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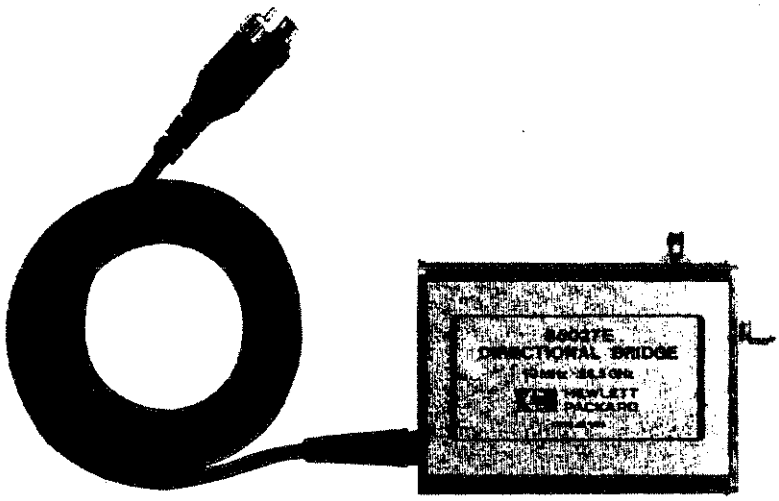
HP 85027E
Directional Bridge
Operating and Service Manual

OPERATING AND SERVICE MANUAL

HP 85027E DIRECTIONAL BRIDGE



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CERTIFICATION

Hewlett-Packard Company certifies that this product met its published specifications at the time of shipment from the factory. Hewlett-Packard further certifies that its calibration measurements are traceable to the United States National Bureau of Standards, to the extent allowed by the Bureau's calibration facility, and to the calibration facilities of other International Standards Organization members.

WARRANTY

This Hewlett-Packard instrument product is warranted against defects in material and workmanship for a period of one year from date of delivery. During the warranty period, Hewlett-Packard Company will, at its option, either repair or replace products which prove to be defective.

For warranty service or repair, this product must be returned to a service facility designated by HP. Buyer shall prepay shipping charges to HP and HP shall pay shipping charges to return the product to Buyer. However, Buyer shall pay all shipping charges, duties, and taxes for products returned to HP from another country.

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

LIMITATION OF WARRANTY

The foregoing warranty shall not apply to defects resulting from improper or inadequate maintenance by Buyer, Buyer-supplied software or interfacing, unauthorized modification or misuse, operation outside of the environmental specifications for the product, or improper site preparation or maintenance.

NO OTHER WARRANTY IS EXPRESSED OR IMPLIED. HP SPECIFICALLY DISCLAIMS THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

EXCLUSIVE REMEDIES

THE REMEDIES PROVIDED HEREIN ARE BUYER'S SOLE AND EXCLUSIVE REMEDIES. HP SHALL NOT BE LIABLE FOR ANY DIRECT, INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, WHETHER BASED ON CONTRACT, TORT, OR ANY OTHER LEGAL THEORY.

ASSISTANCE

Product maintenance agreements and other customer assistance agreements are available for Hewlett-Packard products.

For any assistance, contact your nearest Hewlett-Packard Sales and Service Office. Addresses are provided at the back of this manual.

HP 85027E
DIRECTIONAL BRIDGE

SERIAL NUMBERS

This manual applies directly to HP 85027E directional bridge with the following serial number prefix:

Serial Prefix: 2722A

For additional information about serial numbers, refer to INSTRUMENTS COVERED BY MANUAL in Section 1.

MANUAL PART NUMBER 85027-90014
Microfiche Part Number 85027-90015

Printed: OCTOBER 1987

HEWLETT PACKARD

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HP 85027E
Directional Bridge

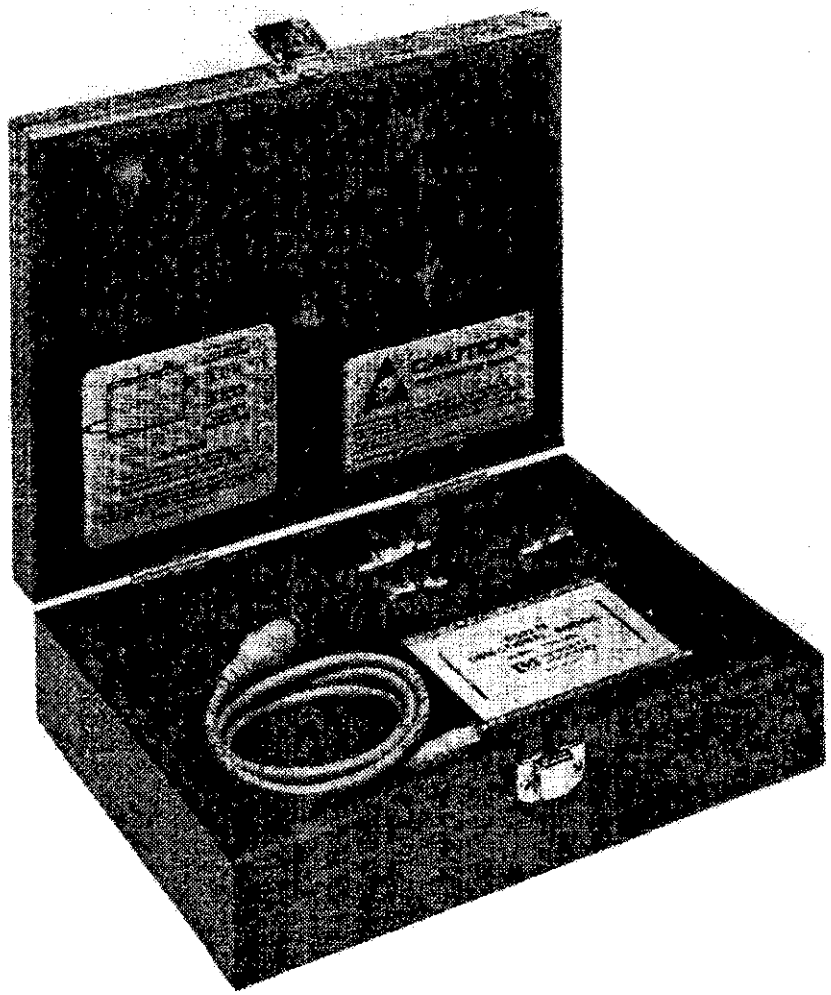


Figure 1-1. HP 85027E in Accessory Case Supplied

Section 1. General Information

SECTION CONTENTS

INTRODUCTION

This manual contains the information required to install, operate, test, adjust and service the Hewlett-Packard 85027E directional bridge. This manual is divided into eight major sections. These sections, and their contents, are listed below.

MANUAL OVERVIEW

Section 1: General Information

Provides information on the product, specifications, accessories, the manual, and recommended test equipment. See the contents list above.

Section 2: Installation

Section 2 tells how to inspect the shipped product to make sure it was not damaged in transit, and what to do if it was.

Section 2 gives important information on the precision 3.5 mm connectors, and the product's environmental requirements for operation, storage, and shipment.

Section 3: Operation

Section 3 not only describes how to operate the product, but warns the user about the hazards of static electricity, excessive input voltages, and connector wear.

Section 3 also provides an operator's check, which verifies that the directional bridge and its companion scalar network analyzer are functioning properly.

Section 4: Performance Tests

This section contains procedures that ensure the HP 85027E meets published specifications.

Section 5: Adjustments

This section contains procedures to adjust the HP 85027E after repair, or if the instrument fails a performance test.

Section 6: Replaceable Parts

This section contains information required to order all replaceable parts and assemblies.

Section 7: Manual Backdating

This section is reserved for information on earlier shipment configurations, at this time there are no previous versions of this product. Therefore, Section 7 currently contains no backdating information.

Section 8: Service

Section 8 provides theory of operation, troubleshooting procedures, and important information on the proper care of the bridge's 3.5 mm connectors.

SAFETY CONSIDERATIONS

There are no hazardous voltages in this directional bridge.

CAUTION

The CAUTION sign in this manual identifies an operating procedure or practice which, if not correctly performed, could damage or destroy the equipment. Do not proceed beyond a CAUTION sign until you fully understand and meet the conditions indicated.

INSTRUMENTS COVERED BY THE MANUAL

A serial number label is attached to the side of the HP 85027E (see Figure 1-2). The serial number is in two parts:

1. The first four digits followed by the letter "A", comprise the serial number prefix. This prefix differentiates between different product versions.
2. The last five digits of the serial number are unique to each instrument.

Figure 1-2. Typical Serial Number Label

The contents of this manual apply directly to directional bridges having the same serial number prefix as those listed on the title page of this manual, under SERIAL NUMBER.

A directional bridge manufactured after the printing of this manual may have a serial prefix that is not listed on the title page. An unlisted serial prefix indicates that the product may be different from those documented in this manual. If this occurs, a manual change supplement is sent with the product, documenting the differences.

The manual change supplement may contain updates which apply to your manual, regardless of the serial prefix number. Such updates usually correct errors in the manual, provide manual improvements, or give recommended replacement part numbers.

To keep this manual as current as possible, periodically request the latest manual change supplement from your nearest Hewlett-Packard office. The part number and print date of the manual is shown on the manual change supplement for reference purposes. This information is also given on the title page of the manual.

ORDERING A PRINTED OR MICROFICHE MANUAL

On the title page of this manual is a manual part number and a microfiche part number. Contact your nearest Hewlett-Packard office to order one of these documents.

Microfiche documents contain the entire manual on 10x15 cm (4x6 in) microfilm transparencies. Each microfiche contains reduced photocopies of the manual pages. Also included in the microfiche package are the latest manual change supplement.

The manual part number also appears on the back cover, in the lower left hand corner.

PRODUCT DESCRIPTION

The HP 85027E is a microwave directional bridge that has a frequency range of 0.01 to 26.5 GHz and a 3.5 mm (male) test port input connector. The bridge makes modulated (AC) or unmodulated (DC) scalar reflection measurements with the HP 8757A scalar network analyzer, and AC measurements with the HP 8756A scalar network analyzer.

A single zero-biased Schottky diode detector in the bridge performs reflection measurements by sampling the return loss of the device under test. A detector can be added for simultaneous transmission measurements. A power splitter can be used with the bridge or detector (or both) for ratio measurements. The RF input signal is typically supplied by a sweep oscillator or a synthesized sweeper.

EQUIPMENT REQUIRED BUT NOT SUPPLIED

The following equipment is required for use with the HP 85027E in making reflection, transmission and ratio measurements.

