

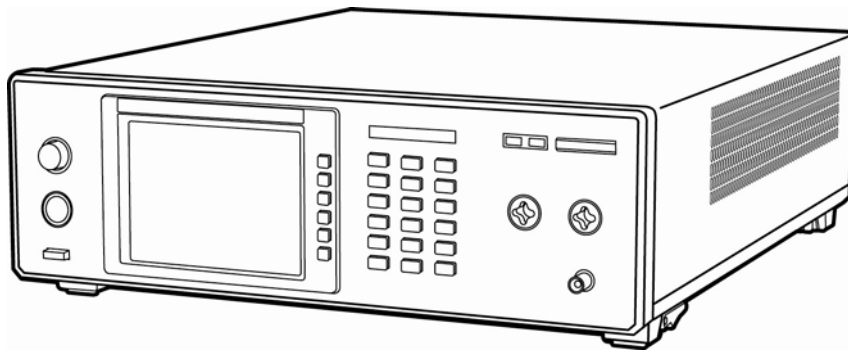
# HIPOT Analyzer

**19055/19055-C**

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User's Manual

# HIPOT Analyzer 19055/19055-C User's Manual



Version 1.3  
July 2011



# Legal Notices

The information in this document is subject to change without notice.

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## **CHROMA ATE INC.**

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This warranty does not apply to any products repaired or altered by persons not authorized by Chroma, or not in accordance with instructions furnished by Chroma. If the instrument is defective as a result of misuse, improper repair, or abnormal conditions or operations, repairs will be billed at cost.

Chroma assumes no responsibility for its product being used in a hazardous or dangerous manner either alone or in conjunction with other equipment. High voltage used in some instruments may be dangerous if misused. Special disclaimers apply to these instruments. Chroma assumes no liability for secondary charges or consequential damages and in any event, Chroma's liability for breach of warranty under any contract or otherwise, shall not exceed the purchase price of the specific instrument shipped and against which a claim is made.

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## **CHROMA ATE INC.**

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<http://www.chromaate.com>

# Material Contents Declaration

The recycling label shown on the product indicates the Hazardous Substances contained in the product as the table listed below.



: See <Table 1>.



: See <Table 2>.

<Table 1>

| Part Name | Hazardous Substances |         |         |                     |                          |                          |
|-----------|----------------------|---------|---------|---------------------|--------------------------|--------------------------|
|           | Lead                 | Mercury | Cadmium | Hexavalent Chromium | Polybrominated Biphenyls | Polybromodiphenyl Ethers |
|           | Pb                   | Hg      | Cd      | Cr <sup>6+</sup>    | PBB                      | PBDE                     |
| PCBA      | O                    | O       | O       | O                   | O                        | O                        |
| CHASSIS   | O                    | O       | O       | O                   | O                        | O                        |
| ACCESSORY | O                    | O       | O       | O                   | O                        | O                        |
| PACKAGE   | O                    | O       | O       | O                   | O                        | O                        |

“O” indicates that the level of the specified chemical substance is less than the threshold level specified in the standards of SJ/T-11363-2006 and EU 2005/618/EC.

“×” indicates that the level of the specified chemical substance exceeds the threshold level specified in the standards of SJ/T-11363-2006 and EU 2005/618/EC.

## Disposal

Do not dispose of electrical appliances as unsorted municipal waste, use separate collection facilities. Contact your local government for information regarding the collection systems available. If electrical appliances are disposed of in landfills or dumps, hazardous substances can leak into the groundwater and get into the food chain, damaging your health and well-being. When replacing old appliances with new one, the retailer is legally obligated to take back your old appliances for disposal at least for free of charge.



<Table 2>

| Part Name | Hazardous Substances |         |         |                     |                          |                          |
|-----------|----------------------|---------|---------|---------------------|--------------------------|--------------------------|
|           | Lead                 | Mercury | Cadmium | Hexavalent Chromium | Polybrominated Biphenyls | Polybromodiphenyl Ethers |
|           | Pb                   | Hg      | Cd      | Cr <sup>6+</sup>    | PBB                      | PBDE                     |
| PCBA      | ×                    | ○       | ○       | ○                   | ○                        | ○                        |
| CHASSIS   | ×                    | ○       | ○       | ○                   | ○                        | ○                        |
| ACCESSORY | ×                    | ○       | ○       | ○                   | ○                        | ○                        |
| PACKAGE   | ○                    | ○       | ○       | ○                   | ○                        | ○                        |

“○” indicates that the level of the specified chemical substance is less than the threshold level specified in the standards of SJ/T-11363-2006 and EU 2005/618/EC.

“×” indicates that the level of the specified chemical substance exceeds the threshold level specified in the standards of SJ/T-11363-2006 and EU 2005/618/EC.

1. Chroma is not fully transitioned to lead-free solder assembly at this moment; however, most of the components used are RoHS compliant.
2. The environment-friendly usage period of the product is assumed under the operating environment specified in each product’s specification.

### Disposal

Do not dispose of electrical appliances as unsorted municipal waste, use separate collection facilities. Contact your local government for information regarding the collection systems available. If electrical appliances are disposed of in landfills or dumps, hazardous substances can leak into the groundwater and get into the food chain, damaging your health and well-being. When replacing old appliances with new one, the retailer is legally obligated to take back your old appliances for disposal at least for free of charge.



## Verification of Compliance

Product Name : Electrical Safety Analyzer  
Trade Name : Chroma  
Main Model Number : 19032-P  
Series Model Number: 19055  
Applicant : Chroma ATE INC.  
Address : 66, Hwa-Ya 1st Rd., Hwa-Ya Technical Park, Kuei-Shan  
Hsiang, Taoyuan Hsien 333, Taiwan  
Report Number : C-C150-0812-304  
Issue Date : February 11, 2009  
Applicable Standards : EN 61326-1:2006 Class A  
EN 61000-3-2:2006  
EN 61000-3-3:1996+A1:2001+A2:2005  
EN 61326-1:2006 (Industrial locations)  
IEC 61000-4-2:2001  
IEC 61000-4-3:2006  
IEC 61000-4-4:2004  
IEC 61000-4-5:2005  
IEC 61000-4-6:2006  
IEC 61000-4-8:2001  
IEC 61000-4-11:2004

One sample of the designated product has been tested in our laboratory and found to be in compliance with the EMC standards cited above and covered by the EMC Directive 2004/108/EC.



TAF 0905  
FCC CAB Code TW1053  
NVLAP Lab Code 200575-6  
IC Code 4699A  
VCCI Accept. No. R-1527, C-1609, T-131, T-1441

**Central Research Technology Co.**  
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(Tsun-Yu Shih/ General Manager)

Date: February 11, 2009





# VERIFICATION

## of conformity with Low Voltage Directive

Verification No.: ACT201845LVD-R1

|   |  |
|---|--|
| <i>Document holder:</i><br>CHROMA ATE INC.  | <i>Type of product:</i><br>Electrical Safety Analyzer        |
| <i>Address:</i><br>66, Hwa-Ya 1st Rd., Hwa-Ya Technology Park,<br>Kuei-Shan Hsiang, Taoyuan Hsien 333, Taiwan | <i>Type designation:</i><br>19032-P and 19055                |
|   | <i>Technical data:</i><br>100-240V~, 50/60Hz, 1200W, Class I |

A sample of the product has been assessed with respect to CE-marking according to the Low Voltage Directive (2006/95/EC) and found to comply with the essential requirements of the Directive. The Standard(s) used for showing the compliance and the full details of the results are given in the Test Report as detailed below:

| Standard(s)          | Report No.   | Report Issued Date |
|----------------------|--------------|--------------------|
| IEC/EN 61010-1: 2001 | ACT201845-R1 | June 29, 2009      |

The holder of the verification is authorized to use this verification in connection with the EC declaration of conformity according to the Directive. The CE marking may only be used if all relevant and effective EC Directives are complied with. Together with the manufacturer's own documented production control, the manufacturer (or his European authorized representative) can in his EC Declaration of Conformity verify compliance with the Low Voltage Directive.

Approved by:

Vincent Tan  
Acts Certification and Testing Services  
June 29, 2009



Acts Certification and Testing Services Co., Ltd.

1<sup>st</sup> Floor, No. 20, Lane 61, Tsinshing Road, Taipei, Taiwan Tel: +886-2-25858775 Fax: +886-2-25983002

# Safety Summary

The following general safety precautions must be observed during all phases of operation, service, and repair of this instrument. Failure to comply with these precautions or specific WARNINGS given elsewhere in this manual will violate safety standards of design, manufacture, and intended use of the instrument. *Chroma* assumes no liability for the customer's failure to comply with these requirements.



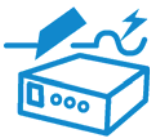
## BEFORE APPLYING POWER

Verify that the power is set to match the rated input of this power supply.



## PROTECTIVE GROUNDING

Make sure to connect the protective grounding to prevent an electric shock before turning on the power.



## NECESSITY OF PROTECTIVE GROUNDING

Never cut off the internal or external protective grounding wire, or disconnect the wiring of protective grounding terminal. Doing so will cause a potential shock hazard that may bring injury to a person.



## FUSES

Only fuses with the required rated current, voltage, and specified type (normal blow, time delay, etc.) should be used. Do not use repaired fuses or short-circuited fuse holders. To do so could cause a shock or fire hazard.



## DO NOT OPERATE IN AN EXPLOSIVE ATMOSPHERE

Do not operate the instrument in the presence of flammable gases or fumes.



## DO NOT REMOVE THE COVER OF THE INSTRUMENT

Operating personnel must not remove the cover of the instrument. Component replacement and internal adjustment can be done only by qualified service personnel.

### **⚠ WARNING**

1. Lethal voltage. AC source may output 6000V peak voltage.
2. Touching the connected circuit or output terminal on the front or rear panel when power is on may result in death.

# Safety Symbols



**DANGER** – High voltage.



**Explanation:** To avoid injury, death of personnel, or damage to the instrument, the operator must refer to an explanation in the instruction manual.



**Protective grounding terminal:** To protect against electrical shock in case of a fault. This symbol indicates that the terminal must be connected to ground before operation of equipment.



The **WARNING** sign denotes a hazard. It calls attention to a procedure, practice, or the like, which, if not correctly performed or adhered to, could result in personal injury. Do not proceed beyond a **WARNING** sign until the indicated conditions are fully understood and met.



The **CAUTION** sign denotes a hazard. It may result in personal injury or death if not noticed timely. It calls attention to procedures, practices and conditions.

# Inspection and Examination

Before the instrument exit the factory, we have a series of inspection and measurement on mechanical and electrical characteristics. Make sure its function of operating for the quality warranty of the product. As soon as the instrument is unpacked, inspect for any damage that may have occurred in transit. Save all packing materials in case that the instrument has to be returned. If damage is found, please file claim with carrier immediately. Do not return the instrument to Chroma without prior approval.

## Standard Accessory

### Standard Equipment



Main unit



User's Manual CD-ROM

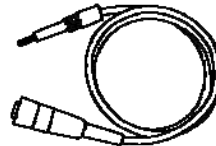
### Standard Equipment (Cable)



- USA-type power cord  
90° elbow  
1.8m x 1



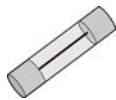
- Power adapter  
3PIN to 2PIN x 1



- HV terminal used test cable x 2



- RTN/LOW terminal used BNC test cable



- 10A fuse x 2

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**Note**    ■ When additional item is required, just inform Chroma the item name.

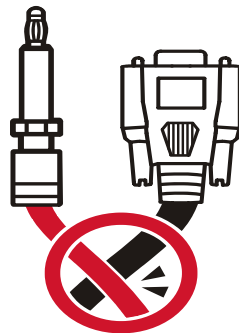
# The Danger of Operating

1. When the instrument is under output voltage, please don't touch test area or you may shock hazard and result in death.  
Please obey the following items.
  - Make sure the grounding cable is connected correctly and using the standard power cord.
  - Don't touch the output terminal.
  - Don't touch test cable of connecting test termination.
  - Don't touch test termination object.
  - Don't touch any charge component of connecting output terminal.
  - As the instrument end the test or turn off output, please don't touch test unit immediately.
2. The shock accidents are usually occurred on the following conditions.
  - The grounding terminal of the instrument doesn't connect correctly.
  - The insulation glove for testing is not used.
  - After test is completed to touch test unit immediately.
3. Remote control for the instrument: This instrument provided with remote control, normally using the external signal to control high voltage output. For safety reasons and prevent from hazards, please exactly follow instructions below while using remote control.
  - Unexpected high voltage output may exist. Make sure if this instrument is under testing/remote controlling before access to the probes.
  - When the instrument is under testing/operating, any access to DUT, test cable and probe output terminal are prohibited, both for the operator/service personnel.
  - Normally remote control of this instrument is controlled by the high voltage test bar. However, using of other control circuit is also possible. For safety reasons and prevent from hazards, please notice that unintentional access to the control test bar or bridging the control circuit to high voltage terminal and test cables may cause hazards. Please keep this terminal/control from unintentional bridging/access to avoid danger.

## **WARNING**

Do not tie up the high voltage cable with RS232, Handler and GPIB control cables or other low voltage side wires. If so, it could cause the product or PC to be down or damaged.

## **DANGER**



## **CAUTION**

Please see *Chapter 3 "Notices before Using"* in this manual for detail descriptions of usage notices and operation hazards.

# Storage, Freight & Maintenance

## **Storage**

When don't use the device, please pack it properly and store under a good environment. (The packing is no needed when the device under appropriate environment.)

## **Freight**

Please use the original packing material when move the device. If the packing material is missing, please use the equivalent buffer material to pack and mark it fragile and waterproof etc to avoid the device damage during movement. The device belongs to precise equipment, please use-qualified transportation as possible. And avoid heavy hitting etc to damage the device.

## **Maintenance**

The device is without any maintenance operation for the general user. (Except for the notice in the manual.) Please contact our company or agent when the device occurred the user judgment abnormal. Don't maintain by yourself to avoid occurred unnecessary danger and serious damage to the device.

# Revision History

The following lists the additions, deletions and modifications in this manual at each revision.

| Date      | Version | Revised Sections   |
|-----------|---------|--|
| Dec. 2009 | 1.0     | Complete this manual   |
| Jan. 2011 | 1.1     | Add usage descriptions of SCANNING and GPIB/RS232 interfaces (IEEE-488.1).   |
| Mar. 2011 | 1.2     | Modify " <i>Material Contents Declaration</i> ".   |
| Jul. 2011 | 1.3     | <p>Add</p> <ul style="list-style-type: none"><li>- the description of "Invalid suffix" in the section of "<i>Error Message</i>".</li><li>- item "CONT(?)" in the section of "<i>IEEE-488.1 Comamnd List</i>" and "<i>IEEE-488.1 New Add Command</i>".</li></ul> <p>Delete</p> <ul style="list-style-type: none"><li>- "Full-function front panel calibration" in the section of "<i>Features</i>".</li><li>- the chapter of "<i>Firmware Update</i>".</li></ul> <p>Update</p> <ul style="list-style-type: none"><li>- the descriptions of "Cutoff Current", "V-display Accuracy" and "Leakage Current Meter" in the chapter of "<i>Specification</i>".</li><li>- the description in the section of "<i>System Parameter Setting</i>".</li><li>- the description in the section of "<i>Description for BREAKDOWN VOLT MODE Interface</i>".</li><li>- the description in the section of "<i>Remote Command</i>".</li></ul> |





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# 1. Introduction

## 1.1 An Overview of Product

Automatic withstand / insulation / grounding testers of the instrument are designed for automatic withstand, insulation resistance and short/open circuit detection of electromechanical and electronic equipments.

The aspect of withstand voltage testing, the output power is AC: 500VA(5kV, 100mA), DC: 150VA(6kV, 25mA). Therefore, it is for withstand test of electronic, electromechanical and component.

Testing aspect of insulation resistance, the measurement range is  $0.1\text{M}\Omega \sim 50\text{G}\Omega$  and test voltage range is 50V ~ 5000V can be set arbitrary.

In the testing aspect of short/open circuit detection, please test if capacitance is short or open before testing high voltage. Please make sure the DUT good contact then processes high voltage test.

All of setting status, time, current, voltage, resistance value, memory number, etc are listed on the display, it is unnecessary to remember any parameter status which be set.

The tester equipped with Good and No Good judgment machinery and signal output of testing result and remote control. It is also for RS232 interface, SCANNING interface, HANDLER interface and GPIB interface of automatic test system. The above equipments make high efficient and accurate tests for electromechanical, and electronic and component.

## 1.2 Features

- Floating high voltage/current simultaneous measurement patent design
- Standard RS232/USB interface
- AC / DC withstand voltage, insulation resistance, short/open circuit detection three in one model
- DC open circuit detection patent design
- Reformation DC quick discharge patent design
- 0.2sec quick discharge
- Keypad locked and data protected function
- Eight kinds of judgment result indication window
- Charge current low limit detection function
- Storage of 500 test setups or 100 sets of memory functions
- GPIB interface optional

## 1.3 Initial Inspection

Before shipment, this instrument was inspected and found to be free of mechanical and electrical defects. As soon as the instrument is unpacked, inspect for any damage that may have occurred in transit. Save all packing materials in case that the instrument has to be

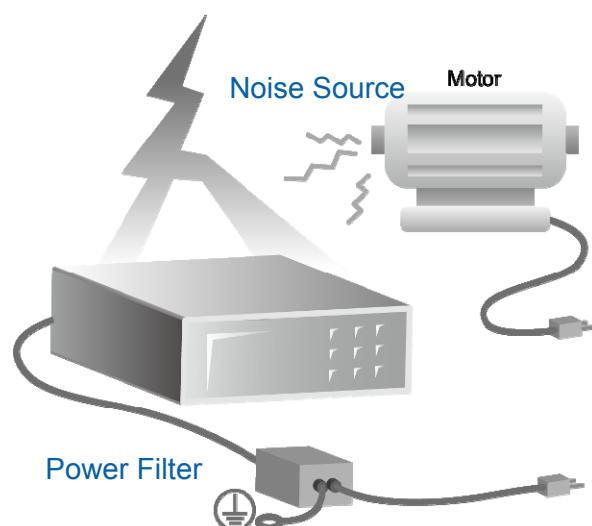
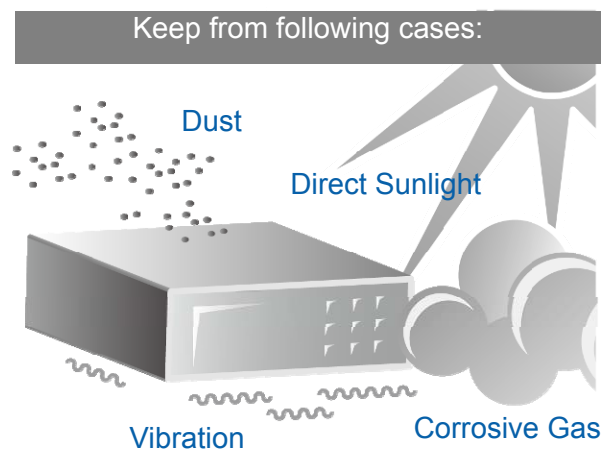
returned. If damage is found, please file claim with carrier immediately. Do not return the instrument to Chroma without prior approval.

## 1.4 Common Environment Conditions

1. Indoor use
2. Altitude: 2000 m
3. Transient Overvoltage at Mains Supply: 2500V
4. Pollution Degree: 2

## 1.5 Ambient Environment

1. Do not use the meter in a dusty or vibrating location. Do not expose it to sunlight or corrosive gas. Be sure that the ambient temperature is  $0 \sim 45^{\circ}\text{C}$  and that humidity is  $15\% \sim 95\%$ .
2. The meter has been carefully designed to reduce the noise from the AC power source. However, it should be used in as noise-free an environment as low as possible. If noise is inevitable, please install a power filter.
3. The meter should be stored within the temperature range  $-10^{\circ}\text{C} \sim +50^{\circ}\text{C}$ . If the unit is not to be in use for a long time, please store it in the original or similar package and keep it from direct sunlight and humidity.



## 2. Specification (18°C ~ 28°C RH ≤ 70%)

|  |   |
|--|---|
| <b>■ AC/DC Withstanding Test</b>                 |   |
| <input type="checkbox"/> Output Voltage          | AC:0.05-5.0kV, steps 0.002kV, DC: 0.05-6.0kV,steps 0.002kV  |
| <input type="checkbox"/> Load Regulation         | ≤ (1% of setting + 0.1% of full scale), Rated load  |
| <input type="checkbox"/> Voltage Accuracy        | ± (1% of setting + 0.1% of full scale)  |
| <input type="checkbox"/> Cutoff Current (Note 1) | AC: 0.001mA ~ 120mA (voltage ≤ 4kV)<br>AC: 0.001mA ~ 100mA (voltage > 4kV)<br>DC: 0.0001mA ~ 25mA<br>0.1uA DC resolution  |
| <input type="checkbox"/> V-display Accuracy      | ± (1% of reading + 0.1% of full scale), 2V resolution   |
| <input type="checkbox"/> Leakage Current Meter   | AC current:<br>3mA range: 0.001mA – 2.999mA, 0.001mA resolution<br>30mA range: 0.01mA -- 29.99mA, 0.01mA resolution<br>120mA range: 0.1mA -- 120.0mA, 0.1mA resolution<br>Measurement Accuracy: ± (1% of reading + 0.5% of range)<br><br>DC current:<br>300uA: 0.1uA– 299.9uA, 0.1uA resolution<br>3mA range: 0.001mA – 2.999mA, 0.001mA resolution<br>25mA range: 0.01mA – 25.00mA, 0.01mA resolution<br>Measurement Accuracy: ± (1% of reading + 0.5% of range)<br><br>AC real current: ± (1% of reading + 5% of total current) |
| <input type="checkbox"/> Output Waveform         | 50Hz, 60Hz ± 0.1%, sine wave  |
| <input type="checkbox"/> Test Time (Note 2)      | 0.3 ~ 999 Sec., and Continue  |
| <input type="checkbox"/> Ramp Time               | 0.1 ~ 999 Sec., and Off   |
| <input type="checkbox"/> Fall Time               | 0.1 ~ 999 Sec., and Off   |
| <input type="checkbox"/> DWELL Time              | 0.1 ~ 999 Sec., and Off (WDC only)  |
| <input type="checkbox"/> Maximum Short Current   | Up to 4kV 200mAac only  |
| <b>■ ARC Detection (Note 3)</b>                  |   |
| <input type="checkbox"/> Detection Current       | AC: 1mA – 20mA, DC: 1mA – 10mA, resolution 0.1mA  |
| <b>■ Corona Detection (Model 19055-C)</b>        |   |
| <input type="checkbox"/> Detection Range         | 0.1 ~ 99.9, and Off   |
| <b>■ HFCC</b>                                    |   |
| <input type="checkbox"/> Capacitance Range       | 1pF ~ 100pF   |
| <input type="checkbox"/> Display Range           | 1pF ~ 200pF   |
| <input type="checkbox"/> Measuring Accuracy      | ± (50% of reading + 3pF )   |
| <b>■ Insulation Resistance Test</b>              |   |
| <input type="checkbox"/> Test Voltage            | DC: 0.050 ~ 5.000 kV, steps 0.002kV   |
| <input type="checkbox"/> V-display Accuracy      | ± (1% of reading + 0.1% of full scale)  |
| <input type="checkbox"/> Resistance Range        | 0.1MΩ ~ 50GΩ  |

|   |  |
|---|--|
| <input type="checkbox"/> Measuring Accuracy                                     | <p><math>\geq 1\text{kV}</math>:<br/> <math>1\text{M}\Omega \sim 1\text{G}\Omega</math>: <math>\pm (3\% \text{ of reading} + 0.1\% \text{ of full scale})</math><br/> <math>1\text{G}\Omega \sim 10\text{G}\Omega</math>: <math>\pm (7\% \text{ of reading} + 2\% \text{ of full scale})</math><br/> <math>10\text{G}\Omega \sim 50\text{G}\Omega</math>: <math>\pm (10\% \text{ of reading} + 1\% \text{ of full scale})</math><br/> <math>500\text{V} \sim 1\text{kV}</math>:<br/> <math>1\text{M}\Omega \sim 1\text{G}\Omega</math>: <math>\pm (3\% \text{ of reading} + 0.1\% \text{ of full scale})</math><br/> <math>1\text{G}\Omega \sim 10\text{G}\Omega</math>: <math>\pm (7\% \text{ of reading} + 2\% \text{ of full scale})</math><br/> <math>10\text{G}\Omega \sim 50\text{G}\Omega</math>: <math>\pm (10\% \text{ of reading} + 1\% \text{ of full scale})</math><br/> <math>&lt; 500\text{V}</math>:<br/> <math>1\text{M}\Omega \sim 1\text{G}\Omega</math>: <math>\pm (5\% \text{ of reading} + (0.2 \times 500\text{V}/\text{Vs})\% \text{ of full scale})</math></p> |
| <input type="checkbox"/> Test Time (Note 2)                                     | 0.3 ~ 999 Sec., and Continue   |
| <b>■ Secure Protection Function</b>   |  |
| <input type="checkbox"/> Ground Fault Interrupt leakage current (for WVAC only) | AC:0.25mA~0.75mA, ON/OFF selectable  |
| <input type="checkbox"/> Fast Discharge   | Approx. 0.2S (Discharge Voltage 5.1kV)   |
| <input type="checkbox"/> Panel Operation Lock                                   | YES, with password On/Off  |
| <b>■ Floating Output (NOTE 4)</b>   |  |
| <input type="checkbox"/> Function   | Wac, Wdc, IR   |
| <input type="checkbox"/> H.V Floating Output                                    | Front panel H.V output only  |
| <input type="checkbox"/> Leakage Current  | Less than 3.5mAac or dc  |
| <b>■ Memory Storage</b>   |  |
| <input type="checkbox"/> Memories, Steps  | 100 groups of memory, each memory includes max.50 Steps (TOTAL 500 steps)  |
| <b>■ PASS/FAIL Judgment Window</b>  |  |
| <input type="checkbox"/> Indication, Alarm                                      | PASS: (Short Sound)<br>FAIL: W-Arc, W-Hi, W-Lo, IR-Lo, IR-Hi, GFI (Long Sound)   |
| <b>■ Remote Connector</b>   |  |
| <input type="checkbox"/> Interlock  | 2 pins connector, pin1 pull-up to digital +V source with 4.7kohm resistor, and pin 2 tied to digital GND   |
| <b>■ Handler Interface</b>  | 24 pins connector, ALL input/output are negative true logic and optically-isolated open collector signals (General-speed photo-coupler used). All outputs must be pulled-up with 22kohm resistor to +V <sub>EXT</sub> (external power supply). All input optic-diode must be series with current limit (10mA $\pm$ 4mA for +3V ~ +26V) circuit.  |
| <b>■ RS232 Interface</b>  | The programming language is SCPI.  |
| <b>■ USB Interface</b>  | USB meet USBTMC  |
| <b>■ GPIB (Optional)</b>  | Complies with IEEE488.1 and 488.2. The programming language is SCPI.   |
| <b>■ Ambient Temperature and Relative Humidity</b>                              |  |
| <input type="checkbox"/> Specifications range                                   | 18 to 28°C, 20 to 70% RH.  |
| <input type="checkbox"/> Operable range   | 0 to 45°C, 15% to 95% RH.  |

|                              |  |
|------------------------------|--|
| □ Storage range              | -10 to 50°C, ≤ 80% RH.   |
| <b>■ Power Requirement</b>   |  |
| □ Line Input                 | 100Vac ~ 240Vac, 47~66 Hz  |
| □ Power Consumption          | No load: <100W, Rated load: 1200W  |
| □ Dimension                  | 430 W x 130 H x 500 D mm   |
| □ Weight                     | < 25 kg  |
| <b>■ SAFETY</b>              |  |
| □ Ground Bond                | Less than 100mΩ at 25Amp, 2sec.  |
| □ Hi-Pot L + N to Earth:     | Less than 15mA at WVAC 1.5kV, 60Hz, 60sec no flashover happen(ARC level<5mA, tested by Chroma 19032).            |
|                              | Less than 0.1mA at WVDC 2.2kV, 60sec no flashover happen, ramp time 2sec(ARC level<5mA, tested by Chroma 19032). |
| □ Insulation L + N to Earth: | Greater than 20MΩ at 500V dc, 2sec.  |
| □ Line leakage current:      | Less than 3.5mA at 256V Vin max, normal and reverse.   |

Note 1: Less than 1/2 duty cycle of 120sec when output power is greater than 300VA.

The current resolution is 1.2count for WAC, and 1.6count for WDC calculated value.

Note 2: The minimum testing time arrives at 90% output voltage specification (NO load).

Note 3: Design in Specifications. Validation point is 1.25kV with a 250kΩ resistor.

Note 4: Except GFI ON/OFF.





### 3. Notices before Using

The tester is with high voltage output up to 6KV sending to external test. It may occur injury and death result from error operation. Please peruse notice item of this chapter and remember to avoid accident.

#### 1. Shock Hazard

For preventing shock be occurred. Before using the tester, put on insulation glove firstly and then running function related to electricity.

#### 2. Grounding

There is a ground terminal on the rear panel cover of the tester. Please use appropriate implement to connect the ground terminal to earth actually. If not, there may be high voltage existed on the cover of the tester. It is very danger whatever touches the machine under the above statuses. It may cause shock hazard, therefore please make sure to connect ground terminal to earth as Figure 3-1 shown.

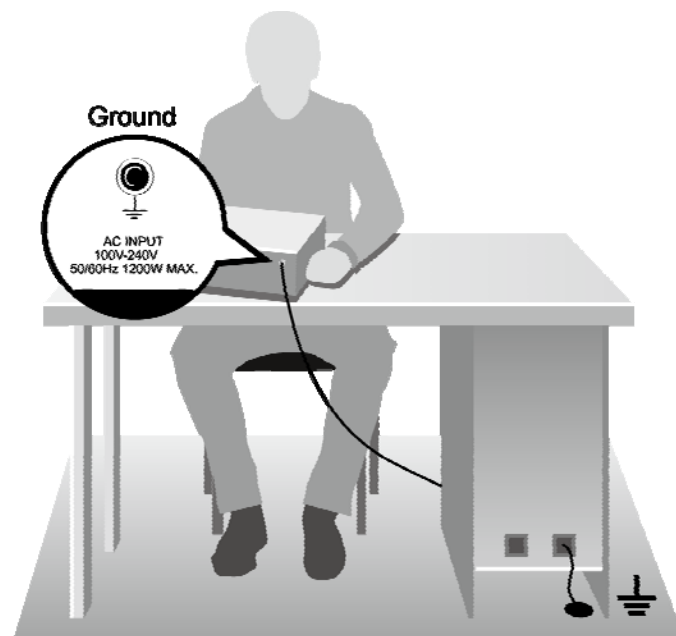


Figure 3-1 Safety Grounding

#### 3. Connect test cable to HV1/HV2 terminal

It is necessary to check if there is loosen or drop occurred in test cables of HV1 and HV2 terminals under operating condition at any time. If you want to connect DUT by test cable, please connect test cable of HV2 or RTN/LOW terminal to DUT(Device Under Test). The uncompleted connection of test cable of HV2 or RTN/LOW terminal or drop is very danger, as there is full of high voltage on DUT. After plugging high voltage jack in HV1 and HV2 and then rotate 90° to screw up clockwise for avoiding the drop of test cable.

#### 4. Connection test of high voltage output terminal

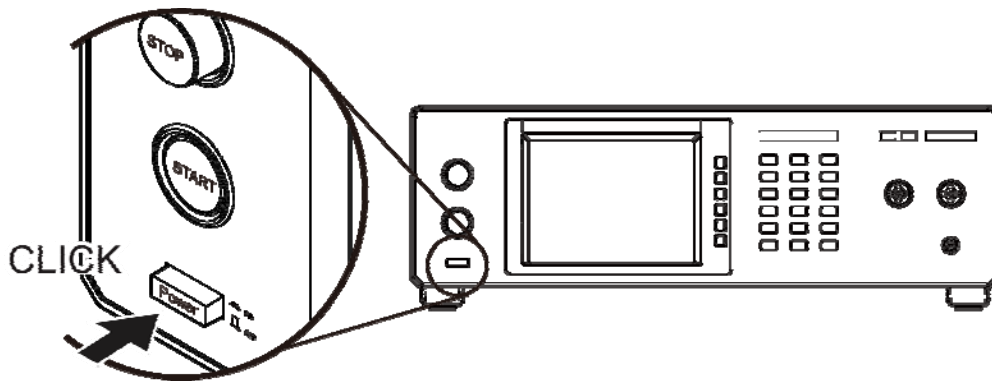
After the test cable of HV2 terminal has been connected. Then follow the below procedures to connect high voltage output cable.

