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Agilent Technologies  
X/P/K281C Adapters  
Including Options 006, 012, 013

Operating and  
Service Manual

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00281-90043

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Country	Phone Number	Fax Number
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Malaysia	1-800-828-848	1-800-801664
Philippines	(632) 8426802 1-800-16510170 (PLDT Subscriber Only)	(632) 8426809 1-800-16510288 (PLDT Subscriber Only)
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Taiwan	0800-047-866	(886) 2 25456723
People's Republic of China	800-810-0189 (preferred) 10800-650-0021	10800-650-0121
India	1-600-11-2929	000-800-650-1101

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## Safety and Regulatory Information

Review this product and related documentation to familiarize yourself with safety markings and instructions before you operate the instrument. This product has been designed and tested in accordance with international standards.

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### WARNING

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

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### CAUTION

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The **CAUTION** notice denotes a hazard. It calls attention to an operating procedure, practice, or the like, which, 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.

## Instrument Markings



When you see this symbol on your instrument, 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 C-Tick mark is a registered trademark of the Australian Spectrum Agency.



The CSA mark is a registered trademark of the Canadian Standards Association.

1SM1-A

This text indicates that the instrument is an Industrial Scientific and Medical Group 1 Class A product (CISPER 11, Clause 4).

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This ISM device complies with Canadian ICES-001.  
Cet appareil ISM est conforme à la norme NMB du Canada

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This symbol indicates that the power line switch is ON.

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This symbol indicates that the power line switch is OFF or in STANDBY position.

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## 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.

## General Information

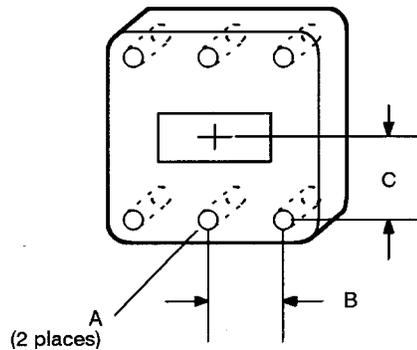
### Description

The X281C, P281C, and K281C 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. A step-like internal structure transforms the waveguide impedance to the 50  $\Omega$  impedance of the coaxial line.

**Option 006** Option 006 adds two alignment holes to the waveguide flange. The dimensions of the Option 006 alignment holes are provided in the following table.

**Table 1** Option 006 Alignment Hole Measurement Dimensions

Model Number	Alignment Hole Diameter "A"	Dimension "B"	Dimension "C"
X281C	3.175 mm (+ 0.014 to 0.0)	15.49 mm	16.26 mm
P281C	3.175 mm (+0.014 to 0.0)	12.62 mm	12.14 mm
K281C	2.381 mm (+0.014 to 0.0)	8.13 mm	8.51 mm



**Figure 1** K281C Option 006 Waveguide Alignment Holes

## General Information

- Option 012** Option 012 for the X281C offers a Type-N (m) connector to replace the standard 7-mm connector.
- Option 013** Option 013 for the X281C offers a Type-N (f) connector to replace the standard 7-mm connector. Option 013 is not offered for the K281C and the P281C.

## Instruments Covered by Manual

The adapters covered by this manual have a two part serial number. The first four digits and letter constitute the serial number prefix. The last five digits form the sequential suffix that is unique to each adapter. The contents of this manual apply to adapters prefixed at 3032A and above.

## Incoming Inspection

Inspect the shipping container for damage. Inspect the adapter for any mechanical damage incurred in transit. 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 adapter has been checked mechanically and electrically.

## Returning for Service

If you need to return the adapters for service, complete one of the blue repair tags located at the end of this manual and attach it to the device. If no repair tag is available, attach a tag indicating the type of service required, your return address, model number, and serial number of the adapter to be repaired.

Repackaging the adapter requires original shipping containers and materials or their equivalents. Agilent can provide packaging materials identical to the original materials. To contact the Agilent Technologies nearest you, refer to [“Service and Support” on page iv](#).

## Storage and Shipment Environment

Store the adapter in a clean, dry environment. The following environmental limitations apply to both storage and shipment.