Scalar Network Analyzers

HP 8757A Scalar Network Analyzer. This scalar network analyzer is a microprocessor based four-channel, three input (four with option 001) receiver with integral digital display. It makes scalar transmission and reflection measurements at RF and microwave frequencies over a dynamic range of −60 dBm to +16 dBm.

The HP 8757A is completely programmable through HP-IB (Hewlett-Packard Interface Bus, Hewlett-Packard's hardware, software, documentation and support for IEEE-488 and IEC 625). Additionally the HP 8757A can control a plotter, a printer, (such as the Thinkjet printer), and a swept source through the 8757 System Interface.

The HP 8757A offers both AC and DC detection. AC detection requires that the source signal be modulated by a signal at 27.8 kHz.

NOTE: The modulation frequency of 27.8 kHz referred to in this manual is actually 27.778 kHz. The DC detection technique modulates the input signal at 27.8 kHz within the bridge, which is on the output of the DUT (device under test).

HP 8756A Scalar Network Analyzer. This scalar network analyzer is a dual channel, microprocessor based receiver with its own digital display. The HP 8756A makes scalar transmission and reflection measurements at RF and microwave frequencies over a dynamic range of −50 dBm to +10 dBm. The HP 8756A is completely programmable through HP-IB, and can control a plotter or swept source through the 8756 System Interface.

When HP 8756A is used with the HP 85027E directional bridge, it is only capable of AC detection measurements.

Swept Signal Sources

HP 8350B. This sweep oscillator mainframe is solid-state, fully HP-IB programmable, and can be controlled by the HP 8757A through the 8757 system interface. It has internal 27.8 kHz square-wave modulation capability. The HP 8350, when equipped with an RF plug-in, provides CW or analog-swept RF stimulus. Depending on the plug-in selected, the HP 8350 can cover the entire frequency range of 0.01 to 26.5 GHz.

HP 8340A/B. This synthesized sweeper is also fully HP-IB programmable and can be controlled by the HP 8757A. It does not require a plug-in as it is a complete analog sweep synthesizer. It generates synthesized output frequencies from 0.01 to 26.5 GHz at up to 1 Hz resolution in CW/Manual mode. The HP 8340 has extremely good resolution, accuracy, and phase noise performance, and can be square-wave modulated at 27.8 kHz by the HP 8757A.

Detectors

One or more HP 85025B detectors are used with the HP 85027E bridge and the HP 8757A to make transmission measurements in AC or DC mode. Detection in the AC and DC mode is similar to that of the HP 85027E. For AC mode (only) transmission measurements, the HP 11664E detector may be used.

Power Splitter

Ratio measurements can be made with the addition of a power splitter. The HP 11667B has a frequency range of DC to 26.5 GHz.

ACCESSORIES

Description	HP Part Number
3.5 mm Connector Cleaning Kit	92193Z
Connector Gage Kit (male and female gages)	1250-1862

Anti-Static Accessories

When cleaning or servicing this product, wear an anti-static wrist strap and work on an anti-static bench mat. The elastic wrist straps are available in three sizes.

Description		HP Part Number
Anti-Static Wrist Strap	Small	9300-0969
	Medium	9300-1257
	Large	9300-0970
Anti-Static Bench Mat		9300-0797

EQUIPMENT AVAILABLE

Additional equipment available for use with the HP 85027E directional bridge and the HP 8757A scalar network analyzer is listed in Section 1 of the network analyzer's operating and service manual.

SPECIFICATIONS

Table 1-1 contains the specifications for this directional bridge. Specifications are the performance standards, or limits, against which the product may be tested.

SUPPLEMENTAL PERFORMANCE CHARACTERISTICS

Table 1-2 contains the supplemental performance characteristics of the directional bridge, These are not specifications, but are typical characteristics included as additional information for the user.

RECOMMENDED TEST EQUIPMENT

Table 1-3 lists equipment that is recommended for use in performance testing the HP 85027E bridge. Other equipment may be substituted if its specifications meet or exceed the specifications listed in the Critical Specifications column.

WARRANTY RESTRICTIONS

Performing any disassembly or repair procedure not included in Section 8 of this manual will void the warranty.

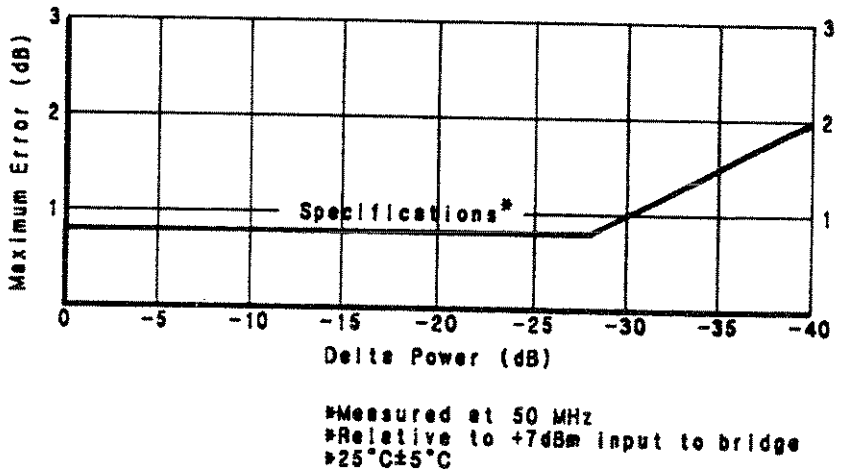
Subjecting a HP 85027E bridge to RF input power levels in excess of +23 dBm or +10 volts will likewise void the warranty.

Connector damage caused by mating with out-of-specification connectors or improper connection technique is not covered by the warranty. (See Connector Inspection in Section 8.)

Table 1-1. Specifications

Frequency Range[1]	0.01 to 26.5 GHz
Connectors Input Test Port	 3.5 mm (female) 3.5 mm (male)
Maximum Input Power	+23 dBm or ±10 volts
Directivity[2] 0.01 to 20.0 GHz 20.0 to 26.5 GHz	 ≥40 dB ≥36 dB
Test Port Match[2] 0.01 to 8.4 GHz 8.4 to 20.0 GHz 20.0 to 26.5 GHz	 ≥23 dB (≤1.15 SWR) ≥15 dB (≤1.43 SWR) ≥11 dB (≤1.43 SWR)

Dynamic Power Accuracy[2]:



1. Unless otherwise noted, all specifications apply from 0°C to +55°C.
2. +25°C ±5°C.

Table 1-2. Supplemental Characteristics

Values in this table are not specifications but are typical, non-warranted performance parameters.	
Typical Return Loss of Connector Savers (Adapters) (to 3.5 mm male or female)	−32 dB
Typical Insertion Loss	
At 0.01 GHz	6.5 dB
At 18 GHz	8.5 dB
At 26.5 GHz	11.0 dB
Typical Input Port Match	
0.01 to 8.4 GHz	≥20 dB (≤1.22 SWR)
8.4 to 18.0 GHz	≥15 dB (≤1.33 SWR)
18.0 to 26.5 GHz	≥9 dB (≤2.1 SWR)
Typical Minimum Input Power for a 40 dB Return Loss at 18 GHz	
HP 8757	+2 dBm
HP 8756/55	+7 dBm
Nominal Impedance	50 ohms
Dimensions	26 mm high x 124 mm wide x 118 mm deep (1.0 inch x 4.9 inches x 4.4 inches)
Cable Length	1219 mm (48 inches)
Net Weight **Shipping Weight**	0.5 kg (1.2 lb) 2.3 kg (5 lb)

Table 1-3. Recommended Test Equipment

Type	Critical Specification	Recommended HP Model Number
Scalar Network Analyzer	HP 85027 AC/DC compatible	HP 8757A
Sweep Oscillator with RF Plug-in or Synthesized Sweeper	HP 8757 compatible Frequency: 0.01 to 26.5 GHz Frequency: 0.01 to 26.5 GHz	HP 8350B with HP 83595 or HP 8340
Detectors (2 required)	Frequency: 0.01 to 26.5 GHz	HP 85025B
Power Splitter	Frequency: 0.01 to 26.5 GHz	HP 11667B
Power Meter	Frequency: 0.01 to 26.5 GHz	HP 436
Power Sensor	Frequency: 0.01 to 26.5 GHz Connector: 3.5 mm	HP 8485
50Ω Load	SWR ≤ 1.22:1 Connector: 3.5 mm	HP 909D*
10 dB Step Attenuator	Frequency: DC to 26.5 GHz Connector: 3.5 mm	HP 8495D Option 004
Directivity Verification Standards	No substitute	HP 85028E

The equipment listed above is used for performance testing, adjustment, and troubleshooting.

*A suitable load is included in the HP 85028E Directivity Verification Standards.

Section 2. Installation

SECTION CONTENTS

INTRODUCTION

This section explains:

- How to inspect the product to see if it was damaged in transit, and what to do if it was.
- Cleaning and using the bridge's precision 3.5 mm connectors.
- The product's environmental requirements during operation, storage, and shipment.
- Packaging the bridge for shipment, and how to return it to Hewlett-Packard for service or performance verification.

INITIAL INSPECTION

If the shipping container or cushioning material is damaged, keep it until the contents of the shipment are checked for completeness, and the product is checked both mechanically and electrically.

Procedures for checking electrical performance are given in Section 4. If the product does not pass the electrical performance tests, refer to Section 8 for troubleshooting.

Notify your nearest Hewlett-Packard office if any of the following conditions exist:

- The product does not pass the performance tests and, using the troubleshooting procedures in Section 8, you cannot correct the problem.
- The product does not pass the performance tests and you wish to return it to Hewlett-Packard for repair.
- The shipping contents are incomplete. (Refer to Table 2-1).
- There is mechanical damage or defect.

Notify the carrier if the shipping container is damaged or if the cushioning material shows signs of stress. Keep all shipping materials for the carrier's inspection. Hewlett-Packard will arrange for repair or replacement without waiting for a claim settlement.

Table 2-1. Contents of HP 85027E Directional Bridge

Description	HP Part Number
Directional Bridge	HP 85027E
3.5 mm open/short	85027-60004
Adapter, 3.5 mm (f) to (f)	85027-60005
Adapter, 3.5 mm (f) to (m)	85027-60006

PREPARATION FOR USE

CAUTION

Electrostatic discharge (ESD) can damage the highly sensitive microcircuits in the HP 85027E. ESD damage is most likely to occur as the bridges are connected or disconnected. Protect the bridges by wearing a grounding strap.

