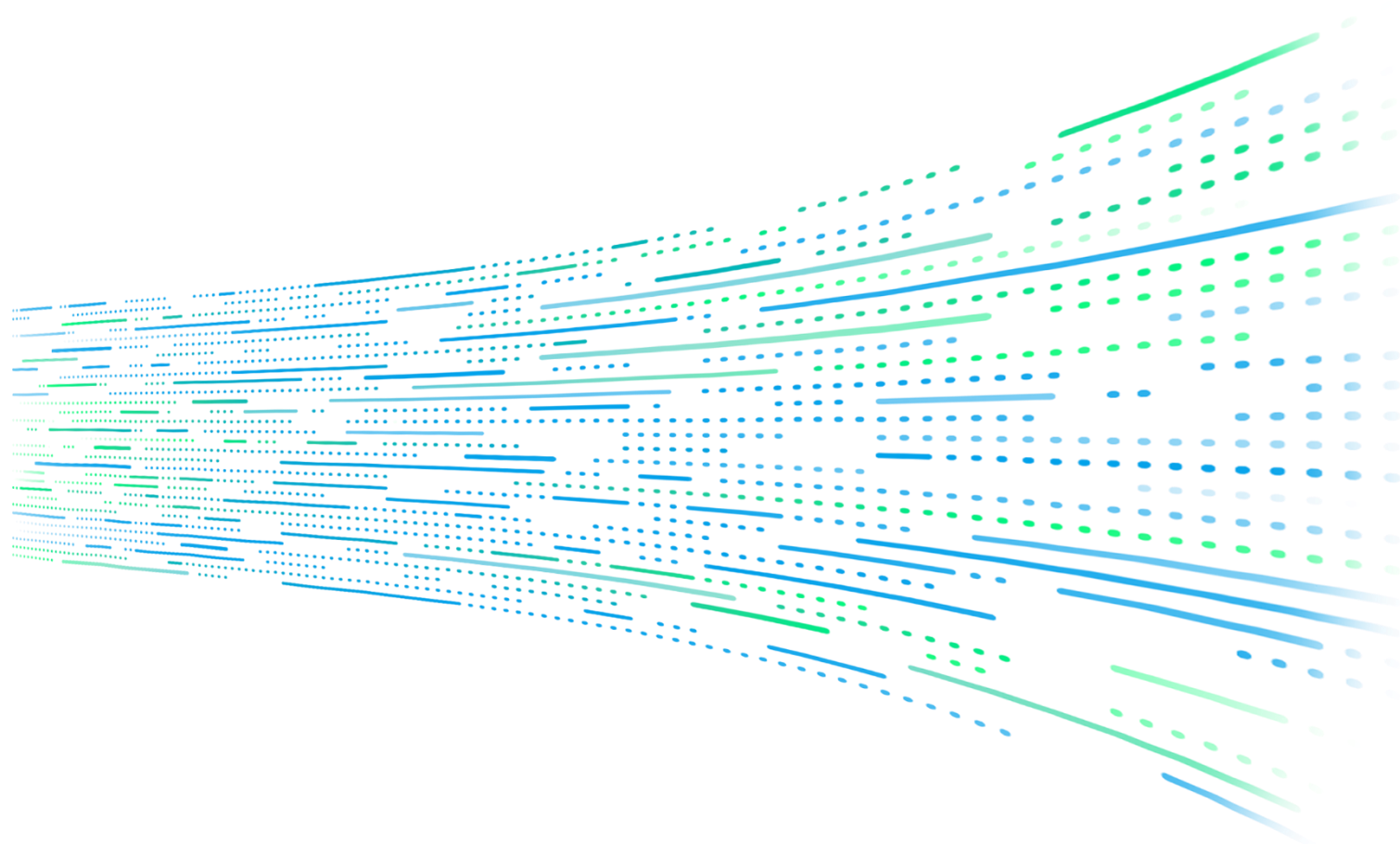


User's Manual

Ground Bond Tester

19572



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Ground Bond Tester 19572 User's Manual



Version 2.1
November 2022

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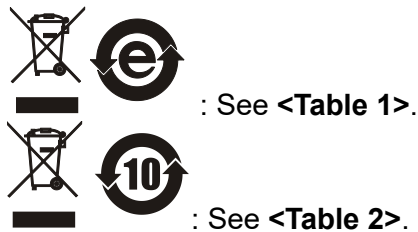
Fax: 886-3-327-8898

e-mail: info@chromaate.com

www.chromaate.com

Material Contents Declaration

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



<Table 1>

Part Name	Hazardous Substances					
	Lead	Mercury	Cadmium	Hexavalent Chromium	Polybrominated Biphenyls/ Polybromodiphenyl Ethers	Selected Phthalates Group
	Pb	Hg	Cd	Cr ⁶⁺	PBB/PBDE	DEHP/BBP/DBP/DIBP
PCBA	O	O	O	O	O	O
CHASSIS	O	O	O	O	O	O
ACCESSORY	O	O	O	O	O	O
PACKAGE	O	O	O	O	O	O

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

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

Remarks:

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

Disposal

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



<Table 2>

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

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

1. Chroma is not fully transitioned to lead-free solder assembly at this moment; however, most of the components used are RoHS compliant.
2. The environment-friendly usage period of the product is assumed under the operating environment specified in each product's specification.
3. This product is complied with EU REACH regulations and no SVHC is in use.

Disposal

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





Declaration of Conformity

For the following equipment :

Ground Bond Tester

(Product Name/ Trade Name)

19572

(Model Designation)

CHROMA ATE INC.

(Manufacturer Name)

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

(Manufacturer Address)

Is herewith confirmed to comply with the requirements set out in the Council Directive on the Approximation of the Laws of the Member States relating to Electromagnetic Compatibility (2014/30/EU) and Low Voltage Directive (2014/35/EU). For the evaluation regarding the Directives, the following standards were applied :

EN 61326-1:2013, Table 2, CISPR 11:2009+A1:2010, Group 1 Class A

EN 61000-3-2:2006+A1:2009+A2:2009, Class A, EN 61000-3-3:2013

IEC 61000-4-2:2008, IEC 61000-4-3:2006+A1:2007+A2:2010, IEC 61000-4-4:2012,

IEC 61000-4-5:2005, IEC 61000-4-6:2008, IEC 61000-4-8:2009, IEC 61000-4-11:2004

EN 61010-1:2010

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

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

CHROMA ATE INC.

(Company Name)

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

(Company Address)

Person responsible for this declaration:

Mr. Vincent Wu

(Name, Surname)

T&M BU Vice President

(Position/Title)

Taiwan

(Place)

2020.12.23

(Date)

Vincent Wu

(Legal Signature)

Safety Summary

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



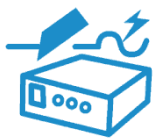
BEFORE APPLYING POWER

Verify that the power is set to match the rated input of this device.



PROTECTIVE GROUNDING

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



NECESSITY OF PROTECTIVE GROUNDING

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



FUSES

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



DO NOT OPERATE IN AN EXPLOSIVE ATMOSPHERE














Do not operate the instrument in the presence of flammable gases or fumes. The instrument should be used in an environment of good ventilation.



DO NOT REMOVE THE COVER OF THE INSTRUMENT

Operating personnel must not remove the cover of the instrument. Component replacement and internal adjustment can be done only by qualified service personnel.

Safety Symbols

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

Inspection and Examination

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

Standard Accessory

Item	Q'ty	Remark
Power cord	1	90° elbow USA-type power cord, length 1.8m
3P – 2P adapter	1	USA-type power cord 3P – 2P adapter
GB test cable	1	Wire used in GC test, length 1m- Max. 45A (1 pair has 2 wires in total)
10A fuse	1	10A SLOW 110VAC used
5A fuse	1	5A SLOW 240VAC used
Quick Start Guide	2	One English version and one Traditional Chinese version



The detailed about using the notice items and the danger of operating are described in *Chapter 3 “Notices before Us”* of this manual.

Storage, Freight, Maintenance, and Cleaning

Storage

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

Freight

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

Maintenance

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

Cleaning

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

Revision History

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

Date	Version	Revised Sections
April 2004	1.0	Complete this manual
June 2004	1.1	Modify “ <i>SYSTEM Setup</i> ” “ <i>How to Enter Memory Process</i> ” “ <i>Store Memory</i> ” “ <i>PROGRAM Setting</i> ” “ <i>Test Procedures</i> ”
May 2005	1.2	Change of address
March 2007	1.3	Add “ <i>Material Contents Declaration</i> ”
Feb. 2008	1.4	Add the following: <ul style="list-style-type: none">– “<i>CE Declaration of Conformity</i>”– SCPI commands in “<i>Command Summary</i>” and “<i>Command Description</i>” sections
May 2011	1.5	Add UL/TUV required descriptions. Modify “ <i>Material Contents Declaration</i> ”.
Mar. 2012	1.6	Modify the following: <ul style="list-style-type: none">– “<i>CE Declaration of Conformity</i>”– Figures in “<i>Remote Control</i>” section– “<i>Time T2</i>” in “<i>Timing Diagram</i>” section
Mar. 2013	1.7	Modify “ <i>How to Enter PRESET Setting Menu</i> ” section.
Sep. 2016	1.8	Modify “ <i>CE Declaration of Conformity</i> ”.
Dec. 2016	1.9	Modify the following: <ul style="list-style-type: none">– “<i>Rear Panel</i>” section– Figures in “<i>Remote Control</i>” section– “<i>Timing Diagram</i>” section
Apr. 2017	2.0	Modify the following: <ul style="list-style-type: none">– “<i>Material Contents Declaration</i>”– “<i>CE Declaration of Conformity</i>”
Nov. 2022	2.1	Change of address and update standard accessory.

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1. Introduction

1.1 Product Overview

This automatic ground bond tester is designed to test ground resistance automatically for electrical machinery and electronic devices. For ground resistance, its test range is from 0~140mΩ, under 10A can up to 510 mΩ. The output test current range is 3~45A can be set arbitrarily.

1.2 Features

1. Clear Display

This instrument has the clearest design for setting the parameters of current states, time, readings, memory no., procedures, and states. All of them can be read from the display directly.

2. Memory Backup

This instrument will backup the data after setting parameters to save to the memory. The data remain in the memory even though open the data after power-off. Therefore, if the data is not necessary to back up, do not save it to the memory to avoid occupying memory space.

3. High/Low Limit Comparison for Pass/Fail Judgment

The function of high/low limit comparison for Pass/Fail judgment is designed to prevent misjudgment due to bad connection or test cable tripping. This function can detect if there is any bad connection or broken line.

4. Software Calibration

Use software to calibrate. There is no need to open the cover but use the keyboard to key in the correct value to complete the work. The calibrated data is stored in EEPROM which is correct and stable.

5. Remote Control

This instrument can extend [START] and [STOP] signals to control externally.

6. The Output of Test Result Signal

The test result can be output by relay contacts, such as PASS, FAIL, and TEST signals output.

