



**Capacitance Meter  
11020  
User's Manual**

Version 1.0  
October 2008  
P/N A11 000578

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## **CHROMA ATE INC.**

No. 66 Hwa-Ya 1<sup>st</sup> Rd., Hwa-Ya Technical Park, Kuei-Shan Hsiang, Taoyuan Hsien,  
Taiwan

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## **CHROMA ATE INC.**

No.66 Hwa-Ya 1<sup>st</sup> Rd, HWA-Ya Technical Park,  
Kuei-Shan Hsiang, Taoyuan Hsien, Taiwan  
Tel: 886-3-327-9999  
Fax: 886-3-327-2886  
<http://www.chromaate.com>

# Material Contents Declaration

Chroma provides material contents declaration for RoHS compliant products as below:

Part Name	Hazardous Substances					
	Lead	Mercury	Cadmium	Hexavalent Chromium	Polybrominated Biphenyls	Polybromodiphenyl Ethers
	Pb	Hg	Cd	Cr <sup>6+</sup>	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
<p>“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.</p> <p>“×” 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.</p>						

## 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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## \*\*\* Storage. Freight. Maintenance \*\*\*

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### **Storage**

When don't use the device, please pack it properly and store under a good environment. (The packing is no needed when the device under appropriate environment.)



### **Freight**

Please use the original packing material when move the device. If the packing material is missing, please use the equivalent buffer material to pack and mark it fragile and waterproof etc to avoid the device damage during movement. The device belongs to precise equipment, please use qualified transportation as possible. And avoid heavy hitting etc to damage the device.

### **Maintenance**

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

# SAFETY SYMBOLS

	<p><b>Explanation:</b> To avoid injury, death of personnel, or damage to the instrument, the operator must refer to an explanation in the instruction manual.</p>
	<p><b>Protective grounding terminal:</b> To protect against electrical shock in case of a fault. This symbol indicates that the terminal must be connected to ground before operation of equipment.</p>
<p><b>WARNING</b></p>	<p>The <b>WARNING</b> sign denotes a hazard. It calls attention to a procedure, practice, or the like, which, if not correctly performed or adhered to, could result in personal injury. Do not proceed beyond a <b>WARNING</b> sign until the indicated conditions are fully understood and met.</p>
<p><b>CAUTION</b></p>	<p>The <b>CAUTION</b> sign denotes a hazard. It may result in personal injury or death if not noticed timely. It calls attention to procedures, practices and conditions.</p>

# Revision History

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

<b>Date</b>	<b>Version</b>	<b>Revised Sections</b>
Oct. 2008	1.0	Complete this manual.





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# 1. Introduction

## 1.1 General

11020 Capacitance Meter is an all-function automatic capacity instrument for testing. This measuring instrument was designed to solve the problems of low labor efficiency and low product quality that have occurred since the electronics sector began to flourish. Promote labor efficiency and product quality for getting international level.

The main purpose of the instrument is for testing capacity during production early stage, for example the production of capacitance winding machine. Besides, this instrument is also applied to the final test before packing for avoiding mixed material to cause error package and reduce product quality. This instrument design is aimed at low frequency. Therefore, under low frequency testing is with high speed measuring for increasing production efficiency.

The measuring instrument offers high accuracy, convenience and quickness and reliability testing at low cost. It also offers high/low limit comparison test function which measure from external trigger machine by Handler interface. This instrument can send measurement result to external by Handler interface for judgment signal of component handling equipment.

The measurement device of high-speed accuracy, humanity keyboard design, guided operation panel, large-sized LCD and password protection functions are for the meter easily in operating.

The basic accuracy of 11020 is 0.1%. When calibrating, use the measurement device (option) is only for calibration and key-in simple measurement parameter. The user only needs to offer open and short conditions in procedure; the calibration procedure can be finished easily and quickly.

When the instrument needs external or test lead extended testing, please notice that need to use the correct four terminals for testing connection. In case of high frequency measurement, it is necessary to consider high frequency response of test cable.

## 1.2 Brief Specifications

- Measurement parameter : Primary parameter C  
Secondary parameter D
- Basic accuracy : Basic 0.1%
- Measurement range : C: 0.01pF ~ 3.9999 F  
D: 0.0001 ~ 9999
- Measurement frequency : 100Hz, 120Hz, 1KHz
- Measurement voltage : Fixed test voltage 1V rms
- Equivalent circuit : Series, Parallel

- Zero calibration : Open, Short
- Interface : Handler interface

### 1.3 Incoming Inspection

Upon receipt of this instrument, please check the items as the following and save all packing materials in case that the instrument has to be returned.

- (1) Any damages or scratches on the surface of the product.
- (2) Listed in Tables 1-1 and 1-2 are accessories for this instrument.

If damage is found, please file claim with carrier immediately. Do not return the instrument to Chroma without prior approval.

