HP 85081B
High Impedance
Input Module
Operating and Service Manual Insert

Manual Part No. 85081-90024

Printed in UK: August 1998

Hewlett-Packard to Agilent Technologies Transition

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

Transition de Hewlett-Packard vers Agilent Technologies

La présente documentation se réfère à un produit qui était auparavant livré sous la marque Hewlett-Packard. Cette marque a été remplacée par Agilent Technologies. D'un point de vue fonctionnel, les deux produits sont identiques et seuls leurs noms les différencient. La documentation comprend toujours des références aux produits Hewlett-Packard, même si certains possèdent déjà l'appelation Agilent Technologies.

Umbenennung Hewlett-Packard in Agilent Technologies

Diese Dokumentation gehört zu einem Produkt, das früher unter dem Markennamen Hewlett-Packard ausgeliefert wurde. Der Markenname lautet in der Zwischenzeit Agilent Technologies. Die Funktionalität der beiden Produkte ist identisch, nur der Name hat sich geändert. Im Dokument wird zum Teil immer noch auf Hewlett-Packard verwiesen. An anderer Stelle wurde die Marke in Agilent Technologies umbenannt.

Hewlett-Packard e la transizione ad Agilent Technologies

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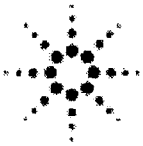
Transición de Hewlett-Packard a Agilent Technologies

Esta documentación proporciona información técnica sobre un producto que anteriormente se distribuía bajo el nombre de marca de la compañía Hewlett-Packard. Dicho nombre de marca ha cambiado ahora a Agilent Technologies. Los dos productos son funcionalmente idénticos, sólo ha cambiado nuestro nombre. Este documento aún incluye referencias a productos de Hewlett-Packard, algunos de los cuales han pasado a Agilent Technologies.



Agilent Technologies

Printed in USA March 2000

Изменение торговой марки Hewlett–Packard на Agilent Technologies

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此文档支持先前以惠普公司 (Hewlett-Packard) 商标名称交付的产品。此商标名称现已更名为安捷伦科技公司 (Agilent Technologies)。两个商标名称的产品在功能上完全相同，只是更改了名称。文档中仍然会提到惠普产品，但其中一些产品名称已改为安捷伦科技公司。

關於惠普公司更名爲安捷倫科技事宜

本資料支持先前以惠普公司 (Hewlett-Packard) 品牌交付的產品，而該品牌現已改名爲安捷倫科技 (Agilent Technologies)。兩個品牌的產品功能相同，僅名稱更換而已。本資料仍含有惠普公司產品參數，但其中的一些產品名稱已改爲安捷倫科技。

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 08508-90043) and the HP 70138A MMS Vector Voltmeter Service Manual (HP Part Number 70138-90002). The HP Model 85081B High Impedance Input Module 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.

HP 85081B High Impedance Input Module Insert
(HP Part Number 85081-90024).

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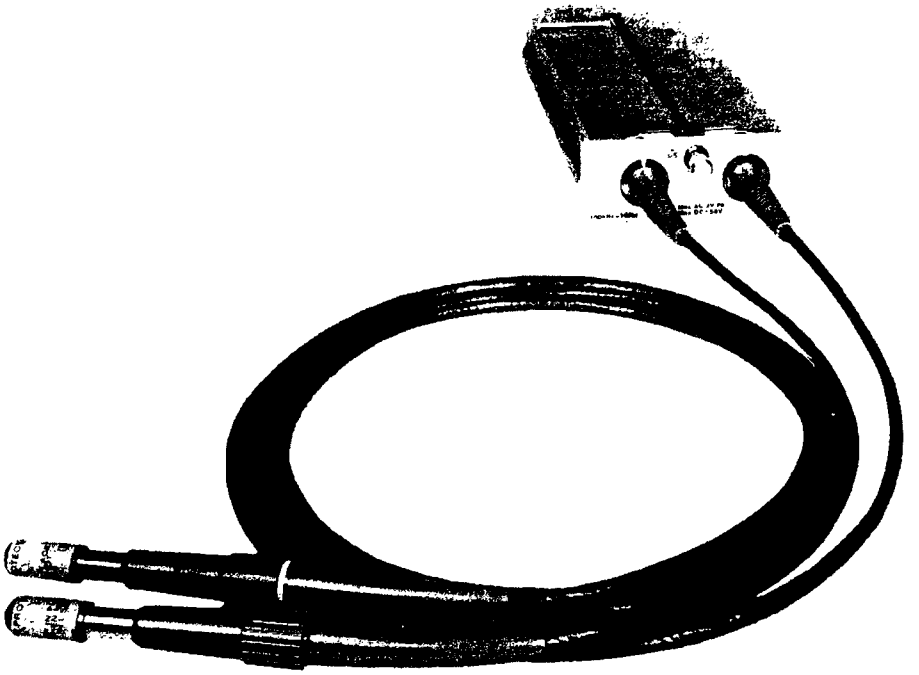


Figure 1-1. The HP 85081B High Impedance Input Module

General Information Section 1

1-1 INTRODUCTION

This service manual contains information required to install, test, adjust and service the Hewlett-Packard Model 85081B High Impedance Input Probe. The HP 85081B 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 micro-film 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 85081B 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 susceptable 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 85081B 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 85081B can measure signals in the frequency range 100kHz to 1GHz and at levels from 10uV to 1V. The HP 85081B 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 85081B 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 85081B 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.

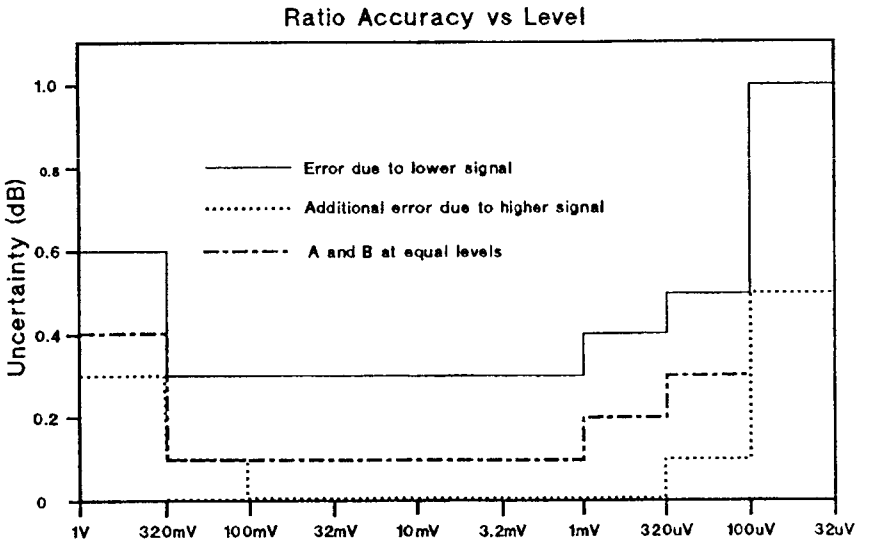
Measurement conditions: All specifications apply to measurements in a 50 ohm system and with autoranging off, unless otherwise stated. Measurements are made with the probes mounted in an HP 11536A Feedthru Tee unless otherwise stated.

Frequency Range	100kHz-1GHz	
Maximum Input (damage level)	2V ac peak, ±50Vdc	
Measurement Range		
A and B Channel maximum	Magnitude measurements	300mV, 100kHz-1MHz 1V, 1MHz-1GHz
	Phase measurements	300mV, 100kHz-1GHz
A (Ref) Channel minimum		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<1.45, 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).	

