



OPERATION MANUAL



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Company statement

The contents described in this manual may not be all the contents of the instrument. Jin Ailian has the right to improve and improve the performance, function, internal structure, appearance, accessories, packaging, etc. of this product without further explanation! For the confusion caused by the inconsistency between the manual and the instrument, you can contact our company through the address on the cover.

Chapter 1 Introduction to the instrument and unpacking installation

Thank you for purchasing and using our products! This chapter first introduces you to the basic performance of the instrument, and then describes some checks that must be performed after you receive the instrument, and you must understand the conditions that the instrument has before installing and using it.

1.1 Introduction to the instrument

JK2516 series DC resistance tester adopts the current mainstream 32-bit CPU and high-density SMD mounting process, 24-bit color 4.3-inch color LCD screen with touch function; the highest resistance measurement accuracy of 0.05% and the minimum resistance resolution of $1\mu\Omega$ are in China. It is second to none and can meet the general resistance measurement requirements; the offset voltage compensation function can effectively eliminate the electromotive force and the contact potential difference of the device under test.

JK2516 series products are powerful tools for various resistance design, inspection, quality control and production testing. Its ultra-high-speed test speed and the output of three levels of comparison results through the Handler interface make it suitable for automated operations on the production line. Its multiple output data display, comparison mode, file sorting, etc. can adapt to the different standard requirements of various resistance manufacturers. JK2516 series products can achieve various tests of commercial standards and military standards such as IEC and IML standards with their excellent performance.

1.2 Unpacking inspection

After unpacking, you should first check whether the appearance of the instrument is damaged due to transportation. We do not recommend that you power on the instrument if the appearance is damaged.

And please confirm according to the packing list. If there is any discrepancy, please contact our company or distributor as soon as possible to protect your rights and interests.

1.3 Power connection

- (1) Power supply voltage range: 90~125V, 190~250V.
- (2) Power supply frequency: 50Hz and 60Hz.
- (3) Power supply range: no more than 30 VA.
- (4) The power input phase line L, neutral line N, and bottom line E should be the same as the power plug of the instrument.
- (5) The instrument has been carefully designed to reduce the clutter caused by the AC power input, but it should still be used in a low-noise environment as much as possible. If it cannot be avoided, install a power filter.

Warning: In order to prevent damage to the instrument or people caused by electric leakage, the user must ensure that the ground wire of the power supply is reliably connected to the ground.

There is a 110V and 220V voltage switch next to the power connector on the rear panel. Pay attention to correct switching.

1.4 Fuses

The instrument has been equipped with a fuse at the factory, users should use the fuse provided by our company.

1.5 Environment

- (1) Please do not use it under dust, vibration, direct sunlight or corrosive gas.
- (2) When the instrument is working normally, the temperature should be 0°C~40°C and the relative humidity ≤80%RH, so please use the instrument under this condition as much as possible to ensure the accuracy of the measurement.
- (3) In order to ensure good ventilation, the test instrument must not block the side ventilation holes to ensure the accuracy of the instrument.
- (4) The instrument has been carefully designed to reduce the clutter caused by the AC power input, and it should still be used in a low-noise environment as much as possible. If it cannot be avoided, install a power filter.
- (5) The instrument will not be used for a long time. Please store it in the original packaging box or similar box in a ventilated room with a temperature of 5°C~40°C and a relative humidity of ≤85%RH. The air should not contain harmful instruments that corrode the measuring instrument Impurities, and direct sunlight should be avoided.
- (6) The instrument, especially the test lead connected to the device under test, should be kept away from strong electromagnetic fields to avoid interference with the measurement.

1.6 Using test fixtures

Please use the test fixtures or test cables provided by our company. The test fixtures or test cables made by users or other companies may cause incorrect measurement results. The instrument test fixture or test cable should be kept clean, and the pins of the device under test should also be kept clean to ensure good contact between the device under test and the test fixture. Connect the test fixture or test cable to the corresponding test end on the front panel of the instrument. Note that the color of the plug of the fixture and the position of the arrow on the instrument panel must be consistent, otherwise it may cause abnormal measurement.

1.7 Warm-up

- (1) In order to ensure accurate measurement of the instrument, the warm-up time should be no less than 30 minutes.
- (2) Please do not switch the instrument frequently to avoid internal data confusion.

1.8 Other characteristics of the instrument

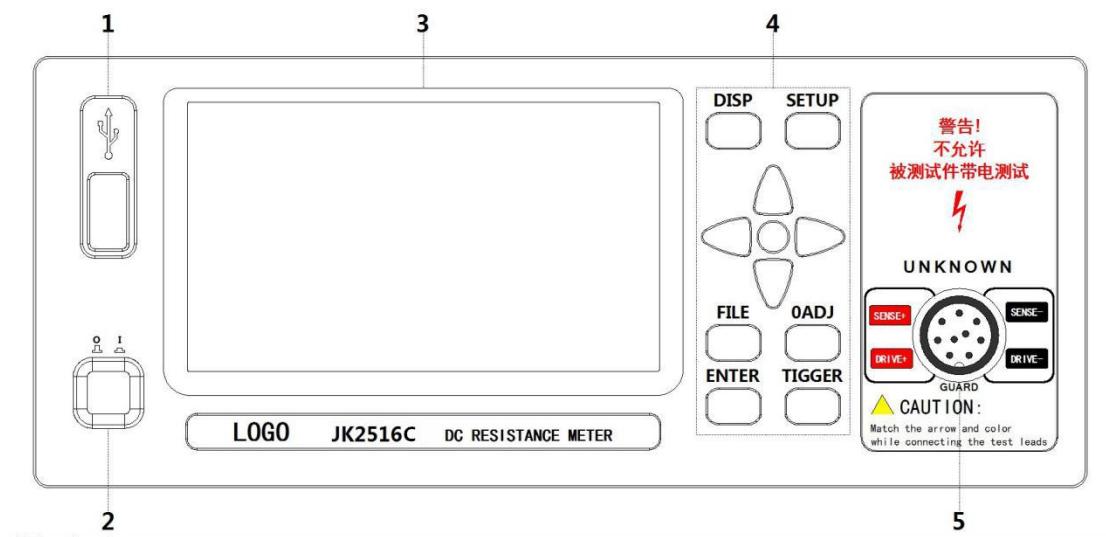
- (1) Power consumption: ≤30VA
- (2) Overall dimensions (W*H*D): 235mm*105mm*360mm; this size is the size after the jacket is added.
- (3) Weight: about 3.6kg;

