IND?	

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

Query syntax: **IDN?**

Query response: **<manufacturer>,<model>,<serial number>,<version>**

Example: Send> **IDN?**
Return> **Onmeas,AT5330,0000000,REV A1.01**

10.10 SAV Subsystem

Figure 10- 8 SAV Subsystem Tree

SAV	

The SAV subsystem saves the settings to internal memory.

Note: SAV takes about 2s to save the data; be sure to wait for the return of OK before the next setting.

Query syntax: **SAV**

Query response: **OK**

Example: Send> **SAV**

Return> **OK**

10.11 SCPI Multi-Instrument Communication

The Onmeas extended SCPI communication protocol also supports multi-instrument communication. Just add the following prefix before each command sent:

ADDR #;:<command>

For example, query the version of the instrument at address 02:

ADDR 2;:idn?

11. Modbus (RTU) Communication Protocol

This chapter includes the following topics:

- Data Format — understand the Modbus communication format.
- Function
- Variable area
- Function Codes

11.1 Data Format

We comply with the Modbus (RTU) communication protocol; the instrument will respond to the commands of the host computer and return a standard response frame.

See: You can contact the sales department of our company to obtain the Onmeas communication test tool, which contains Modbus communication debugging methods. It includes a CRC-16 calculator and conversion of floating-point numbers to the Modbus floating-point format.

11.1.1 Command Frame

Figure 11- 1 Modbus Command Frame

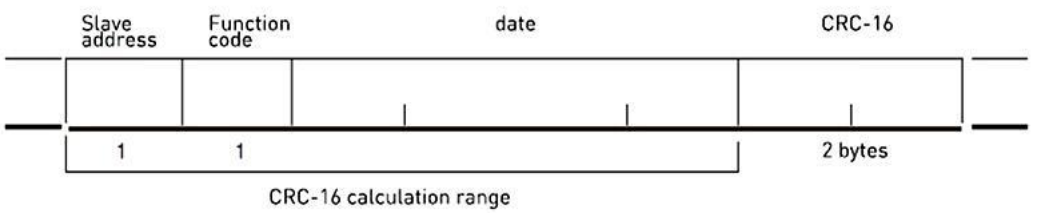


Table 11- 1 Command Frame Description

	At least 3.5 character times of silence required
Slave address	1 byte Modbus can support 00~0x63 slaves Specified as 00 for broadcast In instruments not fitted with the RS485 option, the default slave address is 0x01
Function Codes	1 byte 0x03: Read multiple registers 0x04: =03H, not used 0x06: Write single register, can be replaced by 10H 0x08: Echo Test (used only for debugging) 0x10: Write multiple registers
Data	Specifies the register address, quantity, and content
CRC-16	2 bytes, low byte first Cyclic Redundancy Check All data from the slave address to the end of the data is calculated

	to obtain the CRC16 check code
	At least 3.5 character times of silence required

11.1.2 CRC-16 Calculation Method

1. Set the initial value of the CRC-16 register to 0xFFFF.
2. Perform an XOR operation on the CRC-16 register and the first byte of the message, and return the calculation result to the CRC register.
3. Fill the MSB with 0 and shift the CRC register right by 1 bit.
4. If the bit shifted out from the LSB is "0", repeat step (3) (process the next shift). If the bit shifted out from the LSB is "1", perform an XOR operation on the CRC register and 0xA001, and return the result to the CRC register.
5. Repeat steps (3) and (4) until 8 bits have been shifted.
6. If the message has not been fully processed, perform an XOR operation on the CRC register and the next byte of the message, return the result to the CRC register, and repeat from step (3).
7. Append the calculated result (the value of the CRC register) to the message starting from the low-order byte.

The following is a CRC calculation function written in VB:

```
Function CRC16(data() As Byte) As Byte()
 Dim CRC16Lo As Byte, CRC16Hi As Byte 'CRC register
 Dim CL As Byte, CH As Byte  'Polynomial code &HA001
    Dim SaveHi As Byte, SaveLo As Byte
    Dim i As Integer
    Dim flag As Integer
    CRC16Lo = &HFF
    CRC16Hi = &HFF
    CL = &H1
    CH = &HA0
    For i = 0 To UBound(data)
  CRC16Lo = CRC16Lo Xor data(i) 'Each data byte is XORed with the CRC
register
        For flag = 0 To 7
            SaveHi = CRC16Hi
            SaveLo = CRC16Lo
   CRC16Hi = CRC16Hi \ 2  'The high byte is shifted right by 1 bit
   CRC16Lo = CRC16Lo \ 2  'The low byte is shifted right by 1 bit
   If ((SaveHi And &H1) = &H1) Then 'If the last bit of the high byte is 1
    CRC16Lo = CRC16Lo Or &H80 'Then 1 is filled in at the front after the
low byte is shifted right
   End If    'Otherwise 0 is filled in automatically
   If ((SaveLo And &H1) = &H1) Then 'If the LSB is 1, it is XORed with the
polynomial code
                CRC16Hi = CRC16Hi Xor CH
                CRC16Lo = CRC16Lo Xor CL
            End If
        Next flag
    Next i
    Dim ReturnData(1) As Byte
 ReturnData(0) = CRC16Hi  'CRC high byte
 ReturnData(1) = CRC16Lo  'CRC low byte
    CRC16 = ReturnData
End Function
```

See: Our company's "Onmeas communication test tool "" contains Modbus communication debugging methods. It includes a CRC-16 calculator.

The calculated CRC-16 data must be appended to the end of the command frame, for example: 1234H:

Figure 11- 2 Modbus Appended CRC-16 Value



11.1.3 Response Frame

Unless it is a command broadcast with the slave address 00H, the instrument will return a response frame for any other slave address.

Figure 11- 3 Normal Response Frame

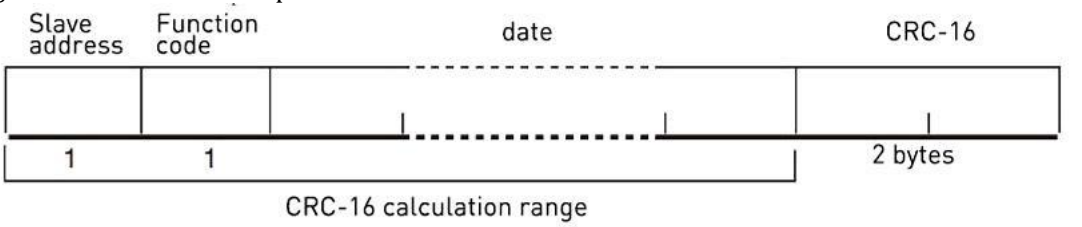


Figure 11- 4 Exception Response Frame

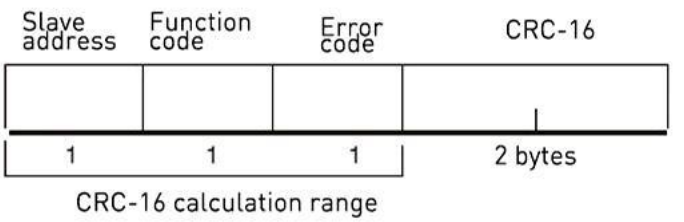


Table 11- 2 Exception Response Frame Description

Slave address	1 byte The slave address is returned as is
Function Codes	1 byte The function code of the command frame is logically ORed with BIT7 (0x80), for example: 0x03 OR 0x80 = 0x83
Error Codes	Exception codes: 0x01 Function code error (function code not supported) 0x02 Register error (register does not exist) 0x03 Data error 0x04 Execution error
CRC-16	2 bytes, low byte first Cyclic Redundancy Check All data from the slave address to the end of the data is calculated to obtain the CRC16 check code

11.1.4 No Response

In the following cases, the instrument will not perform any processing and will not respond, resulting in a communication timeout.

1. Slave address error
2. Transmission error
3. CRC-16 error

4. Digit count error, for example: the total digit count for function code 0x03 must be 8, while the received count is less than 8 or greater than 8 bytes.
5. When the slave address is 0x00, it represents the broadcast address and the instrument does not respond.

