Chroma

HIPOT Analyzer
19056/19057/19057-20
User's Manual

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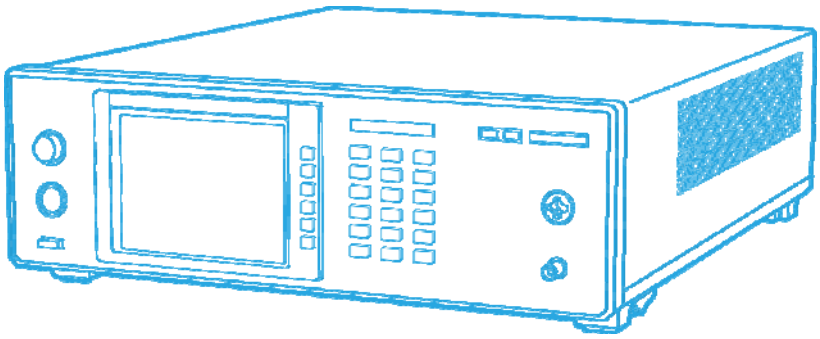

Version 1.1
July 2013

Legal Notices

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

Chroma ATE INC. makes no warranty of any kind with regard to this manual, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose. Chroma ATE INC. shall not be held liable for errors contained herein or direct, indirect, special, incidental or consequential damages in connection with the furnishing, performance, or use of this material.

CHROMA ATE INC.
66 Hwaya 1st Rd., Kueishan Hwaya Technology Park, Taoyuan County 33383, Taiwan

Warranty

All Chroma instruments are warranted against defects in material and workmanship for a period of one year after date of shipment. Chroma agrees to repair or replace any assembly or component found to be defective, under normal use during this period. Chroma's obligation under this warranty is limited solely to repairing any such instrument, which in Chroma's sole opinion proves to be defective within the scope of the warranty when returned to the factory or to an authorized service center. Purchaser is responsible for the shipping and cost of the service item to Chroma factory or service center. Shipment should not be made without prior authorization by Chroma.

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.

Any recommendations made by Chroma for use of its products are based upon tests believed to be reliable, but Chroma makes no warranty of the results to be obtained. This warranty is in lieu of all other warranties, expressed or implied, and no representative or person is authorized to represent or assume for Chroma any liability in connection with the sale of our products other than set forth herein.

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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^{6+}	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^{6+}	PBB	PBDE
PCBA	×	O	O	O	O	O
CHASSIS	×	O	O	O	O	O
ACCESSORY	×	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.

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.

www.chromaate.com Chroma

CE

Declaration of Conformity

For the following equipment :

Hipot Analyzer

(Product Name/ Trade Name)

19056, 19057, 19057-20

(Model Designation)

Chroma ATE Inc.

(Manufacturer Name)

66, Hwa-Ya 1st Rd., Hwa-Ya Technology Park, Kuei-Shan Hsiang, Taoyuan County 33383, Taiwan

(Manufacturer Address)

Is herewith confirmed to comply with the requirements set out in the Council Directive on the Approximation of the Laws of the Member States relating to Electromagnetic Compatibility (2004/108/EC), Low-voltage Directive (2006/95/EC). For the evaluation regarding the Directives, the following standards were applied :

EN 61326-1: 2006, Class A

EN 61000-3-2: 2006+A1: 2009+A2: 2009; EN 61000-3-3: 2008

EN 61326-1: 2006 (industrial locations)

EN 61000-4-2:2009; EN 61000-4-3:2006+A1:2008; EN 61000-4-4:2004;

EN 61000-4-5:2006; EN 61000-4-6:2009; EN 61000-4-8:1993+A1:2001;

EN 61000-4-11:2004

EN 61010-1: 2010

The following importer/manufacturer or authorized representative established within the EUT is responsible for this declaration :

Chroma ATE Inc.

(Company Name)

66, Hwa-Ya 1st Rd., Hwa-Ya Technology Park, Kuei-Shan Hsiang, Taoyuan County 33383, Taiwan

(Company Address)

Person responsible for this declaration:

Mr. Benjamin Huang

(Name, Surname)

T&M BU Division Vice President

(Position/Title)

Taiwan	**2011.11.28**	Benjamin Huang
(Place)	(Date)	(Legal Signature)

Safety Summary

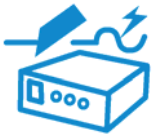
The following general safety precautions must be observed during all phases of operation, service, and repair of this instrument. Failure to comply with these precautions or specific WARNINGS given elsewhere in this manual will violate safety standards of design, manufacture, and intended use of the 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. The instrument should be used in an environment of good ventilation.

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. The output can up to 10kV~20kV voltage.
2. Touching the connected circuit or output terminal on the front or rear panel when the 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.
	**High temperature:** This symbol indicates the temperature is now higher than the acceptable range of human. Do not touch it to avoid any personal injury.
	**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.
WARNING	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.
CAUTION	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.
Notice	This indicates important information or tips for the procedures and applications, etc. The contents should be read carefully.

Inspection and Examination

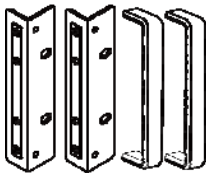
Before the instrument exit the factory, we have a series of inspection and measurement on mechanical and electrical characteristics. Make sure its function of operating for the quality warranty of the product. As soon as the instrument is unpacked, inspect for any damage that may have occurred in transit. 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



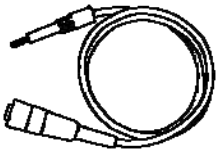
Rack and Handle

Quick Start Guide

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 x 1

■ LOW CONTACT used test cable x 1

■ 6.3A fuse x 2

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

Dangerous Operation

1. When the instrument is under output voltage, 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 connected 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.

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

Storage, Freight, Maintenance & Cleaning

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

Freight
Please use the original packing material when moving 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.

Cleaning
Remove all connected wires and cables on the instrument before cleaning. Use a brush gently to clean the dust on it. For internal cleaning, use a low-pressure air gun to vacuum the dust inside or send it back to the distributors or agents of Chroma for cleaning.

Revision History

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

Date	Version	Revised Sections
Jan. 2012	1.0	Complete this manual.
Jul. 2013	1.1	Modify the description of Note in the chapter of *“Specification”*.

Table of Contents

1. Introduction

1.1 An Overview of Product

Chroma 19056/19057 HIPOT Analyzer series is the equipment which designed for testing and analyzing Extra High Voltage(EHA) withstand voltage. The instrument supports 10kVac/12kVdc/20kVdc with AC20mA/DC10mA maximum output. In basic tests of AC/DC withstand voltage and insulation resistance, contact check in production line testing, except for the original Open Short Check(OSC) design with patent, the High Voltage Contact Check(HVCC) will be added to promote test reliability and efficiency.

The aspect of withstand voltage testing, the 19056 output power is AC: 200VA(10kV, 20mA), DC of 19057: 120VA(12kV, 10mA), DC of 19057-20: 100VA(20kV, 5mA). Therefore, it is for withstand test of electronic, electromechanical and component.

The aspect of insulation resistance testing, the range of the analyzer can be tested from 0.1MΩ to 50GΩ and test voltage from 100V to 5000V. It can be set arbitrarily and only for 19057/19057-20.

In the aspect of Open Short Check(OSC) testing, test if capacitance is short or open before testing high voltage. Be sure the DUT good contact then process high voltage test (this function is only for 19056).

In the aspect of High Voltage Contact Check (HVCC), proceed contact check simultaneously for the component with high insulation capability under outputting high voltage. It avoids bad contact component to regard as good product while testing with high voltage.

In the aspect of High Frequency Contact Check (HFCC), test if DUT with small capacitance is short circuit or open circuit before proceeding high voltage test. To ensure the DUT with good contact and then proceed 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.

The tester is equipped with judgment device of good and no good products, signal output of test result and remote control device. It is also helpful for RS232 interface, HANDLER interface and GPIB interface of automatic test system. The above equipment make high efficient and accurate tests for electromechanical, and electronic and component.

1.2 Feature

- High Voltage Contact Check(HVCC) and High Frequency Contact Check (HFCC) design
- Open/Short Check(OSC) patent design (19056)
- Standard RS232/USB interface
- Improved DC quick discharge design(19057/19057-20)
- Keypad locked and data protected function
- Eight kinds of judgment result indication window
- 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

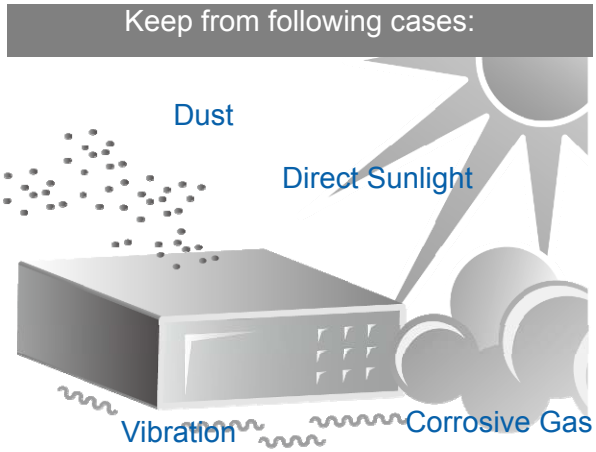
1. Indoor use
2. Altitude: 2000 m
3. Transient Overvoltage at Mains Supply: 2500V
4. Pollution Degree: 2

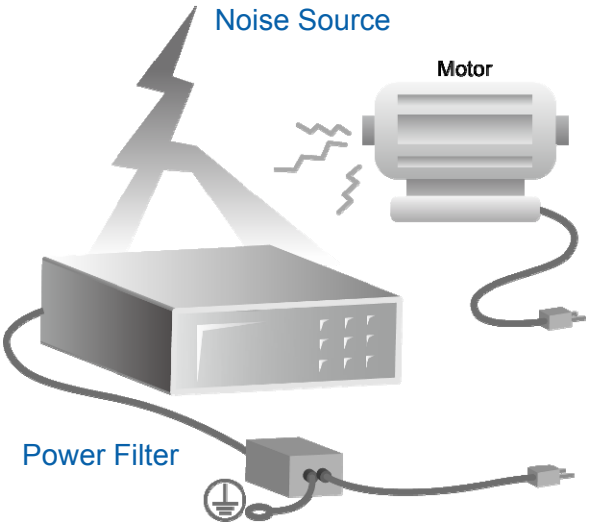
1.5 Ambient Environment

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 ~ 45°C and that humidity is 15% ~ 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°C ~ +50°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%)

Model	19056	19057	19057-20
	AC	DC / IR	DC / IR
❑ **Withstanding Voltage Test**			
❑ Test Voltage	AC: 0.10kV~10.00kV, steps 0.01kV	DC: 0.10kV~12.00kV, steps 0.01kV	DC: 0.10kV~20.00kV, steps 0.01kV
❑ Voltage Accuracy (Note 1)	(1% of setting + 0.1% of full scale)	(1% of setting + 0.1% of full scale)	(1.5% of setting + 0.1% of full scale)
❑ Voltage Regulation	± (1% of output + 10V), Rated load	± (1% of output + 10V), Rated load	± (1% of output + 10V), Rated load
❑ V-display Accuracy (Note 1)	± (1% of reading + 0.1% of full scale) ,10V resolution	± (1% of reading + 0.1% of full scale) ,10V resolution	± (1.5% of reading + 0.1% of full scale) ,10V resolution
❑ Output Frequency	50Hz/60Hz ± 0.1%, sine wave.	--	--
❑ Cutoff Current	AC: 0.001mA~20mA	DC: 0.0001mA~10mA	DC 0.0001mA~5mA
❑ Leakage Current Meter (Note 2)	3.000mA: 0.001mA–2.999mA, 0.001mA resolution. Measurement Accuracy: 0.100mA~2.999mA :±(1% of reading + 0.3% of full range)	300uA: 0.1uA– 299.9uA, 0.1uA resolution. 3.000mA: 0.300mA–2.999mA, 0.001mA resolution. 10.00mA: 3.00mA–10.00mA, 0.01mA resolution. Measurement Accuracy: ± (1% of reading + 0.5% of full range)	300uA: 0.1uA– 299.9uA, 0.1uA resolution. 3.000mA: 0.300mA–2.999mA, 0.001mA resolution. 5.00mA: 3.00mA–5.00mA, 0.01mA resolution. Measurement Accuracy: ± (1% of reading + 0.5% of full range)
❑	3.000mA: 0.001mA–2.999mA, 0.001mA resolution. Measurement Accuracy: 3.00mA~20.00mA : ± (1.5% of reading + 0.3% of full range)		
❑	AC Real Current:±(2% of reading+10% total current)		
❑ Flashover (ARC) Detection (Note 4)	1mA – 20mA, resolution 0.1mA.	1mA – 10mA, resolution 0.1mA.	1mA – 10mA, resolution 0.1mA.
❑ **Insulation Resistance Test (19057/19057-20 only)**			
❑ Test Voltage	--	0.10kV-5.00 kV, steps 0.01kV	
❑ Voltage Accuracy	--	(1% of setting + 0.5% of full scale)	(1.5% of setting + 0.5% of full scale)
❑ V-display Accuracy	--	(1% of setting + 0.5% of full scale)	(1.5% of setting + 0.5% of full scale)
❑ Resistance Range	--	<500V: 0.1MΩ ~ 1.00GΩ ≥ 500V: 1.0MΩ ~ 50GΩ	<500V: 0.1MΩ ~ 1.00GΩ ≥ 500V: 1.0MΩ ~ 50GΩ
❑ Measurement Accuracy (Note 3)	--	≥ 0.50kV 1 MΩ ~ 1GΩ: ± (3% of reading + 0.5% of full scale) 1GΩ ~ 10GΩ: ±(5% of reading + 1% of full scale) 10GΩ ~ 50GΩ: ±(10% of reading + 1% of full scale) < 0.5kV: 1MΩ ~ 1GΩ: ±(5% of reading + (0.5 x 500V/Vs)% of full scale)	
❑ **Test Time**(Note 5)	0.3 ~ 999 Sec., and Continue.		
❑ **Ramp Time**	0.1 ~ 999 Sec., and Off.		
❑ **Fall Time**	0.1 ~ 999 Sec., and Off.		
❑ **DWELL Time**	0.1 ~ 999 Sec., and Off. (WDC only)		
❑ **Contact Check Function**			

❑ **OSC (19056 only)**	(1) Test voltage level: Less than ac 200V. (2) Test frequency: 600Hz. (3) No contact judge: Measured capacitance comparison. (Refer to attachment for detail).		
❑ **HFCC**	High Frequency Contact Check (1) No contact judge: Measured capacitance comparison. (Refer to attachment for detail). (2) Cs,Open,Short value setting in PROGRAM.		
❑ **HVCC**	High voltage contact check (1) Added terminal at rear panel: HV contact, RTN contact. Maximum output current < 10mA. (2) ON/OFF selectable in PROGRAM.		
❑ **Secure Protection Function**			
❑ Ground Fault Interrupt leakage current	AC: 0.25mA~0.75mA ON/OFF selectable.	--	--
❑ Fast Discharge	--	Approx. 0.2S (Discharge Voltage 20kV), DUT ≤ 0.015uF	
❑ Panel Operation Lock	YES, with password On/Off		
❑ **Memory Storage**			
☐ Memories, Steps	100 groups of memory, each memory includes max.50 Steps (TOTAL 500 steps)		
❑ **PASS/FAIL Judgment Window**			
☐ Indication, Alarm	PASS: beeps for time as Pass-Hold timer. FAIL: Continuously beeps till manually reset. Alarm is for final Fail judge.		
☐	PASS: (Short Sound) FAIL: W-Arc, W-Hi, W-Lo, IR-Lo, IR-Hi, GFI (Long Sound)		
❑ **Remote Connector**			
❑ Interlock	2 pins connector, pin1 pull-up to digital +V source with 4.7kohm resistor, and pin 2 tied to digital GND		
❑ Handler Interface	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 $+V_{EXT}$ (external power supply). All input optic-diode must be series with current limit (10mA ± 4mA for +3V ~ +26V) circuit.		
❑ RS232 Interface	Standard: RS232, The programming language is SCPI.		
❑ USB Interface	USB meet USBTMC		
❑ GPIB (Optional)	Standard: Complies with IEEE488.1 and 488.2. The programming language is SCPI.		
❑ **Ambient Temperature and Relative Humidity**			
❑ Specifications range	18 to 28°C, 30 to 70% RH.		
❑ Operable range	0°C to 45°C, 15% to 95% RH@ ≤40°C and no condensation.		
❑ Storage range	-10 to 50°C, ≤ 80% RH.		
❑ **Power Requirement**			
❑ Line Input	100Vac ~ 240Vac, 47~66 Hz		
❑ Power Consumption	No load: <100W, Rated load: 600W		
❑ Dimension (W x H x D)	430 x 130 x 500 mm / 16.93 x 5.12 x 19.69 inch		
❑ Weight	< 28 kg / 61.73 lbs		
❑ **SAFETY**			
❑ 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. Output voltage≤2kV, add extra (0.1% of full scale) error.
2. AC Current meter accuracy reference resistance load. With standard test lead and used “OFFSET GET “ process.Exceed 5.00kV add (0.1% of full range)/kV.
3. Full scale of measuring range
   0.1MΩ~22.0MΩ→ full scale=22.0MΩ
   20MΩ~220MΩ→ full scale=220MΩ
   0.20GΩ~2.20GΩ→ full scale=2.20GΩ
   2.0GΩ~50GΩ→ full scale=50.0GΩ
   Exceed 1.00kV add (2% of reading + 0.2% of full scale)/kV.
4. Design in Specifications.Validation point is 1.25kV with a 250kΩ resistor.
5. The minimum testing time arrives at 90% output voltage specification (NO load). Except Real current, minimum test time is 1s.

