

Errata

Title & Document Type: 8516A S-Parameter Test Set Operating and Service Manual

Manual Part Number: 08516-90001

Revision Date: June 1988

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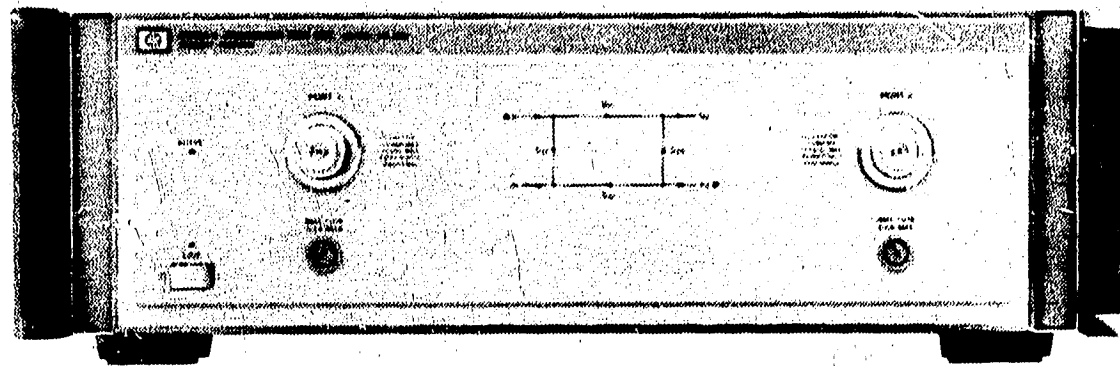
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* * * * *

OPERATING AND SERVICE MANUAL

HP 8516A S-PARAMETER TEST SET



HP Part Number 08516-90001

Printed June 1988

CERTIFICATION

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

WARRANTY

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

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

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

LIMITATION OF WARRANTY

The foregoing warranty shall not apply to defects resulting from improper or inadequate maintenance by Buyer, Buyer-supplied software or interfacing, unauthorized modification or misuse, operation outside of the environmental specifications for the product, or improper site preparation or maintenance.

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ASSISTANCE

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

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

HP 8516A S-PARAMETER TEST SET

SERIAL NUMBERS

This manual applies directly to HP 8516A test sets with serial prefix 2803A.

For additional information about serial numbers, refer to INSTRUMENTS COVERED BY MANUAL in the General Information section.

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Section 1: General Information

INTRODUCTION

The purpose of this manual is to enable you to use your HP 8516A S-parameter test set effectively and confidently. This test set is an integral component of the HP 8510 measurement system.

To begin using your test set, first place this manual in the TEST SETS section of the HP 8510B Test Set and Accessories Manual. The Operating section is distinguished by the tab titled *HP 8516A TEST SET* and it consists of:

- General Information
- Installation
- Operation
- Performance Tests
- Adjustments
- Backdating

The Service section is distinguished by the tab titled *HP 8516A TROUBLESHOOTING* and it consists of:

- Troubleshooting
- Replaceable Parts
- Service

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

VERIFYING THE TEST SET

The HP 8516A has 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, perform a system calibration as described in the HP 8510 Operating and Programming Manual. A successful calibration is an indication that the system and therefore the test set are operating properly.
- To see the specifications of the test set refer to SPECIFICATIONS in the HP 8510B System Manual.
- To verify that the instrument meets its published specifications, refer to the PERFORMANCE TESTS section in the HP 8510B System Manual.

- To troubleshoot the test set, refer to the **SERVICE OVERVIEW** section of the **HP 8510B Service Manual** or the section titled troubleshooting behind the tab titled **HP 8516A TROUBLESHOOTING**. If you are unsuccessful, refer to your **HP 8510 System Manual** for the address of the Hewlett-Packard office nearest you.

MEASUREMENT ACCURACY

Any precision measurement is no better than the calibration of your network analyzer. As a general rule, the shorter the time between a calibration and the measurement of a device-under-test (DUT), the more precise the measurement will be, within the limitations of your system. For this reason Hewlett-Packard recommends that for precision measurements, you recalibrate your system every two hours, or at a minimum, you reverify your system calibration.

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) on the title page under the heading **SERIAL NUMBERS**.

If the serial prefix of your test set is not listed on the title page, your instrument differs from those documented in this manual. The differences are documented in the 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 (on the title page) and is available on request from Hewlett-Packard.

You can order this manual in microfiche form (the part number appears on the title page). With the manual (in 4 x 6 inch microfilm transparency format) you will also receive the latest manual changes supplement.

INSTRUMENT COMPATIBILITY

The HP 8516A is compatible with HP 8510B Network Analyzers with firmware revision B.04.0X and higher and HP 8340A/B or HP 8341A/B synthesizers with firmware revision 11 MAY 88 and later. Additionally, your HP 8340A/B or HP 8341A/B synthesizers must have a serial number prefix of 2812A or higher. If your Network Analyzer and/or HP 834XX source do not fulfill the above conditions it will be necessary to upgrade your system to work with the HP 8516A. Please consult your Hewlett-Packard representative for more information.

DESCRIPTION AND OPERATING CHARACTERISTICS OF THE INSTRUMENT

The combination of the HP 8516A test set with the HP 8510 network analyzer and a HP 834XX source provides a system for making S-parameter measurements over the frequency range of 45 MHz to 40 GHz (Figure 1-1). In the standard configuration this system is particularly 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, for non-reciprocal devices or components like transistors, amplifiers or isolators where S12 measurements are important.

The HP 8516A uses two directional couplers for signal separation. For measurements of active devices, the HP 8516A includes 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 through path 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 S12 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.

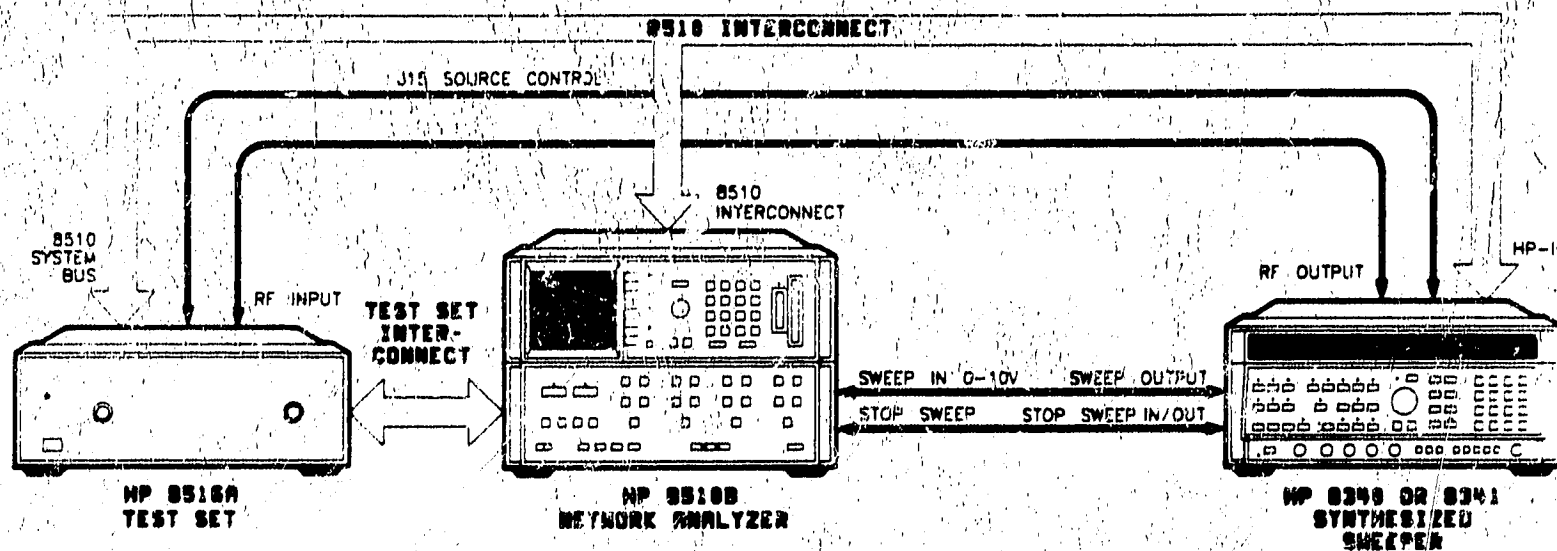


Figure 1-1. Typical HP 8516A Measurement Set-up

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. 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. Only one HP 8516A may be used in this configuration. For more information see "Controlling Multiple Test Sets" in the OPERATION section of this manual.

Option 003

High Forward Dynamic Range Configuration. This option is described in detail in this section under the title "Description and Operating Characteristics of the Instrument."

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.

ACCESSORIES

Accessories Supplied

The accessories supplied with the HP 8516A, including part numbers, are listed in the **INSTALLATION** and **REPLACEABLE PARTS** sections of this manual.

Accessories Available

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

Cables, Calibration, Verification and Adapter Kits. Hewlett-Packard offers several calibration kits suitable for calibrating an HP 8510/8516A 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.

HP 85056A 2.4 mm Calibration Kit. Contains open and short circuits; fixed and sliding loads (2); 2.4 mm to 2.4 mm adapters; 2.4 mm connector tools and gauges.

HP 85057A 2.4 mm Verification Kit. Contains precision airline, mismatched airline, 20 dB and 40 dB attenuators with NBS traceable data and uncertainties.

Cables

HP 85133C 2.4 mm Test Port Return Cable. For measurements where a 2.4 mm device-under-test is connected directly to Port 1 of the test set. The test port return cable is connected between the device-under-test and Port 2.

HP 85133D 2.4 mm Test Port Return Cable Set. For measurements where the 2.4 mm device-under-test is connected between the cable ends.

HP 85134C 3.5 mm Test Port Return Cable. For measurements where one end of a 3.5 mm device-under-test is connected directly to a HP 85130F adapter on Port 1. The test port return cable is connected between the device-under-test and Port 2.

HP 85134D 3.5 mm Test Port Return Cable Set. For measurements where a 3.5 mm device-under-test is connected between the cable ends.

HP 85134E 3.5 mm Flexible Test Port Return Cable. For measurements where one end of a 3.5 mm device-under-test is connected directly to a HP 85130F adapter on Port 1. The test port return cable is connected between the device-under-test and Port 2.

HP 85134F 3.5 mm Flexible Test Port Return Cable Set. For measurements where a 3.5 mm device-under-test is connected between cable ends.

HP 85135C 7 mm Test Port Return Cable. For measurements where one end of a 7 mm device-under-test is connected directly to a HP 85130E adapter on Port 1. The test port return cable is connected between the device-under-test and Port 2.

HP 85135D 7 mm Test Port Return Cable Set. For measurements where a 7 mm device-under-test is connected between the cable ends.

HP 85135E 7 mm Flexible Test Port Return Cable. For measurements where one end of a 7 mm device-under-test is connected directly to a HP 85130E adapter on Port 1. The test port return cable is connected between the device-under-test and Port 2.

HP 85135F 7 mm Flexible Test Port Return Cable Set. For measurements where a 7 mm device-under-test is connected between cable ends.

Adapters

HP 85130E Special 2.4 mm to 7 mm Adapter Set. Used to convert special 2.4 mm ports of the HP 8516A test set to 7 mm connector interface (m or f).

HP 85130F Special 2.4 mm to 3.5 mm Adapter Set. Used to convert special 2.4 mm ports of the HP 8516A test set to 3.5 mm connector interface (m or f).

HP 85130G Special 2.4 mm to 2.4 mm Adapter Set. Used to convert special 2.4 mm ports of the HP 8516A test set to standard 2.4 mm connector interface (m or f). Functions as "test port saver."

HP 11904S 2.4 mm to K-2.92* Adapter Kit. This kit allows you to calibrate your HP 8516A test set using 2.4 mm devices and then change the test ports to K-2.92 and perform fully error corrected measurements. Contains (2) 2.4 mm to K(m) adapters and (2) 2.4 mm to K(f) adapters.

NOTE: For more information on other 2.4 mm adapters, refer to the Operating Note "2.4 mm ADAPTERS and CALIBRATION ACCESSORIES" (HP part number 11900-90J03).

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 8516A by using HP 85135C or HP 85135E cables and HP 85130E adapter set. Please consult with your local HP Sales Office for specific recommendations.

OPERATING AND SAFETY PRECAUTIONS

Operating



Beware of electro-static damage (ESD). The input connectors (test ports or cables or adapters connected to the test ports) are very sensitive to ESD. Use a grounded wrist strap when attaching devices to the input connectors.

Otherwise, you need observe only the following normal precautions in handling and operating the test set:

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

Maximum Power Level	Test Port
+17 dBm	Port 1
+13 dBm	Port 2

* The K connector is developed and manufactured by the Wiltron Company (Morgan Hill, California).

- Do not exceed +15 dBm Source RF input level into the test set and under no circumstances ever apply a DC level to the Source RF input of the test set.
- Do not torque anything to the test port connector with greater than 20 in.-lb of torque. The wrench supplied with your accessory kit is calibrated to 20 in.-lb.
- Do not torque anything to the Source RF input, on the back of your test set, with greater than 10 in.-lb of torque.

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, replaceable parts and similar information for the HP 8516A test set is in this manual or the HP 8510B Service Manual.

ADDITIONAL EQUIPMENT REQUIRED

Additional equipment and accessories required for use with the HP 8516A test set may be found in Table 4-2. 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.

SPECIFICATIONS

The specifications of the HP 8516A test set with an HP 8510B network analyzer are defined in the SPECIFICATIONS section of the HP 8510B System Manual.

CHARACTERISTICS

The performance parameters listed in the Specifications Section in Table 4-1 are typical or nominal characteristics of the HP 8510B/8516A.

Section 2: Installation

INTRODUCTION

This section explains how to install the HP 8516A test set. The topics covered include initial inspection, environmental considerations, positioning and connecting the test set for use, and packaging the instrument. Refer to the INSTALLATION 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.

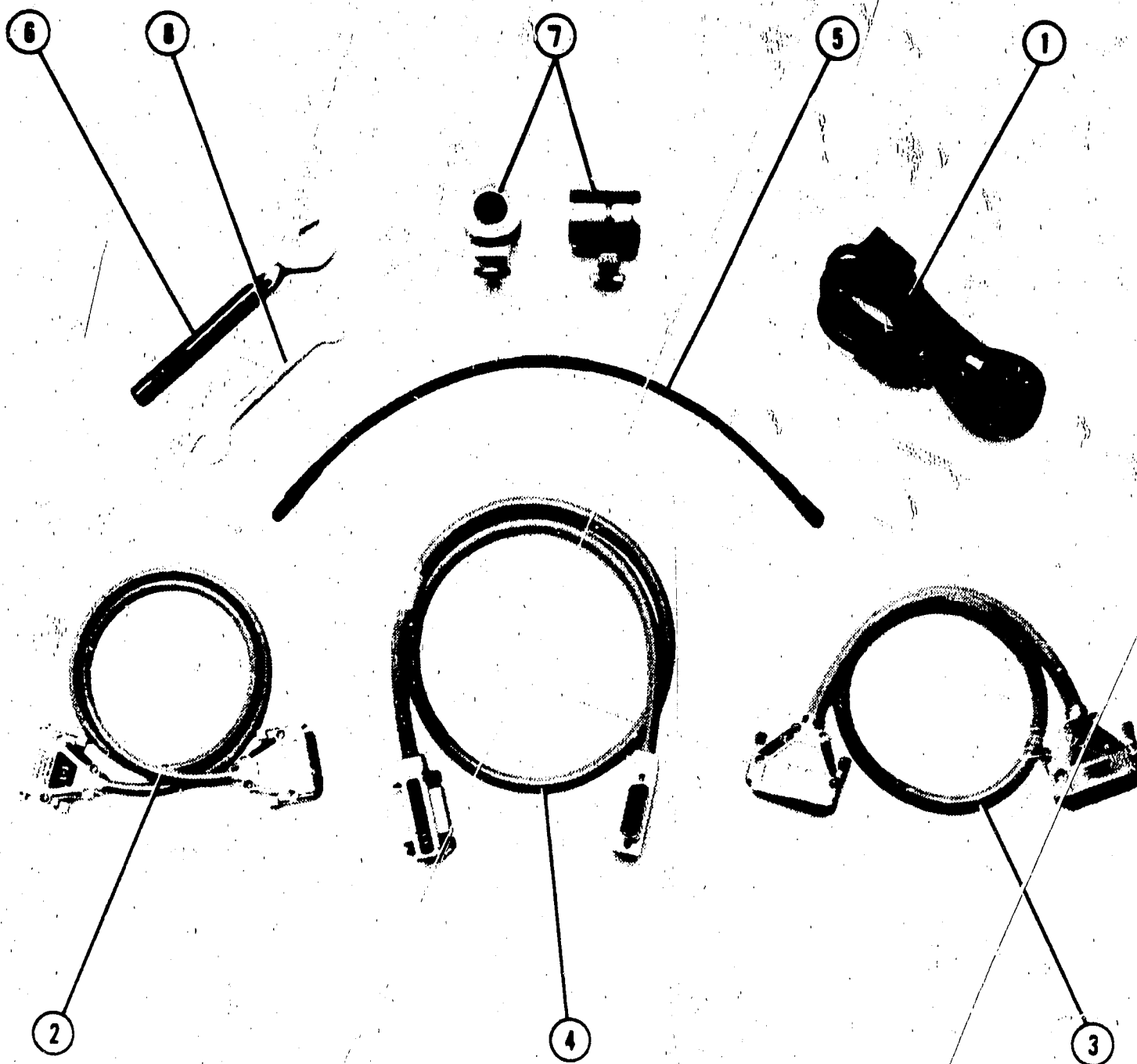
If the shipping container is damaged, perform the performance tests outlined in the HP 8510 manual set. If the test set fails the performance tests, or is damaged or defective, keep the shipping materials and notify both the carrier and the nearest Hewlett-Packard office. The HP office will arrange for 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 meters (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 meters (50,000 feet).



Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
ACCESSORIES						
1	8120-1348	5	1	POWER CORD U.S.A. ONLY	28480	8120-1348
2	08510-60102	8	1	TEST SET CABLE ASSEMBLY	28480	08510-60102
3	08516-60009	0	1	CABLE ASSEMBLY, RS232	28480	08516-60009
4	8120-3445	7	1	HP-IB CABLE ASSEMBLY	28480	8120-3445
5	08513-60009	7	1	FLEX SOURCE CABLE	28480	08513-60009
6	8716-1764	2	1	20 MM TORQUE WRENCH	28480	8716-1764
7	08515-60003	3	2	NON-ROTATING CLAMP	28480	08515-60003
8	8710-1770	8	1	1/2 X 9/16 IN OPEN END WRENCH	28480	8710-1770
SPECIFICATION AND PERFORMANCE VERIFICATION SOFTWARE REV. A.01.02						
	08510-10031	7	2	PROGRAM DISCS (Not Shown)	28480	08510-10031
	08510-10032	8	1	DATA DISC (Not Shown)	28480	08510-10032

Figure 2-1 Accessories Supplied with the HP 8516A

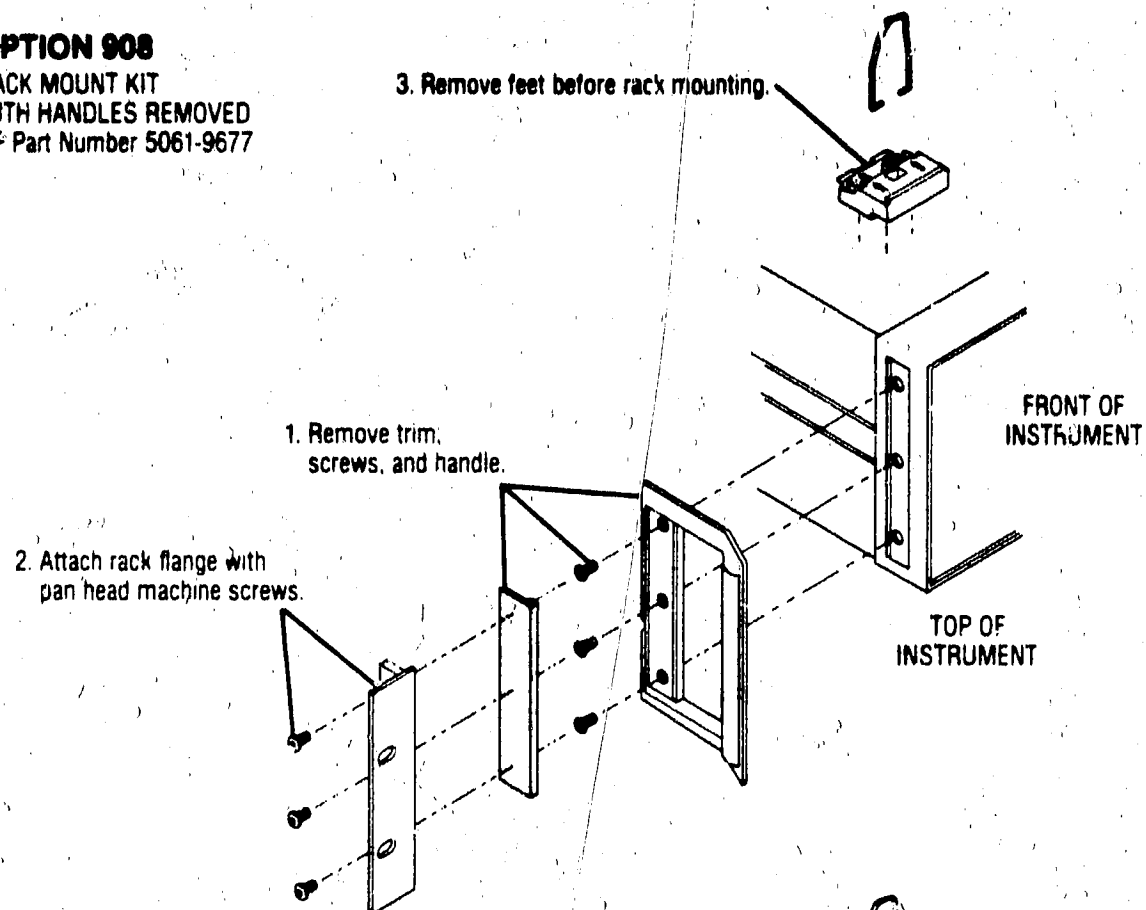
PREPARATION FOR USE

Positioning the Test Set

Typically the test set is placed on a work surface 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.

OPTION 908

RACK MOUNT KIT
WITH HANDLES REMOVED
HP Part Number 5061-9677



OPTION 913

RACK MOUNT KIT FOR
INSTRUMENTS WITH PREVIOUSLY
ATTACHED FRONT HANDLES
HP Part Number 5061-9771

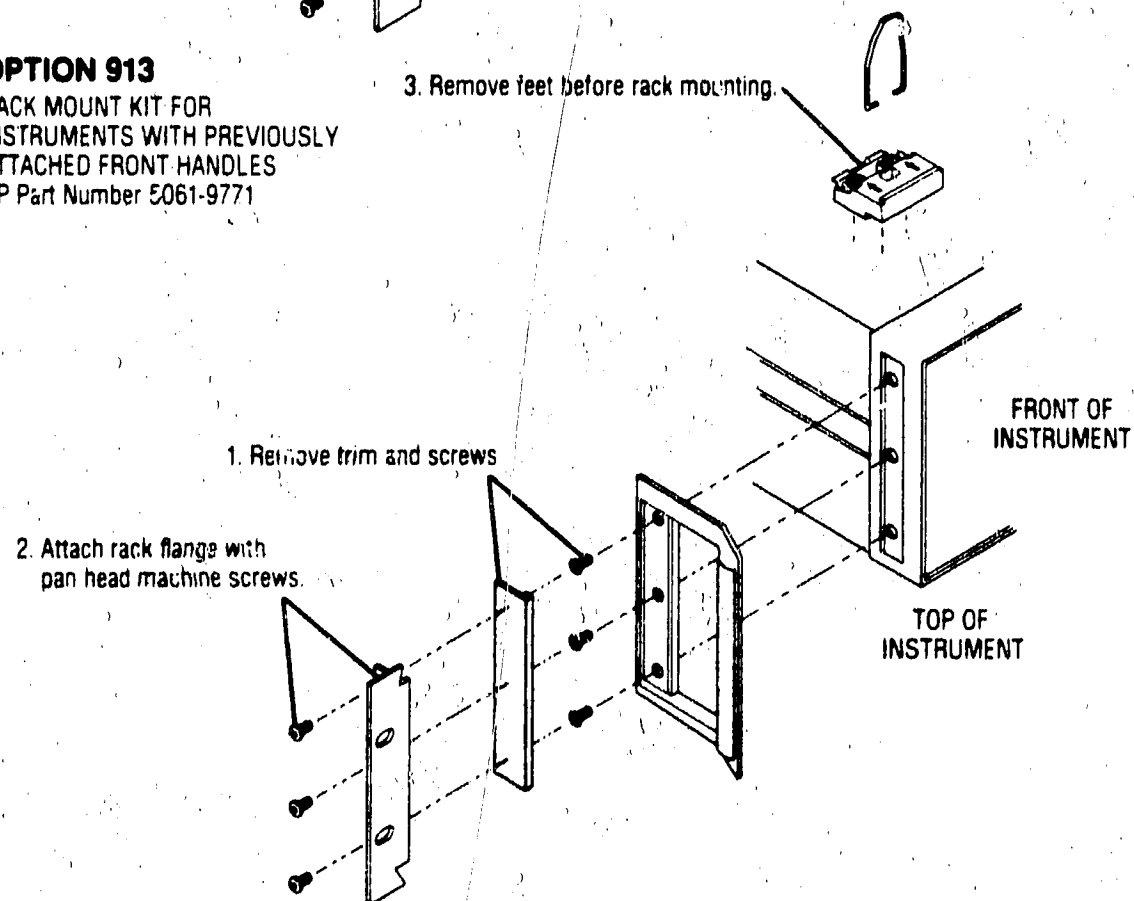


Figure 2-2. Attaching Rack Mounting Hardware

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 and in the HP 85043A system rack manual.

When installing the test set for use on a bench, place it on an antistatic work surface to lessen the chance of ESD. The antistatic surface should extend far enough in front of the test set to provide effective protection for the test ports and cable ends.

Connecting the Test Set

Mating Connectors. HP 8516A PORTS 1 and 2 are Precision 2.4 mm connectors and mate with Precision 2.4 mm female connectors.

The TEST SET INTERCONNECT connector is a series-D subminiature female connector with seven RF connections. It mates with the corresponding male connector.

The 8510 SYSTEM BUS connector is a female HP-IB type connector and mates with the corresponding male connectors of HP-IB 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 8516A J12 HP8510 SYSTEM BUS connector to the HP 8510 INTERCONNECT connector of the HP 85101 display/processor. The test set IF interconnect cable and the system bus cable transmit control signals between the test set and the network analyzer.

Connect the source control cable from the HP 834XX source to the J15 TEST SET INTERCONNECT connector on the rear panel of the HP 8516A test set.

NOTE: The HP 8516A test set requires a HP 834XX source with firmware revision date 11 MAY 88 or later to operate. You may not use a HP 8350B sweep oscillator or any other source. The HP 8510 must have firmware revision 4.0 or higher. See the General Information Section, Instrument Compatibility.

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.