Never touch the center contacts of the connectors.

Use a work station equipped with an anti-static surface.

Power Requirements

CAUTION

Do not apply more than +23 dBm RF power or more than ± 10 volts DC to the HP 85027E. More power or voltage will damage the bridge.

Power for the HP 85027E is supplied by the network analyzer.

MATING CONNECTORS

CAUTION

Use caution when mating an SMA female connector to the precision 3.5 mm male connectors on the HP 85027E. Push the connectors straight together with the female contact concentric with the male. DO NOT overtighten or rotate either center conductor; turn only the outer nut of the male. An out of specification connector can permanently damage its mate. For this reason, you should measure connectors with a connector gage (see section 8, "Mechanical Inspection") and use connector savers whenever possible.

To extend the life of the 3.5 mm (m) connectors, use the precision 3.5 mm (f) to 3.5 mm (f) adapter or the 3.5 mm (f) to 3.5 mm (m) adapter. They are included with the HP 85027E as noted in Table 2-1.

ENVIRONMENTAL REQUIREMENTS

Humidity: Protect this product from temperature extremes which can cause internal condensation.

Environmental Requirements during Operation

Temperature:	Refer to Table 1-1, Specifications
Pressure Altitude:	Up to 4572 metres (15,000 feet).

Environmental Requirements during Storage and Shipment

Temperature:	−40°C to +75°C
Pressure Altitude:	Up to 15240 metres (50,000 feet).

RETURNING THE PRODUCT FOR SERVICE

If you ship the instrument to a Hewlett-Packard office or service center, please include a blue service tag (found at the end of this manual), on which you provide the following information:

1. Your company name and address. **Products cannot be returned to a post office box.**
2. A technical contact person within your company, and their complete phone number.
3. The complete model and serial number of the instrument.
4. The type of service required/failure symptoms.
5. Any other information that may expedite service.

Wrap the bridge (with service tag) in heavy paper or anti-static plastic, and place in a strong shipping container such as a double-wall carton made of 160 kg (350-pound) test material. Pack at least 2.5 cm (1 inch) of polystyrene loose fill packing material (or equivalent). Seal the shipping container securely and mark it **FRAGILE**.

When making inquiries, either by correspondence or by telephone, please refer to the instrument by model and full serial number.

Section 3. Operation

SECTION CONTENTS

INTRODUCTION

This section describes how to use the HP 85027E directional bridge. This section also warns the user about the hazards of static electricity, excessive input voltages, and connector wear.

This section contains an Operators Check, which verifies that the directional bridge and its companion scalar network analyzer are functioning properly.

OPERATING PRECAUTIONS

Electrostatic discharge (ESD), excessive input signals or mechanical shock can dramatically degrade the performance of the HP 85027E. Read the following cautions:

CAUTION

Electrostatic discharge (ESD) can damage the highly sensitive microcircuits in the HP 85027E. MICROCIRCUIT DEVICES ARE DESTROYED EVERY DAY BECAUSE SIMPLE ANTI-STATIC PRECAUTIONS ARE NOT TAKEN. ESD damage is most likely to occur as the bridges are connected or disconnected. Protect the bridges by wearing a grounding strap (HP Part Number 9300-1117).

NEVER touch the center contacts of the connectors.

Use a work station equipped with an anti-static table mat (HP Part Number 9300-0797).

CAUTION

Do not apply more than +23 dBm RF power or more than ±10 volts DC to the HP 85027E. More power or voltage will damage the bridge.

Do not drop the HP 85027E or subject it to mechanical shock.

CONNECTOR WEAR

The input port and test port connectors are part of the microcircuit bridge assembly. They are not separately replaceable or field repairable, although the entire assembly can be replaced with a new or rebuilt assembly. Refer to Section 8, Service, for details. Section 6 contains information about rebuilt assemblies.

Repeated connections will cause connectors to become worn, which will cause greater measurement errors. This problem is best avoided by using an adapter, or connector saver, on the test port whenever some loss in directivity can be tolerated. Refer to Table 1-2 to see the return loss of Hewlett-Packard's connector savers.

Only precision adapters achieve accurate, repeatable measurements. Any adapter should be replaced periodically for best performance. When calibrating, use the same adapters and interconnect cables that will be used for the measurements. Additional information on the proper care, inspection, and cleaning of connectors, adapters and connector savers is in Section 8.

Connecting the HP 85027E

IMPORTANT

With highly accurate measurement devices such as the HP 8757 and 85027E, the condition of mating connectors and adapters can greatly affect measurement error. Always inspect connectors before use, clean them regularly (use the 3.5 mm connector cleaning kit HP Part Number 92193Z), and store them in a protective case (or place plastic end caps on them). Use connector savers whenever possible.

Refer to Section 8 for more information on connector care. Proper maintenance and use of connectors greatly improves measurement accuracy and longevity of costly connectors. Hewlett-Packard has produced a guide to the proper care of microwave connectors, and highly recommends its use. Order HP Part Number 08510-90064.

Insert the connector of the bridge's power cable (W1) into the A, B, (C if HP 8757A, option 001) or R mating connector of the network analyzer and turn the outer sleeve clockwise to tighten it.

Connect the directional bridge input port to the RF output port of the source.

Connect the device under test to the bridge's test port. Section 3 shows typical measurement configurations. Refer to Section 8 for information on the care and use of 3.5 mm connectors.

OPERATING INSTRUCTIONS

Because the HP 85027E has been designed specifically to operate with the HP 8757 scalar network analyzer, operating instructions have been included in Section 3 of the network analyzer's operating manual. Figure 3-2 of this manual illustrates the features of the bridge. Figure 3-4 shows a typical measurement setup with the HP 8757. When you use the bridge with the HP 8757, set the configuration switch on the bridge to the **[HP 8757]** position. If you are using the HP 8756 with the HP 85027E, set the bridge configuration switch to **[HP 8756/HP 8755]** and refer to the HP 8756's manual for the corresponding setups. Figure 3-5 shows a typical measurement setup using a power splitter.

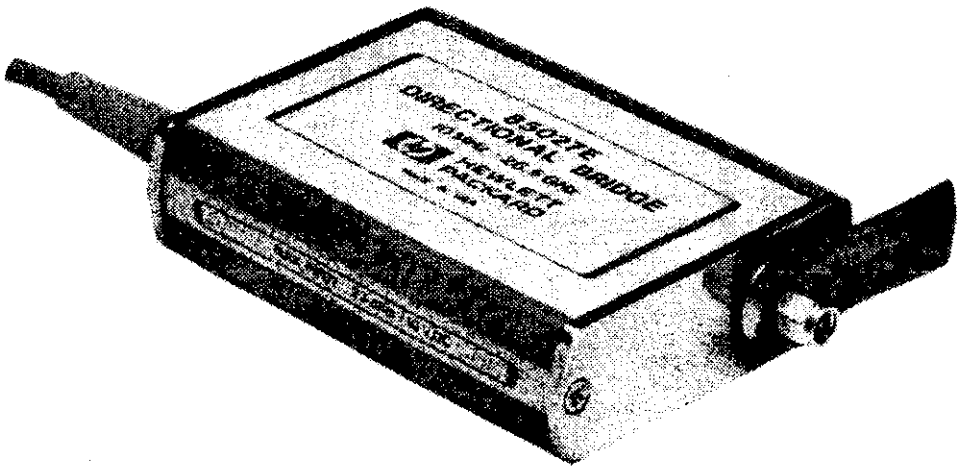
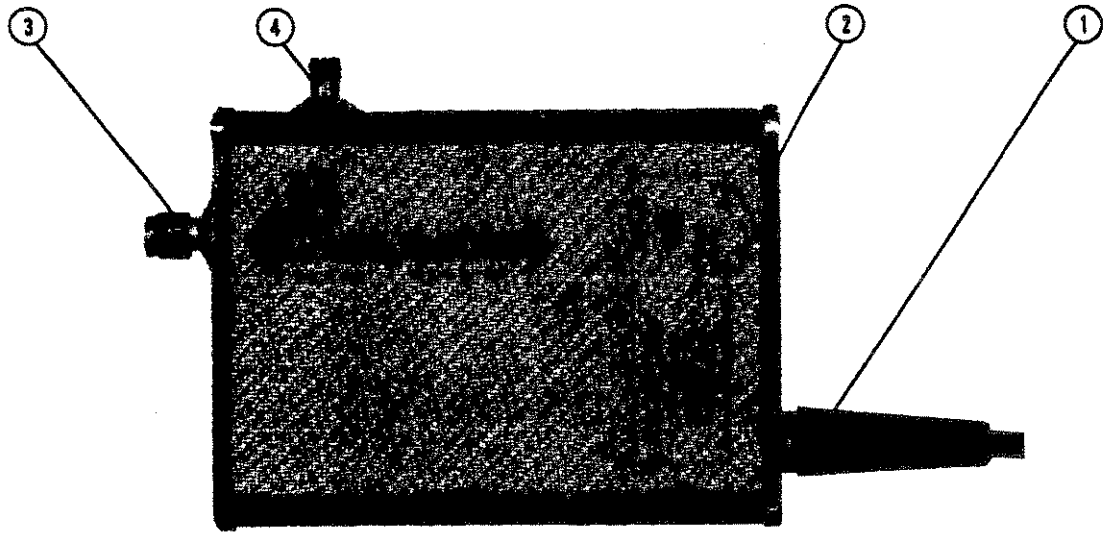


Figure 3-1. HP 85027E



1. **Power supply cable W1.** This cable supplies DC voltages to the bridge, performs control functions and feeds to the analyzer data on the signal reflected by the DUT.
2. **Configuration switch S1.** This switch sets the bridge for use with either the HP 8757 or HP 8756/ HP 8755.
3. **Test port connector J2** (3.5 mm – male). Connect the DUT, calibration short or open here.
4. **Input connector J1** (3.5 mm – female). Apply the RF signal here.

Figure 3-2. HP 85027E Features

OPERATOR'S CHECK

Figure 3-3 illustrates the setup for the operator's check procedure. Follow this procedure to quickly check the entire measurement system. Incorrect results may be caused by any portion of the system, but if the HP 85027E is suspected use the performance tests in Section 4 to determine if the bridge is operating correctly. If the bridge fails those tests, turn to Section 8 to isolate the problem.

