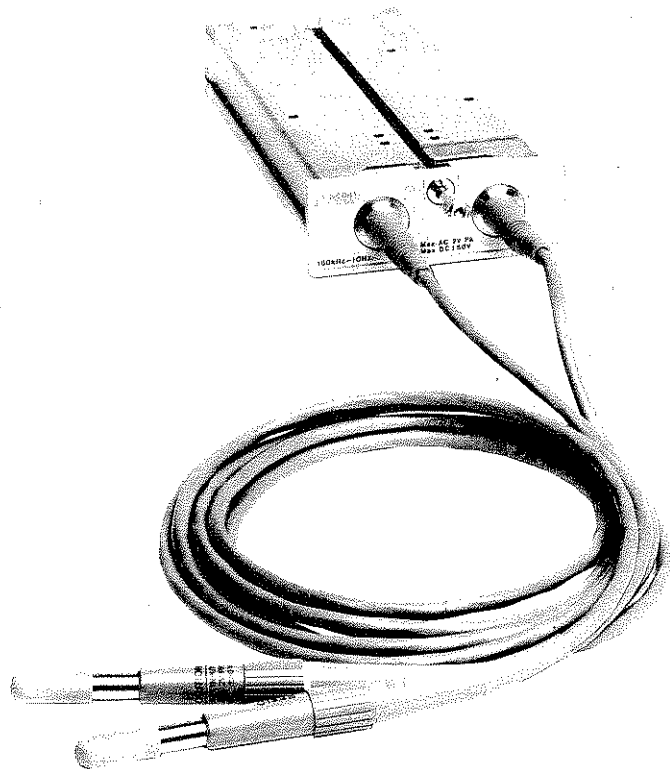


HP 85081A

HIGH IMPEDANCE INPUT PROBE MODULE



HP 85081A High Impedance INPUT MODULE

Operating and Service Manual Insert

Second Edition

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SOUTH QUEENSFERRY, WEST LOTHIAN, SCOTLAND EH30 9TG

Operating and Service Manual Insert HP Part 85081-90000

Microfiche Operating and Service Manual Insert HP Part 85081-90001

Printed in U.K. : April 1989



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CERTIFICATION

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

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

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

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ASSISTANCE

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

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

PLEASE READ THIS FIRST

INTRODUCTION

This package is designed to be used with the HP 8508A Vector Voltmeter mainframe Operating and Service Manual (HP part number 08508-90000) and the HP 70138A MMS Vector Voltmeter Service Manual (HP Part Number 70138-90002). The HP Model 85081A High Impedance Input Probe cannot be used independently of the HP 8508A or the HP 70138A Vector Voltmeters.

INSTALLING THIS PACKAGE

Remove the skin-packing material from this package. Insert the package at the rear of the HP 8508A Vector Voltmeter Operating and Service Manual binder or at the rear of the HP 70138A MMS Vector Voltmeter binder. This package has different coloured tabbing from the mainframe content, for ease of identification.

HP 85081A High Impedance Input Module Insert
(HP part number 85081-90000).

Contents

SECTION 1 - GENERAL INFORMATION

Introduction	1-1
Specifications	1-1
Anti-static Precautions	1-1
Instruments Covered by Manual	1-2
Description	1-2
Recommended Test Equipment	1-2

SECTION 2 - INSTALLATION

Introduction	2-1
Initial Inspection	2-1
Installing the Probe Module	2-1
Power Requirements	2-1
Operating Environment	2-2
Storage and Shipment	2-2
Environment	2-2
Packaging	2-2

SECTION 3 - OPERATION

Introduction	3-1
--------------	-----

SECTION 4 - PERFORMANCE TESTS

Introduction	4-1
Test Equipment Required	4-2
Test Records	4-2
Calibration Cycle	4-2
Performance Tests	4-2
Warm-up Time	4-3
Isolation Between Channels (Input Crosstalk)	4-4
Reference Channel Lock Level and Channel B Noise Floor	4-6
Phase Accuracy vs Frequency	4-8
Phase Offset Accuracy	4-11
Phase Accuracy vs Level	4-13
Amplitude Accuracy vs Frequency	4-16
Amplitude Accuracy vs Input Level (and rear panel output check)	4-19
Voltage Ratio Accuracy vs Level	4-21

SECTION 5 - ADJUSTMENTS

Introduction	5-1
Warm-up Time	5-1
Safety Considerations	5-1
Equipment Required	5-2
Post Repair Adjustments	5-2
Related Adjustments	5-2

Contents

Adjustable Components	5-3
Set up the SRD Bias, Channel A and B bias, and Delay Line Adjustments	5-4
Set up the Symmetry Adjustment for Channels A and B	5-11
Adjustment of the Gain of Channels A and B	5-13
Set up the Module Phase and Impedance	5-15
 SECTION 6 - REPLACEABLE PARTS	
Introduction	6-1
Abbreviations	6-1
Replaceable Parts List	6-1
Ordering Information	6-2
Direct Mail Order System	6-2
 SECTION 7 - MANUAL CHANGES	
Introduction	7-1
 SECTION 8 - SERVICE	
Introduction	8-1
Anti-Static Precautions	8-1
Recommended Test Equipment	8-1
Troubleshooting	8-2
General Description	8-2
Troubleshooting Procedure	8-3
Probe Sampler Board Replacement	8-3
Disassembly and Reassembly Procedures	8-4



Figure 1-1. The HP 85081A High Impedance Input Probe Module

General Information

Section 1

1-1 INTRODUCTION

This service manual contains information required to install, test, adjust and service the Hewlett-Packard Model 85081A High Impedance Input Probe. The HP 85081A High Impedance Input Probe is shown in Figure 1-1.

On the title page of this manual is a Microfiche Part Number. This number can be used to order 4 x 6 inch microfilm transparencies of the manual. Each microfiche contains up to 96 photo duplicates of the manual pages.

1-2 SPECIFICATIONS

Instrument specifications are listed in Table 1-2. These specifications are the performance standards or limits against which the instrument is tested. The specifications listed apply only when the HP 85081A is installed in either an HP 8508A Vector Voltmeter mainframe, or an HP 70138A MMS Vector Voltmeter Module.

1-3 ANTI-STATIC PRECAUTIONS

The printed circuit board contained in this instrument and the probes have components that are susceptible to damage by electrostatic discharge (ESD). To minimize the risks of damaging or decreasing the reliability of the instrument, the following procedures and cautions should be observed.

Static-free Workstation: All unpackaging and servicing should be carried out at a static-free workstation whenever practical.

De-soldering: When de-soldering components, ensure that the soldering iron is earthed. Always use a metalized solder remover.

Anti-Static Freezer Spray: When attempting to locate a temperature-related fault, use only an approved anti-static freezer spray.

Anti-Static Products: Table 1-1 contains details of anti-static products which are available from Hewlett-Packard.

Table 1-1. Anti-Static Products

Product	HP Part Number
Anti-static workstation kit	9300-0792
Metalized Solder Remover	8690-0227
Wrist-strap	9300-0970

1-4 INSTRUMENTS COVERED BY MANUAL

DATE CODE

The year and week of manufacture are stamped on the circuit board and also on the outer casing of the module. Example: "8-18" would indicate week 18 of 1988. There is no serial number.

SERIES CODE

A four-digit series number is contained on a serial number plate. This number should match the series number on the title page of this manual. An instrument manufactured after the printing of this manual may have a series number that is not listed on the title page. The unlisted series number indicates that the instrument is different from those described in this manual. The manual for this new instrument may be accompanied by a Manual Changes supplement. This supplement contains "change information" that explains how to adapt the manual to the new instrument.

In addition to change information, the supplement may also contain information for correcting errors in the manual. To keep this manual as current and as accurate as possible, Hewlett-Packard recommends that you periodically request the latest Manual Changes supplement. The supplement for this manual is identified by the manual print date and part number (both of which appear on the manual title page). Complimentary copies of the supplement are available from Hewlett-Packard. For information concerning a series number that is not listed on the page or in the Manual Changes supplement, contact your nearest Hewlett-Packard office.

1-5 DESCRIPTION

The Hewlett-Packard Model 85081A High Impedance Input Probe is a plug-in module for the HP 8508A Vector Voltmeter and the HP 70138A MMS Vector Voltmeter Module. The HP 85081A can measure signals in the frequency range 100kHz to 1GHz and at levels from 10uV to 1V. The HP 85081A has two high-impedance probes which can be used either alone or with accessories to make in-circuit measurements.

1-6 RECOMMENDED TEST EQUIPMENT

Table 1-1 in the HP 8508A Vector Voltmeter manual lists the test equipment required for testing, adjusting and servicing the HP 8508A Vector Voltmeter and the HP 85081A High Impedance Input Probe. Table 1-1 in the HP 70138A MMS Vector Voltmeter Service Manual lists the equipment required for testing and adjusting the HP 70138A MMS Vector Voltmeter and the HP 85081A High Impedance Input Probe. The Critical Specifications column describes the essential requirements for each piece of test equipment. Other equipment can be substituted if it meets or exceeds the critical specifications.

Table 1-2. Specifications

Specifications describe the instrument's warranted performance over the temperature range 0 to 55 deg C unless otherwise stated. Typical values describe typical, but non-warranted, performance. Nominal values are given as a guide to expected performance.

Measurement conditions: All specifications apply to measurements in a 50 ohm system and with frequency autoranging off, unless otherwise stated. Measurements are made with the probes mounted in an HP 11536A Feedthru Tee unless otherwise stated.

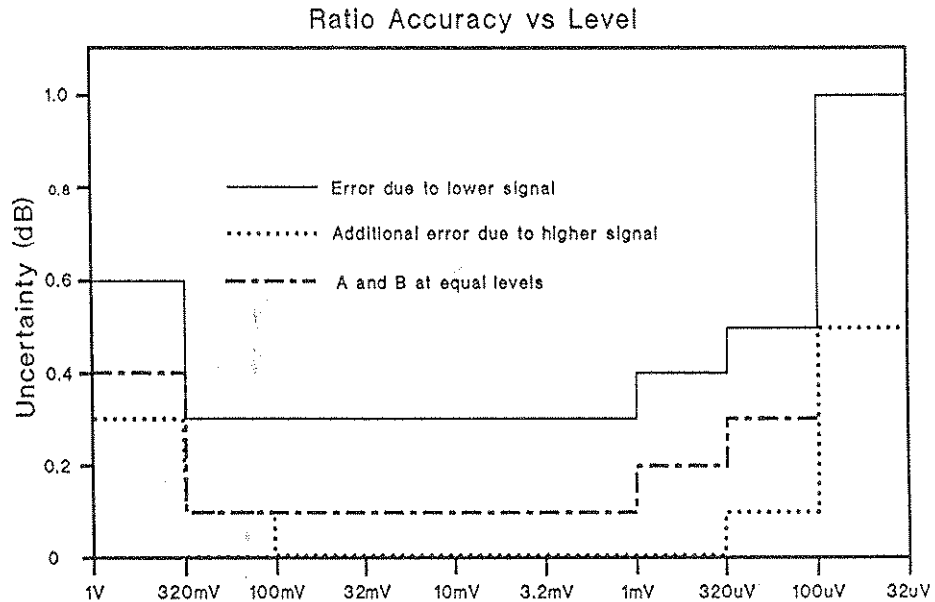
Frequency Range	100kHz-1GHz	
Maximum Input	2V ac peak, ± 50 Vdc	
Measurement Range		
A and B Channel maximum	Magnitude measurements	300mV, 100kHz-1MHz 1V, 1MHz-1GHz
A (Ref) Channel minimum	Phase measurements	300mV, 100kHz-1GHz 10mV, 100kHz-300kHz 1mV, 300kHz-3MHz 300uV, 3MHz-1GHz
B (Meas) Channel noise floor		10uV rms, 1MHz-1GHz
Measurement bandwidth	1kHz (nominal)	
Input Crosstalk	>100dB, 1MHz-500MHz >80dB, 500MHz-1GHz	
Impedance	SWR<1.15, 100kHz-750MHz SWR<1.2, 750MHz-1GHz Probe: 100kohm shunted by 2.5pF (nominal) Probe with 11576A 10:1 Divider: 1Mohm shunted by 2pF (nominal) Probe with 10216A Isolator: 100kohm shunted by 5pF (nominal)	
Magnitude Characteristics		
Resolution:	3 1/2 digits	
Accuracy:	Sum of Amplitude Accuracy vs Frequency and Absolute Accuracy vs Level or Ratio Accuracy vs Level (see following graphs).	

General Information

Ratio Accuracy vs Level (1) (3)

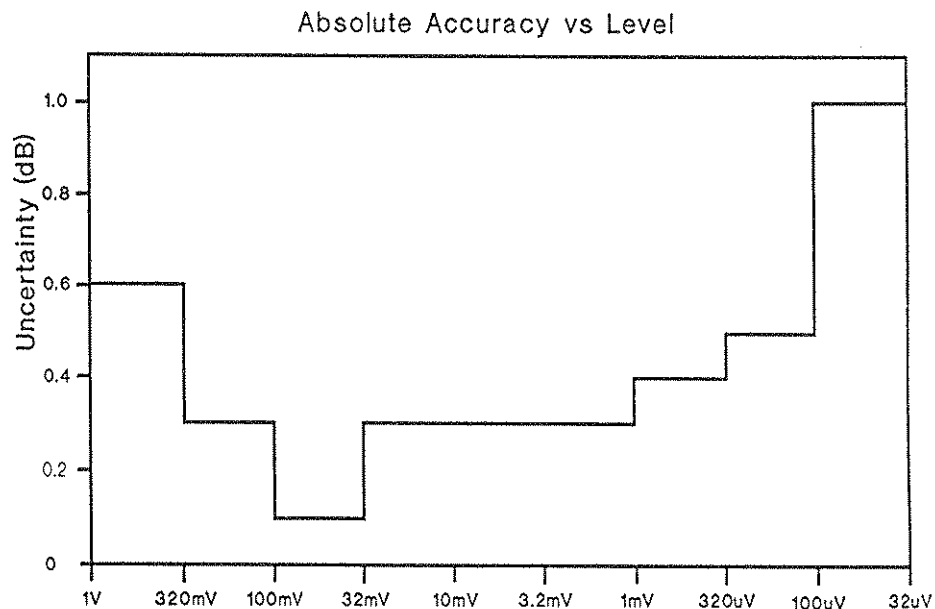
Add this term when making:
Ratio measurements at any single frequency.

(Accuracy vs level is normally determined by the lower level signal. Noise (<320 μ V) and compression (>100mV) effects cause additional errors.)



Absolute Accuracy vs Level (1) (2) (3)

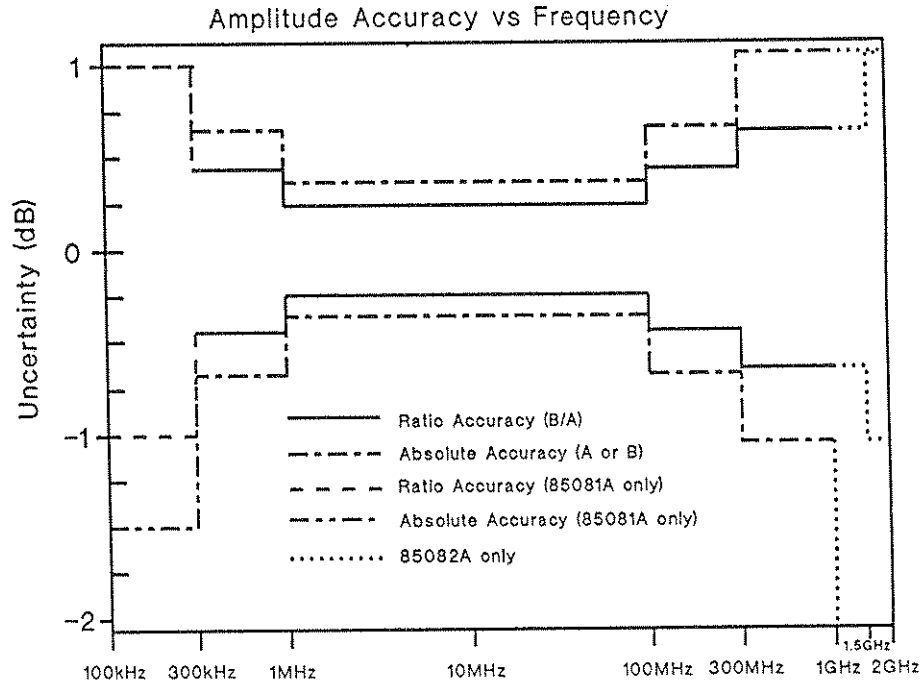
Add this term when making:
Absolute measurements.



Amplitude Accuracy vs Frequency(1) (4)
 (A and B 100mV nominal)

Add this term when making:
 Absolute measurements.
 Ratio measurements over a frequency range.

Ignore this term when making:
 Ratio measurements where the measurement is normalized to a reference at each new frequency.