Anti-Rotation Clamps. Use these clamps to stabilize the test port/RF cable connection. Connect the test port cables to the test ports and tighten them as specified in the cable manual. Loosen the anti-rotation clamp thumb screw 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 thumb screws to prevent further loosening or tightening of the test port/RF cable connection.

The internal O-ring (HP Part Number 0900-0007) 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.

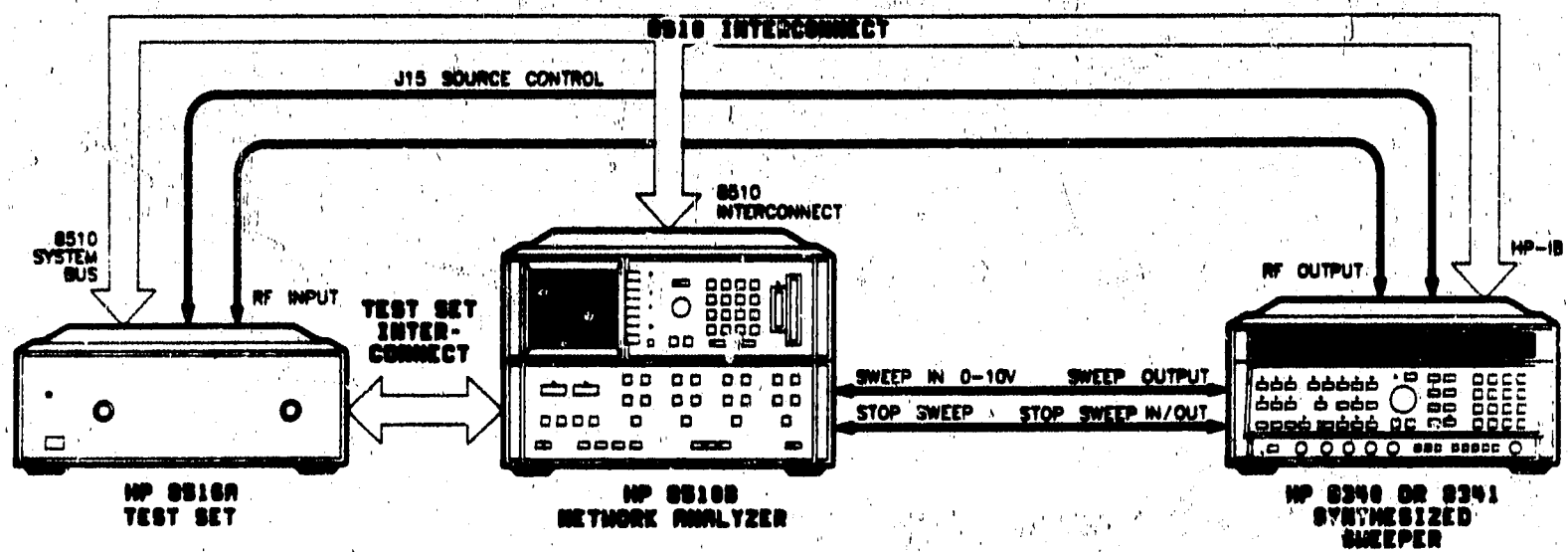


Figure 2-3. HP 8516A System Connections

PACKAGING

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

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 and serial number.

INTRODUCTION

This section illustrates the features and functions of the front and rear panels of the HP 8516A test set. It also describes the Multiple Test Set Option (OPT 001) available with these Hewlett-Packard test sets: HP 8511A, HP 8514B, HP 8515A, HP 8516A. And, includes the related automatic control by the HP 8510 Network Analyzer.

FRONT PANEL FEATURES

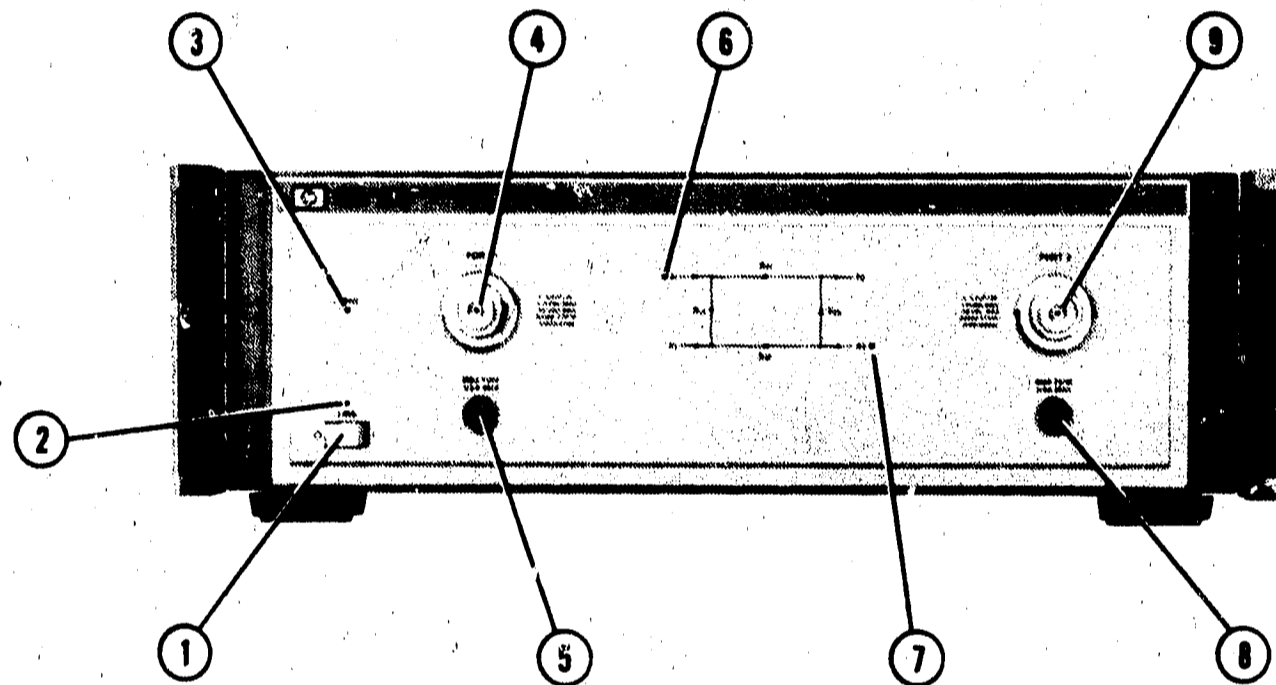


Figure 3-1. Front Panel Features of HP 8516A

1. **Line Switch.** This switch turns the test set on and off. When the side of the switch labeled O is depressed, the test set is off; I is on.
2. **Line LED.** This LED goes on and off with the test set line switch.
3. **Active LED.** This LED lights about two seconds after power is turned on, following the successful conclusion of self-test. If the test set is used with other test sets (option 001) and is not addressed by the HP 8510, then this light remains off.
4. **Port 1.** This test port transmits RF energy from the source to the DUT and receives reflected or transmitted RF energy from the DUT. The reflected RF energy is coupled to a sampler within the instrument. Under no circumstances should anything be torqued to the test port connector with greater than 20 inch-pounds.
5. **Bias Fuse.** 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).
6. **a1 LED.** This LED indicates that the HP 8516A is internally switched to the S11 or S21 mode and source power is switched to Port 1.
7. **a2 LED.** This LED indicates that the HP 8516A is internally switched to the S22 or S12 mode and source power is switches to Port 2.
8. **Bias Fuse.** 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).
9. **Port 2.** In the HP 8516A, this test port transmits RF energy from the source to the DUT and receives reflected or transmitted RF energy from the DUT.

In the HP 8516A option 003, high forward dynamic range configuration, the Port 2 coupler is reversed to optimize dynamic range in the forward direction. The received RF energy is input directly to a sampler within the instrument.

REAR PANEL FEATURES

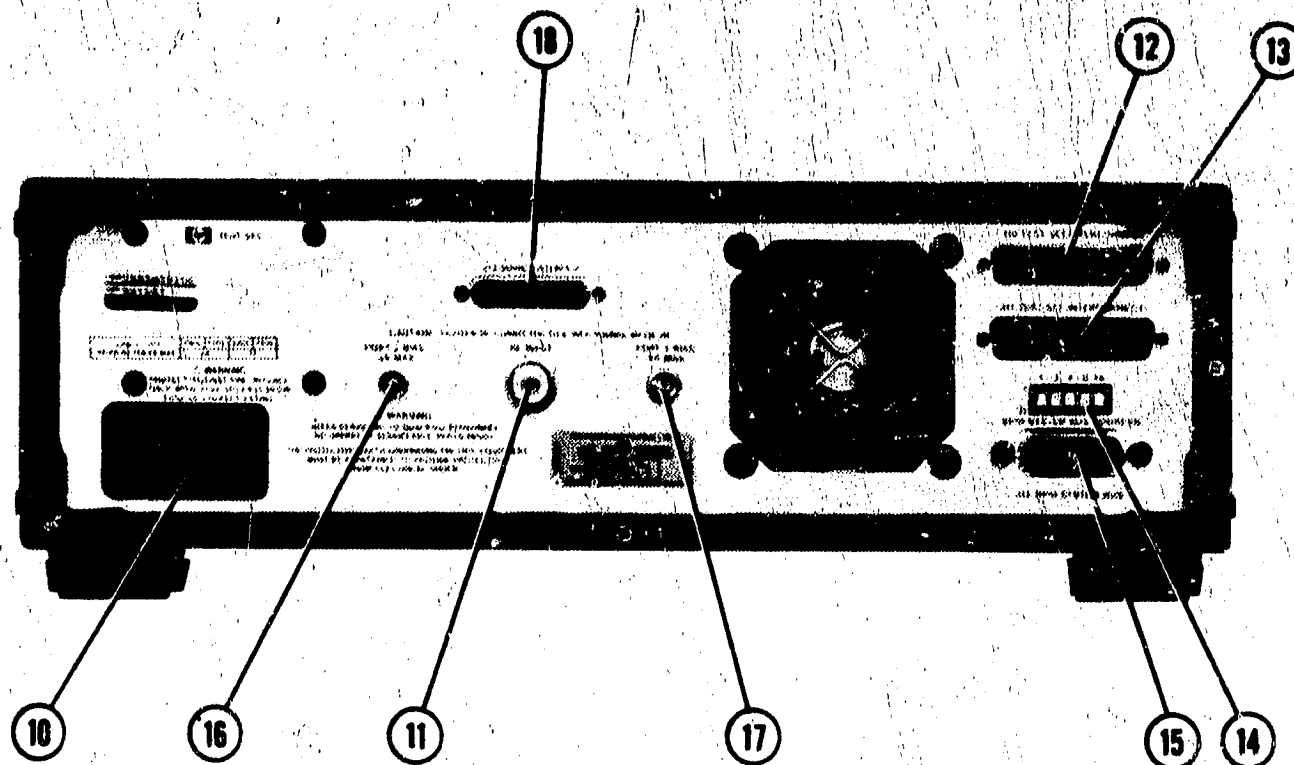


Figure 3-2. Rear Panel Features of HP 8516A

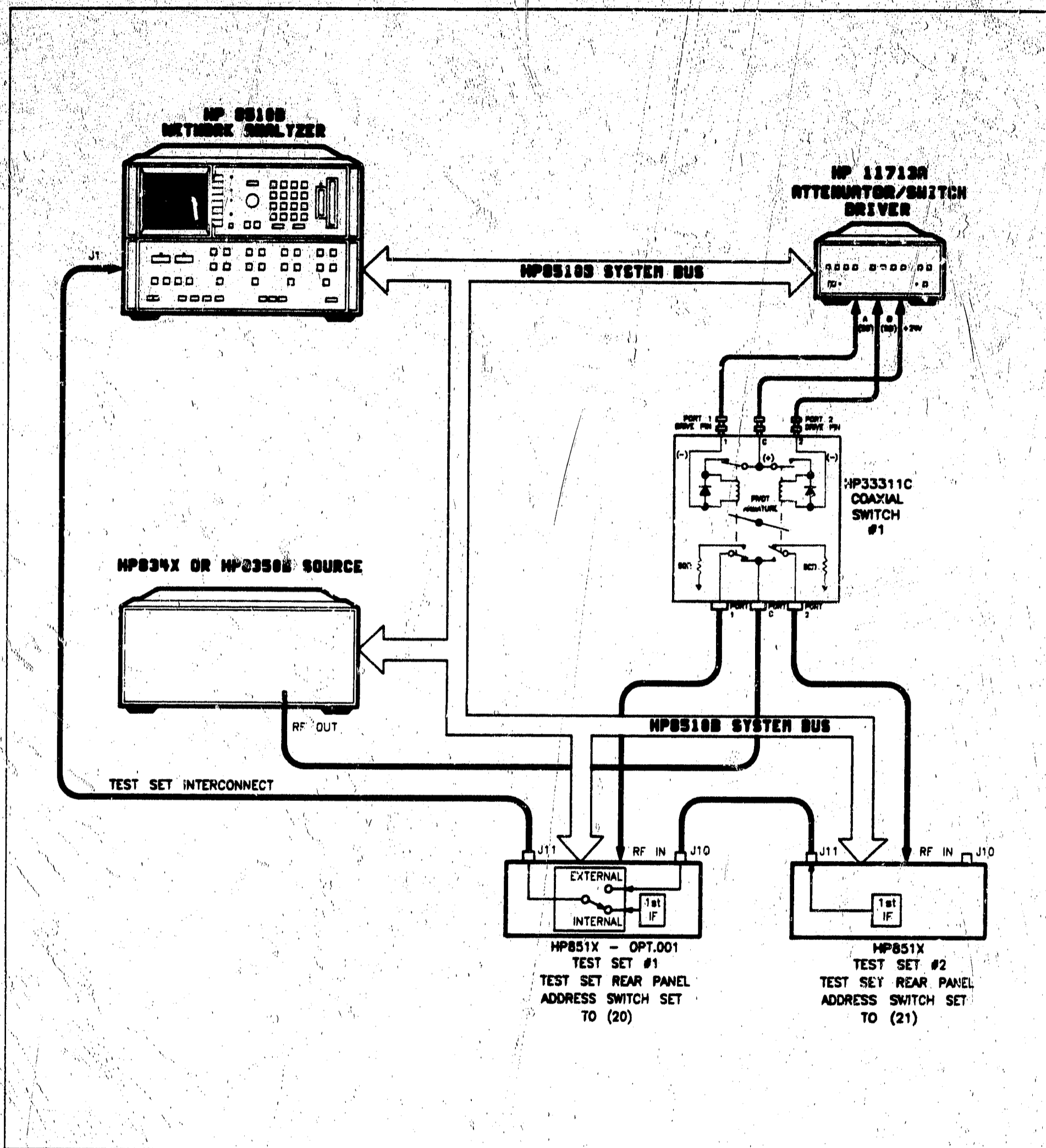
10. **Line module.** This assembly houses the line cord connector, line fuse and line voltage selector. Pull out the right side of the line module cover to replace or change the fuse or to change the voltage selection. Note that the voltage selector drum must be removed to rotate it to a different voltage setting. Recommended fuse values are printed on the rear panel.
11. **RF Input.** This 3.5 mm connector receives RF energy from the source. Connections made to this input must be torqued to no more than 10 in.-lb.
12. **J10 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. Refer to CONTROLLING MULTIPLE TEST SETS in this section for more information.
13. **J11 Test Set Interconnect.** This connector transmits the IF signal from the test set to the HP 85102 IF Detector. It also transmits control signals bidirectionally.

14. **HP 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.
15. **J12 8510 System Bus Connector.** This connector is used for GPIB communications with the HP 85101 display/processor.
16. **Port 2 Bias.** This female BNC connector is used to supply bias through the center conductor of Port 2 to active devices under test.
17. **Port 1 Bias.** This female BNC connector is used to supply bias through the center conductor of Port 1 to active devices under test.
18. **J15 Source Control.** This RS-232 connector is used by the HP 834XX source to control the HP 8516A test set Switch Doubler.

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. When the measurement on test set number 1 is complete, then the HP 8510 can control test set number 2. Please note that 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 3-3, 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.



HP 33311C Coaxial Switch Positions with Dual test sets.

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

Figure 3-3. HP 8510 Dual Test Set Configuration

INSTALLATION

Set each test set rear panel address switch to the address listed in Figure 3-3, if using a dual test set configuration and Figure 3-4, 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.

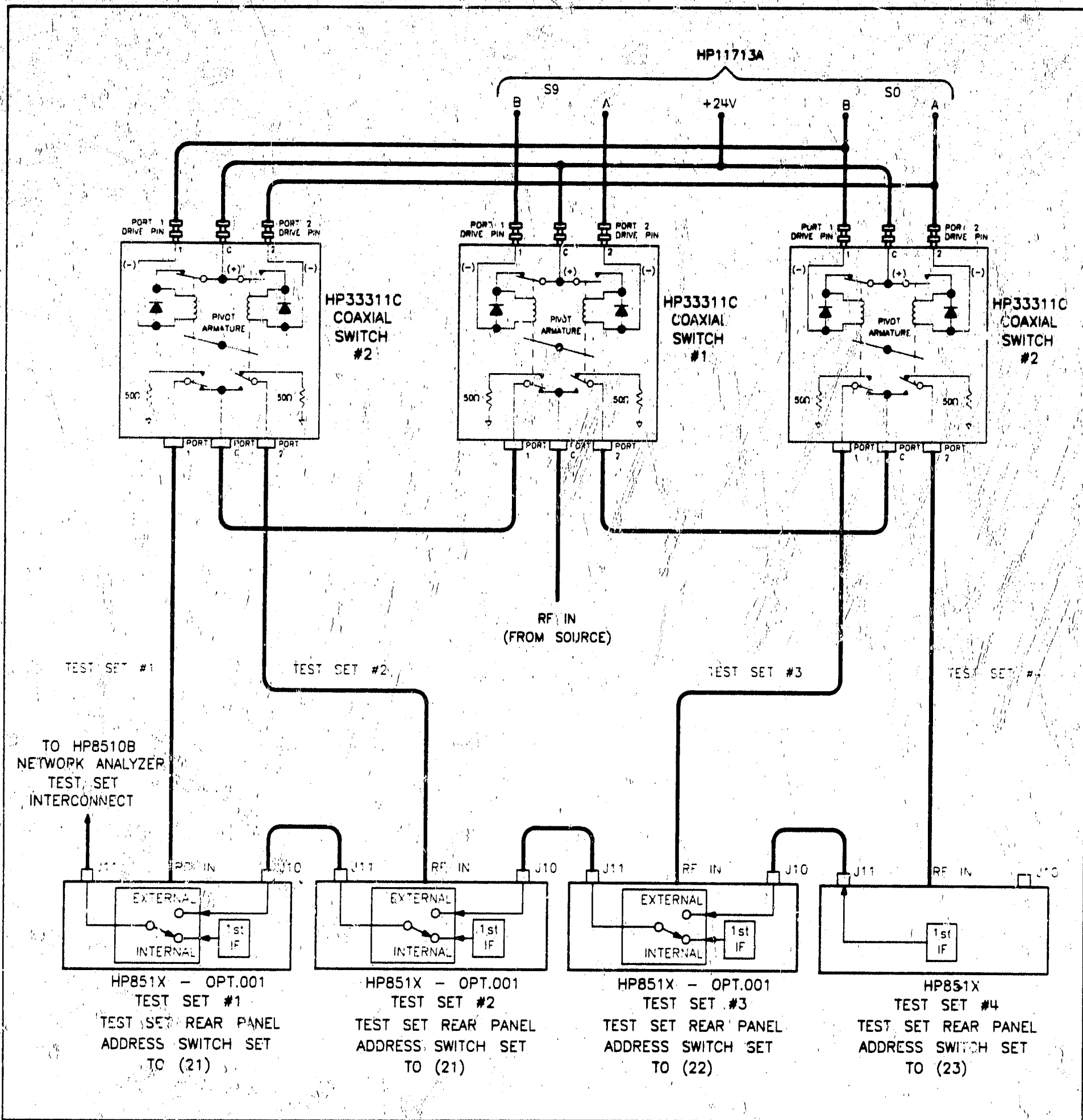
1. Check the active lights of all system test sets.
2. Check the HP 8510's expected test set address by pressing [LOCAL] [TEST SET]. This should match the address of the desired test set. If not, change the address.
3. If unselected test sets are active, (active light ON), deactivate the test set by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

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 Figures 3-3 and 3-4, 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 Figures 3-3 and 3-4.



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

Figure 3-4. RF and IF Switching with Four Test Sets

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 disc 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] [DATA→MEMORY] [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.

Section 4: Specifications

The specifications of the HP 8516A test set with an HP 8510B network analyzer are defined in the SPECIFICATIONS section of the HP 8510B System Manual.

CHARACTERISTICS

The performance parameters listed in Table 4-1 are typical or nominal characteristics of the HP 8510B/8516A.

Table 4-1. HP 8510B/8516A Characteristics

Test Ports (Front Panel)			
Connector type: precision 2.4 mm male			
Connection torque: 20 in.-lb, maximum			
Impedance: 50 ohms nominal			
DC bias: 500 mA, 40 Vdc, maximum			
Damage input level:			
Port 1	Port 2		
17 dBm CW RF	13 dBm CW RF		
Nominal operating power level: ¹			
Frequency	Operating Level	Port 1	Port 2
0.045 to 40 GHz	Standard	-10 dBm \pm 5 dBm	-10 dBm \pm 5 dBm
	Option 003	-10 dBm \pm 5 dBm	-25 dBm \pm 5 dBm
RF Input Connector (Rear Panel)			
Connector type: precision 3.5 mm female			
Connection torque: 10 in.-lbs, maximum			
Damage input level: > +15 dBm. Note: this must be AC coupled.			
User 1 power levels for reference channel phase lock:			
Minimum: -45 dBm			
Maximum: -10 dBm			
1. Available power in PRESET condition.			

Table 4-2. HP 8516A 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 × 133 mm × 609 mm (18.1 × 5.25 × 24 inches)
Weight: HP 8516A: 15 kg (35 lb) net

Table 4-3. Recommended Equipment

Item	Critical Specifications	Recommended Model	Use ¹
Network analyzer	no substitute	HP 8510B	O, P, T
Source ²		HP 8340B or HP 8341B	O, P, T
Controller	no substitute	HP 9000 series 200 or 300 with 2 Mbyte memory	P
Disc drive	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. Revision May 11, 1988 firmware or higher required.

Section 5: Test Set Troubleshooting

The information in this section is presented as an aid in troubleshooting the HP 8516 test set. 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.

The information consists of procedures for checking the following:

- Test Set Temperature
- All Connections
- Power Supply/Regulator, Fuses, Switches
- Test Set Self-test Indicators
- VTO/Driver (LO)
- Nominal Programmed Source Power
- Test Set Disassembly
- Unratioed Power Test

TEST SET TOO HOT

The processor on the A4 HP-IB board 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 degrees celsius, the HP 85101 displays the "Test Set Too Hot" prompt.



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

Determine the reason for the prompt before subjecting the test set to continuous use.

CHECK ALL CONNECTIONS (loose, broken, crimped, etc.)

- Test set rear panel
- A3 Summing Amp and A5 Att/SW Driver board cables
- Sampler cables
- RF path connections from rear panel to front panel. Power holes often result from faulty connections. All semi-rigid coax cables are torqued to 10 in.-lb.

CHECK POWER SUPPLY/REGULATOR, FUSES, AND SWITCHES

A15 Regulator Board Assembly

Use a digital voltmeter to check the voltages of Table 5-1. Use an oscilloscope to check ripple (if necessary).

Table 5-1. Test Set Power Supply Criteria

Nominal Voltage	Test Point	Voltage Range	Maximum Ripple Peak to Peak
+15	A22TP1	+13.7 to +15.9	2 mV
-15	A22TP2	-13.8 to -16.2	2 mV
+5	A22TP3	+4.5 to +5.2	2 mV
-5	A22TP6	-4.8 to -5.5	2 mV

Fuses

The HP 8516A uses seven fuses.

- Two fuses are accessible from the front panel and are used to fuse the bias supply.
- Four fuses are used on the regulator board.
- One fuse is used in the line module on the rear panel.

HP-IB Address Switches

Set the switches as indicated (dark side of switch is depressed). The HP-IB address switch is on the test set rear panel. It is easy to access but need not be changed unless the HP 8510 bus error message "SYSTEM BUS ADDRESS ERROR" is visible on the CRT. It is shown in Figure 5-1.

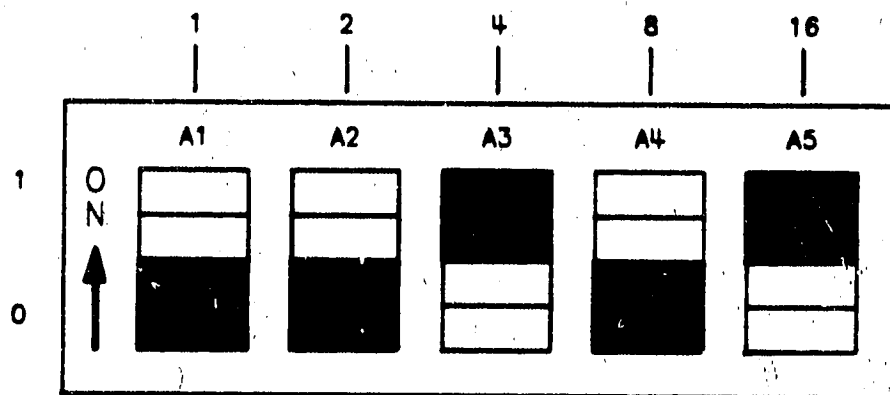


Figure 5-1. HP-IB Switch Setting for All Test Sets (20, Binary)

TEST SET SELF-TEST INDICATORS

If the ACTIVE LED on the front panel of test set selected by the HP 8510, 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 noting which HP-IB LEDs on the A4 board are lit, as shown below:

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

Two seconds after turn-on all four HP-IB LEDs on the top of the A4 board should go off at the same time the front panel ACTIVE LED lights. Then the 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 Fails 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 go on too soon
- ACTIVE LED does not go on

Be aware that there are other problems that can cause the self-test to fail, it is just that the ROMs are the most probable cause.

CHECK VTO/DRIVER (LO)

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

- Using a frequency counter and a voltmeter, check the VTO fundamental frequency and A3 Summing Amp 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 (labelled 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 200 MHz. Check that A3J4 is between -5.6V and -6.8V.

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 Amp board (assuming the HP 85102 is working).

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

Inject a -1 to -12 V DC voltage (in -1 volt steps) into the A14 VTO Drive (A14J2). Monitor A14J1 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.

If a power supply is unavailable, -1 to -10 V DC is available from the AUX OUT on the rear panel of the HP 85102. For more information on this feature please refer to the Operating and Programming Manual of the HP 8510B manual set.

CAUTION

Any positive voltage injected into the VTO drive will damage the VTO.

