Chroma

LCR Meter

11021/11021-L

User's Manual

LCR Meter
11021/11021-L
User's Manual

Version 1.1
July 2013

Legal Notices

The information in this document is subject to change without notice.

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CHROMA ATE INC.

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

Warranty

All of Chroma's instruments are warranted against defects in material and workmanship for a period of one year from date of shipment. Chroma agrees to repair or replace any assembly or component found to be defective, under normal use during this period. Chroma's obligation under this warranty is limited solely to repairing any such instrument, which in Chroma's sole opinion proves to be defective within the scope of the warranty when returned to the factory or to an authorized service center. Purchaser is responsible for the shipping and cost of the service item to Chroma factory or service center. Shipment should not be made without prior authorization by Chroma.

This warranty does not apply to any products repaired or altered by persons not authorized by Chroma, or not in accordance with instructions furnished by Chroma. If the instrument is defective as a result of misuse, improper repair, or abnormal conditions or operations, repairs will be billed at cost.

Chroma assumes no responsibility for its product being used in a hazardous or dangerous manner either alone or in conjunction with other equipment. High voltage used in some instruments may be dangerous if misused. Special disclaimers apply to these instruments. Chroma assumes no liability for secondary charges or consequential damages and in any event, Chroma's liability for breach of warranty under any contract or otherwise, shall not exceed the purchase price of the specific instrument shipped and against which a claim is made.

Any recommendations made by Chroma regarding the use of its products are based upon tests believed to be reliable; Chroma makes no warranty of the results to be obtained. This warranty is in lieu of all other warranties, expressed or implied, and no representative or person is authorized to represent or assume for Chroma any liability in connection with the sale of our products other than set forth herein.

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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	O	O	O	O	O	O
CHASSIS	O	O	O	O	O	O
ACCESSORY	O	O	O	O	O	O
PACKAGE	O	O	O	O	O	O

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

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

Disposal

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

<Table 2>

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

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

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

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

Disposal

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

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CE

Declaration of Conformity

For the following equipment :

LCR Meter

(Product Name/ Trade Name)

11021, 11021-L

(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 55011:1998/A1:1999/A2:2002 Class A, EN 61000-3-2:2006,

EN 61000-3-3:1995/A1:2001/A2:2005, IEC 61000-4-2:1995/A1:1998/A2:2000,

IEC 61000-4-3:2002, IEC 61000-4-4:2004, IEC 61000-4-5:1995/A1:2000,

IEC 61000-4-6:2003, IEC 61000-4-8:1993/A1:2000, IEC 61000-4-11:2004

EN 61010-1:2010 and EN 61010-2-030:2010

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. Benjamin Huang

(Name, Surname)

Division Vice President

(Position/Title)

Taiwan	**2013.05.16**	Benjamin Huang
(Place)	(Date)	(Legal Signature)

Storage, Freight, Maintenance & Disposal

Storage
When the device is not in use, please pack it properly and store it under a good environment. (The packing is not needed when the device under appropriate environment.)

Freight
Please use the original packing material when move the device. If the packing material is missing, please use the equivalent buffer material to pack and mark it fragile as well as keep away from water etc. to avoid damaging the device during movement. The device are precise equipment, please use qualified transportation as possible. And avoid heavy hitting etc to damage the device.

Maintenance
There is no maintenance operation for general user (except for the note in the manual.) Please contact Chroma or its local agent when the device is having the user judgment abnormal. Don't maintain by yourself to avoid occurred unnecessary danger and serious damage to the device.

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

Cleaning
Remove all connected wires and cables on the instrument before cleaning. Use a brush to clean the dust on it. For internal cleaning, use a low-pressure air gun to vacuum the dust inside or send it back to the distributors or agents of Chroma for cleaning.

Revision History

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

Date	Version	Revised Sections
Nov. 2009	1.0	Complete this manual.
Jul. 2013	1.1	Add “CE Declaration of Conformity” Modify the following: − ”*Material Contents Declaration*” − “Standard Accessory” list in the section of “*Checking Before Use*” − Figure in the section of “*Ambient Environment*” − Figure and description in the section of “*Open Correction*” − Figure and description in the section of “*Short Correction*”

Table of Contents

1. Preface

1.1 Product Introduction

The 11021/11021-L LCR METER is an automatic instrument used for testing and analyzing components. The device was designed to solve the problems of low labor efficiency and low product quality that have occurred since the electronics industry began to flourish. It is able to increase the work efficiency and enhance the product quality to international standard.

The applicable frequency ranges for 11021 are 100Hz, 120Hz, 1kHz and 10kHz (the actual output is 9.6KHz), and for 11021-L are 1kHz, 10kHz, 40kHz and 50kHz.

The test functions equipped with this device containing: inductance, capacitance, AC resistance, impedance (L, C, R, and Z), and etc., which are perfect functions for the production line and quality control.

Via the internal-controlled auto mode and the programmable mode measurement functions, the instrument is capable of providing fast, highly accurate, convenient and reliable tests at low cost. It has the functions of Hi/Lo-limit comparison, group test, selection control for frequency and voltage test, data storage setting, GPIB interface for remote controlling 11021 and data transfer as well as statistics analysis function from PC. The handler interface is able to trigger the instrument for measurement and then send the test results to an external device for checking the response of the component.

The multi-function test device, ergonomic keyboard design, guided panel operation, extra-large LCD, and password protection make the 11021 instrument very easy to operate. Its protection enables the test result to be shown on the display clearly.

The basic accuracy of 11021 is 0.1%, and to calibrate it an exclusive measurement device (optional) is required with simple measurement parameters. The calibration can be done easily by giving the condition of OPEN and SHORT in the procedure.

If the meter requires external or extended lead tests, please be noted that the connection test of 4 contacts needs to be applied correctly. In cases of high frequency measurement, it is necessary to consider the high frequency response on the test cable.

1.2 Summary of Specification

- **Measurement Parameter:** Primary parameters – L, C, R, ｜Z｜
  Secondary parameters – Q, D, θ, ESR, Xs
- **Basic Accuracy:** Basic 0.2% (1 KHz/1V rms)
- **Measurement Range:** L -- 0.01uH ~ 9.999 KH
  C -- 0.01pF ~ 99.99 mF
  R -- 0.1mΩ ~ 99.99 MΩ
  ｜Z｜-- 0.1mΩ ~ 99.99 MΩ
  Q -- .0001 ~ 9999
  D -- .0001 ~ 9999
  θ -- -180.00° ~ +180.00°
- **Measurement Frequency:** 11021: Standard: 100Hz, 120Hz, 1kHz, 10kHz (the actual output is 9.6KHz)
  Optaional: 100Hz, 120Hz, 1kHz
  11021-L: 1kHz, 10kHz, 40kHz, 50kHz
- **Measurement Voltage:** Constant voltage: 11021: 0.25Vrms, 1V rms
  11021-L: 50mVrms, 1V rms
- **Equivalent Circuit:** Serial, Parallel
- **Zeroing Calibration:** Open, Short
- **Interface:** RS-232 (standard), GPIB & Handler interface (optional)

1.3 Checking Before Use

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

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

If any damage is found or any accessory is missing, please contact Chroma, its branches, or agents for prompt service.

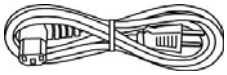
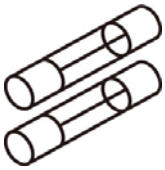
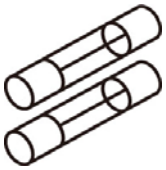
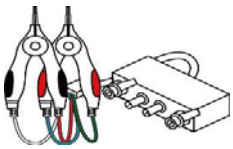
Item				
Name	11021/11021-L Quick Start Guide Traditional Chinese * 1pcs	11021/11021-L Quick Start Guide English *1pcs	11021/11021-L User's Manual CD*1	US Power Cord 1.83M*1pcs
Item				
Name	Power Connector 3PIN to 2PIN* 1pcs	AC 110V used 0.63A/250V Fuse *2pcs	AC 220V used 315mA/250V Fuse *2pcs	A110232 Test Cable 4BNC/2Clips*1pcs

Table 1-1 Standard Accessories

Item	Qty	Description
A110211 Components Test Fixture	1	It is a DIP type passive components test fixture.
A110212 Component Remote Test Fixture	1	It is a DIP type passive components remote test fixture (1 meter.)
A110104 SMD Test Cable	1	It is a SMD type passive components test cable.
A110232 4 BNC Test Cable	1	It is a 4 BNC test cable.
A133004 SMD Test Box	1	It is a SMD type passive components test box.
A110235 GPIB & HANDLER Interface Card	1	It is a GPIB & HANDLER interface card.
A110236 19" Rack Mounting Kit	1	It is fixed on the system frame.
A110242 Battery ESR Test Kit	1	It is test box that isolates the DC voltage of DUT.
A165009 4BNC Test Cable with Probe	1	It is a 4BNC test cable with probe.
50 Pin Handler Control Cable	1	It is a control cable (0.5 meter) with 50 Pin Handler connectors (M) at the two ends.
50 Pin Handler Control Cable	1	It is a control cable (1.5 meter) with 50 Pin Handler connectors (M) at the two ends.

Table 1-2 Optional Accessories

2. Specification (15°C~ 35°C RH ≤ 75%)

2.1 Measurement Function

Primary Parameter:

L	Inductance	Unit: uH, mH, H, KH
C	Capacitance	Unit: pF, nF, uF, mF
R	Resistance	Unit: mΩ, Ω, KΩ, MΩ
｜Z｜	Absolute value of impedance	Unit: mΩ, Ω, KΩ, MΩ

Secondary Parameter:

Q	Quality factor	
D	Dissipation factor	
ESR	Equivalent series resistance	Unit: mΩ, Ω, KΩ, MΩ
θ	Phase angle	Unit: ° (degree)
Xs	Reactance	Unit: mΩ, Ω, KΩ, MΩ

Equivalent Measurement Circuit: Parallel, Serial
Range: Auto, Manual
Trigger Mode: Internal, Manual and External (GPIB, RS-232, Handler Interface)
Measurement Terminal: 4 terminals test
Measurement Speed: Fast, Medium and Slow

2.2 Test Signal

Frequency:

11021 : 100Hz, 120Hz, 1kHz, 10kHz (the actual output frequency is 9.6KHz)
Accuracy : ± 0.25%

11021-L : lKHz, 10KHz, 40KHz, 50KHz
Accuracy : ± 0.02%

Voltage: Constant voltage: 11021: 0.25Vrms, 1V rms
11021-L: 50mVrms, 1V rms

Output Impedance: 25Ω, 100Ω, 1KΩ, 10KΩ, 100KΩ depends on the impedance.

2.3 Accuracy

- Within 1 year of factory calibration
- Temperature: 23°C ± 5°C
- Relative Humidity: <90%RH
- Warm up: At least 30 minutes
- Zero calibrated under the above conditions

1. Impedance – Phase Accuracy

Table 2-1 shows the basic accuracy of 11021:

- The accuracy times 2 when is it is measured in high speed.

Impedance Z	100Hz	120Hz	1KHz	10KHz
10MΩ	2.5% 0.6°	1.0% 0.5°	0.8% 0.4°	
1MΩ	0.6% 0.4°	0.5% 0.3°	0.4% 0.25°	0.5% 1.5°
100KΩ	0.4% 0.2°	0.3% 0.15°	0.2% 0.12°	0.3% 0.5°
10KΩ	0.1% 0.1°			
100Ω	0.3% 0.15°	0.25% 0.12°	0.2% 0.1°	0.2% 0.12°
10Ω	0.4% 0.2°	0.3% 0.2°	0.25% 0.15°	0.3% 0.2°
1Ω	0.5% 0.4°	0.4% 0.4°	0.3% 0.3°	0.4% 0.4°
0.1Ω				

Frequency

Table 2-1 |Z| , θ Accuracy

Table 2-2 shows the basic accuracy of 11021-L:

- The accuracy times 2 when is it is measured in high speed.

