

# **TH9201 Series**

## **AC/DC Withstanding Voltage/ Insulation resistance Tester**

# **Operation Manual**

First Edition

Tonghui Electronic Co.,Ltd.

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# Chapter 1 Setup

This chapter describes the procedures from unpacking to installation to operation checking.

## 1.1 Unpacking

Upon receiving the product, confirm that the necessary accessories are included and have not been damaged in transit. Should any damage or shortage be found, please contact TongHui distributor/agent.

Items	Quantity
TH9201/S / B/C	1
TH90003R withstanding-voltage test leadwires	1
TH90003B withstanding-voltage ground leadwires	1
3A (220V) /5A (110V) Fuse (TH9201/S)	2
2A (220V) /3A (110V) Fuse (TH9201B/C)	2
TH90004 withstanding-voltage test stick	1
TH26034 RS232C cable	1
AC Power cord	1
Operation Manual	1
Test Report	1
Servicing card	1
Accessories ordered by custom	1

## 1.2 Precautions for Installation

Be sure to observe the following precautions when installing the tester.

### 1.2.1 Do not use the tester in a flammable atmosphere.

To prevent explosion or fire, do not use the tester near alcohol, thinner, or other combustible materials, or in an atmosphere containing such vapors.

### 1.2.2 Avoid locations where the tester is exposed to high temperatures or direct sunlight.

Do not locate the tester near a heater or in areas subject to drastic temperature changes.

Operating temperature range: 5 °C to +35 °C

Storage temperature range: -20 °C to +60 °C

### 1.2.3 Avoid humid environments.

Do not locate the tester in a high-humidity environment—near a boiler, humidifier, or water supply.

Operating humidity range: 20 % to 80 % RH (no dew condensation permitted)

Storage humidity range: 90 % RH or less (no dew condensation permitted)

Condensation may occur even within the operating humidity range. In that case, do not start using the tester until the location is completely dry.

#### **1.2.4 Do not place the tester in a corrosive atmosphere.**

Do not install the tester in a corrosive atmosphere or one containing sulfuric acid mist or the like. This may cause corrosion of various conductors and imperfect contact with connectors, leading to malfunction and failure, or in the worst case, a fire.

#### **1.2.5 Do not locate the tester in a dusty environment.**

Dirt and dust in the tester may cause electrical shock or fire.

#### **1.2.6 Do not use the tester where ventilation is poor.**

This tester features a forced-air cooling system. Provide sufficient space for the air inlet on the lateral side and the air outlet on the rear side to allow air to flow.

#### **1.2.7 Do not place the tester on a tilted surface or in a location subject to vibrations.**

If placed on a non-level surface or in a location subject to vibration, the tester may fall, resulting in damage and injury.

#### **1.2.8 Do not use the tester in locations affected by strong magnetic or electric fields.**

Operation in a location subject to magnetic or electric fields may cause the tester to malfunction, resulting in electrical shock or fire.

#### **1.2.9 Do not use the tester in locations near a sensitive measuring instrument or receiver.**

Operation in a location subject, may cause such equipment may be affected by noise generated by the tester.

At a test voltage exceeding 3 kV, corona discharge may be generated to produce substantial amounts of RF broadband emissions between grips on the test leadwire. To minimize this effect, secure a sufficient distance between alligator clips. In addition, keep the alligator clips and test leadwire away from the surfaces of conductors (particularly sharp metal ends).

## 1.3 Precautions for Moving

When moving the tester to the installation site or otherwise transporting it, take the following precautions:

### 1.3.1 Before moving the tester, turn off the power switch.

Transporting the tester with its POWER switch on can lead to electric shock and damage.

### 1.3.2 When moving the tester, Disconnect all wires from it.

Moving the tester without disconnecting the cables may result in breakage of the wire or injury due to the tester tipping over.

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 **WARNING:** This instrument is designed to operate from the overvoltage category II.

Do not operate it from the overvoltage category III or IV.

Before turning on the power, make sure of the fuse and the source voltage agree with the LINE-VOLTAGE RANGE switch on the rear panel.

Nominal voltage range (allowable voltage range):

100 V to 120 V AC (85 V to 132 V AC)

200 V to 240 V AC (170 V to 250 V AC)

Allowable frequency range: 47 Hz to 63 Hz

 **WARNING** To prevent malfunctions, be sure to operate within the line-voltage range.

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## 1.4 Checking and replacing fuse

 **WARNING** To prevent electric shock, before checking or replacing the fuse, be sure to turn off the POWER switch and unplug the AC power cord.

Make sure that the fuse used conforms to the instrument specifications, including shape, rating, and characteristics. Using a fuse with different rating or short-circuiting, the fuse holder will damage the instrument.

- 
1. Turn off the POWER switch, and unplug the AC power cord.
  2. On the rear panel, remove the fuse holder, by pushing it inward and unscrewing it

counterclockwise using a screwdriver.

3. In accordance with the fuse rating specified below, check the fuse type and replace the fuse.

4. Following the above steps in the reverse order, reinstall the fuse holder.

Voltage range	Frequency	Fuse type	Power
100-120V	47-63Hz	5A(TH9201/S) 3A(TH9201B/C)	500VA
200-240V		3A(TH9201/S) 2A(TH9201B/C)	

## 1.5 Connecting the AC Power Cord

The power cord that is provided varies depending on the destination for the product at the factory-shipment.

**Do not use the AC power cord provided with the product as a AC power cord for other instruments.**

**Connection procedure:**

1. Confirm that the supply voltage is within the line voltage range of the tester.
2. Confirm that the POWER switch on the tester is off.
3. Connect the AC power cord to the AC LINE connector on the rear panel.

Use the provided power code or power code that is selected by qualified personnel.

4. Plug in the AC power cord.

---

## 1.6 Grounding

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 **WARNING** Be sure to connect the tester to an electrical ground (safety ground). If the output to a conveyor or peripheral device that is connected to an earth ground or a nearby commercial power line is short-circuited without grounding, the tester chassis is charged to an excessively high voltage, resulting in extreme danger.

This tester is designed as a Class I equipment (equipment protected against electric shock with protective grounding in addition to basic insulation). Therefore, electric shock may occur without proper grounding.

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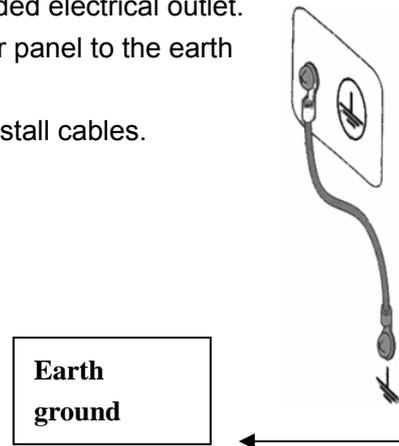
To ensure safety, be sure to ground the tester.

Choose either of the following two available methods of doing so:

1. Connect the AC power cord to a three-contact grounded electrical outlet.
2. Connect the protective conductor terminal on the rear panel to the earth ground.

Have specialized engineers select, manufacture, and install cables.

To ensure secure connection, use proper tools.



## 1.7 Checking Operations

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**⚠ WARNING** Use the interlock jumper only to quickly cancel the protection status. When using this tester, use the interlock function as much as possible to ensure a safe operating environment. To use jigs in withstanding voltage or insulation resistance testing, provide a cover or other means for the DUT to prevent electric shock by cutting off the output when the cover is opened. It is also recommended that an enclosure be provided around the

operating area and that output be cut off every time the door is opened.

Before turning on the power, confirm that the allowable voltage range indicated on the power supply is the same as that indicated on the rear panel of the tester.

When the power is turned on, the tester lights all LEDs on the front panel and self-diagnosis is started.

Before starting up the tester, confirm that all LEDs are on to ensure safety.

It is particularly dangerous to start a test when the DANGER lamp is broken.

Note that, in self-diagnosis, even when the DANGER lamp is lighting, no output or voltage is being generated.

**⚠ CAUTION** After turning off the POWER switch, wait several seconds before turning it on. Turning the POWER switch on/off repeatedly with insufficient intervals may damage the tester.

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### Checking procedure:

1. Confirm that the allowable voltage range indicated on the power supply is the same as that indicated on the rear panel.
2. Confirm that the AC power cord is properly connected to the AC LINE connector on

the rear panel.

3. Plug in the AC power cord.

4. Turn on the POWER switch. Confirm that all LEDs on the front panel are lit.

Following the opening screen, display the ACW screen

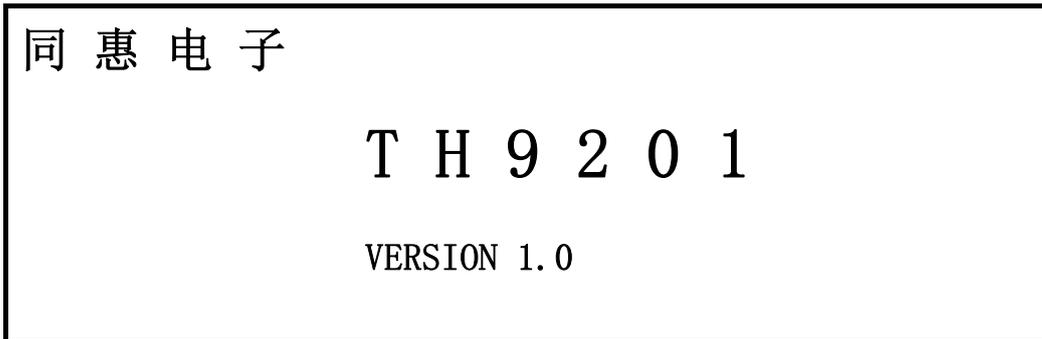
5. Turn off the POWER switch.

6. Turn on the POWER switch again.

7. Following the opening screen, display the ACW screen and confirm that the tester is kept in the READY status.

The above steps complete the checking procedure.

Opening screen:



## 1.8 Other specifications

1. Power:  $\leq 500\text{VA}$  (TH9201/S)

$\leq 350\text{VA}$  (TH9201B/C)

2. Dimensions: 330mm\*140mm\*385mm;

3. Weight: 20kg(TH9201/S)16kg (TH9201B/C) .

# Chapter 2 Precautions on Handling

This chapter describes the precautions to be followed in the handling of this tester. When using the tester, take utmost care to ensure safety.

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 **WARNING** The tester delivers a 5 kV test voltage which can cause human injury or death. When operating the tester, be extremely careful and observe the cautions, warnings, and other instructions given in this chapter.

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## 2.1 Prohibited Operations

### 2.1.1 Do not turn on/off the power repeatedly

After turning OFF the power switch, be sure to allow several seconds or more before turning it ON again. Do not repeat turning ON/OFF the power switch rapidly. If you do this, the protectors of the tester may not be able to render their protective functions properly. Do not turn OFF the power switch when the tester is delivering its test voltage—you may do this only in case of emergency.

### 2.1.2 Do not short the output to the earth ground

Pay attention so that the high test voltage line is not shorted to a nearby AC line or nearby devices (such as conveyors) which are connected to an earth ground. If it is shorted, the tester chassis can be charged up to the hazardous high voltage. Be sure to connect the protective grounding terminal of the tester to an earth line. If this has been securely done, even when the HIGH VOLTAGE terminal is shorted to the LOW terminal, the tester will not be damaged and its chassis will not be charged up to the high voltage.

Be sure to use a dedicated tool when grounding the protective grounding terminal.

 **CAUTION** The term "AC line" here means the line on which the tester is operating. That is the line to whose outlet the AC power cable of the tester is connected. It may be of a commercial AC power line or of a private-generator AC power line.

### 2.1.3 Do not apply an External Voltage

Do not apply a voltage from any external device to the output terminals of the tester. The analog voltmeter on the front panel cannot be used as stand-alone voltmeter. They may be damaged if their output terminals are subject to an external voltage.

## 2.2 Action When in Emergency

In case of an emergency (such as electric shock hazard or burning of DUT), take the following actions. You may do either (a) or (b) first. But be sure to do both.

1. Turn OFF the power switch of the tester.
2. Disconnect the AC power cord of the tester from the AC line receptacle.

## 2.3 Precautions on Testing

### 2.3.1 Wearing Insulation Gloves

When handling the tester, be sure to wear insulation gloves in order to protect yourself against high voltages. If no insulation gloves are available on your market, please order Kikusui distributor/agent for them.