11.1.5 Error Codes

Table 11- 3 Error Code Description

Error Codes	Name	Description	Priority
0x01	Function code error	Function code does not exist	1
0x02	Register error	Register does not exist	2
0x03	Data error	Register quantity or byte count error	3
0x04	Execution error	Invalid data, the written data is not within the allowed range	4

11.2 Function Codes

The instrument supports only the following function codes; for other function codes, an error frame will be returned.

Table 11- 4 Function Codes

Function Codes	Name	Description
0x03	Read Multiple Registers	Read data from multiple consecutive registers
0x04	Same as 0x03	Please use 0x03 instead
0x08	Echo Test	The received data is returned as is
0x10	Write Multiple Registers	Write multiple consecutive registers

11.3 Registers

The register size of the instrument is in 2-byte mode; that is, 2 bytes must be written each time. For example: the speed register is 0x3002, the data is 2 bytes, and the value must be written as 0x0001

Data:

The instrument supports the following types of values:

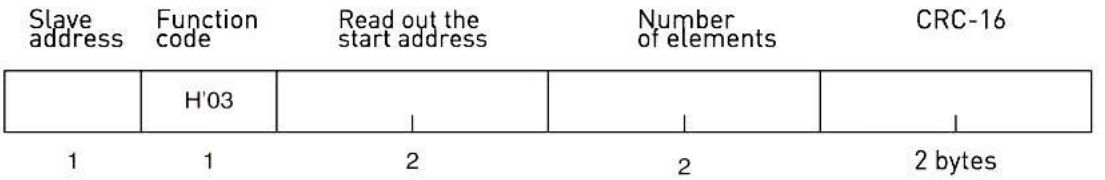
1. 1 register, double-byte (16-bit) integer, for example: 0x64 → 00 64
2. 2 registers, four-byte (32-bit) integer, for example: 0x12345678 → 12 34 56 78
3. 2 registers, four-byte (32-bit) single-precision floating-point number, 3.14 → 40 48 F5 C3



See: Our company's “Onmeas communication test tool “” contains Modbus communication debugging methods. It includes a floating-point converter.

11.4 Read Multiple Registers

Figure 11- 5 Read Multiple Registers (0x03)

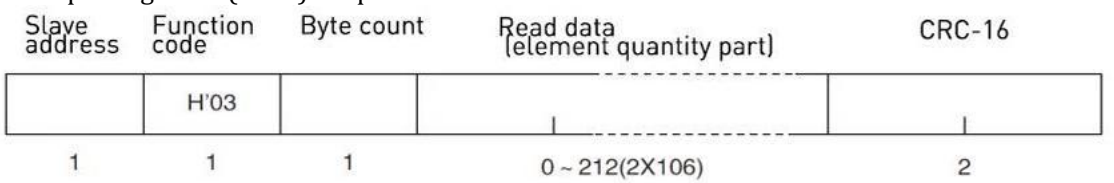


The function code for reading multiple registers is 0x03.

Table 11- 5 Read Multiple Registers

Name	Name	Description
	Slave address	When no RS485 address is specified, the default is 01
0x03	Function Codes	
	Starting address	Starting register address, refer to the Modbus command set
	Number of registers to read 0001~006A (106)	Number of registers to read consecutively. Refer to the Modbus command set to ensure that all these register addresses exist; otherwise, an error frame will be returned.
CRC-16	Check Code	

Figure 11- 6 Read Multiple Registers (0x03) Response Frame



Name	Name	Description
	Slave address	Returned as is
0x03 or 0x83	Function Codes	No exception: 0x03 Error code: 0x83
	Number of bytes	= number of registers x 2 For example: 1 register returns 02
	Data	Data read
CRC-16	Check Code	

11.5 Write Multiple Registers

Figure 11- 7 Write Multiple Registers (0x10)

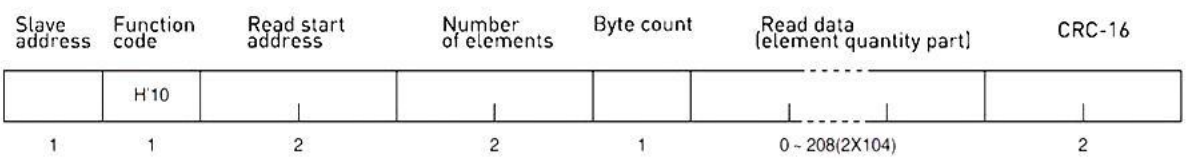
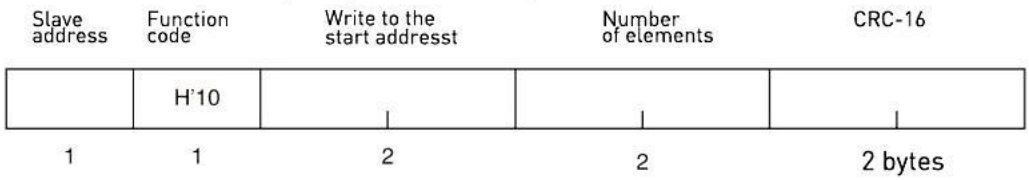


Table 11- 6 Write Multiple Registers

Name	Name	Description

	Slave address	When no RS485 address is specified, the default is 01
0x10	Function Codes	
	Starting address	Starting register address, refer to the Modbus command set
	Number of registers to write 0001~0068 (104)	Number of registers to read consecutively. Refer to the Modbus command set to ensure that all these register addresses exist; otherwise, an error frame will be returned.
	Number of bytes	= number of registers x 2
CRC-16	Check Code	

Figure 11- 8 Write Multiple Registers (0x03) Response Frame

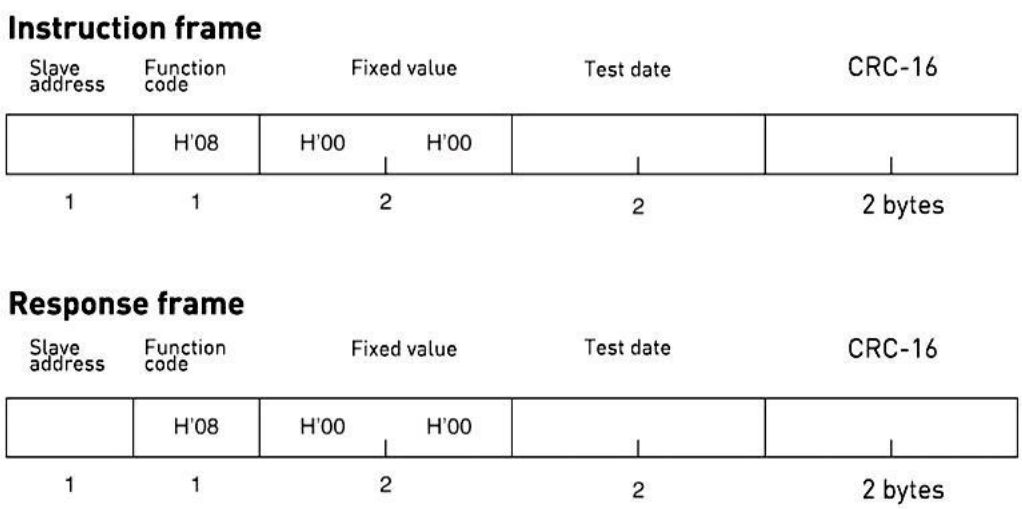


Name	Name	Description
	Slave address	Returned as is
0x10 or 0x90	Function Codes	No exception: 0x10 Error code: 0x90
	Starting address	
	No. of Registers	
	CRC-16 Check Code	

11.6 Echo Test

The function code of the Echo Test is 0x08, which is used for debugging Modbus.

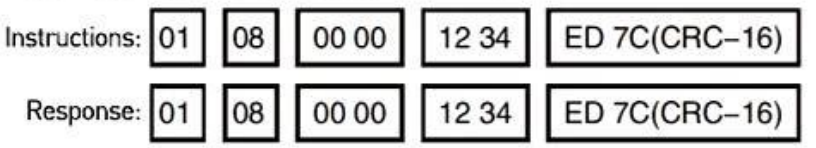
Figure 11- 9 Echo Test (0x08)



Name	Name	Description
	Slave address	Returned as is
0x08	Function Codes	
	Fixed value	00 00
	Test data	Any value: for example 12 34
	CRC-16 Check Code	

Example:

Assume the test data is 0x1234:



12. Modbus (RTU) Command Set

This chapter includes the following topics:

- Register Address

See: Be sure to contact the sales department of our company to obtain the Onmeas instrument communication test tool, which contains Modbus communication debugging methods. It includes a CRC-16 calculator and conversion of floating-point numbers to the Modbus floating-point format.

