



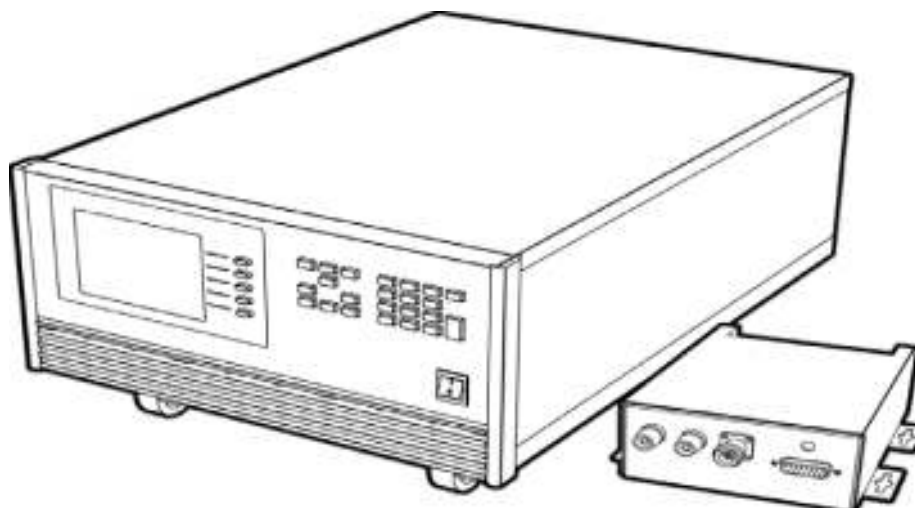
Ripple Current Tester

11810

User's Manual



Ripple Current Tester 11810 User's Manual



Version 1.1
November 2016

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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 a new one, the retailer is legally obligated to take back your old appliances for disposal free of charge.



<Table 2>

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

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

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

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

Disposal

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



Safety Summary

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



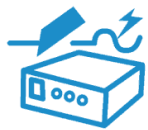
BEFORE APPLYING POWER

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



PROTECTIVE GROUNDING

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



NECESSITY OF PROTECTIVE GROUNDING

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



FUSES

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



DO NOT OPERATE IN AN EXPLOSIVE ATMOSPHERE

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



DO NOT REMOVE THE COVER OF THE INSTRUMENT

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

Safety Symbols

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

Inspection and Examination

Before the instrument exit the factory, we have a series of inspection and measurement on mechanical and electrical characteristics. Make sure its function of operating for the quality warranty of the product. If collision results in damages and defects of the quality and the performance, please contact us for promptly service.

Standard Accessory

Item	Q'ty	Description
11810 main unit	1	
External enclosure	1	
Power cord	1	Line cord
Fuse	2	15A250V slow blow 6.35x31.8mm safety
User's Manual	1	
D-SUB link cable	1	External enclosure control signal cable
DC BIAS link cable (1.5M)	1	DC link cable for main unit and external enclosure
N-terminal link cable (1.5M)	1	AC link cable for main unit and external enclosure
Copper foil wire	1	External enclosure AC output cable
V-sense & GND link cables	1	External enclosure AC signal measurement cable & external enclosure DC BIAS GND output cable
Single fixture	1	2pcs DIP capacitance fixture
A118030 DIP to SMD fixture board	10	Single Channel PCB for SMD capacitance

Optional Accessory

Item	Q'ty	Description
A118029 capacitor series test board	1	SMD capacitor series PCB
A118028 low voltage series fixture	1	20 capacitor series fixture (under 100kHz, Low ESR capacitor used)
A118004 series fixture	1	20 capacitor series fixture (under 100kHz used)
A118005 parallel fixture	1	20 capacitor parallel fixture (under 100kHz used)
A118030 single Channel PCB	10	Single Channel PCB for SMD capacitance
Fixture short film	10	Series fixture short film
DC BIAS link cable (6M)	1	DC link cable for main unit and external enclosure
N-terminal link cable (6M)	1	AC link cable for main unit and external enclosure

Note: When order the accessories, just specify the item.

The Danger of Operating

1. When the instrument is under output voltage, please don't touch test area or you may shock hazard and result in death.

Please obey the following items.

- Make sure the grounding cable is connected correctly and using the standard power cord.
- Don't touch test cable of connecting test termination.
- Don't touch test termination object.

2. The shock accidents are usually occurred on the following conditions.
 - The grounding terminal of the instrument doesn't connect correctly.
 - Extended connection used for voltage output and protection isn't applied properly.



Notice

The detailed about using the notice items and the danger of operating are in *Chapter 3 Notice Items before Using of the manual.*

Storage, Freight & Maintenance

Storage

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

Freight

Please use the original packing material when move the device. If the packing material is missing, please use the equivalent buffer material to pack and mark it fragile and 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

The device is without any maintenance operation for the general user. (Except for the notice 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.

Revision History

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

Date	Version	Revised Sections
Feb. 2010	1.0	Complete this manual
Nov. 2016	1.1	Delete <i>CE Declaration and Certificate</i> .

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1. Preface

1.1 Product Summary

Chroma 11810 ripple current tester is a higher frequency output device following after 11801 and 11800 which is applicable to the component test with higher frequency. According to the design of JIS-C-5102 test method, it is mainly applied on life test of capacitors especially for high frequency ripple current to perform quality reliability test on component

1.2 Product Feature

1. AC output frequency 20kHz – 1MHz, Max AC Output 10A/15V
2. DC Bias 500V max
3. Tracking DC Source supplies internal output amplifier to reduce power consumption and temperature rising inside device. Capable of reducing power cost and maintaining product stability for long-term test requirement.
4. Test operation easily, simplify complicated setting procedures of DC bias and ripple current for operation personnel.
5. When the test is completed, capacitor under test will auto discharge to protect the safety of operation personnel.

1.3 Application

1. The main test product is capacitor for DC-DC used such as electrolytic capacitor (aluminum solid, liquid and tantalum solid) and low voltage MLCC.
2. Electrolytic capacitor quality control and research development equipment
3. SPS filtering capacitor product verification test
4. PC motherboard product verification
5. Converter filtering capacitor product verification test

1.4 Initial Inspection

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

2. Specification (10°C ~ 40°C, < 90%RH)

Specifications

Model		11810
Ripple Current Source		
Current Output Range		0.03A – 10A
Frequency		20kHz ~ 1MHz $\pm 0.02\%$
Accuracy	0.03A-0.39A	$\pm (3\% + 0.01 \text{ A})$, Note2, Note 3
	0.40A-10.00A	$\pm (2\% + 0.05 \text{ A})$, Note2, Note 3
Ripple Voltage Output Range		15Vrms maximum
DC Bias Voltage Source		
Voltage Output Range		DC 0.5 - 500.0V, $\pm (0.3\% + 0.05\text{V})$, Note 3
Output Charge Current		200mA, 40W Maximum
Signal Monitor Parameter Accuracy		
Irms (Ripple Current)	0.030A – 0.399A	$\pm (3\% + 0.01 \text{ A})$, Note2, Note 3
	0.400A – 10.00A	$\pm (2\% + 0.05 \text{ A})$, Note2, Note 3
Vpeak (Normally, set to capacitor rated voltage)		$V_{\text{peak}} = V_{\text{dc}} + V_{\text{ac_peak}}$
Vdc (DC Bias Voltage)		0.00 ~ 500.0V, $\pm (0.3\% + 0.05\text{V})$, Note 3
Vrms (Ripple Voltage)		0.00 ~ 15.00V, $\pm (1\% + 0.01\text{V})$, Note 2, Note 3
Control Function		
Timer		1 min – 10000 hour, 30min error per year
Interface		RS-485 (Standard)
Display		320 X 240 dot-matrix LCD display
Operation		Start, Stop, Continue
Protection		OCP, OTP, Over Load
General		
Operation Environment		Temperature: 10°C ~ 40°C Humidity: < 90 % RH
Power Consumption		1000 VA max.
Power Requirement		220Vac $\pm 10\%$; 48 Hz ~ 62 Hz
Weight		Approx. 40Kg
Size (H x W x D)		222 x 440 x 610 mm
Safety		
Ground Bond		Less than 100m ohm at 25Amp, 2sec
Hipot		Less than 36mA at Wac 1.5kV, 60sec Less than 0.1mA at Wdc 2.2kV, 60sec
Insulation Resistance		Over 100M ohm at 500V 10sec
Line leakage current		Less than 3.5mA at 220V, 3sec, normal, reverse

Note

- Under rated load and voltage correction is well performed.
- Accuracy for test frequency 20kHz to 1MHz (SPC): multiply the accuracy by the following multipliers.

Test Frequency (kHz)	20~100	101~500	501~1000
	X1	X2.5	X5

- Measurement accuracy is guaranteed at the known terminals when all the measurement conditions listed below are satisfied:

- (1) Warm-up time: ≥ 10 min.
- (2) Ambient temperature: $23^{\circ}\text{C} \pm 5^{\circ}\text{C}$
- (3) Accuracy for 10°C to 40°C (**SPC**): multiply the accuracy by the following multipliers.

Temperature($^{\circ}\text{C}$)	10~18	18~28	28~40
	x2	x1	x2

3. Notice Items before Using

For your safety, please peruse notice item of this chapter and remember to avoid accident.

1. Grounding

There is a ground terminal on the rear panel cover of the tester. Please use appropriate implement to connect the ground terminal to earth actually. If not, there may be high voltage existed on the cover of the tester. It is very dangerous whatever touches the machine under the above statuses. It may cause shock hazard, therefore please make sure to connect ground terminal to earth as *Figure 3-1* arrowhead shown.

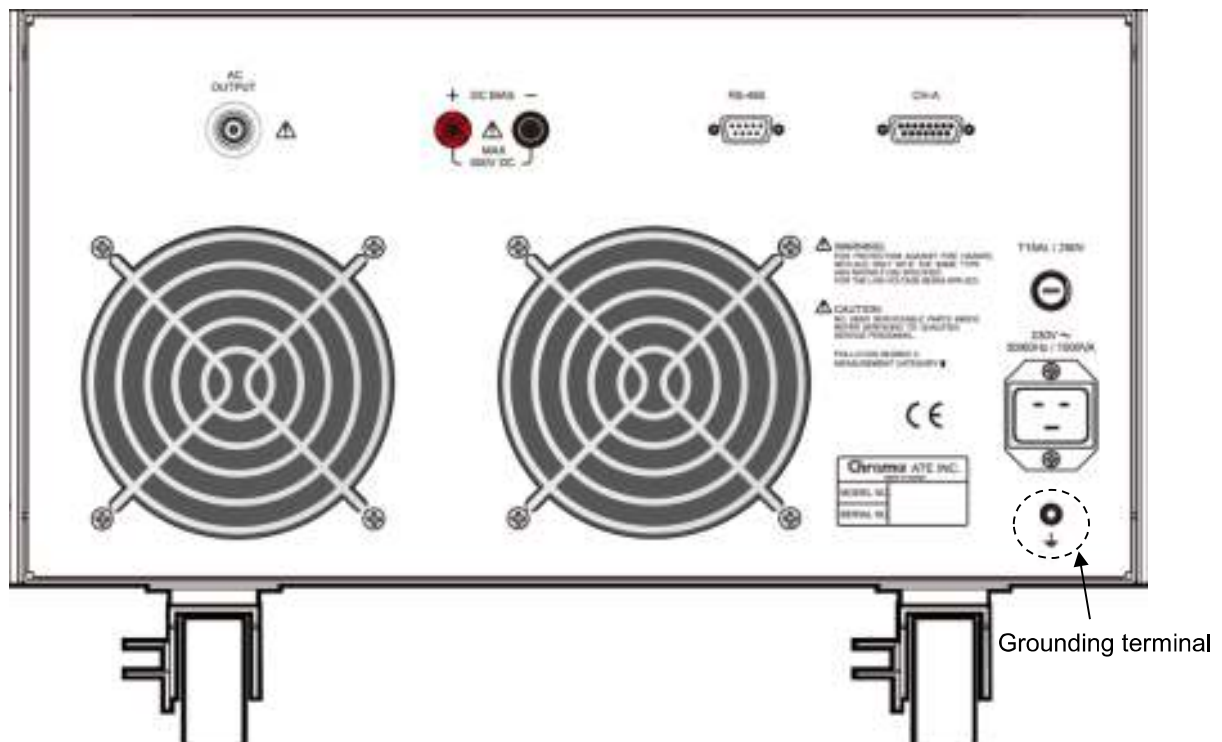


Figure 3-1

2. **11810 need to be used with external box for output, 11810 main unit can't be operated separately.**
3. **Wiring installation should be operated under power-off status.**
The 11810 includes main unit and external box. Before connecting these two devices, please be sure that the main unit power is off status. Connect all link cables exactly and tight up then turn on the main unit power. The detail description about installation, please see Chapter 5.
4. **The tester uses power supply source is over 2200VA.**
When DUT drawing mass current before deadline of fail judgment and output current, it may flows mass current (about ten amperes) up to ten milliseconds. Before processing test may be the same condition. Please notice the capacity of power cord and total withstand current specification of linking with other instrument or equipment. Confirm if the power of power source, power cord, no fuse switch on distributor is enough for the tester need.

