

## Errata

**Title & Document Type:** 8511A Operating & Service Manual

**Manual Part Number:** 08511-90072

**Revision Date:** September 1999

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### HP References in this Manual

This manual may contain references to HP or Hewlett-Packard. Please note that Hewlett-Packard's former test and measurement, semiconductor products and chemical analysis businesses are now part of Agilent Technologies. We have made no changes to this manual copy. The HP XXXX referred to in this document is now the Agilent XXXX. For example, model number HP8648A is now model number Agilent 8648A.

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Search for the model number of this product, and the resulting product page will guide you to any available information. Our service centers may be able to perform calibration if no repair parts are needed, but no other support from Agilent is available.

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HP 8511A  
Frequency Converter  
Test Set

Operating and Service  
Manual

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HP part number: 08511-90072  
Printed in USA  
23 September 1999

Revision 1.0

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## What You'll Find in This Manual...

- Chapter 1** • Descriptions, options and accessory information.
- Chapter 2** • Specifications and definitions.
- Chapter 3** • Installation, environmental and preparation information.
- Chapter 4** • Information on the operation of this test set.
- Chapter 5** • How to do performance tests and other performance information.
- Chapter 6** • Servicing and replaceable parts information.

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## Warranty

### Certification

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

### Warranty

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

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For assistance, call your local Hewlett-Packard Sales and Service Office (refer to “Service and Support” on page viii).

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## Service and Support

Any adjustment, maintenance, or repair of this product must be performed by qualified personnel. Contact your customer engineer through your local HP Service Center. You can find a list of HP Service Centers on the web at <http://www.hp.com/go/tmdir>.

If you do not have access to the Internet, one of these HP centers can direct you to your nearest HP representative:

---

<b>United States:</b>	Hewlett-Packard Company Test and Measurement Call Center PO Box 4026 Englewood, CO 80155-4026 (800) 452 4844 (toll-free in US)
<b>Canada:</b>	Hewlett-Packard Canada Ltd. 5150 Spectrum Way Mississauga, Ontario L4W 5G1 (905) 206 4725
<b>Europe:</b>	Hewlett-Packard European Marketing Centre Postbox 999 1180 AZ Amstelveen The Netherlands (31 20) 547 9900
<b>Japan:</b>	Hewlett-Packard Ltd. Measurement Assistance Center 9-1, Takakura-Cho, Hachioji-Shi Tokyo 192, Japan (81) 426 56 7832 (81) 426 56 7840 (FAX)
<b>Latin America:</b>	Hewlett-Packard Latin American Region Headquarters 5200 Blue Lagoon Drive, 9th Floor Miami, Florida 33126, U.S.A. (305) 267 4245, (305) 267-4220 (305) 267 4288 (FAX)
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## Safety and Regulatory Information

Review this product and related documentation to familiarize yourself with safety markings and instructions before you operate the instrument. This product has been designed and tested in accordance with international standards.

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### WARNING

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The **WARNING** notice denotes a hazard. It calls attention to a procedure, practice, or the like, that, if not correctly performed or adhered to, could result in personal injury. Do not proceed beyond a **WARNING** notice until the indicated conditions are fully understood and met.

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### CAUTION

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The **CAUTION** notice denotes a hazard. It calls attention to an operating procedure, practice, or the like, which, if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a **CAUTION** notice until the indicated conditions are fully understood and met.

## Instrument Markings



When you see this symbol on your instrument, you should refer to the instrument's instruction manual for important information.



This symbol indicates hazardous voltages.



The laser radiation symbol is marked on products that have a laser output.



This symbol indicates that the instrument requires alternating current (ac) input.



The CE mark is a registered trademark of the European Community. If it is accompanied by a year, it indicates the year the design was proven.



The CSA mark is a registered trademark of the Canadian Standards Association.

---

1SM1-A

This text indicates that the instrument is an Industrial Scientific and Medical Group 1 Class A product (CISPER 11, Clause 4).



This symbol indicates that the power line switch is ON.



This symbol indicates that the power line switch is OFF or in STANDBY position.

---



## **Safety Earth Ground**



This is a Safety Class I product (provided with a protective earthing terminal). An uninterruptible safety earth ground must be provided from the main power source to the product input wiring terminals, power cord, or supplied power cord set. Whenever it is likely that the protection has been impaired, the product must be made inoperative and secured against any unintended operation.

## **Before Applying Power**

Verify that the product is configured to match the available main power source as described in the input power configuration instructions in this manual. If this product is to be powered by autotransformer, make sure the common terminal is connected to the neutral (grounded) side of the ac power supply.

# DECLARATION OF CONFORMITY

According to ISO/IEC Guide 22 and EN 45014

**Manufacturer's Name:** Hewlett-Packard Co.

**Manufacturer's Address:** 1400 Fountaingrove Parkway  
Santa Rosa, CA 95403-1799  
USA

Declares that the products:

**Product Name:** Frequency Converter

**Model Number:** HP 8511A, HP 8511B

**Product Options:** This declaration covers all options of the above products.

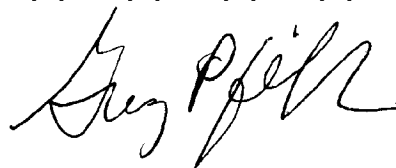
Conform to the following product specifications:

**Safety:** IEC 61010-1:1990 / EN 61010-1:1993  
CAN/CSA-C22.2 No. 1010.1-92

**EMC:** CISPR 11:1990/EN 55011:1991 Group 1, Class A  
IEC 801-2:1984/EN 50082-1:1992 4 kV CD, 8 kV AD  
IEC 801-3:1984/EN 50082-1:1992 3 V/m, 27-500 MHz  
IEC 801-4:1988/EN 50082-1:1992 0.5 kV sig. lines, 1 kV power lines

## Supplementary Information:

The products herewith comply with the requirements of the Low Voltage Directive 73/23/EEC and the EMC Directive 89/336/EEC and carry the CE-marking accordingly.



Santa Rosa, CA, USA 30 Nov. 1998

Greg Pfeiffer/Quality Engineering Manager

European Contact: Your local Hewlett-Packard Sales and Service Office or Hewlett-Packard GmbH Department HQ-TRE, Herreneberger Strasse 130, D71034 Boblingen, Germany (FAX +49-7031-14-3143)

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## Typeface Conventions

- Italics**
  - Used to emphasize important information:  
Use this software *only* with the HP 8511A.
  - Used for the title of a publication:  
Refer to the *HP8511A System-Level User's Guide*.
  - Used to indicate a variable:  
Type `LOAD BIN filename`.
- Instrument Display**
  - Used to show on-screen prompts and messages that you will see on the display of an instrument:  
The HP8511A will display the message `CALL SAVED`.
- [Keypad]**
  - Used for labeled keys on the front panel of an instrument or on a computer keyboard:  
Press `[Return]`.
- {Softkey}**
  - Used for simulated keys that appear on an instrument display:  
Press `{Prior Menu}`.
- User Entry**
  - Used to indicate text that you will enter using the computer keyboard; text shown in this typeface must be typed *exactly* as printed:  
Type `LOAD PARMFILE`
  - Used for examples of programming code:  
`#endif // ifndef NO_CLASS`
- Path Name**
  - Used for a subdirectory name or file path:  
Edit the file `usr/local/bin/sample.txt`
- Computer Display**
  - Used to show messages, prompts, and window labels that appear on a computer monitor:  
The **Edit Parameters** window will appear on the screen.
  - Used for menus, lists, dialog boxes, and button boxes on a computer monitor from which you make selections using the mouse or keyboard:  
Double-click **EXIT** to quit the program.

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# 1

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## General Information

### Introduction

The HP 8511A four channel frequency converter test set is an integral component of the HP 8510 measurement system. The HP 8511A documentation is to be used with the HP 8510 documentation, and may be inserted into the HP 8510 test accessories binder provided with your HP 8510 manual set.

The HP 8511A Operating portion consists of:

- General Information
- Installation
- Operation
- Performance Tests

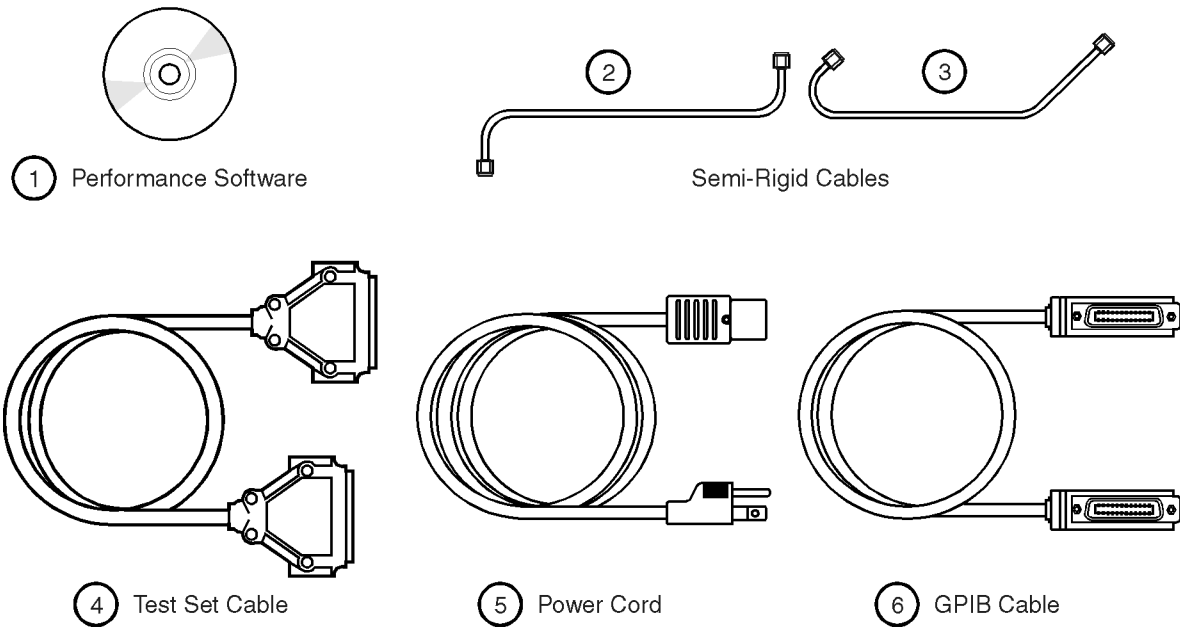
The HP 8511A Service portion consists of:

- Replaceable parts
- Service information





**HP 8511A Test Set**



accessories\_supplied.cdr

**Figure 1-1 HP 8511A Test Set with Accessories Supplied**

Reference Designator	HP Part Number	Qty	Description
1	08511-60024	2	HP 8511A,B and Antenna Measurement System Performance Verification Software Assembly
2	08510-20006	1	Semi-rigid cable
3	08510-20005	1	Semi-rigid cable
4	08510-60102	1	Test set cable assembly
5	8120-1348	1	Power cord (USA only)
6	8120-3445	1	GPIB cable

