

Keysight 16048G/H Test Leads

Operation and
Service Manual

Notices

© Keysight Technologies
1999 - 2019

No part of this manual may be reproduced in any form or by any means (including electronic storage and retrieval or translation into a foreign language) without prior agreement and written consent from Keysight Technologies, Inc. as governed by United States and international copyright laws.

Trademark Acknowledgments

Manual Part Number

16048-90050

Edition

Edition 5, August 19, 2019

Printed in Malaysia

Published by:

Keysight Technologies International
Japan G.K,
1-3-3 Higashikawasaki-cho
Chuo-ku
Kobe-shi, Hyogo, Japan

Warranty

THE MATERIAL CONTAINED IN THIS DOCUMENT IS PROVIDED "AS IS," AND IS SUBJECT TO BEING CHANGED, WITHOUT NOTICE, IN FUTURE EDITIONS. FURTHER, TO THE MAXIMUM EXTENT PERMITTED BY APPLICABLE LAW, KEYSIGHT DISCLAIMS ALL WARRANTIES, EITHER EXPRESS OR IMPLIED WITH REGARD TO THIS MANUAL AND ANY INFORMATION CONTAINED HEREIN, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. KEYSIGHT SHALL NOT BE LIABLE FOR ERRORS OR FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES IN CONNECTION WITH THE FURNISHING, USE, OR PERFORMANCE OF THIS DOCUMENT OR ANY INFORMATION CONTAINED HEREIN. SHOULD KEYSIGHT AND THE USER HAVE A SEPARATE WRITTEN AGREEMENT WITH WARRANTY TERMS COVERING THE MATERIAL IN THIS DOCUMENT THAT CON-

FLICT WITH THESE TERMS, THE WARRANTY TERMS IN THE SEPARATE AGREEMENT WILL CONTROL.

Technology Licenses

The hardware and/or software described in this document are furnished under a license and may be used or copied only in accordance with the terms of such license.

Declaration of Conformity

Declarations of Conformity for this product and for other Keysight products may be downloaded from the Web. Go to <http://www.keysight.com/go/conformity>. You can then search by product number to find the latest Declaration of Conformity.

U.S. Government Rights

The Software is "commercial computer software," as defined by Federal Acquisition Regulation ("FAR") 2.101. Pursuant to FAR 12.212 and 27.405-3 and Department of Defense FAR Supplement ("DFARS") 227.7202, the U.S. government acquires commercial computer software under the same terms by which the software is customarily provided to the public. Accordingly, Keysight provides the Software to U.S. government customers under its standard commercial license, which is embodied in its End User License Agreement (EULA), a copy of which can be found at <http://www.keysight.com/find/sweula>. The license set forth in the EULA represents the exclusive authority by which the U.S. government may use, modify, distribute, or disclose the Software. The EULA and the license set forth therein, does not require or permit, among other things, that Keysight: (1) Furnish technical information related to commercial computer software or commercial computer software documentation that is not customarily provided to the public; or (2) Relinquish to, or otherwise provide, the government rights in excess of these rights customarily provided to the public to use, modify, reproduce, release, perform, display, or disclose commercial computer software or commercial computer software documentation. No addi-

tional government requirements beyond those set forth in the EULA shall apply, except to the extent that those terms, rights, or licenses are explicitly required from all providers of commercial computer software pursuant to the FAR and the DFARS and are set forth specifically in writing elsewhere in the EULA. Keysight shall be under no obligation to update, revise or otherwise modify the Software. With respect to any technical data as defined by FAR 2.101, pursuant to FAR 12.211 and 27.404.2 and DFARS 227.7102, the U.S. government acquires no greater than Limited Rights as defined in FAR 27.401 or DFARS 227.7103-5 (c), as applicable in any technical data.

Safety Notices

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.

1. Installation Guide	
Incoming Inspection	5
Connecting the 16048G/H	6
2. Overview	
Product Overview	7
Functions	8
3. Operation	
E4990A Setting	11
Adapter Setup	11
Performing Fixture Compensation	14
4. Specifications	
Specifications	15
5. Service	
Maintenance	17

Contents

1 Installation Guide

Incoming Inspection

Inspect the shipping container for damage. If the shipping container or cushioning material is damaged, it should be kept until the contents of the shipment have been checked for completeness and the 16048G/H has been checked mechanically and electrically. The contents of the shipment should be as listed in **Table 1-1**. If the contents are incomplete or if there is mechanical damage or defect, notify the nearest Keysight Technologies office. If the shipping container is damaged, or the cushioning material shows signs of unusual stress, notify the carrier as well as the Keysight Technologies office. Keep the shipping materials for the carrier's inspection.

