

85021A/B/C DIRECTIONAL BRIDGE

SERIAL NUMBERS

This manual applies directly to the HP Model 85021A/B/C Directional Bridge with serial numbers prefixed as follows:

Model	Serial Prefix
85021A	2312A
85021B	2309A
85021C	2314A

With changes described in Section VII, this manual also applies to instruments with serial numbers prefixed as follows:

85021A	2301A, 2308A
85021C	2311A

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

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1400 FOUNTAIN GROVE PARKWAY, SANTA ROSA, CA 95404, U.S.A.

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HEWLETT
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Figure 1-1. Model 85021A Directional Bridge in Accessory Case Supplied

1-0

CAUTION

The 85021A/B/C microwave Directional Bridges contain microcircuits that are highly sensitive to electrostatic discharge (ESD). Damage from ESD is most likely to occur as the bridges are connected or disconnected. The surest method of protecting the 85021A/B/C is for the operator to wear a grounding strap that provides a path to ground of no less than 1 Megohm and no more than 2.5 Megohms. Alternatively the operator can ground himself before touching the bridge connectors, by touching any grounded instrument chassis. Never touch the center contacts of the connectors.

Tests at Hewlett-Packard have revealed that repeated ESD charges as low as 250 volts can destroy microwave diodes. Ordinary activities around everyday materials can generate ESD voltages of tens of thousands of volts. Materials conducive to static build-up include floor carpeting, nylon clothing, dry air, paper, adhesive tape, styrofoam, and vinyl. Use of the precautions described here will considerably reduce the probability of damage from ESD.

For service purposes, a work station equipped with an anti-static surface must be used. Use only anti-static solder removers and grounded soldering irons. Some replacement parts may be shipped in static-protective packaging: remove the parts from this packaging only at an anti-static work station while wearing the grounded wrist strap. All anti-static safeguards should conform to state and federal safety standards.



Figure 1-2. Models 85021A, 85021B, and 85021C Directional Bridges

SECTION I
GENERAL INFORMATION

1-1. INTRODUCTION

1-2. This manual contains operating and service information for the Hewlett-Packard Models 85021A, 85021B, and 85021C Microwave Directional Bridges. Section I includes specifications and supplemental performance characteristics, safety considerations, instrument identification, description, and other basic information. Figure 1-1 shows the Model 85021A in the accessory instrument case supplied with each instrument. Figure 1-2 shows all three Directional Bridges.

1-3. On the title page of this manual is a microfiche part number. This number may be used to order 10- by 15-centimeter (4- by 6-inch) microfilm transparencies of the manual. Each microfiche contains up to 60 photo duplicates of the manual pages. The microfiche package also includes the latest Manual Changes supplement as well as all pertinent Service Notes.

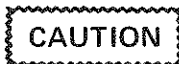
1-4. Refer any questions regarding this manual, the Manual Changes supplement, or the instrument to the nearest HP Sales/Service Office. Always identify the instrument by model number, complete name, and complete serial number in all correspondence. Refer to the inside rear cover of this manual for a worldwide listing of HP Sales/Service Offices.

1-5. SPECIFICATIONS

1-6. Specifications for the 85021A/B/C are listed in Table 1-1. These specifications are performance standards or limits against which the instrument may be tested. Table 1-2 lists supplemental characteristics. These are not specifications but are intended to provide information useful in applying the instrument by giving typical but non-warranted performance parameters.

1-7. SAFETY CONSIDERATIONS

1-8. The voltages present in the 85021A/B/C are not in a range to warrant more than normal caution.



The CAUTION sign in this manual calls

attention to an operating procedure or practice which, if not correctly performed or adhered to, could damage or destroy the equipment. Do not proceed beyond a CAUTION sign until the indicated conditions are fully understood and met.

1-9. INSTRUMENTS COVERED BY MANUAL

1-10. This instrument has a two-part serial number. The first four digits and the letter comprise the serial number prefix. The last five digits form the sequential suffix that is unique to each instrument. The contents of this manual apply directly to instruments having the same serial number prefix as the one given on the title page under the heading SERIAL NUMBERS.

1-11. An instrument manufactured after the printing of this manual may have a serial prefix that is not shown on the title page. This unlisted serial prefix indicates that the instrument is different from those documented in this manual. The manual for such an instrument will be supplied with a yellow Manual Changes supplement containing information to document the differences.

1-12. In addition to change information, the supplement may contain information for correcting errors in the manual. To keep this manual as current and accurate as possible, Hewlett-Packard recommends that you periodically request the latest Manual Changes supplement. The supplement for this manual is keyed to the manual's print date and part number, both of which appear on the title page. Complimentary copies of the supplement are available from Hewlett-Packard.

1-13. DESCRIPTION

1-14. The 85021A, 85021B, and 85021C are microwave Directional Bridges designed to be used in conjunction with the Hewlett-Packard Model 8756A Scalar Network Analyzer for making scalar reflection and transmission measurements. A single zero-biased Schottky diode detector in the bridge samples the return loss of a device under test for reflection measurements. Transmission measurements can be made with the addition of a detector. A power splitter can be used with the bridge for ratio measurements. A swept RF input signal is supplied by a sweep oscillator or a synthesized sweeper.

1-15. The 85021A covers the frequency range of 10 MHz to 18 GHz with an APC-7[®] test port connector and a type-N(f) input connector. The 85021B covers the frequency range of 10 MHz to 26.5 GHz with APC-3.5(f) connectors at both test port and input port.

*APC-7[®] is a registered trademark of the Bunker-Ramo Corporation.

The 85021C covers the frequency range of 10 MHz to 18 GHz with a precision type-N(f) test port connector and a type-N(f) input connector. 85021A/B/C nominal impedance is 50 ohms.

1-16. EQUIPMENT SUPPLIED

1-17. The 85021A, 85021B, and 85021C microwave Directional Bridges are each supplied in an instrument case as illustrated in Figure 1-1.

1-18. EQUIPMENT REQUIRED BUT NOT SUPPLIED

1-19. The following equipment is required for use with the 85021A/B/C in making transmission and reflection measurements:

- HP Model 8756A or 8755C Scalar Network Analyzer.
- HP Model 8350B Sweep Oscillator or 8340A Synthesized Sweeper.
- HP Model 11664A detector (0.01 to 18 GHz) or 11664B detector (0.01 to 26.5 GHz).
- HP Model 85023A/B/C System Verification Kit (see Table 1-3).

1-20. Scalar Network Analyzer

1-21. The Model 8756A Scalar Network Analyzer is a microprocessor based dual-channel receiver with its own digital display. It makes scalar transmission and reflection measurements at RF and microwave frequencies, over a dynamic range of -50 dBm to +10 dBm. It can measure amplitude ratios up to 60 dB. The 8756A is completely programmable through HP-IB (Hewlett-Packard Interface Bus), and can control a plotter (HP 7470A or 9872C) or a swept source (HP 8350B or 8340A) through the 8756 System Interface. HP-IB is Hewlett-Packard's hardware, software, documentation, and support for IEEE-488 and IEC-625, worldwide standards for interfacing instruments. The 85021A/B/C microwave bridges are designed to be used with the 8756A.

1-22. The 85021A, B, and C are also fully compatible with the Model 8755C Scalar Network Analyzer. Although the 8755C is not programmable, it also measures amplitude levels of -50 dBm to +10 dBm and amplitude ratios of 60 dB over a frequency range determined by the detectors used. The 8755C plugs into a Model 180-series display mainframe such as the 182T or the 180TR. In applications where memory or normalization is required, the 8750A Storage Normalizer is used in conjunction with the 8755C. In this case, the display mainframe used with the 8755C may require modification for interface with the 8750A. A table of 8750A/Display Mainframe compatibility is provided in Section I of

the 8755C Operating and Service Manual.

1-23. Both the 8756A and the 8755C use an AC detection technique with an operating frequency of 27.8 kHz. This technique provides nearly drift-free operation. An RF or microwave source signal is modulated at 27.8 kHz and is input to the Scalar Network Analyzer through one or more detector inputs. The detectors demodulate this signal to produce a 27.8 kHz square wave whose peak-to-peak voltage corresponds to the magnitude of the signal at the detector input. Since only the 27.8 kHz modulated signal is detected, unmodulated broadband noise and extraneous signals are eliminated from the measurement.

1-24. Swept Signal Source

1-25. A complete system for making transmission and reflection measurements requires a swept signal source to supply an RF input signal. The Model 8350B Sweep Oscillator with an RF Plug-In installed is an 8756A-compatible solid-state swept signal source with a frequency range determined by the RF Plug-In. For example, the Model 83595A RF Plug-In covers the entire frequency range of the 85021B Directional Bridge (0.01 to 26.5 GHz). The 8350B is fully HP-IB programmable, and can be controlled by the 8756A through the 8756 System Interface. It has internal 27.8 kHz squarewave modulation capability.

1-26. The Model 8350A Sweep Oscillator is similar to the 8350B, and is compatible with the 8756A. However, it does not have the firmware to enable 8756A control through the 8756 System Interface. Retrofit kits are available from Hewlett-Packard to update the 8350A for interface performance comparable to the 8350B.

1-27. The Model 8340A Synthesized Sweeper is an analog sweep synthesizer which generates synthesized output frequencies from 0.01 to 26.5 GHz. It is a complete swept signal source requiring no additional equipment. The 8340A is fully HP-IB programmable, and can be controlled by the 8756A through the 8756 System Interface. The 8340A can be squarewave modulated at 27.8 kHz with the Modulator Drive signal from the 8756A or 8755C Network Analyzer.

1-28. Detectors

1-29. One or more Model 11664A/B detectors are used with the 8756A or the 8755C and the 85021A/B/C Directional Bridges for making microwave transmission measurements. The 27.8 kHz modulated signal from the device under test is applied to the 11664A detector(s) on the Scalar Network Analyzer inputs. The detector demodulates this signal to produce a 27.8 kHz square wave whose

peak-to-peak voltage corresponds to the magnitude of the signal at the detector input. Each detector uses a biased Schottky diode to achieve -50 dBm sensitivity. The frequency range of the 11664A is 0.01 to 18 GHz. The frequency range of the 11664B is 0.01 to 26.5 GHz.

1-30. Power Splitter

1-31. Ratio measurements can be obtained using a power splitter in conjunction with the scalar network analyzer and detector(s). The HP Model 11667A power splitter has a frequency range of DC to 18 GHz. For measurements up to 26.5 GHz, the Weinschel Model 1579B power splitter is recommended.

1-31. EQUIPMENT AVAILABLE

1-32. Additional equipment available for use with the 8756A Scalar Network Analyzer and the 85021A/B/C Directional Bridges is listed in Section I of the 8756A Operating and Service Manual.

1-33. ACCESSORIES AVAILABLE

1-34. Table 1-3 lists 85023-series System Verification Sets available for use with the 85021A/B/C and the 8756A. These accessory sets are supplied with three connector types to correspond with the connectors of the bridges. Each set contains a high quality adapter, standard short and open circuits, a 50-ohm termination, and a 10-dB pad. The APC-7 and APC-3.5 kits contain a precision combination short circuit and shielded open circuit. This unit is designed so that the phase response of the short is exactly opposite to the phase response of the shielded open, to provide the best possible calibration line. Additional precision adapters and other miscellaneous accessories available are listed in Table 1-4.

1-35. RECOMMENDED TEST EQUIPMENT

1-36. Table 1-5 lists recommended test equipment. This equipment is used in performance testing of the 85021A/B/C. Other equipment may be substituted, provided its specifications equal or exceed the specifications given in the Critical Specifications column.

1-37. WARRANTY

1-38. Any attempt to perform any disassembly or repair procedure not clearly outlined in Section VIII, Service, of this manual will automatically void the warranty.

1-39. Subjection of the instrument to RF input power levels in excess of +23 dBm will automatically void the warranty.

Table 1-1. Specifications

	85021A	85021B	85021C
Frequency Range (GHz): ¹	0.01 to 18	0.01 to 26.5	0.01 to 18
Input Connector:	Type N (f)	APC-3.5 (f)	Type N (f)
Output Connector:	APC-7	APC-3.5 (f)	Precision Type N (f)
Maximum Power to Input Port:	+23 dBm	+23 dBm	+23 dBm
Directivity: ²			
0.01 to 0.04 GHz	>36 dB	>36 dB	>36 dB
0.04 to 12.4 GHz	>40 dB	>40 dB	>36 dB
12.4 to 18 GHz	>40 dB	>40 dB	>34 dB
18 to 20 GHz	-	>40 dB	-
20 to 26.5 GHz	-	>36 dB	-
Test Port Match (SWR):			
0.01 to 8.4 GHz	<1.15	<1.15	<1.15
8.4 to 12.4 GHz	<1.25	<1.25	<1.25
12.4 to 18.0 GHz	<1.40	<1.40	<1.40
18.0 to 20.0 GHz	-	<1.40	-
20.0 to 26.5 GHz	-	<1.75	-
Dimensions:	25 mm high x 110 mm wide x 96 mm deep (1.0 in x 4.3 in x 3.9 in) cable length: 1219 mm (48 inches)		
Weight:	Net: 0.5 kg (1.2 lb) Shipping: 2.3 kg (5 lb)		

¹Unless otherwise noted, all specifications are at 0°C to 55°C.

²25°C ± 5°C.

Table 1-2. Supplemental Characteristics

Values in this table are not specifications, but are typical but non-warranted performance parameters included for user information.

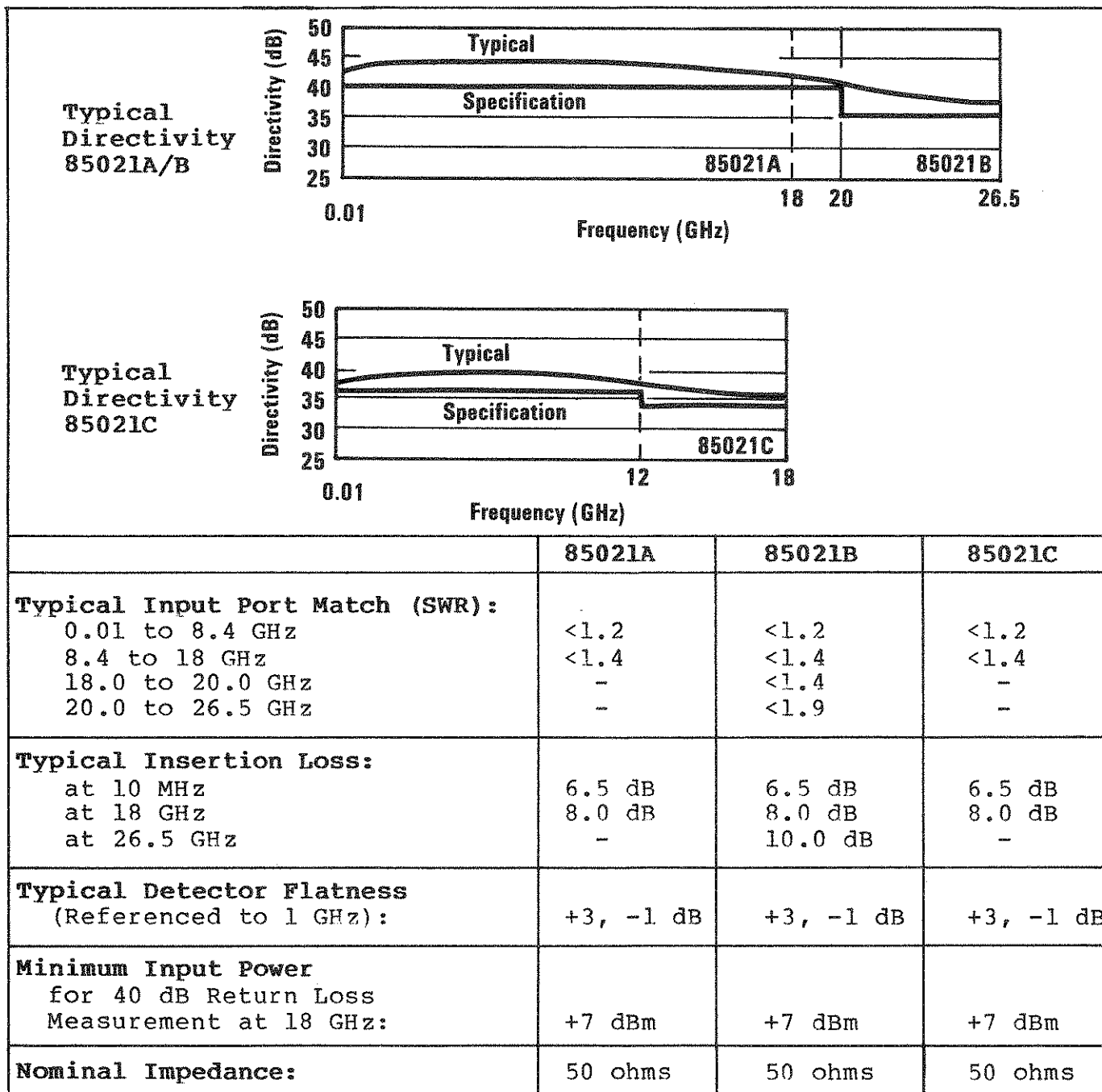


Table 1-3. System Verification Kits (1 of 2)

HP Model 85023A (APC-7) (for use with Model 85021A Directional Bridge)		
Qty	Accessory	HP Part or Model Number
1	APC-7 open/short	85021-60001
1	N(m) to N(m) adapter	1250-1475
1	APC-7 50-ohm termination	909A
1	APC-7 10 dB pad	8492A Opt. 010
1	instrument case	
1	Operating Note	
HP Model 85023B (APC-3.5) (for use with Model 85021B Directional Bridge)		
Qty	Accessory	HP Part or Model Number
1	APC-3.5 open/short	85037-60001
1	APC-3.5(m) to Type-N(m) adapter	1250-1743
1	APC-3.5 50-ohm termination	909D
1	APC-3.5 10 dB pad	8493C Opt. 010
1	instrument case	
1	Operating Note	

Table 1-3. System Verification Kits (2 of 2)

HP Model 85023C (Type-N) (for use with Model 85021C Directional Bridge)		
Qty	Accessory	HP Part or Model Number
1	Type-N short	11512A
1	Type-N open	85032-60001
1	Type-N(m) to Type-N(m) adapter	1250-1475
1	Type-N 50-ohm termination	909A Opt. 012
1	Type-N 10 dB pad	8491B Opt. 010
1	instrument case	
1	Operating Note	

Table 1-4. Accessories Available

Accessory	HP Part or Model Number
Adapters	
APC-7 to N(m)	11525A
APC-7 to N(f)	11524A
APC-7 to APC-3.5(m)	1250-1746
APC-7 to APC-3.5(f)	1250-1747
APC-3.5(m) to APC-3.5(m)	1250-1748
APC-3.5(m) to N(m)	1250-1743
N(m) to N(m)	1250-1475
APC-7 contact extractor	5060-0236
APC-7 Connector Service Kit	11591A
Open-end wrench	
thin, 1/2 x 9/16 inch	8710-0877
Anti-static wrist strap	9300-0791

Table 1-5. Recommended Test Equipment

		85021A	85021B	85021C
Instrument	Critical Specifications	Recommended Test Model		
Scalar Network Analyzer	Operating Frequency: 27.8 kHz 85021A/B/C compatible Includes display	8756A or 8755C/ 182T	8756A or 8755C/ 182T	8756A or 8755C/ 182T
Sweep Oscillator plus RF Plug-In or Synthesized Sweeper	8756A compatible Frequency: 0.01-18 GHz Frequency: 0.01-26.5 GHz Frequency: 0.01-26.5 GHz	8350B 83592A/B or 83595A 8340A	8350B 83595A	8350B 83592A/B or 83595A 8340A
Detectors (2)	Frequency: 0.01-18 GHz Frequency: 0.01-26.5 GHz	11664A *	11664B	11664A
Power Splitter	Frequency: 0.01-18 GHz Frequency: 0.01-26.5 GHz	11667A	Weinschel 1579B	11667A
System Verification Set	APC-7 APC-3.5 Type-N (50 ohms)	85023A	85023B	85023C
50 ohm Sliding Load	APC-7/Type-N, 1.8-18 GHz APC-3.5, 2-26.5 GHz	905A	911C	905A
Digital Multimeter	Accuracy: +0.01% Input Impedance: $\geq 10M$ Ohms	3456A	3456A	3456A
Storage Normalizer	For use with 8755C where memory is required	8750A	8750A	8750A
Amplifier	Output power: +15 dBm	8447E	8447E	8447E

This equipment is used for performance testing, adjustment, and troubleshooting.