Phase Characteristics

Display Range: -179.9 to +180.0 degrees

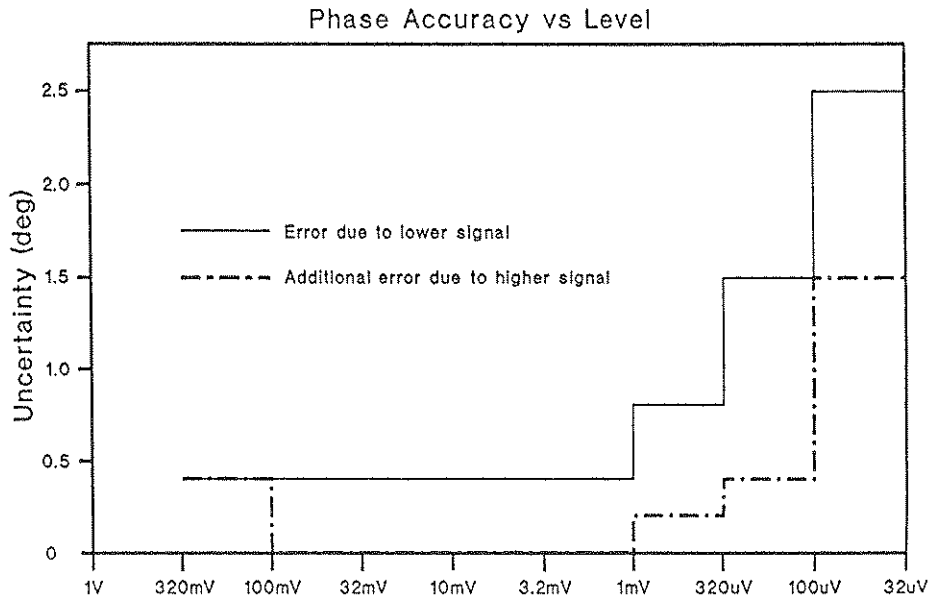
Display Resolution: 0.1 degrees

Accuracy: Phase accuracy has two components - phase accuracy vs level and phase accuracy vs frequency. Add the uncertainty components from the following graphs using the information on each graph to decide if the uncertainty applies to the particular measurement.

General Information

Phase Accuracy vs Level (5) (6) (7)

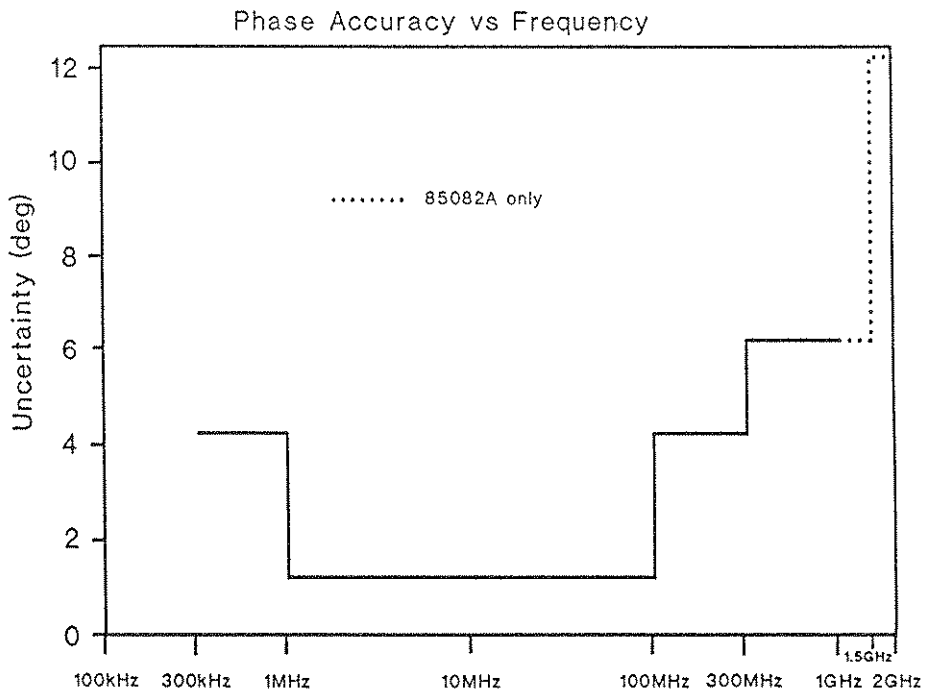
Add this term when making:
Phase measurements at any single frequency.



Phase Accuracy vs Frequency (5) (6) (A and B 100mV nominal)

Add this term when making:
Phase measurements over a frequency range.

Ignore this term when making:
Phase measurements where the measurement is normalized to a reference at each new frequency.



Footnotes

- (1) 15 to 30 degrees C. Add ± 0.1 dB per 5 deg C outside this range.
- (2) A minimum input level depends on frequency. See Measurement Range.
- (3) Add ± 0.5 dB for signals above 100mV at frequencies greater than 500MHz.
- (4) A and B absolute value includes ± 0.15 dB source traceability error.
- (5) 15 to 30 degrees C. Add 1 deg per 5 deg C outside this range.
- (6) Add ± 3 deg for signals above 100mV at frequencies greater than 500MHz.
- (7) Add ± 0.4 deg phase non-linearity for measurements other than 0 deg.

General

Search and lock time

Automatic tuning starts from lowest frequency and searches consecutive bands. Total search and lock time depends on the number of bands to be scanned and the lockup time within the selected band.

Process start time:	50ms after lock is lost.
Lockup (within 1 range):	40ms, frequencies up to 3MHz 20ms, frequencies greater than 3MHz
Ranges (MHz):	0.1-0.2, 0.2-0.6, 0.6-1, 1-3, 3-5, 5-8, 8-15, 15-25, 25-50, 50-80, 80-150, 150-250, 250-500, 500-1000, 1000-2000

Rear Panel Outputs:

Normal Operation: Provides an analog representation of the digital display values, including internal instrument correction factors.

OUTPUT 1 corresponds to DISPLAY 1, OUTPUT 2 corresponds to DISPLAY 2.

Range: 0 to ± 1999 display counts.

Sensitivity: 1mV represents 1 display count (nominal).

For readings greater than ± 1999 counts, the rear panel output voltage will remain fixed at ± 2.0 Volts.

Display resolution can be controlled by manual ranging.

Update rate: Approximately 3 readings per second.

Direct Analog Output: Provides continuous direct output from the internal magnitude and phase detectors through 800Hz low-pass filters. No internal correction is applied.

OUTPUT 1 corresponds to linear magnitude (A or B selected by front panel control).

Sensitivity: 1V equals displayed full scale deflection (nominal). Can be controlled by manual ranging.

OUTPUT 2 corresponds to B-A phase.

Sensitivity: 10mV per degree (nominal).

Phase Jitter: < 3 deg rms (typical, A=100mV, B=100uV)

HP-IB Capability

Interface functions:

SH1 AH1 T6 TE0 L4 LE0 SR1 RL1 PPO DC1 DT1 C0

Transfer Rate:

Normal Operation: Approximately 12 readings per second.

Measurement Conditions: Triggered measurement, default averaging.

Maximum Rate: Approximately 1 reading per 18ms.

Measurement conditions: Continuous output, averaging count 0, system format FP64, display rate off, equal steady state signals at A and B inputs, single output of phase or linear A or B voltage.

General Information

Probe Power Supply

Supplies: +12 and -12 volts and ground
This supply is sufficient to operate 1 HP 85024A High Impedance Probe.

Environment

Temperature: 0 to 55 deg C (operating), -40 to 70 deg C (storage)
Humidity: 0 to 95%, non-condensing
Altitude: 0 to 4500m (operating), 0 to 15000m (storage)

RFI: Conducted and radiated interference is within the requirements of
Messemphaenger-Postverfuegung 526/527/79.

Power: 100, 120, 220 or 240V +5/-10%, 48 to 440 Hz, 40VA

Size: Std: 133mm (5.25in) H x 425.5mm (16.75in) W x 473.3mm (18.65in) D

Weight: Std: 8.1kg (net) 11kg (shipping)

Installation

Section 2

2-1 INTRODUCTION

This section provides installation instructions for the Hewlett-Packard Model 85081A High Impedance Input Probe. This section also includes information about initial inspection and damage claims, preparation for use, packaging, storage and shipment.

2-2 INITIAL INSPECTION

WARNING

IF THERE IS ANY SIGN OF SHIPPING DAMAGE TO THE INSTRUMENT, DO NOT INSTALL IN THE HP 8508A MAINFRAME, OR THE HP 70138A MMS MODULE. RETURN THE INSTRUMENT TO THE NEAREST HEWLETT-PACKARD OFFICE FOR CHECKING.

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 Performance Tests check the complete specification of the instrument.

If the contents of the shipment are incomplete, if there is mechanical damage or defect, or if the instrument performance fails to meet specification, 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 material for the carrier's inspection. The Hewlett-Packard office will arrange for repair or replacement at Hewlett-Packard's option without waiting for a claims settlement, providing that Hewlett-Packard and/or the carrier are notified within 12 days of shipment.

2-3 INSTALLING THE PROBE MODULE

The HP 85081A is installed in the opening on the front panel of the HP 8508A Vector Voltmeter or the HP 70138A MMS Vector Voltmeter. The HP 85081A should be carefully slid into the guides and pushed firmly to ensure the connectors are mated. The module should now be locked in place by turning the knob of the locking mechanism clockwise.

2-4 POWER REQUIREMENTS

The HP 85081A derives its power directly from the HP 8508A Vector Voltmeter mainframe or the HP 70138A MMS Vector Voltmeter.

2-5 OPERATING ENVIRONMENT

- Temperature:** The instrument may be operated in temperatures from 0° Centigrade to +50° Centigrade. (Refer to the specifications for limitations.)
- Humidity:** The instrument may be operated with humidity up to 90% up to 40° Centigrade. However, the instrument should also be protected from temperature extremes which may cause condensation within the instrument.
- Altitude:** The instrument may be operated at altitudes up to 4600m (15000ft).

2-6 STORAGE AND SHIPMENT

Environment

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

- Temperature:** -40° Centigrade to +75° Centigrade.
Humidity: up to 90% at 65° Centigrade.
Altitude: 15300m (50000ft).

The instrument should also be protected from temperature extremes which may cause condensation within the instrument.

Packaging

- Tagging for Service:** If the instrument is being returned to Hewlett-Packard for service, please complete one of the blue repair tags located at the front of this manual and attach it to the instrument.
- Original Packaging:** Containers and material identical to those used in the factory packing 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, model number and full serial number. Also mark the container "FRAGILE" to ensure careful handling.
- Other Packaging:** The following general instructions should be used for re-packaging with commercially available materials.
- (a) Wrap the instrument in heavy paper or plastic. (If shipping to Hewlett-Packard office or service centre, attach a tag indicating the type of service required, return address, model number and full serial number.)
 - (b) Use a strong shipping container. A double-walled carton of 350-pound test material is adequate.
 - (c) Use a layer of shock absorbing material 70mm to 100mm (3 to 4 inch) thick around all sides of the instrument to provide firm cushioning and prevent movement inside the container. Protect the control panel with cardboard.
 - (d) Securely seal the shipping container.
 - (e) Mark the shipping container "FRAGILE" to ensure careful handling.
 - (f) In any correspondence, refer to the instrument by model number and date code.

Operation

Section 3

3-1 INTRODUCTION

This information is contained in the HP 8508A Vector Voltmeter mainframe and HP 70138A MMS Vector Voltmeter manuals.



Performance Tests

Section 4

4-1 INTRODUCTION

The Performance Test procedures in this section of the manual test the instruments electrical performance using the specifications listed in Table 1-2 of this manual as the performance standard. These specifications apply equally when the HP 85081A is used in either the HP 8508A or the HP 70138A Vector Voltmeter.

In the event of failure, refer to the Troubleshooting information in section 8 of this manual, except where specific reference is made to the Adjustment Procedures in section 5.

Power-on Checks

The Power-on Checks are performed automatically at switch-on. These checks test the operation of the mainframe processor, the functionality of the measurement modes and the presence of the HP 85081A Input Module. The Power-on Checks are part of the self-test routine used for operational verification.

Failure of these tests results in an Error Code number being displayed. Errors relating to the HP 85081A are in the 600 Series.

Performance Tests

The Performance Tests verify that the instrument is operating within the limits of the full specification. It should be noted, however, that the specifications apply to measurements in a 50 ohm system with the autoranging off.

In the event of a performance test failure, the test should be repeated with manual range selection and a check made of Adjustment Procedures and, if necessary, the Troubleshooting section.

4-2 TEST EQUIPMENT REQUIRED

Equipment required for the Performance Tests is listed in Table 1-1 in the HP 8508A or HP 70138A Vector Voltmeter manual. Any equipment which meets or exceeds the critical specifications may be substituted for the recommended model.

4-3 TEST RECORDS

The results of the Performance Tests may be recorded in Tables 4-2 to 4-9. The Test Records list all of the tested specifications and their acceptable limits. The results recorded at incoming inspection can be used for comparison in periodic maintenance and troubleshooting after repair or calibration.

4-4 CALIBRATION CYCLE

This instrument requires periodic verification of performance. Depending upon the use and environmental conditions, the instrument should be checked using the Performance Tests at yearly intervals.

4-5 PERFORMANCE TESTS

The Performance Test procedures provide a complete check of the instrument's electrical performance using the specifications listed in Table 1-2 as the performance standard. Table 4-1 gives a complete list of the Performance Tests. If any of the Performance Tests are out of specification, refer to section 5 of this manual and the appropriate Vector Voltmeter manual. If, after adjustment, the Specifications still cannot be met, refer to section 8 of this manual.

Table 4-1. Performance Tests

Test Title	Paragraph Number
Isolation between Channels (Input Crosstalk)	4-7
Reference Channel Lock Level and Channel B Noise Floor	4-8
Phase Accuracy vs Frequency	4-9
Phase Offset Accuracy	4-10
Phase Accuracy vs Level	4-11
Amplitude Accuracy vs Frequency	4-12
Amplitude Accuracy vs Input Level (and rear panel output check)	4-13
Voltage Ratio Accuracy vs Level	4-14

4-6 WARM-UP TIME

The instrument must be switched on for a minimum of 30 minutes before carrying out any tests. Once the instrument's operating temperature has stabilized, perform an automatic internal system calibration by selecting [SHIFT] [CAL TEST] on the HP 8508A or [Misc] [CAL] on the HP 70138A MMS system.

4-7 ISOLATION BETWEEN CHANNELS (INPUT CROSSTALK)

SPECIFICATIONS:

Input Crosstalk:	1 MHz - 500 MHz	> 100 dB
	500 MHz - 1 GHz	> 80 dB

DESCRIPTION:

Crosstalk is defined as the leakage interference between the instrument input channels. Crosstalk is tested by observing the signal level on a terminated input while applying a signal to the other input.

In this procedure, a maximum level signal of 1V_{rms} is applied to the Channel A input of the HP 85081A Input Module while the Channel B input is terminated in 50 ohms.

The crosstalk from Channel A to Channel B is indicated by an amplitude ratio measurement in DISPLAY 1.

EQUIPMENT:

Instrument	Critical Specification	Recommended Model
Signal Source	Frequency Range Amplitude	1.0 -1000 MHz 1.0 V rms
50 Ohm Tee (2)		HP 11536A
50 Ohm Termination		HP 909C
N(m)-N(m) Cable		HP 11500A

PROCEDURE:

1. Configure the equipment as shown in Figure 4-1.

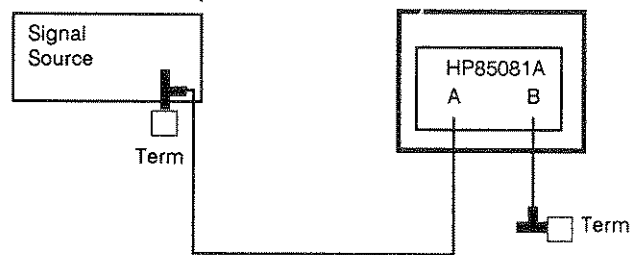


Figure 4-1. Channel Isolation Test Setup

2. Signal Source setup:

Frequency: 1.0 MHz
Amplitude: 1.0 V rms

3. HP 8508A setup	HP 70138A setup	Function
[PRESET]	[I-P]	Instrument preset
[B/A MAG] [DISPLAY] dB	[Mag/Ph] [B/A MAG] [Format Functn][dB]	B/A ratio measurement in dB, in DISPLAY 1.
[LOCK RANGE] [SHIFT] [VIEW RANGE] "up"/"down" arrow keys to select 1-3MHz.	[Lock Range] [1.0 - 3.0MHz]	Set frequency range.
[LOCK RANGE]	[Lock Range] [AUTO LOCK]	Unlock frequency range.
[SHIFT] [CAL/TEST]	[Misc] [CAL]	Self calibration.

4. Note the value obtained for the Input Isolation in DISPLAY 1 and record this value in the Performance Test Record (which is located at the end of the Performance Tests section.)

5. Repeat this procedure for each frequency noted in the Performance Test Record.

Should the results in any particular frequency range fall outwith the specification limits, the test should be repeated with the instrument locked in the appropriate frequency range. The process for locking the frequency range is shown below.

