Keysight 16117C
Low Noise Test Lead

Operation and
Service Manual

KEYSIGHT
TECHNOLOGIES

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Notice

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Warranty

This Agilent Technologies instrument product is warranted against defects in material and workmanship for a period of one year from the date of shipment, except that in the case of certain components listed in this manual, the warranty shall be for the specified period. During the warranty period, Agilent Technologies will, at its option, either repair or replace products which prove to be defective.

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The Agilent Technologies certifies that this product met its published specifications at the time of shipment from the factory. Agilent Technologies further certifies that its calibration measurements are traceable to the United States National Institute of Standards and Technology, to the extent allowed by the Institute's calibration facility, or to the calibration facilities of other International Standards Organization members.

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The remedies provided herein are the buyer's sole and exclusive remedies. Agilent Technologies shall not be liable for any direct, indirect, special, incidental, or consequential damages, whether based on contract, tort, or any other legal theory.

Assistance

Product maintenance agreements and other customer assistance agreements are available for Agilent Technologies products.

If you need assistance, contact your nearest Agilent Technologies Sales and Service Office. Addresses are provided at the back of this manual.

Manual Printing History

The manual printing date and part number indicate its current edition. The printing date changes when a new edition is printed. (Minor corrections and updates which are incorporated at reprint do not cause the date to change.) The manual part number changes when extensive technical changes are incorporated.

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July 2001 ..... Fifth Edition (part number: 16117-90041)

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 with specific *WARNINGS* elsewhere in this manual may impair the protection provided by the equipment. In addition it violates safety standards of design, manufacture, and intended use of the instrument.
The Agilent Technologies assumes no liability for the customer's failure to comply with these requirements.

Note

16117C is designed for use in INSTALLATION CATEGORY I according to IEC 61010-1 and POLLUTION DEGREE 1 according to IEC 61010-1 and IEC 60664-1. 16117C is an INDOOR USE product.

Do NOT operate in an Explosive Atmosphere

Do *not* operate the instrument in the presence of flammable gasses or fumes. Operation of any electrical instrument in such an environment constitutes a safety hazard.

Keep Away from Live Circuits

Operating personnel must not remove instrument covers. Component replacement and internal adjustments must be made only by qualified maintenance personnel. Do not replace components with the power cable connected. Under certain conditions, dangerous voltages may exist even with the power cable removed. To avoid injury, always disconnect power and discharge circuits before touching them.

Do NOT Service or Adjust While Alone

Do *not* attempt internal service or adjustment unless another person, capable of turning off power and capable of rendering first aid and resuscitation, is present.

Do NOT Substitute Parts or Modify Instrument

Because of the danger of introducing additional hazards, do *not* substitute parts or perform unauthorized modifications to the instrument. Return the instrument to a Agilent Technologies Sales and Service Office for service and repair to ensure the safety features are maintained.

Dangerous Procedure Warnings

Warnings, such as the example below, precede *POTENTIALLY DANGEROUS PROCEDURES* throughout this manual. Instructions contained in the **warnings** must be followed.

Warning

Dangerous voltages, capable of causing death, are present in this instrument. Use extreme caution when handling, testing, and adjusting this instrument.

Safety Symbols

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

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

Alternating current.

Direct current.

On (Supply).

Off (Supply).

Warning

This **Warning** sign denotes a hazard. It calls attention to a procedure, practice, condition or the like, which, if not correctly performed or adhered to, could result in injury or death to personnel.

Caution

This **Caution** sign denotes a hazard. It calls attention to a procedure, practice, condition or the like, which, if not correctly performed or adhered to, could result in damage to or destruction of part or all of the product.

Note

Note denotes important information. It calls attention to a procedure, practice, condition or the like, which is essential to highlight.

Affixed to product containing static sensitive devices use anti-static handling procedures to prevent electrostatic discharge damage to component.

Caution, risk of electric shock : Terminals which may be supplied from the interior of the equipment at a voltage exceeding 1 kV, or allow connection to a voltage exceeding 1 kV are marked with this symbol.

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1

General Information

Introduction

The purpose of this manual is to enable you to use your 16117C Low Noise Test Lead efficiently and confidently. This manual contains both general and specific information. To use the 16117C to perform a specific function (without having to read the entire manual), follow the directions in "Using the 16117C".

Using the 16117C

The 16117C has been designed to operate specifically with the 4339B High Resistance Meter.

