TH9201 Series

AC/DC Withstanding Voltage/ Insulation resistance Tester

Operation Manual

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Content

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, 240V）/5A（100V, 120V） Fuse （TH9201/S）	2
2A（220V, 240V）/3A（110V, 120V） 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 customers	1

1.2 Precautions for Installation

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

- **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.

- **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 ℃ to +35 ℃

Storage temperature range: -20 ℃ to +60 ℃

- **A void 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.

- **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.

- **Do not locate the tester in a dusty environment.**

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

- **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.

- **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.

- **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.

- **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:

- **Before moving the tester, turn off the power switch.**

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

- **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.

1.4 Checking power source and fuse

- **Toggle power line voltage**

⚠ **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):

100V：AC（90V to110V AC）

120V：AC（108V to 132V AC）

220V：AC（198V to 242V AC）

240V：AC（216V to 260V AC）

Allowable frequency range: 47 Hz to 63 Hz

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

- **Checking or 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.

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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
100V, 120V	47-63Hz	5A(TH9201/S)	500VA
		3A(TH9201B/C)	350VA
220V, 240V		3A(TH9201/S)	500VA
		2A(TH9201B/C)	350VA

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 an 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 line power are correctly selcected.
3. Confirm that the POWER switch on the tester is off.
4. Connect the AC power cord to the AC LINE connector on the rear panel.
5. Use the provided power code or power code that is selected by qualified personnel.
6. Plug in the AC power cord.

1.6 Grounding

⚠ **WARNING** Be sure to connect the tester to an electrical ground (safety ground). If the output to a conveyer 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 ClassI equipment (equipment protected against electric shock with protective grounding in addition to basic insulation). Therefore, electric shock may occur without proper grounding.

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.

Earth ←

1.7 Checking Operations

⚠ **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.

Checking procedure:

1. Confirm that the supply voltage is the same as that indicated on the rear panel.
2. Confirm that the power socket or the shell of the instrument has reliable grounding.
3. Confirm that the AC power cord is properly connected to the AC LINE connector on the rear panel.

4. Plug in the AC power cord.
5. Turn on the POWER switch. Confirm that all LEDs on the front panel are lit and the opening screen is displayed.
6. Following the opening screen, display the ACW screen and confirm that the tester is kept in the READY status
7. Turn off the POWER switch.

1.8 Other specifications

1. Power：≤500VA（TH9201/S）
   ≤350VA (TH9201B/C)
2.Dimensions：340mm*120mm*450mm;
3.Weight：15kg(TH9201/S);13kg（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.

⚠ **WARNING** The tester derivers 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.

2.1 Prohibited Operations

▪ 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.

▪ 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.

▪ 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

▪ 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.

▪ 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.

▪ 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.

▪ 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.

▪ 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

⚠ **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 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.

Under normal circumstances, it can be guaranteed that the test loop voltage is within the safe voltage range when finishing discharging. When the capacitance of the DUT is too large or the structure of the DUT is special, it may leads to incomplete discharge. In order to ensure complete discharge, test method must be changed by technical personnel.

Discharge time

In general, only DC high voltage test needs discharge and the length of the discharge time varies according to the properties of the DUT.

The discharge of the DUT is conducted by the transformer secondary winding(resistance of approximately 2k). Approximately 0.1s are required for 10uF capacitor with high voltage of 6000V to discharge to 30V. The fixed discharge time of the instrument is 0.2s, which ensures complete discharge of the device.

High-pressure DC filter capacitor inside the instrument is discharged through the discharge resistance of 10k and the discharge can be finished within 0.2S. The internal capacitor discharge circuit is a separate circuit and has no effect on the discharge of external device.

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

The internal resistance of thin film capacitors is much larger than 1000MΩ, the discharge time may take a few days or longer.

Computational formula of discharge time: $t = -\ln(30 / U) \times R \times C$

t: discharge time

30: discharge residue safty voltage 30V

U: test set voltage
R: discharge impedance of the DUT, the discharge impedance of the instrument is approx. 10k
C: capacitance of the DUT
When the time constant (R*C) 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. If the discharge time is greater than 0.2S, be careful to discharge it separately after leaving the instrument.

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 of 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 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） >12mA（TH9201B/C）	At least as long as the output time	Maximum of 1 minute
		<10mA	Not necessary	Continuous output

		（TH9201/S） <6mA （TH9201B/C）		possible
	DC	>6mA(TH9201/S) >3m（TH9201B/C）	At least as long as the output time	Maximum of 1 minute
		<4mA（TH9201/B） <2mA(TH9201B/C)	At least as long as the judgment wait time (WAIT TIME)	Continuous output possible

(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 input source complies with the standard and the tester power configuration is correct.
2. The tester is connected to an earth ground.
3. The coating of the high-voltage test lead wire is free from cracks, fissures, and breakage.
4. The low-voltage test lead wire is not broken.
5. 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

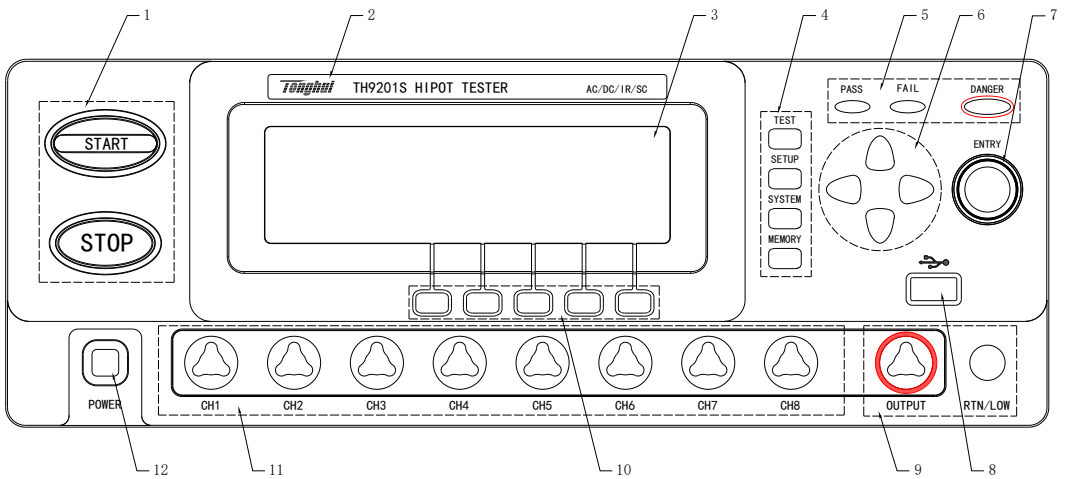

Figure 3-1

1. START and STOP

START : Start up the instrument, once test starts, “TEST” will be displayed at the top right corner of the screen, DANGER indicator lights.

STOP : 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 SYSTEM1setting interface;

It can be switched to SYSTEM2 and INTERFACE.

● **MEMORY**

Press the key in the SETUP page, and the corresponding key lights, the SAVE window is used to save the currently edited test programme; while the LOAD window is used to retrieve saved data, you can set the selected data as the default scheme.

5. Indicator

● **DANGER**

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

● **PASS**

Indicate a test result, it lights in PASS;

When the time function is off (TIME 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 SETUP 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.

⚠ **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

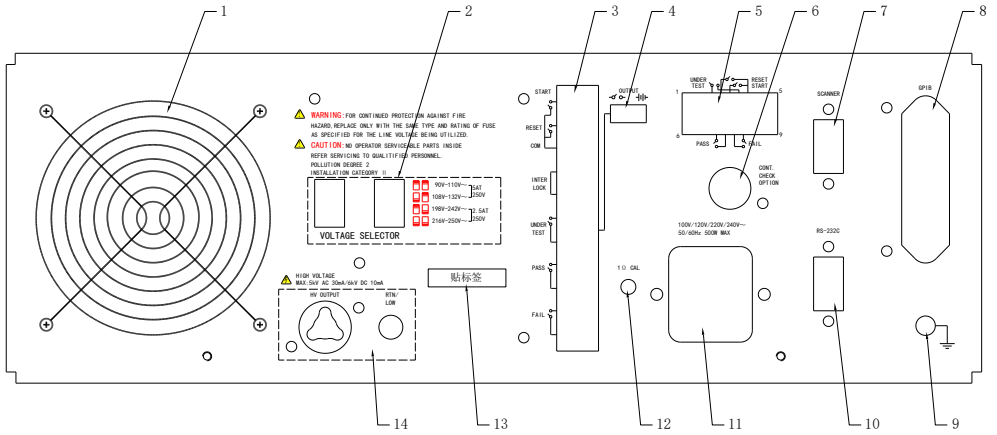


Figure 3-2

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**：Input the reset signal for stopping high voltage, corresponding to STOP signal on the front panel.
- **PASS**：The output qualified signal of the machine, corresponding to PASS indication on the front panel.
- **FAIL**：The output unqualified signal of the machine, corresponding to FAIL indication on the front panel.

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. SBOX control program is needed to be customized.

viii. Backup interface

1. IEEE488 (GPIB) parallel communication interface. (Option)
2. TH10203 control interface (Option): it includes all functions of HANDLER interface. In addition, 24V/1A DC power supply is addeded to connect the small power-driven circuit, such as indicator light.

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 an 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：

- **4 test functions—AC withstanding voltage test, DC withstanding voltage test, insulation resistance test and open & short detection.**

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 ±3%. It's not necessary to adjust output voltage after setting test voltage.

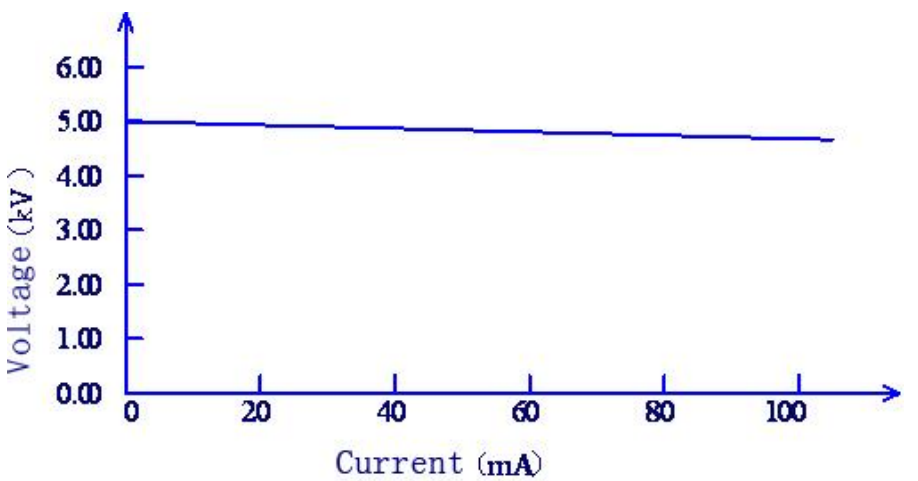


Figure 3-3 AC voltage load adjusting rate

- **DC withstanding voltage test 5kV/10mA(TH9201/S) 5kV/5mA(TH9201B/C)**

TH9201 series can provide DC withstanding voltage test of wide voltage range (Max. output

current is 6kV). Instrument allocates a reliable, low ripple DC/AC switch circuit, voltage load adjusting rate≤1%+10V. When the voltage is between 50-500V, low load impedance may cause unstable output voltage, set the hareware automatic voltage regulation function as OFF and the voltage regulation factor is 10%.

