HIPOT Tester

19051/19052/19053/19054

Quick Start Guide

Chroma

www.chromaate.com

HIPOT Tester
19051/19052/19053/19054
Quick Start Guide

Version 1.1
January 2011
P/N A11 000893

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

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

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Material Contents Declaration

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


: See **<Table 1>**.


: See **<Table 2>**.

<Table 1>

Part Name	Hazardous Substances					
	Lead	Mercury	Cadmium	Hexavalent Chromium	Polybrominated Biphenyls	Polybromodiphenyl Ethers
	Pb	Hg	Cd	Cr^{6+}	PBB	PBDE
PCBA	O	O	O	O	O	O
CHASSIS	O	O	O	O	O	O
ACCESSORY	O	O	O	O	O	O
PACKAGE	O	O	O	O	O	O

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

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

Disposal

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

<Table 2>

Part Name	Hazardous Substances					
	Lead	Mercury	Cadmium	Hexavalent Chromium	Polybrominated Biphenyls	Polybromodiphenyl Ethers
	Pb	Hg	Cd	Cr^{6+}	PBB	PBDE
PCBA	×	O	O	O	O	O
CHASSIS	×	O	O	O	O	O
ACCESSORY	×	O	O	O	O	O
PACKAGE	O	O	O	O	O	O

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

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

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

Disposal

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

Safety Summary

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

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

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

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

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

DO NOT OPERATE IN AN EXPLOSIVE ATMOSPHERE
Do not operate the instrument in the presence of flammable gases or fumes. The instrument should be used in an environment of good ventilation.

DO NOT REMOVE THE COVER OF THE INSTRUMENT
Operating personnel must not remove the cover of the instrument. Component replacement and internal adjustment can be done only by qualified service personnel.

Safety Symbols

	**DANGER –** High voltage.
	**Explanation:** To avoid injury, death of personnel, or damage to the instrument, the operator must refer to an explanation in the instruction manual.
	**High temperature:** This symbol indicates the temperature is now higher than the acceptable range of human. Do not touch it to avoid any personal injury.
	**Protective grounding terminal:** To protect against electrical shock in case of a fault. This symbol indicates that the terminal must be connected to ground before operation of equipment.
⚠WARNING	The **WARNING** sign denotes a hazard. It calls attention to a procedure, practice, or the like, which, if not correctly performed or adhered to, could result in personal injury. Do not proceed beyond a **WARNING** sign until the indicated conditions are fully understood and met.
CAUTION	The **CAUTION** sign denotes a hazard. It may result in personal injury or death if not noticed timely. It calls attention to procedures, practices and conditions.
Notice	This indicates important information or tips for the procedures and applications, etc. The contents should be read carefully.

The Danger of Operating

1. When the instrument is under output voltage, please don't touch test area or you may shock hazard and result in death.

   Please obey the following items.
   - Make sure the grounding cable is connected correctly and using the standard power cord.
   - Don't touch the output terminal.
   - Don't touch test cable of connecting test termination.
   - Don't touch test termination object.
   - Don't touch any charge component of connecting output terminal.
   - As the instrument end the test or turn off output, please don't touch test unit immediately.

2. The shock accidents are usually occurred on the following conditions.
   - The grounding terminal of the instrument doesn't connect correctly.
   - Do not use insulation glove for testing.
   - After test is completed to touch test unit immediately.

3. Remote Control for the instrument: This instrument provided with remote control, normally using the external signal to control to high voltage output. For safety reasons and prevent from hazards, please exactly follow instructions below while using remote control.
   - Unexpected high voltage output may exist. Make sure if this instrument is under testing/remote controlling before access to the probes.
   - When the instrument is under testing/operating, any access to DUT, test cable and probe output terminal are prohibited, both for the operator/service personnel.
   - Normally remote control of this instrument is controlled by the high voltage test bar. However, using of other control circuit is also possible. For safety reasons and prevent from hazards, please notice that unintentional access to the control test bar or bridging the control circuit to high voltage terminal and test cables may cause hazards. Please keep this terminal/control from unintentional bridging/access to avoid danger.

⚠WARNING Don't tie HV cable, RS232, Handler, GPIB control cable and other low voltage cable together. Or it may cause product damaged or PC crashed.


DANGER

Storage, Freight, Maintenance & Cleaning

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

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

Maintenance
There is no maintenance operation for the general user. (Except for the note in the manual.) Please contact our company or agent when the device occurred the user judgment abnormal. Don't maintain by yourself to avoid occurred unnecessary danger and serious damage to the device.

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

Table of Contents

1. Introduction

1.1 An Overview of Product

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

The testing aspect of withstand voltage, the output power of the tester is AC: 150VA(5kV, 30mA), DC: 60VA(6kV, 10mA). Therefore, it is for withstand test of electronic and electromechanical and component.

The testing aspect of insulation resistance, the measurement range of the tester is 0.1MΩ ~ 50GΩ and test voltage range is 50V ~ 1000V can be set arbitrary.