5. The dangerous area under test mode

It is very dangerous to touch the area with voltage under operation status, such as touching DUT, DC BIAS test cable and output terminal.

6. Test end

When the test is over and no need to use, or the tester is not in running status, please be sure power switch is on 0 (that is turn off power) as *Figure 3-2* shows.

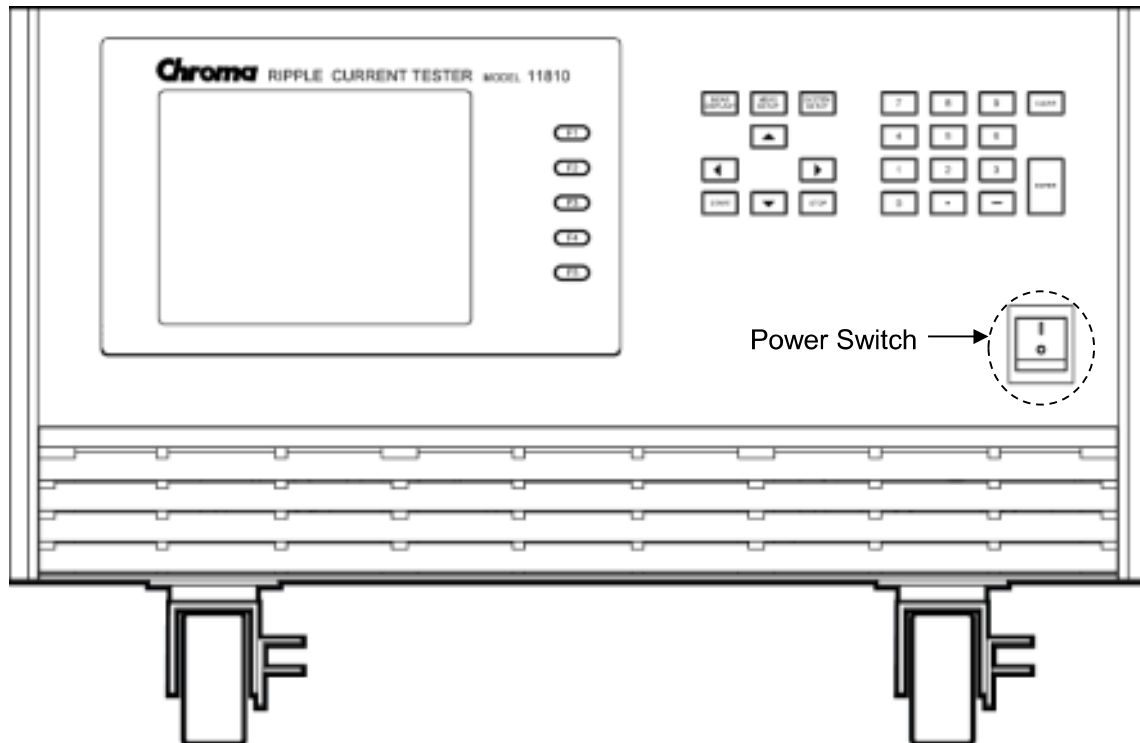


Figure 3-2

※ Notice ※

7. Turn on or off power switch

When power switch is cut off, it needs a few seconds to re-turn on. Please don't turn on and off continuously for avoiding error action occurred.

8. Location

Before using the tester, please confirm there is no obstruction behind cooling fan 50cm or it may cause poor heat dissipation. The tester surrounding 50cm can't near heat source such as oven.

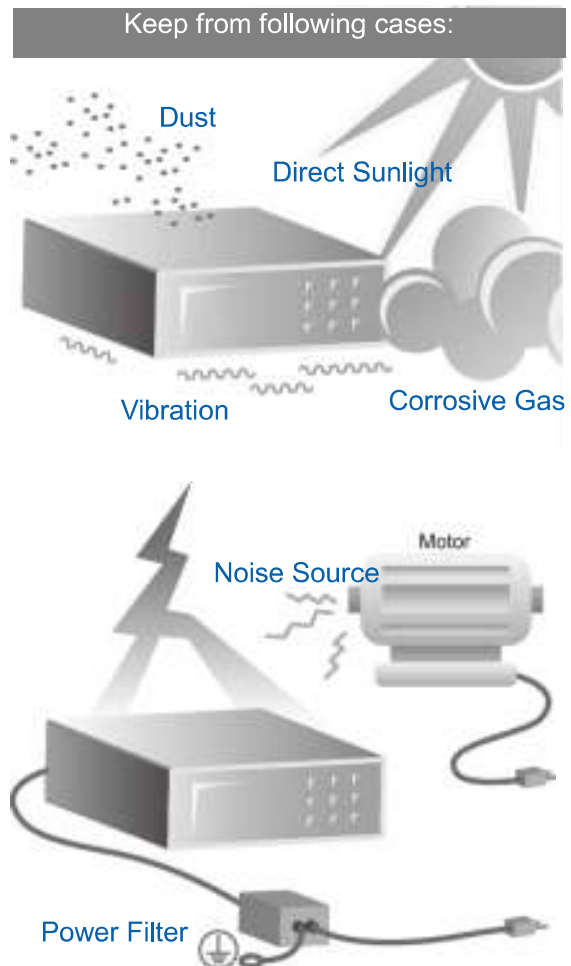
9. The danger handling

Under any danger circumstances, such as electric shock, DUT burning or the main unit burning. Please obey the following procedures to avoid the more dangerous.

- Cut off power switch firstly.
- Then pull off the plug of power cord.

10. 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 $10 \sim 40^{\circ}\text{C}$ and that humidity is below 90%.
- (2) The meter has been carefully designed to reduce the noise from the AC power source. However, it should be used in as noise-free an environment as low as possible. If noise is inevitable, please install a power filter.
- (3) The meter should be stored within the temperature range $-10^{\circ}\text{C} \sim +55^{\circ}\text{C}$. If the unit is not to be in use for a long time, please store it in the original or similar package and keep it from direct sunlight and humidity.



11. Warm up

All functions of the tester are activated when the power switch is turned on. However, to attain the precision in the specification, please warm the instrument over 15 minutes.

12. Common Environment Conditions

- (1) Indoor use
- (2) Altitude: 2000 m
- (3) Temperature: $10^{\circ}\text{C} \sim 40^{\circ}\text{C}$
- (4) Maximum humidity: 90%RH
- (5) Power used instant surge not over 2500V
- (6) Pollution Degree: 2

4. External Component Description

4.1 Front Panel

4.1.1 Keypad Function

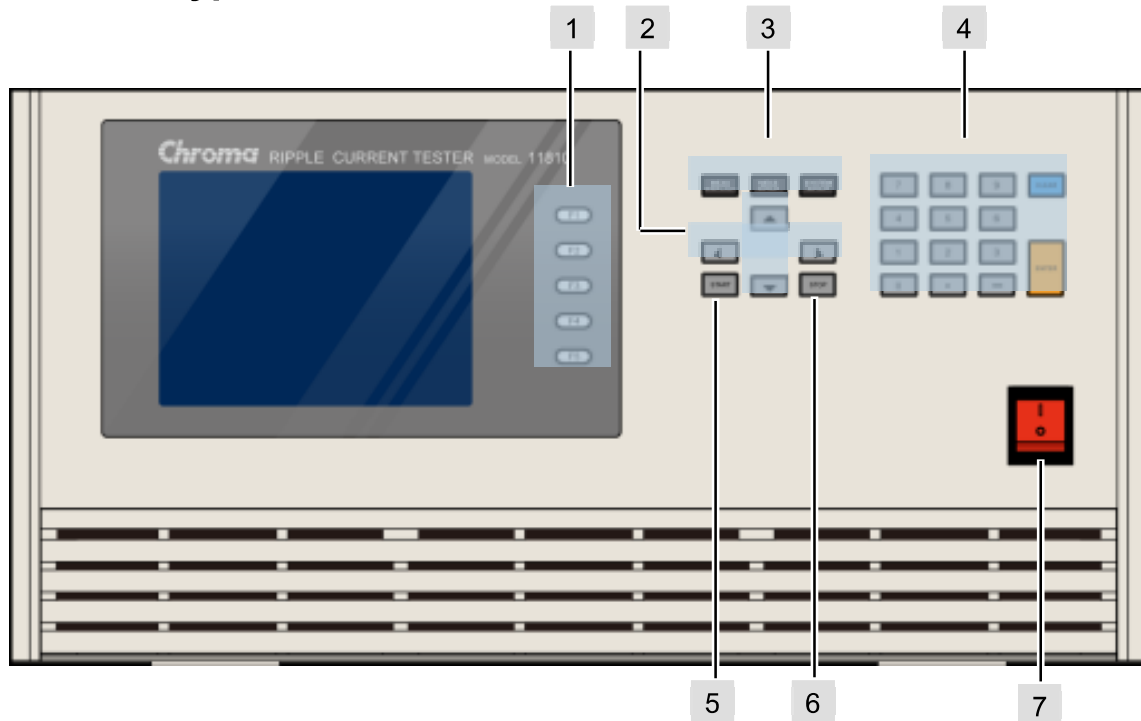


Figure 4-1 11810 Front Panel

- (1) **Function Keys:** There are five function keys (F1~F5). The side of keys will show corresponding functions by different menus for the users' selection.
- (2) **Cursor Keys:** ▲, ▼, ► and ◀ keys coordinates with the display to control movement direction and position of highlighted area under various settings and selectable screens for the parameters inputting.
- (3) **MENU Keys:** The menu keys include **MEAS DISPLAY**, **MEAS SETUP** and **SYSTEM SETUP**.
- [MEAS DISPLAY]:** The tester is under MEAS DISPLAY whenever press this key.
Capable of editing test parameter then press **START** key to start test.
- [MEAS SETUP]:** This key is reserved.
- [SYSTEM SETUP]:** The tester is under ABOUT, CONFIGURATION, SELF TEST, CALIBRATION and Firmware UPDATE selections whenever press this key.
- (4) **Data Entry Keys**
- [0][.]~[9] [-]:** Numerical key, for inputting each test parameter data (numeral).
- [ENTER]:** After inputting test parameter, press this key thus the value of inputting will be confirmed.
- [CLR]:** When input the test parameter, if there is any error can press this key to cancel error data and then input again.

- (5) **START Key:** When the display switch to MEAS DISPLAY function, press **START** Key to begin test execution.
- (6) **STOP Key:** When the system executing the test mode, press **STOP** Key to end test.
- (7) **Power Switch:** The switch provides AC power source that the tester is needed. Before starting, please read *Chapter 3 "Notice Items before Using"* firstly.

4.1.2 LCD Display

LCD display is 40 Characters x 16 Lines. The function definitions of display are as *Figure 4-2*.