The instrument can be locked into a particular frequency range as follows:

HP 8508A	HP 70138A
[LOCK RANGE]	[Lock Range] <i>[required frequency range]</i>
[SHIFT] [VIEW RANGE] "up"/"down" keys to select frequency range.	
[LOCK RANGE]	[Lock Range] [AUTO LOCK]

Note: The frequency points in the Performance Test Record are a minimum requirement as they have been selected to coincide with the specification needs and ranges of the instrument.

4-8 REFERENCE CHANNEL LOCK LEVEL AND CHANNEL B NOISE FLOOR

SPECIFICATIONS:

Reference Channel Lock Level: 10.0 mV, 0.1 MHz - 0.3 MHz.
 1.0 mV, 0.3 MHz - 3.0 MHz.
 0.3 mV, 3.0 MHz - 1.0 GHz.

Channel B Noise Floor: 10 uV rms, 1MHz - 1GHz.

DESCRIPTION:

In this procedure, Channel B is terminated in 50 ohms and the minimum signal amplitude (appropriate to the frequency), is applied to the reference channel (Channel A). The channel should then be locked onto this signal.

The noise floor is defined with the minimum signal applied to Channel A while Channel B is terminated in 50 ohms.

EQUIPMENT:

Instrument	Critical Specification	Recommended Model
Signal Source	Frequency Range 0.1MHz - 1GHz Amplitude -47dBm	HP 8642B
50 Ohm Probe Tee (2)		HP 11536A
50 Ohm Termination		HP 909C
N(m) - N(m) Cable		HP 11500A

PROCEDURE:

1. Configure the test equipment as in Figure 4-2.

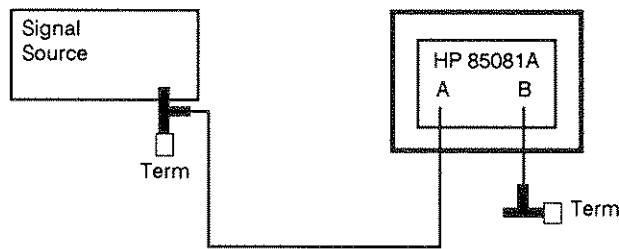


Figure 4-2. Test Setup for Reference Channel Lock Level and Channel B Noise Floor

2. Signal Source setup.:

Frequency: 100 kHz
Amplitude: 10 mV rms

3. HP 8508A setup	HP 70138A setup	Function
[PRESET]	[I-P]	Instrument preset.
[B]	[Mag/Ph Measure] [DISPLAY 2] [B]	'Input Level in DISPLAY 1 Noise Floor in DISPLAY 2.
[SHIFT] [CAL/TEST]	[Misc] [CAL]	Self calibration.

4. Check that Channel A is locked (indicated by the UNLOCKED LED being extinguished).

5. Adjust the signal generator output level and frequency in the sequence shown in the Performance Test Record. Check the status of the UNLOCKED LED and note the noise floor readings and enter them in the Performance Test Record (which is located at the end of the Performance Tests section.)

6. Repeat this procedure for each frequency defined in the Performance Test Record and note the Noise Floor Level and the lock status at each step.

Should the results in any particular frequency range fall outwith the specification limits, the test should be repeated with the instrument locked in the appropriate frequency range. The process for locking the frequency range is shown below.

The instrument can be locked into a particular frequency range as follows:

HP 8508A

HP 70138A

[LOCK RANGE]

[Lock Range] *[required frequency range]*

[SHIFT] [VIEW RANGE]
"up"/"down" keys to select
frequency range.

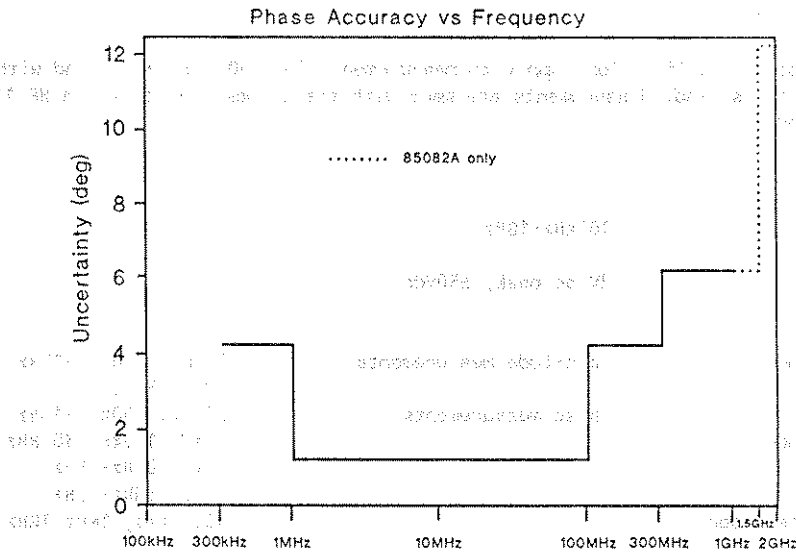
[LOCK RANGE]

[Lock Range] [AUTO LOCK]

Note: The frequency points in the Performance Test Record are a minimum requirement as they have been selected to coincide with the specification needs and frequency ranges of the instrument.

4-9 PHASE ACCURACY vs FREQUENCY

SPECIFICATIONS:



DESCRIPTION:

In this test, the Phase Uncertainty is tested at the reference level of 100mV and zero phase through the frequency range of the instrument, from 300kHz to 1GHz.

The test looks at the phase difference in the phase tracking of the two channels and includes the probe and probe cable tracking error.

EQUIPMENT:

Instrument	Critical Specification	Recommended Model
Signal Source	Frequency Range 0.3 - 1000MHz Amplitude 100 mV	HP 8642B
Power Divider	DC - 4 GHz Ins Loss: 6 dB O/P Tracking <= 0.4 dB Phase Tracking 0.2 deg or better.	HP 11636A
50 Ohm Probe Tee (2)		HP 11536A
50 Ohm Termination (2)		HP 909C

PROCEDURE:

1. Configure the equipment as shown in Figure 4-3 and connect the probe tees directly to the power divider outputs and ensure that the probes are firmly located.

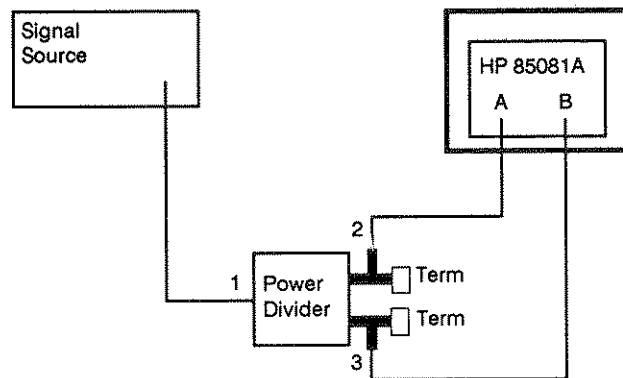


Figure 4-3. Phase Accuracy vs Frequency Test Setup

2. Signal Source setup:

Frequency: 1.0 MHz
 Amplitude: 200mV (to produce a nominal 100mV at the output of the power splitter)

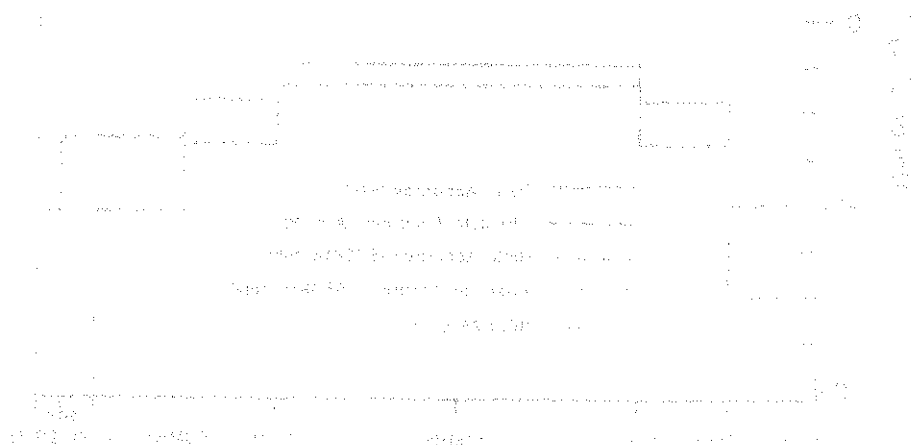
3: HP 8508A setup	HP 70138A setup	Function
[PRESET]	[I-P]	Instrument preset.
[B-A PHASE]	[Mag/Ph Measure] [DISPLAY 2] [B-A PHASE]	Amplitude in DISPLAY 1 Phase in DISPLAY 2.
[LOCK RANGE] [SHIFT] [VIEW RANGE] "up"/"down" keys to select 1-3MHz	[Lock Range] [1.0 - 3.0MHz]	Set frequency range.
[LOCK RANGE]	[Lock Range] [AUTO LOCK]	Unlock frequency range.
[SHIFT] [CAL/TEST]	[Misc] [CAL]	Self calibration.

4. With the output level unchanged, vary the frequency in the sequence shown in the Performance Test Record and record the phase reading at each step. The Performance Test Record is located at the end of the Performance Test section.

5. Connecting the probe tees directly to the power splitter outputs minimizes differences due to electrical path lengths. These differences can lead to significant phase measurement errors. For any frequency point that may be out of limits, this source of error should be balanced out by using manual range selection in conjunction with the following notes.

- a) Repeat the measurement as previously detailed and make a note of the phase lag or lead.
- b) Interchange the two probes, without disturbing the rest of the test setup.
- c) Make a note of this new value of phase lag or lead.
- d) These two measurements should be summed and the result divided by two. This result is the phase error due to the HP 85081A and should be deducted from the phase readings obtained.
- e) Repeat this process for any frequency noted as being out of specification.

Note: At frequencies above 500MHz, rotating the probes in the Tees, or introducing sharp bends in the probe cables, may produce variations in the order of 1 degree.



4-10 PHASE OFFSET ACCURACY

SPECIFICATIONS:

The linearity of phase offset from 0 degrees is ± 0.4 degrees.

DESCRIPTION:

In this test, the channels are set up for a nominal level of 100mV, at a frequency of 1.0MHz. The phase between the two channels is then varied.

EQUIPMENT:

Instrument	Critical Specification	Recommended Model
Signal Source	Dual Channel Synthesizer Frequency Range dc-13 MHz Amplitude 100mV Phase Offset Accuracy ± 0.3 Deg	HP 3326A
50 Ohm Probe Tee (2)		HP 11536A
50 Ohm Termination (2)		HP 909C
Adaptor N(f) to BNC (m) (2)		HP 1250-0077

PROCEDURE:

1. Configure the equipment as shown in Figure 4-4, with the probe tees connected directly to the source output via the adaptors.

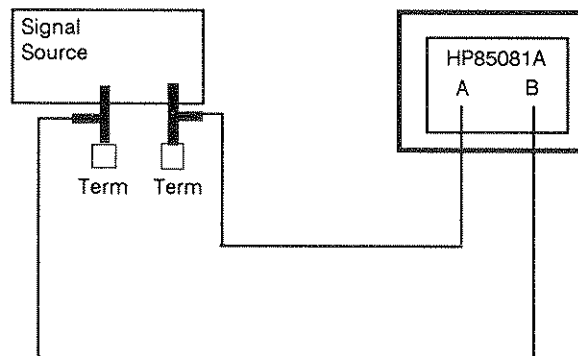


Figure 4-4. Phase Offset Accuracy Setup

Performance Tests

2. Signal Source Setup:

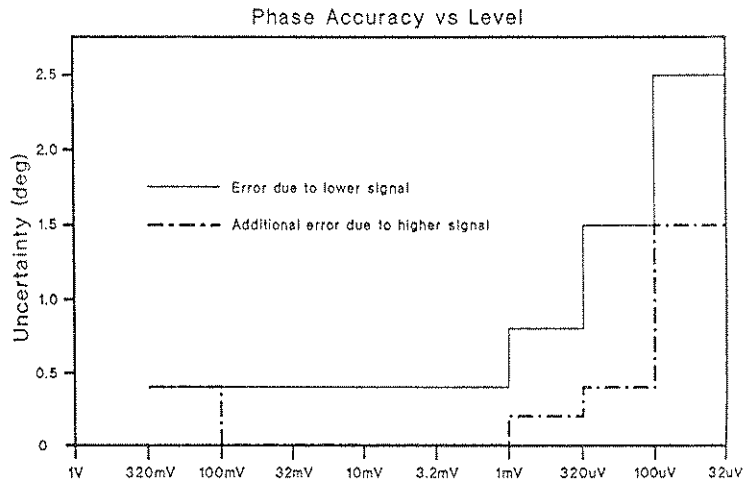
Frequency: 1 MHz on both channels.
 Amplitude: 100mV rms on both Channels.
 Phase Offset: Zero.

3. HP 8508A setup	HP 70138A setup	Function
[PRESET]	[I-P]	Instrument preset.
[B-A PHASE]	[Mag/Ph Measure] [DISPLAY 2] [B-A PHASE]	Amplitude in DISPLAY 1 Phase in DISPLAY 2.
[LOCK RANGE] [SHIFT] [VIEW RANGE] "up"/"down" arrow keys to select 1-3MHz	[Lock Range] [1.0 - 3.0MHz]	Set frequency range.
[LOCK RANGE]	[Lock Range] [AUTO LOCK]	Unlock frequency range.
[SHIFT] [CAL/TEST]	[Misc] [CAL]	Self calibration.
[SHIFT] [SAVE REF]	[Ref] [SAVE REF]	Normalize system.

4. With the frequency and level unchanged, vary the signal source phase offset between the channels as defined in the Performance Test Record and note the instrument reading at each step. The Performance Test Record is located at the end of the Performance Test section.

4-11 PHASE ACCURACY vs LEVEL

SPECIFICATIONS:



DESCRIPTION:

This test is a measure of the instrument's ability to measure phase as the signal level is varied. This is a function of the IF performance. This test can be repeated for other frequencies as required.

EQUIPMENT:

Instrument	Critical Specification	Recommended Model
Signal Source	Frequency Range 0.3 - 13MHz Amplitude 19dBm	HP 8642B
Power Divider	DC - 4 GHz Ins Loss 6 dB O/P Tracking ≤ 0.4 dB Phase Tracking 2 deg or better	HP 11636A
Attenuator (2)	0-110 dB in 10 dB steps.	HP 8496A/G Opt 890*
Attenuator Driver	Required for HP 8496G	HP 11713A**
50 Ohm Probe Tee (2)		HP 11536A
50 Ohm Termination		HP 909C
N(m) - N(m) Cable		HP 11500A

*Calibration required at 30MHz.

NOTE: The construction of the HP 8496 attenuator series is such that the change in electrical length (phase response) as attenuator sections are switched in and out is substantially less than the HP 85081A specifications. This may not be the case if different attenuators are substituted.

** Required if HP 8496G programmable attenuator is used.

PROCEDURE:

1. Configure the Test Equipment as shown in Figure 4-5 with the power splitter and probe tees connected directly to the attenuator.

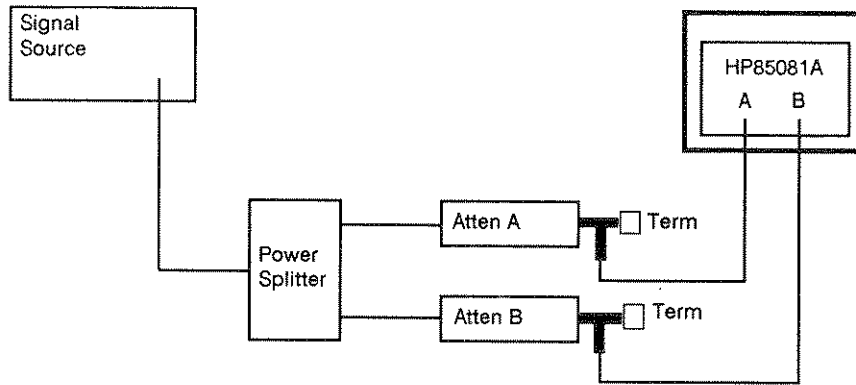


Figure 4-5. Phase Accuracy vs Level Test Setup

2. Set both attenuators to 20 dB.

3. Signal Source setup:

Frequency: 1 MHz
 Amplitude: +19dBm

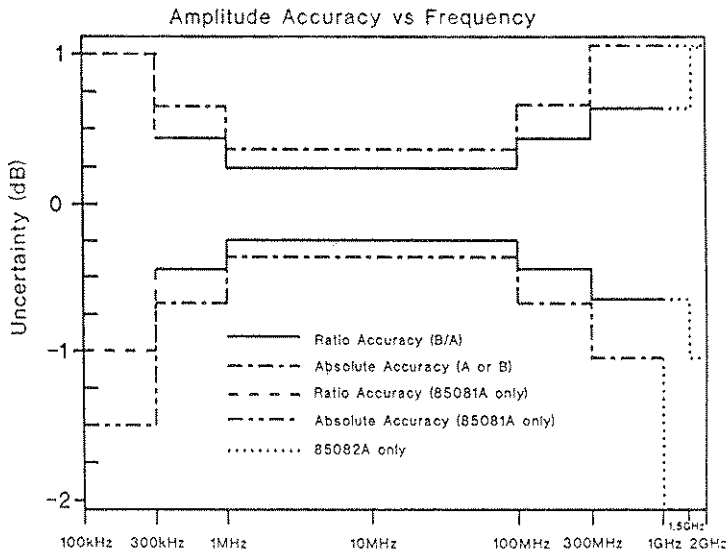
HP 8508A setup	HP 70138A setup	Function
[PRESET]	[I-P]	Instrument preset.
[B-A PHASE]	[Mag/Ph Measure] [DISPLAY 2] [B-A PHASE]	Amplitude in DISPLAY 1 Phase in DISPLAY 2.
[LOCK RANGE] [SHIFT] [VIEW RANGE] "up"/"down" arrow keys to select 1-3MHz	[Lock Range] [1.0 - 3.0 MHz]	Select frequency range.
[LOCK RANGE]	[Lock Range] [AUTO LOCK]	Unlock frequency range.
[SHIFT] [CAL/TEST]	[Misc] [CAL]	Self calibration.
[SHIFT] [SAVE REF]	[Ref] [SAVE REF]	Normalize system.

