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Keysight 8514B S-Parameter and 8512A Reflection/ Transmission Test Sets

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KEYSIGHT TECHNOLOGIES

Operating and Service Manual

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Operating and Service Manual

HP 8514B S-Parameter and HP 8512A Reflection/Transmission Test Sets



HP part number: 08514-90051
Printed in USA April 1996

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Hewlett-Packard Company
Santa Rosa Systems Division
1400 Fountaingrove Parkway
Santa Rosa, CA 95403-1799, U.S.A.

Serial Numbers

This manual applies directly to HP 8514B test sets with serial prefix 2706A and to HP 8512A test sets with serial prefix 2631A.

For additional information about serial numbers, refer to “Instruments Covered By Manual” in the General Information section of this manual.

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What You'll Find in This Manual

Section I: HP 8514B or 8512A Test Set Information

- General information
- Installation
- Operation
- Specifications and characteristics

Section II: HP 8514B or 8512A Troubleshooting Information

- Test set troubleshooting/assembly replacement procedures
- Replaceable parts and accessories
- Service
- Miscellaneous, including:
  - Performance tests
  - Adjustments
  - Manual Backdating

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.

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This Hewlett-Packard system product is warranted against defects in materials and workmanship for a period corresponding to the individual warranty periods of its component products. Instruments are warranted for a period of one year. During the warranty period, Hewlett-Packard Company will, at its option, either repair or replace products that prove to be defective.

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Safety Considerations

General

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.

Safety Symbols

WARNING **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.**

CAUTION 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.



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



Indicates hazardous voltages.



Indicates an earth (ground) terminal.

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.

Typeface Conventions

Italics

- Used to emphasize important information.
- Used for the title of a publication.
- 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 HP 8516A will display the message **`CAL1 SAVED`**.

[Keycap]

- 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.

Declaration of Conformity

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, California 95403 U.S.A.

Declares that the product:

Product Name:	S-Parameter Test Set
Model Numbers:	HP 8514B
Product Options:	This declaration covers all options of the above product(s).

Conforms to the following product specifications:

Safety:	IEC 348:1978/HD 401:1980 CAN/CSA-22.2 No. 231 Series M89
EMC:	CISPR 11:1990 /EN 55011:1991, Group 1 Class A IEC 801-2:1991 /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, 500 V signal, 1000 V AC

Supplementary Information:

The product herewith complies with the requirements of the Low Voltage Directive 73/23/EEC and the EMC Directive 89/336/EEC.

The HP 8514B was qualified as part of a product family which includes the HP 8510C, HP 8530A, HP 8511A, HP 8511B, HP 8515A, HP 8516A, HP 8517A, HP 85105A, HP 85110A, and HP 85309A.

Santa Rosa, California — May 7, 1993 — Dixon Browder

Location — **Date** — **Dixon Browder / Quality Manager**

European Contact:
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am Arbeitsplatz (operator position)
normaler Betrieb (normal position)
nach DIN 45635 T. 19 (per ISO 7779)

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General Information

Introduction

The purpose of this manual is to enable you to use your HP 8514B S-parameter or HP 8512A reflection/ transmission test set effectively and confidently. These test sets are integral components of the HP 8510 measurement system. For that reason, this manual has been divided into two major portions (Operating and Service) to be an integral part of the HP 8510 documentation.

- General information
- Installation
- Operation
- Specifications

The Service part consists of:

- Test set troubleshooting
- Replaceable parts
- Service
- Miscellaneous, including:
  - Performance tests
  - Adjustments
  - Backdating

The major topics of this section, General Information, are:

- how to use the test set what the test set is
- operating, safety and warranty considerations

- test set specifications

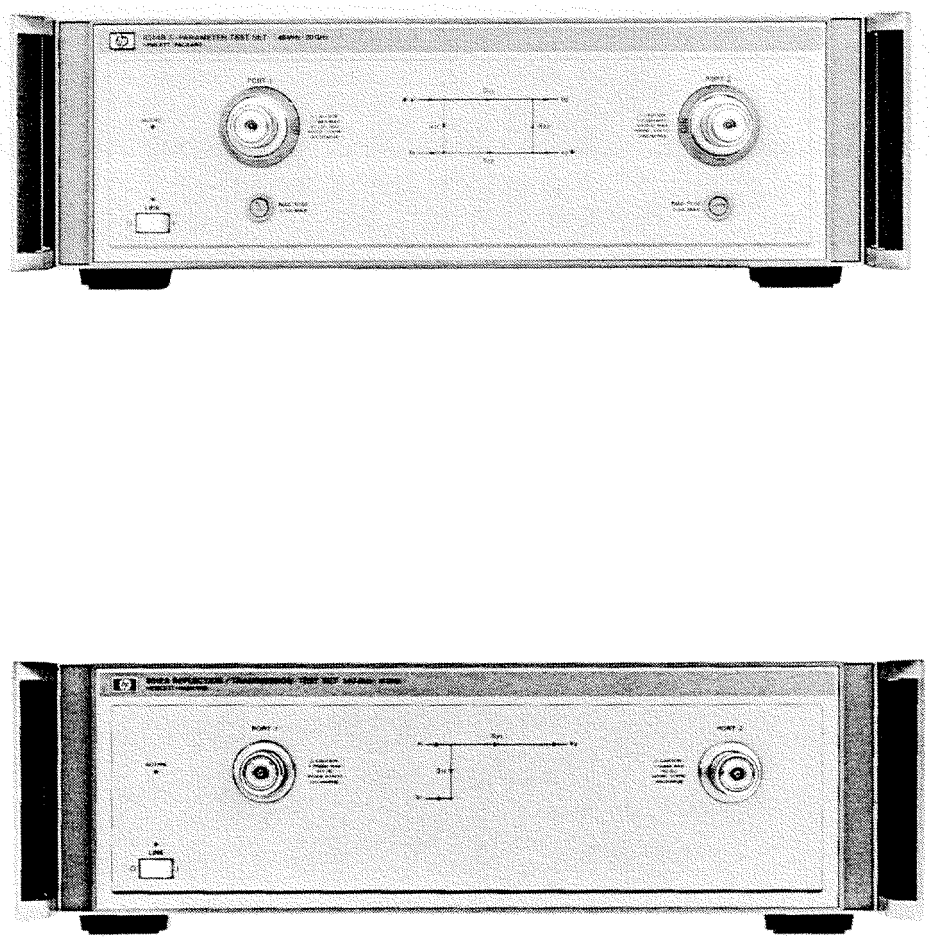


Figure 1-1 HP 8514B (upper) and HP 8512A Test Sets

Verifying the Test Set

The HP 8514B and HP 8512A have been designed to operate specifically with the HP 8510 network analyzer.

- To install the instrument, turn to the Installation section of this manual.
- To check the proper operation of the test set, see the Operator's Check in the Operation section of this manual.
- To see the specifications of the test set, refer to Specifications in the *HP 8510B System Manual* or General Information in volume 1 of the HP 8510A manual set.
- To verify that the instrument meets its published specifications, turn to the Performance Tests section in the *HP 8510B System Manual* or Volume 2 of the *HP 8510A Operating and Service Manual*.

NOTE The HP 8514B can be performance tested only to 18 GHz with the HP 8510A software.

- To troubleshoot the test set, refer to the Service Overview section and the Test Set Troubleshooting section of the *HP 8510B Service Manual*, or refer to the Service section in Volume 4 of the *HP 8510A Operating and Service Manual*. Otherwise call your local Hewlett-Packard office.

Instruments Covered by Manual

You will find a two-part serial number on the rear panel of the instrument. The first four digits and the letter are the serial number prefix. The last five digits are the sequential suffix which is unique to each test set. The contents of this manual apply directly to test sets with the same serial number prefix as the one(s) in the front of this manual.

If the serial prefix of your test set is not listed in the front of this manual, your instrument differs from those documented in this manual. The differences are documented in the yellow manual changes supplement supplied with the manual.

To keep this manual as current and accurate as possible, Hewlett-Packard recommends that you periodically request the latest manual changes supplement, as it may contain replacement information as well as change information. The supplement for this manual is keyed to the manual's print date and part number (in the front of this manual) and is available on request from Hewlett-Packard.

Description and Operating Characteristics of the Instrument

The combination of the HP 8514B test set with the HP 8510 network analyzer and source provides a system for making S-parameter measurements over the frequency range of 45 MHz to 20 GHz. This system is suited for making measurements on two port devices when it is inconvenient or inexpedient to physically reverse the DUT (device under test) to measure all four S-parameters.

The HP 8514B uses two couplers for signal separation. For measurements of active devices, the standard HP 8514B includes:

- four RF to IF converters to measure all four S-parameters without reconnecting the DUT
- two 90 dB programmable step attenuators for changing (in 10 dB steps) the incident power level at both ports
- two bias tees for applying external dc bias to both test port center conductors.

In the “High Forward Dynamic Range Configuration” (option 003), the Port 2 coupler is reversed to optimize dynamic range in the forward measurement direction. Because the b2 sampler is connected to the coupler throughpath instead of the coupled arm, there is less isolation between the b2 sampler and Port 2, and the b2 power level will be higher than b1. This configuration is better for wide dynamic range or reciprocal devices or components like filters, cables, or antennas, where S_{12} is generally not measured. However, as a result of the lower isolation between the test port and the sampler, “sampler bounce,” appearing as an occasional spurious response related to the VTO frequency, can be noticeable in this “asymmetrical” test set.

The HP 8512A reflection/transmission test set uses one coupler for signal separation. The standard HP 8512A has:

- three RF to IF converters, for making reflection (S_{11}) and transmission (S_{21}) measurements
- no step attenuators to internally change the incident power level
- no bias tees to apply external DC bias to the test port center conductors

Table 4-2 on page 4-2 and Table 4-3 on page 4-3 list additional characteristics of the HP 8514B and 8512A, respectively. Figure 1-2 shows the HP 8514B in a typical measurement set-up.

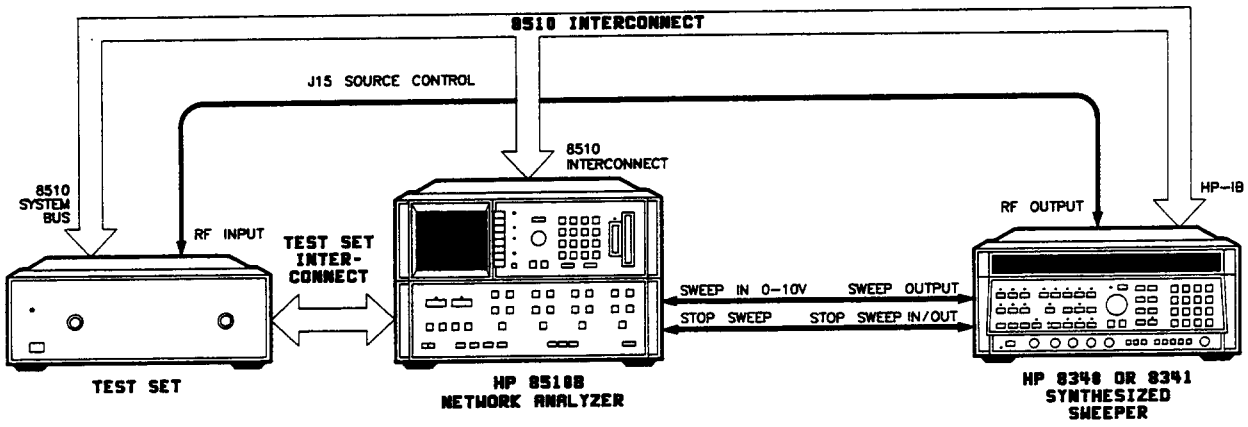


Figure 1-2 Typical HP 8514B Measurement Set-up

Options

Option 001

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

Option 002 (HP 8514B only)

This option deletes the 90 dB programmable step attenuators and the dc bias tees. Note that bias can be applied externally, using the HP 11612A bias tee, if bias is required but attenuation not.

Option 003 (HP 8514B only)

This high forward dynamic range configuration is described in detail in this section, under “Description and Operating Characteristics of the Instrument” on page 1-5.

Option 002/003 (HP 8514B only)

This option is a combination of option 002 and option 003, which were previously described.

Option 908

This option supplies the test set with the parts required to rack mount it with handles removed. Refer to the Installation section of this manual for additional information.

Option 910

This option provides a duplicate test set manual.

Option 913

This option supplies the test set with the parts required to rack mount it with handles. Refer to the Installation section of this manual for additional information.

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 W03 are identified on the serial number label, or on a special identification label supplied with the instrument.

Option W30, Extended Service

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 purchase. Instruments ordered with option W30 are identified on the serial number label, or on a special identification label supplied with the instrument.

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

Accessories

Accessories Supplied

Figure 2-1 on page 2-3 shows the accessories supplied with the HP 8514B and 8512A test sets. The accessories, with part numbers, are listed in the Installation section for both test sets.

Accessories Available

NOTE Additional HP 8510 system accessory information is located in the HP 8510 manual set.

Calibration, Verification and Adapter Kits

Hewlett-Packard offers several calibration kits suitable for calibrating an HP 8510/8514B or 8512A when making error-corrected measurements. Each calibration kit noted below includes a set of precision standards to calibrate an HP 8510 system in the indicated interface. Additional information is located in the System and Documentation Overview section of the *HP 8510B System Manual* and volume 1 of the HP 8510A manual set.

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 50Ω	HP 85054B	HP 85055A	
3.5 to 7 mm			HP 85130A/B[1]

1. These adapters attach directly to the 3.5 mm test ports.

RF Cables

The HP 85131D 3.5 mm Test Port Return Cable Set is a pair of 21 inch long cables specified from DC to 26.5 GHz. Typically it is used with the HP 8514B. One of the cables has 3.5 mm (f) connectors, the other cable has one 3.5 mm (f) and one 3.5 mm (m) connector.

The HP 85132C 7 mm Test Port Return Cable is a single, 36 inch cable for measurements where the device is connected directly to one test port. It is typically used with the HP 8512A. The cable has two 7 mm connectors. Its frequency range is DC to 18 GHz.

Transistor Test Fixture Kit

The HP 85041A Transistor Test Fixture Kit (TTF) is a comprehensive measurement system for testing and characterizing stripline packaged microwave transistors. Although it has 7 mm connectors and a frequency range limited to 18 GHz, the TTF may be easily adapted for use with the HP 8514B. Please consult with your local HP Systems Engineer for specific recommendations.

Operating and Safety Precautions

Electrostatic Discharge Information

Electrostatic discharge (ESD) can damage or destroy electronic components. All work on electronic assemblies should be performed at a static-safe work station. Figure 1-3 shows an example of a static-safe work station using two types of ESD protection:

1. Conductive table-mat and wrist-strap combination.
2. Conductive floor-mat and heel-strap combination.

Both types, when used together, provide a significant level of ESD protection. Of the two, only the table-mat and wrist-strap combination provides adequate ESD protection when used alone.

To ensure user safety, the static-safe accessories must provide at least 1 MΩ of isolation from ground. Refer to Table 1-1, “Static-Safe Accessories” for information on ordering static-safe accessories.

WARNING **These techniques for a static-safe work station should not be used when working on circuitry with a voltage potential greater than 500 volts.**

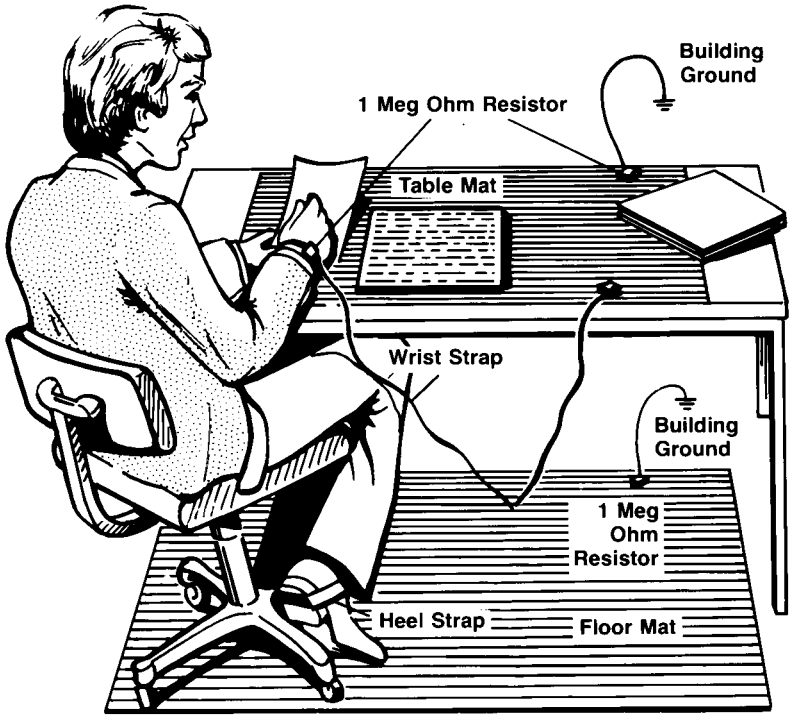


Figure 1-3 ***Example of Static-Safe Workstation***

Reducing ESD Damage

The following suggestions may help reduce ESD damage that occurs during testing and servicing operations.

- Before connecting any coaxial cable to an instrument connector for the first time each day, momentarily ground the center and outer conductors of the cable.
- Personnel should be grounded with a resistor-isolated wrist-strap before touching the center pin of any connector and before removing any assembly from the unit.
- Be sure that all instruments are properly earth-grounded to prevent a buildup of static charge.

Table 1-1, “Static-Safe Accessories” lists static-safe accessories that can be obtained from Hewlett-Packard using the HP part numbers shown.

Table 1-1 Static-Safe Accessories

HP Part Number	Description
9300-0797	Set includes: 3M static control mat 0.6 m X 1.2 m (2 ft X 4 ft) and 4.6 cm (15 ft) ground wire. (The wrist-strap and wrist-strap cord are not included. They must be ordered separately.)
9300-0980	Wrist-strap cord 1.5 m (5 ft).
9300-1383	Wrist-strap, color black, stainless steel, without cord, has four adjustable links and a 7 mm post-type connection.
9300-1169	ESD heel-strap (reusable 6 to 12 months).

Operating Power Level

Do not exceed the front panel operating level power input as noted:

Table 1-2 Maximum Operating Power Level

Maximum Operating Power Level	Test Port
+17 dBm	HP 8514B Port 1 and 2
+20 dBm	HP 8512A Port 1
–13 dBm	HP 8512A Port 2

Service

The voltages in this test set warrant normal caution for operator safety. Nevertheless, service should be performed only by qualified personnel. Service strategy, troubleshooting procedures and replaceable parts information for the HP 8514B and 8512A test sets are in the *HP 8510B Service Manual*.

Additional Equipment Required

Table 4-5 on page 4-4 lists additional equipment and accessories required for use with the HP 8514B and 8512A test sets. The table notes which items are required to verify the performance of the test sets and which are required to operate them. Other equipment may be substituted if its specifications meet or exceed the specifications listed in the critical specifications column.

2

Installation

Introduction

This section explains how to install the HP 8514B and HP 8512A test sets. The topics covered include initial inspection, environmental considerations, positioning and connecting the test set for use, and packaging the instrument. Refer to the Installation section of the HP 8510 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 and illustrated in Figure 2-1.

In addition, check the test set mechanically and electrically. If the test set and shipping container are undamaged, passing the Operator's Check (in the Operation section) should suffice for incoming inspection. If the test set does not pass the Operator's Check, refer to the troubleshooting procedures in the service portion of this manual. Alternatively, call your local HP customer engineer.

If the shipping container is damaged, perform the performance tests outlined in the HP 8510 manual set. If the test set fails the performance tests, or is damaged or defective, keep the shipping materials and notify both the carrier and the nearest Hewleft-Packard office. The HP office will arrange for repair or replacement of the test set without waiting for settlement of the claim. If any of the following accessories are not received with the test set, notify your nearest HP office and the missing parts will be sent to you.

Environmental Considerations

Operation and Storage

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

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

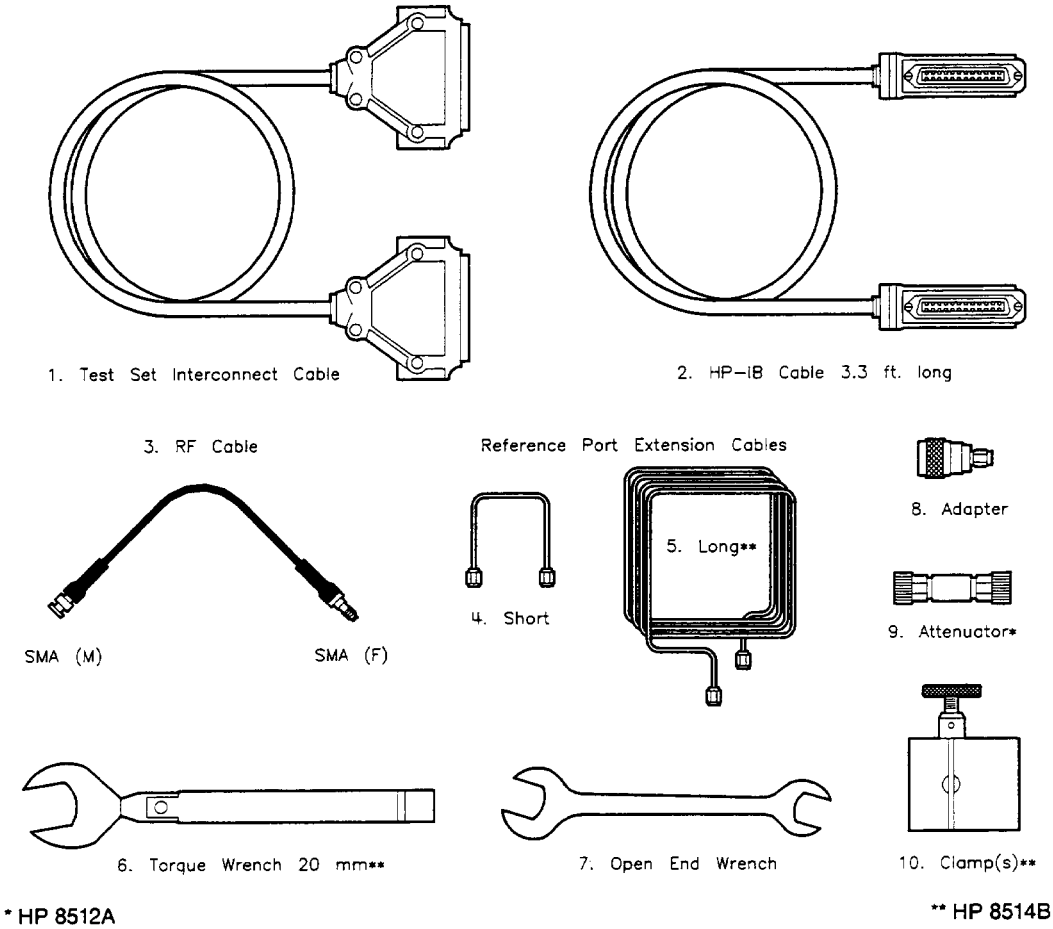


Figure 2-1 Accessories Supplied with HP 8514B and HP 8512A

Item	HP Model or Part Number	
	HP 8514B	**HP 8512A**
Power cord [1]	8120-1348	8120-1348
1. Test set IF interconnect cable	08510-60102	08510-60102
2. HPIB cable	8120-3445	8120-3445
3. RF cable (flexible)	08513-60009	08513-60009
4. Short reference port extension cables (2)	08512-20019	08512-20019
5. Long reference port extension cables (2)	08514-20013	
6. Torque wrench	8710-1764	
7. Open end wrench 1/2 in. X 9/16 in.	8710-1770	
8. Type-N (m) to SMA (m) adapter	1250-1894	1250-1894
9. Attenuator (20 dB, 7 mm)		08512-60002
10. Anti-rotation clamps (2)	08515-60003	
Specifications and Performance Verification		
Program and Data Disk	08510-10033	08510-10033
Operating and Service Manual [1]	08515-90014	08515-90014
Principles of Microwave Connector Care [1]	5954-1566	5954-1566

1. Not shown.

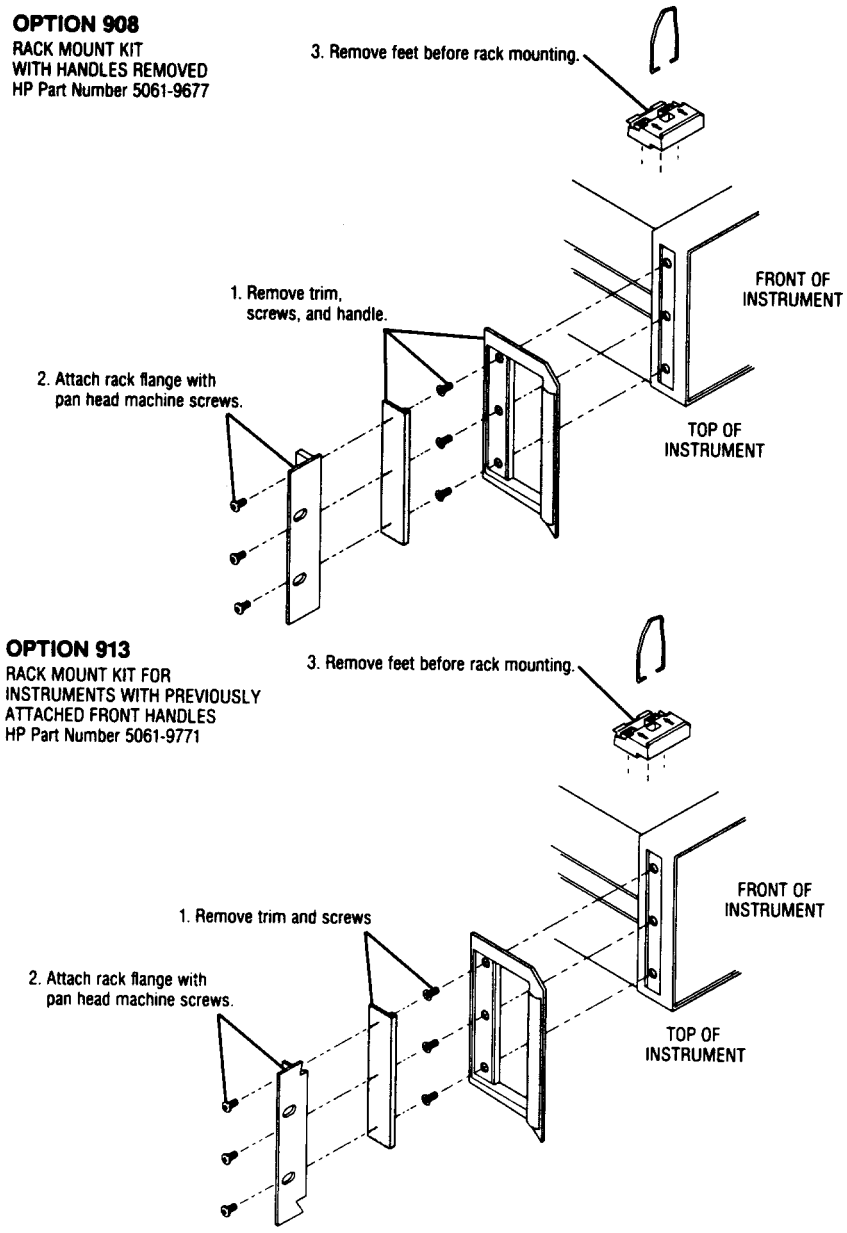


Figure 2-2 Attaching Rack Mounting Hardware

Preparation for Use

Positioning the Test Set

A work surface should be provided for use with the test set 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 2-2.

The recommended rack is the HP 85043A. Instructions for rack mounting the test set in a system configuration with the HP 8510 are provided in the HP 8510 installation section.

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. Refer to “Operating and Safety Precautions” on page 1-9.

Connecting the Test Set

Mating Connectors

HP 8514B Ports 1 and 2 are precision 3.5 mm male connectors and mate with precision 3.5 mm female connectors. The HP 8512A has 7 mm test port connectors.

The TEST SET INTERCONNECT connector is a series-D subminiature female connector with 7 RF connections.

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

Power and Control Connections

Figure 2-3 shows the following connections (with the exception of line power) and the required RF source connections.

Connect the power cord to an electrical outlet and the line module to supply power to the test set.

Connect the test set IF interconnect cable from the J11 TEST SET INTERCONNECT connector on the rear panel of the test set to the J1 TEST SET INTERCONNECT connector on the rear panel of the HP 85102 IF Detector.

Connect the system bus cable from the HP 8514B (or 8512A) J12 8510 SYSTEM BUS connector to the 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 (see above).

RF signals are transmitted from the source to the test set by the 3.5 mm flexible RF cable supplied with the test set. Recommended torque is 56 N-cm (5 in.-lb.) for the RF cable-to-test-set/RF input connection.

Anti-Rotation Clamps (HP 8514B only)

Use these clamps to stabilize the test port/RFcable connection. Connect the test port cables to the test ports and tighten them as specified in the cable manual. Loosen the anti-rotation clamp thumbscrew sufficiently to slip the clamp over the cable and up to the front panel. The clamp end with the flats should come to rest on the flats of the test port shoulder. Finger-tighten the thumbscrews to prevent further loosening or tightening of the test port/RF cable connection.

The internal O-ring is field replaceable without disassembling the anti-rotation clamp. Pry it out with fine tweezers or a similar tool when it no longer holds the RF cable securely. Insert the new O-ring by engaging one side of it in the slot of the phenolic clamp donut. Use your fingers to push the O-ring into the rest of the slot.

The HP part number of the O-ring is 0900-0007 (CD 7).

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.

Alternatively, comparable packaging materials may be used. Wrap the test set in heavy paper or anti-static plastic. If shipping to an HP office or Service Center, complete and attach a service tag (in the HP 8510 manual set). Use sufficient shock absorbing material on all sides of the test set to provide a thick, firm cushion and prevent movement. Seal the shipping container securely and mark it FRAGILE.

In any correspondence with HP, refer to the test set by full model number and serial number

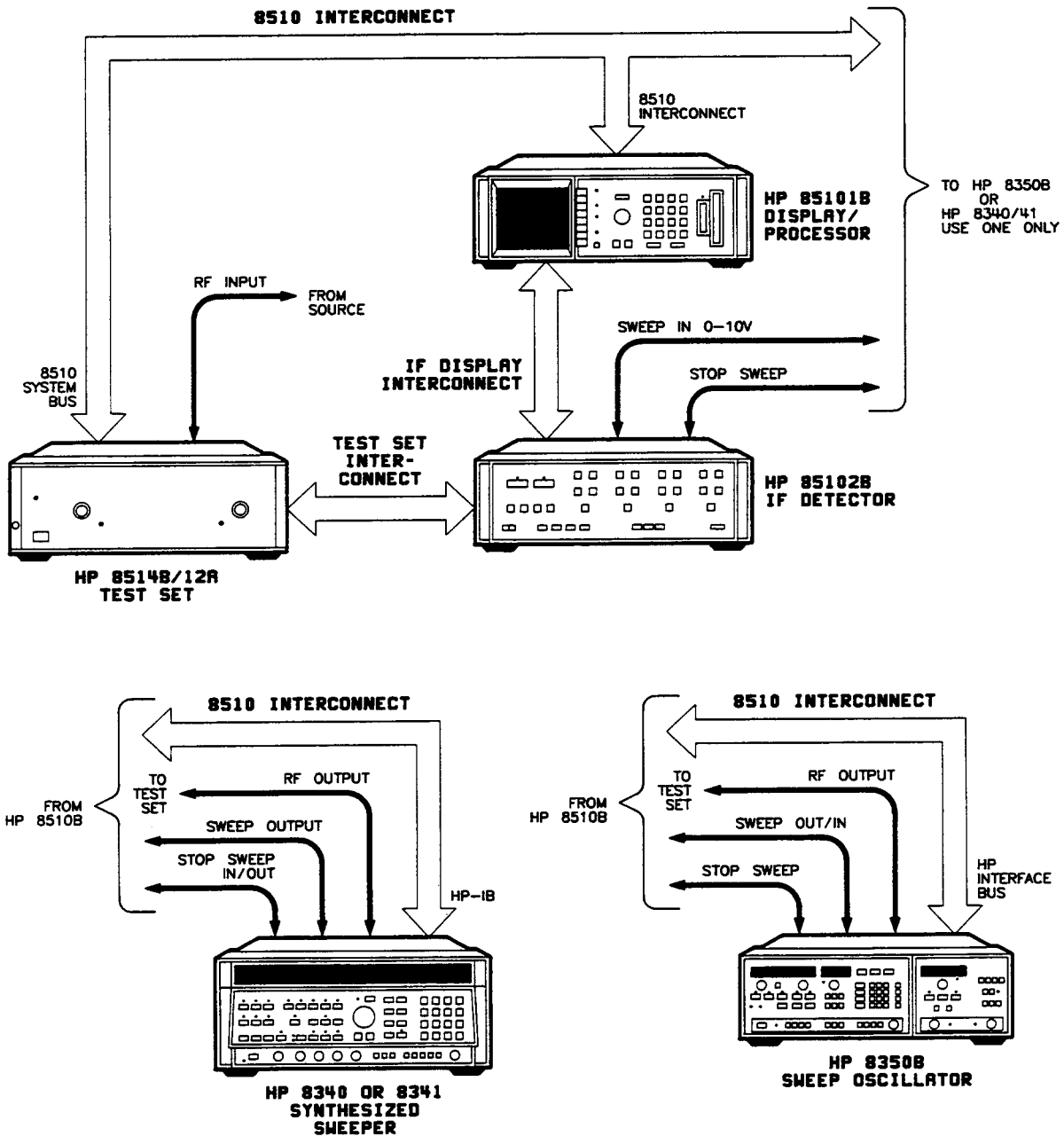


Figure 2-3 HP 8514B and 8512A System Connections

3

Operation

Introduction

This section illustrates the features and functions of the front and rear panels of the HP 8514B and 8512A test sets. It also includes an operator's check procedure. The function of the operator's check is to confirm that the HP 8514B and HP 8512A test sets function properly as part of an HP 8510 system. The performance tests documented in the *HP 8510B System Manual* and volume 2 of the HP 8510A manual set are a more rigorous check. Volume 2 of the HP 8510A manual set documents the HP 8512A only.