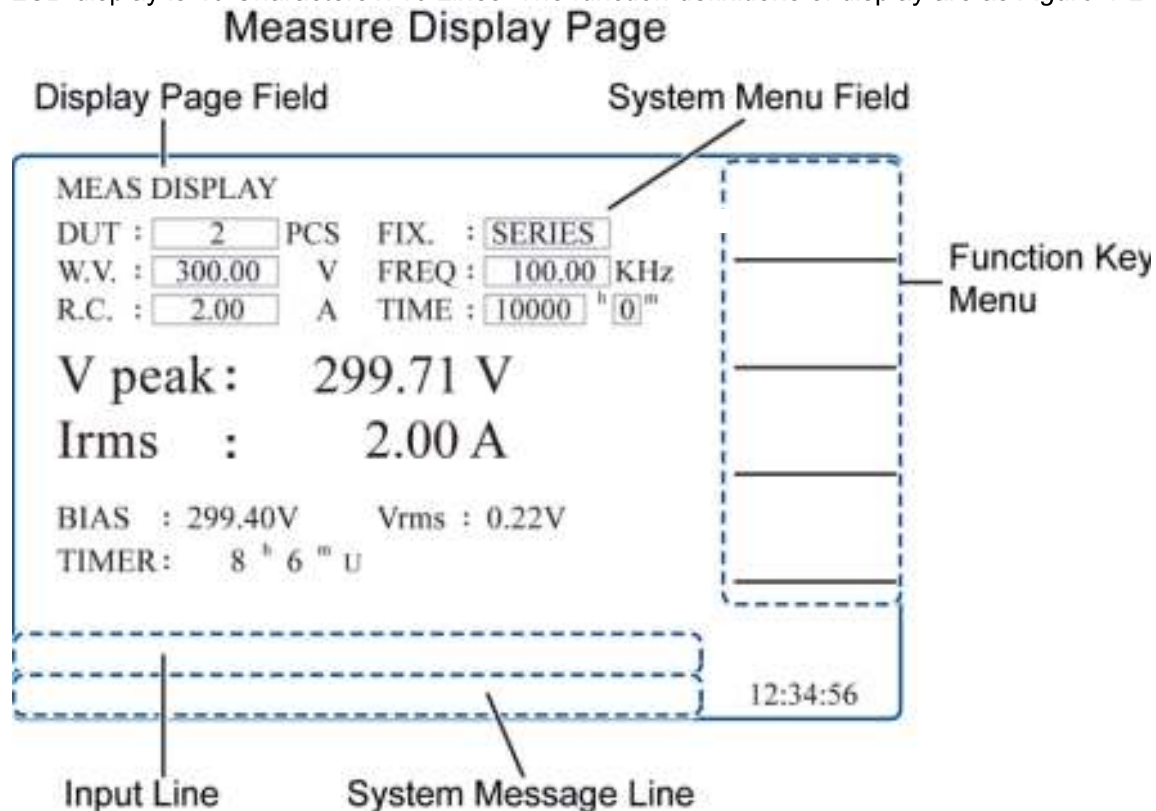


Figure 4-2 Display Page

Display Area

Display Page Field: It shows the current displayed function screen.

System Menu Field: It is capable of selecting different System Menu functions in various screens. By using direction control key to move the highlighted area to the field desire to input parameter thus switch various function selections by Function Key or input data by numerical keys.

Function Key Menu: It shows feature of Function Key. Each function key has different definitions by various displayed screens and selected fields.

Input Line Area: This displayed area is for inputting data. Press **Enter** key to confirm the input is correctly and then change the data on highlighted area.

System Message Area: This line is a displayed area for system status or error signal.

4.2 Rear Panel

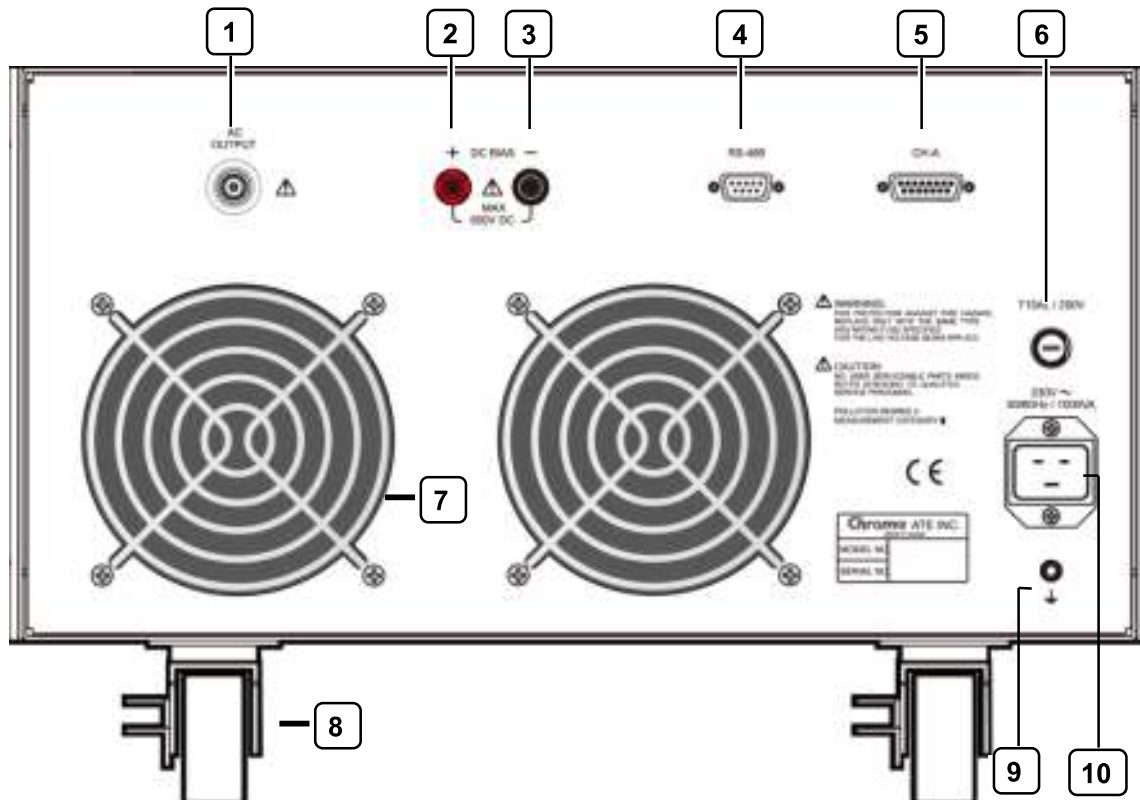


Figure 4-3 11810 Rear Panel

- (1) **AC OUTPUT:** High frequency AC output terminal
- (2) **DC BIAS OUTPUT (+):** DC voltage output positive terminal
- (3) **DC BIAS OUTPUT (-):** DC voltage output GND terminal
- (4) **RS485 Connector:** Control the tester from external signal via RS485
- (5) **CH-A:** It is a connection terminal for D-SUB signal line of external box.
- (6) **Fuse Holder**
- (7) **Dissipation Heat Fan**
- (8) **Caster**
- (9) **GND Terminal:** Grounding terminal of safety. Please use adequate tool to connect the GND terminal to the earth.
- (10) **AC LINE:** AC power socket and fuse holder

Notice

Please be sure to turn off the power then to perform wiring, it avoids personnel injured or equipment damaged. Don't touch/move terminal or wire during output for avoiding electric shock. The highest voltage of electrical output is 500V.

4.3 Panel Description of External Enclosure

4.3.1 Front Panel

Front panel of external box is mainly for connecting output terminal on rear panel of main unit.

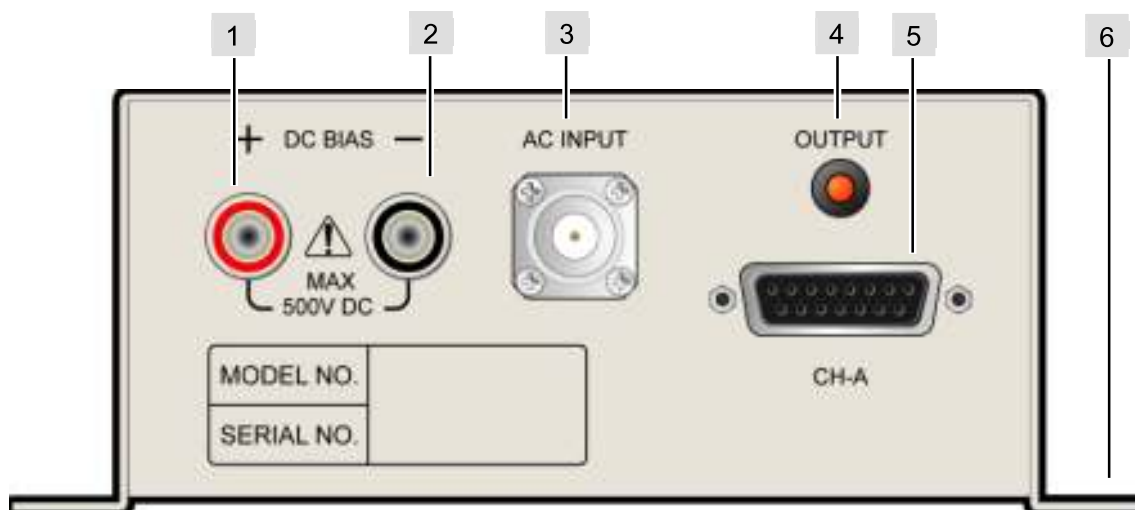


Figure 4-4 Front Panel of External Enclosure

- (1) **DC BIAS INPUT (+):** DC voltage input positive terminal
- (2) **DC BIAS INPUT (-):** DC voltage output GND terminal
- (3) **AC INPUT:** High frequency AC input terminal
- (4) **Output Warning LED:** Output LED blinking for warning while outputting.
- (5) **CH-A:** It is a connection terminal for D-SUB signal line of main unit.
- (6) **Rack Mount:** It is for pad as keeping the external enclosure flat. There are hanging holes inside rack mount for hanging or locking screw when upright.

4.3.2 Rear Panel

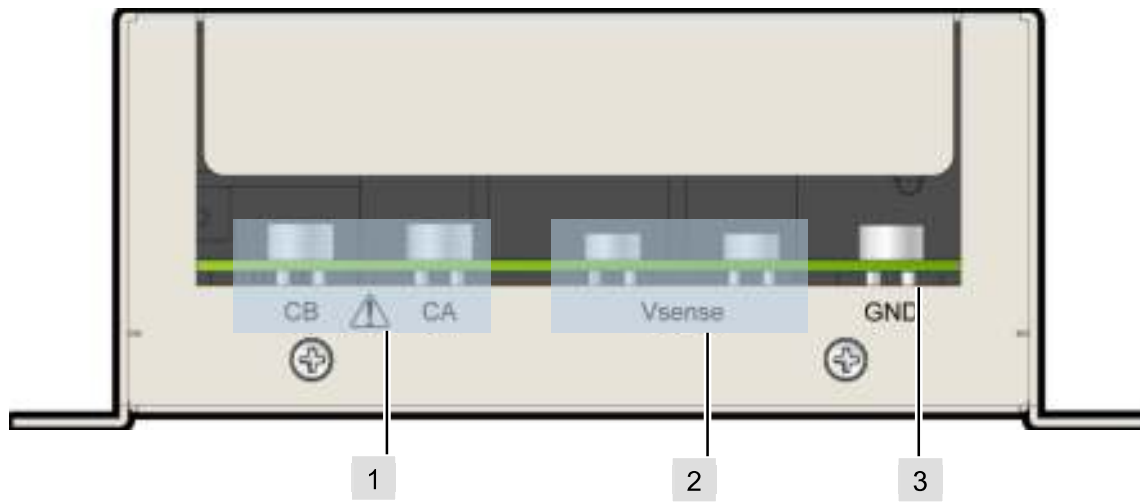


Figure 4-5 Rear Panel of External Enclosure

- (1) **CA, CB:** DC+AC signal output terminal for connecting DUT CA, CB. The CA, CB two terminals are without dividing polarity, their positions can interchange each other while connecting.
- (2) **Vsense:** They are AC voltage detect terminal for connecting DUT fixture (CA, CB). These two terminals are without dividing polarity, their positions can interchange each other while connecting.
- (3) **GND Terminal:** It is a DC signal GND terminal for connecting DUT fixture COM terminal.

 Notice

Please be sure to turn off the power then to perform wiring, it avoids personnel injured or equipment damaged. Don't touch/move terminal or wire during output for avoiding electric shock. The highest voltage of electrical output is 500V.

5. Installation Procedure of System

5.1 Connection of Main Unit and External Box

Please follow the following figure shown to connect all link cables on rear panel of tester.