*Option 001 (APC-7)

SECTION II

INSTALLATION

2-1. INTRODUCTION

2-2. This section provides information about initial inspection, preparation for use, mating connectors, packaging, storage, and shipment.

2-3. INITIAL INSPECTION

2-4. 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 for completeness and the instrument has been checked mechanically and electrically. The contents of the shipment should be as shown in Figure 1-1. Procedures for checking electrical performance are given in Section IV, Performance Tests, of this Operating and Service Manual. If the instrument does not pass the electrical Performance Tests, and a circuit malfunction is suspected, refer to Troubleshooting Procedures in Section VIII, Service, in this manual. If the instrument does not pass the above electrical tests, if the shipment contents are incomplete, or if there is mechanical damage or defect, notify the carrier as well as the nearest 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.

2-5. PREPARATION FOR USE

2-6. Power Requirements

2-7. Power for the Model 85021A/B/C Directional Bridge is obtained from the Model 8756A or 8755C Scalar Network Analyzer.

2-8. Connecting the 85021A/B/C Directional Bridge

2-9. To connect the 85021A/B/C for operation with the 8756A or 8755C Scalar Network Analyzer and the 8350A/B Sweep Oscillator, proceed as follows:

1. Secure the connector of the power cable W1 into the A, R, or B mating connector of the Network Analyzer by turning the outer shell clockwise to tighten.
2. Connect the RF output of the Sweep Oscillator RF Plug-In to the input port of the 85021A/B/C.

CAUTION

Do not apply more than +23 dBm RF power or more than +10 volts DC into the 85021A/B/C. If more than this power or voltage is applied, the Bridge will be damaged.

3. The device under test is connected to the Bridge test port. Typical measurement configurations are shown in Section III. If the Bridge is an 85021A, refer to Figure 2-1 for instructions on APC-7 connectors. Read the instructions on this figure before attempting to use APC-7 connectors.

2-10. Mating Connectors

2-11. The mating connector for an APC-7 connector is another APC-7 connector (see Figure 2-1). The mating connector for a precision type-N connector is a corresponding precision type-N connector whose dimensions conform to U.S. specification MIL-C-39012. The mating connector for a precision APC-3.5 female connector is a precision APC-3.5 male connector. An SMA male connector can be used, although this connection will exhibit a discontinuity with a SWR of about 1.10.

CAUTION

Use caution when mating an SMA male connector to an APC-3.5 female. Push the connectors straight together, with the male contact concentric with the female. DO NOT overtighten or rotate either center conductor; turn only the outer nut of the male. An out of spec connector can permanently damage its mate. Connector dimensions can be measured with a connector gauge (e.g. Maury AL 27A) before use.

2-12. A precision APC-3.5(m) to APC 3-5(m) adapter (HP Part No. 1250-1748), or a precision airline, can be used to extend the life of the 85021B APC-3.5 connectors.

2-13. Operating Environment

2-14. **Temperature:** 0°C to +55°C.

2-15. **Humidity:** 5% to 80% relative at +25°C to +40°C. Protection should be provided from temperature extremes, which cause condensation within the instrument.

2-16. **Altitude:** Up to 4572 metres (15,000 feet).

2-17. STORAGE AND SHIPMENT

2-18. Environment

2-19. The instrument may be stored or shipped in environments within the following limits:

Temperature	. . . . .	-40°C to +75°C
Humidity	. . . . .	5% to 95% relative at 0° to +40°C
Altitude	. . . . .	Up to 15240 meters (50,000 feet)

2-20. The instrument should also be protected from temperature extremes which may cause condensation in the instrument.

2-21. Packaging

2-22. 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 (located on the rear panel serial label). Mark the container FRAGILE to ensure careful handling. In any correspondence, refer to the instrument by model number and full serial number.

2-23. Other Packaging. The following general instructions should be used for repackaging with commercially available packaging materials:

- a. Wrap the instrument in anti-static plastic packaging material. 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.
- b. Use a strong shipping container.
- c. Use enough shock-absorbing material around all sides of the instrument to provide a firm cushion and to prevent movement inside the container.
- d. Seal the shipping container securely.
- e. Mark the shipping container FRAGILE to ensure careful handling.
- f. In any correspondence, refer to the instrument by model number and full serial number.

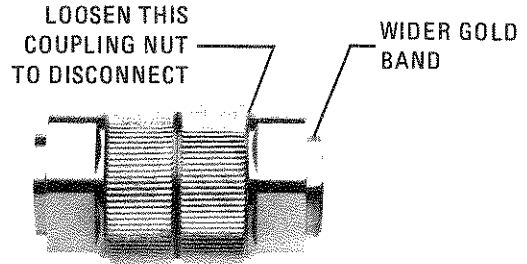
USE OF APC-7 CONNECTORS

To Connect:

1. On one connector, retract the coupling sleeve by turning the coupling nut counterclockwise until the sleeve and nut disengage.
2. On the other connector, fully extend the coupling sleeve by turning the coupling nut clockwise. To engage coupling sleeve and coupling nut when the sleeve is fully retracted, press back lightly on the nut while turning it clockwise.
3. Push the connectors firmly together, and thread the coupling nut of the connector with retracted sleeve over the extended sleeve.
4. Do NOT tighten the other coupling nut since this will tend to loosen the electrical connection.

To Disconnect:

1. Loosen the coupling nut of the connector showing the wider gold band.
2. **IMPORTANT:** Part the connectors carefully to prevent striking the inner conductor contact.



CARE OF APC-7 CONNECTORS

1. Keep contacting surfaces smooth and clean. Irregularities and foreign particles can degrade performance.
2. Protect the contacting surfaces when connector is not in use by leaving the coupling sleeve extended.
3. Use lintless material and/or firm-bristled brush such as tooth brush for cleaning. If a cleaning fluid is needed use isopropyl alcohol. **IMPORTANT:** Do not use aromatic or chlorinated hydrocarbons, esters, ethers, terpenes, higher alcohols, ketones,

or ether-alcohols such as benzene, toluene, turpentine, dioxane, gasoline, cellosolve acetate, or carbon tetrachloride. Keep exposure of the connector parts to both the cleaning fluid and its vapors as brief as possible.



Figure 2-1. Use and Care of APC-7 Connectors

SECTION III

OPERATION

3-1. INTRODUCTION

3-2. This section contains information for operation of the 85021A/B/C Directional Bridges.

3-3. OPERATING PRECAUTIONS

CAUTION

SUSCEPTIBLE TO DAMAGE FROM STATIC DISCHARGE

The 85021A/B/C Directional Bridges contain microcircuits that are highly sensitive to electrostatic discharge (ESD). Damage from ESD is most likely to occur as the bridges are connected or disconnected. The surest method of protecting the 85021A/B/C is for the operator to wear a grounding strap that provides a path to ground of no less than 1 Megohm and no more than 2.5 Megohms. Alternatively the operator can ground himself before touching the bridge connectors, by touching the outer shell of the bridge or any grounded instrument chassis. A work station equipped with an anti-static surface should be used. Never touch the center contacts of the connectors.

Tests at Hewlett-Packard have revealed that repeated ESD charges as low as 250 volts can destroy microwave diodes. Ordinary activities around everyday materials can generate ESD voltages of tens of thousands of volts. Materials conducive to static build-up include floor carpeting, nylon clothing, dry air, paper, adhesive tape, styrofoam, and vinyl. Use of the precautions described here will considerably reduce the probability of damage from ESD.

CAUTION

Do not apply more than +23 dBm RF power or more than +10 volts DC into the 85021A/B/C. If more than this power or voltage is applied, the 85021 will be damaged.

CAUTION

Do not drop the 85021A/B/C or subject it to mechanical shock, as this may cause internal damage.

3-4. FEATURES

3-5. Features of the 85021A, 85021B, and 85021C are shown in Figures 3-1A, 3-1B, and 3-1C, respectively.

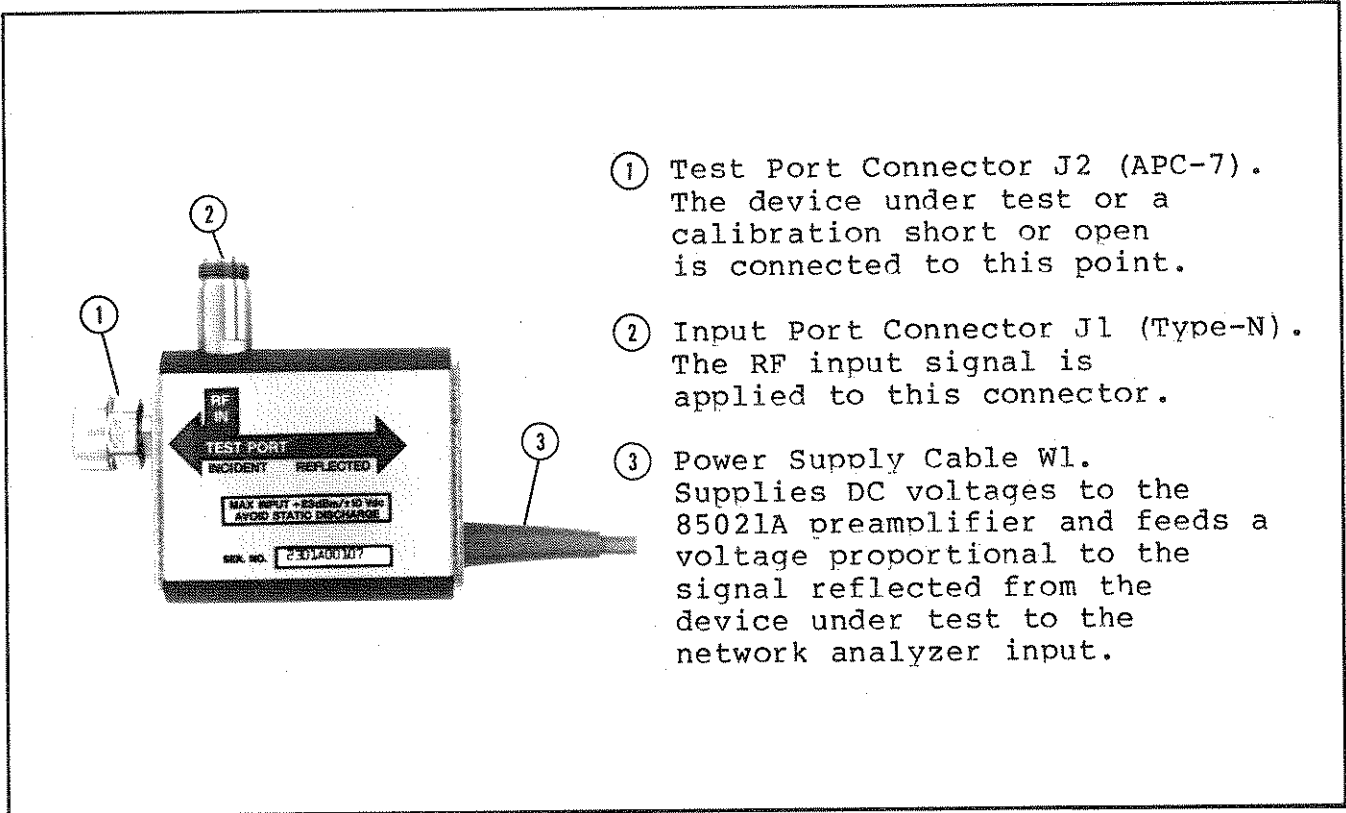
3-6. CONNECTOR WEAR

CAUTION

Do not over-tighten the connectors of the 85021A/B/C bridges. Excessive torque will deform the mating surfaces.

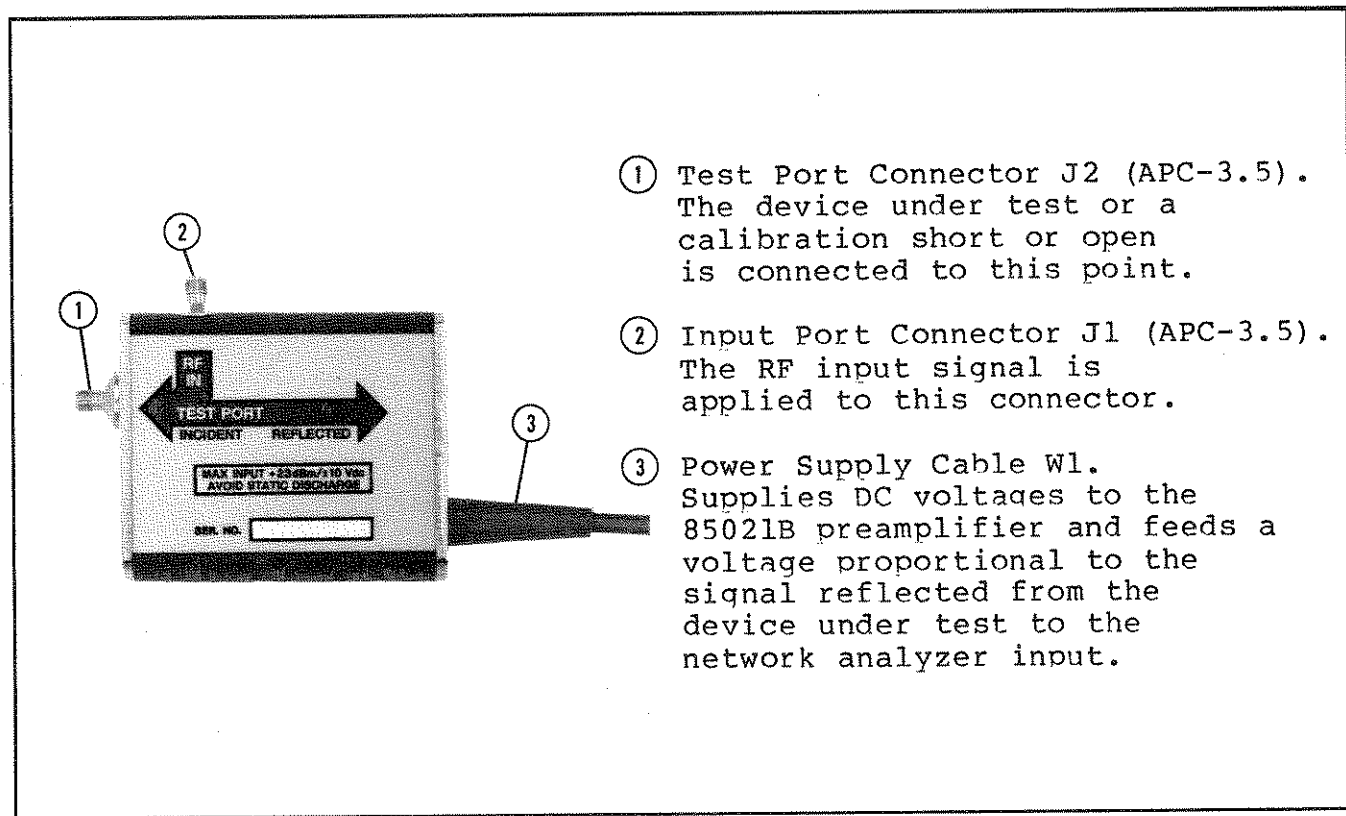
3-7. Repeated connections will cause the connectors to become worn, with a consequent degradation of performance, particularly in the 85021C type-N bridge. To extend the life of the connectors, it is recommended that an adapter be used on the test port in any application where some degradation of directivity can be accepted. For the most accurate measurements, a high quality adapter should be used, and the adapter should be periodically replaced. High quality adapters (low insertion loss, low return loss, stable in use, and durable) are necessary to achieve accurate, repeatable measurements. Calibrate for measurement using the same adapters and interconnect cables that will be used during measurement. To ensure repeatable measurements the adapters and cables must be clean, in good condition, and properly tightened. Start with the best available adapters and calibration standards then replace them when they become unstable. Recommended adapters are listed under Accessories Available in Section I of this manual.