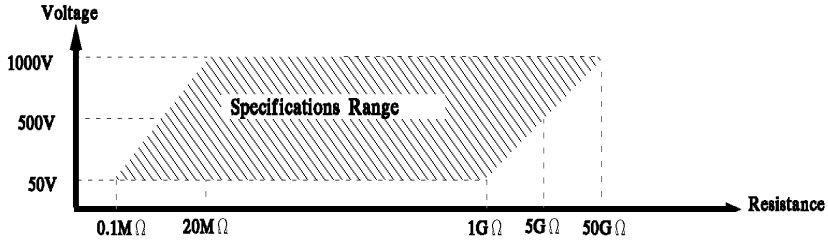
In the testing aspect of short/open circuit detection, please test if test capacitance is short or open before testing high voltage. Please make sure the DUT good contact then processes high voltage test.

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

The tester is equipped with Good and No Good judgment machinery and signal output of testing result and remote control. It is also for GPIB interface and RS232 interface of automatic test system. The above equipments makes high efficient and accurate test.

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

❑ Scan Unit	8 ports, · ±phase (19053 only), 4 ports, · ±phase (19054 only)
❑ Withstanding Voltage Test	
❑ Test Voltage	AC: 0.05 ~ 5kV/ DC: 0.05 ~ 6kV Constant Voltage
❑ Voltage Regulation	≤ (1%+5V), Rated Load
❑ V-display Accuracy	± (1% of reading + 5 counts), 2V resolution
❑ Cutoff Current (Note 2)	AC: 0.1mA ~ 30mA (Note 1), DC: 0.01mA ~ 10mA (Note 1), 0.1uAdc resolution
❑ Current Accuracy (Note2)	± (1% of reading + 5 counts) Real Current ± (5% of total current + 20 counts) (Note2) WAC only
❑ Current Display	Hi limit setting Display Range < 300uA: 0.1uA~299.9uA (dc only) < 3mA: 0.001mA~2.999mA <30mAac (10mAdc): 0.01mA~30.00mAac (10mAdc)
❑ Output Frequency	50Hz, 60Hz
❑ Test Time (Note 3)	0.3 ~ 999 Sec, continue (Note 1) (0.2S for LCD off)
❑ Ramp Time	0.1 ~ 999 Sec, off (Note 1)
❑ Fall Time	0.1 ~ 999 Sec, off
❑ Judgment Delay (Wdc Only)	0.1 ~ 99.9 Sec. (Note 1)
❑ Arc Detection (Note 4)	
❑ Setting Mode	Programmable Setting
❑ Detection Current	AC: 1mA ~ 15mA, DC: 1mA ~ 10mA
❑ Min. pulse width	10us approx.
❑ GOOD/NO-GO Judgment Function	
❑ Judgment System	• 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.

<table>
<tr><td colspan="3">❑ Insulation Resistance Test (19052, 19053, 19054 only)</td></tr>
<tr><td colspan="2">❑ Test Voltage</td><td>DC: 0.05kV ~ 1kV, Constant Voltage</td></tr>
<tr><td colspan="2">❑ V-display Accuracy</td><td>± (1.5% of reading + 5 counts) (open voltage), 2V resolution</td></tr>
<tr><td colspan="2">❑ Resistance Range</td><td>0.1 MΩ ~ 10 GΩ (19052 up to 50GΩ)</td></tr>
<tr><td colspan="2">❑ 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:
<table>
<tr><td>0.10 MΩ ~ 25.00 MΩ</td><td rowspan="2">± (10% of reading + 2% of scale)</td></tr>
<tr><td>22.0 MΩ ~ 250.0 MΩ</td></tr>
<tr><td>0.220 GΩ ~ 1.000</td><td>± (10% of reading + 5% of scale)</td></tr>
</table></td></tr>
<tr><td colspan="3"> 
</td></tr>
<tr><td colspan="3">❑ Secure Protection Function</td></tr>
<tr><td colspan="2">❑ Fast Output Cut-off</td><td>0.4mS typical after NG happen</td></tr>
<tr><td colspan="2">❑ Fast Discharge</td><td>0.2S, Typical</td></tr>
<tr><td colspan="2">❑ Ground Fault Interrupt</td><td>0.5mA ± 0.25mAac (ON), OFF</td></tr>
<tr><td colspan="2">❑ Continuity Check</td><td>1Ω ± 0.2Ω, ON/OFF</td></tr>
<tr><td colspan="2">❑ Panel Operation Lock</td><td>YES</td></tr>
<tr><td colspan="3">❑ Memory Storage</td></tr>
<tr><td colspan="2">❑ Memories, Steps</td><td>99 steps or 99 groups for total 500 memory locations</td></tr>
<tr><td colspan="3">❑ GO/NG Judgment Window</td></tr>
</table>

❑ 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: 20msec. 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 80% for temperature 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

1.3 Standard Accessory

19051 Standard Package

Item	Q'ty	Description
USA-type power cord	1	90° elbow USA-type power cord, length 1.8m
Power adapter	1	USA-type power cord 3P – 2P adapter
HV terminal used test cable	1	Alligator clip – cross HV head, red HV test cable, wire length 1m
LOW terminal used test cable	1	Alligator clip – banana plug, black HV test cable, wire length 1.2m
Test cable of grounding continue	1	Wire used in GC test, length 1.2m
5A fuse	2	For 5.0A SLOW 110VAC used
2.5A fuse	2	For 2.5A SLOW 240VAC used
Quick Start Guide	2	One English version and one Traditional Chinese version.
User's Manual CD-ROM	1	CD for user's manuals in English and Traditional Chinese