Temperature	– 55 to 75 °C
Humidity	< 95% relative at + 40 °C
Altitude	< 15,000 meters (50,000 feet)

## Specifications

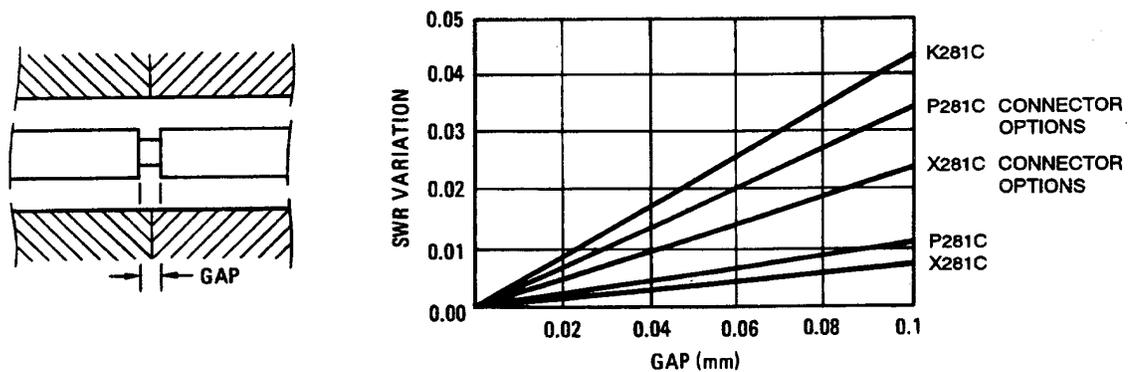
Specifications shown in [Table 2](#) are the performance standards against which the adapter may be tested.

**Table 2** *Specifications*

	X281C	P281C	K281C
Frequency range (GHz)	8.2 to 12.4	12.4 to 18	18 to 26.5
SWR <sup>1</sup>	< 1.05	< 1.06	< 1.07
(Typical SWR)	(< 1.03)	(< 1.04)	(< 1.05)
Operating temperature	0 to +55 °C	0 to +55 °C	0 to +55 °C

1. Specifications in this table are measured with no gap between the full diameters of the male and female center conductors.

[Figure 2](#) shows the variation in SWR introduced by the center conductor gap.



**Figure 2** *Typical SWR Variation Versus Center Conductor Gap*

## Specifications

Supplemental characteristics listed in [Table 3](#) are non-warranted performance parameters that are included as additional information for the user.

**Table 3** *Supplemental Characteristics*

	X281C	P281C	K281C
Typical insertion loss	0.08 dB	0.10 dB	0.12 dB
Maximum peak power <sup>1</sup>	200 W	200 W	100 W
Waveguide size:			
Nominal outer diameter	25.40 x 12.70 (mm)	17.83 x 9.93 (mm)	12.70 x 6.35 (mm)
	1.00 x 0.50 (in)	0.70 x 0.39 (in)	0.50 x 0.25 (in)
EIA	WR90	WR62	WR42
Equivalent flange type	UG-135/U	UG-419/U	UG-597/U
Dimensions: L x W x H	73 x 41 x 61 (mm)	52 x 33 x 55 (mm)	35 x 22 x 38 (mm)
	2.9 x 1.6 x 2.4 (in)	2.0 x 1.3 x 2.2 (in)	1.4 x 0.9 x 1.5 (in)
Net weight	210 g (7.20 oz)	110 g (4.0 oz)	40 g (1.3 oz)
Connector type:			
Standard	7-mm	7-mm	APC-3.5 mm female
Option 012	N-male	not available	APC-3.5 mm male
Option 013	N-female	not available	Not available

1. 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 degrees centigrade and an altitude of sea level. Higher ambient temperatures and altitude would degrade power-handling capability.

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## Operation

Before connecting the adapter, note the precautions below.

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### CAUTION

- Exceeding the energy and power levels shown in [Table 1](#) may result in damage to the adapter or associated equipment.
- 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 may increase RF leakage and the reflection coefficient of the waveguide connection. The supplied plastic cover should be used to protect the flange when the adapter is not in use.
- 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 degrees centigrade and an altitude of sea level. Higher ambient temperatures and altitude would degrade power-handling capability.

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### Operating Environment

Temperature	0 to 55 °C
Humidity	< 95% relative at + 40 °C
Altitude	< 4,600 meters (15,000 feet)

### Operating Procedures

When you connect an adapter to waveguide:

1. Make sure the rectangular ports are oriented the same way; that is, 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 waveguide connections and flange distortion may result in leakage and mismatch.

### Performance Test - SWR

The maximum SWR for the adapters are shown in [Table 2](#) and [Figure 2](#). When making these measurements, the test results must be less than those listed in [Table 2](#) plus the measurement uncertainty of the measuring system. Measurement may be made using a standard reflectometer setup. To ensure satisfactory performance, make sure flanges and coaxial connectors are not damaged or worn.