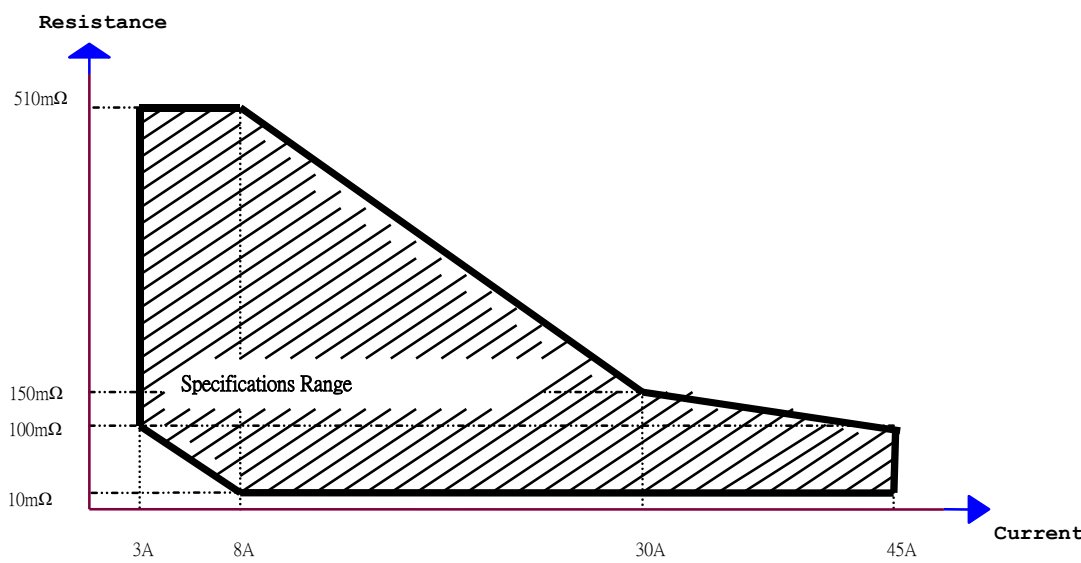
7. Keypad Locked Function

All of the keypads are locked except for [STOP] in the test state.

8. OFFSET Calibration Function

This instrument is with Offset Get function. This function can read the OFFSET of the test terminal, and line impedance of the ground test under test status and then save it in the memory. Automatic deduction for each test makes the test value more correct.

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

□ Ground Bond Tester	
□ Output Current	3.00 ~ 45.0A AC (Note 1, 2)
□ Resolution	3.00A ~ 30.00A 0.01A 30.1A ~ 45.0A 0.1A
□ Accuracy	± (1.5% of setting + 0.5% of full scale)
□ Output Frequency	50Hz, 60Hz
□ Accuracy	± 0.1%
□ Current Meter	0.01 ~ 45.0A
□ Resolution	3.00A ~ 30.00A 0.01A 30.1A ~ 45.0A 0.1A
□ Accuracy	± (1.5% of reading + 0.5% of full scale)
□ Resistance Range	0.1 ~ 510.0mΩ (Note2)
□ Resolution	(R display counts/ I display counts) ≥ 0.2, Resolution: 1mΩ (R display counts/ I display counts) < 0.2, Resolution: 0.1mΩ
□ Accuracy (Note3)	± (2% of reading + 0.5% of full scale), Detail Spec. Range
	
□ Limit Value Setting	HI – LIMIT: 0.1 ~ 510.0mΩ LOW–LIMIT: OFF, 0.1mΩ ~ HI – LIMIT Value, 510.0mΩ MAX.
□ Offset Function	
□ Offset Range	0 ~ 100.0mΩ
□ Test Time	0.5 ~ 999.0 sec. Continue (Note 2)
□ Resolution	0.1sec
□ Memory Storage	
□ Memories, Steps	10 steps or 99 groups for a total of 500 memory locations
□ Ambient Temperature and Relative Humidity	
□ Specifications Range	18 to 28°C (64 to 82°F), ≤ 70% RH.
□ Operable Range	The maximum relative humidity is 80% for temperatures up to 31°C (88°F). Decreasing linearly to 50% relative humidity at 40° C (104°F) Altitude up to 2000m.

	Indoor use only. Pollution degree 2
❑ Storage Range	-10 to 60°C (-14 to 140°F), ≤ 90% RH.
❑ Installation Category	CAT II
❑ Power Requirement	
❑ Line Voltage	AC 100V, 120V, 220V ± 10%, 240V -10% ~ +5%
❑ Frequency	50 or 60 Hz
❑ Power Consumption	No load: < 100VA, With rated load: 880W MAX.
❑ Dimension	320W x 105H x 400D mm
❑ Weight	< 16 kg.
❑ Safety	
❑ Ground Bond	Less than 100mΩ at 25Amp, 2sec
❑ Hipot	Less than 5mA at 1.8kVac, 3sec
❑ Insulation Resistance	Over 20MΩ at 500V 3sec
❑ Line Leakage Current	Less than 3.5mA at 127V, 2sec, normal, reverse

- Note**
- 1. For full rating output, the line input range is +10%, -5%.
 - 2. 40 amp for TUV 120 seconds, 40.1 – 45 amp continue is 60 seconds. The maximum test resistance range is with offset value 510mΩ, at 8amp output.
 - 3. For getting optimal accuracy, please use the 4-wire type for measuring. It is no need to do offset again. When the offset value is lower than 10mΩ, it is over the test specification. Using offset can increase 5mΩ maximum specifications error.

3. Notices before Use

Please 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, please check the power of the tester-related settings and descriptions first before operating the tester.

- **Grounding**

There is a safety grounding terminal at the instrument rear panel. Please use appropriate test leads and tools to connect the grounding terminal surely. If it is not grounding correctly, the chassis of the test machine may contain high voltage when the power circuit or the connecting line of any devices is 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 the earth correctly.

- **Remote control system**

This system is capable of remote control. Usually, it uses the control signal from the rear panel to coordinate with the HI-POT series model (such as 1905X, 1907X) to perform 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 a high voltage output, operators and other personnel are not allowed to touch the DUT, test cable and probe and an output terminal, etc.

- **Turn the power switch on or off ※ Caution ※**

The product should be so positioned that the power switch can be easily reached by the operator during an 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.

- **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. If the tester is under full load output for a long period, the bottom partial site of the tester may be a high temperature over 50°C. Before moving the tester, be sure to power off the tester first and confirm the bottom side of the tester is decreased to below 30°C to avoid burning danger.

- **Installation notices**

When installing or operating the tester, the ventilation holes should be at least 10cm from the wall to keep adequate ventilation.

<<< Emergency Events >>>

- **Emergency management**

In an emergency 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.

■ **DANGER indicator failure**

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

■ **There are four types of AC INPUT power sources 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 the same as marked on the power switch located on the rear panel, and the fuse is changed to the appropriate one when plugging in the power cord. The following table lists the fuses for the voltage used:

Mark	Center Voltage	Range	Fuse
100	100V	90V ~ 110V	10A Slow/250V
120	120V	110V ~ 130V	10A Slow/250V
220	220V	200V ~ 240V	5A Slow/250V
240	240V	220V ~ 250V	5A Slow/250V

The fuse should conform to the voltage used and replace when the power cord is unplugged to avoid electric shock. Use a flat screwdriver to pull open the fuse holder inside the power socket, remove the existing fuse and insert the new one, then plug in the power cord.



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

■ **This instrument operates in an 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 a power regulator to convert it to an applicable power source.

■ **Storage**

The normal temperature range is 0°C ~ 40°C, 80% RH. The operation may incorrect if over the range. The storage temperature is 10°C ~ 60°C, 90% RH. If you are not planning to use it for a long 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.

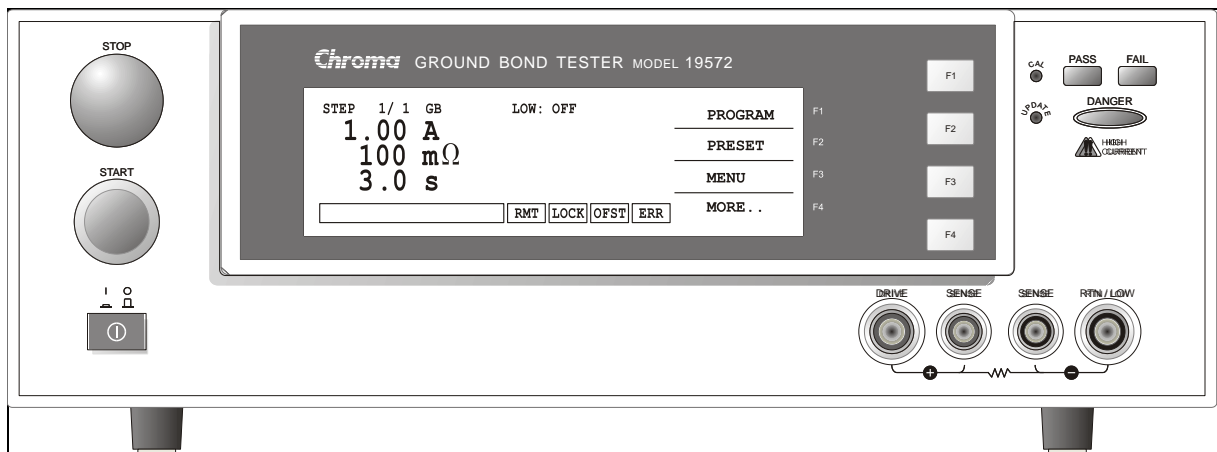
■ **Warming up**

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

4. Panel Description

4.1 Front Panel

The front panel includes several function areas that can be used easily. This chapter introduces each control and information on screen to you.



Display Area

Function Key: There are different function descriptions under different screens. The corresponding function keys (F1-F4) are on the right side of the display. If the description part is blank, it means the corresponding function key is invalid.

Status List: The text in this area indicates the setting method, setting value range, and test result fail status.

RMT: If **RMT** is highlighted, it means the main machine is in a Remote state. The main machine is controlled by a PC through GPIB/RS232 connection cable. All of the keys are invalid except for [STOP], [Local], and [MORE..].

LOCK: If **LOCK** is highlighted, it means the main machine is in a protection state for the set parameters. All modes cannot be entered except for "MEMORY", "TEST" and "KEY LOCK" three modes.

OFST: If **OFST** is highlighted, it means the tester zeroed the resistance of the test lead.

ERR: If **ERR** is highlighted, it means there are unclear errors in the error queue.

DANGER LED: The test status indicator. When the LED is light, it means the tester is under testing status. Do not touch the test terminal when there is high voltage or mass current output.

PASS LED: Pass indicator. DUT is judged as pass when the LED is light.

FAIL LED: Fail indicator. DUT is judged as fail when the LED is light. Cut off the output of the main machine when DUT is judged as fail. The LED is still lit until [STOP] is pressed.

Keypad Area

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

STOP Key: Reset key, after pressing this key the main machine return to standby test status immediately. That is a cut-off output and clears all of the judgments simultaneously.

START Key: After pressing this key, the main machine is under test. The test terminal has an output and each test function start simultaneously.

Cal-Enable: Calibration switch. This key is for calibration only before Chroma ships the device. Non-professional personnel is prohibited to use this function as it may cause product malfunction.

UPDATE: This key is for updating the program before Chroma ships the device. Non-professional personnel is prohibited to use this function as it may cause product malfunction.

Function Keys: Function keys F1 ~ F4, there are different functions under different display menus. The corresponding function key is on the right side of the display. If the description part is blank, it means the corresponding function key is invalid.