- To install the 16117C, turn to Chapter 2.
- To operate the 16117C, turn to Chapter 3.
- To order replaceable parts for the 16117C, turn to "Replaceable Parts" in Chapter 4.

Product Description

The 16117C has been designed to operate specifically with the 4339B High Resistance Meter. The 16117C is used to measure insulation resistance. The 16117C has the following features:

- Prepared exclusive connector for the 4339B. This allows easy to make original test fixture for the 4339B
- High-voltage safety designed using an interlock circuit

Accessories Supplied

The accessories listed in Table 1-1, are supplied with the 16117C:

Table 1-1. Furnished Accessories

Description	Part Number	Quantity
Operation and Service Manual	P/N 16117-90041	1

Operating and Safety Precautions

Service

The voltage levels (up to 1000 V) in this adapter warrants extreme care for operator safety. Service must be performed only by qualified personnel.

Specifications

This section lists the complete 16117C specifications. These specifications are the performance standards and limits against which the 16117C is tested. When shipped from the factory, the 16117C meets the specifications listed in this section.

Applicable Test Voltage	1000 V maximum
Applicable Test Current[1]	10 mA maximum
Applicable Instrument	4339B
Interlock Circuit	furnished
Cable Length	1 m (connector to connector)
Operating Temperature	0 to 55 °C
Operating Humidity	≤70% RH (@40°C)
Non-operating Temperature	–40 to 70 °C
Non-operating Humidity	≤95% RH (@40°C)

1. Maximum measurable current of the 4339B is 100 μA.

2

Preparation for Use

Introduction

This chapter explains how to install the 16117C Low Noise Test Lead. The topics covered include initial inspection, ambient environmental considerations, connecting the adapter for use, and repackaging the adapter for shipment.

Initial Inspection

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

1. Inspect the shipping container for damage, and keep the shipping materials until the incoming inspection is completed.
2. Verify that the shipping container contains everything shown in Figure 2-1 and listed in Table 2-1.
3. Inspect the exterior of the 16117C for any signs of damage.

