

Errata

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HP References in this Manual

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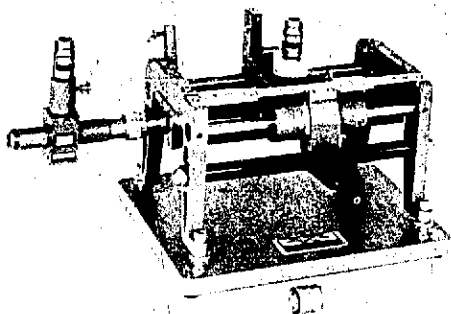


Agilent Technologies

OPERATING AND SERVICE MANUAL

**COAXIAL SWEEP
SLOTTED-LINE SYSTEM
AND SWEEP ADAPTER**

817B/448B



AUGUST 1973

HEWLETT **hp** PACKARD

HP 817B/448B

CAUTION

Model 11664A Detectors are used with the Model 817B. Take care when connecting or disconnecting the 11664A. Always ground yourself by touching the system ground each time before touching the outer shell of the 11664A OR ANY DEVICE CONNECTED TO THE OUTER SHELL. Another method is to wear non-porous gloves. If this is not done, the diode in the 11664A may burn out.

Design parameters of sensitive microwave diodes make these diodes susceptible to burnout from static electricity. Tremendous voltages, of the order of tens of thousands of volts, can be built up on the human body under certain conditions. Conditions susceptible to static build-up are dry air, rubber or composition shoe soles, nylon clothing, or floor carpeting.

If static discharges are noticed by the operator, they indicate a voltage of 20,000 volts or more, which is more than enough to burn out the diode. In this case, some thought should be given to reducing the hazard by removing carpeting, wearing clothing other than nylon, or by adding a shunting path to ground on the 11664A. This consists of a piece of wire soldered to a ground lug held under one of the screws in the 11664A case, nearest the RF input connector. Another method, used here at Hewlett-Packard, is to have the operator wear a light, removable, copper bracelet to ground any static electricity on the body. The bracelet is permanently grounded to the system ground. This has been found to be the surest method of protecting the 11664A, since it does not depend on the operator grounding himself.

1. GENERAL INFORMATION

2. Introduction

3. The Hewlett-Packard Model 817B Swept-Frequency Slotted-Line System consists of a Model 448B Slotted Line Sweep Adapter with two probes, a Model 809C Carriage, a Model 816A Coaxial Slotted-Line, a 00817-20001 Baseplate, and two coaxial shorts: a Model 11512A Type N male short and a Model 11565A APC-7 short. (See ACCESSORIES SUPPLIED.) The Model 809C Universal Probe Carriage and Model 816A Coaxial Slotted-Line Operating Notes are supplied with this manual. Additional equipment needed for operation of this system is listed under EQUIPMENT

REQUIRED BUT NOT SUPPLIED. This manual explains how to use the 817A, briefly describes tests that can be used to verify the system's specifications, and explains how to repair the system.

4. On the rear cover of this manual, below the manual part number, is a "Microfiche" part number. This number may be used to order a 4- x 6-inch microfilm transparency of this manual.

5. Instrument specifications are listed in Table 1. These specifications are the performance standards, or limits, against which the instruments of the system may be tested. Table 2 lists the supplemental operating characteristics.

Table 1. Specifications

SPECIFICATIONS	
ELECTRICAL	GENERAL (cont'd)
Frequency Range: 1.8 to 18 GHz	816A is connected to the load. Type N connector is stainless steel and mates compatibly with Type N connectors whose dimensions conform to MIL-C-39012.
Residual SWR and (Reflection Coefficient):	Dimensions (maximum envelope): 4 1/2 in. long, 7 in. wide, 7 in. high (114 x 178 x 178 mm).
APC-7 Connector:	Weight: 14-3/4 lb. (6.6 kg.).
1.8 to 8 GHz: 1.02 (0.01)	Accessories Furnished: 11512A Short, Type N male; 11565A Short, APC-7.
8 to 12.4 GHz: 1.03 (0.015)	Option 001: APC-7 connectors on both probes of Model 448B.
12.4 to 18 GHz: 1.04 (0.02)	Option 002²: Type N male and Type N female connectors on Model 816A Coaxial Slotted Line.
Type N Connector:	Accessories Available: 11524A Adapter, APC-7 to Type N female; 11525A Adapter, APC-7 to Type N male ¹ ; 11533A Adapter, APC-7 to Type OSM male; 11534A Adapter, APC-7 to Type OSM female.
1.8 to 8 GHz: 1.04 (0.02)	
8 to 12.4 GHz: 1.05 (0.024)	
12.4 to 18 GHz: 1.06 (0.029)	
Impedance: 50 Ω \pm 0.2 Ω	
Maximum Power: 2 watts average (limited by 6-dB pad built into the 448B).	
GENERAL	
Output Connector: Standard model has APC-7 or Type N female, depending upon which end of the	
¹ 11524A APC-7 to Type N female adapter is required to connect the 448B when Type N output is used. ² A UG-298B/U Type N female-to-female adapter is recommended for connecting the 448B when a female output connector is used. The UG-298B/U adapter adds about 1 dB of variation to the power output. ³ Adapters fitting APC-7 to General Radio Type 900, General Radio Type 874, Omni-Spectra Type OSM, TNC, BNC, and Type N are available from Amphenol.	

6. Description

7. The Hewlett-Packard Model 817B Swept-Frequency Slotted-Line System consists of a Model 448B Slotted-Line Sweep Adapter, complete with two probes and a Model 809C Carriage, complete with a Model 816A Coaxial Slotted-Line. The Model 448B is used as a fixed slotted-line with probe. The 817B System is used, in turn, in a larger measurement system for measuring swept SWR. SWR is a Hewlett-Packard term for standing-wave ratio which includes Voltage Standing-Wave Ratio (VSWR). The 817B System may also be used to measure fixed-frequency SWR. If the 817B System is used in a swept-frequency SWR measurement system, additional equipment is necessary. See paragraph EQUIPMENT REQUIRED in this manual for further details. See OPERATION section of this manual for operating details.

