

HIPOT Tester

19071/19072/19073

Quick Start Guide

HIPOT Tester 19071/19072/19073 Quick Start Guide



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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	○	○	○	○	○	○
CHASSIS	○	○	○	○	○	○
ACCESSORY	○	○	○	○	○	○
PACKAGE	○	○	○	○	○	○

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

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

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	×	○	○	○	○	○
CHASSIS	×	○	○	○	○	○
ACCESSORY	×	○	○	○	○	○
PACKAGE	○	○	○	○	○	○

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

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

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

Disposal

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



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.



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



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



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.
 - No 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 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.

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1. Introduction

1.1 An Overview of Function

- This high quality automatic HiPot test instrument is designed to test the withstanding leakage current and insulation resistance for electric machinery and electronic devices.
- For withstanding test, its output power is AC: 100VA (5kV, 20mA), DC: 30VA (6KV, 5mA), which is applicable to electronic, electric machinery and components for withstanding and insulation tests.
- For insulation resistance, its test range is from $0.1M\Omega\sim 50G\Omega$, and test voltage is $0.050kV\sim 1kV$ definable.
- For ground continue, its test range is from $0\Omega\sim 5\Omega$.
- For short/open detection, before testing high voltage test if the capacitance is short or open circuit in advance. For ensure the DUT is good contact then to perform high voltage test.
- All settings for state, time, current, voltage and resistance can be seen clearly on the display. There is no need to memorize the parameter state of any items.
- It is equipped with devices for Pass/Fail judgment, test results and remote control.
- It can perform high efficiency and accurate tests for electric machinery, electronic devices and components.

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

<input type="checkbox"/> Withstanding Voltage Test	
<input type="checkbox"/> Test Voltage	AC: 0.05~5kV / DC: 0.05~6kV Constant Voltage (19072, 19073 only)
<input type="checkbox"/> Voltage Regulation	≤ 1%+5V, Rated Load
<input type="checkbox"/> V-display Accuracy	± (1% of reading + 5 counts), 2V resolution
<input type="checkbox"/> Cutoff Current (Note1)	AC: 0.1mA ~ 20mA, DC: 0.01mA ~ 5mA (Note1), 0.1uAdc resolution
<input type="checkbox"/> I-display Accuracy 0.1uA-299.9uA 0.3mA-2.999mA 3mA-20mA(5mAdc)	± (1.5% of reading + 5 counts) (Note2) WDC only
	± (1.5% of reading + 5 counts) (Note2)
<input type="checkbox"/> Output Frequency	50Hz, 60Hz
<input type="checkbox"/> Test Time	0.1 ~ 999 Sec, continue (Note3)
<input type="checkbox"/> Dwell Time	0.1 ~ 999 Sec, off
<input type="checkbox"/> Ramp Time	0.1 ~ 999 Sec, off (0.1sec approx.)
<input type="checkbox"/> Fall Time	0.1 ~ 999 Sec, off
<input type="checkbox"/> Arc Detection	
<input type="checkbox"/> Setting Mode	Programmable Setting
<input type="checkbox"/> Detection Current	AC: 1mA ~ 20mA, DC:1mA ~ 5mA
<input type="checkbox"/> Min. pulse width	10us approx.
<input type="checkbox"/> GOOD/NO-GO Judgment Function	
<input type="checkbox"/> Judgment System	<ul style="list-style-type: none"> • 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.
<input type="checkbox"/> Insulation Resistance Test (19073 only)	
<input type="checkbox"/> Test Voltage	DC: 0.05kV ~ 1kV, Constant Voltage

<input type="checkbox"/> V-display Accuracy	± (5% of reading + 5 counts) (open voltage), 2V resolution
<input type="checkbox"/> Resistance Range	0.1 MΩ ~ 50 GΩ (Note 4)
<input type="checkbox"/> Measuring Accuracy	≥ 500V: 1MΩ ~ 1000MΩ: ± 4% + 5 counts 1GΩ ~ 10GΩ: ± 7% + 5 counts 10GΩ ~ 50GΩ: ± 12% + 5 counts < 500V: 0.1 MΩ ~ 1000MΩ: ± 7% + 5 counts < 100V: 0.1 MΩ ~ 1000MΩ: ± 10% + 5 counts
<input type="checkbox"/> Secure Protection Function	
<input type="checkbox"/> Fast Output Cut-off	Approx. 0.4mS, after NG happen
<input type="checkbox"/> Fast Discharge	Approx. 0.2S, Typical
<input type="checkbox"/> Ground Fault Interrupt	0.5mA±0.25mAac(ON), OFF
<input type="checkbox"/> Continuity Check	0.1Ω~5.0Ω± 0.2Ω, GC MODE
<input type="checkbox"/> Panel Operation Lock	YES
<input type="checkbox"/> Memory Storage	
<input type="checkbox"/> Memories, Steps	10 steps or 60 groups for total 60 memory location
<input type="checkbox"/> GO/NG Judgment Window	
<input type="checkbox"/> Indication, Alarm	GO: (Short Sound) NG: W-Arc, W-Hi, W-Lo, IR-Lo, IR-Hi, GFI (Long Sound)
<input type="checkbox"/> Remote Connector	
<input type="checkbox"/> Rear Panel 9 Pin D-type Connector	Input: Start, Stop, Interrupt Output: Under test, Pass, Fail
<input type="checkbox"/> TEST/RESET Control	Low – active control, (24V open voltage typical). Input requirements <ul style="list-style-type: none"> • Input time duration: 20msec. Approx. The above input circuits are not isolated from other internal circuits.
<input type="checkbox"/> Options	
<input type="checkbox"/> RS-232 Interface	Baud rate: 4800 ~ 19200, data bits: 8, stop bit: 1
<input type="checkbox"/> RS-485 Interface	A maximum of 32 devices connected to each bus.
<input type="checkbox"/> Ambient Temperature and Relative Humidity	
<input type="checkbox"/> Specifications range	18 to 28°C (64 to 82°F), ≤ 70% RH.