3. Notices before Using

The tester is with high voltage output up to 20kV for 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 in 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.

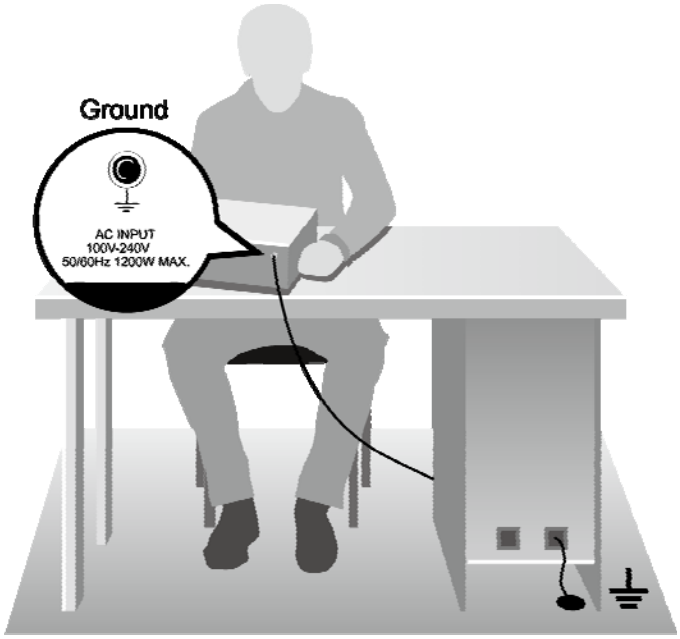


Figure 3-1 Safety Grounding

3. **LCD panel on the analyzer is fragile**
   Don't press LCD panel heavily or use sharp object to touch it, otherwise it may be broken or the display will be abnormal.

4. **Movement notices**

The instrument net weight is 25kg approximately. If there is movement requirement, please install handle and rack ears and use the cart as well to avoid the personnel injury.

5. Connect test cable to HV terminal

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

6. Connect test of high voltage output terminal

After the test cable of RET/LOW terminal has been connected. Then follow the following procedures to connect high voltage output cable.

- Press [STOP] key firstly.
- Confirm DANGER indication LED does not light.
- The test cable of RTN/LOW terminal with HV terminal is shorted; confirm there is no voltage output.
- Plug high voltage test cable in HV terminal.
- Connect the test cable of RTN/LOW terminal to DUT finally, and then HV high voltage test cable also be connected.

7. 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.

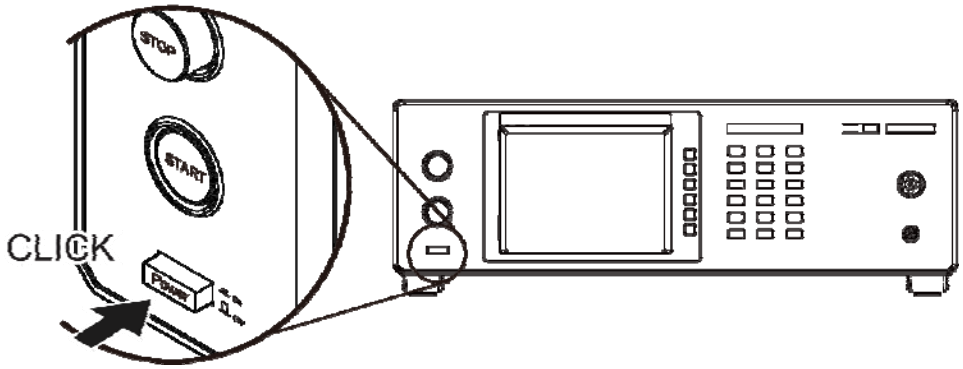


Figure 3-2 POWER SWITCH OFF

8. 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.

CAUTION 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.

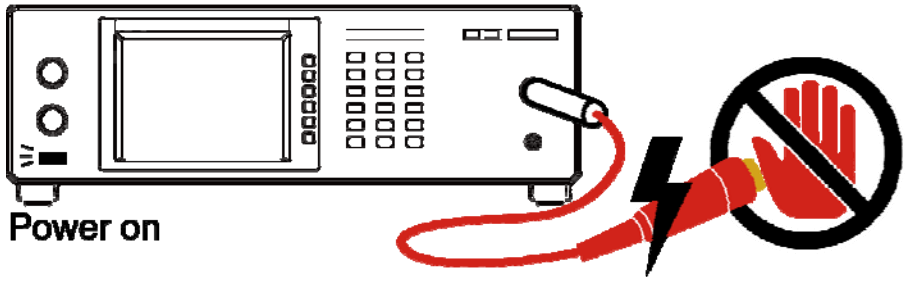


Figure 3-3 Don't touch here when outputs high voltage

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

9. 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 10 and 11. Please follow the described procedures to execute.

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

10. 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.

11. 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 users desire 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: $Vo\, e^{-t/RC} = V_{IL}$

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

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

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

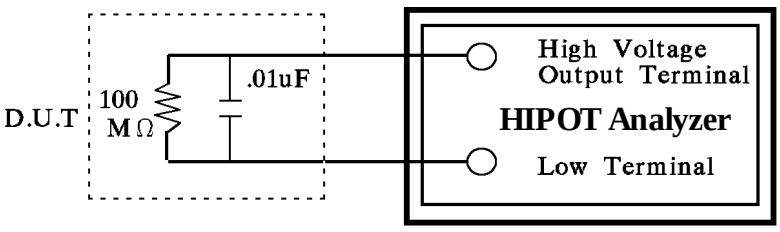


Figure 3-4

12. 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 ※

13. 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 so 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.**

14. 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 HV is short-circuited with RTN/LOW terminal.

<<< Dangerous Event >>>

15. 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 >>>

16. 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 is 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.

17. DANGER indication LED error

When press [START] key, there 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.

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

If the maximum power for testing, 19056's AC: 200VA(10kV, 20mA), 19057's DC: 120VA(12kV, 10mA) and 19057-20's DC: 100VA(20kV, 5mA), please notice its ambient temperature. When the ambient temperature is higher than 40°C, please stop operation until it cools down to normal temperature.

19. 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.

20. 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 into suitable power such as power stabilizer.

21. The analyzer drawing mass current instaneously

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.

22. Storage

The unit normal operating temperature humidity range is 5°C ~ 40°C, 80% RH. If over this range then function may be 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.

23. 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,

24. Warning signal of testing

"DANGER – HIGH VOLTAGE TEST IN PROGRESS, UNAUTHORIZED PERSON KEEP AWAY"

25. 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 which caused by high-voltage discharge.

26. 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. Panel Description

4.1 Front Panel

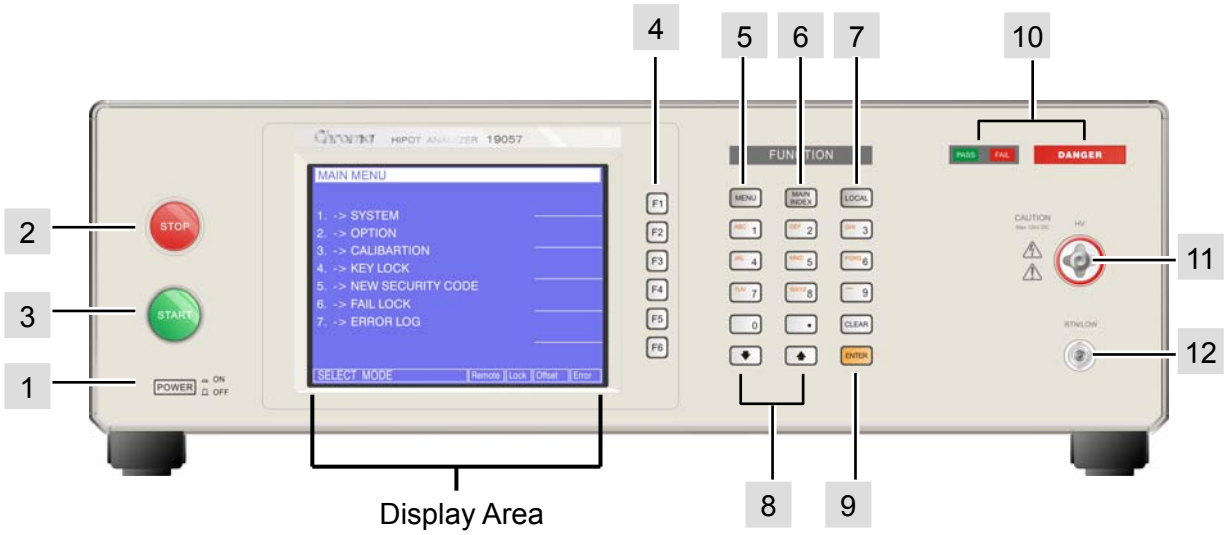
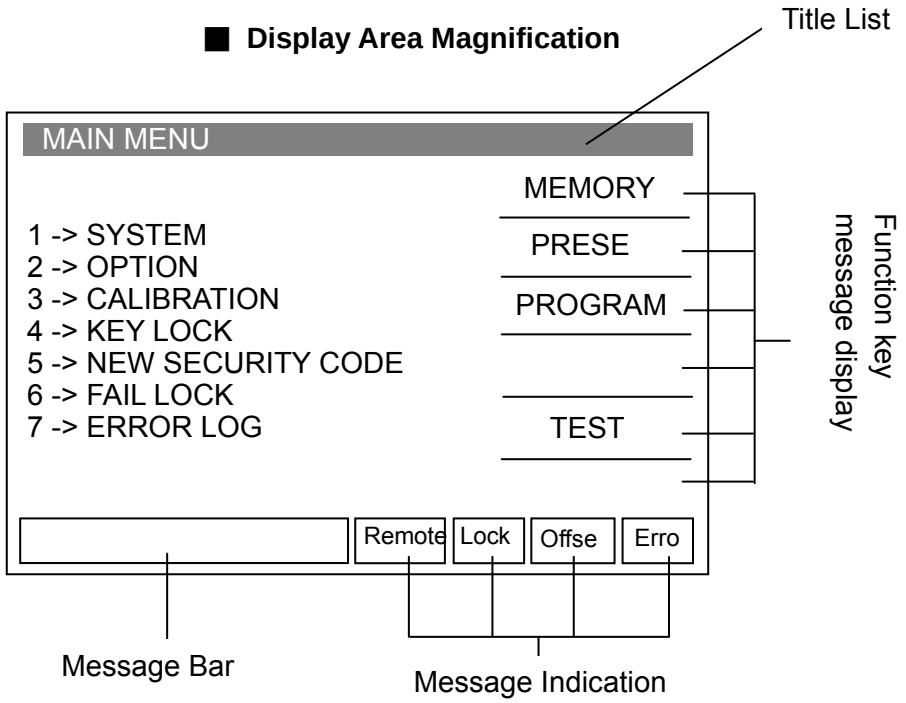


Figure 4-1

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



Display Area

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:

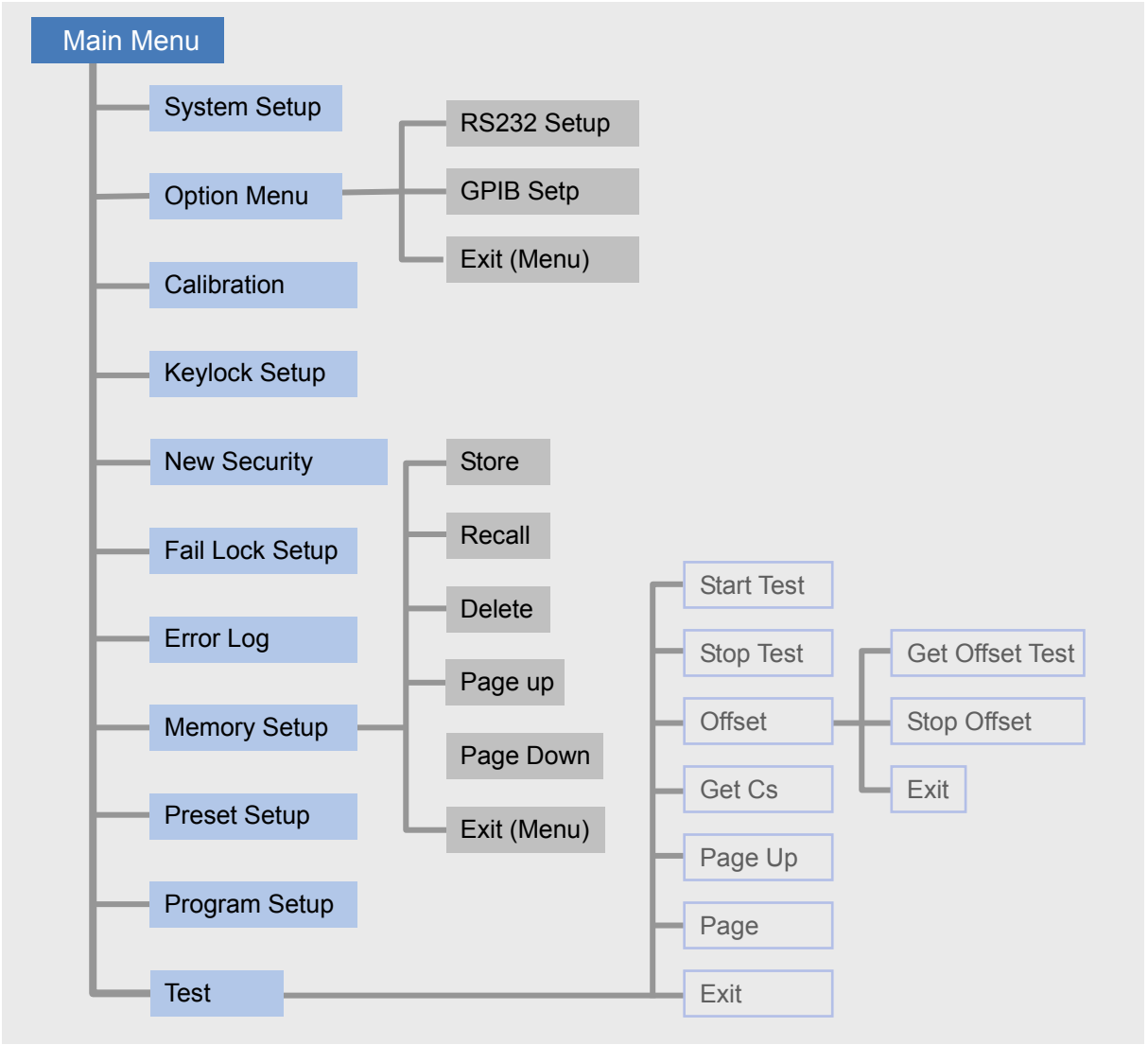
Remote : When this area is highlighted, it means the main unit is under Remote status. That is the main unit controlled by PC through RS232 or GPIB connect to PC. At the same time, all of keys are malfunction except for [STOP] and [LOCAL] keys.

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 [△] and [▽] 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) 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.