8. Options

9. Model 817B Option 001 consists of APC-7 connectors on both probes of the Model 817B. This Option is used with Model 11664A Detectors in the 8755 Frequency Response Test Set, which have APC-7 connectors. Model 817B Option 022 consists of a Type N female connector on one end of the Model 816A Coaxial Slotted-Line and a Type N male connector on the other.

10. Accessories Supplied

11. Two coaxial-line shorts are furnished with the Model 817B, a Model 11512A Type N male short and a Model 11565A APC-7 short. The type of short used is the same as the connector on the device under test.

12. Equipment Required But Not Supplied

13. The Model 817B is not a complete measurement system in itself. A signal source and an indicator system is needed in addition to the Model 817B. The following equipment is required for this system.

14. **Models 8620A/B Sweep Oscillators.** The Models 8620A/B Sweep Oscillators with various plug-in RF Sections furnish a swept-frequency signal in octave bands from 1.8 to 18 GHz.

15. **Model 8755A Swept Amplitude Analyzer.** The Model 8755A Swept Amplitude Analyzer furnishes the squarewave modulation signal for the modulator and the signal-processing circuits between the

detectors and the indicator. No indicator is furnished. (See Model 181A.)

16. **Model 181A Variable Persistence/Storage Mainframe.** The Model 181A Variable Persistence/Storage Mainframe furnishes a mounting structure, voltages, and an indicator for the Model 8755A Swept Amplitude Analyzer.

17. **Model 11664A Detectors.** Two Model 11664A detectors are needed for the Model 817B. Three detectors are normally furnished, but the additional one used for transmission measurements is not used with the Model 817B.

18. **Models 11665A/B Modulators.** One 11665A or 11665B Modulator is needed to squarewave modulate the 817B. The modulation signal is furnished by the 8755.

19. **Model 11678A Low-Pass Filter Kit.** Low-Pass Filters which pass the band of interest but reject the second harmonic of the lowest frequency in the band can be used to reduce unwanted responses on the display. The Model 11678A consists of a set of five filters as follows:

Model	Cutoff Frequency
11688A	2.8 GHz
11689A	4.4 GHz
11684A	6.8 GHz
11685A	9.5 GHz
11686A	13.0 GHz

20. Companion Equipment

21. The following equipment is available and convenient for use in some measurements but is not essential to the operation of the Model 817B.

22. **Models 8491B/8492A Attenuators.** To reduce display variations caused by mismatch reflections when measuring low SWR's over a wide frequency range, use two 6- or 10-dB attenuators inserted between the 11664A detectors and the 817B probes. The HP Model 8491B Coaxial Attenuators have a Type N male connector on one end and a Type N female connector on the other. The HP Model 8492A Coaxial Attenuators have APC-7 connectors on both ends. These attenuators should be used in pairs, one in the "R" channel and one in the "A" channel. For best results, they should be of the same value.

23. Model 905A Coaxial Sliding Load. A coaxial sliding load is convenient when measuring SWR of two-port devices, since the load reflection can be balanced out. The Model 905A Coaxial Sliding Load is available complete with interchangeable connectors to mate with Type N connectors (male or female) or with APC-7 connectors.

24. Model 7035B X-Y Recorder. The Model 7035B X-Y Recorder can be used to make a permanent record of swept slotted-line measurements for future reference.

25. Model 909A Terminations. If a sliding load is not available, fixed terminations such as the Hewlett-Packard Model 909A may be used to terminate ports other than measurement ports on the device under test. These terminations furnish an accurate 50-ohm impedance. For APC-7 connectors, order a standard Model 909A. For Type N connectors, an option must be ordered. To mate with Type N female connectors order Model 909A Option 012 (Type N male). For Type N connectors, order Model Option 013 (Type N female).

26. INSTALLATION

27. Initial Inspection

28. 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 2, Model 817B Features, and procedures for checking electrical performance are given under PERFORMANCE TESTS. If the contents are incomplete, if there is mechanical damage or defect, or if the instrument does not pass the electrical performance test, notify the nearest Hewlett-Packard office. If the shipping container is damaged, or the cushioning material shows signs of stress, notify the carrier as well as the Hewlett-Packard office. Keep the shipping materials for the carrier's inspection. The HP office will arrange for repair or replacement without waiting for claim settlement.

29. Preparation for Use

30. The Model 817B is connected in a measurement system as shown in Figure 1. Both the probes and detectors are interchangeable but some precautions are necessary when handling them as described in the following paragraphs.

31. Handling Model 11664A Detectors. A high electrostatic charge ($> 20,000$ volts) may occur on the human body. Take care not to burn out crystal diodes in detectors by discharge of this electricity when handling the 11664A detectors. The maximum energy discharge permissible is 0.1 erg, which is an extremely small amount of energy. When handling the detectors, do not permit discharge through the diode either directly or to ground. The best method is not to touch the center conductor. If the center conductor must be touched, be sure to touch the outer shell first.

32. Handling Probes. When the Model 11664A Detectors are connected to the probes, the same cautions apply to the probes as for the Detectors. In addition, some special cautions are necessary for the probes. Do not remove the probe unnecessarily, to avoid damaging the probe tip. Do not operate the carriage with the probe all the way in. (See OPERATING INSTRUCTIONS.)

33. Installing Probe Mount in Carriage. The probe mount consists of two parts; the mount itself and a probe lock. These two parts are assembled together loosely so that the lock may be turned to hold the probe in position after it has been inserted and adjusted to the desired depth. It is best to install the mount before installing the probe as follows:

- a. Place probe mount in carriage, loosening the thumbscrew if necessary.
- b. Tighten the thumbscrew.
- c. Turn the lock so that the hole in the lock and the hole in the mount are aligned to receive the probe.

34. Installing Probes. The knurled probe-mount lock center-hole is off-center with the hole in the main body. Only when the knurled lock is in the center of its rotation range do these two holes line up. This is the only time when the probe may be removed or inserted. After the probe has been inserted, rotate the knurled mount (preferably clockwise) to lock the probe. If the mount is always turned in the same direction to lock, it can be unlocked by turning in the opposite direction without damage to the probe. The probe in the Model 448B is held in by a simple thumbscrew.