### 2.3.2 Precautions for Pausing Tests

When changing test conditions, press the STOP switch once to take precautions. If you are not going to resume the test soon or if you are leaving the Test area, be sure to turn-OFF the POWER switch.

### 2.3.3 Items Charged Up to Dangerous High Voltages

When in test, the DUT, test leadwires, probes, and output terminals and their vicinities can be charged up to dangerous high voltages. Never touch them when in test.

 **WARNING** The vinyl sheaths of the alligator clips of the test leadwires which are supplied accompanying the tester have no sufficient insulation for the high test voltages. Never touch them when in test.

### 2.3.4 Matters to be Sure of After Turning-OFF Power

If you have to touch the DUT, test leadwires, probes, and/or output terminals and their vicinities for re-connections or other reasons, be sure of the following two matters.

1. The analog voltmeter indicates “zero.”
2. The DANGER lamp has gone out.

### 2.3.5 Warnings for Remote Control

Be extremely careful when operating the tester in the remote control mode in which the dangerous high test voltage is ON/OFF-controlled remotely. Provide protective means as follows:

1. Provide means to assure that the test setup does not become the test voltage is being delivered by inadvertent operation.
2. Provide means to assure that none can touch the DUT, test leadwires, probes, output terminals and their vicinities when the test voltage is being delivered.

## 2.4 Warning for Residual High Voltages

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 **WARNING** In DC withstanding voltage testing and insulation resistance testing, the test lead wire, test probe, and DUT are charged to a high voltage. The tester is equipped with a discharge circuit, but some time is nonetheless required to discharge them after the output is cut off. There is a danger of electric shock during discharge. To avoid electric shock, take the utmost care to ensure that the DUT, test lead wire, probe, and highly charged parts around the output terminal are not touched. If it is necessary to touch them, be sure to confirm both (1) and (2):

(1) The analog voltmeter indicates “zero.”

(2) The DANGER lamp has gone out.

As soon as the output is cut off, the tester’s discharge circuit starts forced discharging. Do not disconnect the DUT during a test or prior to completion of discharging.

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### **Discharge time**

The length of the discharge time varies according to the properties of the DUT.

Discharge is conducted at a resistance of approximately 2 k in DC withstanding voltage testing, and at 10 k in insulation resistance testing.

When no DUT is connected, the tester itself requires the following lengths of time to reduce the internal capacitor voltage to 30 V.

If the DUT is disconnected during a test or before the completion of discharging, assuming that the DUT has a capacity of 0.01 $\mu$ F and a parallel resistance of 100 M, approximately 5.3 seconds at 5 kV and approximately 3.5 seconds at 1 kV are required for the DUT to discharge to 30 V.

When the approximate time constant of the DUT is known, the time required for discharging to 30 V after the output is cut off is calculated as the time constant times the value given above.

## 2.5 Dangerous States of Failed Tester

Typical possible dangerous states of the tester are as shown below and in which cases the most dangerous situation that “**the high test voltage remains delivered and won’t be turned off!**” may occur. When this situation has occurred, immediately turn OFF the power switch and disconnect the AC power cable from the AC line receptacle.

•**The DANGER lamp does not go out despite you have pressed the STOP switch.**

•**The DANGER lamp does not light up despite the pointer of the analog voltmeter is deflected indicating that the output voltage is being delivered.**

Also when the tester is in other malfunctioning states than the above, there is a possibility that the output voltage is delivered irrespective of your proper operating procedure. Never use

the tester when it has failed.

**⚠ WARNING** Keep the tester away from other people until you call our service engineer for help. Immediately call Tonghui distributor/agent. It is hazardous for an unqualified person to attempt to troubleshoot any tester problem.

## 2.6 To Ensure Long-Term Use without Failures

The withstanding voltage-generating block of the tester is designed to release half the rated amount of heat, in consideration of the size, weight, cost, and other factors of the tester. The tester must therefore be used within the ranges specified below. If you deviate from these ranges, the output block may be heated to excess, activating the internal protection circuit. Should this happen, wait until the temperature returns to the normal level.

Output requirements for withstanding voltage testing

Ambient temperature	Upper current		Pause Time	Output time
T≤40℃	AC	>20mA (TH9201/S)	At least as long as the output time	Maximum of 1 minute
		>12mA (TH9201B/C)		
	DC	<10mA (TH9201/S)	Not necessary	Continuous output possible
		<6mA (TH9201B/C)		
DC	>6mA(TH9201/S)	At least as long as the output time	Maximum of 1 minute	
	>3m (TH9201B/C)			
DC	<5mA (TH9201/B)	At least as long as the judgment wait time (WAIT TIME)	Continuous output possible	
	<2mA(TH9201B/C)			

(Output time = voltage rise time + test time + voltage fall time)

## 2.7 Daily Checking

To avoid accidents, confirm at least the following before starting operation:

1. The tester is connected to an earth ground.
2. The coating of the high-voltage test lead wire is free from cracks, fissures, and breakage.
3. The high-voltage test lead wire is not broken.
4. The tester generates FAIL signal when the ends of the low-voltage test lead wire and high-voltage test lead wire are short-circuited.

# Chapter 3 Part names and Functions

This chapter describes the names and functions of components such as switches, displays, and connectors on the front and rear panels.

## 3.1 Front Panel

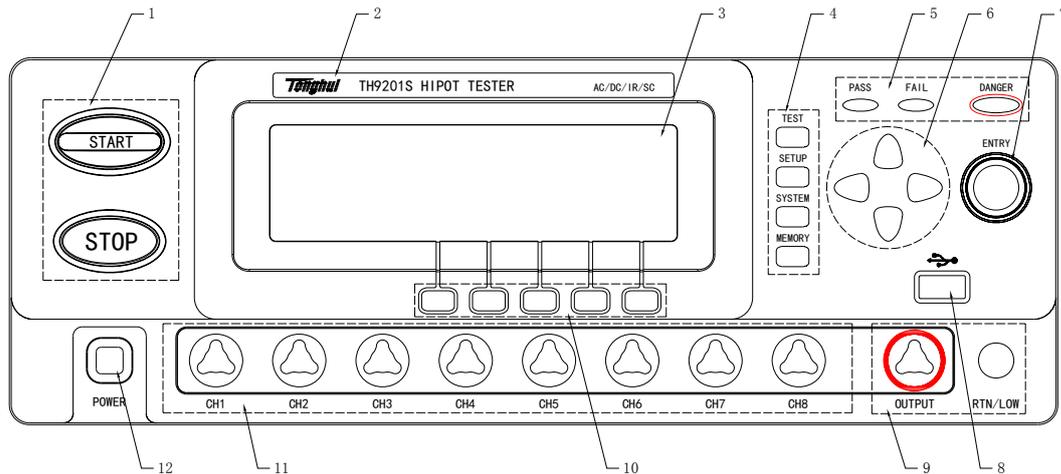


Figure 3-1

### 1. START and STOP

Start up the instrument, once test starts, "TEST" will be displayed at the left corner of the screen, TEST indicator lights.

Stop key, used to cancel the test; Or PASS、 FAIL status.

### 2. Band and model

### 3. LCD screen

240×64 dot- matrix LCD screen, display setting and test interface .etc.

### 4. FUNCTION

Select mode, system, interface..

#### • TEST

Press the key, and the corresponding key lights, the instrument is ready to test.

#### • SETUP

Press the key, and the corresponding key lights, the instrument enters parameter setting;

#### • SYSTEM

Press the key, and the corresponding key lights, display system setting interface;

Including SYSTEM1、SYSTEM2 and INTERFACE.

#### **5. Indicator**

- **TEST**

In the process of testing, it lights in output voltage.

- **PASS**

Indicate a test result, it lights in PASS;

When time function is off, (TIMER OFF), no PASS judge.

- **FAIL**

Indicate a test result, it lights in FAIL.

#### **6. Direction key**

Move direction key to the required setting test condition;

Press **SHIFT** and **▼▲** to change LCD display contrast.

#### **7. Code switch**

When in READY status, set the test condition on LCD.

#### **8. USB interface**

Externally connect to USB storage

#### **9. Output voltage HIGH and LOW terminal**

High and low voltage terminal in test voltage output.

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 **Warning:** In the process of testing, don't touch the high terminal

**Caution:** if external voltage is used in test terminal, it will cause the damage of internal circuit.

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#### **10. Shortcut key (F1-F5)**

Corresponding with the function operation or shortcut key on LCD.

#### **11. 8 channel sweep interface (only for TH9201S)**

Internal 8 channel sweep output interface.

#### **12. POWER**

## 3.2 Instruction of rear panel

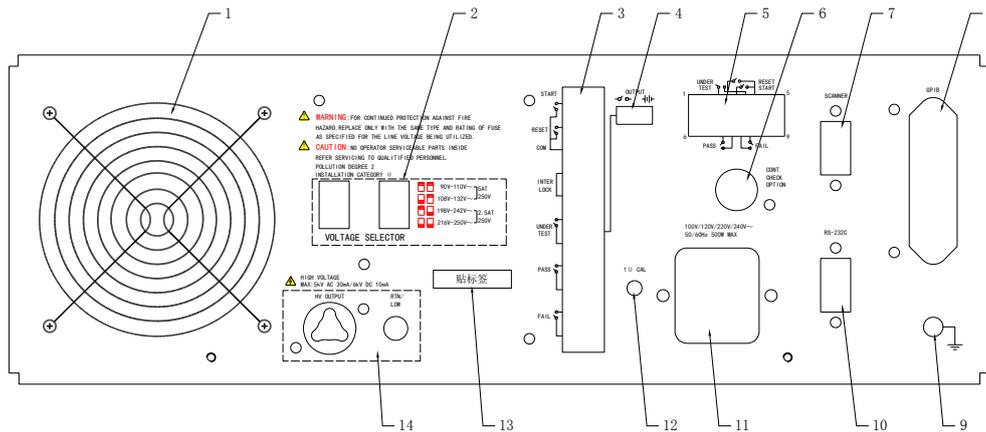


Figure 3-2

### i. Fan

Power amplifier circuit radiator.

### ii. Line voltage range

Switch of input voltage range.

### iii. PLC controller interface

Be used to connect programming controller, where:

- **INTERLOCK:** input the connecting locked signal, if off, starting output is not allowed.
- **TEST:** Output synchronized-signal control when high voltage output is started.
- **START:** Input the starting signal for outputting high voltage, corresponding to START signal on the front panel.
- **RESET:**
- **PASS:**
- **FAIL:**

### iv. OUTPUT

TEST outputs control, output 24V level or relay switch signal, it is suggested to use switch signal to assure signal separation.

### v. HANDEL interface

Use 9 core model D jack to output.

### vi. Ground break-over test interface

When open ground break-over test function, the terminal has to be connected to the place where DUT is connected with low terminal.

### vii. SCAN interface

Be used to connect TH9121 multi-channel tester.

### viii. IEEE488 (GPIB) parallel communication interface

Provide the general communication interface for instrument and external device.

ix. **Protective earth terminal**

Be used to connect instrument to ground.

x. **RS232C serial interface**

Serial communication, realize the communication with computer.

xi. **Power jack**

Be used to input AC power; please use the attached power line with fuse. Change the fuse according to input power.

xii. **Ground break-over calibration**

Ground break-over resistance is 1 ohm, use potentiometer to calibrate if there is deviation.

xiii. **Mark**

This mark describes the instrument's SN.

xiv. **High voltage output interface (optional)**

Stand-by high voltage output interface.

### 3.3 Description

TH9201 Provide 5kVAC/30mA withstanding voltage, 6kVDC/10mA withstanding voltage and insulation resistance tester.

TH9201S Provide 5kVAC/30mA withstanding voltage, 6kVDC/10mA withstanding voltage and insulation resistance with scanning test.

TH9201B Provide 5kVAC/20mA withstanding voltage, 6kVDC/5mA withstanding voltage and insulation resistance test.

TH9201C Provide 5kVAC/20Ma withstanding voltage test.