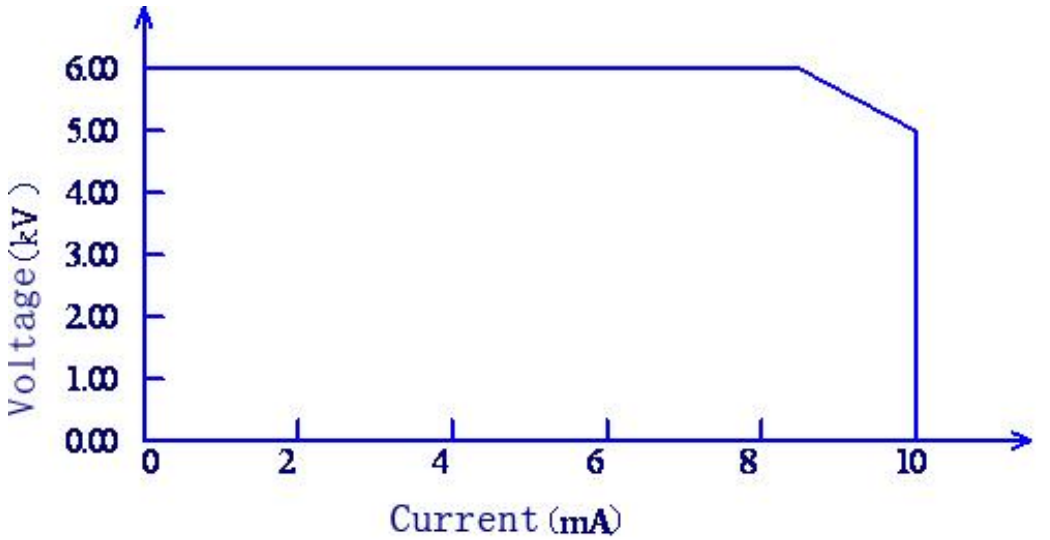


Figure 3-4 DC voltage output range

■ **Insulation resistance test 0.050kV to 1.000kV (resolution of 1V) /0.1MΩ to 10.0GΩ (Max. rated current of TH9201/S is 10mA, TH9201B is 5mA)**

Insulation resistance test range:

When the voltage is less than 500V: 0.1MΩto 1GΩwith accuracy of ±[10% reading +5 digits].

When the voltage is greater than 500V: 0.1MΩto 1GΩ with accuracy of [5% reading +5 digits], 1GΩto 10GΩ with accuracy of [10% reading +5 digits], 10GΩto 50GΩ with accuracy of [5% reading +5 digits].

■ **Open and short detection**

Before starting high voltage test, make sure that the measured pieces are reliably connected and high voltage test are safe.

■ **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.

■ **PLC and HANDLER interfaces bring convenience for the connection and control.**

PLC and HANDLER interfaces can input START, STOP and INTERLOCK signals and output TEST, PASS and FAIL signals. Connecting with a footswitch, they can construct a foot-control device; while connecting with simple test fixtures, they can realize safety interlock, air controls, test indication, etc.

■ **USB interface for backup**

Through the USB interface equipped by all testers except TH9201C, tester programmed test programmes and customer's measuring file can be saved to or recalled from an external U disk, which is convenient to set, use and file a batch of testers.

■ **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.

■ **Waiting time setup function**

TH9201 series can set the test waiting time from 0.1s to 99.9s by a resolution of 0.1s. In this period, the tester will output TEST control signals. They are used to control external devices and ensure a reliable connection. After that high voltage measurement will be enabled.

■ **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 0.5mA, the high voltage output will be cut off. Even if this function is OFF, when the ground current peak is larger than 50mA, this protection will be triggered, 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 ±(1%reading +5V), in insulation resistance test, is± (1% reading +2V). the digital display of test current is ±(1% reading + 5 digits) 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.

■ **Easy operation**

TH9201series are quite easy to be operated. In the setup interface, the test condition is listed. Set test condition, use direction keys to select a topic from the 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).

Instruction for options:

■ **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.

⚠ **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.

■ **Remote control box**

Customers can use this remote control to enable or disable the remote control. It is connected to the PLC terminal on the rear panel, see PLC interface for more information.

Functions:

INTERLOCK:

The interlock is used for the connection of multiple devices or used with the device interlock. It prevents the simultaneous damage to the outputs of all devices resulting from maloperation. When it is disabled, the high voltage operation will be disabled forcibly.

START:

It is used to start the test. Only when INTERLOCK is enabled and stays in the test status, it is usable.

STOP:

It is used to cut off the output voltage and to cancel the fail status. Its functions are the same as that of STOP in the front panel.

■ **HV scanner**

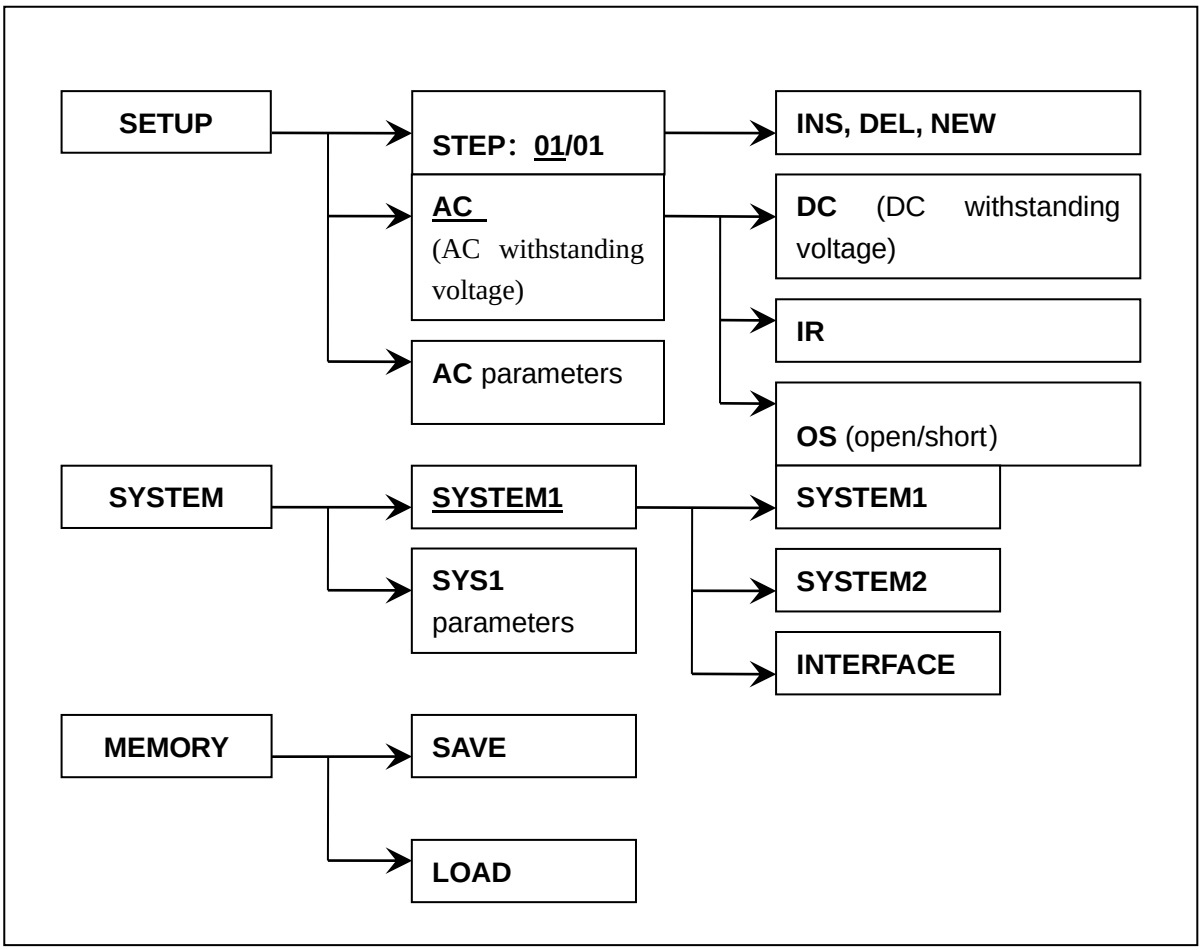
TH9121 high voltage scanner can allocate many test points of the instrument and provide the test voltage.

One high voltage scanner is equipped with eight channels and one channel for one output. Different electric potential (HIGH, LOW, OPEN) can be set at each channel. AC/DC high-voltage insulation test and insulation resistance tests can be made in any one of the eight test points.

Chapter 4 Basic operation

4.1 Interface structure overview

This chapter describes the operation of withstanding voltage and insulation resistance.
The following figure is the interface structure:



Operation Steps

Introduction to the interface:

- The first line in the interface structure shows the initial states corresponding to the function keys on the panel (see sections 4.3, 4.4 for more details.) Because the TEST interface cannot modify parameters, it is not mapped out in above figure.
- The second line in the interface shows the parameter structures of the initial interface. For example: STEP 01/01 in the SETUP interface means that it is the step 1 of the scheme and the total steps is 1; AC: means the AC withstanding voltage test interface; AC parameter means that other parameters are AC withstanding voltage test parameters.
- The third line in the interface is the function toggle interface. When some function lablels are

selected in the second interface, the corresponding functions can be changed and their relative parameters will also vary. For instance, changing AC to DC, the tester will change from the AC withstanding voltage test mode to the DC withstanding voltage test mode, and the current AC parameter will be changed into DC parameter.

4.2 Instruction of interface function

- Basic function operation of panel

TEST： Instrument enters waiting status, the test starts.

SETUP： Change the present 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.

MEMORY： Save and load the test schemes.

▼▲◀▶： 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 3rd step.

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

STEP:	01/01	**AC**	**SCAN:**	1X2X3X4X5X6X7X8X				
VOLT:	0.050	kV	**RISE:**	0.5	S			**LOCK**
UPPER:	1.000	mA	**FALL:**	0.5	S			**OFST**
LOWR:	OFF		**REAL:**	OFF				**RMT**
TIME:	0.5	S	**FREQ:**	50	Hz			**ERR**
ARC:	OFF							
			AC	**DC**	**IR**	**OS**	**MF**	
			F1	F2	F3	F4	F5	

Parameter function

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

4.2.1 SETUP

STEP:	01/01	**AC**	**SCAN:**	1X2X3X4X5X6X7X8X			
VOLT:	0.050	kV	**RISE:**	0.5	S		**LOCK**
UPPER:	1.000	mA	**FALL:**	0.5	S		**OFST**
LOWR:	OFF		**REAL:**	OFF			**RMT**
TIME:	0.5	S	**FREQ:**	50	Hz		**ERR**
ARC:	OFF						
			INS	**DEL**	**NEW**		
			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 current selected parameters.
START		It can be used to switch to the TEST interface in SETUP interface and start high voltage test.

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 Built-in multichannel output and test terminal.

SCAN channel: built-in multichannel circuits

SBOX: 1X2X3X4X5X6X7X8X External multichannel output and test terminal.(custom)

SBOX channel: external TH9121 multichannel output port

The output interface of the multichannel controller can be set to connect with the high voltage output terminal, test terminal and hanging open.