Ratio Accuracy vs Level (1) (3)

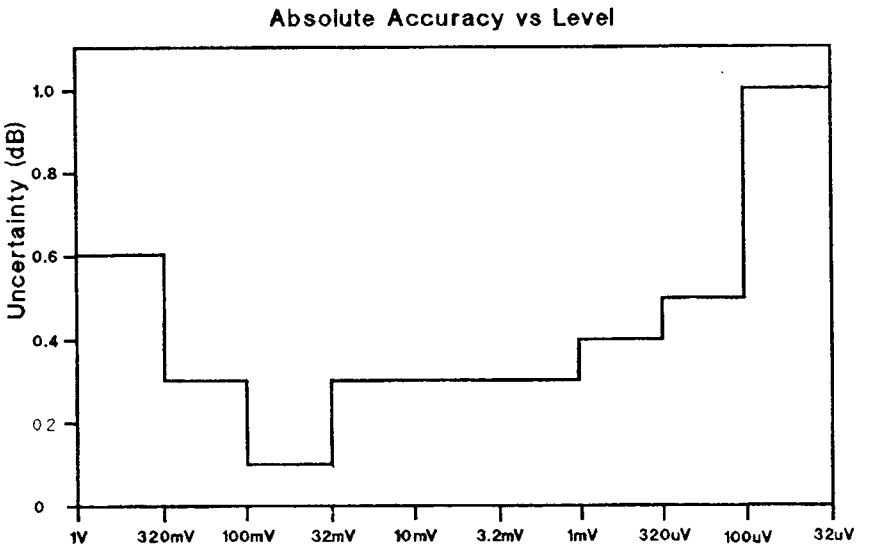
Add this term when making:
Ratio measurements at any single frequency.

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



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

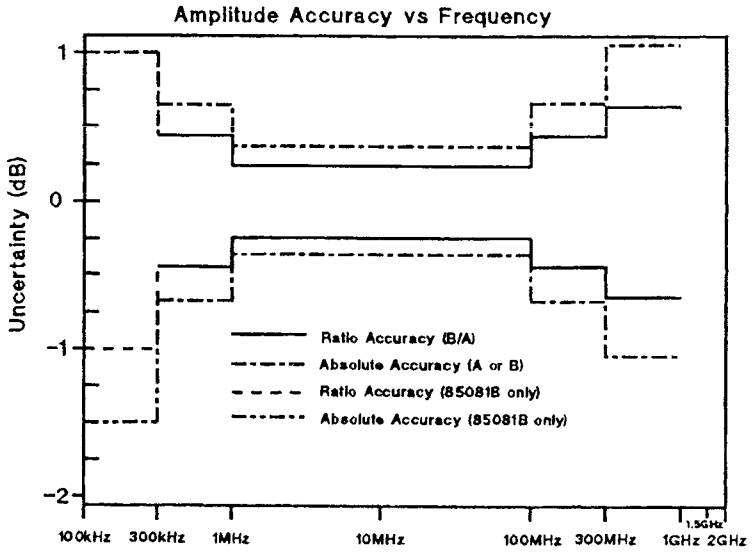
Add this term when making:
Absolute measurements.



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.

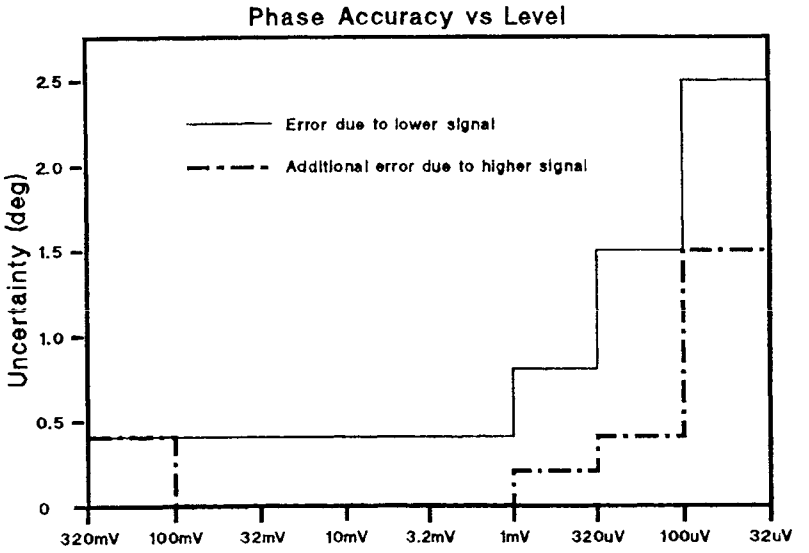


Phase Characteristics

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.

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

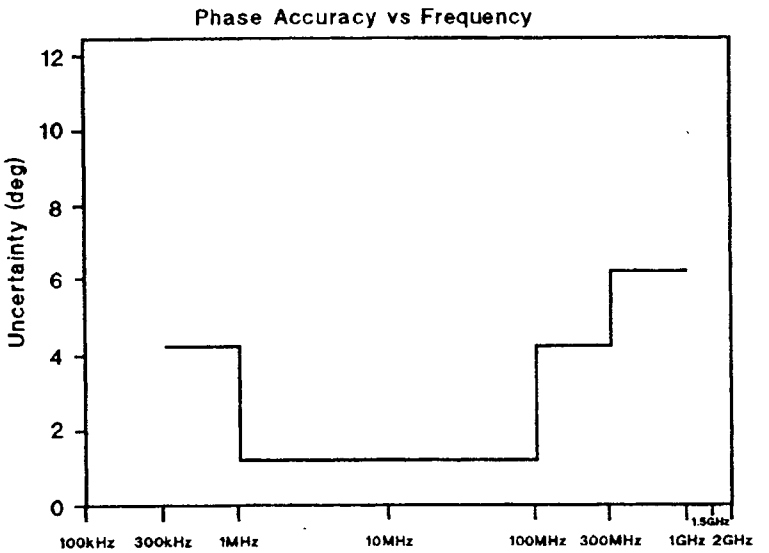
Add this term when making:
Phase measurements at any single frequency.



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 ±0.1dB per 5 deg C outside this range.
(2) A minimum input level depends on frequency. See Measurement Range.
(3) Add ±0.5dB for signals above 100mV at frequencies greater than 500MHz.
(4) A and B absolute value includes ±0.15dB 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, 0.02-0.02.

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 PP0 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.

Probe Power Supply

Supplies:	+12 and -12 volts and ground

This supply is sufficient to operate 1 HP 85024A High Impedance Probe.

Environment

Operating Temperature:	0 to +55°C
Storage Temperature:	-40 to +70°C
Humidity:	Up to 95% relative humidity to 40°C
Operating Altitude:	Up to 4600 m (15000 ft)
EMC:	Meets EN55011:1991 (Group 1 Class A), and EN50082-1:1992

Power

Operating Voltage Range:	100 / 120 / 220 / 240 V
Operating Frequency Range:	47 - 440 Hz
Power Dissipation:	45 VA (max)

Size (HP 8508A)

Height:	149 mm (5.9 in)
Width:	425 mm (16.7 in)
Depth:	441 mm (17.4 in)

Size (HP 85081B)

Height:	28 mm (1.1 in)
Width:	84 mm (3.3 in)
Depth:	189 mm (7.4 in)

Plus two probe leads, each 1500 mm (59 in) long.

Weight (HP 8508A): 8.1 kg (17 lb 14 oz) nominal (excluding HP 85081B).

Weight (HP 85081B): 0.74 kg (1 lb 10 oz) nominal.

Installation Section 2

2-1 INTRODUCTION

This section provides installation instructions for the Hewlett-Packard Model 85081B 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 85081B is installed in the opening on the front panel of the HP 8508A Vector Voltmeter or the HP 70138A MMS Vector Voltmeter. The HP 85081B 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 85081B 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.

3-2 ESD PRECAUTIONS

ATTENTION
Static Sensitive
Devices

Don't destroy your input probes!

The probes of the HP 85081B are susceptible to damage from electro-static discharge (ESD). Comply with the following precautions to help avoid damage to your probes.

Anti-static precautions

Never touch the tip of the probe.

Eliminate ESD on the body by wearing a snug-fitting ground strap that is connected to earth ground through a 1M ohm resistor.

Eliminate ESD on the work surface by using a grounded anti-static bench mat. Optional floor mats provide an extra measure of protection especially in areas with floor carpet. Never use this product on a carpeted work surface unless the carpet is of a conductive type specifically designed to eliminate ESD.

