

# OPERATION MANUAL

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# OPERATION MANUAL

## **JK2683/7200A** Insulation Resistance Tester

Vear1.0

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## Chapter 1 Overview

### **I. Introduction:**

JK7200A/2683 insulation resistance tester is a measuring instrument for measuring the insulation performance of electronic components, dielectric materials, equipment, wires and cables.

JK2683 can be used for diode reverse leakage current test, it is specially used for testing diode reverse leakage current

The instrument is controlled by a single-chip microprocessor, with simple operation and complete functions. It has the characteristics of wide measuring voltage range and fast speed. The output voltage, measuring range resistance, insulation resistance of the measured object, memory group, etc. are displayed on a 20X2 character LCD screen.

The instrument has 5 memory groups to save the sorting extreme value, range automatic and lock, sorting output and external trigger input interface and other functions. The instrument has super anti-interference and anti-impact ability to make the test more direct, more convenient and more reliable.

## 2. Technical indicators:

Model	JK2683	JK7200A
Set measurement voltage	10-1000V	10-1000V
No-load output voltage	$\pm 1\%$ setting voltage $\pm 1V$	
Voltage display accuracy	$\pm 1\%$	
Resistance measurement range	$1 \times 10^3 \Omega - 1 \times 10^{11} \Omega$ 1k $\Omega$ - 1T $\Omega$	$1 \times 10^3 \Omega - 1 \times 10^{11} \Omega$ 1k $\Omega$ - 1T $\Omega$
Resistance measurement accuracy	$< 10G\Omega$ $\pm 3\%$ $\pm 3$ bytes	
	$\geq 10G\Omega$ $\pm 8\%$ $\pm 3$ bytes	
Current	1nA~20mA	no
Range control	Automatic / manual	
measurement method	Continuous/remote control single	
Display method	Voltage: four significant figures; resistance: four or five significant figures	
Test speed	About 5-6 times/sec	
Sorting preset range	0—999999M $\Omega$ (0 means no sorting) 1 file sorting, 5 groups of memory	
Sorting judgment	Pass/Fail	
Ring type	Pass/Fail/Close	
Clear way	open circuit clear	
Interface method	Sorting output (pass/fail), remote control signal input (optional)	
Weight	About 5Kg	
Power consumption	$\leq 40W$	
Power supply	220V ( $1 \pm 10\%$ ) / 50Hz ( $1 \pm 5\%$ )	
Preheat time	Enter the accuracy range in about 15 minutes	
Size	280mm $\times$ 100mm $\times$ 370mm	

## 3. Use environment:

3.1. The working temperature for the instrument to meet the accuracy requirements: 10°C-30°C,

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humidity:  $\leq 65\%RH$ .

3.2. In order to ensure the measurement accuracy of the instrument or not damage the instrument, please pay attention to the following:

- a. Do not use the instrument in dusty, vibrating, direct sunlight or corrosive gas.
- b. Although the instrument has dealt with the AC noise of the power supply, it is still used in an environment with low noise as much as possible. If it is unavoidable, please add a stabilized power supply for the instrument.

3.3. Please store this instrument in an environment with a temperature of  $0^{\circ}C-40^{\circ}C$ . If it is not used for a long time, it should be packaged and stored.