Note: unless otherwise stated, the values of the commands and response frames in the following descriptions are hexadecimal data.

12.1 Register Overview

The following lists all register addresses used by the instrument. Any address not in the table will return error code 0x02.

Table 12- 1 Register Overview

Register Address	Name	Value	Description
1000	Trigger and acquire CH1 data	8-byte floating point DD CC BB AA DD CC BB AA Low byte first, high byte last First 4 bytes: resistance value Last 4 bytes: voltage value	Read-only register; data occupies 4 registers, 8 bytes
1004	Trigger and acquire CH2 data	8-byte floating point DD CC BB AA DD CC BB AA Low byte first, high byte last First 4 bytes: resistance value Last 4 bytes: voltage value	Read-only register; data occupies 4 registers, 8 bytes
1008	Trigger and acquire CH3 data	8-byte floating point DD CC BB AA DD CC BB AA	Read-only register; data occupies 4 registers, 8 bytes

		Low byte first, high byte last First 4 bytes: resistance value Last 4 bytes: voltage value	
100C	Trigger and acquire CH4 data	8-byte floating point DD CC BB AA DD CC BB AA Low byte first, high byte last First 4 bytes: resistance value Last 4 bytes: voltage value	Read-only register; data occupies 4 registers, 8 bytes
1010	Trigger and acquire CH5 data	8-byte floating point DD CC BB AA DD CC BB AA Low byte first, high byte last First 4 bytes: resistance value Last 4 bytes: voltage value	Read-only register; data occupies 4 registers, 8 bytes
1014	Trigger and acquire CH6 data	8-byte floating point DD CC BB AA DD CC BB AA Low byte first, high byte last First 4 bytes: resistance value Last 4 bytes: voltage value	Read-only register; data occupies 4 registers, 8 bytes
1018	Trigger and acquire CH7 data	8-byte floating point DD CC BB AA DD CC BB AA Low byte first, high byte last First 4 bytes: resistance value Last 4 bytes: voltage value	Read-only register; data occupies 4 registers, 8 bytes
101C	Trigger and acquire CH8 data	8-byte floating point DD CC BB AA DD CC BB AA Low byte first, high byte last First 4 bytes: resistance value Last 4 bytes: voltage value	Read-only register; data occupies 4 registers, 8 bytes

1020	Trigger and acquire CH9 data	8-byte floating point DD CC BB AA DD CC BB AA Low byte first, high byte last First 4 bytes: resistance value Last 4 bytes: voltage value	Read-only register; data occupies 4 registers, 8 bytes
1024	Trigger and acquire CH10 data	8-byte floating point DD CC BB AA DD CC BB AA Low byte first, high byte last First 4 bytes: resistance value Last 4 bytes: voltage value	Read-only register; data occupies 4 registers, 8 bytes
1028	Trigger and acquire CH11 data	8-byte floating point DD CC BB AA DD CC BB AA Low byte first, high byte last First 4 bytes: resistance value Last 4 bytes: voltage value	Read-only register; data occupies 4 registers, 8 bytes
102C	Trigger and acquire CH12 data	8-byte floating point DD CC BB AA DD CC BB AA Low byte first, high byte last First 4 bytes: resistance value Last 4 bytes: voltage value	Read-only register; data occupies 4 registers, 8 bytes
1030	Trigger and acquire CH13 data	8-byte floating point DD CC BB AA DD CC BB AA Low byte first, high byte last First 4 bytes: resistance value Last 4 bytes: voltage value	Read-only register; data occupies 4 registers, 8 bytes
1034	Trigger and acquire CH14 data	8-byte floating point DD CC BB AA DD CC BB AA Low byte first, high byte last	Read-only register; data occupies 4 registers, 8 bytes

		First 4 bytes: resistance value Last 4 bytes: voltage value	
1038	Trigger and acquire CH15 data	8-byte floating point DD CC BB AA DD CC BB AA Low byte first, high byte last First 4 bytes: resistance value Last 4 bytes: voltage value	Read-only register; data occupies 4 registers, 8 bytes
103C	Trigger and acquire CH16 data	8-byte floating point DD CC BB AA DD CC BB AA Low byte first, high byte last First 4 bytes: resistance value Last 4 bytes: voltage value	Read-only register; data occupies 4 registers, 8 bytes
1040	Trigger and acquire CH17 data	8-byte floating point DD CC BB AA DD CC BB AA Low byte first, high byte last First 4 bytes: resistance value Last 4 bytes: voltage value	Read-only register; data occupies 4 registers, 8 bytes
1044	Trigger and acquire CH18 data	8-byte floating point DD CC BB AA DD CC BB AA Low byte first, high byte last First 4 bytes: resistance value Last 4 bytes: voltage value	Read-only register; data occupies 4 registers, 8 bytes
1048	Trigger and acquire CH19 data	8-byte floating point DD CC BB AA DD CC BB AA Low byte first, high byte last First 4 bytes: resistance value Last 4 bytes: voltage value	Read-only register; data occupies 4 registers, 8 bytes
104C	Trigger and acquire CH20 data	8-byte floating point DD CC BB AA DD CC BB	Read-only register; data occupies 4 registers, 8 bytes

		AA Low byte first, high byte last First 4 bytes: resistance value Last 4 bytes: voltage value	
1050	Trigger and acquire CH21 data	8-byte floating point DD CC BB AA DD CC BB AA Low byte first, high byte last First 4 bytes: resistance value Last 4 bytes: voltage value	Read-only register; data occupies 4 registers, 8 bytes
1054	Trigger and acquire CH22 data	8-byte floating point DD CC BB AA DD CC BB AA Low byte first, high byte last First 4 bytes: resistance value Last 4 bytes: voltage value	Read-only register; data occupies 4 registers, 8 bytes
1058	Trigger and acquire CH23 data	8-byte floating point DD CC BB AA DD CC BB AA Low byte first, high byte last First 4 bytes: resistance value Last 4 bytes: voltage value	Read-only register; data occupies 4 registers, 8 bytes
105C	Trigger and acquire CH24 data	8-byte floating point DD CC BB AA DD CC BB AA Low byte first, high byte last First 4 bytes: resistance value Last 4 bytes: voltage value	Read-only register; data occupies 4 registers, 8 bytes
1060	Trigger and acquire CH25 data	8-byte floating point DD CC BB AA DD CC BB AA Low byte first, high byte last First 4 bytes: resistance value	Read-only register; data occupies 4 registers, 8 bytes

		Last 4 bytes: voltage value	
1064	Trigger and acquire CH26 data	8-byte floating point DD CC BB AA DD CC BB AA Low byte first, high byte last First 4 bytes: resistance value Last 4 bytes: voltage value	Read-only register; data occupies 4 registers, 8 bytes
1068	Trigger and acquire CH27 data	8-byte floating point DD CC BB AA DD CC BB AA Low byte first, high byte last First 4 bytes: resistance value Last 4 bytes: voltage value	Read-only register; data occupies 4 registers, 8 bytes
106C	Trigger and acquire CH28 data	8-byte floating point DD CC BB AA DD CC BB AA Low byte first, high byte last First 4 bytes: resistance value Last 4 bytes: voltage value	Read-only register; data occupies 4 registers, 8 bytes
1070	Trigger and acquire CH29 data	8-byte floating point DD CC BB AA DD CC BB AA Low byte first, high byte last First 4 bytes: resistance value Last 4 bytes: voltage value	Read-only register; data occupies 4 registers, 8 bytes
1074	Trigger and acquire CH30 data	8-byte floating point DD CC BB AA DD CC BB AA Low byte first, high byte last First 4 bytes: resistance value Last 4 bytes: voltage value	Read-only register; data occupies 4 registers, 8 bytes
1200	Single trigger	2-byte integer Fixed value: 0001	Write-only register; data occupies 1 register
2000	Read resistance CH1	Trigger and acquire CH28	Read-only register, data occupies