35. Storage and Shipment

36. Environment. The system should be stored in a clean, dry environment. The following environ-

mental limitations apply to both storage and shipment:

Temperature: -40°C to $+75^{\circ}\text{C}$
 Humidity: $< 95\%$ relative
 Altitude: $< 25,000$ feet

37. 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. Also, mark the container **FRAGILE** to assure careful handling. In any correspondence, refer to the instrument model number and full serial number.

38. OPERATION

39. Environment

40. The operating environment should be within the following limits:

Temperature: 0°C and $+55^{\circ}\text{C}$
 Humidity: $< 95\%$ relative
 Altitude: $< 15,000$ feet

41. The technique for swept-frequency slotted-line measurements is much the same as for fixed-frequency measurements. A detecting probe is moved along the slotted line for a distance of at least one-half wavelength at the lowest frequency so both maximum and minimum voltages of the standing waves are sampled. However, instead of plotting the maximum and minimum voltages at a single frequency, maximum and minimum voltages are plotted at all frequencies over which the source is swept. The maxima and minima do not occur at the same place on the line at all frequencies, so the final plot is constructed from many sweeps, each with the probe at a different position along the slotted line. At any given frequency, the ratio of the maximum and minimum amplitude of the envelope is the SWR. Since the display is logarithmic, only the envelope of the maxima and minima need be measured.

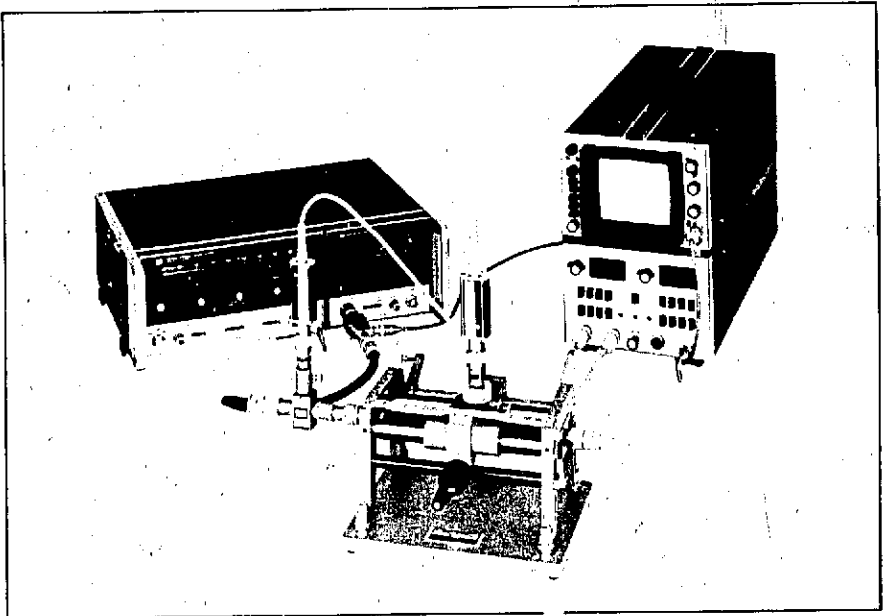


Figure 1. Model 817B Connected in a Measurement System

42. Component Parts

43. The 817B system consists of three parts: the Model 448B Slotted-Line Sweep Adapter with two probes, the Model 809C Carriage with 00817-20001 Baseplate, and a Model 816A Coaxial Slotted-Line. The Model 809C Carriage and Model 816A Slotted-Line instructions will be found in their respective operating notes, which are furnished with this manual.

44. **Slotted-Line Sweep Adapter.** The Slotted-Line Sweep Adapter consists of a pair of interchangeable probe assemblies, a short slotted-section and a probe mount.

45. The fixed slotted-section samples the sweep oscillator output. This voltage is used by the 8755 as a reference level which eliminates the need for leveling and helps cancel the frequency response of the carriage probe. The male connector is attached to the slotted-line as there is a 6 dB pad in this arm for better isolation with high SWR. The amount of voltage sampled is varied by adjusting the probe penetration.

46. The probe/detector combination in the carriage is used as the usual detector in a slotted-line system to sample the standing-waves in the line. The amount of energy sampled may be adjusted by varying the probe penetration.

47. **Connectors.** In the Model 817B, the SWR's of the connectors add to the residual SWR of the system. In order to minimize these reflections, special attention has been paid to the choice of connectors used. The connector outer shells are made of stainless steel for longer wear. The following connectors are used:

a. Amphenol APC-7 connector which has extremely broad-band usability, low SWR, precise alignment, a clearly-defined reference plane, low RF leakage, and low contact-resistance. For these reasons, this is the preferred connector with the least ambiguous results. In addition, the connector is designed to mate with any other APC-7 connector without an adapter.

b. Type N modified connectors are low-SWR compatible types. They mate with all connectors whose dimensions conform to MIL-C-39012.

48. Features

49. Figure 2 illustrates the operating features of the Model 817B Coaxial Swept Slotted-Line System. Note that some features are more fully described in the Model 809C and 816A Operating Notes which are included with this manual.

50. Operator's Check

51. Figure 3 is an operator's check procedure, allowing the operator to make a quick check of the system functions prior to use. The operator's check assumes the Swept Amplitude Analyzer is installed in an oscilloscope mainframe (Frequency Response Test Set). Therefore, if the correct indications are not obtained, trouble may be in either unit. If the Coaxial Swept Slotted-Line System is suspected, refer to the paragraph under TROUBLE SHOOTING in this manual.

52. SWR Measurement

53. Figure 4 illustrates SWR Measurement in a step-by-step procedure. Before making a measurement, be sure to read OPERATING CONSIDERATIONS which follows.

54. Operating Considerations

55. If the bandwidth of the oscilloscope is too low or the sweep rate too high, some of the fine structure of the SWR pattern may be lost. Because of noise, the widest bandwidth may not give the best pattern, but the optimum combination can easily be determined experimentally by keeping the carriage stationary and adjusting the sweep rate and bandwidth for the most crooked trace.