19052 Standard Package

Item	Q'ty	Description
USA-type power cord	1	90° elbow USA-type power cord, length 1.8m
Power adapter	1	USA-type power cord 3P – 2P adapter
HV terminal used test cable	1	Alligator clip – cross HV head, red HV test cable, wire length 1m
LOW terminal used test cable	1	Alligator clip – banana plug, black HV test cable, wire length 1.2m
Test cable of grounding continue	1	Wire used in GC test, length 1.2m
5A fuse	2	For 5.0A SLOW 110VAC used
2.5A fuse	2	For 2.5A SLOW 240VAC used
Quick Start Guide	2	One English version and one Traditional Chinese version.
User's Manual CD-ROM	1	CD for user's manuals in English and Traditional Chinese

19053 Standard Package

Item	Q'ty	Description
USA-type power cord	1	90° elbow USA-type power cord, length 1.8m
Power adapter	1	USA-type power cord 3P – 2P adapter
HV terminal used test cable #1	1	Alligator clip – cross HV head, red HV test cable, wire length 1m
LOW terminal used test cable	1	Alligator clip – banana plug, black HV test cable, wire length 1.2m
Test cable of grounding continue	1	Wire used in GC test, length 1.2m
HV terminal used test cable #2	8	Cross HV head, single head white HV test cable, wire length 1m
5A fuse	2	For 5.0A SLOW 110VAC used
2.5A fuse	2	For 2.5A SLOW 240VAC used
Quick Start Guide	2	One English version and one Traditional Chinese version.
User's Manual CD-ROM	1	CD for user's manuals in English and Traditional Chinese

19054 Standard Package

Item	Q'ty	Description
USA-type power cord	1	90° elbow USA-type power cord, length 1.8m
Power adapter	1	USA-type power cord 3P – 2P adapter
HV terminal used test cable #1	1	Alligator clip – cross HV head, red HV test cable, wire length 1m
LOW terminal used test cable	1	Alligator clip – banana plug, black HV test cable, wire length 1.2m
Test cable of grounding continue	1	Wire used in GC test, length 1.2m
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 used
2.5A fuse	2	For 2.5A SLOW 240VAC used
Quick Start Guide	2	One English version and one Traditional Chinese version.
User's Manual CD-ROM	1	CD for user's manuals in English and Traditional Chinese

1.4 Initial Inspection

Before shipment, this instrument was inspected and found to be free of mechanical and electrical defects. As soon as the instrument is unpacked, inspect for any damage that may have occurred in transit. Save all packing materials in case that the instrument has to be returned. If damage is found, please file claim with carrier immediately. Do not return the instrument to Chroma without prior approval.

2. Precaution before Use

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

1. Shock Hazard

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

2. Grounding

There is a ground terminal on the rear panel cover of the tester. Please use appropriate implement to connect the ground terminal to earth actually. If not, there may be high voltage existed on the cover of the tester. It is very danger whatever touches the machine under the above statuses. It may cause shock hazard, therefore please make sure to connect ground terminal to earth. As figure 2-1 arrow denotation.

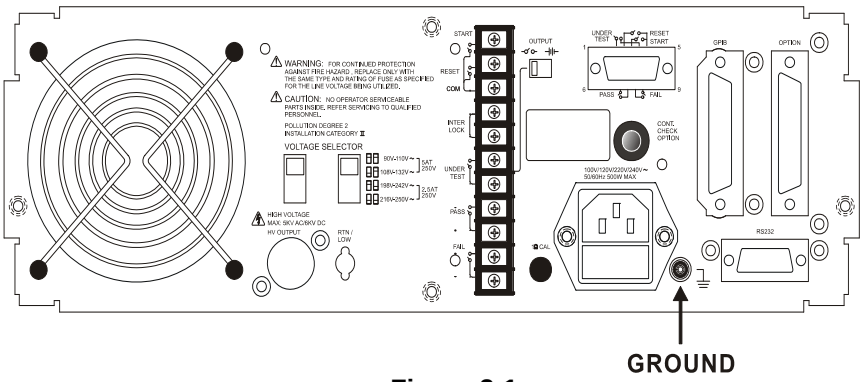


Figure 2-1

3. Connect test cable to RTN/LOW terminal

As figure 2-2 arrow denotation, connect test cable to RTN/LOW terminal. It is necessary to check if there is loosen or drop under operation condition at any time. If you want to connect DUT by testing cable, please connect test cable of RTN/LOW terminal to DUT. (RTN/LOW terminal, which has connected to the main unit) The uncompleted connection of test cable of RTN/LOW terminal or drop is very danger, as there is full of high voltage on DUT.

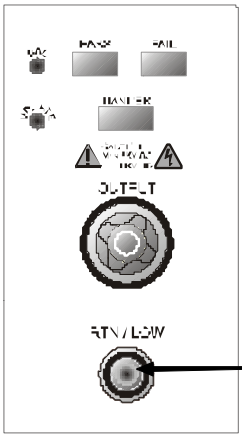


Figure 2-2

4. Connection test of high voltage output terminal

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

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

5. Test stop

When the test is over the and no need to use, or the tester is not run status or needs to exit during use, please be sure power switch is on 0 (that is turn off power). As figure 2-3.

