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※※※ Storage. Freight. Maintenance. Disposal ※※※

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.

Disposal
When the device in badly condition and can't be used or repaired, please discard it according to your company disposal procedures or local legal procedures. Don't discard arbitrary to avoid polluting environment.

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Revision History

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

Date	Version	Revised Sections
Jan. 2003	1.0	Complete this manual.
April 2003	1.1	Modify ”Specifications (18°C ~ 28°C RH ≤ 70%)” “Standard Accessory” “Rear Panel” “RS-485 Interface” “Solving Problems”
Dec. 2003	1.2	Modify “Introduction” “Rear Panel” “Operation” “Auto Range” “Calibration Procedure” “Command Description” Delete “RS-485 Interface” Add “RS485 Interface (Optional)”
March 2004	1.3	Add “The Danger of Operating” “Storage. Freight. Maintenance. Disposal” Modify “Specifications (18ºC ~ 28ºC RH ≤ 70%)” “Rear Panel”
Sep. 2004	1.4	Modify “Product Features” “Optional Accessory” “Rear Panel” “PROGRAM Parameter Setting” “How to Perform Tests” “RS485 Interface (Option)”

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Table of Contents

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1. Introduction

1.1 An Overview of Function

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for the outputted test voltage from zero rising to the specified value.

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1.3 Specifications (18ºC ~ 28ºC RH ≤ 70%)

❑ **Withstanding Voltage Test**	
❑ Test Voltage	AC: 0.05~5kV / DC: 0.05~6kV Constant Voltage (19072, 19073 only)
❑ Voltage Regulation	≤ 1%+5V, Rated Load
❑ V-display Accuracy	± (1% of reading + 5 counts), 2V resolution
❑ Cutoff Current (Note1)	AC: 0.1mA ~ 20mA, DC: 0.01mA ~ 5mA (Note1), 0.1uAdc resolution
❑ 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)
❑ Output Frequency	50Hz, 60Hz
❑ Test Time	0.1 ~ 999 Sec, continue (Note3)
❑ Dwell Time	0.1 ~ 999 Sec, off
❑ Ramp Time	0.1 ~ 999 Sec, off (0.1sec approx.)
❑ Fall Time	0.1 ~ 999 Sec, off
❑ **Arc Detection**	
❑ Setting Mode	Programmable Setting
❑ Detection Current	AC: 1mA ~ 20mA, DC: 1mA ~ 5mA
❑ 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.
❑ **Insulation Resistance Test (19073 only)**	
❑ Test Voltage	DC: 0.05kV ~ 1kV, Constant Voltage
❑ V-display Accuracy	± (5% of reading + 5 counts) (open voltage), 2V resolution
❑ Resistance Range	0.1 MΩ ~ 50 GΩ (Note 4)
❑ 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
❑ **Secure Protection Function**	
❑ Fast Output Cut-off	Approx. 0.4mS, after NG happen
❑ Fast Discharge	Approx. 0.2S, Typical
❑ Ground Fault Interrupt	0.5mA ± 0.25mAac (ON), OFF
❑ Continuity Check	0.1Ω ~ 5.0Ω ± 0.2Ω, GC MODE
❑ Panel Operation Lock	YES
❑ **Memory Storage**	
❑ Memories, Steps	10 steps or 60 groups for total 60 memory location
❑ **GO/NG Judgment Window**	

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❑ Indication, Alarm	GO: (Short Sound) NG: W-Arc, W-Hi, W-Lo, IR-Lo, IR-Hi, GFI (Long Sound)
❑ **Remote Connector**	
❑ Rear Panel 9 Pin D-type Connector	Input: Start, Stop, Interrupt 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 (RS485 only)**	
❑ RS-485 Interface	A maximum of 32 devices connected to each bus
❑ **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)
❑ Storage range	-10 to 60°C (-14 to 140°F), ≤ 80% RH.
❑ **Power Requirement**	
❑ Line Voltage	AC 100V, 120V, 220V ± 10%, 240V +5 -10%
❑ Frequency	50 or 60 Hz
❑ Power	No load: < 60W
❑ Consumption	With rated load: 300W max.
❑ **General**	
❑ Dimension	270(W) x 105(H) x 350(D) mm
❑ Weight	Approx 12kg
❑ **Safety**	
❑ Ground Bond	Less than 100mΩ at 25Amp, 3sec
❑ Hipot	Less than 10mA at 1.8kVac, 3sec
❑ Insulation Resistance	Over 100MΩ at 500V 3sec
❑ 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 60seconds, and the rest time is the same.
If 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 range is 0.3 sec ~ 999 sec.
Note 4: Display resistance range is up to 60GΩ.

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1.4 Standard Accessory

Item	Part Number	Q'ty	Description
Power Cord	W12 010130	1	Line cord
3P – 2P Adapter	N31 000039	1	Power cord adapter
Test Cable (1)	W38 001940	1	Withstanding test cable for HIGH terminal
Test Cable (2)	W38 001760	1	Withstanding test cable for LOW terminal
Test Cable (3)	W38 001930	1	Ground continuity test cable
Fuse (1)	A21 020400	2	3.15A SLOW for 110VAC
Fuse (2)	A21 018300	2	1.6A SLOW for 240VAC

1.5 Optional Accessory

Item	Part Number	Q'ty	Description
RJ-45 twin head link cable	W39 000695	1	L: 450mm
RJ-45 twin head link cable	W38 029300	1	L: 1000mm
RJ-45 twin head link cable	W39 000694	1	L: 2000mm
RJ-45 twin head link cable	W38 029200	1	L: 4000mm
DB-9F single head link cable Across HV head + HV cable	W39 000771	1	L: 7000mm

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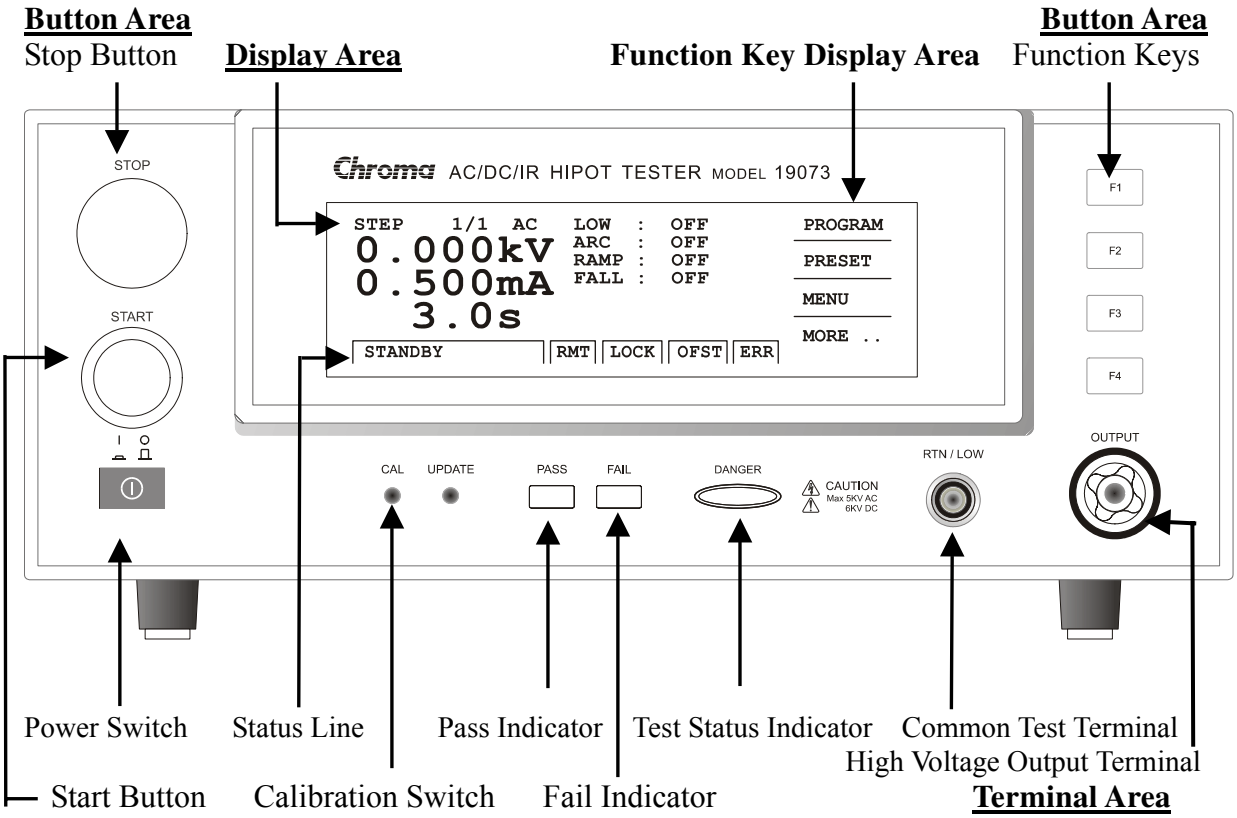
2. Operation and Setting

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.

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- 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.

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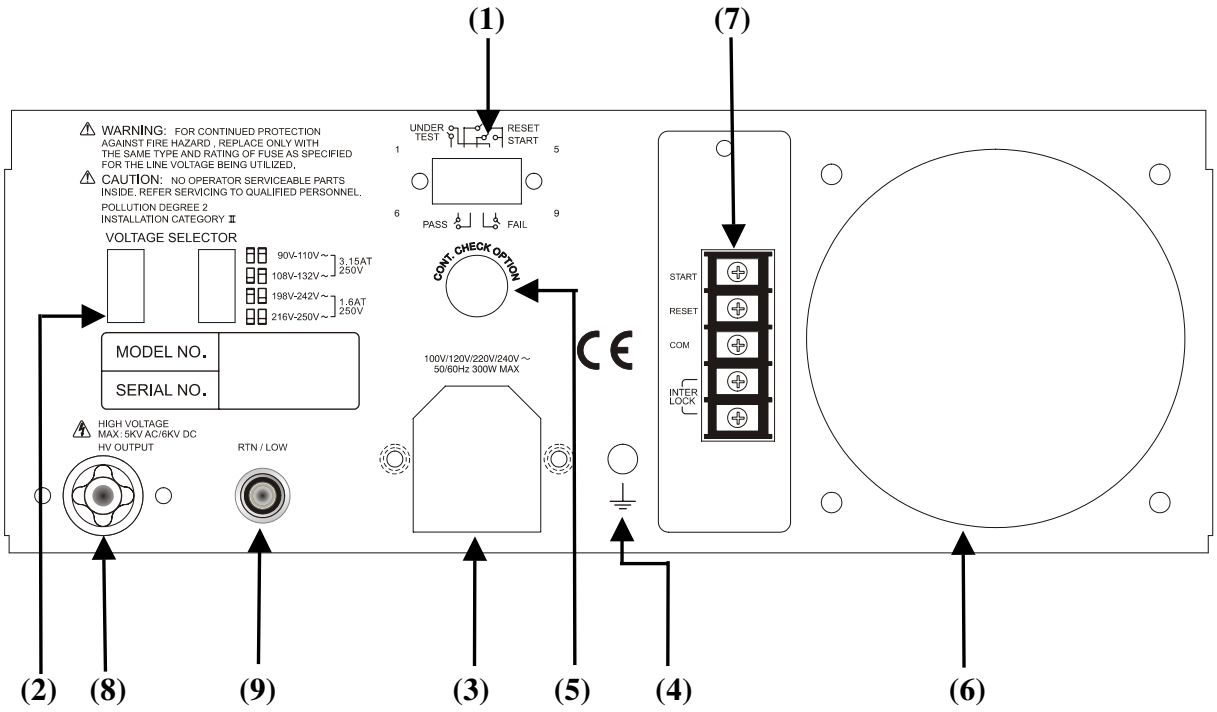
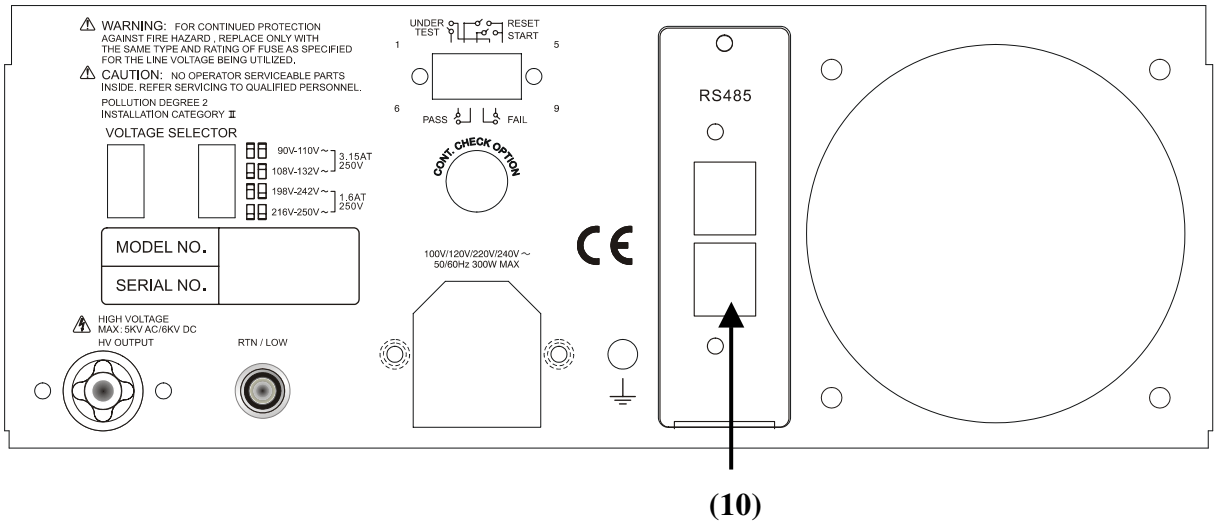
2.2 Rear Panel

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 + RS485 is shown as below:



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(1) REMOTE CONTROL

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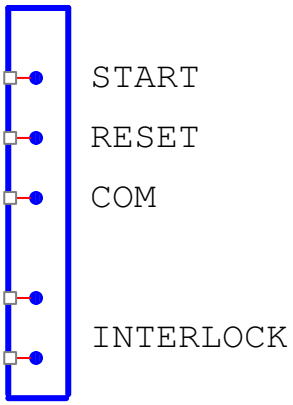
(4) EARTH GROUND TERMINAL: Terminal Grounding for Safety
Use appropriate tools to ground this terminal surely. If it is not grounded surely, when the power circuit or any other devices connection short-circuited with the ground terminal, the instrument chassis may contain high voltage. This is very dangerous 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) Expanded Slot
This slot supports two sockets of RJ-45, which provides multi-link function for the link test model of 19073 + RS485.