**Table 1-1 Standard Accessories**

Item	Qty	Description
Power Cord	1	1.8-meter power cord
Converter	1	Power plug 3P to 2P
Slow Blow Fuse 1A	2	For AC 110V use
Slow Blow Fuse 0.5A	2	For AC 220V use
User's Manual	1	English

**Table 1-2 Optional Accessories**

Item	Qty	Description
A110211 Test Box	1	Test box for DIP type passive component
A110212 Test Box	1	Remote test box (1 meter) of DIP type passive component
A110104 SMD Test Cable	1	Test cable for SMD type passive component
A133004 SMD Test Box	1	Test box for SMD type passive component
A133005 Test Cable	1	Low ESR (<10mΩ) test cable
Handler Conversion Cable	1	24P to 14P Handler conversion cable
BNC Connector 4-Terminal Test Cable	1	4-Terminal test cable
24 Pin Handler Control Line	1	2-terminal 24 Pin Handler connector (M) control line (1 m)
14 Pin Handler Control Line	1	24 Pin Handler connector (M)/ 14 Pin Handler connector control line (0.15 m)

### 1.4 Common Environment Conditions

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

6. Pollution Degree: 2

## **1.5 Maintenance & 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.



## 2. Specifications (15°C ~ 35°C, RH ≤ 75%)

### 2.1 Measurement Functions

<b>C:</b>	Capacitance	<b>Unit:</b>	pF, nF, uF, mF
<b>D:</b>	Loss factor		
<b>Equivalent Measurement Circuit:</b>	Parallel, Series		
<b>Range:</b>	Auto, Manual		
<b>Trigger Mode:</b>	Internal, External (Handler Interface)		
<b>Measurement Terminals:</b>	4-terminal		
<b>Measurement Average:</b>	1 (fastest), 2, 4, 8, 16, 32, 64 (the most stable) etc. seven kinds		

### 2.2 Test Signals

<b>Frequency:</b>	100Hz, 120Hz, 1kHz
<b>Accuracy:</b>	± (0.01% ±0.01Hz)
<b>Voltage:</b>	1Vrms

### 2.3 Measurement Range

Parameter	Range
Capacitance C	0.01pF ~ 3.9999F

### 2.4 Accuracy

- Within 1 year of factory calibration
- Temperature: 23°C ± 5°C
- Relative humidity: <90% RH
- Warm up: 30 minutes minimum
- Zero calibration under above conditions

#### 1. |Z| - θ Accuracy

The basic accuracy is listed in Table 2-1.

- For fast rate, the accuracy must be doubled.

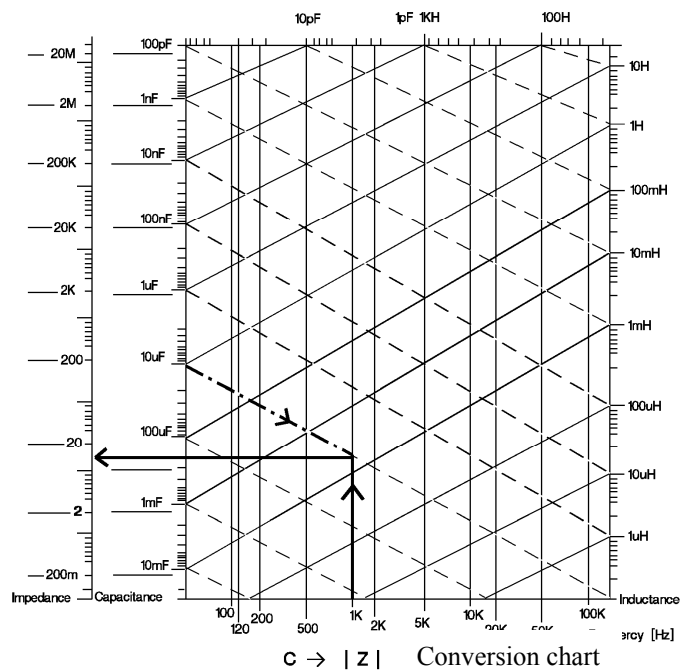
10M	0.32%	0.32%	0.25%
1M	0.2%	0.2%	0.15%
100k	0.15%	0.15%	0.12%
10k	0.12%	0.12%	0.1%
1k	0.15%	0.15%	0.15%
100	0.2%	0.2%	0.2%
10	0.4%	0.4%	0.3%
1	0.9%	0.9%	0.9%
0.1	5.8%	6.5%	6.3%
0.01			

Frequency (Hz)  
Table 2-1 |Z| accuracy

**2. Capacitance Accuracy**

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

According to the following conversion chart of Capacitance and Impedance is for getting the value.





## 2.5 Zero

**Open Zero:** Eliminates the measurement error results from open stray impedance of the test fixture.

**Short Zero:** Eliminates the measurement error results from short residual impedance of the test fixture.

## 2.6 Measurement Time

Beginning from measuring, Analog sampling, Calculate to Compare signal output measurement time is 15mS.