Terminal Area

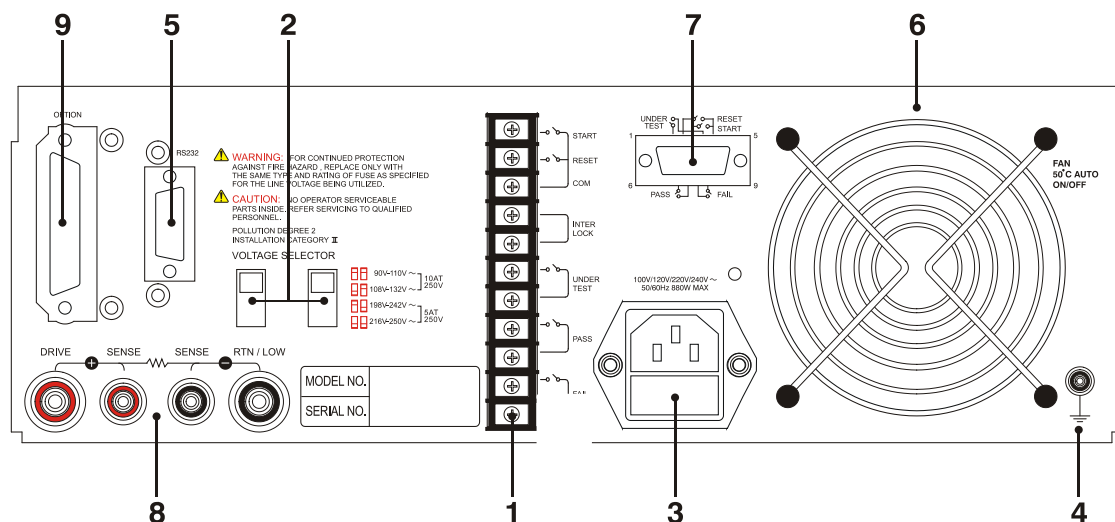
Drive (+): Positive electric potential of mass current output.

Sense (+): Positive terminal for ground bond testing.

Sense (-): Negative terminal for ground bond testing.

RTN/LOW: Common test terminal. It is a big current output negative terminal that is a low potential terminal. This terminal is almost equal to the chassis ground terminal.

4.2 Rear Panel



(1) REMOTE I/O PORT 1: The remote input/output port 1.

START : The signal input terminal for start testing.

STOP : The signal input terminal for stop testing.

INTERLOCK : High voltage only outputs when these two terminals are short-circuited.

UNDER TEST : When the tester is under testing, this output terminal will be short-circuited. Control external signals by using this short condition. The junction specification 30V AC or 60V DC is less than 0.3A action time.

The tester is under testing until being stopped.
PASS : When the tester judges the DUT as pass, this output terminal will be short-circuited. The user defines the short circuit time to control the external signal. When the 30V AC or 60V DC contact is less than 0.3A action time, the DUT is judged as good until the test is stopped.

(2) VOLTAGE SELECTOR: Input Power Range Switch

It changes the tester's AC input power range. There are 4 applicable ranges.

- a. 110V applicable voltage range 90 ~ 110V AC
- b. 120V applicable voltage range 100 ~ 130V AC
- c. 220V applicable voltage range 200 ~ 240V AC
- d. 240V applicable voltage range 220 ~ 250V AC

When switching the power range, be sure to check the fuse and replace it if necessary.

(3) AC LINE: AC power socket and fuse holder.

A tri-cord power and fuse holder. Input AC power the tester needed from the AC power socket. For the detailed specification of using the fuse, please refer to "Chapter 3" or the rear panel descriptions in this manual.

(4) GROUND

Safety ground terminal, please use an appropriate tool to connect this terminal to the ground. If it is not grounded properly when the power circuit or other connecting cable is short-circuited with the ground terminal, the chassis of the tester may exist high voltage. This is very dangerous as anyone touching the tester under the above situation may cause an electric shock hazard. Therefore, please make sure to connect the safety ground terminal to the earth.

(5) RS232 INTERFACE

This socket is for the RS232 interface. GPIB and RS232 interfaces cannot be used simultaneously.

(6) FAN

It is a temperature-controlled fan. When the temperature reaches 50°C, the fan runs automatically, and when the temperature is lower than 45°C, the fan stops automatically.

(7) REMOTE I/O PORT 2: The remote input/output port 2.

All functions of the 9-pin D-Sub connector are the same as (1) Remote I/O port 1.

(8) Terminal Area of Rear Panel

The function of this area is the same as the terminal area on the front panel.

(9) OPTION INTERFACE

This interface is for users who purchased GPIB CARD or PRINTER CARD. GPIB CARD can be used via the computer with GPIB (IEEE 488-1978) interface to do remote control and data transfer. PRINTER CARD can be plugged into the printer's CENTRONICS PORT supported by DOS mode to print the tester parameters and results directly.

4.3 Notices and Procedures before Operation

1. Before plugging in the AC power cord, please confirm the power meets the range labeled on the rear panel first and that the power switch is OFF.
2. Before powering on, be sure to read “Chapter 3” carefully and keep the notices in mind.
3. When powered on, the tester starts a self-test. If there is an abnormal condition, please turn the tester off and pull off the power cord immediately.

4.4 SYSTEM Setup

4.4.1 How to Enter SYSTEM Menu

1. In the power-on screen, press Function Key [MENU] to display the menu below:

1. MEMORY	UP
2. SYSTEM	DOWN
3. OPTION	SELECT
4. CALIBRATION	
5. KEY LOCK	
SELECT FUNC.	RMT LOCK OFST ERR EXIT

6. CHANGE PASSWORD	UP
7. ERROR LOG	DOWN
8. PRINT PROGRAM	SELECT
9. ABOUT	
10. VERSION	
SELECT FUNC.	RMT LOCK OFST ERR EXIT

2. Move the highlight to “SYSTEM” by using Function Key [UP], [DOWN]. Press Function Key [SELECT] to enter the SYSTEM SETUP menu, and display the menu below:

1. CONTRAST : 11	UP
2. BEEPER VOL. : HIGH	DOWN
3. PASS ON : CONT.	ENTER
1-16	RMT LOCK OFST ERR EXIT

4.4.2 Operation Method

1. Enter the SYSTEM SETUP screen, and press function Key [ENTER] to move the highlight to the parameter you want to set.
2. Press function Keys [UP] and [DOWN] to set the parameter.

System parameter setting description table

Setting Item	Range	Initial Setting	Description
Contrast	1~16	7	Adjust LCD brightness
Beeper Vol.	LOW / MEDIUM / HIGH / OFF	HIGH	Adjust buzzer volume
Pass ON	0, 0.1 ~ 99.9 s (0: CONT.)	CONT.	When the tested result is PASS, set the time of "Pass Relay ON" on the rear panel.

4.5 Memory Management

4.5.1 How to Enter the Memory Process

1. In the power-on menu, press Function Key [MENU] to display the menu below:

1. MEMORY	UP
2. SYSTEM	DOWN
3. OPTION	SELECT
4. CALIBRATION	
5. KEY LOCK	
SELECT FUNC.	RMT LOCK OFST ERR EXIT

2. Move the highlight to "Memory" by using Function Key [UP], [DOWN]. Press Function Key [SELECT] to enter Memory management mode and is shown below menu.

1. (0)	STORE
2. (0)	RECALL
3. (0)	DELETE
4. (0)	
5. (0)	
SELECT FUNC.	RMT LOCK OFST ERR EXIT

3. At the same time, follow the instruction of Function Key to recall, store or delete this memory.
2. The value in () means the test step number in the memory.

4.5.2 Delete Memory

To delete the test parameter stored in the memory, follow the steps below to delete it.

1. When the status list shows "SELECT FUNC.", press Function Key [DELETE].
2. Use Function Key [UP] and [DOWN] to select the test parameter data in the memory you wish to delete. Press Function Key [SELECT] and a delete confirmation screen will appear.
3. Press Function Key [YES] to confirm or press Function Key [NO] to cancel.

4.5.3 Recall Memory


If there are a lot of test parameter values in the main memory, follow the steps below to recall a test parameter.

1. When the status list shows "SELECT FUNC.", press Function Key [RECALL].
2. Use Function Key [UP] and [DOWN] to select the test parameter data in the memory you wish to recall.
3. Press Function Key [SELECT] and a recall confirmation window will appear.
4. Press Function Key [YES] to confirm or press Function Key [NO] to cancel.

4.5.4 Store Memory

To store the test parameters set in the memory, follow the steps below to store it.

1. When the status list shows "SELECT FUNC.", press Function Key [STORE].
2. Use Function Key [UP] and [DOWN] to select the memory you wish to store. Press Function Key [SELECT] and the highlight becomes a blinking underline.
3. Use Function Key [UP] and [DOWN] to input the memory name in the meantime.
4. Use Function Key [ENTER] to move the blinking underline highlight to the next position of the character.
5. Press Function Key [ENTER] twice and a store confirmation window will appear.
6. Press Function Key [YES] to confirm or press Function Key [NO] to cancel.

 **CAUTION** ⋮ If the data is already in the memory, it will be overlapped. Please confirm carefully before storing it.

4.6 PRESET Testing

4.6.1 How to Enter PRESET Setting Menu

In the power-on menu, press Function Key [PRESET] then enter the PRESET setting menu, the menu displays as below:

1.PASS HOLD	:	0.5	sec	UP	
2.STEP HOLD	:	0.2	sec	DOWN	
3.JUDG. WAIT	:	0.3	sec		
4.GB FREQ.	:	60	Hz	ENTER	
5.GB VOLTAGE	:	6.0	V		
0.2-99.9	RMT	LOCK	OFST	ERR	EXIT

4.6.2 Operation Method

1. After entering the PRESET menu, move the highlight to the parameter to be set by pressing [ENTER].
2. Press Function Keys [UP] or [DOWN] to set the parameter.

Preset parameter functions table

Setting Item	Range	Initial Setting	Description
PASS HOLD	0.2 ~ 99.9	0.5	When the test result is PASS, set the buzzer beep time.
STEP HOLD	0 ~ 99.9 / 0 = KEY	0.2	It sets interval time between test procedures. Key: It sets test procedure interruption (Please press [START] to continue when the test is stopped.)
JUDG. WAIT	0.1 ~ 99.9	0.3	It sets not to judge time.
GB FREQ.	50/60	60	It sets the output voltage frequency when performing the ground bond test.
GB VOLTAGE	1 - 8	6	It sets the output voltage for the ground bond test.
SOFT. AGC	ON/OFF	ON	It sets if the software's automatic gain compensation function is open.
FAIL CONT.	ON/OFF	OFF	It sets if continues the next step after NG occurs.
SCREEN	ON/OFF	ON	It sets the test screen to be displayed or not.
SMART KEY	ON/OFF	OFF	It sets if open parameter memory function.
START WAIT	0-99.9/0=OFF	OFF	It sets the start test wait time.
PART NO.	Maximum 13 characters	NONE	It sets the product part number.
LOT NO.	Maximum 13 characters	NONE	It sets the product lot number.
SERIAL NO.	Maximum 13 characters	NONE	It sets product serial number format and * indicates variable characters. The product serial number should be 5 characters at least and cannot be all *.

4.7 PROGRAM Setting

4.7.1 Test Procedure Setting

1. In the power-on menu, press Function Key [PROGRAM] then enter PROGRAM setting menu, the menu display as below:

STEP 1 GB		LOW : OFF		UP	
CURR : 3.00A				MORE..	
HIGH : 500mΩ				ENTER	
TIME : 3.0s					
PROCESS STEP	RMT	LOCK	OFST	ERR	EXIT

2. Enter the PROGRAM setting menu, and use Function Key [UP] to increase the test step. The range is from 1 to 99.
3. Press [ENTER] to move the highlight to the parameter you wish to set.
4. Use Function Key [MORE..] to switch the Function Key menu as shown below:

STEP 1 GB		LOW : OFF		DELETE	
CURR : 3.00A				INSERT	
HIGH : 500mΩ				DOWN	
TIME : 3.0s					
PROCESS STEP	RMT	LOCK	OFST	ERR	MORE..