- Press [STOP] key firstly.
- Confirm DANGER indication LED does not light.

- The test cable of HV2 or RTN/LOW terminal with HV1 terminal is shorted; confirm there is no voltage output.
- Plug high voltage test cable in HV1 terminal.
- Connect the test cable of HV2 or RTN/LOW terminal to DUT finally, and then HV1 high voltage test cable also be connected.

**5. Test stop**

When the test is over the and no need to use, or the tester is not under running status or needs to exit during use, please be sure power switch is on OFF (that is turn off power) as Figure 3-2 shown.

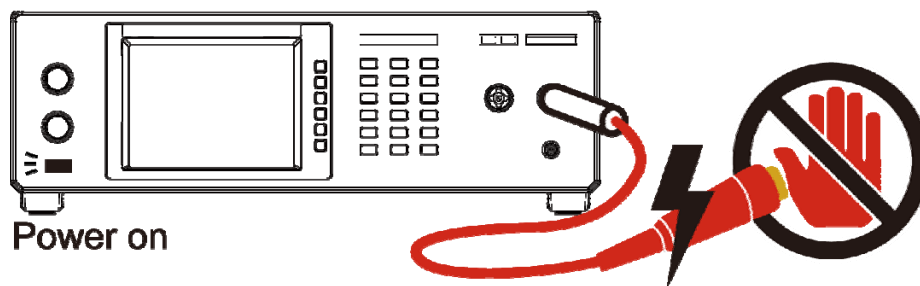


**Figure 3-2 POWER SWITCH OFF**

**6. The dangerous area under test mode**

It is very danger to touch high voltage area under operation status. Such as touch DUT, test cable, probe and output terminal.

※ **When the main unit is under test status, please don't touch alligator clip on test cable. Because the insulation of plastic layer is not enough, touch it may cause hazard as Figure 3-3 shown.**



**Figure 3-3 Don't touch here when outputs high voltage**

**<<< Warning ! When the output terminal is cut off >>>**

**7. Test complete confirmation**

You may touch DUT, high voltage test cable or output terminal, etc high voltage areas under modifying circuit or others test requested conditions. Please confirm the following at the first.

※ **Power switch is turned off.**

※ **As the insulation resistance test unit, DUT may full of high voltage when test is completed. In the meantime, you need to pay attention to obey descriptions of item 8 and 9. Please follow the described procedures to execute.**

<<< Notice! Insulation resistance is charging as testing. >>>

**8. Charge**

When the insulation resistance is testing, DUT, capacitor, test cable, probe and output terminal even includes the tester may full of high voltage. After turning off the power switch, it needs a period of time to discharge. Please obey the above descriptions, don't touch any place may cause shock especially on power just turn off.

**9. Confirm charging voltage has been discharged completely**

The discharged time of charging voltage depends on testing voltage and DUTs' characteristic. To assume that high voltage add to DUT is equivalent to high voltage add to 0.01uF capacity parallel 100MΩ resistance circuit. After turning off power, the voltage which add on testing and DUT decreasing to lower than 30V and the needed time about 3.5 seconds. When test voltage is 500V needs about 2.8 seconds. To assume the time constant of DUT is known, if you want to know the voltage decreasing to below 30V needed time. Please follow the above procedures, multiply the needed time below 30V by time constant as Figure 3-4 shown.

Formula:  $V_0 e^{-t/RC} = V_{IL}$

Ex. :  $1000V \times e^{-t/RC} = 30V$

$e^{-t/RC} = 0.03$

$-t/RC = \ln 0.03 \quad \therefore t = 3.5 \text{ Sec}$

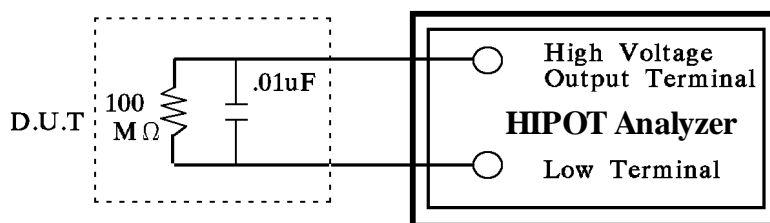


Figure 3-4

**10. Remote control the main unit**

The instrument with remote control, high voltage output control by external control signal usually. For your safety and prevent from hazard, please obey the following rules.

- Don't allow any unexpected high voltage output that may cause danger.
- When the main unit output high voltage, don't permit the operator or other personnel to contact DUT, test cable and probe output terminal.

※ Notice ※

**11. Turn on or turn off power switch**

When power switch is cut off, it needs a few seconds to re-turn on. Please don't turn on and turn off continuously. It is very danger to do that under high voltage output.

**When turn on or turn off power, don't connect any object to high voltage output terminal to avoid hazard that result from abnormal high voltage output.**

**12. Others notice items**

Don't make short-circuited of output cable, grounding cable, transmission cable or AC power to prevent from the analyzer is full of voltage. Please connect the cover of the analyzer to earth firstly when high voltage output terminal HV1 is short-circuited with HV2 or RTN/LOW terminal.

<<< Dangerous Event >>>

**13. The danger management**

Under any danger circumstances, such as shock, DUT burning or the main unit burning. Please obey the following procedures to avoid the more serious danger.

- Cut off power switch firstly.
- Then pull off the plug of power cord.

<<< Solution >>>

**14. Problems**

Under the below circumstances, the occurred problems are very danger. Even press [STOP] key, the output terminal may output high voltage.

- When press [STOP] key, DANGER indication LED is still light.
- The voltage meter without voltage reading but DANGER LED still light. When the above conditions are occurred, please turn off power and pull off AC power plug immediately. Don't use it any more, please send it to our company or office for reparation.

**15. DANGER indication LED error**

When press [START] key, there is already has reading on the voltage meter and DANGER LED still not light. In the meantime, the indication LED may be error please turn off immediately. Please send it to our company or office for reparation.

**16. If the analyzer needs long time using under normal operation. Please notice the following items.**

If the high limit setting value is 100.0mA (withstand voltage test), please notice its ambient temperature. When the ambient temperature is higher than 40°C, please stop operation until it cools down to normal temperature.

**17. The used AC INPUT power of analyzer is 100Vac ~ 240Vac, 47 ~ 66 Hz.**

Only can replace fuse under power-disconnected status, remove fuse stand from power socket and press new fuse slightly into fuse stand then plug in the power socket.

 **WARNING** Please use correct specification as replacing fuse or it may cause hazard.

**18. Normal operation of the unit is AC power**

If the power is unstable, it may cause the unit function is not actual or abnormal. Therefore, please use appropriate equipment to turn to suitable power such as power stabilizer.

**19. Output power is 500VA**

When DUT drawing mass current before deadline of fail judgment and output current, it may flows mass current (about ten amperes) up to ten milliseconds. Before processing test there also may be the same condition. Please notice the capacity of power cord and the current cable of linking with other instrument or equipment.

**20. Storage**

The unit normal operating temperature humidity range is 5°C ~ 40°C, 80% RH. If over this range then function may malfunction. Please don't position the equipment so that it is difficult to operate the disconnecting device. The unit storage temperature range is -10°C ~ 50°C, 80% RH. If you don't use it for a long time, please use original material

packing and then store it. For correct test and safety, please keep it from direct sunlight or high temperature, vibration, humidity and dusty place.

**21. Warm up**

All functions of the analyzer are activated when the power switch is turned on. However, please warm the instrument over 15 minutes for attaining the precision in the specification,.

**22. Warning signal of testing**

**“DANGER – HIGH VOLTAGE TEST IN PROGRESS, UNAUTHORIZED PERSON  
KEEP AWAY”**

**23. Keep test cable away from the panel**

Please keep the high voltage cable or the DUT away from the panel at least 30 cm during operation to avoid the display interference caused by high-voltage discharge.

**24. Notices for connecting automated device**

- The grounding system of the device and the automated station should be connected together.
- Add anti-interference iron core to the high voltage cable and the 2 ends (device output and DUT) of RTN/LOW test cable with winding at least 1 circle.
- The high voltage and RTN/LOW test cable must be separated from the control cable.
- The high voltage and RTN/LOW test cable must keep proper distance from the analyzer panel.



## 4. Description of Panel

### 4.1 Front Panel

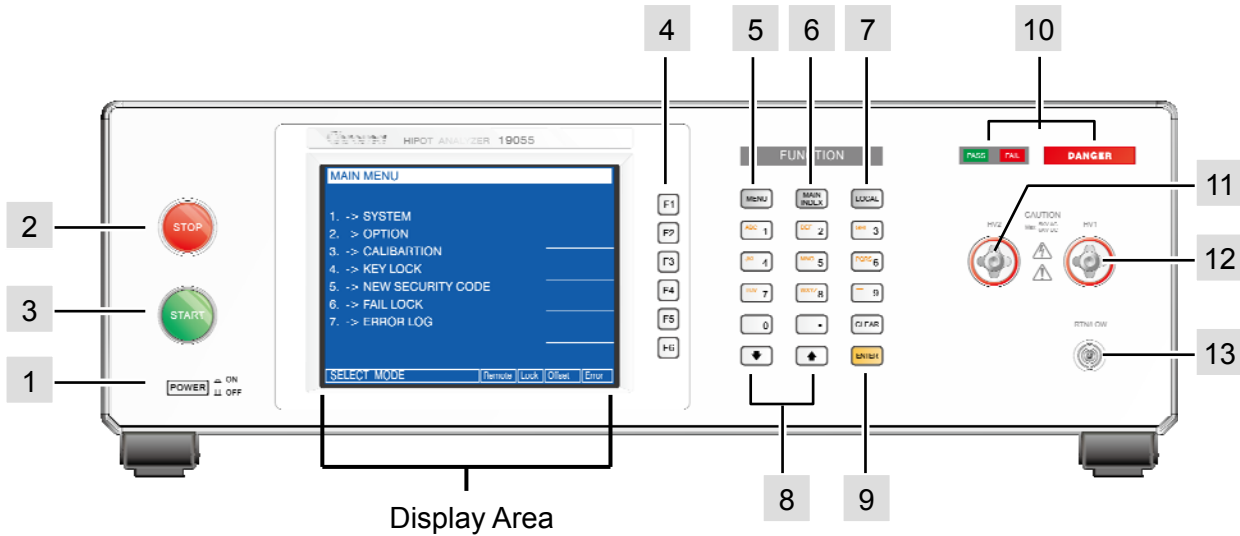
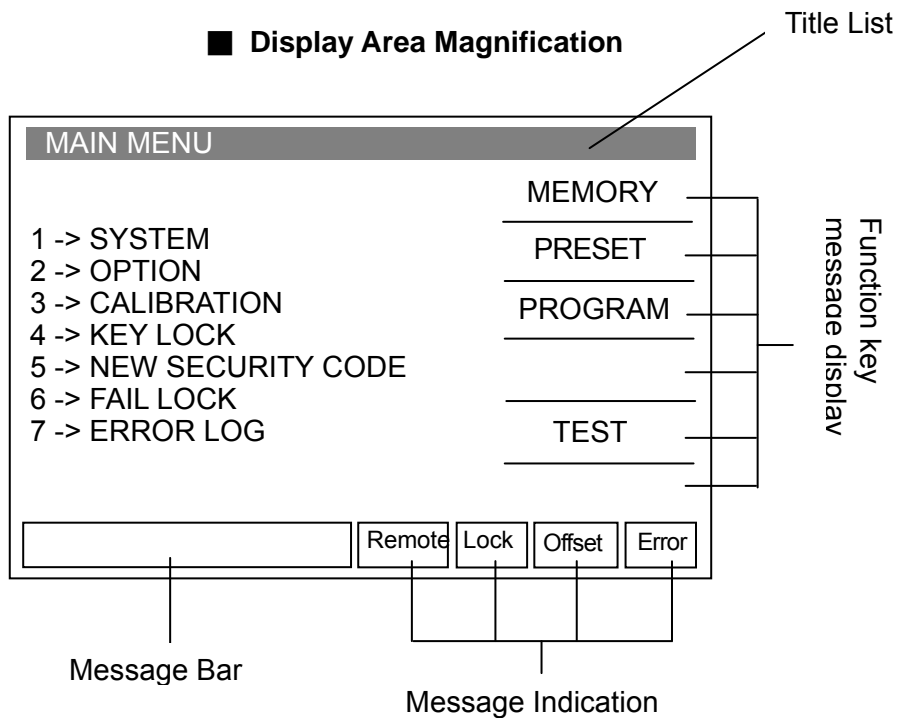


Figure 4-1

Front panel includes several function areas which easy to use. This paragraph will introduce each control and information on screen to you.

#### ■ Display Area Magnification



#### Display Area

**Title List:** This list displays the current setting of main unit or testing mode.

#### Function key message display area:

Under different display menus, there are different function descriptions. The right side of display has corresponding function keys. If the description is

blank or gray scale font, it means corresponding function is invalid.

**Message Bar:** This list indicates the setting method, the range of setting value and the testing time.

**Message Indication Diagram:**

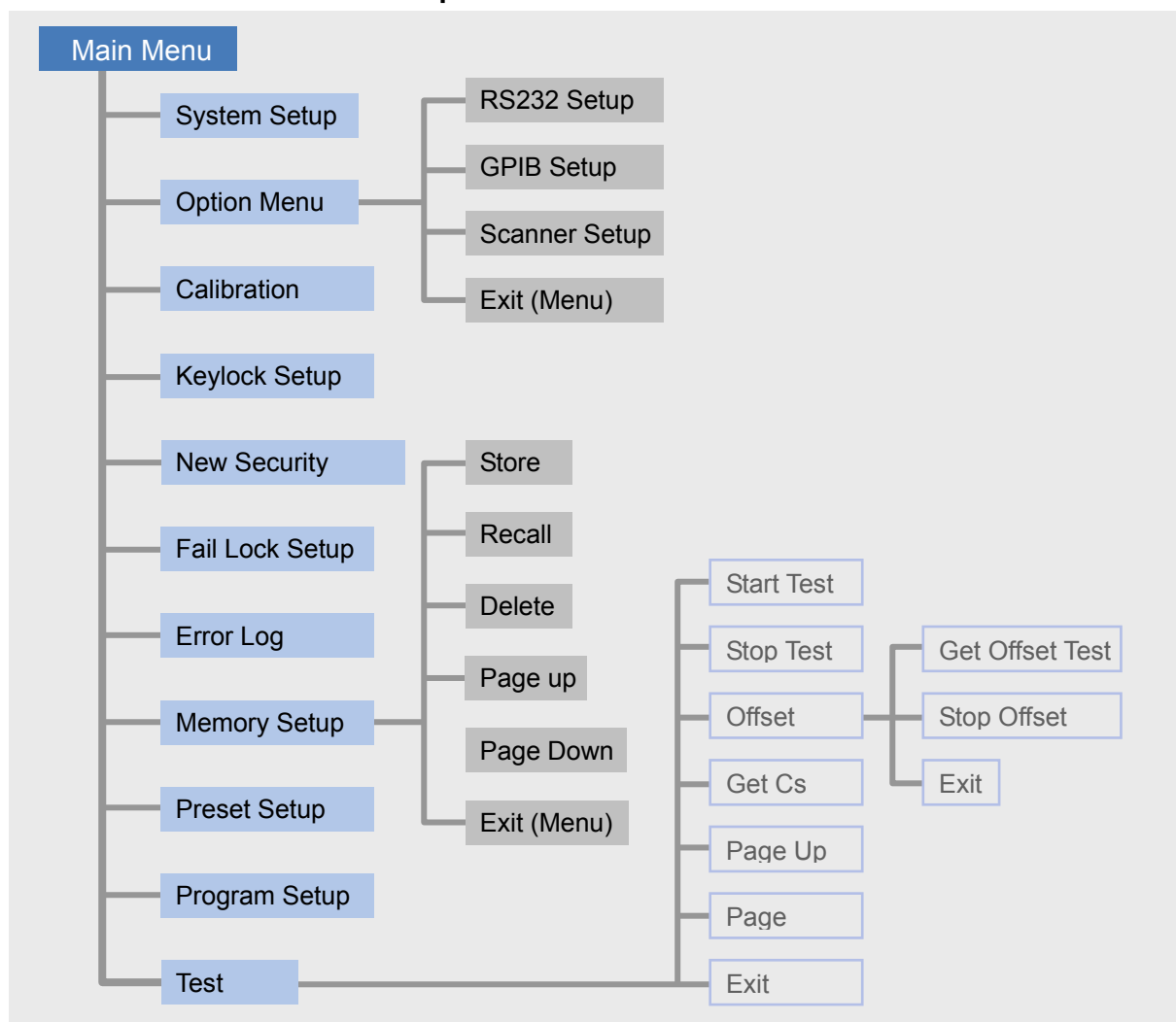
**Remote** : When this area is highlighted, it means the main unit is under Remote status. That is the main unit controlled by PC through RS232 or GPIB connect to PC. At the same time, all of keys are malfunction except for [STOP] and [LOCAL] keys.

**Lock** : When this area is highlighted, it means the main unit is under setting parameter protected mode. Other keys are malfunction except for "MEMORY", "TEST" and "KEY LOCK" modes.

**Offset** : When this area is highlighted, it means the main unit zeroed the leakage current of test cable and test lead currently.

**Error** : When this area is highlighted, it means there is error message produced.

**Simplified Function Flow Chart**





**Key Area**

- (1) Power Switch** : The switch provides AC power source that the analyzer is needed. Before starting, please read Chapter 3 “Notices before Using” firstly.
- (2) STOP Key** : Reset key, after pressing this key the main unit returns to standby testing status immediately, and cuts output and clears all of judgments simultaneously.
- (3) START Key** : After pressing this key, the main unit is under testing status. The testing terminal has output and each judgment function starts simultaneously.
- (4) Function Keys** : Function key. Under different display menus, there are different functions. The right side of display has corresponding function description. If the description is blank or in gray scale font, it means corresponding function is invalid.
- (5) MENU Key** : Under each main display mode, press this key return to “MAIN MENU” mode.
- (6) MAIN INDEX** : Press this key to enter GENERAL and BREAKDOWN MODEs for menu selection.
- (7) LOCAL Key** : When the main unit under Remote status, return the control right to main unit by pressing this key.
- (8) Cursor Keys** : The [ $\Delta$ ] and [ $\nabla$ ] keys are for moving highlighted cursors.
- (9) Data Entry Keys/Program Keys**
- [0][.] ~ [9]** : Numeral/character key is for inputting each test parameter data (numeral or alphabet). Under “MAIN MENU” display mode, [1], [2], [3], [4], [5] keys can enter various display modes.
  - [ENTER]** : Confirmation key. After inputting test parameter, press this confirmation key. Thus the value of inputting will be confirmed.
  - [CLR]** : Clear key. When input test parameter, if there is any error can press this key to cancel error data and then input again.
- (10) Indicator** : With UNDER TEST to indicate LED and judge/display LED.
- (11) HV2** : High voltage output RTN terminal (when GFI setting is FLOAT). Therefore, this terminal is very dangerous. Don't touch it when DANGER LED is lit, there is high voltage outputting.
- (12) HV1** : High electric potential terminal of high voltage output. This terminal belongs to high electric potential output, usually is high voltage output. Therefore, this terminal is very dangerous. Don't touch it when DANGER LED is lit, there is high voltage outputting.
- (13) RTN/LOW** : Common test terminal is a reference terminal as high voltage testing, *i.e.* low electric potential terminal. This terminal is almost equal to earth terminal of the cover.

## 4.2 Rear Panel

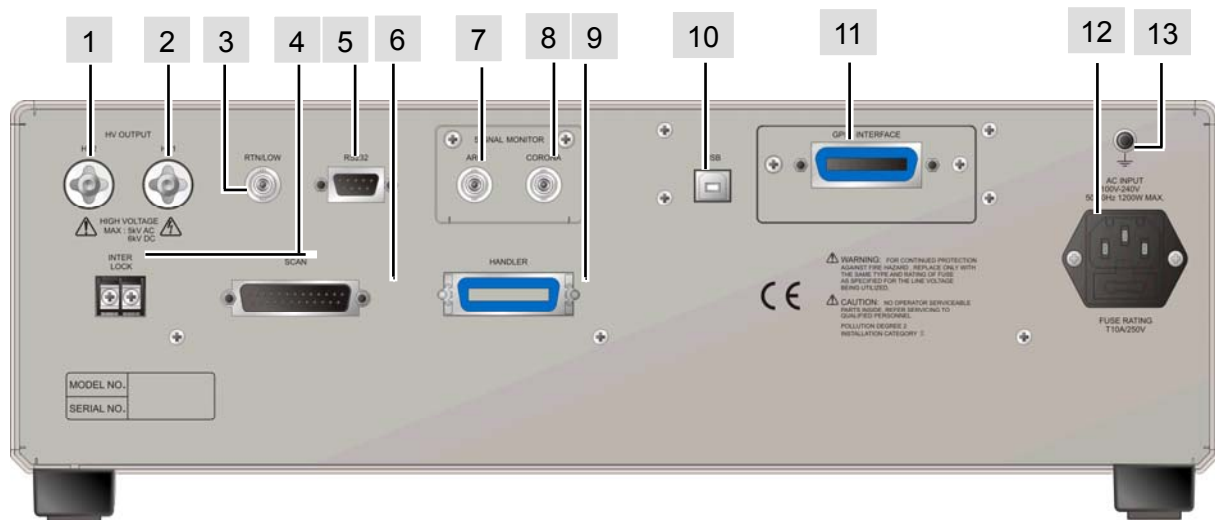


Figure 4-2

- (1) **HV2** : High voltage output RTN terminal (when GFI setting is FLOAT). Therefore, this terminal is very dangerous. Don't touch it when DANGER LED is lit, there is high voltage outputting.
- (2) **HV1** : High electric potential terminal of high voltage output. This terminal belongs to high electric potential output, usually is high voltage output. Therefore, this terminal is very dangerous. Don't touch it when DANGER LED is lit, there is high voltage outputting.
- (3) **RTN/LOW** : Common test terminal is a reference terminal as high voltage testing, *i.e.* low electric potential terminal. This terminal is almost equal to shell earth terminal.
- (4) **INTER LOCK** : The high voltage can be outputted when the two terminals are short-circuited.
- (5) **RS232 Interface** : This socket is for RS232 interface of the instrument. GPIB and RS232 interfaces can't use simultaneously.
- (6) **SCAN Interface** : This interface and 9030 Scanning Box (option) should be connected for control.
- (7) **ARC Monitor** : ARC test signal can be observed from this BNC socket.
- (8) **CORONA Monitor** : CORONA test signal can be observed from this BNC socket. (This function is for 19055-C.)
- (9) **HANDLER Interface**: This socket is for HANDLER interface of the instrument.
- (10)**USB Interface** : USB terminal
- (11)**GPIB Interface (option)**: This socket is for optional GPIB interface. The detailed descriptions, please refer "Chapter 5 – Description of GPIB Interface" in this manual.
- (12)**AC LINE** : AC power socket and fuse holder.  
A tri-cord power and fuse holder. Input AC power, which the analyzer is needed from AC power socket. The detailed specifications of using fuse please refer "Chapter 3 – Notice Items

before Using” or descriptions of rear paonel in this manual.

- (13)GND Terminal** : Safety GND terminal, please use adaptable implement to connect this grounding terminal actually. If there is no grounding actually, the circuit with GND terminal or other instruments connecting cable with GND terminal are short-circuited. The cover of analyzer may exist high voltage. This is very dangerous, anyone touch the analyzer under the above status may cause damage. Therefore, it is necessary to connect safety GND terminal to ground.

### 4.3 Notices and Procedures before Operating

1. Before plugging AC power cable, please confirm power that use firstly and description of rear panel is match or not and power switch is OFF status.
2. Before turning on power, please peruse “Chapter 3 – Notice Items before Using” and remember it.
3. When turns on power, the analyzer will self-test. If there is abnormal condition, please turns off switch and pulls off power cord immediately.

### 4.4 System Parameter Setting

#### Operation methods:

1. When title shows “SYSTEM SETUP”, press [ $\Delta$ ], [ $\nabla$ ] keys to move the highlighted cursor to the parameter item which want to set.
2. Press numeral/character key or Function Keys to set this item parameter data.
3. If shows blinking cursor, it means parameter data is not completed. When data input is error, can press [CLR] to clear and input again. Please press [ENTER] to confirm parameter data is correct finally.

| SYSTEM SETUP    |   |         |       |
|-----------------|---|---------|-------|
| 01. Contrast    | : | 17      | UP    |
| 02. Beeper Vol. | : | HIGH    |       |
| 03. DC 50V AGC  | : | OFF     |       |
| 04. Discharg-V  | : | 3.6kV   | DOWN  |
| 05. After Fail  | : | RESTART |       |
| 06. AC OFFSET   | : | 0.10mA  |       |
| 07. IEEE-488.1  | : | OFF     |       |
|                 |   |         |       |
|                 |   |         |       |
|                 |   |         |       |
|                 |   |         |       |
|                 |   |         |       |
|                 |   |         |       |
|                 |   |         |       |
| 1-31            |   | Remote  | Lock  |
|                 |   | offset  | Error |

#### System parameter setting data description:

| Setting Item  | Range                    | Initial Setting | Description              |
|---------------|--------------------------|-----------------|--------------------------|
| Contrast      | 1~31                     | 17              | Adjust LCD brightness    |
| Beeper Volume | LOW /MEDIUM/<br>HIGH/OFF | HIGH            | Adjust the buzzer volume |

|            |                           |         |   |
|------------|---------------------------|---------|---|
| DC 50V AGC | ON/OFF                    | ON      | Hardware compensation for above DC 50V  |
| Discharg-V | 0.05-5.1KV                | 3.60KV  | DC discharge setting  |
| After Fail | CONTINUE / RESTART / STOP | RESTART | (1) When set as CONTINUE, and any one among STEPs judged as No Good. It will continue until all STEPs are tested.<br>(2) When set as RESTART, and any one among STEPs judged as No Good press START to restart directly.<br>(3) When set as STOP, and any one among STEPs judged as No Good. It is necessary to press STOP then can restart test by pressing START. |
| AC OFFSET  | 0 ~ 2.5mA                 | 0.10mA  | (1) When Offset value is higher than <b>AC OFFSET</b> value, Current reading = Current real measurement value – Offset value.<br>(2) When Offset value is lower than <b>AC OFFSET</b> value, Current value = $\sqrt{(\text{Real measurement value})^2 - (\text{Offset})^2}$   |
| IEEE-488.1 | ON/OFF                    | OFF     | (1) When it sets ON, GPIB/RS232 command format is IEEE-488.1 compatible with 9032C.<br>(2) When it sets OFF, GPIB/RS232 command format is IEEE-488.2.   |

### 4.4.1 Hardware/Software AGC

The output voltage is changed by load effect, and then executing AGC function.

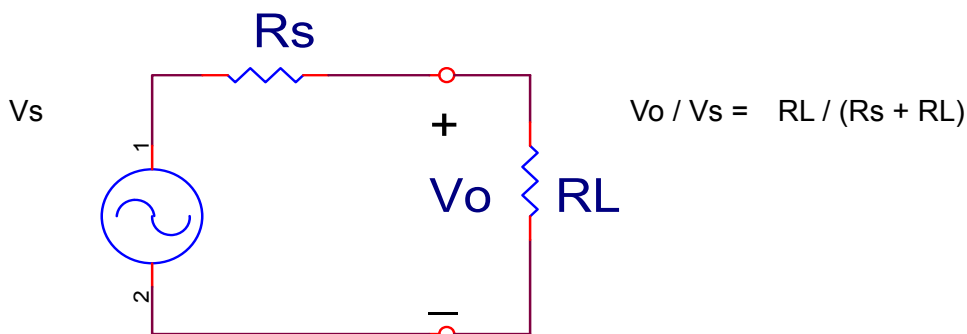
ACV : 50V~5KV (Hardware AGC is always ON, software AGC initial setting is ON and also can be set as OFF.)

DCV : 50V~499V (Hardware AGC initial setting is ON and also can be set as OFF. Software AGC initial setting is ON and also can be set as OFF.)

DCV : 500V~6KV (Hardware AGC is always ON, software AGC initial setting is ON and also can be set as OFF.)

IR : 50V~499V (Hardware AGC initial setting is ON and also can be set as OFF. Software AGC initial setting is ON and also can be set as OFF.)

IR : 500V~5kV (Hardware AGC is always ON, software AGC initial setting is ON and also can be set as OFF.)



1. Hardware AGC: Because  $V_o < V_s$  result from load effect,  $V_o$  using hardware comparison circuit.  $V_o$  voltage compensation is the same as  $V_s$  within 0.1sec.
2. Software AGC: This analyzer using software AGC under DC 50V-500V and IR 50V-1000V. Software compensation speed is more slowly so it won't cause voltage shock to DUT. The general IR RL is larger than  $R_s$  of this analyzer, so  $V_o = V_s$  approximately.

## 4.4.2 Discharg-V

Discharg-V: The high limit setting of DC discharge, the range is 0.05 ~ 5.1kV. The voltage below Discharg-V setting will be discharged quickly in 0.2sec.

## 4.4.3 OFFSET

1. DC OFFSET: Before testing WDC mode, please connect test cable firstly. After the fixture is tested, then processes OFFSET to ensure test value accuracy. The current calculation formula: Current reading = Current real measurement value – Offset value.
2. AC OFFSET: Before testing WAC mode, please connect test cable firstly. After the fixture is tested, then processes OFFSET to ensure test value accuracy. Especially when test voltage is higher and leakage current of test fixture and instrument is increasing. The happened of Offset current is often caused by capacitance feature. According to mathematics, when test a resistive load, its' current value =  $\sqrt{(\text{Resistance load value})^2 + (\text{Offset})^2}$ . Therefore, when measured out resistive load current value, current reading =  $\sqrt{(\text{Real measurement value})^2 - (\text{Offset})^2}$ . When tests a capacitive load, current reading = (real measurement value) – (Offset).
3. OSC OFFSET: There is stray capacitance on wire or fixture, please does OFFSET elimination again on changing wire or fixture every time for ensure the accuracy of testing.

## 4.5 Memory Management of Test Parameter and Test Preset Parameter

When title display "MAIN MENU", press Function Key [MEMORY] and then title will display "MEMORY SETUP". At the same time, the memory can be read, stored or deleted. Each memory includes test parameter, test preset parameter and memory name.

### 4.5.1 Read Memory

1. If there are many sets of test parameter value, which be saved in main memory. Follow the below procedures to recall test parameter.
2. When title display "MEMORY SETUP", press [ $\Delta$ ], [ $\nabla$ ] keys or Function Key [NEXT PAGE] to move the highlighted cursor to the memory name which want to recall.
3. Press Function Key [RECALL] and then show confirm window.
4. Press [ENTER] to confirm or press Function Key [EXIT] to cancel.

## 4.5.2 Store Memory

1. If you want to save testing parameter data which be set in memory. Please follows the below procedures to process. When title display "MEMORY SETUP", press [△], [▽] keys or Function Key "NEXT PAGE" to move the highlighted cursor to the memory number position which want to store.
2. Press Function Key [STORE], the highlighted cursor become underscore blinking cursor. At the same time, input the memory name by using numeral/character keys. Press the same numeral/character keys repeatedly can circle switch display between numeral and alphabet. If you want to input name, can use Function Key [NEXT CHAR.] to move the underscore blinking cursor to the next character.
3. Press [ENTER] to confirm or press Function Key [EXIT] to cancel.