3-8. The input port connector and the test port connector are part of the microcircuit bridge assembly. This assembly may be replaced with a new or a rebuilt assembly. For information concerning exchange assemblies, refer to Section VI, Replaceable Parts, of this manual.



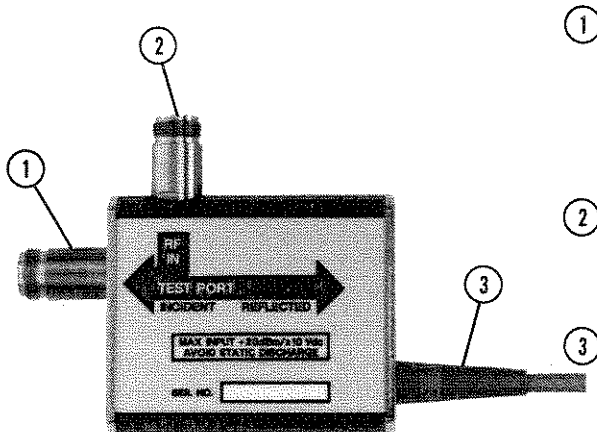
- ① Test Port Connector J2 (APC-7). The device under test or a calibration short or open is connected to this point.
- ② Input Port Connector J1 (Type-N). The RF input signal is applied to this connector.
- ③ Power Supply Cable W1. Supplies DC voltages to the 85021A preamplifier and feeds a voltage proportional to the signal reflected from the device under test to the network analyzer input.

Figure 3-1A. 85021A Features (Rear View)



- ① Test Port Connector J2 (APC-3.5). The device under test or a calibration short or open is connected to this point.
- ② Input Port Connector J1 (APC-3.5). The RF input signal is applied to this connector.
- ③ Power Supply Cable W1. Supplies DC voltages to the 85021B preamplifier and feeds a voltage proportional to the signal reflected from the device under test to the network analyzer input.

Figure 3-1B. 85021B Features (Rear View)



- ① Test Port Connector J2 (Precision Type-N). The device under test or a calibration short or open is connected to this point.
- ② Input Port Connector J1 (Type-N). The RF input signal is applied to this connector.
- ③ Power Supply Cable W1. Supplies DC voltages to the 85021C preamplifier and feeds a voltage proportional to the signal reflected from the device under test to the network analyzer input.

Figure 3-1C. 85021C Features (Rear View)

3-9. The connectors are not separately replaceable. Because they are precision connectors and have contact internally with the bridge microcircuit, they cannot be repaired in the field. An attempt to replace or repair the connectors will probably cause damage to the bridge microcircuit. In addition, special fixtures are required for reassembly. For repair or replacement of any connector, return the 85021A/B/C to Hewlett-Packard. The only exception: the APC-7 outer sleeve and coupling nut and inner conductor contact of the 85021A test port connector J2 can be replaced in the field. Instructions for replacing these parts are given in Section VIII, Service.

3-10. OPERATOR'S CHECK

3-11. Figure 3-2 is an operator's check procedure, which allows the operator to make a quick check of the main system functions prior to use. The test covers the entire measurement system and incorrect indications may be caused by any portion of the system. If the Directional Bridge is suspected, use the performance tests in Section IV to determine if the bridge is working correctly. If not, refer to Section VIII, Service, to isolate the problem.

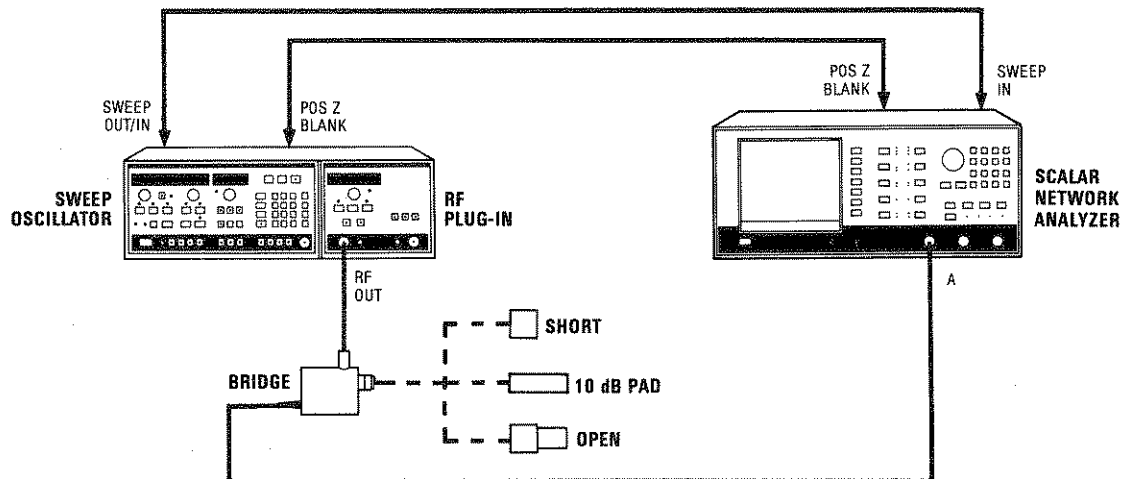
3-12. OPERATING INSTRUCTIONS

3-13. Instructions for operating the 85021A/B/C Directional Bridge with the Model 8756A Scalar Network Analyzer are supplied in Section III of the 8756A Operating and Service Manual. Figure 3-3 illustrates a typical instrument setup for transmission and reflection measurements using the 85021A/B/C bridge with the 8756A.

3-14. The 8755C Scalar Network Analyzer may be substituted for the 8756A, with the addition of the 8750A Storage Normalizer in applications where memory is required. In this case, the display mainframe used with the 8755C may require modification for interface with the 8750A. A table of 8750A/Display Mainframe compatibility is provided in Section I of the 8755C Operating and Service Manual. Figure 3-4 shows a typical measurement setup using the 8755C and the 8750A.

3-15. Ratio measurements can be obtained using a power splitter in conjunction with the scalar network analyzer and detector(s). Figure 3-5 illustrates a typical ratio measurement using a power splitter.

TYPICAL OPERATOR'S CHECK



EQUIPMENT

The equipment listed here is appropriate for checking the 85021A. Refer to Section I for the equipment and accessories recommended for use with the 85021B and 85021C.

Sweep Oscillator	HP 8350A/B
RF Plug-In	HP 83592A
Scalar Network Analyzer	HP 8756A
10-dB Attenuator	8492A Option 010
Calibrated Open/Short	85021-60001

PROCEDURE

1. Connect equipment as shown above.
2. Set up the test equipment as follows:
 On 8756A press **[PRESET]** to preset the 8756A and 8350B. Press 8756A **[SHIFT]** and Channel 2 **[MEAS RATIO]** to shut off Channel 2. Set the 8350B to 50 MHz swept CW by pressing **[SHIFT]** **[CW]** **[5]** **[0]** **[MHZ]**.

Figure 3-2. Operator's Check (1 of 2)

3. Perform an OPEN/SHORT calibration as follows:
 Press 8756A MAIN MENU soft keys [CAL] [OPEN/SHORT] [CHAN 1].
 Connect a calibrated short to the test port of the 85021A/B/C,
 and press [STORE SHORT] to store the short calibration data.
 Remove the short and connect a calibrated open to the test
 port. On the 8756A press [STORE OPEN] to store the open
 calibration data. On the 8756A Channel 1 press [DISPLAY] until
M-MEM is selected. The Channel 1 normalized trace will be
 displayed.
4. Remove the open and connect the 10-dB Attenuator to the
 85021A/B/C test port. Leave the other end of the attenuator
 open.
5. On the 8756A press [CURSOR]. The return loss of the
 unterminated pad (10 dB in each direction) will be displayed.
 The display should read -20 dB \pm 2dB.

Figure 3-2. Operator's Check (2 of 2)

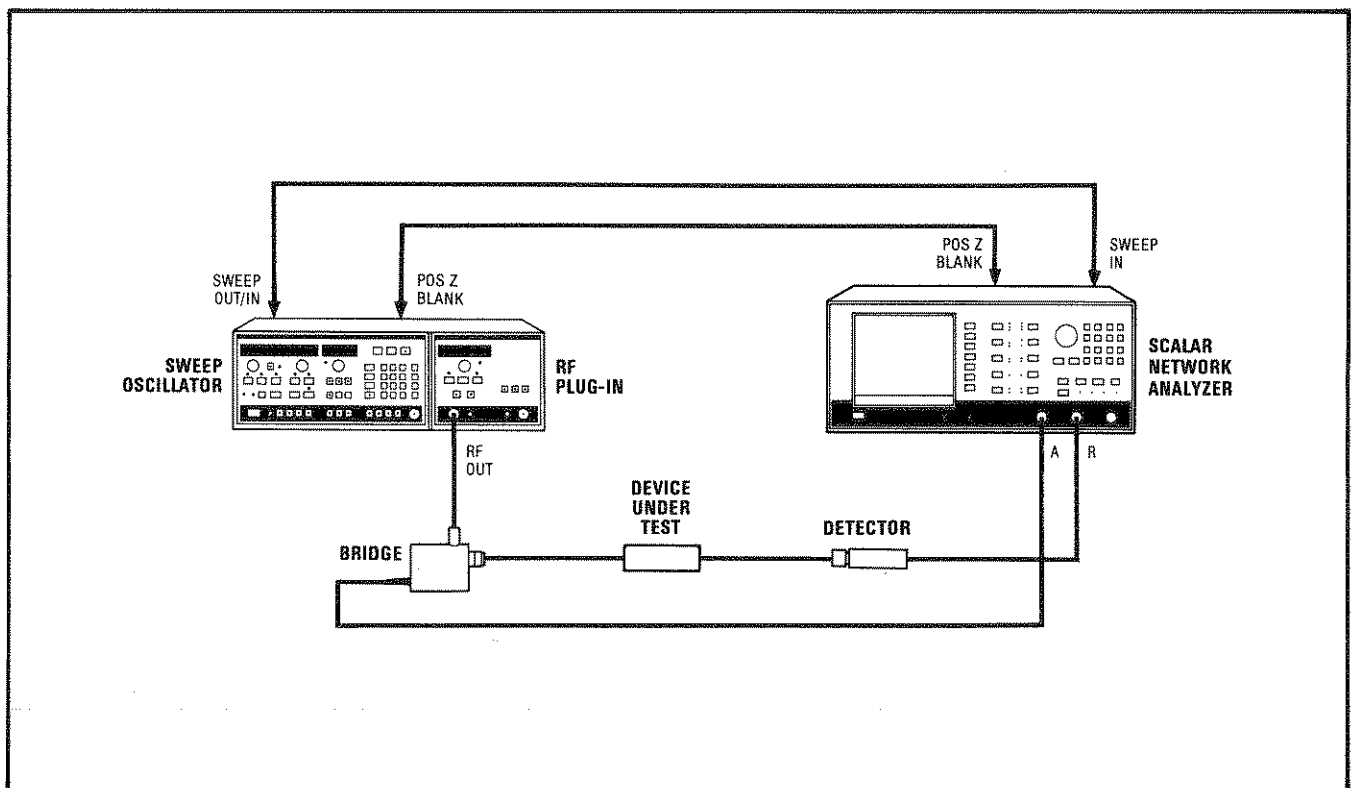


Figure 3-3. Typical Measurement Setup Using 8756A

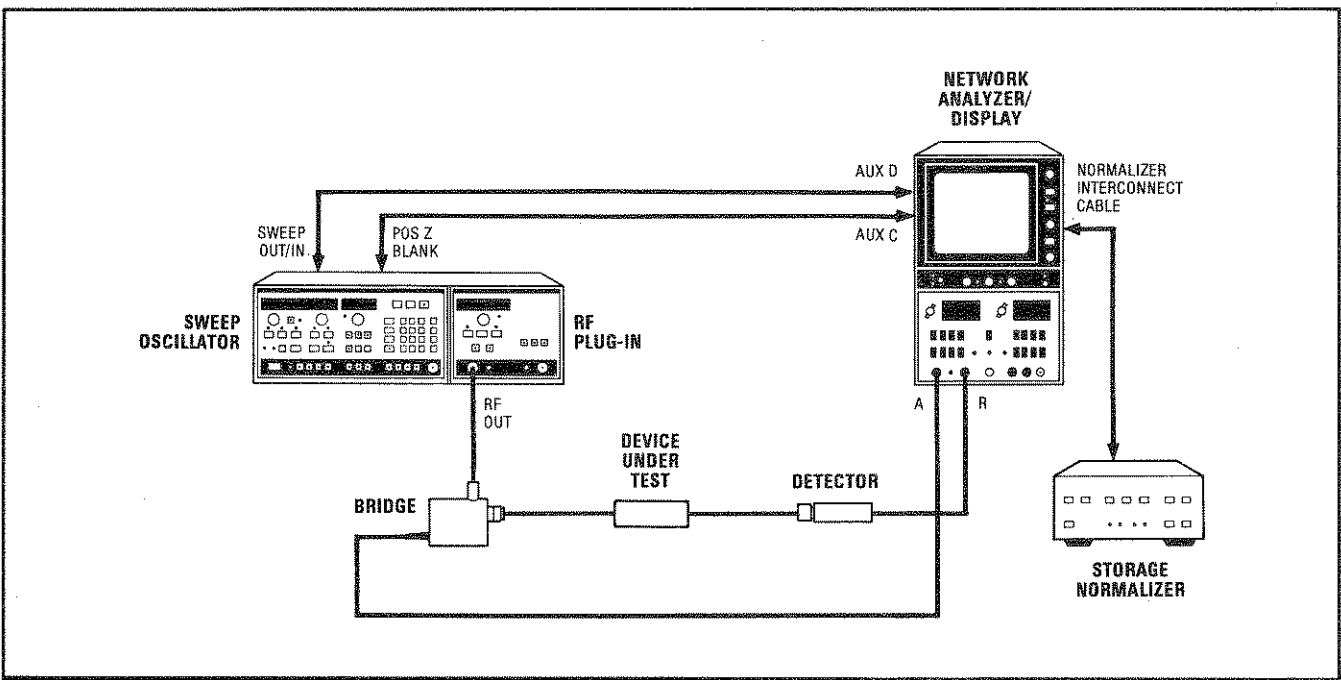


Figure 3-4. Typical Measurement Setup Using 8755C with 8750A

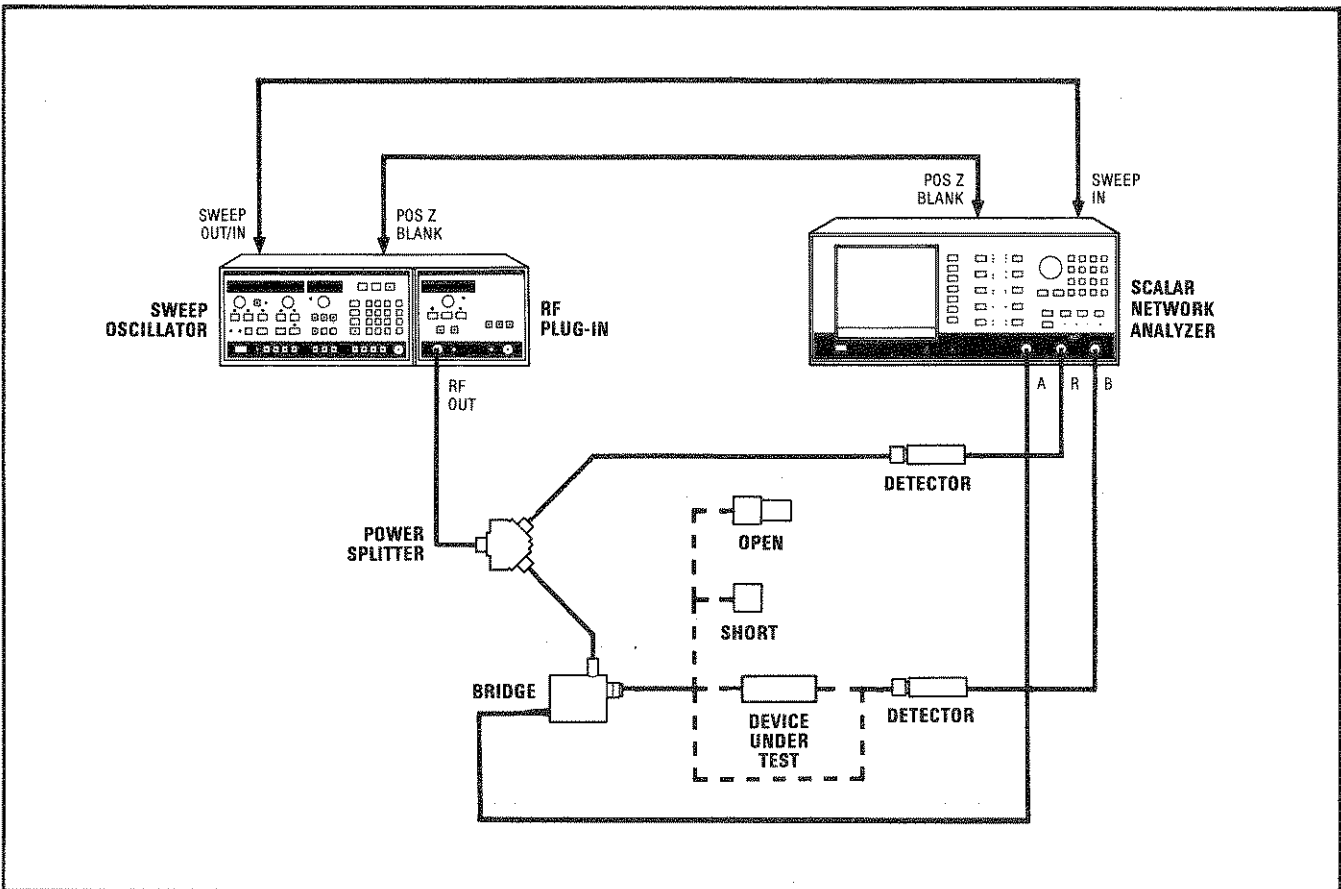


Figure 3-5. Typical Measurement Setup Using Power Splitter

SECTION IV
PERFORMANCE TESTS

4-1. INTRODUCTION

4-2. The procedures in this section test the electrical performance of the 85021A/B/C using the specifications of Table 1-1 as the performance standards. All tests can be performed without access to the interior of the instrument.