## 2.7 Others

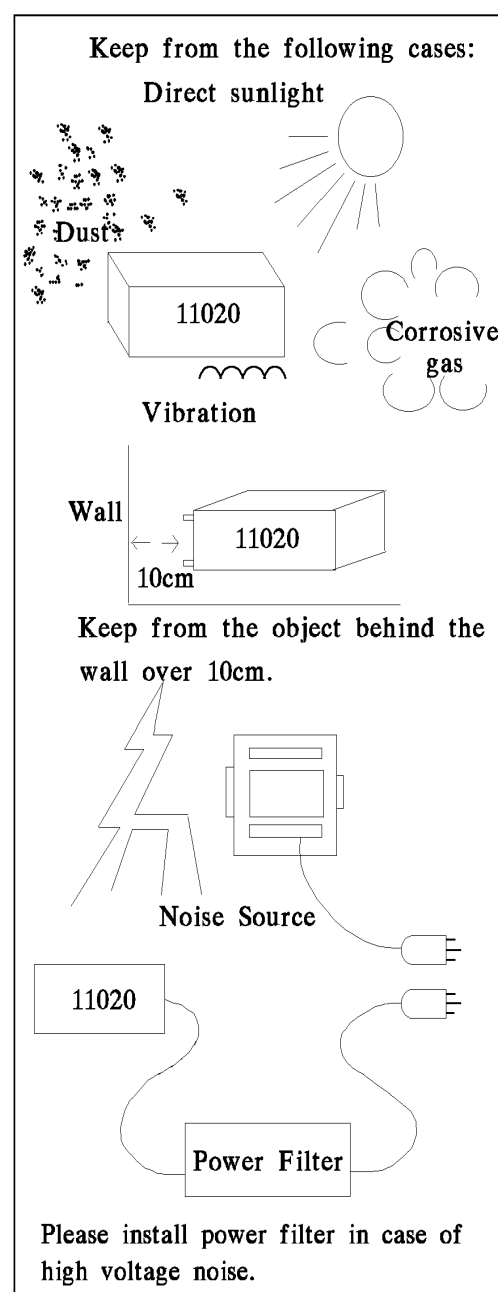
- **Power** : (1) 90V ~ 125V AC 50Hz/60Hz. Power consumption is 65W, maximum  
(2) 190V ~ 250V AC 50Hz/60Hz. Power consumption is 65W, maximum.
- **Environment:** Operating -- 10°C to 40°C, 10 to 90% relative humidity  
Storage -- 0°C to 50°C, 10 to 90% relative humidity
- **Dimension** : 320 (W) x 115 (H) x 350 (D)
- **Weight** : Approx. 5.4kg



## 3. Installation

### 3.1 Ambient Environment

- (1) Do not use the meter in a dusty or vibrating location. Do not expose it to direct sunlight or corrosive gas. Be sure that the ambient temperature is 0 ~ 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 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 as noise-free as low as possible. If noise is inevitable, please install a power filter.
- (4) The meter should be stored within the temperature range 0°C ~ 50°C. If the unit is not to be use for a long time, please store it in the original or similar package and keep it from direct sunlight and humidity.



### 3.2 Power-Line Connection

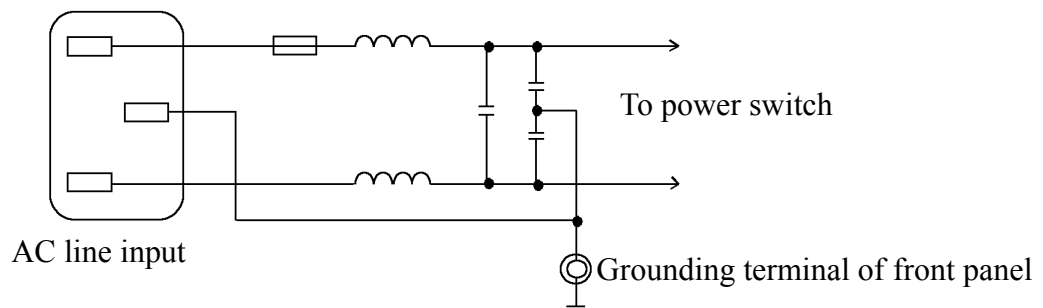
Before plugging in the power cord, please make sure the power switch is in the OFF position and that the voltage selected position of the rear panel meets the required voltage. Please use the 50 Hz or 60Hz power supply frequency.

### 3.3 Fuse

There is one fuse installed in rear panel of the meter. When replacing the fuse, please be careful the following items.

- (1) Please turn off the power and pull the plug from the power supply.
- (2) Fuse spec. AC 100V ~ 120V → T1.0A 250V  
AC 220V ~ 240V → T0.5A 250V

For the reasons of safety and noise reduction, it is necessary to use 3-core power cable for connecting AC power to socket of the rear panel. The illustrations are as the following figure.



### 3.4 Power Regulation

Because the meter is a precision electronic test device, the accuracy is possible to be influenced 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 the only one way to avoid the reasons that cause by power unstable.