Chapter 2 Front and rear panel description and getting started

This chapter describes the basic operation steps of JK2516 series instruments. Before using JK2516 series instruments, please read this chapter in detail so that you can quickly learn the operation of JK2516 series instruments.

2.1 Front panel description

Figure 2-1 briefly describes the front panel of JK2516.



No.	Name	directions
1	USB Interface	USB interface
2	Switch (POWER)	Switch
3	LCD	24-bit color 4.3-inch color TFT LCD screen, resolution 480 × 272 pixels, used to set test conditions and display of measurement results.
4	Trademark and model	Instrument trademark and model
5	Operation button area	
6	【FILE】menu	Press the [FILE] key to enter the "internal and external file management" interface (no)
7	【ENTER】menu	Key input confirmation, [ENTER] key is used to terminate the keypad data input, confirm and save the input data
8	【TRIGGER】menu	Used to change the trigger mode of the instrument INT/MAN
9	【DISP】menu	Press 【DISP】 to return to the measurement display interface
10	【SETUP】menu	Press 【SETUP】 to enter the software area options
11	【O ADJ】menu	Press 【O ADJ】 key to execute 0 calibration function
12	Arrow button	Up, down, left, and right directions buttons
13	O button	Function for confirming software area options

14	Test end (INPUT)	Four-terminal test terminal. Used to connect a four-terminal test cable to measure the device under test. The color of the plug of the test cable and the arrow indicate that it should correspond to the jack on the panel one by one, otherwise it may cause abnormal measurement results.
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2.2 Rear panel description

Figure 2-2 briefly describes the JK2516B rear panel.

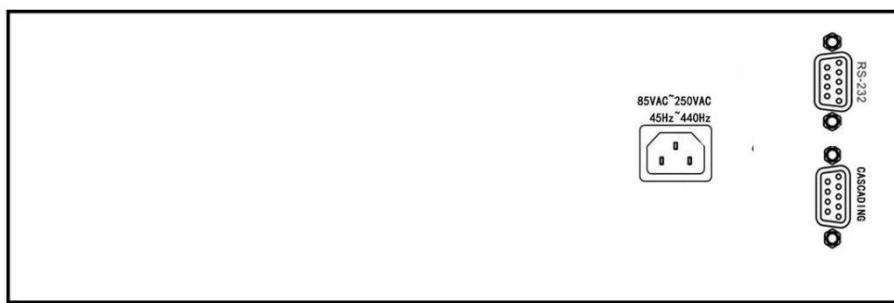


Figure 2-2 Description of the rear panel

(1) RS232C serial interface

Realize serial communication with computer.

(2) Fuse and power socket

Used to install power fuse to protect the instrument; input AC power.

(3) Nameplate

Used to indicate the specific model of the instrument.

2.3 Definition of display area

JK2516 series uses a 24-bit color 4.3-inch color LCD display with a resolution of 480*272.

The display is divided into

The area is displayed as shown below, as shown in Figure 2-3.



Figure 2-3 Display area definition

(1) Main menu area

This area indicates the name of the currently operated page.

(2) Tool area

Chinese and English switch of the instrument

(3) File area (not available yet)

You can perform some file management operations, including file management and full-screen copy.

(4) Software area

This area is used to display the function menu corresponding to the cursor area.

(5) Measurement result display area

This area shows the display of measurement results, such as resistance and temperature.

(6) Functional area

This area is used to modify the test mode and test parameters.

2.4 Buttons and their corresponding display pages

2.4.1 Measurement main menu button 【DISP】

Press (Disp) to enter the measurement display interface. The selectable function page menu corresponding to the soft key area is as follows:

<Measurement display>

<sort display>

<news>

<clear>

2.5 Basic operation

The corresponding menu function at the current cursor will be displayed in the "softkey area". Press the SETUP key to select the first soft key in the soft key area, and then

Use up and down keys to select, and press [O] key to confirm. When you select the area where you need to enter a number or file name, press the [O] key, the number key will be displayed

plate. You can use the up, down, left, and right keys to select numbers or letters and then press the [ENTER] key to confirm the input.

Chapter 3 Basic Operation

3.1 <Measurement display> page

Press the [DISP] menu key, and the <Measurement Display> page will be displayed on the screen.

As shown in Figure 3-1:



Figure 3-1 Measurement display page

The following measurement parameters can be set on this page.