## 4.5.3 Delete Memory

1. If you want to delete test parameter data which be stored in memory. Please follow the below procedures to process.
2. When title display "MEMORY SETUP", press [△], [▽] keys or Function Key [NEXT PAGE] to move the highlighted cursor to the memory name which want to delete.
3. Press Function Key [DELETE] and then show confirm window.
4. Press [ENTER] to confirm or press Function Key [EXIT] to cancel.

## 4.6 Test for Preset Setting

### 4.6.1 Operation Method

1. When the title shows "PRESET SETUP", press [△], [△] keys to move the highlighted cursor to the parameter item which want to set.
2. Press numeral key/character key or Function Keys to set this item parameter data.
3. Press [ENTER] to confirm or press [CLR] to reset.

### 4.6.2 Simple Setting Wizard

1. When the title shows "PRESET SETUP", press [ENTER] key to move the highlighted cursor to the parameter item which want to set.
2. Press numeral key/character key or Function Keys to set this item parameter data.
3. When the highlighted cursor on the last parameter, press [ENTER] key will go to test parameter setting menu directly for user continuous setting.

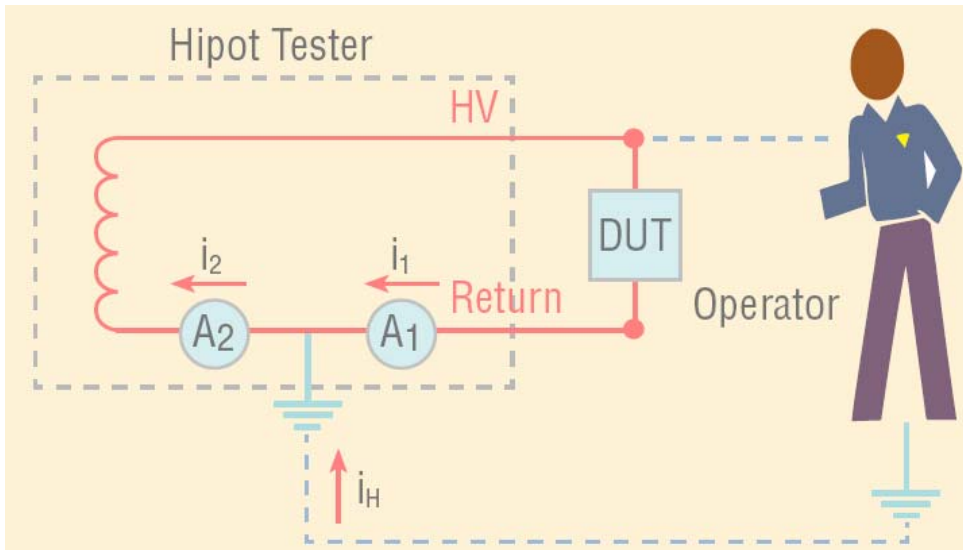
| PRESET SETUP   |                          |
|----------------|--------------------------|
| 01. Pass Hold  | : 0.5 sec                |
| 02. Step Hold  | : 0.2 sec                |
| 03. AC Freq.   | : 60 Hz                  |
| 04. Auto Range | : OFF                    |
| 05. Soft. AGC  | : ON                     |
| 06. Ramp Judg. | : OFF                    |
| 07. GFI.       | : ON                     |
|                |                          |
|                |                          |
|                |                          |
|                |                          |
| 0.2~99.9s      | Remote Lock offset Error |

**Test preset parameter function description table:**

| No. | Setting Item                 | Range            | Initial Setting | Description   |
|-----|------------------------------|------------------|-----------------|---|
| 01  | Pass Hold                    | 0.2~99.9         | 0.5             | It sets PASS buzzer sound continuous time.  |
| 02  | Step Hold                    | 0.1~99.9 / KEY   | 0.2             | It sets interval time between test procedures.<br>Key: It sets test procedure interrupted (Please press [START] to continue when test stop.)  |
| 03  | AC Freq.                     | 50-600Hz         | 60              | It sets the frequency of outputting voltage when tests AC withstanding.   |
| 07  | Auto Range                   | ON/OFF           | OFF             | It sets withstand voltage auto-range function is open or not.   |
| 08  | Soft. AGC                    | ON/OFF           | ON              | It sets software auto gain compensation function is open or not.  |
| 13  | Ramp Judg.                   | ON / OFF         | OFF             | When Ramp. Judg. set to ON, it will judge if the current value is over High Limit setting value as DC mode executing Ramp time. When set Ramp. Judg. to OFF, it won't judge if the current value is over High Limit setting value as DC mode executing Ramp time. |
| 14  | GFI (Ground Fault Interrupt) | ON / OFF / FLOAT | ON              | It sets the function of GFI.  |

### 4.6.3 ON/OFF/FLOAT Setting of GFI (Ground Fault Interrupt)

#### 4.6.3.1 Set GFI to ON



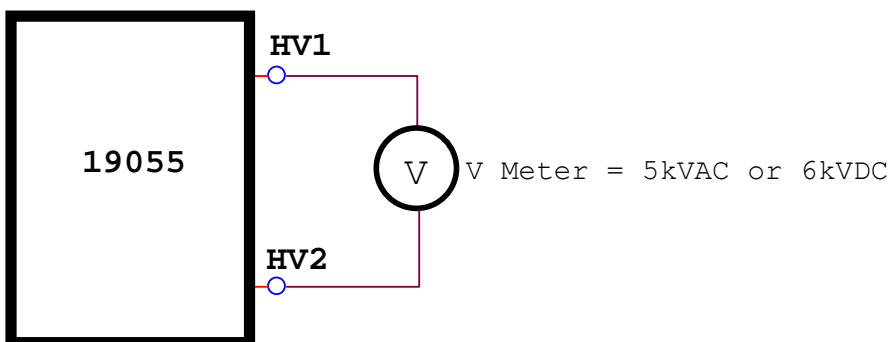
There is a current  $i_H$  produced and flowed through human body when users touch high voltage terminal carelessly.

$$i_2 = i_1 + i_H$$

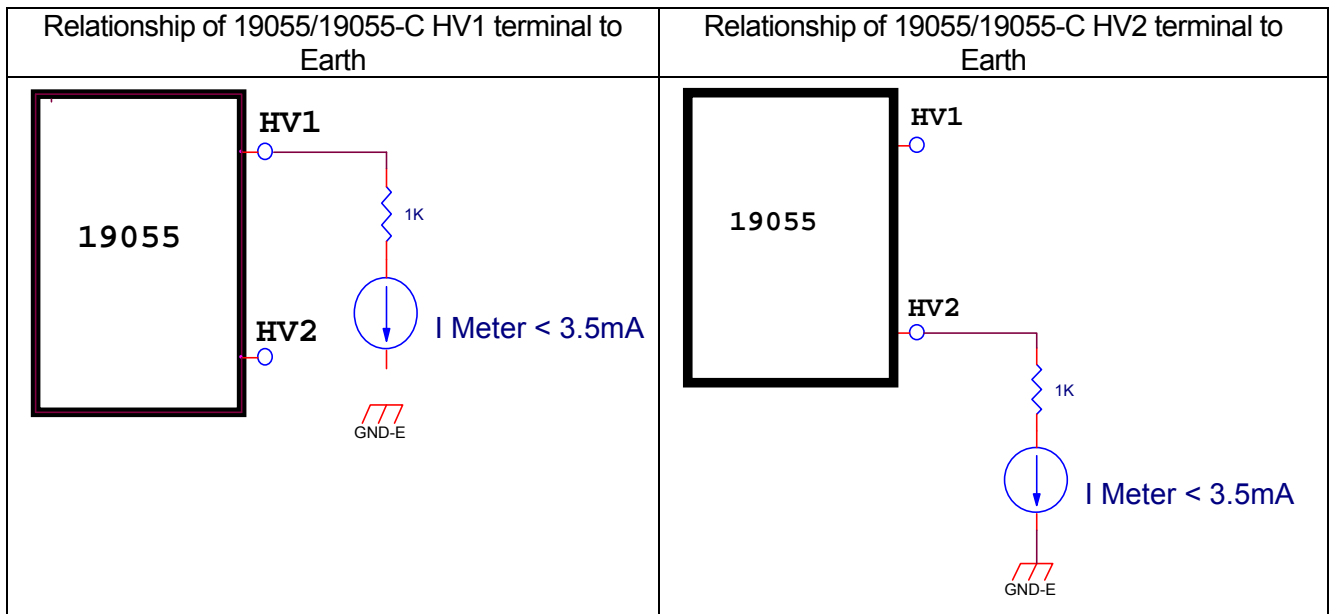
If  $i_H$  is over 0.5mA, the high voltage will be cut off to protect the safety of operator.

#### 4.6.3.2 Set GFI to FLOAT

19055/19055-C high voltage displays Floating status when set GFI to FLOAT. The high voltage output terminals HV1 and HV2 on 19055/19055-C are outputting high voltage 5kVAC or 6kVDC, the relationship of HV1 or HV2 terminal to Earth is given as below figure.







### 4.6.4 Auto Range

- (1) **Auto Range** function sets as **ON**.
- (2) The current range sets to high range *i.e.* 100mA as Figure 4-3 shown.

0.6 sec before ending the test, if the tested current can be represented by low current range then auto range to low as Figure 4-4 shown.

| TEST           |      |          |          |      |              |
|----------------|------|----------|----------|------|--------------|
|                | MODE | SOURCE   | LIMIT    | RES. | OFFSET       |
| 01             | AC   | 1.000 kV | 100.0 mA |      |              |
|                |      |          |          |      | Get Cs       |
|                |      |          |          |      | PAGE UP      |
|                |      |          |          |      | PAGE DOWN    |
|                |      |          |          |      |              |
|                |      |          |          |      | STEP         |
| SCAN: 12345678 |      |          |          |      |              |
|                |      |          | Remote   | Lock | offset Error |

Figure 4-3

| TEST            |      |          |          |        |           |
|-----------------|------|----------|----------|--------|-----------|
|                 | MODE | SOURCE   | LIMIT    | RES.   | OFFSET    |
| 01              | AC   | 1.000 kV | 0.503 mA |        |           |
|                 |      |          |          |        | Get Cs    |
|                 |      |          |          |        | PAGE UP   |
|                 |      |          |          |        | PAGE DOWN |
|                 |      |          |          |        |           |
|                 |      |          |          |        | STEP      |
| SCAN: 12345678  |      |          |          |        |           |
| TEST TIME: 0.0s |      | Remote   | Lock     | offset | Error     |

Figure 4-4

## 4.7 Program Setting

### 4.7.1 Operation Method

1. When the title shows “STEP SETTING”, press [ $\Delta$ ], [ $\nabla$ ] keys to move the highlighted cursor to the parameter item which want to set.
2. Press numeral/character keys or Function Keys to set this item parameter data.
3. Press [ENTER] to confirm or press [CLR] to reset.

### 4.7.2 Various Parameter Settings

TEST STEP: It sets test step.

TEST MODE: It selects test mode. There are AC / DC / IR / PA / OSC test modes can be selected. The following described parameter settings of various test modes.

#### Withstand Voltage Test Mode (AC)

VOLTAGE: It sets withstand voltage test needed voltage

HIGH LIMIT: It sets high limit value of leakage current.

LOW LIMIT: It sets low limit value of leakage current. The range is lower than high limit value of leakage current or OFF.

REAL LIMIT: It sets high limit value of real leakage current. The range is lower than high limit value of leakage current or OFF.

ARC LIMIT: It sets high limit value of ARC.

LIM: It sets high limit value of CORONA. (This function is for 19055-C.)

HFCC: 1. C<sub>S</sub>: It sets standard capacitance of High Frequency Contact Check (HFCC).

2. OPEN: It sets the condition to judge test result as open. The test reading compares with read standard capacitance.

3. SHORT: It sets the condition to judge test result as short. The test reading compares with read standard capacitance.

TIME: 1. RAMP TIME: It sets the required time to increase to setting voltage.

2. TEST TIME: It sets test needed time.

3. FALL TIME: The required time from setting voltage value to decrease to low voltage.

**Withstand Voltage Test Mode (DC)**

VOLTAGE: It sets withstand voltage test needed voltage.

HIGH LIMIT: It sets high limit value of leakage current.

LOW LIMIT: It sets low limit value of leakage current. The range is lower than high limit value of leakage current or OFF.

ARC LIMIT: It sets high limit value of ARC.

LIM: It sets high limit value of CORONA. (This function is for 19055-C.)

HFCC: 1. C<sub>S</sub>: It sets standard capacitance of High Frequency Contact Check (HFCC).

2. OPEN: It sets the condition to judge test result as open. The test reading compares with read standard capacitance.

3. SHORT: It sets the condition to judge test result as short. The test reading compares with read standard capacitance.

TIME: 1. RAMP TIME: It sets the required time to increase to setting voltage.

2. DWELL TIME: It sets DWELL needed time. (During DWELL TIME, don't judge the high and low limit value of leakage current. The limitation is not over high limit of setting range.)

3. TEST TIME: It sets test needed time.

4. FALL TIME: The required time from setting voltage value to decrease to low voltage.

**Insulation Resistance Test Mode (IR)**

VOLTAGE: It sets insulation resistance test needed voltage.

LOW LIMIT: It sets low limit value of insulation resistance.

HIGH LIMIT: It sets high limit value of insulation resistance. The value is higher than low limit value of insulation resistance or OFF.

TIME: 1. RAMP TIME: It sets the required time to increase to setting voltage.

2. TEST TIME: It sets test needed time.

3. FALL TIME: The required time from setting voltage value to decrease to low voltage.

RANGE: It sets the test file of insulation resistance, AUTO means auto range. The relationship between current range and resistance measurement scope are shown as below table.

| Range           | IR Value                      |                                 |
|-----------------|-------------------------------|---------------------------------|
|                 | Setting Voltage<br>50V ~ 499V | Setting Voltage<br>500V ~ 5000V |
| 10mA(3~10mA)    | 0.1MΩ~1MΩ                     | 0.1MΩ~4.5MΩ                     |
| 3mA(0.3~3mA)    | 0.5MΩ~4.5MΩ                   | 3.0MΩ~15.0MΩ                    |
| 300uA(30~300uA) | 3.0MΩ~15.0MΩ                  | 10.0MΩ~45MΩ                     |
| 30uA(3~30uA)    | 10.0MΩ~45MΩ                   | 35.0MΩ~450MΩ                    |
| 3uA(0.3~3uA)    | 45MΩ~0.45GΩ                   | 0.40GΩ~4.5GΩ                    |
| 300nA(20~300nA) | 0.40GΩ~4.9GΩ                  | 4.0GΩ~50.0GΩ                    |

Note: Please follow test voltage and insulation impedance of DUT to calculate the value of current thus follow this to choose suitable current range.

**Pause test mode (PA)**

MESSAGE: Message hint string. The string are inputted by alphabet, Arabic numerals or symbol [ - ]. The max. is 13 characters.

TEST TIME: It sets the action method of pause mode.

- (1) When set it to CONTINUE, pause mode will be ended till press **START** on panel or re-trigger START signal on rear panel.
- (2) The setting is 0.3 ~ 999sec: When the setting time is up then end the pause mode.

Open/Short Circuit Detection Mode (OSC)

OPEN CHK: It sets the condition to judge test result as open. The test reading compares with read standard capacitance [Cs].

SHORT CHK: It sets the condition to judge test result as short. The test reading compares with read standard capacitance [Cs].

Cs: It sets standard capacitance of open/short circuit detection.

## 4.8 How to Process Test

### 4.8.1 Offset Value Calibration of Test Cable/Fixture

1. First of all, DUT will be removed from test cable or fixture. Press Function Key [OFFSET], the display will show "MESSAGE" window.
2. After pressing [START] key, the title will show "GET OFFSET TEST".
3. DANGER LED on front panel lights up, the voltage output time is five seconds (when TEST TIME setting is over 5 seconds). The main unit starts to measure leakage current of test cable and shows its value on the display then stored it to the memory.
4. When test time is ended, [ **Offset** ] is highlighted.

### 4.8.2 Operation of Standard Capacitance (GET Cs)

1. Before testing open/short detection mode (OSC Mode) or changing capacitance under test, it is necessary to read the standard capacitance (GET Cs).
2. Before reading standard capacitance (GET Cs), please press Function Key [OFFSET] to do OFFSET elimination. Doing OFFSET elimination again on changing wire or fixture every time to ensure the accuracy of testing.
3. Before reading the standard capacitance (GET Cs), please use the standard capacitance sample in testing as DUT. Press Function Key [GET Cs] to read the standard capacitance for the standard value in testing.
4. When testing under open/short circuit detection mode (OSC Mode), judge OPEN/SHORT test condition is by GET Cs reading.

### 4.8.3 Method of DUT Connection

#### Withstand Voltage / Insulation Resistance Test Mode (AC / DC / IR / OSC)

First of all, please confirm there is no voltage output and DANGER LED isn't lit. And then connects test cable of low electric potential to RTN/LOW or HV2 terminal of the main unit. This test cable and high voltage output terminal are short-circuited and confirm there is no high voltage output. At the same time, high voltage test cable (red or white) plug in high voltage output terminal OUTPUT. Connect the test cable of low electric potential (RTN/LOW or HV2) to DUT firstly, and then the test cable of high electric potential connects to DUT.

## 4.8.4 Test Procedure

### 4.8.4.1 AC/DC/IR Test Procedure

1. Connection is completed correctly by connecting DUT device method.  
When the title shows "MAIN MENU", press Function Key [TEST] for entering TEST function list, the title will show "TEST". The display shows a list with STEP, which be set and wait for testing. The first field is STEP, the second field is test mode, the third field is test setting value, the fourth field is outputting high limit value, and the fifth field is test result.
2. Please press [STOP] key, ready for testing.  
Press [START] key to start the test. When press this key, start test current / voltage output. At the same time, DANGER LED will be lit. Warning: Now is test status with mass voltage output. The third field will show output voltage reading, the fourth will show output current reading. The timer count down or start to count and displayed on status list.
3. PASS judgment  
When all of test statuses are been tested and the fifth field test result shows PASS, then main unit is judged as PASS and cut off output. The rear panel outputs PASS signal, the buzzer activated simultaneously.
4. FAIL judgment  
If the measurement is abnormal, the main unit is judged as FAIL and stop output immediately. The rear panel outputs FAIL signal, the buzzer activated simultaneously. Keep on activating until [STOP] key of main unit be pressed. The fifth field test result will show fail status.

**Fail Status Description Table**

| Test Result | Meaning  |
|-------------|--|
| HIGH        | Measurement current value over high limit              |
| LOW         | Measurement current value over low limit               |
| ARC         | Current arc over high limit                            |
| LIM         | CORONA over high limit (This function is for 19055-C.) |
| GFI         | Ground fail interrupt                                  |
| ADNO        | Voltage / current reading over hardware valid digit    |
| ADIO        | Current / resistance reading over hardware valid digit |

Under any circumstances only need to press [STOP] key if users want to stop test output.

### 4.8.4.2 OSC Test Procedure

1. Connection is completed correctly by connecting DUT device method.  
When title shows "MAIN MENU", press Function Key [TEST] for entering TEST function list, the title will show "TEST". The display shows a list with STEP, which be set and waiting for testing. The first field is STEP, the second field is test mode (OSC), the third field is output voltage setting value, the fourth field is capacitance reading and the fifth field is test result.
2. Please press [STOP] key, ready for testing.  
Press [START] key to start test. When press this key, start test voltage output. At the same time, DANGER LED will be lit. Warning: Now is test status with voltage output.

The third field will show output voltage reading and the fourth field will show capacitance reading. The timer counts down simultaneously as well as shows on status list.

3. GOOD judgment  
When all of test statuses have been tested and the fifth field result shows PASS, then the main unit is judged as GOOD and cut off the output. The rear panel outputs PASS signal, the buzzer activated simultaneously.
4. No good judgment  
If the measurement value is abnormal, the main unit is judged as FAIL and stop to output immediately. The rear panel outputs FAIL signal, the buzzer activated simultaneously. Keep on functioning until **STOP** key of the main unit be pressed. The fifth field test result will show no good status.

**No good status**

| Test Result | Meaning   |
|-------------|---|
| OPEN        | Capacitance open circuit/reading is fewer than OPEN CHK setting.    |
| SHRT        | Capacitance short circuit/reading is larger than SHORT CHK setting. |

Under any circumstances only need to press **STOP** key if you want to stop the test output.

Note: When OSC Mode is testing, Get Cs current range at this time decides the display of capacity valid digit.

Example: Get Cs voltage 0.018kV, Get Cs capacitance value 17.4nF, current= 1.18mA -- at the mass current range.

Get Cs voltage 0.016kV, Get Cs capacitance value 17.42nF, current= 0.97mA -- at the medium current range.

### 4.8.5 Description for STEP MODE Test Menu

In addition to the LIST MODE test menu, the analyzer adds a STEP MODE test menu for the displayed requirements of ARC, HFCC and CORONA functions. Select "STEP" item by Function Key (F6) in the original test menu and then can change test menu to STEP MODE as below figure shown. If users want to return to LIST MODE test menu, only need to select "LIST" item by Function Key (F6) in STEP MODE menu.

LIST MODE:

| TEST |      |          |          |      |           |
|------|------|----------|----------|------|-----------|
|      | MODE | SOURCE   | LIMIT    | RES. |           |
| 01   | AC   | 1.000 kV | 40.00 mA |      | OFFSET    |
|      |      |          |          |      | Get Cs    |
|      |      |          |          |      | PAGE UP   |
|      |      |          |          |      | PAGE DOWN |
|      |      |          |          |      |           |
|      |      |          |          |      | STEP      |

SCAN: 12345678

|        |      |        |       |
|--------|------|--------|-------|
| Remote | Lock | offset | Error |
|--------|------|--------|-------|

STEP MODE:

| TEST  |                |       |                    |           |
|---|----------------|-------|--------------------|-----------|
| STEP:   | <u>1</u>       | ARC : | <u>5.0mA</u>       |           |
| MODE:   | <u>AC</u>      | LIM : | <u>50.0</u> OFFSET |           |
| HIGH:   | <u>0.500mA</u> | HFCC: | <u>20pF</u>        |           |
| LOW :   | <u>0.100mA</u> |       | Get Cs             |           |
| REAL:   | <u>0.500mA</u> |       | PAGE UP            |           |
| <div style="border: 1px solid black; padding: 5px; display: inline-block;"> <b>0.500 kV</b><br/> <b>0.500 mA</b> </div> |                |       |                    | PAGE DOWN |
|   |                |       |                    |           |
| SCAN: 12345678  |                |       |                    |           |
| <span>Remote</span> <span>Lock</span> <span>offset</span> <span>Error</span>  |                |       |                    |           |

## 4.9 Description for BREAKDOWN VOLT MODE Interface

Enter the selection menu of GENERAL MODE and BREAKDOWN VOLT MODE by pressing "MAIN INDEX" as below figure shown. Select 1 can return to GENERAL MODE and select 2 to enter BREAKDOWN VOLT MODE.

| MAIN INDEX   |                       |
|--|-----------------------|
| 1  | → GENERAL MODE        |
| 2  | → BREAKDOWN VOLT MODE |
|  |                       |
|  |                       |
|  |                       |
|  |                       |
|  |                       |
| <span>Remote</span> <span>Lock</span> <span>offset</span> <span>Error</span> |                       |

The menu is shown as following figure after entering BREAKDOWN VOLT MODE. If users want to exit from BREAKDOWN VOLT MODE test menu, only need to press "MAIN INDEX" key.

| BREAKDOWN VOLT MODE |                |        |       |
|---------------------|----------------|--------|-------|
| MODE:               | AC             | HIGH:  | 5.0mA |
| Ve:                 | 1.000kV        | LOW:   | 50.0  |
| Vs:                 | 0.050kV        | ARC:   | 20pF  |
| STEP:               | 5              | LIM:   | AC    |
| TIME:               | 2.0s           | RAMP:  |       |
|                     |                | CONT.  |       |
| <b>Vrms:</b>        | <b>0.000kV</b> |        | DC    |
| <b>Irms:</b>        | <b>0.000mA</b> |        |       |
|                     | \              | 0      |       |
|                     |                | Remote | Lock  |
|                     |                | offset | Error |

Parameter Function Description Table

| Item  | Range                               | Initial Value      | Description   |
|-------|-------------------------------------|--------------------|---|
| MODE  | AC/DC                               | AC                 | Test mode selection includes AC and DC                              |
| Ve    | 0.05-5kV                            | 0.050kV            | It sets voltage end value.  |
| Vs    | 0.05kV-Ve                           | 0.050kV            | It sets voltage start value.  |
| STEP  | 2-999                               | 2                  | It sets voltage rising STEP quantity.                               |
| TIME  | 0.3-999 sec                         | 3.0s               | It sets test time of each STEP.                                     |
| HIGH  | AC:0.001-100mA<br>DC:0.0001-20mA    | 0.500mA<br>0.500mA | It sets high limit of leakage current.                              |
| LOW   | AC:0-HIGH limit<br>DC: 0-HIGH limit | OFF<br>OFF         | It sets low limit of leakage current.                               |
| ARC   | AC:1-20mA<br>DC:1-10mA              | OFF<br>OFF         | It sets high limit of arc.  |
| LIM   | 0-99.9                              | OFF                | It sets high limit of CORONA. (This function is for 19055-C.)       |
| RAMP  | 0-999.0 0=OFF                       | OFF                | It sets ramp time of each step.                                     |
| CONT. | ON/OFF                              | OFF                | It sets if it continues to test after all steps test are completed. |

## 4.10 Description for HANDLER Interface

### 4.10.1 Specification

#### 4.10.1.1 Drive Capability

Internal signal output specification: DC 24V, 20~40mA

External signal input specification: DC 3V~26V (HIGH), 10mA ± 4mA

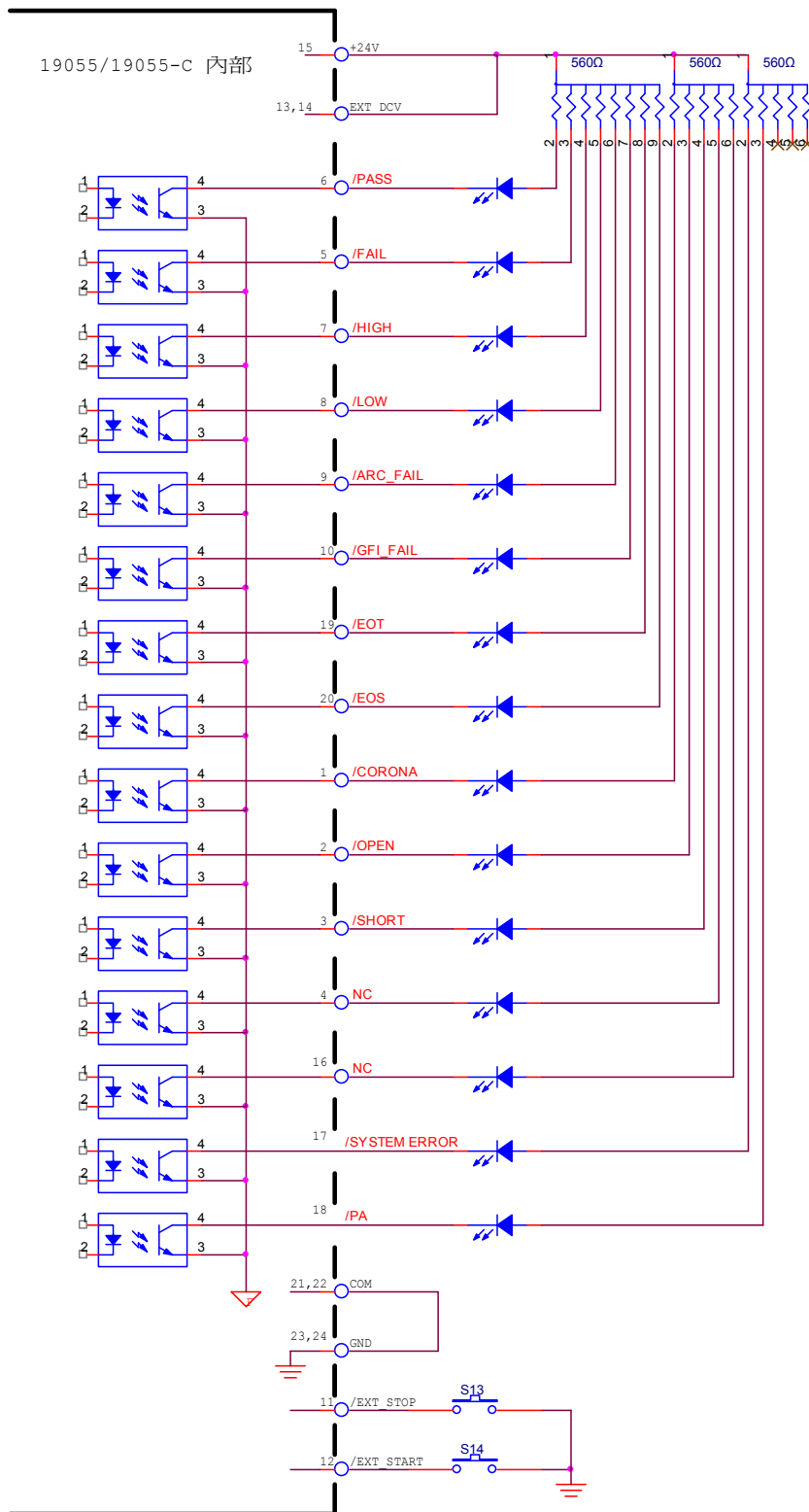


### 4.10.1.2 Pin Description

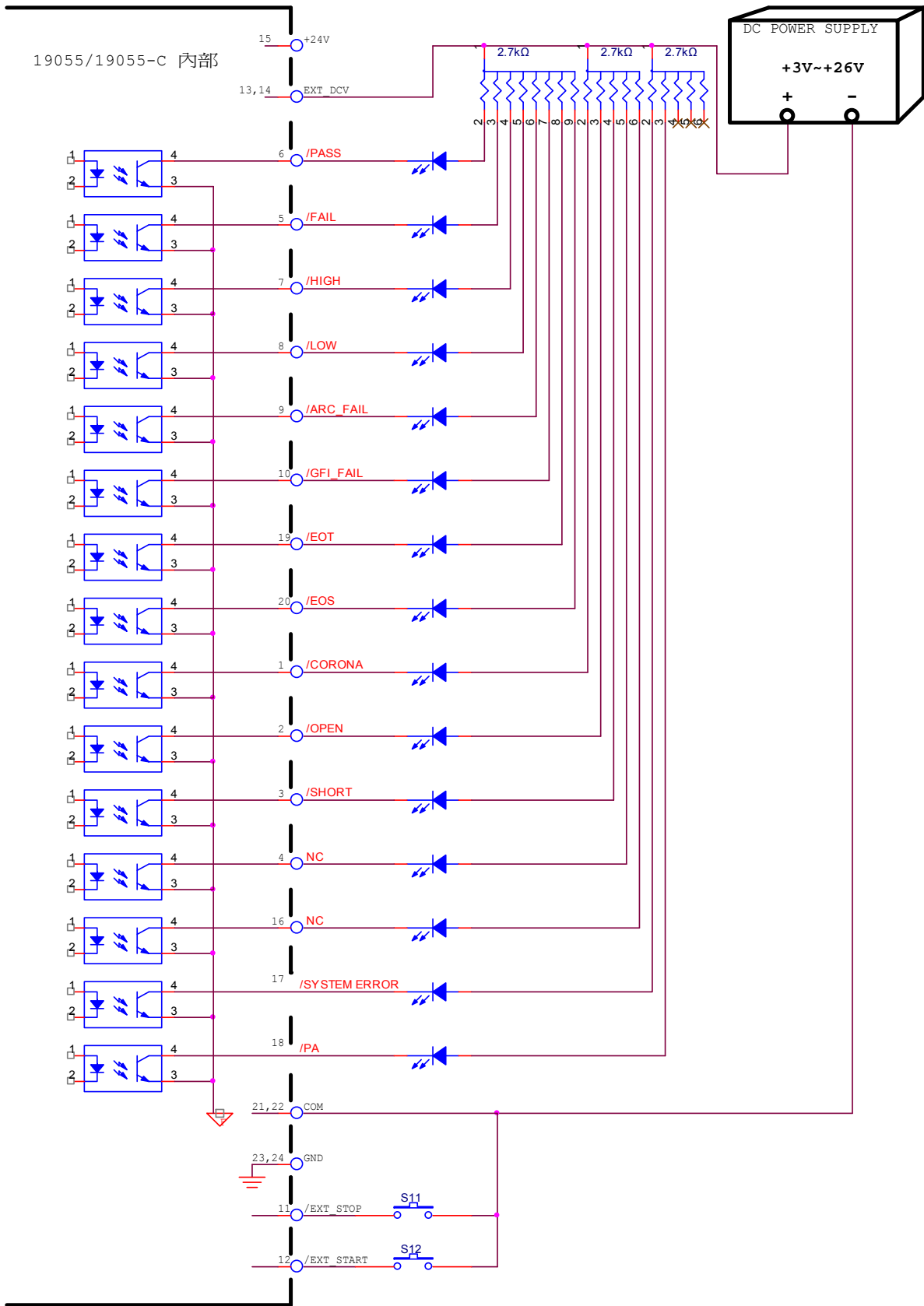
| Pin No. | Signal Name   | Input/Output | Description  |
|---------|---------------|--------------|--|
| 1       | /CORONA       | Output       | CORONA output, this signal is used with /PASS and /FAIL.   |
| 2       | /OPEN         |              | HFCC OPEN output, this signal is used with /PASS and /FAIL.  |
| 3       | /SHORT        |              | HFCC SHORT output, this signal is used with /PASS and /FAIL.   |
| 4,16    | NC            |              | Reserved, unused   |
| 5       | /FAIL         |              | The test result is FAIL for outputting LOW, meanwhile /HI, /LO, /ARC_FAIL and /GFI_FAIL signals will be outputted (LOW activated).   |
| 6       | /PASS         |              | The test result is PASS for outputting LOW, meanwhile /HIGH, /LOW, /ARC_FAIL and /GFI_FAIL signals won't be outputted (all HIGH).  |
| 7       | /HIGH         |              | Test result is HIGH FAIL for outputting LOW.   |
| 8       | /LOW          |              | Test result is LOW FAIL for outputting LOW.  |
| 9       | /ARC_FAIL     |              | Test result is ARC_FAIL for outputting LOW.  |
| 10      | /GFI_FAIL     |              | Test result is GFI_FAIL for outputting LOW.  |
| 11      | /EXT_STOP     | Input        | External STOP signal input, signal status LOW for functioning.   |
| 12      | /EXT_START    | Input        | External START signal input, signal status LOW for functioning.  |
| 13,14   | EXT_DCV       | Input        | +VEXT: External DC voltage input, input voltage range +3V~+26V   |
| 15      | +24V          | Output       | Internal DC voltage output   |
| 17      | /SYSTEM ERROR | Output       | Internal system error signal output pin<br>When the output is LOW stand for system internal error produced.  |
| 18      | /PA           | Output       | When the test is activated, this signal is LOW. Afterwards, every time passes PA mode for once, HIGH or LOW level of /PA signal and COM terminal will be changed once.                   |
| 19      | /EOT          | Output       | When this signal is HIGH stand for Program under testing.<br>When this signal is HIGH stand for Program already ended or standby.  |
| 20      | /EOS          |              | When this signal is HIGH stand for STEP currently under testing.<br>When this signal is LOW stand for STEP already ended and the next step has not yet proceeded or all steps are ended. |
| 21,22   | COM           | ---          | Low voltage terminal of input/output signal  |
| 23,24   | GND           | ---          | Low voltage terminal of internal voltage output  |

