

# Keysight 281A/B Adapters



Operating  
and Service  
Manual



NOTICE: This document contains references to Agilent Technologies. Agilent's former Test and Measurement business has become Keysight Technologies. For more information, go to [www.keysight.com](http://www.keysight.com).



# Notices

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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.

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### 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.

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## Certification

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

## Warranty

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This Keysight Technologies system product is warranted against defects in materials and workmanship for a period corresponding to the individual warranty periods of its component products. Instruments are warranted for a period of one year. During the warranty period, Keysight Technologies will, at its option, either repair or replace products that prove to be defective.

Warranty service for products installed by Keysight Technologies and certain other products designated by Keysight Technologies will be performed at Buyer's facility at no charge within Keysight Technologies service travel areas. Outside Keysight Technologies service travel areas, warranty service will be performed at Buyer's facility only upon Keysight Technologies' prior agreement and Buyer shall pay Keysight Technologies' round trip travel expenses. In all other areas, products must be returned to a service facility designated by Keysight Technologies.

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Keysight Technologies warrants that its software and firmware designated by Keysight Technologies for use with an instrument will execute its programming instructions when properly installed on that instrument. Keysight Technologies does not warrant that the operation of the instrument, or software, or firmware will be uninterrupted or error free.

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The remedies available under this warranty will be defined in, and subject to, the terms and limitations of the warranties contained in the contract of sale. To the extent permitted by local law, this warranty applies only to branded Keysight Technologies products and not to products manufacture by others that may be sold or distributed by Keysight Technologies. Nothing in this warranty will be construed to limit any rights or remedies provided elsewhere in the contract of sale with respect to matters other than year 2000 compliance.

## Assistance

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

For assistance, call your local Keysight Technologies Sales and Service Office (Refer to ["Contacting Keysight" on page 7](#)).

## Safety Earth Ground



This is a Safety Class I product (provided with a protective earthing terminal). An uninterruptible safety earth ground must be provided from the main power source to the product input wiring terminals, power cord, or supplied power cord set. Whenever it is likely that the protection has been impaired, the product must be made inoperative and secured against any unintended operation.

## **Before Applying Power**

Verify that the product is configured to match the available main power source as described in the input power configuration instructions in this manual. If this product is to be powered by autotransformer, make sure the common terminal is connected to the neutral (grounded) side of the ac power supply.

## Contacting Keysight

For more information, please contact your nearest Keysight office.

### Americas

Canada	(877) 894-4414
Latin America	305 269 7500
United States	(800) 829-4444

### Asia Pacific

Australia	1 800 629 485
China	800 810 0189
Hong Kong	800 938 693
India	1 800 112 929
Japan	81 426 56 7832
Korea	080 769 0800
Malaysia	1 800 888 848
Singapore	1 800 375 8100
Taiwan	0800 047 866
Thailand	1 800 226 008

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Austria	0820 87 44 11
Belgium	32 (0) 2 404 93 40
Denmark	45 70 13 15 15
Finland	358 (0) 10 855 2100
France	0825 010 700
Germany	01805 24 6333
Ireland	1890 924 204
Italy	39 02 92 60 8484
Netherlands	31 (0) 20 547 2111
Spain	34 (91) 631 3300
Sweden	0200-88 22 55
Switzerland(French)	41 (21) 8113811 (Opt 2)
Switzerland(German)	0800 80 53 53 (Opt 1)
United Kingdom	44 (0) 118 9276201
Other European Countries:	<a href="http://www.keysight.com/find/contactus">www.keysight.com/find/contactus</a>

Or, go to [www.keysight.com/find/assist](http://www.keysight.com/find/assist) for more information.

