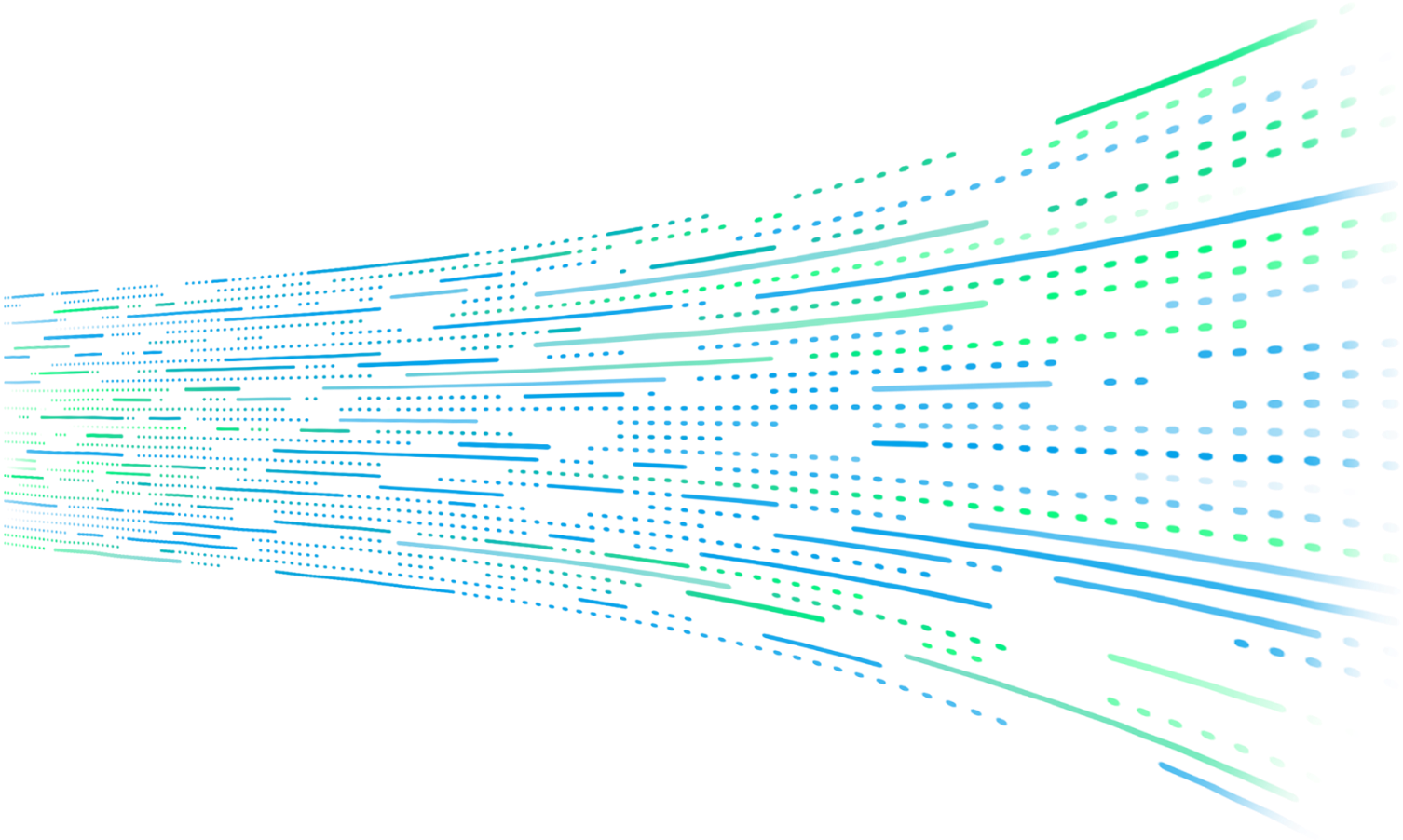
Chroma

Advancing Excellence

User's Manual

HIPOT Tester

19051/19052/19053/19054



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HIPOT Tester
19051/19052/19053/19054
User's Manual

Version 3.3
October 2024

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.
88 Wenmao Rd., Guishan Dist., Taoyuan City 333001, Taiwan

Warranty

All of Chroma's instruments are warranted against defects in material and workmanship for a period of one year from the 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 regarding the use of its products are based upon tests believed to be reliable; 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.

Chroma undertakes no liability for any special or consequential damages, or any of our customer's compensation responsibilities to third parties, arising from use or access of our product.

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www.chromaate.com

Material Contents Declaration

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


: See **<Table 1>**.


: See **<Table 2>**.

<Table 1>

Part Name	Hazardous Substances					
	Lead	Mercury	Cadmium	Hexavalent Chromium	Polybrominated Biphenyls/ Polybromodiphenyl Ethers	Selected Phthalates Group
	Pb	Hg	Cd	Cr^{6+}	PBB/PBDE	DEHP/BBP/DBP/DIBP
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, EU Directive 2011/65/EU, and 2015/863/EU.

“×” indicates that the level of the specified chemical substance exceeds the threshold level specified in the standards of SJ/T-11363-2006, EU Directive 2011/65/EU, and 2015/863/EU.

Remarks:
1. The CE marking on the product is a declaration of product compliance with EU Directive 2011/65/EU and 2015/863/EU.
2. This product complies with EU REACH regulations and no SVHC is in use.

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 ones, the retailer is legally obligated to take back your old appliances for disposal at least free of charge.

<Table 2>

Part Name	Hazardous Substances					
	Lead	Mercury	Cadmium	Hexavalent Chromium	Polybrominated Biphenyls/ Polybromodiphenyl Ethers	Selected Phthalates Group
	Pb	Hg	Cd	Cr^{6+}	PBB/PBDE	DEHP/BBP/DBP/DIBP
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, EU Directive 2011/65/EU, and 2015/863/EU.

"×" indicates that the level of the specified chemical substance exceeds the threshold level specified in the standards of SJ/T-11363-2006, EU Directive 2011/65/EU, and 2015/863/EU.

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.
3. This product complies with EU REACH regulations and no SVHC is in use.

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 ones, the retailer is legally obligated to take back your old appliances for disposal at least free of charge.

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Declaration of Conformity

For the following equipment :

AC/DC/IR/SCAN Hipot Tester

(Product Name/ Trade Name)

19052, 19053, 19054

(Model Designation)

CHROMA ATE INC.

(Manufacturer Name)

88 Wenmao Rd., Guishan Dist., Taoyuan City 333001, 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 (2014/30/EU) and Low Voltage Directive (2014/35/EU). For the evaluation regarding the Directives, the following standards were applied :

EN 61326-1:2013, Class A

EN 61000-3-2:2006+A2:2009, EN 61000-3-3:2008

IEC 61000-4-2:2008, IEC 61000-4-3:2010, IEC 61000-4-4:2011,
IEC 61000-4-5:2005, IEC 61000-4-6:2008, IEC 61000-4-8:2009,
IEC 61000-4-11:2004

EN 61010-1:2010 and EN 61010-2-030:2010

The equipment describe above is in conformity with Directive 2011/65/EU and 2015/863/EU of the European Parliament and of the Council on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

.

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

CHROMA ATE INC.

(Company Name)

88 Wenmao Rd., Guishan Dist., Taoyuan City 333001, Taiwan

(Company Address)

Person responsible for this declaration:

Mr. Vincent Wu

(Name, Surname)

T&M BU Vice President

(Position/Title)

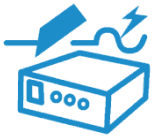
Taiwan	**2020.12.23**	Vincent Wu
(Place)	(Date)	(Legal Signature)

Safety Summary

The following general safety precautions must be observed during all phases of operation, service, and repair of this product. Failure to comply with these precautions or specific WARNINGS given elsewhere in this manual will violate the 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 device.

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 the 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.

Safety Symbols

	**DANGER –** High voltage.
	**Explanation:** To avoid injury, death of personnel, or damage to the instrument, the operator must refer to the explanation in the manual.
	**High temperature:** This symbol indicates the temperature is hazardous. Do not touch to avoid personal injury.
	**Protective grounding terminal:** This symbol indicates that the terminal must be connected to the ground before operating the equipment to protect against electrical shock in case of a fault.
	**Functional grounding:** To identify an earth (ground) terminal in cases where the protective ground is not explicitly stated. This symbol indicates the power connector does not provide grounding.
	**Frame or chassis:** To identify a frame or chassis terminal.
	**Alternating Current (AC)**
	**Direct Current (DC) / Alternating Current (AC)**
	**Direct Current (DC)**
	**Push-on/Push-off power switch**
	The **WARNING** sign highlights an essential operating or maintenance procedure, practice, condition, statement, etc., which if not strictly observed, could result in injury to, or death of, personnel or long-term health hazards.
	The **CAUTION** sign highlights an essential operating or maintenance procedure, practice, condition, statement, etc., which if not strictly observed, could result in damage to, or destruction of, equipment.
	The **Notice** sign highlights an essential operating or maintenance procedure, condition, or statement.

Inspection and Examination

This instrument was inspected before shipment 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 the instrument has to be returned. If damage is found, file a claim with the carrier immediately. Do not return the instrument to Chroma without prior approval.

19051 Standard Package

Item	Q'ty	Remark
HV terminal test cable	1	Alligator clip – cross HV head, red HV test cable, wire length 1m
LOW terminal test cable	1	Alligator clip – banana plug, black HV test cable, wire length 1.2m
Test cable for ground conduction	1	Cal for GC test, length 1.2m
5A fuse	2	For 5.0A SLOW 110VAC use
2.5A fuse	2	For 2.5A SLOW 240VAC use

19052 Standard Package

Item	Q'ty	Remark
HV terminal test cable	1	Alligator clip – cross HV head, red HV test cable, wire length 1m
LOW terminal test cable	1	Alligator clip – banana plug, black HV test cable, wire length 1.2m
Test cable for ground conduction	1	Cable for GC test, length 1.2m
5A fuse	2	For 5.0A SLOW 110VAC use
2.5A fuse	2	For 2.5A SLOW 240VAC use

19053 Standard Package

Item	Q'ty	Remark
HV terminal test cable #1	1	Alligator clip – cross HV head, red HV test cable, wire length 1m
LOW terminal test cable	1	Alligator clip – banana plug, black HV test cable, wire length 1.2m
Test cable for ground conduction	1	Cable for GC test, length 1.2m
HV terminal test cable #2	8	Cross HV head, single head white HV test cable, wire length 1m
5A fuse	2	For 5.0A SLOW 110VAC use
2.5A fuse	2	For 2.5A SLOW 240VAC use

19054 Standard Package

Item	Q'ty	Remark
HV terminal test cable #1	1	Alligator clip – cross HV head, red HV test cable, wire length 1m
LOW terminal test cable	1	Alligator clip – banana plug, black HV test cable, wire length 1.2m
Test cable for ground conduction	1	Cable for GC test, length 1.2m

Item	Q'ty	Remark
HV terminal used test cable #2	4	Cross HV head, single head white HV test cable, wire length 1m
5A fuse	2	For 5.0A SLOW 110VAC use
2.5A fuse	2	For 2.5A SLOW 240VAC use

Note ⋮ Inform Chroma of the item name when an additional item is required.

Hazardous Operating Conditions

1. Do not touch the test area when the tester's output is enabled. Electrical shock could result in physical injury or death.

   Please obey the following items.
   - Make sure the grounding cable is connected correctly and using the standard power cord.
   - Do not touch the output terminal.
   - Do not touch the test wire that is connected to the terminal under the test.
   - Do not touch any unit under test.
   - Do not touch any component that is connected to the output terminal for charging.
   - Do not touch the test unit right after the test has ended or when the output has just been turned off.

2. Shock accidents usually occur under the following conditions.
   - The grounding terminal of the instrument does not connect correctly.
   - Not using insulation gloves for testing.
   - Touch the test unit immediately after the test is done.

3. The high-voltage output can be remotely controlled via an external control signal. When the tester is being remotely controlled, follow the safety guidelines below:
   - No accidental high voltage output is allowed, which may cause danger.
   - When the instrument is under testing/operating, any access to DUT, test cable and the probe output terminal are prohibited, both for the operator/service personnel.
   - Normally remote control of this tester is controlled by the high-voltage test bar. However, using other control circuits is also possible. For safety reasons and to prevent hazards, please note 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

1. Do not bundle or cross the high-voltage cable with the RS-232, GPIB control cables, or other low-voltage side wires. It could damage the product or PC controller.
2. To avoid fire, overheating, and electrical hazards from occurring, be sure to check the alligator clips attached to the cable and that the COMMON (RTN/LOW) and OUTPUT (high voltage output) terminals on the connector are not fallen or damaged before operation.

Storage, Freight, Maintenance, and Cleaning

Storage
When not in use, pack the device properly and store it in a suitable environment.

Freight
Pack the device carefully before moving it. If any of the original packing material is missing, use suitable alternative material and mark it “fragile” and “keep away from water” to avoid damaging the product. This product is a piece of precision test equipment; do not drop or hit it.

Maintenance
In case of any malfunction or abnormality, refer to the manual, or contact your local distributor for prompt service. Do not touch any parts inside the instrument to avoid any danger to yourself or damage to the product.

Cleaning
Be sure to unplug the input power cord from the device and remove all other connected wires before cleaning. Use a brush to clean the dust off the machine surface and a low-pressure air gun to clean the dust inside the device or send it to your local distributor for cleaning.

Revision History

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

Date	Version	Revised Sections
Sep. 2003	1.0	Modify “Inspection and Examination” “Notice Items before Use” “Rear Panel Description” “Insulation Resistance Mode Resistor Calibration”
Oct. 2003	1.1	Modify “Specifications”
March 2004	1.2	Modify “The Danger of Operating” “Specifications” “Notice Items before Use” “Rear Panel Description” “Preset Parameter Setting”
Sep. 2004	1.3	Modify “Specifications” “Notice Items before Use” “Front Panel Description” “Rear Panel Description” “Preset Parameter Setting” “PROGRAM Setting” “How to Process Test” “Remote Command Summary” “Error Messages”
Dec. 2004	1.4	Modify “Introduction” “PROGRAM Setting” “How to Process Test” “Remote Command Summary” “Maintenance”
March 2005	1.5	Add a note to the displayed menu for switching in *OS Test Procedure* section.
Sep. 2005	1.6	Add *“CE Certification”.* Modify “RMT function key” in *“Front Panel”* section. Modify “SCPI command” in *“Remote Command Summary”* section.
March 2006	1.7	Modify “PRESET Parameter Setting Menu” in *“Preset Parameter Setting”* section. Modify “Testing preset parameter function table” in *“Preset Parameter Setting”* section. Modify “Program Setting Menu” in *“PROGRAM Setting”* section. Modify “Function Keys Menu” in *“PROGRAM Setting”* section. Modify “Select Test Mode” in *“PROGRAM Setting”* section. Modify “DC withstand voltage test mode” in *“PROGRAM Setting”* section. Modify “Insulation resistance test mode menu” in *“PROGRAM Setting”* section. Modify “SCPI command” in *“Remote Command Summary”* section. Add “DWLL Description” in *“Each Parameter Setting Data Description”* section. Add “RNG Description” in *“Each Parameter Setting Data Description”* section. Add “Pause Mode menu and description” in *“Each Parameter Setting Data Description”* section. Add *“Initial Inspection”*.

Date	Version	Revised Sections
Aug. 2006	1.8	Modify *"CE Statement of Conformity"* Modify "19051/2/4 standard accessory" in *"Inspection and Examination"* chapter.
Nov. 2006	1.9	Modify the Disposal in *"Storage. Freight. Maintenance. Disposal".* Modify "RS-232/GPIB commands" in *"Remote Command Summary"* section. Modify "Preface" in *"Printer Function"* chapter.
March 2007	2.0	Add *"Material Contents Declaration".*
Jul. 2010	2.1	Modify the following sections: – *"CE Declaration".* – Standard accessory in *"Inspection and Examination".* – "*Hipot*" in *"Specifications"* chapter. – *"Error Messages"* section. – Add UL/TUV required descriptions. – Add two new items in "*Precaution before Use*" chapter.
Jan. 2011	2.2	Modify the following: – *"Material Contents Declaration"* – "Measuring Accuracy" item in *"Specifications"* chapter. – *"Remote Command Summary"* section.
Jun. 2011	2.3	Add the section of *"Timing Diagram"*.
Mar. 2012	2.4	Modify the following: – *"CE Declaration".* – Figure 4-4 in *"Remote Control"* section – "Time T2" in "Timing Diagram" section – *"Remote Command Summary"* section – *"Error Messages"* section.
Dec. 2013	2.5	Add Standard warnings to *"Precaution before Use"* chapter.
Jan. 2015	2.6	Add warning to *"Danger of Operating"*.
Aug. 2016	2.7	Modify *"CE Declaration of Conformity"*.
Dec. 2016	2.8	Modify the following: – Figure 3-1 in *"Precaution before Use"* chapter – Rear panel figure in *"Rear Panel"* section – Figure 4-1, Figure 4-2, Figure 4-3, and Figure 4-4 in *"Remote Control"* section. – *"Timing Diagram"* section.
Apr. 2017	2.9	Modify the following: - *"Material Contents Declaration"*. - *"CE Declaration of Conformity"*.
Dec. 2017	3.0	Modify the following: - Standard accessory in *"Inspection and Examination"* - Add AC Offset related info in *"System Parameter Setting"* section
Feb. 2021	3.1	Change of address.
Oct. 2022	3.2	Revise the entire manual contents.
Oct. 2024	3.3	Modify "*Remote Command Summary*" section.

Table of Contents

1. Introduction

1.1 Product Overview

The 19051/19052/19053/19054 HIPOT Testers are specifically designed for testing the automatic withstand, insulation resistance, grounding resistance, and short/open circuit detection on electromechanical and electronic equipment.

For withstand voltage test, the tester output power is AC: 150VA (5kV, 30mA), DC: 60VA (6kV, 10mA). Thus, it is suitable for performing withstand tests on electronic and electromechanical equipment, and components.

For the insulation resistance test, the measurement range of the tester is 0.1MΩ ~ 50GΩ and the test voltage range is 50V ~ 1000V which can be set as desired.

For short/open circuit detection, the testers firstly will test if the capacitor is short-circuited or open-circuited to ensure that the DUT is in good contact with the high-voltage before performing the high-voltage test.

All of the setting statuses, time, current, voltage, resistance value, memory no., etc. are listed on the display. There is no need to remember any parameters that have been set before.

The testers are equipped with a device for determining good and no-good products, a signal output of test results, a remote control device, and a GPIB interface and RS232 interface that can be utilized for automated test systems. Equipped with the above devices, these testers can perform efficient and accurate tests on motors, electronic equipment, or components.

1.2 Features

- AC / DC withstand voltage, insulation resistance test, and short/open circuit detection four in one model.
- DC open circuit detection patent design.
- Reformation DC quick discharge patent design.
- Conform to TUV (19051/19052/19054), VDE, and CE test requests of safety regulations.
- With 0.4ms quick cut off and 0.2sec quick discharge
- Keypad locked and data protection function.
- Indication window for seven judgment results.
- Standard RS-232 interface.
- Combine 500 test procedures or 100 sets of memory functions.
- Optional GP-IB and PRINTER interfaces
- Full-function front panel calibration.
- The instrument is with [FALL] function, before ending the test to change the output test voltage. The needed time is from setting the voltage value to zero.

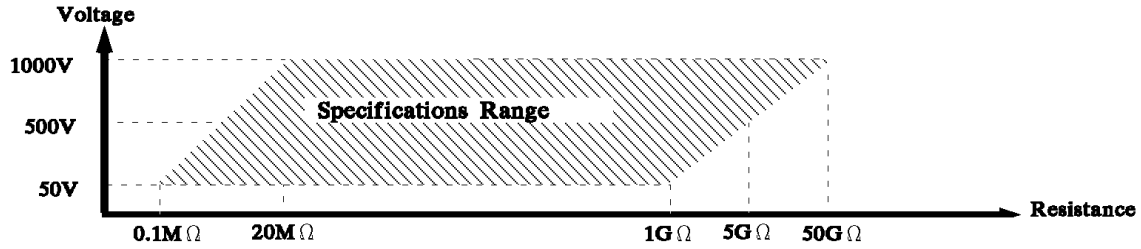
1.3 Initial Inspection

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

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

<table>
<tr><td>❑ Scan Unit</td><td>8 ports, · ±phase (19053 only), 4 ports, · ±phase (19054 only)</td></tr>
<tr><td colspan="2">❑ Withstanding Voltage Test</td></tr>
<tr><td>❑ Test Voltage</td><td>AC: 0.05 ~ 5kV/ DC: 0.05 ~ 6kV Constant Voltage</td></tr>
<tr><td>❑ Voltage Regulation</td><td>≤ (1%+5V), Rated Load</td></tr>
<tr><td>❑ V-display Accuracy</td><td>± (1% of reading + 5 counts), 2V resolution</td></tr>
<tr><td>❑ Cutoff Current (Note 2)</td><td>AC: 0.1mA ~ 30mA (Note 1), DC: 0.01mA ~ 10mA (Note 1), 0.1uAdc resolution</td></tr>
<tr><td>❑ Current Accuracy (Note2)</td><td>± (1% of reading + 5 counts)
Real Current ± (5% of total current + 20 counts) (Note2) WAC only</td></tr>
<tr><td>❑ Current Display</td><td>Hi limit setting Display Range
< 300uA: 0.1uA~299.9uA (dc only)
< 3mA: 0.001mA~2.999mA
<30mAac (10mAdc): 0.01mA~30.00mAac (10mAdc)</td></tr>
<tr><td>❑ Output Frequency</td><td>50Hz, 60Hz</td></tr>
<tr><td>❑ Test Time (Note 3)</td><td>0.3 ~ 999 Sec, continue (Note 1) (0.2S for LCD off)</td></tr>
<tr><td>❑ Ramp Time</td><td>0.1 ~ 999 Sec, off (Note 1)</td></tr>
<tr><td>❑ Fall Time</td><td>0.1 ~ 999 Sec, off</td></tr>
<tr><td>❑ Judgment Delay (Wdc Only)</td><td>0.1 ~ 99.9 Sec. (Note 1)</td></tr>
<tr><td colspan="2">❑ Arc Detection (Note 4)</td></tr>
<tr><td>❑ Setting Mode</td><td>Programmable Setting</td></tr>
<tr><td>❑ Detection Current</td><td>AC: 1mA ~ 15mA, DC: 1mA ~ 10mA</td></tr>
<tr><td>❑ Min. pulse width</td><td>10us approx.</td></tr>
<tr><td colspan="2">❑ GOOD/NO-GO Judgment Function</td></tr>
<tr><td>❑ Judgment System</td><td>• Window comparator.
• A NO-GO judgment is made when a current greater than the high limit value or smaller than the low limit value is detected.
• When a NO-GO judgment is made, the output voltage is cut out and a NO-GO alarm signal is delivered.
• If no abnormal state is detected during the test time a GOOD judgment is made and a GOOD signal is delivered.</td></tr>
<tr><td colspan="2">❑ Insulation Resistance Test (19052, 19053, 19054 only)</td></tr>
<tr><td>❑ Test Voltage</td><td>DC: 0.05kV ~ 1kV, Constant Voltage</td></tr>
<tr><td>❑ V-display Accuracy</td><td>± (1.5% of reading + 5 counts) (open voltage), 2V resolution</td></tr>
<tr><td>❑ Resistance Range</td><td>0.1 MΩ ~ 10 GΩ (19052 up to 50GΩ)</td></tr>
<tr><td>❑ Measuring Accuracy</td><td>≥ 500:
<table>
<tr><td>1.00 MΩ ~ 25.00 MΩ</td><td rowspan="2">± (5% of reading + 2% of scale)</td></tr>
<tr><td>22.0 MΩ ~ 250.0 MΩ</td></tr>
<tr><td>0.220 GΩ ~ 1.000 GΩ</td><td>± (5% of reading + 5% of scale)</td></tr>
<tr><td>1.000 GΩ ~ 2.500 GΩ</td><td>± (10% of reading + 2% of scale)</td></tr>
<tr><td>2.20 GΩ ~ 10.00 GΩ</td><td>± (15% of reading + 5% of scale)</td></tr>
<tr><td>10.00 GΩ ~ 50.00 GΩ</td><td>± (15% of reading + 1% of scale) (19052 only)</td></tr>
</table>
< 500V:</td></tr>
</table>

	0.10 MΩ ~ 25.00 MΩ	± (10% of reading + 2% of scale)
	22.0 MΩ ~ 250.0 MΩ	
	0.220 GΩ ~ 1.000 GΩ	± (10% of reading + 5% of scale)



❑ Secure Protection Function	
❑ Fast Output Cut-off	0.4mS typical after NG happens
❑ Fast Discharge	0.2S, Typical
❑ Ground Fault Interrupt	0.5mA ± 0.25mAac (ON), OFF
❑ Continuity Check	1Ω ± 0.2Ω, ON/OFF
❑ Panel Operation Lock	YES
❑ Memory Storage	
❑ Memories, Steps	99 steps or 99 groups for a total of 500 memory locations
❑ GO/NG Judgment Window	
❑ Indication, Alarm	GO: (Short Sound) NG: W-Arc, W-Hi, W-Lo, IR-Lo, IR-Hi, GFI, Continuity-fail (Long Sound)
❑ Remote Connector	
❑ Rear Panel 9-Pin D-type Connector	Input: Start, Stop, Interrupt (at 11-pin terminal block) Output: Under test, Pass, Fail
❑ TEST/RESET Control	Low - active control, (24V open voltage typical). Input requirements
	Input time duration: 20 msec. approx. The above input circuits are not isolated from other internal circuits.
❑ Options	
❑ Interface Card	
❑ GP-IB Interface	Talk, Listen all function
❑ RS232 (standard option)	Baud rate: 300 ~ 19200, data bits: 8, stop bit: 1
❑ Ambient Temperature and Relative Humidity	
❑ Specifications range	18 to 28°C (64 to 82°F), ≤ 70% RH.
❑ Operable range	Maximum relative humidity is 80% for temperatures up to 31°C (88°F). Decreasing linearly to 50% relative humidity at 40° C (104°F) Altitude up to 2000m. Indoor use only. Pollution degree 2
❑ Storage range	-10 to 60°C (-14 to 140°F), ≤ 80% RH.
❑ Installation Category	CAT II
❑ Power Requirement	
❑ Line Voltage	AC 100V, 120V, 220V ± 10%, 240V +5 -10%
❑ Frequency	50 or 60 Hz
❑ Power	No load: < 100W

❑ Consumption	With rated load: 500W max.
❑ Dimension	320W x 105H x 400D mm
❑ Weight	19051, 19052: 14kg approx. 19053, 19054: 15kg approx.
❑ Safety	
❑ Ground Bond	Less than 100mΩ at 25Amp, 10sec
❑ Hipot	Less than 10mA at Wac 1.5kV, 3sec
❑ Insulation Resistance	Over 20MΩ at 500V 10sec
❑ Line leakage current	Less than 3.5mA at 127V, 3sec, normal, reverse

Note

1. AC set over 100 VA, DC set over 40VA the maximum operating time is 60 seconds, and the same as rest time. If the period is 1/2 duty (TUV ON), for full rating output, the line input range is +10%, -0%.
2. Refer to 1.2kV resistance load only. With the standard test lead, to get the best accuracy, please do not need to process OFFSET.
   WAC mode is less than 500V add an extra 3 counts error.
   WAC scanners on, please add 10 counts/channel. WDC scanner on, add 2 counts/channel.
3. The best test time is dependent on the device under test (DUT).
4. The validation point is 1.25kV with a 250kΩ resistor.

3. Precaution before Use

The Hipot tester has a high voltage output of up to 6KV for testing. It could cause accidents or even death if the tester is used improperly or incorrectly. For your safety, be sure to read the precautions described in this chapter carefully and keep them in mind to avoid accidents.

1. **Shock Hazard**
   To prevent the occurrence of electric shock accidents, we recommend you wear insulating rubber gloves before using this tester and engaging in work related to electricity.

2. **Grounding**
   There is a ground terminal on the tester's rear panel. Be sure to use appropriate tools to ground the terminal firmly. If not doing so, there may be a high voltage on the tester outer casing when the power supply circuit is short-circuited with the ground terminal or the device connecting wire is short-circuited with the ground terminal. This is very dangerous to touch the tester under these circumstances. It could cause a shock hazard; therefore be sure to connect the ground terminal to the earth, as the arrow in Figure 3-1 denoted.