Table 1-1

Contents

Description	Part Number	Qty.
Test Lead (16048G or 16048H)	-	1
Mounting Plate	-	1
BNC Bracket ¹	16048-60073	1
Operation and Service Manual	Option ABA	1

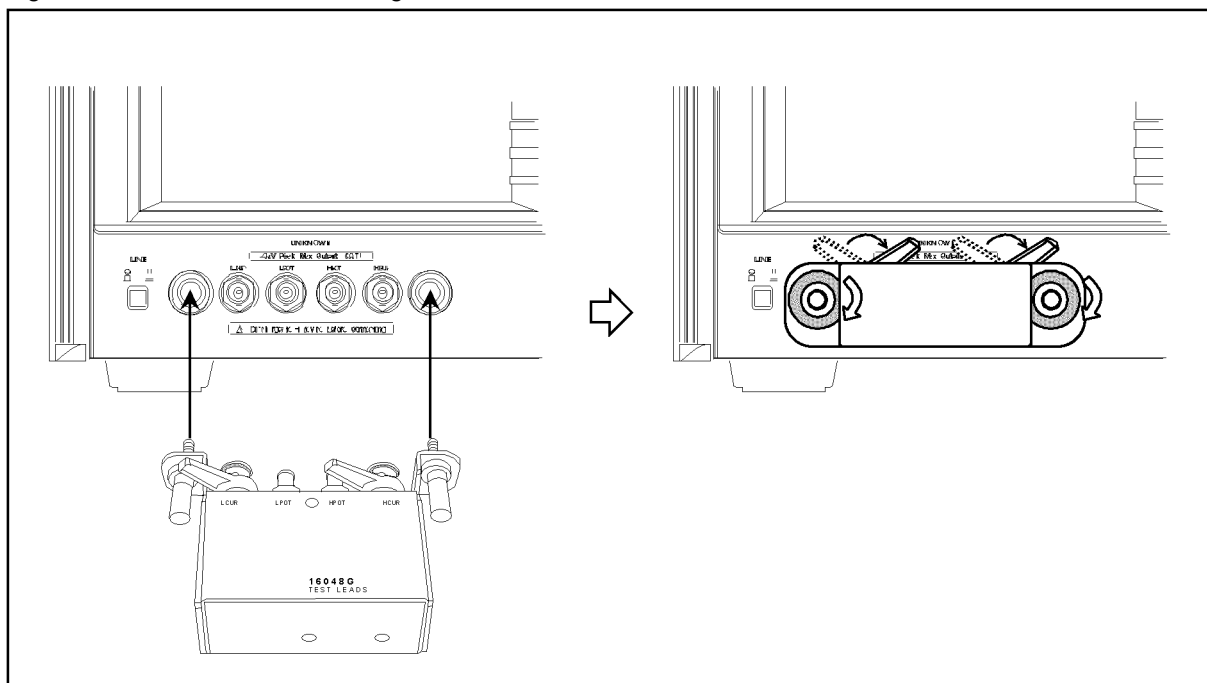
1. Only furnished with option 001.

Connecting the 16048G/H

Follow these steps below to connect the 16048G or 16048H to the Impedance Analyzer.

- Step 1. Set the 16048G/H to the test connectors on the front panel of the Impedance Analyzer by gradually coupling the four BNC connectors and fastening screws of the fixture with the test connectors and accessory mounting holes of the instrument until they come to complete contact.
- Step 2. Fasten two of the four BNC connectors to the mating test connectors by gradually turning the BNC connectors' rotation levers until each pair of connectors are securely connected. Be sure to align the grooves on both sides.
- Step 3. Turn clockwise the fixture's two fastening screws together, so that the fixture is secured to the instrument.
- Step 4. Finally, secure the remaining two BNC connectors of the fixture by turning clockwise their rotation levers.

Figure 1-1 Connecting the fixture to the instrument



NOTE

Using the connection block securing screws enables the 16048G/H to connect the GND of the Impedance Analyzer.