5. Note the Phase reading in Display 2 and record this in the Performance Test Table which is located at the end of the Performance Tests section.

6. Repeat this process for the attenuator settings defined in the Performance Test Record and note the phase reading at each step.

4-12 AMPLITUDE ACCURACY vs FREQUENCY

SPECIFICATION:



DESCRIPTION:

The voltage amplitude accuracy is measured with the channel input level set to $-7.0\text{dBm} \pm 0.1\text{dBm}$ at each frequency point being checked.

The signal level is checked with the power meter and care must be taken to ensure that the power meter calibration factor is corrected for the frequency being used.

To allow measurement of Channel B, a power splitter is used to divide the signal and provide a lock reference to Channel A.

EQUIPMENT:

Instrument	Critical Specification	Recommended Model
Signal Source	Frequency Range 0.1 - 1000 MHz Amplitude 100mV	HP 8642B
Power Divider		HP 11636A
50 ohm Tee (2)		HP 11536A
50 Ohm Termination (2)		HP 909C
N(m)-N(m) Cable		HP 11500A
RF Power Meter	Accuracy $\pm 0.02\text{dB}$ Power Ref 50MHz 1.00mW NBS Traceable.	HP 436A/HP 438A
Power Sensor		HP 8482A

PROCEDURE:

1. Configure the equipment as shown in Figure 4-6 step (a), with the power meter connected to port 2 of the power splitter and Channel B of the HP 85081A connected to port 3 of the power splitter.

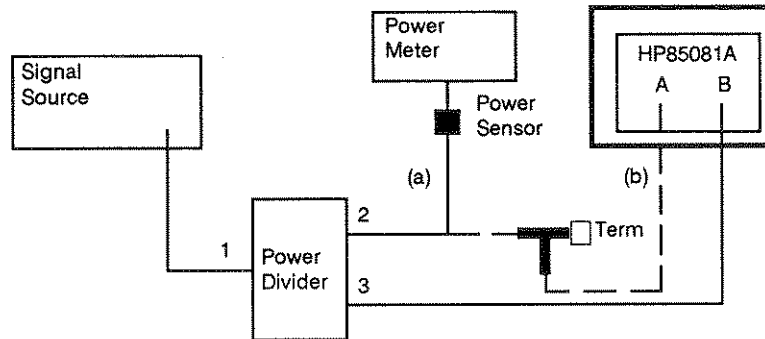


Figure 4-6. Voltage Accuracy Equipment Setup

2. Signal Source setup:

Frequency: 1 MHz.
 Amplitude: -1 dBm. To produce a power meter reading of -7.0 dBm, ± 0.1 dB.

3. Record the power meter reading in the Performance Tests Results table at the rear of this section.
4. Reconfigure the equipment as shown in Figure 4-6 step (b), with Channel A of the HP 85081A connected to port 2 of the power splitter.

HP 8508A setup	HP 70138A setup	Function
[PRESET]	[I-P]	Instrument preset.
[B]	[Mag/Ph Measure] [DISPLAY 2] [B]	'A' voltage in DISPLAY 1 'B' voltage in DISPLAY 2.
[POWER MEAS] [DISPLAY] dB	[Format Functn] [dB]	dBm display.
[LOCK RANGE] [SHIFT] [VIEW RANGE] "up"/"down" arrow keys to select 1-3MHz	[Lock Range] [1.0 - 3.0 MHz]	Select frequency range.
[LOCK RANGE]	[Lock Range] [AUTO LOCK]	Unlock frequency range.
[SHIFT] [CAL/TEST]	[Misc] [CAL]	Self calibration.

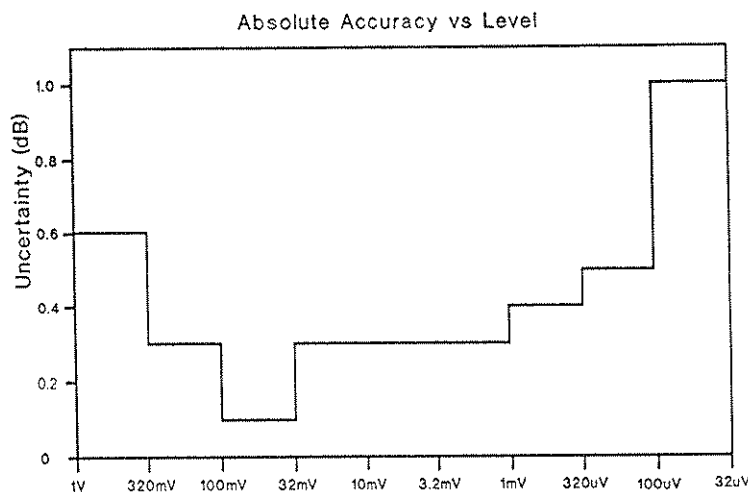
Performance Tests

6. Record the DISPLAY 1 reading in the Performance Tests Results table.
7. Interchange the probe connections and record the value of the DISPLAY 2 reading in the Performance Tests Results table.
8. Repeat the entire test for each frequency point required.

NOTE: Ensure that you set the power meter calibration factors to the value appropriate to the frequency being used.

4-13 AMPLITUDE ACCURACY vs INPUT LEVEL (and rear panel output check)

SPECIFICATIONS:



DESCRIPTION:

The amplitude accuracy is tested by applying known signal levels and comparing these with the results displayed by the Vector Voltmeter.

Rear panel output signals are checked for a nominal sensitivity of 1mV per display count.

EQUIPMENT:

Instrument	Critical Specification	Recommended Model
Signal Source	Dual Channel (+13dBm per channel)	HP 3326A
50 Ohm Tee (2)		HP 11536A
50 Ohm Termination		HP 909C
Attenuator (2)	0 to 110dB in 10dB steps	HP 8496A/G Opt890*
Attenuator Driver	Required for HP 8496G	HP 11713A**
BNC(m)-BNC(m) Cable		HP 11500A
Adaptor N(m)-BNC(m)		HP 1250-0082
Power Meter	Accuracy ±0.02dB	HP 436A/HP 438A
	Ref Output 50MHz, 0.0dBm	
	Traceable to NBS	

* Calibration data required.

** Required if HP 8496G programmable attenuator is used.

PROCEDURE:

1. Configure the equipment as shown in Figure 4-7.

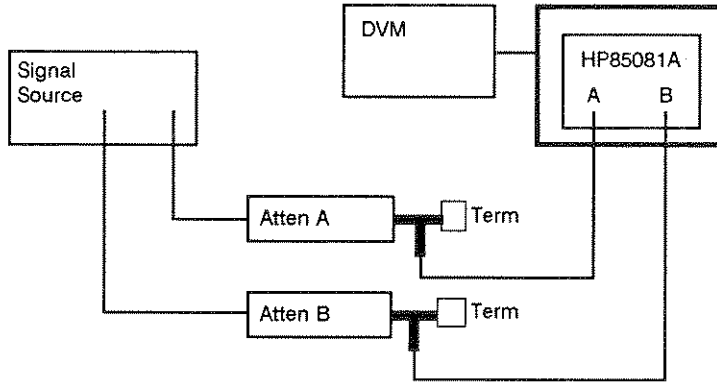


Figure 4-7. Amplitude Accuracy vs Input Level (and rear panel output check) Test Setup

2. Set both attenuators to 20dB.

3. Set both channels of the signal source as follows:

Frequency:	1MHz
Amplitude:	+13dBm

4. Measure the signal source output level with the power meter to verify an output level of +13dBm ±0.1dBm on each channel. Adjust the source output level as necessary to achieve this result.

5. HP 8508A setup	HP 70138A setup	Function
[PRESET]	[I-P]	Instrument preset.
[B] [POWER MEAS] [DISPLAY] dB	[Mag/Ph Measure] [Format Functn] [dB]	Set up for dBm in both displays.
[SHIFT] [CAL/TEST]	[Misc] [CAL]	Self calibration.
[SHIFT] [SAVE REF]	[Ref] [SAVE REF]	Normalize system.

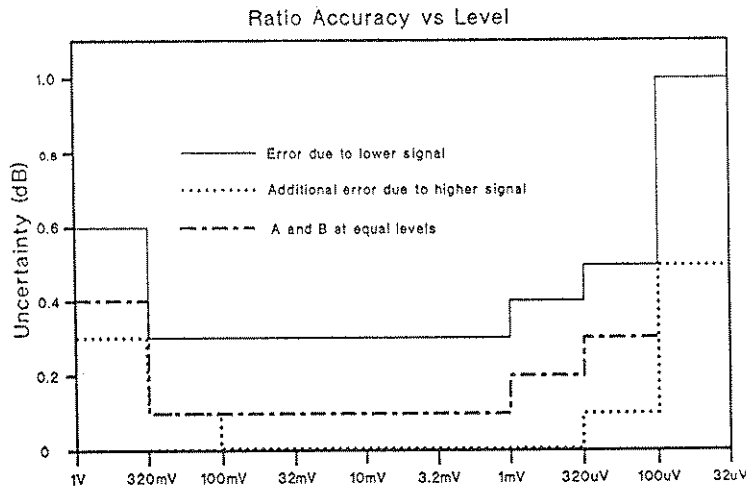
6. Vary the attenuator settings as shown in the Performance Test Table and note the channel readings at each step. Check that these are within the permitted tolerance.

Note the value of the appropriate rear panel output. This has a nominal sensitivity of 1mV per display count.

7. Repeat step 6 for Channel B.

4-14 VOLTAGE RATIO ACCURACY vs LEVEL

SPECIFICATION:



DESCRIPTION:

The voltage ratio accuracy is tested by applying known signal levels and comparing these with the results displayed by the Vector Voltmeter.

EQUIPMENT:

Instrument	Critical Specification	Recommended Model
Signal Source	Dual Channel +13dBm per channel	HP 3326A
50 Ohm Tee (2)		HP 11536A
50 Ohm Termination		HP 909C
Attenuator (2)	0 to 110 dB in 10 dB steps.	HP 8496A/G Opt 890*
Attenuator Driver		HP 11713A**
BNC(m)-BNC(m) Cable		HP 11500A
Adapter N(m)-BNC(m)		HP 1250-0082
Power Meter	Accuracy ±0.02dB	HP 436A/HP438A
	Ref Output 50 MHz 0.0 dBm	
	Traceable to NBS	

* Calibration data required.

** Required if HP 8496G programmable attenuator is used.

PROCEDURE:

1. Configure the Test equipment as shown in Figure 4-8.

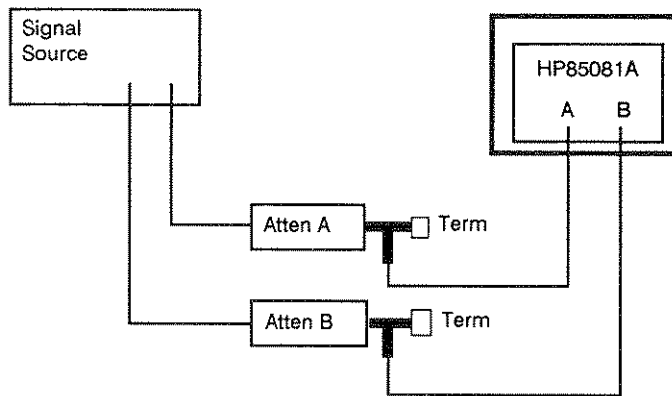


Figure 4-8. Voltage Ratio Accuracy Test Setup

2. Set both attenuators to 20dB.

3. Set both channels of the signal source as follows:

Frequency: 1MHz.
Amplitude: +13dBm.

4. Measure the signal source output level with the power meter, to verify an output level of +13dBm ±0.1dB. Adjust the source level as necessary, to achieve this.

5. HP 8508A setup	HP 70138A setup	Function
[PRESET]	[I-P]	Instrument preset.
[B-A MAG] [DISPLAY] dB	[Mag/Ph Measure] [B/A MAG] [Format Functn] [dB]	B/A ratio measurement, in dB, in DISPLAY 1.
[SHIFT] [CAL/TEST]	[Misc] [CAL]	Self calibration.

6. Enter the corrected attenuator figures in the Performance Test Table (which is located at the end of the Performance Tests section).

7. Vary the attenuator settings as shown in the Performance Test Table and note the channel readings at each step.

8. Calculate the actual errors and check for compliance with the instrument specification.

Table 4-2. Performance Test Record (1 of 8)

Paragraph 4-7

ISOLATION BETWEEN CHANNELS (INPUT CROSSTALK)			
Frequency Range (MHz)	Frequency (MHz)	Isolation (dB in A)	Specification
1.0-3.0	1.0	_____	> -100 dB
3.0-5.0	4.0	_____	> -100 dB
5.0-8.0	6.5	_____	> -100 dB
8.0-15.0	11.5	_____	> -100 dB
15.0-25.0	20.0	_____	> -100 dB
25.0-50.0	35.0	_____	> -100 dB
50.0-80.0	50.0	_____	> -100 dB
50.0-80.0	65.0	_____	> -100 dB
80.0-150.0	115.0	_____	> -100 dB
150.0-250.0	200.0	_____	> -100 dB
250.0-500.0	400.0	_____	> -100 dB
500.0-1000.0	750.0	_____	> -80 dB
500.0-1000.0	1000.0	_____	> -80 dB

Table 4-3. Performance Test Record (2 of 8)

Paragraph 4-8

REFERENCE CHANNEL LOCK LEVEL AND CHANNEL B NOISE FLOOR					
Frequency Range (MHz)	Frequency (MHz)	Channel A Input Level (mV)	Lock OK?	Noise Floor	
				Measured	Maximum
0.1-0.2	0.1	10.0	—	—	N/A
0.1-0.2	0.15	10.0	—	—	N/A
0.2-0.6	0.4	1.0	—	—	N/A
0.6-1.0	0.8	1.0	—	—	N/A
1.0-3.0	1.0	1.0	—	—	10uV rms
3.0-5.0	4.0	0.3	—	—	10uV rms
5.0-8.0	6.5	0.3	—	—	10uV rms
8.0-15.0	11.5	0.3	—	—	10uV rms
15.0-25.0	20.0	0.3	—	—	10uV rms
25.0-50.0	35.0	0.3	—	—	10uV rms
50.0-80.0	50.0	0.3	—	—	10uV rms
50.0-80.0	65.0	0.3	—	—	10uV rms
80.0-150.0	115.0	0.3	—	—	10uV rms
150.0-250.0	200.0	0.3	—	—	10uV rms
250.0-500.0	400.0	0.3	—	—	10uV rms
500.0-1000.0	750.0	0.3	—	—	10uV rms
500.0-1000.0	1000.0	0.3	—	—	10uV rms

Table 4-4. Performance Test Record (3 of 8)

Paragraph 4-9

PHASE ACCURACY vs FREQUENCY at Reference Level			
Frequency Range (MHz)	Frequency (MHz)	Phase Reading (DISPLAY 2)	Tolerance
0.2-0.6	0.3	_____	± 4.2 Deg
0.6-1.0	0.8	_____	± 4.2 Deg
1.0-3.0	1.0	_____	± 1.2 Deg
3.0-5.0	4.0	_____	± 1.2 Deg
5.0-8.0	6.5	_____	± 1.2 Deg
8.0-15.0	11.5	_____	± 1.2 Deg
15.0-25.0	20.0	_____	± 1.2 Deg
25.0-50.0	35.0	_____	± 1.2 Deg
50.0-80.0	50.0	_____	± 1.2 Deg
50.0-80.0	65.0	_____	± 1.2 Deg
80.0-150.0	115.0	_____	± 4.2 Deg
150.0-250.0	200.0	_____	± 4.2 Deg
250.0-500.0	400.0	_____	± 6.2 Deg
500.0-1000.0	750.0	_____	± 6.2 Deg
500.0-1000.0	1000.0	_____	± 6.2 Deg

Table 4-5. Performance Test Record (4 of 8)

Paragraph 4-10

PHASE OFFSET ACCURACY			
Signal Source Phase Offset (Deg)	Vector Voltmeter Phase Reading (DISPLAY 2)	Display Error	Tolerance (Degrees)
+ 180	_____	_____	±0.4
+ 150	_____	_____	±0.4
+ 120	_____	_____	±0.4
+ 90	_____	_____	±0.4
+ 30	_____	_____	±0.4
000	_____	_____	±0.00
- 30	_____	_____	±0.4
- 90	_____	_____	±0.4
- 120	_____	_____	±0.4
- 150	_____	_____	±0.4
- 180	_____	_____	±0.4