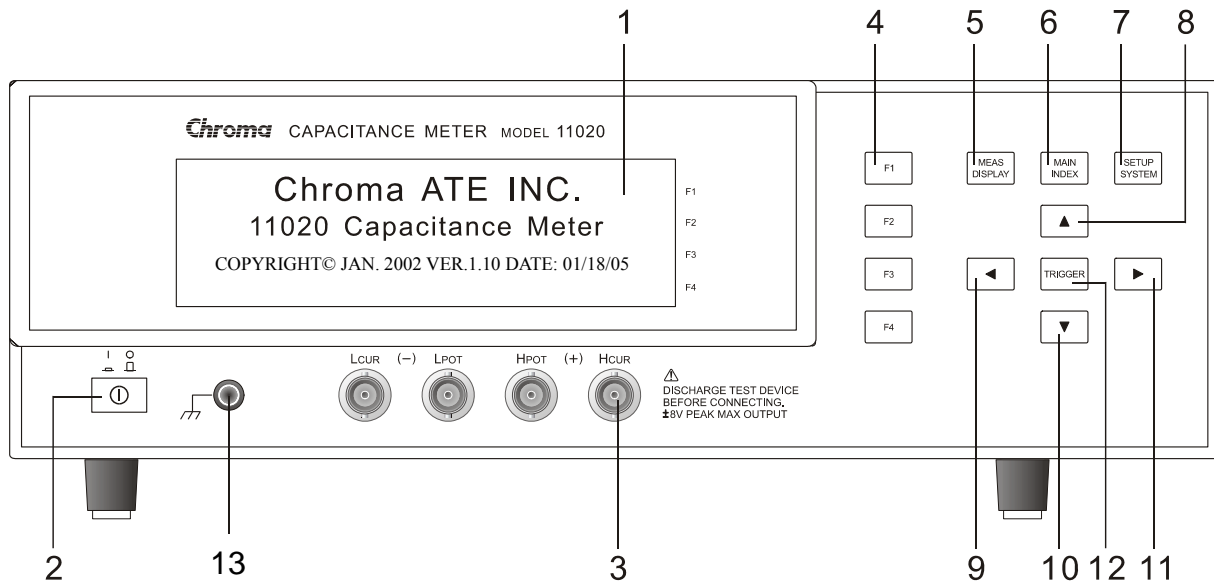
### 3.5 Connecting DUT

Connecting 11020 to D.U.T (unknown device) that can through the 4 BNC connectors which are Hcur, Hpot, Lpot and Lcur.

**Note: Lcur and Lpot connect to DUT should be at the same terminal, Hcur and Hpot connect to another terminal.**

## 4. Description of Panel

### 4.1 Front Panel



#### (1) LCD Display

The resolution of this instrument display is 64x240 Graphic mode LCD, so all the measurements and setting values can be shown clearly.

#### (2) Power Switch

On-off switch

#### (3) Unknown Measurement Socket

Four individual BNC sockets connect an external test device or wire for unknown testing.

H<sub>cur</sub> : Current drive terminal, high potential terminal  
 H<sub>pot</sub> : Potential detect terminal, high potential terminal  
 L<sub>pot</sub> : Potential detect terminal, low potential terminal  
 L<sub>cur</sub> : Current drive terminal, low potential terminal

※ Notice: The "high potential terminal" connect to (+) terminal and "low potential terminal" connect to (-) terminal on front panel while the polarized component is under test.

! Warning: To avoid shocking the instrument, please discharge before measuring polarized component.

#### (4) Function Keys

The major function of these keys 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) Measure Display Key**

Upon pressing this key, the instrument is in basic component measurement & analysis mode. Under this screen, each test parameter can be changed directly and the value can be read out. For example, test frequency, test voltage, measurement parameter, test speed and test circuit (series or parallel)...etc.

**(6) Main Index Key**

Pressing this key allows entry to the main index screen. In this screen you may select what you want to test, for example, the analysis of unknown test result, open test, short test, compare function...etc.

**(7) System Setup Key**

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

**(8) ~ (11) Cursor Keys**

There are four keys, corresponding to up, down, left and right. These keys are for display in different conditions and control cursor, which can be useful when inputting each parameter. The keys can also be selective, e.g., for changing values such as setting frequency or voltage.

