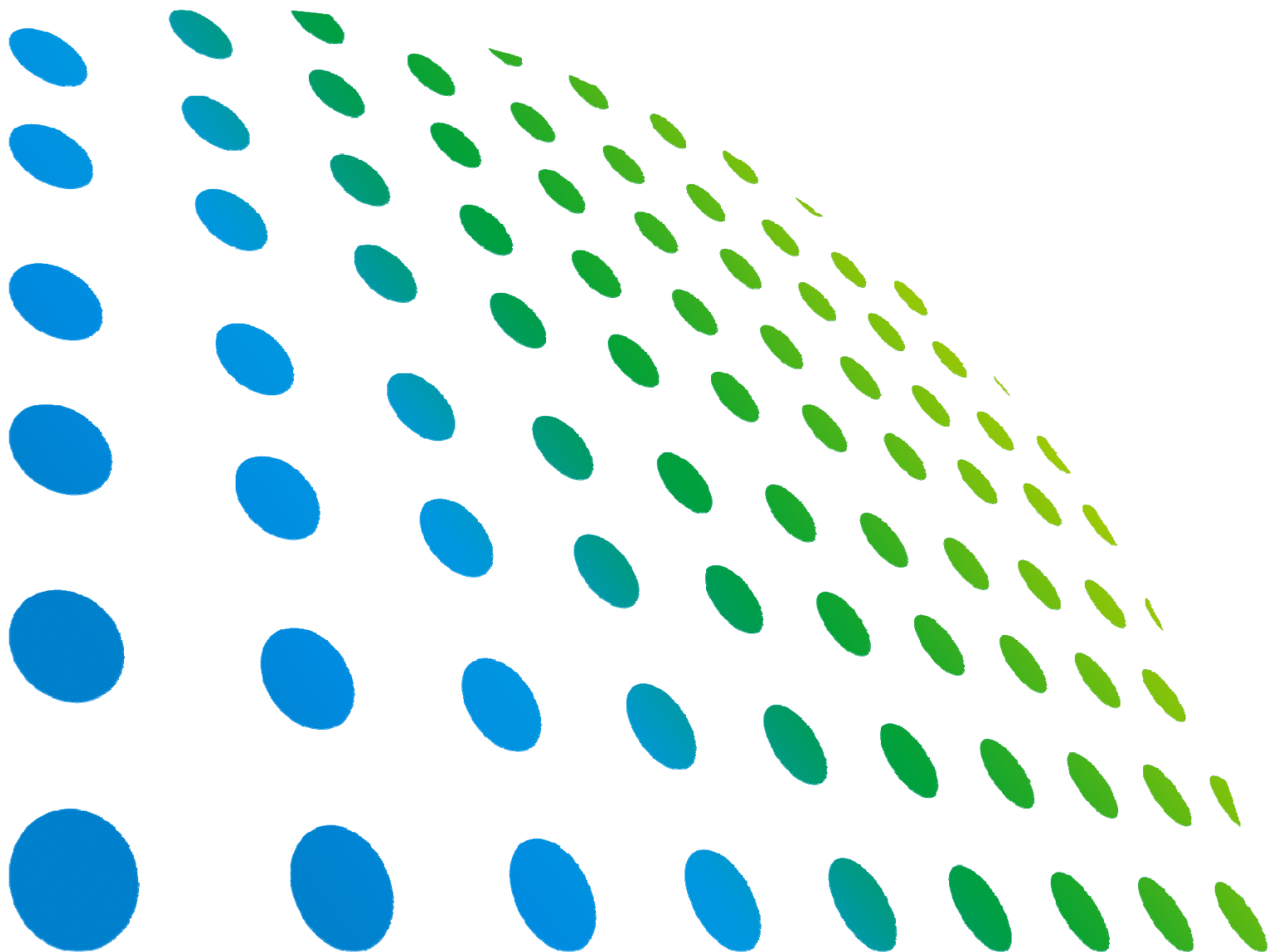




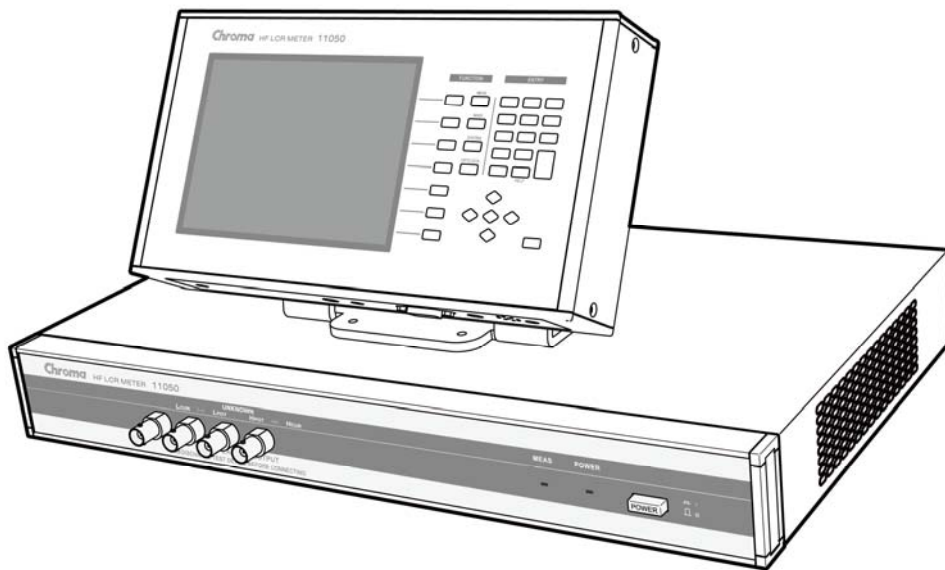
HF LCR Meter

11050

User's Manual



HF LCR Meter 11050 User's Manual



Version 1.0
October 2014

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Material Contents Declaration

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



: See <Table 1>.



: See <Table 2>.

<Table 1>

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

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

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

Disposal

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





Declaration of Conformity

For the following equipment :

HF LCR Meter

(Product Name/ Trade Name)

11050

(Model Designation)

CHROMA ATE INC.

(Manufacturer Name)

66, Hwaya 1st Rd., Kueishan Hwaya Technology Park, Taoyuan County 33383, Taiwan

(Manufacturer Address)

Is herewith confirmed to comply with the requirements set out in the Council Directive on the Approximation of the Laws of the Member States relating to Electromagnetic Compatibility (2004/108/EC) and Low Voltage Directive (2006/95/EC). For the evaluation regarding the Directives, the following standards were applied :

EN 61326-1:2006

EN 55011:2009+A1:2010 Class A, EN 61000-3-2:2006/A1:2009 and /A2:2009,

EN 61000-3-3:2008, IEC 61000-4-2:2008, IEC 61000-4-3:2006/A1:2007/A2:2010,

IEC 61000-4-4:2004/A1:2010, IEC 61000-4-5:2005, IEC 61000-4-6:2008,

IEC 61000-4-8:2009, IEC 61000-4-11:2004

EN 61010-1:2010(Third Edition) and EN 61010-2-030:2010(First Edition)

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

CHROMA ATE INC.

(Company Name)

66, Hwaya 1st Rd., Kueishan Hwaya Technology Park, Taoyuan County 33383, Taiwan

(Company Address)

Person responsible for this declaration:

Mr. Vincent Wu

(Name, Surname)

T&M BU Deputy Director

(Position/Title)

Taiwan

(Place)

2014.6.20

(Date)

(Legal Signature)

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.



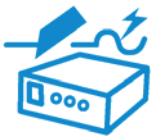
BEFORE APPLYING POWER

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

Revision History

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

Date	Version	Revised Sections
Oct. 2014	1.0	Complete this manual.

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1. Preface

1.1 Overview

The **11050 HF LCR Meter** is a high frequency (1kHz ~10MHz) passive 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.

The test parameters equipped with this device containing L, C, R, Z, Y, DCR, etc., which are perfect functions for the production line and quality control.

Via the instrument is capable of providing fast, highly accurate, convenient and reliable tests. It has the functions of selection controls for test frequency and test voltage, LIMIT TEST, BIN TEST, LOAD, LIST SWEEP, STORE/RECALL and RS232/LAN/GPIB. The handler interface is able to communicate with automation machine.

The instrument provides DC bias ($I \leq 0.02A$) output for measuring coil inductance under bias current source. It also can coordinate with Chroma's DC bias source devices.

The multi-function test device, ergonomic keyboard design, guided panel operation, extra-large LCD, locked key and password protection makes the 11050 instrument very easy to operate. Its protection enables the test results to be shown on the display clearly.

If the instrument requires testing lead extension, use 4 connection points for connecting test correctly. It needs to consider high frequency response of test wire as measuring under high frequency.

1.2 Summary of Specification

- Measurement Parameter: L, C, R, Z, Y, DCR, Q, D, X, θ
- Basic Accuracy: Basic 0.1% (1kHz/ 1V rms)
- Measurement Frequency: 1kHz ~ 10MHz
- Measurement Voltage: 10mV ~ 999mVrms, Step 1mV
1Vrms ~ 5Vrms, Step 10mV
- Output Impedance: 25 Ω , 100 Ω , OFF (synchronous variation by measurement range)
- Equivalent Circuit: Series, Parallel
- Measurement Speed: Fast, medium, slow
- Offset Function: Open, short, load offset
- Interface: RS-232 interface, USB-Host Memory Card), LAN & USB-H interface (option), GPIB interface (option), Handler interface, Bias & Bias Current control interface.

	RS-232	USB-Host Memory	LAN & USB-H	GPIB	Handler	Bias	Bias Current
11050	√	√	Option	Option	√	√	√

Table 1-1 Interface requirement

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 1-2* and *Table 1-3*.

Item	Q'ty	Description
Power Cord	1	A 1 meter bend power cord
Slow Blow Fuse 2.5A	2	For rated voltage AC 100 ~240V use
User's Manual CD	1	CD for user's manuals in English and Traditional Chinese
D-SUB 15Pin link cable - 50CM	1	The cable is for linking the monitor and the instrument.
Adapter	1	Power plug 3P to 2P
M4 x 10 pan head screw	5	Securing display unit and measurement unit.

Table 1-2 Standard Accessories

Item	Q'ty	Description
Quick Start Guide	1	One Traditional Chinese version
A133509	1	GPIB card
A133510	1	LAN & USB-H card
D-SUB 15Pin link cable-2M	1	For hanging monitor connection use
RS232 link cable	1	RS-232 link cable
Cable CEN-36M/CEN-36M	1	Cable for connecting Handler interface

150CM		
Test Cable-BNC+ Alligator Clip	1	BIAS cable
A110242	1	ESR test fixture for supporting 100kHz
A110234	1	High frequency test cable for supporting 1MHz
A133004	1	Four-terminal SMD test kit for supporting 1MHz.
A110211	1	Four-terminal DIP test kit for supporting 10MHz
A110501	1	Four-terminal SMD test kit for supporting 10MHz.

Table 1-3 Optional Accessories

Note : Only name item is required when ordering any the accessories.

2. Specifications

2.1 Measurement Function

- Measurement Parameter:
 - Z : Impedance
 - L : Inductance
 - C : Capacitance
 - R : Resistance
 - Y : Admittance
 - X : Reactance
 - θ : Phase
 - Q : Quality Factor
 - D : Loss Factor
 - DCR : DC Resistance

- Parameter Combination: :

Primary Parameter	L	C	R	Z,Y	DCR
Secondary Parameter	D,Q,R, θ ,Q+R	D,Q,R, θ	Q,X	θ	---

- Equivalent Circuit: Parallel and Series
- Range: Auto and Manual
- Trigger Mode: Internal, Manual and External
- Measurement Terminals: Four-terminal measurement
- Measurement Speed: Fast, Medium and Slow

2.2 Test Signal

- Frequency:
 - 11050 : 1kHz ~ 10MHz
 - Accuracy: $\pm (0.1\% \pm 0.01\text{Hz})$

Range	Resolution	Unit
1.000 ~ 9.999	0.001	kHz
10.00 ~ 99.99	0.01	kHz
100.0 ~ 99.9	0.1	kHz
1.000 ~ 9.999	0.001	MHz
10.00	---	MHz

- Signal Level:

	Range	Resolution	Set Accuracy
Test Voltage	10mVrms to 999mVrms	1mV	$\pm 10\% + 1\text{mV}$
	1Vrms to 5Vrms	10mV	$\pm (10 + 1 \text{ xfs}) \% \pm 10\text{mV}$

×fs: Test frequency, the unit is MHz.

- Output Impedance: Constant Rsou.= Typical : 25 Ω

Constant Rsou.= Typical :100Ω
 Constant Rsou.=OFF (Synchronous variation by measurement range)

Note The relation between test frequency, test voltage and output impedance is the table as below.

Test Frequency	Test Voltage	Output Impedance
1kHz~1MHz	10mV~5V	100Ω
1kHz~10MHz	10mV~1V	25Ω
		100Ω
		OFF

2.3 Parameter Display Range

Parameter	Range
Z, R, X	0.01mΩ ~ 9999.99MΩ
L	0.00001μH ~ 99.999MH
C	0.00001pF ~ 999.999F
Y	0.1nS ~ 99.999kS
DCR	0.01mΩ ~ 999.99MΩ
Q,D	0.00001 ~ 99999
θ	-89.99999° ~ 89.99999°

2.4 Measurement Notices

Measurement accuracy is specified when all of the following conditions are satisfied:

- (1) Warm-up time: ≥ 30 minutes
- (2) Two sides of tester should keep ventilation at least 10cm.
- (3) Single unit ambient measurement, open and short corrections have been performed.
- (4) Single unit + long lead ambient measurement, open and short as well as load offsets have been performed.

2.5 Accuracy

- Within 1 year after factory calibrated
- Temperature: 23°C ± 5°C
- Relative Humidity: 75% maximum
- Warm up: 30 minutes minimum
- Test condition for accuracy specification: Tes voltage is 1Vrms and measurement speed with slow.

1. Z/θ Accuracy

The basic accuracy is listed in *Table 2-1*.

- Measurement with fast rate, accuracy is multiplied by 2.
- Measurement with medium rate, accuracy is multiplied by 1.5.
- Measurement with slow rate, accuracy is multiplied by 1.

Test voltage ≥ 1Vrms, accuracy is multiplied by 1.

Test voltage < 1Vrms, accuracy is multiplied by (1/test voltage).

2. L, C, R Accuracy

For $Q \geq 10$ (loss factor ≤ 0.1), correspond to accuracy of $|Z|$, where

$$|Z_L| = |2\pi fL|$$

$$|Z_C| = |1/(2\pi fC)|$$

See Table 2-1 $|Z|$ - θ Accuracy

If $Q < 10$ (loss factor > 0.1), L accuracy is multiplied by $(1+1/Q)$.

3. D, Q, R Accuracy

$$D \leq 0.1$$

$$D \text{ accuracy} = \pm Ze$$

$$D (Q \geq 10)$$

$$Q \text{ accuracy} = \pm [Ze \times (1+Q^2)] / [1 - Q \times Ze]$$

$Q < 10$, Q accuracy is multiplied by $(1+1/Q)$.

Note Ze is the error corresponding to impedance which is represented by absolute error, ex. Z error = 1%, Ze = 0.01.

$ Z $ (Ω)	10M	±0.5%						
		±0.4°						
	1M	±0.15%	±2.0%					
		±0.09°	±1.2°					
	100k	±0.15%	±1.5%	±2.0%				
		±0.08°	±0.8°	±2.0%				
	10k					±5.0%	±8.0%	
						±5.0°	±8.0°	
	1k					±3.0%	±5.0%	
						±3.0°	±5.0°	
100	±0.1%	±1.5%	±2.0%			±3.0%	±5.0%	
	±0.04°	±0.3°	±2.0°			±3.0°	±5.0°	
10					±5.0%	±8.0%		
					±5.0°	±8.0°		
1							±8.0%	
							±8.0°	
100m	±0.8%	±5.5%	±6.0%					
	±0.5°	±3.0°	±4.0°					
	1k	10k	100k	1M	3M	10M		

Frequency (Hz)
Table 2-1 $|Z|$ - θ Accuracy

4. ESR Accuracy

$$\text{ESR} = \pm Z \times Z_e \quad (Q \geq 10)$$

- Note**
- (1) Z stands for actual measurement impedance.
 - (2) Z_e is the error corresponding to impedance which is represented by absolute error, ex. Z error = 1%, $Z_e = 0.01$.

5. DCR Accuracy

$$\pm (0.5\% + 0.2\text{m}\Omega) > 10\text{m}\Omega$$

$$\pm (1\% + 0.2\text{m}\Omega) < 10\text{m}\Omega$$

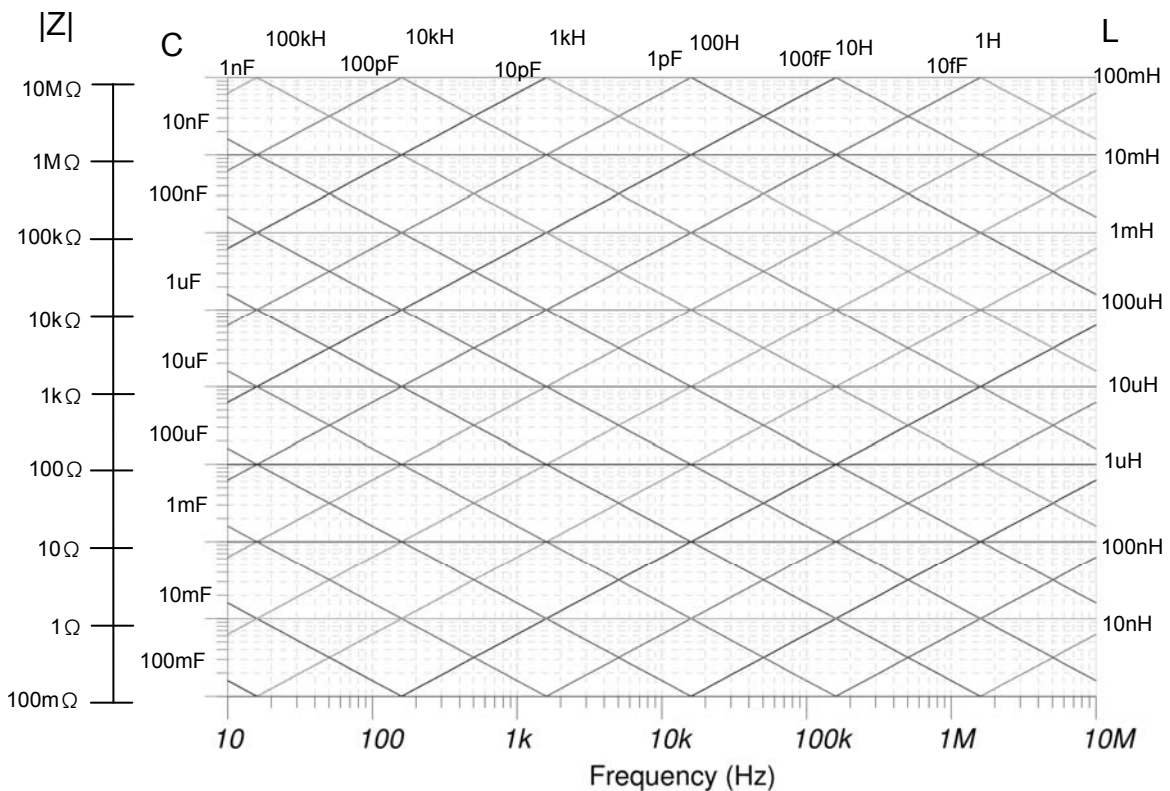


Figure 2-1 Impedance Planar Graph

2.6 Correction

Open Correction:

Remove measurement errors due to open stray impedances of test fixture.

Short Correction:

Remove measurement errors due to short residual impedances of test fixture.

Load Correction:

Place and load the known reference load, the system use the load value as standard.

Open/Short/Load Corrections are recommended to use under the conditions below:

- Connect DC bias measurement passive component additionally.
- Place component test machine

- Test fixture connected externally (user-defined included)
- The condition contains long wire and fixture

Due to there are stray and residual impedance effects in fixtures connected externally, it is suggested to perform Open/Short/Load Correction before measuring DUT. For operation method, see 5.3.1.2 *LCR MODE- OPEN /SHORT CORRECTION*.

2.7 Interface

- **RS-232 interface** : Standard RS-232 interface
- **USB-1 interface** : Standard FLASH MEMORY interface
- **Handler interface** : Output signal of test result and I/O interface of external trigger
- **Bias interface** : DC Bias BNC interface
- **DC Bias Current control interface** : DC bias current control interface
- **USB-2 interface (option)** : Bar Code Reader interface
- **LAN interface (option)** : 10/100 type network interface
- **GPIB interface (option)** : Standard GPIB interface

2.8 Others

- **Display:** Color 640x480 LCD Panel
- **Power:** 100 ~ 240V \pm 10%, 47~63Hz, power consumption is 60VA, maximum.
- **Environment:** Operating 0°C ~ 40°C, 10% ~ 90% relative humidity
Storage -10°C ~ 70°C, 10% ~ 90% relative humidity
- **Dimension:** 11050 entire device installation 428mm (W) x 230mm (H) x 290mm (D)
- **Weight:** 11050 entire device installation 8.0Kg approximately

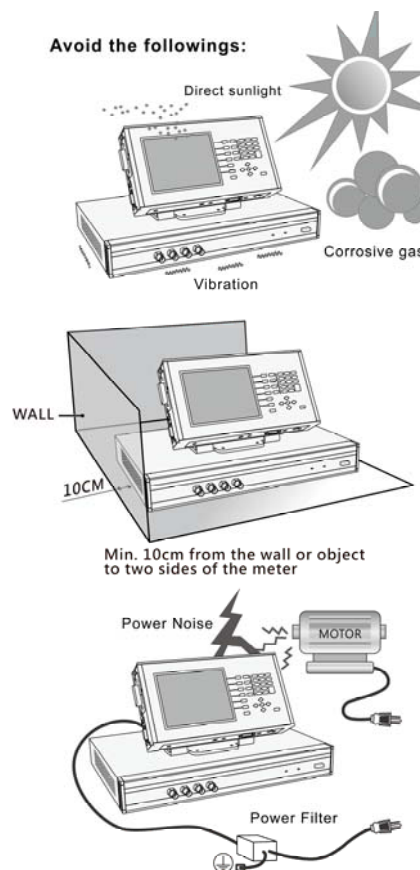
2.9 Bias Current Specification

- **Current Setting Range:** 0~20mA
- **Resolution:** 1mA
- **Accuracy:** \pm (2%+0.5mA)

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 0 ~ 40°C and that the relative humidity is below 90%.
- (2) Two sides 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 should be stored within the temperature range -10°C ~ +70°C. In case it is not to be used for a long time, please store it in the original or similar package, and keep it from direct sunlight and humidity to ensure a good condition for later use.



Note

1. Indoor use
2. Altitude: 2000 m
3. Transient Overvoltage at Mains Supply: 2500V
4. Humidity: Maximum 80%RH at 31°C decreasing to 50%RH at 40°C
5. Pollution Degree: 2

3.2 Power Line Connection

Before plugging in the power cord, make sure the power switch is off. Please use the power supply frequency of 50Hz or 60Hz.

3.3 Fuse

There is one fuse installed in the power inlet on 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: AT2.5A 250V

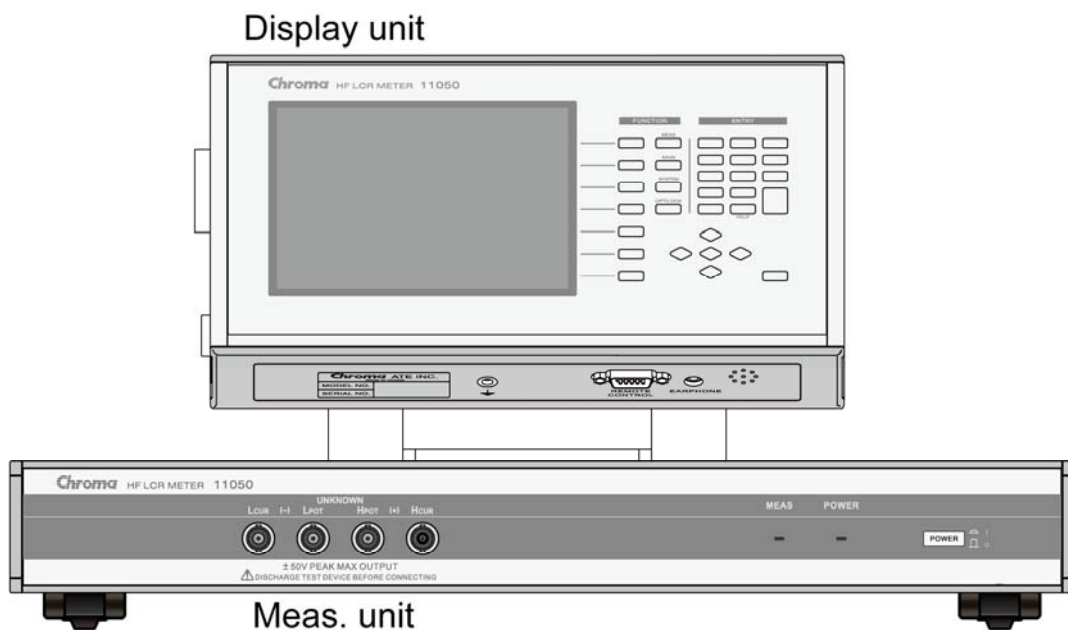
For safety and noise reduction, it is necessary to use a 3-pin power cord to connect the power inlet on the rear panel for AC line input.

3.4 Power Regulation

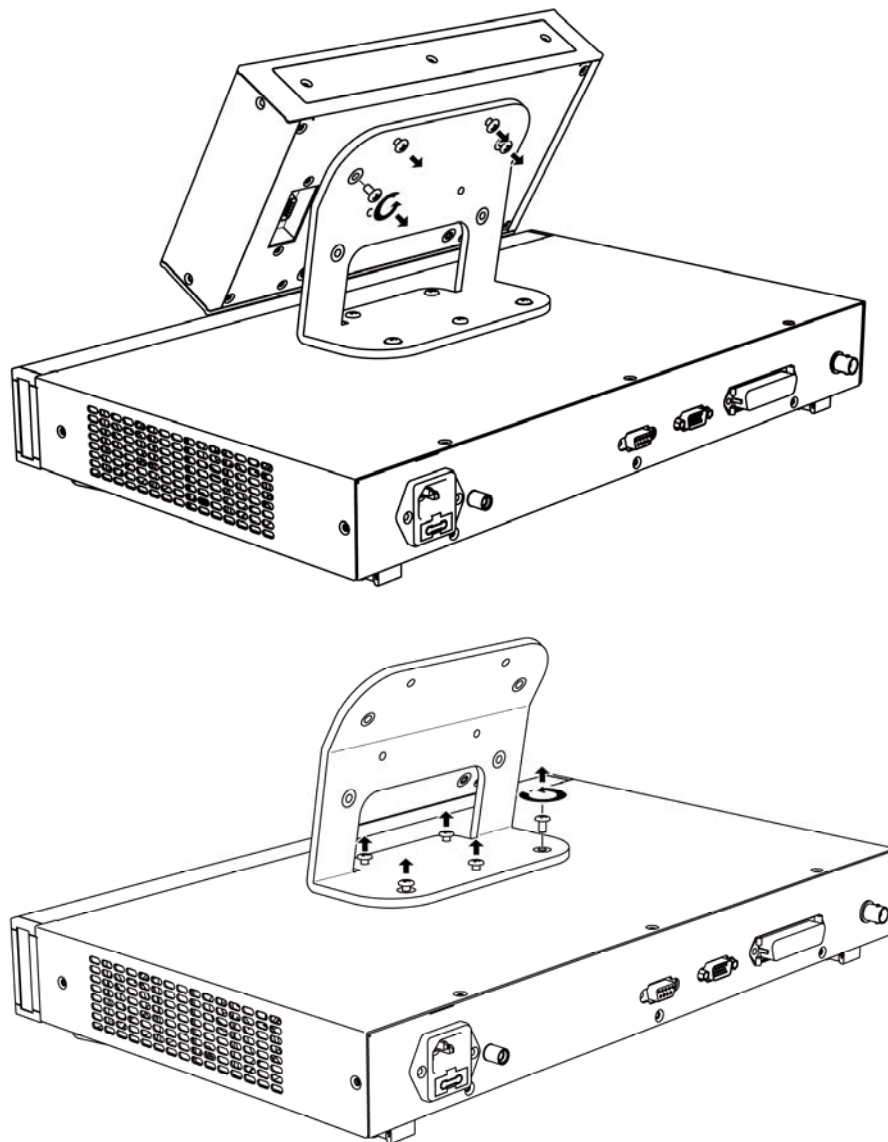
As this instrument belongs precision electrical test device, so the accuracy is possible to be influenced lower by input power unstable after testing. There is $\pm 10\%$ changeable power even in the laboratory, so we suggest that use the regulator in power and test devices to be the only one way to avoid power voltage affecting measured data.

3.5 Entire Device Installation & Allocation

The 11050 entire device installation includes Display Unit and Measurement Unit (abbreviation: Meas. Unit).

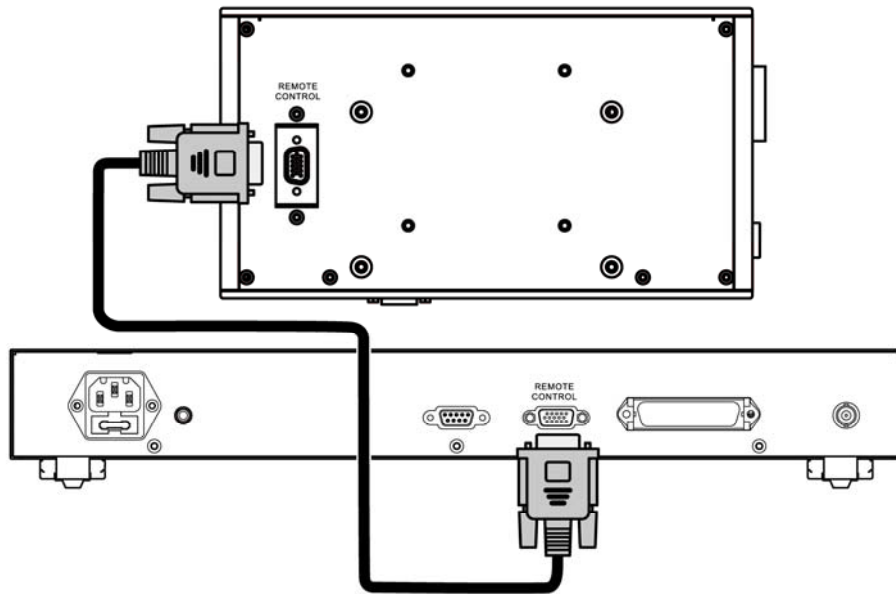


- (1) Entire device installation diagram
Display unit and meas. unit are only fixed by monitor supporting frame when delivery. User can remove pan head screw on monitor supporting frame to separate display unit and meas. unit by actual demand. Disassemble diagrams are as the following.

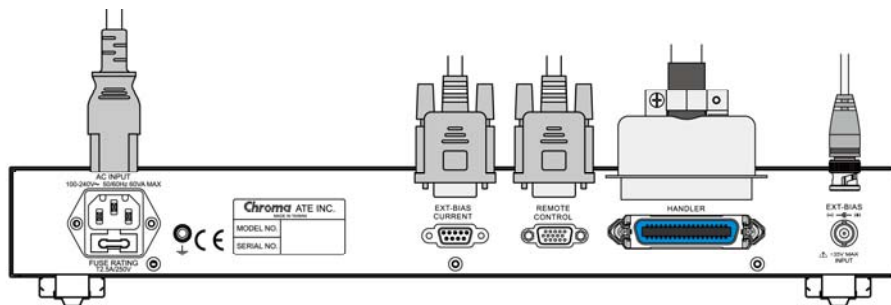


(2) Wiring inspection on rear of entire device

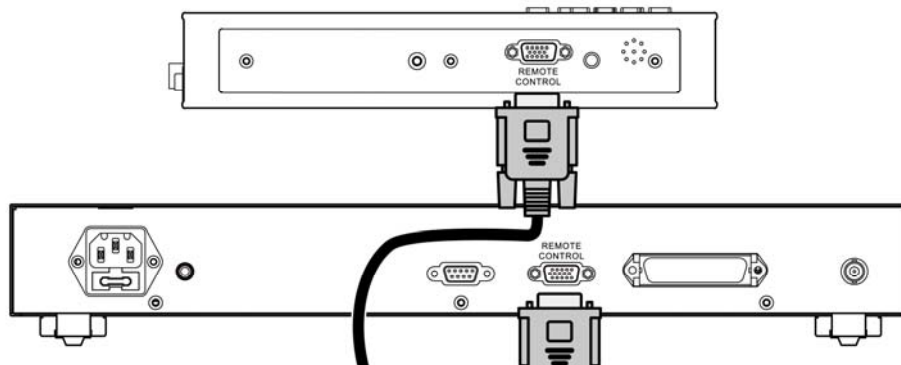
Display unit and meas. unit are only fixed by monitor supporting frame when delivery. Users need to use standard accessory D-SUB 15Pin connecting wire 50CM to connect REMOTE CONTROL terminals on the rear of display unit and meas. unit.



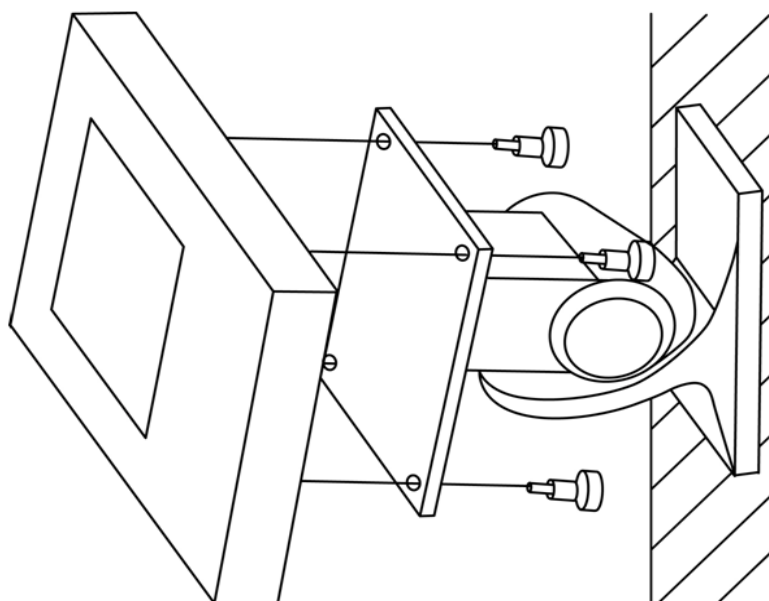
Other wires installation are as the following: From left to right sequentially - AC power cord, RS-232 cable (option), D-SUB 15Pin connecting wire 50CM, Cable CEN-36M/ CEN-36M 150CM (option) and test cable BNC + alligator clip (option).



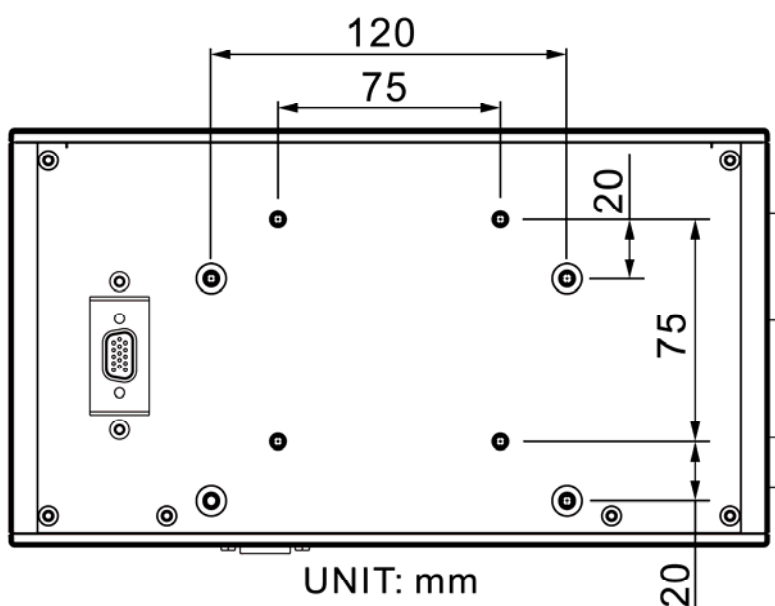
- (3) Allocate display unit at proximal to the user
Purchase D-SUB 15Pin -2M connecting wire additionally to move display unit out that its allocation and meas. unit are as the figure below.



- (4) Hanging Requirements
The separate display unit can hang on the location where monitor supporting frame locked and it also can lock wall rack as the diagram below. The wall rack is locked in screw hole with anti-baked coating.

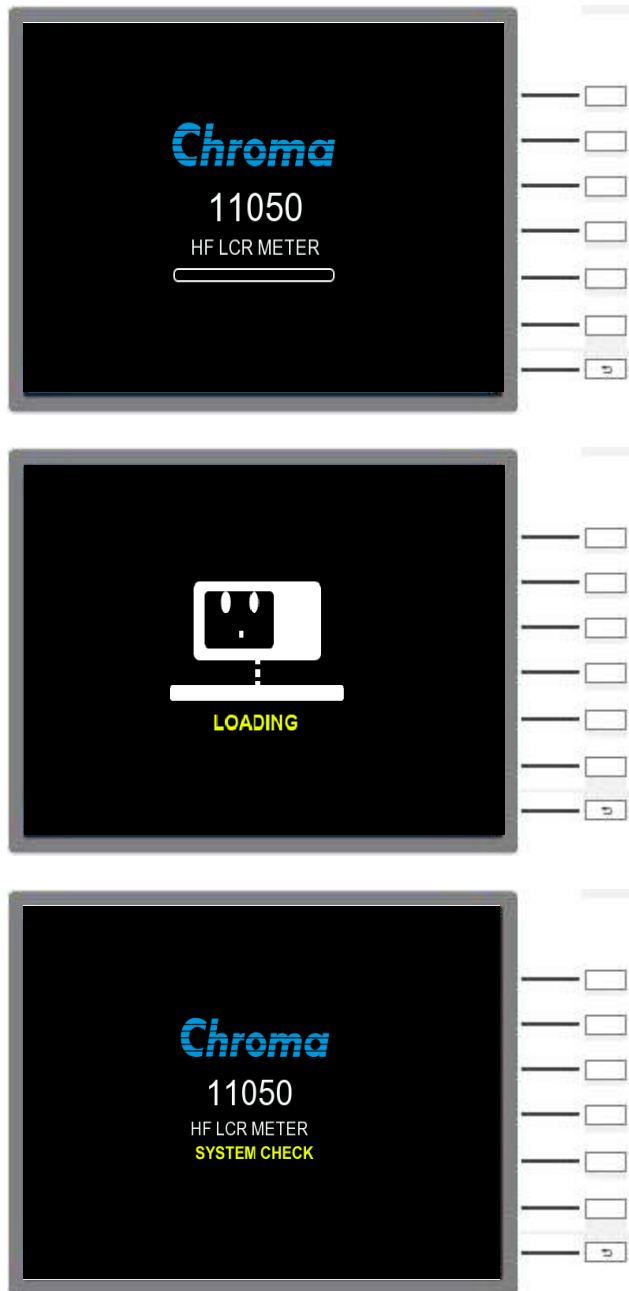


The selection of wall rack is by users' requirement. Screw hole locations on rear panel of display unit as below shows, dimension unit is mm.



3.6 Power-on Procedure

After powering on the tester, the power indicator on 11050 MEASUREMENT UNIT front panel will be lit and the inner fan at two sides will be operating. The meter performs a series of self-test, 11050 display unit will be shown as below.



If "COMMUNICATION ERROR, PLEASE REBOOT" message pops up, the screen shows as below. Please power off the meter, confirm whether display unit and measurement unit connections are normal as well as reboot it.



3.7 FAN LOCK Protection

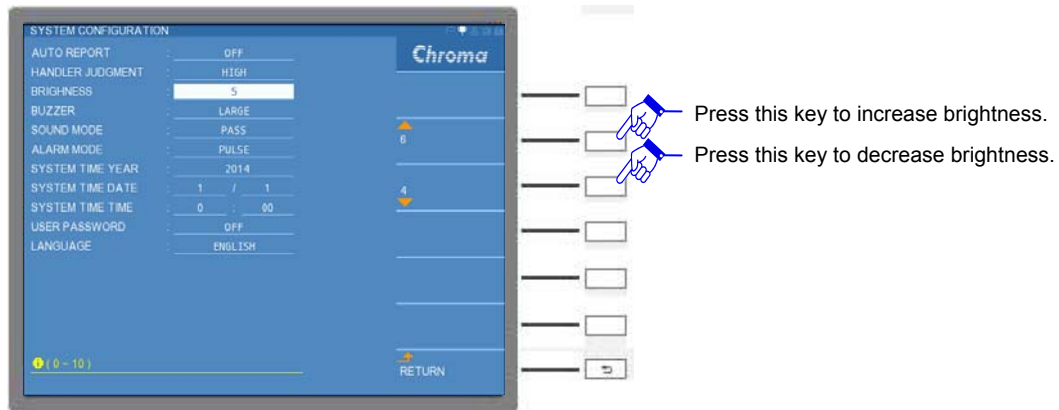
For keeping internal heat dissipation and getting the stable measurement, FAN LOCK protection will be occurred if there is fan failure or foreign material invasion. The meter can't be operated and outputted at the same time, operation screen shows the protection message as below.



- ⚡ CAUTION**
1. Troubleshooting:
 - (1) When FAN LOCK protection is occurred, please power off the meter and then reboot to observe if it is caused by error action.
 - (2) If FAN LOCK is occurred again, please contact the distributor or Chroma's service department for service.
 2. After powering on the meter and start operating, please keep ventilation at left and right sides of meter at least 10cm.

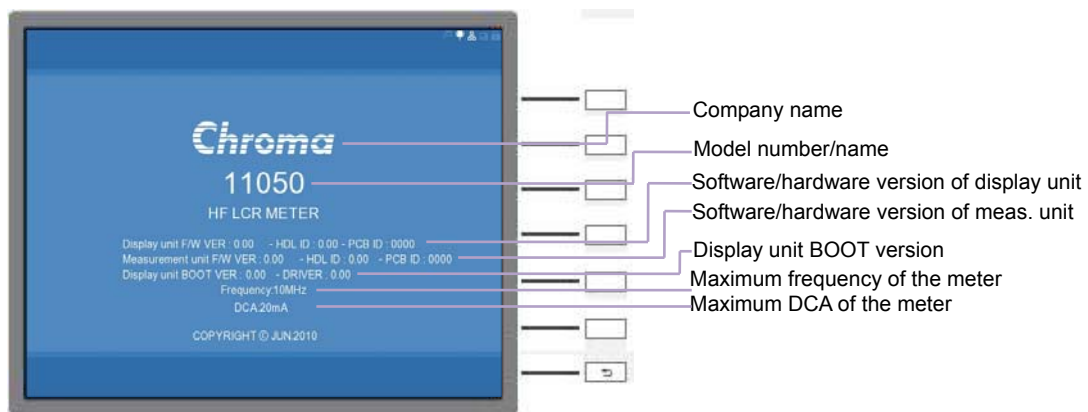
3.8 Contrast Adjustment of LCD Display

To adjust the contrast of LCD display that can be used by the system configuration in system setup, but notice that the adjustment should depend on personal acceptable brightness.



3.9 Query Version

Query version can via ABOUT in system setup, the screen as below shows. The information in the screen below users can get model number/name, program version and maximum measurement frequency.



3.10 Maintenance & Cleaning

Remove all connected wires and cables on the instrument before cleaning. Use a brush to clean the dust on it. If the cover with dirt, use cleaning naphtha to wipe it. Don't use corrosive liquid to avoid the cover damaged. For internal cleaning, use a low-pressure air gun to vacuum the dust inside or send it back to the distributors or agents of Chroma for cleaning.

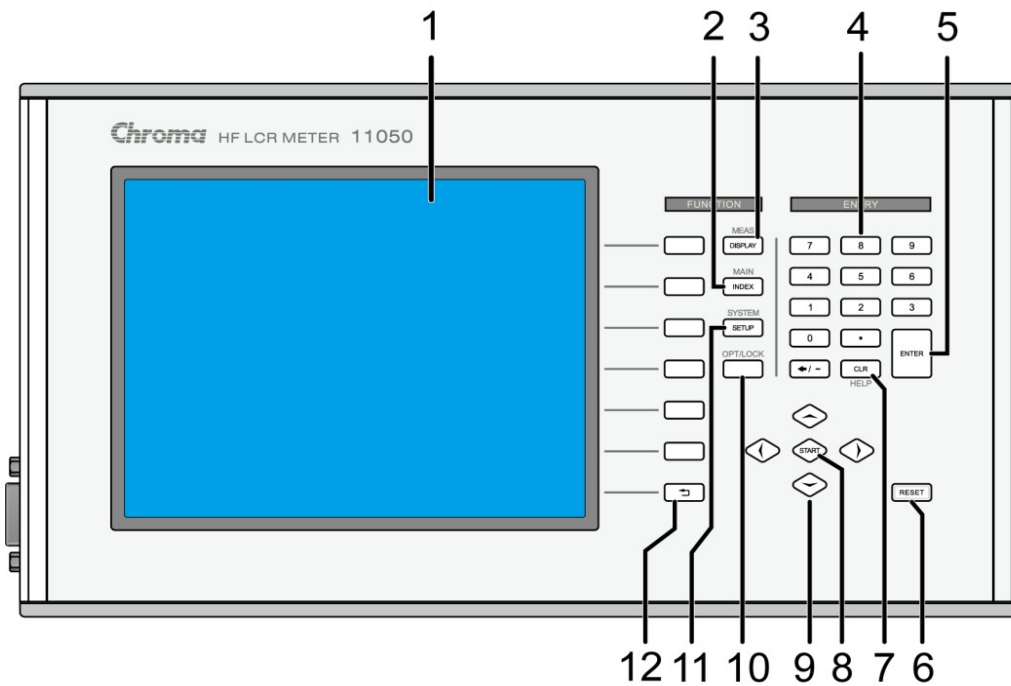
3.11 Notices for Using Fixture & Test Cable

When the test cable or fixture connects DUT for proceeding measurement, please keep the test fixture away from the wire with high current, high voltage or high frequency signal to avoid the interference on the measurement.

4. Descriptions of Display Unit & Meas. Unit

4.1 Display Unit

4.1.1 Front Panel

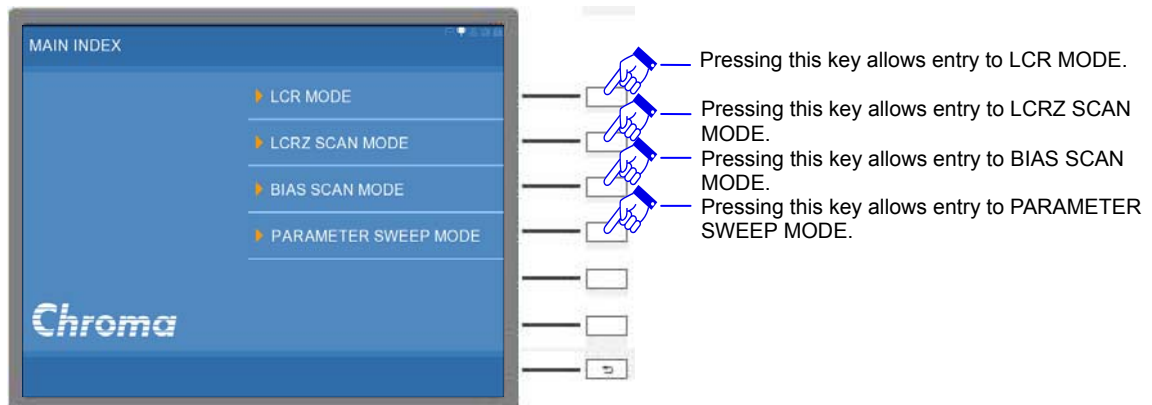


(1) LCD Display

The display of this test device is a color 640 X 480 LCD Panel with backlight function.

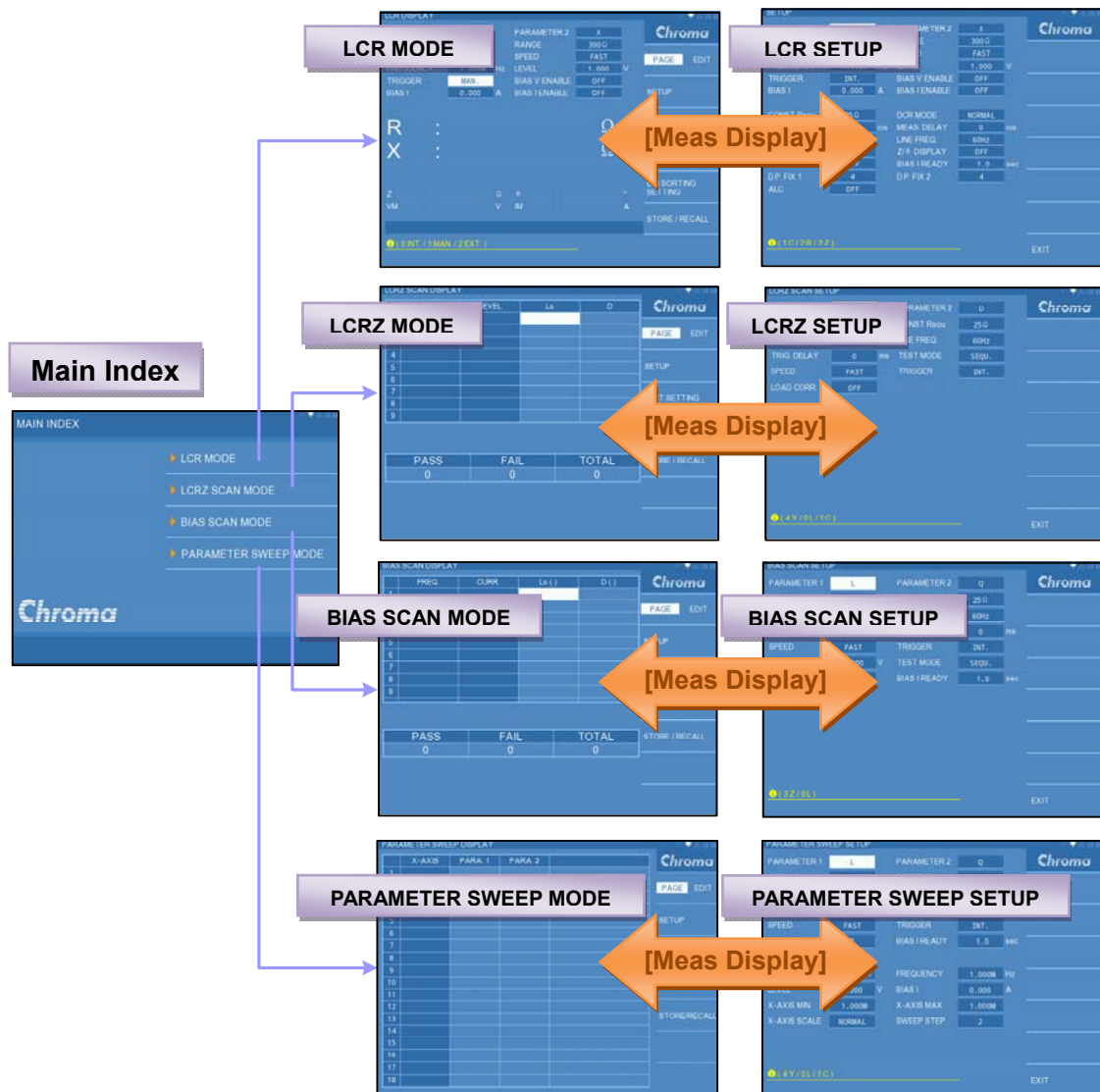
(2) Main Index

Pressing this key allows entry to the main index screen. In this screen you may select the test function you wish to use.



(3) Meas. Display

Upon pressing this key, the instrument is in main index and setup screens switching.



(4) Numbers and Symbol Keys ([0] [9] [.] [-])

These numbers and symbol keys are for each setting condition which needs to input value and symbol.

(5) Enter Key

Its function is to check the value setting or condition selection and parameters setting.

(6) Reset Key

Upon pressing the Reset key, the measurement function stops when performing scan & sweep tests.





(7) Clear Key (CLR)

It clears the inputted values before defining it (ENTER key unpressed). The value is at the cursor located place on the display.

(8) Start Key

This is the key to trigger the start of measurement.



There are , , ,  four arrow keys. These keys set and control the cursor movement, which can be useful when inputting various parameters.

(10) Lock Key

It is a panel key lock function. When pressing this key, the upper right side of the display will show lock pattern indicating the key locked. If users desire to cancel this condition just press this key again.

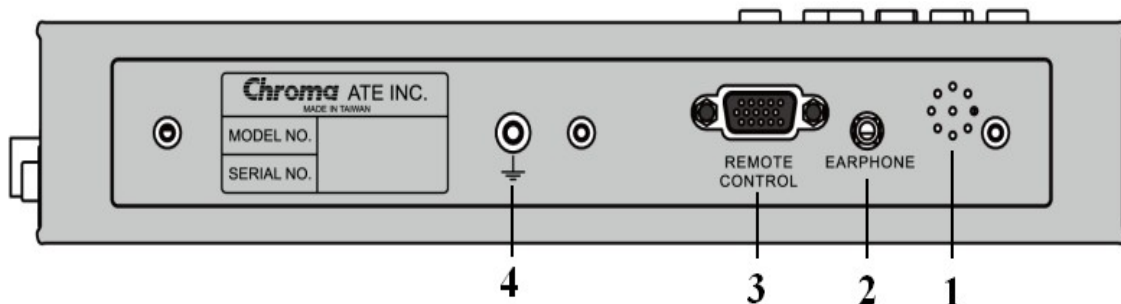
(11) System Setup

Press this key the tester will be under system setup screen. The options can be selected including relate information of main unit, primary system parameter, password setting and memory management.

(12) Selection key

It includes seven keys. The major function shows different conditions of each function or other options which needs to be selected by the user's requirement.

4.1.2 Bottom View of Display Unit



(1) Buzzer beeping location

The location of buzzer sounds.

(2) Earphone Connector

The connector is for connecting earphone.

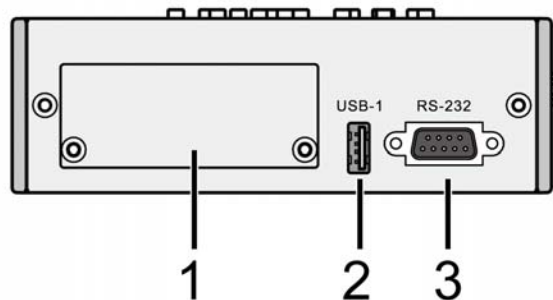
(3) REMOTE CONTROL

Use D-SUB 15Pin connection cable to connect to measurement unit.

(4) Ground terminal

This terminal connects the cover of this instrument directly, then connect to the ground to avoid exterior obstruction that makes instrument connection uncompleted and influences the safety.

4.1.3 Left Side View of Display Unit



(1) Interface Slot

It is a slot for plugging in LAN & USB-H or GPIB interface. Unscrew two screws on light gray cover marked 1 of above figure and plug in optional interfaces as well as lock the screws back.

Notice

- (1) Model number of LAN & USB-H interface card is A133510 (option). Its main function is network communication and for connecting Bar Code Reader interface.
- (2) Model number of GPIB interface card is A133509 (option).

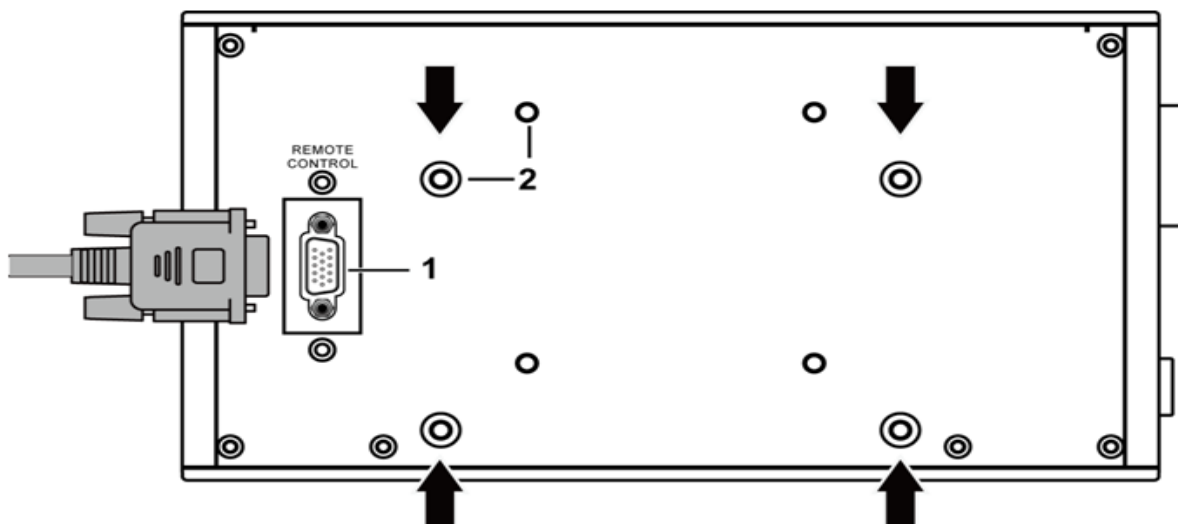
(2) USB Interface

Standard FLASH MEMORY interface

(3) RS-232 Interface

Standard RS-232 interface

4.1.4 Rear Panel of Display Unit



(1) REMOTE CONTROL

Use D-SUB 15Pin connection cable to connect to measurement unit.

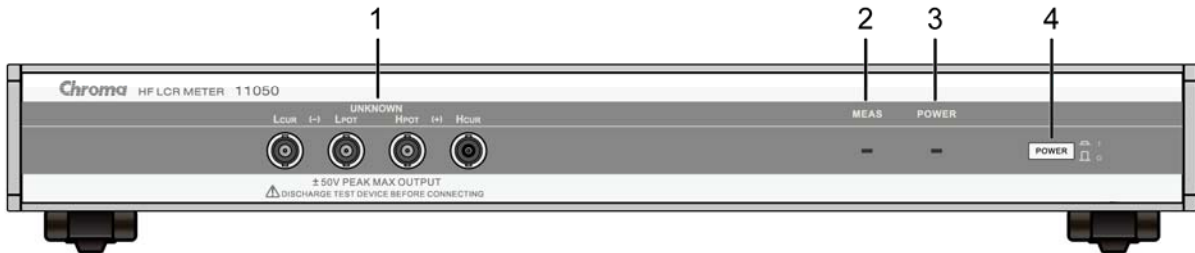
(2) Bracket Mounting Hole

The screw holes are for locking bracket of MEASUREMENT UNIT and DISPLAY UNIT.

