Chroma

PD Calibrator
A195001
User's Manual

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PD Calibrator
A195001
User’s Manual

Version 1.0
December 2020

Legal Notices

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

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CHROMA ATE INC.
88 Wenmao Rd., Guishan Dist., Taoyuan City 333001, Taiwan

Warranty

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

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

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

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

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Material Contents Declaration

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


: See **<Table 1>**.


: See **<Table 2>**.

<Table 1>

Part Name	Hazardous Substances					
	Lead	Mercury	Cadmium	Hexavalent Chromium	Polybrominated Biphenyls/ Polybromodiphenyl Ethers	Selected Phthalates Group
	Pb	Hg	Cd	Cr^{6+}	PBB/PBDE	DEHP/BBP/DBP/DIBP
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, EU Directive 2011/65/EU, and 2015/863/EU.

“×” indicates that the level of the specified chemical substance exceeds the threshold level specified in the standards of SJ/T-11363-2006, EU Directive 2011/65/EU, and 2015/863/EU.

Remarks:
1. The CE marking on product is a declaration of product compliance with EU Directive 2011/65/EU and 2015/863/EU.
2. This product is complied with EU REACH regulation and no SVHC in use.

Disposal

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

<Table 2>

Part Name	Hazardous Substances					
	Lead	Mercury	Cadmium	Hexavalent Chromium	Polybrominated Biphenyls/ Polybromodiphenyl Ethers	Selected Phthalates Group
	Pb	Hg	Cd	Cr^{6+}	PBB/PBDE	DEHP/BBP/DBP/DIBP
PCBA	×	O	O	O	O	O
CHASSIS	×	O	O	O	O	O
ACCESSORY	×	O	O	O	O	O
PACKAGE	O	O	O	O	O	O

"O" indicates that the level of the specified chemical substance is less than the threshold level specified in the standards of SJ/T-11363-2006, EU Directive 2011/65/EU, and 2015/863/EU.

"×" indicates that the level of the specified chemical substance exceeds the threshold level specified in the standards of SJ/T-11363-2006, EU Directive 2011/65/EU, and 2015/863/EU.

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.
3. This product is complied with EU REACH regulation and no SVHC in use.

Disposal

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

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CE

Declaration of Conformity

For the following equipment :

PD Calibrator

(Product Name/ Trade Name)

A195001

(Model Designation)

CHROMA ATE INC.

(Manufacturer Name)

88 Wenmao Rd., Guishan Dist., Taoyuan City 333001, Taiwan

(Manufacturer Address)

Is herewith confirmed to comply with the requirements set out in the Council Directive on the Approximation of the Laws of the Member States relating to Electromagnetic Compatibility (2014/30/EU) and Low Voltage Directive (2014/35/EU). For the evaluation regarding the Directives, the following standards were applied :

EN 61326-1:2013

EN 55011:2016/A1:2017 Group 1 Class B
EN 61326-1:2013 Class B, EN 61326-2-1:2013, EN 61326-2-2:2013,
EN 61000-4-2:2009, EN 61000-4-3:2006/A2:2010, IEC 61000-4-8:2010

EN 61010-1:2010/A1:2019

The equipment describe above is in conformity with Directive 2011/65/EU and 2015/863/EU of the European Parliament and of the Council on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

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

CHROMA ATE INC.

(Company Name)

88 Wenmao Rd., Guishan Dist., Taoyuan City 333001, Taiwan

(Company Address)

Person responsible for this declaration:

Mr. Vincent Wu

(Name, Surname)

T&M BU Vice President

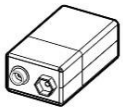
(Position/Title)

Taiwan	**2020.12.30**	Vincent Wu
(Place)	(Date)	(Legal Signature)

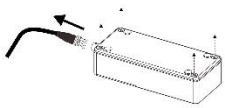
Safety Summary

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

DO NOT OPERATE IN AN EXPLOSIVE ATMOSPHERE
Do not operate the device in the presence of flammable gases or fumes.



BEFORE INSTALLING THE BATTERY
Check whether the battery voltage meets the rated voltage input range of the device.



BE SURE TO POWER OFF THE DEVICE AND REMOVE THE TEST CABLE BEFORE OPENING THE CASE

DO NOT REMOVE THE DEVICE CIRCUIT PARTITION
The operator is prohibited to remove the device circuit partition. Only qualified maintenance personnel can replace the parts and perform internal adjustments.

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

Revision History

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

Date	Version	Revised Sections
Dec. 2020	1.0	Complete this manual.

Table of Contents

1. Overview

1.1 Introduction

The A195001 PD Calibrator is designed with reference to the IEC60270-1 calibration standards, which can be used in daily check to verify the measurement errors or calibrate the PD tester.