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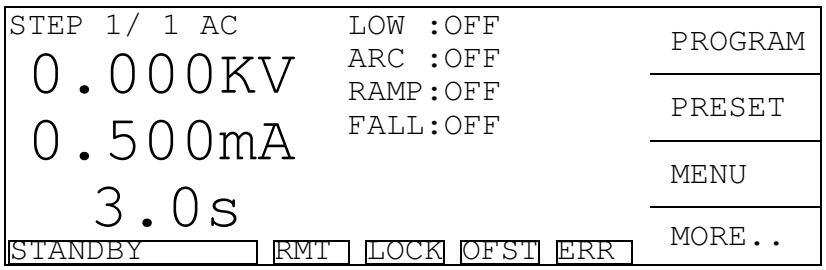
2.3 Operation

[Standby Menu]: The screen appears as below after powered on.



2.3.1 Memory Process

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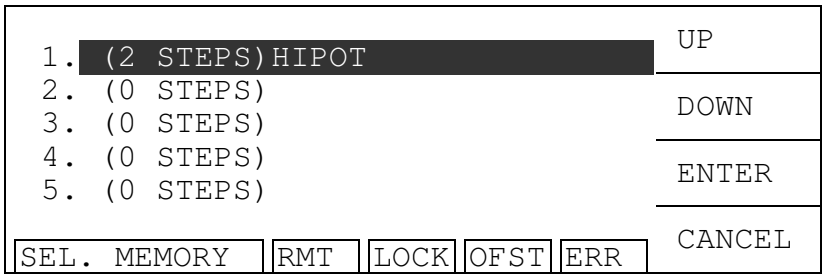
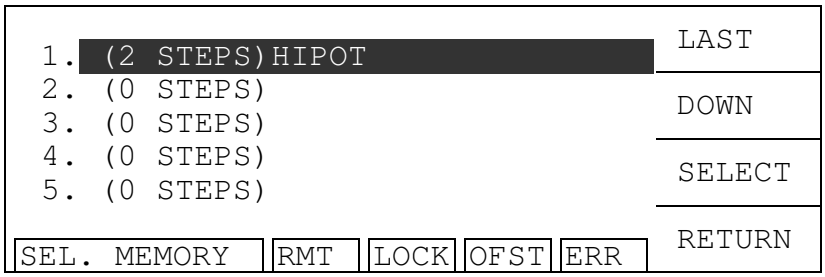
(4) At this time use Function Key [F1] and [F2] to move the highlight to the memory for processing, then press Function Key [F3] will prompt a confirmation window. Press Function Key [ENTER] to confirm and Function Key [UP] or [DOWN] to select stored character of file name. Press [NEXT.C] to select next character and [ENTER] to confirm the file name, the maximum file name is 10 characters.



(5) When executing [RECALL] or [DELETE] function, use Function Key [F1] and [F2] to move the highlight to the memory for processing, then press Function Key [F3] will prompt a confirmation window. Press Function Key [YES] to confirm or Function Key [NO] to cancel, then can recall or delete the memory set. Each memory contains test parameters, preset parameters and number of test steps.



2.3.2 System Setup

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(3) System Parameter Setting Table

Item	Range	Default	Description
CONTRAST	1~15	7	Adjust the LCD brightness
BUZZER VOLUME	HIGH/MEDIUM /LOW/OFF	HIGH	Adjust the buzzer volume
EN50191	ON/OFF	OFF	The output is meet to EN50191 requirement (AC Max 3mA,DC Max 5mA)
DC 50V AGC	ON/OFF	OFF	Select if open hardware AGC as DC voltage setting is 50V~499V. (When this item is OFF, hardware AGC is opened only DC voltage set to above 500V automatically.)

2.3.3 PRESET Parameter Setting

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2.3.4 PROGRAM Parameter Setting

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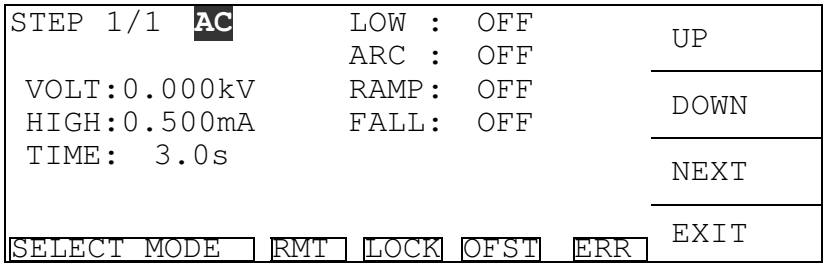
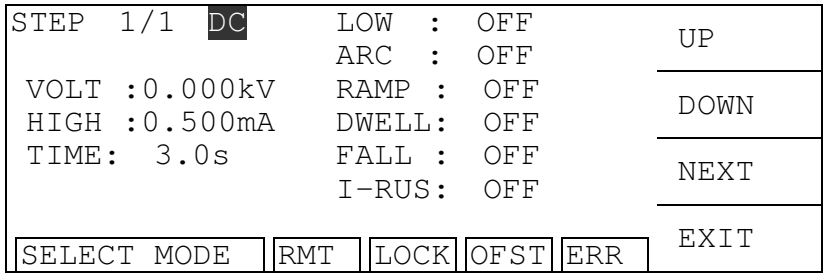
(1) AC HiPot Test Mode



VOLT : Set the required voltage for HiPot test.
HIGH : Set the upper limit for leakage current.
TIME : Set the required time for testing, 0 means continuous test. (Judge the high and low limit for leakage current during the time.) The voltage value is shown which within specification, the minimum test time should be equal to 0.3 second. When the displayed voltage is not reach to 9/10(Software AGC ON) or 2/3(Software AGC OFF) of setting voltage value, the judgment function will show FAIL.
LOW : Set the low limit for leakage current, 0 means OFF.
ARC : Set the high limit for ARC, 0 means OFF.
RAMP : Set the required time for rising to selected voltage, 0 means OFF.
FALL : Set the required time for falling from selected voltage to zero, 0 means OFF.

(2) DC HiPot Test Mode



VOLT : Set the required voltage for HiPot test.
HIGH : Set the high limit for leakage current.
TIME : Set the required time for testing, 0 means continuous test. (Judge the high and low limit for leakage current during the time.) The voltage value is shown which within specification, the minimum test time should be equal to 0.2 second. When the displayed voltage is not reach to 9/10(Software AGC ON) or 2/3(Software AGC OFF) of setting voltage value, the judgment function will show FAIL.
LOW : Set the low limit for leakage current with the value less than the high limit for leakage current or OFF.
ARC : Set the high limit for ARC, 0 means OFF.
RAMP : Set the required time for rising to selected voltage, 0 means OFF.
DWELL : Set DWELL time, 0 means OFF. (Do not judge the high and low limit for leakage current during DWELL TIME operation, but do not over the high limit of setting range.)
FALL : Set the required time for falling from selected voltage to zero, 0 means OFF.
I-RUS : Set the low limit for inrush current, 0 means OFF.

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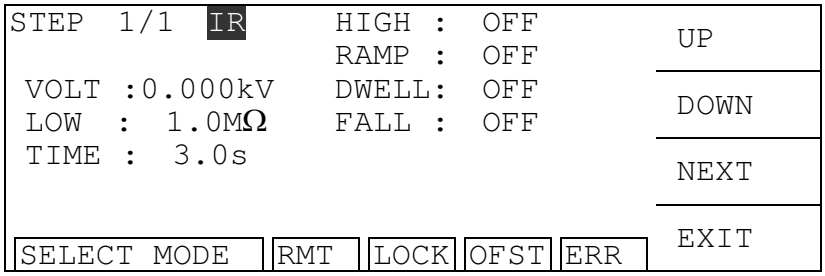
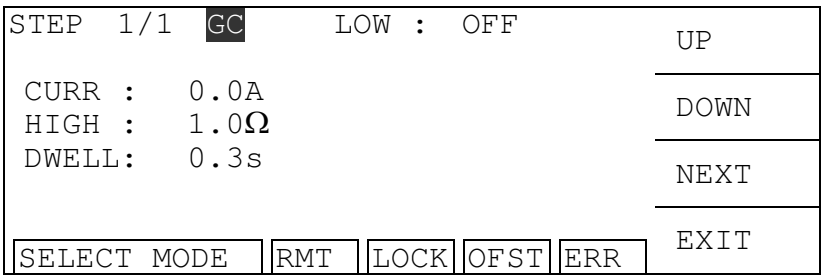
(3) Insulation Resistance Test Mode



VOLT : Set the required voltage for insulation resistance test.
LOW : Set the low limit for insulation resistance.
TIME : Set the time required for test, 0 means continuous test. (Judge the high and low limit for insulation resistance during the time.)
HIGH : Set the high limit for insulation resistance with the value larger than the low limit of insulation resistance or OFF.
DWELL: Set the required time for test, 0 means OFF. (Do not judge the high and low limit for insulation resistance during this period.)
FALL : Set the required time for falling from selected voltage to zero, 0 means OFF.

(4) Ground Continue Mode



CURR : Set the output current (0.1A maximum).
HIGH : Set the high limit of ground continue (0.1Ω ~ 5Ω

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2.4 How to Perform Tests

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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.

Test Result	**Meaning**
PASS	Passed the tests judge as PASS product
HIGH FAIL	Measurement is over the high limit
LOW FAIL	Measurement is under the low limit
ARC FAIL	Current ARC is over the high limit
I/O FAIL	Hardware detects bad signal
NO OUTPUT	Output is not enough (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 (Test fixture bad contact)
GFI TRIPPED	Grounding failed interrupted

(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.

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2.5 Other User Setting Function

2.5.1 KEY LOCK Function

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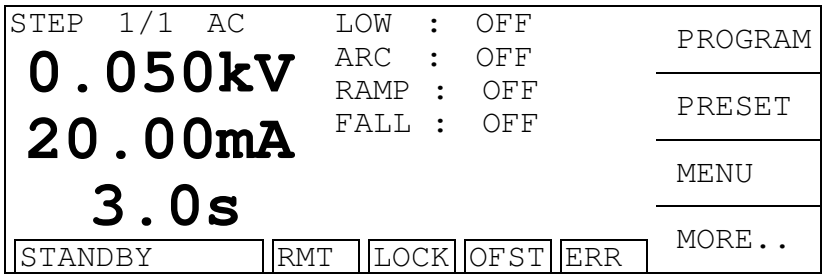
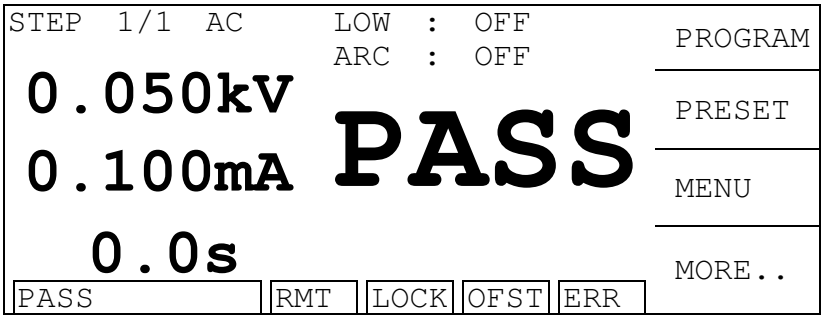
2.5.2 Auto Range

(1) Set WV-AUTO RANGE as ON under PRESET function list.
(2) The current set to high range as below shown.