Impedance Z	Set Range	Range	1kHz	10kHz	40kHz	50kHz
	100 kΩ	10 MΩ	4.00% 0.40°			
		1MΩ	2.00% 0.25°	3.00% 1.50°	5.00% 2.50°	8.00% 2.50°
		330 kΩ 33 kΩ	0.20% 0.12°	0.30% 0.50°	1.00% 1.50°	1.00% 1.50°
	10 kΩ	33 kΩ 3.3 kΩ	0.10% 0.10°	0.15% 0.30°	0.30% 0.30°	0.40% 0.30°
	1 kΩ	3.3 kΩ 300 Ω	0.10% 0.10°	0.15% 0.10°	0.30% 0.30°	0.40% 0.30°
	100 Ω	300 Ω 30 Ω	0.20% 0.10°	0.20% 0.12°	0.30% 0.80°	0.40% 0.80°
	10 Ω	30Ω 1Ω	0.25% 0.15°	0.30% 0.20°	0.40% 0.30°	0.40% 0.40°
		100 mΩ	1.10% 0.90°	1.70% 2.50°	2.00% 5.00°	2.00% 6.00°
				Freqency		

Table 2-2 1V | Z | ,θ Accuracy

Impedance Z	Set Range	Range	1kHz	10kHz	40kHz	50kHz
	100 kΩ	10 MΩ	5.00% 3.50 °			
		1MΩ	2.00% 0.25 °	3.00% 1.50 °	5.00% 2.50 °	8.00% 2.50 °
		330 kΩ 33 kΩ	0.20% 0.12 °	0.75% 0.50 °	1.00% 1.50 °	1.00% 1.50 °
	10 kΩ	33 kΩ 3.3 kΩ	0.10% 0.10 °	0.15% 0.30 °	0.75% 0.75 °	1.00% 0.75 °
	1 kΩ	3.3 kΩ 300 Ω	0.10% 0.10 °	0.15% 0.10 °	0.75% 0.75 °	1.00% 0.75 °
	100 Ω	300 Ω 30 Ω	0.20% 0.10 °	0.20% 0.12 °	0.30% 0.80 °	1.00% 2.00 °
	10 Ω	30Ω 1Ω	0.25% 0.15 °	0.30% 0.20 °	0.40% 0.30 °	1.00% 1.00 °
		100 mΩ	1.10% 0.90 °	1.70% 2.50 °	2.00% 5.00 °	2.00% 6.00 °
				Freqency		

Table 2-3 50mV | Z | , θ Accuracy

2. The accuracy of inductance, capacitance and resistance

The quality factor is ≥ 10 (dissipation factor ≤ 0.1), relative to the impedance accuracy, where

Inductance = $|2\pi fL|$
Capacitance = $|1/(2\pi fC)|$

based on the Figure 2-1 LC and Impedance Conversion Table.

When the quality factor <10 (dissipation factor >0.1), the inductance accuracy times (1+ 1/Q) while the capacitance accuracy times (1+D).

3. Dissipation Factor, Quality Factor, AC Impedance Accuracy

Dissipation Factor

Dissipation Factor Accuracy= $\pm \dfrac{\tan\theta e \times (1 + D^2)}{1 - D \times \tan\theta e}$

Quality Factor ≥ 10

Quality Factor Accuracy = $\pm \dfrac{\tan\theta e \times (1 + Q^2)}{1 - Q \times \tan\theta e}$

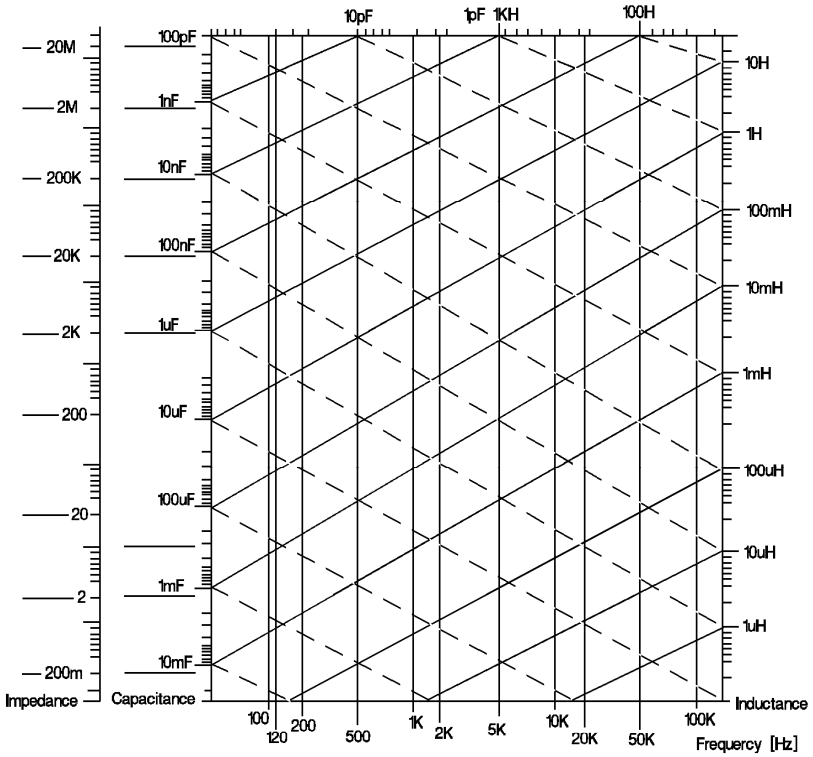
Quality Factor < 10, Quality Factor Accuracy times (1 + 1/Q)

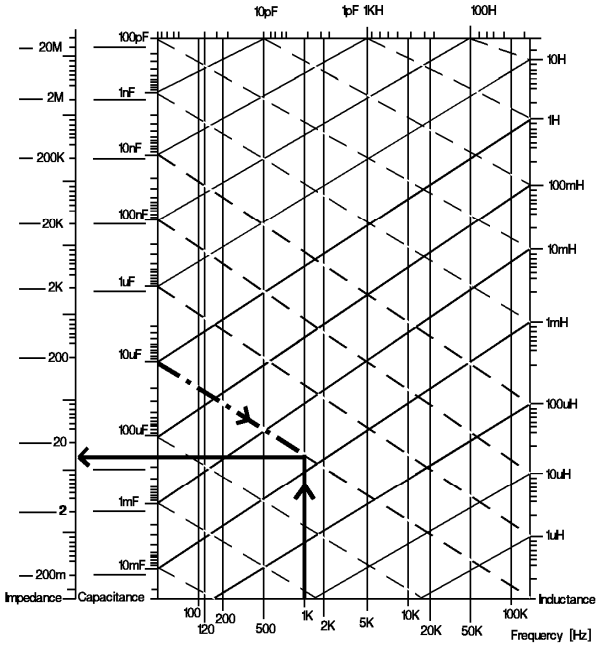
※ The θe is the θ error spec in Table 2-1.

4. Equivalent Series Resistance and Equivalent Parallel Resistance Accuracy

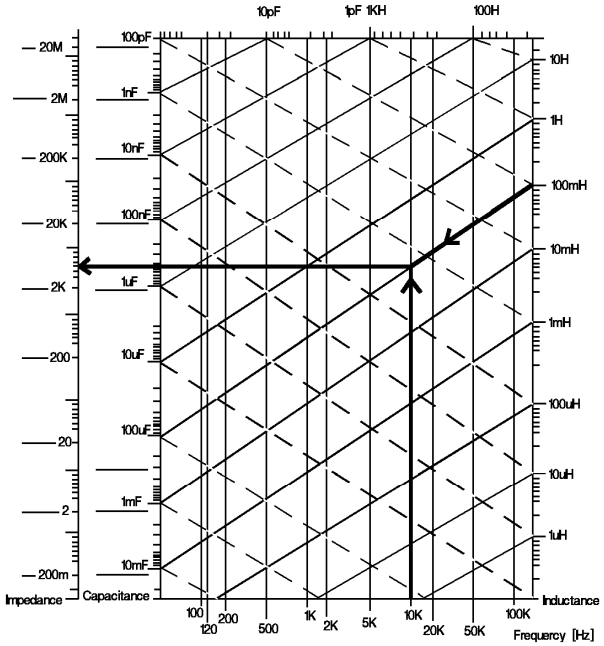
Quality Factor ≤ 0.l
AC Impedance Accuracy = Impedance Accuracy
Quality Factor ≥ 0.l, Accuracy times (l + Q)

Figure 2-1 LC - | Z | Conversion Table





(b). C → | Z | Conversion Table



(c). L → | Z | Conversion Table

2.4 Zeroing

Open Zeroing: It eliminates the open stray impedances measurement errors caused by the test fixture.
Short Zeroing: It eliminates the short residual impedances measurement errors caused by the test fixture.

2.5 Measurement Time

Table 2-4 lists the measurement time from the measurement start, sampling, calculating to binning or comparing signal output.

11021 Measurement Time:

Item	Fast	Medium	Slow
100Hz/120Hz	85mS	145mS	325 mS
1KHz/10KHz	75mS		

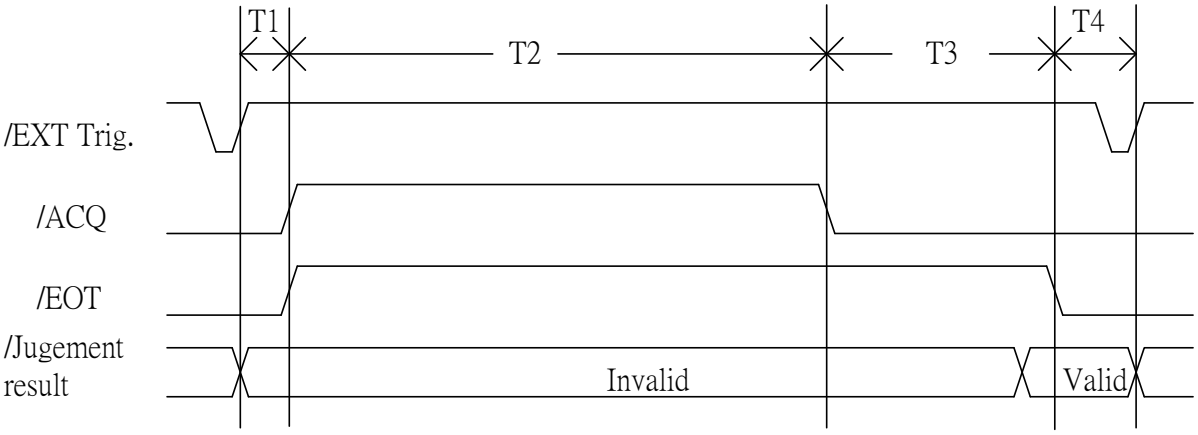
11021-L Measurement Time:

Item	Fast	Medium	Slow
1KHz/10KHz	75mS	145mS	325 mS
40KHz	105mS	185mS	415mS
50KHz	90mS	150mS	400mS

Table 2-4 Measurement Time

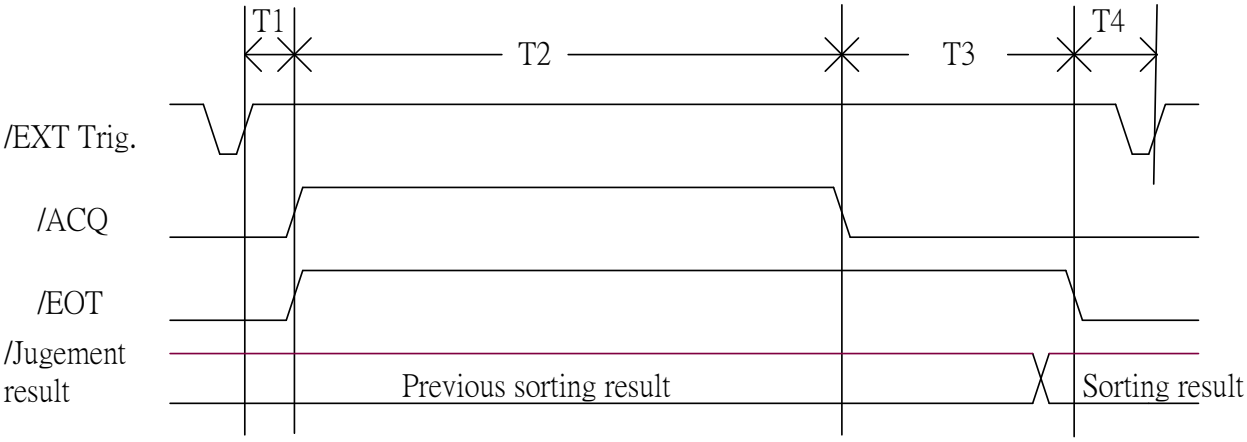
2.6 Trigger Timing

1. Clear Mode (see *4.3 Setting for Operation*)



T1: It is the time of trigger delay that can be set from 0 ~ 9999mS.
T2: It indicates the sampling of analog signal is done and the test goes the next DUT (/ACQ).
T3: It is the time of firmware calculation & judgment signal output completion (/EOT: T2 + T3).
T4: It is the time of next trigger since the measurement ended. (The time length is depending on the trigger signal.).

2. Hold Mode



2.7 Others

- **Power** : (1) 90V ~ 125V AC 50Hz/60Hz, power consumption 50VA max.
  (2) 190V ~ 250V AC 50Hz/60Hz, power consumption 50VA max.
- **Environment** : Operating-- Temperature 10°C to 40°C, 10 to 90% relative humidity.
  Storage -- Temperature 0°C to 50°C, 10 to 90% relative humidity.
- **Dimension** : 206 (W) x 115 (H) x 350 (D).
- **Weight** : Approximately 5 kg.

