

Errata

Title & Document Type: 8348A Operating and Service Manual

Manual Part Number: 08348-90001

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HP References in this Manual

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

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

HP 8348A Microwave Amplifier
Operating and Service Manual
2 to 26.5 GHz

SERIAL NUMBERS

This manual applies to all HP 8348A amplifiers with serial prefix 3111A.



HP Part No. 08348-90001
Printed in USA March 1991

Edition 1.0

Certification

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

Warranty

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, 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.

NO OTHER WARRANTY IS EXPRESSED OR IMPLIED. HP SPECIFICALLY DISCLAIMS THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

EXCLUSIVE REMEDIES

THE REMEDIES PROVIDED HEREIN ARE BUYER'S SOLE AND EXCLUSIVE REMEDIES. HP SHALL NOT BE LIABLE FOR ANY DIRECT, INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, WHETHER BASED ON CONTRACT, TORT, OR ANY OTHER LEGAL THEORY.

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.

Safety Considerations

General

This product and related documentation must be reviewed for familiarization with safety markings and instructions before operation. This product has been designed and tested in accordance with international standards.

Safety Symbols



Instruction manual symbol: the product will be marked with this symbol when it is necessary for the user to refer to the instruction manual (refer to Table of Contents).



Indicates hazardous voltages.



Indicates earth (ground) terminal.

Warning



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

Caution



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

Safety Earth Ground

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

Before Applying Power

Verify that the product is configured to match the available main power source per the input power configuration instructions provided in this manual.

If this product is to be used with an autotransformer make sure the common terminal is connected to the neutral (grounded) side of the main supply.

Servicing

Any servicing, adjustment, maintenance, or repair of this product must be performed only by qualified personnel. Capacitors inside this product may still be charged even when disconnected from their power source.

To avoid a fire hazard, replacement fuses must have the required current rating and be of the type specified in this manual.

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General Information

This chapter provides the following information:

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A definition of specifications	1-3
A definition of operating characteristics	1-3
A list of specifications	1-4
A list of operating characteristics	1-5
The instrument's storage and shipping requirements.....	1-6
How to package the amplifier for shipment	1-6
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The HP 8348A amplifier

This instrument (shown in Figure 1-1) is a broad-band, high-gain, amplifier. Its high output power allows proper device operation of, or complete characterization of, very level-sensitive devices that require high power-driven signals (mixers, power amplifiers, and optical modulators, for example).

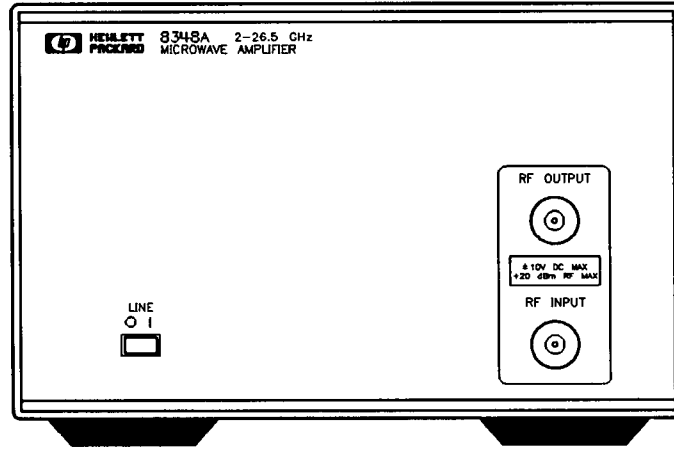


Figure 1-1. HP 8348A Amplifier

Accessories

Two 3.5 mm(f) to 3.5 mm(f) adapters are supplied with the amplifier. Table 5-3 lists accessory part numbers.

Options Available

Option 001, Rear Panel RF Input/Output

Option 002, Rear Panel RF Input/Front Panel RF Output

Option 910, Extra Operating and Service Manual

Option 1BN, MIL-STD 45662A Calibration

This option provides an instrument calibration and a certificate of calibration in full compliance with MIL-STD 45662A.