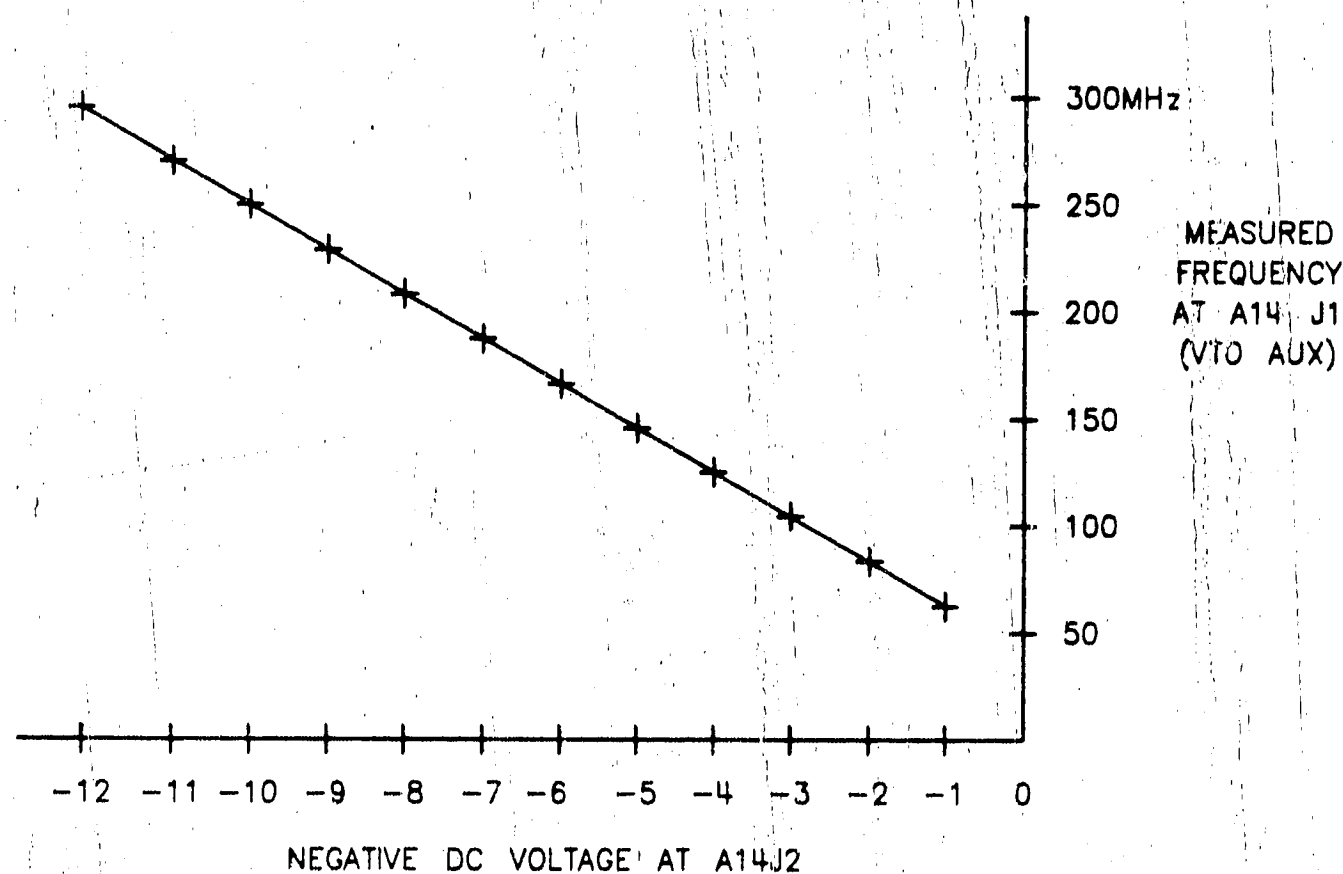


Figure 5-3. VTO Voltage/Frequency Relationship

NOMINAL PROGRAMMED SOURCE POWER

The HP 8516A uses fixed source power. It instructs the source to provide a 0 to $+10$ dBm ramp from 45 MHz to 20 GHz and a constant $+10$ dBm from 20 GHz to 40 GHz. The source power may be varied using the RPG on the HP 8510B Network Analyzer, by $+5$ dBm and -10 dBm but caution must be exercised not to exceed the damage level of the switch-doubler. When the power is varied the shape of the source output remains constant, that is, there is still a 10 dBm ramp from 45 MHz to 20 GHz. For example, the ramp may extend from -2 dBm to 8 dBm.

CAUTION

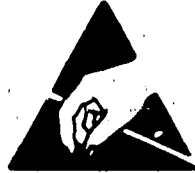
The Switch Doubler may be **DAMAGED** by input of a DC voltage, or a power level of greater than $+15$ dBm.

TEST SET ASSEMBLY REPLACEMENT PROCEDURES

This section consists of removal procedures for the HP 8516A test set components which are difficult to replace. The procedures are identified in the text by bold numbers in parenthesis (1).

- 1 Bias tee
- 2 Coupler
- 3 Switch/splitter
- 4 Frequency converter
- 5 Regulator board assembly
- 6 Capacitor
- 7 3.5 mm RF connectors
- 8 Switch/Doubler interface board
- 9 Switch/Doubler
- 10 2.4mm Test Port connector

Before beginning any of the following procedures:



ATTENTION
Static Sensitive

Handle Only at
Static Safe Work
Stations

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 electro static discharge. Their reliability will, however, be impaired

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 3.5mm and 2.4mm connections are torqued to 10 in.-lb.
7. Exercise caution when handling semi-rigid coax cables. They are easily bent.

EQUIPMENT NEEDED BUT NOT SUPPLIED

Tools	Used On	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 gage	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

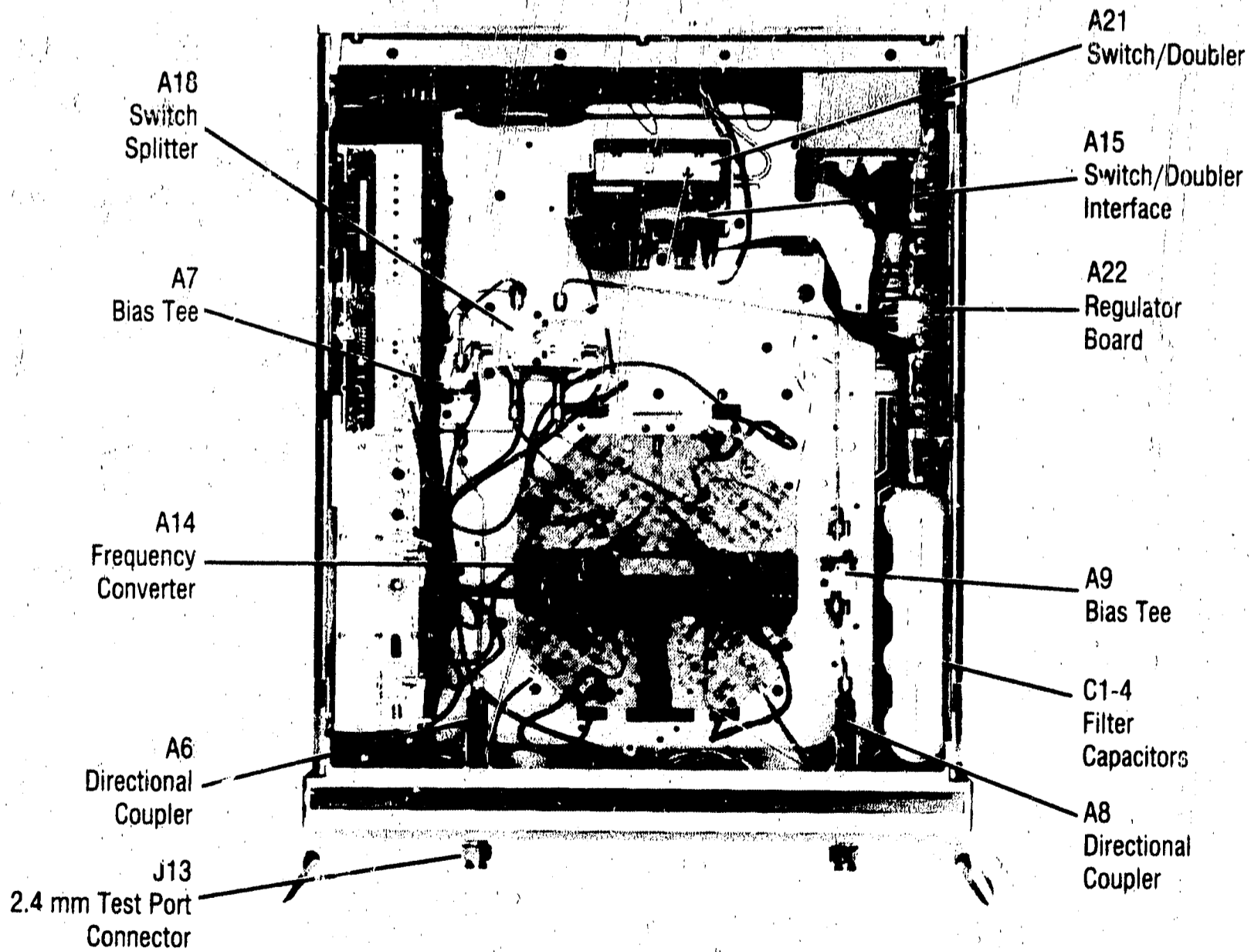


Figure 5-4. General Test Set Component Location Diagram (Top View)

(1) BIAS TEE

1. Unsolder the wire connected to the bias tee.
2. Loosen the nuts (2) on both sides of the bias tee.
3. Disconnect the two semi-rigid cables from the bias tee and remove the tee from the test set.

(2) COUPLER

1. Remove the two semi-rigid cables attached to the coupler.
2. Remove the coupler support bracket.
3. Carefully loosen the nut connecting the coupler to the front panel with the 5/16 inch torque wrench.
4. Remove the coupler away from the front panel and lift it out of the test set.

(3) SWITCH/SPLITTER

1. Remove the five semi-rigid cables and the three flexible cables from the switch/splitter with the 5/16 inch wrench. (Reposition any other cables as required to ease removal.)
2. Remove the four screws which attach the switch/splitter mounting bracket to the top deck.
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 four samplers.



ATTENTION
Static Sensitive

Handle Only at
Static Safe Work
Stations

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 electro static discharge. Their reliability will, however, be impaired

1. Remove the four semi-rigid cables from the four samplers.
2. Remove the in-line attenuators from the samplers.
3. Remove the six 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 four harnessed (multi-colored) wire and socket assemblies.
6. Remove the four 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.

(5) REGULATOR BOARD ASSEMBLY

1. Unplug the transformer socket from the regulator board.
2. Remove the three mounting screws from the top edge of the regulator board.
3. Remove the regulator board. (It may be necessary to partially back out one of the transformer mounting screws for clearance.)

(6) FILTER CAPACITORS

1. Set the test set rightside up and pull the metal and plastic cover off the capacitors.
2. Turn the test set upside down and remove the bottom cover.
3. Discharge each capacitor by attaching one end of an insulated clip lead to the chassis of the instrument and the other end of the clip lead to the 100 Ω 20 watt resistor. Use this resistor to discharge each capacitor terminal (large pozidriv screw on the bottom side of test set). Each capacitor has two (2) terminals. **Discharge every capacitor terminal.** It will take approximately six seconds per capacitor to discharge.
4. To remove a capacitor, remove the corresponding pair of screws and pull the capacitor out of the test set.

(7) 3.5 mm RF INPUT CONNECTOR REPAIR

Refer to Figure 5-5 and the following text to repair 3.5 mm connectors.

Disassembly

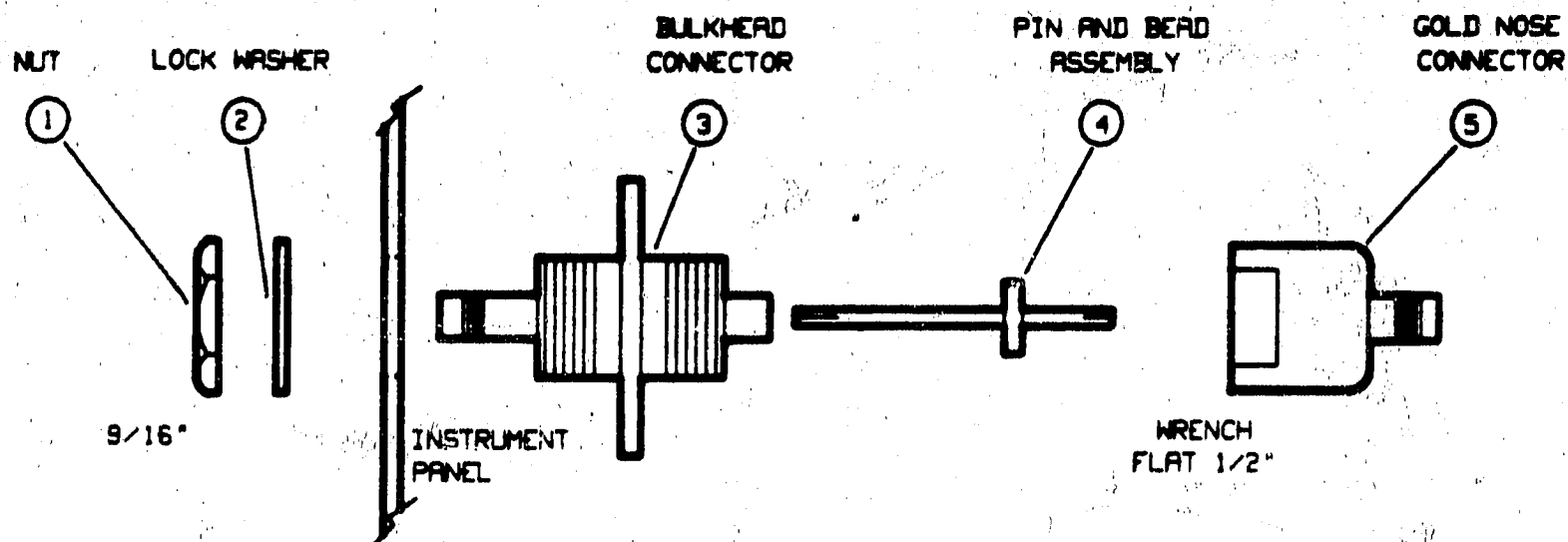


Figure 5-5. Exploded Diagram of 3.5 mm Connector

1. Remove any attached cables from the connector to be replaced.
2. Use a 1/2 inch 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 inch nut driver to loosen the 9/16 inch nut and remove the rest of the connector.
4. Use the part numbers given in the replaceable parts section of this manual.

Assembly

5. Assemble the bulkhead connector, lock washer and nut. Tighten the nut using the 9/16 inch nut driver ($\cong 45$ in.-lb).
6. Clean the pin and bead assembly (using the procedures described in the Microwave Connector Care Manual, provided with your HP 8510B manual set). Insert the pin and bead assembly into the gold nose connector. Attach this assembly to the bulkhead connector. Torque the bulkhead connector to 25 in.-lb. (HP part number 8710-1581 is a 25 in.-lb wrench.)
7. Clean the mating surfaces with liquid freon or alcohol and lint-free swabs.
8. 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.

9. Reconnect the cables disconnected in step 1.

(8) SWITCH/DOUBLER INTERFACE BOARD

1. Remove the semi-rigid cable connecting the doubler to the switch/splitter. Remove the three flexible coax cables attached to the switch splitter.
2. Unplug the four cables connected to the board and move them out of the way.
3. Remove the two screws securing the board to the test sets top deck.
4. Pull the board straight up and remove it from the test set.

(9) SWITCH/DOUBLER

1. Unplug all cables attached to the doubler interface board.
2. Remove all of the semi-rigid cables attached to the SWITCH/SPLITTER, DOUBLER and BIAS Tee (on Port 1).
3. Remove the seven screws securing the top deck to the main deck of the test set.
4. Tilt the top deck assembly out of the test set. Be careful not to crimp the wire attached to the BIAS Tee.
5. Remove the four screws that attach the doubler to the top deck.
6. Lift the doubler out of the top deck and the test set.

(10) 2.4 mm TEST PORT CONNECTOR

1. Remove the COUPLER (2).
2. Carefully loosen the nut on the front of the test set with the 1 inch torque wrench. Remove the nut and washer.
3. Remove the test port connector from the test set.
4. Regage the test port connector assembly after replacement. The specification is $-.0001$ to $-.0007$ inch recession. If the connector is not within specification do not repair. Instead, install another connector assembly.

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, b_1/a_1). 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.

The HP 8516A Test Set is unique among test sets produced by Hewlett-Packard, in that as part of the design criteria, Port 1 and Port 2 were not phase balanced. Because of this, variations will occur when examining the output of the individual samplers or when comparing the S-Parameters. Additionally, the HP 8516A option 003, High Forward Dynamic Range Configuration, has the Port 2 coupler reversed to optimize dynamic range in the forward direction. Because the b2 sampler is connected to the coupler through path instead of the coupled arm there is less isolation between the b2 sampler and Port 2 and the power level will be higher than b1. As a result, "sampler bounce", appearing as an occasional spur related to the VTO frequency can be worse in this "asymmetrical" test set than the standard symmetrical test set.

Figures 5-6, 5-8 and 5-9 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 5-7, following these procedures, shows typical traces.

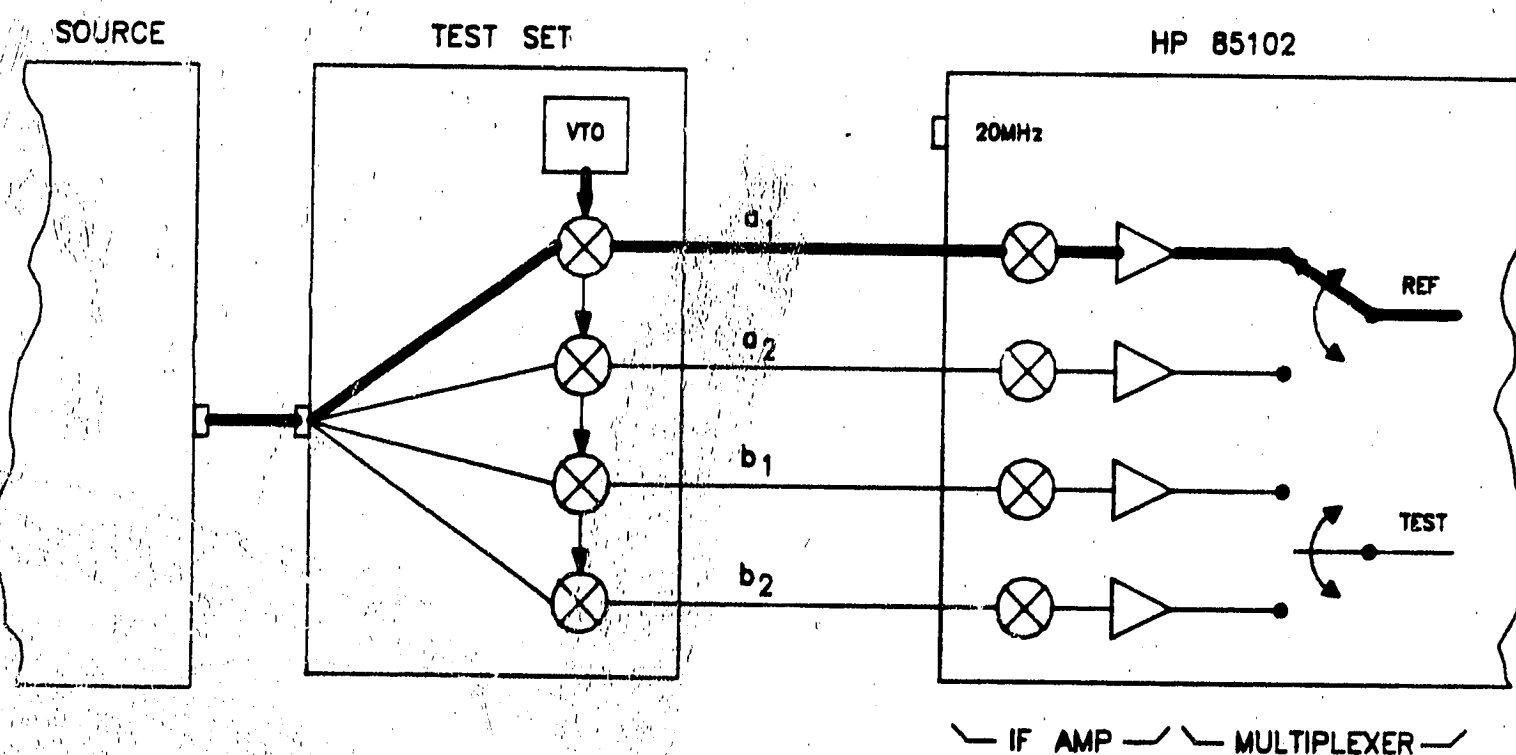


Figure 5-6. Simplified Signal Path of Unratioed Power Test

SAMPLER TEST

1. Press **[PRESET] STIMULUS [MENU]** on the HP 85102 to preset the HP 8510 and access the STIMULUS menu.

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

2. To check all of the samplers in an 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] [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.

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, the RF signal paths are shown in Figure 5-8. Each trace should typically be look like the examples in Figure 5-7 within $\pm 5\text{dB}$.

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 5-8.

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 5-8.

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

NOTE: If one or more channels look abnormal, refer to the procedure titled *If Any User Channels Look Bad* at the end of this section.

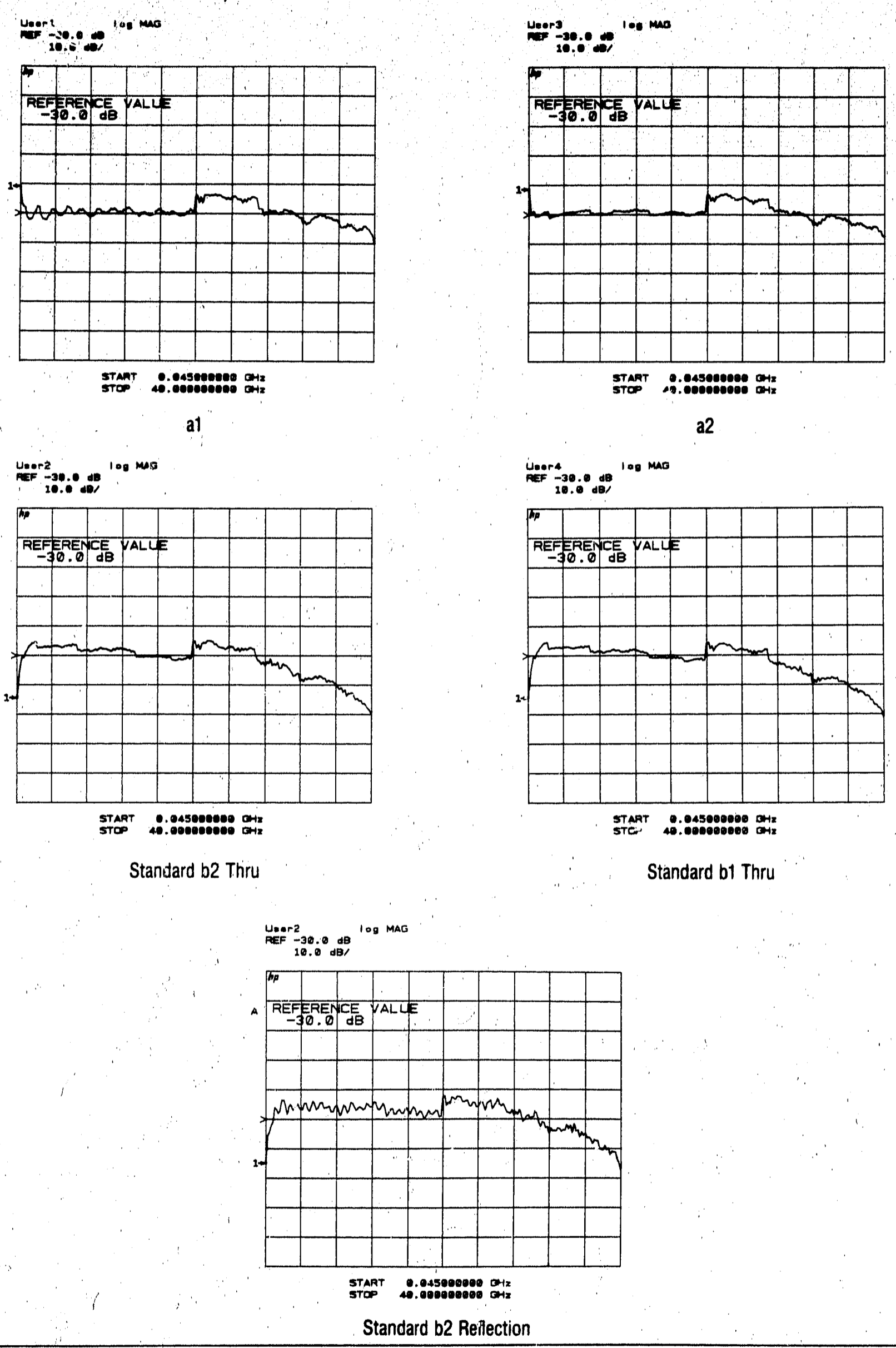
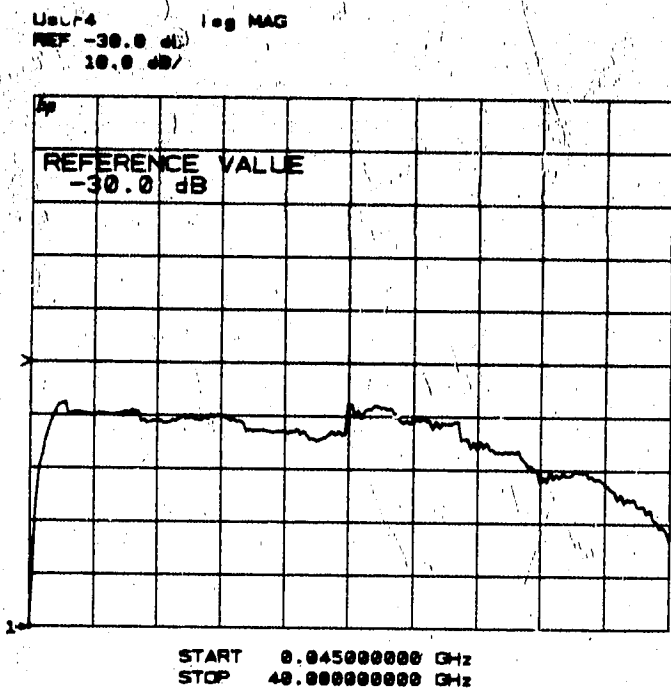
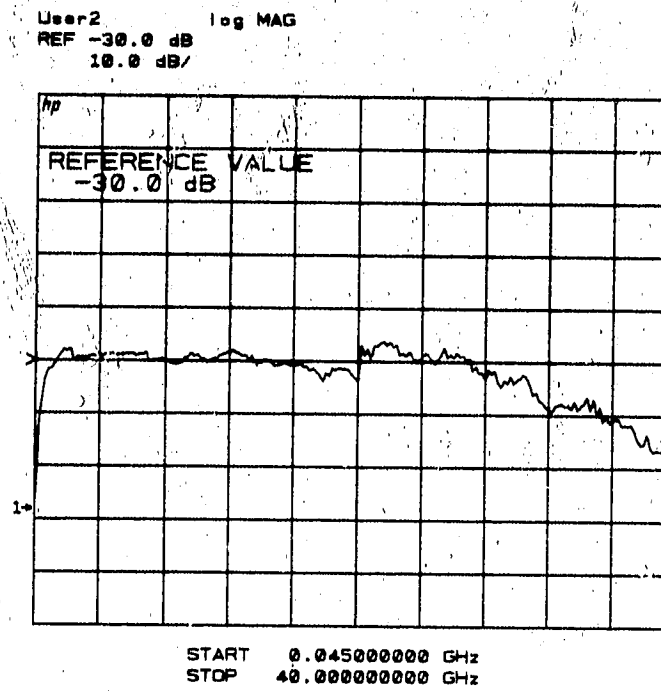