5. Use Function Key [DOWN] to decrease the test step you wish to set. The range is 1 to 99.
6. Use Function Key [DELETE] and [INSERT] to delete and insert a test step.
7. Press Function Key [MORE..] to return to the previous Function Key menu, and continue to set other test parameters.

4.7.2 Operation Method

1. Enter the PROGRAM setting menu, and move the highlight to the parameter you wish to set by pressing [ENTER].
2. Press Function Key [UP] or [DOWN] to set the parameter.

4.7.3 Each Parameter Setting Data Description

The following are the parameter setting data of each test mode.

Ground resistance test mode (GB)

STEP 1	GB	LOW :	OFF	UP
CURR :	3.00A			DOWN
HIGH :	100mΩ			ENTER
TIME :	3.0s			
3.00-45.0A	RMT	LOCK	OFST	ERR
				EXIT

CURR : Sets the current for the ground resistance test.



Because the test current multiplied by the high limit of resistance cannot be over 6.3V, the high limit of resistance will be automatically modified to an adaptable value when it does not correspond to the above condition.

HIGH : Sets the ground resistance high limit. The value is 510mΩ or whichever is minor in 6.3V/ CURRENT.

LOW : Sets the ground resistance low limit. The value is less than the high limit of ground resistance or OFF.

TIME : Sets the test time. 0 means continuous test.

4.8 How to Process Test

4.8.1 Offset Value Calibration of Test Cable

1. In the power-on menu, enter the multi-groups STEPS test menu by pressing Function Key [MORE..].
2. Press Function Key [OFFSET], and the display will show the menu to direct the user to connect the (+) and (-) two terminals of DRIVE and SENSE on the ground bond test applicable test cable and then short-circuit the test cable.
3. Press [START], DANGER LED lights on the front panel. The current output time is the user-defined test time. If the test time is CONT., the current output time is 5 seconds. The main system starts to measure the line resistance of the test cable and show the value on the display, in the meanwhile store it in the memory.

4.8.2 Connecting DUT Methods

Ground resistance test mode (GB)

First of all, confirms there is no current output and the DANGER LED is not lit, screw the test cable and terminal with a tool, and then clip the DUT to the test cable.

4.8.3 Test Procedures

1. Follow the DUT connection method to connect it correctly.
2. In the power-on menu (shown below):



Description:

STEP 1/2 means there are two test steps, now are going to perform the first test procedure. "Line 1" means the test current setting, "Line 2" means the high limit of grounding resistance, and "Line 3" means the test time. The test result shows on the status line.

1. Please press [STOP] ready for testing, the status line shows "STANDBY".
2. Press [START] to start the test.
When pressing this key, it will start testing the current output. The DANGER LED lights up in the meantime, and the status line shows "UNDER TEST". Be aware that the test is having a large current output. "Line 1" shows the output current reading. "Line 2" shows the measured resistance reading. "Line 3" is the timer counting down simultaneously.
3. Pass judgment
When all tests are performed and the result shows a PASS, it means the DUT is judged as PASS, and the tester cut off the output. The rear panel outputs a PASS signal and the buzzer functions simultaneously.
4. Fail judgment
If the measured value is abnormal, the DUT is judged as FAIL and the tester stops output immediately. The rear panel outputs a FAIL signal and the buzzer functions simultaneously until the [STOP] key is pressed. The test result will show a Fail state.

Fail state description table

Test result	Meaning
HI	The measurement resistance value is over the high limit.
LO	The measurement resistance value is over the low limit.
ADV OVER	The current reading is over hardware valid digit.
ADI OVER	Resistance reading is over hardware valid digit.
CAN NOT TEST	Do not set the output current or the measured resistance high limit.

Under any circumstance, you can simply press **STOP** to stop the test output.

4.9 KEY LOCK Function

4.9.1 KEY LOCK Setting

1. In the Power-on menu, you can set KEY LOCK if “LOCK” is not highlighted.
2. Press Function Key [MENU], the menu is shown below.

1. MEMORY	UP
2. SYSTEM	DOWN
3. OPTION	SELECT
4. CALIBRATION	
5. KEY LOCK	
SELECT FUNC.	RMT LOCK OFST ERR EXIT

3. Use Function Key [UP] and [DOWN] to move the highlight to “KEY LOCK”, and press Function Key [SELECT] to enter the KEY LOCK setting menu.
4. Use Function Key [A] and [B] to input the PASSWORD (default is AAAA.)
5. Press [ENTER] to prompt a selection window, and “LOCK” is highlighted. The user can press Function Key [YES] or [NO] to select if lock the MEMORY RECALL function as well.

4.9.2 Canceling KEY LOCK

1. In the Power-on menu, you can release KEY LOCK if “LOCK” is highlighted.
2. Press Function Key [MENU], the menu shown below:

1. MEMORY	UP
2. SYSTEM	DOWN
3. OPTION	SELECT
4. CALIBRATION	
5. KEY LOCK	
SELECT FUNC.	RMT LOCK OFST ERR EXIT

3. Move the highlight to “KEY LOCK” by Function Key [UP] and [DOWN]. Press Function Key [SELECT] to enter the KEY LOCK release menu.
4. Use Function Key [A] and [B] to input the PASSWORD (default is AAAA.)
5. Press Function Key [ENTER], and “LOCK” is not highlighted which means the KEY LOCK function has been canceled.

4.10 User Password Setting

1. In the power-on menu, press Function Key [MENU] to show the menu below:

1. MEMORY	UP
2. SYSTEM	DOWN
3. OPTION	SELECT
4. CALIBRATION	
5. KEY LOCK	
SELECT FUNC.	RMT LOCK OFST ERR EXIT

2. Use Function Key [UP] and [DOWN] to move the highlight to "CHANGE PASSWORD" and press Function Key [SELECT] to enter the password menu.
3. Use Function Key [A] and [B] to input the OLD PASSWORD (default is AAAA). After pressing [ENTER], use Function Key [A] and [B] to input NEW PASSWORD (the maximum is 10 characters). After pressing [ENTER], use Function Key [A] and [B] to input CONFIRM PASSWORD (same as NEW PASSWORD) and press Function Key [ENTER]. Press [EXIT] after completing the setting.

4.11 Remote Control

A remote control switch is located at the rear panel. You can plug in the control cable to use external signals to externally control the device output.

Be aware when using the remote control as it is done by external signals. Use it carefully to avoid the tester error operation causing any danger. The remote control is usually performed by other control circuits. Be careful that it is the switch to control mass current output, so you must connect the control cable not close to the power terminal to keep away from the interference of noise to avoid causing any danger.

1. For single control of START and STOP signals, follow *Figure 4-1* listed below to connect them to the REMOTE position on the front panel of the main system.

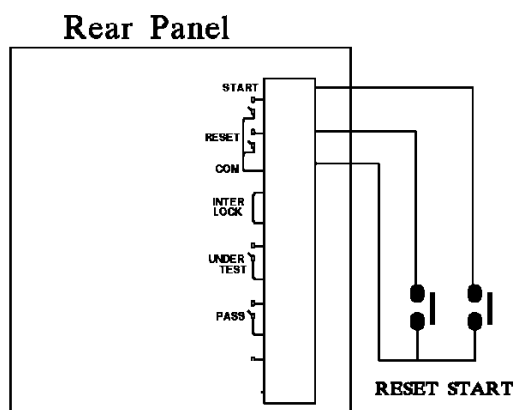


Figure 4-1

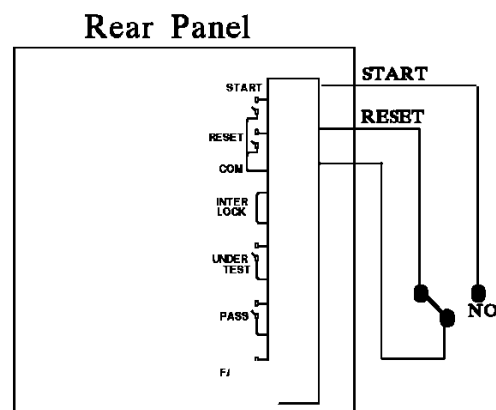


Figure 4-2

2. If it is connected as *Figure 4-2* shows, the system routine is in a STOP state as the NC is connected to STOP and NO is connected to START.
3. The logic components of the transistor, FET, and couplers can be connected and used as a control circuit. The connected signals and circuit are shown in *Figure 4-3* below. To use this circuit to control the system, it must contain the following:
 - (1) The current of the LOW signal is 2mA or less.
 - (2) The active time for the input signal is more than 20mS.

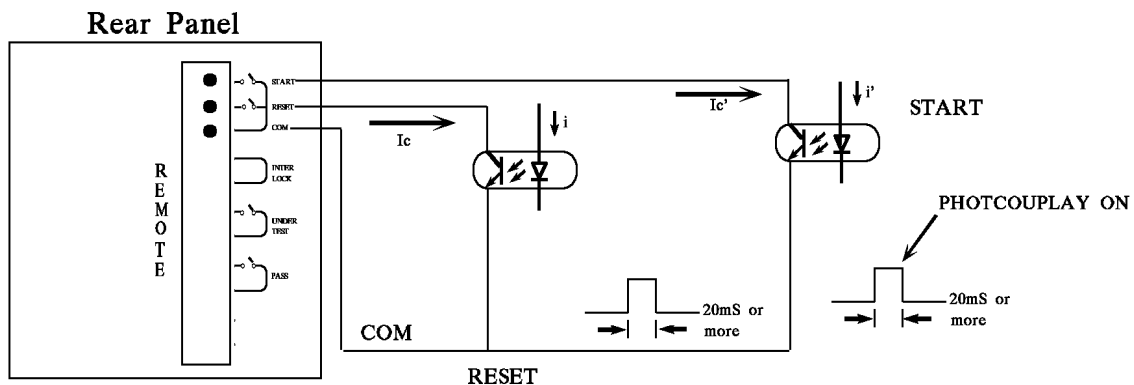


Figure 4-3

4. Either the relay switches control in *Figure 4-1* or the coupler control in *Figure 4-3* uses the contact of components for control action. It can prevent the error operation from interference effectively. Though the system has a lot of precautions, it is necessary to be careful about the interference caused by the measurement system settings.
5. The pin assignment of REMOTE CONTROL is shown in the figure below. It should be memorized when using external control.

