

Capacitor Leakage Current/ IR Meter

11200

User's Manual

Capacitor Leakage Current/IR Meter 11200 User's Manual



Version 1.6
February 2011

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CHROMA ATE INC.

66 Hwa-Ya 1st Rd., Hwa-Ya Technical Park, Kuei-Shan Hsiang, Taoyuan County, Taiwan

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CHROMA ATE INC.

66 Hwa-Ya 1st Rd., Hwa-Ya Technical Park,
Kuei-Shan Hsiang, Taoyuan County, Taiwan
Tel: 886-3-327-9999
Fax: 886-3-327-2886
e-mail: chroma@chroma.com.tw
<http://www.chromaate.com>

Material Contents Declaration

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



: See <Table 1>.



: See <Table 2>.

<Table 1>

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

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

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

Disposal

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



<Table 2>

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

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

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

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

Disposal

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



Safety Summary

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



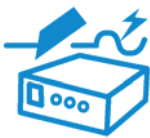
BEFORE APPLYING POWER

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



PROTECTIVE GROUNDING

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



NECESSITY OF PROTECTIVE GROUNDING

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



FUSES

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



DO NOT OPERATE IN AN EXPLOSIVE ATMOSPHERE

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



DO NOT REMOVE THE COVER OF THE INSTRUMENT

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

Safety Symbols



DANGER – High voltage.



Explanation: To avoid injury, death of personnel, or damage to the instrument, the operator must refer to an explanation in the instruction manual.



High temperature: This symbol indicates the temperature is now higher than the acceptable range of human. Do not touch it to avoid any personal injury.



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



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



The **CAUTION** sign denotes a hazard. It may result in personal injury or death if not noticed timely. It calls attention to procedures, practices and conditions.

Storage, Freight & Maintenance

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 keep away from water etc. to avoid damaging the device during movement. The device is precise equipment, please use qualified transportation as possible. And avoid heavy collision etc. that may damage the device.

Maintenance

There is no maintenance operation for general users (except for the one noted in the manual.) Please contact Chroma or its agent if the device is having error judgment. Do not maintain the device by yourself to avoid unnecessary danger and serious damage to the device.

Revision History

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

Date	Version	Revised Sections
Dec. 2003	1.0	Complete this manual.
Jun. 2004	1.1	Modify the followings <ul style="list-style-type: none"> - <i>CHARGE TIME</i> description in “<i>Setting the SYSTEM CONFIG</i>” - <i>*IDN?</i> Description in “<i>Common Use Commands</i>” - <i>Wvtest</i> → <i>WVTest</i> in “<i>General Command Structure</i>” and “<i>Command Description</i>”
Jul. 2006	1.2	Modify the followings <ul style="list-style-type: none"> - The specification of <i>Basic Accuracy, Leakage Current Test</i> and <i>Limit Current Range</i> in the section of “<i>Summary of Specification</i>” - The specification of <i>Test Voltage, Limit Current Range</i> in the section of “<i>Test Signal</i>” for L.C Test - The specification of <i>Constant Current Range</i> in the section of “<i>Test Signal</i>” for WV Test - The screen in the section of “<i>Step Manual Test</i>” - The screen in the section of “<i>NULL Test</i>” - The screens in the section of “<i>The Function of Compare (COMPARE)</i>” - The description in the section of “<i>RS-232C Interface Connector</i>” - The figure in the section of “<i>RS-232C Signal Wire Connection</i>” Add the followings: <ul style="list-style-type: none"> - “<i>Optional Accessory</i>” in the section of “<i>Checking Before Use</i>” - Initial screens in the chapter of “<i>Setting for Operation</i>” - Screens in the section of “<i>Setting the SYSTEM CONFIG</i>” - The descriptions of “<i>RANGE DWELL</i>” and “<i>EXT Vm DISPLAY</i>” in the section of “<i>Setting the SYSTEM CONFIG</i>”
Mar. 2007	1.3	Add the description of 650V and 800V modes in the following sections: <ul style="list-style-type: none"> - “<i>Summary of Specification</i>” in the chapter of “<i>Preface</i>”. - “<i>Test Signal</i>” in the chapter of “<i>Specifications</i>”. - “<i>Sequential Auto Test</i>”, “<i>Step Manual Test</i>” and “<i>Withstand Voltage Test</i>” in the chapter of “<i>Setting for Operation</i>”. - “<i>Command Description</i>” in the chapter of “<i>Communication Protocol</i>”. Modify the IND inquiry description in the section of “ <i>Common Use Commands</i> ” for the chapter of “ <i>Communication Protocol</i> ”.
		Add “ <i>Material Contents Declaration</i> ”.
		Modify the following: <ul style="list-style-type: none"> - Specification errors in the sections of “<i>Summary of Specification</i>” and “<i>Test Signal</i>.” - Figures in the sections of “<i>Connection the Device Under Test (DUT) for Leakage Current Test</i>”, “<i>Front Panel</i>” & “<i>Rear Panel</i>.” Add the following: <ul style="list-style-type: none"> - Description of NA50Hz/NA60Hz in the sections of “<i>Setting the SYSTEM CONFIG</i>” and “<i>Command Description</i>.” - Description of STATUs subsystem in the section of “<i>Command Description</i>.” - A section of “<i>Standard Operation Status Group</i>” in the chapter of “<i>Communication Protocol</i>.”
Feb. 2008	1.4	Modify the following: <ul style="list-style-type: none"> - “<i>Basic Accuracy</i>” in the section of “<i>Summary of Specification</i>.”

- “Setting the SYSTEM CONFIG”, “Sequential Auto Test (SEQ. TEST)”, “Withstand Voltage Test (W.V. TEST)” and “The Function of Compare (COMPARE)” sections in the chapter of “Setting for Operation.”
- “CALCulate Subsystem”, “DISPlay Subsystem” and “LCTest Subsystem” in the section of “Command Description” under “Communication Protocol.”

Add the following:

- “C.C. POWER”, “FORWARD VOLT” and “SURGE TEST” sections in the chapter of “Setting for Operation.”
- “C.C. POWER Subsystem” and “FORWARD VOLTAGE Subsystem” in the section of “Command Description.”

Dec. 2009 1.5

Modify the following:

- “Setting the SYSTEM CONFIG”, “Operation of Main Functions (Main Index)”, “Sequential Auto Test (SEQ. TEST)”, “The Function of Compare (COMPARE)”, “C.C. POWER”, “FORWARD VOLT” and “SURGE TEST” sections in the chapter of “Setting for Operation.”
- “Description of Handler Interface Pins for COMPARE” section in the chapter of “Handler Interface.”
- “General Command Structure” and “Command Description” in the chapter of “Communication Protocol.”
- “Setting RS-232C Interface Baud Rate” section in the chapter of “RS-232C Control Interface.”

Add the following:

- “Example of RS-232C in Visual Basic” in the chapter of “RS-232C Control Interface.”

Feb. 2011 1.6

Modify the following:

- “Setting the SYSTEM CONFIG”, “Sequential Auto Test” and “SURGE TEST” in the chapter of “Setting for Operation.”
- “Command Description” in the chapter of “Communication Protocol.”

Table of Contents

1. Preface.....	1-1
1.1 Overview.....	1-1
1.2 Summary of Specification.....	1-2
1.3 Checking Before Use.....	1-3
2. Specifications.....	2-1
2.1 L.C. Test.....	2-1
2.1.1 Measurement Parameter.....	2-1
2.1.2 Test Signal.....	2-1
2.1.3 Display Range.....	2-1
2.1.4 Measurement Time.....	2-1
2.1.5 NULL.....	2-2
2.2 WV Test.....	2-2
2.2.1 Measurement Parameter.....	2-2
2.2.2 Test Signal.....	2-2
2.2.3 Display Range.....	2-2
2.3 Others.....	2-2
3. Installation.....	3-1
3.1 Ambient Environment.....	3-1
3.2 Power Line Connection.....	3-1
3.3 Fuse.....	3-2
3.4 Power Regulation.....	3-2
3.5 Connecting the Device Under Test (DUT) for Leakage Current Test.....	3-2
4. Description of Panel.....	4-1
4.1 Front Panel.....	4-1
4.2 Rear Panel.....	4-3
5. Setting for Operation.....	5-1
5.1 Setting the System Parameters (System Setup).....	5-2
5.1.1 Setting the SYSTEM CONFIG.....	5-2
5.1.2 Memory Manage Mode (MEM MANAGE).....	5-5
5.1.3 Calibration Mode (CALIBRATION).....	5-5
5.2 Operation of Main Functions (Main Index).....	5-5
5.2.1 Sequential Auto Test (SEQ. TEST).....	5-6
5.2.2 Step Manual Test (STEP TEST).....	5-10
5.2.3 NULL Test.....	5-12
5.2.4 Withstand Voltage Test (W.V. TEST).....	5-13
5.2.5 The Function of Compare (COMPARE).....	5-16
5.2.6 C.C. POWER.....	5-17
5.2.7 FORWARD VOLT.....	5-19
5.2.8 SURGE TEST.....	5-21
6. Handler Interface.....	6-1
6.1 Description of Handler Interface Pins for COMPARE.....	6-1
7. Communication Protocol.....	7-1
7.1 Overview.....	7-1
7.2 Specification of IEEE-488 Interface.....	7-1
7.2.1 IEEE-488 Interface Function.....	7-1
7.2.2 Code Used for Data Transfer.....	7-1
7.2.3 TALK/LISTEN Function.....	7-1
7.2.4 IEEE-488 Interface Connector.....	7-2

7.2.5	Signal Cable of IEEE-488 Interface	7-2
7.2.6	The Response of Interface Message	7-3
7.2.7	The Port Driver	7-3
7.3	GPIB Commands Description (IEEE 488.2)	7-3
7.3.1	Common Use Commands	7-3
7.3.2	Status Byte Register	7-5
7.3.3	Standard Event Status Register	7-6
7.3.4	Standard Operation Status Group	7-7
7.3.5	General Command Structure	7-8
7.3.6	Description of Command Structure	7-10
7.3.7	Command Description	7-11
7.4	Error Messages	7-21
8.	RS-232C Control Interface	8-1
8.1	Overview	8-1
8.2	RS-232C Specification	8-1
8.2.1	RS-232C Interface Connector	8-1
8.2.2	RS-232C Signal Wire Connection	8-1
8.3	Setting RS-232C Interface Baud Rate	8-2
8.4	RS-232C Interface Command	8-2
8.5	Example of RS-232C in Visual Basic	8-2

1. Preface

1.1 Overview

The 11200 Capacitor Leakage Current/IR Meter is an automatic instrument used for testing and analyzing components. The device was designed to solve the problems of low labor efficiency and low product quality that have occurred since the electronics industry began to flourish. It is able to increase the work efficiency and enhance the product quality to international standard.

The test functions equipped with this device containing L.C, I.R, W.V and etc., which are perfect functions for the production line and quality control.

Via the internal-controlled auto mode and the programmable mode measurement functions, the instrument is capable of providing fast, highly accurate, convenient and reliable tests at low cost. It has the functions of Hi/Lo-limit comparison, selection control for voltage test, data storage setting, GPIB interface for remote controlling 11200 and data transfer as well as statistics analysis function from PC. The handler interface is able to trigger the instrument for measurement and then send the test results to an external device for the component response check.

The multi-function test device, ergonomic keyboard design, guided panel operation, extra-large LCD, and password protection makes the 11200 instrument very easy to operate. Its protection enables the test results to be shown on the display clearly.

The 11200 can be calibrated by an exclusive measurement device (optional) with simple measurement parameters. The calibration can be done easily by giving the condition of Null in the procedure.

1.2 Summary of Specification

- (1) Measurement Parameter:
Leakage Current Test: L.C. (Leakage Current), I.R. (Isolated Resistance)
Withstand Voltage Test: Tr, Vt
- (2) Basic Accuracy:
L.C. ----- \pm (0.3% + 0.005 μ A)
- (3) Measurement Range:
L.C. ----- 0.000 μ A ~ 20.0 mA
- (4) Test Voltage/Current:
Test Voltage Range: 650V Mode
 DCV = 1.0 V ~ 100 V, step 0.1 V
 101V ~ 650 V, step 1 V; \pm (0.5% + 0.2V)

 800V Mode
 DCV = 1.0 V ~ 100 V, step 0.1 V
 101V ~ 800 V, step 1 V; \pm (0.5% + 0.2V)

Limit Current Range: 650V Mode
(CCL) DCV \leq 100V: 0.5 mA ~ 500 mA; step 0.5mA
 DCV>100V: 0.5 mA ~ 150 mA; step 0.5mA; \pm (3% + 0.05mA)
 65W Max.

 800V Mode
 DCV \leq 100V: 0.5 mA ~ 500 mA; step 0.5mA
 DCV>100V: 0.5 mA ~ 50 mA; step 0.5mA; \pm (3% + 0.05mA)
 40W Max.
- (5) Zeroing Calibration: Null

1.3 Checking Before Use

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

Upon receipt of the instrument, please check on the following items:

- (1) If there are any damages or scratches on the product surface.
- (2) The standard and optional accessories came with the instrument as listed in Table 1-1.

Item	Part No.	Quantity	Remarks
Power Cord	W12 010170	1	A 1 meter bend power cord
Adaptor	N31 000039	1	For the power plug from 3P to 2P
WIRE BANA.PLUG/Alligator Clip to White High Voltage Cable for 90 CM	W25 000041	1	A test cable
Zentech 705 BNC Test Cable + Alligator Clip for 1M	W38 000900	1	A test cable
Slow Blow Fuse 2A	A21 018700	2	For power source AC 230V use
Slow Blow Fuse 4A	A21 020900	2	For power source AC 115V use
This user's manual	A11 000890	1	English

Table 1-1 Standard Accessories

Note : Only name item and part no. are required when ordering any the accessories.

Optional Accessory

Item	Part No.	Quantity	Remarks
(A110235) GPIB&HANDLER Card for 11021/16502/11200	9 11023599	1	GPIB / HANDLER Card

2. Specifications

2.1 L.C. Test

2.1.1 Measurement Parameter

L.C. (Leakage Current) Unit: mA, μ A
 I.R. (Isolated Resistance) Unit: K Ω , M Ω , G Ω

2.1.2 Test Signal

Test Voltage: 650V Mode
 DCV = 1.0 V ~ 100 V, step 0.1 V
 101V ~ 650 V, step 1 V; \pm (0.5% + 0.2V)

 800V Mode
 DCV = 1.0 V ~ 100 V, step 0.1 V
 101V ~ 800 V, step 1 V; \pm (0.5% + 0.2V)

Limit Current Range: 650V Mode
 DCV \leq 100V: 0.5 mA ~ 500 mA; step 0.5mA
 DCV>100V: 0.5 mA ~ 150 mA; step 0.5mA; \pm (3% + 0.05mA)
 65W Max.

 800V Mode
 DCV \leq 100V: 0.5 mA ~ 500 mA; step 0.5mA
 DCV>100V: 0.5 mA ~ 50 mA; step 0.5mA; \pm (3% + 0.05mA)
 40W Max.

2.1.3 Display Range

Parameter	Range
L.C.	0.000 μ A ~ 20.0 mA
I.R.	0.01 K Ω ~ 99.99 G Ω

2.1.4 Measurement Time

50Hz

Parameter	Fast	Medium	Slow
L.C.	90 mS	170 mS	420 mS
I.R.	90 mS	170 mS	420 mS

60Hz

Parameter	Fast	Medium	Slow
L.C.	77 mS	143 mS	420 mS
I.R.	77 mS	143 mS	420 mS

※ The measurement condition is to Hold Range and the trigger mode is EXT.