In high voltage modular, there is a AB power amplifier power which can assure the programming of output voltage as well as the isolation of output voltage power and line power. 40~600Hz high voltage transformer can rise voltage, and use high voltage feedback loop to assure the accuracy of output voltage, then the actual voltage adjustment rate is far smaller than that of transformer, which can be used to the product whose VA is larger than the actual power.

In AC output, set the operation in 50 or 60Hz, not being limited by line voltage, the voltage waveform isn't affected by line voltage neither. The instrument also has the real current test, and then the large current generated by distributed capacitance can't affect the judgment of real insulation.

To DC and insulation resistance test, TH9201/S/B tester use 600Hz AC to form DC voltage to be the power, which can assure the DC power ripple is far less than the formal withstanding voltage tester, thus to assure the stability of 5000V, 10mA test.

Once connecting the load, TH9201 not only can perform the independent AC withstanding test, DC withstanding voltage test, insulation resistance test, but also multi-item test via the setting of test programme. When connecting with high voltage scanner TH9121, perform multi-items and multi-products test via setting the item of test programme. Each scanner can adopt 8 channels. The tester can be connected to two scanners, reach to 16 channels totally.

TH9201 series all allocate PLC interface, RS-232C、 GPIB(optional), thus the instrument can adapt to the auto test system of different required safety and reliability.

#### Feature:

##### ■ 3 test functions—AC withstanding voltage test, AC withstanding voltage test and insulation resistance test.

TH9201/S/B provides AC withstanding voltage test and insulation resistance test.H9201C provides AC withstanding voltage test.

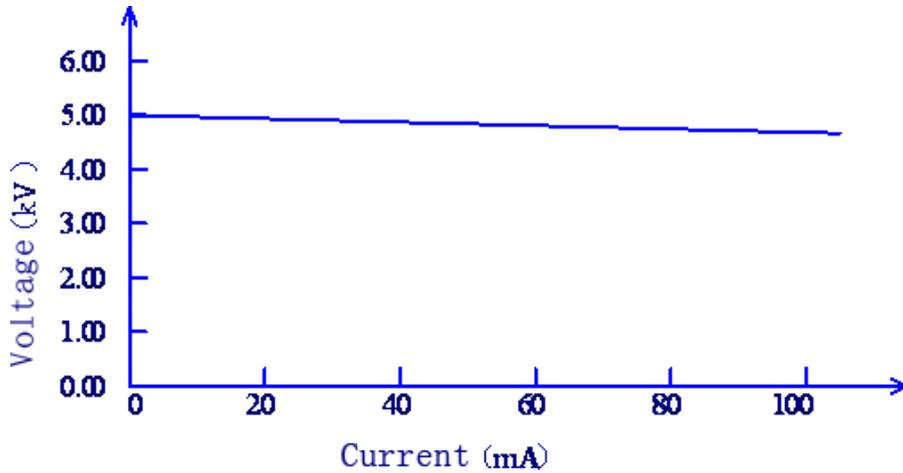
Once connected with load, the tester can perform different tests continually.

##### ■ AC withstanding voltage test 5kV/30mA (TH9201/S) 5kV/20mA (TH9201B/C)

In TH9201/S high voltage modular, there is a AB power amplifier circuit and a 150VA transformer, which can realize the Max. output of 5kV/30mA (1 min), while TH9201B/C power amplifier circuit and a 100VA transformer can realize the Max. output of 5kV/20mA

(1 min) .

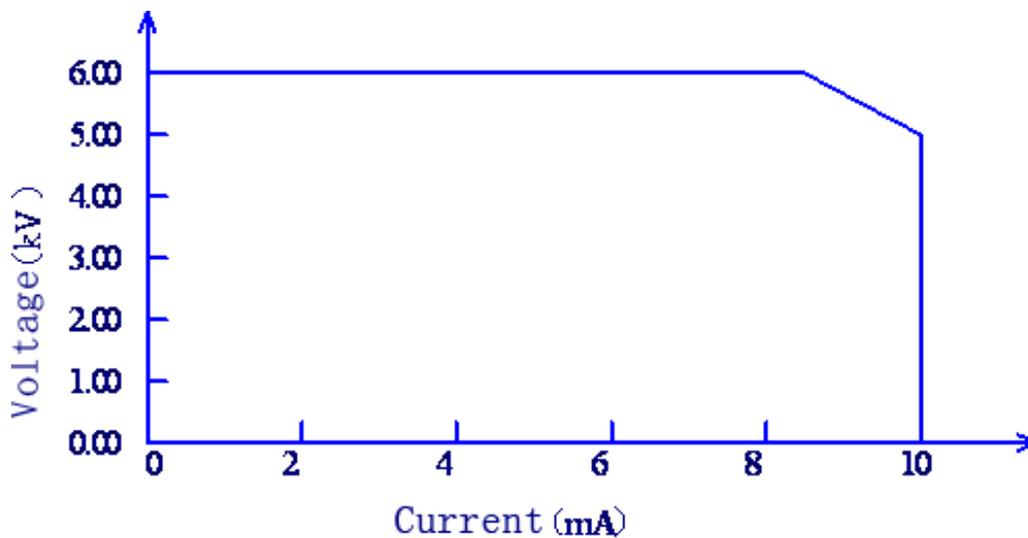
TH9201/S has the highest limit current 30mA, Min. voltage 50V, so instrument generates the test voltage corresponding with 50Hz/60Hz, independent power, auto voltage adjusting rate is smaller than  $\pm 3\%$ . It's not necessary to adjust output voltage after setting test voltage.



**Figure 3-3 AC voltage load adjusting rate**

■ **DC withstanding voltage test 6kV (Max. output power is 50W)**

TH9201 series can provide DC withstanding voltage test of wide voltage range (Max. output power is 50W, the max. holding time is 1 min) . Instrument allocates a reliable, low ripple DC/AC switch circuit, voltage load adjusting rate $\leq 1\%$ .



**Figure 3-4 DC voltage output range**

■ **Insulation resistance test 50V to 1000V (resolution of 1V) /0.1MΩ to 50.0GΩ(Max. rated current range is from 10mA to 50nA)**

■ **Programmable GPIB (optional) and RS-232C interface as the standard**

Except power switch, key lock and execution (auto), other functions can be controlled remotely. In DC withstanding voltage test, AC withstanding voltage test and insulation resistance test, judge and time can be controlled remotely. The test result can also be read via remote control. GPIB and RS-232C interface provides a stable and united standard test interface for PC or other devices.

■ **High voltage scanner can realize the control function flexibly**

TH9201S have internal multi-channels, in withstanding voltage test and insulation resistance, it can control 8 channels to test 8 points. Each channel can be connected to HI/LO/OPEN voltage. TH9201 series can be connected with TH9121 multi-channels scanner with 8 channels. TH9201 series can be connected with 2 scanners at most to operate 16 channels simultaneously.

■ **Rising time control function**

In AC withstanding voltage test, DC withstanding voltage test and insulation resistance test, the test voltage can be raised to set value slowly, it can't provide set voltage to DUT instantly after test starts. The resolution is 0.1s from 0.1s to 99.9s, and the resolution is from 100s to 200s. TH9201series meet each UL test standard and IEC withstanding voltage standard (primary voltage is less than the half of test voltage and it can appoint the fixed rising time when reaching the set test voltage.

■ **Fall time control function**

In the pass judge of AC withstanding voltage test, the test voltage can be reduced gradually. The voltage fall time can be set within 0.0s to 99.9s (with the resolution of 0.1s) and 100s to 200s (with the resolution of 1s) .

■ **Discharge function**

In common condition, the DUT reacts the feature of capacitance. At the moment of the cut of DC withstanding voltage and insulation resistance test, the DUT holds the full charge status, so there is a danger of electric shock..TH9201 has the enforced rapid discharge function after DC withstanding voltage test and insulation resistance test finish.

■ **Reinforced safety**

In order to improve the safety, TH9201series allocate many devices and safe functions including safe output terminal, discharge function and electric wall. The electric wall means

in high voltage test circuit, when return current flowing through shell is larger than 0.6A, the high voltage output will be cut off, thus there will be no shock current in high voltage to protect the operator's safety.

#### ■ Higher test accuracy

TH9201series is voltage digital display, in withstanding voltage test, the accuracy is  $\pm (1\% \text{reading} + 30V)$ , in insulation resistance test, is  $\pm (1\% \text{reading} + 1V)$ . the digital display of test current is  $\pm (3\% \text{reading} + 20\mu A)$  in withstanding voltage test.

#### ■ Current correction function

AC withstanding test needs high sensitivity and voltage, the stray capacitance effects the accuracy of current test. TH9201series has the current correction function to eliminate the moving current.

#### ■ Voltage hold function

In the process of judge, this function allows operator to hold the record of test voltage when the judge result is outputted continuously. The voltage hold function can monitor the breakdown voltage by combining with rising time control function.

#### ■ Easy operation

TH9201series are quite easy to be operated. In the setup interface, the test condition is listed. Set test condition, use direction key to select a topic from LCD display, then rotate code switch. Shortcut key can select the set topic. After setting the data, it will back to test interface to perform test.

#### ■ 50 test programmes, and each one includes 100 test items, so it can save 500 test items totally.

It can edit 50 test programmes which corresponds to user's different test items; the test item is one of AC withstanding voltage test, DC withstanding voltage, insulation resistance test, open and short judge. Each test condition is noninteractive; the memory can save 500 test steps, and if the stored item is so large that most data have to be transferred to external memory. (U-disk is available) .

#### ■ Signal output function

Via signal output (**HANDLER**、**PLC**) , **START**、**STOP**、**INTERLOCK** signal can be inputted, and **TEST**、**PASS**、**FAIL** signal can be outputted.

#### ■ High voltage output terminal on the rear panel (Optional)

On the rear panel, there is an optional high voltage output which is used for high voltage output of scanner.

■ **Small dimension and light**

Used for Max.150VA AC withstanding voltage test, TH9201series are all small and light.

---

 **WARNING:** The instrument applies 5kV AC/DC high voltage, so do not touch the DUT and test line, or it will cause the danger of electric shock.

The safe measures should be taken around DUT to assure the operator's safety. Otherwise, please be care about the outputted high voltage due to the incorrect connection and operation.

---

# Chapter 4 Basic operation

This chapter describes the operation of withstanding voltage and insulation resistance.

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**Attention:** This chapter takes example for TH9201.

---

## 4.1 Turning on the Power

---

### **WARNING**

Before turning on the power, be sure to confirm that the allowable voltage range shown on the power supply is the same as that indicated on the tester's rear panel.

To prevent electric shock, be sure to turn off the POWER switch before connecting / disconnecting the GPIB, and RS-232C cables.

As soon as the power is turned on, all LEDs of the tester light up, and self-diagnosis is started. To ensure safety, confirm before starting up the tester that all LEDs are lit. It is particularly dangerous to start a test when the DANGER lamp is broken. Even when the DANGER lamp is lit, no output or voltage is being generated.

### **CAUTION**

When the POWER switch has been turned off, wait several seconds before turning it on again. Turning the POWER switch on/off repeatedly at insufficient intervals may damage the tester.

---

### **CAUTION**

Even after the power is turned on, the tester does not start a test if the settings are invalid or the tester is in the protection status.

---

### 4.1.1 Turning on the power

- 1. Confirm that the allowable voltage range shown on the power supply is the same as that indicated on the tester's rear panel.
- 2. Confirm that the AC power cord is properly connected to the AC LINE connector on the rear panel.
- 3. Plug in the AC power cord.

- 4. Turn on the tester's POWER switch.
- 5. Following the opening screen that displays the ROM version and other information, the LCD displays the last screen displayed when the POWER switch was turned off in the previous test.

## 4.2 Instruction of interface function

- Basic function operation of panel:

**TEST:** Instrument enters waiting status, the test starts.

**SETUP:** Change the previous interface of test programme, test item, and test parameter. The change of test contents is finished in this interface.

**SYSTEM:** Enters the set interface related with the test environment.

**MEMU:** Save the set parameter and document

**▼▲◀▶:** Cursor can move freely among each parameter.

**F1~F5:** Change the selected data and some special functions.

**ENTRY:** Change the selected data.

- Brief instruction of operation:

Switch the current test item from default AC withstanding voltage (**AC**) to open detection (**OS**) . The operation is as below:

Press '▶' (underline) to "**AC**" (see the figure below);

The following indication is displayed in F1~F5;

Now press '**F4**', in the figure below the position of "**AC**" will be changed to "**OS**"; the following item parameter will also be changed to default one of open detection.