The connection of 8 output channels and test output terminals:

The channel values are:

Open (*X*), high voltage output (▰)and test 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)

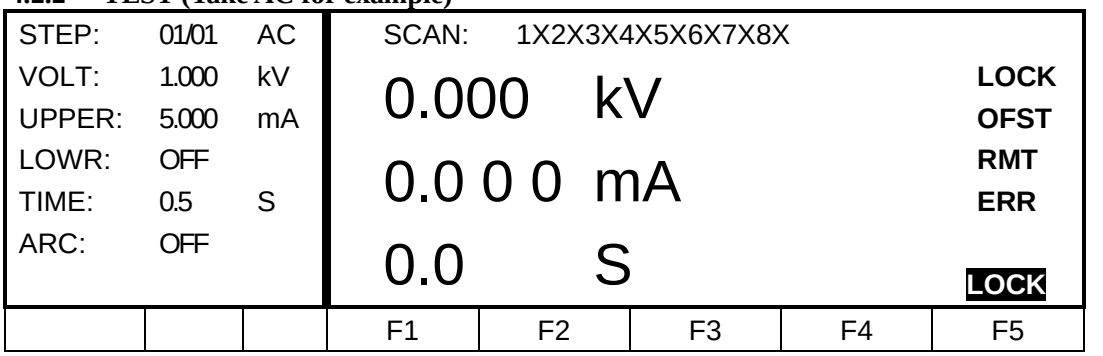


Figure 4.2.2 AC test

Note:

1. **The high voltage can only be started on this interface to test high voltage. Other test conditions have to been set on setup interface.**
2. **Press ▼ in thid interfece can switch to the setup interface.**
3. **The function key F5 can lock the keyboard. When the keyboard is locked, only three keys: START, STOP and F5 (unlock) are usable. Otherwise, the unlocking operation is also controlled by the PASSWORD function in the SYSTEM interface.**

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).

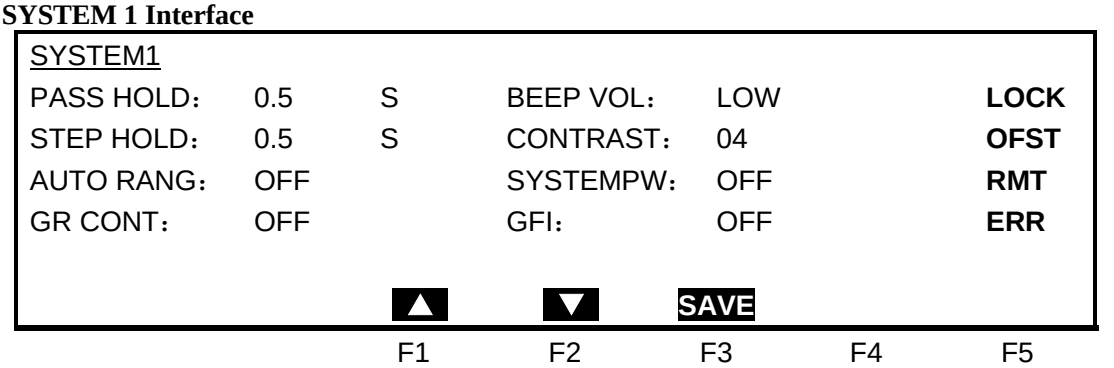
The middle one is the tested current of low terminal, the unit is (mA) and (uA).

The bottom one is the remaining 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

SYSTEM 1 Interface



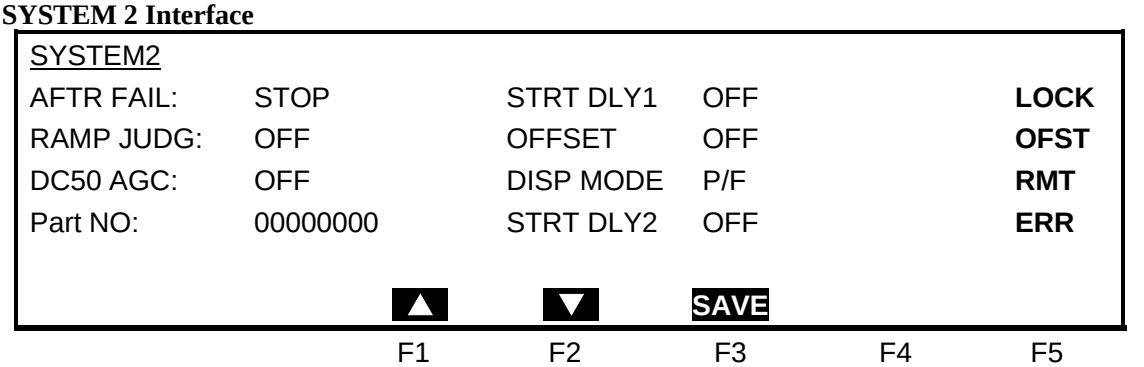
4.2.3.1 SYSTEM1

NOTE: in this interface, press F3 key can save the system interface parameters as the default parameters. It is the same in SYS1, SYS2, SYS3 and INTERFACE interfaces.

Instruction:

Label	Instruction	Definition
PASS HOLD：	0.2S～99.9S	Pass judge hold time.
	KEY	Press STOP key to quit.
STEP HOLD：	0.2S～99.9S	Waiting time.
	KEY	Press 'START' to test the next item.
AUTO RANG：	ON, OFF	Automatically switch the range 0.6s 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, HIGH	Alarm volume.
CONTRAST：	01～10	LCD contrast setup.
PASSWORD：	ON, OFF, SET	Key lock setup. The default password is 90000000.
GFI：	ON, OFF	Discharge wall function.

SYSTEM 2 Interface

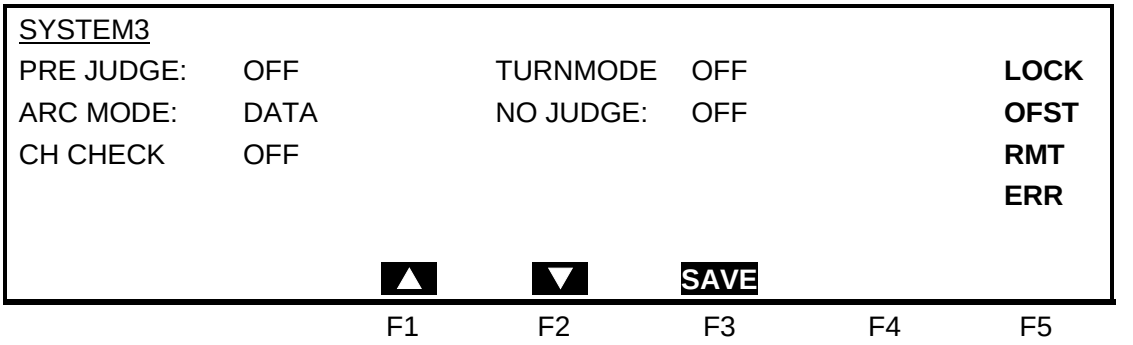


4.2.3.2 SYSTEM2

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 charcters	Number setup of the test programme.
STRT DLY1	OFF~0.1~99.9S	Set the first test delay time.
OFFSET	OFF~ON	Set the clearing of base number.
	GET	Obtain the test base number at the current test condition.
DISP MODE	P/F	Large character display PASS and FAIL.
	DATA	Small character display PASS and FAIL. No influence on test data display.
STRT DLY2	OFF~0.1~99.9S	Set the second test delay time.

SYSTEM 3 Interface

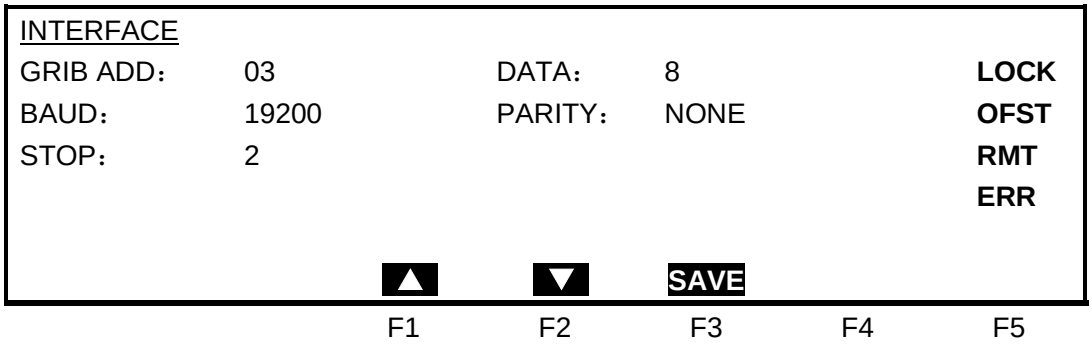


4.2.3.3 SYSTEM3

Instruction:

Label	Instruction	Definition
PRE JUDGE	OFF	OFF: do not distinguish the primary and secondary test.
	1-50	Final step number of the primary test: once the step number is selected, the primary tests end in this step number. *** In this test, no fail result displays when the primary test ends, subsequent tests will be stopped.**
TURNMODE	OFF	OFF: when all the items in the present files are tested, the test is finished.
	ON	Loop test: after the end of the test, it will retest from scratch automatically. *** Set the stop condition or press "STOP" key to stop testing.**
ARC MODE	DATA	Data mode: take ARC current data as reference.
	LEVL	Level mode: take ARC level as reference.
NO JUDGE	OFF, ON	When judging PASS / FAIL, take the opposite result.
CH CHECK	OFF, ON	This function is valid only for TH9201S. When the function is ON, four test terminals of 1-2, 3-4, 5-6 and 7-8 will be formed by default. In each test, the instrument will first check whether the test terminal of the two test lines are shorted and then test the product in accordance with the set requirements.

INTERFACE



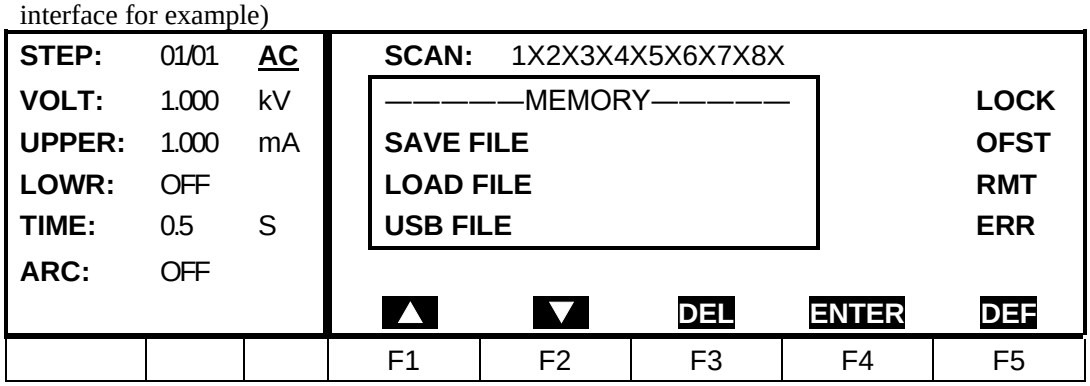
4.2.3.4 INTERFACE

Instruction:

GRIB ADD:	03	Communication interface address.
BAUD:	9600 19200	Communication interface baud rate..
DATA:	7~8	Communication interface data digit.
STOP:	1~2	Communication interface stop digit.
PARITY:	NO NONE	Communication interface even odd check.