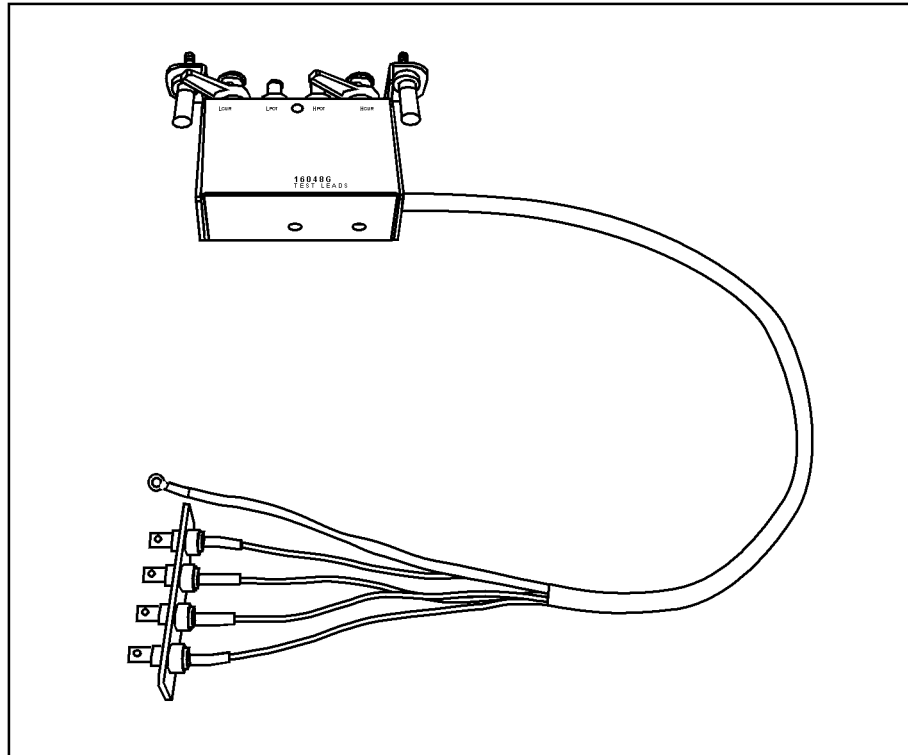
2 Overview

Product Overview

The 16048G/H consists of a direct attachment, 4-terminal pair interface that is equipped with four BNC (f) connectors. These test leads are used to attach user-fabricated test fixtures. Cable length of the 16048G is 1 meter, the 16048H is 2 meter.

Figure 2-1

Product Overview



Functions

Figure 2-2 shows name of each part of the 16048G/H and **Table 2-1** shows their function.

Figure 2-2

16048G/H Parts

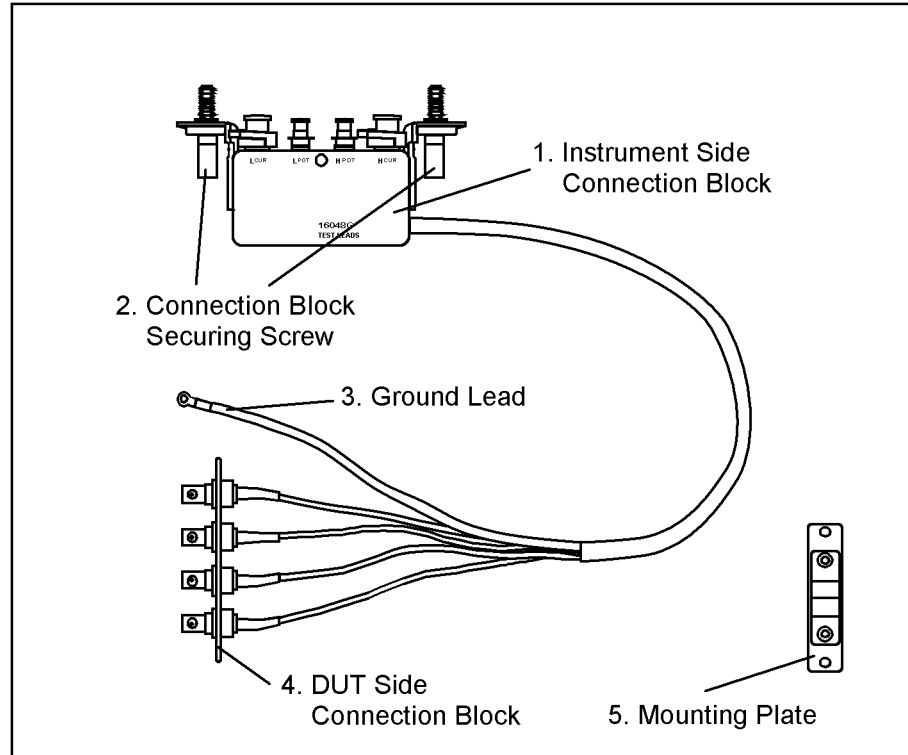


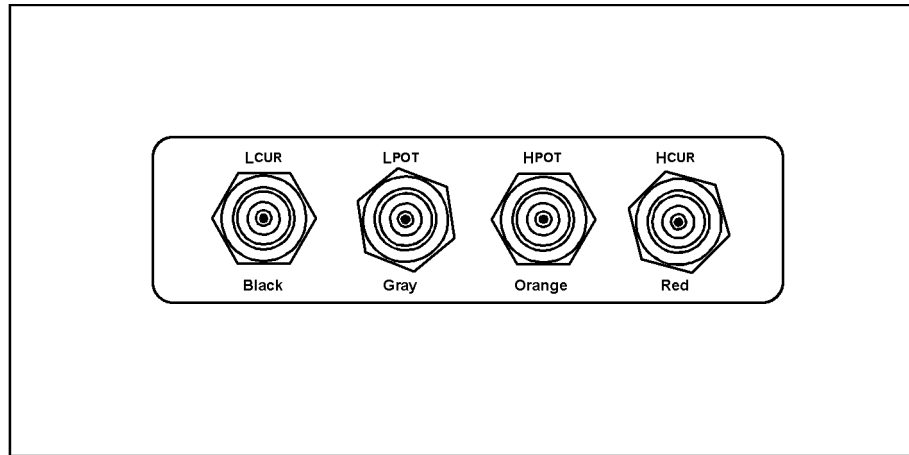
Table 2-1

16048G/H Function

No.	NAME	FUNCTION
1	Instrument Side Connection Block	Connect to the instrument's UNKNOWN terminal.
2	Connection Block Securing Screw	Secures the connection block to the Impedance Analyzer.
3	Ground Lead	Connect to the chassis or grounded part of the measurement target.
4	DUT Side Connection Block	Used to attach BNC Bracket or user-fabricated test fixtures.
5	Mounting Plate	Mounts on the measurement target to stabilize the cable.