Clockwise rotate the knob '**ENTRY**' to change "**AC**" -> "**DC**" -> "**IR**" -> "**OS**", the final affect is the same as the 3<sup>rd</sup> step.

**Note: Function key F1~F5 can be recognized as the shortcut key of operating knob 'ENTRY' and complement function.**

<b>STEP:</b> 01/01 <u>AC</u>	<b>SCAN:</b> 1X2X3X4X5X6X7X8X			
<b>VOLT:</b> 1.000 kV	<b>RISE:</b> 0.5 S			<b>LOCK</b>
<b>UPPER:</b> 1.000 mA	<b>FAIL:</b> 0.5 S			<b>OFST</b>
<b>REAL:</b> 1.000 mA	<b>LOW:</b> 0.001 mA			<b>RMT</b>
<b>TIME:</b> 1.0 S	<b>FREQ:</b> 50 Hz			<b>ERR</b>
<b>ARC:</b> 5.00 mA				
	<b>AC</b>	<b>DC</b>	<b>IR</b>	<b>OS</b>
	F1	F2	F3	F4
				F5

Parameter function

There are mainly 4 function keys which are **SETUP**, **TEST**, **SYSTEM**, **MEMU**.

### 4.2.1 SETUP):

<b>STEP:</b> 01/01 <u>AC</u>	<b>SCAN:</b> 1X2X3X4X5X6X7X8X			
<b>VOLT:</b> 1.000 kV	<b>RISE:</b> 0.5 S			<b>LOCK</b>

<b>UPPER:</b>	1.000	mA	<b>FAIL:</b>	0.5	S	<b>OFST</b>
<b>REAL:</b>	1.000	mA	<b>LOW:</b>	0.001	mA	<b>RMT</b>
<b>TIME:</b>	1.0	S	<b>FREQ:</b>	50	Hz	<b>ERR</b>
<b>ARC:</b>	5.00	mA	<b>INS</b>	<b>DEL</b>	<b>NEW</b>	
			F1	F2	F3	F4
						F5

Figure 4.2.1 AC setup interface

**Instruction**

**STEP: 01/01 Test procedure: current setting No. / total items.**

Key	Function	Instruction
F1	INS	Within the current test programme (PROG), it adds a new test item.
F2	DEL	Within the current test programme (PROG), delete the current test item.
F3	NEW	Create a blank test programme (PROG) (including a new test item), which is used to write a new test programme.
ENTRY		Switch the test item within (PROG) and select the item needing changing.
START		Directly setup the measurement

**AC** Current operating mode of test procedure is AC withstanding voltage. Cursor in this position can switch to other working items by F1~F3, for instance DC、IR、OS.

**SCAN: 1X2X3X4X5X6X7X8X** Connect multi-channel output and test terminal. SCAN channel: as for TH9201S with multi-channel, other models are corresponded with output terminal of TH9121 multi-channel tester. 8 output channels is connected with test output terminal, there are open, high voltage output and ground low terminal.

**Other data** The test condition of current (AC) item (in 4.3 AC withstanding voltage setup) .

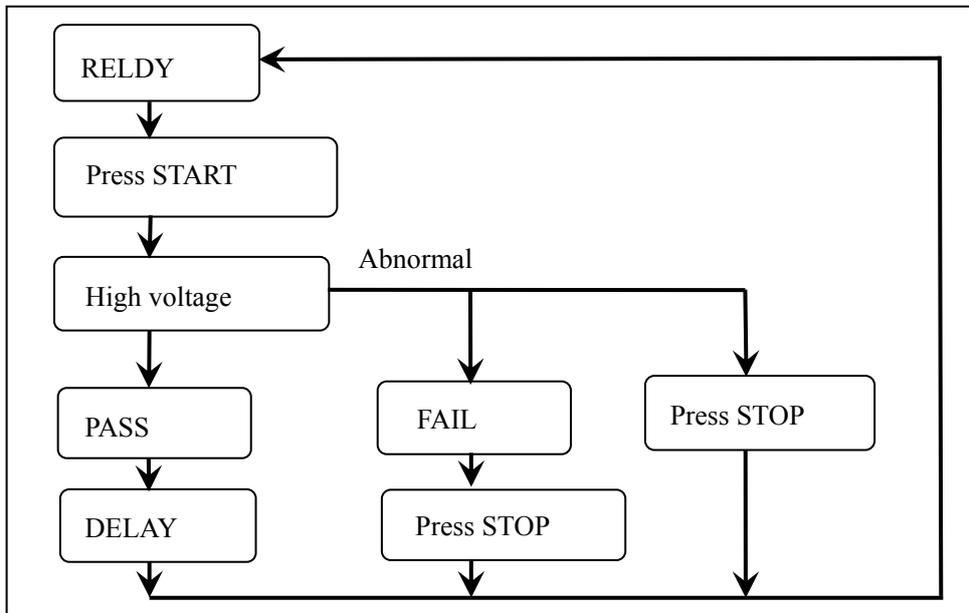
**4.2.2 (TEST): (Take AC for example)**

<b>STEP:</b>	01/01	AC	<b>SCAN:</b>	1X2X3X4X5X6X7X8X	
<b>VOLT:</b>	1.000	kV	<b>1 0 0 0</b>	<b>VAC</b>	<b>LOCK</b>
<b>UPPER:</b>	1.000	mA			<b>OFST</b>
<b>REAL:</b>	1.000	mA	<b>1.0 0 0</b>	<b>mA</b>	<b>RMT</b>
<b>TIME:</b>	1.0	S			<b>ERR</b>
<b>ARC:</b>	1.00	mA	<b>0.5</b>	<b>S</b>	<b>READY</b>

Figure 4.2.2 AC test

**Note:** Press ▼ to enter set interface

The high voltage can only be started on this interface to test high voltage. Other test conditions have to be set on setup interface. The test procedure is as below:



**Figure 4.2.3 Test procedure**

The three large font data in the middle of the front panel is the real time test data.

The top one is high voltage output voltage, the unit is (kV) .

The middle one is the tested current of low terminal, the unit is (mA) and (uA) .

The bottom one is the remained time in testing high voltage, if operator turns off the time control, then the test time no less than 999.9S will be displayed, user can analyze the test condition of DUT with the unit of (S) .

**Note: operator can't leave if the tester is working, and in the process of testing, not close to the test line or DUT.**

#### 4.2.3 (SYSTEM)

SYSTEM1					
PASS HOLD:	0.5	S	BEEP VOL:	LOW	LOCK
STEP HOLD:	0.5	S	CONTRAST:	4	OFST
AUTO RANG:	OFF		PASSWORD:	OFF	RMT
GR CONT:	0.2	S	GFI:	OFF	ERR
			<b>SYS1</b>	<b>SYS2</b>	<b>INT</b>

F1                      F2                      F3                      F4                      F5

#### 4.2.4 SYSTEM1

**Instruction:**

Label	Instruction	Definition
PASS HOLD:	0.2S~99.9S	Pass judge hold time.
STEP HOLD:	0.0S~99.9S	Waiting time.
	KEY	Press 'START' to test the next item.
AUTO RANG:	ON 、 OFF	Automatically switch range before test end.

GR CONT:	OFF	No contact test in low terminal.
	KEY	Press 'START' to do contact test.
	0.2S~99.9S	Contact time setup.
BEEP VOL:	OFF、LOW、HIGHT	Alarm volume.
CONTRAST:	1~10	LCD contrast.
PASSWORD:	ON、OFF	Key lock setup.
GFI:	ON、OFF	Discharge wall function.

<u>SYSTEM2</u>				
AFTR FAIL:	STOP			LOCK
RAMP JUDG:	OFF			OFST
DC50 AGC:	OFF			RMT
PART NO:	0000			ERR
		<b>SYS1</b>	<b>SYS2</b>	<b>INT</b>
		F1	F2	F3
				F4
				F5

#### 4.2.5 SYSTEM2

##### Instruction :

Label	Instruction	Definition
AFTR FAIL:	STOP	Use 'STOP' to quit in fail result.
	CONTINUE	Continue the next step in fail result.
	RESTART	Retest in fail result.
RAMP JUDG:	ON、OFF	Low limit judge in rising withstanding voltage.
DC50 AGC:	ON、OFF	High voltage hardware feedback in DC50V-500V.
PART NO:	8 digit	No. of test programme.

<u>INTERFAC</u>				
GRIB ADD:	03	DATA:	8	LOCK
BAUD:	19200	PARITY:	NONE	OFST
STOP:	2			RMT
				ERR
		<b>SYS1</b>	<b>SYS2</b>	<b>INT</b>
		F1	F2	F3
				F4
				F5

##### Instruction:

GRIB ADD:	03	Communication interface address.
BAUD:	19200	Communication interface baud rate..
STOP:	2	Communication interface stop digit.
DATA:	8	Communication interface data digit.
PARITY:	NONE	Communication interface even odd check.

#### 4.2.4 (MEMORY)

In the interface of any items (AC, DC, IR, OS) in (PROG), press (MEMORY), then the window listed as below is displayed: (take AC interface for example)

<b>STEP:</b> 01/01 <u>AC</u>	<b>SCAN:</b> 1X2X3X4X5X6X7X8X				
<b>VOLT:</b> 1.000 kV	<div style="border: 1px solid black; padding: 5px;"> <p>-----MEMORY-----</p> <p><b>SAVE FILE</b></p> <p><b>LOAD FILE</b></p> </div>	<b>LOCK</b>			
<b>UPPER:</b> 1.000 mA		<b>OFST</b>			
<b>REAL:</b> 1.000 mA		<b>RMT</b>			
<b>TIME:</b> 1.0 S		<b>ERR</b>			
<b>ARC:</b> 5.00 mA					
	<b>SAVE</b>	<b>LOAD</b>		<b>ENTER</b>	
	F1	F2	F3	F4	F5

Use function key F1 F2 to save or load to enter the interface below:

<b>STEP:</b> 01/01 <u>AC</u>	<b>SCAN:</b> 1X2X3X4X5X6X7X8X				
<b>VOLT:</b> 1.000 kV	<div style="border: 1px solid black; padding: 5px;"> <p>-----SAVE-----</p> <p><b>SN</b> : <u>00</u></p> <p><b>NAME</b> : -UNNAME-</p> <p><b>STEP</b> : Black</p> </div>	<b>LOCK</b>			
<b>UPPER:</b> 1.000 mA		<b>OFST</b>			
<b>REAL:</b> 1.000 mA		<b>RMT</b>			
<b>TIME:</b> 1.0 S		<b>ERR</b>			
<b>ARC:</b> 5.00 mA					
	▼	▲		<b>ENTER</b>	
	F1	F2	F3	F4	F5

Instruction:

Label	Instruction	Definition
<b>SN:</b>	00~49	SN of memory.
<b>NAME:</b>	8 digit	Name of programme.
<b>STEP:</b>	Black	The current memory is not available.
	00~99	The number of item saved in memory.

Operator selects the memory and fill in the file name, press **F4 (ENTER)** to enter dialog box to confirm.

Save data.

Load interface:

<b>STEP:</b> 01/01 <u>AC</u>	<b>SCAN:</b> 1X2X3X4X5X6X7X8X				
<b>VOLT:</b> 1.000 kV	<div style="border: 1px solid black; padding: 5px;"> <p>-----LODE-----</p> <p><b>SN</b> : <u>00</u></p> <p><b>NAME</b> : -UNNAME-</p> <p><b>STEP</b> : Black</p> </div>	<b>LOCK</b>			
<b>UPPER:</b> 1.000 mA		<b>OFST</b>			
<b>REAL:</b> 1.000 mA		<b>RMT</b>			
<b>TIME:</b> 1.0 S		<b>ERR</b>			
<b>ARC:</b> 5.00 mA					
	▼	▲		<b>ENTER</b>	
	F1	F2	F3	F4	F5

Operator can't change the file name, but change the SN of memory according to the file name and item length.