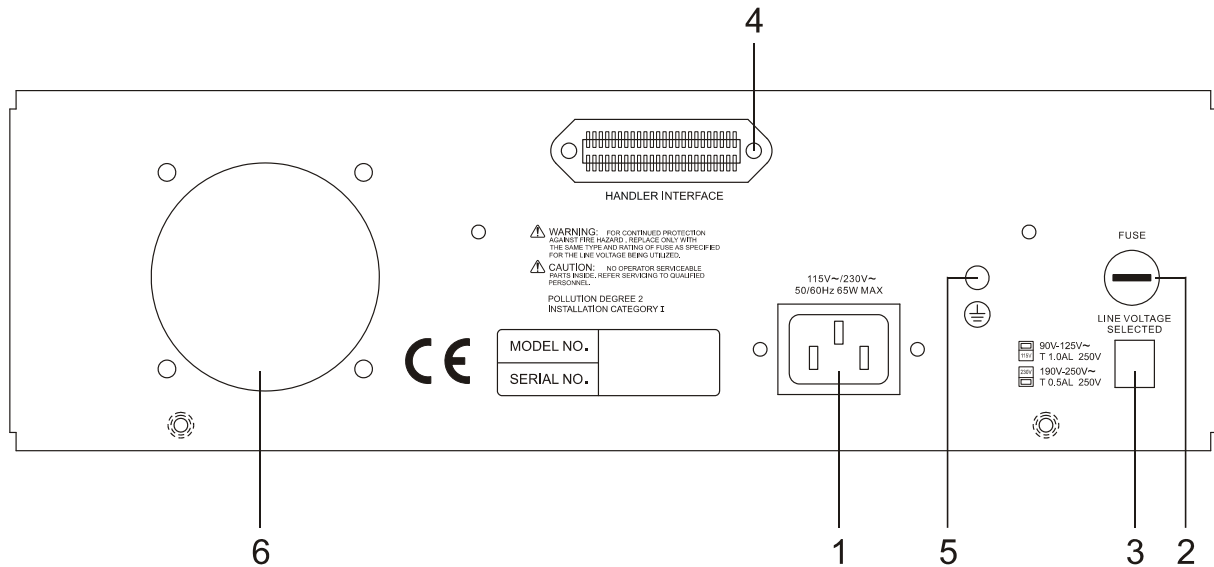
**(12) Trigger Key**

When starting to test the unknown, press this key when the measure condition of the instrument is in manual trigger.

**(13) Guard Terminal**

This terminal connects the cover of the instrument directly to guard to avoid exterior obstruction that makes connection incomplete and compromises the instrument's safety.

## 4.2 Rear Panel



### (1) AC Line Socket

This socket is an approved (by the International Electrotechnical Commission) three-line socket 320. Please use the correct wire, such as Belden SPH-386 or similar (W12 010130).

### (2) Fuse

1.0A or 0.5A slow flow fuse is for preventing the instrument being occurred excess current when 90 ~ 125V or 190 ~ 250V.

### (3) Power Voltage Switch

Ensure power is off, then use screwdriver to switch to required voltage.

### (4) HANDLER INTERFACE Socket

This socket is for connecting component-automated system. As 11020 received trigger signal then start measurement and the test result is outputted from this interface.

### (5) Guard Terminal

This terminal connects the cover of the instrument directly, then connect to the guard for avoiding exterior obstruction that makes instrument connection incomplete and reduce the accuracy.

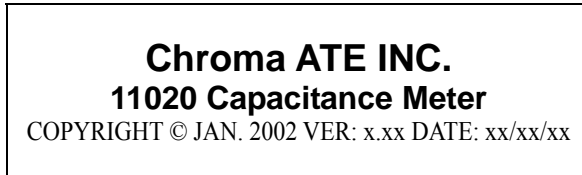
### (6) Fan

Heat dissipation fan keeps test instrument from overheating to ensure the most accurate measuring value.

## 4.3 Description of System Parameters Setting

### 4.3.1 System Setup

1. The display shows the model no. and programming version after the main power is switched on.



Note: If you want to show this screen at any time, press [System Setup], [◀] key in sequence.

2. Power on self-test screen will display for one second, after that, then enter the following Meas. Display:

<b>&lt; MEASURE DISPLAY &gt;</b>	FREQ.: 1.0KHz	F1
Cs : 0.02 pF	AVT. T: 01	F2
	CKT.: SERIES	F3
	NEXT PAGE 1/2	F4

3. When setting test instrument system parameter, press [System Setup] key after power on, then enter the following screen:

<b>&lt; SYSTEM SETUP &gt;</b>	CALIBRATION	F1	← Press this key to enter the system calibration menu.
	MEM MANAGE	F2	← Press this key to enter memory manage.
	SYSTEM CONFIG	F3	← Press this key to enter System Config. Menu.
		F4	

4. Press [F3] (System Config) key to enter system parameter setting screen as the following:

<b>&lt;SYSTEM CONFIG&gt;</b>	CLEAR	F1
HANDLER MODE : CLEAR	HOLD	F2
TRIGGER DELAY ; 0000mS		F3
TRIGGER EDG : RISING		F4
CONTRAST : 07		

5. System parameter setting description are as the following:

**HANDLER MODE:**

CLEAR, HOLD two modes, the factory default value is being set as CLEAR.

CLEAR: When using Handler interface, each time before measuring the last test result will be cleared (Pass or Fail).

HOLD: When using Handler interface, test result (Pass or Fail) will remain until next test result is displayed.



**TRIGGER DELAY:**

This is for adjusting the instrument to trigger action needed delay time. The range is 0 ~ 9999mS, the factory default value is 0mS. (All kinds of trigger mode are affected by this setting.)

**TRIGGER EDG:**

The trigger mode selections are FALLING/RISING. The factory default value is set as "FALLING".

**CONTRAST:**

LCD contrast adjustment range is 0 ~ 13. The factory default value is set as "7".

## 4.3.2 Memory Management

At SYSTEM SETUP status, press [F2] key to enter < MEMORY MANAGEMENT > menu as following:

< SYSTEM SETUP >	CALIBRATION	[F1]
PLEASE ENTER	MEM MANAGE	[F2]
PASSWORD...	SYSTEM CONFIG	[F3]
.....		[F4]

Keyin the correct password before entering memory management.

## 4.4 Operation Instruction

### 4.4.1 Open Correction

1. After turning the instrument on and ensuring every event is OK, press [Main Index] key to enter the main index as the following:

< MAIN INDEX >		[F1]
	COMPARE	[F2] ← Compare test setting
	CORRECTION	[F3] ← Zero correction
		[F4]

2. When pressing [F3], the menu is shown as below.

< MAIN INDEX-CORRECT >		[F1]
	OPEN	[F2] ← Open correction
	SHORT	[F3] ← Short correction
		[F4]

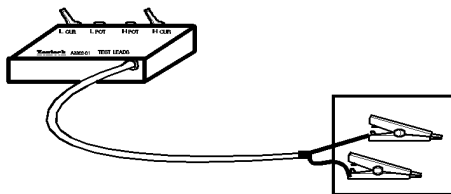
3. When pressing [F2], the menu is shown as below.