1.2 Specifications

Item	Specification	
Charge Range	100pC	1.0, 2.0, 5.0, 10.0, 20.0, 50.0, 100.0 pC
		Injection Capacitance: 1pF, typical
	2000pC	20, 50, 100, 200, 500, 1000, 2000 pC
		Injection Capacitance: 20pF, typical
	Polarity	Positive, Negative
Accuracy	± (3% of setting + 0.5pC)	
Rise Time	< 50ns	
Pulse Repetition	100Hz	
Power Supply	9V battery	
Current Consumption	50mA max.	
Dimension	65(W) x 150(H) x 36.5(D) mm	
Net Weight	Approx. 500g	
Operable Range	− Temperature and Humidity Range: 0°C to 45°C, 15% to 95% and no condensation. − Pollution degree rating: Pollution Degree 2. Rated for indoor, dry location use only. − Working altitude: Up to 2000 meters.	
Storage Range	-10 to 50°C , ≤ 95% RH	

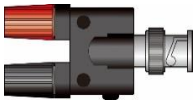
1.3 Standard Equipment and Accessory

Standard Equipment

PD Calibrator

User's Manual CD

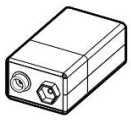
Standard Accessory (Cable)



BNC to Double Binding Post
1 pc.

Banana Plug to Alligator Clip Test Lead - Red
1 pc.

Banana Plug to Alligator Clip Test Lead - Black
1 pc.



9V 6LF22 Alkaline Battery
1 pc.

Note ⋮ When additional accessory is required, please specify the item name.

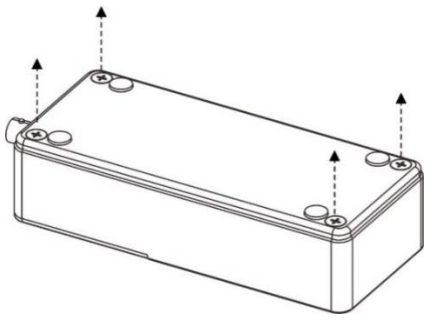
1.4 Inspection

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

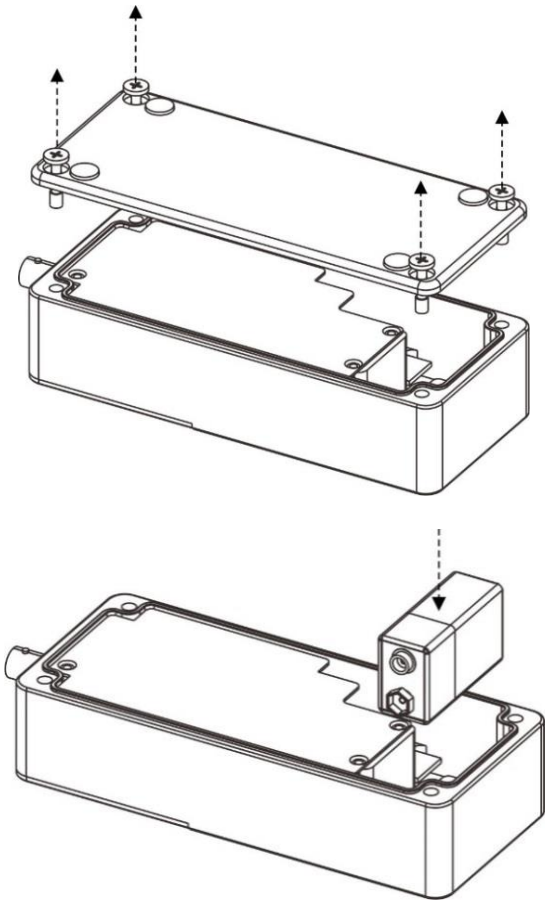
1.5 Installing and Replacing the Battery

Before opening the case for installing or replacing the 9V battery, be sure to power off the calibrator and remove the test cable first.

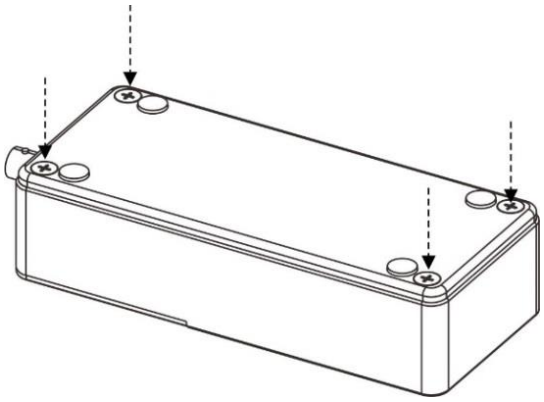
(1) Turn the A195001 calibrator to the back and remove the screws at the four corners and then take off the rear cover.



(2) When the back cover is removed, you can see the battery compartment and the battery connector. Please connect the 9V or replace it.