<input type="checkbox"/> 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
<input type="checkbox"/> Storage range	-10 to 60°C (-14 to 140°F), ≤ 80% RH.
<input type="checkbox"/> Installation Category	CAT II
<input type="checkbox"/> Power Requirement	
<input type="checkbox"/> Line Voltage	AC 100V, 120V, 220V ± 10%, 240V +5 - 10%
<input type="checkbox"/> Frequency	50 or 60 Hz
<input type="checkbox"/> Power	No load: < 60W
<input type="checkbox"/> Consumption	With rated load: 300W max.
<input type="checkbox"/> General	
<input type="checkbox"/> Dimension	270(W) x 105(H) x 350(D) mm
<input type="checkbox"/> Weight	Approx 12kg
<input type="checkbox"/> Safety	
<input type="checkbox"/> Ground Bond	Less than 100mΩ at 25Amp, 3sec
<input type="checkbox"/> Hipot	Less than 10mA at 1.5kVac, 3sec
<input type="checkbox"/> Insulation Resistance	Over 100MΩ at 500V 3sec
<input type="checkbox"/> Line leakage current	Less than 3.5mA at 127V, 3sec, normal, reverse

Note 1: AC set over 75VA, DC set over 22.5VA the maximum operating time is 60 seconds, and the same as rest time.

The period of rest time is 1/2 duty of operating time. For full rating output, the line input range is +10% ~ -0%.

Note 2: Only refer to 1.2kV resistance load.

Note 3: IR test time is 0.3 sec ~ 999 sec.

Note 4: Display resistance range is up to 60GΩ.

1.3 Standard Accessory

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
3.15A fuse	2	For 3.15A SLOW 110VAC used
1.6A fuse	2	For 1.6A SLOW 240VAC used
Quick Start Guide	2	One English version and one Traditional Chinese version.
User's manual CD	1	CD for user's manuals in English and Traditional Chinese

1.4 Optional Accessory

Item	Q'ty	Description
RJ-45 twin head link cable	1	L: 450mm
RJ-45 twin head link cable	1	L: 1000mm
RJ-45 twin head link cable	1	L: 2000mm
RJ-45 twin head link cable	1	L: 4000mm
DB-9F single head link cable	1	L: 7000mm
Across HV head + HV cable	1	L: 2000mm
Black banana head + HV cable	1	L: 2000mm

Remark: Optional accessory is for link test model of 19073 + RS485.