2.1.5 NULL

It eliminates the leakage current of the entire circuitry.

2.2 WV Test

2.2.1 Measurement Parameter

Tr Rise Time Unit: Sec
 Vt Foil Withstand Voltage Unit: V

2.2.2 Test Signal

Constant Current Range: 0.5 mA ~ 150 mA; $\pm(3\% + 0.05 \text{ mA})$
 0.5 mA ~ 100 mA; step 0.5 mA;
 100 mA ~ 150 mA; step 1 mA;

2.2.3 Display Range

Parameter	Range
Tr	50 mS ~ 600 S
Vt	1.0 V ~ 650.0 V

2.3 Others

Power: (1) 90 V ~125 V AC 50Hz/60Hz, power consumption (VA) 400 VA max.
 (2) 190 V~250 V AC 50Hz/60Hz, power consumption (VA) 400 VA max.

Environment: Operating Temperature -- 0°C to 40°C, 10 to 90% relative humidity.
 Storage Temperature -- 0°C to 50°C, 10 to 90% relative humidity.

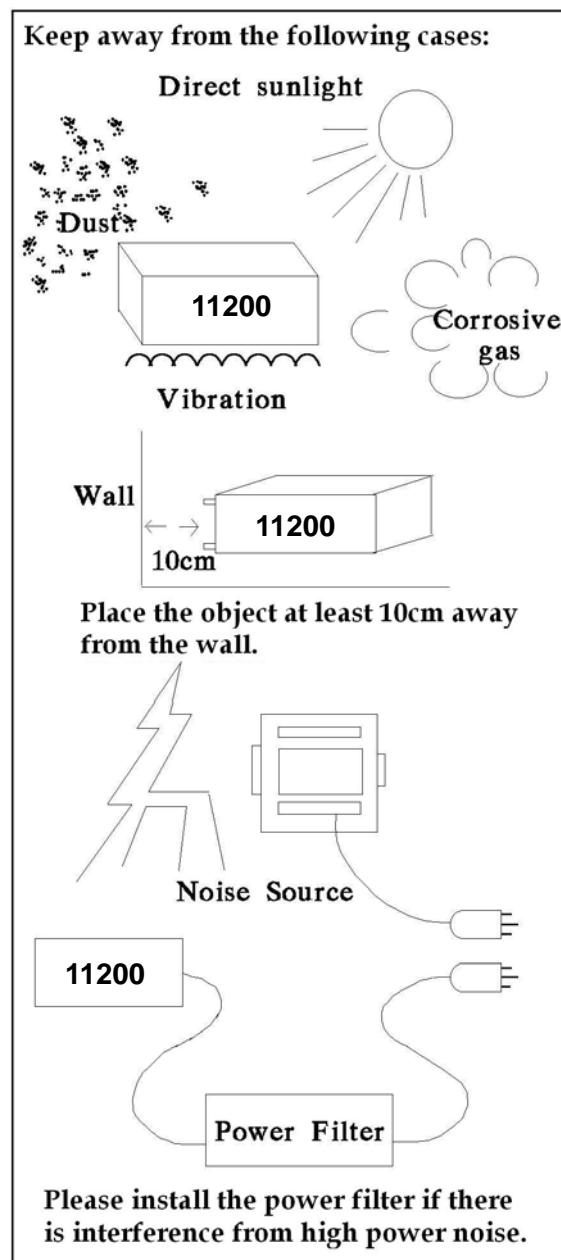
Dimension: 430(W) x 185(H) x 302(D)

Weight: Approximately 10 kg.

3. Installation

3.1 Ambient Environment

- (1) Do not use the meter in a dusty or vibrating location. Do not expose it to sunlight or corrosive gas. Be sure that the ambient temperature is 10 ~ 40°C and that the relative humidity is below 90%.
- (2) The rear of the meter is equipped with a cooling fan to keep the internal temperature down, so adequate ventilation should be ensured. The meter should be located at least 10cm from any object or wall behind it. Do not block the left and right ventilation holes to keep the meter in good precision.
- (3) The meter has been carefully designed to reduce the noise from the AC power source. However, it should be used in a noise-free or as low as possible environment. If noise is inevitable, please install a power filter.
- (4) The meter has been carefully designed to reduce the noise from the AC power source. However, it should be used in a noise-free or as low as possible environment. If noise is inevitable, please install a power filter.



3.2 Power Line Connection

Before plugging in the power cord, make sure the power switch is off and the voltage selector on the rear panel meets the required voltage (115 or 230V). Please use the power supply frequency of 50Hz or 60Hz.

3.3 Fuse

There is one fuse installed in the rear panel, please be aware of the following when replacing it:

1. First turn off the power and unplug the power cord before changing the fuse.
2. The specification of fuse: AC 100 V~120 V → T4.0 A, 250 V (A21 020900)
AC 220 V~240 V → T2.0 A, 250 V (A21 018700)

For safety and noise reduction, it is necessary to use a 3-pin power cord to connect the power inlet on the rear panel for AC line input and to ground the GROUND terminal on the front panel as Figure 3-1 shows below.

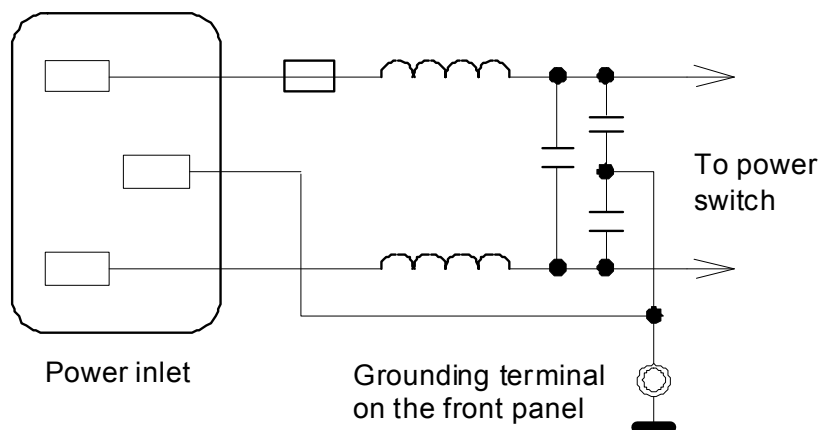


Figure 3-1 Line Input Configuration

3.4 Power Regulation

As this instrument is a precision electronic test device, the accuracy might be severely influenced by the undulated input power after tested. There is $\pm 10\%$ changeable power even in the laboratory, so it is suggested to use a regulator between the power sources and test devices. This is the best way to eliminate the variation of measured data caused by the unstable power voltage.

3.5 Connecting the Device Under Test (DUT) for Leakage Current Test

Connect the UNKNOWN (LEAKAGE CURRENT) test terminal on the front panel to the DUT for leakage current test. Be sure that the DUT polarity is connected correctly, where the DUT's negative terminal is connected to the **HV (-)** of 11200 and the positive terminal is connected to the **INPUT** of 11200 as shown in Figure 3-2.

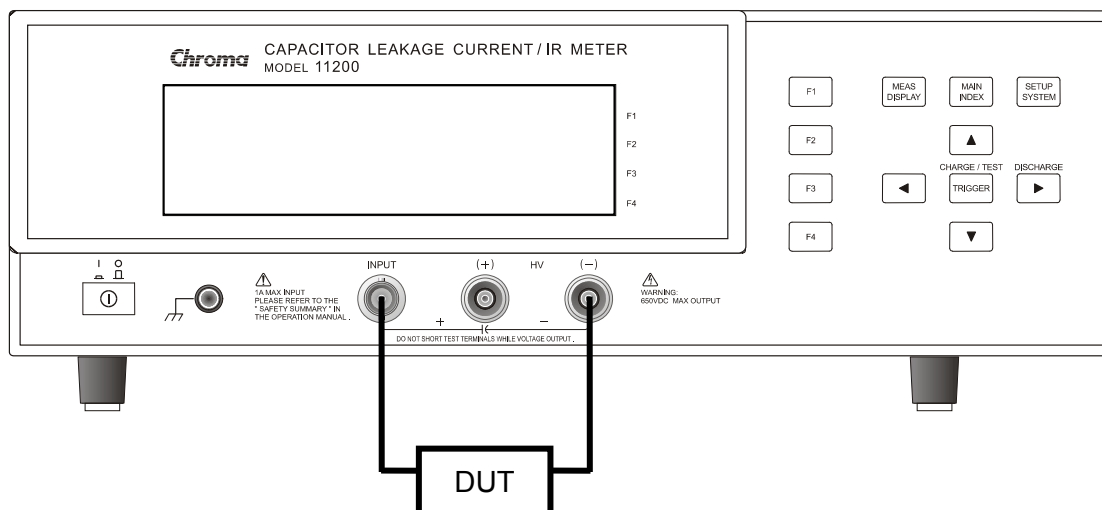
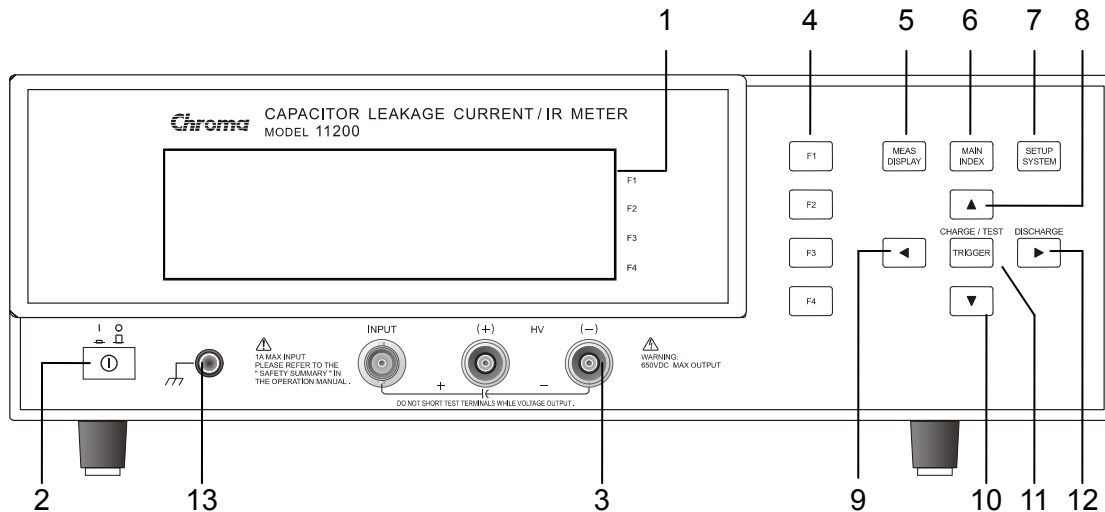


Figure 3-2 DUT Connection for Leakage Current Test

⚠ WARNING Be ware of the high voltage hazard as the maximum output from the UNKNOWN (LEAKAGE CURRENT) is DC 650V. Do not touch the UNKNOWN (LEAKAGE CURRENT) terminal, the test cable and the DUT during test to avoid electric shock. Do not remove the DUT before it is fully discharged as it may contain the voltage that could cause any danger.

4. Description of Panel

4.1 Front Panel



(1) LCD Display

The display of this test device is a 64 X 240 character mode LCD. All measurements and settings can be clearly displayed and seen.

(2) Power Switch

It switches the power to on or off.

(3) LEAKAGE CURRENT Terminal

The leakage current test terminal is composed of two notch type terminals and one BNC terminal, and is connected DUT directly by a test cable. Be sure that the meter is in stop testing or discharge mode when connecting or disconnecting it to a DUT as the output voltage of its negative terminal (white) is pretty high [V(DC) = 0V ~ -650V].

(4) Selection Keys

There are 4 selection keys and their major functions are to show the different conditions of each function or other options which may need to be selected depending on the user's requirements.

(5) Measure Display

Upon pressing this key, the instrument is in basic component measurement & analysis mode. In this screen, each test parameter can be changed directly and the value read such as test voltage, measurement parameter, measurement speed, and etc.

(6) MAIN INDEX

Pressing this key allows entry to the main index screen. In this screen you may select the test function you wish to use, for instance the SEQ.TEST, STEP TEST, NULL, W.V TEST, the function of COMPARE, and etc.

(7) System Setup

Pressing this key gives access to the main system parameters setup screen, which allows each system parameter to be changed directly, e.g., the calibration of this instrument, the memory management, the selection and setting for each system and measurement parameters. (The functions of calibration and memory management require a password for entry).

(8) ~ (11) Cursor

There are [▲], [▼], [◀], and [▶] four arrow keys. These keys set and control the cursor movement, which can be useful when inputting various parameters. They can also be used as selection keys; for instance use [◀], [▶] to change the range, and then use [▲], [▼] to set the voltage.

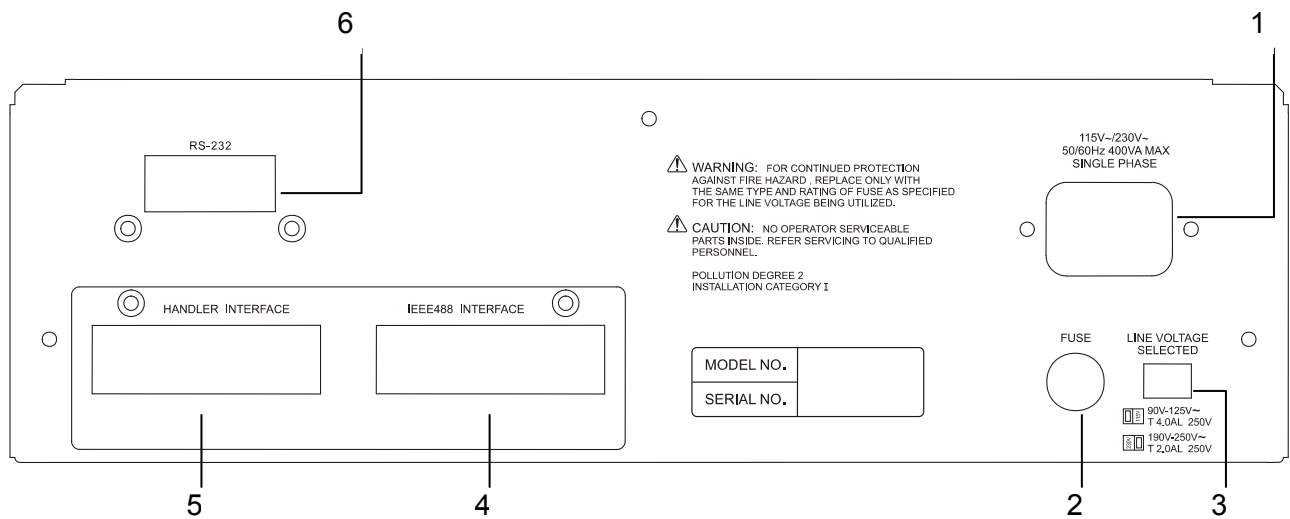
(12) Trigger

This is the key to trigger the start of measurement. When the measurement is in manual mode, press this key to perform the measurement once.

(13) Isolation Terminal

This terminal connects to the case of the instrument. Connect this terminal to the isolation area of DUT to avoid the test value from interfering by external signal that may affect its accuracy.

4.2 Rear Panel



(1) AC Line Socket

It meets the International Electromechanical Commission 320 standard for 3-wire socket. Please use the power cord of Beeline SPH-386 or similar (the accessory W12 010130).

(2) Fuse

A 4A or 2A slow blow fuse is used to prevent the over current from occurring when the instrument power is in 90 ~ 125V or 190 ~ 250V.