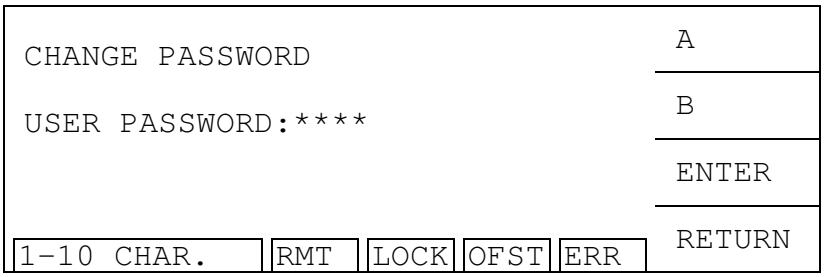


(3) The test is ended before 0.6 sec, if the current is shown as low range then the current auto range to low range as the following figure.



2.5.3 Change User Password

(1) In **[Standby Menu]**, press Function Key [MENU], and use Function Key [F1] and [F2] to move the highlight to "CHANGE PASSWORD" and press Function Key [SELECT] to enter into the password menu.



(2) Use Function Key [A] and [B] to input the original PASSWORD (default is AAAA), and press Function Key [ENTER] will show the following "NEW PASSWORD" window.

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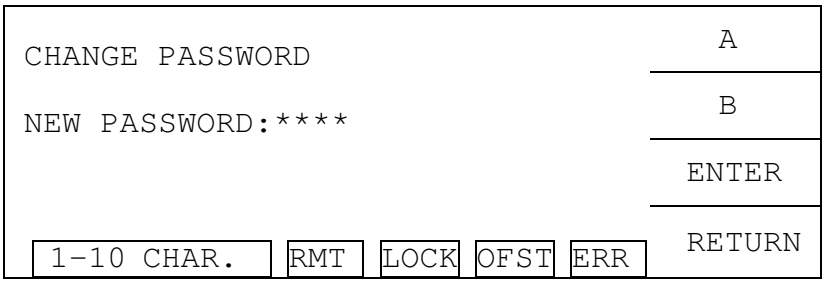
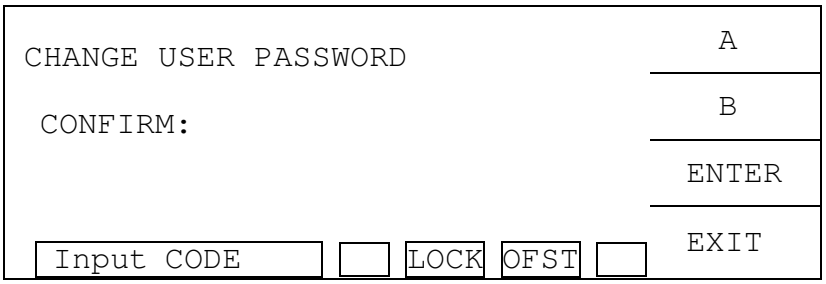


(3) Use Function Key [A] and [B] to input the NEW PASSWORD (maximum10 characters), and press Function Key [ENTER] will display the "CONFIRM" window.



(4) Use Function Key [A] and [B] to input the NEW PASSWORD, and press Function Key [ENTER]. Press [RETURN] after completing the setting.

2.5.4 Remote Control

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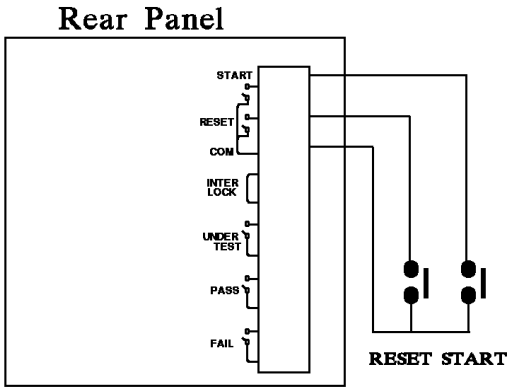

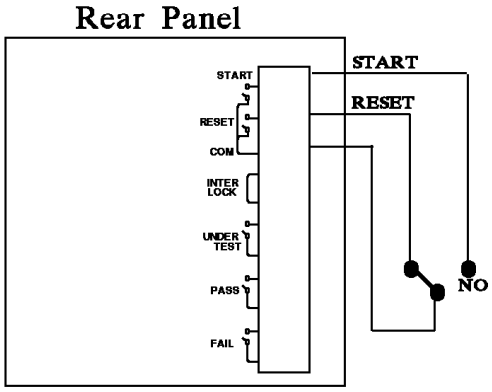

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to control the external signal. The connecting point specification is 115V AC, current less than 0.3A. The action time is from the DUT is passed until it is stopped.

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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.

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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.

<<<

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<Formula>

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

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

$\ln^{-t/RC} = \ln 0.03$

$- t / RC = -3.5$

$t = 3.5$ sec

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power cord. Do not use it again as the failure is very dangerous. Send it back Chroma or dealer for repair and services.

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if over the range. The storage temperature is -10ºC~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.

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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.

3.4 Input/Output Pin Assignment

See the descriptions of front panel and rear panel in Chapter 2.

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4. Calibration Procedure

Before performing this section the HiPot tester must warm up at least for 30 minutes.
Take off the calibration label at the front panel and press the lock switch. After completed the calibration, please press the lock switch again for opening the hardware data backup protection circuit to avoid calibration data loss.

The following items are required for calibration.

■ **Voltage Calibration (See 4.2)**

ACV 5KV Offset (0.05kV) ; AC HiPot Voltage Offset calibration (AC Mode)
ACV 5KV Full (4KV) ; AC HiPot Voltage Full calibration (AC Mode)
DCV 6KV Offset (0.05kV) ; DC HiPot Voltage Offset calibration (DC/IR Mode)
DCV 6KV Full (4KV) ; DC HiPot Voltage Full calibration (DC/IR Mode)
IRV 1KV Offset (0.05kV) ; IR Impedance Voltage Offset calibration (DC/IR Mode)
IRV 1KV Full (1kV) ; IR Impedance Voltage Full calibration (DC/IR Mode)

■ **Current Calibration (See 4.3)**

ACA 3mA Offset (0.12mA) ; AC HiPot current 3mA range Offset calibration (AC Mode)
ACA 3mA Full (2.4mA) ; AC HiPot current 3mA range Full calibration (AC Mode)
ACA 20mA Offset (2.4mA) ; AC HiPot current 20mA range Offset calibration (AC Mode)
ACA 20mA Full (12mA) ; AC HiPot current 20mA range Full calibration (AC Mode)
DCA 3mA Offset (0.12mA) ; DC HiPot current 3mA range Offset calibration (DC/IR Mode)
DCA 3mA Full (2.4mA) ; DC HiPot current 3mA range Full calibration (DC/IR Mode)
DCA 5mA Offset (2.4mA) ; DC HiPot current 5mA range Offset calibration (DC/IR Mode)
DCA 5mA Full (4.8mA) ; DC HiPot current 5mA range Full calibration (DC/IR Mode)

■ **ARCing Calibration (See 4.4)**

AC ARC 20mA (7mA) ; AC Withstanding Voltage ARCing calibration (AC Mode)
DC ARC 5mA (5mA) ; DC Withstanding Voltage ARCing calibration (DC Mode)

■ **Insulation Resistance Calibration (See 4.5)**

IRR Range1 (1000MΩ) ; IR Resistor range 1 calibration (IR Mode)
IRR Range2 (100MΩ) ; IR Resistor range 2 calibration (IR Mode)
IRR Range3 (10MΩ) ; IR Resistor range 3 calibration (IR Mode)
IRR Range4 (10MΩ) ; IR Resistor range 4 calibration (IR Mode)

■ **Ground Continue Calibration**

GC 5Ω Offset (1Ω)

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■ **LCD Contrast Calibration**

CAL. CONTRAST (7) ; LCD contrast calibration

4.1 Calibration

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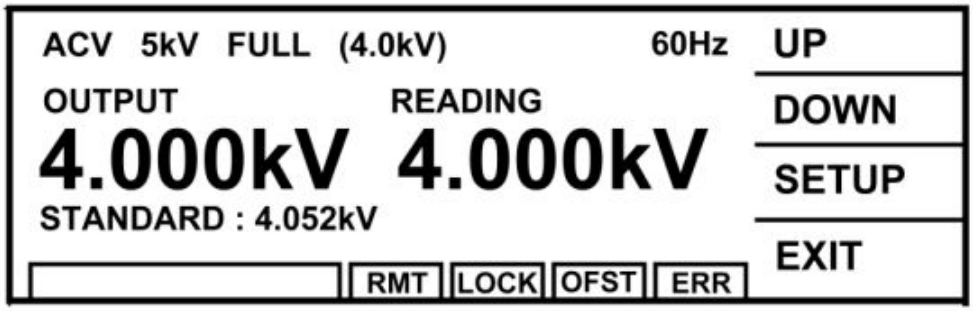
[ENTER] for saving.

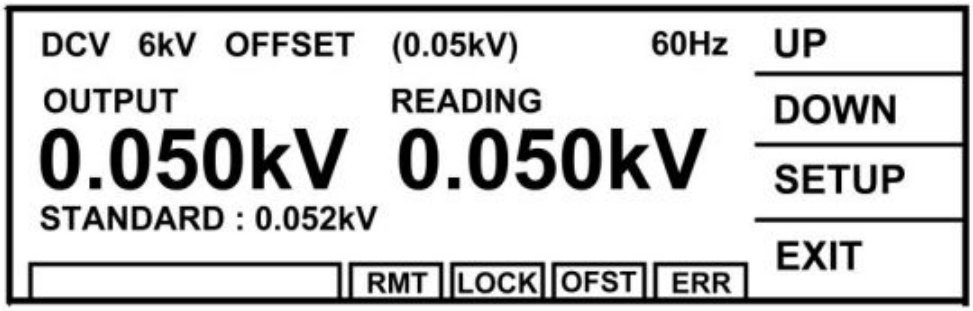
(5) Press [STOP] to stop ACV voltage offset calibration.
(6) Press [UP] to change to the next calibration item.
(7) Press [STOP][START] to read the high voltage meter value, ex. 4.052kV.



(8) Press [INC.] or [DEC.] until shows 4.052 kV and press [ENTER] for saving.
(9) Press [STOP] to stop ACV voltage full scale calibration.

4.2.3 DCV Calibration (DC/IR MODE)

(1) Press [UP] or [DOWN] to select DCV offset calibration.
(2) Connect a DC high voltage meter to HiPot tester.
(3) Press [STOP][START] to read the high voltage meter value, ex. 0. 052kV.



(4) Press [INC.][DEC.] until shows 0.052kV and then press [ENTER] for saving.
(5) Press [STOP] to stop DCV voltage offset calibration.
(6) Press [UP] to change to the next calibration item.
(7) Press [STOP][START] to read the high voltage meter value, ex. 4.052kV.

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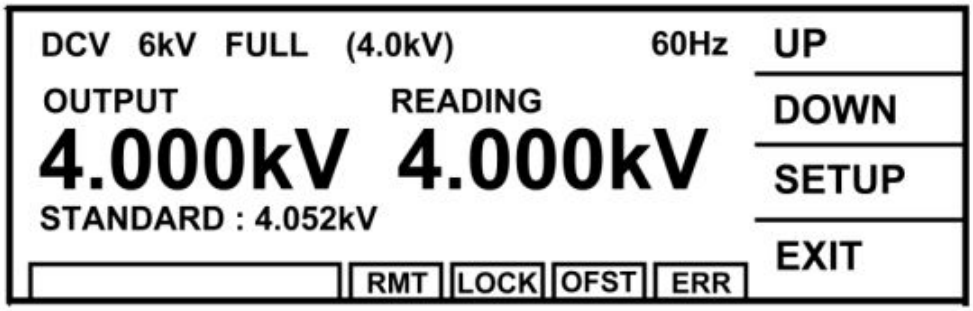
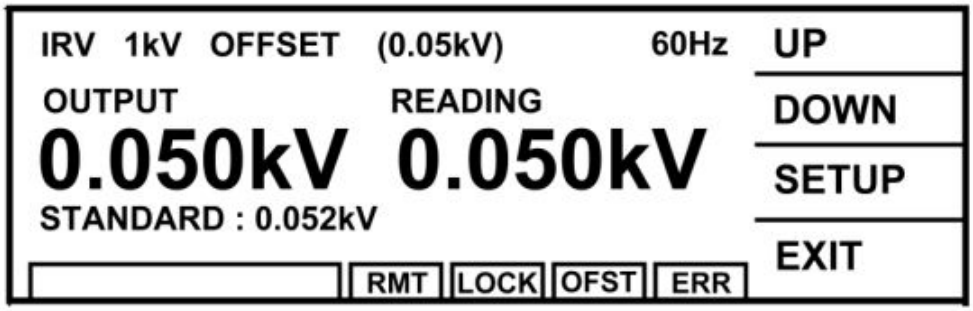


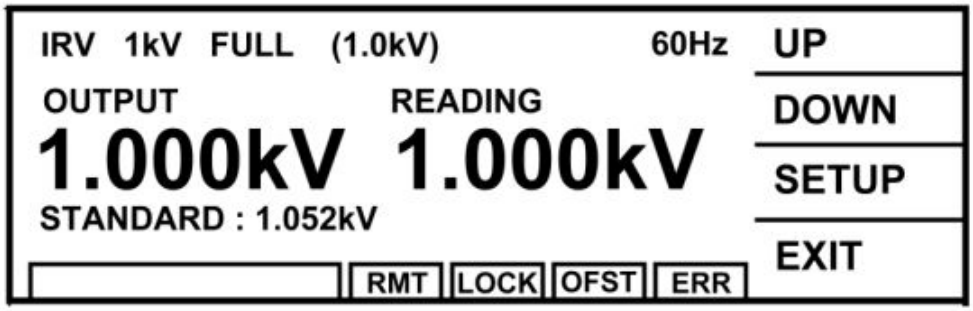
(8) Press [INC.] or [DEC.] until shows 4.052 kV and then press [ENTER] for saving.
(9) Press [STOP] to stop DCV voltage full scale calibration.