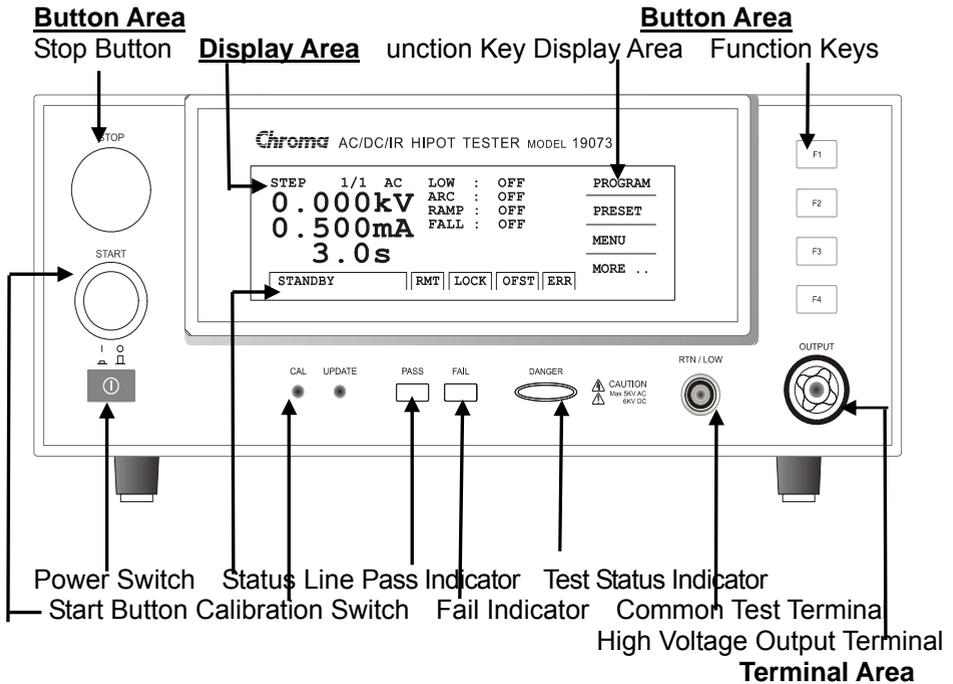
1.5 Initial Inspection

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. Operation and Setting

2.1 Front Panel

The front panel is divided into several function areas. This section explains each control and the information displays on LCD.



2.1.1 Display Area

- **Function Key Display Area:** Different function text appears in different menu. The mapping function keys (F1-F4) are located at right. The function key is invalid if the text is blank.
- **Status Line:** This line shows the setting mode, value range, and test results.

- **RMT**: When the text is highlighted, it means the system is under on-line status.
- **LOCK**: When the text is highlighted, it means the system is under protection via parameter.
- **OFST**: When the text is highlighted, it means the leakage current has been offset by the system.
- **ERR**: When the text is highlighted, it means the system transmission is error.
- **Test State Indicator**: The DANGER indicator, when it lights up it indicates the instrument is under test condition and there is high voltage or mass current output on the test terminal. Do not touch the test terminal at this time.
- **Pass Indicator**: When it lights up it indicates the DUT passes the test. This indicator remains lit up until [STOP] is pressed.
- **Fail Indicator**: When it lights up it indicates the DUT fails the test. This indicator remains lit up until [STOP] is pressed.

2.1.2 Button Area

- **Power Switch**: The switch to supply the AC power source for this instrument.
- **Stop Button [STOP]**: Press this button the instrument will return to the ready state for testing and cut out output as well as clear all judgments.
- **Start Button [START]**: Press this button the instrument will be in test state, which means there are outputs at the test terminal and all judgment functions are activated.
- **Calibration Switch**: It is used by Chroma for calibration before shipping the product. Nonprofessional is prohibited to use this function to avoid causing any damage.
- **Function Keys**: There are different functions in different display menus.

The mapping function description text is at right of the menu. The function key is invalid if the description text is blank.

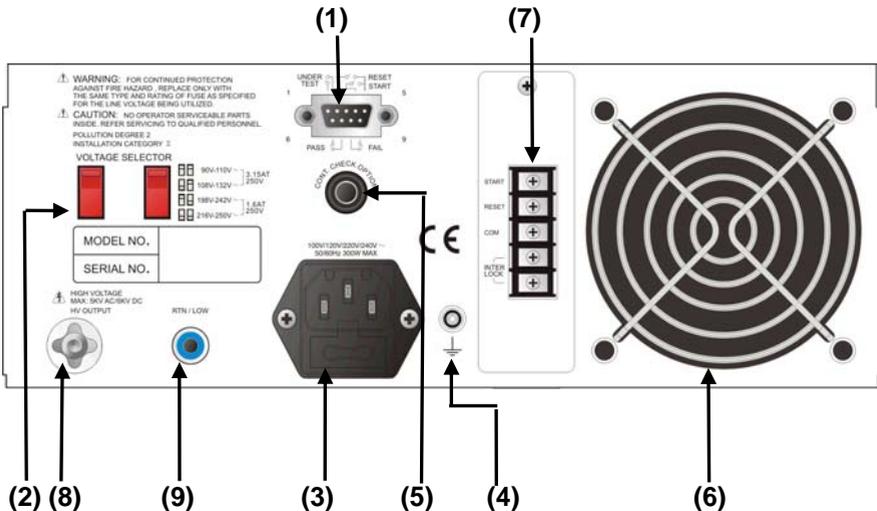
2.1.3 Terminal Area

- High Voltage Output Terminal: The terminal of high voltage with high potential is located at high potential terminal for high voltage output. This test terminal is very dangerous especially when the DANGER indicator is lit up. Do not touch it when there is high voltage output.
- Common Test Terminal (RET/LOW): It is the reference terminal at high voltage test, i.e. the low potential terminal almost equals to the chassis grounding.