Measurement display (main parameter R sorting result)

Test function (parameter R)

Resistance Range (Range AUTO)

Test speed (speed FAST)

system shows

Tools (single save, continuous save baud rate language)

Measurement mode (default routine test)

Sorting (sorting function switch)

Mode (display mode: direct reading + percentage)

Upper limit

Lower limit

3.1.1 Test function

The measurable parameters of JK2516 series are as follows:

R (resistance)

R-T (resistance and temperature) function is not open

T (temperature) function is not open

LPR (low current mode resistance test)

LPR-T (low current mode resistance test and temperature) function is not open

Note: The setting and modification of all functions can be done through the direction keys and O button.

Measurement function setting operation steps:

Use the up and down keys to select the parameter area, then the right side of the screen is displayed,
as the picture shows:



3.1.2 Test mode

Resistance test mode: one is normal test mode, temperature compensation mode (maximum range:100k Ω) , and reference mode.

Reference mode: Provide a test reference to the instrument through the external interface of the instrument for comparison of the tested parts

The measurement shows two types of parameters: resistance parameters and temperature parameters.

Temperature correction function (TC): The resistance value of the component obtained by the test at the current ambient temperature is converted to the environment set by the user

The resistance value of temperature, for example, the resistance value measured at 20°C is 100 Ω , and through the conversion of the calculation formula, the resistance is 10

The value at °C is 96.22 Ω .

Calculation formula:

$$R_t = R_{t0} * \{1 + at0 * (t - t0)\}$$

Rt: measured resistance value at current ambient temperature

t: measured value of current ambient temperature

Rt0: The resistance value at the set temperature is obtained after correction

t0: set temperature value

at0: temperature coefficient of the material

For example: the resistance value measured at 20°C is 100 Ω (assuming the material coefficient is 3930ppm), then the resistance value at 10°C is:

$$R_{t0} = \frac{R_t}{1 + at0 * (t - t0)} = \frac{100}{1 + (3930 \times 10^{-6}) \times (20 - 10)} = 96.22\Omega$$

Note: Before measuring, there must be enough time for the instrument and probe to warm up for a while, generally about half an hour, the temperature sensor should be as close as possible to the component under test, but do not touch it, wait for the measurement to display The value stabilizes before reading.

Temperature conversion (temperature conversion for short Δt): through the thermal effect of resistance, temperature conversion converts the change of resistance value into the difference between the internal temperature of the device under test and the ambient temperature.

Calculation formula:

$$\Delta t = \frac{R_2}{R_1} (k + t_1) - (k + t_a)$$

Δt : the difference between the temperature inside the device under test and the ambient temperature

t_1 : temperature corresponding to the device under test when the resistance value is R_1

t_a : ambient temperature at the time

R_1 : initial resistance measured at t_1

R_2 : Current resistance value of the device under test

K : Reciprocal of the temperature coefficient of the test piece (the reference is 0°C)

For example: the initial temperature resistance value R_1 is 200mΩ, the initial temperature t_1 is 20 °C, the resistance value R_2 after stabilization is 210mΩ, ambient temperature is $t_a = 25^\circ\text{C}$, k is 235, then:

$$\Delta t = \frac{R_2}{R_1} (k + t_1) - (k + t_a) = \frac{210 \times 10^{-3}}{200 \times 10^{-3}} (235 + 20) - (235 + 25) = 7.75^\circ\text{C}$$

Therefore, the temperature of the stabilized resistance value is:

$$t_R = t_a + \Delta t = 25 + 7.75 = 32.75^\circ\text{C}$$

In it

$$k = \frac{1}{at0} - t_0 = \frac{1}{3930 \times 10^{-6}} - 20 = 234.5$$

Note: Conductivity and temperature coefficient of metals and alloys

metallic material	Related metal content[%]	Material density ($\times 10^3$) [kg/m ³]	Conductivity	Temperature Coefficient (20°C) [ppm]
Annealed copper	Copper>99.9	8.89	1.00 to 1.02	3810 to 3970
Hard drawn copper	Copper>99.9	8.89	0.96 to 0.98	3370 to 3850
Cadmium copper	Cadmium: 0.7 to 1.2	8.94	0.85 to 0.88	3340 to 3460
Silver copper	Silver:0.03 to 0.1	8.89	0.96 to 0.98	3930
Chrome Copper	Chrome:0.4 to 0.8	8.89	0.40 to 0.50 0.80 to 0.85	20 30
Corrosion resistant alloy	Nickel:2.5 to 4.0 Silicon:0.5 to 0.1	---	0.25 to 0.45	980 to 1770
Soft aluminum	Aluminum>99.5	2.7	0.63 to 0.64	42
Hard drawn aluminum	Aluminum>99.5	2.7	0.60 to 0.62	40
Aluminum alloy	Silicon:0.4 to 0.6 Magnesium:0.4 to 0.5 Aluminum:99.2 to 98.9	---	0.50 to 0.55	36

Note: The calculation method of copper wire conductivity and temperature coefficient

Diameter[mm]	Annealed copper (conductivity)	Tinned annealed copper (conductivity)	Hard drawn copper (conductivity)
0.01 to 0.26	0.98	0.93	---
0.26 to 0.50	0.993	0.94	0.96
0.50 to 2.00	1.00	0.96	0.96
2.00 to 8.00	1.00	0.97	0.97

Due to temperature coefficient α_t Changes with temperature and the conductivity of the material, Assume that the temperature coefficient of a material at 20°C is α_{20} , Then the temperature coefficient of the material (conductivity C at t°C) at t°C α_{ct} is,

$$\alpha_{ct} = \frac{1}{\frac{1}{\alpha_{20} \times C} + (t - 20)}$$

JK2516 has 12 test ranges:

1GΩ、100MΩ、10MΩ 1MΩ 100kΩ、10kΩ、1kΩ、100Ω 10Ω、1Ω、100mΩ、10mΩ

JK2516A has 8 test ranges:

1MΩ 100kΩ、10kΩ、1kΩ、100Ω 10Ω、1Ω、100mΩ

JK2516C has 11 test ranges:

100MΩ、10MΩ 1MΩ 100kΩ、10kΩ、1kΩ、100Ω 10Ω、1Ω、100mΩ、10mΩ

Temperature test range (PT100) : -10°C--99.9°C

Test range setting operation steps:

- 1) Enter the measurement display interface, press the key to select the range area, the soft key area will display the following menu, as the picture shows:



- AUTO is used to set the range to automatic mode. HOLD is used to switch the range from AUTO mode to HOLD mode. When the range is set to HOLD mode, the range will be

locked at the current test range. The current test range will be displayed in the range area of the screen.