(3) Power Voltage Switch

Be sure to power off the instrument before switching the voltage. Use a small flat screwdriver to switch the power voltage to the proper position.

(4) IEEE-488 INTERFACE Connector

The input/output connecting cable follows the IEEE488-1978 standard. The functions include: total remote control, selected result output, with or without controller, and IEEE-488 interface connection acceptance.

(5) HANDLER INTERFACE Connector

It is the element handler. The output is GO/NG and status etc., while the input is "Start" signal. It accepts Amphonol "Microribbon" plug or P/N 57-30240 or equivalent products.

(6) RS232 INTERFACE Connector

The input/output connecting cable follows the RS232 standard. The functions include: total remote control, selected result output, with or without controller, and RS232 interface connection acceptance.

5. Setting for Operation

1. Power on the meter and the LCD will prompt the company name, the model number of this instrument, the firmware version and the CPLD version along with 650V/800V mode respectively as shown below:

650V Mode

CHROMA 11200 LEAKAGE CURRENT METER COPYRIGHT © AUG 2003 VER:01.10 2006.03.21 CPLD:11200 0.0	F1 F2 F3 F4
---	----------------------

800V Mode

CHROMA 11200 LEAKAGE CURRENT METER 800V COPYRIGHT © AUG 2003 VER:01.10 2006.03.21 CPLD:11200 0.0	F1 F2 F3 F4
---	----------------------



Notice

Press [System Setup] and [◀] at any time can show this screen when the meter is powered on.

2. The meter will run self test after powered on for 1 second as shown below:

FPGA CHECK : PASS SRAM CHECK : PASS EEPROM CHECK : PASS HANDLER TEST : UNINSTALL CALIBRATION DATA : PASS	F1 F2 F3 F4
--	----------------------

3. Then it enters into the <MAIN INDEX> as shown below:

<MAIN INDEX>	F1 F2 F3 F4
SEQ. TEST	
STEP TEST	
NULL	
NEXT PAGE 1 / 3	

5.1 Setting the System Parameters (System Setup)

To set the system parameters, press [System Setup] after powered on. It will enter the following screen:

< SYSTEM SETUP >		
	CALIBRATION	F1 ← Enter System Calibration Screen
	MEM MANAGE	F2 ← Enter Memory Manage Screen
	SYSTEM CONFIG	F3 ← Set the System Parameter
		F4

5.1.1 Setting the SYSTEM CONFIG

1. Press [F3] (i.e. SYSTEM CONFIG) to enter the system parameter setting screen as shown below:

< SYSTEM CONFIG >		
TEST PARAMETER : L.C.	I . R .	F1
BEEPER : LOW		F2
SOUND MODE : FAIL	L . C .	F3
ALARM MODE : PULSE		F4
TRIG. DELAY : 0 0 0 0 mS		
TRIG. EDGE : FALLING		
HANDLER MODE : CLEAR		

2. There are 3 pages for system setting. Press the up and down arrow keys to move to the next page. Following shows the second page:

< SYSTEM CONFIG >		
CONTRAST : 0 7	DI G I T UP	F1
GPI B ADDRESS : 1 7		F2
RS 2 3 2 BAUDRATE : 1 9 2 0 0	DI G I T DOWN	F3
KEY LOCK : OFF		F4
LINE FREQUENCY : 6 0 Hz		
CHARGE TIME : V _m = V _s		
RANGE DWELL : 0 . 0 S		

3. Below shows the third page:

< SYSTEM CONFIG >		
AVERAGE : 0 7	DI G I T UP	F1
EXT V _m DISPLAY : OFF		F2
DISCHARGE VOLT : 0 . 2	DI G I T DOWN	F3
DIGITS : 4 1 / 2		F4

4. Below explains the setting of system parameters:
 - (1) TEST PARAMETER:
It sets the test parameters for leakage current (L.C.) or isolation resistance (I.R.).
The default setting is L.C.

- (2) BEEPER:
It sets the warning beep volume to OFF, LOW, and HIGH. The default setting is LOW.
- (3) SOUND MODE:
FAIL: It beeps when detected no good product during performing the measurement of COMPARE.
PASS: It beeps when detected good product during performing the measurement of COMPARE.
The default setting is FAIL.
- (4) ALARM MODE:
PULSE: It sets the warning to a short beep during good/no good product judgment.
CONTINUOUS: It sets the warning to a continuous long beep during good/no good product judgment. The default setting is PULSE.
- (5) TRIGGER DELAY:
It is to adjust the time delayed for measurement when the meter receives the trigger signal. The range is from 0 to 9995mS, and the default setting is 0mS.
- (6) TRIGGER EDGE:
It sets the RISING and FALLING edge trigger. The default setting is FALLING edge trigger.
- (7) HANDLER MODE:
CLEAR: When the Handler interface is in use, it will clear the output signal (PASS or FAIL) of previous tested result before measuring.
HOLD: When the Handler interface is in use, the output signal (PASS or FAIL) of tested result will remain until the next test result shows otherwise.
The default setting is CLEAR.
- (8) CONTRAST:
It sets the contrast of LCD using the selection key at right to DIGIT UP or DIGIT DOWN the value. The adjustable range is from 00 to 15, where the smaller value the brighter. The default setting is 07.
- (9) GPIB ADDRESS:
It sets the GPIB interface address. The default setting is 17 and the range is from 00 to 30.
- (10) RS232 BAUDRATE:
It sets the RS232 transmission baud rate. There are 600, 1200, 4800, 9600, 19200 and 28800 for selection. The default setting is 19200.
- (11) KEY LOCK:
It locks the key. The default setting is OFF. Switch to MEASURE DISPLAY the word <LOCK> will appear at upper right of test screens including L.C., I.R. and W.V when it is on. To disable it, press [F1], [F4], and [SYSTEM SETUP].
- (12) LINE FREQUENCY:
It sets the line frequency to 50Hz, 60Hz, 60HzNA or 50HzNA for AC110V/220V power source. The default setting is 60Hz.

Trigger Time	50Hz	60Hz	50HzNA	60HzNA
INT TRIG	20mS	16.7mS	20mS	16.7mS
EXIT TRIG	20mS	16.7mS	3mS	3mS

(13) CHARGE TIME:

It sets the counting mode FROM Vm=Vs or FROM Vm=0V for charge time. The default setting is FROM Vm=Vs.

Counting the CHARGE TIME is required during leakage current test. According to the standard of JIS (Japanese Industrial Standards), the charge time starts to count when the DUT is charged to the rated voltage. Therefore, in order to comply with the JIS standard, set it to option FROM Vm=Vs. The selection FROM Vm=0V is to count the charge time when the test begins.

 **Notice**

When setting Vm=Vs, if the voltage is unable to charge to 98% of rated working voltage within 600sec, 11200 will discharge forcibly with error return and end the test.

(14) RANGE DWELL:

It sets the interval of DWELL time when switching RANGE. The setting range is 0.0S~9.9S and default is 0.0S.

(15) AVERAGE:

It sets the average number of times for measurement. The range is from 1 to 8 and the default is 1. When some entries are measured it will average the test results according to the set number and then show the measured value. The greater the value the longer time it takes.

(16) EXT Vm DISPLAY:

It sets if displaying the measured voltage immediately when waiting for external trigger signal. The default is ON (display) while OFF is not to display.

(17) DISCHARGE VOLT:

It sets the level of discharge voltage. The default is 0.2V with maximum 1.0V. 11200 takes 3 steps for discharge and the discharge current of each step is listed below:

Vs<100V, Id=300mA

100V<Vs<200, Id=150mA

200V<Vs<650, Id=50mA

(18) DIGITS:

L.C. shows the selection of digits that is 3 1/2 or 4 1/2.

5.1.2 Memory Manage Mode (MEM MANAGE)

1. In SYSTEM SETUP, press [F2] (i.e. MEMORY MANAGE) it will show the following screen:

<code>< MEM MANAGE ></code>	<u>CALIBRATION</u>	F1 ← Calibration the range
<code>PLEASE ENTER</code>	<u>MEM MANAGE</u>	F2 ← Managing the memory
<code>PASSWORD. . .</code>	<u>SYSTEM CONFIG</u>	F3 ← Setting the system
		F4

Enter the correct password to access the Memory Manage function.

5.1.3 Calibration Mode (CALIBRATION)

1. In SYSTEM SETUP, press [F1] (i.e. MEM MANAGE) it will show the following screen:

<code>< SYSTEM SETUP ></code>	<u>CALIBRATION</u>	F1 ← Calibration the range
<code>PLEASE ENTER</code>	<u>MEM MANAGE</u>	F2 ← Managing the memory
<code>PASSWORD. . .</code>	<u>SYSTEM CONFIG</u>	F3 ← Setting the system
		F4

Enter the correct password to access the Memory Manage function.

5.2 Operation of Main Functions (Main Index)

1. There are three pages of main functions.
2. The first page of <MAIN INDEX> is as shown below:

<code>AIN INDEX ></code>	<u>SEQ. TEST</u>	F1 ← Enter Sequence Test Function
	<u>STEP TEST</u>	F2 ← Enter Step Test Function
	<u>NULL</u>	F3 ← Execute NULL
	<code>NEXT PAGE 1 / 3</code>	F4 ← Go to the 2nd page

3. The second page of <MAIN INDEX> is as follows:

AIN INDEX >	W . V . TEST	F1 ← Enter Withstand Voltage Test
	COMPARE	F2 ← Go to Compare Setting Screen
	C . C . POWER	F3 ← Go to C. C. Power Setting Scree
	NEXT PAGE 2 / 3	F4 ← Go to the 3rd page

4. The third page of <MAIN INDEX> is as follows:

AIN INDEX >	FORWARD VOLT	F1 ← Enter Diode Forward Voltage Test
	SURGE TEST	F2 ← Enter Surge Test
		F3
	NEXT PAGE 3 / 3	F4 ← Go to the 1st page

5.2.1 Sequential Auto Test (SEQ. TEST)

1. On the first page of <MAIN INDEX>, press [F1] to go to the <SEQ. TEST> screen. There are two pages in <SEQ. TEST>:




(1) Selections on page 1:

<MEAS. DISPLAY: SEQ. TEST >	TEST V : 20.0 V	F1 ← Set the test voltage
IR : 1.9 MΩ	C . C . : 500.0 mA	F2 ← Set the charge current limi
PASS	RANGE : A 20 mA	F3 ← Set the current range
V _m = 0.0V	NEXT PAGE 1 / 2	F4 ← Switch to next page
CHARGE TEST DISCHARGE		

(2) Selections on page 2:

<MEAS. DISPLAY: SEQ. TEST >	CHG T : 0 S	F1 ← Set the DUT charge time
IR : 1.9 MΩ	DWELL T : 0.2 S	F2 ← Set the time delayed
PASS	SPEED : MEDIUM	F3 ← Set the measurement speed
V _m = 0.0V	NEXT PAGE 2 / 2	F4 ← Swtich to previous page
CHARGE TEST DISCHARGE		

Notice

- When in Charge and Test mode, only  and  keys can be activated along with the parameter settings for RANGE and SPEED, the rest of functions and keys are invalid.
- When in Charge and Test mode, the  key is the DISCHARGE function key for always.
- When BUS, EXT are selected in TRIGGER mode, the measurement



is triggered by external interface control and the key will be invalid.




2. Below explains the displayed data:

- (1) It shows the measured result I.R.: 1.9 MΩ when the TEST PARAMETER in SYSTEM CONFIG sets to I.R., and shows L.C.: 1.9 mA when setting to L.C.
- (2) When the COMPARE parameter in MAIN INDEX:COMPARE is set to OFF, it indicates the measured result will not be displayed.
When the COMPARE parameter in MAIN INDEX:COMPARE is set to ON, it indicates the measured result PASS/HI/LO will be displayed.
When PASS shows, it indicates the measured result does not exceed the I.R. low limit or the L.C. high limit set in MAIN INDEX:COMPARE.
When LO shows, it indicates the measured result is lower than the I.R. low limit set in MAIN INDEX:COMPARE. The TEST PARAMETER in SYSTEM CONFIG is set according to the I.R. condition.
When HI shows, it indicates the measured result is higher than the L.C. high limit set in MAIN INDEX:COMPARE. The TEST PARAMETER in SYSTEM CONFIG is set according to the L.C. condition.
- (3) Vm=0.0 V → it shows the voltage measurement at present.
- (4) CHARGE TEST DISCHARGE → it shows the test state at present. Press




key and follow the steps CHARGE→DWELL→TEST→DISCHARGE to run the test. The actual test steps will show on the screen during the process.

3. Below explains the setting of parameters:

- (1) Press : The TEST V: 020.0V (test voltage) selection is highlighted→ the range is 650V: 1V~650V/800V: 1V~800V.

Operation:


Press : Tune it from low to high.

650V:

6.3→10.0→16.0→25.0→35.0→50.0→63.0→100.0→160.0→200.0→250.0
→350.0→400.0→450.0→500.0→550.0→600.0→630.0.

800V:

6.3→10.0→16.0→25.0→35.0→50.0→63.0→100.0→160.0→200.0→250.0
→350.0→400.0→450.0→500.0→550.0→600.0→630.0→800.0.


Press : Tune it from high to low.


650V:


6.3←10.0←16.0←25.0←35.0←50.0←63.0←100.0←160.0←200.0←250.0
0←350.0←400.0←450.0←500.0←550.0←600.0←630.0.

800V:


6.3←10.0←16.0←25.0←35.0←50.0←63.0←100.0←160.0←200.0←250.0
0←350.0←400.0←450.0←500.0←550.0←600.0←630.0←800.0.


Press : Fine-tune it with the STEP of -0.1V when TEST V ≤ 100V and - 1.0V when TEST V > 100V.


Press  : Fine-tune it with the STEP of +0.1V when TEST V < 100V and 1.0V when TEST V ≥ 100V.


- (2) Press  : The C.C.: 500.0mA (setting for charge current limit) selection is highlighted → the range is 0.5mA~500.0mA.

Operation:

Press  : Tune it with the STEP of + 5mA when C.C. ≤ 100mA, and with the STEP of + 50mA when C.C. > 100mA.


Press  : Tune it with the STEP of - 5mA when C.C. < 100mA, and with the STEP of - 50mA when C.C. ≥ 100mA.

Press  : Fine-tune it with the STEP of -0.5mA.



Press  : Fine-tune it with the STEP of +0.5mA.


 **Notice**

- 650V: When TEST V > 100V, the C.C. maximum is 150mA.
- 800V: When TEST V > 100V, the C.C. maximum is 50mA.


- (3) Press  : The RANGE: 20mA (leakage current measurement range) selection is highlighted.



Operation:

Press   : Adjust the leakage current measurement range, where A indicates Auto range, H indicates fixed range.


Press  again: The RANGE: 20mA (leakage current measurement range) selection highlighted.


Press  : Select the current range 2uA→20uA→200uA→2mA→20mA.


Press  : Select the current range 20mA→2mA→200uA→20uA→2uA.


- (4) Press  →  : The CHG T: 10S (DUT charge time) selection is highlighted → the range is 0S ~ 999S.



Operation:

Press  : Tune it with the STEP of +10S when CHG T < 100S, and with the STEP of +100S when CHG T ≥ 100S.


Press  : Tune it with the STEP of -10S when CHG T ≤ 100S, and with the STEP of - 100S when CHG T > 100S.


Press  : Fine-tune it with the STEP of -1S.


Press  : Fine-tune it with the STEP of +1S.


- (5) Press  →  : The DWELL T: 1.0S (the time delayed for test) selection is highlighted → the range is 0.2S ~ 999S.

