

Operating and Service Manual

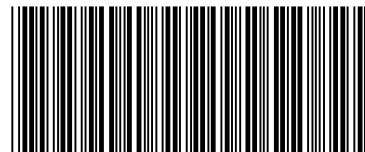
11667B Power Splitter



Agilent Technologies

Part Number 11667-90037

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11667-90037

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Hewlett-Packard to Agilent Technologies Transition

This documentation supports a product that previously shipped under the Hewlett-Packard company brand name. The brand name has now been changed to Agilent Technologies. The two products are functionally identical, only our name has changed. The document still includes references to Hewlett-Packard products, some of which have been transitioned to Agilent Technologies.

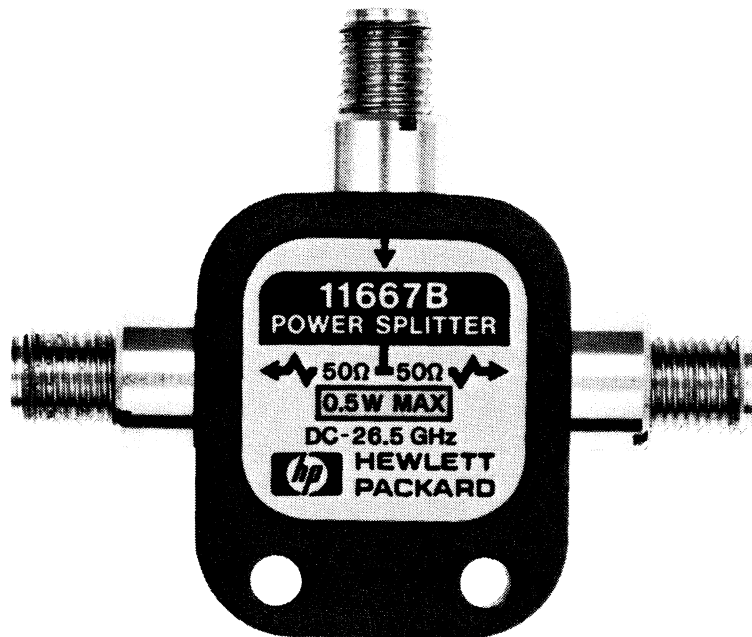
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HP 11667B POWER SPLITTER



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HP 11667B POWER SPLITTER

INSTRUMENTS COVERED BY MANUAL

For important information concerning instruments manufactured after the printing of this manual, as well as changes keyed to specific serial numbers, refer to Paragraph 9. INSTRUMENTS COVERED BY MANUAL.

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**HEWLETT
PACKARD**

1. GENERAL INFORMATION

2. Introduction

3. This manual contains operating and service information for the Hewlett-Packard Model 11667B power splitter (shown in Figure 2). It explains the nature of the operator's check for this device and describes the one performance test required: testing the tracking between the output arms.

4. On the title page of this manual is a microfiche part number that can be used to order 10 x 15 cm (4 x 6 in) microfilm transparencies of this manual. The microfiche package includes the latest Manual Changes Supplement, and pertinent service notes.

5. Specifications

6. Performance specifications are listed in Table 1. These are performance standards or limits against which the instrument may be tested. Table 2 provides supplemental characteristics. These are not specifications, but are typical characteristics included as additional information for the user.

7. Safety Considerations

8. Do not apply more than +27 dBm RF CW power to the HP 11667B, or damage to the power splitter may occur.

9. Instruments Covered By Manual

10. The contents of this manual apply directly to all instruments, unless a yellow Manual Changes supplement is included with the manual. An instrument manufactured after the printing of this manual may have features that do not appear in this manual. In that case, a Manual Changes supplement documenting the differences will be provided with the manual.

11. In addition to change information, the supplement may contain information for correcting errors in the manual. To keep this manual as current as possible, Hewlett-Packard recommends that you periodically request the latest Manual Changes supplement. The supplement for this manual is keyed to its print date and part number, both of which appear on the title page. Changes may be keyed to specific serial numbers, in which case the relevant serial numbers will be noted on the first page of the supplement. Complimentary copies of the supplement are available from your local Hewlett-Packard office listed at the back of this manual.