Do not introduce ESD into the Device Under Test (DUT) while using the probes. If an unprotected person touches a part of the DUT, a static surge could damage the DUT as well as the probes.

Always refit the protective cover when the probe is not in use.

Mechanical abuse

The tips of the probes are fragile and can break if the probe is dropped.

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 perfomance standard. These specifications apply equally when the HP 85081B 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 85081B 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 85081B 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
Amplitude Accuracy vs Frequency	4-10
Phase Accuracy vs Level	4-11
Phase Offset Accuracy	4-12
Voltage Ratio Accuracy vs Level	4-13
Amplitude Accuracy vs Input Level (and rear panel output check)	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 1Vrms is applied to the Channel A input of the HP 85081B 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	1.0 -1000 MHz	HP 8642B
	Amplitude	1.0 V rms	
50 Ohm Tee (2)			HP 11536A
50 Ohm Termination (2)			HP 909C

PROCEDURE:

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

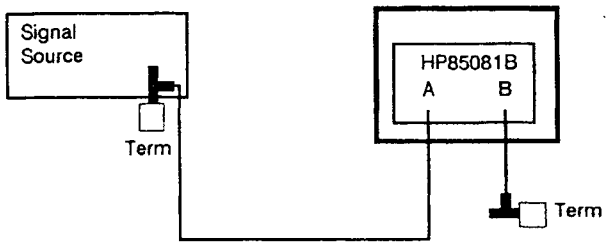


Figure 4-1. Channel Isolation Test Setup

2. Signal Source setup:

Frequency:	1.0 MHz
Amplitude:	0.010 V rms

3.

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.
[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. Adjust the signal source amplitude to 1.0 V rms.

5. 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.)

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

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 (2)		HP 909C

PROCEDURE:

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

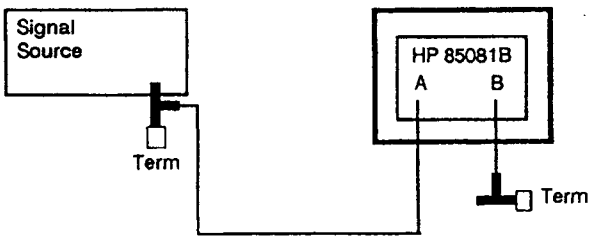


Figure 4-2. Test Setup for Reference Channel Lock Level and Channel B Noise Floor

2. Signal Source setup:

Frequency:	100 kHz
Amplitude1	0 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
[POWER MEAS]	[Format Functn][dB]	Display Readings in dBm
[DISPLAY] dB		
[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 frquency 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.

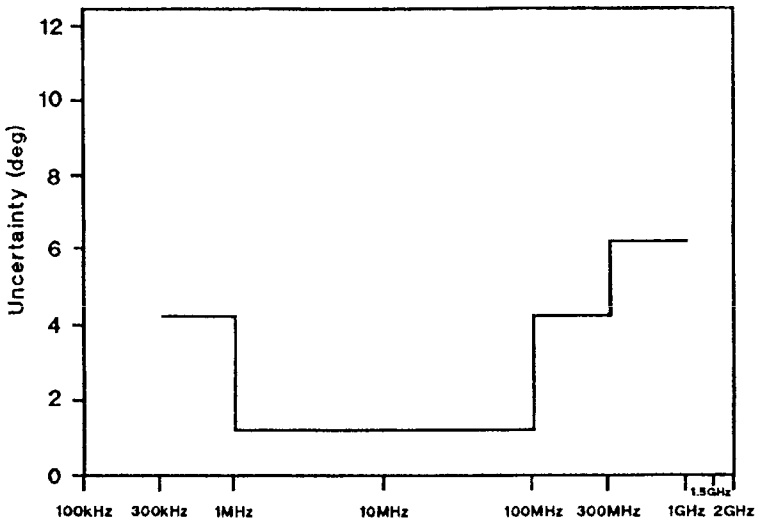
The instrument can be locked into a particular frequency range as follows:

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	HP 8642B
	Amplitude	100 mV	
Power Divider	DC - 4 GHz		
	Ins Loss: 6 dB		HP 11636A
	O/P Tracking	< = 0.4 dB	
	Phase Tracking	0.2 deg or better.	
50 Ohm Probe Tee (2)			HP 11536A
50 Ohm Termination (2)			HP 909C
10dB Attenuator (2)			HP 8491A/B

PROCEDURE:

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

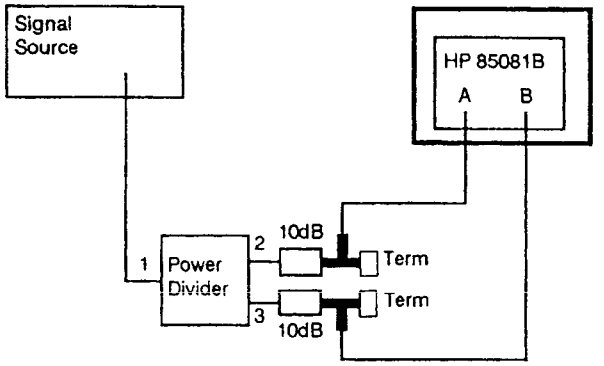


Figure 4-3. Phase Accuracy vs Frequency Test Setup

2. Signal Source setup:

Frequency:	1.0 MHz
Amplitude:	640mV (This will produce a nominal 100mV at the ouput of the 10dB attenuator.)

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.

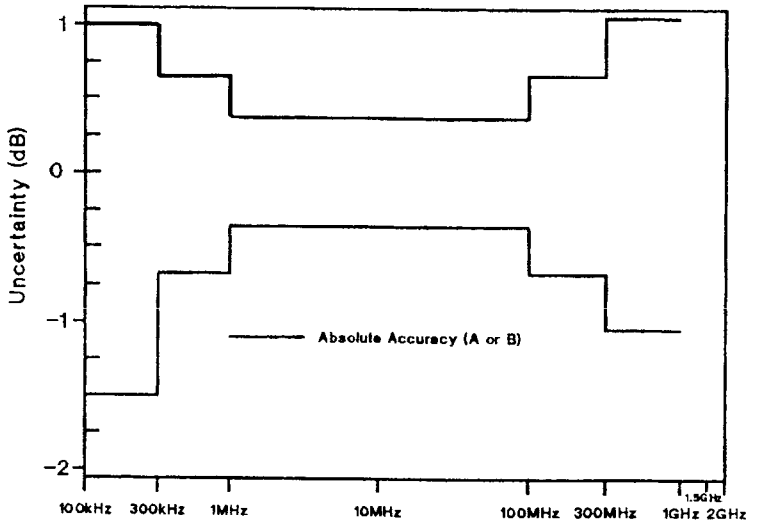
5. Connecting the probe tees directly to the 10dB attenuator outputs minimizes differences due to electrical path lengths. These differences can lead to significant phase measurement errors. For any frequency point that may be out of limits, this source of error should be balanced out by using manual 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 AMPLITUDE ACCURACY vs FREQUENCY

SPECIFICATION:



DESCRIPTION:

The voltage amplitude accuracy is measured with the channel input level set to -7.0dBm ±0.1dBm 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	HP 8642B
	Amplitude	100mV	
Power Divider			HP 11636A
50 ohm Tee (2)			HP 11536A
50 Ohm Termination (2)			HP 909C
N(m)-N(m) Cable			HP 11500A/B
RF Power Meter	Accuracy	±0.02dB	HP 436A/HP 438A
	Power Ref	50MHz 1.00mW	
	NBS Traceable.		
Power Sensor			HP 8482A
Adapter N(f) - N(f)			HP 1250-0777
10dB Attenuator (2)			HP 8491A/B

PROCEDURE:

1. Configure the equipment as shown in Figure 4-4 step (a), with the power sensor connected to the 10dB attenuator which is connected to port 2 of the power splitter; and Channel B of the HP 85081B connected via the 50ohm Tee to the 10dB attenuator which is connected to port 3 of the power splitter.