4-3. EQUIPMENT REQUIRED

4-4. Equipment required for the performance tests is listed in the Recommended Test Equipment table in Section I. Any equipment that satisfies the critical specifications given in the table may be substituted for the recommended model.

4-5. PERFORMANCE TEST RECORD

4-6. Results of the performance tests may be tabulated on the Performance Test Record at the end of the procedures. The Test Record lists all of the tested specifications and their acceptable limits. Test results recorded at incoming inspection can be used for comparison in periodic maintenance and troubleshooting and after repairs or adjustments.

4-7. DIRECTIVITY

Specifications:

	85021A	85021B	85021C
0.01 to 0.04 GHz	>36 dB	>36 dB	>36 dB
0.04 to 12.4 GHz	>40 dB	>40 dB	>36 dB
12.4 to 18 GHz	>40 dB	>40 dB	>34 dB
18 to 20 GHz	-	>40 dB	-
20 to 26.5 GHz	-	>36 dB	-

Description:

Directivity is a measure of the ability of a directive device to discriminate between incident and reflected signals. In principle, directivity can be measured when the TEST port is terminated with a perfect load to eliminate all reflected signals. Any remaining signals detected are the directivity errors. However, since no perfect load is available, the test procedures below make allowances for this external error.

First an open-short calibration is performed. Then for frequencies below 2 GHz, a fixed load with the best possible return loss is attached to the TEST port, and the new measured value is recorded. Above 2 GHz, a sliding load is used to further reduce measurement uncertainties.

Equipment:

The equipment listed here is appropriate for testing the 85021A. Refer to Section I for the equipment and accessories recommended for use with the 85021B and 85021C.

Sweep Oscillator	HP 8350A/B
RF Plug-In	83592A
Scalar Network Analyzer	HP 8756A
Calibrated Open/Short	HP 85021-60001
Fixed Load	HP 909A
Sliding Load	HP 905A

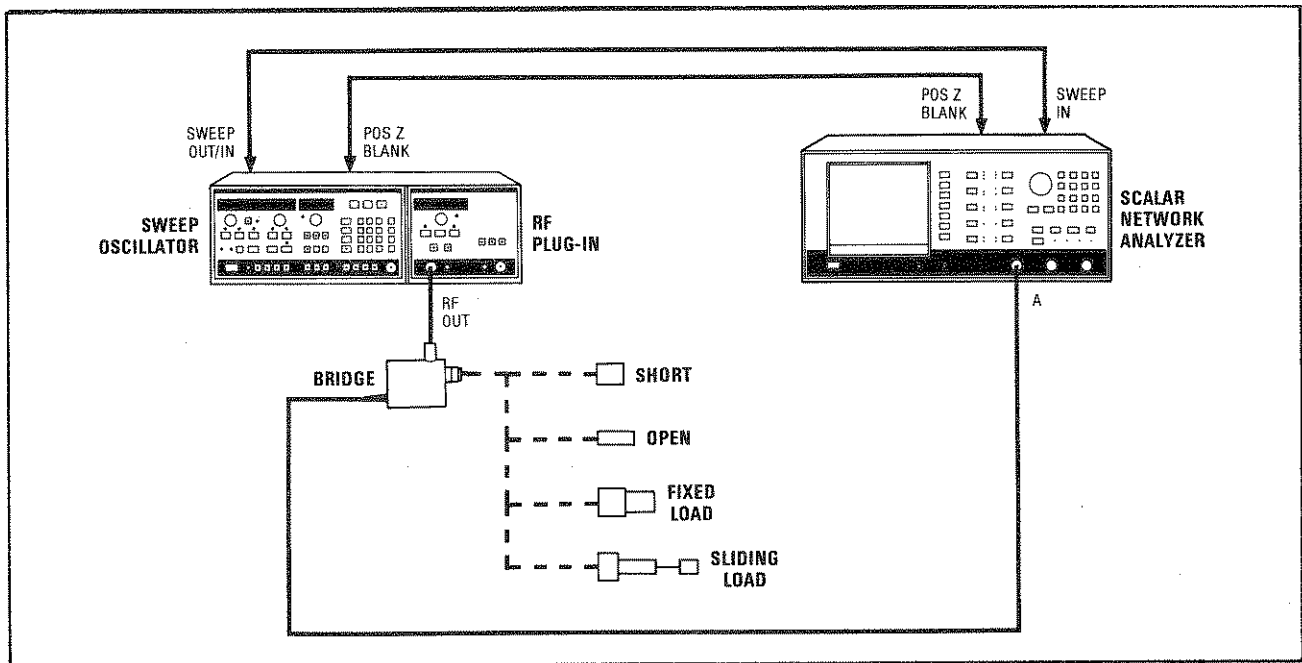


Figure 4-1. Directivity Test Setup

Procedure

1. Connect the equipment as shown in Figure 4-1. Do not connect the fixed load or the sliding load at this time.
2. Set up the test equipment as follows:
On Sweep Oscillator, press **[INSTR PRESET] [SWEEP TIME] [1] [5] [0] [ms] [] MOD**. On the RF Plug-In, RF power is ON. On the Scalar Network Analyzer, press **[PRESET]**, then turn off Channel 2 by pressing **[SHIFT]** and Channel 2 **[MEAS RATIO]**.

Below 2 GHz

3. On the 8350A/B Sweep Oscillator, set the START and STOP frequencies to correspond to the first band of frequencies in Table 4-1, the Performance Test Record (0.01 to 0.04 GHz).
4. Perform an open/short calibration.
5. Attach the fixed load to the TEST port of the 85021A/B/C. On the 8756A, press **[SHIFT] [SCALE]** for the AUTOSCALE function, then press **[CURSOR] [CURSOR MAX 1]** to find the point of minimum return loss (the high point on the trace). Record the displayed CURSOR value on the Performance Test Record, Table 4-1. This value represents the scalar sum of directivity signals (desired measurement) plus reflected signals from the fixed load (undesired error). Thus, fixed load quality directly affects the quality of directivity measurements. Refer to Figure 4-2. The shaded areas in this figure indicate the probable range of measurable values for each specified

directivity value. On the horizontal axis, locate the fixed load's reflection coefficient or its specified return loss (convert from SWR, if necessary). Move up from this point to the upper limit of the shaded area between the diagonal lines. Enter the value of this upper limit on the Performance Test Record, Table 4-1. Allowing for the load error, any directivity measurement that falls below this limit indicates that the 85021A/B/C is probably within specifications for the frequency band of interest. If the measurement falls above the upper limit, the bridge does not meet specifications, and troubleshooting procedures should be performed.

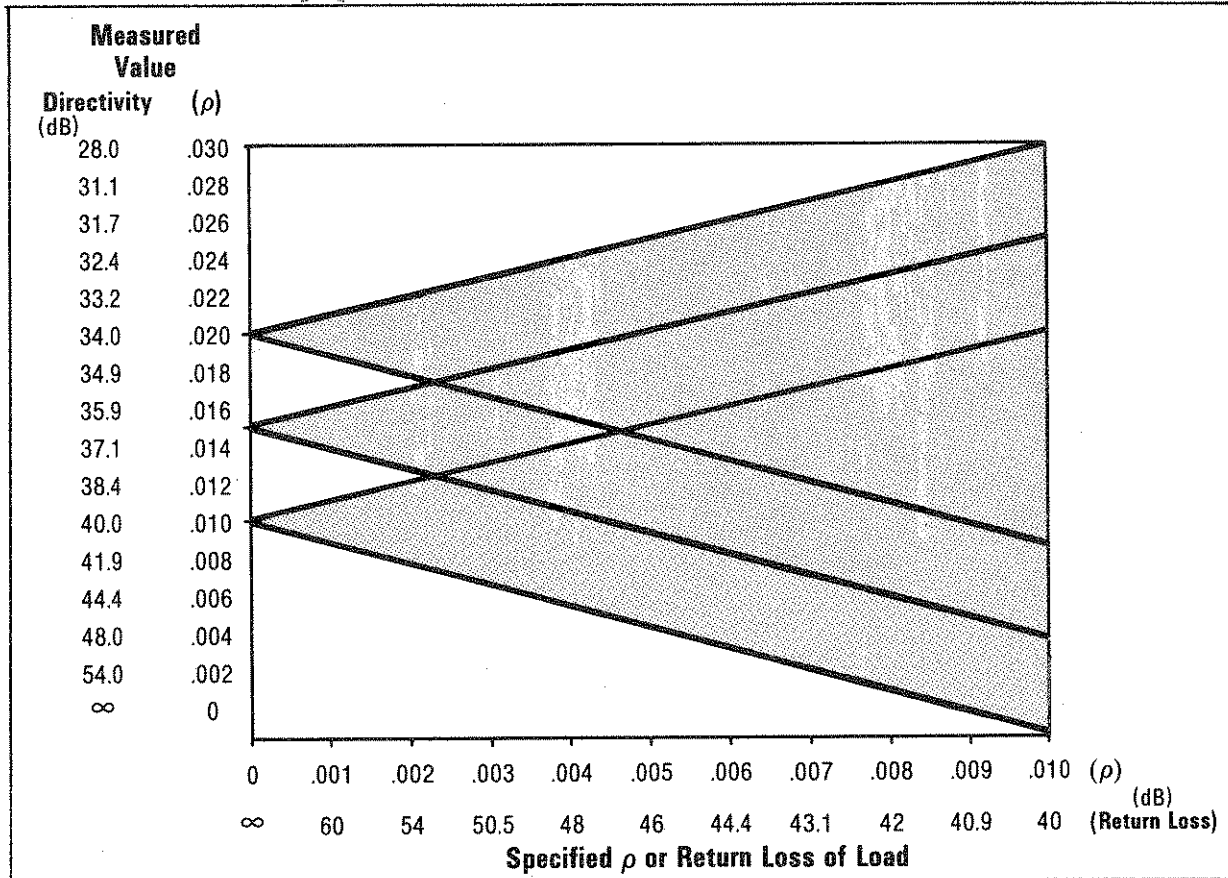


Figure 4-2. Probable Range of Measurable Directivity Values

- On the 8350A/B Sweep Oscillator, set the START frequency to 0.04 GHz and the STOP frequency to 2 GHz. Repeat Steps 4 and 5.

Above 2 GHz

- On the 8350A/B Sweep Oscillator, set the START frequency to 2.0 GHz and the STOP frequency to 12.4 GHz to correspond to the next band of frequencies on the Performance Test Record, Table 4-1.

8. Perform an open/short calibration.
9. Connect the sliding load to the TEST port of the 85021A/B/C. (Refer to the Operating and Service Manual for the sliding load if you are not familiar with its use.)
10. On the Scalar Network Analyzer, adjust the [SCALE] and [REF LEVEL] to position the trace on the display. Slowly move the sliding load back and forth: the trace should change slightly, as the phase of the sliding load reflection changes. For several frequencies (i.e., horizontal points) on the display, note the maximum and minimum measured return loss for various sliding load positions.

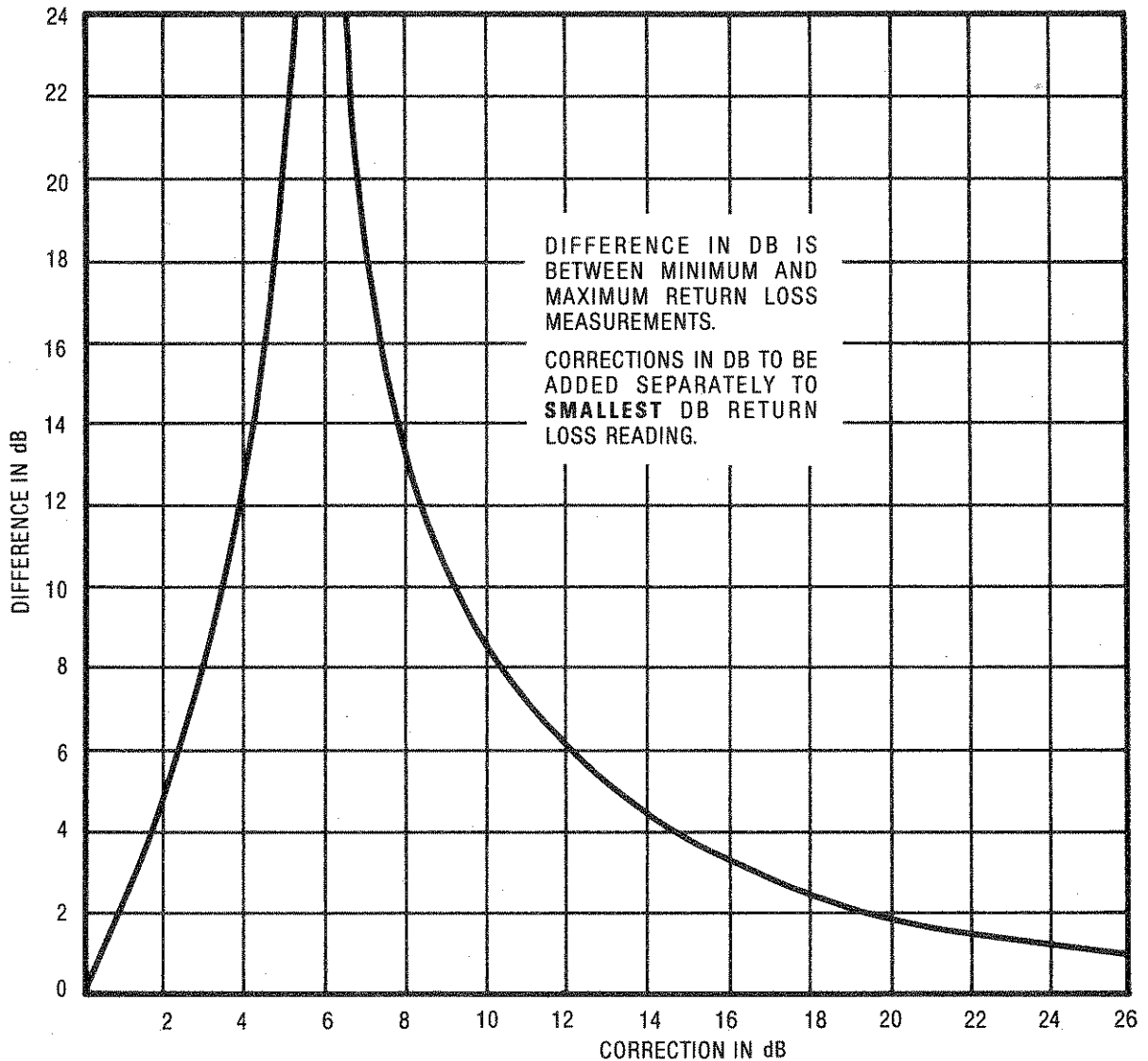


Figure 4-3. Signal Separation Chart

11. For each frequency, the maximum and minimum measured return loss values correspond to the directivity signal and the sliding load reflected signal adding and subtracting. These two signals can be separated using a Signal Separation Chart, Figure 4-3. Calculate the **difference** in dB between the maximum and minimum measured return loss at each frequency (the low and high point on the trace), and locate this value on the vertical axis. Intersect the curves in two places, and determine the **two** correction values in dB. Add each of these correction values to the **minimum** measured return loss (the **smaller** of the two). The resulting two corrected values are the **separated** directivity signal and sliding load reflected signal.
12. Usually, the larger return loss value is the measured directivity error. (The smaller is the sliding load reflection.) To verify this, use **one** of the two following methods:
 - A. Measure the sliding load return loss on an automatic (vector error corrected) network analyzer. Then match the measured return loss to one of the two separated signals. The other separated signal is the directivity of the 85021A/B/C Directional Bridge.
 - B. Slowly retract the center conductor of the sliding load about 2mm. This introduces a discontinuity at the 85021A/B/C TEST port, causing the measured directivity to change. Repeat steps 10 and 11 above. After the signals are separated, one of the two should match one of the two separated signals from the **first** measurement. This unchanged value is the return loss of the sliding load. The **other** separated value from the **first** measurement is the directivity of the 85021A/B/C Directional Bridge.
13. Enter the directivity on the Performance Test Record, Table 4-1.
14. The quality of the sliding load directly affects the quality of the directivity measurements. Although the signal separation technique above removes reflections of the load itself, the mismatch of the sliding load connector and airline introduces reflections and uncertainties. To estimate these uncertainties, refer to Figure 4-2. Locate the specified return loss of the sliding load airline and connector on the horizontal axis (convert from SWR). Move up from this point to the upper limit of the shaded area between the diagonal lines. This value is the upper limit of the Bridge specified directivity corresponding to the sliding load's return loss

for this frequency range. Enter this value on the Performance Test Record, Table 4-1.

15. On the Sweep Oscillator, set the START and STOP frequencies to the next band of interest listed on the Performance Test Record, Table 4-1. Repeat Steps 8 through 14.

4-8. TEST PORT MATCH (SWR)

Specifications:

	85021A	85021B	85021C
0.01 to 8.4 GHz	≤ 1.15	≤ 1.15	≤ 1.15
8.4 to 12.4 GHz	≤ 1.25	≤ 1.25	≤ 1.25
12.4 to 18.0 GHz	≤ 1.40	≤ 1.40	≤ 1.40
18.0 to 20.0 GHz	-	≤ 1.40	-
20.0 to 26.5 GHz	-	≤ 1.75	-

Description:

Using a typical reflection measurement setup, another directional bridge is used to measure the Test port SWR of the directional bridge under test. The directional bridge under test must be biased by a Scalar Network Analyzer, and its RF IN port must be properly terminated.

