

# **User's and Service Guide**

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**11667A**

**DC to 18 GHz Power Splitter**

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## General Information

The 11667A power splitter is a two-resistor type power splitter for use in network measurements where one arm of the power splitter is used for leveling or to supply a reference signal for a ratio measurement.

## Specifications

The specifications are listed in [Table 1](#). These specifications are the performance standards or limits, against which the power splitter may be tested. The typical operating characteristics are provided in [Table 2, “Typical Operating Characteristics,” on page 4](#). They are included as additional information only; they are not specifications.

**Table 1 11667A Specifications**

	Frequency (GHz)		
	DC to 4	4 to 8	8 to 18
<b>Input SWR</b>	≤1.15	≤1.25	≤1.45
<b>Equivalent Output SWR</b> (Leveling or ratio measurement)	≤1.10	≤1.20	≤1.33 <sup>1</sup>
<b>Output Tracking</b> (between output arms)	0.15 dB	0.20 dB	0.25 dB

1. ≤ 1.38 for Option 002

**Frequency Range:** DC to 18 GHz

**Maximum Input Power:** +27 dBm

### Connectors:

Type-N Female on all ports

Option 001: Type-N Male on the Input and Type-N Female on the Output Ports

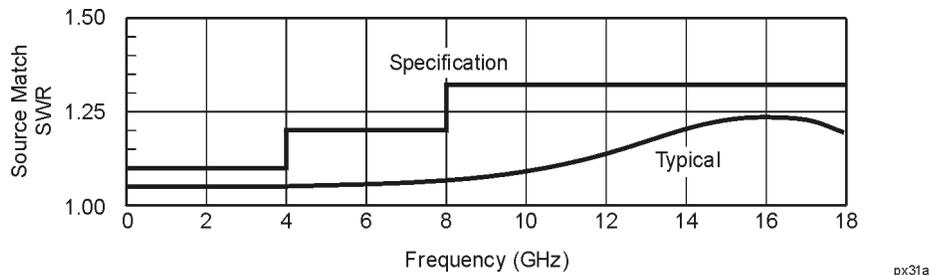
Option 002: Type-N Female on the Input and APC-7 on the Output Ports

**Dimensions:** 52mm wide x 46mm high x 21.3mm deep (2.06 in. x 1.82 in. x 0.84 in.)

**Shipping Weight:** 0.22 kg (8 oz.)

**Table 2 Typical Operating Characteristics**

	Frequency (GHz)		
	DC to 4	4 to 8	8 to 18
<b>Phase Tracking</b> (between output arms), typically:	$\leq 0.5^\circ$	$\leq 1.5^\circ$	$\leq 3.0^\circ$
<b>Insertion Loss:</b> 6 dB nominal (input to either output)	$\leq -0.2$ , +0.6 dB	$\leq -0.2$ , +1.0 dB	$\leq -0.2$ , +1.8 dB

**Figure 1 Leveling or Ratio Measurement Source Match Graph**


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**CAUTION** Applying a signal greater than +27 dBm (0.5 Watts) may result in damage to the power splitter.

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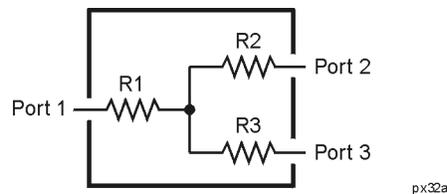
## Options

The standard 11667A power splitter is supplied with a female type-N on all three ports. The Option 001 provides a type-N male connector on the input and two type-N female connectors on the output ports. The Option 002 is supplied with a type-N female connector on the input and APC-7 connectors on the output ports.

