Keysight 16089A/B/C Kelvin Clip Leads

Operation and
Service Manual

KEYSIGHT
TECHNOLOGIES

Notices

Trademark Acknowledgments

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CAUTION

A **CAUTION** notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a CAUTION notice until the indicated conditions are fully understood and met.

WARNING

A **WARNING** notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a WARNING notice until the indicated conditions are fully understood and met.

Table of Contents

1 General Information

Introduction

The purpose of this manual is to enable you to use your Keysight 16089A/B/C Kelvin Clip Leads efficiently and confidently. This manual contains both general and specific information. To use the 16089A/B/C to perform a specific function (without having to read the entire manual), follow the directions in "Using the 16089A/B/C".

Using the 16089A/B/C

The 16089A/B/C has been designed to operate specifically with the LCR Meter.

- To install the 16089A/B/C, turn to Chapter 2.
- To operate the 16089A/B/C, turn to Chapter 3.
- To order replaceable parts for the 16089A/B/C, turn to "Replaceable Parts" in Chapter 4.

Product Description

The 16089A/B/C has been designed to operate specifically with the following four-terminal-pair type LCR meters and impedance analyzers.

The 16089A/B/C make it possible to measure odd-shaped components that cannot be measured with conventional test fixtures. The 16089A, 16089B, and 16089C consist of a direct attachment, four-terminal-pair type test leads that are equipped with two insulated Kelvin clips. Three sizes of Kelvin clips are provided. The 16089A Kelvin Clip Leads is equipped with two large Kelvin clips, the 16089B Kelvin Clip Leads is equipped with middle size clips and the 16089C Kelvin Clip Leads is equipped with small size clips.

Accessories Supplied

The following accessories are supplied with the 16089A/B/C:

Table 1-1 Furnished Accessories

Description	Part Number	Quantity
Operation and Service Manual (this manual)[1]	Option ABA	1

1. The manual is furnished only Option ABA is ordered.

Operating and Safety Precautions

Operating

You need to observe only normal precautions in handling and operating the 16089A/B/C. Do not exceed the operating input power, voltage and current level and signal type appropriate for the instrument being used, refer to your instrument's operation manual.

CAUTION

Electrostatic discharge (ESD) can damage the highly sensitive microcircuits in your instrument. ESD damage is most likely to occur as the test leads are being connected or disconnected. Protect them from ESD damage by wearing a grounding strap that provides a high resistance path to ground. Alternatively, ground yourself to discharge any static charge built-up by touching the outer shell of any grounded instrument chassis before touching the test port connectors.

Never touch the test clip contacts.

Use a work station equipped with an anti-static work surface.

Service

The voltage levels found in these test leads when used with the intended instruments do not warrant more than normal safety precautions for operator safety. Nevertheless, service should be performed only by qualified personnel.

Specifications

This section lists the complete 16089A/B/C specifications. These specifications are the performance standards and limits against which the 16089A/B/C is tested. When shipped from the factory, the 16089A/B/C meets the following specifications:

Maximum dc Bias Voltage	± 42V peak max
Frequency Range	5Hz to 100kHz
Operating Temperature	0 to 55°C
Operating Humidity	≤ 95% RH (@40°C)
Non-operating Temperature	-40 to 70°C
Non-operating Humidity	≤ 95% RH (@40°C)
Weight	300g
Cable length	0.94m

Supplemental Performance Characteristics

This section gives supplemental performance characteristics. Supplemental performance characteristics are not specifications, but are typical characteristics included as additional information for the operator. Supplemental performance characteristics are not guaranteed.

Supplemental Performance Characteristics of 16089A

Applicable DUT size

Diameter of DUT's terminals	≤ 15mm

Supplemental Performance Characteristics of 16089B

Applicable DUT size

Diameter of DUT's terminals	≤ 7.9mm
Length of DUT's terminals	≥ 3mm

Supplemental Performance Characteristics of 16089C

Applicable DUT size

Diameter of DUT's terminals	≤ 1mm
Space between DUT's terminals	≥ 2mm
Length of DUT's terminals	≥ 2mm

2 Preparation for Use

Introduction

This chapter explains how to install the Keysight 16089A/B/C Kelvin Clip Leads. The topics covered include initial inspection, ambient environmental considerations, connecting the test leads for use, and repackaging the test leads for shipment.