Figure 2-3

Cable Assignment



Overview
Functions

3 Operation

This chapter describes the proper methods for setting the Impedance Analyzer fixture compensation with the 16048G/H.

E4990A Setting

Before you begin your measurement, you should perform the adapter setup in the E4990A. Also refer to the *Operational Manual* of the E4990A about the adapter setup.

Adapter Setup

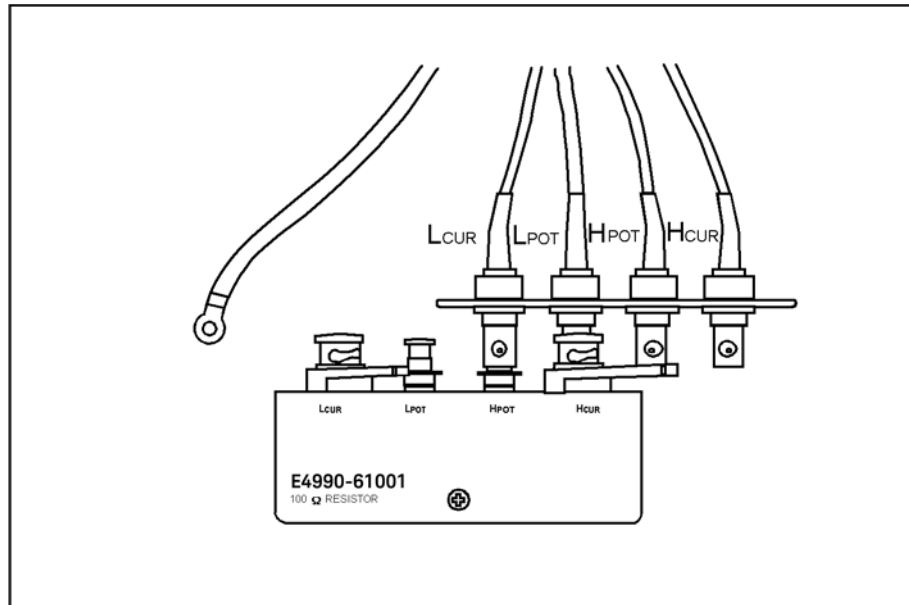
Connect the 16048G/H to the E4990A and perform the adapter setup described below.

NOTE

For the adapter setup, use the 100 Ω resistor furnished with the E4990A (Keysight P/N E4990-61001).

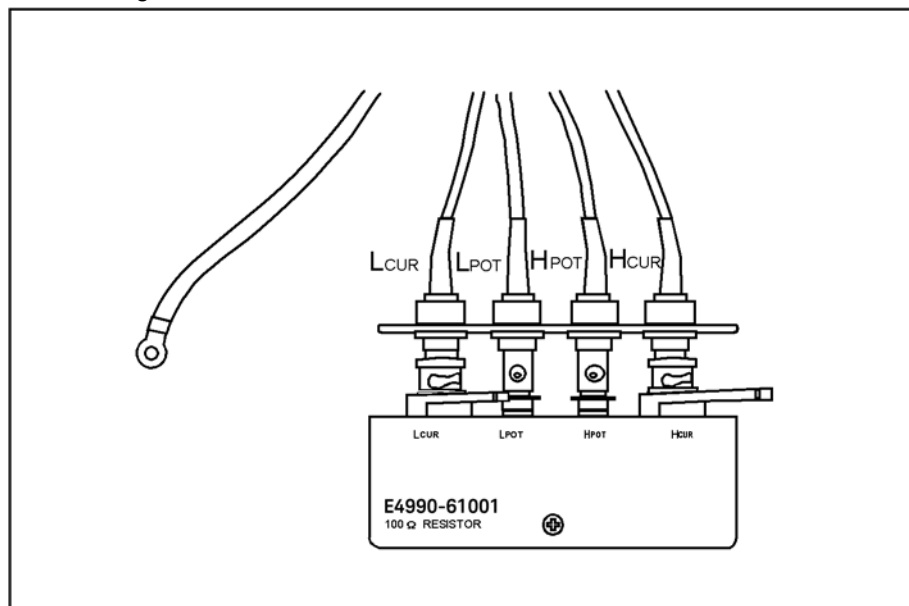
1. Allow the E4990A more than 30 minutes of warm-up time after turning it on.
2. Press the **[Cal]** key to bring up the Calibration Menu.
3. Press the **Adapter []** key to bring up the Adapter Setup Menu. **[]** shows the current settings.
4. Select **4TP 1M** in the case of 16048G, **4TP 2M** in the 16048H. When the selection is completed, the softkey label will show **Adapter [4TP 1m]** or **Adapter [4TP 2m]**.
5. Press the **Adapter Setup** key to bring up the Adapter Setup Menu.
6. Connect the Lcur terminal and Lpot terminal on the 16048G or 16048H to the Hpot terminal and Hcur terminal of the 100 Ω resistor furnished with the E4990A. The Hcur and Hpot terminal on the 16048G/H should remain open (nothing should be connected).