Option 1BP, MIL-STD 45662A Calibration with Data

This option provides an instrument calibration, a certificate of calibration, and test data in full compliance with MIL-STD 45662A.

Specifications and Operating Characteristics

Specifications

Specifications (listed in Table 1-1) are the performance standards or limits against which the instrument is tested. Specifications apply from +20 to +30°C (unless otherwise noted), and only after the instrument's temperature stabilizes after one hour continuous operation. Unless otherwise noted, corrected limits are given when specifications are subject to optimization with error-correction routines.

Operating Characteristics

Operating characteristics (listed in Table 1-2) are non-warranted parameters. They are not specifications, but are typical performance parameters that most units meet from +20 to +30°C.

Table 1-1. HP 8348A Specifications

FREQUENCY	
Frequency Range	2.0 to 26.5 GHz
AMPLITUDE	
Maximum Output Power (at 0 dBm input power)	
2.0 to 20.0 GHz	≥+25 dBm
20.0 to 26.5 GHz	≥+23 dBm
Minimum Small Signal Gain (at -15 dBm input power)	
2.0 to 20 GHz	≥25 dB
20.0 to 26.5 GHz	≥23 dB
INPUT AND OUTPUT	
Maximum Continuous Input	
Microwave Power:	+22 dBm
DC Voltage:	±10V
GENERAL	
Input and Output Connectors	3.5 mm male
Power Requirements	100, 120, 200, or 240V (±10%), 50 to 400 Hz; 85 VA maximum
Temperature Range	
Operation	+20 to +30°C
Storage	-40 to +75°C
Weight	
Net	7 kg (15 lb)
Shipping	14 kg (31 lb)
Dimensions	
Height	133 mm (5.2 in)
Width	214 mm (8.4 in)
Depth	366 mm (14.4 in)

Table 1-2. HP 8348A Operating Characteristics

FREQUENCY	
Frequency Range	1.0 to 26.5 GHz
AMPLITUDE	
Maximum Output Power (at 0 dBm input power)	
1.0 to 2.0 GHz	≥+20 dBm
Output Power Flatness (at 0 dBm input power)	
1.0 to 26.5 GHz	±4 dB
Minimum Small Signal Gain (at -15 dBm input power)	
1.0 to 2.0 GHz	≥20 dB
Harmonics and Spurious (at maximum specified output power)	
1.0 to 2.0 GHz	>20 dB below the carrier.
2.0 to 26.5 GHz	>15 dB below the carrier.
Third Order Intercept	
2.0 to 20.0 GHz	+36 dBm (nominal)
20.0 to 26.5 GHz	+31 dBm (nominal)
INPUT AND OUTPUT	
Impedance	50Ω (nominal)
Input SWR	<3:1
Output SWR	
1.0 to 2.0 GHz	<6:1
2.0 to 20.0 GHz	<4.5:1
20.0 to 26.5 GHz	<2:1
Noise Figure	
1.0 to 20 GHz	<10 dB
20 to 26.5 GHz	<13 dB
Reverse Isolation	>50 dB
PULSE TRANSMISSION CAPABILITY	
Rise/Fall Time:	<5 ns
Delay Time (input to output):	<5 ns
GENERAL	
Temperature Range	
Operation	0 to +50°C

Storing and Shipping

Environment

You may store or ship the instrument in environments within the following limits:

Temperature	-40 to + 75°C
Altitude	<7600 metres (25,000 feet)
Humidity	5 to 95% relative

Packaging

Containers and materials identical to those used in factory packaging are available through Hewlett-Packard offices. If you choose to package the instrument with commercially available materials, follow these instructions.

1. Wrap the instrument in heavy paper.
2. Use a strong shipping container. A double-wall carton made of 350-pound test material is adequate.
3. Use enough shock-absorbing material (3 to 4 inch layer) around all sides of the instrument to provide a firm cushion and prevent movement inside the container. Protect the control panel with cardboard.
4. Seal the shipping container securely.
5. Mark the shipping container "FRAGILE".