	measurement result	data	2 registers
2002	Read resistance CH2 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
2004	Read resistance CH3 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
2006	Read resistance CH4 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
2008	Read resistance CH5 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
200A	Read resistance CH6 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
200C	Read resistance CH7 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
200E	Read resistance CH8 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
2010	Read resistance CH9 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
2012	Read resistance CH10 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
2014	Read resistance CH11 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
2016	Read resistance CH12 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
2018	Read resistance CH13 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
201A	Read resistance CH14 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
201C	Read resistance CH15 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
201E	Read resistance CH16 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
2020	Read resistance CH17 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
2022	Read resistance CH18 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
2024	Read resistance CH19 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
2026	Read resistance CH20 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
2028	Read resistance CH21 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
202A	Read resistance CH22 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
202C	Read resistance CH23	Trigger and acquire CH28	Read-only register, data occupies

	measurement result	data	2 registers
202E	Read resistance CH24 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
2030	Read resistance CH25 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
2032	Read resistance CH26 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
2034	Read resistance CH27 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
2036	Read resistance CH28 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
2038	Read resistance CH29 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
203A	Read resistance CH30 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
2000	Read resistance CH1 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
2002	Read resistance CH2 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
2004	Read resistance CH3 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
2006	Read resistance CH4 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
2008	Read resistance CH5 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
200A	Read resistance CH6 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
200C	Read resistance CH7 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
200E	Read resistance CH8 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
2010	Read resistance CH9 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
2012	Read resistance CH10 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
2014	Read resistance CH11 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
2016	Read resistance CH12 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
2018	Read resistance CH13 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
201A	Read resistance CH14 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
201C	Read resistance CH15	Trigger and acquire CH28	Read-only register, data occupies

	measurement result	data	2 registers
201E	Read resistance CH16 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
2020	Read resistance CH17 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
2022	Read resistance CH18 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
2024	Read resistance CH19 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
2026	Read resistance CH20 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
2028	Read resistance CH21 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
202A	Read resistance CH22 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
202C	Read resistance CH23 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
202E	Read resistance CH24 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
2030	Read resistance CH25 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
2032	Read resistance CH26 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
2034	Read resistance CH27 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
2036	Read resistance CH28 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
2038	Read resistance CH29 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
203A	Read resistance CH30 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
2100	Read voltage CH1 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
2102	Read voltage CH2 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
2104	Read voltage CH3 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
2106	Read voltage CH4 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
2108	Read voltage CH5 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
210A	Read voltage CH6 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers

210C	Read voltage CH7 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
210E	Read voltage CH8 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
2110	Read voltage CH9 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
2112	Read voltage CH10 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
2114	Read voltage CH11 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
2116	Read voltage CH12 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
2118	Read voltage CH13 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
211A	Read voltage CH14 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
211C	Read voltage CH15 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
211E	Read voltage CH16 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
2120	Read voltage CH17 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
2122	Read voltage CH18 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
2124	Read voltage CH19 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
2126	Read voltage CH20 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
2128	Read voltage CH21 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
212A	Read voltage CH22 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
212C	Read voltage CH23 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
212E	Read voltage CH24 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
2130	Read voltage CH25 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
2132	Read voltage CH26 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
2134	Read voltage CH27 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
2136	Read voltage CH28 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers

2138	Read voltage CH29 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
213A	Read voltage CH30 measurement result	Trigger and acquire CH28 data	Read-only register, data occupies 2 registers
2400	Read resistance CH1 measurement result	4-byte floating point, CCDDAABB	Read-only register, data occupies 2 registers
2402	Read resistance CH2 measurement result	4-byte floating point, CCDDAABB	Read-only register, data occupies 2 registers
2404	Read resistance CH3 measurement result	4-byte floating point, CCDDAABB	Read-only register, data occupies 2 registers
2406	Read resistance CH4 measurement result	4-byte floating point, CCDDAABB	Read-only register, data occupies 2 registers
2408	Read resistance CH5 measurement result	4-byte floating point, CCDDAABB	Read-only register, data occupies 2 registers
240A	Read resistance CH6 measurement result	4-byte floating point, CCDDAABB	Read-only register, data occupies 2 registers
240C	Read resistance CH7 measurement result	4-byte floating point, CCDDAABB	Read-only register, data occupies 2 registers
240E	Read resistance CH8 measurement result	4-byte floating point, CCDDAABB	Read-only register, data occupies 2 registers
2410	Read resistance CH9 measurement result	4-byte floating point, CCDDAABB	Read-only register, data occupies 2 registers
2412	Read resistance CH10 measurement result	4-byte floating point, CCDDAABB	Read-only register, data occupies 2 registers
2414	Read resistance CH11 measurement result	4-byte floating point, CCDDAABB	Read-only register, data occupies 2 registers
2416	Read resistance CH12 measurement result	4-byte floating point, CCDDAABB	Read-only register, data occupies 2 registers
2418	Read resistance CH13 measurement result	4-byte floating point, CCDDAABB	Read-only register, data occupies 2 registers
241A	Read resistance CH14 measurement result	4-byte floating point, CCDDAABB	Read-only register, data occupies 2 registers
241C	Read resistance CH15 measurement result	4-byte floating point, CCDDAABB	Read-only register, data occupies 2 registers
241E	Read resistance CH16 measurement result	4-byte floating point, CCDDAABB	Read-only register, data occupies 2 registers
2420	Read resistance CH17 measurement result	4-byte floating point, CCDDAABB	Read-only register, data occupies 2 registers
2422	Read resistance CH18 measurement result	4-byte floating point, CCDDAABB	Read-only register, data occupies 2 registers
2424	Read resistance CH19 measurement result	4-byte floating point, CCDDAABB	Read-only register, data occupies 2 registers
2426	Read resistance CH20	4-byte floating point,	Read-only register, data occupies

	measurement result	CCDDAABB	2 registers
2428	Read resistance CH21 measurement result	4-byte floating point, CCDDAABB	Read-only register, data occupies 2 registers
242A	Read resistance CH22 measurement result	4-byte floating point, CCDDAABB	Read-only register, data occupies 2 registers
242C	Read resistance CH23 measurement result	4-byte floating point, CCDDAABB	Read-only register, data occupies 2 registers
242E	Read resistance CH24 measurement result	4-byte floating point, CCDDAABB	Read-only register, data occupies 2 registers
2430	Read resistance CH25 measurement result	4-byte floating point, CCDDAABB	Read-only register, data occupies 2 registers
2432	Read resistance CH26 measurement result	4-byte floating point, CCDDAABB	Read-only register, data occupies 2 registers
2434	Read resistance CH27 measurement result	4-byte floating point, CCDDAABB	Read-only register, data occupies 2 registers
2436	Read resistance CH28 measurement result	4-byte floating point, CCDDAABB	Read-only register, data occupies 2 registers
2438	Read resistance CH29 measurement result	4-byte floating point, CCDDAABB	Read-only register, data occupies 2 registers
243A	Read resistance CH30 measurement result	4-byte floating point, CCDDAABB	Read-only register, data occupies 2 registers
2500	Read voltage CH1 measurement result	4-byte floating point, CCDDAABB	Read-only register, data occupies 2 registers
2502	Read voltage CH2 measurement result	4-byte floating point, CCDDAABB	Read-only register, data occupies 2 registers
2504	Read voltage CH3 measurement result	4-byte floating point, CCDDAABB	Read-only register, data occupies 2 registers
2506	Read voltage CH4 measurement result	4-byte floating point, CCDDAABB	Read-only register, data occupies 2 registers
2508	Read voltage CH5 measurement result	4-byte floating point, CCDDAABB	Read-only register, data occupies 2 registers
250A	Read voltage CH6 measurement result	4-byte floating point, CCDDAABB	Read-only register, data occupies 2 registers
250C	Read voltage CH7 measurement result	4-byte floating point, CCDDAABB	Read-only register, data occupies 2 registers
250E	Read voltage CH8 measurement result	4-byte floating point, CCDDAABB	Read-only register, data occupies 2 registers
2510	Read voltage CH9 measurement result	4-byte floating point, CCDDAABB	Read-only register, data occupies 2 registers
2512	Read voltage CH10 measurement result	4-byte floating point, CCDDAABB	Read-only register, data occupies 2 registers
2514	Read voltage CH11 measurement result	4-byte floating point, CCDDAABB	Read-only register, data occupies 2 registers