Figure 3-1 Connecting 100 Ω Resistor (Phase Compensation Data Measurement)



7. Press the **Phase [-]** key to start the phase compensation data measurement. About 1 minute later, the phase compensation data measurement is completed and the softkey label changes to **Phase [Done]**. Press the **[Save Phase]** key.
8. Connect the Lcur, Lpot, Hcur, Hpot terminal on the 16048G or 16048H to the Lcur, Lpot, Hcur, Hpot terminal of the 100 Ω resistor respectively.

Figure 3-2 Connecting 100 Ω Resistor (Load Data Measurement)



Operation
E4990A Setting

9. Press the **E4990-61001 [-]** key to start the load data measurement. When the load data measurement is completed, the softkey label changes to **E4990-61001 [DONE]**.
10. Press the **Save Impedance** key.

Performing Fixture Compensation

To compensate stray capacitance and residual impedance, fixture compensation should be performed. When you use the optional BNC Bracket (Keysight P/N 16048-60073) or an user fabricated test fixture, fixture compensation is required. Refer to the help manual of the Impedance Analyzer for the fixture compensation procedure.

4 Specifications

This chapter provides specifications of the 16048G/H Test Leads.

Specifications

Applicable Instruments	E4990A	
Maximum Voltage	± 42 V peak max. (AC+DC)	
Operating Environment	Temp.	-20°C to +150°C (Exclude up to 20 cm from four terminal pair connection block)
	Humidity	15% to 95% RH(@ wet bulb temp. < 40 °C)
Non-operating Environment	Temp.	-40 °C to +70 °C
	Humidity	≤ 90 % RH (@ wet bulb temp. < 65 °C)
Cable Length (Nominal)	1 m (16048G) / 2 m (16048H)	
Weight	Approximately 460 g (16048G) Approximately 690 g (16048H)	
Safety Standards	EN61010-1:1993 +A2:1995 IEC61010-1:1990 +A1:1992 +A2:1995 CSA C22.2 No.1010.1:1992 INSTALLATION CATEGORY I POLLUTION DEGREE 2 INDOOR USE	

Specifications
Specifications

5 Service

This chapter provides information on servicing and proper maintenance.

Serial number for Non-RoHS 16048G/H: “MY431xxxxx and below” /
“SG431xxxxx and below”

Serial number for RoHS 16048G/H: “MY432xxxxx and above” /
“SG432xxxxx and above”

Maintenance

An exploded view of the 16048G/H for parts identification is shown in **Figure 5-1** to **Figure 5-4**. Due to limited availability of RoHS compliance station and technical difficulties in RoHS soldering, only parts and support level that do not require RoHS soldering are supported. Replace all defective parts with their respective RoHS compliance part number. Do not disassemble any further than shown. Maintenance consists principally of cleaning contacts and replacing worn or damaged parts. Take special care when cleaning contacts.

To order parts, use the Keysight part numbers listed in **Table 5-1** to **Table 5-4**. 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.

Figure 5-1 Replacable Parts (part 1 of 4)