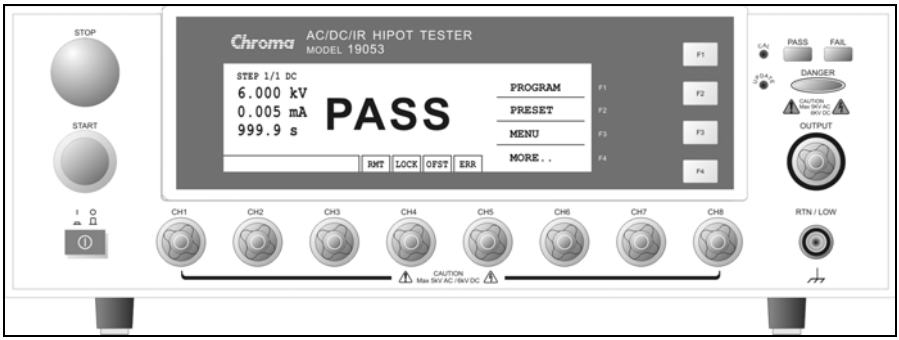


Figure 2-3

6. The dangerous area under test mode

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

CAUTION When the main unit is under test status, please don't touch alligator clipper on test cable. Because the insulation of plastic layer is not enough, touch it may cause hazard. As figure 2-4.

Please don't touch here when high voltage output

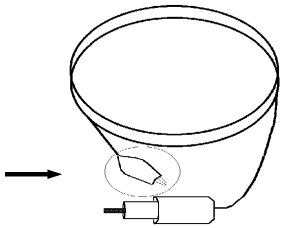


Figure 2-4

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

7. Test complete confirmation

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

Power switch is turned off.

As the insulation resistance test unit, DUT may full of high voltage when test is completed. In the meantime, you need to pay attention to obey descriptions of item 8 and 9 of this chapter. As the described

procedures to execute.

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

8. Charge

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

9. Confirm charging voltage has been discharged completely

The discharged time of charging voltage is depends on testing voltage and DUT characteristic. To assume that high voltage add to DUT is equivalent to high voltage add to 0.01uF capacity parallel 100MΩ resistance circuit. When test voltage is 1000V, then after turned off power, the voltage which add on testing and DUT decrease to lower than 30V and needed time about 3.5 seconds. When test voltage is 500V, needs about 2.8 seconds. To assume the time constant of DUT is known, if you want to know the voltage decrease to below 30V needed time. Please follow the above procedures, multiply needed time of decreasing to below 30V by time constant. As figure 2-5.

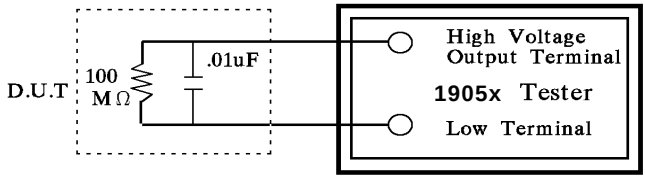


Figure 2-5

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

- Don't allow any unexpected high voltage output that may cause danger.

- When the main unit output high voltage, don't permit the operator or others personnel to contact DUT, test cable and probe output terminal.

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

The product should be so positioned that the power switch can be easily reached by the operator during emergency. When power switch is cut off, it needs a few seconds to re-turn on. Please don't turn on and turn off continuously. It is very danger to do that under high voltage output. When turn on or turn off power, don't connect any object to high voltage output terminal to avoid hazard, which result from abnormal high voltage output.

12. Others notice items

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

<<< Dangerous event >>>

13. The danger handling

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

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

<<< Solution >>>

14. Problems

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

- When press [STOP] key, DANGER indication LED is still light.
- The voltage meter without voltage reading but DANGER LED is still light.

When the above conditions are occurred, please turn off power and pull off AC power plug immediately. Don't use any more, please send to our company or office for reparation.

15. DANGER indication LED error

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

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

If the high limit setting value is 20.00mA (withstand voltage test), please notice its' ambient temperature. When the ambient temperature is higher than 40°C, please stop operation until it cools down to normal temperature.

17. The tester includes four kinds of AC INPUT power. Please accord with local voltage turn the voltage selection switch on rear panel to the right position.

When you want to plug in power cable, be sure input AC power scale is the same as rear panel switch power. Also need to replace fuse, the following table is voltage and fuse which 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

Be sure used voltage when replace fuse. Only can replace fuse under power-disconnected status by flat type screwdriver.

⚠WARNING Please use correct specification when replacing fuse or it may cause hazard.

18. Normal operation of the unit is AC power. If power is unstable within selection voltage range, it may cause the unit function is not actual or abnormal. Therefore, please use appropriate equipment turn to suitable power such as power stabilizer.

19. The tester use power transformer is over 200VA. When DUT drawing mass current. Before deadline of no good judgment and output current, it may flows mass current (about ten amperes) up to ten milliseconds. Before processing test may be the same condition. Please notice the capacity of power cord and the current cable of linking with other instrument or equipment.

20. Storage

The unit normal operation temperature humidity range is 5°C ~ 40°C, 75% RH. If over this range then function may malfunction. The unit storage temperature range is -10°C ~ 50°C, 80% RH. If you don't use

it for a long time, please use original material packing and then store it. For correct test and safety, please keep it from direct sunlight or high temperature, vibration, humidity and dusty place.