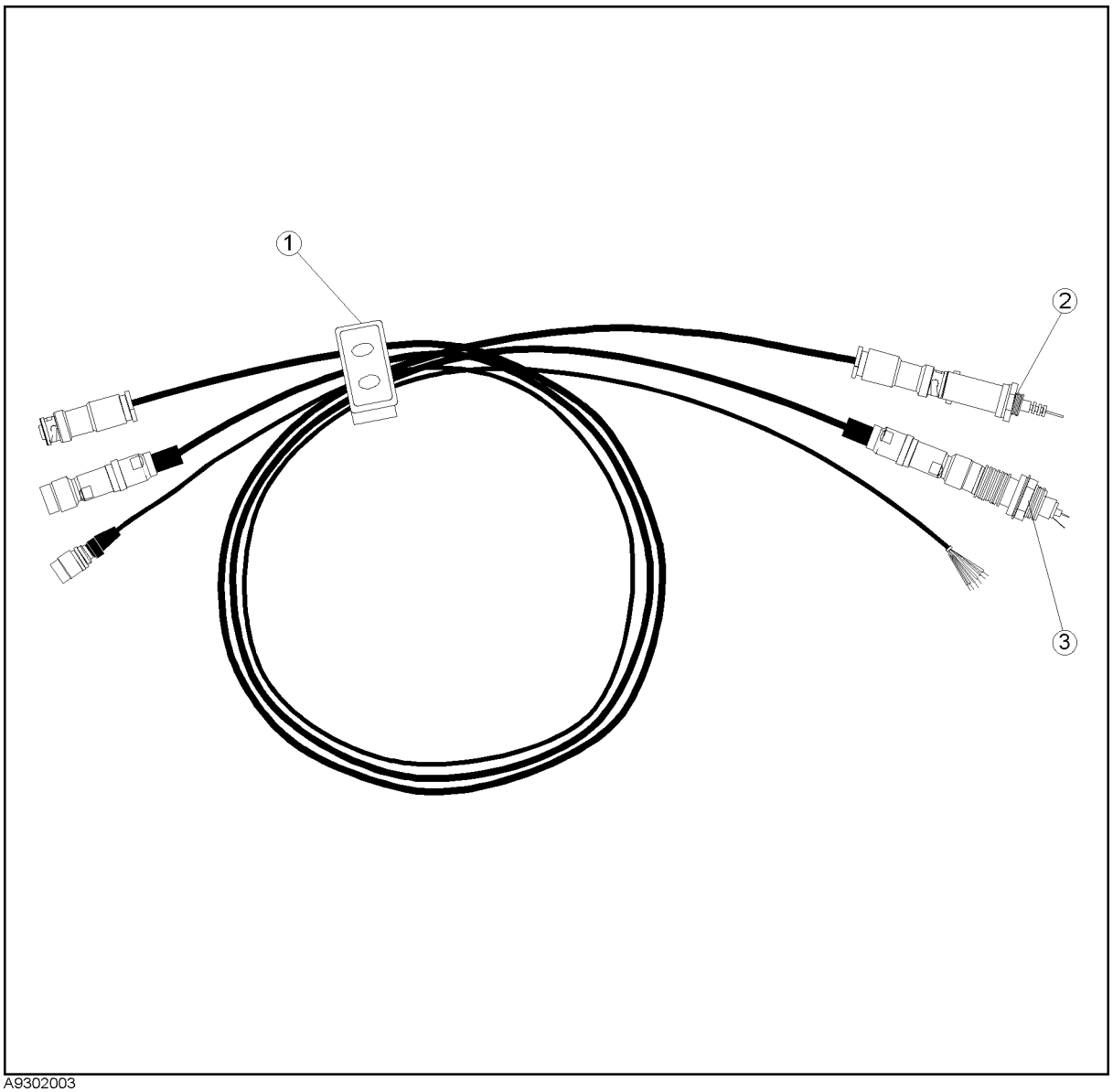

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Figure 2-1. Product Overview

Table 2-1. Contents

Description	Agilent Part Number	Quantity
① Low Noise Test Lead	16117C	1
② BNC Female-Connector	1250-2317	1
③ Triaxial Female-Connector	1250-2228	1
④ Operation and Service Manual[1]	16117-90041	1

1 Operation and Service Manual is not shown in Figure 2-1.

Ambient Environmental Considerations

Operating and Storage

The 16117C must be operated within an ambient temperature range of 0°C to +55°C and relative humidity up to 70% RH at 40°C (non-condensing).

The 16117C may be stored within a temperature range of −40°C to +70°, and at a relative humidity up to 95% at +40°C (non-condensing).

Connecting the Adapter for Use

The 4339B connection with 16117C has two configurations: floating and grounded DUT measurement configurations. The connections are different for each configuration. The connections are as shown in Figure 2-2 and Figure 2-3.

Warning

Do NOT touch the electrode and UNKNOWN connector while the High Voltage indicator is lit which shows the 4339B's output is a high voltage of up to 1000 Vdc maximum. You must operate after turning off the voltage source output and you have confirmed the high voltage indicator is turned off.