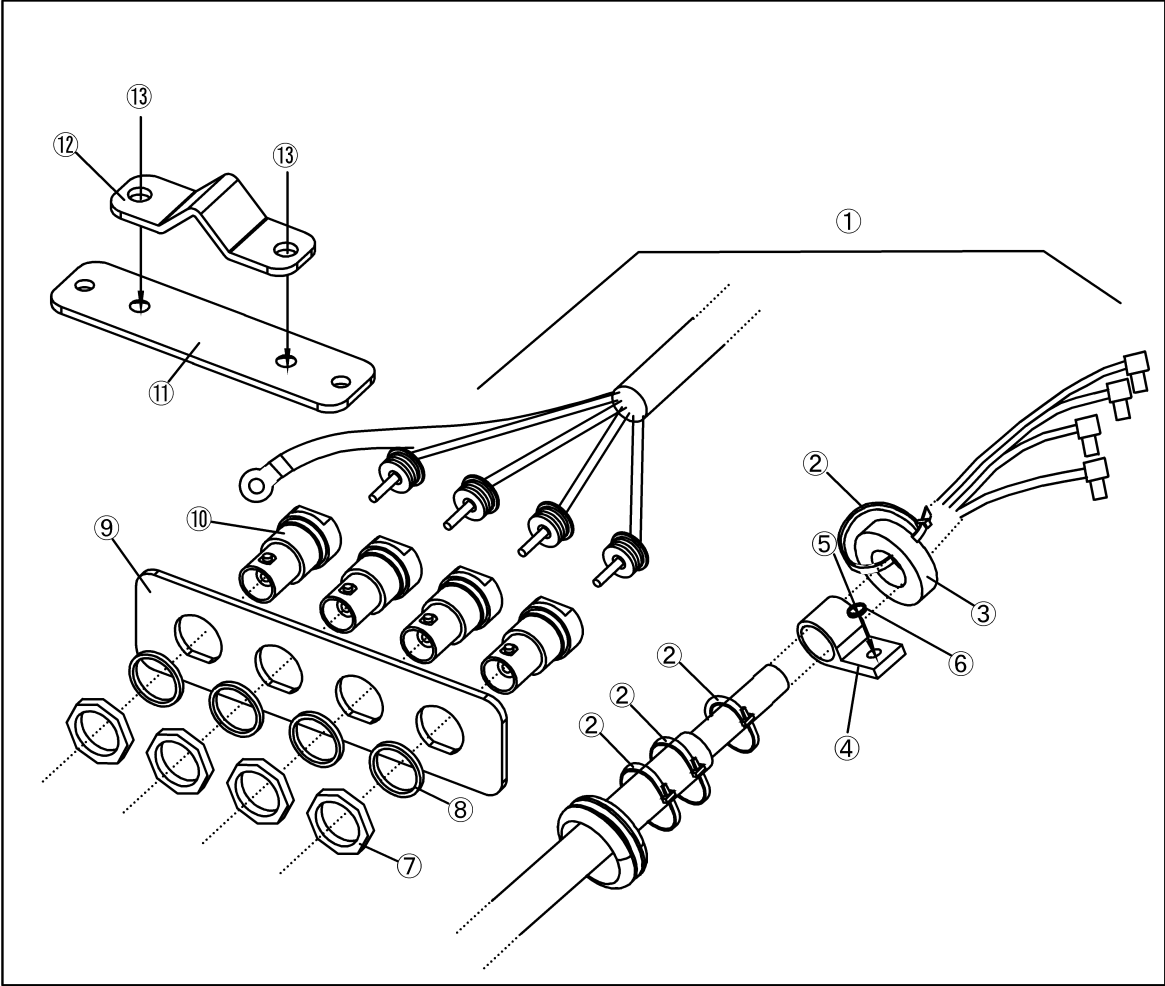


Table 5-1

Replacable Parts (part 1 of 4)

Reference Designator	Keysight Part No.	Keysight RoHS Compliant Part No.	Qty.	Description
1	16048-61620	16048-61620	1	CBL ASSY 16048G (Excludes 2,3,4,5,6)
	16048-61623	16048-61623	1	CBL ASSY 16048H (Excludes 2,3,4,5,6)
2	1400-0493	1400-0493	4	CABLE TIE
3	9170-1465	9170-2521	1	CORE
4	-	-	1	CBL CLANP
5	0515-1550	0515-0372	1	SCR M3-L 8 P-H
6	3050-0891	3050-0891	1	WASHER M3
7	2950-0035	2950-0035	4	NUT-HEX-DBL-CHAM
8	2190-0102	2190-0102	4	WASHER
9	16048-00623	16048-00623	1	GUIDE
10	1250-0252	1250-0252	4	CONN-RF BNC
11	16048-00626	16048-00676	1	PLATE
12	16048-00627	16048-00627	1	ANGLE
13	0515-1012	0515-2043	2	SCR FL M4L8

Figure 5-2 Replacable Parts (part 2 of 4)