Also included in this section:

- a description of the Multiple Test Set Option (Option 001)
- instructions for connecting a cable and anti-rotation clamp to your test set test port.

Front Panel Features

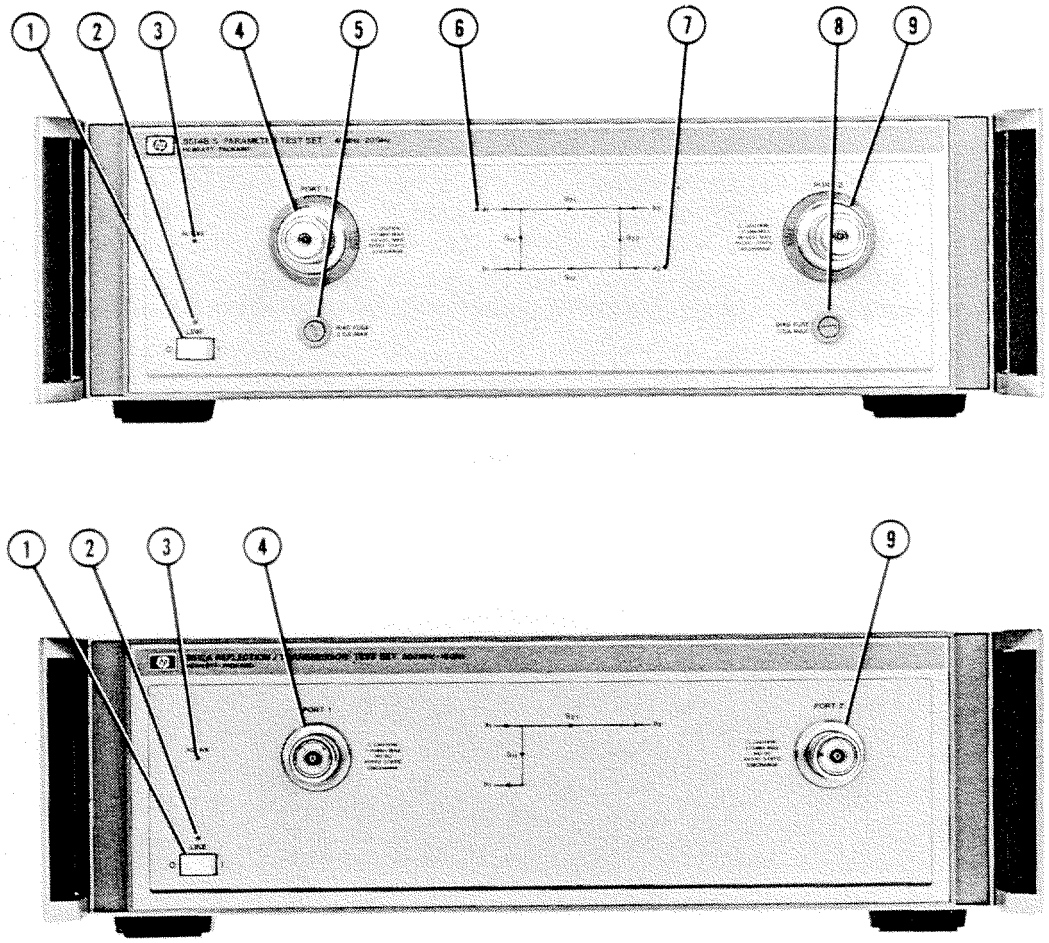


Figure 3-1 Front Panel Features of HP 8514B (upper) and HP 8512A

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; | is on.

2. Line LED

This LED goes on and off with the test set line switch.

3. Active LED

This LED lights about two seconds after power is turned on, following the successful conclusion of self-test.

4. Port 1

This test port transmits RF energy from the source to the DUT and receives reflected RF energy from the DUT. The reflected RF energy is coupled to a sampler within the instrument.

5. Bias Fuse (HP 8514B only)

The fuse which limits bias applied to Port 1 is within this holder (see the instrument front panel or the replaceable parts list for the value of the fuse F1).

6. a1 LED (HP 8514B only)

This LED indicates that the HP 8514B is internally switched to the S11 or S21 mode and source power is switched to Port 1.

7. a2 LE. (HP 8514B only)

This LED indicates that the HP 8514B is internally switched to the S22 or S12 mode and source power is switches to Port 2.

8. Bias Fuse (HP 8514B only)

The fuse which limits bias applied to Port 2 is within this holder (see the instrument front panel or the replaceable parts list for the value of the fuse F2).

9. Port 2

In the HP 8514B, this test port transmits RF energy from the source to the DUT and receives reflected RF energy from the DUT.

In the HP 8512A, this port only receives transmitted (from Port 1) RF energy. The received RF energy is input directly to a sampler within the instrument.

Rear Panel Features

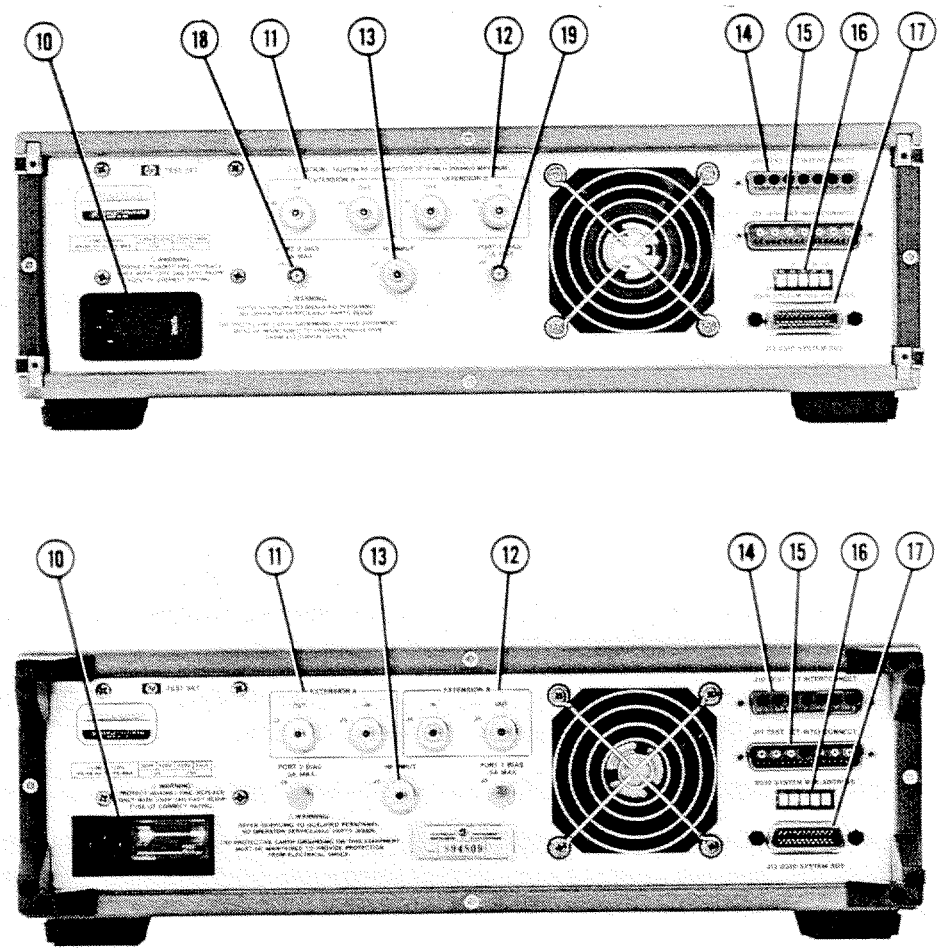


Figure 3-2 Rear Panel Features of HP 8514B (upper) and HP 8512A

10. 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 voltage setting. Recommended fuse values are printed on the rear panel.

11. Extension A

This pair of 3.5 mm connectors holds the reference port extension cable (RPEC, supplied) used to equalize the length of the reference signal-a2 sampler path with the test signal-b2 sampler path.

When the DUT is connected to Port 2 with any of the recommended RF cables, connect the long RPEC to Extension A.

12. Extension B

This pair of 3.5 mm connectors holds the reference port extension cable (RPEC, supplied) used to equalize the length of the reference signal-a1 sampler path with the test signal-b1 sampler path.

When the DUT is connected to Port 1 with any of the recommended RF cables, connect the long RPEC to Extension B. When the DUT is connected directly to Port 1, connect the short RPEC to Extension B.

13. RF Input

This 3.5 mm connector receives RF energy from the source.

14. J1O Test Set Interconnect

This connector is used only in test sets with option 001. It allows connecting another test set to the option 001 test set. Up to four test sets can be serially connected to the HP 8510. The HP 8510 system automatically selects the IF output from the chosen test set for processing and display.

15. J11 Test Set lnterconnect

This connector transmits the IF signal from the test set to the HP 85102 IF Detector. It also transmits control signals bidirectionaliy.

16. 8510 System Bus Address Switch

This five-pole binary-weighted switch sets 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.

17. J12 8510 System Bus Connector

This connector is used for HPIB communications with the HP85101 display/processor.

18. Port 2 Bias (HP 8514B only)

This female BNC connector is used to supply bias through the center conductor of Port 2 to active devices under test.

19. Port 1 Bias (HP 8514B only)

This female BNC connector is used to supply bias through the center conductor of Port 1 to active devices under test.

Operator's Check

Passing this check confirms that the HP 8514B and HP 8512A test sets function properly as part of an HP 8510 system.

Equipment

Item	HP Model or Part Number
Network analyzer system	HP 8510A/B
Test port return cable set	HP 85131D[1]
Test port return cable	HP 85131C[2]
10 dB pad (attenuator)	HP 8493C option 010[2]

1. Use with HP 8514B.

2. Use with HP 8512A.

Procedure

Plug in and turn on the test set (it should not be connected to any other instrument or device now). 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. Turn off the test set and connect it to the HP 8510 system as shown in Figure 2-3 on page 2-7. Turn on all of the system instruments, network analyzer last. Let the instruments complete their self-tests.

Remove any cables or DUTs from the test set test ports. Press **[PRESET]**, STIMULUS, **[MENU]** on the HP 85102 to preset the HP 8510 and access the STIMULUS menu.

1. HP 8340/41 systems: press **[STEP]** on the HP 85101 to put the source in step mode.

b. HP 8350B systems: press **[SWEEPTIME]**, **[2]**, **[0]**, **[0]**, **[k/m]**, to set the sweep time to 200 ms. In narrow band systems, the level of the frequency band generated should match the levels shown in Figure 3-3 for a given frequency.

Now perform either the HP 8514B or 8512A Operator's Check.

In case of difficulty, refer to Test Set Troubleshooting in the *HP 8510B Service Manual* or contact your local HP Service Office.

HP 8514B Operator's Check

NOTE All of the following HP 8514B CRT traces should decrease from –20 ±5 dB at 2 GHz to –27 ±5 dB at 20 GHz.

Sampler Test

1. To check all of the samplers in the HP 8514B test set, first redefine the a2 and b2 phaselock and drive paths:

   Press PARAMETER, **[MENU]**, **[User 3 a2]**, **[REDEFINE PARAMETER]**, **[DRIVE]**, **[Port 2]**, **[PHASE LOCK]**, **[a2]**, **[REDEFINE DONE]**, to redefine a2.

   Press **[User 2 b2]**, **[REDEFINE PARAMETER]**, **[DRIVE]**, **[Port 2]**, **[PHASE LOCK]**, **[a2]**, **[REDEFINE DONE]** to redefine b2.

2. Connect an open (or short) to port 1 and port 2.

3. Press **[User 1 a1]**, **[User 2 b2]**, **[User 3 a2]**, and **[User 4 b1]** to check the channels indicated. The b1 and b2 traces should resemble Figure 3-3. The a1 and a2 traces should resemble Figure 3-4.

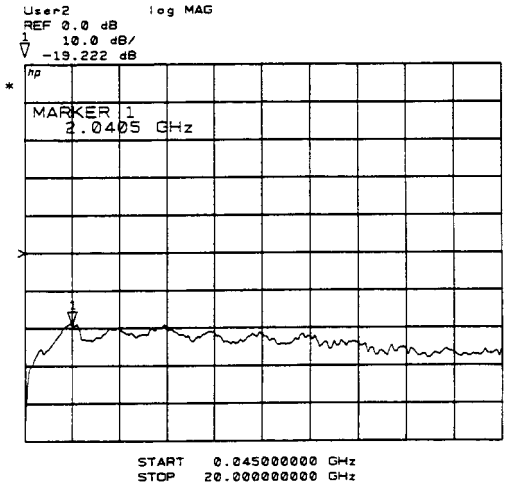


Figure 3-3 Typical Operator's Check CRT Power Level Trace

b1 Thru Test

4. Connect a thru (two test port return cables) from port 1 to port 2.

5. Press PARAMETER, **[MENU]**, **[User 4 b1]**, **[REDEFINE PARAMETER]**, **[DRIVE]**, **[PORT 2]**, **[PHASELOCK]**, **[a2]**, **[REDEFINE DONE]** to observe the b1 thru power level trace. The trace should resemble Figure 3-4.

b2 Thru Test

6. Leave the thru connection of step 4 connected. Press PARAMETER, **[MENU]**, **[USER 2 b2]**, **[REDEFINE PARAMETER]**, **[DRIVE]**, **[PORT 1]**, **[PHASELOCK]**, **[a1]**, **[REDEFINE DONE]** to observe the b2 power level trace. The trace should resemble Figure 3-4.

   Make sure that you redefine the parameters to the original conditions for a1, b1, a2, and b2.

7. If any of the traces are not within the specified limits, check all of the connections and repeat the above procedure. If symptoms persist, refer to the Service Overview section of the *HP 8510B Service Manual* or volume 4 of the HP 8510A manual set.

HP 8512A Operator's Check

NOTE All of the following HP 8512A CRT traces should decrease from –20 ±5 dB at 0.5 GHz to –32 ±5 dB at 18 GHz.

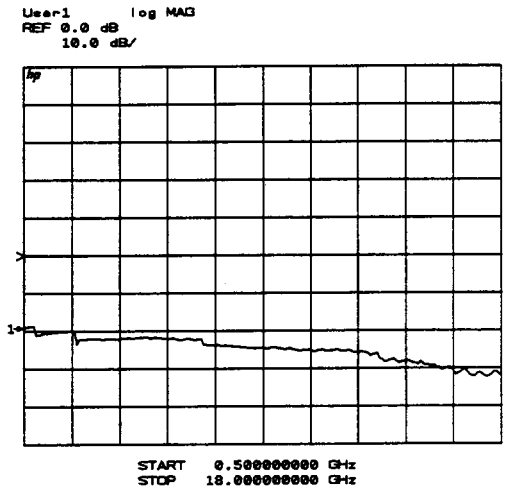


Figure 3-4 Typical Operator's Check CRT Power Level Trace

a1 Test

1. Press PARAMETER, **[MENU]**, **[USER 1 a1]**, to see the channel a1 power level trace.

b1 Reflection Test

2. Connect an open (or a short) to port 1.
3. Press **[USER 4 b1]** to observe the b1 power level trace. The trace should resemble Figure 3-3.

b2 Thru Test

4. Connect a thru (a 20 dB attenuator and test port return cable) between port 1 and port 2.
5. Press PARAMETER, **[MENU]**, **[USER 2 b2]**, **[REDEFINE PARAMETER]**, **[DRIVE]**, **[PORT 1]**, **[PHASELOCK]**, **[a1]**, **[REDEFINE DONE]** to observe the b2 power level trace. The trace should resemble Figure 3-4.
6. If any of the traces are not within the specified limits, check all of the connections and repeat the above procedure. If symptoms persist, refer to the Service Overview section of the *HP 8510B Service Manual* or volume 4 of the HP 8510A manual set.

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. Only one HP 8516A test set may be used in a multiple test set configuration.

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 3-5, 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.

Installation

Set each test set rear panel address switch to the address listed in Figure 3-5, if using a two test set configuration and Figure 3-6, 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.

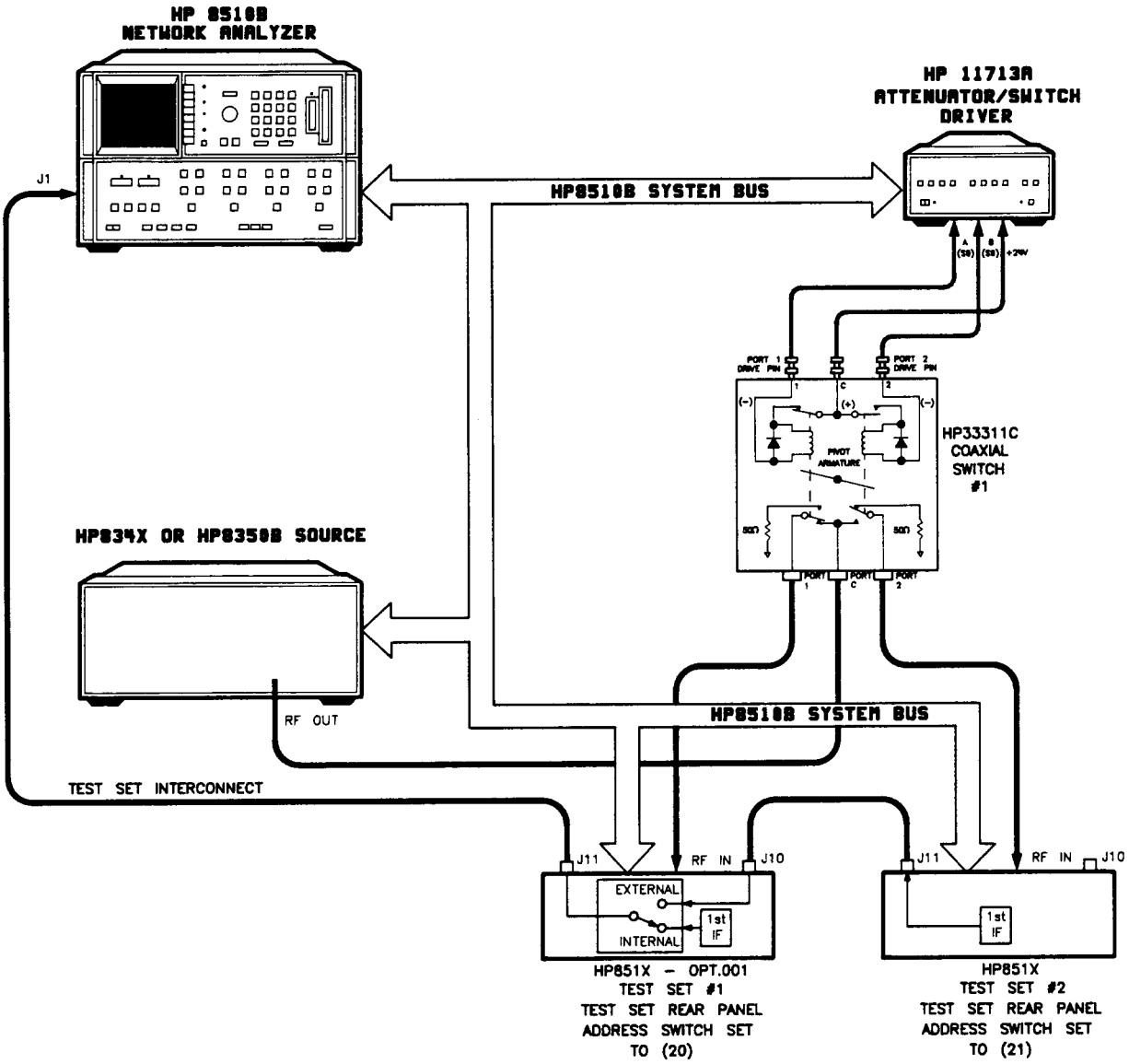
Operation

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.



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.

Figure 3-5 RF and IF Switching with Two Test Sets

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

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 **[x1]**, or it can be changed under program control using the HP 8510 HP-IB `ADDRESS;` command. The HP-IB 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 Switches. As shown in Figure 3-5 and Figure 3-6, 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 3-5 and Figure 3-6.

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.

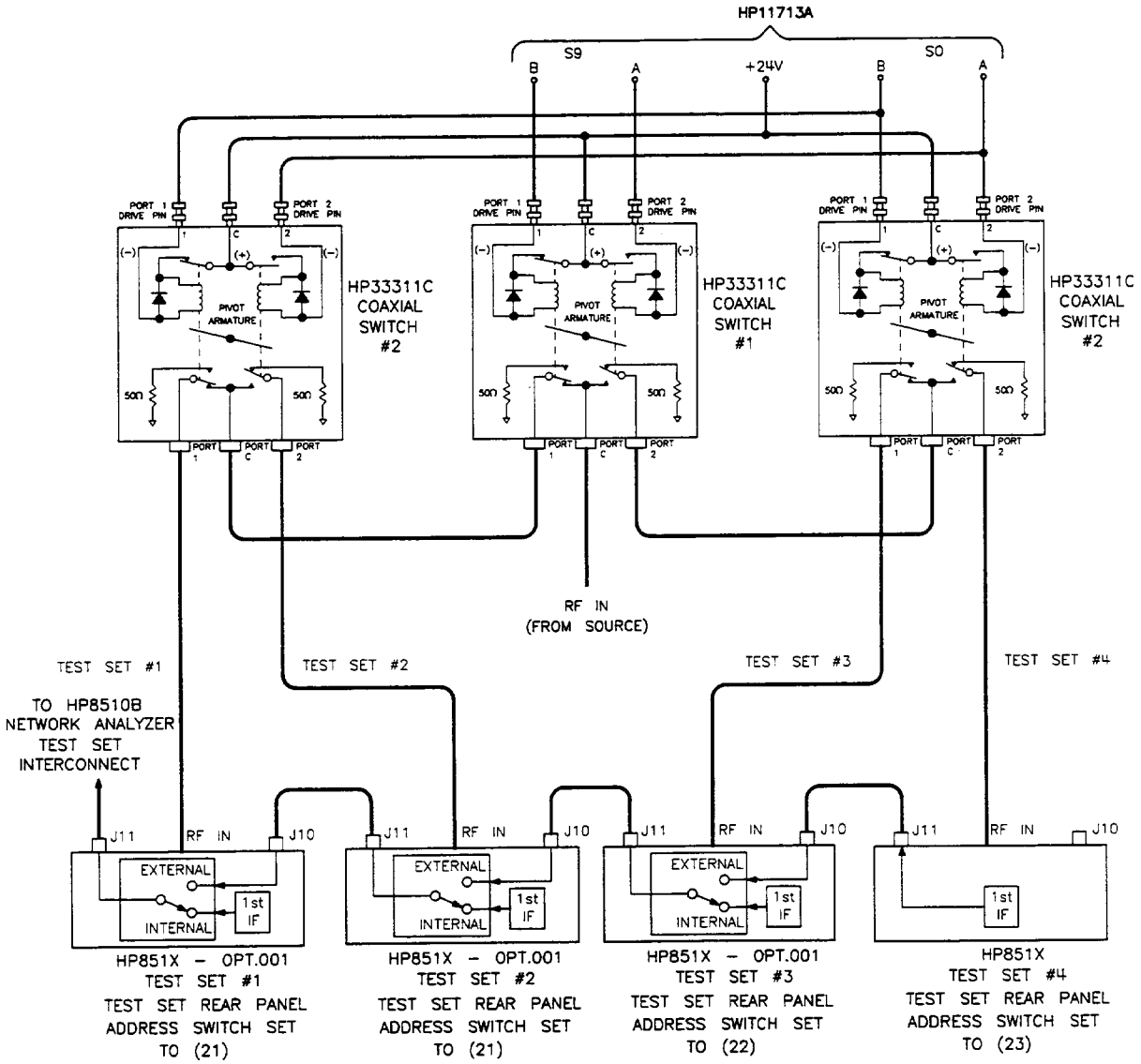
It may be convenient to store a Hardware State file and an Instrument State file for each combination of test set and cal set. You may also store your Hardware State file on a tape or disk for future use. To change the configuration, simply recall the appropriate Hardware State file, which sets the Address 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, first connect a device with a known response at test set number 1, then press HP 8510 **[LOCAL]**, **[TEST SET]**, **[ADDRESS of TEST SET]**, enter the address of test set number 1 (this would be 20), then press **[x1]**. The test set number 1 measurement should appear. Press **[DISPLAY]**, **[DATAÆMEMORY]**, **[DISPLAY: DATA and MEMORY]** to store the trace for later comparison. Now use **[ADDRESS of TEST SET]** to select test set number 2, then switch back to test set number 1. 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.



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.

Figure 3-6 RF and IF Switching with Four Test Sets

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

Cable and Anti-Rotation Clamp Installation

The HP 08515-60003 Anti-Rotation Clamps are used to secure the RF connections at the test ports of several Hewlett-Packard test sets. When installed, each clamp holds the large nut that secures the test set RF port connector to the front panel, and the RF cable connector or the front panel adapter mated with the port connector.

Without the clamps, the test port connections may become loose after moving the connected device and could invalidate calibrations and measurements.

Procedure

NOTE Although the anti-rotation clamps may be used with front panel adapters, these instructions refer to an installation using the HP RF Cables. Adapter installations will be similar.

1. Two anti-rotation clamps are included in the test set accessories box. Remove one from the box and loosen the thumbscrew until it is almost out of the counter-bored hole in the clamp body.

   Gently push the clamp (round-hole end first) over and past the RF cable connector you will connect to the test set RF port. The rubber O-ring in the round end of the clamp will fit tightly over the connector. Wiggle the clamp if necessary to get it over the connector.

   Connect the cable to the test port and tighten as specified in the cable manual.

NOTE The test set RF connector is easily loosened, so hold the RF cable throughout the rest of this procedure. Do not allow the cable to rotate.

2. Turn the clamp so that the thumbscrew is pointing up. From there, turn the clamp to visually align the clamp flats with the flats on the test port connector nut. This will minimize rotating the connector in the next step. Refer to Figure 3-7.

NOTE The flats may be in any orientation in respect to the front panel.

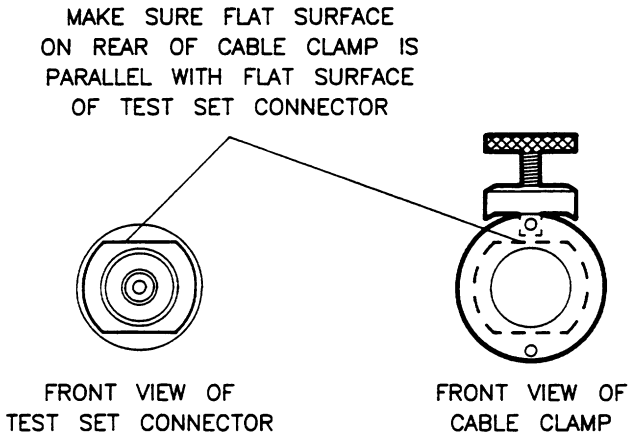


Figure 3-7 Visually Aligning Clamp and Nut Flats

3. Make sure that you do not twist the cable as you attach it to the test port. Use the torque wrench supplied with your calibration kit to tighten the cable to no more than 90 N-cm (8 in.-lb).

4. Hold the cable with one hand and with the other, press the clamp gently and steadily while wiggling the clamp straight over the RF connector and onto the test port connector nut. The internal flats in the clamp must fit over the flats on the test port connector nut. Try not to rotate the clamp as you do this or the RF connection may be loosened. Refer to Figure 3-8.

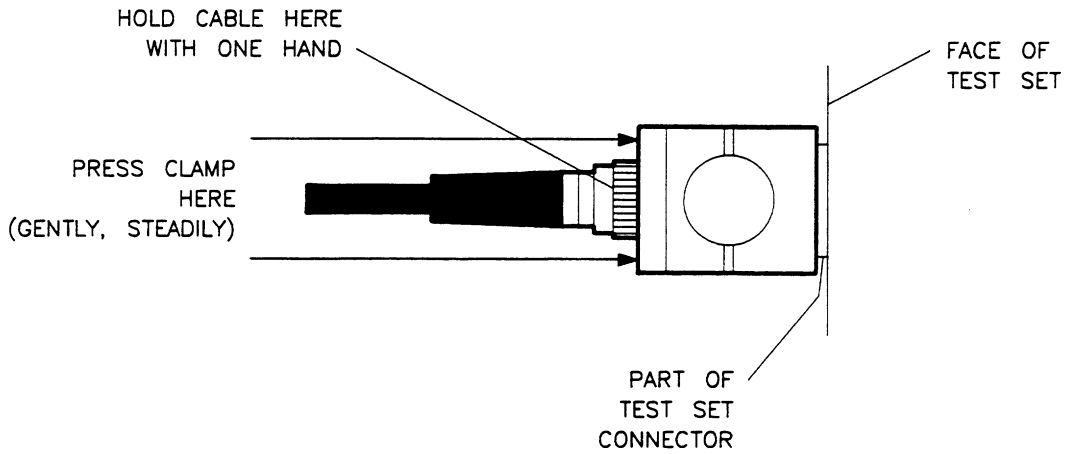


Figure 3-8 Mating the Clamp and Nut Flats

5. Make sure that the thumbscrew is aligned with the counter-sunk hole in the clamp body. Push the clamp toward the test set front panel and then tighten the thumbscrew with your fingers. The cable cannot be damaged by tightening the thumbscrew too tightly. Refer to Figure 3-9.

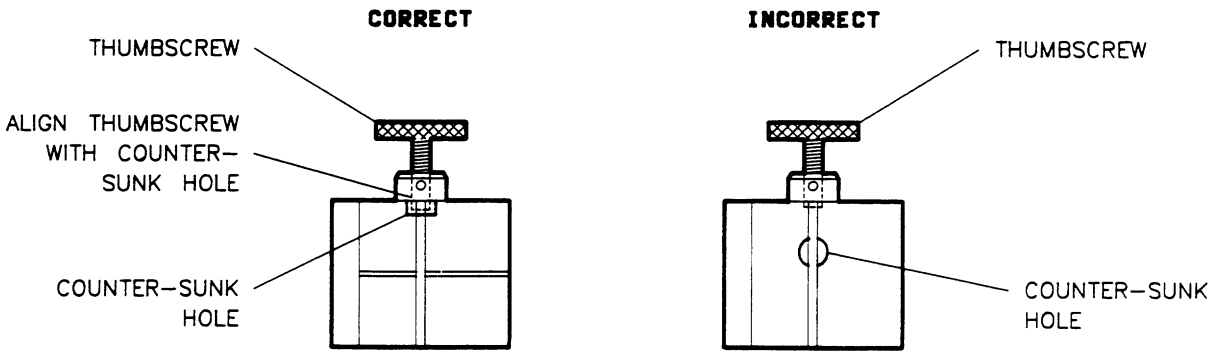


Figure 3-9 Aligning the Thumbscrew with the Counter-Bored Hole

6. Repeat steps 1 through 5 for the other clamp.

This completes the anti-rotation clamp installation procedure. Refer to the installation section of the test set operating and service manual for instructions to replace the internal O-ring in the anti-rotation clamp.

4

Specifications

Specifications describe the warranted performance of the instrument.

The electrical specifications of the HP 8514B and HP 8512A test sets with an HP 8510B network analyzer are defined in the Specifications section of the *HP 8510B System Manual*. Specifications for HP 8510A systems are defined in General Information, volume 1 of the HP 8510A manual set.

Mechanical Specifications

Table 4-1 Mechanical Specifications

Test Ports (Front Panel)	
NMD-3.5 mm connector center pin recession:	0.005 mm to 0.056 mm (0.0002 in. to 0.0022 in.)
NOTE: Refer to your calibration kit manual for information on how to use your gauge.	

Supplemental Characteristics

The supplemental characteristics listed in Table 4-2 and Table 4-3 are intended to provide information useful in applying the instrument by giving typical, but non-warranted, performance parameters.