<MAIN INDEX-CORRECT OPEN>	SINGLE	[F1] ← Single point frequency
	MULTI	[F2] ← Multi point frequency
		[F3]
		[F4]

4. According to your requirements to select single or multi point frequency, the menu is shown as below.

<MAIN INDEX-CORRECT OPEN>	SINGLE	[F1] ← Single point frequency
OPEN CIRCUIT TEST LEADS THEN PRESSTRIGGER.	MULTI	[F2] ← Multi point frequency
		[F3]
		[F4]

The above screen informs users now doing open correction of test cable. Please prepare the test cable then press [TRIGGER] to start test. Meanwhile, please set the test clip to open status as below figure.



If there is anything wrong, the screen will show [FAIL], which means the procedure of open correction is wrong. Check for breaks in the test cable, ensure clips are making good contact and run test again. When open correction is successful, the screen will show [PASS]. Press any key to escape to another index as the following:

<MAIN INDEX-CORRECT OPEN>	SINGLE	[F1]
FREQ: 1.0KHz    RANGE: 1		[F2]
CALIB: 2	MULTI	[F3]
Cp: 0.0000pF		[F4]
MEASURE PASS... 100%		
PRESS ANY KEY TO EXIT		

Note: For getting the accurate test, please warm up about 10 ~ 30 minutes before measuring.

#### 4.4.2 Short Correction

1. After turning the instrument on and ensuring every event is OK, press [Main Index] key to enter the main index as the following:

< MAIN INDEX > <hr/> COMPARE <hr/> CORRECTION <hr/>	[F1] [F2] ← Compare setting [F3] ← Zero correction [F4]
--	--

2. When pressing [F3] key, the menu is shown as below.

< MAIN INDEX-CORRECT > <hr/> OPEN <hr/> SHORT <hr/>	[F1] [F2] ← Open correction [F3] ← Short correction [F4]
--	---

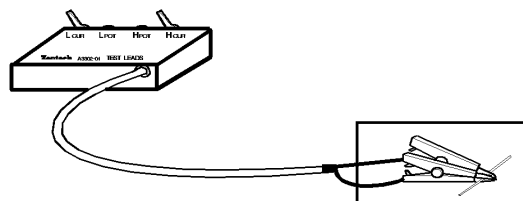
3. When pressing [F3] key, the menu is shown as below.

< MAIN INDEX-CORRECTSHORT > SINGLE <hr/> MULTI <hr/>	[F1] ← Single point frequency [F2] ← Multi point frequency [F3] [F4]
---	---

4. According to your requirements to select single or multi point frequency, the menu is shown as below.

< MAIN INDEX-CORRECTSHORT > SINGLE SHORT CIRCUIT TEST LEADS THEN PRESS TRIGGER. <hr/> MULTI <hr/>	[F1] ← Single point frequency [F2] ← Multi point frequency [F3] [F4]
--	---

The above screen informs users now doing short correction of test cable. Please prepare the test cable then press [TRIGGER] to start test. Meanwhile, please set the test clip to short status as below figure.



If there is error in testing short, the display will show [FAIL] to indicate the procedure of short test is wrong. Please inspect if the test cable break or the clip bad contact, and run short test again after inspecting. When the short test is successful, the display will show [PASS] to indicate the short test is completed and then press any key to exit is shown as below.

< MAIN INDEX-CORRECTSHORT > SINGLE FREQ: 1KHz      RANGE: 8 CALIB: 2 MULTI <hr/> Rs: 0.0000mΩ MEASURE PASS... 100% PRESS ANY KEY TO EXIT	[F1] [F2] [F3] [F4]
---	------------------------------

### 4.4.3 Description of Parameter Setting Operation

1. After turning the instrument on and ensuring every event is OK, press [Measure Display] key to enter the component parameter analysis test as the following:

< MEASURE DISPLAY > Cs : 0.01pF	FREQ.: 1.0 KHz	[F1] ← Setting of test frequency
	AVGT: 01	[F2] ← Setting of measurement average
	CKT.: SERIES	[F3] ← Setting of equivalent circuit mode
	NEXT PAGE 1/3	[F4] ← To the second page

< MEASURE DISPLAY > Cs : 0.01pF	RANGE: A 20mF	[F1] ← Range setting
	D VAL: OFF	[F2] ← Setting of D value test function
	TRIG.: INTER	[F3] ← Setting of trigger mode
	NEXT PAGE 2/3	[F4] ← To the third page

< MEASURE DISPLAY > Cs : 0.01pF	COMP.: OFF	[F1] ← Compare setting
		[F2]
		[F3]
	NEXT PAGE 3/3	[F4] ← To the first page

2. The setting descriptions of various parameters are as the following:

**FREQ:** The setting of test frequency. There are three frequencies – 100Hz, 120Hz and 1kHz. The default value in the factory is set as “1kHz.” To setup frequency, press [F1] and when frequency item is highlighted, press [Δ] and [▽] keys to select frequency.