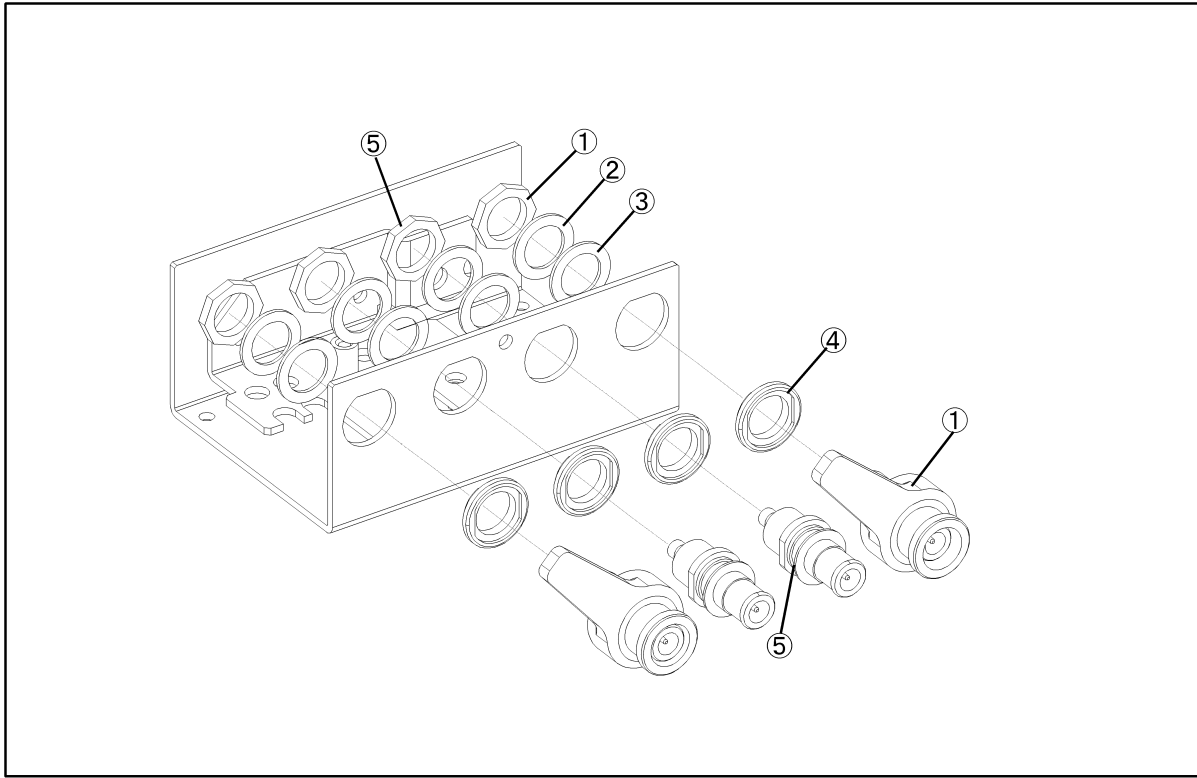


Table 5-2 Replacable Parts (part 2 of 4)

Reference Designator	Keysight Part No.	Keysight RoHS Compliant Part No.	Qty.	Description
1	16044-60001	5012-8618	2	CONN BNC-SMB
2	3050-0067	3050-0067	4	WSHR-FL MTLC
3	3050-0789	3050-0789	4	WSHR-FL NM
4	16047-40002	16047-40002	4	INSULATOR
5	1253-0476	5012-8630	2	ADPT BNC-SMB

Figure 5-3 Replacable Parts (part 3 of 4)

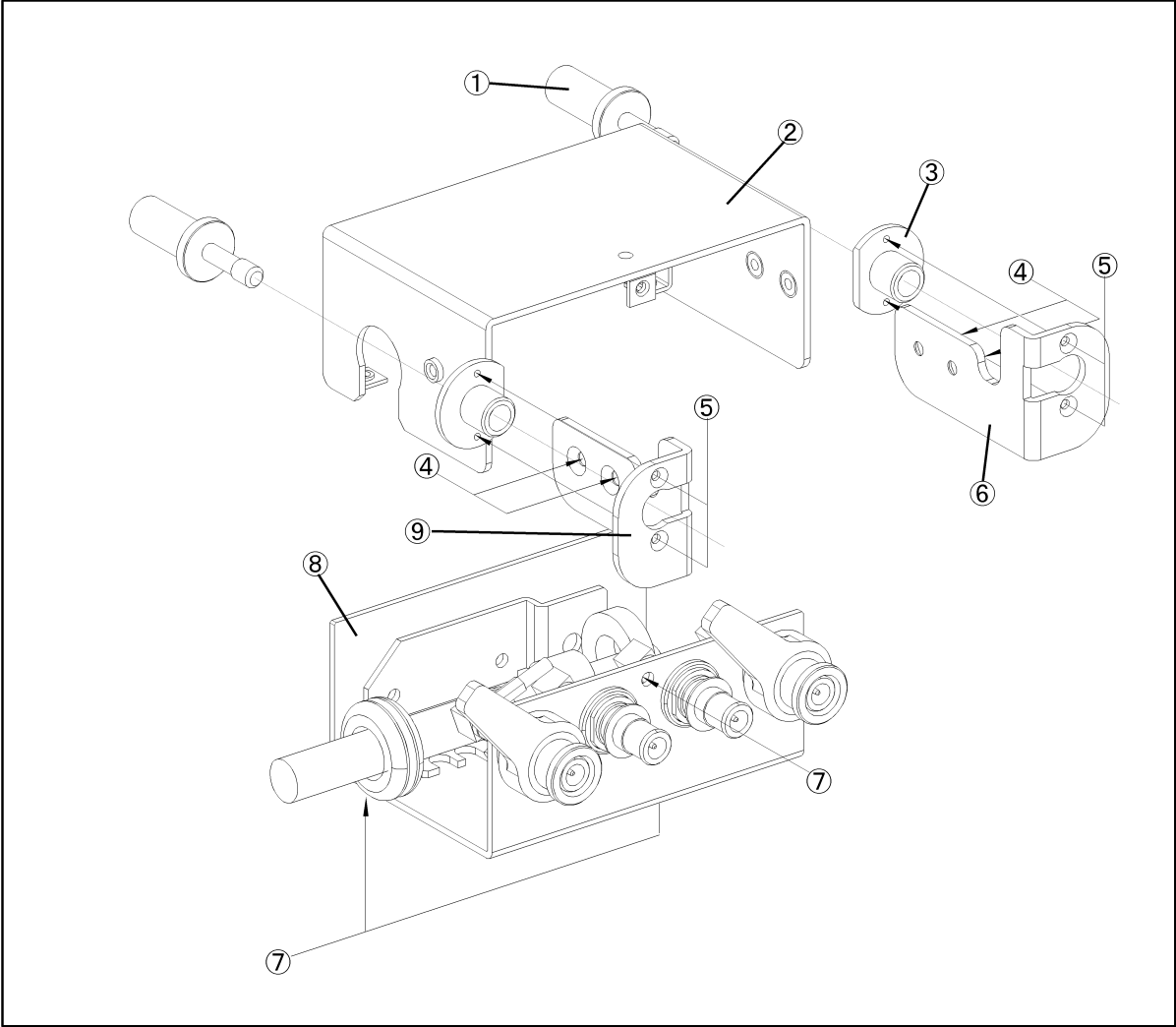


Table 5-3

Replacable Parts (part 3 of 4)