## 4.3 Test item interface and parameter setup

### 4.3.1 AC withstanding voltage test parameter setup:

STEP:	01/01	AC	SCAN:	1X2X3X4X5X6X7X8X		
VOLT:	1.000	kV	RISE:	0.5	S	LOC
UPPER:	1.000	mA	FAIL:	0.5	S	OFST
REAL:	1.000	mA	LOW:	0.001	mA	RND
TIME:	1.0	S	FREQ:	50	Hz	ERR
ARC:	5.00	mA				
			▼	▲		
			F1	F2	F3	F4
						F5

Figure 4.3.1 AC setup interface

Instruction:

VOLT:	0.005~5.000kV	Voltage value of AC high voltage test
UPPER:	0.01~30.00mA	Current high limit value of AC withstanding voltage
REAL:	OFF~0.001~30.00mA	Real current high limit value of AC withstanding voltage
TIME:	OFF~0.1~999.9S	Test time of AC withstanding voltage
ARC:	OFF~0.1~15.0 mA	Current Max. value of AC arc
RISE:	OFF~0.1~999.9S	Voltage rising time of AC high voltage test
FAIL:	OFF~0.1~999.9S	Voltage down time of AC high voltage test
LOW:	OFF~0.001~30.00mA	Low limit current value of AC
FREQ:	50/60	AC working frequency

### 4.3.2 DC withstanding voltage test parameter setup (DC):

STEP:	01/01	DC	SCAN:	1X2X3X4X5X6X7X8X		
VOLT:	1.000	kV	RISE:	0.5	S	LOC
LOW:	1.000	mA	FAIL:	0.5	S	OFST
UPPER:	1.000	mA	WAT:	0.2	S	RND
TIME:	1.0	S	CHEK:	OFF		ERR
ARC:	5.00	mA				
			▼	▲		
			F1	F2	F3	F4
						F5

Figure 4.3.2 DC setup interface

Instruction:

VOLT:	0.050~6.000kV	Voltage value of DC high voltage test
UPPER:	0.001~10.00mA	Current high limit value of DC high voltage
LOW:	OFF~0.001~10.00mA	Current low limit value of DC withstanding voltage
TIME:	OFF~0.1~999.9S	Test time of DC withstanding voltage
ARC:	OFF~0.1~10.0 mA	Current Max. value of DC arc

RISE:	OFF~0.1~999.9S	Voltage rising time of DC high voltage
FAIL:	OFF~0.1~999.9S	Voltage down time of DC high voltage test
WAT:	OFF~0.1~999.9S	DC charge waiting time
CHEK:	ON OFF	DC capacitance load charge current test.

#### 4.3.3 Insulation resistance (IR) test parameter setup: (Figure 4.3.3):

STEP:	01/01	IR	SCAN:	1X2X3X4X5X6X7X8X		
VOLT:	<u>1</u> .000	kV	RISE:	0.5	S	LOC
UPPER:	1.000	mA	FAIL:	0.5	S	OFST
LOW:	1.000	mA	SAGC	OFF		RND
TIME:	1.0	S				ERR
RANG:	AUTO					
			▼	▲		
			F1	F2	F3	F4
					F5	

Figure 4.3 IR setup interface

Instruction:

VOLT:	0.050~6.000kV	Voltage value of IR test
UPPER:	0.001~10.00mA	High limit value of IR
LOW:	OFF~0.001~10.00mA	Low limit value of IR.
TIME:	OFF~0.1~999.9S	Test time of IR.
RANG:	AUTO、300nA、3uA、30uA、300uA、3mA、10mA	Range control of IR.
RISE:	OFF~0.1~999.9S	Rising time of insulation voltage.
FAIL:	OFF~0.1~999.9S	Down time of insulation voltage.
SAGC:	ON、OFF	Software auto voltage control.

#### 4.3.4 Open detection (OS) parameter setup:

STEP:	1/1	OS	SCAN:	1X2X3X4X5X6X7X8X		
OPEN CHK:	50%					
SHORT CHK:	300%					
STAN:	<u>1.00</u> nF					
			GET			
			F1	F2	F3	F4
					F5	

Figure 4.3.4 OS setup interface

Instruction:

OPEN CHK:	1%~100%	Percentage of open judge value and standard value
SHORT CHK:	OFF~100%~500%	Percentage of short judge value and standard value
STAN:		Sampling standard value

Note: 1. When the cursor is in the position as the table below, (F1) position displays (GET) .



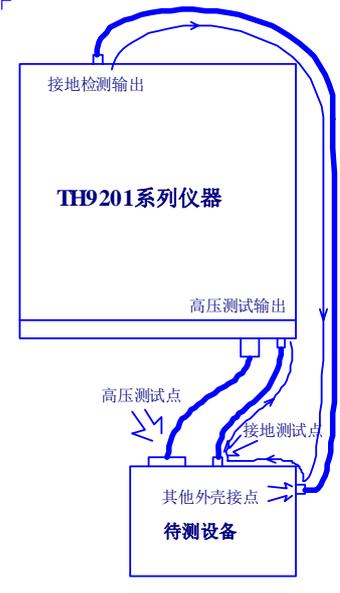
## 1. Ground connection test

Ground connection is used in testing device, now the low test terminal is connected to the ground terminal (shell), which is used to judge the reliability of ground connection. If the low terminal connection is not reliable, the shell of DUT takes high voltage in the process of testing; it will cause the accident shock.

Instruction:

- High voltage test terminal is connected to the ground terminal of DUT.
- Test low terminal is connected to the ground connection terminal of shell.
- Ground check terminal is connected to other terminals of shell (screw).
- Set ground connection test, test time is set by user.
- Start test, instrument firstly executes ground check: output current from ground check, and flows back to test low terminal shown as the figure.
- If the test circuit connection is normal within the set time (if circle resistance < 1ohm, it is normal), the ground check is passed and test continues.
- If test circuit is not available (if circle resistance > 1ohm, it is abnormal), the instrument will quit testing, and displays connection error (GR FAIL).

Note: ground breakover parameter is the GR CONT in **SYSTEM1** interface.



## 1. Electric wall function

Electric wall is used to check the ground current and avoid shocking in the process of testing. When outputting high voltage, the current from voltage output terminal will be back to shell through body, it will cause a serious result.

Instruction:

- When starting electric wall, if ground current is larger than 0.5mA, it judges as shock.
- When electric wall is closed, if ground current is larger than 30mA, it judges as shock.
- When the judge is shock, the instrument will output high voltage within 0.3S, and quit test status, as well as display GFI FAIL.

Note: when ground current reaches to 30mA, it is so serious that it will cause the operator coma or death. It is suggested

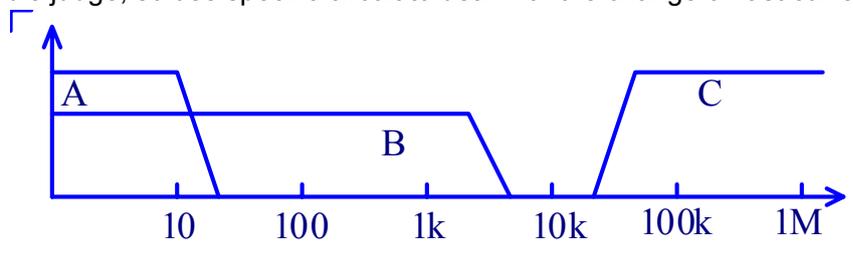


to open electric wall.

## 2. Current over limit and arc detection (ARC) function

Current over limit is divided as: current low and high limit, current range over limit, arc detection.

- Current low limit judge (**LOW**): generally for judging low terminal break. When instrument tests device, there must be a certain leakage current, when the leakage current is smaller than the set current value, it means fail, if the leakage current of DUT is quite small, then it is not necessary to turn off the function. It displays (**LOW FAIL**) in over limit.
- Current high limit judge (**HIGH**): When instrument tests device, there must be a certain leakage current, when the leakage current is larger than the set current value, it means fail. It displays (**HI FAIL**) in over limit.
- Current range over limit (**RNGE**): current sampling judge is slow, and sometimes the current changes quickly so that sampling circuit can't reflect, otherwise, if current has passed the range of current test, it would trigger the over limit judge. It displays (**RNGE FAIL**) in over limit.
- Real current high limit judge (**REAL**): DUT is considered as capacitive, and the capacitor takes current in AC test. When the capacitive change is big, then the capacitive current has nothing to do with the test result, now you can select real current judge which only judges the current of same voltage phase. It displays (**REAL FAIL**) in over limit.
- (ARC) : It is a practical function in component test, which tests the instant fire in partial circuit of high voltage. Because the speed of partial fire is quite fast, and the filter coefficient of common current detection circuit is so large that it can't make a suitable judge, so use specific circuit to deal with the change of fast current pulse.



Current over limit judge and frequency response contrast of arc detection: (in the figure above)

- Zone A: current response of current sampling display, the power ripple has to be filtered, so the analyze response rate is 0.1S class.
- Zone B: sampling analyze circuit rate is too slow, and long-time over-flow may cause the damage of DUT, as well as effect the output circuit. In circuit, current fast response circuit is added for compensating slow sampling response. It can response the over-flow signal quickly, but if current waveform is big, high

accuracy contrast can't be performed, but over range judge.

- Zone C: Arc detection circuit. There is air breakdown in high voltage, which causes the partial high frequency self-motivation. There is low frequency current in current sampling circuit, and the fast signal can't be handled meanwhile. Arc detection circuit only samples the changeable amplitude to find the potential defect in current return circuit.

# TH9201series specification

Model		TH9201	TH9201S	TH9201B	TH9201C
<b>Voltage output</b>					
AC	Output voltage range	0.05kV—5kV			
	Voltage frequency	50Hz、60Hz selectable			
	Max. output power	150VA (5kV/30mA)		100VA (5kV/20mA)	
DC	Output voltage range	0.05kV—6kV		0.5kV—6kV	-----
	Max. output power	50VA(5kV/10mA)		25VA(5kV/5mA)	-----
	Discharge function	Auto discharge after test ends		Auto discharge after test ends	-----
IR	Output voltage range	50V – 1000V			-----
	Max. output power	10 VA (1000V/10mA)			-----
	Discharge function	Auto discharge after test ends			-----
8 channels sweep		-----	Available	-----	
<b>Voltage display</b>					
Digit	Test range	0.00kV – 6.00kV AC/DC			
	Accuracy	±(1.0%reading+2V)			
<b>Current display</b>					
Test range	AC	0.1mA – 30mA		0.1mA – 20mA	
	DC	0.01mA – 10mA		0.01mA – 5mA	-----
Accuracy		±(1%reading+10digits) (after correction)			
Arc detection	AC	1mA – 15mA		1mA – 15mA	
	DC	1mA – 10mA		1mA – 5mA	
<b>Insulation resistance display</b>					
Resistance test range		0.01MΩ– 9.99GΩ, (current range is from10nA – 10mA)			-----
Resistance test accuracy		±(5%reading+5digits) (after correction)			-----
<b>Parameter setup</b>					
Voltage rising time		0.1s – 999s			
Voltage down time		0.1s – 999s			
Voltage waiting time		0.1s – 99.9s(only for DC)			
Test time setup		0.3s – 999s			
Other function		Fast discharge, body protection, Handler, RS-232C、 GPIB interface			

# Chapter 5 TH9201 RS232 Commands

## 1. Commands for System settings

### **:SYSTem:VERSion?**

Inquires about the version of the tester.

#### **--Syntax:**

Command message:

Query message:

:SYST:VERS?

#### **--Example:**

:SYST:VERS?

#### **--Response message**

If the version of the tester is 1.00,

Ver 1.00 is returned.

### **:SYSTem:TIME:PASS**

Sets the pass hold time in a PASS judgment.

Also inquires about the current PASS hold time.

#### **--Syntax:**

Command message: :SYST:TIME:PASS <time>

Query message:

:SYST:TIME:PASS?

#### **--Program data:**

Data format:float

Set value: 0.3~99.9

Resolution: 0.1

Unit: s

#### **--Example:**

To set the PASS hold time to 1.0s,

:SYST:TIME:PASS 1.0

#### **--Example:**

:SYST:TIME:PASS?