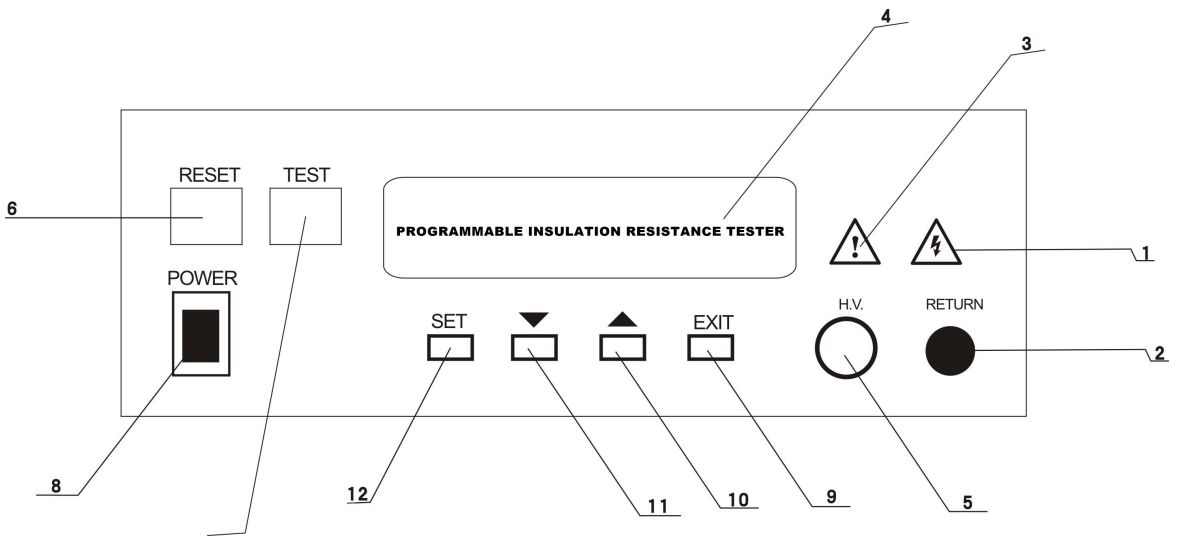
## Chapter 2 Instrument Structure

### 1. Front panel description: The outline diagram of the front panel is shown in Figure 2-1

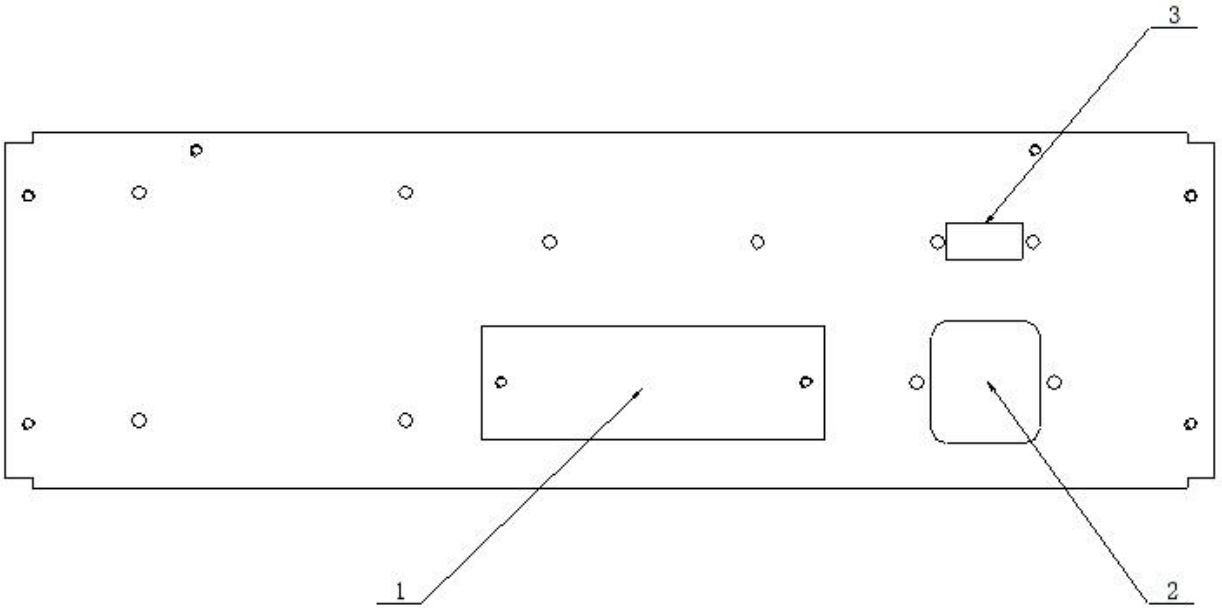
No.	Name	Description
1	Voltage output indicator	
2	Test end	Connect the DUT, signal input terminal
3	Test end	Connect the DUT, voltage output terminal
4	Ground terminal	Connect the shield end of the DUT
5	LCD screen	Display various setting information or test results, etc.
6	Reset button and sorting lamp	Reset and test failure indication
7	Start button and sorting light	Start and test pass indication
8	Switch	Control instrument power
9	EXIT key	Set exit and reset
10	DOWN key	Set input data and range selection, etc.
11	UP key	Set input data and range selection, etc.
12	SET key	Setting function selection, etc.