Reference Designator	Keysight Part No.	Keysight RoHS Compliant Part No.	Qty.	Description
1	16047-24021	16047-24021	2	KNOB
2	16048-04021	16048-04021	1	COVER TOP (16048G)
	16048-04025	16048-04025	1	COVER TOP (16048H)
3	16047-24026	16047-24026	2	FLANGE
4	0515-0914	0515-1946	4	SCR-MACH M3X0.5
5	0515-0952	0515-2151	4	SCR-MACH M2X0.4
6	16048-00624	16048-00624	1	ANGLE
7	0515-0914	0515-1946	3	SCR-MACH M3X0.5
8	16048-04022	16048-04022	1	COVER BOTTOM
9	16048-00625	16048-00625	1	ANGLE

Figure 5-4 Replacable Parts (part 4 of 4)

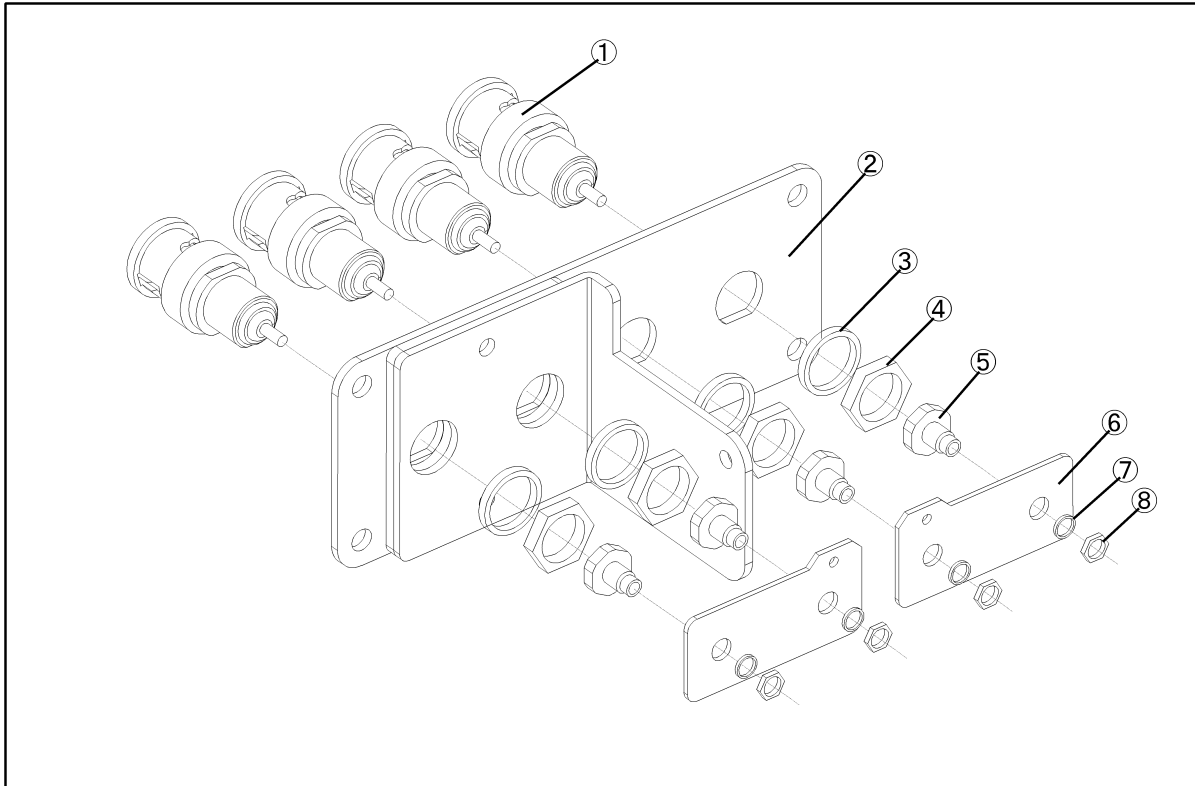


Table 5-4 Replacable Parts (part 4 of 4)

Reference Designator	Keysight Part No.	Keysight RoHS Compliant Part No.	Qty.	Description
1	1250-1985	5012-8627 ^a	4	CONNECTOR-BNC
2	16048-00621	16048-00671	1	PLATE
3	2190-0016	2190-0016	4	WASHER
4	2950-0043	2950-0043	4	NUT-HEX-DBL-CHAM
5	16380-24001	16380-24001 ^a	4	TERMINAL
6	42036-00601	42036-00601	2	PLATE
7	3050-0893	3050-0893	4	WASHER
8	0535-0043	0535-0043	4	NUT

a. 1+5, 16048-65001, SUB ASSEMBLY - For Service Center only.

Service
Maintenance

This information is subject to change without notice.
© Keysight Technologies 1999 - 2019
Edition 5, August 19, 2019



16048-90050
www.keysight.com