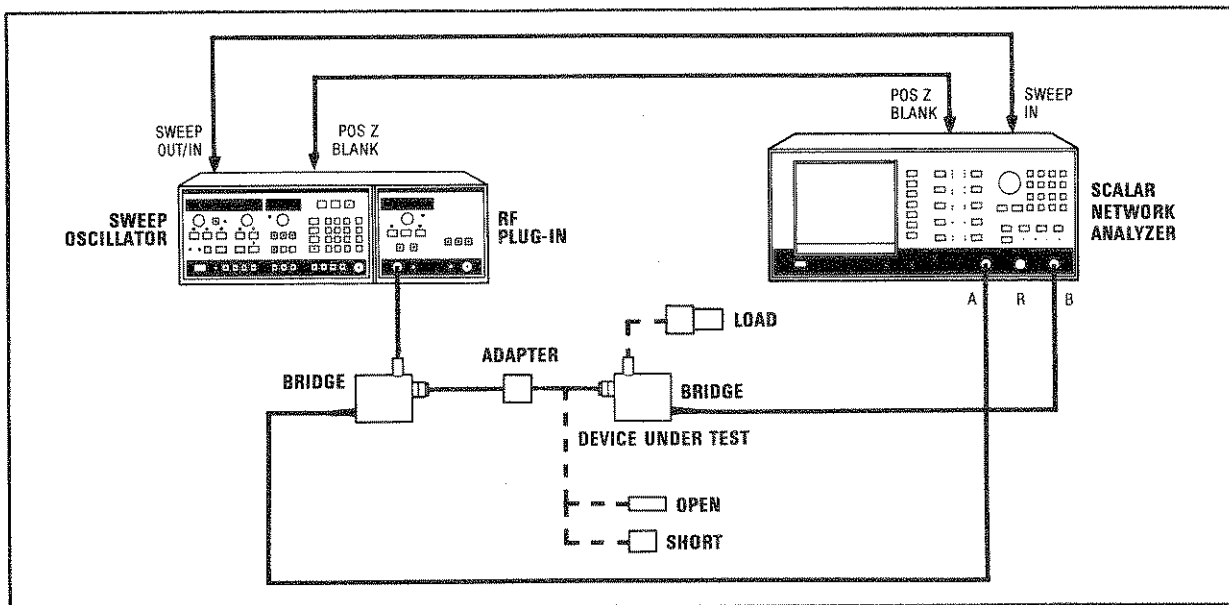


Figure 4-4. TEST Port SWR Test Setup

Equipment:

The equipment listed here is appropriate for testing the 85021A. Refer to Section I for the equipment and accessories recommended for use with the 85021B and 85021C.

Sweep Oscillator	HP 8350A/B
RF Plug-In	83592A
Scalar Network Analyzer	HP 8756A
Calibrated Open/Short	HP 85021-60001
Directional Bridge*	85021A
50-Ohm Load	HP 909A
Adapters (85021B/C only)	See Section I

*A second directional bridge is required as a test instrument in addition to the directional bridge under test.

Procedure:

1. Set up the equipment as shown in Figure 4-4, with the calibrated short connected to the directional bridge (the test device, not the device under test).
2. Set up the test equipment as follows:
On the Sweep Oscillator, press [INSTR PRESET] [SWEEP TIME] [1] [5] [0] [ms] [L MOD]. On the Scalar Network Analyzer, press [PRESET], then turn off Channel 2 by pressing [SHIFT] and Channel 2 [MEAS RATIO].
3. On the 8350A/B Sweep Oscillator, set the START and STOP frequencies to correspond to the first band of frequencies in the Performance Test Record (0.01 to 8.4 GHz).
4. Perform an open/short calibration.
5. Connect the directional bridge under test to the first directional bridge, TEST port to TEST port. Use adapters if necessary. Recommended high quality adapters are listed in Section I of this manual. Connect the 50-ohm load to the input port of the directional bridge under test.
6. On the 8756A, press [SHIFT] [SCALE] for the AUTOSCALE function, then press [CURSOR] [CURSOR MAX 1] to find the point of minimum return loss (the high point on the trace). Use the reflectometer calculator to convert this measured return loss to SWR. Enter this value on the Performance Test Record, Table 4-1.
7. On the Sweep Oscillator, set the START and STOP frequencies to the next band of interest listed on the Performance Test Record. Repeat steps 4 through 7 for each frequency band.

Table 4-1. Performance Test Record

DIRECTIVITY			
Frequency Range	Step	Scalar Sum of Directivity Signals	Upper Limit (from Fig. 4-2)
0.01 to 0.04 GHz	5	_____	_____
0.04 to 2.0 GHz	6	_____	_____
2.0 to 12.4 GHz	7	_____	_____
	13	_____	_____
12.4 to 18.0 GHz	14	_____	_____
	13	_____	_____
18.0 to 20.0 GHz*	14	_____	_____
	13	_____	_____
20.0 to 26.5 GHz*	14	_____	_____
	13	_____	_____
14	_____	_____	_____
TEST PORT MATCH (SWR)			
Frequency Range	Step	Calculated SWR	Specified Upper Limit
0.01 to 8.4 GHz	6	_____	1.15
8.4 to 12.4 GHz	6	_____	1.25
12.4 to 18.0 GHz	6	_____	1.40
18.0 to 20.0 GHz*	6	_____	1.40
20.0 to 26.5 GHz*	6	_____	1.75

*85021B only

SECTION V

ADJUSTMENTS

5-1. INTRODUCTION

5-2. There are no adjustments recommended for regular calibration or normal use of the 85021A/B/C Directional Bridge. However, if the internal bridge microcircuit is replaced, adjustments must be made to compensate the preamplifier for the individual diode characteristics. The procedures for replacing the bridge microcircuit and adjusting the preamplifier are described in Section VIII, Service, of this manual.

SECTION VI
REPLACEABLE PARTS

6-1. INTRODUCTION

6-2. This section contains information for ordering parts. Table 6-1 lists the available exchange assemblies. Table 6-2 lists abbreviations used in the parts lists and the names and addresses that correspond with the manufacturers' code numbers. Tables 6-3A/B/C list the replaceable parts in reference designator order for the 85021A, 85021B, and 85021C separately. Only the listed parts are replaceable.

6-3. EXCHANGE ASSEMBLIES

6-4. The microcircuit bridge assembly, including input and test port connectors and the reference termination, may be replaced on an exchange basis, thus affording a considerable cost savings. Table 6-1 lists these assemblies for the three Bridges, together with the part numbers for the exchange assemblies. Exchange, factory repaired and tested assemblies are available only on a trade-in basis; therefore, the defective assemblies must be returned for credit. For this reason, assemblies required for spare parts stock must be ordered by the new assembly part number.

6-5. ABBREVIATIONS

6-6. Table 6-2 contains three major sections: Reference Designations expands the designators used in the parts list; Abbreviations defines all abbreviations used in the descriptions of replaceable parts; Manufacturers Code List references the name and address of a typical manufacturer with the code number provided in the parts list.

6-7. REPLACEABLE PARTS LISTS

6-8. Tables 6-3A/B/C are the lists of replaceable parts for the 85021A, 85021B, and 85021C respectively, and are organized as follows:

- a. Electrical assemblies and their components in alpha-numerical order by reference designation.
- b. Chassis-mounted parts in alpha-numerical order by reference designation.

c. Miscellaneous parts.

6-9. The information given for each part consists of the following:

- a. The Hewlett-Packard part number.
- b. Part number check digit (CD).
- c. The total quantity (Qty) in the instrument.
- d. The description of the part.
- e. A typical manufacturer of the part in a five-digit code.
- f. The manufacturer's number for the part.

6-10. The total quantity for each part is given only once for each instrument - at the first appearance of the part number in the list for that instrument.

6-11. ILLUSTRATIONS

6-12. Figures 6-1A/B/C, Replaceable Parts Identification, illustrate the locations of miscellaneous replaceable parts, some of which are also listed in Tables 6-3A/B/C. These parts are denoted with reference designation prefix MP.

6-13. ORDERING INFORMATION

6-14. To order a part listed in the Replaceable Parts Lists, quote the Hewlett-Packard part number with its check digit (CD), indicate the quantity, and address the order to the nearest Hewlett-Packard Office. The check digit will ensure accurate and timely processing of your order.

6-15. To order a part that is not listed in the Replaceable Parts List, include the instrument model number, instrument serial number, description and function of the part, and the number of parts required. Address the order to the nearest Hewlett-Packard Office.

Table 6-1. Exchange Microcircuit Bridge Assemblies

(Includes input and test port connectors and reference termination.)

INSTRUMENT	NEW PART NUMBER	REBUILT-EXCHANGE PART NUMBER
85021A	5086-7376	5086-6376
85021B	5086-7377	5086-6377
85021C	5086-7399	5086-6399

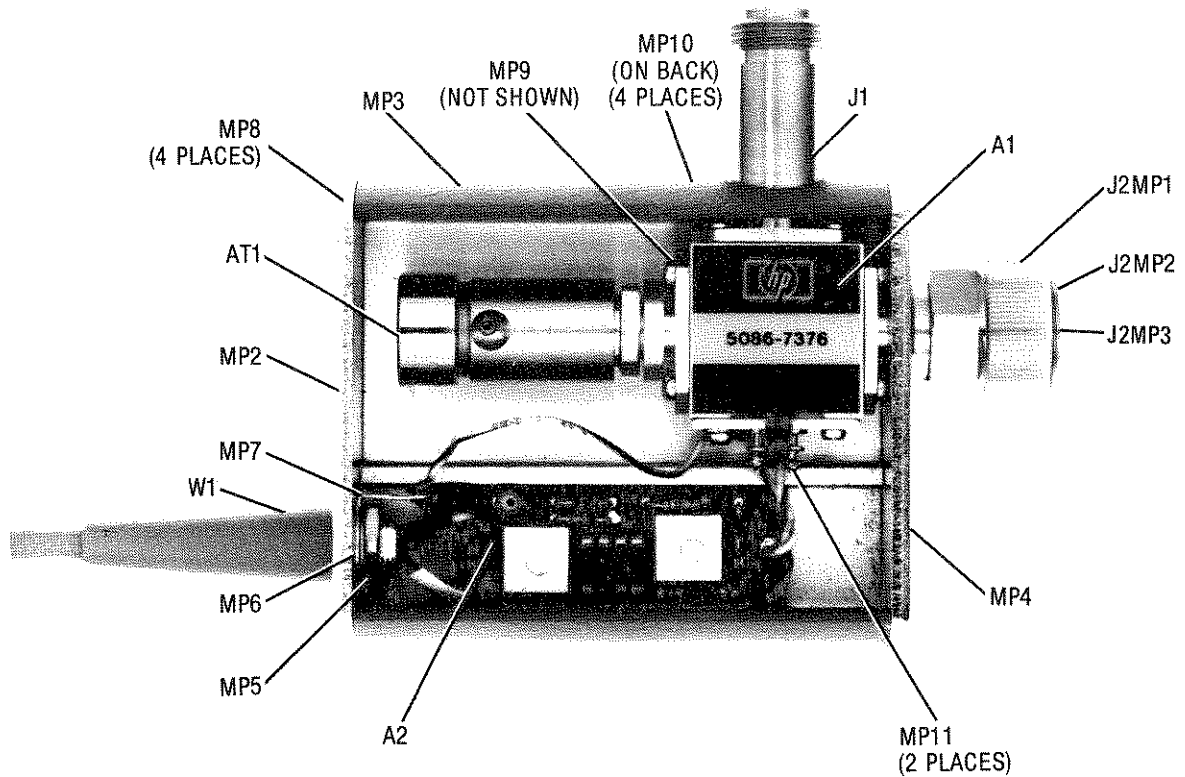
Table 6-2. Manufacturers Code List, Reference Designations, and Abbreviations

MANUFACTURERS CODE LIST			
MFR NO	MANUFACTURER NAME	ADDRESS	ZIP CODE
00000	ANY SATISFACTORY SUPPLIER		
06383	PANDUIT CORP	TINLEY PARK IL	60477
06665	PRECISION MONOLITHICS INC	SANTA CLARA CA	95050
15526	METRIC AND MULTISTANDARD COMPONENT CORP	ELMSFORD NY	10523
24546	CORNING GLASS WORKS	BRADFORD PA	16701
28480	HEWLETT-PACKARD CORP HQ	PALO ALTO CA	94304
REFERENCE DESIGNATORS			
A	assembly	CR	diode
BT	battery	F	fuse
C	capacitor	J	jack
		L	inductor
		P	plug
		Q	transistor
		R	resistor
		S	switch
		U	integrated circuit
		W	cable
ABBREVIATIONS			
AMPL	amplifier	G	giga (10 ⁹)
CCW	counterclockwise	H	henries
COMP	composition	K	kilo = 1000
CONN	connector	M	milli = 10 ⁻³
CW	clockwise	MEG	meg = 10 ⁶
DEPC	deposited carbon	MET FLM	metal film
ELECT	electrolytic	MET OX	metallic oxide
F	farads	MFR	manufacturer
		MHz	mega Hertz
		NPN	negative-positive-negative
		P	peak
		PIV	peak inverse voltage
		PNP	positive-negative-positive
		PP	peak-to-peak
		RMS	root-mean-square
		S-B	slow-blow
		SI	silicon
		VAR	variable
		VDCW	dc working volts
		W	watts
		WIV	working inverse voltage

Table 6-3A. Model 85021A Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A1	5086-7376	4	1	BRIDGE ASSEMBLY (INCLUDES CONNECTORS J1 AND J2 AND REFERENCE TERMINATION AT1)	28480	5086-7376
A1	5086-6376	2		REBUILT 5086-7376	28480	5086-6376
A2	85020-60001	5	1	BOARD ASSEMBLY-PREAMPLIFIER	28480	85020-60001
A2C1	0180-2794	5	2	CAPACITOR-FXD 3.3UF+20% 35VDC TA	28480	0180-2794
A2C2	0180-2794	5		CAPACITOR-FXD 3.3UF+20% 35VDC TA	28480	0180-2794
A2C3	0160-3878	6	1	CAPACITOR-FXD 1000PF+20% 100VDC CER	28480	0160-3878
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
A2R1	0698-7205	0	1	RESISTOR 51.1 1% .05W F TC=0+100	24546	C3-1/8-TO-51R1-F
A2R2	2100-3210	6	1	RESISTOR-TRMR 10K 10% C TOP-ADJ 1-TRN	28480	2100-3210
A2R3	0698-7248	1	1	RESISTOR 3.16K 1% .05W F TC=0+100	24546	C3-1/8-TO-3161-F
A2R4	2100-3253	7	1	RESISTOR-TRMR 50K 10% C TOP-ADJ 1-TRN	28480	2100-3253
A2R5	0698-7212	9	1	RESISTOR 100 1% .05W F TC=0+100	24546	C3-1/8-TO-100R-F
A2U1	1826-0932	0	1	IC OP AMP PRCN 8-DIP-C PKG	06665	OP27FZ
A2TP1	0360-0535	0	1	TERMINAL-TEST POINT .330IN ABOVE	28480	0360-0535
J2MP1	1250-1837	5	1	SLEEVE-RF CONNECTOR APC-7	28480	1250-1837
J2MP2	1250-1465	5	1	COUPLING NUT-RF CONNECTOR APC-7	28480	1250-1465
J2MP3	1250-1839	7	1	CONTACT-RF CONNECTOR APC-7	28480	1250-1839
MP1	5001-1590	4	1	DRESS COVER	28480	5001-1590
MP2	7100-1275	4	1	END COVER	28480	7100-1275
MP3	5021-3587	5	1	EXTRUDED FRAME	28480	5021-3587
MP4	7100-1276	5	1	PORT COVER	28480	7100-1276
MP5	2950-0001	8	1	NUT-HEX-DBL-CHAM 3/8-32-THD .094-IN-THK	28480	2950-0001
MP6	2190-0016	3	1	WASHER-LK INTEL 3/8-IN .377-IN-ID	28480	2190-0016
MP7	0360-1190	5	1	TERMINAL-SLDR LUG PL-MTG FOR-#3/8-SCR	28480	0360-1190
MP8	0515-0823	8	4	SCREW-THD-RLG M3X0.5 10MM-LG	28480	0515-0823
MP9	1531-0289	5	1	BRIDGE SPACER S-ST	28480	1531-0289
MP10	0515-0820	5	4	SCREW-MACH-M2X0.4 5MM-LG 90 DEG FLH	15526	9635X (M2.5)
MP11	1251-3172	7	1	CONNECTOR SGL-CONT SKT .031-IN-BSC-SZ RND	28480	1251-3172
MP12	7121-4308	4	1	85021A IDENTIFICATION LABEL	28480	7121-4308
MP13	1400-0249	0	1	CABLE TIE .062-.625-DIA .091-WD NYL	06383	PLT1M-8
MP14	9211-4452	2	1	85021A INSTRUMENT CASE	28480	9211-4452
MP15	85021-80001	8	1	FOAM PAD IN INSTRUMENT CASE	28480	85021-80001
MP16	5952-0948	9	1	REFLECTOMETER CALCULATOR	28480	5952-0948
MP17	9211-0126	9	1	CARTON CORR BSC 11.5-IN-LG 8.625-IN-WD	28480	9211-0126
W1	8120-3804		1	POWER CORD ASSEMBLY 24-AWG 4-COND	28480	8120-3804