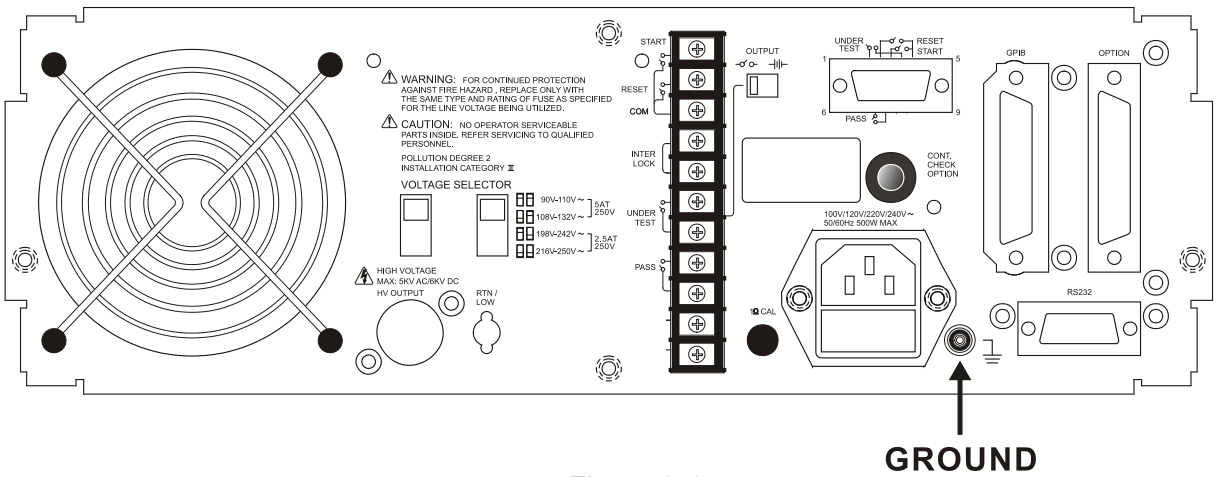
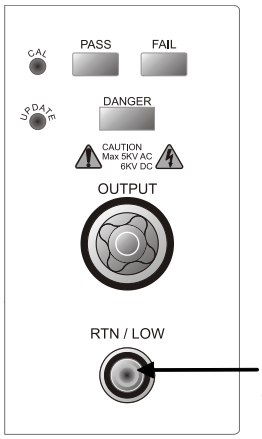


Figure 3-1

3. **Connecting test cable to RTN/LOW terminal**
   As the arrow in *Figure 3-2* denoted, connect the test cable to the RTN/LOW terminal. It is necessary to check if the test cable is loosened or dropped during operation at any time. When connecting the test cable, please use the test cable on the RTN/LOW terminal to connect the DUT first (the RTN/LOW terminal is already connected to the host.) It is very dangerous if the test cable on the RTN/LOW terminal is not fully connected or dropped because the entire DUT may be filled with high voltage.



The test cable of the terminal should be connected and locked well.

Figure 3-2

4. Connection test for the high voltage output terminal

After the test cable of the COMMON terminal has been connected, follow the steps below to connect the high-voltage output cable.

- Press the [STOP] key first.
- Make sure the DANGER LED is off.
- Short circuit the test cable of RTN/LOW terminal with high voltage output terminal and make sure there is no voltage output.
- Plug in the high-voltage test cable to the high-voltage output terminal.
- Last, connect the test cable of the RTN/LOW terminal to DUT, and then connect the high voltage test cable as well.

5. Test stop

When the test is over and no need to use it or the tester is not running or the user needs to be away during use, please be sure to turn the power switch to 0 (that is to turn off the power) as *Figure 3-3* shows.

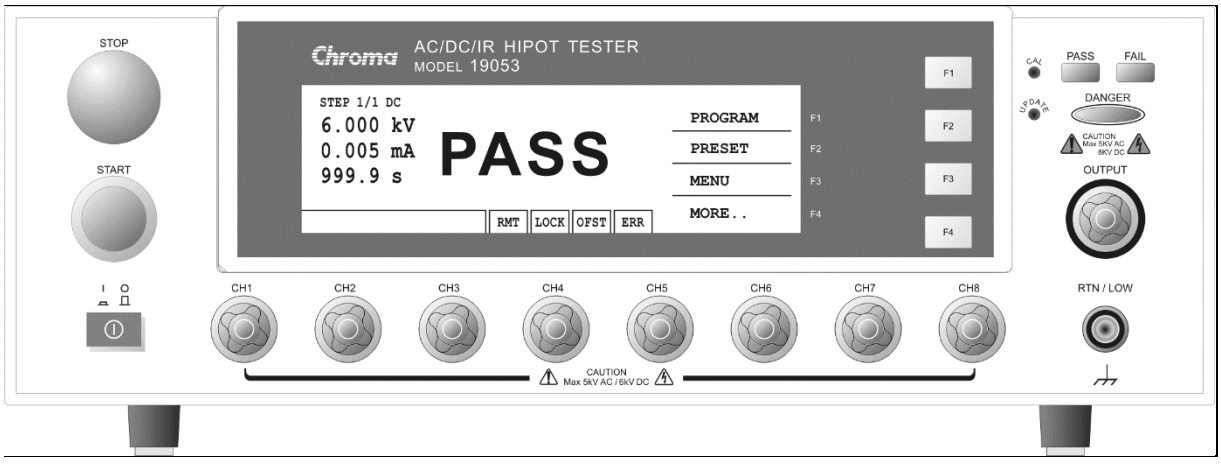


Figure 3-3

6. The dangerous area under test mode

It is very dangerous to touch high-voltage areas such as the DUT, test cable, probe, and output terminal during operation.

CAUTION Do not touch the alligator clipper on the test cable as *Figure 3-4* shows when the main unit is in a testing state. This is because the insulation of the plastic layer is not enough and touching it may cause hazards.

Do not touch here when outputting high voltage.

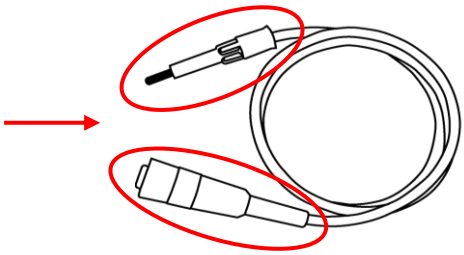


Figure 3-4

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

7. Test complete confirmation

You may need to touch the high voltage areas on the DUT, high voltage test cable or output terminal, etc. to modify the circuit or to meet other test conditions. Before doing so, be sure to confirm the following first.

- The power switch is turned off.
- As an insulation resistance tester, the DUT may be full of high voltage when the test is completed. At this time, you should pay attention to the descriptions of items 8 and 9 below, and execute as described.

<<< Note! When testing insulation resistance is charging. >>>

8. Charge

When testing the insulation resistance, the DUT, capacitor, test cable, probe, and output terminal even the tester is full of high voltage. After turning off the power switch, it needs a period to discharge. Please follow the above descriptions; do not touch any place that may cause shock especially when the power is just turned off.

9. Confirm charging voltage has been discharged completely.

The time required for discharging the charged voltage depends on the testing voltage and the DUT characteristic. Assuming that the high voltage added to the DUT is equivalent to the high voltage added to 0.01uF capacity paralleling with 100MΩ resistance circuit. When the test voltage is 1000V, after turning off the power, it requires about 3.5 seconds for the voltage added to the test and the DUT to decrease to lower than 30V and about 2.8 seconds to 500V. Assuming the time constant of a DUT is known, if you want to know the time for the voltage to decrease to below 30V, use the way mentioned above to multiply the time required for decreasing to below 30V by the time constant as *Figure 3-5* shows.

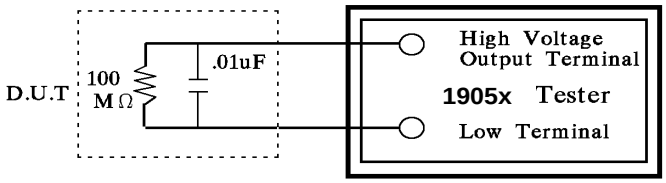


Figure 3-5

<Formula>
Test Voltage * $e^{-t/RC}$ = Residual Voltage
Ex.: 1000V * $e^{-t/RC}$ = 30V
ln $e^{-t/RC}$ = ln 0.03
- t / RC = -3.5
t = 3.5 sec

10. Remote control the main unit

The instrument is capable of remote control for high voltage output via external control signals in general. For your safety and prevention of hazards, please obey the following rules.

- Do not allow any unexpected high voltage output that may cause danger.
- When the main unit outputs a high voltage, do not permit the operator or other personnel to contact the DUT, the test cable, and the probe output terminal.

11. Turn on or off the power switch ※ *Note* ※

The instrument should be positioned where the power switch can be easily reached by the operator when an emergency occurs. When the power switch is turned off, it needs a few seconds to turn on again. Please do not turn it on and off continuously. It is very dangerous to do that under high voltage output. When turning on or off the power, do not connect any object to the high-voltage output terminal to avoid hazards.

12. Others notice items

Do not short-circuit the output cable, grounding cable, transmission cable, or AC power to prevent the tester from fulling of voltage. Please connect the tester cover to earth first when the high voltage output terminal is short-circuited with the RTN / LOW terminal.

<<< Dangerous event >>>

13. The danger handling

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

- Cut off the power switch first.
- Then pull off the power plug.

<<< Solution >>>

14. Problems

The problems that occurred in the following circumstances are very dangerous. Even press [STOP], the output terminal may still output high voltage.

- The DANGER LED is still on when [STOP] key is pressed.
- The voltage meter has no voltage reading but the DANGER LED is still on.

When the above conditions occur, please turn off the power and pull off the AC power plug immediately. Do not use it anymore, and send the instrument to Chroma's service center for repair.

15. DANGER LED error

When [START] is pressed, there are already readings on the voltage meter but the DANGER LED is still off. This means the LED may be broken, please turn it off

immediately and send the instrument to Chroma's service center for repair.

16. **If the tester is to be used for a long time under normal operation, please notice the following items.**
    If the high limit is set to 20.00mA (withstand voltage test), please be aware of its ambient temperature. When the ambient temperature is higher than 40°C, please stop operation until it cools down to normal temperature.

17. The tester includes four kinds of AC INPUT power. Please comply with the local voltage to turn the voltage selection switch on the rear panel to the right position.
    When plugging in the power cord, be sure that the input AC power scale is the same as the one stated on the rear panel. For fuse replacement, the table below lists the voltage and fuse that can be used.

Scale	Nominal Value	Range	Fuse
90V ~ 110V	100V	90V ~ 110V	5A Slow/250V
108V ~ 132V	120V	108V ~ 132V	5A Slow/250V
198V ~ 242V	220V	198V ~ 242V	2.5A Slow/250V
216V ~ 250V	240V	216V ~ 250V	2.5A Slow/250V

    Check the voltage used before replacing the fuse. The fuse can only be replaced under a power-disconnected state by a flat screwdriver.

    ⚠WARNING Be sure to use a fuse with the correct specification when replacing it. Otherwise, it may cause hazards.

18. This tester uses AC power for normal operation. If the power is unstable within that voltage range, it may cause the tester to function inaccurately or abnormally. Therefore, please use appropriate equipment such as a power regulator to stabilize the power.

19. The tester uses a power transformer of over 200VA. When the DUT draws a massive current, before judging it as no good and cutting off the output current, the current could flow in for several ten milliseconds, and the condition maybe the same before testing. Thus, it is necessary to watch out for the power cord capacity and the current cable used in connecting with other instruments or equipment.

20. **Storage**
    The temperature and humidity range of the tester for normal operation is 5°C ~ 40°C, 75% RH. The tester may malfunction if over the range. The storage temperature range is -10°C ~ 50°C, 80% RH. If you are not using the tester for a long time, please use the original packing material to store it. For accurate testing and safety, please keep it from direct sunlight or high temperature, vibration, humidity, and dusty places.

21. **Warm-up**
    All of the tester functions are activated when the power switch is turned on. However, to attain the precision in the specification, please warm up the instrument for more than 15 minutes.

22. **Warning signal when testing**
    "DANGER – HIGH VOLTAGE TEST IN PROGRESS, UNAUTHORIZED PERSON KEEP AWAY"

23. Keep the 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 display interference caused by the high-voltage discharge.

24. Notices for connecting automated device

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

25. Standard warnings

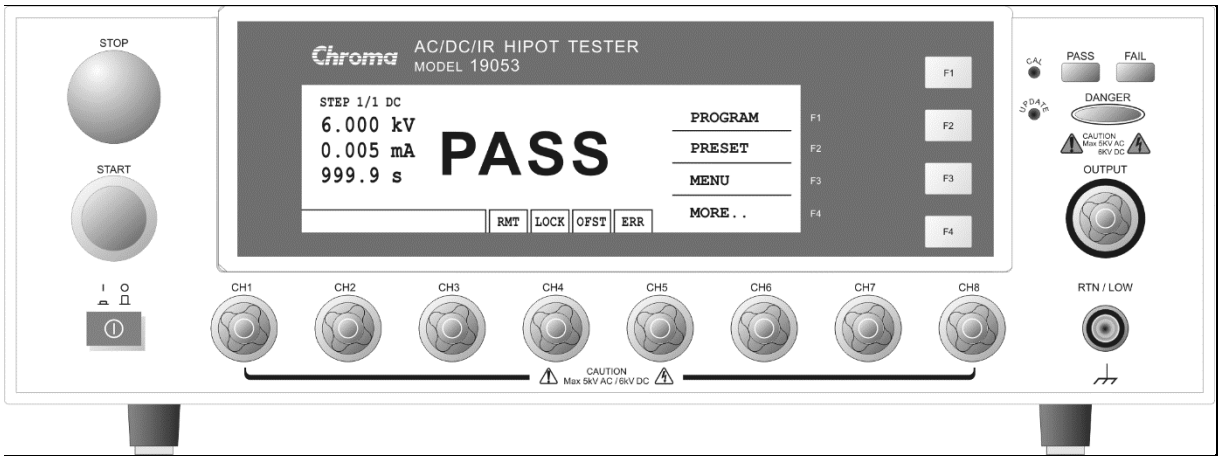
⚠WARNING

1. Only accessories that meet the manufacturer's specifications shall be used.
2. Do not disable the grounding plug for safety purposes. Use a grounded power outlet.
3. Do not block any ventilation openings to prevent the equipment from overheating. Keep the ventilation slits uncovered during operation. Failure to do so could cause the instrument to overheat and may damage the internal components.
4. The mains plug is used as the disconnecting device and shall remain readily operable. The socket-outlet shall be installed near the equipment and shall be easily accessible.
5. If the instrument is used in a matter not specified by the manufacturer, the protection provided by the instrument may be impaired.
6. For European: A certified power supply cord cannot be lighter than a light PVC sheathed flexible cord according to IEC 60227, designation H03 VV-F or H03 VVH2-F (for equipment mass not exceeding 3 kg), or H05 VV-F or H05 VVH2-F2 (for equipment mass exceeding 3 kg), and be rated for at least 3G 0.75 mm² (for rated current up to 10 A) or 3G 1.0mm² (for rated current over 10 A up to 16 A) wire or larger, and the length of the power cord cannot exceed 2 m.

4. Panel Description

4.1 Front Panel

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



■ **Display Area**

Function key display area: Under different display menus, there are different function descriptions. The right side of the display has corresponding function keys (F1-F4). If the description is blank, it means the corresponding function is invalid.

State list: This list indicates the setting mode and the range of setting values and displays no good state of the testing result.

RMT : When this area is highlighted, it means the main unit is under Remote status. That is the main unit controlled by the PC through a GPIB/RS232 connecting cable. At the same time, all of the keys malfunction except for [STOP], [Local] and [MORE..] Keys.

Note As connecting RS232, the word “RMT” on LCD will not be highlighted only when giving the command of :SYSTem:LOCk:REQuest?. When the word “RMT” is not highlighted, all keys can be operated as usual.

LOCK : When this area is highlighted, it means the main unit is under setting parameter protected mode. The other mode can’t enter except for the "MEMORY", "TEST" and "KEY LOCK" modes.

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

ERR : When this area is highlighted, it means there is an unclear error in the error queue.

Danger LED: The testing status indication LED. When the LED is light, the tester is under testing status. There is a high voltage or mass current on the testing terminal. Don’t touch the testing terminal at the same time.

PASS LED : When this LED is light, it means DUT is judged as PASS after testing.

FAIL LED : When this LED is light, it means DUT is judged as FAIL after testing and

then cutting off the main unit output immediately. This LED keeps on light until the main unit is pressed [STOP] key.

- **Key Area**

Power Switch : The switch provides an AC power source which the tester needs.

STOP Key : Reset key, after pressing this key the main unit returns to standby testing status immediately. That is cutting output and clearing all of the judgments simultaneously.

START Key : After pressing this key, the main unit is under testing status. The testing terminal has an output and each judgment function starts simultaneously.

Cal-Enable : Calibration switch. This key is only for calibration before exiting the factory. Non-professional personnel using this function is prohibited or may cause product malfunction.

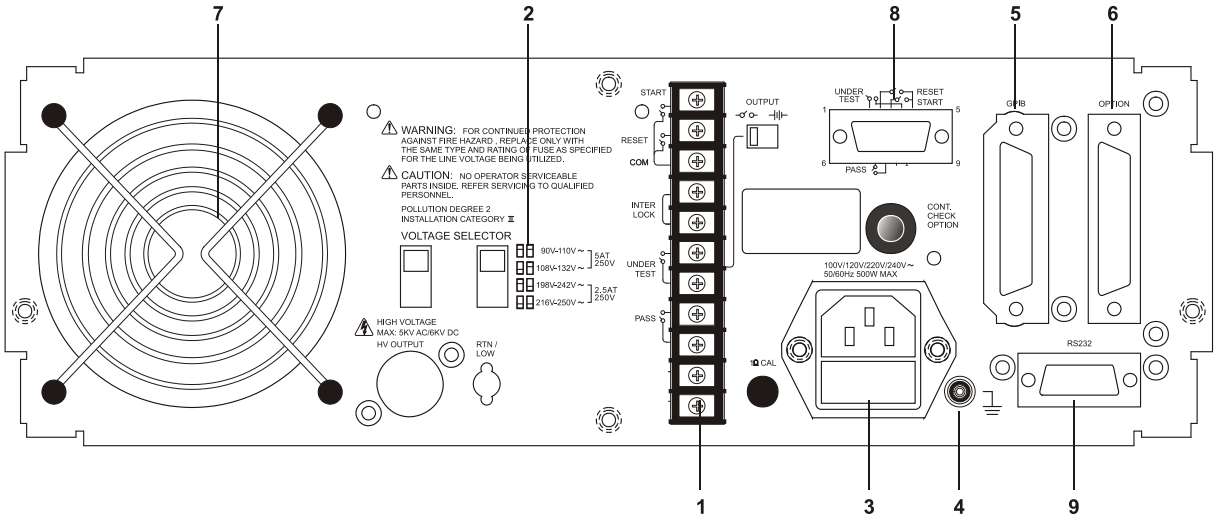
Function Keys: Function key. Under different display menus, there are different functions. The right side of the display has a corresponding function description. If the description is blank, it means the corresponding function key is invalid.

- **Terminal Area**

OUTPUT : High electric potential terminal of high voltage output. This terminal belongs to high electric potential output, usually high voltage output. Therefore, this terminal is very dangerous. Don't touch it when the DANGER LED is light, there is high voltage outputting.

RTN / LOW : The common test terminal. It's a reference terminal when high voltage tests, it is also a low electric potential terminal. This terminal is almost equal to the cover grounding terminal.

4.2 Rear Panel



1. **REMOTE I/O** : The test result signal output terminal.
   START : Start test signal input terminal.
   STOP : Stop the test signal input terminal.
   INTER LOCK : To short-circuit these two terminals so that high voltage can be outputted.
   UNDER TEST : When the tester is under test status, this output terminal will short circuit.

Control external signals by using this short condition. The junction specification 115V AC is lower than 0.3A action time.
This tester is under testing status until STOP is stopped.

PASS : When the tester judge DUT is PASS, this output terminal is a short circuit. Control external signal by using this short circuit condition. The junction specification 115V AC is lower than 0.3A.
The action time is 0.2sec ~ 99.9sec. (Can be set)

OUTPUT Switch: When toggles this switch to the power symbol, the UNDER TEST output terminal will be short-circuited under test status. When toggles this switch to the voltage symbol, the UNDER TEST terminal outputs 24V under test status. This function can be used with 3002B or 3002D and is for controlling the valve.

2. **VOLTAGE SELECTOR Input Power Supply Range Switch**
   Changing the tester-inputted AC power. Using AC power has four kinds as below.
   a. 90 ~ 110V AC
   b. 108 ~ 132V AC
   c. 198 ~ 242V AC
   d. 216 ~ 250V AC
   Toggle this power switch by applying AC power and notice the change of fuse.
3. **AC LINE:** AC power socket and fuse holder.
   A tri-cord power and fuse holder. Input AC power, which the tester needs from the AC power socket. For the detailed specification of using fuse please refer to *"Chapter 3 - Precaution before Use"* or descriptions of the rear panel in this manual.
4. **GROUND:** Safety GND terminal. Please use an adaptable implement to connect this grounding terminal. If there is no grounding actually, the circuit with the GND terminal or other instruments connecting the cable with the GND terminal is a short circuit. The cover of the tester may have high voltage. This is very dangerous, anyone who touches the tester under the above status may cause damage. Therefore, it is necessary to connect the safety GND terminal to the ground.
5. **GPIB INTERFACE (Option)**
   This socket is for an optional GIPB interface (IEEE-488-1978). The detailed descriptions, please refer to "*Chapter 5 - Description of GPIB Interface"* in this manual.
6. **OPTION:** This socket is the option PRINTER interface for the tester. The detailed descriptions please refer to chapter 8 of this manual.
7. **FAN:** The temperature control fan.
   When the temperature reaches 50°C, the fan opens automatically. When the temperature is lower than 45°C, the fan stops automatically.
8. **9 Pin D Connector**
   All of the 9-pin D-Sub connector functions are the same as (1) Remote I/O.
9. **RS232 Interface**
   This socket is the standard RS232 interface for the tester. GPIB and RS232 interfaces cannot be used simultaneously.

4.3 Notice Items and Procedures before Operation

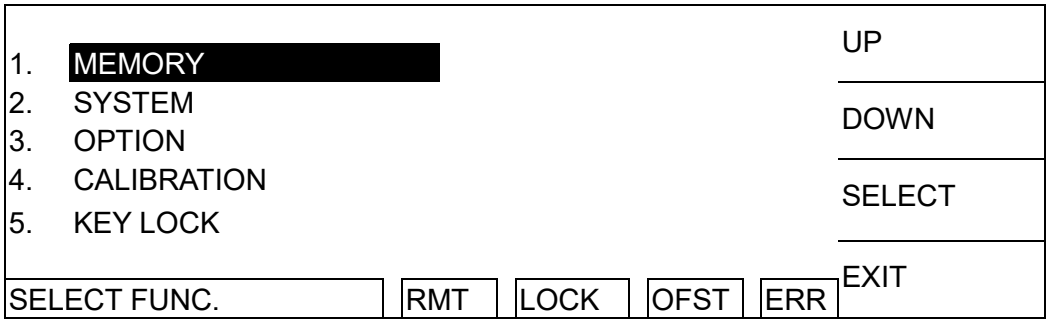
1. Before plugging in the AC power cable, please confirm the power that is used first whether the description of the rear panel matches or not, and whether the power switch is OFF status.

2. Before turning on the power, please peruse *"Chapter 3 - Precaution before Use"* and remember it.
3. When turns on power, the tester will self-test. If there is an abnormal condition, please turn off the switch and pull off the power cord immediately.

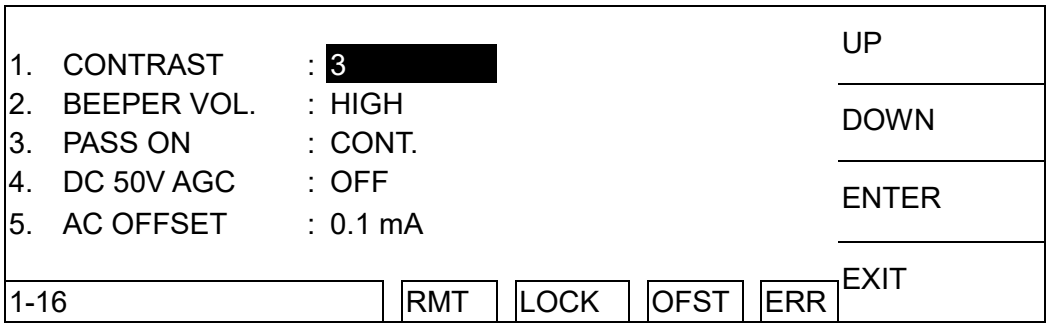
4.4 System Parameter Setting

4.4.1 How to Enter System Parameter Setting Menu

1. Under power on the menu, press Function Key **MENU** the menu as the following:



2. Move the highlighted to "SYSTEM" by Function Key **UP**, **DOWN**. Press Function Key **SELECT** to enter the system parameter setting menu shown as the following:



4.4.2 Operation Method

1. After entering the system parameter setting menu, press Function Key **ENTER** to move the highlighted to the parameter item, which wants to be set.
2. Press Function Keys **UP** and **DOWN** to set this item parameter data.

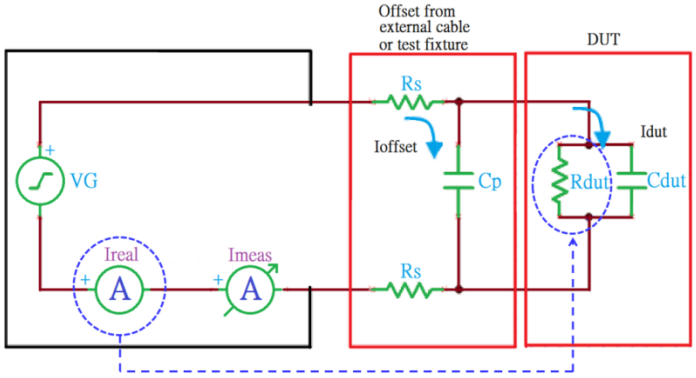
System parameter setting data description table

Setting Item	Range	Initial Setting	Description
Contrast	1~16	7	Adjust LCD brightness
Beeper Vol.	LOW / MEDIUM / HIGH / OFF	HIGH	Adjust buzzer volume
PASS ON	CONT. /0.1~99.9s	CONT.	It sets a continuous time of PASS signal on the Remote I/O interface of the rear panel.
DC 50V AGC	ON/OFF	ON	When set above DC 50V, check if the hardware automatic gain

Setting Item	Range	Initial Setting	Description
			compensation function is open or not.
AC OFFSET	0 ~ 2.5mA	0.10mA	(1) When the Offset value is larger than the **AC OFFSET** setting value, the current reading = current real test value – Offset value. (2) When the Offset value is smaller than the **AC OFFSET** setting value, the current reading = $\sqrt{}$ (real test value)^2 - (Offset)^2.

Note

1. AC OFFSET: Connect the test cable and test fixture before testing WAC mode, users can do offset action in advance to ensure test value accuracy. Especially when the test voltage is higher, the leakage current of the test fixture and the tester will increase relatively. Offset current occurred mostly due to capacitance characteristics as the figure below shows.



Imeas: Current actual measured value
Ioffset: The leakage current is caused by an external cable or test fixture and usually comes from Cp effect.
Ireal: Resistive current by calculating (real leakage current)
Imeas': Imeas value after calibrating offset

When calibrating the test cable/fixture OFFSET value, the system will base the actual testing fixture and wire leakage current to follow the AC offset setup value proceeding formula judgment and calibrating measurement.
If DUT capacitance >> resistance then Imeas' = Imeas-Ioffset after calibrating.