3. Installation

3.1 Ambient Environment

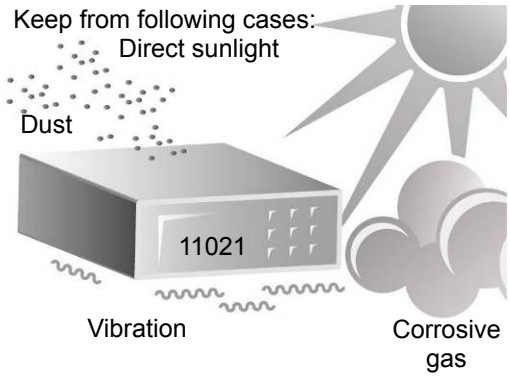
(1) Do not use the meter in a dusty or vibrating location. Do not expose it to sunlight or corrosive gas. Be sure that the ambient temperature is 10 ~ 40°C and that the relative humidity is below 90%.

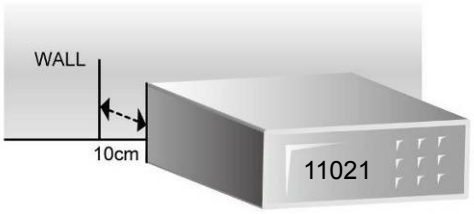
(2) The rear of the meter is equipped with a cooling fan to keep the internal temperature down, so adequate ventilation should be ensured. The meter should be located at least 10cm from any object or wall behind it. Do not block the left and right ventilation holes to keep the meter in good precision.

(3) The meter has been carefully designed to reduce the noise from the AC power source. However, it should be used in an environment with lowest noise as possible. If noise is inevitable, please install a power filter.

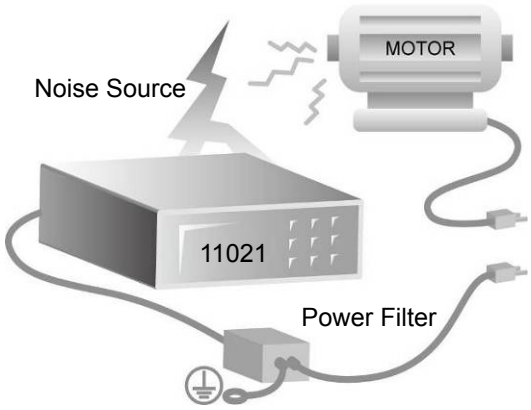
(4) The meter should be stored within the temperature range of 0°C ~ 50°C. If the unit is not going to be used for a long time, please store it in its original box or a similar package and keep it from direct sunlight and humidity.

(5) Common Environment Conditions
1. Indoor use
2. Altitude: 2000 m
3. Transient Overvoltage at Mains Supply: 2500V
4. Pollution Degree: 2





Keep from objects in the behind at over 10cm



Please install the power filter in case of interface from high power noise

3.2 Power Line Connection

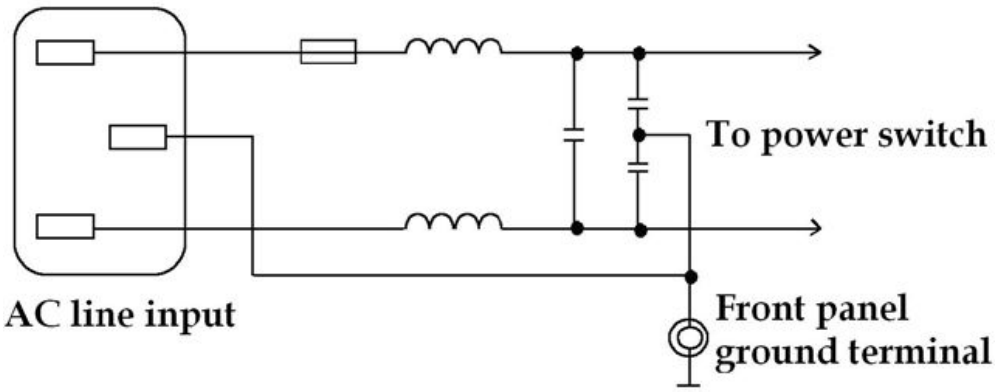
Before plugging in the power cord, make sure the power switch is off and the voltage selector on the rear panel meets the required voltage. Please use the power supply frequency of 50 Hz or 60Hz.

3.3 Fuse

There is one fuse installed in the rear panel. Please be aware of the following when replacing the fuse:

(1) First turn off the power and unplug the power cord before changing the fuse.
(2) The specification of fuse: AC 100V~120V → T630mA 250V
AC 220V~240V → T315mA 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 and to ground the GROUND terminal on the front panel as shown below.



3.4 Power Regulation

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

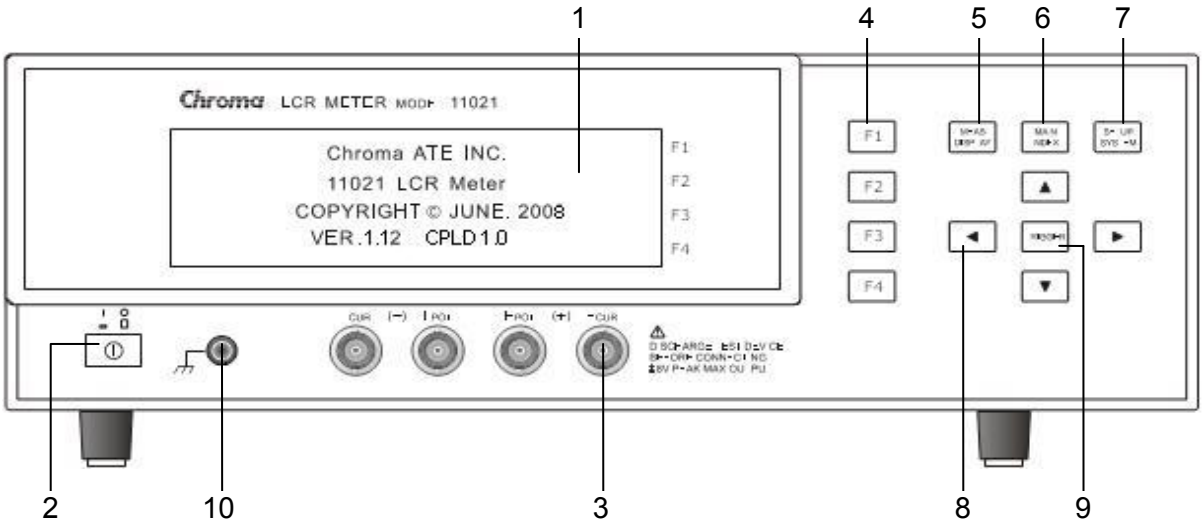
3.5 Connecting the Device Under Test (DUT)

As connecting the 11021/11021-L LCR to a DUT (Device Under Test) can be done via the BNC connectors labeled with HCUR, HPOT, LPOT and LCUR, the external test device is often required.

Notice Be noted that the LCUR and LPOT connectors should connect to the same terminal on DUT, while the HCUR and HPOT should connect to another.

4. Description of Panel

4.1 Front Panel Description



(1) LCD Display

The display of this test device is a 40 X 4 character mode LCD. All measurements and settings can be clearly displayed.

(2) Power Switch

It switches the power to on or off.

(3) Unknown DUT Connectors

There are 4 unique BNC connectors that can connect an external test device or lead to perform the measurement of an unknown DUT.

HCUR: The current drive terminal with high potential.
HPOT: The potential detector with high potential.
LPOT: The potential detector with low potential.
LCUR: The current drive terminal with low potential.

CAUTION When the DUT is a component containing polarity, the “high potential” should connect to the terminal marked with (+), while “low potential” should connect to the terminal marked with (-) on the front panel during test.

WARNING When measuring the component containing polarity, be sure to discharge first to avoid damaging the instrument.

(4) Function Keys

There are 4 function keys. The major function of them is to show the different conditions of each function or other options which may need to be selected depending on the user’s requirements.

(5) MEAS DISPLAY

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

(6) MAIN INDEX

Pressing this key allows entry to the main index screen. In this screen you may select the test function you wish to use, for instance the DUT test result sorting function, open test, short test, comparing function…etc.

(7) SYSTEM SETUP

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

(8) Cursor

There are [▲], [▼], [◄], and [►] four arrow keys. These keys are for display in different conditions and control cursor, which can be useful when inputting each parameter. They can also be used as selection keys; for instance use [◄], [►] to change the range, also use [▲], [▼] to set the frequency or voltage.

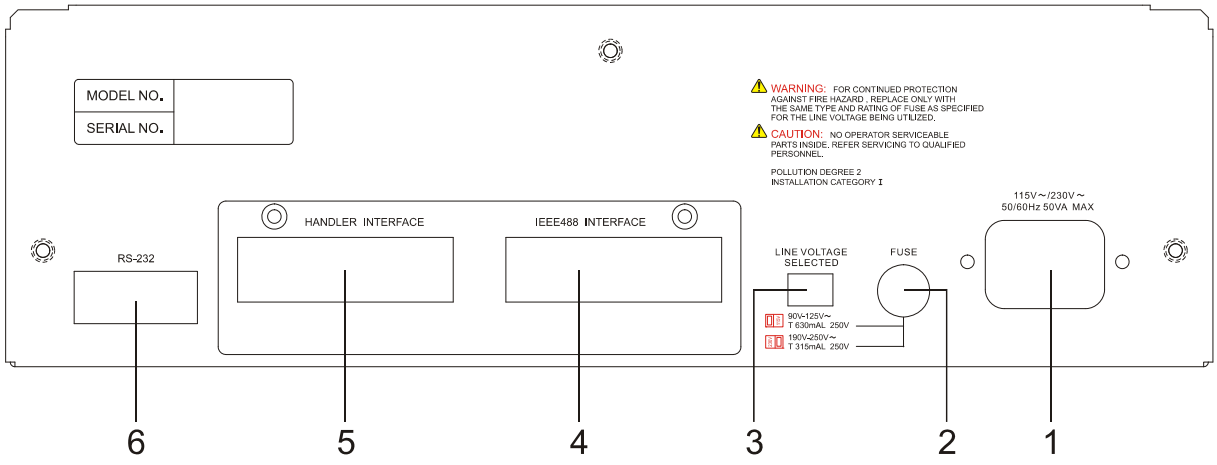
(9) Trigger

This is the key to trigger the measurement for start. When the measurement is in manual state, press this key can do the measurement once.

(10) Isolation Terminal

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

4.2 Rear Panel Description



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

(2) Fuse
A 630mA or 315mA slow blow fuse is used to prevent the over current from occurring when the instrument power is in 90 ~ 125V or 190 ~ 250V.

(3) Power Voltage Switch
Be sure to power off the instrument before switching the voltage. Use a small flat screwdriver to switch the power voltage to the proper position.

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

(5) HANDLER Interface Connector
It is the element handler. The output is GO/NG and status etc., while the input is “Start” signal. It accepts Amphonol “Microribbon” plug or P/N 57-30240 or equivalent products.

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

4.3 Setting for Operation

4.3.1 Setting the System Parameters (System Setup)

1. Power on the meter and the LCD will prompt the company name and the model number along with the firmware version as shown below:

Chroma ATE INC.
11021 LCR Meter COPYRIGHT © JUNE. 2008
VER.1.12 CPLD 1.0

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

2. The meter will run self test after powered on for 1 second, and then it will enter the following measurement screen:

< MEAS. DISPLAY >	FREQ.: 1KHz	F1
Cp : 0.9999 nF	LEVEL: 1.00 V	F2
D : 0.0001	PARA.: Cp - D	F3
	NEXT PAGE 1/3	F4

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

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

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

< SYSTEM CONFIG >	OFF	F1
BEEPER: LOW	LOW	F2
KEY LOCK: OFF	HIGH	F3
SOUND MODE: FAIL		F4

5. There 4 pages for system setting. Press the up and down arrow keys to move to the next page. Following shows the second page:

< SYSTEM CONFIG >	PULSE	F1
ALARM MODE: PULSE	CONTINUOUS	F2
HANDLER MODE: CLEAR		F3
GPIB ADDRESS: 17		F4

Following shows the third page:

< SYSTEM CONFIG >	INCREASE	F1
TRIGGER DELAY: 0000mS	DECREASE	F2
TRIGGER EDGE: FALLING	DIGIT	F3
LINE FREQUENCY: 60Hz		F4

Following shows the fourth page:

< SYSTEM CONFIG >	INCREASE	F1
BAUD RATE: 19200	DECREASE	F2
0.25V Range Mode: 5*		F3
		F4

*: 11021 is 0.25V Range Mode and 11021-L is 50mV Range Mode.

6. Below explains the setting of system parameters:

BEEPER:
It sets the warning volume to OFF, LOW, and HIGH. The default setting is LOW.