Table 4-2 HP 8510B/8514B Characteristics

Test Ports (Front Panel)	RF Input Connectors (Rear Panel)
Connector type: precision 3.5 mm male	**Connector type:** precision 3.5 mm female
Impedance: 50 ohms nominal	**Damage input level:** >+23 dBm
Incident signal attenuation range: 0 to 90 dB in 10 dB steps	**Source power levels for reference channel phase lock:** Minimum: 0 dBm Maximum: +14 dBm
DC bias: 500 mA, 40 VDC, maximum	**Nominal connector nut size:** 8 mm
Damage input level: >+17 dBm CW RF[1]	**Recommended torque:** Precision 3.5 mm: 90 N-cm (8 in.-lb.) SMA: 56 N-cm (5 in.-lb.)
Nominal operating power level:[2] Frequency — Operating Level 0.045 to 8 GHz — +3 dBm 8 to 20 GHz — 0 dBm	
Nominal connector nut size: 20 mm	
Recommended torque: 90 N-cm (8 in.-lb.)	

1. Do not exceed +10 dBm to test port for proper operation.

2. Available power in PRESET condition.

Table 4-3 HP 8510B/8512A Characteristics

Test Ports (Front Panel)	RF Input Connectors (Rear Panel)
Connector type: 7mm **Impedance:** 50 ohms nominal **Damage input level:**[1] Port 1: >+23 dBm Port 2: >+13 dBm **Nominal operating power level:** Frequency — Operating Level 0.045 to 8 GHz — +4 dBm 8 to 18 GHz — +2 dBm **Nominal connector nut size:** 20 mm **Recommended torque:** 90 N-cm (8 in.-lb.)	**Connector type:** precision 3.5 mm female **Damage input level:** +23 dBm **Source power levels for reference channel phase lock:** Minimum: –2 dBm Maximum: +12 dBm **Nominal connector nut size:** 8 mm **Recommended torque:** Precision 3.5 mm: 90 N-cm (8 in.-lb.) SMA: 56 N-cm (5 in.-lb.)

1. Do not exceed +10 dBm input to Port 1 or –10 dBm input to Port 2 for proper operation.

Table 4-4 HP 8514B and 8512A 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:	HP 8514B: 17 kg (38 lb) net HP 8512A: 15 kg (33 lb) net

Table 4-5 Recommended Equipment

Item	Critical Specifications	Recommended Model	Use[1]
Network analyzer	No substitute	HP 8510A/B	O,P,T
Source[2]			O,P,T
Controller[3]	No substitute	HP 9000 series 200 or 300 with 1 Mbyte memory	P
Disc drive[3]	compatible with controller		P
Multimeter	range: 0 to 50V	HP 3456A	T
Oscilloscope	50 MHz bandwidth	HP 1740A	T

1. O = operation; P = performance test; T = troubleshooting

2. HP 8340 or 8341 or 8350 with plug-in. Refer to HP 8510 installation manual for additional information.

3. Not required for manual performance tests with HP 8510A.

5

Test Set Troubleshooting

This chapter consists of procedures for checking the following:

- Test Set Temperature
- Check All Connections
- Check Power Supply/Regulator, Fuses, and Switches
- Test Set Self-test Indicators
- Check VTO/Driver (LO)
- Test Set Troubleshooting Using Time Domain
- Test Set Assembly Replacement Procedures
- 3.5 mm RF Connector Repair
- Unratioed Power Test

The information in this section is presented as an aid in troubleshooting the HP 8512A, HP 8514A, and HP 8514B test sets. If you are not certain that the problem with your system is due to a faulty test set, read the sections titled Service Overview and Built-in Diagnostics in this manual. Continue with this section only if you know the test set is faulty.

For specific information about the HP 8514A, refer to the material in the HP 8510A manual set.

Test Set Temperature

The processor on the A4 HP-IB assembly monitors the test set temperature with a comparator on the A3 VTO summing amplifier. The temperature sensor is located on the A14 VTO/driver assembly. If the temperature of the VTO/driver exceeds 85°C, the HP 85101 displays the **`Test Set Too Hot`** prompt.

CAUTION

`TEST SET TOO HOT` means turn off the test set immediately. This message is only a prompt. It does not turn off the test set.

Determine the reason for the prompt before again subjecting the test set to continuous use. Make sure the fan is operating properly and is not covered by a piece of paper, etc. Make sure the fan and the side panel air exhaust has at least 8 cm (about 3 inches) clearance, and top cover exhaust has at least 1.5 cm (about 0.5 inches) clearance.

Check All Connections (loose, broken, crimped, etc.)

Power holes (power loss at a specific frequency) often result from faulty connections. Check the following connections:

- Test set rear panel (including the extension links)
- Cables connected to the A3 summing amplifier and A5 Attenuator/Switch
- Sampler cables
- RF path connections from rear panel to front panel

Check Power Supply/Regulator, Fuses, and Switches

A15 Regulator Board Assembly

Use a digital voltmeter to check the voltages given in Table 5-1. Use an oscilloscope to check AC ripple. Use chassis ground as reference.

Table 5-1 Test Set Power Supply Tolerannces

Nominal Voltage	Test Point	Voltage Range	Maximum Ripple Peak to Peak
+15 V	A15TP1	+13.7 to +15.9 V	2 mV
–15 V	A15TP2	–13.8 to –16.2 V	2 mV
+5 V	A15TP3	+4.5 to +5.2 V	2 mV
–5 V	A15TP6	–4.8 to –5.5 V	2 mV

Fuses

Fuses for the regulator board assembly, rear panel, and front panel are specified in the parts list of each test set. The locations of these fuses are also given in the parts list.

Address Switches

Set the switches as indicated in Figure 5-1 (dark side of switch is depressed). The HP-IB address switch is on the test set rear panel. The HP-IB address switch is easy to access but need not be changed unless HP 8510 bus error messages are visible on the CRT. This switch is set to the binary number 20 at the factory.

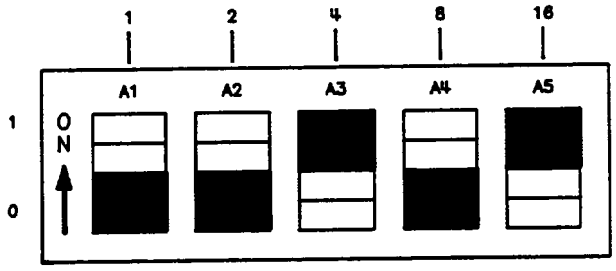


Figure 5-1 Default HP-IB Switch Setting for All Test Sets (20, Binary)

Test Set Self-Test Indicators

If the **ACTIVE** LED on the front panel does not light within two seconds of turn on, or lights immediately, the test set has not passed its self-test. You can determine what part of the self-test failed by determining which HP-IB LEDs on the A4 assembly are lit. The table below shows the possible self-test failures:

Self-Test Indication	A4 HP-IB LEDs				Time (after turn-on)
	LSN	TLK	SRQ	REM	
PWON	ON	ON	ON	ON	0 to 0.5 seconds on briefly
Fail ROM Test	OFF	ON	ON	ON	
Pass ROM Test	OFF	OFF	ON	ON	0.5 to 2.0 seconds
Pass RAM Test	OFF	OFF	OFF	ON	
Pass RAM Test	OFF	OFF	OFF	OFF	after 2 seconds

Two seconds after turn-on, all four HP-IB LEDs should go off, and the front panel **ACTIVE** LED should light simultaneously. After going out briefly, the HP-IB LEDs will light according to the state of the test set. If you are using multiple test sets, the first test set in line will be the active test set until another is chosen.

If Self-Test Falls to Run

If the portion of memory which contains the self-test programming is faulty, the self-test will not run properly. The following conditions indicate that the self-test ROMs are faulty:

- all LEDs flash briefly and go off
- all LEDs flash briefly and stay on
- **ACTIVE** LED goes on before HP-IB LEDs go out

- **ACTIVE** LED does not go on at all (check LED operation before proceeding)

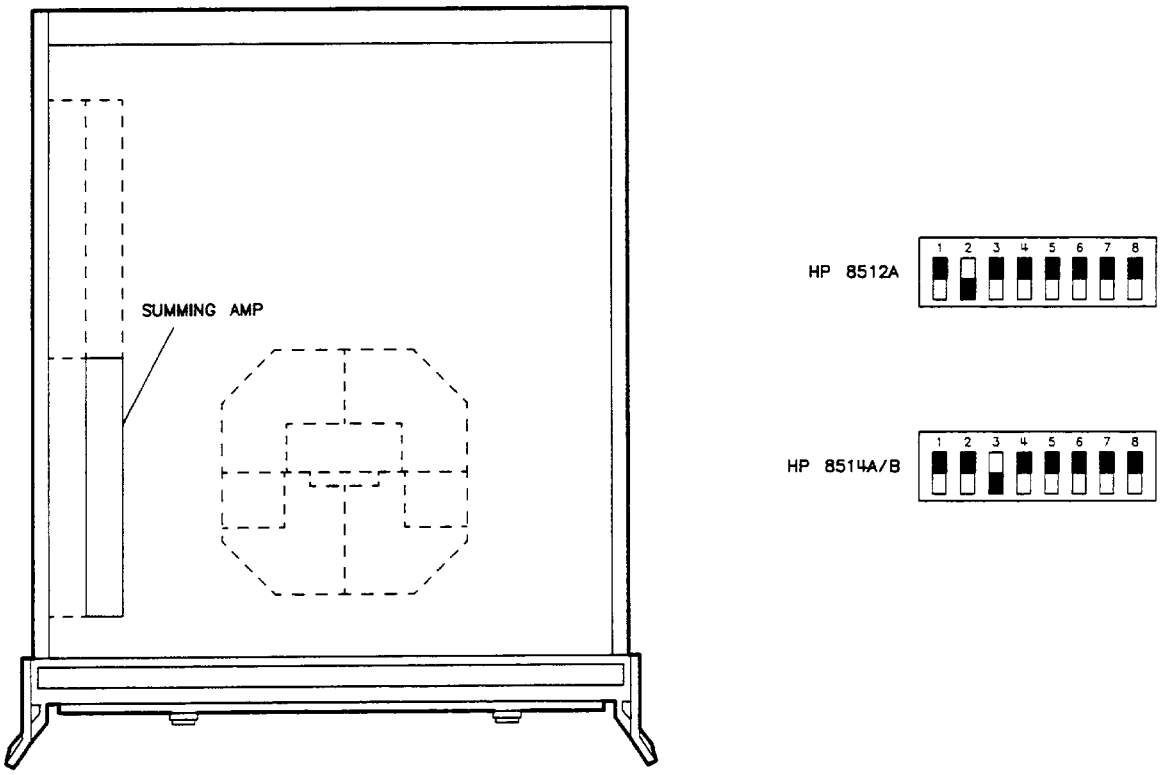


Figure 5-2 Location of A3 Assembly and A3 Configuration Switch Settings

Configuration Switch

The configuration switch is on the A3 summing amplifier assembly (refer to Figure 5-2). It is not easy to access or reset (you must remove the top cover, a bracket, and the A3 assembly). Therefore, unless one of the following conditions exist, don't change it. Reasons to suspect these switches are set incorrectly include:

- HP 8510 turn-on frequencies are not those of test set.
- HP 8510 allows selection of two port S-parameters with a transmission/reflection test set.

Check VTO/Driver (LO)

There are two procedures provided to check the VTO. The first one (1) checks the VTO at two frequencies, the second one (2) is more thorough and checks the VTO at 12 frequencies throughout the VTO range.

1. Using a frequency counter and a voltmeter, check the VTO fundamental frequency and A3 summing amplifier output as follows:

   Disconnect the Test Set-IF Interconnect cable. Using a BNC-to-snap-on cable (provided in the service kit) connect the frequency counter to A14J1 (labeled VTO AUX, on the VTO board assembly). Check that A14J1 is between 165 MHz and 195 MHz.

   Disconnect the cable to A3J4. The VTO frequency should be between 150 MHz and 190 MHz. Check that A3J4 is between –5.6 and –6.8 Vdc.

   If the VTO frequency is not correct, but the voltage at A3J4 is correct, suspect a bad VTO. If the voltage at A3J4 is not correct, suspect a bad A3 summing amplifier assembly (assuming the HP 85102 is working).

2. Use a power supply and a frequency counter to check the VTO as follows:

   Inject a –1 to –12V DC voltage (in –1 volt steps) into the A14 VTO drive (A14J2). Monitor A14Jl to verify that the VTO steps through its range of 65 MHz to 300 MHz (about –21.3 MHz/volt). Figure 5-3 illustrates the relationship of voltage at A14J2 to VTO oscillation frequency.

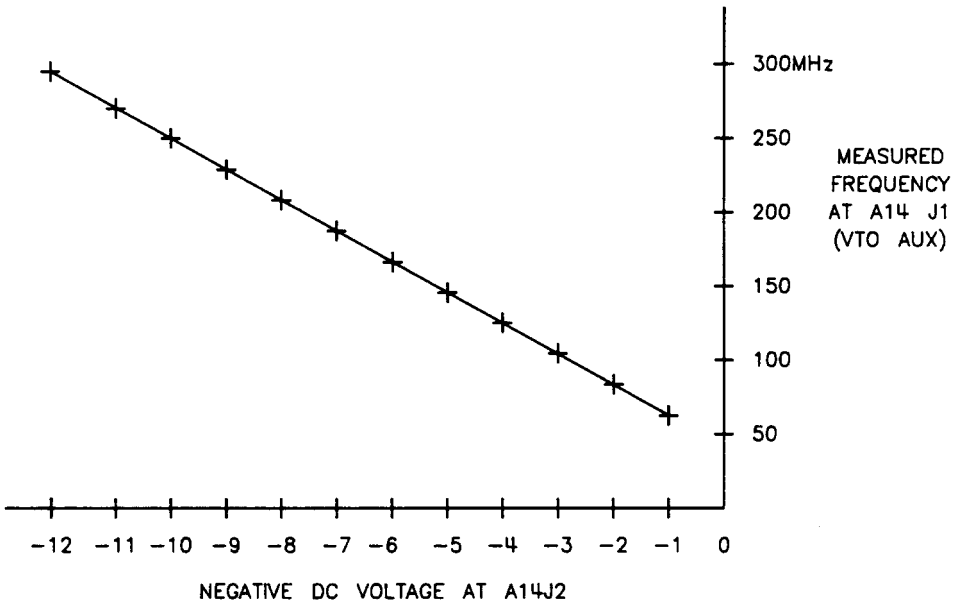


Figure 5-3 VTO Voltage/Frequency Relationship

Test Set Troubleshooting Using Time Domain

Time domain response of the test set can be used to identify problems in the RF path. The plots below show typical time domain responses of the HP 8512A, 8513A, 8514A/B, and 8515A test sets. These can be used as rough standards when trying to locate a problem in the RF path. Keep in mind that the absolute location in time and absolute height of the responses will vary from test set to test set. The significant factor is the relative height of the main impulse (determined by the calibrated short) and the discontinuities. Discontinuities that may be causing a problem will usually stand out as being much greater than the typical response.

Set up the system as follows to obtain a time domain trace:

1. Connect a short or shielded open to the test set port 1.
2. Press **[PRESET] [DOMAIN] [TIME BAND PASS]** STIMULUS **[MENU] [NUMBER OF POINTS] [4] [0] [1] [S11] [LOG MAG]**.
3. Set the START/STOP TIME, SCALE, and REF VALUE as indicated in Table 5-2, below.

Table 5-2 Suggested Parameter Values for Time Domain Troubleshooting

Test Set	Start Time	Stop Time	Scale	REF Value	Refer to Figure #
HP 8512A	–1.0 ns	11.0 ns	10 dB/	–20 dB	Figure 5-4
HP 8514A/B	–6.0 ns	6.0 ns	5 dB/	–20 dB	Figure 5-5

4. For the HP 8514A or 8515A, you can check the port 2 responses using the same set-up as described above except connect the termination to port 2 and select S22 instead of S11. Peaks in the trace that are

significantly greater than those shown indicate a possible loose or bad connection in the RF path at that location.

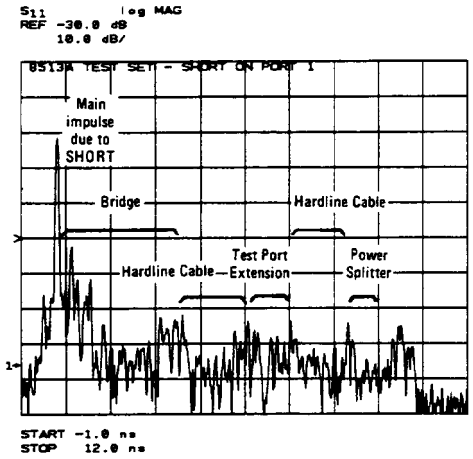


Figure 5-4 HP 8512A Typical Port 1 Response

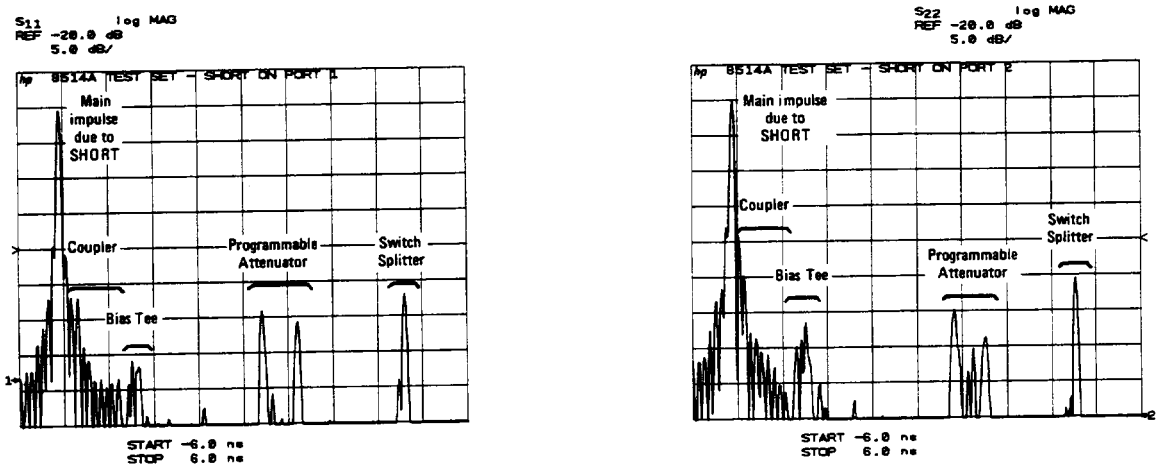


Figure 5-5 HP 8514A/B Typical Port 1 and Port 2 Response

Test Set Assembly Replacement Procedures

This section describes how to replace HP 8510 test set major assemblies and components. The HP 8510 test sets include the HP 8512A, 8514A, and 8514B. This procedure does not explain how to remove 7 mm connectors. If your test set has 7 mm connectors, refer to the test set manual for removal instructions.

Not all of the procedures apply to all of the test sets. Nor do all of the test sets contain all of the parts documented in the following text and figures. Use them as applicable. The procedures appear in this order:

1 Bias tee

2 Coupler

3 Switch/splitter

4 Frequency converter

5 Sampler

6 VTO assembly

7 Regulator board assembly

8 Step attenuator assembly

9 Capacitor

10 3.5 mm RF connectors

11 Fan

12 Port 1 and 2 3.5 mm connectors

13 Power transformer

Before beginning any of the following procedures:

- Turn the test set OFF.
- Remove the top cover.
- Reverse the following procedures to install parts.

CAUTION Electrostatic discharge (ESD) can damage or destroy electronic components. All work on electronic assemblies should be performed at a static-safe workstation. Refer to "Operating and Safety Precautions" on page 1-9 for more information on preventing ESD.

The assemblies handled in this procedure are very sensitive to damage by static electricity. They may or may not continue to function if subjected to an electrostatic discharge. In any case, an electrostatic discharge will impair the reliability of these assemblies. Always perform the following steps in order.

1. Ground the work area and yourself to prevent electrostatic damage to the microcircuits.
2. Turn the test set OFF.
3. Disconnect the power cord.
4. Remove the top cover.
5. Reverse the following procedures to install parts.
6. All 3.5 mm and 2.4 mm connections are torqued to 90 N-cm (8 in.-lb.).
7. Exercise caution when handling semi-rigid coax cables. They are easily bent.

Equipment Needed But Not Supplied

The table below lists all equipment needed for replacing the various assemblies documented in the procedures in this section. To locate all major assemblies in the test sets, refer to the Replaceable Parts chapter of this manual.

Tools	Used With	HP Part Number
2 point pozidriv	all components	8710-0900
1 point pozidriv	all components	8710-0899
5/16 inch torque wrench, 10 in.-lb	all components	8710-1655
anti-static mat	all components	9300-0797
wrist strap	all components	9300-1257
clip lead	capacitors	any supplier
9/16 inch nut driver	connector repair	8720-0008
1/2 inch torque wrench, 25 in.-lb.	connector repair	8710-1581
3.5 mm connector gauge	connector repair	1250-1862
connector cleaning kit	connector repair	92193Z
100Ω 20 watt resistor	capacitor removal	0819-0019
1 inch torque wrench, 72 in.-lb.	coupler removal	MTB 100 72lbinE[1]

1. Order from Mountz Company, 1080 North 11th Street, San Jose, CA 95112

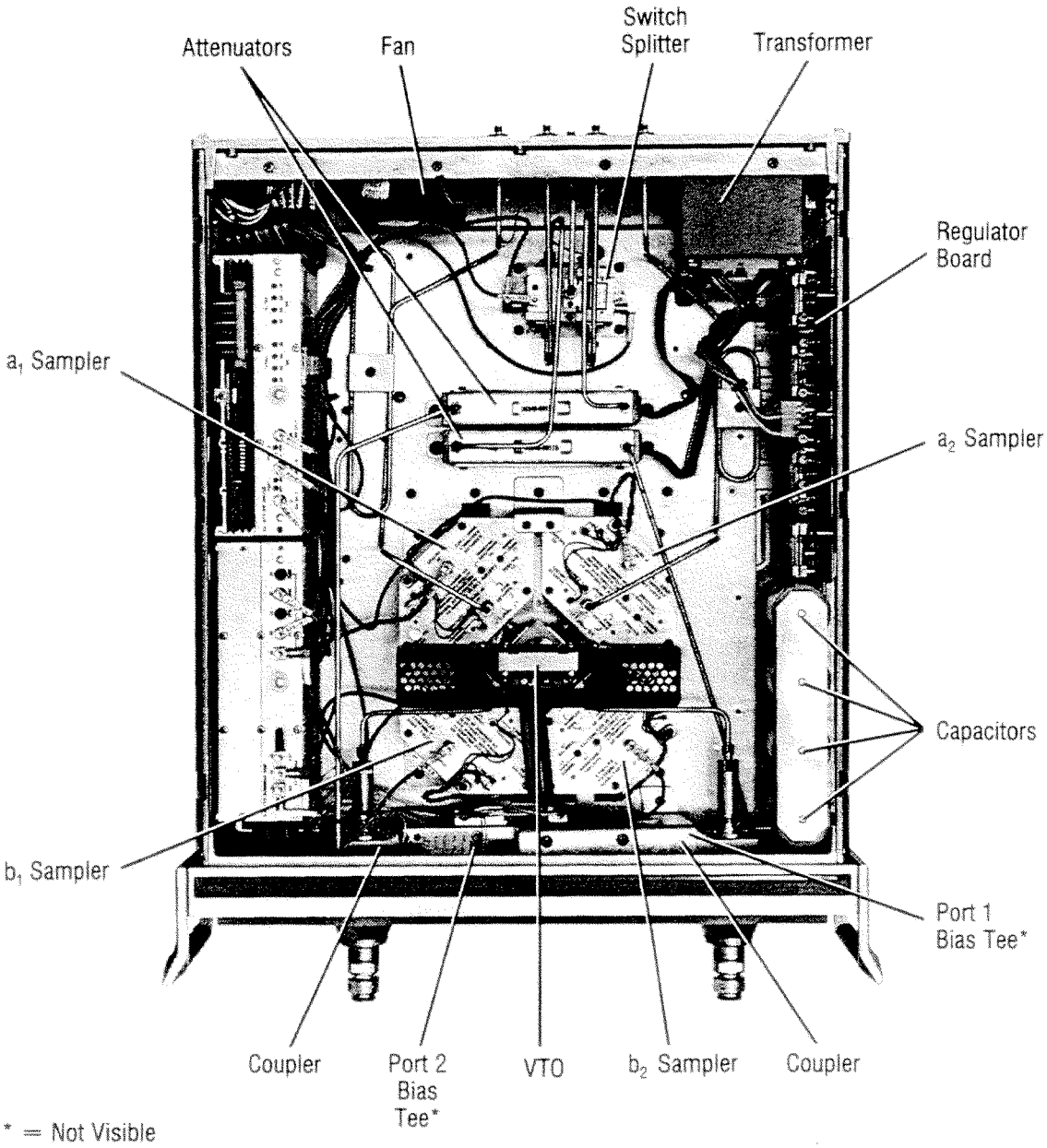

Attenuators
Fan
Switch Splitter
Transformer
Regulator Board
a_1 Sampler
a_2 Sampler
Capacitors
b_1 Sampler
Port 1 Bias Tee*
Coupler
Port 2 Bias Tee*
VTO
b_2 Sampler
Coupler
* = Not Visible

Figure 5-6 General Component Location Diagram

(1) Bias Tee

1. Desolder the wire connected to the bias tee.
2. Loosen the nuts on both sides of the bias tee.
3. Disconnect the semi-rigid cable from the bias tee and remove the tee from the test set.

(2) Coupler

1. Remove the bias tee as described in procedure **(1)**.
2. Remove the aluminum shield (which covers the couplers), disconnect any wires that cross the coupler and remove the two screws which attach the coupler to the test set chassis.
3. Disconnect the semi-rigid cable from the coupler to the sampler.
4. Carefully loosen the nut on the front of the test set with the 1 in. torque wrench. Remove the nut and washer.
5. Move the coupler away from the front panel and lift it out of the test set.
6. Remove any brackets before sending the coupler to HP for repair.

(3) Switch/Splitter

NOTE Reflection/transmission test sets use a splitter rather than a combination switch/splitter. Both devices are installed in the same place in the various test sets.

1. Remove the semi-rigid cables from the switch/splitter with the 5/16 in. wrench. (Reposition any other cables as required to ease removal.)
2. Remove the four (4) screws which attach the switch/splitter mounting bracket to the chassis.
3. Remove the switch/splitter and bracket from the test set.
4. Remove the bracket from the switch/splitter before sending the switch/splitter to HP for repair.

(4) Frequency Converter

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

CAUTION

Electrostatic discharge (ESD) can damage or destroy electronic components. All work on electronic assemblies should be performed at a static-safe workstation. Refer to “Operating and Safety Precautions” on page 1-9 for more information on preventing ESD.

The assemblies handled in this procedure are very sensitive to damage by static electricity. They may or may not continue to function if subjected to an electrostatic discharge. In any case, an electrostatic discharge will impair the reliability of these assemblies. Always perform the following steps in order.

The frequency converter is especially sensitive to electrostatic discharge. Wear a ground strap that is connected to earth ground when performing this procedure.

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

NOTE

Torque all SMA connections to 56 N-cm (5 in.-lb) with the 5/16” torque wrench.

(5) Sampler

1. Remove the frequency converter **(4)** from the test set.
2. Remove the heat sink from the VTO by removing the eight (8) screws that hold it to the VTO.
3. Remove the two (2) sampler mounting screws from the opposite ends of the sampler. Loosen the nut connecting the VTO to the sampler and remove the sampler.

(6) VTO Assembly

1. Remove the frequency converter **(4)** from the test set.
2. Remove the 2 sampler mounting screws from each sampler. (The VTO heat sink may need to be removed for access.)
3. Loosen the nuts connecting the VTO to each sampler, disconnect the samplers and remove the VTO assembly.
4. Remove the two (2) VTO mounting bracket screws to separate the bracket from the VTO before returning the VTO to HP for repair.

(7) Regulator Board Assembly

1. Unplug the transformer socket from the regulator board.
2. Remove the three (3) mounting screws from the top edge of the regulator board. (it may be necessary to disconnect some semi-rigid cables to ease removal of the screws.)
3. Remove the regulator board. (it may be necessary to partially back out one of the transformer mounting screws for clearance.)

(8) Step Attenuator Assembly

1. Unplug the ribbon cables of the step attenuator to be removed. (Remove the regulator board **(7)** to access the ribbon cable sockets if necessary.)
2. Remove the attenuator mounting bracket screws.
3. Remove the attenuator and mounting bracket from the test set.
4. Remove the mounting bracket from the attenuator before sending the attenuator to HP for repair.

(9) Capacitor

1. Set the test set upright and pull the metal and plastic cover off the capacitors.
2. Turn the test set upside-down and remove the bottom cover.

NOTE It is important to plug in the test set before performing step 3.

3. Discharge each capacitor terminal (large pozidrive screw on the bottom side of the test set) through a high wattage resistor and clip lead to earth ground. Each capacitor has two (2) terminals. *Discharge every capacitor terminal for 30 seconds*.
4. To remove a capacitor, remove the corresponding pair of screws and pull the capacitor out of the test set.

(10) 3.5 mm RF Connector Repair

Refer to Figure 5-9 on page 5-22 and the following text to repair 3.5 mm connectors.

Disassembly

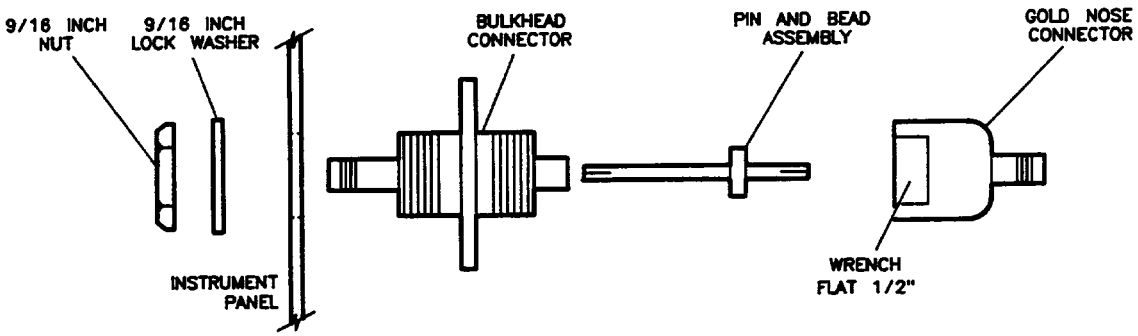


Figure 5-7 Exploded Diagram of 3.5 mm Connector

1. Remove any attached cables from the connector to be replaced.
2. Use a 1/2 in. wrench to loosen the gold nose connector. Remove the pin and bead assembly from the connector. If only the pin and bead assembly needs to be replaced, continue with step 6.
3. From the inside of the test set, use the 9/16 in. nut driver to loosen the 9/16 in nut and remove the rest of the connector.

4. Use the part numbers given below for replacement purposes.

Replacement Part	HP Part Number
Nut	2950-0132
Lock washer	2190-0104
Bulkhead connector	08513-20017
Pin and bead assembly (3 pieces[1])	5061-5394
Gold nose connector	08513-20016

1. Assembled at the factory, not available separately.

Assembly

5. Assemble the bulk head connector, lock washer and nut. Tighten the nut using the 9/16 in. nut driver to 495 N-cm (45 in.-lb).
6. Clean the pin and bead assembly as described in the *Microwave Connector Care Manual*. Insert the pin and bead assembly into the gold nose connector. Attach this assembly to the bulkhead connector. Torque the bulkhead connector to 281 N-cm (25 in.-lb.)
7. Clean the mating surfaces with liquid freon or alcohol and lint-free swabs.
8. Gauge the pin depth of the gold nose connector.

Location	Pin Depth Specification
Front Panel, HP 8511A	0.0000 to +0.0017 inch
Rear Panel, HP 8512A, 8513A, 8514A, 8514B, 8515A	0.0000 to +0.003 inch

NOTE If the pin depth is out-of-specification, do not shim. Instead, install another pin and bead assembly.

9. Reconnect the cables disconnected in step 1.

(11) Fan

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

NOTE To replace the fan, transformer T1 must be removed so that the ends of the fan wires may be unsoldered from line module FL1.

Disassembly

1. Turn the test set on its right-hand side.
2. Use a 5/16 inch open end wrench to remove the hardline cables connected between couplers A7, A9 and bulkhead connectors J2 and J5.
3. Unplug the transformer connector mating with connector J2 on the A15 regulator board assembly.
4. Use a large pozi-driv screwdriver to remove the four screws and washers holding transformer T1 onto the rear panel.
5. Use a large pozi-driv screwdriver to remove the one screw holding the transformer angle bracket to the main deck. Carefully remove the transformer from the test set and put it on the bench close to the test set. The transformer wires soldered to the FL1 line module are short, so do not pull on the transformer too much.
6. Strip the heat shrink tubing off of the two fan wires and unsolder them from line module FL1. Use wire cutters to cut any cable ties holding the fan wires to nearby cables.
7. Use a small pozi-driv screwdriver to remove the screw and lock washer securing the green/yellow fan ground wire to the top of the rear panel frame.
8. Use a small pozi-driv screwdriver to remove the four screws holding fan B1 to the rear panel and remove the fan.