### 2. Rear panel description: The outline diagram of the rear panel is shown in Figure 2-2

No.	Name	Description
1	Power input and fuse socket	Please connect to 220V/50Hz power supply, 1A fuse
2	Nameplate	Displays the date of manufacture, instrument number and company name
3	HANDLER interface (optional)	Sorting output and external trigger signal interface



**Figure 2-1 JK7200A front panel schematic diagram**



**Figure 2-2 Schematic diagram of the rear panel of JK7200A**

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## Chapter 3 Principles of Work

### 1. Test principle: V/I method measurement

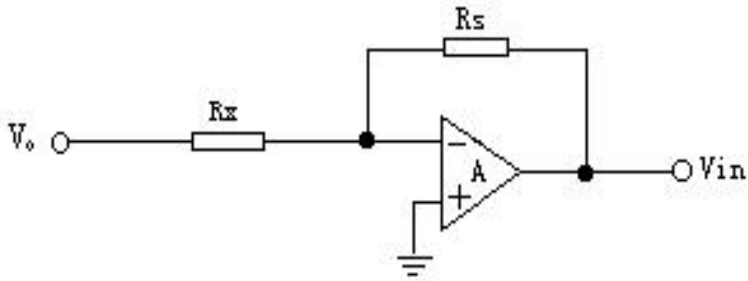


Figure 3-1 Test principle diagram

In Figure 3-1:  $V_o$  is the measured voltage,  $R_x$  is the measured resistance,  $R_s$  is the precision resistance,  $V_{in}$  is the sampling voltage,

The measuring resistance and the feedback resistance of the operational amplifier A (ie the range resistance  $R_s$ ) form a negative feedback amplifier circuit. Sample  $V_{in}$

The  $R_x$  calculation formula can be obtained:

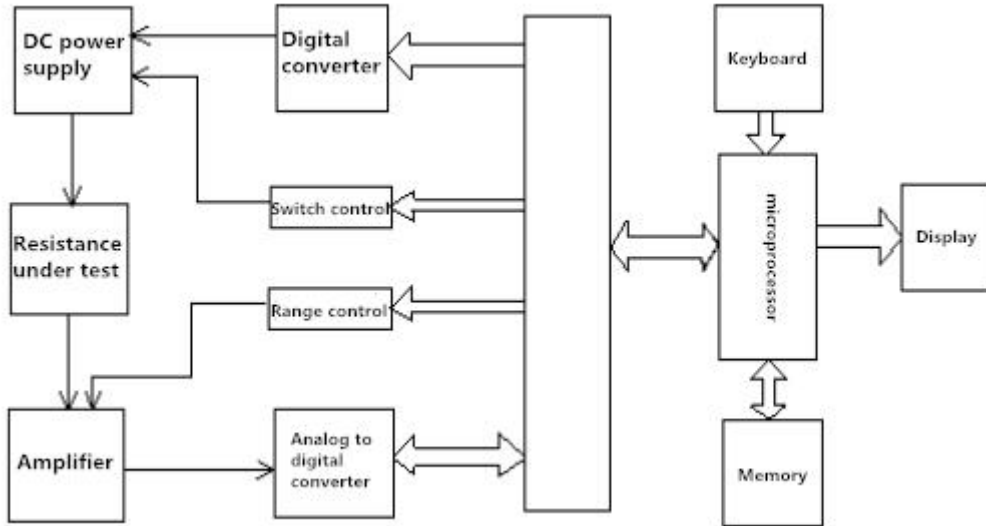
$$R_x = - R_s V_o / V_{in}$$

The test data is displayed on the LCD screen after being processed by the MCU.

### 2. Brief description of principle block diagram:

Figure 3-2 is the block diagram of the JK2683 insulation resistance tester.

The microprocessor is the center of all operation commands of the instrument. It obtains input parameters from the keyboard to complete all measurement control. It calculates the obtained measurement values according to a certain formula and sends the calculation results to the LCD screen for display.