Returning an Instrument for Service

If your amplifier requires service, contact the HP office nearest you for information on where to send it (Table 6-5 lists sales and service offices). When you send the amplifier to Hewlett-Packard, include a service tag (located at the end of this manual), on which you provide the following information:

1. Your company name and address (do not give a post office box).
2. A technical contact person within your company, and their complete phone number.
3. The complete model and serial number of the instrument.
4. Indicate the type of service required (calibration or repair).
5. Include any applicable information.

When making inquiries, either by correspondence or by telephone, please refer to the instrument by model number and full serial number.

Manufacturer's Declaration

Note



This is to certify that this product meets the radio frequency interference requirements of Directive FTZ 1046/1984. The German Bundespost has been notified that this equipment was put into circulation and has been granted the right to check the product type for compliance with these requirements.

Note: If test and measurement equipment is operated with unshielded cables and/or used for measurements on open set-ups, the user must ensure that under these operating conditions, the radio frequency interference limits are met at the border of his premises.

Model HP 8348A

Note



Hiermit wird bescheinigt, dass dieses Gerät/System in Übereinstimmung mit den Bestimmungen von Postverfügung 1046/84 funkentstört ist.

Der Deutschen Bundespost wurde das Inverkehrbringen dieses Gerätes/Systems angezeigt und die Berechtigung zur Überprüfung der Serie auf Einhaltung der Bestimmungen eingeräumt.

Zustuzinformatiun für Mess- und Testgeräte:

Werden Mess- und Testgeräte mit ungeschirmten Kabeln und/oder in offenen Messaufbauten verwendet, so ist vom Betreiber sicherzustellen, dass die Funk-Entstörbestimmungen unter Betriebsbedingungen an seiner Grundstücksgrenze eingehalten werden.

Installation

This chapter provides the following information:

	Page
How to initially check the amplifier	2-2
Instrument serial number information.....	2-2
The instrument's environmental requirements	2-4
An explanation of electrostatic discharge hazards and precautions	2-4
The instrument's power requirements	2-6
How to set the line voltage selector switch	2-6
How to check the fuse	2-7
How to check for the proper power cable	2-8

Initial Inspection

Inspect the shipping container for damage. If the shipping container or cushioning material is damaged, keep it until you have verified that the contents are complete and you have tested the amplifier mechanically and electrically.

The shipping container and packaging material are shown in Figure 2-2 (part numbers are provided in Table 5-2). If the contents are incomplete or if the amplifier does not pass the performance tests (Chapter 4) notify the nearest HP office. If the shipping container is damaged or the cushioning material shows signs of stress, notify the carrier. Keep the shipping materials for the carrier's inspection. The HP office will arrange for repair or replacement without waiting for a claim settlement.

If the shipping container and cushioning material are in good condition, retain them for possible future use. You may wish to ship the amplifier to another location or to return it to Hewlett-Packard for service. Instructions for repackaging and shipping the instrument are located at the end of this chapter.

Serial Numbers

Hewlett-Packard makes frequent improvements to its products to enhance their performance, usability, or reliability, and to control costs. Hewlett-Packard service personnel have access to records of design changes to each type of equipment, based on the equipment's serial number. If you contact Hewlett-Packard about your amplifier, have the complete serial number available to make sure that you receive the most complete and accurate information possible.

A serial number label is attached to the rear panel of the amplifier. A typical serial number label is shown in Figure 2-1. The first four digits followed by a letter comprise the serial number prefix; the last five digits are the sequential suffix, unique to each instrument.