## 4.10.2 External Control Circuit Diagram

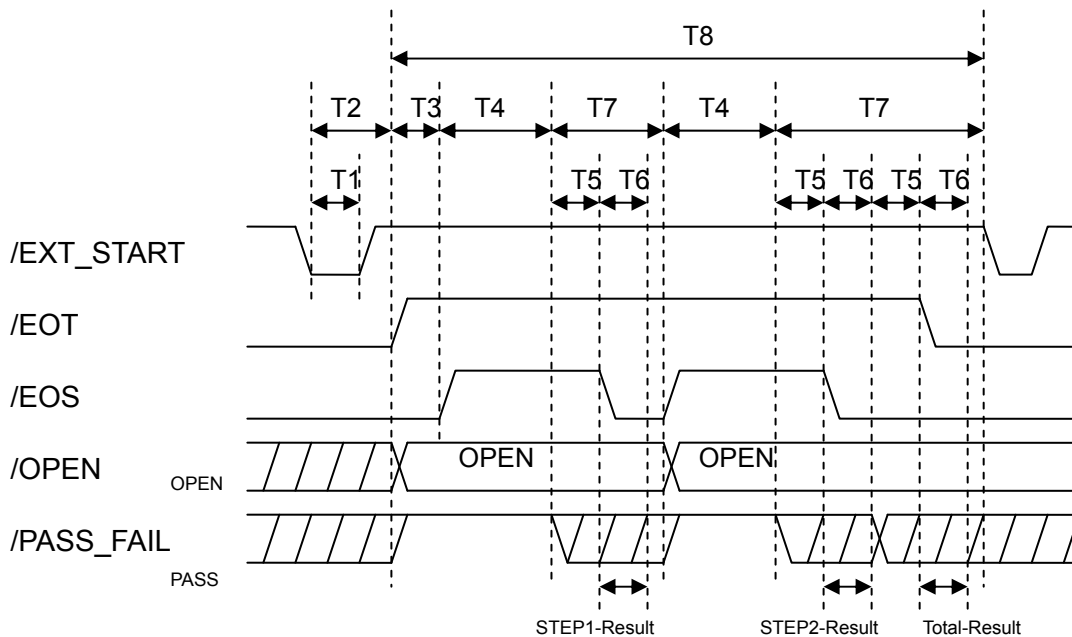
### 4.10.2.1 Use Internal Power as an Example



### 4.10.2.2 Use External Power as an Example



### 4.10.3 Timing Diagram



Timing Diagram – Take an example by two test steps

| Time | Limit  | Description  |
|------|--------|--|
| T1   | > 10mS | External trigger signal (/EXT_START) remained time need to be larger than 10mS.                            |
| T2   | < 20mS | The time of start external trigger signal (/EXT_START) to /EOT signal cleared, it will be fewer than 20mS. |
| T3   | -      | Trigger Delay setting time   |
| T4   | -      | Various Steps test needed time   |
| T5   | > 10mS | /PASS_FAIL signal stable waiting time will be larger than 10mS.  |
| T6   | > 10mS | EOS Hold time, EOS HOLD time + SUB PASS time or /EOT signal stable waiting time will be larger than 10mS.  |
| T7   | -      | Each test steps end required time  |
| T8   | -      | PROGRAM required time  |

## 4.11 CALIBRATION Function

### 4.11.1 Enter Calibration Method

1. Open the upper cover, press **SW402** and then powered the analyzer on.
2. When the title bar shows "MAIN MENU", press numerical key which corresponds to **CALIBRATION** then will show "ENTER CALIBRATION PASSWORD" window.
3. By using numerical keys to input PASSWORD [7] [9] [3] [1].
4. Press **ENTER**, select **[DEVICE]** and then enter calibration procedure.

### 4.11.2 Clear Memory

1. When title list shows "MAIN MENU", press numerical key that corresponds to **CALIBRATION** then will show "ENTER CALIBRATION PASSWORD" window.

2. By using numerical keys to input PASSWORD [8] [5] [2] [4] [6].
3. After pressed [ENTER] key, shows "MESSAGE" window. Users can select if want to clear memory by Function Keys [YES], [NO] or press [EXIT] to abort memory clearance.
4. If Function Key [YES] is selected, all of saved data will be cleared and all setting parameters will be reset as initial value.
5. After cleared the memory, Option parameter needs to be reset.

## 4.12 KEY LOCK Function

### KEY LOCK setting method:

1. When title list shows "MAIN MENU", if text block "LOCK" isn't highlighted pressing numerical key that corresponds to KEY LOCK then it will show "KEY LOCK" window.
2. By using numerical key to input PASSWORD (please input 0000, when NEW SECURITY CODE does not be set).
3. Press [ENTER] key will show "MESSAGE" window, text block "LOCK" will be highlighted. Users can select if lock "MEMORY RECALL" function together by Function Keys [YES], [NO].
4. Press Function Key [EXIT] to complete KEY LOCK function.

**Note**   : When 19055 set as KEY LOCK ON then restart, and enter TEST menu directly.

### KEY LOCK release method:

1. When title list shows "MAIN MENU", if text block "LOCK" is highlighted pressing numerical key that corresponds to KEY LOCK then it will show "RELEASE KEY LOCK" window.
2. By using numerical key to input PASSWORD (please input 0000, when NEW SECURITY CODE does not be set).
3. Press [ENTER] key, text block "LOCK" will release highlight and it means KEY LOCK Function had been cancelled.

## 4.13 User Password Setting

1. When title list shows "MAIN MENU", press numerical key that corresponds to NEW SECURITY CODE then it will show "ENTER USER PASSWORD" window.
2. By using numerical key to input PASSWORD (please input 0000, when PASSWORD does not be set). Press [ENTER] key will show "ENTER NEW PASSWORD" window.
3. By using numerical key to input NEW PASSWORD (the maximum is twelve characters), press [ENTER] key will show "ENTER CONFIRM PASSWORD" window.
4. Using numerical key to input CONFIRM PASSWORD (is the same as NEW PASSWORD), press [ENTER] key will show "MESSAGE" window. At the same time, the setting has been done and can press any key to exit.

**Note**   : If users forgot the password, please follow paragraph 4.11.2 "Clear Memory" to clear memory, PASSWORD will be reset to initial value, *i.e.* 0000.

## 4.14 FAIL LOCK Function

### 4.14.1 FAIL LOCK Setting and Using

1. When title list shows "MAIN MENU", press numerical key that corresponds to FAIL LOCK then it will show "FAIL LOCK" window.
2. By using numerical keys to input PASSWORD [0] [0] [0] [0] (when NEW SECURITY CODE does not be set).
3. After [ENTER] key is pressed, message indication box [LOCK] will be highlighted. All keys are invalid temporary except for [STOP], [START], Function Key [TEST] and FAIL LOCK until FAIL LOCK function is unlock.
4. When FAIL LOCK function activated, if DUT is judged as FAIL then it will show Figure 4-5.

| TEST-FAIL LOCK  |      |         |          |           |       |
|-----------------|------|---------|----------|-----------|-------|
|                 | MODE | SOURCE  | LIMIT    | RES.      |       |
| 01              | AC   | 0.386kV | 0.095 mA | HIGH      |       |
|                 |      |         |          |           |       |
|                 |      |         |          |           |       |
|                 |      |         |          | PAGE UP   |       |
|                 |      |         |          | PAGE DOWN |       |
|                 |      |         |          | UNLOCK    |       |
|                 |      |         |          | STEP      |       |
| SCAN:12345678   |      |         |          |           |       |
| TESET TIME:2,0s |      | Remote  | Lock     | offset    | Error |

Figure 4-5

5. Meanwhile, press [STOP] and Function Key [UNLOCK] to clear buzzer sound, then shows "UNLOCK" window.
6. By using numerical keys to input PASSWORD [0] [0] [0] [0] (when NEW SECURITY CODE does not be set). Press [START] key to restart test.
7. Press [MENU] to return to MAIN MENU.

**Note** : When 19055 set as FAIL LOCK ON then to restart, and enter TEST menu directly.

### 4.14.2 Release FAIL LOCK

1. When title list shows "MAIN MENU", press numerical key that corresponds to FAIL LOCK then it will show "RELEASE FAIL LOCK" window.
2. By using numerical keys to input PASSWORD [0] [0] [0] [0] (when NEW SECURITY CODE does not be set).
3. Press [ENTER] key, FAIL LOCK function will be released and message indication box "LOCK" highlight will also be released.

## 5. Description for GPIB/RS232 Interface (IEEE-488.2)

### 5.1 Guide

Users can use computer via GPIB (IEEE 488-1978) or RS232 interface to control remotely and transfer data.

### 5.2 GPIB Interface (Option)

#### 5.2.1 Adaptable Standard

IEEE488-1978 standard

#### 5.2.2 Interface Capability

| Code | Meaning                       |
|------|-------------------------------|
| SH1  | Source Handshake              |
| AH1  | Acceptor Handshake            |
| T4   | Basic Talker requirement      |
| L4   | Basic Listener requirement    |
| SR1  | Service request requirement   |
| RL1  | All remote/local requirement  |
| PP0  | No Parallel poll requirement  |
| DC1  | All device clear requirement  |
| DT0  | No device trigger requirement |
| C0   | No controller requirement     |

#### 5.2.3 Interface Message

The analyzer is capable of responding to the following messages.

| Message | Meaning               | Response   |
|---------|-----------------------|--|
| GTL     | Go To Local           | Switch the analyzer to Local status                  |
| SDC     | Selected Device Clear | Restart the analyzer                                 |
| LLO     | Local Lockout         | From [LOCAL] key switch to Local status is forbidden |
| IFC     | Interface Clear       | Reset GPIB interface                                 |

## 5.2.4 Command Format Description

The analyzer GPIB function is composed of command string which inputted by ASCII code to attain functions of remote control and setting. The length of the command string is limited in 1024 characters (include end code) [Command + Parameter] composes a command. Two commands can be connected by semicolon and ended by end code. The end code can be any one of the following types, the analyzer can distinguish by itself.

### End Code

|           |
|-----------|
| LF        |
| CR+LF     |
| EOI       |
| LF+EOI    |
| CR+LF+EOI |

## 5.2.5 Related Panel Description

### 1. Address Setting

- Under title list "MAIN MENU", press numerical key that corresponds to "OPTION MENU" to enter title list "OPTION MENU".
- Press Function Key [GPIB] to enter "GPIB SETUP" and then selects GPIB Address by using Function Key [UP] or [DOWN].
- The setting is completed and pressed Function Key [EXIT] to exit.

### 2. Remote / Local Control

- The signal block "Remote" is highlighted, it means the analyzer is on Remote status.
- On Remote status can use [LOCAL] key on panel to switch the analyzer to Local status.
- On Remote status, all of panel keys are malfunction except for [LOCAL] (switch to Local) and [STOP] (reset instrument) keys.
- By using LLO [Local Lockout] command of GPIB, it makes [LOCAL] key malfunction.

## 5.3 RS232 Interface Specification

### 5.3.1 Data Format

Baud Rate: 9600 / 19200 / 38400

Parity: NONE / ODD / EVEN

Flow Control: NONE / SOFTWARE

Bits: 1 start bit

8 data bits or 7 data bits add 1 parity bit

1 end bit

### 5.3.2 Command Format

The analyzer RS232 interface function is composed of command string which is inputted by ASCII code to attain function of remote control and setting. The length of the command



string is limited in 1024 characters (include end code) [Command + Parameter] compose a command. Two commands can be connected by semicolon and ended by end code. The end code is one type of the following, the analyzer can distinguish by itself.

End of String

|       |
|-------|
| LF    |
| CR+LF |

### 5.3.3 Connector

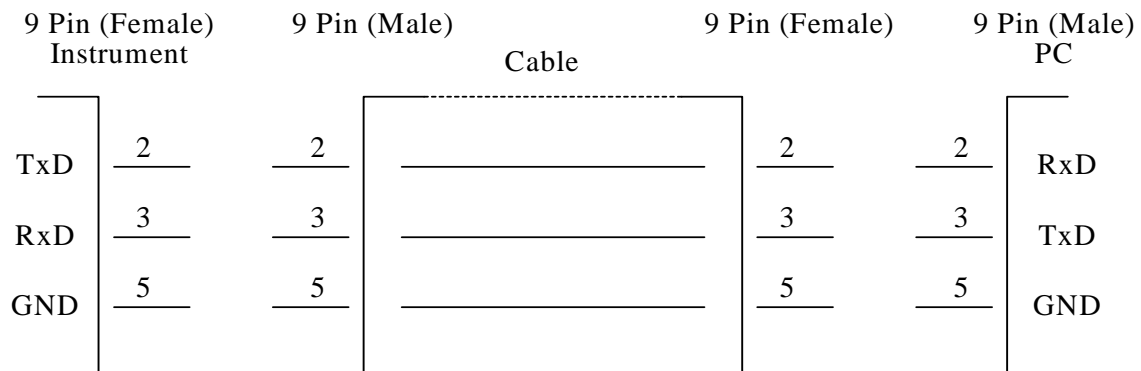
RS232 connector of the analyzer is 9 pins female connector.



| Pin No. | Description          |
|---------|----------------------|
| 1       | * Not to be used     |
| 2       | TxD Transmit data    |
| 3       | RxD Receive data     |
| 4       | * Not to be used     |
| 5       | GND Signal grounding |
| 6       | * Not to be used     |
| 7       | * Not to be used     |
| 8       | * Not to be used     |
| 9       | * Not to be used     |

### 5.3.4 Cable Wiring Method

RS232 connector of the analyzer is 9 pins female connector.



## 5.4 Remote Command

### 5.4.1 Command Summary

- **IEEE 488.2 Command**

```
*CLS
*ESE      < enable value >
*ESE?
*ESR?
*IDN?
*OPC
*OPC?
*PSC      0 | 1
*PSC?
*RST
*RCL      < register number >
*SAV      < register number >
*SRE      < enable value >
*SRE?
*STB?
```

The parameter syntax format of SCPI command includes the following:

- (1) Dual arrow symbol "< >" denote the defined parameter of SCPI command standard.
- (2) "< numeric value >" is metric system value, "< boolean >" is Boolean equation data and its value is 0 or 1.
- (3) Vertical line " | " denotes OR parameter.
- (4) "< channel list >" denotes Scanner and Channel status, their meanings are:  
(@S(C1, C2...)) S denotes Scan number and C1, C2... denotes Channel number.

- **SCPI Command**

```
:MEMory
|  DELeTe
|  |  [:NAME] <name>
|  |  :LOCAtion
|  |  :STATe
|  |  |  :DEFine <name>,<register number>
|  |  |  :DEFine? <name>
|  |  :FREE
|  |  |  :STATe?
|  |  |  :STEP?
|  |  :NSTates?
:SYSTem
|  :ERRor
|  |  [:NEXT]?
|  |  :VERSion?
[:SOURce]
|  :FUNCTion <GENeral|BREakdown>
|  :FUNCTion?
|  :SAFETy
|  |  :FETCh? [<item>],[,<item>]
|  |  :STARt
|  |  |  [:ONCE]
|  |  |  :OFFSet GET|OFF
|  |  |  :OFFSet?
|  |  |  : CSTandard GET
|  |  :STOP
|  |  :STATus
|  |  :SNUMber?
|  |  :RESult
|  |  |  :ALL
|  |  |  |  [:JUDGment]?
```

```

| | | | :OMETerage?
| | | | :RMETerage?
| | | | :MMETerage
| | | | |[:NORMal]?
| | | | :CMETerage?
| | | | :CCMETerage?
| | | | :MODE?
| | | | :TIME
| | | | |[:ELAPsed]
| | | | | | :RAMP?
| | | | | | |[:TEST]?
| | | | | | | :DWELI?
| | | | | | | :FALL?
| | | | :COMPlated?
| | | | [:LAST]
| | | | |[:JUDGment]?
| | | | :AREPort <boolean>|ON|OFF (RS232 interface only)
| | | | :AREPort? (RS232 interface only)
| | | | | :ITEM [-item>],[,<item>] (RS232 interface only)
| | | | | :ITEM?
| | | | :ASAVe <boolean>|ON|OFF
| | | | :BREakdown
| | | | |[:JUDGment]?
| | | | |[:JUDGement]?
| | | | | :MMETerage?
| | | | | :OMETerage?
| | | | | :CMETerage?
| | | | | :MODE?
| | | | | :STEP?
| | | | | :TIME
| | | | | |[:ELAPsed]
| | | | | | |[:TEST]?
| | | | | | | :DWELI?
| | | | | :WVotage?
| | | | :STEP<n>
| | | | :DELeTe
| | | | :SET?
| | | | :MODE?
| | | | :AC
| | | | |[:LEVe] <numeric value>
| | | | |[:LEVe]?
| | | | | :LIMit
| | | | | |[:HIGH] <numeric value>
| | | | | |[:HIGH]?
| | | | | | :LOW <numeric value>
| | | | | | :LOW?
| | | | | | :REAL <numeric value>
| | | | | | |[:HIGH] <numeric value>
| | | | | | |[:HIGH]?
| | | | | | :CORona <numeric value>
| | | | | | :CORona?
| | | | | | :ARC
| | | | | | |[:LEVe] <numeric value>
| | | | | | |[:LEVe]?
| | | | | | :OPEN <numeric value>
| | | | | | :OPEN?
| | | | | | :SHORT <numeric value>
| | | | | | :SHORT?
| | | | | :CSTandard <numeric value>
| | | | | :CSTandard?
| | | | | :HFCC
| | | | | | :OFFSet <numeric value>
| | | | | | :OFFSet?
| | | | | :CURRent
| | | | | | :OFFSet
| | | | | | |[:NORmal] <numeric value>
| | | | | | |[:NORmal]?
| | | | | | :REAL <numeric value>
| | | | | | :REAL?
| | | | | :TIME
| | | | | | :RAMP <numeric value>
| | | | | | :RAMP?
| | | | | | |[:TEST] <numeric value>
| | | | | | |[:TEST]?

```

```

: | :FALL <numeric value>
: | :FALL?
: | :CHANnel
: | | [:HIGH] <channel list>
: | | [:HIGH]?
: | | :LOW <channel list>
: | | :LOW?
: | :DC
: | | [:LEVel] <numeric value>
: | | [:LEVel]?
: | | :LIMit
: | | | [:HIGH] <numeric value>
: | | | [:HIGH]?
: | | | :LOW <numeric value>
: | | | :LOW?
: | | | :CORona <numeric value>
: | | | :CORona?
: | | | :ARC
: | | | | [:LEVel] <numeric value>
: | | | | [:LEVel]?
: | | | :OPEN <numeric value>
: | | | :OPEN?
: | | | :SHORT <numeric value>
: | | | :SHORT?
: | | :CSTandard <numeric value>
: | | :CSTandard?
: | | :HFCC
: | | | :OFFSet <numeric value>
: | | | :OFFSet?
: | | :CURRent
: | | | :OFFSet <numeric value>
: | | | :OFFSet?
: | | :TIME
: | | | :DWELI <numeric value>
: | | | :DWELI?
: | | | :RAMP <numeric value>
: | | | :RAMP?
: | | | | [:TEST] <numeric value>
: | | | | [:TEST]?
: | | | :FALL <numeric value>
: | | | :FALL?
: | | :CHANnel
: | | | | [:HIGH] <channel list>
: | | | | [:HIGH]?
: | | | | :LOW <channel list>
: | | | | :LOW?
: | :IR
: | | | [:LEVel] <numeric value>
: | | | [:LEVel]?
: | | | LIMit
: | | | | :HIGH <numeric value>
: | | | | :HIGH?
: | | | | | [:LOW] <numeric value>
: | | | | | [:LOW]?
: | | | :TIME
: | | | :RAMP <numeric value>
: | | | :RAMP?
: | | | | [:TEST] <numeric value>
: | | | | [:TEST]?
: | | | :FALL <numeric value>
: | | | :FALL?
: | | | :RANGe
: | | | | [:UPPer] <numeric value>
: | | | | [:UPPer]?
: | | | | :LOWer <numeric value>
: | | | | :LOWer?
: | | | | :AUTO <ON|OFF or boolean>
: | | | | :AUTO?
: | | | :CHANnel
: | | | | | [:HIGH] <channel list>
: | | | | | [:HIGH]?
: | | | | | :LOW <channel list>
: | | | | | :LOW?
: | :PAuse

```

```

| | | | | [:MESSAge] <string data>
| | | | | [:MESSAge]?
| | | | | :TIME
| | | | | | [:TEST] <numeric value>
| | | | | | [:TEST]?
| | | | | :OSC
| | | | | :LIMit
| | | | | | [:OPEN] <numeric value>
| | | | | | [:OPEN]?
| | | | | | :SHORT <numeric value>
| | | | | | :SHORT?
| | | | | :CRANge? <MAXimum|MINimum|NOW>
| | | | | : CURRent<m>
| | | | | | : OFFSet <numeric value>
| | | | | | : OFFSet?
| | | | | :CSTandard <numeric value>
| | | | | :CSTandard?
| | | | | :CHANnel
| | | | | | [:HIGH] <channel list>
| | | | | | [:HIGH]?
| | | | | | :LOW <channel list>
| | | | | | :LOW?
| | | | | :PRESet
| | | | | :TIME
| | | | | | :PASS <numeric value>
| | | | | | :PASS?
| | | | | | :STEP <numeric value>
| | | | | | :STEP?
| | | | | :AC
| | | | | | :FREQuency <numeric value>
| | | | | | :FREQuency?
| | | | | :WRANge
| | | | | | [:AUTO] <boolean> |ON|OFF
| | | | | | [:AUTO]?
| | | | | :AGC
| | | | | | [:SOFTware] <Boolean> |ON|OFF
| | | | | | [:SOFTware]?
| | | | | :RJUDgment <boolean> |ON|OFF
| | | | | :RJUDgment?
| | | | | :GFI <FLOAT|ON|OFF>
| | | | | :GFI?
| | | | | :BREakdown
| | | | | | :MODE?
| | | | | :AC
| | | | | | [:LEVEl] <start>,<end>
| | | | | | [:LEVEl]?
| | | | | | :LIMit
| | | | | | | [:HIGH] <numeric value>
| | | | | | | [:HIGH]?
| | | | | | | :LOW <numeric value>
| | | | | | | :LOW?
| | | | | | | :ARC <numeric value>
| | | | | | | :ARC?
| | | | | | | :CORona <numeric value>
| | | | | | | :CORona?
| | | | | | :TIME
| | | | | | | [:TEST] <numeric value>
| | | | | | | [:TEST]?
| | | | | | | :RAMP <numeric value>
| | | | | | | :RAMP?
| | | | | | :CONTInue <boolean> | ON | OFF
| | | | | | :CONTInue?
| | | | | | :STEP <numeric value>
| | | | | | :STEP?
| | | | | :DC
| | | | | | [:LEVEl] <start>,<end>
| | | | | | [:LEVEl]?
| | | | | | :LIMit
| | | | | | | [:HIGH] <numeric value>
| | | | | | | [:HIGH]?
| | | | | | | :LOW <numeric value>
| | | | | | | :LOW?
| | | | | | | :ARC <numeric value>
| | | | | | | :ARC?

```

```

| | | | | :CORona <numeric value>
| | | | | :CORona?
| | | | | :TIME
| | | | | [:TEST] <numeric value>
| | | | | [:TEST]?
| | | | | :RAMP <numeric value>
| | | | | :RAMP?
| | | | | :DWELI <numeric value>
| | | | | :DWELI?
| | | | | :CONTInue <boolean> | ON | OFF
| | | | | :CONTInue?
| | | | | :STEP <numeric value>
| | | | | :STEP?
| | | | | :TRIGer
| | | | | :SOURce
| | | | | :EXTernal
| | | | | :STATe <boolean>|ON|OFF
| | | | | :STATe?

```

## 5.4.2 Command Description

- **IEEE 488.2 Command**

- **\*CLS**

- Clear status command data configuration, the following actions are needed.
    - Clear standard event status register
    - Clear status bit group register except for MAV bit (bit 4).

- **\*ESE < numeric value >**

- It uses for setting standard event status enable register value, <metric system value> range is 0 ~255.

- **\*ESE?**

- The controller is used for query standard event status of device enable register value. The output format is <metric system value>, its range is 0 ~255.

- **\*ESR?**

- The controller queries the standard event register value of the device. After performing this command, the standard event register value will be cleared to 0. The output format is <metric system value>, its range is 0 ~255.

- **\*IDN?**

- The controller is for reading the basic data of the device. The output format separates four fields by comma, it denotes separately: manufacturer, device model, serial number and firmware version.

- **\*OPC**

- Operation completed command.

- **\*OPC?**

- Operation completed query command. The output format is ASCII character "1".

- **\*PSC 0 / 1**

- Power on status clear command
    - Note: This command parameter is "0" or "1".

- **\*PSC?**

- Power on status clear query command

The output format is ASCII character " 1 " or " 0 ".

**\*RST**

The device reset command.

**\*RCL < Metric system numeric value >**

Recall command. This command is recalling the saved parameters.

Note: This command parameter is "0" or "1".

**\*SAV < Metric system numeric value >**

Save command. This command is saving the current parameters to memory.

Note: This command parameter is "0" or "1".

**\*SRE < Metric system numeric value >**

It used for setting service request register value, its <metric system value> is 0 ~ 255.

**\*SRE?**

The controller is for reading service request enabled register initial setting.

The output format is <metric system value>, its range is 0 ~255.

Note: Bit "6" in this command is always zero.

**\*STB?**

The controller is for reading status bit register value.

The output format is <metric system value>, its range is 0 ~255.

● **SCPI Command**

**:MEMory:DELEte[:NAME] < name >**

This command deletes the parameter data of the <name> indicated in the main memory.

The < name > is character data.

Example: Input command "**MEM:DEL "123"**"

Description: This command means to delete parameter data of "123" in the main memory.

**:MEMory:DELEte:LOCAtion < register number >**

This command deletes the parameter data of <register number> in the main memory.

< register number > is integral data.

Example: Input command "**MEM:DEL:LOCA 1**"

Description: This command means to delete the first parameter data in the main memory.

**:MEMory:STATe:DEFine < name >, < register number >**

The command sets the memory name of <register number> in the main memory.

Example: Input command "**MEM:STAT:DEF TEST,1**"

Description: This command means to set parameter data name TEST of the first memory in the main memory.

**:MEMory:STATe:DEFine? < name >**

The command queries <register number> memory which <name> indicated.

Example: Input command "**MEM:STAT:DEF? TEST**"

Return message "**1**"

Description: Return message "**1**" means the location of TEST parameter data is at the first group.

**:MEMory:FREE:STATe?**

This command queries the rest PRESET parameter number in the main memory.

Example: Input command "**MEM:FREE:STAT?**"

Return message "**97,3**"

Description: Return message "**97,3**" means the rest parameter data are 97 groups can be set, there are 3 groups have been used.

**:MEMory:FREE:STEP?**

This command queries the rest STEP number in the main memory.

Example: Input command "**MEM:FREE:STEP?**"

Return message "**497,3**"

Description: Return message "**497,3**" means the rest can be set STEPs are 497 steps, there are 3 steps have been used.

**:MEMory:NStates?**

This command queries the maximum value plus 1 of the analyzer \*SAV / \*RCL parameter can be used.

Example: Input command "**MEM:NST?**"

Return message "**101**"

Description: Return message "**101**" means the storage capacity of the main memory is 100 groups (101-1).

**:SYSTem:ERRor[:NEXT]?**

This command reads message in Error Queue. The returned message please see section 5.5 Error Message.

Example: Input command "**SYST:ERR?**"

Return message "**+0, "No error"**"

Description: Return message "**+0, "No error"**" means there is no error message in queue.

**:SYSTem:VERSion?**

This command queries the SCPI version of this device.

Example: Input command "**SYST:VERS?**"

Return message "**1990.0**"

Description: Return message "**1990.0**" means the device supported SCPI version is 1990.0.

**[:SOURce]:FUNCtion < GENERAL / BREakdown >**

This command switches GENERAL MODE or BREAKDOWN VOLT MODE.

Example: Input command "**FUNC GEN**"

Description: Switch to GENERAL MODE

**[:SOURce]:FUNCtion?**

This command queries measurement mode.

Example: Input command "**FUNC?**"

Return message "**GENERAL**"

Description: Return message "**GENERAL**" means GENERAL MODE currently.