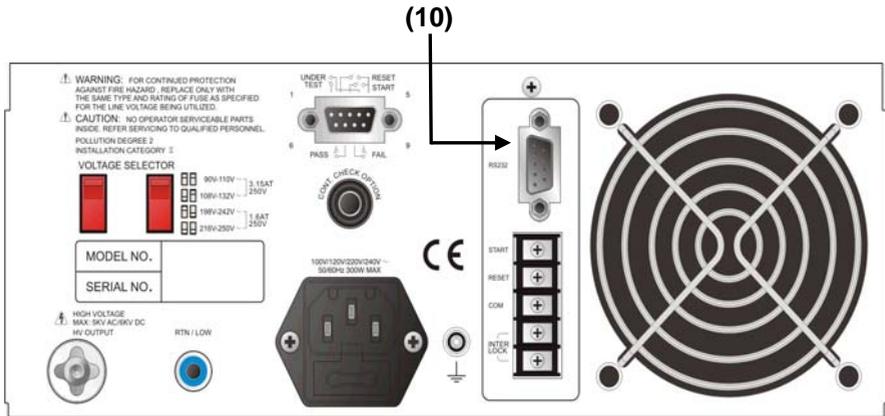
2.2 Rear Panel

The rear panel is divided into several areas. This section describes the function of each area.

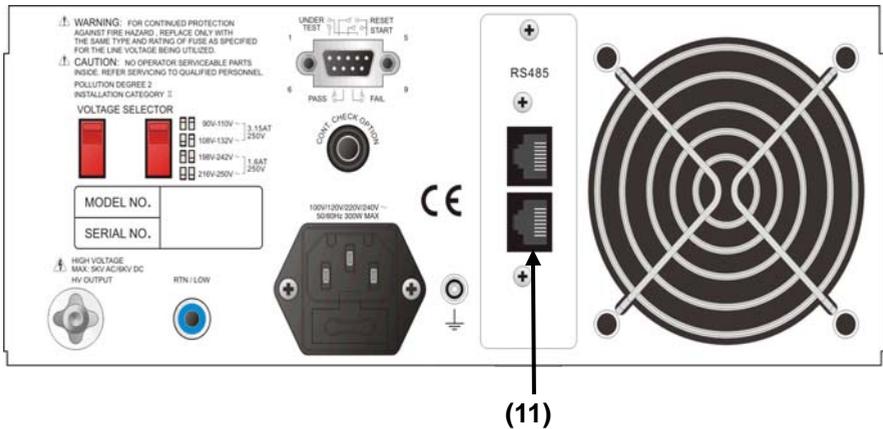
The standard rear panel of 19071/19072/19073:



The rear panel of link test model of 19073 + RS232 is shown as below:

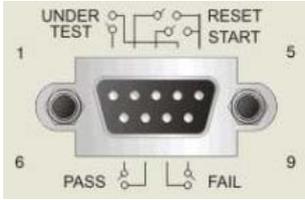


The rear panel of link test model of 19073 + RS485 is shown as below:



(1) REMOTE CONTROL

- The connection diagram of remote control signals is as the following.



- **START:** The input terminal for start test signal.
- **RESET:** The input terminal for stop test signal.
- **COM:** The common input terminal for START and RESET signal.
- **UNDER TEST:** This terminal will short-circuit when in test mode, thus it can be used to control the external signal. The connecting point specification is 115V AC, current less than 0.3A. The action time is from the instrument enters the test mode until it is reset or completes the test.
- **PASS:** This terminal will short-circuit when the DUT passes the tests, thus it can be used to control the external signal. The connecting point specification is 115V AC, current less than 0.3A. The action time is from the DUT is passed until it is reset.
- **FAIL:** This terminal will short-circuit when the DUT fails the tests, thus it can be used to control the external signal. The connecting point specification is 115V AC, current less than 0.3A. The action time is from the DUT is failed until it is reset.

(2) VOLTAGE SELECTOR: Input Power Range Switch

- To change the input AC power source for the following 4 types:
 - Voltage range 90V ~ 110V AC (3.15AT, 250V)
 - Voltage range 108V ~ 132V AC (3.15AT, 250V)
 - Voltage range 198V ~ 242V AC (1.6AT, 250V)
 - Voltage range 216V ~ 250V AC (1.6AT, 250V)
- Be sure to use correct fuse when switch the power source.

(3) AC LINE: AC Power Socket and Fuse Holder

It is a three-pin power socket and a fuse holder. AC power is inputted from this socket to supply the AC source needed by this instrument.

For detailed usage and specification of fuse, see *Chapter 3 Installation and Maintenance*.

(4) EARTH GROUND TERMINAL: Terminal Grounding for Safety

Use appropriate tools to ground this terminal surely. If it is not grounded surely, when the power circuit or any other devices connection short-circuited with the ground terminal, the instrument chassis may contain high voltage. This is very dangerous as it may cause electric shock if anyone touches it under the situation; therefore, it is necessary to connect the ground terminal to earth assuredly.