There are four screw holes at top side and four at bottom side. The bracket locked to screw holes at top or bottom side is adjusted by users' visual angle.

4.2 Measurement Unit

4.2.1 Front Panel



(1) UNKNOWN

Four individual BNC sockets, connect an external test device or wire for DUT measurement.

H_{CUR} : Current drive terminal, high potential terminal.

H_{POT} : Potential detection terminal, high potential terminal.

L_{POT} : Potential detection terminal, low potential terminal

L_{CUR} : Current drive terminal, low potential terminal.

⚡ CAUTION : That “high” terminals for (+) and “low” terminals for (–) polarity as marked on the front panel while polarized component is under test.

⚠ WARNING

1. It is prohibited to connect the output over $\pm 50V$ PEAK MAX. Discharge first before measuring the charged component to avoid damaging the instrument. Test the charged component with A110242 fixture (option) is recommended and the withstand voltage is up to 100V.
2. The cover and axis of L_{CUR} test terminal can't be connected over $\pm 1V$. Make sure the ground integrity to avoid it burning down when Bias Current system test is required.

(2) MEAS LED

It indicates the meter under measuring while this LED is blinking.

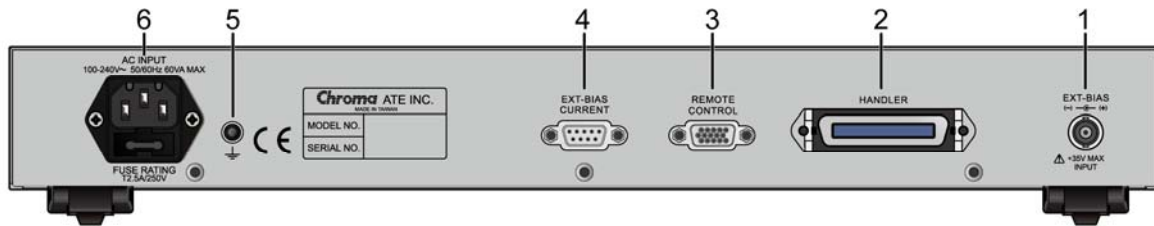
(3) POWER LED

It indicates power on while this LED lit continuously.

(4) POWER Switch

This pressed indicates power on and unpressed indicates power off.

4.2.2 Rear Panel of Measurement Unit



(1) EXT. BIAS

DC bias input for connecting externally, 35V maximum input voltage.

(2) HANDLER

It is a I/O interface for outputting test result signal and triggering externally. For detail descriptions, please see *chapter 6 HANDLER Interface*.

(3) REMOTE CONTROL

Use D-SUB 15Pin connection cable to connect to display unit.

(4) EXT-BIAS CURRENT

It connects and controls external DC bias current 1320.



CAUTION

1. Power on sequence: 11050 first and then 1320 when 11050 adds DC bias current 1320.
2. Use 2014 delivered version of DC Bias Current Source 1320. Please contact Chroma's customer service if there is problem about 1320 version.

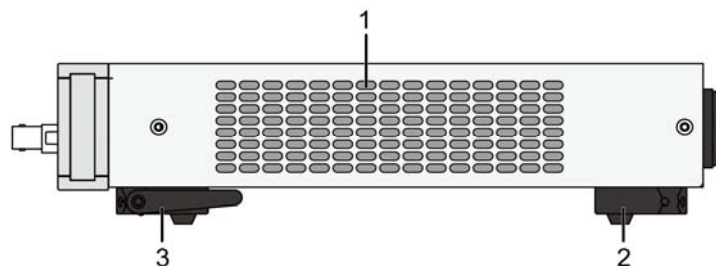
(5) Ground terminal

This terminal connects the cover of this instrument directly, then connect it to the ground to avoid exterior obstruction that makes instrument connection uncompleted and influences the safety.

(6) AC Line Socket

It meets the International Electromechanical Commission 320 standard for 3-wire socket. Please use the power cord of Belden SPH-386 or similar.

4.2.3 Side View of Measurement Unit



(1) Fan Inlet/Outlet

Air inlet/outlet of fan at two sides

 **Notice**

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.

(2) Rear Foot Pad

It's fixed foot pad.

(3) Front Foot Pad

It's a adjustable foot pad that provides appropriate angle to users.

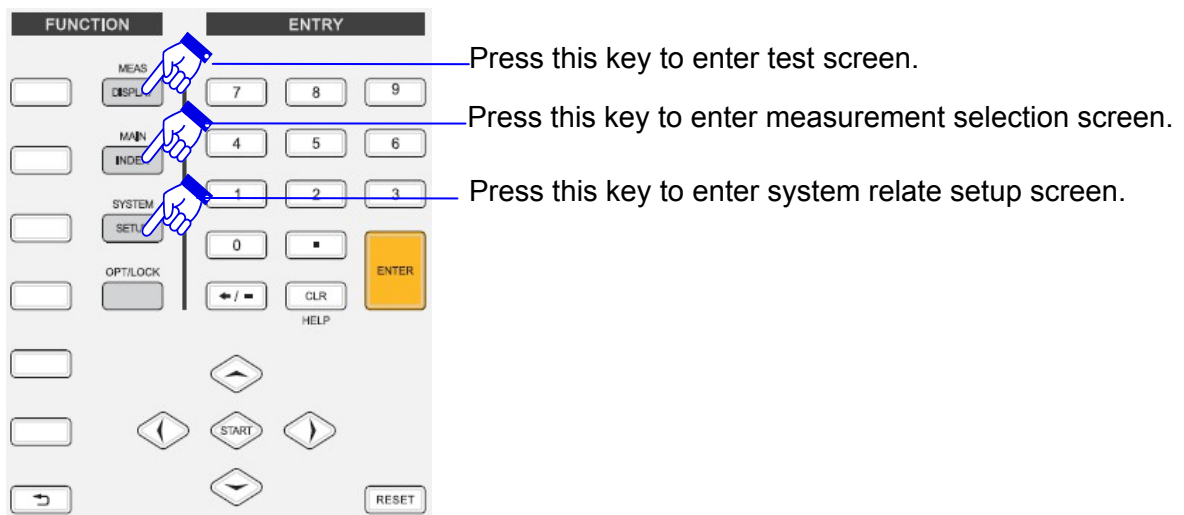
5. Setting for Operation

5.1 Basic Operation

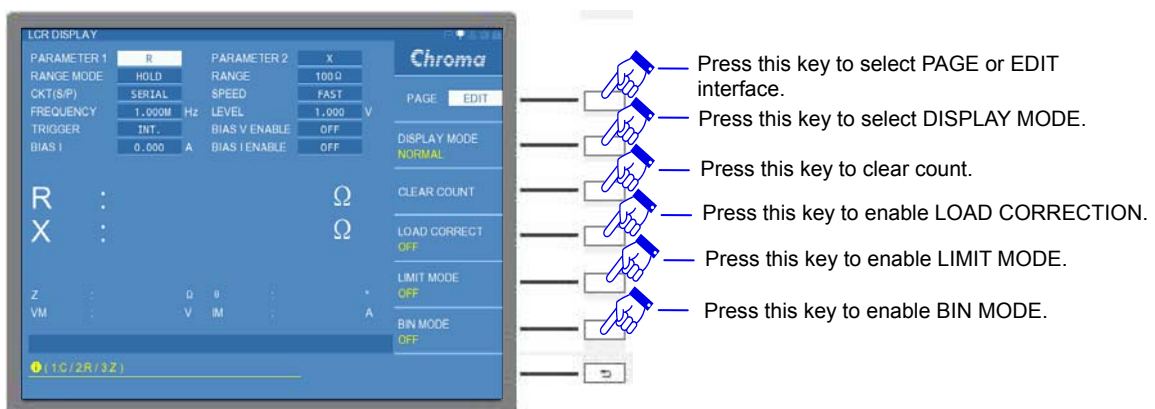
The tester mainly provides the right key of Display Unit front panel to users' control interface. Its operation is easy and convenience. Next to introduce several basic operation modes as below.

1. Main Menu Key Setting:

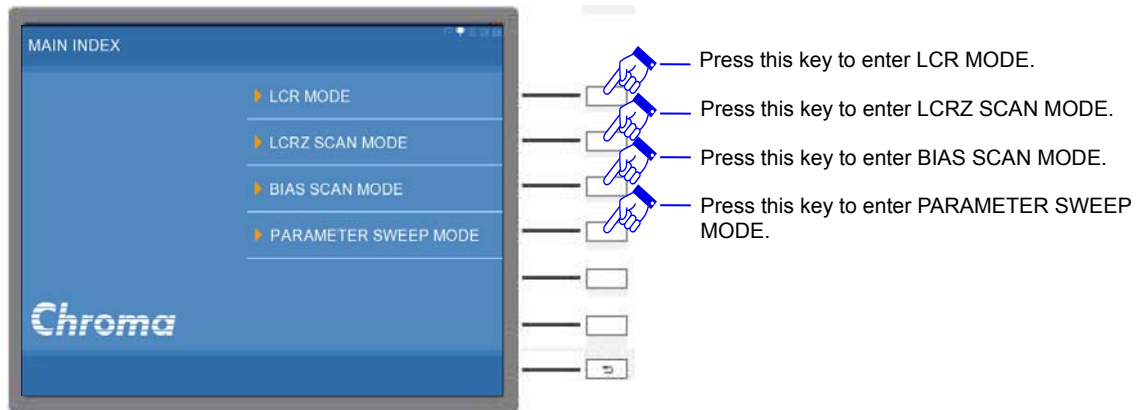
[MEAS DISPLAY], [MAIN INDEX] and [SYSTEM SETUP] are function keys for three main screens shown as below. [MEAS DISPLAY] can return the previous selected test screen or quick enter basic setting screen at the present mode. [MAIN INDEX] is a selection screen of measurement mode and [SYSTEM SETUP] is the system relate setup menu of the meter.



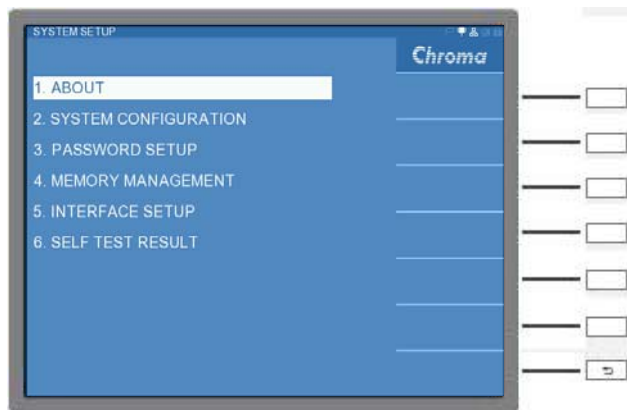
Test screens will be varied by test function selection, LCR parameter test screen is as the following.



MAIN INDEX menu as below shows.





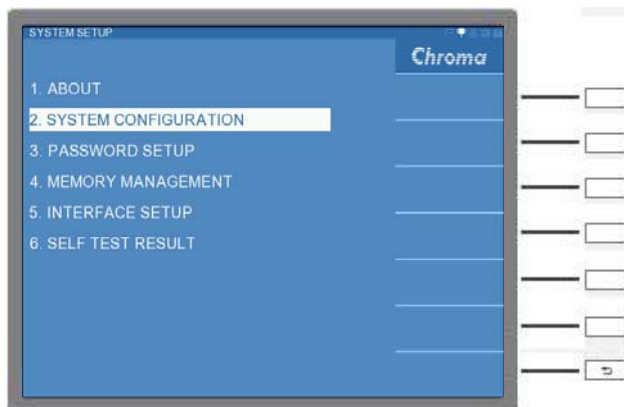
System Setup menu as below shows.



2. Basic Operation:

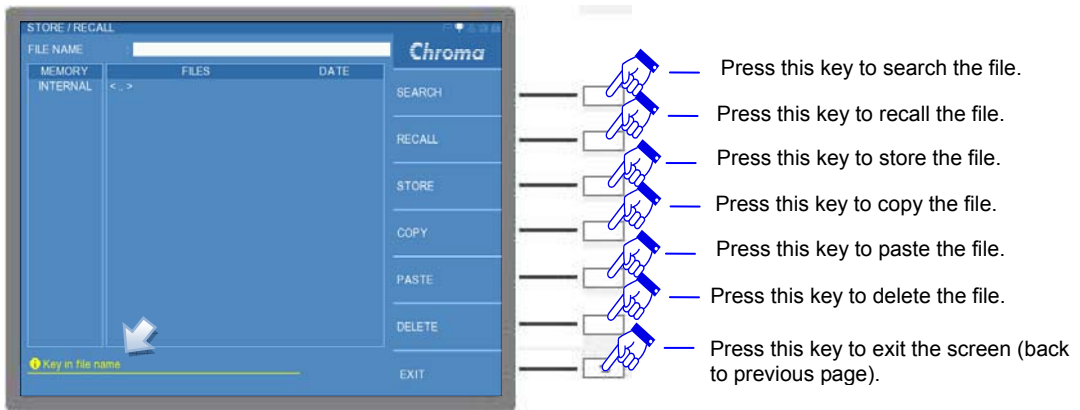
(1) Function Selection:

Selecting the screen option needs to use selection key, direction control keys  and  to move the highlight to the function desire to select and then press **ENTER** for entry. System Setup menu as below shows.

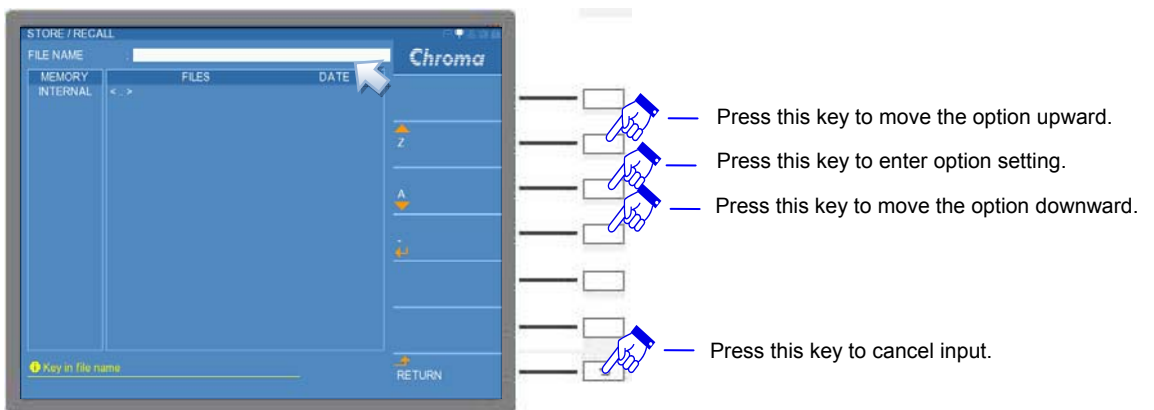


(2) Key in Setting:

To set the setting or parameter in function option needs to use selection key, direction control key, **ENTER**, and numeral keys. The following screen is STORE/RECALL file name setting, the right of the screen is function option by using selection key to select the function to be used. When moving the highlight to the set option, the bottom of screen has instruction such as "Key in file name".

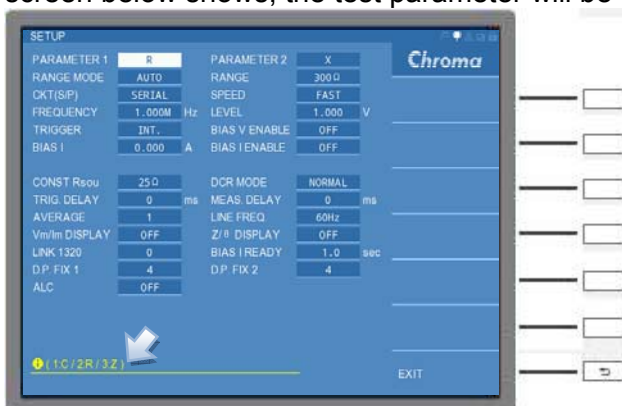


Meanwhile, File Name needs to perform editing, input English alphabet or numeral. After pressing **ENTER**, select English alphabet at the right of screen or numeral key for editing as below shows.



(3) Shortcut Key Operation:

Take SETUP menu of LCR Mode as an example, the function or table desires to set with shortcut key function. The bottom of screen shows the option that can be set. The front of option has a numeral indicating its settings, key in the option numeral key to be set thus complete the setting. Press numeral key [1] as the screen below shows, the test parameter will be immediate set to C parameter.



Press **ENTER** on the function or table to be set, the right side of screen shows all shortcut keys.



The various parameters will map to different shortcut keys as the *Table 5-1* shows. The unused shortcut keys will be disabled and not displayed, other settings can be done in the same manner.

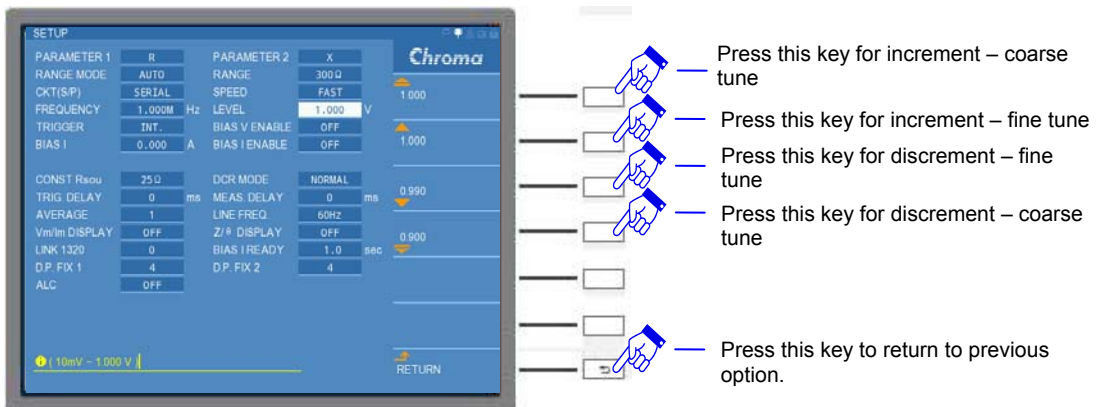
PARAMETER1	PARAMETER2
0 : L	0:D / 1:Q / 2:R / 4:X / 5:θ / 6:Q+R
1 : C	0:D / 1:Q / 2:R / 5:θ
2 : R	1:Q / 4:X
3 : Z	5:θ
4 : Y	5:θ
5 : DCR	

Table 5-1 PARAMETER1 & PARAMETER2 Shortcut Key Mapping

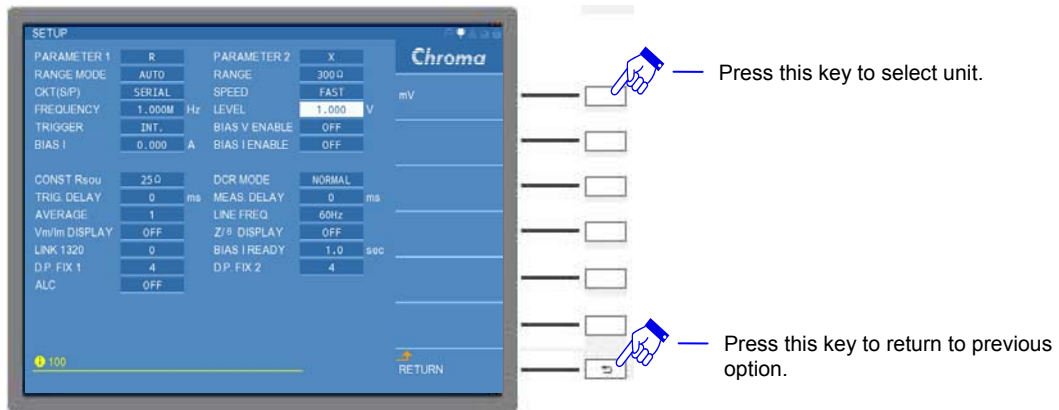
(4) Value Operation in the Table:

If the option setting is a value, the bottom of screen shows the range of value. The following screen shows test voltage settings in SETUP page of LCR Mode.

Use the value option at the right screen to select test voltage to be set by scrolling up and down.

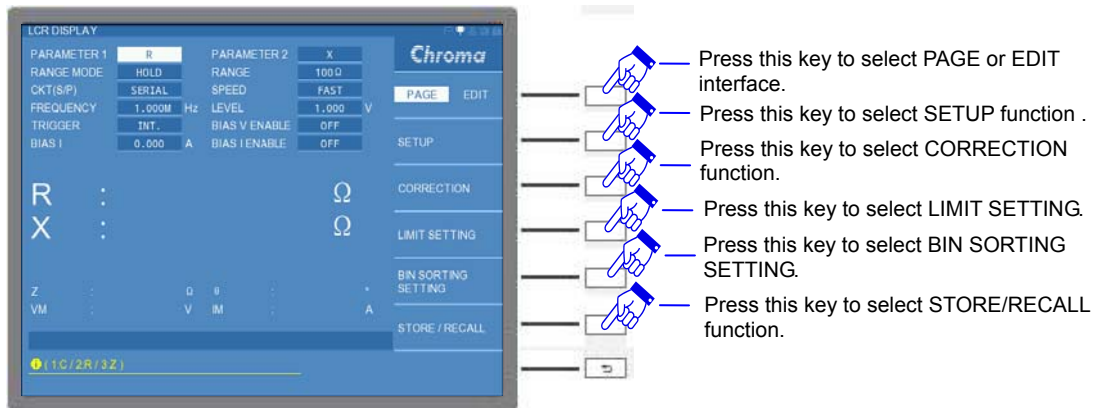


Key in the test voltage to be set and press mV selection key if mV required then the setting is completed.

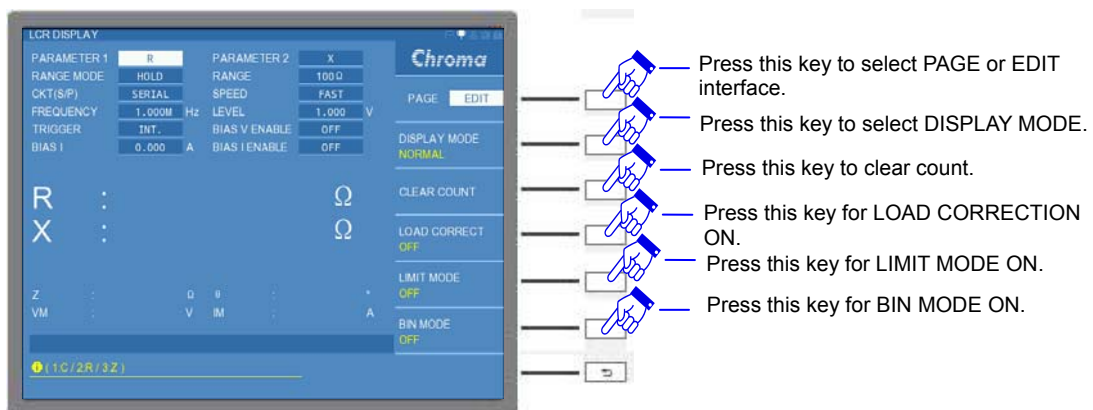


(5) EDIT and PAGE Interfaces Operation:

There are PAGE and EDIT interfaces at the right side of screen, use selection key to select the interface as the below shows LCR Mode test screen. Select any function option under PAGE interface thus it enters the selected function setting screen.

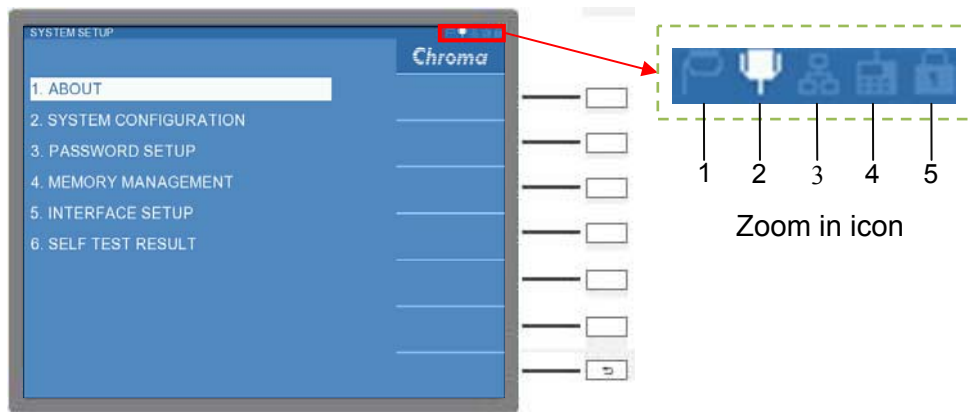


The function set can quick enable/disable and switch along with clear display screen mode if EDIT interface selected.



3. Description for System Setup:

The upper right corner of each operation screen has five icons for showing operation status currently of the meter as below red frame shows. The highlighted area indicates it is in use or is with the function currently whereas this function isn't equipped if it is unhighlighted. The detail descriptions are as the following.



(1) GPIB function icon

It indicates the meter is with GPIB connection function and equipped with GPIB interface. (option).


(2) RS232 function icon

RS232 function icon. RS232 interface is the standard equipment of the meter, the icon will be highlighted after powered-on.

(3) LAN function icon

It indicates the meter is with LAN connection function and equipped with LAN & USB-H interface. (option).

(4) REMOTE function icon

When the external connection device controls the meter, it is already controlled by external connection device. If there is error command, this icon will turn into red shown as .

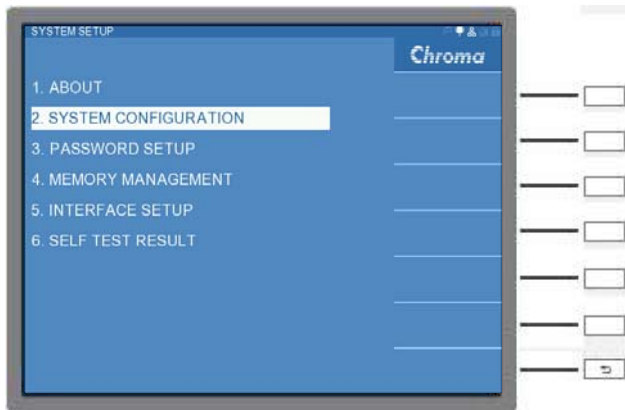
(5) LOCK function icon

Press LOCK key while the tester is under setting or measuring. The icon will be displayed as highlighted.

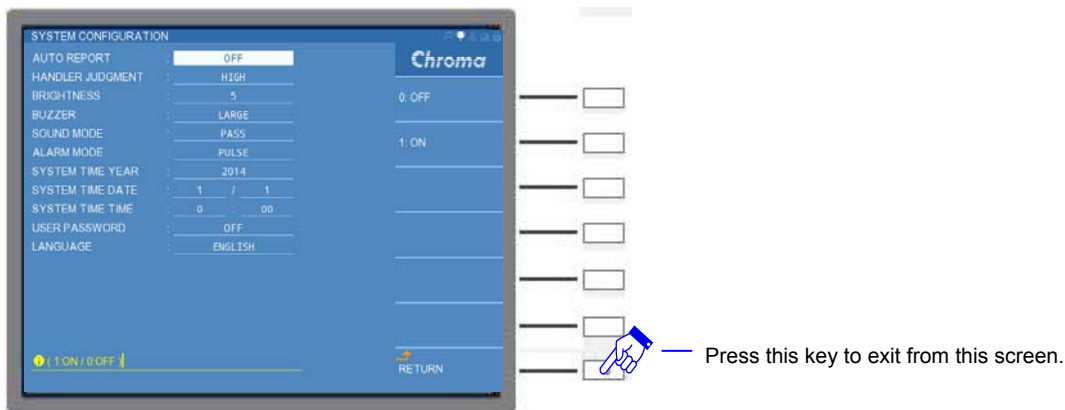
5.2 Setup Description

5.2.1 System Configuration

Power on the meter, wait the display until for entry operation screen. Press [SYSTEM SETUP] to enter SYSTEM SETUP screen as below shows.



Entering System Configuration screen as below shows.



The parameters of SYSTEM CONFIGURATION are given as the following.

AUTO REPORT:

It auto generates measurement result and auto outputs data result under measuring via RS232 interface on Display Unit. The control range is “ON/OFF” and default value when delivery is with “OFF”.

HANDLER JUDGMENT:

Output Limit Test result of measurement data Judgment to external fixture or device via Handler interface on Measurement Unit . Please see *chapter 6 HANDLER Interface*. Users select judgment signal level with “HIGH” or “LOW” as output. The default setting is “HIGH”.

BRIGHTNESS:

To adjust the contrast of the display. The control range is “0~10”, the value 0 indicates darkest and the value 10 indicates brightest. The default setting is “5”.

BUZZER:

It sets the warning beep volume to SMALL, LARGE, and OFF. The default setting is LARGE.

SOUND MODE:

It selects warning beep of judgment mode. The function needs to coordinate with Buzzer fuction for activation, there are two selections of “PASS” and “FAIL” can be set. The meter sounds beep if the setting is PASS and DUT measurement result meets setting condition. Otherwise, the meter also sounds beep when the setting is FAIL and DUT measurement

result can't meet setting condition. The default setting is PASS.

ALARM MODE:

It sets the beep of buzzer. The function needs to coordinate with Buzzer function and SOUND MODE setting for activation, its selections are PULSE and LEVEL. The default setting is PULSE.

SYSTEM TIME YEAR:

The system running year currently. The factory default is actual year.

SYSTEM TIME DATE:

The system running date currently. The factory default is actual month/date.

SYSTEM TIME TIME:

The system running time currently. The factory default is actual time.

USER PASSWORD:

It is for keying in user exclusive password when the meter powered-on or modifying setting parameter. Its control range is two selections of ON and OFF. The operation is to press [LOCK] to lock all control interfaces when the setting is "ON". Press [LOCK] again if it needs to be unlocked and key in exclusive password. For password setting, please see section 5.2.2. The default setting is OFF.

LANGUAGE:

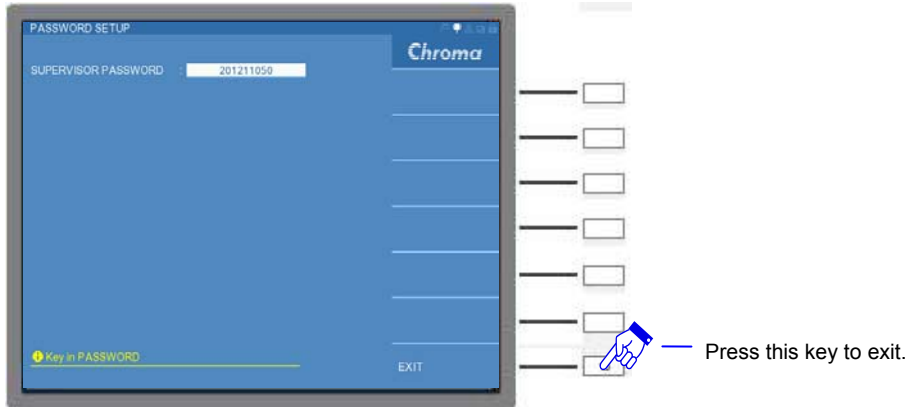
It selects the interface displayed language. The setting range includes two selections of English and S.CHINESE. The default setting is English.

5.2.2 Password Setup

Select PASSWORD SETUP to enter password setting under SYSTEM SETUP, meanwhile input password window will be popped up. Key in PASSWORD for entering the setup. The meter initial setting exclusive SUPERVISOR PASSWORD is 201211050 as the screen below.



After entering PASSWORD SETUP screen, there is SUPERVISOR PASSWORD for users keying in exclusive password, 12 digits at most. The password in the following is default setting that we recommend users to change it at first time use.

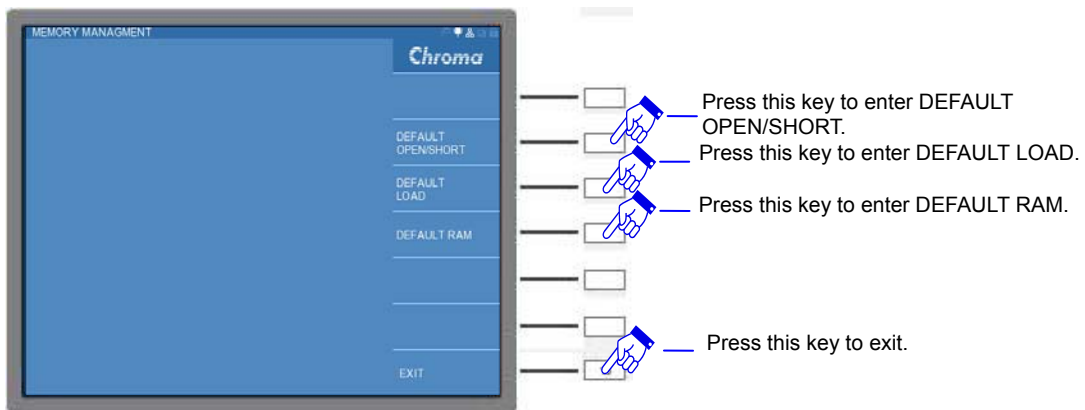


When USER PASSWORD function in SYSTEM CONFIGURATION is activated, press [LOCK] to lock all control interfaces to avoid users' misaction. Press [LOCK] again if it needs to be unlocked and key in exclusive password.

⚡ CAUTION : If PASSWORD is missing, the instrument needs to be return to Chroma for reset.

5.2.3 Memory Management

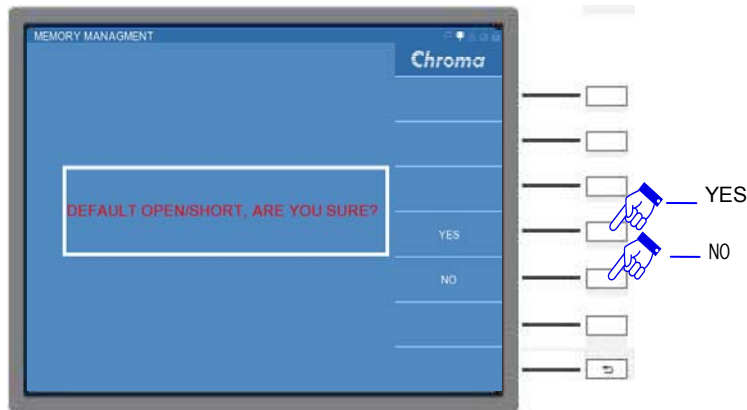
Select MEMORY MANAGEMENT under SYSTEM SETUP status. Key in SUPERVISOR PASSWORD to enter memory management function as below shows.



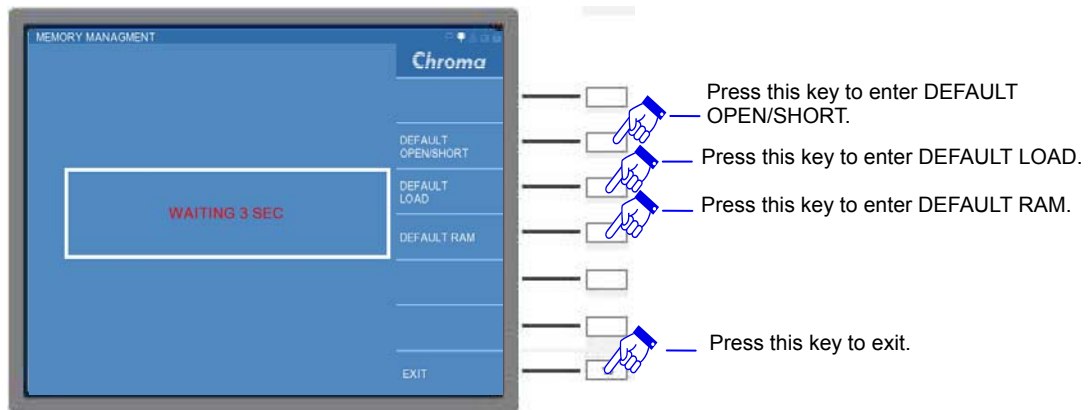
DEFAULT OPEN/ SHORT:

It sets open and short values initialized. Clear open/short offset value of fixture and restore to default setting of the meter.

“DEFAULT OPEN/ SHORT, ARE YOU SURE ?” window pops up as operating DEFAULT OPEN/ SHORT. Click “YES” to delete it, otherwise click “NO”.



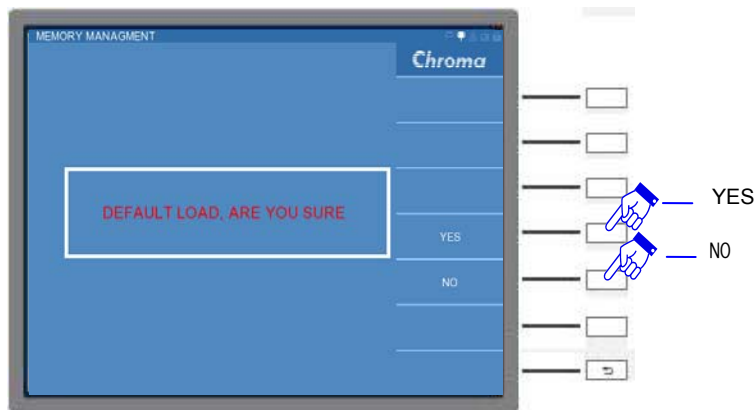
“Waiting 3 seconds” screen pops up when “YES” clicked, the clearance action is completed when ending second count down.



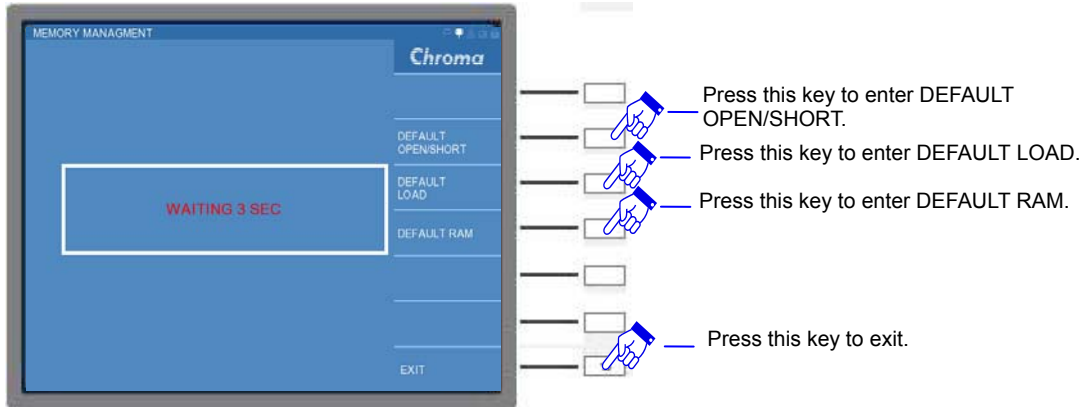
DEFAULT LOAD:

Load offset data initialization, clear load offset value.

“DEFAULT LOAD, ARE YOU SURE ?” window pops up as operating DEFAULT LOAD. Click “YES” to delete it, otherwise click “NO”.



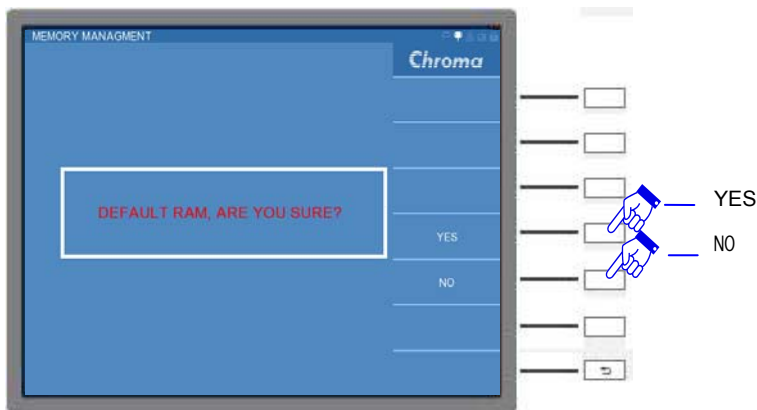
“Waiting 3 seconds” screen pops up when “YES” clicked, the clearance action is completed when ending second count down.



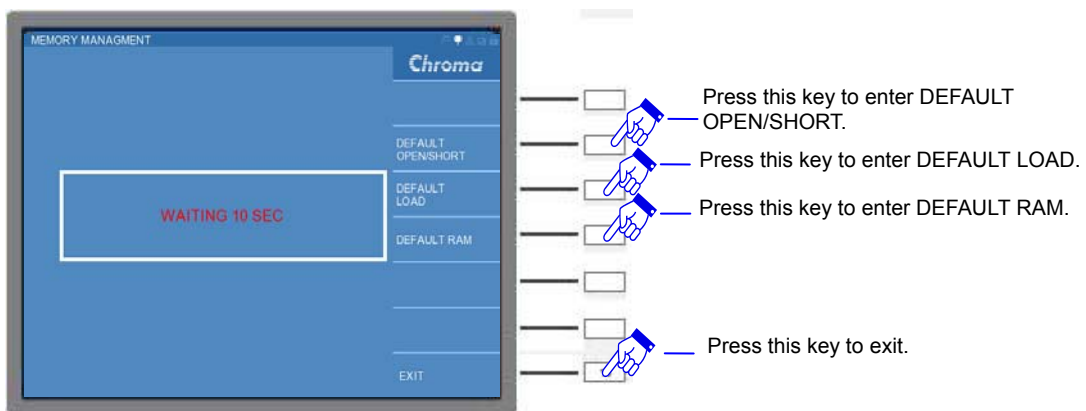
DEFAULT RAM:

Memory initialization, all operation settings will be returned to default. SUPERVISOR PASSWORD and USER PASSWORD still remains original setting, the test file saved in the meter won't be deleted.

“DEFAULT RAM, ARE YOU SURE ?” window pops up as operating DEFAULT RAM. Click “YES” to delete it, otherwise click “NO”.

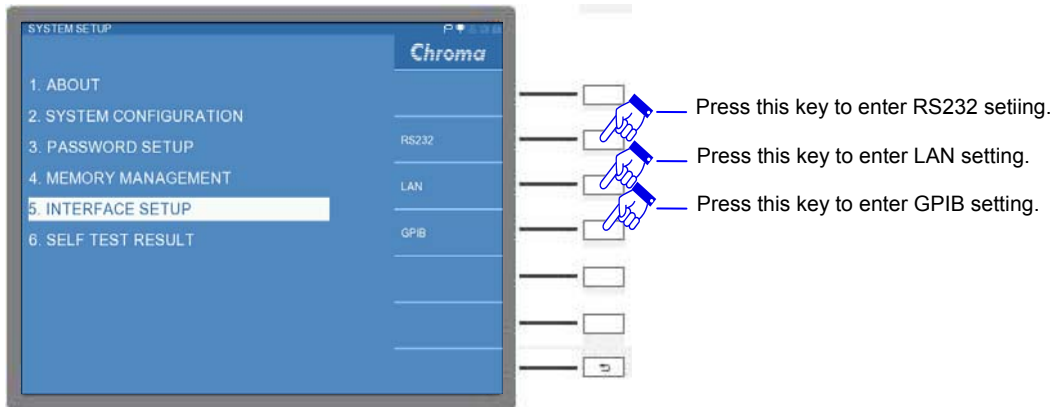


“Waiting 10 seconds” screen pops up when “YES” clicked, the clearance action is completed when ending second count down.



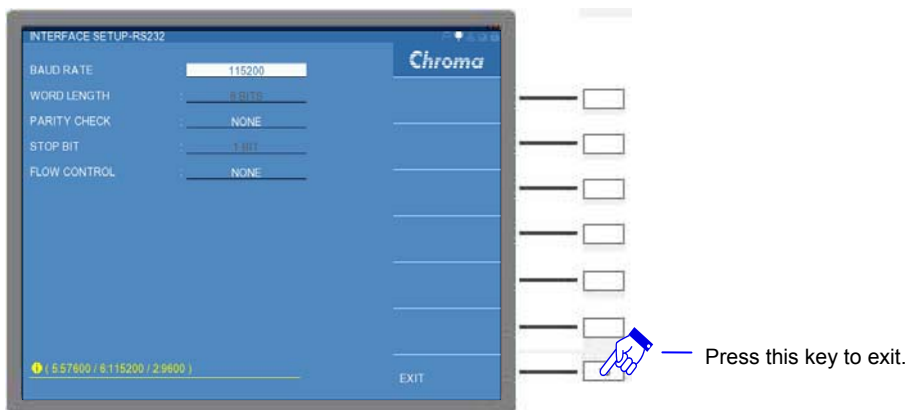
5.2.4 Interface Setup

Select INTERFACE SETUP under SYSTEM SETUP status, the right of screen shows three interfaces of RS232, LAN (option) and GPIB (option) as the screen below.



5.2.4.1 RS232 Setting

Select RS232 setting to enter INTERFACE SETUP-RS232 as below screen shows.



Parameter and setting are as the following.

BAUD RATE:

Baud rate setting, there are 9600, 19200, 38400, 57600 and 115200 for selection with factory default to 115200 when shipped.

WORD LENGTH:

The WORD LENGTH is fixed to 8 which is the same as ASCII code.

PRRITY CHECK:

There are NONE, ODD and EVEN for selection with factory default to NONE when shipped.

STOP BIT:

Stop bit is fixed to 1.

FLOW CONTROL:

There are NONE and H/W(hardware) for selection with factory default to NONE when shipped.

⚡ CAUTION : The baud rate setting should be same as the RS-232C interface card, or there may have data transmission problem.

Connection of RS-232C signal line:

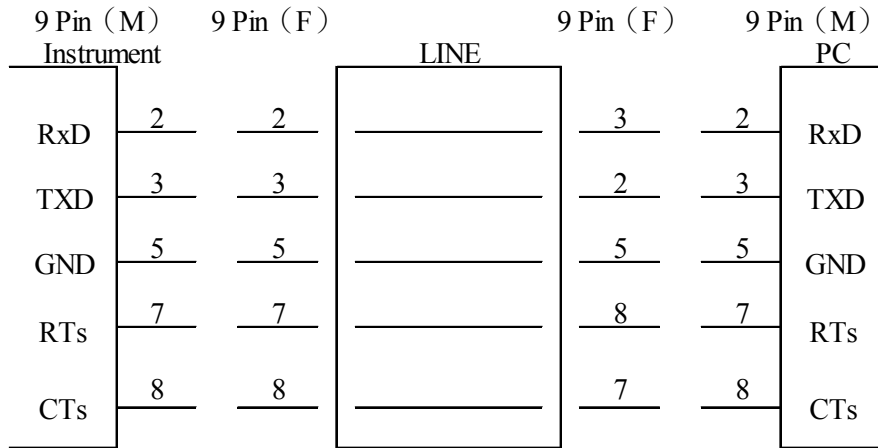


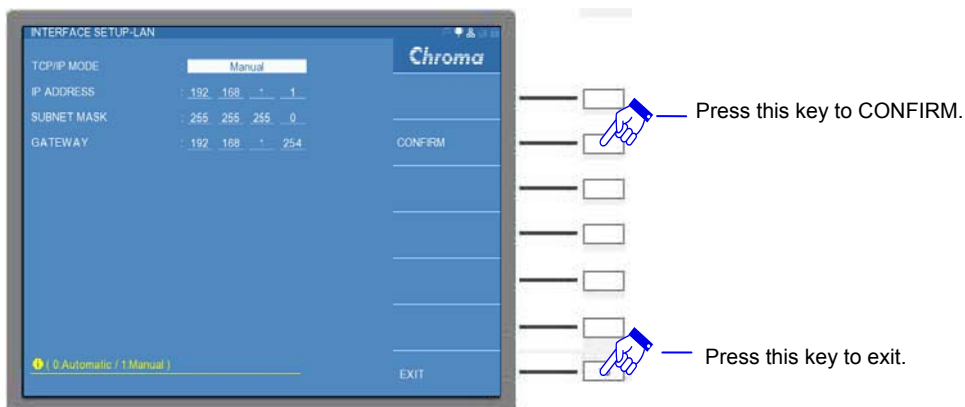
Table of RS-232C signal line and pin:

	Pin	Name	Description
Ground	5	GND	Grounding wire
Data	2	RxD	Receiving data
	3	TxD	Transmitting data
	7	RTs	Transmitting request
	8	CTs	Transmitting clear

⚡ CAUTION : When the instrument is connected via RS232 and PC, it is recommended both use the same system power voltage. This is for avoiding burn down the instrument or component inside PC terminal interface.

5.2.4.2 LAN Setting

Select LAN setting to enter INTERFACE SETUP-LAN as screen below shows.



TCP/IP MODE:

Transmission Control Protocol and Internet Protocol setting methods. The meter includes two modes of Automatic and Manual. If Automatic mode is selected, a DHCP (Dynamic Host Configuration Protocol) server needs to be set up on network. The meter will get IP ADDRESS, SUBNET MASK and GATEWAY settings from DHCP server automatically. After getting the settings, please press CONFIRM for confirmation. If Manual mode is selected, set IP ADDRESS and SUBNET MASK by users. After the setting is completed, please press CONFIRM for confirmation. The default setting is Manual.

IP ADDRESS:

Internet communication protocol address.

SUBNET MASK:

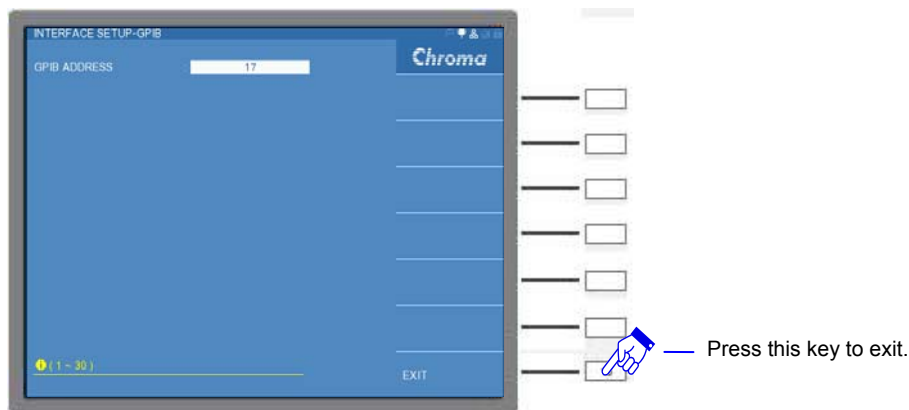
It is for subnet mask.

GATEWAY:

Communication gateway

Note : PORT is fixed used in 16881.

5.2.4.3 GPIB Setting



GPIB ADDRESS:

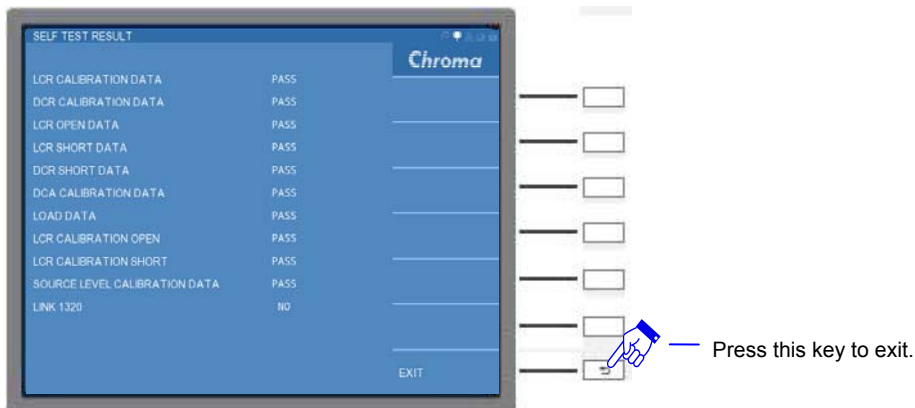
It selects GPIB address. The factory default setting is 17 and the range is 1~30.

5.2.5 SELF TEST RESULT

Select SELT TEST RESULT under SYSTEM SETUP as the screen below shows.



Enter SELF TEST RESULT, the screen shows the meter's status currently and if calibration data is normal operation as below.



LCR CALIBRATION DATA: Parameter calibration data of passive component

DCR CALIBRATION DATA: DC resistance calibration data

LCR OPEN DATA: Parameter open data of passive component

LCR SHORT DATA: Parameter short data of passive component

DCR SHORT DATA: DC resistance short data

DCA CALIBRATION DATA: DC current calibration data

LOAD DATA: Load offset data

LCR CALIBRATION OPEN: Open calibration of passive component

LCR CALIBRATION SHORT: Short calibration of passive component

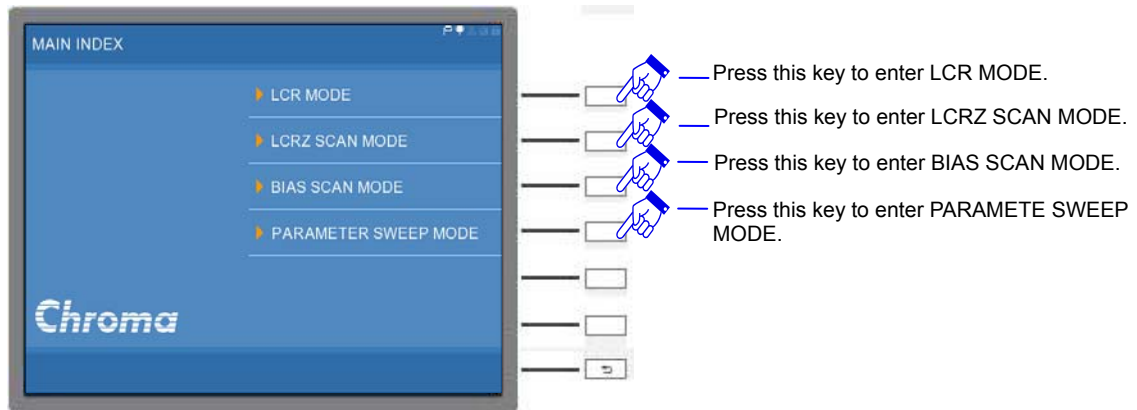
SOURCE LEVEL CALIBRATION DATA: Level calibration of measurement signal source

LINK 1320: The connection status when it connects Bias Current Source 1320.

⚡ CAUTION : The calibration data should be shown as PASS. If it is FAIL, please
: contact the distributor for the instrument calibration.

5.3 Operation of Main Index

Press [MAIN INDEX] to enter main index menu, where four modes of LCR MODE, LCRZ SCAN MODE, BIAS SCAN MODE and PARAMETER SWEEP MODE for selection as the screen below shows.



LCR MODE:

It sets measurement parameter and environment for quick measuring DUT parameter and providing judgment results of test value comparison or binning.

LCRZ SCAN MODE:

Users set multiple sets (9 sets at most) of various test frequencies, voltage sizes and parameters for DUT performing compare test by DUT frequency and voltage characteristic. It shows test value of DUT by the table and provides compare judgment result of test value.

BIAS SCAN MODE:

This meter is able to connect Chroma's DC Bias Current Source 1320 for performing inductance DC bias current scanning test. Users set multiple sets (27 sets at most) of various test frequencies, current sizes and parameters for performing compare test. It shows test value of DUT by the table and provides compare judgment result of test value.

PARAMETER SWEEP MODE:

Users sets test frequency, test voltage or test current in a certain range for DUT performing multiple points (401 points at most) sweeping measurement that provides detail graph analysis to users' reference.

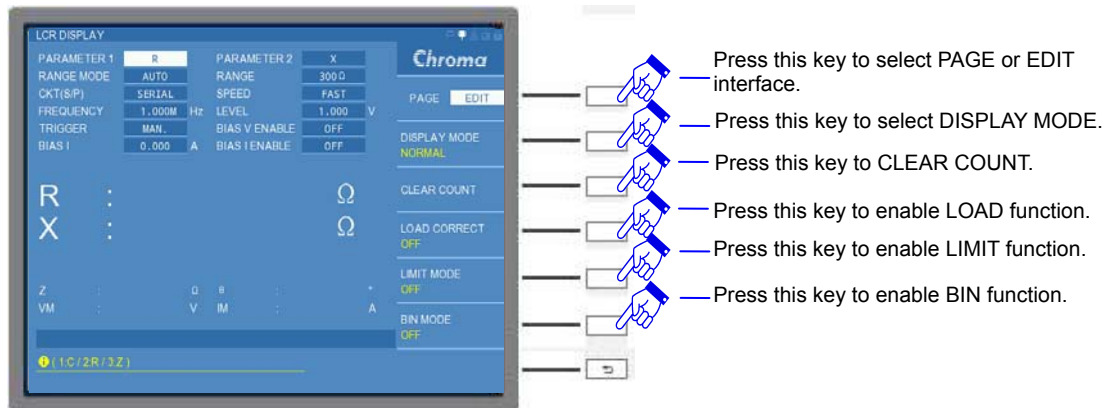
5.3.1 Operation of LCR MODE

5.3.1.1 LCR MODE – Measurement Parameter & Environment Setting

NORMAL Mode:

It is general common used measurement display screen for setting basic test parameters. The related operation descriptions are described as the following.

The upper left side of LCR DISPLAY screen is measurement parameter and environment setting, the lower left side is measurement result display area as well as the right side is open/short offset or value operation statistical function as below shows.



Descriptions for measurement parameter and environment setting are as the following.

PARAMETER1:

It is primary parameter that includes six measurement parameters of “L”, “C”, “R”, “Z”, “Y” and “DCR” for selection. The default setting is “R”.

PARAMETER2:

It is secondary parameter that follows primary parameter setting coordinating with different secondary measurement parameters. The default setting is “X”.

RANGE MODE:

It is for switching range mode that includes “AUTO” and “HOLD”. The default setting is “AUTO”.

RANGE:

It is for selecting resistance of measurement range. The RANGE MODE will be changed from “AUTO” to “HOLD” when adjusting resistance of measurement range. The default setting is “300Ω”.

Note Resistance of measurement range will be limited by varied test frequency, range descriptions are as follows.

1. When $FREQUENCY \leq 50kHz$, there are 12 ranges for selection - “0.3Ω”, “1Ω”, “3Ω”, “10Ω”, “30Ω”, “100Ω”, “300Ω”, “1kΩ”, “3kΩ”, “10kΩ”, “30kΩ” and “100kΩ”.
2. When $50kHz < FREQUENCY \leq 200kHz$, there are 11 ranges for selection - “0.3Ω”, “1Ω”, “3Ω”, “10Ω”, “30Ω”, “100Ω”, “300Ω”, “1kΩ”, “3kΩ”, “10kΩ” and “30kΩ”.
3. When $200kHz < FREQUENCY < 1MHz$, there are 8 ranges for selection – “1Ω”, “3Ω”, “10Ω”, “30Ω”, “100Ω”, “300Ω”, “1kΩ” and “3kΩ”.
4. When $FREQUENCY \geq 1MHz$, there are 4 ranges for selection - “10Ω”, “30Ω”, “100Ω” and “300Ω”.

CKT(S/P):

It is for selecting equivalent circuit SERIAL or PARALLEL mode. The default setting is SERIAL.

SPEED:

It sets measurement speed that includes FAST, MEDIUM and SLOW for selection. The default setting is FAST.