**[:SOURce]:SAFETY:FETCh? [ < item > ] [ , < item > ]**

The command can query the measurement data. The < item > is character data. The command responds the following data:



| Character Data | Return Data  |
|----------------|--|
| STEP           | Step serial number at present  |
| MODE           | Mode at present  |
| OMETerage      | Output meterage at present   |
| MMETerage      | Measured meterage at present   |
| RMETerage      | AC MODE Real Current measured meterage at present  |
| CMETerage      | Corona meterage at present (This function is for 19055-C.)   |
| CCMETerage     | C meterage of HFCC in AC MODE and DC MODE at present   |
| RELapsed       | The elapsed time of ramp at present  |
| RLEave         | The leave time of ramp at present  |
| DELapsed       | The elapsed time of dwell at present   |
| DLEave         | The leave time of dwell at present   |
| TELapsed       | The elapsed time of test at present<br>Return 9.9000001E+37 while Test Time sets as CONT. and it is higher than 999 sec.                   |
| TLEave         | The leave time of test at present<br>Return the leave time when Test Time is limited time.<br>Return 9.9000001E+37 when Test Time is CONT. |
| FELapsed       | The elapsed Fall Time at present   |
| FLEave         | The leave Fall Time at present   |

Example: Input command **"SAFE: FETC?"STEP, MODE, OMET**

Return message **"1, AC, +5.000000E+02"**

Description: Return message **"1, AC, +5.000000E+02"** means STEP, MODE and output value results are STEP1, AC MODE and 0.500kV.

**[ :SOURce]:SAFEty:STARt[:ONCE]**

This command is for starting the test.

Example: Input command **"SAFE:STAR"**

Description: This command means to start the test.

**[ :SOURce]:SAFEty:STARt:OFFSet GET / OFF**

This command gets offset value when the parameter is GET, and disable offset function when the parameter is OFF.

Example: Input command **"SAFE:STAR OFFS GET"**

Description: It means to start the function of getting offset value.

**[ :SOURce]:SAFEty:STARt:OFFSet?**

This command queries if do offset action or not.

Example: Input command **"SAFE:STAR OFFS?"**

Return message **"0"**

Description: Return message **"0"** means the main unit is without doing offset action.

**[ :SOURce]:SAFEty: STARt:CSTandard GET**

This command is for starting GET Cs function of short/open detection mode.

Example: Input command **"SAFE: STAR: CST GET"**

Description: It means to start GET Cs function of short/open circuit detection mode.

**[ :SOURce]:SAFEty:STOP**

This command is for stopping the test.

Example: Input command **"SAFE:STOP"**

Description: It means to stop the main unit test.

**[[:SOURce]:SAFety:STATus?**

This command queries the execution status of the current device. Return character data RUNNING|STOPPED.

Example: Input command "**SAFE:STAT?**"

Return message "**RUNNING**"

Description: Return message "**RUNNING**" means the main unit is testing now.

**[[:SOURce]:SAFety:SNUMber?**

This command queries how many steps have been set in the memory.

Example: Input command "**SAFE:SNUM?**"

Return message "**+2**"

Description: Return message "**+2**" means 2 steps in the main memory have been set.

**[[:SOURce]:SAFety:RESult:ALL:OMETerage?**

This command queries OUTPUT METER reading of all steps.

Example: Input command "**SAFE:RES:ALL:OMET?**"

Return message "**5.100000E+01**"

Description: Return message "**5.100000E+01**" means query OUTPUT METER result is 0.051kV.

**[[:SOURce]:SAFety:RESult:ALL:RMETerage?**

This command queries REAL CURRENT METER readings of all STEPs under GENERAL MODE.

Example: Input command "**SAFE:RES:ALL:RMET?**"

Return message "**7.000000E-05**"

Description: Return message "**7.000000E-05**" means query REAL CURRENT METER result is 0.07mA.

**[[:SOURce]:SAFety:RESult:ALL:CMETerage? (This function is for 19055-C.)**

This command queries CORONA METER readings of all STEPs under GENERAL MODE.

Example: Input command "**SAFE:RES:ALL:CMET?**"

Return message "**1.200000E+01**"

Description: Return message "**1.200000E+01**" means query CORONA METER result is 12.

**[[:SOURce]:SAFety:RESult:ALL:CCMETerage?**

This command queries C reading of HFCC in all STEPs under GENERAL MODE.

Example: Input command "**SAFE:RES:ALL:CCMET?**"

Return message "**1.000000E-08**"

Description: Return message "**1.000000E-08**" means query C measured result of HFCC is 10pF.

**[[:SOURce]:SAFety:RESult:ALL:MMETerage[:NORMal]?**

This command queries MEASURE METER reading of all STEPs.

Example: Input command "**SAFE:RES:ALL:MMET?**"

Return message "**7.000000E-05**"

Description: Return message "**7.000000E-05**" means query MEASURE METER result is 0.07mA.

**[:SOURce]:SAFEty:RESult:ALL:MODE?**

This command queries MODE of all STEPs. Return character data AC|DC|IR|PA|OSC.

Example: Input command “SAFE:RES:ALL:MODE?”

Return message “DC”

Description: Return message “DC” means to set mode as DC.

**[:SOURce]:SAFEty:RESult:ALL:TIME[:ELAPsed]:RAMP?**

This command queries elapse time of ramp of all STEPs.

Example: Input command “SAFE:RES:ALL:TIME: RAMP?”

Return message “1.000000E+00”

Description: Return message “1.000000E+00” means ramp time of the test is 1 second.

**[:SOURce]:SAFEty:RESult:ALL:TIME[:ELAPsed]][:TEST]?**

This command queries the test time of all steps.

Example: Input command “SAFE:RES:ALL:TIME?”

Return message “3.000000E+00”

Description: Return message “3.000000E+00” means the test needed time result is 3 seconds.

**[:SOURce]:SAFEty:RESult:ALL:TIME[:ELAPsed]:DWELI?**

This command queries dwell time of testing all steps.

Example: Input command “SAFE:RES:ALL:TIME:DWEL?”

Return message “2.500000E+00”

Description: Return message “2.500000E+00” means the test dwell time is 2.5 seconds.

**[:SOURce]:SAFEty:RESult:ALL:TIME[:ELAPsed]:FALL?**

This command queries fall time of testing all STEPs.

Example: Input command “SAFE:RES:ALL:TIME:FALL?”

Return message “1.000000E+00”

Description: Return message “1.000000E+00” means fall time of testing is 1.0 second.

**[:SOURce]:SAFEty:RESult:ALL[:JUDGment]?**

This command queries the judgment results of all steps. Return formats are: First Step Result, Second Step, Result..., Last Step Result. Code meanings are given as below table.

**Test Result Code List:**

| Mode         | AC  |     | DC  |     | IR  |     | OSC |     | ALL |     |
|--------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|              | HEX | DEC | HEX | DEC | HEX | DEC | HEX | DEC | HEX | DEC |
| STOP         |     |     |     |     |     |     |     |     | 70  | 112 |
| USER STOP    |     |     |     |     |     |     |     |     | 71  | 113 |
| CAN NOT TEST |     |     |     |     |     |     |     |     | 72  | 114 |
| TESTING      |     |     |     |     |     |     |     |     | 73  | 115 |
| PASS         |     |     |     |     |     |     |     |     | 74  | 116 |
| HIGH FAIL    | 21  | 33  | 31  | 49  | 41  | 65  |     |     |     |     |
| LOW FAIL     | 22  | 34  | 32  | 50  | 42  | 66  |     |     |     |     |
| ARC FAIL     | 23  | 35  | 33  | 51  |     |     |     |     |     |     |
| HIGH FAIL    | 24  | 36  | 34  | 52  |     |     | 64  | 100 |     |     |
| CHECK FAIL   |     |     | 35  | 53  |     |     |     |     |     |     |
| OUTPUT A/D   | 26  | 38  | 36  | 54  | 46  | 70  | 66  | 102 |     |     |

|                        |    |    |    |    |    |    |    |     |  |
|------------------------|----|----|----|----|----|----|----|-----|--|
| <b>OVER</b>            |    |    |    |    |    |    |    |     |  |
| <b>METER A/D OVER</b>  | 27 | 39 | 37 | 55 | 47 | 71 | 67 | 103 |  |
| <b>REAL HIGH FAIL</b>  | 2A | 42 |    |    |    |    |    |     |  |
| <b>CORONA FAIL</b>     | 2B | 43 |    |    |    |    |    |     |  |
| <b>SHORT FAIL</b>      |    |    |    |    |    |    | 61 | 97  |  |
| <b>OPEN FAIL</b>       |    |    |    |    |    |    | 62 | 98  |  |
| <b>GFI FAIL</b>        | 2D | 45 | 3D | 61 | 4D | 77 | 6D | 109 |  |
| <b>HFCC OPEN FAIL</b>  | 2E | 46 | 3E | 62 |    |    |    |     |  |
| <b>HFCC SHORT FAIL</b> | 2F | 47 | 3F | 63 |    |    |    |     |  |

Example: Input command **“SAFE:RES:ALL?”**

Return message **“116”**

Description: Return message **“116”** means judgment result is pass.

**[ :SOURce ] :SAFEty :RESult :COMPleted ?**

This command queries if the device complete the execution action of all setting values. Return 1 or 0.

Example: Input command **“SAFE:RES:COMP?”**

Return message **“1”**

Description: Return message **“1”** means the execution actions of all setting values are completed.

**[ :SOURce ] :SAFEty :RESult [ :LAST ] [ :JUDGment ] ?**

This command queries the judgment result code of the last step.

Example: Input command **“SAFE:RES:LAST?”**

Return message **“116”**

Description: This command means the judgment result of the last step is pass.

**[ :SOURce ] :SAFEty :RESult :AREPort < boolean > / ON / OFF**

It sets if auto report test result (for RS232 interface only).

Example: Input command **“SAFE:RES:AREP ON”**

Description: It indicates to set auto report test result after the main unit is completed.

**[ :SOURce ] :SAFEty :RESult :AREPort ?**

It queries if the device auto report test result, return 1 or 0 (for RS232 interface only).

Example: Input command **“SAFE:RES:AREP?”**.

Return message **“1”**

Description: Return message **“1”** means the device will auto report test result after the test is completed.

**[ :SOURce ] :SAFEty :RESult :AREPort :ITEM [ < item > ] [ , < item > ]**

It sets test data for auto report, < item > is for character data. The meanings are listed as below.

| <b>Character</b> | <b>Return Data</b>                           |
|------------------|--|
| MODE             | Measure MODE                                 |
| OMETerage        | Output value                                 |
| MMETerage        | Measurement value                            |
| RMETerage        | Real Current measurement value               |
| CMETerage        | Corona measurement value (for model 19055-C) |
| CCMETerage       | C measurement value of HFCC                  |

|          |  |
|----------|--|
| RELapsed | RAMP elapsed time  |
| DELapsed | DWELL elapsed time   |
| TELapsed | TEST elapsed time<br>Return 9.9000001E+37 while Test Time sets as CONT. and higher than 999 sec. |
| FELapsed | Fall Time elapsed  |
| STATE    | Test result code   |

The sequence for report data:

MODE, OMETerage, MMETerage, LACMETerage, LDCMETerage, RELapsed, DELapsed, TELapsed, FELapsed, STATE

Example: 1. Input command "**SAFE: RES: AREP ON**". It sets to enable auto report.

2. Input command "**SAFE: RES: AREP: ITEM STAT, MODE, OMET**".

It sets the data which require to report.

It assumed the test as AC MODE then return message is as below.

AC, +5.200000E+01, 116

Description: It follows the data reported to set it after the test is completed.

**Note**     : The parameter setting is no need to follow the sequence but the data will be reported by sequence.

**[:SOURce]:SAFEty:RESult:AREPort:ITEM?**

It queries data item of device auto report test as well as returns data report item. (For RS232 interface only)

Example: Input command "**SAFE:RES:AREP:ITEM?**"

Return message "MODE,OMET,STAT"

Description: The return message means auto report data at present including "Measurement MODE", "Output value" and "Test result code".

**SOURce:SAFEty:RESult:ASAVe     < boolean > | ON | OFF**

This command is for setting if the function of auto report is saved until power on next time. (For RS232 interface only)

Example: Input command "**SOUR:SAFE:RES:ASAV ON**"

Description: There is still the function of auto report when set this command to ON after powering on next time.

**SOURce:SAFEty:RESult:ASAVe?**

It queries if the device auto report function is saved until power on next time.

Example: Input command "**SOUR:SAFE:RES:ASAV?**"

Description: It returns 1 to represent the setting of auto report function is saved until power on next time.

**[:SOURce]:SAFEty:RESult:BREakdown[:JUDGment]?**

This command queries the judgment result code under BREAK DOWN VOLT MODE.

Example: Input command "**SAFE:RES:BRE?**"

Return message "**116**"

Description: This command means the judgment result of the main unit is pass.

**[:SOURce]:SAFEty:RESult:BREakdown:MMETerage?**

This command queries MEASURE METER reading under BREAK DOWN VOLT MODE.

Example: Input command **"SAFE:RES:BRE:MMET?"**

Return message **"7.000000E-05"**

Description: It returns **"7.000000E-05"** to indicate the result of query MEASURE METER is 0.07mA.

**[:SOURce]:SAFety:RESult:BRERead:OMETerage?**

This command queries OUTPUT METER reading under BREAK DOWN VOLT MODE.

Example: Input command **"SAFE:RES:BRE:OMET?"**

Return message **"5.100000E+01"**

Description: It returns **"5.100000E+01"** to indicate the result of query OUTPUT METER is 0.051kV.

**[:SOURce]:SAFety:RESult:BRERead:CMETerage?** (This function is for 19055-C.)

This command queries CORONA METER reading under BREAK DOWN VOLT MODE.

Example: Input command **"SAFE:RES:BRE:CMET?"**

Return message **"1.200000E+01"**

Description: It returns **"1.200000E+01"** to indicate the result of query CORONA METER is 12.

**[:SOURce]:SAFety:RESult:BRERead:MODE?**

This command queries the selected MODE under BREAK DOWN VOLT MODE, and returns character data AC or DC.

Example: Input command **"SAFE:RES:BRE:MODE?"**

Return message **"DC"**

Description: It returns **"DC"** to indicate its mode is DC.

**[:SOURce]:SAFety:RESult:BRERead:STEP?**

This command queries the executed STEP number under BREAK DOWN VOLT MODE.

Example: Input command **"SAFE:RES:BRE:STEP?"**

Return message **"2"**

Description: It returns **"2"** to indicate the executed 2 STEPs.

**[:SOURce]:SAFety:RESult: BRERead:TIME[:ELAPsed][:TEST]?**

This command queries the executed test time of the STEP under BREAK DOWN VOLT MODE.

Example: Input command **"SAFE:RES: BRE:TIME?"**

Return message **"3.000000E+00"**

Description: It returns **"3.000000E+00"** to indicate the tested time of the STEP is 3 seconds.

**[:SOURce]:SAFety:RESult: BRERead:TIME[:ELAPsed]:DWELI?**

This command queries the executed dwell time of the STEP under BREAK DOWN VOLT MODE.

Example: Input command **"SAFE:RES: BRE:TIME:DWEL?"**

Return message **"3.000000E+00"**

Description: It returns **"3.000000E+00"** to indicate the tested dwell time of the STEP is 3 seconds.

**[:SOURce]:SAFety:RESult: BRERead:TIME[:ELAPsed]:RAMP?**

It queries the executed ramp time of the STEP under BREAK DOWN VOLT MODE.

Example: Input command "**SAFE:RES: BRE:TIME:RAMP?**"

Return message "**3.000000E+00**"

Description: It returns "**3.000000E+00**" to indicate that the STEP tested ramp time is 3 seconds.

**[[:SOURce]:SAFety:RESult: BREakdown:WVoltage?**

This command returns voltage value before FAIL occurred under BREAK DOWN VOLT MODE. The command returns 9.910000E+37 as the test passed.

Example: Input command "**SAFE:RES: BRE:WV?**"

Return message "**7.500000E+01**"

Description: It returns "**7.500000E+01**" to indicate voltage value is 75V before FAIL occurred.

**[[:SOURce]:SAFety:STEP<n>:DELeTe**

This command will delete <n> represented step and the step which behind <n> will fill a vacancy forward under GENERAL MODE.

Example: Input command "**SAFE:STEP 1:DEL**"

Description: It means to delete STEP 1 setting value in working memory of the main unit.

**[[:SOURce]:SAFety:STEP<n>:SET?**

This command queries all settings in the selected STEP under GENERAL MODE.

Example: Input command **SAFE:STEP 1:SET?**

Return message **1,AC,+5.000000E+03, +6.000000E-04,+7.000000E-06,  
+8.000000E-03+8.000000E-06,+3.300000+E01,  
+5.000000E-01,+3.000000E+00,+2.600000E-08,  
+3.000000E+00, +1.000000E+00, +2.000000E+00  
(0),(0)**

Description: It means STEP settings in working memory are STEP1, AC, VOLT: 5.000kV, HIGH:0.600mA, LOW:0.007mA, ARC:8.0mA, Real Limit:0.008mA, Corona:33, HFCC C:26pF, HFCC OPEN:50%, HFCC SHORT:300%, TIME:3.0s, RAMP:1.0s, FALL:2.0s, SCAN BOX :OFF

**[[:SOURce]:SAFety:STEP<n>:MODE?**

This command queries MODE in the selected STEP under GENERAL MODE. It will return character data AC, DC, IR, PA or OSC.

Example: Input command "**SAFE:STEP1:MODE?**"

Return message "**DC**"

Description: It returns "**DC**" to indicate its mode is DC.

**[[:SOURce]:SAFety:STEP<n>:AC[:LEVel] < numeric value >**

This command sets the selected STEP, the required voltage value as testing AC withstand. The unit is in volt (V).

Range: 50~5000

Example: Input command "**SAFE:STEP 2:AC 3000**"

Description: This command means to set the required voltage value of STEP 2 in the main unit to 3000V as testing AC withstand.

**[[:SOURce]:SAFety:STEP<n>:AC[:LEVel]?**

This command queries the selected STEP, the required voltage value as testing AC withstand.

Example: Input command "**SAFE:STEP 2:AC?**"

Return message "**3.000000E+03**"

Description: Return message "**3.000000E+03**" means the required voltage value of STEP 2 in the main unit is 3000V as testing AC withstand.

**[[:SOURce]:SAFety:STEP<n>:AC:LIMit[:HIGH] < numeric value >**

This command sets the selected STEP, the high limit value of AC withstand leakage current under GENERAL MODE. The unit is in Ampere (A).

Range: 0.000001~0.12 when 50V~4kV, 0.000001~0.10 when it is above 4.001kV.

Example: Input command "**SAFE:STEP 2:AC:LIM 0.01**"

Description: This command sets STEP 2 high limit of AC withstand leakage current in the main unit is 10mA.

**[[:SOURce]:SAFety:STEP<n>:AC:LIMit[:HIGH]?**

This command queries the selected STEP, the high limit value of AC withstand leakage current under GENERAL MODE.

Example: Input command "**SAFE:STEP 2:AC:LIM?**"

Return message "**1.000000E-02**"

Description: Return message "**1.000000E-02**" means STEP 2 high limit of AC withstand leakage current in the main unit is 10mA.

**[[:SOURce]:SAFety:STEP<n>:AC:LIMit:LOW < numeric value >**

This command sets the selected STEP, the low limit value of AC withstand leakage current under GENERAL MODE.

Range: 0=OFF, 0.000001~0.12 (low limit value of leakage current  $\leq$  high limit value of setting)

Example: Input command "**SAFE:STEP 2:AC:LIM:LOW 0.00001**"

Description: This command sets STEP 2 low limit of AC withstand leakage current in the main unit is 0.01mA.

**[[:SOURce]:SAFety:STEP<n>:AC:LIMit:LOW?**

This command queries the selected STEP, the low limit value of AC withstand leakage current under GENERAL MODE. The unit is in Ampere (A).

Example: Input command "**SAFE:STEP 2:AC:LIM:LOW?**"

Return message "**1.000000E-05**"

Description: It returns "**1.000000E-05**" to indicate STEP 2 low limit of AC withstand leakage current in the main unit is 0.01mA.

**[[:SOURce]:SAFety:STEP<n>:AC:LIMit:REAL < numeric value >**

This command sets the selected STEP, the high limit value of AC withstand leakage Real Current under GENERAL MODE.

Range: 0=OFF, 0.000001~0.12 (high limit value of Real Current  $\leq$  high limit value of setting)

Example: Input command "**SAFE:STEP 2:AC:LIM: REAL 0.00001**"

Description: It sets STEP 2 high limit value of leakage Real Current in the main unit is 0.01mA.

**[[:SOURce]:SAFety:STEP<n>:AC:LIMit:REAL?**

This command queries the selected STEP, the high limit value of AC withstand Real Current under GENERAL MODE. The unit is in Ampere (A).

Example: Input command "**SAFE:STEP 2:AC:LIM: REAL?**"

Return message "**1.000000E-05**"

Description: It returns "**1.000000E-05**" to indicate STEP 2 high limit of AC withstand Real Current in the main unit is 0.01mA.



**[[:SOURce]:SAFety:STEP<n>:AC:LIMit:ARC[:LEVel] < numeric value >**

This command sets the selected STEP, its ARC detection value under GENERAL MODE. The unit is in Ampere (A).

Range: 0 or 0.001~0.02, 0 is for setting OFF.

Example: Input command "**SAFE:STEP 2:AC:LIM:ARC 0.004**"

Description: It sets STEP 2 ARC detection value in the main unit is 4mA.

**[[:SOURce]:SAFety:STEP<n>:AC:LIMit:ARC[:LEVel]?**

This command queries the selected STEP, its ARC detection value under GENERAL MODE.

Example: Input command "**SAFE:STEP 2:AC:LIM:ARC?**"

Return message "**4.000000E-03**"

Description: It returns "**4.000000E-03**" to indicate STEP 2 ARC detection value in the main unit is 4.0mA.

**[[:SOURce]:SAFety:STEP<n>:AC:LIMit:CORona < numeric value >**

This command sets the selected STEP, its Corona high limit value of AC withstand under GENERAL MODE. (This function is for 19055-C.)

Range: 0=OFF, 0.1-99.9

Example: Input command "**SAFE:STEP 2:AC:LIM: COR 20.2**"

Description: It sets STEP 2 Corona high limit values of AC withstand in the main unit to **20.2**.

**[[:SOURce]:SAFety:STEP<n>:AC:LIMit:CORona? (This function is for 19055-C.)**

This command queries the selected STEP, its Corona high limit value of AC withstand under GENERAL MODE.

Example: Input command "**SAFE:STEP 2:AC:LIM:COR?**"

Return message "**+2.020000E+01**"

Description: It returns "**+2.020000E+01**" to indicate STEP 2 Corona high limit values of AC withstand in the main unit is 20.2.

**[[:SOURce]:SAFety:STEP<n>:AC:LIMit:OPEN < numeric value >**

This command sets the selected STEP, its OPEN high limit value of AC withstand leakage HFCC under GENERAL MODE.

Range: 10%-100%

Example: Input command "**SAFE:STEP 2:AC:LIM: OPEN 0.2**"

Description: It sets STEP 2 OPEN high limit value of AC withstand leakage HFCC in the main unit to 20%.

**[[:SOURce]:SAFety:STEP<n>:AC:LIMit:OPEN?**

This command queries the selected STEP, its OPEN high limit value of AC withstand leakage current HFCC under GENERAL MODE.

Example: Input command "**SAFE:STEP 2:AC:LIM:OPEN?**"

Return message "**+2.000000E-01**"

Description: It returns "**+2.000000E-01**" to indicate STEP 2 OPEN high limit values of AC withstand leakage current in the main unit is 20%.

**[[:SOURce]:SAFety:STEP<n>:AC:LIMit:SHORT < numeric value >**

This command sets the selected STEP, its SHORT high limit value of AC withstand HFCC under GENERAL MODE.

Range: When Cs is below 40 pF (included), the setting is 0 (i.e. OFF),

100%-500%. When Cs is above 41 pF (included), it only can set 0 (i.e.

OFF).

Example: Input command **"SAFE:STEP 2:AC:LIM:SHOR 3"**

Description: It sets STEP 2 SHORT high limit values of AC withstand HFCC to 300%.

**[:SOURce]:SAFETy:STEP<n>:AC:LIMit: SHORt?**

This command queries the selected STEP, its SHORT high limit value of AC withstand HFCC under GENERAL MODE.

Example: Input command **"SAFE:STEP 2:AC:LIM:SHOR?"**

Return message **"+3.000000E+00"**

Description: It returns **"+3.000000E+00"** to indicate STEP 2 SHORT high limit value of AC withstand leakage current is 300%.

**[:SOURce]:SAFETy:STEP<n>:AC:CSTandard < numeric value >**

This command sets the selected STEP, its C value of AC withstand leakage current HFCC under GENERAL MODE.

Range: 0=OFF,1-100pF

Example: Input command **"SAFE:STEP 2:AC: CST 20E-12"**

Description: It sets STEP 2 C value of AC withstand leakage current HFCC in the main unit to 20pF.

**[:SOURce]:SAFETy:STEP<n>:AC: CSTandard?**

This command queries the selected STEP, its C value of AC withstand leakage current HFCC under GENERAL MODE.

Example: Input command **"SAFE:STEP 2:AC: CST?"**

Return message **"+2.000000E-11"**

Description: It returns **"+2.000000E-11"** to indicate STEP 2 C value of AC withstand leakage current HFCC in the main unit is 20pF.

**[:SOURce]:SAFETy:STEP<n>:AC:CURREnt:OFFSet[:NORmal]  
<numeric value>**

This command sets AC Offset value under GENERAL MODE. The unit is in Ampere (A).

Range:

High Limit setting range is 0.001~2.999mA, the OFFSET setting range is 0.000000~0.002999.

High Limit setting range is 3~29.99mA, the OFFSET setting range is 0.00000~0.02999.

High Limit setting range is 30~120mA, the OFFSET setting range is 0.00000~0.100.

Example: Input command **"SAFE:STEP 1:AC:CURR:OFFS 0.005"**

Description: It sets STEP 1 AC Offset of the main unit is 5mA.

**[:SOURce]:SAFETy:STEP<n>:AC:CURREnt:OFFSet[:NORmal]?**

This command queries Offset value of the selected STEP under GENERAL MODE.

Example: Input command **"SAFE:STEP 1:AC:CURR:OFFS?"**

Return message **"5.000000E-03"**

Description: It returns **"5.000000E-03"** to indicate Offset value of STEP1 in the main unit is 5mA.

**[:SOURce]:SAFETy:STEP<n>:AC:CURREnt:OFFSet :REAL <numeric value>**

This command sets Offset value of AC Real Current under GENERAL MODE. The unit is in Ampere (A).

Range:

High Limit setting range is 0.001~2.999mA, OFFSET setting range of Real Current is 0.000000~0.002999.

High Limit setting range is 3~29.99mA, OFFSET setting range of Real Current is 0.000000~0.02999.

High Limit setting range is 30~120mA, OFFSET setting range of Real Current is 0.000000~0.100.

Example: Input command "**SAFE:STEP 1:AC:CURR:OFFS:REAL 0.005**"

Description: It sets Offset of STEP 1 AC Real Current in the main unit to 5mA.

**[:SOURce]:SAFety:STEP<n>:AC:CURRent:OFFSet:REAL?**

This command queries the selected STEP, its Offset value of Real Current under GENERAL MODE.

Example: Input command "**SAFE:STEP 1:AC:CURR:OFFS:REAL?**"

Return message "**5.000000E-03**"

Description: It returns "**5.000000E-03**" to indicate STEP1 Offset value of Real Current in the main unit is 5mA.

**[:SOURce]:SAFety:STEP<n>:AC:HFCC:OFFSet <numeric value>**

This command sets C value Offset of AC HFCC under GENERAL MODE. The unit is in Farad (F).

Range: 0~100pF

Example: Input command "**SAFE:STEP 1:AC:HFCC:OFFS 20E-12**"

Description: It sets C value Offset of STEP 1 AC HFCC in the main unit to 20pF.

**[:SOURce]:SAFety:STEP<n>:AC:HFCC:OFFSet?**

This command queries the selected STEP, its C value Offset of HFCC under GENERAL MODE.

Example: Input command "**SAFE:STEP 1:AC:HFCC:OFFS?**"

Return message "**+2.000000E-11**"

Description: It returns "**+2.000000E-11**" to indicate STEP 1 C value Offset of HFCC in the main unit is 20pF.

**[:SOURce]:SAFety:STEP<n>:AC:TIME:RAMP < numeric value >**

This command sets the selected STEP, its required time ramp to setting voltage under GENERAL MODE. The unit is in second (s).

Range: 0 or 0.1~999.0, 0 is for setting OFF.

Example: Input command "**SAFE:STEP 2:AC:TIME:RAMP 5**"

Description: It sets the required time of STEP 2 in the main unit to ramp to setting voltage is 5.0 sec.

**[:SOURce]:SAFety:STEP<n>:AC:TIME:RAMP ?**

This command queries the selected STEP, its required time ramp to setting voltage under GENERAL MODE.

Example: Input command "**SAFE:STEP 2:AC:TIME:RAMP?**"

Return message "**5.000000E+00**"

Description: It returns "**5.000000E+00**" to indicate the required time of STEP 2 in the main unit to ramp to setting voltage is 5.0 sec.

**[:SOURce]:SAFety:STEP<n>:AC:TIME[:TEST] < numeric value >**

This command sets the selected STEP, its required time of testing under GENERAL MODE.

Range: 0 or 0.3~999.0, 0 is for setting CONTINUE.

Example: Input command "**SAFE:STEP 2:AC:TIME 10**"

Description: It sets the required time of testing STEP 2 in the main unit to 10.0 sec.

**[[:SOURce]:SAFety:STEP<n>:AC:TIME[:TEST]?]**

This command queries the selected STEP, its required time of testing under GENERAL MODE.

Example: Input command "**SAFE:STEP 2:AC:TIME?**"

Return message "**1.000000E+01**"

Description: It returns "**1.000000E+01**" to indicate STEP 2 required time of testing in the main unit is 5 sec.

**[[:SOURce]:SAFety:STEP<n>:AC:TIME:FALL < numeric value >]**

This command sets the selected STEP, its required time of setting voltage value to fall to 0 under GENERAL MODE. The unit is in second (s).

Range: 0 or 0.1~999.0, 0 is for setting OFF.

Example: Input command "**SAFE:STEP 2:AC:TIME:FALL 3**"

Description: It sets the required time of STEP 2 setting voltage value in the main unit to fall to 0 is 3.0 sec.

**[[:SOURce]:SAFety:STEP<n>:AC:TIME:FALL?]**

This command queries the selected STEP, its required time of setting voltage value to fall to 0 under GENERAL MODE.

Example: Input command "**SAFE:STEP 2:AC:TIME:FALL?**"

Return message "**3.000000E+00**"

Description: It returns "**3.000000E+00**" to indicate the required time of STEP 2 setting voltage value in the main unit to fall to 0 is 3.0 sec.

**[[:SOURce]:SAFety:STEP<n>:AC:CHANnel[:HIGH] < channel list >]**

This command sets selected step that the setting of output terminal. < channel list > formats are as below:

(@SN(C1, C2, C3)), SN is Scan Box number, C1, C2 and C3 are Channels numbers.

Example: Input command "**SAFE:STEP 2:AC:CHAN(@2(1,2))**"

Description: This command sets output channel status of scanning test of the main unit STEP 2 is BOX 2 channel 1 and 2 HIGH output.

Example: Input command "**SAFE:STEP 2:AC:CHAN(@2(0))**"

Description: This command means output channel status of scanning test of the main unit STEP 2 is to set BOX 2 original HIGH output channel to OFF.

**[[:SOURce]:SAFety:STEP<n>:AC:CHANnel[:HIGH]?]**

This command queries the selected step which setting of high voltage output terminal.

Example: Input command "**SAFE:STEP 2:AC:CHAN?**"

Return message "**(@2(1,2))**"

Description: Return message "**(@2(1,2))**" means output channel status of scanning test of the main unit STEP 2 is BOX 2 channel 1 and 2 HIGH output.

**[[:SOURce]:SAFety:STEP<n>:AC:CHANnel:LOW < channel list >]**

This command sets output status of scanning common test channel (RTN/LOW).

Example: Input command "**SAFE:STEP 2:AC:CHAN:LOW (@2(2,4))**"

Description: This command means output channel status of scanning test of the main unit STEP 2 is to set to BOX 2 channel 2 and 4 LOW output.