## Verifying the HP 8511A

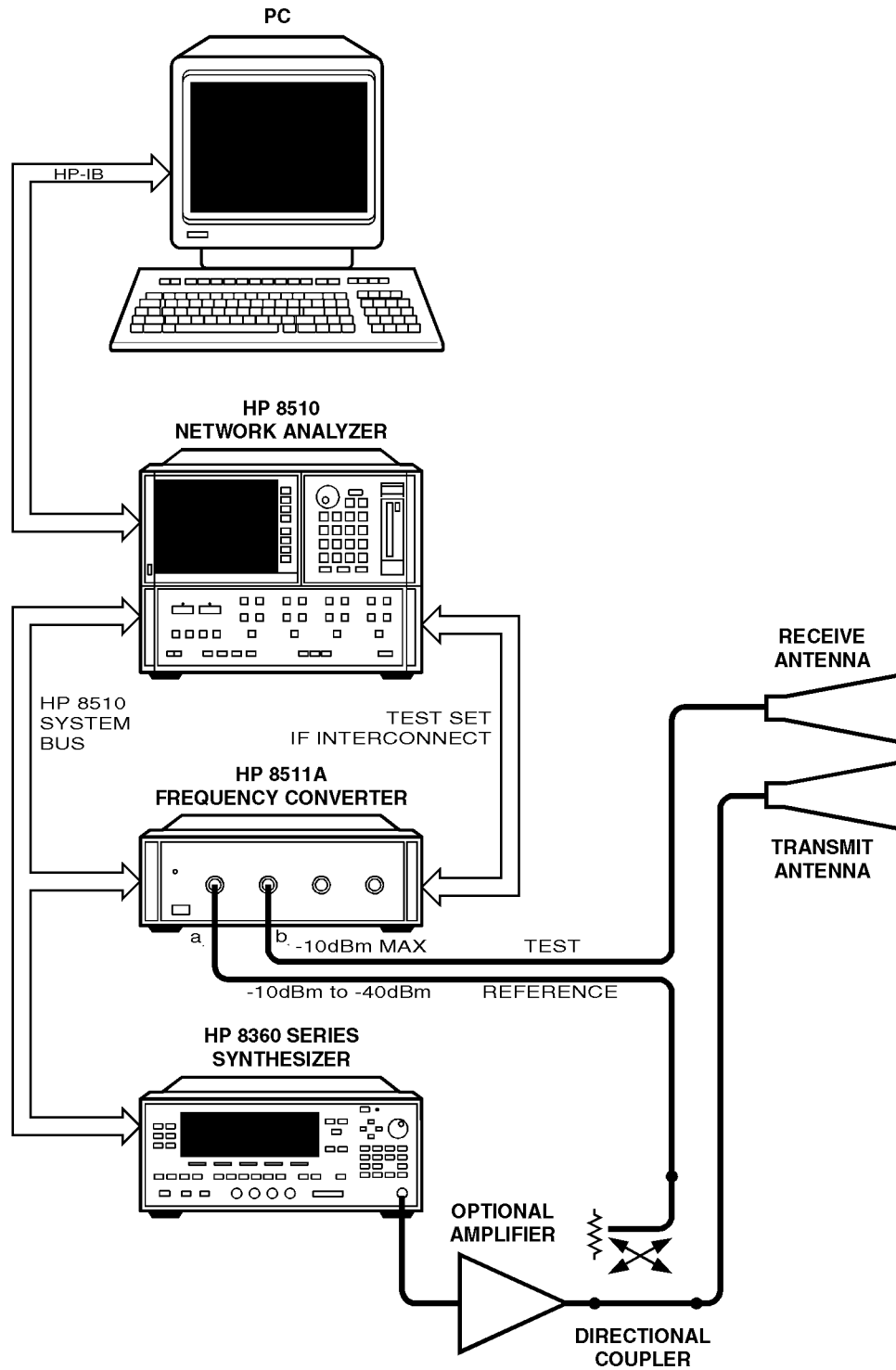
The HP 8511A has been designed to operate specifically with the HP 8510 network analyzer.

- To install the instrument, turn to Chapter 3, “Installation” of this manual.
- To check the proper operation of the HP 8511A, see “Operators Check” on page 4-3 of this manual.
- To verify that the instrument meets its published specifications, use the HP 8511A,B and Antenna Measurement System Performance Verification Software (HP part number 08511-60024).
- To troubleshoot the HP 8511A, begin with the “Service and Equipment Overview” chapter of the *HP 8510 On-Site Service Manual*.

---

## Description and Operating Characteristics

The HP 8511A four channel frequency converter test set, has been designed to operate with the HP 8510 network analyzer and other microwave accessories (like couplers and power splitters). The HP 8511A provides a convenient means of customizing a test configuration for a variety of applications within the frequency range of 45 MHz to 26.5 GHz. In addition to configurations for measuring reflection and transmission parameters of one-port or two-port devices, you can build configurations to characterize antenna parameters, radar cross sections and frequency translation devices. Figure 1-2 on page 1-5 shows one possible measurement set-up.



example\_setup.cdr

**Figure 1-2** Example of an HP 8511A Measurement Set-up

**Description and Operating Characteristics**

Table 2-1 on page 2-1 lists the operating specifications and characteristics of the HP 8511A. Note that the performance of the HP 8511A is verifiable only as part of an HP 8510 system. Verification is performed at the ports of the HP 8511A.

## Software and Hardware Requirements

### Computer Requirements

The computer requirements to successfully install and operate the software are as follows:

- 100% IBM-PC compatible computer.
- Pentium 133 or better.
- Windows 95<sup>®</sup>, Windows 98<sup>®</sup> or Windows NT<sup>®</sup> 4.0 installed.
- GPIB interface card and cable, or Hewlett-Packard GPIB card and cable.
- HP BASIC for Windows, version 6.32 or later installed.
- A CD-ROM drive.
- HP 8511A,B and Antenna Measurement System Performance Verification Software.
- Internet Explorer<sup>®</sup> 4.0 or higher or Netscape<sup>®</sup> 4.0 or higher.

## **Options**

### **Option 001**

Option 001 adds IF switching capability to allow up to four test sets to be connected to the HP 8510 at the same time. The test set in use is selected from the HP 8510 front panel. The 20 MHz IF signal is transmitted from the standard test sets through the option 001 test set to the HP 8510. IF switching is performed automatically by the option 001 test set, without reconnections.

### **Option 908**

Option 908 supplies the test set with the parts required to rack mount it with the handles removed. Refer to Chapter 3, “Installation” of this manual for additional information.

### **Option 910**

Provides a duplicate test set manual at the time of purchase.

### **Option 913**

Option 913 supplies the test set with the parts required to rack mount it with handles. Refer to Chapter 3, “Installation” of this manual for additional information.

## Service and Support Options

### Option W03

#### Warranty Conversion

Option W03 converts the standard one year return to Hewlett-Packard warranty to a 90 day on-site warranty. W03 can only be ordered at the time of instrument purchase. Instruments ordered with option WOS are identified on the serial number label, or on a special identification label supplied with the instrument.

### Option W30

#### Extended Service (Return)

Option W30 adds two additional years of return-to-HP service, to follow the first year of warranty. Option W30 can be ordered *only* at the time of sale. Instruments ordered with option W30 are identified on the serial number label, or on a special identification label supplied with the instrument.

### Option W31

#### Extended Service (On-Site)

Option W30 adds two additional years of on-site repair coverage, to follow the first year of warranty. Option W31 can be ordered *only* at the time of sale.

### Option 1BN

#### Certificate of Calibration

Option 1BN adds MIL-STD 45662A Certificate of Calibration to the instrument. This option must be ordered when the instrument is ordered.

### Option 1BP

#### Certificate of Calibration (With Data)

Option 1BP adds a MIL-STD 45662A certificate of Calibration and the corresponding calibration data to the instrument. This option must be ordered when the instrument is ordered.

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#### NOTE

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Additional system warranty information is included in the HP 8510 manual set.



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## Accessories

### Accessories Supplied

Figure 1-1 on page 1-2 refers to the HP 8511A with the accessories and part numbers supplied.

### Accessories Available

The HP 8511A can support a multitude of measurement systems. The calibration, verification and adapter kits listed below may or may not be applicable for any given system. Please consult with your local HP Field Engineer for specific recommendations. Additional information is included in the HP 8510 manual set and the HP 8510 data sheet.

Connector Type	Calibration Kit	Verification Kit	Adapter Kit
3.5 mm	HP 85052B,E	HP 85053B	
7 mm	HP 85050B,C,D	HP 85051B	
Type-N 50 $\Omega$	HP 85054B	HP 85055A	
3.5 to 7 mm			HP 85130A,B

### Cables

The choice of cables depends on the type of signal separation device(s) used and the system configuration. A twenty foot long IF interconnect cable can be ordered using HP part number 08510-60103.

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## Operating and Safety Precautions

### Electrostatic Discharge (ESD)

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#### CAUTION

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Ground yourself (with a wrist strap) and the instrument, especially when making or breaking connections at the input ports. Do not exceed the instrument's maximum input power level of +13 dBm as +13 dBm is the damage level.

Other than the above ESD precautions, you need observe only normal precautions in handling and operating the HP 8511A.

### Service

The voltages in this test set warrant normal caution for operator safety. Service should be performed only by qualified personnel. For more information on service strategy, troubleshooting procedures, replaceable parts and similar information refer to the *HP 8510 On-Site Service Manual*.

### Additional Equipment Required

Table 2-6 on page 2-6 lists additional equipment and accessories required for use with the HP 8511A frequency converter. The table also notes which items are required to verify the performance of the test set and which items are required for operation. Other equipment may be substituted if its specifications meet or exceed the specifications listed in the critical specifications column.

## **Miscellaneous**

### **Adjustments**

The HP 8511A has no adjustments. Specifically, no attempt should be made to adjust the samplers.

### **Replacement Parts**

The replaceable parts are listed in Chapter 6, “Service and Replaceable Parts” of this manual.

# 2

## Specifications

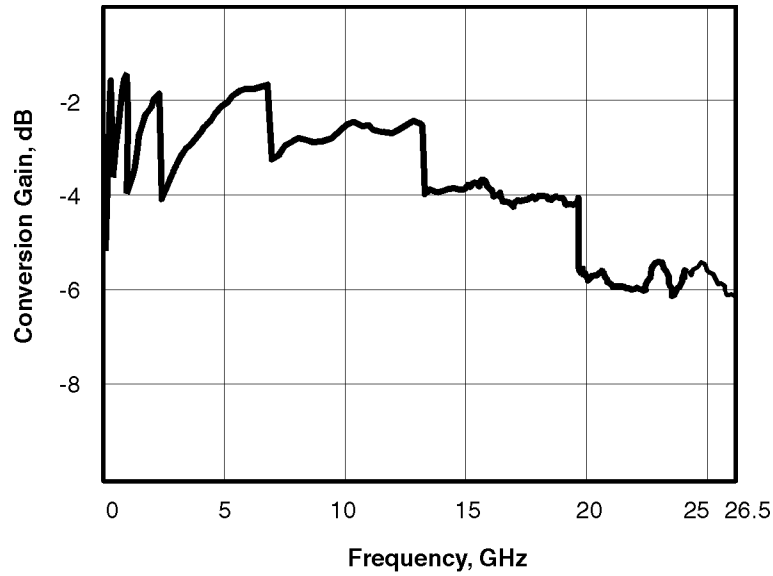
### Definitions

Specifications and characteristics differ as defined in Table 2-1. Both are based on certain operating conditions. Those conditions are defined in “Specification Assumptions” on page 2-5.

**Table 2-1 HP 8510/HP 8511A Performance<sup>1</sup>**

Parameter	0.045 to 8 GHz	8 to 20 GHz	20 to 26.5 GHz
Frequency Response Tracking			
Magnitude (ripple) <sup>2</sup>	±0.5 dB	±0.5 dB	±0.5 dB
Phase (ripple)	±5 degrees	±5 degrees	±5 degrees
Magnitude slope <sup>3</sup>	±0.08 dB/GHz	±0.08 dB/GHz	±0.08 dB/GHz
Crosstalk <sup>4</sup>	-80 dB	-80 dB	-80 dB
High Level Noise <sup>5</sup>			
Magnitude (ratio)	0.012 dB rms	0.02 dB rms	0.04 dB rms
Phase (ratio)	0.1 degrees rms	0.15 degrees rms	0.25 degrees rms
Low Level Noise <sup>6</sup>	-95 dBm	-90 dBm	-85 dBm
Conversion Gain <sup>7</sup>		-2 dB to -12 dB	

1. These performance parameters are field verifiable using the supplied software and the performance tests documented in the *HP 8511A,B and Antenna Measurement System Performance Verification Software Installation and Getting Started Guide* (HP part number 5962-0493).
2. Deviation from a least-squares-straight-line fit, excluding noise and slope. Ratio measurement of any two ports. (Note: b2 to b1 tracking is not field verified with the performance test software.)
3. Slope of least-squares-straight-line fit over full frequency range.
4. Uncorrected port to port crosstalk with averaging factor of 1024.
5. Trace noise, sweep to sweep variation.
6. Low level noise measured with 50 ohm load at port, and calculated as the mean value of a 101 point trace with IF averaging set at one. Low level noise varies with averaging factor 10 log (averaging factor).
7. See Figure 2-1 on page 2-2.



freq\_graph.cdr

**Figure 2-1 Conversion Example**

**Table 2-2 HP 8510/HP 8511A Characteristics<sup>1</sup>**

Parameter	0.045 to 8 GHz	8 to 20 GHz	20 to 26.5 GHz
Dynamic Range <sup>2</sup> all inputs	105 dB (-40 to -115 dBm)	105 dB (-40 to -115 dBm)	98 dB (-45 to -113 dBm)
Accuracy Enhanced Crosstalk <sup>3</sup> -115 dB	-115 dB	-113 dB	

1. The performance parameters listed are characteristic of the HP 8511A/HP 8510. They are typical or nominal figures and are not field verifiable.
2. Determined by 0.1 dB compression level and system low level noise. Low level noise measured with 50 ohm load at port and 1024 averaging factor. Noise floor varies with averaging factor: 10 log (averaging factor).
3. Effective crosstalk with isolation calibration, excludes noise.