FREQUENCY:

It sets test frequency for setting test frequency range of 1KHz~10MHz. For the limitation of usage range, please see *section 2.2 Test Signal*. The default setting is “1M” Hz.

LEVEL:

It sets test voltage for selecting test voltage range of 10mV~1V. For the limitation of usage range, please see *section 2.2 Test Signal*. The default setting is “1.000” V.

TRIGGER:

It selects trigger mode that includes “INT”, “MAN”, “EXT” and “BUS”. The default setting is “INT”.

BIAS V ENABLE:

It enables bias voltage. When the DC bias input connected externally is enabled, for detail description see EXT. BIAS BNC connector in *section 4.2.2 Rear Panel of Measurement Unit*. Its operation includes ON and OFF, the default setting is “OFF”.

BIAS I:

It sets bias current. The range of the meter is 0mA~100mA when DC Bias Current Source 1320 doesn't be connected. Select the number in LINK 1320 option first and then set bias current value in BIAS I option when connecting DC Bias Current Source 1320. The default setting is “0.000” A.



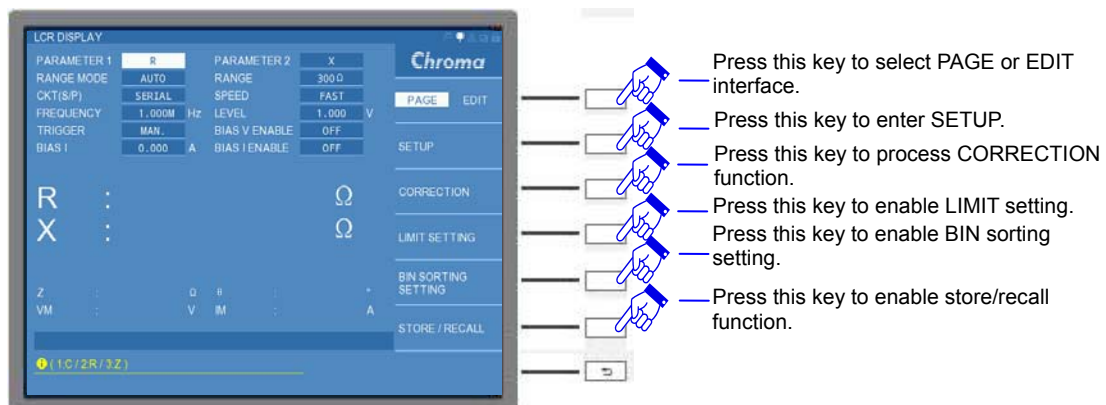
CAUTION

1. Power-on sequence is 11050 first and 1320 followed when adding DC Bias Current Source 1320 to 11050.
2. Use 2014 delivered version of DC Bias Current Source 1320. Please contact Chroma's customer service if there is problem about 1320 version.

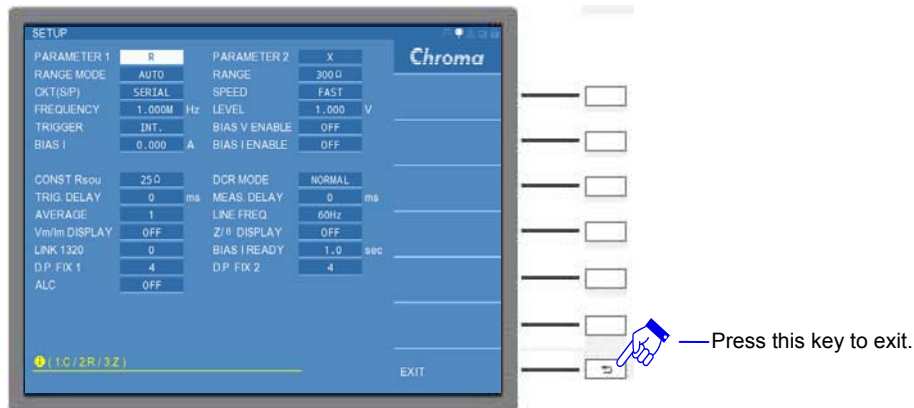
BIAS I ENABLE:

It enables bias current. When it is enabled under the condition of bias current input need which includes the operations of “ON” and “OFF”. The default setting is “OFF”.

Press [MEAS DISPLAY] on LCD DISPLAY screen or select PAGE interface at the right side of screen for entering SETUP function as below shows.



For entry measurement environment setting as the screen below shows.



Descriptions for SETUP page are as the following.

The page above divides into upper and lower areas. The upper area contains 12 test parameters of PARAMETER1, PARAMETER2, RANGE MODE, RANGE, CKT (S/P), SPEED, FREQUENCY, LEVEL, TRIGGER, BIAS V ENABLE, BIAS I and BIAS I ENABLE. These parameters are the same as LCR DISPLAY thus don't take more description here. The lower area belongs advanced setting and the descriptions are as the following.

CONST Rsou:

It selects output resistance mode including three modes of "OFF", "100Ω" and "25Ω" for selection. The default setting is "25Ω".

DCR MODE:

It selects DC resistance mode. The meter measures output test signal sources of DCR parameter that includes "SMALL" (small DC signal source \approx 20mA) and "NORMAL" (normal DC signal source \approx 100mA) two selections. Select the appropriate measurement signal source by DUT's resistance. The default setting is "SMALL".

TRIGGER DELAY:

When it connects with automatic machine, external trigger EXT for coordinating with its action. Meanwhile, the trigger action of meter needs to be delayed thus users can adjust TRIGGER DELAY time. Its setting range is "0~9999" ms and default setting is "0" ms.

MEAS. DELAY:

It is for PARAMETER1 as additional function of DCR measurement. The inductance is with transient effect thus the instrument confirm the stability of DUT signal first in testing inductance. If DUT signal is stable thus it enters measurement at once, it enters measurement after MEAS. DELAY TIME if the signal is unstable. Control range of MEAS. DELAY TIME is "0~99999"ms. The default setting is "0" ms.

AVERAGE:

It sets average time of measurement. Select the average setting as "1", the program will take average in each time of measurement. If the setting is "2", the program will take average in two times of measurements. Following test can be deduced accordingly. The setting range is "1~10", the default setting is "1".

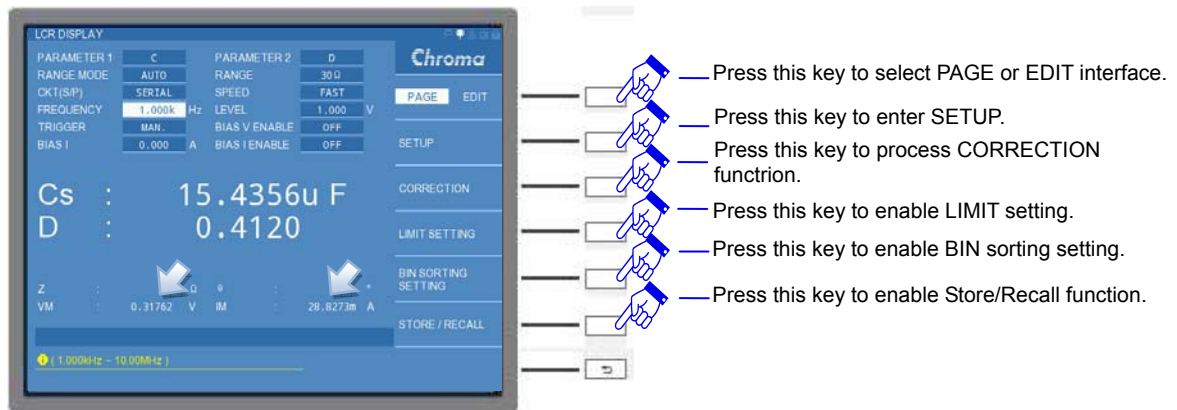
LINE FREQ.:

It selects input AC power mode. The correct power frequency selection helps stability and correctness of test value. Three selections of "50Hz", "60Hz" and "N/A" for range. "N/A" indicates not consider power frequency but test speed will be faster. The default setting is "60Hz".

Vm/Im DISPLAY:

It displays voltage and current value. VM and IM at the bottom of LCR DISPLAY show voltage and current value on the DUT if "ON" is selected. The default setting is "OFF".

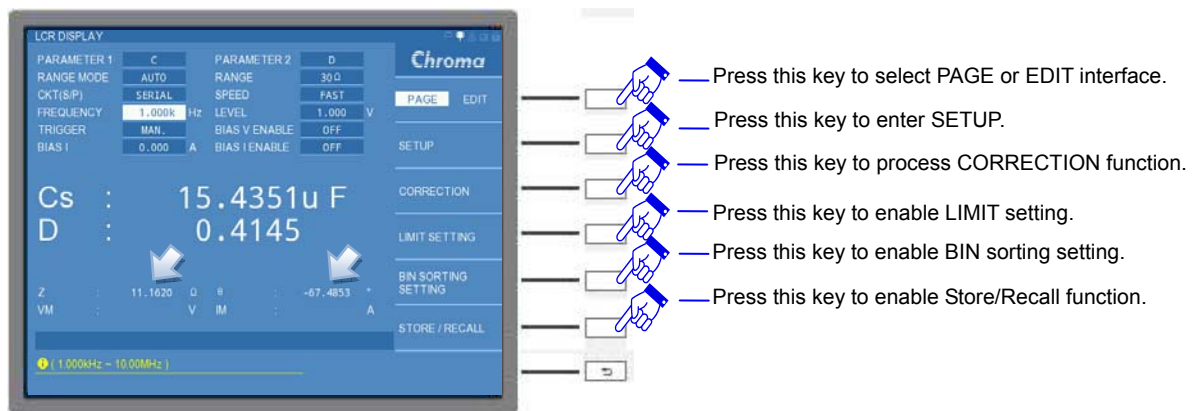
LCR DISPLAY Page shows as below after the function is enabled.



Z/θ DISPLAY:

It displays impedance and phase angle. Z and θ at the bottom of LCR DISPLAY will be shown as below if "ON" is selected. The default setting is "OFF".

LCR DISPLAY Page shows as below after the function is enabled.



LINK 1320:

It sets the number for connecting 1320. BIAS I setting current follows linked 1320 quantity to provide bias current for setting if 1320 number is set. The maximum setting is 15 sets and the default setting is "0".

Note

1. A set of 1320 provides ±20A.
2. Power-on sequence is 11050 first and 1320 next when adding DC Bias Current Source 1320 to 11050.
3. Use 2014 delivered version of DC Bias Current Source 1320. Please contact Chroma's customer service if there is problem about 1320 version.

BIAS I READY:

It sets current stable time that is for coordinating DELAY.T setting after outputting bias current source 1320. The 11050 needs to be set ≥ 10s for measurement when 1320 DELAY TIME

setting is 10s. BIAS I READY control range is “0.1~100”s and the default setting is “0” s.

D.P. FIX1:

The displayed digit of primary parameter after decimal point. It follows users’ requirement to set measurement of primary parameter and to display digit length with 1~5 digit can be selected. The default setting is “4”.

D.P. FIX2:

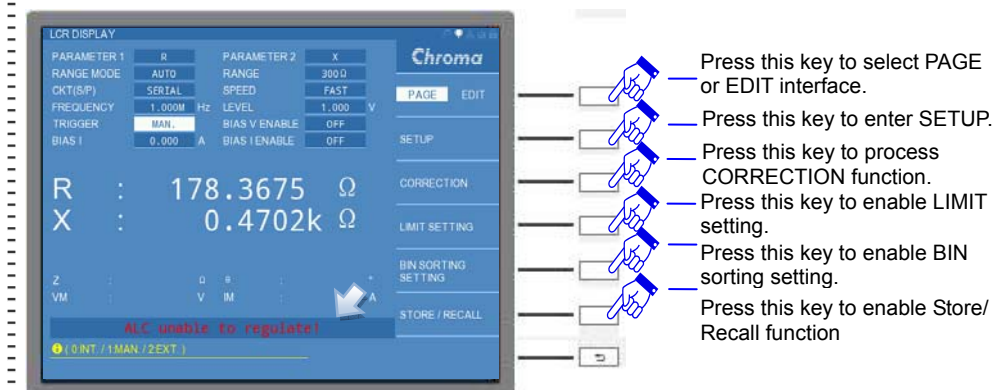
The displayed digit of secondary parameter after decimal point. It follows users’ requirement to set measurement of secondary parameter and to display digit length with 1~5 digit can be selected. The default setting is “4”.

Except for basic measurement screen in LCR MODE and setting method of measurement parameter, other two displayed modes are also included. Select DISPLAY MODE in EDIT interface at right menu of LCR DISPLAY. “NORMAL”, “JUDGMENT” and “SPECIAL” are in DISPLAY MODE for switching which will be described as follows.

ALC:

It auto compensates voltage value of DUT in measuring. ALC (Auto Level Control) function is for setting voltage level and getting stable test voltage for DUT that won’t be varied by DUT’s impedance level. The default setting is OFF.

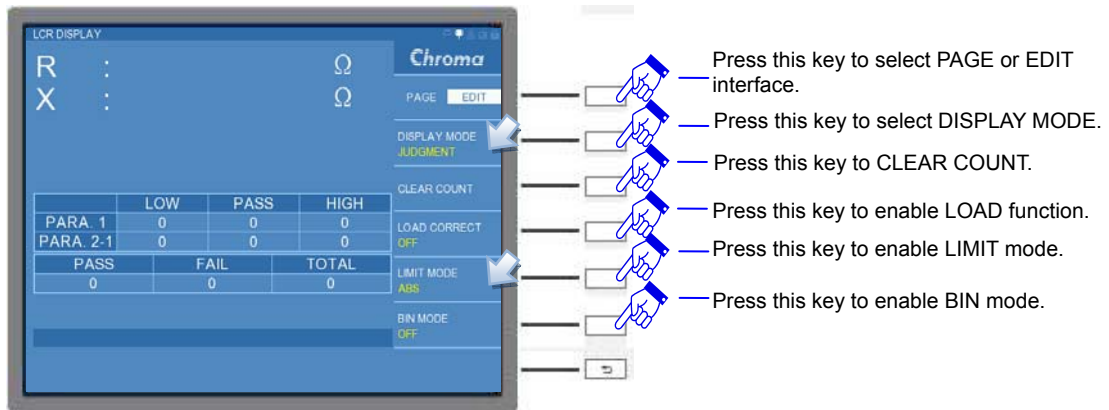
⚡ CAUTION: The screen shows “ALC unable to regulate” message indicating ALC function can’t modify test voltage as below shows.



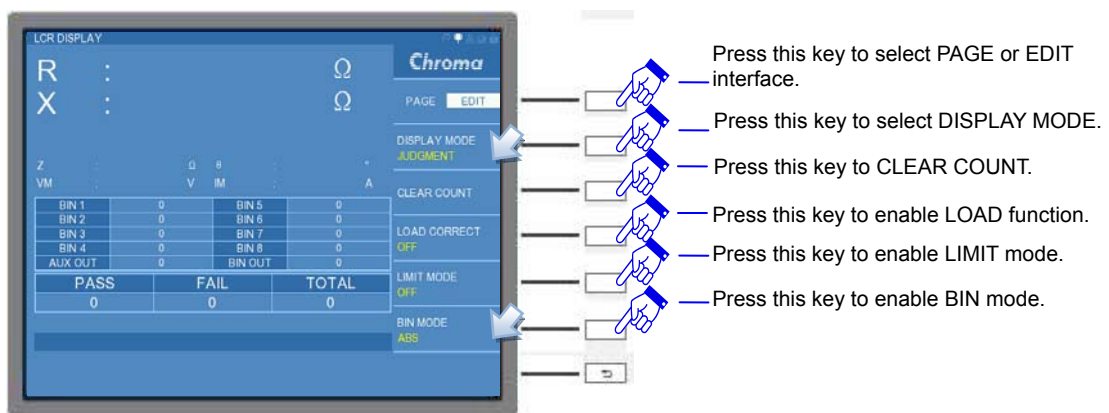
JUDGMENT Mode:

This screen is mainly applied on LIMIT TEST or BIN SORTING TEST to count pass, fail and DUT total number.

LIMIT TEST screen:



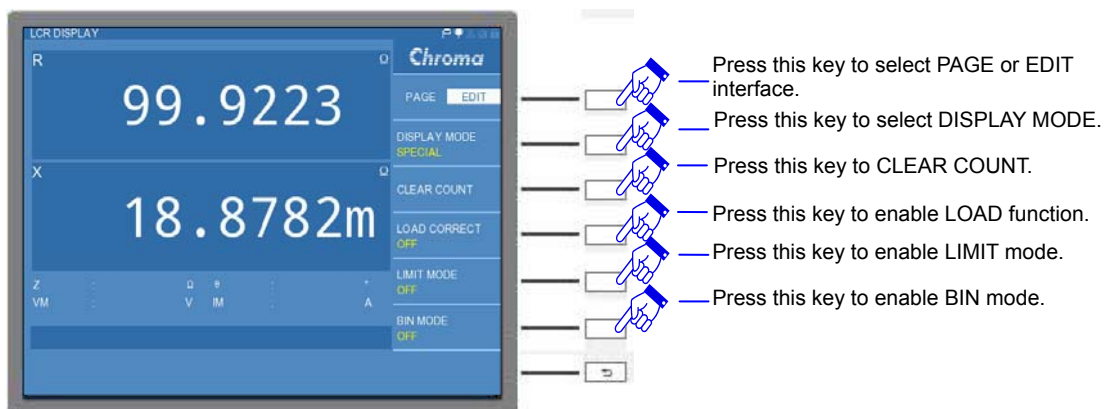
BIN SORTING TEST screen:



Note If LIMIT TEST is selected thus BIN SORTING TEST will be disabled. On the contrary, LIMIT TEST will be disabled if BIN SORTING TEST is selected.

SPECIAL Mode:

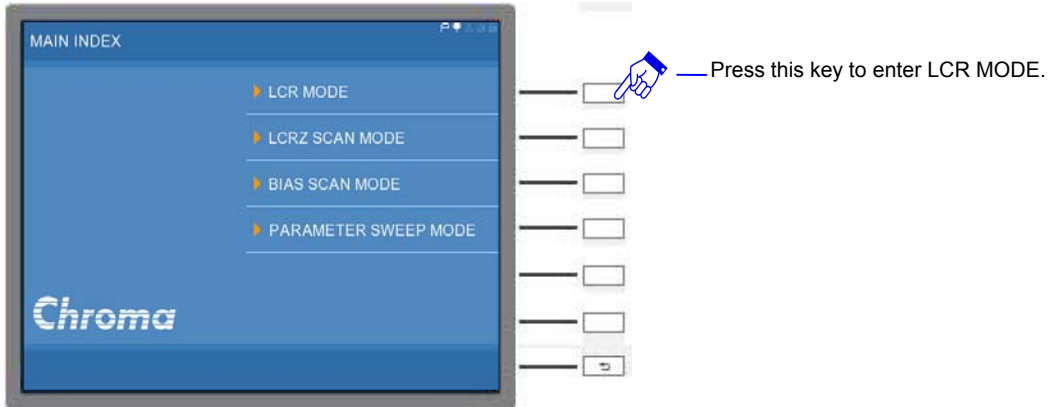
This screen simplify a lot of settings that only remains displayed measurement for users observing measurement result clearly.



“Operation Sample”

Take measurement power inductance as an example, measurement and setting procedures are as the following.

- (1) Click [MAIN INDEX] on DISPLAY UNIT to enter LCR MODE.



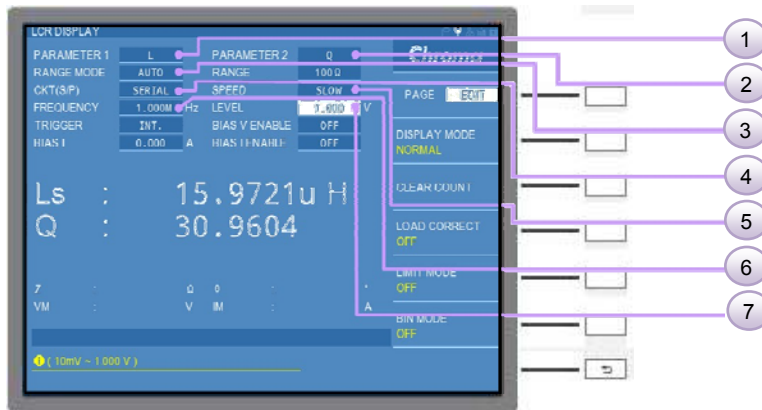
(2) Enter LCR MODE initialisation screen



(3) Measure L/(Q or Rs) of DUT to enter LCR DISPLAY screen. Follow DUT – inductance characteristics separately to set primary/secondary parameter, range mode, equivalent circuit (series/parallel) mode, measurement speed, test frequency, test voltage, etc. Please refer the *Table 5-2 DUT – Inductance L/(Q or Rs) Setting* to set the figure below by sequential.

Step	Function	Parameter	Unit	Remark
1	PARAMETER1	Ls		
2	PARAMETER2	Q or Rs		
3	RANGE MODE	Auto		
4	CKT(S/P)	SERIAL		
5	SPEED	SLOW		
6	FREQUENCY	1.000M	Hz	
7	LEVEL	1.000	V	

Table 5-2 DUT – Inductance L/(Q or Rs) Setting

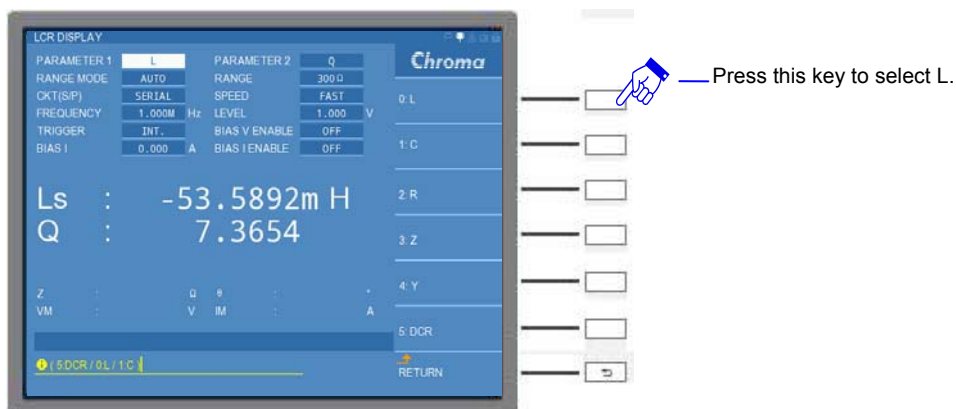


Note The initial setting of the meter is Internal Trigger (INT.) after powered on entering LCR mode.

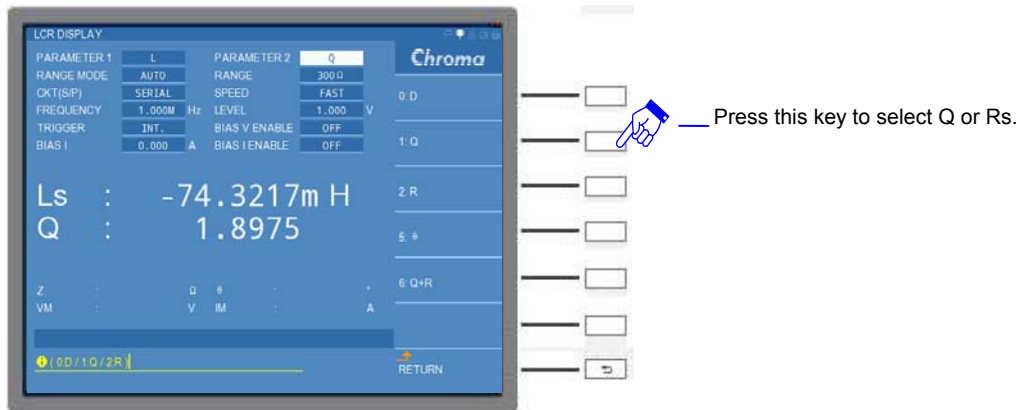
Step 1: Operate the direction control keys of , , or on DISPLAY UNIT to highlight the column of PARAMETER1.



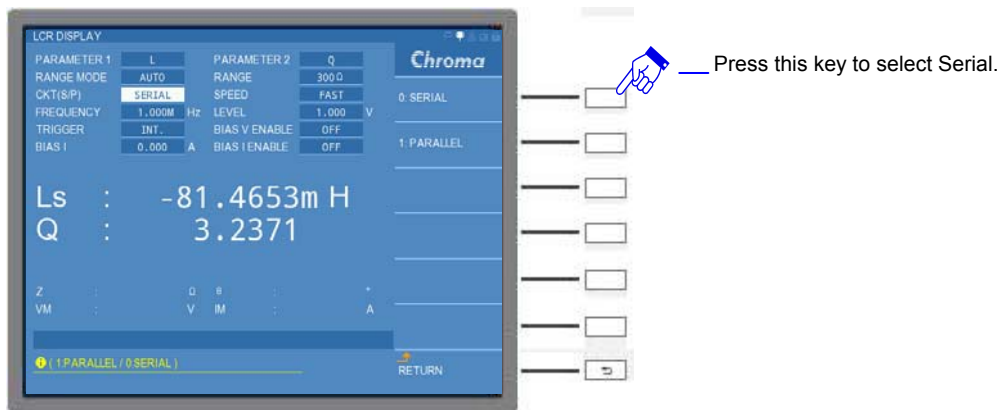
Press [ENTER] on DISPLAY UNIT and select L parameter at the right side of window.



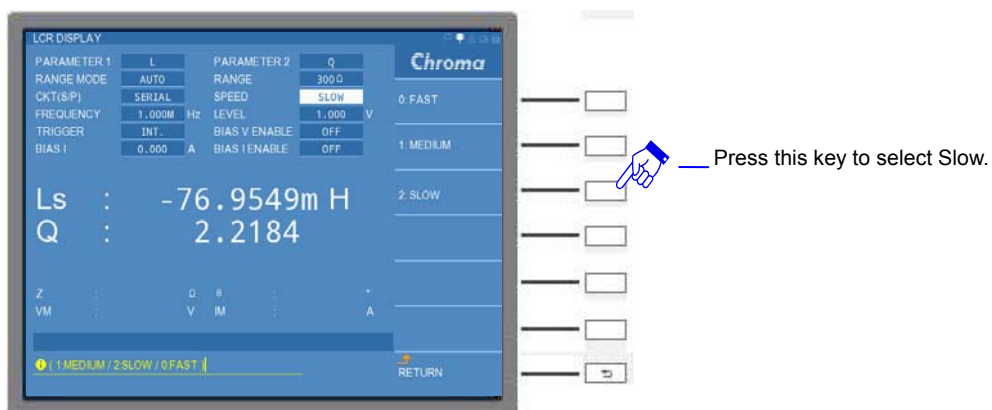
Step 2: Press the right key on DISPLAY UNIT to highlight the column of PARAMETER2 and [ENTER] to select Q or Rs parameter (Q parameter is selected in the example).



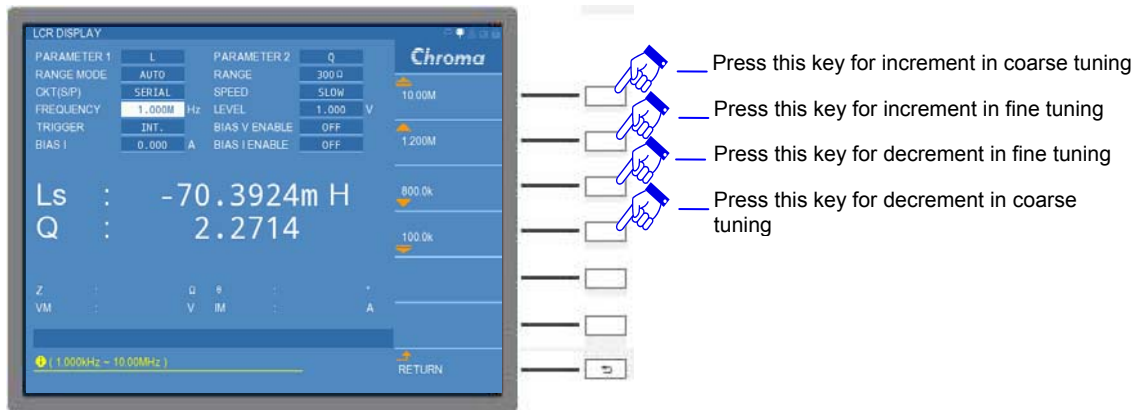
Step 3: Press the direction control keys of , , or on DISPLAY UNIT to highlight the column of CKT(S/P) and [ENTER] to select equivalent circuit to Serial or Parallel. Serial is selected in the example.



Step 4: Press the right key on DISPLAY UNIT to highlight the column of SPEED and [ENTER] to select SLOW.




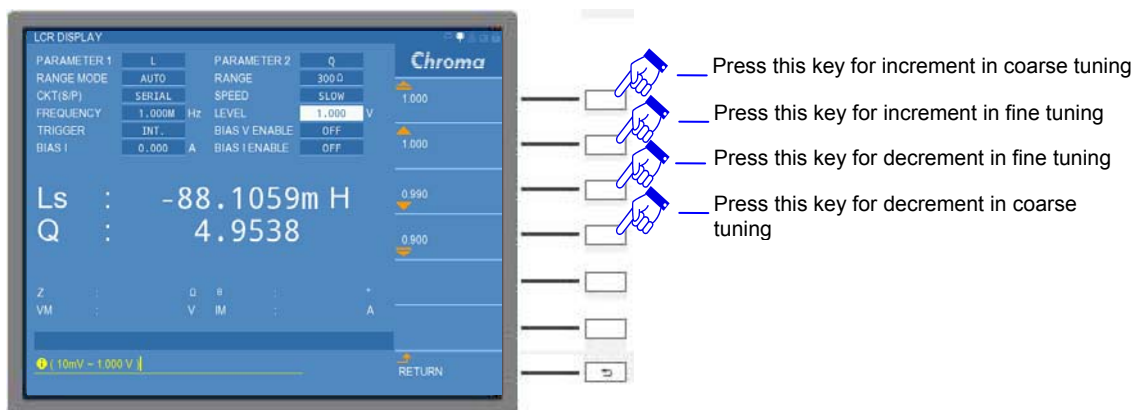
Step 5: Press the direction control keys of , , or on DISPLAY UNIT to highlight the column of FREQUENCY. Up/down scroll bar will be shown on the right of window. The highlighted value will be varied by users' scrolling and changed it to 1.000MHz.



Or use numerical key [1] on DISPLAY UNIT to select MHz at the right of window.



Step 6: Press the right key  on DISPLAY UNIT to highlight the column of LEVEL. Up/down scroll bar will be shown on the right of window. The highlighted value will be varied by users' scrolling and changed it to 1.000V.



Or use numerical keys on DISPLAY UNIT to input the setting value and press [ENTER].

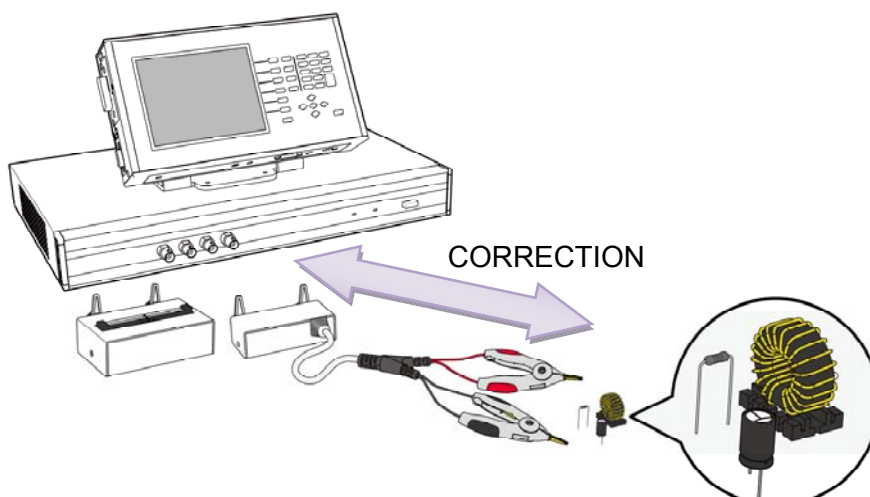


Step 7: Connect the DUT to UNKNOWN four ends BNC terminal of meter for measuring its value.

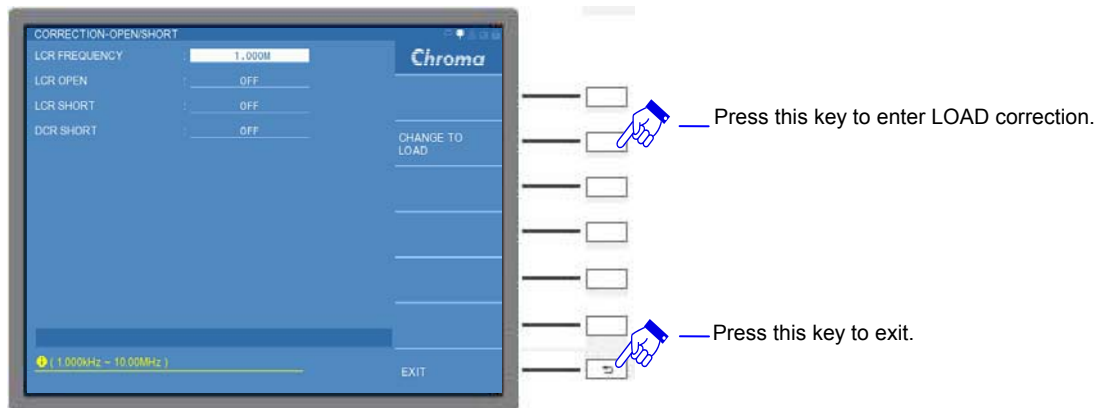


5.3.1.2 LCR MODE- OPEN /SHORT CORRECTION

This section is aimed to introduce open/short correction for measuring ACR. The tester only performs machine inner calibration when delivery. It also executes open/short correction for external connected test fixtures that avoids the fixture affecting DUT and causing additional measurement error. For DCR correction, please see the next section. The diagram as below shows.



Open/short correction operation: Select CORRECTION at the right Page of LCR Display to enter CORRECTION-OPEN/SHORT function as the screen below shows.



Descriptions for CORRECTION-OPEN/SHORT screen are as the following.

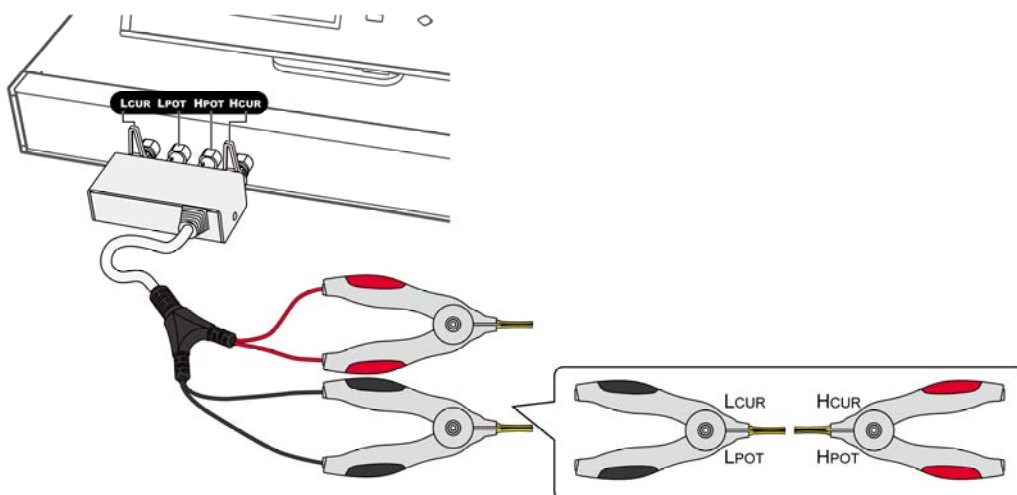
LCR FREQUENCY:

It sets LCR correction frequency. Users perform OPEN and SHORT single frequency correction for the required specific frequency. The setting frequency range is 1kHz~10MHz and default setting is “1M”.

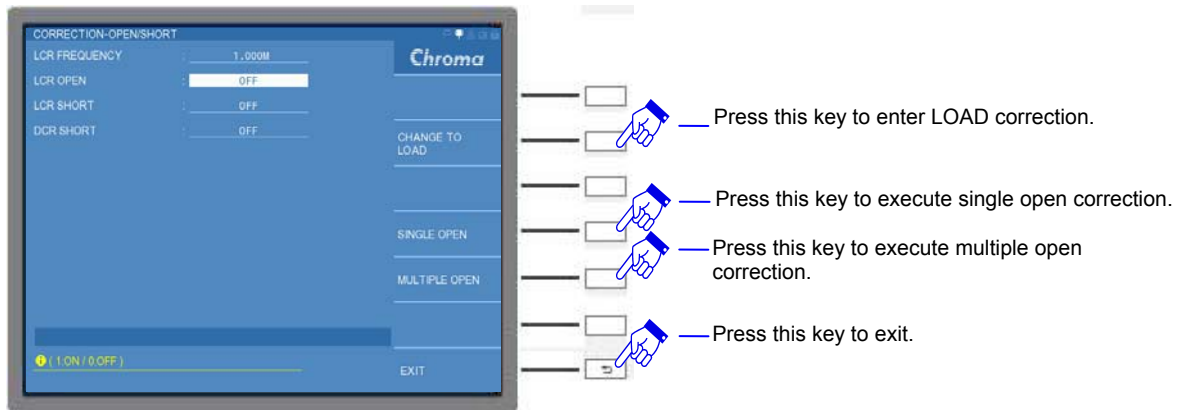
LCR OPEN:

It sets LCR for performing open correction on fixture. It can select SINGLE OPEN or MULTIPLE OPEN, SINGLE OPEN needs to coordinate with LCR FREQUENCY set frequency to do correction. Change “OFF” in LCR OPEN column to “ON” after SINGLE OPEN or MULTIPLE OPEN executed. The default setting is “OFF”.

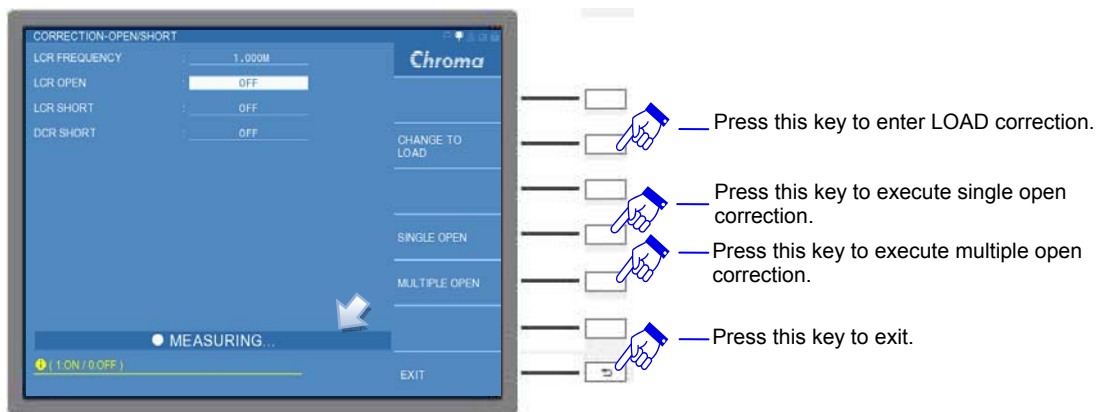
Take a test fixture to execute MULTIPLE OPEN correction as an example, connect the fixture to UNKNOWN four ends of BNC connector. The fixture is short-circuited with HCUR and HPOT, LCUR and LPOT as the diagram in the following.



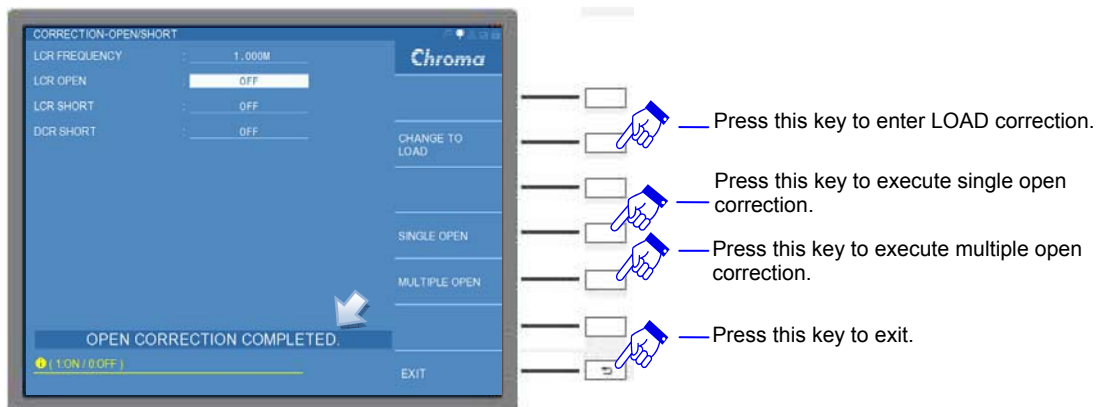
Use the direction control key (▲, ▼) of Display Unit to switch it to LCR OPEN column.



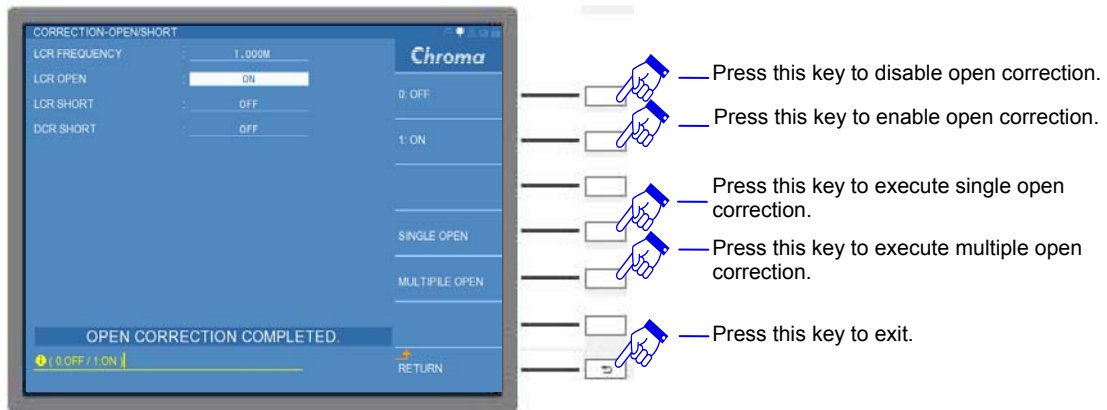
Press MULTIPLE OPEN to perform open correction and the screen shows “MEASURING...”. The range for executing correction frequency is 1kHz ~ 10MHz, the status screen is as the following.



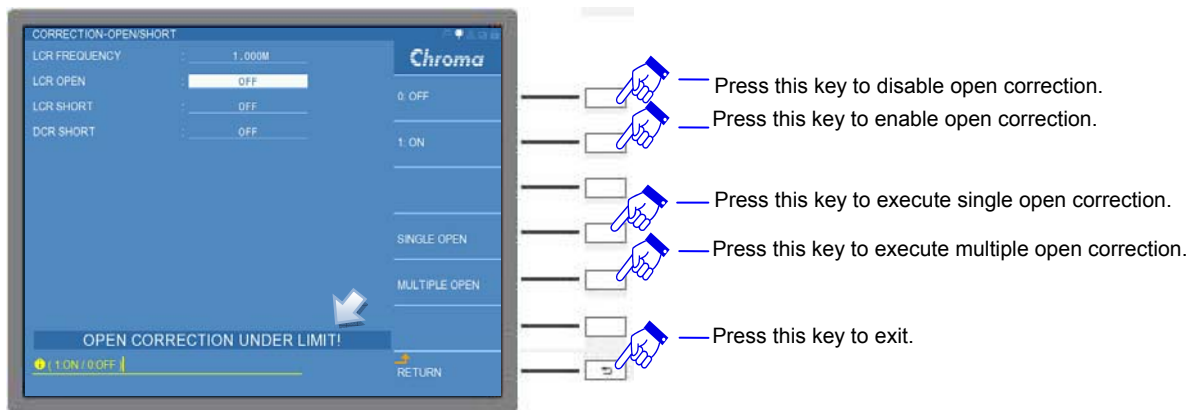
The screen shows “OPEN CORRECTION COMPLETED.” that indicates open correction completed.



Change LCR OPEN column from “OFF” to “ON”.



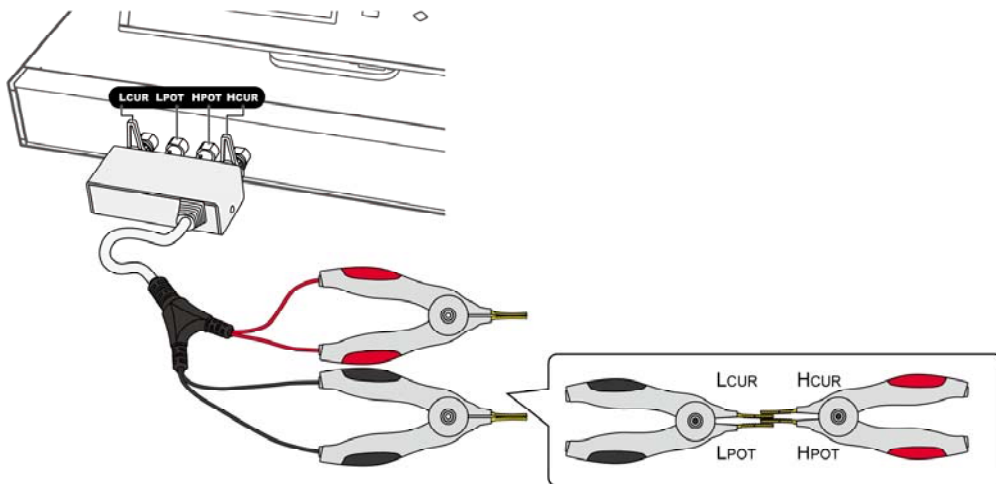
The screen shows “OPEN CORRECTION UNDER LIMIT!” as the screen in the following when open correction is with error. It represents open test action encountered problem, please check whether the test cable is broken or test clip bad contact. Execute open test again after inspecting.



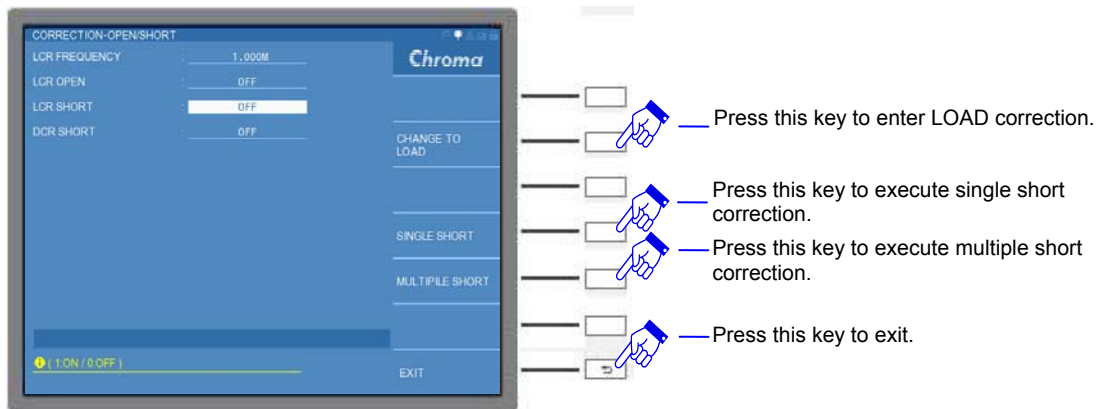
LCR SHORT:

It sets LCR for performing short correction on fixture. It can select SINGLE SHORT or MULTIPLE SHORT, SINGLE SHORT needs to coordinate with LCR FREQUENCY set frequency to do correction. Change “OFF” in LCR SHORT column to “ON” after SINGLE SHORT or MULTIPLE SHORT executed. The default setting is “OFF”.

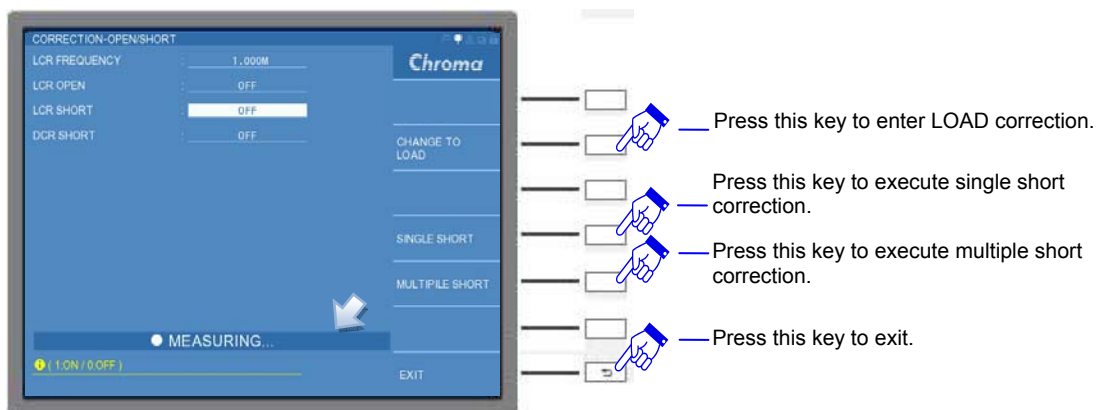
Take a test fixture to execute 1MHz SINGLE SHORT correction as an example, connect the fixture to UNKNOWN BNC connector. HCUR, HPOT, LCUR and LPOT will be short-circuited as the diagram in the following.



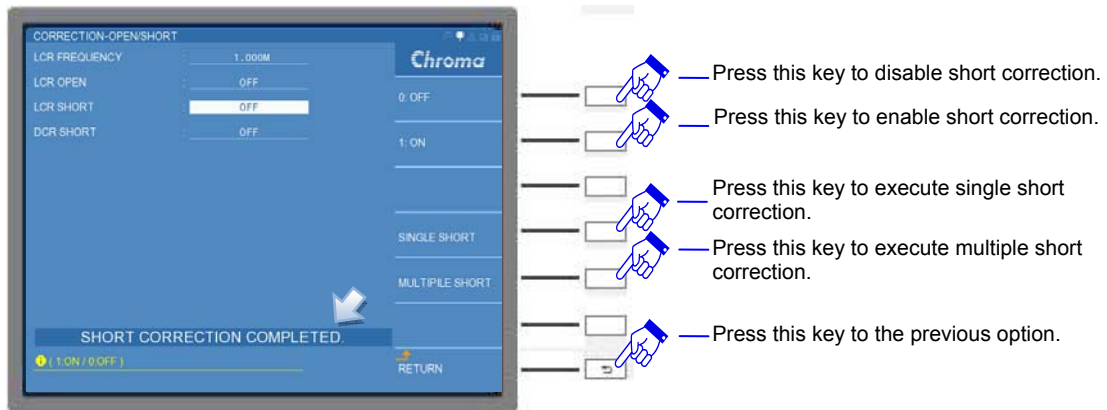
Use the direction control key (▲, ▼) of Display Unit to switch it to LCR SHORT column.



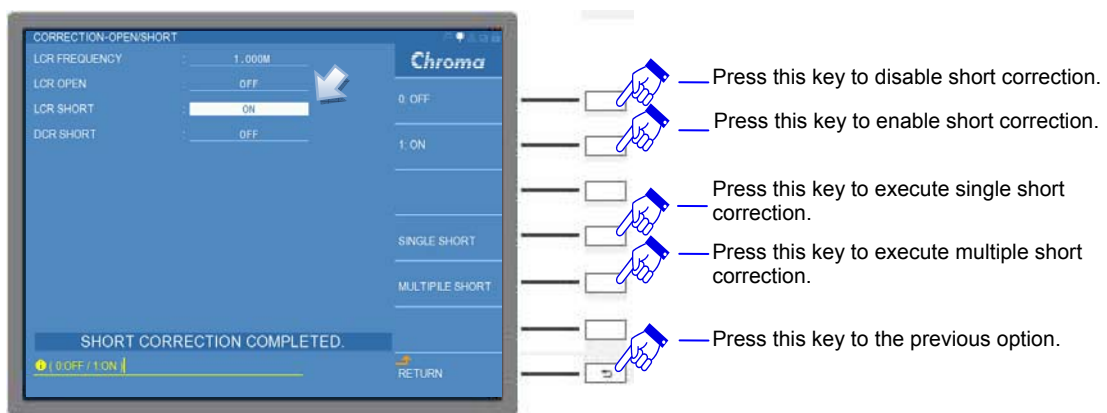
Press SINGLE SHORT to perform 1MHz short correction and the screen shows “MEASURING...”. The processing status screen is as the following.



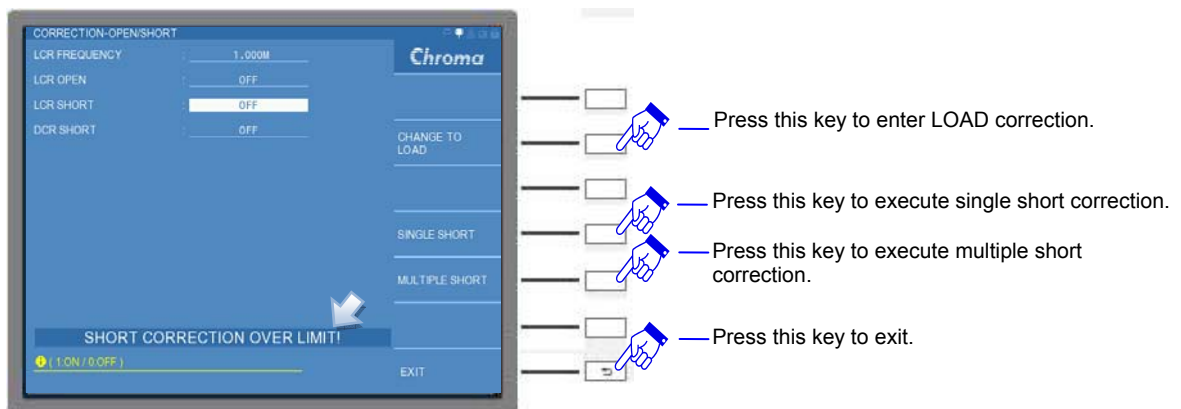
The screen shows “SHORT CORRECTION COMPLETED.” that indicates short correction completed.



Change LCR SHORT column from “OFF” to “ON”.



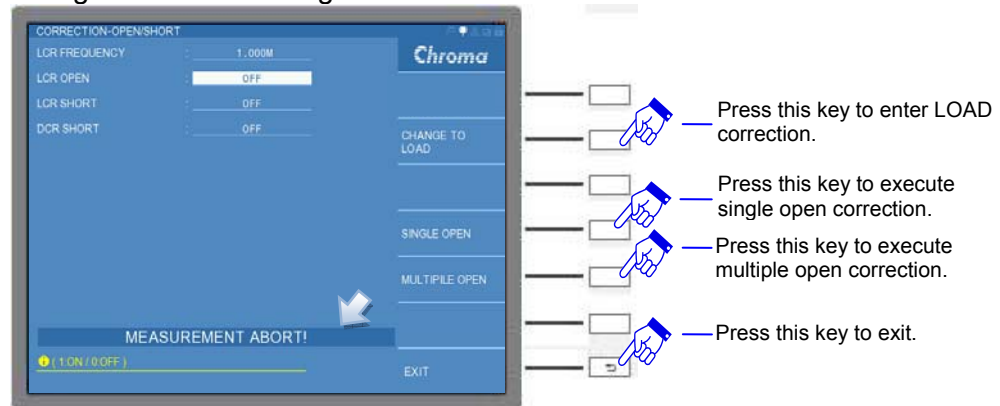
The short correction screen shows “SHORT CORRECTION OVER LIMIT!” (as the screen below) or “SHORT CORRECTION OVER FAIL”. It represents short test action encountered problem, please check whether the test cable is broken or test clip bad contact. Execute short test again after inspecting.



Notice

1. The measured frequency will affect the selection of test fixture. The stray capacitance effect of DUT can't be ignored under the circumstance of fixture far away the main unit and higher frequency of measurement.
2. It is recommended to perform MULTIPLE OPEN and MULTIPLE SHORT if test item includes parameter test with multiple frequency.
3. Users need to perform open/short correction again after powered on each time or before replacing/testing measurement fixture.

- Users can press [RESET] on Display Unit when open/short to be aborted by requirement. The screen shows “MEASUREMENT ABORT!” as the figure in the following.



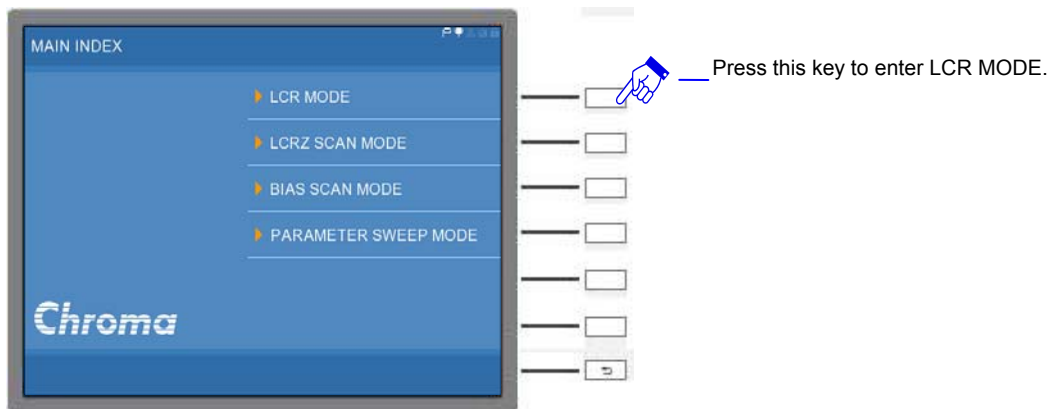
The usage of LCRZ SCAN MODE, BIAS SCAN MODE and PARAMETER SWEEP MODE can be done in the same manner with OPEN/SHORT correction of LCR MODE.

“Operation Example”

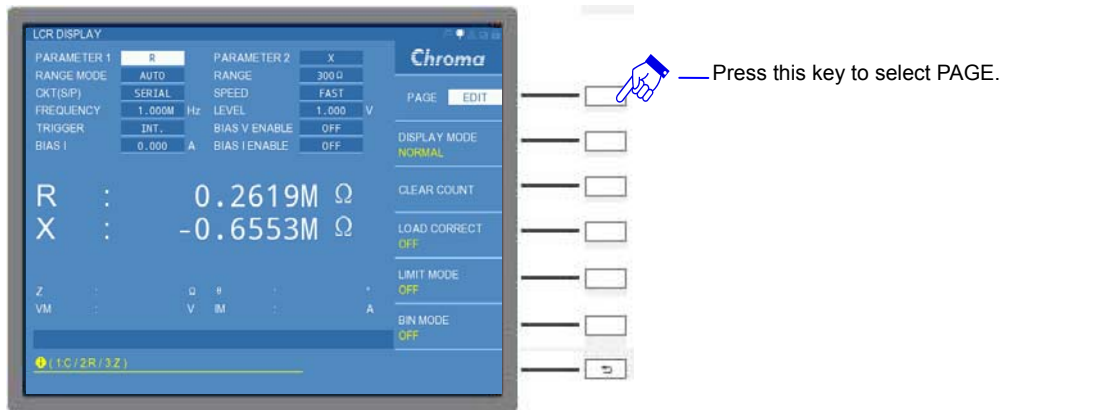
Before the meter starts measuring (DUT unplaced) in single unit(fixture included) application, it is need to execute open/short correction to get the optimum measurement accuracy. Operation for open/short correction is as the following.