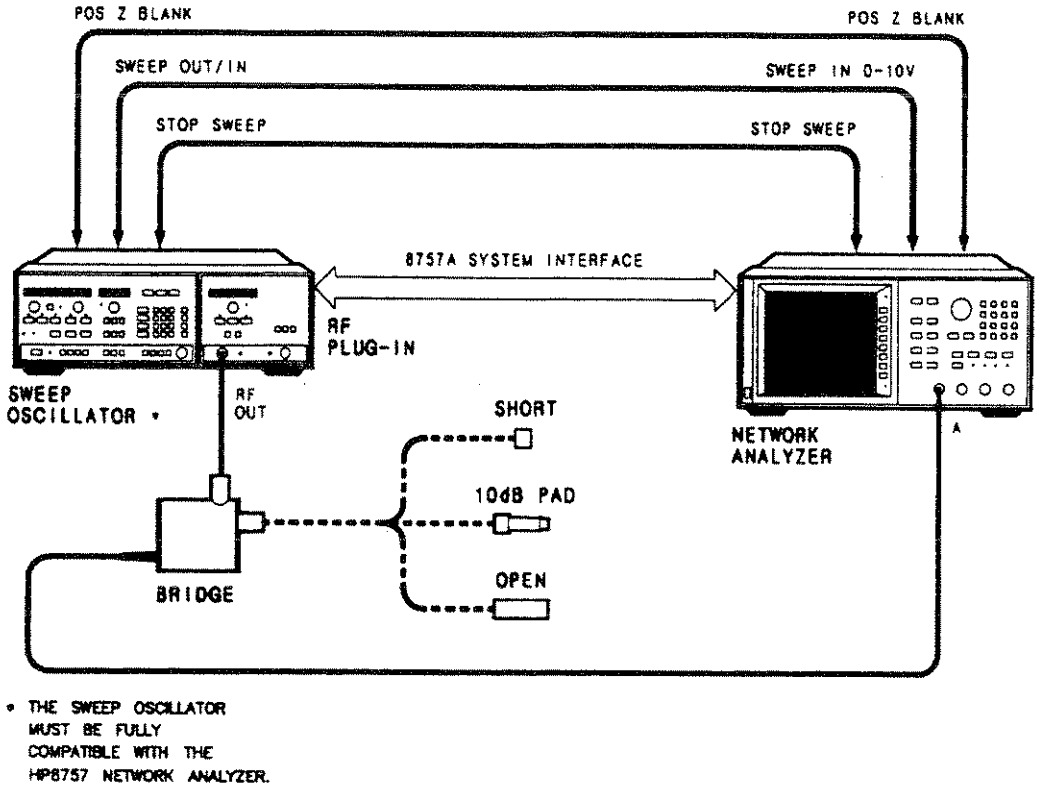


Figure 3-3. Typical Operator's Check using HP 8757A

Equipment

Scalar Network Analyzer	HP 8757
Sweep Oscillator	HP 8350
RF Plug-in	HP 83595
3.5 mm Open/Short	HP Part No. 85037-60001
10 dB Pad	HP 8493C Option 010

NOTE: If you perform this procedure with the HP 8756, set the configuration switch in step 2 to **[HP8756/8755]**, and omit step 8.

Procedure

1. Connect the equipment as shown in Figure 3-3. Allow a 30 minute warm up period.
2. Set the HP 85027E switch (S1) to **[HP8757]**.

3. Press **[PRESET]** on the HP 8757 and turn off channel 2.

4. Set the HP 8350B to a CW frequency of 50 MHz at 0 dBm.

5. Perform a short/open calibration and then press **[DISPLAY] [MEAS-MEM]** on the HP 8757 for normalized measurements. Turn on the cursor.

6. Connect the 10 dB pad to the test port of the bridge.

7. The cursor value should now be −20.0 ±2.0 dB.

8. To check the DC performance of the bridge, perform steps 1 through 4. Then select **[MODE DC]** and perform a manual DC ZERO. Continue with steps 5 through 7. The final result should again be −20.0 ±2.0 dB.

NOTE: Figures 3-4 and 3-5 show typical measurement setups using the HP 8757 and power splitter, respectively.

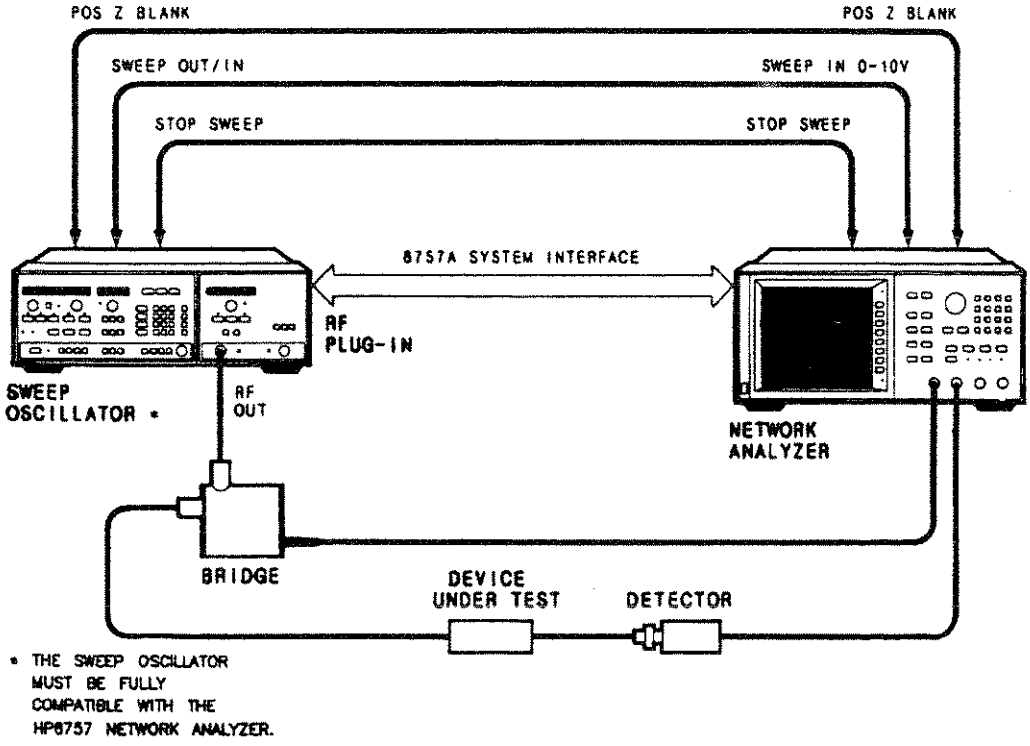


Figure 3-4. Typical Measurement Setup using HP 8757

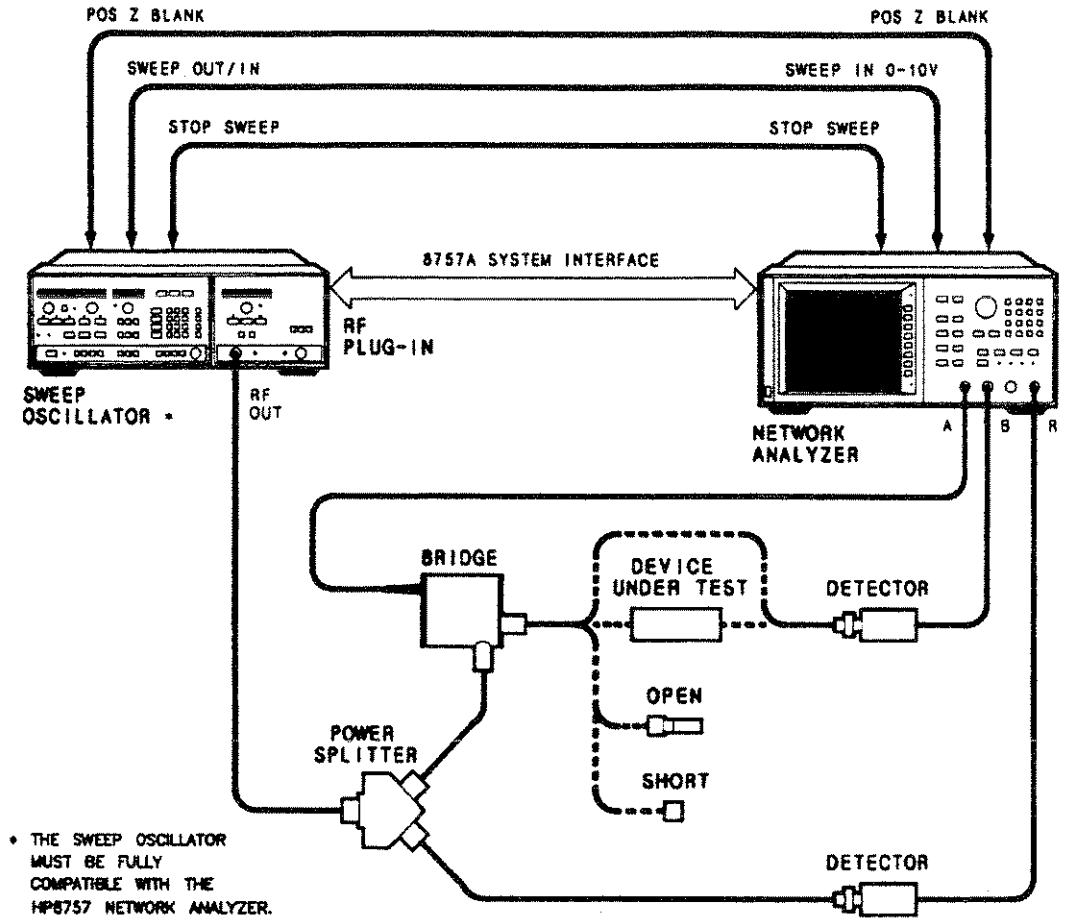


Figure 3-5. Typical Measurement Setup using Power Splitter

Section 4. Performance Tests

SECTION CONTENTS

INTRODUCTION

The procedures in this section test the directivity, test port match and dynamic accuracy of the HP 85027E directional bridge using the specifications of Table 1-1 as the performance standards. Record the specifications and test results in the test record, located at the end of this section. Each test procedure lists the equipment required. You may substitute test equipment if the substitute equipment meets or exceeds the critical specifications of Table 1-5. Each of the tests can be performed without access to the interior of the bridge.

EQUIPMENT REQUIRED

The equipment required to test the HP 85027E is listed in Table 1-3 in Section 1. Any equipment that satisfies the critical specifications given in the table can be substituted for the recommended model.