(5) CONTINUITY CHECK: Ground continue measuring and current output terminal

This function is for detecting ground continues of DUT grounding terminal.

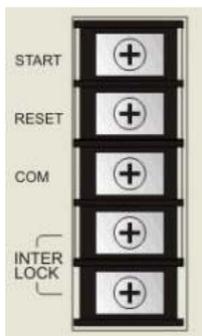
(6) FAN

The fan is activated simultaneously when the tester is powered on.

(7) Expanded Slot

The standard is 5PIN terminal slot, this slot provides the following functions:

- The connection diagram of expanded slot signals is as the following.



- START: Input terminal of starting test signal.
- RESET: Input terminal of stopping test signal.
- COM : Input common terminal of START and RESET signals.
- INTER LOCK: Short-circuited these two terminals then can output high

voltage. (This function is only for installing 5PIN on expanded slot. If this unit is link test model of 19073 + RS485, these two terminals are short-circuited fixedly.)

(8) HV OUTPUT Terminal

This terminal is the same as HV output terminal of front panel.

(9) Common Test Terminal: RET/LOW

This terminal is the same as common test terminal of front panel.

(10) RS-232 Interface Card:

This socket is for RS-232 interface which provided by the tester, it uses binary code transmission mode. Its command format is the same as RS-485 interface.

(11) RS-485 Slot

This slot supports two sockets of RJ-45 which provides multi-link function for the link test model of 19073 + RS485.

2.3 How to Perform Tests

■ Test Cable Offset Calibration

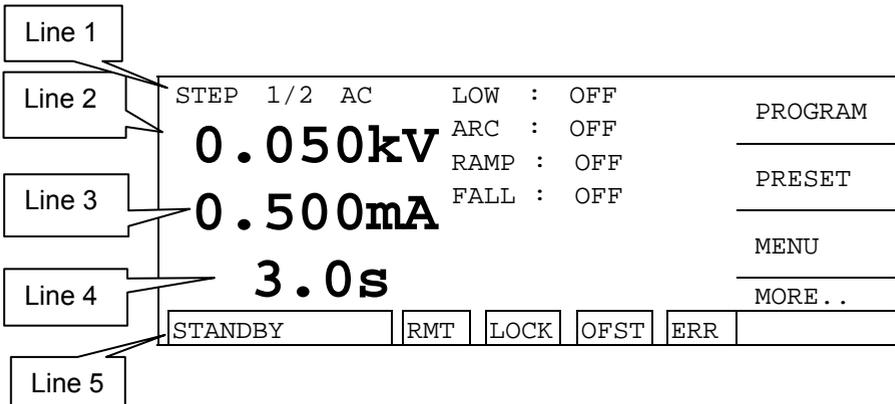
- (1) In [**Standby Menu**], press Function Key [**MORE..**] to enter the test menu of multiple STEPS.
- (2) Press Function Key [**OFFSET**], the monitor will show a menu to indicate you to open the output terminal.
- (3) Press [**START**], the DANGER indicator on the front panel will light up. The test time is 5 seconds. The system starts to measure the test cable offset and shows the reading on monitor, then saves it to memory.

■ Connection the DUT

First, ensure there is no voltage output and the DANGER indicator is off. Then connect the low potential test cable (black) to the common test terminal on system, and secure it with fixed plate. Short-circuit the test cable and high voltage output terminal. After confirming no high voltage is output, connect the DUT with low potential test cable first and high potential test cable later, and then plug in the high voltage test cable (red or white) to "High Voltage Output Terminal".

■ Test Steps(AC/DC/IR/GC)

- (1) Connection the DUT with correct procedures.
- (2) In **[Standby Menu]** (as shown below):



1. STEP 1/2 in “Line 1” indicates there are 2 test steps, and currently it is executing step 1. M02 1/2 in “Line 1” indicates this test parameter set have saved into the index 2 memory. There are 2 test steps in the memory, and currently it is executing step 1.
 2. AC in “Line 1” indicates this step is AC HiPot test mode.
 3. “Line 2” indicates the output voltage set for test.
 4. “Line 3” indicates the high limit for leakage current under STANDBY state in AC or DC HiPot test mode; or the low limit for insulation resistance under STANDBY state in IR test mode. When in TEST mode, it is the value of real leakage current or insulation resistance.
 5. “Line 4” indicates the testing time set under STANDBY state; or the remaining testing time under TEST state.
 6. “Line 5” is the “Status Line” that shows the current state or test results.
- (3) Press [STOP] to enable it standby for test and the “Status Line” shows “STANDBY”.
 - (4) Press [START] to begin the test. It will begin to output the test

voltage. The DANGER indicator lights up and the “Status Line” shows “UNDER TEST” to warn you that it is in test state and there is mass voltage output. “Line 2” will show the output voltage reading, “Line 3” will show the reading of leakage current or insulation resistance, and “Line 4” performs timing and countdown work.