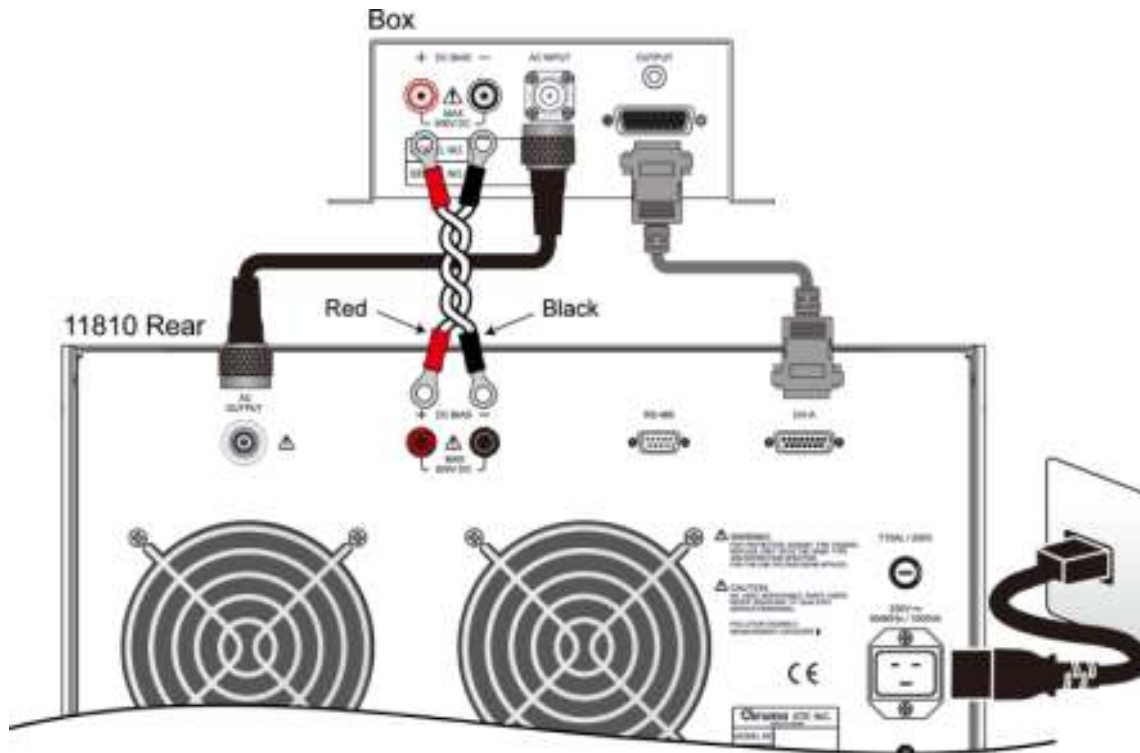


Figure 5-1 Connection Illustration of Main Unit and External Box

- (1) Use N-type terminal link cable to connect 11810 and AC OUTPUT terminal of external box.
- (2) Use DC BIAS link cable to connect 11810 and DC BIAS terminal of external box.
- (3) Use D-SUB link cable to connect 11810 and CH-A terminal of external box.
- (4) Use 11810 attached power cord to connect socket.

5.2 Notices for Power Connection

- (1) Confirm AC power is 220V 50/60Hz.
- (2) Confirm if source, power cord and no fuse switch etc on distribution plate is enough for the tester needed power.
- (3) For avoiding power voltage abnormal variation and machine damaged which resulted from oversight or unexpected situation. Please be sure to use the fuse with the same specification and capacity while changing it.
- (4) Don't use high noise sources to avoid measurement errors such as simple generator source, square wave output U.P.S., etc.

5.3 Test Cable Connection

The external box is mainly through fixture to distribute output voltage uniformly on each DUTs, the connection of external box and test cable of fixture is as *Figure 5-2* shown. The 11810 can select variety of fixtures, their wiring methods are similarity. Only connecting terminals on external box which corresponds to terminals of CA, COM and CB on fixture. Take an example by A118029 as *Figure 5-3* shows.

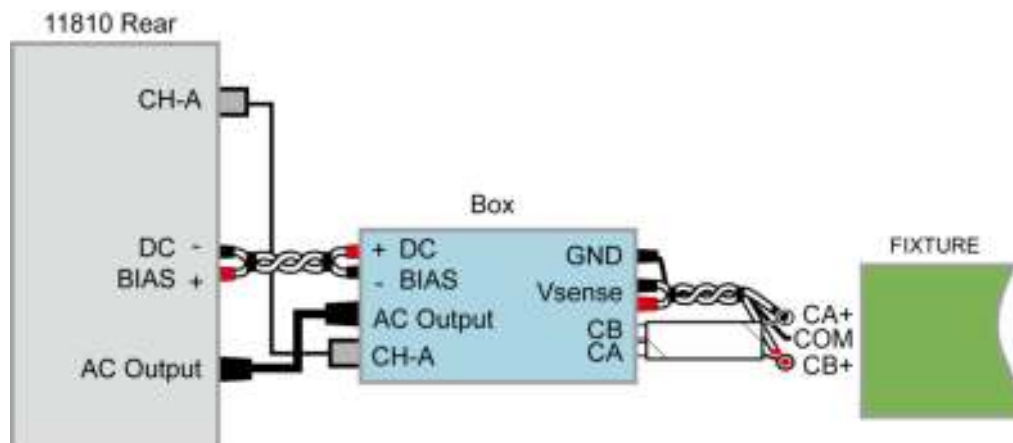


Figure 5-2 11810 Output Wiring Illustration

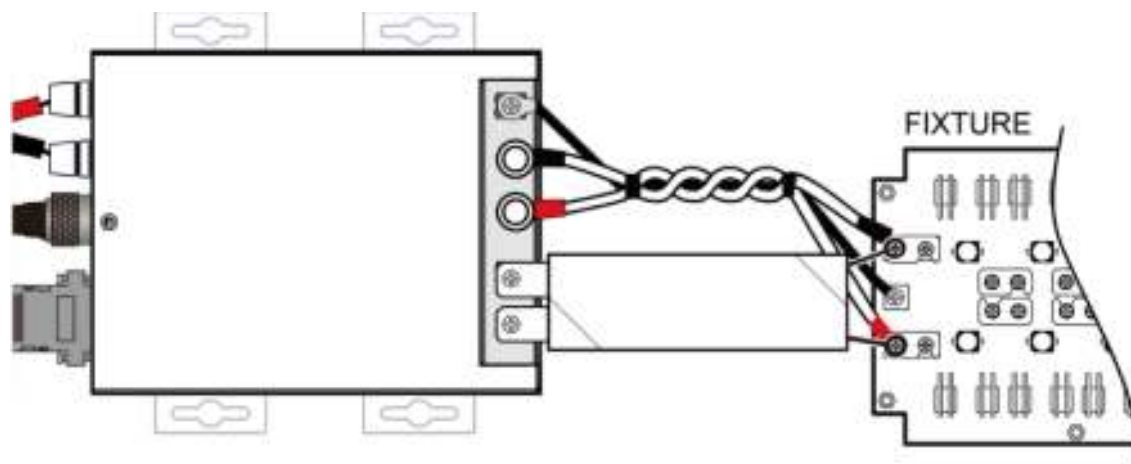


Figure 5-3 Connection Illustration of External Box and Fixture A118029

Notice

DUT life test will have the requirement for entering oven, the design of 11810 output cable and DUT fixture max. temperature tolerance is 150°C. The external box can't place into oven but hangable design of rack mount for convenience of placing it nearby threading hole of oven

5.4 Test Fixture (Option)

5.4.1 Series Fixture

According to JIS-C-5102 test method to extendedly design 2pcs for a set and 10 sets of series loop in total which can accommodate 20pcs capacitors under test at most. Besides, series fixture conforms to feature requirements of various capacitors divided into two kinds of (1) A118004 series fixture and (2) A118028 low voltage series fixture. Their wiring methods are the same.

Using notices:

- 1 The connected capacitor quantity under test needs to be even numbers. The capacitor quantity under test is less than 20pcs, the outlets unconnected DUT need to connect to short PIN. *Figure 5-4* is the connection by using series fixture and test capacitor quantity is 10pcs, the former 10 sockets are for placing DUT and the latter 10 unused sockets are for placing short PIN.

- 2 Take notice of series fixture with single DUT max voltage limit and total voltage output limit.

(A) Use A118004 series fixture, DUT min 4pcs and max 20pcs. Total output voltage max 500Vdc however withstand voltage on single DUT can't over 100Vdc.

Ex. 1: The A118004 series fixture inserted 20pcs capacitors under test, the instrument provides max DC BIAS 50V to each DUTs ($10 \times 50V = 500V$). If the setting is 60V then it will over output capability ($10 \times 60V = 600V$ Error).

Ex. 2: When users operate A118004 series fixture to connect 4pcs capacitors under test, the rest capacitors are short-circuited. The voltage can't set as 120V, although total output only need 240V ($2 \times 120V = 240V$) the withstand voltage on single DUT is already over 100Vdc Error.

(B) When users operate A118028 low voltage series fixture, DUT 10pcs min and 20pcs max but single DUT 16Vdc Max.

(C) Please use single accessory fixture of standard accessory when DUT is 2pcs.

2. DIP socket min spacing of A11804/ A118028 series capacitor fixture is 5.6mm.

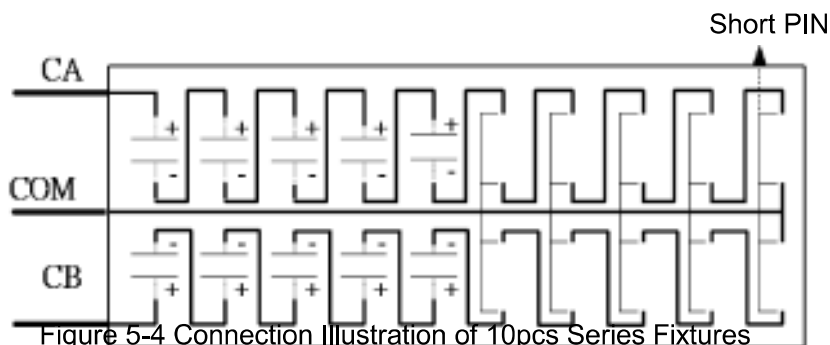


Figure 5-4 Connection Illustration of 10pcs Series Fixtures



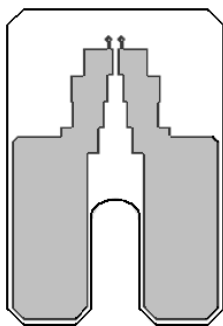
Figure 5-5 Short PIN Outline



For ensure to spread voltage of series fixture average over each DUTs, DUT IR applicable ranges are as follows.

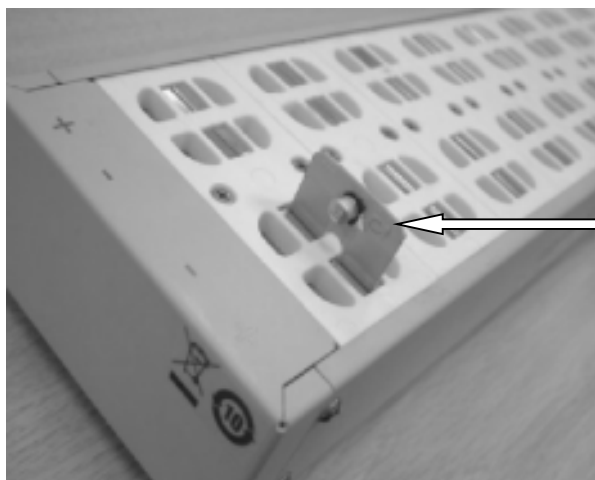
Series fixture (A118004)	DUT IR needed $>50k\Omega$
Low voltage series fixture (A118028)	DUT IR needed $>3.6k\Omega$

5.4.2 A118030 Single Channel PCB

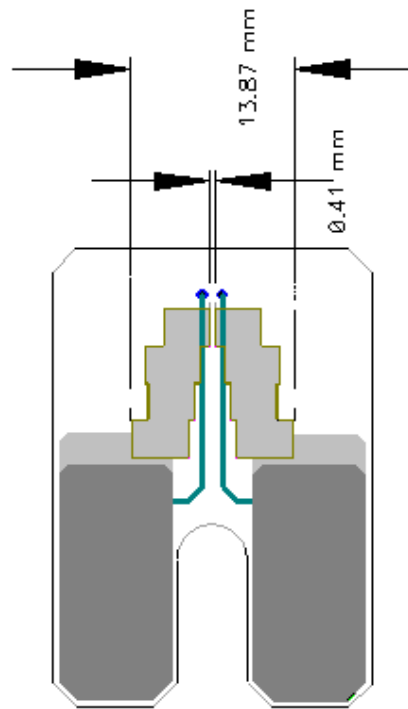


A118030 single Channel PCB for SMD capacitor, because single fixture or series fixture design is DIP component socket for testing SMD DUT need to coordinate with this PCB load board, its outline as figure at left.

SMD DUT can coordinate with option A118030 to solder DUT firstly on A118030 PCB and then insert it into A118028 low voltage series fixture. Before and after using A118030 to perform load life test which can pull out and then insert it to A110211 Component Test Fixture. Record electrical parameter C/D/Z/ESR by LCR 11022, and 11200 used with test clip to measure LC.

