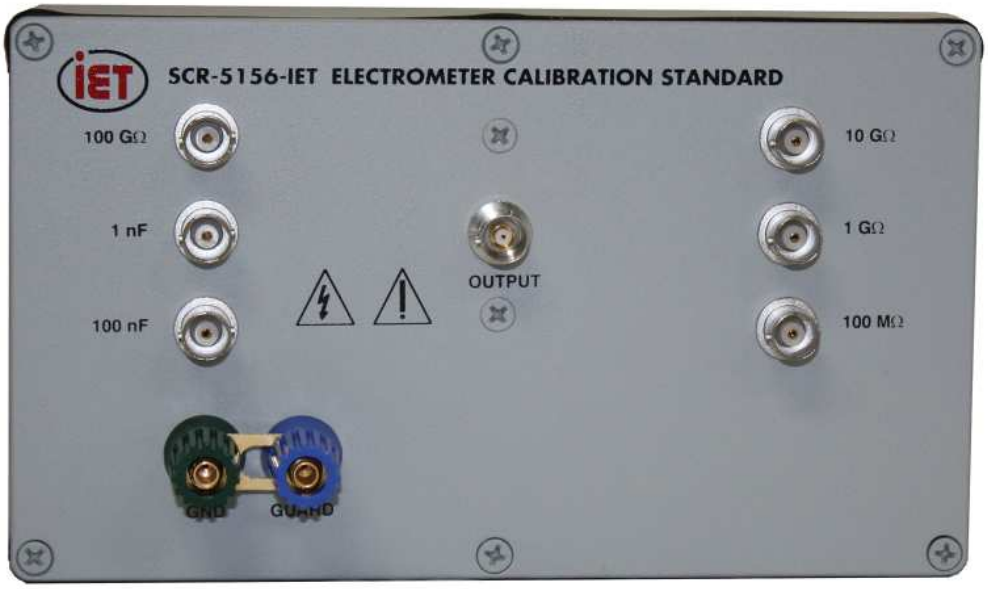
♦ PRECISION INSTRUMENTS FOR TEST AND MEASUREMENT ♦

SCR-5156-IET
Electrometer Calibration Standard

User and Service Manual



Visit www.ietlabs.com for manual revision updates

SCR-5156-IET im/March 2024

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Revision	Description
March 2024	**Changed stibility for capacitance from 300 ppm to 500 ppm**

WARRANTY

We warrant that this product is free from defects in material and workmanship and, when properly used, will perform in accordance with applicable IET specifications. If within one year after original shipment, it is found not to meet this standard, it will be repaired or, at the option of IET, replaced at no charge when returned to IET. Changes in this product not approved by IET or application of voltages or currents greater than those allowed by the specifications shall void this warranty. IET shall not be liable for any indirect, special, or consequential damages, even if notice has been given to the possibility of such damages.

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE.

Safety Symbols

General definitions of safety symbols used on the instrument or in manuals are listed below.

Caution symbol: the product is marked with this symbol when it is necessary for the user to refer to the instruction manual.

Hazardous voltage symbol: the product is marked with this symbol when high voltage maybe present on the product and an electrical shock hazard can exist.

Indicates the grounding protect terminal, which is used to prevent electric shock from the leakage on chassis. The ground terminal must connect to earth before using the product

Direct current.

Alternating current.

Frame or chassis terminal. A connection to the frame (chassis) of the equipment which normally includes all exposed metal structures.

On supply.

Off supply.

Hot surface. Avoid contact. Surfaces are hot and may cause personal injury if touched.

Disposal

Waste Electrical and Electronic Equipment (WEEE) Directive 2002/96/EC
This product complies with the WEEE Directive (2002/96/EC) marking requirements.
The affixed label indicates that you must not discard this electrical/ electronic product in domestic household waste.
Product Category: With reference to the equipment types in the WEEE directive Annex 1, this product is classified as a “Monitoring and Control instrumentation” product.

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.

Proposition 65 Warning for California Residents

WARNING: Cancer and Reproductive Harm - www.P65Warnings.ca.gov.

This product may contain chemicals known to the State of California to cause cancer, birth defects, or other reproductive harm

SAFETY PRECAUTIONS

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 with specific WARNINGS elsewhere in this manual may impair the protection provided by the equipment. Such noncompliance would also violate safety standards of design, manufacture, and intended use of the instrument.