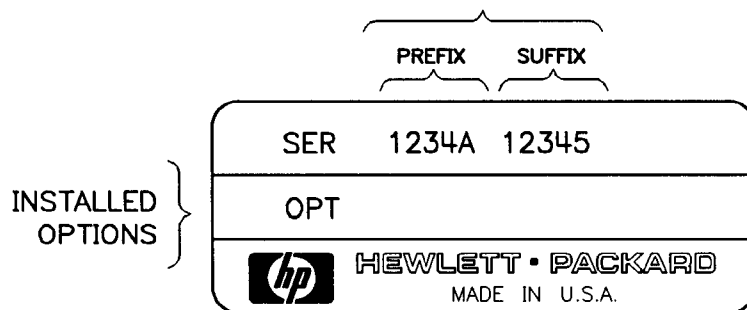


Figure 2-1. Typical Serial Number Label

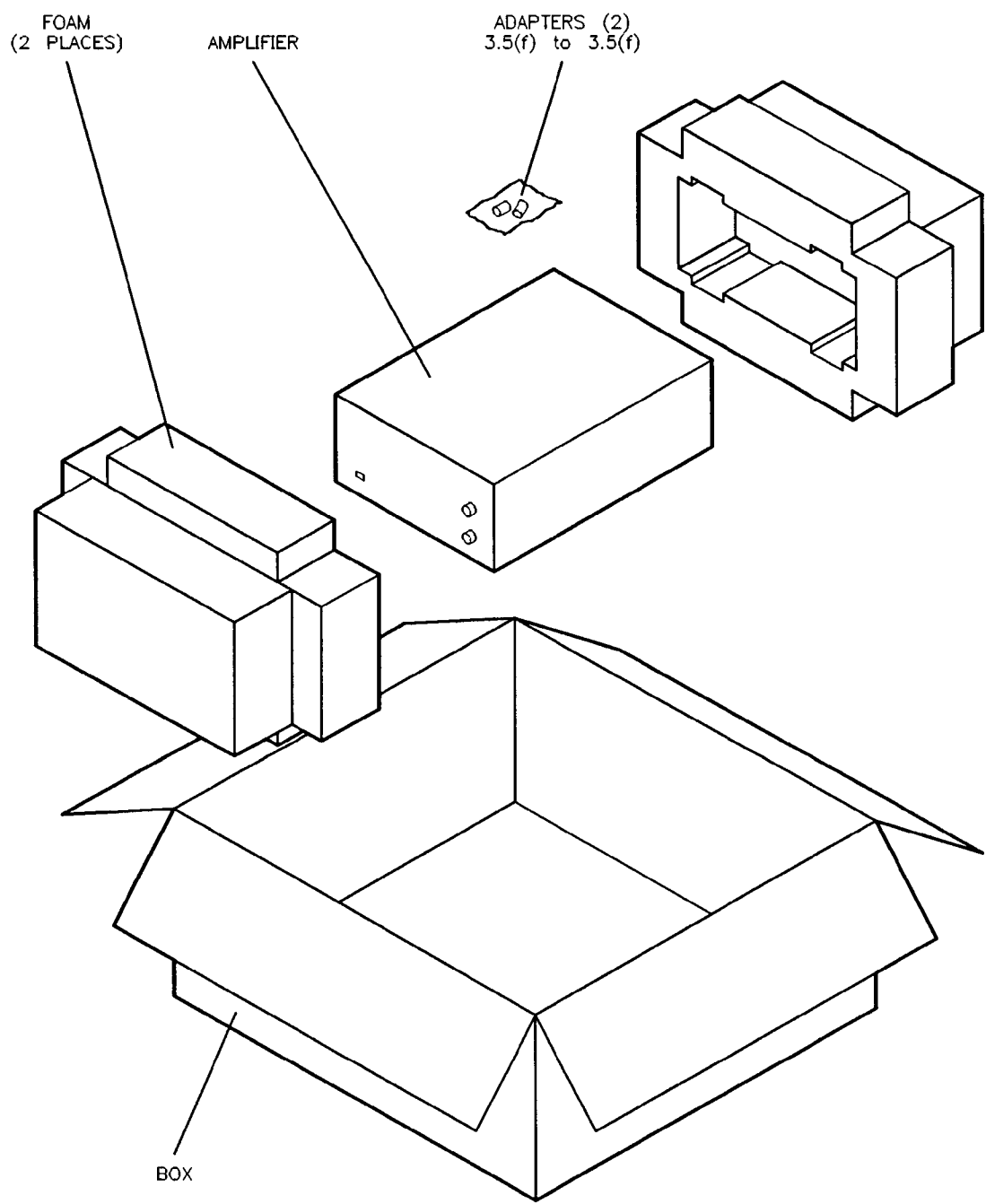


Figure 2-2. HP 8348A Shipping Container and Contents

Operating Environment

To meet the specifications listed in Table 1-1, you must operate this instrument within the following limits:

Temperature	+20 to +30°C
Altitude	<4500 metres (15,000 feet)
Humidity	5 to 80% relative

Electrostatic Discharge

Because electrostatic discharge (ESD) can damage or destroy electronic components, perform all work on assemblies consisting of electronic components at a static-free work station.

Figure 2-3 is an example of a static-safe work station using two types of ESD protection that can be used either together or separately:

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

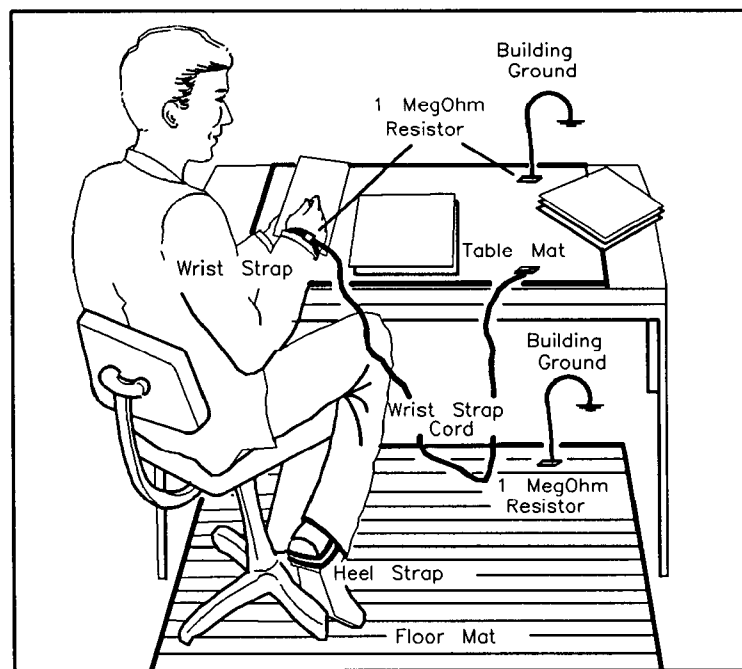


Figure 2-3. Example of a Static-Safe Work Station

Reducing Damage Caused by ESD

The following can help reduce ESD damage that occurs during testing and servicing operations:

- Before you connect a coaxial cable to an amplifier connector for the first time each day, momentarily ground the cable center and outer conductors.
- Ground yourself with a resistor-isolated wrist strap before touching the center pin of *any* connector, and before removing *any* assembly from the instrument.
- To prevent a buildup of static charge, ensure that all instruments are properly earth-grounded.

Static-Safe Accessories. See chapter 5 for static-safe accessories that can be obtained from Hewlett-Packard.