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# **1 Introduction**

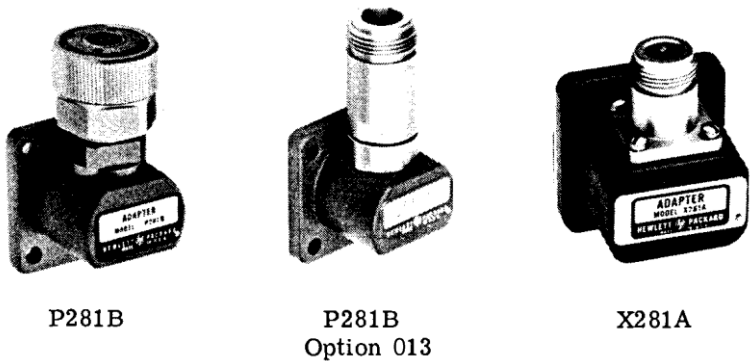
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This chapter provides an overview of the Keysight 281A/B Adapters.

## Product Overview

Keysight 281 adapters provide a convenient means of coupling between waveguide and coaxial systems. Power can be transmitted in either direction, and each adapter covers the full frequency range of its waveguide size with an SWR of less than 1.30. The flanges are lapped to a slight, controlled convexity to assure minimum leakage at the waveguide joint. A probe transforms the waveguide impedance to the 50- $\Omega$  impedance of coaxial line. Complete specifications for the adapters are given in Table 1.

Examples of the waveguide flange and coaxial connectors used on these adapters are shown in Figure 1-1. One type of flange and two types of coaxial connectors are used: Type N female connectors (which are compatible with connectors conforming to MILS-71), are available on all 281A adapters and Amphenol precision 7-mm connectors (available on the 281B adapters). The 7-mm connector features precise alignment, a clearly defined reference plane, and low RF leakage. In addition, any pair can be connected together without an adapter. Option 013 adapters have stainless steel Type N female connectors and are available on the P281B.



**Figure 1-1** Adapters Showing Flange Types and Coaxial Connector Styles

## **2 Installation**

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“Protect Flanges” on page 16

“Operating Procedure” on page 16

“Performance Test” on page 16

This chapter provides you important information on how to check and prepare your instrument for operation.

## Initial Inspection

- 1 Unpack and inspect the shipping container and its contents thoroughly to ensure that nothing was damaged during shipment. If the shipping container or cushioning material is damaged, the contents should be checked both mechanically and electrically. Check for mechanical damage such as scratches or dents. If the shipping container is not damaged, check the packaging material for signs of stress that indicate rough handling in transit. If the adapter appears undamaged, perform the electrical check.

The electrical performance of the adapter should be checked as soon as possible after receipt against the specifications shown in [Table 3-1 on page 18](#). If the adapter does not perform within the specifications, see the following steps for recommended claim procedure and repackaging the instrument.

- 2 If the contents are damaged or defective, contact your nearest Keysight Technologies Service and Support Office. Refer to [“Contacting Keysight”](#) in the front matter of this manual. Keysight Technologies will arrange for repair or replacement of the damaged or defective equipment. Keep the shipping materials for the carrier’s inspection.
- 3 If you are returning the instrument under warranty or for service, repackaging the instrument requires original shipping containers and materials or their equivalents. Keysight Technologies can provide packaging materials identical to the original materials. Refer to [“Contacting Keysight”](#) in the front matter of this manual for the Keysight Technologies nearest to you. Attach a tag indicating the type of service required, return address, model number, and serial number. Mark the container **FRAGILE** to assure careful handling. In any correspondence, refer to the instrument by its model number and serial number.

- 4 If you are repackaging the instrument with commercially available materials, use the following general instructions:
  - a Wrap the adapter in heavy paper or plastic. (If shipping to an Keysight Technologies office or service center, attach a tag indicating the type of service required, return address, model number, and serial number.)
  - b Use a strong shipping container. A double-wall carton made of 350-pound test material is adequate.
  - c Use enough shock-absorbing material (3 to 4-inch layer) around all sides of the adapter to provide firm cushioning and prevent movement inside the container.
  - d Seal the shipping container securely.
  - e Mark the shipping container ***FRAGILE*** to assure careful handling.