Table 1. Specifications

Frequency Range: DC to 26.5 GHz

Maximum Input Power: +27 dBm (0.5W)

Description	Frequency (GHz)	
	DC to 18	DC to 26.5
Input SWR	≤1.22	≤1.29
Equivalent Output SWR (Leveling or ratio measurement)	≤1.22	≤1.22
Output Tracking (between output arms)	0.25 dB	0.40 dB

Connectors: Precision 3.5mm Female on all ports

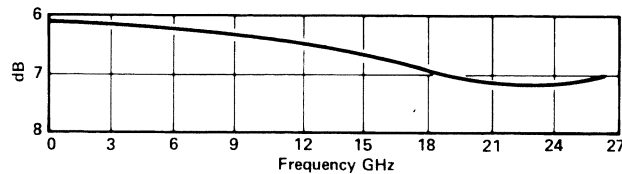
Dimensions: 47 mm wide x 40 mm high x 10 mm deep (1.85 in x 1.57 in x 0.39 in)

Shipping Weight: 0.14 kg (4.94 oz.)

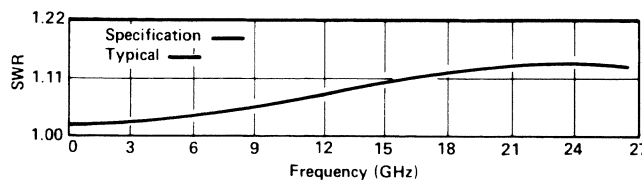
Table 2. Supplemental Characteristics

Description	Frequency (GHz)	
	DC to 18	DC to 26.5
Phase Tracking (between output arms), typically:	≤1.5°	≤2.5°

Typical insertion loss:



Leveling or ratio measurement
source match:



12. Description

13. The HP 11667B is a two-resistor power splitter used in network measurement systems where one output arm is used for leveling or to supply a reference signal for ratio measurements.

14. When the HP 11667B is used in a network analyzer system, the node at the fork of the power splitter is held constant by the leveling action of the network analyzer reference channel (see Figure 1). Because a virtual ground is present at the node, the resistance in each output arm is 50 ohms, giving a 50 ohm matched output impedance.

15. When the source power level is varied (e.g., when measuring gain compression), ratioing is required to maintain calibration. This is not necessary when using the HP 11667B, because the ratio between the signals in the two arms is unaffected. Variations in power level appear in both arms equally and simultaneously.

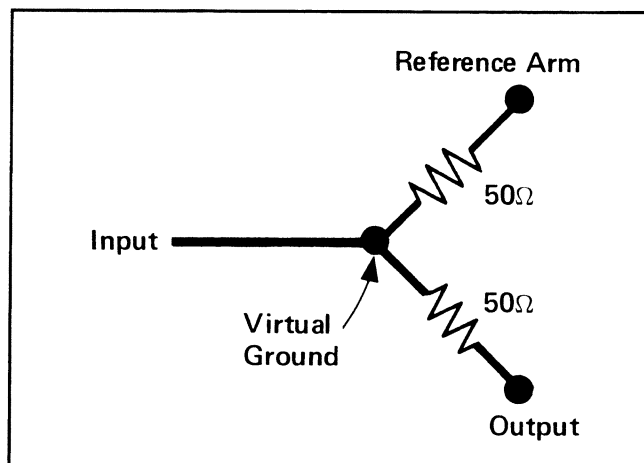


Figure 1. HP 11667B Schematic

16. INSTALLATION

17. Initial Inspection

18. If the shipping container or cushioning material is damaged, it should be kept until the contents of the shipment have been checked both mechanically and electrically. Procedures for checking electrical performance are given in this manual under **PERFORMANCE TESTS**. If the instrument does not pass these electrical tests, or shipping contents are incomplete, or there is mechanical damage or defect, notify your nearest Hewlett-Packard office. If the shipping container is damaged, or the cushioning material shows signs of stress, notify the carrier as well as Hewlett-Packard. Keep the shipping materials for the carrier's inspection. Hewlett-Packard will arrange for repair or replacement without waiting for claim settlement.

19. Preparation For Use

20. Figure 3 shows a typical measurement configuration using the HP 11667B.

21. **Mating Connectors.** The mating connector for a precision 3.5mm female connector is a precision 3.5mm male connector.

CAUTION

An SMA connector will mate with a precision 3.5mm connector, but it should ONLY be done with the following considerations:

1. Important structural dimensional differences exist between these two types of connectors:
 - a. Precision 3.5mm connectors are air dielectric devices. Only air exists between the center and outer conductors. The male or female center conductor is supported solely by a plastic "bead" deep within the connector body. **SMA connectors** employ a plastic dielectric to support the entire length of the center conductor.
 - b. The diameters of both the center and the outer conductors differ between SMA and precision 3.5mm connectors. When an SMA

connector is mated with a precision 3.5mm connector, the connection will exhibit a discontinuity mismatch (SWR) of typically 1.10 (return loss = 26.5 dB), at 20 GHz. The mating of SMA and precision 3.5mm connectors should be done only when such a high connector mismatch can be tolerated.