3-2 Principle block diagram

## Chapter 4 Operation Description

This chapter will introduce the operation of this instrument in detail, please read it carefully before operation to avoid improper operation endangering life safety And damage the instrument.

### 1. Power on status

After booting, the LCD screen displays the instrument model and functions, and the boot display screen is as follows:

JK2683	
Insulation	R_Meter

After displaying for a few seconds, the LCD screen displays the memory group and its setting parameters in the last test, and enters the state to be tested, the display screen is as follows:

IR	TEST	M2	1MΩ
10 0	V	— — — — —	MΩ

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If you press  $\wedge$  (up) key or  $\vee$  (down) key to test any one of 5 groups of memory groups (M1—M5) in the state to be tested, if the memory group is not changed, it will be initially tested The status parameters are as follows:

1. Test voltage: the set value in a certain memory group after the user's last test, such as: 100V
2. Test range: initial range 1M $\Omega$ , automatic
3. Sorting preset value: the set value in a certain memory group after the user's last test
4. Sound condition: last time user set condition
5. Remote control test: closed

## Parameter setting status:

### 1. Test voltage setting:

Press the SET key to enter the test voltage setting in the state to be tested, the screen is as follows:

VOLTAGE = XXX V
RANGE: 10—1000

If you want to set the parameters in a certain memory group, please change to the corresponding memory group in the state to be tested, and then press the setting key to set.

After entering the setting voltage, the last voltage setting value in this memory group will be displayed. The voltage setting range is 10-1000V, and the step-by-step setting voltage is 1V. You can use the  $\wedge$  (up) key or  $\vee$  (down) key to change the value of the set voltage.

Specifically: when pressing the  $\vee$  key first, the setting starts from the single digit of the set voltage, the number will decrease from 9 to 0 and then cycle to 9; when the number has been changed to the single digit of the set voltage, press  $\wedge$  Key to set the tens digit of the voltage, the number will increase from 0 to 9 and then cycle to 0; when the number has been changed to the tens digit of the set voltage, press the  $\vee$  key again, the hundreds digit of the voltage will be set, The number will decrement from 9 to 0 and then cycle to 9. When the number has been changed to the hundreds digit of the set voltage, press the  $\wedge$  key to set the thousands digit of the voltage, and the number will increase from 0 to 9 and then Cycle to 0; when the number has been changed to the thousands digit of the set voltage, press the  $\vee$  key again, it will return to the single digit of the set voltage, and repeat this cycle until you press the SET key to enter the next parameter setting, or press The EXIT key exits the setting state and enters the waiting state.

If the setting data exceeds the setting range during setting, the buzzer will alarm when exiting the setting state, and at the same time, the setting parameter that is out of range is restored to the last setting value. When setting the data, you can press the  $\wedge$  (up) key or the  $\vee$  (down) key first, as long as you press another key, the next value of the setting data will be changed.

If you press the SET key to enter the next parameter setting, or press the EXIT key to exit the setting state and enter the waiting state.

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## 2. Upper limit setting of resistance sorting:

Press the setting key again to enter the upper limit setting of resistance sorting, the screen is as follows:

HI__LIMIT= XXXXXX MΩ
RANGE: 0—999999

The resistance upper limit setting range is: 0-999999MΩ. When it is 0, the upper limit is not sorted. The setting method of the upper limit sorting data is the same as the voltage setting.

If you press the SET key to enter the next parameter setting, or press the EXIT key to exit the setting state and enter the waiting state.

## 3. Resistance sorting lower limit setting value:

Press the setting key again to enter the lower limit setting value of resistance sorting, the screen is as follows:

LO__LIMIT= XXXXXX MΩ
RANGE: 0—999999

The resistance lower limit setting range is: 0-999999MΩ. When it is 0, the lower limit will not be sorted. The setting method of the lower limit sorting data is the same as the voltage setting. When the upper and lower limits are set to zero, no sorting is performed, the sorting light is off, and the buzzer will not sound.

If you press the SET key to enter the next parameter setting, or press the EXIT key to exit the setting state and enter the waiting state.