■ ↑ (+) Used to select the range upward.

■ ↓ (-) Used to select the range downward.

3.1.3 Test speed

JK2516, 2516C resistance test result data is displayed with 6 digits in decimal point floating mode, 2516A resistance test result data is 5 digits displayed, temperature test result is displayed with 4 digits, and one digit after the decimal point.

1) Press the key to select the speed area, the soft key area will display the following menu, as the picture shows:



■ FAST

■ MED

■ SLOW

2) Select the above soft keys to modify the settings.

3.1.4 Trigger settings

1) Press the key to select the trigger area, the soft key area will display the following menu, as the picture shows:



- INT
- EXT

3.1.5 Tools

Tool operation steps:

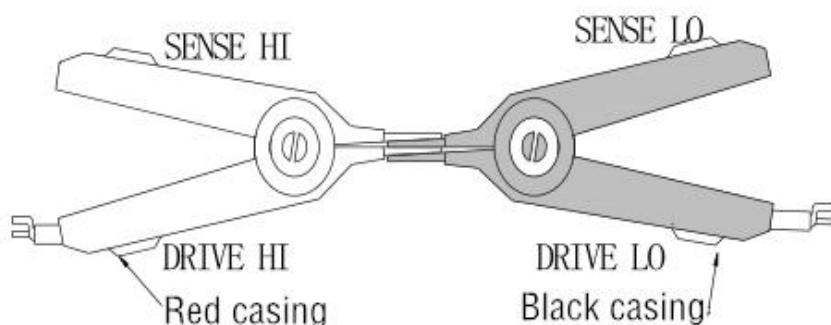
Display (ON/OFF): A switch for displaying the measured value. ON means to display the measured value, and OFF does not display.

0ADJ(ON/OFF): OFF means to turn off the short-circuit reset function, ON means to turn on this function.

0ADJ: Perform short-circuit clearing operation. During this process, it is necessary to ensure that the test terminal has a good short circuit, otherwise it will bring unnecessary errors to the subsequent measurement results.

Note: Measurement speed: When SLOW1, MED, and FAST, the measurement result is displayed in 5 digits.

Clearing operation: when using this key for short-circuit clearing, the test fixture should be shorted correctly, otherwise it will cause the deduction of data error, thus causing the deviation of the test results. The correct shorting method is shown below:





About reset:

In order to achieve high-precision measurement, zero calibration is necessary. Press the SETUP key on the panel to enter and use the up and down cursors to select zero to open Clearoff

Press the key to enter the interface for preparing to clear. Before starting to reset, please short-circuit the test clip as follows.

3.2 <Compare display> page

Enter the measurement display interface, press the setting key to select the Comp display, and press the confirm key <Comp display> to enter the interface.

As shown in Figure 3-2:



Figure 3-2 compare display page

The following parameters can be set on the <Comp Display> page.

- file
- tool
- Comp
- Comp mode

Upper limit

Lower limit

3.2.1 Compare

Press the up and down keys to select to enter the compare, select the setting key, press the up and down keys to select "ON", "OFF" as the picture shows:



Comp (ON/OFF): The ON comparison function is turned on. Only when this value is ON, the sorting signal will work.

OFF turns off this function.

3.2.2 Comp mode, upper and lower limits, percentage error settings

Press the up and down keys to select the mode, press the setting key to enter the setting interface, press to select two modes: ABS, %, and then set the corresponding value. as the picture shows:



Comp mode

■ABS (upper and lower limits)

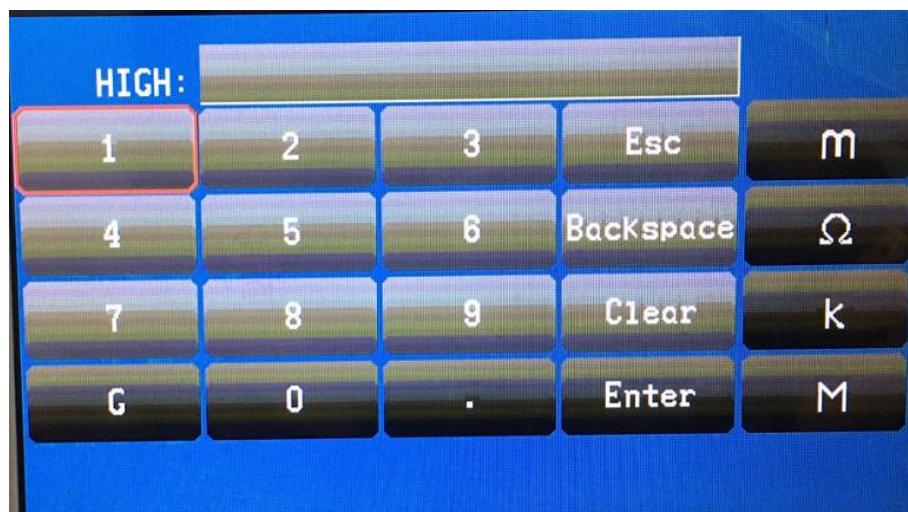
Select this mode to set the upper and lower limit values. The measured value will be compared with the set value to determine whether it is higher than (HI) or lower than (LO). If it is within the range of the set value It is a qualified product (IN). The upper limit must be greater than or equal to the lower limit.