2516	Read voltage CH12 measurement result	4-byte floating point, CCDDAABB	Read-only register, data occupies 2 registers
2518	Read voltage CH13 measurement result	4-byte floating point, CCDDAABB	Read-only register, data occupies 2 registers
251A	Read voltage CH14 measurement result	4-byte floating point, CCDDAABB	Read-only register, data occupies 2 registers
251C	Read voltage CH15 measurement result	4-byte floating point, CCDDAABB	Read-only register, data occupies 2 registers
251E	Read voltage CH16 measurement result	4-byte floating point, CCDDAABB	Read-only register, data occupies 2 registers
2520	Read voltage CH17 measurement result	4-byte floating point, CCDDAABB	Read-only register, data occupies 2 registers
2522	Read voltage CH18 measurement result	4-byte floating point, CCDDAABB	Read-only register, data occupies 2 registers
2524	Read voltage CH19 measurement result	4-byte floating point, CCDDAABB	Read-only register, data occupies 2 registers
2526	Read voltage CH20 measurement result	4-byte floating point, CCDDAABB	Read-only register, data occupies 2 registers
2528	Read voltage CH21 measurement result	4-byte floating point, CCDDAABB	Read-only register, data occupies 2 registers
252A	Read voltage CH22 measurement result	4-byte floating point, CCDDAABB	Read-only register, data occupies 2 registers
252C	Read voltage CH23 measurement result	4-byte floating point, CCDDAABB	Read-only register, data occupies 2 registers
252E	Read voltage CH24 measurement result	4-byte floating point, CCDDAABB	Read-only register, data occupies 2 registers
2530	Read voltage CH25 measurement result	4-byte floating point, CCDDAABB	Read-only register, data occupies 2 registers
2532	Read voltage CH26 measurement result	4-byte floating point, CCDDAABB	Read-only register, data occupies 2 registers
2534	Read voltage CH27 measurement result	4-byte floating point, CCDDAABB	Read-only register, data occupies 2 registers
2536	Read voltage CH28 measurement result	4-byte floating point, CCDDAABB	Read-only register, data occupies 2 registers
2538	Read voltage CH29 measurement result	4-byte floating point, CCDDAABB	Read-only register, data occupies 2 registers
253A	Read voltage CH30 measurement result	4-byte floating point, CCDDAABB	Read-only register, data occupies 2 registers
2300	Get the comparator result	4-byte integer	Read-only register, data occupies 2 registers BIT29~BIT0 correspond to CH30~CH1 pass e.g. BIT0=1 means CH1 OK

0000	Read the instrument version number	4-byte ASCII	Read-only register, data occupies 2 registers
3000	Function register	0000: R-V 0001: R 0002: V	Read/Write register, 2-byte integer
3001	Resistance range	0001~0006	Read/Write register, 2-byte integer
3002	Voltage range	0001~0002	Read/Write register, 2-byte integer
3005	Test Speed	0000: Slow 0001: Medium 0002: Fast	Read/Write register, 2-byte integer
3007	Trigger Mode	0000: Internal 0001: external	Read/Write register, 2-byte integer
3008	Trigger delay	0000: Off 0001~0x2710 (1~10000)	Read/Write register, 2-byte integer Unit: ms
300E	System language	0000: English 0001: Simplified Chinese	Read/Write register, 2-byte integer
3020	Channel switch	BIT29~BIT0 correspond to the channels CH30~CH1 1: ON, 0: OFF	
3100	Resistance comparator status	0000: Comparator off 0001: Comparator on	Read/Write register, 2-byte integer
3101	Voltage comparator status	0000: Comparator off 0001: Comparator on	Read/Write register, 2-byte integer
3102	Resistance comparator setting mode	0000: uniform setting 0001: independent setting	Read/Write register, 2-byte integer
3103	Voltage comparator setting mode	0000: uniform setting 0001: independent setting	Read/Write register, 2-byte integer
3104	Beeper	0000: Off 0001: PASS beep 0002: FAIL beep	Read/Write register, 2-byte integer
3110	Resistance CH1 lower limit	4-byte floating-point number	Read/Write register, data occupies 2 registers

		Data order: DD CC BB AA	
3112	Resistance CH1 upper limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
3114	Resistance CH2 lower limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
3116	Resistance CH2 upper limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
3118	Resistance CH3 lower limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
311A	Resistance CH3 upper limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
311C	Resistance CH4 lower limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
311E	Resistance CH4 upper limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
3120	Resistance CH5 lower limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
3122	Resistance CH5 upper limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
3124	Resistance CH6 lower limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
3126	Resistance CH6 upper limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
3128	Resistance CH7 lower limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
312A	Resistance CH7 upper limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
312C	Resistance CH8 lower limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
312E	Resistance CH8 upper limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
3130	Resistance CH9 lower limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
3132	Resistance CH9 upper limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
3134	Resistance CH10 lower limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
3136	Resistance CH10 upper limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
3138	Resistance CH11 lower limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
313A	Resistance CH11 upper limit	4-byte floating-point number	Read/Write register, data occupies 2 registers

313C	Resistance CH12 lower limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
313E	Resistance CH12 upper limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
3140	Resistance CH13 lower limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
3142	Resistance CH13 upper limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
3144	Resistance CH14 lower limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
3146	Resistance CH14 upper limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
3148	Resistance CH15 lower limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
314A	Resistance CH15 upper limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
314C	Resistance CH16 lower limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
314E	Resistance CH16 upper limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
3150	Resistance CH17 lower limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
3152	Resistance CH17 upper limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
3154	Resistance CH18 lower limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
3156	Resistance CH18 upper limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
3158	Resistance CH19 lower limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
315A	Resistance CH19 upper limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
315C	Resistance CH20 lower limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
315E	Resistance CH20 upper limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
3160	Resistance CH21 lower limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
3162	Resistance CH21 upper limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
3164	Resistance CH22 lower limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
3166	Resistance CH22 upper limit	4-byte floating-point number	Read/Write register, data occupies 2 registers

3168	Resistance CH23 lower limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
316A	Resistance CH23 upper limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
316C	Resistance CH24 lower limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
316E	Resistance CH24 upper limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
3170	Resistance CH25 lower limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
3172	Resistance CH25 upper limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
3174	Resistance CH26 lower limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
3176	Resistance CH26 upper limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
3178	Resistance CH27 lower limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
317A	Resistance CH27 upper limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
317C	Resistance CH28 lower limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
317E	Resistance CH28 upper limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
3180	Resistance CH29 lower limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
3182	Resistance CH29 upper limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
3184	Resistance CH30 lower limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
3186	Resistance CH30 upper limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
3210	Voltage CH1 lower limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
3212	Voltage CH1 upper limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
3214	Voltage CH2 lower limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
3216	Voltage CH2 upper limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
3218	Voltage CH3 lower limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
321A	Voltage CH3 upper limit	4-byte floating-point	Read/Write register, data

		number	occupies 2 registers
321C	Voltage CH4 lower limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
321E	Voltage CH4 upper limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
3220	Voltage CH5 lower limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
3222	Voltage CH5 upper limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
3224	Voltage CH6 lower limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
3226	Voltage CH6 upper limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
3228	Voltage CH7 lower limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
322A	Voltage CH7 upper limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
322C	Voltage CH8 lower limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
322E	Voltage CH8 upper limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
3230	Voltage CH9 lower limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
3232	Voltage CH9 upper limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
3234	Voltage CH10 lower limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
3236	Voltage CH10 upper limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
3238	Voltage CH11 lower limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
323A	Voltage CH11 upper limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
323C	Voltage CH12 lower limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
323E	Voltage CH12 upper limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
3240	Voltage CH13 lower limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
3242	Voltage CH13 upper limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
3244	Voltage CH14 lower limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
3246	Voltage CH14 upper limit	4-byte floating-point	Read/Write register, data