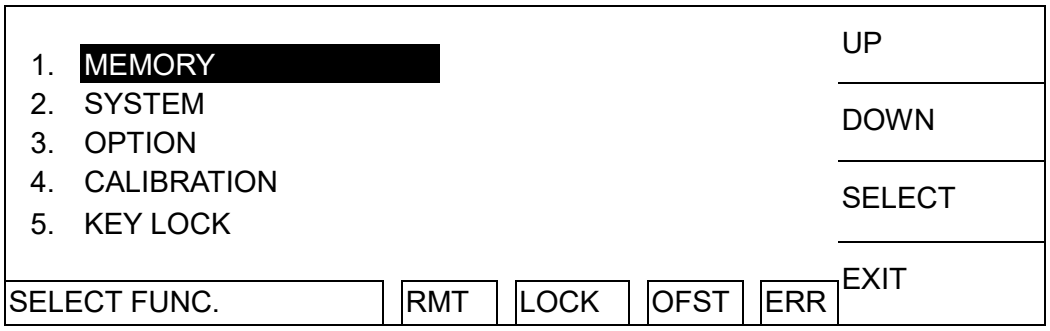
If DUT capacitance << resistance then $\mathrm{Imeas}' = \sqrt{\mathrm{Imeas}^2 - \mathrm{Ioffset}^2}$ after calibrating.

2. AC OFFSET is an adding function if the version is after F/W 5.10, OFFSET Calibration parameters before version F/W 5.10 use Imeas to deduct the Ioffset value.

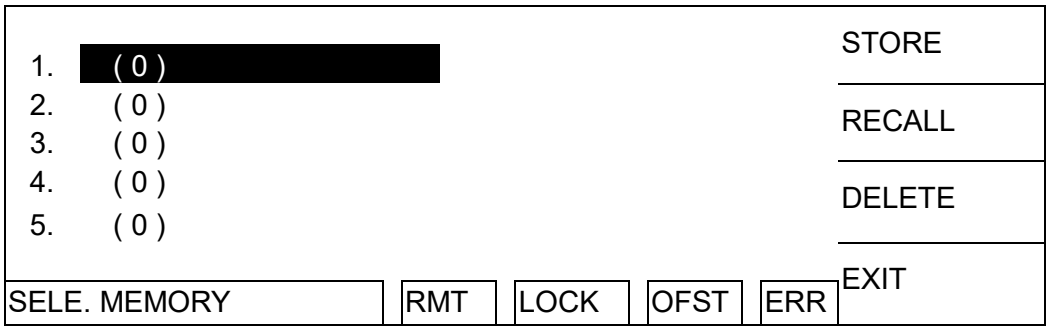
4.5 Test Parameter and Memory Management of Test Preset Parameter

4.5.1 How to Enter Memory Management Menu

1. Under power on the menu, press Function Key **MENU** the menu as the following:



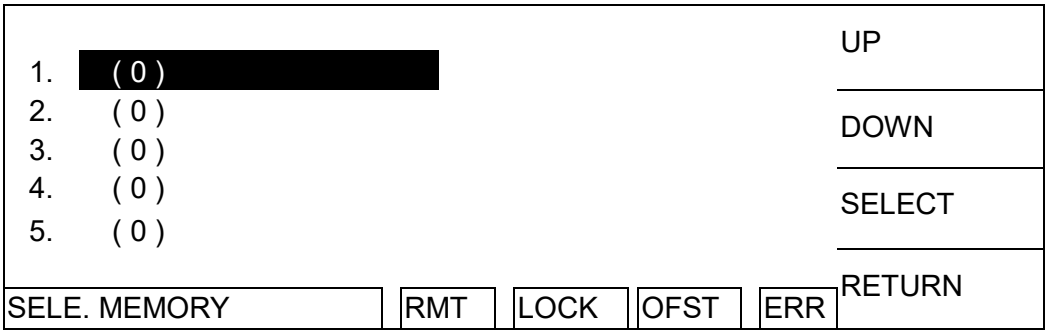
2. Move the highlight to "MEMORY" by Function Key **UP**, **DOWN**. Press Function Key **SELECT** to enter the Memory management mode shown as the following:



3. At this time, can read, store, or delete this set memory by Function Key.
4. The value within ( ) means this set memory included the test procedure number.

4.5.2 How to Select a Set of Memory

1. When the state list shows "SELECT MEMORY", move the highlighted to the memory that you want to manage by Function Key **UP**, **DOWN**. Press Function Key **SELECT** is shown in the following menu:



2. At this time, follow Function Key instructions to read, store, or delete this set of memory.

4.5.3 Delete Memory

If users want to delete test parameter data which be stored in memory, please follow the below procedures to process.

1. Press Function Key **DELETE** when the status bar shows [SELECT FUNC.].
2. Select the test parameter data of memory, that want to delete by using Function Key **UP**, **DOWN**. Press Function Key **DELETE** and then show the delete confirm window.
3. Press Function Key **YES** to confirm or press Function Key **NO** to cancel.

4.5.4 Read Memory

If there are many sets of test parameter values that are saved in the main memory. Follow the below procedures to recall the test parameter.

1. Press Function Key **RECALL** when the status bar shows [SELECT FUNC.].
2. Select the test parameter data of memory that you want to read by using Function Key **UP**, **DOWN**.
3. Press Function Key **SELECT** and then show the confirm window.
4. Press Function Key **YES** to confirm or press Function Key **NO** to cancel.

4.5.5 Store Memory

If users want to save test parameter data which be set in the memory. Please follow the below procedures to process.

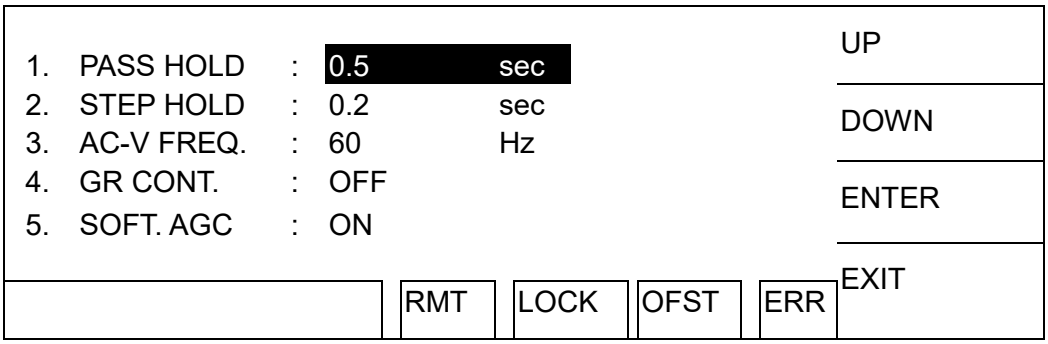
1. When the status bar shows [SELECT FUNC.], press Function Key **STORE**.
2. Selecting the memory want to store by using Function Key **UP**, **DOWN**. Press Function Key **SELECT** and the cursor becomes an underscore blinking cursor.
3. At this time, input the memory name by using Function Key **UP**, **DOWN**.
4. By using Function Key **ENTER** to move the underscore blinking cursor to the next character.
5. If press Function Key **ENTER** twice then will show a read confirmation window.
6. Press Function Key **YES** to confirm or press Function Key **NO** to cancel.

Note If there is covered data in the memory name, please be careful to confirm before storing.

4.6 Preset Parameter Setting

4.6.1 How to Enter Testing Preset Parameter Setting Menu

Under power on the menu, press Function Key **PRESET** to enter the testing preset parameter setting menu as the following.



4.6.2 Operation Methods

1. After entering the test preset parameter setting menu, press **ENTER** key and move the highlighted cursor to the parameter item you want to set.
2. Press Function Keys **UP** or **DOWN** to set this item parameter data.

Testing preset parameter function description table:

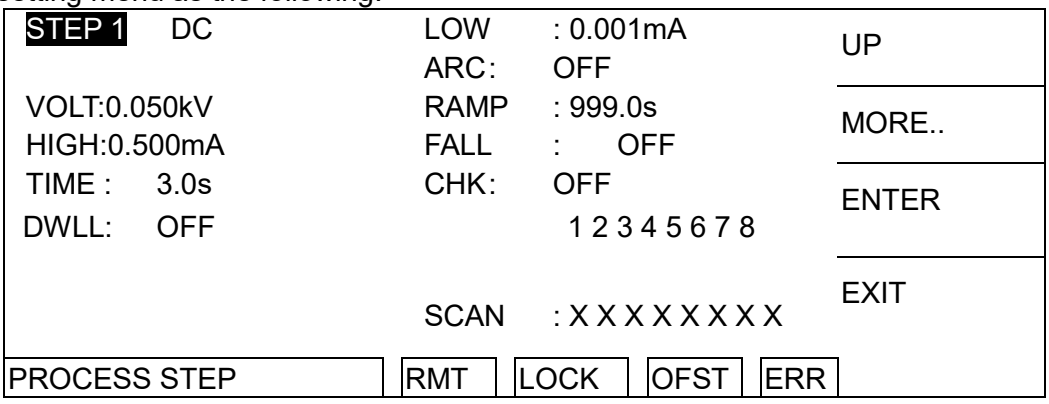
Setting Item	Range	Initial Setting	Description
Pass Hold	0.2 ~ 99.9	0.5	When the display shows PASS, the continuous time buzzer beeps.
Step Hold	0.0 ~ 99.9 / KEY	0.2	Set interval time between test procedures. Key: Set test procedure is interrupted. (Please press [START] to continue when the test stops.)
AC-V Freq.	50/60	60	Set AC-V FREQ. of HIPOT tester by inputting frequency of AC source.
GR CONT.	OFF/KEY/TIME (0.2sec~99.9sec)	OFF	Set grounding to continue to test no good function operation mode. 1. When set to OFF, it doesn't proceed with the grounding and continues the test. 2. When set to KEY, press START KEY to proceed with the grounding and continue the test. 3. When set to TIME, GR CONT operation modes are as below descriptions. (1) When users press START KEY, the program judges if DUT is connected well by GR CONT. ON or OFF. (2) If GR CONT. judges DUT is connected well then proceed test automatically when set TIME is up. (3) After the test is ended, re-judge if GR

			CONT. is continuing for the condition of the proceeding test.
Soft. AGC	ON/OFF	ON	Set software automatic gain compensation function is open or not.
Auto Range	ON/OFF	OFF	Set withstand voltage auto-range function is open or not.
GFI	ON/OFF	ON	Set ground fail interrupt function
AFTER FAIL	STOP/CONTINUE/ RESTART	STOP	After setting FAIL, it indicates if stop the test, continue to the next step, or restart.
SCREEN	ON/OFF	ON	Set if show test screen.
SMART KEY	ON/OFF	OFF	Set if open parameter memory function.
RAMP JUDG.	ON/OFF	ON	When setting this item to ON, it means during ramp time will judge the high limit under DC mode. When setting this item to OFF, it means during ramp time won't judge the high limit under DC mode.
Part No.	Not over 13 characters	None	Set the product Part No.
Lot No.	Not over 13 characters	None	Set the product Lot No.
Serial No.	Not over 13 characters	None	Set the product serial no. format. * means changeable character.

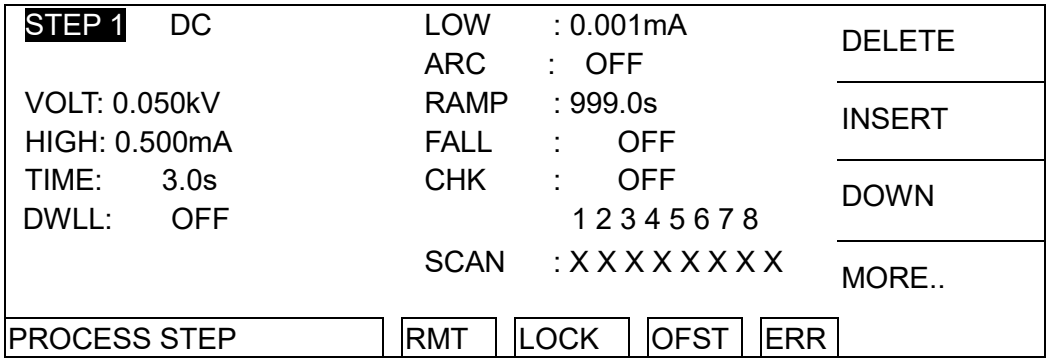
4.7 PROGRAM Setting

4.7.1 Test Procedure Setting

1. Under power on the menu, press Function Key **PROGRAM** and then enter PROGRAM setting menu as the following:



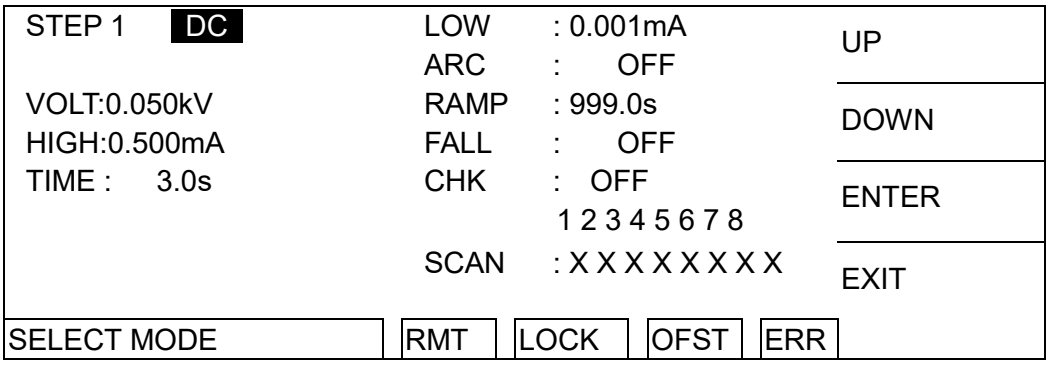
2. After entering the PROGRAM setting menu, use Function Keys **UP** to select the test procedure want to set, the range is 1~99.
3. Press **ENTER** key to move the highlighted cursor to the parameter item that wants to be set.
4. Press Function Key **MORE..** can switch to other menus for settings as follows.



5. By using Function Keys **DOWN** to decrease the test procedure that you want to set, the range is 1~99.
6. Press Function Keys **DELETE** and **INSERT** for deleting, and inserting a test procedure.
7. Press Function Key **MORE..** can return to the PROGRAM setting menu to continue setting other test parameters.

4.7.2 Select Test Mode

1. After entering the PROGRAM setting menu, press **ENTER** key to move the highlighted cursor to the following position.



2. Use Function Key **UP**, **DOWN** to select test mode. There are AC / DC / IR / OS / PA test modes that can be selected (19051 only AC / DC / OS / PA). Different test modes have different test parameters that can be set.

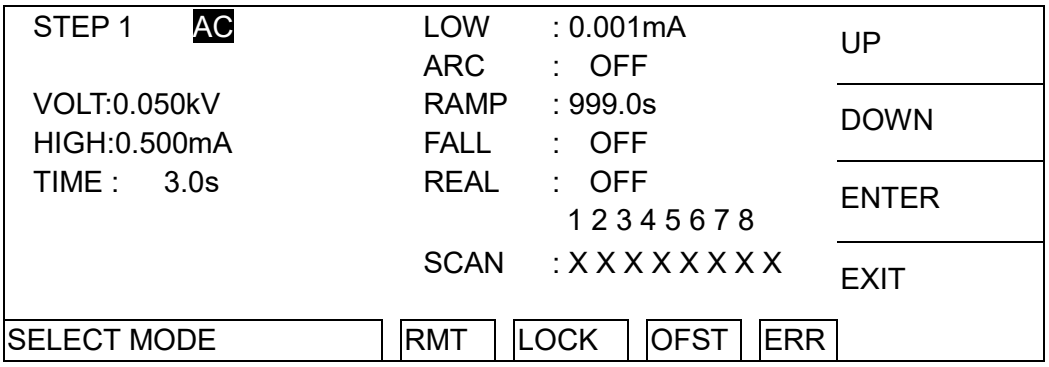
4.7.3 SMART KEY Operation Methods

1. When starts SMART KEY function of the PRESET parameter in each test, it records the test parameters. The test parameters include: withstand test needed voltage, the high limit value of leakage current, needed test time, the low limit of leakage current, the high limit of electric arc, needed rise time to setting voltage, the high limit of real leakage current, scanning selection point. Each parameter can store ten sets of values.
2. After entering the PROGRAM setting screen, press **ENTER** key continuous for one second then will show the S-KEY word on the lower left side of the screen. At this time, the adjustment function of the **UP** and **DOWN** keys is disabled and read back the previous test parameter. If users want to recover the adjustment function of the **UP** and **DOWN** keys, press **ENTER** continuously for one second until the S-KEY word on the lower left side of the screen disappears.

4.7.4 Each Parameter Setting Data Description

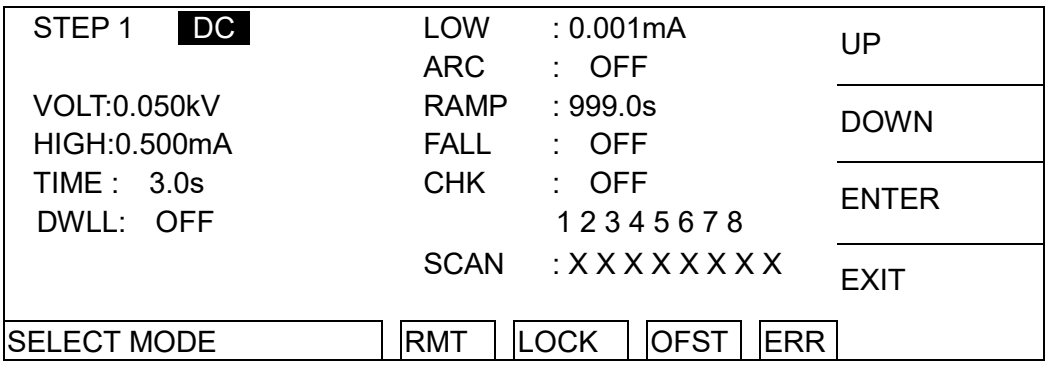
The following described parameter setting data of each test mode.

AC withstand voltage test mode



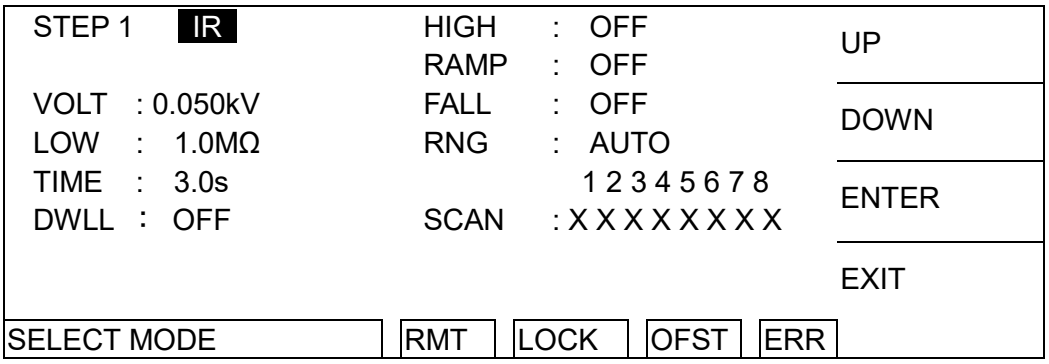
VOLT : Setting withstand voltage test needed voltage.
HIGH : Setting leakage current high limit value.
TIME : Setting test needed time, input 0 means continuous test.
LOW : Setting leakage current low limit value, input 0 means OFF.
ARC : Setting arc high limit, input 0 means OFF.
RAMP : Step-up setting voltage needed time, input 0 means OFF.
FALL : The needed time is from setting the voltage value to zero, 0 means OFF.
REAL : Setting real leakage current high limit value, input 0 means OFF.
SCAN : Setting scan test selection point.

DC withstand voltage test mode



VOLT : Set withstand voltage test needed voltage.
HIGH : Set leakage current high limit value.
TIME : Set test needed time, input 0 means continuous test.
DWLL : Set DWELL needed time, 0 means OFF.
(During the DWELL TIME action, it doesn't judge the high and low limit value of leakage current but the limit doesn't over the high limit of setting range.)
LOW : Set leakage current low limit value, input 0 means OFF.
ARC : Set arc high limit, input 0 means OFF.
RAMP : Step-up setting voltage needed time, input 0 means OFF.
FALL : The needed time is from setting the voltage value to zero, 0 means OFF.
CHK : Select detect charge current over low (CHECK LOW)
SCAN : Set scan test selection point.

IR Insulation resistance test mode



VOLT : Set insulation resistance test needed voltage.
LOW : Set insulation resistance low limit value.
TIME : Set test needed time, input 0 means continuous test.
DWLL : Set DWELL needed time, 0 means OFF.
(During the DWELL TIME action, it doesn't judge the high/low limit value of insulation resistance but the limit doesn't over the high limit of the setting range.)
HIGH : Set insulation resistance high limit value, input 0 means OFF
RAMP : Step-up setting voltage needed time, input 0 means OFF.
FALL : The needed time is from setting the voltage value to zero, 0 means OFF.
RNG : Set the current test range of insulation resistance, AUTO means automatic switch range. The relation between the current range and resistance measurement range is as below table shown.

Range	IR Display Value	
	Setting Voltage 50V ~ 250V	Setting Voltage 250V ~ 1000V
10mA(3~10mA)	0.10MΩ~0.10MΩ	0.10MΩ~1.00MΩ
3mA(0.3~3mA)	0.10MΩ~0.90MΩ	0.10MΩ~3.50MΩ
300uA(30~300uA)	0.10MΩ~9.00MΩ	0.10MΩ~25.00MΩ 22.0MΩ~35.0MΩ
30uA(3~30uA)	0.10MΩ~25.00MΩ 22.0MΩ~90.0MΩ	0.10MΩ~25.00MΩ 22.0MΩ~250.0MΩ 0.220GΩ~0.350GΩ
3uA(0.3~3uA)	22.0MΩ~250.0MΩ 0.220GΩ~0.900GΩ	25.0MΩ~250.0MΩ 0.220GΩ~2.500GΩ 2.20GΩ~3.33GΩ
300nA(20~300nA)	0.200GΩ~2.000GΩ	0.200GΩ~2.500GΩ 2.20GΩ~50.00GΩ

Note Select IR suitable current range please follow the test voltage and DUT insulation resistance for counting the quantity of current then follows it to select a suitable current range.

SCAN : Set scan test selection point.

Short/Open Circuit detection test mode (OS)

STEP 1 OS		OPEN CHK : 50%				UP
		SHORT CHK : 300%				
		1 2 3 4 5 6 7 8				DOWN
		SCAN : X X X X X X X X				
						ENTER
						EXIT
SELECT MODE	RMT	LOCK	OFST	ERR		

OPEN CHK : Set the judgment test result to open condition(compare the test reading with the read standard capacitance value [Cs]).

SHORT CHK : Set the judgment test result to a short condition(compare the test reading with the read standard capacitance value [Cs]).

SCAN : Set the scanning test selection point.

Pause Mode

STEP 1 PA						UP
MESSAGE : PAUSE MODE						DOWN
UNDER TEST SIGNAL : OFF						
TIME : CONT.						ENTER
						EXIT
SELECT MODE	RMT	LOCK	OFST	ERR		

MESSAGE: Set the message that shows on the pause screen, the maximum input character is 15.

UNDER TEST SIGNAL: Set UNDER TEST signal on the rear panel when pausing and DANGER LED action.

(1) Set to ON: UNDER TEST terminal on the rear panel is short circuit under pause mode. The DANGER LED on the panel is blinking.

(2) Set to OFF: UNDER TEST terminal on the rear panel is open circuit under pause mode. The DANGER LED on the panel isn't blinking.

TIME: Set the method of PAUSE MODE.

(1) Set to CONT: Pause mode is ended until press START on the panel or the START signal is re-triggered on the rear panel.

(2) Set to 0.3~999sec: Pause mode is ended until the setting time's up.

4.8 How to Process Test

4.8.1 Offset Value Calibration Confirmation of Test Cable

1. Under power on the menu, press Function Key **MORE..** to enter multiple sets of STEPS test menus.
2. Press Function Key **OFFSET** and the display will show a menu indicating the user open the output terminal.
3. After pressing the **START** key, the DANGER LED on the front panel is light up. When test time is ended and the PASS indicator lights up, meanwhile Offset block is also highlighted. This means the tester zeroed the test cable and test lead.

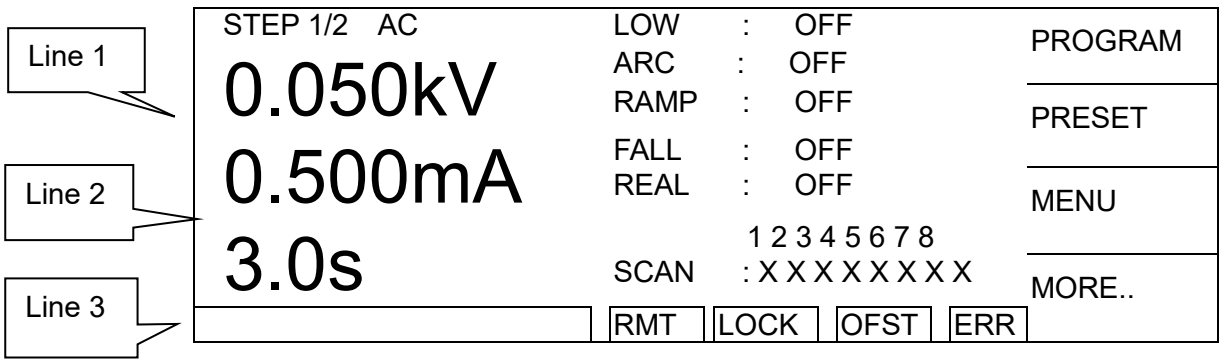
4.8.2 Connecting DUT Methods

Withstanding voltage / Insulation resistance test mode (AC / DC / IR / OS)
First of all, confirms there is no voltage output, and the DANGER LED is not lighted. Then connect the test cable (black) of low electric potential to the RTN / LOW terminal of the main unit and fix the fixture. This test cable and the high voltage output terminal are short-circuited and confirm there is no high voltage output. At the same time, a high voltage test cable (red or white) plug-in high voltage output terminal OUTPUT. Connecting the test cable of low electric potential to DUT first, and then connecting the test cable of high electric potential to DUT.

4.8.3 Test Procedure (AC / DC / IR / OS)

4.8.3.1 AC / DC / IR Test Procedure

1. Connection is completed correctly by connecting the DUT device method.
2. Under power on the menu (as in the following figure):



Schema:

STEP 1/2 means there are 2 test procedures in total and now executing the first test procedure. AC means test mode. "Line 1" means setting voltage value, "Line 2" means setting the current high limit, and "Line 3" means test time. The test results are shown on the status list.

3. Please press the **STOP** key, ready for testing, the status list show "STANDBY".
4. Press the **START** key to start the test.
   When pressing this key, start the voltage output. At the same time, the DANGER LED will

be lit, and the status list will show "UNDER TEST". Warning: Now test status is with output voltage. "Line 1" will show the output voltage output value; "Line 2" will show the current reading. "Line 3" the timer is counting down simultaneously.

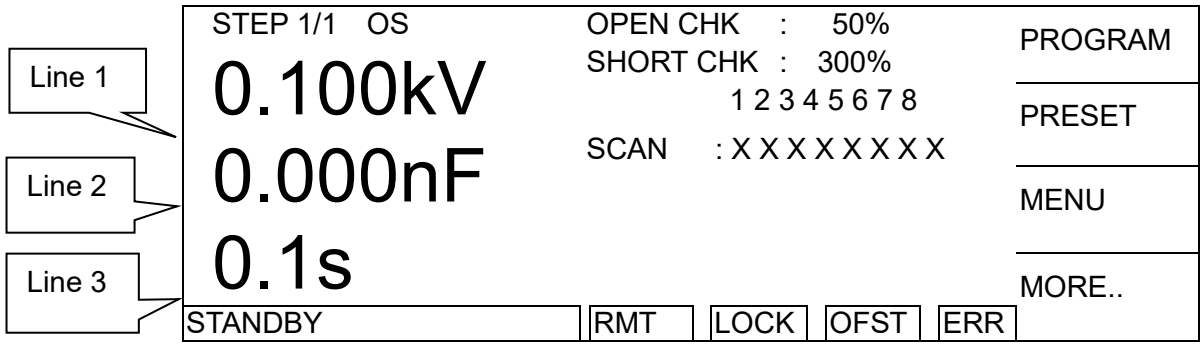
5. GOOD judgment
   When all of the test statuses have been tested and the result shows PASS, then the main unit is judged as GOOD and cut off output. The rear panel outputs a PASS signal, and the buzzer functions simultaneously.
6. No good judgment
   If the measurement value is abnormal, the main unit is judged as FAIL and stops outputting immediately. The rear panel outputs a FAIL signal, and the buzzer functions simultaneously. Keep on function until the **STOP** key of the main unit is pressed. The test result will show no good status.