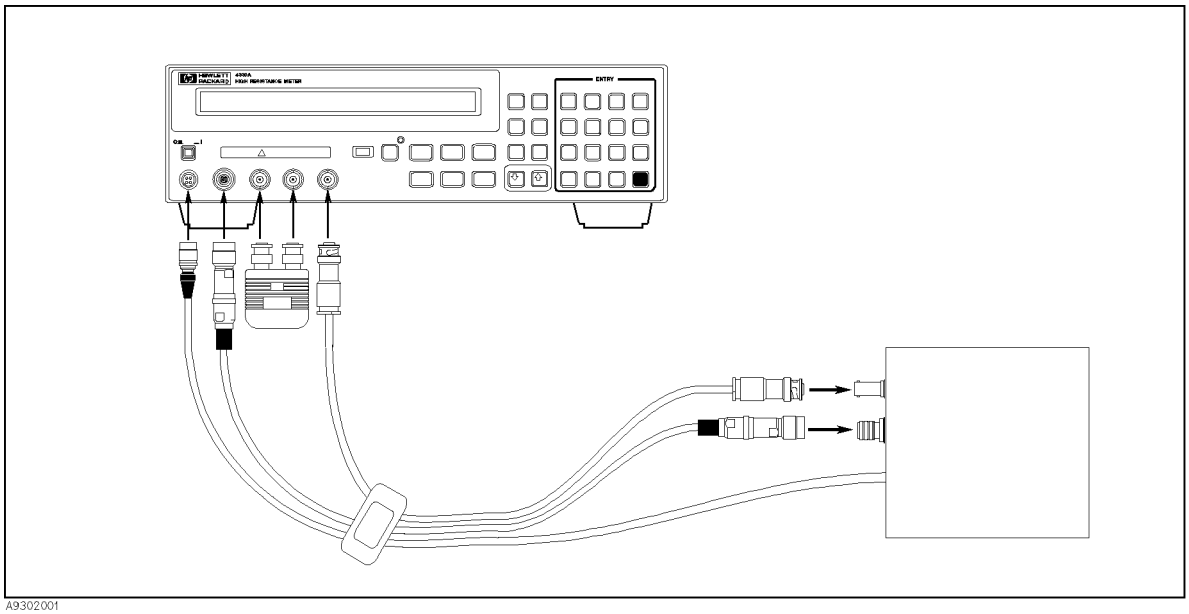

Figure 2-2. Floating DUT Measurement

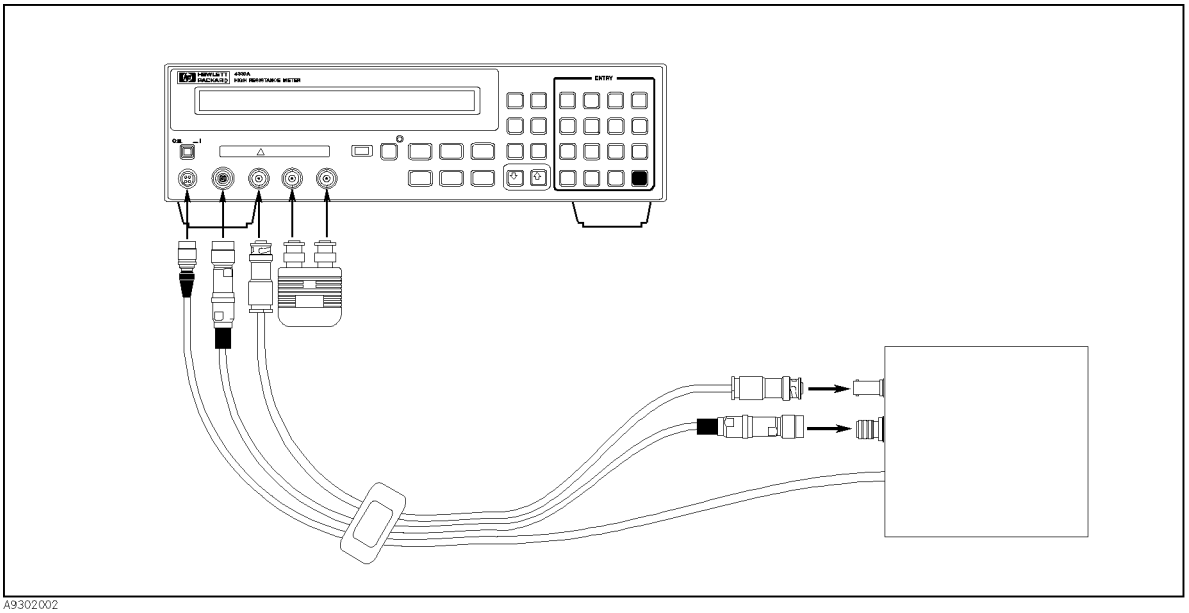

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Figure 2-3. Grounded DUT Measurement

Packaging the Adapter

If shipment to a Agilent Technologies service center is required, each adapter should be repackaged using the original factory packaging materials.

Alteratively, comparable packaging materials may be used. Wrap the adapter in heavy paper and pack in anti-static plastic packing material. Use sufficient shock absorbing material on all sides of the 16117C 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 the features of the 16117C (see Figure 3-1), and the connection to the 4339B and DUT.

