User's and Service Guide

HP 11667A
Power Splitter

HP Part Number 11667-90003 Supersedes: September 1974
Printed in USA November 1999

Notice.

The information contained in this document is subject to change without notice.

Hewlett-Packard makes no warranty of any kind with regard to this material, including but not limited to, the implied warranties of merchantability and fitness for a particular purpose. Hewlett-Packard shall not be liable for errors contained herein or for incidental or consequential damages in connection with the furnishing, performance, or use of this material.

General Information

The HP 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 HP 11667A Specifications

	Frequency (GHz)		
	DC to 4	4 to 8	8 to 18
Input SWR	≤1.15	≤1.25	≤1.45
Equivalent Output SWR (Leveling or ratio measurement)	≤1.10	≤1.20	≤1.33[1]
Output Tracking (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

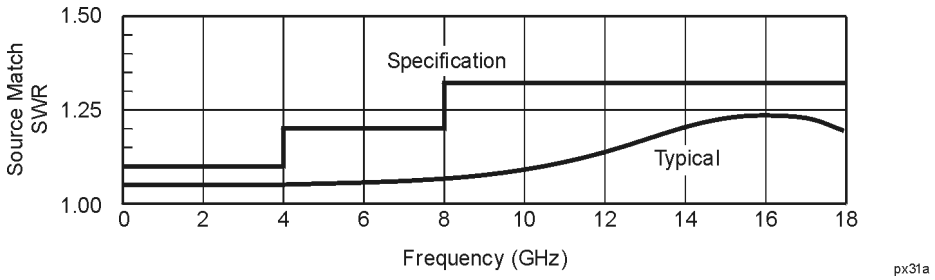
Dimensions: 52mm wide x 46mm high x 21.3mm deep (2.06 in. x 1.82 in. x 0.84 in.)

Shipping Weight: 0.22 kg (8 oz.)

Table 2 Typical Operating Characteristics

	Frequency (GHz)		
	DC to 4	4 to 8	8 to 18
Phase Tracking (between output arms), typically:	≤0.5˚	≤1.5˚	≤3.0˚
Insertion Loss: 6 dB nominal (input to either output)	≤–0.2, +0.6 dB	≤–0.2, +1.0 dB	≤–0.2, +1.8 dB

Figure 1 Leveling or Ratio Measurement Source Match Graph



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

Options

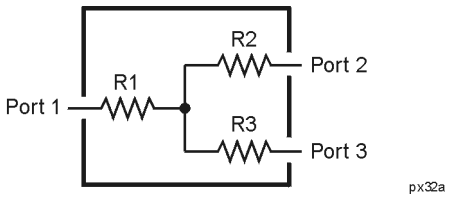
The standard HP 11667A power splitter is supplied with a female type-N on all three ports. The Option 001 provides a type-N male connector on the input and two type-N female connectors on the output ports. The Option 002 is supplied with a type-N female connector on the input and APC-7 connectors on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

Description

The HP 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.

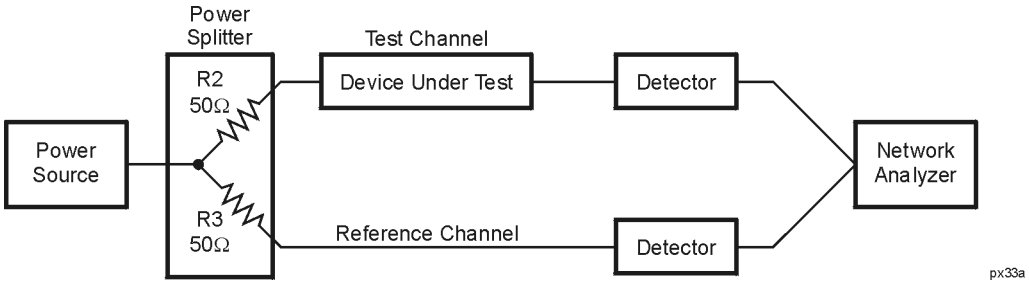
Figure 2 Typical Power Splitter Diagram



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

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

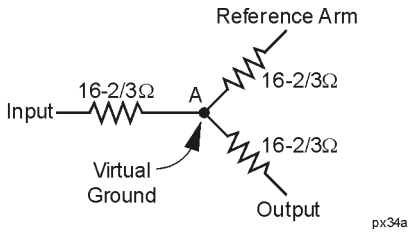
Figure 3 Simplified Diagram of a Network Analyzer System



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.

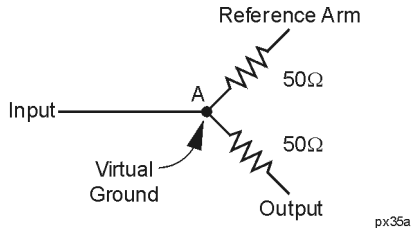
If a three-resistor power splitter, as shown in Figure 4, is used in leveling or ratio measurement applications, each port will have an output impedance of 16 2/3 Ω to ground. This would be a 3:1 mismatch which could cause significant measurement errors.