Initial Inspection

These test leads have been carefully inspected electrically and mechanically before being shipped from the factory. They should be in perfect physical condition, no scratches, dents or the like. They should also be in perfect electrical condition. Verify this by carefully performing an incoming inspection to check the test lead set for signs of physical damage and missing contents.If any discrepancy is found, notify the carrier and Keysight Technologies. Your Keysight Technologies sales office will arrange for repair and replacement without waiting for the claim to be settled.

- Inspect the shipping container for damage. Keep the shipping materials until the inspection is completed.
- Verify that the shipping container contains everything shown in Figure 2-1, Figure 2-2, Figure 2-3, and Figure 2-4 and listed in Table 2-1, and Table 2-2, Table 2-3.
- Inspect the exterior of the 16089A/B/C for any signs of damage.

16089A

Figure 2-1 16089A Product Overview

Table 2-1 Contents of 16089A

Description	Keysight Part Number	Qty
Kelvin Clip Leads 1m	Option 800[1]	1
Kelvin Clip Leads 2m	Option C20[1]	
Operation and Service Manual (this manual)[2]	Option ABA	1

1. Either option 800 or C20 will be furnished.
2. Operation and Service Manual is not shown in Figure 2-1 and furnished only Option ABA is ordered.

16089B

Figure 2-2 16089B Product Overview

Table 2-2 Contents of 16089B

Description	Keysight Part Number	Qty
Kelvin Clip Leads 1m	Option 800[1]	1
Kelvin Clip Leads 2m	Option C20[1]	
Operation and Service Manual (this manual)[2]	Option ABA	1

1. Either option 800 or C20 will be furnished.
2. Operation and Service Manual is not shown in Figure 2-2 and furnished only Option ABA is ordered.

16089C

Figure 2-3 16089C Product Overview

Table 2-3 Contents of 16089C

Description	Keysight Part Number	Qty
Kelvin IC Clip Leads	16089-60603[1]	1
Operation and Service Manual (this manual)[2]	Option ABA	1

1. Keysight internal-only part number.
2. Operation and Service Manual is not shown in Figure 2-3 and furnished only Option ABA is ordered.

Ambient Environmental Considerations

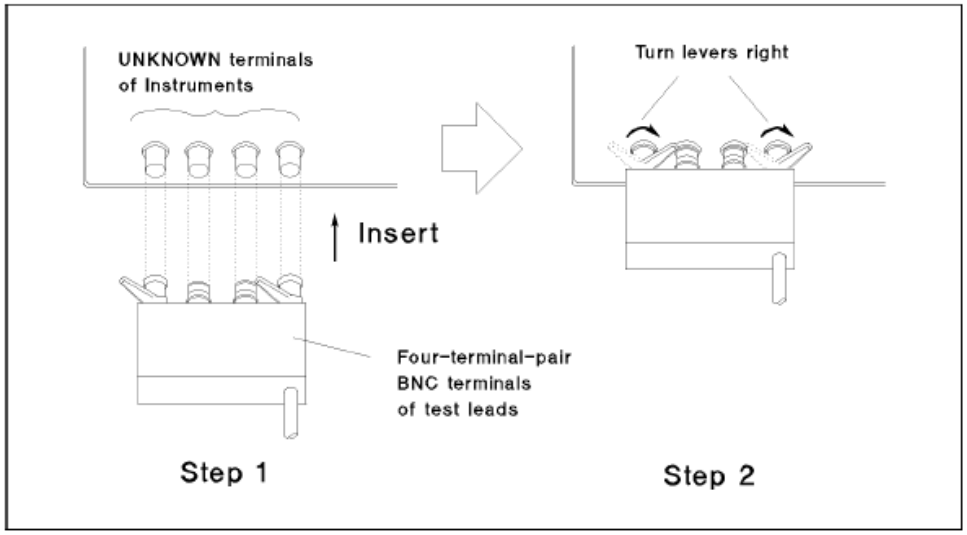
Operating and Storage

The 16089A/B/C must be operated within an ambient temperature range of 0°C to 55°C and relative humidity up to 95% at 40°C (non-condensing).

The 16089A/B/C may be stored within a temperature range of -40°C to +70°C, and at a relative humidity of up to 95% at +40°C (non-condensing).

Connecting the Test Leads for Use

Figure 2-4 Connecting the Test Leads



Packaging the Test Leads

If shipment to a Keysight Technologies service center is required, each test lead set should be repackaged using the original factory packaging materials.