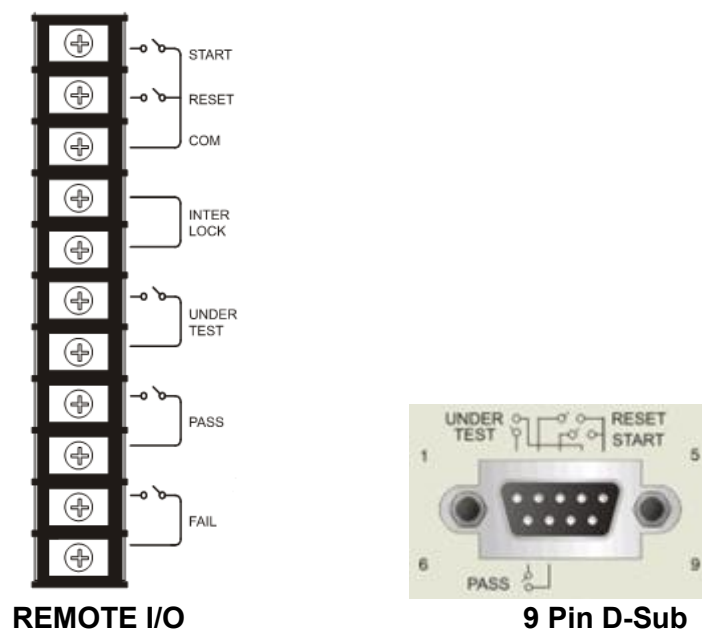


Figure 4-4 Pin Assignment on Rear Panel

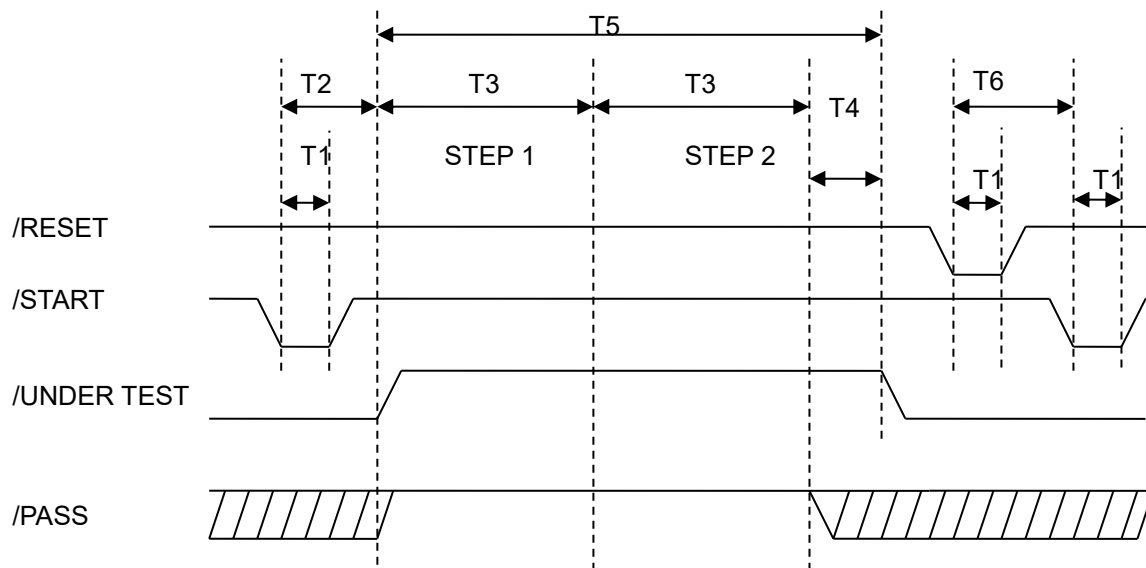
4.12 Output Signal

This instrument has indication signals for the indicator and beeper. The output signals on the system's rear panel are:

UNDER TEST: This terminal will be short-circuited when in the test state, thus it can be used to control the external signal. The connection point specification is 30V AC or 60V DC, the current is less than 0.3A.

PASS: This terminal will be short-circuited when the DUT passes the tests, the user specifies the time of the short circuit and it can be used to control the external signal. The contact point specification is 30V AC or 60V DC, the current is less than 0.3A. The action time is from the DUT passes until it stops.

4.13 Timing Diagram



Timing diagram – Example of Two Test Steps

Time	Limit	Description
T1	> 20mS	The time for the external trigger signal /START & /RESET to remain should be larger than 20mS.
T2	< 200mS	The time for the external trigger signal /START to /UNDER TEST signal to be cleared should be less than 200mS. The previous STEP test result /PASS signal status has been cleared in advance.
	< 300mS	The time for the external trigger signal /START to /UNDER TEST signal to be cleared should be less than 300mS. The previous STEP test result /PASS signal status hasn't been cleared in advance.
T3	-	Test needed time of various test steps.
T4	> 5mS	/Pass signal sent larger than 5mS, /UNDER TEST signal is end.

T5	-	The equipment used time as testing, the signal is simultaneous with the Danger lamp on the panel.
T6	>160mS	The time for the external trigger signal /RESET to /START signal to start, which should be larger than 160mS (the SCREEN setting is OFF).
	>250mS	The time for the external trigger signal /RESET to /START signal to start, which should be larger than 250mS (the SCREEN setting is ON).

5. Remote Interface Description

5.1 RS232 Interface Specification

5.1.1 Data Format

Baud Rate: 300 / 600 / 1200 / 2400 / 4800 / 9600 / 19200

Parity: NONE / ODD / EVEN

Flow Control: NONE / SOFTWARE

Transmit bit: 1 initial bit

8 data bits or 7 data bits add 1 parity bit

1 end bit

5.1.2 Command Format

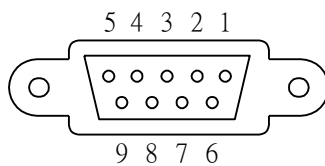
The RS232 interface of the instrument is inputted by ASCII code to compose a command string for the remote control and set function. The length limit of a command string is within 1024 characters (including end code) [command + parameter] to compose a command. Two commands can connect by semicolon “;” and add end code finally. The end code can be any type of the below and the instrument can distinguish them by itself.

End code

LF
CR + LF

5.1.3 Connector

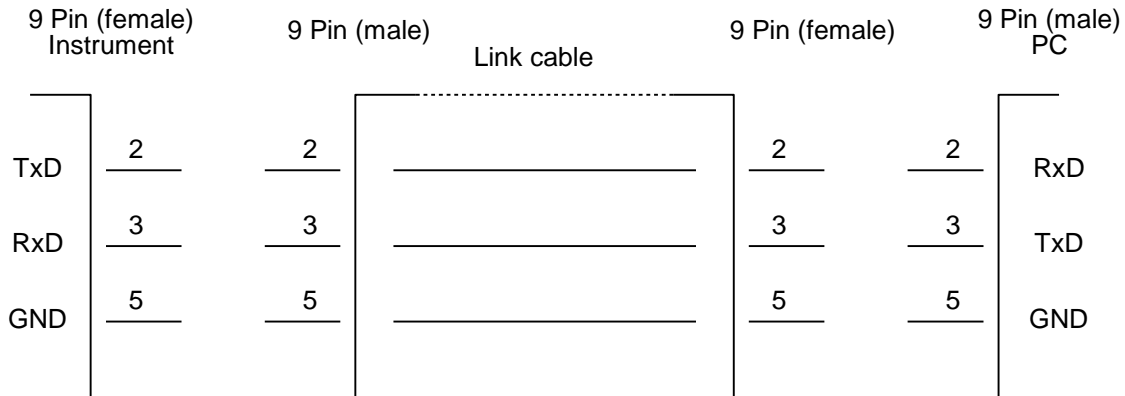
The RS232 connector of this tester is a 9-pin female connector.



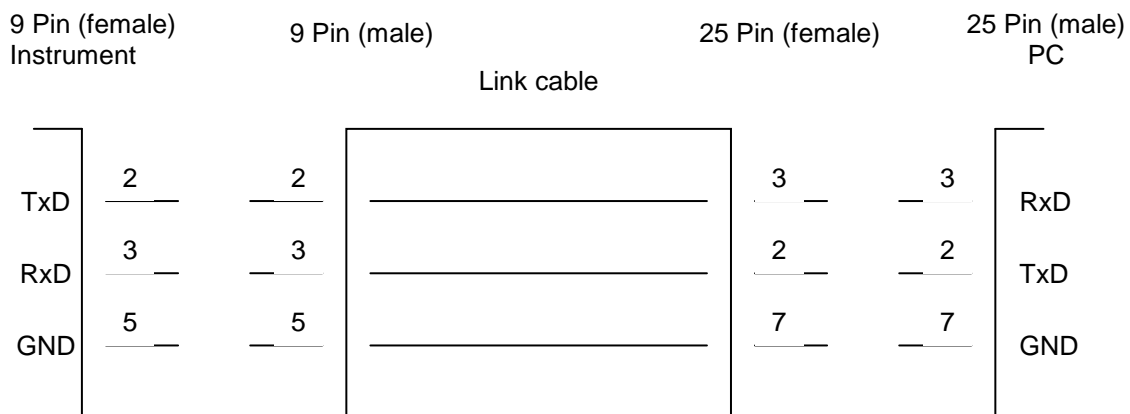
Pin No.	Description
1 *	Not used
2 TxD	Deliver data
3 RxD	Receive data
4 *	Not used
5 GND	Grounding
6 *	Not used
7 *	Not used
8 *	Not used
9 *	Not used

5.1.4 Connection Method

DB-9 to DB-9 Serial Connection



DB-9 to DB-25 Serial Connection



5.2 Remote Interface Command

5.2.1 Command Summary

- **IEEE 488.2 Command**
 - *CLS
 - *ESE < enable value >
 - *ESE?
 - *ESR?
 - *IDN?
 - *OPC
 - *OPC?
 - *PSC 0 | 1
 - *PSC?
 - *RST
 - *RCL < register number >
 - *SAV < register number >
 - *SRE < enable value >
 - *SRE?

*STB?

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

● SCPI Command

```

:MEMory
|   :DELeTe
|   |   :LOCAtion    < register number >
|   :FREe
|   |   :STATe?
|   |   :STEP?
|   :STATe

|   |   :DEFine    <name>, <register number>
|   |   :DEFine?   <name>
|   |   :LABEl?    < register number >
|   NSTates?
:SYSTem
|   :ERRor
|   |   [NEXT]?
|   :VERSion?
|   :KLOCK < boolean > / ON / OFF
|   :KLOCK?
|   :LOCK
|   |   :OWNer?
|   |   :REQuest?
|   |   :RELease
|   [:SOURce]
|   :SAFEty
|   |   :FETCh?    [ < item > ] { , < item > }
|   |   :STARt
|   |   |   [:ONCE]
|   |   |   :OFFSet  GET | OFF
|   |   |   :OFFSet?
|   |   :STOP
|   |   :STATus?
|   |   :SNUMber?
|   |   :RESult
|   |   |   :ALL
|   |   |   |   [:JUDGment]?
|   |   |   |   :OMETerage?
|   |   |   |   :MMETerage?
|   |   |   |   :MODE?
|   |   |   |   :TIME
|   |   |   |   |   [:ELAPsed]
|   |   |   |   |   |   [:TEST]?
|   |   |   :COMPleted?
|   |   |   [:LAST]
|   |   |   |   [:JUDGment]?
|   |   |   |   :MMETerage?
|   |   |   |   :OMETerage?
|   |   |   :STEP<n>
|   |   |   :JUDGment?

```

			:MMETerage?	
			:OMETerage?	
			:AREPort	
			[:JUDGment]	
			[:MESsage] < boolean > / ON / OFF	(RS232 interface only)
			:AREPort	(RS232 interface only)
			[:JUDGment]	
			[:MESsage] ?	(RS232 interface only)
			:OMETerage < boolean > / ON / OFF	(RS232 interface only)
			:OMETerage?	(RS232 interface only)
			:MMETerage < boolean > / ON / OFF	(RS232 interface only)
			:MMETerage?	(RS232 interface only)
			:AStart	
			:STATus?	
			:STEP<n>	
			:DELeTe	
			:SEt?	
			:MODE?	
			:GB	
			[:LEVel] < numeric value >	
			[:LEVel]?	
			:LIMit	
			[:HIGH] < numeric value >	
			[:HIGH]?	
			:LOW < numeric value >	
			:LOW?	
			:TIME	
			[:TEST] < numeric value >	
			[:TEST]?	
			:PRESet	
			:TIME	
			:PASS < numeric value >	
			:PASS?	
			:STEP < numeric value > KEY	
			:STEP?	
			:JUDGment < numeric value >	
			:JUDGment?	
			:GB	
			:FREQuency < numeric value >	
			:FREQUery?	
			:VOLTage < numeric value >	
			:VOLTage?	
			:AGC	
			[:SOFTware] <boolean> ON OFF	
			[:SOFTware]?	
			:FCONtinuity <boolean> ON OFF	
			:FCONtinuity?	
			:SCREen <boolean> ON OFF	
			:SCREen?	
			:KEYboard	
			:SMART <boolean> ON OFF	
			:SMART?	
			:TIME	
			:AStart < numeric value >	
			:ASart?	
			:NUMber	
			:PART <part number>	

					:PART?	
					:LOT	<lot number>
					:LOT?	
					:SERIAL	<serial number>
					:SERIAL?	