Assembly

1. Assemble the bulkhead connector, lock washer and nut. Use the 9/16 inch nut driver to tighten the nut to approximately 500 N-cm (45 in.-lb.).
2. Clean the pin and bead assembly using the procedures described in the *Microwave Connector Care Manual* (HP Part number 08510-90064) provided with your HP 8510B manual set.
3. Clean the mating surfaces with liquid freon or alcohol and lint-free swabs.

4. Check the pin depth of the gold nose connector. The pin depth specification is 0.0000 to +0.0030 inch.

NOTE If the pin depth is not within specification, do not shim. Instead, install another pin and bead assembly.

5. Reconnect the cables disconnected in step 1 using a 5/16 inch torque wrench rated at 56 N-cm (5 in.-lb.).

(12) Port 1 3.5 mm Connector
Port 2 3.5 mm Connector

Refer to Figure 5-8 and the following text to replace or repair these 3.5 mm test port connectors.

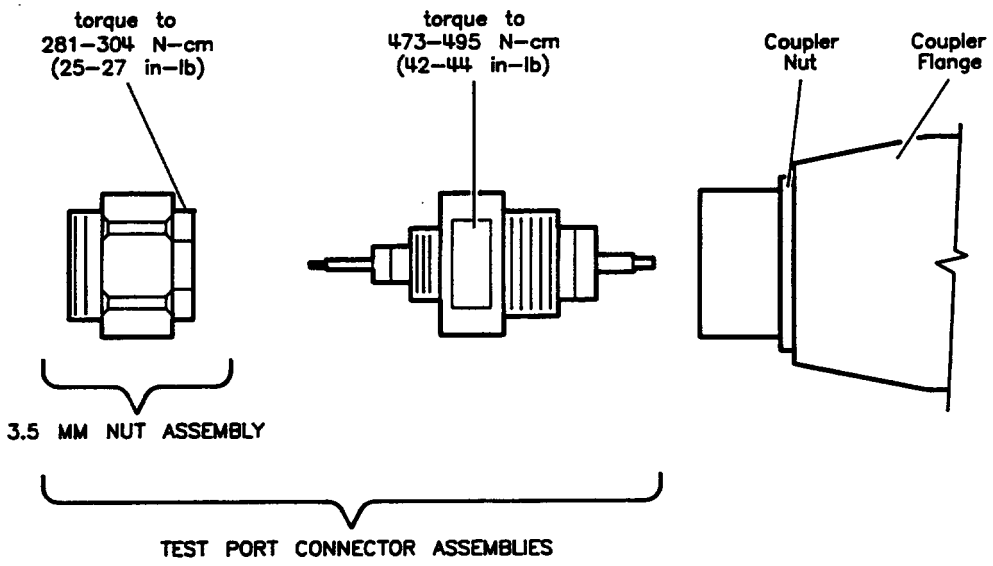


Figure 5-8 Exploded View of the 3.5 mm Port Connector

Center Pin Repair Procedure

NOTE Damaged test port center pins must be repaired by replacing the complete test port connector assembly.

1. Remove the test port connector assembly, using a 5/8 inch flat wrench.
2. Replace with a new test port connector assembly using a 5/8 inch torque wrench to the limits called out in Figure 5-8.
3. Check the test port pin depth with a 3.5 mm gauge. The center pin recession specificiation is +0.005 to +0.056 mm (+0.0002 to +0.002 in).

3.5 mm Nut Repair Procedure

1. Remove the damaged nut withh a 9/16 inch flat wrench.
2. Replace with a new nut.
3. Torque with a 9/16 inch torque wrench to the limits set in Figure 5-8.

(13) Power Transformer

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

1. Turn the test set on its right-hand side.
2. Use a 5/16 inch open end wrench to remove the hardline cable connected between coupler A7 and bulkhead connector J2.
3. Unplug the transformer connector mating with connector J2 on the A15 regulator board assembly.
4. Use a large pozi-driv screwdriver to remove the four screws and washers holding transformer T1 onto the rear panel.
5. Use a large pozi-driv screwdriver to remove the one screw holding the transformer angle bracket to the main deck. Carefully remove the transformer from the test set and put it on the bench close to the test set. The transformer wires soldered to line module FL1 are short, so do not pull on the transformer too much.
6. Strip the heat shrink tubing off of the transformer wires soldered to line module FL1 and unsolder them. Unsolder the transformer ground wire connected to the chassis side rail.

7. Remove transformer T1. When replacing the transformer, refer to Figure 5-9, which illustrates the locations of the various wires connected to line module FL1.

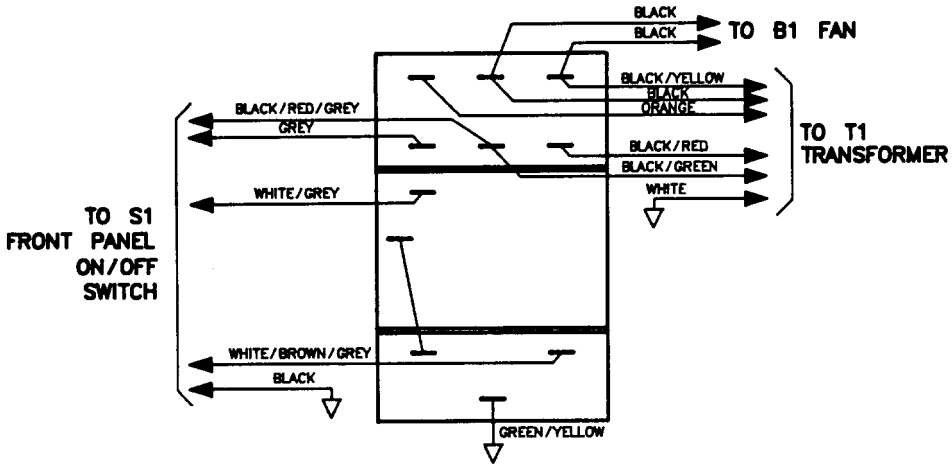


Figure 5-9 Wire Connections to Line Module FL1

Unratioed Power Test

This procedure allows you to check the output power level of each test set sampler/mixer assembly and its associated IF amplifier alone. The normal power level display, S11 for example, is a ratio (in this case, b1/a1). The network analyzer automatically powers and phase-locks a predefined port or ports to make the measurement selected.

Ratioed measurements provide useful data but they can mask certain malfunctions. Assume, for example, the task is to measure an S-parameter at a specific power level. If the test set has a 20 dB power hole due to a faulty RF input connector, that deficiency would be invisible (ratioed out) in a ratioed measurement. But the data would be incorrect; it would not have been taken at the specified power level.

Similarly, troubleshooting system faults in a ratioed measurement mode can be deceptive. The solution is to check each channel singly, to check the power in an unratioed mode. To do so requires specifying which port to drive power to and which channel to achieve phase lock with. The following procedures include steps to redefine parameters as required.

Figure 5-14 through Figure 5-25 show which assemblies are parts of the signal path of each channel. Realizing that some assemblies are common to two, or all four, channels is a powerful troubleshooting tool. Figure 5-11 and Figure 5-14 through Figure 5-25, following these procedures, show typical traces.

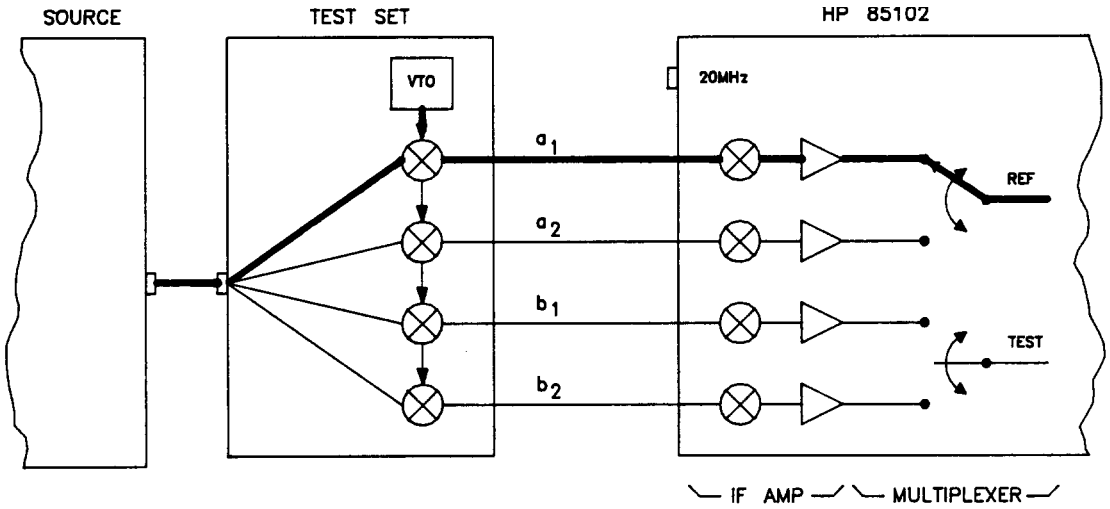


Figure 5-10 Simplified Signal Path of Unratioed Power Test

HP 8512A Test Set

NOTE For an HP 8512A, check the b1 and b2 trace between 2 GHz and 18 GHz. Below 2 GHz, the coupler response rolls off rapidly in the b1 reflection trace.

1. Remove any cables or DUTs from the test set input ports. Press **[PRESET]** STIMULUS **[MENU]** on the HP 85102 to access the STIMULUS menu.
   a. HP 8340/41 systems: press **[STEP]** on the HP 85101 to set the source to step mode.
   b. HP 8350B systems: press **[SWEEP TIME]** and use the entry keys to set the sweep time to 200 ms.

a1 Test

2. Press PARAMETER **[MENU] [USER 1 a1]** to see the unratioed power trace.

   For an HP 8512A, the trace level should decrease from –20 ±5 dB at low frequency to –35 ±5 dB at high frequency.

b1 Reflection Test

3. Connect an open (or a short) to port 1.
4. Press **[USER 4 b1]** and check that the trace for each is within the limits described above.

b2 Thru Test

5. Connect a thru between port 1 and port 2 (connect pad to port 1 and test port return cable between pad and port 2).

   For an HP 8512A, use a 20 dB system pad.
6. Press **[USER 2 b2]** and check that the trace is within the same limits.
7. If one or more channels appear faulty, refer to the procedure titled “If Any User Channel Looks Bad” on page 5-36.

HP 8514B Test Set

NOTE For an HP 8514B, check the b1 and b2 trace between 2 GHz and 20 GHz. Below 2 GHz the coupler rolls off rapidly.

1. Press **[PRESET]** STIMULUS **[MENU]** on the HP 85102 to preset the HP 8510 and access the STIMULUS menu.
   a. HP 8340/41 systems: press **[STEP]** on the HP 85101 to put the source in step mode.
   b. HP 8350B systems: press **[SWEEPTIME]** and use the entry keys to set the sweep time to 200 ms.

Sampler Test

2. To check all of the samplers in a S-parameter test set, first redefine the a2 and b2 phase lock and drive paths:

   Press PARAMETER **[MENU] [User 3 a2] [REDEFINE PARAMETER] [DRIVE] [Port 2] [PHASELOCK] [a2] [REDEFINE DONE]** to redefine a2.

   Press **[User 2 b2] [REDEFINE PARAMETER] [DRIVE] [Port 2] [PHASELOCK] [a2] [REDEFINE DONE]** to redefine b2.

3. Connect an open (or short) to port 1 and port 2.
4. Press **[User 1 a1]**, **[User 2 b2]**, **[User 3 a2]**, and **[User 4 b1]** to check the samplers indicated. Each trace should be within the following limits:

   For an HP 8514B, the traces should decrease from –20 ±5 dB at low frequency to –27 ±5 dB at high frequency.

NOTE The RF signal paths are shown in Figure 5-11 through Figure 5-25.

b1 Thru Test

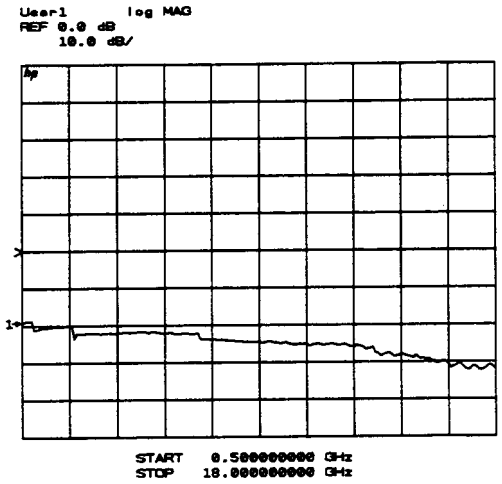
5. Connect a thru (two RF cables) from port 1 to port 2.
6. Press PARAMETER **[MENU] [USER 4 b1] [REDEFINE PARAMETER] [DRIVE] [PORT 2] [PHASELOCK] [a2] [REDEFINE DONE]** to observe the b1 power level trace through the path indicated by Figure 5-12 through Figure 5-25 b1 thru.

b2 Thru Test

7. Press Parameter **[MENU] [USER 2 b2] [REDEFINE PARAMETER] [DRIVE] [PORT 1] [PHASELOCK] [a1] [REDEFINE DONE**] to observe the b2 power level trace through the path indicated by Figure 5-12 through Figure 5-25.

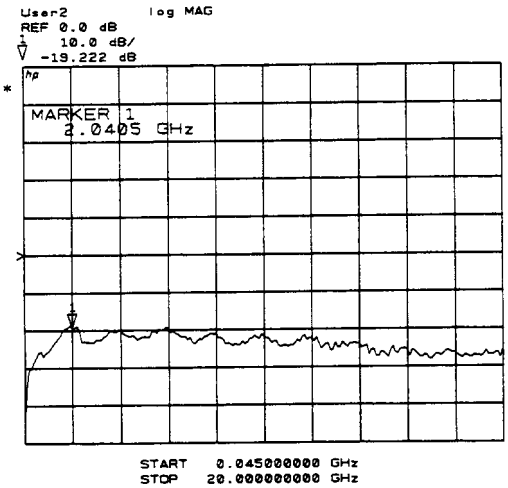
Next Step

If one or more channels look abnormal, refer to the procedure titled “If Any User Channel Looks Bad” on page 5-36.



HP 8512A

a1 and b2 thru trace



HP 8514B

b1 reflection and b2 reflection trace

Figure 5-11 Typical Test Set Unratioed Power Test Traces

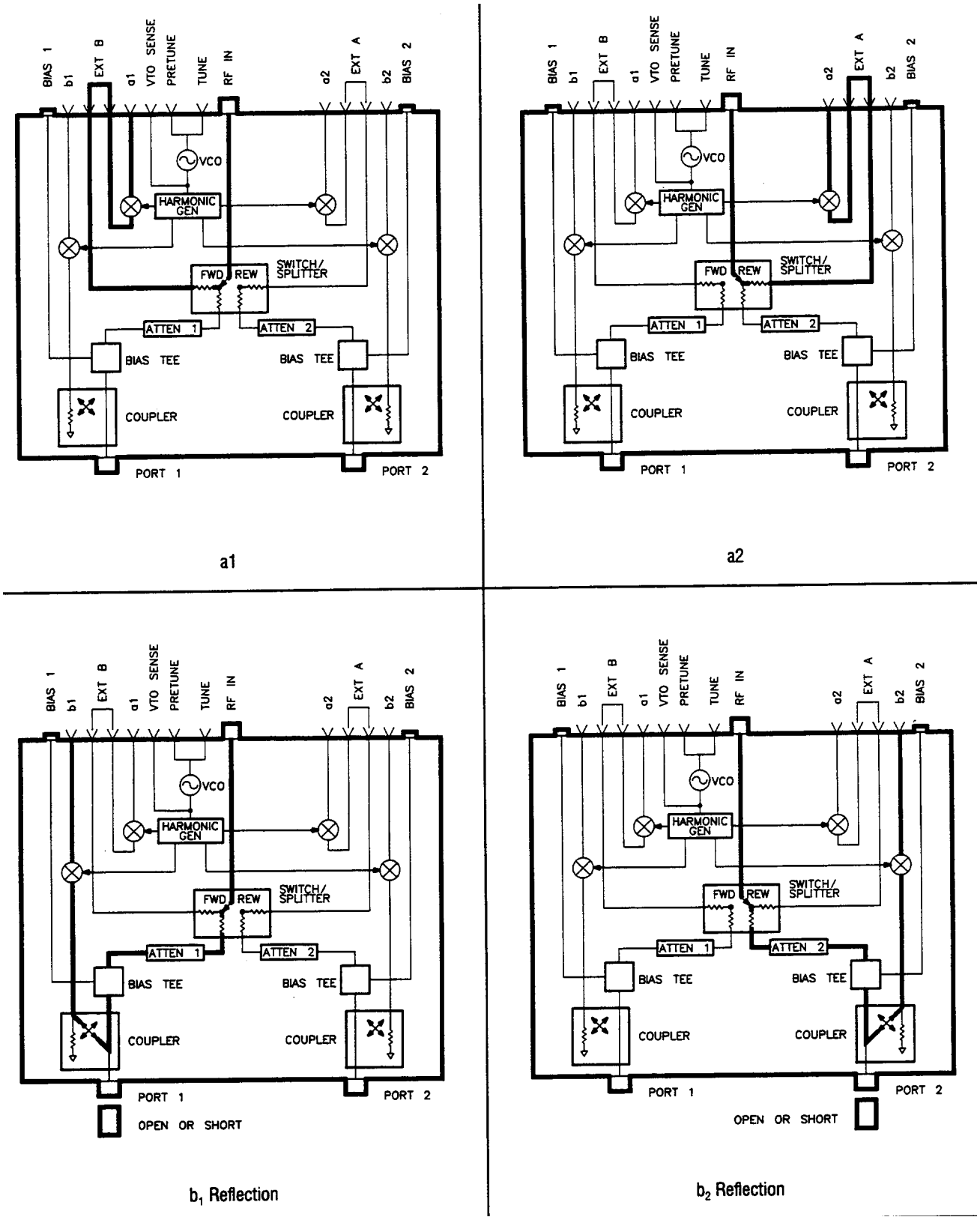


Figure 5-12 User Signal Paths in Test Sets (1 of 2)

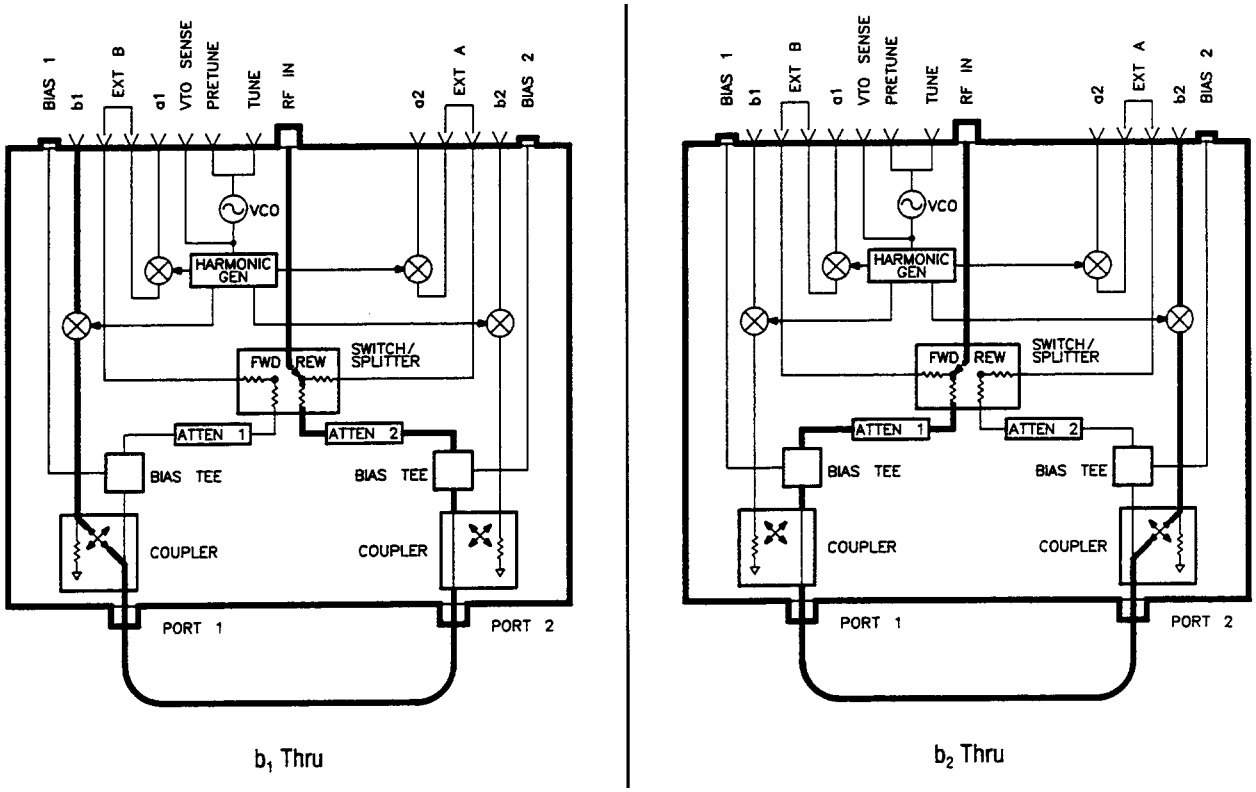


Figure 5-13 User Signal Paths in Test Sets (2 of 2)