		number	occupies 2 registers
3248	Voltage CH15 lower limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
324A	Voltage CH15 upper limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
324C	Voltage CH16 lower limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
324E	Voltage CH16 upper limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
3250	Voltage CH17 lower limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
3252	Voltage CH17 upper limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
3254	Voltage CH18 lower limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
3256	Voltage CH18 upper limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
3258	Voltage CH19 lower limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
325A	Voltage CH19 upper limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
325C	Voltage CH20 lower limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
325E	Voltage CH20 upper limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
3260	Voltage CH21 lower limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
3262	Voltage CH21 upper limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
3264	Voltage CH22 lower limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
3266	Voltage CH22 upper limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
3268	Voltage CH23 lower limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
326A	Voltage CH23 upper limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
326C	Voltage CH24 lower limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
326E	Voltage CH24 upper limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
3270	Voltage CH25 lower limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
3272	Voltage CH25 upper limit	4-byte floating-point	Read/Write register, data

		number	occupies 2 registers
3274	Voltage CH26 lower limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
3276	Voltage CH26 upper limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
3278	Voltage CH27 lower limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
327A	Voltage CH27 upper limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
327C	Voltage CH28 lower limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
327E	Voltage CH28 upper limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
3280	Voltage CH29 lower limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
3282	Voltage CH29 upper limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
3284	Voltage CH30 lower limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
3286	Voltage CH30 upper limit	4-byte floating-point number	Read/Write register, data occupies 2 registers
4000	Save the settings to internal memory	2 bytes	Read-only register, 2-byte data

12.2 Debugging Methods

12.2.1 [Communication Protocol] Selection

The instrument supports 2 communication protocols: SCPI and Modbus (RTU). Before debugging, set the protocol to Modbus.

12.2.2 Modbus [Station No.] Selection

If the Modbus (RTU) protocol is used, the station address of this instrument must be set properly.

Set the station number to 01~15.

12.2.3 Debugging Tools

Download it from our website www.anbai.cn, or contact our sales department to obtain the “Onmeas instrument communication test tool” Ver4.0 or above for Modbus debugging.

12.3 Triggering and Acquiring Data

12.3.1 [1200] Single Trigger

Writing the fixed value 0001 to register [1200] executes one trigger but does not return measurement data. Use it together with the Handler EOM signal to acquire the data.

Registers	1200	Write-only
No. of Registers	1	
Number of bytes	2	
Data Format	2-byte integer	Fixed value 0001

- Send the write command:

1	2	3-4	4-5	6	7-8	9	10
01	10	1200	0001	02	0001	55	91
Slave	Read	Registers		No. of Registers		Check Code	

Response:

1	2	3-4	5-6	7-8
01	10	1200	0001	04B1
Station No.	Write	Registers	Quantity	CRC16

12.3.2 Triggering a Channel and Returning Measurement Data

Registers	1000	Read-only
No. of Registers	4	
Number of bytes	8	
Data Format	8 bytes First 4 bytes: resistance floating point Last 4 bytes: voltage floating point	Byte order DDCC BBAA

Send:

1	2	3	4	5	6	7	8
01	03	10	00	00	04	40	C9
Slave	Read	Registers		No. of Registers		Check Code	

Response:

1	2	3	4-7	8-11	12-13
01	03	08	50 15 02 F9	50 15 02 F9	883A

		Byte s	Resistance floating point	Voltage floating point	CRC-16

Resistance floating point: 50 15 02 F9 => 1E10 means open circuit

Voltage floating point: 50 15 02 F9 => 1E10 means open circuit

The other channels are similar to CH1; for the register addresses refer to the “Register Overview” section.

12.4 Acquiring Measurement Data

12.4.1 Acquiring Resistance Measurement Results [2000-203A] or [2400-243A]

Registers 2000~203A or 2400-243A acquire the resistance measurement data; registers 2000~2001 or 2400-2401 acquire the measurement data of channel 1, and so on, with every 2 registers storing the measurement data of one

[2000-203A] registers return data in AABBCCDD format, convenient for direct conversion by Windows programming software

[2400-24DA] registers return data in CCDDAABB format, convenient for direct conversion by PLCs and other configuration software

- **Acquiring the resistance measurement result of channel 1:**

Registers	2000	Read-only
No. of Registers	2	
Number of bytes	4	
Data Format	4-byte floating-point number	Byte order AABBCCDD

Send:

1	2	3	4	5	6	7	8
01	03	20	00	00	02	CF	CB
Slave	Read	Registers		No. of Registers		Check Code	

Response:

1	2	3	4	5	6	7	8	9
01	03	04	4E	6E	6B	28	A3	E8
01	03	Byte s	Single-precision floating-point number				CRC-16	

Where B4~B6 are the measurement data: 4E6E6B28 represents 1E9 (low byte first)

12.4.2 Acquiring Voltage Measurement Results [2100-213A] or [2500-253A]

Registers 2100~213A acquire the voltage measurement data; registers 2100~2101 or [2500-253A] acquire the measurement data of channel 1, and so on, with every 2 registers storing the measurement data of one channel.

[2100-213A] registers return data in AABBCCDD format, convenient for direct conversion by

Windows programming software
[2500-25DA] registers return data in CCDDAABB format, convenient for direct conversion by PLCs and other configuration software

The acquisition method is the same as for resistance in the previous section.

12.4.3 [2300] Acquiring the Comparator Result

Registers	2300	Read-Only Registers
No. of Registers	2	
Number of bytes	4	BIT29~BIT0 correspond to the pass bins of the channels

Send: 01 03 23 00 00 02 CF 8F
Return: 01 03 04 **00 00 00 00** FA 33
Here,
00 00 00 00 corresponds in bit order to the pass bin of each channel
BIT0 0: CH1 NG 1: CH1 OK
BIT1 0: CH2 NG 1: CH2 OK
.....
BIT29 0: CH30 NG 1: CH30 OK

12.5 Parameter Settings

12.5.1 [3000] Measurement Function

Registers	3000	Read 03/Write 10
No. of Registers	1	
Number of bytes	2	0000: RV 0001: R 0002: V

- Write register

1	2	3-4	5-6	7	8-9	10-11
01	10	3000	0001	02	0001	9653
Station No.	Write	Registers	Quantity	Number of bytes	Function: R	CRC16

Return:

1	2	3-4	5-6	7-8
01	10	3000	0001	0EC9
Station No.	Write	Registers	Quantity	CRC16

- Read register

1	2	3-4	5-6	7-8
01	03	3000	0002	CB0B
Station No.	Read	Registers	Number	CRC16

			of bytes	

Return:

1	2	3	4-5	6-7
01	03	04	0000	7A31
Station No.	Read	Number of bytes	Function: RV	CRC16

12.5.2 [3001] Resistance Range

Registers	3001	Read 03/Write 10
No. of Registers	1	
Number of bytes	2	0001: 30mΩ 0002: 300 mΩ 0003: 3 Ω 0004: 30 Ω 0005: 300 Ω 0006: 3kΩ

- Write register

1	2	3-4	5-6	7	8-9	10-11
01	10	3001	0001	02	0002	1643
Station No.	Write	Registers	Quantity	Number of bytes	Range 2, 300mΩ	CRC16

Return:

1	2	3-4	5-6	7-8
01	10	3001	0001	5F09
Station No.	Write	Registers	Quantity	CRC16

- Read register

1	2	3-4	5-6	7-8
01	03	3001	0001	9ACB
Station No.	Read	Registers	Quantity	CRC16

Return:

1	2	3	4-5	6-7
01	03	02	0002	5BF3
Station No.	Read	Number of bytes	Range 2, 300mΩ	CRC16

12.5.3 [3002] Voltage Range

Registers	3002	Read 03/Write 10
No. of Registers	1	
Number of bytes	2	0000: 6V 0001: 60V