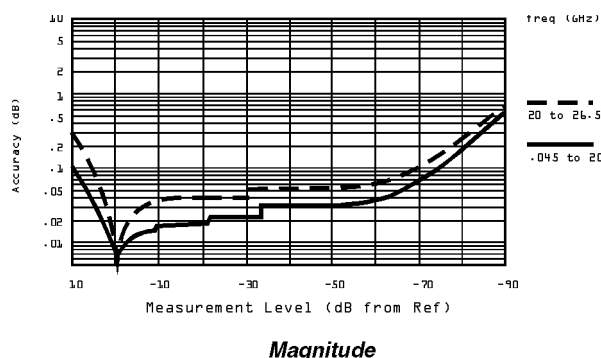
**Table 2-3 HP 8510/HP 8511A Characteristics<sup>1</sup> (part 2)**

Tracking Drift (typical)	Magnitude $0.001 \times V^{\circ}C$ , Linear Phase $(0.1 \times f(\text{GHz})) \times V^{\circ}C$ , degrees		
<b>Input Ports</b>			
Connector type:	female 3.5 mm		
Impedance:	50 ohms nominal		
Damage level:	±3 dBm (20 mW) CW RF input <sup>2</sup>		
Port input power for phase lock:	Frequency:	Minimum:	Maximum:
	0.045 to 8 GHz	-40 dBm	-5 dBm
	8 to 20 GHz	-38 dBm	-5 dBm
	20 to 26.5 GHz	-35 dBm	-5 dBm

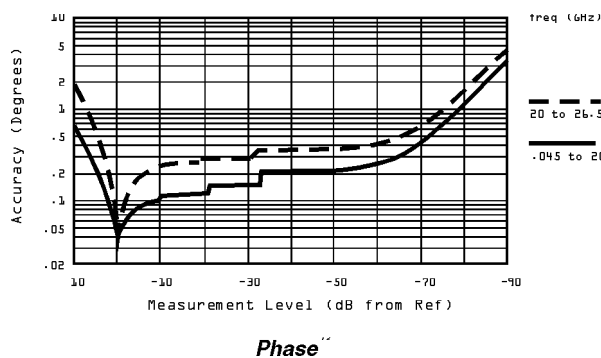
1. The performance parameters listed are characteristic of the HP 8511A/HP 8510. They are typical or nominal figures and are not field verifiable.
2. Do not exceed -5 dBm input to sampler for proper phase lock operation.

## Dynamic Accuracy

Figure 2-2 and Figure 2-3 illustrate worst case magnitude and phase uncertainty due to IF residuals and detector inaccuracies. This data excludes uncertainty due to noise, frequency response, directivity, port matches and connector repeatability.



**Figure 2-2 Worst Case Dynamic Accuracy (Magnitude)**



**Figure 2-3 Worst Case Dynamic Accuracy (Phase)\***

\* Phase detector accuracy is better than 0.02 degrees, useful for measurements where only phase changes.

## Source of System Dynamic Accuracy Errors

The factors affecting dynamic accuracy listed below are primarily a function of the IF detector. Compression through, is primarily a function of the sampler/mixer circuitry. In order to measure these values, some of the system cables must be disconnected to gain access to the individual instruments.

**Table 2-4** *IF Amplifier Gain Accuracy*

IF Amplifier Power Range <sup>1</sup>	Maximum Gain Error (dB)
-10 to -34 dBm	0
-34 to -46 dB	±0.005
-46 to -58 dB	±0.010
-58 to -70 dB	±0.015
≤0	±0.025
Detector Circularity Error	±0.003 dB peak
IF Residuals	-140 dBm <sup>1</sup>
IF Linearity	±0.003 dB
Incremental Phase Accuracy (Phase versus Phase) at Measurement Reference	±0.001 degrees/degree, not to exceed 0.02 degrees peak.

1. Measured at the IF input to the HP 8510, not at the test set test ports.

**Table 2-5** *HP 8511A Power Requirements and Physical Characteristics*

Operating Temperature	0 ° C to 55 ° C
Power	110, 120, 220 or 240 ±10% Vac; 47 to 66 Hz line frequency
Dimensions	460 mm x 133 mm x 609 mm (18.1 x 5.25 x 24 inches)
Weight	13 kg (29 lb) net; 17 kg (38 lb) shipping

---

## Specification Assumptions

The specifications of the HP 8511A assume that the following operating conditions are met:

- All system instruments have reached stable operating temperature.
- RF source: HP 8360 series source. Other sources recommended in the HP 8511A Performance Test procedures may be used for verification within the frequency limits of those sources. When used with another recommended source, the performance specifications may differ from those for the HP 8510, HP 8511A, HP 8360 series configuration. The performance test software will display and print the limits for the chosen configuration.
- Performance verification temperature:  $23 \pm 3$  °C.
- RF source power levels as follows:

Test	Power at Input Level (dBm)	
	0.045 to 18 GHz	18 to 26.5 GHz
Compression, Crosstalk	-40	-45
Conversion Gain, Tracking, High Level Noise	-45	-20



## Recommended Test Equipment

**Table 2-6 Recommended Test Equipment**

Item	Critical Specifications	Recommended Model (or Part Number)
Network analyzer	no substitute	HP 8510B, C
PC	no substitute	See "Computer Requirements" on page 1-7 for detailed information.
Disk drive	compatible with controller	
Multimeter	range: 0 to 50V	HP 3456A
Oscilloscope	50 MHz bandwidth	HP 1740A
Power Meter		HP 436 Option 022 HP 437 HP 438 HP E4418 HP E4419
Power sensor	dc to 26.5 GHz (APC 3.5)	HP 8485A
Power splitter	dc to 26.5 GHz (APC 3.5)	HP 11667B (5086-7408)
Female to female adapter	dc to 26.5 GHz (APC 3.5)	1250-1749
Male to male adapter	dc to 26.5 GHz (APC 3.5)	1250-1748
50 ohm load (male connector)	dc to 26.5 GHz (APC 3.5)	HP 909D option 040
Torque wrench, 8 in-lb, 5/16 in		8710-1765
RF cable, 1 m RF source to splitter	26.5 GHz or 50 GHz (as needed) Use good quality flex or semirigid cable.	
Attenuator, 6 dB (qty 2)	dc to 26.5 GHz (APC 3.5)	HP 8493C option 006
Attenuator, 10 dB	dc to 26.5 GHz (APC 3.5)	HP 8493C option 010
RF cable 1 M	APC 3.5	
RF cable 10 in (qty 2)	APC 3.5	

# 3

## Installation

### Introduction

This chapter explains how to install the HP 8511A test set. The topics covered include initial inspection, environmental considerations, positioning and connecting the test set for use, and packaging the instrument. Refer to the “Installation” chapter of the *HP 8510 On-Site Service manual* for more complete system connection and turn-on instructions.

### Initial Inspection

Inspect the shipping container (including cushioning material) for damage. If it is damaged, keep it until you have checked the contents for completeness. The contents are listed in Table 3-1.

In addition, check the test set mechanically and electrically. If the test set and shipping container are undamaged, passing the Operator’s Check (in Chapter 4, “Operation”) should suffice for incoming inspection. If the test set does not pass the Operator’s Check, refer to the troubleshooting procedures in the *HP 8510 On-Site Service Manual* or call your local HP Customer Engineer.

If the shipping container is damaged or defective, keep the shipping materials and notify both the carrier and the nearest Hewlett-Packard office. The HP office will arrange for repair or replacement of the test set without waiting for settlement of the claim. If the components received with the test set are incomplete, notify your nearest HP office and the deficient parts will be sent to you.

**Table 3-1** *Contents of the HP 8511A Shipping Container*

Item	Part Number
Power Cord	8120-1348
Test set cable assembly	08510-60102
GPIB cable	8120-3445
Performance test software (CD-ROM) assembly	08511-60024
<i>HP 8511A Operating and Service Manual</i>	08511-90072
Semi-rigid cables (2) <sup>1</sup>	08510-20005 08510-20006

1. For performance testing and operator's check.

## Environmental Considerations

### Operation and Storage

To perform within specifications, the HP 8511A should be operated in temperatures between 0 °C and + 55 °C with relative humidity between 5% and 95% at 40 °C (maximum dry bulb temperature). It may be operated at altitudes up to 4,500 metres (15,000 feet).

The HP 8511A may be stored in temperatures from -40 °C to +75 °C, with relative humidity up to 90% at +65 °C (maximum dry bulb temperature) and at altitudes up to 15,240 metres (50,000 feet).

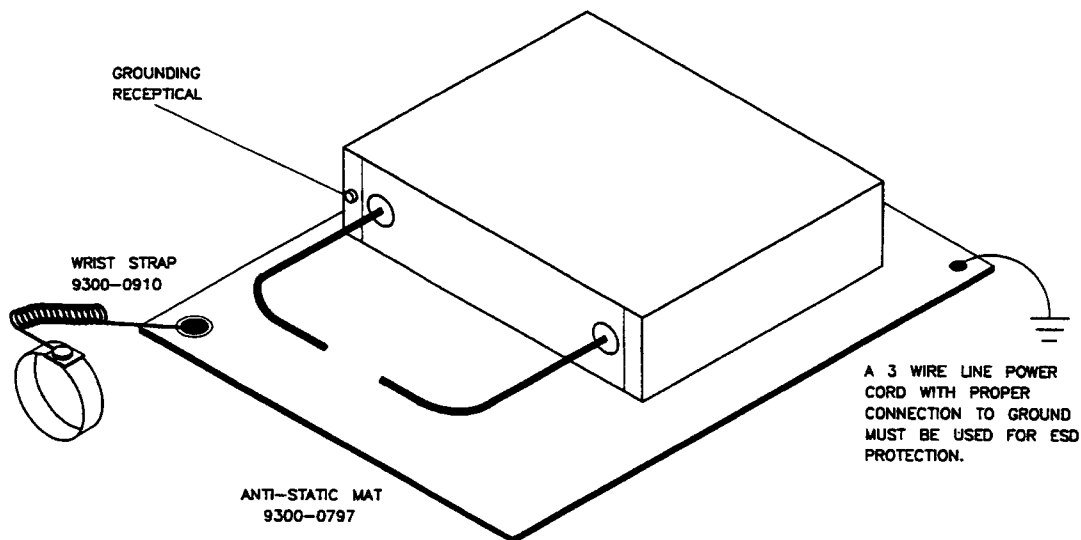
### Preparation for Use

#### Positioning the Test Set

Typically the HP 8511A is placed under the HP 8510 network analyzer or the source whether it is rack-mounted or used on a bench. To install the flanges to rack mount the instrument (with or without handles) in a standard 19 inch rack, refer to Figure 3-2 on page 3-3.

### Static-free Workstation

When installing the test set for use on a bench, place it on a grounded anti-static work surface to lessen the chance of ESD damage. The anti-static surface should extend far enough in front of the test set to provide effective protection at the test ports and cable ends. If your test set is equipped with a grounding receptacle, you may use that in place of a static mat.

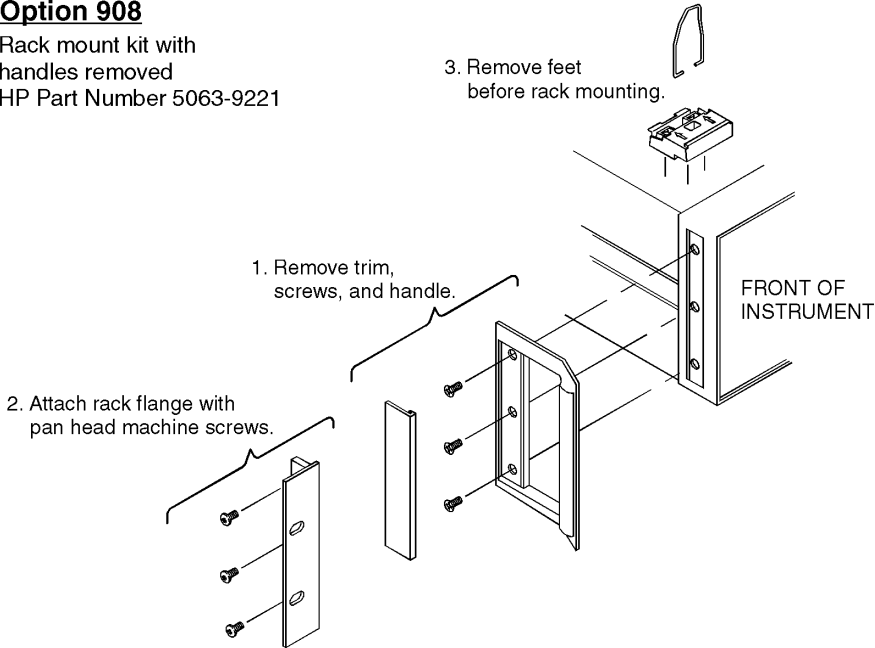


static.cdr

Figure 3-1 Static Safe Work Area

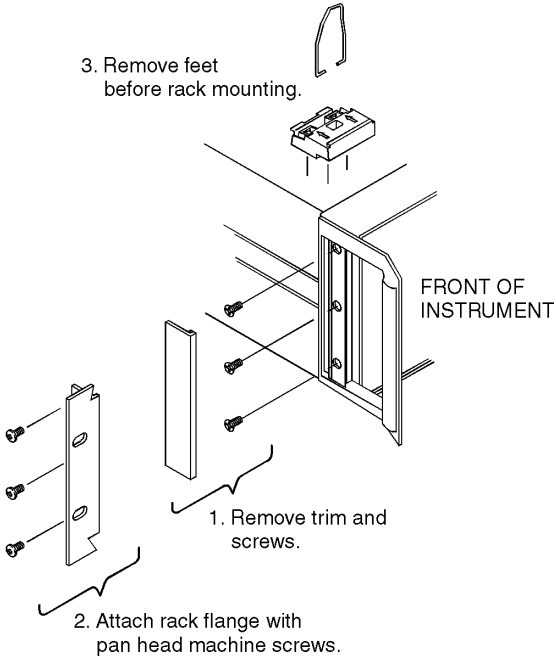
**Option 908**

Rack mount kit with handles removed  
HP Part Number 5063-9221



**Option 913**

Rack mount kit for instruments with previously attached front handles  
HP Part Number 5063-9234



rackmount.cdr

**Figure 3-2 Attaching the Rack Mounting Hardware**

The recommended system rack is the HP 85043C. Instructions for rack-mounting the HP 8511A in a system configuration with the HP 8510 are provided in the “Installation” section of the *HP 8510 On-Site Service Manual* and in the *HP 85043C System Rack Installation Manual* (HP part number 85043-90022).