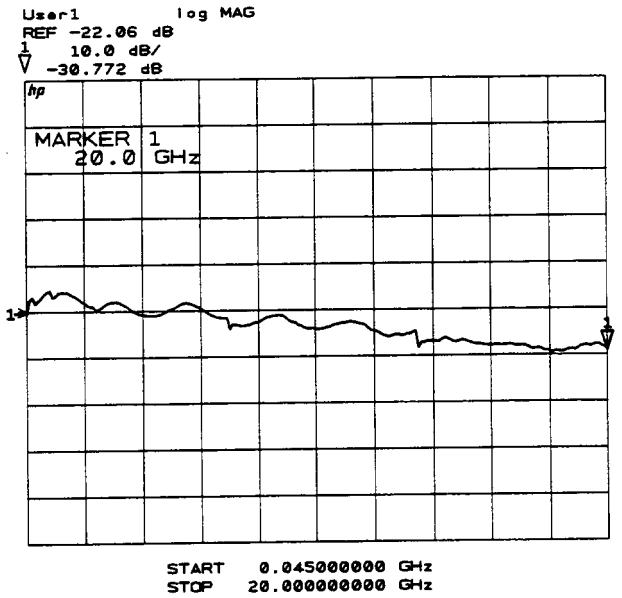


Figure 5-14 Typical HP 8514B Option 002/003 a1 Reflection Trace

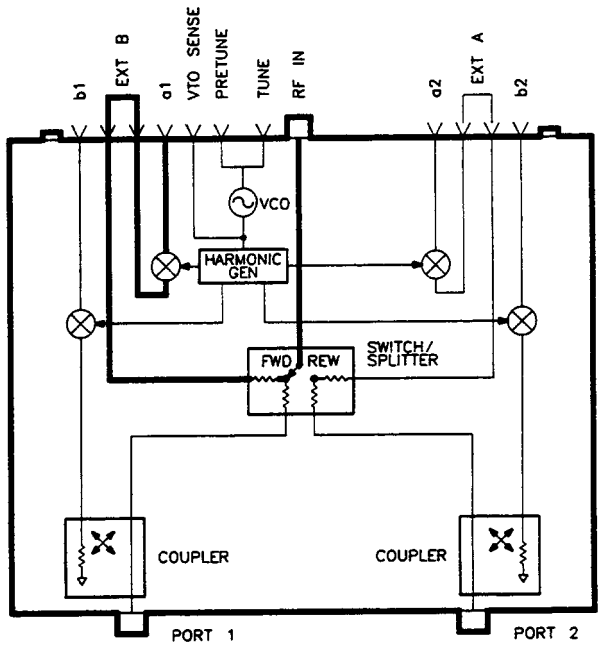


Figure 5-15 HP 8514B Option 002/003 a1 Reflection Signal Path

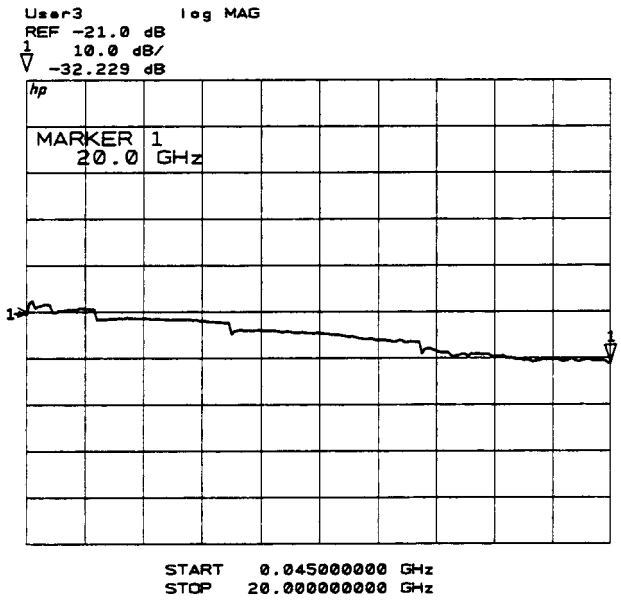


Figure 5-16 Typical HP 8514B Option 002/003 a2 Reflection Trace

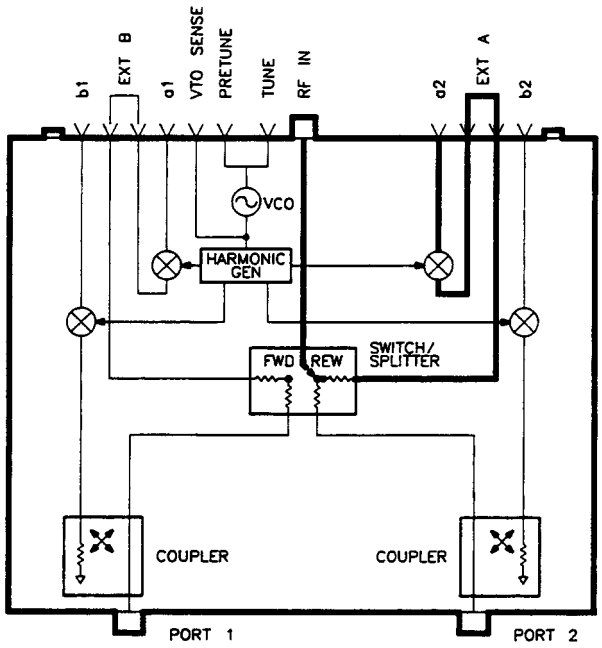


Figure 5-17 HP 8514B Option 002/003 a2 Reflection Signal Path

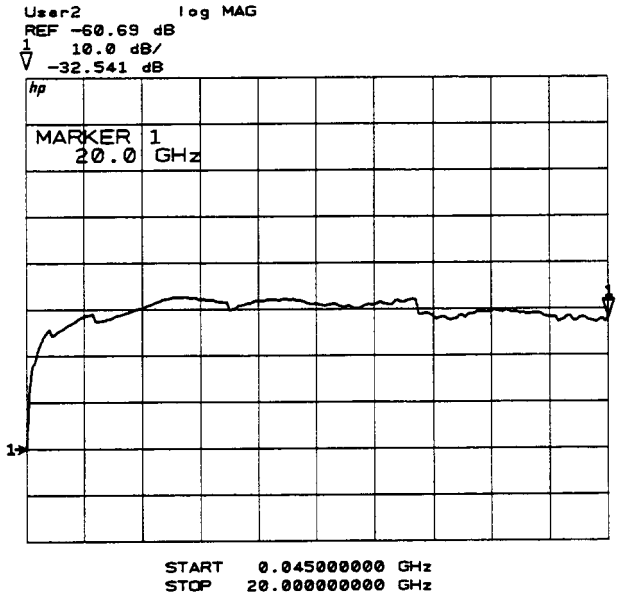


Figure 5-18 Typical HP 8514B Option 002/003 b1 Reflection Trace

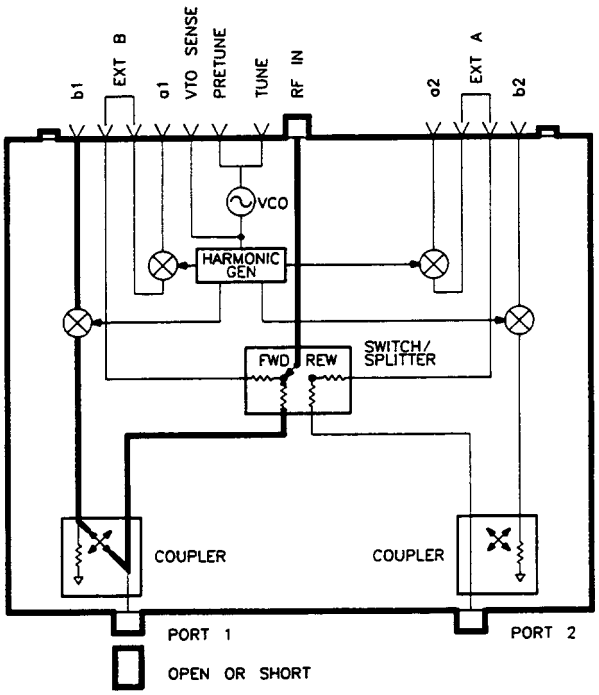


Figure 5-19 HP 8514B Option 002/003 b1 Reflection Signal Path

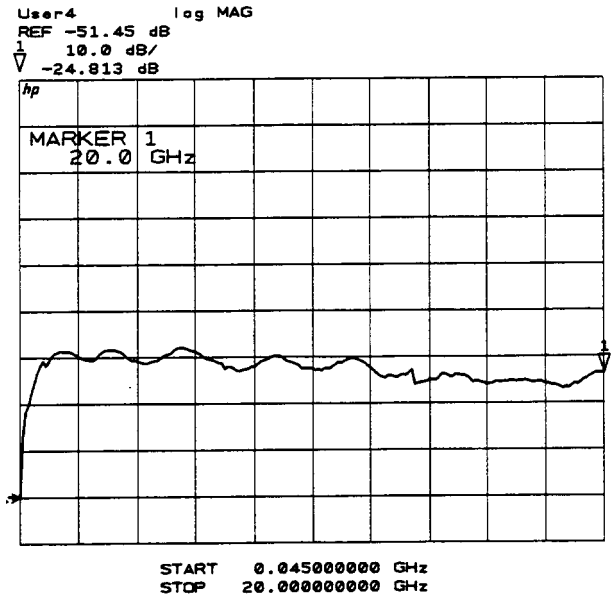


Figure 5-20 Typical HP 8514B Option 002/003 b2 Reflection Trace

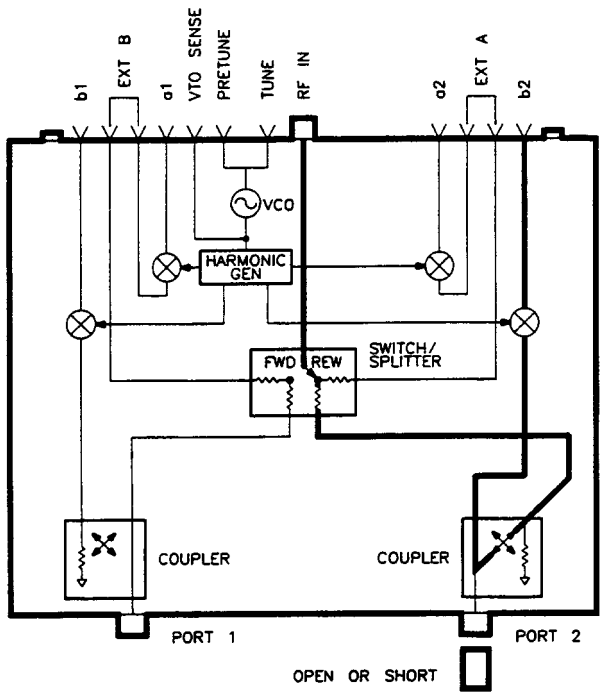


Figure 5-21 HP 8514B Option 002/003 b2 Reflection Signal Path

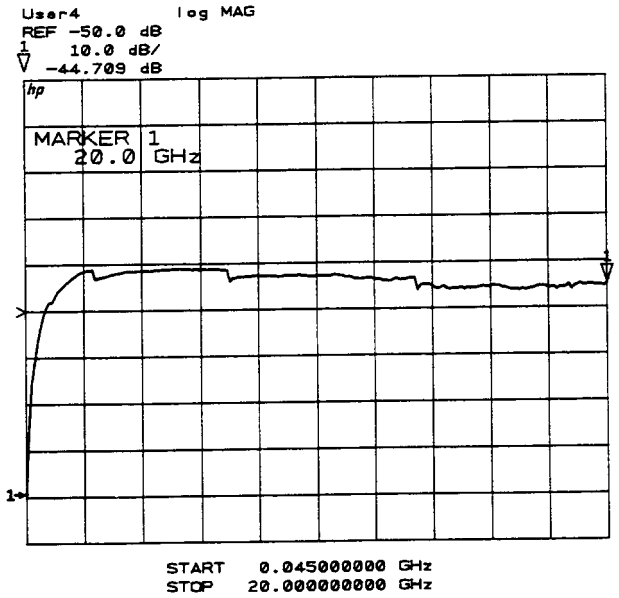


Figure 5-22 Typical HP 8514B Option 002/003 b1 Thru Trace

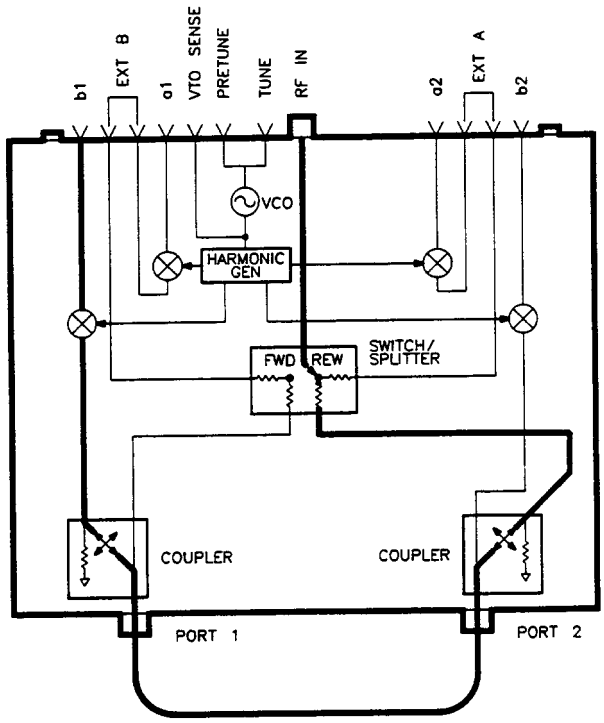


Figure 5-23 HP 8514B Option 002/003 b1 Thru Signal Path

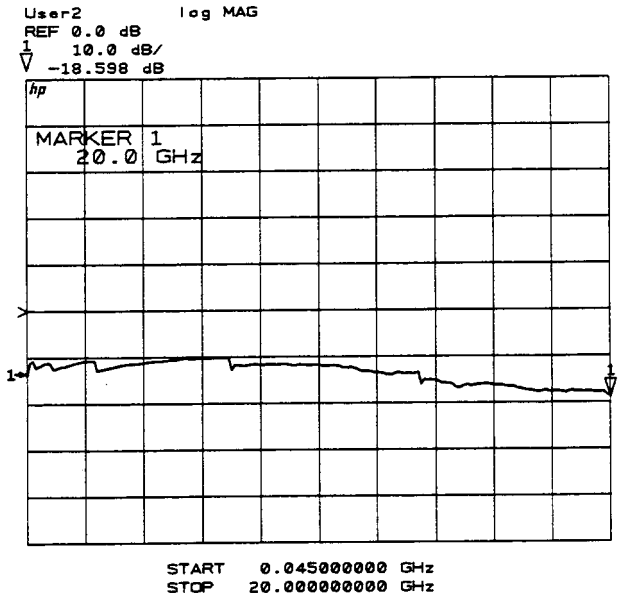


Figure 5-24 Typical HP 8514B Option 002/003 b2 Thru Trace

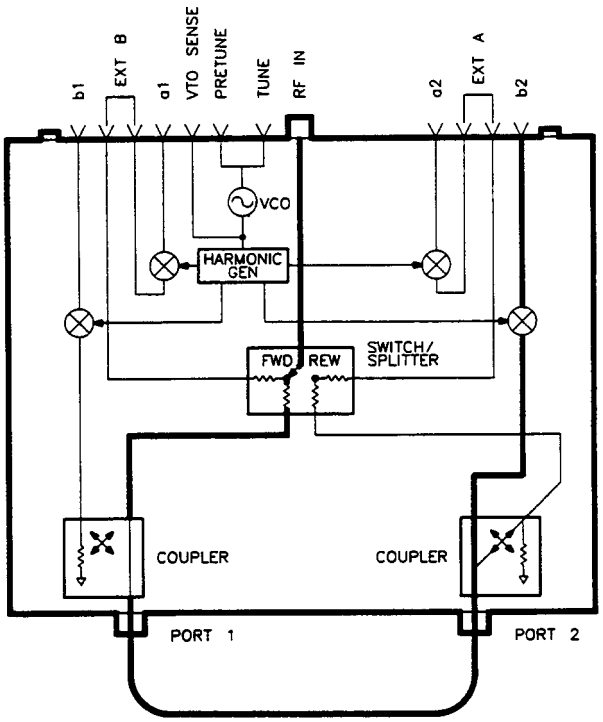


Figure 5-25 HP 8514B Option 002/003 b2 Thru Signal Path

If Any User Channel Looks Bad

One or more user channels appear faulty. The question is, what is at fault?, the source or test set or IF/detector (HP 85102). The service adapter is a source/test set emulator. It provides the same 20 MHz signal to the HP 85102B as the test set and source. Thus it indicates whether the problem is in the IF/detector.

Equipment

- HP 85102B service adapter (provided in the *HP 8510B Service Manual*, refer to Service Tools).
- BNC to BNC cable

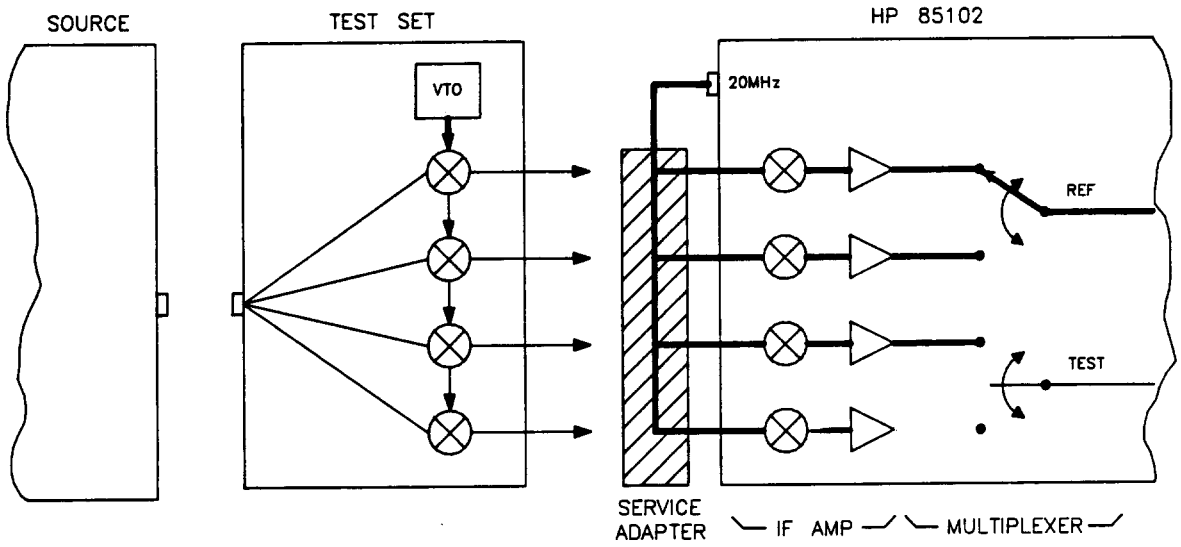


Figure 5-26 HP 85102 Signal Path with Service Adapter

Service Adapter Procedure

1. Connect the HP 85102B service adapter to the HP 85102B rear panel "20 MHz OUT" connector and the "J2 IF-DISPLAY INTERCONNECT" connector.
2. Press **[PRESET] [MARKER]** STIMULUS **[MENU] [STEP]** PARAMETER **[MENU]** and each User softkey to observe the unratioed power level of the User1 through User4 channels. The traces should be flat lines, quite close to each other, as indicated by the marker value (typically about –28 ±5 dB).

Service Adapter Conclusions

- **If all of the channels look good** (with the service adapter) and all looked bad in the unratioed power test, the HP 85101 and 85102 are working. The problem is probably source related. Refer to the Source Tests and Service Program sections of the Service Manual to continue troubleshooting the problem.
- **If all four User channels look bad** (with the service adapter), suspect the 20 MHz signal from the A6 clock board assembly. Refer to the paragraph titled HP 85102 IF/Detector Tests in the Service Program section to verify the 20 MHz output.
- **If one or more (but not all) channels look bad**, troubleshoot the HP 85102 by referring to the Service Program and Block Diagrams sections of the Service Manual. Then recheck the unratioed channel power levels.

  Single channel problems suggest the IF Mixer board corresponding to the User function (channel a1, b1, b2, or a2) is faulty. Refer to the Overall System Block diagram located in the Block Diagrams section of the Service Manual.

  Multiple channel problems indicate the problem is most likely in the circuitry after the IF Mixer boards (for example, the IF amplifiers or synchronous detectors). Refer to the HP 85102A Overall Block Diagram in the Block Diagrams section of the Service Manual.

  Determine whether the failure is in the reference path or the test path.

  Test the suspect board(s) using the procedures provided in the Service Program section.

  Check the IF Amplifiers and Synchronous Detectors by swapping the reference and test board assemblies (since they are identical) and seeing if the problem moves.

6

Replaceable Parts

Introduction

This section contains information for ordering parts. Exchange Assemblies Available describes how to order assemblies which are available on an exchange basis.

HP 8514B replaceable parts are identified by Table 6-1 and Figure 6-1 through Figure 6-12.

HP 8512A replaceable parts are identified by Table 6-2 and Figure 6-7, Figure 6-8, and Figure 6-13 through Figure 6-19.

Exchange Assemblies Available

The items 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

A3 VTO summing amplifier board assembly

A4 HPIB board assembly

A5 attenuator/switch driver assembly[1]

A6 coupler

A7 bias tee[1]

A8 coupler[1]

A9 bias tee[1]

A10 sampler assembly (input b1)

A11 sampler assembly (input b2)

A12 sampler assembly (input a1)

A13 sampler assembly (input a2)[1]

A14 VTO/driver assembly

A15 regulator board assembly

A16 step attenuator[1]

A17 step attenuator[1]

A18 switch/splitter[1]

1. HP 8514B only.

Replaceable Parts Lists

The replaceable parts lists consist of illustrations and tables. Use the illustrations to identify the part to be ordered; use the tables to determine the ordering information. Each table is arranged in alpha-numerical order by reference designator. The reference designator keys the part listed to the illustration. The part number listed is HP's part number. Quantity refers to the total number of that part in the instrument. The description is a brief written description of the part and may be used for ordering purposes.

The replaceable parts of ports 1 and 2 of the HP 8514B are identified in Figure 6-10.

The replaceable parts of ports 1 and 2 of the HP 8512B are identified in Figure 6-19. Additional center conductor and outer nut replacement information is in Service Note 8512A-4A.

For information concerning the repair of 3.5 mm rear panel connectors, refer to the Test Set Troubleshooting section of the *HP 8510B Service Manual* or Service Note 8511A-1.

Reference Designations			
A	assembly	J	electrical connector, jack
AT	attenuator	MP	miscellaneous part
B	fan	R	resistor
C	capacitor	T	transformer
E	miscellaneous electrical part	W	cable, wire
F	fuse	X	socket
FL	filter		
More comprehensive tables of reference designators and abbreviations are behind the Replacement Parts tab of the *HP 8510B Service Manual*.			

Table 6-1 HP 8514B Replaceable Parts

Reference Designation	HP Part Number	Qty	Description
A1	08513-60005	1	BOARD ASSEMBLY, FRONT PANEL
A1DS1	1990-0858	2	LED-LAMP LUM-INT=15UCD IF=25MA-MAX
A1DS2	1990-0858		LED-LAMP LUM-INT=15UCD IF=25MA-MAX
A2			SEE Figure 6-8
A3	08513-60008	1	VTO SUMMING AMPLIFIER BD ASSY (NEW)
A4	08514-60029	1	BOARD ASSEMBLY, HPIB (NEW)
A5	08513-60011	1	ATTENUATOR/SWITCH DRIVER (NEW)
A6	5180-2749	1	DIRECTIONAL COUPLER (NEW)
A7	5086-7322	2	BIAS TEE, PORT 2 (NEW)
A7	5086-6322	2	BIAS TEE, PORT 2 (REBUILT)
A8	5180-2749	1	DIRECTIONAL COUPLER
A9	5086-7322		BIAS TEE, PORT 1 (NEW)
A9	5086-6322		BIAS TEE, PORT 1 (REBUILT)
A10	5086-7402	1	B1 SAMPLER ASSY (NEW)
A10	5086-6402	1	B1 SAMPLER ASSY (REBUILT)
A11	5086-7402	1	B2 SAMPLER ASSY (NEW)
A11	5086-6402	1	B2 SAMPLER ASSY (REBUILT)
A12	5086-7402	1	A1 SAMPLER ASSY (NEW)
A12	5086-6402	1	A1 SAMPLER ASSY (REBUILT)
A13	5086-7402	1	A2 SAMPLER ASSY (NEW)
A13	5086-6402	1	A2 SAMPLER ASSY (REBUILT)
A14	5086-7231	1	VTO/DRIVER (NEW)
A14	5086-6231	1	VTO/DRIVER (REBUILT)
A15	08513-60007	1	BOARD ASSEMBLY, REGULATOR
A16	08340-60175	2	STEP ATTENUATOR, PORT 1
A17	08340-60175		STEP ATTENUATOR, PORT 2
A18	5086-7324	1	SWITCH/SPLITTER (NEW)
A18	5086-6324	1	SWITCH/SPLITTER (REBUILT)
A19	08513-60001	1	BOARD ASSEMBLY, MOTHER
			THE FOLLOWING PARTS ARE NOT SUPPLIED
			WHEN A19 IS ORDERED: A19C1, A19C2, A19C3, A19C4
A19C1	0180-2671	4	CAPACITOR-FXD .012F+75-10% 3OVDC AL
A19C2	0180-2671		CAPACITOR-FXD .012F+75-10% 3OVDC AL
A19C3	0180-2671		CAPACITOR-FXD .012F+75-10% 30VDC AL
A19C4	0180-2971		CAPACITOR-FXD .012F+75-10% 3OVDC AL
A19C5	0160-4834	2	CAPACITOR-FXD .047UF ±10% 100VDC CER
A19C6	0160-4834		CAPACITOR-FXD .047UF ±10% 100VDC CER
A19J1	1251-5745		CONNECTOR 20-PIN M POST TYPE
			(A19J1 DOES NOT INCLUDE A19MP1 & A19MP2)
A19J2	1251-6868	4	CONNECTOR 5-PIN M POST TYPE
A19J3	1251-7939	1	CONN-POST TYPE .100-PIN-SPCG 14-CONT
			(A19J3 DOES NOT INCLUDE A19MP3)
A19J4	1251-6868		CONNECTOR 5-PIN M POST TYPE
A19J5	1251-6868		CONNECTOR 5-PIN M POST TYPE
A19J6	1251-6868		CONNECTOR 5-PIN M POST TYPE
A19J7	1251-3825	1	CONNECTOR 5-PIN M POST TYPE
A19J8	1200-1304	2	IC SOCKET 14 PIN

Table 6-1 HP 8514B Replaceable Parts (Continued)

Reference Designation	HP Part Number	Qty	Description
A19J9	1200-1304	2	IC SOCKET 14 PIN
A19R1	0764-0015	2	RESISTOR 560 5% 2W MO TC=0 ±200
A19R2	0764-0015		RESISTOR 560 5% 2W MO TC=0 ±200
A19R3	0764-0016	2	RESISTOR 1K 5% 2W MO TC=0 ±200
A19R4	0764-0016		RESISTOR 1K 5% 2W MO TC=0 ±200
A19R5	0757-0394		RESISTOR 51.1 1% .125W TC=0 ±100
A19R6	0757-0394		RESISTOR 51.1 1% .125W TC=0 ±100
A19XA2	1251-7882	5	CONNECTOR-PC EDGE 2-ROWS
A19XA3	1251-7882		CONNECTOR-PC EDGE 2-ROWS
A19XA4	1251-7882		CONNECTOR-PC EDGE 2-ROWS
A19XA5	1251-7882		CONNECTOR-PC EDGE 2-ROWS
A19XA6-A19XA14			NOT ASSIGNED
A19XA15	1251-7882		CONNECTOR-PC EDGE 2-ROWS
A20	08513-60006	1	BOARD ASSEMBLY, HPIB INTERCONNECT
MISCELLANEOUS ELECTRICAL PARTS			
AT1	8493C	1	3.5 MM 20 DB ATTENUATOR
AT2	8493C	1	3.5 MM 20 DB ATTENUATOR
AT3			SEE Figure 6-11
B1	08513-20031	1	FAN-TBAX 34-CFM 115V 50/60-HZ 1.5KV-DIEL
C1	0160-4311	1	CAPACITOR-FXD .022UF +80-20% 100VDC CER
DS1	1990-0858	2	LED-LAMP LUM-INT=15UCD IF=25MA-MAX
DS2	1990-0858		LED-LAMP LUM-INT=15UCD IF=25MA-MAX
E1	0360-0009	1	TERMINAL-SLDR LUG PL-MTG FOR-#SCR
E2	0360-0031	2	TERMINAL-CRIMP R-TNG #6 22-16-AWG RED
E3	0360-0031		TERMINAL-CRIMP R-TNG #6 22-16-AWG RED
E4	0362-0265	2	CONNECTOR-SGL CONT SKT 1.14-MM-BSC-SZ
E5	0362-0265		CONNECTOR-SGL CONT SKT 1.14-MM-BSC-SZ
E6	08513-00018	1	INSULATOR-BRACE
E7	0360-1673	1	TERMINAL STRIP 6-TERM PHEN 1.5-IN-L
E8	5021-3510	5	CONTACT-FEMALE
E9	5021-3510		CONTACT-FEMALE
E10	5021-3510		CONTACT-FEMALE
E11	5021-3510		CONTACT-FEMALE
E12	5021-3510		CONTACT-FEMALE
E13	5061-5301	5	3.5MM BEAD-R AY
E14	5061-5301		3.5MM BEAD-R AY
E15	5061-5301		3.5MM BEAD-R AY
E16	5061-5301		3.5MM BEAD-R AY
E17	5061-5301		3.5MM BEAD-R AY
E18	08513-20016	5	CONNECTOR NOSE-F
E19	08513-20016		CONNECTOR NOSE-F
E20	08513-20016		CONNECTOR NOSE-F
E21	08513-20016		CONNECTOR NOSE-F
E22	08513-20016		CONNECTOR NOSE-F
E23	08513-20017	5	CONN-BULKHEAD
E24	08513-20017		CONN-BULKHEAD

Table 6-1 HP 8514B Replaceable Parts (Continued)

Reference Designation	HP Part Number	Qty	Description
E25	08513-20017		CONN-BULKHEAD
E26	08513-20017		CONN-BULKHEAD
E27	08513-20017		CONN-BULKHEAD
E28	08513-20018	5	CENTER CNDCT-BHD
E29	08513-20018		CENTER CNDCT-BHD
E30	08513-20018		CENTER CNDCT-BHD
E31	08513-20018		CENTER CNDCT-SHO
E32	08513-20018		CENTER CNOCT-BHD
E33	2110-0797	2	FUSEHOLDER
E34	2110-0797		FUSEHOLDER
E35	85050-20001	2	CONTACT CTR COND
E36	85050-20001		CONTACT CTR COND
E37	2110-0565	2	FUSEHOLDER CAP 12A MAX FOR UL
E38	2110-0565		FUSEHOLDER CAP 12A MAX FOR UL
E39	1251-3720	8	CONNECTOR-SGL CONT SKT .04-IN-BSC-SZ RND
E40	1251-3720		CONNECTOR-SGL CONT SKT .04-IN-BSC-SZ RND
E41	1251-3720		CONNECTOR-SGL CONT SKT .04-IN-BSC-SZ RND
E42	1251-3720		CONNECTOR-SGL CONT SKT .04-IN-BSC-SZ RND
E43	1251-3720		CONNECTOR-SGL CONT SKT .04-IN-BSC-SZ RND
E44	1251-3720		CONNECTOR-SGL CONT SKT .04-IN-BSC-SZ RND
E45	1251-3720		CONNECTOR-SGL CONT SKT .04-IN-BSC-SZ RND
E46	1251-3720		CONNECTOR-SGL CONT SKT .04-IN-BSC-SZ RND
E47	1251-3720		CONNECTOR-SGL CONT SKT .04-IN-BSC-SZ RNO
E48	1251-3720		CONNECTOR-SGL CONT SKT .04-IN-BSC-SZ RND
F1	2110-0012	2	FUSE .5A 250V NTD 1.25X.25 UL
F2	2110-0012		FUSE .5A 250V NTD 1.25X.25 UL
F3	2110-0002	1	FUSE 2.0A 250V NTD 1.25X.25 UL
FL1	9135-0217	1	LINE MODULE-FILTERED
J6	1250-0083	2	CONNECTOR-RF BNC FEM SGL-HOLE-FR 50-OHM
J8	1250-0083		CONNECTOR-RF BNC FEM SGL-HOLE-FR 50-OHM
R1	0757-0394	1	RESISTOR 51.1 1% .125W F TC=0 ±100
T1	9100-4616	1	POWER XFMR
W1-W12			SEE Figure 6-8
W13	08513-60l33	1	CA AY A3J1-A14J1
W14	08513-60134	1	CA AY A3J2-J11A7
W15			SEE Figure 6-8
W16	08513-60136	1	CA AY A3J5-J11A5
W17			SEE Figure 6-8
W18	08513-60138	1	CA AY A3J7-J11A6
W19			SEE Figure 6-8
W20	08513-60140	1	CA AY A3J4-A14J2
W21	08513-60141	1	CA AY A5J2-A18J4
W22	08513-60142	1	CA AY A5J1-A18J3
W23	08513-60143	1	CA AY A5J3-A18J6
W24	08513-60144	1	CA AY A12J3-J11A1
W25	08513-60145	1	CA AY A13J3-J11A4
W26	08513-60146	1	CA AY A10J3-J11A2

Table 6-1 HP 8514B Replaceable Parts (Continued)

Reference Designation	HP Part Number	Qty	Description
W27	08513-60147	1	CA AY A11J3-J11A3
W28			NOT ASSIGNED
W29			NOT ASSIGNED
W30			NOT ASSIGNED
W31	08514-20028	1	CA RF A8J3-A11J2
W32	08514-20027	1	CA RF A6J3-A10J2
W33	08514-20013	2	CA RF J2-J3
W34	08514-20014	2	A18J1J3
W35	08514-20015	1	CA RF A18J7-A17J2
W36	08514-20016	1	CA RF A7J1-A16J1
W37	08514-20017	1	CA RF A18J8-A16J2
W38	08514-20018	1	CA RF A9J1-A17J1
W39	08514-20019	1	CA RF A18J5-J7
W40	08514-20026	1	CA RF A13J2-J2
W41	08514-20025	1	CA RF A12J2-J5
W42			NOT ASSIGNED
W43	08514-20013		CA RF J4-J5
W44	08514-20014		A18J2J4
W45-W49			SEE Figure 6-11
W50-W56			NOT ASSIGNED
W57	08513-60014	1	CBL AY RP-MB
W58	08513-60036	1	CBL AY RP-HPIB
W59	85102-60226	1	CA ASSY LINE SW
W60	08513-60013	1	CA AY FRPNL-MBD
W61	08510-60102	1	CBL AY TEST SET
W62	8120-1348	1	CABLE ASSY 18AWG 3-CNDCT BLK-JKT
W63	8120-3445	1	HP-IB CABLE 1 METER
W64	8120-4396	1	CBL C AY-SMA
W65	08514-20001	1	CA RF A9J1-A18J7
W66	08514-20002	1	CA RF A7J1-A18J8
W67	08512-20019	2	CA AY J2J3 & J4J5
W68	08512-20019		CA AY J2J3 & J4J5
MISCELLANEOUS MECHANICAL & CHASSIS PARTS			
1	0380-0643	2	STANDOFF-HEX .255-IN-LG 6-32THD
2	0400-0002	4	GROMMET-RND .188-IN-ID .312-IN-GRV-OD
3	0590-0926	4	THREADED INSERT-STDF 6-32 .188-IN-LG SST
4	1251-2942	4	LOCK-SUBMIN D CONN
5	2360-0113	1	SCREW-MACH 6-32 .25-IN-LG PAN-HD-POZI
6	2360-0123	7	SCREW-MACH 6-32 .625-IN-LG PAN-HD-POZI
7	2420-0001	4	NUT-HEX-W/LKWR 6-32-THD .109-IN-THK
8	2420-0022	2	NUT-SPCLY 6-32-THD .23-IN-THK .354-OD
9	2510-0138	3	SCREW-MACH 8-32 3-IN-LG PAN-HD-POZI
10	2510-0270	1	SCREW-MACH 8-32 3.25-IN-LG PAN-HD-POZI
11	2580-0004	4	NUT-HEX-W/LKWR 8-32-THD .125-IN-THK
12	3050-0139	9	WASHER-FL MTLC NO. 8 .172-IN-ID
13	3050-0152	4	WASHER-SHLDR NO. 8 .172-IN-ID .438-IN-OD
14	3050-0227	4	WASHER-FL MTLC NO. 6 .149-IN-ID

Table 6-1 HP 8514B Replaceable Parts (Continued)

Reference Designation	HP Part Number	Qty	Description
15	3050-0692	3	WASHER-FL MTLC NO. 10 .202-IN-ID
16	3160-0309	1	FINGER GUARD
17	08514-00011	1	REAR PANEL
18	0624-0099	37	SCREW-TPG 4-40 .375-IN-LG PAN-HD-POZI
19	0624-0100	8	SCREW-TPG 4-40 .5-IN-LG PAN-HD-POZI STL
20	1400-0757	2	CLAMP-CABLE .25-DIA 1-WD PVC
21	2190-0011	8	WASHER-LK INTL T NO. 10. 195-IN-ID
22	2200-0105	13	SCREW-MACH 4-40 .312-IN-LG PAN-HD-POZI
23	2200-0165	14	SCREW-MACH 4-40 .25-IN-LG 82 DEG
24	2360-0115	62	SCREW-MACH 6-32 .312-IN-LG PAN-HD-POZI
25	2360-0119	6	SCREW-MACH 6-32 .438-IN-LG PAN-HD-POZI
26	2360-0333	12	SCREW-MACH 6-32 .25-IN-LG 100 DEG
27	2510-0192	16	SCREW-MACH 8-32 .25-IN-LG 100 DEG
28	2680-0129	8	SCREW-MACH 10-32 .312-IN-LG PAN-HD-POZI
29	5021-8403	1	FRAME FRONT
30	5021-5804	1	FRAME REAR
31	5021-5837	4	STRUT CORNER 18”
32	08505-20132	2	END PLATE ENCL
33	08513-60156	2	ENCLOSURE CKT
34	08512-20005	1	RFI GASKET
35	08513-00001	1	DECK
36	08513-00002	1	TRANSFORMER BRKT
37	08513-00005	1	MTG BRACKET-LH
38	08513-00006	1	MTG BRACKET-RH
39	08513-00015	1	CAP SPRT PLATE
40	08513-00037	1	BRACKET-CKT ENCL
41	08513-20013	1	BRACE-DECK
42	08513-20015	1	MOUNTING BAR
43	5021-8747	1	FRONT BEZEL MACH
44	0460-0100	1	TAPE-INDL 1-IN-W .002-IN-T ACRLC-XFR-ADH
45	0520-0174	1	SCREW-MACH 2-56 .25-IN-LG PAN-HD-POZI
46	0624-0589	8	SCREW-TPG 4-40 .25-IN-LG UNCT 82 DEG
47	1400-1209	1	CLP CA .69D 1.0W
48	1450-0615	2	RETAINER-LED 0.75 IN LG; 0.38 IN WD
49			NOT ASSIGNED
50	2110-0569	2	FUSEHOLDER COMPONENT NUT; THREAD M12.7
51	2190-0016	2	WASHER-LK INTL T 3/8 IN .377-IN-ID
52	2190-0104	5	WASHER-LK INTL T 7/16 IN .439-IN-ID
53	2200-0109	2	SCREW-MACH 4-40 .438-IN-LG PAN-HD-POZI
54	2200-0164	4	SCREW-MACH 4-40 .188-IN-LG UNCT 82 DEG
55	2260-0009	8	NUT-HEX-W/LKWR 4-40-THD .094-IN-THK
56	2360-0121	1	SCREW-MACH 6-32 .5-IN-LG PAN-HD-POZI
57	2510-0043	4	SCREW-MACH 8-32 .312-IN-LG PAN-HD-POZI
58	2510-0141	4	SCREW-MACH 8-32 .562-IN-LG PAN-HD-POZI
59	2950-0001	2	NUT-HEX-DBL-CHAM 3/8-32-THD .094-IN-THK
60	2950-0132	5	NUT-HEX-DBL-CHAM 7/16-28-THD .094-IN-THK
61	7121-2380	1	LABEL-SERIAL NUMBER

Table 6-1 HP 8514B Replaceable Parts (Continued)

Reference Designation	HP Part Number	Qty	Description
62	5021-0906	7	SLEEV RF PIN POS
63	5021-3427	2	WSHR-TS PORT CON
64	5021-3428	2	NUT-FLG TS PORT
65	08340-40002	2	MOUNT-LED
66	08512-00008	1	CLAMP A
67	08512-00009	1	CLAMP B
68	08512-00010	1	CLAMP C
69	08512-00011	1	CLAMP D
70	08514-00005	2	ATTENUATOR BRACKET
71	08513-00017	2	BRACKET-CONV AY
72	85102-00041	1	COVER-I.F. MUX
73	08513-00022	1	CVR-ATTEN DRVR
74	85102-00041	1	CVR BLANK-IF MUX
75	08514-00028	1	FRONT PANEL
76	08514-00014	1	SUB PANEL
77	08514-00008	1	MOUNTING BRACKET
78	08514-00007	1	SW MNTG PLATE
79	08514-20005	1	BLOCK-MTG CPLR
80	2510-0195	6	SCREW-MACH 8-32 .375-IN-LG 100 DEG
81	7120-4835	1	LABEL-INFORMATION .75-IN-WD 2-IN-LG PPR
82	7121-2527	1	LABEL-WARNING 1-IN-WD 7-IN-LG PPR
83	5021-8496	2	TRIM FRNT HNDL
84	5040-7201	4	FOOT-BOTTOM
85	5041-8802	1	STRIP TRIM TOP
86	5040-7221	4	FOOT-REAR
87	5062-3747	1	COVER BTM 18” FM
88	5061-9457	1	COVER AY SIDE
89	5061-9499	2	HANDLE AY FRONT
90	08513-00040	1	TEST SET CVR TOP
91	08513-00041	1	COVER-SIDE PERF
92	3050-0105	3	WASHER-FL MTLC NO. 4 .125-IN-ID
93	0380-0010	4	SPACER-RND .625-IN-LG .18-IN-ID
94	2360-0127	1	SCREW-MACH 6-32 .875-IN-LG PAN-HD-POZI
95	08513-00017	1	CONV-ASSEY BRACKET
96	08514-20024	2	PORT FLANGE