56. **Adjusting the Trace Slope.** If the slope of the ripple pattern causes the trace to go off the screen of the oscilloscope, loosen the setscrew in the slotted-line sweep adapter on the side opposite to the OUTPUT label with an 0.05-inch across-the-flats hex-head wrench while holding your hand under the adapter. When the polyiron insert comes loose, its position may be adjusted to reduce the slope. When the best position is found, tighten the setscrew.

57. A number of techniques are available for making more precise measurements. They are described in the following paragraphs.

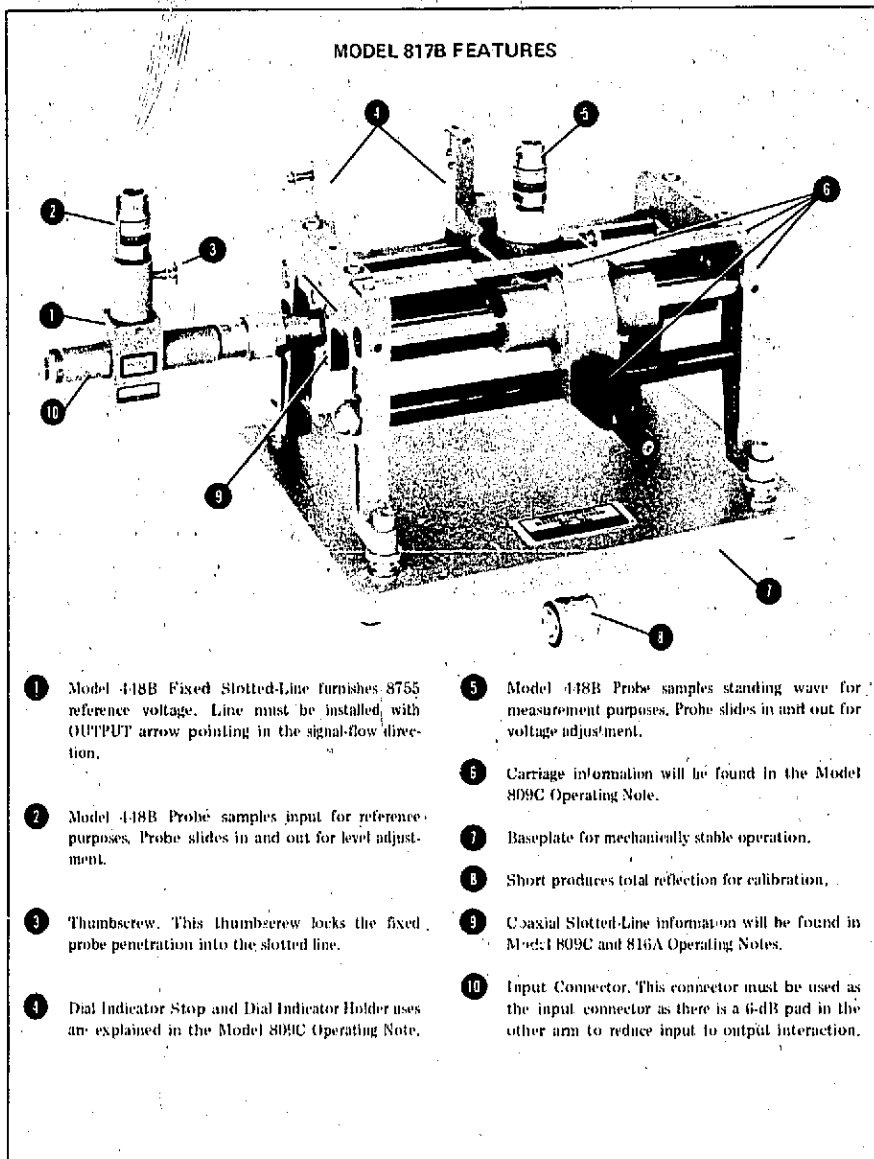


Figure 2. Model 817B Features

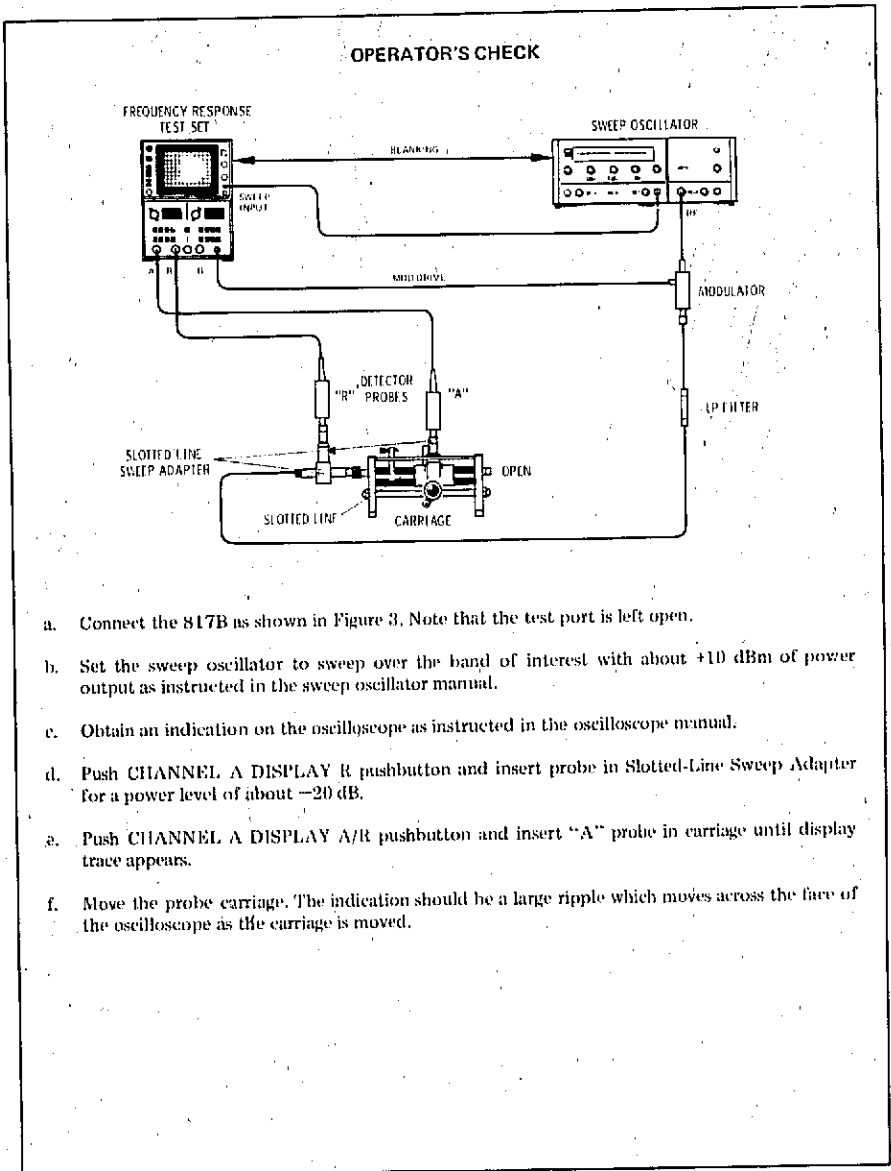


Figure 3. Operator's Check

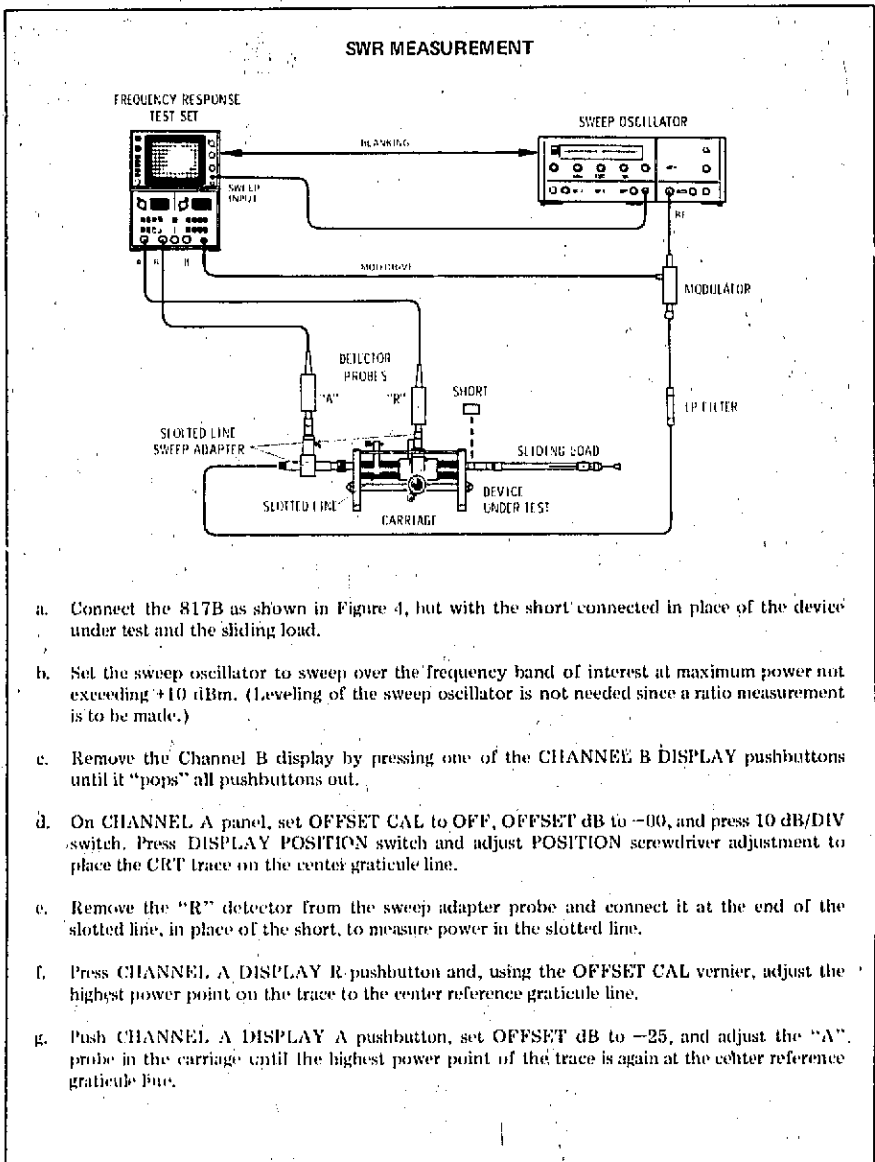


Figure 4. SWR Measurement (1 of 2)

SWR MEASUREMENT

- b. Remove the "R" detector and reconnect it to the "R" probe on the slotted-line sweep adapter. Reconnect the short to the slotted line.
- i. Press CHANNEL A DISPLAY R and adjust the "R" probe so that the highest power point on the trace is at the center reference graticule line.
- j. Remove short and connect port of device under test. If device has more than one port, connect a sliding load or fixed termination to the other ports.
- k. Press CHANNEL A DISPLAY A/R, set OFFSET to -00, and set OFFSET CAL to ON.
- l. Adjust CHANNEL A OFFSET CAL vernier to place the trace in the center of the screen. Any slope of the trace can be reduced by adjusting the polyiron load in the slotted-line sweep adapter. See ADJUSTING THE TRACE SLOPE in the text.
- m. Set oscilloscope to WRITE, move carriage over at least one-half wavelength at the lowest frequency being swept, and store the trace.* Ripple variations can be reduced by the insertion of a pair of 6- or 10-dB pads, depending upon the available power from the source, between the probes and the detectors.
- n. Measure the width of the trace in a vertical direction. Compute SWR by using the formula

$$SWR = \log_{10}^{-1} (dB/20)$$

- o. For a discussion of errors and methods of eliminating them, refer to OPERATING CONSIDERATIONS.