21. Warm up

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

22. Warning signal of testing

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

23. Keep test cable away from the panel

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

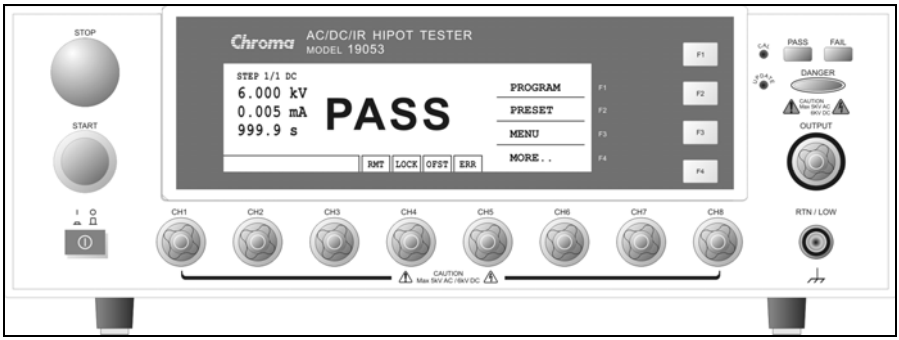
24. Notices for connecting automated device

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

3. Panel Description

3.1 Front Panel

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 display has corresponding function keys (F1-F4). If the description is blank, it means corresponding function is invalid.

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

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

  Note: As connecting RS232, the word “RMT” on LCD will not be highlighted only when give 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 "MEMORY", "TEST" and "KEY LOCK" modes.

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

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

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

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

FAIL LED : When this LED is light, it means DUT judge as FAIL after testing and then cutting off the main unit output immediately. This LED keeps on light until the main unit be pressed [STOP] key.

- **Key Area**

Power Switch : The switch provides AC power source which the tester is needed.

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

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

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

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

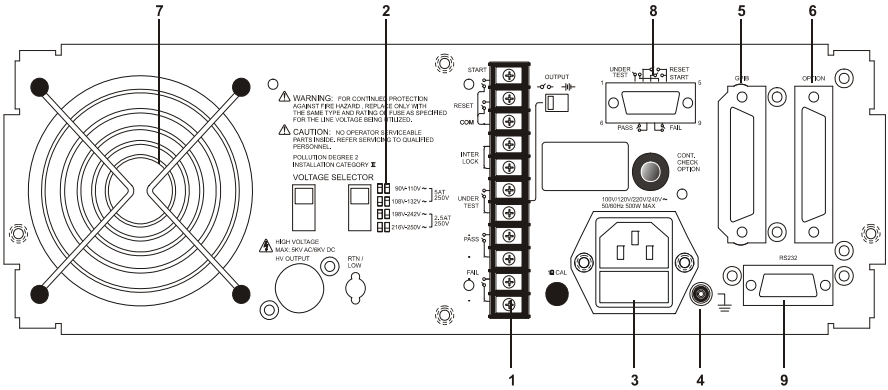
- **Terminal Area**

OUTPUT : High electric potential terminal of high voltage output. This terminal is belong to high electric potential output, usually is high voltage output. Therefore, this terminal

is very dangerous. Don't touch it when DANGER LED is light, there is high voltage outputting.

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

3.2 Rear Panel



1. REMOTE I/O: The test result signal output terminal.
START: Start test signal input terminal.
STOP: Stop test signal input terminal.
INTER LOCK: Output only when this two terminals are short circuit and high voltage.
UNDER TEST : When the tester is under test status, this output terminal will short circuit. Control external signal by using this short condition. The junction specification 115V AC current 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 short circuit. Control external signal by using this short circuit condition. The junction specification 115V AC current is lower than 0.3A.
The action time is 0.2sec ~ 99.9sec. (Can be set)
FAIL: When the tester judge DUT is FAIL, this output terminal will be short-circuited. Control external signal by using this short condition. The junction specification 115V AC current is

lower than 0.3A. The action time: From judging FAIL to STOP is stopped.

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

Switching 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 is needed from AC power socket. The detailed specification of using fuse please refers "Chapter 3 - Notice Items Before Using" or descriptions of rear panel in this manual.

4. GROUND: Safety GND terminal. Please use adaptable implement to connect this grounding terminal actually. If there is no grounding actually, the circuit with GND terminal or other instruments connecting cable with GND terminal is short circuit. The cover of tester may exist high voltage. This is very dangerous, anyone touch the tester under the above status may cause damage. Therefore, it is necessary to connect safety GND terminal to ground.

5. GPIB INTERFACE (Option)

This socket is for optional GIPB interface (IEEE-488-1978).

6. OPTION: This socket is the option PRINTER interface for the tester.

7. FAN: The temperature control fan.

When the temperature reaches 50°C, fan opens automatically. When the temperature is lower than 45°C, fan stops automatically.

8. 9 Pin D Connector
All of 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 interface can't use simultaneously.