Alternatively, comparable packaging materials may be used. Wrap the test leads in heavy paper and pack in anti-static plastic packaging material. Use sufficient shock absorbing material on all sides of the 16089A/B/C to provide a thick, firm cushion and to prevent movement. Seal the shipping container securely and mark it FRAGILE.

3 Operation

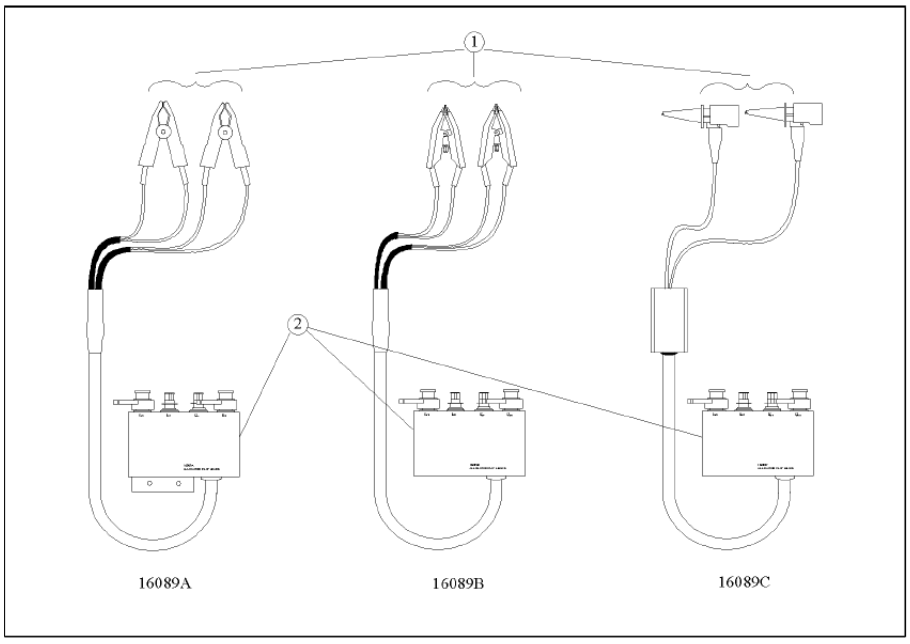
Introduction

This Chapter describes using the test leads and compensation techniques for these test leads.

Test Leads Features

16089A/B/C

Figure 3-1 16089A/B/C Test Leads Features

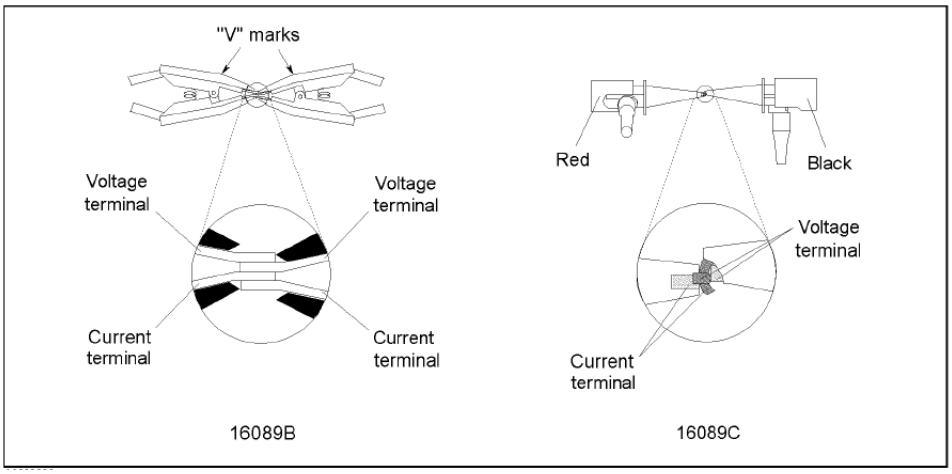


1. Kelvin Clips. These are connected to the DUT.
2. Four-terminal-pair BNC terminals. These terminals are connected to the UNKNOWN terminals of your measurement instrument.