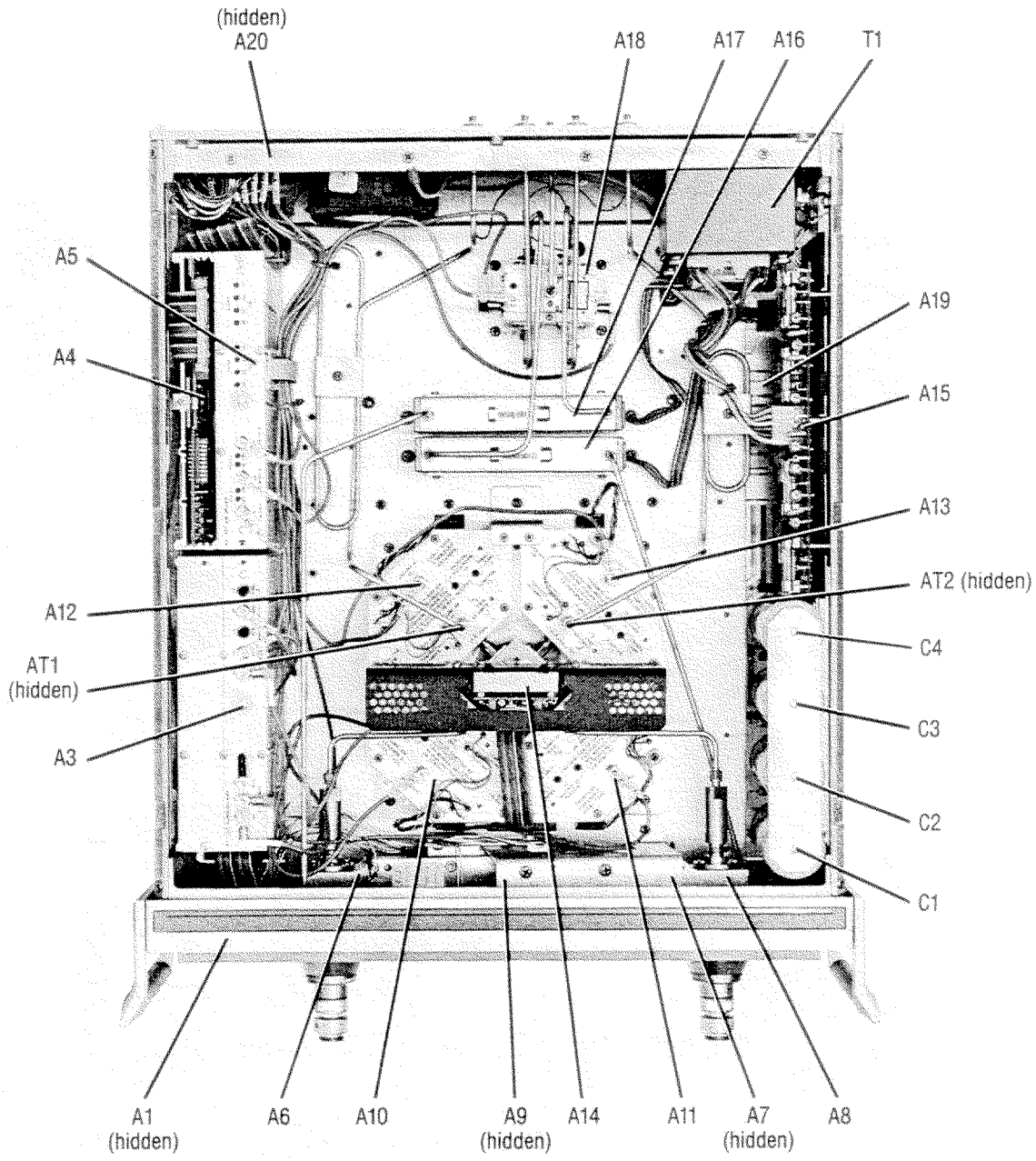


Figure 6-1 HP 8514B Top View Showing Locations of Major Assemblies

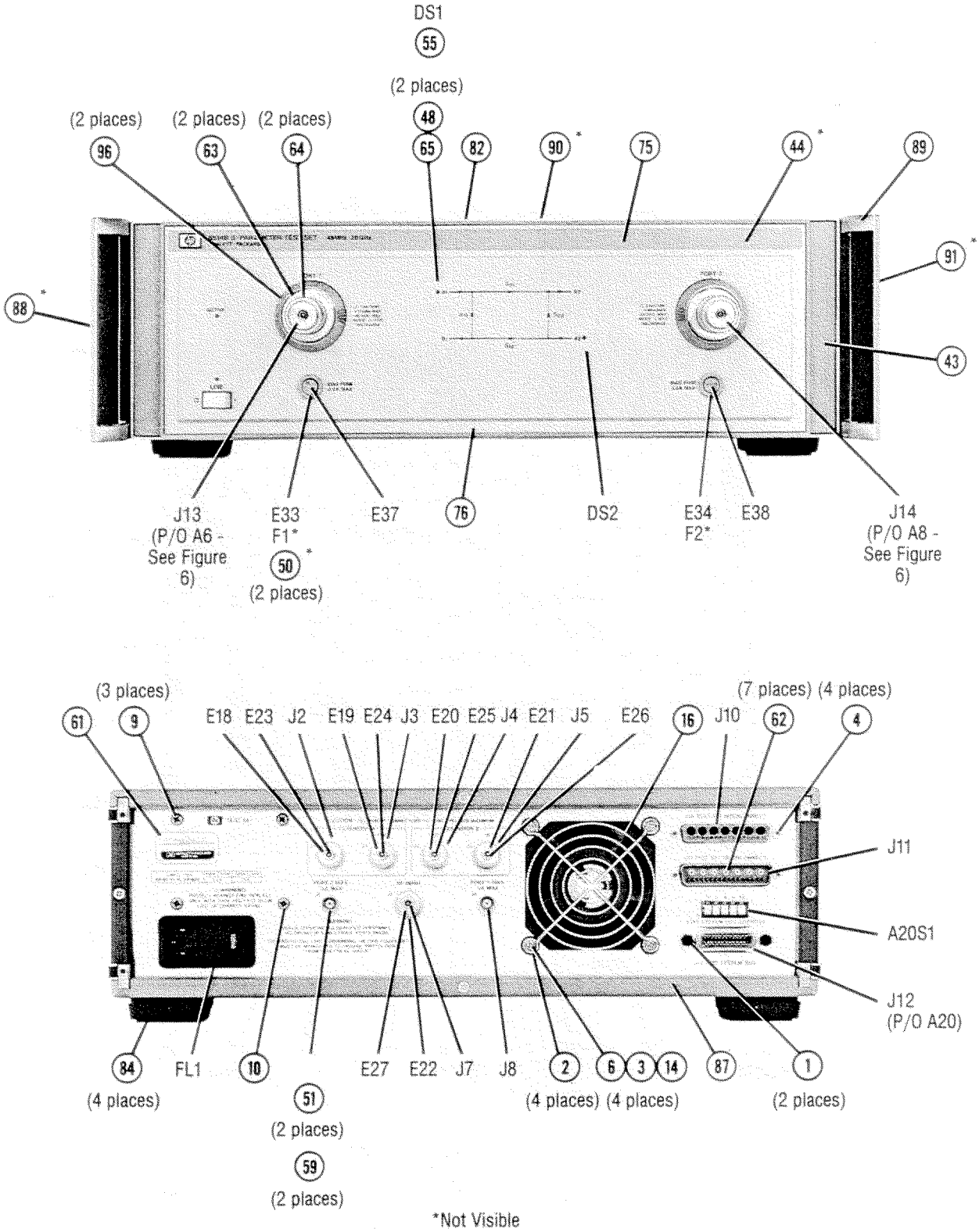


Figure 6-2 HP 8514B Miscellaneous Mechanical, Chassis and Electrical Parts

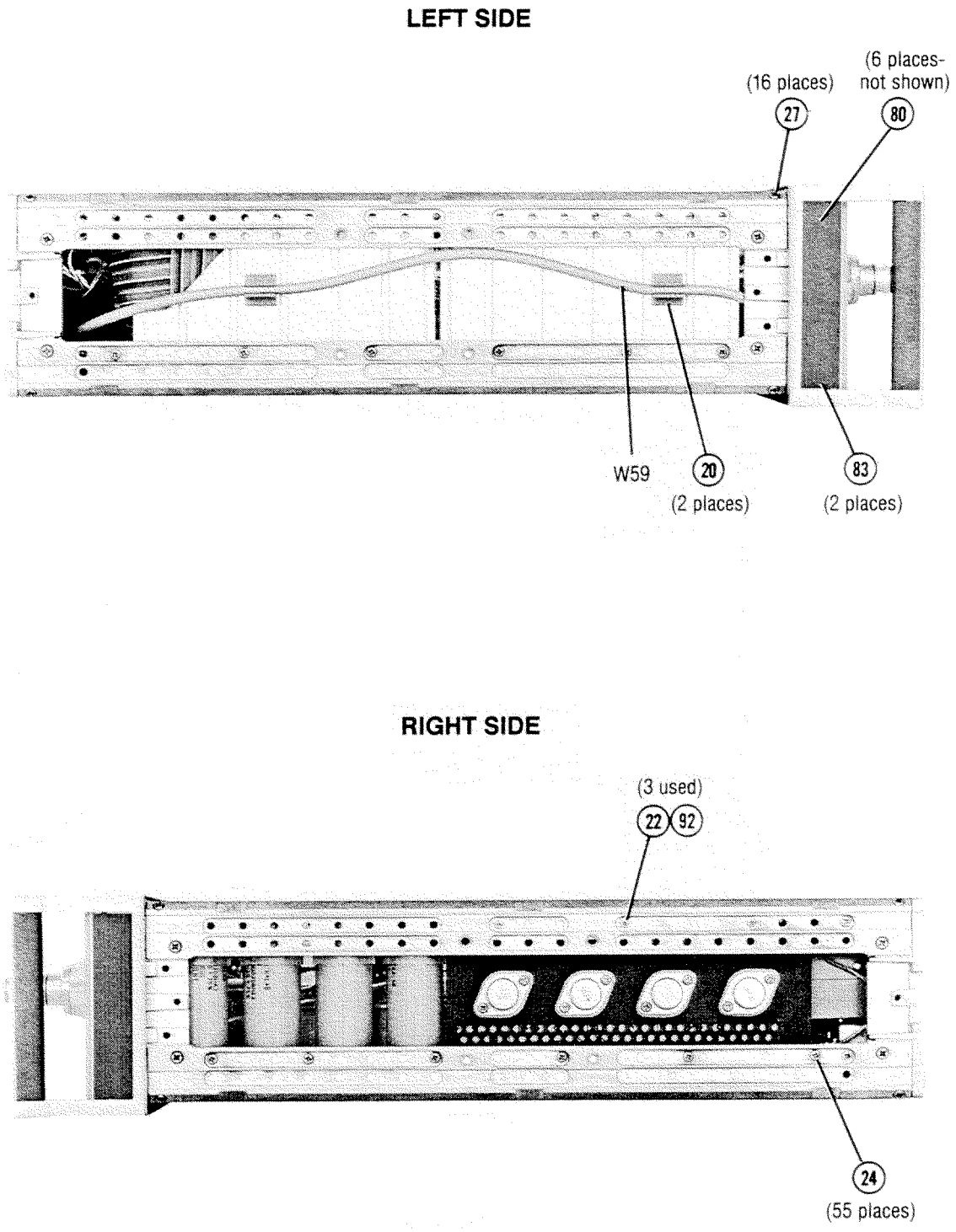


Figure 6-3 HP 8514B Miscellaneous Mechanical, Chassis and Electrical Parts

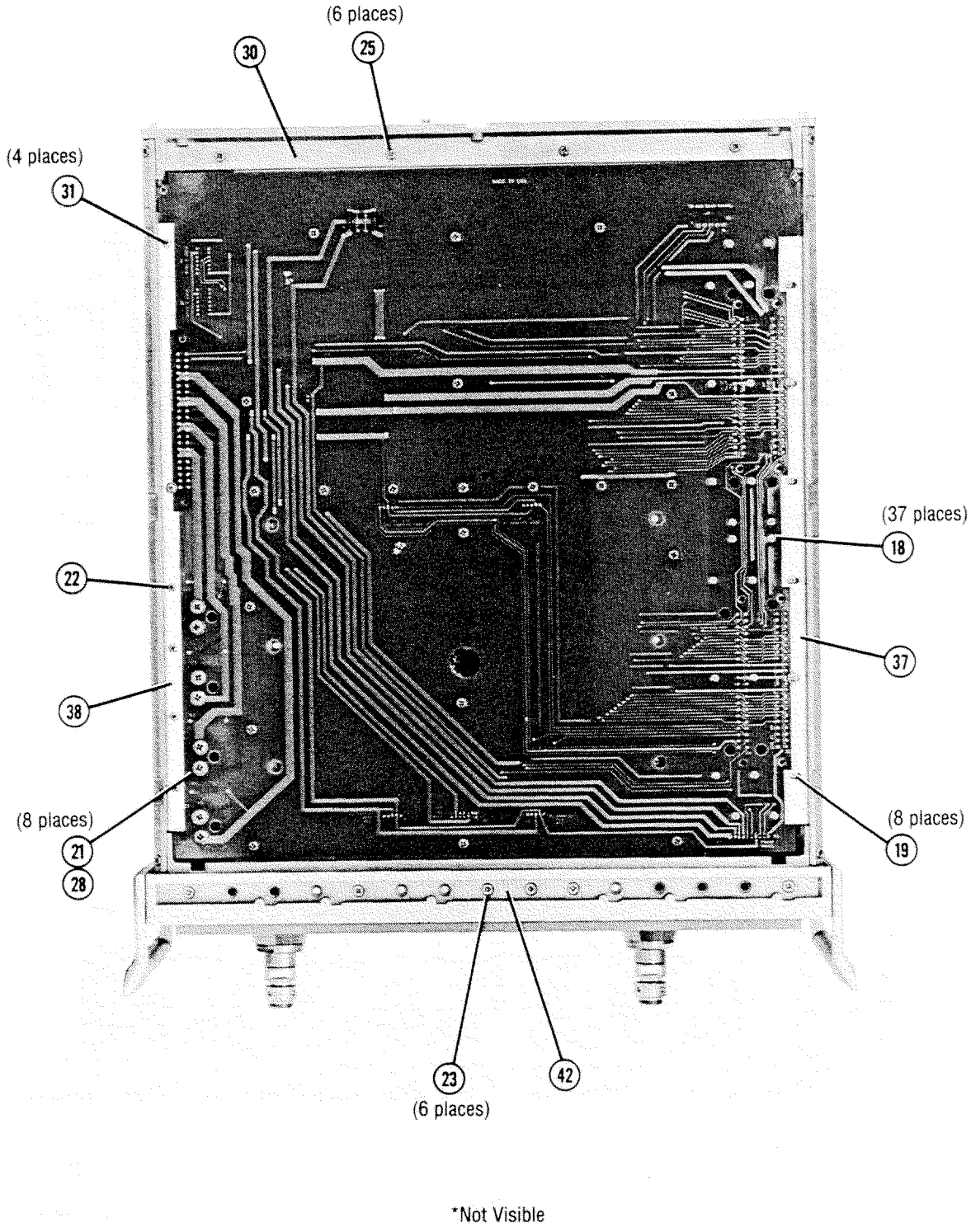


Figure 6-4 HP 8514B Miscellaneous Mechanical, Chassis and Electrical Parts

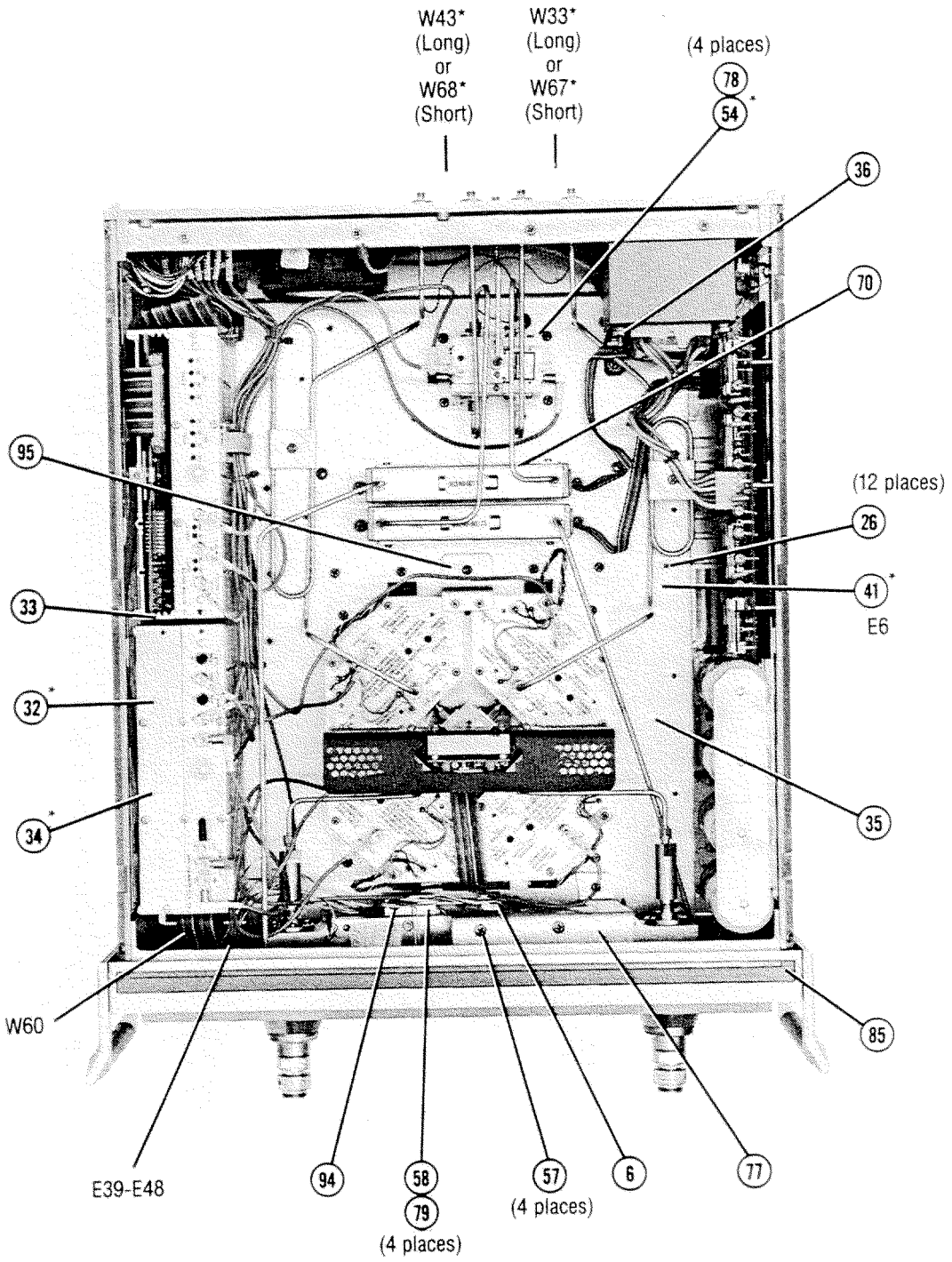
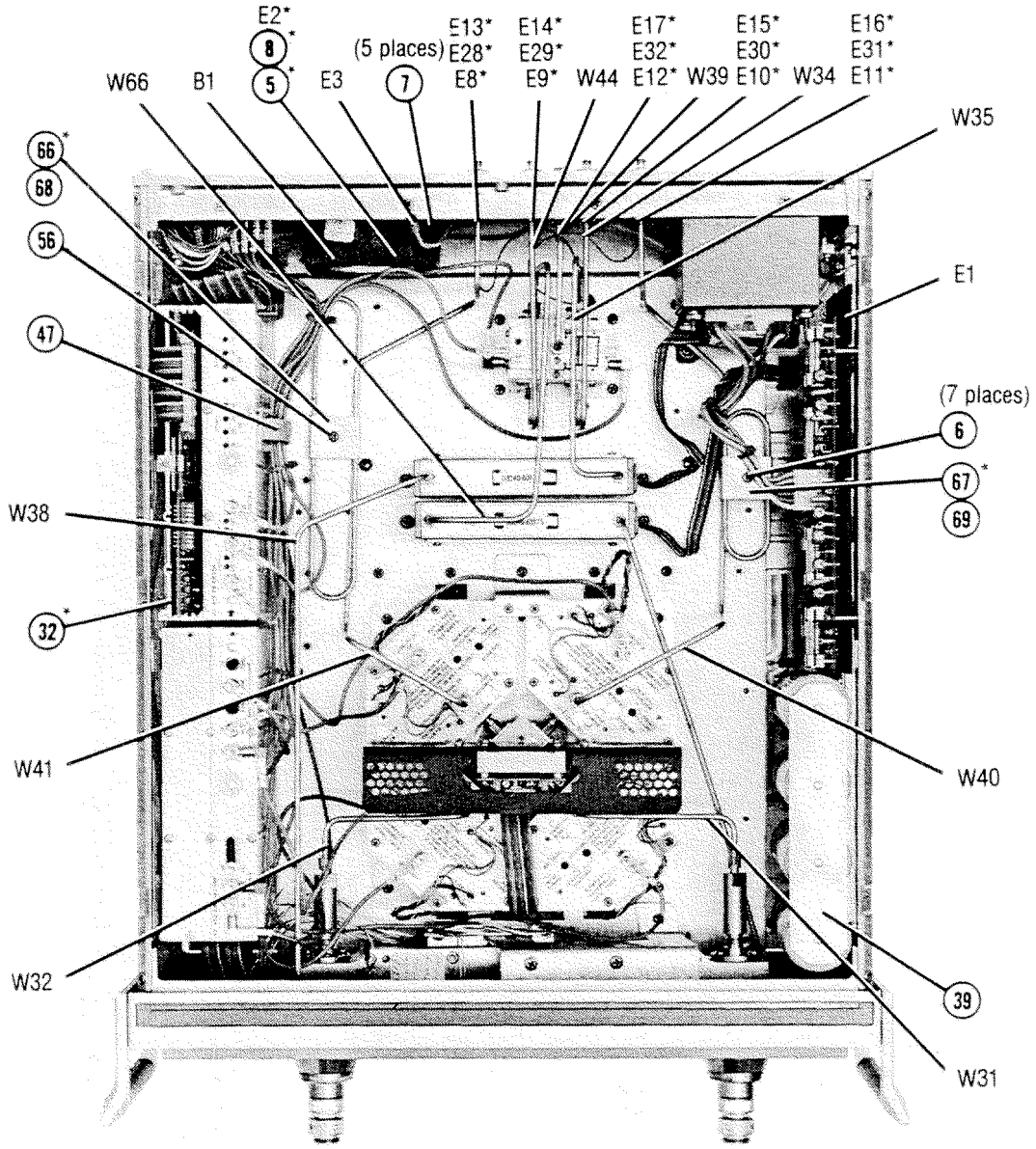


Figure 6-5 HP 8514B Miscellaneous Mechanical, Chassis and Electrical Parts



*Not Visible

Figure 6-6 HP 8514B Miscellaneous Mechanical, Chassis and Electrical Parts

A19

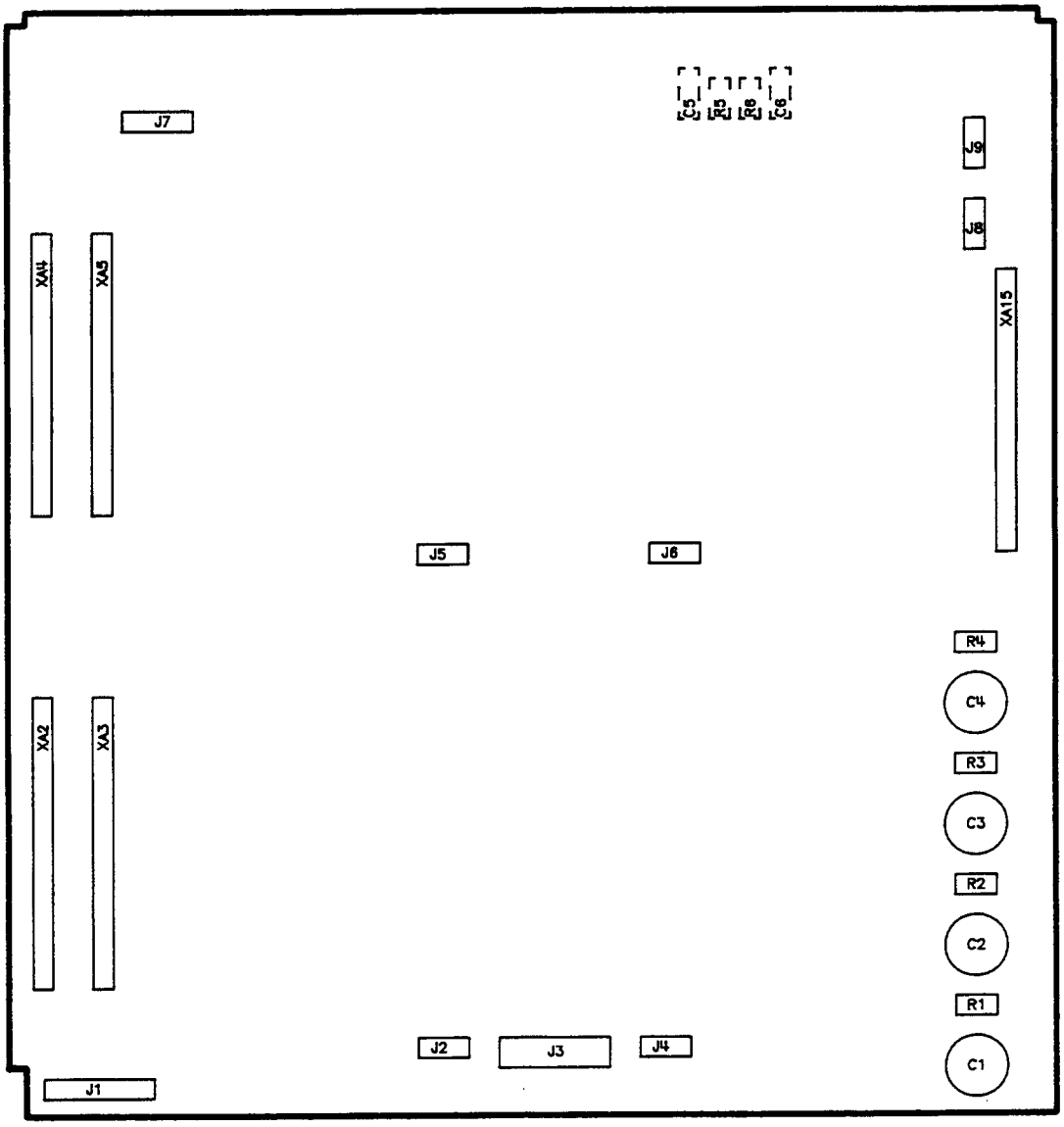
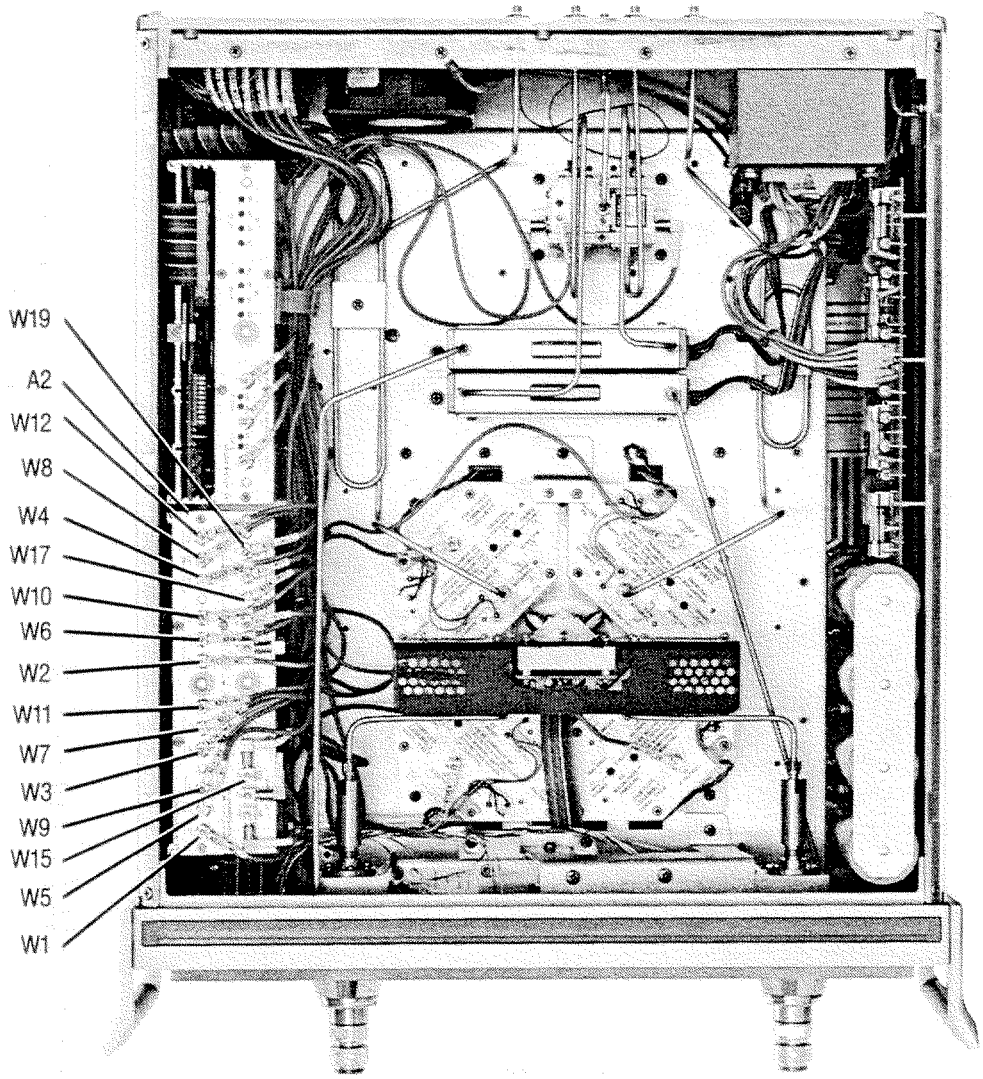


Figure 6-7 HP 8514B and HP 8512A Motherboard Component Location Diagram

Figure 6-8 Parts Unique to HP 8514B and 8512A Option 001


W19
A2
W12
W8
W4
W17
W10
W6
W2
W11
W7
W3
W9
W15
W5
W1

Reference Designation	HP Part Number	Qty	Description
A2	08513-60004	1	IF MULTIPLEXER BD AY (NEW)
A2	08513-69004		IF MULTIPLEXER BD AY (REBUILT)
W1	08513-60121	1	A12J3-A2J1 CABLE AY
W2	08513-60122	1	A13J3-A2J7 CABLE AY
W3	08513-60123	1	A10J3-A2J4 CABLE AY
W4	08513-60124	1	A11J3-A2J10 CABLE AY
W5	08513-60125	1	A2J2-J11A1 CABLE AY
W6	08513-60126	1	A2J8-J11A4 CABLE AY
W7	08513-60127	1	A2J5-J11A2 CABLE AY
W8	08513-60128	1	A2J11-J11A3 CABLE AY
W9	08613-60129	1	A2J3-J10A1 CABLE AY
W10	08513-60130	1	A2J9-J10A4 CABLE AY
W11	08513-60131	1	A2J6-J10A2 CABLE AY
W12	08513-60132	1	A2J12-J10A3 CABLE AY
W13			SEE Table 6-1
W14			SEE Table 6-1
W15	08513-60135	1	A3J3-J10A7 CABLE AY
W16			SEE Table 6-1
W17	08513-60137	1	A3J6-J10A5 CABLE AY
W18			SEE Table 6-1
W19	08513-60139	1	A3J8-J10A6 CABLE AY

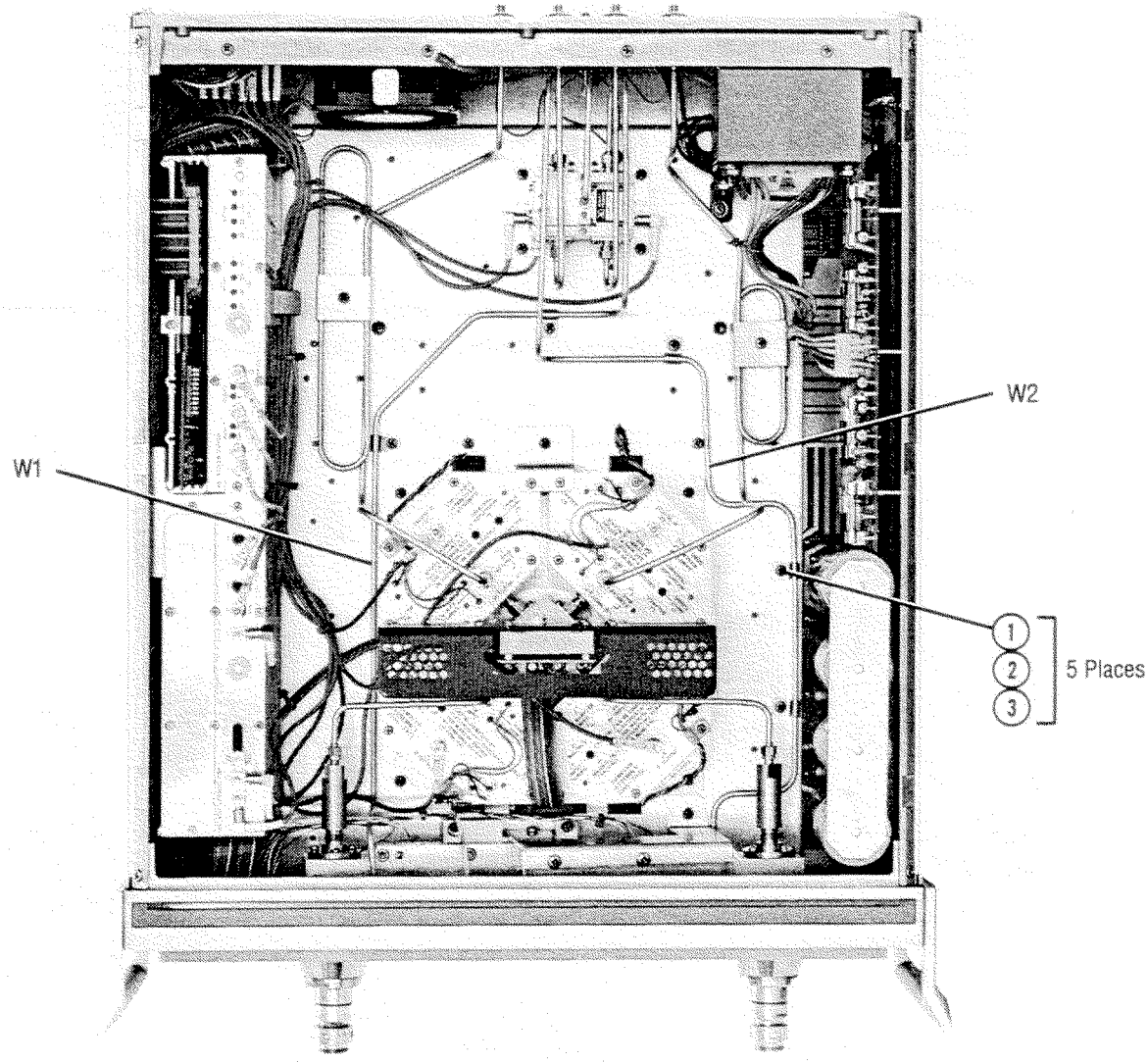
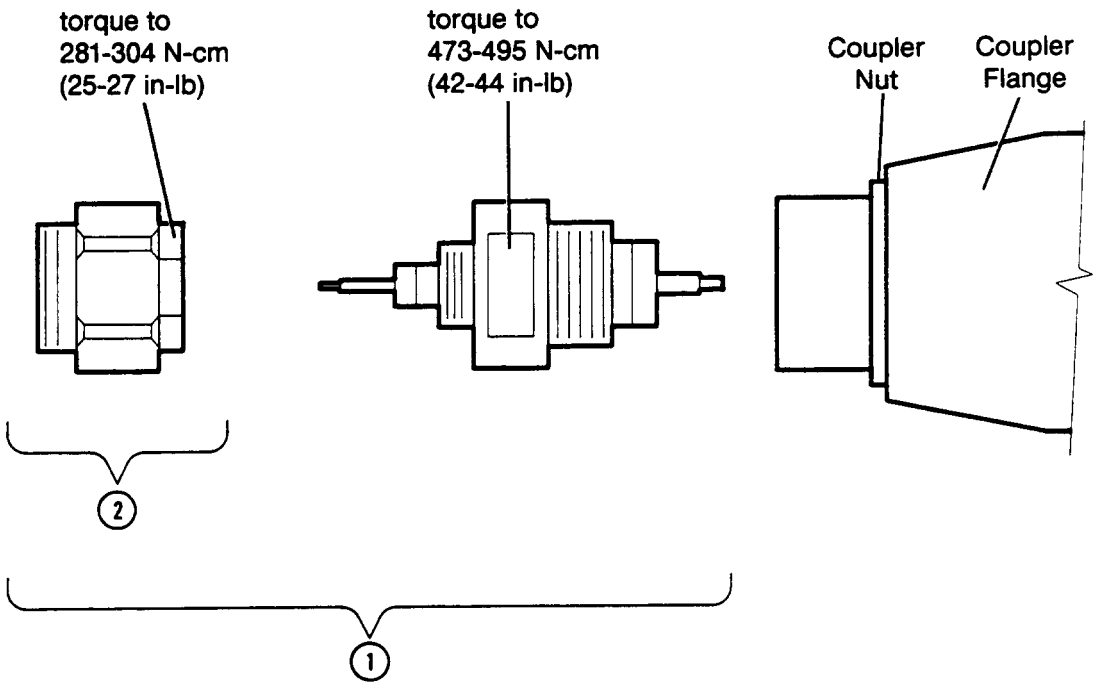


Figure 6-9 Parts Unique to HP 8514B Option 002

Reference Designation	HP Part Number	Qty	Description
W1	08514-20022	1	A18J1-A6J2 CABLE ASSY
W2	08514-20023	1	A18J7-A8J2 CABLE ASSY
1	2360-0113	5	MACHINE SCREW, 8/32X0.25
2	1400-0054	5	OPTION 002 CABLE CLAMP
3	3050-0139	5	FLAT WASHER, 0.172 ID



NOTE: Center pin is not replaceable by itself.