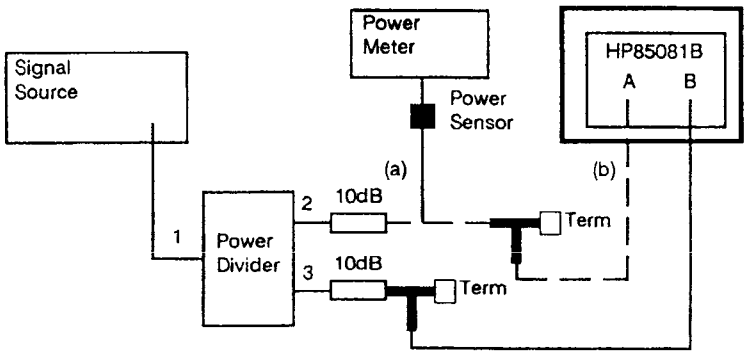


Figure 4-4. Voltage Accuracy Equipment Setup

2. Signal Source setup:

Frequency:	1 MHz.
Amplitude:	9 dBm. To produce a power meter reading of -7.0 dBm, ±0.1dB at the outputs of the 10dB attenuators.

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 4-4 step (b), with Channel A of the HP 85081B connected (via the 50ohm Tee) to the output of the 10dB attenuator, which is connected to port 2 of the power splitter.

5. 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.

6. Record the DISPLAY 1 reading in the Performance Tests Results table.

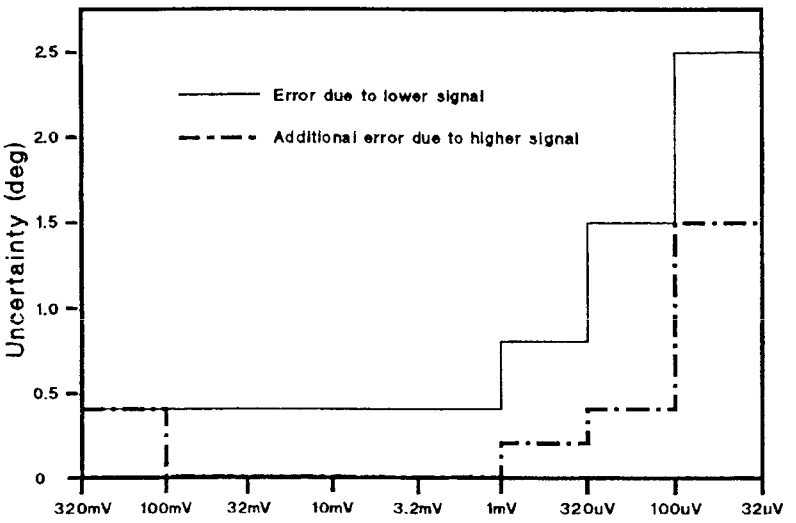
7. Interchange the probe connections and record the value of the DISPLAY 2 reading in the Performance Tests Results table.

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.

4-11 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 (2)		HP 909C
N(m) - N(m) Cable		HP 11500A/B
Adapter N(f) - N(f)		HP 1250-0777

*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 85081B 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.

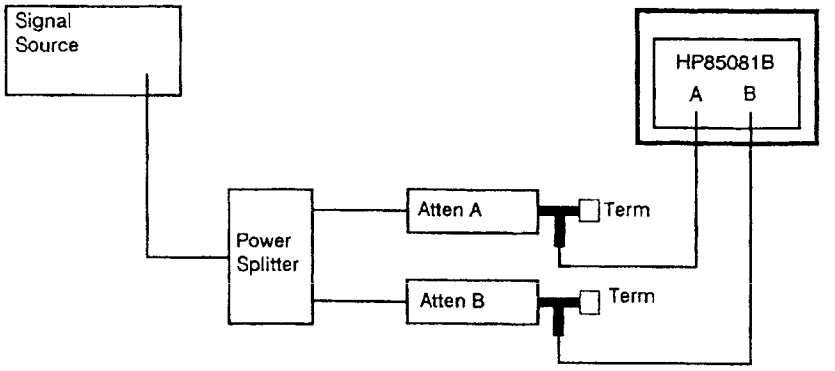


Figure 4-5. Phase Accuracy vs Level Test Setup

2. Set both attenuators to 20 dB.

3. Signal Source setup:

Frequency:	1 MHz
Amplitude:	+19dBm

4.

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 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 4-6, with the probe tees connected directly to the source output via the adaptors.

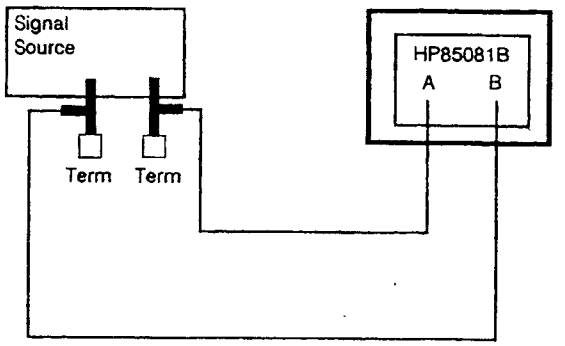


Figure 4-6. Phase Offset Accuracy Setup

2. Signal Source Setup:

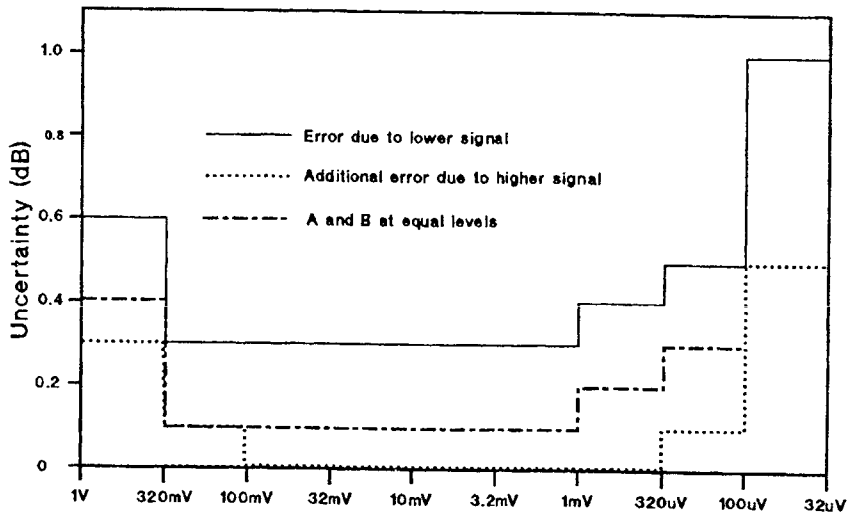
Frequency:	1 MHz on both channels.
Amplitude:	100mV rms on both Channels.
Phase Offset:	Zero.

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.

4-13 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 (2)		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(2)		HP 8120-1839
Adapter N(m)-BNC(f)(2)		HP 1250-0780
Power Meter	Accuracy ±0.02dB	HP 436A/HP438A
	Ref Output 50 MHz 0.0 dBm	
	Traceable to NBS	
Power Sensor		HP 8482A

* Calibration data required.
** Required if HP 8496G programmable attenuator is used.

PROCEDURE:

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

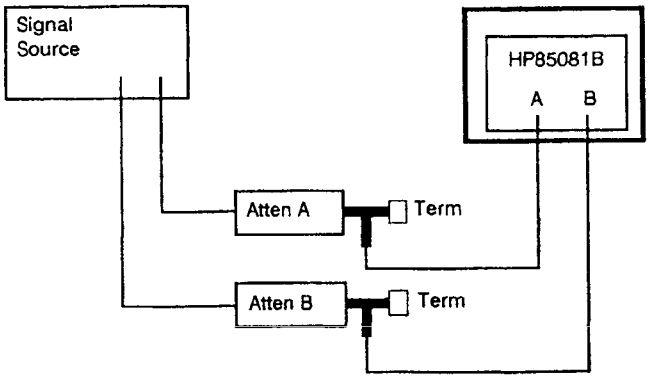


Figure 4-7. Voltage Ratio Accuracy Test Setup

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.