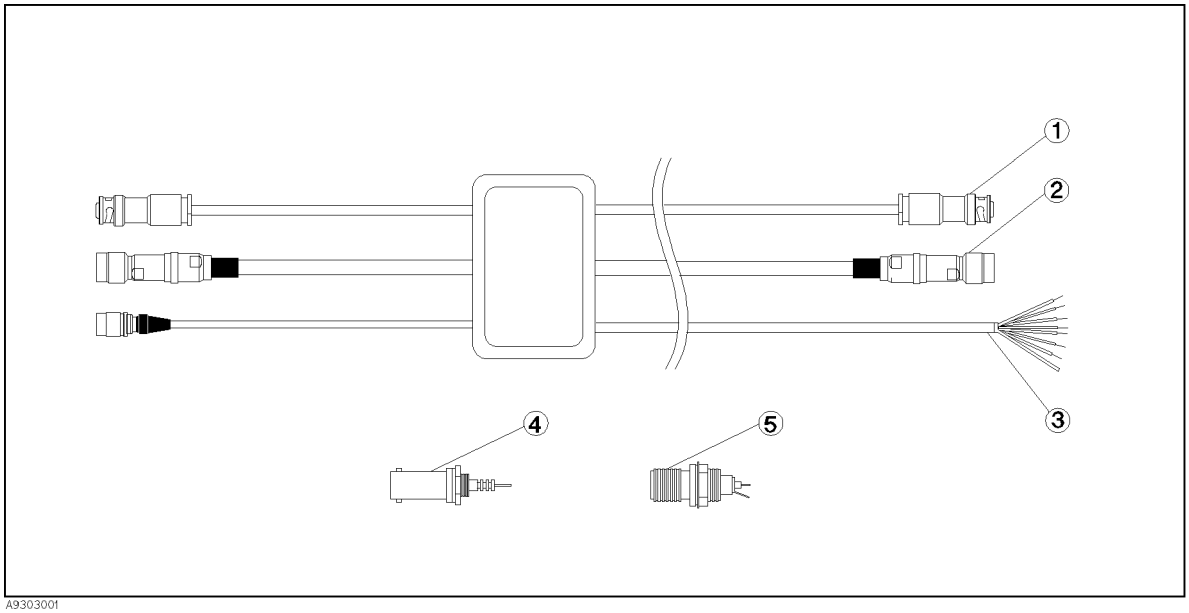

Figure 3-1. Adapter Features

1. *BNC cable.* This connector provides the source voltage to the 16117C. This is a high-voltage BNC connector and is not compatible with standard BNC connectors.
2. *Triaxial cable.* The measured signal is carried on the center conductor of this connector.
3. *Interlock cable.* This connector enables the interlock function which enables and disables the application of the source voltage from the 4339B when the interlock line is connected and disconnected respectively.
4. *BNC female-connector.*
5. *Triaxial female-connector.*

Making a Custom Test Fixture

This section describes how to make a custom test fixture for the 4339B.

Note When you make a custom test fixture using the 16117C, you must observe the usage guidelines described in this section.

Configuration

The 16117C is provided so the user can make custom test fixtures for the 4339B. Figure 3-2 shows an simplified configuration of test fixture in floating DUT measurement with the 16117C.