85021A



CAUTION

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

Figure 6-1A. 85021A Replaceable Parts Identification

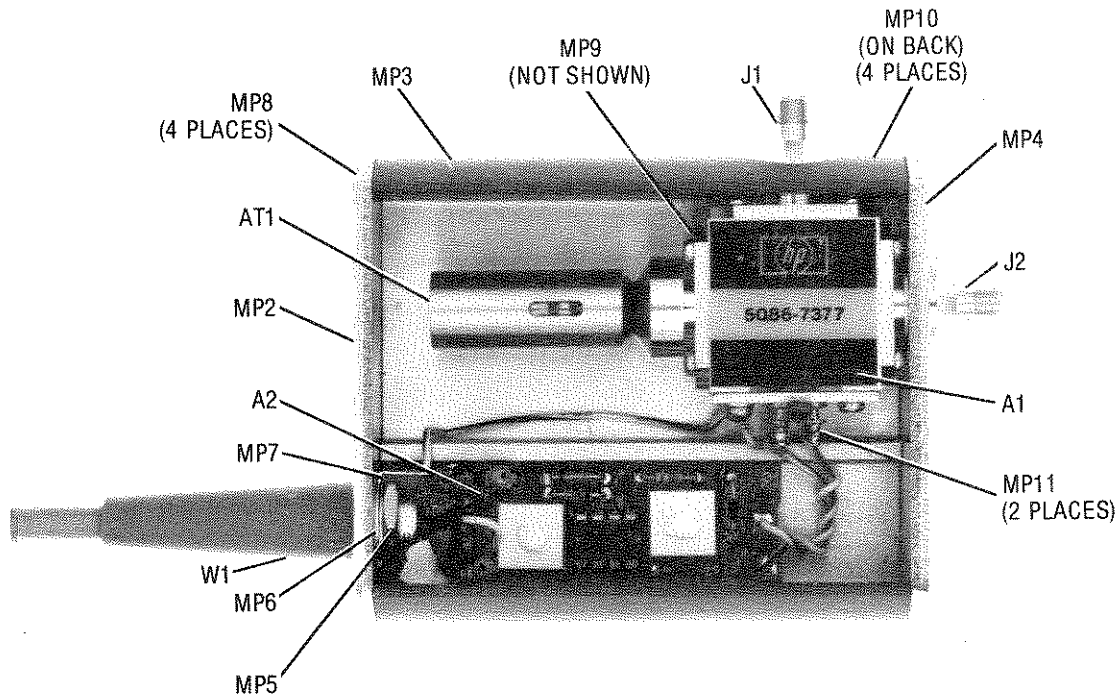
Figure 6-1A. 85021A Replaceable Parts Identification

Table 6-3B. Model 85021B Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A1	5086-7377	5	1	BRIDGE ASSEMBLY (INCLUDES CONNECTORS J1 AND J2 AND REFERENCE TERMINATION AT1)	28480	5086-7377
A1	5086-6377	3		REBUILT 5086-7377	28480	5086-6377
A2	85020-60001	5	1	BOARD ASSEMBLY-PREAMPLIFIER	28480	85020-60001
A2C1	0180-2794	5	2	CAPACITOR-FXD 3.3UF±20% 35VDC TA	28480	0180-2794
A2C2	0180-2794	5		CAPACITOR-FXD 3.3UF±20% 35VDC TA	28480	0180-2794
A2C3	0160-3878	6	1	CAPACITOR-FXD 1000PF±20% 100VDC CER	28480	0160-3878
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
A2R1	0698-7205	0	1	RESISTOR 51.1 1% .05W F TC=0+100	24546	C3-1/8-TO-51R1-F
A2R2	2100-3210	6	1	RESISTOR-TRMR 10K 10% C TOP-ADJ 1-TRN	28480	2100-3210
A2R3	0698-7248	1	1	RESISTOR 3.16K 1% .05W F TC=0+100	24546	C3-1/8-TO-3161-F
A2R4	2100-3253	7	1	RESISTOR-TRMR 50K 10% C TOP-ADJ 1-TRN	28480	2100-3253
A2R5	0698-7212	9	1	RESISTOR 100 1% .05W F TC=0+100	24546	C3-1/8-TO-100R-F
A2U1	1826-0932	0	1	IC OP AMP PRCN 8-DIP-C PKG	06665	OP27FZ
A2TP1	0360-0535	0	1	TERMINAL-TEST POINT .330IN ABOVE	28480	0360-0535
MP1	5001-1590	4	1	DRESS COVER	28480	5001-1590
MP2	7100-1275	4	1	END COVER	28480	7100-1275
MP3	5021-3587	5	1	EXTRUDED FRAME	28480	5021-3587
MP4	7100-1276	5	1	PORT COVER	28480	7100-1276
MP5	2950-0001	8	1	NUT-HEX-DBL-CHAM 3/8-32-THD .094-IN-THK	28480	2950-0001
MP6	2190-0016	3	1	WASHER-LK INTEL T 3/8-IN .377-IN-ID	28480	2190-0016
MP7	0360-1190	5	1	TERMINAL-SLDR LUG PL-MTG FOR-#3/8-SCR	28480	0360-1190
MP8	0515-0823	8	4	SCREW-THD-RLG M3X0.5 10MM-LG	28480	0515-0823
MP9	1531-0289	5	1	BRIDGE SPACER S-ST	28480	1531-0289
MP10	0515-0820	5	4	SCREW-MACH M2X0.4 5MM-LG 90 DEG FLH	15526	963SX (M2.5)
MP11	1251-3172	7	1	CONNECTOR SGL-COMT SKT .03-IN-BSC-SZ RND	28480	1251-3172
MP12	7121-4310	8	1	85021B IDENTIFICATION LABEL	28480	7121-4310
MP13	1400-0249	0	1	CABLE TIE .062-.625-DIA .091-WD NYL	06383	PLTIM-8
MP14	9211-4428	2	1	85021B INSTRUMENT CASE	28480	9211-4428
MP15	85021-80001	8	1	FOAM PAD IN INSTRUMENT CASE	28480	85021-80001
MP16	5952-0948	9	1	REFLECTOMETER CALCULATOR	28480	5952-0948
MP17	9211-0126	9	1	CARTON CORR RSC 11.5-IN-LG 8.625-IN-WD	28480	9211-0126
W1	8120-3804		1	POWER CORD ASSEMBLY 24-AWG 4-COND	28480	8120-3804

See introduction to this section for ordering information
 *Indicates factory selected value

85021B



CAUTION

Input Connector J1 and Test Port Connector J2 are precision connectors and are not separately replaceable. Do not disassemble J1 or J2 or attempt to replace them or any of their component parts. Any attempt to perform any disassembly or repair procedure not clearly outlined in Section VIII, Service, of this manual will automatically void the warranty. Damaged connectors can be repaired or replaced only by Hewlett-Packard.

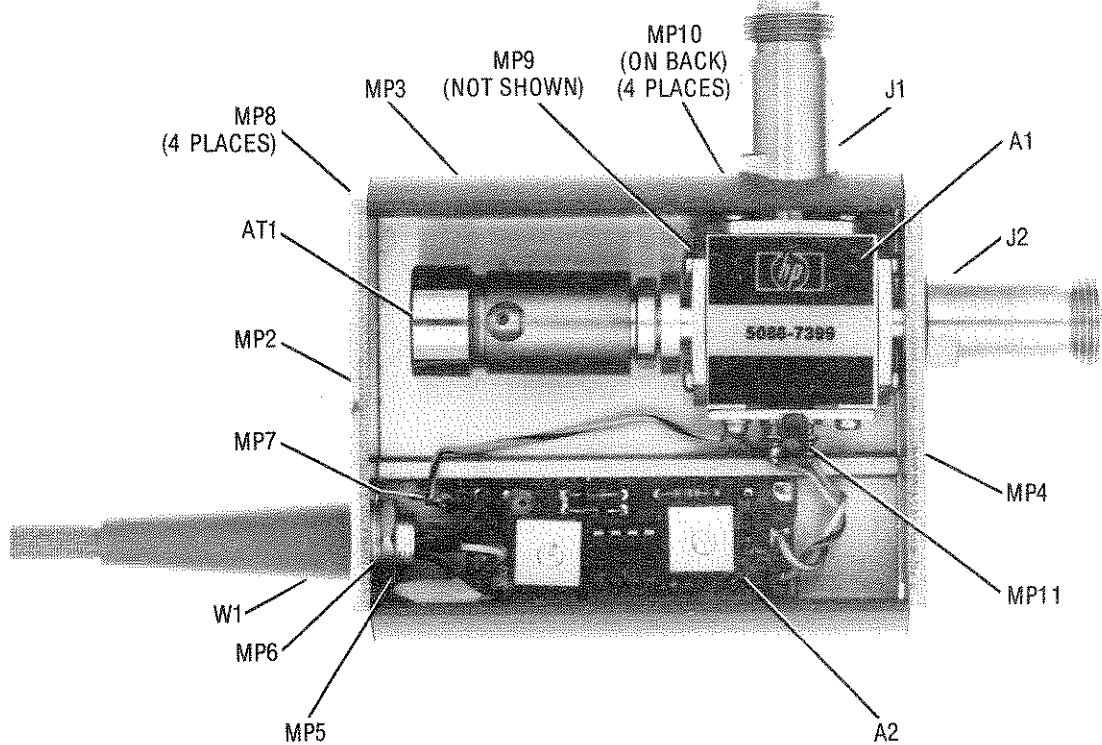
Figure 6-1B. 85021B Replaceable Parts Identification

Figure 6-1B. 85021B Replaceable Parts Identification

Table 6-3C. Model 85021C Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A1	5086-7399	1	1	BRIDGE ASSEMBLY (INCLUDES CONNECTORS J1 AND J2 AND REFERENCE TERMINATION AT1)	28480	5086-7399
A1	5086-6399	9		REBUILT 5086-7399	28480	5086-6399
A2	85020-60001	5	1	BOARD ASSEMBLY-PREAMPLIFIER	28480	85020-60001
A2C1	0180-2794	5	2	CAPACITOR-FXD 3.3UF+20% 35VDC TA	28480	0180-2794
A2C2	0180-2794	5		CAPACITOR-FXD 3.3UF+20% 35VDC TA	28480	0180-2794
A2C3	0160-3878	6	1	CAPACITOR-FXD 1000PF+20% 100VDC CER	28480	0160-3878
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
A2R1	0698-7205	0	1	RESISTOR 51.1 1% .05W F TC=0+100	24546	C3-1/8-TO-51R1-F
A2R2	2100-3210	6	1	RESISTOR-TRMR 10K 10% C TOP-ADJ 1-TRN	28480	2100-3210
A2R3	0698-7248	1	1	RESISTOR 3.16K 1% .05W F TC=0+100	24546	C3-1/8-TO-3161-F
A2R4	2100-3253	7	1	RESISTOR-TRMR 50K 10% C TOP-ADJ 1-TRN	28480	2100-3253
A2R5	0698-7212	9	1	RESISTOR 100 1% .05W F TC=0+100	24546	C3-1/8-TO-100R-F
A2U1	1826-0932	0	1	IC OP AMP PRCN 8-DIP-C PKG	06665	OP27FZ
A2TP1	0360-0535	0	1	TERMINAL-TEST POINT .330IN ABOVE	28480	0360-0535
MP1	5001-1590	4	1	DRESS COVER	28480	5001-1590
MP2	7100-1275	4	1	END COVER	28480	7100-1275
MP3	5021-3587	5	1	EXTRUDED FRAME	28480	5021-3587
MP4	7100-1276	5	1	PORT COVER	28480	7100-1276
MP5	2950-0001	8	1	NUT-HEX-DBL-CHAM 3/8-32-THD .094-IN-THK	28480	2950-0001
MP6	2190-0016	3	1	WASHER-LK INTL T 3/8-IN .377-IN-ID	28480	2190-0016
MP7	0360-1190	5	1	TERMINAL-SLDR LUG PL-MPG FOR-#3/8-SCR	28480	0360-1190
MP8	0515-0823	8	4	SCREW-THD-RLG M3X0.5 10MM-LG	28480	0515-0823
MP9	1531-0289	5	1	BRIDGE SPACER S-ST	28480	1531-0289
MP10	0515-0820	5	4	SCREW-MACH M2X0.4 5MM-LG 90 DEG FLH	15526	963SX (M2.5)
MP11	1251-3172	7	1	CONNECTOR SGL-CONT SKT .02-IN-BSC-SZ RND	28480	1251-3172
MP12	7121-4512	2	1	85021C IDENTIFICATION LABEL	28480	7121-4512
MP13	1400-0249	0	1	CABLE TIE .062-.625-DIA .091-WD NYL	06383	PLTIM-8
MP14	9211-4429	3	1	85021C INSTRUMENT CASE	28480	9211-4429
MP15	85021-80001	8	1	FOAM PAD IN INSTRUMENT CASE	28480	85021-80001
MP16	5952-0948	9	1	REFLECTOMETER CALCULATOR	28480	5952-0948
MP17	9211-0126	9	1	CARTON CORR RSC 11.5-IN-LG 8.625-IN-WD	28480	9211-0126
W1	8120-3804		1	POWER CORD ASSEMBLY 24-AWG 4-COND	28480	8120-3804

85021C



CAUTION

Input Connector J1 and Test Port Connector J2 are not separately replaceable. Do not disassemble J1 or J2 or attempt to replace them or any of their component parts. Any attempt to perform any disassembly or repair procedure not clearly outlined in Section VIII, Service, of this manual will automatically void the warranty. Damaged connectors can be repaired or replaced only by Hewlett-Packard.

Figure 6-1C. 85021C Replaceable Parts Identification

Figure 6-1C. 85021C Replaceable Parts Identification

6-9/6-10

SECTION VII

MANUAL BACKDATING CHANGES

7-1. INTRODUCTION

7-2. 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 (with serial numbers prefixed 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.

7-3. 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 (with serial numbers prefixed higher than the one on the title page) are documented in a yellow Manual Changes Supplement.

7-4. To adapt this manual to an earlier instrument, refer to Table 7-1 and make the manual backdating changes listed opposite your instrument serial number or serial number prefix.

7-5. For additional information about serial number coverage, refer to INSTRUMENTS COVERED BY THE MANUAL in Section I.

Table 7-1. Manual Backdating Changes by Serial Number Prefix

Serial Prefix	Make Manual Change		
	85021A	85021B	85021C
2301A	A		
2308A	A		
2311A			A

7-6. MANUAL CHANGE INSTRUCTIONS

CHANGE A

Page 1-8, Table 1-1:

Change the **Directivity** and **Test Port Match (SWR)** specifications to read as follows:

	85021A	85021B	85021C
Directivity:			
0.01 to 0.04 GHz	>33 dB	>36 dB	>33 dB
0.04 to 12.4 GHz	>40 dB	>40 dB	>36 dB
12.4 to 18 GHz	>40 dB	>40 dB	>34 dB
18 to 20 GHz	-	>40 dB	-
20 to 26.5 GHz	-	>36 dB	-
Test Port Match (SWR):			
0.01 to 8.4 GHz	<1.15	<1.15	<1.15
8.4 to 12.4 GHz	<1.25	<1.25	<1.25
12.4 to 18.0 GHz	<1.55	<1.40	<1.65
18.0 to 20.0 GHz	-	<1.40	-
20.0 to 26.5 GHz	-	<1.75	-

SECTION VIII

SERVICE

8-1. INTRODUCTION

8-2. This section provides instructions for troubleshooting and repair of the 85021A/B/C Directional Bridge.

8-3. CAUTION NOTES

8-4. The CAUTION sign denotes a hazard to the instrument. It calls attention to an operating, maintenance, or repair procedure which, if not correctly performed or adhered to, could result in damage to or destruction of part or all of the instrument. Do not proceed beyond a CAUTION sign until the indicated conditions are fully understood and met.

8-5. THEORY OF OPERATION

8-6. The operation of the 85021A/B/C is described to assist with troubleshooting procedures. Schematic diagrams are supplied for the A1 directional bridge circuit and the A2 preamplifier, together with a component locations diagram for the A2 preamplifier assembly.

8-7. TROUBLESHOOTING

8-8. Troubleshooting the 85021A/B/C involves performing the Operator's Check and the Performance Tests. If a problem persists, refer to TROUBLESHOOTING PROCEDURES later in this section. The troubleshooting procedures are designed to help the technician isolate a problem to the defective component. A troubleshooting flow diagram is provided in Figure 8-4.

8-9. RECOMMENDED TEST EQUIPMENT

8-10. Equipment recommended to test and maintain the instrument is listed in Section I, General Information. If the equipment listed is not available, equipment that meets the critical specifications listed may be substituted.

8-11. REPAIR AND REPLACEMENT

8-12. The following procedures are described:

@ APC-7 connector repair (85021A only)

- Power cable replacement
- Preamplifier assembly replacement
- Replacement of the bridge microcircuit assembly
- Preamplifier adjustment following replacement of the bridge microcircuit assembly

THEORY OF OPERATION

A1 Bridge Circuit

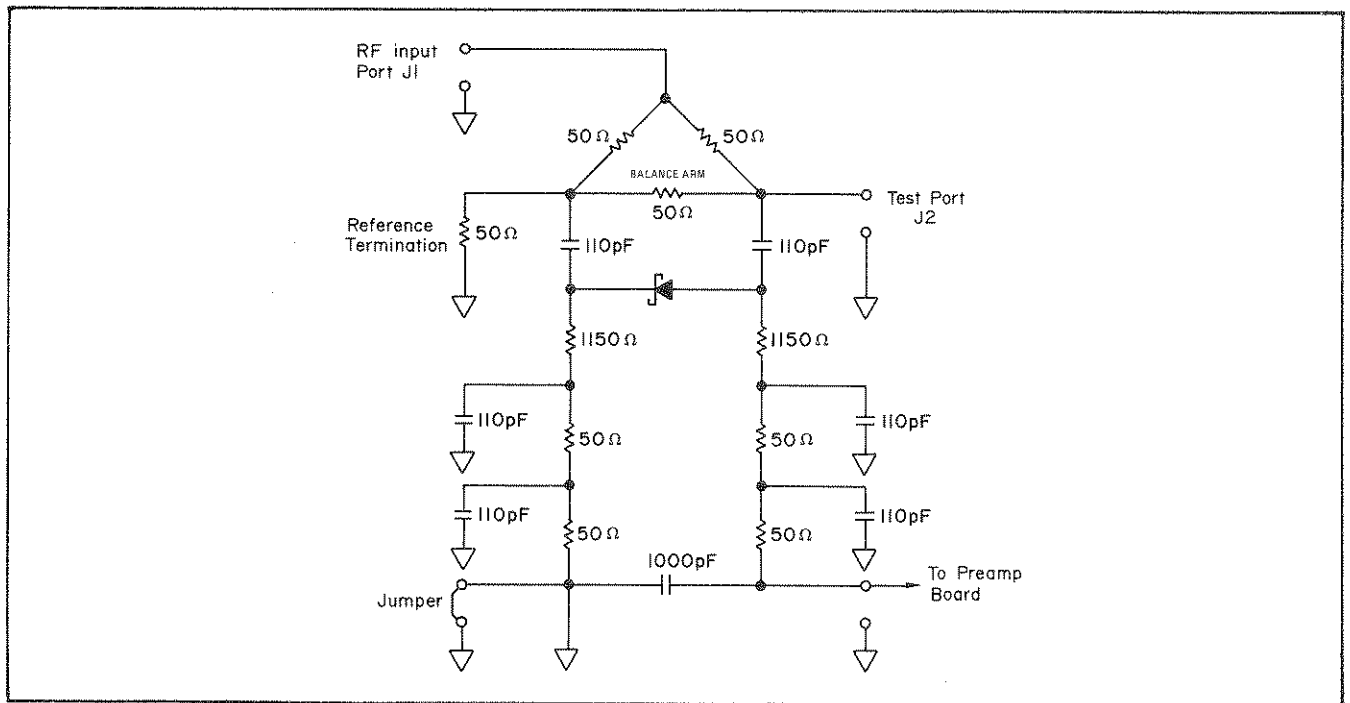


Figure 8-1. A1 Bridge Circuit Schematic Diagram

The 85021A/B/C Directional Bridge is a broadband device used to measure return loss. The voltage across the balance arm (see Figure 8-1) is proportional to the return loss of the device under test. Placing a diode across the balance arm enables the conversion of the microwave voltage to a 27 kHz square wave whose amplitude is proportional to the return loss. The 1150-ohm isolation resistors and the 110-pF/50-ohm R-C filter serve to isolate the balanced detector from the Network Analyzer. A property of the R-C filter is that it buffers the output, reducing the imbalance across the center arm created by the ground on one side of the output and the preamplifier connection on the other.