Operation:

Press  : Tune it with the STEP of +1S when DWELL T < 100S, and with the STEP of + 10S when DWELL T ≥ 100S.

Press  : Tune it with the STEP of -1S when DWELL T ≤ 100S, and with the STEP of - 10S when DWELL T > 100S.

Press  : Fine-tune it with the STEP of -0.1S.

Press  : Fine-tune it with the STEP of +0.1S.

 **Notice**

⋮ Calculation of Hold Range DWELL Time (SEQ Tester◇DWELL T)

Range	Rseries
20mA	0Ω
2mA	22Ω
200uA	22Ω
20uA	200Ω
2uA	200Ω



DWELL Time = 5x (CxRseries)

Ex: C = 3600uF Range = 2mA


DWELL Time = 5x (3600uFx22Ω) = 0.396sec

DWELL Time is set to 0.4sec.

When the calculated DWELL Time is less than 0.2sec, it is set to 0.2sec.

- (6) Press  →  : The SPEED: FAST (measurement speed) selection is highlighted.

Operation:

Press  again: Select FAST, MEDIUM or SLOW. The lower speed the more stable the measurement is. The default setting is MEDIUM.

5.2.2 Step Manual Test (STEP TEST)

- On the first page of <MAIN INDEX>, press [F2] to go to the <STEP. TEST> screen. There are two pages in <STEP. TEST>:





(1) Selections on page 1:

< MEAS. DISPLAY : STEP. TEST >		TEST V : 20.0 V	F1 ← Set the test voltage
I R :	1.9 MΩ	C. C. : 500.0 mA	F2 ← Set the charge current limit
V _m = 20.0 V		RANGE : A 20 mA	F3 ← Set the current range
CHARGE TEST DISCHARGE		NEXT PAGE 1 / 2	F4 ← Switch to next page

(2) Selections on page 2:

< MEAS. DISPLAY : STEP. TEST >		TRIGGER : INT	F1 ← Select the trigger mode
I R :	1.9 MΩ	SPEED : MEDIUM	F2 ← Set the measurement speed
V _m = 20.0 V			F3
CHARGE TEST DISCHARGE		NEXT PAGE 2 / 2	F4 ← Switch to previous page

Notice

- * When in Charge and Test mode, only  and  keys are valid along with the parameter settings for RANGE and SPEED, the rest of functions and keys are invalid.
- * When in Charge and Test mode, the  key is the DISCHARGE function key for always.
- * When BUS, EXT are selected in TRIGGER mode, the measurement is triggered by external interface control and the key  will be invalid.


- Below explains the displayed data:

- It shows the measured result I.R.: 1.9 MΩ when the TEST PARAMETER in SYSTEM CONFIG sets to I.R., and shows L.C.: 1.9 mA when setting to L.C.
- V_m=0.0 V → it shows the voltage measurement at present.
- CHARGE TEST DISCHARGE → it shows the test state at present. Press




key and follow the STEP TEST to run the test. The actual test steps will show on the screen during the process.

- Below explains the setting of parameters:


- Press : The TEST V: 020.0V (test voltage) selection is highlighted → the range is 650V: 1V~650V/800V: 1V~800V.

Operation:

Press : Tune it from low to high.


650V:
6.3→10.0→16.0→25.0→35.0→50.0→63.0→100.0→160.0→200.0→250.0
→350.0→400.0→450.0→500.0→550.0→600.0→630.0.


800V:
6.3→10.0→16.0→25.0→35.0→50.0→63.0→100.0→160.0→200.0→250.0
→350.0→400.0→450.0→500.0→550.0→600.0→630.0→800.0.


Press  : Tune it from high to low.

650V:
6.3←10.0←16.0←25.0←35.0←50.0←63.0←100.0←160.0←200.0←250.0
←350.0←400.0←450.0←500.0←550.0←600.0←630.0.


800V:
6.3←10.0←16.0←25.0←35.0←50.0←63.0←100.0←160.0←200.0←250.0
←350.0←400.0←450.0←500.0←550.0←600.0←630.0←800.0.


Press  : Fine-tune it with the STEP of -0.1V TEST V ≤ 100V and - 1.0V when TEST V > 100V.


Press  : Fine-tune it with the STEP of +0.1V TEST V < 100V and + 1.0V when TEST V ≥ 100V.


- (2) Press  : The C.C.: 500.0mA (setting for charge current limit) selection is highlighted → the range is 0.5mA~500.0mA.

Operation:

Press  : Tune it with the STEP of + 5mA when C.C. < 100mA, and with the STEP of + 50mA when C.C. ≥ 100mA.


Press  : Tune it with the STEP of - 5mA when C.C. ≤ 100mA, and with the STEP of - 50mA when C.C. > 100mA.

Press  : Fine-tune it with the STEP of -0.5mA.



Press  : Fine-tune it with the STEP of +0.5mA.


 **Notice**

- 650V: When TEST V > 100V, the C.C. maximum is 150mA.
- 800V: When TEST V > 100V, the C.C. maximum is 50mA.


- (3) Press  : The RANGE: 20mA (leakage current measurement range) selection is highlighted.


Operation:

Press   : Adjust the leakage current measurement range, where A indicates Auto range, H indicates fixed range.


Press  again: The RANGE: 20mA (leakage current measurement range) selection highlighted.



Press  : Select the current range 2uA→20uA→200uA→2mA→20mA.

Press  : Select the current range 20mA→2mA→200uA→20uA→2uA.


(4) Press  →  : The TRIGGER: INT. (trigger mode) selection is highlighted.

Operation:

Press  again: Select INT (triggered internally), EXT (triggered externally), MAN (triggered manually) and BUS (triggered by GPIB/RS232). The default setting is INT.

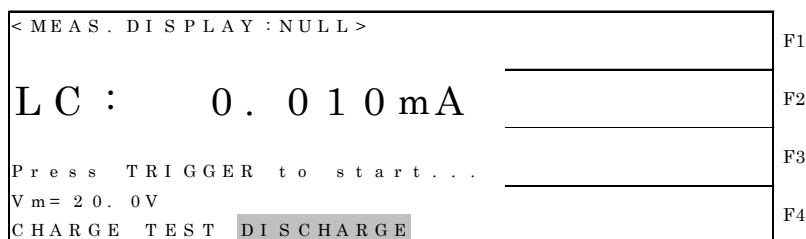
(5) Press  →  : The SPEED: FAST (measurement speed) selection is highlighted.

Operation:




Press  again: Select FAST, MEDIUM or SLOW. The lower speed the more stable the measurement is. The default setting is MEDIUM.


5.2.3 NULL Test

1. On the first page of <MAIN INDEX>, press [F3] to go to the <NULL> screen:



Notice

- * When in Charge and Test mode, only  key is valid, the rest of the keys are invalid; and the  key is the DISCHARGE function key for always.
- * When BUS, EXT are selected in TRIGGER mode, the measurement is triggered by external interface control and the key  will be invalid.

2. There is no setting for this function; press  once can complete the tests automatically. The test procedure is DISCHARGE→CHARGE→TEST→ DISCHARGE.
3. Below explains the displayed data:
 - (1) L.C.: 0.01 mA → it shows the measured result.
 - (2) Vm=20.0 V → it shows the voltage measurement at present.
 - (3) CHARGE TEST DISCHARGE → it shows the test state at present. Press




key and follow the NULL TEST to run the test. The actual test steps will show on the screen during the process.

4. The explanation of action:

The system outputs the voltage set by TEST V in STEP TEST and SEQ. TEST when running NULL TEST, and it will follow the sequence 20mA→2mA→200uA→ 20uA→2uA to read the leakage current of each range under open circuit condition when the system is in TEST mode.

When the screen returns to CHARGE TEST **DISCHARGE**, the meter is done with NULL

TEST. Press  to return to page 1 of MAIN INDEX.

5.2.4 Withstand Voltage Test (W.V. TEST)




It is applied to the EIAJ RC-2364A withstand voltage test for the film of aluminum-foil.

1. On the second page of <MAIN INDEX>, press [F1] to go to the <W.V. TEST> screen:

< MEAS. DISPLAY: W. V. TEST >		
Tr :	0.15 S	Vf : 50.0 V F1 ← Set the rated withstanding voltage
Vt :	58.00 V	C.C. : 2.0 mA F2 ← Set the charged C.C. of W.V.
Vm=	0.0 V 58.0 V / 30.15 S	Tend: Tr + 30 S F3 ← Set the measurement time
CHARGE TEST	DISCHARGE	CHG Tend: 5 S F4 ← Set the maximum charge time



② ① ③

Notice

- * When in Charge and Test mode, only  key can be activated, the rest of the keys are invalid; and the  key is the DISCHARGE function key for always.
- * When BUS, EXT are selected in TRIGGER mode, the measurement is triggered by external interface control and the key  will be invalid.

2. Explanation of the parameter and displayed data:

- (1) Vf: The standard dielectric withstands voltage.
- (2) C.C: The charged constant current of W.V.
- (3) Tend: Tr+, the time for withstands voltage.
- (4) CHG Tend: It sets the maximum charge time.
- (5) Tr: It shows the time between the start of current application and the time when the voltage reaches 90% of the rated withstand voltage (Vf).
- (6) Vt: It shows the measured voltage when the test time reaches Tend.
- (7) Description of the screen:

- 1→ It displays the current test state. Press  to enter into the CHARGE mode and it will go to DISCHARGE mode until the test time is up to end the test. (Press  to interrupt the test.)
- 2→ It monitors the output terminal voltage in any mode.
- 3→ It shows the last measured voltage and time when the test ends.
- (8) Figure 5-1 is the curve diagram of foil withstanding voltage test that shows the relationship among Tr, Vt, Vf and Tend.

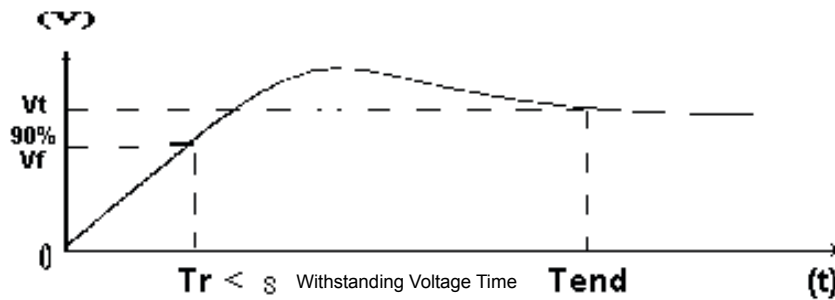




Figure 5-1

3. Below explains the setting of parameters:

- (1) Press  : The Vf : 50.0 V (the rated withstanding voltage) selection is highlighted → the range is 650V: 1V~650V/800V: 1V~800V.

Operation:


Press  : Tune it from low to high.

650V:

6.3→10.0→16.0→25.0→35.0→50.0→63.0→100.0→160.0→200.0→250.0→
350.0→400.0→450.0→500.0→550.0→600.0→630.0.

800V:

6.3→10.0→16.0→25.0→35.0→50.0→63.0→100.0→160.0→200.0→250.0→
350.0→400.0→450.0→500.0→550.0→600.0→630.0→800.0.


Press  : Tune it from high to low.


650V:


6.3←10.0←16.0←25.0←35.0←50.0←63.0←100.0←160.0←200.0←250.0←
350.0←400.0←450.0←500.0←550.0←600.0←630.0.

800V:


6.3←10.0←16.0←25.0←35.0←50.0←63.0←100.0←160.0←200.0←250.0←
350.0←400.0←450.0←500.0←550.0←600.0←630.0←800.0.


Press  : Fine-tune it with the STEP of -0.1V.


Press  : Fine-tune it with the STEP of +0.1V.


- (2) Press  : The C.C.: 150.0mA (charged constant current of W.V.) selection is highlighted → the range is 0.5mA~150.0mA.

Operation:

Press  : Tune it with the STEP of +5mA when C.C. < 100mA, and with the STEP of + 50mA when C.C. ≥ 100mA.

Press  : Tune it with the STEP of -5mA when C.C. ≤ 100mA, and with the STEP of - 50mA when C.C. > 100mA.


Press  : Fine-tune it with the STEP of -0.5mA.

Press  : Fine-tune it with the STEP of +0.5mA.


 **Notice**


650V: When TEST V > 100V, the C.C. maximum is 150mA.


800V: When TEST V > 100V, the C.C. maximum is 50mA.


- (3) Press  : The Tend: Tr+ 030 S (W.V. measurement time) selection is highlighted → the range is 30S~600S.


Operation:

Press  : Tune it with the STEP of +10S when Tend < 100S, and with the STEP of + 100S when Tend ≥ 100S.

Press  : Tune it with the STEP of -10S when Tend ≤ 100S, and with the STEP of - 100S when Tend > 100S.

Press  : Fine-tune it with the STEP of -1S.


Press  : Fine-tune it with the STEP of +1S.


- (4) Press  : CHG Tend: 5 S (set the maximum charge time) selection is highlighted → the range is 5S~600S.

Operation:

Press  : Tune it with the STEP of +30S.

Press  : Tune it with the STEP of -30S.

Press  : Fine-tune it with the STEP of -5S.












Press  : Fine-tune it with the STEP of +5S.

5.2.5 The Function of Compare (COMPARE)

1. On the second page of <MAIN INDEX>, press [F2] to go to the <COMPARE> screen:

MAIN INDEX : COMPARE >	MODE : IR / LC	F1 ← Set the parameter
PARAMETER : L . C .	COMPARE : OFF	F2 ← Set the compare function
UPPER (+) : 0 2 0 . 0 0 0 mA		F3
LOWER (-) : -----		F4

2. Below explains the setting of parameters:

- (1) Press  (set the parameter): The MODE is highlighted. Press  again to change the parameter setting to IR/LC or VF.
- (2) Press  (set the compare function): The COMPARE function is highlighted. Press  again to set the COMPARE function ON or OFF.
- (3) Press  or  to move the cursor to PARAMETER, UPPER, LOWER and CONT CHK columns. When the cursor is at UPPER, LOWER or CONT CHK column, press    can change the value. Press  can ignore the limit. Press  again if there is a need to compare it once more.

< MAIN INDEX : COMPARE >	DIGIT UP	F1 ← Increase the digit
PARAMETER : L . C .	DIGIT DOWN	F2 ← Decrease the digit
UPPER (+) : 0 2 0 . 0 0 0 mA	DIGIT	F3 ← Move the cursor
LOWER (-) : -----	LIMIT OFF	F4 ← Ignore the limit

Description: The TEST PARAMETER in SYSTEM CONFIG defines the IR/LC PARAMETER mode.

UPPER: It sets the upper value for comparison.
 LOWER: It sets the lower value for comparison.
 CONT CHK: It sets the contact check function (0.5pF~100pF.)

Notice

- * CONT CHK is an optional function; it cannot be set if not selected.
- * When the external capacitance is larger than the value set by contact check, PASS is determined without showing on the screen.
- * When the external capacitance is smaller than the value set by contact check, FAIL is determined and the screen shows "CONTACT CHK FAIL" which means the DUT is not connected or in bad connection.