■% (percentage error)

Select this mode, you can set the nominal value and percentage, if the set nominal value is 100, the percentage is 10, then this value: $100 \pm 10\%$, compare the measured value with this set value , Judge whether it is higher than (HI) or lower than (LO), if it is within the range of the set value, it is a qualified product (IN). The nominal value is the reference value of the deviation display mode.

3.2.3 Upper and lower limit settings

Press the key to select the upper limit, press O to enter the upper limit setting interface,as the picture shows:



Use the up and down keys to select the value, and press the enter key to select, up to 6 digits can be set.

If you find a setting error, you can select "Backsapce", press the confirm button to delete the data, select "clear", press the confirm button to reset. After setting, select "Enter", click the confirm button to confirm the setting result, select "Esc", click the confirm button to exit the upper limit setting interface and enter the measurement display interface.

The steps of lower limit setting and upper limit setting are the same.

3.3 <File Display> page (function is not open)

Press the <Measurement Display> or [MEAS] button on the screen, and then press the file display in the soft key area to enter the <File Display> page. As shown in Figure 3-3:

		Doc	Tool	Meas Disp
Shift ON	Shift Alarm NG	NG Color Red	GD Color Green	Comp Disp
R: 479.67 Ω				Shift Disp
BIN: 1 2 3				Stats Disp
				More
				11:36:54

Figure 3-3 File comparison display page

The following parameters can be set on the <File Display> page.

- File
 - File management: Press this touch key to enter the file operation page.
 - Full Screen Copy: Press this touch key to intercept the current screen content into an image format and save it to a USB flash drive. If the user has not inserted a USB flash drive before, it will not be saved.
 - Save data OFF: Press this touch button, this button will change to <Save data ON>, indicating that the current test result will be continuously saved to the .CSV file of the U disk after each measurement, if the user has not inserted U before Disk, it is not saved. Press <Save Data ON> again, it will change to <Save Data OFF> again, at this time stop saving data. Each time you switch OFF and ON, a new .CSV file is created in the U disk. Open this file through the computer to analyze the measured data set.
 - Tools
- Chinese and English switch of the instrument

Chapter 4 Performance Index

4.1 Measurement function

4.1.1 Measurement parameters and symbols

R: resistance

LPR: Low current mode

4.1.3 Range

Range mode: automatic, manual (hold, increase, decrease)

4.1.4 Trigger

Internal, manual

Internal: Continuous measurement of the DUT and output of the results

Manual: Press the PLC "TRIGGER" key, the measuring instrument performs a measurement and displays the results, usually in a waiting state.

4.1.5 Test terminal method

Using four-terminal measurement

DRIVE HI: current drives high-end

SENSE HI: high-end voltage sampling

DRIVE LO: current drive low end

SENSE LO: voltage sampling low end

4.1.6 Resistance measurement time

Measurement time= 100ms +t1 (50 Hz)	/	100ms+t1 (60 Hz)	Fast
130 ms+t1 (50 Hz)	/	130ms+t1 (60 Hz)	Middle
170ms+t1 (50 Hz)	/	170 ms +t1 (60 Hz)	Slow

Note: t is the measurement waiting time, t1 is the data processing time, about 5ms.

4.1.7 Average (function not open)

1-255 programmable: This number reflects the number of measurements during the process of measuring resistance to the measured value display.

4.2 Test signal

4.2.1 Range current

JK2516:Range current: 1µA -- 1A

JK2516A: Range current: 10µA – 100mA

JK2516C:Range current: 1µA -- 1A

4.2.2 Open circuit output voltage

Open circuit output voltage: 1V~10V

4.2.3 Measurement display maximum range

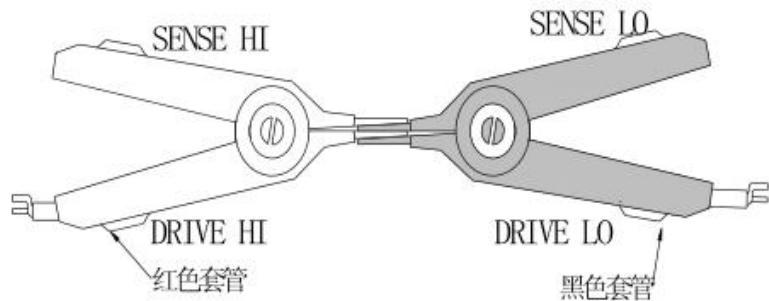
Parameter	Measurement display range
R	1µΩ — 2MΩ
LPR	0.1mΩ—2.1kΩ

4.3 Measurement accuracy

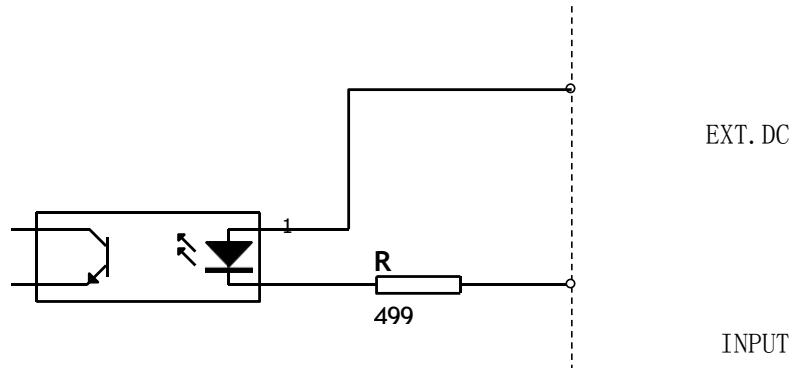
When checking the measurement accuracy of the instrument, it must be carried out under the following conditions:

- a. Warm-up time at start up: ≥30 minutes.
- b. The test cable is correctly short-circuited, 0ADJ is ON, press the touch key or press panel 0ADJ to perform short-circuit calibration.