2. Because SMA connectors are not precision mechanical devices, and are especially susceptible to mechanical wear (causing them to degrade so that they are out of specification), they are potentially damaging to any precision 3.5mm connectors with which they are mated.

A worn or out-of-spec SMA connector can permanently damage its mate **ON THE VERY FIRST CONNECTION**. Therefore, **BEFORE** making any connections, ensure that you have inspected both connectors visually, and that you have checked the mating plane dimensions with an appropriate connector gauge. **BOTH** connectors must be within specifications or permanent damage may result.

Pay special attention to the SMA male pin. A male pin that is too long may smash or break the delicate fingers on the precision 3.5mm female connector. Carefully align the two connectors. With the male contact precisely concentric with the female, push them straight together. Do not overtighten or rotate either center connector. Turn only the outer nut of the male connector and use a torque wrench (8 in-lb, 90 N-cm) for the final connection.

Refer to Table 3 for a list of precision 3.5mm adaptors available from Hewlett-Packard.

22. A precision 3.5mm(m) to precision 3.5mm(m) adapter (HP Part No. 1250-1864), or a precision airline, can be used to extend the life of the 11667B precision 3.5mm connectors.

23. Operating Environment. The operating environment should be within the following limits:

Temperature.....	0° to +55°C (+32° to +131°F)
Humidity.....	Up to 95% relative
Altitude.....	Up to 4,572 metres (15,000 feet)

24. Storage and Shipment

25. Environment. The instrument may be stored or shipped in environments within the following limits:

Temperature.....	-40° to +75°C (-40° to +167°F)
Humidity.....	Up to 95%
Altitude.....	Up to 7,620 metres (25,000 feet)

26. Protection should be provided from temperature extremes, which can cause condensation within the instrument.

27. Original Packaging. Containers and materials identical to those used in factory packaging are available through Hewlett-Packard offices. If the instrument 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. Ensure that the container is marked **FRAGILE** to assure careful handling. In any correspondence, refer to the instrument by model number and full serial number.

28. Other Packaging. The following general instructions should be used for repackaging with commercially available materials:

1. Wrap the instrument in heavy paper or plastic. If shipping to a Hewlett-Packard office or service center, attach a tag indicating the type of service required, return address, model number, and full serial number.
2. Use a strong shipping container. A double wall carton made of 350-pound test material is adequate.
3. Use enough shock absorbing material (a 3 to 4 inch layer) around all sides of the instrument to provide firm cushion and prevent movement inside the container.
4. Seal the shipping container securely.
5. Mark the shipping container **FRAGILE** to assure careful handling.