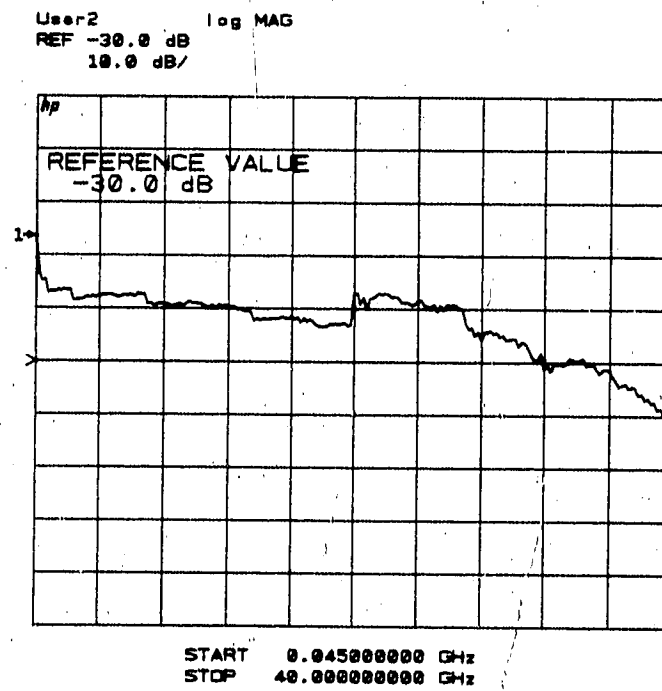
Figure 5-7a. Typical Test Set Unratioed Power Test Traces



Option (003) b1 Thru



Option (003) b2 Reflection



Option (003) b2 Thru

Figure 5-7b. Typical Test Set Unratioed Power Test Traces Option 003

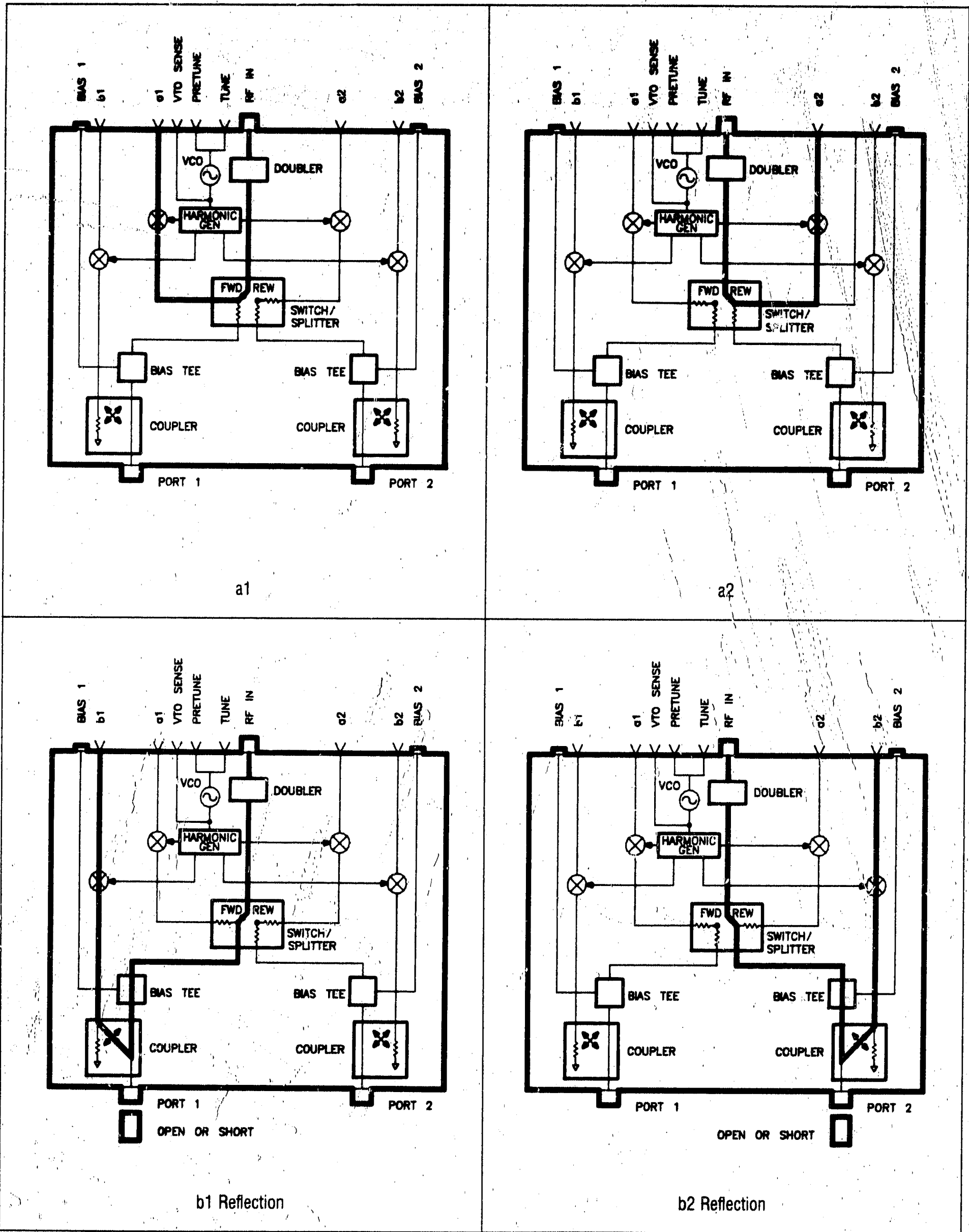


Figure 5-8a. User Signal Paths in Test Sets

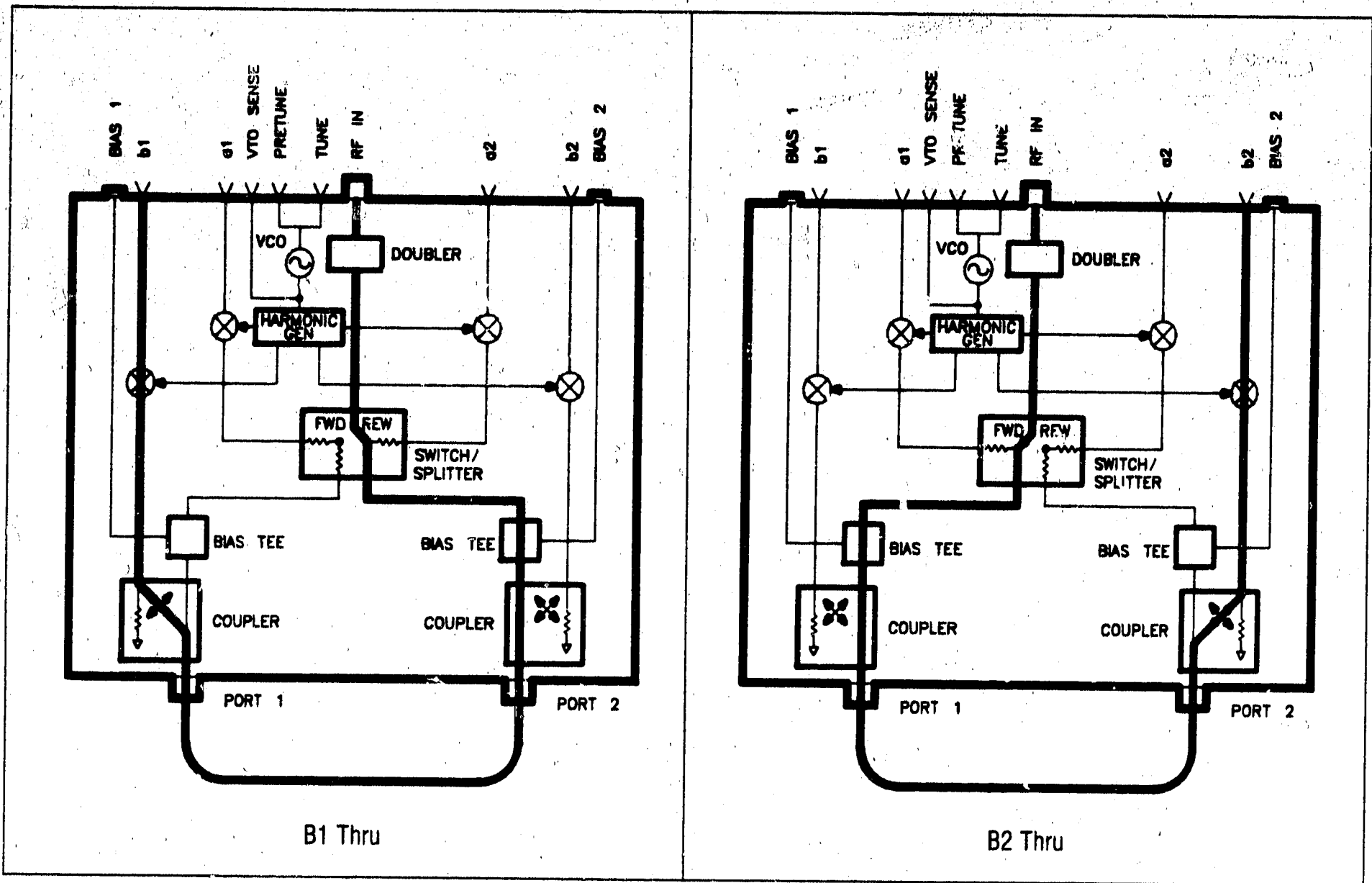


Figure 5-8b. User Signal Paths in Test Sets

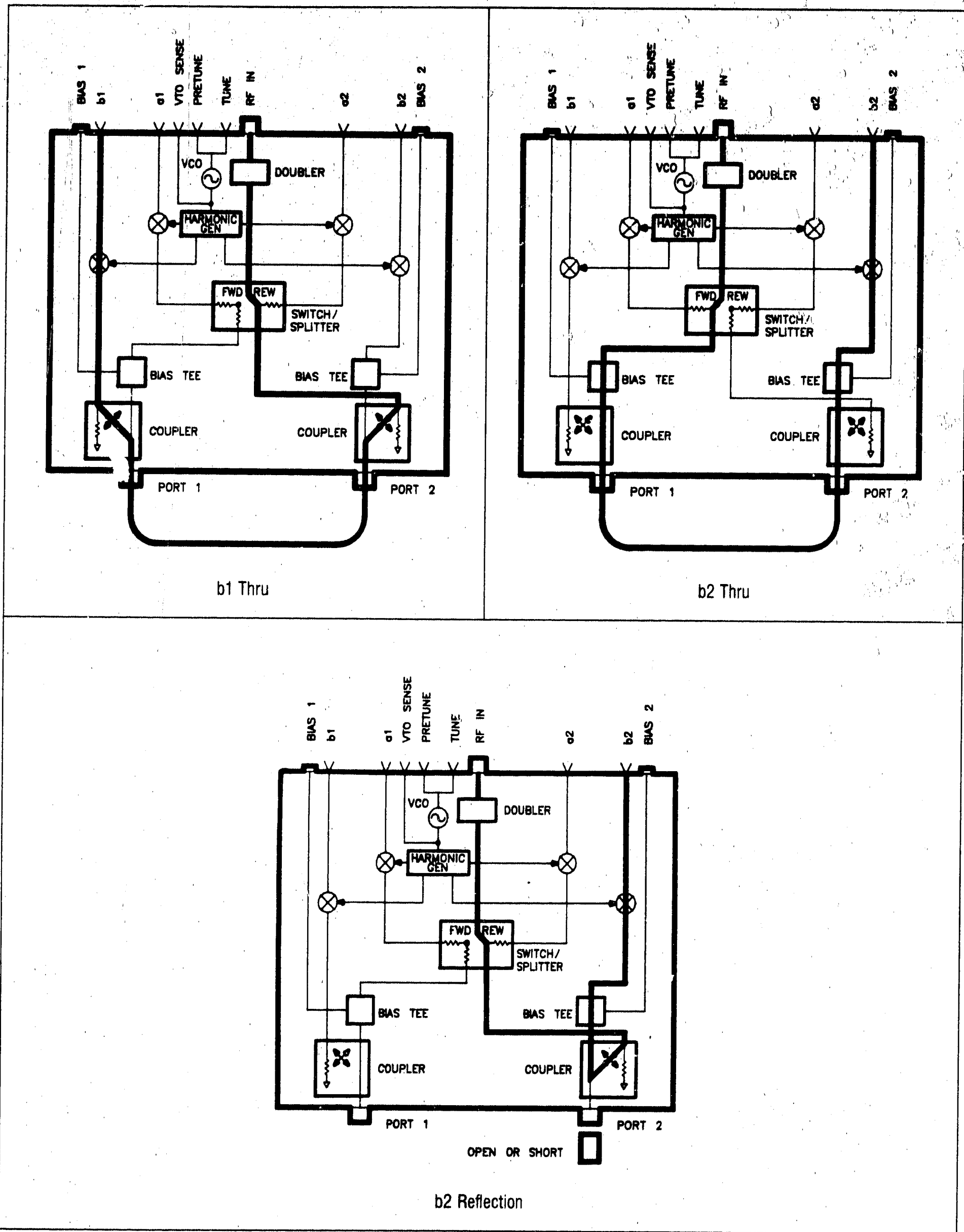


Figure 5-8c. User Signal Paths in Test Sets Option 003

IF ANY USER CHANNEL APPEARS FAULTY

If one or more user channels appear faulty, the problem might be with the source, test set, or HP 85102B IF/detector. 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 or not the problem is in the HP 85102B IF/detector.

Equipment

- HP 85102B service adapter (provided in the HP 8510B Service Manual, see SERVICE TOOLS)
- BNC to BNC cable

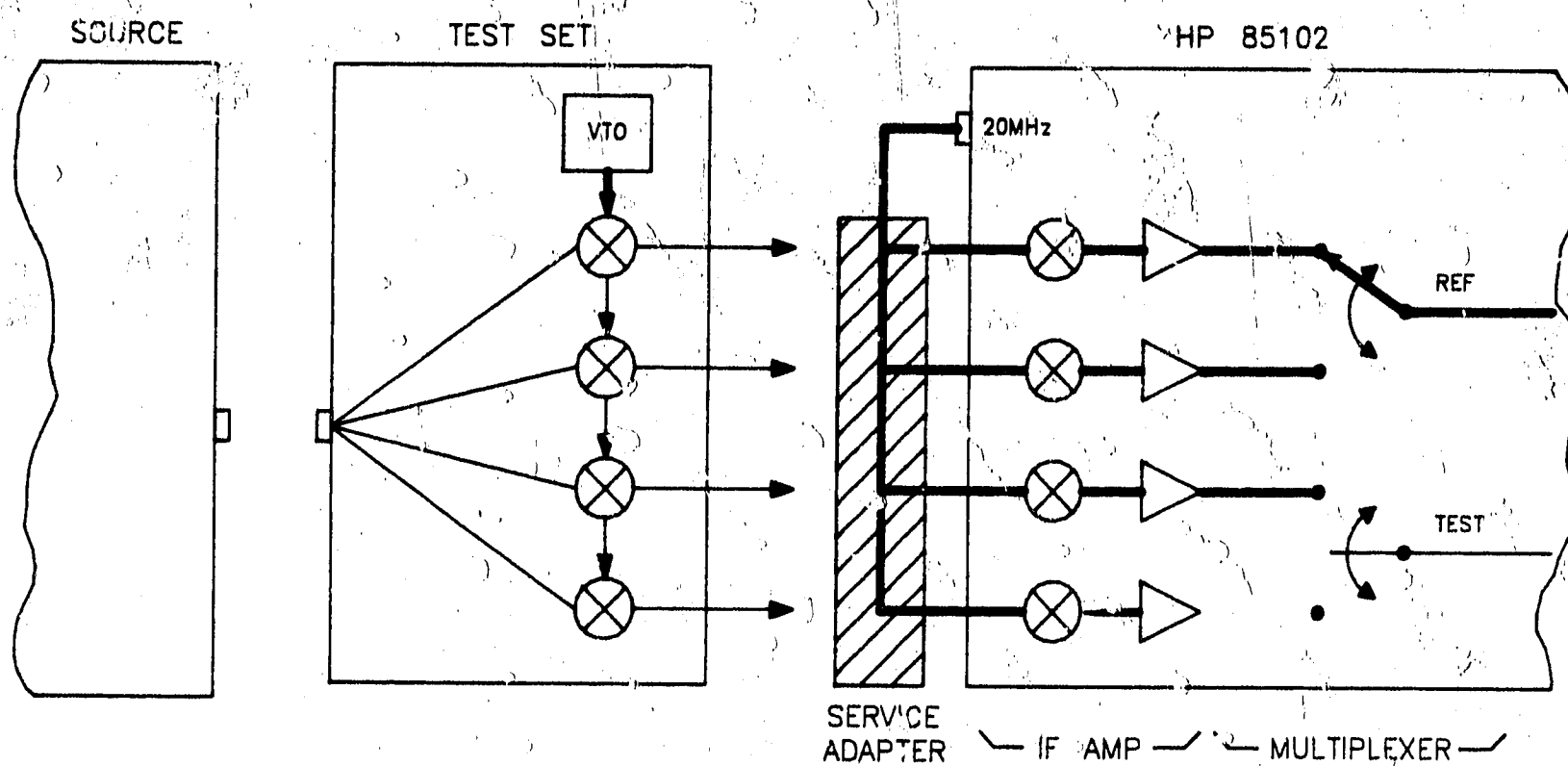


Figure 5-9. HP 85102 Signal Path with Service Adapter

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 unratiod 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 unratioced 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 unratioced channel power levels.*

Single channel problems suggest the IF Mixer board corresponding to the User function (channel a1, b1, a1, 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.

Section 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. Table 6-1 is a list of manufacturers (by code number) and reference designations.

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, Option 001
- A3 VTO summing amplifier board assembly
- A4 HPIB board assembly
- A5 attenuator/switch driver assembly

- A7 bias tee, Port 1
- A9 bias tee, Port 2

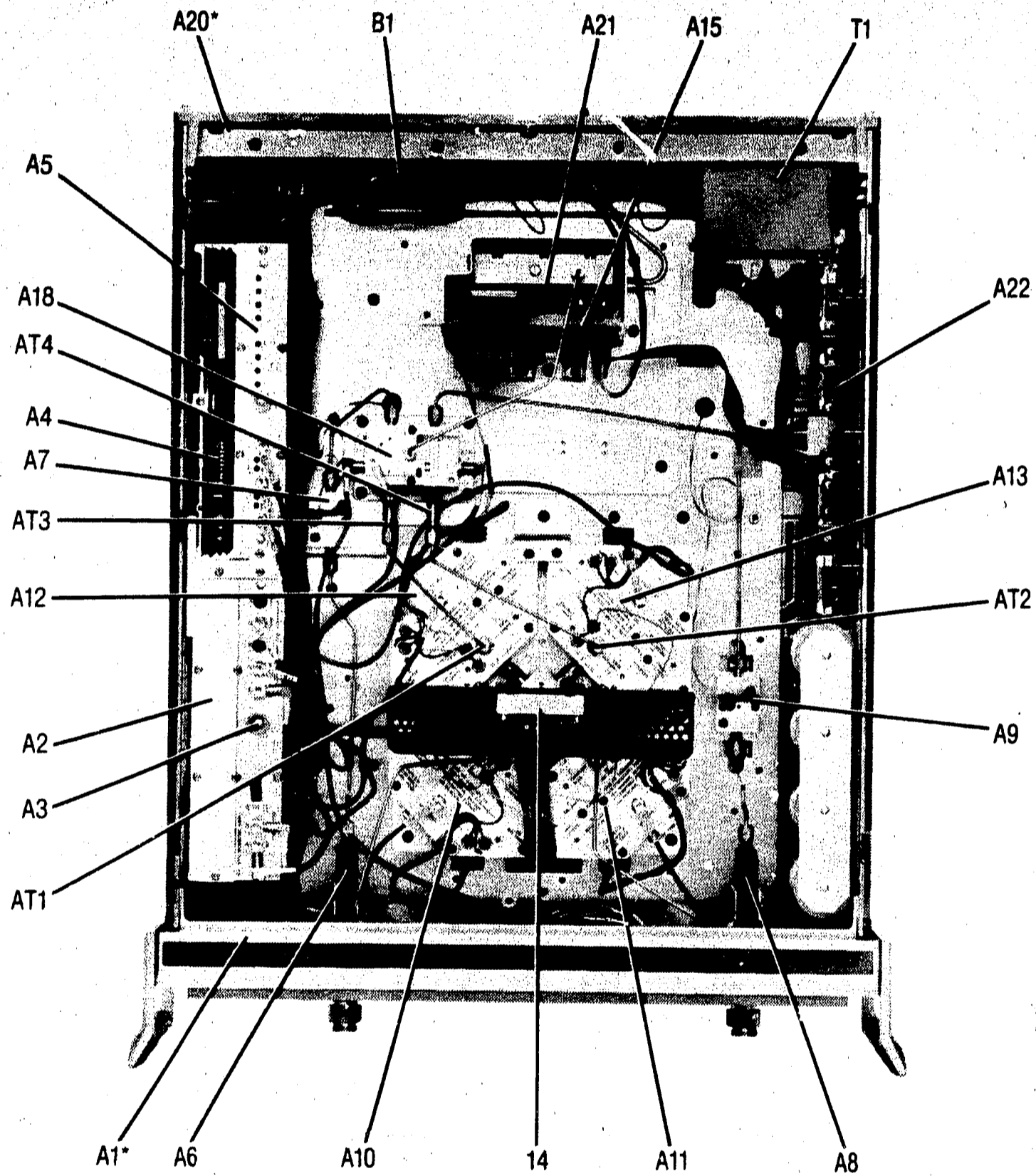
- A14 frequency converter assembly
- A15 doubler interface board assembly
- A18 switch/splitter
- A21 switch doubler
- A22 regulator board assembly

REPLACEABLE PARTS LISTS

The replaceable parts lists consist of figures with illustrations. Use the illustrations to identify the part to be ordered. Each figure is arranged in alphanumerical order by reference designator. The reference designator keys the part listed to the illustration. The first part number listed is a Hewlett-Packard part number and may differ from the manufacturer's part number. The check digit serves as an error check of the part number and should be used when ordering a part. 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. Manufacturers code is a five-digit number assigned to each manufacturer (identified in Table 6-1). The manufacturer part number may or may not be the same as the HP part number.

Table 6-1. Manufacturer Codes and Reference Designations

Manufacturer Codes			
Manufacturer Code	Manufacturer Name		Address
00000	any satisfactory supplier		
00853	Sangamo Elec Co, S Carolina Div		Pickens, SC 29671
24546	Corning Glass Works (Bradford)		Bradford, PA 16701
28480	Hewlett-Packard Co Corporate HQ		Palo Alto, CA 94304
56289	Sprague Electric Company		North Adams, MA 01247
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		
<p>More comprehensive tables of manufacturer codes, reference designators, and abbreviations are behind the REPLACEABLE PARTS tab of the HP 8510B Service Manual.</p>			



*Not visible

Figure 6-1. Major Assemblies List (1 of 2)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
MAJOR ASSEMBLIES LIST						
A1	08513-60005	3	1	BOARD ASSEMBLY, FRONT PANEL (NEW)	28480	08513-60005
A2	08513-60004	2	1	BD ASSY, USED FOR OPT 001 ONLY	28480	08513-60004
A2	08513-69004	0	1	BD ASSY, USED FOR OPT 001 ONLY	28480	08513-69004
A3	08513-60008	6	1	BD ASSY, VTO SUMMING AMPLIFIER (NEW)	28480	08513-60008
A3	03513-69008	4	1	BD ASSY, VTO SUMMING AMPLIFIER (REBUILT)	28480	08513-69008
A4	08516-60029	4	1	BOARD ASSEMBLY, HP IB (NEW)	28480	08516-60029
A4	08516-69029	2	1	BOARD ASSEMBLY, HP IB (REBUILT)	28480	08516-69029
A5	08513-60011	1	1	BD ASSY, ATTEN/SWITCH DRIVER (NEW)	28480	08513-60011
A5	08513-69011	9	1	BD ASSY, ATTEN/SWITCH DRIVER (REBUILT)	28480	08513-69011
A6	0955-0422	5	2	DIRECTIONAL COUPLER 40GHZ 2.4MM, PORT 1	28480	0955-0422
A7	5086-7484	5	2	BIAS TEE, PORT 1 (NEW)	28480	5086-7484
A7	5086-6484	3		BIAS TEE, PORT 1 (REBUILT)	28480	5086-6484
A8	0955-0422	5		DIRECTIONAL COUPLER 40GHZ 2.4MM, PORT 2	28480	0955-0422
A9	5086-7484	5		BIAS TEE, PORT 2 (NEW)	28480	5086-7484
A9	5086-6484	3		BIAS TEE, PORT 2 (REBUILT)	28480	5086-6484
A10				NOT ASSIGNED		
A11				NOT ASSIGNED		
A12				NOT ASSIGNED		
A13				NOT ASSIGNED		
A14	5086-7480	0	1	FREQ. CONV.(SAMPLERS & VTO) (NEW)	28480	5086-7480
A14	5086-6480	8	1	FREQ. CONV.(SAMPLERS & VTO) (REBUILT)	28480	5086-6480
A15	08516-60013	6	1	BOARD ASSEY, DOUBLER INTERFACE (NEW)	28480	08516-60013
A15	08516-69013	4	1	BOARD ASSEY, DOUBLER INTERFACE (REBUILT)	28480	08516-69013
A16				NOT ASSIGNED		
A17				NOT ASSIGNED		
A18	5086-7478	7	1	SWITCH/SPLITTER (NEW)	28480	5086-7478
A18	5086-6478	5	1	SWITCH/SPLITTER (REBUILT)	28480	5086-6478
A20	08513-60006	4	1	BOARD ASSEY, HPIB INTERCONNECT (NEW)	28480	08513-60006
A21	5086-7472	1	1	ASSEMBLY, SWITCH DOUBLER (NEW)	28480	5086-7472
A21	5086-6472	9	1	ASSEMBLY, SWITCH DOUBLER (REBUILT)	28480	5086-6472
A22	08516-60002	3	1	BOARD ASSEMBLY, REGULATOR (NEW)	28480	08516-60002
A22	08516-69002	1	1	BOARD ASSEMBLY, REGULATOR (REBUILT)	28480	08516-69002
AT1	8490D #006	3	1	2.4MM 6dB ATTENUATOR	28480	8490D #006
AT2	8490D #006	3	1	2.4MM 6dB ATTENUATOR	28480	8490D #006
AT3	33340DZ	3	1	2.4MM 13dB SHAPED ATTENUATOR	28480	33340DZ
AT4	33340DZ	3	1	2.4MM 13dB SHAPED ATTENUATOR	28480	33340DZ
B1	08513-20031	1	1	FAN-TBAX 34-CFM 115V 50/60-HZ 1.5KVDIEL	28480	08513-20031
T1	9100-4723	5	1	POWER, TRANSFORMER	28480	5181-0124

Figure 6-1. Major Assemblies (2 of 2)