- Write register

1	2	3-4	5-6	7	8-9	10-11
01	10	3002	0001	02	0001	1643
Station No.	Write	Registers	Quantity	Number of bytes	Voltage range 1, 60V	CRC16

Return:

1	2	3-4	5-6	7-8
01	10	3002	0001	AF09
Station No.	Write	Registers	Quantity	CRC16

- Read register

1	2	3-4	5-6	7-8
01	03	3002	0001	2ACA
Station No.	Read	Registers	Quantity	CRC16

Return:

1	2	3	4-5	6-7
01	03	02	0000	B844
Station No.	Read	Number of bytes	Range 0, 6V	CRC16

12.5.4 [3005] Test Speed

Registers	3005	Read 03/Write 10
No. of Registers	1	
Number of bytes	2	0000: SLOW 0001: MED 0002: FAST

- Write register

1	2	3-4	5-6	7	8-9	10-11
01	10	3005	0001	02	0001	1EC8
Station No.	Write	Registers	Quantity	Number of bytes	Speed medium	CRC16

Return:

1	2	3-4	5-6	7-8
01	10	3005	0001	1EC8
Station No.	Write	Registers	Quantity	CRC16

- Read register

1	2	3-4	5-6	7-8

01	03	3005	0001	9B0B
Station No.	Read	Registers	Quantity	CRC16

Return:

1	2	3	4-5	6-7
01	03	02	0001	7984
Station No.	Read	Number of bytes	Speed medium	CRC16

12.5.5 [3007] Trigger Mode

Registers	3007	Read 03/Write 10
No. of Registers	1	
Number of bytes	2	0000: internal trigger 0001: external trigger

- Write register

1	2	3-4	5-6	7	8-9	10-11
01	10	3007	0001	02	0001	5624
Station No.	Write	Registers	Quantity	Number of bytes	External trigger	CRC16

Return:

1	2	3-4	5-6	7-8
01	10	3007	0001	BF08
Station No.	Write	Registers	Quantity	CRC16

- Read register

1	2	3-4	5-6	7-8
01	03	3007	0001	3ACB
Station No.	Read	Registers	Quantity	CRC16

Return:

1	2	3	4-5	6-7
01	03	02	0001	7984
Station No.	Read	Number of bytes	External trigger	CRC16

12.5.6 [3008] Trigger Delay

Registers	3008-3009	Read 03/Write 10
No. of Registers	1	

Number of bytes	2	2-byte integer, unit: ms 0: trigger delay off 1~10000ms

- Write register

1	2	3-4	5-6	7	8-9	10-11
01	10	3008	0001	02	0064	5624
Station No.	Write	Registers	Quantity	Number of bytes	Trigger delay 100ms	CRC16

Return:

1	2	3-4	5-6	7-8
01	10	3008	0001	BF08
Station No.	Write	Registers	Quantity	CRC16

- Read register

1	2	3-4	5-6	7-8
01	03	3008	0001	0AC8
Station No.	Read	Registers	Quantity	CRC16

Return:

1	2	3	4-5	6-7
01	03	02	0064	B9AF
Station No.	Read	Number of bytes	100ms	CRC16

12.5.7 [300E] System Language

Registers	300E	Read 03/Write 10
No. of Registers	1	
Number of bytes	2	0000 English 0001 Chinese

- Write register

1	2	3-4	5-6	7	8-9	10-11
01	10	300E	0001	02	0000	977D
Station No.	Write	Registers	Quantity	Number of bytes	0000: English	CRC16

Return:

1	2	3-4	5-6	7-8
01	10	300E	0001	670A
Station No.	Write	Registers	Quantity	CRC16

- Read register

1	2	3-4	5-6	7-8
01	03	300E	0001	EAC9
Station No.	Read	Registers	Quantity	CRC16

Return:

1	2	3	4-5	6-7
01	03	02	0001	7984
Station No.	Read	Number of bytes	0001: Chinese	CRC16

12.5.8 [3020] Channel Switch

Registers	3020-3021	Read 03/Write 10
No. of Registers	2	
Number of bytes	4	BIT29~BIT0: correspond to CH30~CH1 respectively 0: off, 1: on

- Write register

1	2	3-4	5-6	7	8-11	12-13
01	10	3020	0002	04	3F FF FF FE	977D
Station No.	Write	Registers	Quantity	Number of bytes	CH1 off	CRC16

Return:

1	2	3-4	5-6	7-8
01	10	3020	0001	670A
Station No.	Write	Registers	Quantity	CRC16

- Read register

1	2	3-4	5-6	7-8
01	03	3020	0001	CAC1
Station No.	Read	Registers	Quantity	CRC16

Return:

1	2	3	4-7	8-9
01	03	04	3F FF FF FE	0667
Station No.	Read	Number of bytes	CH1 off	CRC16

12.5.9 [3100] Resistance Comparator Switch

Registers	3100	Read 03/Write 10
No. of Registers	1	
Number of bytes	2	0000: off 0001: on

- Write register

1	2	3-4	5-6	7	8-9	10-11
01	10	3100	0001	02	00 01	4753
Station No.	Write	Registers	Quantity	Number of bytes	Resistance comparator on	CRC16

Return:

1	2	3-4	5-6	7-8
01	10	3100	0001	0F35
Station No.	Write	Registers	Quantity	CRC16

- Read register

1	2	3-4	5-6	7-8
01	03	3100	0001	8AF6
Station No.	Read	Registers	Quantity	CRC16

Return:

1	2	3	4-5	6-7
01	03	02	0001	7984
Station No.	Read	Number of bytes	Resistance comparator on	CRC16

12.5.10 [3101] Voltage Comparator Switch

Registers	3101	Read 03/Write 10
No. of Registers	1	
Number of bytes	2	0000: off 0001: on

- Write register

1	2	3-4	5-6	7	8-9	10-11
01	10	3101	0001	02	00 01	4682
Station No.	Write	Registers	Quantity	Number of bytes	Voltage comparator on	CRC16

Return:

1	2	3-4	5-6	7-8

01	10	3101	0001	5EF5
Station No.	Write	Registers	Quantity	CRC16

- Read register

1	2	3-4	5-6	7-8
01	03	3101	0001	DB36
Station No.	Read	Registers	Quantity	CRC16

Return:

1	2	3	4-5	6-7
01	03	02	0001	7984
Station No.	Read	Number of bytes	Voltage comparator on	CRC16

12.5.11 [3102] Resistance Comparison Mode

Registers	3102	Read 03/Write 10
No. of Registers	1	
Number of bytes	2	0000: uniform setting 0001: independent setting

- Write register

1	2	3-4	5-6	7	8-9	10-11
01	10	3102	0001	02	00 01	46B1
Station No.	Write	Registers	Quantity	Number of bytes	Independent setting	CRC16

Return:

1	2	3-4	5-6	7-8
01	10	3102	0001	AEF5
Station No.	Write	Registers	Quantity	CRC16

- Read register

1	2	3-4	5-6	7-8
01	03	3102	0001	2B36
Station No.	Read	Registers	Quantity	CRC16

Return:

1	2	3	4-5	6-7
01	03	02	0001	7984
Station No.	Read	Number of bytes	Independent setting	CRC16

12.5.12 [3103] Voltage Comparison Mode

Registers	3103	Read 03/Write 10
No. of Registers	1	
Number of bytes	2	0000: uniform setting 0001: independent setting

- Write register

1	2	3-4	5-6	7	8-9	10-11
01	10	3103	0001	02	00 01	4760
Station No.	Write	Registers	Quantity	Number of bytes	Independent setting	CRC16

Return:

1	2	3-4	5-6	7-8
01	10	3103	0001	FF35
Station No.	Write	Registers	Quantity	CRC16

- Read register

1	2	3-4	5-6	7-8
01	03	3103	0001	7AF6
Station No.	Read	Registers	Quantity	CRC16

Return:

1	2	3	4-5	6-7
01	03	02	0001	7984
Station No.	Read	Number of bytes	Independent setting	CRC16

12.5.13 [3104] Beeper

Registers	3104	Read 03/Write 10
No. of Registers	1	
Number of bytes	2	0000: beeper off 0001: PASS beep 0002: FAIL beep

- Write register

1	2	3-4	5-6	7	8-9	10-11
01	10	3104	0001	02	00 00	8717
Station No.	Write	Registers	Quantity	Number of bytes	Beeper off	CRC16

Return:

1	2	3-4	5-6	7-8

01	10	3104	0001	4EF4
Station No.	Write	Registers	Quantity	CRC16

- Read register

1	2	3-4	5-6	7-8
01	03	3104	0001	CB37
Station No.	Read	Registers	Quantity	CRC16

Return:

1	2	3	4-5	6-7
01	03	02	0000	B844
Station No.	Read	Number of bytes	Beeper off	CRC16

12.5.14 Comparator Limit Settings

For the detailed register list refer to the “Register Overview” section.