(12) 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

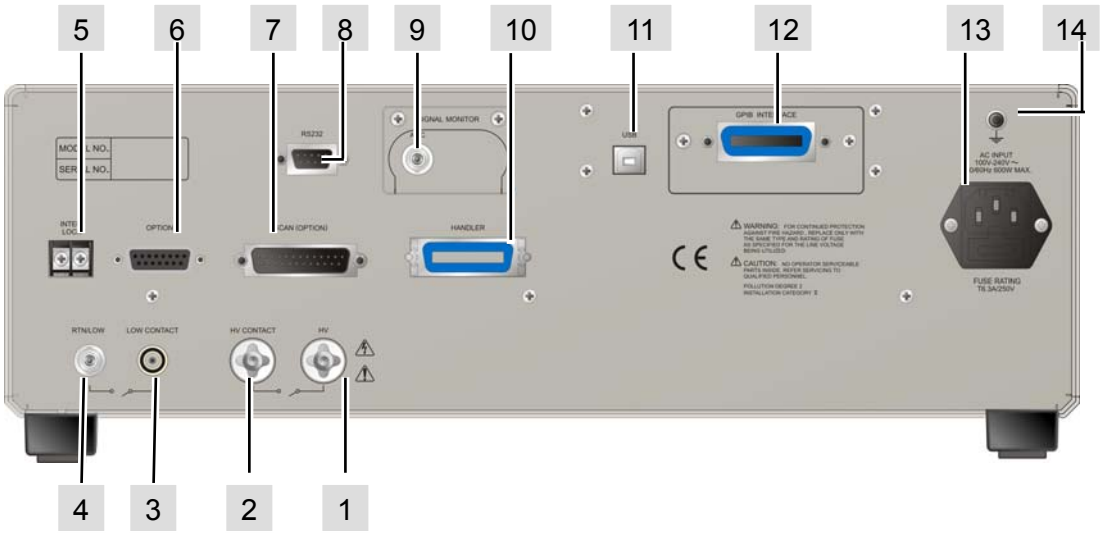


Figure 4-2

(1) HV : The output terminal of high voltage. 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.

(2) HV CONTACT : High electric potential terminal of HV contact check. Connect this output terminal and HV output terminal to DUT simultaneously for proceeding HV contact check function. This terminal usually is high voltage output, thus this test terminal is very dangerous. Don't touch it when DANGER LED is lit and with high voltage output.

(3) LOW CONTACT : High electric potential terminal of low contact check. Connect this output terminal and RET/LOW terminal to DUT simultaneously for proceeding low contact check function.

(4) 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.

(5) INTER LOCK : The high voltage can be outputted when the two terminals are short-circuited.

(6) OPTION Interface (reserved function) : It is reserved interface and without any function currently. This interface can't be connected.

(7) SCAN Interface (reserved function) : It is reserved interface and without any function currently. This interface can't be connected.

(8) RS232 Interface : This socket is for RS232 interface of the instrument. GPIB and RS232 interfaces can't be used simultaneously.

(9) ARC Monitor : ARC test signal can be observed from this BNC socket.

(10) HANDLER Interface: This socket is for HANDLER interface of the instrument.

(11) USB Interface : USB terminal

(12) GPIB Interface (option): This socket is for optional GIPB interface. The detail descriptions, please refer "*Chapter 5 – GPIB/RS232 Interface*

(IEEE-488.2)" in this manual.

(13)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 – Notices before Using*" or descriptions of rear panel in this manual.

(14)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

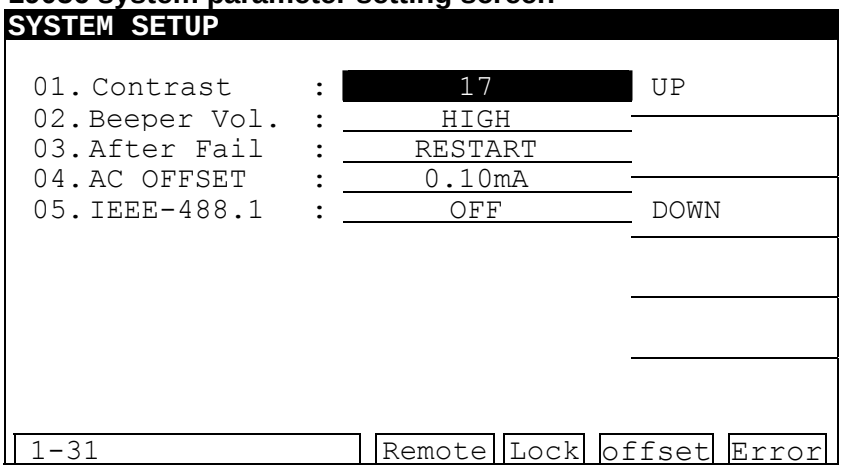
1. Before plugging AC power cable, please confirm if the power used coincide with that marked on rear panel, and the power switch is OFF status.
2. Before turning on the power, please peruse "*Chapter 3 – Notices before Using*" and remember it.
3. When turn the power on, the analyzer will self-test. If there is abnormal condition, please turn the switch off and pull the power cord off immediately.

4.4 System Parameter Setting

Operation method:

1. When the title shows "SYSTEM SETUP", press [△], [▽] keys to move the highlighted cursor to the parameter item to be set.
2. Press numeral/character key or Function Keys to set the item parameter data.
3. If the blinking cursor is shown, it means parameter data is not completed. When the data input is error, [CLR] can be pressed to clear and input it again. Please press [ENTER] to confirm parameter data is correct finally.

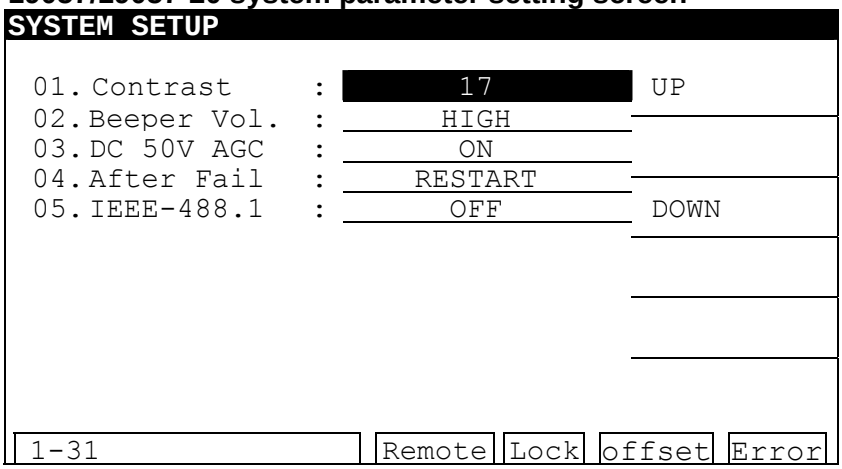
19056 system parameter setting screen



19056 system parameter setting data description:

Setting Item	Range	Initial Setting	Description
Contrast	1~31	17	Adjust LCD brightness
Beeper Volume	LOW /MEDIUM/ HIGH/OFF	HIGH	Adjust the buzzer volume
After Fail	CONTINUE / RESTART / STOP	RESTART	(1) When set it as CONTINUE, and any one among STEPs is judged as No Good. It will continue until all STEPs are tested. (2) When set it as RESTART, and any one among STEPs is judged as No Good. Press START to restart directly. (3) When set it as STOP, and any one among STEPs is judged as No Good. It is necessary to press STOP then can restart test by pressing START.
AC OFFSET	0~2.5mA	0.1mA	(1) When Offset value is higher than **AC OFFSET** value, Current reading = Current real measurement value – Offset value. (2) When Offset value is lower than **AC OFFSET** value, Current value = $\sqrt{(\text{Real measurement value})^2 - (\text{Offset})^2}$
IEEE-488.1	ON/OFF	OFF	(1) When set it as ON, GPIB/RS232 command format is IEEE-488.1 which is compatible with 9032C. (2) When set it as OFF, GPIB/RS232 command format is IEEE-488.2.

19057/19057-20 system parameter setting screen



19057/19057-20 system parameter setting data description:

Setting Item	Range	Initial Setting	Description
Contrast	1~31	17	Adjust LCD brightness
Beeper Volume	LOW /MEDIUM/ HIGH/OFF	HIGH	Adjust the buzzer volume
DC 100V AGC	ON/OFF	ON	ON: When it is above DC 100V, hardware voltage compensation will be executed.

			OFF: When it is below DC500, there is no hardware voltage compensation.
After Fail	CONTINUE / RESTART / STOP	RESTART	(1) When set it as CONTINUE, and any one among STEPs is judged as No Good. It will continue until all STEPs are tested. (2) When set it as RESTART, and any one among STEPs is judged as No Good. Press START to restart directly. (3) When set it as STOP, and any one among STEPs is judged as No Good. It is necessary to press STOP then can restart test by pressing START.
IEEE-488.1	ON/OFF	OFF	(1) When set it as ON, GPIB/RS232 command format is IEEE-488.1 which is compatible with 9032C. (2) When set it as OFF, GPIB/RS232 command format is IEEE-488.2.

4.4.1 Hardware/Software AGC

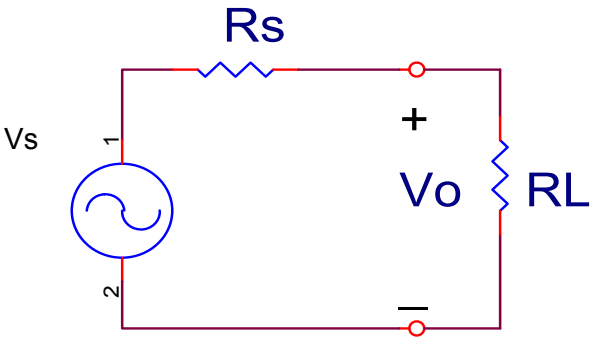
The output voltage is changed by load effect, and then executing AGC function.

ACV : 100V~10kV → hardware AGC is always ON, software AGC initial setting is ON and also can be set as OFF.

DCV : 100V~499V → hardware AGC initial setting is ON and also can be set as OFF. (Refer DC 100V AGC setting.) Software AGC initial setting is ON and also can be set as OFF.)

DCV : 500V~12KV (19057-20 is 20kV) → hardware AGC is always ON, software AGC initial setting is ON and also can be set as OFF.)

IRV : 100V~5kV → hardware AGC is always OFF, software AGC initial setting is ON and also can be set as OFF.)



Vo / Vs = RL / (Rs + RL)

1. Hardware AGC: Because Vo<Vs result from load effect, Vo using hardware comparison circuit. Vo voltage compensation is the same as Vs within test time.
2. Software AGC: This analyzer uses software AGC under DC 100V-500V and IR 100V-5000V. Software compensation speed is more slowly so it won't cause voltage shock to DUT. The general IR RL is larger than Rs of this analyzer, so Vo=Vs approximately.

4.4.2 OFFSET

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

4.5 Memory Management of Test Parameter and Test Preset Parameter

When the title displays "MAIN MENU", press Function Key [MEMORY] and then the 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 the title displays "MEMORY SETUP", press [△], [▽] keys or Function Key [NEXT PAGE] to move the highlighted cursor to the memory name to be recalled.
3. Press Function Key [RECALL] and then the confirmation window will be shown.
4. Press [ENTER] to confirm or press Function Key [EXIT] to cancel.

4.5.2 Store Memory

1. If users desire to save testing parameter data to be set in the memory. Please follow the procedures below to proceed setting and store. When the title displays "MEMORY SETUP", press [△], [▽] keys or Function Key "NEXT PAGE" to move the highlighted cursor to the memory number position to be stored.
2. Press Function Key [STORE], the highlighted cursor becomes 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 users desire to input the name, use the same numeral/character keys continuously. Be able to 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 users desire to delete the test parameter data to be saved in the memory. Please follow the procedures below to proceed.
2. When the title displays “MEMORY SETUP”, press [△], [▽] keys or Function Key [NEXT PAGE] to move the highlighted cursor to the memory name to be deleted.
3. Press Function Key [DELETE] and then the confirmation window will be shown..
4. Press [ENTER] to confirm or press Function Key [EXIT] to cancel.

4.6 Preset Setting

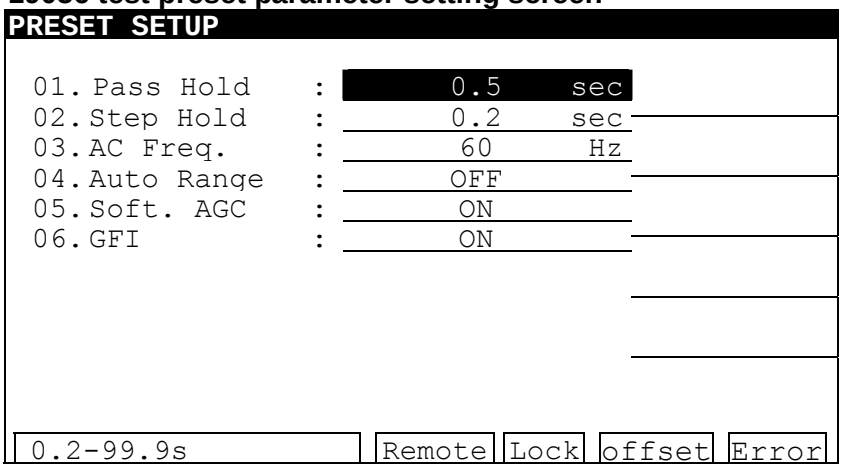
4.6.1 Operation Method

1. When the title shows “PRESET SETUP”, press [△], [△] keys to move the highlighted cursor to the parameter item to be 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 to be set.
2. Press numeral key/character key or Function Keys to set this item parameter data.
3. When the highlighted cursor is at the last parameter, press [ENTER] key to go to test parameter setting menu directly for users’ setting continuously.

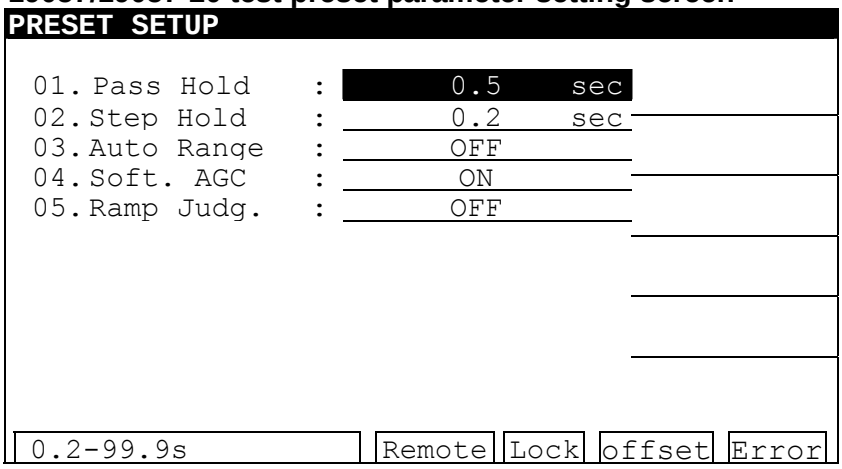
19056 test preset parameter setting screen



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. Key: It sets test procedure interrupted (Please press [START] to continue when test stop.)
03	AC Freq.	50-60Hz	60	It sets the frequency of outputting voltage when tests AC withstanding.
04	Auto Range	ON/OFF	OFF	It sets if withstand voltage auto-range function is open.
05	Soft. AGC	ON/OFF	ON	It sets if software auto gain compensation function is open.
06	GFI (Ground Fault Interrupt)	ON / OFF	ON	It sets the function of GFI.

19057/19057-20 test preset parameter setting screen

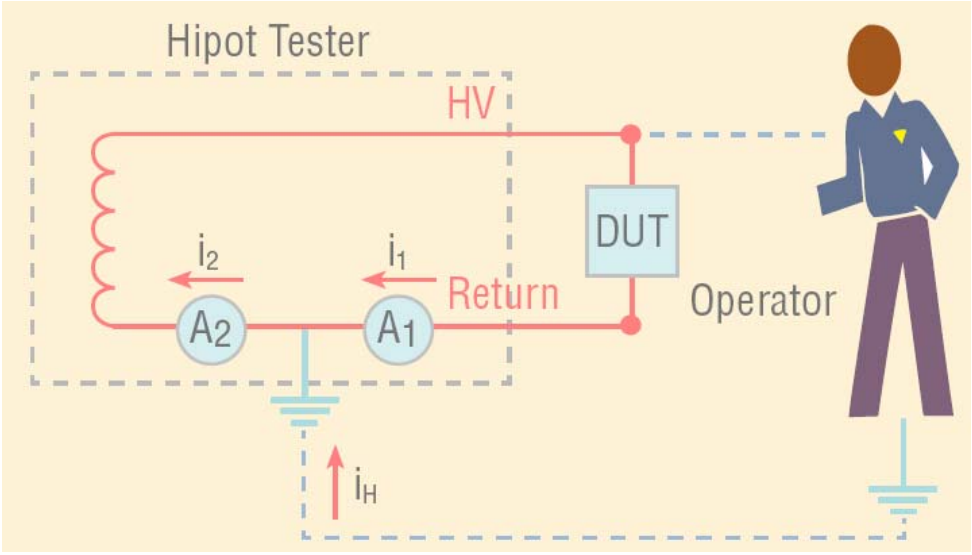


Test preset parameter function description table:

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. Key: It sets test procedure interrupted (Please press [START] to continue when test stop.)
03	Auto Range	ON/OFF	OFF	It sets if withstand voltage auto-range function is open.
04	Soft. AGC	ON/OFF	ON	It sets if software auto gain compensation function is open.