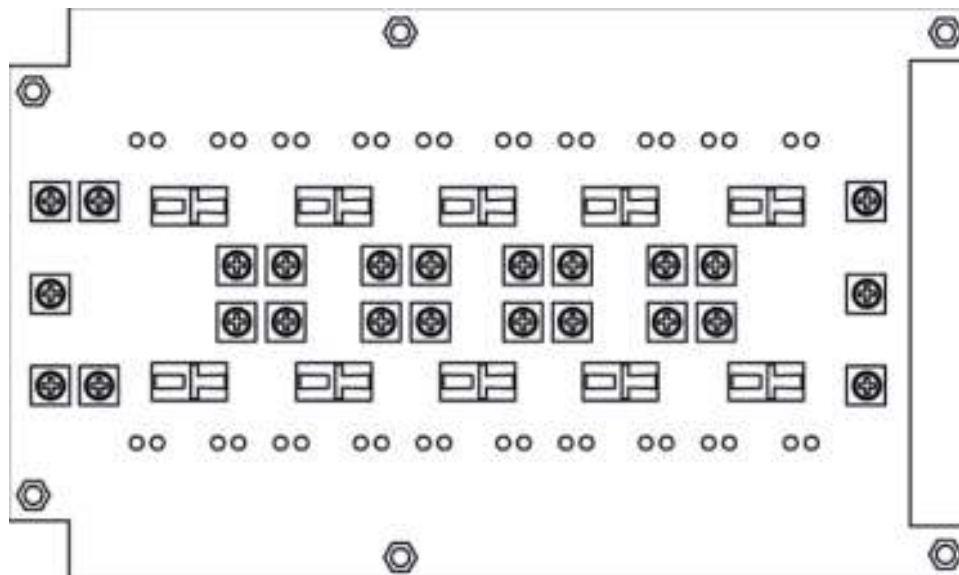


A118030 single Channel PCB soldered capacitor DUT to insert it into A118028 low voltage series fixture.

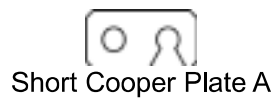


DUT solder point spacing:
Narrowest 0.41mm
Widest 13.87mm

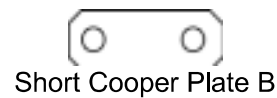
5.4.3 SMD Series Fixture Board (A118029)



A118029



Short Cooper Plate A



Short Cooper Plate B

It is a series fixture specially design for SMD component under test, PCB is with test pin for the convenience of measuring component data under test of instrument. A piece of PCB can solder 10 components under test, the loop is shown as *Figure 5-6*. The fixture board can expand DUT quantity by cascading, loop diagram as *Figure 5-7*.

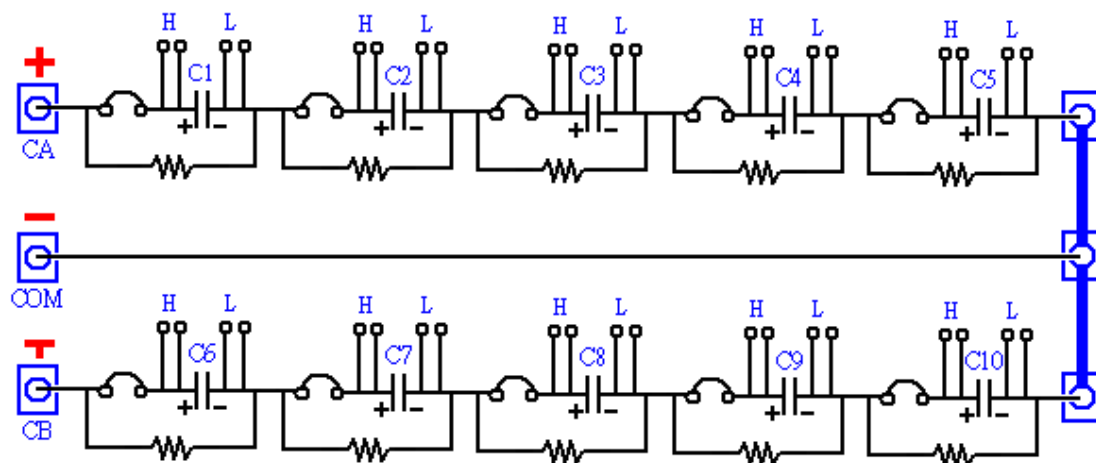


Figure 5-6 SMD Series Fixture Loop

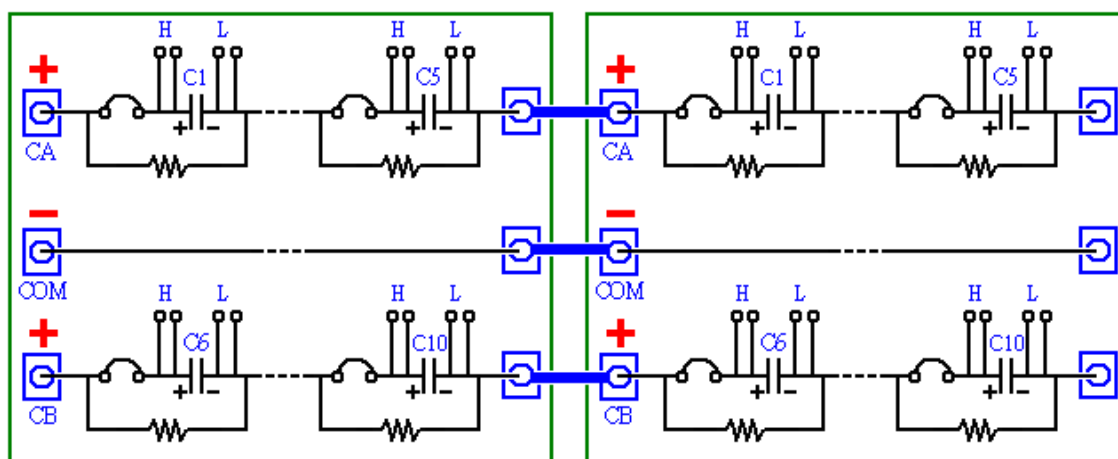


Figure 5-7 SMD Two Pieces of Series Fixtures Cascade Loop

Using notices:

1. The connected capacitor quantity under test needs to be even numbers, DUT quantity 10PCS at least (inserted fully to a piece of fixture). However, single DUT max is 16Vdc.
2. When fixture board cascaded to expand DUT quantity, it is needed to take notice of D.U.T. parameter setting max 20PCS and max total output voltage can't over DC 500V.
3. The fixture boards are cascaded to extend DUT quantity, the rest plug-in locations on the fixture should be short-circuited if the plug-in quantity is below 20PCS.
For instance, connection method of testing 14PCS of SMD capacitors:
Plug 10PCS in the first A118029 + plug 4PCS in the second A118029, the rest of 6PCS uses copper plate to short-circuit.



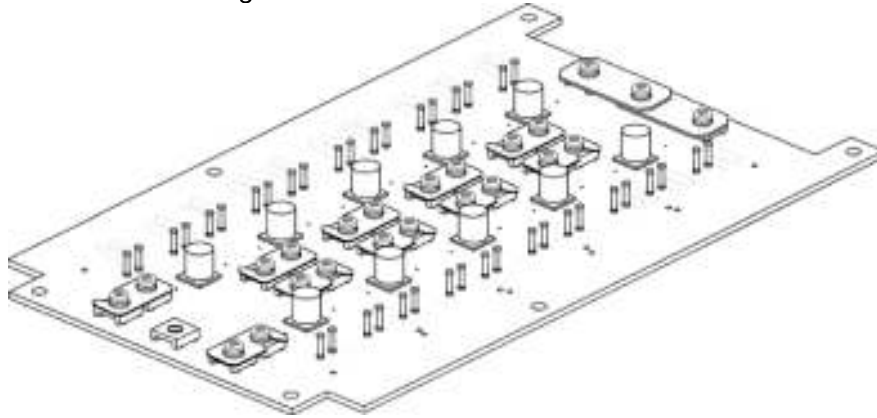
The using electrical specifications of A118029(SMD) and A118028 low voltage series fixture (DIP) are the same. For ensure series voltage can spread averagely on each DUTs, DUT IR applicable range as below:
SMD series fixture board (A118029) DUT IR need $> 3.6k\Omega$

Operation procedures of A118029 are as follows:

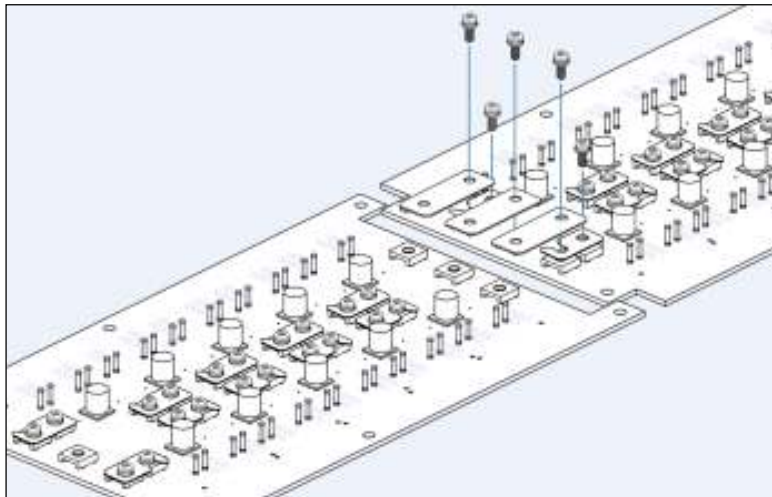
- (1) Firstly use A118029 empty plate to do Open/Short calibration of LCR meter. LCR meter probe clip A118029 test pins of four terminals separately to remove short circuit copper plate, unsoldered DUTs do Open calibration. The DUT plug-in location of solder tin short performs Short calibration.
- (2) Solder SMD DUT on the top of PCB.
- (3) Using of two kinds of short circuit copper plate (please refer Assembly Guide below).
- (4) 11810 connection and setting output (please refer 5.3).
- (5) Before and after burn-in using test pin to measure DUT LCR variation. Remove copper plate at two ends of DUT desired to measure, by using probe of LCR meter to clip test pin. Compare the differences before and after burn-in by the method of four terminals measurement.

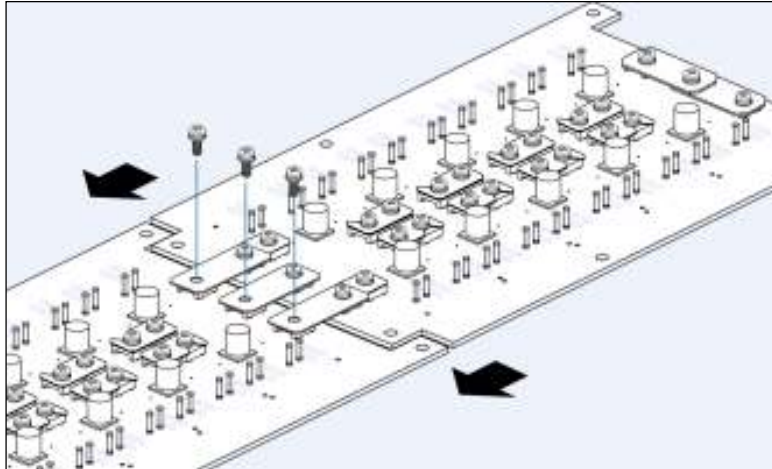
Assembly Guide:

1. Connection method of single A118029:

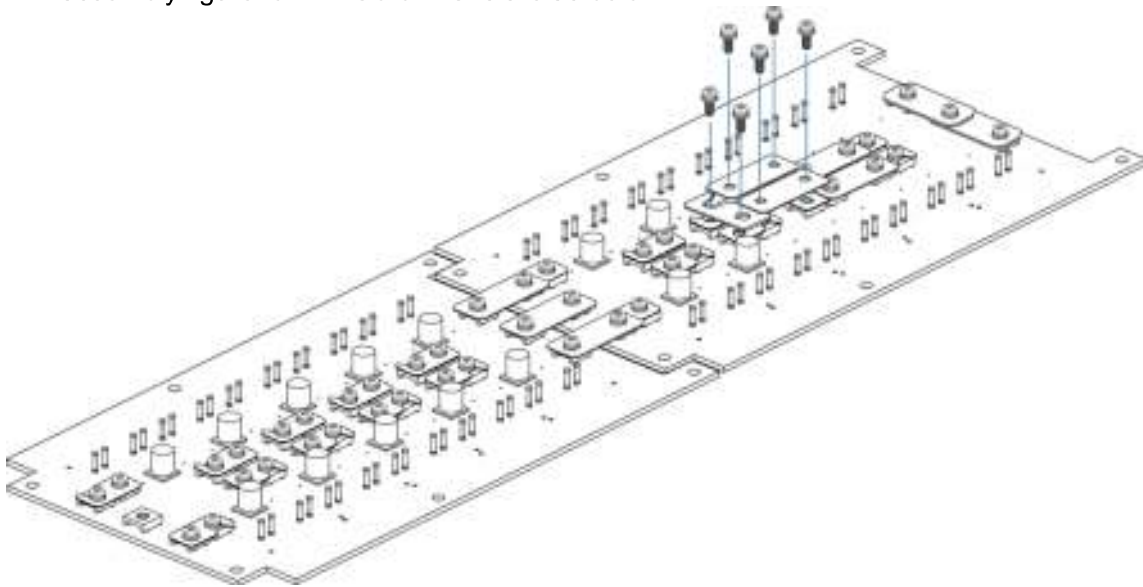


2. Assembly method of two pieces of A118029:
When DUT quantity is over 10PCS, it can cascade two pieces of A118029 through short-circuited copper plate. Change copper plates of CN13, CN24 and CN23 placed laterally to connect CA, COM, CB of the second fixture board. However, CN13, CN24 and CN23 of the second fixture board still short circuit by laterally as below figure shown.