## Operation

### Protect Flanges

Care should be taken to protect the face of the flange from any damage that would prevent close surface-to-surface contact. Any burring, denting, or scratching will increase RF leakage and the reflection coefficient of the joint. The supplied plastic cover should be used to protect the flange when the adapter is not in use.

### Operating Procedure

Use the following procedure when you connect an adapter to a waveguide.

- 1 Make sure the rectangular ports are oriented the same way (i.e., not "cross-guided").
- 2 Align ports carefully to minimize reflections.
- 3 Clamp or bolt flanges securely together so that pressure is evenly distributed over the contacting surfaces. Loose joints and flange distortion result in leakage and mismatch.

### Performance Test

The maximum SWR for the adapters are listed in [Table 3-1 on page 18](#). When making these measurements, the test results must be less than those listed in [Table 3-1](#) plus the measurement uncertainty of the measurement system. Measurements may be made using a standard reflectometer setup. To ensure satisfactory performance, make sure flanges and coaxial connectors are not damaged or worn.

# **3**

## **Specification**

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This chapter provides the specifications of the Keysight 281A/B Adapters.

## General Specifications

### Physical Specifications

Model	X281A	P281B
Weight	0.1 kg (1/4 lb)	0.1 kg (3/16 lb)
Length	37 mm (1-7/16 in)	26 mm (1 in)

### Specifications

**Table 3-1** Specifications

Model	X281A	P281B
Frequency range (GHz) <sup>*</sup>	8.20 to 12.40	12.40 to 18.00
Fits waveguide size:		
Nom. OD (in.)	1 x 1/2	0.702 - 0.391
EIA	WR90	WR62
Equivalent flange	UG135/U	UG419/U
Coaxial connector <sup>†</sup>	N female	APC-7 <sup>‡</sup>

\* Maximum Reflection Coefficient: 0.11 (1.25 SWR) over entire frequency range.

† Typical maximum power handling capability for the Type N and APC-7 connectors is 200 W (refer to caution below).

‡ Option 013 furnished with stainless steel Type N female connector.

#### CAUTION

The power that can be handled will be a function of the size of the center conductor. The majority of the heat flow will be via conduction. The weak point is the coax portion. The waveguide portion is capable of higher power. These numbers are assuming an ambient temperature of 25 °C and an altitude of sea level. Higher ambient temperatures and altitude would degrade power-handling capability.

# Mechanical Characteristic

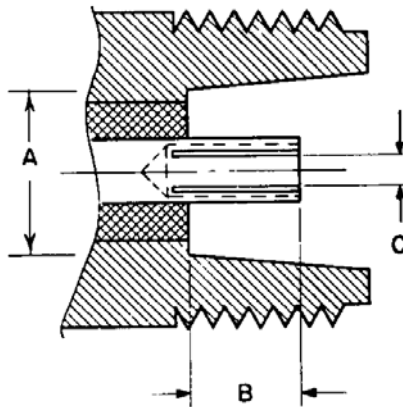
## Connector Types

### Type N Connectors

Two versions of the Type N coaxial connector are used on the adapters: one is used on the 281A model, and the other is used in the 281B Option 013 model.

The version on the 281A model is plated brass and is compatible with connectors conforming to MIL-C-71. The version on the 281B Option 013 model is stainless steel and is compatible with connectors conforming to MIL-C-71 or MIL-C-39012.

Dimensions of these connectors are given in [Figure 3-2](#) and [Table 3-2](#).