## 4. Alarm switch setting:

Press the setting button again to enter the alarm switch setting, the screen is as follows:

BEEPER: ON
SELECT BY ^ OR v

The buzzer can be turned on (ON) or closed (OFF) by pressing the ^ key or v key. When the sorting is valid, the buzzer will turn on or off the buzzer according to the buzzer switch and buzzer conditions.

If you press the SET key to enter the next parameter setting, or press the EXIT key to exit the setting state and enter the waiting state.

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### 5. Alarm condition setting:

Press the SET button again to enter the setting of alarm conditions, the screen is as follows:

BEEPER MODE: PASS
SELECT BY ^ OR ∨

You can use the ^ key or ∨ key to select PASS or FAIL to control the buzzer. When the sorting is valid and the buzzer is turned on, the buzzer will turn on or off the buzzer according to the sorting result. Pass: turn on the beep when the sorting is passed; fail: turn on the beep when the sorting fails.

If you press the SET key to enter the next parameter setting, or press the EXIT key to exit the setting state and enter the waiting state.

### 6. Remote control switch setting:

Press the setting key again to enter the remote control switch setting, the screen is as follows:

PLC REMOTE: OFF
SELECT BY ^ OR ∨

The remote control test can be turned on (ON) or closed (OFF) by pressing the ^ key or the ∨ key. When the remote control is turned on, the test can only be triggered by the remote control signal. The trigger signal is low-level effective and a low-level signal Can only be tested once.

If you press the SET key to enter the next parameter setting, or press the EXIT key to exit the setting state and enter the waiting state.

### 7. Clear data storage switch settings:

Press the set key again to enter the reset data storage switch setting, the screen is as follows:

CLEAR SAVE: OFF
SELECT BY ^ OR ∨

You can use the ^ key or ∨ key to choose to turn on (ON) or off (OFF) to clear the data storage. If the data is not cleared this time or the data has been stored after the reset, the clear data storage operation cannot be performed, that is, it cannot be selected ON, only OFF is displayed. If it has been cleared, the cleared data will be stored in EEPROM after selecting ON to prepare it for the next startup. Use this menu only to prevent multiple EEPROM write operations, in order to extend the life of EEPROM.

If you press the SET key to enter the first parameter setting, or press the EXIT key to exit the setting state and enter the waiting state.

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## Reset state

Note: The accuracy and linearity will be affected if the zero is incorrectly cleared! !

In the state to be tested, press the EXIT key to enter the reset state, the display screen is as follows:

IR	CLEAR	M2	1M $\Omega$
10 0	V	X . X X X	mV

There is no output voltage when clearing, and only the setting voltage of the memory group is displayed. For the accuracy of clearing, please remove the test line before clearing.

"Clear" is used to clear the base of the internal wiring and its circuit. Clearing will directly affect the test accuracy and its linearity. If the test accuracy is incorrect, most of the reasons are not cleared or incorrectly cleared. The zero reset operation should be performed after the instrument has been warmed up for 15 minutes. The environment, temperature, humidity, and operation mode will be greatly affected when the high-end range is reset. Please ensure that the section "Using Environment" is described in Chapter 1. The unit displayed during resetting is mV. If the voltage displayed during resetting is greater than 100mV, the instrument cannot be used normally. The resetting error is mainly because the test terminal is not open, the test environment is not satisfied, or the instrument is damaged. In the range of 1K  $\Omega$ , 10K  $\Omega$ , 100K  $\Omega$ , 1M  $\Omega$ , the clear value is below 1mV, the clear value of 1M  $\Omega$  \_1 is below 10mV, the clear value of 1M  $\Omega$  \_2 is below 50mV, and the clear value of 1M  $\Omega$  \_3 is below 100mV, otherwise it is wrong.

When clearing, first clear the 1K  $\Omega$  range. After the displayed clear data is stable, use the  $\wedge$  key or  $\vee$  key to change the range. After the displayed clear data is stable, use the  $\wedge$  key or  $\vee$  key to change the range until all Until the range is cleared. After clearing, press the RESET (reset) key to enter the test state and wait for the test.

If the measurement data is correct after the reset or the reset test (that is, the reset data is correct), the reset storage switch can be turned on, and the reset value will be stored in EEPROM for use next time it is turned on. If it is not stored, the reset value after the next startup will be the reset value stored last time. If the EEPROM can no longer be written or damaged, it can only be reset to zero after each startup.