## Connecting the Test Set

### Mating Connectors

**INPUT PORTS** a1, b1, b2 and a2 are precision 3.5 mm female connectors and mate with precision 3.5 mm male connectors.

The **TEST SET INTERCONNECT** connector is a series D subminiature female connector with 7 RF cavities. It mates with the corresponding male connector.

The 8510 **SYSTEM BUS** connector is a female GPIB type connector and mates with the corresponding male connectors of GPIB cables.

### Power and Control Connections

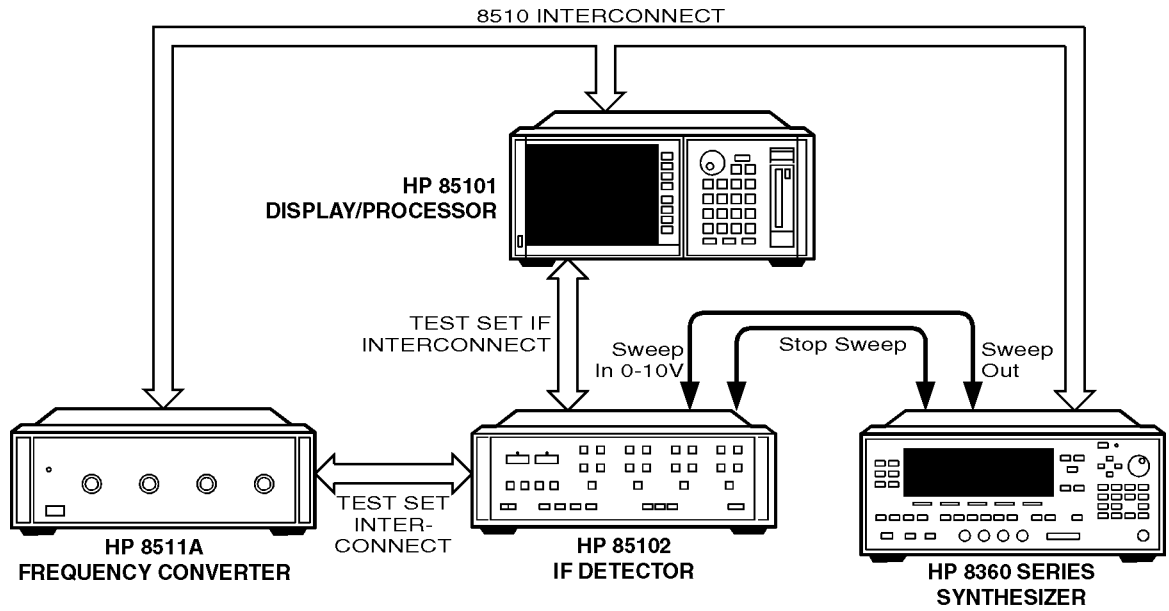
The following connections, with the exception of line power, are illustrated in Figure 3-3 on page 3-5. That figure also shows connections required for the RF source.

1. Connect the line cord between an electrical outlet and the line module to supply power to the frequency converter.
2. Connect the test set IF interconnect cable from the **J11 TEST SET INTERCONNECT** connector on the rear panel of the HP 8511A to the **J1 TEST SET INTERCONNECT** connector on the rear panel of the HP 85102 IF detector.
3. Connect the system bus cable from the HP 8511A **J12 HP 8510 SYSTEM BUS** connector to the HP 8510 **INTERCONNECT** connector of the HP 85101 display/processor. The test set IF interconnect cable and the system bus cable transmit control signals between the test set and the network analyzer.

### Signal Path Connections

The IF signals from the test set are transmitted to the HP 85102 IF detector by the test set IF interconnect cable supplied. Longer IF interconnect cables are available (see “Cables” on page 1-10) of this manual.

RF signals are typically transmitted from the source to the DUT (device under test) or signal separation devices by 3.5 mm flexible or semi-rigid cables.



tssyscon.cdr

*Figure 3-3 HP 8511A System Connections*

## **Packaging**

If reshipping is required, each test set should be repackaged in the original factory package. Containers and materials identical to those used by the factory are available through Hewlett-Packard offices.

If comparable packaging materials are used, wrap the test set in heavy paper or anti-static material. If shipping to an HP Office or Service Center, complete and attach a service tag (refer to the “Installation” chapter in the *HP 8510 On-Site Service Manual*). Use sufficient shock absorbing material on all sides of the HP 8511A to provide a thick, firm cushion and to prevent movement. Seal the shipping container securely and mark it FRAGILE.

In any correspondence with HP, refer to the HP 8511A by full model and serial number (located on the rear panel).

## Introduction

This chapter illustrates the features and functions of the front and rear panels of the HP 8511A (see Figure 4-1 and Figure 4-2 on page 4-2).

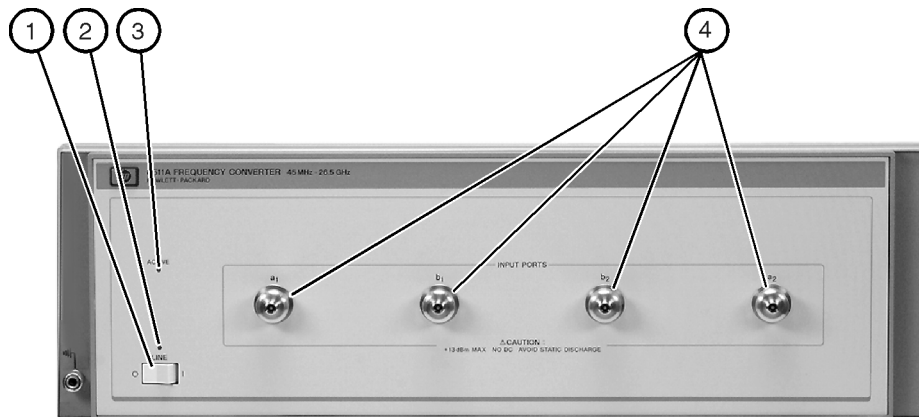
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### CAUTION

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Static Sensitive. Handle only at a static safe work station. Damage level of input ports:  $> +13$  dBm (20 mW) or  $> 1.0$  Vdc.

### Front Panel Features



fp\_features.cdr

**Figure 4-1** Front Panel Features

1. **Line Switch.** This switch turns the test set on and off. When the side of the switch labeled O is depressed, the test set is off; I is on.
2. **Line LED.** This LED goes on and off with the test set.
3. **Active LED.** This LED lights about two seconds after power is turned on, following the successful conclusion of self-test.
4. **Input Ports a1, b1, b2, a2.** These input ports transmit RF energy to the samplers within the instrument.



**NOTE**

The a1 or a2 input port must be used for system phaselock.



rp\_features.cdr

**Figure 4-2** Rear Panel Features

5. **Line module.** This assembly houses the line cord connector, line fuse and line voltage selector. Pull out the right side of the line module cover to replace or change the fuse, or to change the voltage selection. Note that the voltage selector drum must be removed to rotate it to a different setting. Recommended fuse values are printed on the rear panel.
6. **J10 Test Set Interconnect.** This connector is used only in test sets with Option 001. It allows connecting a second test set to an HP 8510 system and automatically selecting the IF output from either test set for processing by the HP 8510.
7. **J11 Test Set Interconnect.** This connector transmits the IF signal from the test set to the HP 85102 IF Detector. It also transmits control signals bidirectionally.
8. **HP 8510 System Bus Address Switch.** This five-gang binary-weighted switch selects the system bus address of the test set. The binary weight of each pole is indicated on the rear panel as are the on and off positions. Decimal twenty (off-off-on-off-on, from left to right) is the default setting.
9. **J12 HP 8510 System Bus Connector.** This connector is used for GPIB communications with the HP 85101 display/processor.

## Operators Check

The purpose of this check is to confirm that the HP 8511A frequency converter functions properly as part of an HP 8510 system. See Chapter 5, “Performance Tests” for more information.

### Equipment

**Table 4-1** *Necessary Equipment*

Description	Model or HP Part Number
Network analyzer system	HP 8510B,C
Semi-rigid cables (2)	08510-20005 08510-20006
Power splitter	HP 11667B (5086-7408) <sup>1</sup>
20 dB pad (attenuator)	HP 8493C option 020

1. Supplied with the HP 8510 service kit.

### NOTE

This procedure must be performed with a properly configured and operational HP 8510 system. See Figure 3-3 on page 3-5 or the “Installation” chapter of the *HP 8510 On-Site Service Manual* for more information.

### Procedure

Plug in and turn on the frequency converter. The line LED should light immediately and the active LED should light in about two seconds. Those indications mean that the instrument has passed its self-test. In case of difficulty, refer to the ‘Main Troubleshooting Procedure’ chapter in the *HP 8510 On-Site Service Manual* or contact your local HP Service Office.

Turn on the source and then the HP 8510.

1. Press **[PRESET]** on the HP 85102 to preset the HP 8510.

HP 8360 series systems:

- Press **STIMULUS [MENU] [STEP]** and then use the entry keys to set the sweep time to 200 ms. In narrow band systems, the power level in the frequency band generated should match the level shown in Figure 4-4 on page 4-4 for a given frequency.

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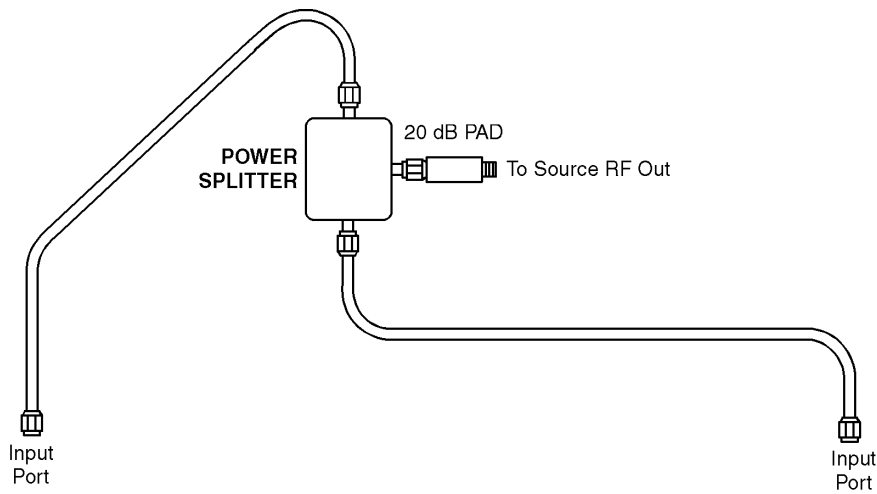
**NOTE**

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All of the observed traces should decrease from  $-15 \pm 5$  dB at 45 MHz to  $-35 \pm 5$  dB at 26.5 MHz, similar to Figure 4-4.