4.2.4 IRV Calibration (DC/IR Mode)

(1) Press [UP] or [DOWN] to select IRV offset calibration.
(2) Connect a DC high voltage meter to HiPot tester.
(3) Press [STOP][START] to read the high voltage meter value, ex. 0. 052kV.



(4) Press [INC.] or [DEC.] until shows 0. 052 kV and then press [ENTER] for saving.
(5) Press [STOP] to stop IR voltage offset calibration.
(6) Press [UP] to change to the next calibration item.
(7) Press [STOP][START] to read the high voltage meter value, ex. 1.052kV.



(8) Press [INC.] or [DEC.] until shows 1.052 kV and then press [ENTER] for saving.
(9) Press [STOP] to stop IR voltage full scale calibration.

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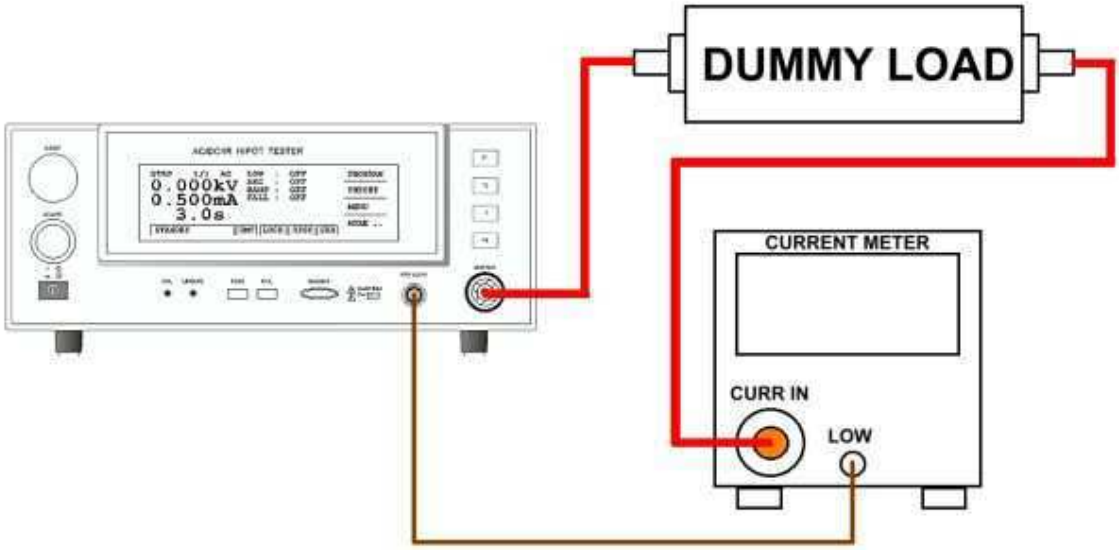
4.3 Current Calibration

4.3.1 Connection Diagram



Caution

The dummy load connected to HiPot terminal contains high voltage. Be very careful with it as it may cause hazard.

4.3.2 ACA Calibration (AC MODE)

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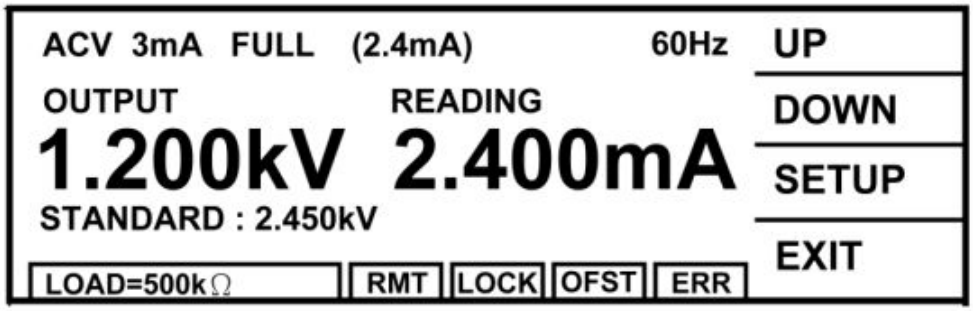
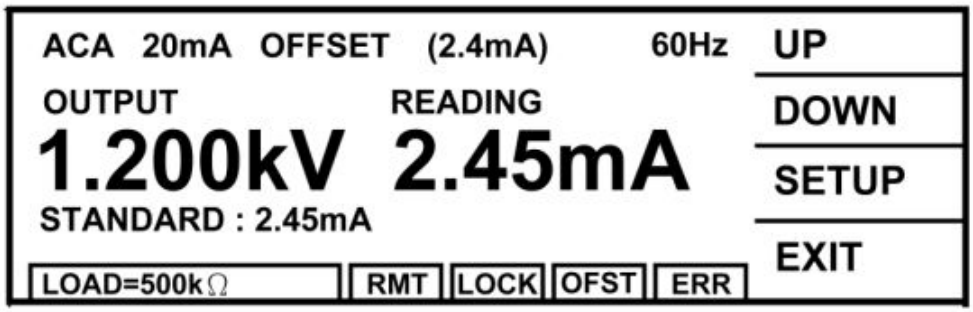
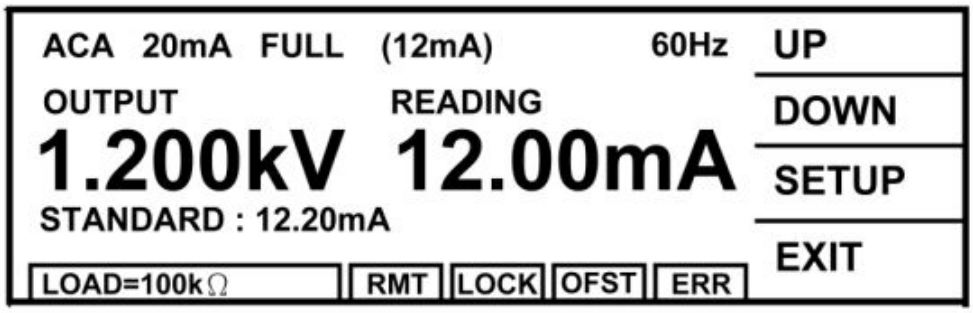
(6) Change the dummy load resistor to 500kΩ 10watt or higher.
(7) Press [STOP][START] to read the ammeter value, ex. 2.450mA.



(8) Press [INC.] or [DEC.] until shows 2.450mA and then press [ENTER] for saving.
(9) Press [STOP] to stop ACA 3.0mA range full scale calibration.
(10) Press [UP] to change to the next calibration item.
(11) Press [STOP][START] to read the ammeter value, ex. 2.450mA.



(12) Press [INC.] or [DEC.] until shows 2.450mA and then press [ENTER] for saving.
(13) Press [STOP] to stop ACA 20.0mA range offset calibration.
(14) Press [UP] to change to the next calibration item.
(15) Change the dummy load resistor to 100kΩ 50watt or higher.
(16) Press [STOP][START] to read the ammeter value, ex. 12.20mA.



(17) Press [INC.] or [DEC.] until shows 12.20mA and then press [ENTER] for saving.
(18) Press [STOP] to stop ACA 20.0mA range full scale calibration.

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4.3.3 DCA Calibration (DC/IR MODE)

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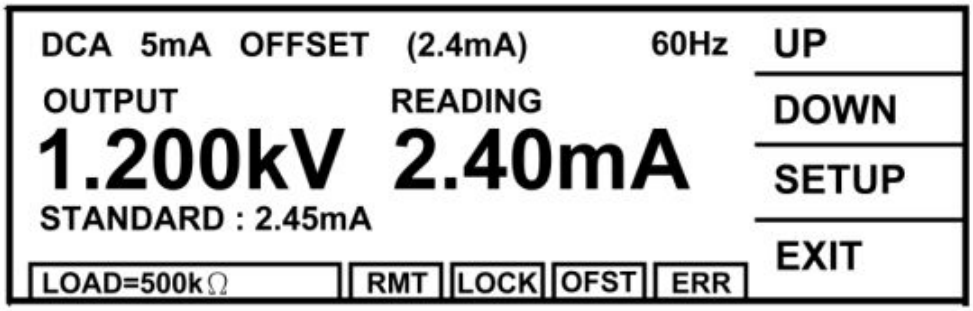
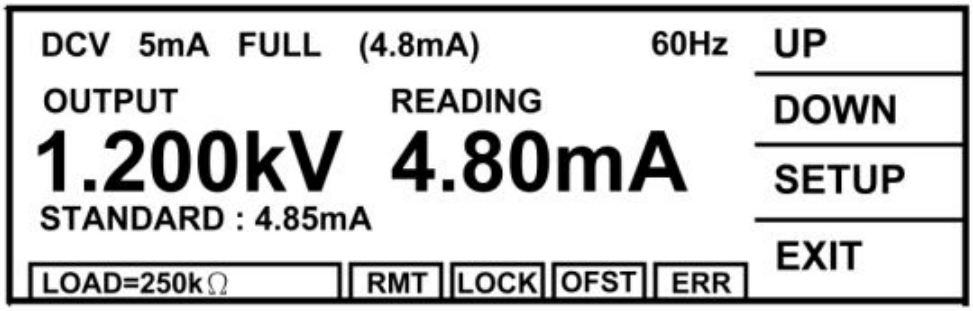


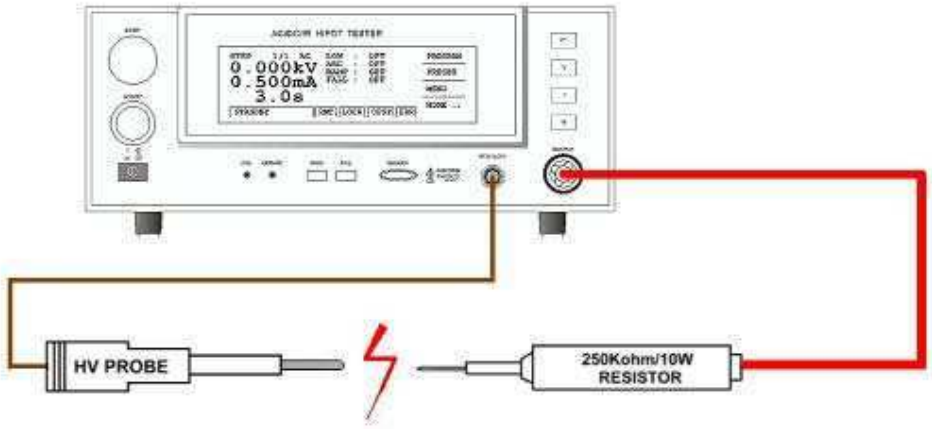
(12) Press [INC.] or [DEC.] until shows 2.45mA and then press [ENTER] for saving.
(13) Press [STOP] to stop DCA 5.0mA range offset calibration.
(14) Press [UP] to change to the next calibration item.
(15) Change the dummy load resistor to 250kΩ 20watt or higher.
(16) Press [STOP][START] to read the ammeter value, ex. 4.85mA.



(17) Press [INC.] or [DEC.] until shows 4.85mA and then press [ENTER] for saving.
(18) Press [STOP] to stop DCA 5.0mA range full scale calibration.

4.4 ARC Calibration

4.4.1 Connection Diagram



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Caution

1. ARC calibration is very special, the high voltage terminal are in outside. Be careful with it as it may cause hazard.
2. Please contact your local agent for more detailed descriptions.