Test result	Meaning
HI	Measurement of current / Resistance value over a high limit
LO	Measurement of current / Resistance value over a low limit
ARC	Current arc over a high limit
CHECK LOW	Charging current over low
ADV OVER	Voltage / current reading over hardware valid digit.
ADI OVER	Current / resistance reading over hardware valid digit.
GR CONT.	Grounding on test no good
GFI TRIP	Ground fail interrupt
AC REAL HI	Real current measurement value over a high limit

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

4.8.3.2 OS Test Procedure

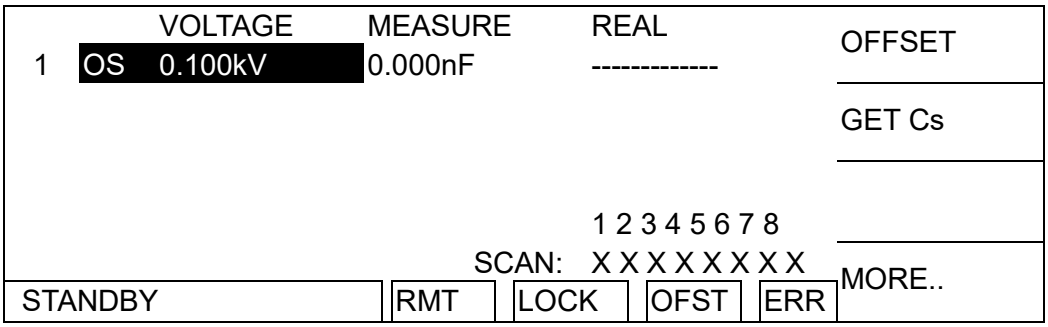
1. Connection is completed correctly by connecting the DUT device method under the standby menu.
2. Under the standby menu (as in the following figure):



Schema:

OS means the test mode is short/open detection mode. "Site 1" means the setting voltage value, "Site 2" means the capacitance value which is read, and "Site 3" means the test time. The test results are shown on the status list.

3. Please press **STOP**, ready for testing, the status list shows "STANDBY".
4. Please press **F4** **MORE..** to switch the menu that is displayed.



(1) Please press **F1** **OFFSET** to offset, it is necessary to offset the wire or fixture at each time change to ensure the accuracy of the test.
(2) When testing or changing a new capacitance DUT, the testing capacitance standard sample is DUT. Press **F2** GET Cs to read the standard capacitance value for testing.
(3) Please press **F4** **MORE..** key again to switch the menu which is displayed to standby.
(4) Press the **START** key to begin the test. It will begin to output the voltage. The DANGER indicator lights up and the "Status Line" shows "UNDER TEST" to warn you that it is in a test state and there is voltage output. "Line 1" will show the voltage output reading, "Line 2" will show the reading of capacitance, and "Line 3" performs timing and countdown work.

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

Example: Get Cs voltage 0.018kV, Get Cs capacitance value 17.4nF, current= 1.18mA -- at the mass current range.
Get Cs voltage 0.016kV, Get Cs capacitance value 17.42nF, current= 0.97mA -- at the medium current range.

5. GOOD judgment
When all of the test statuses have been tested and the result shows PASS, then the main unit is judged as GOOD and cut off the output. The rear panel outputs a PASS signal, and the buzzer functions simultaneously.
6. No good judgment
If the measurement value is abnormal, the main unit is judged as FAIL and stops outputting immediately. The rear panel outputs a FAIL signal, and the buzzer functions simultaneously. Keep on function until the **STOP** key of the main unit is pressed. The test result will show no good status.

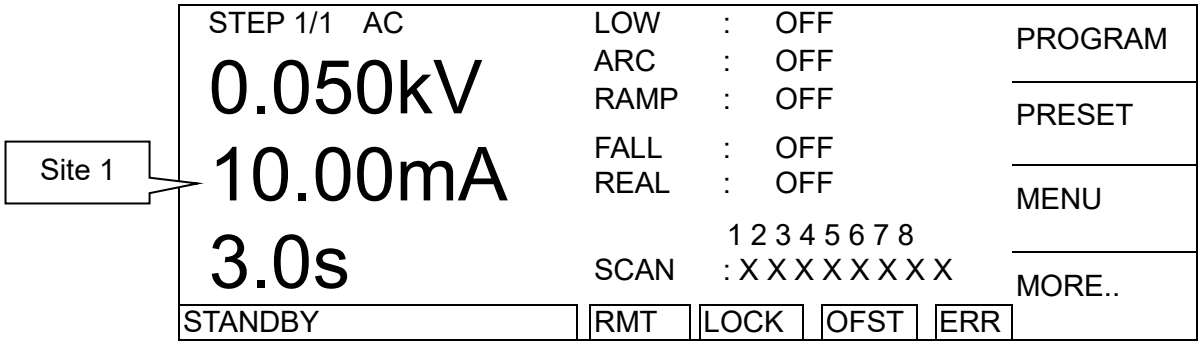
No good status

Test result	Meaning
OPEN	Capacitance open circuit/reading is fewer than the OPEN CHK setting.
SHOP	Capacitance short circuit/reading is larger than the SHORT CHK setting.

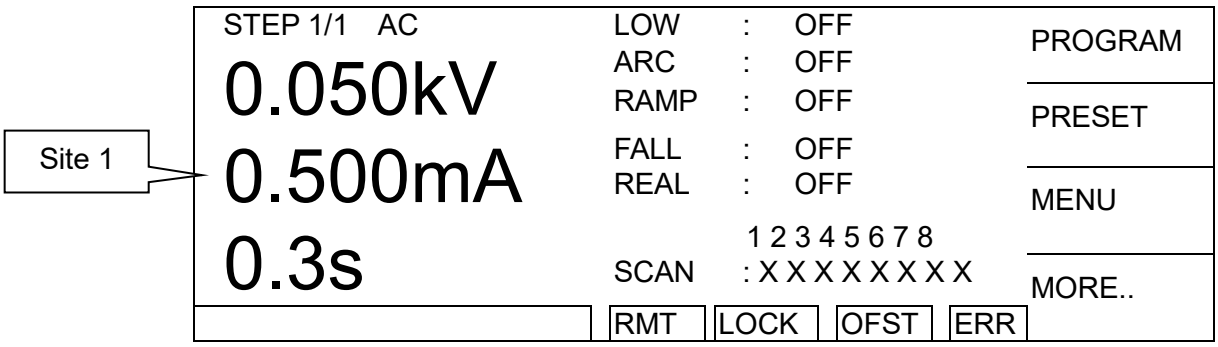
Under any circumstances only need to press the **STOP** key if users want to stop the test output.

4.8.4 Auto Range

1. Set Auto Range as ON.
2. Set the range to high current as Site 1 shown in the following menu.



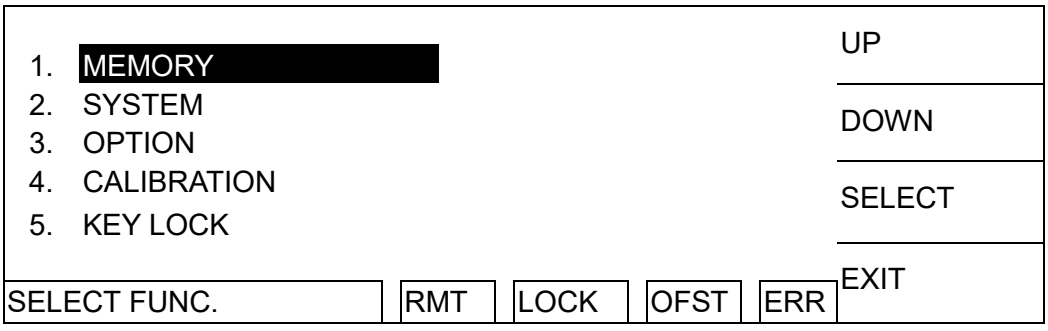
3. Before ending the test previous 0.6 sec., the tested current is shown and auto range to low current as the Site 1 in the following menu.



4.9 KEY LOCK Function

4.9.1 KEY LOCK Setting Method

1. Under the power on the menu, if the "LOCK" text block isn't highlighted then can set the KEY LOCK function.
2. Press Function Key **MENU** then show the following menu:

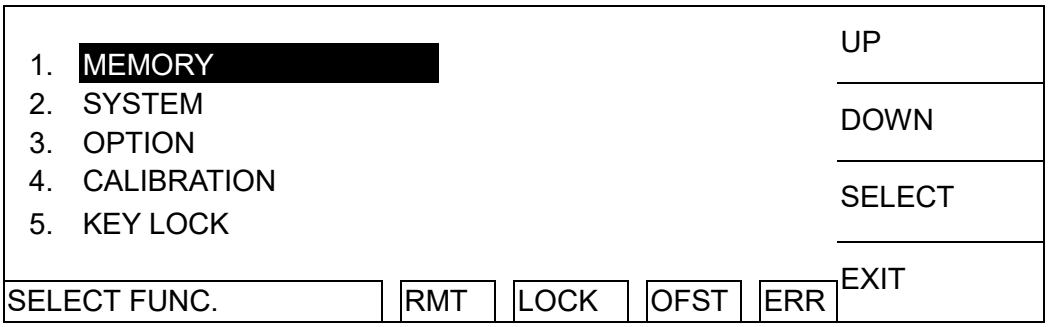


3. Move the highlighted to "KEY LOCK" by using Function Keys **UP**, **DOWN**. Press Function Key **SELECT** to enter the KEY LOCK setting menu.
4. Use Function Keys **A** and **B** to input PASSWORD (please input AAAA, when PASSWORD is not set).

5. Press **ENTER** to show the selection window, "LOCK" text block will show highlighted. The user can use Function Keys **YES** and **NO** to select whether to lock the MEMORY RECALL function or not.
6. Press Function Keys **EXIT** to complete the KEY LOCK function.

4.9.2 KEY LOCK Release Method

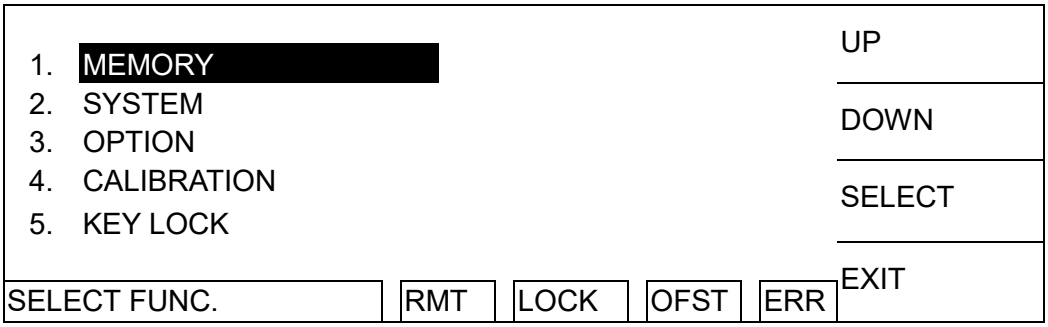
1. Under the power on the menu, if the "LOCK" text block is highlighted then can release the KEY LOCK function.
2. Press Function Key **MENU** then show the following menu:



3. Move the highlighted to "KEY LOCK" by using Function Keys **UP**, **DOWN**. Press Function Key **SELECT** to enter the KEY LOCK release menu.
4. Use Function Keys **A** and **B** to input PASSWORD (please input AAAA, when PASSWORD is not set).
5. Press the Function Key **ENTER** key, "LOCK" text block will release the highlighted. It means the KEY LOCK function is released.

4.10 Setting User Password

1. Under power on the menu, press Function Key **MENU** then show the following menu:



2. Move the highlighted to "CHANGE PASSWORD" by using Function Keys **UP**, **DOWN**. Press Function Key **ENTER** to enter the password input menu.
3. Use Function Keys **A** and **B** to input PASSWORD (please input AAAA, when PASSWORD is not set). Press **ENTER** to show the "ENTER NEW PASSWORD" window.
4. Using Function Keys **A** and **B** to input NEW PASSWORD (not over ten characters), pressing the **ENTER** key will show the "ENTER CONFIRM PASSWORD" window.
5. Using Function Keys **A** and **B** to input CONFIRM PASSWORD (the same as NEW PASSWORD), press **ENTER** key. At the same time, the setting has been done, and can

press **EXIT** to exit.

4.11 Remote Control

This tester has a REMOTE socket of the remote switch on the rear panel. When you want to control this tester with an external signal, plug the control cable into the socket. Please don't touch high voltage terminal or it may cause danger. Remote control by high voltage test bar usually.

Users can use another control circuit instead of a high-voltage bar. Please notice that this is the switch controlling high voltage output. Be careful that the control cables don't close high voltage terminal and test cables to avoid danger.

1. If the user desires to control START single and STOP signals, refer to *Figure 4-1*. This figure describes the methods connecting the REMOTE position on the front panel.

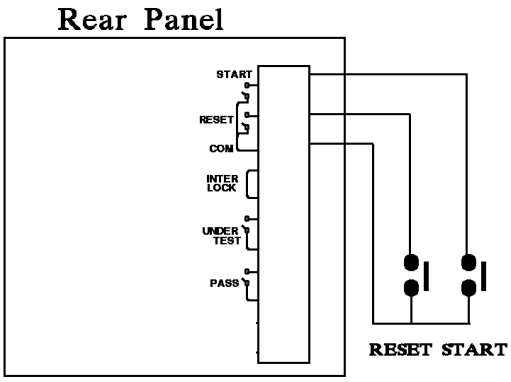


Figure 4-1

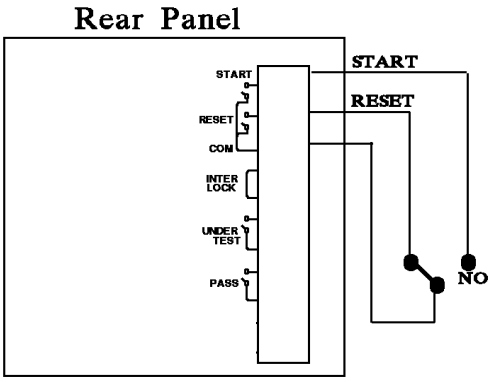


Figure 4-2

2. As *Figure 4-2*, the main unit is under STOP status. NC point is connecting to STOP and NO point connecting to START.
3. Some logical components such as transistors, FET, and couplers. Also can be used to connect as a control circuit as *Figure 4-3*. The connecting signal and circuit are as *Figure 4-3*. Only the circuit includes the following statuses, it can control the main unit.
   (1) The signal of the LOW flowing current is 2mA or less.
   (2) The action time of the input signal should be over 20 mS.

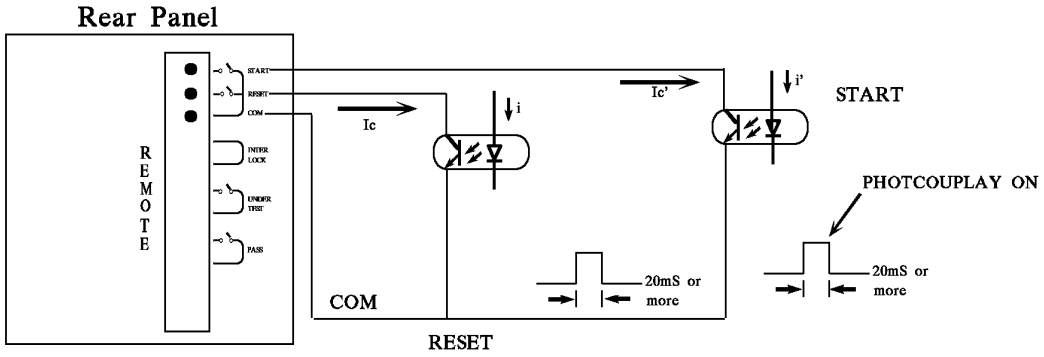
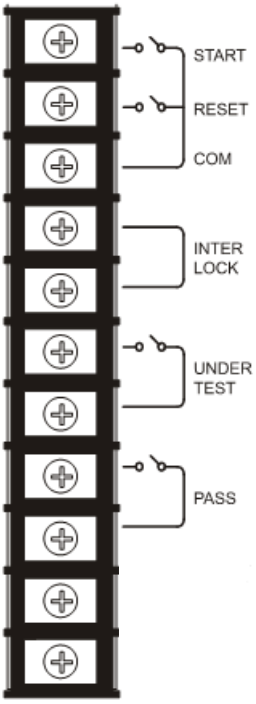


Figure 4-3

4. The relay switch control as in *Figure 4-1* and photo-coupler control as in *Figure 4-3* is controlled by component contact. It is effective to avoid error operation systems caused by interference. Although the main unit has a lot of preventions, it is necessary to be careful that interferences result from setting the measurement system.
5. The pin diagram of REMOTE CONTROL is as *Figure 4-4*. When users want to control external, please remember this pin diagram.



REMOTE I/O

9 Pin D-Sub

Figure 4-4

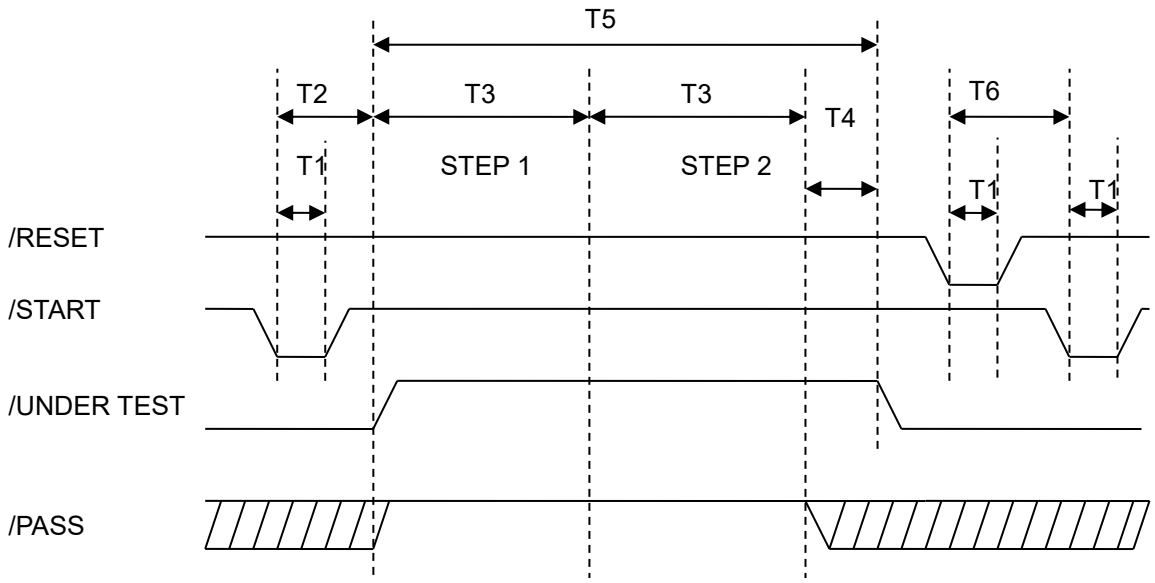
4.12 Output Signal

The tester includes LED and buzzer two kinds of indication signal. The rear panel of the tester has the following output signals.

UNDER TEST : When the analyzer is under test, the output terminal will short circuit. Users can use this short condition to control external signals. The junction specification 115V AC is lower than 0.3A.

PASS : When the tester judge DUT is good, the output terminal will short circuit. Users can use this short circuit condition to control external signals. The junction specification 115V AC is lower than 0.3A.
The action time is 0.2sec ~ 99.9sec. can be set.

4.13 Timing Diagram



Timing diagram – take an example by two test steps

Time	Limit	Description
T1	> 20mS	The time of external trigger signal/START & /RESET to remain which needs larger than 20mS.
T2	< 200mS	The time of the external trigger signal /START to /UNDER TEST signal to be cleared will be smaller than 200mS. The previous STEP test result /PASS signal status has been cleared in advance.
	< 300mS	The time of the external trigger signal /START to /UNDER TEST signal to be cleared will be smaller than 300mS. The previous STEP test result /PASS signal status hasn't been cleared in advance.
T3	-	Test needed time of various test steps.

Time	Limit	Description
T4	> 5mS	Pass signal sent larger than 5mS, /UNDER TEST signal is the end.
T5	-	The equipment used time for testing, and the signal is simultaneous with the Danger lamp on the panel.
T6	>160mS	The time of the external trigger signal /RESET to /START signal to be started needs to be larger than 160mS (SCREEN setting is OFF).
	>250mS	The time of the external trigger signal /RESET to /START signal to be started needs to be larger than 250mS (SCREEN setting is ON).

4.14 Scan Test

The tester multipoint scans on DUT (only 19053/19054) for a more faster and effective test. Setting method:

1. Enter the test parameter setting menu and set the test parameter in sequence.
2. When the highlighted position is on "SCAN", press Function Key **MOVE** can select the output channel want to set. (19053: 1 ~ 8 / 19054: 1 ~ 4)
3. At the same time, can use Function Key **CHANGE** to set the status of the scanning test output terminal. Pressing this key will show "H", "L" and "X" in sequence, which means do output from High Channel; do output and don't output from Low Channel.
4. When the setting is completed, press Function Key **ENTER** to confirm and exit.

5. GPIB Operation Description (Option)

5.1 Guide

The user can use a computer with a GPIB (IEEE 488-1978) interface to remote control and data transfer.

5.2 Interface Specification

5.2.1 Adaptable Standard

IEEE488-1978 standard

5.2.2 Interface Capability

Code	Meaning
SH1	Source Handshake Equipped with source handshake interface function
AH1	Acceptor Handshake Equipped with acceptor handshake interface function
T4	Basic Talker requirement Equipped with a basic talker interface function
L4	Basic Listener requirement Equipped with a basic listener interface function
SR1	Service request requirement Equipped with service request interface function
RL1	All remote/local requirement Equipped with remote/local interface function
PP0	No Parallel poll requirement No parallel poll interface function
DC1	All devices have a clear requirement Equipped with device clear interface function
DT0	No Device trigger requirement No device trigger interface function
C0	No controller requirement No controller interface function

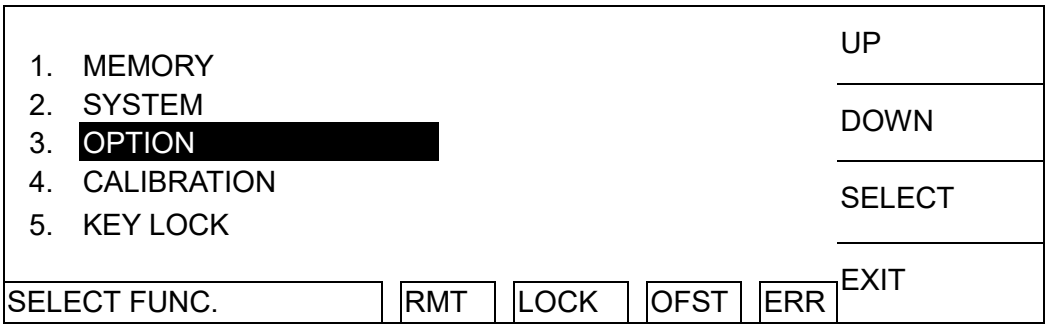
5.2.3 Code in Use

ASCII code.

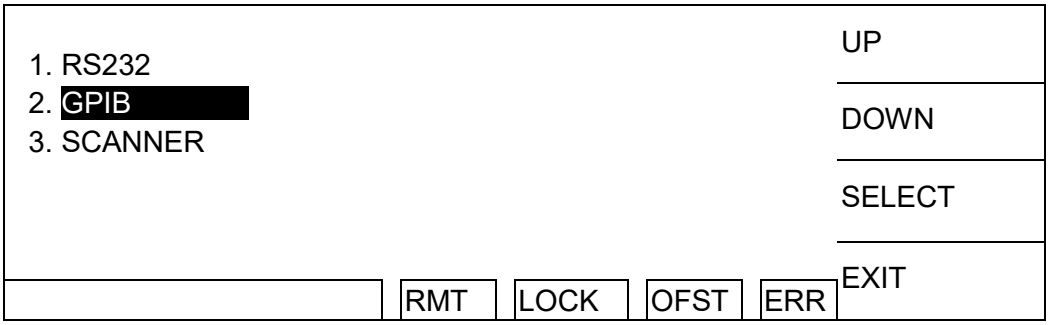
5.3 GPIB Related Panel Descriptions

5.3.1 Address Setting

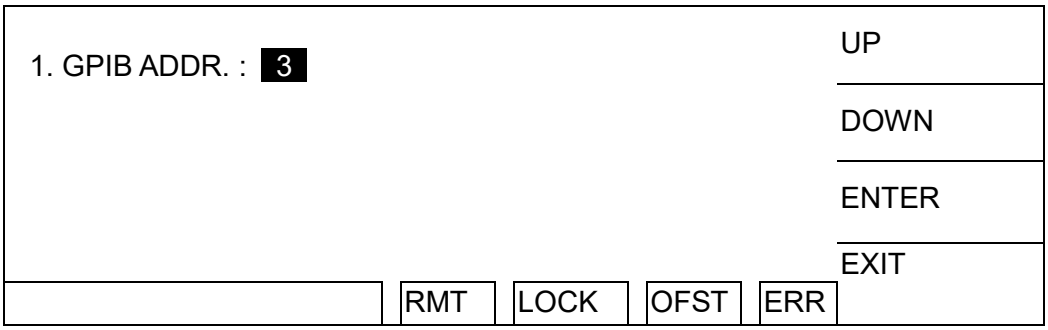
1. Under power on the menu, press Function Key **MENU** as the following:



2. Move the highlight to "OPTION" by Function Key **UP**, **DOWN**. Press Function Key **SELECT** to enter OPTION select setting as the following:



3. Move the highlighted to "GPIB" by Function Key **UP**, **DOWN**. Press Function Key **SELECT** to enter the GPIB setting menu as the following:



4. Then select GPIB Address by Function Key **UP**, **DOWN**.
5. The setting is completed, press Function Key **EXIT** to exit.

5.3.2 Remote / Local

1. The signal block Remote is highlighted, which means the analyzer is on Remote status.
2. On Remote status can use the **LOCAL** key on the panel to switch the analyzer to Local status.
3. On Remote status, all of the panel keys are malfunctioning except for Function Key **LOCAL** (switch to Local) **MENU**, **MORE..** and **STOP** (reset instrument) keys.

4. Using the LLO [Local lockout] command of GPIB makes the **LOCAL** key malfunction.

5.4 Interface Message

The analyzer is capable of responding to the following messages.

Signal	Meaning	Response
GTL	Go To Local	It can switch the analyzer to a Local status.
SDC	Selected Device Clear	Restart the analyzer.
LLO	Local Lockout	Using the **LOCAL** key to switch to Local status is forbidden.
IFC	Interface Clear	Reset the GPIB interface.