**a1 and b1 Test**

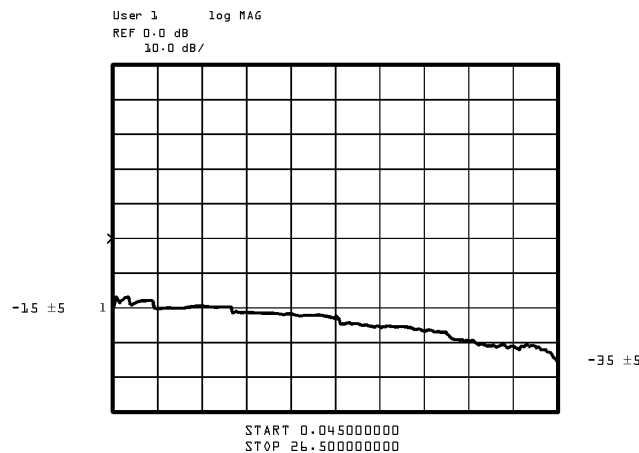
- Loosely connect the 20 dB pad to the power splitter and the RF source cable to the pad as shown in Figure 4-3 on page 4-4. Connect the other end of the RF source cable to the output of the source. Rotate the semi-rigid cables to the required position for connection to ports a1 and b1. Tighten all connections.



hdwrconfig.cdr

**Figure 4-3** *Hardware Configuration for Operator's Check*

- Press PARAMETER [MENU] [User 1 a1] to observe the a1 power level trace.



**Figure 4-4** *Typical Operator's Check CRT Trace*

- Press [User 4 b1] to observe the b1 power level trace.

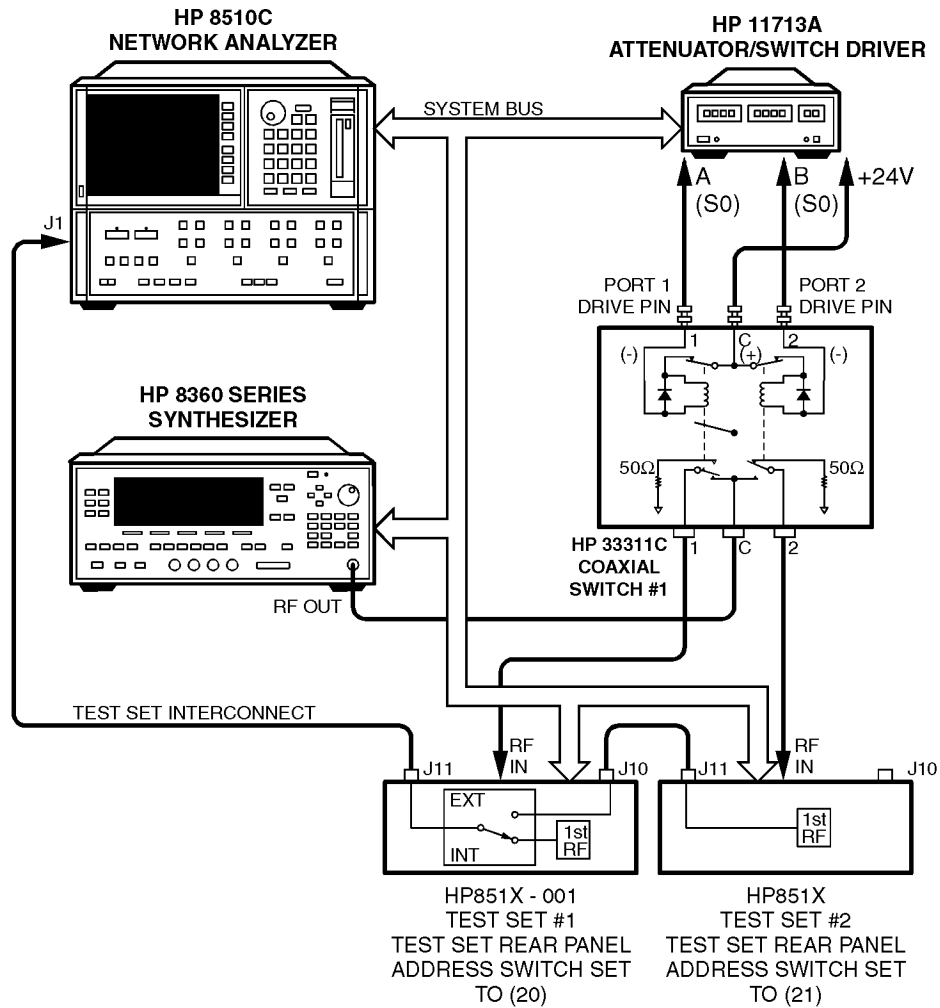
### **a2 and b2 Test**

5. Reconnect the semi-rigid cables (as in step 2) to ports a2 and b2. Disregard the running error message **Caution: "NO IF FOUND"**.
6. Press [User 3 a2] [REDEFINE PARAMETER] [PHASE LOCK] [a2] [REDEFINE DONE] to observe the a2 power level trace.
7. Press [User 2 b2] [REDEFINE PARAMETER] [PHASE LOCK] [a2] [REDEFINE DONE] to see the b2 trace.
8. If any of the traces are not within the limits noted in this procedure, check all of the connections and repeat the procedure. If symptoms persist, refer to the "Service and Equipment Overview" chapter in the *HP 8510 On-Site Service Manual*.

## Controlling Multiple Test Sets

Option 001 for the HP 851X-series test sets allows an HP 8510 to alternately control up to four test sets. While a measurement is proceeding on test set number 1, which is equipped with option 001, test device hookup can be accomplished on Test Set number 2, which does not need to be equipped with option 001, unless another test set is to be connected. When the measurement on test set number 1 is complete, then the HP 8510 can control test set number 2.

In a standard test set, the 20 MHz IF and control signals are applied directly to J11 TEST SET INTERCONNECT, which connects to the HP 8510. Option 001 adds a set of IF switches, control switches, and the J10 TEST SET INTERCONNECT connector. This allows the selection of 20 MHz test set IF signals. As shown in Figure 4-5 on page 4-7, test set number 1 can apply its IF to the HP 8510 or it can switch to pass the IF from test set number 2 through the J10 TEST SET INTERCONNECT to the HP 8510.



**NOTE:**

1. Not all system connections are shown.
2. In dual source configurations, the second can be multiplexed in a similar manner. If only one dual source test set is used, the second source can be directly connected to the appropriate test set.

tsrfif2.cdr

**Figure 4-5 RF and IF Switching with Two Test Sets**

**Table 4-2 HP 33311C Coaxial Switch Positions with Two Test Sets**

New ADDRESS of Test Set	Test Set Selected	HP 33311C Coaxial Switch Port Selected
20	1	Port 1
21	2	Port 2

## Installation

Set each test set rear panel address switch to the address listed in Table 4-2 on page 4-7 if using a two test set configuration, and Table 4-3 on page 4-10 if configuring more than two test sets. Use the supplied test set interconnect cable to connect test set number 1, J11 to the HP 8510. Use the supplied test set interconnect cable to connect test set number 2, J11, to test set number 1, J10. You may continue this test set “daisy chain” to include up to four test sets if the total length of all test set interconnect cables does not exceed 13 meters (about 40 feet). The last test set in the chain does not require option 001.

If the RF coaxial switch(s) is not incorporated into the system, then the RF input to the test set must be manually switched to the active test set.

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## Operation

### Initialization at Power-up

Upon power-up, the IF switches must be configured so that only one system test set is active. The following procedure shows how to make one test set active.

1. Check the active lights of all system test sets.
2. Check the HP 8510's expected test set address by pressing **[LOCAL] [TEST SET]**. This should match the address of the desired test set. If not, change the address.
3. If unselected test sets are active, (active light ON), deactivate the test set by temporarily addressing it. Then return to the desired address.

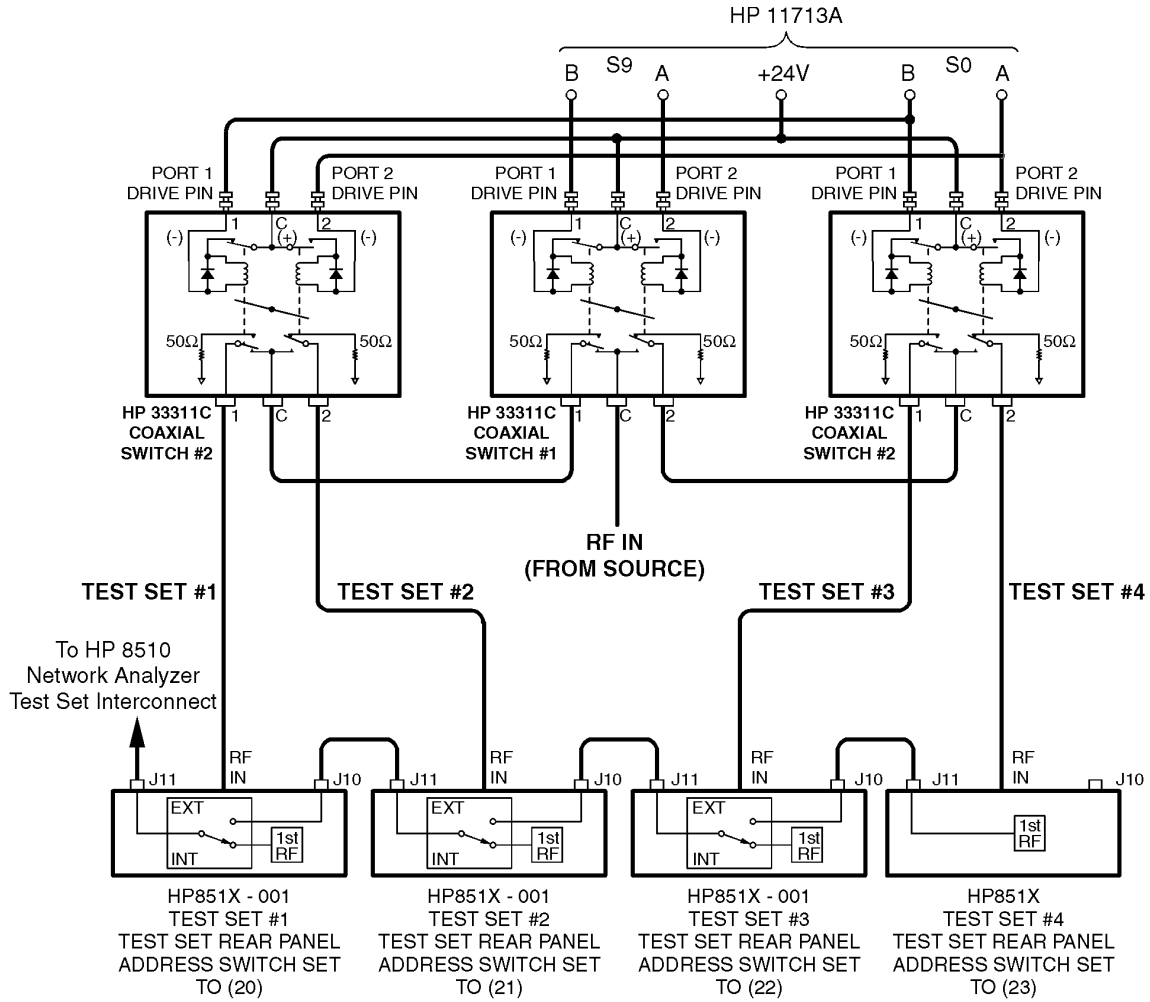
### Selecting a Test Set

**Test Set IF Switching.** The active test set is selected by the built-in capability of the HP 8510 to generate an addressed command to the test set. Each time the HP 8510 **ADDRESS of TEST SET** function is changed (see HP 8510 **LOCAL** Menu), the HP 8510 switches the previously addressed test set IF to external and the newly addressed test set IF to internal. The test set front panel **ACTIVE** indicator shows the test set status. When the test set is active the IF signals from the test set are applied directly to J11 TEST SET INTERCONNECT. When the test set is inactive the IF signals appearing at J10 are passed through to J11 and on to the next test set or the HP 8510.

The address of the test set can be changed manually from the HP 8510 front panel by selecting the **ADDRESS of TEST SET** function then entering the address of the test set and pressing **[X]**, or it can be changed under program control using the HP 8510 GPIB **ADDRESS;** command. The GPIB address of a particular test set is set by address switches on the test set rear panel.

**RF Switch Driver Commands.** A related feature of the HP 8510 is that when the **HP 8510 ADDRESS of TEST SET** function is changed, a code sequence is automatically issued over the HP 8510 system bus to the device at the **ADDRESS of RF SWITCH**. In the recommended configuration, this device is an HP 11713A attenuator/switch driver which in turn controls one or more HP 33311C coaxial switch. As shown in Figure 4-5 on page 4-7 and Figure 4-6 on page 4-10, these switches are used to select which of the test sets receive the RF Output of the network analyzer source. The exact command issued depends upon the new value of the **ADDRESS of TEST SET** function, also shown in Figure 4-5 on page 4-7 and Figure 4-6 on page 4-10.