Note Here, we only introduce environmental operation of LCR MODE whereas other modes also use the same interface and operation. The sequential section won't describe it repeatedly.

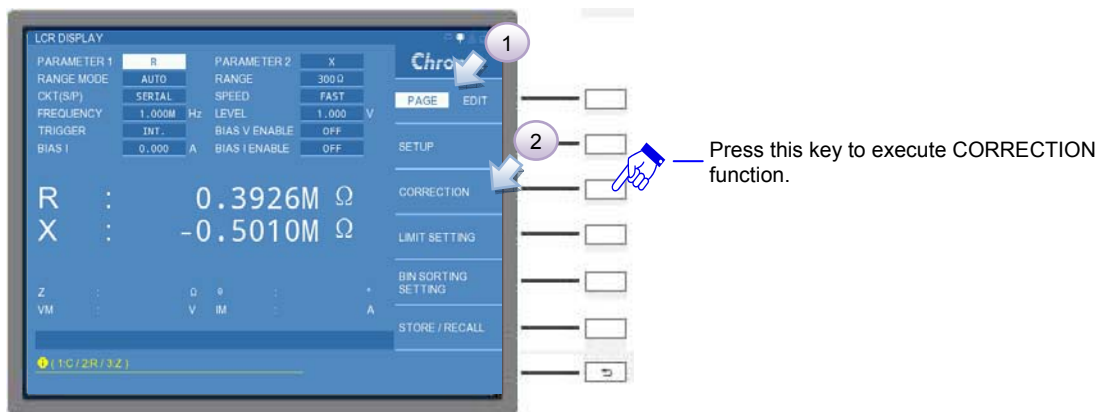
- Place the test fixture on UNKNOWN four ends BNC terminal of the meter after powered-on.
- Press [MAIN INDEX] on DISPLAY UNIT, it enters LCR MODE.




- Enter initial screen in LCR MODE.



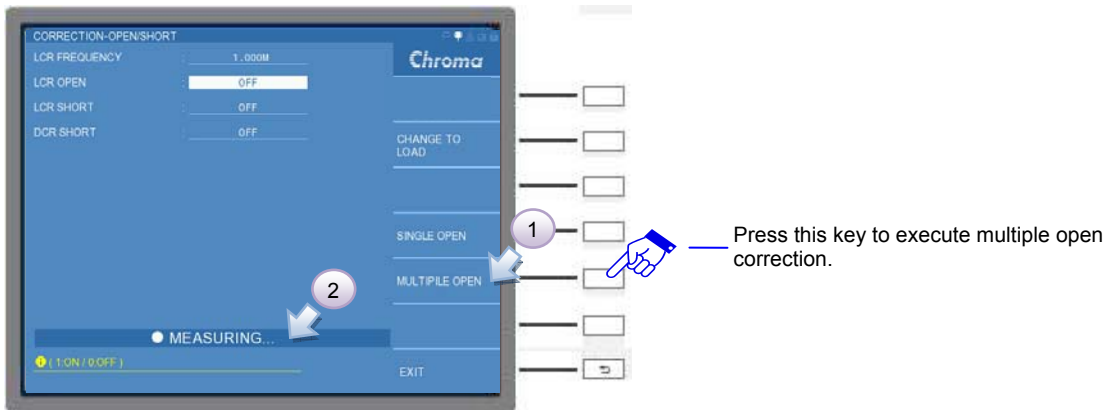
- (4) Change the menu to PAGE interface at the right window and press CORRECTION to enter CORRECTION-OPEN/SHORT screen.



- (5) Open correction: Use the direction control key – down key () to highlight LCR OPEN column after entered CORRECTION-OPEN/SHORT screen. The right side of window will show MULTIPLE OPEN. Make sure whether HCUR is short-circuited with HPOT and LCUR with LPOT.



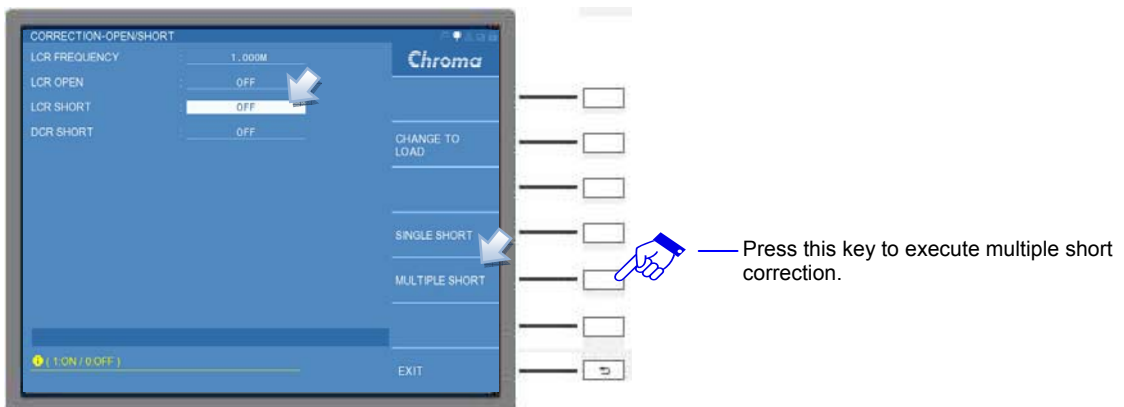
Next to press MULTIPLE OPEN to start open correction function, the screen shows “MEASURING...” at this time. The range of correction frequency is 1kHz ~ 10MHz and the screen is as the following.



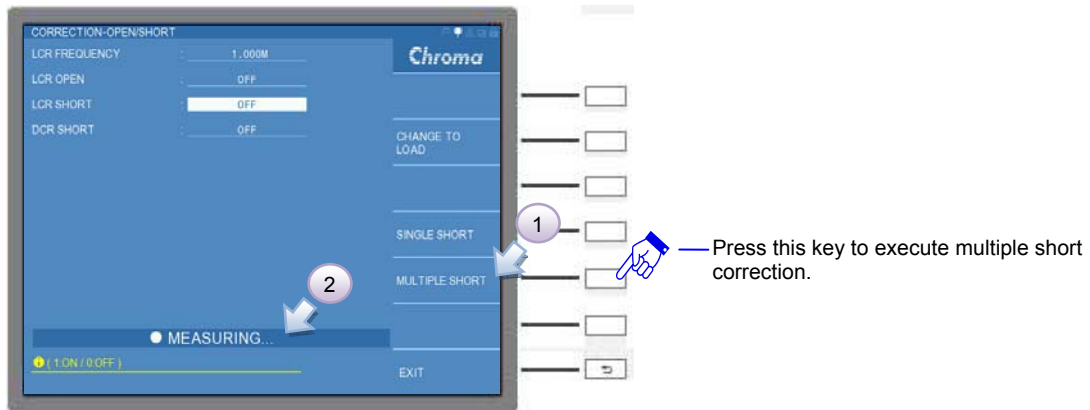
For a few minutes later, the screen shows “OPEN CORRECTION COMPLETED.” thus open correction is completed.



- (6) Short correction: Use the direction control key – down key (▼) to highlight LCR SHORT column. The right side of window will show MULTIPLE SHORT. Make sure whether HCUR is short-circuited with HPOT and LCUR with LPOT.





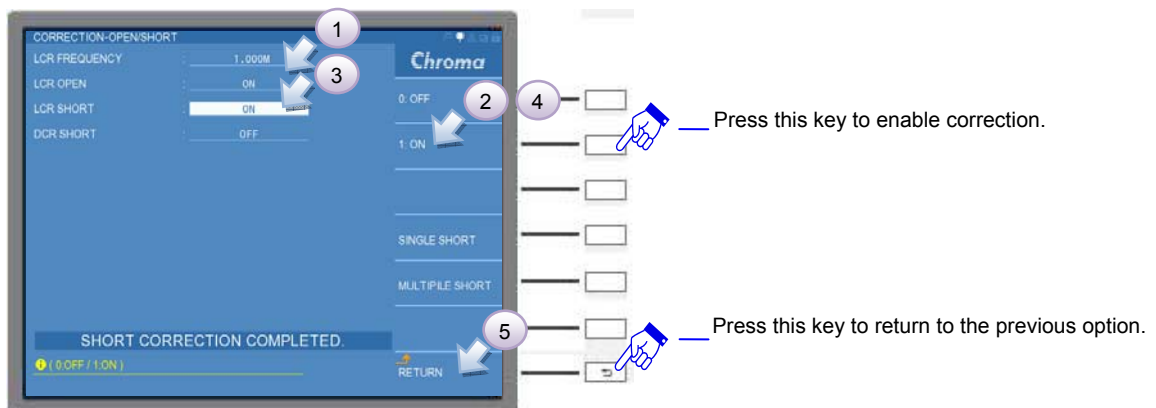
Next to press MULTIPLE SHORT to start short correction function, the screen shows “MEASURING...” at this time. The range of correction frequency is 1kHz ~ 10MHz and the screen is as the following.



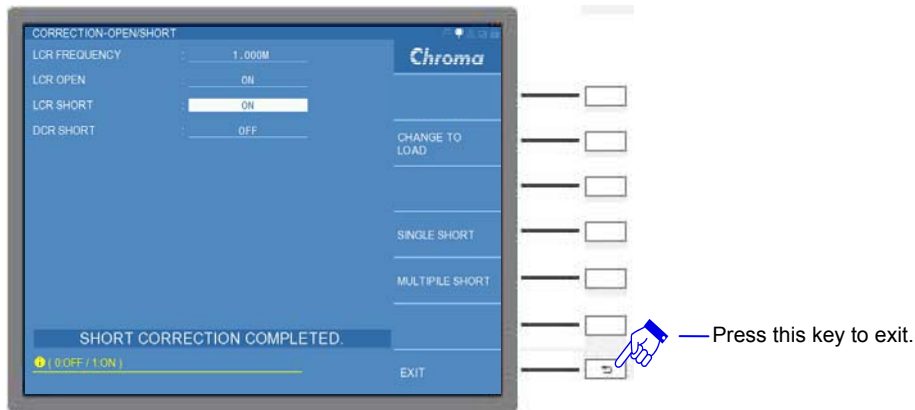
The screen shows “SHORT CORRECTION COMPLETED.” thus short correction is completed.



- (7) Use the direction control key – up/down key (, ) to highlight LCR OPEN column after open/short correction is done. It sets the right menu of window to ON and enables open correction function. In the same way, it sets LCR SHORT to ON and enables short correction function as well as presses RETURN to exit from the setting.



- (8) Press EXIT or [MEAS DISPLAY] to exit from CORRECTION-OPEN/SHORT screen.



(9) It returns LCR DISPLAY to confirm whether measurement quantity level of fixture short is small.

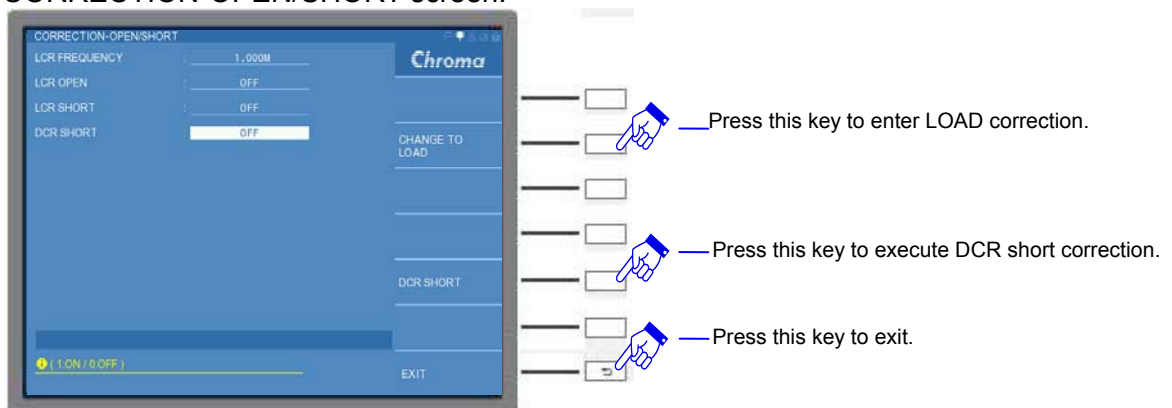


(10) Place the DUT and start measuring after executed the above described open/short correction.

5.3.1.3 LCR MODE - DCR SHORT CORRECTION

This section DCR Short Correction continues the concept of previous section Open/Short Correction that is aimed at DCR test such as DCR measurement of inductance.

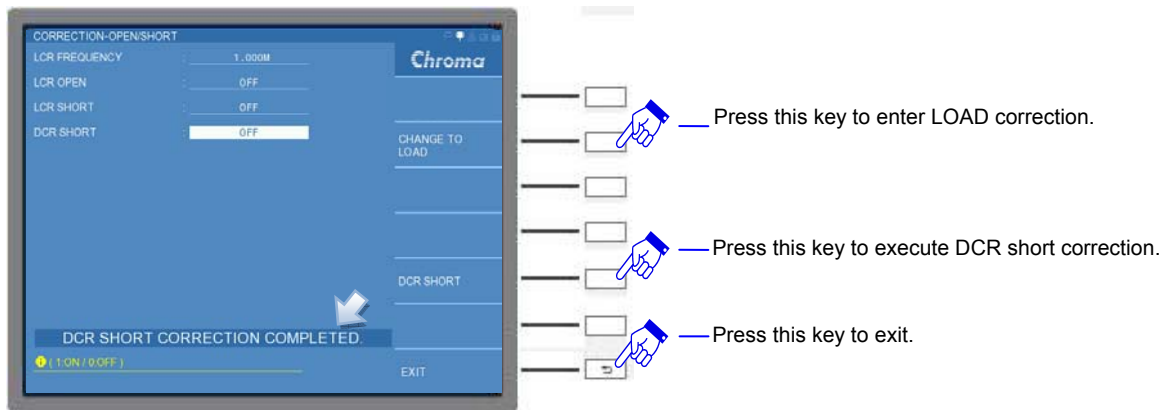
DCR short correction operation: Select CORRECTION at the right Page of LCR Display to enter CORRECTION-OPEN/SHORT screen.



DCR SHORT:

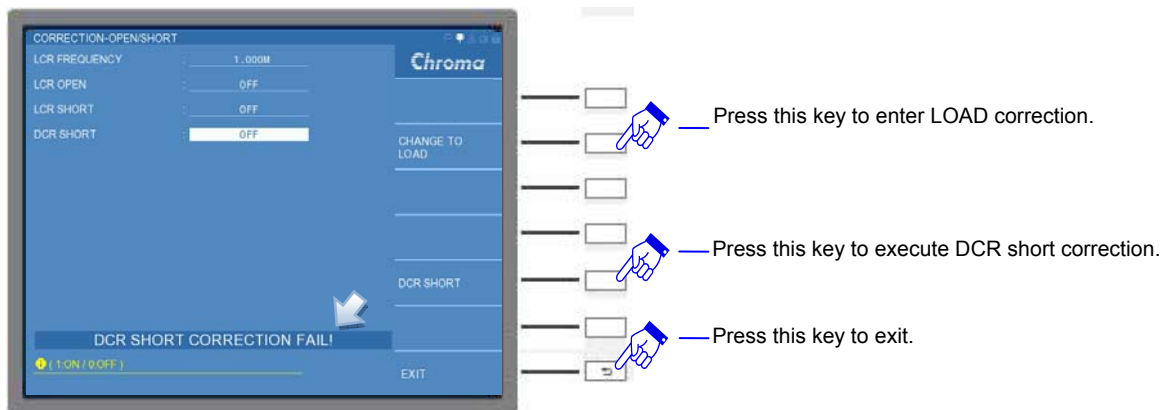
It sets LCR for performing DCR correction on fixture. Change “OFF” in DCR SHORT column to “ON” after DCR Short Correction executed. The default setting is “OFF”.

It selects DCR SHORT in selection key to do correction. The screen shows “DCR SHORT CORRECTION COMPLETED.” that indicates DCR short correction completed.



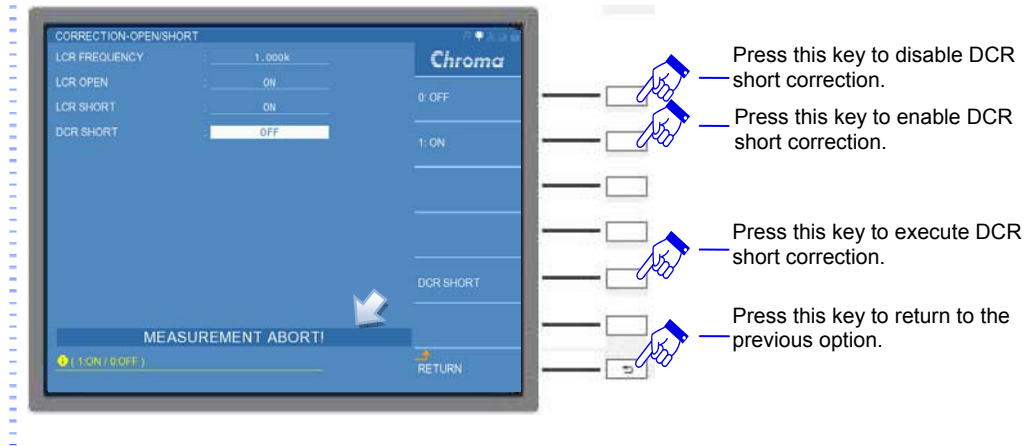
Next to change “OFF” in DCR SHORT column to “ON” thus it enables DCR short correction function.

The screen shows “DCR SHORT CORRECTION FAIL!” as the screen in the following when DCR short correction is with error. It represents DCR short test action encountered problem, please check whether the test cable is broken or test clip bad contact. Execute short test again after inspecting.



Notice

1. Users need to do DCR short correction at each time powered-on or replacing measurement fixture if test item includes DCR test item.
2. Users can press [RESET] on Display Unit when DCR short correction to be aborted by requirement. The screen shows “MEASUREMENT ABORT!” as the figure in the following.

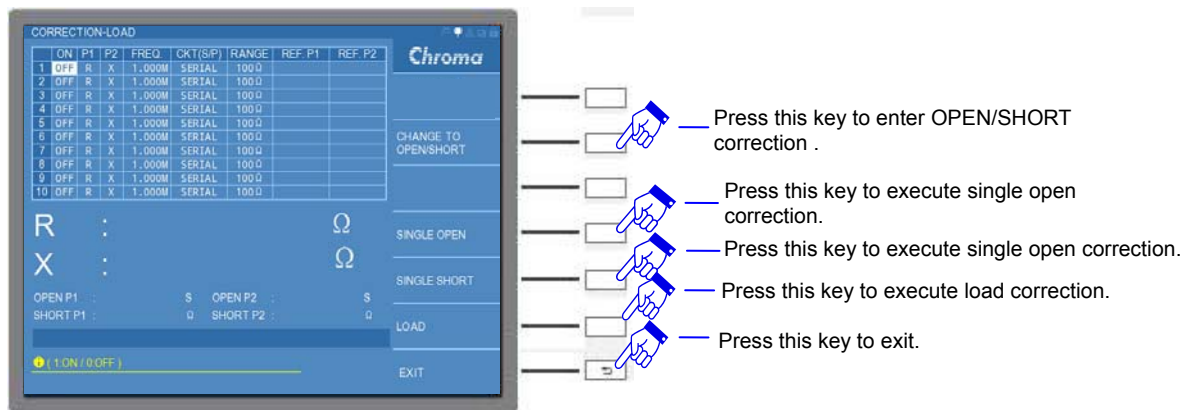


The usage of LCRZ SCAN MODE, BIAS SCAN MODE and PARAMETER SWEEP MODE can be done in the same manner with DCR correction of LCR MODE.

5.3.1.4 LCR MODE - OPEN /SHORT/LOAD CORRECTION

LOAD Correction is mainly applied on known reference load (GOLDEN SAMPLE). It is loaded into the machine as standard value which coordinates with open/short correction to reduce further stray and residual impedance of external connected fixture/long wire effect on the accuracy.

The operation method is to select CORRECTION in Page interface of LCR Display and press CHANGE TO LOAD at the right of CORRECTION-OPEN/SHORT window thus entered CORRECTION-LOAD screen as the following.



The left side of CORRECTION-LOAD window includes four areas from up to down as the following.

- (1) Parameter Setting Table

	ON	P1	P2	FREQ.	CKT(S/P)	RANGE	REF. P1	REF. P2
1	OFF	R	X	1.000M	SERIAL	100 Ω		
2	OFF	R	X	1.000M	SERIAL	100 Ω		
3	OFF	R	X	1.000M	SERIAL	100 Ω		
4	OFF	R	X	1.000M	SERIAL	100 Ω		
5	OFF	R	X	1.000M	SERIAL	100 Ω		
6	OFF	R	X	1.000M	SERIAL	100 Ω		
7	OFF	R	X	1.000M	SERIAL	100 Ω		
8	OFF	R	X	1.000M	SERIAL	100 Ω		
9	OFF	R	X	1.000M	SERIAL	100 Ω		
10	OFF	R	X	1.000M	SERIAL	100 Ω		

There are ten different test items can be set as the figure above shows. Input reference load by users and load it into parameter setting table based on known parameters as standard value.

Parameter functions in the table are introduced as the following.

ON: It enables the load of this column. The default setting is "OFF".

P1: The primary measurement parameters include five parameters - "L", "C", "R", "Z" and "Y" for selection. The default setting is "R".

P2: According to the primary measurement parameter setting, it coordinates with different secondary measurement parameters. The default setting is "X".

FREQ.: It sets measurement frequency range as 1kHz ~ 10MHz. The default setting is "1.000M" Hz.

CKT(S/P): It selects DUT equivalent circuit mode. SERIAL or PARALLEL two modes are for selection. The default setting is SERIAL.

RANGE: It sets measurement range impedance value. The default setting is "100Ω".

REF. P1: Correction value of primary measurement parameter

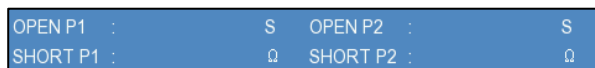
REF. P2: Correction value of secondary measurement parameter

(2) Display Area of Correction Parameter Result



It displays load correction status of primary/secondary parameter until it meets the value in parameter setting table.

(3) Display Area of Open/Short Correction Result



The result after open/short correction executed will be shown in this area.

OPEN P1: OPEN primary measurement parameter correction value, the displayed value $1/\Omega$, unit: S.

OPEN P2: OPEN secondary measurement parameter correction value, the displayed value $1/\Omega$, unit: S.

SHORT P1: SHORT primary measurement parameter correction value, unit: Ω.

SHORT P2 : SHORT secondary measurement parameter correction value, unit: Ω.

(4) Status Display Area



The displayed statuses are as the following:

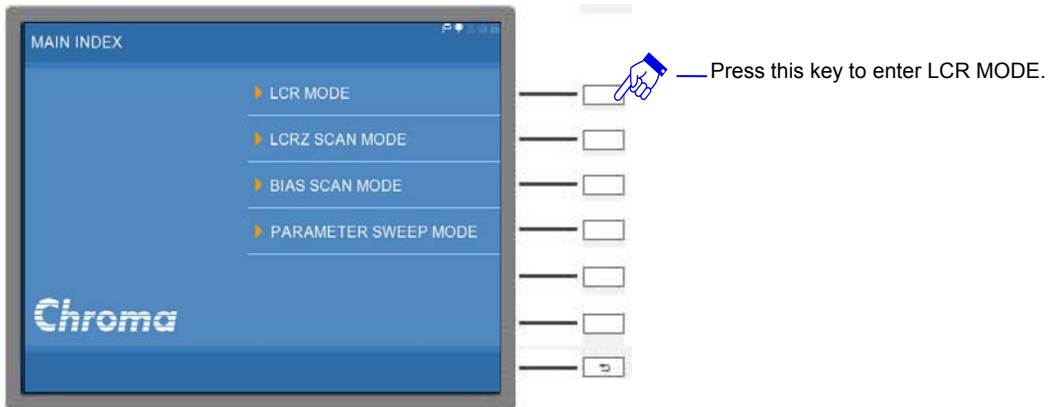
- MEASURING...**
- LOAD OPEN CORRECTION COMPLETED.**
- LOAD OPEN CORRECTION UNDER LIMIT!**
- LOAD SHORT CORRECTION COMPLETED.**
- LOAD SHORT CORRECTION OVER LIMIT!**
- LOAD CORRECTION COMPLETED.**
- MEASUREMENT ABORT!**

“Operation Example”

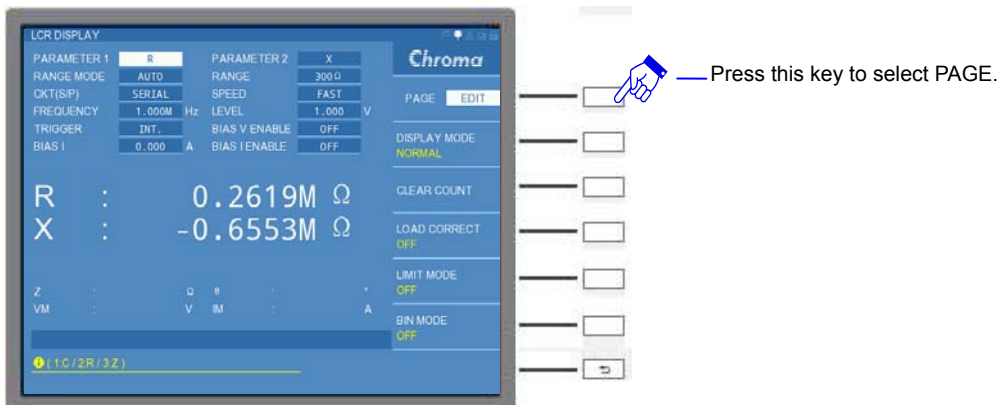
Before the meter starts measuring (DUT unplaced) in long wire application, it is need to execute open/short/load correction (Load ON) to get the optimum measurement accuracy. The operation method is as the following.

Note Here, we only introduce environmental operation of LCR MODE whereas other modes also use the same interface and operation. The sequential section won't describe it repeatedly.

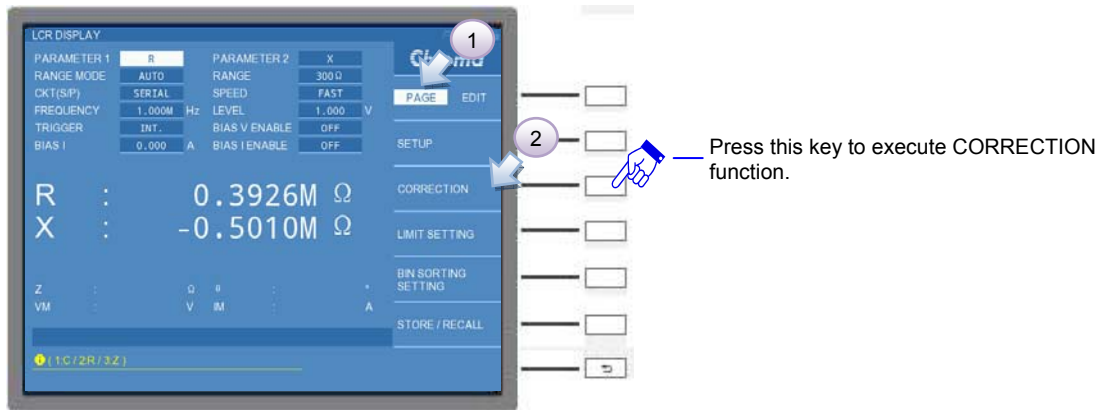
- (1) Place the test long wire and its clamp/fixture(DUT not included) on UNKNOWN four ends BNC terminal after powered-on.
- (2) Press [MAIN INDEX] on DISPLAY UNIT, it enters LCR MODE.



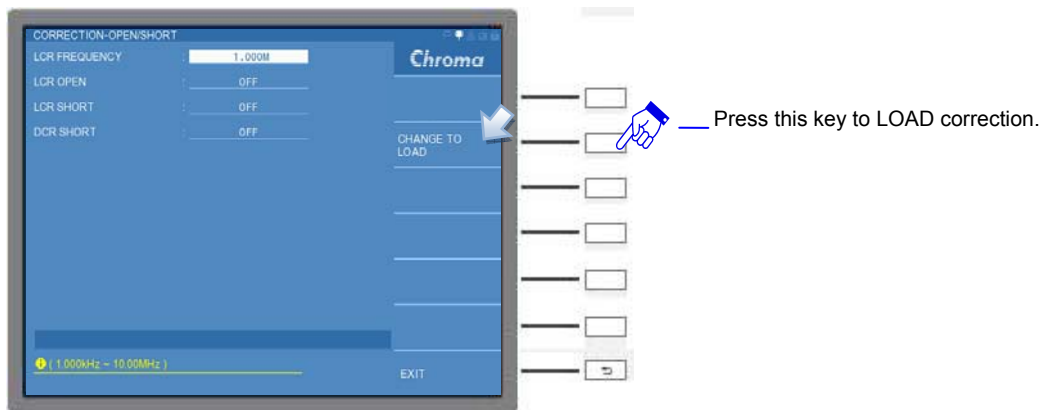
- (3) Enter initial screen in LCR MODE.



- (4) Change the menu to PAGE interface at the right window and press CORRECTION to enter CORRECTION-OPEN/SHORT screen.



- (5) Select CHANGE TO LOAD at the right of window after entered CORRECTION-OPEN/SHORT screen, thus it enters CORRECTION-LOAD function screen.



- (6) Enter initial screen in CORRECTION-LOAD.



- (7) It selects a standard inductance (or GOLDEN SAMPLE of known test value) as the table below shows. There are three test items corresponding parameters with different frequencies in the following table. Input the value to the table based on the parameter such as P1/P2 (measurement parameter), FREQ. (test frequency),

CKT(S/P) (serial/parallel mode) and RANGE along with primary/secondary measurement parameter known value of reference load (GOLDEN SAMPLE).

	P1	P2	FREQ.	CKT(S/P)	RANGE	REF.P1	REF.P2
1	Ls	Rs	1M	SERIAL	10Ω	296n	3.4
2	Ls	Rs	3M	SERIAL	10Ω	275n	4.5
3	Ls	Rs	10M	SERIAL	30Ω	246n	5.3

Table 5-3 Standard Inductance (or GOLDEN SAMPLE of Known Test Value)

After inputting all values of three test items to the corresponding table, press RETURN key at the right of screen that all parameters input are completed. The input completed status is as the figure below.



Note

The selection of RANGE needs to close to impedance value of DUT, it is for getting the optimum accuracy. It follows the known parameter to convert DUT impedance value and selects the required range by *Figure 5-1 Range & Impedance (Z) Reference Table*.

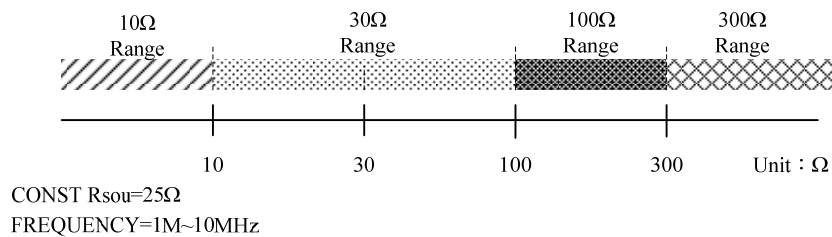


Figure 5-1 Range & Impedance (Z) Reference Table

The impedance(Z) is related to resistance & reactance. Take inductance as an example, its impedance is related to resistance & reactance(inductive reactance). Formula of resistance(Rs) and reactance (XL) is as the following for serial model. The set value is converted into inductive reactance and total impedance. Please bring the values into the formula below to get the required total impedance.

$$XL = |2\pi fL|$$

$$Z = \sqrt{(Rs^2 + XL^2)}$$

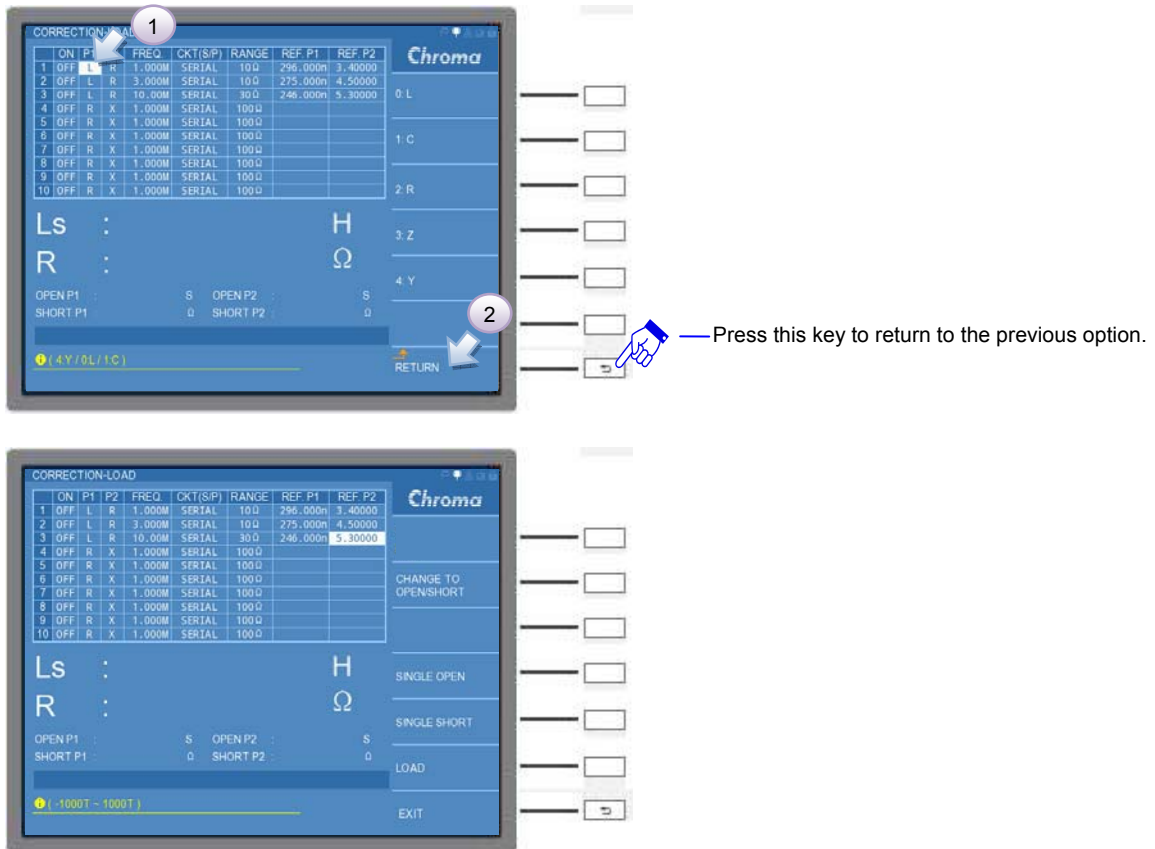
Item	FREQUENCY(Hz)	L(H)	Rs(Ω)	XL (Ω)	Z(Ω)
1	1M	296n	3.4	1.86	3.88
2	3M	275n	4.5	5.18	6.86

3	10M	246n	5.3	15.46	16.34
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Table 5-4 Impedance Counting Example of Open/Short/Load Correction Test Item

Get the required total impedance to correspond *Figure 5-2 Range & Impedance (Z) Reference Table* to find the corresponding range, for example total impedance of item 1 is 3.88Ω which is below of 10Ω so the range should be set to 10Ω . In the same way, the range of item 2 also select 10Ω . Total impedance of item 3 is 16.34Ω which is below of 30Ω and its measureable range is $10\sim 100$ so the range should be set to 30Ω .

- (8) Use direction control key (▲, ▼, ◀, ▶) on DISPLAY UNIT to highlight any setting of item 1. The right option of window shows parameter setting corresponded table during the cursor moving on the table. Press RETURN to switch it to the correction setting can be operated.

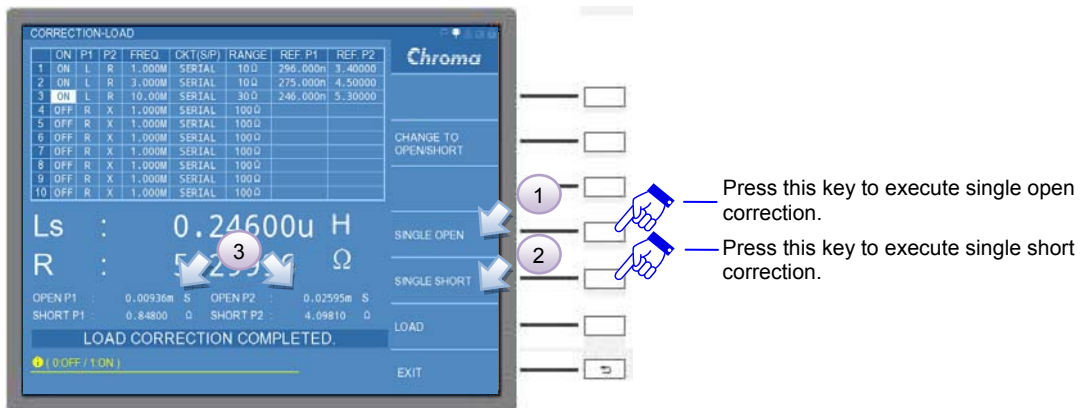


- (9) Before executing load correction, please execute single open correction and single short correction for long wire and its clamp/fixture (DUT not included) in sequence. The correction value will be recorded into the screen after open/short correction ended.

Notice

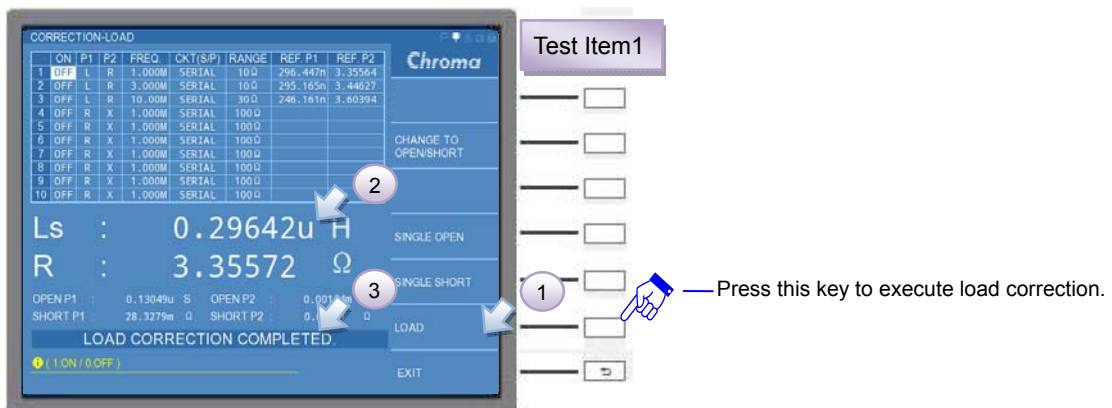
1. For long wire and its clamp/fixture (DUT not included) of open/short correction, please see the connection in 5.3.1.2 LCR MODE- OPEN /SHORT CORRECTION.
2. If the same long wire and its clamp/fixture (DUT not included) are used. It is recommended to execute open corrections of all test items first and then all short corrections. For example, execute open correction of three test items first and adjust fixture for

- executing short correction as well as do load correction for each test item when processing single open/short correction.



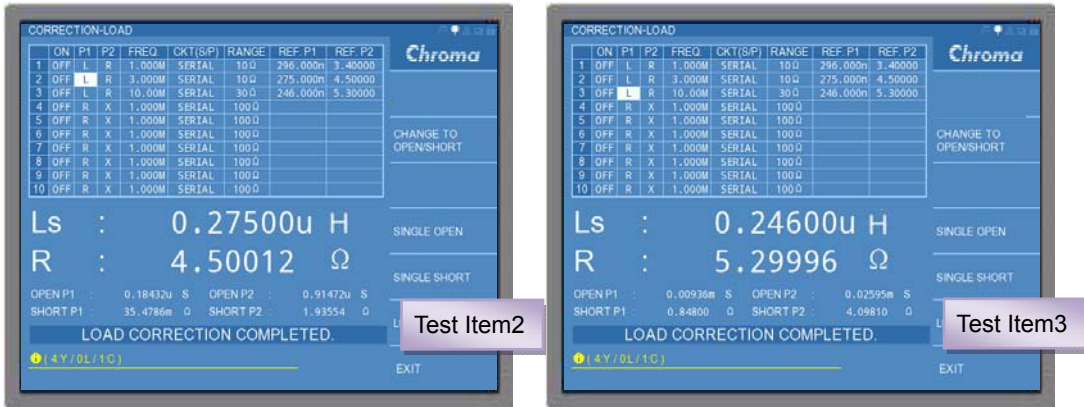
- (10) Place standard inductance (or GOLDEN SAMPLE of known test value) into long wire and its clamp/fixture and next to execute load correction. The screen shows "LOAD CORRECTION COMPLETED." that indicates load correction completed.

Note The measurement of meter at the beginning has some differences with target known test value. The last offset value displayed on the screen will close to GOLDEN SAMPLE setting of known test value during executing load offset procedure. The operating point of DUT is related to offset time, offset results of various inductance level and operating frequency has some differences. The second offset can be performed for obtaining better load offset result if the last offset result has some differences with GOLDEN SAMPLE setting.



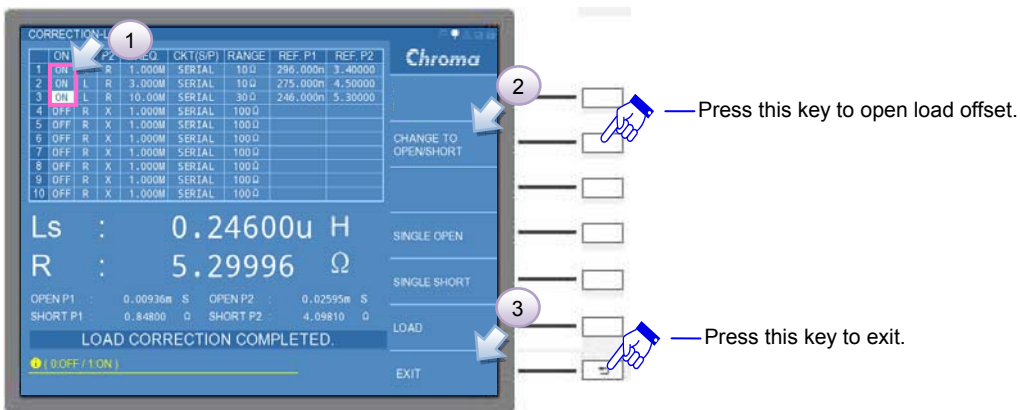
Note Make sure if offset result approximates to the setting when the offset ends.

- (11) Two test items follows step (8)~(10) for execution and its' offset result as below shows.
Load offset result of test item 2 and 3.



(12) Load offset function is enabled after all open/short/load offsets are completed.

Use the direction key of (▲, ▼, ◀, ▶) on DISPLAY UNIT to move the cursor to ON column of test item 1. The right side shows OFF/ON for selection that ON column will be changed from OFF to ON after ON selected. The other two test items also are managed by the same method. Press RETURN key at right screen after it is completed.



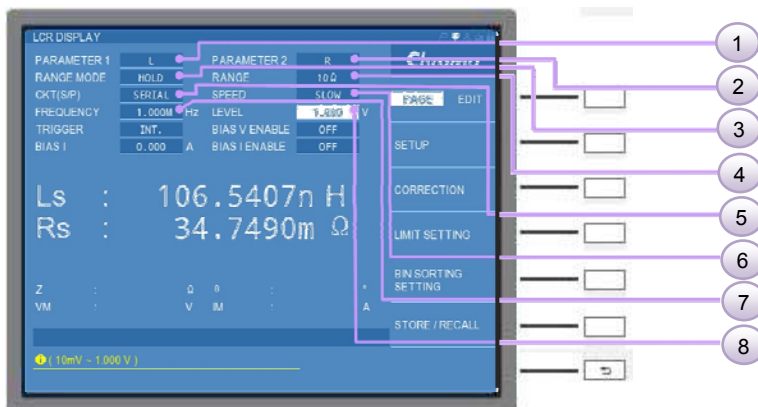
(13) Open/short/load offset execution of three test items are done to remove standard inductance (or GOLDEN SAMPLE of known test value). Press EXIT or [MEAS DISPLAY] key to return to LCR MODE screen.



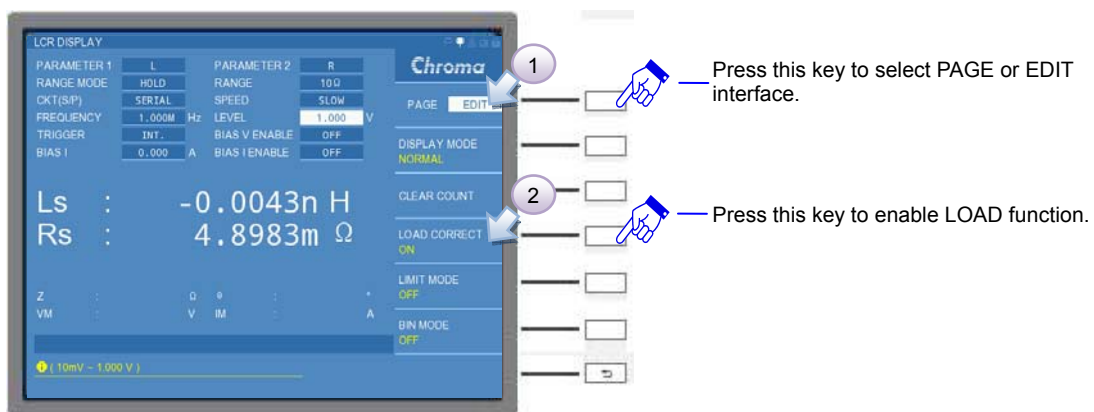
(14) After arranging the previous setting of open/short/load offset, please refer Table 5-5 Open/short/load offset test item 1 setting and correspond the numerical sequence in it.

Step	Function	Parameter Setting	Unit	Remark
1	PARAMETER1	Ls		
2	PARAMETER2	Rs		
3	RANGE MODE	HOLD		
4	RANGE	10Ω		
5	CKT(S/P)	SERIAL		
6	SPEED	SLOW		
7	FREQUENCY	1.000M	Hz	
8	LEVEL	1.000	V	

Table 5-5 Open/short/load offset test item 1 setting



(15) Next to switch it to EDIT interface in order to set LOAD CORRECT setting to ON.



(16) Place the DUT to start measuring by open/short/load offset test item 1 after the above execution is completed. To check if it meet to calculation result via *Table 5-4 Impedance Counting Example of Open/Short/Load Correction Test Item.*



(17) Test item 2 and 3 use the same method for operation which its measured result as below shows.

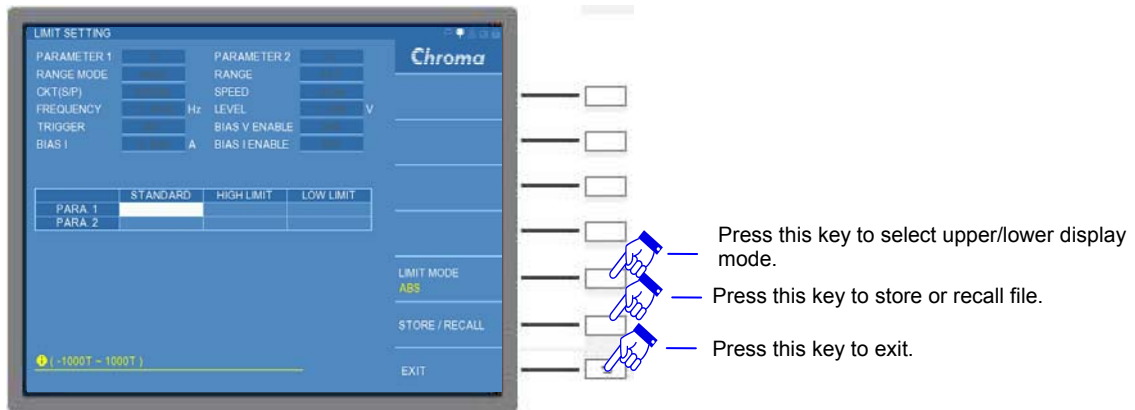


- ⚡ CAUTION**
1. Parameter setting of LCR DISPLAY need to notice that primary/secondary parameter, test frequency and range settings should be the same as load offset setting. It can express load offset function, otherwise the load offset function will be lost.
 2. LOAD CORRECT in EDIT interface of LCR DISPLAY screen needs to be enabled simultaneous with load enable in load offset screen that load offset function can be worked.
 3. Execute open/short offset first before operating load offset.

5.3.1.5 LCR MODE – LIMIT TEST Function

LIMIT TEST needs to use with DISPLAY MODE in EDIT interface of LCR DISPLAY that are applied in JUDGMENT mode. It can calculate total counts of good product/no good product and DUT.

LIMIT TEST setting screen need to via LIMIT SETTING selection in PAGE interface of LCR DISPLAY to enter LIMIT Test setting screen as the following.

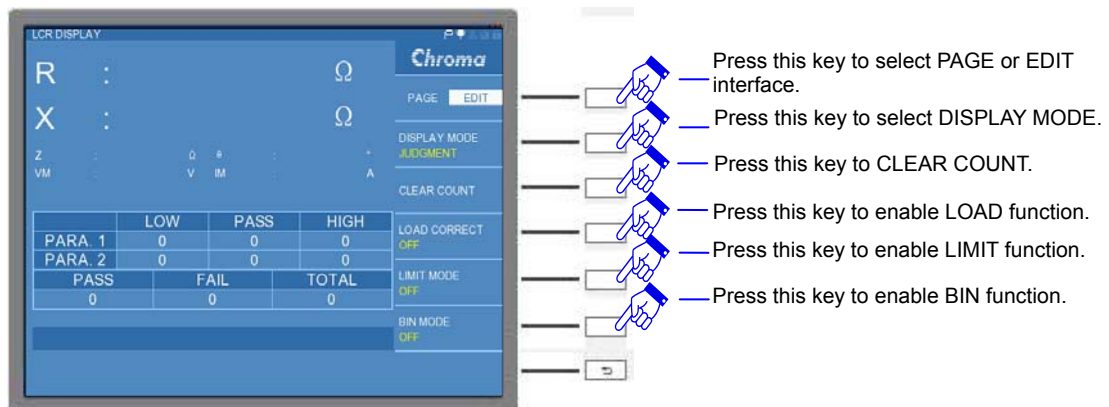


The upper screen reserves parameter setting of LCR DISPLAY and it can't be used here. The lower screen can enter STANDARD, HIGH LIMIT and LOW LIMIT for measurement primary/secondary parameter.

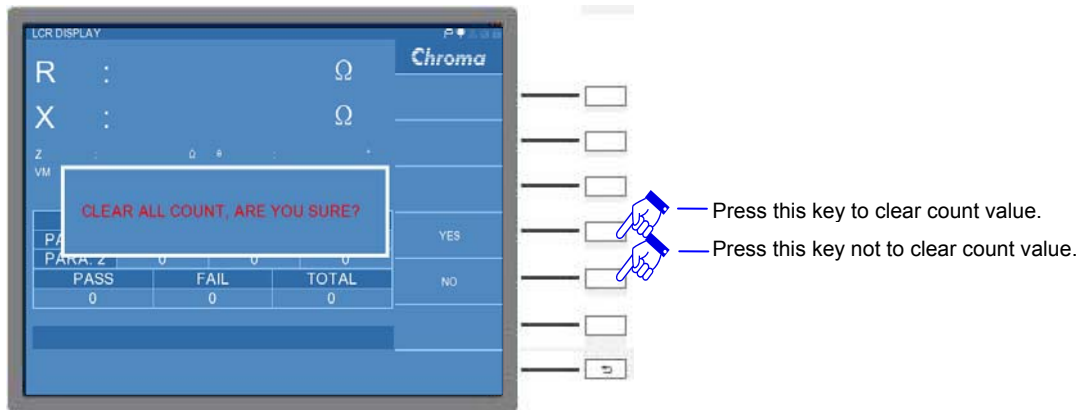
Note █ PARA.1 represents primary parameter and PARA.2 represents secondary parameter.

High/low limit value follows LIMIT MODE at lower right of screen to select ABS (absolute value) or % (percentage) mode. Column HIGH LIMIT and LOW LIMIT enter a value if ABS mode is selected. Column HIGH LIMIT and LOW LIMIT enter percentage compared with parameter standard value if % mode is selected.

Press EXIT or [MEAS. DISPLAY] key to return to LCR DISPLAY screen after the setting is completed. It is switched to EDIT interface to select DISPLAY MODE as JUDGMENT mode and enabled LIMIT MODE by selection key for starting the test. The lower screen displays LIMIT test, Pass/Fail and Count Result as below.

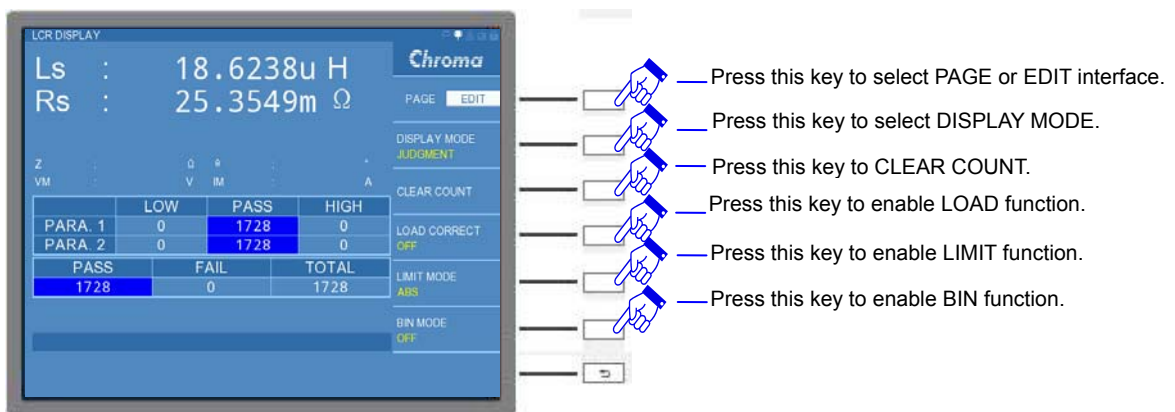


It selects CLEAR COUNT via selection key and "CLEAR ALL COUNT, ARE YOU SURE?" message popped up if compare result to be calculated again. Select YES if all counts to be cleared. Select NO if all counts not to be cleared.

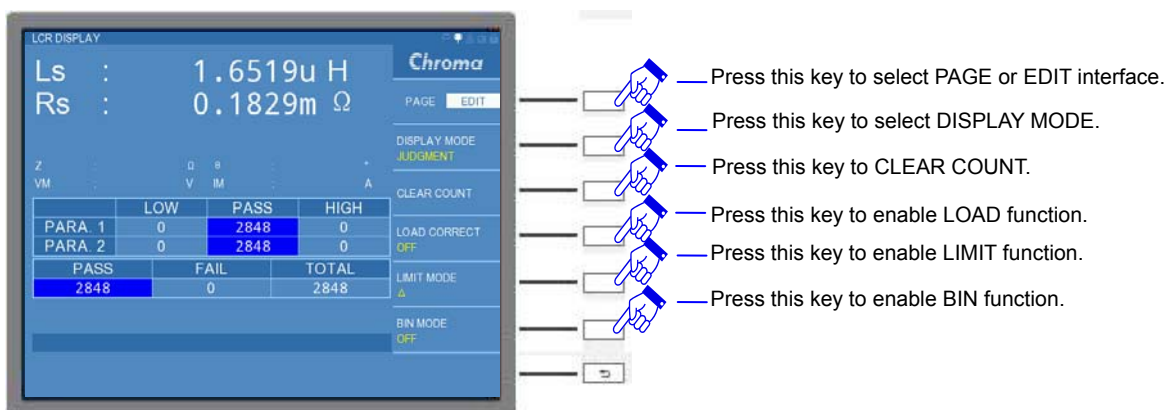


LIMIT MODE of LCR DISPLAY includes four modes of "OFF", "ABS", "Δ" and "Δ%". Except for "OFF" mode belongs to compare test function not to be enabled, other three modes are described as the following.

ABS mode: It displays the measurement value of primary/secondary parameter at present and calculates Pass, Fail, DUT total count, etc.



Δ mode: It displays the difference of primary/secondary parameter and nominal standard value along with calculates Pass, Fail, DUT total count, etc.



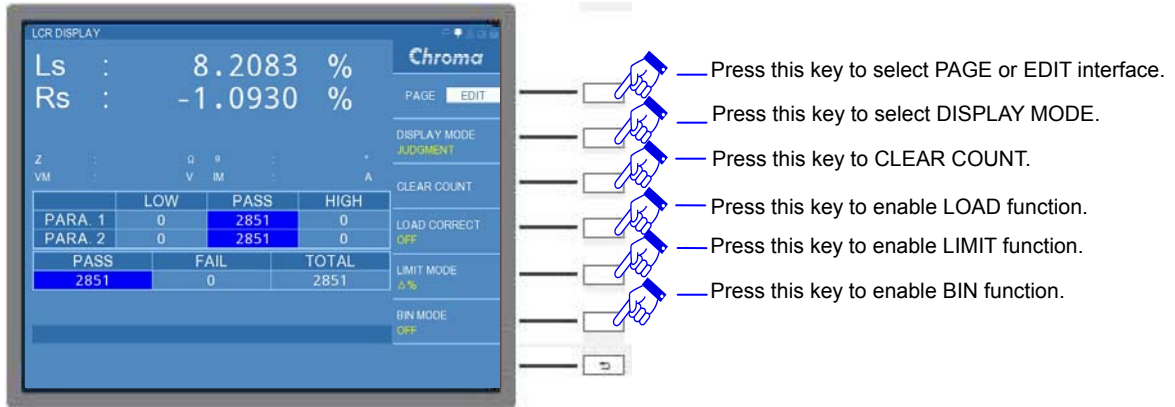
Calculation method:

Δ primary parameter = Nominal standard value of primary parameter – primary parameter of actual DUT

Δ secondary parameter = Nominal standard value of secondary parameter – secondary

parameter of actual DUT

Δ% mode: It displays the difference percentage of primary/secondary parameter and nominal standard value along with calculates Pass, Fail, DUT total count, etc.