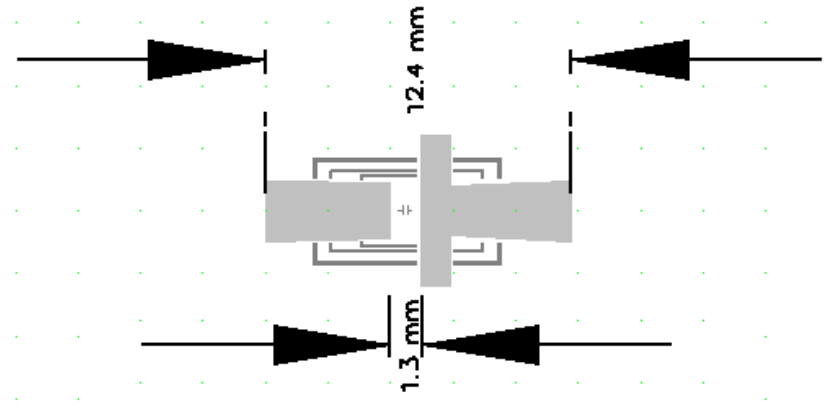


3. The second A118029 assembly method when it doesn't plug fully with DUT:
When DUT quantity $10PCS < DUT < 20PCS$ (need to be even numbers), the locations don't plug DUT which need to short-circuit by short-circuited copper plate B. The assembly figure for 14PCS of DUTs are as below.



 Notice

Use a piece of short circuit plate A by laterally on locations of 15 and 16PCS in assemblable figure above. The purpose is to shorten AC high frequency signal loop for reducing the loss of high frequency circuit. Whereas, all spaces don't connect DUT which need to use short plate B to lock then DC signal can complete loop.



DUT solder point spacing:
Narrowest 1.3mm / Widest 12.4mm

5.4.4 Parallel Fixture

According to JIS-C-5102 test method to design 2pcs for a set and 10 sets of parallel loop in total which can accommodate 20pcs capacitors under test at most and 2pcs capacitors under test at least.

Using Notices:

1. The connected capacitor quantity under test needs to be even numbers, the min. is 2pcs and the max. is 20pcs. Its polarity connection is as Figure 5-8 shown.
2. The 11801 provides max 10A ripple current as using parallel fixture inserted 20pcs capacitors under test. The instrument provides max DC BIAS 500V/max ripple current 1A to each DUTs.
3. DIP slot min spacing of A11804/ A118028 series capacitor fixture is 5.6mm.

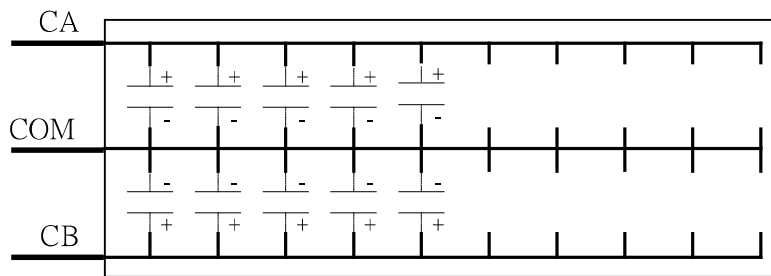


Figure 5-8 Connection Illustration of 10pcs Parallel Fixtures

6. Using Instruction

6.1 System Setup

Press main function key **SYSTEM SETUP**. The system provides five function options under this page, users can operate Function key for selection.

- (1) ABOUT
- (2) CONFIG
- (3) SELF TEST
- (4) CALB.
- (5) F.W. UPDATE

 **Notice** SELF TEST, CALB. and F.W. UPDATE functions are only for maintenance or calibration personnel.

6.1.1 ABOUT Page

Press **SYSTEM SETUP** main function key then as *Figure 6-1* shows.

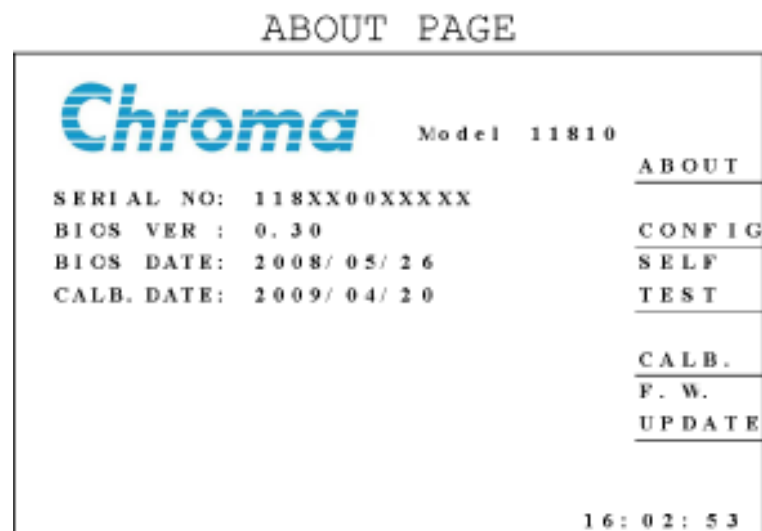


Figure 6-1

The data descriptions above figure shown:

1. SERIAL NO: Factory serial number
2. BIOS VER: Version number of system program
3. BIOS DATE: Date of system program
4. CALB.DATE: Calibration date of instrument

6.1.2 CONFIG Page

Press **CONFIG** sub-function key under SYSTEM SETUP main function, then enter CONFIG page as Figure 6-2.

CONFIG PAGE

C O N F I G U R A T I O N		
T I M E R M O D E	: U P	A B O U T C O N F I G S E L F T E S T C A L B .
B A U D R A T E	: 1 1 5 2 0 0	
R S 4 8 5 A D D R E S S	: 1	
C O N T R A S T	: 7	
B U Z Z E R	: O N	
D A T E (y y / m m / d d)	: 0 9 / 0 4 / 2 4	
T I M E	: 1 1 : 4 9 : 3 2	
D U T . F a i l M o d e :	I G N O R E	

Figure 6-2

By using direction keys **▲**, **▼**, **▶** and **◀** to move the highlight to the field desire to set. Each data descriptions are as the following:

Table list of config data:

Item	Range	Initial Setting	Description
Timer Mode	UP / DOWN	UP	It sets the count mode of the timer by using UP and DOWN keys. Up: The timer start to count from zero to the setting time then it will be stopped DOWN: The timer start to count from setting time to zero then it will be stopped.
BaudRate	9600 ~ 115200	115200	Transfer rate setting. The control method is by using sub-function keys of INCR. and DECR. to change it. Its ranges are 9600 / 14400 / 19200 / 28800 / 38400 / 56000 / 57600 / 115200 eight types for selecting.
RS485 Address	1 ~ 32	1	The tester is with RS485 interface address setting. The selection method is by using numerical (0..9) + ENTER keys to input address or by using sub-function keys INCR. and DECR. to change it.

CONTRAST	0 ~ 15	7	Adjust LCD contrast. The control method is by using numerical (0..9) + ENTER keys to set or by using sub-function keys INCR. and DECR. to change it. Adjusting the proper brightness by personal needed for avoiding over brightness or darkness.
BUZZER	ON / OFF	ON	Select buzzer switch. The selection method is by using sub-function keys INCR. and DECR. to change it. When the setting is "ON", the system error and end test will start buzzer alarm for the operation personnel.
DATE(yy/mm/dd)	-	-	The system date year(yy)/month(mm)/date(mm) setting function. The LCD shows the current system year, month, date. Please move the highlight to the field that you want to change. By using numerical (0..9) + ENTER keys to set or sub-function keys INCR. and DECR. then press SET key to change the system date.
TIME	-	-	System hour: minute: second setting function. The LCD shows the current system time (24-hour system). Please move the highlight to the field that you want to change. By using numerical (0..9) + ENTER keys to set or sub-function keys INCR. and DECR. then press SET key to change the system time.
DUT. Fail Mode	IGNORE/ STOP/ WARN	IGNORE	Dut. Fail Mode is as <i>Figure 6-2</i> shown. The system program auto detects short function at DUT terminal of series fixture. The system will auto detect to warn or auto end the test as DUT fail happened just like a capacitor damaged and short-circuited. For avoiding knock-on effect which caused by continuous process fail test, it will be difficult on tracing analysis of test result. The function consists of three items of IGNORE , STOP and WARN . Power-on default IGNORE means undetected that is without any reaction. If the DUT detects fail, test auto end to select STOP . If the DUT fails, the test won't auto end but only warning to select WARN .

6.2 MEAS DISPLAY

Press **MEAS DISPLAY** main function key for entering Measure Display Page. All test related operations are included in the page. When enter Measure Display page, the system is standby status for setting test parameter until the operation personnel press **START** key to perform the test. Its descriptions are given as the following.

6.2.1 MEAS DISPLAY Page

Measure Display Page

MEAS DISPLAY	
Parameter Setting	DUT : 2 PCS FIX. : SERIES
	W.V. : 300.00 V FREQ : 100.00 KHz
	R.C. : 2.00 A TIME : 10000 h 0 m
Measurement Data Display	Vpeak: 299.71 V
	Irms : 2.00 A
	BIAS : 299.40 V Vrms : 0.22 V
	TIMER 8 h 6 m U
12:34:56	

6.2.2 Parameter Setting

By using ▲, ▼, ▢ and ◀ keys to select the parameter item desired to set. The parameter items can be set are as below:

Item	Range	Initial Setting	Description
1 DUT	2 ~ 20 Pcs	2	It sets DUT quantity. (Note 1) By using numerical keys for setting, they need to be even numbers.
2 FIX	SERIES / PARALLEL / SERIES LOW V	SERIES	It sets DUT connection test method which associated with the fixture. Series/parallel/series low voltage fixture
3 W.V.	2.0V ~ 500V	100	It sets max. DUT Withstand Voltage, the result is the sum of BIAS voltage and peak ripple voltage.
4 FREQ	20 KHz ~ 1000 KHz	100	It sets DUT ripple current frequency. By using numerical keys for setting, the spacing is 1KHz.
5 R.C.	0.03 ~ 10.00 A	0.1	It sets DUT ripple current. By using numerical keys for setting, the spacing is 0.01A.
6 TIME	1min. ~ 10000hrs	1	It sets the time of timer. By using numerical keys for setting.

Note

1. When the tester tests multiple DUTs, distribution voltages of each components under test may be have little differences by the parameter of that component.

6.2.3 Measurement Data

Item	Range	Description
1	Vpeak	0.00V ~ 500.0V
2	Irms	0.000A ~ 10.00A
3	BIAS	0.00V ~ 500.0V
4	Vrms	0.00V ~ 15.00V
5	TIMER	1min. ~ 10000hrs

Note When the tester tests multiple DUTs (ex. 20PCS in series), voltage or current displayed value on single component under test is average data as the parameter of that component may be have little differences.

6.3 Test Function Execution

6.3.1 Notices for Operation

Please confirm the following items before pressing **START** to process test.

- (1) The specification of capacitor under test should be the same.
- (2) When testing electrolytic capacitor, its polarity connection should be correct.
- (3) To ensure if self-detection of the system has error as power on.
- (4) The test fixture of actual using should be the same as FIX. field on the menu. The maximum 20 capacitors can be tested at the same time and the minimum 2 capacitors, DUT should be even numbers.
- (5) When using series fixture, if the quantity of test capacitor is less than 20, the socket of unconnected DUT should be short-circuited by SHORT chip.
- (6) To ensure if all setting parameters are over the defined specification of instrument and DUT fixture. Please refer *section 5.4*.
- (7) Please confirm DUT's maximum withstand voltage and current specification for avoiding DUT damaged.

6.3.2 Output Procedure Setting

After pressing **START**, the instrument auto output explanation for procedure.

Charge process:

- (1) Setting DC BIAS voltage. The system will output DC voltage by 50% of W.V. setting value firstly.
- (2) Setting ripple current. The system is in accordance with R.C. and FREQ setting value of test parameters to output ripple current for measured Irms identical with R.C. setting value.
- (3) The current output of the system up to 100% setting value, BIAS output is 1/5 voltage of residual Vpeak value.
- (4) Confirm R.C. current output value repeatedly then BIAS output is 2/5 of residual Vpeak value.