Example: Input command **“SAFE:STEP 2:AC:CHAN:LOW (@2(0))”**

Description: This command sets LOW output channel of scanning test of the main unit STEP 2 is OFF.

**[[:SOURce]:SAFETy:STEP<n>:AC:CHANnel:LOW?**

This command queries the selected step which Return channel setting.

Example: Input command **“SAFE:STEP 2:AC:CHAN:LOW?”**

Return message **“( @2(2,4))”**

Description: Return message **“( @2(2,4))”** means output channel status of scanning test of the main unit STEP 2 is BOX 1 channel 2 and 4 LOW output.

**[[:SOURce]:SAFETy:STEP<n>:DC[:LEVel] < numeric value >**

This command sets the selected STEP, its required voltage value of testing DC withstand voltage under GENERAL MODE. The unit is in Volt (V).

Range: 50~6000

Example: Input command **“SAFE:STEP 3:DC 4000”**

Description: It sets the required voltage value of testing STEP 3 DC withstand voltage in the main unit to 4000V.

**[[:SOURce]:SAFETy:STEP<n>:DC[:LEVel]?**

This command queries the selected STEP, its required voltage value of testing DC withstand voltage under GENERAL MODE.

Example: Input command **“SAFE:STEP 3:DC?”**

Return message **“4.000000E+03”**

Description: It returns **“4.000000E+03”** to indicate STEP 3 voltage value of testing DC withstand voltage in the main unit is 4000V.

**[[:SOURce]:]SAFETy:STEP<n>:DC:LIMit[:HIGH] < numeric value >**

This command sets the selected step, its high limit value of DC withstand voltage leakage current under GENERAL MODE. The unit is Ampere (A).

Range: 0.000000001~0.025

Example: Input command **“SAFE:STEP 3:DC:LIM 0.002999”**

Description: This command sets STEP 3 high limit value of DC withstand voltage leakage current is 2.999mA.

**[[:SOURce]:]SAFETy:STEP<n>:DC:LIMit[:HIGH]?**

This command queries the selected STEP, its high limit value of DC withstand voltage leakage current under GENERAL MODE.

Example: Input command **“SAFE:STEP 3:DC:LIM?”**

Return message **“2.999000E-03”**

Description: It returns **“2.999000E-03”** to indicate STEP 3 high limit value of DC withstand voltage leakage current is 2.999mA.

**[[:SOURce]:]SAFETy:STEP<n>:DC:LIMit:LOW < numeric value >**

This command sets the selected STEP, its low limit value of DC withstand voltage leakage current under GENERAL MODE. The unit is Ampere (A).

Range: 0 or 0.000000001~0.025, 0 is for setting OFF (low limit value of leakage current  $\leq$  high limit value of setting).

Example: Input command **“SAFE:STEP 3:DC:LIM:LOW 0.000001”**

Description: This command sets STEP 3 low limit value of DC withstand voltage leakage current in the main unit is 0.001mA.

**[:SOURce]:SAFety:STEP<n>:DC:LIMit:LOW?**

This command queries the selected STEP, its low limit value of DC withstand voltage leakage current under GENERAL MODE.

Example: Input command "**SAFE:STEP 3:DC:LIM:LOW?**"

Return message "**1.000000E-06**"

Description: Return message "**1.000000E-06**" to indicate STEP 3 low limit value of DC withstand voltage leakage current in the main unit is 0.001mA.

**[:SOURce]:SAFety:STEP<n>:DC:LIMit:ARC[:LEVel] < numeric value >**

This command sets the selected STEP, its ARC detection value under GENERAL MODE. The unit is in Ampere (A).

Range: 0 or 0.001~0.01, 0 is for setting OFF

Example: Input command "**SAFE:STEP 3:DC:LIM:ARC 0.0025**"

Description: This command sets ARC detection value of STEP 3 in the main unit to 2.5mA.

**[:SOURce]:SAFety:STEP<n>:DC:LIMit:ARC[:LEVel]?**

This command queries the selected STEP, its ARC detection value.

Example: Input command "**SAFE:STEP 3:DC:LIM:ARC?**"

Return message "**2.500000E-03**"

Description: It returns "**2.500000E-03**" to indicate STEP 3 ARC detection value in the main unit is 2.5mA.

**[:SOURce]:SAFety:STEP<n>:DC:LIMit:CORona < numeric value >**

This command sets the selected STEP, its Corona high limit value of DC withstand voltage under GENERAL MODE. (This function is for 19055-C.)

Range: 0=OFF, 0.1-99.9

Example: Input command "**SAFE:STEP 2:DC:LIM: COR 20.2**"

Description: It sets STEP 2 Corona high limit value of DC withstand voltage in the main unit to **20.0**.

**[:SOURce]:SAFety:STEP<n>:DC:LIMit:CORona? (This function is for 19055-C.)**

This command queries the selected STEP, its Corona high limit value of DC withstand voltage under GENERAL MODE.

Example: Input command "**SAFE:STEP 2:DC:LIM:COR?**"

Return message "**+2.020000E+01**"

Description: It returns "**+2.020000E+01**" to indicate STEP 2 Corona high limit value of DC withstand voltage in the main unit is 20.2.

**[:SOURce]:SAFety:STEP<n>:DC:LIMit:OPEN < numeric value >**

This command sets the selected STEP, its OPEN high limit value of DC withstand voltage leakage current HFCC under GENERAL MODE.

Range: 10%-100%

Example: Input command "**SAFE:STEP 2:DC:LIM:OPEN 0.2**"

Description: It sets STEP 2 OPEN high limit value of DC withstand voltage leakage current HFCC in the main unit to 20%.

**[:SOURce]:SAFety:STEP<n>:DC:LIMit:OPEN?**

This command queries the selected STEP, its OPEN high limit value of DC withstand voltage HFCC under GENERAL MODE.

Example: Input command "**SAFE:STEP 2:DC:LIM:OPEN?**"

Return message "**+2.000000E-01**"

Description: It returns "**+2.000000E-01**" to indicate STEP 2 OPEN high limit value

of DC current withstand voltage in the main unit is 20%.

**[[:SOURce]:SAFEty:STEP<n>:DC:LIMit:SHORt < numeric value >**

This command sets the selected STEP, its SHORT high limit value of DC withstand voltage HFCC under GENERAL MODE.

Range: When Cs is below 40 pF (included), its setting is 0 (i.e. OFF), 100%-500%.

When Cs is above 41 pF (included), it only can set as 0 (i.e. OFF)

Example: Input command "**SAFE:STEP 2:DC:LIM:SHOR 3**"

Description: It sets STEP 2 SHORT high limit value of DC withstand voltage HFCC in the main unit to 300%.

**[[:SOURce]:SAFEty:STEP<n>:DC:LIMit: SHOR?**

This command queries the selected STEP, its SHORT high limit value of DC withstand voltage HFCC under GENERAL MODE.

Example: Input command "**SAFE:STEP 2:DC:LIM:SHOR?**"

Return message "**+3.000000E+00**"

Description: It returns "**+3.000000E+00**" to indicate STEP 2 SHORT high limit value of DC withstand voltage HFCC in the main unit is 300%.

**[[:SOURce]:SAFEty:STEP<n>:DC:CSTandard < numeric value >**

This command sets the selected STEP, its C value of DC withstand voltage HFCC under GENERAL MODE.

Range: 0=OFF, 1-100pF

Example: Input command "**SAFE:STEP 2:DC: CST 20E-12**"

Description: It sets STEP 2 C value of DC withstand voltage HFCC in the main unit to 20pF.

**[[:SOURce]:SAFEty:STEP<n>:DC: CSTandard?**

This command queries the selected STEP, its C value of DC withstand voltage HFCC under GENERAL MODE.

Example: Input command "**SAFE:STEP 2:DC: CST?**"

Return message "**+2.000000E-11**"

Description: It returns "**+2.000000E-11**" to indicate STEP 2 C value of DC withstand voltage HFCC in the main unit is 20pF.

**[[:SOURce]:SAFEty:STEP<n>:DC:CURRent:OFFSet <numeric value>**

This command sets Offset value of DC under GENERAL MODE. The unit is in Ampere (A).

Range:

The Offset setting range is 0.0000000~0.000002999 when High Limit setting range is from 0.001uA to 2.999uA.

The Offset setting range is 0.0000000~0.00002999 when High Limit setting range is from 3.00uA to 29.99uA.

The Offset setting range is 0.0000000~0.0002999 when High Limit setting range is from 30.0uA to 299.9uA.

The Offset setting range is 0.000000~0.002999 when High Limit setting range is from 0.3mA to 2.999mA.

The Offset setting range is 0.000000~0.02500 when High Limit setting range is from 3mA to 25mA.

Example: Input command "**SAFE:STEP 1:DC:CURR:OFFS 0.005**"

Description: It sets STEP 1 DC Offset of in the main unit is 5mA.

**[[:SOURce]:SAFEty:STEP<n>:DC:CURRent:OFFSet?**

This command queries Offset value of the selected STEP under GENERAL MODE.

Example: Input command "**SAFE:STEP 1:DC:CURR:OFFS?**"

Return message "**5.000000E-03**"

Description: It returns "**5.000000E-03**" to indicate Offset value of STEP1 in the main unit is 5mA.

**[:SOURce]:SAFety:STEP<n>:DC:HFCC:OFFSet <numeric value>**

This command sets C value Offset of DC HFCC under GENERAL MODE. The unit is in Farad (F).

Range: 0~100pF

Example: Input command "**SAFE:STEP 1:DC:HFCC:OFFS 20E-12**"

Description: It sets C value Offset of STEP 1 DC HFCC in the main unit to 20pF.

**[:SOURce]:SAFety:STEP<n>:DC:HFCC:OFFSet?**

This command queries the selected STEP, its C value Offset of HFCC under GENERAL MODE.

Example: Input command "**SAFE:STEP 1:DC:HFCC:OFFS?**"

Return message "**+2.000000E-11**"

Description: It returns "**+2.000000E-11**" to indicate C value Offset of STEP 1 HFCC is 20pF.

**[:SOURce]:SAFety:STEP<n>:DC:TIME:DWELI < numeric value >**

This command sets the selected STEP, its DWELL required time under GENERAL MODE. The unit is in second (s).

Range: 0 or 0.1~999.0, 0 is for setting OFF.

Example: Input command "**SAFE: STEP 3: DC: TIME: DWEL 2.5**"

Description: This command sets dwell required time of STEP 3 in the main unit to 2.5 sec.

**[:SOURce]:SAFety:STEP<n>:DC:TIME:DWELI?**

This command queries the selected STEP, its DWELL required time under GENERAL MODE.

Example: Input command "**SAFE: STEP 3: DC: TIME: DWEL?**"

Return message "**2.500000E+00**"

Description: It returns "**2.500000E+00**" to indicate DWELL time of STEP 3 in the main unit is 2.5 sec.

**[:SOURce]:SAFety:STEP<n>:DC:TIME:RAMP < numeric value >**

This command sets the selected STEP, its required time of testing to ramp to setting voltage. The unit is in second (s).

Range: 0 or 0.1~999.0, 0 is for setting OFF.

Example: Input command "**SAFE: STEP 3: DC: TIME: RAMP 2**"

Description: This command sets STEP 3 required time of testing to ramp to setting voltage in the main unit to 2.0 sec.

**[:SOURce]:SAFety:STEP<n>:DC:TIME:RAMP?**

This command queries the selected STEP, its required time of testing to ramp to setting voltage.

Example: Input command "**SAFE: STEP 3: DC: TIME: RAMP?**"

Return message "**2.000000E+00**"

Description: It returns "**2.000000E+00**" to indicate STEP 3 required time of testing to ramp to setting voltage in the main unit is 2.0 sec.



**[[:SOURce]:SAFety:STEP<n>:DC:TIME[:TEST] < numeric value >**

This command sets the selected STEP, its required time of testing under GENERAL MODE. The unit is in second (s).

Range: 0 or 0.3~999.0, 0 is for setting CONTINUE.

Example: Input command "**SAFE:STEP 3:DC:TIME 1**"

Description: This command sets the required time of STEP 3 in the main unit to 1.0sec.

**[[:SOURce]:SAFety:STEP<n>:DC:TIME[:TEST]?**

This command queries the selected STEP, its required time of testing under GENERAL MODE.

Example: Input command "**SAFE:STEP 3:DC:TIME?**"

Return message "**1.000000E+00**"

Description: It returns "**1.000000E+00**" to indicate STEP 3 required time of testing in the main unit is 1 sec.

**[[:SOURce]:SAFety:STEP<n>:DC:TIME:FALL < numeric value >**

This command sets the selected STEP, its required time of setting voltage value to fall to 0 under GENERAL MODE. The unit is in second (s).

Range: 0 or 0.1~999.0, 0 is for setting OFF.

Example: Input command "**SAFE:STEP 3:DC:TIME:FALL 3**"

Description: It sets STEP 3 required time of setting voltage value to fall to 0 in the main unit to 3.0 sec.

**[[:SOURce]:SAFety:STEP<n>:DC:TIME:FALL?**

This command queries the selected STEP, its required time of setting voltage value to fall to 0 under GENERAL MODE.

Example: Input command "**SAFE:STEP 3:DC:TIME:FALL?**"

Return message "**3.000000E+00**"

Description: It returns "**3.000000E+00**" to indicate STEP 3 required time of setting voltage value to fall to 0 in the main unit is 3.0 sec.

**[[:SOURce]:SAFety:STEP<n>:DC:CHANnel[:HIGH] < channel list >**

It sets the selected step that the setting of output terminal. < channel list > formats are as below:

(@SN(C1, C2, C3)), SN is Scan Box number, C1, C2 and C3 are Channels numbers.

Example: Input command "**SAFE: STEP 3: DC:CHAN(@2(1,2))**"

Description: This command sets output channel status of scanning test of STEP 3 in the main unit is BOX 2 channel 1 and 2 HIGH output.

Example: Input command "**SAFE: STEP 3: DC:CHAN(@2(0))**"

Description: This command sets output channel status of scanning test of STEP 3 in the main unit is to set BOX 2 original HIGH output channel to OFF.

**[[:SOURce]:SAFety:STEP<n>:DC:CHANnel[:HIGH]?**

It queries high voltage output channel setting of selected step.

Example: Input command "**SAFE: STEP 3: DC: CHAN?**"

Return message "**(@2(1,2))**"

Description: Return message "**(@2(1,2))**" means output channel status of scanning test of STEP 3 in the main unit is set BOX 2 channel 1 and 2 to HIGH output.

**[[:SOURce]:SAFety:STEP<n>:DC:CHANnel:LOW < channel list >**

It sets output status of scanning common test channel (RTN/LOW).

Example: Input command "**SAFE:STEP 3:DC:CHAN:LOW (@2(2,4))**"

Description: It sets output channel status of scanning test of STEP 3 in the main unit is BOX 2 channel 2 and 4 LOW output.

Example: Input command "**SAFE:STEP 3:DC:CHAN:LOW (@2(0))**"

Description: It sets LOW output channel of scanning test of STEP 3 in the main unit is OFF.

**[[:SOURce]:SAFety:STEP<n>:DC:CHANnel:LOW?**

It queries return channel setting of selected step.

Example: Input command "**SAFE:STEP 3:DC:CHAN:LOW?**"

Return message "**(@2(2,4))**"

Description: Return message "**(@2(2,4))**" means output channel status of scanning test of STEP 3 in the main unit is BOX 2 channel 2 and 4 LOW output.

**[[:SOURce]:SAFety:STEP<n>:IR[:LEVel] < numeric value >**

This command sets the selected STEP, its required voltage value as testing IR under GENERAL MODE. The unit is in Volt (V).

Range: 50~5000

Example: Input command "**SAFE:STEP 4:IR 1000**"

Description: This command sets STEP 4 required voltage value as testing IR to 1000V.

**[[:SOURce]:SAFety:STEP<n>:IR[:LEVel]?**

This command queries the selected STEP, its required voltage value as testing IR under GENERAL MODE.

Example: Input command "**SAFE:STEP 4:IR?**"

Return message "**1.000000E+03**"

Description: It returns "**1.000000E+03**" to indicate STEP 4 required voltage value as testing IR in the main unit is 1000V.

**[[:SOURce]:SAFety:STEP<n>:IR:LIMit:HIGH < numeric value >**

This command sets the selected STEP, its high limit value of IR under GENERAL MODE. The unit is in ohm.

Range: 0~50000000000, 0 is for setting OFF.

Example: Input command "**SAFE:STEP 4:IR:LIM:HIGH 50000000000**"

Description: It sets STEP 4 high limit value of IR in the main unit to 50GΩ.

**[[:SOURce]:SAFety:STEP<n>:IR:LIMit:HIGH?**

This command queries the selected STEP, its high limit value of IR under GENERAL MODE.

Example: Input command "**SAFE:STEP 4:IR:LIM:HIGH?**"

Return message "**5.000000E+10**"

Description: It returns "**5.000000E+10**" to indicate STEP 4 high limit value of IR in the main unit is 50GΩ.

**[[:SOURce]:SAFety:STEP<n>:IR:LIMit[:LOW] < numeric value >**

This command sets the selected STEP, its low limit value of IR under GENERAL MODE. The unit is in ohm.

Range: 100000~50000000000 (low limit value of insulation resistance ≤ high limit

value of setting)

Example: Input command **"SAFE:STEP 4:IR:LIM 100000"**

Description: It sets STEP 4 low limit value of IR in the main unit to 0.1 MΩ.

**[:SOURce]:SAFety:STEP<n>:IR:LIMit[:LOW]?**

This command queries the selected STEP, its low limit value of IR under GENERAL MODE.

Example: Input command **"SAFE:STEP 4:IR:LIM?"**

Return message **"1.000000E+05"**

Description: It returns **"1.000000E+05"** to indicate STEP 4 low limit value of IR in the main unit is 0.1MΩ.

**[:SOURce]:SAFety:STEP<n>:IR:TIME:RAMP < numeric value >**

This command sets the selected STEP, its required time of testing to ramp to setting voltage. The unit is in second (s).

Range: 0 or 0.1~999.0, 0 is for setting OFF

Example: Input command **"SAFE:STEP 4:IR:TIME:RAMP 0.5"**

Description: This command sets STEP 4 required time of testing to ramp to setting voltage to 0.5 sec.

**[:SOURce]:SAFety:STEP<n>:IR:TIME:RAMP?**

This command queries the selected STEP, its required time of testing to ramp to setting voltage under GENERAL MODE.

Example: Input command **"SAFE:STEP 4:IR:TIME:RAMP?"**

Return message **"5.000000E-01"**

Description: It returns **"5.000000E-01"** to indicate STEP 4 required time of testing to ramp to setting voltage in the main unit is 0.5 sec.

**[:SOURce]:SAFety:STEP<n>:IR:TIME[:TEST] < numeric value >**

This command sets the selected STEP, its required time of testing. The unit is in second (s).

Range: 0 or 0.3~999.0, 0 is for setting CONTINUE

Example: Input command **"SAFE:STEP 4:IR:TIME 1"**

Description: It sets STEP 4 required time of testing in the main unit to 1.0sec. test needed time of STEP 4 in the

**[:SOURce]:SAFety:STEP<n>:IR:TIME[:TEST]?**

This command queries the selected STEP, its required time of testing under GENERAL MODE.

Example: Input command **"SAFE:STEP 4:IR:TIME?"**

Return message **"1.000000E+00"**

Description: It returns **"1.000000E+00"** to indicate STEP 4 required time of testing in the main unit is 1 sec.

**[:SOURce]:SAFety:STEP<n>:IR:TIME:FALL < numeric value >**

This command sets the selected STEP, its required time of setting voltage value to fall to 0 under GENERAL MODE. The unit is in second (s).

Range: 0 or 0.1~999.0, 0 is for setting OFF

Example: Input command **"SAFE:STEP 4:IR:TIME:FALL 3"**

Description: It sets STEP 4 required time of setting voltage value to fall to 0 in the main unit is 3.0sec.

**[:SOURce]:SAFety:STEP<n>:IR:TIME:FALL?**

This command queries the selected STEP, its required time of setting voltage value to fall to 0 under GENERAL MODE

Example: Input command "**SAFE:STEP 4:IR:TIME:FALL?**"

Return message "**3.000000E+00**"

Description: It returns "**3.000000E+00**" to indicate STEP 4 required time of setting voltage value to fall to 0 in the main unit is 3.0 sec.

**[[:SOURce]:SAFETy:STEP<n>:IR: RANGe: UPPer < numeric value >**

This command selects the range upper than the current measured according to current value users inputted under GENERAL MODE. The unit is in Ampere (A).

Range: 0~0.01

Example: Input command "**SAFE:STEP 4:IR:RANG 0.0003**"

Description: It sets IR measured current value of STEP 4 in the main unit to 300uA thus the selected IR range upper than the current measured is 3mA.

**[[:SOURce]:SAFETy:STEP<n>:IR: RANGe: UPPer?**

This command queries the range being set under GENERAL MODE.

Example: Input command "**SAFE:STEP 4:IR:RANG:UPP?**"

Return message "**3.000000E-03**"

Description: It returns "**3.000000E-03**" to indicate STEP 4 setting range in the main unit is 3mA.

**[[:SOURce]:SAFETy:STEP<n>:IR: RANGe: LOWer < numeric value >**

This command selects the range lower than the current measured according to current value users inputted under GENERAL MODE.. The unit is in Ampere (A).

Range: 0~0.01

Example: Input command "**SAFE:STEP 4:IR:RANG:LOW 0.0003**"

Description: It sets IR measured current value of STEP 4 in the main unit to 300uA thus the selected IR range lower than the current measured is 300uA.

**[[:SOURce]:SAFETy:STEP<n>:IR: RANGe: LOWer?**

This command queries the setting range under GENERAL MODE.

Example: Input command "**SAFE:STEP 4:IR:RANG:LOW?**"

Return message "**3.000000E-04**"

Description: It returns "**3.000000E-04**" to indicate SETP 4 setting range in the main unit is 300uA.

**[[:SOURce]:SAFETy:STEP<n>:IR: RANGe: AUTO < boolean > | On | OFF**

This command sets if IR range change to AUTO under GENERAL MODE.

It sets to AUTO when parameter is ON or 1.

It sets to disable AUTO when parameter is OFF or 0.

Note: It remains the default setting range when AUTO unset and gives OFF parameter. It sets 10mA when the default setting is AUTO and gives OFF parameter.

Example: Input command "**SAFE:STEP 4:IR:RANG:AUTO ON**"

Description: It sets STEP 4 IR measured current range in the main unit to AUTO.

**[[:SOURce]:SAFETy:STEP<n>:IR: RANGe: AUTO?**

This command queries if IR range change to AUTO under GENERAL MODE.

It sets to AUTO when returns 1.

It sets to disable AUTO when returns 0.

Example: Input command "**SAFE:STEP 4:IR:AUTO?**"

Return message "**1**"

Description: It returns “1” to indicate STEP 4 setting range in the main unit is AUTO.

**[[:SOURce]:SAFEty:STEP<n>:IR:CHANnel[:HIGH] < channel list >**

It sets selected step which is the setting of output terminal. < channel list > formats are as below:

(@SN(C1, C2, C3)), SN is Scan Box number, C1, C2 and C3 are Channels numbers.

Example: Input command “**SAFE: STEP 4: IR:CHAN(@2(1,2))**”

Description: It sets output channel status of scanning test in the main unit STEP 4 is BOX 2 channel 1 and 2 HIGH output.

Example: Input command “**SAFE: STEP 4: IR:CHAN(@2(0))**”

Description: It sets output channel status of scanning test in the main unit STEP 4 is set BOX 2 original HIGH output channel to OFF.

**[[:SOURce]:SAFEty:STEP<n>:IR:CHANnel[:HIGH]?**

It queries the selected step which setting of high voltage output channel.

Example: Input command “**SAFE: STEP 4: IR: CHAN?**”

Return message “(**@2(1,2)**)”

Description: Return message “(**@2(1,2)**)” means output channel status of scanning test in main unit STEP 4 is set BOX 2 channel 1 and 2 to HIGH output.

**[[:SOURce]:SAFEty:STEP<n>:IR:CHANnel:LOW < channel list >**

It sets output status of scanning common test channel (RTN/LOW).

Example: Input command “**SAFE:STEP 4:IR:CHAN:LOW (@2(2,4))**”

Description: It sets output channel status of scanning test in the main unit STEP 4 is channel 2 and 4 LOW output.

Example: Input command “**SAFE:STEP 4:IR:CHAN:LOW (@2(0))**”

Description: It sets LOW output channel status of scanning test in the main unit STEP 4 is set BOX 2 original LOW output channel to OFF.

**[[:SOURce]:SAFEty:STEP<n>:IR:CHANnel:LOW?**

It queries RETURN channel setting of selected step.

Example: Input command “**SAFE: STEP 4: IR: CHAN: LOW?**”

Return message “(**@2(2,4)**)”

Description: Return message “(**@2(2,4)**)” means output channel status of scanning test in the main unit STEP 4 is BOX 2 channel 2 and 4 LOW output.

**[[: SOURce]:SAFEty:STEP<n>:PAuse:MESSAge <string data >**

This command sets the message hint string of PAUSE mode under GENERAL MODE.

Example: Input command “**SAFE: STEP 5: PA: MESS CHROMA**”

Description: It sets the message string of STEP 5 in the main unit to CHROMA.

**[[: SOURce]:SAFEty:STEP<n>:PAuse:MESSAge?**

This command queries the setting string of message under GENERAL MODE.

Example: Input command “**SAFE: STEP 5: PA: MESS?**”

Return message “**CHROMA**”

Description: It returns “**CHROMA**” to indicate message string of STEP 5 in the main unit is “CHROMA”.

**[ : SOURce]:SAFEty:STEP<n>:PAuse:TIME[:TEST] <numeric\_value>**

This command sets the selected STEP, its required time of testing PA mode under GENERAL MODE.

Range: 0 or 0.3~999.0, 0 is for setting OFF.

Example: Input command "**SAFE:STEP 5:PA:TIME 5**"

Description: It sets STEP 5 required time of testing in the main unit to 5.0sec.

**[ : SOURce]:SAFEty:STEP<n>:PAuse:TIME[:TEST]?**

This command queries the selected STEP, its required time of testing PA mode under GENERAL MODE.

Example: Input command "**SAFE:STEP 5:PA:TIME ?**"

Return message "**5.000000E+00**"

Description: It returns "**5.000000E+00**" to indicate STEP 5 required time setting of testing in the main unit is 5.0sec.

**[ :SOURce]: SAFEty: STEP<n>: OSC: LIMit: OPEN < numeric value >**

This command sets the selected STEP, its setting percentage is judged by open circuit as detecting open/short circuit under GENERAL MODE.

Range: 0.1~1.0

Example: Input command "**SAFE: STEP 6: OSC: LIM: OPEN 0.3**"

Description: It sets open circuit judgment percentage of STEP 6 in the main unit as detecting open/short circuit is 30%.

**[ :SOURce]: SAFEty: STEP<n>: OSC: LIMit: OPEN?**

This command queries the selected STEP, its setting percentage is judged by open circuit as detecting open/short circuit under GENERAL MODE.

Example: Input command "**SAFE: STEP 6: OSC: LIM: OPEN?**"

Return message "**3.000000E-01**"

Description: It returns "**3.000000E-01**" to indicate STEP 6 open circuit judgment percentage as detecting open/short circuit in the main unit is 30%.

**[ :SOURce]: SAFEty: STEP<n>: OSC: LIMit: SHORt < numeric value >**

This command the selected STEP, its setting percentage is judged by short circuit as detecting open/short circuit under GENERAL MODE.

Range: 0 or 1~5, 0 is for setting OFF

Example: Input command "**SAFE: STEP 6: OSC: LIM: SHOR 3**"

Description: It sets STEP 6 short circuit judgment percentage in the main unit as detecting open/short circuit to 300%.

**[ :SOURce]: SAFEty: STEP<n>: OSC: LIMit: SHORt?**

This command queries the selected STEP, its setting percentage is judged by short circuit as detecting open/short circuit under GENERAL MODE.

Example: Input command "**SAFE: STEP 6: OSC: LIM: SHOR?**"

Return message "**3.000000E+00**"

Description: It returns "**3.000000E+00**" to indicate STEP 6 short circuit judgment percentage as detecting open/short circuit in the main unit is 300%.

**[ :SOURce]:SAFEty:STEP<n>:OSC:CRANge? <MAXimum/MINimum/NOW>**

This command queries the range can set maximum, minimum value and the range is operating now under GENERAL MODE.

Example: Input command "**SAFE:STEP 6:OSC:CRAN? NOW**"

Return message "**3**"

Description: It returns “3” to indicate STEP 6 OSC range in the main unit located at 3 now.

**[[:SOURce]:SAFEty:STEP<n>:OSC:CURRent<m>:OFFSet <numeric value>**

This command sets OSC current range and Offset value under GENERAL MODE. Setting Range: m:RANGE NUMBER(1~3), numeric value= Cs value. The unit is in F.

Range: 0~999.9nF.

Example: Input command “**SAFE:STEP1:OSC:CURR 3:OFFS 0.0000001**”

Description: It sets current range to 3, offset value to 10nF of STEP 1 OSC in the main unit.

**[[:SOURce]:SAFEty:STEP<n>:OSC:CURRent<m>:OFFSet?**

This command queries Offset value of the selected STEP under GENERAL MODE.

Range: m:RANGE NUMBER(1~3)

Example: Input command “**SAFE:STEP 1:OSC:CURR 1:OFFS?**”

Return message “**1.8000000E-11**”

Description: It returns “**1.8000000E-11**” to indicate STEP 1 Offset value in the main unit is 18pF.

**[[:SOURce]:SAFEty:STEP<n>:OSC:CSTandard <numeric value>**

This command sets OSC standard capacitance value under GENERAL MODE.

Range: 0.001-40nF, the unit is in F.

Example: Input command “**SOUR:SAFE:STEP 1:OSC:CST 0.00000009**”

Description: It sets STEP 1 OSC in the main unit, standard capacitance value (Cs) is 9nF.

**[[:SOURce]:SAFEty:STEP<n>:OSC:CSTandard?**

This command queries OSC standard capacitance value under GENERAL MODE.

Example: Input command “**SOUR:SAFE:STEP 1:OSC:CST?**”

Return message “**+9.000000E-09**”

Description: It returns “**+9.000000E-09**” to indicate standard capacitance value (Cs) is 9nF.

**[[:SOURce]:SAFEty:STEP<n>:OSC:CHANnel[:HIGH] <channel list >**

It sets the selected step which is the setting of output terminal. < channel list > formats are as below:

(@SN(C1, C2, C3)), SN is Scan Box number, C1, C2 and C3 are Channels numbers.

Example: Input command “**SAFE:STEP 6:OSC:CHAN(@2(1,2))**”

Description: It sets output channel status of scanning test in the main unit STEP 6 is BOX 2 channel 1 and 2 HIGH output.

Example: Input command “**SAFE:STEP 6:OSC:CHAN(@2(0))**”

Description: It sets output channel status of scanning test in the main unit STEP 6 is set BOX 2 original HIGH output channel to OFF.

**[[:SOURce]:SAFEty:STEP<n>:OSC:CHANnel[:HIGH]?**

It queries high voltage output terminal setting of the selected STEP.

Example: Input command “**SAFE:STEP 6:OSC:CHAN?**”

Return message “**(@2(1,2))**”

Description: Return message “**(@2(1,2))**” means output channel status of scanning test in the main unit STEP 6 is set BOX 2 channel 1 and 2 to

HIGH output.

**[[:SOURce]: SAFETY: STEP<n>: OSC: CHANnel:LOW< channel list >**

It sets the output status of scanning common test channel (RTN/LOW).

Example: Input command "**SAFE: STEP 6: OSC: CHAN: LOW (@2(2,4))**"

Description: It sets output channel status of scanning test in the main unit STEP 6 to channel 2 and 4 LOW output.

Example: Input command "**SAFE:STEP 6: OSC: CHAN: LOW (@(20))**"

Description: It sets output channel status of scanning test in the main unit STEP 6 is set BOX 2 original LOW output channel to OFF.