IET Labs assumes no liability for the customer's failure to comply with these precautions.

The SCR-5156-IET complies with INSTALLATION CATEGORY I as well as POLLUTION DEGREE 2 in IEC61010-1.

If an instrument is marked CAT I (IEC Measurement Category I), or it is not marked with a measurement category, its measurement terminals must not be connected to line-voltage mains.

The SCR-5156-IET is an indoor use product.

 DANGEROUS PROCEDURE WARNINGS 

Comply with all WARNINGS - Procedures throughout in this manual and instructions on the instrument prevent you from potential hazard. These instructions contained in the warnings must be followed.

BEFORE APPLYING POWER
Verify that all safety precautions are taken. Make all connections to the instrument before applying power. Note the instrument's external markings described under "Safety Symbols".

- DO NOT Operate in an Explosive Atmosphere
- Do not operate the instrument in the presence of inflammable gasses or fumes
- Operation of any electrical instrument in such an environment clearly constitutes a safety hazard
- Use Caution around live circuits and whenever hazardous voltages > 45 V are present
- Operators must not remove instrument covers
- Component replacement and internal adjustments must be made by qualified maintenance personnel only
- DO NOT substitute parts or modify the instrument
- When working with high voltages; post warning signs, train personnel and keep unauthorized personnel away.

Do not apply any voltage or currents to the terminals of the instrument in excess of the maximum limits indicated in the specifications section of this manual.

To avoid the danger of introducing additional hazards, do not install substitute parts or perform unauthorized modifications to the instrument.

Return the instrument to an IET Labs for service and repair to ensure that safety features are maintained in operational condition.

Contents

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Chapter 1
INTRODUCTION

1.1 Introduction

The SCR-5156-IET Electometer Calibration Standard consists of a 6 resistances from 100 MΩ to 100 GΩ and 2 capacitance standards with capacitance values of 1 nF and 100 nF.

The standards are in series between the center contact of each bnc connector and the center contact of the triaxial connector.

The **OUTPUT** triaxial connector has the inner shield connected to the **GUARD** binding post and the outer shield is connected to the housing and the **GND** binding post.

A gold plated shorting link is also provided to connect **GUARD** to **GND**.

The SCR-5156-IET is designed for calibration of electrometers and other applications requiring resistance standards for current calibration and capacitance standards for charge calibration.

The SCR-5156-IET can be used in conjunction with a dc voltage source and electrometer.

A ground post is electrically connected to the chassis. The ground post is provided so the chassis can be connected to earth ground for safety.

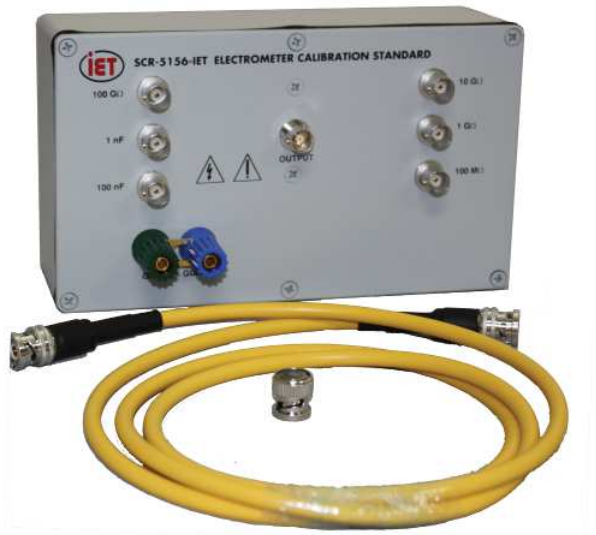

Figure 1-1: SCR-5156-IET

SCR-5156-IET shown in Figure 1-1 features:

- Individual bnc connectors for each standard
- Triaxial connector for the **OUTPUT**
- A **GUARD** terminal
- A **GROUND** terminal connected to case

Chapter 2
SPECIFICATIONS

For convenience to the user, the pertinent specifications are given in a typical **OPERATING GUIDE**, like the one shown in Figure 2-1, affixed to the case of the instrument.