## Description

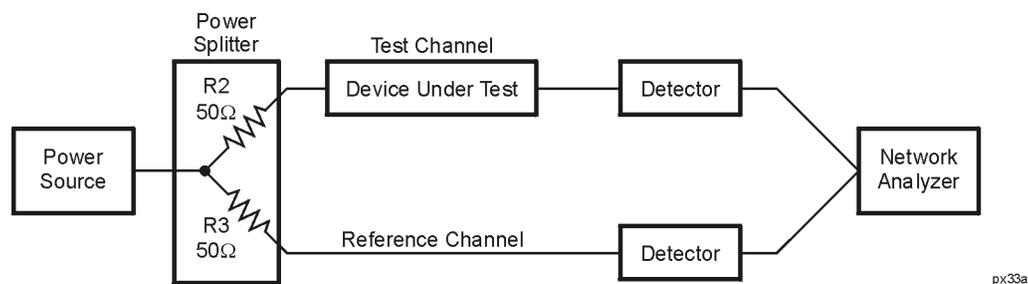
The 11667A is a two-resistor power splitter for use in measurement systems where one arm is an active arm. The active arm may be a leveling loop, or a reference channel of the network analyzer for making a ratio measurement.

Power splitters used for wide-frequency coverage are usually of the resistive type. The generalized form of a power splitter is shown in [Figure 2, on page 5](#).

**Figure 2 Typical Power Splitter Diagram**

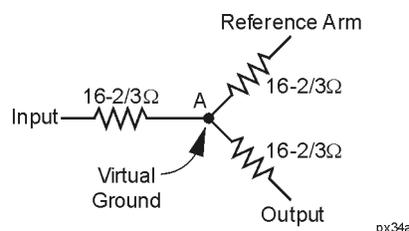
For simple power-dividing, a resistance value of  $16 \frac{2}{3} \Omega$  in each arm will give an output impedance of  $50 \Omega$  on any port, provided that all other ports are terminated in the characteristic impedance of  $50 \Omega$ .

A network analyzer measurement system, as shown in [Figure 3](#), uses the recommended two-resistor type power splitter. Here  $R2 = R3 = 50 \Omega$ , and  $R1 = 0 \Omega$ . The two-resistor power splitter, such as model 11667A, provides a better output SWR when used in leveling or in ratio measurement applications.

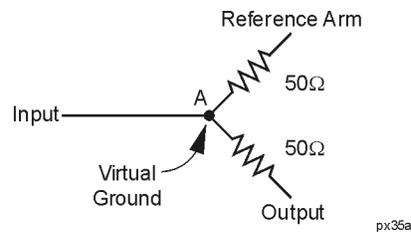
**Figure 3 Simplified Diagram of a Network Analyzer System**

When a power splitter is used in a network analyzer system, the node at the fork of the power splitter is kept at a fixed voltage by the AGC action of the network analyzer's reference channel. Since this action forces the node to be held at a constant voltage, a virtual ground is present.

If a three-resistor power splitter, as shown in [Figure 4](#), is used in leveling or ratio measurement applications, each port will have an output impedance of  $16 \frac{2}{3} \Omega$  to ground. This would be a 3:1 mismatch which could cause significant measurement errors.

**Figure 4 Three-Resistor Power Splitter**

However, the 11667A power splitter uses two  $50 \Omega$  resistors, as shown in [Figure 5, on page 6](#). The network analyzer creates a virtual ground at the fork, enabling the resistance in each output arm of the power splitter to be a matched  $50 \text{ ohms}$ .