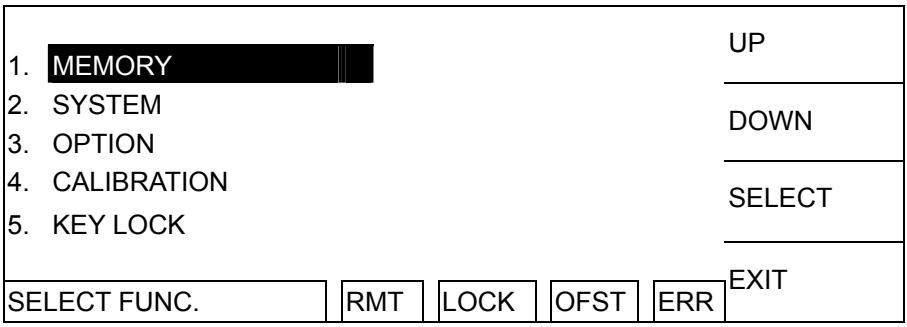
3.3 Notice Items and Procedures before Operation

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

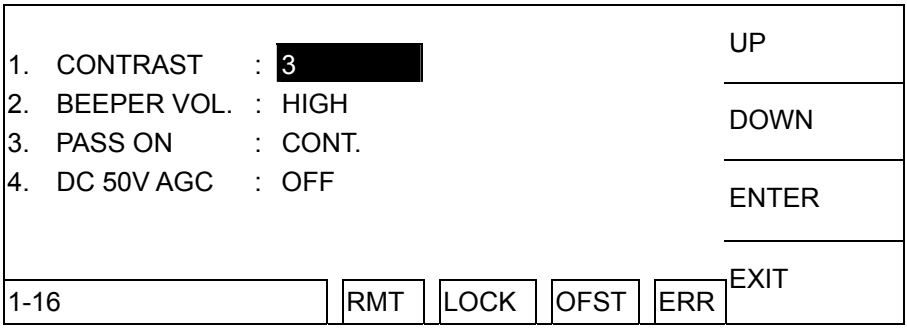
3.4 System Parameter Setting

3.4.1 How to Enter System Parameter Setting Menu

1. Under power on 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 system parameter setting menu is shown as the following:



3.4.2 Operation Method

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

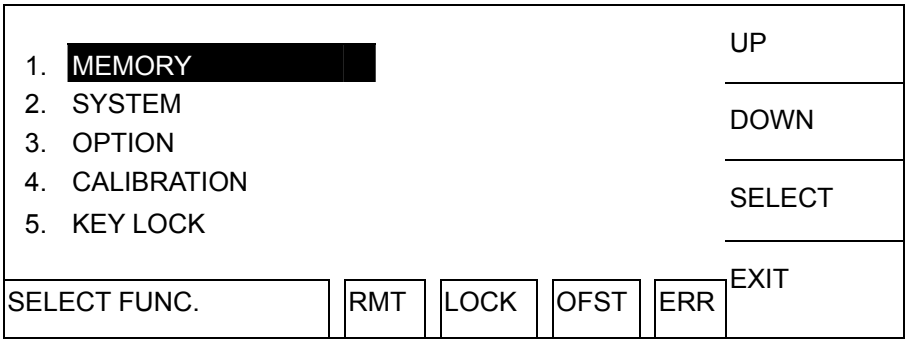
System parameter setting data description table

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 continuous time of PASS signal on Remote I/O interface of rear panel.
DC 50V AGC	ON/OFF	ON	When it is set above DC 50V, hardware automatic gain compensation function is open or not.

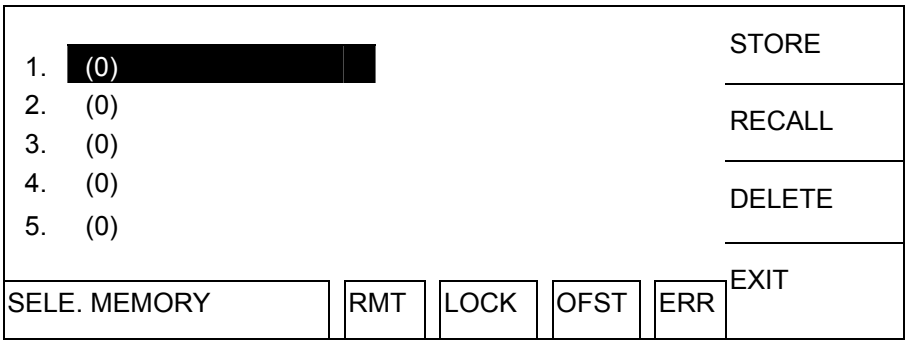
3.5 Test Parameter and Memory Management of Test Preset Parameter

3.5.1 How to Enter Memory Management Menu

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



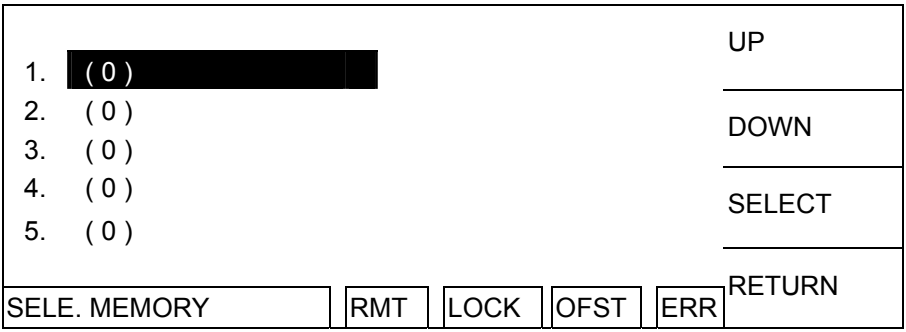
2. Move the highlight to "MEMORY" by Function Key **UP**, **DOWN**. Press Function Key **SELECT** to enter Memory management mode is shown as the following:



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

3.5.2 How to Select a Set of Memory

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



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

3.5.3 Delete Memory

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

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

3.5.4 Read Memory

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

1. Press Function Key **RECALL** when status bar shows [SELECT FUNC.].
2. Select the test parameter data of memory, which want to read by using Function Key **UP**, **DOWN**.