29. OPERATION

30. Features

31. Features of the HP 11667B are shown in Figure 2.

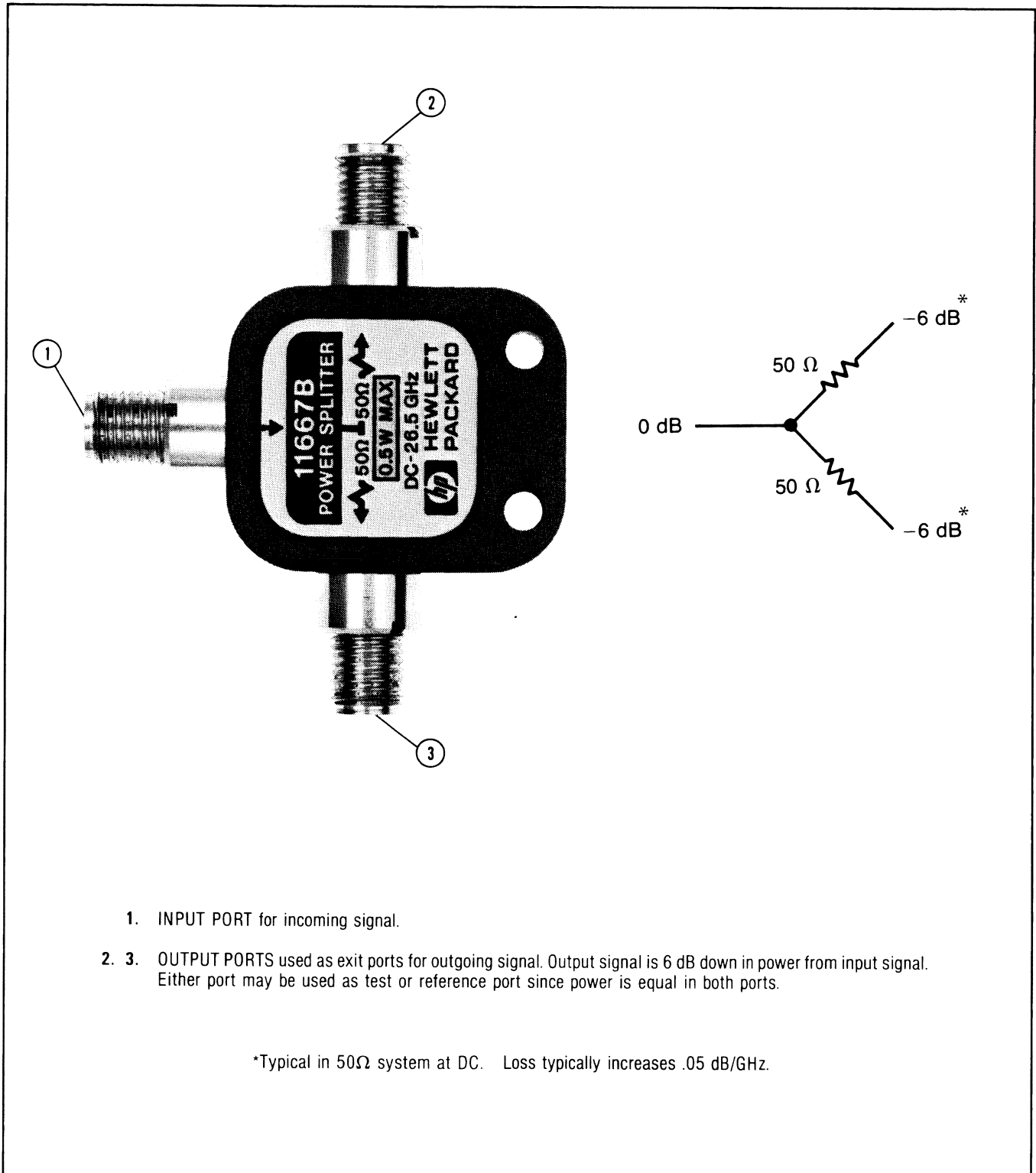
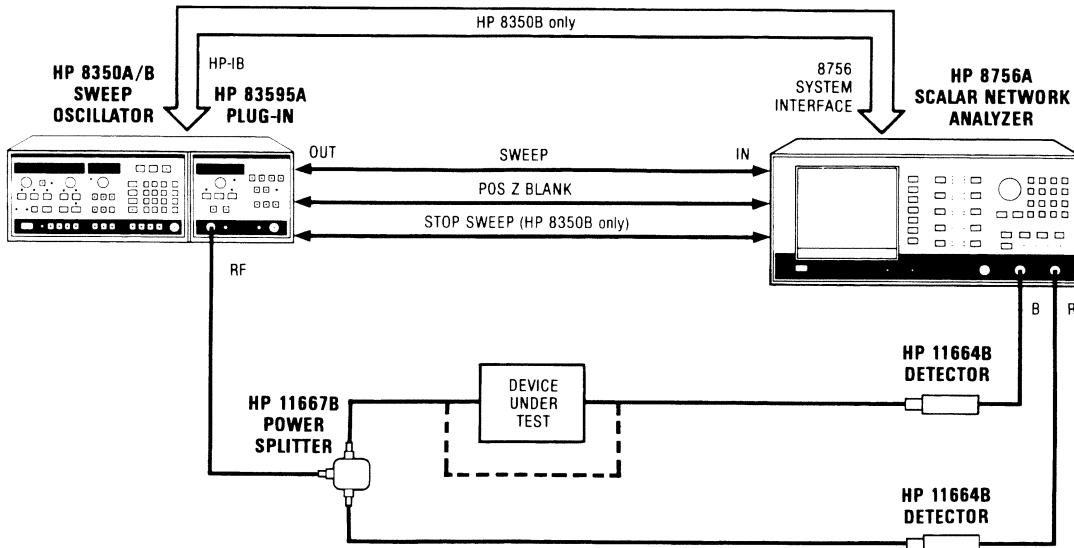


Figure 2. Instrument Features

32. Operator's Check

33. The operator's check consists of performing

a measurement as shown in Figure 3. Successful measurement of a known component verifies operation.