The correct short-circuit method of the test cable is shown in the figure below:



Input schematic



Note: In order to avoid damage to the interface, the power supply voltage should not exceed the power supply requirements. In order to avoid damage to the interface, please wire after the instrument is turned off.

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

Chapter 5 Technical Specifications

The following data are measured under the following conditions:

Temperature condition: $23^{\circ}\text{C} \pm 5^{\circ}\text{C}$

Humidity condition: 80%RH

Zero value adjustment: Zero warm-up time before test: >60 minutes

Calibration time: 6 months

Sampling rate:

Fast: about 60 times/second

Medium speed: about 10 times/second

Slow speed: about 2 times/second

High speed: about 167 times/second

(VFD display turns off the numerical display)

Test current accuracy: 0.001%

JK2516

Range		Maximum display value	Resolu-tion	Fast	Middle, Slow	Test current	Open circuit voltage
11	10mΩ	11.5000mΩ	0.1Ω	0.2%±200 bytes	0.1%±10 bytes	1A	≤1V
10	100mΩ	115.000mΩ	1Ω	0.1%±100 bytes	0.05%±4 bytes	100mA	≤1V
9	1Ω	1.15000Ω	10Ω	0.05%±20 bytes	0.02%±2 bytes	100mA	≤1V
8	10Ω	11.5000Ω	0.1mΩ	0.05%±20 bytes	0.01%±2 bytes	10mA	≤1V
7	100Ω	115.000Ω	1mΩ	0.02%±10 bytes	0.01%±2 bytes	1mA	≤5V
6	1kΩ	1.1500kΩ	10mΩ	0.02%±5 bytes	0.01%±2 bytes	1mA	≤5V
5	10kΩ	11.5000kΩ	0.1Ω	0.02%±5 bytes	0.01%±2 bytes	1mA	≤5V
4	100kΩ	115.000kΩ	1Ω	0.05%±5 bytes	0.02%±2 bytes	<100uA	≤10V
3	1MΩ	1.15000MΩ	10Ω	0.1%±20 bytes	0.05%±3 bytes	<10uA	≤10V
2	10MΩ	11.5000MΩ	0.1kΩ	0.2%±50 bytes	0.1%±10 bytes	<10uA	≤10V
1	100MΩ	115.0MΩ	0.1MΩ	≤110M: 0.3%±50 bytes >110M: 1%±100 bytes	≤110M: 0.2%±10 bytes >110M: 0.5%±50 bytes	<10uA	≤10V
0	1G	1.15G	10M			<10uA	≤10V

JK2516A

Range		Maximum display value	Resolution	Fast	Middle, Slow	Test current	Open circuit voltage
10	100mΩ	115.000mΩ	1Ω	0.1%±100 bytes	0.05%±4 bytes	100mA	≤1V
9	1Ω	1.15000Ω	10Ω	0.05%±20 bytes	0.02%±2 bytes	100mA	≤1V
8	10Ω	11.5000Ω	0.1mΩ	0.05%±20 bytes	0.01%±2 bytes	10mA	≤1V
7	100Ω	115.000Ω	1mΩ	0.02%±10 bytes	0.01%±2 bytes	1mA	≤5V
6	1kΩ	1.1500kΩ	10mΩ	0.02%±5 bytes	0.01%±2 bytes	1mA	≤5V
5	10kΩ	11.5000kΩ	0.1Ω	0.02%±5 bytes	0.01%±2 bytes	1mA	≤5V
4	100kΩ	115.000kΩ	1Ω	0.05%±5 bytes	0.02%±2 bytes	<100uA	≤10V
3	1MΩ	1.15000MΩ	10Ω	0.1%±20 bytes	0.05%±3 bytes	<10uA	≤10V

JK2516C

Range		Maximum display value	Resolution	Fast	Middle,Slow	Test Current	Open Circuit voltage
11	10mΩ	11.5000mΩ	0.1Ω	0.2%±200 bytes	0.1%±10 bytes	1A	≤1V
10	100mΩ	115.000mΩ	1Ω	0.1%±100 bytes	0.05%±4 bytes	100mA	≤1V
9	1Ω	1.15000Ω	10Ω	0.05%±20 bytes	0.02%±2 bytes	100mA	≤1V
8	10Ω	11.5000Ω	0.1mΩ	0.05%±20 bytes	0.01%±2 bytes	10mA	≤1V
7	100Ω	115.000Ω	1mΩ	0.02%±10 bytes	0.01%±2 bytes	1mA	≤5V
6	1kΩ	1.1500kΩ	10mΩ	0.02%±5 bytes	0.01%±2 bytes	1mA	≤5V
5	10kΩ	11.5000kΩ	0.1Ω	0.02%±5 bytes	0.01%±2 bytes	1mA	≤5V
4	100kΩ	115.000kΩ	1Ω	0.05%±5 bytes	0.02%±2 bytes	<100uA	≤10V

3	1MΩ	1.15000MΩ	10Ω	0.1%±20 bytes	<i>0.05%±3 bytes</i>	<10uA	≤10V
2	10MΩ	11.5000MΩ	0.1kΩ	0.2%±50 bytes	<i>0.1%±10 bytes</i>	<10uA	≤10V
1	100MΩ	115.0MΩ	0.1MΩ	≤110M: 0.3%±50 bytes >110M: 1%±100 bytes	≤110M: 0.2%±10 bytes >110M: 0.5%±50 bytes	<10uA	≤10V

Note: Rd is the display reading of the measuring instrument; Fs is the full scale.