05	Ramp Judg.	ON / OFF	OFF	When Ramp. Judg. is set to ON, it will judge if the current value is over High Limit setting value as DC mode executing Ramp time. When Ramp. Judg. is set to OFF, it won't judge if the current value is over High Limit setting value as DC mode executing Ramp time.

4.6.3 GFI(Ground Fault Interrupt) Description

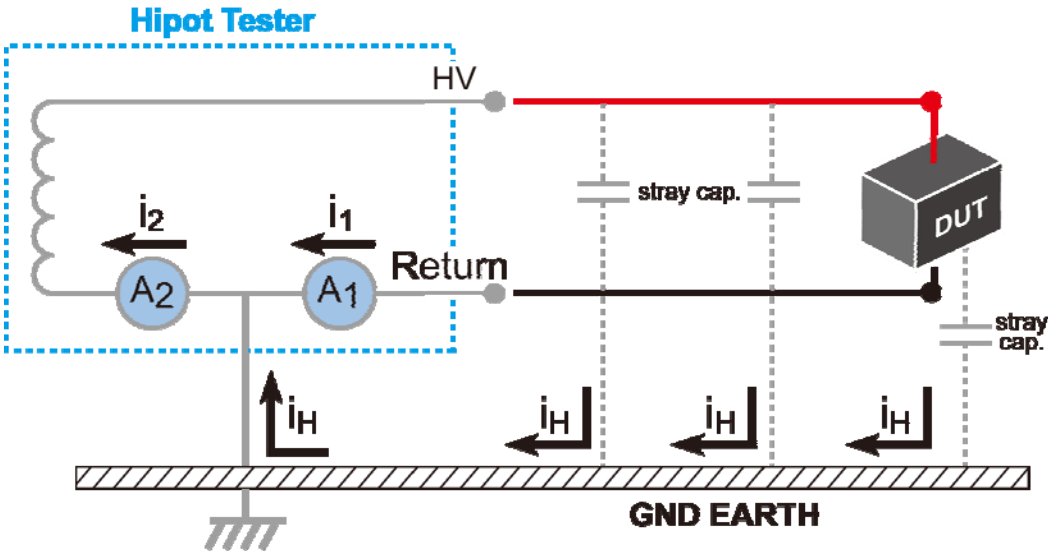


There is a current i_H produced and flowed through human body when users touch high voltage terminal carelessly.

$$i_2 = i_1 + i_H$$

If i_H is over GFI action current (0.5mA), the high voltage will be cut to protect the safety of operator.

Note The stray capacitance of high voltage cable path or DUT to GND_EARTH, leakage current i_H will be generated when outputting AC high voltage. GFI FAIL will be generated when leakage current is up to GFI level (i_H>0.5mA) as the below figure shown. The high voltage cable and DUT should decrease contact area for GND_EARTH while proceeding test. It is for minimizing the leakage current effect on the test.



4.6.4 Auto Range

(1) Set **Auto Range** function to **ON**.
(2) Take an example by 19056, the current range is set to high range *i.e.* 20mA 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.

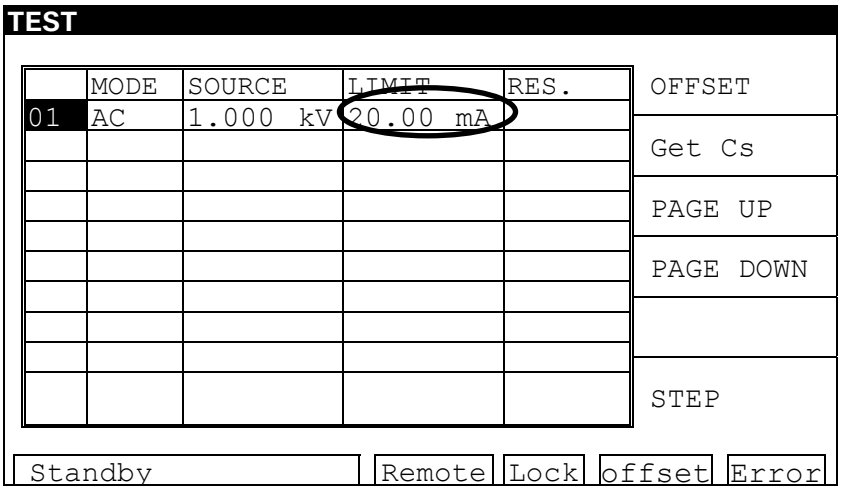


Figure 4-3

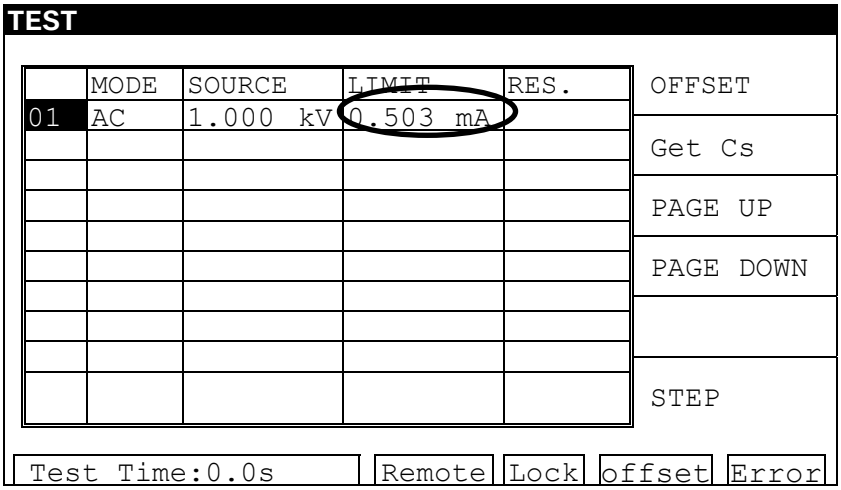


Figure 4-4

4.7 Program Setting

4.7.1 Operation Method

1. When the title shows “STEP SETTING”, press [△], [▽] keys to move the highlighted cursor to the parameter item to be 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: According to different models to select, there are AC / DC / IR / PA /OSC test modes can be selected. The following describes parameter settings of various test modes.

Withstand Voltage Test Mode (AC) - 19056
VOLTAGE: It sets withstand voltage test required 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.
HFCC: It sets if High Frequency Contact Check (HFCC) function is activated. When set it to ON, the parameter HFCC can be set as the following.
1. C_S: 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.

HVCC: It sets if High Voltage Contact Check (HVCC) function is activated.

When set it to ON, check if terminal HV and HV CONTACT, terminal RET LOW and LOW CONTACT are good contact before outputting voltage. If the DUT doesn't be connected exactly, thus withstand voltage test can't be proceeded.

TIME: 1. RAMP TIME: It sets the required time to increase to setting voltage.
2. TEST TIME: It sets test required time.
3. FALL TIME: The required time from setting voltage value to decrease to low voltage.

Note Plese be aware the capacitance of DUT+fixture can't over 200pF while using HFCC function.

Withstand Voltage Test Mode (DC) - 19057/19057-20

VOLTAGE: It sets withstand voltage test required 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.
HFCC: It sets if High Frequency Contact Check (HFCC) function is activated. When set it to ON, the parameter HFCC can be set as the following.
1. C_S: 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.

HVCC: It sets if High Voltage Contact Check (HVCC) function is activated.
When set it to ON, check if terminal HV and HV CONTACT, terminal RET LOW and LOW CONTACT are good contact before outputting voltage. If the DUT doesn't be connected exactly, thus withstand voltage test can't be proceeded.

TIME: 1. RAMP TIME: It sets the required time to increase to setting voltage.
2. DWELL TIME: It sets DWELL required time. Don't judge high limit and low limit of leakage current during DWELL TIME but it is not over high limit of setting range.
3. TEST TIME: It sets test required time.
4. FALL TIME: The required time from setting voltage value to decrease to low voltage.

Note Plese be aware the capacitance of DUT+fixture can't over 200pF while using HFCC function.

Insulation Resistance Test Mode (IR) - 19057/19057-20

VOLTAGE: It sets insulation resistance test required 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 required time.
3. FALL TIME: The required time from setting voltage value to decrease to low voltage.
RANGE: It sets the current 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 Display	
	Setting Voltage 100V ~ 499V	Setting Voltage 500V ~ 5000V

10mA(3~10mA)	--	1.0MΩ~22.0MΩ 20MΩ~220MΩ 0.20GΩ~2.20GΩ 2.0GΩ~50.0GΩ
3mA(0.3~3mA)	0.1MΩ~22.0MΩ 20MΩ~220MΩ 0.20GΩ~2.20GΩ	
300uA(30~300uA)		
30uA(3~30uA)		
3uA(0.3~3uA)		
300nA(30~300nA)		
30nA(10~30nA)	--	

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) - 19056

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].

C_S: 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 is lit, 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 Operation of High Voltage Contact Check (HVCC)

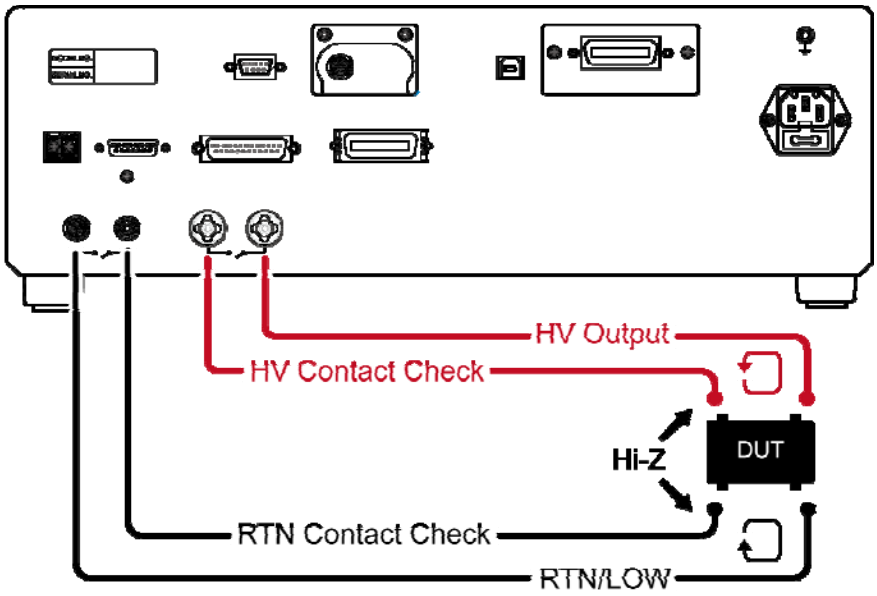
4.8.3.1 HVCC Function

When HVCC in test procedure is set to ON, HVCC function will be activated. HV CONTACT and HV terminal connect to HV test terminal of DUT, LOW CONTACT and RET/LOW terminal connect to low voltage test terminal of DUT. If HV CONTACT and HV terminal, LOW CONTACT and RET/LOW terminal are good contact thus withstand voltage test can be proceeded continuously. If any terminal of HV CONTACT and HV, LOW CONTACT and RET/LOW are open circuit status thus it will be judged as OPEN and withstand voltage test will be stopped.

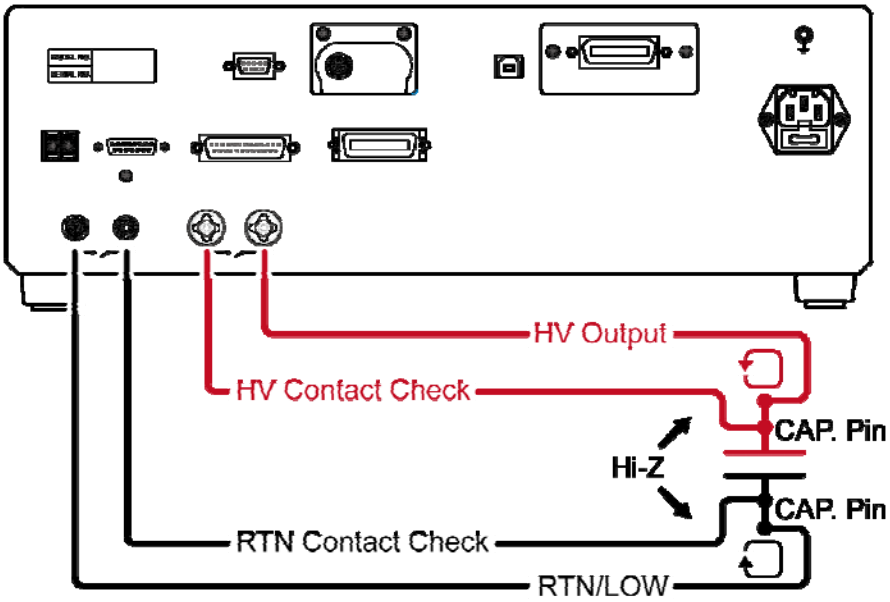
4.8.3.2 Wiring Method

The CONTACT output terminal connects DUT exactly and INTERLOCK of the instrument is short circuit status, thus the test can be started normally.

1. When the DUT is PHOTO COUPLER:



2. When the DUT is capacitor:



4.8.4 Method of DUT Connection

Withstand Voltage / Insulation Resistance Test Mode (AC / DC / IR / OSC)
First of all, please be sure there is no voltage output and DANGER LED doesn't be lit. Connect test cable of low electric potential to RTN/LOW terminal of the main unit. This test cable and high voltage output terminal are short-circuited and be sure there is no high voltage output. The high voltage test cable (red or white) plug in high voltage output terminal OUTPUT at the same time. Connect the test cable of low electric potential (RTN/LOW) to DUT firstly, and then connect the test cable of high electric potential to DUT.

4.8.5 Test Procedure

4.8.5.1 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 shows "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 this key is pressed, 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
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.

4.8.5.2 OSC Test Procedure

1. Connection is completed correctly by connecting DUT device method.
   When the title shows "MAIN MENU", press Function Key [TEST] to enter 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 the test. When this key is pressed, 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, thus the main unit is judged as GOOD and cut off the output. The rear panel outputs PASS signal, the buzzer is activated simultaneously.
4. No good judgment
   If the measurement value is abnormal, the main unit is judged as FAIL and the output will be stopped 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

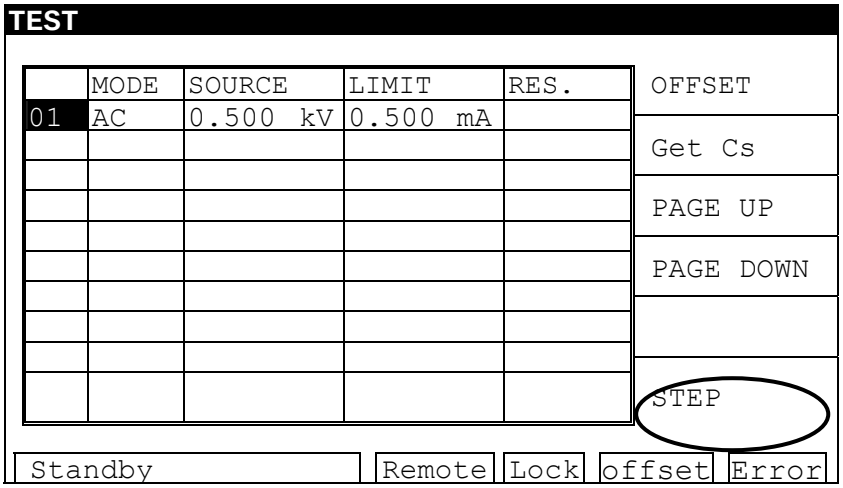
Test Result	Meaning
OPEN	Capacitance open circuit/reading is fewer than OPEN CHK setting.
SHRT	Capacitance short circuit/reading is larger than SHORT CHK setting.