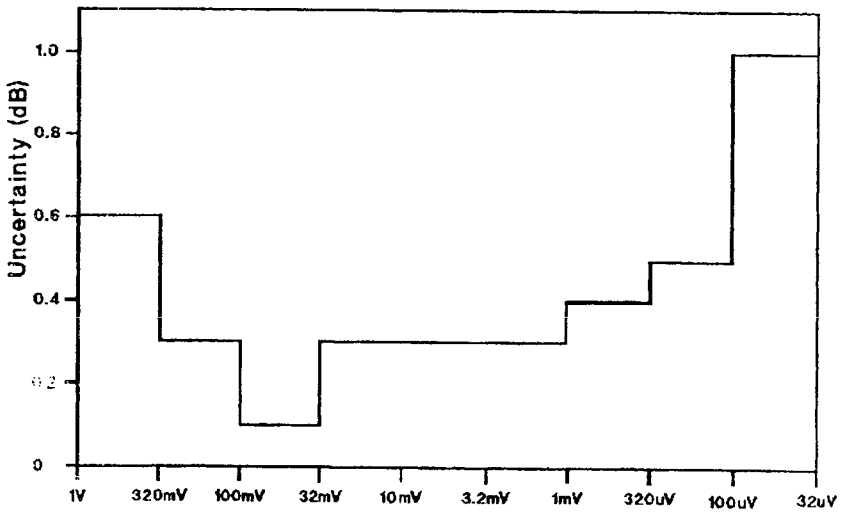
6. Enter the corrected attenuator figures in the Performance Test Table (which is located at the end of the Performance Tests section).

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.

4-14 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 (2)		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 8120-1839
Adaptor N(m)-BNC(f)(2)		HP 1250-0780
Power Meter	Accuracy ±0.02dB Ref Output 50MHz, 0.0dBm Traceable to NBS	HP 436A/HP 438A
Power Sensor		HP 8482A
DVM		HP 3456A

* Calibration data required.
** Required if HP 8496G programmable attenuator is used.

PROCEDURE:

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

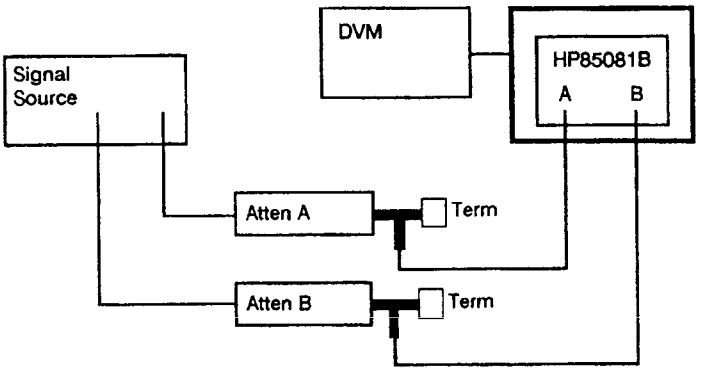


Figure 4-8. Amplitude Accuracy vs Input Level (and rear panel output check) Test Setup

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 ouput 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] [DISPLAY 2] [B] [Format Functn] [dB]	Set up for dBm in both displays.
[SHIFT] [CAL/TEST]	[Misc] [CAL]	Self calibration.

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.

4-15 SWR MEASUREMENT

SPECIFICATIONS:

SWR <1.15	100kHz to 750MHz	(Return loss = -23dB)
SWR <1.45	750MHz to 1.0GHz	(Return loss = -14.7dB)

DESCRIPTION:

The SWR of each input is measured over the operating frequency range 100kHz to 1.0GHz.

EQUIPMENT:

Instrument	Critical Specification	Recommended Model
Network Analyzer		HP 8753A/B/C
S Parameter Test Set		HP 85046A
Phase Matched Cables		HP 11851B
50 ohm Tee (2)		HP 11536A
50 ohm Termination (2)		HP 909C

PROCEDURE:

1. Connect the equipment as shown in Figure 4-9.

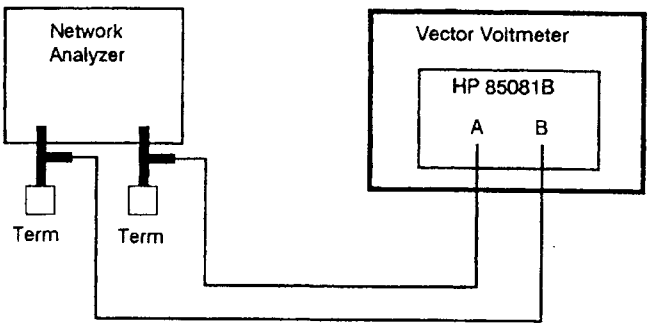


Figure 4-9. SWR Measurement Setup

2. Set up the Network Analyzer for SWR measurement.

3. Measure the SWR over the frequency range 100kHz to 1GHz and record the results in the Performance Test Record (which is contained at the end of the Performance Tests section).

Table 4-2. Performance Test Record (1 of 9)

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 9)

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 9)

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 9)

Paragraph 4-10

AMPLITUDE ACCURACY vs FREQUENCY						
Frequency (MHz)	Power Meter Reading (M) (dBm)	Display Reading 1	2	Errors Channel A (M-1)	Channel B (M-2)	Limits
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 4-6. Performance Test Record (5 of 9)

Paragraph 4-11

PHASE ACCURACY vs 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 9)

Paragraph 4-12

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 4-8. Performance Test Record (7 of 9)

Paragraph 4-13

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		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)
A	B								
100mV	100mV	20	20	____	____	____	____	____	±0.3
100mV	32mV	20	30	____	____	____	____	____	±0.4
100mV	10mV	20	40	____	____	____	____	____	±0.4
100mV	3.2mV	20	50	____	____	____	____	____	±0.4
100mV	1.0mV	20	60	____	____	____	____	____	±0.4
100mV	320uV	20	70	____	____	____	____	____	±0.4
100mV	100uV	20	80	____	____	____	____	____	±0.4
100mV	32uV	20	90	____	____	____	____	____	±0.4
100mV	320mV	20	10	____	____	____	____	____	±1.0
100mV	1000mV	20	0	____	____	____	____	____	±1.0

* Data from Calibration Certificate.

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

Paragraph 4-14

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 4-10. Performance Test Record (9 of 9)

Paragraph 4-15

SWR MEASUREMENT			
Frequency Range	Measured SWR Channel A	Channel B	Specification
100kHz to 750MHz	_____	_____	<1.15
750MHz to 1.0GHz	_____	_____	<1.45

Note: The condition of the connectors and the quality of the connections in the measurement system (adaptors, cables, 50 ohm Tees, terminations, twists in the probe cables or loose cable connections, etc) can dramatically affect the accuracy of the measurement. Connection quality determines directivity and match, which in turn determines measurement accuracy.

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 85081B 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 85081B 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.

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 85081B Input Module are to meet their performance requirements.

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

When performing the adjustments to an HP 85081B 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 85081B 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 85081B High Impedance Input Module.

Table 5-2. Adjustable Components

Reference Designator	Adjustment Name	Adjustment Paragraph
R32	SRD Bias	5-11
R10/R110	Channel A and B Symmetry	5-12
R15/R115	Channel A and B Bias	5-14
R3/R103	Channel A and B Gain	5-14
R38	LF Phase	5-15
DD 01	Delay Line	5-16

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 85081B adjustments can now be accessed.

NOTE: Adjust all potentiometers to their mid-position. This will minimize time to converge.

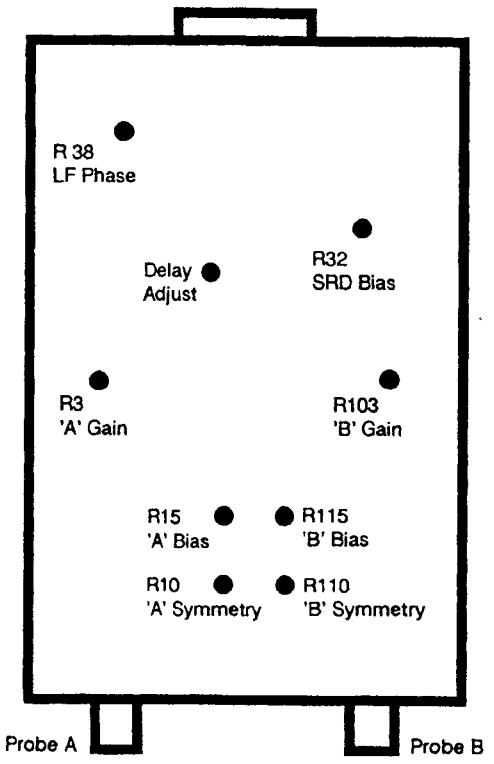


Figure 5-1. Input Module Adjustment Locations

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 85081B adjustments.