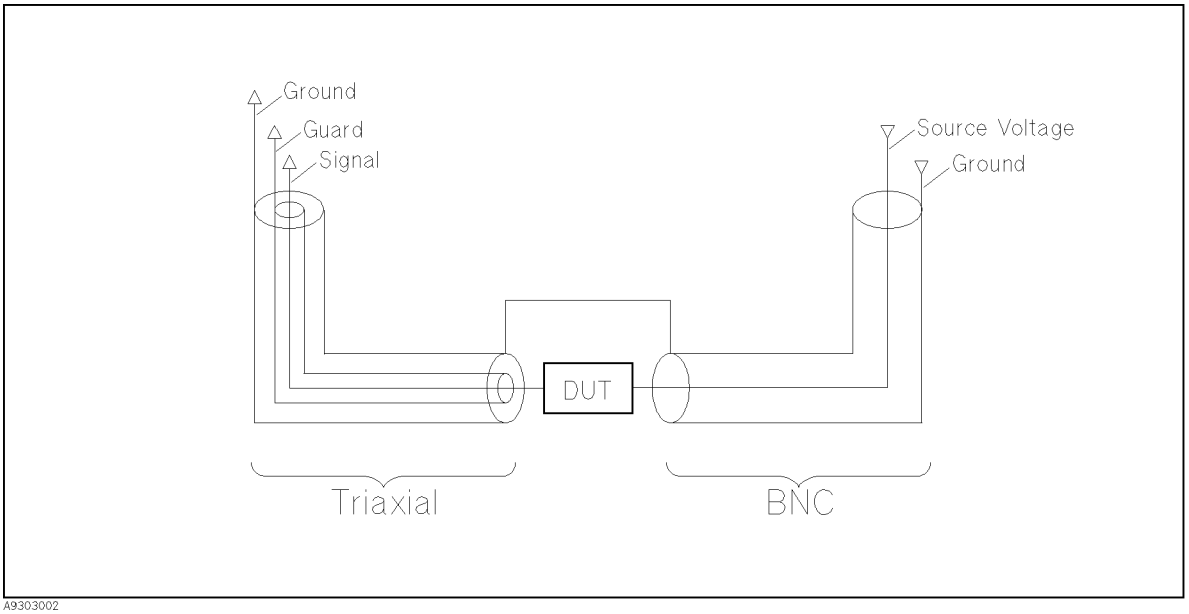

Figure 3-2. Floating DUT Measurement Configuration

The BNC connector provides source voltage up to 1000 V. A triaxial connector is used for the measured signal path. The triaxial connector's center conductor carries the signal. The inner shield is a Guard, and the outer shield is the ground. Using a guard circuit eliminates the external noise to the center conductors. The Guard must extend as close as possible to the DUT contact, but not connected.

For information about the Grounded DUT measurement configuration, refer to *4339B High Resistance Meter Operation Manual*.

Interlock Circuit

The interlock circuit automatically enables interlocking the source voltage and current limit function. To enable this function in your custom test fixture, the 16117C provides an interlock cable. This section describes how to use interlock circuit to meet your custom test fixture requirements.

Figure 3-3 shows pin assignments for the interlock cable.

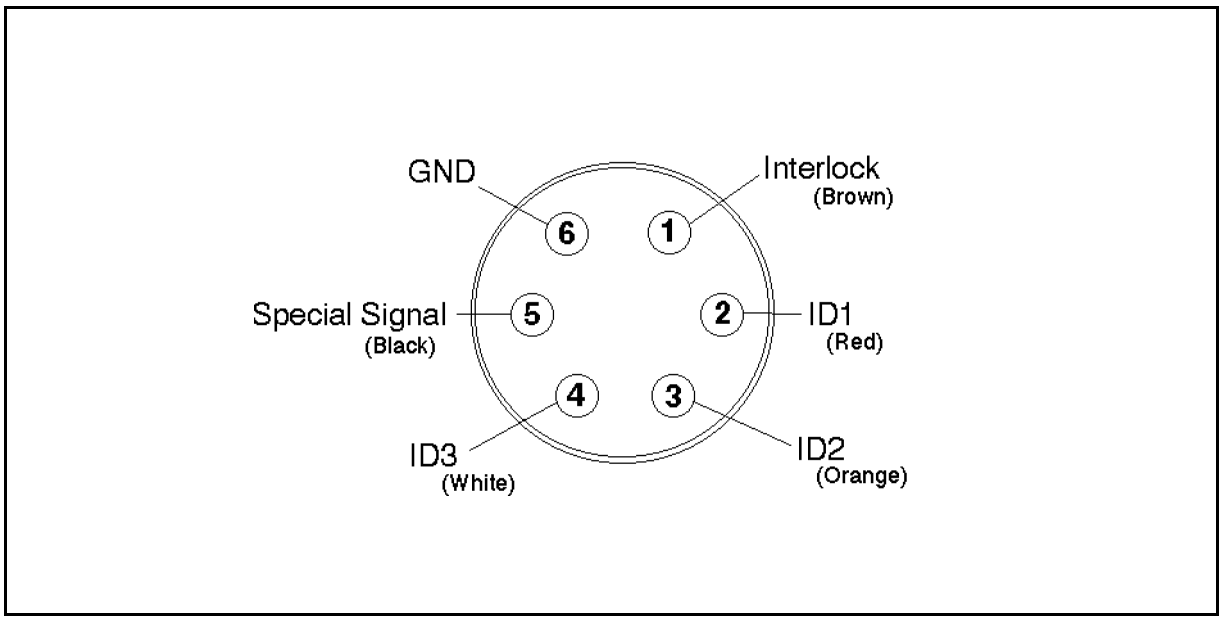

Figure 3-3. Interlock cable Assignment (Wiring Side View)

The interlock cable has six lines. The 4339B changes some settings: Voltage Output, Current Limit, and Resistivity Mode, depending on the interlock status. Table 3-1, describes the role of each line:

Table 3-1. Pin Assignment of Interlock Connector

Pin	Name	Description
Interlock	Interrupt signal	Disable or enable Voltage Output[1]
ID1	State signal[2]	Identificate Test Fixture
ID2		
ID3		
Special Signal	State signal	used for 16008B switching ρs and ρv[3]
GND	Ground	Connected to Chassis

1 When Interlock line is grounded, voltage output is enabled.

2 Refer to Table 3-2.

3 When the special signal line is grounded, the ρv (RV) mode is selected.

The ID signals are used by the 4339B to identify the current limit and the output voltage performance requested by the test fixture. The 4339B is programmed beforehand to change the current limit and output voltage settings according to the ID line status. The ID status, test fixture identification, and the 4339B current limit and output voltage correspondence is listed in Table 3-2.