4.2.4 MEMORY

In Setup interface, press MEMORY key and then the window listed as below is displayed: (take AC interface for example)



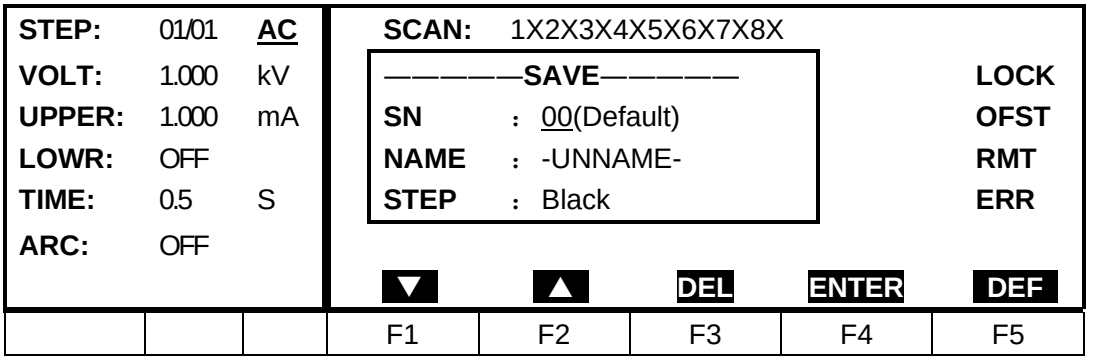
4.2.4.1 MEMORY

Instruction:

Label	Definition
SAVE FILE	Enter into the SAVE interface.
LOAD FILE	Enter into the LOAD interface.
USB FILE	Enter into the USB interface.

Use direction keys (▼▲**)** to save or load and press **F4(ENTER)** to enter the file management interfaces:

SAVE interface:



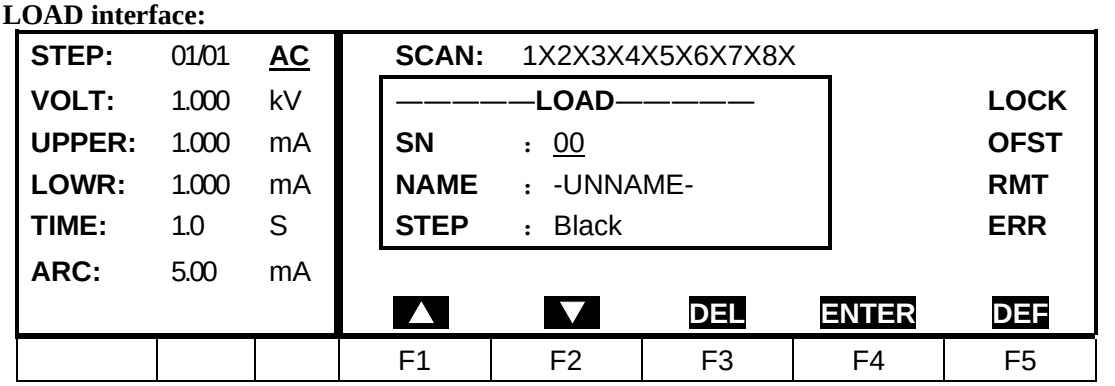
4.2.4.2 SAVE

Instruction:

Label	Instruction	Definition
SN:	00～49	SN of memory.
	Default	Default interface
NAME:	8 digits	Name of programme. Only be modified in this interface.
STEP:	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.

LOAD interface:



4.2.4.3 LOAD

Operator can't change the file name, but change the SN of memory according to the file name and item length and press **F4 (ENTER)** to enter dialog box to confirm.

USB memory function instruction: enter into the USB operation interface

Press MEMORY key to enter into the memory selection interface, select USB FILE to enter into the USB operation interface:

RAM FILE		USB FILE				
▶	00: IR500V		00: blank			
	01: blank	▶	01: blank			
	02: DC2000V		02: blank			
	03: AC1000V		03: blank			
	04: blank		04: blank			
		COPY	PAST	DELE	SELE	ALT
		F1	F2	F3	F4	F5

4.2.4.4 USB memory

View files

The left column are interior storage files which can be scanned through the direction key or rotary knob.

The right column are USB storage files which can be scanned through the direction key or rotary knob.

If there is no USB disk inserted, No USB Disk will be prompted as shown below:

RAM FILE		USB FILE				
▶	00: IR500V					
	01: blank					
	02: DC2000V		**No USB DISK**			
	03: AC1000V					
	04: blank					
		COPY	PAST	DELE	SELE	ALT
		F1	F2	F3	F4	F5

Select files

Move the cursor to the selected file, press F4 (SELE) key and the file will be marked " √ ". If you want to cancel the selected file, move the cursor to this file and press the F4 (SELE) key again.

RAM FILE			USB FILE				
▶	00: IR500V	√	00: blank				
	01: blank		01: blank				
	02: DC2000V		02: blank				
	03: AC1000V		03: blank				
	04: blank		04: blank				
			COPY	PAST	DELE	SELE	ALT
			F1	F2	F3	F4	F5

Also, you can select the several files at the same time, shown as below:

RAM FILE				USB FILE		
	00:	IR500V	√	00:	blank	
	01:	blank		01:	blank	
▶	02:	DC2000V	√	02:	blank	
	03:	AC1000V		03:	blank	
	04:	blank		04:	blank	

COPY	PAST	DELE	SELE	ALT
F1	F2	F3	F4	F5

Press F5 (ALT) to select all the files or not. If the cursor is in the RAM FILE area, press F5 key to select all or none of the non-empty files in the RAM FILE area. As shown below:

RAM FILE				USB FILE		
▶	00:	IR500V	√	00:	blank	
	01:	AC1000V	√	01:	blank	
	02:	DC2000V	√	02:	blank	
	03:	blank		03:	blank	
	04:	blank		04:	blank	

COPY	PAST	DELE	SELE	ALT
F1	F2	F3	F4	F5

Copy files

When you choose one or more of your files, press F1 (COPY) to copy the selected file to the instrument's BUFF.

Paste files

When you copy your file, move the cursor to the place you want to paste, press the F2 key (PAST) to paste. For example, paste the three files in RAM FILE into the USB: copy the three files selected and move the cursor to the USB FILE area, press the F2 key (PAST) to paste. As shown below:

RAM FILE			USB FILE		
	00:	IR500V	▶	00:	IR500V
	01:	blank		01:	blank
	02:	DC2000V		02:	DC2000V
	03:	AC1000V		03:	AC1000V
	04:	blank		04:	blank

COPY	PAST	DELE	SELE	ALT
F1	F2	F3	F4	F5

NOTE:when moving the stored record, they can only be stored to the corresponding item. For example, 00 archive file can only be stored to 00 file.

Delete files

It is only valid in USB FILE area. Move the cursor to the file you want to delete, press F4 (DELE) to delete the file.

4.3 Test item interface and parameter setup

4.3.1 AC withstanding voltage test parameter setup:

STEP:	01/01	AC	SCAN:	1X2X3X4X5X6X7X8X			
VOLT:	0.050	kV	RISE:	0.5	S		**LOC**
UPPER:	1.000	mA	FALL:	0.5	S		**OFST**
REAL:	OFF		LOWR:	0.001	mA		**RMT**
TIME:	0.5	S	FREQ:	50	Hz		**ERR**
ARC:	OFF						
			▼	▲			
			F1	F2	F3	F4	F5

Figure 4.3.1 AC setup interface

Instruction of AC test parameters:

VOLT:	0.050~5.000kV	Voltage value of AC high voltage test
UPPER:	0.001~30.00mA	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
LOWR:	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:

STEP：	01/01	DC	SCAN:	1X2X3X4X5X6X7X8X			
VOLT：	0.050	kV	RISE:	0.5	S		**LOC**
UPPER：	1.000	mA	FALL:	0.5	S		**OFST**
LOWR：	OFF		WAIT:	OFF			**RMT**
TIME：	0.5	S	CHEK:	OFF			**ERR**
ARC：	OFF						
			▼	▲			
			F1	F2	F3	F4	F5

Figure 4.3.2 DC setup interface

Instruction of DC test parameters:

VOLT:	0.050~6.000kV	Voltage value of DC high voltage test
UPPER:	0.1uA～10.00mA	Current high limit value of DC high voltage
LOWR:	OFF~0.1uA~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 test parameter setup:

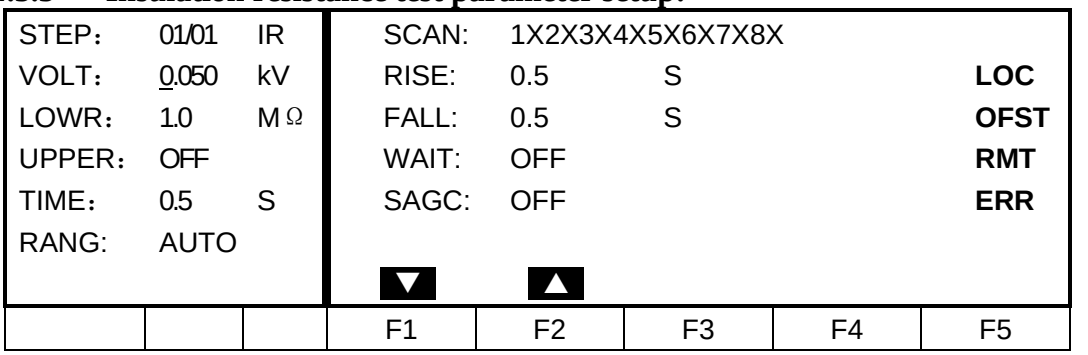


Figure 4.3.3 IR setup interface

Instruction of IR test parameters:

VOLT:	0.050～1.000kV	Voltage value of IR test
UPPER:	0.1M～50.00G	High limit value of IR
LOWR:	OFF～0.1M～50.0G	Low limit value of IR.
TIME:	OFF～0.1～999.9S	Test time of IR.
RANG:	AUTO	Auo range mode. The range will be changed according to the test value.
	300nA,3uA,30uA, 300uA, 3mA, 10mA	Fixed range mode. Use I = U/R to estimate the range to accelerate the test speed and improve the test accuracy.
RISE:	OFF～0.1～999.9S	Rising time of insulation voltage.
FALL:	OFF～0.1～999.9S	Down time of insulation voltage.
WAIT:	OFF～0.1～999.9S	Wait time < rise time + test time When the voltage rises and start counting, the current high limit will not be judged in the waiting time. (RNG FAIL)
SAGC:	ON, OFF	Software auto voltage control.