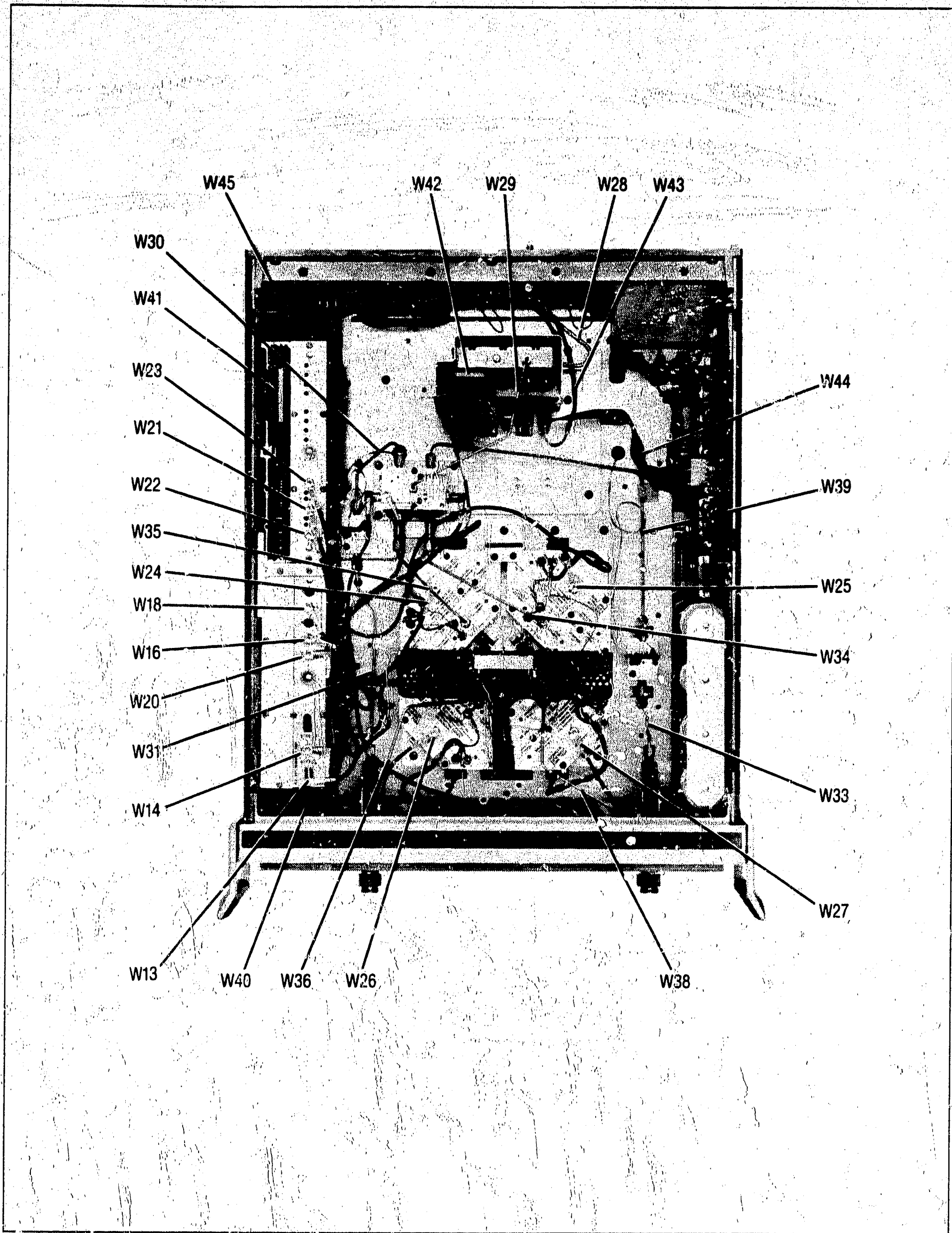
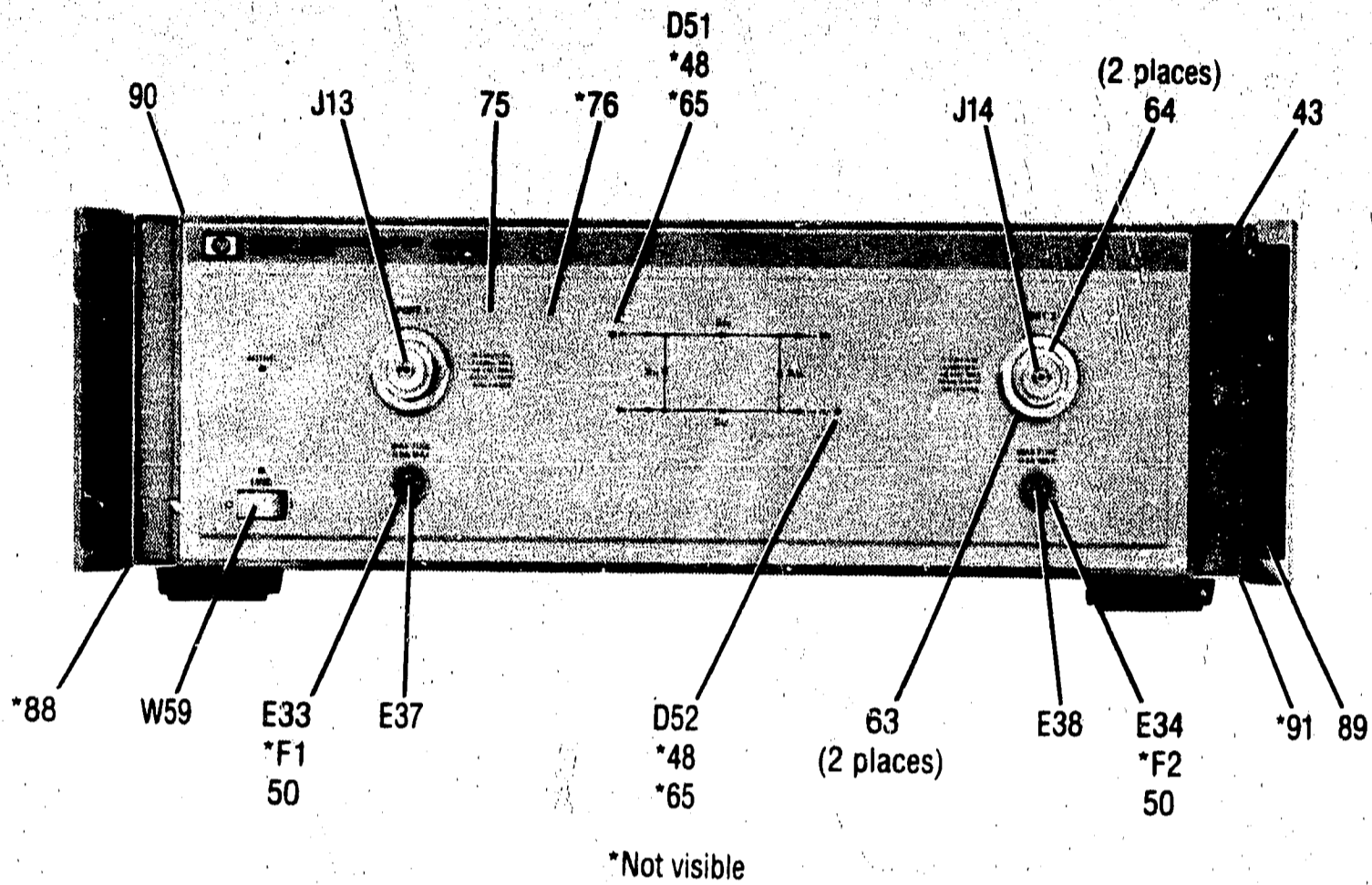


Figure 6-2. Cable Assemblies (1 of 2)

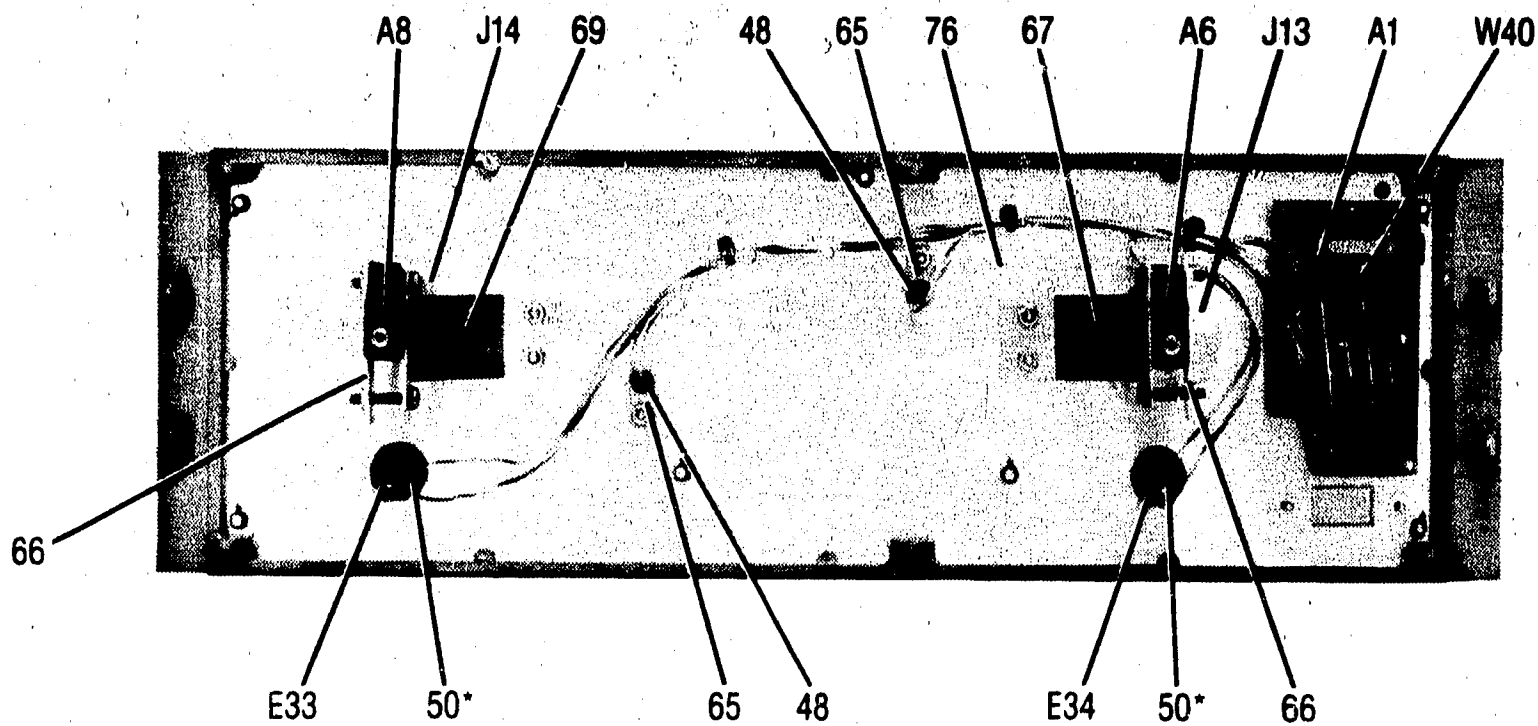
Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
COAX CABLE ASSEMBLIES						
W1-W12				THESE CABLES ARE USED FOR OPTION 001		
W13	08513-60133	8	1	CA AY A3J1 TO A14J1	28480	08513-60133
W14	08513-60134	9	1	CA AY A3J2 TO J11A7	28480	08513-60134
W15				THIS CABEL IS USED FOR OPTION 001		
W16	08513-60136	1	1	CA AY A3J5 TO J11A5	28480	08513-60136
W17				THIS CABEL IS USED FOR OPTION 001		
W18	08513-60138	3	1	CA AY A3J7 TO J11A6	28480	08513-60138
W19				THIS CABEL IS USED FOR OPTION 001		
W20	08513-60140	5	1	CA AY A3J4 TO A14J2	28480	08513-60140
W21	08513-60141	6	1	CA AY A5J2 TO A18J4	28480	08513-60141
W22	08513-60142	7	1	CA AY A5J1 TO A18J3	28480	08513-60142
W23	08513-60143	8	1	CA AY A5J3 TO A18J6	28480	08513-60143
W24	08513-60144	9	1	CA AY A12J3 TO J11A1	28480	08513-60144
W25	08513-60145	0	1	CA AY A13J3 TO J11A4	28480	08513-60145
W26	08513-60146	1	1	CA AY A10J3 TO J11A2	28480	08513-60146
W27	08513-60147	2	1	CA AY A11J3 TO J11A3	28480	08513-60147
SEMI-RIGID COAX RF CABLES						
W28	08516-20003	0	1	CA RF J1 TO A22	28480	08516-20003
W29	08516-20006	3	1	CA RF A22 TO A18	28480	08516-20006
W30	08516-2000F	2	1	CA RF A18 TO A7	28480	08516-20005
W31	08516-20011	0	1	CA RF A7 TO A6	28480	08516-20011
W32				THIS CABLE IS USED FOR OPT 003 TEST SETS		
W33	08516-20012	1	1	CA RF A8 TO A9	28480	08516-20012
W34	08516-20009	8	1	CA RF A18 TO A13	28480	08516-20009
W35	08516-20010	9	1	CA RF A18 TO A12	28480	08516-20010
W36	08516-20007	4	1	CA RF A6 TO A10	28480	08516-20007
W37				THIS CABLE IS USED FOR OPT 003 TEST SETS		
W38	08516-20008	5	1	CA RF A8 TO A11	28480	08516-20008
W39	08516-20015	4	1	CA RF A9 TO A18	28480	08516-20015
MISCELLANEOUS CABLE ASSEMBLIES						
W40	08513-60013	3	1	CA ASSY A1 TO A19	28480	08513-60013
W41	08513-60036	0	1	CA ASSY A4 TO A20	28480	08513-60036
W42	08516-60007	8	1	CA ASSY A21 TO A22	28480	08516-60007
W43	08516-60006	7	1	CA ASSY A21 TO REAR PANEL	28480	08516-60006
W44	08516-60008	9	1	CA ASSY A22 TO A15	28480	08516-60008
W45	08513-60014	4	1	CA ASSY J10 TO J11 (REAR PANEL)	28480	08513-60014

Figure 6-2. Cable Assemblies (2 of 2)



Reference Designation	HP Part Number	C	D	Qty	Description	Mfr Code	Mfr Part Number
FRONT VIEW							
DS1	1990-0858	6		1	LED-LAMP LUM-INT = 15UCD IF=25MA MAX	28480	1990-0858
DS2	1990-0858	6		1	LED-LAMP LUM-INT = 15UCD IF=25MA MAX	28480	1990-0858
E33, E34	2110-0565	2		1	FUSEHOLDER	28480	2110-0797
E37	2110-0565	9		1	FUSEHOLDER CAP 12A MAX FOR UL	28480	2110-0565
E38	2110-0565	9		1	FUSEHOLDER CAP 12A MAX FOR UL	28480	2110-0565
F1	2110-0012	1		1	FUSE .5A 250V NTD 1.25X.25 UL	28480	2110-0012
F2	2110-0012	1		1	FUSE .5A 250V NTD 1.25X.25 UL	28480	2110-0012
J13	08516-60005	6		1	CONNECTOR ASSY, 2.4MM TEST PORT	28480	08516-60005
J14	08516-60005	6		1	CONNECTOR ASSY, 2.4MM TEST PORT	28480	08516-60005
W59	85102-60226	5		1	CABLE ASSY LINE SWITCH	28480	85102-60226
43	85102-20054	3		1	FRONT BEZEL	28480	85102-20054
48	1450-0615	9		2	RETAINER LED 0.75 IN LG; 0.38 IN	28480	1450-0615
50	2110-0569	3		2	FUSEHOLDER-COMPONENT NUT; THREAD	28480	2110-0569
63	5021-3427	2		2	WSHR-TS PORT CONN	28480	5021-3427
64	5021-3428	3		2	NUT FLANGE TS PORT CONN	28480	5021-3428
65	08340-40002	9		2	MOUNT LED	28480	08340-40002
75	08516-00001	6		1	FRONT PANEL	28480	08516-00001
76	08616-00002	7		1	SUB PANEL	28480	08616-00002
88	5061-9457	4		1	COVER ASSY SIDE	28480	5061-9457
89	5061-9499	4		2	HANDLE ASSY FRONT	28480	5061-9499
90	08513-00033	1		1	TEST SET COVER TOP	28480	08513-00033
91	08513-00034	2		1	COVER SIDE PERF	28480	08513-00034

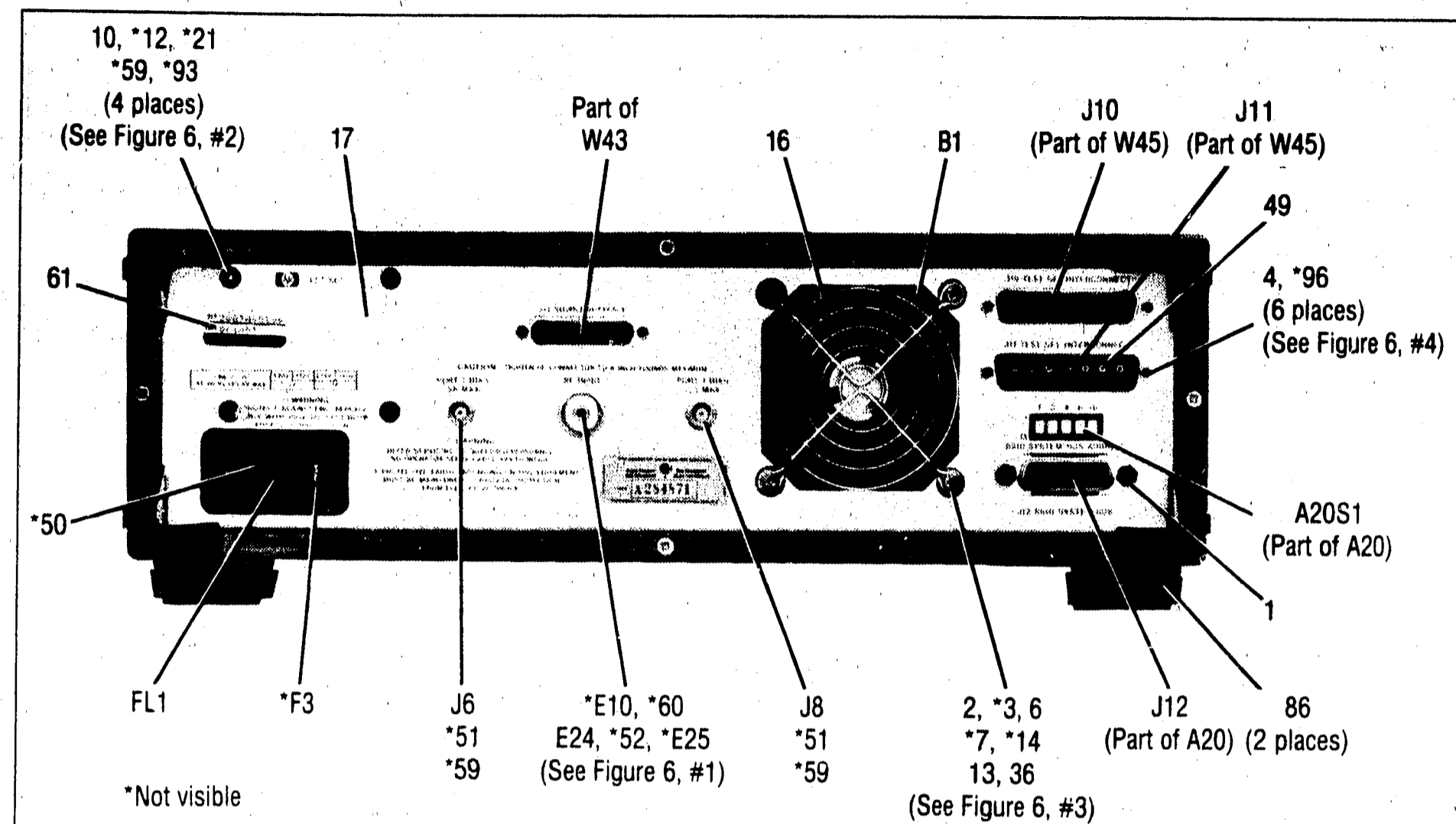
Figure. 6-3. Front View



*Not visible

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
FRONT INTERNAL						
A1	08513-60005	4	1	BOARD ASSEMBLY, FRONT PANEL	28480	08513-60005
A6	0955-0422	5	1	DIRECTIONAL COUPLER 40GHz 2.4MM PORT 1	28480	0955-0422
A8	0955-0422	5	1	DIRECTIONAL COUPLER 40GHz 2.4MM PORT 2	28480	0955-0422
E33	08513-80028	2	2	FUSEHOLDER	28480	08513-80028
E34	08513-80028	2	2	FUSEHOLDER	28480	08513-80028
J13	08516-60005	6	2	CONNECTOR ASSY, 2.4MM TEST PORT	28480	08516-60005
J14	08516-60005	6	2	CONNECTOR ASSY, 2.4MM TEST PORT	28480	08516-60005
W40	08513-60013	3	1	CA ASSY A1 TO A19	28480	08513-60013
48	1450-0615	9	2	RETAINER LED 0.75 IN LG; 0.38IN	28480	1450-0615
50	2110-0569	3	2	FUSEHOLDER COMPONENT NUT; THREAD	28480	2110-0569
65	08340-40002	9	2	MOUNT LED	28480	08340-40002
66	08516-00010	6	2	COUPLER CLAMP	28480	08516-00010
67	08516-00009	5	2	COUPLER SUPPORT	28480	08516-00009
76	08516-00002	7	1	SUB PANEL	28480	08516-00002

Figure. 6-4. Front Internal



Reference Designation	HP Part Number	C	D	Qty	Description	Mfr Code	Mfr Part Number
REAR EXTERNAL							
B1	08513-20031	1		1	FAN-TBAX 34-CFM 115V 50/60-HZ 1.5KVDIEL	28480	08513-20031
E10	08513-20016	2		1	GOLD NOSE CONNECTOR	28480	08513-20016
E24	5061-5394	0		1	PIN AND BEAD ASSEMBLY	28480	5061-5394
E25	08513-20017	3		1	BULKHEAD CONNECTOR	28480	08513-20017
F3	2110-0002	9		1	FUSE 2.0A 250V NTD 1.25X.25 UL	28480	2110-0002
FL1	9135-0217	7		1	LINE MODULE-FILTERED	28480	9135-0217
J6	1250-0083	1		2	CONNECTOR-RF BNC FEM SGL-HOLE-FR 50-OHM	28480	1250-0083
J8	1250-0083	1		1	CONNECTOR-RF BNC FEM SGL-HOLE-FR 50-OHM	28480	1250-0083
J10	1251-2197	4		1	CONNECTOR R&P 24F	28480	1251-2197
J11	1251-2204	4		1	CONNECTOR R&P 24M	28480	1251-2204
1	0380-0643	3		2	STANDOFF-HEX .255-IN-LG 6-32 THD	00000	ORDER BY DESCRIPTION
2	0400-0002	2		4	GROMMET-RND .188-IN-ID .312-IN-GRV-OD	28480	0400-0002
3	0590-0926	0		4	THREADED INSERT-STDF 6-32 .188-IN-LG SST	28480	0590-0926
4	1251-7812	0		6	CONNECTOR JACKSCREW	28480	1251-7812
6	2360-0123	4		4	SCREW-MACH 6-32 .625-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
7	2420-0001	5		4	NUT-HEX-W/LKWR 6-32-THD .109-IN-THK	00000	ORDER BY DESCRIPTION
10	2510-0270	1		4	SCREW-MACH 8-32 3.25-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
12	3050-0139	6		12	WASHER-FL MTLN NO.8 .172-IN-ID	28480	3050-0139
13	3050-0152	3		4	WASHER-SHLDR NO.8 .172-IN-ID .438-IN-OD	28480	3050-0152
14	3050-0227	3		4	WASHER-FL MTLN NO.6 .149-IN-ID	28480	3050-0227
16	3160-0309	5		1	FINGER GUARD	28480	3160-0309
17	08516-00003	8		1	REAR PANEL	28480	08516-00003
21	2190-0017	4		4	WASHER-LK INTL NO. 10 .195-IN-ID	28480	ORDER BY DESCRIPTION
36	08513-00002	4		1	TRANSFORMER BRACKET	28480	08513-00002
49	5021-0906	6		14	TEFLON CABLE SLEEVE	28480	5021-0906
50	5001-3907	1		2	LINE MODULE RETAINER CLIPS	28480	5001-3907
51	2190-0016	3		2	WASHER-LK INTL T 3/8 IN .377-IN-ID	28480	2190-0016
52	2190-0104	0		5	WASHER-LK INTL T 7/16 IN .439-IN-ID	28480	2190-0104
59	2950-0001	8		2	NUT-HEX-DBL-CHAM 3/8-32-THD .094-IN-THK	00000	ORDER BY DESCRIPTION
60	2950-0132	6		5	NUT-HEX-DBL-CHAM 7/16-28-THD .094-IN-THK	00000	ORDER BY DESCRIPTION
61	7121-2380	8		1	LABEL-SERIAL NUMBER	28480	7120-2380
86	5040-7221	2		2	FOOT-REAR	28480	5040-7221
93	0380-0010	8		4	SPACER-RND .625-IN-LG .18-IN-ID	28480	0380-0010
96	0590-0663	2		6	NUT-HEX 4/40	28480	0590-0663