KEY LOCK:
It locks the key. The default setting is OFF. Switch to MEASURE DISPLAY or BIN COUNT and COMPARE COUNT, the word <LOCK> will show on the screen upper right when it is on. To disable it, press [F1], [F4], and [SYSTEM SETUP].

SOUND MODE:
FAIL: It beeps when detected no good product during performing the measurement of BIN or COMPARE.
PASS: It beeps when detected good product during performing the measurement of BIN or COMPARE.
The default setting is FAIL.

ALARM MODE:
PULSE: It sets the warning to a short beep during good/no good product judgment.
CONTINUOUS: It sets the warning to a continuous long beep during good/no good product judgment.
The default setting is PULSE.

HANDLER MODE:
CLEAR: When the Handler interface is in use, it will clear the output signal (PASS or FAIL) of previous tested result before measuring.
HOLD: When the Handler interface is in use, the output signal (PASS or FAIL) of tested result will remain until the next test result shows otherwise.
The default setting is CLEAR.

GPIB ADDRESS:
It sets the GPIB interface address. The default setting is 17 and the range is from 01 to 30.

TRIGGER DELAY:
It is to adjust the time delayed for measurement when the meter receives the trigger signal. The range is from 0 to 9999mS, and the default setting is 0mS that is only valid when in EXT TRIG MODE.

TRIGGER EDGE:
It sets the RISING and FALLING edge trigger. The default setting is FALLING edge trigger.

LINE FREQUENCY:
It sets the line frequency to 50Hz or 60Hz for AC110V/220V power source. The default setting is 60Hz. 11021 can be synchronized with 50Hz/60Hz line frequency; however, the 11021-L can only be synchronized with 50Hz line frequency.

BAUD RATE:
There are 2400, 4800, 9600, 19200 and 38400 five rates available for setting. The default setting is 19200.

0.25V Range Mode (for 11021) / 50mV Range Mode (for 11021-L):
The test range will be 3 or 5 ranges when in 0.25V (for 11021) / 50mV (11021-L). The default setting is 5.
5: 10/100/1k/10k/100k ohm, 5 ranges in total, 3: 10/1k/100k ohm, 3 ranges in total.

4.3.2 Memory Manage

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

< SYSTEM SETUP >	CALIBRATION	F1	←Calibrating the range
PASSWORD: ▉	MEMORY MANAGE	F2	←Managing the memory
	SYSTEM CONFIG	F3	←Setting the system
		F4	

Enter the correct password to access the Memory Manage function.

4.4 Description of Operation

4.4.1 Open Correction

1. When the meter is powered on normally, press [MAIN INDEX] to enter the main screen as shown below:

< MAIN INDEX >	BINNING	F1	←Set the sorting test
	COMPARE	F2	←Set HI/LO limit for comparison
	CORRECTION	F3	←Zeroing calibration
		F4	

2. Press [F3] to show the following screen:

< CORRECTION >	OPEN	F1	← Open zeroing
	SHORT	F2	← Short zeroing
		F3	
		F4	

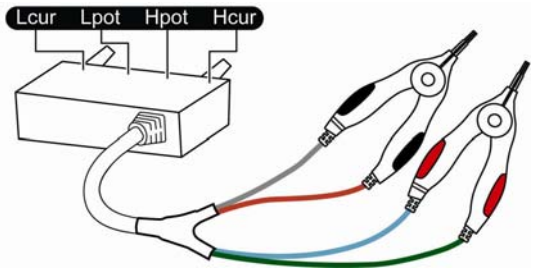
3. Press [F1] to show the following screen:

< CORRECTION OPEN >	SINGLE	F1 ← Single frequency
	MULTI	F2 ← Multi frequency
		F3
	ABORT	F4 ← Cancel correction, return to previous page

4. Select Single or Multi frequency as need, and the screen appears as below:

< CORRECTION OPEN >		F1
OPEN CIRCUIT TEST LEADS		F2
THEN PRESS TRIGGER.		F3
	ABORT	F4 ← Cancel correction, return to previous page

The figure above tells the user that it will do the open correction now. Please prepare the test cable and press [TRIGGER] to start the correction. Be sure to use the Test Cable of 4BNC/2Clips shipped along with the LCR Meter and keep it in open state as the figure shown below.



When there is an open zeroing test error, the display will show [FAIL] to indicate the test has encountered a problem. Please check the test cable to see if it is disconnected or there is any bad connection of the clip. Do the open zeroing test again after the examination.

[PASS] will appear on the display to indicate the open zeroing test is done when the test is correct. Press [EXIT] in the following screen to quit.

< CORRECTION OPEN >		F1
F: 10KHz Cp: 0.00 pF		F2
PASS		F3
Press 'EXIT' to exit.	EXIT	F4 ← Quit the screen

4.4.2 Short Correction

1. When the meter is powered on normally, press [MAIN INDEX] to enter the main screen as shown below:

< MAIN INDEX >	BINNING	F1	←Set the sorting test
	COMPARE	F2	←Set HI/LO limit for comparison
	CORRECTION	F3	←Zeroing calibration
		F4	

2. Press [F3] to show the following screen:

< CORRECTION >	OPEN	F1	← Open zeroing
	SHORT	F2	← Short zeroing
		F3	
		F4	

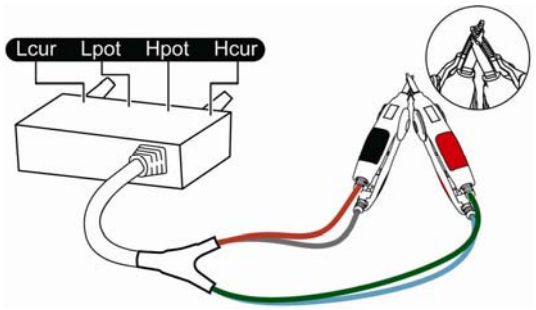
3. Press [F2] to show the following screen:

< CORRECTION SHORT >	SINGLE	F1	← Single frequency
	MULTI	F2	← Multi frequency
		F3	
	ABORT	F4	← Cancel correction, return to previous page

4. Select Single or Multi frequency as need, and the screen appears as below:

< CORRECTION SHORT >		F1	
SHORT CIRCUIT TEST LEADS		F2	
THEN PRESS TRIGGER.		F3	
	ABORT	F4	← Cancel correction, return to previous page

The figure above tells the user that it will do the short correction now. Please prepare the test cable and press [TRIGGER] to start the correction. Be sure to use the Test Cable of 4BNC/2Clips shipped along with the LCR Meter and keep it in short state as the figure shown below.



When the test cable is connected as the figure shown above, be sure to connect H_{CUR} and L_{CUR} first and then the $_{POT}$ and $_{CUR}$. Press [Trig] to start the short correction. When there is a

short zeroing test error, the display will show [FAIL] to indicate the test has encountered a problem. Please check the test cable to see if it is disconnected or there is any bad connection of the clip. Do the short zeroing test again after the examination.

[PASS] will appear on the display to indicate the open zeroing test is done when the test is correct. Press [EXIT] in the following screen to quit.

< CORRECTION SHORT >		F1
F: 10KHz Rs: 0.001 -Ω		F2
PASS		F3
Press 'EXIT' to exit.	EXIT	F4 ← Quit the screen

4.4.3 Setting LCRZ Components Parameters

1. When the meter is powered on normally, press [Measure Display] to enter the LCRZ components parameters analysis test screen as shown below:

< MEAS. DISPLAY >	FREQ.: 1KHz	F1 ← Set the frequency for test
Cp : 0.9999 nF	LEVEL: 1.00 V	F2 ← Set the voltage for test
D : 0.0001	PARA.: Cp - D	F3 ← Set the parameter for test
	NEXT PAGE 1/3	F4 ← Switch to 2nd page

< MEAS. DISPLAY >	RANGE: H 100KΩ	F1 ← Set the range
Cp : 0.9999 nF	SPEED: FAST	F2 ← Set the measurement speed
D : 0.0001	TRIG.: INT.	F3 ← Set the trigger mode
	NEXT PAGE 2/3	F4 ← Switch to the 3rd page

< MEAS. DISPLAY >	BIN : OFF	F1 ←Set the sorting test
Cp : 0.9999 nF	COMP.: OFF	F2 ←Set HI/LO limit for comparison
D : 0.0001		F3
	NEXT PAGE 3/3	F4 ←Switch to the 1st page

2. Below explains the setting of each parameter:

FREQ.: It sets the frequency for test. The 11021 has 100Hz, 120Hz, 1KHz, and 10KHz four frequencies, while 11021-L has 1KHz, 10KHz, 40kHz and 50kHz. The default setting is 1KHz. Press [F1] can switch the frequency sequentially or press [▲], [▼] to select a frequency.

LEVEL: It sets the voltage for setting. There are constant voltages 0.25Vrms and 1.0Vrms for 11021 and 50mVrms and 1.0Vrms for 11021-L. The default setting is 1.0V. Press [F2] directly or [▲], [▼] for switch.

PARA.: It sets the parameter for test. The parameters are divided into three groups. The primary parameters of L, C, R, and Z are the first group; Series and Parallel modes are the second group; while Q, D, ESR, θ, and Xs parameters

are the third group of secondary parameters. Press [F3] or [◄], [►] to move the cursor and then press [◄], [►] to select the parameter to be set.

RANGE: It sets the range for test. A indicates Auto (auto ranging), H indicates Hold (manually fixed range). Press [F1] or [◄], [►] to move the cursor and press [▲], [▼] to switch the range. There are 100KΩ, 10KΩ, 1KΩ, 100Ω, and 10Ω five ranges. When selecting 3 in 0.25V (for 11021) / 50mV (11021-L) Range Mode, there are 100KΩ, 1KΩ and 10Ω available for selection.

SPEED: It sets the measurement speed for test. There are speeds of FAST, MEDIUM and SLOW. The lower the speed the more stable it is. Press [F2] or [▲], [▼] to switch the measurement speed. The default setting is FAST.

TRIG.: It sets the trigger mode for test. There are Internal (continuous trigger), External (trigger externally) and Manual (trigger manually) three modes. Press [F3] directly or [▲], [▼] to switch the mode. The default setting is Internal.

BIN. : It sets the binning function for test. Press [F1] to switch it to OFF or ON. When it sets to ON, the BIN X will appear on the screen. The parameter setting is via the BINNING in MAIN INDEX screen.

COMP.: It sets the maximum/minimum limit for comparison test. There are OFF, ON-VAL, ON-Δ, and ON-Δ% four types. Press [F2] or [▲], [▼] to switch it. The parameter setting is via the COMPARE in MAIN INDEX.

When the parameter setting is done, press [SYSTEM SETUP] to save the changed values.

4.4.4 Setting BINNING

1. When the meter is powered on normally, press [MAIN INDEX] to enter the main screen as shown below:

MAIN INDEX >	INNING	F1	-Set the sorting test
	OMPARE	F2	-Set HI/LO limit for comparison
	ORRECTION	F3	-Zeroing calibration
		F4	

Press [F1] to enter the binning test screen as shown below.

< BINNING >	SETTING	F1	← Set the condition
	COUNT	F2	← Set the counter
		F3	
		F4	

Press [F1] to enter the setting screen as shown below.

< BIN SETTING >	Zs-θ	INCREASE	F1 ← Increase the number
PRI_NOMINAL: 0000.0000	-Ω	DECREASE	F2 ← Decrease the number
SEC_HI_LIMIT: 0.0000	-°	DIGIT	F3 ← Move the cursor rightward
SEC_LO_LIMIT: 0.0000	-°		F4

Assuming to set PRI_NOMINAL to 10KΩ, SEC_HI_LIMIT to＋0.5°, and SEC_ LO_ LIMIT to -0.5°, follow the steps below for setting:

(1) Press [▲], [▼] to move the cursor to PRI_NOMINAL, and press [F3] or [◄], [►]to move the cursor to the denary number, then press [F1] to adjust the number to 1. Press [F3] or [◄], [►] again to move the cursor to (-), and press [F1] to set the unit to K.
(2) Press [▼] to move the cursor to SEC_HI_LIMIT, the cursor will stop at +. Then press [F3] or [◄], [►] to move the cursor to the first digit of decimal point, press [F1] again (the number increased) to adjust the number to 5.
(3) When the previous setting is done, press [▼], the cursor will move the next setting item SEC_LO_LIMIT automatically. Press [F1] to set it to (-), then press [F3] or [◄], [►] to move the cursor to the first digit of decimal point, press [F1] again (the number increased) to adjust the number to 5.
(4) Now, the setting is done as the figure shown below.

< BIN SETTING >	Zs-θ	INCREASE	F1
PRI_NOMINAL: 10.000	KΩ	DECREASE	F2
SEC_HI_LIMIT : 0.500	-°	DIGIT	F3
SEC_LO_LIMIT : -0000.500	-°		F4

Description: PRI_NOMINAL indicates the primary parameter. The setting range is 0000.0000p~9999.9999G.
SEC_HI_LIMIT indicates the comparison high limit value for secondary parameter. The setting range is –999.9999G~+999.9999G.
SEC_LO_LIMIT indicates the comparison low limit value for secondary parameter. The setting range is –999.9999G~+999.9999G.