Figure 6-10 HP 8514B Ports 1 and 2 Replaceable Parts

Reference Designation	HP Part Number	Qty	Description
1	5062-1272	2	TEST PORT CONNECTOR ASSY
2	5062-1245	2	3.5 MM NUT ASSEMBLY

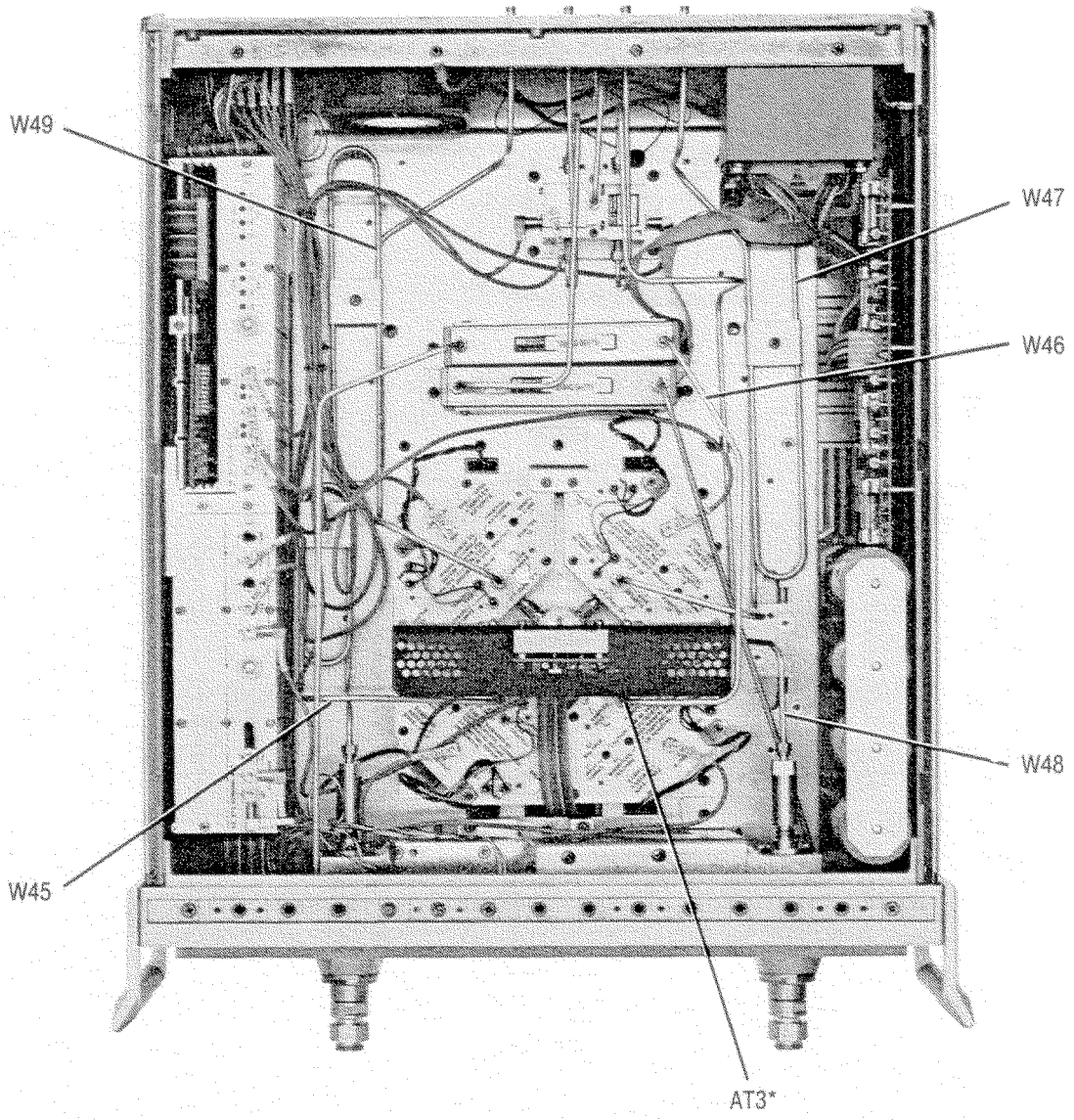


Figure 6-11 Parts Unique to HP 8514B Option 003

Reference Designation	HP Part Number	Qty	Description
W45	08514-20057	1	CABLE RF A6J3-A10J2
W46	08514-20058	1	CABLE RF A11J2-A17J2
W47	08514-20059	1	CABLE RF A13J2-J2
W48	08514-20060	1	CABLE RF A8J3-A18J7
W49	08514-20061	1	CABLE RF A12J2-J5
AT3	33340CZ	1	3.5 MM SHAPED PAD

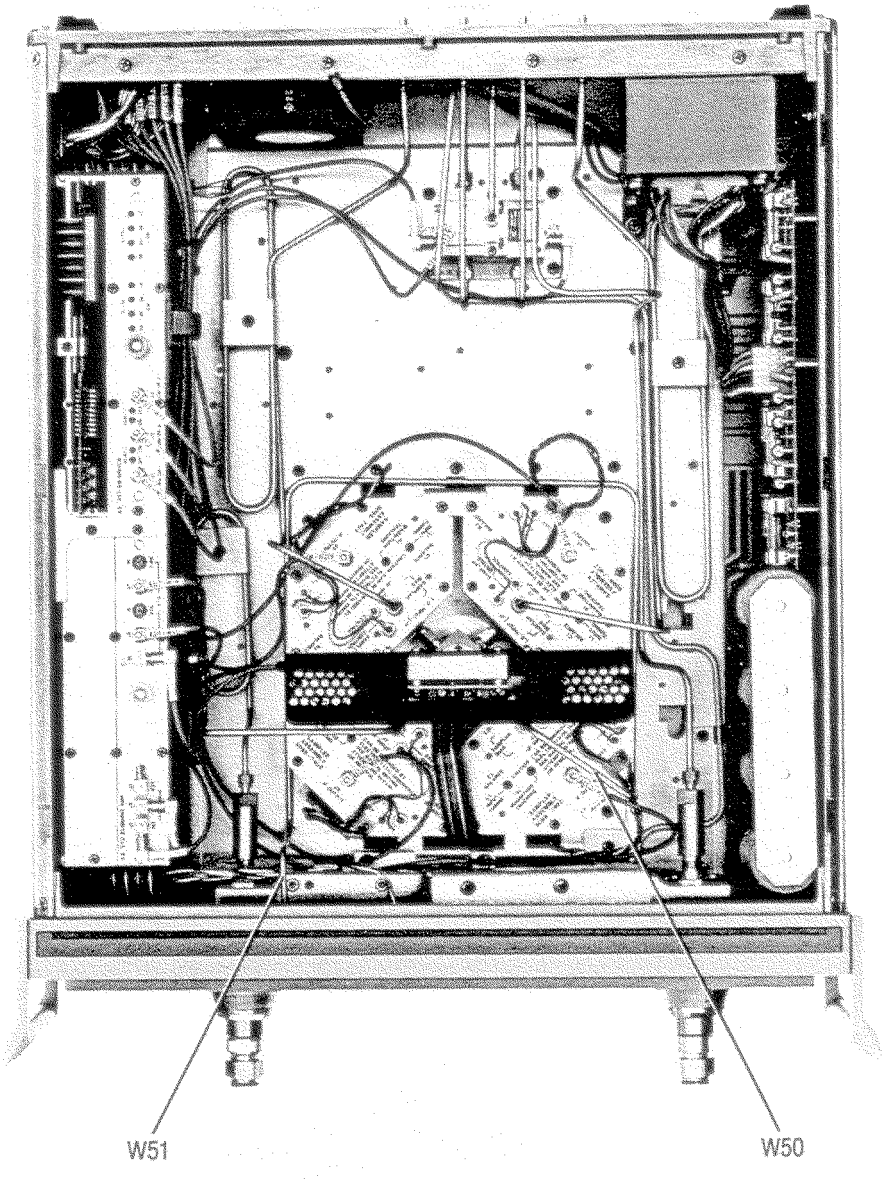


Figure 6-12 HP 8514B Option 002/003 Parts

Reference Designation	HP Part Number	Qty	Description
W45			SEE Figure 6-11
W47			SEE Figure 6-11
W48			SEE Figure 6-11
W49			SEE Figure 6-11
W50	08514-20090	1	CABLE RF A8 TO A11
W51	08514-20091	1	CABLE RF A6 TO A18
AT3			SEE Figure 6-11

Table 6-2 HP 8512A Replaceable Parts

Reference Designation	HP Part Number	Qty	Description
A1	08513-60005	1	BOARD ASSEMBLY, FRONT PANEL
A1DS1	1990-0858	2	LED-LAMP LUM-INT-15UCD IF=25MA-MAX
A1DS2	1990-0858		LED-LAMP LUM-INT-15UCD IF=25MA-MAX
A2			SEE Figure 6-8
A3	08513-60008		BOARD ASSEMBLY, VTO SUMMING AMPLIFIER
A4	08513-60002	1	BOARD ASSEMBLY, HP IB
A5			NOT ASSIGNED
A6	5080-0351	1	DIRECTIONAL COUPLER (7mm connector is replaceable: see Figure 9)
A7-A9			NOT ASSIGNED
A10	5086-7402	1	B1 SAMPLER ASSEMBLY (NEW)
A10	5086-6402		B1 SAMPLER ASSEMBLY (REBUILT)
A11	5086-7402	1	B2 SAMPLER ASSEMBLY (NEW)
A11	5086-6402		B2 SAMPLER ASSEMBLY (REBUILT)
A12	5086-7402	1	A1 SAMPLER ASSEMBLY (NEW)
A12	5086-6402		A1 SAMPLER ASSEMBLY (REBUILT)
A13			NOT ASSIGNED
A14	5086-7231	1	VTO/DRIVER (NEW)
A14	5086-6231	1	VTO/DRIVER (REBUILT)
A15	08513-60007	1	REGULATOR BOARD ASSEMBLY
A15	08515-69007	1	REGULATOR BOARD ASSEMBLY
A16-A17			NOT ASSIGNED
A18	5086-7408	1	POWER SPLITTER
A19	08513-60001	1	BOARD ASSEMBLY, MOTHER
			THE FOLLOWING PARTS ARE NOT SUPPLIED
			WHEN A19 IS ORDERED:
			A19C1, A19C2, A19C3, A19C4
A19C1	0180-2671	4	CAPACITOR-FXD .012F+75-10% 3OVDC AL
A19C2	0180-2671		CAPACITOR-FXD .012F+75-10% 3OVDC AL
A19C3	0180-2671		CAPACITOR-FXD .012F+75-10% 3OVDC AL
A19C4	0180-2671		CAPACfTOR-FXD .012F+75-10% 3OVDC AL
A19C5	0160-4834		CAPACITOR-FXD .047UF ±10% 100VDC CER
A19C6	0160-4834		CAPACITOR-FXD .047UF ±10% 100VDC CER
A19J1	1251-5745		CONNECTOR 20-PIN M POST TYPE
			(A19J1 DOES NOT INCLUDE A19MP1 & A19MP2)
A19J2	1251-6868	4	CONNECTOR 5-PIN M POST TYPE
A19J3	1251-7939	1	CONN-POST TYPE .100-PIN-SPCG 14-CONT
			(A19J3 DOES NOT INCLUDE A19MP3)
A19J4	1251-6868		CONNECTOR 5-PIN M POST TYPE
A19J5	1251-6868		CONNECTOR 5-PIN M POST TYPE
A19J6	1251-6868		CONNECTOR 5-PIN M POST TYPE
A19J7	1251-3825	1	CONNECTOR 5-PIN M POST TYPE
A19J8	1200-0508	2	SOCKET-IC 14-CONT DIP-SLDR
A19J9	1200-0508		SOCKET-IC 14-CONT DIP-SLDR
A19MP1	1251-5595		POLARIZING KEY-POST CONN
A19MP2	1251-5595		POLARIZING KEY-POST CONN
A19MP3	1251-5595		POLARIZING KEY-POST CONN

Table 6-2 HP 8512A Replaceable Parts (Continued)

Reference Designation	HP Part Number	Qty	Description
A19R1	0764-0015	2	RESISTOR 560 5% 2W MO TC=0±200
A19R2	0764-0015		RESISTOR 560 5% 2W MO TC=0±200
A19R3	0764-0016	2	RESISTOR 1K 5% 2W MO TC=0±200
AI9R4	0764-0016		RESISTOR 1K 5% 2W MO TC=0±200
A19R5	0757-0394		RESISTOR 51.1 1% .125W F TC=0±100
A19R6	0757-0394		RESISTOR 51.1 1% .125W F TC=0±100
A19XA2	1251-7882	5	CONNECTOR-PC EDGE 2-ROWS
A19XA3	1251-7882		CONNECTOR-PC EDGE 2-ROWS
A19XA4	1251-7882		CONNECTOR-PC EDGE 2-ROWS
A19XA5	1251-7882		CONNECTOR-PC EDGE 2-ROWS
A19XA6-A19XA14			NOT ASSIGNED
A19XA15	1251-7882		CONNECTOR-PC EDGE 2-ROWS
A20	08513-60006	1	BOARD ASSEMBLY, HPIB INTERCONNECT
MISCELLANEOUS ELECTRICAL PARTS			
B1	3160-0273	1	FAN-TBAX 34-CFM 115V 50/60-HZ 1.5KV-DIEL
E1	0360-0009	1	TERMINAL-SLDR LUG PL-MTG FOR-#6-SCR
E2	0360-0031	2	TERMINAL-CRIMP R-TNG #6 22-16-AWG RED
E3	0360-0031		TERMINAL-CRIMP R-TNG #6 22-16-AWG RED
E4	0362-0265	2	CONNECTOR-SGL CONT SKT 1.14-MM-BSC-SZ
E5	0362-0265		CONNECTOR-SGL CONT SKT 1.14-MM-BSC-SZ
E6	08513-00018	1	INSULATOR-BRACE
E7	1250-0816	2	CONTACT-RF CONN CONTACT ASSY
E8	1250-0816		CONTACT-RF CONN CONTACT ASSY
E9	1531-0278	1	MACHINED PART-SST OUTER FLANGE-COUPLER
E10	5021-3510	5	CONTACT-FEMALE
E11	5021-3510		CONTACT-FEMALE
E12	5021-3510		CONTACT-FEMALE
E13	5021-3510		CONTACT-FEMALE
E14	5021-3510		CONTACT-FEMALE
E15	5040-0306	2	INSULATOR
E16	5040-0306		INSULATOR
E17	08512-20001	1	CTR BDY PNL CONN
E18	08512-20002	1	INR CNDCT-PNL
E19	08513-20016	5	CONNECTOR NOSE-F
E20	08513-20016		CONNECTOR NOSE-F
E21	08513-20016		CONNECTOR NOSE-F
E22	08513-20016		CONNECTOR NOSE-F
E23	08513-20016		CONNECTOR NOSE-F
E24	08513-20017	5	CONN-BULKHEAD
E25	08513-20017		CONN-BULKHEAD
E26	08513-20017		CONN-BULKHEAD
E27	08513-20017		CONN-BULKHEAD
E28	08513-20017		CONN-BULKHEAD
E29	08513-20018	5	CENTER CNDCT-BHD
E30	08513-20018		CENTER CNDCT-BHD
E31	08513-20018		CENTER CNDCT-BHD

Table 6-2 HP 8512A Replaceable Parts (Continued)

Reference Designation	HP Part Number	Qty	Description
E32	08513-20018		CENTER CNDCT-BHD
E33	08513-20018		CENTER CNDCT-BHD
E34	85040-20015	1	CENTER CONDUCTOR
E35	85050-20001	2	CONTACT CTR COND
E36	85050-20001		CONTACT CTR COND
E37	1250-1466	1	CONNECTOR-RF APC-7 HERMAPHR UNMTD 50-OHM
E38	5061-5301	5	3.5MM BEAD-R AY
E39	5061-5301		3.5MM BEAD-R AY
E40	5061-5301		3.5MM BEAD-R AY
E41	5061-5301		3.5MM BEAD-R AY
E42-E43			SEE Figure 6-19
F1-F2			NOT ASSIGNED
F3	2110-0043	1	FUSE 1.5A 250V NTD 1.25X.25 UL
FL1	0960-0443	1	LINE MODULE-FILTERED
T1	5180-1233	1	POWER XFMR
W1	08513-60121	1	CA AY A12J3-A2J1
W2			NOT ASSIGNED
W3	08513-60123	1	CA AY A10J3-A2J4
W4	08513-60124	1	CA AY A11J3-A2J10
W5	08513-60125	1	CA AY A2J2-J11A1
W6	08513-60126	1	CA AY A2J8-J11A4
W7	08513-60127	1	CA AY A2J5-J11A2
W8	08513-60128	1	CA AY A2J11-J11A3
W9	08513-60129	1	CA AY A2J3-J10AI
W10	08513-60130	1	CA AY A2J9-J10A4
W11	08513-60131	1	CA AY A2J6-J10A2
W12	08513-60132	1	CA AY A2J12-J10A3
W13	08513-60133	1	CA AY A3J1-A14J1
W14	08513-60134	1	CA AY A3J2-J11A7
W15	08513-60135	1	CA AY A3J3-J10A7
W16	08513-60136	1	CA AY A3J5-J11A5
W17	08513-60137	1	CA AY A3J6-J10A5
W18	08513-60138	1	CA AY A3J7-J11A6
W19	08513-60139	1	CA AY A3J8-J10A6
W20	08513-60140	1	CA AY A3J4-A14J2
W21-W24			NOT ASSIGNED
W24	08513-60144	1	CA AY A12J3-J11A1
W25			NOT ASSIGNED
W26	08513-60146	1	CA AY A10J3-J11A2
W27	08513-60147	1	CA AY A11J3-J11A3
W28-W30			NOT ASSIGNED
W31	08512-20011	1	CA AY A6J3-A10J2
W32	08512-20012	1	CA AY A8J1-A11J2
W33	08512-20006	1	CA AY A12J2-J4
W34	08513-20020	1	CA RF A18J3/PRT 1
W35	08513-20021	1	CA RF A18J2/PRT 2
W36	08513-20022	1	CA AY A18J1/RF

Table 6-2 HP 8512A Replaceable Parts (Continued)

Reference Designation	HP Part Number	Qty	Description
W37	08512-20017	1	CA AY A6J2-J2
W38			NOT ASSIGNED
W39	08512-20019	2	CA AY J2J3 & J4J5
W40-W48			NOT ASSIGNED
W49	08512-20019		CA AY J2J3 & J4J5
W50-W56			NOT ASSIGNED
W57	08513-60014	1	CBL AY RP-MB
W58	08513-60036	1	CBL AY RP-HPIB
W59	85102-60193	1	CA ASSY LINE SW
W60	08513-60013	1	CA AY FRPNL-MBD
W61	08510-60102	1	CBL AY TEST SET
W62	8120-1348	1	CABLE ASSY 18AWG 3-CNDCT BLK-JKT
W63	8120-3445	1	HP-IB CABLE 1 METER
W64	8120-4396	1	CBL C AY-SMA
	08513-60005	1	BD AY FRONT PNL
MISCELLANEOUS MECHANICAL & CHASSIS PARTS			
1	0380-0643	2	STANDOFF-HEX .255-IN-LG 6-32THD
2	0400-0002	4	GROMMET-RND .188-IN-ID .312-IN-GRV-OD
3	0590-0926	4	THREADED INSERT-STDF 6-32 .188-IN-LG SST
4	1251-2942	4	LOCK-SUBMIN D CONN
5	2360-0113	3	SCREW-MACH 6-32 .25-IN-LG PAN-HD-POZI
6	2360-0123	6	SCREW-MACH 6-32 .625-IN-LG PAN-HD-POZI
7	2420-0001	5	NUT-HEX-W/LKWR 6-32-THD .109-IN-THK
8	2420-0022	1	NUT-SPCLY 6-32-THD .23-IN-THK .354-OD
9	2510-0138	3	SCREW-MACH 8-32 3-IN-LG PAN-HD-POZI
10	2510-0270	1	SCREW-MACH 8-32 3.25-IN-LG PAN-HD-POZI
11	2580-0003	4	NUT-HEX-W/LKWR 8-32-THD .125-IN-THK
12	3050-0139	9	WASHER-FL MTLC NO. 8 .172-IN-ID
13	3050-0152	4	WASHER-SHLDR NO. 8 .172-IN-ID .438-IN-OD
14	3050-0227	4	WASHER-FL MTLC NO. 6 .149-IN-ID
15	3050-0692	3	WASHER-FL MTLC NO. 10 .202-IN-ID
16	3160-0309	1	FINGER GUARD
17	08514-00004	1	REAR PANEL
18	0624-0099	37	SCREW-TPG 4-40 .375-IN-LG PAN-HD-POZI
19	0624-0100	8	SCREW-TPG 4-40 .5-IN-LG PAN-HD-POZI STL
20	1400-0757	2	CLAMP-CABLE .25-DIA 1-WD PVC
21	2190-0011	8	WASHER-LK INTL T NO. 10 .195-IN-ID
22	2200-0105	9	SCREW-MACH 4-40 .312-IN-LG PAN-HD-POZI
23	2200-0165	22	SCREW-MACH 4-40 .25-IN-LG 82 DEG
24	2360-0115	55	SCREW-MACH 6-32 .312-IN-LG PAN-HD-POZI
25	2360-0119	6	SCREW-MACH 6-32 .438-IN-LG PAN-HD-POZI
26	2360-0333	12	SCREW-MACH 6-32 .25-IN-LG 100 DEG
27	2510-0192	16	SCREW-MACH 8-32 .25-IN-LG 100 DEG
28	2680-0129	8	SCREW-MACH 10-32 .312-IN-LG PAN-HD-POZI
29	5020-8803	1	FRAME FRONT
30	5020-8804	1	FRAME REAR
31	5020-8837	4	STRUT CORNER 18”

Table 6-2 HP 8512A Replaceable Parts (Continued)

Reference Designation	HP Part Number	Qty	Description
32	08505-20132	2	END PLATE ENCL
33	08505-20163	2	ENCLOSURE CKT
34	08512-20005	1	RFI GASKET
35	08513-00001	1	DECK
36	08513-00002	1	TRANSFORMER BRKT
37	08513-00005	1	MTG BRACKET-LH
38	08513-00006	1	MTG BRACKET-RH
39	08513-00015	1	CAP SPRT PLATE
40	08513-00016	1	BRACKER-CKT ENCL
41	O8513-20013	1	BRACE-DECK
42	08513-20015	1	MOUNTING BAR
43	85102-20054	1	FRONT BEZEL MACH
44	0460-0100	1	TP ACRLC-XFR-A 1
45	2200-0165		SCREW-MACH 4-40 .25-IN-LG 82 DEG
46	1400-1209	1	CLP CA .69D 1.0W
47	2190-0104	5	WASHER-LK INTL T 7/16 IN .439-IN-ID
48	2200-0109	1	SCREW-MACH 4-40 .438-IN-LG PAN-HD-POZI
49	2360-0121	2	SCREW-MACH 6-32 .5-IN-LG PAN-HD-POZI
50	2510-0141	4	SCREW-MACH 8-32 .562-IN-LG PAN-HD-POZI
51	2950-0132	5	NUT-HEX-DBL-CHAM 7/16-28-THD .094-IN-THK
52	6960-0001	2	PLUG-HOLE DOME-HD FOR .375-D-HOLE STL
53	7121-2380	1	LABEL-SERIAL NUMBER
54	5021-0906	6	SLEEV RF PIN POS
55	5021-3427	2	WSHR-TS PORT CON
56	5021-3438	2	NUT-FLG TS PORT
57	08512-00001	1	FRONT PANEL
58	08512-00008	2	CLAMP A
59	08512-00009	1	CLAMP B
60	08512-00010	2	CLAMP C
61	08512-00011	1	CLAMP D
62	08513-00017	2	BRACKET-CONV AY
63	08513-00019	1	COVER-I.F. MUX
64	08513-00027	1	CVR BLANK-IF MUX
65	08514-00002	1	SUB PANEL
66	08514-20005	1	BLOCK-MTG CPLR
67			NOT ASSIGNED
68	85102-00041	1	COVER-BLANK A16
69	2510-0195	6	SCREW-MACH 8-32 .375-IN-LG 100 DEG
70	7120-4835	1	LABEL-INFORMATION .75-IN-WD 2-IN-LG PPR
71	7120-5911	1	LABEL-WARNING 1-IN-WD 7-IN-LG PPR
72-74			NOT ASSIGNED
75	5020-8896	2	TRIM FRNT HNDL
76	5040-7201	4	FOOT-BOTTOM
77	5040-7202	1	STRIP TRIM TOP
78	5040-7221	4	FOOT-REAR
79	5060-9847	1	COVER BTM 18” FM
80	5060-9857	1	COVER AY SIDE

Table 6-2 HP 8512A Replaceable Parts (Continued)

Reference Designation	HP Part Number	Qty	Description
81	5060-9899	2	HANDLE AY FRONT
82	08513-00021	1	TEST SET CVR TOP
83	08513-00025	1	COVER-SIDE PERF
84	0380-0010	4	SPACER-RND .625-IN-LG .18-IN-ID
85	3050-0105	3	WASHER-FL MTLC NO. 4 .125-IN-ID
86	2360-0127	1	SCREW-MACH 6-32 .875-IN-LG PAN-HD-POZI
87	08513-00017		CONV-ASSEY