**Figure 3-2** Dimensions of Type N Connectors

### 3 Specification









**Table 3-2** Dimensions of Type N Connectors

<b>Model</b>	<b>281A</b>	<b>281B</b>
A	0.316 min	0.316 min
	0.320 max	0.320 max
B	0.188 min	0.204 min
	0.206 max	0.207 max
C	0.063 min	0.063 min
	0.066 max	0.066 max

#### **Precision 7 mm Connectors**

Except for Option 013, the 281B model adapter has an APC-7 precision 7-mm coaxial connector. These connectors rely on uniform end-to-end contact of both conductors for electrical continuity. Consequently, the condition of the contacting surfaces is critical: they should be kept clean and smooth. To prevent damage when the adapter is not in use, the connector's threaded sleeve should be fully extended.

## Safety and Regulatory Markings

	This symbol indicates that you should refer to the instrument's instruction manual for important information.
	This symbol indicates hazardous voltages.
	The laser radiation symbol is marked on products that have a laser output.
	This symbol indicates that the instrument requires alternating current (ac) input.
	The CE mark is a registered trademark of the European Community. If it is accompanied by a year, it indicates the year the design was proven.
	The CSA mark is a registered trademark of the Canadian Standards Association.
<b>ISM1-A</b>	This text indicates that the instrument is an Industrial Scientific and Medical Group 1 Class A product (CISPER 11, Clause 4).
	This symbol indicates that the power line switch is ON.
	This symbol indicates that the power line switch is OFF or in STANDBY position.

## **Declaration of Conformity**

A copy of the Manufacturer's Declaration of Conformity for this instrument can be obtained by contacting your local Keysight Technologies sales representative.

## **4 Service Information**

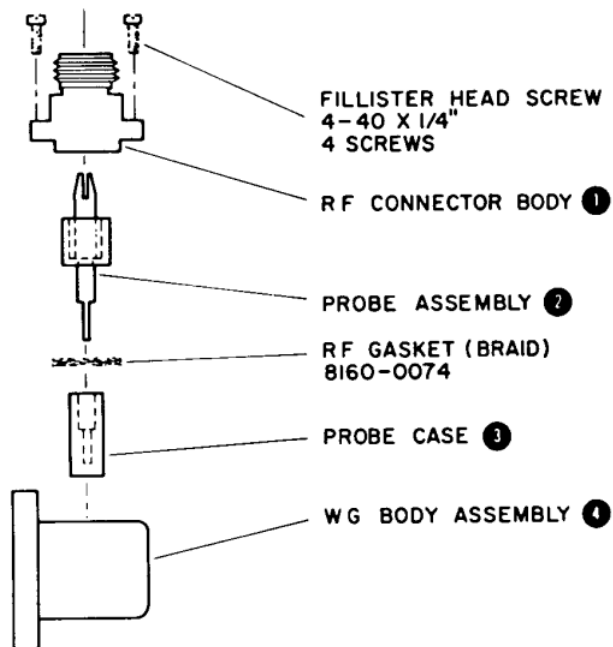
Replaceable Parts 24

This chapter lists the available replaceable parts for the Keysight 281A/B Adapters.

## Replaceable Parts

The 281A may be disassembled for part replacement, but the 281B should be returned to Keysight because liquid nitrogen and special wrenches and gauges are needed for assembly.

The exploded view of [Figure 4-1](#) gives information for ordering replaceable parts and can be used as an assembly guide. To obtain a replaceable part, give the adapter's full model number and part number from [Table 4-1](#), and address the order to the nearest Keysight Technologies office.



**Figure 4-1** 281A Replaceable Parts

**Table 4-1** 281A Replaceable Parts

Item No.	Description	Model No.	Keysight Part No.
1	RF Connector body	X281A	5020-0213
2	Probe Assembly: Probe Body* Probe Insulator*	X281A	Not applicable 00281-20025 00281-20106
3	Probe Case	X281A	X281A-5
4	X-band	X281A	00281-20017
	Flange Cap (not shown):		
	X-band	X281A	5040-0354
	P-band	P281B	5040-0358

\* This part is a subcomponent of item number 2 (Probe Assembly for X281A).

**NOTE**

All 281B adapters should be returned for part replacement.

#### **4 Service Information**

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