**[[:SOURce]:SAFETY:PRESet:TIME:PASS < numeric value >**

This command sets the buzzer sound continuous time when the main unit passes. The unit is in second (s).

Range: 0.2~99.9.

Example: Input command "**SAFE:PRES:TIME:PASS 3**"

Description: It sets the buzzer sound continuous time to 3 seconds when the main unit passes.

**[[:SOURce]:SAFETY:PRESet:TIME:PASS?**

This command queries the buzzer sound continuous time when the main unit passes.

Example: Input command "**SAFE:PRES:TIME:PASS?**"

Return message "**3.000000E+00**"

Description: It returns "**3.000000E+00**" to indicate the buzzer sound continuous time is 3 seconds when the main unit passes.

Example: Input command "**SAFE:PRES:TIME:PASS?**"

Return message "**3.000000E+00**"

Description: It returns "**3.000000E+00**" to indicate the buzzer sound continuous time is 3 seconds when the main unit passes.

**[[:SOURce]:SAFETY:PRESet:TIME:STEP < numeric value > | KEY**

This command sets the interval time between step and step, or the next start command to execute the next step under GENERAL MODE. The unit is in second (s).

Range: KEY or 0.1~99.9.

Example: Input command "**SAFE:PRES:TIME:STEP 0.5**"

Description: It sets the interval time between step and step to 0.5 second.

**[[:SOURce]:SAFETY:PRESet:TIME:STEP?**

This command queries the interval time between step and step, the return value is KEY or the value in second.

Example: Input command "**SAFE:PRES:TIME:PASS?**"

Return message "**5.000000E-01**"

Description: It returns "**5.000000E-01**" to indicate the interval time between step and step is 0.5 second.

**[[:SOURce]:SAFETY:PRESet:AC:FREQuency < numeric value >**

This command sets the output voltage frequency as testing AC withstand voltage under GENERAL MODE and BREAKDOWN MODE. The unit is Hertz (Hz).

Range: 50~600

Example: Input command "**SAFE:PRES:AC:FREQ 60**"

Description: It sets the output voltage frequency of testing AC withstand voltage in



the main unit to 60Hz.

**[[:SOURce]:SAFEty:PRESet:AC:FREQuency?**

This command queries output voltage frequency of testing AC withstand voltage.

Example: Input command "**SAFE:PRES:AC:FREQ?**"

Return message "**6.000000E+01**"

Description: It returns "**6.000000E+01**" to indicate output voltage frequency of testing AC withstand voltage is 60Hz.

**[[:SOURce]:SAFEty:PRESet:WRANge[:AUTO] < boolean > | ON | OFF**

This command sets if withstand voltage auto range function is ON or OFF under GENERAL MODE.

Example: Input command "**SAFE:PRES:WRAN ON**"

Description: It sets withstand voltage auto range function to ON.

**[[:SOURce]:SAFEty:PRESet:WRANge[:AUTO]?**

This command queries if withstand voltage auto range function is ON or OFF, return 1 or 0. .

Example: Input command "**SAFE:PRES:WRAN?**"

Return message "**1**"

Description: It returns "**1**" to indicate withstand voltage auto range function is ON.

**[[:SOURce]:SAFEty:PRESet:AGC[:SOFTware] < boolean > | ON | OFF**

This command sets if software AGC is ON or OFF under GENERAL MODE.

Example: Input command "**SAFE:PRES:AGC ON**"

Description: It sets software AGC in the main unit to ON.

**[[:SOURce]:SAFEty:PRESet:AGC[:SOFTware]?**

This command queries if software AGC is ON or OFF.

Example: Input command "**SAFE:PRES:AGC?**"

Return message "**1**"

Description: It returns "**1**" to indicate software AGC in the main unit is ON.

**[[:SOURce]:SAFEty:PRESet:RJUDgmnet < boolean > | ON | OFF**

This command sets if Ramp Judg. ON or OFF under GENERAL MODE.

Example: Input command "**SAFE:PRES:RJUD ON**"

Description: It sets Ramp Judg. ON in the main unit.

**[[:SOURce]:SAFEty:PRESet:RJUDgment?**

This command queries Ramp Judg. ON or OFF.

Example: Input command "**SAFE:PRES:RJUD?**"

Return message "**1**"

Description: It returns "**1**" to indicate Ramp Judg. ON.

**[[:SOURce]:SAFEty:PRESet:GFI ON/OFF/FLOAT**

This command is used for GFI setting under GENERAL MODE and BREAKDOWN MODE.

Example: Input command "**SAFE:PRES:GFI ON**"

Description: It sets GFI ON.

**[[:SOURce]:SAFEty:PRESet:GFI?**

This command queries GFI setting.

Example: Input command "**SAFE:PRES:GFI?**"

Return message "ON"  
Description: It indicates GFI ON.

**[:SOURce]:SAFETy: BREAkdown:MODE?**

This command queries which mode for setting at present under BREAKDOWN MODE.

Example: Input command "**SAFE: BRE:MODE?**"  
Return message "AC"

Description: It indicates AC MODE.

**[:SOURce]:SAFETy: BREAkdown:AC[:LEVel] < start V >, < end V >**

This command sets start voltage and end voltage of AC MODE under BREAKDOWN MODE. The unit is Volt (V).

Range: Start voltage: 50V ~ end voltage  
End voltage: start voltage ~ 5000V

Example: Input command "**SAFE: BRE:AC 500,1000**"

Description: It sets start voltage 500V and end voltage 1000V of AC MODE in the main unit.

**[:SOURce]:SAFETy: BREAkdown:AC[:LEVel]?**

This command queries start voltage and end voltage of AC MODE under BREAKDOWN MODE. The unit is Volt (V).

Example: Input command "**SAFE: BRE:AC?**"  
Return message "+5.000000E+02,+1.000000E+03"

Description: It indicates start voltage 500V and end voltage 1000V of AC MODE.

**[:SOURce]:SAFETy: BREAkdown:AC:LIMit[:HIGH] < numeric value >**

This command sets leakage current high limit of AC MODE under BREAKDOWN MODE. The unit is Ampere (A).

Range: 0.000001~0.1

Example: Input command "**SAFE: BRE:AC:LIM 0.01**"

Description: It sets leakage current high limit of AC MODE in the main unit to 10mA.

**[:SOURce]:SAFETy: BREAkdown:AC:LIMit[:HIGH]?**

This command queries leakage current high limit of AC MODE under BREAKDOWN MODE.

Example: Input command "**SAFE: BRE:AC:LIM?**"  
Return message "**1.000000E-02**"

Description: It returns "**1.000000E-02**" to indicate leakage current high limit of AC MODE in the main unit is 10mA.

**[:SOURce]:SAFETy: BREAkdown:AC:LIMit:LOW < numeric value >**

This command sets leakage current low limit of AC MODE under BREAKDOWN MODE.

Range: 0: OFF or 0.000001~0.1 (low limit value of leakage current ≤ high limit value of setting)

Example: Input command "**SAFE: BRE:AC:LIM:LOW 0.00001**"

Description: It sets leakage current low limit of AC MODE in the main unit to 0.01mA.

**[:SOURce]:SAFETy: BREAkdown:AC:LIMit:LOW?**

This command queries leakage current low limit of AC MODE under BREAKDOWN MODE. The unit is Ampere (A).

Example: Input command **“SAFE:BRE:AC:LIM:LOW?”**

Description: It returns **“1.000000E-05”** to indicate leakage current low limit of AC MODE in the main unit is 0.01mA.

**[[:SOURce]:SAFety:BREakdown:AC:LIMit:ARC[:LEVel] < numeric value >**

This command sets ARC detection value of AC MODE under BREAKDOWN MODE. The unit is Ampere (A).

Range: 0 or 0.001~0.02, 0 is for setting OFF.

Example: Input command **“SAFE:BRE:AC:LIM:ARC 0.004”**

Description: It sets ARC detection value of AC MODE in the main unit to 4mA.

**[[:SOURce]:SAFety:BREakdown:AC:LIMit:ARC[:LEVel]?]**

This command queries ARC detection value of AC MODE under BREAKDOWN MODE.

Example: Input command **“SAFE:BRE:AC:LIM:ARC?”**

Return message **“4.000000E-03”**

Description: It returns **“4.000000E-03”** to indicate ARC detection value of AC MODE in the main unit is 4.0mA.

**[[:SOURce]:SAFety:BREakdown:AC:LIMit:CORona < numeric value >**

This command sets Corona high limit of AC MODE under BREAKDOWN MODE. (This function is for 19055-C.)

Range: 0=OFF, 0.1-99.9

Example: Input command **“SAFE:BRE:AC:LIM: COR 20.2”**

Description: It sets Corona high limit of AC MODE in the main unit to **20.2**.

**[[:SOURce]:SAFety:BREakdiwn:AC:LIMit:CORona?]** (This function is for 19055-C.)

This command queries Corona high limit of AC MODE under BREAKDOWN MODE.

Example: Input command **“SAFE:BRE:AC:LIM:COR?”**

Return message **“+2.020000E+01”**

Description: It returns **“+2.020000E+01”** Corona high limit of AC MODE in the main unit is 20.2.

**[[:SOURce]:SAFety:BREakdown:AC:TIME[:TEST] < numeric value >**

This command sets test required time of each STEPs under BREAKDOWN MODE. The unit is second (s).

Range: 0.3~999.0

Example: Input command **“SAFE:BRE:AC:TIME 10”**

Description: It sets test required time of each STEPs in the main unit to 10.0 sec.

**[[:SOURce]:SAFety:BREakdown:AC:TIME[:TEST]?]**

This command queries test required time of each STEPs under BREAKDOWN MODE.

Example: Input command **“SAFE:BRE:AC:TIME?”**

Return message **“1.000000E+01”**

Description: It returns **“1.000000E+01”** to indicate test required time of each STEPs is 5 sec.

**[[:SOURce]:SAFety:BREakdown:AC:TIME:RAMP < numeric value >**

This command sets test rising to setting voltage required time of each STEPs under BREAKDOWN MODE. The unit is second (s).

Range: 0 or 0.1~999.0, 0 is for setting OFF.

Example: Input command **"SAFE:BRE:AC:TIME:RAMP 10"**

Description: It sets test rising to setting voltage required time of each STEPs in the main unit to 10.0 sec.

**[[:SOURce]:SAFEty:BREakdown:AC:TIME:RAMP?**

This command queries test rising to setting voltage required time of each STEPs under BREAKDOWN MODE.

Example: Input command **"SAFE:BRE:AC:TIME:RAMP?"**

Return message **"1.000000E+01"**

Description: It returns **"1.000000E+01"** to indicate test rising to setting voltage required time of each STEPs is 5 sec.

**[[:SOURce]:SAFEty:BREakdown:AC:CONTinue < boolean > | ON | OFF**

This command sets if continues to output while testing to the last STEP under BREAKDOWN MODE.

Example: Input command **"SAFE:BRE:AC:CONT ON"**.

Description: It sets to continue to output while testing to the last STEP.

**[[:SOURce]:SAFEty:BREakdown:AC:CONTinue?**

This command queries if continues to output while testing to the last STEP under BREAKDOWN MODE.

Example: Input command **"SAFE:BRE:AC:CONT?"**

Return message **"1"**

Description: It indicates to continue outputting while testing to the last STEP.

**[[:SOURce]:SAFEty:BREakdown:AC:STEP < numeric value >**

This command sets how many STEP require to test under BREAKDOWN MODE.

Range: 2~999

Example: Input command **"SAFE:BRE:AC:STEP 10"**

Description: It sets to test 10 STEPs in the main unit.

**[[:SOURce]:SAFEty:BREakdown:AC:STEP?**

This command queries how many STEP require to test under BREAKDOWN MODE.

Example: Input command **"SAFE:BRE:AC:STEP?"**

Return message **"10"**

Description: It returns **"10"** to indicate 10 STEPs had been tested in the main unit.

**[[:SOURce]:SAFEty:BREakdown:DC[:LEVel] < start V >,<end V>**

This command sets start voltage and end voltage of DC MODE under BREAKDOWN MODE. The unit is Volt (V).

Range: Start voltage: 50V ~ end voltage

End voltage: start voltage ~ 6000V

Example: Input command **"SAFE:BRE:DC 500,1000"**

Description: It sets start voltage 500V and end voltage 1000V of AC MODE in the main unit.

**[[:SOURce]:SAFEty:BREakdown:DC[:LEVel]?**

This command queries start voltage and end voltage of DC MODE under BREAKDOWN MODE. The unit is Volt (V).

Example: Input command **"SAFE:BRE:DC?"**

Return message **"+5.000000E+02,+1.000000E+03"**

Description: It indicates start voltage 500V and end voltage 1000V of DC MODE.

**[[:SOURce]:SAFEty:BREakdown:DC:LIMit[:HIGH] < numeric value >**

This command sets leakage current high limit of DC MODE under BREAKDOWN MODE. The unit is Ampere (A).

Range: 0.000000001~0.025

Example: Input command "**SAFE:BRE:DC:LIM 0.01**"

Description: It sets leakage current high limit of DC MODE in the main unit to 10mA.

**[[:SOURce]:SAFEty:BREakdown:DC:LIMit[:HIGH]?**

This command queries leakage current high limit of DC MODE under BREAKDOWN MODE.

Example: Input command "**SAFE:BRE:DC:LIM?**"

Return message "**1.000000E-02**"

Description: It returns "**1.000000E-02**" to indicate leakage current high limit of DC MODE is 10mA.

**[[:SOURce]:SAFEty:BREakdown:DC:LIMit:LOW < numeric value >**

This command sets leakage current low limit of DC MODE under BREAKDOWN MODE.

Range: 0:OFF or 0.0000001~0.025 (low limit value of leakage current  $\leq$  high limit value of setting)

Example: Input command "**SAFE:BRE:DC:LIM:LOW 0.00001**"

Description: It sets leakage current low limit of DC MODE in the main unit to 0.01mA.

**[[:SOURce]:SAFEty:BREakdown:DC:LIMit:LOW?**

This command queries leakage current low limit of DC MODE under BREAKDOWN MODE. The unit is Ampere (A).

Example: Input command "**SAFE:BRE:DC:LIM:LOW?**"

Return message "**1.000000E-05**"

Description: It returns "**1.000000E-05**" to indicate leakage current low limit of DC MODE in the main unit is 0.01mA.

**[[:SOURce]:SAFEty:BREakdown:DC:LIMit:ARC[:LEVel] < numeric value >**

This command sets ARC detection value of DC MODE under BREAKDOWN MODE. The unit is Ampere (A).

Range: 0 or 0.001~0.01, 0 is for setting OFF.

Example: Input command "**SAFE:BRE:DC:LIM:ARC 0.004**"

Description: It sets ARC detection value of DC MODE in the main unit to 4mA.

**[[:SOURce]:SAFEty:BREakdown:DC:LIMit:ARC[:LEVel]?**

This command queries ARC detection value of DC MODE under BREAKDOWN MODE.

Example: Input command "**SAFE:BRE:DC:LIM:ARC?**"

Return message "**4.000000E-03**"

Description: It returns "**4.000000E-03**" to indicate ARC detection value of DC MODE in the main unit is 4.0mA.

**[[:SOURce]:SAFEty:BREakdown:DC:LIMit:CORona < numeric value >**

This command sets Corona high limit value of DC MODE under BREAKDOWN MODE. (This function is for 19055-C.)

Range: 0=OFF, 0.1-99.9

Example: Input command "**SAFE:BRE:DC:LIM: COR 20.2**"

Description: It sets Corona high limit value of DC MODE in the main unit to **20.2**.

**[[:SOURce]:SAFEty:BREakdiwn:DC:LIMit:CORona?** (This function is for 19055-C.)

This command queries Corona high limit value of DC MODE under BREAKDOWN MODE.

Example: Input command "**SAFE:BRE:DC:LIM:COR?**"

Return message "**+2.020000E+01**"

Description: It returns "**+2.020000E+01**" to indicate Corona high limit value of DC MODE in the main unit is 20.0.

**[[:SOURce]:SAFEty:BREakdown:DC:TIME[:TEST] < numeric value >**

This command sets test required time of each STEPs under BREAKDOWN MODE. The unit is second (s).

Range: 0.3~999.0

Example: Input command "**SAFE:BRE:DC:TIME 10**"

Description: It sets test required time of each STEPs in the main unit to 10.0sec.

**[[:SOURce]:SAFEty:BREakdown:DC:TIME[:TEST]?**

This command queries test required time of STEP under BREAKDOWN MODE.

Example: Input command "**SAFE:BRE:DC:TIME?**"

Return message "**1.000000E+01**"

Description: It returns "**1.000000E+01**" to indicate test required time of each STEPs in the main unit is 5 sec.

**[[:SOURce]:SAFEty:BREakdown:DC:TIME:DWELI < numeric value >**

This command sets dwell time of each STEPs under BREAKDOWN MODE. The unit is second (s).

Range: 0 or 0.1~999.0, 0 indicates without dwell time.

Example: Input command "**SAFE:BRE:DC:TIME:DWEL 10**"

Description: It sets dwell time of each STEPs in the main unit to 10.0 sec.

**[[:SOURce]:SAFEty:BREakdown:DC:TIME:DWELI?**

This command queries dwell time of STEP under BREAKDOWN MODE.

Example: Input command "**SAFE:BRE:DC:TIME:DWEL?**"

Return message "**1.000000E+01**"

Description: It returns "**1.000000E+01**" to indicate dwell time of each STEP in the main unit is 5 sec.

**[[:SOURce]:SAFEty:BREakdown:DC:TIME:RAMP < numeric value >**

This command sets test rising to setting voltage required time of each STEPs under BREAKDOWN MODE. The unit is second (s).

Range: 0 or 0.1~999.0, 0 is for setting OFF.

Example: Input command "**SAFE:BRE:DC:TIME:RAMP 10**"

Description: It sets test rising to setting voltage required time of each STEPs in the main unit to 10.0 sec.

**[[:SOURce]:SAFEty:BREakdown:DC:TIME:RAMP?**

This command queries test rising to setting voltage required time of each STEPs under BREAKDOWN MODE.

Example: Input command "**SAFE:BRE:DC:TIME:RAMP?**"

Return message "**1.000000E+01**"

Description: It returns "**1.000000E+01**" to indicate test rising to setting voltage required time of each STEPs is 5 sec.

**[[:SOURce]:SAFety:BReakdown:DC:CONTinue < *boolean* > / ON / OFF**

This command sets if continues to output while testing to the last STEP under BREAKDOWN MODE.

Example: Input command "**SAFE:BR:DC:CONT ON**".

Description: It sets to continue to output while testing to the last STEP.

**[[:SOURce]:SAFety:BReakdown:DC:CONTinue?**

This command queries if continues to output while testing to the last STEP under BREAKDOWN MODE.

Example: Input command "**SAFE:BR:DC:CONT?**"

Return message "**1**"

Description: It indicates to continue outputting while testing to the last STEP.

**[[:SOURce]:SAFety:BReakdown:DC:STEP < *numeric value* >**

This command sets how many STEPs required to test under BREAKDOWN MODE.

Range: 2~999

Example: Input command "**SAFE:BR:DC:STEP 10**"

Description: It sets 10 STEPs for testing in the main unit.

**[[:SOURce]:SAFety:BReakdown:DC:STEP?**

This command queries how many STEPs to test under BREAKDOWN MODE.

Example: Input command "**SAFE:BR:DC:STEP?**"

Return message "**10**"

Description: It returns "**10**" to indicate 10 STEPs for testing in the main unit.

**TRIGger:SOURce:EXTernal:STATe < *boolean* > / ON / OFF**

This command sets if START KEY is blocked under remote status when the setting is used in GENERAL MODE and BREAKDOWN MODE.

When the parameter is 1 and under remote status, it won't block START KEY.

When the parameter is 0 and under remote status, it will block START KEY.

Example: Input command "**TRIG:SOUR:EXT:STAT 0**"

Description: It sets the main unit will block START KEY under remote status.

**TRIGger:SOURce:EXTernal:STATe?**

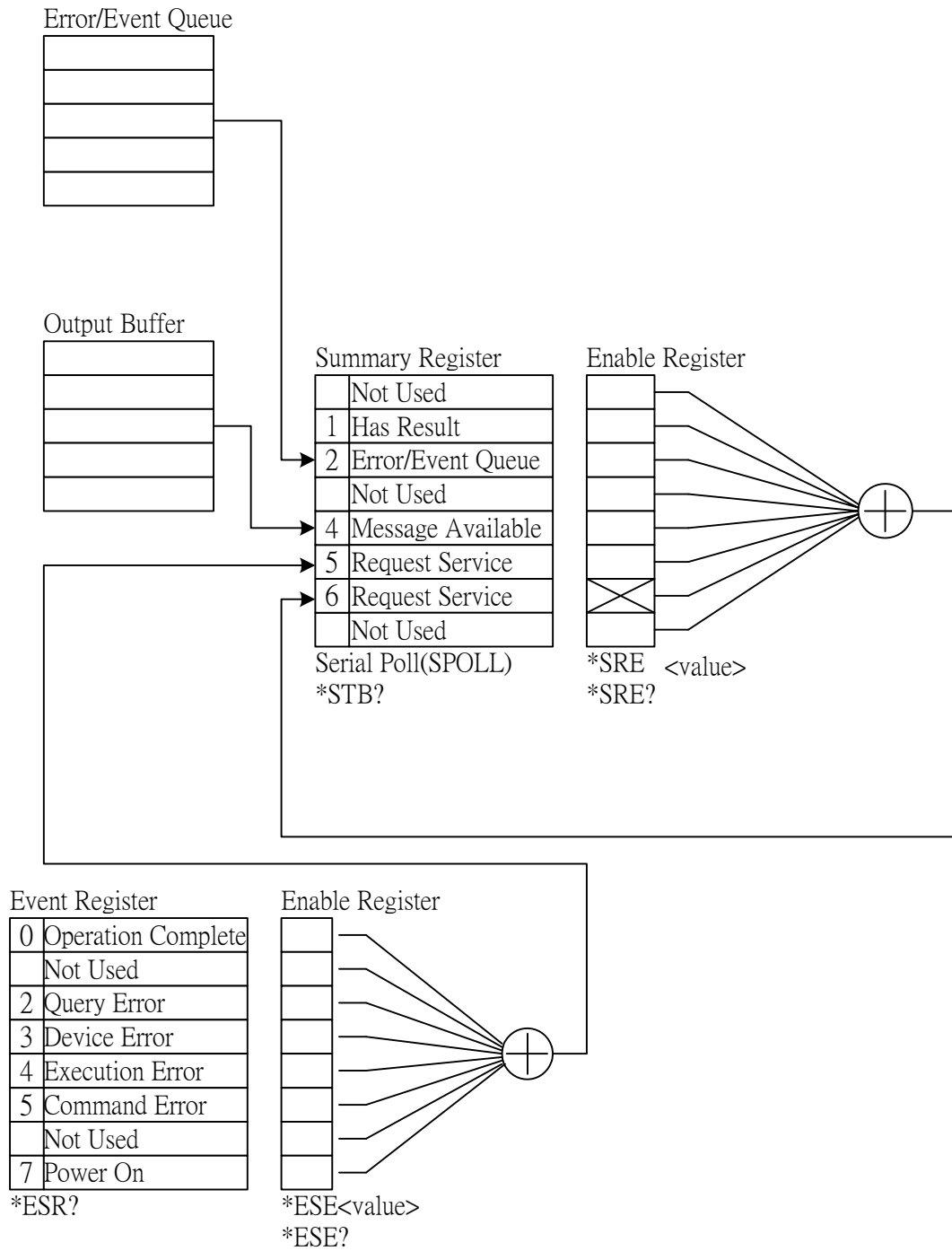
This command queries if START KEY is blocked under remote status when the setting is used in GENERAL MODE and BREAKDOWN MODE.

Example: Input command "**TRIG:SOUR:EXT:STAT?**"

Return message "**0**"

Description: It returns "**0**" to indicate the main unit will block START KEY under remote status.

### 5.4.3 SCPI Status System





## 5.5 Error Message

- Error messages are saved in error queue which access by FIFO method. The first returned error message is the first being saved.
- When the error message is over 30, the last position will save -350, "Queue overflow". The error queue can't save error message any more till there is error message out.
- When there is no error occurred, the first position will save +0, "No error" in error queue.

- 102 Syntax error  
Syntax error, it usually includes unallowed character symbol in command.
- 103 Invalid separator  
Invalid separator characters are found in command string.
- 108 Parameter not allowed  
The device receives unallowed parameter.
- 109 Missing parameter  
Parameter is missed
- 112 Program mnemonic too long  
Simple command program header over twelve characters
- 113 Undefined header  
The device received undefined program header.
- 114 Header suffix out of range  
The value of a numeric suffix attached to a program mnemonic is out of range.
- 120 Numeric data error  
The numerical parameter is error.
- 131 Invalid suffix  
The illegal variable
- 140 Character data error  
The input character data is error.
- 151 Invalid string data  
Uncompleted string data, usually double quotation is missed.
- 158 String data not allowed  
The device is received disallowed string data.
- 170 Expression error  
The device is received uncompleted parameter data, such as missing the right parenthesis.
- 200 Execution error  
Command execution error
- 203 Command protected  
The device does not receive this command.
- 221 Settings conflict  
The device is occupied and the command is not received.
- 222 Data out of range  
The parameter value is out of range.
- 223 Too much data  
Received string length is over, can't be executed.
- 290 Memory use error  
Save or read memory error
- 291 Out of memory  
The data cannot store because the main memory is full.
- 292 Referenced name does not exist  
Referenced name does not exist.

- 293 Referenced name already exist  
Referenced name is already existed.
- 350 Queue overflow  
Error message overflow
- 361 Parity error in program message  
The parity is error.
- 365 Time out error  
The device isn't received end character within a certain time.
- 363 Input buffer overrun  
The input buffer is out of range.
- 400 Queue error  
The output buffer is out of range.
- 410 Query INTERRUPTED  
When received a query command, you don't read out the query result and then received a query command at once. The query will be interrupted.
- 420 Query UNTERMINATED  
There is no data in queue, meanwhile read the command of output queue data.

## 5.6 Basic Example

### 5.6.1 GPIB

#### ■ Example of GPIB Basic

```

REM-----
REM   Please run the ULI file before this program.
REM   This program is that getting results through GPIB from the device.
REM   GPIB address is 3
REM-----

CLS
PRINT "Program is running..."
OPEN "GPIB0" FOR OUTPUT AS #1           `open #1 for output (write)
OPEN "GPIB0" FOR INPUT AS #2           `open #2 for input (read)

PRINT #1, "ABORT"                       `initializing message.
PRINT #1, "GPIBEOS IN LF"               `set the end code

PRINT #1, "OUTPUT 3;:SOURce:SAFety:STOP" `send STOP command to device 3
PRINT #1, "OUTPUT 3;:SOURce:SAFety:SNUMBer?"
PRINT #1, "ENTER 3"
INPUT #2, STEPNUM%

PRINT "DEL STEPS"
IF STEPNUM% > 0 THEN
  FOR I% = STEPNUM% TO 1 STEP - 1
    PRINT #1, "OUTPUT 3;:SOURce:SAFety:STEP", I%, ":DElete"
  NEXT I%
END IF                                     `clear all steps

PRINT "SET STEPS"
PRINT #1, "OUTPUT 3;:SOURce:SAFety:STEP 1:DC 1000"
PRINT #1, "OUTPUT 3;:SOURce:SAFety:STEP 1:DC:LIMit 0.004"
PRINT #1, "OUTPUT 3;:SOURce:SAFety:STEP 1:DC:TIME 2"

PRINT #1, "OUTPUT 3;:SOURce:SAFety:STEP 2:AC 1000"
PRINT #1, "OUTPUT 3;:SOURce:SAFety:STEP 2:AC:LIMit 0.02"
PRINT #1, "OUTPUT 3;:SOURce:SAFety:STEP 2:AC:TIME:TEST 3"

PRINT #1, "OUTPUT 3;:SOURce:SAFety:STOP"
PRINT #1, "OUTPUT 3;:SOURce:SAFety:START" `start test

STATUS$ = "RUNNING"
WHILE STATUS$ <> "STOPPED"
  PRINT #1, "OUTPUT 3;:SAFety:STATus?"
  PRINT #1, "ENTER 3"
  INPUT #2, STATUS$
  PRINT STATUS$

  IF STATUS$ = "STOPPED" THEN
    PRINT #1, "OUTPUT 3;:SOURce:SAFety:STOP"
    PRINT #1, "OUTPUT 3;:SAFety:RESult:ALL:OMET?"
    PRINT #1, "ENTER 3"

    FOR J% = 1 TO STEPNUM%
      INPUT #2, RESULT$
    
```

```

        PRINT "STEP", J%, ":", RESULT$
    NEXT J%

    PRINT
    PRINT #1, "OUTPUT 3;:SAFETY:RESULT:ALL:MMET?"
    PRINT #1, "ENTER 3"

    FOR J% = 1 TO STEPNUM%
        INPUT #2, RESULT$
        PRINT "STEP", J%, ":", RESULT$
    NEXT J%
    END IF
WEND

PRINT #1, "OUTPUT 3;:SOURCE:SAFETY:STOP"
CLOSE : SYSTEM
END

```

■ **Saved and recalled from GPIB Basic example**

```

REM -----
REM   Program compiled using Microsoft version 1.1 (MS-DOS 6.22)
REM   Please run the ULI file before this program
REM   Device GPIB address is 3
REM -----

OPEN "GPIB0" FOR OUTPUT AS #1      'open #1 for output (write)
OPEN "GPIB0" FOR INPUT AS #2      'open #2 for input (read)
PRINT #1, "ABORT"                  'initializing complete
PRINT #1, "GPIBEOS IN LF"         'set the end code

PRINT #1, "OUTPUT 3;SOURCE:SAFETY:STEP1:AC:LEVEL 500"
PRINT #1, "OUTPUT 3;SOURCE:SAFETY:STEP1:AC:LIMIT:HIGH 0.04"

PRINT #1, "OUTPUT 3;SOURCE:SAFETY:STEP2:AC:LEVEL 5000"
PRINT #1, "OUTPUT 3;SOURCE:SAFETY:STEP2:AC:LIMIT:HIGH 0.04"

PRINT #1, "OUTPUT 3;*SAV 1"        'Work memory were Stored in memory 1
PRINT #1, "OUTPUT 3;MEMORY:DEFINE AAA,1" 'Define the name of memory 1 is AAA

PRINT #1, "OUTPUT 3;SOURCE:SAFETY:STEP3:DC:LEVEL 700"
PRINT #1, "OUTPUT 3;SOURCE:SAFETY:STEP3:DC:LIMIT:HIGH 0.01"

PRINT #1, "OUTPUT 3;SOURCE:SAFETY:STEP4:IR:LEVEL 800"
PRINT #1, "OUTPUT 3;SOURCE:SAFETY:STEP4:IR:LIMIT:HIGH 5000000"

PRINT #1, "OUTPUT 3;*SAV 3"        'Work memory were Stored in memory 3
PRINT #1, "OUTPUT 3;MEMORY:DEFINE BBB,3" 'Define the name of memory 3 is BBB

PRINT #1, "OUTPUT 3;*RCL 1"       'Recall the memory 1

CLOSE : SYSTEM
END

```

### ■ Using status reporting from GPIB Basic example

```

REM-----
REM   Please run the ULI file before this program.
REM   This program is that getting results through GPIB from the device.
REM   Device GPIB address is 3
REM-----

CLS
PRINT "Program is running..."
OPEN "GPIB0" FOR OUTPUT AS #1           'set the talker
OPEN "GPIB 0" FOR INPUT AS #2         'set the listener

REM define the SRQ-handling routine
ON PEN GOSUB MySRQRoutine

REM Enable the on SRQ functionality
PEN ON

PRINT #1, "ABORT"                      'initializing complete
PRINT #1, "GPIBEOS IN LF"              'set the end code
PRINT "waiting for SRQ from device"
PRINT #1, "OUTPUT 3;:SOURCE:SAFETY:STOP" 'STOP the Device

PRINT #1, "OUTPUT 3;*SRE 32"           'set status enable register
PRINT #1, "OUTPUT 3;*ESE 60"          'set standard enable register

PRINT #1, "OUTPUT 3;:sdf"              'send undefined command
FOR I% = 1 TO 10000
    PRINT "Please wait for SRQ ", I%
NEXT I%
PRINT "Program is stopped!"

GOTO END1

MySRQRoutine:                          'SRQ interrupt
    PEN OFF
    PRINT "Running the SRQ"
    PRINT #1, "OUTPUT 3;*ESR?"
    PRINT #1, "ENTER 3"
    INPUT #2, C%                        'get the questionable state

    IF C% = 32 THEN
        PRINT "All Pass"
    ELSE
        PRINT " Fail "
    END IF                              'End of SRQ interrupt

END1:
CLOSE : SYSTEM
END

```

## 5.6.2 Example of RS232 Basic

```

REM-----
REM   Program compiled using Microsoft version 1.1(MS-DOS 6.22)
REM   RS232 example program
REM-----

OPEN "COM1:9600,N,8,1,LF" FOR RANDOM AS #1      'open serial port 2 as device
1
PRINT #1, "SOURce:SAFety:STOP"                'send "STOP" command to device

PRINT #1, "SOURce:SAFety:SNUMBer?"
INPUT #1, STEPNUM%

IF STEPNUM% > 0 THEN
  FOR I% = STEPNUM% TO 1 STEP - 1
    TEMP$ = INPUT$(LOC(1), 1)
    PRINT #1, "SOURce:SAFety:STEP", I%, ":DELeTe"      'clear all steps
data
  NEXT I%
END IF

PRINT #1, "SOURce:SAFety:STEP1:AC:LEVel 500"
PRINT #1, "SOURce:SAFety:STEP1:AC:LIMit:HIGH 0.003"
PRINT #1, "SOURce:SAFety:STEP1:AC:TIME:TEST 3"

PRINT #1, "SOURce:SAFety:STEP2:DC:LEVel 500"
PRINT #1, "SOURce:SAFety:STEP2:DC:LIMIT 0.003"
PRINT #1, "SOURce:SAFety:STEP2:DC:TIME 3"

PRINT #1, "SOURce:SAFety:STEP3:IR:LEVel 500"
PRINT #1, "SOURce:SAFety:STEP3:IR:LIMIT 300000"
PRINT #1, "SOURce:SAFety:STEP3:IR:TIME 3"

PRINT #1, "SOURce:SAFety:SNUMBer?"
INPUT #1, STEPNUM%

PRINT #1, "SOURce:SAFety:START"                'start test

STATUS$ = "RUNNING"
WHILE STATUS$ <> "STOPPED"                      'do while status is not stopped
  PRINT #1, "SOURce:SAFety:STATUS?"
  INPUT #1, STATUS$                            'read status

  IF STATUS$ = "STOPPED" THEN                  'if status is not TESTING
    PRINT #1, "SOURce:SAFety:STOP"            'send STOP command
    PRINT #1, "SAFety:RESult:ALL:OMET?"

    FOR J% = 1 TO STEPNUM%
      INPUT #1, RESULT$
      PRINT "STEP", J%, ":", RESULT$
    NEXT J%
    PRINT

    PRINT #1, "SAFety:RESult:ALL:MMET?"
    FOR J% = 1 TO STEPNUM%

```

```
        INPUT #1, RESULT$
        PRINT "STEP", J%, ":", RESULT$
    NEXT J%
END IF
WEND

PRINT #1, "SOURCE:SAFETY:STOP"
CLOSE #1
END
```





## 6. GPIB/RS232 Interface (IEEE-488.1)

### 6.1 Introduction

When 11.IEEE-488.1setting in SYSTEM SETUP is ON, GPIB/RS232 command list and add new command please refer the description in this chapter. Please see GPIB/RS232 command in *9032C User's Manual* for detail descriptions.