5.2.2 Command Description

● IEEE 488.2 Command

*CLS

It clears the status data by performing the following.
 Clear the standard event status register
 Clear the status byte registers except for the MAV bit (bit 4).

*ESE < metric system value>

This command sets the value of standard event status enables register, the <metric system value> range is 0 ~255.

*ESE?

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

*ESR?

The controller queries the standard event register value of the device. After performing this command, the standard event register value will be cleared to 0.
 The output format is <metric system value>, and the range is 0 ~255.

*IDN?

The controller is for reading the basic data of the device. The output format is separated into four fields by comma, which are manufacturer, device model, serial number, and firmware version.

*OPC

Operation complete command

*OPC?

Operation complete query command. The output format is an ASCII character "1".

*PSC 0 | 1

This command is the power on status clear command

*PSC?

This command queries the power on clear status. The output format is an ASCII character "1" or "0".

*RST

The device reset command.

*RCL < metric system value>

Recall command, this command recalls the saved status.

***SAV < metric system value >**

Save command, this command saves the current status to the memory.

***SRE < metric system value >**

This command sets the service request register value, and the <metric system value> value is 0 ~ 255.

***SRE?**

The controller sets the service request enable register initial setting. The output format is <metric system value>, and the range is 0 ~255.

***STB?**

The controller reads the status bit register value.

The output format is <metric system value>, its' range is 0 ~255

● **SCPI Command**

:MEMory:DELeTe:LOCAtion < register number >

This command is for deleting < register number > denoted parameter data in system memory. < register number > is integral data.

:MEMory:FREE:STATe?

This command is for query remainder PRESET parameter quantity in the system memory.

:MEMory:FREE:STEP?

This command queries the remainder STEP quantity in the system memory.

:MEMory:STATe:DEFine <name>, <register number>

This command defines a name to a memory located at a certain specified position inside the main memory.

:MEMory:STATe:DEFine? <name>

This command is for querying the location inside the main memory by the memory name.

:MEMory:STATe:LABEl? < register number >

This command queries the name inside the main memory by location.

:MEMory:NSTates?

This command queries the main system *SAV / *RCL maximum value adds 1 to the applicable parameter.

:SYSTem:ERRor[:NEXT]?

This command reads the message in the error queue. For the detail of the return message, please check them in *section 5.3*.

:SYSTem:VERSion?

This command queries the system SCPI version.

:SYSTem:KLOCK < boolean > | ON | OFF

This command locks or unlocks the LOCAL key function without switching to the LOCAL or REMOTE control.

:SYSTem:KLOCK?

This command queries if the LOCAL key is locked or not.

:SYSTem:LOCK:OWNer?

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

Return character NONE|REMOTE.

:SYSTem:LOCK:REQuest?

This command switches to the REMOTE control.

:SYSTem:LOCK:RELease

This command switches to the LOCAL control.

[:SOURce]:SAFEty:FETCh? [< item >] [, < item >]

This command queries the system measurement result, <item> is character data, the meaning as below:

Character Data	Return Data
STEP	The STEP sequence number at present.
MODE	The MODE at present.
OMETerage	The output value now.
MMETerage	The measurement value at present.
TELApsed	The TEST executed time at present.
TLEFT	The TEST remains time at present.

[:SOURce]:SAFEty:STARt[:ONCE]

This command starts the test.

[:SOURce]:SAFEty:STARt:OFFSet GET | OFF

If the parameter is GET, it gets the offset value. At the same time, the system may output mass current. If the parameter is OFF, the offset is disabled.

[:SOURce]:SAFEty:STARt:OFFSet?

This command queries if the offset is enabled or not.

[:SOURce]:SAFEty:STOP

This command stops the test.

[:SOURce]:SAFEty:STATus?

This command queries the current system execution status, the return character data is RUNNING|STOPPED.

[:SOURce]:SAFEty:SNUMber?

This command queries the STEP number in the memory.

[:SOURce]:SAFEty:RESult:ALL:OMETerage?

This command queries the OUTPUT METER reading of all steps.

[:SOURce]:SAFEty:RESult:ALL:MMETerage?

This command queries the MEASURE METER reading of all steps.

[:SOURce]:SAFEty:RESult:ALL:MODE?

This command queries the MODE of all steps, it will return the GB character data.

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

This command queries the test time of all steps.

[[:SOURce]:SAFEty:RESult:ALL[:JUDGment]?

This command queries all judgment results. Return format: First Step Result, Second Step Result, ..., Last Step Result. The code meaning is listed in the table below.

Test result code table

Mode	GB	
	HEX	DEC
STOP	70	112
USER STOP	71	113
CAN NOT TEST	72	114
TESTING	73	115
PASS	74	116
HIGH FAIL	11	17
LOW FAIL	12	18
OUTPUT A/D OVER	16	22
METER A/D OVER	17	23

[[:SOURce]:SAFEty:RESult:COMPLeted?

This command queries the system if the execution is completed or not, returning 1 or 0.

[[:SOURce]:SAFEty:RESult[:LAST]][:JUDGment]?

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

The code table for judgment result

Result	Code (hexadecimal)	Code (metric system)
PASS	74	116
USER STOP	71	113
CAN NOT TEST	72	114
TESTING	73	115
STOP	70	112

The code table for the failed judgment result

	GB MODE	
	Hex	Dec
HI	11	17
LO	12	18
ADV OVER	16	22
ADI OVER	17	23

[[:SOURce]:SAFEty:RESult:LAST:MMETerage?

It queries the Measure Meter value of the last step.

[[:SOURce]:SAFEty:RESult:LAST:OMETerage?

It queries the Output Meter value of the last step.

:SOURce:SAFEty:RESult:STEP<n>:JUDGment?

It queries the judgment result code of the selected step.

:SOURce:SAFety:RESult:STEP<n>:MMETerage?

It queries the Measure Meter value of the selected step.

:SOURce:SAFety:RESult:STEP<n>:OMETerage?

It queries the Output Meter value of the selected step.

[[:SOURce]:SAFety:RESult:AREPort[:JUDGment]][:MESSage]< *boolean* > | ON | OFF

This command sets if auto reporting the test result. If set to ON, the test will return "PASS" or "FAIL" string data when the test is completed. (RS232 interface only)

[[:SOURce]:SAFety:RESult:AREPort[:JUDGment]][:MESSage]?

This command queries if auto reporting the test result, it returns 1 or 0 (RS232 interface only).

[[:SOURce]:SAFety:RESult:AREPort:OMETerage < *boolean* > | ON | OFF

This command sets if auto reporting the test result. If set as ON, the test will return the output current value of all STEPs when completed. If some STEPs do not need to be tested, there is no output value. The STEPs return is +9.910000E+37 (RS232 interface only).

[[:SOURce]:SAFety:RESult:AREPort:OMETerage ?

This command queries the output current if auto reporting the test result, it returns 1 or 0 (RS232 interface only).

[[:SOURce]:SAFety:RESult:AREPort:MMETerage < *boolean* > | ON | OFF

This command sets if the measured value auto reports the test result. If set as ON, the test will return the measured value of all STEPs when completed. If some STEPs do not need to be tested, there is no measured value. The STEPs return is +9.910000E+37 (RS232 interface only).

[[:SOURce]:SAFety:RESult:AREPort:MMETerage ?

This command queries if the measured value auto reports the test result, and it returns 1 or 0 (RS232 interface only).

[[:SOURce]:SAFety:AStart:STATus?

This command queries the GBSS MODE status and returns character data ON|OFF.

[[:SOURce]:SAFety:STEP<n>:DELeTe

This command deletes the STEP of <n> represented, and the next STEP of <n> will fill it.

[[:SOURce]:SAFety:STEP<n>:SET?

This command queries all setting values in the selected STEP.

[[:SOURce]:SAFety:STEP<n>:MODE?

This command queries the MODE in the selected STEP, it will return GB character data.

[[:SOURce]:SAFety:STEP<n>:GB[:LEVel] < *numeric value* >

This command sets the current required for the ground bond test of the selected STEP. The unit is ampere (A).

[[:SOURce]:SAFety:STEP<n>:GB[:LEVel]?

This command queries the current set for the ground bond test of the selected STEP.

[[:SOURce]:SAFEty:STEP<n>:GB:LIMit[:HIGH] < numeric value >

This command sets the ground bond test high limit for judgment of the selected STEP.
The unit is Ohm.

[[:SOURce]:SAFEty:STEP<n>:GB:LIMit[:HIGH]?]

This command queries the ground bond test high limit for judgment of the selected STEP.

[[:SOURce]:SAFEty:STEP<n>:GB:LIMit:LOW]

This command sets the ground bond test low limit for judgment of the selected STEP.

[[:SOURce]:SAFEty:STEP<n>:GB:LIMit:LOW?]

This command queries the ground bond test low limit for judgment of the selected STEP.

[[:SOURce]:SAFEty:STEP<n>:GB:TIME[:TEST] < numeric value >

This command sets the time required for the selected STEP for testing. The unit is second (s).

[[:SOURce]:SAFEty:STEP<n>:GB:TIME[:TEST]?]

This command queries the time required for the selected STEP for testing.

[[:SOURce]:SAFEty:PRESet:TIME:PASS < numeric value >

This command sets the BUZZER beep time when passes the test.
<numeric_value> is a value between 0.2 and 99.9(included).

[[:SOURce]:SAFEty:PRESet:TIME:PASS?]

This command queries the BUZZER beep time when passes the test. It returns a value between 0.2 and 99.9 (included).

[[:SOURce]:SAFEty:PRESet:TIME:STEP < numeric value > | KEY]

This command sets the interval time between STEP and the time to start the command to execute the next STEP.

[[:SOURce]:SAFEty:PRESet:TIME:STEP?]

This command queries the interval setting between steps, the return value is KEY or the unit of second.

[[:SOURce]:SAFEty:PRESet:TIME:JUDGment < numeric value >

This command sets a certain period and no detection in certain conditions.

[[:SOURce]:SAFEty:PRESet:TIME:JUDGment?]

This command queries the time for waiting detection.

[[:SOURce]:SAFEty:PRESet:GB:FREQuency < numeric value >

This command sets the output current frequency for the ground bond test.

[[:SOURce]:SAFEty:PRESet:GB:FREQuency?]

This command queries the output current frequency for the ground bond test.

[[:SOURce]:SAFEty:PRESet:GB:VOLTage < numeric value >

This command sets the open voltage for the ground bond test.

[[:SOURce]:SAFEty:PRESet:GB:VOLTage?]

This command queries the open voltage for the ground bond test.

[[:SOURce]:SAFEty:PRESet:AGC[:SOFTware] < boolean > | ON | OFF

This command sets the software AGC to open or not.

[[:SOURce]:SAFEty:PRESet:AGC[:SOFTware]?]

This command queries if the software AGC is open or not. The return character is 1 or 0.

[[:SOURce]:SAFEty:PRESet:FCONTinuity < boolean > | ON | OFF

This command sets if continue to test the next step when fails the test.

[[:SOURce]:SAFEty:PRESet:FCONTinuity?]

This command queries if FCONTinuity is open or not. It returns character 1 or 0.