5.2.6 C.C. POWER

- On the second page of <MAIN INDEX>, press [F3] to go to the <C.C.POWER> screen:






(1) Voltage Measurement Mode

< MEAS. DISPLAY; C. C. POWER >		MAX V : 1.0 V	F1 ← Set voltage
V : 0.3 V		C.C. : 1.0 mA	F2 ← Set constant current
CC MODE		TRIG. : MAN	F3 ← Select trigger mode
V _m = 0.3 V		DISP. : VOLTAGE	F4 ← Switch voltage/current display
CHARGE TEST DISCHARGE			



(2) Voltage/Current Measurement Mode

< MEAS. DISPLAY; C. C. POWER >		MAX V : 1.0 V	F1 ← Set voltage
I : 0.001 uA		C.C. : 1.0 mA	F2 ← Set constant current
		TRIG. : MAN	F3 ← Select trigger mode
V _m = 0.3 V		DISP. : A 20 mA	F4 ← Switch voltage/current display
CHARGE TEST DISCHARGE			


Notice

- * When executing Charge and Test measurement only  (discharge) and   (adjust voltage dynamically or set current limit) are valid. All other keys are invalid and  key is always the function of DISCHARGE. It remains in DISCHARGE when standby.
- * When the TRIGGER mode is selected as BUS, EXT, the measurement action is triggered by external interface and it is invalid to press .


- Explanation of the parameter and displayed data:


- (1) MAX V: It sets the maximum output voltage.
- (2) C.C: It sets the constant current.
- (3) Press  to enter the CHARGE mode. There is no time limit for C.C. POWER to output voltage. The 11200 is like the POWER SUPPLY, the screen will appear when in CC MODE and disappear when in CV MODE. To end, press  to go to DISCHARGE mode.
- (4) DISP.: It switches the voltage/current display. There are voltage mode and voltage/current mode for selection.


- Below explains the setting of parameters:

- (1) Press : The MAX V: 1.0 V (the maximum output voltage) is highlighted → the range is 650V: 1V~650V/800V:1V~800V.


Operation:


Press : It tunes the setting with the STEP of 0.1V when pressing once. If press and hold it for more than 1 sec, it changes to tune with the STEP of 5.0V. The setting can be changed during Charge.

Press : It tunes the setting with the STEP of 0.1V when pressing once. If press and hold it for more than 1 sec, it changes to tune with the STEP of 5.0V. The setting can be changed during Charge.

- (2) Press : The C.C.: 150.0mA (the constant current) is highlighted→ the range is 0.5mA~500.0mA.


Operation:


Press : It tunes the setting with the STEP of 0.5mA when pressing once. If press and hold it for more than 1 sec, it changes to tune with the STEP of 5.0mA. The setting can be changed during Charge.

Press : It tunes the setting with the STEP of 0.5mA when pressing once. If press and hold it for more than 1 sec, it changes to tune with the STEP of 5.0mA. The setting can be changed during Charge.


- (3) Press : TRIGGER: The MAN (setting trigger mode parameter) is highlighted.



Operation:


Press  again: Select the EXT (external trigger) or MAN (manual trigger). The default is MAN.

- (4) Press : DISP.: The VOLTAGE (voltage display) is highlighted indicating it is set to display the voltage.


Operation:

When C.C. setting is <20mA, press  again, the RANGE: A 20mA (leakage current measurement range) is highlighted indicating it is set to display the voltage/current.

Press  : Adjust the leakage current measurement range parameter, A means auto range and H means fixed range.

Press  again: The RANGE: A 20mA (leakage current measurement range parameter) is highlighted.

Press : Select the current range 2uA→20uA→200uA→2mA→20mA.

Press : Select the current range 20mA→2mA→200uA→20uA→2uA.

 **Notice**

- 650V: When MAX V (test voltage parameter) > 100V, the C.C. maximum is 150mA.
- 800V: When MAX V (test voltage parameter) > 100V, the C.C. maximum is 50mA.
- DISP: It switches the measurement mode to (1) Voltage mode and (2)

Voltage/Current mode as explained below:
 (1) Voltage mode can only measure the voltage.
 (2) Voltage/Current mode can measure both voltage and current; however the C.C. must be set to <20mA as the RELAY will switch when the mode switches. It is suggested to remain in (2) Voltage/Current mode when both voltage and current measurements are required to minimize the RELAY switch.

5.2.7 FORWARD VOLT


1. On the third page of <MAIN INDEX>, press [F1] to go to the <FORWARD VOLT> screen. <FORWARD VOLT> has two pages:

(1) Selections on page 1:


EAS. DISPLAY : FORWARD. V >		MAX V : 2.5 V	F1 ← Set the test voltage
:	0.6 V	C.C. : 500.0 mA	F2 ← Set the charge current limit
ASS		DWELL : 0.2 S	F3 ← Set the time for delay test
= 0.6 V		NEXT PAGE 1 / 2	F4 ← Go to next page
ARGE TEST DISCHARGE			

(2) Selections on page 2:


EAS. DISPLAY : FORWARD. V >		TRIG. : INT	F1 ← Select the trigger mode
:	0.6 V	SPEED : SLOW	F2 ← Set the measurement speed
ASS		COMP : ON	F3 ← Set the compare function
= 0.6 V		NEXT PAGE 2 / 2	F4 ← Back to previous page
ARGE TEST DISCHARGE			


2. Explanation of the parameter and displayed data:
 - (1) V → it is the diode forward voltage.
 - (2) When COMP ON the system will compare the measured forward voltage with the UPPER&LOWER set by V. The screen will show PASS if the value does not exceed; otherwise it will show HIGH if it is larger than UPPER and show LOW if it is smaller than LOWER.
 - (3) CHARGE TEST DISCHARGE → It shows the present test mode. Press  will follow the procedure of CHARGE → DWELL → TEST → DISCHARGE for execution and the actual test steps will show on the screen during test.


3. Below explains the setting of parameters:


- (1) Press : The MAX V: 020.0V (the test voltage) is highlighted → the range is 650V: 1V~650V/800V: 1V~800V.


Operation:

Press : Tune it with the STEP of 10V from low to high.


Press : Tune it with the STEP of -10V from high to low.


Press : Fine-tune it with the STEP of -0.1V.


Press : Fine-tune it with the STEP of +0.1V.


- (2) Press : C.C.: 500.0mA (the charge current limit) is highlighted → the range is 0.5mA~500.0mA.

Operation:

Press : Tune it in the STEP of +5mA.

Press : Tune it in the STEP of -5mA.


Press : Fine-tune it with the STEP of -0.5mA.

Press : Fine-tune it with the STEP of +0.5mA.


 **Notice**


650V: When TEST V > 100V, the C.C. maximum is 150mA.


800V: When TEST V > 100V, the C.C. maximum is 50mA.


- (3) Press : The DWELL: 1.0S (set the time for delay test) is highlighted → the range is 0.2S ~ 999S.

Operation:

Press : Tune it with the STEP of + 1S when DWELL T <100S, and with the STEP of + 10S when DWELL T ≥ 100S.


Press : Tune it with the STEP of - 1S when DWELL T ≤100S, and with the STEP of - 10S when DWELL T > 100S.



Press : Fine-tune it with the STEP of -0.1S when DWELL T < 100S and + 1S when DWELL T ≥100S.

Press : Fine-tune it with the STEP of +0.1S when DWELL T ≤100S and - 1S when DWELL T >100S.


- (4) Press  → : The TRIGGER: INT. (set the trigger mode) is highlighted.




Operation:

Press  again: It selects INT (internal trigger), EXT (external trigger), MAN (triggered manually) or BUS (triggered by GPIB/RS232). The factory default is INT.

- (5) Press  → : The SPEED: FAST (set the measurement speed) is highlighted.

Operation:

Press  again: It selects FAST, MEDIUM or SLOW. The lower speed the more stable the measurement is. The factory default is MEDIUM.

- (6) Press  →  (set the compare function): The COMPARE function is highlighted. Press  again to change the COMPARE ON, OFF setting.

5.2.8 SURGE TEST

It is applied to capacitor surge test (JIS C 5101-1, 5101-3, 5101-4).

- On the third page of <MAIN INDEX>, press [F2] to go to the <SURGE TEST> screen. <SURGE TEST> has two pages.

(1) Selections on page 1:

EAS. DISPLAY : SURGE >		TEST V : 20.0 V	F1 ← Set the test voltage
C :	1.00 mA	C.C. : 500.0 mA	F2 ← Set the charge current limit
= 0.0V	5S LOOP= 1	SPEED : SLOW	F3 ← Set the measurement speed
ARGE TEST	DISCHARGE	NEXT PAGE 1 / 2	F4 ← Go to next page

(2) Selections on page 2:

EAS. DISPLAY : SURGE >		CHG T : 1 S	F1 ← Set the charge time for DUT
C :	1.00 mA	DCHG T : 10 S	F2 ← Set the discharge time for DUT
= 0.0V	5S LOOP= 1	LOOP : 1	F3 ← Set the no. of times for loop test
ARGE TEST	DISCHARGE	NEXT PAGE 2 / 2	F4 ← Back to previous page


- Explanation of the parameter and displayed data:

- $V_m=0.0\text{ V}$ → It displays the voltage measured at present.
- 5S → It counts the charge/discharge time. It counts charge time when in CHARGE and counts discharge time when in DISCHARGE.
- LOOP=1 → It shows the number of times for loop test.
- CHARGE TEST DISCHARGE → It shows the test status at present. Press




will follow the procedure of CHG T → TEST → DCHG T for execution and the actual test steps will show on the screen during test.

- Below explains the setting of parameters:

- Press : TEST V: 020.0V (test voltage parameter) is highlighted → the range is 650V: 1V~650V/800V: 1V~800V.


Notice : Surge voltage: $V_r * 1.15$ for $V_r \leq 315V$, $V_r * 1.10$ for $V_r > 315V$, V_r : rated voltage.

Operation:

Press : Tune it from low to high.


650V: 7.3→11.5→18.4→28.8→40.3→57.5→72.5→115.0→184.0→230.0→
288.0→385.0→440.0→550.0→605.0→660.0.


800V: 7.3→11.5→18.4→28.8→40.3→57.5→72.5→115.0→184.0→230.0→
288.0→385.0→440.0→550.0→605.0→660.0→693.0→800.0.


Press : Tune it from low to high.

650V: 7.3←11.5←18.4←28.8←40.3←57.5←72.5←115.0←184.0←230.0←
288.0←385.0←440.0←550.0←605.0←660.0.


800V: 7.3←11.5←18.4←28.8←40.3←57.5←72.5←115.0←184.0←230.0←
288.0←385.0←440.0←550.0←605.0←660.0←693.0←800.0.


Press : Fine-tune it with the STEP of -0.1V when TEST V < 100V and + 1.0V when TEST V ≥ 100V.


Press : Fine-tune it with the STEP of +0.1V when TEST V ≤ 100V and - 1.0V when TEST V > 100V.

(2) Press : The C.C.: 500.0mA (set the charge current limit) is highlighted → the range is 0.5mA~500.0mA.


Operation:

Press : Tune it with the STEP of +5mA when C.C. < 100mA and + 50mA when C.C. ≥ 100mA.


Press : Tune it with the STEP of -5mA when C.C. ≤ 100mA and -50mA when C.C. > 100mA.



Press : Fine-tune it with the STEP of -0.5mA.

Press : Fine-tune it with the STEP of +0.5mA.


(3) Press : The SPEED: FAST (set the measurement speed) is highlighted.


Operation:


Press  again: It selects FAST, MEDIUM or SLOW. The lower speed the more stable the measurement is. The factory default is MEDIUM.


(4) Press  → : The CHG T: 10S (set the charge time for DUT) is highlighted → the range is 0S ~ 999S.



Operation:

Press : Tune it with the STEP of +10S when CHG T < 100S, and with the STEP of +100S when CHG T ≥ 100S.

Press : Tune it with the STEP of -10S when CHG T ≤ 100S, and with the STEP of -100S when CHG T > 100S.


Press : Fine-tune it with the STEP of -1S.


Press : Fine-tune it with the STEP of +1S.


- (5) Press  → : The DCHG T: 10S (set the discharge time for DUT) is highlighted → the range is 0S ~ 999S.



Operation:

Press : Tune it with the STEP of +10S when CHG T < 100S.

Press : Tune it with the STEP of -10S when CHG T ≤ 100S.


Press : Fine-tune it with the STEP of -1S.


Press : Fine-tune it with the STEP of +1S.


- (6) Press  → : The LOOP: 1 (set the no. of times for loop test) is highlighted → the range is 1 ~ 9999 and the factory default is 1000.

Operation:

Press : Tune it with the STEP of +100.

Press : Tune it with the STEP of -100.

Press : Fine-tune it with the STEP of -1.

Press : Fine-tune it with the STEP of +1.

Notice

- * If the capacitor does not charge to the voltage set in TEST V within CHG T time, the screen will show “charge error!!” and stop the test.
- * If the capacitor does not discharge to the voltage set in Discharge Volt within DCHG T time, the screen will show “POOR DISCHARGE” and stop the test.
- * When the COMPARE function is enabled, the test will stop if Fail (HIGH or LOW) is encountered and “PASS” will show when the loop test ends if Pass.

6. Handler Interface

The COMPARE in 11200 is connected to external unit by Handler interface. The connector is 24-pin, and its pin assignment is described as below.

6.1 Description of Handler Interface Pins for COMPARE

Pin	Name	Description
1	/EXT	Triggered externally
2	X	N.C
3,20	/TEST	Test
5-7	GND	Ground the external DC
4,24	X	N.C
8	COMMON	Ground the internal power source
9,13	X	N.C
10	VEXT	External DC voltage, acceptable range is +5V~24V
11	VINT	Internal DC voltage +5V
12	X	N.C
14	/C_CHK FAIL	CONT CHK FAIL
15	/PASS /CC_MODE	Measurement Mode: The measured result is within the upper/lower limit (PASS). CC POWER: It is in CC MODE when charge.
16	/CHARGE	It is charging.
17	/FAIL	The measured result is no good (FAIL). CC POWER: The measured current exceeds the range display.
18	/EOT	End of test.
19	/HI	The measured result of LC is higher than the upper limit and IR is lower than the lower limit.
21	/LO	The measured result of LC is lower than the lower limit and IR is higher than the upper limit.
22	/ACQ	End of the analog sampling. It is able to shift the next DUT to the 11200 test terminal.
23	/FAIL_CHARGE	The charging is failed.

Note Voltage output is ON when C.C. POWER is in /EXT positive or negative edge trigger, and voltage output OFF is controlled by Discharge on the panel.

7. Communication Protocol

7.1 Overview

The meter 11200 can be controlled remotely and is able to perform data transfer function via the IEEE-488.2/RS232 interface.

7.2 Specification of IEEE-488 Interface

7.2.1 IEEE-488 Interface Function

1. For IEEE-488 interface, it is able to use the commands of 488.1 (compatible with KEITHLEY 5802) and 488.2 interfaces (including common use and general commands.) It must be set in 11200 SYSTEM SETUP prior uses.
2. This chapter mainly explains the commands of GPIB interface bus to facilitate users in writing programs to control the 11200 for handling the tested data.

Code	Meaning
SH1	Source handshake (talker)
AH1	Acceptor handshake (listener)
T6	Basic talker function
	Serial poll function
	Release the talker function by MLA
	TALK ONLY function not available
L4	Basic listener function
	Release the listener function by MTA
SR1	Device requests service from controller
RL1	Remote-local switch function
PR0	No parallel poll functions
DC1	No device clear function
DT1	No device trigger function
C0	No controller function

7.2.2 Code Used for Data Transfer

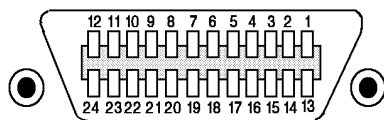
The code used for data transfer is the ISO ASCII code.

7.2.3 TALK/LISTEN Function

"TALK/LISTEN" denotes full programmability and is suitable for the controller or computer system with data processing.