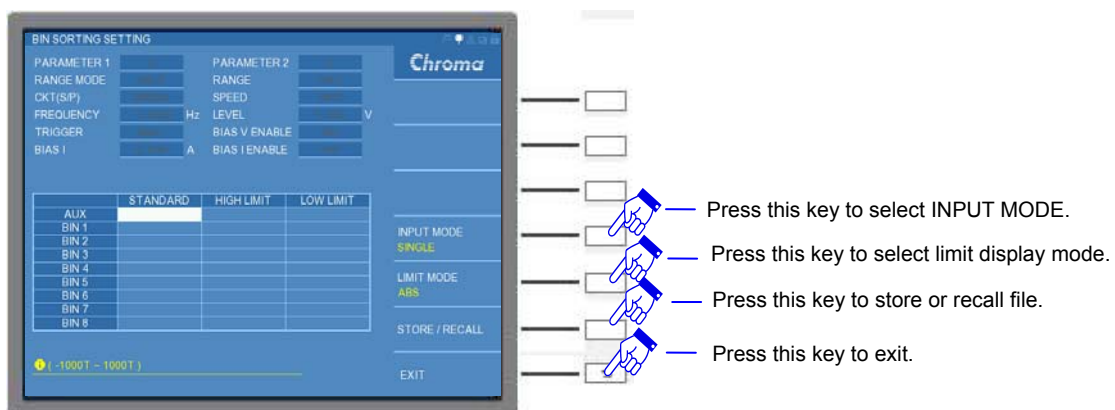
Calculation method:

$$\Delta \text{Primary parameter}\% = \frac{\text{Primary parameter of actual DUT value}}{\text{Nominal standard value of primary parameter}} \times 100\%$$

$$\Delta \text{Secondary parameter}\% = \frac{\text{Secondary parameter of actual DUT value}}{\text{Nominal standard value of secondary parameter}} \times 100\%$$

5.3.1.6 LCR MODE - BIN SORTING TEST Function

BIN SORTING TEST needs to use with JUDGMENT mode in EDIT interface of LCR DISPLAY. Follow the parameter level set to sort DUT and judge if it is Pass or Fail based on DUT's primary/secondary parameter as well as display DUT total count. For setting and operation are as follows.



The upper screen remains parameter setting of LCR DISPLAY and the setting here can't be used. The lower screen includes STANDARD (nominal standard value), HIGH LIMIT and LOW LIMIT of primary/secondary parameter bin sorting. AUX indicates secondary parameter setting and BIN1~BIN8 indicates various bin sorting setting of primary parameter.

The lower right screen includes INPUT MODE, LIMIT MODE and STORE/RECALL functions for selection. The functions are described as follows.

INPUT MODE:

It sets input mode selection. It only can set single column if SINGLE setting is selected. It can edit the entire line for increasing operation speed set by users if ALL setting is selected. The default setting is "SINGLE".

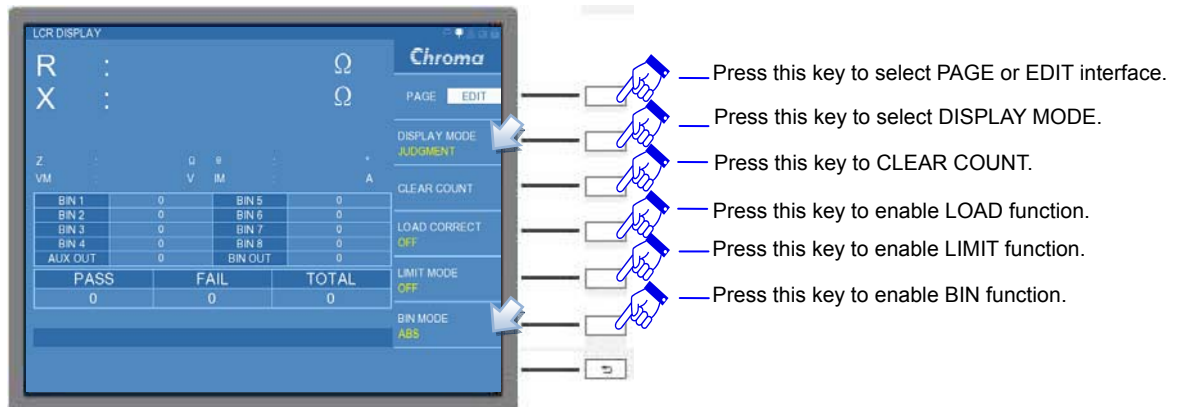
LIMIT MODE:

It sets high/low limit mode selection. There are two modes of "ABS" and "%" for selection which applies on HIGH LIMIT and LOW LIMIT settings. The default setting is "ABS".

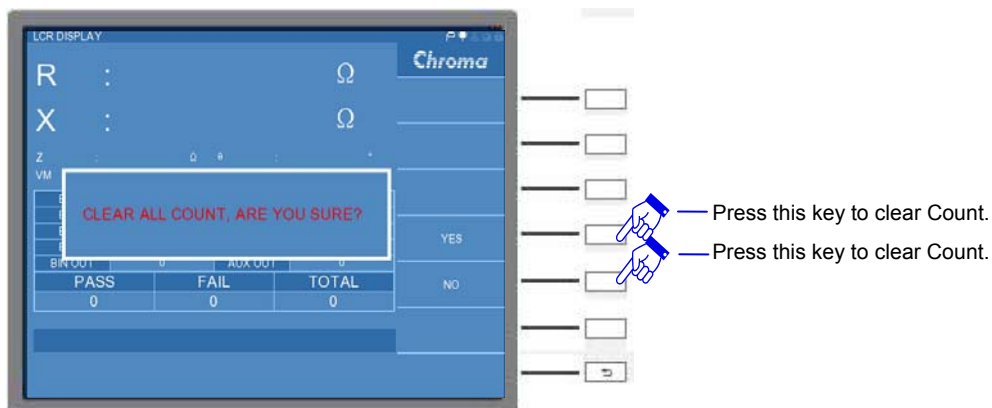
STORE/RECALL:

It stores or recalls the data. For more detail, please see 5.3.1.7 LCR MODE - STORE/RECALL Operation.

Press EXIT or [MEAS. DISPLAY] key to return to LCR DISPLAY screen after the setting is completed. It selects DISPLAY MODE to JUDGMENT mode in EDIT interface and enables BIN MODE at lower right screen for starting the test. The lower screen displays Bin Sorting and Calculation Result as the following.



It selects CLEAR COUNT via EDIT interface and "CLEAR ALL COUNT, ARE YOU SURE?" message popped up if compare result to be calculated again. Select YES if all counts to be cleared. Select NO if all counts not to be cleared.



BIN MODE of LCR DISPLAY includes four modes of "OFF", "ABS", "Δ" and "Δ%". Except for "OFF" mode belongs to compare test function not to be enabled, other three modes are described as the following.

ABS mode: It displays the measurement value of primary/secondary parameter at present

and calculate Pass, Fail, DUT total count, etc.

Chroma LCR DISPLAY

Ls : 19.6391u H
Rs : 24.5959m Ω

BIN 1	4	BIN 5	0
BIN 2	2	BIN 6	0
BIN 3	0	BIN 7	3
BIN 4	1	BIN 8	0
AUX OUT	0	BIN OUT	0

PASS	10	FAIL	0	TOTAL	10
------	----	------	---	-------	----

Legend:

- Press this key to select PAGE or EDIT interface.
- Press this key to select DISPLAY MODE.
- Press this key to CLEAR COUNT.
- Press this key to enable LOAD function.
- Press this key to enable LIMIT function.
- Press this key to enable BIN function.

Δ mode: It displays the difference of primary/secondary parameter and nominal standard value along with calculates Pass, Fail, DUT total count, etc.

Chroma LCR DISPLAY

Ls : -0.3196u H
Rs : -1.0746m Ω

BIN 1	6	BIN 5	0
BIN 2	2	BIN 6	0
BIN 3	0	BIN 7	3
BIN 4	1	BIN 8	0
AUX OUT	0	BIN OUT	0

PASS	12	FAIL	0	TOTAL	12
------	----	------	---	-------	----

Legend:

- Press this key to select PAGE or EDIT interface.
- Press this key to select DISPLAY MODE.
- Press this key to CLEAR COUNT.
- Press this key to enable LOAD function.
- Press this key to enable LIMIT function.
- Press this key to enable BIN function.

Calculation method:

Δ primary parameter = Nominal standard value of primary parameter – primary parameter of actual DUT

Δ secondary parameter = Nominal standard value of secondary parameter – secondary parameter of actual DUT

Δ% mode: It displays the difference percentage of primary/secondary parameter and nominal standard value along with calculates Pass, Fail, DUT total count, etc.

Chroma LCR DISPLAY

Ls : -0.8218 %
Rs : -0.3511 %

BIN 1	7	BIN 5	0
BIN 2	2	BIN 6	0
BIN 3	0	BIN 7	3
BIN 4	1	BIN 8	0
AUX OUT	0	BIN OUT	0

PASS	13	FAIL	0	TOTAL	13
------	----	------	---	-------	----

Legend:

- Press this key to select PAGE or EDIT interface.
- Press this key to select DISPLAY MODE.
- Press this key to CLEAR COUNT.
- Press this key to enable LOAD function.
- Press this key to enable LIMIT function.
- Press this key to enable BIN function.

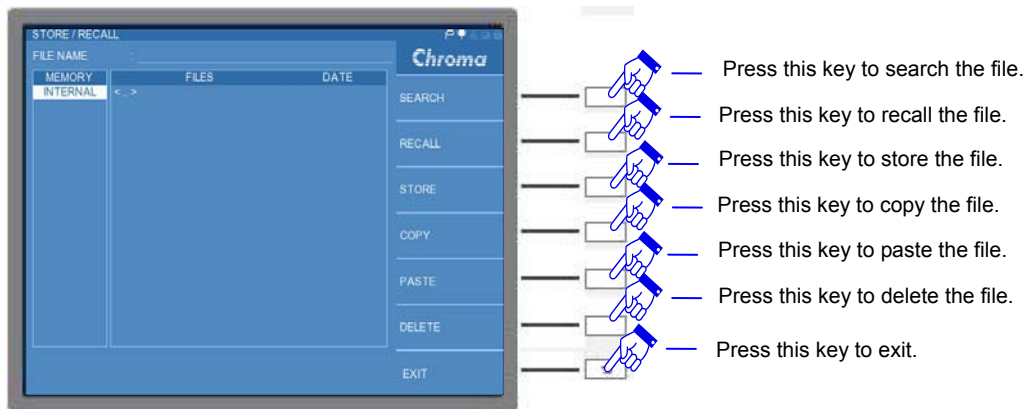
Calculation method:

$$\Delta \text{ Primary parameter \%} = \frac{\text{Primary parameter of actual DUT value}}{\text{Nominal standard value of primary parameter}} \times 100\%$$

$$\Delta \text{ Secondary parameter \%} = \frac{\text{Secondary parameter of actual DUT value}}{\text{Nominal standard value of secondary parameter}} \times 100\%$$

5.3.1.7 LCR MODE - STORE/RECALL Operation

It selects STORE / RECALL selection in PAGE interface of LCR DISPLAY thus enters data access function screen as the screen below.



There is a location for inputting FILE NAME at the upper of STORE/RECALL screen that can input the file name to be stored or searched.

There are SEARCH, RECALL, STORE, COPY, PASTE and DELETE functions at the right of STORE / RECALL screen. The memory includes INTERNAL and USB.

SEARCH: It selects this function for inputting complete file name or keyword to search file.

RECALL: It recalls the file.

STORE: It stores the file. The internal memory can store 10 files and external memory is depended by memory capacity.

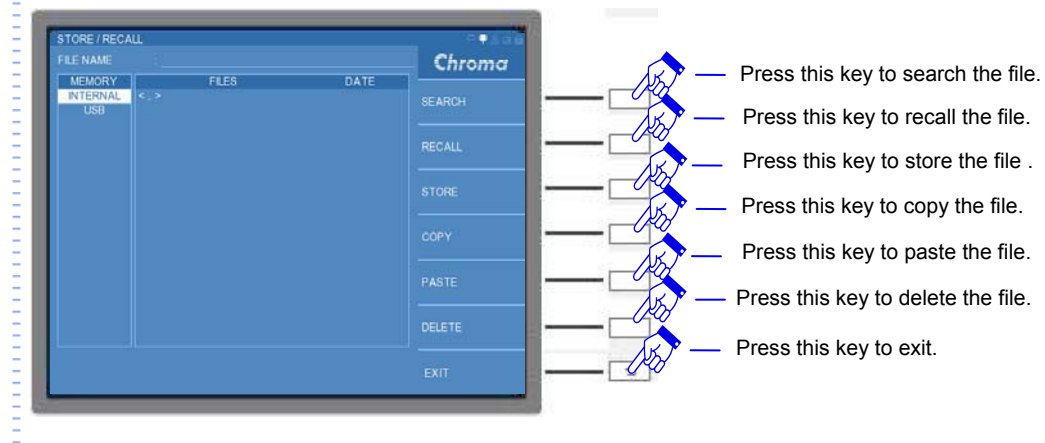
COPY: It copies the file.

PASTE: It pastes the file.

DELETE: It deletes the file.

There is also STORE / RECALL function for selection in LIMIT SETTING and BIN SORTING SETTING.

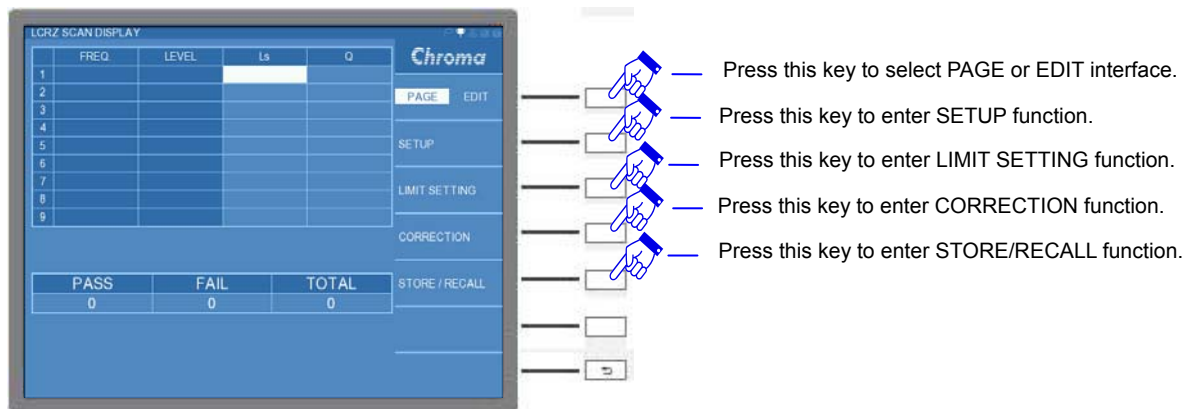
Note Select selection key EXIT first for exiting if USB can't be read. It enters STORE/RECALL after a few seconds interval that USB can be seen as the figure below shows.



5.3.2 LCRZ SCAN MODE Operation

5.3.2.1 LCRZ SCAN DISPLAY Description

It enters LCRZ SCAN DISPLAY and the table in the middle of screen displays test frequency users' set along with the measurement result voltage corresponded. The lower of screen displays test result of comparison function and the right of screen displays parameter setting of test function as the screen below.



Select PAGE interface at right screen and related descriptions as the following.

SETUP:

The basic setup includes parameter setting to be measured such as measurement parameter (L, C, R...), AVERAGE and SPEED...

LIMIT SETTING:

It sets test frequency, test voltage, nominal value of DUT and high/low limit of nominal value. .

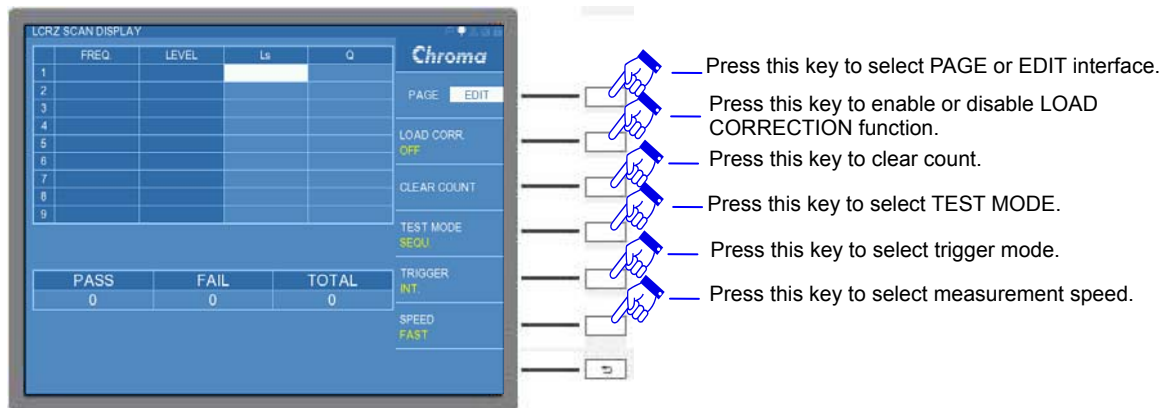
CORRECTION:

It corrects open/short circuit. See 5.3.1.2 for operation description.

STORE/RECALL:

It archives the data. See 5.3.1.7 for operation description.

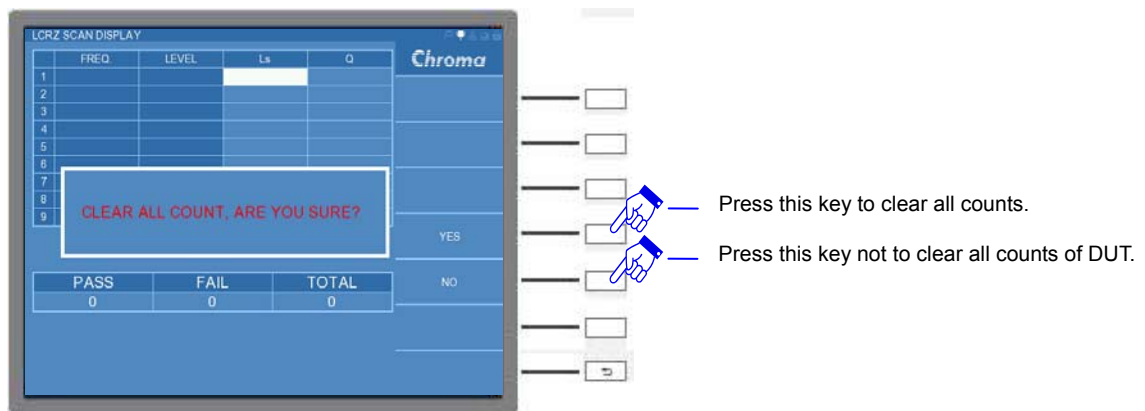
It selects EDIT interface at right screen as the following.



The functions in EDIT interface except for “CLEAR COUNT” function, other functions of “LOAD CORR”, “TEST MODE”, “TRIGGER” and “SPEED” will be synchronized with SETUP under PAGE interface. Users can fast operate it under EDIT interface. Here supplementary explanation for “CLEAR COUNT” function.

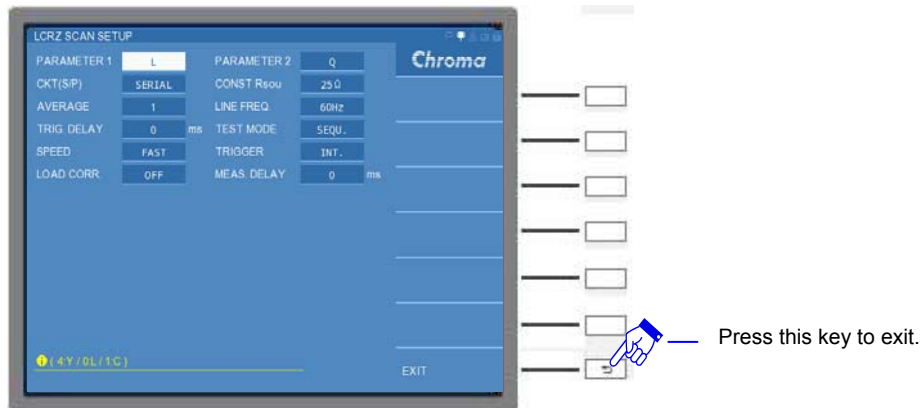
CLEAR COUNT:

It clears count. It selects CLEAR COUNT and “CLEAR ALL COUNT, ARE YOU SURE?” message popped up if compare result to be calculated again. Select YES if all counts to be cleared. Select NO if all counts not to be cleared.



5.3.2.2 LCRZ SCAN SETUP

It enters LCRZ SCAN SETUP screen if PAGE interface at right screen is selected and SETUP function key is pressed as the screen below shows.



LCRZ SCAN SETUP descriptions are as follows.

PARAMETER1:

It selects primary parameter which includes L, C, R, Z and Y for selection. The default setting is "L".

PARAMETER2:

It selects secondary parameter which follows the setting of primary parameter to coordinate with different secondary parameter. The default setting is "Q".

CKT (S/P):

It selects equivalent circuit (series/parallel) mode which includes "SERIAL" and "PARALLEL" modes. The default setting is "SERIAL".

CONST R_{sou}:

It selects output impedance mode which includes three modes of "OFF", "100Ω" and "25Ω" for selection. The default setting is "25Ω".

AVERAGE:

It sets average time for measurement. By choosing the average setting such as "1", the program will take average in each time of measurement. If it is set to "2", the program will take average in two times of measurement. Following test can be deduced accordingly and the setting range is '1~10'. The default setting is "1".

LINE FREQ.:

It selects input AC power mode. To select the correct line frequency will be helpful to the stability and accuracy of test value. It includes three selections of "50Hz", "60Hz" and "N/A"; "N/A" indicates not to consider power frequency but test speed increased. The default setting is "60Hz".

TRIG. DELAY:

When it is used with auto machinery, external trigger EXT for coordinating with the action of auto machinery needs to delay the meter trigger. Thus users can adjust TRIGGER DELAY time, its setting range is "0~9999"ms. The default setting is "0"ms.

TEST MODE:

It executes test mode which includes "SEQU" or "STEP" measurement for selection. The default setting is "SEQU".

SPEED:

It measures speed mode which includes “FAST”, “MEDIUM” and “SLOW” for selection. The default setting is “FAST”.

TRIGGER:

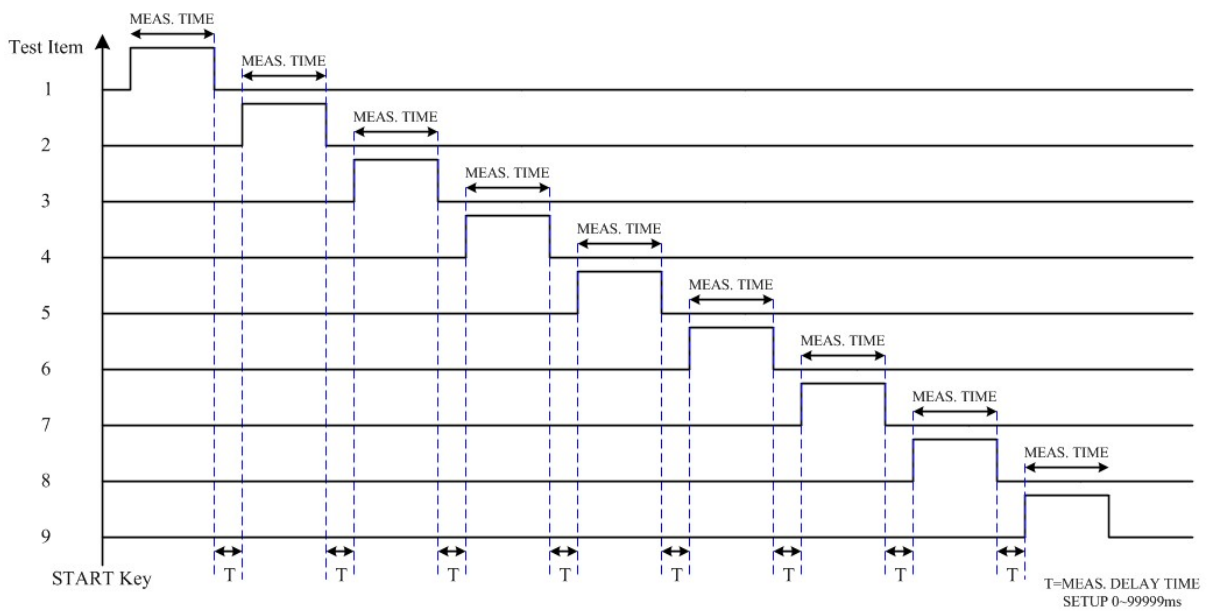
It selects trigger mode which includes “INT”, “MAN”, “EXT” and “BUS” for selection. The default setting is “INT”.

LOAD CORR.:

It is the function of load correction which includes “ON” or “OFF”. The default setting is “OFF”.

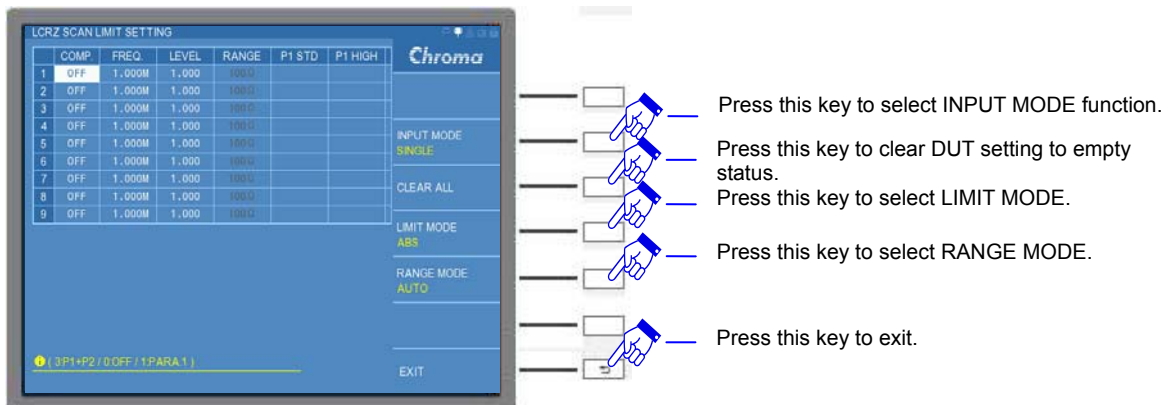
MEAS. DELAY:

It sets the time delayed for executing next test item as the figure below shows. MEAS. DELAY control range is “0~99999”ms. The default setting is “0” ms.

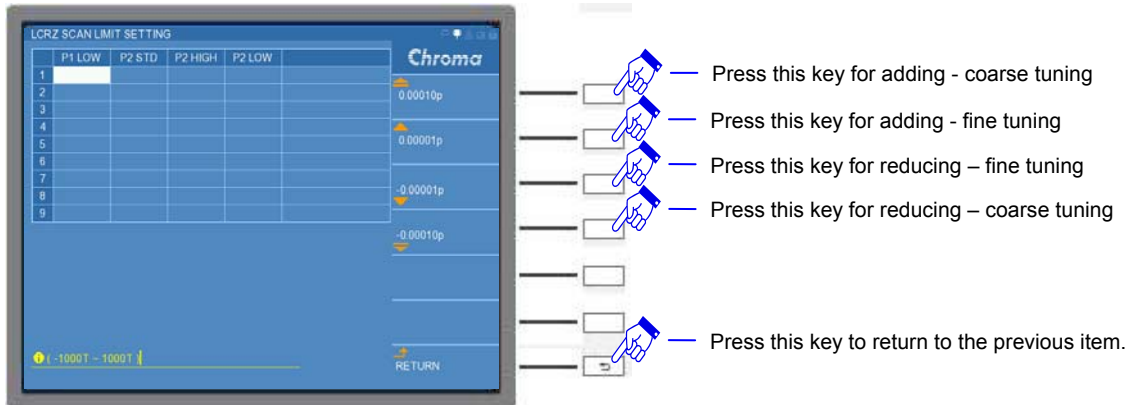


5.3.2.3 LCRZ SCAN LIMIT SETTING

It enters LCRZ SCAN LIMIT SETTING screen if PAGE interface at right screen is selected and LIMIT SETTING function key is pressed as the screen below shows.



“P1 LOW”, “P2 STD”, “P2 HIGH” and “P2 LOW” parameter settings can’t be displayed on the same screen due to the restriction of column width. Control the cursor direction control key of (◀, ▶) on DISPLAY UNIT unitl parameter columns of “P1 LOW”, “P2 STD”, “P2 HIGH” and “P2 LOW” are seen.



The screen is divided into central table and right column that will be explained separately as the following.

The central table displays ten setting items of “COMP. ”, “Freq.”, “LEVEL”, “RANGE”, “P1 STD”, “P1 HIGH”, “P1 LOW”, “P2 STD”, “P2 HIGH”, “P2 LOW”, etc. The left screen labelled column 1~9 for users additional setting 9 different test conditions and comparisons. Descriptions for the detail parameter settings are as the following.

COMP.:

It sets compare mode. Users can select single parameter or two parameters for comparison, operation modes are: “OFF”, “PARA.1”, “PARA.2” and “P1+P2”. The default setting is “OFF”.

⚡ CAUTION : The LCRZ SCAN DISPLAY can’t display measurement result and represented by blank when COMP. is set to OFF.

Freq.:

It can set measurement frequency range from 1 kHz to 10MHz. The default setting is “1.000M”.

LEVEL:

It can select Test voltage range of 10mV~1V. The default setting is “1V”.

RANGE:

It selects impedance value of measurement range. Use selection key to switch RANGE MODE to “HOLD” mode for selecting measurement range its impedance adjustment is need. The measurement range can’t be adjusted if RANGE MODE is in “AUTO” mode. The default setting is “100Ω”.

P1 STD:

The standard value of primary parameter includes five measurement parameters of L, C, R, Z and Y for selection. This column is for inputting primary standard value of DUT. The default setting is empty.

P1 HIGH:

This column is for setting the high limit of “P1 STD” standard value. The default setting is empty.

P1 LOW:

This column is for setting the low limit of “P1 STD” standard value. The default setting is empty.

P2 STD:

The standard value of secondary parameter follows “P1 STD” parameter to select corresponded “P2 STD” parameter (PARAMETER2 description in 5.3.2.2 LCRZ SCAN SETUP). The column is for inputting secondary standard value of DUT. The default setting is empty.

P2 HIGH:

This column is for setting the high limit of “P2 STD” standard value. The default setting is empty.

P2 LOW:

This column is for setting the low limit of “P2 STD” standard value. The default setting is empty.

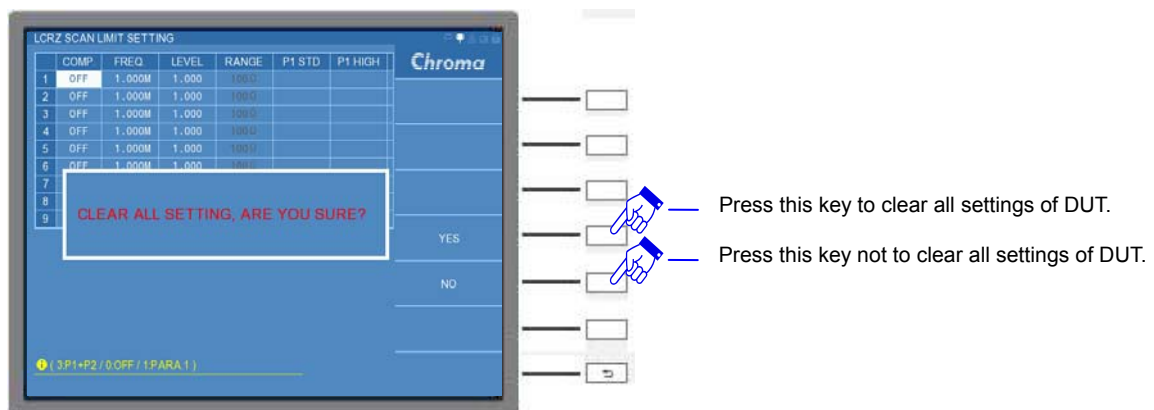
The right screen includes function items of “INPUT MODE”, “CLEAR ALL” and “LIMIT MODE” for selection. Its' descriptions are as the following.

INPUT MODE:

It sets input mode selection. It only can set single column if SINGLE setting is selected. It can edit the entire line for increasing operation speed set by users if ALL setting is selected. The default setting is “SINGLE”.

CLEAR ALL:

It clears all “P1 STD”, “P1 HIGH”, “P1 LOW”, “P2 STD”, “P2 HIGH” and “P2 LOW” parameter settings of DUT. “CLEAR ALL COUNT, ARE YOU SURE?” message will be popped up if “CLEAR ALL” function used. Select YES if all settings to be cleared. Select NO if all settings not to be cleared.



It clears the parameters of “P1 STD”, “P1 HIGH”, “P1 LOW”, “P2 STD”, “P2 HIGH” and “P2 LOW” when executing “CLEAR ALL” function.

Note : “CLEAR ALL” function can’t clear the measured setting parameters of “COMP. ”, “Freq.” and “LEVEL”.

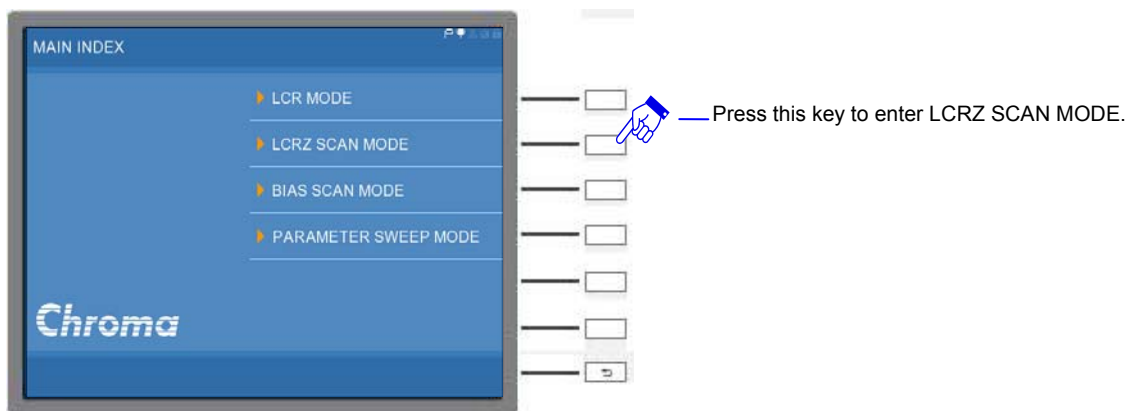
LIMIT MODE:

It selects two high/low limit modes of “ABS” and “%” for selection that applies on the settings of “P1 HIGH”, “P1 LOW”, “P2 HIGH” and “P2 LOW”. The default setting is “ABS”.

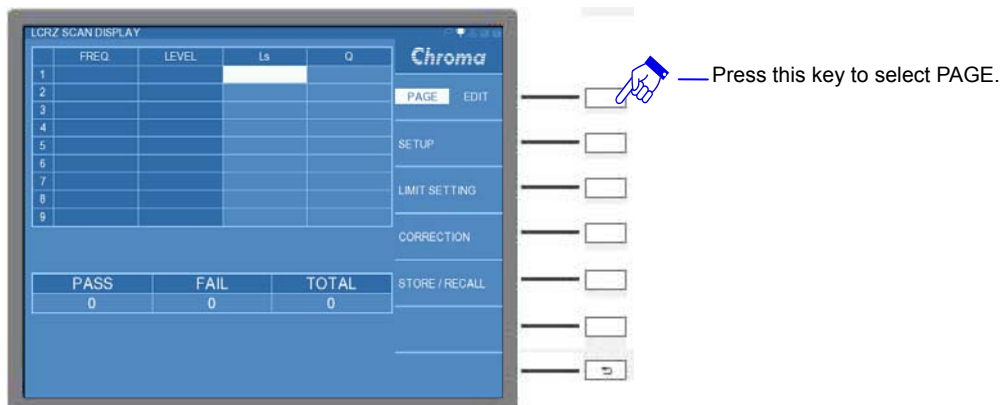
“Operation Example”

Here, use a inductance to do measurement for setting multiple sets (9 sets at most) of different test frequency, voltage level and parameter on DUT processing compare test in long wire application. Before the meter starts measuring (DUT unplaced), it is need to execute open/short/load correction (Load ON) to get the optimum measurement accuracy. The operation method is as the following.

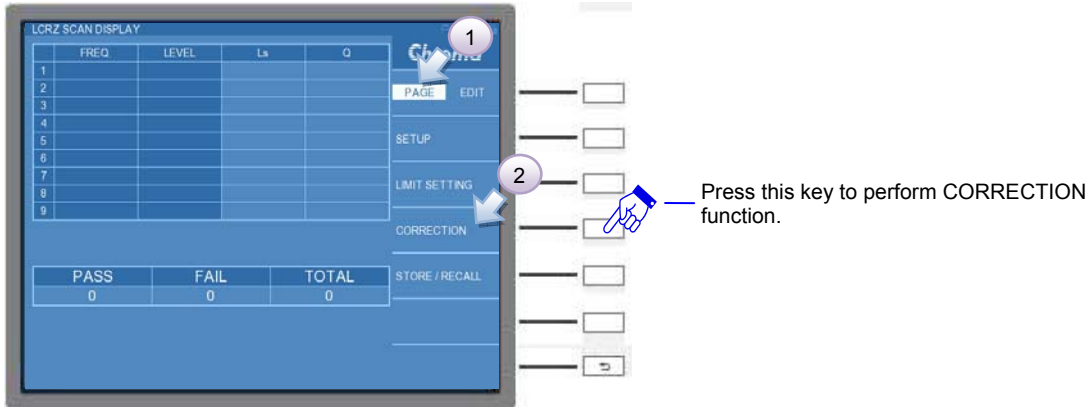
- (1) Place the test long wire and its clamp/fixture(DUT not included) on UNKNOWN four ends BNC terminal after powered-on.
- (2) Press [MAIN INDEX] on DISPLAY UNIT, it enters LCRZ SCAN MODE.



- (3) It enters initial screen in LCRZ SCAN MODE.



- (4) It selects a standard inductance (or GOLDEN SAMPLE of known test value), its parameter value can refer *Table 5-3 Standard Inductance (or GOLDEN SAMPLE of Known Test Value)*. Change the menu to PAGE interface at the right window and press CORRECTION to start processing load correction.



- Note**
- (1) For detail operation, refer the setting in 5.3.1.4 LCR MODE - OPEN /SHORT/LOAD CORRECTION.
 - (2) This example continue to use the operation example in 5.3.1.4 LCR MODE - OPEN /SHORT/LOAD CORRECTION.

The parameter used as Table 5-3 Standard Inductance (or GOLDEN SAMPLE of Known Test Value) shows.

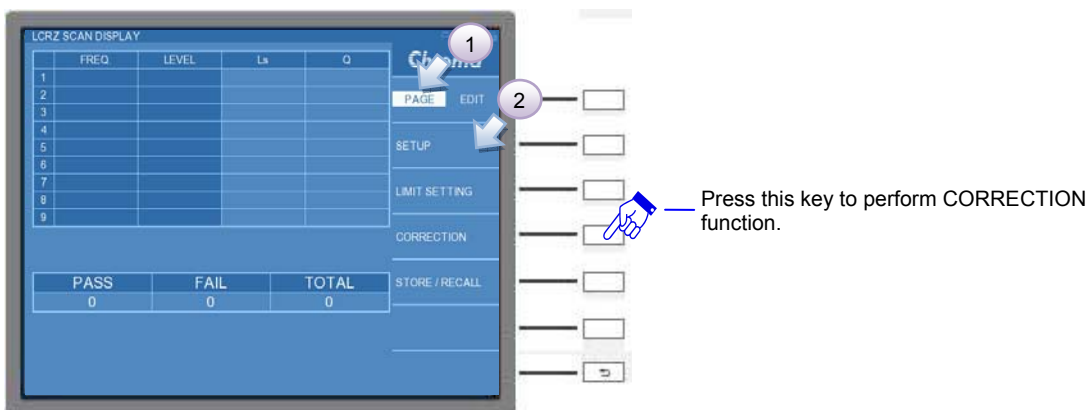
	P1	P2	FREQ.	CKT(S/P)	RANGE	REF.P1	REF.P2
1	Ls	Rs	1M	SERIAL	10Ω	296n	3.4
2	Ls	Rs	3M	SERIAL	10Ω	275n	4.5
3	Ls	Rs	10M	SERIAL	30Ω	246n	5.3

- (5) Open/short/load correction are done to remove standard inductance (or GOLDEN SAMPLE of known test value). Press EXIT or [MEAS DISPLAY] key to return to LCRZ SCAN DISPLAY screen. Inductance parameter specifications of DUT are as the following.

	FREQ	LEVEL	RANGE	Ls	Ls Error	Rs	Rs Error
1	1.000M	1.000	10Ω	296n	±1%	3.4	±1%
2	3.000M	1.000	10Ω	275n	±1%	4.5	±1%
3	10.00M	1.000	30Ω	246n	±1%	5.3	±1%

Table 5-6 DUT – parameter specification of inductance

- (6) It enters LCRZ SCAN SETUP screen if PAGE interface is selected and SETUP function key is pressed as the screen below shows.

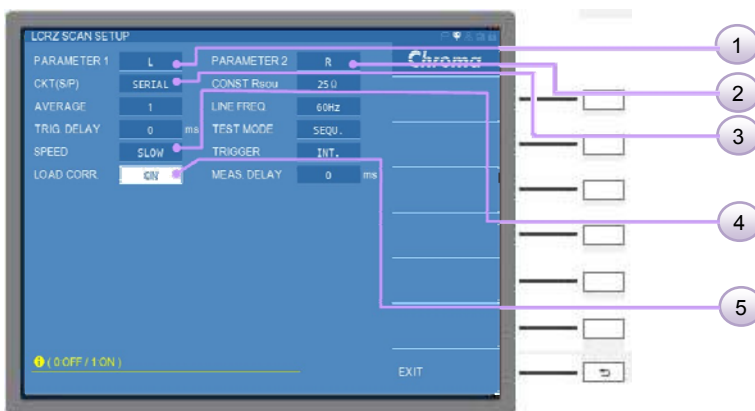




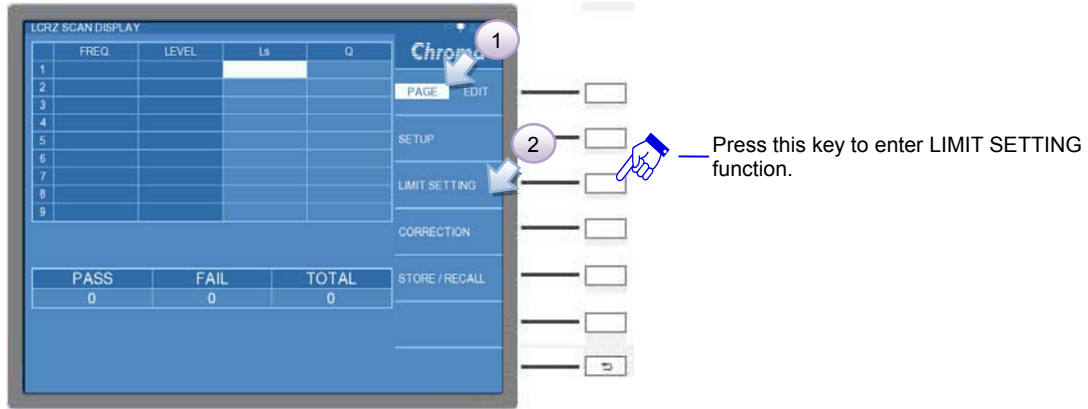
- (7) Please refer *Table 5-7 1 LCRZ SCAN SETUP* and correspond to the numbering sequence in below table after entered LCRZ SCAN SETUP screen. Press RETURN to exit from the parameter menu after the setting completed.

Step	Function	Parameter Setting	Unit	Remark
1	PARAMETER1	Ls		
2	PARAMETER2	Rs		
3	CKT(S/P)	SERIAL		
4	SPEED	SLOW		
5	LOAD CORR.	ON		

Table 5-7 1 LCRZ SCAN SETUP



- (8) Press EXIT or [MEAS. DISPLAY] key to return to LCRZ SCAN DISPLAY screen after the setting of LCRZ SCAN SETUP function is completed. Select PAGE interface again and press LIMIT SETTING function key.



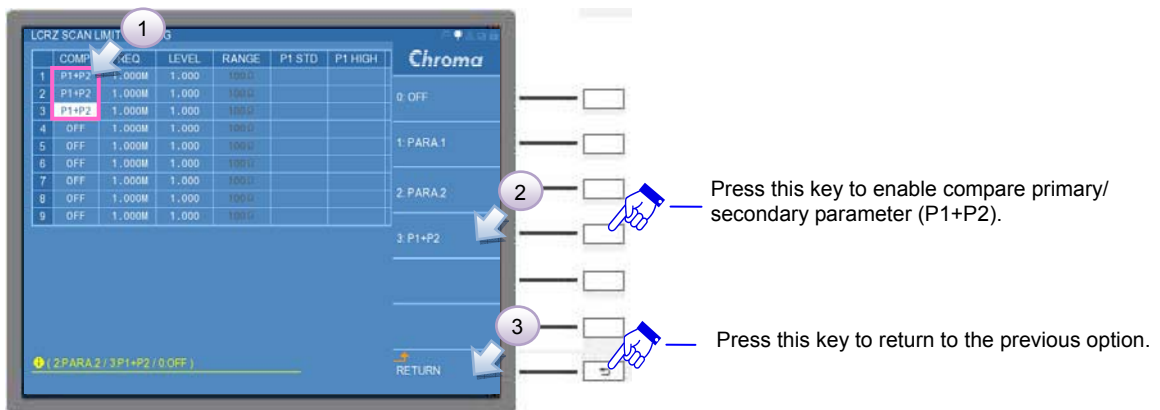
(9) It enters LCRZ SCAN LIMIT SETTING screen, refer test item 1~3 in *Table 5-6 DUT – parameter specification of inductance.*



The detail settings in the table are as the following.

COMP. setting

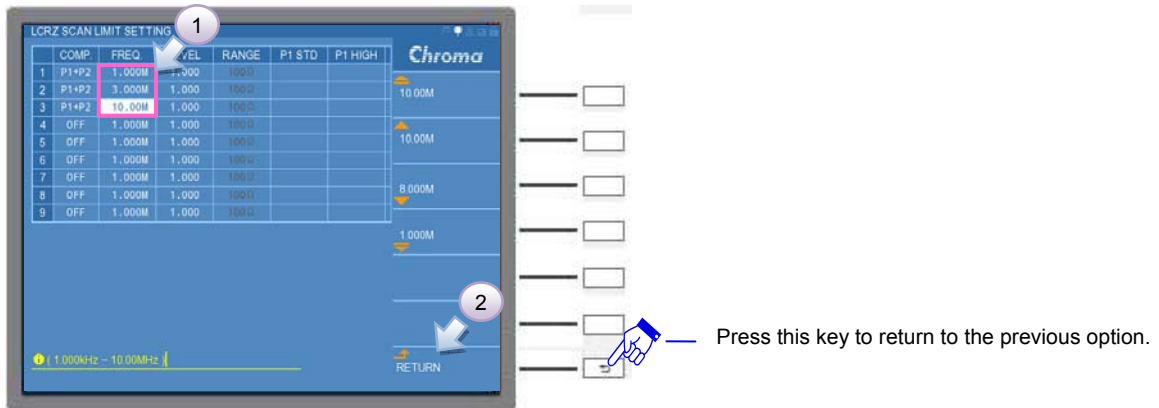
Use the direction key of (▲, ▼, ◀, ▶) on DISPLAY UNIT to move the cursor to COMP. column of test item 1. The compare primary/secondary parameter (P1+P2) is enabled, test item 2~3 also be operated by the same method. Press RETURN key and exit from the parameter menu after the setting is completed.



FREQ. setting

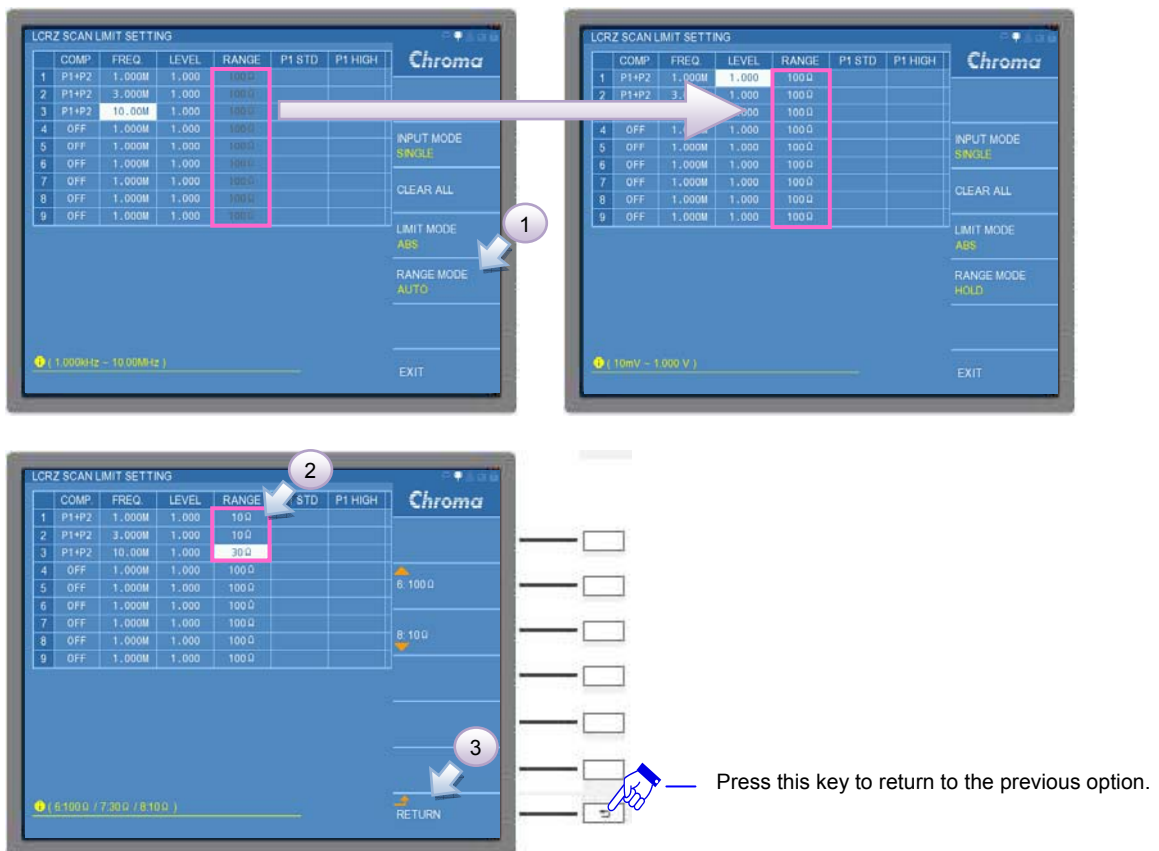
Use the direction key of (▲, ▼, ◀, ▶) on DISPLAY UNIT to move the cursor to FREQ. column of test item 1. The test item 1 is set to 1MHz, the test item 2 is inputted

to 3MHz and the test item 3 is inputted to 10MHz by the same method. Press RETURN key and exit from the parameter menu after the setting is completed.



RANGE setting

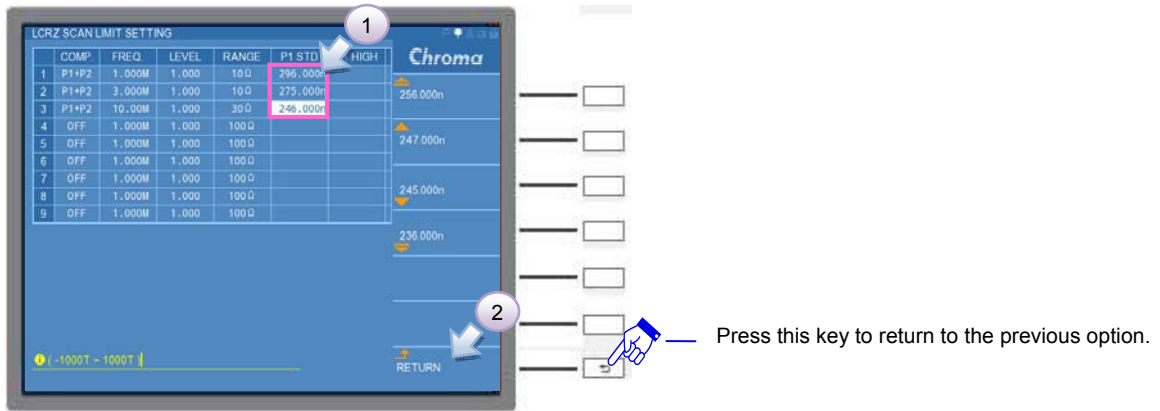
Please switch RANGE MODE at right menu of window from AUTO to HOLD, meanwhile the font on RANGE column will be changed from black can't be entered to white can be entered. Use the direction key of (▲, ▼, ◀, ▶) on DISPLAY UNIT to move the cursor to RANGE column of test item 1. The test item 1 is set to 10Ω, the test item 2 is inputted to 10Ω and the test item 3 is inputted to 30Ω by the same method. Press RETURN key and exit from the parameter menu after the setting is completed.



P1 STD setting

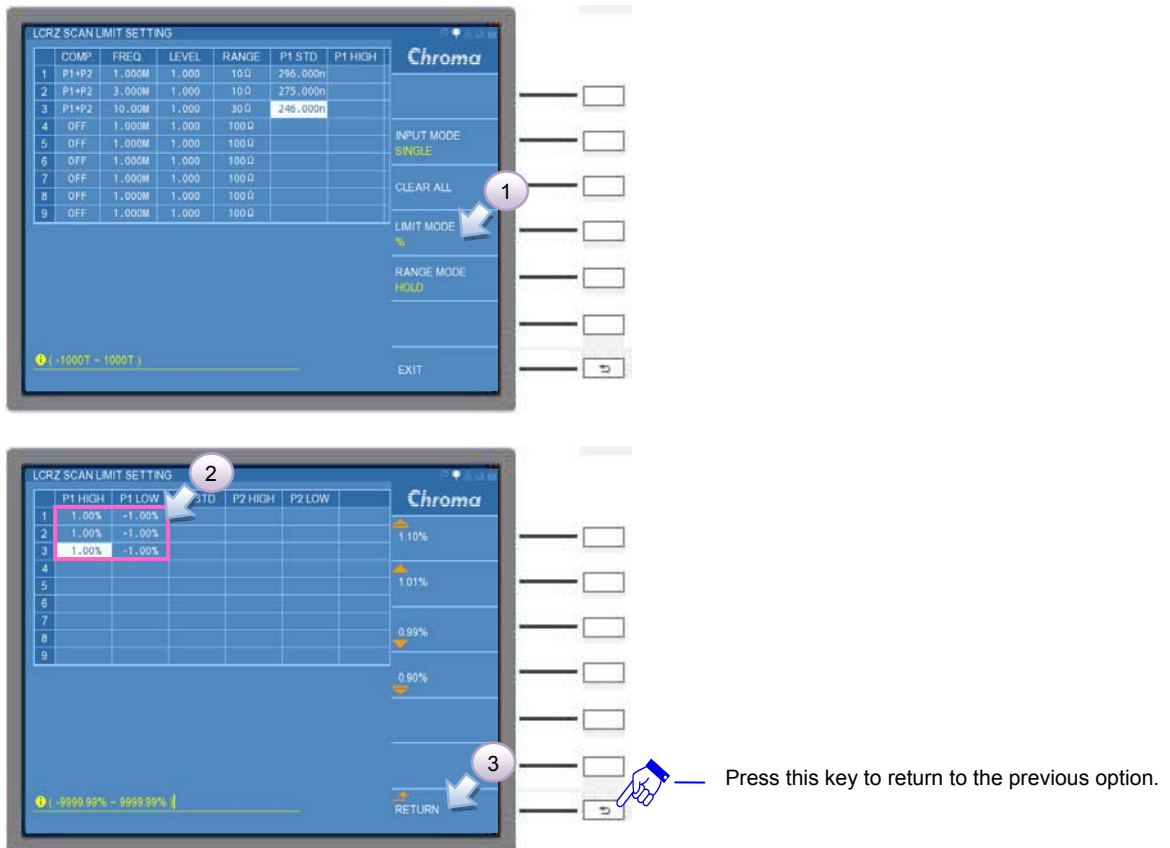
Use the direction key of (▲, ▼, ◀, ▶) on DISPLAY UNIT to move the cursor to STD

column of test item 1. The test item 1 is set to 296nF, the test item 2 is inputted to 275nF and the test item 3 is inputted to 246nF by the same method. Press RETURN key and exit from the parameter menu after the setting is completed.



P1 HIGH/LOW setting

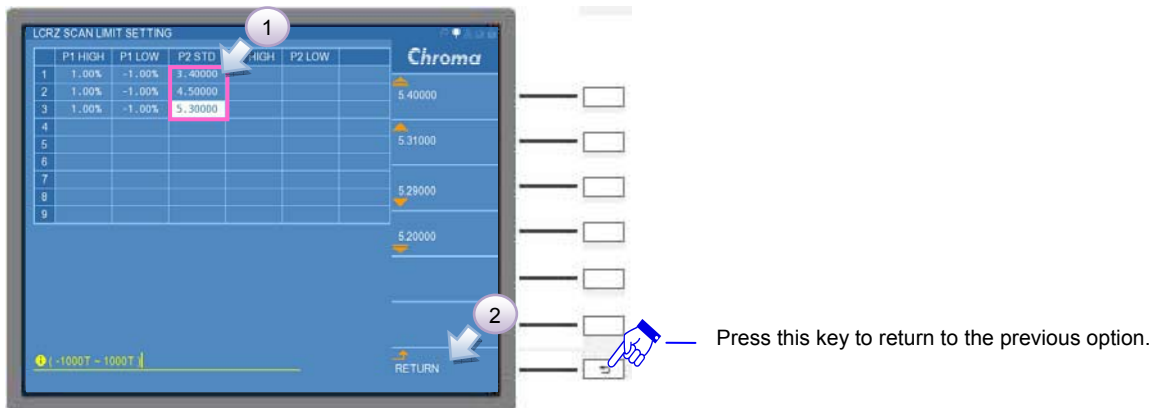
Please switch LIMIT MODE at right menu of window from ABS to % that makes HIGH/LOW column for setting ±%. Use the direction key of (▲, ▼, ◀, ▶) on DISPLAY UNIT to move the cursor to P1 HIGH column of test item 1. The test item 1 is set to 1% and the test items 2~3 are inputted to 1% by the same method. Press RETURN key and exit from the parameter menu after the setting is completed.