Power Requirements

Table 2-1. HP 8348A Power Requirements

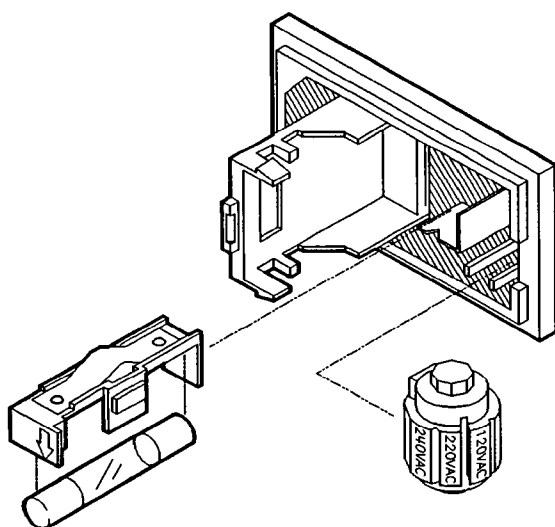
Characteristic	Requirement
Input Voltage	100, 120, 200, or 240V ($\pm 10\%$)
Frequency	50 to 400 Hz
Power	85 VA (max)

Setting the Line Voltage Selector Switch

Caution



Before connecting the HP 8348A to the power source, set the rear-panel voltage selector switch correctly to adapt the amplifier to the power source. An improper selector switch setting can damage the unit when it is turned on. The selected voltage range (100 to 120V, or 200 to 240V) is visible through the small "window."



CAUTION:

Do not attempt to rotate the voltage selector cam while it is installed in the line module or non-repairable damage will result. The cam must be completely removed from the line module, rotated to the proper position, and reinstalled. Refer to the instruction below.

REPLACEMENT OF FUSE

1. Pry open line module cover door.
2. Pull out fuse carrier.
3. Insert fuse of proper rating.
4. Place carrier back into line module.

SELECTION OF OPERATING VOLTAGE

1. Pry open line module cover door.
2. REMOVE CAM FROM THE LINE MODULE.
3. Rotate the cam to the desired voltage. (When the line module cover is closed, the selected voltage will be visible through a small window).
4. Insert the cam back into the line module.
5. Close the line module cover door.

Figure 2-4. Setting the Voltage Selector Switch and Checking the Fuse

Checking the Fuse

The line fuse is housed in a small container in the rear-panel ac power module (see Figure 2-4).

Note



The ac line input fuse is the same value regardless of the input line voltage. It is rated at 1.0A, 250V. See Chapter 5 for the part number.

Checking the Power Cable

The HP 8348A is equipped with a three-wire power cable, in accordance with international safety standards. When connected to an appropriate power line outlet, this cable grounds the amplifier chassis.

Warning

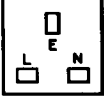

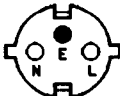


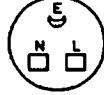
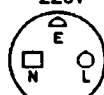
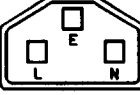


Failure to ground the amplifier properly can result in personal injury or death.

Before turning on the HP 8348A, you must connect its protective earth terminals to the protective conductor of the main power cable. Insert the main power cable plug only into a socket outlet that has a protective earth contact.

Do not **defeat the earth-grounding protection by using an extension cable, power cable, or auto transformer without a protective ground conductor. If you are using an auto transformer, make sure its common terminal is connected to the protective earth contact of the power source outlet socket.**

Various power cables are available to connect the HP 8348A to the types of ac power outlets unique to specific geographic areas. The cable appropriate for the area to which the amplifier is originally shipped is included with the unit. You can order additional ac power cables for use in different areas. Figure 2-5 lists the available ac power cables, illustrates the plug configurations, and identifies the geographic area in which each cable is appropriate.