Figure 6-5. Rear External

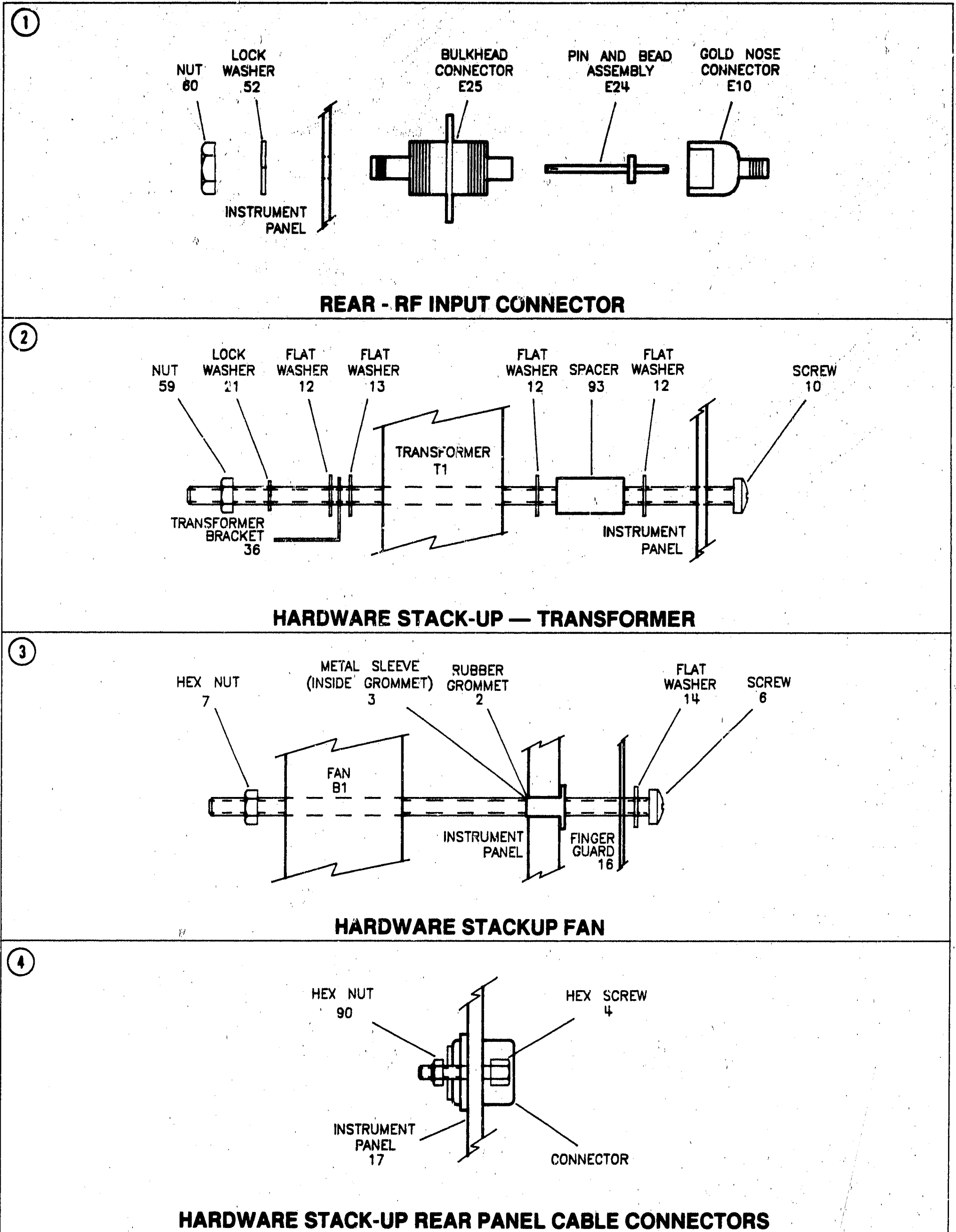
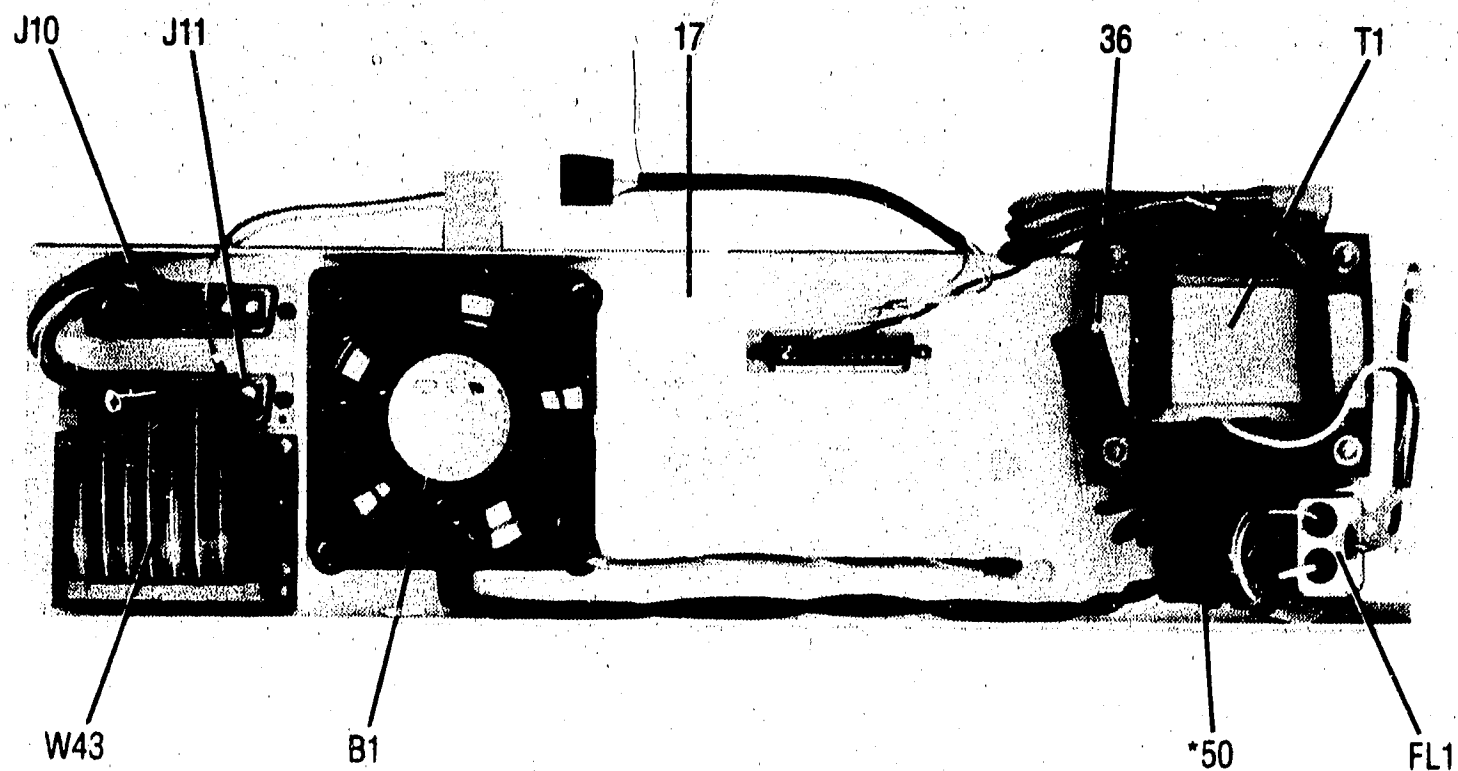


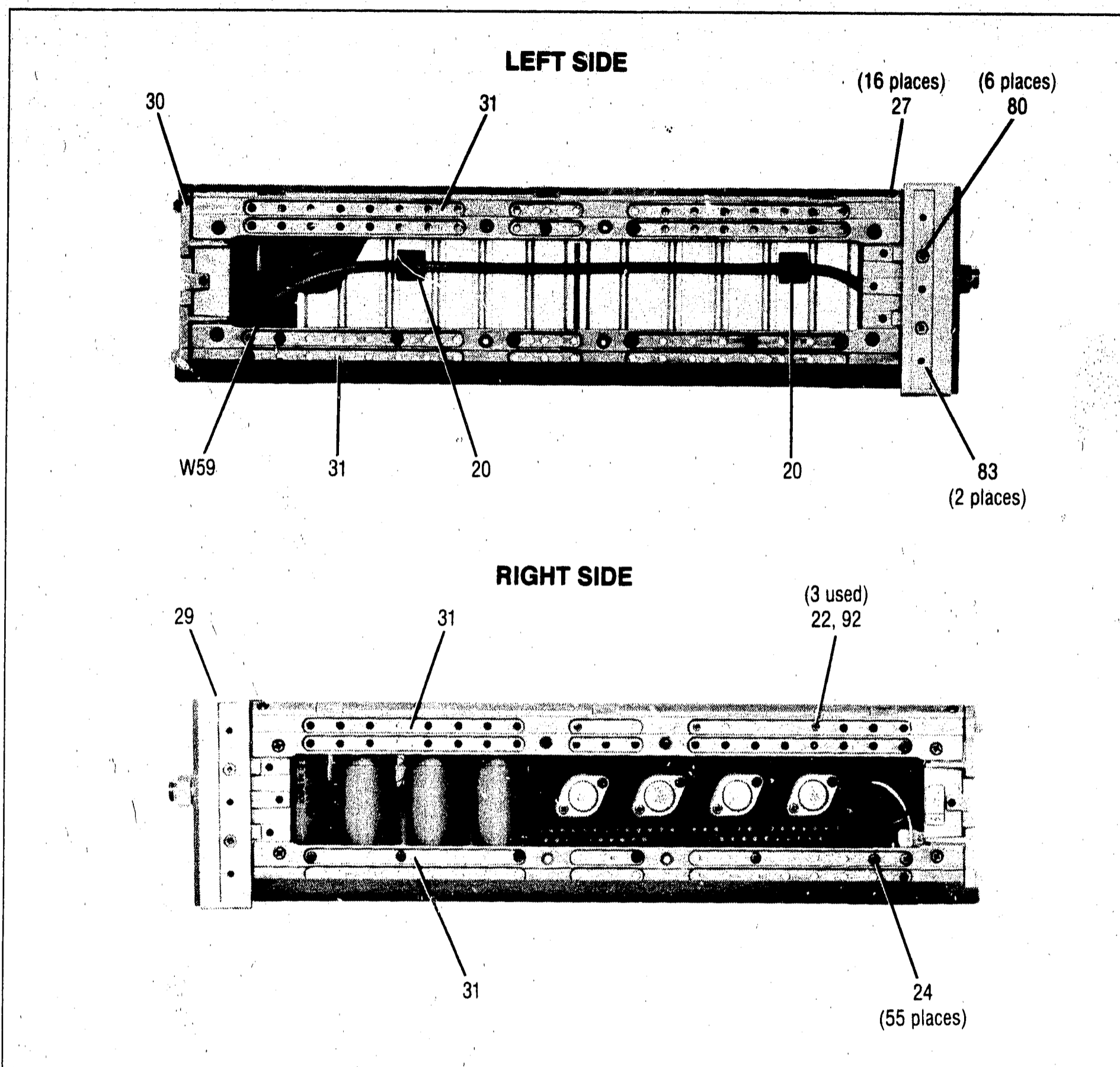
Figure 6-6. Detailed Views



*Not visible

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
				REAR INTERNAL		
B1	08513-20031	1	1	FAN TBAX 34-CFM 115V 50/60 HZ 1.5KVDIEL	28480	08513-20031
FL1	9135-0217	7	1	LINE MODULE FILTERED	28480	9135-0217
J10	1251-2197	4	1	CONNECTOR R&P 24F	28480	1251-2197
J11	1251-2204	4	1	CONNECTOR R&P 24M	28480	1251-2204
T1	5181-0124	8	1	POWER, TRANSFORMER	28480	5181-0124
W43	08516-60006	9	1	CA ASSY A21 TO REAR PANEL	28480	08516-60006
17	08516-00003	7	1	REAR PANEL	28480	08516-00003
36	08513-00002	4	1	TRANSFORMER BRACKET	28480	08513-00002
50	5001-3907	1	2	LINE MODULE RETAINER CLIPS	28480	5001-3907

Figure 6-7. Rear Internal



Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
				LEFT AND RIGHT SIDES		
W59	85102-60226	6	1	CABLE ASSY LINE SWITCH	28480	85102-60226
20	1400-0757	5	2	CLAMP CABLE .25 DIA 1-WD PVC	28480	1400-0757
22	2200-0105	4	13	SCREW MACH 4-40 .312IN LG PAN HD POZI	28480	2200-0105
24	2360-0115	4	62	SCREW MACH 6-32 .312IN LG PAN HD POZI	28480	2360-0115
27	0515-1367	7	16	SMM 4.0 8 FL Pd	28480	0515-1367
29	5021-5803	2	1	FRAME FRONT	28480	5021-5803
30	5021-5804	3	1	FRAME REAR	28480	5021-5804
31	5021-5837	2	4	STRUT CORNER 18"	28480	5021-5837
80	0515-0396	0	6	SMM 4.0 10 FL Pd	28480	0515-0396
83	5020-8896	7	2	TRIM FRNT HNDL	28480	5020-8896
92	3050-0105	6	3	WASHER FL MTLC NO.4 .125 IN ID	28480	3050-0105

Figure 6-8. Detailed View, Right and Left

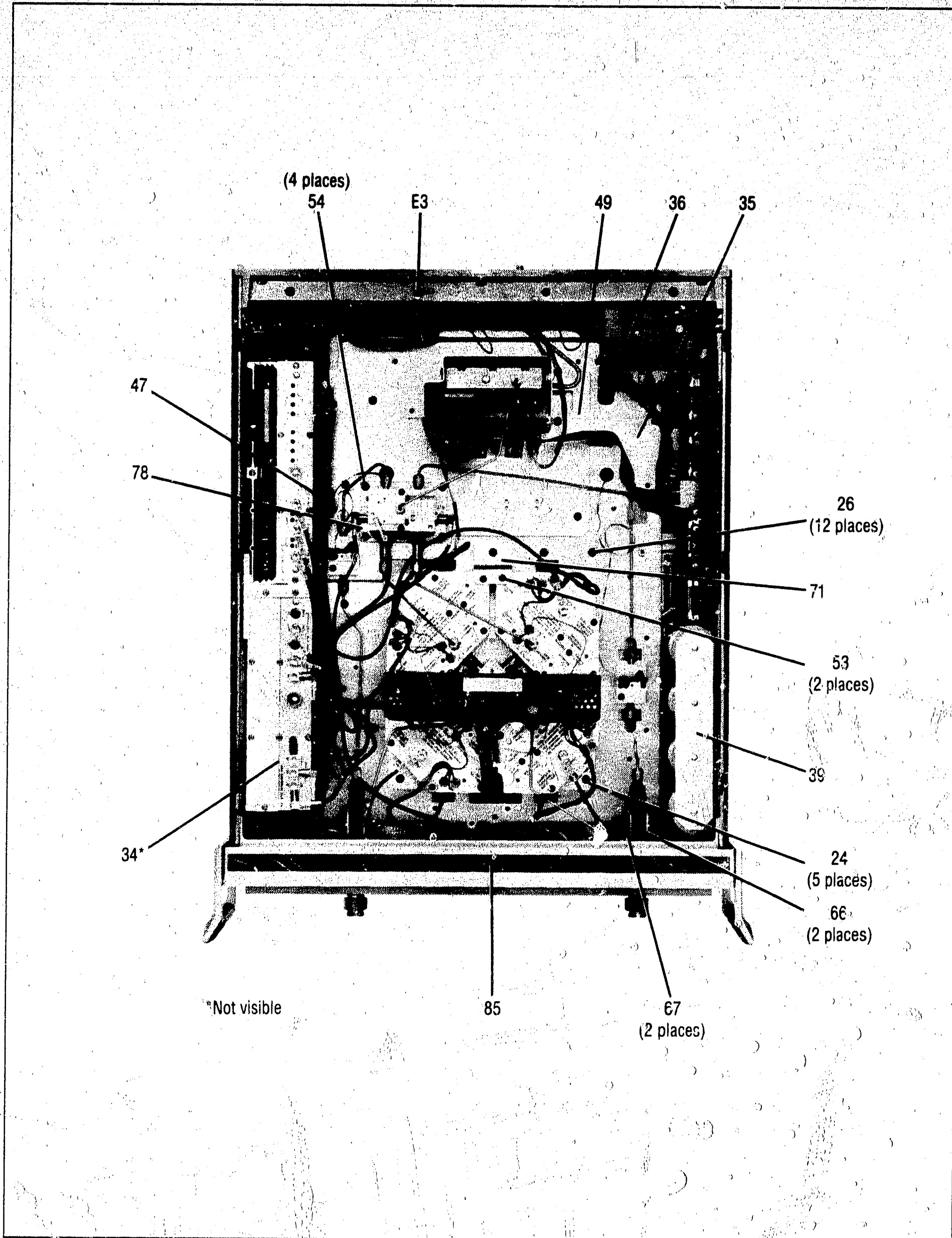


Figure 6-9. Miscellaneous Mechanical and Electrical Parts (1 of 2)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
				MISCELLANEOUS PARTS (TOP)		
E3	0360-0031	1		TERMINAL CRIMP R TNG #6 22-16 AWG RED	28480	0360-0031
24	2360-0115	4	5	SCREW MACH 6-32 .312 IN LG PAN HD POZI	00000	ORDER BY DESCRIPTION
26	2360-0333	8	12	SCREW MACH 6-32 .25-IN-LG 100 DEG.	28480	2360-0333
34	08512-20005	8	1	RFI GASKET	28480	08512-20005
35	08513-00001	3	1	MAIN DECK	28480	08513-00001
36	08513-00002	4	1	TRANSFORMER BRACKET	28480	08513-00002
39	08513-00015	9	1	CAP APRT PLATE	28480	08513-00015
47	1400-1209	4	1	CLP CA .69D 1.0W	28480	1400-1209
49	08516-00004	6	1	TOP DECK	28480	08516-00004
53	2200-0109	7	2	SCREW MACH 4-40 .438 IN LG PAN HD POZI	00000	ORDER BY DESCRIPTION
54	2200-0164	5	4	SCREW MACH 4-40 .168 IN LG UNCT 82 DEG	00000	ORDER BY DESCRIPTION
66	08516-00010	6	2	COUPLER CLAMP	28480	08516-00010
67	08516-00009	5	2	COUPLER SUPPORT	28480	08516-00009
71	08513-00017	1	2	BRACKET-CONV ASSY	28480	08513-00017
78	08514-00007	0	1	SWITCH SPLITTER MOUNTING PLATE	28480	08514-00007
85	5040-7202	9	1	STRIP TRIM TOP	28480	5040-7202

Figure 6-9. Miscellaneous Mechanical and Electrical Parts (2 of 2)

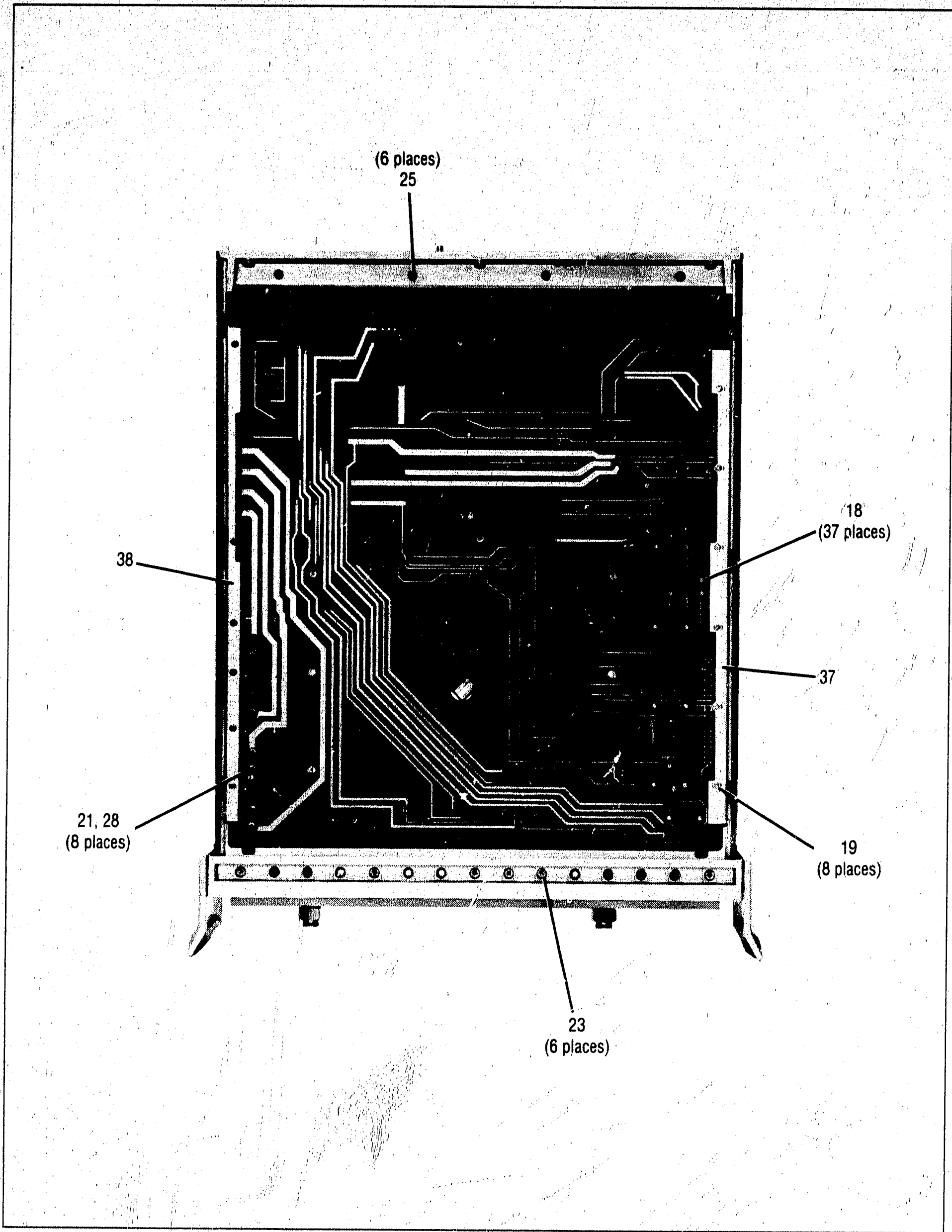


Figure 6-10. Miscellaneous Mechanical and Electrical Parts (1 of 2)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
				MISCELLANEOUS PARTS (BOTTEM)		
18	0624-0099	1	37	SCREW TPG 4-40 .375 IN LG PAN HD POZI	00000	ORDER BY DESCRIPTION
19	0624-0100	5	8	SCREW TPG 4-40 .5 IN LG PAN HD POZI STL	00000	ORDER BY DESCRIPTION
21	2190-0011	8	8	WASHER LK INTL T NO. 10 .195 IN ID	00000	ORDER BY DESCRIPTION
23	2200-0165	6	14	SCREW MACH 4-40 .25 IN LG 82 DEG	00000	ORDER BY DESCRIPTION
25	2360-0119	8	6	SCREW MACH 6-32 .438 IN LG PAN HD POZI	00000	ORDER BY DESCRIPTION
27	2680-0129	8	8	SCREW MACH 10-32 .312 IN LG PAN HD POZI	00000	ORDER BY DESCRIPTION
37	08513-00005	7	1	MTG BRACKET LH	28480	08513-00005
38	08513-00006	8	1	MTG BRACKET RH	28480	08513-00006

Figure 6-10. Miscellaneous Mechanical and Electrical Parts (2 of 2)

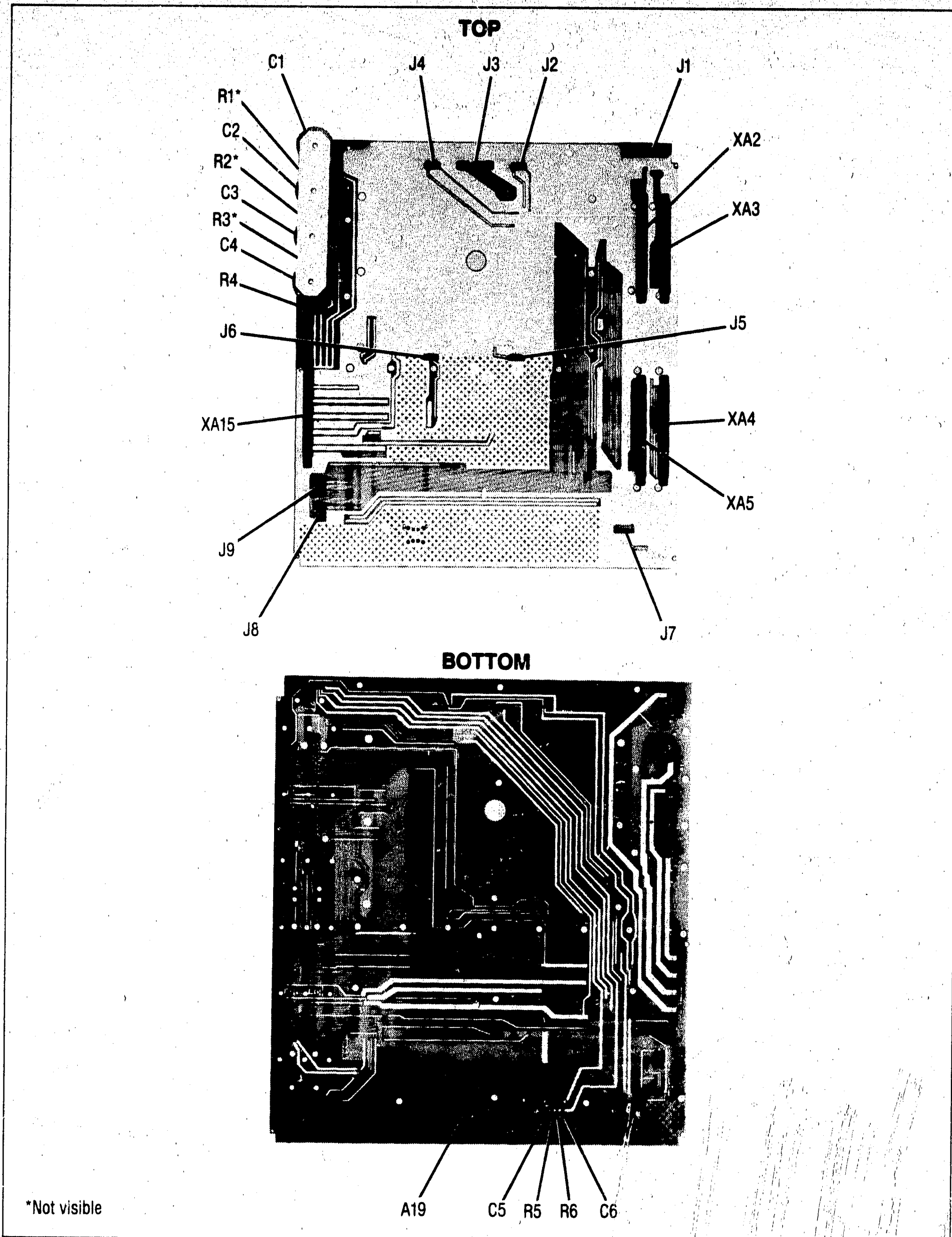


Figure 6-11. Motherboard Parts (1 of 2)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A19	08513-60001	9	1	BOARD ASSEMBLY, MOTHER THE FOLLOWING PARTS ARE NOT SUPPLIED WHEN A19 IS ORDERED: A19C1, A19C2, A19C3, A19C4	28480	08513-60001
A19C1	0180-2671	7	4	CAPACITOR-FXD .012F +75-10% 30VDC AL	00853	500123U030AC2A
A19C2	0180-2671	7		CAPACITOR-FXD .012F +75-10% 30VDC AL	00853	500123U030AC2A
A19C3	0180-2671	7		CAPACITOR-FXD .012F +75-10% 30VDC AL	00853	500123U030AC2A
A19C4	0180-2671	7		CAPACITOR-FXD .012F +75-10% 30VDC AL	00853	500123U030AC2A
A19C5-C6	0160-4834	6	2	CAPACITOR-FXD .047UF ± 10% 100VDC CER	28480	0160-4834
A19J1	1251-5745	4		CONNECTOR 20-PIN M POST TYPE (A19J1 DOES NOT INCLUDE A19MP1 & A19MP2)	28480	1251-5745
A19J2	1251-6868	4	4	CONNECTOR 5-PIN M POST TYPE	28480	1251-6868
A19J3	1251-7939	2	1	CONN-POST TYPE .100-PIN-SPCG 14-CONT (A19J3 DOES NOT INCLUDE A19MP3)	28480	1251-7939
A19J4	1251-6868	4		CONNECTOR 5-PIN M POST TYPE	28480	1251-6868
A19J5	1251-6868	4		CONNECTOR 5-PIN M POST TYPE	28480	1251-6868
A19J6	1251-6868	4		CONNECTOR 5-PIN M POST TYPE	28480	1251-6868
A19J7	1251-3825	7	1	CONNECTOR 5-PIN M POST TYPE	28480	1251-3825
A19J8	1200-0508	0	2	SOCKET-IC 14-CONT DIP-SLDR	28480	1200-0508
A19J9	1200-0508	0		SOCKET-IC 14-CONT DIP-SLDR	28480	1200-0508
A19R1	0764-0015	7	2	RESISTOR 560 5% 2W MO TC=0±200	28480	0764-0015
A19R2	0764-0015	7		RESISTOR 560 5% 2W MO TC=0±200	28480	0764-0015
A19R3	0764-0016	8	2	RESISTOR 1K 5% 2W MO TC=0±200	28480	0764-0016
A19R4	0764-0016	8		RESISTOR 1K 5% 2W MO TC=0±200	28480	0764-0016
A19R5	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0±100	24546	C4-1/8-T0-51R1-F
A19R6	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0±100	24546	C4-1/8-T0-51R1-F
A19XA2	1251-7882	4	5	CONNECTOR-PC EDGE 2-ROWS	28480	1251-7882
A19XA3	1251-7882	4		CONNECTOR-PC EDGE 2-ROWS	28480	1251-7882
A19XA4	1251-7882	4		CONNECTOR-PC EDGE 2-ROWS	28480	1251-7882
A19XA5	1251-7882	4		CONNECTOR-PC EDGE 2-ROWS	28480	1251-7882
A19XA6- A19XA14 A19XA15	1251-7882	4		NOT ASSIGNED CONNECTOR-PC EDGE 2-ROWS	28480	1251-7882