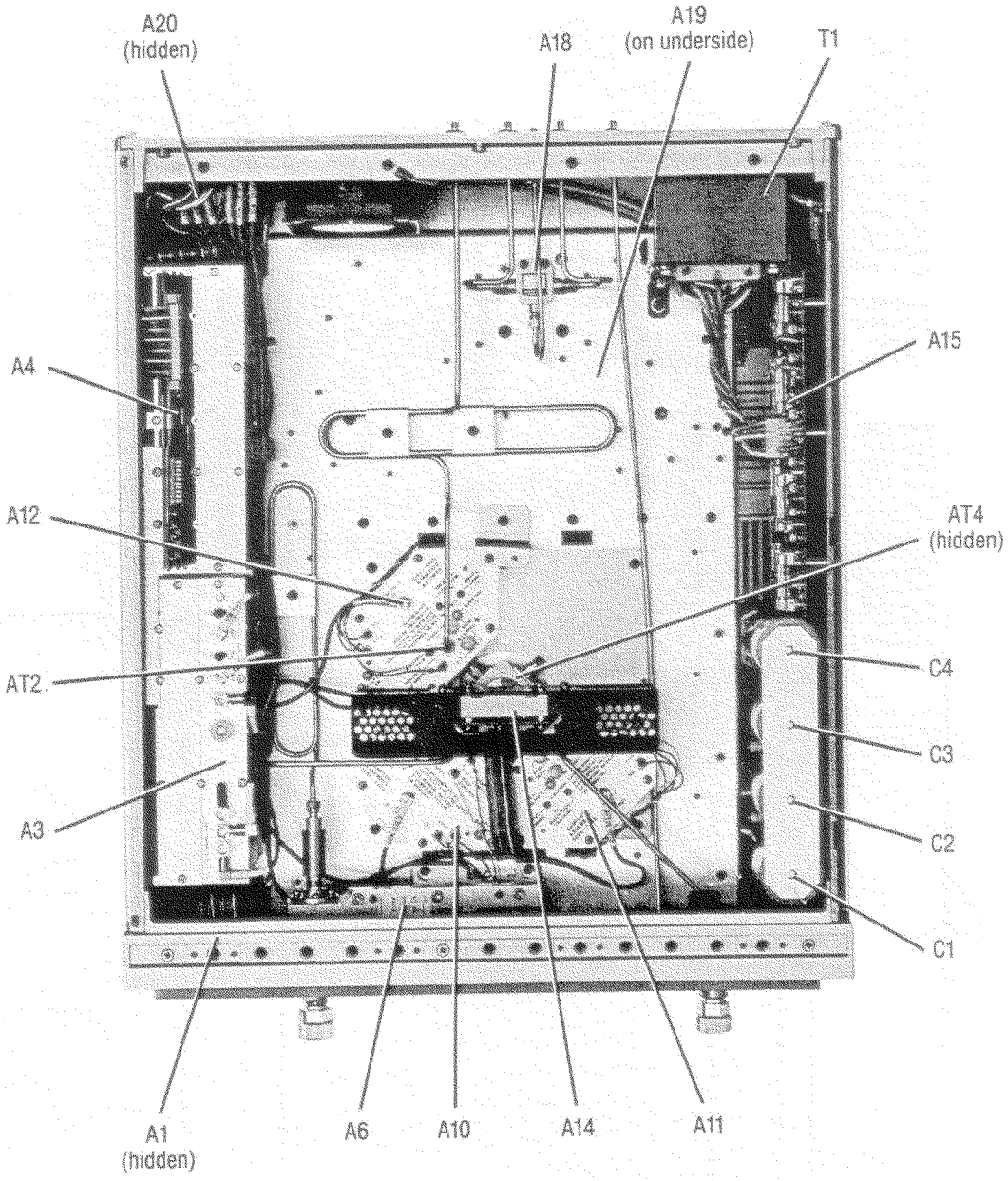


Figure 6-13 HP 8512A Top View Showing Locations of Major Assemblies

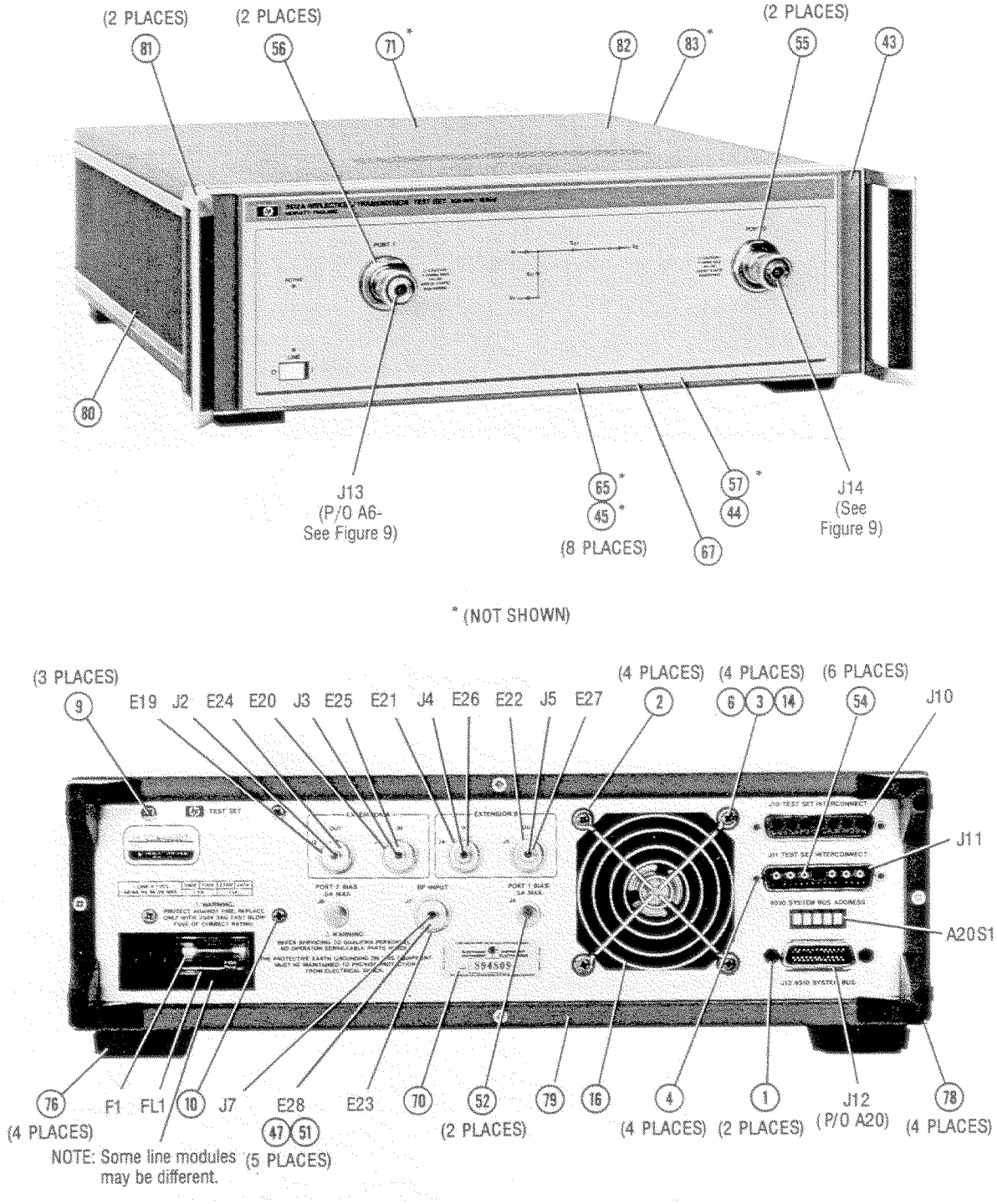


Figure 6-14 HP 8512A Miscellaneous Mechanical, Chassis, and Electrical Parts

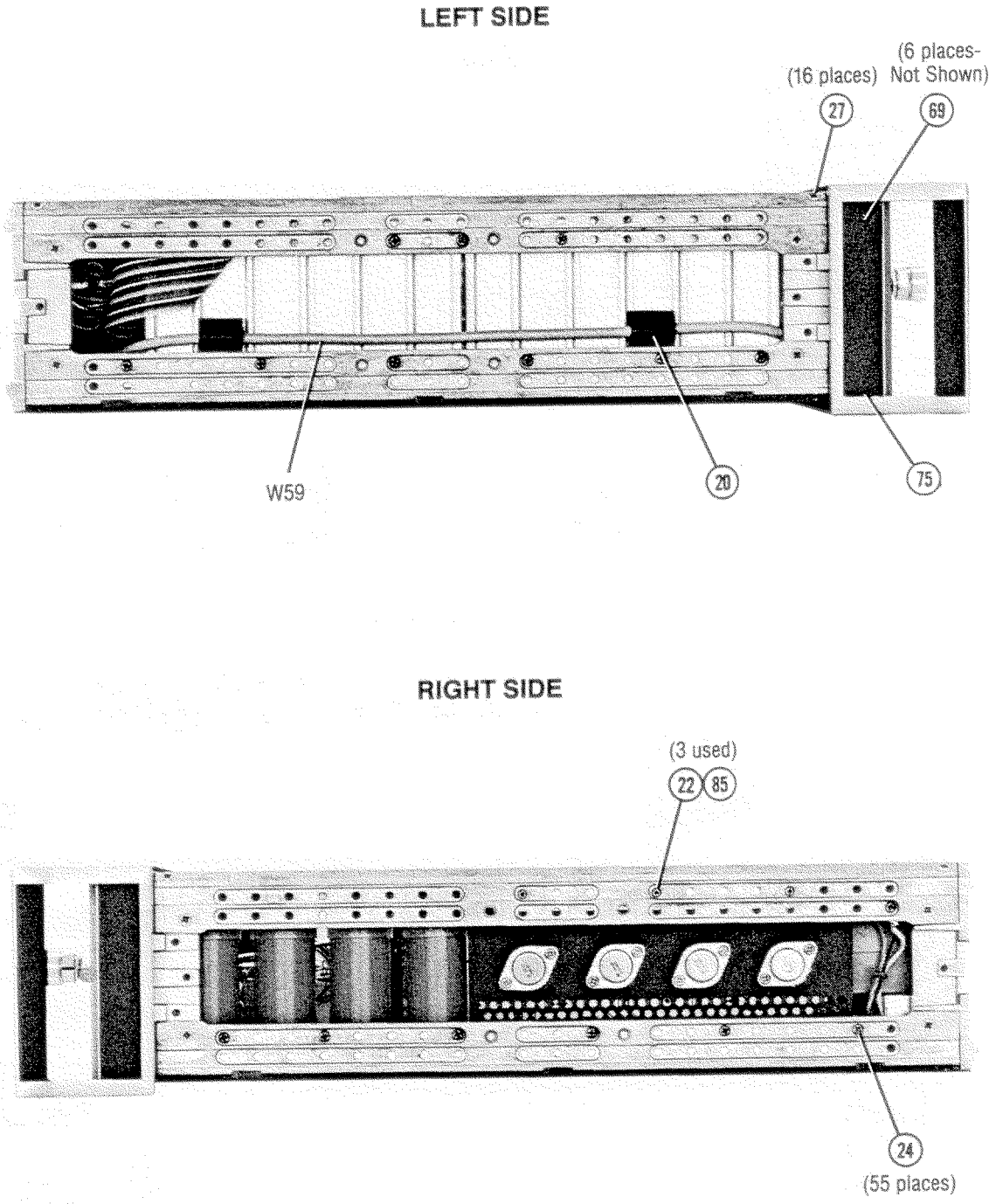


Figure 6-15 HP 8512A Miscellaneous Mechanical, Chassis, and Electrical Parts

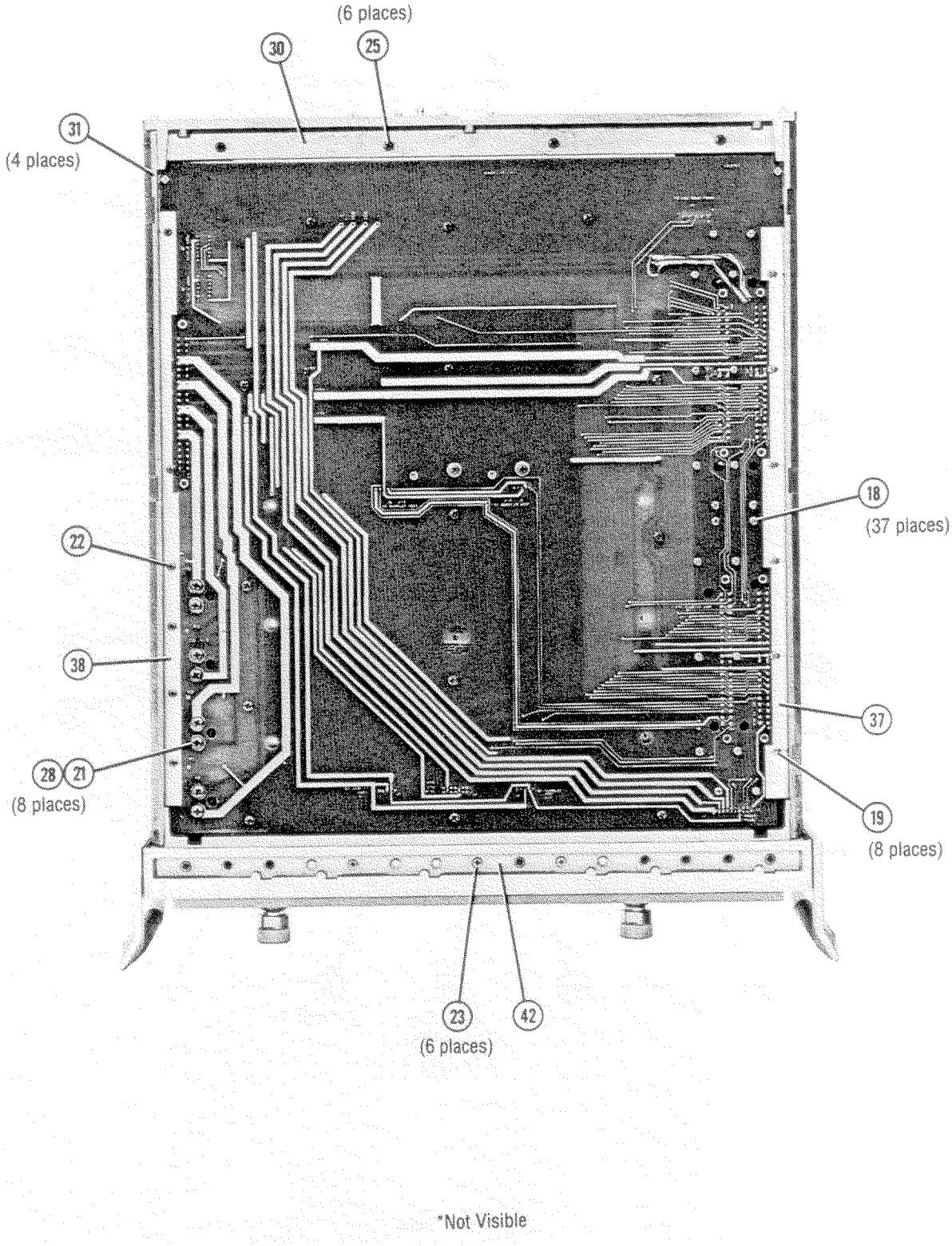


Figure 6-16 HP 8512A Miscellaneous Mechanical, Chassis, and Electrical Parts

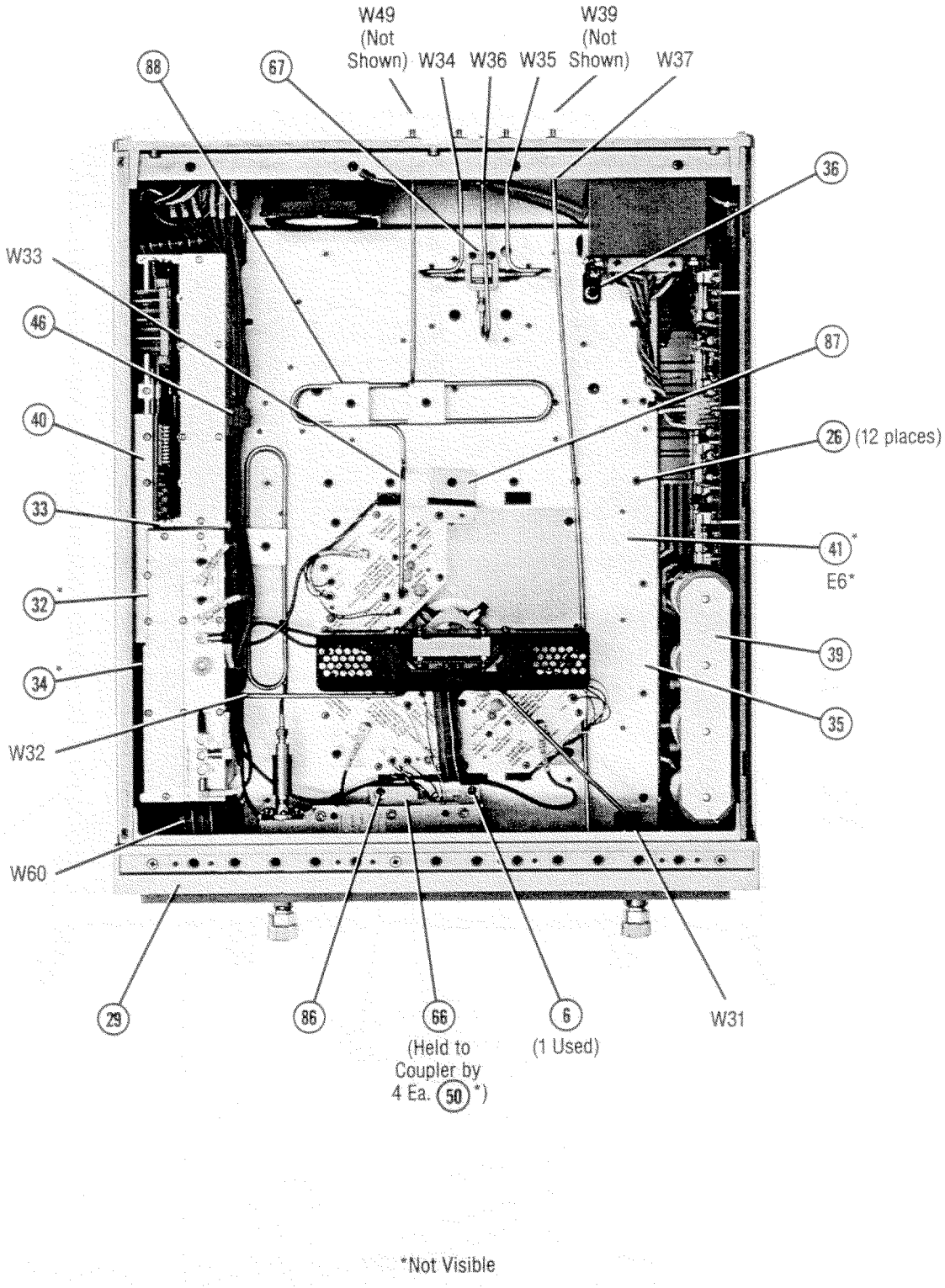


Figure 6-17 HP 8512A Miscellaneous Mechanical, Chassis, and Electrical Parts

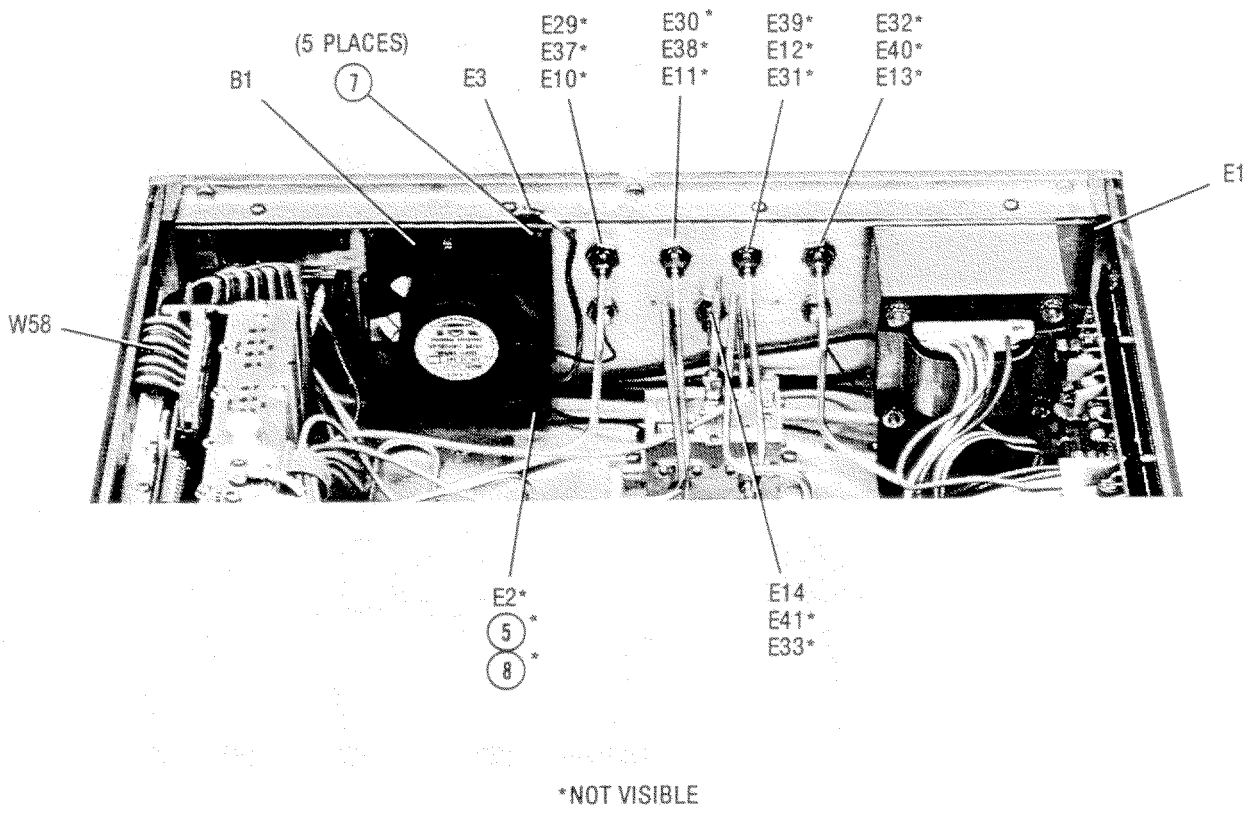


Figure 6-18 HP 8512A Miscellaneous Mechanical, Chassis, and Electrical Parts

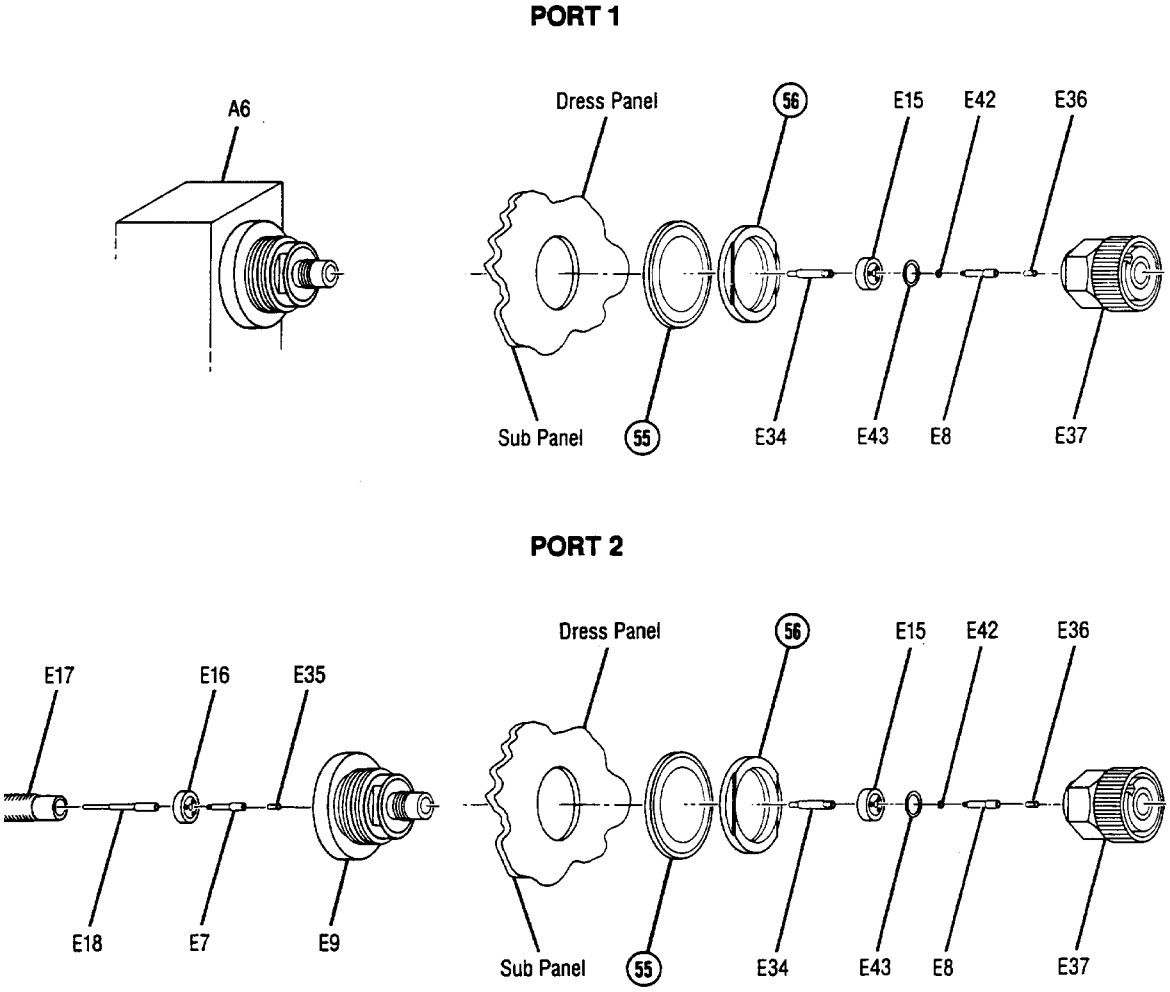


Figure 6-19 HP 8512A Port 1 and Port 2 Replaceable Parts

Reference Designation	HP Part Number	Qty	Description
E42	5020-8541	9	0.0005 IN. INNER SHIM
	5020-8540	8	0.0010 IN. INNER SHIM
	08742-0005	3	0.0020 IN. INNER SHIM
E43	5021-0830	5	0.0010 IN. OUTER SHIM
	08742-0006	4	0.0020 IN. OUTER SHIM

7

Service

This HP 8514B/8512A Service section consists of a wiring diagram keyed to Figure 6-7 on page 6-16, the component location diagram of the motherboard (A19). Use these two tools as aids to troubleshoot motherboard trace and component problems. This section also provides information on servicing the front panel test port connectors.

Other service information is included in the Test Set Troubleshooting section of the this manual. Topics covered include checks of the major assemblies and assembly removal procedures, among others.

The repair of 3.5 mm RF connectors (like those on the rear panels of these test sets) is described in the Test Set Troubleshooting section of this manual.

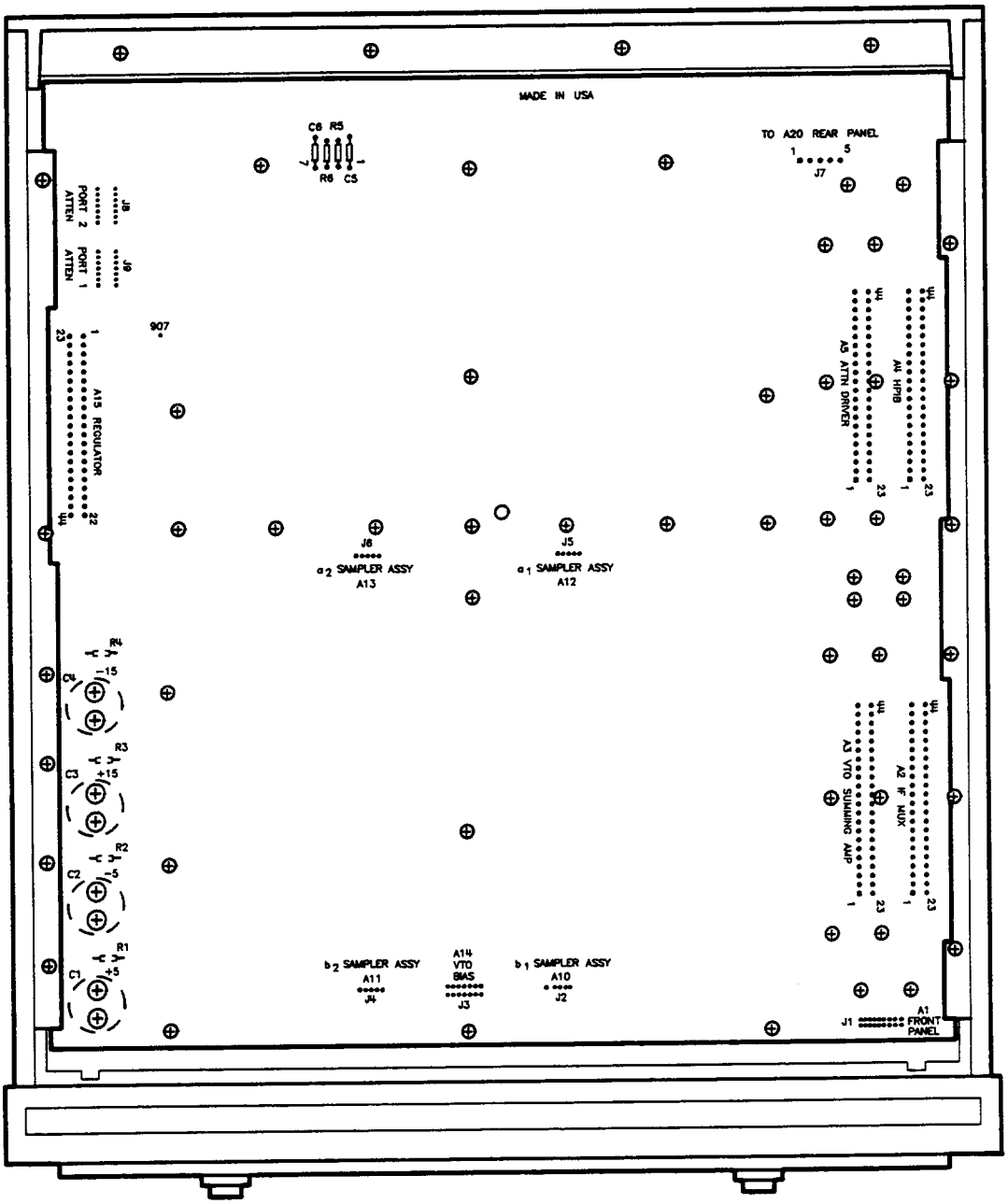
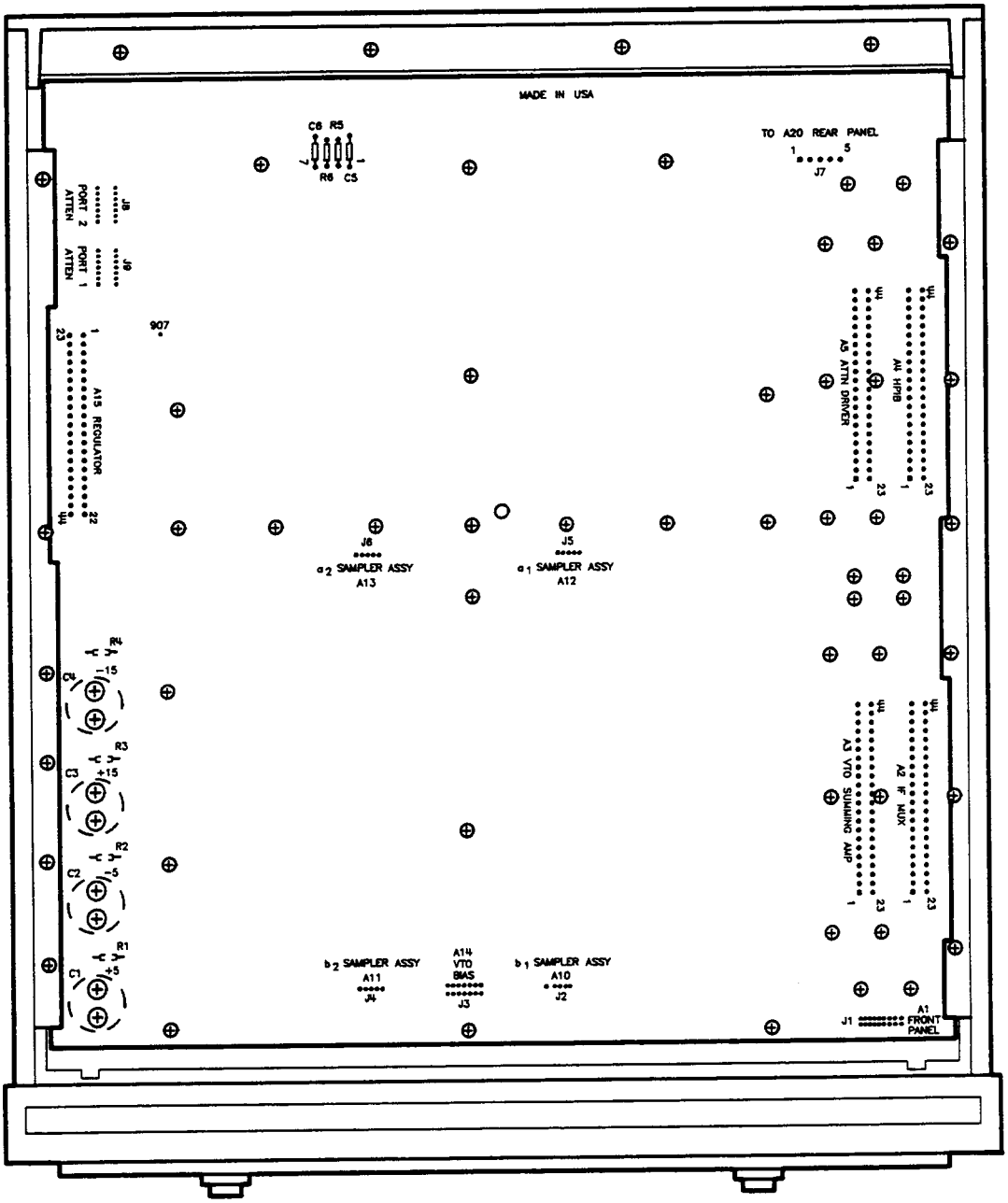


Figure 7-1 HP 8514B/8512A Motherboard


MADE IN USA
C6 R5
R6 C5
TO A20 REAR PANEL
J7
PORT 2 ATTEN
J8
PORT 1 ATTEN
J9
907
A15 REGULATOR
A5 ATTN DRIVER
A4 HPIB
A3 VTO SUMMING AMP
A2 IF MUX
J6
a2 SAMPLER ASSY
A13
J5
a1 SAMPLER ASSY
A12
b2 SAMPLER ASSY
A11
J4
A14 VTO BIAS
J3
b1 SAMPLER ASSY
A10
J2
J1
A1 FRONT PANEL

8

Miscellaneous

Performance Tests

Performance test information and procedures are located in the Performance Test section of the *HP 8510B System Manual* and volume 2 of the HP 8510A manual set. Note that the HP 8510B performance test software (supplied with the System Manual) is required to test the HP 8514B up to 20 GHz.

Adjustments

The HP 8514B and HP 8512A have one adjustment only, the sample assembly adjustment. The procedure is documented in the *HP 8510B Service Manual* in the section titled Adjustments. It is also in the Test Set Adjustments section in volume 2 of the HP 8510A manual set. The adjustment is software-guided.

This adjustment should be performed only if the need to do so is firmly established. A poor adjustment is worse than none at all. Thus the software driven adjustment procedure begins with a check of the sampler in question to establish the need.

Do not perform the actual adjustment if the sampler passes the check.

Manual Backdating

Manual backdating is not required for this manual set. This manual applies directly to instruments with the same (or lower) serial number prefix indicated in the front section of this manual. Instruments with serial number prefixes higher than indicated may be documented in a manual update supplement.

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