**AVG. T:** The setting of measurement average. It is the average value after measuring n time. There are seven kinds of settings – 1 (factory default value), 2, 4, 8, 16, 32 and 64. The more of setting value and the longer of test time, however it can get more stable test value. After pressing [F2] to select this item then press [Δ] and [▽] keys to select setting value.

**CKT.:** The setting of equivalent circuit mode consists of PARALL. and SERIES. The factory default value is SERIES.

**RANGE:** Range setting. A means Auto, H means Hold. Press [F1] to highlight this item, then press [Δ] and [▽] keys to change. There are eighteen ranges - 100pF, 1nF, 5.0nF, 40nF, 50nF, 400nF, 500nF, 4uF, 5uF, 40uF, 50uF, 200uF, 1.5mF, 2mF, 15mF, 20mF, 150mF and 200mF. The range value is different by test frequency setting.

**D VAL:** The setting of D value test function. It indicates if the measurement of loss factor is ON. It the setting is ON, then the value D will show on the display as below.

< MEASURE DISPLAY > Cs : 0.01pF D : 0.0001	FREQ.: 1.0 KHz AVGT: 01 CKT.: SERIES NEXT PAGE 1/3
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TRIG.: The setting of trigger mode. There are two kinds of trigger modes – Internal and External. Switch by pressing [F3]. External mode also can be triggered by manual.

COMP.: The compare setting of test value. It indicates if the compare of the actual test value and high/low limit setting value is ON. If the setting set as ON, the display will show the words of Hi Go Lo and the bottom side of one of the three words will show the highlight as below. Go represents the value is within the high/low limit; Lo represents the value is lower than the low limit; Hi represents the value is higher than the high limit. The settings of this function are described in the next section.

< MEASURE DISPLAY >	COMP.: ON	[F1]
Cs : 0.01pF		[F2]
Hi    Go    Lo		[F3]
	NEXTPAGE 3/3	[F4]

#### 4.4.4 Description of Compare Setting Operation

1. Press [MAIN INDEX] and [F2] keys then show the following menu.

<MAIN INDEX: COMPARE SET>	DIGIT UP	[F1]	
PARAMETER: Cs – D		[F2]	← The value of the cursor positioned digit up.
NOMINAL: 00000.0000pF	DIGIT DOWN	[F3]	← The value of the cursor positioned digit down.
HI_LIMIT: +00.00%		[F4]	← The cursor moves right for one digit.
LO_LIMIT: -00.00%	DIGIT		
AUX HIGH: 0000.0000			
AUX LOW: 0000.0000	MODE: %		← It includes % and ABS modes.

2. By using the following examples to describe the operation method of Compare function.

Assumed that there are a lot of 100uF electrolytic capacitors needs to do capacitance testing, % mode is used firstly and the error range within  $\pm 10\%$ . Their setting methods are as the following.

In the above menu, the highlighted area is on NOMINAL item, or press [ $\Delta$ ] and [ $\nabla$ ] keys to move the highlight to NOMINAL item. The first zero on the highlighted area is blinking and then press [F3] key for thrice (DIGIT: the cursor moves to right for one digit). At this time, the cursor is on the second zero of the left side of decimal point. Press [F1] key, the selected digit will be changed from 0 to 1, then press [F3] key for six times the cursor will move to “p” position as above menu and press [F1] for twice then show “u” word.

Meanwhile, NOMINAL setting is completed as the following menu:

<MAIN INDEX: COMPARE SET>	DIGIT UP	[F1]
PARAMETER: Cs – D		[F2]
NOMINAL: 00100.0000uF	DIGIT DOWN	[F3]
HI_LIMIT: +10.00%		[F4]
LO_LIMIT: -10.00%	DIGIT	
AUX HIGH: 0000.0000		
AUX LOW: 0000.0000	MODE: %	

The sequential operation methods are the same as above, set HI\_LIMIT (the high limit value of the primary parameter) as +10.00% and LO\_LIMIT (the low limit value of the primary parameter) as -10.00%. After the setting is completed, the menu should be the same as the following menu.

<MAIN INDEX : COMPARE SET>	DIGIT UP	F1
PARAMETER: Cs - D	DIGIT DOWN	F2
NOMINAL: 00100.0000uF	DIGIT	F3
HI_LIMIT: +10.00%	MODE: %	F4
LO_LIMIT: -10.00%		
AUX HIGH: 0000.0000		
AUX LOW: 0000.0000		

The sequential operation methods are the same as above, set AUX HIGH (the high limit value of the secondary parameter) as 0000.1000 and AUX LOW (the low limit value of the secondary parameter) as 0000.0000. After the setting is completed, the menu should be as below.

<MAIN INDEX : COMPARE SET>	DIGIT UP	F1
PARAMETER: Cs - D	DIGIT DOWN	F2
NOMINAL: 00100.0000uF	DIGIT	F3
HI_LIMIT: +10.00%	MODE: %	F4
LO_LIMIT: -10.00%		
AUX HIGH: 0000.1000		
AUX LOW: 0000.0000		

After completing the above setting, press [MEAS DISPLAY] key to back to the measurement display and press [F4] key to the third page as below.