Table 3-2. ID Signal Condition

IDs Condition			Test Fixture	Description
ID3	**ID2**	**ID1**		
GND	GND	GND	16339A	No Limitation
GND	GND	Open	16008B	No Limitation
GND	Open	GND	16117B	Current Limit: 0.5 mA
GND	Open	Open	04339-65005	100 V maximum Current Limit: 1 mA
Open	GND	GND	Not Applicable (N/A)	Not Used No Voltage output
Open	GND	Open	N/A	
Open	Open	GND	N/A	
Open	Open	Open	N/A	All IDs are opened No Voltage output

By grounding all ID lines, the 4339B has no set current and output voltage limitations other than the current and output voltage limits of the 4339B itself. In which case, if the Interlock line is grounded, the 4339B can apply a source voltage of up to 1000 V. If the interlock connector is not connected, all ID lines are all open, so, the 4339B will not apply a source voltage.

Example Configuration of Custom Test Fixture

Warning

Agilent Technologies shall NOT LIABLE for any damages or dangers to the operator incurred on use of a customized product except for the 16117C itself. Follow the instructions in following example of making test fixture the operator can operate safely for high voltage measurements.

Figure 3-4 shows an example of test fixture configuration. This example shows the test fixture for measuring insulation resistance. This custom test fixture has a cover for contacting the DUT, and the source voltage is interlocked with open and close of this cover.