[[:SOURce]:SAFEty:PRESet:SCREen < boolean > | ON | OFF

This command sets the test screen to ON or OFF.

[[:SOURce]:SAFEty:PRESet:SCREen?]

This command queries if the test screen is ON or OFF. It returns character 1 or 0.

[[:SOURce]:SAFEty:PRESet:KEYboard:SMART < boolean > | ON | OFF

This command sets the SMART KEY to open or not.

[[:SOURce]:SAFEty:PRESet:KEYboard:SMART?]

This command queries if the SMART KEY is open or not. It returns character 1 or 0.

[[:SOURce]:SAFEty:PRESet:TIME:ASart < numeric value >

This command set the waiting time to start in GBSS MODE. The setting range is 0.1~99.9 seconds. When set to 0, it means the GBSS MODE is off.

[[:SOURce]:SAFEty:PRESet:TIME:ASart?]

This command queries the waiting time to start the GBSS MODE.

[[:SOURce]:SAFEty:PRESet:NUMber:PART <part number>

This command sets the part number.

[[:SOURce]:SAFEty:PRESet:NUMber:PART?]

This command queries the part number.

[[:SOURce]:SAFEty:PRESet:NUMber:LOT <lot number>

This command sets the lot number.

[[:SOURce]:SAFEty:PRESet:NUMber:LOT?]

This command queries the lot number.

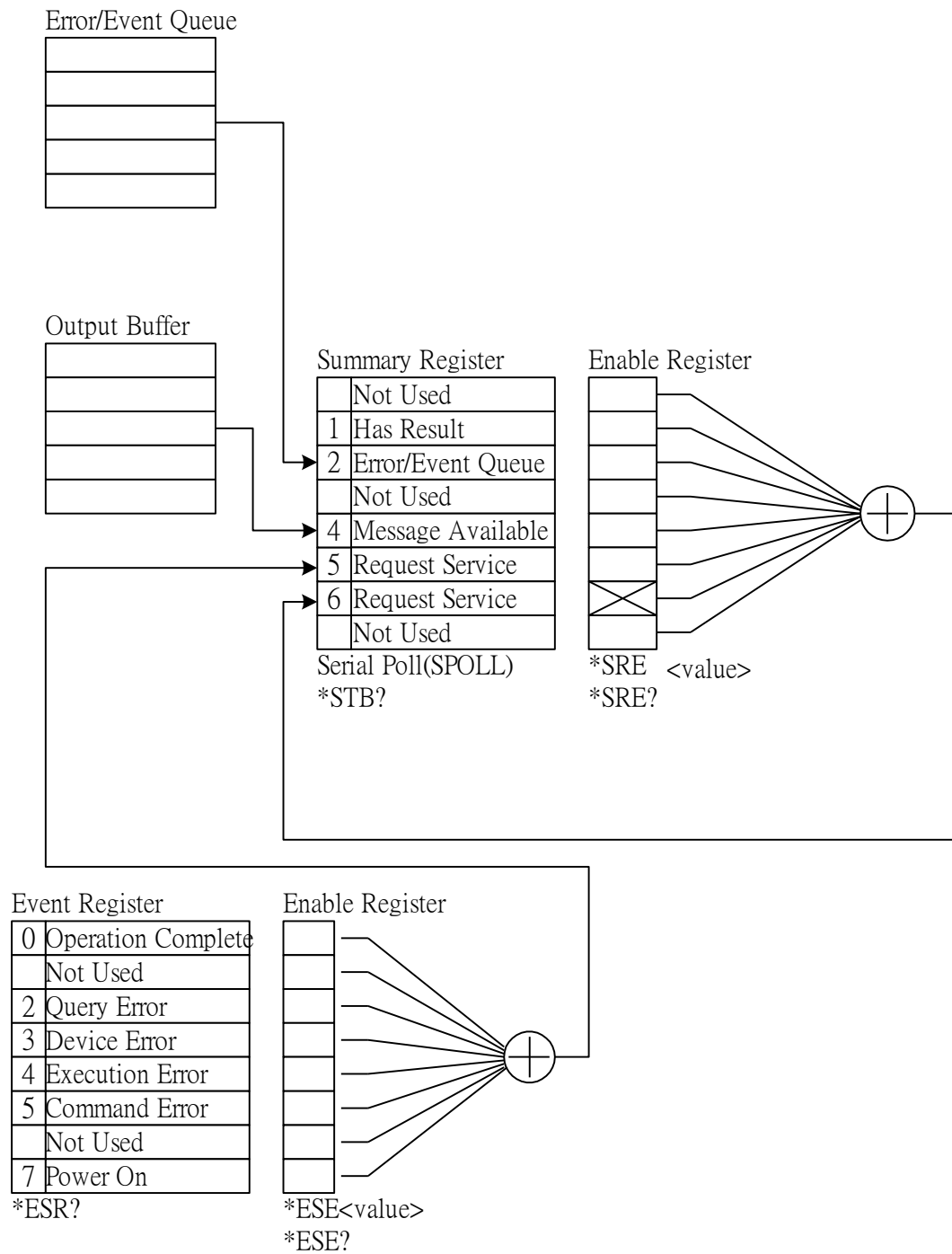
[[:SOURce]:SAFEty:PRESet:NUMber:SERial <serial number>

This command sets the serial number format of the product, * means universal character.

[[:SOURce]:SAFEty:PRESet:NUMber:SERial?]

This command queries the serial number format of the product.

5.2.3 SCPI Status System



5.3 Error Messages

- Error messages are saved in error queue which access by FIFO method. The return first error message is the first being saved.
- When the error message is over 30, the last position would be saved as -350, "Queue overflow". The error queue can't save error message any more until there is error message out.
- When there is no error occurred, the first position would be saved +0, "No error".

-102	Syntax error Syntax error usually includes not allowed character symbol in command.
-108	Parameter not allowed The device receives parameter is not allowed.
-109	Missing parameter The parameter is missing.
-112	Program mnemonic too long A simple command program header is over 12 characters.
-113	Undefined header The device received an undefined header.
-114	Header suffix out of range The header suffix is out of range.
-151	Invalid string data Invalid string data is usually missing double quotations.
-158	String data not allowed The device received disallowed string data.
-170	Expression error The device is received uncompleted parameter data, such as missing the right parenthesis.
-222	Data out of range The data is out of range.
-291	Out of memory The data is out of memory.
-361	Parity error The parity is an error.
-365	Time out error The device does not receive the end character within a certain time.
-363	Input buffer overrun The device received over 1024 characters.
-400	Queue error The output queue data is over 256 characters.
-410	Query INTERRUPTED When received a query command, you don't read out the query result and then received another query command immediately.
-420	Query UNTERMINATED There is no data in the queue, meanwhile received the command of reading output queue data.

5.4 RS232 Operation Using Basic

```

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

REM open serial port as device 1
OPEN "COM1:9600,N,8,1,RS,CS,DS,CD,LF" FOR RANDOM AS #1
PRINT #1, ":SOURce:SAFEty:STOP"
PRINT #1, ":SOURce:SAFEty:SNUMber ?"
INPUT #1, STEPNUM%
CLS
IF STEPNUM% > 0 THEN
    FOR I = STEPNUM% TO 1 STEP -1
        PRINT #1, "SOURce:SAFEty:STEP", I, ":DELeTe""clear all steps data
    NEXT I
END IF
PRINT #1, "SOURce:SAFEty:STEP1:GB:LEVeI 3.1"
PRINT #1, "SOURce:SAFEty:STEP1:GB:LIMit:HIGH 0.2"
PRINT #1, "SOURce:SAFEty:STEP1:GB:TIME:TEST 3.1"
PRINT #1, "SOURce:SAFEty:STEP2:GB:LEVeI 3.2"
PRINT #1, "SOURce:SAFEty:STEP2:GB:LIMit:HIGH 0.3"
PRINT #1, "SOURce:SAFEty:STEP2:GB:TIME:TEST 3.2"
SLEEP 1
PRINT #1, "SOURce:SAFEty:START"                'start test

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

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

    IF status$ = "STOPPED" THEN                'if status not=TEST
        PRINT #1, "SOURce:SAFEty:STOP"

        PRINT #1, "SAFEty:RESult:ALL:OMET?"
        FOR j = 1 TO STEPNUM%
            INPUT #1, result$
            PRINT "step", j, ":", result$
        NEXT j
        PRINT
        PRINT #1, "SAFEty:RESult:ALL:MMET?"
        FOR j = 1 TO STEPNUM%
            INPUT #1, result$
            PRINT "step", j, ":", result$
        NEXT j
    END IF
WEND
PRINT #1, "SOURce:SAFEty:STOP"
CLOSE #1
END

```

6. GPIB Description (Option)

6.1 Guide

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

6.2 Interface Specification

6.2.1 Applicable Standard

IEEE488-1978 standard

6.2.2 Interface Capability

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

6.2.3 Using Code

ASCII code.

6.3 GPIB Related Panel Description

6.3.1 Address Setting

- Under the power-on menu, press Function Key **MENU** as the following shown:

1. MEMORY	UP
2. SYSTEM	DOWN
3. OPTION	SELECT
4. CALIBRATION	EXIT
5. KEY LOCK	
SELECT FUNC.	RMT LOCK OFST ERR

- Move the highlight to "OPTION" by Function Key **UP**, **DOWN**. Press Function Key **SELECT** to enter the OPTION selection set as the following:

1. RS232	UP
2. GPIB	DOWN
3. PRINTER	SELECT
	EXIT
	RMT LOCK OFST ERR

- Move the highlight to "GPIB" by Function Key **UP**, **DOWN**. Press Function Key **SELECT** to enter the GPIB setting menu as shown below:

1. GPIB ADDR.: 3	UP
	DOWN
	ENTER
	EXIT
	RMT LOCK OFST ERR

- Then select GPIB Address by Function Keys **UP**, **DOWN**.
- When the setting is completed, presses Function Key **EXIT** to exit.

6.3.2 Remote / Local

1. The signal block Remote is highlighted, which means the tester is in Remote status.
2. When in Remote status, it can use Function Key **LOCAL** to switch the tester to Local status.
3. When in Remote status, all of the panel keys are malfunctioning except for Function Key **LOCAL** (switch to Local) **MENU**, **MORE..** and **STOP** (reset instrument) keys.
4. Using the LLO [Local lockout] command of GPIB will disable the **LOCAL** key.

6.4 Interface Message

The tester is capable of responding to the following interface messages.

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

6.5 GPIB Control / Setting Command Descriptions

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

End code

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

Status response command

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


7. Printer Function (Option)

Preface

The user can connect a printer (any brand printer except for HP) to print the test parameter settings or test results report.

How to print the test parameter settings?

1. Under the power-on screen, press Function Key F3 **MENU** then move the cursor to 8. PRINT PROGRAM.
2. Press Function Key F3 **SELECT**, connect the correct printer and it will automatically print out the test parameter settings in the memory.

How to print the test result reports?

After setting the printer parameter, follow the normal test procedures to test. When the test is completed according to the user settings, connect the correct printer to print out the test results report.

Enter the print parameter setting screen for the printer.

1. Under the power-on screen, press Function Key **MENU** then move the cursor to 3. OPTION.
2. Press Function Key **SELECT**, then move the cursor to 3. PRINT.
3. Press Function Key F3 **SELECT**, then start to set the print parameter.

How to set the print parameters?

1. Use Function Keys **UP** and **DOWN** to set various parameter data.
2. Use Function Key **ENTER** to move the cursor.
3. Use Function Key **EXIT** to exit this screen.