5.1 General specifications

Screen: 4.3 inches

Display range: 0.1u~ 1G,

Minimum resolution: 0.1 .

Maximum reading: 105000

Test signal: 10m ~10k

Range constant current test, 100k~1G

Range constant pressure test. Trigger:

Internal, manual, external and remote triggering.

Range: automatic and manual.

Clear: Clear short circuit.

Comparator: output NG-LO, GD-IN, NG-HI, built-in 30 sorting records.

Signal: Pass (GD), fail (NG), OFF setting.

Test terminal: 4-terminal shield (including 2 detection terminals and 2 drive terminals) and external shield ground terminal.

Interface: Handler interface;

RS232 interface;

Programming language: SCPI

surroundings:

Index: temperature 15℃~35℃ humidity <80% RH

Operation: temperature 10℃~40℃ humidity 10~90% RH

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

Power supply: 198V ~ 252VAC 48.5Hz ~ 52.5Hz

Fuse: 0.5A slow blow

Power: 15VA max

Weight: about 3kg.

Included accessories: instruction manual, ATL501 four-terminal Kelvin cable, AC power cord, verification report, quality assurance.

Chapter 6 Remote control (function not open)

PLC interface description:

- 1-3: external trigger short circuit signal input (short circuit >200mS is effective)
- 6-7: Unqualified switch signal output
- 8-9: Qualified switch signal output

6.1 RS232C interface description

The currently widely used serial communication standard is the RS-232 standard, which can also be called the asynchronous serial communication standard. RS is the abbreviation of the English name of "Recommended Standard" (recommended standard), and 232 is the standard number. This standard is the US electronics industry. The Association (IEA) officially announced the standard in 1969, which stipulates that it should be transmitted one data line at a time. Like most serial ports in the world, the serial interface of this instrument is not strictly based on the RS-232 standard, but only provides a minimal subset. The following table:

Signal	Abbreviation	Connector pin number
Transmit data	TXD	2
Receive data	RXD	3
Ground	GND	5

The reason is that the operation of three lines is much cheaper than the operation of five or six lines. This is the biggest advantage of using serial port communication.

The connection between the instrument and the computer is shown in Figure 6-1:

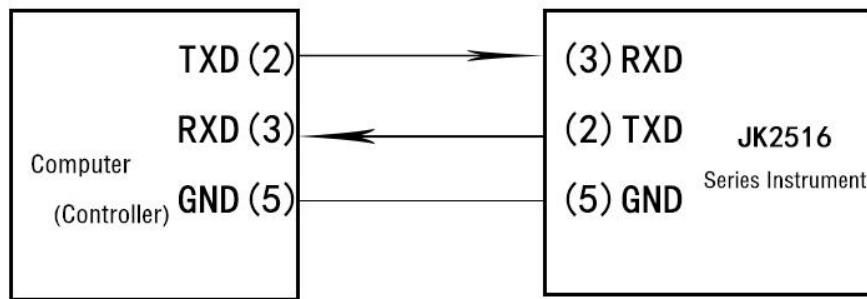


Figure 6-1 Schematic diagram of connection between computer and instrument

As can be seen from Figure 6-1, the pin definition of the instrument is different from that of the 9-pin connector serial interface used by the computer. Users can buy the serial interface cable of computer and Jinke instrument from Changzhou Jin Ailian Electronic Technology Co., Ltd.

RS232 interface baud rate 9600, no parity, 8 data bits, 1 stop bit.

For the format of the result data sent by the instrument to the computer, refer to the description of the command reference section.

RS-232C communication protocol

RS-232 serial interface can be interconnected with the serial interface of the controller (for example: personal computer or industrial computer) through a straight-through DB-9 cable.

Note: The instrument cannot use null modem cables.

You can directly make or purchase 9-core straight-through cables from Jinke Instruments.

The user-made 3-wire cable should pay attention to:

- Using the DB9 port of the PC, you may want to short-circuit 4-6 and 7-8 of the DB-9 connector (pin) on the computer side

Figure 6-1 RS-232 interface on the rear panel



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

The default communication settings of the instrument:

Transmission mode: full-duplex asynchronous communication with start bit and stop bit

Data bits: 8 bits

Stop bit: 1 bit

Check digit: None

The basic format of the data sent by the host computer is: (computer -> JK2516)

AB+command word+data and decimal point+unit+AF 11 data in total (DB0—DB10)

Any command sent by the computer starts with AB and ends with AF. A total of 11 data are sent.