### Adjustments

Adjustments should not be made unless the adapter does not meet specifications, or unless the unit has been physically damaged.

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## Service Information

### Replacing the Center Conductor Contact

Not all parts on the adapters are replaceable, but all of the adapters have a replaceable center conductor contact.

When you replace the center conductor contact, observe the following precautions:

- Before installing the new center conductor contact, apply Loctite sealant #222 to the threads of the center conductor.
- Do not use excessive force when tightening center conductor parts.

### Models K281C and K281C Option 012

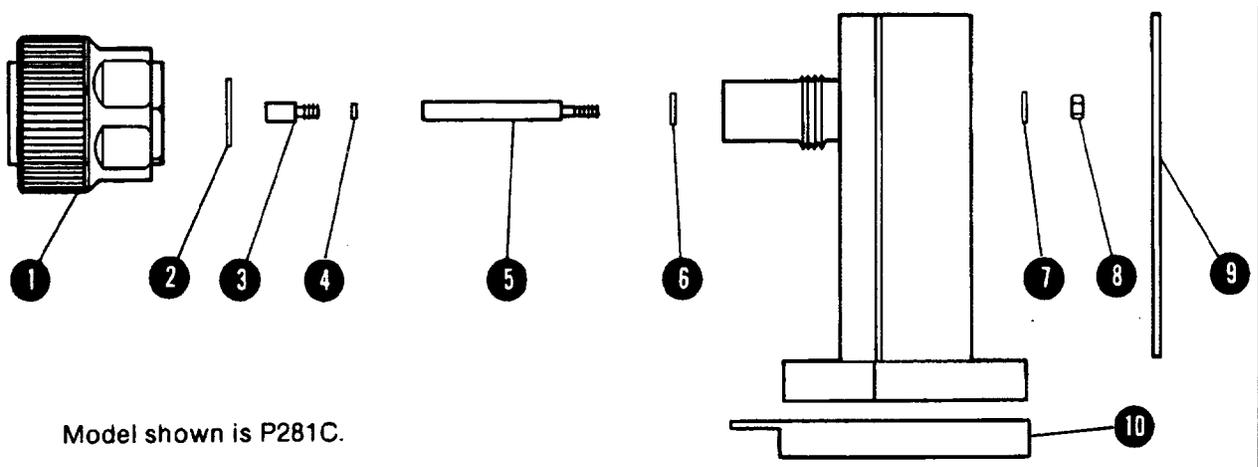
To replace the center conductor, you will need a 5/64 inch hexagonal nut driver.

In some units, the center conductor mounting hole was made oversized to allow for a slight adjustment. When the center conductor is replaced in these units, it may be necessary to readjust and retest if the unit does not meet specifications.

If the mounting hole appears to be oversized, mount the center conductor toward one end of the adapter as far as it will go. If the adapter fails the performance test, move the center conductor toward the opposite end and then retest.

## Replaceable Parts

Replaceable parts for P281C adapter are shown below. Refer to [Table 4](#), [Table 5](#), and [Table 6](#) for identification of parts and corresponding part numbers for all models. For ordering information, contact the nearest Agilent office listed in “[Service and Support](#)” on page iv.



Model shown is P281C.

**Figure 3** *Replaceable Parts*

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**NOTE**

[Table 1 on page 1](#) gives dimensional tolerances for Option 006 that can be expected to yield satisfactory results. It may be necessary to try various combinations of spacers and shims to obtain proper dimensions. The use of at least one shim is recommended because of electro-chemical differences between the connector body and the adapter body. Refer to the appropriate table of replaceable parts for the thickness of shims and spacers.

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**CAUTION**

Take care to avoid damaging parts. Burring, scratching, denting or deforming parts may impair operating characteristics.