* If a storage oscilloscope is not available, take a time-exposure photograph of the trace.

58. Padding the Detectors. If sufficient power is available, the mismatch errors of the detectors can be reduced by inserting well-matched attenuators between both probes and detectors. Equal values of attenuation should be used in each arm.

59. Using a Sliding Load at Swept Frequencies. If the device under test is out of specifications at several frequencies and has an unused port terminated in a load, the SWR due to the load can be balanced out. Connect a sliding load to the unused port. Mechanically link the sliding load to the probe in the carriage so that the distance (the phase) between the carriage probe and the sliding load is held constant. Use the procedure given in the following paragraph.

60. To mechanically couple an HP Model 905A Sliding Load, use a piece of 3/8 inch outside diameter aluminum tubing approximately 18 inches long with a right-angle bend 4 inches from one end. Clamp a 1-1/16 inch inside diameter cable clamp around the sliding collar of the load, a 3/8 inch inside diameter cable clamp on the tubing, and fasten the two cable clamps together with a screw and nut. (See Figure 5.) Connect the long end of the tubing to the moving portion of the carriage (micrometer holder).

61. Adjust the various clamps so that the load tracks with the carriage over the entire length of travel. Measure the SWR in the same manner as described in Figure 4, SWR Measurement. The effect of any reflection from the sliding load will be cancelled out since there is a fixed distance between the probe and load. The position of the top and bottom of the trace will move with any reflection from the load but, since the detector and load move together, both the top and bottom of the trace will move in unison and the effect of the width measurement will be cancelled out.

62. Using a Sliding Load at a Fixed Frequency. If the device under test is out of specifications at only one frequency and has an unused port terminated in a load, the SWR due to the load can be balanced out. Connect a sliding load to the unused port(s). Set the sweep oscillator for CW operation at the frequency in question and slide the load. The SWR due only to the device under test is the average between the maximum and minimum indications.

63. Compensating for Trace Width. The width of the oscilloscope trace adds a small amount to the top and bottom of the trace. To compensate for this error, run a trace with the carriage stationary. Read the trace width. Subtract this value from the measured value.

64. Error Considerations

65. For a discussion of swept SWR measurements and measurement errors see Stephen F. Adam, "Swept-Frequency SWR Measurements in Coaxial Systems", HP Journal Vol. 18 No. 4, Dec. 1966, pp. 15-20, or Application Note 84, obtainable free from your nearest Hewlett-Packard office.

66. The following error sources affect the accuracy of the measurement made with the Model 817E.

a. The residual SWR of the slotted line limits the accuracy of measurements made with the Model 817B. This limitation is similar to the limitation imposed by directivity on directional couplers. In both cases there is an additional rotating phasor of unknown phase added to the value of the measurement. In value, the residual SWR of 1.04 (to 18 GHz) of the slotted line approximately equals the ambiguity of a 34 dB coupler.² This error is not a single error but consists of slope (which can be adjusted) and connector SWR (which varies with different connectors). The slope, in turn, consists of slope variation and irregularities.

b. Variations in power input to the log amplifiers of the Model 8755 will cause errors. This is because the logarithmic amplifiers in the 8755 are not perfect analog logarithmic amplifiers but stepped, linear devices which only approximate a true logarithmic curve. To minimize this tracking error, the detector probes are adjusted so that both detectors are operating at the same absolute power input. This provides the best accuracy for the 8755.

c. Excess probe penetration into the line can also cause errors due to interference. This interference is minimized in the measurement procedure by reducing the coupling to at least 25 dB (down) from the incident power on the line. This procedure is recommended when measuring low

¹ B.O. Weinschel, G.U. Sorger, S.J. Hall, J.E. Ebert, "Precision Coaxial VSWR Measurements by Coupled Sliding-Load Technique", IEEE Transactions on Instrumentation and Measurement, Vol. IM-13, No. 4, Dec. 1964.

² Calculated with a reflectometer calculator, obtainable free from any Hewlett-Packard office.

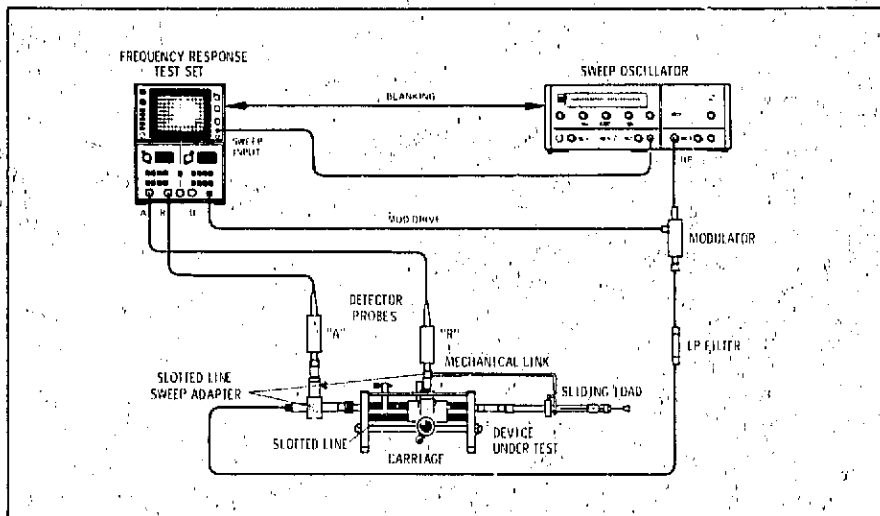


Figure 5. Mechanically-Coupled Sliding Load

SWR's. When measuring high SWR's the coupling may be increased to increase the dynamic measurement range.

d. The improper choice of bandwidth/sweep rate can lead to error. The 8755 has a 10 kHz bandwidth, thus allowing fast sweep-speeds. Any noise interference, especially when using low-power sources or padding the detectors to improve matching between detectors and probes, can be averaged by pushing the SMOOTHING push-button. This reduces the bandwidth of the 8755 to 300 Hz and requires a substantially lower sweep-speed to prevent distortion. Gradually increase the sweep speed from the slowest possible until the waveshape just begins to change. Then back the control off until the waveshape is undistorted. This is the maximum sweep-speed.

e. Repeatability of connectors due to varying torque tightening may be a problem in comparison measurements. The use of a torque of 16 inch/pounds is recommended in this case.

f. The finite width of the trace causes a measurement error. See COMPENSATING FOR TRACE WIDTH for a method of correcting the measured value for this error.