4.4.2 AC ARC Calibration (AC MODE)

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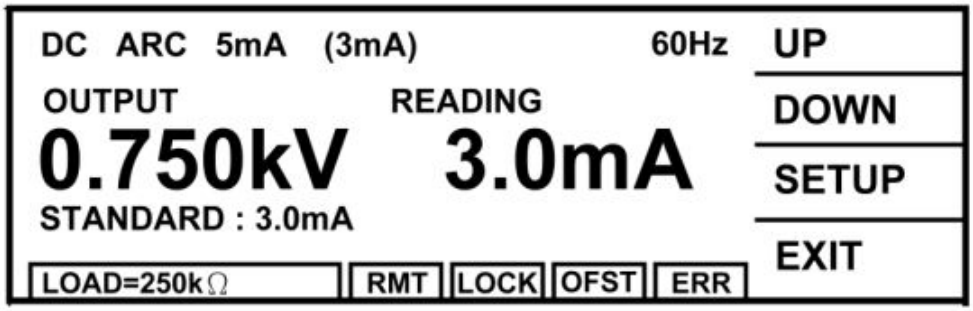
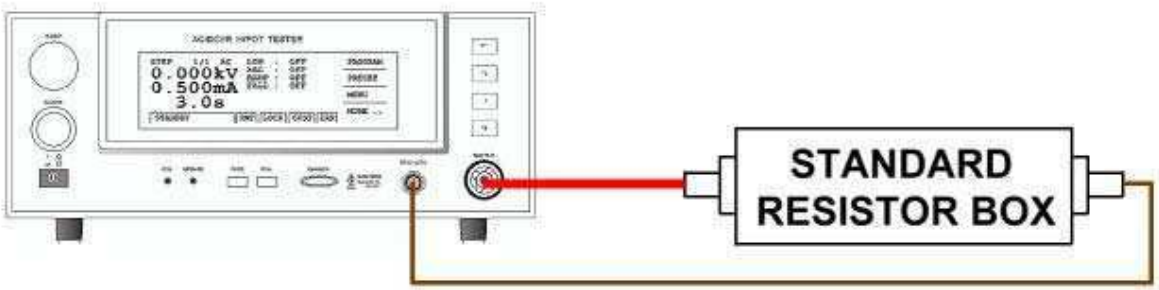


(4) Press [RETURN] twice to exit ARC reading setting.
(5) Press [STOP] [START] for starting test.
(6) Press [INC.] or [DEC.] to adjust the low terminal of HiPot tester get closer to another terminal of the dummy load resistor gradually, and generate sparking between these two. The HiPot tester happens ARC fail.
(7) Repeat step (5) – (6) until the sparking between these two is smaller, the HiPot tester still happens ARC fail.

4.5 IRR Calibration (IR Mode)

4.5.1 Connection Diagram



4.5.2 Insulation Resistance Calibration

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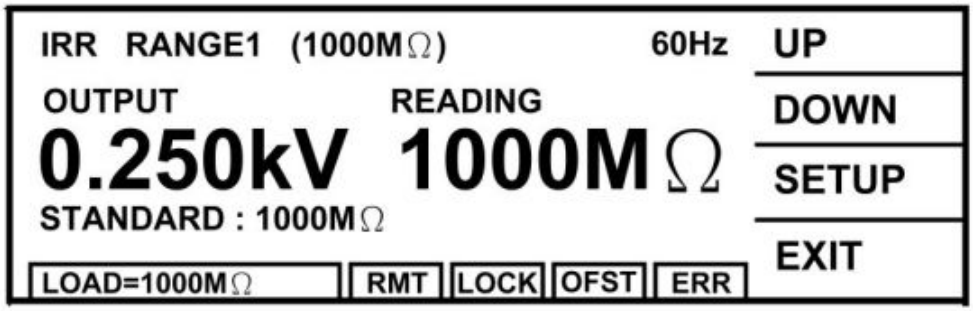
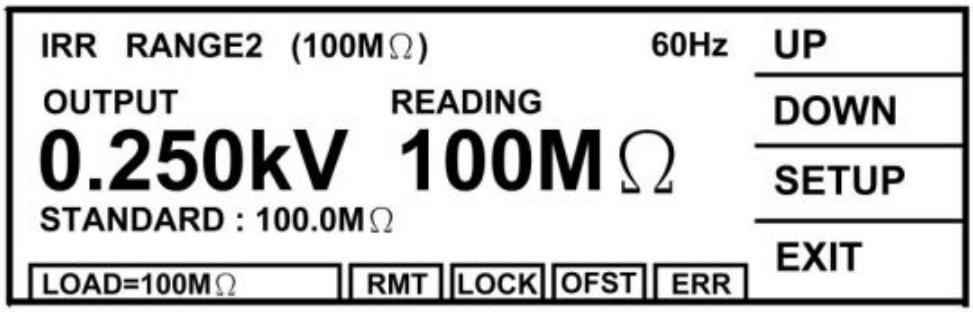
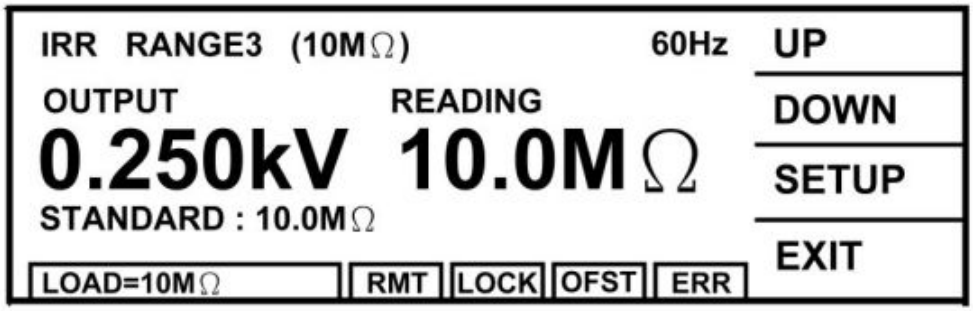


(5) Press [STOP] to stop IRR range 1 calibration.
(6) Press [UP] to change to the next calibration item.
(7) Change the standard dummy load resistor to 100MΩ.
(8) Press [STOP] [START].
(9) Press [INC.] or [DEC.] until shows the standard resistance value, ex. 100MΩ and then press [ENTER] for saving.



(10) Press [STOP] to stop IRR range 2 calibration.
(11) Press [UP] to change to the next calibration item.
(12) Change the standard dummy load resistor to 10MΩ.
(13) Press [STOP] [START].
(14) Press [INC.] or [DEC.] until shows the standard resistance value, ex. 10MΩ and then press [ENTER] for saving.



(15) Press [STOP] to stop IRR range 3 calibration.
(16) Press [UP] to change to the next calibration item.
(17) Press [STOP] [START].
(18) Press [INC.] or [DEC.] until shows the standard resistance value, ex. 10MΩ and then

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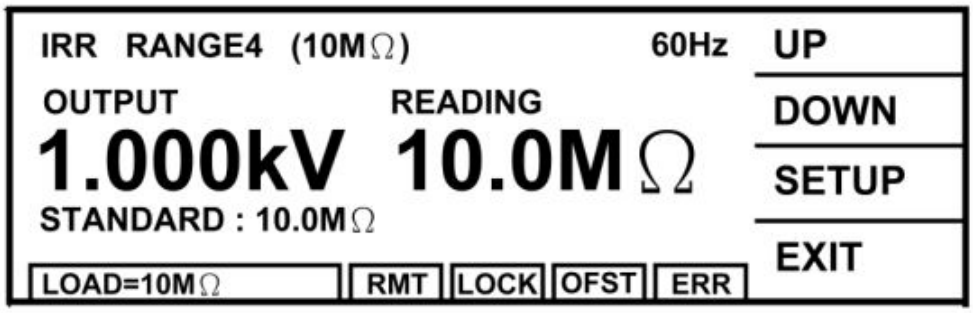
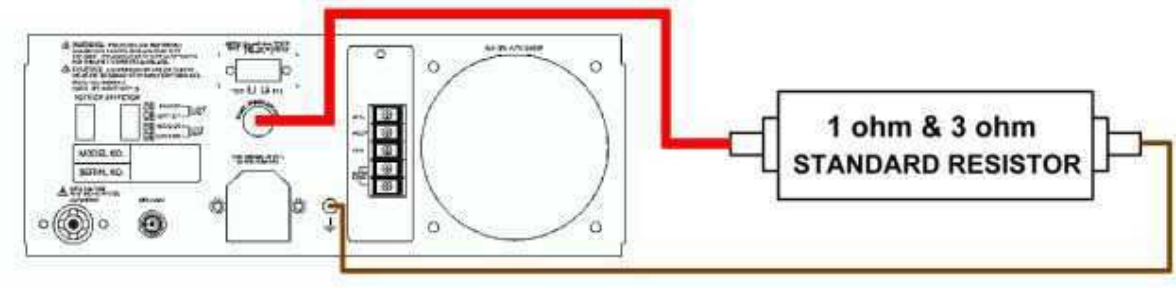
press [ENTER] for saving.



(19) Press [STOP] to stop IRR range 4 calibration.

4.6 Ground Continue Calibration

4.6.1 Connection Diagram



4.6.2 Description of Ground Continue Calibration

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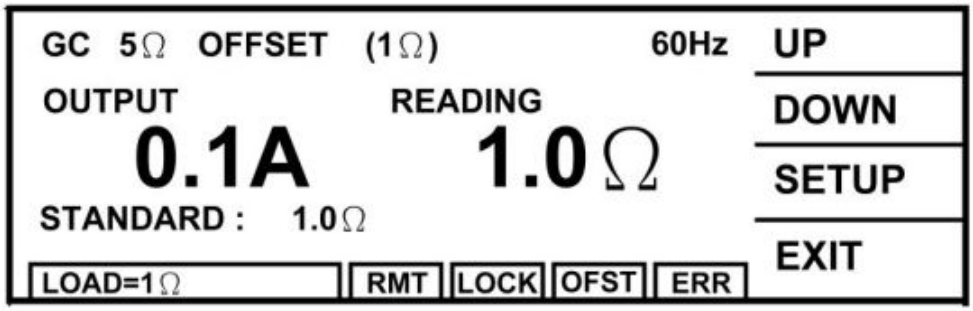
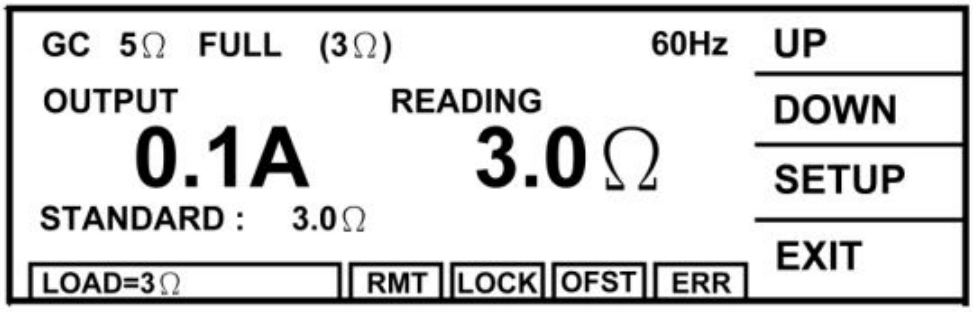


(5) Press [ENTER] for saving the calibration value.
(6) Press [STOP] to stop GC 5Ω Offset calibration.

Change the standard resistor to 3Ω.
(1) Press [UP].
(2) Connect resistor to ground and CONT.CHK OPTION terminal of rear panel.
(3) Press [STOP][START] to read GC resistance value 3Ω.
(4) Press [UP] or [DOWN] until the reading is the actual resistance value.



(5) Press [ENTER] for saving the calibration value.
(6) Press [STOP] to stop GC 5Ω Full calibration.

4.7 LCD Contrast Calibration

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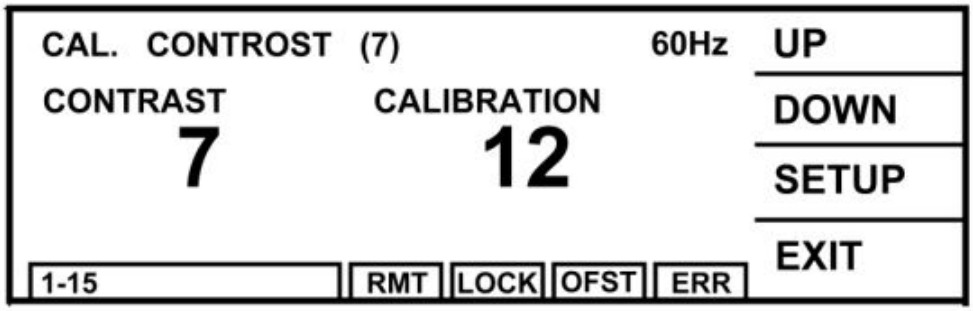

4.8 Complete Calibration

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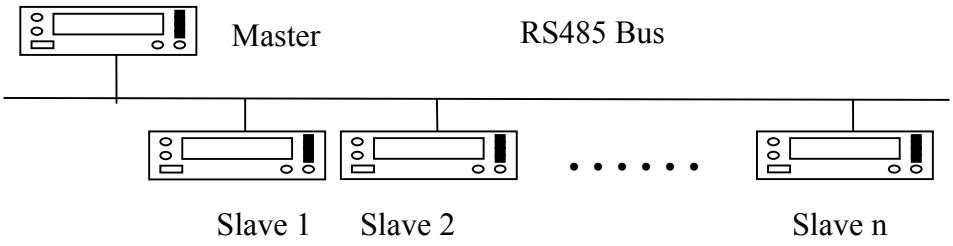
5. RS485 Interface (For Link Model of 19073 + RS485)

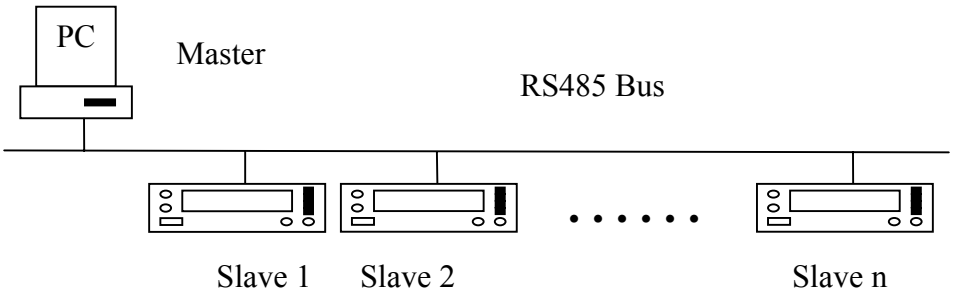
If link model of 19073 + RS485 is purchased, please refer this chapter.