PERFORMANCE TEST RECORD

Results of the performance test procedures may be tabulated on the test record card located at the end of this section. Each test record lists all of the tested specifications and their acceptable limits. The results recorded at incoming inspection can be used for comparison in periodic maintenance and troubleshooting, and after repairs or adjustments have been made.

DIRECTIVITY

Specification (at 25°c ± 5°c)

0.01 to 20.0 GHz	40 dB
20.0 to 26.5 GHz	36 dB

Description

NOTE: Directivity can only be verified with the HP 85028E Directivity Verification Standards. The standards include the procedure for verifying the directivity of your bridge.

The HP 85028E Directivity Verification Standards use a sliding mismatch to determine directivity.

TEST PORT MATCH

Specifications (at 25°c ± 5°c)

Frequency	Test Port Match
0.01 to 8.4 GHz	≥23 dB
8.4 to 20.0 GHz	≥15 dB
20.0 to 26.5 GHz	≥11 dB

Description

Using a typical reflection measurement setup, as shown in Figure 4-1 a second directional bridge is used to measure the TEST PORT of the bridge under test. The bridge under test must be biased by the HP 8757 and its RF IN PORT must be properly terminated.

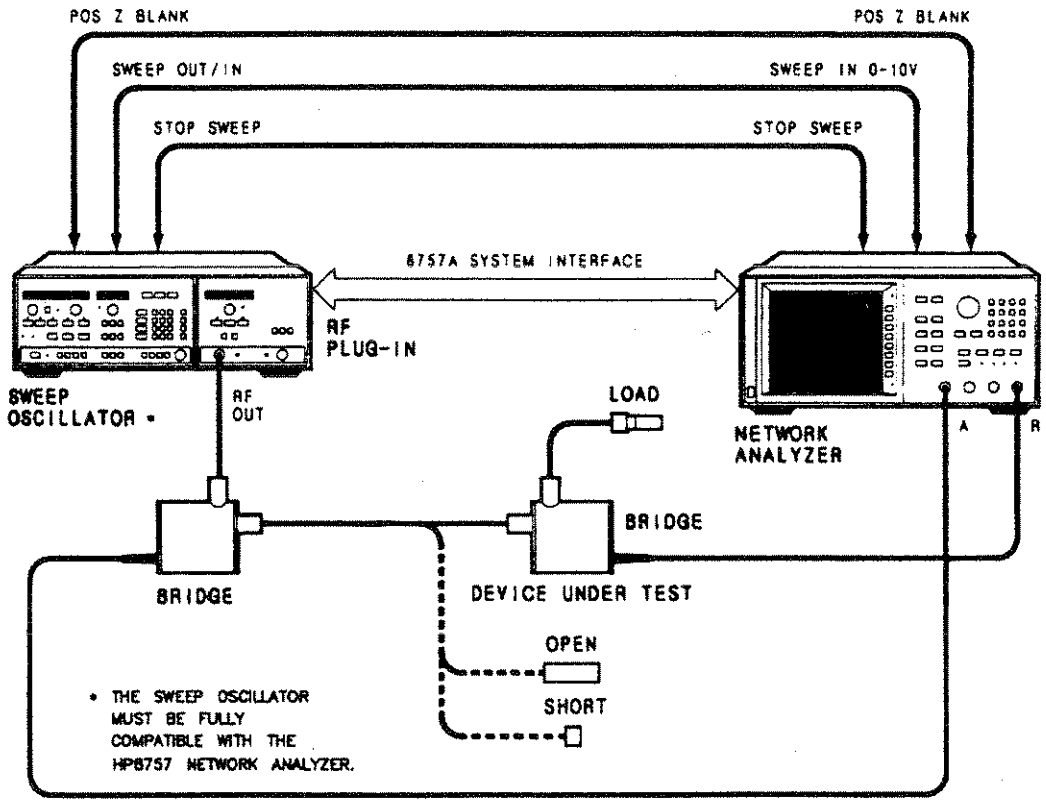


Figure 4-1. Test Port Match Performance Test Setup

Equipment

Sweep Oscillator	HP 8350
RF Plug-in	HP 83595
Scalar Network Analyzer	HP 8757
Open/Short	HP Part Number 85027-60004
50Ω Load	HP 909D
Directional Bridge	HP 85027B

Procedure

1. Set up the equipment as shown in Figure 4-1, with the calibrated open connected to the test directional bridge, not the directional bridge under test.
2. Preset the analyzer. It should indicate that input A is on channel 1. Turn off channel 2. The preset command should also preset the sweep oscillator to a sweep time of 200 ms with 27.8 kHz modulation on. If this does not occur, check the sweeper-to-analyzer interconnections.
3. Set the sweep oscillator start frequency to 0.01 GHz and the stop frequency to 8.4 GHz.
4. Perform an open/short calibration and store it in memory.
5. Connect the test ports of the two directional bridges together. Connect the 50 ohm load to the input port of the directional bridge under test.
6. On the HP 8757 turn on the cursor and press the **[MAX]** softkey to find the point of minimum return loss (highest point) on the trace. Enter this value on the performance test record.
7. Repeat steps 3 through 6 for the following frequency bands:

   8.4 to 20.0 GHz
   20.0 to 26.5 GHz

8. If the test results (including uncertainties) are not within specifications, refer to the troubleshooting section of this manual.

DYNAMIC POWER ACCURACY (AC and DC)

Specifications

Refer to Table 1-1 in Section 1 for a chart showing dynamic power accuracy specifications. This table shows the specifications in terms of maximum error, e.g. at −10 dB the maximum error is 0.8 dB. This test procedure expresses the specification relative to a reference point, e.g. the 0.8 dB maximum error specification is expressed as ±0.4 dB, etc.

Nominal Power	Maximum Error (relative)
0 dB	Reference
−10 dB	±0.4 dB
−20 dB	±0.4 dB
−30 dB	±0.5 dB
−40 dB	±1.0 dB

Description

Using the setup illustrated in Figure 4-2 the scalar network analyzer is used to measure the dynamic power accuracy of the bridge under test.

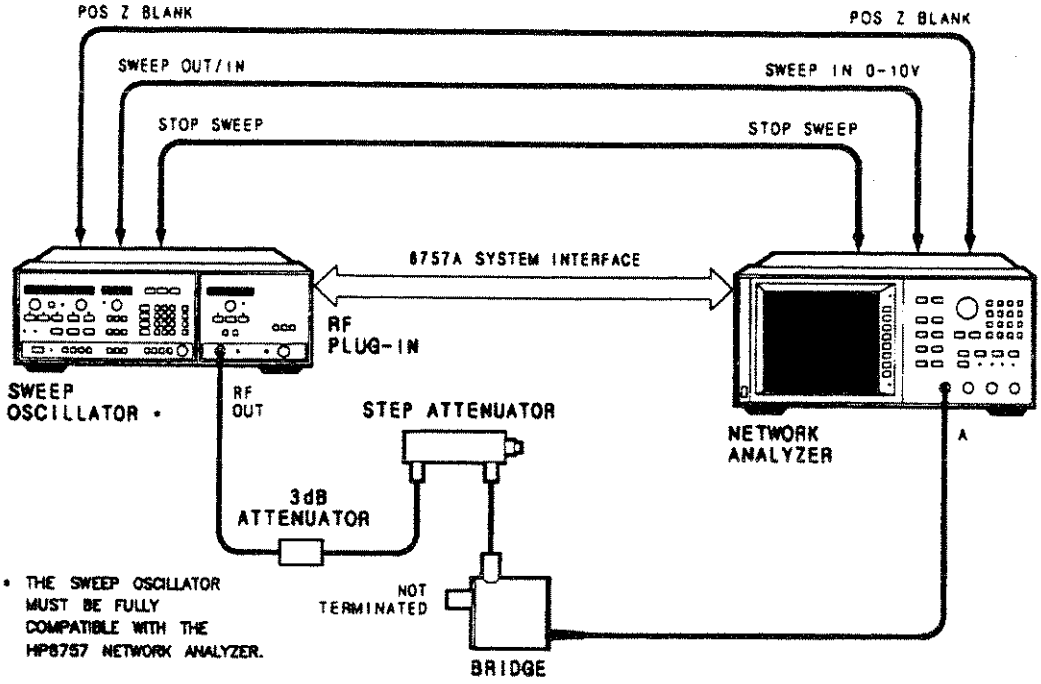


Figure 4-2. Dynamic Power Accuracy Performance Test Setup

Equipment

Sweep Oscillator	HP 8350
RF Plug-in	HP 83595A
Scalar Network Analyzer	HP 8757A
Adapter(s)	As Needed
Step Attenuator	HP 8495D option 004
3 dB Attenuator	HP 8493C option 003

Procedure

1. Set up the equipment as shown in Figure 4-2, preset the instruments and allow 30 minutes for warm-up.
2. Adjust the RF plug-in as required to output +10 dBm at 50 MHz CW.
3. Set the attenuator to 0 dB attenuation.
4. On the analyzer, turn on the cursor and press **[MEAS→MEM]** and **[MEAS-MEM]**. This should result in a 0 dB reading.
5. Step down the attenuator 10 dB at a time. Note the cursor readings on the appropriate lines of the test record.
6. All of the test results should be within the specifications as tabulated in column two of the test record. However there is a source of error which can adversely affect the results — attenuator inaccuracy: For example, the attenuator at a nominal setting of 10 dB may not actually attenuate 10 dB.

   To overcome this error, refer to the attenuator's calibration data and use the actual attenuation value for each setting.
7. If, after removing the source of error from the test results as noted above, the bridge still does not meet its specifications, refer to the troubleshooting information in Section 8.
8. If you are using an HP 8757A with the bridge and wish to test its DC dynamic power accuracy, return to the SYSTEM menu, select DC mode and perform a short/open calibration by pressing these keys: **[SYSTEM] [MODE] [CAL] [SHORT/OPEN] [DISPLAY]** and **[MEAS-MEM]**.
9. Perform steps 3 through 8 and enter the results in the fourth column of the test record.

Hewlett Packard 85027E
Directional Bridge

Serial Number: _____ **Date:** _____

Tested By: _____ **Temperature** _____

DIRECTIVITY Refer to the test record in the HP 85028E directivity verification standards procedure.