Figure 6-11. Motherboard Parts (2 of 2)

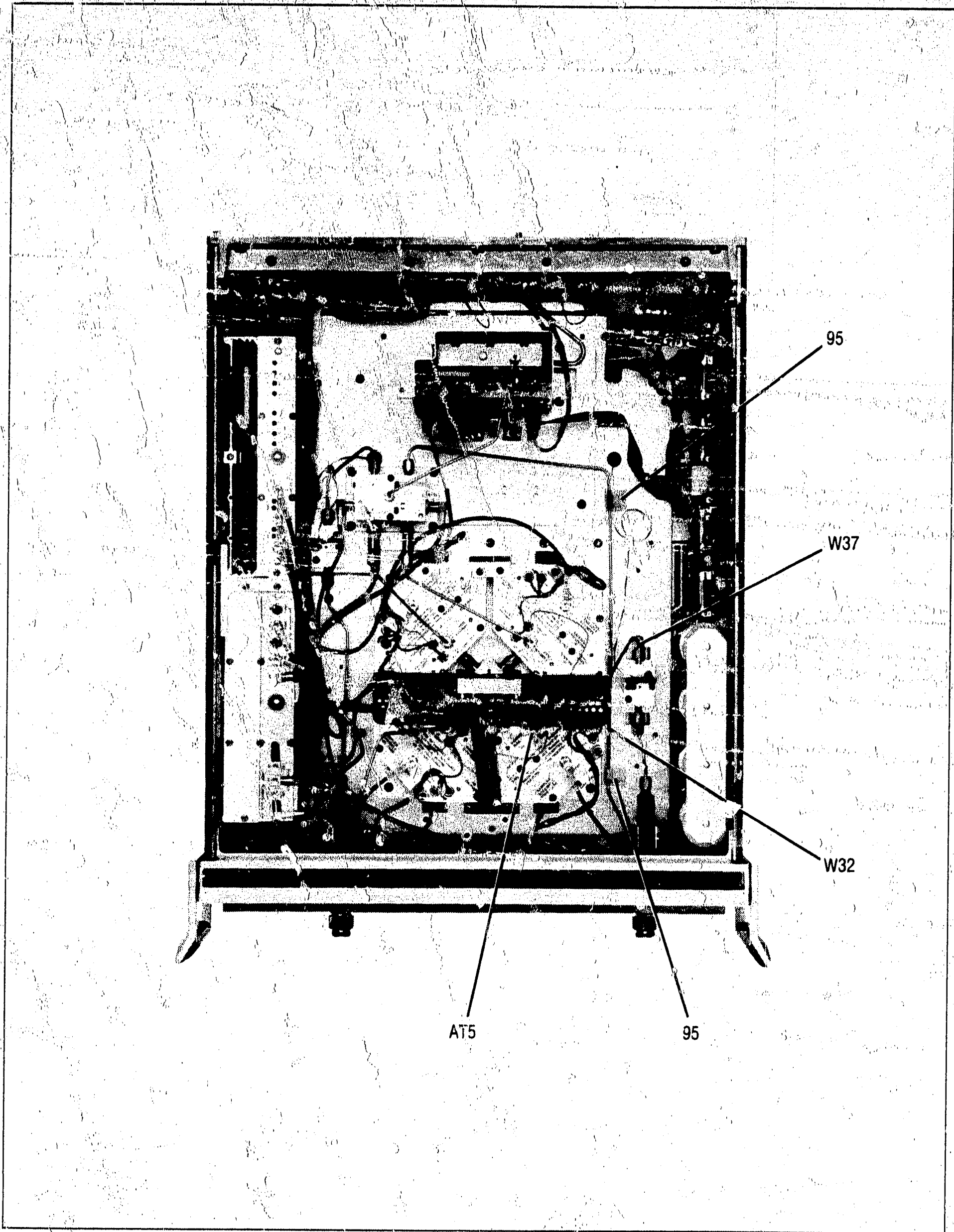


Figure 6-12. Parts Unique to Option 003 (1 of 2)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
				PARTS UNIQUE TO OPTION 003		
W32	08516-20004	1	1	CA AY A8 TO A18	28480	08516-20004
W37	08516-20014	3	1	CA AY A9 TO A11	28480	08516-20014
AT5	8490D #003	7	1	2.4MM 3dB ATTENUATOR	28480	8490D
95	1400-1470	1	2	CABLE CLAMP	28480	1400-1470

Figure 6-12. Parts Unique to Option 003 (2 of 2)

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

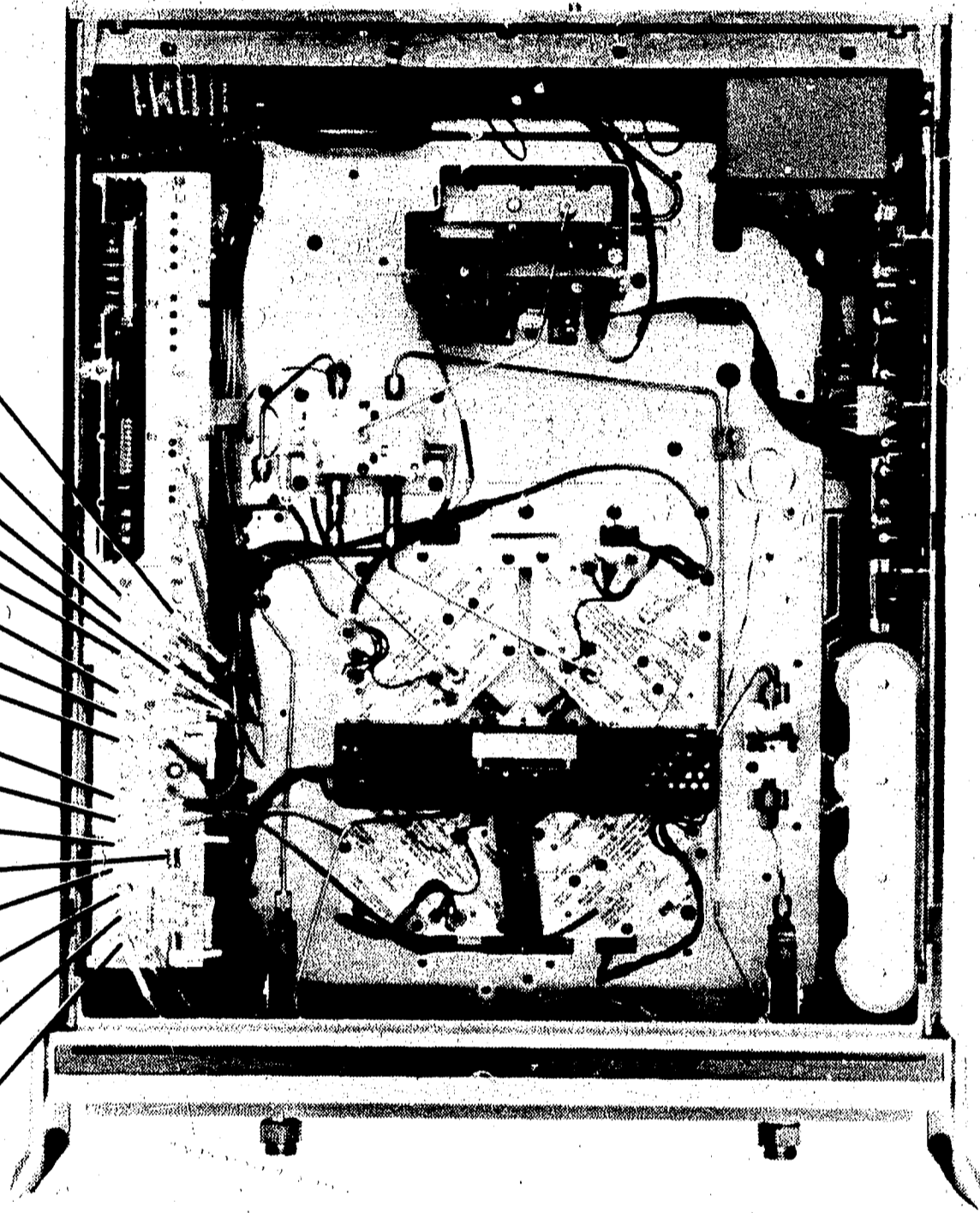
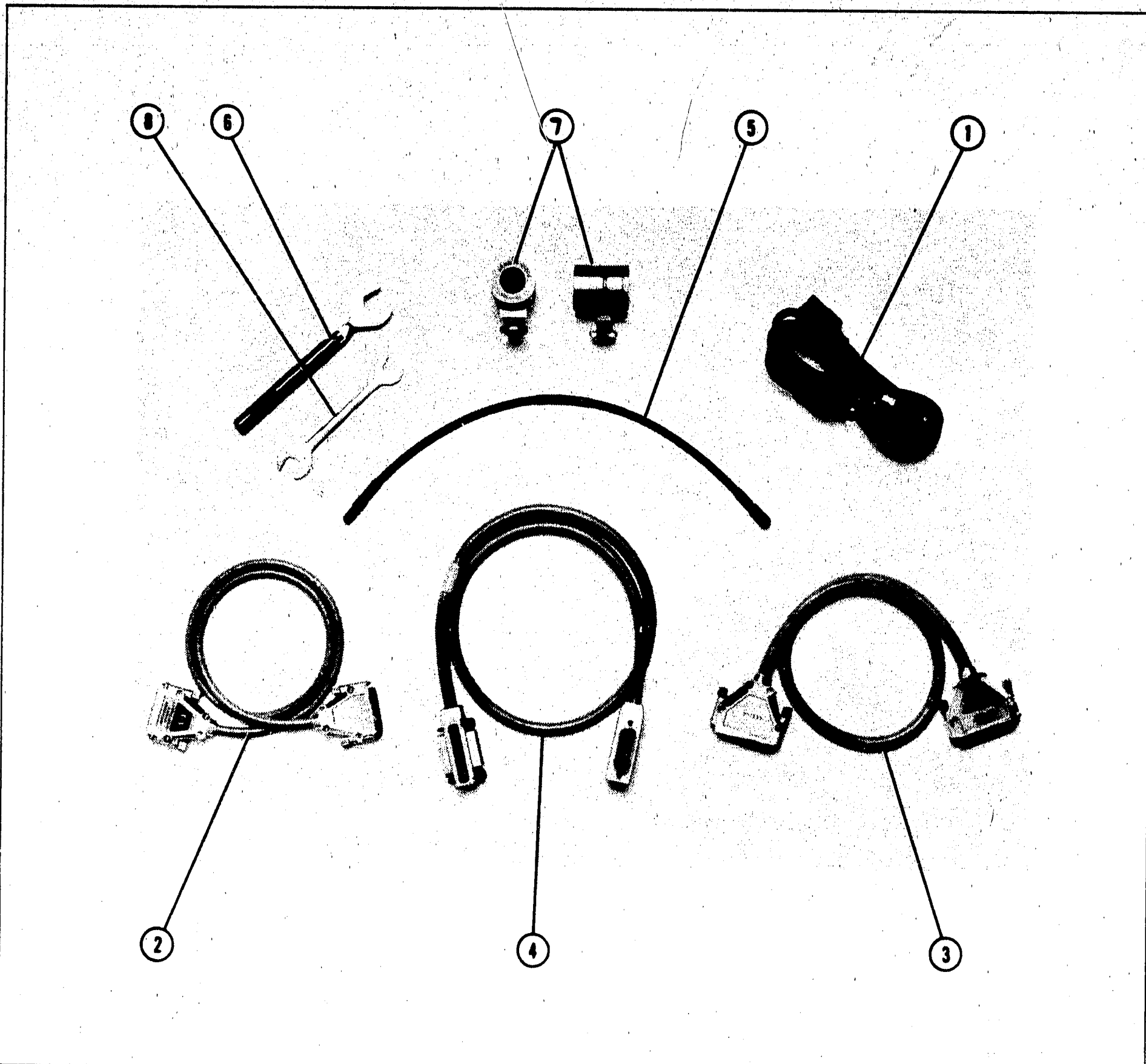


Figure 6-13. Parts Unique to Option 001 (1 of 2)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
PARTS UNIQUE TO OPTION 001						
A2	08513-60004	2	1	BD ASSY, IF MULTIPLEXER (NEW)	28480	08513-60004
A2	08513-69004	0	1	BD ASSY, IF MULTIPLEXER (REBUILT)	28480	08513-69004
W1	08513-60121	4	1	CA AY A12J3 TO A2J1	28480	08513-60121
W2	08513-60122	5	1	CA AY A13J3 TO A2J7	28480	08513-60122
W3	08513-60123	6	1	CA AY A10J3 TO A2J4	28480	08513-60123
W4	08513-60124	7	1	CA AY A11J3 TO A2J10	28480	08513-60124
W5	08513-60125	8	1	CA AY A2J2 TO J11A1	28480	08513-60125
W6	08513-60126	9	1	CA AY A2J8 TO J11A4	28480	08513-60126
W7	08513-60127	0	1	CA AY A2J5 TO J11A2	28480	08513-60127
W8	08513-60128	1	1	CA AY A2J11 TO J11A3	28480	08513-60128
W9	08513-60129	2	1	CA AY A2J3 TO J10A1	28480	08513-60129
W10	08513-60130	3	1	CA AY A2J9 TO J10A4	28480	08513-60130
W11	08513-60131	4	1	CA AY A2J6 TO J10A2	28480	08513-60131
W12	08513-60132	5	1	CA AY A2J12 TO J10A3	28480	08513-60132
W13-W14				NOT UNIQUE TO OPTION 001		
W15	08513-60135	8	1	CA AY A3J3 TO J10A7	28480	08513-60135
W16				NOT UNIQUE TO OPTION 001		
W17	08513-60137	0	1	CA AY A3J6 TO J10A5	28480	08513-60137
W18				NOT UNIQUE TO OPTION 001		
W19	08513-60139	2	1	CA AY A3J8 TO J10A6	28480	08513-60139

Figure 6-13. Parts Unique to Option 001 (2 of 2)



Reference Designation	HP Part Number	C	D	Qty	Description	Mfr Code	Mfr Part Number
ACCESSORIES							
1	8120-1348	5		1	POWER CORD U.S.A. ONLY	28480	8120-1348
2	08510-60102	8		1	TEST SET CABLE ASSEMBLY	28480	08510-60102
3	08516-60009	0		1	CABLE ASSEMBLY, RS232	28480	08516-60009
4	8120-3445	7		1	HP-IB CABLE ASSEMBLY	28480	8120-3445
5	08513-60009	7		1	FLEX SOURCE CABLE	28480	08513-60009
6	8716-1764	2		1	20 MM TORQUE WRENCH	28480	8716-1764
7	08515-60003	3		2	NON-ROTATING CLAMP	28480	08515-60003
8	8710-1770	8		1	1/2 X 9/16 IN OPEN END WRENCH	28480	8710-1770
SPECIFICATION AND PERFORMANCE VERIFICATION SOFTWARE REV. A.01.02							
	08510-10031	7		2	PROGRAM DISCS (Not Shown)	28480	08510-10031
	08510-10032	8		1	DATA DISC (Not Shown)	28480	08510-10032

Figure 6-14. Accessories

Section 7: Service

This HP 8516A SERVICE section consists of a wiring diagram keyed to Figure 7-1, the component location diagram of the motherboard (A19), RF and Control Block Diagrams for the HP 8516A. Use these tools as aids to troubleshoot motherboard trace and component problems.

Other service information is included in the TEST SET TROUBLESHOOTING sections of the HP 8510B Service Manual and this manual. Topics covered include checks of the major assemblies and assembly removal procedures, and RF troubleshooting procedures.

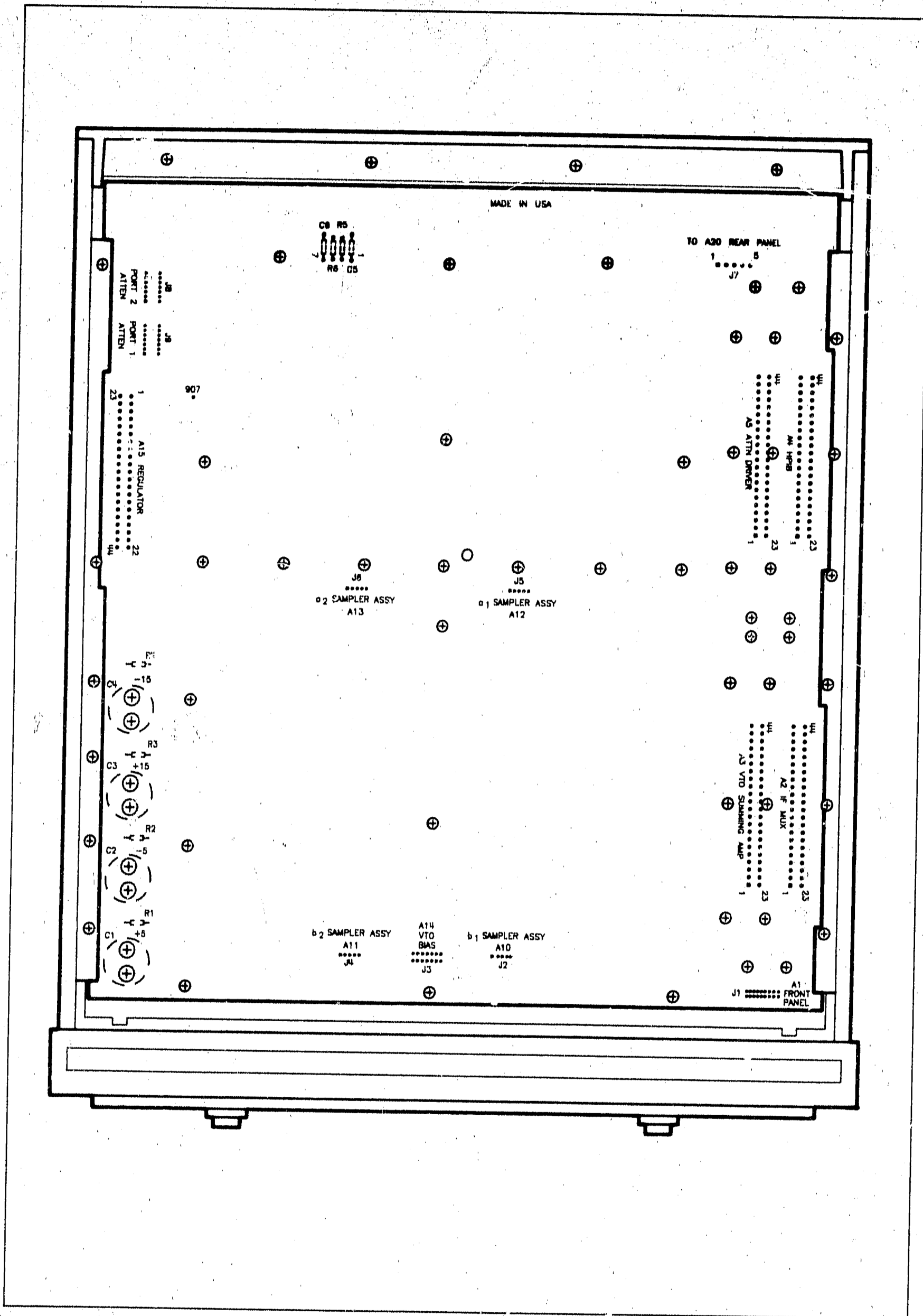


Figure 7-1. HP 8516A Motherboard

Table 4. HP 8516A Test Sets Interconnect Table (1 of 2)

MEMORIC	DESCRIPTION	SIGNAL ENTERS MOTHERBOARD (CONNECTOR/PIN)	SIGNAL EXITS MOTHERBOARD (CONNECTOR)	SIGNAL ENTERS (ASSEMBLY) →	A1 FRONT PANEL	A2 IF MULTIPLEXER	A3 VTO SUMMING AMP	A4 HP-IB	A5 ATTN/SWITCH	A10 SAMPLER	A11 SAMPLER	A12 SAMPLER	A13 SAMPLER	A14 VTO/DRIVER	A15 REGULATOR	A16 STEP ATTN 1	A17 STEP ATTN 2	A20 REAR PANEL	
				→	J1	XA2	XA3	XA4	XA5	J2	J4	J5	J6	J3	XA15	J8	J9	J7	
ACTIVE AB0 AB1 AB2	Active LED Indicator Address Bus Bit 0 Address Bus Bit 1 Address Bus Bit 2	YA4-3 XA4-29 XA4-8 XA4-30	Motherboard Pin Numbers	4		29 8 30	29 8 30		29 8 30										
AB3 AB4 A1S11 A1S10	Address Bus Bit 3 Address Bus Bit 4 Attenuator 1 Section 1 In Attenuator 1 Section 1 Out	XA4-9 XA4-31 XA5-4 XA5-26				9 31	9 31		9 31								2 13		
A1S21 A1S20 A1S31 A1S30	Attenuator 1 Section 2 In Attenuator 1 Section 2 Out Attenuator 1 Section 3 In Attenuator 1 Section 3 Out	XA5-24 XA5-3 XA5-23 XA5-2															9 3 5 11		
A1S41 A1S40 A2S11 A2S10	Attenuator 1 Section 4 In Attenuator 1 Section 4 Out Attenuator 2 Section 1 In Attenuator 2 Section 1 Out	XA5-25 XA5-1 XA5-44 XA5-22															10 4 2	13	
A2S21 A2S20 A2S31 A2S30	Attenuator 2 Section 2 In Attenuator 2 Section 2 Out Attenuator 2 Section 3 In Attenuator 2 Section 3 Out	XA5-18 XA5-42 XA5-40 XA5-20																9 3 5 11	
A2S41 A2S40 BNMINT BSRQ	Attenuator 2 Section 4 In Attenuator 2 Section 4 Out Buffered Non-Maskable Interrupt Buffered Service Request	XA5-19 XA5-41 XA4-28 XA4-2			28	4 28		2	28									10 4	
DB0 DB1 DB2 DB3	Data Bus Bit 0 Data Bus Bit 1 Data Bus Bit 2 Data Bus Bit 3	XA4-15 XA4-27 XA4-16 XA4-38				15 37 16 38	15 37 16 38		15 37 16 38										
DB4 DB5 DB6 DB7	Data Bus Bit 4 Data Bus Bit 5 Data Bus Bit 6 Data Bus Bit 7	XA4-17 XA4-39 XA4-18 XA4-40			39	17 39 18 40	17 18 40												
GND LAP1 LAP2 LATDRVP	Chassis Ground Low = Port 1 Attenuator Present Low = Port 2 Attenuator Present Low = Attenuator Switch/Driver Present	XA15-18-23, 40-44 J8-1 J9-1 XA5-43			3, 5	11, 12, 33, 34	11, 12, 33, 34 19 41 44	11, 12, 33, 34	11, 12, 33, 34 21	2	2	2	2	3, 4			14	14	