3. Press Function Key **SELECT** and then show confirm window.
4. Press Function Key **YES** to confirm or press Function Key **NO** to cancel.

3.5.5 Store Memory

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

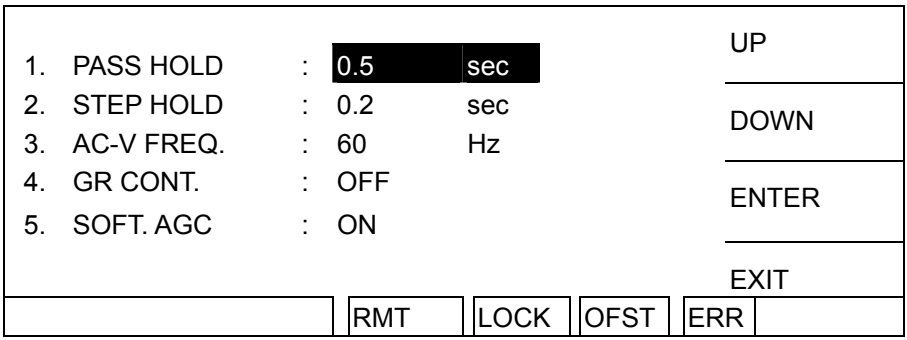
1. When status bar shows [SELECT FUNC.], press Function Key **STORE**.
2. Selecting the memory want to store by using Function Key **UP**, **DOWN**. Press Function Key **SELECT**, the cursor become underscore blinking cursor.
3. At this time, input the memory name by using Function Key **UP**, **DOWN**.
4. By using Function Key **ENTER** to move the underscore blinking cursor to 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

3.6 Preset Parameter Setting

3.6.1 How to Enter Testing Preset Parameter Setting Menu

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



3.6.2 Operation Methods

1. After entering test preset parameter setting menu, press **ENTER** key move the highlighted cursor to the parameter item, which 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 of 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 test stop.)

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 continue test no good function operation mode. 1. When set to OFF, it doesn't proceed grounding continue test. 2. When set to KEY, press START KEY to proceed grounding continue test. 3. When set to TIME, GR CONT operation modes are as below descriptions. (1) When users press START KEY, the program judge if DUT connected well by GR CONT. ON or OFF. (2) If CR CONT. judge DUT is connected well then proceed test automatically when set TIME is up. (3) After the test is ended, re-judge if CR CONT. is continue for the condition of 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 or 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	ON/OFF	ON	When set this item to ON, it

JUDG.			means during ramp time will judge high limit under DC mode. When set this item to OFF, it means during ramp time won't judge 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.

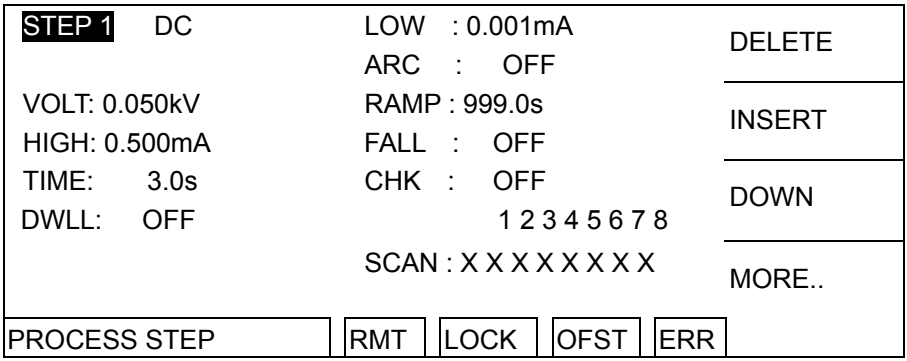
3.7 PROGRAM Setting

3.7.1 Test Procedure Setting

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

STEP 1 DC	LOW : 0.001mA		UP
	ARC : OFF		
VOLT: 0.050kV	RAMP : 999.0s		MORE..
HIGH: 0.500mA	FALL: OFF		
TIME: 3.0s	CHK : OFF		ENTER
DWLL: OFF	1 2 3 4 5 6 7 8		
	SCAN : X X X X X X X X		EXIT
PROCESS STEP	RMT	LOCK OFST ERR	

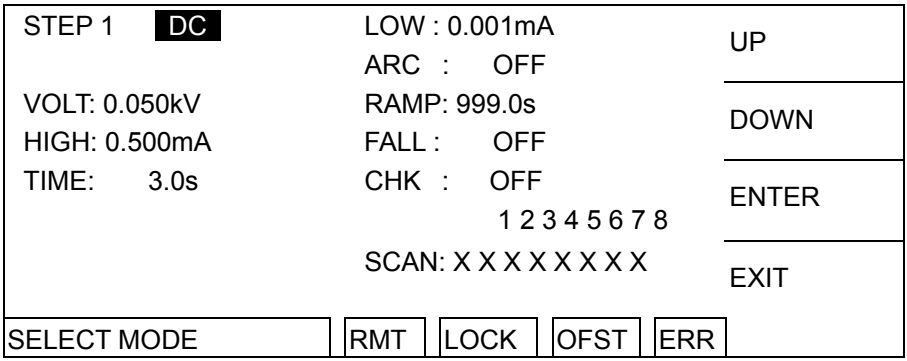
2. After entering PROGRAM setting menu, use Function Keys **UP** select the test procedure want to set, the range is 1~99.
3. Press **ENTER** key move the highlighted cursor to the parameter item, which want to set.
4. Press Function Key **MORE..** can switch to other setting menu as the following.