Table 4-6. Performance Test Record (5 of 8)

Paragraph 4-11

PHASE ACCURACY vs SIGNAL LEVEL					
Attenuator A Setting	Attenuator B Setting	Channel A Input Level	Channel B Input Level	Phase Reading	Tolerance (Degrees)
20 dB	20 dB	100mV	100mV	_____	0
20 dB	0 dB	100mV	1000mV	_____	±1.3
20 dB	10 dB	100mV	320mV	_____	±0.8
20 dB	30 dB	100mV	32mV	_____	±0.3
20 dB	40 dB	100mV	10mV	_____	±0.3
20 dB	50 dB	100mV	3.2mV	_____	±0.3
20 dB	60 dB	100mV	1.0mV	_____	±0.8
20 dB	70 dB	100mV	320uV	_____	±1.1
0 dB	20 dB	1000mV	100mV	_____	±1.3
10dB	20dB	320mV	100mV	_____	±0.8
30dB	20dB	32mV	100mV	_____	±0.8
40dB	20dB	10mV	100mV	_____	±0.8
50dB	20dB	3.2mV	100mV	_____	±0.8
60dB	20dB	1.0mV	100mV	_____	±0.8
70dB	20dB	320uV	100mV	_____	±1.1

Table 4-7. Performance Test Record (6 of 8)

Paragraph 4-12

AMPLITUDE ACCURACY vs FREQUENCY						
Frequency (MHz)	Power Meter Reading (M) (dBm)	Display Reading		Errors		Limits
		1	2	Channel A (M-1)	Channel B (M-2)	
0.300	_____	_____	_____	_____	_____	± 0.65
1.000	_____	_____	_____	_____	_____	± 0.35
10.000	_____	_____	_____	_____	_____	± 0.35
50.000	_____	_____	_____	_____	_____	± 0.35
100.000	_____	_____	_____	_____	_____	± 0.35
300.000	_____	_____	_____	_____	_____	± 0.65
700.000	_____	_____	_____	_____	_____	± 1.0
1000.000	_____	_____	_____	_____	_____	± 1.0

Table 4-8. Performance Test Record (7 of 8)

Paragraph 4-13

AMPLITUDE ACCURACY - CHANNEL A (Source Output +13dBm, ±0.1dBm)						
Attenuator A Setting	Attenuator 'A' Cal Data (A)*	Channel A Input Level (L) = (13-A)	Display 1 Reading (D)	Measurement Error (E) = (L-D)	Limits	Rear Panel Output 1
20dB	_____	_____	_____	_____	±0.3	_____
10dB	_____	_____	_____	_____	±0.6	_____
0dB	_____	_____	_____	_____	±0.6	_____
30dB	_____	_____	_____	_____	±0.3	_____
40dB	_____	_____	_____	_____	±0.3	_____
50dB	_____	_____	_____	_____	±0.3	_____
60dB	_____	_____	_____	_____	±0.4	_____
70dB	_____	_____	_____	_____	±0.6	_____

* Data from Calibration Certificate.

AMPLITUDE ACCURACY - CHANNEL B (Source Output +13dBm, ±0.1dBm)						
Attenuator B Setting	Attenuator 'B' Cal Data (B)*	Channel B Input Level (L) = (13-B)	Display 2 Reading (D)	Measurement Error (E) = (L-D)	Limits	Rear Panel Output 2
20dB	_____	_____	_____	_____	±0.3	_____
10dB	_____	_____	_____	_____	±0.6	_____
0dB	_____	_____	_____	_____	±0.6	_____
30dB	_____	_____	_____	_____	±0.3	_____
40dB	_____	_____	_____	_____	±0.3	_____
50dB	_____	_____	_____	_____	±0.3	_____
60dB	_____	_____	_____	_____	±0.4	_____
70dB	_____	_____	_____	_____	±0.6	_____

* Data from Calibration Certificate.

Table 4-9. Performance Test Record (8 of 8)

Paragraph 4-14

VOLTAGE RATIO ACCURACY vs LEVEL (for Level A = Level B up to 300MHz)								
Nominal I/P Level	Atten A Setting (dB)	Atten B Setting (dB)	Atten A Actual * A	Atten B Actual * B	(B-A) Actual (R)	Display Reading (D)	Error (D-R)	Spec (dB)
100mV	20	20	_____	_____	_____	_____	_____	±0.1
320mV	10	10	_____	_____	_____	_____	_____	±0.4
1000mV	0	0	_____	_____	_____	_____	_____	±0.4
32mV	30	30	_____	_____	_____	_____	_____	±0.1
10mV	40	40	_____	_____	_____	_____	_____	±0.1
3.2mV	50	50	_____	_____	_____	_____	_____	±0.1
1.0mV	60	60	_____	_____	_____	_____	_____	±0.2
320uV	70	70	_____	_____	_____	_____	_____	±0.3

* Data from Calibration Certificate.

B/A RATIO ACCURACY vs LEVEL (where A and B vary)								
Nominal I/P Level A B	Atten A Setting (dB)	Atten B Setting (dB)	Atten A Actual * A	Atten B Actual * B	(B-A) Actual (R)	Display Reading (D)	Error (D-R)	Spec (dB)
100mV 100mV	100mV	20	20	_____	_____	_____	_____	±0.3
100mV 32mV	32mV	20	30	_____	_____	_____	_____	±0.4
100mV 10mV	10mV	20	40	_____	_____	_____	_____	±0.4
100mV 3.2mV	3.2mV	20	50	_____	_____	_____	_____	±0.4
100mV 1.0mV	1.0mV	20	60	_____	_____	_____	_____	±0.4
100mV 320uV	320uV	20	70	_____	_____	_____	_____	±0.4
100mV 100uV	100uV	20	80	_____	_____	_____	_____	±0.4
100mV 32uV	32uV	20	90	_____	_____	_____	_____	±0.4
100mV 320mV	320mV	20	10	_____	_____	_____	_____	±1.0
100mV 1000mV	1000mV	20	0	_____	_____	_____	_____	±1.0

* Data from Calibration Certificate.

Adjustments

Section 5

5-1 INTRODUCTION

This section describes the adjustment procedures required to enable the HP 8508A Vector Voltmeter mainframe or the HP 70138A MMS Vector Voltmeter module with the HP 85081A High Impedance Input Module to meet the specifications listed in Table 1-2 of this manual. Adjustments should only be made after determining that the instrument is out of calibration or if a repair has been carried out.

5-2 WARM-UP TIME

The HP 8508A or HP 70138A Vector Voltmeter with HP 85081A must be switched on for a minimum of 30 minutes before carrying out any adjustments. This allows the instrument to reach a stable operating temperature.

5-3 SAFETY CONSIDERATIONS

WARNING

PROCEDURES DESCRIBED IN THIS SECTION ARE PERFORMED WITH THE MAINFRAME PROTECTIVE COVERS REMOVED AND POWER SUPPLIED TO THE INSTRUMENT. SERVICING SHOULD ONLY BE PERFORMED BY TRAINED PERSONNEL WHO ARE AWARE OF THE HAZARDS INVOLVED.

Anti-Static Precautions

The printed circuit board contained in this instrument has components and devices which are susceptible to damage by electrostatic discharge (ESD). To minimize the risks of damaging or decreasing the reliability of the instrument, the following procedures and cautions should be observed when servicing the instrument.

Static-free Workstation

All servicing should be carried out at a static-free workstation whenever practical.

De-soldering

When de-soldering components, ensure that the soldering iron is grounded. Always use a metalized solder remover.

Adjustments

Anti-Static Freezer Spray

When attempting to locate a temperature related fault, use only an approved anti-static freezer spray.

Anti-Static Products

Table 5-1 contains details of anti-static products which are available from Hewlett-Packard.

Table 5-1. Anti-Static Products

Product	HP Part Number
Anti-static workstation kit	9300-0792
Metalized Solder Remover	8690-0227
Wrist-strap and cord	9300-0970

5-4 EQUIPMENT REQUIRED

All adjustment procedures contain a list of required test equipment. The test equipment is also identified by callouts in the test setup diagrams, where included. If substitutions must be made for the specified test equipment, refer to the Recommended Test Equipment table in the HP 8508A Vector Voltmeter mainframe manual or the HP 70138A MMS Vector Voltmeter module manual for the minimum specifications. It is important that the test equipment meet the critical specifications listed in the table if the Vector Voltmeter and the HP 85081A Input Module are to meet their performance requirements.

Note: Use a non-metallic tool whenever possible (HP Part Number 8830-0024).

When performing the adjustments to an HP 85081A which is contained in an HP 70138A MMS Vector Voltmeter, a module extender (HP Part Number 08508-60032) is required.

5-5 POST REPAIR ADJUSTMENTS

In the event of a module repair, it will be necessary to carry out all the adjustments as listed in Table 5-2.

5-6 RELATED ADJUSTMENTS

Several of the HP 85081A adjustments are interdependent and isolated adjustments should not be attempted. Because of their interactive nature, the adjustments for SRD Bias, Channel Bias, and Delay should be checked at least twice.

5-7 ADJUSTABLE COMPONENTS

Table 5-2 lists all adjustable components in the HP 85081A High Impedance Input Module.

Table 5-2. Adjustable Components

Reference Designator	Adjustment Name	Adjustment Paragraph
A6R32	SRD Bias	5-9
A6R15/R115	Channel A and B Bias	5-9
A6DD 01	Delay Line	5-9
A6R10/R110	Channel A and B Symmetry	5-10
A6R3/R103	Channel A and B Gain	5-11
A6R38	LF Phase	5-12

5-8 ACCESS TO THE ADJUSTMENTS

Before starting the adjustment procedures, it will be necessary to remove the instrument covers, or install an extender so that the adjustments can be readily accessed.

HP 8508A Vector Voltmeter

Remove the instrument top cover. The HP 85081A adjustments can now be accessed.

HP 70138A MMS Vector Voltmeter

Install an MMS Module Extender (HP part number 70001-60013) in the HP 70001A Mainframe and install the HP 70138A in the extender. There are two ways to access to the HP 85081A adjustments.

1. Install the HP 85081A into the HP 70138A MMS Vector Voltmeter. Access to the HP 85081A adjustments is through the holes provided in the A5 Processor and A6 Power Supply Assemblies on the right-hand side of the HP 70138A.

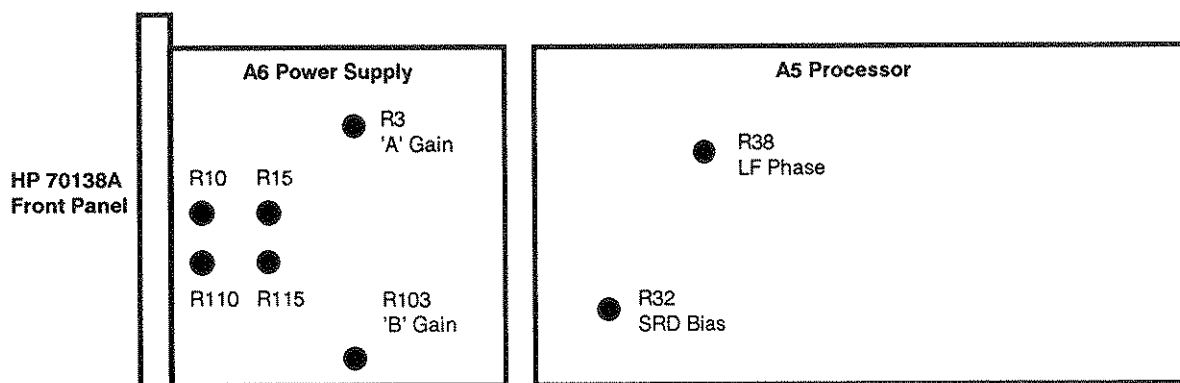


Figure 5-1. Input Module Adjustment Access Points in the HP 70138A

2. Install an Input Module Extender (HP part number 08508-60032) in the HP 70138A. Connect the HP 85081A to the extender. The HP 85081A adjustments are directly accessible.

5- 9 Set up the SRD Bias, Channel A and B Bias, and the Delay Line Adjustments

DESCRIPTION

The bias level of the SRD is adjusted for a maximum reading in the UHF amplitude response. The Channel Bias is set for optimum flatness of the high frequency amplitude, and the Delay Line is adjusted to compensate for the differences in electrical length within the HP 85081A.

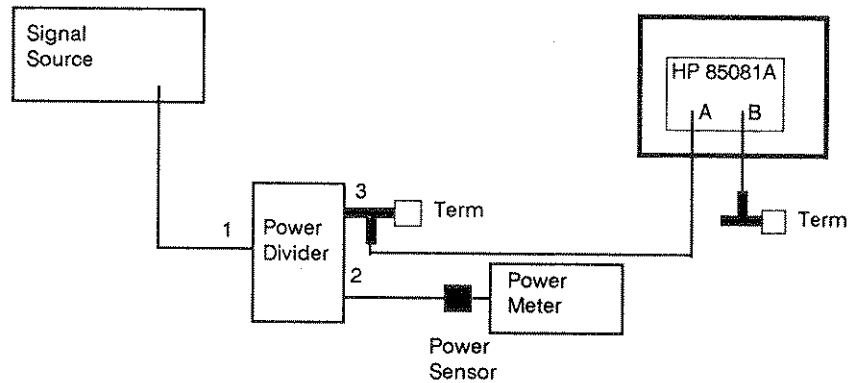


Figure 5-2. SRD Bias Adjust Setup

EQUIPMENT

Instrument	Recommended Model
Signal Source	HP 8642B
Power Divider	HP 11636A
Power Meter	HP 436A/HP 438A
Power Sensor	HP 8482A
Phase Matched Cables	HP 11851B
50ohm Termination	HP 909C

PROCEDURE

This procedure is in three interdependent parts. Perform all three parts in sequence at least twice to ensure correct adjustment.

A. SRD Bias Adjustment

1. Configure the equipment as shown in Figure 5-2.
2. Switch on the equipment and allow to warm up for 30 minutes.
3. On the signal generator:

Frequency	1.0GHz
Level	-1.0dBm. Adjust for a power meter reading of $-7.0\text{dBm} \pm 0.1\text{dBm}$.

4.

HP 8508A Setup [PRESET]	HP 70138A Setup [I-P]	Function: DISPLAY 1 reads Channel A.
----------------------------	--------------------------	---
5. Adjust A6R32 to obtain a maximum reading on DISPLAY 1.
NOTE: Adjustment of A6R32 changes the calibration settings for the entire HP 85081A.

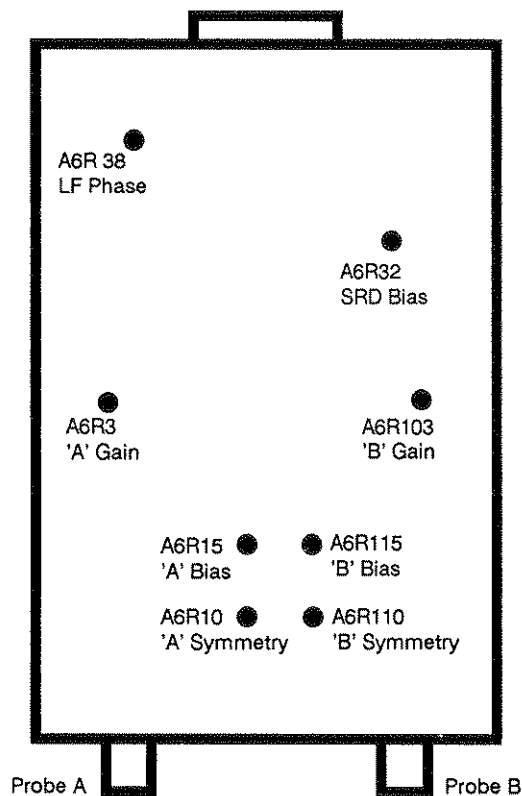


Figure 5-3. Input Module Adjustment Locations

B. Channels A and B Bias Adjustment (Amplitude vs Frequency)

DESCRIPTION

The bias level is adjusted for optimum flatness of the high frequency amplitude.

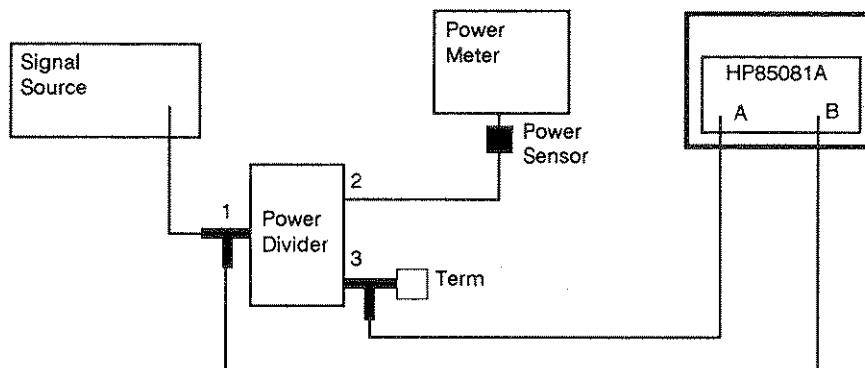


Figure 5-4. Bias Adjustment Setup

EQUIPMENT

Instrument	Recommended Model
Signal Source	HP 8642B
Power Divider	HP 11636A
50 ohm Tee (2)	HP 11536A
50 ohm Termination (2)	HP 909C

PROCEDURE

1. Configure the equipment as shown in Figure 5-4.

HP 8508A setup	HP 70138A setup	Function
[PRESET]	[I-P]	Preset status.
[B]	[Mag/Ph Measure] [DISPLAY 2] [B]	Direct measurement in both displays.
[SHIFT] [CAL/TEST]	[Misc] [CAL]	Instrument Calibration.