If the current PASS hold time is 1.0,

1.0 is returned.

### **:SYSTem:TIME:STEP**

Sets the step hold time .

Also inquires about the current step hold time.

**--Syntax:**

Command message: :SYST:TIME:STEP <time>

Query message:

:SYST:TIME:STEP?

**--Program data:**

Data format: float

Set value: 0.3~99.9

Resolution: 0.1

Unit: s

**--Example:**

To set the step hold time to 1.0s,

:SYST:TIME:STEP 1.0.

**--Example:**

:SYST:TIME:STEP?

If the current step hold time is 1.0,

1.0 is returned.

**:SYSTem:RJUDgment**

Sets the RAMP JUDG's status.

Also inquires about the current RAMP JUDG's status.

**--Syntax:**

Command message:

:SYST:RJUD < ON/OFF/1/0 >

Query message:

:SYST:RJUD?

**--Program data<ON/OFF>:**

Data format: Character

Set value: 0 (OFF) , 1 (ON)

**--Example:**

To set the RAMP JUDG to ON,

:SYST:RJUD ON

**--Example:**

:SYST:RJUD?

If the current RAMP JUDG is ON,

ON is returned.

**:SYSTem:WRANge**

Sets the AUTO RANGE's status.

Also inquires about the current AUTO RANGE's status.

**--Syntax:**

Command message:

:SYST:WRAN < ON/OFF/1/0 >

Query message:

:SYST:WRAN?

**--Program data<ON/OFF>:**

Data format: Character

Set value: 0 (OFF) , 1 (ON)

**--Example:**

To set the AUTO RANGE's status to ON,

:SYST:WRAN ON.

**--Example:**

:SYST:WRAN?

If the current AUTO RANGE's status is ON,

ON is returned.

**:SYSTem:GCONtinuity**

Sets the GR CONT's status.

Also inquires about the current GR CONT's status.

**--Syntax:**

Command message:

:SYST:GCON < ON/OFF/1/0 >

Query message:

:SYST:GCON?

**--Program data<ON/OFF>:**

Data format: Character

Set value: 0 (OFF) , 1 (ON)

**--Example:**

To set the GR CONT's status to ON,

:SYST:GCON ON.

**--Example:**

:SYST: GCON?

If the current GR CONT's status is ON,

ON is returned.

**:SYSTem:GFI**

Sets the GFI's status.

Also inquires about the current GFI's status.

**--Syntax:**

Command message:

:SYST:GFI < ON/OFF/1/0 >

Query message:

:SYST:GFI?

**--Program data<ON/OFF>:**

Data format: Character

Set value: 0 (OFF) , 1 (ON)

**--Example:**

To set the GFI's status to ON,

:SYST:GFI ON.

**--Example:**

:SYST: GFI?

If the current GFI's status is ON,

ON is returned.

**:SYSTem:FAIL**

Sets the AFTR FAIL's status.

Also inquires about the current AFTR FAIL's status.

**--Syntax:**

Command message:

:SYST:FAIL < STOP/CONTInue/REStart >

Query message:

:SYST:FAIL?

**--Program data< STOP/CONTInue/REStart >:**

Data format: Character

Set value: STOP/CONTInue/REStart

**--Example:**

To set the AFTR FAIL's status to STOP,

:SYST:FAIL STOP.

**--Example:**

:SYST: FAIL?

If the current AFTR FAIL's status is STOP,

STOP is returned.

**:SYSTem:BEEP**

Sets the buzzer volume.

Also inquires about the current buzzer volume.

**--Syntax:**

Command message: :SYST:BEEP < ON/OFF/1/0 >

Query message:

:SYST:BEEP?

**--Program data:**

Data format: Integer

Set value: 0~2 (0 is OFF)

Resolution: 1

Unit:

**--Example:**

To set the buzzer volume to 1,

:SYST:BEEP 1.

**--Example:**

:SYST:BEEP?

If the current buzzer volume is 1,

1 is returned.

**:SYSTem:DAGC**

Sets the DC50 AGC's status.

Also inquires about the current DC50 AGC's status.

**--Syntax:**

Command message:

:SYST:DAGC < ON/OFF/1/0 >

Query message:

:SYST:DAGC?

**--Program data<ON/OFF>:**

Data format: Character

Set value: 0 (OFF) , 1 (ON)

**--Example:**

To set the DC50 AGC's status to ON,

:SYST:DAGC ON.

**--Example:**

:SYST: DAGC?

If the current DC50 AGC's status is ON,

ON is returned.

## **:SYST:CR**

Sets the LCD contrast.

Also inquires about the current LCD contrast.

### **--Syntax:**

Command message: :SYST:CR < set value >  
:SYSTEM:CONTRAST < set value >

Query message:  
:SYST:CR?  
:SYSTEM:CONTRAST?

### **--Program data:**

Data format: Integer

Set value: 1~10

Resolution: 1

Unit:

### **--Example:**

To set the LCD contrast to 4,  
:SYST:CR 4.

### **--Example:**

:SYST:CR?  
If the current LCD contrast is 4,  
4 is returned.

## **:SYSTem:PART**

Sets the part number.

Also inquires about the current part number.

### **--Syntax:**

Command message: :SYST:PART < set value >

Query message:  
:SYST:PART?

### **--Program data:**

Data format: Integer

Set value: 8 位

Resolution:

Unit:

### **--Example:**

To set the part number to 20090501,

:SYST:PART 20090501.

--Example:

:SYST:PART?

If the current part number is 20090501,  
20090501 is returned.

### **:SYSTem:LOCK**

Sets the KEY LOCK's status.

Also inquires about the current KEY LOCK's status.

--Syntax:

Command message:

:SYST:LOCK < ON/OFF/1/0 >

Query message:

:SYST:LOCK?

--Program data<ON/OFF>:

Data format: Character

Set value: 0 (OFF) , 1 (ON)

--Example:

To set the KEY LOCK's status to ON,

:SYST:LOCK ON.

--Example:

:SYST: LOCK?

If the current KEY LOCK's status is ON,

ON is returned.

## **2. Commands for AC settings**

### **:SOURce:SAFEty:STEP:AC:LEVel**

Sets the test voltage for ACW test.

Also inquires about the test voltage.

--Syntax:

Command message:     :

SOUR:SAFE:STEP <sn>:AC:LEV < voltage >

Query message:

:SOUR:SAFE:STEP <sn>:AC:LEV?

--Program data<sn>:

Data format: Integer

Set value: 1~49

Resolution: 1

Unit:

**--Program data<voltage>:**

Data format: float

Set value: 50~5000

Resolution: 1

Unit: V

**--Example:**

To set the test voltage for step 1 to 1000,

:SOUR:SAFE:STEP 1:AC:LEV 1000.

**--Example:**

:SOUR:SAFE:STEP 1:AC:LEV?

If the current test voltage for step 1 is 1000,

1000 is returned.

**:SOURce:SAFEty:STEP:AC:LIMit:LOW**

Sets the LOWER current for ACW test.

Also inquires about the LOWER current.

**--Syntax:**

Command message:

:SOUR:SAFE:STEP <sn>:AC:LIM:LOW <current>

Query message:

:SOUR:SAFE:STEP <sn>:AC:LIM:LOW?

**--Program data<sn>:**

Data format: Integer

Set value: 1~49

Resolution: 1

Unit:

**--Program data<current>:**

Data format: float

Set value: 0~30.000E-3 (0 is OFF)

Resolution: 1.000E-6

Unit: A

**--Example:**

To set the LOWER current for step 1 to 0.001,

:SOUR:SAFE:STEP 1:AC:LIM:LOW 0.001.

**--Example:**

:SOUR:SAFE:STEP 1:AC:LIM:LOW?

If the current LOWER current for step 1 is 0.001,  
0.001 is returned.

**:SOURce:SAFEty:STEP:AC:LIMit:HIGH**

Sets the UPPER current for ACW test.  
Also inquires about the UPPER current.

**--Syntax:**

Command message:

:SOUR:SAFE:STEP <sn>:AC:LIM:HIGH <current>

Query message:

:SOUR:SAFE:STEP <sn>:AC:LIM:HIGH?

**--Program data<sn>:**

Data format: Integer

Set value: 1~49

Resolution: 1

Unit:

**--Program data< current>:**

Data format: float

Set value: 1.00E-6~30.000E-3

Resolution: 1.000E-6

Unit: A

**--Example:**

To set the UPPER current for step 1 to 0.001,

:SOUR:SAFE:STEP 1:AC:LIM:LOW 0.001.

**--Example:**

:SOUR:SAFE:STEP 1:AC:LIM:LOW?

If the current UPPER current for step 1 is 0.001,

0.001 is returned.

**:SOURce:SAFEty:STEP:AC:LIMit:ARC**

Sets the ARC current for ACW test.  
Also inquires about the ARC current.

**--Syntax:**

Command message:

:SOUR:SAFE:STEP <sn>:AC:LIM:ARC <current>

Query message:

:SOUR:SAFE:STEP <sn>:AC:LIM:ARC?

**--Program data<sn>:**

Data format: Integer  
Set value: 1~49  
Resolution: 1  
Unit:

**--Program data<current>:**

Data format: float  
Set value: 0~15.0E-3 (0 is OFF)  
Resolution: 1.000E-4  
Unit: A

**--Example:**

To set the ARC current for step 1 to 0.001,  
:SOUR:SAFE:STEP 1:AC:LIM:ARC 0.001.

**--Example:**

:SOUR:SAFE:STEP 1:AC:LIM:ARC?  
If the current ARC current for step 1 is 0.001,  
0.001 is returned.

**:SOURce:SAFEty:STEP:AC:LIMit:REAL**

Sets the REAL current for ACW test.  
Also inquires about the REAL current.

**--Syntax:**

Command message: :SOUR:SAFE:STEP <sn>:AC:LIM:REAL <current>

Query message:

:SOUR:SAFE:STEP <sn>:AC:LIM:REAL?

**--Program data<sn>:**

Data format: Integer  
Set value: 1~49  
Resolution: 1  
Unit:

**--Program data<current>:**

Data format: float  
Set value: 0~30.000E-3 (0 is OFF)  
Resolution: 1.000E-6  
Unit: A

**--Example:**

To set the REAL current for step 1 to 0.001,

:SOUR:SAFE:STEP:AC:LIM:REAL 0.001.

--Example:

:SOUR:SAFE:STEP:AC:LIM:REAL?

If the current REAL current for step 1 is 0.001,  
0.001 is returned.

#### **:SOURce:SAFETy:STEP:AC:TIME:RAMP**

Sets the RISE time for ACW test.

Also inquires about the RISE time.

--Syntax:

Command message:

SOUR:SAFE:STEP <sn>:AC:TIME:RAMP <time>

Query message:

SOUR:SAFE:STEP <sn>:AC:TIME:RAMP?

--Program data<sn>:

Data format: Integer

Set value: 1~49

Resolution: 1

Unit:

--Program data<time>:

Data format: float

Set value: 0~999.9 (0 is OFF)

Resolution: 0.1

Unit: s

--Example:

To set the RISE time for step 1 to 1,

:SOUR:SAFE:STEP 1:AC:TIME:RAMP 1.

--Example:

:SOUR:SAFE:STEP 1:AC:TIME:RAMP?

If the current RISE time for step 1 is 1,  
1 is returned.

#### **:SOURce:SAFETy:STEP:AC:TIME:FALL**

Sets the FALL time for ACW test.

Also inquires about the FALL time.

--Syntax:

Command message:

SOUR:SAFE:STEP <sn>:AC:TIME:FALL <time>

Query message:

SOUR:SAFE:STEP <sn>:AC:TIME:FALL?

**--Program data<sn>:**

Data format: Integer

Set value: 1~49

Resolution: 1

Unit:

**--Program data<time>:**

Data format: float

Set value: 0~999.9 (0 is OFF)

Resolution: 0.1

Unit: s

**--Example:**

To set the FALL time for step 1 to 1,

:SOUR:SAFE:STEP 1:AC:TIME:FALL 1.

**--Example:**

:SOUR:SAFE:STEP 1:AC:TIME:FALL?

If the current FALL time for step 1 is 1,

1 is returned.

**:SOURce:SAFEty:STEP:AC:TIME:TEST**

Sets the test time for ACW test.