67. OPERATOR'S MAINTENANCE

68. The only operator's maintenance consists of keeping the Model 817B clean and of replacing the center contact in the APC-7 connector when it gets damaged or worn. This contact is a small four-pronged spring-action contact which snaps into a recess in the center conductor. It is normally held in by the spring-action of the four prongs. With a magnifying glass examine the contact to determine if it needs replacement.

CAUTION

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

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

- Place so the connector faces down, if possible.
- Tap the connector lightly and the contact should now protrude slightly. Insert the centering

pin of the HP Contact Extractor, HP Part Number 5060-0236 with the jaws open. If this tool is not available, an ordinary draftsman's mechanical pencil may be used. (The ends of the jaws may have to be filed to get a good grasp at the very end.)

c. Allow the jaws of the tool used to close and pull straight away from the connector without twisting. The contact should come out with the tool. If not, repeat the process. Do not reuse the contact.

d. Snap a new contact in place by pushing it in with a fingernail.

69. PERFORMANCE TESTS

70. Performance testing the Model 817B consists of measuring the residual SWR. The residual SWR is measured by placing a totally reflecting short on the test port, reflecting the input power, and measuring the resultant standing wave.

71. Measure the SWR of a sliding load with CW operation using the setup shown in Figure 4. Move the sliding load while observing the spot excursions. The true residual SWR is the average of the maximum and minimum excursions. This value should be within the values given in Table 1 for the type connector used. To convert SWR to return loss use the formula:

$$\text{return loss} = 20 \log_{10} \text{SWR or}$$

$$1.02 \text{ SWR} = 0.17 \text{ dB}$$

$$1.03 \text{ SWR} = 0.26 \text{ dB}$$

$$1.04 \text{ SWR} = 0.34 \text{ dB}$$

$$1.05 \text{ SWR} = 0.42 \text{ dB}$$

$$1.06 \text{ SWR} = 0.51 \text{ dB}$$

72. ADJUSTMENTS

73. Adjustments on the Model 817B have been covered in the OPERATION section or in the Operating Note for the Model 809C. The Model 817B requires no other adjustments.

74. REPAIR

75. Troubleshooting

76. Troubleshooting the Model 817B consists, in general, of substituting one component for

another. Since there are two channels, "A" and "B", components from one channel can be substituted in the other channel whenever there is any question concerning the operation of the Model 817B. Also, since the 817B uses only two of the normal complement of three Model 1166-A Detectors, a spare detector is available for substitution.

77. Repair Procedures

78. Repair procedures for the individual components of the Model 817B are given in the instructions for each individual component. Refer to the instructions for the component involved.

79. Replaceable Parts

80. Replaceable parts are listed in the instructions of the individual components which make up the Model 817B. See Figure 6 for replaceable parts in the 448B.

81. Ordering Information

82. To obtain replacement parts, address order inquiry to your local Hewlett-Packard office.

83. To obtain a part that is not listed, include:

- Model number
- Serial number
- Description of part
- Function and location of part.

84. Replacing the Probe Tips

85. Should the wire probe tip get damaged, refer to Figure 7 and proceed as follows:

a. Clamp the probe tip BELOW THE SHOULDER AT THE WIDER PORTION. To do this, use a pin vise which can be inserted inside the probe body shell, such as part number 240-C manufactured by L.S. Starrett Co., Athol, Mass.

b. Remove probe tip by turning it counter-clockwise.

c. Place a tiny amount of conductive silver paint, such as Silpaint¹, on the threads of a new probe tip, HP Part No. 00-448-2006, and screw it clockwise into the probe body until snug, using a

¹ Registered trademark for product L02-1068, manufactured by Electronic Materials Co., Santa Ana, CA 92705.

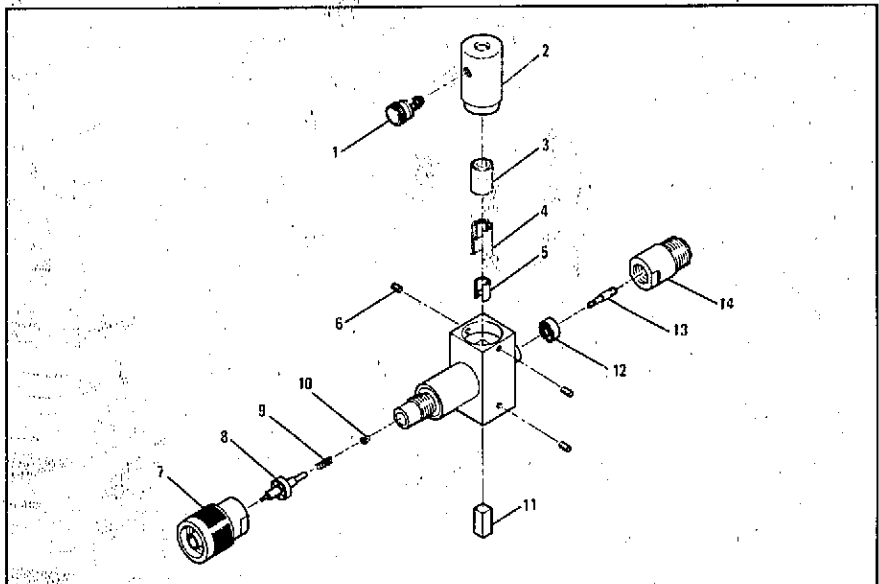
pin vice in a manner similar to the way the faulty pin was removed. Silpaint may be ordered from Hewlett-Packard as Part No. 5080-5050.