P2 STD setting

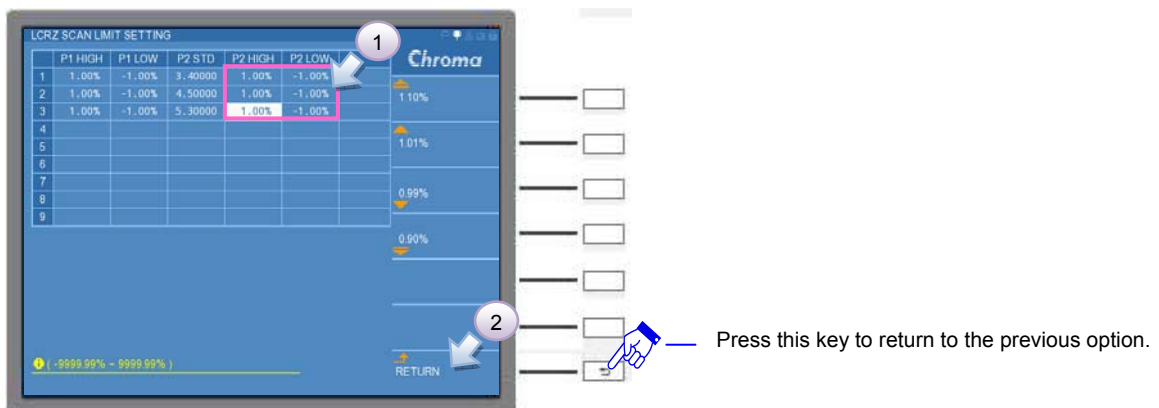
Use the direction key of (▲, ▼, ◀, ▶) on DISPLAY UNIT to move the cursor to P2 STD column of test item 1. The test item 1 is set to 3.4 (Ω), the test item 2 is inputted to

4.5(Ω) and the test item 3 is inputted to 5.3(Ω) by the same method. Press RETURN key and exit from the parameter menu after the setting is completed.

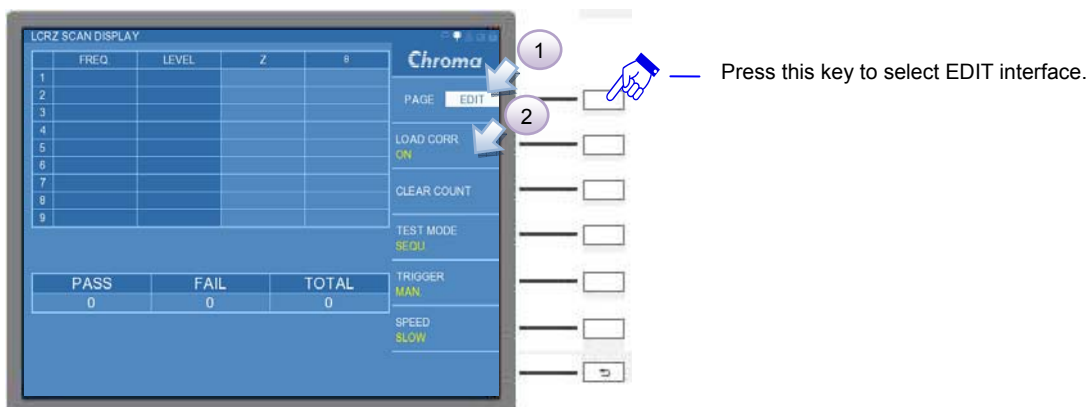


P2 HIGH/LOW setting

Use the direction key of (\uparrow , \downarrow , \leftarrow , \rightarrow) on DISPLAY UNIT to move the cursor to P2 HIGH column of test item 1. The test item 1 is set to 1% and the test items 2~3 are inputted to 1% by the same method. Press RETURN key and exit from the parameter menu after the setting is completed.



(10) Press EXIT or [MEAS DISPLAY] key to return to LCRZ SCAN DISPLAY screen after the setting of LIMIT SETTING function is completed. It switches the interface to EDIT and sets LOAD CORR. to ON.



(11) Press [START] key to start measuring after placing the DUT.



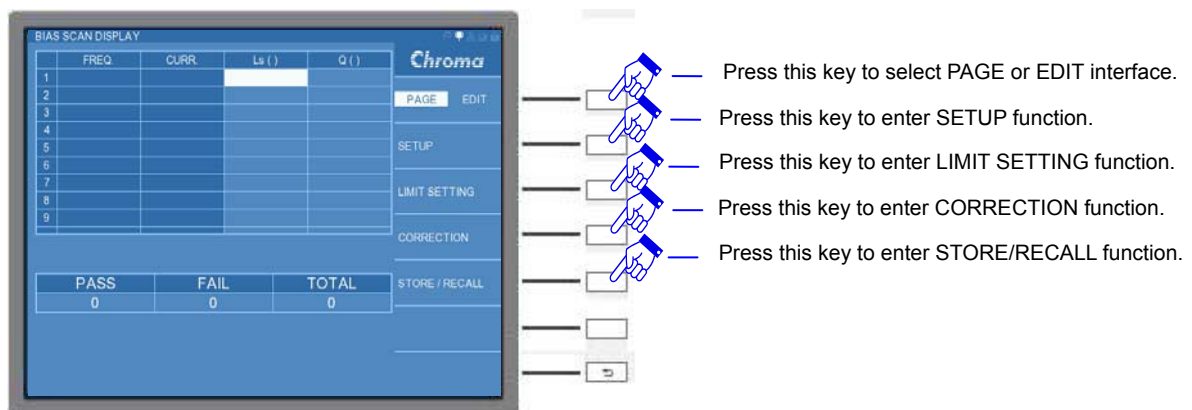
Note

- (1) The texts of FREQ. and LEVEL columns in LCRZ SCAN DISPLAY are yellow font thus it represents the test item in conformity with load correction setting.
- (2) Primary/secondary parameter, test frequency and range setting in SETUP and LIMIT SETTING function of PAGE interface should be the same as load correction setting that the function can be work. Otherwise, the load correction function will be lost.

5.3.3 BIAS SCAN MODE Operation

5.3.3.1 BIAS SCAN DISPLAY Description

It enters BIAS SCAN DISPLAY and the table in the middle of screen displays test frequency users' set along with the measurement result voltage corresponded. The lower of screen displays test result of comparison function and the right of screen displays parameter setting of test function as the screen below.



Select PAGE interface at right screen and related descriptions as the following.

SETUP:

The basic setup includes parameter setting to be measured such as measurement parameter (L and Z), AVERAGE, SPEED, etc.

LIMIT SETTING:

It sets test frequency, test voltage, high limit of DUT, etc.

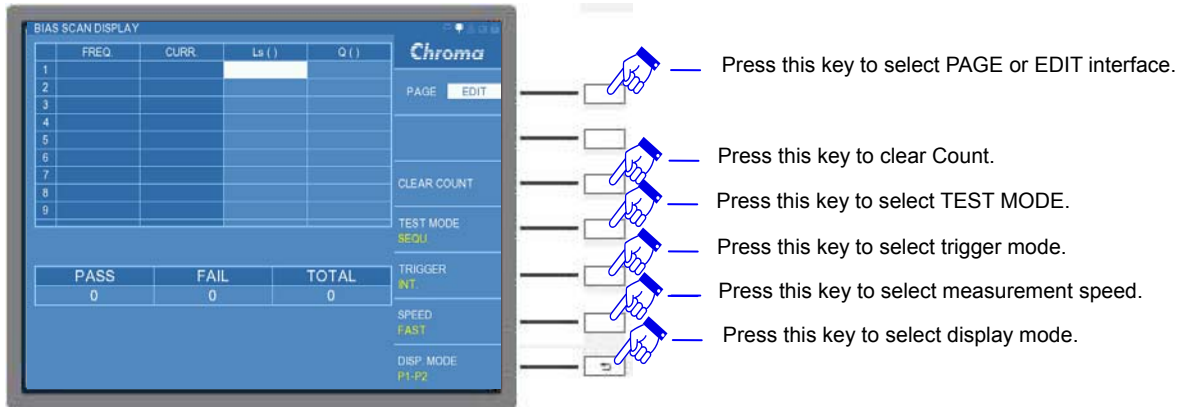
CORRECTION:

It corrects open/short circuit. See 5.3.1.2 for operation description.

STORE/RECALL:

It archives the data. See 5.3.1.7 for operation description.

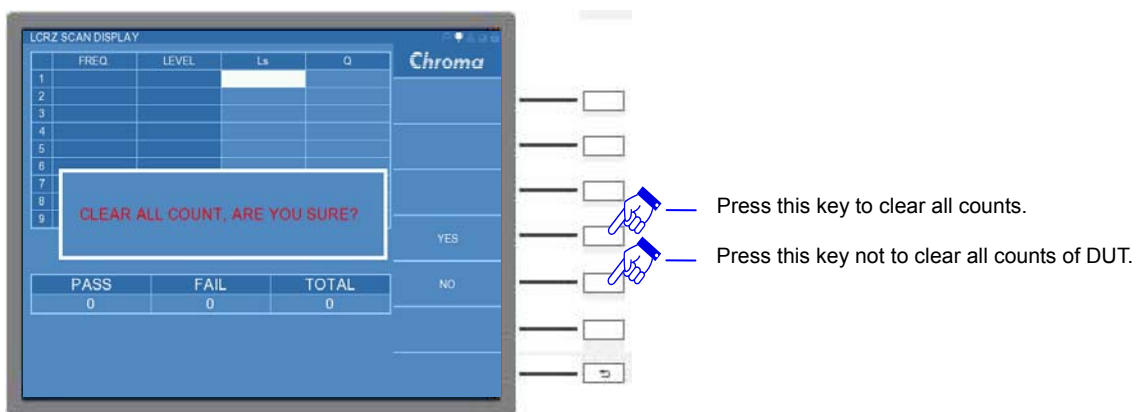
It selects EDIT interface at right screen as the following.



The functions in EDIT interface except for “CLEAR COUNT” and “DISP. MODE ” functions, other functions of “TEST MODE”, “TRIGGER” and “SPEED” will be synchronizd with SETUP under PAGE interface. Users can fast operate it under EDIT interface. Here supplementary explanations for “CLEAR COUNT” and “DISP. MODE” functions.

CLEAR COUNT:

It clears count. It selects CLEAR COUNT and “CLEAR ALL COUNT, ARE YOU SURE?” message popped up if compare result to be calculated again. Select YES if all counts to be cleared. Select NO if all counts not to be cleared.



DISP. MODE:

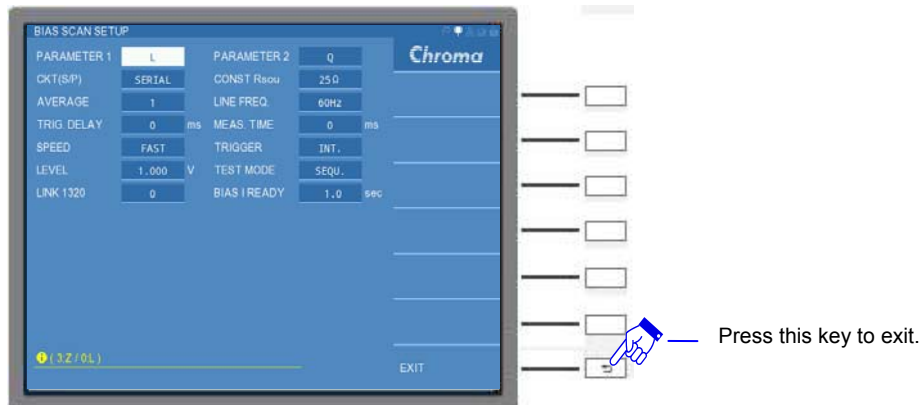
It displays mode setting which includes three states of “P1-P2” (primary/secondary parameter display), “P1-P1%” (primary parameter value & primary parameter percentage display), and “P1%-P2” (primary parameter percentage/secondary parameter value display). The default setting is “P1-P2”.

The following subsection describes SETUP and LIMIT SETTING separately in PAGE

interface. For CORRECTION, see section 5.3.1.2 and STORE/ RECALL see section 5.3.1.7.

5.3.3.2 BIAS SCAN MODE SETUP

It enters BIAS SCAN SETUP screen if PAGE interface at right screen is selected and SETUP function key is pressed as the screen below shows.



BIAS SCAN SETUP descriptions are as follows.

PARAMETER1:

It selects primary parameter which includes L and Z for selection. The default setting is “L”.

PARAMETER2:

It selects secondary parameter which follows the setting of primary parameter to coordinate with different secondary parameter. The default setting is “Q”.

CKT (S/P):

It selects equivalent circuit (series/parallel) mode which includes “SERIAL” and “PARALLEL” modes. The default setting is “SERIAL”.

CONST R_{sou}:

It selects output impedance mode which includes three modes of “OFF”, “100Ω” and “25Ω” for selection. The default setting is “25Ω”.

AVERAGE:

It sets average time for measurement. By choosing the average setting such as “1”, the program will take average in each time of measurement. If it is set to “2”, the program will take average in two times of measurement. Following test can be deduced accordingly and the setting range is ‘1~10’. The default setting is “1”.

LINE FREQ.:

It selects input AC power mode. To select the correct line frequency will be helpful to the stability and accuracy of test value. It includes three selections of “50Hz”, “60Hz” and “N/A”; “N/A” indicates not to consider power frequency but test speed increased. The default setting is “60Hz”.

TRIG. DELAY:

When it is used with auto machinery, external trigger EXT for coordinating with the action of

auto machinery needs to delay the meter trigger. Thus users can adjust TRIGGER DELAY time, its setting range is "0~9999"ms. The default setting is "0"ms.

MEAS. TIME:

It measures the time which can set how many times to read the measurement, the setting range is "0~99999" ms. The default setting is "0"ms.

SPEED:

It measures speed mode which includes "FAST", "MEDIUM" and "SLOW" for selection. The default setting is "FAST".

TRIGGER:

It selects trigger mode which includes "INT", "MAN", "EXT" and "BUS" for selection. The default setting is "INT".

LEVEL:

It sets test voltage level that the test voltage range is 10mV~1V for selection. The default setting is "1V".

TEST MODE:

It executes test mode which includes "SEQU" or "STEP" measurement for selection. The default setting is "SEQU".

LINK 1320:

It sets the device number for connecting 1320. The current level setting will follow the number of connected 1320 to supply bias current and the maximum setting is 15 sets. The default setting is "0".

Note

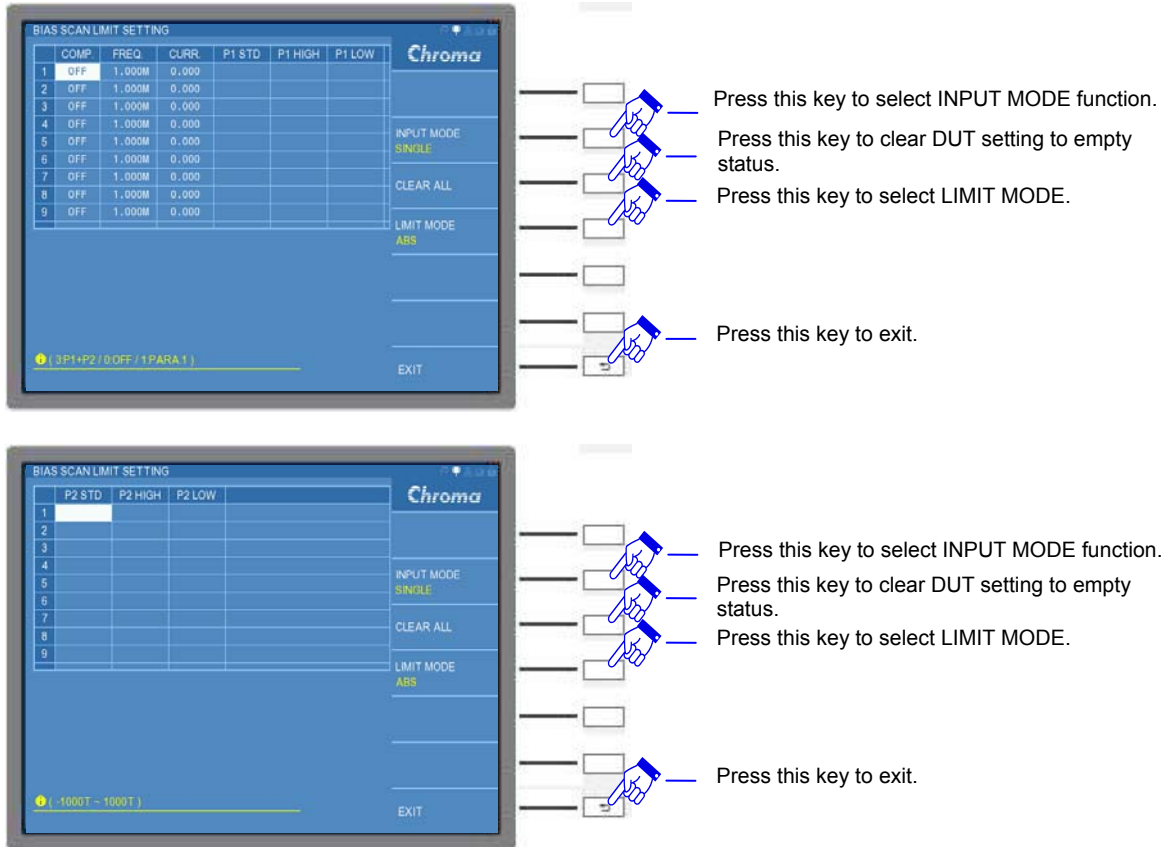
1. A set of 1320 can supply $\pm 20A$ current.
2. Power-on sequence, 11050 first and next 1320 when adding DC bias current source 1320 to 11050.
3. Use 2014 delivered version of DC Bias Current Source 1320. Please contact Chroma's customer service if there is problem about 1320 version.

BIAS I READY:

It sets current stable time that is for coordinating DELAY.T setting after outputting bias current source 1320. The 11050 needs to be set $\geq 10s$ for measurement when 1320 DELAY TIME setting is 10s. BIAS I READY control range is "0.1~100"s and the default setting is "0" s.

5.3.3.3 BIAS SCAN LIMIT SETTING

It enters BIAS SCAN LIMIT SETTING screen if PAGE interface at right screen is selected and LIMIT SETTING function key is pressed as the screen below shows.



Note The compare measurement parameter includes nine settings, “P2 STD”, “P2 HIGH” and “P2 LOW” parameter settings can’t be displayed on the same screen due to the restriction of column width. Control the cursor direction control key of (◀, ▶) on DISPLAY UNIT unitl parameter columns of “P2 STD”, “P2 HIGH” and “P2 LOW” are seen.

The screen is divided into central table and right column that will be explained separately as the following.

The central table displays nine parameters of “COMP. ”, “Freq.”, “CURR.”, “P1 STD”, “P1 HIGH”, “P1 LOW”, “P2 STD”, “P2 HIGH”, “P2 LOW”, etc. Three parameters of “COMP. ”, “Freq.” and “CURR.” are setting conditions for users measuring on the DUT, other parameters of “P1 STD”, “P1 HIGH”, “P1 LOW”, “P2 STD”, “P2 HIGH” and “P2 LOW” indicate DUTs’ parameter setting. The left screen labelled column 1~9 for users additional setting 9 different test conditions and comparisons. Descriptions for setting parameters are as the following.

COMP.:

It sets compare mode. Users can select single parameter or two parameters for comparison, operation modes are: “OFF”, “PARA.1”, “PARA.2” and “P1+P2”. The default setting is “OFF”.

⚡ CAUTION The LCRZ SCAN DISPLAY can’t display measurement result and respresented by blank when COMP. is set to to OFF.

Freq.:

It can set measurement frequency range from 1 kHz to 10MHz. The default setting is

“1.000M”.

CURR.:

It sets test current. The meter can't set the current when DC Bias Current Source 1320 doesn't be connected. Select the number in LINK 1320 option first and then set bias current value in CURR option when connecting DC Bias Current Source 1320. The default setting is “0.000” A.

Note

1. A set of 1320 can supply $\pm 20A$ current.
2. Power-on sequence is 11050 first and 1320 followed when adding DC bias current source 1320 to 11050.
3. Use 2014 delivered version of DC Bias Current Source 1320. Please contact Chroma's customer service if there is problem about 1320 version.

P1 STD:

This column is for inputting primary standard value of DUT. The default setting is empty.

P1 HIGH:

This column is for setting the high limit of “P1 STD” standard value. The default setting is empty.

P1 LOW:

This column is for setting the low limit of “P1 STD” standard value. The default setting is empty.

P2 STD:

The column is for inputting secondary standard value of DUT. The default setting is empty.

P2 HIGH:

This column is for setting the high limit of “P2 STD” standard value. The default setting is empty.

P2 LOW:

This column is for setting the low limit of “P2 STD” standard value. The default setting is empty.

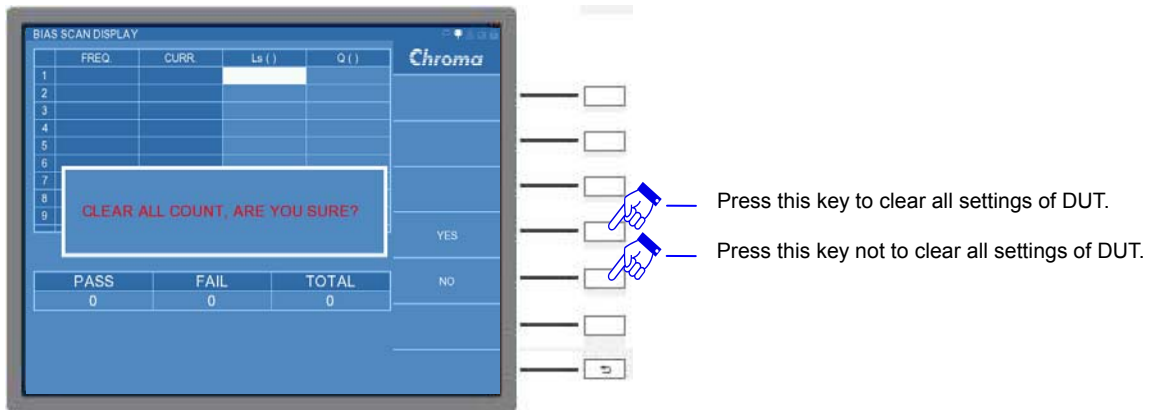
The right screen includes function items of “INPUT MODE”, “CLEAR ALL” and “LIMIT MODE” for selection. Its' descriptions are as the following.

INPUT MODE:

It sets input mode selection. It only can set single column if SINGLE setting is selected. It can edit the entire line for increasing operation speed set by users if ALL setting is selected. The default setting is “SINGLE”.

CLEAR ALL:

It clears all “P1 STD”, “P1 HIGH”, “P1 LOW”, “P2 STD”, “P2 HIGH” and “P2 LOW” parameter settings of DUT. “CLEAR ALL COUNT, ARE YOU SURE?” message will be popped up if “CLEAR ALL” function used. Select YES if all settings to be cleared. Select NO if all settings not to be cleared.



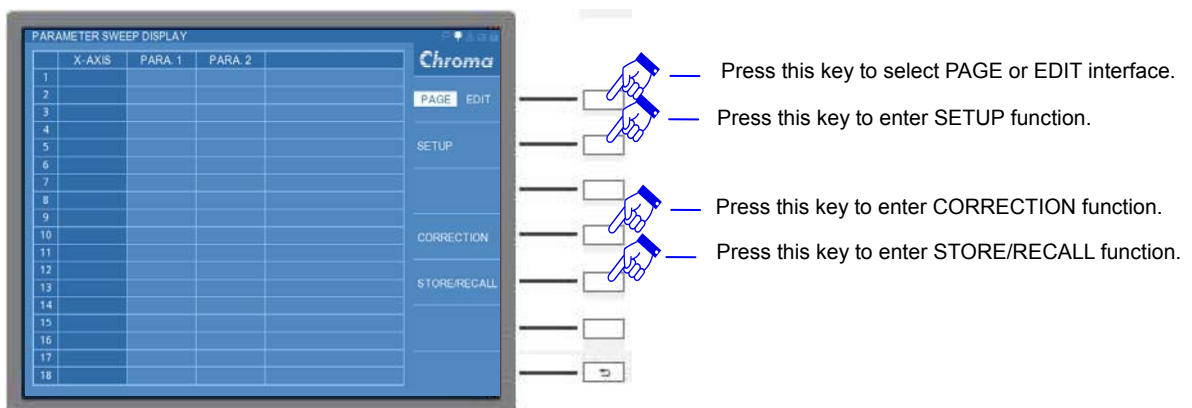
LIMIT MODE:

It selects two high/low limit modes of "ABS" and "%" for selection that applies on the settings of "P1 HIGH", "P1 LOW", "P2 HIGH" and "P2 LOW". The default setting is "ABS".

5.3.4 PARAMETER SWEEP MODE Operation

5.3.4.1 PARAMETER SWEEP DISPLAY Description

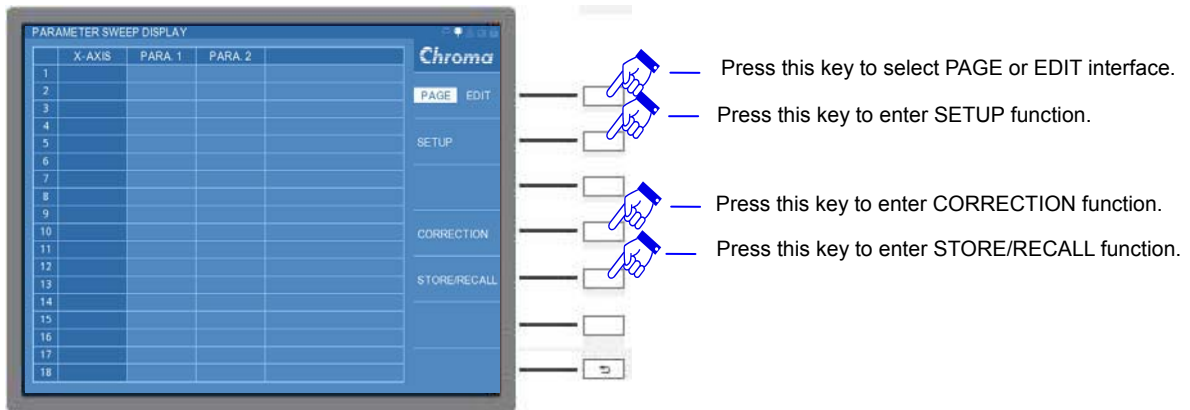
It enters PARAMETER SWEEP DISPLAY as the screen below.



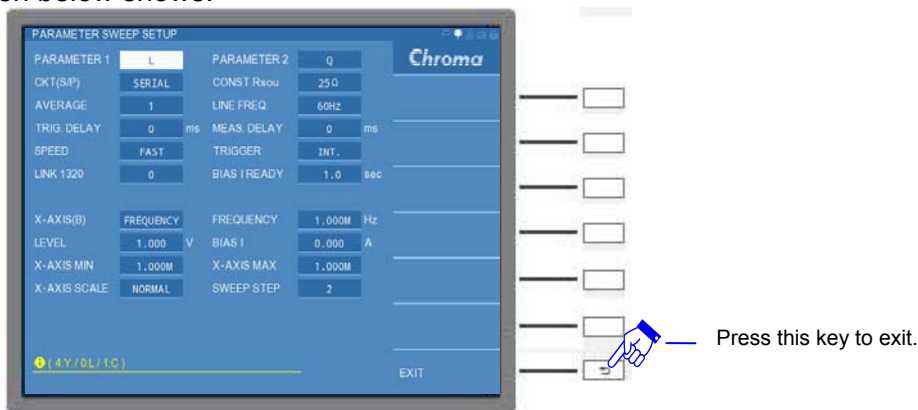
The subsections in the following introduces SETUP function in PAGE interface and three display modes in EDIT interface. It also attaches operation example as users' setting reference. For CORRECTION and STORE/ RECALL in PAGE interface, please refer separate section 5.3.1.2 and 5.3.1.6 in user's manual.

5.3.4.2 Parameter Sweep Setup

Make sure if the setting item at the right of PARAMETER SWEEP DISPLAY screen is switched to PAGE interface and the figure as below shows.



Next to select SETUP function for entering PARAMETER SWEEP SETUP screen as the screen below shows.



Setting descriptions for PARAMETER SWEEP SETUP screen are as the following.

Setting descriptions for the upper block are given as below.

PARAMETER1:

It is primary parameter that includes five measurement parameters of “L”, “C”, “R”, “Z” and “Y” for selection. The default setting is “L”.

PARAMETER2:

It is secondary parameter that follows primary parameter setting for coordinating with different secondary parameters. The default setting is “Q”.

CKT(S/P):

It is for selecting equivalent circuit SERIAL or PARALLEL mode. The default setting is SERIAL.

CONST Rsou:

It selects output resistance mode including three modes of “OFF”, “100Ω” and “25Ω” for selection. The default setting is “25Ω”.

AVERAGE:

It sets average time of measurement. Select the average setting as “1”, the program will take average in each time of measurement. If the setting is “2”, the program will take average in two times of measurements. Following test can be deduced accordingly. The setting range is “1~10”, the default setting is “1”.

LINE FREQ.:

It selects input AC power mode. The correct power frequency selection helps stability and correctness of test value. Three selections of "50Hz", "60Hz" and "N/A" for range. "N/A" indicates not consider power frequency but test speed will be faster. The default setting is "60Hz".

TRIG. DELAY:

When it connects with automatic machine, external trigger EXT for coordinating with its action. Meanwhile, the trigger action of meter needs to be delayed thus users can adjust TRIGGER DELAY time. Its setting range is "0~9999" ms and default setting is "0" ms.

MEAS. DELAY:

It is for PARAMETER1 as additional function of DCR measurement. The inductance is with transient effect thus the instrument confirm the stability of DUT signal first in testing inductance. If DUT signal is stable thus it enters measurement at once, it enters measurement after MEAS. DELAY TIME if the signal is unstable. Control range of MEAS. DELAY TIME is "0~99999"ms. The default setting is "0" ms.

SPEED:

It sets measurement speed that includes FAST, MEDIUM and SLOW for selection. The default setting is FAST.

TRIGGER:

It selects trigger mode that includes "INT", "MAN", "EXT" and "BUS". The default setting is "INT".

LINK 1320:

It sets the number for connecting 1320. BIAS I setting current follows linked 1320 quantity to provide bias current for setting if 1320 number is set. The maximum setting is 15 sets and the default setting is "0".

- 註
1. A set of 1320 provides $\pm 20A$.
 2. Power-on sequence is 11050 first and 1320 next when adding DC Bias Current Source 1320 to 11050.
 3. Use 2014 delivered version of DC Bias Current Source 1320. Please contact Chroma's customer service if there is problem about 1320 version.

BIAS I READY:

It sets current stable time that is for coordinating DELAY.T setting after outputting bias current source 1320. The 11050 needs to be set $\geq 10s$ for measurement when 1320 DELAY TIME setting is 10s. BIAS I READY control range is "0.1~100"s and the default setting is "0" s.

Setting descriptions for the lower block are given as below.

X-AXIS (B):

It selects X-axis parameters of FREQUENCY, VOLTAGE and CURRENT. The default setting is "FREQUENCY".

FREQUENCY:

It can set measurement frequency range from 1 kHz to 10MHz. The default setting is "1.000M" Hz.

Note FREQUENCY column will lose functionality and won't be included in

- measurement setting parameter if X-AXIS (B) setting is FREQUENCY.

LEVEL:

It can select test voltage range of 10mV~1V. The default setting is "1.000" V.

- Note** ■ LEVEL column will lose functionality and won't be included in measurement setting parameter if X-AXIS (B) setting is VOLTAGE.

BIAS I:

It sets bias current value. The meter can't set the current when DC Bias Current Source 1320 doesn't be connected. Select the number in LINK 1320 option first and then set bias current value in BIAS I option when connecting DC Bias Current Source 1320. The default setting is "0.000" A.

- Note** ■
1. BIAS I column will lose functionality and won't be included in measurement setting parameter if X-AXIS (B) setting is CURRENT.
 2. A set of 1320 can supply ± 20 A current.
 3. Power-on sequence is 11050 first and 1320 followed when adding DC bias current source 1320 to 11050.
 4. Use 2014 delivered version of DC Bias Current Source 1320. Please contact Chroma's customer service if there is problem about 1320 version.

X-AXIS MIN:

The minimum display value setting of X-axis follows X-AXIS (B) selected three settings of FREQUENCY, VOLTAGE and CURRENT to correspond relative frequency, voltage and current. The initial X-AXIS (B) sets to FREQUENCY and its X-AXIS MIN test range can be set from 1kHz to 10MHz. The default setting is "1.000M".

- Note** ■
1. The min test range can be set from 10mV to 1V when X-AXIS (B) = VOLTAGE. The default setting is "1.000".
 2. The min test range can be set from 0mV to 0.00A when X-AXIS (B) = CURRENT. The default setting is "0.000".
 3. The min test range can be set from -20A to 20.00A when X-AXIS (B) = CURRENT and LINK 1320=1. The default setting is "0.000".
 4. The min test range can be set from $-20 \times N$ A to $20.00 \times N$ A when X-AXIS (B) = CURRENT and LINK 1320=N set (maximum is 15 sets). The default setting is "0.000".

X-AXIS MAX:

The maximum display value setting of X-axis follows X-AXIS (B) selected three settings of FREQUENCY, VOLTAGE and CURRENT to correspond relative frequency, voltage and current. The X-AXIS (B) sets to FREQUENCY and its X-AXIS MAX test range can be set from 1kHz to 10MHz. The default setting is "1.000M".

- Note** ■
1. The max test range can be set from 10mV to 1V when X-AXIS (B) = VOLTAGE. The default setting is "1.000".
 2. The max test range can be set from 0mV to 0.00A when X-AXIS (B) = CURRENT. The default setting is "0.000".
 3. The max test range can be set from -20A to 20.00A when X-AXIS (B) = CURRENT and LINK 1320=1. The default setting is "0.000".
 4. The max test range can be set from $-20 \times N$ A to $20.00 \times N$ A when X-AXIS (B) = CURRENT and LINK 1320=N set (maximum is 15 sets). The default setting is "0.000".

X-AXIS SCALE:

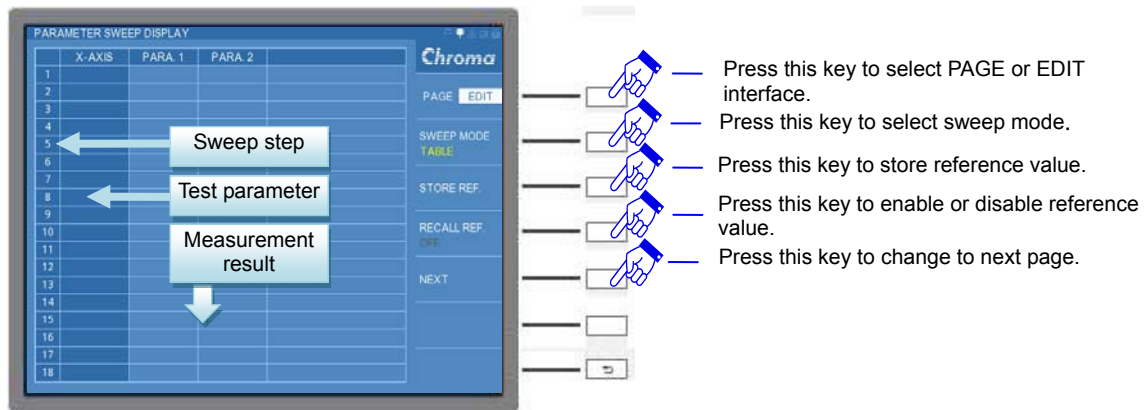
It sets x-axis scale level which can select NORMAL and LOGARITHM. The default setting is "NORMAL".

SWEEP STEP:

It sets sweep step which its range can be set as 2 ~ 401 steps. The default setting is "2".

5.3.4.3 Sweep Result Display - TABLE MODE Description & Operation

There are three measurement result display modes in PARAMETER SWEEP MODE, the 1st one is TABLE MODE. The sweep measurement result is represented by the table method for users confirming test parameter corresponded measurement value of DUT set via checking table method. Operation method is to select SWEEP MODE in EDIT interface to "TABLE" as the figure below shows.



The table in the middle of screen from left to right are labelled as: sweep step (step 2~401), X-AXIS test parameter (frequency, voltage and current), PARA.1 (primary parameter measurement result of DUT) and PARA.2 (secondary parameter measurement result of DUT).

EDIT interface function at right screen.

SWEEP MODE:

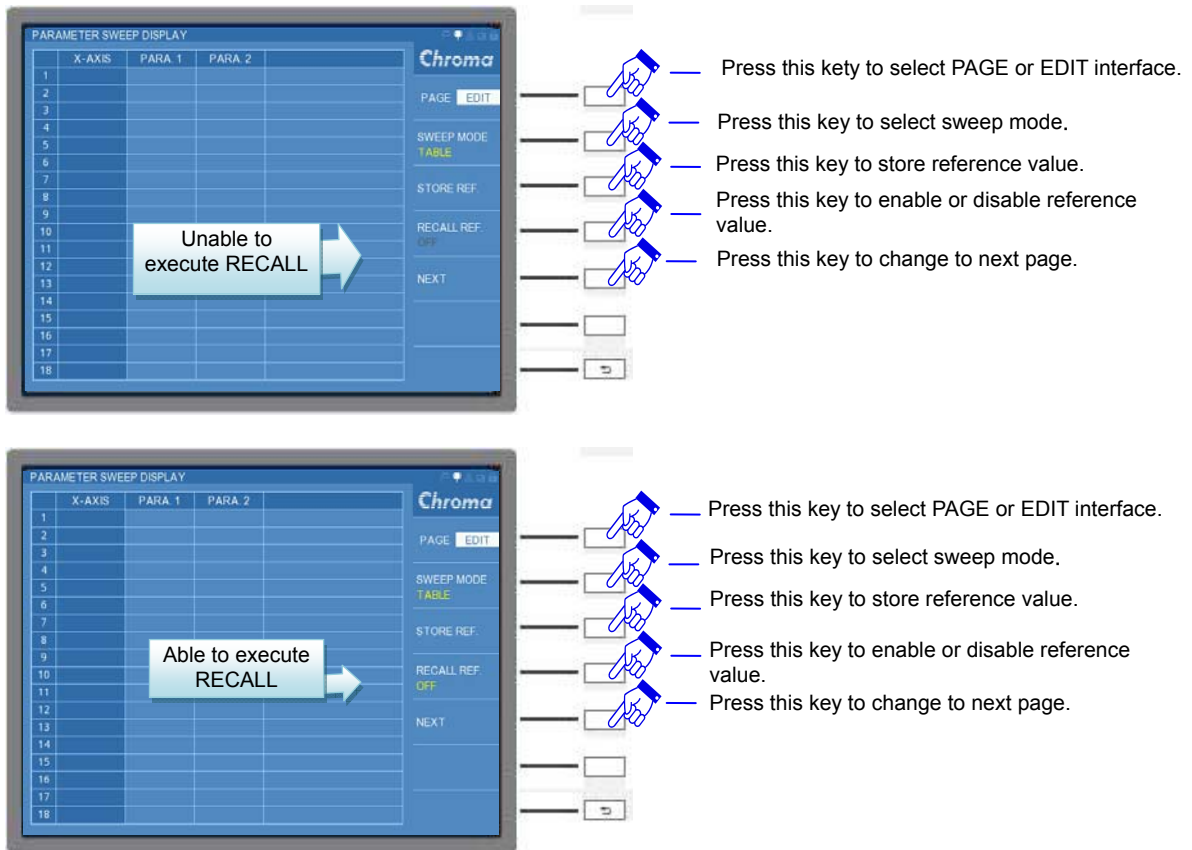
There are three modes of TABLE, PLOT and PLOT_R to represent measurement result. The default setting is "TABLE".

STORE REF:

It stores reference value. Executing this function is to store reference value of standard object for other DUTs' parameter comparison.

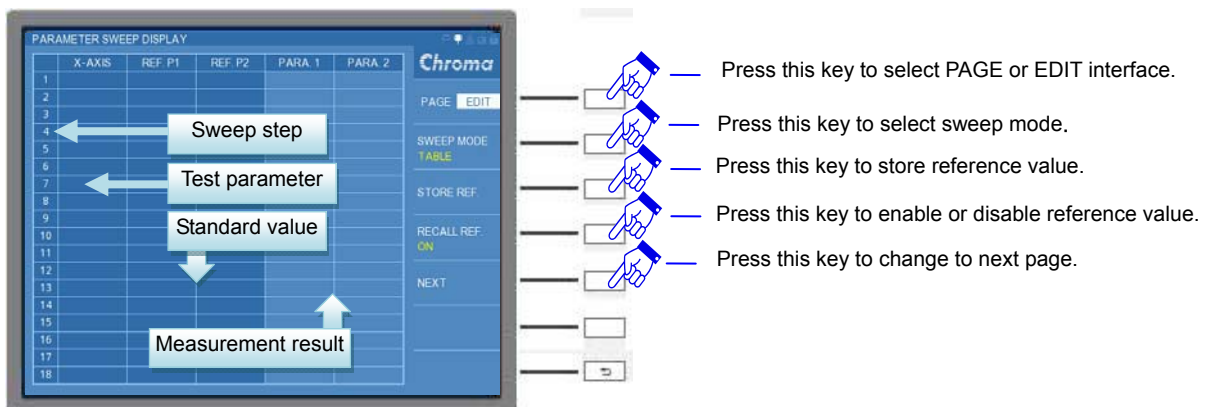
RECALL REF:

It recalls the previous saved reference value. "RECALL REF" function will turn from not operational mode to executable "ON/OFF" switch as the figure below shows. The default setting is "OFF".



- Note**
- RECALL REF. function will return to the status can't be executed when the meter powered-on. There are two conditions can be triggered.
 - It selects "STORE REF".
 - SETUP parameter status in PAGE interface is the same as the previous setting before power-on such as PARAMETER1, PARAMETER2, X-AXIS (B), X-AXIS MIN, X-AXIS MAX and X-AXIS SCALE.
 - ※ The function above only record a reference value for once. It can't record several reference values with simultaneous.

If RECALL REF. is set to ON thus the screen will increase standard value columns of REF. P1 and REF. P2 as the figure below.



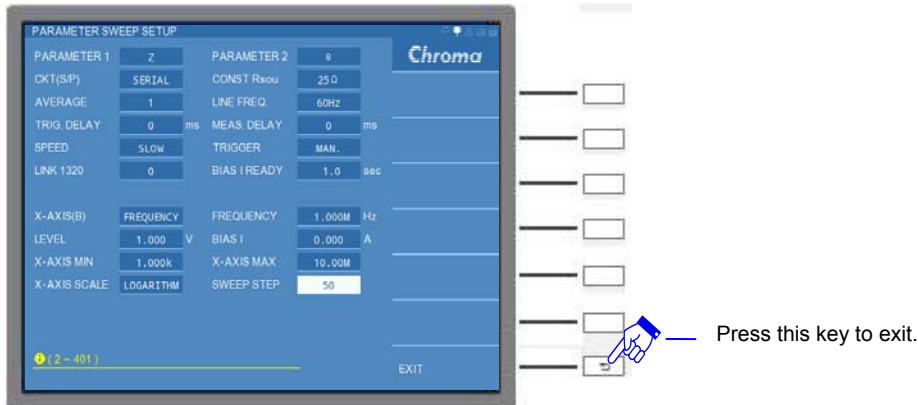
NEXT:

It switches to the next page. Each page only can show 18 entries measurement results, the

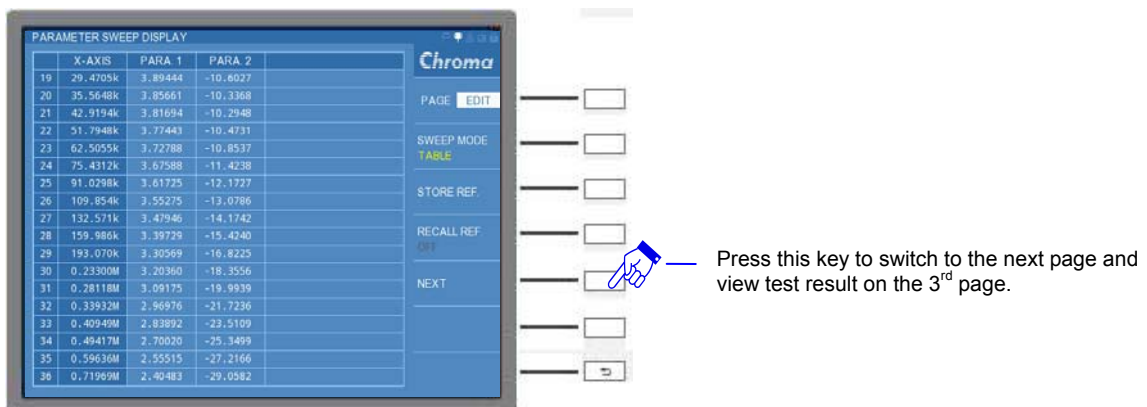
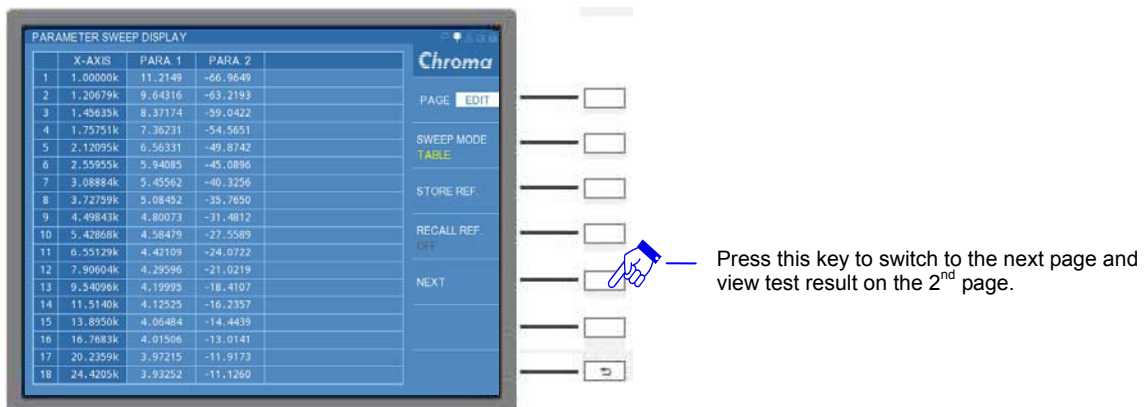
measurement value over 18 entries need to press “NEXT” to switch to the next page. It will return to the 1st page after the measurement set page is switched.

Operation example

Take a 15uF/450V electrolytic capacitor as an example. First, enter SETUP function in PAGE interface to set the parameter for measuring DUT. It is mainly measuring Z and θ variations in range from 1K to 10MHz of the DUT. The screen after set as below shows.



Press EXIT key to exit from the setting screen after the setting is completed and next to return to PARAMETER SWEEP DISPLAY screen. Press [START] key on DISPLAY UNIT, it starts to process measurement. The measurement result as the figure below show.





Press this key to switch to the next page and return test result of the 1st page.

Select STORE REF in EDIT interface to change RECALL REF to control key and switch it to "ON" if the measurement data this time as standard value. The measurement screen adds two columns for REF P1 and REF P2. The measurement result of original PARA1 and PARA2 will be converted into REF P1 and REF P2 as standard value display.

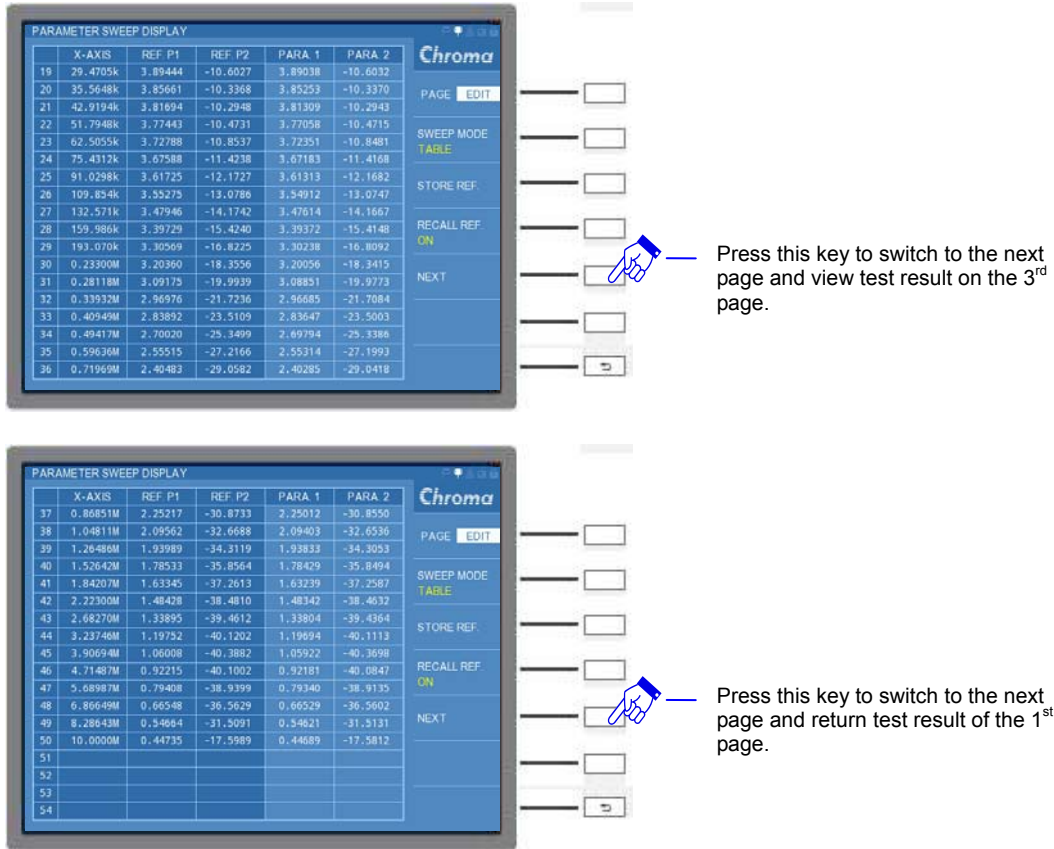


- Press this key to select PAGE or EDIT interface.
- Press this key to select sweep mode.
- Press this key to store reference value.
- Press this key to enable or disable reference value.
- Press this key to change to next page.

Execute [START] again that the measurement result will be displayed simultaneous with reference value as the figure below.

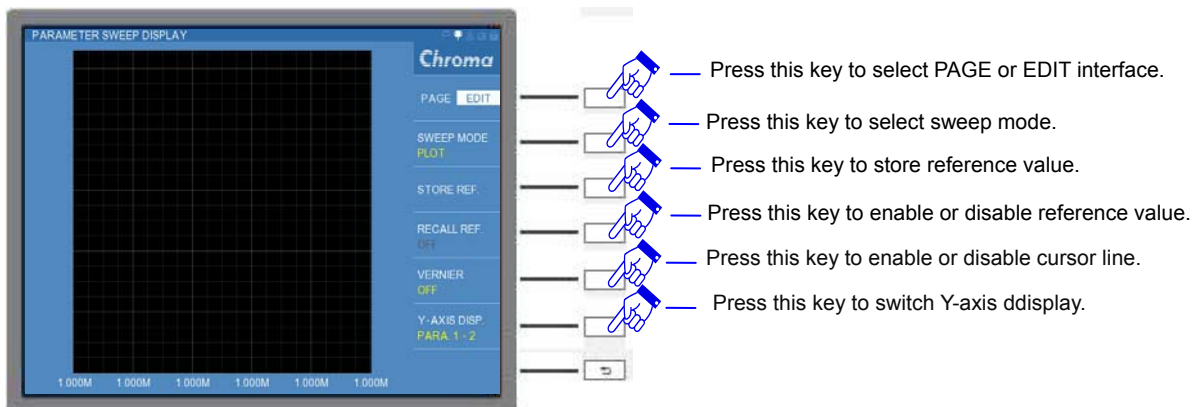


Press this key to switch to the next page and view test result on the 2nd page.



5.3.4.4 Sweep Result Display - PLOT MODE Description & Operation

The 2nd measurement result display is PLOT MODE in PARAMETER SWEEP MODE. The measurement result of DUT is represented by graphic method for users getting DUTs' characteristic curve via graphics.



There are two additional functions of VERNIER and Y-AXIS DISP. when SWEEP MODE is switched to PLOT display as the figure above. The two functions are introduced separately as the following.

VERNIER:

The vernier is for users to get the measurement value on the waveform. It can use direction control keys of (▲, ▼, ◀, ▶) of DISPLAY UNIT to control the movement of cursor line and represented by yellow vertical line. The default setting is “OFF”.

- Note**
- Left/right direction control keys (◀, ▶): Fine tune
 - Up/down direction control keys (▲, ▼): Coarse tune

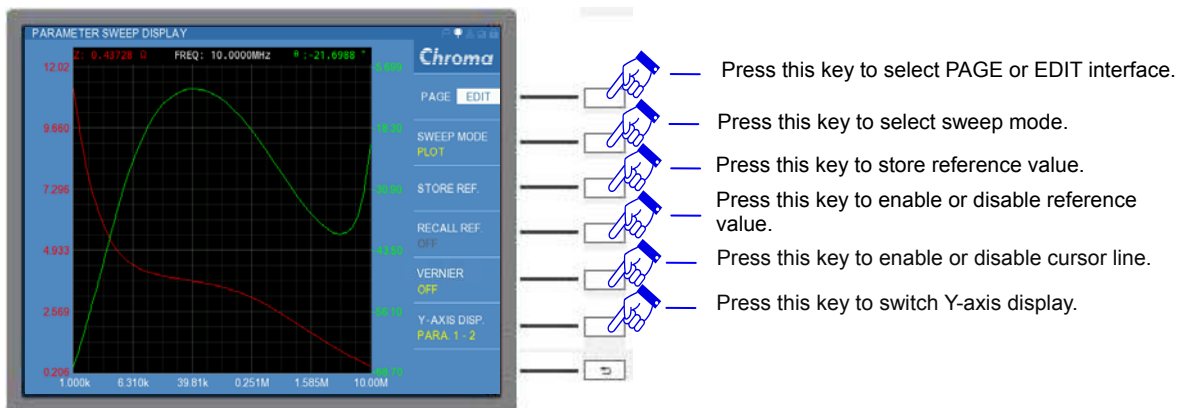
Y-AXIS DISP:

It switches Y-axis parameter display. The graphic area only displays parameter measurement result of PARA.1 or PARA.2 when PARA.1 or PARA.2 is selected. Whereas, the graphic area displays measurement results of two parameters with simultaneous when PARA.2-1 or PARA.1-2 is selected. Color representation: PARA.1 in red and PARA.2 in green. The default setting is “PARA.1-2”.

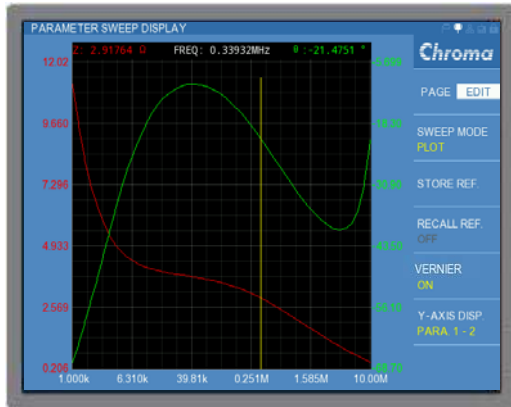
- Note**
- PARA.2-1 selected: PARA.1 curve will be located at foreground and PARA.2 curve will be located at background.
 - PARA.1-2 selected: PARA.2 curve will be located at foreground and PARA.1 curve will be located at background.







“Operation example”

Take the example of 15uF/450V electrolytic capacitor which is the same as section 5.3.4.3. The graph after scanned as below shows.

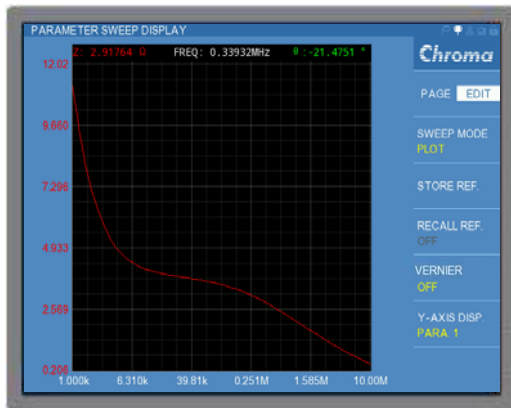








The red line in the screen corresponds PARA.1 of Y axis at the left side, the green line corresponds PARA.2 of Y axis at the right side and X axis displays the test parameter X-AXIS set. Select direction control keys of (◀, ▶) to make the yellow vertical line to move to the frequency to be observed if VERNIER function is enabled. The frequency corresponds the parameters of PARA.1 and PARA.2, correspondence relation between three will be displayed on the window. When the cursor line at FREQ=0.33932MHz, Z=2.91764Ω and $\theta=-21.4751^\circ$ as the figure below shows.

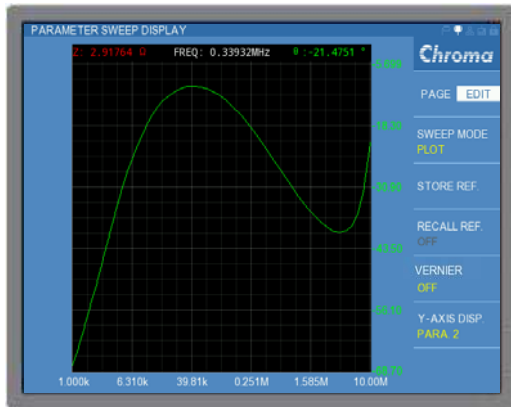








-  — Press this key to select PAGE or EDIT interface.
-  — Press this key to select sweep mode.
-  — Press this key to store reference value.
-  — Press this key to enable or disable reference value.
-  — Press this key to enable or disable cursor line.
-  — Press this key to switch Y-axis display.

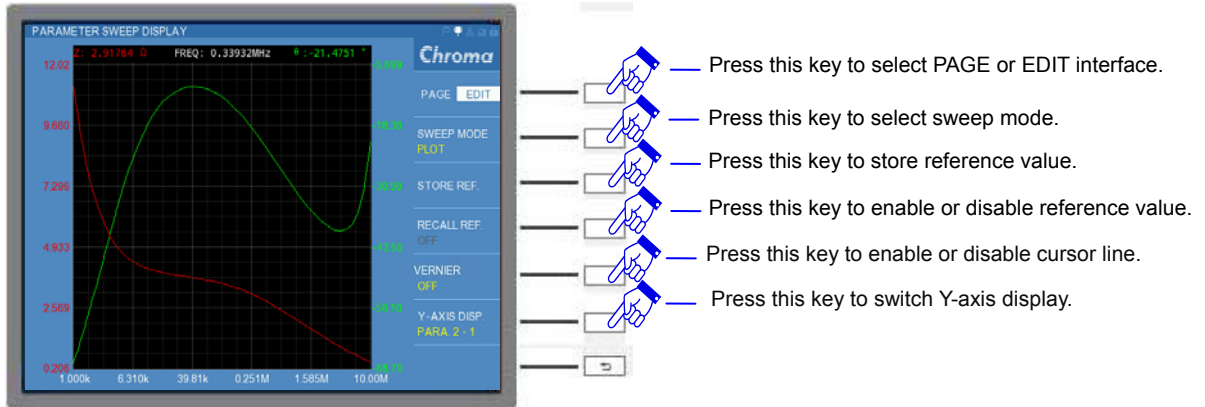
Except for Y-AXIS DISP in above description is PARA.1-2 mode, it also can be switched to other three modes of PARA.1, PARA.2 and PARA.2-1 as the figure below shows.