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

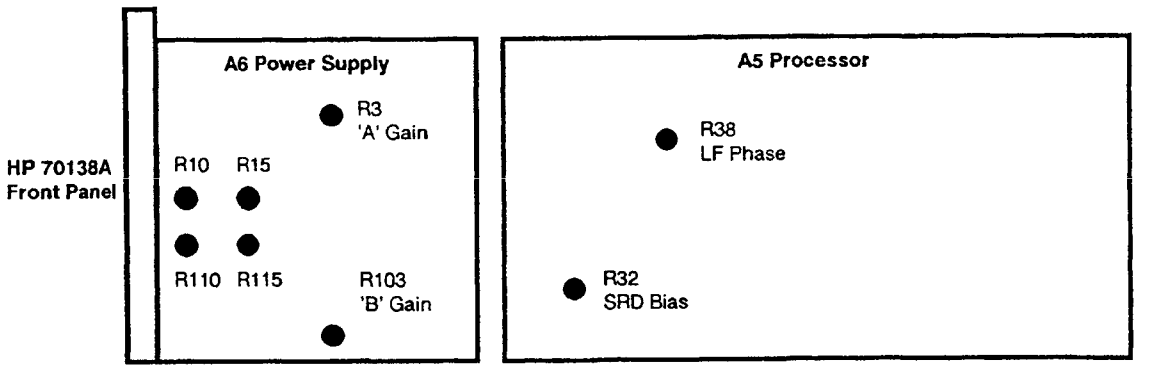


Figure 5-2. Input Module Adjustment Access Points in the HP 70138A

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

NOTE: Adjust all potentiometers to their mid-position. This will minimize time to converge.

5- 9 GENERAL TEST EQUIPMENT LIST

Instrument	Recommended Model
Signal Source	HP 8642B
Power Divider	HP 11636A
Power Meter	HP 436A/HP 437A/HP 438A
Power Sensor	HP 8482A
Oscilloscope 1GHz	HP 54100D
50ohm Termination (2)	HP 909C
50ohm Tee (2)	HP 11536A
10dB Attenuators (2)	HP 8491A/B

If substitutions must be made for the specified test equipment, refer to the Recommended Test Equipment table in Section 1 of the HP 8508A and HP 70138A Vector Voltmeter manuals for the minimum specifications. It is important that the test equipment meet the critical specifications listed in the table if the appropriate Vector Voltmeter and the HP 85081B High Impedance Input Probe are to meet their requirements.

NOTE: Use a non-metallic adjustment tool whenever possible (HP part number 8830-0024).

5- 10 GENERAL TEST EQUIPMENT SET-UP

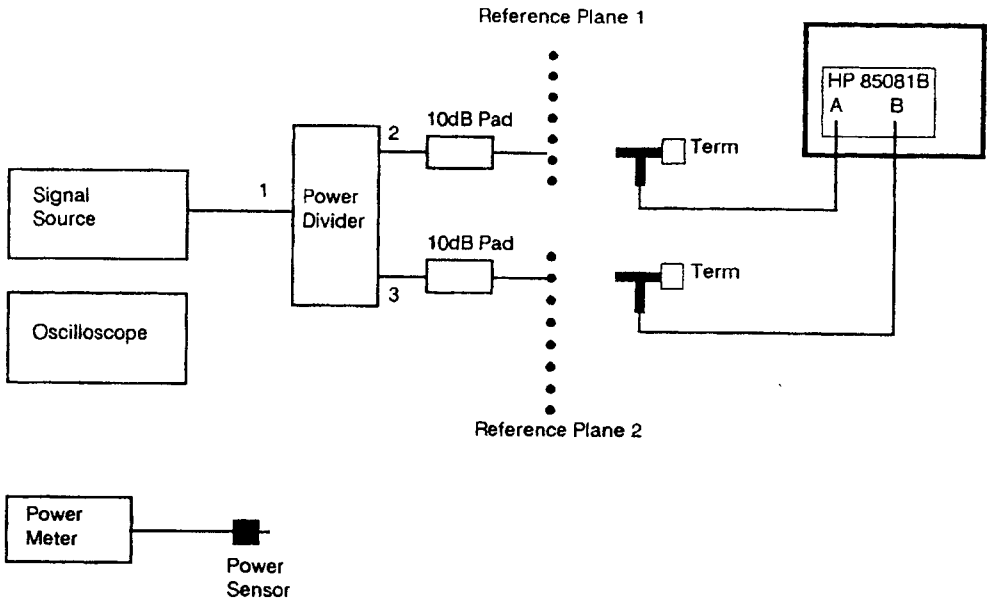


Figure 5-3. General Test Setup

5- 11 SRD Bias Adjustment

DESCRIPTION

The SRD bias is adjusted for a minimum reading in the UHF amplitude response.

PROCEDURE

1. Configure the equipment as shown in Figure 5-3, with the HP 85081B installed in either an HP 8508A or HP 70138A Vector Voltmeter mainframe.

2. Connect the Channel A 50ohm Tee to the 10dB attenuator at *Reference Plane 1.* Connect the Channel B 50ohm Tee to the 10dB attenuator at *Reference Plane 2.*

3. On the signal generator:

Frequency	1.0GHz
Level	9.0dBm.

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 1-2GHz frequency range.

5. Adjust R32 (refer to Figure 5-1) to obtain a maximum reading on DISPLAY 1.
NOTE: Adjustment of R32 changes the calibration settings for the entire HP 85081B.

5-12 Channel A and B Symmetry Adjustments

DESCRIPTION

Minimises the residual signal at the A and B probe tips.

PROCEDURE

1. Configure the equipment as shown in Figure 5-3. Separate the Channel A probe from the Channel A 50ohm Tee (being careful to observe proper static control procedures). Connect the Channel A probe to the oscilloscope channel 1 input using the probe-to-BNC adaptor (HP 10218A).

2. Separate the Channel B probe from the Channel B 50ohm Tee (being careful to observe proper static control procedures). Connect the Channel B probe to the oscilloscope channel 1 input using the probe-to-BNC adaptor (HP 10218A).

3. On the oscilloscope:

Display	Alt
Sweep Speed	1us/div
Vertical Sensitivity	20mV/div
Input Coupling	50ohm
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 1000-2000 MHz	[Lock Range][1-2GHz]	Select 1-2GHz frequency range.
[SHIFT][CAL TEST]	[Misc][CAL]	Instrument calibration.

5. Adjust R10 (Channel A symmetry) for a minimum symmetrical amplitude signal about the oscilloscope channel 1 trace.

6. Adjust R110 (Channel B symmetry) for a minimum symmetrical amplitude signal about the oscilloscope channel 2 trace.

NOTE: An inability to null out the residual signal indicates that there is sampler probe damage.

7. Reconnect the Channel A probe to the Channel A 50ohm Tee.

8. Reconnect the Channel B probe to the Channel B 50ohm Tee.

5-13 Power Level Measurements

DESCRIPTION

The power level at each reference plane is noted at frequencies of 50MHz and 1GHz and will be used in all subsequent measurements.

PROCEDURE

1. Connect the power sensor to the 10dB attenuator at *Reference Plane 1.* Connect the Channel B 50ohm Tee to the 10dB attenuator at *Reference Plane 2.*

2. On the signal generator:

Frequency	50 MHz
Output level	9.0dBm

3. Note the power meter reading. (Record this reading as P1 in the power meter record table located at the rear of this section.) This reading will be used in each of the subsequent Channel A tests at 50MHz (approx -7dBm).