5.1 Description of Function

1. RS485 interface can connect multi-device, and it up to multi-device test synchronously through Master operation.



2. It is able to connect PC from this interface (PC includes RS485 interface). The PC is instead of Master for up to remote control function.



5.2 Parameter Setting

1. Press [MENU] under [STANDBY] screen, and by using [F1], [F2] to move the highlight to “OPTION” then press [SELECT]. Move the highlight to [REMOTE INTERFACE], press [SELECT] then can enter RS485 setting screen.
2. Use [NEXT] to move the highlight, and [UP], [DOWN] to switch the setting value.
3. Setting item descriptions:
   a. INTERFACE: It selects if the RS485 interface existed or not.
   b. UNIT TYPE: It selects the device is Master or Slave.
   c. BAUD RATE: It selects the transmission rate is 4800, 9600 or 19200 baud rate.
   d. SLAVE NUMBER (Master Only): When the tester is powered-on or test completed (selectable), Master will detect if address 1 to Slave communication is normal or not.
   e. CHECK RESULT (Master Only): When CHECK RESULT ON, the rear panel

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signal meanings of Master are as the following:
UNDER TEST signal: It means Slave in testing.
PASS signal: It means all Slave connections are normal and the test completed.
FAIL signal: It means Slave not complete the test, may be the connections abnormal.

ⓘ ***NOTE:***
When CHECK RESULT ON, Master will not judge the test result of the DUT, thus Master can't connect the DUT.

---

4. SEND START (Master Only): It controls that Master receives [START] signal of front panel or rear panel, if it will send the signal to all Slaves through RS485 interface.

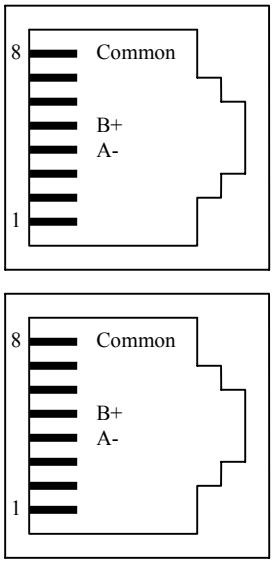
ⓘ ***NOTE:***
When the tester power-on, before testing if Slave communication is normal, Master will switch Slave to Remote status in advance. When the test is completed, if this switch (SEND START) set as OFF then Master will switch Slave to Local status.

---

5. UNIT ADDRESS (Slave Only): It sets Slave address, the range is 1-31 (Master address is fixed on 32).

5.3 Terminal and Pin Signal Connection

RS485



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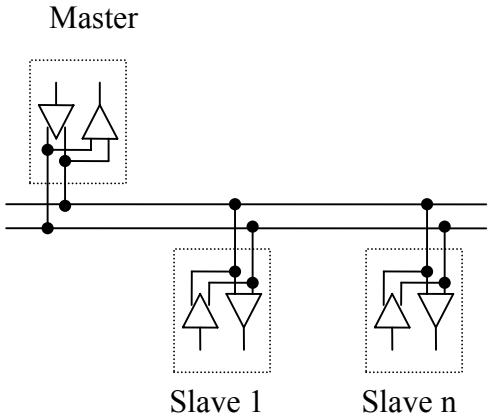
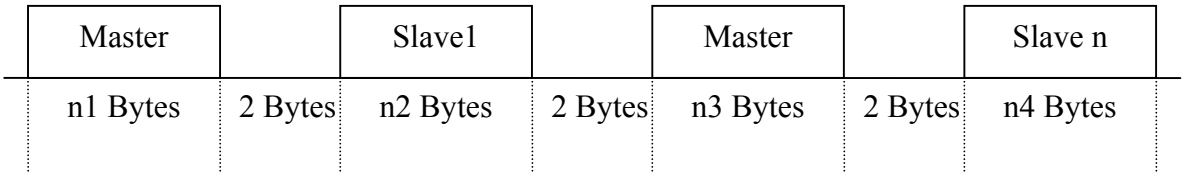
5.4 Communication Protocol

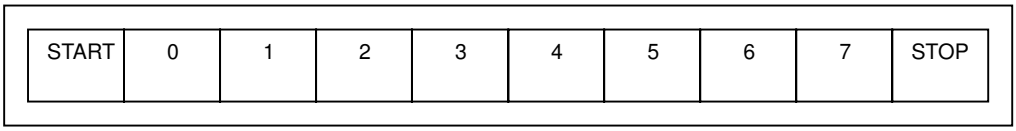
This interface uses half duplex of 2-wire system non-synchronized transmission mode.



Before the bus control is transferred, please wait the time of two characters.



The transmission format of character is 1 initial bit, 8 data bits and 1 end bit, the total is 10 bits.



The receivers don't respond any data under broadcast mode. When the receivers receive the query functions under node-to-node transmission mode, it returns the relative data. However, the receivers receive the execution command, it returns the result of executing. About Reply Message, please refer the descriptions of command.

The commands are packed into packets, Data Frame as the following:

Header	DA	SA	Length	Data Field	Checksum
1 byte	1 byte	1 byte	1 byte	n bytes	1 byte

Header: 0xAB
Destination Address: 0x0 ~ 0x7F, 0xFF is broadcast address
Source Address: 0x0 ~ 0x7F
Data Field Length: It means the length of data field.
Data Field: Please refer the command set.

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Command Code	Parameter
1 byte	0 ~ n-1 bytes

Checksum: Summing these values into two supplements, included data are DA + SA + Length + Data Field

5.5 Command List

Commands	Code (Hex)
*IDN?	0x90
Display Address	0x20
Stop	0x21
Start	0x22
Offset Get/Off	0x23
Offset?	0xA3
Step Parameters	0x24
Step Parameters?	0xA4
Preset Parameters	0x25
Preset Parameters	0xA5
Store Memory	0x26
Recall Memory	0x27
Delete Memory	0x28
System Setting	0x29
System Setting?	0xA9
Key Lock	0x2A
Key Lock?	0xAA
Initialize All Steps Parameters	0x2C
Step Number?	0xAD
Remote/Local	0x2E
Remote?	0xAE
Result?	0xB1
Reply Message	0x7F

5.6 Command Description

*IDN?

Description: It queries the devices' identification and describes the string.
Command code: 0x90
Parameter: None
Return data: The format is "Company Name, Device Name, Device S/N, Firmware Version, Hold Field"
Example:
Master (0x70): 0xAB 0x01 0x70 0x01 0x90 0xFE
Slave (0x01): 0xAB 0x70 0x01 0x16 0x90 0x43 0x48 0x52 0x4F 0x4D 0x41 0x2C 0x31 0x39 0x30 0x37 0x33 0x2C 0x30 0x2C 0x33 0x2E 0x30 0x37 0x2C 0x30 0x53

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Descriptions of example
The setting meanings of HEX inputs are as the following:
0xAB = Header
0x01 = Destination Address
0x70 = Source Address
0x01 = Data Field Length
0x90 = Command Code
0xFE = Checksum

The reading meanings of returning HEX code are as the following:
0xAB = Header
0x70 = Destination Address
0x01 = Source Address
0x16 = Data Field Length
0x90 = Command Code
0x43 0x48 0x52 0x4F 0x4E 0x4D 0x41 = "CHROMA" Company Name (return data)
0x2C = "," (return data)
0x31 0x39 0x30 0x37 0x33 = "19073" Device Name (return data)
0x2C = "," (return data)
0x30 = "0" Device S/N (return data)
0x2C = "," (return data)
33 2E 30 37 = "3.07" Firmware Version (return data)
0x2C = " ," (return data)
30 = "0"Hold Field (return data)
0x53 = Checksum

Display Address

Description:	It displays the device address.
Command code:	0x20
Parameter:	None
Return data:	Reply Message
Example:	Master (0x70): 0xAB 0x01 0x70 0x01 0x20 0x6E
	Slave (0x01): 0xAB 0x70 0x01 0x02 0x7F 0x00 0x0E

Descriptions of example
The setting meanings of HEX inputs are as the following:
0xAB = Header
0x01 = Destination Address
0x70 = Source Address
0x01 = Source Address
0x20 = Command Code
0x6E = Checksum

The reading meanings of returning HEX code are as the following:
0xAB = Header
0x70 = Destination Address
0x01 = Source Address
0x02 = Source Address
0x7F = Reply Message Command Code

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0x00 = Reply Message Return Data
0x0E = Checksum

Stop

Description:	Stop test
Command code:	0x21
Parameter:	None
Return data:	Reply Message
Example:	Master (0x70): 0xAB 0x01 0x70 0x01 0x21 0x6D
	Slave (0x01): 0xAB 0x70 0x01 0x02 0x7F 0x00 0x0E

Descriptions of example
The setting meanings of HEX inputs are as the following:
0xAB = Header
0x01 = Destination Address
0x70 = Source Address
0x01 = Data Field Length
0x21 = Command Code
0x6D = Checksum

The reading meanings of returning HEX code are as the following:
0xAB = Header
0x70 = Destination Address
0x01 = Source Address
0x02 = Data Field Length
0x7F = Reply Message Command Code
0x00 = Reply Message Return Data
0x0E = Checksum

Start

Description:	Start test
Command code:	0x22
Parameter:	None
Return data:	Reply Message
Example:	Master (0x70): 0xAB 0x01 0x70 0x01 0x22 0x6C
	Slave (0x01): 0xAB 0x70 0x01 0x02 0x7F 0x00 0x0E

Descriptions of example
The setting meanings of HEX inputs are as the following:
0xAB = Header
0x01 = Destination Address
0x70 = Source Address
0x01 = Data Field Length
0x22 = Command Code
0x6C = Checksum

The reading meanings of returning HEX code are as the following:
0xAB = Header
0x70 = Destination Address

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0x01 = Source Address
0x02 = Data Field Length
0x7F = Reply Message Command Code
0x00 = Reply Message Return Data
0x0E = Checksum

Offset Get/Off

Description:	It switches OFFSET status.
Command code:	0x23
Parameter:	1 byte, 0:OFF or 2:GET
Return data:	Reply Message
Example:	Master (0x70): 0xAB 0x01 0x70 0x02 0x23 0x02 0x68
	Slave (0x01): 0xAB 0x70 0x01 0x02 0x7F 0x00 0x0E

Descriptions of example
The setting meanings of HEX inputs are as the following:
0xAB = Header
0x01 = Destination Address
0x70 = Source Address
0x02 = Data Field Length
0x23 = Command Code
0x02 = 2:GET (Command Parameter)
0x68 = Checksum

The reading meanings of returning HEX code are as the following:
0xAB = Header
0x70 = Destination Address
0x01 = Source Address
0x02 = Data Field Length
0x7F = Reply Message Command Code
0x00 = Reply Message Return Data
0x0E = Checksum

Offset?

Description:	It queries OFFSET status.
Command code:	0xA3
Parameter:	None
Return data:	1 byte, 0: Off, 1:On or 2:Getting
Example:	Master (0x70):0xAB 0x01 0x70 0x01 0xA3 0xEB
	Slave (0x01): 0xAB 0x70 0x01 0x02 0xA3 0x00 0xEA

Descriptions of example
The setting meanings of HEX inputs are as the following:
0xAB = Header
0x01 = Destination Address
0x70 = Source Address
0x01 = Data Field Length
0xA3 = Command Code
0xEB = Checksum

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The reading meanings of returning HEX code are as the following:
0xAB = Header
0x70 = Destination Address
0x01 = Source Address
0x02 = Data Field Length
0xA3 = Command Code
0x00 = 0: Off (Return Data)
0xEA = Checksum

Step Parameters

Description: It sets all parameters of various steps.
Command code: 0x24
Parameter: 28 bytes

AC mode

Name	Size (byte)	Unit	Range	Description
Step index	1	-	1~10	Must less or equal original step number + 1
Mode	1	-	1	AC mode
Source	2	V	0, 50~5000	0:OFF
Ramp Time	2	100mS	0~9990	0:OFF
Reserved	2	-	0	Reserved
Test Time	2	100mS	0~9990	0:Continue
Fall Time	2	100mS	0~9990	0:OFF
High Limit	4	100nA	10~200000	
Low Limit	4	100nA	0, 10~200000	0:OFF
Arc Limit	4	100nA	0, 10000~200000	0:OFF
Reserved	4	-	0	Reserved

DC Mode

Name	Size (byte)	Unit	Range	Description
Step index	1	-	1~10	Must less or equal original step number + 1
Mode	1	-	2	DC mode
Source	2	V	0, 50~6000	
Ramp Time	2	100mS	0~9990	0:OFF
Dwell Time	2	100mS	0~9990	0:OFF
Test Time	2	100mS	0~9990	0:Continue
Fall Time	2	100mS	0~9990	0:OFF
High Limit	4	100nA	1~50000	
Low Limit	4	100nA	0~50000	0:OFF
Arc Limit	4	100nA	0, 10000~50000	0:OFF
Inrush Limit	4	100nA	0, 5~50000	0:OFF