5. By using Function Keys **DOWN** to decrease test procedure which you want to set, the range is 1~99.
6. Press Function Keys **DELETE**, **INSERT** can delete, insert a test procedure.
7. Press Function Key **MORE..** can return to PROGRAM setting menu to continue setting others test parameter.

3.7.2 Select Test Mode

1. After entering 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 can be selected (19051 only AC / DC / OS / PA). Different test modes have different test parameters can be set.

3.7.3 SMART KEY Operation Methods

1. When starts SMART KEY function of PRESET parameter in each test, it records the test parameters. The test parameter includes: 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 value.
2. After entering PROGRAM setting screen, press **ENTER** key continuous for one second then will show S-KEY word on the lower left side of screen. At this time, the adjustment function of **UP** and **DOWN** keys is disabled and read back the previous test parameter. If want to recover the adjustment function of **UP** and **DOWN** keys, press **ENTER** key continuous for one second until S-KEY word on the lower left side of screen is disappeared.

3.7.4 Each Parameter Setting Data Description

The following described parameter setting data of each test mode.

AC withstand voltage test mode

STEP 1 AC	LOW: 0.001mA		UP
	ARC : OFF		
VOLT: 0.050kV	RAMP: 999.0s		DOWN
HIGH: 0.500mA	FALL: OFF		
TIME: 3.0s	REAL: OFF		ENTER
	1 2 3 4 5 6 7 8		
	SCAN: X X X X X X X X		EXIT
SELECT MODE	RMT	LOCK	OFST ERR

VOLT: It sets withstand voltage test needed voltage.
HIGH: It sets leakage current high limit value.
TIME: It sets test needed time, input 0 means continuous test.
LOW: It sets leakage current low limit value, input 0 means OFF.
ARC: It sets 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 voltage value to zero, 0 means OFF.
REAL: It sets real leakage current high limit value, input 0 means OFF.
SCAN: It sets scan test selection point.

DC withstand voltage test mode

STEP 1 DC	LOW : 0.001mA ARC : OFF		UP
VOLT: 0.050kV	RAMP: 999.0s		DOWN
HIGH: 0.500mA	FALL : OFF		
TIME: 3.0s	CHK : OFF		ENTER
DWLL: OFF	1 2 3 4 5 6 7 8		
	SCAN: X X X X X X X X		EXIT
SELECT MODE	RMT	LOCK OFST ERR	

VOLT: It sets withstand voltage test needed voltage.
HIGH: It sets leakage current high limit value.
TIME: It sets test needed time, input 0 means continuous test.
DWLL: It sets DWELL needed time, 0 means OFF.
(During DWELL TIME action don't judge high and low limit value of leakage current but the limit don't over high limit of setting range.)
LOW: It sets leakage current low limit value, input 0 means OFF.
ARC: It sets 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 voltage value to zero, 0 means OFF.
CHK: It selects detect charge current over low (CHECK LOW)
SCAN: It sets scan test selection point.

IR Insulation resistance test mode

STEP 1 IR	HIGH : OFF RAMP: OFF		UP
VOLT : 0.050kV	FALL : OFF		DOWN
LOW : 1.0MΩ	RNG : AUTO		
TIME : 3.0s	1 2 3 4 5 6 7 8		ENTER
	SCAN: X X X X X X X X		EXIT
SELECT MODE	RMT	LOCK OFST ERR	

VOLT: It sets insulation resistance test needed voltage.
LOW: It sets insulation resistance low limit value.
TIME: It sets test needed time, input 0 means continuous test.
HIGH: It sets 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 voltage value to zero, 0 means OFF.
RNG: It sets the current test range of insulation resistance, AUTO means automatic switch range. The relation of 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 follows test voltage and DUT insulation resistance for counting the quantity of current then follows it to select suitable current range.

SCAN: It sets scan test selection point.

Short/Open Circuit detection test mode (OS)

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

OPEN CHK: It sets the judgment test result to open condition(compare the test reading with the read standard capacitance value [Cs]).
SHORT CHK: It sets the judgment test result to short condition(compare the test reading with the read standard capacitance value [Cs]).
SCAN: It sets the scanning test selection point.

Pause Mode

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

MESSAGE: It sets the message shows on pause screen, the maximum input character is 15.
UNDER TEST SIGNAL: It sets UNDER TEST signal on rear panel when pause and DANGER LED action.

(1) It sets to ON: UNDER TEST terminal on rear panel is short circuit under pause mode. DANGER LED on panel is blinking.
(2) It sets to OFF: UNDER TEST terminal on rear panel is open

circuit under pause mode. DANGER LED on panel isn't blinking.

TIME: It sets the method of PAUSE MODE.

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

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

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