2.1 Specifications

Nominal Value	Initial adjustment to nominal	Stability (ppm/yr)	Voltage coefficient (ppm/V)	Temperature coefficient (ppm/°C)	Resistor type
100 MΩ	1%	100	1	±35	Thick-film
1 GΩ		100	1	±35	
10 GΩ		500	2	±50	
100 GΩ		500	5	±50	
1 nF		500	5	±50	Polystyrene
100 nF		500	5	±50	MPP

Calibrated Values:

23°C; traceable to SI, with measurement uncertainties

Capacitance is calibrated at 1 kHz, 15 Vac

Maximum Input Voltage:

500 Vpk

Terminals:

6 bnc connectors for standard values
One triaxial output which is common to all 6 standards, One five-way binding post for guard with shorting link for connection to ground, and one ground post electrically connected to case

Environmental:

Operating 23°C ± 3°C
Humidity: 30 to 60 % RH non-condensing

Dimensions:

20 cm W x 11 cm H x 5.7 cm D (7.55” W x 4.38” H x 2.24” D)

Weight:

2.4 kg (3.5 lbs), nominal

SCR-5156-IET ELECTROMETER CALIBRATION STANDARD

CONSULT INSTRUCTION MANUAL FOR PROPER INSTRUMENT OPERATION

Nominal Value	Initial adjustment to nominal	Stability (ppm/yr)	Voltage coefficient (ppm/V)	Temperature coefficient (ppm/°C)	Resistor type
100 MΩ	1%	100	1	±35	Thick-film
1 GΩ		100	1	±35	
10 GΩ		500	2	±50	
100 GΩ		500	5	±50	
1 nF		500	5	±50	Polystyrene
100 nF		500	5	±50	MPP

Maximum Input Voltage:
500 Vpk
Terminals:
6 bnc connectors for standard values
One triaxial output which is common for all 6 standards

Observe all safety rules when working with high voltages or line voltages. Connect the (G) terminal to earth ground in order to maintain the case at a safe voltage. Whenever hazardous voltages (>45 V) are used, take all measures to avoid accidental contact with any live components: a) Use maximum insulation and minimize the use of bare conductors. b) Remove power when adjusting switches. c) Post warning signs and keep personnel safely away.

CE

SCR-5156-IET SN: E1-2409656

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SCR-5156-IET - November 09, 2020

Table 2-1 Typical Label for SCR-5156-IET

Chapter 3
OPERATION

3.1 Initial inspection and setup

This instrument was carefully inspected before shipment. It should be in proper electrical and mechanical order upon receipt.

An **OPERATION GUIDE** is attached to the case of the instrument to provide ready reference to specifications. See Figure 2-1.

Keep plastic caps on bnc and triaxial connectors when not in use.

The SCR-5156-IET includes:
Instruction Manual
Cable, 3 Lug Triaxial to 3 Lug Triaxial, 5'
Short, BNC
Accredited Calibration Certificate Traceable to SI

3.2 Connection

Connections should be made between the triaxial connector and each bnc connector as recommended for the electrometer being calibrated.

CAUTION

Do not touch triaxial or bnc connectors with bare hands to minimize leakage.

Clean connectors with denatured alcohol when necessary.

3.2.1 Electrical considerations

Use the SCR-5156-IET a the recommended temperature and environmental conditions as given in specifications section.

Use the recommended dc voltage calibrator that is stated in the electrometer instruction manual for current and charge calibration.

WARNING

Connect the CASE GND terminal to earth or other suitable ground in order to maintain the case at a safe voltage.

Whenever hazardous voltages (>45 v) are used, take all measures to avoid accidental contact with any live components.

Use maximum insulation and minimize the use of bare conductors.

Post warning signs and keep personnel safely away.

The green binding post labeled **GND** (Ground) is connected to the case and may be used accordingly for safety or a shield terminal.

As a good safety practice, the case should be grounded using the **GND** terminal when high voltages are applied. The maximum voltage between the Lo binding post and GND terminal should not exceed 1000 V peak.

Since high voltages may be present, it is important to observe all precautions and safety rules. Do not touch case of SCR-5156-IET while high voltage is present.

Keep maximum applied voltages within values indicated for each resistance and capacitance value. Maximum voltage is peak or dc.

3.3 Current calibration

Connect the SRC-5156-IET OUTPUT jack to the INPUT jack of the electrometer using the supplied triaxial cable or equivalent.

Connect the appropriate resistance standard bnc connector to the dc voltage source using a suitable bnc cable and adapter if necessary.

Be sure that the shorting link is connected between GUARD and GND terminals on the SCR-5156-IET.