## Test status

In the state to be tested, press the START key to enter the test state, the display screen is as follows:

IR	TEST	M2	1M $\Omega$
XX. XX	V	X . X X X	M $\Omega$

During the test, the output voltage is displayed with four-digit data, and the unit is: Volt (V); the resistance is displayed with four or five-digit data, the unit is: K $\Omega$ , M $\Omega$ , G $\Omega$ , T $\Omega$ , and the relationship is as follows:

$$1 \text{ T } \Omega = 10^3 \text{ G } \Omega = 10^6 \text{ M } \Omega = 10^9 \text{ K } \Omega = 10^{12} \Omega$$

Note: Due to the load effect of the power supply (internal resistance affects the output voltage), the output no-load voltage and the loaded voltage may not be the same. When the setting voltage is less than 200V, the internal resistance is about 10K $\Omega$ , and when the voltage is greater than 200V, the internal resistance is about 30K $\Omega$ .

When testing, there will be an indicator light flashing to indicate that it is in the test state; the instrument has one-level sorting, five groups of memories, and the memory groups can be cycled through the  $\wedge$  key or the  $\vee$  key in the test state.

The time required for one test is about 172mS. When the range resistance is greater than 1M $\Omega$ , only 4 valid data will be displayed when the resistance is displayed, and 5 valid data will be displayed when it is less than or equal to 1M $\Omega$ .

The test method is as follows:

Before entering the test, please connect the DUT as shown in Figure 4-12 (especially the DUT with polarity such as capacitors).

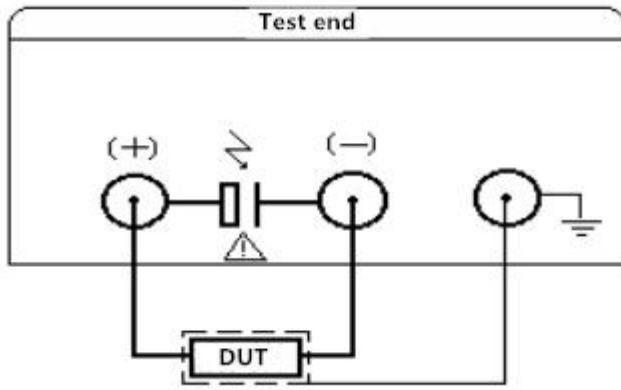


Figure 4-12 Test connection diagram

**Attention:**

- (1) To test the output voltage at the (-) terminal, please connect the DUT in the reset state to avoid electric shock.
- (2) Be sure to connect the polar DUT (electrolytic capacitor, etc.) according to the positive and negative terminals in the figure, and remove it after resetting it for a few seconds (discharge through a 20K/5W resistor after resetting) to prevent electric shock.
- (3) In order to obtain the ideal accuracy and stability, please ensure that the test environment meets the requirements in the section "Usage Environment" in Chapter 1. Factors such as the shielding of the DUT and the length of the test line will affect the measurement accuracy.

**1. Operation process:**

a. Press the start key to enter the test state. During the measurement, you can use the  $\wedge$  key or the  $\vee$  key to change the range or change the output voltage. This function is switched back and forth by the SET key during measurement. When entering for the first time, the upper right corner of the screen displays 1M $\Omega$ . At this time, you can use the  $\wedge$  key or the  $\vee$  key to select the range. If the over-range is not manually changed, the range is automatic. If the over-range is manually changed, the range is locked and can only be changed manually. When the range is locked, over-range  $\vee$  (you can reduce the range by pressing the  $\vee$  key) and under-range  $\wedge$  (you can use the  $\wedge$  key to increase the range in increments) sign. The range is automatic after starting the test from the state to be tested each time, and the range will be locked only if the over-range is manually changed. There are 7 ranges in the instrument, namely 1K $\Omega$ , 10K $\Omega$ , 100K $\Omega$ , 1M $\Omega$ , 1M $\Omega$ \_1, 1M $\Omega$ \_2, and 1M $\Omega$ \_3; the last three ranges are amplified by 11 times, 51 times and 101 times when the range is 1M $\Omega$ . The selection of the range is generally determined by the following formula: (test voltage/test impedance)  $\times$  range resistance value. If the value of range resistance is between 0.11V and 1.50V, it is the best range. If it is not within this range, the accuracy of the test result is not high. . During the test, if the range has been locked or the maximum or minimum range, and its sampling voltage is less than 0.01V-0.04V (different ranges), it will display BELOW, or if the sampling voltage is greater than 2.00V, it will display OVER. If you choose, it cannot be measured normally. The picture is as follows:

IR	TEST	M2	VOL_
XX.XX	V	BELOW	M $\Omega$

IR	TEST	M2	VOL_
XX.XX	V	OVER	M $\Omega$

When the SET key is used to switch to the available  $\wedge$  key or  $\vee$  key to change the output voltage, the upper right corner of the screen displays VOL\_, and the screen is as follows:

IR	TEST	M2	VOL_
XX.XX	V	X . X X X	M $\Omega$

At this time, you can use the  $\wedge$  key or the  $\vee$  key to increase or decrease the output voltage. If it is in the 100V range (setting  $\leq$ 100V), the amount of change is about 1V each time, and the range is 10-100V. In the 100V range,

the output voltage can be output below 10V. The voltage measured below 8V is not accurate; if it is in the 1000V range (>100V when setting), the amount of change is about 10V each time, and the range is 101-1000V. In the 1000V range, it can also output under 100V but it is measured under 80V. The voltage is not accurate, which will affect the accuracy of the resistance test.

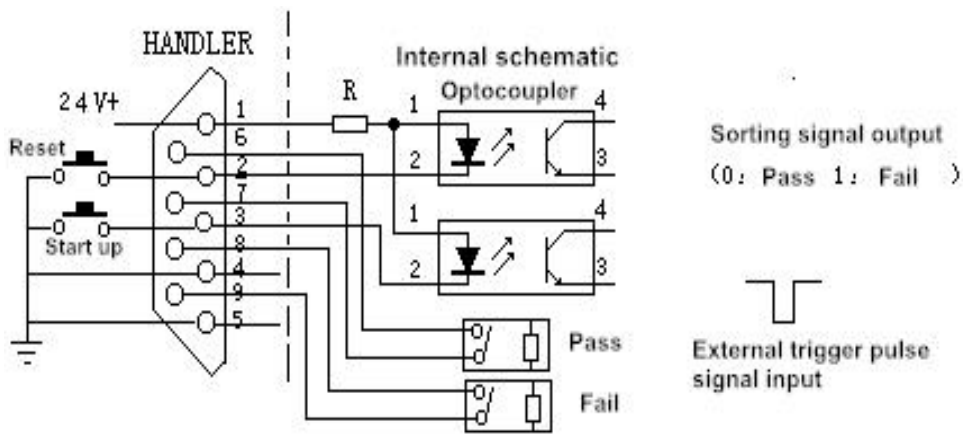
a. Press the reset button to stop the test and display the last measured value. At this time, there is no output voltage and discharge the DUT. If the reset button is pressed again, it will return to the state to be tested. If the start button is pressed, the test will continue.

**5. Remote control interface (optional):**

This interface is mainly used for assembly line operation, the trigger mode is level trigger, the low level is effective (short the 4 and 5 pins of the interface output), the pulse width should not be less than 20mS, and a low level can only be measured once. If the trigger signal is always low during remote control, the keyboard cannot be operated. The range is locked during remote control, and can only be manually selected or tested when not in remote control to determine the range, and then turn on the remote control switch after resetting. When selecting control, please connect the resistance under test first, and send the trigger pulse after a certain delay.

Note: If the test line is not handled properly during the remote control test, the measurement accuracy of high impedance will be affected, so it is best not to use the remote control interface when measuring high impedance.

If remote control is used, the interface principle is as follows:



HANDLER Wiring diagram

**JK7200A/2683 software data format**

This software runs in WIN95, WIN98 or WINNT environment, the main frequency is above 300MHz, and at least 500M hard disk space. In addition, OFFICE2000 must be pre-installed in the computer in order to process the

data in the database.