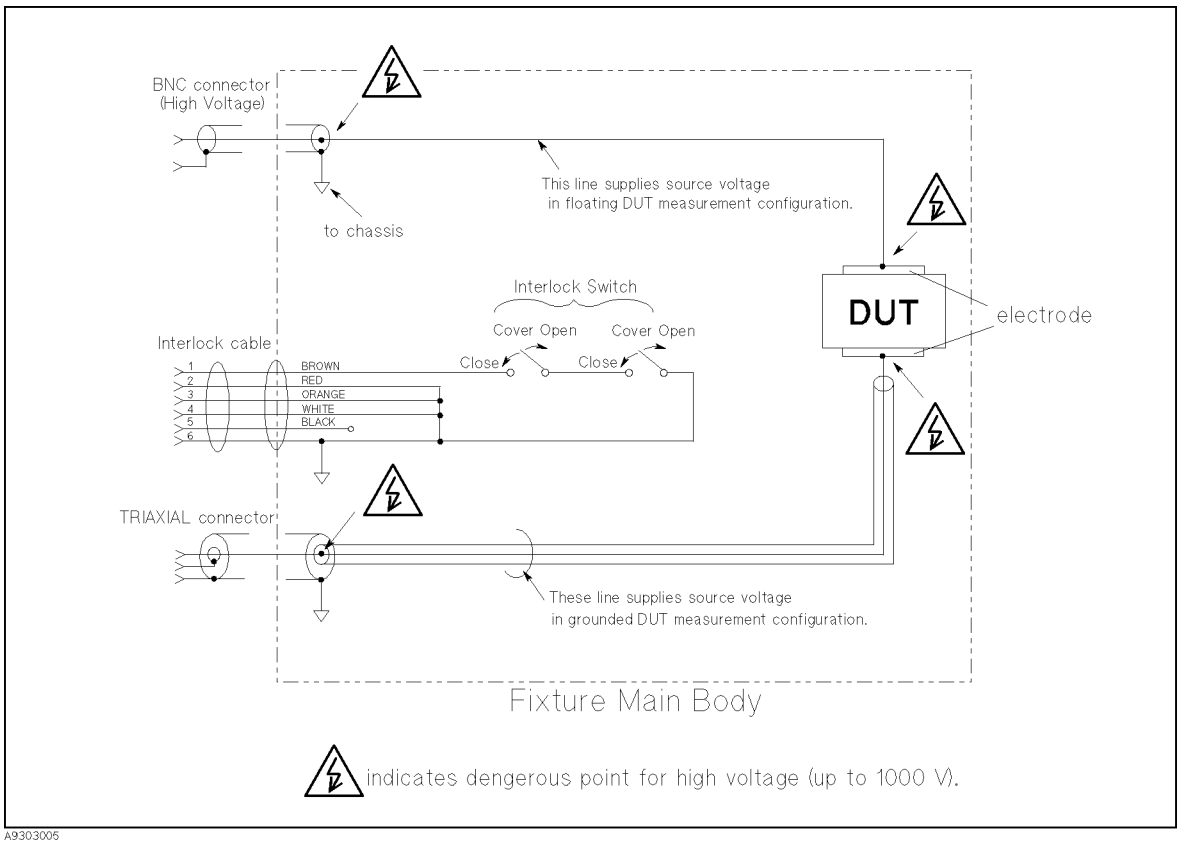

Figure 3-4. Example Configuration of Custom Test Fixture

Center conductor of BNC connector and center conductor of triaxial connector is connected to contact of DUT. A source voltage of up to 1000 V is applied these lines and the inner shield of triaxial connector. So, you must use cable which can withstand a voltage greater than 1000 V.

The inner shield of the triaxial connector is extended close to the DUT contact as a guard line.

Warning

You must design the test fixture so the operator can not touch the points which are indicated or the dangerous voltage symbol in Figure 3-4, to avoid electrical hazards to the operator. Specially, around the electrodes should be protected with a cover which is interlocked with source voltage output.

Interlock lines are configured as,

- No current and source voltage limitation
  All ID lines are connected to ground.
- Interlocking the source voltage output with open and close the cover of test fixture
  Interlock switch is connected in series to Interlock line (brown). This switch turns on and off together with opening and closing the cover of the customized test fixture.

Note 

It is recommended that interlock line should have two or more switches. This is effective to avoid unexpectedly applying source voltage due to trouble with the interlock switch.

- Automatic resistivity mode change is not used
  Special Signal line (black) is not connected

Note 

The end of unconnected line should be covered with insulations to avoid contact to ground.

Checking Procedure

The 16117C and the 4339B is operated with high voltage up to 1000 V. These products are designed that operator can measure safely. To keep safety condition, you must execute following checking procedure periodically.

This procedure assumes your fixture has top cover interlocing source voltage output of the 4339B.

Warning 

Do NOT touch the electrode and UNKNOWN connector while the High Voltage indicator is lit which shows the 4339B's output is a high voltage of up to 1000 Vdc maximum. You must operate after turning off the voltage source output and you have confirmed the high voltage indicator is turned off.

Daily Safety Verification Procedure

1. Connect the your fixture to the 4339B.
2. Close the top cover of your fixture.
3. Set source voltage to 42 V.
4. Press V output key of the 4339B.
   Confirm that the V output indicator and the High Voltage indicator turn on.
5. Open top cover of your fixure.
   Confirm that the High Voltage indicator turnes off immediately.
6. Close the top cover again.
   Confirm that the High Voltage indicator still turns off.

If you encountered any errors in checking procedure, contact your nearest Agilent Technologies Office.

4

Service

Introduction

This chapter gives the replaceable parts information for the 16117C.

Replaceable Parts

Table 4-1 identify the replaceable parts. Do not disassemble the 16117C any further than shown in Table 4-1. The listed parts can be ordered from your nearest Agilent Technologies Office. Ordering information should include the Agilent part number and the quantity required.

Table 4-1. Replaceable Parts List

Agilent Part Number	Qty.	Description
16117-87102	1	Model Label
16117-40001	1	Holder
16117-40002	1	Holder (with Nuts)[1]
16117-87103	2	Warning Label (Red) on BNC and Triaxial cable
16117-87104	1	Label (Yellow) on Interlock cable
16117-61604	1	Cable Assembly (Triaxial)[2]
16117-61605	1	Cable Assembly (BNC)[2]
16117-61606	1	Cable Assembly (Interlock)[2]
3050-0891	2	Washer Flat to fix a holder
0515-1552	2	Screw Pan Head to fix a holder
1250-2228	1	Triaxial Connector Female
1250-2317	1	BNC Connector Female
16117-90041	1	Operation and Service Manual

1 not including a model label.

2 including a warning label and a cable tie.

Warning

These servicing instructions are for use by qualified personnel only. Do NOT perform any servicing other than that contained in the operating section unless you are qualified to do so.

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