5.5 GPIB Control / Setting Command Descriptions

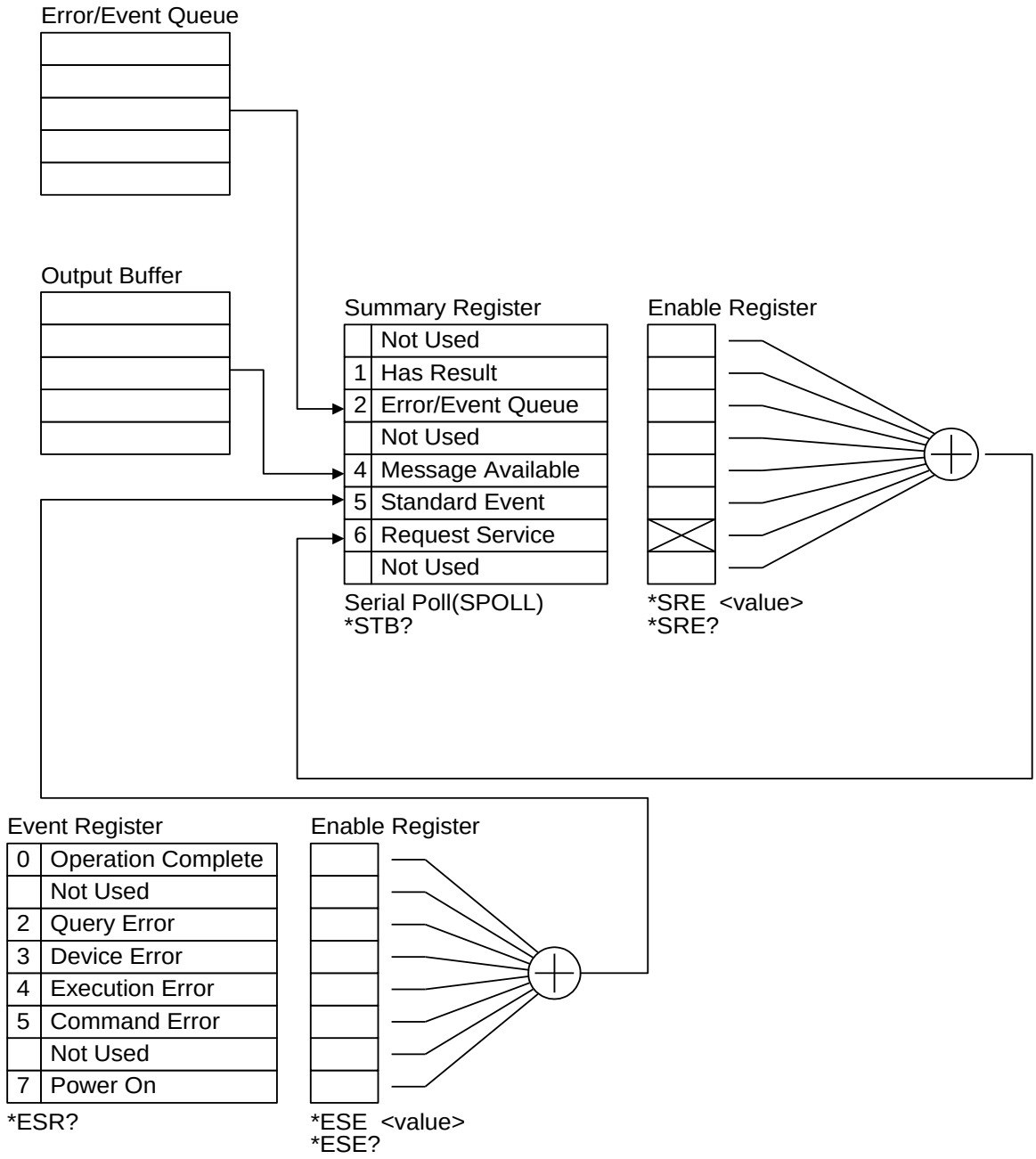
The analyzer GPIB function composed command string is inputted by ASCII code to attain functions of remote control and setting. The length of the command string is limited to 1024 characters (including end code) [Command + Parameter] compose a command. Two commands can be connected by semicolon and end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

End code

LF
CR+LF
EOI
LF+EOI
CR+LF+EOI

Status response command

✳CLS
✳ESE <*enable value*>
✳ESE?
✳ESR?
✳SRE <*enable value*>
✳SRE?
✳STB?
✳PSC 0|1
✳PSC?



5.6 IEEE 488.2 Command

* CLS command
  Clear status data configuration of the following actions is needed.
  Clear standard event status register.
  Clear status bit group register except for MAV bit (bit 4).

* ESE *<metric system value>* Command
  Use setting standard event status enable register value, <metric system value> range is 0 ~255.

* ESE? Command
  The controller is used for querying the standard event status of the device and enables register value.
  The output format is <metric system value>, and the range is 0~255.

* ESR? Command
  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>, and the range is 0~255.

* SRE <metric system value> Command
  Use for setting service request register value, the <metric system value> value is 0~255.

* SRE? Command
  The controller is reading service requests to enable the register initial setting.
  The output format is <metric system value>, and the range is 0~255.

* STB? Command
  The controller is for reading the status bit register value.
  The output format is <metric system value>, and the range is 0~255.

* OPC Command
  Operation is completed command

* OPC? Command
  Operation complete query command.
  The output format is ASCII character "1".

* PSC 0|1 Command
  Power on status clear command.

* PSC? Command
  Power on status clear query command.
  The output format is ASCII character "1" or "0".

* RST Command
  The device reset command.

* IDN? Command
  The controller is for reading the basic data of the device.
  The output format separates four fields by comma, which denote separately: manufacturer, device model, serial number, and firmware version.

* SAV <metric system value> Command
  Save command.
  This command saves the current status to memory, its' metric system value range is 1~ 99.

* RCL <metric system value> Command
  Recall command.
  This command recalls the saved status, its' metric system value range is 1~99.

5.7 Remote Command Summary

SCPI command

The parameter syntax format of SCPI command includes the following.
Dual arrow symbol "< >" denote the defined parameter of SCPI command standard.
"<numeric _ value>" is metric system value, "<boolean>" is Boolean equation data and its' value is 0 or 1. Vertical line " | " denotes OR parameter.

: SYSTem
: ERRor
: [NEXT]?
: VERSion?
: KLOCk <boolean>|ON|OFF
: KLOCk?
: LOCK
: OWNer?
: REQuest?
: RELease
: ROUNDing <boolean> | ON | OFF
: ROUNDing?

MEMory
: DELete
: LOCAtion <register number>
: FREE
: STEP?
: STATe?
: STATe
: DEFine <name>, <register number>
: DEFine? <name>
: LEAble? <register number>
: NSTAtes?
: SOURce
: SAFEty
: FETCh? *[<item>] { , <item> }*
: STARt
[: ONCE]
: OFFSet GET|OFF
: OFFSet?
: CSTandard
: STOP
: STATus?
: RESult
: ALL
[: JUDGment]?
: OMETerage?
: MMETerage?
: RMETerage?
: TIME
[: ELAPsed]
[: TEST]?

```
                                : RAMP?
            : MODE?
        : COMPleted?
        : AREPort?   (RS232 Interface only)
            [: JUDGment]
                [: MESsage]?
        : AREPort    (RS232 Interface only)
            [: JUDGment]
                [:MESsage] <Boolean> |ON | OFF
            : OMETerage <Boolean> |ON | OFF
            : OMETerage?
            : MMETerage <Boolean> |ON | OFF
            : MMETerage?
            : RMETerage
            : RMETerage?
        [: LAST]
            [: JUDGment]?
            : OMETerage?
            : MMETerage?
            : RMETerage?
        :STEP<n>
            : JUDGment]?
            : OMETerage?
            : MMETerage?
            : RMETerage?

: SNUMber?
: STEP<n>
        : DELete
        : SET?
        : MODE?
        : AC
            [: LEVel] <numeric_value>
            [: LEVel]?
            : LIMit
                [: HIGH]   <numeric_value>
                [: HIGH]?
                : LOW     <numeric_value>
                : LOW?
                : ARC
                            [: LEVel] <numeric_value>
                            [: LEVel]?
                : REAL
                            [: HIGH]
                            [: HIGH]?
            : TIME
                : RAMP <numeric_value>
                : RAMP?
                [: TEST] <numeric_value>
                [: TEST]?
                : FALL <numeric_value>
                : FALL?
            : CHANnel
                [: HIGH] <channel_list>
```

```
            [: HIGH]?
            : LOW    <channel_list>
            : LOW?
        : CURRent
            : OFFSet <numeric_value>
            : OFFSet?
    : DC
        [: LEVel] <numeric_value>
        [: LEVel]?
        : LIMit
            [: HIGH]    <numeric_value>
            [: HIGH]?
            : LOW     <numeric_value>
            : LOW?
            : ARC
                    [: LEVel] <numeric_value>
                    [: LEVel]?
        : CLOW    <boolean>|ON|OFF
        : CLOW
        : TIME
            : DWELl <numeric_value>
            : DWELl?
            : RAMP <numeric_value>
            : RAMP?
            [: TEST] <numeric_value>
            [: TEST]?
            : FALL <numeric_value>
            : FALL?
        : CHANnel
            [: HIGH]    <channel_list>
            [: HIGH]?
            : LOW     <channel_list>
            : LOW?
        : CURRent
            : OFFSet <numeric_value>
            : OFFSet?
    : IR
        [: LEVel] <numeric_value>
        [: LEVel]?
        : LIMit
            : HIGH    <numeric_value>
            : HIGH?
            [: LOW]    <numeric_value>
            [: LOW]?
        : TIME
            : DWELl <numeric_value>
            : DWELl?
            : RAMP <numeric_value>
            : RAMP?
            [: TEST] <numeric_value>
            [: TEST]?
            : FALL <numeric_value>
            : FALL?
        : RANGe
```

```
                [: UPPer] <numeric_value>
                [: UPPer]?
                : LOWer <numeric_value>
                : LOWer?
                : AUTO <ON/OFF or Boolean>
                : AUTO?
            : CHANnel
                [: HIGH] <channel_list>
                [: HIGH]?
                : LOW   <channel_list>
                : LOW?
        : OSC
            : LIMit
                : OPEN   <numeric_value>
                : OPEN?
                : SHORt   <numeric_value>
                : SHORt?
            : CHANnel
                [: HIGH] <channel_list>
                [: HIGH]?
                : LOW   <channel_list>
                : LOW?
            : CRANge? <MAXimun|MINimum|NOW>
            : CURRent<m>
                : OFFSet <numeric_value>
                : OFFSet?
            : CSTandard <range>,<numeric value>
            : CSTandard?
        : Pause
            : [: MESSage] <string data>
            : [: MESSage]?
            : UTSIgnal   < boolean> | ON | OFF >
            : UTSIgnal?
            : TIME
              [:TEST] <numeric_value>
              [: TEST]?
: PRESet
        : TIME
            : PASS       <numeric_value>
            : PASS?
            : STEP       <numeric_value>|KEY
            : STEP?
            : RJUDgment <ON/OFF or boolean>
            : RJUDgment?
        : AC
            : FREQuency <numeric_value>
            : FREQuency?
        : WRANge
            [: AUTO]        <boolean>|ON|OFF
            [: AUTO]?
        : AGC
            [: SOFTware]    <boolean>|ON|OFF
            [: SOFTware]?
        : GFI
```

[: SWITch] <boolean>|ON|OFF
[: SWITCH]?
: GR
: CONTinue <numeric_value>|ON|OFF
: CONTinue?
: FAIL
: OPERation STOP|CONTinue|RESTart
: OPERation?
: SCREen <Boolean>|ON|OFF
: SCREen?
: KEYboard
: SMARt <Boolean>|ON|OFF
: SMARt?
: RJUDgment <Boolean>|ON|OFF
: RJUDgment?
: NUMber
: PART
: PART?
: LOT
: LOT?
: SERIal
: SERIal?

: SYSTem

: VERSion?

: 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.

: ERRor

: [NEXT]?

: SYSTem: ERRor: [NEXT]?

This command reads the message in the Error Queue.

For returned messages please refer to section 5.7 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 the queue.

: KLOCk < boolean > |ON |OFF

: SYSTem: KLOCk

This command locks or releases the LOCAL key function but no switch of LOCAL or REMOTE.

Example: Input command **"SYST:KLOC ON"**

Description: It means the LOCAL function key is locked for the setting panel.

: KLOCk?

: SYSTem: KLOCk?

This command queries if the LOCAL key is being locked.

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

Return message **"1"**

Description: Return message **"1"** means the LOCAL key is locked.

: **LOCK**

: OWNer?

: SYSTem:LOCK:OWNer?

This command queries if it is controlled by the REMOTE terminal.

Return character data NONE|REMOTE.

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

Return message **"REMOTE"**

Description: Return message **"REMOTE"** means the instrument is under the status of REMOTE terminal control.

: REQuest?

: SYSTem:LOCK:REQuest?

This command switches to REMOTE terminal control.

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

Return message **"1"**

Description: Return message **"1"** means the instrument is already set to the status of REMOTE.

: RELease

: SYSTem:LOCK:RELease

This command switches to LOCAL terminal control.

Example: Input command **"SYST:REL"**

Description: It means the instrument is already set to the status of NONE.

: **ROUNDing < boolean > | ON | OFF**

: SYSTem:ROUNDing

This command sets if rounding is performed based on the display accuracy for the next measurement. When ON, the measured values queried by the remote commands will be consistent with the screen display; when OFF, the measured values queried by the remote commands are unprocessed raw data. The screen display shows the rounded result. The default is ON.

Example: Input command "**SYST:ROUND ON"**

Description: Indicates the rounding mechanism is turned on.

: MEMory

: DELete

LOCAtion < *register number* >

: MEMory: DELete: LOCAtion

This command deletes the parameter data in the main memory.

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

Description: It means deleting the first group of parameter data in the main memory.

: STATe

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

The command sets the name of the location of a certain memory in the main memory.

< *name* > The characters can be used are 0 ~ 9, A ~ Z, —.

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

Description: It means to set the first group of parameter data names in the main

memory as TEST.

: DEFine? < *name* >
The command queries the location in the main memory by the name of the memory.
< *name* > The characters can be used are 0 ~ 9, A ~ Z, —.
Example: Input command "**MEM:STAT:DEF? TEST"**
Return message "**1"**
Description: Return message "**1"** means the parameter data location of TEST is at the first group.

: LABEl? < *register number* >
This command queries the name in the main memory by the location of the memory.
Example: Input command "**MEM:STAT:LABEl? 1"**
Return message "**TEST"**
Description: Return message "**TEST"** means the first group parameter data name is TEST.

: NSTates?
This command queries the storage capacity in the main memory.
The storage capacity return to the main memory is the maximum value plus one.
Example: Input command "**MEM:NST?"**
Return message "**100"**
Description: Return message "**100"** means the storage capacity of the main memory is 99 groups (100-1).

: FREE
: STEP?
: 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 of STEP can be set is 497, there are 3 steps that have been used.

: STATe?
: MEMory: FREE: STATe?
This command queries the rest parameter data number that can be set in the main memory.
Example: Input command "**MEM:FREE:STAT?"**
Return message "**97,3"**
Description: Return message "**97,3"** means the rest parameter data number can be set is 97, 3 groups have been used.

[: SOURce]
: SAFEty
: STARt
[: ONCE]
: SOURce: SAFEty: STARt
This command starts the test.
Example: Input command "**SAFE:STAR"**
Description: It means to start the main unit test.

: OFFSet GET|OFF
: SOURce: SAFEty: STARt: OFFSet GET
This command gets an offset value.
Example: Input command "**SAFE:STAR OFFS GET"**
Description: It means to start the function of getting offset value.

: SOURce: SAFEty: STARt: OFFSet OFF
This command is off offset function.
Example: Input command **"SAFE:STAR OFFS OFF"**
Description: It means to of the function of getting offset value.

: OFFSet?
: SOURce: SAFEty: STARt: OFFSet?
This command queries if offset action or not.
Return 0, means without doing zero action, 1 means zero action has been done, 2 means zero action processing.
Example: Input command **"SAFE:STAR OFFS?"**
Return message **"0"**
Description: Return message **"0"** means the main unit is without doing zero action.

: CSTandard
: SOURce: SAFEty: STARt: CSTandard
This command starts the GET Cs function of short/open circuit detection mode.
Example: Input command **"SAFE:STAR:CST"**
Description: It means to start the GET Cs function of short/open circuit detection mode.

: STOP
: SOURce: SAFEty: STOP
This command stops the test.
Example: Input command **"SAFE:STOP"**
Description: It means to stop the main unit test.

: STATus?
: 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.

: FETCh? [< item >] { , < item > }
The command queries the metered data. The < item > is character data.
The command responding the following data:

ITEM	Responding Data
STEP	The step number.
MODE	The test mode.
OMETerage	The value of the output meter.
MMETerage	The value of the measuring meter.
RMETerage	The value of the real meter.

ITEM	Responding Data
RELApsed	The elapsed time of the ramp.
RLEFt	The left time of the ramp.
TELApsed	The elapsed time of the test.
TLEFt	The left time of the test.
FELApsed	The elapsed time of fall.
FLEFt	The left time of fall.
DELApsed	The elapsed time of dwell.
DLEFt	The left time of dwell.
CHANnel	The scan box status.

Example: Input command **"SAFE:FETC?"STEP, MODE, OMET**
Return message **"1, AC, +5.000000E+02"**
Description: Return message **"1, AC, +5.000000E+02"** means to query the current STEP, MODE, and output value results are STEP1, AC MODE, and 0.500kV.

: RESult
: ALL
[: JUDGment]?
: SOURce: SAFEty: RESult: ALL: JUDGment?
This command queries all STEP judgment results.
Example : Input command **"SAFE:RES:ALL?"**
Return message **"116"**
Description: Return message **"116"** means judgment results are PASS.

: OMETerage?
: SOURce: SAFEty: RESult: ALL: OMETerage?
This command queries all OUTPUT METER readings of STEP.
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.

: MMETerage?
: SOURce: SAFEty: RESult: ALL: MMETerage?
This command queries all MEASURE METER readings of STEP.
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.

: RMETerage?
: SOURce: SAFEty: RESult: ALL: RMETerage?
This command queries all REAL CURRENT METER readings of STEP.
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.

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

This command queries the needed time of all STEP tests.
Example : Input command **"SAFE:RES:ALL:TIME"**
Return message **"3.000000E+00"**
Description: Return message **"3.000000E+00"** means the test needed time is set to 3 seconds.

: RAMP?
: SOURce: SAFEty: RESult: ALL: TIME: RAMP?
This command queries the time of all STEP tests ramp to the setting voltage.
Example : Input command **"SAFE:RES:ALL:TIME: RAMP"**
Return message **"1.000000E+00"**
Description: Return message **"1.000000E+00"** means ramp to the setting voltage needed time is set to 1 second.

:FALL?
: SOURce: SAFEty: RESult: ALL: TIME: FALL?
This command queries the time of all STEP tests from the setting voltage falls to zero.
Example : Input command **"SAFE:RES:ALL:TIME: FALL"**
Return message **"2.000000E+00"**
Description: Return message **"2.000000E+00"** means from the setting voltage falls to zero needed time is set to 2 seconds.

:DWELI?
: SOURce: SAFEty: RESult: ALL: TIME: DWELI?
This command queries the dwell time of all STEP tests.
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 set to 2.5 seconds.

:MODE?
: SOURce: SAFEty: RESult: ALL: MODE?
This command queries all STEP modes and will return character data.
AC|DC|IR|OS|PA
Example : Input command **"SAFE:RES:ALL: MODE?"**
Return message **"DC"**
Description: Return message **"DC"** means the MODE setting is DC MODE.

: COMPleted?
: SOURce: SAFEty: RESult: COMPlete?
This command queries if the device completes the execution of all setting values.
Return 1 or 0 (1 means the execution is completed, 0 means the execution action isn't completed).
Example : Input command **"SAFE:RES:COMP?"**
Return message **"1"**
Description: Return message **"1"** means the execution of all settings is completed.

: AREPort (RS232 Interface only)
[:JUDGment]
[:MESsage] <boolean>|ON|OFF
: SOURce: SAFEty: RESult: AREPort**:JUDGment:MESsage**
< boolean > | ON | OFF
This command sets if auto reporting the test result. When set as ON or 1, the test is completed, and it returns the string data of "PASS" or "FAIL". When set as OFF or 0, it will not auto-report the result.
Example : Input command **"SAFE:RES:AREP ON"**
Description: It means the main unit will auto-report test results after the test is completed.

:OMETerage
: SOURce: SAFEty: RESult: AREPort**:**OMETerage ***< boolean > | ON | OFF***
This command sets if OUTPUT METER auto reports the test result. When set as ON or 1, the test is completed, and return messages are OUTPUT VALUE of all STEPs. If some STEPs are not tested, it denotes these STEPs don't have OUTPUT VALUE, return +9.910000E+37. When it is set as OFF or 0, it will not auto-report the test result.
Example : Input command **"SAFE:RES:AREP:OMET ON"**
Description: It means the main unit auto reports the test results of OUTPUT METER after the test is completed.

:OMETerage ?
: SOURce: SAFEty: RESult: AREPort:OMETerage?
This command queries if OUTPUT METER auto reports the test result. Return 1 or 0 (1 means OUTPUT METER will auto-report the test result, 0 means OUTPUT METER will not auto-report the test result).
Example : Input command **"SAFE:RES:AREP:OMET?"**
Return message **"1"**
Description: Return message **"1"** means the main unit will auto report OUTPUT METER result after the test is completed.

:MMETerage
: SOURce: SAFEty: RESult: AREPort**:**MMETerage ***< boolean > | ON | OFF***
This command sets if MEASURE METER auto reports the test result. When set as OFF or 1, the test is completed, and return messages are MEASURE VALUE of all STEPs. If some STEPs are not tested, it denotes these STEPs don't have MEASURE VALUE, return +9.910000E+37. When set as OFF or 0, it will not auto-report the test result.
Example : Input command **"SAFE:RES:AREP:MMET ON"**
Description: It means to set the main unit auto report MEASURE METER test result after the test is completed.

: MMETerage ?
: SOURce: SAFEty: RESult: AREPort: MMETerage ?
This command queries if MEASURE METER auto reports the test result. Return 1 or 0 (1 means MEASURE METER will auto-report the test result, and 0 means MEASURE METER will not auto-report the test result).
Example: Input command **"SAFE:RES:AREP:MMET?"**
Return message **"1"**

Description: Return message **"1"** means the main unit will auto report MEASURE METER results after the test is completed.

:RMETerage

: SOURce: SAFEty: RESult: AREPort**:**RMETerage ***< boolean > | ON | OFF***

This command sets if REAL CURRENT METER auto reports the test result. When set as OFF or 1, the test is completed, and return messages are REAL CURRENT VALUE of all STEPs. If some STEPs are not tested, it denotes these STEPs don't have REAL CURRENT VALUE, return +9.910000E+37. When set as OFF or 0, it will not auto-report the test result.

Example: Input command **"SAFE:RES:AREP:RMET ON"**

Description: It means to set the main unit auto-report test result of REAL CURRENT METER after the test is completed.

:RMETerage ?

: SOURce: SAFEty: RESult: AREPort:RMETerage?

This command queries if REAL CURRENT METER auto reports the test result. Return 1 or 0 (1 means REAL CURRENT METER will auto-report the test result, 0 means REAL CURRENT METER will not auto-report the test result).

Example : Input command **"SAFE:RES:AREP:RMET?"**
Return message **"1"**

Description: Return message **"1"** means auto report the result of REAL CURRENT METER after the main unit test is completed.

[: LAST]?

[: JUDGment]?

: SOURce: SAFEty: RESult: LAST: JUDGment?

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

Example : Input command **"SAFE:RES:LAST?"**
Return message **"116"**

Description: Return message **"116"** means the judgment result of the last STEP is PASS.

: OMETerage?

: SOURce: SAFEty: RESult: LAST: OMETerage?

This command queries the OUTPUT METER reading of the last STEP.

Example : Input command **"SAFE:RES:LAST:OMET"**
Return message **"5.100000E+01"**

Description: Return message **"5.100000E+01"** means OUTPUT METER reading of the last STEP is 0.051kV.

: MMETerage?

: SOURce: SAFEty: RESult: LAST: MMETerage?

This command queries the MEASURE METER reading of the last STEP.

Example : Input command **"SAFE:RES:LAST:MMET"**
Return message **"2.000000E-07"**

Description: Return message **"2.000000E-07** means MEASURE METER reading of the last STEP is 2uA.

: RMETerage?

: SOURce: SAFEty: RESult: LAST: RMETerage?

This command queries the REAL CURRENT METER reading of the last

STEP.
Example : Input command **"SAFE:RES:LAST:RMET"**
Return message **"8.000000E-07"**
Description: Return message **"8.000000E-07"** means the REAL CURRENT METER reading of the last STEP is 0.008mA.

: STEP<n>

: JUDGment?
: SOURce: SAFEty: RESult: STEP: JUDGment?
This command queries the judgment result code of the selected STEP.
Example : Input command **"SAFE:RES:STEP2:JUDG?"**
Return message **"116"**
Description: Return message **"116"** means query the judgment result of the second STEP is PASS.

: OMETerage?
: SOURce: SAFEty: RESult: STEP: OMETerage?
This command queries the OUTPUT METER reading of the selected STEP.
Example : Input command **"SAFE:RES:STEP2:OMET?"**
Return message **"5.000000E+03"**
Description: Return message **"5.000000E+03"** means the OUTPUT METER reading of the second STEP is 5000V.

: MMETerage?
: SOURce: SAFEty: RESult: STEP: MMETerage?
This command queries the MEASURE METER reading of the selected STEP.
Example : Input command **"SAFE:RES:STEP2:MMET?"**
Return message **"2.500000E-05"**
Description: Return message **"2.500000E-05"** means the MEASURE METER reading of the second STEP is 0.025mA.

: RMETerage?
: SOURce: SAFEty: RESult: STEP: RMETerage?
This command queries the REAL CURRENT METER reading of the selected STEP.
Example : Input command **"SAFE:RES:STEP2:MMET?"**
Return message **"1.000000E-05"**
Description: Return message **"1.000000E-05"** means the MEASURE METER reading of the second STEP is 0.010mA.

Common judgment result code list

Screen Prompt Word	Judgment Result	Code (HEX)	Code (Decimal)
PASS	PASS	74	116
STOP	USER STOP	71	113
CAN NOT TEST	CAN NOT TEST	72	114
	TESTING	73	115
	STOP	70	112
GR CONT.	GR CONT.	78	120
GFI TRIP	TRIPPED	79	121

Judgment of no good code list

		AC MODE		DC MODE		IR MODE	
Screen Prompt Word	**Code Meaning**	Hex	Dec	Hex	Dec	Hex	Dec
HI	HI	11	17	21	33	31	49
LO	LO	12	18	22	34	32	50
ARC	ARC	13	19	23	35	33	----
CHECK LOW	CHECK LOW	----	----	25	37	----	----
ADI OVER	ADI OVER	16	22	26	38	36	54
ADV OVER	ADV OVER	17	23	27	39	37	55
AC REAL HI	REAL HIGH	1a	26	----	----	----	----

		OSC MODE	
Screen Prompt Word	**Code Meaning**	Hex	Dec
SHORT	SHORT	61	97
OPEN	OPEN	62	98
SHORT	IO	64	100
SHORT	ADI OVER	67	103
OPEN	ADV OVER	66	102

: SNUMber?
: SOURce: SAFEty: SNUMber?
This command queries the STEP number being set in the memory.
Example: Input command **"SAFE:SNUM?"**
Return message **"+2"**
Description: Return message **"+2"** means 2 steps have been set in the memory.

: STEP<n>

: DELete
: SOURce: SAFEty: STEP: DELete
This command clears all setting values in the selected Step to the initial value.
<n> The metric system value is 1 ~99 (included).
Example: Input command **"SAFE:STEP 1:DEL"**
Description: This command means deleting the STEP1 setting value in the memory.

: SET?
: SOURce: SAFEty: STEP: SET?
This command queries all setting values in the selected STEP.
Example: Input command **SAFE:SETP 1:SET?**
Return message **1, AC, 5.000000E+03, 6.000000E-04, 7.000000E-06, 8.000000E-03, 3.000000E+00, 1.000000E+00, 2.000000E+00, 4.000000E-04, (@(0)), (@(0))**
Description: This command means the STEP setting value is STEP 1, AC, VOLT: 5.000kV, HIGH: 0.600mA, LOW: 0.007mA, ARC: 8.0mA, TIME: 3.0s, RAMP: 1.0s, FALL: 2.0s, REAL: 0.400mA, SCAN HI: 0, SCAN LOW: 0.

: MODE?
: SOURce: SAFEty: STEP: MODE?
This command queries MODE in the selected STEP.

Return character data AC | DC | IR | OS | PA
Example: Input command **"SAFE:STEP 1:MODE?"**
Return message **"AC"**
Description: Return message **"AC"** means STEP 1 set to AC MODE.

: AC
[: LEVel] <numeric_value>
: SOURce: SAFEty: STEP: AC: LEVel
This command sets the selected Step and the AC withstand voltage test needed voltage value.
<numeric_value> is 50 ~ 5000 (included), and the unit is volt.
Example: Input command **"SAFE:STEP 1:AC 3000"**
Description: This command means that STEP1 is the AC withstand voltage test and the needed voltage value is 3000V.