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

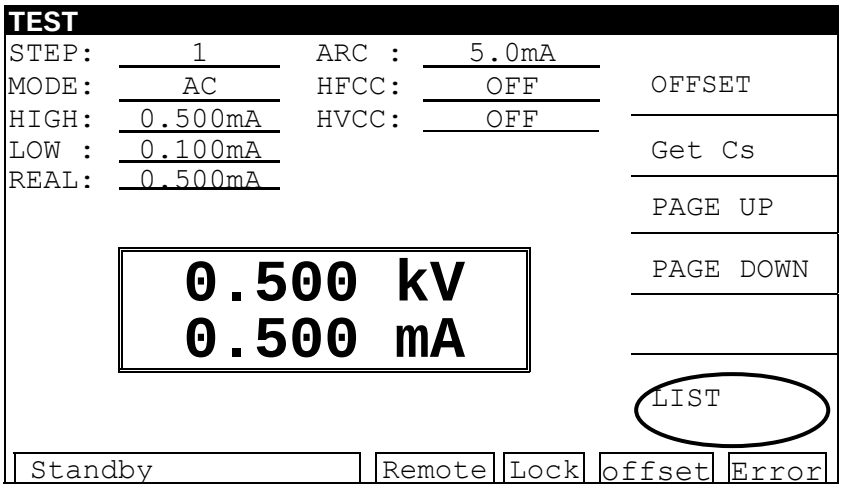
4.8.6 STEP MODE Test Menu

In addition to the LIST MODE test menu, the analyzer adds a STEP MODE test menu for the displayed requirements of ARC and HFCC 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 desire to return to LIST MODE test menu, only need to select “LIST” item by Function Key (F6) in STEP MODE menu.

LIST MODE:

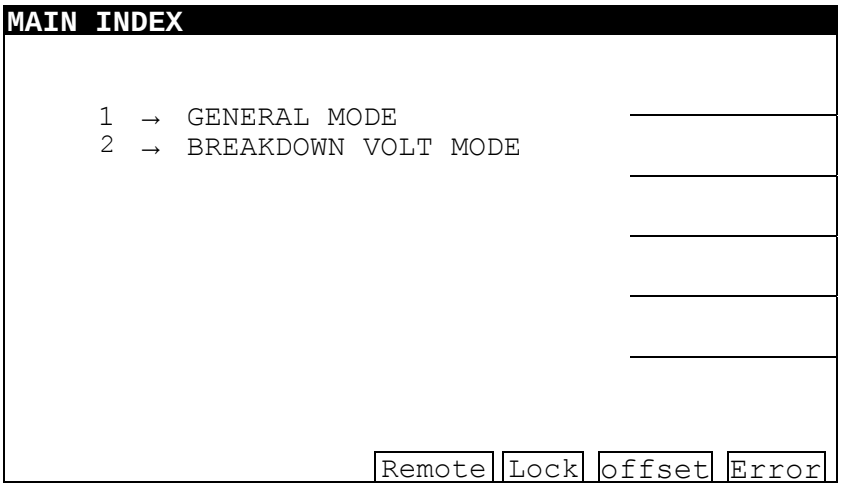


STEP MODE:



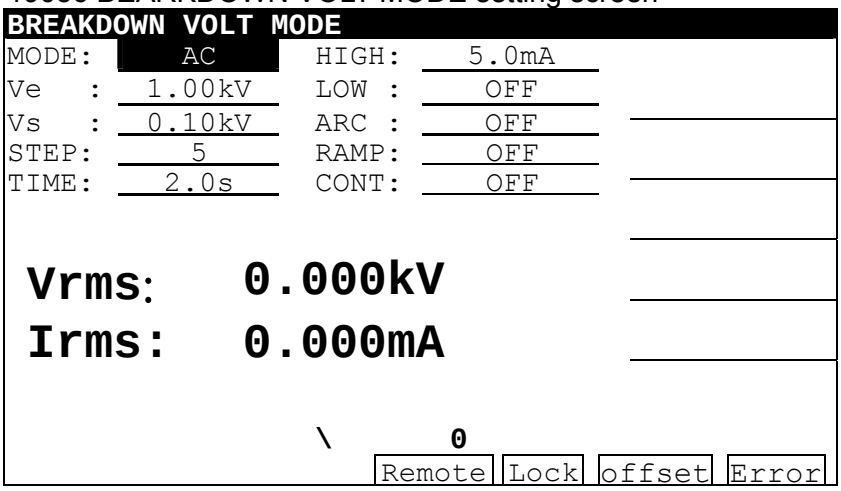
4.9 BREAKDOWN VOLT MODE Interface

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



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

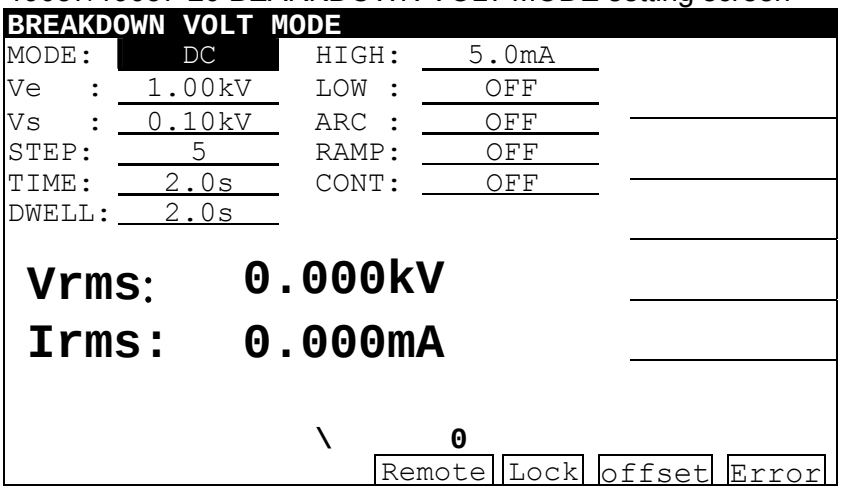
19056 BEARKDOWN VOLT MODE setting screen



19056 BEARKDOWN VOLT MODE parameter function description table

Item	Range	Initial Value	Description
MODE	AC	AC	Test mode selection, AC only
Ve	0.10-10kV	0.10kV	It sets voltage end value.
Vs	0.10kV-Ve	0.10kV	It sets voltage start value.
STEP	2-999	2	It sets voltage rising STEP number.
TIME	0.3-999.0 sec	3.0s	It sets test time of each STEP.
HIGH	0.001-20mA	0.500mA	It sets high limit of leakage current.
LOW	0-20mA	OFF	It sets low limit of leakage current.
ARC	1-20mA	OFF	It sets high limit of arc.
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.

19057/19057-20 BEARKDOWN VOLT MODE setting screen



19057/19057-20 BEARKDOWN VOLT MODE parameter function description table

Item	Range	Initial Value	Description
MODE	DC	DC	Test mode selection, DC only
Ve	19057 :0.10-12kV 19057-20:0.10-20kV	0.10kV	It sets voltage end value.
Vs	0.10kV-Ve	0.10kV	It sets voltage start value.
STEP	2-999	2	It sets voltage rising STEP number.
TIME	0.3-999.0 sec	3.0s	It sets test time of each STEP.
DWELL	0-999.0 sec	2.0s	It sets DWELL time of each STEP.
HIGH	19057 :0.0001-10mA 19057-20:0.0001-5mA	0.500mA	It sets high limit of leakage current.
LOW	19057 :0-10mA 19057-20:0-5mA	OFF	It sets low limit of leakage current.
ARC	19057 :1-10mA 19057-20:1-10mA	OFF	It sets high limit of arc.
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 HANDLER Interface

4.10.1 Specification

4.10.1.1Drive Capability

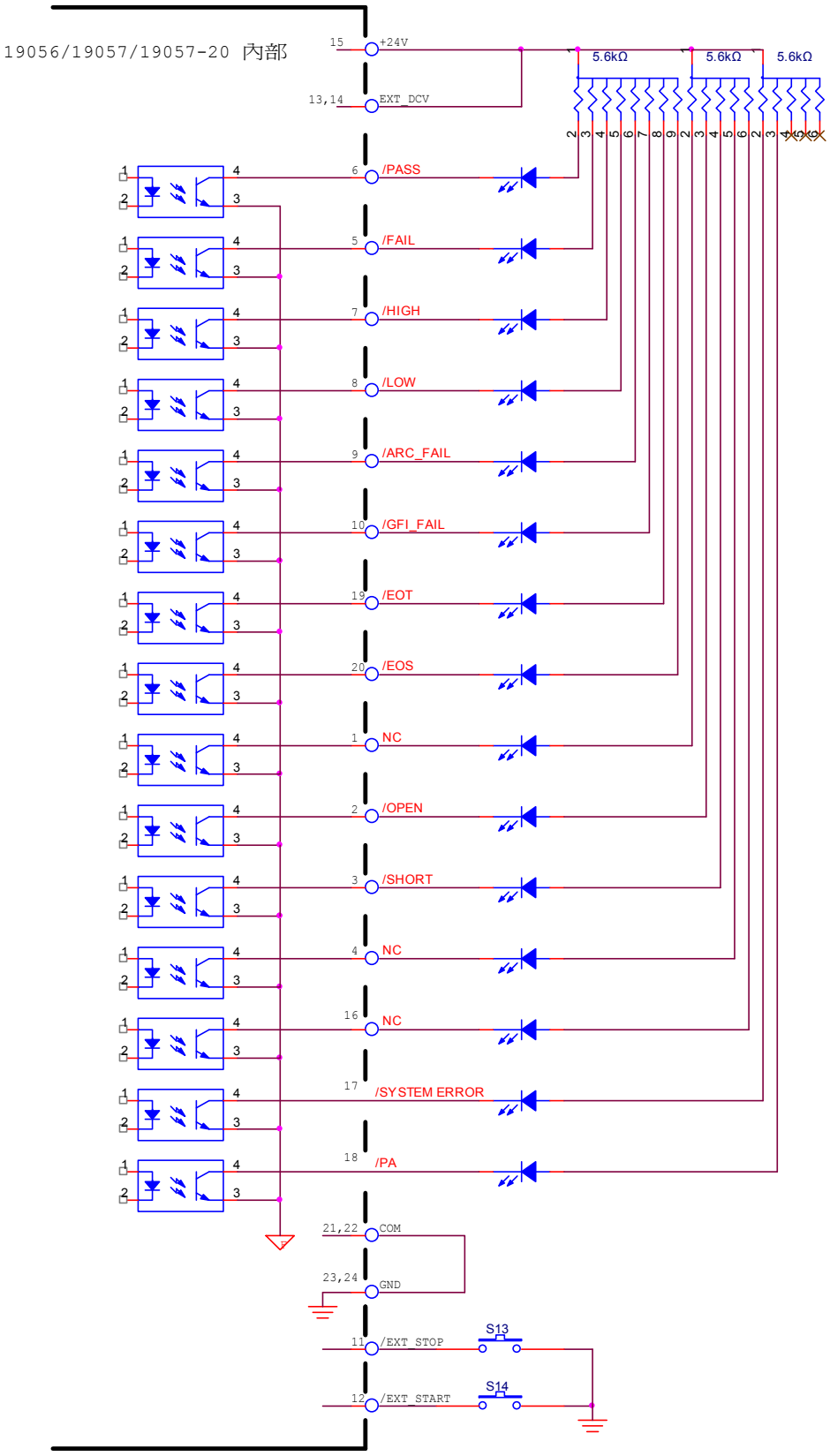
Internal signal output specification: DC 24V, 20~40mA
External signal input specification: DC 3V~26V (HIGH), 10mA ± 4mA

4.10.1.2 Pin Description

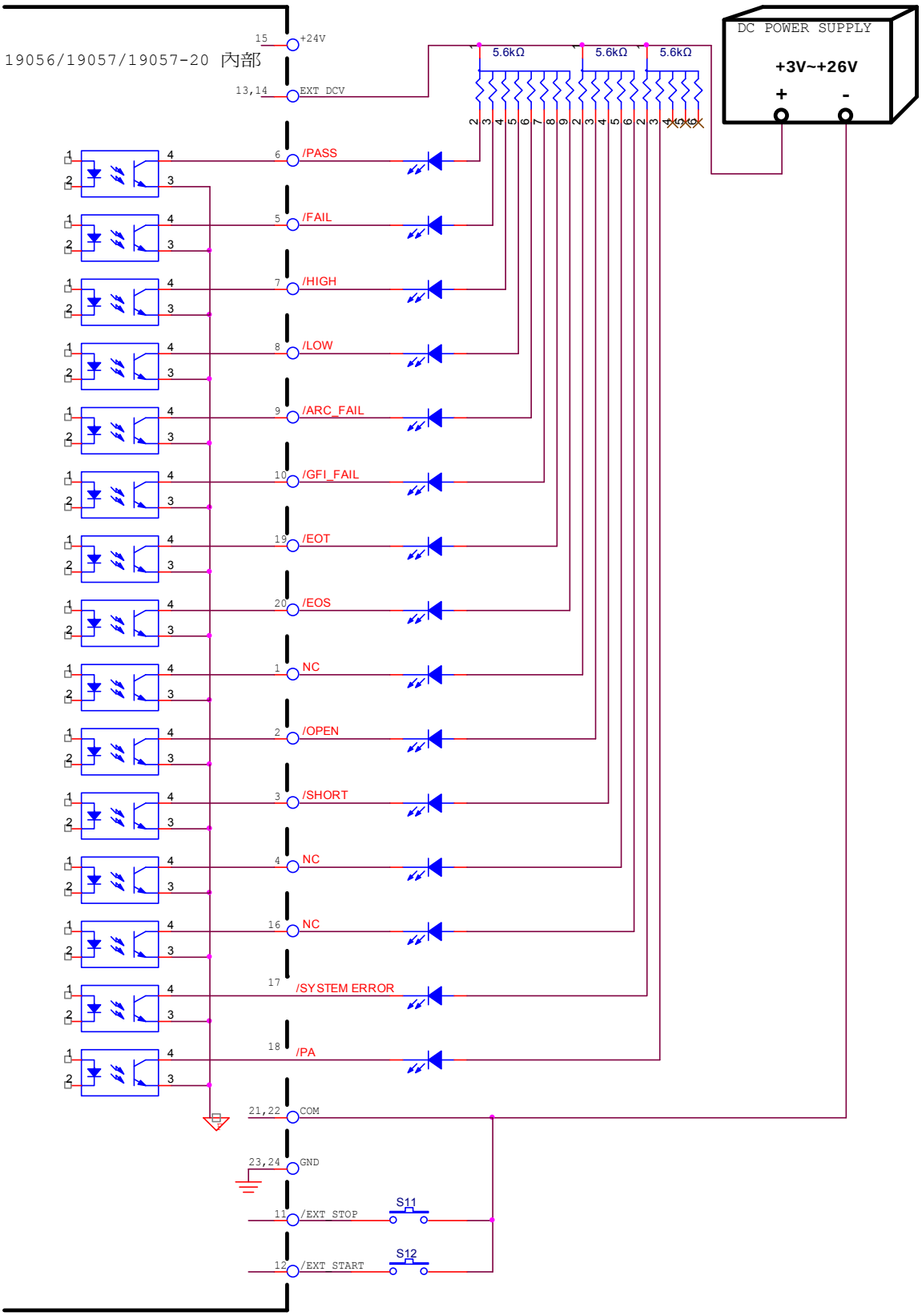
Pin No.	Signal Name	Input/Output	Description
1	NC	Output	Reserved, unused
2	/OPEN		When HVCC and HFCC are judged as OPEN, the output is LOW.
3	/SHORT		When HFCC is judged as SHORT, the output is LOW.
4,16	NC		Reserved, unused
5	/FAIL		The test result is FAIL for outputting LOW, meanwhile /HI, /LO, /ARC_FAIL 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. When the output is LOW indicating 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 indicating Program under testing. When this signal is LOW indicating Program already ended or standby.
20	/EOS		When this signal is HIGH indicating STEP currently under testing. When this signal is LOW indicating STEP already ended and the next step has not proceeded yet 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

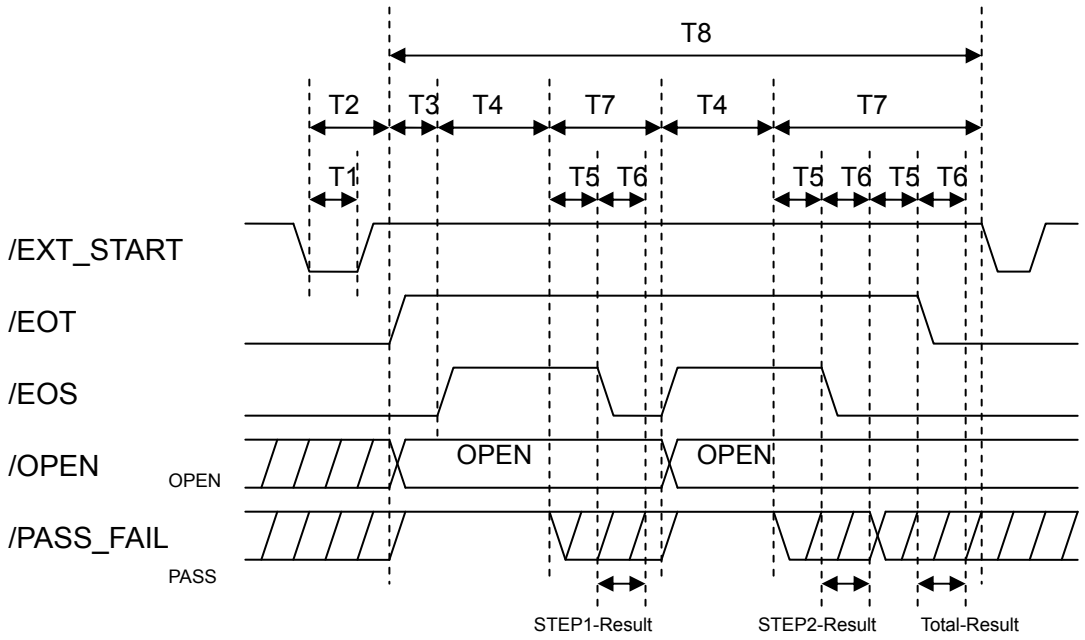
4.10.2.1Use Internal Power as an Example



4.10.2.2Use 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 required 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 step end required time
T8	-	PROGRAM required time

4.11 CALIBRATION Function

4.11.1 Enter Calibration Procedure

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 “ENTER CALIBRATION PASSWORD” window will be shown.
3. By using numerical keys to input PASSWORD [7] [9] [3] [1].
4. Press **ENTER** and select **[DEVICE] to** enter calibration procedure.