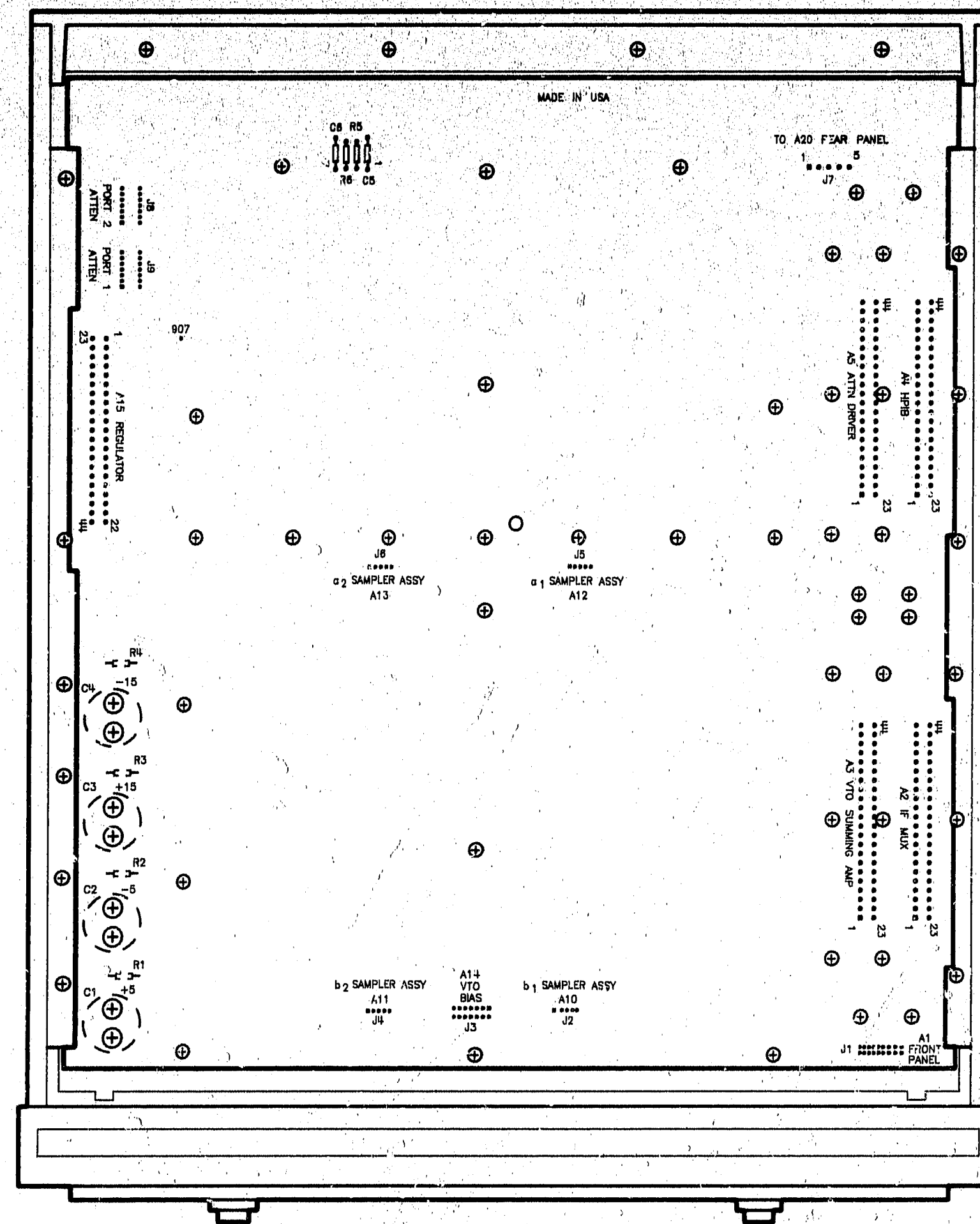
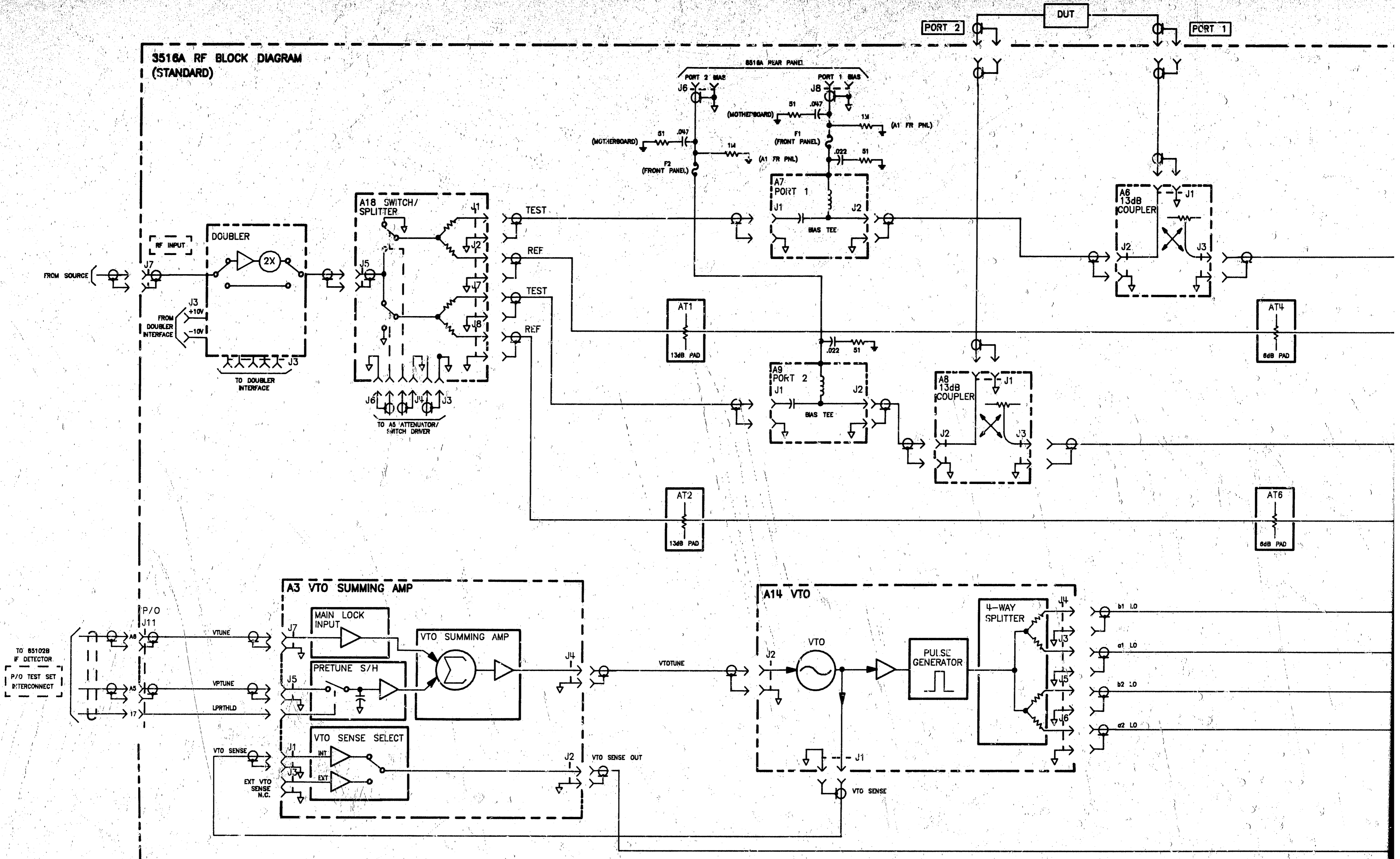


Table 4. HP 8516A Test Sets Interconnect Table (2 of 2)

MEMORIC	DESCRIPTION	SIGNAL ENTERS MOTHERBOARD (CONNECTOR/PIN)	SIGNAL EXITS MOTHERBOARD (CONNECTOR)	SIGNAL ENTERS (ASSEMBLY) →	A1 FRONT PANEL	A2 IF MULTIPLEXER	A3 VTO SUMMING AMP	A4 HP-IB	A5 ATTN/SWITCH	A10 SAMPLER	A11 SAMPLER	A12 SAMPLER	A13 SAMPLER	A14 VTO/DRIVER	A15 REGULATOR	A16 STEP ATTN 1	A17 STEP ATTN 2	A20 REAR PANEL		
				←	J1	XA2	XA3	XA4	XA5	J2	J4	J5	J6	J3	XA15	J8	J9	J7		
LBIOS LBUFWH LENDRA LOPTP	Low = Buffered I/O Strobe Low = Buffered Write Low = End of Range Low = Option Present	XA4-5 XA4-27 XA3-43 XA2-20	Motherboard Pin Numbers			5	5	27	5										2	
LPRTHLD LP2ACT LSWDRVP LTEMP	Low = Return Hold Low = Port 2 Active Low = Sweep Driver Present Low = Over Temperature	J11-17 XA4-4 XA3-21 XA3-7		6																3
PWCN P1ACT P1BIASIN P1BIASOUT	Power On Port 1 Active Port 1 Bias Voltage In Port 1 Bias Voltage Out	XA4-6 XA4-26 J8 (Rear Panel) Port 1 (Front Panel)				6	6		6							1				
P2BIASIN P2BIASOUT SWEPTBIAS SBA1	Port 2 Bias Voltage In Port 2 Bias Voltage Out Swept Bias A1 Sampler On/Off	J6 (Rear Panel) Port 2 (Front Panel) XA3-24 XA3-4																		
SBA2 SBB1 SBB2 TEMP2	A2 Sampler On/Off B1 Sampler On/Off B2 Sampler On/Off Analog Temperature Sensor	XA3-26 XA3-3 XA3-25 XA3-1									5					5				
VSET +5VA +5VCAP -5VCAP	VTO Set Voltage +5 Volts to Attenuators +5 Volts Unregulated to Input Filter Capacitor -5 Volts Unregulated to Input Filter Capacitor	XA3-2 XA5-17, 39 XA15-45 XA15-8, 9, 30, 31													13, 14		6	6		
+15VCAP -15VCAP +5VREG -5VREG	+15 Volts Unregulated to Input Filter Capacitor -15 Volts Unregulated to Input Filter Capacitor +5 Volts Regulated Supply -5 Volts Regulated Supply	XA15-12, 13, 34, 35 XA15-16, 17, 38, 39 XA15-2, 3, 24, 25 XA15-6, 7, 28, 29																		
+15VREG -15VREG	+15 Volts Regulated Supply -15 Volts Regulated Supply	XA15-10, 11, 32, 33 XA15-14, 15, 36, 37																		
						1, 2	14, 36	14, 36	14, 36						9, 10 7, 8	26, 27 8, 5, 30, 31				
						7, 8	10, 32 13, 35	10, 32 13, 35	10, 32 13, 35	10, 32 13, 35	4 3	4 3	4 3	4 3	11, 12 5, 6					

**3516A RF BLOCK DIAGRAM
(STANDARD)**



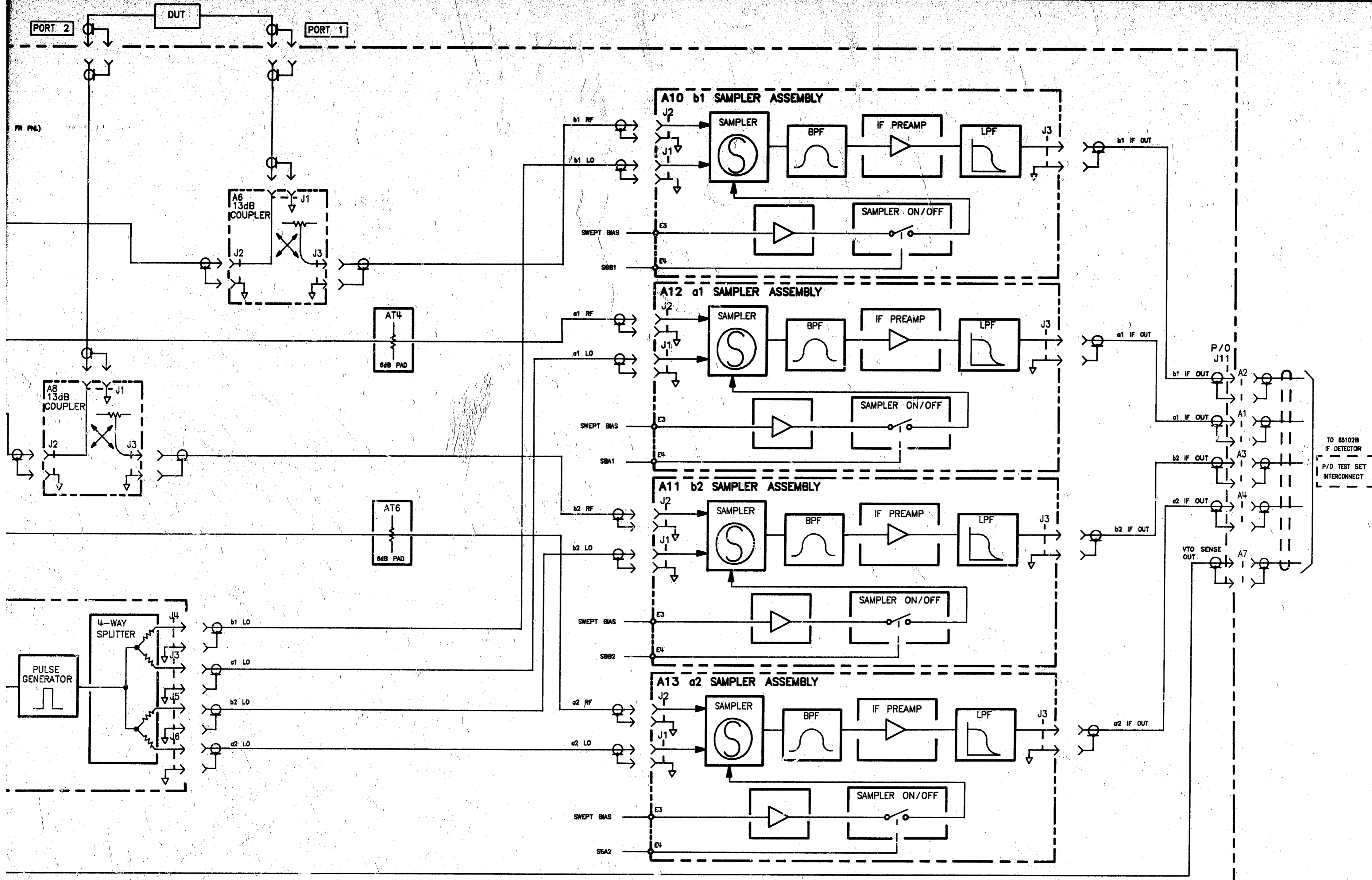
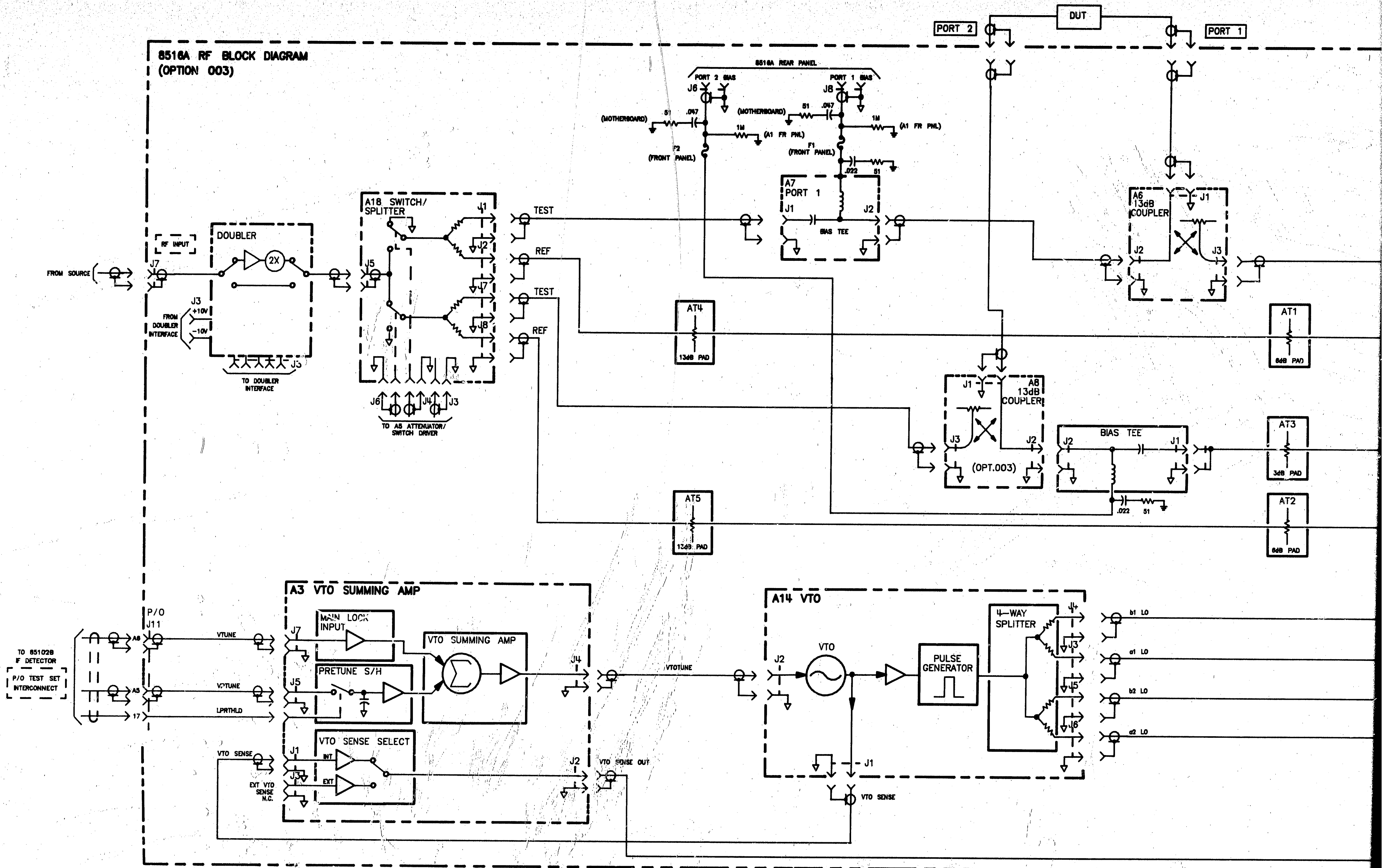


Figure 7-2. HP 8516A RF Block Diagram (Standard) Service 7-7/7-8

**8516A RF BLOCK DIAGRAM
(OPTION 003)**



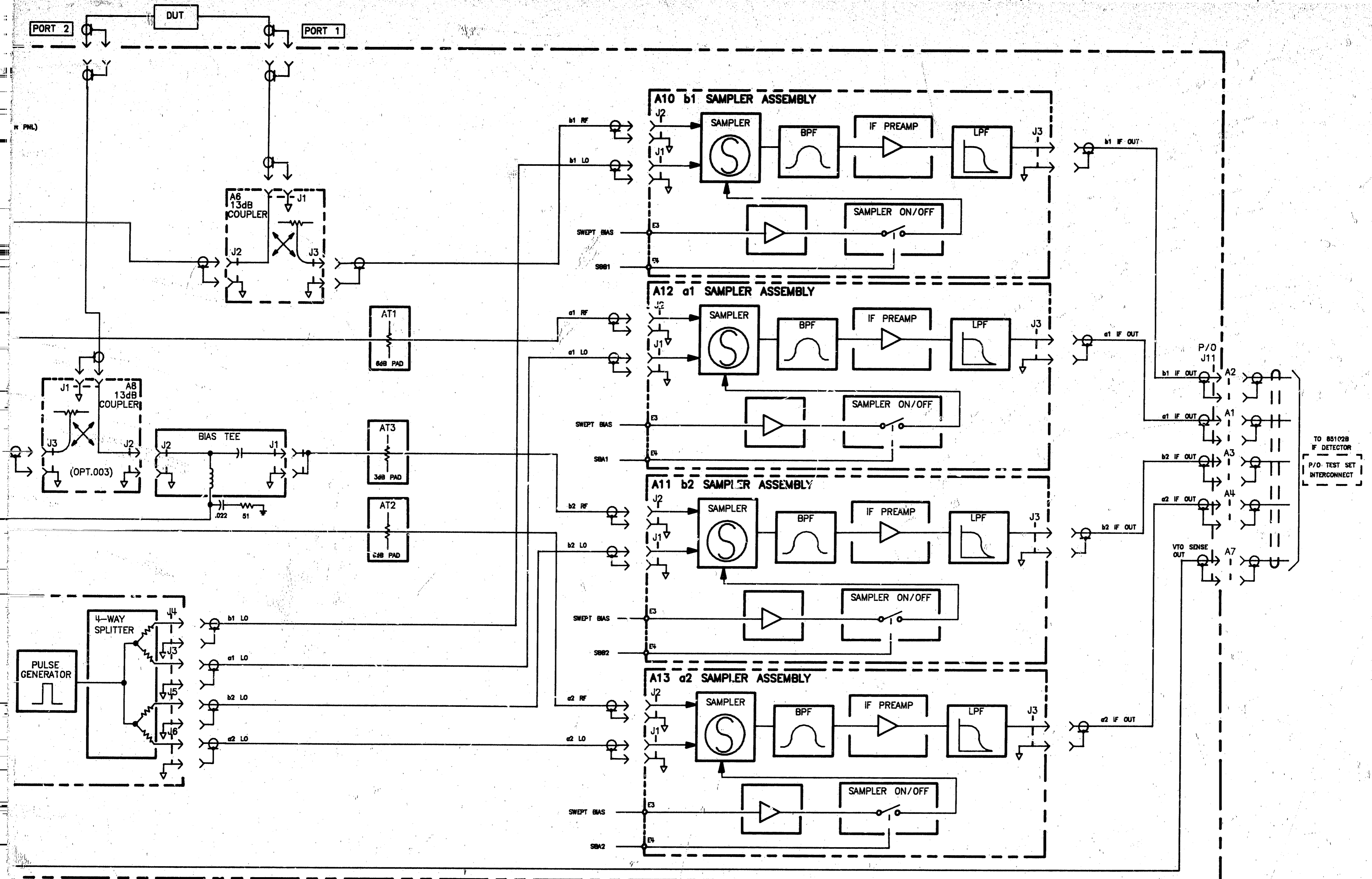
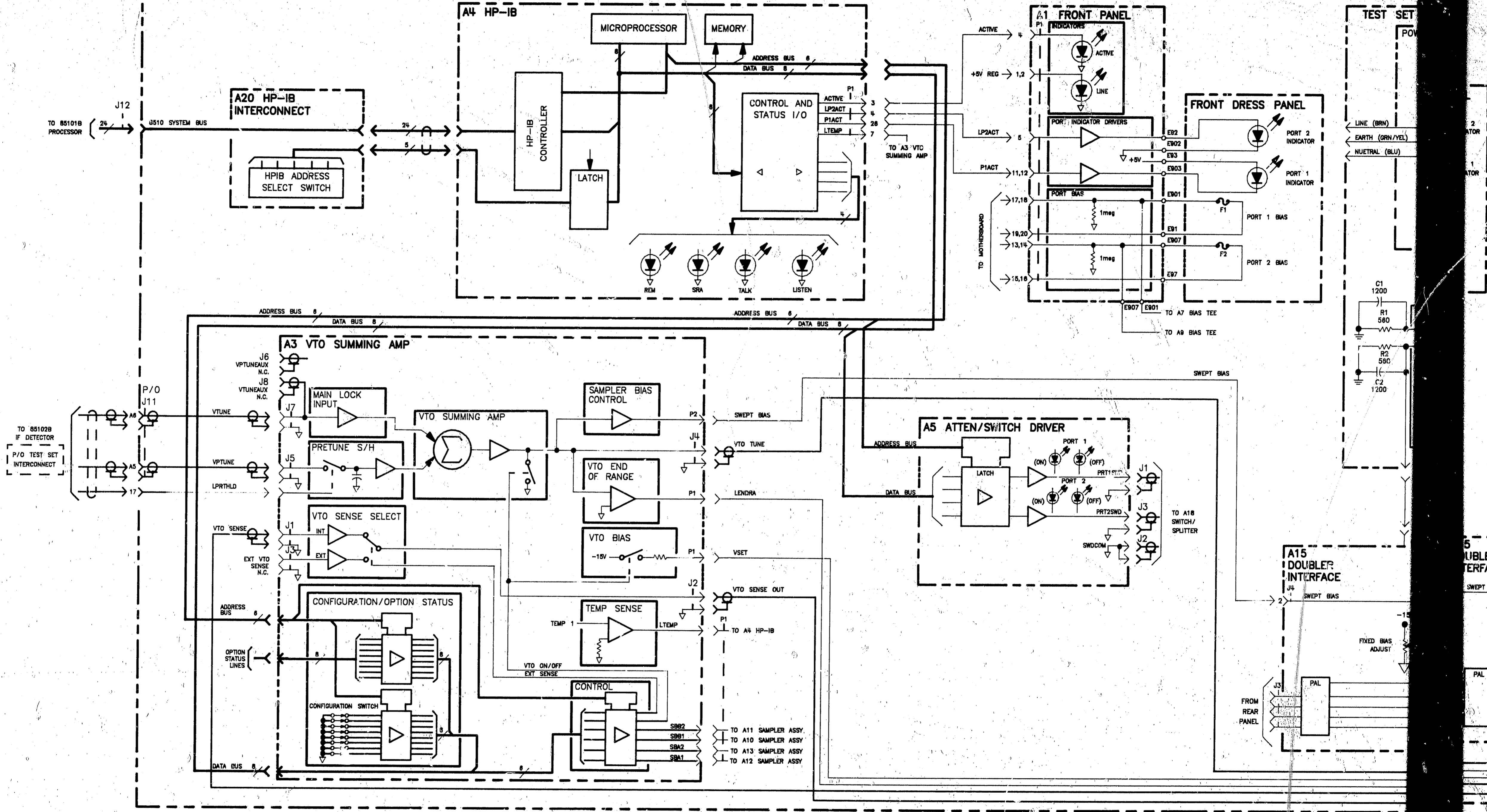


Figure 7-3. HP 8516A RF Block Diagram (Option 003)
 Service 7-9/7-10

8516A CONTROL BLOCK DIAGRAM



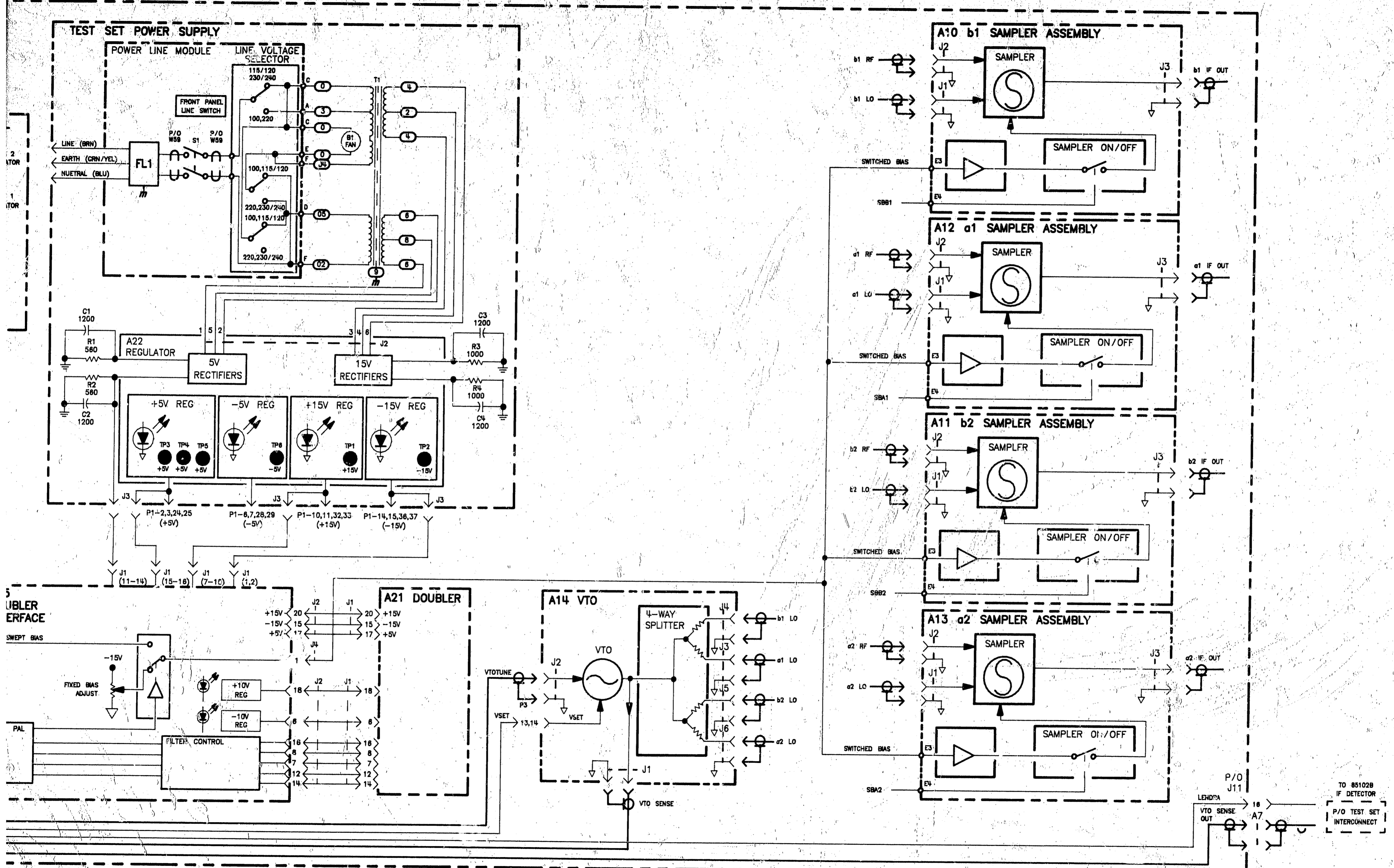


Figure 7-4. HP 8516A Control Block Diagram Service 7-11/7-12

Section 8: Performance Tests

Performance test information and procedures are located in the PERFORMANCE TESTS section of the HP 8510B System Manual. Note that the HP 8510B performance test software (supplied with the Test Set) is required to test the HP 8516A. Performance test results are based on the HP 8510 System, including the test set, cables, calibration kit etcetera.

Section 9: Adjustments

The HP 8516A has no adjustments. Specifically no attempt should be made to adjust the samplers, as is done in other Hewlett-Packard test sets.

Section 10: 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 on the title page. Instruments with serial number prefixes higher than the title page prefix may be documented in a manual update supplement.