## Replaceable Parts

**Table 4 X281C Replaceable Parts**

Item No.	Description	Part Number
1	Connector body	1250-1466
2	Spacer	00281-20027 (0.05 mm)
	or	00281-20028 (0.075 mm)
	or	00281-20049 (0.025 mm)
3	Center conductor contact	
	G-slotted	85050-20001
	Collet holder	85130-20002
4	Shim	5020-8540 (0.013 mm)
	or	5020-8541 (0.025 mm)
5	Center conductor	Not replaceable
6	Spacer	Not replaceable
7	Washer	Not replaceable
8	Nut	Not replaceable
9	Blank label	Not replaceable
10	Flange cap	5040-0354
<b>X281C Option 012</b>		
1	Connector body	
	Male	1250-0916
	Nut	1250-0918
	Ring	1250-0016
2	Spacer	00281-20027 (0.05 mm)
	or	00281-20028 (0.075 mm)
	or	00281-20049 (0.025 mm)
3	Center conductor contact	5180-0988
4	Shim	5020-8540 (0.013 mm)
	or	5020-8541 (0.025 mm)
5	Center conductor	Not replaceable
6	Spacer	Not replaceable
7	Washer	Not replaceable
8	Nut	Not replaceable
9	Blank label	Not replaceable
10	Flange cap	5040-0354

**Table 4 X281C Replaceable Parts (Continued)**

Item No.	Description	Part Number
<b>X281C Option 013</b>		
1	Connector body	1250-0914
2	Spacer	00281-20027 (0.05 mm)
	or	00281-20028 (0.075 mm)
	or	00281-20049 (0.025 mm)
3	Center conductor contact	5180-0854
4	Shim	5020-8540 (0.013 mm)
	or	5020-8541 (0.025 mm)
5	Center conductor	Not replaceable
6	Spacer	Not replaceable
7	Washer	Not replaceable
8	Nut	Not replaceable
9	Blank label	Not replaceable
10	Flange cap	5040-0354

**Table 5 P281C Replaceable Parts**

Item No.	Description	Part Number
1	Connector body	1250-1466
2	Spacer	00281-20027 (0.05 mm)
	or	00281-20028 (0.075 mm)
	or	00281-20049 (0.025 mm)
3	Center conductor contact	
	G-slotted	85050-20001
	Collet holder	85130-20002
4	Shim	5020-8540 (0.013 mm)
	or	5020-8541 (0.025 mm)
5	Center conductor	Not replaceable
6	Spacer	Not replaceable
7	Washer	Not replaceable
8	Nut	Not replaceable
9	Blank label	Not replaceable
10	Flange cap	5040-0358

## Replaceable Parts

**Table 6** *K281C Replaceable Parts*

Item No.	Description	Part Number
1	Connector body	1250-1507
2	Spacer	5021-9679 (0.013 mm)
	or	5021-9680 (0.025 mm)
	or	5021-9681 (0.051 mm)
3	Center conductor contact	00281-20043
6	Spacer	000281-20045
7	Washer	3050-0261
8	Nut	0608-0003
9	Blank label	Not replaceable
10	Flange cap	5040-0357
<b>Needed But Not Supplied</b>		
5/64 inch hexagonal nut driver		
<b>K218C Option 012</b>		
1	Connector body	1250-1509
2	Spacer	5021-9679 (0.013 mm)
	or	5021-9680 (0.025 mm)
	or	5021-9681 (0.051 mm)
3	Center conductor contact	00281-20044
6	Spacer	000281-20045
7	Washer	3050-0261
8	Nut	0608-0003
9	Blank label	Not replaceable
10	Flange cap	5040-0357
<b>Needed But Not Supplied</b>		
5/64 inch hexagonal nut driver		
<b>Miscellaneous Items</b>		
	Loctite #222	0470-0573
	Operating and Service Manual	00281-90043

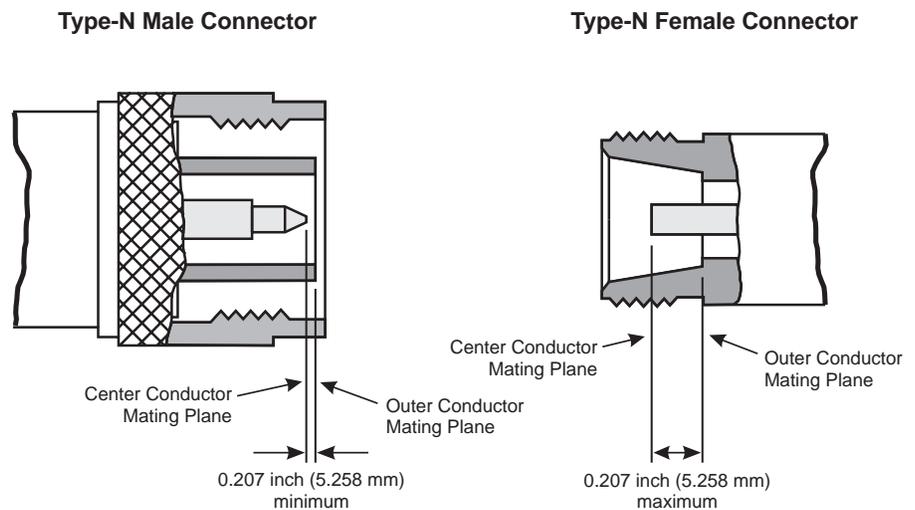
## Connector Types

Pin depth is the distance that the center conductor mating plane differs from being flush with the outer conductor mating plane. The pin depth of a connector can be in one of two states, protruding or recessed.