- NOTE:**
1. Not all system connections are shown.
  2. In dual source configurations, the second can be multiplexed in a similar manner. If only one dual source test set is used, the second source can be directly connected to the appropriate test set.

tsrfif.cdr

**Figure 4-6 RF and IF Switching with Four Test Sets**

**Table 4-3 HP 33311C Coaxial Switch Positions with Four Test Sets**

New ADDRESS of Test Set	Test Set Selected	HP 33311C Coaxial Switch Port Selected	
		Switch #1	Switch #2
20	1	Port 1	Port 1
21	2	Port 1	Port 2
22	3	Port 2	Port 1
23	4	Port 2	Port 2

## **Measurement Calibration**

After selecting the active test set, perform the system calibration procedure as usual. When you select a different test set, make sure that you recall the cal set that applies to that test set.

Since the cal set limited instrument state does not include the number of the active test set, a cal set which does not apply to the current test set can be turned on without any HP 8510 caution messages appearing. This will cause errors in the displayed data because incorrect error coefficients are applied to the measured data.

It may be convenient to store a hardware state file and an instrument state file for each combination of test set and cal set. You may also store your hardware state file on a disk for future use. To change the configuration, simply recall the appropriate hardware state file, which sets the address of test set and issues the RF switch command, then the appropriate instrument state file, which recalls the cal set.

## **Operational Checks**

To check operation of a multiple test set configuration:

1. Connect a device with a known response at test set number 1.
2. Press HP 8510 [LOCAL] [TEST SET], [ADDRESS of TEST SET].
3. Enter the address of test set number 1 (this would be 20).
4. Press [x]. The test set number 1 measurement should appear.
5. Press [DISPLAY] [DATA-MEMORY] [DISPLAY: DATA and MEMORY] to store the trace for later comparison.
6. Use **ADDRESS of TEST SET** to select test set number 2.
7. Switch back to test set number 1.
8. Observe any difference in the response between the stored trace and the result after switching back and forth between the test sets. Repeat for each of the test sets. Any difference in the data believed due to the option 001 IF switch or RF switching must be investigated.

## **Performance Verification**

Standard system performance verification procedures are used to verify the operation of the option 001 test set as test set number 1. To verify the performance of another test set in the chain, select it as the active test set and proceed as usual.

# 5

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## Performance Tests

The HP 8511A ships with the HP 8511A/B and Antenna Measurement System Performance Verification Software assembly (HP part number 08511-60024). This assembly includes performance verification software with on-line help and an installation and getting started manual (HP part number 5962-0493).

Follow the *HP 8511A/B and Antenna Measurement System Performance Verification Software* assembly documentation to install the software and to verify the performance of your test set.

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## Port Return Loss

### Test Procedure (optional)

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**NOTE**

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An HP 8515A test set is required to perform this test.

1. Disconnect the HP 8511A from the GPIB, the test set IF interconnect and the RF source signal. Leave it connected to the line power.
2. Place the HP 8515 test set on top of the HP 8511A. Connect the HP 8515 test set in the system by connecting the GPIB, the test set IF interconnect, the RF source power, and the line power to it.
3. Turn on the HP 8511A and treat it like a device under test. You will use the HP 8515 test set to make S11 measurements of each port on the HP 8511A.
4. Perform the calibration at the end of the cable and take care to avoid overly sharp cable bends (defined in the cable manual). Then measure the return loss of each port on the HP 8511A.

# 6

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## Service and Replaceable Parts

This chapter of the HP 8511A manual contains service information and replaceable parts lists. Topics covered in this chapter include checks of the major assemblies and assembly removal procedures.

Other service information is also located in the MAIN TROUBLESHOOTING section of the *HP 8510 On-Site Service Manual*.

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## Replaceable Parts

### Introduction

This chapter contains information for ordering parts. “Exchange Assemblies Available” describes how to order assemblies which are available on an exchange basis. Figure 1-1 on page 1-2 and Figure 1-2 on page 1-5 identify the parts of a standard HP 8511A. Figure 3-2 on page 3-3 identifies the parts unique to Option 001 and Figure 3-3 on page 3-5 is a component location diagram of the motherboard.

### Exchange Assemblies Available

The assemblies below are replaceable on a rebuilt exchange basis at a cost saving. They are not field-repairable. Defective assemblies must be returned for credit to realize the cost savings. Thus, assemblies required for spare parts stock should be ordered by the new assembly part number which is included in the replaceable parts list of this section. See the parts list for the orderable part numbers.

- A2 = IF multiplexer board assembly (option 001 only)
- A3 = VTO summing amplifier board assembly
- A4 = GPIB board assembly
- A10, A11, A12, 13 = sampler assembly (inputs b1, b2, a1, a2)
- A14 = VTO driver
- A15 = regulator board assembly

### Replaceable Parts List

Accompanying each replaceable parts illustration is a replaceable parts list. Each list is arranged in alpha-numerical order by reference designator. The reference designator keys the part listed to the illustration. Quantity refers to the total number of the part in the instrument. The description is a brief written description of the part and may be used for ordering purposes.

### Reference Designations

- A = assembly
- B = fan
- C = capacitor
- W = cable, wire
- T = transformer

**Table 6-1 HP 8511A Replaceable Parts**

Reference Designation	HP Part Number	Qty	Description
A1	08511-60009	1	Assembly, front panel
	0180-2671	4	C AL 12000U 30V
	08511-60024	1	HP 8511A/B and Antenna Measurement System Performance Verification Software Assembly
	08510-20005	1	Cable (semi-rigid)
	08510-20006	1	Cable (semi-rigid)
	08510-60102	1	Cable Assembly, Test Set
	08510-90360	1	Quick Reference Connector Care Card
W31	08511-20001	1	Cable RF A12J1-A1
W32	08511-20002	1	Cable RF A1011-B1B2
W34	08511-20004	1	Cable RF A13J1-A2
W13	08511-60021	1	Cable SMA/SMB 150C
W15	08511-60022	1	Cable SMA/SMB 150C
W16	08513-60136	1	Cable SMB/MSC 483W
W18	08513-60138	1	Cable SMB/MSC 457W
W20	08513-60140	1	Cable SMB/SMB 305W
W13	08513-60133	1	Cable assembly A3J1-A14J1
W14	08513-60134	1	Cable assembly A3J2-J11A7
C22, 23, 26	08513-60144	1	Cable SMB/MSC 457W
W25	08513-60145	1	Cable SMB/MSC 610W
W26	08513-60146	1	Cable SMB/MSC 610W
W27	08513-60147	1	Cable SMB/MSC 762W
	08511-90072	1	HP 8511A Operating and Service Manual
	08512-20005	1	RFI gasket
	08513-00001	1	Deck
	08513-00005	1	Mounting bracket LH
	08513-00006	1	Mounting bracket RH
	08513-00015	1	Plate, support cap
	08513-00017	1	Bracket CONV AY
	08513-00018	1	Insulator brace
	08513-00037	1	Bracket enclosure
	08513-00040	1	Cover (test set top)



Service and Replaceable Parts  
**Replaceable Parts**

**Table 6-1 HP 8511A Replaceable Parts (Continued)**

Reference Designation	HP Part Number	Qty	Description
	08513-00041	1	Cover (side PERF)
	08513-20013	1	Brace (deck)
	08513-20015	1	Mounting bar
A19	08513-60001	1	Mother board assembly
A15	08513-60007	1	Regulator board assembly
A15	08513-69007	1	Regulator board assembly (rebuilt)
A3	08513-60008	1	Board assembly VTO summing amp
A3	08513-69008	1	Board assembly VTO summing amp (rebuilt)
A10, A11, A12, A13, A14	5087-7041	1	Sampler assembly + VTO driver
A10, A11, A12, A13, A14	5087-6041	1	Sampler assembly + VTO driver (rebuilt)
A20	08513-60006	1	GPIB interface board assembly
	08513-60156	2	ENC assembly doubler
	08513-65002	1	INTMD board assembly
	08514-60010	1	Rear panel
	08515-80003	1	PROM program
	0955-0207	1	Attenuator 5 dB 2 W SMA
	1250-1251	1	Adapter F SMA F SMA
	1252-4694	1	CAP PROT 50PIN F
	1252-4695	1	CAP PROT 50PIN M
	1252-5007	1	CAP PROT 24PIN F
	1400-0054	1	CLP CA .07D .37W
	1400-0650	2	CLP CA .25D .75W
	1400-0757	1	CLP CA .25D 1.00W
	1400-1209	1	CLP CA .69D 1.00W
	1401-0050	3	CAP PROT .125ID
	1401-0245	5	CAP COND .240ID
B1	08513-20031	1	Fan Assembly
C1, C2, C3, C4	0180-2671	4	CAP FXD 30 Vdc AL
	5001-0539	2	Trim side 132.6H
T1	9100-4616	1	Transformer power
	5021-5804	1	Frame FM rear
	5021-5837	4	Corner strut

**Table 6-1 HP 8511A Replaceable Parts (Continued)**

Reference Designation	HP Part Number	Qty	Description
	5021-8403	1	FR front 132.6H
	5040-6988	1	Cover (front frame)
	5041-8801	4	Foot FM .5 M
	5041-8802	1	Trim strip
	5041-8821	2	Standoff RR panel
	5062-3747	1	Cover (bottom)
	5062-3757	1	Cover (side)
	5062-3989	1	Front handle kit
	5062-6618	4	3.5 mm bulkhead female connector
	5087-7041	1	Frequency converter, sampler assembly
	6990-0028	5	Hole-plug .438 DNY
	6990-0086	5	Hole-plug .375 DNY
	8120-1348	1	Cable, BNC 1 foot
	8120-3445	1	Cable GPIB, 1 meter
	85102-00041	2	Cover blank
	9220-4962	1	End cap Corr Flt
	08510-10035	1	Test Set Performance Software

## Replacement Procedures

### Replacing the (T1) Power Transformer

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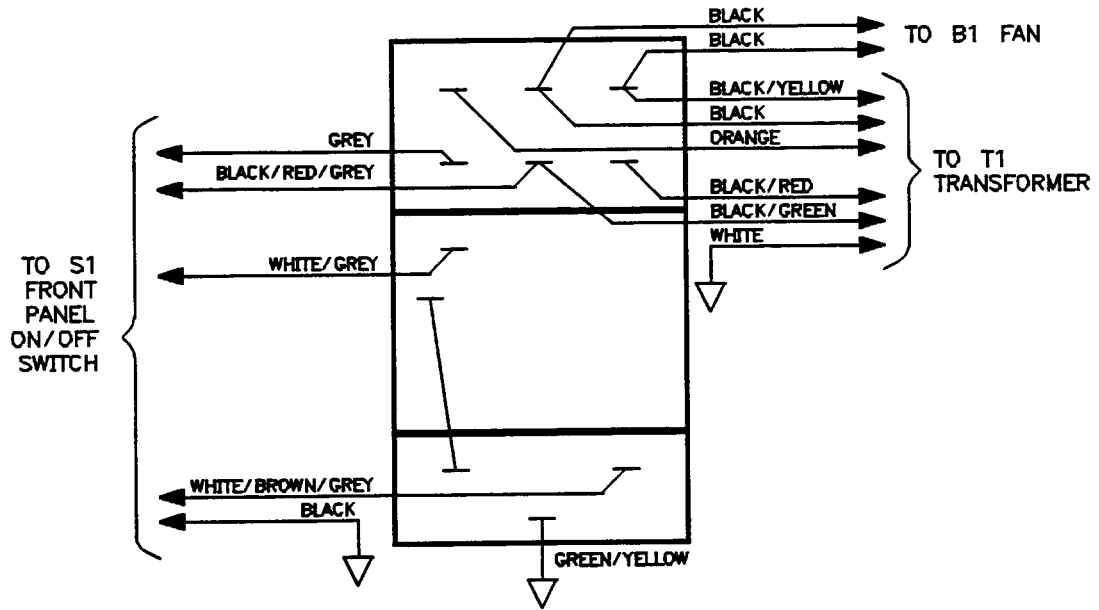
#### WARNING

---

Turn the test set OFF and disconnect the power cord from the mains. Electrocutation can result if power is not removed from the test set prior to this procedure.

#### Procedure

1. Turn the test set on its right side.
2. Unplug the transformer connector at J2 on the A15 regulator board.
3. Using a large pozidriv screwdriver, remove the four screws and washers that hold the transformer onto the rear panel.
4. Using a large pozidriv screwdriver, remove the screw that holds the transformer angle bracket to the main deck. The transformer wires soldered to the line module are short, so do not pull the transformer out too far.
5. Carefully remove the transformer from the test set and put it on the bench close to the test set.
6. Strip the heat shrink tubing off the transformer wires soldered to the line module, and unsolder the wires.
7. Unsolder the transformer ground wire connected to the chassis side rail.
8. Remove the transformer.
9. When you replace the transformer, refer to Figure 6-1 for the location of the wires connected to the line module.



linemod

Figure 6-1 Wire Connections to Line Module FL1

## Replacing the (B1) Fan

---

### WARNING

---

Turn the test set OFF and disconnect the power cord from the mains. Electrocutation can result if power is not removed from the test set prior to this procedure.