NOTE: When making power meter measurements, it is essential that the power meter calibration factor is correct for the frequency being measured.

4. On the signal generator:

Frequency	1GHz
Output level	9.0dBm

5. Note the power meter reading. (Record this reading as P2 in the power meter record table located at the rear of this section.) This reading will be used in each of the subsequent Channel A tests at 1GHz (approx -7dBm).

6. Connect the power sensor to the 10dB attenuator at *Reference Plane 2.* Connect the Channel A 50ohm Tee to the 10dB attenuator at *Reference Plane 1.*

7. On the signal generator:

Frequency	50 MHz
Output level	9.0dBm

8. Note the power meter reading. (Record this reading as P3 in the power meter record table located at the rear of this section.) This reading will be used in each of the subsequent Channel B tests at 50MHz (approx -7dBm).

9. On the signal generator:

Frequency	1GHz
Output level	9.0dBm

10. Note the power meter reading. (Record this reading as P4 in the power meter record table located at the rear of this section.) This reading will be used in each of the subsequent Channel B tests at 1GHz (approx -7dBm).

5-14 (a) Channel A and B Adjustments (Channel A and B Bias Adjustments)

DESCRIPTION

The bias level is adjusted for optimum flatness of the A and B Channel high frequency amplitude. Nominally 0.6dB referred to 50MHz.

PROCEDURE

1. Connect the Channel A 50ohm Tee to the 10dB attenuator at *Reference Plane 1*. Connect the Channel B 50ohm Tee to the 10dB attenuator at *Reference Plane 2*.

2. On the signal generator:

Frequency	50MHz
Level	9.0dBm

3.	HP 8508A Setup:	HP 70138A Setup:	Function:
	[PRESET]	**[I-P]**	Instrument preset
	[B][POWER MEAS] [DISPLAY] **dB**	[Mag/Ph Measure] [DISPLAY 2][B] [Format Functn] [UNITS dB]	dBm Magnitude in both displays
	[LOCK RANGE] [SHIFT] [VIEW RANGE] 'up'/'down' arrow keys to select 50-80MHz	[Lock Range] [50-80MHz]	Select 50-80 MHz frequency range
	[SHIFT][CAL TEST]	[Misc][CAL]	Instrument calibration
	[SHIFT][SAVE REF]	[Ref][SAVE REF]	Normalizes instrument

4. On the signal generator:

Frequency	1GHz
Level	9.0dBm

5.	HP 8508A Setup:	HP 70138A Setup:	Function:
	[LOCK RANGE] [SHIFT] [VIEW RANGE] 'up'/'down' arrow keys to select 50-80MHz	[Lock Range] [50-80MHz]	Select 50-80 MHz frequency range
	[SHIFT][CAL TEST]	[Misc][CAL]	Instrument calibration

6. Adjust R15 for a reading of +A (obtained from the power meter record table at the end of the Adjustments section) in DISPLAY 1.

7. Adjust R115 for a reading of +B (obtained from the power meter record table at the end of the Adjustments section) in DISPLAY 2.

NOTE: The values of A and B are the compensated value taking account of signal level variations at the two frequencies, the tracking error of the power divider and the accuracy of the two attenuators.

5-14 (b) Channel A and B Adjustments (Channel A and B Gain Adjustments)

DESCRIPTION

The Channel A and B gain adjustments set up the overall absolute gain of the A and B channels.

PROCEDURE

1. Connect the Channel A 50ohm Tee to the 10dB attenuator at *Reference Plane 1.* Connect the Channel B 50ohm Tee to the 10dB attenuator at *Reference Plane 2.*

2. On the signal generator:

Frequency	50 MHz
Level	9.0 dBm

3.

HP 8508A Setup	HP 70138A Setup	Function
[PRESET]	[I-P]	Instrument preset
[B][POWER MEAS] [DISPLAY] **dB**	[Mag/Ph Measure] [DISPLAY 2] [B] [Format Functn] [UNITS dB]	dBm magnitude in both displays
[LOCK RANGE] [SHIFT][VIEW RANGE] 'up'/'down' arrow keys to select 50-80MHz	[Lock Range][50-80MHz]	Select 50-80MHz frequency range
[SHIFT][CAL TEST]	[Misc][CAL]	Instrument calibration

4. Using the readings recorded in the power meter record contained at the rear of the Adjustments section, adjust R3 (Channel A Gain) until the reading in DISPLAY 1 is the same as P1 (Channel A power level at 50MHz).

5. Using the readings recorded in the power meter record contained at the rear of the Adjustments section, adjust R103 (Channel B Gain) until the reading in DISPLAY 2 is the same as P3 (Channel B power level at 50MHz).

Because of the interactive nature of the adjustments, it will be necessary to repeat Section 5-14 until no further adjustments are required.

6.

HP 8508A Setup	HP 70138A Setup	Function
[SHIFT][CAL TEST]	[Misc][CAL]	Instrument calibration

7. Check that the TEST OUTPUT LED extinguishes.

5-15 Set up the Module Phase Adjustment

DESCRIPTION

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

PROCEDURE

1. Connect the Channel A 50ohm Tee to the 10dB attenuator at *Reference Plane 1.* Connect the Channel B 50ohm Tee to the 10dB attenuator at *Reference Plane 2.*

2. On the signal generator

Frequency	50 MHz
Level	9.0dBm

3.

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

4. **HP 8508A:** DISPLAY 1 should show the characters HI (this is the identification for the HP 85081B High Impedance Input Module). If other characters are displayed, adjust R38 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 85081B High Impedance Input Module). If other characters are displayed, adjust R38 until the characters HI appear.

5. **HP 8508A:** Adjust R38 for a reading of 0.0 in DISPLAY 2, and HI in DISPLAY 1. Select [HOLD VALUE] to cancel the test.

HP 70138A: Adjust R38 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] to cancel the test.

5-16 Delay Line Adjustment (Phase vs Frequency)

DESCRIPTION

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

PROCEDURE

1. Connect the Channel A 50ohm Tee to the 10dB attenuator at *Reference Plane 1.* Connect the Channel B 50ohm Tee to the 10dB attenuator at *Reference Plane 2.*

2. On the signal generator

Frequency	50 MHz
Level	9.0dBm

3.

HP 8508A Setup	HP 70138A Setup	Function
[PRESET]	[I-P]	Instrument preset
[B-A PHASE]	[Mag/Ph Measure] [DISPLAY 2] [B-A PHASE]	DISPLAY 1 - Magnitude DISPLAY 2 - Phase
[LOCK RANGE] [SHIFT] [VIEW RANGE] 'up'/'down' arrow keys to select 50-80MHz	[Lock Range] [50 -80MHz]	Select 50-80MHz frequency range
[SHIFT] [CAL TEST]	[Misc] [CAL]	Instrument calibration
[SHIFT] [SAVE REF]	[Ref] [SAVE REF]	Normalizes instrument

4. Disconnect the Channel A 50ohm Tee and connect the power sensor to the 10dB attenuator at *Reference Plane 1.* Connect the Channel B 50ohm Tee to the 10dB attenuator at *Reference Plane 2.*

5. On the signal generator

Frequency	1GHz
Level	9.0dBm

6. Using the readings recorded in the power meter record contained at the rear of the Adjustments section, adjust the signal generator output level to produce a power level equal to the value of P1 (Channel A power at 50MHz).

NOTE: When making power meter measurements, it is essential that the power meter calibration factor is correct for the frequency being measured.

7. Disconnect the power sensor and connect the Channel A 50ohm Tee to the 10dB attenuator at *Reference Plane 1.*

8.	HP 8508A Setup	HP 70138A Setup	Function
	[LOCK RANGE] [SHIFT] [VIEW RANGE] 'up'/'down' arrow keys to select 1-2GHz	[Lock Range] [1-2GHz]	Select 1-2GHz frequency range
	[SHIFT] [CAL TEST]	[Misc] [CAL]	Instrument calibration

9. Note the reading in DISPLAY 2. If this reading is within the range ±1.0 Deg changes to the delay adjustment will not be necessary. The delay line adjustment is complete and the entire adjustment procedure should be repeated from Section 5-11 until the results are stable and no further adjustments are required. However, if the reading is greater than ±1.0 Deg, continue with the procedure.