4.11.2 Clear Memory

1. When the title list shows "MAIN MENU", press numerical key which corresponds to **CALIBRATION** then "ENTER CALIBRATION PASSWORD" window will be shown.
2. By using numerical keys to input PASSWORD [8] [5] [2] [4] [6].
3. After pressing [ENTER] key, "MESSAGE" window will be shown. Users can select if clear memory by Function Keys [YES], [NO] or press [EXIT] to abort memory clearance.
4. If Function Key [YES] is selected, thus all saved data will be cleared and all setting parameters will be reset as initial value.
5. After clearing 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 set KEY LOCK to ON then restart, and enter TEST menu directly.

KEY LOCK release method:

1. When the title list shows "MAIN MENU", if text block "LOCK" is highlighted by pressing numerical key which 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 the highlight and it means KEY LOCK function had been cancelled.

4.13 User Password Setting

1. When the title list shows "MAIN MENU", press numerical key which corresponds to NEW SECURITY CODE then "ENTER USER PASSWORD" window will be shown.
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 *4.11.2 "Clear Memory"* to clear the memory, PASSWORD will be reset to initial value, *i.e.* 0000.

4.14 FAIL LOCK Function

4.14.1 FAIL LOCK Setting and Usage

1. When the title list shows “MAIN MENU”, press numerical key which corresponds to FAIL LOCK then “FAIL LOCK” window will be shown.
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, the 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 is activated, if DUT is judged as FAIL then it will show the test screen as below.

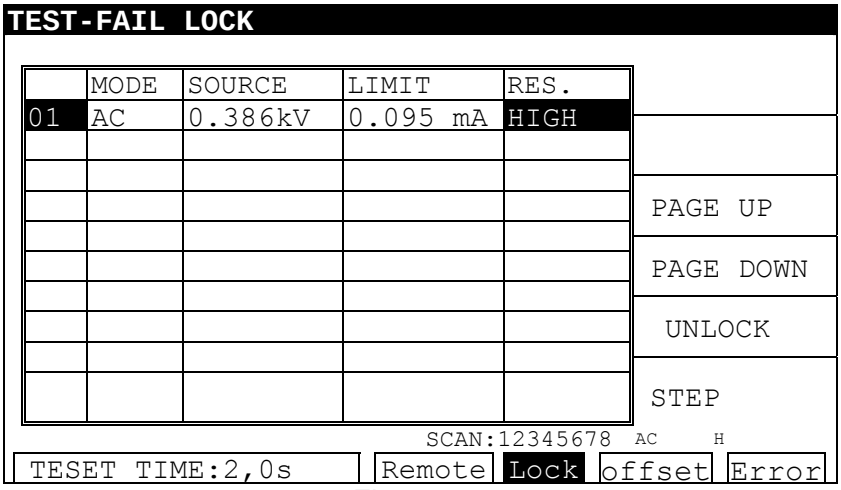


Figure 4-5

5. Meanwhile, press [STOP] and Function Key [UNLOCK] to clear buzzer sound, then the “UNLOCK” window will be shown.
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 the test.
7. Press [MENU] to return to MAIN MENU.

Note When FAIL LOCK is set as ON then to restart, then it will enter TEST menu directly.

4.14.2 Release FAIL LOCK

1. When the title list shows “MAIN MENU”, press numerical key which corresponds to FAIL LOCK then the “RELEASE FAIL LOCK” window will be shown.
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 the message indication box “LOCK” highlight will also be released.

5. GPIB/RS232 Interface (IEEE-488.2)

5.1 Introduction

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

2. **Remote / Local Control**
   - The signal block "Remote" is highlighted, it means the analyzer under 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

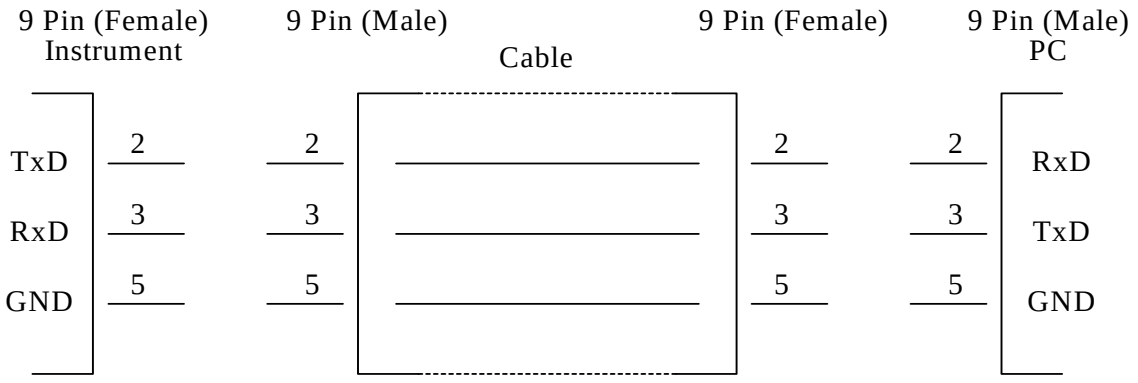
5.3.3 Connector

RS232 connector of the analyzer is 9 pins female connector.

Pin No.		Description
1	*	Don’t use
2	TxD	Transmit data
3	RxD	Receive data
4	*	Don’t use
5	GND	Signal grounding
6	*	Don’t use
7	*	Don’t use
8	*	Don’t use
9	*	Don’t use

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 "< >" denotes 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? (For 19056 only)
|   |   |   | :MMETerage
|   |   |   | |   [:NORMal]?
|   |   |   | :CMETerage?
|   |   |   | :CCMETerage?
|   |   |   | :MODE?
|   |   |   | :TIME
|   |   |   | |   [:ELAPsed]
|   |   |   | |   |   :RAMP?
|   |   |   | |   |   [:TEST]?
|   |   |   | |   |   :DWELl? (For 19057 and 19057-20 only)
|   |   |   | |   |   :FALL?
|   |   |   :COMPleted?
|   |   |   [:LAST]
|   |   |   |   [:JUDGmemt]?
|   |   |   :AREPort <boolean>|ON|OFF (For RS232 interface only)
|   |   |   :AREPort (For RS232 interface only)
|   |   |   |   :ITEM [<item>][,<item>] (For RS232 interface only)
|   |   |   |   :ITEM?
|   |   |   :ASAVe <boolean>|ON|OFF
|   |   |   :BREakdown
|   |   |   |   [:JUDGment]?
|   |   |   |   [:JUDGement]?
|   |   |   |   :MMETerage?
|   |   |   |   :OMETerage?
|   |   |   |   :CMETerage?
|   |   |   |   :MODE?
|   |   |   |   :STEP?
|   |   |   |   :TIME
|   |   |   |   |   [:ELAPsed]
|   |   |   |   |   |   [:TEST]?
|   |   |   |   |   |   :DWELl? (For 19057 and 19057-20 only)
|   |   |   |   |   :WVoltage?
|   |   :STEP<n>
|   |   |   :DELete
|   |   |   :SET?
|   |   |   :MODE?
|   |   |   :AC (For 19056 only)
|   |   |   |   [:LEVel] <numeric value>
|   |   |   |   [:LEVel]?
|   |   |   |   :LIMit
|   |   |   |   |   [:HIGH] <numeric value>
|   |   |   |   |   [:HIGH]?
|   |   |   |   |   :LOW <numeric value>
|   |   |   |   |   :LOW?
|   |   |   |   |   :REAL <numeric value>
|   |   |   |   |   |   [:HIGH] <numeric value>
|   |   |   |   |   |   [:HIGH]?
|   |   |   |   |   :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?
|   |   |   |   :HVCC <boolean>|ON|OFF
|   |   |   |   :HVCC?
|   |   |   |   :CURRent
|   |   |   |   |   :OFFSet
|   |   |   |   |   |       [:NORmal] <numeric value>
|   |   |   |   |   |       [:NORmal]?
|   |   |   |   |   |       :REAL <numeric value>
|   |   |   |   |   |       :REAL?
|   |   |   |   :TIME
|   |   |   |   |   :RAMP <numeric value>
```

```
|   |   |   |   |   :RAMP?
|   |   |   |   |   [:TEST] <numeric value>
|   |   |   |   |   [:TEST]?
|   |   |   |   |   :FALL <numeric value>
|   |   |   |   |   :FALL?
|   |   |   :DC (For 19057 and 19057-20 only)
|   |   |   |   [: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?
|   |   |   |   :HVCC <boolean>|ON|OFF
|   |   |   |   :HVCC?
|   |   |   |   |   :OFFSet <numeric value>
|   |   |   |   |   :OFFSet?
|   |   |   |   :TIME
|   |   |   |   |   :DWELI <numeric value>
|   |   |   |   |   :DWELI?
|   |   |   |   |   :RAMP <numeric value>
|   |   |   |   |   :RAMP?
|   |   |   |   |   [:TEST] <numeric value>
|   |   |   |   |   [:TEST]?
|   |   |   |   |   :FALL <numeric value>
|   |   |   |   |   :FALL?
|   |   |   :IR   (For 19057 and 19057-20 only)
|   |   |   |   [: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?
|   |   |   :PAuse
|   |   |   |   [:MESSage] <string data>
|   |   |   |   [:MESSage]?
|   |   |   |   :TIME
|   |   |   |   |       [:TEST] <numeric value>
|   |   |   |   |       [:TEST]?
|   |   |   :OSC
|   |   |   |   :LIMit
|   |   |   |   |   [:OPEN] <numeric value>
|   |   |   |   |   [:OPEN?]
|   |   |   |   |   :SHORt   <numeric value>
|   |   |   |   |   :SHORt?
```

```
|   |   |   |   :CRANge? <MAXimun|MINimum|NOW>
|   |   |   |   : CURRent<m>
|   |   |   |   |   : OFFSet <numeric value>
|   |   |   |   |   : OFFSet?
|   |   |   |   :CSTandard <numeric value>
|   |   |   |   :CSTandard?
|   |   :PRESet
|   |   |   :TIME
|   |   |   |   :PASS <numeric value>
|   |   |   |   :PASS?
|   |   |   |   :STEP <numeric value>
|   |   |   |   :STEP?
|   |   |   :AC
|   |   |   |   :FREQuency <numeric value>   (For 19056 only)
|   |   |   |   :FREQuency? (For 19056 only)
|   |   |   :WRANge
|   |   |   |   [:AUTO] <  boolean> |ON|OFF
|   |   |   |   [:AUTO]?
|   |   |   :AGC
|   |   |   |   [:SOFTware] <Boolean>|ON|OFF
|   |   |   |   [:SOFTware]?
|   |   |   :RJUDgment <  boolean>|ON|OFF (For 19057 and 19057-20 only)
|   |   |   :RJUDgment? (For 19057 and 19057-20 only)
|   |   |   :GFI <ON|OFF>   (For 19056 only)
|   |   |   :GFI? (For 19056 only)
|   |   :BREakdown
|   |   |   :MODE?
|   |   |   :AC    (For 19056 only)
|   |   |   |   [: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   (For 19057 and 19057-20 only)
|   |   |   |   [: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?
|   |   |   |   |   :DWELl <numeric value>
|   |   |   |   |   :DWELl?
|   |   |   |   :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 <*Metric system numeric value*>**
It is used 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 is used for setting service request register value, its <metric system numeric value> is 0 ~ 255.

***SRE?**
The controller is for reading service request enabled register initial setting.
The output format is <metric system numeric 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 numeric 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 (for 19056 only).

CMETerage	Corona meterage at present (this parameter can't be used when there is no Corona).
CCMETerage	HFCC C measured value of 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. (for 19057, 19057-20 only).
DLEAve	The leave time of dwell at present. (for 19057, 19057-20 only).
TELApsed	The elapsed time of test at present. 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. Return the leave time when Test Time is limited time. 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(for 19056 only).
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 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-11"**
Description: Return message **"1.000000E-11"** 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 required time result is 3 seconds.

[:SOURce]:SAFEty:RESult:ALL:TIME[:ELAPsed]:DWELl?
This command queries dwell time for testing all steps. (For 19057, 19057-20 only)
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 for 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	
Code	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 OVER	26	38	36	54	46	70	66	102		
METER A/D OVER	27	39	37	55	47	71	67	103		

REAL HIGH FAIL	**2A**	**42**								
CORONA FAIL	**2B**	**43**								
SHORT FAIL							**61**	**97**		
OPEN FAIL							**62**	**98**		
GFI FAIL	**2D**	**45**	**3D**	**61**	**4D**	**77**	**6D**	**109**		
HVCC OPEN FAIL	**2E**	**46**	**3E**	**62**						
HFCC SHORT FAIL	**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 under GENERAL MODE.
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.

Character	Return Data
MODE	Measure MODE
OMETerage	Output value
MMETerage	Measurement value
RMETerage	Real Current measurement value (for 19056 only).
CMETerage	Corona measurement value (this parameter can't be used when there is no Corona).
CCMETerage	C measurement value of HFCC

RELApsed	RAMP elapsed time
DELApsed	DWELL elapsed time (for 19057 and 19057-20 only).
TELApsed	TEST elapsed time Return 9.9000001E+37 while Test Time sets as CONT. and higher than 999 sec.
FELApsed	Fall Time elapsed time.
STATe	Test result code

The sequence for report data:
MODE, OMETerage, MMETerage ,CMETerage, RMETerage, CCMETerage, 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 to be reported. 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:BREakdown: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:BREakdown: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:BREakdown: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:BREakdown: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: BREakdown: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: BREakdown:TIME[:ELAPsed]:DWELl?
This command queries the executed dwell time of the STEP under BREAK DOWN VOLT MODE. (For 19057 and 19057-20 only)
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: BREakdown: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 **"**7.5**00000E+01"**
Description: It returns **"**7.5**00000E+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-06,+8.000000E-03,+3.300000+E01, +2.600000E-11,+5.000000E-01,+3.000000E+00, +3.000000E+00, +1.000000E+00, +2.000000E+00**
Description: It means STEP settings in working memory are STEP1, AC, VOLT: 5.000kV, HIGH:0.600mA, LOW:0.007mA, Real Limit:0.008mA, ARC: 8.0mA, Corona:33, HFCC C:26pF, HFCC OPEN:50%, HFCC SHORT:300%, TIME:3.0s, RAMP:1.0s, FALL:2.0s.