OPEN and SHORT Compensation

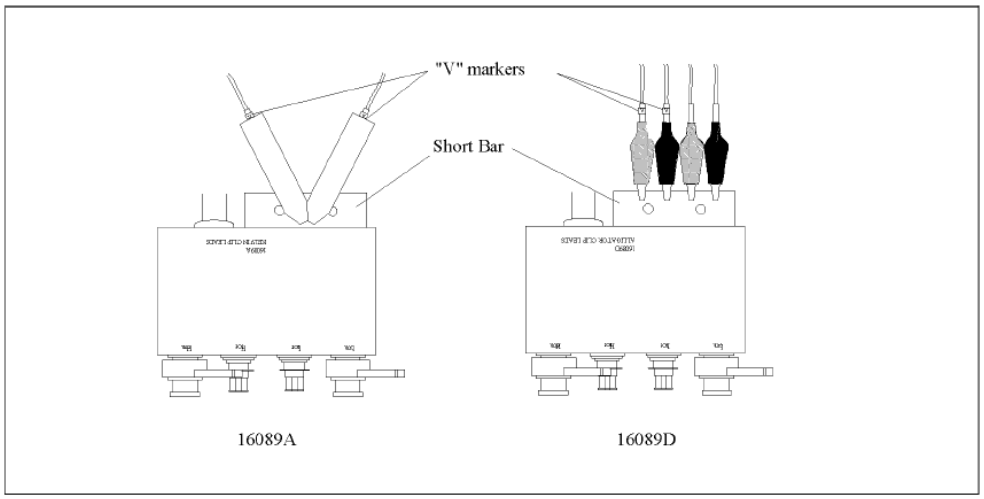
The 16089A/B/C have inherent stray capacitance, residual inductance, and residual resistance that affect the measurement. To cancel the effects caused by these residuals and thus minimize their effect on measurement accuracy, the measurement instrument's OPEN and SHORT compensation capabilities must be used. The procedures are described in the measurement instrument's operation manual.

Figure 3-2 Making a Short Condition for the 16089B and 16089C



When you perform SHORT compensation for the 16089A, use the furnished short bar shown in Figure 3-3.

Figure 3-3 Making a short Condition for the 16089A



NOTE

If the furnished short bar of 16089A is corroded, worn or damaged, reverse the position or replace it with a new short bar. To reverse the short bar, remove the 2 screws that fixes the short bar and reverse the position.

Operation

Step-by-step instructions on how to make a measurement with the 16089A/B/C are:

1. Set the Cable Length setting according to the LCR meter/Impedance Analyzer operation manuals.
2. Connect the test leads of 16089A/B/C to the measurement instrument's UNKNOWN terminals.
3. Perform OPEN and SHORT compensation as described in the measurement instrument's operation manual. Figure 3-2 and Figure 3-3 show how to make short condition for the SHORT compensation.
4. Connect the component to be tested into the test clips.

4 Service

Introduction

This chapter gives replaceable parts information for the 16089A, 16089B and 16089C.

Serial Number for Non-RoHS Kelvin Clip Leads:

16089A: “MY44100001 - MY44199999” or “SG44100001 - SG44199999”

16089B: “MY40100001 – MY40199999” or “SG40100001 – SG40199999”

16089C: “MY44100001 – MY44199999” or “SG44100001- SG44199999”

Serial Number for RoHS Kelvin Clip Leads:

16089A: “MY44200001 and above” or “SG44200001 and above”

16089B: “MY40200001 and above” or “SG40200001 and above”

16089C: “MY44200001 and above” or “SG44200001 and above”

Replaceable Parts

To order parts, use the Keysight part numbers listed in Table 4-1, Table 4-2 and Table 4-3. If a faulty part is located in an assembly that cannot be disassembled, order the next higher assembly or return the fixture to the nearest Keysight Technologies Sales/Service Office for repair or replacement.

Shown are the supported parts and their respective RoHS compliant replacement support part. RoHS conversion involves with design and dimension change which result in the RoHS support part backward incompatible with non-RoHS test fixture. Special handling is needed while using the RoHS replacement part on non-RoHS test fixture. The original support part number is replaced by the respective “RoHS Compliant Replacement Part”. Once the original support part is depleted, please proceed to obtain the RoHS compliant support part.