86. Replacing the Probe Body

87. If the probe body is damaged, refer to Figure 7 and proceed as follows:

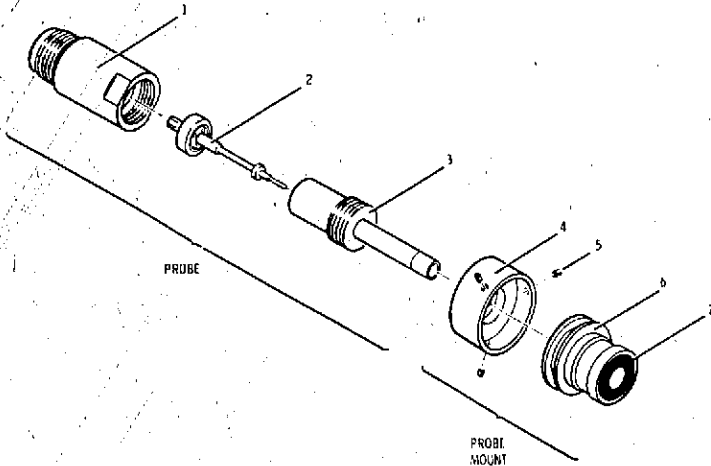
- a. Secure the probe body in a pin vise or drill press chuck. Make sure pressure is clamped on the body only beyond the shaft shoulder and that the probe tip is not touched.
- b. With a 9/16-inch (1/2-inch for APC-7) open-end wrench, remove the connector.
- c. Replace the probe body and tighten in a similar manner in which it was removed.

PARTS LIST



Item	HP Part Number	Description
1	0570-1059	Knurled Thumbscrew 8-32 x 1/4
2	00448-2001	Probe Holder
3	00448-2002	Probe Holder Lock
4	00448-2027	Probe Holder Guide
5	00448-2026	Leakage Suppressor (polyiron)
6	3030-0007 (3)	Setscrew 4-40 x 1/8" Hollow Hex Head
7	Male Type-N Connector Assembly 1250-0916 1250-0917 1250-0918 1250-0015	Consisting Of: Connector Body Male Center Conductor Pin (shown at 8) Coupling Nut Rubber Gasket
8	Center Conductor Assembly 1250-0917 5040-0306 5020-3296	Consisting Of: Male Center Conductor Pin Insulating Bead Contact Holder
9	146C 9012	Spring
10	5020-3297	Sliding Contact
11	00448-2021	Polyiron Mode Suppressor
12	5040-0306	Insulating Bead
13	1250-0915	Female Pin
14	1250-0914	Connector Female Body
15	0520-0118	Screw, nylon 2-56 x 0.625" with head cut off

Figure 6. Fixed Slotted Line Replaceable Parts



Item	HP Part Number	Description
1	00448-60003 00448-60004 1250-0914 1250-0909	Probe Assembly Complete, Type N female Probe Assembly Complete, APC-7 (Option 001) Standard Connector (female Type N) Option 001 Connector (APC-7)
2	1250-0816 5040-0306 00448-22002 00447-20006 00448-2006	Probe center conductor asy., consists of: Contact APC-7 Insulator Center Conductor, Probe Bead Tip, Probe
3	00448-22001	Body, Probe
4	00448-2011	Lock
5	0570-0183	Screw, Machine 4-40 x 1/8 setscrew hex head
6	00448-6002	Holder
7	00448-4301	Polyiron Probe Shield (cemented in)

Figure 7. Probe Assembly Replaceable Parts

MANUAL CHANGES

MANUAL CHANGES

COAXIAL SWEPT SLOTTED-LINE SYSTEM AND SWEEP ADAPTER

MANUAL IDENTIFICATION

Model Number: 817B/448B
Date Printed: August 1973
Part Number: 00817-90004

This supplement contains important information for correcting manual errors and for adapting the manual to instruments containing improvements made after the printing of the manual.

To use this supplement:

Make all ERRATA corrections

Make all appropriate serial number related changes indicated in the tables below.

Serial Prefix or Number	Make Manual Changes	Serial Prefix or Number	Make Manual Changes

► NEW ITEM

ERRATA

Page 1, Paragraph 3:

Change last sentence to "This manual explains how to use the 817B, briefly describes tests that can be used to verify the system's specifications, and explains how to repair the system."

► Page 1, Table 1:

Change Option 002 to 022: Type N male and Type N female connectors on Model 816A Coaxial Slotted Line, 11511A Female N short replaces 11565A.

► Page 6, Figure 2:

Change Item 1 to read: "Model 448 Slotted-Line Sweep Adapter furnishes 8755 reference voltage. Line must be installed with OUTPUT arrow pointing in the signal-flow direction."

Page 7, Figure 3:

► Change step b to read: "Set the sweep oscillator to sweep over the band of interest with less than +10 dBm of power output as instructed in the sweep oscillator manual."

Change last sentence in step f to read "The indication should be a large ripple which moves across the face of the 8755 as the carriage is moved."

Page 8, Figure 4:

Interchange "A" and "R".

NOTE

Manual change supplements are revised as often as necessary to keep manuals as current and accurate as possible. Hewlett-Packard recommends that you periodically request the latest edition of this supplement. Free copies are available from all HP offices. When requesting copies quote the manual identification information from your supplement, or the model number and print date from the title page of the manual.

3 April 1979

2 Pages

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ERRATA (Cont'd)

Page 11, Figure 5:
Interchange "A" and "R".

Page 14, Figure 6:
Change item 2 to 00448-20002.

Change item 9 to 1460-0977.

Add the following to the Description for item 15:
"... (located in blind end of item 11)."

Add item 16 00448-20001 Body.

Add item 17 00448-60005 Cartridge Assembly, 6 dB.

NOTE

When removing this attenuator cartridge, between items 10 and 16, note the orientation of the cartridge. When replacing cartridge, insert new one in the same orientation.

Page 15/16, Figure 7:

Make the following changes to item 2.

Add 1250-0915 Contact Type N.

Change 00448-22002 to 00448-20004.

Change 00447-20006 to 00448-2025.

Change item 3 to 00448-20003.

Add the following to the Description of item 6:
"... (with polyiron probe shield cemented in)".

Delete item 7.