When the HI/LOW limit setting for primary and secondary parameter is done, press [▼] will appear the BIN SETTING screen (as shown below). The operation is same as (1) ~ (3). If the HI/LOW setting of BIN is symmetry such as ±0.1%, then it is only necessary to set the H value to +0.1% and press [TRIGGER], the L value will be set to -0.1% automatically. If the HI/LOW setting of BIN is not symmetry, then set the H value first and L value next.

< BIN SETTING >	Zs-θ			INCREASE	F1
1.H: +0000.10 %	L: -0.10	%		DECREASE	F2
2.H: +0.20 %	L: -0.20	%		DIGIT	F3
3.H: +0.30 %	L: -0.30	%			F4

< BIN SETTING >		Zs-θ		INCREASE F1
4.H: +0000.40 %	L: -0.40		%	DECREASE F2
5.H: +0.50 %	L: -0.50		%	DIGIT F3
6.H: +0.60 %	L: -0.60		%	F4

< BIN SETTING >		Zs-θ		INCREASE F1
7.H: +0000.70 %	L: -0.70		%	DECREASE F2
8.H: +0.80 %	L: -0.80		%	DIGIT F3
				F4

2. After all settings are done, press [MAIN INDEX] and [F2] (COUNT) to enter the BINNING test screen as shown below:

0: 0	4: 0		RESET F1
1: 32857	5: 0	8: 0	F2
2: 1128	6: 0	X: 0	F3
3: 253	7: 0	T: 34238	F4

The BIN 0 counter is to calculate the number of tested secondary parameters that exceed the HI/LOW setting.
The BIN 1 counter in this example is to calculate the number of tested secondary parameters that do not exceed the HI/LOW setting and the number of tested primary parameters that are within the range of ±0.1%. The rest of BIN 2~8 is set accordingly.
The X counter is to calculate the number of tested secondary parameters that doe not exceed the HI/LOW setting but the tested primary parameters exceed the range setting of all BIN 1 ~ 8.
The T counter is to calculate the number of all tested items.
RESET: Press [F1] will clear all of the counters.

The H/L setting range for BIN1~BIN8 is –9999.99%~+9999.99%.
When exiting the BIN SETTING screen, check if the HI and LO setting parameters are reasonable. Once HI < LO, the HI and LO settings will be switched automatically.

4.4.5 Setting COMPARE

1. When the meter is powered on normally, press [MAIN INDEX] to enter the main screen as shown below:

< MAIN INDEX >	BINNING	F1 ←Set the sorting test
	COMPARE	F2 ←Set HI/LO limit for comparison
	CORRECTION	F3 ←Zeroing calibration
		F4

2. Press [F2] to enter the screen as shown below:

< COMPARE >	SETTING	F1 ← Set the condition
	COUNT	F2 ← Set the counter
		F3
		F4

3. Press [F1] to enter the setting screen as shown below:

< COMP. SETTING >	Cs-D	INCREASE	F1 ← Increase the digit number.
PRI_NOMINAL: +000.0000	-F	DECREASE	F2 ← Decrease the digit number.
PRI_HI_LIMIT: 0.0000	-F	DIGIT	F3 ← Move the cursor right.
PRI_LO_LIMIT: 0.0000	-F	VALUE	F4 ← Hi/Low limit of primary.

PRI_NOMINAL: The nominal of DUT's primary parameter, the setting range is 0000.0000p~9999.9999G.
PRI_HI_LIMIT: The high limit of primary parameter.
PRI_LO_LIMIT: The low limit of primary parameter.
SEC_HI_LIMITL: The high limit of secondary parameter.
SEC_LO_LIMIT: The low limit of secondary parameter.

Press [F4] can select the high/low limit VALUE or PERCENT for primary parameter. The setting range for value is –999.9999G ~ +999.9999G and for PERCENT is –9999.99% ~ +9999.99%. The format of secondary parameter is fixed to VALUE and the setting range is –999.9999G ~ +999.9999G.

When exiting the COMP SETTING screen, check if the HI and LO setting parameters are reasonable. Once HI < LO, the HI and LO settings will be switched automatically.

4. Refer to section 4.4.4 *Setting BINNING* for detail setting operation. When the setting is done, press [MAIN INDEX] to return to the previous screen (as shown above). Next, press [F2] (COUNT) to begin the test. The test screen appears as below:

PRIMARY	SECONDARY	RESET	F1
GO: 44	GO: 0		F2
HI: 64	HI: 131	TOTAL:	F3
LO: 23	LO: 0	131	F4

5. GPIB Commands

5.1 Overview

Via the IEEE-488.2 interface the remote control and the data transfer function can be performed 11021/11021-L. This chapter mainly explains the commands of GPIB interface bus to facilitate users in writing programs to control the 11021/11021-L for handling the tested data.

5.2 Specification of IEEE-488 Interface

5.2.1 IEEE-488 Interface Function

Code	Meaning
SH1	Source handshake (talker)
AH1	Acceptor handshake (listener)
T6	Basic talker function
	Serial poll function
	Release the talker function by MLA
	TALK ONLY function not available
L4	Basic listener function
	Release the listener function by MTA
SR0	No device request service from controller
RL1	Remote-local switch function
PP0	No parallel poll functions
DC0	No device clear function
DT0	No device trigger function
C0	No controller function

5.2.2 Code Used for Data Transfer

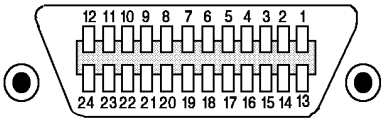
The code used for data transfer is the ISO ASCII code.

5.2.3 TALK/LISTEN Function

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

5.2.4 IEEE-488 Interface Connector

- Below shows the connector pin assignment:



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

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

5.2.5 Signal Cable of IEEE-488 Interface

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

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

5.2.6 The Response of Interface Message

Interface Message	Response
GTL (to local)	● Only addressed devices that receive this command are set to local mode. ● Disable the remote control mode to enable the front panel switch.

5.2.7 The Port Driver

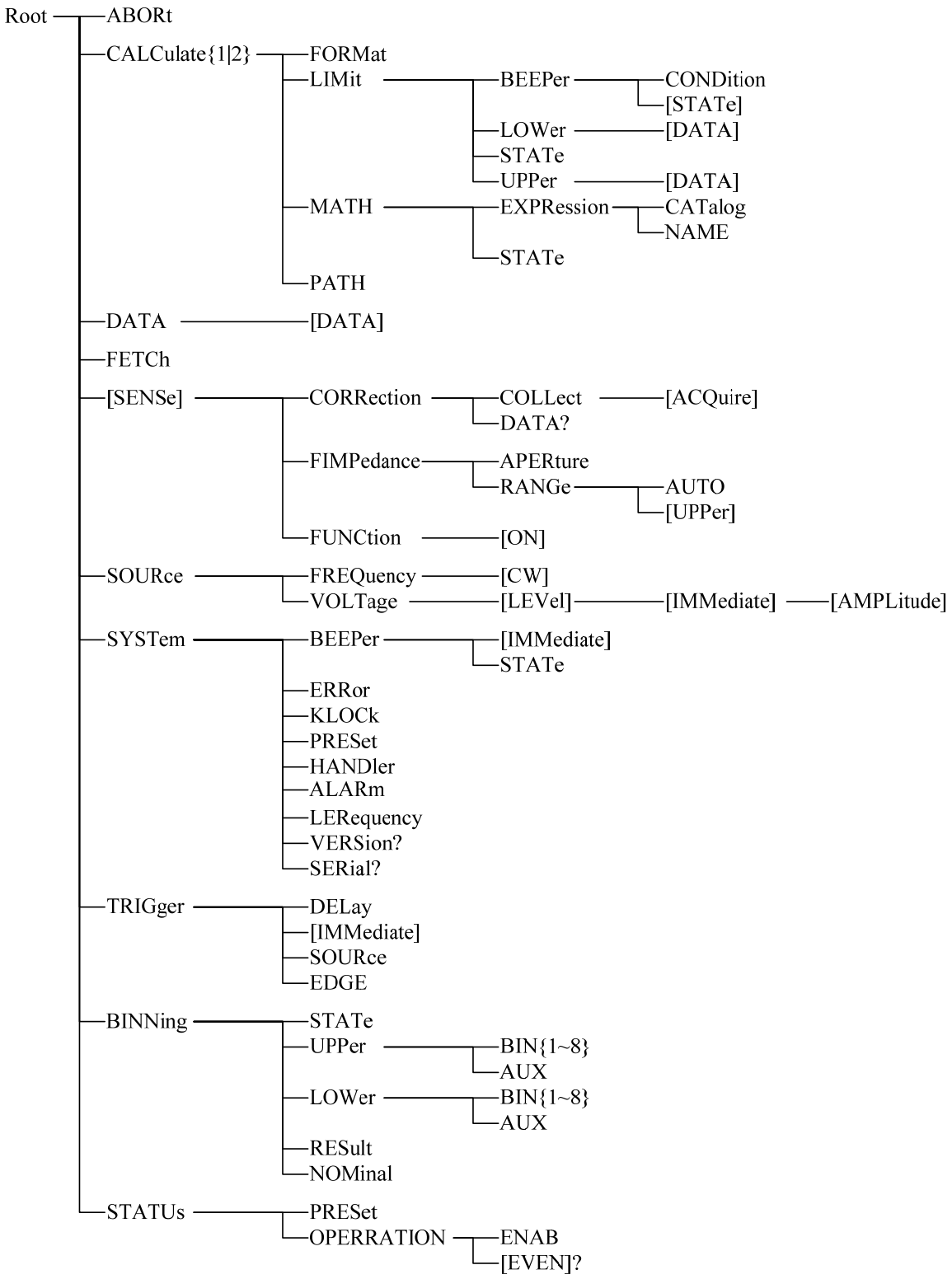
The specification of port driver is listed below:

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

5.3 GPIB Commands Description

5.3.1 Command Structure

The GPIB commands are in tree structure and the 11021/11021-L related commands are shown below.



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

: CALCulate1:MATH:EXPRession:NAME

In addition, to give two commands at the same time (ex. NAME and CATalog), use the following method to simplify the command.

:CALCulate1:MATH:EXPRession:NAME;CATalog

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

:CALCulate1:MATH:EXPRession:NAME
:CALCulate1:MATH:EXPRession:CATalog

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

:CALCulate1:MATH:EXPRession:NAME;:SOURce:FREQuncy:CW

It means the same as the following two command lines.

:CALCulate1:MATH:EXPRession:NAME
:SOURce:FREQuncy:CW

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

For instance to set the frequency to 1KHz, send :SOURce : FREQuency [:CW] 1KHz , and if query is needed, send :SOURce : FREQuency [:CW] ?. The lower case letter and the text in [ ] in the command indicates they can be omitted, for example:

:SOURce:FREQuency [:CW]; can be written to
:SOUR:FREQ;

5.3.2 Command Syntax

(1) The Syntax of common use commands
The GPIB commands for 11021/11021-L are divided into general commands (as listed above) and common use commands. The general commands are in tree structure, while the common use commands have no such structure and can be given in the following format no matter which level it is on:
*RST
(2) Either upper or lower case is ok for the letters.
(3) A star “*” has to be the leading character of each command.
(4) End of Character
There three types of end of character [CARRIAGE RETURN](0Dh), [NEW LINE](0Ah) and [CARRIAGE RETURN](0Dh) + [NEW LINE](0Ah).

5.3.3 Common Commands

(1) *CLS
It clears the register.
(2) *ESE <enable value>
It enables the bit of standard event enable register. The specified bit will reflect on the status byte.
(3) *ESE?
It queries the standard event enable register. 11021/11021-L will return a decimal value to indicate the binary set in the enable register for bit.
(4) *ESR?
It queries the standard event register. 11021/11021-L will return a decimal value to indicate the binary of standard event register.
(5) *IDN?
It queries the identification string of 4 columns (separated by comma.)
(6) *OPC
It informs the 11021/11021-L to set the execution completed bit (bit 0) for the standard event register when all operations are done.
(7) *RST
It sets the 11021/11021-L to return to the factory default without changing the lock status.
(8) *SRE
It enables the bit in the status byte enable register.
(9) *SRE?
It queries the contents of status byte enable register. 11021/11021-L will return a decimal value to indicate the binary of standard event register.
(10) *STB?
It queries the contents of status byte register.
(11) *TRG
It triggers the 11021/11021-L in bus/manual trigger mode. When the test is done, the data will send to register automatically.
(12) *TST?
It runs self-test and returns the test result summary of errors. It returns φ if there is no error.