4.3.4 Open and short detection test parameter setup:

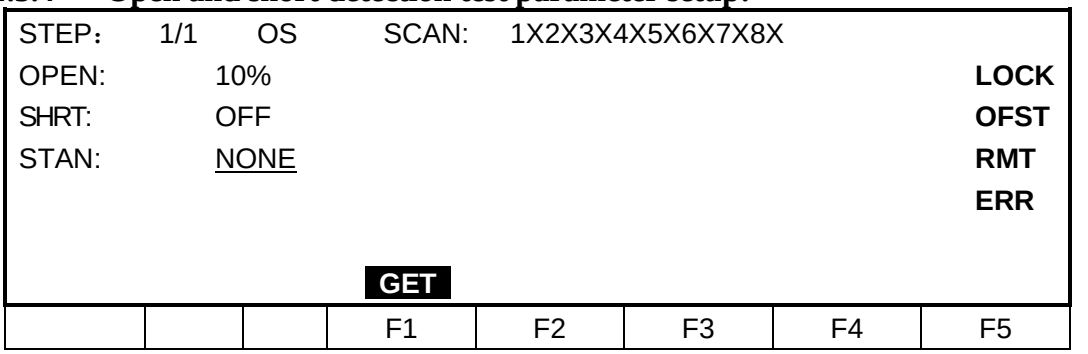


Figure 4.3.4 OS setup interface

Instruction of OS test parameters:

OPEN:	10%～100%	Percentage of open judge value and standard value
SHRT:	OFF～100%～500%	Percentage of short judge value and standard value
STAN:	Previous standard values	Sampling standard value
	GET	Take the present obtained distribution parameter as the standard

Note：1. When the cursor is in the position as the table above, **F1** position displays **GET**.

2. Press **F1** function key, the instrument enters standard value sampling status. The instrument outputs 100V voltage in sampling, and the current flowing through the DUT can be obtained within 100ms. **(Please be attention in voltage output)**

3. The capacitance value here is not the real capacitance value, but the value of the sampled current being transferred via impedance. The value should be close to that of capacitor installed in the test terminal. (The sampling current is not only generated by capacitor)

OPEN SHORT value setup: the OS function can be set to meet the following necessary conditions:

1. The maximum value of the test impedance when the instrument is not connected to the DUT and the maximum value of the test impedance when connecting the DUT has obvious limit, which is marked with an OPEN value.
2. The minimum value of the impedance when the measured piece is good and the value of the impedance when the measured piece is in short-circuit has a obvious limit, which is marked with a SHORT value.

Example: take 3-coil inductance as an example: 1-2 capacitance of about 300P, 1-3 capacitance of about 200P and 2-3 may be in short-circuit. After short circuit, the capacitance of 1-2 and 1-3 are in parallel connection.

1. Do not connect the measured piece GET: STAN = 100P, confirm the open value.
2. Several good measured pieces test standard values, such as recording GET data range: STAN = 350P ~ 450P, confirm the standard value.
3. Short circuit 2-3, GET data range: STAN = 550P ~ 650P, confirm the short circuit value.

Parameter setting calculation:

1. Assuming STAN = 400P
2. OPEN value: lower limit = 100P / 400P = 25%, OPEN upper limit = 350P / 400P = 88%. It is recommended to take 40-60%.
3. SHORT: lower limit = 450P / 400P = 112%, upper limit = 550P / 400P = 138% It is recommended to take 120-130%.

4.3.5 MF multichannel assist control setup (only used in multichannel test instruments)

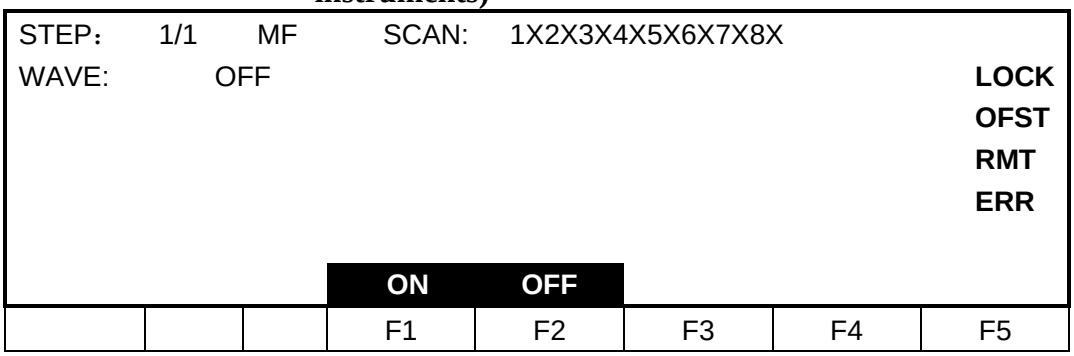


Figure 4.3.5 MF setup interface

Instruction of OS test parameters:

Scan	SCAN:	1X2X3X4X5X6X7X8X	Controllable 8 output channels
		X	X : this channel is open circuit
		■	Full frame: this channel is connecting with high voltage terminal
		□	Empty frame: this channel is connecting with test low terminal
Sample	WAVE:	ON	Connect the multichannel according to the current SCAN value. It is convenient to connect the external device for performance test.
		OFF	Disconnect the multichannel

NOTE:

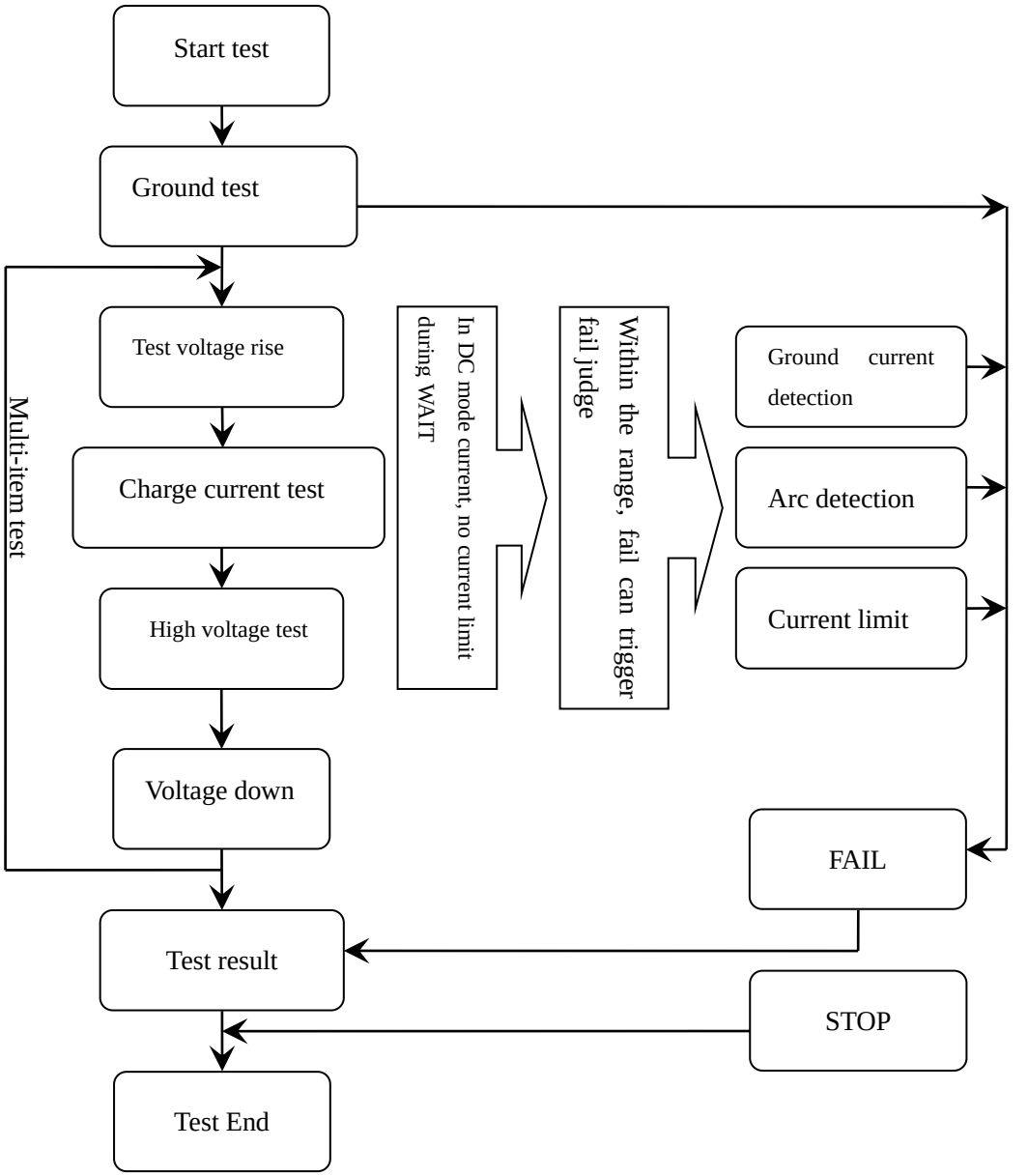
The multi-channel equipment must be restructuring when using this function. It is recommended to buy a complete set of the instruments.

This function is an auxiliary function of the multi-channel withstand voltage meter in order to realize the TH90010 test system connection. Refer to the TH90010 system description for details.

TH90010 is a test system composed of withstand voltage tester and interturn withstand voltage tester, which can achieve the transformer withstand voltage and interturn sequence test.

4.4 Test function theory and instruction

This section describes the principle and use of the test for ground connection, ground current detection, and arc detection in the order of the test procedure.



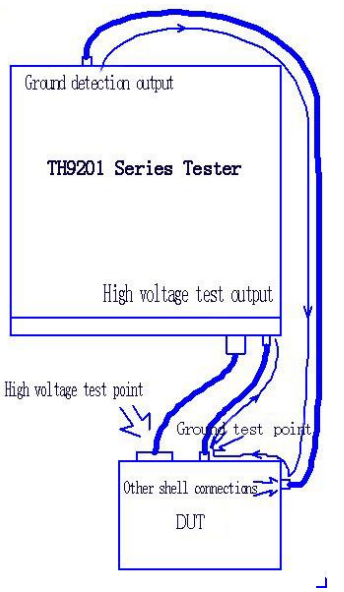
Test process of the instrument

4.4.1 Start up test

In measurement mode, after checking the test conditions and the correct connection with DUT, press START key to start up test. After the delay set by STAT DLY1 and STRT DLY2 in SYSTEM2, the tester will start measurement.

4.4.2 Low terminal 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 test 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 1:ground breakover parameter is the GR CONT in SYSTEM1 interface.

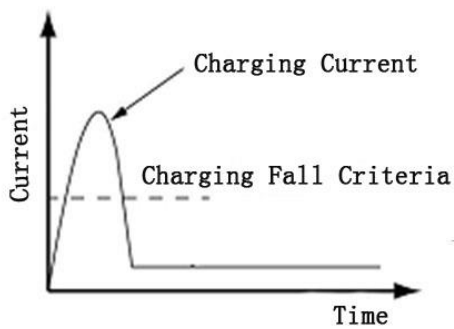
Note 2: for test convenience, the test low-terminal and the ground detecting terminal can be connected directly. And then they are attached to the DUT to realize the ground breakover test. However, this function will bring many dangers for other operators, because it will give them false safety messages.

4.4.3 Voltage rise

Some DUTs are voltage-sensitive, so this function is useful. The output voltage rises from 0. The resolution of the output voltage, controlled by the instrument, varies in every 0.1S and depends on the test voltage and the voltage rise time {ΔV = V / (10*S)}. If the voltage rise time (RISE OFF) is turned off, the default voltage rise time will be 0.1S.

4.4.4 DC charging current detection

This function is used to judge the connection of DUT. DUTs are generally capacitive components. In DC mode, the distributed capacitor will be charged at the voltage rise time (when the measurement starts) and its current will be much larger than the tested current being set. The charging current will fall quickly when the capacitor is fully charged. The presence or the absence of the charging current can judge the connection of DUT. When using this function, the test waiting time should be set longer than the



charging time so as to avoid wrong judgment.