(5) PASS Judgment

When all test steps are done and “Status Line” shows PASS, it indicates the DUT is a quality product. Then the output is cut out, rear panel outputs the PASS signal and buzzer (short beep) in the meantime.

(6) FAIL Judgment

If the measurement is abnormal, the system will judge the DUT as a failed product and cut out the output. The rear panel outputs FAIL signal and buzzer (long beep) in the meantime. The action continues until [STOP] key is pressed. “Status Line” will show fail state as below. Please see page 2-16 “Description Table for Test Result”.

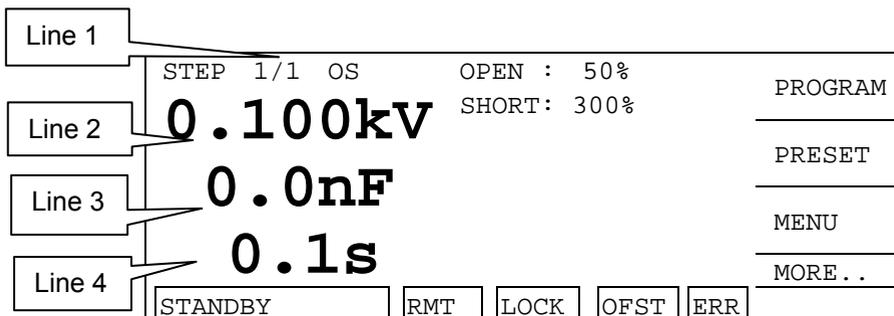
(7) If any errors happen and cause the [START] key to be locked, you can press [STOP] to release it.

(8) You can press [STOP] key anytime to stop the test output in any case.

■ Test Steps(OS)

(1) Connection the DUT with correct procedures.

(2) In [Standby Menu] (as shown below):



1. OS in “Line 1” indicates this step is **open/short detection mode**.
 2. “Line 2” indicates the output voltage set for test.
 3. “Line 3” indicates the capacitance value for reading.
 4. “Line 4” indicates the test time.
- (3) Press [STOP] to enable it standby for test and the “Status Line” shows “STANDBY”.
- (4) Please press [MORE..] to enter the test menu of multiple STEPS, the menu as shown below:

1	OS	OUTPUT 0.100kV	MEASURE 0.0nF	RESULT -----	OFFSET
					GET Cs
					MORE..
STANDBY		RMT	LOCK	OFST	ERR

1. Please press [OFFSET] to perform OFFSET elimination at first. It is needed to perform OFFSET elimination again when change the wire or fixture every time. This is for ensure the accuracy for the test.
2. It is need that the capacitance standard sample for the test as the DUT when test or change new DUT of capacitance. Press [GET Cs] to read the standard capacitance value for the value when test.
3. Please press [MORE..] again to back to standby menu.
4. Press [START] 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 test state and there is voltage output. “Line 2” will show the voltage output reading, “Line 3” will show the reading of capacitance, and “Line 4” performs timing and countdown work.

Note: When test OSC Mode, 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) PASS Judgment

When all test steps are done and “Status Line” shows PASS, it indicates the DUT is a good product. Then the output is cut off, rear panel outputs the PASS signal and buzzer (short beep) in the meantime.

(6) FAIL Judgment

If the measurement is abnormal, the system will judge the DUT as a failed product and cut off the output. The rear panel outputs FAIL signal and buzzer (long beep) in the meantime. The action continues until [STOP] key is pressed. “Status Line” will show fail state as below.

Test Result	Meaning
PASS	Passed the tests judged as PASS product
HIGH FAIL	Measurement is over the high limit
LOW FAIL	Measurement is under the low limit
OPEN FAIL	Capacitance open/capacitance reading is lower than the setting of OPEN.
SHORT FAIL	Capacitance short/capacitance reading is higher than the setting of SHORT.
ARC FAIL	Current ARC is over the high limit
I/O FAIL	Hardware detects bad signal (It maybe short circuit of DUT).
NO OUTPUT	Output is not enough (It maybe the test time is not enough).
VOLT OVER	Voltage reading is over the hardware valid digits.
CURR OVER	Current reading is over the hardware valid digits.
INRUSH FAIL	Charging current is over low (It maybe test fixture bad contact).
GFI TRIPPED	Grounding failed interrupted
SLAVE FAIL	SLAVE communication fails
SKIPPED	The step is skipped. To skip the step don't need to implement as conducting Get Offset or Get Cs.
Cs/SHORT FAIL	The Cs is too high. To stop the detection of SHORT may be resolve this problem.

(7) If any errors happen and cause the [START] key to be locked, you can press [STOP] to release it.

- (8) You can press [STOP] key anytime to stop the test output in any case.