OPEN/SHORT DATA	1
EEPROM CHECK	2
GPIB & HANDLER	4
CALIBRATION DATA	8

5.3.4 Command Description

ABORt Command

(1) Command: ABORt
Parameter: None
Return: None
Function: The command has no function.

BINNing Command Set

(1) Command: BINNing:UPPer:BIN{1~8}
Parameter: {?| , <number>}
Return: The high limit of each BIN, the format is < NR3 >.
Function: It sets the high limit of each BIN within the value –9999.99 ~ +9999.99. To set BIN2 to +99.89%, send the command BINNing:UPPer:BIN2 +99.89; and send command BINNing:UPPer:BIN2? for query.
Syntax: BINN:UPP:BIN1 99.99
Query Syntax: BINN:UPP:BIN1?
Return Data: 9.999000e+01

(2) Command: BINNing:UPPer:AUX
Parameter: {The high limit of secondary parameter (NR3)}
Return: The high limit of secondary parameter, the format is < NR3 >.
Function: It sets the AUX-HI for BINNING that is the high limit for the secondary measurement parameter (–9.9999E11 ~ +9.9999E11).
Syntax: BINN:UPP:AUX 999.9999E9
Query Syntax: BINN:UPP:AUX?
Return Data: 9.999990E11

(3) Command: BINNing:LOWer:BIN{1~8}
Parameter: {?| , <number> (NR2 mode)
Return: {The low limit of each BIN}
Function: It sets the low limit of each BIN. The value is –9999.99 ~ +9999.99.
Syntax: BINN:LOW:BIN1 -99.99
Query Syntax: BINN:LOW?BIN1?
Return Data: -9.999000e+01

(4) Command: BINNing:LOWer:AUX
Parameter: {The low limit of secondary parameter (NR3)}
Return: {The low limit of secondary parameter (NR3)}
Function: It sets the AUX-LO for BINNING that is the low limit of the secondary measurement parameter (–9.9999E11 ~ +9.9999E11).
Syntax: BINN:LOW:AUX -999.9999E9
Query Syntax: BINN:LOW:AUX?
Return Data: -9.9999990E11

(5) Command: BINNing:NOMinal
Parameter: {The nominal of primary parameter (NR3)}
Return: {The nominal of primary parameter (NR3)}
Function: It sets the NOMINAL for BINNING that is the nominal of the primary measurement parameter (0.0000E-16 ~ +9.9999E12).
Syntax: BINN: NOM 0.9999E+9 Set the center value to be 0000.9999G..
Query Syntax: BINN:NOM?
Return Data: 9.9990000E8

(6) Command: BINNing:STATe
Parameter: {ON (1) | OFF (0) }
Return: {1 | 0}
Function: It sets the BINNING to on or off.
Syntax: BINN:STAT ON

Query Syntax: BINN:STAT?
Return Data: 1

(7) Command: BINNing:RESult?
Parameter: None
Return: {The result of BINNING (+0 ~ +9)}
Function: It queries the BINNING result. If BINNING is OFF or the sorting result is 0, it outputs +0. If the sorting result is OUT, it outputs +9.
Query Syntax: BINN:RES?
Return Data: 1

CALCulate Command Set

(1) Command: CALCulate1:FORMat
Parameter: {REAL|MLINear|CP|CS|LP|LS|ZS|RS|RP}
Return: {Rp|Zs|Cp|Cs|Lp|Ls|Zs|Rs|Rp}
Function: It sets or queries the primary parameter of present measurement.
Description:

REAL	The real part of impedance
MLINear	The absolute of impedance
CP	The equivalent parallel capacitance
CS	The equivalent serial capacitance
LP	The equivalent parallel inductance
LS	The equivalent serial inductance
ZS	The equivalent serial impedance
RS	The equivalent serial resistance
RP	The equivalent parallel resistance

Syntax: CALC1:FORM REAL
Query Syntax: CALC1:FORM?
Return Data: Rp (Rs)
PS: Set the status return to be Rp or Rs by the command [:SENSe]:FUNCtion[:ON].

(2) Command: CALCulate2:FORMat
Parameter: {IMAGinary|PHASe|D|Q|REAL|RS|XS}
Return: {Xs|PHAS|D|Q|Rs|RS|Xs}
Function: It sets or queries the secondary parameter of present measurement.
Description:

IMAGinary	The imaginary part of impedance
PHASe	The phase
D	The dissipation factor
Q	The quality factor
REAL	The real part of impedance
RS	The equivalent serial resistance
XS	The serial equivalent of imaginary part

Syntax: CALC2:FORM Q
Query Syntax: CALC2:FORM?
Return Data: Q

(3) Command: CALCulate{1|2}:LIMit:BEEPer:CONDition
Parameter: {FAIL|PASS}
Return: {FAIL|PASS}
Function: It defines the beeper output.
Description:

FAIL	The beeper enables when the comparison result is FAIL.
PASS	The beeper enables when the comparison result is PASS.

Syntax: CALC1:LIM:BEEP:COND FAIL

Query Syntax: CALC1:LIM:BEEP:COND?
Return Data: FAIL

(4) Command: CALCulate{1|2}:LIMit:BEEPer[:STATe]
Parameter: {ON (1) | OFF (0) }
Return: {1|0}
Function: It sets or queries if the beeper is enabled.
Description: ON (1) Enable the beeper.
OFF (0) Disable the beeper.
Syntax: CALC1:LIM:BEEP OFF
Query Syntax: CALC1:LIM:BEEP?
Return Data: 0

(5) Command: CALCulate{1|2}:LIMit:LOWer[:DATA]
Parameter: {The lower limit | MAXimum | MINimum }
Return: The lower limit, the format is < NR3 >
Function: It sets or queries the low limit.
Description: (DEV) means <NR3>, the upper limit has to be between –9.9999E11 ~ +9.9999E11. MAXimum (999.9999G) or MINimum (–999.9999G) can be sent directly.
(PCNT) means <NR2> (only applicable for CALCulate1 parameter), the upper limit has to be between –9999.99 ~ +9999.99. MAXimum (9999.99) or MINimum (–9999.99) can be sent directly.
Syntax: CALC1:LIM:LOW -999.9999E-12
Query Syntax: CALC1:LIM:LOW?
Return Data: -9.9999990E-10

(6) Command: CALCulate{1|2}:LIMit:STATe
Parameter: {ON (1) | OFF (0)}
Return: {1|0}
Function: It sets or queries if the comparison function is enabled.
Description: ON (1) Enable the comparison function.
OFF (0) Disable the comparison function.
Syntax: CALC1:LIM:STAT ON
Query Syntax: CALC1:LIM:STAT?
Return Data: 1

(7) Command: CALCulate{1|2}:LIMit:UPPer[:DATA]
Parameter: {The upper limit | MAXimum | MINimum }
Return: The upper limit, the format is < NR3 >
Function: It sets or queries the upper limit.
Description: (DEV) means <NR3>, the upper limit has to be between –9.999E11 ~ 9.999E11. MAXimum (999.9999G) or MINimum (–999.9999G) can be sent directly.
(PCNT) means <NR2> (only applicable for CALCulate1 parameter), the upper limit has to be between +9999.99 ~ –9999.99. MAXimum (9999.99) or MINimum (–9999.99) can be sent directly.
Syntax: CALC1:LIM:UPP 999.9999E-12
Query Syntax: CALC1:LIM:UPP?
Return Data: 9.9999990E-10

(8) Command: CALCulate{1|2}:MATH:EXPRession:CATalog?
Parameter: None
Return: The absolute value of deviation (DEV) or percentage (PCNT).

Function: The return value can be used with the command CALCulate{1|2}:MATH:EXPRession:NAME.
Query Syntax: CALC1:MATH:EXPR:CAT?
Return Data: DEV,PCNT

(9) Command: CALCulate{1|2}:MATH:EXPRession:NAME
Parameter: {DEV|PCNT}
Return: {DEV|PCNT}
Function: It sets or queries the expression of value.
Syntax: CALC1:MATH:EXPR:NAME DEV
Query Syntax: CALC1:MATH:EXPR:NAME?
Return Data: DEV

(10) Command: CALCulate{1|2}:MATH:STATe
Parameter: {ON(1) |OFF(0) }
Return: {1|0}
Function: It sets or queries if command CALCulate{1|2}:MATH:EXPRession:NAME is enabled for operation.
Description: ON (1) Enable the operation.
OFF(0) Disable the operation.
Syntax: CALC1:MATH:STAT ON
Query Syntax: CALC1:MATH:STAT?
Return Data: 1

(11) Command: CALCulate{1|2}:PATH?
Parameter: None
Return: FORM, MATH, LIM
Function: It follows the execution path of CALCulate subsystem for return.
Query Syntax: CALC1:PATH?
Return Data: FORM,MATH,LIM

DATA Command Set

(1) Command: DATA [:DATA]
Parameter: {COMPARE the center data of primary parameters (reference data) (NR3)}
Return: The COMPARE center data of primary parameters, the format is (NR3)
Function: It sets or querys the center data of primary parameters in COMPARE mode. If the data of primary parameter is 100, send the command DATA:[DATA] 100;
Syntax: DATA 0.0009E-12
Query Syntax: DATA?
Return Data: 9.0000000E-16

FETCh? Command

(1) Command: FETCh?
Parameter: None
Return: <STATE>, <DAT1>, <DAT2>, <CMP1>, <CMP2>
Function: It retrieves the measured result got by INITiate command.
Description:
<STATE> Measurement State
0 Normal
1 Over load (Range selected error)

2 The DUT has no contact
<DAT1> The test data of primary parameter
<DAT2> The test data of secondary parameter

Following outputs only when the comparator is on:
<CMP1> The compared result of primary parameter
<CMP2> The compared result of secondary parameter
0 No secondary parameter
1 The tested data is within the range
2 The tested data is too high
4 The tested data is too low
8 The DUT has no contact

Following outputs only when BINNING is on:
<BIN> The sorting result.
0 The secondary parameter is Fail
1~8 The primary and secondary parameters are Pass
9 The primary parameter is Fail

Query Syntax: FETC?
Return Data: 0,1.314969e+00,1.176097e+02,2
PS: <STATE>:0;<DAT1>:1.314969e+00;<DAT2>:1.176097e+02;<BIN>:2

[:SENSe] Command Set

(1) Command: [:SENSe]:CORRection:COLLect[:ACQuire]
Parameter: {STANdard1|STANdard2}
Return: None
Function: It executes OPEN and SHORT correction procedure.
Description: STANdard1: Execute OPEN procedure.
STANdard2: Execute SHORT procedure.
Syntax: CORR:COLL STAN1

(2) Command: [:SENSe]:CORRection:DATA?STANdard
Parameter: {STANdard1| STANdard2}
Return: Two correction values, the format is < NR3 >
Function: It queries the corrected value.
STANdard 1 is the corrected value of OPEN that is G and B.
STANdard 2 is the corrected value of SHORT that is R and X.
Query Syntax: CORR:DATA? STAN1
Return Data: 1.451959e-11,5.616254e-09

(3) Command: [:SENSe]:FIMPedance:APERture
Parameter: FAST, MEDium, SLOW
Return: FAST, MEDIUM, SLOW
Function: It sets or queries the measurement speed.
Syntax: FIMP:APER MED
Query Syntax: FIMP:APER?
Return Data: MEDIUM

(4) Command: [:SENSe]:FIMPedance:RANGe:AUTO
Parameter: {ON(1) |OFF(0) }
Return: {1|0}
Function: It sets or queries if auto range selection mode is enabled.