[: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 **"SAFEty:STEP1:MODE?"**
Return message **"DC"**
Description: It returns **"DC"** to indicate its mode is DC MODE.

[:SOURce]:SAFEty:STEP<n>:AC[:LEVel] < *numeric value* >
This command sets the selected STEP, the required voltage value as testing AC withstand under GENERAL MODE. The unit is in volt (V). (For 19056 only)
Range: 100~10000
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 under GENERAL MODE. (For 19056 only)
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). (For 19056 only)
Range: 0.000001~0.02.
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. (For 19056 only)
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. (For 19056 only)
Range: 0=OFF, 0.000001~0.12 (low limit value of leakage current ≤ 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). (For 19056 only)
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. (For 19056 only)
Range: 0=OFF, 0.000001~0.12 (high limit value of Real Current ≤ 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). (For 19056 only)
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). (For 19056 only)
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. (For 19056 only)
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 leakage current under GENERAL MODE. (It is only for 19056 and with CORONA function.)
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 leakage current 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 leakage current under GENERAL MODE. (It is only for 19056 and with CORONA function.)
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 leakage current in the main unit is 20.2.

[:SOURce]:SAFEty:STEP<n>:AC:HVCC < *boolean* > | *ON* | *OFF*
This command sets the selected STEP, its HVCC value of AC withstand voltage under GENERAL MODE. (For 19056 only)
Example: Input command **"SAFE:STEP 2:AC:HVCC ON"**
Description: It sets HVCC of AC withstand voltage in the main unit STEP 2 to ON.

[:SOURce]:SAFEty:STEP<n>:AC:HVCC?
This command queries the selected STEP, its HVCC value of AC withstand voltage under GENERAL MODE. (For 19056 only)
Example: Input command **"SAFE:STEP 2:AC:HVCC?"**
Return message **"1"**
Description: It returns **"1"** to indicate HVCC value of AC withstand voltage in the main unit STEP 2 is ON.

[: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 voltage 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 voltage HFCC to 300%.

[:SOURce]:SAFEty:STEP<n>:AC:LIMit: SHORt?
This command queries the selected STEP, its SHORT high limit value of AC withstand leakage current 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 voltage 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 voltage 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: (For 19056 only)
High Limit setting range is 0.001~2.999mA, the OFFSET setting range is 0.000000~0.002999.
High Limit setting range is 3~20.00mA, the OFFSET setting range is

0.00000~0.02000.
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. (For 19056 only)
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). (For 19056 only)
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 3~20.00mA, OFFSET setting range of Real Current is 0.00000~0.02000.
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. (For 19056 only)
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). (For 19056 only)
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. (For 19056 only)
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. (For 19056 only)
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. (For 19056 only)
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). (For 19056 only)
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. (For 19056 only)
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>: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). (For 19057 and 19057-20 only)
Range: When the model is 19057, the range is 100~12000.
When the model is 19057-20, the range is 100~20000.
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. (For 19057 and 19057-20 only)
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). (For 19057 and 19057-20 only)
Range: When the model is 19057, the range is 0.0000001~0.01.
When the model is 19057-20, the range is 0.0000001~0.005.
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. (For 19057 and 19057-20 only)
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). (For 19057 and 19057-20 only)
Range: When the model is 19057, the range is 0 or 0.0000001~0.01. 0 is for setting OFF.
When the model is 19057-20, the range is 0 or 0.0000001~0.005. 0 is for setting OFF (low limit value of leakage current ≤ high limit value for 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. (For 19057 and 19057-20 only)
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). (For 19057 and 19057-20 only)
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 under GENERAL MODE. (For 19057 and 19057-20 only)

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 19057 and 19057-20 only, it is also with CORONA function.
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 command queries the selected STEP, its Corona high limit value of DC withstand voltage under GENERAL MODE. This function is for 19057 and 19057-20 only, it is also with CORONA function.
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:HVCC < *boolean* > | *ON* | *OFF*
This command sets the selected STEP, its HVCC value of DC withstand voltage under GENERAL MODE. (For 19057 and 19057-20 only)
Example: Input command **"SAFE:STEP 2:DC:HVCC ON"**
Description: It sets STEP 2 HVCC value of DC withstand voltage in the main unit to ON.

[:SOURce]:SAFEty:STEP<n>:DC:HVCC?
This command queries the selected STEP, its HVCC value of DC withstand voltage under GENERAL MODE. (For 19057 and 19057-20 only)
Example: Input command **"SAFE:STEP 2:DC:HVCC?"**
Return message **"1"**
Description: It returns **"1"** to indicate STEP 2 HVCC value of DC withstand voltage in the main unit is ON.

[: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). (For 19057 and 19057-20 only)
Range: The Offset setting range is 0.0000000~0.0002999 when High Limit setting range is from 0.1uA 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 0.000000~0.01000 when the model is 19057 with High Limit setting range from 3mA to 10mA.
The Offset setting range is 0.000000~0.00500 when the model is 19057-20 with High Limit setting range from 3mA to 5mA.
Example: Input command **"SAFE:STEP 1:DC:CURR:OFFS 0.005**
Description: It sets STEP 1 DC Offset to 5mA.

[:SOURce]:SAFEty:STEP<n>:DC:CURRent:OFFSet?
This command queries Offset value of the selected STEP under GENERAL MODE. (For 19057 and 19057-20 only)
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:DWELl < *numeric value* >
This command sets the selected STEP, its DWELL required time under GENERAL MODE. The unit is in second (s). (For 19057 and 19057-20 only)
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:DWELl?
This command queries the selected STEP, its DWELL required time under GENERAL MODE. (For 19057 and 19057-20 only)
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). (For 19057 and 19057-20 only)
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. (For 19057 and 19057-20 only)
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). (For 19057 and 19057-20 only)
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 1.0 sec.

[:SOURce]:SAFEty:STEP<n>:DC:TIME[:TEST]?
This command queries the selected STEP, its required time of testing under GENERAL MODE. (For 19057 and 19057-20 only)
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). (For 19057 and 19057-20 only)
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. (For 19057 and 19057-20 only)
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>: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). (For 19057 and 19057-20 only)
Range: 10~5000
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. (For 19057 and 19057-20 only)
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. (For 19057 and 19057-20 only)
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. (For 19057 and 19057-20 only)
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. (For 19057 and 19057-20 only)
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. (For 19057 and 19057-20 only)
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). (For 19057 and 19057-20 only)
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. (For 19057 and 19057-20 only)
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). (For 19057 and 19057-20 only)
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.

[:SOURce]:SAFEty:STEP<n>:IR:TIME[:TEST]?
This command queries the selected STEP, its required time of testing under GENERAL MODE. (For 19057 and 19057-20 only)
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). (For 19057 and

19057-20 only)
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. (For 19057 and 19057-20 only)
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 higher than the current measured according to current value users inputted under GENERAL MODE. The unit is in Ampere (A). (For 19057 and 19057-20 only)
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 higher than the current measured is 3mA.

[:SOURce]:SAFEty:STEP<n>:IR: RANGe: UPPer?
This command queries the range to be set under GENERAL MODE. (For 19057 and 19057-20 only)
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). (For 19057 and 19057-20 only)
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. (For 19057 and 19057-20 only)
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 to be changed to AUTO under GENERAL MODE. (For 19057 and 19057-20 only)
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 to be changed to AUTO under GENERAL MODE. (For 19057 and 19057-20 only)
It sets to AUTO when 1 returned.
It sets to disable AUTO when 0 returned.
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>: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 to 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. (For 19056 only)
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 sets the selected STEP, its setting percentage is judged by short circuit as detecting open/short circuit under GENERAL MODE. (For 19056 only)
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. (For 19056 only)
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 which maximum, minimum value can be set and the range is operating now under GENERAL MODE. (For 19056 only)
Example: Input command **"SAFE:STEP 6:OSC:CRAN? NOW"**
Return message **"1"**
Description: It returns **"1"** to indicate STEP 6 OSC range in the main unit is located at 1 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 can be inputted only), numeric value= Cs value. The unit is in F.
Range: 0~999.9nF. (For 19056 only)
Example: Input command **"SAFE:STEP1:OSC:CURR 1:OFFS 0.00000001"**
Description: It sets current range to 1, 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 can be inputted only) (For 19056 only)
Example: Input command **"SAFE:STEP 1:OSC:CURR 1:OFFS?**
Return message **"1.0000000E-10"**
Description: It returns **"1.0000000E-10"** to indicate STEP 1 Offset value in the main unit is 100pF.

[:SOURce]:SAFEty:STEP<n>:OSC:CSTandard ***<numeric value>***
This command sets OSC standard capacitance value under GENERAL MODE.
Range: 0.1-10.0nF, the unit is in F. (For 19056 only)
Example: Input command **"SOUR:SAFE:STEP 1:OSC:CST 0.000000009"**
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. (For 19056 only)
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: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.

[: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). (For 19056 only)
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. (For 19056 only)
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:WARN?"**
Return message **"1"**
Description: It returns **"1"** to indicate withstand voltage auto range function 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 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"** (For 19057 and 19057-20 only)
Description: It sets Ramp Judg. of the main unit to ON.

[:SOURce]:SAFEty:PRESet:RJUDgment?
This command queries Ramp Judg. ON or OFF. (For 19057 and 19057-20 only)
Example: Input command **"SAFE:PRES:RJUD?"**
Return message **"1"**
Description: It returns **"1"** to indicate Ramp Judg. ON.

[:SOURce]:SAFEty:PRESet:GFI *ON*|*OFF*
This command is used for GFI setting under GENERAL MODE and BREAKDOWN MODE. (For 19056 only)
Example: Input command **"SAFE:PRES:GFI ON"**
Description: It sets GFI ON.

[:SOURce]:SAFEty:PRESet:GFI?

This command queries GFI setting. (For 19056 only)
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). (For 19056 only)
Range: Start voltage: 100V ~ end voltage
End voltage: start voltage ~ 10000V
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). (For 19056 only)
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). (For 19056 only)
Range: 0.000001~0.02
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. (For 19056 only)
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. (For 19056 only)
Range: 0: OFF or 0.000001~0.02 (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). (For 19056 only)
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). (For 19056 only)
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. (For 19056 only)
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. (For 19056 only and with CORONA function)
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:BREakdown:AC:LIMit:CORona?
This command queries Corona high limit of AC MODE under BREAKDOWN MODE. (For 19056 only and with CORONA function)
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). (For 19056 only)
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. (For 19056 only)
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). (For 19056 only)

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. (For 19056 only)
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. (For 19056 only)
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. (For 19056 only)
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 to be required to test under BREAKDOWN MODE.
Range: 2~999 (For 19056 only)
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 to be required to test under BREAKDOWN MODE. (For 19056 only)
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). (For 19057 and 19057-20 only)
Range: Start voltage: 100V ~ end voltage
End voltage: 19057, start voltage ~ 12000V
19057-20, start voltage ~ 20000V
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). (For 19057 and 19057-20 only)
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). (For 19057 and 19057-20 only)
Range: When the model is 19057, the range is 0.00000001~0.01.
When the model is 19057-20, the range is 0.00000001~0.005.
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. (For 19057 and 19057-20 only)
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. (For 19057 and 19057-20 only)
Range: When the model is 19057, 0:OFF or 0.0000001~0.01.
When the model is 19057-20, 0:OFF or 0.0000001~0.005.
(low limit value of leakage current ≤ 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). (For 19057 and 19057-20 only)
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). (For 19057 and 19057-20 only)
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. (For 19057 and 19057-20 only)
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. (For 19057 and 19057-20 only, and also with CORONA function)
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 command queries Corona high limit value of DC MODE under BREAKDOWN MODE. (For 19057 and 19057-20 only, and also with CORONA function)
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). (For 19057 and 19057-20 only)
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:DWELl < *numeric value* >
This command sets dwell time of each STEPs under BREAKDOWN MODE. The unit is second (s). (For 19057 and 19057-20 only)
Range: 0 or 0.1~999.0, 0 indicates it 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:DWELl?
This command queries dwell time of STEP under BREAKDOWN MODE. (For 19057 and 19057-20 only)
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). (For 19057 and 19057-20 only)
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. (For 19057 and 19057-20 only)
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. (For 19057 and 19057-20 only)
Example: Input command **"SAFE:BRE: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. (For 19057 and 19057-20 only)
Example: Input command **"SAFE:BRE:DC:CONT?"**
Return message **"1"**
Description: It indicates to continue outputting while testing to the last STEP.

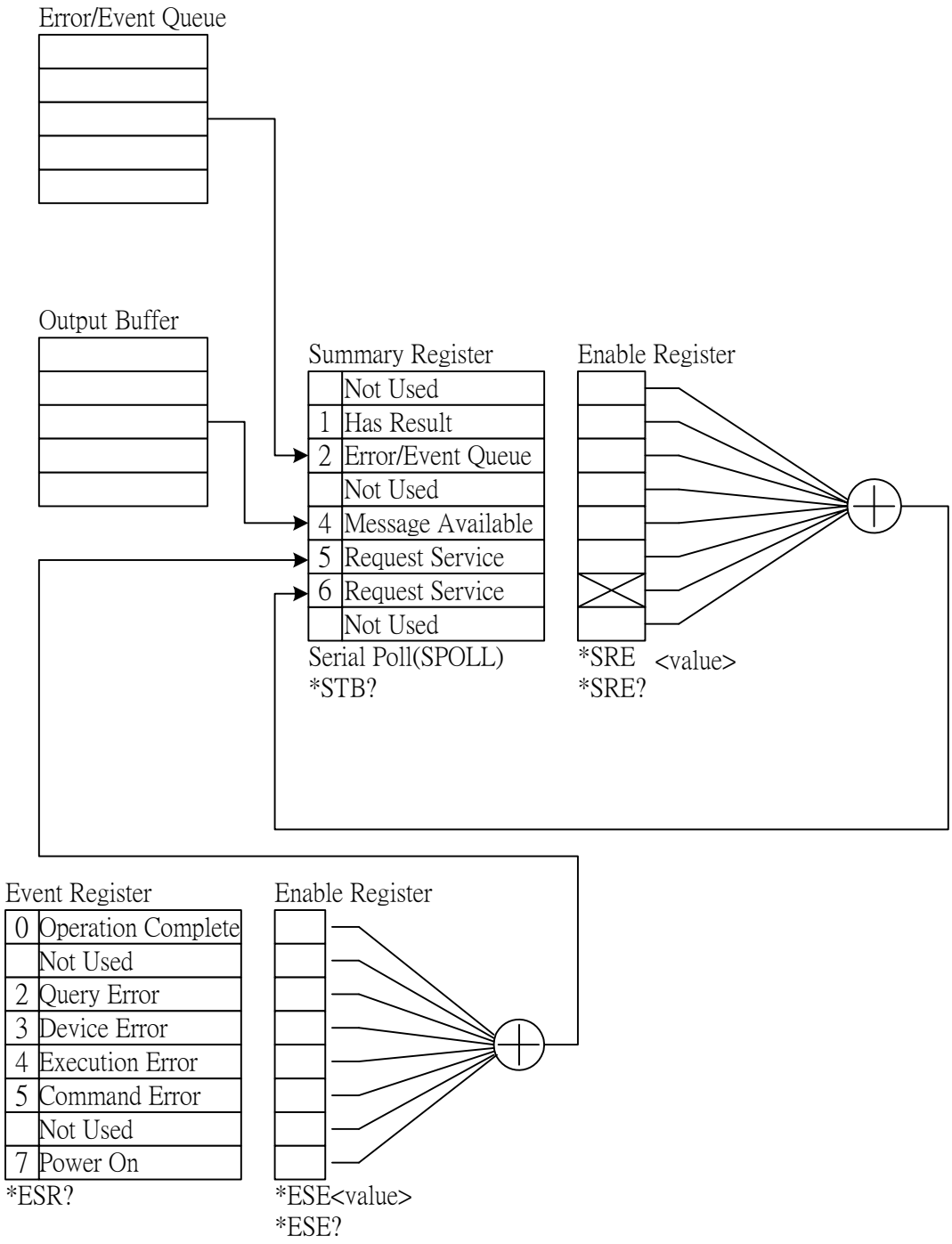
[:SOURce]:SAFEty:BREakdown:DC:STEP < *numeric value* >
This command sets how many STEPs required to test under BREAKDOWN MODE. (For 19057 and 19057-20 only)
Range: 2~999
Example: Input command **"SAFE:BRE:DC:STEP 10"**
Description: It sets 10 STEPs for testing in the main unit.