4.4.5 High-voltage test

This function is used to make high-voltage test on DUT. The test circuit should be connected correctly. The measurement result will not be affected by special attach parameters and be the real withstanding-voltage current required by the test.

4.4.6 Voltage fall

It is the same as the voltage rise function depending on the characteristics of DUT. The voltage will fall when the high-voltage test ends. The resolution of the output voltage, controlled by the instrument, varies in every 0.1S and depends on the test voltage and the voltage rise time {ΔV = V / (10*S)}. If the voltage fall time (FALL OFF) is turned off, the default voltage rise time will be 0.1S.

4.4.7 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 AC, 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 AC, it is so serious that it will cause the operator coma or death. It is suggested to open electric wall.

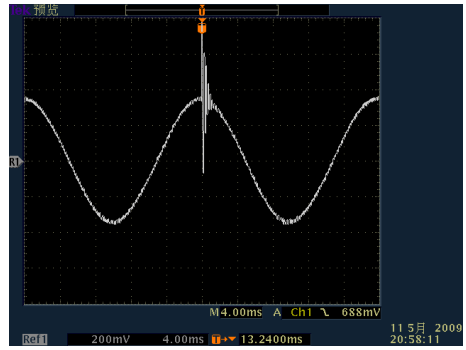
4.4.8 Current over limit and arc detection (ARC) function

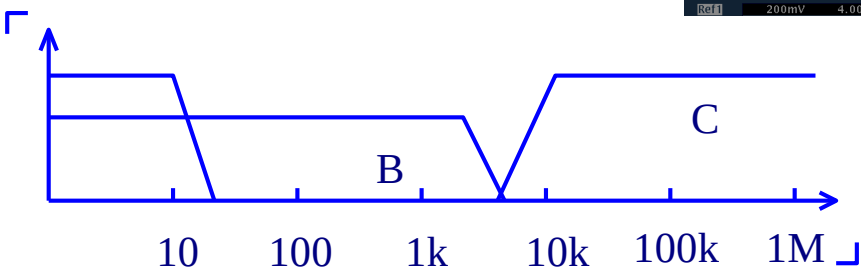
Current over limit is divided as:current low and high limit, current range over limit, arc detection.

- 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.

NOTE: The AC test frequency is 50/60Hz.

4.4.9 Fail judgment

When a setting exceeds its corresponding limit, the instrument will judge the DUT as a failure and the following results are: the current test is stopped, the voltage output is cut off, and the test result will be dealt with.

4.4.10 Deal with test results

IF no setting exceeds the limits listed in the right part of the below table, the instrument will judge the

DUT as pass. And then PASS will be displayed on the screen, the pass indicator will light (this is controlled by PASS HOLD in SYSTEM1.) as well. Otherwise, FAIL and the fail reason (HI, as shown in below table) will be displayed and the failure indicator will light (this is controlled by AFTR FIL in SYSTEM2.). When the results are output and some other test items are waiting to be dealt with, the instrument will transfer to the next test item or it will exit from the test waiting status.

STEP:	01/01	AC	SCAN:	1X2X3X4X5X6X7X8X	
VOLT:	1.000	kV			**LOCK**
UPPER:	1.000	mA	**FAIL**		**OFST**
REAL:	1.000	mA			**RMT**
TIME:	1.0	S		**HI**	**ERR**
ARC:	1.0	mA			

4.4.11 STOP

In any test mode, if you press down the “STOP” button on the instrument, it will automatically end the test. When the test ends, no measurement result will be output.

4.4.12 OFFSET

Before the test, due to the working environment and placement changes of test cables, there may some base numbers when the instrument is in no load test. For customers who require accurate measurements, zero clearing operation can be done in SYSTEM2 interface. Specific steps are as follows:

1. Set the current test conditions in the SETUP interface.
2. Select the OFFSET item in the SYSTEM2 interface and set it to ON.
3. Press GET, the instrument will automatically start the high voltage test and use the current test value as a zero value.
4. If the customer does not set the test time, the STOP key can be used to stop the test.

4.5 Structure and Use of Interface Circuit

4.5.1 PLC and HANDLER interfaces

PLC interface is a control interface used to connect PLC controllers. Importing and exporting signals on the interface meet the requirements of PLC standard interface.

Except INTERLOCK signal, other signals on HANDLER interface are directly interconnected.

PLC signals schematic circuit is shown as follows (The output interface on the rear panel of the reference instrument arranges from top to bottom.) Figure 4.5.1

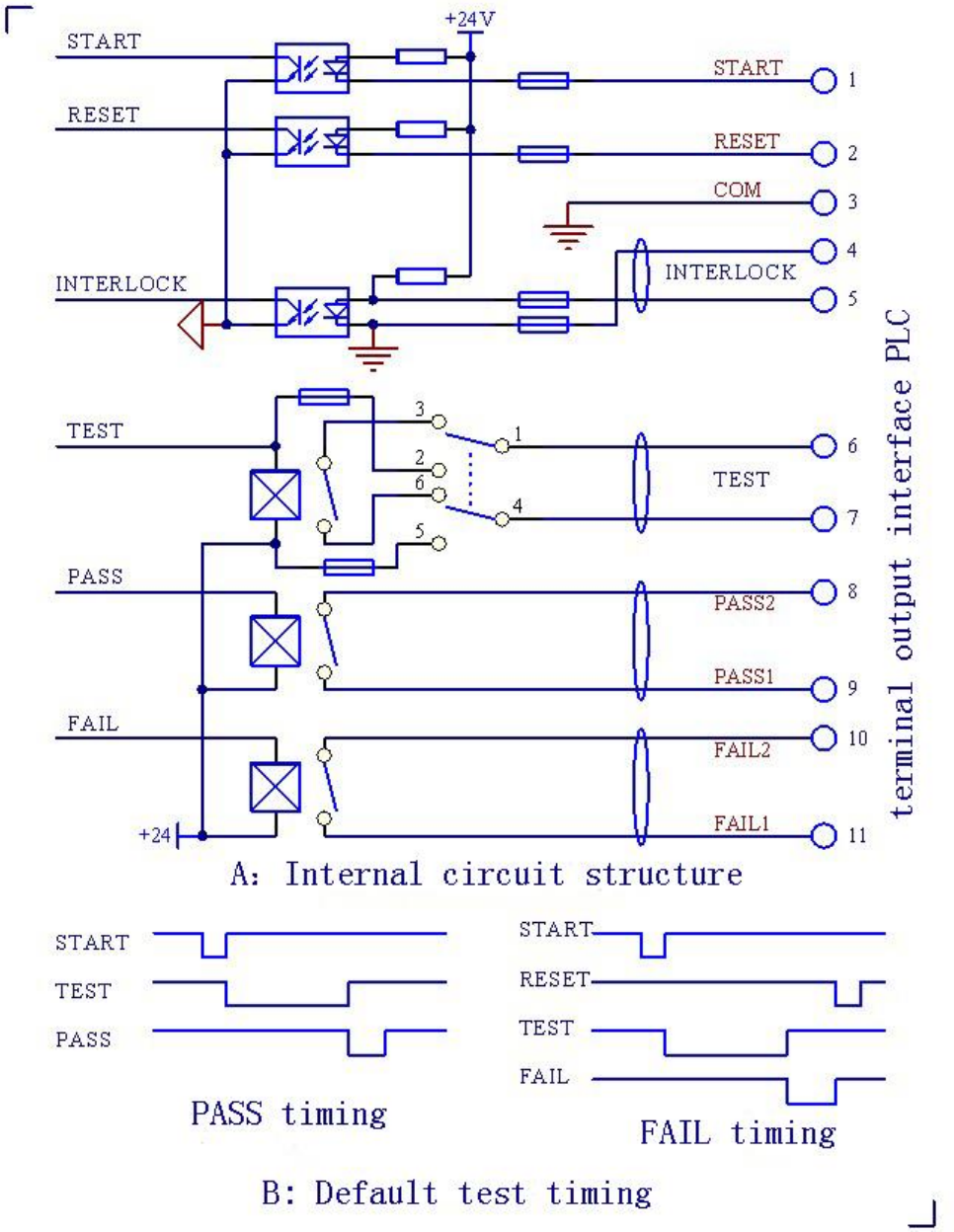
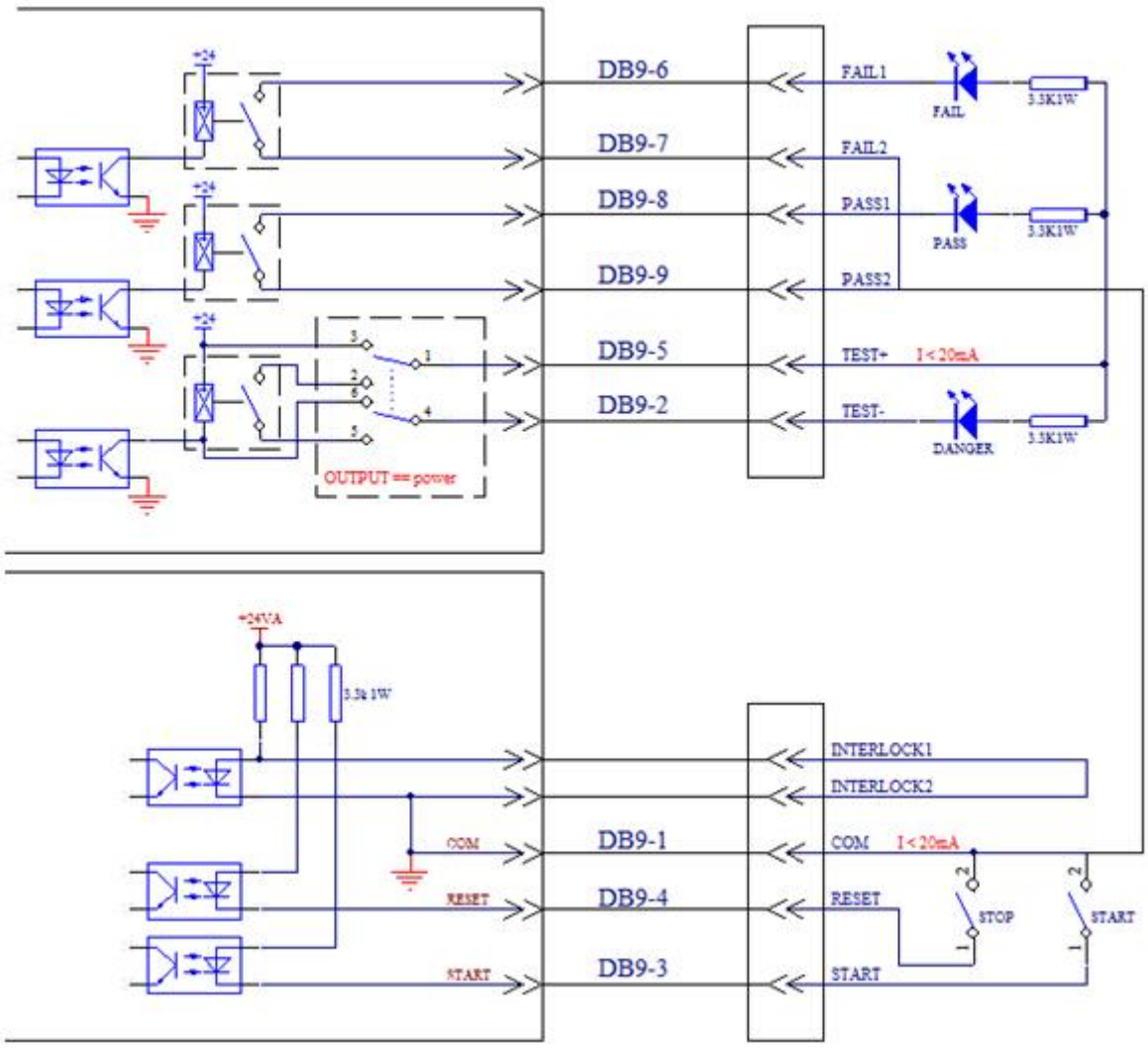