No.	Command function	Command data	Format/Remarks
The digital data format is: 5 data + 1 decimal point			
	X. XXXX	X 2EH XXXX	
	XX. XXX	XX 2EH XXX	
	XXX. XX	XXX 2EH XX	
Note: Set the resistance to decimal. Example: If the upper limit of resistance is set to 123.45Ω , the data format sent is:			
	ABH EAH 1H 2H 3H 2EH 4H 5H A1H 00H AFH		

1	Set resistance upper limit	EAH	ABH EAH Data+decimal point unit(A0—A3)
2	Set resistance lower limit	EBH	ABH EBH Data + decimal point unit(A0 — A3) AFH
3	Set percentage upper limit	EDH	ABH EDH Data+decimal point AFH
4	Set percentage lower limit	EFH	ABH EFH Data+decimal point AFH
5	Set nominal value	ECH	ABH ECH Data + decimal point unit(A0 — A3) AFH
6	Reset	D9H	ABH D9H open(55H)or close (5AH) AFH
7	Set sort	DAH	ABH DAH open(55H)or close (5AH) AFH
8	Set alarm	DBH	ABH DBH open pass(55H) , Failure (AAH) or close(5AH) AFH
9	Set display	DDH	ABH DDH %(55H)or R(5AH) AFH
10	Set speed	DEH	ABH DEH fast (55H) or slow (5AH) AFH
11	Set method	DFH	ABH DFH locking(55H)or automatic (5AH) AFH
12	Set trigger	DCH	ABH DCH external (55H)or internal (5AH) AFH
13	Single	9DH	ABH 9DH AFH Single time is valid when the trigger is outside, press once to measure once
14	Initialization	ADH	ABH ADH AFH Program initialization

Unit (1-bit)	
mΩ	A0H
Ω	A1H
KΩ	A2H
MΩ	A3H

The basic format for the host computer to receive the measurement data is: (JK2516BB → Computer) ABH + measurement data (6 digits) + unit (1 digit) + sorting result (1 digit) + measurement status (1 digit) + AFH

Any measurement data packet received by the computer starts with AB and ends with AF. A total of 11 data are received as one data packet.

The 6-bit measurement data are (this data is only output from the lower computer during the test).

Measurement data (6 bit)	
Space	20H
Decimal point	2EH
Number	0—9

Sort result (1 bit)	
High	B0H
Pass	B1H
Low	B2H
Close sort	B4H

Unit (1 bit)	
mΩ	A0H
Ω	A1H
KΩ	A2H
MΩ	A3H
Percentage	A4H

Measurement state (1 bit)	
Direct reading	C0H
Error	C1H
upper ultra,	C2H
lower ultra	C3H
Percentage	C4H

The lower computer sends data to the computer once every test, and sends one data packet at a time. The format is based on the above.

There is an initialization process when the program is turned on:

When the initialization starts, the computer sends the command ADH to the lower computer. After the lower computer receives the command, it transmits the initialization data to the computer. The computer initialization interface makes the data status of the upper computer and the lower computer consistent.

The instructions sent by the lower computer are sent in the form of data packets: a total of 6 data packets are sent.

Packet No.	Command function	Command data	Format/Remarks
1	Send resistance upper limit	EAH	ABH EAH Data+Decimal point Unit (A0—A3) AFH
2	Send resistance lower limit	EBH	ABH EBH Data+Decimal point Unit (A0—A3) AFH
3	Send percentage upper limit	EDH	ABH EDH Data+Decimal point AFH
4	Send percentage lower limit	EFH	ABH EFH Data+Decimal point AFH

5	Send nominal value	ECH	ABH ECH Data+Decimal point Unit (A0—A3) AFH
6	Send status	ADH	ABH ACH Open(55H)or Close(5AH) AFH
			The state sequence is: clear sorting information ring display speed mode trigger

Note: Currently only the computer receives the test data, the computer cannot control the instrument

Chapter 7 Complete set and warranty

7.1 Complete set

The following items should be provided when the instrument leaves the factory:

No.	Name	Quantity
1	JK2516 series instrument	1 Set
2	JK26050A Four-terminal test cable	1 Piece
3	Three-wire power cord	1 Piece
5	2A Fuse	2 Pieces
6	User Manual	1 Copy
7	Product Certification	1 Copy
8	Test Report	1 Copy
9	Warranty Card	1 Copy

After receiving the instrument, the user should check the above contents when unpacking the inspection. If there is any deficiency, please contact the company or the operation department immediately.

7.2 Logo

Each instrument panel or nameplate has the following signs.

- a. The name or trademark of the manufacturer;
- b. Product name and model;
- c. Product number and year of manufacture;
- d. Mark and number of the license for manufacturing measuring instruments;
- e. Test terminal sign;

7.3 Packaging

The measuring instruments are usually packed in plastic bags with accessories, spare parts, instruction manuals and product certificates in a sturdy packaging box that is dust-proof, shock-proof and moisture-proof.

7.4 Transportation

The measuring instrument should be handled with care, moisture, and shower during transportation.

7.5 Storage

The measuring instrument is stored in a ventilated room with an ambient temperature of 5°C to 40°C and a relative humidity of not more than 85%. The air should not contain harmful impurities that corrode the measuring instrument.

7.6 Warranty

Warranty period: The user unit purchases the instrument from the company, calculated from the company's shipping date, and the purchaser from the operating department, calculated from the shipping date of the operating department, the warranty period is two years. The warranty card shall be issued for the instrument. During the warranty period, if the user damages the instrument due to improper operation of the user, the maintenance cost shall be borne by the user. The instrument is responsible for lifetime maintenance by the company.

The maintenance of this instrument requires professional and technical personnel to perform maintenance; please do not replace the internal components of the instrument without authorization;

After maintenance, you must re-measure and calibrate, so as not to affect the test accuracy. Because the user blindly repairs, the damage to the instrument caused by replacing the instrument parts is not covered by the warranty, and the user should bear the maintenance cost.