IR Mode

Name	Size (byte)	Unit	Range	Description
Step index	1	-	1~10	Must less or equal original step number + 1
Mode	1	-	3	IR mode
Source	2	V	0, 50~1000	
Ramp Time	2	100mS	0~9990	0:OFF
Dwell Time	2	100mS	0~9990	0:OFF
Test Time	2	100mS	0, 3~9990	0:Continue
Fall Time	2	100mS	0~9990	0:OFF
High Limit	4	100kOhm	0~500000	0:OFF
Low Limit	4	100kOhm	1~500000	

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Reserved	4	-	0	Reserved
Reserved	4	-	0	Reserved

GC Mode

Name	Size (byte)	Unit	Range	Description
Step index	1	-	1~10	Must less or equal original step number + 1
Mode	1	-	4	GC mode
Source	2	mA	0/100	
Reserved	2	-	0	Reserved
Dwell Time	2	100mS	1~10	
Reserved	2	-	0	Reserved
Reserved	2	-	0	Reserved
High Limit	4	100mOhm	1~50	
Low Limit	4	100mOhm	0~50	0:OFF
Reserved	4	-	0	Reserved
Reserved	4	-	0	Reserved

PA Mode (Pause mode)

Name	Size (byte)	Unit	Range	Description
Step index	1	-	1~10	Must less or equal original step number + 1
Mode	1	-	5	PA mode
UT Signal	2	-	1 or 2	(Under Test Signal) 1:Off, 2:On
Message	16	-		C String, maximum length is 15
Reserved	4	-	0	Reserved
Reserved	4	-	0	Reserved

Return data: Reply Message
Example: Master (0x70): 0xAB 0x01 0x70 0x1D 0x24 0x01 0x01 0xE8 0x03 0x14 0x00 0x00 0x00 0x32 0x00 0x1E 0x00 0x10 0x27 0x00 0x00 0xE8 0x03 0x00 0x00 0x10 0x27 0x00 0x00 0x00 0x00 0x00 0x00 0xA4
Slave (0x01): 0xAB 0x70 0x01 0x02 0x7F 0x00 0x0E
Remark: When the length of data is larger than 1 character (byte), it is need to send the minimum character in advance.

Descriptions of example

The setting meanings of HEX inputs are as the following:
0xAB = Header
0x01 = Destination Address
0x70 = Source Address
0x1D = Data Field Length
0x24 = Command Code
0x01 = Step1 (Command Parameter)
0x01 = AC Mode (Command Parameter)
0xE8 0x03 = Voltage 1000V (Command Parameter)
0x14 0x00 = Ramp Time 2sec (Command Parameter)
0x00 0x00 = Reserved (Command Parameter)
0x32 0x00 = Test Time 5sec (Command Parameter)
0x1E 0x00 = fall time 3sec (Command Parameter)
0x10 0x27 0x00 0x00 = Hi Limit 1.000mA (Command Parameter)
0xE8 0x03 0x00 0x00 = Low Limit 0.100mA (Command Parameter)
0x10 0x27 0x00 0x00 = Arc Limit 1.000mA (Command Parameter)
0x00 0x00 0x00 0x00 = Reserved (Command Parameter)

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0x0E = Checksum

The reading meanings of returning HEX code are as the following:
0xAB = Header
0x70 = Destination Address
0x01 = Source Address
0x02 = Data Field Length
0x7F = Reply Message Command Code
0x00 = Reply Message Return Data
0x0E = Checksum

Step Parameters?

Description:	It queries all parameters of various steps.	
Command code:	0xA4	
Parameter:	1 byte, the serial number of step, the range is 1-10	
Return data:	28 bytes data	
Example:	Master (0x70):	0xAB 0x01 0x70 0x02 0xA4 0x01 0xE8
	Slave (0x01):	0xAB 0x70 0x01 0x1D 0xA4 0x01 0x01 0x38 0x04 0x1E 0x00 0x00 0x00 0x3C 0x00 0x09 0x00 0x0C 0x17 0x00 0x00 0x90 0x01 0x00 0x00 0x20 0x4E 0x00 0x00 0x00 0x00 0x00 0x00 0x0B

Descriptions of example
The setting meanings of HEX inputs are as the following:
0xAB = Header
0x01 = Destination Address
0x70 = Source Address
0x02 = Data Field Length
0xA4 = Command Code
0x01 = Parameter
0xE8 = Checksum

The reading meanings of returning HEX code are as the following:
0xAB = Header
0x70 = Destination Address
0x01 = Source Address
0x1D = Data Field Length
0xA4 = Command Code
0x01 = Step1 (Return Data)
0x01 = AC Mode (Return Data)
0x38 0xE4 = Voltage 1080V (Return Data)
0x1E 0x00 = Ramp Time 3sec (Return Data)
0x00 0x00 = Reserved (Return Data)
0x3C 0x00 = Test Time 6sec (Return Data)
0x09 0x00 = Fall Time 0.9sec (Return Data)
0x0C 0x17 0x00 0x00 = Hi Limit 0.590mA (Return Data)
0x90 0x01 0x00 0x00 = Low Limit 0.040mA (Return Data)
0x20 0x4E 0x00 0x00 = Arc Limit 2.000mA (Return Data)
0x00 0x00 0x00 0x00 = Reserved (Return Data)

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0x0B = Checksum

Preset Parameters

Description: It sets all parameters of Preset.
Command code: 0x25
Parameter: 6 bytes

Name	Size (byte)	Unit	Range	Description
AC Frequency	1	Hz	50/60	
Software AGC	1	-	0/1	0:OFF, 1:ON
WV Auto Range	1	-	0/1	0:OFF, 1:ON
IR Auto Range	1	-	0/1	0:OFF, 1:ON
Fail Restart	1	-	0/1	0:OFF, 1:ON
Ground Fault Interrupt	1	-	0/1	0:OFF, 1:ON

Return data: Reply Message
Example: Master (0x70): 0xAB 0x01 0x70 0x07 0x25 0x32 0x00 0x01 0x00 0x00 0x01 0x2F
Slave (0x01): 0xAB 0x70 0x01 0x02 0x7F 0x00 0x0E

Descriptions of example
The setting meanings of HEX inputs are as the following:
0xAB = Header
0x01 = Destination Address
0x70 = Source Address
0x07 = Data Field Length
0x25 = Command Code
0x32 = ACV Frequency 50Hz
0x00 = Software AGC OFF
0x01 = WV Auto Range ON
0x00 = IR Auto Range OFF
0x00 = Fail Restart ON
0x01 = Ground Fault Interrupt ON
0x2F = Checksum

The reading meanings of returning HEX code are as the following:
0xAB = Header
0x70 = Destination Address
0x01 = Source Address
0x02 = Data Field Length
0x7F = Reply Message Command Code
0x00 = Reply Message Return Data
0x0E = Checksum

Preset Parameter?

Description: It queries all parameters of Preset.
Command code: 0xA5
Parameter: None

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Return data: 6 bytes
Example: Master (0x70): 0xAB 0x01 0x70 0x01 0xA5 0xE9
Slave (0x01): 0xAB 0x70 0x01 0x07 0xA5 0x3C 0x01 0x00 0x01 0x01 0x00 0xA4

Descriptions of example
The setting meanings of HEX inputs are as the following:
0xAB = Header
0x01 = Destination Address
0x70 = Source Address
0x01 = Data Field Length
0xA5 = Data Field Length
0xE9 = Checksum

The reading meanings of returning HEX code are as the following:
0xAB = Header
0x70 = Destination Address
0x01 = Source Address
0x07 = Data Field Length
0xA5 = Command Code
0x3C = ACV Frequency 60Hz (Return Data)
0x01 = Software AGC ON (Return Data)
0x00 = WV Auto Range OFF (Return Data)
0x01 = IR Auto Range ON (Return Data)
0x01 = Fail Restart OFF (Return Data)
0x00 = Ground Fault Interrupt OFF (Return Data)
0xA4 = Checksum

Store Memory

Description: It saves the parameters of various steps and Preset to the internal memory.
Command code: 0x26
Parameter: Serial number of memory + Name of memory. The length of serial number of memory is 1 character. The range is 1 ~ 60, the name length of the memory is 0 ~ 10 character.
Return data: Reply Message
Example: Master (0x70): 0xAB 0x01 0x70 0x08 0x26 0x01 0x43 0x48 0x52 0x4F 0x4D 0x41 0xA6
Slave (0x01): 0xAB 0x70 0x01 0x02 0x7F 0x00 0x0E

Descriptions of example
The setting meanings of HEX inputs are as the following:
0xAB = Header
0x01 = Destination Address
0x70 = Source Address
0x08 = Data Field Length
0x26 = Command Code
0x01 = Memory S/N

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0x43 0x48 0x52 0x4F 0x4D 0x41 = ”CHROMA” Memory Name
(Command Parameter)
0xA6 = Checksum

The reading meanings of returning HEX code are as the following:
0xAB = Header
0x70 = Destination Address
0x01 = Source Address
0x02 = Data Field Length
0x7F = Reply Message Command Code
0x00 = Reply Message Return Data
0x0E = Checksum

Recall Memory

Description: It recalls the saved test steps from various device internal memories.
Command code: 0x27
Parameter: 1 byte, serial number of memory, the range is 1 ~ 60
Return data: Reply Message
Example: Master (0x70): 0xAB 0x01 0x70 0x02 0x27 0x01 0x65
Slave (0x01): 0xAB 0x70 0x01 0x02 0x7F 0x00 0x0E

Descriptions of example
The setting meanings of HEX inputs are as the following:
0xAB = Header
0x01 = Destination Address
0x70 = Source Address
0x02 = Data Field Length
0x27 = Command Code
0x01 = “01” Memory S/N (Command Parameter)
0x65 = Checksum

The reading meanings of returning HEX code are as the following:
0xAB = Header
0x70 = Destination Address
0x01 = Source Address
0x02 = Data Field Length
0x7F = Reply Message Command Code
0x00 = Reply Message Return Data
0x0E = Checksum

Delete Memory

Description: It deletes the saved test steps from the memories inside device.
Command code: 0x28
Parameter: 1 byte, serial number of memory, the range is 0 ~ 60. When the parameter is 0, it means it is need to clear the working memory, this includes all steps and Preset parameters.
Return data: Reply Message
Example: Master (0x70): 0xAB 0x01 0x70 0x02 0x28 0x01 0x64
Slave (0x01): 0xAB 0x70 0x01 0x02 0x7F 0x00 0x0E

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Descriptions of example
The setting meanings of HEX inputs are as the following:
0xAB = Header
0x01 = Destination Address
0x70 = Source Address
0x02 = Data Field Length
0x28 = Command Code
0x01 = "01" Memory S/N (Command Parameter)
0x64 = Checksum

The reading meanings of returning HEX code are as the following:
0xAB = Header
0x70 = Destination Address
0x01 = Source Address
0x02 = Data Field Length
0x7F = Reply Message Command Code
0x00 = Reply Message Return Data
0x0E = Checksum

System Setting

Description: It sets the system parameter.
Command code: 0x29
Parameter: 4 bytes

Name	Size (byte)	Unit	Range	Description
Contrast	1	-	1~15	
Buzzer Volume	1	-	0/1/2/3	0:OFF, 1:Low, 2:Medium, 3:High
EN50191	1	-	0/1	0:OFF, 1:ON (AC maximum is 3mA)
DC 50V AGC	1	-	0/1	0:OFF, 1:ON

Return data: Reply Message
Example: Master (0x70): 0xAB 0x01 0x70 0x05 0x29 0x0A 0x03 0x00 0x00 0x54
Slave (0x01): 0xAB 0x70 0x01 0x02 0x7F 0x00 0x0E

Descriptions of example
The setting meanings of HEX inputs are as the following:
0xAB = Header
0x01 = Destination Address
0x70 = Source Address
0x05 = Data Field Length
0x29 = Command Code
0x0A = Contrast 10 (Command Parameter)
0x03 = Buzzer Volume High (Command Parameter)
0x00 = EN50191 OFF (Command Parameter)
0x00 = DC 50V AGC OFF (Command Parameter)
0x64 = Checksum

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The reading meanings of returning HEX code are as the following:
0xAB = Header
0x70 = Destination Address
0x01 = Source Address
0x02 = Data Field Length
0x7F = Reply Message Command Code
0x00 = Reply Message Return Data
0x0E = Checksum

System Setting?