7.2.4 IEEE-488 Interface Connector

Below shows the connector pin assignment:



1 DIO1	13 DIO5
2 DIO2	14 DIO6
3 DIO3	15 DIO7
4 DIO4	16 DIO8
5 EOI	17 REN
6 DAV	18 GND
7 NRFD	19 GND
8 NDAC	20 GND
9 IFC	21 GND
10 SRQ	22 GND
11 ATN	23 GND
12 SHIELD	24 GND

- Meter side connector:
DDK 57 LE-20240 or equivalent.
- Cable side connector:
DDK 57-10240 or equivalent.

7.2.5 Signal Cable of IEEE-488 Interface

- The interface is composed of the data, the handshake and the control ports as shown in the table below:

Port	Signal Cable of Port	Description
Data Port	DIO1 (Data Input/Output 1)	Besides data input, it is also used for interface and device message input/output.
	DIO2 (Data Input/Output 2)	
	DIO3 (Data Input/Output 3)	
	DIO4 (Data Input/Output 4)	
	DIO5 (Data Input/Output 5)	
	DIO6 (Data Input/Output 6)	
	DIO7 (Data Input/Output 7)	
	DIO8 (Data Input/Output 8)	
Handshake Port	DAC (Data Valid)	Indicate that the data on the data port are valid.
	NRFD (Not Ready For Data)	Indicate that the listener is ready to receive.
	NDAC (Not Data Accepted)	Indicate that the listener has finished the data reception.
Control Port	ATN (Attention)	Indicate the signal on the data port carries data or message of an interface or device.
	REN (Remote Enable)	Switch between remote and local control mode.
	IFC (Interface Clear)	Used to reset the interface.
	SRQ (Service Request)	Signal sent by talker to call the controller.
	EOI (End of Identification)	Indicate end of data.

7.2.6 The Response of Interface Message

Interface Message	Response
GTL (to local)	<ul style="list-style-type: none"> ● Only addressed devices that receive this command are set to local mode. ● Disable the remote control mode to enable the front panel switch.

7.2.7 The Port Driver

The specification of port driver is listed below:

DIO1-8 SRQ NRFD NDAC	Open Collector
EOI REN DAV IFC ATN	3 States

7.3 GPIB Commands Description (IEEE 488.2)

7.3.1 Common Use Commands

- (1) The syntax of common use commands
 The GPIB commands for 11200 are divided into general commands (as listed above) and common use commands. The general commands are in tree structure, while the common use commands have no such structure and can be given in the following format no matter which level it is on:

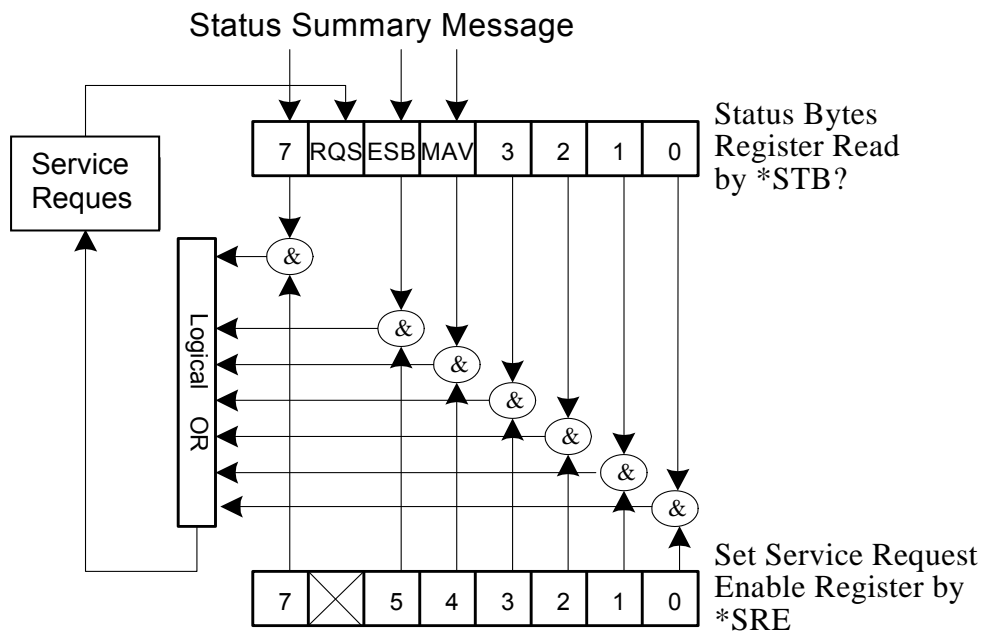
*RST

- (2) Either upper or lower case is ok for the letters.
 (3) A star "*" has to be the leading character of each command.
 (4) End of Character
 There three types of end of character [CARRIAGE RETURN](0Dh), [NEW LINE](0Ah) and [CARRIAGE RETURN](0Dh) + [NEW LINE](0Ah).

Command	Description										
*IDN?	It queries the identification string of 4 columns (separated by comma.) Return the ID string: "Chroma,11200,000000000001,01.11"(650V Mode) Return the ID string: "Chroma,11200-800V,000000000001,01.11"(800V Mode)										
*RST	It enables the 11200 to return to default state.										
*TST?	It runs self-test and returns the test result summary of errors. Return: <table border="1" data-bbox="592 573 975 757"> <tbody> <tr> <td>No Error</td> <td>0</td> </tr> <tr> <td>RAM</td> <td>1</td> </tr> <tr> <td>EEPROM</td> <td>2</td> </tr> <tr> <td>CPLD</td> <td>4</td> </tr> <tr> <td>Calibration Data</td> <td>8</td> </tr> </tbody> </table>	No Error	0	RAM	1	EEPROM	2	CPLD	4	Calibration Data	8
No Error	0										
RAM	1										
EEPROM	2										
CPLD	4										
Calibration Data	8										
*OPC	It informs the 11200 to set the event register to bit 0 when all operations are done.										
*CLS	It clears the register.										
*ESE <numeric_value>	It sets the event register.										
*ESE?	It queries the bit in the started register.										
*ESR?	It queries the text of event register.										
*SRE <numeric_value>	It sets the bit of the started register.										
*SRE?	It queries the text of the started register.										
*STB?	It queries the contents of status byte register. The query returns a numeric value in the format of <NR1>.										
*TRG	It triggers the 11200 in bus trigger mode.										
*RCL<numeric_value>	It recalls the number of meter status that saved in EEPROM.										
*SAV<numeric_value>	It saves the meter status to EEPROM.										
*LRN?	The 11200 returns a null string when receiving this command.										

7.3.2 Status Byte Register

The Status Byte Register is composed of eight bits that summarize an overlaying status data structure. The Status Byte Register can be read using *STB? to return a decimal expression of the register contents (which means the total byte weight of all the byte set to "1".)

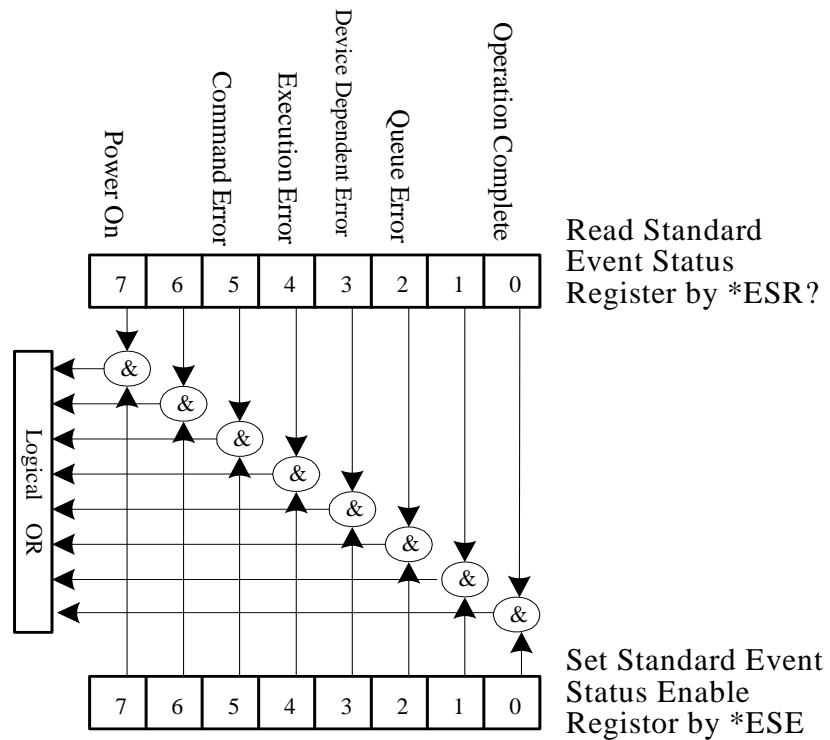


Bit No.	Bit Weight	Description
7	128	Operation Status Register Summary Bit
6	64	Request Service Bit. This bit is set when any enabled bit of the Status Byte Register has been set, which indicates 11200 LCR Meter has at least one reason for requesting service.
5	32	Standard Event Status Register Summary Bit.
4	16	Message Available Bit. This bit is set whenever the 11200 LCR Meter has data available in the output queue, and is reset when the available data is read.
3-0		Always 0.

7.3.3 Standard Event Status Register

The Standard Event Status Register is frequently used and is one of the simplest. The common use commands *ESE and *ESR? can be utilized to program it.

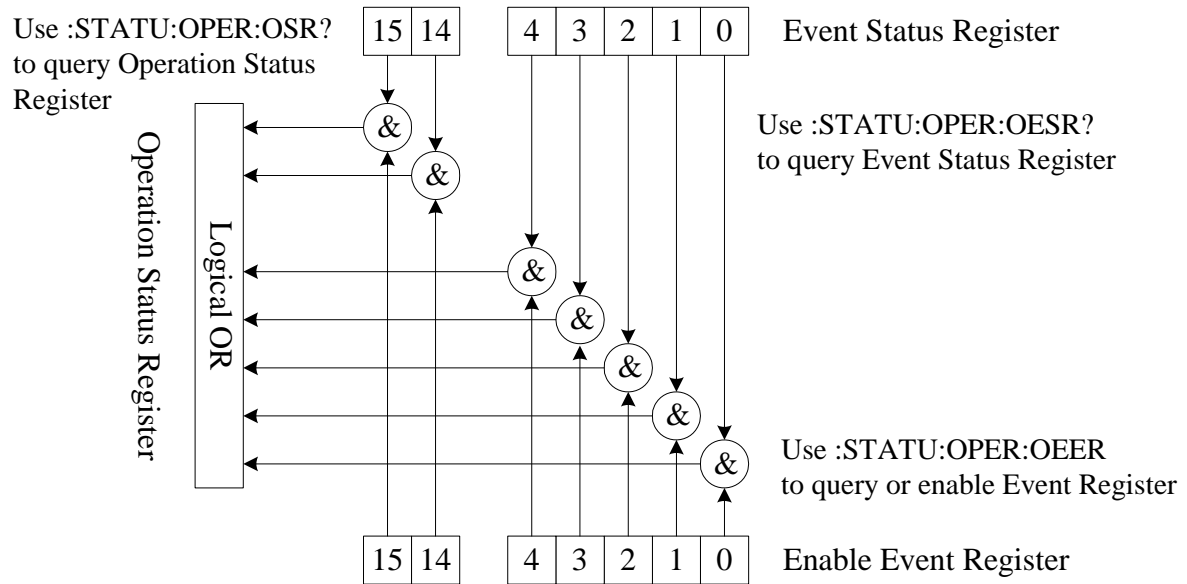
Summary Message
Event Bit (ESB)
Bit 5 of Status Byte
Register



Bit No.	Bit Weight	Description
7	128	Power on Bit. Power off the 11200 and turn on again, this bit is set to 1.
6		Always 0.
5	32	Command Error Bit. This bit is set to 1 if there is any IEEE 488.2 syntax error.
4	16	Execution Error Bit. This bit is set to 1 when the command parameter is out of valid range or inconsistent.
3	8	Device Dependent Error Bit. This bit is set to 1 when too many errors have occurred that the error queue is full.
2	4	Queue Error Bit. This bit is set to 1 when reading data from the output buffer and no data is present, or when the data is lost.
1		Always 0.
0	1	

7.3.4 Standard Operation Status Group

11200 provides standard operation status groups – the STATUs subsystem commands can be used to access the operation status register group. Each group has an event register and an enable register.



Bit No	Bit Weight	Description
6 – 15		Always 0.
5	32	It will set to 1 when 11200 is triggered.
4	16	It will set to 1 when 11200 is performing measurement.
3		Always 0.
2		Always 0.
1		Always 0.
0		Always 0.

7.3.5 General Command Structure

Command	Parameter	Return
ABORt		[No query]
CALCulate		
: LIMit		
: FORMat	{IR LC VF}	{IR LC VF}
: BEEPer		
:	{FAIL PASS}	{FAIL PASS}
CONDition		
: STATE	{OFF ON 0 1}	{ 0 1}
: CLEar		[No query]
: FAIL?	[For query only]	{ 1(PASS) 0(FAIL)}
: LOWer		
[:DATA]	{<numeric_value> MAX MIN}	<numeric_value>
: STATE	{OFF ON 0 1}	{ 0 1}
: UPPer		
[:DATA]	{<numeric_value> MAX MIN}	<numeric_value>
: ONOFF	<numeric_value>	<numeric_value>
: NULL		
: [IMMediate]		[No query]
: DATA?	[For query only]	{NR3}, {NR3}, {NR3}, {NR3}, {NR3}
DISPlay		
: STATE	[For query only]	{LCTEST WVTEST NULL MAIN SYSTEM}
: LCTest		[No query]
: WVTest		[No query]
: CCPower		[No query]
: VF		[No query]
: SURge		[No query]
LCTest		
: SOURce		
: VOLTage	{<numeric_value> MAX MIN}	<numeric_value>
: CURRent	{<numeric_value> MAX MIN}	<numeric_value>
: CONFIgure		
: FUNCTion	{SEQ STEP SURGE}	{SEQ STEP SURGE}
: SPEEd	{FAST MEDIUM SLOW}	{FAST MEDIUM SLOW}
: RANGE	{<range> MIN MAX}	{<range>}
: AUTO	{OFF ON 0 1}	{0 1}
: CHGTime	{<numeric_value> MIN MAX}	<numeric_value>
: DCHGTime	{<numeric_value> MIN MAX}	<numeric_value>
: CYCLP	{<numeric_value> MIN MAX}	<numeric_value>
: DWELI	{<numeric_value> MIN MAX}	<numeric_value>
: MEASure		
: STATE?	[For query only]	{CHG TEST DCHG}
: FETCh?	[For query only]	{0:OK 1:ERROR 2:ContChk Fail 3:Surge test busy},{NO PASS HIGH LOW}
: IR?	[For query only]	{NR3}