- (5) Confirm R.C. current output value repeatedly then BIAS output is 3/5 of residual Vpeak value.
- (6) Confirm R.C. current output value repeatedly then BIAS output is 4/5 of residual Vpeak value.
- (7) Confirm R.C. current output value repeatedly, BIAS output is up to 100% of Vpeak setting value for the output completion.
- (8) Test time start to count.

Charge process illustration:

If parameter setting W.V = 50.00V R.C = 1A.

Charge steps are given as below:

Step	Character in Message Display Area	DC BIAS Setting	Irms. (R.C)	Vrms (=Vp/√2)	Vpeak
1	TESTING → SET W.V * 50%!!	25V			25V
2	TESTING → SET R.C.!!		1.00A	3.536V (=5Vp)	30V
3	TESTING → SET DC BIAS!!	(50-30)x1/5=4V 30+4= 34V	1.00A	3.536V	34V
4	TESTING → SET R.C.!!		1.00A	3.536V	34V
5	TESTING → SET DC BIAS!!	(50-30)x2/5=8V 30+8= 38V	1.00A	3.536V	38V
6	TESTING → SET R.C.!!		1.00A	3.536V	38V
7	TESTING → SET DC BIAS!!	(50-30)x3/5=12V 20+12= 42V	1.00A	3.536V	42V
8	TESTING → SET R.C.!!		1.00A	3.536V	42V
9	TESTING → SET DC BIAS!!	(50-30)x4/5=16V 30+16= 46V	1.00A	3.536V	46V
10	TESTING → SET R.C.!!		1.00A	3.536V	46V
11	TESTING → SET DC BIAS!!	(50-30)x5/5=20V 30+20= 50V	1.00A	3.536V	50V

Such complicated charge test procedures are consideration of charge characteristic for capacitor. The characteristic variation of electrolytic capacitor may affect Vrms during DC Bias rising. It is needed to apply pressuring charge method by segment for getting accuracy output and it can't over W.V. voltage.



W.V. value is a ripple voltage peak value of DC Bias add R.C. for simulating working voltage and withstand ripple current specification of capacitor as applying on rectified filter.

$$W.V. = V_{dc} + V_p$$

$$= V_{dc} + (\sqrt{2}) V_{rms}$$

6.3.3 Notices in Testing

- (1) The operating personnel can press **STOP** to terminate the test during testing, other keys are disabled.
- (2) When ripple current output is stable, please don't move test cable arbitrarily for avoiding output current inaccuracy.
- (3) For prolonging the life of LCD lamp, the display contrast will be dimmed automatically for 5 minutes without any key being operated. Meanwhile, the operation personnel only need to press any key to recover contrast brightness. The display brightness after

dimming contrast is darker than ordinary, the operation personnel should avoid to misjudge it as does not boot then to restart the tester power.

- (4) If power failure occurred suddenly during testing, please toggle the tester power to OFF.
- (5) CONTINUE or RESET selection pages of TEST TIMER data as below figure shown.
This function is for executing test again after interrupting, if the original test timer needs to reset. The selection method is by using left and right keys on the panel to move the highlight to the selected field then press **ENTER** key to confirm. If users want to cancel START RUN function, move the highlight to **CANCEL** field and press **ENTER** key to cancel this test command.

Measure Display Page

MEAS DISPLAY			
DUT :	2	PCS	FIX. : SERIES
W.V. :	299.40	V	FREQ : 100.00 KHz
R.C. :	2.00	A	TIME : 10000 h 0 m
START RUN Test Timer Counter : CONTINUE RESET CANCEL			
BIAS :	299.40 V	Vrms :	0.00 V
TIMER:	8 h 6 m U		
12:34:56			

6.3.4 End or Interrupt Test

This section describes interrupted test conditions of the system generated, and the related steps as the test ended/interrupted.

6.3.4.1 Test Interruption Condition

- (1) The operation personnel press **STOP** key.
- (2) System open circuit: The current can't reach to setting value, for example DUT open circuit the display will show "D.U.T. OPEN CIRCUIT !" message to inform users. Over Temperature Protection (OTP): The temperature of dissipation heat chip inside system is over rated temperature in testing. For avoiding component inside the tester damaged, the system will interrupt test automatically and shows "Protection, Please Turn Off!" message. The system needs to be turned off then to restart for testing again.
- (3) Ripple current fail: The system compares the actual measurement ripple current value (Irms) with the setting value in testing. When the measurement ripple current is over the setting value $\pm 10\%$ or below 50% range. The system interrupts the test and shows "D.U.T. TESTING Irms FAIL!!" message. The test capacitors happen OPEN and SHORT conditions, it may be resulted from long time testing.
- (4) DC bias output fail: The system judges DC bias output fail conditions as the following.

- (a) Measurement voltage is higher than 5% of W.V. setting value: It shows "D.U.T. TESTING BIAS OVER W.V.!!" message.
- (b) Measurement voltage is lower than 50% of BIAS setting value: It shows "D.U.T. TESTING BIAS FAIL!" message.
- (5) System program auto detect DUT fail: When users operating series fixture, DUT short fail is occurred. For example a capacitor damaged and short-circuited, the system will show "D.U.T. Fail !!" to warn users or auto end test (CONFIG setting) for avoiding fail test process continuously.

When the above items (2) ~ (5) are happened, the system interrupt test automatically and buzzer (buzzer is ON) will alarm. At this time, the operation personnel can press **STOP** key to stop buzzer alarm.



Users press **START** again to continue or re-test after troubleshooting. Only "Protection! Please Turn Off!" message appeared, the system need to be turn off. After troubleshooting, restart the power then the test will be normally.

6.3.4.2 Step Description of End or Interruption

Whatever the system end test as time's up or interrupt test as error happened. The system is executed by the following steps.

- (1) Disconnect ripple current output.
- (2) Disconnect DC bias output, waiting two-end voltages of capacitor under test to decrease to below 10%.
- (3) Test timer stop counting.
- (4) The system will pause Vpeak, Irms and BIAS measurements.

7. Message Description

This chapter consists of system self-test, edit and test related descriptions.

7.1 Self-test Message

The 11810 power switch is activated, the system will be auto tested.

Message	Description
SRAM DATA CHECK	Check if parameter data inside SRAM is in setting range.
EEPROM CHECK	Check if EEPROM function is normal.
REAL TIME CLOCK CHECK	Check if time count IC is normal.
CALIBRATION DATA CHECK	Check if calibration data are existed.

7.2 Edit Message

When users set test parameter under MEAS DISPLAY page, displayed messages for parameter range error are as below table.

Message	Description
Range Error:0.03-10.00	Input value over the range can be set.
Data Error:2-20	Input data error. TEST D.U.T setting can't input odd number, the quantity of capacitor under test should be set as even number.

7.3 Test Message

Press **START** under MEAS DISPLAY page, start to output displayed message description. According to output procedure, it divides into setting time and testing time.

7.3.1 Message During Setting Time

Message	Description
Irms EDIT DATA OVER 10.0A!	When the fixture is parallel mode, the output ripple current is over 10.0A high limit. Output ripple current = R.C. setting value* (DUT quantity/2). Please reset test parameters.
W.V EDIT DATA OVER 500.0V	When the fixture is series mode, the output DC bias is over system 500.0V high limit. Output DC bias = BIAS setting value* (DUT quantity/2). Please reset test parameters.
TESTING→SET DC BIAS!	After the output ripple setting is completed, the system enters the output DC bias mode.

BIAS V OUTPUT ERROR!	The system DC bias can't normal output, it maybe the inner circuit loose or bad contact. Please contact with the personnel for maintenance.
TESTING→SET R.C.!	The operation personnel press START key, the system confirm test parameter and self-test result are normal. Enter the output ripple mode.
Protection, Please Turn Off!	When the system entering over temperature protection, it means dissipation heat chip of amplifier temperature is over high. Please confirm dissipation heat fan is normal functioning. After troubleshooting, restart the tester for normal functioning.
D.U.T. OPEN CIRCUIT!	Ripple current can't normal output, maybe output current circuit is OPEN. Please confirm DUT or link cable is connected well.
REMOTE SENSE OPEN CIRCUIT!	The system sets VAC output, it will auto stop output as current measured but voltage unmeasured. Please confirm V-Sense link cable between the system and fixture is connected well.
VAC PROG. CIRCUIT OPEN!	The system sets VAC output, it will auto stop output as voltage/current unmeasured. It maybe the inner circuit loose or bad contact. Please contact with the personnel for maintenance.
Current driving fail!!	The setting value can't be stable as outputting ripple current, the system auto stop output after a period of time. Please check if DUT test condition is over specification.
OUTPUT V _p OVER W.V. VALUE!	When users adjust the output ripple current, V _{peak} voltage of two terminals of capacitor under test is over W.V. setting value of capacitor under test. Please confirm if W.V. or R.C. setting value is correct.

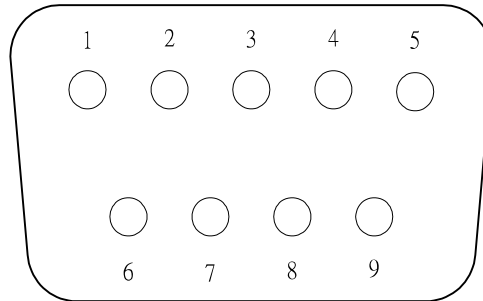
7.3.2 Testing Time Interrupted or Failed Message

Message	Description
STOP TESTING!	The operation personnel press STOP key to interrupt test or error occurred during test procedure.
D.U.T. TESTING BIAS FAIL!!	The system detected BIAS voltage error during testing, it will auto interrupt the test. It maybe capacitor under test generated impedance variation, please check DUT.
D.U.T. TESTING BIAS OVER W.V.!	The system detected output DC bias in testing is over 105% of W.V. setting value or below 50%.
D.U.T. TESTING I _{rms} FAIL!	The system detected output ripple current interrupted or over high in testing. The system will interrupt the test automatically. It maybe capacitor under test already open-circuited or short-circuited.
OUTPUT V _p OVER W.V. VALUE!	V _{peak} voltage at two ends of capacitor under test is already over setting value of W.V. capacitor under test. The system sound a warning, press STOP can stop the buzzer then press the key again to stop output. Please confirm if setting value of W.V. or R.C. is correct.

POWER LIMIT !!	Vrms is already over 15V current but can't maintain R.C. setting value. The system sound a warning, press STOP can stop the buzzer then press the key again to stop output. Please check test condition.
D.U.T. FAIL!	Fixture DUT in series is short-circuited, please check if DUT is abnormal.
Over Current Protection!	The system output terminal may be short-circuited which causes transient current over high and enter over current protection. Please confirm the link cable of output terminal and fixtures are with short circuit condition.
Protection! Please Turn Off!	When the system entering over temperature protection, it means dissipation heat chip of amplifier temperature is over high. Please confirm dissipation heat fan is normal functioning. After troubleshooting, restart the tester for normal functioning.

8. Communication Protocol

8.1 RS-485 Pin Signal



RS485 Terminal Zoom Figure

PIN1=>B (-) of 9PIN-D-SUB

PIN2=>A (+) of 9PIN-D-SUB

PIN5=>GND of 9PIN-D-SUB

11810 RS-485 using half-duplex mode.

8.2 Interface Description

Data Frame: When Controller gives Query Command, Module responds command format to Controller request.