16089A Replaceable Parts

Table 4-1 16089A Replaceable Parts

Keysight Non-RoHS Part Number	Description	Qty	RoHS Compliant Replacement Part	Description	Qty
16089-60001	Test Leads[1]	1	16089-60601[2]	Kelvin Clip Leads	1
16089-04001	Cover Top	1	16089-60601[2]	Kelvin Clip Leads	1
0515-0914	Screw Flat Head M3X0.5 L6	2	0515-1946	Screw Flat Head M3X0.5 L6	2
16089-60011	Large Clip Assembly	2	16089-60611	Large Clip Assembly	2
7121-2696	Wire Marker “V”	2	7121-2696	Wire Marker “V”	2
16089-01201	Short Bar	1	16089-01201	Short Bar	1
0515-1550	Screw	2	0515-0372	Screw	2

1. The whole unit. Keysight internal-only part.
2. For 2m test leads, please order 16089-60606 instead. (Both 16089-60606 and 16089-60601 are Keysight Internal part numbers only)

Red and orange cables are screwed on the one Kelvin clip assembly. Gray and black cables are screwed on the other Kelvin clip assembly. Orange and gray cables are marked “V”.

16089B Replaceable Parts

Table 4-2 16089B Replaceable Parts

Keysight Non-RoHS Part Number	Description	Qty	RoHS Compliant Replacement Part	Description	Qty
16089-60002	Test Leads[1]	1	16089B[2]	Kelvin Clip Leads	1
16089-04002	Cover Top	1	16089B[2]	Kelvin Clip Leads	1
0515-0914	Screw Flat Head M3X0.5 L6	2	0515-1946	Screw Flat Head M3X0.5 L6	2
16005-60010	Kelvin Clip Assembly	2	16005-60010	Kelvin Clip Assembly	2

1. The whole unit. Keysight internal-only part.
2. 16089-60602 is removed from support parts due to increasing costs. Purchase 16089B Medium Kelvin Clip Lead as the replacement.

On one Kelvin clip, the orange cable is screwed on the “V” marked side, and the red cable is screwed on the non-marked side. On the other Kelvin clip, the gray cable is screwed on the “V” marked side, and the black cable is screwed on the non-marked side.

16089C Replaceable Parts

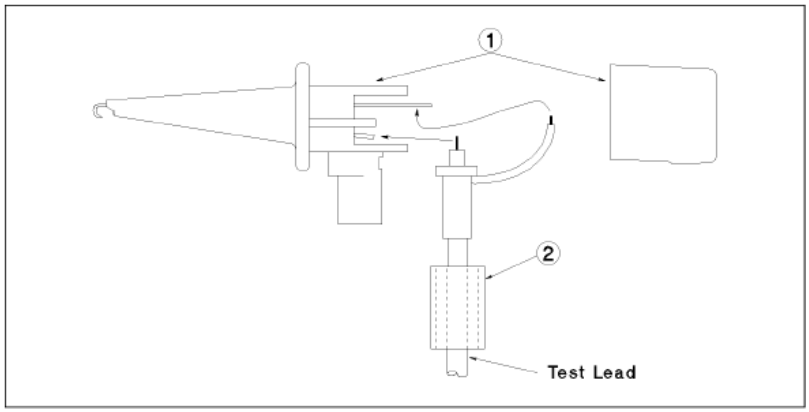
Table 4-3 16089C Replaceable Parts

Ref /D[1]	Keysight Non-RoHS Part Number	Description	Qty	RoHS Compliant Replacement Part	Description	Qty
	16089-60003	Test Leads[2]	1	16089-60603	Kelvin IC Clip Leads	1
	16089-04003	Cover Top	1	16089-60603[3]	Kelvin IC Clip Leads	1
	0515-0914	Screw Flat Head M3x0.5 L6	2	0515-1946	Screw Flat Head M3x0.5 L6	2
1	16005-60013	Test Clip Assembly Red	1	16005-60013	Test Clip Assembly Red	1
	16005-60015	Test Clip Assembly Black	1	16005-60015	Test Clip Assembly Black	1
2	0890-1809	Tube Heat Shrinkable Red	2cm	0890-2296	Tube Heat Shrinkable Red	2cm
	0890-1808	Tube Heat Shrinkable Black	2cm	0890-2295	Tube Heat Shrinkable Black	2cm

1. Corresponding to designator in Figure 4-1.
2. The whole unit. Keysight internal-only part.
3. Poka-Yoke Design Change. RoHS cover top (16089-04603) is not backward compatible with non-RoHS fixture. REplace the whole fixture.

Connection from the cables to the Kelvin clip is shown in Figure 4-1.

Figure 4-1 Kelvin Clip Connections



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