TEST PORT MATCH

Frequency Band	Specification	Test Result
0.01 to 8.4 GHz	≥23 dB	_____
8.4 to 20.0 GHz	≥15 dB	_____
20.0 to 26.5 GHz	≥11 dB	_____

DYNAMIC POWER ACCURACY PERFORMANCE

Delta Power (Nominal)	AC/DC Specification	Attenuator Error (dB)	AC Test Result	DC Test Result
0 dB	Reference	_____	_____	_____
−10 dB	0.4 dB	_____	_____	_____
−20 dB	0.4 dB	_____	_____	_____
−30 dB	0.5 dB	_____	_____	_____
−40 dB	1.0 dB	_____	_____	_____

Section 5. Adjustments

INTRODUCTION

The adjustments in this section should only be done under three circumstances:

- The internal bridge microcircuit assembly (A1) is replaced.
- The circuit board assembly (A2) is repaired or replaced.
- The directional bridge does not pass one of the performance tests.

After repairing this product you must perform the adjustments in this section to match the preamplifier to the characteristics of the microcircuit.

ADJUSTMENT PROCEDURES

AC Adjustment Procedure

1. Connect the equipment as shown in Figure 5-1. Turn on the analyzer, source and power meter and allow 30 minutes for warm-up.

NOTE: To perform the following adjustments refer to Figure 5-2 for the locations of the adjustment potentiometers.

2. Connect the power meter sensor to the calibrated 10 dB step attenuator.

NOTE: If your attenuator does not have calibration data, determine exactly how much the attenuation changes between the 0 dB and 30 dB settings. Do this with the source set for about +13 dBm at 50 MHz CW. Use this correction value when the procedure refers to calibrated 30 dB; for example, 29.9 dB or 30.06 dB.

3. Set the attenuator for 0 dB.

4. Preset the analyzer. Set the source to generate 50 MHz CW without modulation. Adjust the output for a reading of +6.5 dBm on the power meter.

5. Remove the printed, plastic switch configuration label from the back of the bridge (additional labels are available as HP part number 85027-80004).

6. Disconnect the power sensor from the attenuator and turn on modulation. Connect the bridge input port to the attenuator, leaving the test port open.

7. On the analyzer, turn on averaging (averaging factor = 8), and the cursor. Turn on smoothing (5%).

8. Adjust R5 (see Figure 5-2) for a cursor reading of −6 ±0.1 dBm.

NOTE: The ±0.1 dB margin shown in step 8 is not a specification, but simply a starting point for this adjustment. The actual specification, which is verified later in the procedure, is ±0.8 dB.

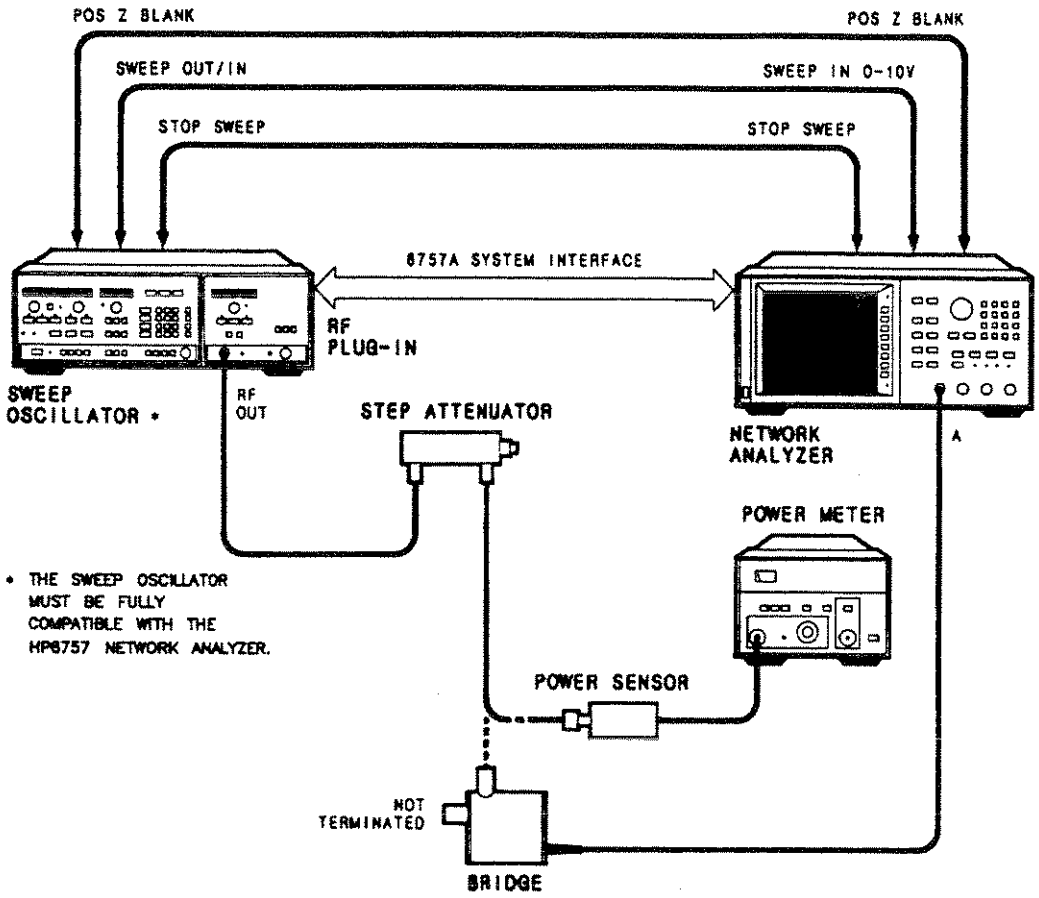


Figure 5-1. Adjustment Test Equipment Setup

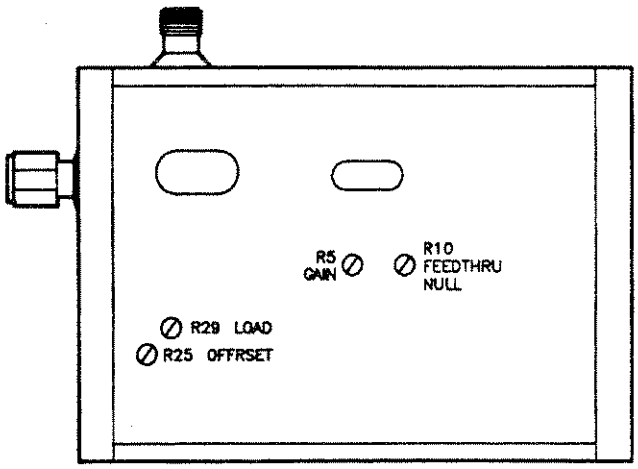


Figure 5-2. Locations of Adjustment Potentiometers

9. Set the attenuator to 0 dB and adjust R29 (Figure 5-2) for a cursor reading of **calibrated** −30 dB, minus 6, ±0.1 dBm (nominally −36 dBm).

10. Set the attenuator to 0 dB and adjust R29 (if required) until the cursor reads −6 ±0.1 dBm.

11. Repeat steps 8 through 10 until the change in level is equal to the **calibrated** 30 dB ±0.1 dB and, with 0 dB attenuation, the cursor indicates −6 ±0.1 dBm.

DC Adjustment Procedure

NOTE: You can perform this DC procedure only with an HP 8757A analyzer.

12. Set the HP 8757A to DC mode.

13. Set the reference level to −50 dBm at mid-screen, and the scale to 5 dB/DIV.

14. On the source, turn off the RF power.

15. On the analyzer, press **[CAL] [CONFIG SYSTEM]**. If your analyzer has firmware revision 2.0 or above, press **[CAL]** and select **[MORE] [AUTOCAL]**, to turn auto calibration OFF.

16. On the bridge, use a jumper to short pad **Y** (where yellow wire terminates) to ground.

17. Adjust R25 for a minimum reading on the analyzer (it should be <-50 dBm).

18. Remove the short, and turn auto cal back ON.

Feedthrough Null Adjustment Procedure

19. On the analyzer, press **[CAL]** and select **[DC DET ZERO] [AUTOZERO]**.

20. Adjust R10 for as high a trace as possible. Adjust slowly, because averaging and smoothing mask adjustment effects.

NOTE: Steps 19 and 20 must be repeated until no further change is noted.

DC Mode RF Adjustment Check

21. Turn on the source's RF power.

22. Set the attenuator to 0dB.

23. On the analyzer, verify DC mode, averaging, smoothing, and the cursor are still on. Allow the trace to settle. Press **[DISPLAY] [MEAS→MEM] [MEAS-MEM]**. The cursor should now indicate 0.0 dB.

24. Set the attenuator to 30 dB.

25. The cursor should now indicate the calibrated −30 dB to within 0.8 dB.

26. If the value indicated is not within 0.8 dB of the calibrated −30 dB, it may be necessary to adjust R5 and R29 until the **difference** between the 0 dB and 30 dB attenuator setting is just within 0.8 dB of the calibrated 30 dB. Adjust R5 when the attenuator setting is 0 dB and R29 when at 30 dB.

27. If any adjustments are made, it will be necessary to repeat the AC adjustment procedure again, only this time using a tolerance limit of ±0.8 dB instead of the 0.1 dB indicated in steps 8 through 11. This will allow you to split the error difference between the two modes of operation.

28. Both AC and DC dynamic accuracy specifications should be within the limits given in Table 1-1.

Section 6. Replaceable Parts

SECTION CONTENTS

INTRODUCTION

This section contains information for ordering parts. Exchange assemblies, manufacturer codes, reference designations and abbreviations are also described.

EXCHANGE ASSEMBLIES

The bridge microcircuit may be replaced on an exchange basis, affording a considerable cost savings. This assembly includes the input and test port connectors, and the reference termination. Instructions for ordering an exchange microcircuit are given at the end of this section. Exchange, factory-repaired and tested assemblies are available only on a trade-in basis; therefore, the defective assembly must be returned for credit. For this reason, assemblies required for spare parts stock must be ordered by the new assembly part number. Figure 6-1 describes the module exchange procedure.

The A1 bridge microcircuit assembly exchange part number is given in Table 6-1, HP 85027E Replaceable Parts.

The module exchange program described here is a fast, efficient, economical method of keeping your Hewlett-Packard instrument in service.

Locate defective module using troubleshooting procedures and service sheets in this manual.

Is a replacement module on hand?

YES → Install the replacement module. Keep the defective module for return to HP.

NO

Order restored-exchange module from HP. Refer to the replaceable parts section for part numbers.

Swap replacement module and defective module.