[: LEVel]?
: SOURce: SAFEty: STEP: AC: LEVel?
This command queries selected STEP which AC withstand voltage test needed voltage value.
The return value is 50 ~ 5000 (included), and the unit is volt.
Example: Input command **"SAFE:STEP 1:AC?"**
Return message **"3.000000E+03"**
Description: Return message **"3.000000E+03"** means voltage value set to 3000V when testing STEP1 AC withstand voltage.

: LIMit
[: HIGH] <numeric_value>
: SOURce: SAFEty: STEP: AC: LIMit: HIGH
This command sets the selected STEP for the leakage current high limit of AC withstand voltage.
Example: Input command **"SAFE:STEP 1:AC:LIM 0.01"**
Description: This command sets the leakage current high limit value of the main unit STEP1 to 10mA.

[: HIGH]?
: SOURce: SAFEty: STEP: AC: LIMit: HIGH?
This command queries the selected STEP for the leakage current high limit of AC withstand voltage.
Example: Input command **"SAFE:STEP 1:AC:LIM?"**
Return message **"1.000000E-02"**
Description: Return message **"1.000000E-02"** means the leakage current high limit value of the main unit STEP1 is 10mA.

: LOW <numeric_value>
: SOURce: SAFEty: STEP: AC: LIMit: LOW
This command sets the selected STEP for the leakage current low limit of AC withstand voltage.
Example: Input command **"SAFE:STEP 1:AC:LIM:LOW 0.00001"**
Description: This command sets the leakage current low limit value of the main unit STEP1 to 0.01mA.

: LOW?
: SOURce: SAFEty: STEP: AC: LIMit: LOW?
This command queries the selected STEP for the leakage current low

limit of AC withstand voltage.
Example: Input command **"SAFE:STEP 1:AC:LIM:LOW?"**
Return message **"1.000000E-05"**
Description: Return message **"1.000000E-05"** means the leakage current low limit value of the main unit STEP1 is 0.01mA.

: ARC
[: LEVel] <numeric_value>
: SOURce: SAFEty: STEP: AC: LIMit: ARC: LEVel
This command sets selected STEP which ARC checking value.
Example: Input command **"SAFE:STEP 1:AC:LIM:ARC 0.004"**
Description: This command means ARC checking the value of the main unit STEP1 is set to 4mA.

[: LEVel]?
: SOURce: SAFEty: STEP: AC: LIMit: ARC: LEVel?
This command queries selected STEP which ARC checking value.
Example: Input command **"SAFE:STEP 1:AC:LIM:ARC?"**
Return message **"4.000000E-03"**
Description: Return message **"4.000000E-03"** means ARC checking value of the main unit STEP 1 is set to 4.0mA.

: REAL
[: HIGH]
: SOURce: SAFEty: STEP: AC: LIMit: REAL: HIGH
This command sets the selected STEP for the real current high limit value of AC withstand voltage.
Example: Input command **"SAFE:STEP 1:AC:LIM:REAL 0.0001"**
Description: This command means the real current high limit value AC withstand voltage of the main unit STEP1 is 0.10mA.

[: HIGH]?
: SOURce: SAFEty: STEP: AC: LIMit: REAL: HIGH?
This command queries the selected STEP of the real current high limit value for AC withstand voltage.
Example: Input command **"SAFE:STEP 1:AC:LIM:REAL?"**
Return message **"1.000000E-04"**
Description: Return message **"1.000000E-04"** means the ARC checking value of the main unit STEP 1 is set to 0.10mA.

: TIME
: RAMP <numeric_value>
: SOURce: SAFEty: STEP: AC: TIME: RAMP
This command sets the selected STEP which tests ramps to set the voltage needed time.
Example: Input command **"SAFE:STEP 1:AC:TIME:RAMP 5"**
Description: This command means test ramps to setting voltage needed time of the main unit STEP 1 is 5.0sec.

: RAMP?
: SOURce: SAFEty: STEP: AC: TIME: RAMP?
This command queries the selected STEP which tests ramps to set the voltage needed time.
Example: Input command **"SAFE:STEP 1:AC:TIME:RAMP?"**

Return message **"5.000000E+00"**
Description: Return message **"5.000000E+00"** means test ramps to setting voltage needed time of the main unit STEP 1 is set to 5.0sec.

[: TEST] <numeric_value>
: SOURce: SAFEty: STEP: AC: TIME: TEST
This command sets the selected STEP which tests the needed time.
Example: Input command **"SAFE:STEP 1:AC:TIME 10"**
Description: This command means to test the needed time of the main unit STEP 1 is 10.0sec.

[: TEST]?
: SOURce: SAFEty: STEP: AC: TIME: TEST?
This command queries selected STEP which test needed time.
Example: Input command **"SAFE:STEP 1:AC:TIME?"**
Return message **"1.000000E+01"**
Description: Return message **"1.000000E+01"** means the test needed time of the main unit STEP 1 is set to 5sec.

: FALL <numeric_value>
: SOURce: SAFEty: STEP: AC: TIME: FALL
This command sets the selected STEP which sets the voltage value fall to zero needed time.
Example: Input command **"SAFE:STEP 1:AC:TIME:FALL 4"**
Description: This command means setting the voltage value of the main unit STEP 1 fall to zero needed time is 5.0 sec.

: FALL?
: SOURce: SAFEty: STEP: AC: TIME: FALL?
This command queries the selected STEP which setting voltage value falls to zero needed time.
Example: Input command **"SAFE:STEP 1:AC:TIME:FALL?"**
Return message **"4.000000E+00"**
Description: Return message "**4.000000E+00"** means setting the voltage value of the main unit STEP 1 falls to zero needed time is 4 sec.

: CHANnel
[: HIGH] <channel_list>
: SOURce: SAFEty: STEP: AC: CHANnel: HIGH
This command sets the output channel status of the scanning test high voltage.
Example: Input command "SAFE:STEP 1:AC:CHAN(@(1,3))"
Description: This command means the output channel of the scanning test of the main unit STEP 1 is set to channel 1 and 3 HIGH output.
Example: Input command **"SAFE:STEP 1:AC:CHAN(@(0))"**
Description: This command means a HIGH output channel of scanning test output channel of the main unit STEP 1 is set to OFF.

[: HIGH]?
: SOURce: SAFEty: STEP: AC: CHANnel: HIGH?
This command queries the output channel status of scanning test high

voltage.
Example: Input command **"SAFE:STEP 1:AC:CHAN?"**
Return message **"(@(1,3))"**
Description: Return message **"(@(1,3))"** means the output channel status of the scanning test of the main unit STEP 1 is channel 1 and 3 HIGH output.

: LOW <channel_list>
: SOURce: SAFEty: STEP: AC: CHANnel: LOW
This command sets the output status of scanning the common test channel (RTN/LOW).
Example: Input command **"SAFE:STEP 1:AC:CHAN:LOW (@(2,4))"**
Description: This command means the output channel of the scanning test of the main unit STEP 1 is set to channel 2 and 4 LOW output.
Example: Input command **"SAFE:STEP 3:AC:CHAN:LOW (@(0))"**
Description: This command means the LOW output channel of the scanning test of the main unit STEP 1 is set to OFF.

: LOW?
: SOURce: SAFEty: STEP: AC: CHANnel: LOW?
This command queries the output status of scanning common test channel (RTN/LOW).
Example: Input command **"SAFE:STEP 1:AC:CHAN:LOW?"**
Return message **"(@(2,4))"**
Description: Return message **"(@(2,4))"** means the output channel status of the scanning test of the main unit STEP 1 is channel 2 and 4 LOW output.

:CURRent

:OFFSet <numeric_value>
:SOURce:SAFEty:STEP:AC:CURRent:OFFSet
This command sets AC withstand test OFFSET value of selected STEP.
Parameter ***<numeric value>***: The OFFSET value of AC withstand test, the unit is ampere (A).
Example: Input command **"SAFE:STEP 1:AC:CURR:OFFS 0.00001"**
Description: It indicates setting the OFFSET value of the AC withstand for the main unit STEP 1 to 0.01mA.

:OFFSet?
:SOURce:SAFEty:STEP:AC: CURRent:OFFSet?
This command queries AC withstand test OFFSET value of selected STEP.
Example: Input command **"SAFE:STEP 1:AC:CURR:OFFS?"**
Return message **"+1.000000E-05"**
Description: Return message **"+1.000000E-05"** means the AC withstand test OFFSET value of the main unit STEP 1 is 0.01mA.

: DC

[: LEVel] <numeric_value>
: SOURce: SAFEty: STEP: DC: LEVel
This command sets selected STEP which DC withstand voltage test needed voltage value.
<numeric_value> is 50-6000 (included), the unit is volt.
Example: Input command **"SAFE:STEP 2:DC 4000"**
Description: This command means the voltage value of the DC withstand voltage test needed for the main unit STEP 2 is set to 4000V.

[: LEVel]?
: SOURce: SAFEty: STEP: DC: LEVel?
This command queries the selected STEP for the voltage value needed by the DC withstand voltage.
The return value is 50-6000(included), and the unit is volt.
Example: Input command **"SAFE:STEP 2:DC?"**
Return message **"4.000000E+03"**
Description: Return message **"4.000000E+03"** means the set voltage value of the DC withstand voltage for the main unit STEP 2 is 4000V.

: LIMit

[: HIGH] <numeric_value>
: SOURce: SAFEty: STEP: DC: LIMit: HIGH
This command sets the selected STEP of the leakage current high limit for the DC withstand voltage.
Example: Input command **"SAFE:STEP 2:DC:LIM 0.002999"**
Description: This command means the leakage current high limit of DC withstand voltage for the main unit STEP 2 is set to 2.999mA.

[: HIGH]?
: SOURce: SAFEty: STEP: DC: LIMit: HIGH?
This command queries the selected STEP for the leakage current high limit value of the DC withstand voltage.
Example: Input command **"SAFE:STEP 2:DC:LIM?"**
Return message **"2.999000E-03"**
Description: Return message **"2.999000E-03"** means the high limit value of the DC withstand voltage leakage current for the main unit STEP 2 is 2.999mA.

: LOW <numeric_value>
: SOURce: SAFEty: STEP: DC: LIMit: LOW
This command sets the selected STEP for the DC withstand voltage leakage current low limit.
Example: Input command **"SAFE:STEP 2:DC:LIM:LOW 0.000001"**
Description: This command means the DC withstand voltage leakage current low limit of the main unit STEP 2 is set to 0.001mA.

: LOW?
: SOURce: SAFEty: STEP: DC: LIMit: LOW?
This command queries the selected STEP for the DC withstand voltage leakage current low limit.
Example: Input command **"SAFE:STEP 2:DC:LIM:LOW?"**
Return message **"1.000000E-06"**
Description: Return message **"1.000000E-06"** means DC withstand voltage leakage current low limit value of the main unit STEP 2 is 0.001mA.

: ARC

[: LEVel] <numeric_value>
: SOURce: SAFEty: STEP: DC: LIMit: ARC: LEVel
This command sets selected STEP which ARC checking value.

Example: Input command **"SAFE:STEP 2:DC:LIM:ARC 0.0025"**
Description: This command means the ARC checking the value of the main unit STEP 2 is set to 2.5mA.

[: LEVel]?
: SOURce: SAFEty: STEP: DC: LIMit: ARC: LEVel?
This command queries selected STEP which ARC checking value.
Example: Input command **"SAFE:STEP 2:DC:LIM:ARC?"**
Return message **"2.500000E-03"**
Description: Return message **"2.500000E-03"** means the ARC checking the value of the main unit STEP 2 is 2.5mA.

: CLOW <boolean>|ON|OFF
: SOURce: SAFEty: STEP: DC: CLOW
This command sets the selected STEP to detect if the charge current is overly low or not.
Example: Input command **"SAFE:STEP 2:DC:CLOW ON"**
Description: This command means detection of charge current over low the function of the main unit STEP 2 is set to ON.

: CLOW?
: SOURce: SAFEty: STEP: DC: CLOW?
This command queries the selected STEP to detect if the charge current is overly low or not.
Example: Input command **"SAFE:STEP 2:DC:CLOW?"**
Return message **"1"**
Description: Return message **"1"** means detection charge current over the low function of the main unit STEP 2 is ON.

: TIME

: RAMP <numeric_value>
: SOURce: SAFEty: STEP: DC: TIME: RAMP
This command sets the selected STEP which tests ramps to setting the voltage needed time.
Example: Input command **"SAFE: STEP 2: DC: TIME: RAMP 2"**
Description: This command means test ramps to set the voltage needed time of the main unit STEP 2 is set to 2.0 sec.

: RAMP?
: SOURce: SAFEty: STEP: DC: TIME: RAMP?
This command queries selected STEP which tests ramps to setting voltage needed time.
Example: Input command **"SAFE: STEP 2: DC: TIME: RAMP?"**
Return message **"2.000000E+00"**
Description: Return message **"2.000000E+00"** means test ramps to the setting voltage needed time of the main unit STEP 2 is 2.0 sec.

[: TEST] <numeric_value>
: SOURce: SAFEty: STEP: DC: TIME: TEST
This command sets selected STEP which test needed time.
Example: Input command **"SAFE:STEP 2:DC:TIME 1"**
Description: This command means to test the needed time of the main unit STEP 2 is set to 1.0 sec.

[: TEST]?
: SOURce: SAFEty: STEP: DC: TIME: TEST?
This command queries selected STEP which tests needed time.
Example: Input command **"SAFE:STEP 2:DC:TIME?"**
Return message **"1.000000E+00"**
Description: Return message **"1.000000E+00"** means test needed time of the main unit STEP 2 is 1 sec.

: FALL <numeric_value>
: SOURce: SAFEty: STEP: DC: TIME: FALL
This command sets the selected STEP which sets the voltage value fall to zero needed time.
Example: Input command **"SAFE: STEP 2: DC: TIME: FALL 1.5"**
Description: This command means setting the voltage value fall to zero needed time of the main unit STEP 2 is set to 1.5 sec.

: FALL?
: SOURce: SAFEty: STEP: DC: TIME: FALL?
This command queries the selected STEP which sets the time needed for the voltage to fall to zero.
Example: Input command **"SAFE: STEP 2: DC: TIME: FALL?"**
Return message **"1.500000E+00"**
Description: Return message **"1.500000E+00"** means the needed time for the voltage to fall to zero for the main unit STEP 2 is 1.5 sec.

: DWELl <numeric_value>
: SOURce: SAFEty: STEP: DC: TIME: DWELl
This command sets selected STEP which dwells needed time.
Example: Input command **"SAFE: STEP 2: DC: TIME: DWEL 2.5"**
Description: This command means dwell needed time of the main unit STEP 2 is set to 2.5 sec.

: DWELI?
: SOURce: SAFEty: STEP: DC: TIME: DWELI?
This command queries selected STEP which sets dwell time.
Example: Input command **"SAFE: STEP 2: DC: TIME: DWEL?"**
Return message **"2.500000E+00"**
Description: Return message **"2.500000E+00"** means dwell time of the main unit STEP 2 is 2.5 sec.

: CHANnel
[: HIGH] <channel_list>
: SOURce: SAFEty: STEP: DC: CHANnel: HIGH
This command sets the status of the scanning test high voltage output channel.
Example: Input command **"SAFE: STEP 2: DC: CHAN(@(1,3))"**
Description: This command means the output channel of the scanning test of the main unit STEP 2 is set to channel 1 and 3 HIGH output.
Example: Input command **"SAFE: STEP 2: DC: CHAN(@(0))"**
Description: This command means a HIGH output channel of scanning test of the main unit STEP 2 is set to OFF.

[: HIGH]?
: SOURce: SAFEty: STEP: DC: CHANnel: HIGH?
This command queries the status of the scanning test high voltage output channel.
Example: Input command **"SAFE:STEP 2:DC:CHAN?"**
Return message **"(@(1,3))"**
Description: Return message **"(@(1,3))"** means output channel status of scanning test of the main unit STEP 2 is channel 1 and 3 HIGH output.

: LOW <channel_list>
: SOURce: SAFEty: STEP: DC: CHANnel: LOW
This command sets the output status to scan the common test channel (RTN/LOW).
Example: Input command **"SAFE:STEP 2:DC:CHAN:LOW (@(2,4))"**
Description: This command means the output channel of the scanning test of the main unit STEP 2 is set to channel 2 and 4 LOW output.
Example: Input command **"SAFE:STEP 2:DC:CHAN:LOW (@(0))"**
Description: This command means LOW output channel of scanning test of the main unit STEP 2 is set to OFF.

: LOW?
: SOURce: SAFEty: STEP: DC: CHANnel: LOW?
This command queries the output status of scanning common test channel (RTN/LOW).
Example: Input command **"SAFE: STEP 2: DC: CHAN: LOW?"**
Return message **"(@(2,4))"**
Description: Return message **"(@(2,4))"** means high voltage channel status of scanning test of the main unit STEP 2 is channel 2 and 4 LOW output.

:CURRent
:OFFSet <numeric_value>
:SOURce:SAFEty:STEP:DC:CURRent :OFFSet
This command sets the DC withstand test OFFSET value of the selected STEP.
Parameter ***<numeric value>***: The OFFSET value of DC withstand test, the unit is ampere (A).
Example: Input command **"SAFE:STEP 1:DC:CURR:OFFS 0.00001"**
Description: It indicates setting the DC withstand test OFFSET value of the main unit STEP 1 to 0.01mA.

:OFFSet?
:SOURce:SAFEty:STEP:DC:CURRent:OFFSet?
This command queries DC withstand test OFFSET value of the selected STEP.
Example: Input command **"SAFE:STEP 1:DC:CURR:OFFS?"**
Return message **"+1.000000E-05"**
Description: Return message **"+1.000000E-05"** means DC withstand test OFFSET value of the main unit STEP 1 is 0.01mA.

: IR

[: LEVel] <numeric_value>

: SOURce: SAFEty: STEP: IR: LEVel

This command sets selected STEP which IR test needed voltage value.

<numeric_value> is 50-1000 (included), the unit is volt.

Example: Input command **"SAFE:STEP 3:IR 1000"**

Description: This command means the IR test needed the voltage value of the main unit STEP 3 is set to 1000V.

[: LEVel]?

: SOURce: SAFEty: STEP: IR: LEVel?

This command sets selected STEP which IR test needed voltage value.

The return value is 50-1000 (included), and the unit is volt.

Example: Input command **"SAFE:STEP 3:IR?"**

Return message **"1.000000E+03"**

Description: Return message **"1.000000E+03"** means the IR test needed voltage value of the main unit STEP 3 is 1000V.

: LIMit

: HIGH <numeric_value>

: SOURce: SAFEty: STEP: IR: LIMit: HIGH

This command sets selected STEP which IR high limit.

Example: Input command **"SAFE:STEP 3:IR:LIM:HIGH 50000000000"**

Description: This command means IR high limit of the main unit STEP 3 is set to 50GΩ.

: HIGH?

: SOURce: SAFEty: STEP: IR: LIMit: HIGH?

This command queries selected STEP which IR high limit.

Example: Input command **"SAFE:STEP 3:IR:LIM:HIGH?"**

Return message **"5.000000E+10"**

Description: Return message **"5.000000E+10"** means IR high limit of the main unit STEP 3 is 50GΩ.

[: LOW] <numeric_value>

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

This command sets selected STEP which IR low limit.

Example: Input command **"SAFE:STEP 3:IR:LIM:100000"**

Description: This command means IR low limit of the main unit STEP 3 is set to 0.1 MΩ.

[: LOW]?

: SOURce: SAFEty: STEP: IR: LIMit: LOW?

This command queries selected STEP which IR low limit.

Example: Input command **"SAFE:STEP 3:IR:LIM?"**

Return message **"1.000000E+05"**

Description: Return message **"1.000000E+05"** means IR low limit of the main unit STEP 3 is 0.1MΩ.

: TIME

: RAMP <numeric_value>

: SOURce: SAFEty: STEP: IR: TIME: RAMP
This command sets the selected STEP which tests the ramp to set the voltage needed time.
Example: Input command **"SAFE: STEP 3: IR: TIME: RAMP 0.5"**
Description: This command means test ramp to setting voltage needed time of the main unit STEP 3 is set to 0.5 sec.

: RAMP?
: SOURce: SAFEty: STEP: IR: TIME: RAMP?
This command queries selected STEP which tests the ramp to set the voltage needed time.
Example: Input command **"SAFE: STEP 3: IR: TIME: RAMP?"**
Return message **"5.000000E-01"**
Description: Return message **"5.000000E-01"** means test ramp to setting voltage needed time of the main unit STEP 3 is 0.5 sec.

[: TEST] <numeric_value>
: SOURce: SAFEty: STEP: IR: TIME: TEST
This command sets the time needed for testing the selected STEP.
Example: Input command **"SAFE:STEP 3:IR:TIME 1"**
Description: This command means the needed time for testing the main unit STEP 3 is set to 1.0 sec.

[: TEST]?
: SOURce: SAFEty: STEP: IR: TIME: TEST?
This command queries the time needed for testing the selected STEP.
Example: Input command **"SAFE:STEP 3:IR:TIME?"**
Return message **"1.000000E+00"**
Description: Return message **"1.000000E+00"** means test needed time of the main unit STEP 3 is 1 sec.

: FALL <numeric_value>
: SOURce: SAFEty: STEP: IR: TIME: FALL
This command sets selected STEP which sets the voltage value of falling to zero needed time.
Example: Input command **"SAFE: STEP 3: IR: TIME: FALL 0.3"**
Description: This command means setting the voltage value of the main unit STEP 3 fall to zero needed time is set to 0.3 sec.

: FALL?
: SOURce: SAFEty: STEP: IR: TIME: FALL?
This command queries selected STEP which sets the voltage value of falling to zero needed time.
Example: Input command **"SAFE: STEP 3: IR: TIME: FALL?"**
Return message **"3.000000E-01"**
Description: Return message **"3.000000E-01"** means setting the voltage value of the main unit STEP 3 falls to zero needed time is 0.3 sec.

:DWELl <numeric_value>
: SOURce: SAFEty: STEP: IR: TIME:DWELI

This command sets the selected STEP, and the dwell needed time.
Example: Input command **"SAFE:STEP 3:IR:TIME:DWEL 2.5"**
Description: This command means dwell needed time of the main unit STEP 3 is 2.5 sec.

: DWELI?
: SOURce: SAFEty: STEP: IR: TIME:DWELI?
This command queries the selected STEP and the dwell time to be set.
Example: Input command **"SAFE: STEP 3: IR: TIME: DWEL?"**
Return message **"2.500000E+00"**
Description: Return message **"2.500000E+00"** means dwell time of the main unit STEP 3 is 2.5 sec.

: RANGe

[:UPPer] <numeric_value>
: SOURce: SAFEty: STEP: IR: RANGe: UPPer
This command follows the users' input current value to select the range which upper than the current can be measured.
Example: Input command **"SAFE: STEP 3: IR: RANG 0.0003"**
Description: This command means IR measured the current value of the main unit STEP 3 is set to 300uA. Meanwhile, the selected IR range upper than the current can be measured is 3mA.

[:UPPer]?
: SOURce: SAFEty: STEP: IR: RANGe: UPPer?
This command queries the range is set.
Example: Input command **"SAFE:STEP 3:IR:RANG?"**
Return message **"3.000000E-03"**
Description: Return message **"3.000000E-03"** means setting the range of the main unit STEP 3 is 3mA.

:LOWer <numeric_value>
: SOURce: SAFEty: STEP: IR: RANGe: LOWer
This command follows the users' input current value to select the range lower than the current can be measured.
Example: Input command **"SAFE: STEP 3: IR: RANG: LOW 0.0003"**
Description: This command means the IR-measured current value of the main unit STEP 3 is set to 300uA. Meanwhile, the selected IR range lower than the current can be measured is 300uA.

:LOWer?
: SOURce: SAFEty: STEP: IR: RANGe: LOWer?
This command queries the range is set.
Example: Input command **"SAFE: STEP 3: IR: RANG: LOW?"**
Return message **"3.000000E-04"**
Description: Return message **"3.000000E-04"** means setting the range of the main unit STEP 3 is 300uA.

: AUTO <ON/OFF or boolean >
: SOURce: SAFEty: STEP: IR: RANGe: AUTO

This command sets if the IR range switches to AUTO.
Parameter ON or 1 indicates AUTO on.
Parameter OFF or 0 indicates AUTO off.

Note When users don't set AUTO and give the OFF parameter, it will remain in the previous setting range. When users set AUTO and give OFF parameter then it will set to 10mA range.

Example: Input command **"SAFE: STEP 3: IR: RANG: AUTO ON"**
Description: This command means IR measured the current range of the main unit STEP 3 is AUTO.

: AUTO?
: SOURce: SAFEty: STEP: IR: RANGe: AUTO?
This command queries if the IR range switches to AUTO.
Return 1 indicates the setting is AUTO status.
Return 0 indicates the setting is AUTO status off.
Example: Input command **"SAFE: STEP 3: IR: RANG: AUTO?"**
Return message **"1"**
Description: Return message **"1"** means setting the range of the main unit STEP 3 is AUTO.

: CHANnel
[: HIGH] <channel_list>
: SOURce: SAFEty: STEP: IR: CHANnel: HIGH
This command sets the status of the scanning test high voltage output channel.
Example: Input command **"SAFE: STEP 3: IR: CHAN(@(1,3))"**
Description: This command means the output channel of the scanning test of the main unit STEP 3 is set to channel 1 and 3 HIGH output.
Example: Input command **"SAFE: STEP 3: IR: CHAN(@(0))"**
Description: This command means a HIGH output channel of scanning test of the main unit STEP 3 is set to OFF.

[: HIGH]?
: SOURce: SAFEty: STEP: IR: CHANnel: HIGH?
This command queries the status of the scanning test high voltage output channel.
Example: Input command **"SAFE:STEP 3:IR:CHAN?"**
Return message **"(@(1,3))"**
Description: Return message **"(@(1,3))"** means output channel status of scanning test of the main unit STEP 3 is channel 1 and 3 HIGH output.

: LOW <channel_list>
: SOURce: SAFEty: STEP: IR: CHANnel: LOW
This command sets the output status of scanning the common test channel (RTN/LOW).
Example: Input command **"SAFE:STEP 3:IR:CHAN:LOW (@(2,4))"**
Description: This command means the output channel of the scanning test of the main unit STEP 3 is set to channel 2 and 4 LOW output.
Example: Input command **"SAFE:STEP 3:DC:CHAN:LOW (@(0))"**

Description: This command means LOW output channel of scanning test of the main unit STEP 3 is set to OFF.

: LOW?
: SOURce: SAFEty: STEP: IR: CHANnel: LOW?
This command queries the output status of scanning the common test channel (RTN/LOW).
Example: Input command **"SAFE: STEP 3: DC: CHAN: LOW?"**
Return message **"(@(2,4))"**
Description: Return message **"(@(2,4))"** means output channel status of scanning test of the main unit STEP 3 is channel 2 and 4 LOW output.

: OSC
: LIMit
: OPEN <numeric_value>
: SOURce: SAFEty: STEP: OSC: LIMit: OPEN
This command sets selected STEP which setting percentage is judged by the open circuit as detecting short/open circuit.
Example: Input command **"SAFE: STEP 4: OSC: LIM: OPEN 0.3"**
Description: This command means open circuit judgment percentage of the main unit STEP 4 as detecting short/open circuit is set to 30%.

: OPEN?
: SOURce: SAFEty: STEP: OSC: LIMit: OPEN?
This command queries selected STEP which setting percentage is judged by the open circuit as detecting short/open circuit.
Example: Input command **"SAFE: STEP 4: OSC: LIM: OPEN?"**
Return message **"3.000000E-01"**
Description: Return message **"3.000000E-01"** means open circuit judgment percentage of the main unit STEP 4 as detecting short/open circuit is 30%.

:SHORt <numeric_value>
: SOURce: SAFEty: STEP: OSC: LIMit: SHORt
This command sets selected STEP which setting percentage is judged by the short circuit as detecting a short/open circuit.
Example: Input command **"SAFE: STEP 4: OSC: LIM: SHOR 3"**
Description: This command means short circuit judgment percentage of the main unit STEP 4 as detecting short/open circuit is set to 300%.