JK7200A uses RS-232C standard asynchronous serial communication bus interface to communicate with external control equipment, the transmission baud rate is fixed at 2400bit, the signal logic level is  $\pm 12V$ , and the maximum transmission distance is 15 meters. The serial interface adopts direct communication, only three signal wires TXD (transmit), RXD (receive), and GND (ground) are used, and a nine-core standard interface socket is used.

The basic format of the data sent by the host computer is: (computer -> JK7200A)

AA+command word+data+BF total 3 data

**Any instruction sent by the computer starts with AA and ends with BF, and a total of 3 data are sent.**

No.	Command function	Command data	Format/Remarks
1	Start up	FAH	AAH FAH BFH
2	Reset	FBH	AAH FBH BFH
Reset command Note: There are two resets for resetting. The first time you press the reset button, it just pauses the test, while the second reset is to return to			
Parameter setting status			

The basic format for the upper computer to receive measurement data is: (JK7200A -> computer)

ABH + measurement data (15 bits) + sorting result (1 bit)+ AFH (DB0—DB17)

**Any measurement data packet received by the computer starts with AB and ends with AF. A total of 18 data packets are received as a data packet.**

The 15 bits of data are voltage parameter 1 (5 bits), resistance parameter 2 (6 bits), and time (4 bits) (this data is only output from the lower computer during testing).

Example: Voltage 500V, resistance 1234M, time 99, the test passed

The data packet received by the computer is:

ABH **00H 05H 00H 00H 00H** 00H 01H 02H 03H 04H 00H 4DH **00H 09H 09H 00H** 91H AFH

Since there is no instrument to receive, so I can only write a rough outline. The five digits following ABH are voltage data (DB1-DB5), and the next five digits are resistance data (DB6-DB10). The unit of resistance is (DB11) and time. In (DB12-DB14), (DB15) was originally 0.1 seconds of time, but because the baud rate was changed to 2400, the sending data was slow and the display was not continuous, so it could not be displayed. This bit can be shielded to display and sorting results (DB16), AFH

Resistance unit (1 bit)	
<b>GΩ</b>	47H
<b>MΩ</b>	4DH
<b>KΩ</b>	6BH
<b>TΩ</b>	54H

Sorting result (1 bit)	
Normal measurement	90H
Test passed	91H
Test failed	92H

A few notes:

'==90H: During the test 91H: Test passed 92H: Test failed==

'==No parameter setting, only test data and sorting results are recorded==

'=====The data format is: ABH+16DB+AFH=====

'==Voltage 5 bits, resistance 6 bits, time 4 bits plus the last 1 bit sorting result==

'=====The baud rate is set to 2400=====

Case 71

Label1(1) = "GΩ"

Case 77

Label1(1) = "MΩ"

Case 107

Label1(1) = "kΩ"

Case 84

Label1(1) = "TΩ"

Select Case InByte(6) ;If INBYTE (6) is B0H, it will display "-----"

Case 176

Text1(8) = "\_\_\_"

1. The communication control of the serial port is set to 2400, n, 8, 1
2. All control commands are sent by the computer to the lower computer, and the lower computer just sends the measured data and sorting results to the computer during the test, and the computer displays it.

The above is the communication protocol of JK7200A/2683. If you have any details, please consult our company.

## Chapter 5 Set-up and Warranty

### 1. Complete set:

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

- |                                 |                 |
|---------------------------------|-----------------|
| 1. Insulation resistance tester | 1 set           |
| 2. 1 power cord                 | 1 pc            |
| 3. Measuring line               | 1 group (3 pcs) |
| 4. instruction manual           | 1 pc            |
| 5. Warranty card                | 1 pc            |
| 6. Certificate                  | 1 pc            |
| 7. Test report                  | 1 pc            |

After the user receives the instrument, open the box and check the above items. If there is any missing, please

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contact our company or the management department immediately.

**2. Warranty:**

Warranty period: If the user purchases the instrument from the company, it is calculated from the company's delivery date, and for the purchaser from the business department, it is calculated from the delivery date of the business department. The warranty period is two years. The warranty card should be issued for the instrument.

During the warranty period, due to improper operation by the user or severe damage to the instrument, the maintenance cost shall be borne by the user.