Refer to the instructions for the electrometer and dc voltage calibrator being used for proper connections and voltages.

The generated current value may be calculated by

$$I = V/R$$

Where: I = generated current
V = dc calibrator voltage
R = calibrated value of the resistance std.

3.4 Charge calibration

Connect the SRC-5156-IET OUTPUT jack to the INPUT jack of the electrometer using the supplied triaxial cable or equivalent.

Warning To ensure proper grounding, connect the OUTPUT of the SRC-5156-IET to the electrometer INPUT before applying voltages to the standard.

Connect the appropriate capacitance standard bnc connector to the dc voltage source using a suitable bnc cable and adapter if necessary.

Be sure that the shorting link is connected between GUARD and GND terminals on the SCR-5156-IET.

Refer to the instructions for the electrometer and dc voltage calibrator being used for proper connections and voltages.

The generated charge value may be calculated by

$$Q=CV$$

Where: Q = generated charge
V = dc calibrator voltage
C = calibrated value of the capacitance std.

3.5 Guarded operation

Guarded connections are recommended for resistance above 1 GΩ and when using the SCR-5156-IET as a resistance standard to test instruments with an internal voltage source such as the Keithley 6517.

1.) Connect the triaxial OUTPUT of the SCR-5156-IET to the INPUT of the Keithley 6517 or equivalent with the supplied triaxial to triaxial cable or equivalent.

2.) Remove the shorting link between GND and GUARD on the SCR-5156-IET

3.) Connect the SCR-5156-300 BNC Shorting Plug to the desired resistance standard BNC connector.

4.) If the triaxial connection to the instrument does not include guard then connect guard to the blue GUARD terminal on the SCR-5156-IET.

 **WARNING** 

Do not touch chassis of the SCR-5156-IET as hazardous voltage maybe present.

3.6 Environmental conditions

3.6.1 Operating temperature and humidity

For optimal accuracy, use in an environment of 23°C ±3°C and relative humidity between 30 % and 60 %.

3.6.2 Storage conditions

The SCR-5156-IET should be maintained within the storage temperature range of 0°C to 40°C to maintain its accuracy within the specified limits. Keep humidity below 60 % RH when possible.

Chapter 4
MAINTENANCE

4.1 Preventive Maintenance

Keep the unit free from dust and contaminates to minimize leakage current and maintain dielectric strength.

Always keep the plastic covers on the bnc and triaxial connectors when not in use.

CAUTION

Do not touch bnc or trialxial connectors with bare hands to minimize leakage.

4.1.1 Cleaning

When necessary, the front panel should be cleaned to eliminate any leakage paths around the binding posts. To clean the front panel, wipe the front panel clean using alcohol and a lint-free cloth.

Cleaning of the triaxial and bnc connectors can be done by applying alcohol to a cotton swab and wiping around the insulators.

4.2 Calibration

4.2.1 Calibration Interval

The recommended calibration interval for the SCR-5156-IET is twelve (12) months.

4.2.2 General Considerations

Before starting the calibration procedure, you need to consider the following:

- Calibration environment should be 23°C and <60% RH.
- Test instruments should be sufficiently more accurate than the SCR-5156-IET.
- The uncertainty of the measurement instruments has to be considered in the calibration to allow a band of uncertainty.
- The testing equipment and the SCR-5156-IET should stabilize at laboratory conditions for at least 24 hours.
- Proper metrology practices should be followed to minimize leakage.

4.2.3 Required Equipment

Many combinations of DMM, and bridges may be used to calibrate this instrument. Possible choices include the MI 6000B, MI 6652A for resistance and the IET 1620, AH2500 and AH2700 for capacitance.

4.2.4 Calibration Procedure

To calibrate the SCR-5156-IET, proceed as follows:

1. Setup the calibration equipment in the resistance-measurement mode.
2. Measure the resistance
3. Setup the capacitance measurement instruments for measurement of capacitance at 1 kHz.
4. Measure the capacitance
5. Check that calibrated values of resistance or capacitance are within stability specifications.

4.3 Customer service

The IET warranty attests to the quality of materials and workmanship in our products. For application assistance or if difficulties occur, our engineers will assist in any way possible. If you cannot eliminate the difficulty, please e-mail, FAX, or phone our Service Department, giving full information of the trouble and of steps taken to remedy it. Be sure to include the type and serial number of the instrument.

For technical support, call 516-334-5959 or visit www.ietlabs.com