Insertion Loss or Gain

This sequence lists the steps for a typical insertion loss or gain measurement.

<p>Calibration:</p> <p>MEAS PWR B or MEAS RATIO B/R, DISPLAY MEAS. Connect B Input detector to splitter, Set Start/Stop Frequencies, Set Power Level. DISPLAY—MEM, DISPLAY M—MEAS.</p>	<p>Measurement:</p> <p>Connect test device. CURSOR, Position Cursor, Read magnitude and frequency.</p>
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Calibration sets a zero dB reference with the detector connected. After connecting the test device, a negative measured value indicates insertion loss; a positive value indicates gain.

Figure 3. Typical Measurement Procedure

34. PERFORMANCE TESTS

35. Performance testing the HP 11667B consists only of testing the tracking between the output arms (refer to Paragraph 41).
36. Phase information is required to measure the SWR of the HP 11667B. The only instrument that is practical for making this measurement to 26.5 GHz is the HP 8510 network analyzer. For further information, refer to the HP 8510 Operating Manual.
37. SWR is usually performance tested using a scalar network analyzer such as the HP 8756A. To measure the SWR of the HP 11667B with an HP 8756A, an HP 85021B bridge would be required. Both the bridge and the HP 11667B have female precision 3.5mm connectors. Therefore, a precision 3.5mm male-to-male adapter would be required to connect the power splitter to the bridge.
38. If the adapter is connected to the bridge, and a calibration is performed at the end of the adapter, the directivity of the bridge is degraded, and the measurement uncertainty is unacceptable.
39. If a calibration is performed at the precision 3.5mm female port of the bridge, and the adapter is connected to the power splitter, the SWR of the adapter masks the SWR of the power splitter.
40. Phase information is required to calibrate out the effects of the adapter. The HP 8510 can be calibrated in either female or male precision 3.5mm, and using internal error correction, it has an effective directivity greater than 40 dB. Therefore, to accurately measure the SWR of the HP 11667B, refer to the HP 8510 network analyzer Operating Manual.

41. OUTPUT TRACKING TEST

SPECIFICATION:

DC to 18 GHz: 0.25 dB
 DC to 26.5 GHz: 0.40 dB

DESCRIPTION:

One output arm of the HP 11667B is terminated in 50 ohms. A measurement is taken on the other arm and stored in the HP 8756A. The load and detector are then reversed, and a display minus memory reading is taken on the HP 8756A. The flatness of the HP 11667B (including the HP 11664B detector) is displayed as peak-to-peak variation on the HP 8756A CRT.