Also inquires about the test time.

**--Syntax:**

Command message:

SOUR:SAFE:STEP <sn>:AC:TIME:TEST <time>

Query message:

SOUR:SAFE:STEP <sn>:AC:TIME:TEST?

**--Program data<sn>:**

Data format: Integer

Set value: 1~49

Resolution: 1

Unit:

**--Program data<time>:**

Data format: float

Set value: 0~999.9 (0 is OFF)

Resolution: 0.1

Unit: s

**--Example:**

To set the TEST time for step 1 to 1,  
:SOUR:SAFE:STEP 1:AC:TIME:TEST 1.

--Example:

:SOUR:SAFE:STEP 1:AC:TIME:TEST?

If the current TEST time for step 1 is 1,  
1 is returned.

### **:SOURce:SAFEty:STEP:AC:FREQ**

Sets the test frequency for ACW test.

Also inquires about the test frequency.

--Syntax:

Command message:

SOUR:SAFE:STEP <sn>:AC:TIME:FREQ <freq>

Query message:

SOUR:SAFE:STEP <sn>:AC:TIME:FREQ ?

--Program data<sn>:

Data format: Integer

Set value: 1~49

Resolution: 1

Unit:

--Program data<freq>:

Data format: Character

Set value: 50/60

Resolution:

Unit: Hz

--Example:

To set the test frequency for step 1 to 50,  
:SOUR:SAFE:STEP :AC:TIME:FREQ 50.

--Example:

:SOUR:SAFE:STEP :AC:TIME:FREQ?

If the current test frequency for step 1 is 50,  
50 is returned.

### **:SOUR:SAFE:STEP:AC:CHAN**

Sets HIGH/LOW/OPEN for the scanner channel for ACW test.

Also inquires about the set value for the scanner channel.

--Syntax:

Command message:

SOUR:SAFE:STEP <sn>:AC:CHAN <channel>:

<HIGH/LOW/OPEN>

Query message:

SOUR:SAFE:STEP <sn>:AC:CHAN <channel>?

--Program data<sn>:

Data format: Integer

Set value: 1~49

Resolution: 1

Unit:

--Program data< channel >:

Data format: Integer

Set value: 1~8

Resolution: 1

Unit:

--Program data<HIGH/LOW/OPEN>:

Data format: Character

Set value: HIGH/LOW/OPEN

Resolution:

Unit:

--Example:

To set the scanner channel 1 for step 1 to HIGH,

: SOUR:SAFE:STEP 1:AC:CHAN 1:HIGH.

--Example:

SOUR:SAFE:STEP 1:AC:CHAN 1?

If the scanner channel 1 for step 1 is HIGH,

HIGH is returned.

### 3. Commands for DC settings

**:SOURCE:SAFETY:STEP:DC:LEVEL**

Sets the test voltage for DCW test.

Also inquires about the test voltage.

--Syntax:

Command message: :

SOUR:SAFE:STEP <sn>:DC:LEV <volt>

Query message:

:SOUR:SAFE:STEP <sn>:DC:LEV?

--Program data<sn>:

Data format: Integer

Set value: 1~49

Resolution: 1

Unit:

**--Program data<volt>:**

Data format: float

Set value: 50~6000

Resolution: 1

Unit: V

**--Example:**

To set the test voltage for step 1 to 1000,

:SOUR:SAFE:STEP 1:DC:LEV 1000.

**--Example:**

:SOUR:SAFE:STEP 1:DC:LEV?

If the current test voltage for step 1 is 1000,

1000 is returned.

**:SOURce:SAFEty:STEP:DC:LIMit:LOW**

Sets the LOWER current for DCW test.

Also inquires about the LOWER current.

**--Syntax:**

Command message:

:SOUR:SAFE:STEP <sn>:DC:LIM:LOW <current>

Query message:

:SOUR:SAFE:STEP <sn>:DC:LIM:LOW?

**--Program data<sn>:**

Data format: Integer

Set value: 1~49

Resolution: 1

Unit:

**--Program data<current>:**

Data format: float

Set value: 0~10.000E-3 (0 is OFF)

Resolution: 1.000E-6

Unit: A

**--Example:**

To set the LOWER current for step 1 to 0.001,

:SOUR:SAFE:STEP 1:DC:LIM:LOW 0.001.

**--Example:**

:SOUR:SAFE:STEP 1:DC:LIM:LOW?

If the current LOWER current for step 1 is 0.001,  
0.001 is returned.

**:SOURce:SAFETy:STEP:DC:LIMit:HIGH**

Sets the UPPER current for DCW test.  
Also inquires about the UPPER current.

**--Syntax:**

Command message:

:SOUR:SAFE:STEP <sn>:DC:LIM:HIGH <current>

Query message:

:SOUR:SAFE:STEP <sn>:DC:LIM:HIGH?

**--Program data<sn>:**

Data format: Integer

Set value: 1~49

Resolution: 1

Unit:

**--Program data<current>:**

Data format: float

Set value: 1.00E-6~10.000E-3

Resolution: 1.000E-6

Unit: A

**--Example:**

To set the UPPER current for step 1 to 0.001,

:SOUR:SAFE:STEP 1:DC:LIM:LOW 0.001.

**--Example:**

:SOUR:SAFE:STEP 1:DC:LIM:LOW?

If the current UPPER current for step 1 is 0.001,

0.001 is returned.

**:SOURce:SAFETy:STEP:DC:LIMit:ARC**

Sets the ARC current for DCW test.  
Also inquires about the ARC current.

**--Syntax:**

Command message:

:SOUR:SAFE:STEP <sn>:DC:LIM:ARC <current>

Query message:

:SOUR:SAFE:STEP <sn>:DC:LIM:ARC?

**--Program data<sn>:**

Data format: Integer

Set value: 1~49

Resolution: 1

Unit:

**--Program data<current>:**

Data format: float

Set value: 0~10.0E-3 (0 is OFF)

Resolution: 1.000E-4

Unit: A

**--Example:**

To set the ARC current for step 1 to 0.001,

:SOUR:SAFE:STEP 1:DC:LIM:ARC 0.001.

**--Example:**

:SOUR:SAFE:STEP 1:DC:LIM:ARC?

If the current ARC current for step 1 is 0.001,

0.001 is returned.

**:SOUR:SAFE:STEP:DC:TIME:RAMP**

Sets the RISE time for DCW test.

Also inquires about the RISE time.

**--Syntax:**

Command message:

SOUR:SAFE:STEP <sn>:DC:TIME:RAMP <time>

Query message:

SOUR:SAFE:STEP <sn>:DC:TIME:RAMP?

**--Program data<sn>:**

Data format: Integer

Set value: 1~49

Resolution: 1

Unit:

**--Program data<time>:**

Data format: float

Set value: 0~999.9 (0 is OFF)

Resolution: 0.1

Unit: s

--Example:

To set the RISE time for step 1 to 1,  
:SOUR:SAFE:STEP 1:DC:TIME:RAMP 1.

--Example:

:SOUR:SAFE:STEP 1:DC:TIME:RAMP?  
If the current RISE time for step 1 is 1,  
1 is returned..

#### **:SOUR:SAFE:STEP:DC:TIME:FALL**

Sets the FALL time for DCW test.  
Also inquires about the FALL time.

--Syntax:

Command message:

SOUR:SAFE:STEP <sn>:DC:TIME:FALL <time>

Query message:

SOUR:SAFE:STEP <sn>:DC:TIME:FALL?

--Program data<sn>:

Data format: Integer

Set value: 1~49

Resolution: 1

Unit:

--Program data<time>:

Data format: float

Set value: 0~999.9 (0 is OFF)

Resolution: 0.1

Unit: s

--Example:

To set the FALL time for step 1 to 1,  
:SOUR:SAFE:STEP 1:DC:TIME:FALL 1.

--Example:

:SOUR:SAFE:STEP 1:DC:TIME:FALL?  
If the current FALL time for step 1 is 1,  
1 is returned.

#### **:SOUR:SAFE:STEP:DC:TIME:TEST**

Sets the test time for DCW test.  
Also inquires about the test time.

--Syntax:

Command message:

SOUR:SAFE:STEP <sn>:DC:TIME:TEST <time>

Query message:

SOUR:SAFE:STEP <sn>:DC:TIME:TEST?

**--Program data<sn>:**

Data format: Integer

Set value: 1~49

Resolution: 1

Unit:

**--Program data<time>:**

Data format: float

Set value: 0~999.9 (0 is OFF)

Resolution: 0.1

Unit: s

**--Example:**

To set the TEST time for step 1 to 1,

:SOUR:SAFE:STEP 1:DC:TIME:TEST 1.

**--Example:**

:SOUR:SAFE:STEP 1:DC:TIME:TEST?

If the current TEST time for step 1 is 1,

1 is returned .

#### **:SOUR:SAFE:STEP:DC:TIME:DWEL**

Sets the WAIT time for DCW test.

Also inquires about the WAIT time.

**--Syntax:**

Command message:

SOUR:SAFE:STEP <sn>:DC:TIME:DWEL <time>

Query message:

SOUR:SAFE:STEP <sn>:DC:TIME:DWEL?

**--Program data<sn>:**

Data format: Integer

Set value: 1~49

Resolution: 1

Unit:

**--Program data<time>:**

Data format: float

Set value: 0~999.9 (0 is OFF)

Resolution: 0.1

Unit: s

--Example:

To set the WAIT time for step 1 to 1,  
:SOUR:SAFE:STEP 1:DC:TIME:DWEL 1.

--Example:

:SOUR:SAFE:STEP 1:DC:TIME:DWEL?  
If the current WAIT time for step 1 is 1,  
1 is returned.

#### **:SOUR:SAFE:STEP:DC:CLOW**

Sets the CHECK LOW's status for DCW test.  
Also inquires about the CHECK LOW's status.

--Syntax:

Command message:

SOUR:SAFE:STEP <sn>:DC:CLOW <ON/OFF> or <1/0>

Query message:

SOUR:SAFE:STEP <sn>:DC: CLOW ?

--Program data<sn>:

Data format: Integer

Set value: 1~49

Resolution: 1

Unit:

--Program data<set value>:

Data format: Character

Set value: OFF(0), ON(1)

Resolution:

Unit:

--Example:

To set the CHECK LOW's status for step 1 to ON,  
:SOUR:SAFE:STEP :DC:CLOW ON.

--Example:

:SOUR:SAFE:STEP :DC:CLOW?  
If the current CHECK LOW's status for step 1 is ON,  
ON is returned.

#### **:SOUR:SAFE:STEP:DC:CHAN**

Sets HIGH/LOW/OPEN for the scanner channel for DCW test.  
Also inquires about the set value for the scanner channel.

--Syntax:

Command message:  
SOUR:SAFE:STEP <sn>:DC:CHAN <channel>:  
<HIGH/LOW/OPEN>

Query message:  
SOUR:SAFE:STEP <sn>:DC:CHAN <channel>?

**--Program data<sn>:**

Data format: Integer  
Set value: 1~49  
Resolution: 1  
Unit:

**--Program data< channel >:**

Data format: Integer  
Set value: 1~8  
Resolution: 1  
Unit:

**--Program data<HIGH/LOW/OPEN>:**

Data format: Character  
Set value: HIGH/LOW/OPEN  
Resolution:  
Unit:

**--Example:**

To set the scanner channel 1 for step 1 to HIGH,  
: SOUR:SAFE:STEP 1:DC:CHAN 1:HIGH.

**--Example:**

SOUR:SAFE:STEP 1:DC:CHAN 1?  
If the scanner channel 1 for step 1 is HIGH,  
HIGH is returned

#### 4. Commands for IR Settings

**:SOURce:SAFEty:STEP:IR:LEVel**

Sets the test voltage for IR test.  
Also inquires about the test voltage.

**--Syntax:**

Command message: :  
SOUR:SAFE:STEP <sn>:IR:LEV <volt>

Query message:  
:SOUR:SAFE:STEP <sn>:IR:LEV?

**--Program data<sn>:**

Data format: Integer

Set value: 1~49

Resolution: 1

Unit:

**--Program data<volt>:**

Data format: float

Set value: 50~1000

Resolution: 1

Unit: V

**--Example:**

To set the test voltage for step 1 to 1000,

:SOUR:SAFE:STEP 1:IR:LEV 1000.