Figure 4.5.1: PLC Interface Structure and Timing

NOTE：

1. **In the TEST signal power mode, PLC interface can output signals of 24V, at this moment the real internal resistance appropriates to 20Ω and the drive current is less than 30mA. Therefore, above signals can be applied to drive miniwatt components like LED. DO NOT use this signal as a power to drive other charged components so as to avoid damaging the internal electric source.**
2. **If the connected currenct is greater than 10mA, use the external power mode, and to ensure that TEST signal operation mode is switch mode.**



4.5.2 Simple indicating circuit diagram of HANDLER PLC

NOTE:

1. **DB1-9 is the output signal identification for HANDLER interface, corresponding to the corresponding output end.**
2. **In the above diagram, the connection power supply current is very small, it can only be connected to 24VDC voltage load and the load current is about 10mA, such as LED indicators and signal relay coils.**
3. **INTERLOCK signal is the online enable signal, the instrument can work properly when it is in short circuit. If disconnect it, the instrument will not be allowed to start the high voltage test.**

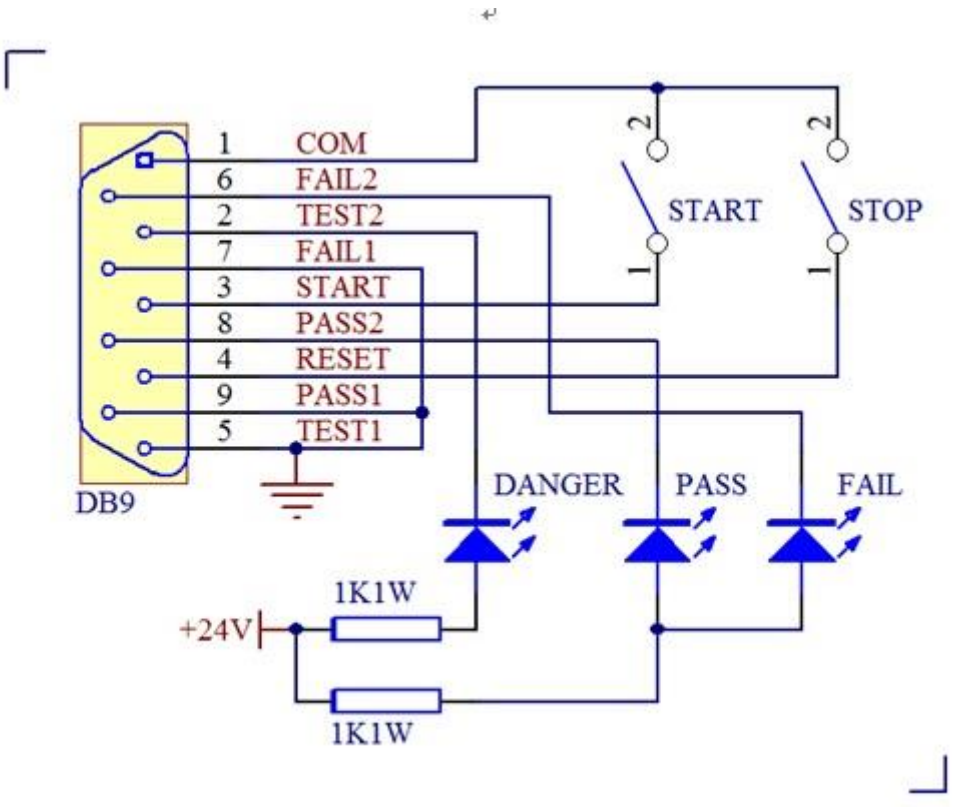


Figure 4.5.3 Connection of HANDLER external Circuit

1. The above picture shows the connection circuit diagram of the external power and the indicator, the TEST control switch of the instrument interface should be in switch mode.
2. When the load current is relatively large, use an external power supply, the TEST control switch of the instrument interface should be in switch mode. Instrument control contacts can control the control signal of 220VAC with the maximum current smaller than 1A.

Note: In external power mode, the TEST control switch of the instrument interface should be in switch mode, or it will burn the instrument.

Chapter 5 TH9201 RS232 Commands

5.1Commands 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:WRANge

Sets the AUTO RANGE's status.

Also inquires about the current AUTO RANGE's status.

--Syntax:

Command message:

:SYST:WRAN <ON/OFF> or <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:WARN ON or :SYST:WRAN 1

--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> or <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 or :SYST:GCON 1

--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> or <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 or :SYST:GFI 1

--Example:

:SYST: GFI?

If the current GFI's status is ON,

ON 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.

: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:KLOCK

Sets the KEY LOCK's status.

Also inquires about the current KEY LOCK's status.

--**Syntax**:

Command message:

:SYST:KLOCK <ON/OFF> or <1/0>

Query message:

:SYST:KLOCK?

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

Data format: Character

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

--Example:

To set the KEY LOCK's status to ON,

:SYST:KLOCK ON or :SYST:KLOCK 1

--Example:

:SYST: KLOCK?

If the current KEY LOCK's status is ON,

ON is returned.

:SYST:FAIL

Sets the AFTR FAIL's status.

Also inquires about the current AFTR FAIL's status.

--**Syntax**:

Command message:

:SYST:FAIL <STOP/CONT/REST/NEXT>

Query message:

:SYST:FAIL?

--**Program data**< STOP/CONT/REST/NEXT >:

Data format: Enum

Set value: STOP/CONT/REST/NEXT

--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.

:SYST:SDLY1

Sets the value of STRT DLY1.

Also inquires about the current STRT DLY1's value

--**Syntax**:

Command message:

:SYST:SDLY1 <data>

Query message:

:SYST: SDLY1?

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

Data format: float

Set value: 0~99.9 (0 is OFF)

Resolution: 0.1

Unit:

--Example:

To set the value of STRT DLY1 to 1s,

:SYST:SDLY1 1

--Example:

:SYST:SDLY1 1?

If the current value of STRT DLY1 is 1.0,

1.0 is returned.

:SYST:RJUDgment

Sets the RAMP JUDG's status.

Also inquires about the current RAMP JUDG's status.

--**Syntax**:

Command message:

:SYST:RJUD <ON/OFF> or <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's status to ON,

: SYST:RJUD ON or :SYST:RJUD 1

--Example:

:SYST: RJUD?

If the current RAMP JUDG is ON,

ON is returned.

:SYSTem:OFFSET

Sets the OFFSET's status.

Also inquires about the current OFFSET's status.

--Syntax:

Command message:

:SYST: OFFSET<ON/OFF> or <1/0>

Query message:

:SYST:OFFSET?

--Program data<ON/OFF>:

Data format: Character

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

--Example:

To set the OFFSET's status to ON,

:SYST: OFFSET ON or :SYST: OFFSET 1

--Example:

:SYST: OFFSET?

If the current OFFSET's status is ON,

ON 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> or <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 or :SYST:DAGC 1

--Example:

:SYST: DAGC?

If the current DC50 AGC's status is ON,

ON is returned.

:SYSTem:DMODE

Sets the DISP MODE's status.

Also inquires about the current DISP MODE's status.

--Syntax:

Command message:

:SYST:DMODE <PF/DATA>

Query message:

:SYST: DMODE?

--Program data<PF/DATA>:

Data format: Enum

Set value: PF , DATA

--Example:

To set the DISP MODE's status to PF,

:SYST: DMODE PF

--Example:

:SYST: DMODE PF?

If the current DISP MODE's status is PF,

PF 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 digits

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.

:SYST:SDLY2

Sets the value of STRT DLY2.

Also inquires about the current STRT DLY2's value

--**Syntax**:

Command message:

:SYST:SDLY2 <data>

Query message:

:SYST: SDLY2?

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

Data format: float

Set value: 0~99.9 (0 is OFF)

Resolution: 0.1

Unit:

--Example:

To set the value of STRT DLY2 to 1s,

:SYST:SDLY2 1

--Example:

:SYST:SDLY2 1?

If the current value of STRT DLY2 is 1.0,

1.0 is returned.

:SYST:PJDG

Sets the PRE JUDGE's status.

Also inquires about the current PRE JUDGE's status.

--**Syntax**:

Command message:

:SYST:PJDG <sn>

Query message:

:SYST:PJDG?

--Program data<sn>:

Data format: Integer

Set value: 0~20 (0 is OFF)

Resolution: 1

Unit:

--Example:

To set the PRE JUDGE's status to OFF,

:SYST:PJDG 0

--Example:

:SYST: PJDG?

If the current PRE PJDG is OFF,

OFF is returned.

:SYST:TURN

Sets the TURN MODE's status.

Also inquires about the current TURN MODE's status.

--Syntax:

Command message:

:SYST:TURN <ON/OFF> or <1/0>

Query message:

:SYST:TURN?

--Program data<ON/OFF>:

Data format: Character

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

--Example:

To set the TURN MODE's status to ON,

:SYST:TURN ON or :SYST:TURN 1

--Example:

:SYST: TURN?

If the current TURN MODE's status is ON,

ON is returned.

:SYST:ARC

Sets the ARC MODE's status.

Also inquires about the current ARC MODE's status.

--Syntax:

Command message:

:SYST: ARC <DATA/LEVEL>

Query message:

:SYST: ARC?

--Program data<DATA/LEVEL>:

Data format: Enum

Set value: DATA, LEVEL

--Example:

To set the ARC MODE's status to DATA,

:SYST: ARC MODE DATA

--Example:

:SYST: ARC?

If the current ARC MODE's status is DATA,

DATA is returned.

:SYST:NJDG

Sets the NO JUDGE's status.

Also inquires about the current NO JUDGE's status.

--Syntax:

Command message:

:SYST:NJDG <ON/OFF> or <1/0>

Query message:

:SYST:NJDG?

--Program data<ON/OFF>:

Data format: Character

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

--Example:

To set the NO JUDGE's status to ON,

:SYST:NJDG ON or :SYST:NJDG 1

--Example:

:SYST: NJDG?

If the current NO JUDGE's status is ON,

ON is returned.

:SYST:CCHK

Sets the CHANNEL CHECK's status.

Also inquires about the current CCHK's status.

--Syntax:

Command message:

:SYST:CCHK <ON/OFF> or <1/0>

Query message:

:SYST:CCHK?

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

Data format: Character

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

--Example:

To set the CH CHECK's status to ON,

:SYST:CCHK ON or :SYST:CCHK 1

--Example:

:SYST: CCHK?

If the current CH CHECK's status is ON,

ON is returned.

:SYST:FETCH

Sets the mode for fetching the test data.

Also inquires about the current mode for fetching the test data.