**Figure 5 11667A Power Splitter Schematic**

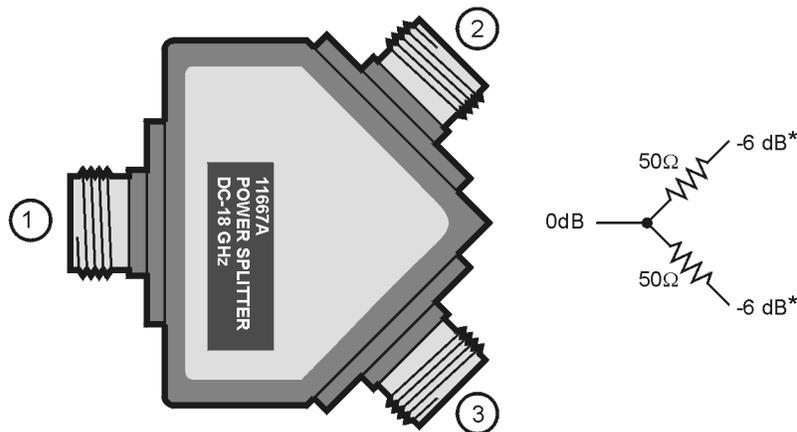
Although optimized for leveling or ratio measurements when used as a coupler, the power splitter still provides excellent frequency response tracking for direct power splitting applications with typically <math><1.8:1</math> SWR.

## Installation

### Initial 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 mechanically and electrically. If the contents are incomplete, or if there is mechanical damage or defects, or if the device does not meet specifications, notify the nearest Agilent office. If the shipping container is damaged, or the cushioning material shows signs of stress, notify the carrier as well as the Agilent office. Keep the shipping materials for the carrier's inspection. The office will arrange for repair or replacement without waiting for claim settlement.

**Figure 6 Device Features**



- ① INPUT PORT for incoming signal.
- ② ③ OUTPUT PORTS used as exit ports for outgoing signal. Output signal is 6 dB down in power from input signal. Either port may be used as test or reference port since power is equal in both ports.

\* Typical in 50Ω system.

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## **Storage and Shipment**

### **Environment.**

The splitter should be stored in a clean, dry environment. The following environmental limitations apply to storage and shipment:

Temperature:  $-40\text{ }^{\circ}\text{C}$  to  $+75\text{ }^{\circ}\text{C}$

Humidity:  $<95\%$  relative

Altitude:  $<25,000$  feet

### **Original Packaging.**

If you need to ship the splitter for any reason, be sure to use the original (or comparable) packaging materials. If the device is being returned to Hewlett-Packard for servicing, attach a tag indicating the type of service required, return address, model number, and full serial number. Also mark the container **FRAGILE** to assure careful handling. In any correspondence, refer to the instrument model number and full serial number.

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## **Operation**

### **Environment**

The operating environment should be within the following limits:

Temperature: 0 °C to +55 °C

Humidity: <95% relative

Altitude: <15,000 feet

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## **Adjustments**

The 11667A power splitter requires no electrical or mechanical adjustments.

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## Service

### Replacing the APC-7 Center Contact (Option 002 Only)

This contact is a small, four-pronged, spring-action contact which snaps into a recess in the center conductor. It is normally held in place by the spring-action of the four prongs. With a magnifying glass, examine the contact to determine if it needs replacement.

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**CAUTION** Do *not* remove this contact for inspection. It may be damaged by removal.

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The contact should be free of burrs or wear and the prongs should be equally spaced. Push the contact in with your fingernail and note the spring action. If the contact needs replacing, proceed as follows:

1. Place the power splitter so that the connector face is down.
2. Tap the pin connector lightly and the contact should protrude slightly. Insert the centering pin of the contact extractor (Part Number 5060-0236) with the jaws open. If this tool is not available, an ordinary draftsman's mechanical pencil may be used. (The end of the jaws may have to be filed to get a good grasp at the very end.)
3. Allow the jaws of the tool to close and pull straight away from the connector without twisting. The contact should come out with the tool. If not, repeat the process. Do not reuse the contact.
4. Insert a new contact (Part Number 1250-0907) with the fingernail.

### Troubleshooting

Troubleshooting the 11667A power splitter usually takes advantage of the fact that the circuit elements are split into two channels. Malfunctions will usually occur in only one channel at a time. Therefore, malfunctions can be confirmed by reversing connections to the splitter.