Figure 4 Three-Resistor Power Splitter



However, the HP 11667A power splitter uses two 50 Ω 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 ohms.

Figure 5 HP 11667A Power Splitter Schematic



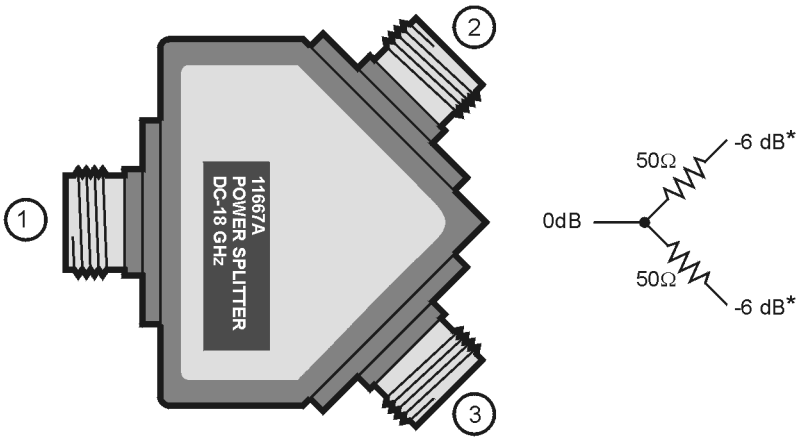
Although optimized for leveling or ratio measurements when used as a coupler, the power splitter still provides excellent frequency response tracking for direct power splitting applications with typically <1.8:1 SWR.

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 Hewlett-Packard office. If the shipping container is damaged, or the cushioning material shows signs of stress, notify the carrier as well as the Hewlett-Packard office. Keep the shipping materials for the carrier's inspection. The HP 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.

px36a

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 ˚C to +75 ˚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.

Operation

Environment

The operating environment should be within the following limits:

Temperature: 0 ˚C to +55 ˚C

Humidity: <95% relative

Altitude: <15,000 feet

Adjustments

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

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.

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

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 HP contact extractor (HP 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 (HP Part Number 1250-0907) with the fingernail.

Troubleshooting

Troubleshooting the HP 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 Ω ±2 Ω.

Ordering Information

To obtain replacement parts, contact the nearest Hewlett-Packard office. Table 3 on page 11 lists the replaceable parts. Do not try to replace any parts not listed.

Table 3 Replaceable Parts

HP Part Number	Qty	Description
2200-0165	6	Screw: machine 4-40 x 0.312-inch Pozidriv flat head
Standard 11667A and Type-N Female on Option 002		
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
Model 11667A Option 001 (Male Type-N Input)		
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
Model 11667A Option 002 (APC-7 Connectors Only)		
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

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

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 Locktite 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 Locktite 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.

Hewlett-Packard Sales and Service Office

Table 4 Hewlett-Packard Sales and Service Offices

UNITED STATES		
Instrument Support Center Hewlett-Packard Company (800) 403-0801		
EUROPEAN FIELD OPERATIONS		
Headquarters Hewlett-Packard S.A. 150, Route du Nant-d'Avril 1217 Meyrin 2/ Geneva Switzerland (41 22) 780.8111	France Hewlett-Packard France 1 Avenue Du Canada Zone D'Activite De Courtaboeuf F-91947 Les Ulis Cedex France (33 1) 69 82 60 60	Germany Hewlett-Packard GmbH Hewlett-Packard Strasse 61352 Bad Homburg v.d.H Germany (49 6172) 16-0
Great Britain Hewlett-Packard Ltd. Eskdale Road, Winnersh Triangle Wokingham, Berkshire RG41 5DZ England (44 118) 9696622		
INTERCON FIELD OPERATIONS		
Headquarters Hewlett-Packard Company 3495 Deer Creek Rd. Palo Alto, CA 94304-1316 USA (415) 857-5027	Australia Hewlett-Packard Australia Ltd. 31-41 Joseph Street Blackburn, Victoria 3130 (61 3) 895-2895	Canada Hewlett-Packard (Canada) Ltd. 17500 South Service Road Trans-Canada Highway Kirkland, Quebec H9J 2X8 Canada (514) 697-4232
Japan Hewlett-Packard Japan, Ltd. Measurement Assistance Center 9-1, Takakura-Cho, Hachioji-Shi, Tokyo 192-8510, Japan TEL (81) -426-56-7832 FAX (81) -426-56-7840	Singapore Hewlett-Packard Singapore (Pte.) Ltd. 150 Beach Road #29-00 Gateway West Singapore 0718 (65) 291-9088	Taiwan Hewlett-Packard Taiwan 8th Floor, H-P Building 337 Fu Hsing North Road Taipei, Taiwan (886 2) 712-0404
China China Hewlett-Packard Co. 38 Bei San Huan X1 Road Shuang Yu Shu Hai Dian District Beijing, China (86 1) 256-6888		