--**Syntax**:

Command message:

:SYST:FETCH <AUTO/MANU>

Query message:

:SYST:FETCH?

--**Program data**<AUTO/MANU>:

Data format: Enum

Set value: AUTO, MANU

--Example:

To set the FETCH to AUTO,

:SYST:FETCH AUTO

--Example:

:SYST: FETCH?

If the current FETCH status is AUTO,

AUTO is returned.

5.2 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**.**

5.3 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

5.4 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: Ω

--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: Ω

--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**.**

5.5 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**.**

5.6 Other Commands

***IDN**

Inquires about the tester's name and ROM version.

--Syntax:

Command message: *IDN?

--Example:

*IDN?

TH9201 Ver:1.0 is returned.

: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:NEW <n>

Create a new document with n steps

--Data:

n—represents a step, for example, 2 indicates that the new document has 2 steps

--Example:

:SOUR:SAFE:NEW 1

Indicates that a new document has been created, and the number of steps is 1, that is, a single test document

:SOUR:SAFE:STEP <n>:FUNC <value>

Set the test function for step n

--Data:

n—represents a step, such as 1 for step 1

Value—represents the test function:

0—means no function

1— Indicates AC withstand voltage

2— Indicates DC withstand voltage

3—Insulation resistance

4—Short circuit

--Example:

:SOUR:SAFE:STEP 1:FUNC 1

Indicates that the test function in step 1 is set to AC withstand voltage

:SOUR:SAFE:FUNC?

Query all step functions

--Syntax:

:SOUR:SAFE:FUNC?

--Example:

:SOUR:SAFE:FUNC?

: SOUR:SAFE:LOAD

Read the storage file.

--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

: 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: MΩ

--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.

--Syntax:

:TEST:FETCH?

--Response message:

Judge,Judge1,Judge2,…Judgen,Data1, Data 2,…, Datan

Judge---- is the total judgment of the test, 1---PASS, 2---FAIL

Judge1~Judgen---- is the judgment of each step, 1---PASS, 2---FAIL

Data1~Datan---- test data for each step

--Unit: A/MΩ

--Example:

After the test is over, enter: TEST:FETCH?

--Returned messages

Returns: 1,1,1,1.00,1.00

Indicates that the test results are:

The total judgment is PASS

The first step is to judge as PASS

The second step is to judge as PASS

The first step data is 1.00

The second step data is 1.00

--Related settings

This command can be set to AUTO/MANU (automatic/manual) two modes.

Press the SYSTEM key, then use the knob to enter the INTERFACE setting interface, and use the cursor to move to the FETCH option to select AUTO/MANU mode.

When set to AUTO, when the test is over, the test result will be returned automatically.

: TEST:FETCH2?

Inquires the test results.

--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）

5（INT）

----Unit: Current:A

Resistance: MΩ

--Example:

TEST:FETCH2?

--Returned messages

Return: 0, 0, 0

Indicates that the instrument is currently in the READY state

Returns: 1, 1000, 1.0

Indicates that the instrument is currently under test, the voltage is 1000V, and the current is 1.0mA

: TEST:FETCH4?

Inquires the test results.

--**Syntax**:

:TEST:FETCH4?

--Return message format:

Func1,Judge1,data1;…Funcn,Judgen,Datan;

Func---- is the test function, 1---ACW 2---DCW 3---IR 4--OS

Judge---- is the sorting judgment, 1---PASS, 2---FAIL

Data---for the test data

--Data unit: Current:A

Resistance: MΩ

--Example:

After the test, enter: TEST:FETCH4?

--Returned messages

Returns: 1,1,1.00e-6

Indicates that the test results are:

Function as ACW

Sorting judged as PASS

Test data is 1uA

--Related settings

This command can be set to AUTO/MANU (automatic/manual) two modes.

Press the SYSTEM key, then use the knob to enter the INTERFACE setting interface, use the cursor to move Go to the FETCH option, you can choose the AUTO/MANU mode.

When set to AUTO, when the test is over, the test result will be returned automatically.

:FETCH:JUDGE?

Inquires the test results

--Syntax:

:FETCH:JUDGE?

--Return message format:

Query test judgment results

-- Return data

Status: 0 (None)

1 (PASS)

2 (HIGH FAIL)

3 (LOW FAIL)

4 (ARC FAIL)

5 (RANGE FAIL)

--Example:

:FETCH:JUDGE?

--Returned messages

Returns: 1

Indicates that the current test result is: PASS

: SOUR:SAFE:STEPSN?

Inquires about the current STEP during a test.

--Syntax:

:SOUR:SAFE:STEPSN?

--Example:

:SOUR:SAFE:STEPSN?

--Returned messages

1, means the current step is 1

: SYS:FETCH:MODE

Return data format, there are currently two formats, 0 is: TEST:FETCH? Return format; 1 is: TEST:FETCH4? return format;

--Syntax

:SYS:FETCH:MODE <sn>

--Data<sn>:

Data Type: Integer

Data range: 0/1

Data Precision: 1

Data unit:

--Example:

will return format 1

The command is: :SYS:FETCH:MODE 1

Chapter 6 TH9201series specification

Model			TH9201	TH9201S	TH9201B	TH9201C
Withstanding voltage test						
Output voltage	**AC**	**Range**	0.050kV—5.000kV			
		Waveform	Sinusoidal wave			
		Distortion	< 3%			
		frequency	50, 60Hzselectable			
		Frequency accuracy	±2%			
		Max. output power	150VA（5.000kV 30mA）		100VA（5.000kV 20mA）	
	DC	**range**	0.050 kV—6.00kV			------
		Signal source frequency	600Hz			------
		Max. output power	50VA （5.000kV 10mA）		25VA （5.000kV 5mA）	------
	Voltage regulation		±（1.0% +10V) （nominal power）			
	Voltage resolution		1V			
	Voltage display accuracy		±(2.0%reading+5V) (non-load)			
	Voltage generating method		DDS signal source +AB power amplifier			
Current test range	**AC**	**Range**	0.001mA – 30.00 mA		0.001mA – 20.0mA	
		Short-circuit current	>60 mA (output voltage>500V)		>40 mA (output voltage>500V)	
		Resolution	0.001 mA		0.001 mA	
		Accuracy	±(1% reading +5 digits)		±(1% reading+5 digits)	
		Effective current	OFF-0.001 mA-30 mA		OFF-0.001 mA-20 mA	
	DC	**Range**	0.1uA – 10.00mA		0.1uA – 5.00mA	------
		Accuracy	±(1.0% reading +5 digits)		±(1.0% reading +5 digits)	------
	Discharge function		Auto discharge after test ends（DCW）			------
IR test						
Output voltage			0.050V – 1.000V			
Voltage resolution			1V			
Voltage test accuracy			±(1.0% reading+2V)			
Max. output current			10mA		5mA	
Max. output power			10 VA（1000V/1mA）		5VA （1000V/1mA）	

Output short current		≥20mA	≥10mA	
Load regulation		≤1％（nominal power）		
Ripple（1kV）		≤3% (1kV, non-load)		
Discharge function		Auto discharge after test ends		
Resistance measurement range		0.01MΩ– 50GΩ, (current range: 1nA – 10mA)		
Resistance display range (1000V)		10 mA 0.1 MΩ-10 MΩ 3mA 0.3 MΩ-30 MΩ 300uA 3 MΩ-300 MΩ 30uA 30 MΩ-3GΩ 3uA 300 MΩ-30GΩ 300nA > 30GΩ		
Resistance measurement accuracy		≥500V 1MΩ– 1GΩ ±(5% reading +5 digits) 1GΩ– 10GΩ±(10% reading +5 digits) 10GΩ– 50GΩ±(15% reading +5 digits) < 500V 0.1MΩ– 1GΩ±(10% reading +5 digits)		
Current measurement accuracy		±(1.5% reading +5 digits) (after offset)		
Arc detection				
Measurement range	**AC**	1mA – 15mA	1mA – 15mA	
	DC	1mA – 10mA	1mA – 5mA	------
Comparator				
Judgement mode		Window comparison mode: I_{lower} ON: at $I_{lower} < Ix < I_{upper}$, PASS; at $I_x \le I_{lower}$ or $I_x \ge I_{upper}$, FAIL（condition: $I_{lower} < I_{upper}$） I_{lower} OFF: at $Ix < I_{upper}$, PASS; at $I_x \ge I_{upper}$, FAIL The same judgment mode for insulation resistance judgment.		
Current upper limit I_{uppper}	AC	0.001mA – 30mA	0.001mA – 20mA	
	DC	0.1uA – 10mA	0.1uA – 5mA	------
Current lower limitI_{lower} (LOWER OFF)	AC	0.001mA – 30mA	0.001mA – mA	------
	DC	0.1uA – 10mA	0.1uA – 5mA	------
Resistance upper limit		OFF - 0.01MΩ - 50GΩ		------
Resistance lower limit		0.01MΩ– 50GΩ		------
Judging output		PASS/FAIL LCD or LED respectively display, sound alarm		------
Parameter setup				
Voltage rising time		0.1s – 999s		
Voltage down time		0 s – 999s (only after the withstanding voltage test passes）		
Voltage waiting time		0.1s – 999.9s (only for DC withstanding voltage and rising time+ test time＞ waiting time)		
Test time setup		0.3s – 999s（when TIMER is ON）		
Time accuracy		±（0.2% set value + 20ms）		
Measurement function				
Keyboard lock		Prevent the test conditions being modified unintentionally.		
Base clear function		Clear the current flowing through the IR or distributed capacitor between the		

	output cables.
Start-up waiting display	After the test starts (press START), high-voltage enabling signals will be output. Waiting for a while, high-voltage begins to be output.
Ground connection	Ensure the test low terminals are connected correctly.
Current over-range judging	The hardware will rapidly judge the insulation breakdown. It is more convenient and safer than voltage sampling and can reduce shocks to products.
ARC detection	Sample abrupt signals of current and then judge the potential danger and the rough scale of the return circuit.
Electric wall function	Protect personal safety at the moment of accidental electric shock or leakage.
Alarm volume adjustment	OFF, HIGH, LOW
High-voltage indicator	Window indicator or LED indicator
Storage and interface	
file program and storage	50 programmable test files, 100 test steps respectively set for AC, DC and IR in each file. There are 500 steps in total.
USB interface	available / available / available / ------
Start-up parameters storage	Parameter settings automatically saved, and automatically loaded next time of turning on the tester.
Control interface	PLC, HANDLER
Communication interface	RS232C, SCANNER, GPIB(option)

General Specifications

General specifications		
Working temperature & humidity		0°C－40°C, ≤90%RH
Power supply		90V-110V, 108V-132V, 198V-242V, 216V-260V 47.5-63Hz
Power consumption	TH9201/S	≤500VA
	TH9201B/C	≤ 350VA
Dimensions		340mm×120mm×450mm
Weight	TH9201/S	Approx. 15kg
	TH9201B/C	Approx. 13kg

Included accessories:

TH90003R	Withstanding voltage test clip	1
TH90003B	Withstanding voltage grounding clip	1
TH90004	Withstanding voltage test rod	1

Options

TH9121	8-channel high-voltage scanner
TH90006R	Scanning high-voltage scanner
TH90006B	Scanning grounding-line connection cable
TH9100-GPIB	Interface board
TH9200-SOFT1	RS232C communication control software
TH9200-SOFT2	GPIB communication control software