Description: It queries the system parameter.
Command code: 0xA9
Parameter: None
Return data: 4 bytes
Example:
Master (0x70): 0xAB 0x01 0x70 0x01 0xA9 0xE5
Slave (0x01): 0xAB 0x70 0x01 0x05 0xA9 0x08 0x01 0x01 0x01 0xD6

Descriptions of example
The setting meanings of HEX inputs are as the following:
0xAB = Header
0x01 = Destination Address
0x70 = Source Address
0x01 = Data Field Length
0xA9 = Command Code
0xE5 = Checksum

The reading meanings of returning HEX code are as the following:
0xAB = Header
0x70 = Destination Address
0x01 = Source Address
0x05 = Data Field Length
0xA9 = Command Code
0x08 = Contrast 8 (Return Data)
0x03 = Buzzer Volume Low (Return Data)
0x00 = EN50191 ON (Return Data)
0x00 = DC 50V AGC ON (Return Data)
0xD6 = Checksum

Key Lock

Description: It switches KEY LOCK status.
Command code: 0x2A
Parameter: 1 byte
0: key board lock OFF, recall key lock OFF
1: key board lock ON, recall key lock OFF
2: key board lock ON, recall key lock ON
Return data: Reply Message
Example: Master (0x70): 0xAB 0x01 0x70 0x02 0x2A 0x01 0x62
Slave (0x01): 0xAB 0x70 0x01 0x02 0x7F 0x00 0x0E

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Descriptions of example
The setting meanings of HEX inputs are as the following:
0xAB = Header
0x01 = Destination Address
0x70 = Source Address
0x02 = Data Field Length
0x2A = Command Code
0x01 = "01"key board lock ON, recall key lock (Command Parameter)
0x62 = Checksum

The reading meanings of returning HEX code are as the following:
0xAB = Header
0x70 = Destination Address
0x01 = Source Address
0x02 = Data Field Length
0x7F = Reply Message Command Code
0x00 = Reply Message Return Data
0x0E = Checksum

Key Lock?

Description:	It queries KEY LOCK status.
Command code:	0xAA
Parameter:	None
Return data:	1 byte data
	0: key board lock OFF, recall key lock OFF
	1: key board lock ON, recall key lock OFF
	2: key board lock ON, recall key lock ON
Example:	Master (0x70): 0xAB 0x01 0x70 0x01 0xAA 0xE4
	Slave (0x01): 0xAB 0x70 0x01 0x02 0xAA 0x01 0xE2

Descriptions of example
The setting meanings of HEX inputs are as the following:
0xAB = Header
0x01 = Destination Address
0x70 = Source Address
0x01 = Data Field Length
0xAA = Command Code
0xE4 = Checksum

The reading meanings of returning HEX code are as the following:
0xAB = Header
0x70 = Destination Address
0x01 = Source Address
0x02 = Data Field Length
0xAA = Command Code
0x01 = "01"Key Board Lock ON, Recall Key Lock OFF (Return Data)
0Xe2 = Checksum

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Initialize All Steps Parameters

Description: It sets all steps to the initial setting, this command will delete all steps.
Command code: 0x2C
Parameter: None
Return data: Reply Message
Example: Master (0x70): 0xAB 0x01 0x70 0x01 0x2C 0x62
Slave (0x01): 0xAB 0x70 0x01 0x02 0x7F 0x00 0x0E

Descriptions of example
The setting meanings of HEX inputs are as the following:
0xAB = Header
0x01 = Destination Address
0x70 = Source Address
0x01 = Data Field Length
0x2C = Command Code
0x62 = Checksum

The reading meanings of returning HEX code are as the following:
0xAB = Header
0x70 = Destination Address
0x01 = Source Address
0x02 = Data Field Length
0x7F = Reply Message Command Code
0x00 = Reply Message Return Data
0x0E = Checksum

Step Number?

Description: It queries the step numbers of being set.
Command code: 0xAD
Parameter: None
Return data: 1 byte data
Example: Master (0x70): 0xAB 0x01 0x70 0x01 0xAD 0xE1
Slave (0x01): 0xAB 0x70 0x01 0x02 0xAD 0x05 0xDB

Descriptions of example
The setting meanings of HEX inputs are as the following:
0xAB = Header
0x01 = Destination Address
0x70 = Source Address
0x01 = Data Field Length
0xAD = Command Code
0xE1 = Checksum

The reading meanings of returning HEX code are as the following:
0xAB = Header
0x70 = Destination Address
0x01 = Source Address
0x02 = Data Field Length
0xAD = Command Code

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0x05 = "05" the step numbers of being set (Return Data)
0xDB = Checksum

Remote/Local

Description: It switches the device to remote or local control.
Command code: 0x2E
Parameter: 1 byte
0: Go to Local.
1: Go to Remote.
2: Go to Remote and Local Lockout
Return data: Reply Message
Example: Master (0x70): 0xAB 0x01 0x70 0x02 0x2E 0x01 0x5E
Slave (0x01): 0xAB 0x70 0x01 0x02 0x7F 0x00 0x0E

Descriptions of example
The setting meanings of HEX inputs are as the following:
0xAB = Header
0x01 = Destination Address
0x70 = Source Address
0x02 = Data Field Length
0x2C = Command Code
0x01 = "1"Go to Remote (Command Parameter)
0x62 = Checksum

The reading meanings of returning HEX code are as the following:
0xAB = Header
0x70 = Destination Address
0x01 = Source Address
0x02 = Data Field Length
0x7F = Reply Message Command Code
0x00 = Reply Message Return Data
0x0E = Checksum

Remote Status?

Description: It queries remote status of the device.
Command code: 0xAE
Parameter: None
Return data: 1 byte data
0: Local
1: Remote
2: Remote and Local Lockout
Example: Master (0x70): 0xAB 0x01 0x70 0x01 0xAE 0xE0
Slave (0x01): 0xAB 0x70 0x01 0x02 0xAE 0x01 0xDE

Descriptions of example
The setting meanings of HEX inputs are as the following:
0xAB = Header
0x01 = Destination Address
0x70 = Source Address

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0x01 = Data Field Length
0xAB = Command Code
0xE0 = Checksum

The reading meanings of returning HEX code are as the following:
0xAB = Header
0x70 = Destination Address
0x01 = Source Address
0x02 = Data Field Length
0xAE = Command Code
0x00 = "1" Remote (Return Data)
0xDE = Checksum

Result?

Description: It queries the test result and measurement value.
Command code: 0xB1
Parameter: 2 bytes, serial numbers of steps + items of measurement values, the range of serial numbers of steps is 0 ~ 10. When the range is 0, it means to query the last one which starts to perform or the step which be performed completely. According to the weight of 2 to divide the measurement value option into 8 items, if queries multi-item simultaneously, the lesser weight is sent at first.

The measurement value option:

AC mode

Item Number	Name	Size (byte)	Unit	Description
1	Mode	1	-	1:AC Mode
2	Meter 1 (Source)	2	V	30000: Maximum, 31000: Not Value
4	Meter 2 (Current)	4	100nA	1000000000: Maximum, 1100000000: Not Value
8	Meter 3	4	-	Reserved
16	Ramp Time	2	100mS	30000: Maximum, 31000: Not Value
32	Reserved	2	-	Reserved
64	Test Time	2	100mS	30000: Maximum, 31000: Not Value
128	Fall Time	2	100mS	30000: Maximum, 31000: Not Value

DC mode

Item Number	Name	Size (byte)	Unit	Description
1	Mode	1	-	2:DC Mode
2	Meter 1 (Source)	2	V	30000: Maximum, 31000: Not Value
4	Meter 2 (Current)	4	100nA	1000000000: Maximum, 1100000000: Not Value
8	Meter 3 (Inrush)	4	100nA	1000000000: Maximum, 1100000000: Not Value
16	Ramp Time	2	100mS	30000: Maximum, 31000: Not Value
32	Dwell Time	2	100mS	30000: Maximum, 31000: Not Value
64	Test Time	2	100mS	30000: Maximum, 31000: Not Value
128	Fall Time	2	100mS	30000: Maximum, 31000: Not Value

IR mode

Item Number	Name	Size (byte)	Unit	Description
1	Mode	1	-	3:IR Mode
2	Meter 1 (Source)	2	V	30000: Maximum, 31000: Not Value
4	Meter 2 (Resistance)	4	100kOhm	1000000000: Maximum, 1100000000: Not Value

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8	Meter 3	4	-	Reserved
16	Ramp Time	2	100mS	30000: Maximum, 31000: Not Value
32	Dwell Time	2	100mS	30000: Maximum, 31000: Not Value
64	Test Time	2	100mS	30000: Maximum, 31000: Not Value
128	Fall Time	2	100mS	30000: Maximum, 31000: Not Value

GC mode

Item Number	Name	Size (byte)	Unit	Description
1	Mode	1	-	4:GC Mode
2	Meter 1 (Source)	2	mA	30000: Maximum, 31000: Not Value
4	Meter 2 (Resistance)	4	100mOhm	1000000000: Maximum, 1100000000: Not Value
8	Meter 3	4	-	Reserved
16	Reserved	2	-	Reserved
32	Dwell Time	2	100mS	30000: Maximum, 31000: Not Value
64	Reserved	2	-	Reserved
128	Reserved	2	-	Reserved

PA mode

Item Number	Name	Size (byte)	Unit	Description
1	Mode	1	-	5:PA Mode
2	Under Test Signal	2	-	1:Off, 2:On
4, 8, 16, 32, 64 or 128	Message	16	-	C String, maximum length is 15

Return data: The flag of new test result (1 byte) + serial number of step (1 byte) + test result (1 byte) + measurement value option (1 byte) [+ measurement value 1 + measurement value 2 + …]

The flag is with new test result: it is the correct flag that can judge the measurement result. This flag set as ON when the test is initiated, and set as OFF when the test is stopped. Alternatively, the test is ended and the result is read by this command, then set as OFF. Thus, only in the test duration, the test completed or uses this command to read first time, this flag is ON otherwise is OFF.

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Return test result codes:

Mode	AC		DC		IR		GC		ALL	
Code	HEX	DEC	HEX	DEC	HEX	DEC	HEX	DEC	HEX	DEC
STOP									70	112
USER									71	113
INTERRUPT										
CAN NOT									72	114
TEST										
TESTING									73	115
PASS									74	116
SKIP									75	117
GFI FAIL									79	121
HIGH FAIL	11	17	21	33	31	49	41	65		
LOW FAIL	12	18	22	34	32	50	42	66		
ARC FAIL	13	19	23	35						
I/O FAIL	14	20	24	36	34	52				
NO OUTPUT	15	21	25	37	35	53				
VOLTAGE OVER	16	22	26	38	36	54				
CURRENT OVER	17	23	27	39	37	55				
INRUSH FAIL			28	40						

Example: The test results of devices:

Master (0x70): 0xAB 0x01 0x70 0x03 0xB1 0x00 0xD7 0xE0

Slave (0x01): 0xAB 0x70 0x01 0x12 0xB1 0x01 0x01 0x74 0xD7 0x01 0x63 0x00 0x5A 0x00 0x00 0x00 0x0F 0x00 0x1E 0x00 0x18 0x00 0x7C

Descriptions of example

The setting meanings of HEX inputs are as the following:

0xAB = Header

0x01 = Destination Address

0x70 = Source Address

0x03 = Data Field Length

0xB1 = Command Code

0x00 = “00“ It queries the last step that begins to execute or have been executed. (Command Parameter)

0xD7 = “D7” Item Number (Command Parameter)

0xE0 = Checksum

The reading meanings of returning HEX code are as the following:

0xAB = Header

0x70 = Destination Address

0x01 = Source Address

0x12 = Data Field Length

0xB1 = Command Code

0x01 = New test result (Return Data)

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0x01 = Step1 (Return Data)
0x74 = Test result code "PASS" (Return Data)
0xD7 = Item number (Return Data)
0x01 = AC mode (Return Data)
0x63 0x00 = Display Volt 0.100kV (Return Data)
0x5A 0x00 0x00 0x00 = Curr 0.009mA (Return Data)
0xOF 0x00 = ramp time 1.5sec (Return Data)
0x1E 0x00 = test time 3.0sec (Return Data)
0x18 0x00 = fall time 2.4sec (Return Data)
0x7C = Checksum

Note:
When the tester is pause mode, the data field length of returning may be different from other modes.

Reply Message

Description: It queries the performed result of previous command.
Command code: 0x7F
Parameter: None
Return data: 1 byte
0 – OK, no error
1 – Command Error (Include Execution Error)
2 – Parameter Error
Example: Relay Message Return Data
Slave (0x01): 0xAB 0x70 0x01 0x02 0x7F 0x00 0x0E

Descriptions of example
The reading meanings of returning HEX code are as the following:
0xAB = Header
0x70 = Destination Address
0x01 = Source Address
0x02 = Data Field Length
0x7F = Command Code
0x00 = "00"OK, no error (Return Data)
0x0E = Checksum

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5.7 Flow Diagram

1. Confirm if all of Slaves' communication is normal or not:

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2. Upload the test steps from one slave then download to all slaves.

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3. Read the measurement data:

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6. Maintenance

6.1 General

Our warranty (at the front of the manual) attests the quality of materials and workmanship in our products. If malfunction should be suspected, or other information be desired applications engineers are available for technical assistance. Application assistance is available in Taiwan by calling 886-2-22983855 and asking for applications support. For support outside of Taiwan please contact your local Chroma distributor.

6.2 Instrument Return

Before returning an instrument to Chroma for service please call our Service Department at 886-2-22983855 for return material authorization. It will be necessary to include a purchase order number to ensure expedient processing, although units found to be in warranty period will be repaired at no-charge. For any questions on repair costs or shipment instructions please contact our service department at the above number. To safeguard an instrument during storage and shipping please use packaging that is adequate to protect it from damage, i.e., equivalent to the original packaging and mark the box "Delicate Electronic Instrument". Return material should be sent freight prepaid, to:

Chroma Ate Inc.
No.43, Wu-chuan Rd., Wu-ku Ind.Park,
Wu-ku, Taipei Hsien, Taiwan
Attention: Service Department

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