Two parameters which define the quality of the bridge are Directivity and Source Match.

Directivity is a measure of the residual error in the bridge. When the test port is terminated in a perfect 50-ohm load, the detector diode should read zero. However, because of non-symmetry due to resistor imbalances, component placement, coaxial imbalances,

etc., a voltage will be output to the Network Analyzer. The ratio of the detected voltage with a perfect 50-ohm load to the detected voltage with a short is the directivity.

Source Match is a measure of the impedance looking into the test port. It is usually given as SWR. It is a function of the bridge element values, and is independent of directivity: that is, a bridge with very good directivity could have poor source match.

A2 Preamplifier Circuit

The output of the bridge circuit is a low level 27 kHz signal. Before it is input to the Network Analyzer, it must be amplified. This is the function of the preamplifier. Figure 8-3 is a schematic diagram of the preamplifier A2, and Figure 8-2 is a preamplifier component locations diagram.

The functional center of the preamplifier circuit is a low-noise operational amplifier U1 wired in the non-inverting configuration. The gain of the preamplifier is controlled by R3 and R4 (Gain = $1 + R4/R3$). The gain may be varied from 1 to approximately 17. R4 is the GAIN adjustment and compensates for the sensitivity of the bridge diode.

The input impedance adjustment R2 (Z) compensates for the internal resistance of the diode. The input impedance may be varied from 100 ohms to approximately 10k ohms.

The 100 ohm resistor R5 and the 1000 pF capacitor C3 form a decoupling network which keeps RF signals from the input of the operational amplifier.

R1 is placed in series with the non-inverting input of the operational amplifier U1 to prevent the input signal from shorting to ground through the 10k potentiometer R2.

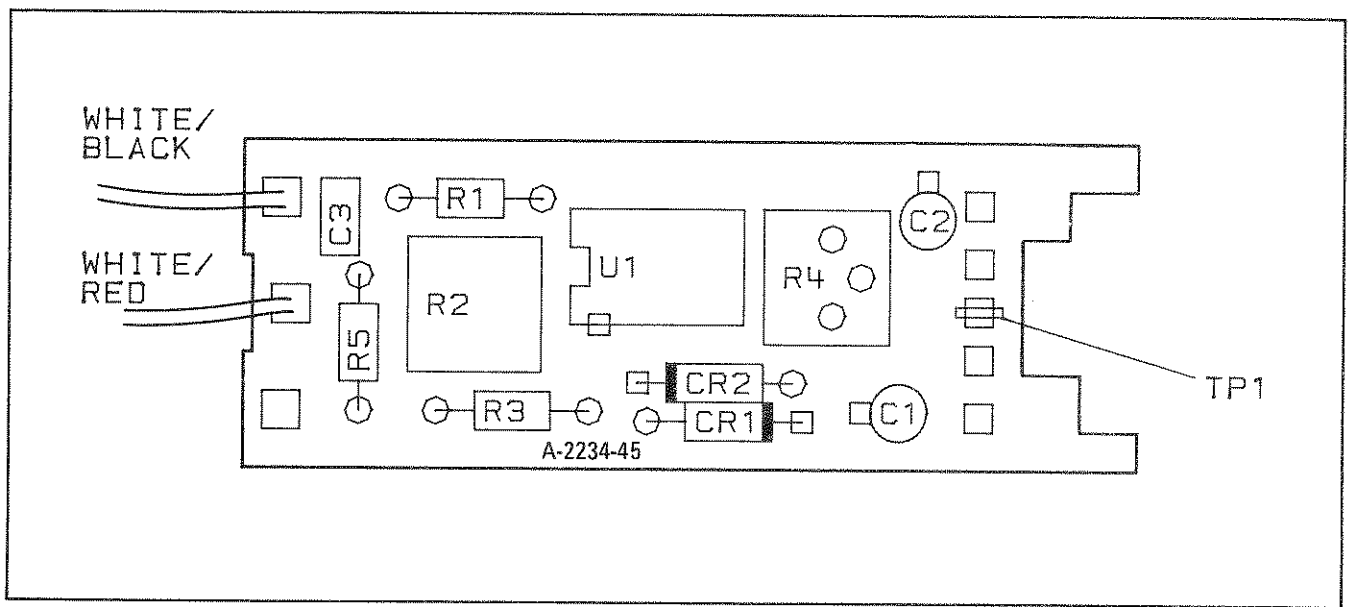


Figure 8-2. A2 Preamplifier Component Locations Diagram

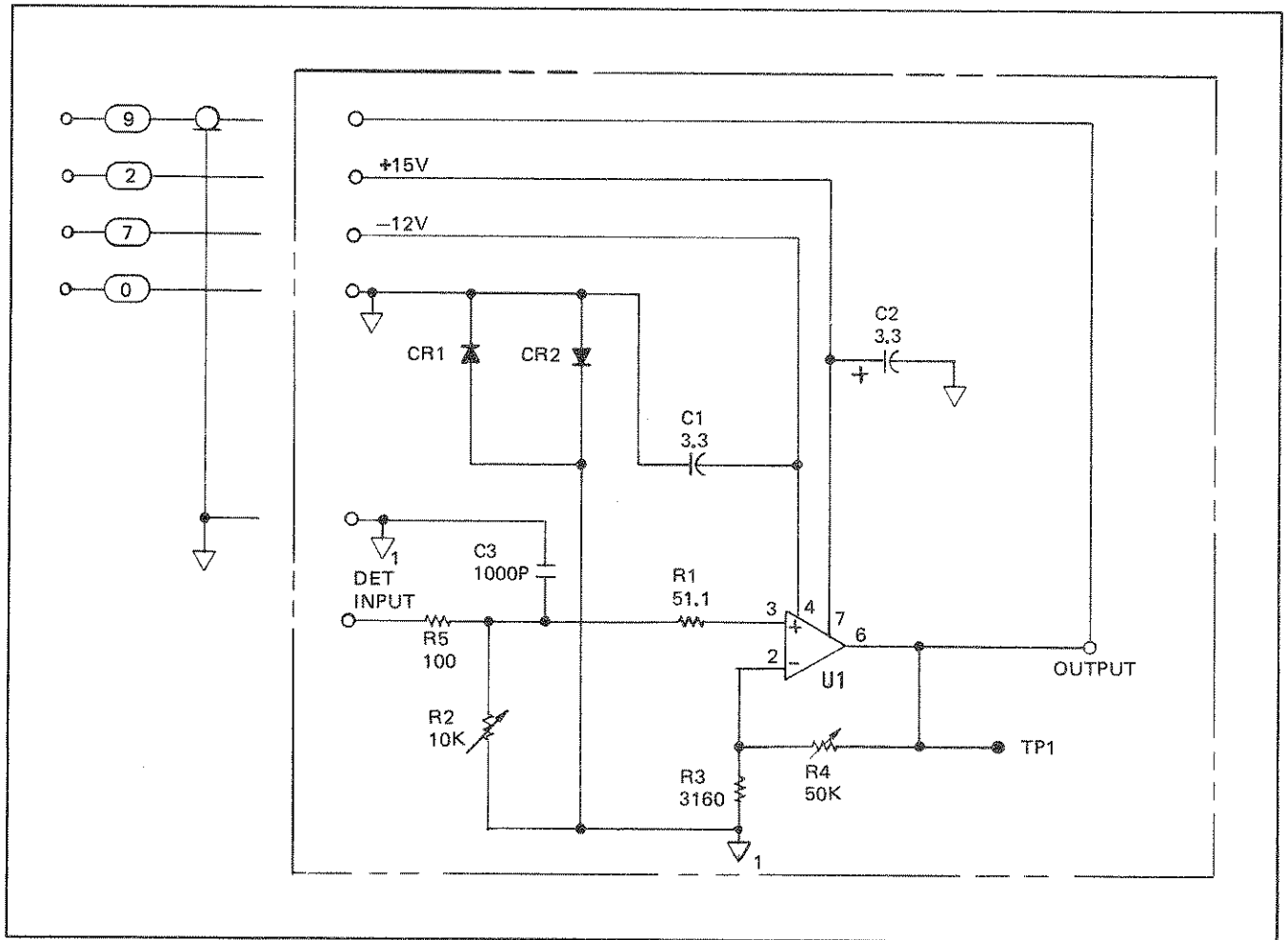


Figure 8-3. A2 Preamplifier Assembly Schematic Diagram

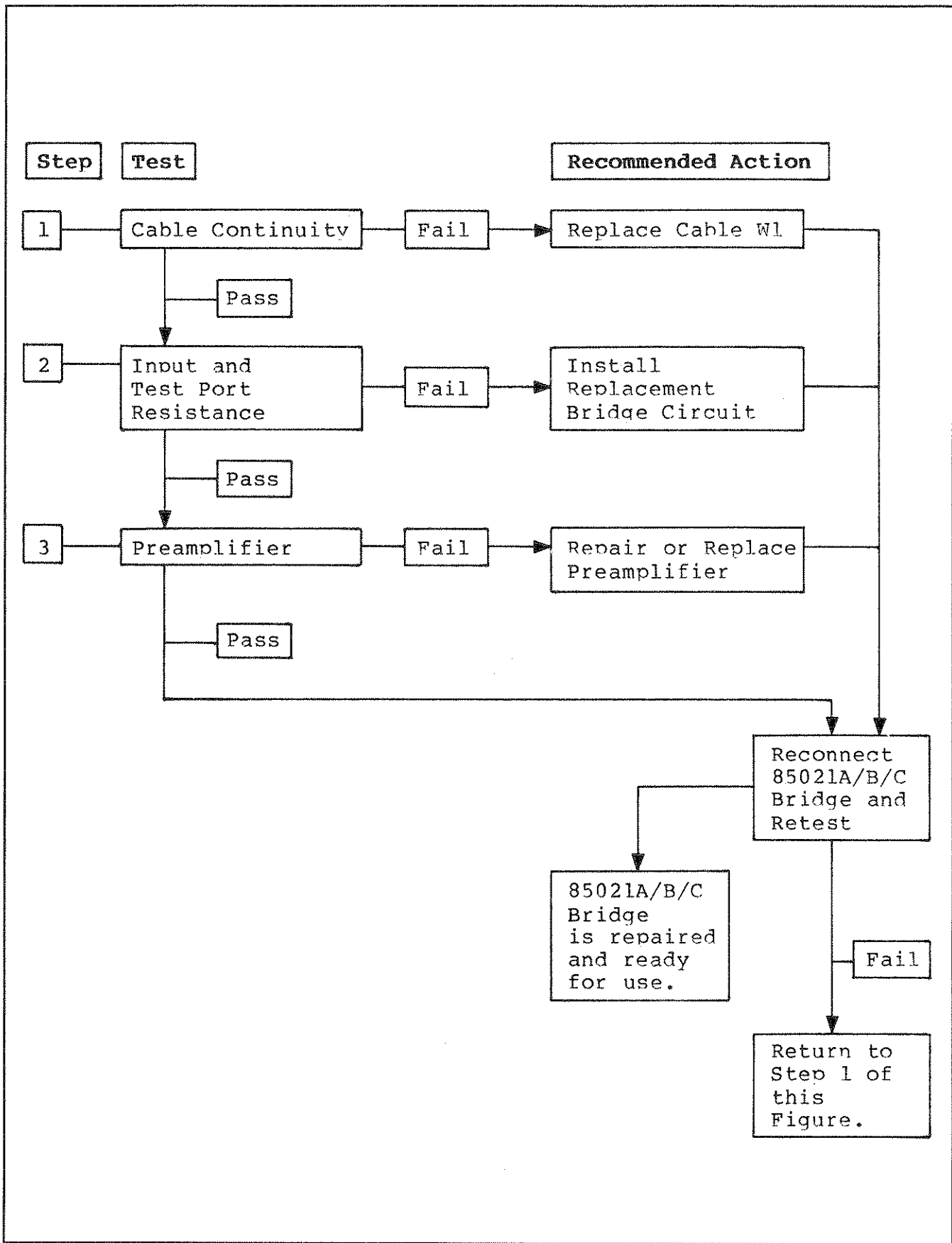


Figure 8-4. Troubleshooting Flow Diagram

TROUBLESHOOTING PROCEDURES

If a problem persists following the Operator's Check in Section III and the Performance Tests in Section IV, perform the troubleshooting procedures outlined below to isolate the cause and correct the problem. Refer to the troubleshooting flow diagram in Figure 8-4. Instructions for repair or replacement of defective components are provided following the troubleshooting procedures.

CAUTION

The 85021A/B/C Directional Bridges contain microcircuits that are highly sensitive to electrostatic discharge (ESD). For service purposes, a work station equipped with an anti-static surface must be used and a grounded wrist strap must be worn. Never touch the center contacts of the connectors with the fingers. Ground the leads of the digital multimeter by touching them to the grounded instrument chassis before making measurements.

Internal Access

To obtain access to the interior of the 85021A/B/C for troubleshooting and repair purposes, proceed as follows:

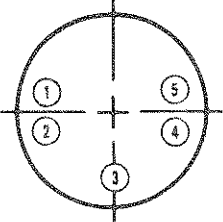
1. (85021A ONLY). Using a thin 1/2-inch open-end wrench (see Table 1-4), remove the coupling nut from the APC-7 test port connector.
2. Remove the two screws holding the port cover (the test port end plate).
3. Remove the port cover.
4. Slide the top dress cover out of the grey bridge housing. The interior of the 85021A/B/C is now accessible.

Cable Continuity Check

1. Use a digital multimeter to check the continuity of power cable W1 from the connector pins to the wire connections inside the bridge housing. Table 8-1 lists the W1 connector pins and the corresponding wires.
2. If there are discontinuities in any of the wires replace cable W1, following the instructions outlined under Repair and

Replacement Procedures. Repeat the performance tests in Section IV.

Table 8-1. Wires in Power Cable W1

	CONNECTOR PIN	CORRESPONDING WIRE
	1	White (coax center conductor)
	2	Shield (coax outer conductor)
	3	No connection
	4	Violet
	5	Red

Input Port and Test Port Resistance Checks

1. Ground the leads of the DMM by touching them to the grounded instrument chassis.
2. Measure the resistance from the center contact of input port connector J1 to the center contact of test port connector J2. The resistance should be 33 ohms +2 ohms.
3. Measure the resistance from the center contact of input connector J1 to signal ground (the black/white wire connected to the microcircuit housing). The resistance should be 83 ohms +2 ohms.
4. Measure the resistance from the center contact of test port connector J2 to signal ground. The resistance should be 83 ohms +2 ohms.
5. If the above resistance measurements are not correct, the bridge microcircuit assembly A1 is defective and must be replaced.

CAUTION

Do not attempt to disassemble or repair the bridge microcircuit assembly A1, including connectors J1 and J2 and reference termination AT1. Do not remove or loosen any screws on this assembly. Any attempt to perform any disassembly or repair not clearly outlined in this manual will automatically void the warranty.

The bridge microcircuit assembly, including input and test

port connectors and the reference termination, may be replaced on an exchange basis, thus affording a considerable cost savings. Refer to Section VI, Replaceable Parts, of this manual for the part numbers for new and exchange assemblies. The procedures for replacement of the microcircuit and subsequent adjustment of the preamplifier are described below under Repair and Replacement Procedures.

Preamplifier Check

1. Disconnect the power cable W1 from the Network Analyzer. Unsolder the white/red and white/black wires from the pins on the A1 bridge assembly.
2. Measure the resistance from the input (white/red wire) to signal ground (white/black wire). The resistance should vary from 100 ohms to 10,000 ohms as A2R2 is adjusted through its range.
3. Measure the output resistance, from TP1 to signal ground. The resistance should vary from 3k ohms to 53k ohms as A2R4 is adjusted through its range.
4. Connect the 8756A/8755C MODULATOR DRIVE output center conductor through a 1 Megohm resistor to the 85021 A2 preamplifier input (white/red wire). Connect the 8756A/8755C MODULATOR DRIVE output outer conductor to the 85021 A2 preamplifier signal ground (white/black wire).
5. Connect the 85021 power cable W1 to the A input of the 8756A/8755C.
6. Set the 8756A/8755C channel 1 to display the power level of input A.
7. Erase all memories from any storage device used with the display.
8. Turn A2R2 and A2R4 fully counterclockwise. The 8756A/8755C should display a noise floor of about -50dBm.
9. Turn A2R2 fully clockwise. Adjust A2R4 from one end of its range to the other. The display should change by about 20 dB.
10. If the preamplifier fails to meet any of the above conditions, replace the defective components. Repeat the performance tests in Section IV.