[:SOURce]:SAFEty:BREakdown:DC:STEP?
This command queries how many STEPs to test under BREAKDOWN MODE. (For 19057 and 19057-20 only)
Example: Input command **"SAFE:BRE: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 accessed 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 to be queried.
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	TIME (?)	{f ¦*}	It sets test time.
12	RAMP (?)	{f ¦*}	It sets voltage ramp time.
13	OFST (?)	{c}	Get offset
14	*SAV	{n}	It saves the setting value.
15	*RCL	{n}	It reads the setting value.
16	CLER	X	It clears the memory.
17	*IDN ?	X	It queries the tester number.
18	*DDT (?)	{n ¦ c}	It sets the response of Trigger command.
19	*TRG	X	It executes Trigger command.
20	*RST	X	It resets the tester.
21	PSTR (?)	{String}	It sets Pause Mode Message.
22	MEAS: STEPnnn?	X	It reads the test result data of specified STEP.
23	GTEC	X	It activates GET Cs function in OSC Mode.
24	DWLL (?)	{f ¦*}	It sets DWELL time.
25	FALL (?)	{f ¦*}	It sets voltage falling time.
26	IRRNG (?)	{n ¦c}	It selects RANGE of IR mode.
27	CST (?)	{f ¦*}	It sets Cs value.
28	OPLI (?)	{f ¦*}	It sets Open Limit.
29	SHLI (?)	{f ¦*}	It sets Short Limit.
30	CRNA (?)	{f ¦*}	It sets CORONA Limit.
31	FUNC (?)	{String}	It sets General Breakdown Mode.
32	BSTEP (?)	{n}	It sets step in Breakdown Mode.

33	RELI (?)	{f ¦*}	It sets AC mode Real High Limit.
34	CONT(?)	{n ¦c}	It sets CONT in Breakdown Mode.
35	HVCC(?)	{n ¦c}	It sets HVCC.

Note

1. Parameter description:
   x: no parameter required c: indicate mnemonic
   n: indicate the integer *: indicate "*" character of ASCII
2. 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 each specification, for example: the specification of 9032C.

WV Mode	f = 0.01 ~ 20.00 mA
WD Mode	When the model is 19057, f = 0.0001 ~ 10.00 mA When the model is 19057-20, f = 0.0001 ~ 5.00 mA
IR Mode	f = 0 ~ 50000 MΩ, 0(OFF)
OSC Mode	SHORT CHK.=0(OFF), 100%~500%

Description: 1. It is disabled only when it is 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' t 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%).

3. LOLI (?) {f ¦*}

Function: It sets Low Limit value.

Parameter : Please refer "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 falling time.
Parameter: f: 0 ~ 999 second
Description: It can be set as FALL only when 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 when in AC/DC/OSC.

9. OPLI(?) {f|*}
Function: It sets OPEN LIMIT value.
Parameter: 0.1~1
Description: It can be set only when in AC/DC/OSC.

10. SHLI(?) {f|*}
Function: It sets SHORT LIMIT value.
Parameter: 1.0~5.0
Description: It can be set only when 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(?) {f|*}
Function: It sets Real High Limit value in AC Mode.
Parameter: 0~120mA
Description: It can be set only in AC Mode. 0~20mA.

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.

16. HVCC(?) {n|c}
Function: It sets HVCC value.
Parameter: 0, 1, ON and OFF
Description: It can be set only in General Mode.

7. Calibration

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” is 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*)

19056 voltage calibration

ACV	10kV	Offset (100V)	;AC Voltage	OFFSET	point
ACV	10kV	Full (6kV)	;AC Voltage	FULL	point
OSCV	100V	Offset (50V)	;OSCV Voltage	OFFSET	point
OSCV	100V	Full (100V)	;OSCV Voltage	FULL	point

19057 voltage calibration

DCV	12kV	Offset (100V)	;DC Voltage	OFFSET	point
DCV	12kV	Full (6kV)	;DC Voltage	FULL	point
IRV	5kV	Offset (100V)	;IR Voltage	OFFSET	point
IRV	5kV	Full (4kV)	;IR Voltage	FULL	point

19057-20 voltage calibration

DCV	20kV	Offset (100V)	;DC Voltage	OFFSET	point
DCV	20kV	Full (10kV)	;DC Voltage	FULL	point
IRV	5kV	Offset (100V)	;IR Voltage	OFFSET	point
IRV	5kV	Full (4kV)	;IR Voltage	FULL	point

Current Calibration (see *section 7.3*)

19056 current calibration

ACA	3mA	Offset (0.12mA)	;AC 2.99mA	range	OFFSET	point
ACA	3mA	Full (2.5mA)	;AC 2.99mA	range	FULL	point
ACA	20mA	Offset (2.5mA)	;AC 19.99mA	range	OFFSET	point
ACA	20mA	Full (12mA)	;AC 19.99mA	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	20mA	Offset (2.5mA)	;AC 19.99mA	range	OFFSET	point
RCA	20mA	Full (12mA)	;AC 19.99mA	range	FULL	point

19057 current calibration

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	10mA	Offset (2.5mA)	;DC 9.99mA	range	OFFSET	point
DCA	10mA	Full (4.8mA)	;DC 9.99mA	range	FULL	point

19057-20 current calibration

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	5mA	Offset (2.5mA)	;DC 5mA	range	OFFSET	point
DCA	5mA	Full (4.8mA)	;DC 5mA	range	FULL	point

Withstand Voltage Mode Arcing Calibration (see *section 7.4*)

19056 arcing calibration

AC	ARC	20mA(5mA)	;AC Arcing	Calibration

19057 arcing calibration

DC	ARC	10mA(5mA)	;DC Arcing	Calibration

19057-20 arcing calibration

DC	ARC	10mA(5mA)	;DC Arcing	Calibration

Empty Load Leakage Current Calibration (see *section 7.5*)

ACA	3mA	Range Offset Cali	; ACA 3mA Offset	Calibration

Insulation Resistance Mode Leakage Current Meter Calibration (see section 7.6)

IRR	370MΩ Offset (40MΩ)	;IR Resistor 370MΩ OFFSET point
IRR	370MΩ Full (200MΩ)	;IR Resistor 370MΩ FULL point
IRR	3.7GΩ Offset (400MΩ)	;IR Resistor 3.7GΩ OFFSET point
IRR	3.7GΩ Full (2GΩ)	;IR Resistor 3.7GΩ FULL point
IRR	50GΩ Offset (4GΩ)	;IR Resistor 50GΩ OFFSET point
IRR	50GΩ Full (20GΩ)	;IR Resistor 50GΩ FULL point
IRR	60GΩ Offset (40GΩ)	;IR Resistor 60GΩ OFFSET point
IRR	60GΩ Full (60GΩ)	;IR Resistor 60GΩ FULL point

High Frequency Contact Check Capacitance Calibration (see *section 7.7*)

HFCC	0pF	Offset Cali	; HFCC 0pF	OFFSET point
HFCC	164pF	Full Cali	; HFCC 164pF	OFFSET 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/OSCV Calibration - 19056

Connect ACV high voltage meter to withstand tester or connect 9102 for selecting ACV MODE [100MΩ].

Display	ACV 10kV 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 10kV Full (6kV)	; ACV FULL POINT calibration

Press	[STOP] [START]	; Read out the HV meter value
		; Example 6.052kV
Press	[6] [.] [0] [5] [2] [ENTER]	
Press	[STOP]	; End ACV voltage calibration
Display	OSCV 100V Offset (50V)	; OSCV OFFSET POINT calibration
Press	[STOP] [START]	; Read out the HV meter value
		; Example 0.042kV
Press	[0] [.] [0] [4] [2] [ENTER]	
Press	[STOP]	; Stop OSCV OFFSET POINT calibration
Press	[△] key to display	
Display	OSCV 100V Full (100V)	; OSCV FULL POINT calibration
Press	[STOP] [START]	; Read out the HV meter value
		; Example 0.102kV
Press	[0] [.] [1] [0] [2] [ENTER]	
Press	[STOP]	; End OSCV voltage calibration

7.2.2 DCV Calibration - 19057

Connect DCV high voltage meter to withstand tester or connect 9102 for selecting DCV MODE [1.00GΩ].

Press	[△] key to display	
Display	DCV 12kV 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 12kV Full (6kV)	; DCV FULL POINT calibration
Press	[STOP] [START]	; Read out the HV meter value
		; Example 6.052kV
Press	[6] [.] [0] [5] [2] [ENTER]	
Press	[STOP]	; End DCV voltage calibration

7.2.3 DCV Calibration - 19057-20

Connect DCV high voltage meter to withstand tester or connect 9102 for selecting DCV MODE [1.00GΩ].

Press	[△] key to display	
Display	DCV 20kV 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 20kV Full (10kV)	; DCV FULL POINT calibration
Press	[STOP] [START]	; Read out the HV meter value
		; Example 10.05kV
Press	[1] [0] [.] [0] [5] [ENTER]	

Press [STOP] ; End DCV voltage calibration

7.2.4 IR Voltage Calibration - 19057/19057-20

Connect DCV high voltage meter to withstand tester or connect 9102 for selecting DCV MODE [1.00GΩ].

Press [△] key to display
Display IRV 5kV 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 5kV Full (4kV) ; IRV FULL POINT calibration
Press [STOP] [START] ; Read out the HV meter value
; Example 4.052kV
Press [4] [.] [0] [5] [2] [ENTER]
Press [STOP] ; End 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 (19056)

Connect high potential terminal of withstand voltage tester to 10MΩ load resistor, and connect it to high potential terminal (HV) of AC ammeter. Connect low potential terminal (RET/LOW) 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 Offset point calibration

Press [△] key to display
Display IRV 5kV Full (4kV) ; IRV FULL POINT calibration
Press [STOP] [START] ; Read out the HV meter value
; Example 4.052kV
Press [4] [.] [0] [5] [2] [ENTER]
Press [STOP]

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 2.403mA
Press	[2] [.] [4] [0] [3] [ENTER]	
Press	[STOP]	; Stop ACA 2.999mA range calibration
Press	[△] key to display	
Display	ACA 20mA Offset(2.5mA)	; ACA 20.00mA range Offset point calibration
Press	[STOP] [START]	; Read out the ammeter value ; Example 2.403mA
Press	[2] [.] [9] [0] [3] [ENTER]	
Press	[STOP]	; Stop ACA 20.00mA range Offset point calibration

Change the dummy load resistor to 100kΩ 200watt (or higher).

Press	[△] key to display	
Display	ACA 20mA FULL(12mA)	; ACA 20.00mA range full point calibration
Press	[STOP] [START]	; Read out the ammeter value ; Example 12.50mA
Press	[1] [2] [.] [5] [0] [ENTER]	
Press	[STOP]	; Stop ACA 20.0mA range calibration

7.3.2 RCA Current Calibration (19056)

Connect high potential terminal of withstand voltage tester to 10MΩ load resistor, and connect to high potential terminal (HV) of AC ammeter. Connect low potential terminal (RET/LOW) of withstand voltage tester to low potential terminal of AC ammeter.

Press	[△] 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 500kΩ/50watt (or higher).

Press	[△] 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. 2.403mA)
Press	[2] [.] [4] [0] [3] [ENTER]	
Press	[STOP]	; Stop RCA 2.999mA range calibration
Press	[△] key to display	
Display	RCA 20mA Offset(2.5mA)	; RCA 20.00mA range Offset point calibration
Press	[STOP] [START]	; Read out the ammeter value (Ex. 2.403mA)
Press	[2] [.] [4] [0] [3] [ENTER]	
Press	[STOP]	; Stop RCA 20.00mA range Offset point calibration

Change the dummy load resistor to 100kΩ/200watt (or higher).

Press	[△] key to display	
Display	RCA 20mA FULL (25mA)	; RCA 20.00mA range full point calibration
Press	[STOP] [START]	; Read out the ammeter value (Ex. 12.50mA)
Press	[1] [2] [.] [5] [0] [ENTER]	
Press	[STOP]	; Stop RCA 20.00mA range calibration

7.3.3 DC Current Calibration (19057/19057-20)

Connect high potential terminal of withstand voltage tester to 10MΩ load resistor, and connect it to high potential terminal of DC ammeter. Connect low potential terminal of withstand voltage tester to low potential terminal of DC ammeter

Press [△] 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] [.] [0] [1] [2] [ENTER]
Press [STOP] ; Stop DCA 299.9uA Offset point calibration
Press [△] 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 [△] 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 500kΩ 50watt (or higher).
Press [△] key to display
Display DCA 3mA FULL (2.5mA) ; DCA 2.999mA range full point calibration.
Press [STOP] [START] ; Read out the ammeter value
; Example 2.403mA
Press [2] [.] [4] [0] [3] [ENTER]
Press [STOP] ; Stop DCA 2.999mA range calibration
Press [△] key to display
Display DCA 10mA Offset (2.5mA) ; DCA 10.00mA range Offset point calibration
Press [STOP] [START] ; Read out the ammeter value
; Example 2.403mA
Press [2] [.] [4] [0] [3] [ENTER]
Press [STOP] ; Stop DCA 10.00mA Offset point calibration

Change the load resistor to 250kΩ 100watt (or higher).
Press [△] key to display
Display DCA 10mA Full (4.8mA) ; DCA 10.00mA range full point calibration
Press [STOP] [START] ; Read out the ammeter value
; Example 4.81mA
Press [4] [.] [8] [1] [ENTER]
Press [STOP] ; Stop DCA 10.00mA range calibration

7.4 Withstand Voltage Mode Arc Calibration

Notice ARC calibration is very special, the high voltage terminal is positioned at outside.

7.4.1 AC Arc Calibration (19056)

Press	[△] key to display	; AC arc sensitivity calibration
Display	AC ARC 20mA (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	[4] [.] [5] [ENTER]	; For example, 4.5mA is critical point of ARC FAIL and ARC PASS.
Press	[STOP]	; Stop AC arc calibration

7.4.2 DC Arc Calibration (19057/19057-20)

Press	[△] key to display	; DC arc sensitivity calibration
Display	DC ARC 10mA (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	[4] [.] [6] [ENTER]	; For example, 4.6mA is critical point of ARC FAIL and ARC PASS.
Press	[STOP]	; Stop DC arc calibration

7.5 Empty Load Leakage Current Calibration (19056)

Do not connect any test cable and load resistor to high potential terminal and low one of withstand voltage tester.

Press	[△] key to display	; ACA empty leakage current calibration (Caution: Output voltage will up to 8kV).
Display	ACA 3mA Range Offset Cail	; ACA 2.999mA range Offset calibration
Press	[STOP] [START]	; Read empty load Offset value ; DANGER LED stop blinking and calibration is completed.

7.6 Resistor Calibration of Insulation Resistance Mode (19057/19057-20)

Connect the standard load resistor to high potential terminal and low one 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 200MΩ.
Press [△] key to display
Display IRR 370MΩ Full (200MΩ) ; Connect IR standard resistor to 200MΩ
Press [STOP] [START] ; Read out the IRR value
; If IR standard resistor is 200MΩ
Press [2] [0] [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 2.0GΩ.
Press [△] key to display
Display IRR 3.7GΩ Full (2.0GΩ) ; Connect IR standard resistor to 2.0GΩ
Press [STOP] [START] ; Read out the IRR value
; If IR standard resistor is 2.0GΩ
Press [2] [0] [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 20GΩ.
Press [△] key to display
Display IRR 50GΩ Full (20GΩ) ; Connect IR standard resistor to 20GΩ
Press [STOP] [START] ; Read out the IRR value

; If IR standard resistor is 20GΩ

Press [2] [0] [0] [0] [0] [ENTER]
Press [STOP] ; Stop

7.7 High Frequency Contact Check Capacitance Calibration

Connect 0pF capacitance fixture for calibration to high potential terminal of withstand voltage tester.

Press [△] key to display
Display HFCC Offset (0pF) ; HFCC Offset point calibration
Press [STOP] [START] ; Read Offset point capacitance value
Press [0] [ENTER]

Press [STOP] ; Stop HFCC 0pF Offset point calibration

Connect 164pF capacitance fixture for calibration to high potential terminal and low one of withstand voltage tester.

Press [△] key to display
Display HFCC Offset (0pF) ; HFCCFull point calibration
Press [STOP] [START] ; Read Full point capacitance value
Press [1] [6] [4] [ENTER]

Press [STOP] ; Stop HFCC 164pF Full point calibration

7.8 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.

CAUTION 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 Technology 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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