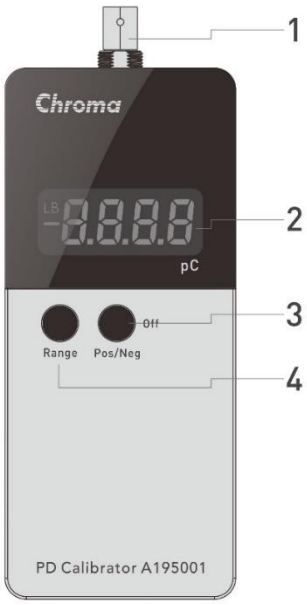


(3) Close the rear cover and secure the screws and then the battery installation is completed.



2. Operation

2.1 Panel Function



(1) Output terminal: Generates coulomb value based on the set value.
(2) Display area: Displays the current setting and output status
(3) Pos/Neg switch/power off button: Switches the PD output polarity or power off the calibrator.
(4) Range switch/power on button: Switches the PD range or power on the calibrator.

2.2 Operation and Display Description

(1) Range switch/power on button

- Power on: In power off state, long press Range button for 3 seconds and the screen will display the value that is in output state.

- Switch range: In power on state, long press Range button for 3 seconds to select 100pC or 2000pC output range.

► 100pC range (with decimal point):

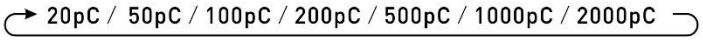
► 2000pC range (no decimal point):

- Switch to output Coulomb value: In power on state, press Range button to select outputting pC value.

► 100pC range:

1.0pC / 2.0pC / 5.0pC / 10.0pC / 20.0pC / 50.0pC / 100.0pC

► 2000pC range:



(2) Pos/Neg switch/power off button

- Switch output polarity: In power on state, press Pos/Neg (OFF) button to select the output polarity.

► ”+” shows when output polarity is positive 

► ”-” shows when output polarity is negative 

- Power off: In power on state, press and hold Pos/Neg (OFF) button 3 seconds, the screen will turn off without displaying any value. The calibrator is turned off.

(3) Low battery warning

- When the battery voltage is lower than 7.1V, the screen will display LOBAT.

- When the battery voltage is lower than 6.6V, the screen continuing shows LOBAT and automatically powers off. Please replace the battery immediately.

(4) Auto power off

If there is no operation over 15 minutes, the calibrator will automatically power off. If you need to use it again, press Range button to turn it on.

3. Calibrating Measurement System

3.1 Introduction and Precautions

The objective of calibration is to verify that the measurement system can correctly measure the size of specified PD. The calibration of the measurement system must be performed in a complete test circuit. A current pulse with a known charge q0 is inrushed into the terminal connected to the DUT to confirm the apparent charge and the measurement signal proportional relationship (Scale factor k). The pulse size should be close to the expected PD measurement value (50% to 200% of the specified PD magnitude, IEC 60270) to ensure that the specified PD size for measurement has good accuracy.

When performing calibration, be sure to read and follow the instructions below:

(1) Before connecting the calibrator, make sure that there is no high voltage output at the test terminal.
(2) When the calibration procedure is completed, the calibrator must be disconnected from the test terminal before starting the high-voltage output test.
(3) The calibrator pulse inrush should be as close as possible to the position where PD is expected to occur.
(4) Background noise (refer to IEC 60270).

Measurements are easily affected by interference. Random interference signals may superimpose on the PD pulse making it larger than the PD pulse generated by the calibrator and cause unstable or erroneous measurement results. If there is no special requirement, the general background noise should be less than 50% of the acceptable PD size. To avoid misleading calibration, please ensure the following:

- Minimize the background interference
- The calibration pulse is by far larger than the background interference.
- The background interference is known and under consideration.

There are also several ways to reduce the interference.

- The interference can be reduced by properly grounding all conductive structures and the power of the test and measurement circuit can be filtered as well. Testing in a shielded space can also reduce the interference, and grounding the shielded case can block the external interference too.
- Interferences in the environment are random. If partial discharges usually occur repeatedly almost at the same phase in each applied voltage cycle, the signal can be averaged to reduce the random interferences.

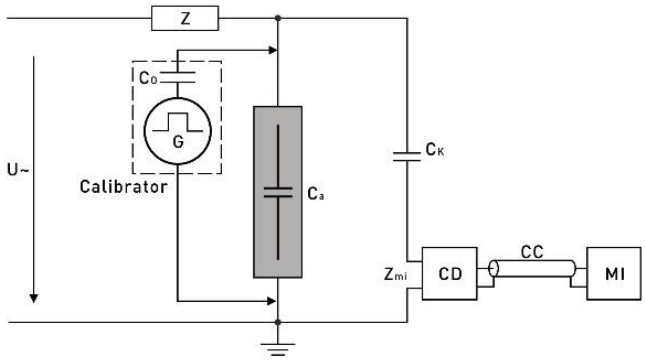
3.2 Standard Test Circuit for PD Measurement

Since the equivalent capacitance Ca of the insulated DUT will affect the circuit characteristics, all new DUTs need to be calibrated, unless their series or models are the same. Calibration is not required if the percentage difference of equivalent capacitance average is less than ±10% (IEC 60270).