### 6.2 IEEE-488.1 Comamnd List

| Item | Command         | Parameter | Function   |
|------|-----------------|-----------|--|
| 1    | STOP            | X         | It stops the test.                               |
| 2    | TEST            | X         | It starts test function.                         |
| 3    | SHOW ( ? )      | {c}       | It sets the test value of inquiring.             |
| 4    | STEP ( ? )      | {n}       | It sets STEP.                                    |
| 5    | MODE ( ? )      | {n c}     | It sets test mode.                               |
| 6    | SOUR ( ? )      | {f}       | It sets the output voltage or current.           |
| 7    | VOLT ( ? )      | {f}       | It sets output voltage.                          |
| 8    | HILI ( ? )      | {f !*}    | It sets High Limit.                              |
| 9    | LOLI ( ? )      | {f !*}    | It sets Low Limit.                               |
| 10   | SARC ( ? )      | {f !*}    | It sets ARC.                                     |
| 11   | BOXN ( ? )      | {n}       | It sets Box number.                              |
| 12   | HICH ( ? )      | {n !*}    | It sets High Channel.                            |
| 13   | LOCH ( ? )      | {n !*}    | It sets Low Channel.                             |
| 14   | TIME ( ? )      | {f !*}    | It sets test time.                               |
| 15   | RAMP ( ? )      | {f !*}    | It sets voltage ramp time.                       |
| 16   | OFST ( ? )      | {c}       | Get offset                                       |
| 17   | *SAV            | {n}       | It saves the setting value.                      |
| 18   | *RCL            | {n}       | It reads the setting value.                      |
| 19   | CLER            | X         | It clears the memory.                            |
| 20   | *IDN ?          | X         | It queries the tester number.                    |
| 21   | *DDT ( ? )      | {n   c}   | It sets the response of Trigger command.         |
| 22   | *TRG            | X         | It executes Trigger command.                     |
| 23   | *RST            | X         | It resets the tester.                            |
| 24   | PSTR ( ? )      | {String}  | It sets Pause Mode Message.                      |
| 25   | MEAS : STEPnnn? | X         | It reads the test result data of specified STEP. |
| 26   | GTEC            | X         | It activates GET Cs function in OSC Mode.        |
| 27   | DWLL ( ? )      | {f !*}    | It sets DWELL time.                              |
| 28   | FALL ( ? )      | {f !*}    | It sets voltage fall time.                       |
| 29   | IRRNG ( ? )     | {n  c}    | It selects RANGE of IR mode.                     |
| 30   | CST ( ? )       | {f !*}    | It sets Cs value.                                |
| 31   | OPLI ( ? )      | {f !*}    | It sets Open Limit.                              |
| 32   | SHLI ( ? )      | {f !*}    | It sets Short Limit.                             |

|    |             |          |                                  |
|----|-------------|----------|----------------------------------|
| 33 | CRNA ( ? )  | {f !*}   | It sets CORONA Limit.            |
| 34 | FUNC ( ? )  | {String} | It sets General Breakdown Mode.  |
| 35 | BSTEP ( ? ) | {n}      | It sets step in Breakdown Mode.  |
| 36 | RELI ( ? )  | {f !*}   | It sets AC mode Real High Limit. |
| 37 | CONT(?)     | {n  c}   | It sets CONT in Breakdown Mode.  |

- Note**
- Parameter description:
    - x: no parameter required
    - n: indicates the integer
    - c: indicates mnemonic
    - !: indicates "\*" character of ASCII
  - It needs to give start voltage and end voltage under Breakdown Mode, for example, "SOUR 0.05,0.1" indicates start voltage 0.05kV and end voltage 0.1kV.

### 6.3 IEEE-488.1 New Add Command

#### 1. MODE ( ? ) {n|c}

Function: It sets MODE.

Parameter: Be able to use mnemonic or Mode number.

| Test Mode                | Mnemonic | Number |
|--------------------------|----------|--------|
| AC withstand voltage     | WA or A  | 1      |
| DC withstand voltage     | WD or D  | 2      |
| Insulation Resistance    | IR or I  | 3      |
| PAUSE                    | PA or P  | 5      |
| OSC Short/Open detection | OS or O  | 6      |

Description: If the test mode is changed, the test condition will be cleared and become initial value.

#### 2. HILI ( ? ) {f !\*}

Function: It sets High Limit value

Parameter: 1. "!!": Disable means no High Limit testing.

2. f: Please refer to each specification, for example: the specification os 9032C.

|                 |                              |
|-----------------|------------------------------|
| <b>WV Mode</b>  | f = 0.01 ~ 120.00 mA         |
| <b>WD Mode</b>  | f = 0.01 ~ 20.00 mA          |
| <b>IR Mode</b>  | f = 0 ~ 50000 MΩ, 0(OFF)     |
| <b>OSC Mode</b> | SHORT CHK.=0(OFF), 100%~500% |

Description: 1. It is disabled only under IR Mode.

2. If the High Limit is lower than Low Limit, the Low limit will be disabled under WV and WD Mode.

3. The setting value can not lower than Low Limit on IR Mode or it may cause Error 2.

4. HILO is for setting SHORT CHK. Range in OSC mode, its input value range is 1~5 (100%~500%).

5. f=0.01mA~120mA(voltage≤4kV), f=01mA~100mA(voltage > 4kV) in WV Mode.

**3. LOLI ( ? ) {f !\*}**

Function: It sets Low Limit value.

Parameter: Please refer to "HILI" command.

|          |                    |
|----------|--------------------|
| OSC Mode | OPEN CHK.=10%~100% |
|----------|--------------------|

Description: 1. It may be disabled in WV and WD Mode. The Low Limit can't larger than High Limit.

2. It can't be disabled in IR Mode, moreover High Limit is disabled when the setting is larger than High Limit.

3. LOLI is for setting OPEN CHK range in OSC Mode, its input value range is 0.1~1 (10%~100%).

**4. GETC**

Function: It activates GET Cs function in OSC Mode.

Parameter: None

Description: This command can be executed only when PROGRAM function table with setting OSC Mode.

**5. DWLL ( ? ) {f !\*}**

Function: It sets DWELL time.

Parameter: f : 0 ~ 999 second

Description: DWLL can be set only in testing DC withstand voltage.

**6. FALL ( ? ) {f !\*}**

Function: It sets the voltage fall time.

Parameter: f: 0 ~ 999 second

Description: Fall can be set in testing AC/DC/IR.

**7. IRRNG ( ? ) {n !c}**

Function: It selects RANGE in IR mode.

Parameter: 0 = AUTO  
 1 = 300nA  
 2 = 3uA  
 3 = 30uA  
 4 = 300uA  
 5 = 3mA  
 6 = 10mA

**8. CST(?) {f!\*}**

Function: It sets Cs value.

Parameter: AC|DC 0~100pF  
 OSC MODE 0.001~40nF

Description: It can be set only in AC/DC/OSC.

**9. OPLI(?) {f!\*}**

Function: It sets OPEN LIMIT value.

Parameter: 0.1~1

Description: It can be set only in AC/DC/OSC.

**10. SHLI(?) {f!\*}**

Function: It sets SHORT LIMIT value.

Parameter: 1.0~5.0

Description: It can be set only in AC/DC/OSC.

**11. CRNA(?) {f|\*}**

Function: It sets CORONA LIMIT value.

Parameter: 0~99.9

Description: It can be set only in AC/DC.

**12. FUNC(?) {string}**

Function: It sets General Breakdown Mode.

Parameter: General, Breakdown.

**13. BSTEP(?) {n}**

Function: It sets step value in Breakdown Mode.

Parameter: 2~999

Description: It can be set only in Breakdown Mode.

**14. RELI(?)**

Function: It sets Real High Limit value in AC Mode.

Parameter: 0~120mA

Description: It can be set only in AC Mode. 0~120mA (voltage  $\leq$  4kV), 0~100mA (voltage  $>$  4kV).

**15. CONT(?) {n|c}**

Function: It sets CONT. value of Breakdown Mode.

Parameter: 0, 1, ON and OFF

Description: It can be set only in Breakdown Mode.

## 7. Calibration Step

Before processing the calibration step in this section, the analyzer should be warm up at least 30 minutes.

- Open the top cover then power on after pressing **SW402**.
- When "MAIN MENU" displayed on the title bar, press numerical key corresponded to **CALIBRATION** will pop up the window of "ENTER CALIBRATION PASSWORD".
- Key in password "7" "9" "3" "1" by numerical key.
- After pressing **ENTER** to select "**DEVICE**" on the LCD will enter calibration step of the analyzer.
- Press **SW402** for once after the calibration is completed. It prevents the calibrated data from losing.

### Voltage Calibration (see section 7.2)

|     |     |               |             |        |       |
|-----|-----|---------------|-------------|--------|-------|
| ACV | 5kV | Offset (100V) | ;AC Voltage | OFFSET | point |
| ACV | 5kV | Full (4kV)    | ;AC Voltage | FULL   | point |
| DCV | 6kV | Offset (100V) | ;DC Voltage | OFFSET | point |
| DCV | 6kV | Full (4kV)    | ;DC Voltage | FULL   | point |
| IRV | 1kV | Offset (100V) | ;IR Voltage | OFFSET | point |
| IRV | 1kV | Full (1kV)    | ;IR Voltage | FULL   | point |

### Current Calibration (see section 7.3)

|     |       |                  |                   |        |       |
|-----|-------|------------------|-------------------|--------|-------|
| ACA | 3mA   | Offset (0.12mA)  | ;AC 2.99mA range  | OFFSET | point |
| ACA | 3mA   | Full (2.5mA)     | ;AC 2.99mA range  | FULL   | point |
| ACA | 30mA  | Offset (2.5mA)   | ;AC 29.99mA range | OFFSET | point |
| ACA | 30mA  | Full (25mA)      | ;AC 29.99mA range | FULL   | point |
| ACA | 100mA | Offset (25mA)    | ;AC 100.0mA range | OFFSET | point |
| ACA | 100mA | Full (37.5mA)    | ;AC 100.0mA range | FULL   | point |
| RCA | 3mA   | Offset (0.12mA)  | ;AC 2.99mA range  | OFFSET | point |
| RCA | 3mA   | Full (2.5mA)     | ;AC 2.99mA range  | FULL   | point |
| RCA | 30mA  | Offset (2.5mA)   | ;AC 29.99mA range | OFFSET | point |
| RCA | 30mA  | Full (25mA)      | ;AC 29.99mA range | FULL   | point |
| RCA | 100mA | Offset (25mA)    | ;AC 100.0mA range | OFFSET | point |
| RCA | 100mA | Full (37.5mA)    | ;AC 100.0mA range | FULL   | point |
| DCA | 0.3mA | Offset (0.012mA) | ;DC 299.9uA range | OFFSET | point |
| DCA | 0.3mA | Full (0.12mA)    | ;DC 299.9uA range | FULL   | point |
| DCA | 3mA   | Offset (0.12mA)  | ;DC 2.99mA range  | OFFSET | point |
| DCA | 3mA   | Full (2.5mA)     | ;DC 2.99mA range  | FULL   | point |
| DCA | 20mA  | Offset (2.5mA)   | ;DC 20mA range    | OFFSET | point |
| DCA | 20mA  | Full (10mA)      | ;DC 20mA range    | FULL   | point |

### Withstand Voltage Mode Arcing Calibration (see section 7.4)

|    |     |           |            |             |
|----|-----|-----------|------------|-------------|
| AC | ARC | 20mA(5mA) | ;AC Arcing | Calibration |
| DC | ARC | 10mA(5mA) | ;DC Arcing | Calibration |

### Insulation Resistance Mode Leakage Current Meter Calibration (see section 7.5)

|     |               |                         |                            |        |       |
|-----|---------------|-------------------------|----------------------------|--------|-------|
| IRR | 370M $\Omega$ | Offset (40M $\Omega$ )  | ;IR Resistor 370M $\Omega$ | OFFSET | point |
| IRR | 370M $\Omega$ | Full (250M $\Omega$ )   | ;IR Resistor 370M $\Omega$ | FULL   | point |
| IRR | 3.7G $\Omega$ | Offset (400M $\Omega$ ) | ;IR Resistor 3.7G $\Omega$ | OFFSET | point |
| IRR | 3.7G $\Omega$ | Full (2.5G $\Omega$ )   | ;IR Resistor 3.7G $\Omega$ | FULL   | point |

IRR 50GΩ Offset (4GΩ) ;IR Resistor 50GΩ OFFSET point  
 IRR 50GΩ Full (40GΩ) ;IR Resistor 50GΩ FULL point

## 7.1 Enter Calibration Menu

Press [3] [ENTER]  
 Display password  
 Press [7] [9] [3] [1] [ENTER]  
 Press Function key [DEVICE]

## 7.2 Voltage Calibration

### 7.2.1 ACV Calibration

Connect ACV high voltage meter to withstand tester or connecting 9102 to select ACV MODE [100MΩ].

Display ACV 5kV Offset (100V) ; ACV OFFSET POINT calibration  
 Press [STOP] [START] ; Read out the HV meter value  
 ; Example 0.092kV  
 Press [0] [.] [0] [9] [2] [ENTER]  
 Press [STOP] ; Stop ACV OFFSET POINT calibration  
 Press [△] key to display  
 Display ACV 5kV Full (4kV) ; ACV FULL POINT calibration  
 Press [STOP] [START] ; Read out the HV meter value  
 ; Example 4.052kV  
 Press [4] [.] [0] [5] [2] [ENTER]  
 Press [STOP] ; Stop ACV voltage calibration

### 7.2.2 DCV Calibration

Connect DCV high voltage meter to withstand tester or connecting 9102 to select DCV MODE [1.00GΩ].

Press [△] key to display  
 Display DCV 6kV Offset (100V) ; DCV OFFSET POINT calibration  
 Press [STOP] [START] ; Read out the HV meter value  
 ; Example 0.092kV  
 Press [0] [.] [0] [9] [2] [ENTER]  
 Press [STOP] ; Stop DCV OFFSET POINT calibration  
 Press [△] key to display  
 Display DCV 6kV Full (4kV) ; DCV FULL POINT calibration  
 Press [STOP] [START] ; Read out the HV meter value  
 ; Example 4.052kV  
 Press [4] [.] [0] [5] [2] [ENTER]  
 Press [STOP] ; Stop DCV Voltage calibration

## 7.2.3 IR Voltage Calibration

Connect DCV high voltage meter to withstand tester or connecting 9102 to select DCV MODE [1.00GΩ].

|         |                             |                                     |
|---------|-----------------------------|-------------------------------------|
| Press   | [△] key to display          |                                     |
| Display | IRV 1kV Offset (100V)       | ; IRV OFFSET POINT calibration      |
| Press   | [STOP] [START]              | ; Read out the HV meter value       |
|         |                             | ; Example 0.092kV                   |
| Press   | [0] [.] [0] [9] [2] [ENTER] |                                     |
| Press   | [STOP]                      | ; Stop IRV OFFSET POINT calibration |
| Press   | [△] key to display          |                                     |
| Display | IRV 1kV Full (1kV)          | ; IRV FULL POINT calibration.       |
| Press   | [STOP] [START]              | ; Read out the HV meter value       |
|         |                             | ; Example 1.052kV                   |
| Press   | [1] [.] [0] [5] [2] [ENTER] |                                     |
| Press   | [STOP]                      | ; Stop IR voltage calibration       |

## 7.3 Current Calibration

Caution: The dummy load must be between high potential terminal and input terminal of ammeter. Otherwise, the dangerous condition may be occurred.

### 7.3.1 AC Current Calibration

Connect high potential terminal of withstand voltage tester to 10MΩ load resistor, and connect to high potential terminal (HV1) of AC ammeter. However, connect low potential terminal (HV2) of withstand voltage tester to low potential terminal of AC ammeter.

|         |                             |   |
|---------|-----------------------------|---|
| Press   | [△] key to display          |   |
| Display | ACA 3mA offset (0.12mA)     | ; ACA 2.999mA range Offset point calibration      |
| Press   | [STOP] [START]              |   |
|         |                             | ; Read out the ammeter value                      |
|         |                             | ; Example 0.124mA                                 |
| Press   | [0] [.] [1] [2] [4] [ENTER] |   |
| Press   | [STOP]                      | ; Stop ACA 2.999mA range Offset point calibration |

Change the dummy load resistor to 500kΩ 50watt (or higher).

|         |                             |  |
|---------|-----------------------------|--|
| Press   | [△] key to display          |  |
| Display | ACA 3mA Full (2.5mA)        | ; ACA 2.999mA range Full point calibration   |
| Press   | [STOP] [START]              | ; Read out the ammeter value                 |
|         |                             | ; Example 2.903mA                            |
| Press   | [2] [.] [9] [0] [3] [ENTER] |  |
| Press   | [STOP]                      | ; Stop ACA 2.999mA range calibration         |
| Press   | [△] key to display          |  |
| Display | ACA 30mA Offset(2.5mA)      | ; ACA 30.00mA range Offset point calibration |

Press [STOP] [START] ; Read out the ammeter value  
; Example 2.903mA  
Press [2] [.] [9] [0] [3] [ENTER]  
Press [STOP] ; Stop ACA 30.00mA range Offset point calibration

Change the dummy load resistor to 50k $\Omega$  200watt (or higher).

Press [ $\Delta$ ] key to display  
Display ACA 30mA FULL(25mA) ; ACA 30.00mA range full point calibration.  
Press [STOP] [START] ; Read out the ammeter value  
; Example 24.50mA

Press [2] [4] [.] [5] [0] [ENTER]  
Press [STOP] ; Stop ACA 30.00mA range calibration

Press [ $\Delta$ ] key to display  
Display ACA 100mA Offset(25mA) ; ACA 100.0mA range Offset point calibration  
Press [STOP] [START] ; Read out the ammeter value  
; Example 24.50mA

Press [2] [4] [.] [5] [0] [ENTER]  
Press [STOP] ; Stop ACA 100.0mA range Offset point calibration

Change the dummy load resistor to 32k $\Omega$  200watt (or higher).

Press [ $\Delta$ ] key to display  
Display ACA 100mA FULL(37.5mA) ; ACA 100.0mA range full point calibration  
Press [STOP] [START] ; Read out the ammeter value  
; Example 37.12mA

Press [3] [7] [.] [1] [2] [ENTER]  
Press [STOP] ; Stop ACA 100.0mA range calibration

## 7.3.2 RCA Current Calibration

Connect high potential terminal of withstand voltage tester to 10M $\Omega$  load resistor, and connect to high potential terminal (HV1) of AC ammeter. However, connect low potential terminal (HV2) of withstand voltage tester to low potential terminal of AC ammeter.

Press [ $\Delta$ ] key to display  
Display RCA 3mA Offset (0.12mA) ; RCA 2.999mA range Offset point calibration  
Press [STOP] [START] ; Read out the ammeter value (Ex. 0.124mA)  
Press [0] [.] [1] [2] [4] [ENTER]  
Press [STOP] ; Stop RCA 2.999mA Offset point calibration

Change the dummy load resistor to 500k $\Omega$ /50watt (or higher).

Press [ $\Delta$ ] key to display  
Display RCA 3mA Full (2.5mA) ; RCA 2.999mA range Full point calibration  
Press [STOP] [START] ; Read out the ammeter value (Ex. 2.903mA)  
Press [2] [.] [9] [0] [3] [ENTER]  
Press [STOP] ; Stop RCA 2.999mA range calibration  
Press [ $\Delta$ ] key to display  
Display RCA 30mA Offset(2.5mA) ; RCA 30.00mA range Offset point calibration  
Press [STOP] [START] ; 2.903mA



Press [2] [.] [9] [0] [3] [ENTER]  
 Press [STOP] ; Stop RCA 30.00mA range Offset point calibration

Change the dummy load resistor to 50k $\Omega$ /200watt (or higher).

Press [ $\Delta$ ] key to display  
 Display RCA 30mA FULL (25mA) ; RCA 30.00mA range full point calibration  
 Press [STOP] [START] ; Read out the ammeter value (Ex. 24.50mA)  
 Press [2] [4] [.] [5] [0] [ENTER]  
 Press [STOP] ; Stop RCA 30.00mA range calibration  
 Press [ $\Delta$ ] key to display  
 Display RCA 100mA Offset(25mA) ; RCA 100.0mA range Offset point calibration  
 Press [STOP] [START] ; Read out the ammeter value (Ex. 24.50mA)  
 Press [2] [4] [.] [5] [0] [ENTER]  
 Press [STOP] ; Stop RCA 100.0mA range Offset point calibration

Change the dummy load resistor to 32k $\Omega$ /200watt (or higher).

Press [ $\Delta$ ] key to display  
 Display RCA 100mA FULL(37.5mA) ; RCA 100.0mA range full point calibration  
 Press [STOP] [START] ; Read out the ammeter value (Ex. 37.12mA)  
 Press [3] [7] [.] [1] [2] [ENTER]  
 Press [STOP] ; Stop RCA 100.0mA range calibration

### 7.3.3 DC Current Calibration

Connect high potential terminal of withstand voltage tester to 10M $\Omega$  load resistor, and connect to high potential terminal of AC ammeter. However, connect low potential terminal of withstand voltage tester to low potential terminal of DC ammeter or connect 9102 to select DCA MODE [10M $\Omega$ ].

Press [ $\Delta$ ] key to display  
 Display DCA 0.3mA Offset (0.012mA) ; DCA 299.9uA range Offset point calibration  
 Press [STOP] [START] ; Read out the ammeter value  
 ; Ex. 0.012mA

Press [0] [.] [1] [2] [4] [ENTER]  
 Press [STOP] ; Stop DCA 2.999uA Offset point calibration

Press [ $\Delta$ ] key to display  
 Display DCA 0.3mA FULL (0.12mA) ; DCA 299.9uA range full point calibration  
 Press [STOP] [START] ; Read out the ammeter value  
 ; Example 0.120mA

Press [0] [.] [1] [2] [0] [ENTER]  
 Press [STOP] ; Stop DCA 299.9uA range calibration

Press [ $\Delta$ ] key to display  
 Display DCA 3mA Offset (0.12mA) ; DCA 2.999mA range Offset point calibration  
 Press [STOP] [START] ; Read out the ammeter value  
 ; Example 0.124mA

Press [0] [.] [1] [2] [4] [ENTER]  
 Press [STOP] ; Stop DCA 2.999mA Offset point calibration

Change the load resistor to 500k $\Omega$  50watt (or higher) or connect 9102 to select DCA MODE

[500kΩ].

Press [△] key to display ; DCA 2.999mA range full point calibration.  
 Display DCA 3mA FULL (2.5mA) ; Read out the ammeter value  
 Press [STOP] [START] ; Example 2.039mA

Press [2] [.] [0] [3] [9] [ENTER]  
 Press [STOP] ; Stop DCA 2.999mA range calibration

Press [△] key to display ; DCA 20.00mA range Offset point calibration  
 Display DCA 20mA Offset (2.5mA) ; Read out the ammeter value  
 Press [STOP] [START] ; Example 2.903mA


Press [2] [.] [9] [0] [3] [ENTER]  
 Press [STOP] ; Stop DCA 20.00mA Offset point calibration

Change the load resistor to 100kΩ 100watt (or higher) or connect 9102 to select DCA MODE [100kΩ].

Press [△] key to display ; DCA 20.00mA range full point calibration  
 Display DCA 20mA Full (10mA) ; Read out the ammeter value  
 Press [STOP] [START] ; Example 10.01mA

Press [1] [0] [.] [0] [1] [ENTER]  
 Press [STOP] ; Stop DCA 20.00mA range calibration

## 7.4 Withstand Voltage Mode Arc Calibration

 **Notice** ARC calibration is very special, the high voltage terminal is positioned outside.

Press [△] key to display ; AC arc sensitivity calibration  
 Display AC ARC 40mA (5mA) ; AC withstand voltage arc  
 Press [STOP] [START] ; The high voltage output terminal series 250kΩ 5watt resistance by using two high voltage cables. The other high voltage cable (grounding cable) is as close as possible to the first cable but doesn't contact each other, and arc is produced.

Press [2] [.] [2] [ENTER] ; For example, 2.2mA is critical point of ARC FAIL and ARC PASS.  
 Press [STOP] ; Stop AC arc calibration

Press [△] key to display ; DC arc sensitivity calibration  
 Display DC ARC 12mA (5mA) ; DC withstand voltage arc  
 Press [STOP] [START] ; The high voltage output terminal series 250kΩ 5watt resistance by using two high voltage cables. The other high voltage cable (grounding cable) is as close as possible to the first cable but doesn't contact each other, and arc is produced.

Press [2] [.] [4] [ENTER] ; For example, 2.4mA is critical point of ARC FAIL and ARC PASS.

Press [STOP] ; Stop DC arc calibration

## 7.5 Resistor Calibration for Insulation Resistance Mode

The standard load resistor is connected between high potential terminal and low potential terminal of withstand voltage tester.

Press [△] key to display  
 Display IRR 370MΩ Offset (40MΩ) ; Connect IR standard resistor to 40MΩ  
 Press [STOP] [START] ; Read out the IRR value  
 ; If IR standard resistor is 40MΩ

Press [4][0] [ENTER]  
 Press [STOP] ; Stop

Change the standard load resistor to 250MΩ.

Press [△] key to display  
 Display IRR 370MΩ Full (250MΩ) ; Connect IR standard resistor to 250MΩ  
 Press [STOP] [START] ; Read out the IRR value  
 ; If IR standard resistor is 250MΩ

Press [2] [5] [0] [ENTER]  
 Press [STOP] ; Stop

Change the standard load resistor to 400MΩ.

Press [△] key to display.  
 Display IRR 3.7GΩ Offset (400MΩ) ; Connect IR standard resistor to 400MΩ  
 Press [STOP] [START] ; Read out the IRR value  
 ; If IR standard resistor is 400MΩ

Press [4] [0] [0] [ENTER]  
 Press [STOP] ; Stop

Change the standard load resistor to 2.5GΩ.

Press [△] key to display  
 Display IRR 3.7GΩ Full (2.5GΩ) ; Connect IR standard resistor to 2.5GΩ  
 Press [STOP] [START] ; Read out the IRR value  
 ; If IR standard resistor is 2.5GΩ

Press [2] [5] [0] [0] [ENTER]  
 Press [STOP] ; Stop

Change the standard load resistor to 4GΩ.

Press [△] key to display  
 Display IRR 50GΩ Offset (4GΩ) ; Connect IR standard resistor to 4GΩ  
 Press [STOP] [START] ; Read out the IRR value  
 ; If IR standard resistor is 4GΩ

Press [4] [0] [0] [0] [ENTER]  
 Press [STOP] ; Stop

Change the standard load resistor to 40GΩ.

Press [△] key to display

Display IRR 50G $\Omega$  Full (40G $\Omega$ ) ; Connect IR standard resistor to 40G $\Omega$   
Press [STOP] [START] ; Read out the IRR value

Press [4] [0] [0] [0] [ENTER] ; If IR standard resistor is 40G $\Omega$   
Press [STOP] ; Stop

## 7.6 Complete Calibration

Press [EXIT]  
[MENU]  
Go to MAIN MENU

## 8. Maintenance

### 8.1 General

Our warranty (at the front of the manual) attests the quality of materials and workmanship in our products. If malfunction should be suspected, or other information be desired applications engineers are available for technical assistance. Application assistance is available in the Taiwan by calling 886-3-3279999 and asking for applications support. For support outside of the Taiwan please contact your local Chroma distributor.

### 8.2 Battery Replacement

Batteries are included in the instrument. Please contact the service center for battery replacement.

**Note: Don't open the cover of the equipment for battery replacement by yourself.**

#### Battery Rating

1. Model number: CR2032L/1HF
2. Nominal voltage: 3V
3. Typical capacity: 225mAh

### 8.3 Instrument Return

Before returning an instrument to Chroma for service, please call our Service Department at 886-3-3279688 for return material authorization. It will be necessary to include a purchase order number to insure expedient processing, although units found to be in warranty will be repaired at no-charge. For any questions on repair costs or shipment instructions please contact our service department at the above number. To safeguard an instrument during storage and shipping please use packaging that is adequate to protect it from damage, i.e., equivalent to the original packaging and mark the box "Delicate Electronic Instrument".

Return material should be sent freight prepaid, to:

**Chroma Ate Inc.  
No. 66 Hwa-Ya 1st Rd., Hwa-Ya Technical Park,  
Kuei-Shan 33383, Taoyuan County, Taiwan  
Attention: Service Department**

**Note** ⓘ This machine is overweight, please use wheelbarrow to avoid injuring.





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