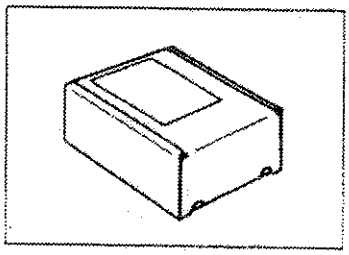
Return defective module to HP.

Order restored-exchange module from HP. Refer to the replaceable parts section for part numbers.

Put restored exchange module in spares stock.

Return defective module to HP.

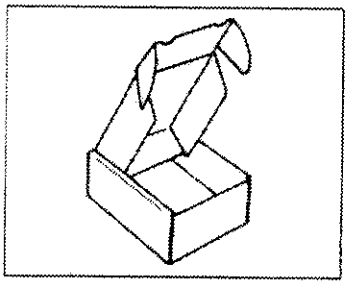
A.



Restored-exchange modules are shipped individually in boxes like this. In addition to the circuit module, the box contains:

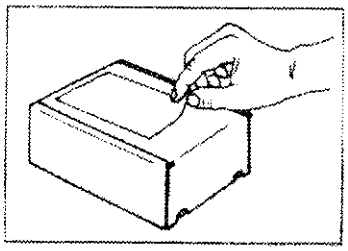
Exchange assembly failure report
Return address label

B.



Open box carefully - it will be used to return defective module to HP. Complete failure report. Place it and defective module in box. Be sure to remove enclosed return address label.

C.



Seal box with tape. Inside U.S.A.*, stick preprinted return address label over label already on box, and return box to HP. Outside U.S.A., do not use address label; instead address box to the nearest HP office.

*HP pays postage on boxes mailed in U.S.A.

Figure 6-1. Module Exchange Procedure

REPLACEABLE PARTS LIST DESCRIPTION

Organization

The replaceable parts lists are organized as follows:

- Components and assemblies of the directional bridge given in alphabetic/numerical order by reference designation.
- Components of the A2 circuit board assembly given in alphabetic/numerical order by reference designation.

Information

The following information is given for each part:

- The Hewlett-Packard part number.
- The part number check digit (CD).
- The total quantity (Qty) used in the product.
- The description of the part.
- The five digit code of the typical manufacturer of the part.
- The manufacturer's part number for the part.

NOTE: The total quantity for each part is given only once, at the first appearance of the part in the list.

ORDERING INFORMATION

To order a part listed in the replaceable parts list, indicate the Hewlett-Packard part number (with check digit to ensure efficient processing) and the quantity desired. Address the order to the nearest Hewlett-Packard office.

To order a part that is not listed in the replaceable parts list, include the instrument model and serial number, the description and function of the part and the quantity desired. Address the order to the nearest Hewlett-Packard office.

CAUTION

Only the parts listed are replaceable. Any attempt to perform any disassembly or repair procedure not specifically outlined in Section 8 of this manual will void the warranty. Damaged connectors can be repaired or replaced only by Hewlett-Packard.

Table 6-1. HP 85027E Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A1 (NEW)	5086-7477	6	1	BRIDGE MICROCIRCUIT ASSEMBLY (NEW)	28480	5086-7477
A1 (REBUILT)	5086-6477	4		BRIDGE MICROCIRCUIT ASSEMBLY (REBUILT)	28480	5086-6477
A2***	85027-60001	2	1	PREAMPLIFIER ASSEMBLY	28480	85027-60001
AT1	P/O A1		1	TERMINATION CARTRIDGE	28480	P/O A1
J1	P/O A1		1	INPUT CONNECTOR	28480	P/O A1
J2	P/O A1		1	TEST PORT CONNECTOR	28480	P/O A1
MP1	85027-00001	6	1	DRESS COVER	28480	85027-00001
MP2	85027-20005	2	1	CABLE COVER	28480	85027-20005
MP3	85027-20003	0	1	EXTRUDED HOUSING	28480	85027-20003
MP4	85027-20004	1	1	PORT COVER	28480	85027-20004
MP5	0535-0694	3	1	NUTM-DBLHX	28480	0535-0694
MP6	85027-00002	7	1	WRENCH, CONNECTOR SAVER	28480	85027-00002
MP7	0360-0602	6	1	TERMINAL-SLDR LUG PL-MTG FOR-#2-SCR	28480	0360-0602
MP8	0515-1445	2	4	SCREW-THD-RLG-M3 X 0.5 8MM-LG	28480	0515-1445
MP9	1531-0289	5	1	MACHINED PART-SST SPACER-BRIDGE	28480	1531-0289
MP10	0515-0820	5	4	SCREW-MACH M2 X 0.4 5MM-LG 90-DEG-FLH-HD	28480	0515-0820
MP11	0515-0912	6	4	SCREW-MACH 3.0 X 8MM PN PD	28480	0515-0912
MP12*	85027-80017	2	1	ID LABEL 85027E (FRONT LABEL)	28480	85027-80017
MP13*	85027-80012	7	1	FOAM PAD	28480	85027-80012
MP14*	85027-80015	0	1	WOOD INSTRUMENT CASE	28480	85027-80015
MP15	2190-0584	0	4	LOCK WASHER M3.0	28480	2190-0584
MP16	85027-80018	3	1	LABEL ID 85027E (SERIAL TAG)	28480	85027-80018
MP17				NOT ASSIGNED		
MP18	85027-80004	7	1	LABEL IN RF TEST (BACK LABEL)	28480	85027-80004
MP19	85027-80005	8	1	LABEL WARNING MAXIMUM INPUT (SIDE)	28480	85027-80005
MP20				NOT ASSIGNED		
MP21*	85027-60005	6	1	ADAPTER 3.5 F TO 3.5 F	28480	85027-60005
MP22*	85027-60006	7	1	ADAPTER 3.5 M TO 3.5 F	28480	85027-60006
MP23*	85027-60004	5	1	3.5 MM OPEN/SHORT	28480	85027-60004
W1	85025-60003	2	1	CABLE ASSY	28480	85025-60003
	92193Z			3.5 MM CONNECTOR CLEANING KIT	28480	92193Z