REPAIR AND REPLACEMENT PROCEDURES

APC-7 Connector Repair (85021A only)

CAUTION

The parts of the 85021A test port connector described in this procedure are the only connector parts in the 85021A/B/C Directional Bridge that can be replaced in the field. Except for these parts, the connectors are part of the bridge microcircuit assembly and are not separately replaceable. An attempt to repair or replace the connectors, except for the parts of the APC-7 connector listed here, will probably cause damage to the microcircuit. For any other repair, or replacement of any connector, return the 85021A/B/C to Hewlett-Packard. Any attempt to perform any disassembly or repair procedure not clearly outlined in this section will automatically void the warranty.

This procedure explains how to replace the center contact and coupling mechanism of the 85021A APC-7 TEST port connector. Figure 8-5 illustrates these parts. For replacement part numbers see Section VI of this manual. An APC-7 Connector Service Kit, Model Number 11591A, is available from Hewlett-Packard. Tools for connector disassembly, spare contacts, and instructions are included in the kit.

Center Contact Replacement. The center contact of the APC-7 connector is susceptible to wear and damage. This contact is a small four-pronged collet which snaps into a recess in the center conductor and is held there by spring tension. DO NOT REMOVE THIS CONTACT FOR INSPECTION, as damage may occur. Examine the contact with a magnifying glass to determine if it needs replacement. The prongs should be equally spaced and free of burrs or wear. If the contact is removed do not re-use it. To replace the contact proceed as follows:

1. Position the connector with the center contact facing down. Tap the connector lightly so that the contact protrudes slightly.
2. Use an APC-7 contact extractor tool, HP part number 5060-0236. Open the jaws of the extractor by pulling back on the arms,

and insert with the jaws open over the center contact.

3. Allow the jaws of the tool to close, and pull straight away from the connector without twisting.
4. Insert a new contact into place by hand, applying only enough inward pressure to snap it into place.

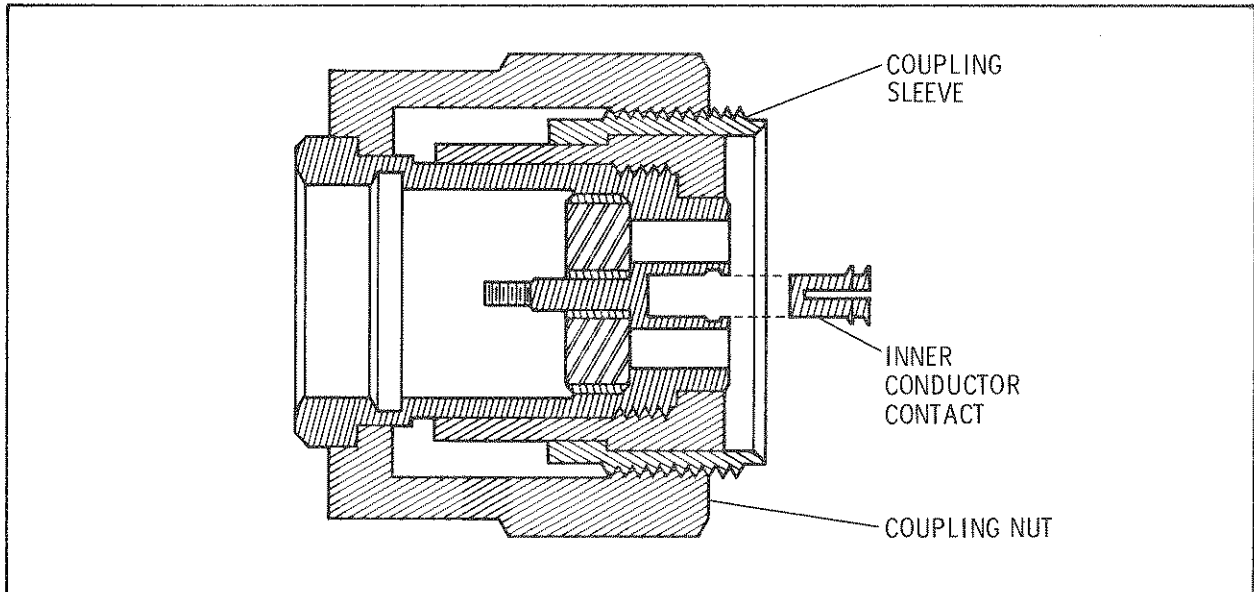


Figure 8-5. Replaceable Parts in 85021A TEST Port Connector

Coupling Mechanism. The coupling mechanism includes the coupling nut and the two-piece coupling sleeve assembly shown in Figure 8-5. Both of these parts can be replaced without damaging the conductors. The special spanner wrench required for this procedure, HP part number 5060-0237, is included in APC-7 Connector Service Kit 11591A. To remove the coupling mechanism proceed as follows:

1. Fully extend the coupling sleeve by turning the coupling nut clockwise, to provide a guide for the spanner wrench.
2. Align the wrench so that both pegs engage the holes in the end of the coupling sleeve assembly.
3. Turn the coupling nut counterclockwise to screw it over the threads of the spanner wrench.
4. Unscrew the sleeve assembly by turning the wrench counterclockwise.

5. To install a new coupling mechanism, set the coupling nut in place on the connector first, then thread on the coupling sleeve assembly and tighten it firmly with the spanner wrench. (Extending the coupling sleeve helps to keep the spanner in position during the final tightening.)

Power Cable Replacement

Preamplifier Assembly Replacement

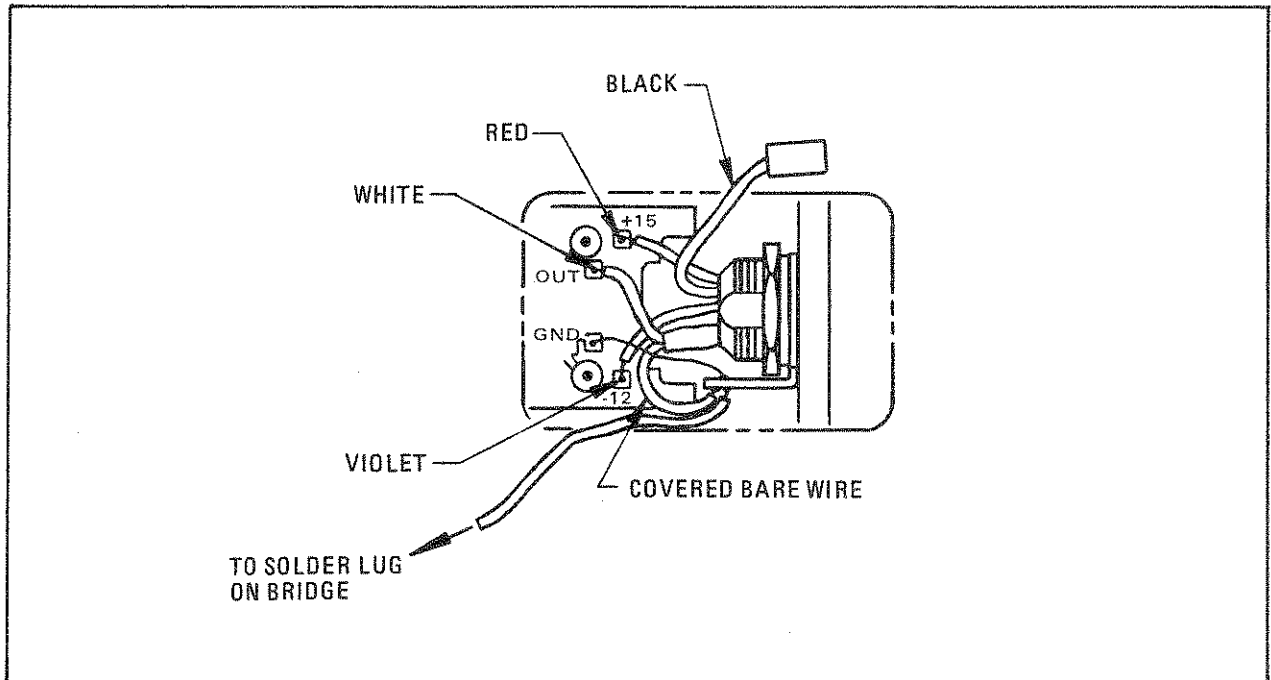


Figure 8-6. Cable to Preamplifier Wiring Diagram

To replace the power cable W1 or the preamplifier assembly A2, proceed as follows:

1. Remove the two screws holding the port cover (test port end plate), and remove the port cover.
2. Slide the top dress cover out of the Bridge frame.
3. Unsolder the wires connected to the power cable/preamplifier assembly.
4. To rewire the power cable, refer to Figure 8-6, Cable to Preamplifier Wiring Diagram.
5. To reconnect the preamplifier A2 to the bridge microcircuit A1, solder the white/black wire to the pad at the top of the preamplifier (the side furthest from the microcircuit). Solder the white/red wire to the middle pad on the preamplifier.

3. Remove the protective backing from the aluminum foil and apply it to the back of the frame.
4. Remove the protective backing from the new serial number label and apply it over the foil backing.
5. Solder the preamplifier wires back into place. Solder the white/red wire to pin 2 on the bridge housing (see Figure 8-7). Solder the white/black wires to pin 1 and the bottom of the solder lug. Be sure that pin 1 and the solder lug are wired together.
6. Slide the dress cover back into place.
7. Replace the port cover and its screws. Replace the APC-7 coupling nut on the test port connector if the Directional Bridge is an 85021A.
8. Perform the preamplifier adjustment procedure outlined below.

Preamplifier Adjustment Following Replacement of the Bridge Microcircuit

Normally no adjustments are required on the 85021A/B/C Directional Bridges. However, if the internal bridge microcircuit is replaced, the adjustment described here should be performed to compensate the preamplifier for the individual diode characteristics.

NOTE

Allow the equipment to warm up for 30 minutes before performing this adjustment.

Description

The input impedance and gain of the preamplifier assembly are adjusted alternately with the Z and GAIN potentiometers, while the attenuator tracking is observed on the Network Analyzer display.

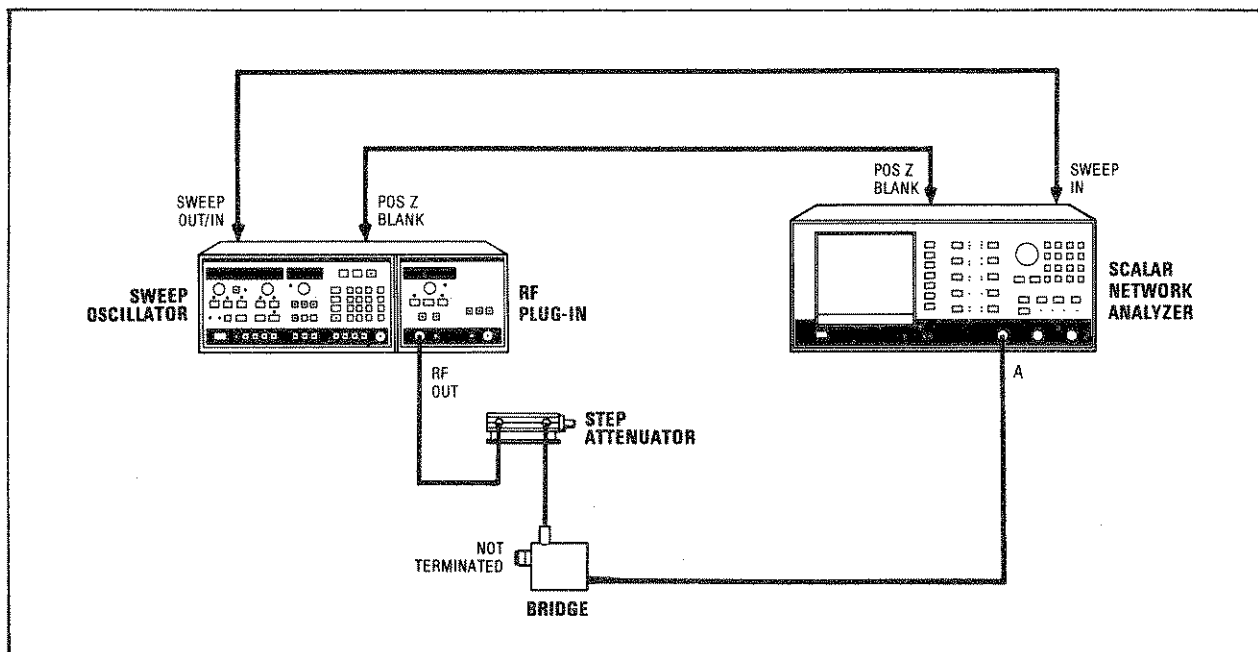


Figure 8-8. Preamplifier Assembly Adjustment Setup

Equipment

Scalar Network Analyzer	HP 8756A
Sweep Oscillator	HP 8350A/B
RF Plug-In	HP 83592A
Step Attenuator	HP 8495B (Calibrated)

NOTE

If a leveled output power of +13 dBm cannot be obtained from the Sweep Oscillator RF Plug-In, use a Model 8447E Amplifier at the Plug-In RF output.

Procedure

1. Remove the silicone rubber seal from the two potentiometers to gain access to the screwdriver slots.
2. Connect the equipment as shown in Figure 8-8. Allow the equipment to warm up for 30 minutes.
3. On the 8350A/B, press [INSTR PRESET] [SHIFT] [CW] [2] [0] [0] [MHz], Plug-In [POWER LEVEL] [1] [3] [dBm]. Make sure that [MOD] is on.
4. Set the 8756A as follows:

CHANNEL 2	. . . . .	OFF
CHANNEL 1	. . . . .	ON
MEAS PWR	. . . . .	A
REF LEVEL	. . . . .	0
SCALE	. . . . .	10 DB/DIV

5. Set the attenuator to 0 dB. Set the REFERENCE POSITION near the top of the screen. Adjust the REFERENCE LEVEL to coincide with the REFERENCE POSITION. (The reference level should be 0 dBm \pm 2 dB with an input signal of +13 dBm.)
6. Set the attenuator to 20 dB. On the 85021A/B/C, adjust A2R2 (Z) to position the trace on the graticule line 20 dB below the reference.
7. Set the attenuator to 0 dB. On the 85021A/B/C, adjust A2R4 (GAIN) to reposition the trace at the reference.
8. Iterate between the last two steps until the trace is on the graticule line \pm 0.5 dB at both steps.
9. Step the attenuator in 10-dB steps to 50 dB. Check that the traces at all steps are spaced at 10 dB intervals \pm 0.5 dB on the display. If the trace is not tracking at 10-dB intervals, iterate between 0 dB and 40 dB of attenuation while compensating the GAIN and Z adjustments as described above.

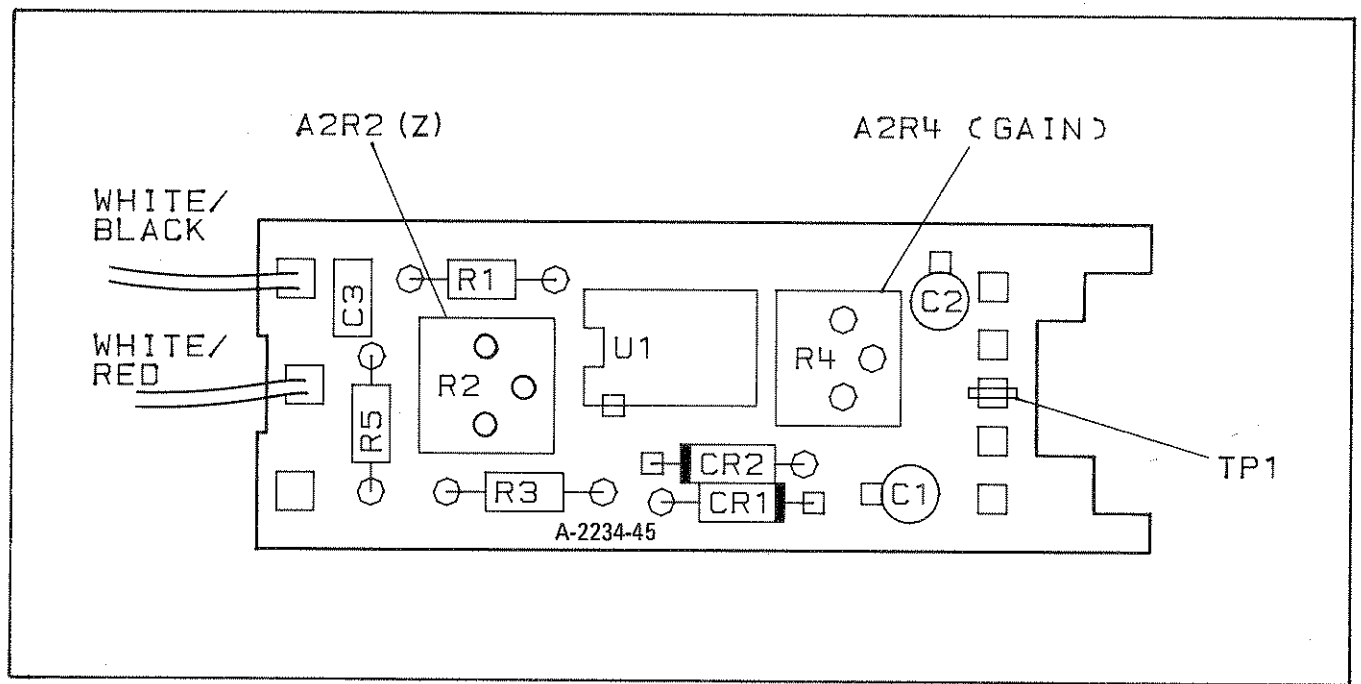


Figure 8-9. Preamplifier Assembly Adjustment Locations

Product Line Sales/Support Key

- Key Product Line
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CM Component
C Computer Systems Sales only
CH Computer Systems Hardware Sales and Services
CS Computer Systems Software Sales and Services
E Electronic Instruments & Measurement Systems
M Medical Products
MP Medical Products Primary SRO
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P Personal/Computation Products
S Sales only for specific product line
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P.O. Box 26-189
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Tel: 16621 hpnas n
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Tel: 16621 hpnas n
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Sector F/81
ISLAMABAD
Tel: 26875
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