3. Installation and Maintenance

3.1 Notices for Installation

This instrument generates high voltage output up to 6KV for external test. Any incorrect or mistaken procedures in using this instrument may cause injury or death. Thus for your safety, be sure to read through the notices described in this chapter and memorize them to prevent any accidents from happening.

■ Induction and electric shock

To avoid electric shock, we suggest you to put on the insulation rubber gloves before performing any electricity related work.

■ Grounding

There is a safety grounding terminal at the instrument rear panel. Ensure to use appropriate tools to connect the grounding terminal surely. If it is not grounding correctly, the chassis of test machine may contain high voltage when the power circuit or the connecting line of any devices short-circuited with the grounding terminal. This is very dangerous as it may cause electric shock if anyone touches the instrument under the circumstances. Therefore, it is necessary to connect the safety grounding terminal to earth correctly. See 2.2 *Rear Panel Description* for detail information.

■ Connecting test cable to the “Common Test Terminal”

Please connect the test cable to “Common Test Terminal” actually. Always check if the test cable is connected properly during test. When you need to connect the test cable to the unit for test, use the one on Common Test Terminal first to connect the DUT. It is very dangerous if the test cable on Common Test Terminal is not connected completely or loose as the entire DUT may contain high voltage. Refer to 2.1 *Front Panel Description*.

■ Connecting test cable to the “High Voltage Output Terminal”

Follow the procedures below to connect the high voltage output line after the “Common Test Terminal” is connected.

- Press [STOP] button first.
- Ensure the DANGER indicator is off.
- Short circuit the “Common Test Terminal” test cable and “High Voltage Output Terminal”, and ensure there is no voltage output.

- Last, connect the “Common Test Terminal” test line to the DUT and then the high voltage test cable to the DUT.
- Plug in the high voltage test cable to the “High Voltage Output Terminal”.

■ **End test**

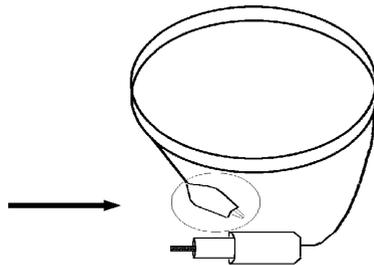
When tests are done and the test instrument is not in use or need to leave for a while during usage, make sure to turn off the power switch (to O). See 2-1 *Front Panel Description* for detail information.

■ **Dangerous places when the instrument is in test mode**

It is very dangerous to touch the area with high voltage such as the DUT, test cable, probe, and output terminal when the instrument is in test mode.

※ **DO NOT touch the alligator clip as shown below on the test cable when the system is in test mode as the rubber insulation is not good enough and may cause danger if touched.**

Do not touch it when in high voltage output



■ **End test confirmation**

You may touch the DUT, high voltage test cable or high voltage output area like output terminal in order to alter the layout or perform particular test request, thus be sure to turn off the power before doing it. For testing the DC HiPot/insulation resistance, the DUT may contain high voltage after completing the test, so you need to carefully follow the instructions described in this chapter to perform the work.

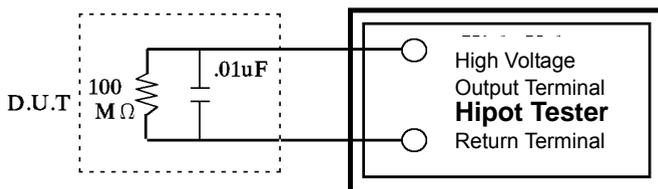
3.1.1 Charging During DC HiPot/Insulation Resistance Test

■ Charge

When doing DC HiPot/insulation resistance test, the DUT, capacitor, test cable, probe and output terminal, even the test instrument may charge with high voltage. The charged voltage may need a period of to discharge after the power switch is turned off. Do not touch any places that may cause electric shock as mentioned above especially at the moment of turning off the power.

■ Confirming the charged voltage is discharged totally

The test voltage applied as well as the DUT characteristics determine the total discharge time for the charged voltage. Assuming the high voltage on the DUT is the voltage plus a 0.01uF capacitor paralleling a 100MΩ resistance circuit, then after turning off the power the voltage on test instrument and DUT takes about 3.5 seconds to decrease to 30V. Thus when the test voltage is 500V, it needs about 2.8 seconds. Suppose we already know the time constant of a DUT, you can follow the description above to calculate the time required for voltage decreasing to beneath 30V after turning off the power. The method is using the time decreased to under 30V multiplies the time constant ratio as the figure shown below.



<Formula>

$$\text{Test Voltage} * e^{-t/RC} = \text{Residual Voltage}$$

$$\begin{aligned} \text{Ex.: } 1000\text{V} * e^{-t/RC} &= 30\text{V} \\ \ln^{-t/RC} &= \ln 0.03 \\ -t / RC &= -3.5 \\ t &= 3.5 \text{ sec} \end{aligned}$$

■ Remote control system

This system is capable of remote control. Usually it uses external

control signal to do the high voltage output control. For your safety and to prevent accidents, the following principles of control must be performed accurately. Do not allow any unexpected high voltage output to cause any hazards. When the system has high voltage output, operators and other personnel are not allowed to touch the DUT, test cable and probe and output terminal, etc.