[3110~3113] Comparator Channel 1 Limit Settings

Upper limit:

Registers	3110-3111	Read 03/Write 10
No. of Registers	2	
Number of bytes	4	Lower-limit floating point

- Write register

1	2	3-4	5-6	7	8-9	10-11
01	10	3110	0002	04	3C 23 D7 0A	895F
Station No.	Write	Registers	Quantity	Number of bytes	10mΩ	CRC16

Return:

1	2	3-4	5-6	7-8
01	10	3110	0002	4EF1
Station No.	Write	Registers	Quantity	CRC16

- Read register

1	2	3-4	5-6	7-8
01	03	3110	0002	CB32
Station No.	Read	Registers	Quantity	CRC16

Return:

1	2	3	4-5	6-7
01	03	04	3C 23 D7 0A	D85E

Station No.	Read	Number of bytes	100ms	CRC16

Upper Limit:

Registers	3112-3113	Read 03/Write 10
No. of Registers	2	
Number of bytes	4	Upper-limit floating point

- Write register

1	2	3-4	5-6	7	8-9	10-11
01	10	3112	0002	04	3C A3 D7 0A	096E
Station No.	Write	Registers	Quantity	Number of bytes	10mΩ	CRC16

Return:

1	2	3-4	5-6	7-8
01	10	3112	0002	EF31
Station No.	Write	Registers	Quantity	CRC16

- Read register

1	2	3-4	5-6	7-8
01	03	3112	0002	6AF2
Station No.	Read	Registers	Quantity	CRC16

Return:

1	2	3	4-7	8-9
01	03	04	3C A3 D7 0A	D9B6
Station No.	Read	Number of bytes	20mΩ	CRC16

12.5.15 [4000] Parameter Save

Parameter settings must be saved using register 4000; otherwise the data will be lost at the next power-on.

Registers	4000	Write-only 10
No. of Registers	1	
Number of bytes	2	0001: fixed value

- Write register

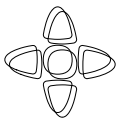
1	2	3-4	5-6	7	8-9	10-11

01	10	4000	0001	02	0001	2654
Station No.	Write	Registers	Quantity	Number of bytes	Fixed value	CRC16

Return:

1	2	3-4	5-6	7-8
01	10	4000	0001	1409
Station No.	Write	Registers	Quantity	CRC16

13. Specifications



You will learn about the following:

Technical specifications.
General specifications.
Dimensions.

13.1 Technical Specifications

The following data are measured under the following conditions:
Temperature condition: 23℃±5℃
Humidity: <65% R.H.
Zero adjustment: short-circuit zeroing before testing
Warm-up time: >60 minutes
Calibration interval: 12 months
Channel: CH1
Test speed: slow
Resistance specifications:

RANGE No.		1	2	3	4	5	6
RANGE		30mΩ	300mΩ	3Ω	30Ω	300Ω	3kΩ
Maximum Dispalyed Values		31.000m	310.00m	3.1000	31.000	310.00	3200.0
Resolution		1μΩ	10μΩ	100μΩ	1mΩ	10mΩ	100mΩ
Measured Current		100mA	10mA	1mA	100μA	10μA	10μA
ACCURACY	SLOW	±0.5% rdg. ±5 dgt					
	MEDIUM	±0.5% rdg. ±10 dgt					
	FAST	±0.5% rdg. ±10 dgt					
	EX.FAST	±1% rdg. ±20 dgt					
Temperature coefficient		(±0.05% rdg. ± 0.5 dgt.)/℃					

Voltage specifications:

RANGE No.		0	1
Maximum Dispalyed Values		±6.0600	±60.600
Resolution		100μV	1mV
AC	SLOW	±0.01%rdg. ±5dgt	

	MEDIUM	±0.05%rdg. ±7dgt
	FAST	±0.1%rdg. ±7dgt
Temperature coefficient		(±0.001% rdg. ±0.5 dgt.)/℃

13.2 General Specifications

Screen: TFT-LCD true-color display, 3.5-inch screen.

Test speed: With all channels on:

Slow: 4s/30 channels

Medium: 3s/30 channels

Fast: 2s/30 channels

Ranging mode: Manual

Calibration: Full-range short-circuit automatic zeroing and manual zeroing

File: Settings saved automatically

Trigger: Internal and external trigger.

Interface: Handler interface

RS232 interface, USB interface and RS485 interface

Programming language:SCPI and Modbus (RTU)

Auxiliary function: keyboard lock

Environment: Rated: temperature 18℃~28℃ humidity ≤65% RH

Operation: Temperature 10℃~40℃ Humidity 10~80% RH

Storage: Temperature 0℃~50℃ Humidity 10~90% RH

Power: 85VAC~250VAC

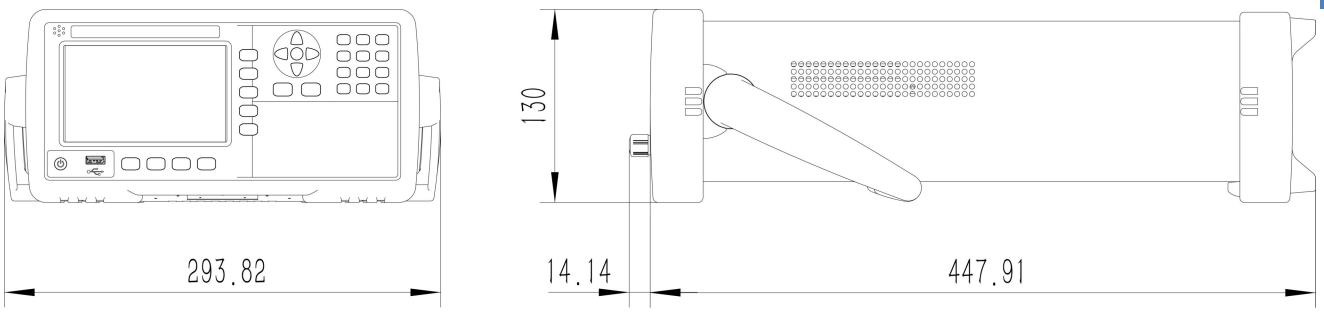
Fuse: 250V 2A slow-blow (internal)

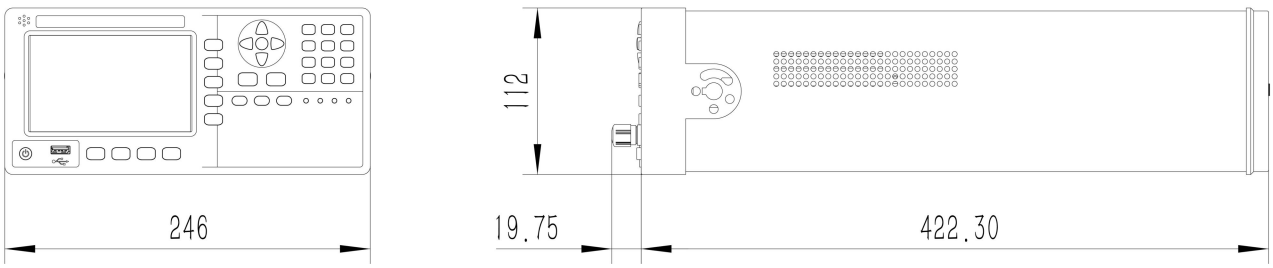
Power consumption: Max. 20VA

Weight: Approx. 5 kg.

13.3 Dimensions

(Schematic Diagram)





-AT5330 User Guide-

English Edition

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