-  — Press this key to select PAGE or EDIT interface.
-  — Press this key to select sweep mode.
-  — Press this key to store reference value.
-  — Press this key to enable or disable reference value.
-  — Press this key to enable or disable cursor line.
-  — Press this key to switch Y-axis display.

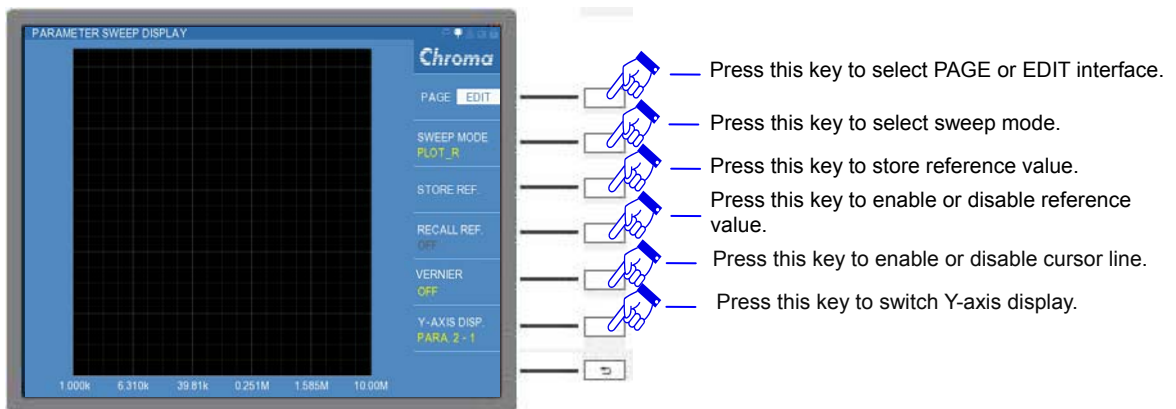


-  — Press this key to select PAGE or EDIT interface.
-  — Press this key to select sweep mode.
-  — Press this key to store reference value.
-  — Press this key to enable or disable reference value.
-  — Press this key to enable or disable cursor line.
-  — Press this key to switch Y-axis display.



5.3.4.5 Sweep Result Display - PLOT_R MODE Description & Operation

PLOT_R MODE is another measurement result display mode in PARAMETER SWEEP MODE. The difference between PLOT MODE and PLOT_R MODE is the later mode return to the test that is suitable for DUT in inductance L/I curve.



The operation method is the same as 5.3.4.4 Sweep Result Display - PLOT MODE Description & Operation.

6. HANDLER Interface

6.1 Specification

6.1.1 Driving Capability

It provides external DC source to +Vext terminal with input voltage range +5V~+24V while executing automated measurement. Use GND pin for low voltage terminal of external DC voltage input & input/output signal. The maximum output current of output signal terminal is 5mA. Please follow +Vext supply voltage to select appropriate current limiting resistor.

6.1.2 Pin Assignment

Pin No.	Signal	Input/ Output	Description
1,19	VEXT	-	External DC voltage input, the range is between +5Vdc~+24Vdc.
17	/EXT	Input (I/P)	It turns from HIGH to LOW when external input is START signal. The detail description as <i>Figure 6-1</i> shows.
15, 18, 30, 36	GND	-	It is the low voltage terminal for external DC voltage input and input/output signal.
4	BIN0	Output (O/P)	BIN 0, secondary parameter test value is over the high, low setting.
5	BIN1	Output (O/P)	BIN 1, primary parameter test value is within BIN 1 judgment range.
6	BIN2	Output (O/P)	BIN 2, primary parameter test value is within BIN 2 judgment range.
7	BIN3	Output (O/P)	BIN 3, primary parameter test value is within BIN 3 judgment range.
8	BIN4	Output (O/P)	BIN 4, primary parameter test value is within BIN 4 judgment range.
9	BIN5	Output (O/P)	BIN 5, primary parameter test value is within BIN 5 judgment range.
10	BIN6	Output (O/P)	BIN 6, primary parameter test value is within BIN 6 judgment range.
11	BIN7	Output (O/P)	BIN 7, primary parameter test value is within BIN7 judgment range.
12	BIN8	Output (O/P)	BIN 8, primary parameter test value is within BIN 8 judgment range.
13	BIN OUT	Output (O/P)	BIN OUT, primary parameter test value isn't in all judgment specifications.
22	A GO	Output (O/P)	Primary parameter test value is within judgment range.
23	A NG	Output (O/P)	Primary parameter test value isn't within judgment range.
24	A HI	Output (O/P)	Primary parameter test value is over high limit of judgment range.
25	A LO	Output (O/P)	Primary parameter test value is below low limit of

			judgment range.
26	B GO	Output (O/P)	Secondary parameter test value is within judgment range.
27	B NG	Output (O/P)	Secondary parameter test value isn't within judgment range.
28	B HI	Output (O/P)	Secondary parameter test value is over high limit of judgment range.
29	B LO	Output (O/P)	Secondary parameter test value is below low limit of judgment range.
31	GO	Output (O/P)	Primary and secondary parameter test value are all within judgment range.
32	NG	Output (O/P)	Either primary or secondary parameter isn't in judgment range.
16	ACQ	Output (O/P)	End of the analog sampling. The DUT can be moved.
3	EOT	Output (O/P)	End of test.

Table 6-1 I/O Interface Control Signal Table

6.2 Example of External Control Circuit

HANDLER control interface mainly includes two types - Input Port (I/P) and Output Port (O/P).

6.2.1 HANDLER Control Interface- Input Port (I/P)

Example of Input Port (I/P) circuit applies the general connection as *Figure 6-1 Example of /EXT Control Circuit* shows. Take control circuit application of external input START signal as an example. The trigger is done when external input START signal trigger activating (/EXT is Low) and the optical coupler inside of the machine is ON. The inner action principle transmitted control signal of conduction state is through optical coupler. The level is LOW when it is with action and the level is High when it is without action.

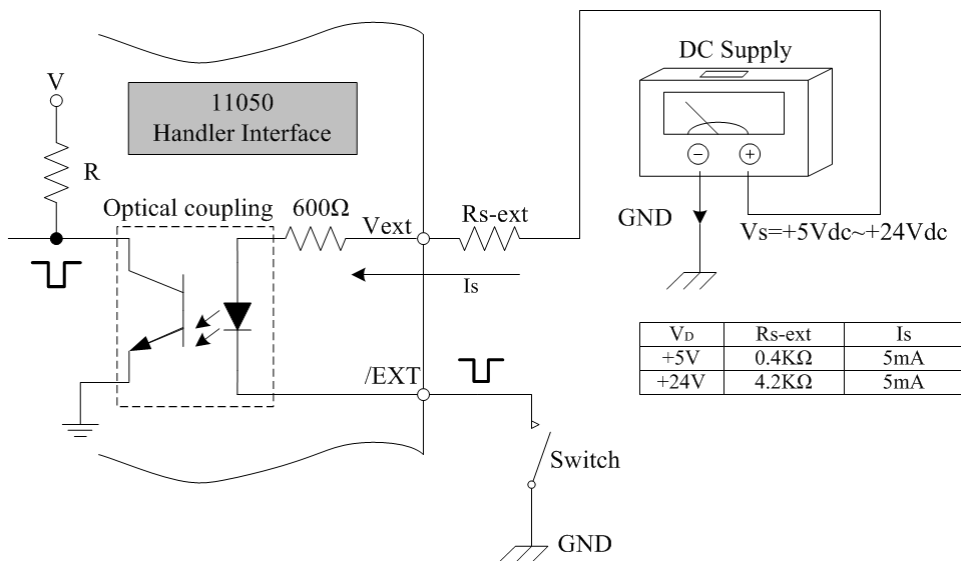


Figure 6-1 Example of /EXT Control Circuit

6.2.2 HANDLER Control Interface - Output Port (O/P)

Example of Output Port (O/P) circuit applies the general connection as *Figure 6-2 Example of HANDLER Interface Output Circuit* shows. The typical I_o current is 5mA. The selection of external resistance (R_{o-ext}) will be varied by external DC voltage source V_s . Take +5Vdc and +24Vdc as example in below figure, the selected resistances are 1k Ω and 4.8k Ω .

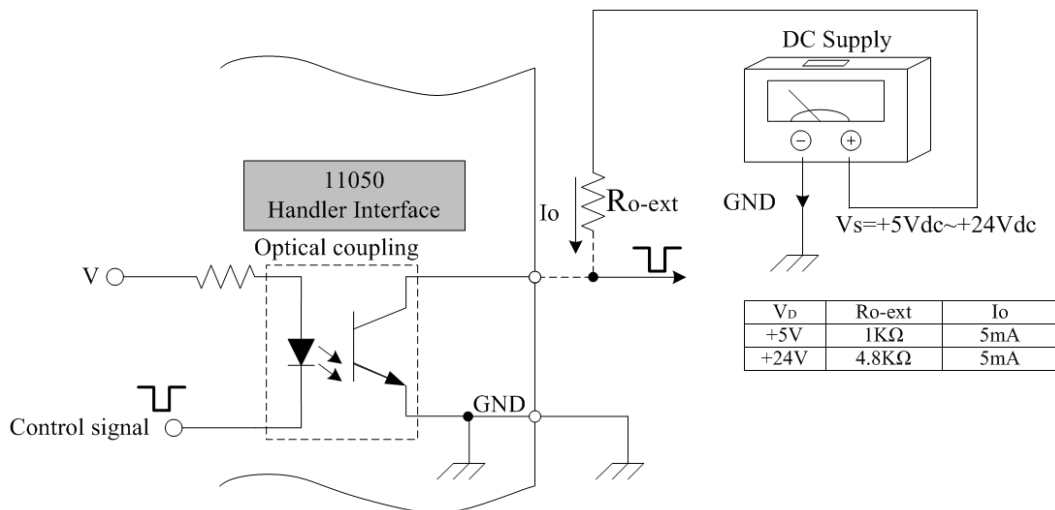


Figure 6-2 Example of HANDLER Interface Output Circuit

6.3 Corresponding Mode and Sequence of HANDLER Control Interface

The meter includes four modes of LCR MODE, LCRZ SCAN MODE, BIAS SCAN MODE and PARAMETER SWEEP MODE for selection. PARAMETER SWEEP MODE is only for 401-dot scanning mode but not provide signal action for judgment. Other modes corresponded to HANDLER control interface will be explained in the sections below.

6.3.1 HANDLER Control Interface in LCR MODE

LCR MODE includes two judgment modes: LIMIT TEST and BIN SORTING TEST. The relation between Display Unit and HANDLER are described as follows.

LIMIT TEST display screen:



Reference table of LIMIT TEST display screen and HANDLER interface as below shows.

LIMIT TEST		
LIMIT TEST Display Screen	HANDLER Interface	Remark
PARA.1 LOW	A LO	
PARA.1 PASS	A GO	
PARA.1 HIGH	A HI	
-	A NG	Display unit is without display. Users can control it by HANDLER interface.
PARA.2 LOW	B LO	
PARA.2 PASS	B GO	
PARA.2 HIGH	B HI	
-	B NG	Display unit is without display. Users can control it by HANDLER interface.
PASS	GO	
FAIL	NG	

Users refer the table above to design control method required.

BIN SORTING TEST display screen:



Reference table of BIN SORTING TEST display screen and HANDLER interface as below shows.

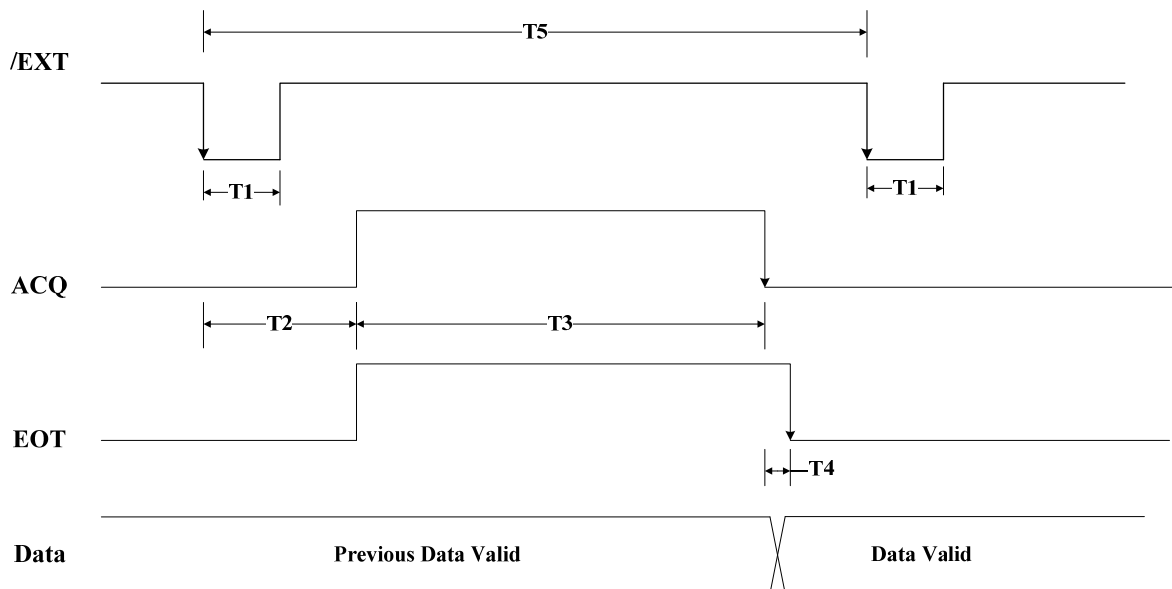
BIN SORTING TEST		
BIN SORTING TEST Display Screen	HANDLER Interface	Remark
AUX OUT	BIN0	
BIN1	BIN1	

BIN2	BIN2	
BIN3	BIN3	
BIN4	BIN4	
BIN5	BIN5	
BIN6	BIN6	
BIN7	BIN7	
BIN8	BIN8	
BIN OUT	BIN OUT	
PASS	GO	
FAIL	NG	

Users refer the table above to design control method required.

Sequence of control interface:

The mainly external action sequence under the circumstance of fast measurement speed and 10MHz test frequency. To enable [LOCK] key function on display unit is required.



Signal descriptions in FAST measurement speed are as the following:

T1: Pulse width of trigger signal: 2ms (Typ.)

T2: Measurement delay time: 4ms (Typ.)

T3: ADC measurement completion time: 11ms (Typ.)

T4: Data invalid: 1ms (Typ.)

T5: Measurement interval time: Longer than 20ms

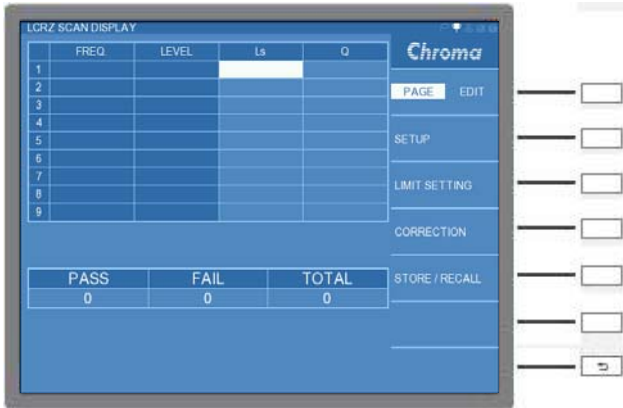
Data: It includes judgment signals of BIN0~BIN8, BIN OUT, GO, NG, etc.

Note ADC measured completion time is varied by different measurement speed. The measurement time under typical various measurement speeds (Typ.) are as the following.

Measurement Speed	Measurement Time
FAST	11ms
MEDIUM	180ms
SLOW	360ms

6.3.2 HANDLER Control Interface in LCRZ SCAN MODE

The signal of LCRZ SCAN MODE can be judged to be PASS or FAIL.



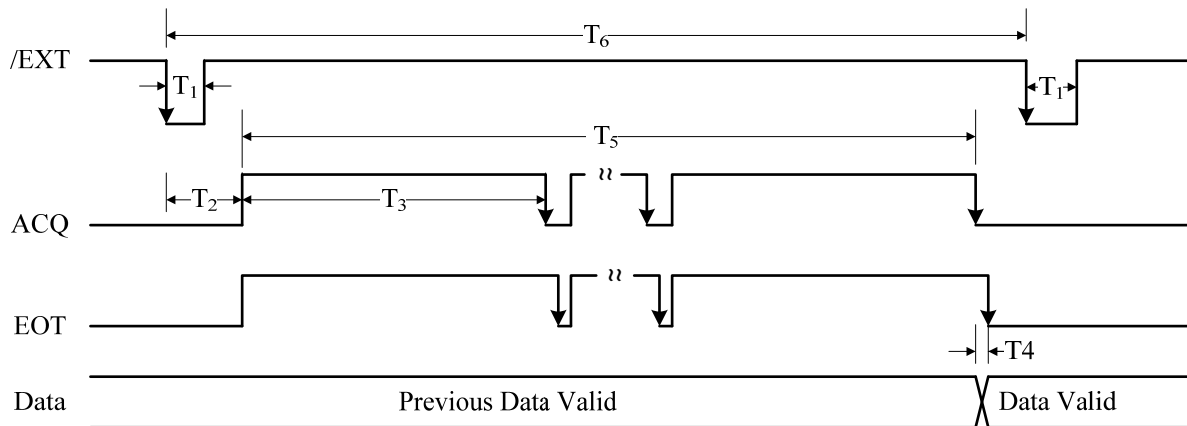
Reference table of LCRZ SCAN MODE display screen and HANDLER interface as below shows.

BIN SORTING TEST		
LCRZ SCAN MODE Display Screen	HANDLER Interface	Remark
PASS	GO	
FAIL	NG	

Users can refer the table above to design control method required.

Sequence of control interface:

The mainly external action sequence under the circumstance of fast measurement speed and 10MHz test frequency. To enable [LOCK] key function on display unit is required.



Descriptions for various signals are as the following:

T1: Pulse width of trigger signal: 2ms (Typ.)

T2: Measurement delay time: 4ms (Typ.)

T3: ADC measurement completion time: 17ms (Typ.)

T4: Data invalid: 1ms (Typ.)

T5: Scan completed time at a time: $T5 \times n(\text{count})$ measurement time

T6: Measurement interval time: It is varied by scan count.

Data: It includes judgment signals of A GO, A NG, A HI, A LO, B GO, B NG, B HI, B LO, GO and NG.

6.3.3 HANDLER Control Interface in BIAS SCAN MODE

The signal of BIAS SCAN MODE can be judged to be PASS or FAIL.



Reference table of BIAS SCAN MODE display screen and HANDLER interface as below shows.

BIN SORTING TEST		
BIAS SCAN MODE Display Screen	HANDLER Interface	Remark
PASS	GO	
FAIL	NG	

Users can refer the table above to design control method required.

Sequence of control interface:

BIAS SCAN MODE in the meter should be connected to 1320 DC bias current source and it sets the required current stable time. For more detail description, please refer 1320 user's manual.

7. SCPI Command

7.1 Data Format

Frequently used symbols are given as below table.

Name	Symbol	Description
Angle brackets	< >	The item in angle brackets is parameter format abbreviation. Ex.: INPut[:STATe] <Boolean> indicates that the command can accept the parameter with Boolean format.
Straight line		Straight line separates the parameters which can be replaced.
Square brackets	[]	The item in square brackets is a selection one. Ex.: INPut[:STATe] <Boolean> indicates that STATe can be omitted.
Curly brackets	{ }	Curly bracket indicates that the parameter can be repeated. <A> {<, B>} is noted at the right column which indicates parameter "A" to be inputted, whereas parameter "B" can be omitted or input for once or several times.

The parameter format abbreviation can be accepted by the command are given as below table.

Parameter Format Abbreviation	Description	Example
Character parameter	The character parameter is with long/short two kinds of format. The written method is the first half with uppercase character and the second half with lowercase character. The lowercase omitted is short format. For example, long format of MINimum parameter is MINIMUM and short format is MIN.	MAXIMUM, MAX
NR1	The value is without a decimal point. The decimal point is at the right side of the last significant figure.	123, 0123
NR2	The value includes decimal point.	12.3, 0.123
NR3	The value includes decimal point and exponent.	1.23E+2
NRf	Flexible decimal format, NR1, NR2 and NR3 are included.	123, 12.3, 1.23E+3
NRf+	Expanded decimal format, NRf, MINimum and MAXimum are included. MINimum and MAXimum are minimum and maximum limit of the parameter.	123, 12.3, 1.23E+3, MIN, MAX
Boolean	Boolean variable. It can accept character format of ON, OFF and digital format of 1 (ON), 0 (OFF).	ON, 1, OFF, 0

All commands and response messages are transmitted in ASCII code format. Before sending the new command, the response message needs to be read totally. Otherwise, the remaining response message will be disappeared and a query interrupted error will be generated.

Every program message needs to add termination character at last, it represents to end program message. The termination character is ASCII new line character (line feed), ASCII code byte is 0Ah (line feed). The device response message will use 0Ah as the end of response message.

7.2 Command List

7.2.1 IEEE-488.2

```
*CLS
*ESE <NR1>
*ESE?
*ESR?
*IDN?
*OPC
*OPC?
*RST
*SRE <NR1>
*SRE?
*STB?
*TRG
```

7.2.2 SCPI

7.2.2.1 LCR METER

```
:ABORt
:CALCulate{1|2}
|---:FORMat {REAL|MLINear|LP|LS|CP|CS|RS|RP|ZS|YP|
          IMAGinary|PHASe|D|Q|GP|RS|XS}
|---:COUNT
|---|---:CLEAr
|---:LIMit subsystem
|---|---:BEEPer
|---|---|---:CONDition {FAIL|PASS}
|---|---|---[:STATe] <Boolean>
|---|---:LOWer
|---|---|---[:DATA] <NRf+>
|---|---:MODE { ABS(0)|PCNT(2)}
|---|---:STATe <Boolean>
|---|---|---:MODE {OFF(0)|ABS(1)|DEV(2)|PCNT(3)}
|---|---:UPPer
|---|---|---[:DATA] <NRf+>
|---|---:MATH
|---|---|---:EXPRession
|---|---|---|---:CATalog?
|---|---|---|---:NAME {DEV|PCNT}
|---|---|---:STATe <Boolean>
|---:PATH?
:CALCulate3
|---:LIMit subsystem
|---|---:LOWer
|---|---|---[:DATA] <NRf+>
|---|---:UPPer
|---|---|---[:DATA] <NRf+>
```



```

:CALCulate{4|5}
|---:MATH
|---|---[:STATE] <Boolean>
:DISPlay
|---[:WINDow]
|---|---:PAGE <NR1>
|---|---|---:MODE <NR1>
:DATA
|---[:DATA] REF{1|2|3},<Nrf>
|---[:DATA]? {REF1|REF2|REF3|ZS|PHASE|IMON|VMON}
:FETCh?
:INITiate
|---:CONTinuous <Boolean>
|---[:IMMediate]
[:SENSe]
|---:AVERage
|---|---:COUNT <NR1>
|---:CORRection
|---|---:COLlect
|---|---|---[:ACQuire] STANdard{1|2|3|4|5}
|---:LOAD
|---|---:CORRection <Boolean>
|---:FIMPedance
|---|---:APERture {FAST|MEDIum|SLOW}
|---|---:RANGe
|---|---|---:AUTO <Boolean>
|---|---|---[:UPPer] {<NR1>|UP|DOWN}
|---:FUNction
|---|---[:ON] {FIMPedance|FADMittance}
:SOURce
|---:FREQuency
|---|---[:CW] <Nrf+> [HZ|KHZ|MHZ]
|---:VOLTagE
|---|---[:LEVel]
|---|---|---[:IMMediate]
|---|---|---|---[:AMPLitude] <Nrf+> [MV|V]
|---:BIAS
|---|---:CURRent <Nrf+> [MA|A]
|---|---|---[:STATe] <Boolean>
|---|---|---:EXTernal < NR1>
|---|---:VOLTagE
|---|---|---[:STATe] <Boolean>
:SYSTem
|---:BEEPer
|---|---[:IMMediate]
|---:STATe {OFF(0)|SMALl(1)|LARGe(2)}
|---:ALARm {PULSe(0)|CONTinuous(1)}
|---:SOUNd {PASS|FAIL}
|---:CONST {0(OFF)|1(100Ω)|2(25Ω)}
|---:DCR
|---|---[:LEVel] {NORMal(0)|SMALl(1)}
|---:LFRequency {0(60HZ)|1(50HZ)|2(NA)}
|---:KLOCK?
|---:AREPort <Boolean>
|---:HANDler
|---|---[:JUDGment] {0(HIGH)|1(LOW)}
|---:VERSion?
|---:PRESet
|---:ERRor?
|---:USER
|---|---:PASSWORD <Boolean>
|---:LANGUAGe {0(ENGLISH)}
|---:TRIGger
|---|---:DELay <NR1>
|---:AVERage
|---|---:TIME <NR1>
|---:DELay
|---|---:TIME <NR1>
|---:MEAS
|---|---[:UNIT]
|---|---|---:IDN?
:TRIGger
|---[:IMMediate]
|---:DELay <NR1>
|---:SOURce {INTernal(0)|MANual(1)|EXTernal(2)|BUS(3)}

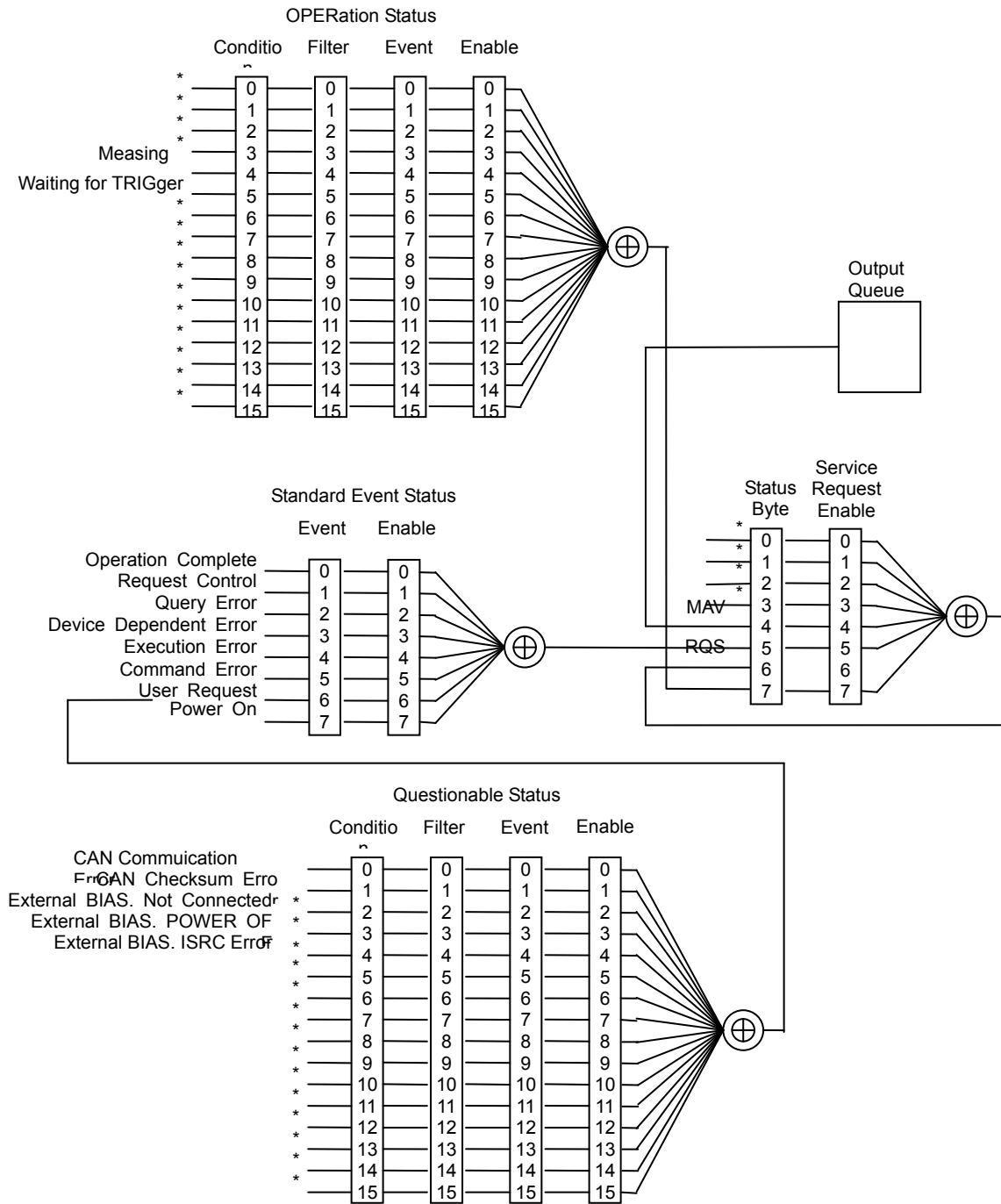
```

```

:BINning
|---[:STATe] <Boolean>
|---|---:MODE {OFF(0)|ABS(1)|DEV(2)|PCNT(3)}
|---:MODE {ABS(0)|PCNT(2)}
|---:LiMit
|---|---:UPPer
|---|---|---:BIN{1~8} <NRf>
|---|---|---:AUx <NRf>
|---|---|---:AUx2 <NRf>
|---|---:LOWer
|---|---|---:BIN{1~8} <NRf>
|---|---|---:AUx <NRf>
|---|---|---:AUx2 <NRf>
|---|---:NOMInal
|---|---|---:BIN{1~8} <NRf>
|---|---|---:AUx <NRf>
|---|---|---:AUx2 <NRf>
|---:RESUlt?
|---:COUnT
|---|---[:DATA]? [{<NR1>|TOTAL|ALL}]
|---|---:CLEar
:STATus
|---:OPERation
|---|---:CONDition?
|---|---:ENABle <NR1>
|---|---:ENABle?
|---|---[:EVENT]?
|---|---:NTRansition <NR1>
|---|---:NTRansition?
|---|---:PTRansition <NR1>
|---|---:PTRansition?
|---|---:PRESet
|---:QUEStionable
|---|---:CONDition?
|---|---:ENABle <NR1>
|---|---:ENABle?
|---|---[:EVENT]?
|---|---:NTRansition <NR1>
|---|---:NTRansition?
|---|---:PTRansition <NR1>
|---|---:PTRansition?
|---|---:PRESet
:MEMory
|---:SYNC

```

7.2.3 STATUS Configuration



7.2.3.1 How to Use STATUS to Get Operated Once Complete

Measurement

1. STAT:OPER:PTR 32
2. STAT:OPER:EVENT? ; It clears EVENT.

3. TRIG ; It operates the measurement.
4. STAT:OPER:EVENT? ; It indicates to operate complete measurement for once until the returned 32 is read.

7.2.3.2 How to Use STATUS to Get Measures Status in System from Idle

1. STAT:OPER:PTR 16
2. STAT:OPER:EVENT? ; It clears EVENT.
3. TRIG ; It operates the measurement.
4. STAT:OPER:EVENT? ; It indicates the system to enter measures status from idle status until the returned 16 is read.

7.2.3.3 How to Use STATUS to Get Occurred Communication Error in System

1. STAT:QUES:PTR 3
2. STAT:QUES:EVENT? ; It clears EVENT.
3. TRIG ; It operates the measurement or gives other commands on the system to set parameter.
4. STAT:QUES:EVENT? ; It indicates communication error occurred in system when the return value isn't equal to 0.

7.2.4 Command Description

7.2.4.1 Common Command

***CLS**

It clears status data, actions need to be executed as the following.

- Clear error queue
- Clear standard event status register
- Clear status byte register
- Clear operation event register

Set command format: *CLS

***ESE**

It sets standard event status enable register.

Set command format: *ESE <NR1>

Parameter: 0~255.

Query command format: *ESE?

Return data: <NR1>

***ESR?**

It queries standard event status register, clear the register after executed.

Query command format: *ESR?

Return data: <NR1>

***IDN?**

It queries the device basic data. The return data is separated by comma, four fields are manufacturer, device model, serial number or 0, firmware version.

Query command format: *IDN?

Return data: manufacturer, model Number, serial number or 0, firmware revision

***OPC**

Operation completion command. When *OPC command is performed and all operations are completed, OPC bit (bit 0) of standard event status register will be set.

Set command format: *OPC

***OPC?**

It queries operation completion command. When *OPC command is performed and all operations are completed, 1 will be returned.

Query command format: *OPC?

Return data: 1

***RST**

It enforces ABORt command.

It clears setting data to return to booting status (status return register not included).

Device reset command, actions need to be executed as the following.

- ABORt
- Clear measurement data
- Clear DEVIATION data
- Clear CORRECTION data

Set command format: *RST

***SRE**

It sets service request enable register.

Set command format: *SRE <NR1>

Parameter: 0~255.

Query command format: *SRE?

Return data: <NR1>

***STB?**

It queries service request status register.

Query command format: *STB?

Return data: <NR1>

***TRG**

It executes Trigger action, this command can be accepted only when TRIG:SOUR command is set to BUS.

Set command format: *TRG

7.2.4.2 LCR METER Command Set

ABORt Subsystem

ABORt

It resets Trigger system to idle status and stops measurement. The command doesn't change INITiate:CONTinuous status. If INITiate:CONTinuous is set to ON thus Trigger system will exit from idle status to enter to continuous Waiting-for-Trigger

status.

Set command format: ABORt

CALCulate Subsystem

CALCulate1:FORMat {REAL|MLINear|LP|LS|CP|CS|RS|RP|ZS|YP|DCR }

CALCulate1:FORMat?

It sets or queries measurement primary parameter at present.

Set parameter: **{REAL|MLINear|LP|LS|CP|CS|RS|RP|ZS|YP|DCR }**

Return parameter: {REAL|MLINear|LP|LS|CP|CS|RS|RP|ZS|YP|DCR }

Description:

REAL	Real part of impedance
MLINear	Absoulte value of impedance
LP	Equivalent parallel capacitor
LS	Equivalent series inductance
CP	Equivalent parallel capacitor
CS	Equivalent series capacitor
RS	Equivalent series resistance
RP	Equivalent parallel resistance
ZS	Equivalent series impedance
YP	Equivalent parallel admittance
DCR	DC resistance

Set command example: CALC1:FORM LP

Query command example: CALC1:FORM?

Return data example: LP

CALCulate2:FORMat {IMAGinary|PHASe|D|Q|GP|REAL|RS|XS|QR}

CALCulate2:FORMat?

It sets or queries measurement secondary parameter at present.

Set parameter: **{IMAGinary|PHASe|D|Q|GP|REAL|RS|XS|QR}**

Return parameter: {IMAGinary|PHASe|D|Q|GP|REAL|RS|XS|QR}

Description:

IMAGinary	Imaginary part of impedance
PHASe	Phase angle
D	Loss factor
Q	Quality factor
GP	Equivalent parallel conductance
REAL	Real part of impedance
RS	Equivalent series resistance
XS	Series equivalent value of imaginary part
QR	Quality factor & equivalent series resistance

Set command example: CALC2:FORM D

Query command example: CALC2:FORM?

Return data example: D

CALCulate{1|2}: LIMit: BEEPer: CONDition {FAIL|PASS}

CALCulate{1|2}: LIMit: BEEPer: CONDition?

It sets or queries output definition of comparator result beeper.

Set parameter: {FAIL|PASS}

Return parameter: {FAIL|PASS}

Description:

FAIL	The beeper is activated when comparison result is FAIL.
PASS	The beeper is activated when comparison result is PASS.

Set Syntax: CALC1:LIM:BEEP:COND FAIL

Query Syntax: CALC1:LIM:BEEP:COND?

Return Data: 0

CALCulate{1|2}:LIMit:BEEP[:STATe] {OFF|{ON|SMAL}|LARG|0|1|2}
CALCulate{1|2}:LIMit:BEEP[:STATe]?

It sets or queries comparator result of beeper output.

Set parameter: {ON|OFF|1|0}

Return parameter: {0|1}

OFF(0) It disables the beeper.

ON (1) It enables the beeper (small).

SMAL (1) It enables the beeper (small).

LARG (2) It enables the beeper (large).

Set Syntax: CALC1:LIM:BEEP OFF

Query Syntax: CALC1:LIM:BEEP?

Return Data: 0

CALCulate{1|2}:COUNt:CLEar

It clears count result of comparator.

Set parameter: None

Return parameter: None

Set command format: CALCulate1:COUN:CLE

CALCulate{1|2}: LIMit: LOWER[: DATA] {<numeric_value>|MAXimum|MINimum}
CALCulate{1|2}: LIMit: LOWER[: DATA]?

It sets or queries lower limit of comparator.

Set parameter: {Lower limit |MAXimum |MINimum }

Return parameter: Lower limit, format is < NR3 >

Description:

(DEV) value denotes lower limit should between $-1.0000e+15$ ~ $+1.0000e+15$ that can direct give the command of MAXimum ($1.0000e+15$) or MINimum ($-1.0000e+15$).

(PCNT) value denotes lower limit should between $-9.99999e+3$ ~ $+9.99999e+3$ that can direct give the command of MAXimum ($-9.99999e+3$) or MINimum ($-9.99999e+3$).

Set syntax: CALC1:LIM:LOW $-1.0000e+15$

Query syntax: CALC1:LIM:LOW?

Return data: $-1.0000e+15$

CALCulate{1|2}: LIMit: MODE {ABS|PCNT}

CALCulate{1|2}: LIMit: MODE?

It sets or queries higher/lower limit mode of comparator.

Set parameter:

ABS Higher/lower limit value is in ABS mode.

PCNT Higher/lower limit value is in PCNT mode.

Return parameter: {ABS|PCNT}

Set command example: CALCulate1:LIMit:MODE PCNT

Query command example: CALCulate1:LIMit:MODE?

Return data example: PCNT

CALCulate{1|2}: LIMit[: STATe] {ON|OFF|1|0}

CALCulate{1|2}: LIMit[: STATe]?

It sets or queries if the comparison function is activated.

Set parameter: {ON(1) |OFF(0)}

Return parameter: {0|1}

Description:

ON (1) It enables comparison function.

OFF (0) It disables comparison function.

Set syntax: CALC1:LIM:STAT ON

Query syntax: CALC1:LIM:STAT?

Return data: 1

CALCulate{1|2}: LIMit: STATe:MODE {OFF|ABS|DEV|PCNT|0|1|2|3}

CALCulate{1|2}: LIMit: STATe:MODE?

It sets or queries comparison function.

Set parameter: {OFF|ABS|DEV|PCNT|0|1|2|3}

Return parameter: {OFF|ABS|DEV|PCNT}

Description:

OFF (0) It disables comparison function.

ABS (1) It enables comparison function. (ABS mode)

DEV (2) It enables comparison function. (DEV mode)

PCNT (3) It enables comparison function. (PCNT mode)

Set syntax: CALC1:LIM:STAT OFF

Query syntax: CALC1:LIM:STAT?

Return data: 0

CALCulate{1|2}: LIMit: UPPer[: DATA] {<numeric_value>|MAXimum|MINimum}

CALCulate{1|2}: LIMit: UPPer[: DATA]?

It sets or queries upper limit of comparator.

Set parameter: {Upper limit |MAXimum |MINimum}

Return parameter: Upper limit, format is in < NR3 >.

Description:

(DEV) value denotes upper limit should between -1.0000e+15~
+1.0000e+15 that can direct give the command of MAXimum (1.0000e+15)
or MINimum (-1.0000e+15).

(PCNT) value denotes upper limit should between -9.99999e+3~
+9.99999e+3 that can direct give the command of MAXimum (-9.99999e+3)
or MINimum (-9.99999e+3).

Set syntax: CALC1:LIM:UPP -1.0000e+15

Query syntax: CALC1:LIM:UPP?

Return data: -1.0000e+15

CALCulate{1|2}: MATH: EXPReSSion: CATalog?

It queries the parameter which can be used with the command of CALCulate{1|2}:

MATH: EXPReSSion: NAME.

Set parameter: None

Return parameter: Bias absolute value (DEV) or percentage (PCNT).

Query syntax: CALC1:MATH:EXPR:CAT?

Return data: DEV, PCNT

CALCulate{1|2}: MATH: EXPReSSion: NAME {DEV|PCNT}

CALCulate{1|2}: MATH: EXPReSSion: NAME?

It sets or queries expression of comparator value.

Set parameter: {DEV|PCNT}

Return parameter: {DEV|PCNT}

Set syntax: CALC1:MATH:EXPR:NAME DEV

Query syntax: CALC1:MATH:EXPR:NAME?

Return data: DEV

CALCulate{1|2}: MATH: STATe {ON|OFF|1|0}**CALCulate{1|2}: MATH: STATe?**

It sets or queries whether CALCulate {1|2} : MATH : EXPReSSion : NAME definition operation is action or not.

Set parameter: {ON(1)|OFF(0)}

Return parameter: {1|0}

Description:

ON (1) Operation is activated.

OFF(0) Operation isn't activated.

Set syntax: CALC1:MATH:STAT ON

Query syntax: CALC1:MATH:STAT?

Return data: 1

CALCulate{1|2}: PATH?

It queries return sequence of CALCulate subsystem.

Set parameter: None

Return parameter: FORM, MATH, LIM

Query syntax: CALC1:PATH?

Return data: FORM,MATH,LIM

CALCulate3: LIMit: LOWER[: DATA] {<numeric_value>|MAXimum|MINimum}**CALCulate3: LIMit: LOWER[: DATA]?**

It sets or queries lower limit of comparator.

Set parameter: {Lower limit |MAXimum |MINimum}

Return parameter: Lower limit, format is in < NR3 >.

Description:

(DEV) value denotes lower limit should between -1.0000e+15~+1.0000e+15 that can direct give the command of MAXimum (1.0000e+15) or MINimum (-1.0000e+15).

(PCNT) value denotes lower limit should between -9.99999e+3~+9.99999e+3 that can direct give the command of MAXimum (-9.99999e+3) or MINimum (-9.99999e+3).

Set syntax: CALC3:LIM:LOW -1.0000e+15

Query syntax: CALC3:LIM:LOW?

Return data: -1.0000e+15

CALCulate3: LIMit: UPPER[: DATA] {<numeric_value>|MAXimum|MINimum}**CALCulate3: LIMit: UPPER[: DATA]?**

It sets or queries upper limit of comparator.

Set parameter: {Upper limit |MAXimum |MINimum}

Return parameter: Upper limit, format is in < NR3 >.

Description:

(DEV) value denotes upper limit should between -1.0000e+15~+1.0000e+15 that can direct give the command of MAXimum (1.0000e+15) or MINimum (-1.0000e+15).

(PCNT) value denotes upper limit should between -9.99999e+3~+9.99999e+3 that can direct give the command of MAXimum (-9.99999e+3) or MINimum (-9.99999e+3).

Set syntax: CALC3:LIM:UPP -1.0000e+15

Query syntax: CALC3:LIM:UPP?

Return data: -1.0000e+15

CALCulate{4|5}:MATH[:STATe] {ON|OFF|1|0}
CALCulate{4|5}:MATH[:STATe]?

It sets or queries if Vm/Im/Z-θ function is enabled.

Set parameter: {ON(1)|OFF(0)}

Return parameter: {1|0}

Description:

CALCulate4 It sets voltage (Vm) and (Im).
 CALCulate5 It sets Z-θ.
 ON (1) It is enabled.
 OFF(0) It is disabled.

Set syntax: CALC4:MATH:STAT ON

Query syntax: CALC4:MATH:STAT?

Return data: 1

DISPlay Subsystem

DISPlay[:WINDow]:PAGE <value>
DISPlay[:WINDow]:PAGE?

It sets or queries the display window.

Set parameter:

1 It enters LCR measurement window.

Return parameter: {0|1}

Description: 0 indicates it is not in LCR DISPLAY measurement window.

Set command example: DISP:PAGE 1

Query command example: DISP:PAGE?

Return data: 1

DISPlay[:WINDow]:PAGE:MODE <value>
DISPlay[:WINDow]:PAGE:MODE?

It sets or queries the mode for display window.

Set parameter:

0 NORMAL mode
 1 JUDGMENT mode
 2 SPECIAL mode

Return parameter: { 0|1|2 }

Set command example: DISP:PAGE:MODE 1

Query command example: DISP:PAGE:MODE?

Return data: 1

DATA Subsystem

DATA[: DATA] REF{1|2},<numeric_value>

It sets or queries the nominal value of primary parameter in COMPARE mode.

Set parameter:

REF1,numeric Nominal value of COMPARE primary parameter
 REF2,numeric Nominal value of COMPARE secondary parameter
 REF3,numeric Nominal value of COMPARE secondary parameter

Return parameter: None

Set syntax: DATA REF1,0.0009E-12

DATA[:DATA]?

It queries the nominal value of primary/secondary parameter (REF1 | REF2 | REF3) and the measurements of relative parameter (ZS|PHASe|IMON|VMON).

Set parameter:

REF1 Nominal value of COMPARE primary parameter

REF2	Nominal value of COMPARE secondary parameter
REF3	Nominal value of COMPARE secondary parameter
ZS	It measures Zs value.
PHASe	It measures phase angle.
IMON	It measures current value.
VMON	It measures voltage value.

The return value is 0 when Im / Vm /Z-θ Display function OFF.

Return parameter: It is numerical mode in the format of <NR3>.

Query syntax: DATA? REF1

Return data: 1.000

FETCH Subsystem

FETCH?

It fetches measurement result.

Return parameter: <STATE>,<DAT1>,<DAT2>,<CMP1>,<CMP2>

Description:

<STATE> The measurement status is in the format of <NR1>.

- 0 Normal
- 1 Range error
- 4 Other error

<DAT1> Test value of primary parameter is in the data format of <NR3>.

<DAT2> Test value of secondary parameter is in the data format of <NR3>.

The following outputs will be included when comparator is enabled.

- <CMP1> Comparison result of primary parameter
- <CMP2> Comparison result of secondary parameter
 - 0 No secondary parameter
 - 1 Test value is within the range.
 - 2 Test value is too high.
 - 4 Test value is too low.

The following outputs will be included when BINNING is enabled.

- <BIN> Sequence result is in the data format of <NR1>.
 - 0 Secondary parameter FAIL
 - 1~8 Primary parameter PASS, secondary parameter PASS
 - 9 Primary parameter FAIL

Query syntax: FETC?

Return data: :0,1.314969e+00,1.176097e+02,9

FETCH?

It fetches measurement result when parameter 2 is Q+R.

Return parameter: <STATE>,<DAT1>,<DAT2>,<DAT3>,<CMP1>,<CMP2>,<CMP3>

Description:

<STATE> The measurement status is in the format of <NR1>.

- 0 Normal
- 1 Range error
- 4 Other error

<DAT1> Test value of primary parameter is in the data format of <NR3>.

<DAT2> Q test value of secondary parameter is in the data format of <NR3>.

<DAT3> R test value of secondary parameter is in the data format of <NR3>.

The following outputs will be included when comparator is enabled.

- <CMP1> Comparison result of primary parameter

<CMP2>	Comparison result of secondary parameter Q
<CMP3>	Comparison result of secondary parameter R
0	No secondary parameter
1	Test value is within the range.
2	Test value is too high.
4	Test value is too low.

The following outputs will be included when BINNING is enabled.

<BIN>	Sequence result is in the data format of <NR1>.
0	Secondary parameter Q+R FAIL
1~8	Primary parameter PASS, secondary parameter Q+R PASS
9	Primary parameter FAIL
<CMP2>	Test result of secondary parameter Q
<CMP3>	Test result of secondary parameter R
0	FAIL
1	PASS

Query syntax: FETC?

Return data: :0,1.314969e+00,1.176097e+02,9,0,1

INITiate Subsystem

INITiate:CONTInuous {ON|OFF|1|0}

INITiate:CONTInuous?

It sets or queries if initiate continuous the system.

It changes Trigger system to Waiting-for-Trigger status when the parameter is ON. The system starts executing when receiving Trigger signal. It returns to Waiting-for-Trigger status to wait the next Trigger signal when the execution is done.

Set parameter:

1 or ON It initiates continuous the system and sets Trigger to EXT mode.

0 or OFF It doesn't initiate continuous the system .

Return parameter: {0|1}

Set command example: INIT:CONT 0

Query command example: INIT:CONT?

Return data example: 0

INITiate[:IMMediate]

All sequences exit from idle status and enter initial status.

It changes Trigger system to Waiting-for-Trigger status. LIST sequence starts executing when Trigger signal is received. It returns to Idle status when the execution is done. Execute this command again is need that the next Trigger signal can be accepted. Error message of -213,"Init ignored" will be generated when INITiate:CONTInuous is ON or Trigger system isn't in Idle status.

Set parameter: None

Return parameter: None

Set command example: INIT

SENSE Subsystem

[SENSE]:AVERage:COUNT <value>

[SENSE]:AVERage:COUNT?

It sets or queries average count.

Set parameter: 1~10, the format is <NR1>.

Return parameter: <NR1>

Set command example: AVER:COUN 1

Query command example: AVER:COUN?

Return data example: 1

[SENSe]:FIMPedance:APERture {FAST(0)|MEDium(1)|SLOW(2)}
[SENSe]:FIMPedance:APERture?

It sets or queries measurement speed.

Set parameter:

FAST or 0	Fast measurement
MEDium or 1	Medium measurement
SLOW or 2	Slow measurement

Return parameter: {0|1|2}

Set command example: SENS:FIMP:APER FAST

Query command example: SENS:FIMP:APER?

Return data example: 0

[SENSe]:FIMPedance:RANGe:AUTO {ON|OFF|1|0}
[SENSe]:FIMPedance:RANGe:AUTO?

It sets or queries if auto range selection mode is enabled.

Set parameter:

1 or ON	Auto range selection mode is enabled.
0 or OFF	Auto range selection mode is disabled.

Return parameter: {0|1}

Set command example: FIMP:RANG:AUTO ON

Query command example: FIMP:RANG:AUTO?

Return data example: 1

[SENSe]:FIMPedance:RANGe[:UPPer] {<numeric_value>|UP|DOWN}
[SENSe]:FIMPedance:RANGe[:UPPer]?

It sets or queries measurement range.

Set parameter:

numeric	Measurement range 0~11 is in the format of <NR1>.
UP	It switches to the previous range.
DOWN	It switches to the next range.

LCR parameter measurement range:

0	100KOhm
1	30KOhm
2	10KOhm
3	3KOhm
4	1KOhm
5	300Ohm
6	100Ohm
7	30Ohm
8	10Ohm
9	3Ohm
10	1Ohm
11	300Mohm

DCR parameter measurement range:

0	100KOhm
1	10KOhm
2	1KOhm
3	100Ohm
4	10Ohm
5	1Ohm
6	0.1Ohm

Return parameter: 0~11, the format is <NR1>.

Set command example: FIMP:RANG 1
 Query command example: FIMP:RANG?
 Return data example: 1

[SENSe]:FUNction[:ON] {FIMPedance|FADMittance}
[SENSe]:FUNction[:ON]?

It sets or queries measurement equivalent mode.

Set parameter:

FIMPedance Equivalent series mode
 FADMittance Equivalent parallel mode

Return parameter: {FIMPEDANCE|FADMITTANCE}

Set command example: SENS:FUNC FIMP

Query command example: SENS:FUNC?

Return data example: FIMPEDANCE

[SENSe]:LOAD:CORRection {ON|OFF|1|0}
[SENSe]:LOAD:CORRection?

It sets or queries if LOAD CORRection function is enabled.

Set parameter:

1 or ON LOAD CORRection function is enabled.
 0 or OFF LOAD CORRection function is disabled.

Return parameter: {0|1}

Set command example: SENS:LOAD:CORR ON

Query command example: SENS:LOAD:CORR?

Return data example: 1

SOURce Subsystem

SOURce:FREQuency[:CW] <numeric_value>[HZ|KHZ|K|MA]
SOURce:FREQuency[:CW]?

It sets or queries AC output signal frequency.

Set parameter:

numeric It sets test frequency from 1kHz to 10MHz. The unit auto defines as HZ if there is no unit in the command. The format is <NR3>.
 MINimum 20Hz
 MAXimum 10MHz

Return parameter: Return test frequency is in the format of <NR3>.

Set command example: SOUR:FREQ 10.0KHz

Query command example: SOUR:FREQ?

Return data example: 1.0E+4

SOURce:VOLTag[:LEVel][:IMMediate][:AMPLitude] <numeric_value>[MV|V]
SOURce:VOLTag[:LEVel][:IMMediate][:AMPLitude]?

It sets or queries amplitude level of AC output signal.

Set parameter:

numeric It sets test voltage from 0.01 to 5.0V. The unit auto defines as V if there is no unit in the command. The format is <NR3>.
 MINimum 0.01V
 MAXimum 5.0V

Return parameter: Return output signal amplitude is in the format of <NR3>.

Set command example: SOUR:VOLT 1.0V

Query command example: SOUR:VOLT?

Return data example: 1.0E+0

SOURce:BIAS:CURRent:STATe {ON|OFF|1|0}
SOURce:BIAS:CURRent:STATe?

It sets or queries if DC bias current is outputted.

Set parameter:

- 1 or ON Output DC bias current is enabled.
- 0 or OFF Output DC bias current is disabled.

Return parameter: {0|1}

Set command example: SOUR:BIAS:CURR ON

Query command example: SOUR:BIAS:CURR?

Return data example: 1

SOURce:BIAS:CURRent:EXTernal {0~15}
SOURce:BIAS:CURRent:EXTernal?

It sets or queries EXTERNAL BIAS connection status.

Set parameter:

- 1~15 EXTERNAL BIAS ON (1~15)
- 0 EXTERNAL BIAS OFF

Return parameter: {0|1}

Set command example: SOUR:BIAS:CURR:LINK ON

Query command example: SOUR:BIAS:CURR:LINK?

Return data example: 1

SOURce:BIAS:CURRent <numeric_value>[A]
SOURce:BIAS:CURRent?

It sets or queries DC bias current.

Set parameter:

- numeric It sets DC bias current, 0~0.1A.
- MINimum 0.00A
- MAXimum 0.10A

Return parameter: Return DC bias current is in the format of <NR3>.

Set command example: SOUR:BIAS:CURR 0.1

Query command example: SOUR:BIAS:CURR?

SOURce:BIAS:CURRent:READY <numeric_value>[S]
SOURce:BIAS:CURRent:READY?

It sets or queries output stable time of DC bias current.

Set parameter:

- numeric It sets output stable time of DC bias current, 0.0~100S.
- MINimum 0.0S
- MAXimum 100S

Return parameter: Output stable time of DC bias current is in the format of <NR3>.

Set command example: SOUR:BIAS:CURR:READY 0.1

Query command example: SOUR:BIAS:CURR:READY?

SOURce:BIAS:VOLTage:STATe {ON|OFF|1|0}
SOURce:BIAS:VOLTage:STATe?

It sets or queries if DC bias voltage is outputted when connecting DC voltage equipment.

Set parameter:

- 1 or ON Output DC bias is enabled.
- 0 or OFF Output DC bias is disabled.

Return parameter: {0|1}

Set command example: SOUR:BIAS:CURR ON

Query command example: SOUR:BIAS:CURR?

Return data example: 1

SYSTem Subsystem

SYSTem:BEEPer[:IMMediate]

It enables the beeper immediately.

Set parameter: None

Return parameter: None

Set command format: SYST:BEEP

SYSTem:BEEPer:STATe {OFF|SMAL|LARGE}

SYSTem:BEEPer:STATe?

It sets or queries if the beeper is enabled.

Set parameter:

0 or OFF The beeper is disabled.

1 or SMAL The beeper is with small volume.

2 or LARGE The beeper is with large volume.

Return parameter: {0|1}

Set command example: SYST:BEEP:STAT SMAL

Query command example: SYST:BEEP:STAT?

Return data example: 1

SYSTem:ALARm {PULSe(0)|CONTInuous(1)}

SYSTem:ALARm?

It selects the alarm sound of beeper. According to SYST:BEEP:SOUN to decide test result PASS or FAIL in measurement screen.

Set parameter:

0 or PULSe The beeper is in pulse action.

1 or CONTInuous The beeper is in continuous action.

Return parameter: {PULS|CONT}

Set command example: SYST:ALAR PULS

Query command example: SYST:ALAR?

Return data example: 0

SYSTem:SOUNd {PASS|FAIL}

SYSTem:SOUNd?

It follows measurement function to judge the result as PASS or FAIL to trigger the beeper.

Set parameter:

0 or PASS It enables the beeper to output PULSE or LEVEL when test result is PASS.

1 or FAIL It enables the beeper to output PULSE or LEVEL when test result is FAIL.

Return parameter: {PASS|FAIL}

Set command example: SYST:SOUN PASS

Query command example: SYST:BPPP:SOUN?

Return data example: PASS

SYSTem:CONSt <numeric_value>

SYSTem:CONSt?

It sets or queries output impedance mode.

Set parameter: Numeric is in the mode of <NR1>.

0 OFF mode is based on measurement range 100K Ω , 10K Ω , 1K Ω , 100 Ω , 10 Ω and 1 Ω to switch output impedance.

1 100 Ω mode

2 25Ω mode

Return parameter: {0|1|2}

Set command example: SYST:CONS 0

Query command example: SYST:CONS?

Return data example: 0

SYSTem:DCR[:LEVel] {NORMal|SMALl}

SYSTem:DCR[:LEVel]?

It sets or queries measurement signal level of DCR.

Set parameter:

0 or NORMal Measurement signal of DCR is 100mA.

1 or SMALl Measurement signal of DCR is 20mA.

Return parameter: {0|1}

Set command example: SYST:DCR NORM

Query command example: SYST:DCR?

Return data example: 1

SYSTem:LFRequency {0|1|2}

SYSTem:LFRequency?

It sets or queries LCR power frequency.

Set parameter:

0 It sets power frequency to 60Hz.

1 It sets power frequency to 50Hz.

2 NA means ignore the influence of power frequency

Return parameter: {0|1|2}

Set command example: SYST:LFR 0

Query command example: SYST:LFR?

Return data example: 0

SYSTem:KLOCK?

It queries if 11050 key is locked.

Return parameter: {0|1}

0 The key isn't locked.

1 The key is locked.

Query command example: SYST:KLOC?

Return data example: 1

SYSTem:AREPort {ON|OFF|1|0}

SYSTem:AREPort?

It sets or queries if auto report measurement under RS232 REMOTE status.

Set parameter:

1 or ON It auto reports measurement (return format is the same as FETCH? command return value).

0 or OFF It doesn't auto report measurement.

Return parameter: {0|1}

Set command example: SYST:AREP ON

Query command example: SYST:AREP?

Return data example: 1

SYSTem:HANDler[:JUDGment] {0|1}

SYSTem:HANDler[:JUDGment]?