< MEASURE DISPLAY >	COMP.: ON	F1
Cs : 0.01pF		F2
		F3
	NEXT PAGE 3/3	F4

Connect to UUT then press [F1] key to set COMP as ON to open compare function, meanwhile to start proceeding capacity measurement. As the following menu the measured Cs is 95.00uF, the error value is between the high and low limit. The lower side of GO word shows the highlighted area, it means this capacitor is PASS. Please follow this way to complete all of measurements.

< MEASURE DISPLAY >	COMP.: ON	F1
Cs : 95.00 uF		F2
Hi Go Lo		F3
■ ■		F4
	NEXT PAGE 3/3	

When pressing [F1] key to set COMP as ON-%,  $\Delta\%$  will be shown on the monitor as below.  $\Delta\%$  represents differential value percentage of the actual measurement value and the nominal setting value.

< MEASURE DISPLAY >		COMP.: ON-%	F1
Cs :	95.00 uF		F2
Hi	Go	Lo $\Delta\%$	F3
	█	-5.000%	F4
		NEXTPAGE 3/3	

When COMP function is OFF again and the value D measurement function is ON the monitor will show as below.

< MEASURE DISPLAY >		RANGE: A 2.0mF	F1
Cs :	95.00 uF	D VAL: ON	F2
D :	0.0500	TRIG.: INTER	F3
		NEXT PAGE 2/3	F4

Then set COMP function as ON, the monitor will show as below menu. The errors of capacitance value and D value are within the high/low limit of the setting so that “GO” word will be shown as the following.

< MEASURE DISPLAY >		COMP.: ON	F1
Cs :	95.00 uF		F2
D :	0.0500		F3
Cs:GO	D:GO	NEXTPAGE 3/3	F4

When COMP set as ON-%, the monitor will show as below menu. Meanwhile, the value Cs is replaced by the calculation value  $\Delta\%$ .

< MEASURE DISPLAY >		COMP.: ON-%	F1
$\Delta\%$ :	-5.000%		F2
D :	0.0500		F3
Cs:GO	D:GO	NEXTPAGE 3/3	F4

When set the operation mode to ABS, the menu will show as below.

<MAIN INDEX : COMPARE SET>		DIGIT UP	F1	← The value of the cursor positioned digit up.
PARAMETER : Cs – D		DIGIT DOWN	F2	← The value of the cursor positioned digit down.
NOMINAL : 00000.0000pF		DIGIT	F3	← The cursor moves right for one digit.
HI_LIMIT : 00000.0000-F		MODE: ABS	F4	← It includes % and ABS modes.
LO_LIMIT : 00000.0000-F				
AUX HIGH : 0000.0000				
AUX LOW : 0000.0000				

Take an example by the above error range  $\pm 10\%$  thus ABS mode will set HI\_LIMIT to 110.0000uF and LO\_LIMIT to 90.0000uF are shown as below menu. About other operation methods are the same as % mode.

<MAIN INDEX : COMPARE SET>	DIGIT UP	
PARAMETER : Cs — D	DIGIT DOWN	F1
NOMINAL : 00100.0000uF	DIGIT	F2
HI_LIMIT : 00110.0000uF		F3
LO_LIMIT : 00090.0000uF		F4
AUX HIGH : 0000.0000	MODE: ABS	
AUX LOW : 0000.0000		

- 3. This method is connecting handler interface to auto instrument to sieve the capacitor for getting the fastest inspection result. If users do inspection by handler interface, the trigger mode set to EXTER is needed as the above menu by pressing [F3] to change TRIG.: INTER to TRIG.: EXTER. About the pin assignments of the handler interface are described as the next chapter.



## 5. Description of Handler Interface

COMPARE function in 11020 is connecting to external equipment by Handler interface. The 24Pin connector is the standard accessory and another connector is 14 Pin by using Handler cable for changing 24Pin to 14Pin. Pin descriptions are as the following table.

### 5.1 24 Pin

Pin	Name	Description
1	/EXT	External trigger
2	X	N.C
3, 20	LO	Test value is lower than LO_LIMIT.
4, 24	HI	Test value is higher than HI_LIMIT.
5-7	GND	Ground
8	X	N.C
9, 13	NG	Test value is over high/low limit.
10	VCC	External DC voltage, acceptable voltage range is +5V ~ 24V.
11	VINT	Internal DC voltage +5V
12	X	N.C
14-17	X	N.C
18	EOT	End of test
19	0	Always 0
21	GO	Test value is within high and low limit.
22	ACQ	Analog sampling is end, can move the next DUT to test terminal on 11020.
23	X	N.C

### 5.2 14 Pin

Pin	Name	Description
1	HI	Test value is higher than HI_LIMIT.
2	GO	Test value is within high and low limit.
3	LO	Test value is lower than LO_LIMIT.
4-6	X	N.C
7	VCC	External DC voltage, acceptable voltage range is +5V ~ 24V.
8	/EXT	External trigger
9	EOT	End of test
10-13	X	N.C
14	GND	Ground

Note: External trigger signal/EXT effective minimum signal width is 1.25 $\mu$ S.