: LC?	[For query only]	{NR3}
: SURge:IR?	[For query only]	{NR1},{NR3}
: SURge:LC?	[For query only]	{NR1},{NR3}
: VMON?	[For query only]	{NR3}
WVTest		
: SOURce		
: VOLTage	{<numeric_value> MAX MIN}	<numeric_value>
: CURRent	{<numeric_value> MAX MIN}	<numeric_value>
: CONFigure		
: TEND	{<numeric_value> MIN MAX}	<numeric_value>
: CHGTEND	{<numeric_value> MIN MAX}	<numeric_value>
: MEASure		
: STATE?	[For query only]	{CHG TEST DCHG}
: TRise?	[For query only]	{NR2}
: VTerminate?	[For query only]	{NR3}
: TEnd?	[For query only]	{NR3}
: Vend?	[For query only]	{NR3}
: DATA		
: DATA?	[For query only]	<set1_TIME><set1_VOLTAGE> <set2_TIME><set2_VOLTAGE> <setn_TIME><setn_VOLTAGE>
: POINts	<start>,<end>	<numeric_value>
CCPower		
: SOURce		
: VOLTage	{<numeric_value> MAX MIN}	<numeric_value>
: CURRent	{<numeric_value> MAX MIN}	<numeric_value>
: MEASure		
: STATE?	[For query only]	{CHG TEST DCHG}
: VOLTage?	[For query only]	{NR3}
VF		
: SOURce		
: VOLTage	{<numeric_value> MAX MIN}	<numeric_value>
: CURRent	{<numeric_value> MAX MIN}	<numeric_value>
: CONFigure		
: SPEed	{FAST MEDIUM SLOW}	{FAST MEDIUM SLOW}
: DWELI	{<numeric_value> MIN MAX}	<numeric_value>
: MEASure		
: STATE?	[For query only]	{CHG TEST DCHG}
: FETCh?	[For query only]	{0 1},{NO PASS HIGH LOW}
: VOLTage?	[For query only]	{NR3}
TRIGger		
[: IMMEDIATE]		[No query]
: SOURce	{BUS EXTERNAL}	{INT EXT MAN BUS}
: DELay	{<numeric_value> MAX MIN}	<numeric_value>
: EDGE	{FALLing RISing}	{FALL RISI}
SYSTEM		
: BEEPer		
[: IMMEDIATE]		[No query]
: STATE	{HIGH LOW OFF}	{HIGH LOW OFF}

: ALARm	{PULSe CONTinuous}	{PULS CONT}
: LFRequency	{50 60 NA60 NA50} [HZ]	{50 60 60NA 50NA} [HZ]
: HANdler	{CLEAR HOLD}	{CLEAR HOLD}
: CONTRast	<numeric_value>	<numeric_value>
: CHGTMode	{0(Vm=Vs) 1(Vm=0)}	{0(Vm=Vs) 1(Vm=0)}
: RANGEdwell	<numeric_value>	<numeric_value>
: AVErage	<numeric_value>	<numeric_value>
: EXTvm	{ON OFF}	{ON OFF}
: DIGIts	{0 1}	{0 1}
: PRESet		[No query]
: ERRor?	[For query only]	<numeric_value>, <string>
STATUs		
: PREset		[No query]
: OPERation		
: OESR?	[For query only]	{NR1}
: OEER	{numeric_value}	{numeric_value}
: OSR?	[For query only]	{NR1}

7.3.6 Description of Command Structure

The top of the command tree structure is Root. There are six levels from top to bottom. To give a certain level of command, it is necessary to follow the specific path to access it. For example, it is required to state the whole path to give the command of LOWer as shown below.

Ex. :CALCulate:COMPare:LOWer 3.12E2

In addition, when giving two commands at the same time (ex. to set or query ZERO ON and OFFSet) use the following method to simplify the command.

:CALCulate:ZERO:ON;OFFSet?

It is same as the following two commands below, but simpler.

:CALCulate:ZERO:ON
:CALCulate:ZERO:OFFSet?

Colon (:) is required to separate the command between levels and the first colon at the beginning of each command line indicates the Root. Also two commands need to be separated by semicolon (;) in one command line. For example:

Ex. :CALCulate:ZERO:ON;;CONFIgure:DRY:ON

It means the same as the following two command lines.

:CALCulate:ZERO:ON
:CONFIgure:DRY:ON

The colon after a semicolon indicates the Root. If the command is available for setting and query, add a parameter to the command when setting it and add a question mark "?" to it when query is required.

:CALCulate:ZERO:ON?

The lower case letter and the text in [] in the command indicate they can be omitted.

7.3.7 Command Description

:ABORt Command

:ABORt

Function: It triggers the system to abort the process and enters the DISCHARGE mode.

Parameter: None

Return: None

CALCulate Subsystem

:CALCulate:LIMit:FORMat {IR | LC| VF }

Function: It sets or queries the mode of comparator. The measurement parameter is set synchronously.

Parameter: IR is the resistance, LC is the current while VF is the voltage.

Return: The query returns IR or LC or VF.

:CALCulate:LIMit:BEEPer:CONDition {FAIL | PASS}

Function: It defines the beeper output.

Parameter: FAIL The beeper enables when the comparison result is FAIL.

 PASS The beeper enables when the comparison result is PASS.

Return: The query returns FAIL or PASS.

:CALCulate:LIMit:BEEPer:STATe {OFF | ON | 0 | 1 }

Function: It sets or queries if the beeper is enabled.

Parameter: OFF(0) Disable the beeper.

 ON (1) Enable the beeper.

Return: The query returns 0 or 1.

:CALCulate:LIMit:CLEar

Function: It clears the report data of CALCulate:LIMit:FAIL? Command.

Parameter: None.

Return: It has no query.

:CALCulate:LIMit:FAIL?

Function: It returns the result.

Parameter: None.

Return: The query returns 0 (the result is FAIL) or 1 (the result is PASS).

:CALCulate:LIMit:LOWer[:DATA] {<numeric_value>|MIN|MAX}

Function: It sets or queries the low limit.

Parameter: numeric_value, MIN, MAX, unit IR: K, MA, G(OHM) / LC: uA, mA / VF:V.

Return: The query returns a numeric value in the format of <NR2>.

:CALCulate:LIMit:STATe {OFF | ON | 0 | 1 }

Function: It sets or queries if the comparison function is enabled.

Parameter: ON (1) Enable the comparison function.
OFF (0) Disable the comparison function.

Return: The query returns 0 or 1.

:CALCulate:LIMit:UPPer[:DATA{<numeric_value>|MIN|MAX}

Function: It sets or queries the upper limit.

Parameter: numeric_value, MIN, MAX, unit IR:K, MA, G(OHM) / LC:uA, mA / VF:V.

Return: The query returns a numeric value in the format of <NR2>.

:CALCulate:LIMit:ONOff{<numeric_value>}

Function: It sets or queries the selected comparator function (0~63.)

Parameter: 1 - Disable the comparator, 0 - Enable the comparator.

Bit5: Control the VF upper limit comparator; bit4: Control the VF lower limit comparator; bit3: Control the LC upper limit comparator; bit2: Control the LC lower limit comparator; bit1: Control the IR upper limit comparator; bit0: Control IR lower limit comparator.

Return: The query returns 0~63.

:CALCulate:NULL[:IMMediate]

Function: It runs the range 20mA, 2mA, 200uA, 20uA and 2uA for open circuit null.

Parameter: None.

Return: None.

:CALCulate:NULL:DATA?

Function: It queries the open circuit leakage of range 20mA, 2mA, 200uA, 20uA and 2uA.

Parameter: None.

Return: The query returns a numeric value in the format of <NR3>.

:CALCulate:LIMit:CONTActcheck:STATe {OFF | ON}

Function: It sets or queries if the contact check function is enabled.

Parameter: OFF disables the contact check function while ON enables the contact check function.

Return: The query returns 0 or 1.

:CALCulate:LIMit:CONTActcheck:LOWer[:DATA] {<numeric_value>|MIN|MAX}

Function: It sets or queries the lower limit of contact check parameter.

Parameter: numeric_value, MIN, MAX, unit: pF.

Return: The query returns a numeric value in the format of <NR2>.

:CALCulate:LIMit:CONTActcheck[:LOWer :DATA]

Function: It sets or queries the lower limit for contact check parameter.

Parameter: DATA, unit: pF.

Return: The query returns a numeric value in the format of <NR2>.

DISPlay Subsystem

:DISPlay:STATe?

Function: It queries the test screen displayed at present.

Parameter: None.

Return: The query returns LC TEST, WV TEST, NULL TEST, MAIN, SYSTEM, VF TEST, CC POWER TEST, and SURGE TEST.

:DISPlay:LCTest

Function: It switches the display screen to LC TEST function.

Parameter: None.

Return: None.

:DISPlay:WVTest

Function: It switches the display screen to WV TEST function.

Parameter: None.

Return: None.

:DISPlay:CCP

Function: It switches the display screen to C.C. POWER function.

Parameter: None.

Return: None.

:DISPlay:VF

Function: It switches the display screen to FORWARD VOLTAGE function.

Parameter: None.

Return: None.

:DISPlay:SURGE

Function: It switches the display screen to SURGE TEST function.

Parameter: None.

Return: None.

LCTest Subsystem**:LCTest:SOURce:VOLTage {<numeric_value> | MIN | MAX}**

Function: It sets or queries the test voltage of LC.

Parameter: The numeric value is 650V: 1V~650V / 800V: 1V~800V.

The MINimum is 1V.

The MAXimum is 650V: 650V / 800V: 800V.

Return: The query returns a numeric value in the format of <NR2> and unit V.

:LCTest:SOURce:CURREnt {<numeric_value> | MIN | MAX}

Function: It sets or queries the constant current of LC.

Parameter: The numeric value is 0.5mA~500.0mA.

The MINimum is 0.5mA.

The MAXimum is 500.0mA (test voltage <=100V) or 150mA.

Return: The query returns a numeric value in the format of <NR2> and unit mA.



- 650V: When TEST V > 100V, the C.C. maximum is 150mA.
- 800V: When TEST V > 100V, the C.C. maximum is 50mA.

:LCTest:CONFigure:FUNCTION {SEQ | STEP | SURGE}

Function: It sets or queries the test mode of LC.

Parameter: SEQ is sequential automatic test mode, STEP is the single manual test mode and SURGE is loop test mode.

Return: The query returns SEQ or STEP or SURGE.

:LCTest:CONFigure:SPEEd {FAST | MEDIUM | SLOW}

Function: It sets or queries the speed mode of LC/IR test.

Parameter: FAST the test speed is in fast mode.
 MEDIUM the test speed is in medium mode.
 SLOW the test speed is in slow mode.

Return: The query returns FAST or MEDIUM or SLOW.

:LCTest:CONFigure:RANGe {<numeric_value> | MIN | MAX}

Function: It sets or queries the measurement range.

Parameter: The numeric_value is 4(20mA), 3(2mA), 2 (200uA), 1(20uA) and 0(2uA).
 The MINimum is 2uA.
 The MAXimum is 20mA.

Return: The query returns a numeric value in the format of NR1 (0-4).

:LCTest:CONFigure:RANGe:AUTO {OFF | ON | 0 | 1 }

Function: It sets or queries if auto range is enabled.

Parameter: OFF or 0 means to select the range manually.
 ON or 1 means to select the range automatically.

Return: The query returns 0 or 1.

:LCTest:CONFigure:CHGTime { <numeric_value> | MIN | MAX}

Function: It sets or queries the charge time of test.

Parameter: The numeric_value is 0Sec~999Sec.
 The MINimum is 1Sec, and the MAXimum is 999Sec.

Return: The query returns a numeric value in the format of <NR2>.

:LCTest:CONFigure:DCHGTime { <numeric_value> | MIN | MAX}

Function: It sets or queries the discharge time of test.

Parameter: numeric_value is 0Sec~999Sec.
 The MINimum is 1Sec, and the MAXimum is 999Sec.

Return: The query returns a numeric value in the format of <NR1>.

:LCTest:CONFigure:CYCLP { <numeric_value> | MIN | MAX}

Function: It sets or queries the number of times for loop test.

Parameter: numeric_value is 1~9999.
 The MINimum is 1 and the MAXimum is 9999.

Return: The query returns a numeric value in the format of <NR1>.

:LCTest:CONFigure:DWELI { <numeric_value> | MIN | MAX}

Function: It sets or queries the delayed time of SEQ test mode.

Parameter: The numeric_value is 0.2Sec~999Sec.
 The MINimum is 0.2Sec and the MAXimum is 999Sec.

Return: The query returns a numeric value in the format of <NR2>.

:LCTest:MEASure:STATe?

Function: It queries the test state at present.

Parameter: None.

Return: The query returns CHG, TETS or DCHG.



When querying in Discharge it needs to check if the 11200 voltage is lower than the Discharge threshold (below 0.2V) to ensure the DUT is discharged completed for next test.

:LCTest:MEASure:FETCh?

Function: It queries the test result.

Parameter: None.

Return: The query returns {0: OK | 1: ERROR | 2: ContChk Fail | 3: Surge busy}, {NO | PASS | HIGH | LOW}.

:LCTest:MEASure:IR?

Function: It queries the test result of IR

Parameter: None.

Return: The query returns a numeric value in the format of <NR3> and the unit OHM. The measurement error returns (-1).

:LCTest:MEASure:LC?

Function: It queries the test result of LC.

Parameter: None.

Return: The query returns a numeric value in the format of <NR3> and the unit uAMP. The measurement error returns (-1).

:LCTest:MEASure:SURge:IR?

Function: It queries the test result of IR. It is the last entry at present if during the surge test. It is the last entry if end of the test and inform the entry no.

Parameter: None.

Return: The query returns a numeric value in the format of <NR1>, <NR3> and the unit OHM. The measurement error returns (-1).

:LCTest:MEASure:SURge:LC?

Function: It queries the test result of LC. It is the last entry at present if during the surge test. It is the last entry if end of the test and inform the entry no.

Parameter: None.

Return: The query returns a numeric value in the format of <NR1>, <NR3> and the unit uAMP. The measurement error returns (-1).

:LCTest:MEASure:VMON?

Function: It queries the measured voltage at present.

Parameter: None.

Return: The query returns a numeric value in the format of <NR3> and unit VOLT.



It can be used in any measurement mode and read back the measured voltage at present.

WVTest Subsystem**:WVTest:SOURce:VOLTage {<numeric_value> | MIN | MAX}**

Function: It sets or queries the working voltage of WV.

Parameter: The numerical value is 650V: 1.0V~650V / 800V: 1.0V~800V.

The MINimum is 1.0V while the MAXimum is 650V: 650V / 800V: 800V.

Return: The query returns a numeric value in the format of <NR2> and unit V.

:WVTest:SOURce:CURREnt {<numeric_value> | MIN | MAX}

Function: It sets or queries the constant current of WV.

Parameter: The numeric value is 0.5mA ~150.0mA.

The MINimum is 0.5mA.

The MAXimum is 650V: When TEST V > 100V, the C.C. maximum is 150mA.

800V: When TEST V > 100V, the C.C. maximum is 50mA.

Return: The query returns a numeric value in the format of <NR2> and unit mA.

:WVTest:CONFigure:TEND {<numeric_value> | MIN | MAX}

Function: It sets or queries the end of test time of WV.

Parameter: The numeric value is 30Sec ~ 600Sec.

The MINimum is 30Sec while the MAXimum is 600Sec.

Return: The query returns a numeric value in the format of <NR2> and unit S.

:WVTest:CONFigure:CHGTEND {<numeric_value> | MIN | MAX}

Function: It sets or queries the maximum charge time of WV.

Parameter: The numeric value is 5Sec ~ 600Sec.

The MINimum is 5Sec while the MAXimum is 600Sec.

Return: The query returns a numeric value in the format of <NR2> and unit S.

:WVTest:MEASure:STATe?

Function: It queries the test state at present.

Parameter: None.

Return: The query returns CHG, TETS or DCHG.



When querying in Discharge it needs to check if the 11200 voltage is lower than the Discharge threshold (below 0.2V) to ensure the DUT is discharged completed for next test.

:WVTest:MEASure:TRISe?

Function: It queries the rise time when the voltage reaches 0.9Vf (working voltage).

Parameter: None.

Return: The query returns a numeric value in the format of <NR2> and unit S.

:WVTest:MEASure:VTerminate?

Function: It queries the voltage when the test time reaches Tend.

Parameter: None.

Return: The query returns a numeric value in the format of <NR3> and unit V.

:WVTest:MEASure:TEnd?