It sets or queries slew mode of Handler PASS/FAIL pin.

Set parameter:

0 slew mode is from Low to High.

1 slew mode is from High to Low.
Return parameter: {0|1}
Set command example: SYST:HAND 0
Query command example: SYST:HAND?
Return data example: 0

SYSTem:VERSion?

It queries SCPI version.
Set parameter: None
Return parameter: It fixed returns 1990.0.
Query command example: SYST:VERS?

SYSTem:PRESet

It sets 11050 to return to default status but don't change key locked status.
Set parameter: None
Return parameter:None
Set command example: SYST:PRES

SYSTem:ERRor?

It queries 1st error message of Error Queue.
Set parameter: None
Return parameter: <numeric_value>,"<String>"
Example: +0,"No error"
Query command example: SYST:ERR?

SYSTem:USER:PASSWORD {ON|OFF|1|0}

SYSTem:USER:PASSWORD?

It sets or queries if the function of user password is enabled.
Set parameter:
 1 or ON The function of user password is enabled.
 0 or OFF The function of user password is disabled.
Return parameter: {0|1}
Set command example: SYST:USER:PASSWORD ON
Query command example: SYST:USER:PASSWORD?
Return data example: 1

SYSTem:LANGUAGE {0}

SYSTem:LANGUAGE?

It sets or queries language.
Set parameter:
 0 Language is in ENGLISH.
Return parameter: {0|1}
Set command example: SYST:LANGUAGE 0
Query command example: SYST:LANGUAGE?
Return data example: 0

SYSTem:TRIGger:DELay <numeric_value>

SYSTem:TRIGger:DELay?

It sets trigger delay time, the unit is mS.
Set parameter:
 numeric 0 to 9999mS is in the format of <NR1>.
Return parameter: 0 to 9999 is in the format of <NR1>.
Set command example: SYST:TRIG:DEL 10
Query command example: SYST:TRIG:DEL?

Return data example: 10

SYSTem:AVERage:TIME <numeric_value>

SYSTem:AVERage:TIME?

It sets or queries average time.

Set parameter: 1~10 is in the format of <NR1>.

Return parameter: <NR1>

Set command example: SYST:AVER:TIME 1

Query command example: SYST:AVER:TIME?

Return data example: 1

SYSTem:DELay:TIME <numeric_value>

SYSTem:DELay:TIME?

It sets measurement delay time, the unit is mS.

Set parameter:

numeric 0 to 99999mS is in the format of <NR1>.

Return parameter: 0 to 9999 is in the format of <NR1>.

Set command example: SYST:DEL:TIME 10

Query command example: SYST:DEL:TIME?

Return data example: 10

SYSTem:MEASure[:UNIT]:IDN?

It queries basic data of MEASURE UNIT. The return data is separated by comma which includes four columns of manufacturer, model number, serial number or 0, firmware revision.

Query command format: SYST:MEAS:UNIT:IDN?

Return data: manufacturer,model Number,serial number or 0,firmware revision

TRIGger Subsystem

TRIGger:DELay <numeric_value>

TRIGger:DELay?

It sets the time delayed for trigger and unit mS. .

Set parameter:

numeric 0 to 9999mS is in the format of <NR1>.

Return parameter: 0 to 9999 is in the format of <NR1>.

Set command example: TRIG:DEL 10

Query command example: TRIG:DEL?

Return data example: 10

TRIGger[:IMMEDIATE]

It executes the measurement for trigger.

Set parameter: None

Return parameter: None

Set command example: TRIG

TRIGger:SOURce {INTernal(0)|MANual(1)|EXTerna(2)|BUS(3)}

TRIGger:SOURce?

It sets or queries the measurement for trigger source.

Set parameter:

INTernal or 0 It sets internal continuous for trigger mode.

MANual or 1 It sets START key on panel for trigger mode.

EXTernal or 2 It sets START key of Handle or SCAN BOX for trigger mode.

BUS or 3 It accepts *TRG command of IEEE-488.2.
 Return parameter: {0|1|2|3}
 Set command example: TRIG:SOUR EXT
 Query command example: TRIG:SOUR?
 Return data example: 2

BINNING Subsystem

BINning[:STATe] {ON|OFF|1|0}

BINning[:STATe]?

It sets or queries if BINSORTING function is enabled.

Set parameter:

1 or ON It enables BINSORTING function.

0 or OFF It disables BINSORTING function.

Return parameter: {0|1}

Set command example: BINN ON

Query command example: BINN?

Return data example: 1

BINning: STATe:MODE {OFF|ABS|DEV|PCNT|0|1|2|3}

BINning: STATe:MODE?

It sets or queries BINSORTING function mode.

Set parameter: {OFF|ABS|DEV|PCNT|0|1|2|3}

Return parameter: {OFF|ABS|DEV|PCNT }

Description:

OFF (0) It disables BINSORTING function.

ABS (1) It enables BINSORTING function (ABS mode).

DEV (2) It enables BINSORTING function (DEV mode).

PCNT(3) It enables BINSORTING function (PCNT mode).

Set syntax: CALC1:STAT OFF

Query syntax: CALC1:STAT?

Return data: 0

BINning:MODE {ABS|PCNT}

BINning:MODE?

It sets or queries numeric mode of BIN upper/lower limit.

Set parameter:

ABS Upper/lower limit value is in ABS mode.

PCNT Upper/lower limit value is in PCNT mode.

Return parameter: {ABS|PCNT}

Set command example: BINN:MODE PCNT

Query command example: BINN:MODE?

Return data example: PCNT

BINning:LIMit:UPPer:BIN{1~8} <numeric_value>

BINning:LIMit:UPPer:BIN{1~8}?

It sets or queries BIN 1~8 upper limit of primary parameter.

Set parameter:

numeric It sets upper limit of BIN1~8 in the format of <NRf>.

Return parameter: The format is <NR3>.

Set command example: BINN:LIM:UPP:BIN1 100.0

Query command example: BINN:LIM:UPP:BIN1?

Return data example: 1.0E+2

BINning:LIMit:UPPer:AUX <numeric_value>**BINning:LIMit:UPPer:AUX?**

It sets or queries upper limit of secondary parameter.

Set parameter:

numeric It sets lower limit of secondary parameter in the format of <NRf>.

Return parameter: The format is <NR3>.

Set command example: BINN:LIM:UPP:AUX 1.0E2

Query command example: BINN:LIM:UPP:AUX?

Return data example: 1.0E2

BINning:LIMit:UPPer:AUX2 <numeric_value>**BINning:LIMit:UPPer:AUX2?**

It sets or queries upper limit of secondary parameter.

Set parameter:

numeric It sets lower limit of secondary parameter in the format of <NRf>.

Return parameter: The format is <NR3>.

Set command example: BINN:LIM:UPP:AUX2 1.0E2

Query command example: BINN:LIM:UPP:AUX2?

Return data example: 1.0E2

BINning:LIMit:LOWer:BIN{1~8} <numeric_value>**BINning:LIMit:LOWer:BIN{1~8}?**

It sets or queries BIN 1~8 lower limit of primary parameter.

Set parameter:

numeric It sets lower limit of BIN1~8 in the format of <NRf>.

Return parameter: The format is <NR3>.

Set command example: BINN:LIM:LOW:BIN1 1.0

Query command example: BINN:LIM:LOW:BIN1?

Return data example: 1.0E+0

BINning:LIMit:LOWer:AUX <numeric_value>**BINning:LIMit:LOWer:AUX?**

It sets or queries lower limit of secondary parameter.

Set parameter:

numeric It sets lower limit of secondary parameter in the format of <NRf>.

Return parameter: The format is <NR3>.

Set command example: BINN:LIM:LOW:AUX 1.0E+0

Query command example: BINN:LIM:LOW:AUX?

Return data example: 1.0E+0

BINning:LIMit:LOWer:AUX2 <numeric_value>**BINning:LIMit:LOWer:AUX2?**

It sets or queries lower limit of secondary parameter.

Set parameter:

numeric It sets lower limit of secondary parameter in the format of <NRf>.

Return parameter: The format is <NR3>.

Set command example: BINN:LIM:LOW:AUX2 1.0E+0

Query command example: BINN:LIM:LOW:AUX2?

Return data example: 1.0E+0

BINning:LIMit:NOMInal:BIN{1~8} <numeric_value>**BINning:LIMit:NOMInal:BIN{1~8}?**

It sets or queries nominal value of primary parameter BIN 1~8 in PCNT mode. Use BIN1 nominal value to calculate upper/lower limit of BIN2~8 when the nominal value of

BIN2~8 not be set.

Set parameter:

numeric It sets nominal value of primary parameter PCNT in the format of <NRf>.

Return parameter: The format is <NR3>.

Set command example: BINN:LIM:NOMI:BIN1 10

Query command example: BINN:LIM:NOMI:BIN1?

Return data example: 1.0E+0

BINning:LIMit:NOMInal:AUX <numeric_value>

BINning:LIMit:NOMInal:AUX?

It sets or queries nominal value of secondary parameter in PCNT mode.

Set parameter:

numeric It sets nominal value of primary parameter PCNT in the format of <NRf>.

Return parameter: The format is <NR3>.

Set command example: BINN:LIM:NOMI:AUX 10

Query command example: BINN:LIM:NOMI:AUX?

Return data example: 1.0E+0

BINning:LIMit:NOMInal:AUX2 <numeric_value>

BINning:LIMit:NOMInal:AUX2?

It sets or queries nominal value of secondary parameter in PCNT mode.

Set parameter:

numeric It sets nominal value of primary parameter PCNT in the format of <NRf>.

Return parameter: The format is <NR3>.

Set command example: BINN:LIM:NOMI:AUX2 10

Query command example: BINN:LIM:NOMI:AUX2?

Return data example: 1.0E+0

BINning:RESUit?

It queries the result for BIN SORTING.

Set parameter: None

Return parameter:

+0 Secondary parameter FAIL

+1~+8 Binning result of primary parameter BIN1~8

+9 Primary parameter FAIL

Query command format: BINN:RESU?

Return data example: 1

BINning:COUNt:CLEAr

It clears the result for binning count.

Set parameter: None

Return parameter: None

Set command format: BINN:COUN:CLE

MEMory Subsystem

MEMory:SYNC

This command needs to be executed after 11050 LCR test parameters and condition settings are done. The 11050D transmits test parameter to measurement unit (11050M) that enters waiting measurement trigger status.

Set parameter: None

Return parameter: None
 Set command example: MEM:SYNC
 Query command example: None

STATus Subsystem

STATus:OPERation:CONDition?

It queries operation status register.

Return parameter: 0~65535 is in the format of <NR1>.

Query command example: STAT:OPER:COND?

STATus:OPERation:ENABle <numeric_value>

STATus:OPERation:ENABle?

It sets operation enable register.

Set parameter:

numeric 0~65535 is in the format of <NR1>.

Return parameter: 0~65535 is in the format of <NR1>.

Set command example: STAT:OPER:ENAB 255

Query command example: STAT:OPER:ENAB?

STATUs:OPERation[:EVENT]?

It queries operation event register.

Set parameter: None

Return parameter: 0~65535 is in the format of <NR1>.

Query command example: STATU:OPER?

Bit Position	15-2	5	4	3-0
Condition	Reserved, unused	Waiting for Trigger	Measing	Reserved, unused

STATUs:OPERation:NTRansition <numeric_value>

STATUs:OPERation:NTRansition?

It sets negative transition register of operation. If the register is set to 1, the status register of operation is from 1 changed to 0 thus signal register of operation will be set. Please refer STATUs:OPERation:PTRansition command.

Set parameter:

Numeric 0~65535 is in the format of <NR1>.

Return parameter: 0~65535 is in the format of <NR1>.

Set command example: STATU:OPER:NTR 255

Query command example: STAT:OPER:NTR?

STATUs:OPERation:PTRansition <numeric_value>

STATUs:OPERation:PTRansition?

It sets positive transition register of operation. If the register is set to 1, the status register of operation is from 0 changed to 1 thus signal register of operation will be set. Please refer STATUs:OPERation:PTRansition command.

Set parameter:

Numeric 0~65535 is in the format of <NR1>.

Return parameter: 0~65535 is in the format of <NR1>.

Set command example: STAT:OPER:PTR 255

Query command example: STAT:OPER:PTR?

STATUs:OPERation:PRESet

It sets various registers of operation to preset status, the settings of various registers

are given as the following.
 Set ENABLE bit to 0's.
 Set PTRansition bit to 0's.
 Set NTRansition bit to 0's.
 Set parameter: None
 Return parameter: None
 Set command example: STAT:OPER:PRES

STATus:QUEStionable:CONDition?

It queries questionable condition register.
 Return parameter: 0~65535 is in the format of <NR1>.
 Set command example: STAT:QUES:COND 255
 Query command example: STAT:QUES:COND?

STATUs:QUEStionable:ENABLE <numeric_value>

STATUs:QUEStionable:ENABLE?

It sets questionable enable register.
 Set parameter:
 Numeric 0~65535 is in the format of <NR1>.
 Return parameter: 0~65535 is in the format of <NR1>.
 Set command example: STAT:QUES:ENAB 255
 Query command example: STAT:QUES:ENAB?

STATUs:QUEStionable[:EVENT]?

It queries questionable event register.
 Set parameter: None
 Return parameter: 0~65535 is in the format of <NR1>.
 Query command example: STAT:QUES?
 QUESTIONABLE EVENT bit configuration.

Bit Position	15-5	4	3	2	1	0
Condition	Reserved, unused	External BIAS. ISRC Error	External BIAS. POWER OFF	External BIAS. Not Connected	CAN BUS Checksum Error	CAN BUS Commuication Error

STATus:QUEStionable:NTRansition <numeric_value>

STATus:QUEStionable:NTRansition?

It sets negative transition register of operation. If the register is set to 1, the status register of operation is from 1 changed to 0 thus signal register of questionable will be set. Please refer STATus: QUEStionable:PTRansition command.
 Set parameter:
 Numeric 0~65535 is in the format of <NR1>.
 Return parameter: 0~65535 is in the format of <NR1>.
 Set command example: STAT:QUES:NTR 255
 Query command example: STAT:QUES:NTR?

STATUs:QUEStionable:PTRansition <numeric_value>

STATUs:QUEStionable:PTRansition?

It sets positive transition register of operation. If the register is set to 1, the status register of operation is from 0 changed to 1 thus signal register of questionable will be set. Please refer STATus:QUEStionable:PTRansition command.
 Set parameter:

numeric 0~65535 is in the format of <NR1>.
 Return parameter: 0~65535 is in the format of <NR1>.
 Set command example: STAT:QUES:PTR 255
 Query command example: STAT: QUES:PTR?

STATUs:QUEStionable:PRESet

It sets various registers of questionable to preset status, the settings of various registers are given as the following.

Set ENABle bit to 0's.

Set PTRansition bit to 0's.

Set NTRansition bit to 0's.

Set parameter: None

Return parameter: None

Set command example: STAT:QUES:PRES

7.2.4.3 LCRZ:SCAN Command Set

CALCulate Subsystem

LCRZ:SCAN:CALCulate1:FORMat {REAL|MLINear|LP|LS|CP|CS|RS|RP|ZS|YP}
LCRZ:SCAN:CALCulate1:FORMat?

It sets or queries measurement primary parameter at present.

Set parameter: {REAL|MLINear|LP|LS|CP|CS|RS|RP|ZS|YP }

Return parameter: {REAL|MLINear|LP|LS|CP|CS|RS|RP|ZS|YP }

Description:

REAL	Real part of impedance
MLINear	Absolute value of impedance
LP	Equivalent parallel capacitance
LS	Equivalent series inductance
CP	Equivalent parallel capacitance
CS	Equivalent series capacitance
RS	Equivalent series resistance
RP	Equivalent parallel resistance
ZS	Equivalent series impedance
YP	Equivalent parallel admittance

Set command example: LCRZ:SCAN:CALC1:FORM LP

Query command example: LCRZ:SCAN:CALC1:FORM?

Return data example: LP

LCRZ:SCAN:CALCulate2:FORMat {IMAGinary|PHASe|D|Q|GP|REAL|RS|XS}
LCRZ:SCAN:CALCulate2:FORMat?

It sets or queries measurement secondary parameter at present.

Set parameter: {IMAGinary|PHASe|D|Q|GP|REAL|RS|XS}

Return parameter: {IMAGinary|PHASe|D|Q|GP|REAL|RS|XS}

Description:

IMAGinary	Imaginary of impedance
PHASe	Phase angle
D	Loss factor
Q	Quality factor
GP	Equivalent parallel conductance
REAL	Real part of impedance
RS	Equivalent series resistance
XS	Series equivalent value of imaginary

Set command example: LCRZ:SCAN:CALC2:FORM D
Query command example: LCRZ:SCAN:CALC2:FORM?
Return data example: D

LCRZ:SCAN:CALCulate{1|2}:COUNT:CLEar

It clears count result of comparator.

Set parameter: None

Return parameter: None

Set command format: LCRZ:SCAN:CALCulate1:COUN:CLE

CONDition Subsystem

LCRZ:SCAN:CONDition:LFRequency {0|1|2}

LCRZ:SCAN:CONDition:LFRequency?

It sets or queries LCR power frequency.

Set parameter:

- 0 It sets power frequency to 60Hz.
- 1 It sets power frequency to 50Hz.
- 2 NA means to ignore the influence of power frequency.

Return parameter: {0|1|2}

Set command example: LCRZ:SCAN:COND:LFR 0

Query command example: LCRZ:SCAN:COND:LFR?

Return data example: 0

LCRZ:SCAN:CONDition:DELay:TIME <numeric_value>

LCRZ:SCAN:CONDition:DELay:TIME?

It sets measurement delay time in the unit of mS.

Set parameter:

numeric 0 to 99999mS is in the format of <NR1>.

Return parameter: 0 to 9999 is in the format of <NR1>.

Set command example: LCRZ:SCAN:COND:DEL:TIME 10

Query command example: LCRZ:SCAN:COND:DEL:TIME?

Return data example: 10

LCRZ:SCAN:CONDition:CONSt <numeric_value>

LCRZ:SCAN:CONDition:CONSt?

It sets or queries impedance mode for output.

Set parameter: numeric is <NR1> mode.

- 0 OFF mode follows measurement ranges of 100K, 10K, 1K, 100, 10 or 1 to switch output impedance.
- 1 Output impedance 100 Ω
- 2 Output impedance 25 Ω

Return parameter: {0|1|2}

Set command example: LCRZ:SCAN:COND:CONS 0

Query command example: LCRZ:SCAN:COND:CONS?

Return data example: 0

LCRZ:SCAN:CONDition:TMODE <numeric_value>

LCRZ:SCAN:CONDition:TMODE?

It sets or queries test mode.

Set parameter:

- 0 Sequence test mode
- 1 Single step test mode

Return parameter: {0|1}

Set command example: LCRZ:SCAN:COND:TMODE 1
 Query command example: LCRZ:SCAN:COND:TMODE?
 Return data example: 1

LCRZ:SCAN:CONDition:LOAD:CORRection {ON|OFF|1|0}
LCRZ:SCAN:CONDition:LOAD:CORRection?

It sets or queries if LOAD CORRection function is enabled.

Set parameter:

1 or ON It enables LOAD CORRection function.
 0 or OFF It disables LOAD CORRection function.

Return parameter:{0|1}

Set command example: LCRZ:SCAN:COND:LOAD:CORR ON

Query command example: LCRZ:SCAN:COND:LOAD:CORR?

Return data example: 1

LIMit Subsystem

LCRZ:SCAN:LIMit:[STATe] <numeric_value>,<numeric_value>
LCRZ:SCAN:LIMit:[STATe]? <numeric_value>

It sets or queries compare mode.

Set parameter:

<Parameter 1> Compare 1~9 set
 <Parameter 2> Compare mode
 0 or OFF It disables compare mode.
 1 Primary parameter comparison
 2 Secondary parameter comparison
 3 Primary and secondary parameter are all with comparison

Query command parameter:

1 to 9 Compare 1~9 set

Return parameter: It returns compare mode for n set.

Set command example: LCRZ:SCAN:LIM:STAT 9,2

Query command example: LCRZ:SCAN:LIM:STAT? 9

Return data example: 2

LCRZ:SCAN:LIMit:SOURce:FREQUency <numeric_value>,<numeric_value>
LCRZ:SCAN:LIMit:SOURce:FREQUency? <numeric_value>

It sets or queries test voltage.

Set parameter:

<Parameter 1> Compare 1~9 set
 <Parameter 2> Test frequency
 numeric Test frequency 1.0E+3 to 1.0E+7
 MINimum 1.0E+3
 MAXimum 1.0E+7

Query command parameter:

1 to 9 Compare 1~9 set

Return parameter: It returns test frequency for n set.

Set command example: LCRZ:SCAN:LIM:SOUR:FREQ 9,1.0E+4

Query command example: LCRZ:SCAN:LIM:SOUR:FREQ? 9

Return data example: 1.0E+4

LCRZ:SCAN:LIMit:SOURce:VOLTage[:LEVel] <numeric_value>,<numeric_value>
LCRZ:SCAN:LIMit:SOURce:VOLTage[:LEVel]? <numeric_value>

It sets or queries test voltage.

Set parameter:

<Parameter 1> Compare 1~9 set
 <Parameter 2> Test voltage 0.01 to 5.0
 numeric Test voltage 0.01 to 5.0
 MINimum 0.01
 MAXimum 5.0
 Query command parameter:
 1 to 9 Compare 1~9 set
 Return parameter: It returns test voltage for n set.
 Set command example: LCRZ:SCAN:LIM:SOUR:VOLT 9,1.0
 Query command example: LCRZ:SCAN:LIM:SOUR:VOLT? 9
 Return data example: 1.0E+0

LCRZ:SCAN:LIMit:MODE <numeric_value>

LCRZ:SCAN:LIMit:MODE?

It sets or queries setting mode for upper/lower limit.

Set parameter:

0 or ABS ABS mode
 1 or PCNT PCNT(%) mode

Set command example: LCRZ:SCAN:LIM:MODE ABS

Query command example: LCRZ:SCAN:LIM:MODE?

Return data example: ABS

LCRZ:SCAN:LIMit:PARA1:TOLerance

<numeric_value>,<numeric_value>,<numeric_value>,<numeric_value>

LCRZ:SCAN:LIMit:PARA1:TOLerance:? <numeric_value>

It sets or queries judgment condition parameter of primary parameter measurement result (nominal value, upper/lower limit).

Set parameter:

<Parameter 1> Compare 1~9 set
 <Parameter 2> Nominal value setting
 <Parameter 3> Upper limit setting
 <Parameter 4> Lower limit setting

The values of parameter 3 and 4 are percentage or absolute decided by the command of LCRZ:SCAN:LIM:MODE.

Query command parameter:

1 to 9 Compare 1~9 set

Return parameter: It returns nominal value, upper/lower limit of n set.

Set command example: LCRZ:SCAN:LIM:PARA1:TOL 9,10.0,11.0,9.0

Query command example: LCRZ:SCAN:LIM:PARA1:TOL? 9

Return data example: 1.0E+1,1.1E+1,9.0E+0

LCRZ:SCAN:LIMit:PARA2:TOLerance

<numeric_value>,<numeric_value>,<numeric_value>,<numeric_value>

LCRZ:SCAN:LIMit:PARA2:TOLerance:? <numeric_value>

It sets or queries judgment condition parameter of secondary parameter measurement result (nominal value, upper/lower limit).

Set parameter:

<Parameter 1> Compare 1~9 set
 <Parameter 2> Nominal value setting
 <Parameter 3> Upper limit setting
 <Parameter 4> Lower limit setting

The values of parameter 3 and 4 are percentage or absolute decided by the command of LCRZ:SCAN:LIM:MODE.

Query command parameter:

1 to 9 Compare 1~9 set

Return parameter: It returns nominal value, upper/lower limit of n set.

Set command example: LCRZ:SCAN:LIM:PARA2:TOL 9,10.0,11.0,9.0

Query command example: LCRZ:SCAN:LIM:PARA2:TOL? 9

Return data example: 1.0E+1,1.1E+1,9.0E+0

LCRZ:SCAN:LIMit:FIMPedance:RANGe:AUTO {ON|OFF|1|0}

LCRZ:SCAN:LIMit:FIMPedance:RANGe:AUTO?

It sets or queries if auto range selection mode is enabled

Set parameter:

1 or ON It enables auto range selection mode.

0 or OFF It disables auto range selection mode.

Return parameter: {0|1}

Set command example: LCRZ:SCAN:LIM:RANG:AUTO ON

Query command example: LCRZ:SCAN:LIM:RANG:AUTO?

Return data example: 1

LCRZ:SCAN:LIMit:RANGe <numeric_value>,<numeric_value>

LCRZ:SCAN:LIMit:RANGe? <numeric_value>

It sets or queries measurement range.

Set parameter:

<Parameter 1> Compare 1~9 set

< Parameter 2>

numeric Measurement range 0~11 is in the format of <NR1>.

Measurement range:

0 100KOhm

1 30KOhm

2 10KOhm

3 3KOhm

4 1KOhm

5 300Ohm

6 100Ohm

7 30Ohm

8 10Ohm

9 3Ohm

10 1Ohm

11 300Mohm

Return parameter: 0~11 is in the format of <NR1>.

Set command example: LCRZ:SCAN:LIM:RANG 9,1

Query command example: LCRZ:SCAN:LIM:RANG? 9

Return data example: 1

DISPlay Subsystem

LCRZ:SCAN:DISPlay[:WINDow]:PAGE <value>

LCRZ:SCAN:DISPlay[:WINDow]:PAGE?

It sets or queries display window.

Set parameter:

1 It enters LCRZ SCAN measurement window.

Return parameter: {0|1}

Description: 0 indicates that isn't in LCRZ SCAN DISPLAY measurement window.

Set command example: LCRZ:SCAN:DISP:PAGE 1

Query command example: LCRZ:SCAN:DISP:PAGE?

Return data: 1

SENSe Subsystem

LCRZ:SCAN:[SENSe]:AVERAge:COUNT <value>

LCRZ:SCAN:[SENSe]:AVERAge:COUNT?

It sets or queries average count.

Set parameter: 1~10 is in the format of <NR1>.

Return parameter: <NR1>

Set command example: LCRZ:SCAN:AVER:COUN 1

Query command example: LCRZ:SCAN:AVER:COUN?

Return data example: 1

LCRZ:SCAN:[SENSe]:FIMPedance:APERture {FAST(0)|MEDium(1)|SLOW(2)}

LCRZ:SCAN:[SENSe]:FIMPedance:APERture?

It sets or queries measurement speed.

Set parameter:

FAST or 0 The measurement is in fast speed.

MEDium or 1 The measurement is in medium speed.

SLOW or 2 The measurement is in slow speed.

Return parameter: {0|1|2}

Set command example: LCRZ:SCAN:SENS:FIMP:APER FAST

Query command example: LCRZ:SCAN:SENS:FIMP:APER?

Return data example: 0

LCRZ:SCAN:[SENSe]:FUNcTION[:ON] {FIMPedance|FADMittance}

LCRZ:SCAN:[SENSe]:FUNcTION[:ON]?

It sets or queries measurement equivalent mode.

Set parameter:

FIMPedance Equivalent series mode

FADMittance Equivalent parallel mode

Return parameter: {FIMPEDANCE|FADMITTANCE}

Set command example: LCRZ:SCAN:SENS:FUNC FIMP

Query command example: LCRZ:SCAN:SENS:FUNC?

Return data example: FIMPEDANCE

TRIGger Subsystem

LCRZ:SCAN:TRIGger:DELay <numeric_value>

LCRZ:SCAN:TRIGger:DELay?

It sets the time delayed for trigger in the unit of mS.

Set parameter:

numeric 0 to 9999mS is in the format of <NR1>.

Return parameter: 0 to 9999 is in the format of <NR1>.

Set command example: LCRZ:SCAN:TRIG:DEL 10

Query command example: LCRZ:SCAN:TRIG:DEL?

Return data example: 10

LCRZ:SCAN:TRIGger[:IMMediate]

It executes the measurement for trigger.

Set parameter: None

Return parameter: None

Set command example: LCRZ:SCAN:TRIG

LCRZ:SCAN:TRIGger:SOURce {INTernal(0)|MANual(1)|EXTerna(2)|BUS(3)}

LCRZ:SCAN:TRIGger:SOURce?

It sets or queries the measurement for trigger source.

Set parameter:

INTernal or 0	It sets the internal continuous for trigger mode.
MANual or 1	It sets START key on panel for trigger mode.
EXTernal or 2	It sets START key of Handle or SCAN BOX for trigger mode.
BUS or 3	It accepts *TRG command of IEEE-488.2.

Return parameter: {0|1|2|3}

Set command example: LCRZ:SCAN:TRIG:SOUR EXT

Query command example: LCRZ:SCAN:TRIG:SOUR?

Return data example: 2

FETCh Subsystem

LCRZ:SCAN:FETCh?

It fetches the measurement result.

Return parameter:

<RESULT>,<STATE>,<DAT1>,<DAT2>,<STATE>,<DAT1>,<DAT2>,<STATE>,<DAT1>,<DAT2>...

Description:

<RESULT>	Test result
0	No good product
1	Good product
2	No good product
<STATE>	Measurement state of step 1 - 9, data format <NR1>
0	Normal
1	Range error
4	Other error
<DAT1> 1~9	Test value of primary parameter is in the data format of <NR3>.
<DAT2> 1~9	Test value of secondary parameter is in the data format of <NR3>.

Query syntax: LCRZ:SCAN:FETC?

Return data: 0,0,1.314969e+00,1.176097e+02,0,1.1+e00,2.2E+02...

MEMory Subsystem

LCRZ:SCAN:MEMory:SYNC

This command needs to be executed after 11050 LCRZ SCAN test parameters and condition settings are done. The 11050D transmits test parameter to measurement unit (11050M) that enters waiting measurement trigger status.

Set parameter: None

Return parameter: None

Set command example: LCRZ:SCAN:MEM:SYNC

Query command example: None

7.2.4.4 BIAS:SCAN Command Set

CALCulate Subsystem

BIAS:SCAN:CALCulate1:FORMat {MLINear|LP|LS|ZS}

BIAS:SCAN:CALCulate1:FORMat?

It sets or queries the measurement primary parameter at present.

Set parameter: {MLINear|LP|LS|ZS}

Return parameter: {MLINear|LP|LS|ZS}

Description:

MLINear	Absolute value of impedance
LP	Equivalent parallel capacitance
LS	Equivalent series inductance
ZS	Equivalent series impedance

Set command example: BIAS:SCAN:CALC1:FORM LP

Query command example: BIAS:SCAN:CALC1:FORM?

Return data example: LP

BIAS:SCAN:CALCulate2:FORMat {PHASe|D|Q|RS}

BIAS:SCAN:CALCulate2:FORMat?

It sets or queries the measurement secondary parameter at present.

Set parameter: {PHASe|D|Q|RS}

Return parameter: {PHASe|D|Q|RS }

Description:

PHASe	Phase angle
D	Loass factor
Q	Quality factor
RS	Equivalent series resistance

Set command example: BIAS:SCAN:CALC2:FORM D

Query command example: BIAS:SCAN:CALC2:FORM?

Return data example: D

BIAS:SCAN:CALCulate{1|2}:COUNT:CLEar

It clears the count result of comparator.

Set parameter: None

Return parameter: None

Set command format: BIAS:SCAN:CALCulate1:COUN:CLE

CONDition Subsystem

BIAS:SCAN:LCRZ:SCAN:CONDition:LFRequency {0|1|2}

BIAS:SCAN:LCRZ:SCAN:CONDition:LFRequency?

It sets or queries LCR power frequency.

Set parameter:

0	It sets power frequency to 60Hz.
1	It sets power frequency to 50Hz.
2	NA means to ignore the influence of power frequency.

Return parameter: {0|1|2}

Set command example: BIAS:SCAN:COND:LFR 0

Query command example: BIAS:SCAN:COND:LFR?

Return data example: 0

BIAS:SCAN:CONDition:DELay:TIME <numeric_value>

BIAS:SCAN:CONDition:DELay:TIME?

It sets the time delayed for trigger in the unit of mS.

Set parameter:

numeric 0 to 99999mS is in the format of <NR1>.

Return parameter: 0 to 9999 is in the format of <NR1>.

Set command example: BIAS:SCAN:COND:DEL:TIME 10

Query command example: BIAS:SCAN:COND:DEL:TIME?

Return data example: 10

BIAS:SCAN:CONDition:CONSt <numeric_value>

BIAS:SCAN:CONDition:CONSt?

It sets or queries impedance mode for output.

Set parameter: numeric is <NR1> mode.

- 0 OFF mode follows measurement ranges of 100K, 10K, 1K, 100, 10 or 1 to switch output impedance.
- 1 Output impedance 100Ω
- 2 Output impedance 25Ω

Return parameter: {0|1|2}

Set command example: BIAS:SCAN:COND:CONS 0

Query command example: BIAS:SCAN:COND:CONS?

Return data example: 0

BIAS:SCAN:CONDition:TMODE <numeric_value>**BIAS:SCAN:CONDition:TMODE?**

It sets or queries test mode.

Set parameter:

- 0 Sequence test mode
- 1 Single step test mode

Return parameter: {0|1}

Set command example: BIAS:SCAN:COND:TMODE 1

Query command example: BIAS:SCAN:COND:TMODE?

Return data example: 1

BIAS:SCAN:CONDition:MEASure:TIME <numeric_value>**BIAS:SCAN:CONDition:MEASure:TIME?**

It sets measurement time in the unit of mS.

Set parameter:

numeric 0 to 99999mS is in the format of <NR1>.

Return parameter: 0 to 9999 is in the format of <NR1>.

Set command example: BIAS:SCAN:COND:DEL:TIME 10

Query command example: BIAS:SCAN:COND:DEL:TIME?

Return data example: 10

LIMit Subsystem**BIAS:SCAN:LIMit:[STATe] <numeric_value>,<numeric_value>****BIAS:SCAN:LIMit:[STATe]? <numeric_value>**

It sets or queries compare mode.

Set parameter:

- <Parameter 1> Compare 1~27 set
- <Parameter 2> Compare mode
- 0 or OFF It disables compare mode.
- 1 Primary parameter comparison
- 2 Secondary parameter comparison
- 3 Primary and secondary parameter are all with comparison

Query command parameter:

- 1 to 27 Compare 1~27 set

Return parameter: It returns compare mode for n set.

Set command example: BIAS:SCAN:LIM:STAT 27,2

Query command example: BIAS:SCAN:LIM:STAT? 27

Return data example: 2

BIAS:SCAN:LIMit:SOURce:FREQuency <numeric_value>,<numeric_value>**BIAS:SCAN:LIMit:SOURce:FREQuency? <numeric_value>**

It sets or queries test frequency.

Set parameter:

<Parameter 1> Compare 1~27 set
 <Parameter 2> Test frequency
 numeric Test frequency 1.0E+3 to 1.0E+7
 MINimum 1.0E+3
 MAXimum 1.0E+7

Query command parameter:

1 to 27 Compare 1~27 set

Return parameter: It returns test frequency for n set.

Set command example: BIAS:SCAN:LIM:SOUR:FREQ 27,1.0E+4

Query command example: BIAS:SCAN:LIM:SOUR:FREQ? 27

Return data example: 1.0E+4

BIAS:SCAN:LIMit:SOURce:BIAS:CURRent <numeric_value>,<numeric_value>
BIAS:SCAN:LIMit:SOURce:BIAS:CURRent? <numeric_value>

It sets or queries test current.

Set parameter:

<Parameter 1> Compare 1~27 set
 <Parameter 2> Test current -300.0 to 300.0
 numeric Test current -300.0 to 300.0
 MINimum -300.0
 MAXimum 300.0

Query command parameter:

1 to 27 Compare 1~27 set

Return parameter: It returns test voltage for n set.

Set command example: BIAS:SCAN:LIM:SOUR:BIAS:CURR 27,1.0

Query command example: BIAS:SCAN:LIM:SOUR:BIAS:CURR? 27

Return data example: 1.0E+0

BIAS:SCAN:LIMit:MODE <numeric_value>
BIAS:SCAN:LIMit:MODE?

It sets or queries setting mode for upper/lower limit.

Set parameter:

0 or ABS ABS mode
 1 or PCNT PCNT(%) mode

Set command example: BIAS:SCAN:LIM:MODE ABS

Query command example: BIAS:SCAN:LIM:MODE?

Return data example: ABS

BIAS:SCAN:LIMit:PARA1:TOLerance
<numeric_value>,<numeric_value>,<numeric_value>,<numeric_value>
BIAS:SCAN:LIMit:PARA1:TOLerance:? <numeric_value>

It sets or queries judgment condition parameter of primary parameter measurement result (nominal value, upper/lower limit).

Set parameter:

<Parameter 1> Compare 1~27 set
 <Parameter 2> Nominal value setting
 <Parameter 3> Upper limit setting
 <Parameter 4> Lower limit setting

The values of parameter 3 and 4 are percentage or absolute decided by the command of BIAS:SCAN:LIM:MODE.

Query command parameter:

1 to 27 Compare 1~27 set

Return parameter: It returns nominal value, upper/lower limit of n set.
 Set command example: BIAS:SCAN:LIM:PARA1:TOL 27,10.0,11.0,9.0
 Query command example: BIAS:SCAN:LIM:PARA1:TOL? 27
 Return data example: 1.0E+1,1.1E+1,9.0E+0

BIAS:SCAN:LIMit:PARA2:TOLerance

<numeric_value>,<numeric_value>,<numeric_value>,<numeric_value>

BIAS:SCAN:LIMit:PARA2:TOLerance:? <numeric_value>

It sets or queries judgment condition parameter of secondary parameter measurement result (nominal value, upper/lower limit).

Set parameter:

<Parameter 1> Compare 1~27 set
 <Parameter 2> Nominal value setting
 <Parameter 3> Upper limit setting
 <Parameter 4> Lower limit setting

The values of parameter 3 and 4 are percentage or absolute decided by the command of BIAS:SCAN:LIM:MODE.

Query command parameter:

1 to 27 Compare 1~27 set

Return parameter: It returns nominal value, upper/lower limit of n set.

Set command example: BIAS:SCAN:LIM:PARA2:TOL 27,10.0,11.0,9.0

Query command example: BIAS:SCAN:LIM:PARA2:TOL? 27

Return data example: 1.0E+1,1.1E+1,9.0E+0

DISPlay Subsystem

BIAS:SCAN:DISPlay[:WINDow]:PAGE <value>

BIAS:SCAN:DISPlay[:WINDow]:PAGE?

It sets or queries display window.

Set parameter:

1 It enters BIAS SCAN measurement window.

Return parameter: {0|1}

Description: 0 indicates that isn't in BIAS SCAN DISPLAY measurement window.

Set command example: BIAS:SCAN:DISP:PAGE 1

Query command example: BIAS:SCAN:DISP:PAGE?

Return data: 1

SENSe Subsystem

BIAS:SCAN:[SENSe]:AVERage:COUNT <value>

BIAS:SCAN:[SENSe]:AVERage:COUNT?

It sets or queries average count.

Set parameter: 1~10 is in the format of <NR1>.

Return parameter: <NR1>

Set command example: BIAS:SCAN:AVER:COUN 1

Query command example: BIAS:SCAN:AVER:COUN?

Return data example: 1

BIAS:SCAN:[SENSe]:FIMPedance:APERture {FAST(0)|MEDlum(1)|SLOW(2)}

BIAS:SCAN:[SENSe]:FIMPedance:APERture?

It sets or queries measurement speed.

Set parameter:

FAST or 0 The measurement is in fast speed.
 MEDlum or 1 The measurement is in medium speed.
 SLOW or 2 The measurement is in slow speed.

Return parameter: {0|1|2}

Set command example: BIAS:SCAN:SENS:FIMP:APER FAST

Query command example: BIAS:SCAN:SENS:FIMP:APER?

Return data example: 0

BIAS:SCAN:[SENSe]:FUNcTION[:ON] {FIMPedance|FADMittance}

BIAS:SCAN:[SENSe]:FUNcTION[:ON]?

It sets or queries measurement equivalent mode.

Set parameter:

FIMPedance Equivalent series mode

FADMittance Equivalent parallel mode

Return parameter: {FIMPEDANCE|FADMITTANCE}

Set command example: BIAS:SCAN:SENS:FUNC FIMP

Query command example: BIAS:SCAN:SENS:FUNC?

Return data example: FIMPEDANCE

SOURce Subsystem

BIAS:SCAN:SOURce:VOLTage[:LEVel] <numeric_value>[MV|V]

BIAS:SCAN:SOURce:VOLTage[:LEVel]?

It sets or queries amplitude level for AC output signal.

Set parameter:

numeric It sets test voltage 0.01 to 5.0V, the unit will be auto defined to V if there is no given unit. The format is in <NR3>.

MINimum 0.01V

MAXimum 5.0V

Return parameter: It returns output signal amplitude in the format of <NR3>

Set command example: BIAS:SCAN:SOUR:VOLT 1.0V

Query command example: BIAS:SCAN:SOUR:VOLT?

Return data example: 1.0E+0

BIAS:SCAN:SOURce:BIAS:CURRent:EXTernal {0~15}

BIAS:SCAN:SOURce:BIAS:CURRent:EXTernal?

It sets or queries the status for connecting EXTERNAL BIAS.

Set parameter:

1~15 EXTERNAL BIAS ON (1~15 set)

0 EXTERNAL BIAS OFF

Return parameter: 0~15, the format is <NR1>.

Set command example: BIAS:SCAN:SOUR:BIAS:CURR:EXT ON

Query command example: BIAS:SCAN:SOUR:BIAS:CURR: EXT?

Return data example: 1

BIAS:SCAN:SOURce:BIAS:CURRent:READY <numeric_value>[S]

BIAS:SCAN:SOURce:BIAS:CURRent:READY?

It sets or queries output stable time of DC bias current.

Set parameter:

numeric It sets output stable time of DC bias current 0.0~100S.

MINimum 0.0S

MAXimum 100S

Return parameter: Output stable time of DC bias current is in the format of <NR3>.

Set command example: BIAS:SCAN:SOUR:BIAS:CURR:READY 0.1

Query command example: BIAS:SCAN:SOUR:BIAS:CURR:READY?

TRIGger Subsystem

BIAS:SCAN:TRIGger:DELay <numeric_value>**BIAS:SCAN:TRIGger:DELay?**

It sets the time delayed for trigger in the unit of mS.

Set parameter:

numeric 0 to 9999mS is in the format of <NR1>.

Return parameter: 0 to 9999 is in the format of <NR1>.

Set command example: BIAS:SCAN:TRIG:DEL 10

Query command example: BIAS:SCAN:TRIG:DEL?

Return data example: 10

BIAS:SCAN:TRIGger[:IMMediate]

It executes the measurement for trigger.

Set parameter: None

Return parameter: None

Set command example: BIAS:SCAN:TRIG

BIAS:SCAN:TRIGger:SOURce {INTernal(0)|MANual(1)|EXTerna(2)|BUS(3)}**BIAS:SCAN:TRIGger:SOURce?**

It sets or queries the measurement for trigger source.

Set parameter:

INTernal or 0 It sets the internal continuous for trigger mode.

MANual or 1 It sets START key on panel for trigger mode.

EXTernal or 2 It sets START key of Handle or SCAN BOX for trigger mode.

BUS or 3 It accepts *TRG command of IEEE-488.2.

Return parameter: {0|1|2|3}

Set command example: BIAS:SCAN:TRIG:SOUR EXT

Query command example: BIAS:SCAN:TRIG:SOUR?

Return data example: 2

FETCH Subsystem**BIAS:SCAN:FETCH?**

It fetches the measurement result.

<RESULT>,<STATE>,<DAT1>,<DAT2>,<STATE>,<DAT1>,<DAT2>,<STATE>,<DAT1>,<DAT2>...

Description:

<RESULT> Test result

0 No good product

1 Good product

2 No good product

<STATE> Measurement state of step 1~27, data format <NR1>

0 Normal

1 Range error

4 Other error

<DAT1> 1~27 Test value of primary parameter is in the data format of <NR3>.

<DAT2> 1~27 Test value of secondary parameter is in the data format of <NR3>.

Query syntax: BIAS:SCAN:FETC?

Return data: 0,0,1.314969e+00,1.176097e+02,0,1.1+e00,2.2E+02...

MEMory Subsystem**LCRZ:SCAN:MEMory:SYNC**

This command needs to be executed after 11050 BIAS SCAN test parameters and

condition settings are done. The 11050D transmits test parameter to measurement unit (11050M) that enters waiting measurement trigger status.

Set parameter: None

Return parameter: None

Set command example: BIAS:SCAN:MEM:SYNC

Query command example: None

7.2.4.5 PARAMeter:SWEEP Command Set

CALCulate Subsystem

PARAMeter:SWEEP:LCRZ:SCAN:CALCulate1:FORMat
{REAL|MLINear|LP|LS|CP|CS|RS|RP|ZS|YP}

PARAMeter:SWEEP:LCRZ:SCAN:CALCulate1:FORMat?

It sets or queries the measurement primary parameter at present.

Set parameter: {REAL|MLINear|LP|LS|CP|CS|RS|RP|ZS|YP}

Return parameter: {REAL|MLINear|LP|LS|CP|CS|RS|RP|ZS|YP}

Description:

REAL	Impedance real
MLINear	Absolute value of impedance
LP	Equivalent parallel capacitance
LS	Equivalent series inductance
CP	Equivalent parallel capacitance
CS	Equivalent series capacitance
RS	Equivalent series resistance
RP	Equivalent parallel resistance
ZS	Equivalent series impedance
YP	Equivalent parallel admittance

Set command example: PARA:SWEEP:CALC1:FORM LP

Query command example: PARA:SWEEP:CALC1:FORM?

Return data example: LP

PARAMeter:SWEEP:CALCulate2:FORMat
{IMAGinary|PHASe|D|Q|GP|REAL|RS|XS}

PARAMeter:SWEEP:CALCulate2:FORMat?

It sets or queries the measurement secondary parameter at present.

Set parameter: {IMAGinary|PHASe|D|Q|GP|REAL|RS|XS}

Return parameter: {IMAGinary|PHASe|D|Q|GP|REAL|RS|XS}

Description:

IMAGinary	Impedance imaginary
PHASe	Phase angle
D	Loss factor
Q	Quality factor
GP	Equivalent parallel conductance
REAL	Impedance real
RS	Equivalent series resistance
XS	Series equivalent value of imaginary

Set command example: PARA:SWEEP:CALC2:FORM D

Query command example: PARA:SWEEP:CALC2:FORM?

Return data example: D

CONDition Subsystem

PARAMeter:SWEEP:CONDition:LFRrequency {0|1|2}**PARAMeter:SWEEP:CONDition:LFRrequency?**

It sets or queries LCR power frequency.

Set parameter:

- 0 It sets power frequency to 60Hz.
- 1 It sets power frequency to 50Hz.
- 2 NA means to ignore the influence of power frequency.

Return parameter: {0|1|2}

Set command example: PARA:SWEEP:COND:LFR 0

Query command example: PARA:SWEEP:COND:LFR?

Return data example: 0

PARAMeter:SWEEP:CONDition:CONSt <numeric_value>**PARAMeter:SWEEP:CONDition:CONSt?**

It sets or queries impedance mode for output.

Set parameter: numeric is <NR1> mode.

- 0 OFF mode follows measurement ranges of 100K, 10K, 1K, 100, 10 or 1 to switch output impedance.
- 1 Output impedance 100Ω
- 2 Output impedance 25Ω

Return parameter: {0|1|2}

Set command example: PARA:SWEEP:COND:CONS 0

Query command example: PARA:SWEEP:COND:CONS?

Return data example: 0

PARAMeter:SWEEP:CONDition:XAXIS:MODE <numeric_value>**PARAMeter:SWEEP:CONDition:XAXIS:MODE?**

It sets or queries the mode for X axis.

Set parameter: numeric is <NR1> mode.

- 0 X axis indicates frequency.
- 1 X axis indicates voltage.
- 2 X axis indicates current.

Return parameter: {0|1|2}

Set command example: PARA:SWEEP:COND:XAXIS:MODE 0

Query command example: PARA:SWEEP:COND:XAXIS:MODE?

Return data example: 0

PARAMeter:SWEEP:CONDition:XAXIS:MINinum <numeric_value>**PARAMeter:SWEEP:CONDition:XAXIS:MINinum?**

It sets or queries the minimum of X axis and follows its mode to decide setting range.

Set parameter:

X axis: Frequency

- numeric Test frequency 1.0E+3 to 1.0E+7
- MINimum 1.0E+3
- MAXimum 1.0E+7

X axis: Voltage

- numeric It sets test voltage from 0.01 to 5.0V.
- MINimum 0.01
- MAXimum 5.0

X axis: Current

- numeric It sets test voltage from 0.01 to 5.0V.
- MINimum -300.0
- MAXimum 300.0

Set command example: PARA:SWEEP:COND:XAXIZ:MIN 1.0E+1

Query command example: PARA:SWEEP:COND:XAXIZ:MIN?
Return data example: 1.0E+0

PARAMeter:SWEEP:CONDition:XAXIS:MAXimum <numeric_value>
PARAMeter:SWEEP:CONDition:XAXIS:MAXimum?

It sets or queries the maximum of X axis and follows its mode to decide setting range.

Set parameter:

X axis: Frequency

numeric Test frequency 1.0E+3 to 1.0E+7
MINimum 1.0E+3
MAXimum 1.0E+7

X axis: Voltage

numeric It sets test voltage from 0.01 to 5.0V.
MINimum 0.01
MAXimum 5.0

X axis: Current

numeric It sets test voltage from -300.0 to 300.0A.
MINimum -300.0
MAXimum 300.0

Set command example: PARA:SWEEP:COND: XAXIS:MAX 1.0E+1

Query command example: PARA:SWEEP:COND: XAXIS:MAX?

Return data example: 1.0E+0

PARAMeter:SWEEP:CONDition:XAXIS:SCALE <numeric_value>
PARAMeter:SWEEP:CONDition:XAXIS:SCALE?

It sets or queries scale of X axis.

Set parameter: numeric is <NR1> mode.

0 Scale of X axis is NORMAL.
1 Scale of X axis is LOGARITHM.

Return parameter: {0|1}

Set command example: PARA:SWEEP:COND: XAXIS:SCAL 0

Query command example: PARA:SWEEP:COND: XAXIS:SCAL?

Return data example: 0

PARAMeter:SWEEP:CONDition:SWEEP:STEP <numeric_value>
PARAMeter:SWEEP:CONDition:SWEEP:STEP?

It sets or queries test step.

Set parameter:

numeric 2 to 401 is in the format of <NR1>.

Return parameter: 2 to 401 is in the format of <NR1>.

Set command example: PARA:SWEEP:COND:SWEEP:STEP 10

Query command example: PARA:SWEEP:COND:SWEEP:STEP?

Return data example: 10

PARAMeter:SWEEP:CONDition:SWEEP:MODE <numeric_value>
PARAMeter:SWEEP:CONDition:SWEEP:MODE?

It sets or queries test mode.

Set parameter: numeric is <NR1> mode.

0 Test mode is TABLE.
1 Test mode is PLOT.
2 Test mode is PLOT_R.

Return parameter: {0|1}

Set command example: PARA:SWEEP:COND:SWEEP:MODE 0

Query command example: PARA:SWEEP:COND:SWEEP:MODE?

Return data example: 0

DISPlay Subsystem

PARAMeter:SWEEP:DISPlay[:WINDow]:PAGE <value>

PARAMeter:SWEEP:DISPlay[:WINDow]:PAGE?

It sets or queries display page.

Set parameter:

1 It enters PARAMETER SWEEP measurement page.

Return parameter: {0|1}

Description: 0 indicates it isn't in PARAMETER SWEEP DISPLAY measurement page.

Set command example: PARA:SWEEP:DISP:PAGE 1

Query command example: PARA:SWEEP:DISP:PAGE?

Return data: 1

SENSe Subsystem

PARAMeter:SWEEP:[SENSe]:AVERage:COUNT <value>

PARAMeter:SWEEP:[SENSe]:AVERage:COUNT?

It sets or queries average count.

Set parameter: 1~10 is in the format of <NR1>.

Return parameter: <NR1>

Set command example: PARA:SWEEP:AVER:COUN 1

Query command example: PARA:SWEEP:AVER:COUN?

Return data: example: 1

PARAMeter:SWEEP:[SENSe]:FIMPedance:APERture

{FAST(0)|MEDlum(1)|SLOW(2)}

PARAMeter:SWEEP:[SENSe]:FIMPedance:APERture?

It sets or queries measurement speed.

Set parameter:

FAST or 0 The measurement is in fast speed.

MEDlum or 1 The measurement is in medium speed.

SLOW or 2 The measurement is in slow speed.

Return parameter: {0|1|2}

Set command example: PARA:SWEEP:SENS:FIMP:APER FAST

Query command example: PARA:SWEEP:SENS:FIMP:APER?

Return data example: 0

PARAMeter:SWEEP:[SENSe]:FUNCtion[:ON] {FIMPedance|FADMittance}

PARAMeter:SWEEP:[SENSe]:FUNCtion[:ON]?

It sets or queries measurement equivalent mode.

Set parameter:

FIMPedance Equivalent series mode

FADMittance Equivalent parallel mode

Return parameter: {FIMPEDANCE|FADMITTANCE}

Set command example: PARA:SWEEP:SENS:FUNC FIMP

Query command example: PARA:SWEEP:SENS:FUNC?

Return data example: FIMPEDANCE

SOURce Subsystem

PARAMeter:SWEEP:SOURce:FREQuency[:CW] <numeric_value>[HZ|KHZ|K|MA]

PARAMeter:SWEEP:SOURce:FREQuency[:CW]?

It sets or queries the frequency for AC output signal.

Set parameter:

numeric It sets test frequency 1kHz to 10MHz, the unit will be auto defined to HZ if there is no given unit. Its format is in <NR3>.

MINimum 1kHz

MAXimum 10MHz

Return parameter: It returns test frequency in the format of <NR3>.

Set command example: PARA:SWEEP:SOUR:FREQ 10.0KHz

Query command example: PARA:SWEEP:SOUR:FREQ?

Return data example: 1.0E+4

PARAMeter:SWEEP:SOURce:VOLTage[:LEVel] <numeric_value>

PARAMeter:SWEEP:SOURce:VOLTage[:LEVel]?

It sets or queries the amplitude level for AC output signal.

Set parameter:

numeric It sets test voltage 0.01 to 5.0 in the format of <NR3>.

MINimum 0.01V

MAXimum 5.0V

Return parameter: It returns output signal amplitude in the format of <NR3>

Set command example: PARA:SWEEP:SOUR:VOLT 1.0V

Query command example: PARA:SWEEP:SOUR:VOLT?

Return data example: 1.0E+0

PARAMeter:SWEEP:SOURce:BIAS:CURRent <numeric_value>[A]

PARAMeter:SWEEP:SOURce:BIAS:CURRent?

It sets or queries DC bias current.

Set parameter:

numeric It sets DC bias current -300.0~300.0A.

MINimum -300.0A

MAXimum 300.0A

Return parameter: It returns DC bias current in the format of <NR3>.

Set command example: PARA:SWEEP:SOUR:BIAS:CURR 0.1

Query comm Return data example: It returns data example\$: 1.0E-1

PARAMeter:SWEEP:SOURce:BIAS:CURRent:EXTernal {0~15}

PARAMeter:SWEEP:SOURce:BIAS:CURRent:EXTernal?

It sets or queries the status for connecting EXTERNAL BIAS.

Set parameter:

1~15 EXTERNAL BIAS ON (1~15 set)

0 EXTERNAL BIAS OFF

Return parameter: 0~15, the format is <NR1>.

Set command example: PARA:SWEEP:SOUR:BIAS:CURR:LINK ON

Query command example: PARA:SWEEP:SOUR:BIAS:CURR:LINK?

Return data example: 1

PARAMeter:SWEEP:SOURce:BIAS:CURRent:READY <numeric_value>[S]

PARAMeter:SWEEP:SOURce:BIAS:CURRent:READY?

It sets or queries output stable time of DC bias current.

Set parameter:

numeric It sets output stable time of DC bias current 0.0~100S.

MINimum 0.0S

MAXimum 100S

Return parameter: Output stable time of DC bias current is in the format of <NR3>.

Set command example: PARA:SWEEP:SOUR:BIAS:CURR:READY 0.1

Query command example: PARA:SWEEP:SOUR:BIAS:CURR:READY?

TRIGger Subsystem

PARAMeter:SWEEP:TRIGger:DELay <numeric_value>

PARAMeter:SWEEP:TRIGger:DELay?

It sets the time delayed for trigger in the unit of mS.

Set parameter:

numeric 0 to 9999mS is in the format of <NR1>.

Return parameter: 0 to 9999 is in the format of <NR1>.

Set command example: PARA:SWEEP:TRIG:DEL 10

Query command example: PARA:SWEEP:TRIG:DEL?

Return data example: 10

PARAMeter:SWEEP:TRIGger[:IMMediate]

It executes the measurement for trigger.

Set parameter: None

Return parameter: None

Set command example: PARA:SWEEP:TRIG

PARAMeter:SWEEP:TRIGger:SOURce {INTernal(0)|MANual(1)|EXTerna(2)|BUS(3)}

PARAMeter:SWEEP:TRIGger:SOURce?

It sets or queries the measurement for trigger source.

Set parameter:

INTernal or 0 It sets the internal continuous for trigger mode.

MANual or 1 It sets START key on panel for trigger mode.

EXTernal or 2 It sets START key of Handle or SCAN BOX for trigger mode.

BUS or 3 It accepts *TRG command of IEEE-488.2.

Return parameter: {0|1|2|3}

Set command example: PARA:SWEEP:TRIG:SOUR EXT

Query command example: PARA:SWEEP:TRIG:SOUR?

Return data example: 2

FETCh Subsystem

PARAMeter:SWEEP:FETCh?

It fetches the measurement result.

<STEP>,<STATE>,<XAXIS>,<DAT1>,<DAT2>,<STATE>,<XAXIS>,<DAT1>,<DAT2>,<STATE>,<XAXIS>,<DAT1>,<DAT2>...

Description:

<STEP> Test step, data format is <NR1>.

<STATE> Measurement state, data format is <NR1>.

0 Normal

1 Range error

4 Other error

<XAXIS> X axis value of step 2~N is in the data format of <NR3>.

<DAT1> Primary parameter test value of step 2~N is in the data format of <NR3>. The maximum N is 401.

<DAT2> Secondary parameter test value of step 2~N is in the data format of <NR3>. The maximum N is 401.

Query syntax: PARA:SWEEP:FETC?

Return data: 0,2.335e+00,1.314e+00,1.176e+02,0,1.1+e00,2.2+e00,3.3E+02...

MEMory Subsystem

PARAMeter:SWEEP:MEMory:SYNC

This command needs to be executed after 11050 PARAMETER SWEEP test parameters and condition settings are done. The 11050D transmits test parameter to measurement unit (11050M) that enters waiting measurement trigger status.

Set parameter: None

Return parameter: None

Set command example: PARA:SWEEP:MEM:SYNC

Query command example: None



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