Since the power splitter works to DC, an ohmmeter can be used to check the inner conductor connections. The resistance from either output center conductor to the input center conductor should be  $50\ \Omega \pm 2\ \Omega$ .

### Ordering Information

To obtain replacement parts, contact the nearest Agilent Technologies. [Table 3 on page 11](#) lists the replaceable parts. Do not try to replace any parts not listed.

**Table 3 Replaceable Parts**

Part Number	Qty	Description
2200-0165	6	Screw: machine 4-40 x 0.312-inch Pozidriv flat head
<b>Standard 11667A and Type-N Female on Option 002</b>		
1250-0549	3	Connector Type-N
1250-0915	3	Contact: center conductor Female
5040-0306	3	Insulator
5020-9108	3	Conductor: center
5020-9107	3	Conductor: outer
<b>Model 11667A Option 001 (Male Type-N Input)</b>		
1250-2184	1	Retaining Ring
5021-1746	1	Connector Flange
1250-0916	1	Connector Body Type-N
1250-0917	1	Male Pin Type-N
1250-0918	1	Connector Nut Type-N
5020-9778	1	Center Conductor Extension
<b>Model 11667A Option 002 (APC-7 Connectors Only)</b>		
1250-0909	2	Connector Assembly: APC-7
5021-1746	2	Connector Flange
85130-20002	2	Contact holder: center conductor
85050-20001	2	Contact: center conductor

## Repair

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**CAUTION** Do *not* open the 11667A power splitter. Opening the 11667A power splitter voids the warranty.

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Replace only the parts shown in [Table 3](#). To replace these parts, proceed as follows:

### ***Standard Model 11667A and Type-N Connectors on Options 001 and 002***

1. Loosen and remove the two Pozidriv screws on the faulty connector. Remove the flange.
2. With a rotating motion, pull the center conductor assembly loose.
3. Use a pin vise to unscrew the two pins.
4. Replace the defective part.
5. Apply a small amount of Loctite to the threads of the contact and screw the center conductor assembly together.
6. Push the end of the conductor assembly into the connector hole while rotating the assembly. Do not force it on. It should slide on.
7. Complete the remainder of the assembly in reverse order of disassembly.

### ***Option 002 (APC-7 Connectors)***

1. With a thin 1/2-inch open wrench, remove the outer connector assembly on the faulty connector.
2. Loosen and remove the two Pozidriv screws. Remove the flange.
3. With a rotating motion, pull the center conductor assembly loose.
4. Use a pin vise to unscrew the two pins.
5. Replace the defective part.
6. Apply a small amount of Loctite to the threads of the contact and screw the center conductor assembly together.
7. Push the end of the center conductor assembly into the connector hole while rotating the assembly. Do not force it on: it should slide on.
8. Complete the remainder of the assembly in reverse order of disassembly.

## Contacting Agilent

By internet, phone, or fax, get assistance with all your test and measurement needs.

**Online assistance:** [www.agilent.com/find/assist](http://www.agilent.com/find/assist)

<b>United States</b> (tel) 1 800 452 4844	<b>Latin America</b> (tel) (305) 269 7500 (fax) (305) 269 7599	<b>Canada</b> (tel) 1 877 894 4414 (fax) (905) 282-6495	<b>Europe</b> (tel) (+31) 20 547 2323 (fax) (+31) 20 547 2390
<b>New Zealand</b> (tel) 0 800 738 378 (fax) (+64) 4 495 8950	<b>Japan</b> (tel) (+81) 426 56 7832 (fax) (+81) 426 56 7840	<b>Australia</b> (tel) 1 800 629 485 (fax) (+61) 3 9210 5947	

### Asia Call Center Numbers

Country	Phone Number	Fax Number
Singapore	1-800-375-8100	(65) 836-0252
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)
Thailand	(088) 226-008 (outside Bangkok) (662) 661-3999 (within Bangkok)	(66) 1-661-3714
Hong Kong	800-930-871	(852) 2506 9233
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