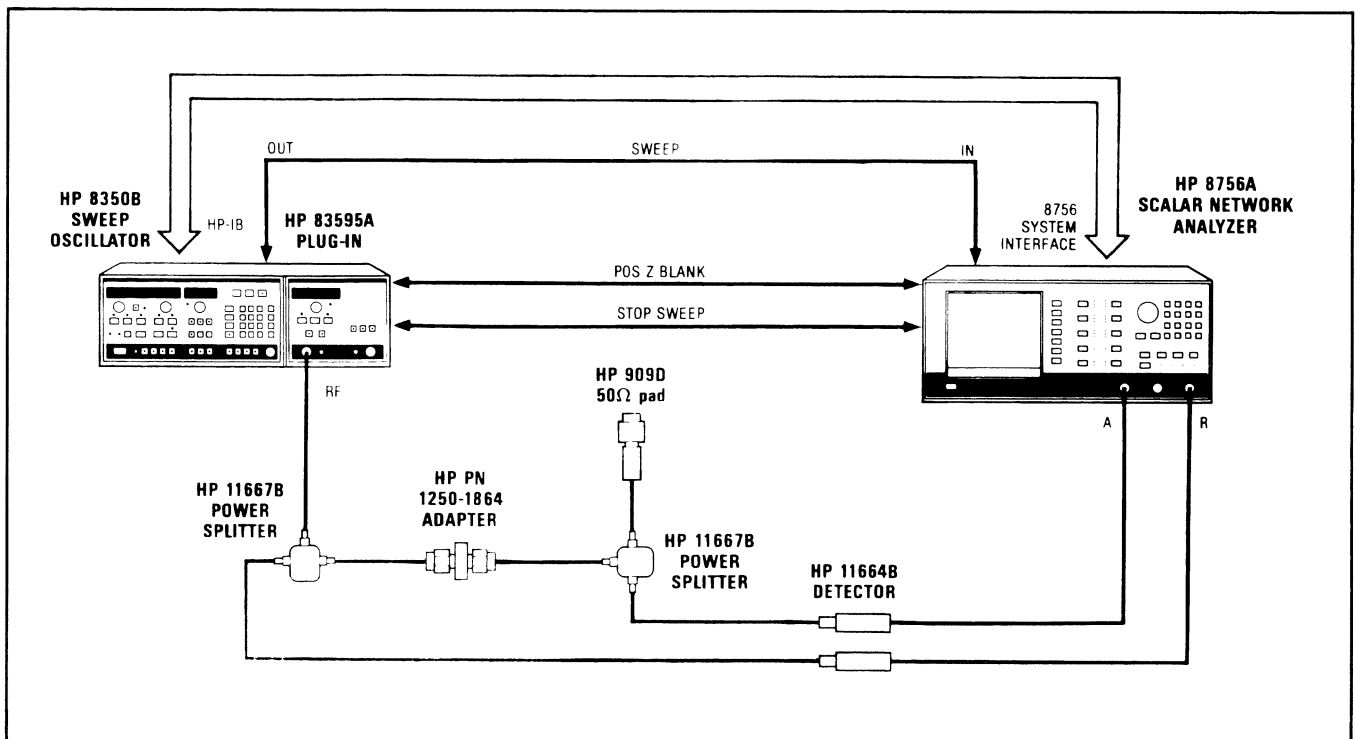


Figure 4. Output Tracking Test Setup

NOTE

An HP 8350B is used in this performance test. A modified HP 8350A has the same capabilities as an HP 8350B, but an unmodified HP 8350A DOES NOT. If an unmodified HP 8350A is being used, DO NOT connect the 8756 SYSTEM INTERFACE or the Stop Sweep. Because the 8756 SYSTEM INTERFACE cannot be used, pressing [PRESET] on the HP 8756A will NOT cause the HP 8350A to preset. The operator must press [PRESET] on BOTH the HP 8756A AND the HP 8350A. In addition, operator must press [□ MOD] on the HP 8350A to turn square wave modulation on, and must set the sweep time to >200 ms.

EQUIPMENT:

Power Splitter (one plus Test Device)	HP 11667B
Sweep Oscillator	HP 8350B
RF Plug-In	HP 83595A
Network Analyzer	HP 8756A
Detector (2 required)	HP 11664B
50 Ohm Load (precision 3.5mm[m])	HP 909D
Adapter (precision 3.5mm[m] to precision 3.5 mm[m])	HP 1250-1864

PROCEDURE:

1. Connect equipment as show in Figure 4. Press [**PRESET**] on the HP 8756A to preset both the HP 8756A and the HP 8350B (this will also turn the HP 8350B [**MOD**] on, and set the sweep rate to 200 ms). Allow 30 minutes warm-up.
2. On the HP 8756A, press [**SHIFT**] [**DISPLAY**] to store the trace in memory.
3. Reverse the output port connections.
4. On the HP 8756A, press [**DISPLAY**] until the **M-MEM** LED is on.
5. Frequency tracking is the peak to peak variation of the CRT trace.

42. ADJUSTMENTS

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

44. SERVICE**45. Troubleshooting**

46. The circuit elements of the HP 11667B are split into to identical channels. A malfunction will usually occur in only one channel and can be confirmed by reversing connections to the splitter.

47. Because 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 ohms \pm 2 ohms.

48. Ordering Information

49. The HP 11667B has no field replaceable parts.

50. Table 3 lists the precision 3.5mm adaptors available from Hewlett-Packard.

Table 3. Precision 3.5mm Adaptors Available From Hewlett-Packard

Description	Part Number
Precision 3.5mm(m) to N(M)	1250-1743
Precision 3.5mm(m) to N(f)	1250-1750
Precision 3.5mm(f) to N(m)	1250-1744
Precision 3.5mm(f) to N(f)	1250-1745
Precision 3.5mm(m) to Precision 7mm	1250-1746
Precision 3.5mm(f) to Precision 7mm	1257-1747
Precision 3.5mm(m) to Precision 3.5mm(m)	1250-1864
Precision 3.5mm(f) to Precision 3.5m(f)	1250-1865
Precision 3.5mm(m) to Precision 3.5mm(f)	1250-1866

Contacting Agilent

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