Print parameters description:

- A. AUTO PRINT - - It has the following 3 parameters to set the printing of the test report.
 1. PASS: OFF - - When it is ON, it will print out the test result report if the test result is PASS.
 2. FAIL: OFF - - When it is ON, it will print out the test result report if the test result is FAIL.
 3. F. FEED: OFF - - When it is ON, the paper will skip to another page at the end of printing.
- B. PRINT DATA - - It has the following 5 parameters to set the printing of the test result report including all data.
 1. PART NO.: OFF -- When it is ON, the test report will print the PART NUMBER.
 2. LOT NO.: OFF -- When it is ON, the test report will print the LOT NUMBER.
 3. SERIAL NO.: OFF -- When it is ON, the test report will print the SERIAL NUMBER.
 4. TEST DATA: OFF -- When it is ON, the test report will print the STEP, MODE, and current/resistance data.
 5. RESULT: OFF -- When it is ON, the test report will print the test results that are PASS or FAIL.

8. Calibration Procedure

Calibration equipment:

1. Standard resistance 10m/100m/150m/500m Ω
2. Agilent 34401A Digital Multimeter or above
3. Yokogawa TYPE 2215 50A Current Shunt or above

Before processing this section the tester should be warmed up for at least 30 minutes. Press down the calibration switch (CAL) which has a hardware protection circuit to avoid calibration data loss.

The following items are required for calibration:

GBA	45A	Offset (3A)	;GB current	OFFSET	point
GBA	45A	Full (30A)	;GB current	FULL	point
GBVX1	8V	Offset (0.3V)	;GB voltage X1	OFFSET	point
GBVX1	8V	Full (3V)	;GB voltage X1	FULL	point
GBVX108V		Offset (0.03V)	;GB voltage X10	OFFSET	point
GBVX108V		Full (0.3V)	;GB voltage X10	FULL	point
CONTRAST	VALUE	6	;Contrast Value		

8.1 Calibration Menu

1. After powered on and initialized, press the function key [MENU] [DOWN] [DOWN] [DOWN] [SELECT] in sequence to enter the CALIBRATION function. A password menu will appear.
2. Press function key [A] [A] [A] [B] [SELECT] in sequence to display the calibration menu.

8.2 Start Calibration

Connect Yokogawa TYPE 2215 Current Shunt (50 mV, 50A, with four terminals) or equivalent shunt to the Sense and Drive terminals of 19572. Use the 34401A DMM to set the ACV Meter and Auto Range function simultaneously, and measure the TYPE 2215 Current Shunt SENSE +/- terminals.

Display	GBA 45A OFFSET (3A)	; Grounding current offset.
	3.00A	
Press	[STOP] [START]	; Read the ACV meter value.
		; Example 2.897mV
Press	[INC.] or [DEC.] until 19572 LCD STANDARD displays 2.897 A.	
Press	[ENTER]	; Save the calibration value into memory.
Press	[STOP]	; Stop GBA offset calibration.
Press	[UP] key to display	
Display	GBA 45A FULL (30A)	; Grounding current full scale.
	30.00A	
Press	[STOP] [START]	; Read the ACV meter value.

; Example 29.87mV
 Press [INC.] or [DEC.] until 19572 LCD STANDARD displays 29.87 A.
 Press [ENTER] ; Save the calibration value into memory.
 Press [STOP] ; Stop GBA full-scale calibration.

Take off the Current Shunt, and connect the test cable of the main system to 100mΩ STANDARD. Connect the AC voltage meter to the 19572 Sense + and Sense – terminals.

Press [UP] key to display ; Grounding voltage offset.
 Display GBVX1 8V OFFSET(0.3V) ; 3.0Amp into 100mΩ
 0.300V
 Press [STOP] [START] ; Read the ACV meter value.
 ; Example 0.302 volts
 Press [INC.] or [DEC.] until 19572 LCD STANDARD displays 0.302V.
 Press [ENTER] ; Save the calibration value into memory.
 Press [STOP] ; Stop GBV offset calibration.
 Press [UP] key to display ; Grounding voltage full scale.
 Display GBVX1 8V FULL (3V) ; 30Amp into 100mΩ.
 3.000V
 Press [STOP] [START] ; Read the ACV meter value.
 ; Example 3.021 volts
 Press [INC.] or [DEC.] until 19572 LCD STANDARD displays 3.021 V.
 Press [ENTER] ; Save the calibration value into memory.
 Press [STOP] ; Stop GBV full-scale calibration.
 Press [UP] to display ; Grounding voltage offset
 Display GBVX10 8V OFFSET(0.03V) ; 0.3Amp into 100mΩ
 0.030V
 Press [STOP] [START] ; Read the ACV meter value.
 ; Example 0.031 volts
 Press [INC.] or [DEC.] until 19572 LCD STANDARD displays 0.031V.
 Press [ENTER] ; Save the calibration value into memory.
 Press [STOP] ; Stop GBV full-scale calibration.
 Press [UP] to display ; Grounding voltage full scale.
 Display GBVX10 8V FULL (0.3V) ; 3Amp into 100mΩ.
 0.300V
 Press [STOP] [START] ; Read the ACV meter value.
 ; Example 0.302 volts
 Press [INC.] or [DEC.] until 19572 STANDARD displays 0.302 V.
 Press [ENTER] ; Save the calibration value into memory.
 Press [STOP] ; Stop GBV full-scale calibration.

 Press [UP] key to display ; Contrast adjusted value.
 Press [SETUP] key to display contrast value 6
 Press [INC.] or [DEC.] until LCD brightness is applicable.
 Press [ENTER] [EXIT] key to quit the calibration process

8.3 Complete Calibration

Press (CAL) switch off on the front panel to avoid data loss.

Press [DOWN] [DOWN] [DOWN] [SELECT]
 Display PASSWORD:

Press [A] [A] [A] [A] [ENTER]
Display The Calibration is ON.

If “The Calibration is OFF” displays, press [A] [A] [A] [A] [ENTER] again until it displays “The Calibration is ON”.

9. Tester Status Definition at INTERLOCK OPEN

9.1 Before Testing

If INTERLOCK OPEN occurs before testing, no matter whether the tester has any set data, the LCD on the lower left will show CAN NOT TEST when the START key is pressed. Using the RS232 or GPIB interface to send **[:SOURce]: SAFETy:RESUlt[:LAST][:JUDGment]?** command querying the judgment result, the return code is 114.

9.2 During Testing

If INTERLOCK OPEN occurs during testing (voltage output and STEP HOLD TIME \neq key are included), the tester stops testing immediately. This is equal to pressing the STOP key, the LCD on the lower left will show STOPPED.

1. If INTERLOCK keeps OPEN, pressing START this time, all STEPs are initialized and the screen stays at STEP1 while the LCD on the lower left shows CAN NOT TEST. Using RS232 or GPIB interface to send **[:SOURce]:SAFETy: RESUlt[:LAST] [:JUDGment]?** command querying the judgment result, the return code is 114.
2. When INTERLOCK CLOSE, press START then the test starts from STEP1.

9.3 STEP HOLD TIME \neq KEY, FAIL CONT. = OFF

1. When the testing of all steps is done, the LCD shows PASS. When INTERLOCK OPEN, press START then all STEPs are initialized and the screen stays at STEP1 while the LCD on the lower left shows CAN NOT TEST. Using RS232 or GPIB interface to send **[:SOURce]:SAFETy:RESUlt[:LAST][: JUDGment]?** command querying the judgment result, the return code is 114.
2. If FAIL occurs to a certain STEP and INTERLOCK OPEN at this time, pressing START is invalid but sustains the original FAIL status.

9.4 STEP HOLD TIME = KEY, FAIL CONT. = OFF

1. When all steps are tested, the LCD will show PASS. Please refer to item 1 in *section 9.3*.
2. When the testing of all steps is not finished and in WAIT KEY, INTERLOCK OPEN at this time, press START then the status of the next step will become CAN NOT TEST. Using RS232 or GPIB interface to send **[:SOURce]:SAFETy:RESUlt[:LAST][: JUDGment]?** command querying the judgment result, the return code is 114. When INTERLOCK CLOSE, press START then the test will start from the pretest step.
3. If FAIL occurs to a certain STEP, INTERLOCK OPEN at this time, pressing START key is invalid but sustains the original FAIL status.

9.5 STEP HOLD TIME \neq KEY, FAIL CONT. = ON

1. When all steps are tested, the LCD will show PASS. Please refer to item 1 in *section 9.3*.
2. When all steps are tested, the LCD will show FAIL. Please refer to item 2 in *section 9.3*.
3. If FAIL occurs to a certain STEP during testing, please refer to item 1 in *section 9.2*.

9.6 STEP HOLD TIME = KEY, FAIL CONT. = ON

1. When all steps are tested, whether the LCD shows PASS or FAIL, INTERLOCK OPEN at this time, press START then all STEPs are initialized and the screen stays at STEP1 while the LCD on the lower left shows CAN NOT TEST. Using RS232 or GPIB interface to send **[:SOURCE]: SAFETy:RESUlt[:LAST][:JUDGment]?** command querying the judgment result, the return code is 114.
2. When in WAIT KEY, please refer to item 2 in *section 9.4*.

10. GBSS MODE

The GBSS MODE stands for Ground Bond Smart Start Mode.

Main Function:

When the test terminal contacts DUT, the tester will be activated automatically to test the DUT without pressing START to activate the instrument.

Operation Method:

1. Press the function key [PROGRAM] under the main screen. In this screen, set various parameter values of preset and back to the main screen when completed.
2. Press the function key [PRESET] under the main screen. In this screen, select 10. START WAIT and then set the required wait time for starting (wait time, *i.e.* the time of the test terminal connects DUT to start the tester).
3. Press the function key [EXIT] to return to the main screen. Press START to activate GBSS MODE then the LCD on the lower left will show "GB OPEN..". It denotes the test terminal does not contact DUT. **(Note 1)**
4. After DUT is contacted, start counting and wait to activate. When the counting is completed, the testing starts.
5. When the test is completed, the test terminal and DUT are disconnected, and then connects the next DUT for testing.
6. Press STOP to stop GBSS MODE. **(Note 2)**
7. Enter [PRESET] to set 10. START WAIT to OFF and then close GBSS MODE. **(Note 3)**

Note

1. When starting GBSS MODE, all of the keys malfunction except for STOP and INTERLOCK. Press STOP to stop GBSS MODE if the user wants to restore other function keys.
2. Pressing STOP just stops the GBSS MODE. When the user presses START, it will enter GBSS MODE again.
3. When 10. START WAIT in the [PRESET] menu is set to OFF, and the tester will return to the normal test mode (need to press START to start the test).

11. Maintenance

11.1 General


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

11.2 Cleaning

If there is any dirt on the cover of the tester, use the general cleaning alcohol to wipe it, and power on until the LCD is dried.

11.3 Battery Replacement

Batteries are included in the tester. Please contact Chroma's service center for battery replacement.


 **CAUTION** : Do not open the device cover to replace the battery by yourself.

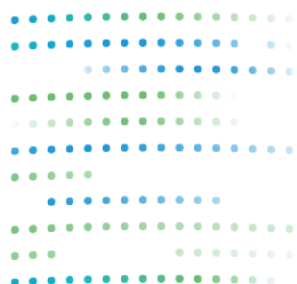
Battery specification

1. Model: CR2/38.L
2. Nominal voltage: 3V
3. Typical capacity: 1800mAH (Rated capacity at 200uA to 20°C)
(End-point voltage: 2.0V)

11.4 Instrument Return

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

 **CAUTION** : The tester is overweight so be sure to use a platform trolley when moving it to avoid any injury.



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