Function: It queries the total test time of WV, that is Rise Time (Tr)+ Test Time.

Parameter: None.

Return: The query returns a numeric value in the format of <NR3> and unit S.

:WVTest:MEASure:VEnd?

Function: It queries the voltage when the WV ends.

Parameter: None.

Return: The query returns a numeric value in the format of <NR3> and unit V.

:WVTest:MEASure:DATA[:DATA]?

Function: It returns the data in buffer and the entries are defined by POINTs command.

Parameter: None.

Return: The query returns

<set1> : The 1st set of measured data.

<set2> : The 2nd set of measured data.

.

<setn> : Return the data of last set.

Each returned data set contains the following: <point>, <time>, <voltage>, where

<point> is the data number in the format of <NR1>, the first entry is 1,
 <time> is the time data in the format of <NR2>, and unit S.
 <voltage> is the voltage data in the format of <NR2> and unit V.

:WVTest:MEASure:POINts <start> <end>

Function: It sets or queries the number of data entries.

Parameter: It sets the number of data entries to be returned, where

<start> : Set the start entry of returned data, the range is 0~220 (default is 0).

<end> : Set the end entry of returned data, the range is 0~220 (default is 220).

Return: The query returns the number of data entries saved. If it returns 0, it indicates there is no data entry. The query returns a numeric value in the format of <NR1>.

C.C. POWER Subsystem

:CCPower:SOURce:VOLTage {<numeric_value> | MIN | MAX}

Function: It sets or queries the test voltage of C.C. POWER function.

Parameter: The numeric value is 650V:1V~650V / 800V:1V~800V.

The MINimum is 1V while the MAXimum is 650V:650V / 800V:800V.

Return: The query returns a numeric value in the format of <NR2> and unit V.

:CCPower:SOURce:CURREnt {<numeric_value> | MIN | MAX}

Function: It sets or queries the constant current of C.C. POWER function.

Parameter: The numeric value is 0.5mA~500.0mA.

The MINimum is 0.5mA.

The MAXimum is 650V: 500.0mA (test voltage <=100V) or 150mA.

800V: 500.0mA (test voltage <=100V) or 50mA.

Return: The query returns a numeric value in the format of <NR2> and unit mA.

:CCPower:MEASure:VOLTage?

Function: It queries the measured voltage.

Parameter: None.

Return: The query returns a numeric value in the format of <NR3> and unit VOLT.

:CCPower:MEASure:STATe?

Function: It queries the test state at present.

Parameter: None.

Return: The query returns Charge/Discharge, CC mode ON/OFF.

:CCPower:MEASure:CURREnt?

Function: It returns the measured current. The C.C. must be <20mA and switched to the Voltage/Current mode for current measurement. It returns -1 if unable to conduct the measurement.

Parameter: None.

Return: The query returns a numeric value in the format of <NR3> and unit uAMP. (-1) is returned for measurement error.

:CCPower:CONFigure:RANGe {<numeric_value> | MIN | MAX}

Function: It sets or queries the measurement range.

Parameter: numeric_value is 4(20mA), 3(2mA), 2 (200uA), 1(20uA) and 0(2uA),

MINimum is 2uA and MAXimum is 20mA.

Return: The query returns a numeric value in the format of NR1 (0-4).

:CCPower:CONFigure:RANGe:AUTO {OFF | ON | 0 | 1 }

Function: It sets or queries if auto range mode is enabled.

Parameter: OFF or 0 to select the measurement range manually, and ON or 1 to select auto range.

Return: The query returns 0 or 1.

:CCPower:CONFigure:DISPlay {VOLTage | CURRent }

Function: It sets or queries the C.C Power measurement display mode.

VOLTage: Voltage mode.

CURRent: Voltage/Current mode.

(1) Voltage mode can measure the voltage only. (2) Voltage/Current mode can measure both voltage and current; however the C.C. must be set to <20mA as the RELAY will switch when the mode switches. It is suggested to remain in (2) Voltage/Current mode when both voltage and current measurements are required to minimize the RELAY switch.

Parameter: VOLTage selects the voltage mode for measurement and CURRent selects voltage/current mode for measurement where the voltage is sub display and the current is main display.

Return: The query returns VOLTAGE or CURRENT.

FORWARD VOLTAGE Subsystem

:VF:CONFigure:SPEed {FAST | MEDIUM | SLOW}

Function: It sets or queries the speed mode of FORWARD VOLT test.

Parameter: FAST means the test speed is in fast mode.

MEDIUM means the test speed is in medium mode.

SLOW means the test speed is in low mode.

Return: The query returns FAST, MEDIUM or SLOW.

:VF:CONFigure:DWELI { <numeric_value> | MIN | MAX }

Function: t sets or queries the time delayed for FORWARD VOLTAGE test.

Parameter: numeric_value is 0.2Sec~999Sec.

The MINimum is 0.2Sec while the MAXimum is 999Sec.

Return: The query returns a numeric value in the format of <NR2>.

:VF:SOURce:VOLTage {<numeric_value> | MIN | MAX}

Function: t sets or queries the test voltage for FORWARD VOLTAGE test.

Parameter: The numeric value is 650V:1V~650V / 800V:1V~800V °

The MINimum is 1V.

The MAXimum is 650V:650V / 800V:800V.

Return: The query returns a numeric value in the format of <NR2> and unit VOLT.

:VF:SOURce:CURRent {<numeric_value> | MIN | MAX}

Function: t sets or queries the constant current of FORWARD VOLTAGE.

Parameter: The numeric value is 0.5mA~500.0mA.

The MINimum is 0.5mA.

The MAXimum is 650V: 500.0mA (test voltage <=100V) or 150mA.

800V: 500.0mA (test voltage <=100V) or 50mA.

Return: The query returns a numeric value in the format of <NR2> and unit mA.

:VF:MEASure:FETCh?

Function: It queries the test result of FORWARD VOLTAGE.

Parameter: None.

Return: The query returns {0:OK | 1:ERROR}, {NO | PASS | HIGH | LOW}.

:VF:MEASure:VOLTage?

Function: It queries the measured voltage during test.

Parameter: None.

Return: The query returns a numeric value in the format of <NR3> and unit VOLT.

:VF:MEASure:STATe?

Function: It queries the test state at present.

Parameter: None.

Return: The query returns Charge /TEST/Discharge.

TRIGger Subsystem**:TRIGger[:IMMEDIATE]**

Function: It sets the screen (LCT or WVT) following the DISPLAY command to enable the test function.

Parameter: None.

Return: None.

:TRIGger:SOURce {BUS | EXTERNAL}

Function: It sets or queries the trigger mode.

Parameter: BUS Set to BUS trigger mode.

 EXTERNAL Set to external trigger mode.

Return: The query returns BUS, EXT, INT, MAN.

:TRIGger:DELay {<numeric_value>|MIN|MAX}

Function: It sets or queries the time delayed for trigger.

Parameter: The numeric value is 0mS~9995mS.

 The MINimum is 0mS while the MAXimum is 9995mS.

Return: The query returns a numeric value in the format of <NR1>.

:TRIGger:EDGE {FALL | RISE}

Function: It sets or queries the signal mode of external trigger.

Parameter: FALLing is the falling edge trigger.

 RISing is the rising edge trigger.

Return: The query returns FALL or RISE.

SYSTEM Subsystem**:SYSTEM:BEEPer [:IMMEDIATE]**

Function: It beeps immediately.

Parameter: None.

Return: None.

:SYSTEM:BEEPer:STATe {HIGH | LOW | OFF}

Function: It sets or queries if the beeper is enabled.

Parameter: HIGH Enable the beeper in HIGH volume mode.

 LOW Enable the beeper in LOW volume mode.

 OFF Disable all beepers including error beeps.

Return: The query returns LARG, SMAL or OFF.

:SYSTem:ALARm {PULSe|CONTInuous}

Function: It sets or queries the beeper's action in comparison function.

Parameter: PULSe It beeps with pulse.
 CONTInuous It beeps continuously.

Return: The query returns PULS or CONT.

:SYSTem:LFRrequency { 50 | 60 | NA60 | NA50}

Function: It sets or queries the operating line frequency of 11200.

Parameter: 50 indicate the line frequency is 50Hz, the external trigger AD integration time is the same as internal trigger.

 60 indicates the line frequency is 60Hz, the external trigger AD integration time is the same as internal trigger.

 NA60 indicates the line frequency is 60Hz, the external trigger AD integration time is 3mS.

 NA50 indicates the line frequency is 50Hz, the external trigger AD integration time is 3mS.

Return: The query returns 50 or 60, or 60NA or 50NA.

:SYSTem:HANDler { CLEAR | HOLD}

Function: It sets or queries the HANDLER state.

Parameter: CLEAR It clears the previous test result before executing measurement.
 HOLD It holds the test result and change until different result appears.

Return: The query returns CLEAR or HOLD.

:SYSTem:CONTrast <numeric_value>

Function: It sets or queries the contrast of LCD.

Parameter: The value is 0~15.

Return: The query returns a numeric value in the format of <NR1>.

:SYSTem:CHGTMode {0 | 1}

Function: It sets the charge time mode.

Parameter: 0: Vm=Vs, 1: Vm=0.

Return: The query returns 0 or 1.

:SYSTem:RANGEDwell <numeric_value>

Function: It sets the time delayed for switching the IR/LC range.

Parameter: The value is 0.0S~9.9S.

 The MINimum is 0.0S while the MAXimum is 9.9S.

Return: The query returns a numeric value in the format of <NR2> and unit S.

:SYSTem:AVERage <numeric_value>

Function: It sets the average number of times for measurement. The selection is from 1 to 8.

Parameter: The value is 1~8.

 The MINimum is 1 while the MAXimum is 8.

Return: The query returns a numeric value in the format of <NR1>.

:SYSTem:DIGIts{0 | 1}

Function: It sets the measurement digits for SEQ and STEP mode.

Parameter: 0: it shows 3 1/2 digits, 1: it shows 4 1/2 digits.

Return: The query returns 0 or 1.

:SYSTem:PRESet

Function: It resets the 11200 to its default state.

Parameter: None.

Return: None.

:SYSTem:ERRor?

Function: It queries the error number or message in the error queue of 11200.

Parameter: None.

Return: numeric_value The error message number.

string The error message string containing 80 characters max.

STATUs Subsystem**:STATUs:OPERation:OESR?**

Function: It returns the event register contents of operation status group.

Parameter: None.

Return: The query returns a numeric value in the format of NR1.

:STATUs:OPERation:OEER< numeric_value >

Function: It sets or queries the enable register contents of operation status group.

Parameter: Decimal expression for register contents.

Return: The query returns a numeric value in the format of NR1.

:STATUs:OPERation:OSR?

Function: It returns the operation register contents of operation status group.

Parameter: None.

Return: The query returns a numeric value in the format of NR1.

:STATUs:PREset

Function: It clears the event and the enable register contents of operation status group

Parameter: None.

Return: None.

7.4 Error Messages

Read error queue from remote interface:

SYSTem:ERRor?

Below is the format of error message (maximum 80 characters for an error string):

■ Execution Error

0	No error There is no error message exist at present.
-102	Syntax error Invalid character exists in the command string, ex. SOUR:DRIVE,1
-104	Data Type error The parameter is not defined in the command string.
-106	Illegal parameter value The parameter type is error in the command string.
-202	Setting conflict One of the following conditions may cause the error:

- Sending out *TRG or TRIGGER command when the trigger mode is external.
 - Sending out *TRG or TRIGGER command when DRIVE=STBY.
- 203 Data out of range
The data parameter exceeds the valid range, ex. SOUR:DRIVE 8.
- 211 Data stale
The following condition may cause the error:
- Receiving READ? command when DRIVE=STBY.
- 224 Self-test failed
The self-test executed via remote interface (*TST) is failed. In addition, there are other test errors. Refer to *TST? command for the description of return format.
- 225 Too many errors
More than 20 errors are occurred and the error queue is full. It will not store other errors until some of them are deleted. The error queue will be cleared after powered off or executing *CLS (clear state) command.
- 226 Query INTERRUPTED
When the device is in sending data state, the sending data is interrupted due to device change to receiving state after got the new command. The output buffer will be cleared.

8. RS-232C Control Interface

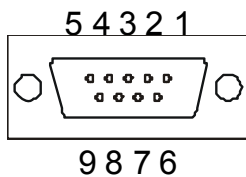
8.1 Overview

The RS-232C interface used by the LCR Meter is a standard interface defined by Electronic Industries Association (EIA). It is widely used in microcomputer systems nowadays and can be utilized to control or transfer data.

8.2 RS-232C Specification

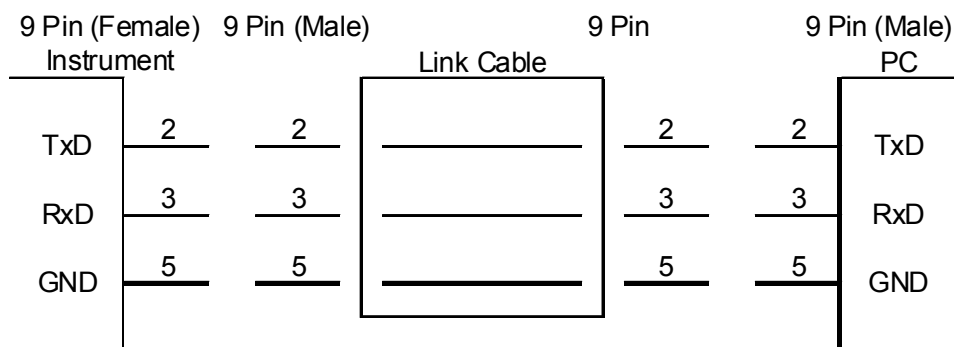
8.2.1 RS-232C Interface Connector

The RS-232 interface connector is a 9-pin female connector.



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

8.2.2 RS-232C Signal Wire Connection



8.3 Setting RS-232C Interface Baud Rate

Press [System Setup] to enter <SYSTEM CONFIG> and then set the RS-232C BAUDRATE. There are 600, 1200, 4800, 9600, 19200 and 28800 six selections. The default setting is 19200.

- PARITY CHECK
The PARITY CHECK is fixed to NONE.
- WORD LENGTH
The WORD LENGTH is fixed to 8.
- STOP BIT
The STOP BIT is 1.



The baud rate setting must comply with the one set on the RS-232 interface card in PC, or it may cause problem during data transmission.

8.4 RS-232C Interface Command

The detail description of RS-232C interface commands, please refer to *7.3 GPIB Commands Description (IEEE 488.2)*.

8.5 Example of RS-232C in Visual Basic

Using the MSComm components in VB:

- (1) Set the communication port
MSComm1.CommPort = i 'Set the communication port number to i
- (2) Set the transmission rate
MSComm1.Settings = "9600,n,8,1" "9600,n,8,1"
- (3) Open the communication port
MSComm1.PortOpen = True 'Open the communication port
- (4) Receive the data
Text1.Text = MSComm1.Input 'Receive the data
- (5) Send the data
DimData As String

Data = "*"IDN?" + Chr(&HD) + Chr(&HA)'data and add the end byte 0x0D, 0x0A
MSComm1.Output Data 'Send out the data



Headquarters 總公司

CHROMA ATE INC. 致茂電子股份有限公司

66, Hwa-ya 1st Rd., Hwaya Technology Park,

Kuei-shan 33383, Taoyuan, Taiwan

台灣桃園縣33383龜山鄉華亞科技園區華亞一路 66 號

TEL: + 886 - 3 - 327 - 9999

FAX: + 886 - 3 - 327 - 8898

e-mail: chroma@chroma.com.tw

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