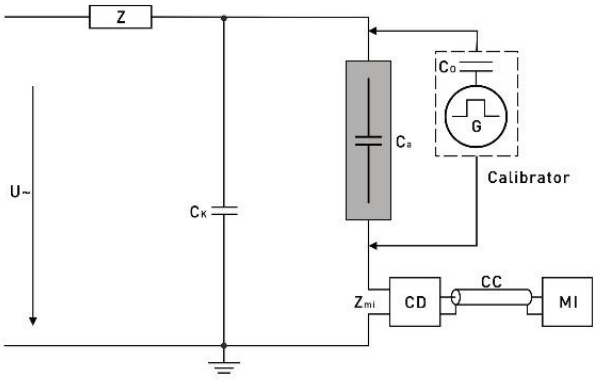
As to the equivalent capacitance Ca of DUT, the CO should be much smaller than Ca (CO <0.1 * Ca), otherwise the calibration factor must be considered. However, Ck >> Ca (Ck usually>1nF) in common situation, so CO and Ca will not affect the measurement result.

The connection method of basic partial discharge detection, measurement circuit and calibrator is shown in the figure below. The PD pulse current generated by the calibrator flows through the coupling device C_K and the measurement impedance Z_{mi} to form a detection loop. The measurement impedance connects the detection signal to the measurement instrument through the coupling device CD to perform the PD measurement.

- The coupling capacitor and the measuring impedance are connected in series and grounded; therefore, the DUT is directly connected between the high-voltage output and the ground terminal.

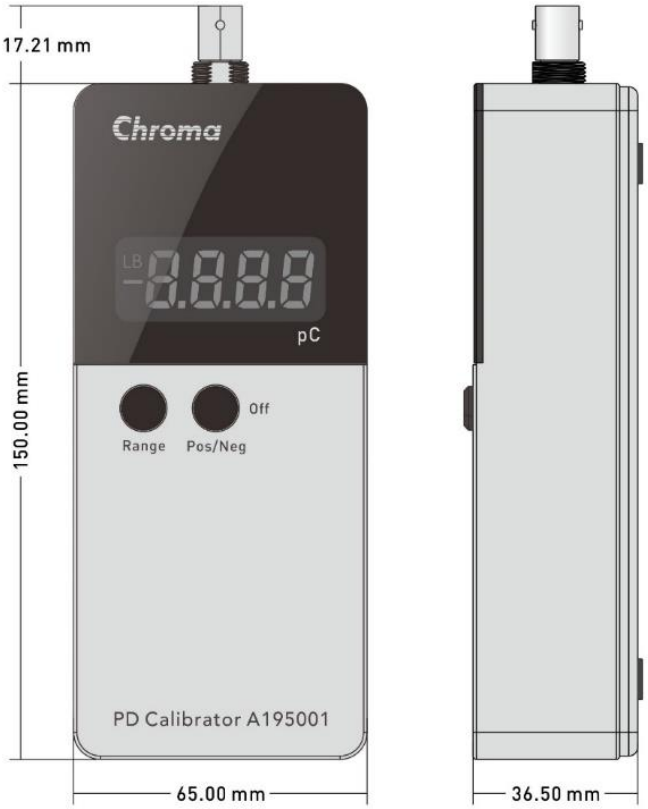


- The DUT is connected to the measured impedance in series and then grounded; therefore, good insulation is required between the DUT low-voltage end and the ground terminal.



Components:
U- high-voltage supply
Z filter
C_a test object
C_K coupling capacitor
CD coupling device
Z_{mi} input impedance of measuring system
CC connecting cable
MI measuring instrument

4. Dimensions



5. Calibration and Maintenance

5.1 Calibration

This calibrator has been calibrated according to the methods described in the Appendix A.3 of IEC 60270.

5.2 Precautions for Maintenance

This calibrator has no maintenance operation items for general users.

When abnormality occurs to this calibrator, please contact Chroma or its local distributor. Do not conduct maintenance at your own to avoid unnecessary hazard or causing more damage to the device.

5.3 Simple Troubleshooting

Except for replacing battery on the calibrator, there is no other failure that can be easily troubleshot by general users.

When abnormality occurs to this calibrator, please contact Chroma or its local distributor. Do not conduct maintenance at your own to avoid unnecessary hazard or causing more damage to the device.

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