Syntax: FIMP:RANG:AUTO ON Set to auto switch mode.
Query Syntax: FIMP:RANG:AUTO?
Return Data: 1

(5) Command: [:SENSe]:FIMPedance:RANGe[:UPPer]
Parameter: {measurement range|UP|DOWN}
Unit: It automatically sets to OHM.
Return: {measurement range}, the format is < NR3 >
Function: It sets or queries the measurement range.
Description: UP Move to the previous range
DOWN Move to the next range
There are100K, 10K, 1K, 100 and 10 ohm 5 ranges in total. When selecting 3 in 0.25V (for 11021) / 50mV (11021-L) Range Mode, there are 100K, 1K and 10 ohm available for selection.
Syntax: FIMP:RANG:UPP 1e3 Set the range to 1K.
Query Syntax: FIMP:RANG:UPP?
Return Data: 1.000000e+03

(6) Command: [:SENSe]:FUNCtion[:ON]
Parameter: {FIMPedance|FADMittance}
Return: {FIMP|FADM}
Description: FIMPedance is in the equivalent serial mode.
FADMittance is in the equivalent parallel mode.
Function: It sets or queries the equivalent parallel mode of circuit measurement.
Syntax: FUNC FIMP Set to the equivalent parallel mode.
Query Syntax: FUNC?
Return Data: FIMP

SOURce Command Set

(1) Command: SOURce:FREQuency[:CW]
Parameter: The test frequency, 11021: {1.0E+2|1.2E+2|1.0E+3|1.0E+4};
11021-L：{1.0E+3|1.0E+4|4.0E+4|5.0E+4}
Unit: It automatically sets to HZ.
Return: The test frequency, the format is < NR3 >
Function: It sets or queries the present test frequency.
Description: The test frequencies for 11021 are 100Hz, 120Hz, 1KHz and 10KHz; for 11021-L are 1KHz, 10KHz, 40kHz and 50kHz.
Syntax: SOUR:FREQ 1.0e3Set the test frequency to 1KHz
Query Syntax: SOUR:FREQ?
Return Data: 1.000000e+03

(2) Command: SOURce:VOLTage[:LEVel][:IMMediate][:AMPLitude]
Parameter: The test voltage 11021: {0.25|1.0}; 11021-L: {0.05|1.0}
Return: The test voltage, the format is < NR2 >
Function: It sets or queries the present test voltage.
Description: The test voltages are 0.25Vrms and 1V rms for11021, and 50mVrms and 1V rms for 11021-L.
Syntax: SOUR:VOLT 0.05 Set the test voltage to 50mVrms.
Query Syntax: SOUR:VOLT?
Return Data: 0.05

SYSTem Command Set

(1) Command: SYSTem:BEEPer[:IMMediate]
Parameter: None
Return: None
Function: It makes the beeper beeps immediately.
Syntax: SYST:BEEP

(2) Command: SYSTem:BEEPer:STATe
Parameter: {OFF (0)| LOW (1)| HIGH (2)}
Return: {0|1|2}
Function: It sets or queries if the beeper is enabled.
OFF (0) – The beeper is off.
LOW (1) – The beeper is on (low volume)
HIGH (2) – The beeper is on (high volume)
Syntax: SYST:BEEP:STAT LOW
Query Syntax: SYST:BEEP:STAT?
Return Data: 1

(3) Command: SYSTem:ERRor?
Parameter: None
Return: It returns the error messages in the error queue.
Query Syntax: SYST:ERR?
Return Data: 0,”No error”

(4) Command: SYSTem:KLOCk
Parameter: {ON (1) |OFF (0)}
Return: {1|0}
Function: It sets or queries if the keys of 11021/11021-L are locked.
Syntax: SYST:KLOC ON
Query Syntax: SYST:KLOC?
Return Data: 1

(5) Command: SYSTem:LFRequency
Parameter: {50 | 60}
Return: {50 | 60}
Function: It sets or queries the LINE frequency.
Syntax: SYST:LFR 60
Query Syntax: SYST:LFR?
Return Data: 60

(6) Command: SYSTem:PRESet
Parameter: None
Return: None
Function: It sets the 11021/11021-L to default settings without changing the key lock state.
Syntax: SYST:PRE

(7) Command: SYSTem:VERSion?
Parameter: None
Return: The response of 11021/11021-L SCPI version is Y.V where Y indicates the year and V is the version no.
Query Syntax: SYST:VERS?
Return Data: 1999.0

(8) Command: SYSTem:ALARm
Parameter: {PULSE | CONTINUOUS}
Return: {PULS | CONT}
Function: It sets the beep to PULSE or CONTINUOUS.
It is used when doing BIN SORTING and COMPARE.
Syntax: SYST:ALAR PULS
Query Syntax: SYST:ALAR?
Return Data: PULSE

(9) Command: SYSTem:HANDler
Parameter: {CLEAR| HOLD}
Return: {CLEA | HOLD}
Function: It sets to HANDLER MODE, see section 4.3.1.
Syntax: SYST:HAND CLEA
Query Syntax: SYST:HAND?
Return Data: CLEAR

TRIGger Command Set

(1) Command: TRIGger:DELay
Parameter: The trigger delay time.
Unit: S.
Return: The trigger delay time, the format is < NR3 >
Function: It sets or queries the trigger delay time in the range of 0~9.999 and only valid in EXT TRIG MODE.
Syntax: TRIG:DEL 1.000 Set the time to delay 1.000S for trigger.
Query Syntax: TRIG:DEL?
Return Data: 1.000000e+00

(2) Command: TRIGger[:IMMediate]
Parameter: None
Return: None
Function: It triggers the measurement no matter what the present state is.
Syntax: TRIG

(3) Command: TRIGger:SOURce
Parameter: {BUS;MANual |EXTernal|INTernal }
Return: { MAN.|EXT.|INT. }
Function: It sets or queries the present trigger mode.
Description: BUS/ MANual Triggered by bus/manual
EXTernal Triggered externally
INTernal Triggered internally
Syntax: TRIG:SOUR BUS
Query Syntax: TRIG:SOUR?
Return Data: MAN.

(4) Command: TRIGger:EDGE
Parameter: {FALLing | RISIng}
Return: {FALLING | RISING}
Function: It sets the TRIGGER mode to EXTERNAL, RISING or FALLING edge triggering.
Syntax: TRIG:EDGE FALL

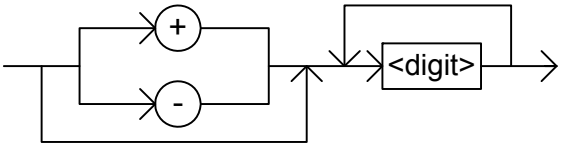
Query Syntax: TRIG:EDGE?
Return Data: FALLING

5.3.5 Data Transmission Format

The numeric data will be transmitted in the format of ASCII byte, <NR1>(integer), <NR2>(fixed decimal), <NR3>(float point). The data is separated by comma (IEEE-488.2 standard). The format is explained as below:

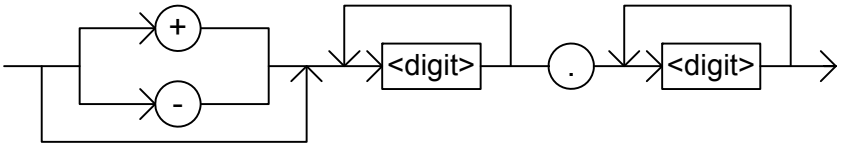
(1) <NR1> format:

Ex.: 9000



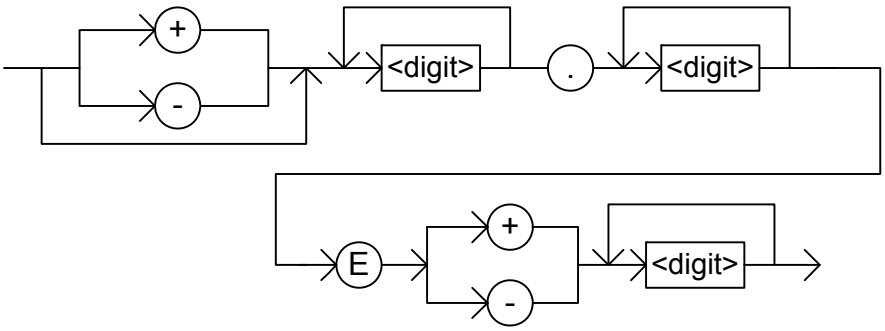
(2) <NR2> format:

Ex.: 9000.0



(3) <NR3> format:

Ex.: 9.0E+3



5.4 Release the GPIB Connection Mode

To release it, press [F1], [F4], and [SYSTEM SETUP] keys sequentially. If it is in KEY LOCK mode, press it again to release the key lock state.

5.5 Structure of Status Report

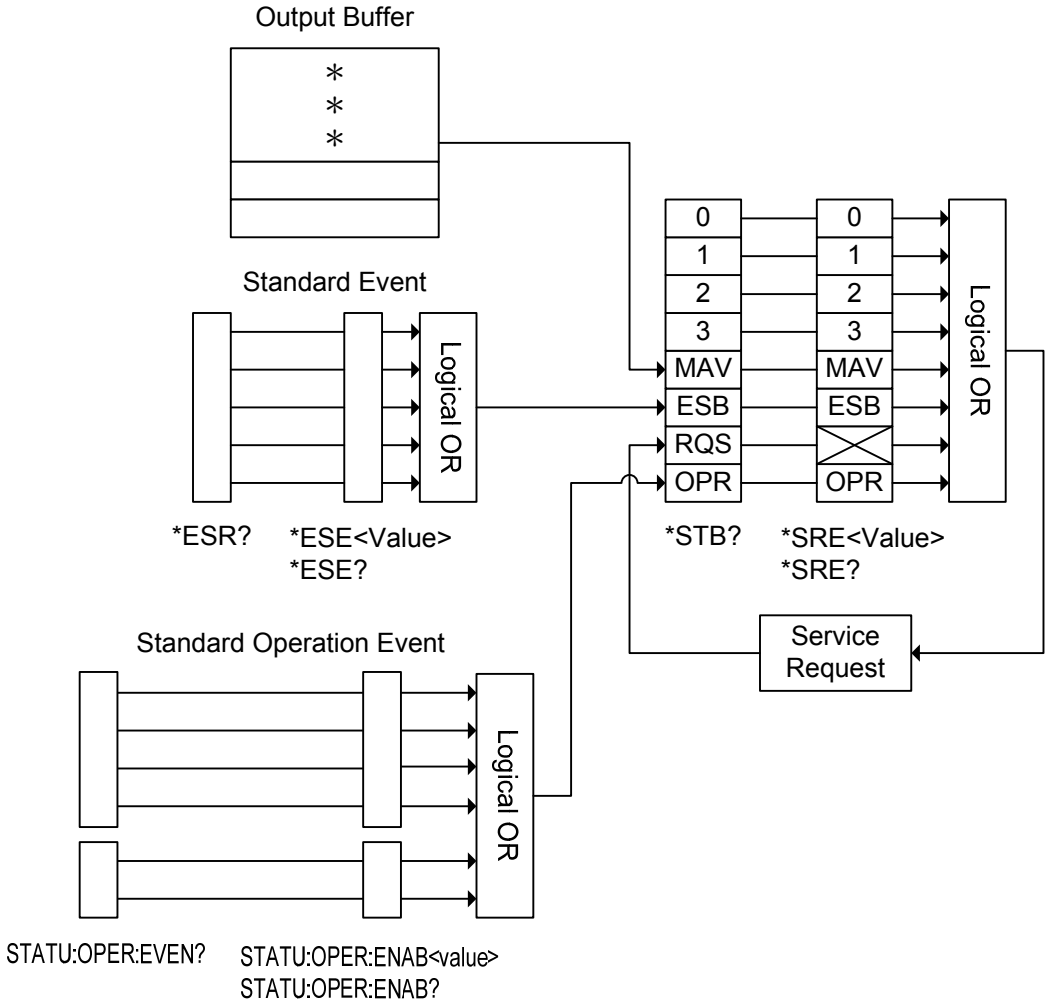


Figure 5-1 The Structure of Status Report

5.6 Status Byte Register

The Status Byte Register is composed of eight bits that summarize an overlaying status data structure. The Status Byte Register can be read using either *STB? or SPOLL that returns a decimal expression of the register contents.

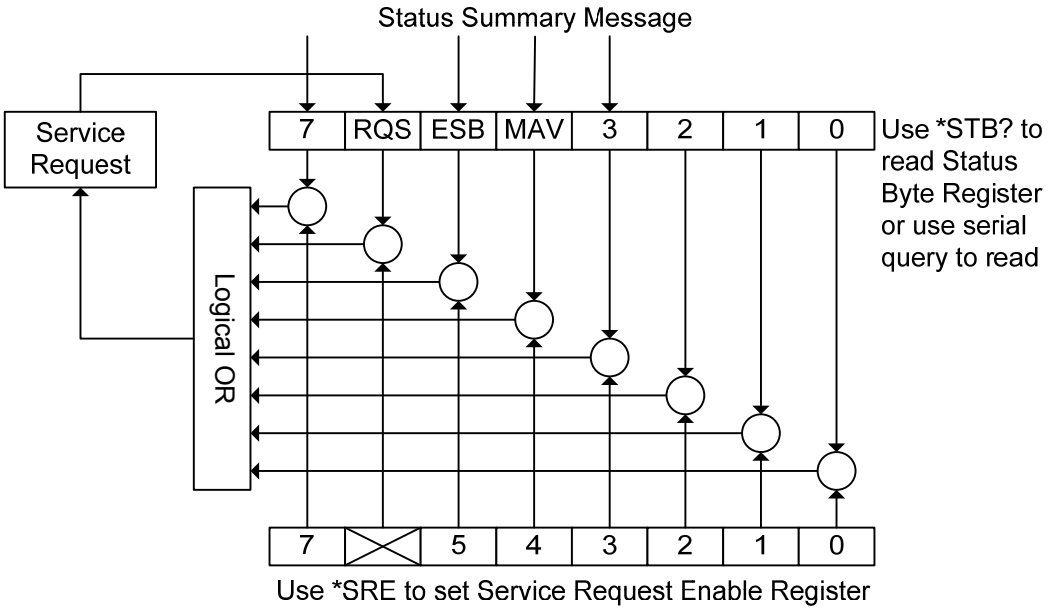


Figure 5-2 Status Byte Register

Bit No.	Bit Weight	Description
7	128	It is the Operation Status Register Summary Bit.
6	64	It is the Request Service Bit – this bit is set when any enabled bit of the Status Byte Register has been set, which indicates the 11021/11021-L LCR Meter has at least one reason for requesting service.
5	32	It is the Standard Event Status Register Summary Bit.
4	16	It is the Message Available Bit – this bit is set whenever the 11021/11021-L LCR Meter has data available in the output queue, and is reset when the available data is read.
3-0		It is always 0.