**--Example:**

:SOUR:SAFE:STEP 1:IR:LEV?

If the current test voltage for step 1 is 1000,

1000 is returned.

**:SOURce:SAFEty:STEP:IR:LIMit:LOW**

Sets the LOWER resistance for IR test.

Also inquires about the LOWER resistance.

**--Syntax:**

Command message:

:SOUR:SAFE:STEP <sn>:IR:LIM:LOW <resistance>

Query message:

:SOUR:SAFE:STEP <sn>:IR:LIM:LOW?

**--Program data<sn>:**

Data format: Integer

Set value: 1~49

Resolution: 1

Unit:

**--Program data< resistance >:**

Data format: float

Set value: 1.0E5~5.0E10

Resolution: 1.0E5

Unit:  $\Omega$

**--Example:**

To set the LOWER resistance for step 1 to 1000000,

:SOUR:SAFE:STEP 1:IR:LIM:LOW 1000000.

--Example:

:SOUR:SAFE:STEP 1:IR:LIM:LOW?

If the current LOWER resistance for step 1 is 1000000,  
1000000 is returned.

#### **:SOURce:SAFEty:STEP:IR:LIMit:HIGH**

Sets the UPPER resistance for IR test.

Also inquires about the UPPER resistance.

--Syntax:

Command message:

:SOUR:SAFE:STEP <sn>:IR:LIM:HIGH <resistance >

Query message:

:SOUR:SAFE:STEP <sn>:IR:LIM:HIGH?

--Program data<sn>:

Data format: Integer

Set value: 1~49

Resolution: 1

Unit:

--Program data<resistance >:

Data format: float

Set value: 0~5E10 (0 is OFF)

Resolution: 1.0E5

Unit:  $\Omega$

--Example:

To set the UPPER resistance for step 1 to 1000000,

:SOUR:SAFE:STEP 1:IR:LIM:HIGH 1000000.

--Example:

:SOUR:SAFE:STEP 1:IR:LIM:HIGH?

If the current UPPER resistance for step 1 is 1000000,  
1000000 is returned.

#### **:SOUR:SAFE:STEP:IR:TIME:RAMP**

Sets the RISE time for IR test.

Also inquires about the RISE time.

--Syntax:

Command message:

SOUR:SAFE:STEP <sn>:IR:TIME:RAMP <time>

Query message:

SOUR:SAFE:STEP <sn>:IR:TIME:RAMP?

**--Program data<sn>:**

Data format: Integer

Set value: 1~49

Resolution: 1

Unit:

**--Program data<time>:**

Data format: float

Set value: 0~999.9 (0 is OFF)

Resolution: 0.1

Unit: s

**--Example:**

To set the RISE time for step 1 to 1,

:SOUR:SAFE:STEP 1:IR:TIME:RAMP 1.

**--Example:**

:SOUR:SAFE:STEP 1:IR:TIME:RAMP?

If the current RISE time for step 1 is 1,

1 is returned.

**:SOUR:SAFE:STEP:IR:TIME:FALL**

Sets the FALL time for IR test.

Also inquires about the FALL time.

**--Syntax:**

Command message:

SOUR:SAFE:STEP <sn>:IR:TIME:FALL <time>

Query message:

SOUR:SAFE:STEP <sn>:IR:TIME:FALL?

**--Program data<sn>:**

Data format: Integer

Set value: 1~49

Resolution: 1

Unit:

**--Program data<time>:**

Data format: float

Set value: 0~999.9 (0 is OFF)

Resolution: 0.1

Unit: s

**--Example:**

To set the FALL time for step 1 to 1,  
:SOUR:SAFE:STEP 1:IR:TIME:FALL 1.

--Example:

:SOUR:SAFE:STEP 1:IR:TIME:FALL?

If the current FALL time for step 1 is 1,  
1 is returned.

#### **:SOUR:SAFE:STEP:IR:TIME:TEST**

Sets the test time for IR test.  
Also inquires about the test time

--Syntax:

Command message:

SOUR:SAFE:STEP <sn>:IR:TIME:TEST <time>

Query message:

SOUR:SAFE:STEP <sn>:IR:TIME:TEST?

--Program data<sn>:

Data format: Integer

Set value: 1~49

Resolution: 1

Unit:

--Program data<time>:

Data format: float

Set value: 0~999.9 (0 is OFF)

Resolution: 0.1

Unit: s

--Example:

To set the TEST time for step 1 to 1,  
:SOUR:SAFE:STEP 1:IR:TIME:TEST 1.

--Example:

:SOUR:SAFE:STEP 1:IR:TIME:TEST?

If the current TEST time for step 1 is 1,  
1 is returned.

#### **:SOUR:SAFE:STEP:IR:AGC**

Sets the AGC's status for IR test.  
Also inquires about the AGC's status

--Syntax:

Command message:

SOUR:SAFE:STEP <sn>:IR:AGC <ON/OFF> or <1/0>

Query message:

SOUR:SAFE:STEP <sn>:IR:AGC?

**--Program data<sn>:**

Data format: Integer

Set value: 1~49

Resolution: 1

Unit:

**--Program data<set value>:**

Data format: Character

Set value: OFF(0), ON(1)

Resolution:

Unit:

**--Example:**

To set the AGC's status for step 1 to ON,

:SOUR:SAFE:STEP :IR:AGC ON.

**--Example:**

:SOUR:SAFE:STEP :IR:AGC?

If the current AGC's status for step 1 is ON,

ON is returned

## **:SOUR:SAFE:STEP:IR:CHAN**

Sets HIGH/LOW/OPEN for the scanner channel for IR test.

Also inquires about the set value for the scanner channel.

**--Syntax:**

Command message:

SOUR:SAFE:STEP <sn>:IR:CHAN <channel>:

<HIGH/LOW/OPEN>

Query message:

SOUR:SAFE:STEP <sn>:IR:CHAN <channel>?

**--Program data<sn>:**

Data format: Integer

Set value: 1~49

Resolution: 1

Unit:

**--Program data< channel >:**

Data format: Integer

Set value: 1~8

Resolution: 1

Unit:

**--Program data**<HIGH/LOW/OPEN>:

Data format: Character

Set value: HIGH/LOW/OPEN

Resolution:

Unit:

**--Example:**

To set the scanner channel 1 for step 1 to HIGH,  
: SOUR:SAFE:STEP 1:IR:CHAN 1:HIGH.

**--Example:**

SOUR:SAFE:STEP 1:IR:CHAN 1?  
If the scanner channel 1 for step 1 is HIGH,  
HIGH is returned.

## 5. Commands for OS Settings

**: SOUR:SAFE:STEP:OSC:OPEN**

Sets the OPEN rate for OS test.

Also inquires the OPEN rate.

**--Syntax:**

Command message: :

SOUR:SAFE:STEP <sn>:OSC:OPEN <set value>

Query message:

:SOUR:SAFE:STEP <sn>:OSC:OPEN?

**--Program data**<sn>:

Data format: Integer

Set value: 1~49

Resolution: 1

Unit:

**--Program data**<set value>:

Data format: float

Set value: 0.1~1.0

Resolution: 0.1

Unit:

**--Example:**

To set the OPEN rate for step 1 to 50%,

:SOUR:SAFE:STEP 1:OS:OPEN 0.5.

--Example:

:SOUR:SAFE:STEP 1:OS:OPEN?

If the OPEN rate for step 1 is 50%,  
0.5 is returned.

### **: SOUR:SAFE:STEP:OSC:SHOR**

Sets the SHORT rate for OS test.

Also inquires the SHORT rate.

--Syntax:

Command message:     :

SOUR:SAFE:STEP <sn>:OSC:SHOR <set value >

Query message:

:SOUR:SAFE:STEP <sn>:OSC:SHOR?

--Program data<sn>:

Data format: Integer

Set value: 1~49

Resolution: 1

Unit:

--Program data<set value >:

Data format: Integer

Set value: 0~5 (0 is OFF)

Resolution: 1

Unit:

--Example:

To set the SHORT rate for step 1 to 200%,

:SOUR:SAFE:STEP 1:OS:SHOR 2.

--Example:

:SOUR:SAFE:STEP 1:OS:SHOR?

If the SHORT rate for step 1 is 200%,  
2 is returned.

### **:SOUR:SAFE:STEP:OS:CHAN**

Sets HIGH/LOW/OPEN for the scanner channel for OS test.

Also inquires about the set value for the scanner channel.

--Syntax:

Command message:

SOUR:SAFE:STEP                   <sn>:OS:CHAN

<channel>:

<HIGH/LOW/OPEN>

Query message:

SOUR:SAFE:STEP <sn>:OS: CHAN <channel>?

**--Program data**<sn>:

Data format: Integer

Set value: 1~49

Resolution: 1

Unit:

**--Program data**< channel >:

Data format: Integer

Set value: 1~8

Resolution: 1

Unit:

**--Program data**<HIGH/LOW/OPEN>:

Data format: Character

Set value: HIGH/LOW/OPEN

Resolution:

Unit:

**--Example:**

To set the scanner channel 1 for step 1 to HIGH,

: SOUR:SAFE:STEP 1:OS:CHAN 1:HIGH.

**--Example:**

SOUR:SAFE:STEP 1:OS:CHAN 1?

If the scanner channel 1 for step 1 is HIGH,

HIGH is returned.

## 6. Other Commands

### **:SOUR:SAFE:START**

Starts testing.

**--Syntax:**

Command message: :SOUR:SAFE:START

**--Example:**

:SOUR:SAFE:START

### **:SOUR:SAFE:STOP**

Stops a test. Also cancels FAIL,PASS,STOP status.

**--Syntax:**

Command message: :SOUR:SAFE:STOP

--Example:  
:SOUR:SAFE:STOP

**: SOUR:SAFE:LOAD**

Recalls the contents of memory stored before.

**--Syntax:**

Command message:

SOUR:SAFE:LOAD <sn>

**--Program data<sn>:**

Data format: Integer

Set value: 1~49

Resolution: 1

Unit:

**--Example:**

To recall memory 1,  
SOUR:SAFE:LOAD 1

**: SOUR:SAFE:STEPSN?**

Inquires about the current STEP during a test.

**--Syntax:**

:SOUR:SAFE:STEPSN?

**--Example:**

:SOUR:SAFE:STEPSN?  
If the current STEP during a test is 2,  
2 is returned.

**\*IDN**

Inquires about the tester's name and ROM version.

**--Syntax:**

Command message: \*IDN?

**--Example:**

\*IDN?  
TH9201 Ver:1.0 is returned.

**: TEST:DATAI?**

Inquires about the monitor current during the ACW/DCW test.

**--Syntax:**

:TEST:DATAI?

**--Unit: mA**

--Example:

:TEST:DATAI?

If the present monitor current in an ACW test is 1.00,  
1.00 is returned.

**: TEST:DATAR?**

Inquires about the monitor resistance during the IR test.

--Syntax:

:TEST:DATAR?

--Unit: M $\Omega$

--Example:

:TEST:DATAR?

If the present monitor resistance in an IR test is 1.00,  
1.00 is returned.

**: TEST:FETCH?**

Inquires the test results of per step.

--Syntax:

:TEST:FETCH?

--Response message:

data1, data 2,..., datan

--Unit: mA/M $\Omega$

--Example:

TEST:FETCH?

If the result of step1 is 1.00mA, the step2's is 3.00mA,  
1.00,3.00 is returned.

**: TEST:FETCH2?**

Inquires the test voltage, current (for ACW or DCW test) or resistance (for IR test), status of the current step.

--Syntax:

:TEST:FETCH2?

--Response message:

Status value, voltage value, current or resistance value

----**Program data**< status >:

0 (READY)

1 (TEST)

2 (PASS)

3 (FAIL)

4 (STOP)

----**Program data**< voltage value >:

Data format: Integer

Resolution: 1

Unit: V

----**Program data**< current or resistance value >:

Data format: float

Unit: mA/M $\Omega$

--Example:

:TEST:FETCH2?

If the current monitor voltage is 1000V, the monitor current is 1.00mA in an ACW test,

1, 1000, 1.00 is returned.