■ **Turn the power switch on or off ※Attention※**

The product should be so positioned that the power switch can be easily reached by the operator during emergency. Once the power switch is cut off, wait a few seconds to turn it on again. Do not turn on/off the power switch repeatedly to avoid causing any errors. It is very dangerous to do repeating power on/of in high voltage output state. **The high voltage output terminal cannot connect to any objects during power on or off to avoid hazards caused by abnormal high voltage output.**

■ **Miscellaneous notices**

Do not short circuit the instrument output line, grounding line, transmission line, or other connector grounding line, and AC source to avoid the entire test device being charged to a very dangerous voltage. To short circuit the High Voltage Output Terminal and Common Test Terminal, the instrument chassis must be grounded to earth first.

3.1.2 Emergency Events

■ **Emergency management**

In the emergency situations of electric shock, DUT on fire or system on fire, follow the steps below to avoid causing bigger hazards.

- First, cut off the power switch.
- Then, unplug the power cord.

3.1.3 Solving Problems

■ **When problem happens**

The problems in the following conditions are very dangerous. The output terminal may still have high voltage output even the [STOP] button is pressed, so you need to be very careful.

- The DANGER indicator still lights up after the [STOP] button is

pressed.

- There is no reading on voltage meter, however the DANGER indicator is lit.

When any of the above conditions happens, turn off the power and unplug the AC power cord. Do not use it again as the failure is very dangerous. Send it back Chroma or dealer for repair and services.

■ **DANGER indicator failure**

If you press the [START] button and the voltage meter shows readings but the DANGER indicator is still off, it means the indicator may be failure. Turn the instrument off and replace it immediately, then return the malfunction device to Chroma or dealer for repair and services.

■ **Notices when operating the instrument of long duration under normal condition**

If the setting high limit closes to the rated value, pay attention to the temperature changes. Stop using it if the ambient temperature is over 40°C. Wait until the temperature is down to normal to resume the operation, and the instrument must be inspected first.

■ **There are four types of AC INPUT power source used in this instrument**

Switch the voltage selector on the rear panel to the correct position according to the voltage used locally. Ensure the AC power source is same as marked on the power switch that located on the rear panel, and the fuse is changed to the appropriate one when plug in the power cord. Following table lists the fuses for the voltage used:

Center Voltage	Range	Fuse
100V	90V ~ 110V	3.15A Slow/250V
120V	108V ~ 132V	3.15A Slow/250V
220V	198V ~ 242V	1.6A Slow/250V
240V	216V ~ 250V	1.6A Slow/250V

The fuse should conform to the voltage used and replace it when the power cord is unplugged to avoid electric shock. When replacing the fuse, press the fuse holder inside the power socket then remove the existing fuse and insert the new one, then plug in the power cord.

 **CAUTION** Be sure to use correct fuse when changing it, or it may cause danger easily.

■ **This instrument operates in AC power source.**

If the power source is unstable in the range selected, it may cause the instrument to act abnormally or inaccurately. Please use appropriate equipment such as power regulator to convert it to applicable power source.

■ **This instrument uses the power transformer 200VA or above.**

If the tested device draws a great amount of current, it may flow in large current (about 10 Ampere) up to 10mS before the judgment of fail and output current cut off. The same situation may occur before performing the test. Thus it is necessary to pay attention to the capacity of power cord and the current line linked with other instruments and devices.

■ **Storage**

The normal temperature range is 18°C~28°C, ≤ 70% RH. The operation may incorrect if over the range. The storage temperature is -10°C~60°C, ≤ 80% RH. If you are not planning to use it for a long period of time, pack it with the original box for storage. For the sake of correct test and safety of this instrument, make sure not to store it in a place with direct sunlight or high temperature, also away from shaky, damp and dusty area.

■ **Warming up**

This instrument activates at power on; however, in order to meet the accuracy specified in the specification, please warm it up for 15 minutes or above.

■ **Warning Signal of Testing**

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

■ **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.

■ **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.

3.2 Notices for Maintenance

Except notified in the manual there is no items can be maintained by user in this device.

Please contact Chroma or sales agent when any abnormal condition occurs in this device. Do not perform maintenance by yourself to avoid causing any unnecessary hazards that may damage the device.

3.3 Troubleshooting

Besides replacing the fuse (see 3.1.3 Solving Problems) or other notified in the manual, there is no troubleshooting to be performed by user.

Please contact Chroma or sales agent when any abnormal condition occurs in this device. Do not perform maintenance by yourself to avoid causing any unnecessary hazards that may damage the device.



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