To replace the fan (B1), you must remove the transformer (T1) so that the ends of the fan wires can be unsoldered from the line module FL1. Refer to the Table 6-1 on page 6-3 for the part numbers used.

### Procedure

1. Turn the test set on its right side.
2. Unplug the transformer connector at J2 on the A15 regulator board.
3. Using a large pozidriv screwdriver, remove the four screws and washers that hold the transformer onto the rear panel.
4. Using a large pozidriv screwdriver, remove the screw that holds the transformer angle bracket to the main deck. The transformer wires soldered to the line module are short, so do not pull the transformer out too far.
5. Carefully remove the transformer from the test set and put it on the bench close to the test set.
6. Strip the heat shrink tubing off the two fan wires and unsolder the wires for the line module. Cut any cable ties holding the fan wires to nearby cables.
7. Using a small pozidriv screwdriver, remove the screw and lock washer that secure the green/yellow fan ground wire to the top of the rear panel frame.
8. Using a small pozidriv screwdriver, remove the four screws that hold the fan to the rear panel and remove the fan.

## Replacing the Frequency Converter

---

**WARNING**

---

Turn the test set OFF and disconnect the power cord from the mains. Electrocutation can result if power is not removed from the test set prior to this procedure.

The frequency converter consists of a voltage-tuned oscillator (VTO) assembly and four samplers.

### Procedure

1. Remove the semi-rigid cable attached to each of the four samplers.
2. Remove the two in-line attenuators from the samplers.
3. Remove the six flexible cables from the frequency converter by gently pulling on the gold connector.
4. Remove the four frequency converter mounting plate screws and the bracket screw that fastens the frequency converter to the chassis.
5. Unplug the ribbon cable near the front panel.
6. Unplug the four harnessed (multi-colored) wire and socket assemblies.
7. Lift the frequency converter out of the test set.
8. Remove the frequency converter bracket by removing the two pozidriv screws.

Service and Replaceable Parts  
Replacement Procedures

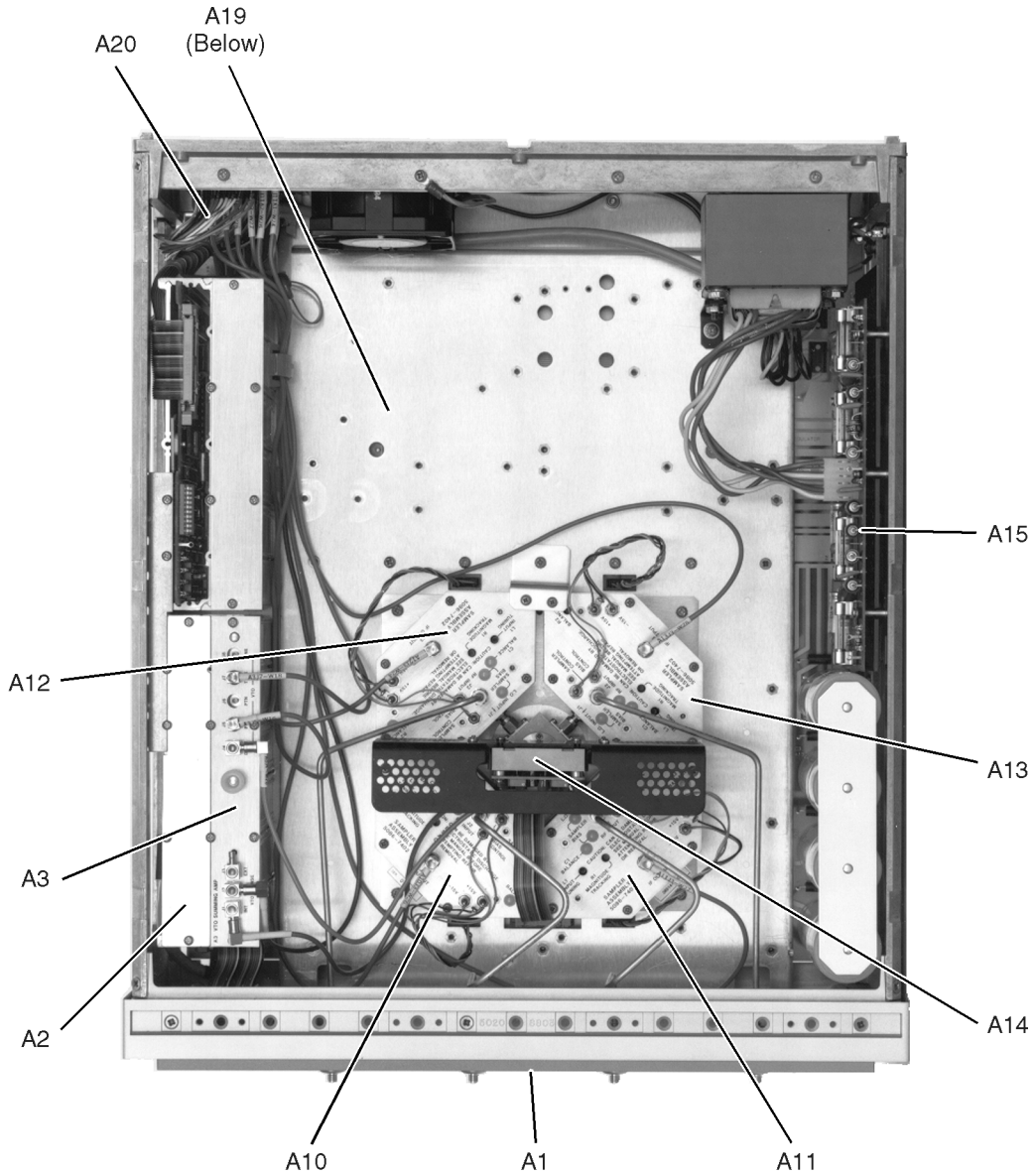


figure1.cdr

**Figure 6-2 HP 8511A Major Assemblies**

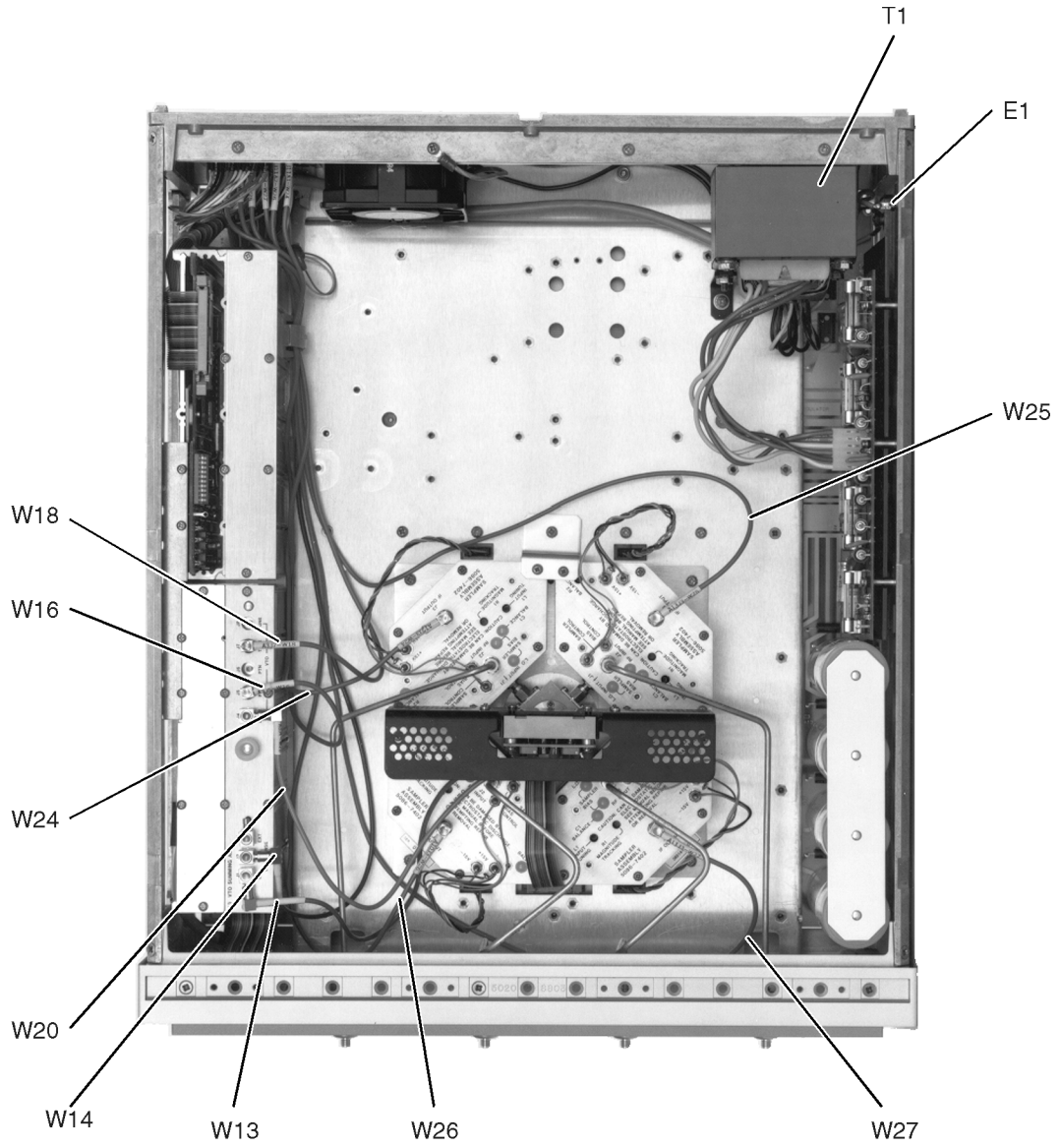


figure2\_4of5.cdr

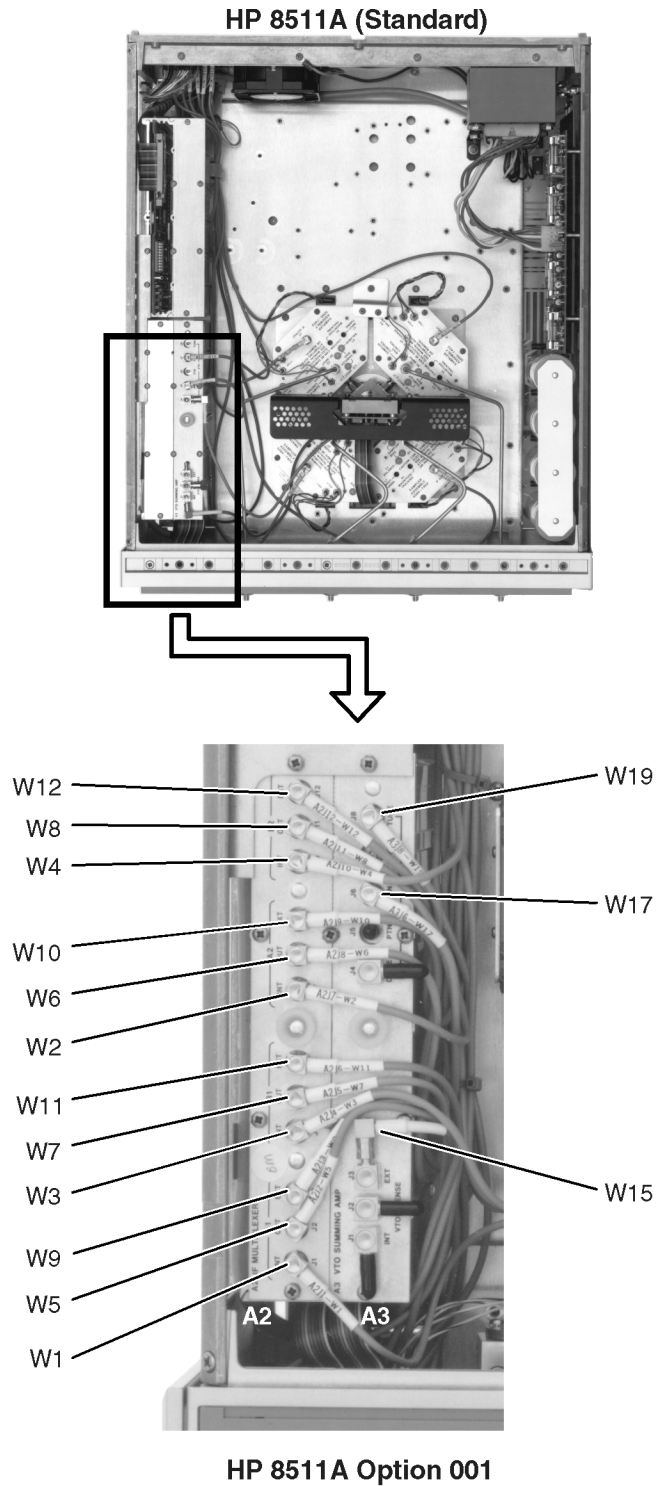
**Figure 6-3** *HP 8511A Miscellaneous Mechanical, Chassis and Electrical Parts*