SHORt?
: SOURce: SAFEty: STEP: OSC: LIMit: SHORt?
This command queries selected STEP which setting percentage is judged by the short circuit as detecting short/open circuit.
Example: Input command **"SAFE: STEP 4: OSC: LIM: SHORt?"**
Return message "3.000000E+00"
Description: Return message "3.000000E+00" means short circuit judgment percentage of the main unit STEP 4 as detecting short/open circuit is 300%.

: CHANnel

[: HIGH] <channel_list>

: SOURce: SAFEty: STEP: OSC: CHANnel: HIGH

This command sets the status of the scanning test high voltage output channel.

Example: Input command **"SAFE: STEP 4: OSC: CHAN(@(1,3))"**

Description: This command means the output channel of the scanning test of the main unit STEP 4 is set to channel 1 and 3 HIGH output.

Example: Input command **"SAFE: STEP 4: OSC: CHAN(@(0))"**

Description: This command means the output channel of the scanning test of the main unit STEP 4 is set to OFF.

[: HIGH]?

: SOURce: SAFEty: STEP: OSC: CHANnel: HIGH?

This command queries the status of the scanning test high voltage output channel.

Example: Input command **"SAFE: STEP 4: OSC: CHAN?"**

Return message **"(@(1,3))"**

Description: Return message **"(@(1,3))"** means output channel status of scanning test of the main unit STEP 4 is channel 1 and 3 HIGH output.

: LOW <channel_list>

: SOURce: SAFEty: STEP: OSC: CHANnel: LOW

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

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

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

Example: Input command **"SAFE:STEP 4:DC:CHAN:LOW (@(0))"**

Description: This command means the output channel of the scanning test of the main unit STEP 4 is set to OFF.

: LOW?

: SOURce: SAFEty: STEP: OSC: CHANnel: LOW?

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

Example: Input command **"SAFE: STEP 4: OSC: CHAN: LOW?"**

Return message **"(@(2,4))"**

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

:CRANge? *<MAXimun|MINimum|NOW>*

:SOURce:SAFEty:STEP:OSC:CRANge

This command queries the maximum, minimum, and operating current range of the selected STEP under short/open detection mode.

Example: Input command **"SAFE:STEP 6:OSC:CRAN? MAX"**

Return message **"3"**

Description: Return message **"3"** means the main unit STEP 6 can be set a maximum range is 3.

:CURRent<m>

:OFFSet *<numeric value>*

:SOURce:SAFEty:STEP:OSC:CURRent:OFFSet

This command sets the OFFSET value of the selected STEP range under short/open detection mode.

Parameter m: The range in short/open detection mode.

Parameter ***<numeric value>***: The OFFSET value in short/open detection mode, the unit is Farad (F).

Setting scope: Ranges 1, 2, and 3 are 0~0.0000009999.

Example: Input command **"SAFE:STEP 6:OSC:CURR3:OFFS 0.00000001"**

Description: It indicates to set range 3 OFFSET value of the main unit STEP 6 under short/open detection mode is 10nF.

:OFFSet?

:SOURce:SAFEty:STEP:OSC:CURRent:OFFSet?

This command queries the OFFSET value of the selected STEP range under short/open detection mode.

Parameter m: The range in short/open detection mode.

Example: Input command **"SAFE:STEP 6:OSC:CURR3:OFFS?"**
Return message **"+1.000000E-08"**

Description: Return message **"+1.000000E-08"** means the OFFSET value of the main unit STEP 6 is 10nF.

:CSTandard *<range>,<numeric value>*

:SOURce:SAFEty:STEP:OSC:CSTandard

This command sets the Cs value of the selected STEP range under short/open detection mode.

Parameter ***<range>***: The range in short/open detection mode.

Parameter ***<numeric value>***: The Cs value of short/open detection mode, the unit is Farad (F).

Cs setting scope: Range 1:0.001~9.999nF
Range 2:0.01~99.99nF
Range 3:0.1~500.0nF

Example: Input command **"SAFE:STEP 6:OSC:CST 1, 0.000000001"**

Description: It indicates the range 1 Cs value of the main unit STEP 6 under short/open detection mode is 1nF.

:CSTandard?

:SOURce:SAFEty:STEP:OSC:CSTandard?

This command queries the Cs value of the selected STEP range under short/open detection mode.

Example: Input command **"SAFE:STEP 6:OSC:CST?"**
Return message **"+1.000000E-09"**

Description: Return message **"+1.000000E-09"** means the Cs value of the main unit STEP 6 is 1nF.

: PAuse

: [:MESSage] <string>

: SOURce:SAFEty:STEP:PAuse:MESSage

This command sets the string of the message.

Example: Input command **"SAFE: STEP 5: PA: MESS CHROMA"**

Description: This command means the message string of the main

unit STEP 5 is set to CHROMA.

: [:MESSage] ?

: SOURce:SAFEty:STEP:PAuse:MESSage?
This command queries the setting string of the message.
Example: Input command **"SAFE: STEP 5: PA: MESS?"**
Return message **"CHROMA"**
Description: Return message **"CHROMA"** means message string of the main unit STEP 5 is "CHROMA".

: UTSIgnal < boolean > | ON | OFF >

: SOURce:SAFEty:STEP:PAuse:UTSIgnal
This command sets the status of UNDER TEST SIGNAL.
The parameter is ON or 1 indicating the setting is ON.
The parameter is OFF or 0 indicating the setting is OFF.
Example: Input command **"SAFE: STEP 5: PA: UTSI ON"**
Description: This command means the status of UNDER TEST SIGNAL of the main unit STEP 5 is set to ON.

: UTSIgnal?

: SOURce:SAFEty:STEP:PAuse:UTSIgnal?
This command queries the status of UNDER TEST SIGNAL.
Return 1 indicates the setting ON.
Return 0 indicates the setting OFF.
Example: Input command **SAFE: STEP 5: PA: UTSI ON**
Return message **"1"**
Description: Return message **"1"** means the status of UNDER TEST SIGNAL of the main unit STEP 5 is ON.

: TIME

[:TEST] <numeric_value>

: SOURce: SAFEty: STEP: PAuse: TIME: TEST
This command sets the time needed for testing the selected STEP.
Example: Input command **"SAFE: STEP 5: PA:TIME 5"**
Description: This command means the needed time for testing the main unit STEP 5 is set to 5.0 sec.

[:TEST]?

: SOURce:SAFEty:STEP :PA:TIME:TEST?
This command queries the time needed for testing the selected STEP.
Example: Input command **"SAFE: STEP 5: PA:TIME?"**
Return message **"5.000000E+00"**
Description: Return message **"5.000000E+00"** means the test needed time for the main unit STEP 5 is 5.0 sec.

: PRESet

: TIME

: PASS <numeric_value>

: SOURce: SAFEty: PRESet: TIME: PASS
This command sets the buzzer sound continuously time when pass.
<numeric_value> is 0.2-99.9(included).
Example: Input command **"SAFE: PRES: TIME: PASS 1"**

Description: This command means the buzzer sounds continuous when PASS is set to 1 sec.

: PASS?
: SOURce: SAFEty: PRESet: TIME: PASS?
This command queries buzzer sound output continuously time when passes. The return value is 0.2-99.9 (included).
Example: Input command **"SAFE: PRES: TIME: PASS?"**
Return message **"1.000000E+00"**
Description: Return message **"1.000000E+00"** means the buzzer sounds continuous when PASS is set to 1 sec.

: STEP <numeric_value>|KEY
: SOURce: SAFEty: PRESet: TIME: STEP
This command sets the interval time between STEP and STEP. <numeric_value> is a value or character KEY from 0.1 to 99.9 (included).
Example: Input command **"SAFE: PRES: TIME: STEP 0.5"**
Description: This command means the interval time between STEP and STEP is set to 1 sec.

: STEP?
: SOURce: SAFEty: PRESet: TIME: STEP?
This command queries the interval time between STEP and STEP, or the next start command to execute the next STEP. The return value is 0.1-99.9 (included).
Example: Input command **"SAFE: PRES: TIME: STEP?"**
Return message **"5.000000E-01"**
Description: Return message **"5.000000E-01"** means the interval time between STEP and STEP is 0.5 sec.

: RJUDgment <Boolean> |ON|OFF
: SOURce: SAFEty: PRESet: RJUDgment
This command sets the status of RAMP JUDGMENT.
The parameter is ON or 1 indicates the setting ON.
The parameter is OFF or 0 indicates the setting OFF.
Example: Input command **"SAFE:PRES:RJUD ON"**
Description: This command means the status of RAMP JUDGMENT is set to ON.

: RJUDgment?
: SOURce: SAFEty: PRESet: RJUDgment?
This command queries the status of RJUDGMENT.
Return 1 indicates the setting ON.
Return 0 indicates the setting OFF.
Example: Input command **"SAFE: PRES: RJUD?"**
Return message **"1"**
Description: This command means the queried setting result of RAMP JUDGMENT is ON.

: AC
: FREQuency <numeric_value>
: SOURce: SAFEty: PRESet: AC: FREQuency
This command sets the output voltage frequency when testing AC

withstand voltage.
<numeric_value> is the value of 50 or 60.
Example: Input command **"SAFE: PRES: AC: FREQ 60"**
Description: This command means the output voltage frequency when testing AC withstand voltage is set to 60Hz.

: FREQuency?
: SOURce: SAFEty: PRESet: AC: FREQuency?
This command queries the output voltage frequency when testing AC withstand voltage. The return value is 50 or 60.
Example: Input command **"SAFE: PRES: AC: FREQ?"**
Return message **"6.000000E+01"**
Description: Return message **"6.000000E+01"** means the output voltage frequency when testing AC withstand voltage is 60Hz.

: WRANge
[: AUTO] <boolean>|ON|OFF
: SOURce: SAFEty: PRESet: WRANge: AUTO
This command sets the withstand voltage auto range function is ON or OFF.
Example: Input command **"SAFE: PRES: WRAN OFF"**
Description: This command means withstand voltage auto range function is set to OFF.
[: AUTO]?
: SOURce: SAFEty: PRESet: WRANge: AUTO?
This command queries withstand voltage auto range function is ON or OFF.
Return 1 or 0 (0 means withstand voltage auto range function is OFF, 1 means withstand voltage auto range function is ON).
Example: Input command **"SAFE: PRES: WRNG?"**
Return message **"0"**
Description: Return message **"0"** means withstand voltage auto range function is OFF.

: AGC
[: SOFTware] <boolean>|ON|OFF
: SOURce: SAFEty: PRESet: AGC: SOFTware
This command sets software AGC as ON or OFF.
Example: Input command **"SAFE: PRES: AGC ON"**
Description: This command means the software AGC function is set to ON.

[: SOFTware]?
: SOURce: SAFEty: PRESet: AGC: SOFTware?
This command queries whether software AGC is ON or OFF.
Return 1 or 0 (0 means AGC is OFF, 1 means AGC is ON).
Example: Input command **"SAFE: PRES: AGC?"**
Return message **"1"**
Description: Return message **"1"** means the software AGC function is ON.

: GCONtinuity <numeric_value>|ON|OFF
: SOURce: SAFEty: PRESet: GCONtinuity
This command sets GR CONT. parameter of PRESET.

Parameter 0 or OFF indicates OFF, parameter 0.1 or ON indicates KEY and parameter 0.2-99.9 sec indicates start.

Note "start" counts down the second you need under the stage of detecting DUT connection.

Example: Input command **"SAFE: PRES: GCON ON"**
Description: This command means GR CONT. function is set to ON.

: GCONtinuity?
: SOURce: SAFEty: PRESet: GCONtinuity?
This command queries if the grounding resistance test is ON or OFF, or enters the status of SMART START.
Return OFF or ON or setting time (OFF indicates grounding resistance doesn't open, ON indicates grounding resistance open. When the time is responded, it indicates to enter the status of SMART START.
Example: Input command **"SAFE: PRES: GCON?"**
Return message **"1"**
Description: Return message **"1"** means GR CONT. function is ON.

: GFI
[: SWITch] <Boolean>|ON|OFF
: SOURce: SAFEty: PRESet: GFI: SWITch
This command sets the GFI switch as ON or OFF.
Example: Input command **"SAFE: PRES: GFI OFF"**
Description: This command means the GFI function is set to OFF.

[: SWITch]?
: SOURce: SAFEty: PRESet: GFI: SWITch?
This command queries GFI switch is ON or OFF.
Return 1 or 0 (0 means GFI is OFF, 1 means GFI is ON).
Example: Input command **"SAFE: PRES: GFI?"**
Return message **"0"**
Description: Return message **"0"** means the GFI function is OFF.

: FAIL
:OPERation STOP|CONTinue|RESTart
: SOURce: SAFEty: PRESet: FAIL: OPERation
This command sets the AFTER FAIL parameter of PRESET.
Parameter STOP is to stop the test.
Parameter CONTinue is to continue the test.
Parameter RESTart is FAIL occurred then press START to retest.
Example: Input command **"SAFE: PRES: FAIL: OPER CONT"**
Description: This command means the function of AFTER FAIL is set to CONTINUE.

:OPERation?
This command queries the setting status of AFTER FAIL.
The response value is the same as the setting value STOP or CONTINUE or RESTART.
Example: Input command **"SAFE: PRES: FAIL: OPER?"**
Return message **"CONTINUE"**
Description: Return message **"CONTINUE"** means the setting status of AFTER FAIL is CONTINUE.

:SCREen <Boolean>|ON|OFF
: SOURce: SAFEty: PRESet: SCREen
This command sets if display test screen.
Example: Input command **SAFE: PRES: SCRE ON**
Description: This command means if the display function of the test screen is set to ON.

:SCREen ?
: SOURce: SAFEty: PRESet: SCREen?
This command queries if displays a test screen.
Example: Input command **"SAFE: PRES: SCRE?"**
Return message **"1"**
Description: Return message **"1"** means the test screen is displayed.

: KEYboard

:SMARt <Boolean>|ON|OFF
: SOURce: SAFEty: PRESet: KEYboard: SMARt
This command sets if the SMART KEY is ON or OFF.
Example: Input command **"SAFE: PRES: KEY: SMAR ON"**
Description: This command means the function of SMART KEY is set to ON.

:SMARt?
: SOURce: SAFEty: PRESet: KEYboard: SMARt?
This command queries if the SMART KEY is ON or OFF.
Return character 0 or 1 (0 indicates SMART KEY doesn't open, 1 indicates SMART KEY opened).
Example: Input command **"SAFE: PRES: KEY: SMRT?"**
Return message **"1"**
Description: Return message **"1"** means the setting status of SMART KEY is ON.

: NUMber

: PART
: SOURce: SAFEty: PRESet: NUMber: PART
This command sets a part number of the product.
Example: Input command **"SAFE: PRES: NUM: PART 19054"**
Description: This command means a part number of the product is set to 19054.

: PART?
SOURce: SAFEty: PRESet: NUMber: PART?
This command queries the part number of the product.
Example: Input command **"SAFE: PRES: NUM: PART?"**
Return message **"19054"**
Description: Return message "**19054"** means the part number of the product is 19054.

LOT
: SOURce: SAFEty: PRESet: NUMber: LOT
This command sets the lot number of the product.
Example: Input command **"SAFE: PRES: NUM: LOT 0054"**
Description: This command means the lot number of the product is

set to 0054.

LOT?
: SOURce: SAFEty: PRESet: NUMber: LOT?
This command queries the lot number of the product.
Example : Input command **"SAFE: PRES: NUM: LOT?"**
Return message **"0054"**
Description: Return message **"0054"** means the lot number of the product is 0054.

SERIal
: SOURce: SAFEty: PRESet: NUMber: SERIal
This command sets the serial number format of the product, denoted changeable character by *.
Example: Input command **"SAFE: PRES: NUM: SERI AAP190540***"**
Description: This command means the serial number format of the product is set to "AAP190540***".

SERIal?
: SOURce: SAFEty: PRESet: NUMber: SERIal?
This command queries the serial number format of the product.
Example: Input command **"SAFE: PRES: NUM: SERI?"**
Return message **"AAP190540***"**
Description: Return message **"AAP190540***"** means the serial number of the product is AAP190540***.

5.8 Error Messages

- Error messages are saved in error queue which accessed by FIFO method. The return first 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, the first position will save +0,"No error" in error queue.

-102 Syntax error
A syntax error that usually has characters or symbols not allowed in the command.
-103 Invalid separator
Invalid separator found in a command string
-108 Parameter not allowed
The device receives parameter is not allowed.
-109 Missing parameter
The parameter is missing.
-112 Program mnemonic too long
A simple command program header is over 12 characters.
-113 Undefined header
The device received an undefined header.
-114 Header suffix out of range
The Variable is out of range.
-120 Numeric data error
Numerical parameter error

-140 Character data error
Inputted character data error
-141 Invalid character data
Input invalid character data
-151 Invalid string data
Invalid string data is usually missing double quotations.
-158 String data not allowed
The device received disallowed string data.
-170 Expression error
The device receives uncompleted parameter data, such as missing the right parenthesis.
-200 Execution error
Command executing error
-203 Command protected
The device does not receive this command.
-221 Settings conflict
The device does not receive this command.
-222 Data out of range
The data is out of range.
-223 Too much data
The received string length is over, can't execute.
-290 Memory use error
Store or reading the memory is an error.
-291 Out of memory
The value is out of memory.
-292 Referenced name does not exist
The referenced name does not exist.
-293 Referenced name already exists
The referenced name already exists.
-350 Queue overflow
The error message saved the number in the queue over 30.
-361 Parity error in the program message
The parity is an error.
-365 Time out error
The device does not receive the end character within a certain time.
-363 Input buffer overrun
The device received over 1024 characters.
-400 Queue error
The output queue data is over 256 characters.
-410 Query INTERRUPTED
When receive a query command, you don't read out the query result and then receive a query command immediately. The query will be interrupted.
-420 Query UNTERMINATED
There is no data in the queue, meanwhile received the command of reading output queue data.

5.9 GPIB Operation via Basic Programming

```
REM-------------------------------------------------------------------------
REM       Please run the ULI file before this program.
REM       This program inputs data through GPIB to 1905X.
REM       1905X's    GPIB address is 3
REM-------------------------------------------------------------------------

CLS
PRINT "Program is running"
OPEN "gpib0" FOR OUTPUT AS #1
OPEN "gpib0" FOR INPUT AS #2
PRINT #1, "abort"
PRINT #1, "GPIBEOS IN LF"

PRINT #1, "output 3; SOURce: SAFEty: STOP"
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

PRINT "set steps"

PRINT #1, "output 3; SOURce: SAFEty: STEP 1: DC 1000"
PRINT #1, "output 3; SOURce: SAFEty: STEP 1: DC: LIMit 0.0004"
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 0.0002"
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"

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
```

```
REM-------------------------------------------------------------------------------------
REM       Please run the ULI file before this program.
REM       This program is getting results
REM       through GPIB from the 1905X.
REM       1905X's GPIB address is 3
REM-------------------------------------------------------------------------------------
REM CLS
PRINT "Program is running."
OPEN "gpib0" FOR OUTPUT AS #1               'set the talker
OPEN "gpib0" FOR INPUT AS #2                'set the listener

REM    defines the SRQ-handling routine
ON PEN GOSUB MySRQRoutine
REM Enable the SRQ functionality
PEN ON

PRINT #1, "abort"

PRINT #1, "GPIBEOS IN LF"                   ' set the end code
REM PRINT "waiting for SRQ from 1905X"
PRINT #1, "output 3; SOURce: SAFEty: STOP"      ' STOP the instrument

PRINT #1, "output 3; *SRE 2"                'set status enable register
PRINT #1, "output 3; *ESE 60"               'set standard enable register

PRINT #1, "output 3; SOURce: SAFEty: STARt"

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;*STB?"
    PRINT #1, "enter 3"
    INPUT #2, Q$                       'get the questionable state
    PRINT Q$

    RES = CVI (Q$)

                                   IF RES AND 2 = 2 THEN
        PRINT "HAS RESULT!"
    END IF                             'End of SRQ interrupt

END1:
        PRINT #1, "output 3; SOURce: SAFEty: RESult: LAST: JUDGment?"
        PRINT #1, "enter 3"
        INPUT #2, S$                     ' get the questionable state
        PRINT S$

     PRINT #1, "output 3;*STB?"
     PRINT #1, "enter 3"
     INPUT #2, Q$                        ' get the questionable state
    PRINT Q$

CLOSE:   SYSTEM
```

```
REM ------------------------------------------------------------
        'Please run the ULI file before this program
        '1905X GPIB address is 3
REM ------------------------------------------------------------
OPEN "gpib0" FOR OUTPUT AS #1
                               OPEN "gpib0" FOR INPUT AS #2
PRINT #1, "abort"
PRINT #1, "GPIBEOS IN LF"
PRINT #1, "output 3; SOURce: SAFEty: STOP"
PRINT #1, "output 3; SOURce: SAFEty: STEP1: AC: LEVel 600"
          PRINT #1, "output 3; SOURce: SAFEty: STEP1: AC: LIMit: HIGH 0.0004"
PRINT #1, "output 3; SOURce: SAFEty: STEP2: AC: LEVel 500"
          PRINT #1, "output 3; SOURce: SAFEty: STEP2: AC: LIMit: HIGH 0.0003"
'Work memory was stored in memory AAA.
PRINT #1, "output 3; *SAV 1"
PRINT #1, "output 3; MEMory: STATe: DEFine AAA,1"
'Work memory was stored in memory 1.
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"
PRINT #1, "output 3; MEMory: STATe: DEFine BBB, 3"
'Work memory was stored in memory 3.

'PRINT #1, "output 3; MEMory: STORe: NAME BBB"
'Work memory was stored in memory BBB.

PRINT #1, "output 3; *RCL 1"    'Recall the memory 1
'PRINT #1, "output 3; MEMory: RECAll: NAME AAA"    'Recall the memory AAA

CLOSE:    SYSTEM
```

6. RS232 Interface

6.1 Guide

The user can use the computer by RS232 interface to remote control and data transfer.

6.2 Interface Specification

It's a standard RS232 interface, the setting value as the following:
BAUD RATE : 300 / 600 / 1200 / 2400 / 4800 / 9600 / 19200
PARITY : NONE / ODD / EVEN
FLOW CTRL. : NONE / SOFTWARE

6.3 Command Format

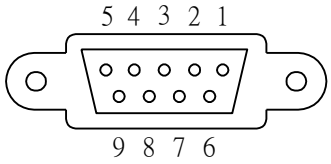
The analyzer RS232 interface function composed command string is inputted by ASCII code to attain functions of remote control and setting. The length of the command string is limited to 1024 characters (including end code) [Command + Parameter] compose a command. Two commands can be connected by semicolon and end by ending code. The end code is the following types, the analyzer can distinguish it by itself.

End code

LF
CR + LF

6.4 Connector

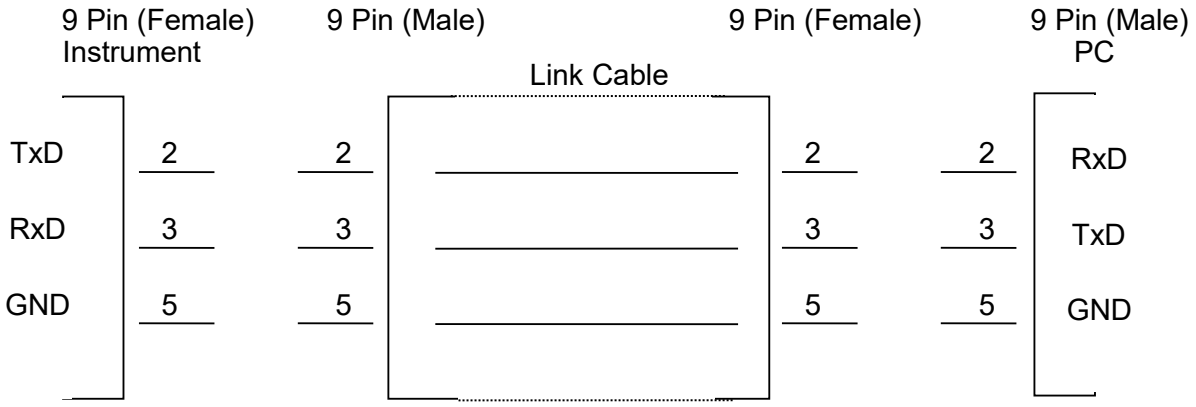
The analyzer RS232 connecter is a 9-pin D-Sub connector.



Pin Number		Description
1	*	Don't use
2	TxD	Send data
3	RxD	Receive data
4	*	Don't use
5	GND	Ground
6	*	Don't use
7	*	Don't use
8	*	Don't use
9	*	Don't use

6.5 Method of Connecting

The connection as the following:



6.6 RS232 Operation Using Basic

```
REM-----------------------------------------------------------------
REM       RS232 example program
REM       Program compiled using Microsoft version 1.1 (MS-DOS 6.22)
REM-----------------------------------------------------------------

REM open serial port as device 1
OPEN "COM2: 9600,N, 8,1,RS, CS, DS, CD, LF" FOR RANDOM AS #1

PRINT #1, "SOURce: SAFEty: STOP"    'send "STOP" command to the device

PRINT #1, "SOURce: SAFEty: SNUMBer?"
INPUT #1, STEPNUM%

IF STEPNUM% > 0 THEN
    FOR I = STEPNUM% TO 1 STEP -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 0.0003"
PRINT #1, "SOURce: SAFEty: STEP1: AC: TIME: TEST 3"

PRINT #1, "SOURce: SAFEty: STEP2: DC: LEVel 500"
PRINT #1, "SOURce: SAFEty: STEP2: DC: LIMIT 0.0003"
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

WHILE status$ <> "STOPPED"
      PRINT #1, "SOURce: SAFEty: STATUS?"
      INPUT #1, status$                                    'read status

      IF status$ = "STOPPED" THEN                          'if status not=TEST
          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
```

7. Bar Code Scan Test (Option)

7.1 Guide

The user can use a bar code scanner by RS232 interface to remote control and automatic test.

7.2 Interface Specification

The standard RS232 interface.

7.3 Method of Connecting

Please see the Description of the *RS232 Interface*.

7.4 Method of Using

Set the product serial number under the PRESET menu screen.

1. The setting characters of the product serial number are 5 ~ 13.
2. The character can be set are 0 ~ 9, A ~ Z, —, *
3. * means changeable character.
4. There is at least a non “*” character in the string of product serial numbers.
5. The setting string number of the product serial number is the same as the string number of the bar code.

   Ex.1: Bar code string 9789572218488
   The product serial number can be set as 9**********
   or *******2*****
   or **********8

   Ex. 2: Bar code string C12345
   The product serial number can be set as C*****
   or *****5

   Ex. 3: Bar code string 12–34–56
   The product serial number can be set as 1*******
   or **–*****

If the string scanned from the bar code is the same as the product serial number, then will start test automatically.

8. Calibration Procedure

Before processing this section the HI-POT tester is warmed up for at least 30 minutes. Take off the calibration front panel. Press the lock switch, this is a hardware data backup protection circuit, to avoid calibration data loss.

The following items are needed to do the calibration.

Voltage Calibration (See *8.2*)

ACV 5kV Offset (100V)	; AC Voltage OFFSET point
ACV 5kV Full (4kV)	; AC Voltage FULL point
DCV 6kV Offset (100V)	; DC Voltage OFFSET point
DCV 6kV Full (4kV)	; DC Voltage FULL point
IRV 1kV Offset (100V)	; IR Voltage OFFSET point
IRV 1kV Full (1kV)	; IR Voltage FULL point

Current Calibration (See *8.3*)

ACA 3mA Offset (0.12mA)	; AC total current 2.99mA range OFFSET point
ACA 3mA Full (2.5mA)	; AC total current 2.99mA range FULL point
ACA30mA Offset (2.5mA)	; AC total current 30mA range OFFSET point
ACA 30mA Full (25mA)	; AC total current 30mA range FULL point
RACA 3mA Offset (0.12mA)	; AC real current 2.99mA range OFFSET point
RACA 3mA Full (2.5mA)	; AC real current 2.99mA range FULL point
RACA 30mA Offset (2.5mA)	; AC real current 30mA range OFFSET point
RACA 30mA Full (25mA)	; AC real current 30mA 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 10mA range OFFSET point
DCA 10mA Full (8mA)	; DC 10mA range FULL point

Withstanding Voltage Mode ARCing Calibration (See *8.4*)

AC ARC 15mA (5mA)	; AC ARCing calibration
DC ARC 10mA (5mA)	; DC ARCing calibration

Insulation Resistance Mode Leakage Current Meter Calibration (See *0*)

IRR Range1 (1GΩ)	; IR Resistor range 1 Calibration
IRR Range2 (100MΩ)	; IR Resistor range 2 Calibration
IRR Range3 (10MΩ)	; IR Resistor range 3 Calibration
IRR Range4 (10MΩ)	; IR Resistor range 4 Calibration

Ground Continue Calibration (See *8.6*)

Contrast Calibration (See *8.7*)

8.1 Calibration

Press	[MENU] [DOWN] [DOWN] [DOWN]	
Display	CALIBRATION	
Press	[ENTER]	
Display	password	
Press	[A] [A] [A] [B] [ENTER]	

8.2 Voltage Calibration

8.2.1 ACV Calibration

Connect an ACV HI voltage meter to the HI-POT tester.