3. On the signal generator:

Set up the signal generator output level for a reading of $-7.0\text{dBm} \pm 0.1\text{dBm}$ on the power meter. Adjust the signal generator output frequency in 5MHz steps between 900MHz and 1000MHz. Note the frequency at which a peak reading is obtained on DISPLAY 1 of the Vector Voltmeter. (This frequency reading will typically be in the range 940 to 950MHz.)

Record this frequency reading, as the value will be required when making the Delay adjustment.

4. Maintaining this frequency, adjust R15 for a reading of 106mV in DISPLAY 1.
5. Interchange the two probes so that the Channel B probe is now on test port 3 of the power divider, and Channel A is connected to the signal generator.
6. Repeat the procedure in step 3, and note the frequency at which a peak reading is obtained in DISPLAY 2.
7. Maintaining this frequency, adjust R115 for a reading of 106mV in DISPLAY 2.

Adjustments

C. DELAY LINE Adjustment (Phase vs Frequency)

DESCRIPTION

This adjustment compensates for the differences in electrical length of the probes and cables.

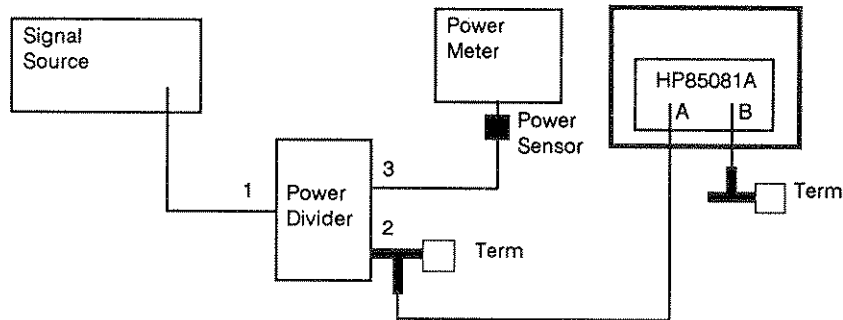


Figure 5-5. Delay Line Adjust Setup

EQUIPMENT

Instrument	Recommended Model
Signal Source	HP 8642B
Power Divider	HP 11636A
50 ohm Tee (2)	HP 11536A
50 ohm Termination (2)	HP 909C

PROCEDURE

1. Configure the equipment as shown in Figure 5-5.
2. On the signal generator:

Frequency	50 MHz
Output level	-1.0dBm
3. Adjust the signal generator output level to produce a power meter reading of $-7.00\text{dBm} \pm 0.1\text{dBm}$.
4. Normalize the power meter reading which should now read "0".
5. Reconfigure the equipment as shown in Figure 5-6.

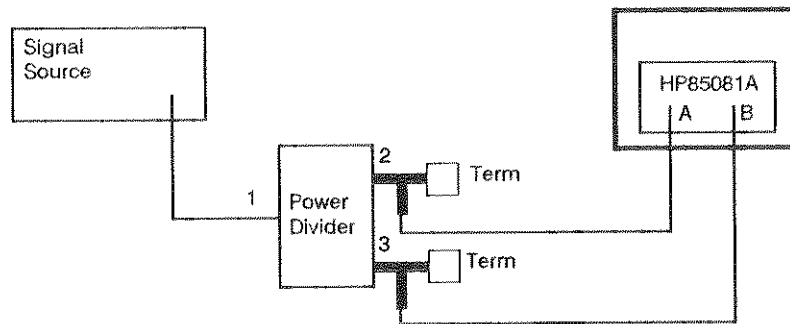


Figure 5-6. Delay Line Adjust Setup

6.	HP 8508A Setup	HP 70138A Setup	Function
	[PRESET]	[I-P]	Preset Status
	[B-A PHASE]	[Mag/Ph Measure] [DISPLAY 2] [B-A PHASE]	DISPLAY 1 - Magnitude DISPLAY 2 - Phase
	[SHIFT] [CAL TEST]	[Misc] [CAL]	Instrument Calibration
	[SHIFT] [SAVE REF]	[Ref] [SAVE REF]	Normalizes Instrument

7. Reconfigure the equipment as shown in Figure 5-5.

8. Readjust the signal generator as follows and change the power meter calibration factor to accommodate the change of frequency.

Frequency	1.0GHz
Signal level	-1.0 dBm (Adjust for a power meter reading of "0".)

9. Disconnect the power meter and reconfigure the equipment as shown in Figure 5-6.

10. Note the phase reading in DISPLAY 2. If this is within the range ± 2.0 deg, it will not be necessary to make any delay adjustment. However, if the reading is greater than ± 2.0 deg, then continue with the procedure.

NOTE: Twists in the probe cables or loose cable connections could affect this reading.

NOTE:

Before proceeding with the delay adjustment procedure, it will be necessary to determine exactly how access will be made to the adjustment. There are several possibilities depending upon the HP 85081A and whether an HP 8508A Vector Voltmeter mainframe or HP 70138A MMS Vector Voltmeter is being used.

HP 85081A: Dependent upon which casting the HP 85081A is fitted with, access to the adjustment will either be from the top or the bottom of the HP 85081A. To determine which access your HP 85081A is fitted with, turn the HP 85081A so that the bottom panel is uppermost, with the front panel towards you. Check to see if there is a 6mm hole about two-thirds the way along the center axis of the module. The delay adjustment screw will be visible through this hole. If this hole is not present, the delay adjustment can only be accessed from the topside of the module.

Adjustments

Access to the delay adjustment

HP 85081A with topside adjustment access: Remove the top cover from the module. Locate the delay adjustment wiper arm and peel off the silicone adhesive that secures the arm in position.

HP 8508A: In this case, the top cover should be removed from the HP 8508A Vector Voltmeter mainframe. With the HP 85081A Input Module installed in the HP 8508A, the delay adjustment can be readily accessed.

HP 70138A: In this case, the HP 85081A Input Module should be used with the module extender (HP Part Number 08508-60032). Access to the delay adjustment is readily available.

HP 85081A with underside adjustment access:

HP 8508A: In this case, the bottom cover should be removed from the HP 8508A Vector Voltmeter mainframe and the instrument turned onto its right side. With the HP 85081A Input Module installed in the HP 8508A, the delay adjustment can be accessed through a hole in the bottom of the HP 8508A.

In some early instruments, this hole may not have been provided. However, information is given in Section 7 of the HP 8508A Service Manual as to how this hole can be added.

The alternative process is to extend the HP 85081A Input Module from the HP 8508A Vector Voltmeter mainframe using a module extender (HP part number 08508-60032). Access to this adjustment is readily available.

HP 70138A: In this case, the HP 85081A Input Module should be used with the module extender (HP part number 08508-60032). Access to the delay adjustment is readily available.

11. Configure the equipment as shown in Figure 5-6 (with the HP 85081A installed for access to the delay adjustment).
12. Repeat steps 2 through 9.
13. Adjust the delay adjuster for a reading of '0' in DISPLAY 2.
14. Interchange the connections at the input of the HP 85081A and note the phase reading obtained in DISPLAY 2.
15. The delay adjuster should now be adjusted for a reading equivalent to half the value obtained in step 14.
16. Cancel the normalization of the power meter.

NOTE: After completing this adjustment, repeat the SRD Bias, Channel Bias, and Delay adjustments at least once more until the results are stable. When the results are stable, you can continue with the other adjustment procedures.

17. When the results are stable, the HP 85081A with topside access to the delay adjustment should have the delay adjust wiper arm secured with silicone adhesive. Replace the HP 85081A Input Module top cover.

NOTE: The HP 85081A with underside access does not have the delay adjust wiper arm secured with silicone adhesive.

5-10 Set up the SYMMETRY Adjustment for Channels A and B

DESCRIPTION

Minimizes the residual signal at the sampler inputs.

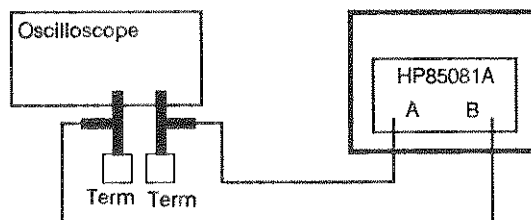


Figure 5-7. Symmetry Adjust Setup

EQUIPMENT

Instrument	Recommended Model
Oscilloscope 275MHz	HP 54100D
50 ohm Termination (2)	HP 909C
50 ohm Tee (2)	HP 11536A
Probe/BNC Adaptor (2)	HP 10218A

PROCEDURE

1. Configure the equipment as shown in Figure 5-7.
2. Switch on the equipment and allow to warm up for 30 minutes.
3. On the oscilloscope:

Display	Alt
Sweep Speed	1us/div
Sensitivity	20uV/div
Input Coupling	AC
Triggering	As required.

4.

HP 8508A Setup:	HP 70138A Setup:	Function:
[PRESET]	[I-P]	Instrument Preset
[LOCK RANGE] [SHIFT] [VIEW RANGE] 'up'/'down' arrow keys to select 1000-2000MHz	[Lock Range] [1-2GHz]	Select 1-2 GHz frequency range

Adjustments

5. Adjust A6R10 (Channel A Symmetry) and A6R110 (Channel B Symmetry) in turn so that the sampler pulses displayed on the oscilloscope traces are symmetrical about the baseline.

The pulse leakage display is typically spikes in the order of 10mV in amplitude and they should be symmetrical about the baseline.

NOTE: If this result cannot be achieved, sampler damage is indicated.

6. Cancel the [LOCK RANGE] or [AUTO LOCK] as appropriate.

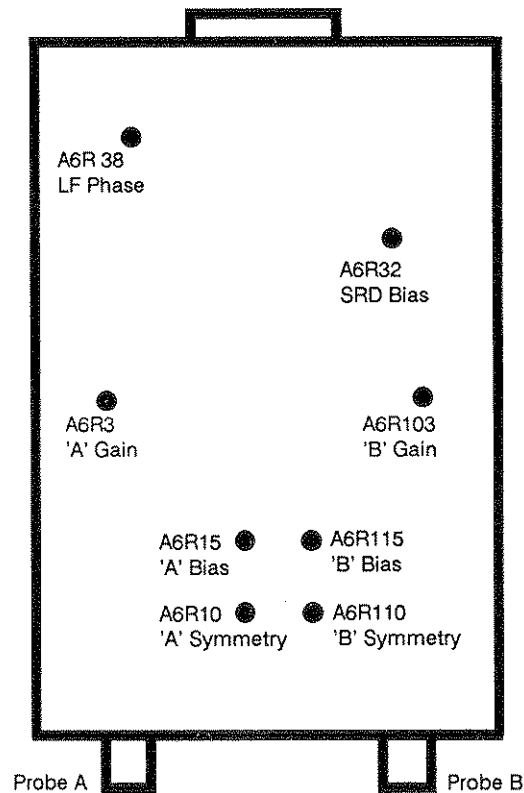


Figure 5-8. Input Module Adjustment Locations

5-11 Adjustment of the Gain of Channels A and B

DESCRIPTION

These adjustments set up the overall absolute gain of the HP 85081A Input Module. Note that this adjustment changes the gain at all frequencies.

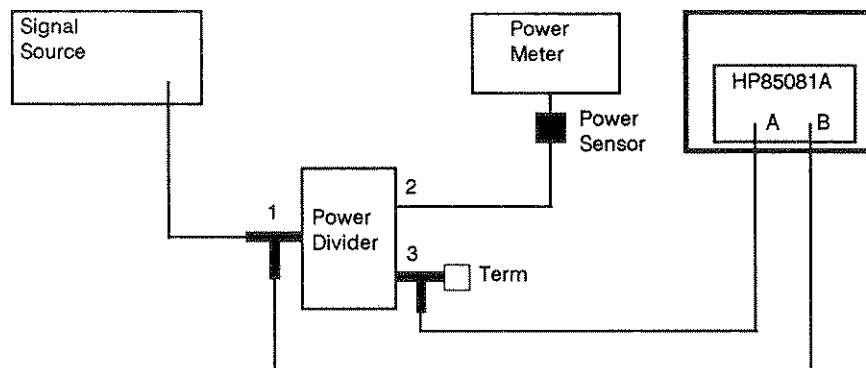


Figure 5-9. Channel Gain Setup

EQUIPMENT

Instrument	Recommended Model
Signal Source	HP 8642B
Power Divider	HP 11636A
Power Meter	HP 436A/HP 438A
Power Sensor	HP 8482A
50 ohm Tee (2)	HP 11536A
50 ohm Termination (2)	HP 909C

PROCEDURE

1. Configure the equipment as shown in Figure 5-9.
2. Switch on the equipment and allow to warm up for 30 minutes.
3. On the signal generator:

Frequency	50 MHz
Level	0.0 dBm

4. Adjust the signal generator output as necessary for a power meter reading of $-7.0\text{dBm} \pm 0.1\text{dBm}$. Record the value of the power meter reading.

Adjustments

HP 8508A Setup	HP 70138A Setup	Function
[PRESET]	[I-P]	Instrument preset
[POWER MEAS] [DISPLAY] dB	[Mag/Ph Measure] [DISPLAY 2] [B] [Format Functn] [dB]	dBm magnitude in both displays
[SHIFT] [CAL/TEST]	[Misc] [CAL]	Instrument calibration

6. Record the value of the reading on the power meter.

7. Interchange the cable connections so that port 2 of the power divider is connected to Channel A of the HP 85081A and port 3 is connected to the power meter. Record the value of the power meter reading.

8. Adjust A6R3 (Channel A Gain) until the reading in DISPLAY 1 is the same as the power meter reading obtained in step 6.

9. Interchange the probes.

10. Adjust A6R103 (Channel B Gain) until the reading in DISPLAY 2 is the same as the power meter reading obtained in step 6.

11. Press [SHIFT] [CAL/TEST] on the HP 8508A, or [Misc] [CAL] on the HP70138A and check that the TEST output LED extinguishes.

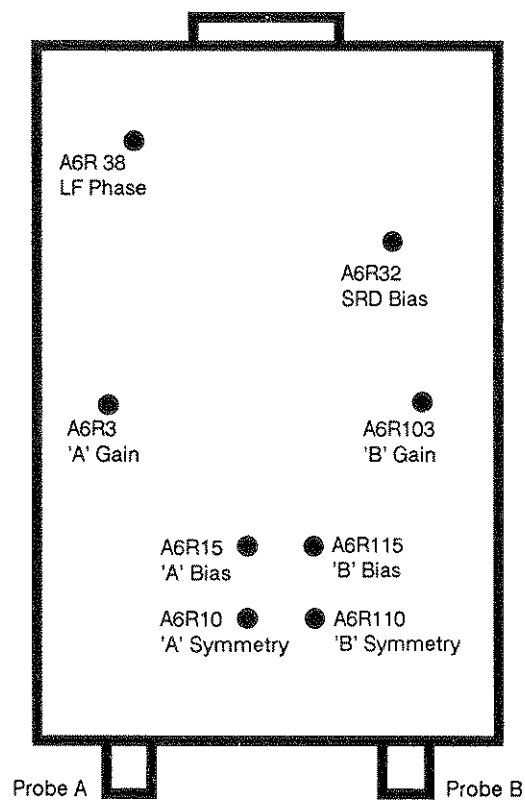


Figure 5-10. Input Module Adjustment Locations

5-12 Set up the Module Phase and Impedance

DESCRIPTION

This adjustment is controlled by an internal test routine which will affect the phase readings at all frequencies.

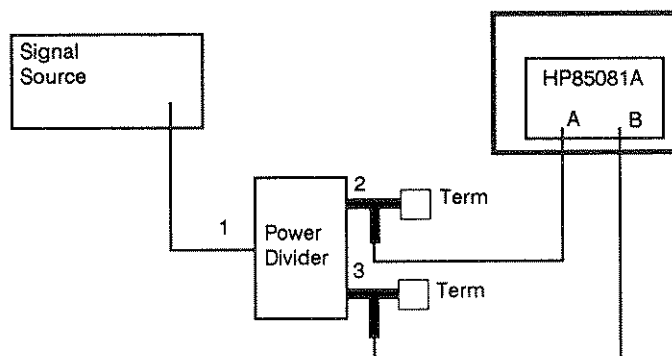


Figure 5-11. LF Phase Adjust Setup

EQUIPMENT

Instrument	Recommended Model
Signal Source	HP 8642B
Power Divider	HP 11636A
50 ohm Tee (2)	HP 11536A
50 Termination (2)	HP 909C

PROCEDURE

1. Configure the equipment as shown in Figure 5-11.
2. Switch on the equipment and allow to warm up for 30 minutes.
3. On the signal generator

Frequency	50 MHz
Level	-1.0dBm

Adjustments

4.	HP 8508A Setup	HP 70138A Setup	Function
	[PRESET]	[I-P]	Instrument preset
	[SHIFT] [POWER MEAS]	[MISC] [7] [0] [1] [3] [8] [MISC] [SELF TEST MENU]	Instrument into self-test setup mode.
	'up'/'down' keys for test "6"	'up'/'down' keys for test "6"	Setup code for test 6.
	[HOLD VALUE]	[Misc] [TEST ON]	Runs test.