Service and Replaceable Parts  
**Replacement Procedures**

**Table 6-2 HP 8511A Option 001 Replaceable Parts**

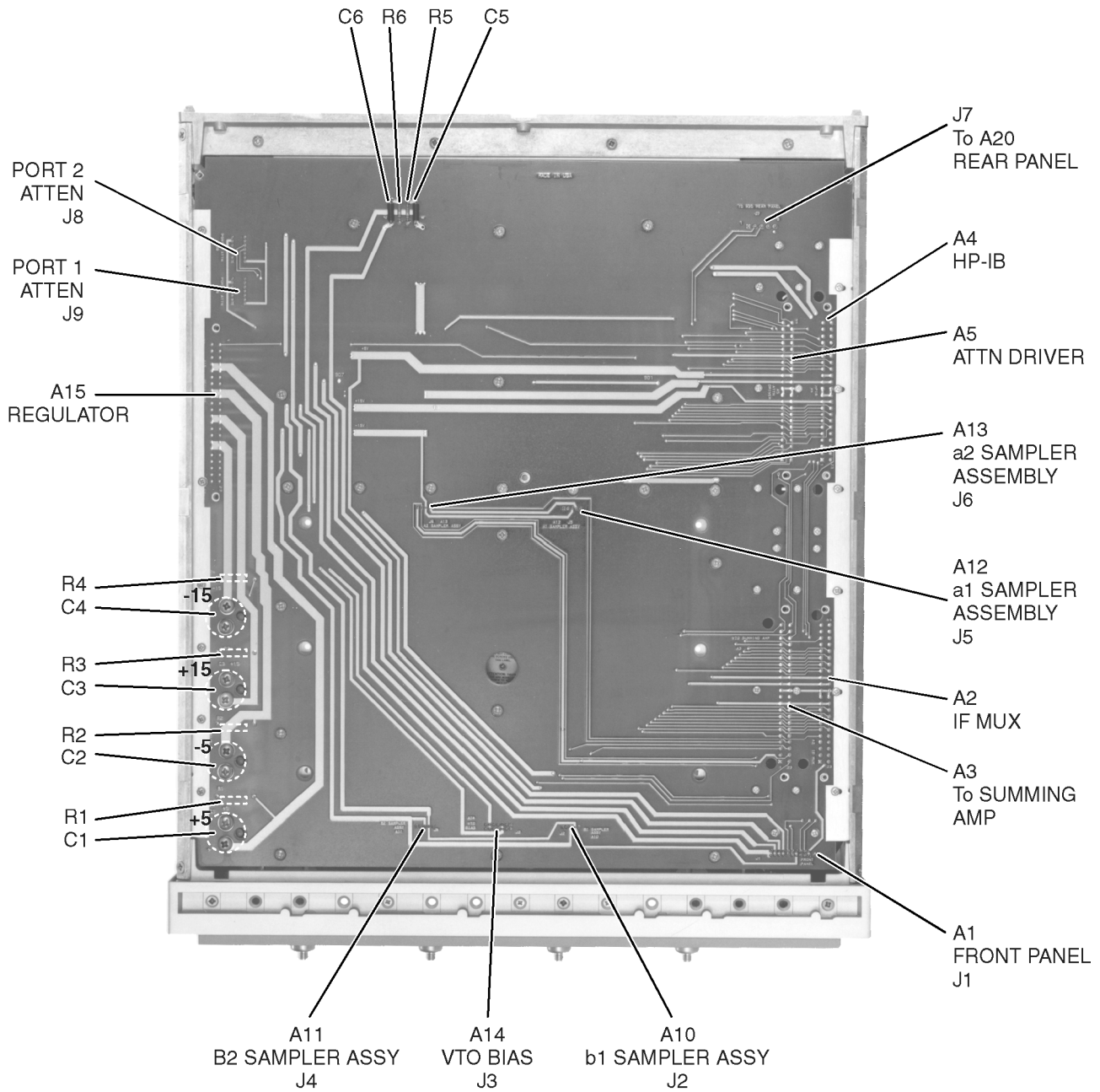
Reference Designator	HP Part Number	Qty	Description
A2	08513-60004	1	IF multiplexor board assembly
A2	08513-69004	1	IF multiplexor board assembly (rebuilt)
	08510-60102	1	Cable assembly, test set
	08510-60106	1	Cable, test set IF interconnect
W1	08513-60121	1	Cable assembly A12J3-A2J1
W2	08513-60122	1	Cable assembly A13J3-A2J7
W3	08513-60123	1	Cable assembly A10J3-A2J4
W4	08513-60124	1	Cable assembly A11J3-A2J10
W5	08513-60125	1	Cable SMB/MSC 635W
W6	08513-60126	1	Cable SMB/MSC 533W
W7	08513-60127	1	Cable SMB/MSC 737W
W8	08513-60128	1	Cable assembly A2J11-J11A3
W9	08513-60129	1	Cable SMB/MSC 711W
W10	08513-60130	1	Cable SMB/MSC 546W
W11	08513-60131	1	Cable SMB/MSC 762W
W12	08513-60132	1	Cable SMB/MSC 457W
W15	08513-60135	1	Cable SMB/MSC 610W
W17	08513-60137	1	Cable SMB/MSC 483W
W19	08513-60139	1	Cable SMB/MSC 457W
W24	08513-60144	1	Cable SMB/MSC 457W
W25	08513-60145	1	Cable SMB/MSC 610W
W26	08513-60146	1	Cable SMB/MSC 610W
W27	08513-60147	1	Cable SMB/MSC 762W
	85102-00041	1	Cover blank



topint\_001.cdr

**Figure 6-4** *Parts Unique to HP 8511A Option 001*

Service and Replaceable Parts  
**Replacement Procedures**



motherboard.cdr

**Figure 6-5 HP 8511A Motherboard**

Table 6-6 Test Sets Interconnect Table (1 of 2)

Mnemonic	Description	Signal Enters Motherboard (Connector/Pin)	Signal Enters (Assembly) →	A1 Front Panel	A2 IF Multiplexer	A3 VTO Summing Amp	A4 GPIB	A5 Attenuator/Switch	A10 Sampler	A11 Sampler	A12 Sampler	A13 Sampler	A14 VTO/Driver	A15 Regulator	A16 Step Attenuator 1	A17 Step Attenuator 2	A20 Rear Panel
			→	J1	XA2	XA3	XA4	XA5	J2	J4	J5	J6	J3	XA15	J8	J9	J7
Active	Active LED Indicator	XA4-3		4													
AB0	Address Bus Bit 0	XA4-29			29	29		29									
AB1	Address Bus Bit 1	XA4-8			8	8		8									
AB2	Address Bus Bit 2	XA4-30			30	30		30									
AB3	Address Bus Bit 3	XA4-9			9												
AB4	Address Bus Bit 4	XA4-31			31												
A1S11	Attenuator 1 Section 1 In	XA5-4													2		
A1S10	Attenuator 1 Section 1 Out	XA5-26													13		
A1S21	Attenuator 1 Section 2 In	XA5-24													9		
A1S20	Attenuator 1 Section 2 Out	XA5-3													3		
A1S31	Attenuator 1 Section 3 In	XA5-23													5		
A1S30	Attenuator 1 Section 3 Out	XA5-2													11		
A1S41	Attenuator 1 Section 4 In	XA5-25													10		
A1S40	Attenuator 1 Section 4 Out	XA5-1													4		
A1S11	Attenuator 2 Section 1 In	XA5-44													2		
A1S10	Attenuator 2 Section 1 Out	XA5-22														13	
A2S21	Attenuator 2 Section 2 In	XA5-18															9
A2S20	Attenuator 2 Section 2 Out	XA5-42															3
A2S31	Attenuator 2 Section 3 In	XA5-40															5
A2S30	Attenuator 2 Section 3 Out	XA5-20															11
A2S41	Attenuator 2 Section 4 In	XA5-19															10
A2S40	Attenuator 2 Section 4 Out	XA5-41			4												4
BNMINT	Buffered Non-Maskable Interrupt	XA4-28		28	28			28									
BSRQ	Buffered Service Request	XA4-2					2										
DB0	Data Bus Bit 0	XA4-15			15	15		15									
DB1	Data Bus Bit 1	XA4-37			37	37		37									
DB2	Data Bus Bit 2	XA4-16			16	16		16									
DB3	Data Bus Bit 3	XA4-38			38	38		38									
DB4	Data Bus Bit 4	XA4-17			17	17											
DB5	Data Bus Bit 5	XA4-39		39	39												
DB6	Data Bus Bit 6	XA4-18			18	18											
DB7	Data Bus Bit 7	XA4-40			40	40											
GND	Chassis Ground	XA15-18-23, 40-44		3, 5	11, 12, 33, 34	11, 12, 33, 34	11, 12, 33, 34	11, 12, 33, 34	2	2	2	2	3, 4		14	14	
LAP1	Low = Port 1 Attenuator Present	J8-1				19											
LAP2	Low = Port 2 Attenuator Present	J9-1				41											
LATDRVP	Low = Attenuator Switch/Driver Present	XA5-43				44		21									

Motherboard Pin Numbers

Table 6-6 Test Sets Interconnect Table (2 of 2)

Mnemonic	Description	Signal Enters Motherboard (Connector/Pin)	Signal Enters (Assembly) →	A1 Front Panel	A2 IF Multiplexer	A3 VTO Summing Amp	A4 GPIB	A5 Attenuator/Switch	A10 Sampler	A11 Sampler	A12 Sampler	A13 Sampler	A14 VTO/Driver	A15 Regulator	A16 Step Attenuator 1	A17 Step Attenuator 2	A20 Rear Panel
			Signal Exits Motherboard (Connector) →	J1	XA2	XA3	XA4	XA5	J2	J4	J5	J6	J3	XA15	J8	J9	J7
LBIOS	Low = Buffered I/O Strobe	XA4-5			5	5		5									
LBUFWR	Low = buffered Write	XA4-27					27										
LENDRA	Low = End of Range	XA3-43															2
LOPTP	Low = Option Present	XA2-20			20												
LPRTHLD	Low = Pretun Hold	J11-17															
LP2ACT	Low = Port 2 Active	XA4-4	6														3
LSWDRVP	Low = Sweep Driver Present	XA3-21						43									
LTEMP	Low = Over Temperature	XA3-7			7		7	7									
PWON	Power On	XA4-6			6	6		6									1
P1ACT	Port 1 Active	XA4-26															
P1BIASIN	Port 1 Bias Voltage In	J8 (Rear Panel)	19, 20														
P1BIASOUT	Port 1 Bias Voltage Out	Port 1 (Front Panel)	17, 18														
P2BIASIN	Port 2 Bias Voltage In	J6 (Rear Panel)	15, 16														
P2BIASOUT	Port 2 Bias Voltage Out	Port 2 (Front Panel)	13, 14														
SWEPTBIAS	Swept Bias	XA3-24							1	1	1						
SBA1	A1 Sampler On/Off	XA3-4									5						
SBA2	A2 Sampler On/Off	XA3-26										5					
SBB1	B1 Sampler On/Off	XA3-3															
SBB2	B2 Sampler On/Off	XA3-25															
TEMP2	Analog Temperature Sensor	XA3-1											1				
VSET	VTO Set Voltage	XA3-2											13, 14				
+5VA	+5 Volts to Attenuators	XA15-17, 39													6	6	
+5VCAP	+5 Volts Unregulated to Input Filter Capacitor	XA15-45												26, 27			
-5VCAP	-5 Volts Unregulated to Input Filter Capacitor	XA15-8, 9, 30, 31												8, 9, 30, 31			
+15VCAP	+15 Volts Unregulated to Input Filter Capacitor	XA15-12, 13, 34, 35												12, 13, 34			
-15VCAP	-15 Volts Unregulated to Input Filter Capacitor	XA15-16, 17, 38, 39												16, 17, 38, 39			
+5VREG	+ 5 Volts Regulated Supply	XA15-2, 3, 24, 25	1, 2	14, 36	14, 36	14, 36							9, 10				
-5VREG	-15 Volts Regulated Supply	XA15-6, 7, 28, 29											7, 8				
+15VREG	+15 Volts Regulated Supply	XA15-10, 11, 32, 33	7, 8	10, 32	10, 32	10, 32	10, 32	10, 32	4	4	4	4	11, 12				
-15VREG	-15 Volts Regulated Supply	XA15-14, 15, 36, 37		13, 35	13, 35	13, 35	13, 35	13, 35	3	3	3	3	5, 6				

Motherboard Pin Numbers