Figure 4, Figure 5, and Figure 6 show a visual representation of proper pin depth for connector types for standard and option models.

**Table 7 Connector Types for Standard and Options**

	X281C	P281C	K281C
Standard	7-mm	7-mm	APC-3.5 mm female
Option 012	N-male	Not available	APC-3.5 mm male
Option 013	N-female	Not available	Not available



**Figure 4 Type-N Connectors**

Connector Types

3.5-mm Male Connector

3.5-mm Female Connector

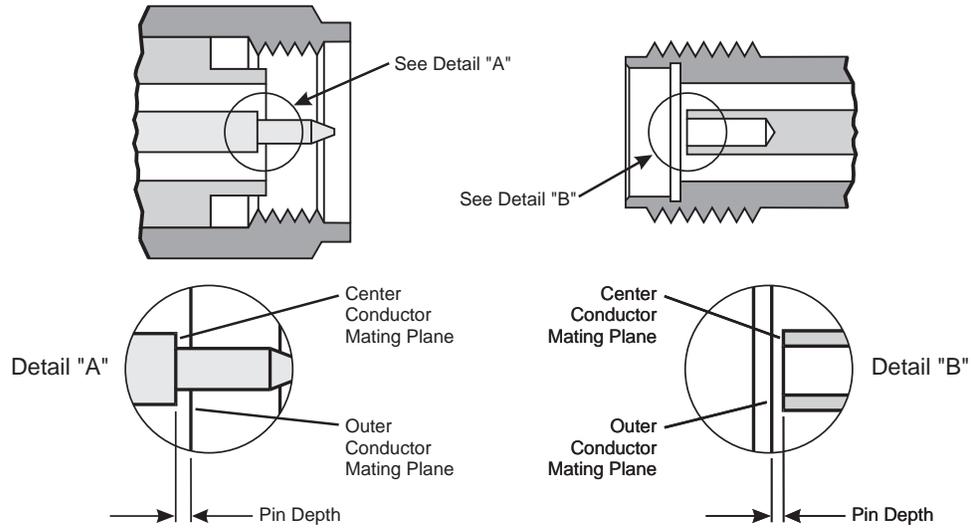


Figure 5 3.5-mm Connectors

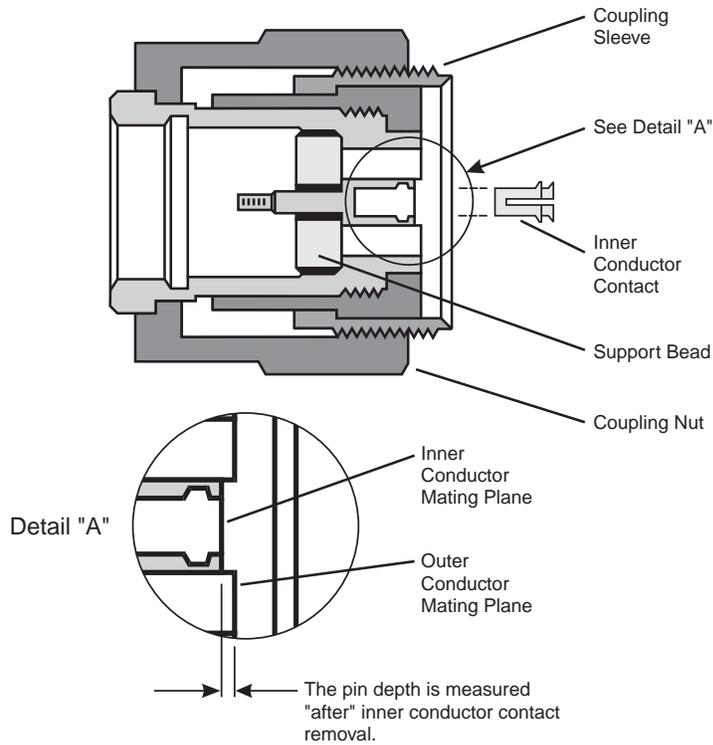


Figure 6 7-mm Connector