Table 5-1 Assignments of Status Byte

5.7 Standard Event Status Register

The Standard Event Status Register is frequently used and is one of the simplest. Use the 11021/11021-L common used commands *ESE and *ESR? can program it.

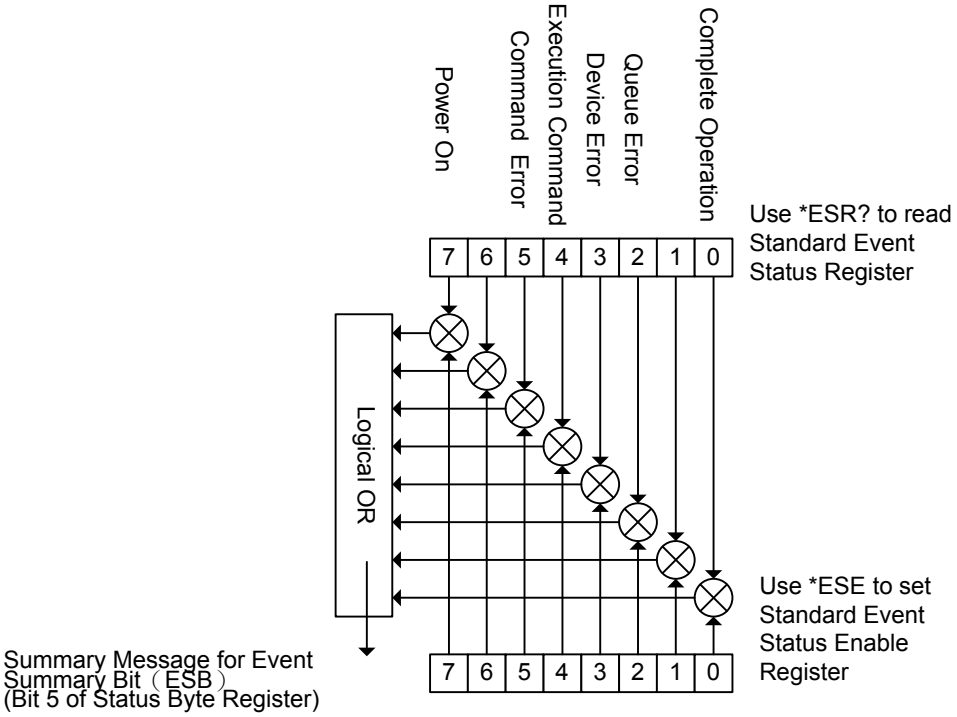


Figure 5-3 Standard Event Status Register

Bit No.	Bit Weight	Description
7	128	Power on Bit – This bit is set when the 11021/11021-L LCR Meter has been turned OFF and then ON since the last time this register was read.
6		Always 0.
5	32	Command Error Bit - This bit is set if the following command errors occur. ■ An IEEE 488.2 syntax error occurred. ■ The 11021/11021-L LCR Meter received a program message for Group Execution Trigger.
4	16	Execution Error Bit - This bit is set when a parameter of an 11021/11021-L -IB command is out of its legal input range.
3	8	Device Dependent Error Bit - This bit is set when too many errors have occurred that the error queue is full.
2	4	Queue Error Bit - This bit is set when reading data from the output buffer and no data is present, or when the data is lost.
1		Always 0.
0	1	Operation Complete Bit - This bit is set when the 11021/11021-L LCR Meter has completed all selected pending operations before the *OPC command is sent.

Table 5-2 Assignments of Standard Event Status Register

5.8 Operation Status Group

The 11021/11021-L LCR Meter has an Operation Status Register Group for STATus subsystem commands to access, see also the STATus subsystem in GPIB commands. The group contains an event register and an enable register. The enable register enables the corresponding bit in the event register to set the status summary bit and bit 7 of the Status Byte Register.

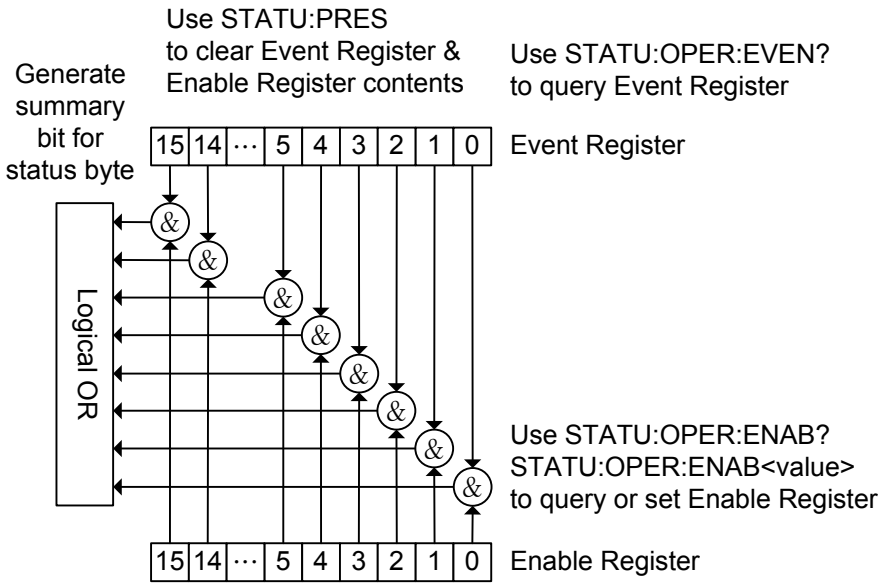


Figure 5-4 Operation Status Group

Bit No.	Bit Weight	Description
10 – 15		Always 0.
6		Always 0.
5	32	Always 0.
4	16	This bit is set when the 11021/11021-L LCR is executing the measurement.
3		Always 0.
2	4	Always 0.
1	2	Always 0.
0		Always 0.

Table 5-3 Assignments of Operation Status Condition Register

5.9 Error Messages

Read error queue from remote interface:
SYSTem:ERRor?

Below is the format of error message (maximum 80 characters for an error string):
-102 “Syntax error”

Execution Error

0 No error
There is no error message exist at present.

-102 Syntax error
Invalid character exists in the command string, ex. TST?

-104 Data Type error
The parameter is not defined in the command string.

-106 Illegal parameter value
The parameter type is error in the command string.

-202 Setting conflict
One of the following conditions may cause the error:
■ Sending out *TRG or TRIGGER command when the trigger mode is external.

-203 Data out of range
The data parameter exceeds the valid range, ex. TRIGger:DELay 10

-211 Data stale
The following condition may cause the error:

-224 Self-test failed
The self-test executed via remote interface (*TST) is failed. In addition, there are other test errors. Refer to *TST? command for the description of return format.

-225 Too many errors
More than 16 errors are occurred and the error queue is full. It will not store other errors until some of them are deleted. The error queue will be cleared after powered off or executing *CLS (clear state) command.

-226 Query INTERRUPTED
When the device is in sending data state, the sending data is interrupted due to device change to receiving state after got the new command. The output buffer will be cleared.

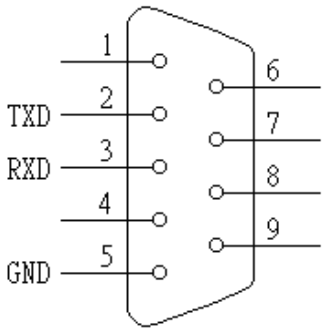
6. Description of RS-232C Control Interface

6.1 Overview

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

6.2 RS-232C Specification

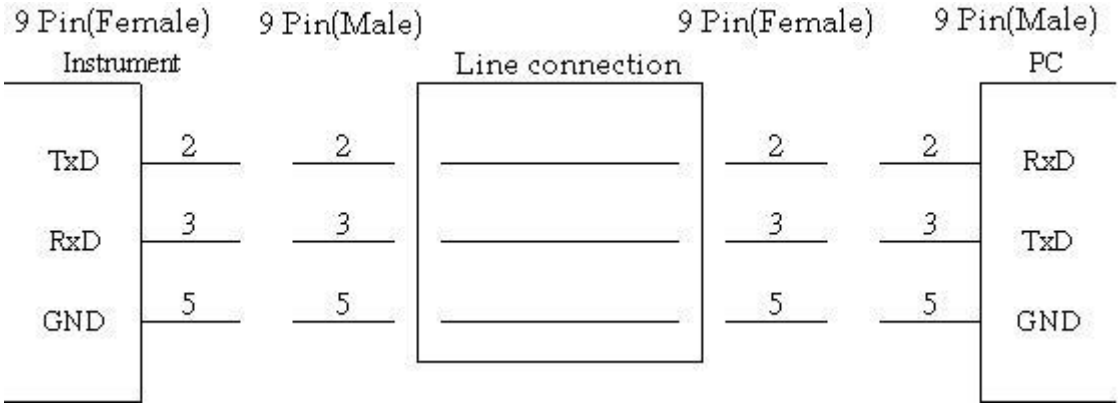
6.2.1 RS-232C Interface Connector (LCR Meter)



6.2.2 RS-232C Signal Line and Pin Assignment (LCR Meter)

Pin	Name	Description
2	TxD	Transmitting data
3	RxD	Receiving data
5	GND	Ground wire

6.2.3 RS-232C Signal Line Connection



6.3 Setting RS-232C Interface Baud Rate

Press [System Setup] to enter <SYSTEM CONFIG> and then set the RS-232C BAUDRATE. There are 2400, 4800, 9600, 19200 and 38400 five selections. The default setting is 19200.

6.4 RS-232C Interface Command

The detail description of RS-232C interface commands, please refer to the GPIB commands description.

7. Description of Handler Interface

The BINNING and COMPARE in 11021/11021-L are connected to external unit by Handler interface. The connector is 24-pin, and its pin assignment is described as below.

7.1 Description of Handler Interface Pins for BINNING

Pin	Name	Description
1	/EXT	External trigger.
2	X	N.C
3, 20	BIN 7	BIN 7, the primary parameter test value is within the set BIN 7 range.
4, 24	BIN 8	BIN 8, the primary parameter test value is within the set BIN 8 range.
5-7	GND	Ground the external DC power source.
8	COMMON	The internal power grounding terminal, connect to earth.
9, 13	BIN OUT	BIN OUT, the primary parameter test value is not within the specifications set.
10	VEXT	External DC voltage, the acceptable voltage range is 5V ~ 24V.
11	VINT	Internal DC voltage +5V
12	X	N.C
14	BIN 5	BIN 5, the primary parameter test value is within the set BIN 5 range.
15	BIN 0	BIN 0, the secondary parameter test value exceeds the set upper, lower value
16	BIN 6	BIN 6, the primary parameter test value is within the set BIN 6 range.
17	BIN 1	BIN 1, the primary parameter test value is within the set BIN 1 range.
18	/EOT	End of test.
19	BIN 2	BIN 2, the primary parameter test value is within the set BIN 2 range.
21	BIN 3	BIN 3, the primary parameter test value is within the set BIN 3 range.
22	/ACQ	End of the analog sampling. It is able to move the next DUT to the 11021/11021-L test terminal.
23	BIN 4	BIN 4, the primary parameter test value is within the set BIN 4 range.

7.2 Description of Handler Interface Pins for COMPARE

Pin	Name	Description
1	/EXT	External trigger.
2	X	N.C
3,20	A LO	The primary parameter test value is too low.
4,24	A HI	The primary parameter test value is too high.
5-7	GND	Ground
8	COMMON	The internal power grounding terminal, connect to earth.
9,13	A NG	The primary parameter test value is not within the specification.
10	VEXT	External DC voltage, the acceptable voltage range is 5V ~ 24V.
11	VINT	Internal DC voltage +5V
12	X	N.C
14	X	N.C
15	B NG	The secondary parameter test value is not within the specification.
16	X	N.C
17	A GO	The primary parameter test value is within the specification.
18	/EOT	End of Test.
19	B GO	The secondary parameter test value is within the specification.
21	GO	The primary and secondary parameter test values are within the specification.
22	/ACQ	End of the analog sampling. It is able to move the next DUT to the 11021/11021-L test terminal.
23	X	N.C

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