5. **HP 8508A:** DISPLAY 1 should show the characters HI (this is the identification for the HP 85081A High Impedance Input Module). If other characters are displayed, adjust A6R38 until the display shows the characters HI in DISPLAY 1.

HP 70138A: At the right hand of the MMS screen, the lower display should show the characters HI (this is the identification for the HP 85081A High Impedance Input Module). If other characters are displayed, adjust A6R38 until the characters HI appears.

6. **HP 8508A:** Adjust A6R38 for a reading of 0.0 in DISPLAY 2, and HI in DISPLAY 1. Select [HOLD VALUE] to cancel the test.

HP 70138A: Adjust A6R38 for a reading of 0.0 in the upper display at the right-hand side of the MMS screen, and a reading of HI in the lower display. Select [Misc] [TEST OFF].

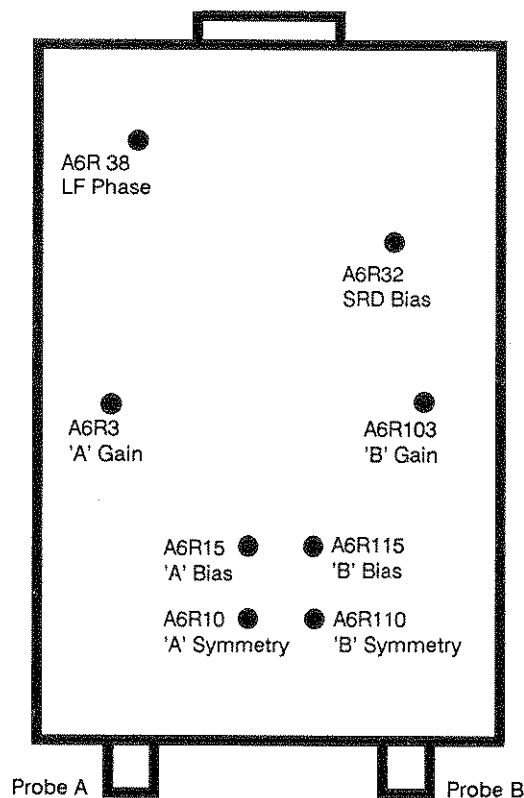


Figure 5-12. Input Module Adjustment Locations

7. Adjust R10 for a minimum amplitude signal on the oscilloscope display.

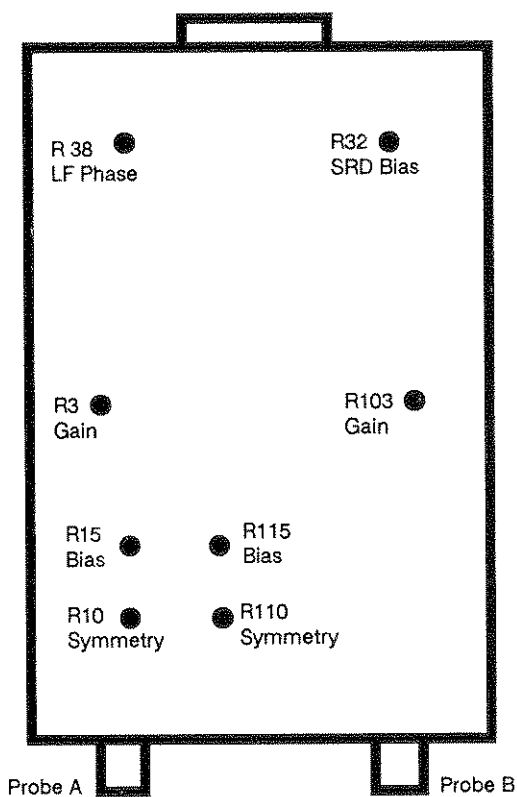


Figure 5-14. Input Module Adjustment Locations

8. Replace the HP 8508A top cover.

5-15 Set up the SYMMETRY adjustment for Channel B

DESCRIPTION

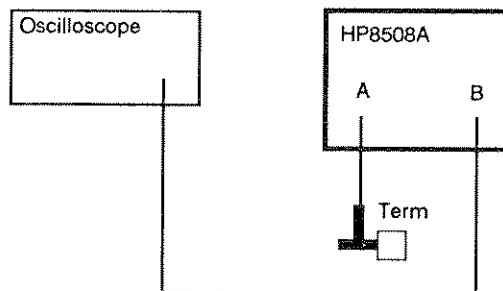


Figure 5-15. Symmetry Adjust Setup

EQUIPMENT

Instrument	Recommended Model
Oscilloscope	HP 54200A
50 ohm Termination	HP 908A
50 ohm Tee	HP 11536A
Probe/BNC Adapter	HP 10218A

PROCEDURE

1. Touch the Input Module probe shell to ground, to discharge stray capacitances.
2. Configure the equipment as shown in Figure 5-15.
3. Switch on the equipment and allow to warm up for 30 minutes.
4. Remove the HP 8508A top cover to allow access to the adjustments in the Input Module.
5. On the oscilloscope:

Sweep Speed	1us/div
Sensitivity	20uV/div
Triggering	As required.

6. On the HP 8508A:

Select [PRESET] [B] [LOCK RANGE] to disable the instrument autorange.
 Select UP/DOWN 'Arrow' keys to set instrument on 1-2 GHz range.

- Adjust R110 for a minimum amplitude signal on the oscilloscope display.

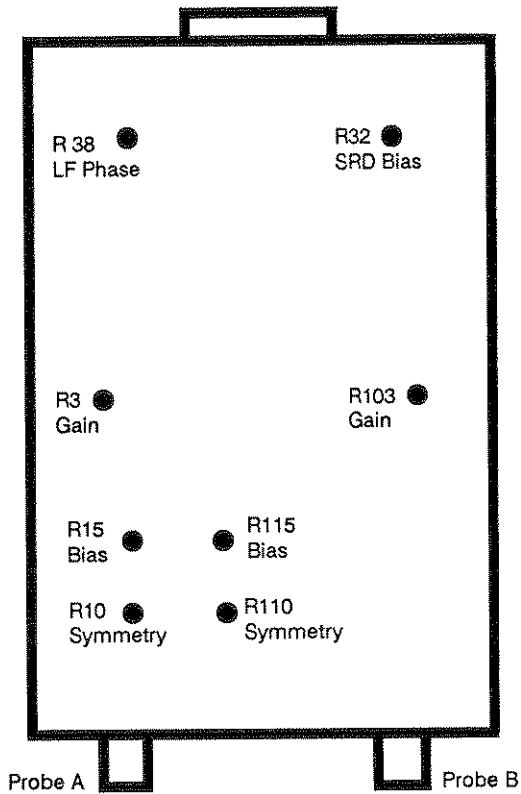


Figure 5-16. Input Module Adjustment Locations

- Replace the HP 8508A top cover.

5-16 Set up the Module Phase and Impedance

DESCRIPTION

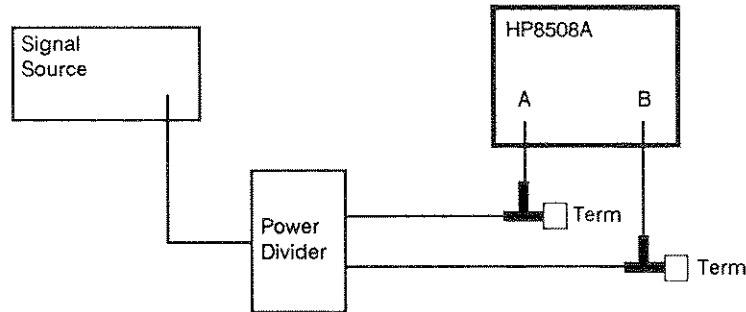


Figure 5-17. LF Phase Adjust Setup

EQUIPMENT

Instrument	Recommended Model
Signal Generator	HP 8657A
Power Divider	HP 11636A
50 ohm Termination (2)	HP 908A
50 ohm Tee (2)	HP 11536A

PROCEDURE

1. Configure the equipment as shown in Figure 5-17.
2. Switch on the equipment and allow to warm up for 30 minutes.
3. Remove the HP 8508A top cover to allow access to the adjustments in the Input Module.
4. On the Signal Generator.

Frequency 50 MHz.
Amplitude -1 dBm

5. On the HP 8508A.

Select [PRESET] [SHIFT] [POWER] to put the instrument into the 'setup' mode. The Display will now indicate which setup code is being used. It will appear as:

tSt nnnn

tSt indicates that the instrument is in the 'setup' mode and **nnnn** is the current setup code.

Use the UP/DOWN 'Arrow' keys to set up test code 006.

Press [HOLD VALUE] and check that the indicator lamp is illuminated.

6. Display 1 should show the characters HI (this is the identification for the HP 85081A High Impedance Input Module). If other characters are displayed, adjust R38 until the display shows the characters HI.

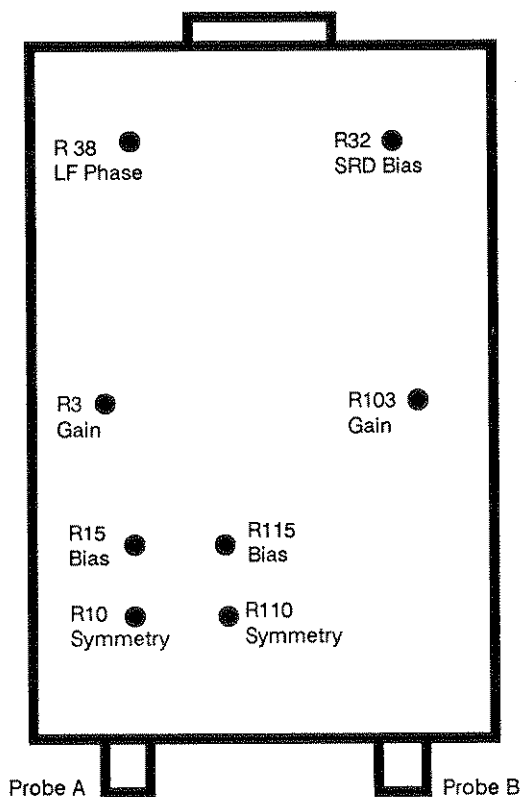


Figure 5-18. Input Module Adjustment Locations

7. Adjust R38 for a reading of 00.0 in Display 2. (This is the 'fine tune' adjustment.)

8. Press [HOLD VALUE] to cancel the function.

9. Replace the HP 8508A top cover.

Replaceable Parts

Section 6

6-1 INTRODUCTION

This section contains information for ordering parts. Table 6-2 lists the abbreviations used in the parts list and throughout the manual. Table 6-3 lists all replaceable parts in reference designator order and Table 6-4 lists the names and addresses that correspond to the manufacturer's code number used in the parts list.

6-2 ABBREVIATIONS

Table 6-2 lists all the abbreviations used in the parts lists and throughout the manual. In some cases, two forms of an abbreviation are given, one in all capital letters and the other in partial or no capital letters. This is because the abbreviations used in the parts list are always all capitals; however, in other parts of the manual, abbreviations are used in partial or no capital letters.

6-3 REPLACEABLE PARTS LIST

Table 6-3 is organized as follows:

- (a) Electrical assemblies and their components in alpha-numeric order followed by reference designation.
- (b) Chassis-mounted parts in alpha-numeric order by reference designation.
- (c) Miscellaneous parts.

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 part number for that part.

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

6-4 ORDERING INFORMATION

To order a part listed in the replaceable parts list table, quote the Hewlett-Packard part number (with the check digit), indicate the quantity required, and address the order to the nearest Hewlett-Packard office. The check digit will ensure accurate and timely processing of your order.

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

6-5 DIRECT MAIL ORDER SYSTEM

Within the USA, Hewlett-Packard can supply parts through a direct mail order system. Advantages of using the system are as follows:

- (a) Direct ordering and shipment from the HP Parts Centre in Roseville, California.
- (b) No maximum or minimum order value on any mail order (there is a minimum order amount for parts ordered through a local HP office when the orders require billing and invoicing).
- (c) Prepaid transportation (there is a small handling charge for each order).
- (d) No invoices - to provide these advantages, a cheque or money order must accompany each order.

Mail order forms and specific ordering information are available through your local HP office. Addresses and phone numbers are located at the back of this manual.

Table 6-1. Reference Designations

REFERENCE DESIGNATIONS			
A	assembly	E	miscellaneous electrical part
AT	attenuator; isolator; termination	F	fuse
B	fan; motor	FL	filter
BT	battery	H	hardware
C	capacitor	HY	circulator
CP	coupler	J	electrical connector (stationary portion); jack
CR	diode; diode thyristor; varactor	K	relay
DC	directional coupler	L	coil; inductor
DL	delay line	M	meter
DS	annunciator; signaling device (audible or visual); lamp; LED	MP	miscellaneous mechanical part
P	electrical connector (movable portion); plug	O	transistor; SCR; triode thyristor; FET
U	integrated circuit; microcircuit	R	resistor
V	electron tube	RT	thermistor
VR	voltage regulator; breakdown diode	S	switch
W	cable; transmission path; wire	T	transformer
X	socket	TB	terminal board
Y	crystal unit (piezo-electric or quartz)	TC	thermocouple
Z	tuned cavity; tuned circuit	TP	test point

Table 6-2. Abbreviations (1 of 2)

ABBREVIATIONS			
A	ampere	COEF	coefficient
ac	alternating current	COM	common
ACCESS	accessory	COMP	composition
ADJ	adjustment	COMPL	complete
A/D	analog-to-digital	CONN	connector
AF	audio frequency	CP	cadmium plate
AFC	automatic frequency control	CRT	cathode-ray tube
AGC	automatic gain control	CTL	complementary transistor logic
AL	aluminum	CW	continuous wave
ALC	automatic level control	cw	clockwise
AM	amplitude modulation	cm	centimeter
AMPL	amplifier	D/A	digital-to-analog
APC	automatic phase control	dB	decibel
ASSY	assembly	dBm	decibel referred to 1 mW
AUX	auxiliary	dc	direct current
avg	average	deg	degree (temperature interval or difference)
AWG	American wire gauge	°	degree (plane angle)
BAL	balance	°C	degree Celsius (centigrade)
BCD	binary coded decimal	°F	degree Fahrenheit
BD	board	°K	degree Kelvin
BECU	beryllium copper	DEPC	deposited carbon
BFO	beat frequency oscillator	DET	detector
BH	binder head	diam	diameter
BKDN	breakdown	DIA	diameter (used in parts list)
BP	bandpass	DIFF AMPL	differential amplifier
BPF	bandpass filter	div	division
BRS	brass	DPDT	double-pole, double-throw
BWO	backward-wave oscillator	DR	drive
CAL	calibrate	DSB	double sideband
ccw	counter-clockwise	DTL	diode transistor logic
CER	ceramic	DVM	digital voltmeter
CHAN	channel	ECL	emitter coupled logic
cm	centimeter	EMF	electromotive force
CMO	cabinet mount only	EDP	electronic data processing
COAX	coaxial	ELECT	electrolytic
		ENCAP	encapsulated
		EXT	external
		F	farad
		FET	field-effect transistor
		F/F	flip-flop
		FH	flat head
		FIL H	fillister head
		FM	frequency modulation
		FP	front panel
		FREQ	frequency
		FXD	fixed
		g	gram
		GE	germanium
		GHz	gigahertz
		GL	glass
		GRD	ground(ed)
		H	henry
		h	hour
		HET	heterodyne
		HEX	hexagonal
		HD	head
		HDW	hardware
		HF	high frequency
		HG	mercury
		HI	high
		HP	Hewlett-Packard
		HPF	high pass filter
		HR	hour (used in parts list)
		HV	high voltage
		Hz	Hertz
		IC	integrated circuit
		ID	inside diameter
		IF	intermediate frequency
		IMPG	impregnated
		in	incandescent
		INCL	include(s)
		INP	input
		INS	insulation
		INT	internal
		kg	kilogram
		kHz	kilohertz
		k	kilohm
		kV	kilovolt
		lb	pound
		LC	inductance-capacitance
		LED	light-emitting diode
		LF	low frequency
		LG	long
		LH	left hand
		LIM	limit
		LIN	linear taper (used in parts list)
		LK WASH	lock washer
		LO	low; local oscillator
		LOG	logarithmic taper (used in parts list)
		log	logarithmic
		LPF	low pass filter
		LV	low voltage
		m	meter (distance)
		mA	milliampere
		MAX	maximum
		M	megohm
		MEG	meg (10 ⁶) (used in parts list)
		MET FLM	metal film
		MET OX	metallic oxide
		MF	medium frequency; microfarad (used in parts list)
		MFR	manufacturer
		mg	milligram
		MHz	megahertz
		mH	millihenry
		mho	mho
		min	minute (time)
		...	minute (plane angle)
		MINAT	miniature
		mm	millimeter

NOTE

All abbreviations in the parts list will be in upper-case.