NOTE: Twists in the probe cables, or rotating the probes in the adaptors, could affect phase readings.

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

Access to the Delay Adjustment

HP 8508A Vector Voltmeter procedure:

Install the HP 85081B in the HP 8508A Vector Voltmeter mainframe. Remove the bottom cover from the HP 8508A. Stand the HP 8508A on its right side. The delay adjuster is is now accessible through the 6mm hole in the bottom of the HP 8508A. Continue with the procedure from step 8.

In some instruments, this hole may not have been provided. To add the hole to the HP 85081B Input Module compartment baseplate, refer to the location diagram shown below.

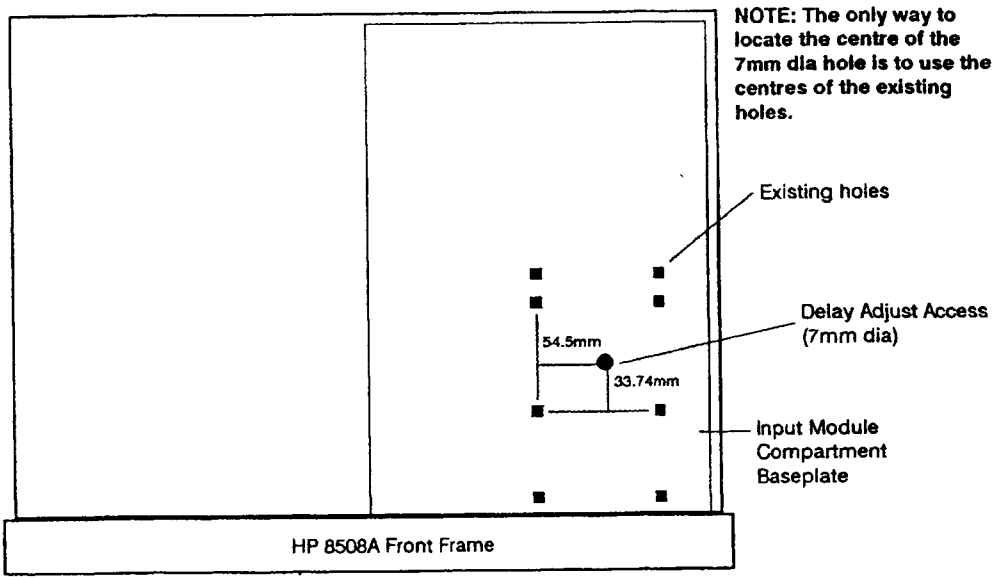


Figure 5-4. Delay Adjust Access Location

The alternative process is to extend the HP 85081B 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 Procedure:

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

10. Repeat steps 1 through 9 (with the HP 85081B installed for access to the delay adjustments).

11. Adjust the Delay Adjuster (DD01) for a reading of '0' in DISPLAY 2.

12. Interchange the probe Tees and note the new phase reading in DISPLAY 2.

13. The delay adjuster should now be adjusted for a reading equivalent to half the value obtained in step 12.

14. The adjustment is now complete.

After completing this adjustment, repeat the entire Module Adjustment procedure from Section 5-11 until the results are stable.

Table 5-3. Power Meter Readings Record

POWER METER READINGS (taken in Section 5-13)	
Reference	Power Level (dBm)
P1 (Channel A power at 50MHz)	
P2 (Channel A power at 1GHz)	
P3 (Channel B power at 50MHz)	
P4 (Channel B power at 1GHz)	

Calculate the value that DISPLAY 1 will be adjusted for and record as A.

A = P1-P2+0.6 ____ - ____ +0.6 = ____

Calculate the value that DISPLAY 2 will be adjusted for and record as B.

B = P3-P4+0.6 ____ - ____ +0.6 = ____

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

Table 6-2. Abbreviations (1 of 2)

ABBREVIATIONS

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

NOTE

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

Table 6-2. Abbreviations (2 of 2)

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

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
	85081-69200	7	1	Rebuilt Hi-Z Input Module	
	85081-60300	0	2	Probe Circuit Board	
	08405-2044	9	2	Probe Insulator	
	08405-6055	6	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	
	85081-00010	3	1	Label - Horizontal (HP 8508A System)	
	85081-00009	0	1	Label - Vertical (HP 70138A System)	

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 code 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 date code and series code coverage.

Service

Section 8

8-1 INTRODUCTION

The HP 85081B 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 susceptable 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 85081B 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 85081B 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.

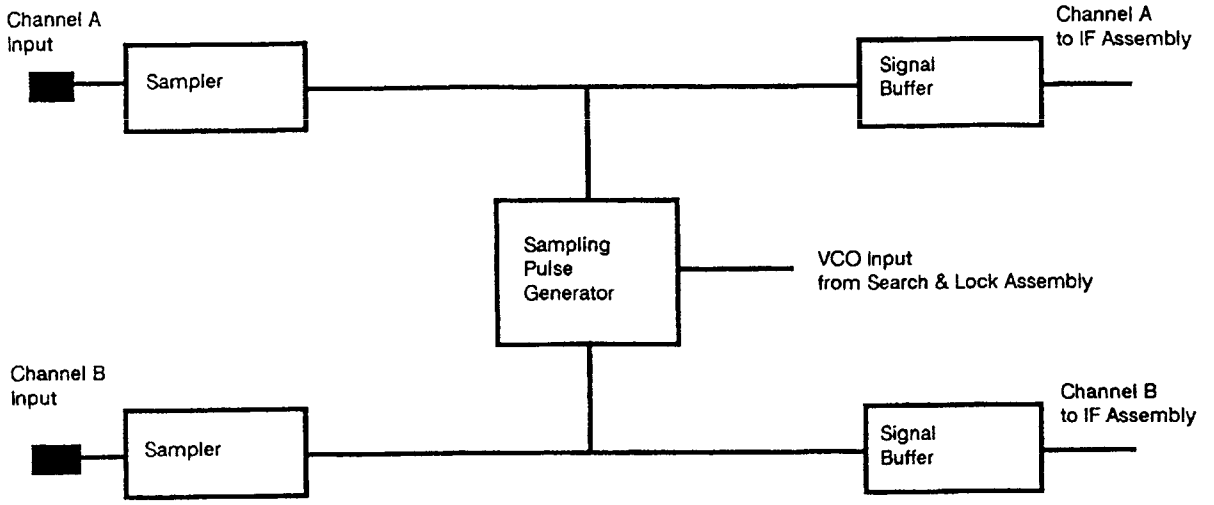


Figure 8-1. Simplified Block Diagram

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 85081B 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 85081B is properly installed in the HP 8508A Vector Voltmeter mainframe or the HP 70138A MMS Vector Voltmeter Module. The HP 85081B 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 85081B 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 85081B adjustments indicates that the HP 85081B 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.

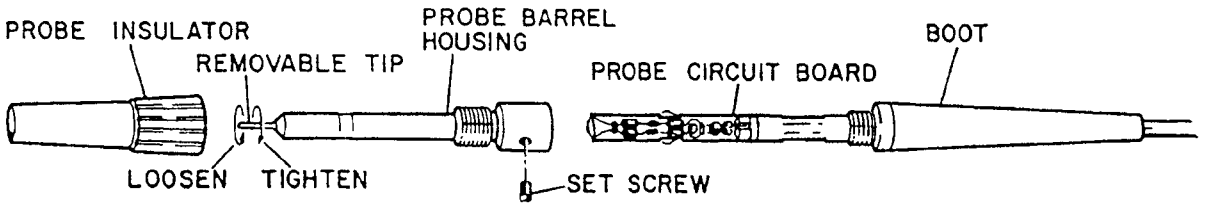


Figure 8-2. Probe Housing Assembly

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 85081B from the Vector Voltmeter.
3. Place the HP 85081B 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 85081B is now ready for operation.

Printed in U.S.A

Manual Part Number
85081-90024

Agilent Technologies