* NOT SHOWN
** SEE TABLE 6-2**

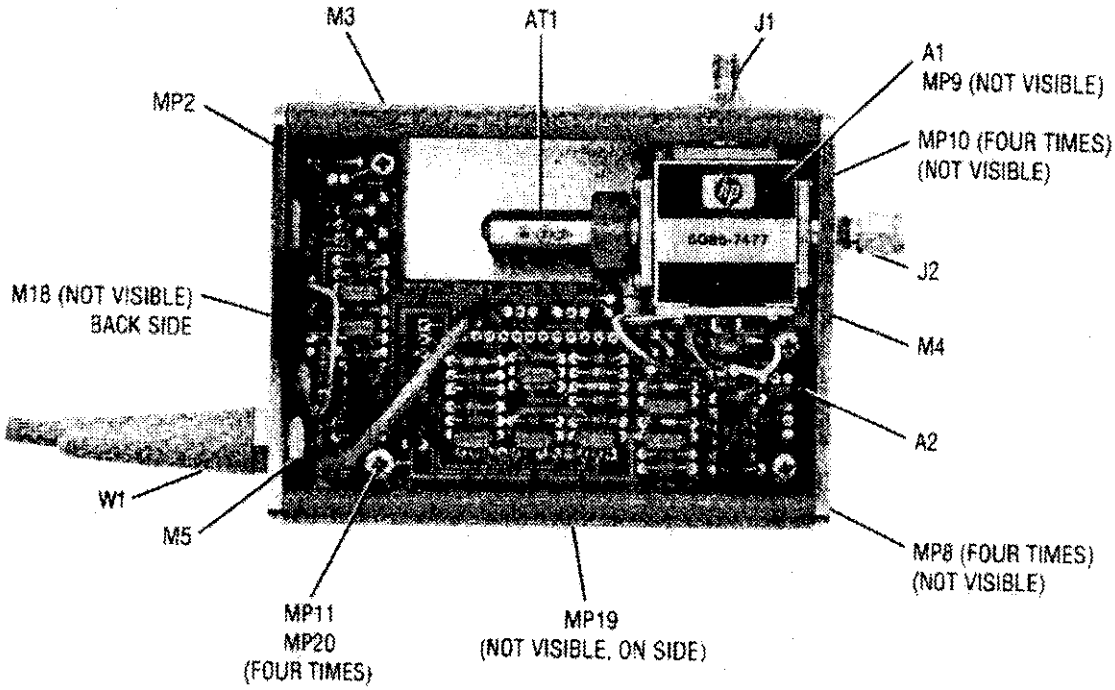


Figure 6-2. HP 85027E Replaceable Parts Identification

Table 6-2. A2 Bridge Circuit Assembly Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
				A2 BRIDGE CIRCUIT BOARD ASSEMBLY		
A2	85027-60001	2	1	BRIDGE PC BOARD ASSEMBLY	28480	85027-60001
A2C1	0160-5375	2	8	CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-5375
A2C2	0160-5375	2		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-5375
A2C3	0160-5375	2		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-5375
A2C4	0160-5375	2		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-5375
A2C5	0180-2683	1	1	CAPACITOR-FXD 4.7UF +-20% 35VDC TA	28480	0180-2683
A2C6	0160-5375	2		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-5375
A2C7	0160-5375	2		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-5375
A2C8	0160-5375	2		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-5375
A2C9	0160-5375	2		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-5375
A2C10	0180-2661	5	2	CAPACITOR-FXD 1UF +-10% 50VDC TA	25088	DIROGSIA50K
A2C11	0180-2661	5		CAPACITOR-FXD 1UF +-10% 50VDC TA	25088	DIROGSIA50K
A2C12	0160-0573	2	1	CAPACITOR-FXD 4700PF +-20% 100VDC CER	28480	0160-0573
A2CR1	1901-0050	3	2	DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR2	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR3	1901-0539	3	1	DIODE-SM SIG SCHOTTKY	28480	1901-0539
A2MP1	85027-20001	8	1	SD-AD/DC BRIDGE	28480	85027-20001
A2R1	0698-7212	9	7	RESISTOR 100 1% .05W F TC=0+-100	24546	C3-1/8-TO-100R-F
A2R2	0698-7279	8	1	RESISTOR 61.9K 1% .05W F TC=0+-100	24546	C3-1/8-TO-6192-F
A2R3	0698-7249	2	1	RESISTOR 3.48K 1% .05W F TC=0+-100	24546	C3-1/8-TO-3481-F
A2R4	0698-7264	5	1	RESISTOR 100K 1% .05W F TC=0+-100	24546	C3-1/8-TO-1003-F
A2R5	2100-3091	1	2	RESISTOR-TRMR 2K 10% C TOP-ADJ 17-TRN	32997	3292W-1-202
A2R6	0698-7212	9		RESISTOR 100 1% .05W F TC=0+-100	24546	C3-1/8-TO-100R-F
A2R7	0698-7212	9		RESISTOR 100 1% .05W F TC=0+-100	24546	C3-1/8-TO-100R-F
A2R8	0698-7212	9		RESISTOR 100 1% .05W F TC=0+-100	24546	C3-1/8-TO-100R-F
A2R9	0698-8615	8	1	RESISTOR 75K 1% .05W F TC=0+-100	28480	0698-8615
A2R10	2100-3097	7	1	RESISTOR-TRMR 100K 10% C TOP-ADJ 17-TRN	32997	3292W-1-104
A2R11	0698-7212	9		RESISTOR 100 1% .05W F TC=0+-100	24546	C3-1/8-TO-100R-F
A2R12	0698-7212	9		RESISTOR 100 1% .05W F TC=0+-100	24546	C3-1/8-TO-100R-F
A2R14	0698-7268	9	1	RESISTOR 147K 1% .05W F TC=0+-100	24546	C3-1/8-TO-1473-F
A2R15	0698-7236	7	1	RESISTOR 1K 1% .05W F TC=0+-100	24546	C3-1/8-TO-1001-F
A2R16	0698-7253	8	2	RESISTOR 5.11K 1% .05W F TC=0+-100	24546	C3-1/8-TO-5111-F
A2R17	0698-7212	9		RESISTOR 100 1% .05W F TC=0+-100	24546	C3-1/8-TO-100R-F
A2R18	0698-7229	6	1	RESISTOR 511 1% .05W F TC=0+-100	24546	C3-1/8-TO-511R-F
A2R19	0698-7247	0	1	RESISTOR 2.87K 1% .05W F TC=0+-100	24546	C3-1/8-TO-2871-F
A2R21	0698-7261	8	1	RESISTOR 11K 1% .05W F TC=0+-100	24546	C3-1/8-TO-1102-F
A2R22	0698-7253	8		RESISTOR 5.11K 1% .05W F TC=0+-100	24546	C3-1/8-TO-5111-F
A2R23	0698-7251	6	2	RESISTOR 4.22K 1% .05W F TC=0+-100	24546	C3-1/8-TO-4221-F
A2R24	0698-7251	6		RESISTOR 4.22K 1% .05W F TC=0+-100	24546	C3-1/8-TO-4221-F
A2R25	2100-3091	1		RESISTOR-TRMR 2K 10% C TOP-ADJ 17-TRN	32997	3292W-1-202
A2R28	0698-7224	3	1	RESISTOR 316 1% .05W F TC=0+-100	24546	C3-1/8-TO-316R-F
A2R29	2100-3286	6	1	RESISTOR-TRMR 10K 10% C TOP-ADJ 17-TRN	32997	3292W-1-103
A2R30	0698-7277	6	1	RESISTOR 51.1K 1% .05W F TC=0+-100	24546	C3-1/8-TO-5112-F
A2RT1	0837-0324	6	1	THERMISTOR DISC 2K-OHM TC=4.4%/C-DEG	28480	0837-0324
A2S1	3101-2851	2	1	SWITCH	28480	3101-2851
A2U1	1NB7-8045	6	1	PREAMP HYBRID ASSEMBLY	28480	1NB7-8045
A2U2	1NB7-8039	8	1	CLOCK HYBRID ASSEMBLY	28480	1NB7-8039
A2U3	1826-0412	1	1	IC COMPARATOR PRCN DUAL 8-DIP-P PKG	27014	LM393N
A2U4	1826-0772	6	1	IC V RGL TR-ADJ-POS 1.2/32V TO-92 PKG	28480	1826-0772
A2U5	1826-0285	6	1	IC V RGLTR TO-92	04713	MC79L05C
A2U6	1826-0932	0	1	IC OP AMP PRCN 8-DIP-C PKG	06665	0P-27FZ
A2VR1	1902-3245	6	2	DIODE-ZNR 21.5V 5% DO-35 PD=.4W	28480	1902-3245
A2VR2	1902-3245	6		DIODE-ZNR 21.5V 5% DO-35 PD=.4W	28480	1902-3245

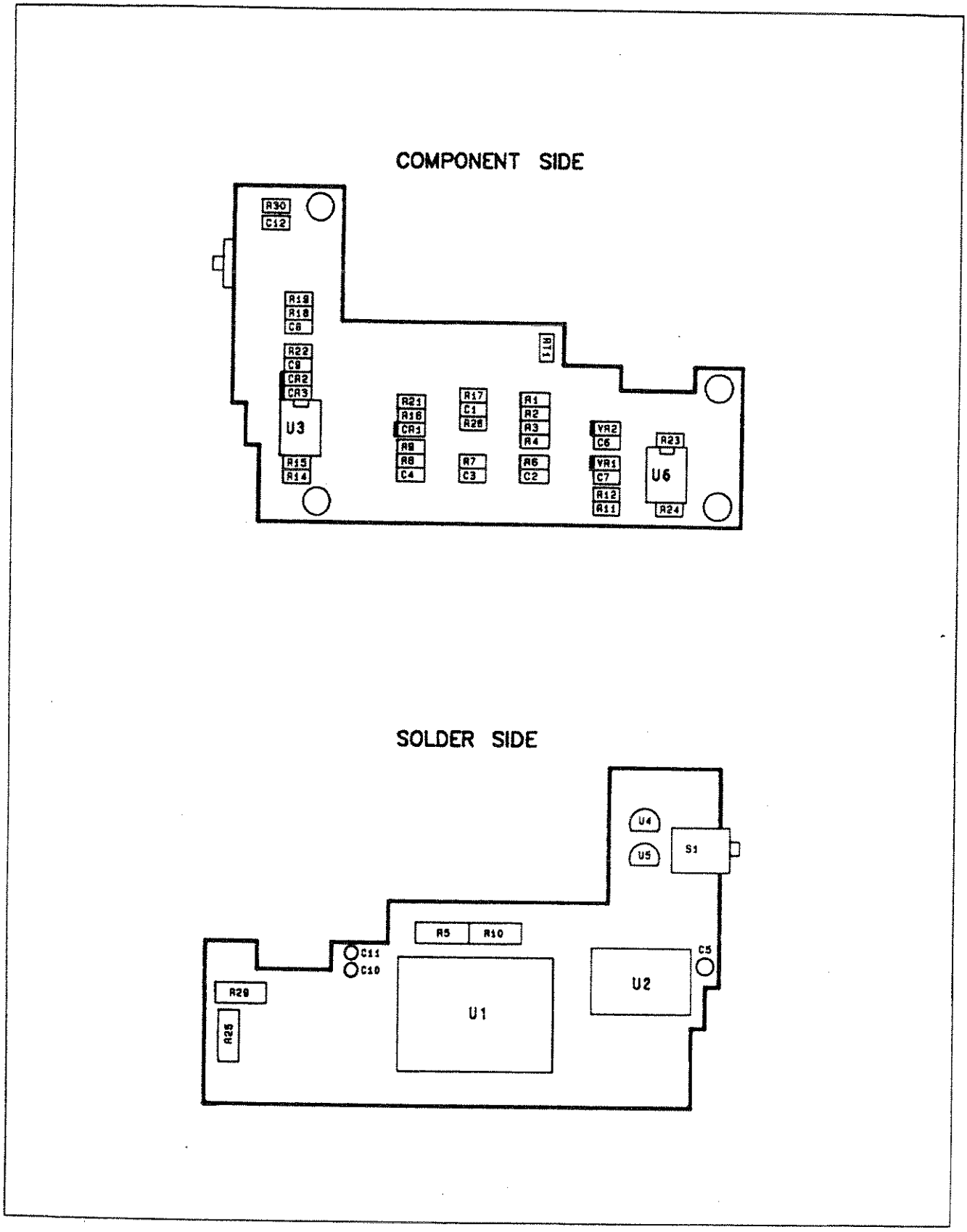


Figure 6-3. A2 Circuit Board Component Location

Table 6-3. Manufacturers' Code List

Manufacturers Code List

Code	Manufacturer	Address	Zip Code
04713	Motorola Semiconductor Products	Phoenix AZ	85008
06383	Panduit Corp	Tinley Park IL	60477
06665	Precision Monolithics Inc	Santa Clara CA	95050
24546	Corning Glass Works (Bradford)	Bradford PA	16701
25088	Siemens Corp	Iselin NJ	08830
27014	National Semiconductor Corp	Santa Clara CA	95051
28480	Hewlett-Packard Company Corporate HQ	Palo Alto CA	94304
32997	Bourns Inc Trimpot Prod Div	Riverside CA	92507

Reference Designators

A	assembly	R	resistor
AT	termination assembly	TP	test point
C	capacitor	S	switch
CR	diode	U	integrated circuit
J	jack	VR	diode
L	inductor	W	cable
MP	miscellaneous part		

Abbreviations

ADJ	adjustable	RMS	root-mean-square
ASSY	assembly	SGL	signal
BD	board	SI	silicon
CER	ceramic	SIG	signal
DBLHX	double chamfered, hex	SLDR	solder
FXD	fixed	STR	straight
G	giga (10^9)	TA	tantalum
K	kilo (10^3	THD	thread
MA	milli-amp	TML	terminal
MEG	mega (10^6)	TRMR	trimmer
MFR	manufacturer	TRN	turn
MHZ	megahertz	UF	microfarad
PF	picofarad	VDC	volts, direct current
PRCN	precision	W	watt
RGLTR	regulator	ZNR	zener

Section 7. Manual Backdating Changes

INTRODUCTION

This manual has been written for and applies directly to instruments with serial numbers prefixed as indicated on the title page. Earlier versions of the instrument (serial prefixes lower than the one indicated on the title page) may be slightly different in design or appearance. The purpose of this section of the manual is to document these differences. With the information provided in this section, this manual can be corrected so that it applies to any earlier version or configuration of the instrument. Later versions of the instrument (serial prefixes higher than the one indicated on the title page) are documented in a yellow manual changes supplement.

Since there are no earlier versions of the HP 85027E directional bridge, there is no change information required here. If your instrument serial number is different than the one on the title page, it will be documented in a manual change supplement. Complimentary copies of this supplement can be obtained from your nearest Hewlett-Packard office. Refer to INSTRUMENTS COVERED BY MANUAL in Section 1 for more information about serial number coverage.