Press	[UP] or [DOWN] several times to display	
Display	ACV 5kv Offset (100V)	; ACV Voltage Offset calibration
Press	[STOP] [START]	; read out the HV meter value ; example 0. 105kV
Press	[UP] or [DOWN] until display 0. 105 kV	
Press	[ENTER] to save the calibration value.	
Press	[STOP]	; stop ACV voltage offset calibration
Press	[UP]	
Display	ACV 5kV Full (4kV)	; ACV Voltage full scale calibration
Press	[STOP] [START]	; read out the HV meter value ; example 4.152kV
Press	[UP] or [DOWN] until display 4.152 kV	
Press	[ENTER] to save the calibration value.	
Press	[STOP]	; stop ACV voltage full-scale calibration

8.2.2 DCV Calibration

Connect a DCV HI voltage meter to the HI-POT tester.

Press	[UP]	
Display	DCV 6kV Offset (100V)	; DCV voltage Offset calibration
Press	[STOP] [START]	; read out the HV meter value ; example 0.105kV
Press	[UP] or [DOWN] until display 0. 105 kV	
Press	[ENTER] to save the calibration value.	
Press	[STOP]	; stop DCV voltage offset calibration
Press	[UP] key	
Display	DCV 6kV Full (4kV)	; DCV Voltage full scale calibration
Press	[STOP] [START]	; read out the HV meter value ; example 4.152kV
Press	[UP] or [DOWN] until display 4.152 kV	
Press	[ENTER] to save the calibration value.	
Press	[STOP]	; stop DCV voltage full scale calibration

8.2.3 IR Voltage Calibration

Connect a DCV HI voltage meter to the HI-POT tester.

Press	[UP]	
Display	IRV 1kV Offset (100V)	; IR voltage Offset calibration
Press	[STOP] [START]	; read out the HV meter value
		; example 0. 105kV
Press	[UP] or [DOWN] until display 0. 105 kV	
Press	[ENTER] to save the calibration value.	
Press	[STOP]	; stop IR voltage Offset calibration
Press	[UP] to display	
Display	IRV 1kV Full (1kV)	; IR voltage full scale calibration
Press	[STOP] [START]	; read out the HV meter value
		; example 1.052kV
Press	[UP] or [DOWN] until display 1.052 kV	
Press	[ENTER] to save the calibration value.	
Press	[STOP]	; stop IR voltage full-scale calibration

8.3 Current Calibration

Caution! The dummy load must be between the HI terminal and the ammeter input terminal. Or, danger may happen.

8.3.1 AC Current Calibration

Connect a dummy load resistor 10MΩ between HI-POT testers. Connect HI terminal to AC ammeter input HI terminal, connect LO terminal of HI-POT tester to input LO terminal of AC ammeter.

Press	[UP]	
Display	ACA 3mA offset (0.12mA)	; ACA 2.99mA range Offset calibration
Press	[STOP] [START]	; read out the ammeter value
		; example 0.124mA
Press	[UP] or [DOWN] until display 0. 124mA	
Press	[ENTER] to save the calibration value.	
Press	[STOP]	; stop ACA 2.999mA range Offset calibration

Change the dummy load resistor to 500kohm 50watt or higher.

Press	[UP]	
Display	ACA 3mA Full (2.5mA)	; ACA 2.999mA range full scale calibration
Press	[STOP] [START]	; read out the ammeter value
		; example 2.503mA]
Press	[UP] or [DOWN] until display 2.503mA	
Press	[ENTER] to save the calibration value.	
Press	[STOP]	; stop ACA 2.99mA range full scale calibration

Press [UP]
Display ACA 30mA offset (2.5mA) ; ACA 30.00mA range Offset calibration
Press [STOP] [START] ; read out the ammeter value ; example 2.503mA
Press [UP] or [DOWN] until display 2.503mA
Press [ENTER] to save the calibration value.
Press [STOP] ; stop ACA 30.00mA range Offset calibration

Change the dummy load resistor to 50kΩ 200watt or higher.

Press [UP]
Display ACA 30mA full (25mA) ; ACA 30.00mA range full scale calibration
Press [STOP] [START] ; read out the ammeter value ; example 24.50mA
Press [UP] or [DOWN] until display 24.50mA
Press [ENTER] ; stop ACA 30.00mA range full scale calibration

8.3.2 AC Real Current Calibration

Connect a dummy load resistor 10MΩ between HI-POT testers. Connect the HI terminal of the HI-POT tester to input the HI terminal of the AC ammeter, and connect the LO terminal of the HI-POT tester to input the LO terminal of the AC ammeter.

Press [UP]
Display RACA 3mA offset (0.12mA) ; RACA 2.999mA range Offset calibration
Press [STOP] [START] ; read out the ammeter value ; example 0.124mA
Press [UP] or [DOWN] until display 0. 124mA
Press [ENTER] to save the calibration value.
Press [STOP] ; stop RACA 2.999mA range Offset calibration

Change the dummy load resistor to 500kΩ 50watt or higher.

Press [UP] to display
Display RACA 3mA Full (2.5mA) ; RACA 2.999mA range full scale calibration
Press [STOP] [START] ; read out the ammeter value ; example 2.503mA
Press [UP] or [DOWN] until display 2.503mA
Press [ENTER] to save the calibration value.
Press [STOP] ; stop RACA 2.999mA range full scale calibration
Press [UP]
Dsplay RACA 30mA offset (2.5mA) ; RACA 30mA range Offset calibration
Press [STOP] [START] ; read out the ammeter value ; example 2.503mA

Press [UP] or [DOWN] until display 2.503mA
Press [ENTER] to save the calibration value.
Press [STOP] ; stop RACA 30.00mA range Offset calibration

Change the dummy load resistor to 50kΩ 200watt or higher.

Press [UP]
Display RACA 30mA full 2.50mA (25mA) ; RACA 30mA range full scale.
Press [STOP] [START] ; read our the ammeter value
; example 24.50mA
Press [UP] or [DOWN] until display 24.50mA
Press [STOP] ; stop RACA 30mA range full scale
; calibration

8.3.3 DC Current Calibration

Connect a dummy load resistor 10MΩ between HI-POT testers. Connect the HI terminal of the HI-POT tester to input the HI terminal of the DC ammeter, and connect the LO terminal of the HI-POT tester to input the LO terminal of the DC ammeter.

Press [UP]
display DCA 3mA offset (0.12mA) ; DCA 2.999mA range Offset calibration
Press [STOP] [START] ; read out the ammeter value
; example 0.124mA
Press [UP] or [DOWN] until display 0.124mA
Press [ENTER] to save the calibration value.
Press [STOP] ; stop DCA 2.999mA range Offset calibration

Change the dummy load resistor to 500kΩ 50watt or higher.

Press [UP]
Display DCA 3mA Full (2.5mA) ; DCA 2.999mA range full scale calibration.
Press [STOP] [START] ; read out the ammeter value
; example 2.503mA
Press [UP] or [DOWN] key until display 2.503mA
Press [ENTER] for saving the calibration value.
Press [STOP] ; stop DCA 2.999mA range full scale calibration.
Press [UP]
Display DCA 10mA offset (2.5mA) ; DCA 10.00mA range Offset calibration.
Press [STOP] [START] ; read out the ammeter value
; example 2.503mA
Press [UP] or [DOWN] until display 2.503mA
Press [ENTER] to save the calibration value.
Press [STOP] ; stop DCA 10.00mA range Offset calibration.

Change the dummy load resistor to150kΩ 100watt or higher.

Press	[UP] to display	
Display	DCA 10mA full (8mA)	; DCA 10.00mA range full-scale calibration.
Press	[STOP] [START]	; read out the ammeter value ; example 8.02mA
Press	[UP] or [DOWN] until display 8.02mA	
Press	[ENTER] to save the calibration value.	
Press	[STOP]	; stop DCA 10.00mA range full scale calibration.

8.4 Withstanding Voltage Mode ARCing Calibration

CAUTION

1. ARCing calibration is very special, the high-voltage terminal is on the outside.
2. Please contact your local agent for more detailed descriptions.

Press	[UP]	; AC arcing sensitivity calibration.
Display	AC ARC 15mA (5mA)	; AC hipot ARCing.
Press	[STOP] [START]	; Using two HV cables, HV output terminal series 250kΩ 5watt resistance. Another HV cable (ground wire RTN/LOW) is as possible as close to the first cable but does not contact each other. Then press [STOP] [START] to generate ARCing.
Press	[UP] or [DOWN] until ARC NG high limit value is a critical point for generating ARC NG and non-generating ARC NG.	
Press	[STOP]	; stop AC ARCing calibration.
Press	[UP]	; DC ARCing sensitivity calibration
Display	DC ARC 10mA (5mA)	; DC hipot ARCing.
Press	[STOP] [START]	; Using two HV cables, HV output terminal series 250kΩ 5watt resistance. Another HV cable (ground wire RTN/LOW) is as possible as close to the first cable but does not contact each other. Then press [STOP] [START] to generate ARCing.
Press	[UP] or [DOWN] until ARC FAIL high limit value is a critical point of generating ARC FAIL and non-generating ARC NG.	
Press	[STOP]	; stop DC ARCing calibration.

8.5 Insulation Resistance Mode Resistor Calibration

Connecting a standard dummy load resistor between the high voltage output terminal and low potential terminal of the Hi-Pot tester.

IRR Range1 (1GΩ) ; resistor of IR to 1GΩ
IRR Range2 (100MΩ) ; resistor of IR to 100.0Ω
IRR Range3 (10MΩ) ; resistor of IR to 10.0MΩ
IRR Range4 (10MΩ) ; resistor of IR to 10.0MΩ

Change the dummy load resistor to 1GΩ.

Press [UP]
Display IRR Range1 (1GΩ) ; resistor of IR to 1GΩ
Press [STOP] [START] ; read the IRR value
; example 1GΩ
Press [UP] or [DOWN] until display 1000MΩ
Press [STOP] ; stop IRR Range1 calibration.

Change the dummy load resistor to 100MΩ.

Press [UP]
Display IRR Range2 (100MΩ) ; resistor of IR to 100MΩ
Press [STOP] [START] ; read the IRR value
; example 100.0MΩ
Press [UP] or [DOWN] until display 100.0MΩ
Press [ENTER] to save the calibration value.
Press [STOP] ; stop IRR Range2 calibration.

Change the dummy load resistor to 10MΩ.

Press [UP]
Display IRR Range3 (10MΩ) ; resistor of IR to 10MΩ
Press [STOP] [START] ; read the IRR value
; example 10MΩ
Press [UP] or [DOWN] until display 10.00MΩ
Press [STOP] ; stop IRR Range3 calibration.

Change the dummy load resistor to 10MΩ.

Press [UP]
Display IRR Range4 (10MΩ) ; resistor of IR to 10MΩ
Press [STOP] [START] ; read the IRR value
Press [UP] or [DOWN] until display 10.00MΩ
Press [ENTER] to save the calibration value.
Press [STOP] ; stop IRR Range4 calibration.

8.6 Ground Continue Calibration

1. Press [UP].
2. Connect resistance (0.8 ohm) to CONT. CHECK OPTION of rear panel and grounding terminal. Press [STOP] [START] to adjust 1 ohm in the rear panel, and calibrate VR to the critical point of PASS and FAIL.
3. Press [STOP] twice.

8.7 Contrast Calibration

1. Press [UP].
2. Press [SETUP]
3. Press [UP] or [DOWN] until LCD contrast brightness is appropriate.

8.8 Finish Calibration

Press	[EXIT] [DOWN] [DOWN] [DOWN] [ENTER]
Display	PASSWORD:
Press	[A] [A] [A] [A] [ENTER]
Display	CALIBRATION IS OFF or CALIBRATION IS ON; choose CALIBRATION IS ON, if shows CALIBRATION IS OFF.
Press	[A] [A] [A] [A] [ENTER]
Display	CALIBRATION IS ON
Press	[EXIT] to complete calibration steps.

8.9 Remote Calibration Command

8.9.1 Command List

```
CALibration
        :STATe <Boolean>
        :REQuest?
        :VALue <Numeric Value>
        :SAFEty
                :STARt
                :STOP
                :AC
                        :VRANge? MAXimum|MINimum
                        :VOLTage ( range)
                                :OFFSet
                                        [:SOURce]
                                                [:VOLTage]   [<Numeric Value>]
                                                [:VOLTage] ?
                                        :BEST?
                                :FULL
                                        [:SOURce]
                                                [:VOLTage]   [<Numeric Value>]
                                                [:VOLTage] ?
                                        :BEST?
                        :CRANge? MAXimum|MINimum
                        :CURRent ( range)
                                :OFFSet
```

```
                [:SOURce]
                    [:VOLTage]  [<Numeric Value>]
                    [:VOLTage] ?
                :BEST?
            :FULL
                [:SOURce]
                    [:VOLTage]  [<Numeric Value>]
                    [:VOLTage] ?
                :BEST?
        :RCRANge? MAXimum|MINimum
        :RCURrent ( range)
            :OFFSet
                [:SOURce]
                    [:VOLTage]  [<Numeric Value>]
                    [:VOLTage] ?
                :BEST?
            :FULL
                [:SOURce]
                    [:VOLTage]  [<Numeric Value>]
                    [:VOLTage] ?
                :BEST?
        :ARANge? MAXimum|MINimum
        :ARC ( range)
            :SLOPe
                [:SOURce]
                    [:VOLTage]  [<Numeric Value>]
                    [:VOLTage] ?
                :LEVel [<Numeric Value>]
                :LEVel?
                :BEST?
:DC
        :VRANge? MAXimum|MINimum
        :VOLTage ( range)
            :OFFSet
                [:SOURce]
                    [:VOLTage]  [<Numeric Value>]
                    [:VOLTage] ?
                :BEST?
            :FULL
                [:SOURce]
                    [:VOLTage]  [<Numeric Value>]
                    [:VOLTage] ?
                :BEST?
        :CRANge? MAXimum|MINimum
        :CURRent ( range)
            :OFFSet
                [:SOURce]
                    [:VOLTage]  [<Numeric Value>]
                    [:VOLTage] ?
                :BEST?
            :FULL
                [:SOURce]
                    [:VOLTage]  [<Numeric Value>]
                    [:VOLTage] ?
                :BEST?
        :ARANge? MAXimum|MINimum
        :ARC ( range)
            :SLOPe
                [:SOURce]
                    [:VOLTage]  [<Numeric Value>]
                    [:VOLTage] ?
                :LEVel [<Numeric Value>]
                :LEVel?
                :BEST?
:IR
        :VRANge? MAXimum|MINimum
        :VOLTage ( range)
            :OFFSet
```

```
                [:SOURce]
                        [:VOLTage]  [<Numeric Value>]
                        [:VOLTage] ?
                :BEST?
        :FULL
                [:SOURce]
                        [:VOLTage]  [<Numeric Value>]
                        [:VOLTage] ?
                :BEST?
:RRANge? MAXimum|MINimum
:RESistance ( range)
        :SLOPe
                [:SOURce]
                        [:VOLTage]  [<Numeric Value>]
                        [:VOLTage] ?
                :BEST?
```

8.9.2 Commands Summary

- **:CALibration:STATe <Boolean>**
  The command is used to select if the calibration data applies (1) or (0). At *RST, the state is set to ON.

- **:CALibration:REQuest?**
  The event attempts to attain calibrate this device and returns 1 if succeeds and 0 if it fails.

- **:CALibration:VALue <Numeric_Value>**
  Enters the value of calibration. If the state is not calibration or output, an error –203 will be generated in addition to the execution error.

- **:CALibration:SAFEty:STARt**
  Start output the source, and can enter the value of calibration. When the state is not calibration, an error –203 will be generated as executing this command.

- **:CALibration:SAFEty:STOP**
  Stop outputting the source.

- **:CALibration:SAFEty:AC:VRANge? {MAXimum, MINimum }**
  Query the maximum and minimum range of the voltage source and meter of the AC mode.

- **:CALibration:SAFEty:AC:VOLTage (range):OFFSet[:SOURce] [:VOLTage] [<Numeric Value>]**
  Changing to the offset item of the voltage source and voltage meter of AC mode, and setting the output voltage value that is used in the calibration.

- **:CALibration:SAFEty:AC:VOLTage (range):OFFSet[:SOURce] [:VOLTage] ?**
  Change to the offset item of the voltage source and voltage meter of AC mode, and return the output voltage value that is used in the calibration.

- **:CALibration:SAFEty:AC:VOLTage (range):OFFSet:BEST?**
  Change to the offset item of the voltage source and voltage meter of AC mode, and return the best value that is selected by the device.

- **:CALibration:SAFEty:AC:VOLTage (range):FULL[:SOURce] [:VOLTage] [<Numeric Value>]**
  Change to the offset item of the voltage source and voltage meter of AC mode, and set the output voltage value that is used in the calibration.

- **:CALibration:SAFEty:AC:VOLTage (range):FULL[:SOURce] [:VOLTage] ?**
  Change to the offset item of the voltage source and voltage meter of AC mode, and return the output voltage value that is used in the calibration.

- **:CALibration:SAFEty:AC:VOLTage (range):FULL:BEST?**
  Change to the offset item of the voltage source and voltage meter of AC mode, and return the best value that is selected by the device.

- **:CALibration:SAFEty:AC:CRANge? { MAXimum, MINimum }**
  Query the maximum and minimum of the range of the current meter of the AC mode.

- **:CALibration:SAFEty:AC:CURRent (range):OFFSet[:SOURce] [:VOLTage] [<Numeric Value>]**
  Change to the offset item of the current meter of AC mode, and set the output voltage value that is used in the calibration. The header suffix (range) is selected for the range of current.

- **:CALibration:SAFEty:AC:CURRent (range):OFFSet[:SOURce] [:VOLTage] ?**
  Change to the offset item of the current meter of AC mode, and return the output voltage value that is used in the calibration.

- **:CALibration:SAFEty:AC:CURRent (range):OFFSet:BEST?**
  Change to the offset item of the current meter of AC mode, and return the best value that is selected by the device.

- **:CALibration:SAFEty:AC:CURRent (range):FULL[:SOURce] [:VOLTage] [<Numeric Value>]**
  Change to the full item of the current meter of AC mode, and set the output voltage value that is used in the calibration.

- **:CALibration:SAFEty:AC:CURRent (range):FULL[:SOURce] [:VOLTage] ?**
  Change to the full item of the current meter of AC mode, and return the output voltage value that is used in the calibration.

- **:CALibration:SAFEty:AC:CURRent (range):FULL:BEST?**
  Change to the full item of the current meter of AC mode, and return the best value that is selected by the device.

- **:CALibration:SAFEty:AC:RCRAnge? { MAXimum, MINimum }**
  Query the maximum and minimum range of the real current meter of the AC mode.

- **:CALibration:SAFEty:AC:RCURrent (range):OFFSet[:SOURce] [:VOLTage] [<Numeric Value>]**
  Change to the offset item of the real current meter of AC mode, and set the output voltage value that is used in the calibration. The header suffix (range) is selected for the range of current.

- **:CALibration:SAFEty:AC:RCURrent (range):OFFSet[:SOURce] [:VOLTage] ?**
  Change to the offset item of the real current meter of AC mode, and return the output voltage value that is used in the calibration.

- **:CALibration:SAFEty:AC:RCURrent (range):OFFSet:BEST?**
  Change to the offset item of the real current meter of AC mode, and return the best value that is selected by the device.

- **:CALibration:SAFEty:AC:RCURrent (range):FULL[:SOURce] [:VOLTage] [<Numeric Value>]**
  Change to the full item of the real current meter of AC mode, and set the output voltage value that is used in the calibration.

- **:CALibration:SAFEty:AC:RCURrent (range):FULL[:SOURce] [:VOLTage] ?**
  Change to the full item of the real current meter of AC mode, and return the output voltage value that is used in the calibration.

- **:CALibration:SAFEty:AC:RCURrent (range):FULL:BEST?**
  Change to the full item of the real current meter of AC mode, and return the best value that is selected by the device.

- **:CALibration:SAFEty:AC:ARANge? {MAXimum, MINimum }**
  Query the maximum and minimum range of the arc meter of the AC mode.

- **:CALibration:SAFEty:AC:ARC (range):SLOPe[:SOURce] [:VOLTage] [<Numeric Value>]**
  Change to the arc item of AC mode, and set the output voltage value that is used in the calibration.

- **:CALibration:SAFEty:AC:ARC (range):SLOPe[:SOURce] [:VOLTage] ?**
  Change to the arc item of AC mode, and return the output voltage value that is used in the calibration.

- **:CALibration:SAFEty:AC:ARC (range):SLOPe:LEVel [<Numeric Value>]**
  Change to the arc item of AC mode, and set the arc limit value.

- **:CALibration:SAFEty:AC:ARC (range):SLOPe:LEVel?**
  Change to the arc item of AC mode, and returns the arc limit value.

- **:CALibration:SAFEty:AC:ARC (range):SLOPe:BEST?**
  Change to the arc item of AC mode, and return the best arc limit value that is selected by the device.

- **:CALibration:SAFEty:DC:VRANge? {MAXimum, MINimum}**
  Query the maximum and minimum range of the voltage source and meter of the DC mode.

- **:CALibration:SAFEty:DC:VOLTage (range):OFFSet[:SOURce] [:VOLTage] [<Numeric Value>]**
  Change to the offset item of the voltage source and voltage meter of DC mode, and set the output voltage value that is used in the calibration.

- **:CALibration:SAFEty:DC:VOLTage (range):OFFSet[:SOURce] [:VOLTage] ?**
  Change to the offset item of the voltage source and voltage meter of DC mode, and return the output voltage value that is used in the calibration.

- **:CALibration:SAFEty:DC:VOLTage (range):OFFSet:BEST?**
  Change to the offset item of the voltage source and voltage meter of DC mode, and return the best value that is selected by the device.

- **:CALibration:SAFEty:DC:VOLTage (range):FULL[:SOURce] [:VOLTage] [<Numeric Value>]**
  Change to the offset item of the voltage source and voltage meter of DC mode, and set the output voltage value that is used in the calibration.

- **:CALibration:SAFEty:DC:VOLTage (range):FULL[:SOURce] [:VOLTage] ?**
  Change to the offset item of the voltage source and voltage meter of DC mode, and return the output voltage value that is used in the calibration.

- **:CALibration:SAFEty:DC:VOLTage (range):FULL:BEST?**
  Change to the offset item of the voltage source and voltage meter of DC mode, and return the best value that is selected by the device.

- **:CALibration:SAFEty:DC:CRANge? { MAXimum, MINimum }**
  Query the maximum and minimum range of the current meter of the DC mode.

- **:CALibration:SAFEty:DC:CURRent (range):OFFSet[:SOURce] [:VOLTage] [<Numeric Value>]**
  Change to the offset item of the current meter of DC mode, and set the output voltage value that is used in the calibration. The header suffix (range) is selected for the range of current.

- **:CALibration:SAFEty:DC:CURRent (range):OFFSet[:SOURce] [:VOLTage] ?**
  Change to the offset item of the current meter of DC mode, and return the output voltage value that is used in the calibration.

- **:CALibration:SAFEty:DC:CURRent (range):OFFSet:BEST?**
  Change to the offset item of the current meter of DC mode, and return the best value that is selected by the device.

- **:CALibration:SAFEty:DC:CURRent (range):FULL[:SOURce] [:VOLTage] [<Numeric Value>]**
  Change to the full item of the current meter of DC mode, and set the output voltage value that is used in the calibration.

- **:CALibration:SAFEty:DC:CURRent (range):FULL[:SOURce] [:VOLTage] ?**
  Change to the full item of the current meter of DC mode, and return the output voltage value that is used in the calibration.

- **:CALibration:SAFEty:DC:CURRent (range):FULL:BEST?**
  Change to the full item of the current meter of DC mode, and return the best value that is selected by the device.

- **:CALibration:SAFEty:DC:ARANge? {MAXimum, MINimum }**
  Query the maximum and minimum range of the arc meter of the DC mode.

- **:CALibration:SAFEty:DC:ARC (range):SLOPe[:SOURce] [:VOLTage] [<Numeric Value>]**
  Change to the arc item of DC mode, and set the output voltage value that is used in the calibration.

- **:CALibration:SAFEty:DC:ARC (range):SLOPe[:SOURce] [:VOLTage] ?**
  Change to the arc item of DC mode, and return the output voltage value that is used in the calibration.

- **:CALibration:SAFEty:DC:ARC (range):SLOPe:LEVel [<Numeric Value>]**
  Change to the arc item of DC mode, and set the arc limit value.

- **:CALibration:SAFEty:DC:ARC (range):SLOPe:LEVel?**
  Change to the arc item of DC mode, and returns the arc limit value.

- **:CALibration:SAFEty:DC:ARC (range):SLOPe:BEST?**
  Changing to the arc item of DC mode, and returns the best arc limit value that is selected by the device.

- **:CALibration:SAFEty:IR:VRANge? {MAXimum, MINimum }**
  Query the maximum and minimum range of the voltage source and meter of the IR mode.

- **:CALibration:SAFEty:IR:VOLTage (range):OFFSet[:SOURce] [:VOLTage] [<Numeric Value>]**
  Change to the offset item of the voltage source and voltage meter of IR mode, and set the output voltage value that is used in the calibration.

- **:CALibration:SAFEty:IR:VOLTage (range):OFFSet[:SOURce] [:VOLTage] ?**
  Change to the offset item of the voltage source and voltage meter of IR mode, and return the output voltage value that is used in the calibration.

- **:CALibration:SAFEty:IR:VOLTage (range):OFFSet:BEST?**
  Change to the offset item of the voltage source and voltage meter of IR mode, and return the best value that is selected by the device.

- **:CALibration:SAFEty:IR:VOLTage (range):FULL[:SOURce] [:VOLTage] [<Numeric Value>]**
  Change to the full item of the voltage source and voltage meter of IR mode, and set the output voltage value that is used in the calibration.

- **:CALibration:SAFEty:IR:VOLTage (range):FULL[:SOURce] [:VOLTage] ?**
  Change to the full item of the voltage source and voltage meter of IR mode, and return the output voltage value that is used in the calibration.

- **:CALibration:SAFEty:IR:VOLTage (range):FULL:BEST?**
  Change to the full item of the voltage source and voltage meter of IR mode, and return the best value that is selected by the device.

- **:CALibration:SAFEty:IR:RRANge? { MAXimum, MINimum }**
  Query the maximum and minimum range of the resistance meter of the IR mode.

- **:CALibration:SAFEty:IR:RESistance (range):SLOPe[:SOURce] [:VOLTage] [<Numeric Value>]**
  Change to the resistance item of IR mode, and set the output voltage value that is used in the calibration.

- **:CALibration:SAFEty:IR:RESistance (range):SLOPe[:SOURce] [:VOLTage] ?**
  Change to the resistance item of IR mode, and return the output voltage value which is used in the calibration.

- **:CALibration:SAFEty:IR:RESistance (range):SLOPe:BEST?**
  Change to the resistance item of IR mode, and returns the best value that is selected by the device.

9. Maintenance

9.1 General

Our warranty (at the front of the manual) attests to the quality of materials and workmanship in our products. If a malfunction should be suspected, or other information is desired application engineers are available for technical assistance. Application assistance is available in Taiwan by calling 886-3-3279999 and asking for application support. For support outside of Taiwan please contact your local Chroma distributor.

9.2 Instrument Return

Before returning an instrument to Chroma for service, please call our Service Department for return material authorization. It will be necessary to include a purchase order number to ensure 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.

Chroma

Advancing Excellence

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