Header	DA	SA	Length	Data Field	Check Sum
1byte	1 byte	1 byte	1 byte	n byte	1 byte

Header: 0xAB

DA: Destination Address, (0x00~0x7f)

SA: Source Address(0x0~0x7f)

Length: The data length of the data field

Checksum: 2's Complement(DA+SA+Length+Data)

Data Field:

CmdType	CmdData
1 byte	see following table

CmdType: Code, description as below

Query CmdType: description as below

8.3 Control Command Set

Command	Code	CmdData Description
*IDN?	0x10	Code : 0x10 CmdData : none Query Command: 0x90 Return the ID string: Company Name,Model,SerialNo,Version,ReservedCode Company Name:Chroma Model:11810 SeialeNo:AAO118100001~AAO118109999 Version:X,XX ReservedCode:0 return CmdData: 0x90 + Return the ID string
Download	0x05	The system enters auto download mode when it received this command. Code : 0x05 CmdData: (2 byte) 1st byte: Model, 0x0A - 11810 2nd byte: secondary command Bit 0 ~ 3: 0 – Master, 1 – Slave1, 2 – Slave2, ..., 15 – Slave15 1~15, reserved Bit 4 ~ 6: 0 – DL, 1 – DLW, reserved 2 – DLB, download BOOT program 3 – DLP, ... download MAIN program 7 – END, end of program downloading, the system will restart when end of MAIN program downloading. the system don't restart when end of BOOT program downloading. Bit 7: 0 – echo off, 1 – echo on Echo: "OK\n" "E1\n" – Command error "E2\n" – Erased error "E3\n" – Programmed error "E4\n" – Record format error
Remote on/off	0x11	This command sets the 11810 to enter/exit remote operation mode Code : 0x11 CmdData : on/off, 1 byte, 0 – OFF, 1 – ON Query Command: 0x91 return CmdData: on/off, 1 byte, 0 – OFF, 1 – ON
Reply Message	0x7F	When the system at echo status must call this command. Every setting and query command complete must following respond message, but query command no error occur don't replay 0x00 message. Code : 0x7F Return CmdData: 0x00 – OK, no error 0x01 – Command Error (include CheckSum error, CmdType error) 0x02 – Data Error 0x03 –Command Invalid (The current status can't execute this command, for example: the command of setting parameter can't be executed under test screen.)
Test Status?	0x12	PC queries 11810 test status now. Code : 0x12 CmdData: none Query Command: 0x92 return CmdData (1 byte):

Command	Code	CmdData Description
		0 – Standby, 1 – Test End, 2 – Stop, 3 – Testing
Timer Counter Mode	0x13	This command sets the Timer counting mode of 11810 Code : 0x13 CmdData: (1 byte) 0 – up, 1 – down Query Command: 0x93 return CmdData (1 byte): 0 – up, 1 – down
Buzzer on/off	0x14	This command sets the state of Buzzer Code : 0x14 CmdData: (1 yte) 0 – OFF, 1 – ON Query Command: 0x94 return CmdData (1 byte): 0 – OFF, 1 – ON
Set WV	0x15	This command sets the output working voltage for testing (unit: V) Code : 0x15 CmdData: (4 byte Float) Default value : 6.3V Range Min value : 0.5V, Max value : 500V Query Command: 0x95 return CmdData (4 byte): WV Value (4 byte Float, LSB first)
Set Frequency	0x16	This command sets the Frequency of output ripple (unit: kHz) Code : 0x16 CmdData: (4 byte Float) Default value : 100kHz Range Min value : 20kHz, Max value : 1000kHz Query Command: 0x96 return CmdData (4 byte): Frequency Value (4 byte Float, LSB first)
Set R.C.	0x17	This command sets The Ripple Current (unit: A) Code : 0x17 CmdData: (4 byte Float) Default value : 1.00 A Range Min value : 0.03 A, Max value : 10 A Query Command: 0x97 return CmdData (4 byte): R.C.Value (4 byte Float, LSB first)
Set Time	0x18	This command sets the test time (unit: minute) Code : CmdData: (4 byte long) Default value : 60 minute Min value : 1 minute, Max value : 600000 minute Query Command: 0x98 return CmdData (4 byte): Time Value (4 byte long, LSB first)
Set DUT	0x19	This command sets the number of DUT which is under test(unit: pcs) Code : 0x19 CmdData: (1 byte unsigned char) Default value :2 pcs Min value : 2 pcs, Max value : 20 pcs Query Command: 0x99 return CmdData (1 byte): Time Value (1 byte unsigned)
Set Fixture	0x1A	This command selects the fixture mode for testing Code : 0x1A CmdData: (1 byte)

Command	Code	CmdData Description
		0 –PARALLEL, 1 – SERIES, 2 – SERIES LOW V Query Command: 0x9A return CmdData (1 byte): 0 –PARALLEL, 1 – SERIES, 2 – SERIES LOW V
Test Parameter	0x1B	Download test parameter from PC to 11810 or query 11810 test parameter. Code : 0x1B, CmdData : (18 byte) 1~4byte :W.V. (Float) 5~8byte :Frequency(Float) 9~12byte :R.C.(Float) 13~16byte :Time (long) 17 byte : DUT (unsigned char) 18 byte: Fixture(unsigned char) 0 –PARALLEL, 1 – SERIES, 2 – SERIES LOW V Query Command: 0x9B return CmdData(18 byte): 1~4byte :W.V. (Float) 5~8byte :Frequency(Float) 9~12byte :R.C.(Float) 13~16byte :Time (long) 17 byte : DUT (unsigned char) 18 byte: Fixture(0 –PARALLEL, 1 – SERIES, 2 – SERIES LOW V)
Meas Vpeak?	0x1C	This command queries the measurement value of Vpeak Code : 0x1C CmdData : none Query Command: 0x9C return CmdData (4 byte): Vpeak Value (4 byte Float, LSB first)
Meas Irms?	0x1D	This command queries the measurement value of Irms Code : 0x1D CmdData : none Query Command: 0x9D return CmdData (4 byte): Irms Value (4 byte Float, LSB first)
Meas Bias?	0x1E	This command queries the measurement value of BIAS Code : 0x1E CmdData : none Query Command: 0x9E return CmdData (4 byte): BIAS Value (4 byte Float, LSB first)
Meas Vrms?	0x1F	This command queries the measurement value of Vrms Code : 0x1F CmdData : none Query Command: 0x9F return CmdData (4 byte): Vrms Value (4 byte Float, LSB first)
Testing Timer?	0x20	This command queries the testing Timer Value Code : 0x20 CmdData : none Query Command: 0xA0 return CmdData (4 byte): Timer Value (4 byte long, LSB first)
Error Code?	0x21	This command queries error code Code : 0x21 CmdData : none Query Command: 0xA1

Command	Code	CmdData Description
		return CmdData (2 byte): Error Code (2 byte unsigned, LSB first) 0x0000 : Normal 0x0201 : Current driving fail 0x0202 : OUTPUT Vp OVER W.V. VALUE! 0x0203 : POWER LIMIT! 0x2001 : Over Current Protection! 0x2002 : Protection, Please Turn Off! 0x2006 : REMOTE SENSE OPEN CIRCUIT! 0x2008 : D.U.T. OPEN CIRCUIT! 0x2009 : VAC PROG. CIRCUIT OPEN! 0x200B : BIAS V OUTPUT ERROR! 0x3000 : D.U.T. TESING Irms FAIL! 0x3001 : D.U.T. TESTING BIAS OVER W.V.!! 0x3002 : D.U.T. TESTING BIAS FAIL! 0x3003 : D.U.T. FAIL!
UUT MEAS?	0x22	PC queries measurement data. Code : 0x22 CmdData : none Query Command: 0xA2 return CmdData (23 byte): 1~4byte :Vpeak (Float) 5~8byte :Irms (Float) 9~12byte :BIAS (Float) 13~16byte :Vrms (Float) 17~20byte :Timer (long) 21~22byte :Error Code (unsigned integer) 23byte: Test Status(unsigned char)

9. Maintenance

9.1 General

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

9.2 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.

9.3 Instrument Return

Before returning an instrument to Chroma for service please call our Service Department at 886-3-3279688 for return material authorization. It will be necessary to include a purchase order number to ensure expedient processing, although units found to be in warranty will be repaired at no-charge. For any questions on repair costs or shipment instructions please contact our service department at the above number. To safeguard an instrument during storage and shipping please use packaging that is adequate to protect it from damage, i.e., equivalent to the original packaging and mark the box "Delicate Electronic Instrument". Return material should be sent freight prepaid, to:

Chroma ATE Inc.
66 Huaya 1st Road, Guishan, Taoyuan 33383, Taiwan
Attention: Service Department

Note This machine is overweight, please use handcart to avoid injuring.

Appendix A Description for Using Example

Description for operating example: Put 10PCS SMD capacitors into oven for processing durability test.

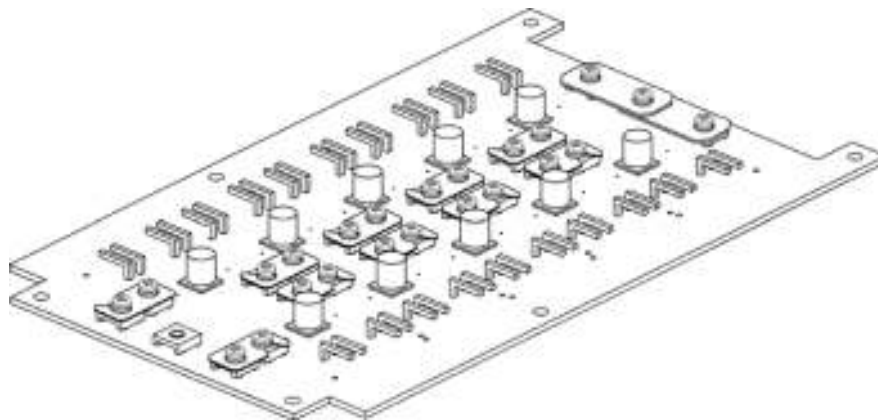
Capacitor spec: Type X5R, package 0402, capacitance 1uF

Test condition: Withstand 6.3V, ripple current 1.17A

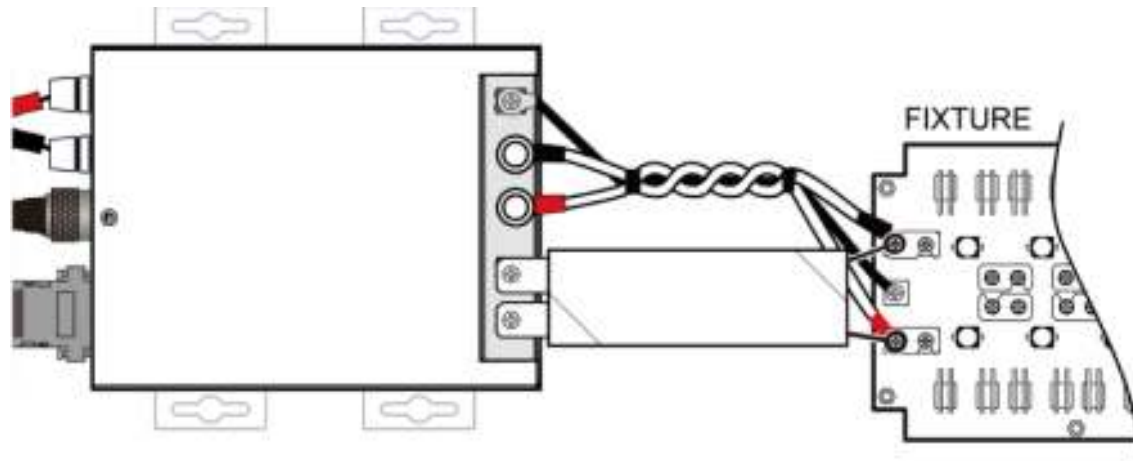
Burn-in duration: 1000 hrs

Operating Procedure:

- (1) Please refer introduction in chapter 4 and assemblable description in chapter 5 for completing 11810 installation. Moreover, warm-up above 15 minutes.
- (2) According to DUT to select appropriate fixture, SMD capacitor of 0402 package is suitable for using A118029. Solder DUT on A118029 fixture refer 5.4.3, for installing A118029 refer wiring method in 5.3.

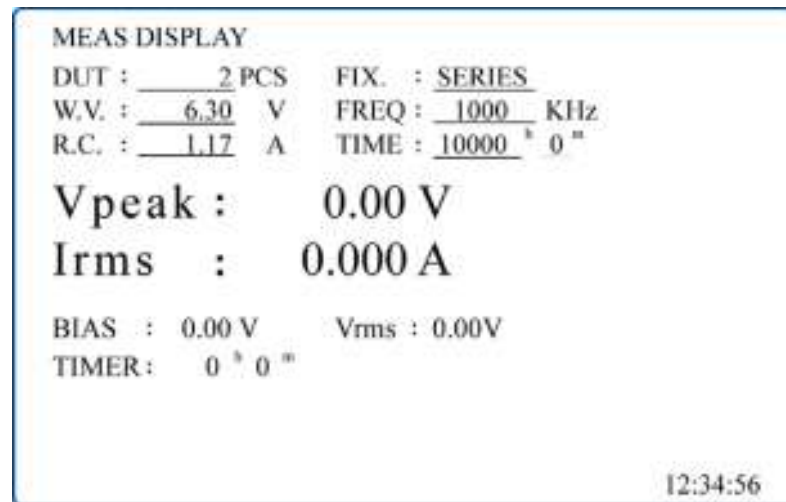


Assemble 10PCS DUTs on A118029



Connection Illustration of External Box and Fixture A118029

- (3) Press **MEAS DISPLAY** after powering on, set parameter by direction and numeric keys as below figure shown.



Setting parameter page

- (4) Press **Start** to start test until setting duration 10000 hours ended.
- (5) The DUT ended the test which can measure parameter feature variation via LCR meter. Don't need to desolder DUT by using short copper plate open circuit and test pin on A118029, users can test DUT's variation easily.



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