Table 6-2. Abbreviations (2 of 2)

MOD modulator	OD outside diameter	PWV peak working voltage	TD time delay
MOM momentary	OH oval head	RC resistance-capacitance	TERM terminal
MOS metal-oxide semiconductor	OP AMPL operational amplifier	RECT rectifier	TFT thin-film transistor
ms millisecond	OPT option	REF reference	TGL toggle
MTG mounting	OSC oscillator	REG regulated	THD thread
MTR meter (indicating device)	OX oxide	REPL replaceable	THRU through
mV millivolt	oz ounce	RF radio frequency	TI titanium
mVac millivolt, ac	Ω ohm	RFI radio frequency interference	TOL tolerance
mVdc millivolt, dc	P peak (used in parts list)	RH round head; right hand	TRIM trimmer
mVpk millivolt, peak	PAM pulse-amplitude modulation	RLC resistance-inductance-capacitance	TSTR transistor
mVp-p millivolt, peak-to-peak	PC printed circuit	RMO rack mount only	TTL transistor-transistor logic
mVrms millivolt, rms	PCM pulse-code modulation; pulse-count modulation	rms root-mean-square	TV television
mW milliwatt	PDM pulse-duration modulation	RND round	TVI television interference
MUX multiplex	pF picofarad	ROM read-only memory	TWT traveling wave tube
MY mylar	PH BRZ phosphor bronze	R&P rack and panel	U micro (10 ⁻⁶) (used in parts list)
μA microampere	PHL Phillips	RWV reverse working voltage	UF microfarad (used in parts list)
μF microfarad	PIN positive-intrinsic-negative	S scattering parameter	UHF ultrahigh frequency
μH microhenry	PIV peak inverse voltage	s second (time)	UNDEF undefined
μmho micromho	pk peak	s second (plane angle)	UNREG unregulated
μs microsecond	PL phase lock	S-B slow-blow (fuse) (used in parts list)	V volt
μV microvolt	PLO phase lock oscillator	SCR silicon controlled rectifier; screw	VA voltampere
μVac microvolt, ac	PM phase modulation	SE selenium	Vac volts, ac
μVdc microvolt, dc	PNP positive-negative-positive	SECT sections	VAR variable
μVpk microvolt, peak	P/O part of	SEMICON semiconductor	VCO voltage-controlled oscillator
μVp-p microvolt, peak-to-peak	POLY polystyrene	SHF superhigh frequency	Vdc volts, dc
μVrms microvolt, rms	PORC porcelain	SI silicon	VDCW volts, dc, working (used in parts list)
μW microwatt	POS positive; position(s) (used in parts list)	SIL silver	V(F) volts, filtered
nA nanoampere	POSN position	SL slide	VFO variable-frequency oscillator
NC no connection	POT potentiometer	SNR signal-to-noise ratio	VHF very-high frequency
N/C normally closed	p-p peak-to-peak	SPDT single-pole, double-throw	Vpk volts, peak
NE neon	PP peak-to-peak (used in parts list)	SPG spring	Vp-p volts, peak-to-peak
NEG negative	PPM pulse-position modulation	SR split ring	Vrms volts, rms
nF nanofarad	PREAMPL preamplifier	SPST single-pole, single-throw	VSWR voltage standing wave ratio
NI PL nickel plate	PRF pulse-repetition frequency	SS Service Sheet	VTO voltage-tune oscillator
N/O normally open	PRR pulse repetition rate	SSB single sideband	VTVM vacuum-tube voltmeter
NOM nominal	ps picosecond	SST stainless steel	V(X) volts, switched
NORM normal	PT point	STL steel	W watt
NPN negative-positive-negative	PTM pulse-time modulation	SQ square	W/ with
NPO negative-positive zero (zero temperature coefficient)	PWM pulse-width modulation	SWR standing-wave ratio	WIV working inverse voltage
NRFR not recommended for field replacement		SYNC synchronize	WW wirewound
NSR not separately replaceable		T timed (slow-blow fuse)	W/O without
ns nanosecond		TA tantalum	YIG yttrium-iron-garnet
nW nanowatt		TC temperature compensating	Z ₀ characteristic impedance
OBD order by description			

NOTE

All abbreviations in the parts list will be in upper-case.

MULTIPLIERS

Abbreviation	Prefix	Multiple
T	tera	10 ¹²
G	giga	10 ⁹
M	mega	10 ⁶
k	kilo	10 ³
da	deka	10
d	deci	10 ⁻¹
c	centi	10 ⁻²
m	milli	10 ⁻³
μ	micro	10 ⁻⁶
n	nano	10 ⁻⁹
p	pico	10 ⁻¹²
f	femto	10 ⁻¹⁵
a	atto	10 ⁻¹⁸

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code
	85081-69100	3	1	Rebuilt Hi-Z Input Module	
	08405-6054	4	2	Probe Circuit Board	
	08405-2044	9	2	Probe Insulator	
	08405-6055	7	2	Probe Barrel	
	08405-40003	8	2	Probe Tip Static Protector	
	85081-20105	9	1	Rod, Module Locking	
	85081-20107	1	1	Knob, Module Locking	
	0510-0070	7	2	Retainer, Crsnt.Ext Ring Retaining	
	85081-00001	3	1	Label - Horizontal (HP 8508A System)	
	85081-00005	7	1	Label - Vertical (HP 70138A System)	

Table 6-4. Code List of Manufacturers

Mfr Code	Manufacturer Name	Address	Zip Code
08792	PAPST-MOTOPEN KG	SCHWAPZUWALD	7742
09188	VIM A/S	GLOSTRUP	2080
H9027	SCHUPFER AG	LUZERN	CH-60
50167	FUJITSU MICROELECTRONICS INC	SANTA CLARA	95054
54013	HITACHI AMERICA LTD	SUNNYVALE	94088
00779	AMP INC	HARRISBURG	17111
01121	ALLEN-BRADLEY CO INC	EL PASO	79935
01295	TEXAS INSTRUMENTS INC	DALLAS	75265
02111	SPECTROL ELECTRONICS CORP	CITY OF IND	91745
03508	GE CO SEMICONDUCTOR PROD DEPT	AUBURN	13201
03888	K D I PYROFILM CORP	WHIPPANY	07981
04713	MOTOROLA INC SEMI-COND PROD	PHOENIX	85008
07263	FAIRCHILD CORP	MOUNTAIN VIEW	94042
07933	RAYTHEON CO SEMICONDUCTOR DIV HQ	MOUNTAIN VIEW	94040
09353	C & K COMPONENTS INC	NEWTON	02158
10552	CIS CORP ASHEVILLE DIV	SKYLAND	28776
10899	EASTERN AIR DEVICES INC	GREAT NECK	11021
11236	CIS CORP BERNE DIV	BERNE	46711
14433	ITT SEMICONDUCTORS DIV	TUSTIN	92680
14936	GENEAPAL INSTRUMENT CORP (DIODE)	HICKSVILLE	11802
15818	TELEDYNE SEMICONDUCTOR	MOUNTAIN VIEW	94043
17856	SILICONIX INC	SANTA CLARA	95054
18324	SIGNETICS CORP	SUNNYVALE	94088
19701	MEPCO/CENTRALAB INC	WEST PALM BEACH	33407
20627	POHM CORP	IRVINE	92716
24355	ANALOG DEVICES INC	NORWOOD	02062
24546	CORNING ELECTRONICS	SANTA CLARA	95050
27014	NATIONAL SEMICONDUCTOR CORP	SANTA CLARA	95052
27167	CORNING GLASS WORKS (WILMINGTON)	WILMINGTON	28401
28440	HEWLETT-PACKARD CO CORPORATE HQ	PALO ALTO	94304
31585	RCA CORP SOLID STATE DIV	SOMERVILLE	
31680	BEMAN MFG INC	ETTERS	17319
32293	INTERSIL INC	CUPERTINO	95014
34649	INTEL CORP	SANTA CLARA	95054
51642	CENTRE ENGINEERING INC	STATE COLLEGE	16801
56289	SPRAGUE ELECTRIC CO	NORTH ADAMS	01247
71468	ITT CORP CANNON ELECTRIC DIV	SANTA ANA	92702
72136	ELECTRO MOTIVE CORP	FLORENCE	06226
73899	J F D ELECTRONICS CORP	BROOKLYN	11219
75042	TRW INC PHILADELPHIA DIV	PHILADELPHIA	19108
9N171	UNITRODE CORP	LEXINGTON	02173
9N283	WORKSAFE INC	NEW YORK	10001
91637	DALE ELECTRONICS INC	EL PASO	79936

Manual Changes

Section 7

7-1 INTRODUCTION

This section normally contains information for adapting this manual to instruments for which the content does not directly apply. Since this manual does directly apply to instruments having the series number listed on the title page, no change information is given here. Refer to INSTRUMENTS COVERED BY MANUAL in Section 1 for additional important information about serial number coverage.

Service

Section 8

8-1 INTRODUCTION

The HP 85081A is not repairable to component level. Should a unit prove to be defective, it should be replaced with a rebuilt assembly (exchange unit) obtainable through your local HP Service Office.

8-2 ANTI-STATIC PRECAUTIONS

The printed circuit board of this instrument is susceptible to damage by electrostatic discharge (ESD). To minimize the risks of damaging or decreasing the reliability of the instrument, the following procedures and cautions should be observed when servicing the instrument.

Static-free Workstation

All servicing should be carried out at a static-free workstation.

De-soldering

When desoldering, ensure that the soldering iron is earthed. Always use a metalized solder remover.

Anti-static freezer spray

When attempting to locate a temperature related fault, use only an approved anti-static freezer spray.

Anti-static Products

Table 8-1 contains details of anti-static products which are available from Hewlett-Packard.

Table 8-1. Anti-Static Products

Product	HP Part No.
Anti-static workstation kit	9300-0792
Metalized Solder Remover	8690-0227
Wrist-strap and cord	9300-0970

8-3 RECOMMENDED TEST EQUIPMENT

Equipment required to troubleshoot the HP 85081A is listed in Table 1-2. Other equipment may be substituted if it meets or exceeds the critical specifications listed in the table.

8-4 TROUBLESHOOTING

GENERAL DESCRIPTION

The HP 85081A is a two-channel RF to IF convertor plug-in module that operates in the 100kHz to 1GHz frequency range. The module reconstructs two RF signals (having the same fundamental frequency) into two IF signals at a frequency of 20kHz. These re-constructed signals have the same amplitude and phase relationships of the original RF signal.

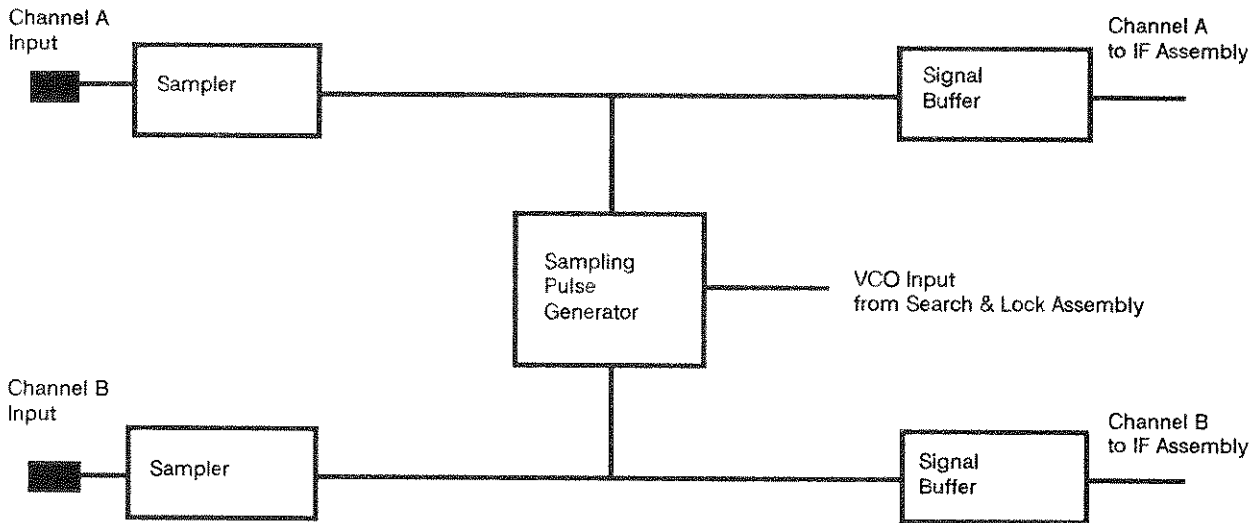


Figure 8-1. Simplified Block Diagram

The Input Module, with its associated cables and probes, form a dual-channel sampling system. The main elements of which are a Pulse Generator, two Sampling Bridges and two Signal Buffers. The sampling bridges are located in the test probes and flexible cables transfer the sampling point from the Input Module to the Probe tips.

SERVICING THE INPUT MODULE

The Input Module must be installed in either an HP 8508A mainframe or an HP 70138A MMS Vector Voltmeter before it can be tested. Should the Self Test process detect a failure in the Input Module, an appropriate Error Code in the 600 Series will be shown in DISPLAY 2 of the instrument.

TROUBLESHOOTING PROCEDURE

An HP 85081A failure will be indicated in one of two ways. Either the HP 8508A or the MMS System will display an error code in the 600 Series, or no digits will be shown in the displays.

1. Check that the HP 85081A is properly installed in the HP 8508A Vector Voltmeter mainframe or the HP 70138A MMS Vector Voltmeter Module. The HP 85081A could also be installed in an Input Module Extender (HP part number 08508-60032).
2. Cycle the instrument power.
3. Test the probes by performing the adjustment procedure for the probe symmetry or by checking with the CAL/TEST output on the instrument front panel. If, however, one or both probes prove to be defective, the preferred repair strategy is to replace the faulty module with a rebuilt exchange unit.
4. If the probes are found to be operating correctly, the Input Module Adjustment procedures should be carried out and the self tests run again.
5. Should the Input Module still fail the self test, it should be replaced with an exchange module.
6. If the HP 85081A adjustments are completed successfully, then this indicates that the problem is in either the HP 8508A Vector Voltmeter mainframe, or the HP 70138A MMS Vector Voltmeter module.

Failure of the HP 85081A adjustments indicates that the HP 85081A should be replaced.

The replacement module is already calibrated and no adjustments should be necessary when this is installed.

PROBE SAMPLER BOARD REPLACEMENT

The Sampler Assembly is mounted on a small plug-in circuit board mounted in the probe assembly, as shown below.

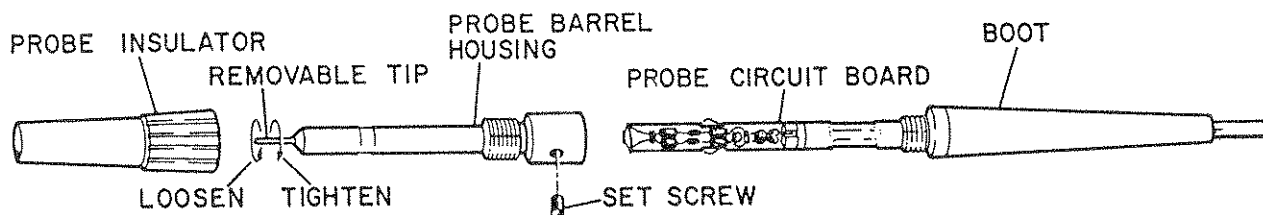


Figure 8-2. Probe Housing Assembly

NOTE: The Sampler Assembly can be easily damaged by static discharge and ESD precautions should be observed when handling this assembly.

To gain access to the Sampler Assembly, unscrew the probe insulator. Unscrew the small set screw and then the probe barrel housing. The probe circuit board can now be carefully pulled free.

When the probe circuit board is being replaced, be sure to align the board in the guides so that the connector pins mate together readily when the board is pushed gently into position. Ensure that the inside of the probe barrel is clean before re-assembly. Once assembled, the Input Module adjustment procedures should be carried out.

DISASSEMBLY AND REASSEMBLY PROCEDURES

The following operations must only be performed at an ESD protected environment.

Disassembly of the Input Module

1. Ensure the LINE switch is off.
2. Remove the HP 85081A from the Vector Voltmeter.
3. Place the HP 85081A on a flat surface (with the front panel towards you).
4. Remove the two crescent clips from the retaining rod.
5. Remove the retaining rod.
6. Remove the two screws holding the front panel to the module. Put the front panel in a safe place.
7. Remove the three screws exposed at the top of the module.
8. Turn the module over and remove the 12 screws holding the two halves of the assembly together.
9. The module casing can now be separated to allow access to the module circuit board assembly.

Reassembly of the Input Module

1. Install the circuit board and close the module casing.
2. Reinsert (and tighten) the 12 screws.
3. Turn the module over and replace the three fixing screws.
4. Refit the front panel and the two fixing screws.
5. Replace the retaining rod and the two crescent clips (HP part number 0510-0070).

The HP 85081A is now ready for operation.