PLUG TYPE ¹	CABLE HP PART NUMBER ²	PLUG DESCRIPTION ²	CABLE LENGTH (inches)	CABLE COLOR	FOR USE IN COUNTRY
250V 	8120-1351 8120-1703	Straight BS1363A 90°	90 90	Mint Gray Mint Gray	United Kingdom, Cyprus, Nigeria, Zimbabwe, Singapore
250V 	8120-1369 8120-0696	Straight ZNSS198/ASC112 90°	79 87	Gray Gray	Australia, New Zealand
250V 	8120-1689 8120-1692	Straight CEE7-VII 90°	79 79	Mint Gray Mint Gray	East and West Europe, Saudi Arabia, Egypt, Republic of So. Africa, India (unpolarized in many nations)
125V 	8120-1348 8120-1398 8120-1754 8120-1378 8120-1521 8120-1676	Straight NEMA5-15P 90° Straight NEMA5-15P Straight NEMA5-15P 90° Straight NEMA5-15P	80 80 36 80 80 36	Black Black Black Jade Gray Jade Gray Jade Gray	United States, Canada, Japan, (100V or 200V), Mexico, Philippines, Taiwan
250V 	8120-2104	Straight SEV1011.1959 24507, Type 12	79	Gray	Switzerland
250V 	8120-0698	Straight NEMA6-15P			United States, Canada
220V 	8120-1957 8120-2956	Straight DHCK 107 90°	79 79	Gray Gray	Denmark
250V 	8120-1860	Straight CEE22-VI (System Cabinet Use)			

1. E = Earth Ground; L = Line; N = Neutral.

2. Part number for plug is industry identifier for plug only. Number shown for cable is HP Part Number for complete cable including plug.

Figure 2-5. AC Power Cables Available

Operation

This chapter provides the following information:

	Page
A description of the front panel	3-2
A description of the rear panel	3-3
An operator's check	3-5

Note



The equipment required to perform the operator's check is illustrated in Figure 3-3. Refer to Table 4-1 for critical specifications and recommended model numbers. Other equipment may be substituted if it meets or exceeds the critical specifications listed.

Reducing ESD



- Before you connect a coaxial cable to an amplifier connector for the first time each day, momentarily ground the cable center and outer conductors.
 - Ground yourself with a resistor-isolated wrist strap before touching the center pin of *any* connector.
 - To prevent a buildup of static charge, ensure that all instruments are properly earth-grounded.
-

Front Panel Features

- ① **RF OUTPUT** 3.5 mm male connector supplies the amplified RF output from the amplifier. See Table 1-1 and Table 1-2 for detailed information.
- ② **RF INPUT** 3.5 mm male connector to apply an RF input to the amplifier. See Table 1-1 and Table 1-2 for detailed information.

Caution



The amplifier input is sensitive to static electricity. Ground any cable before you connect it. Also read “Electrostatic Discharge” in Chapter 2 and follow the recommendations provided.

- ③ **LINE** AC line switch. This switch turns the instrument primary power on and off.

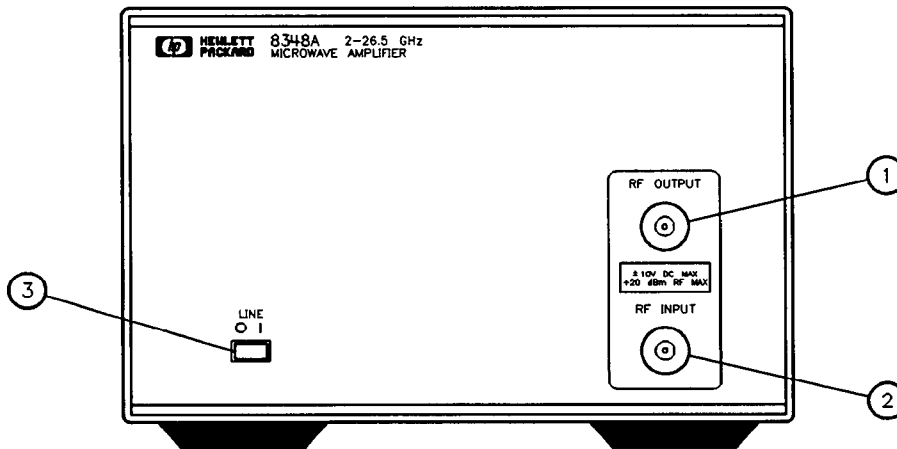


Figure 3-1. HP 8348A Front Panel

Rear Panel Features

- ① **AC POWER MODULE** Contains a three-wire ac power receptacle, a line voltage selector (100, 120, 200, or 240 volts), and a line fuse.
- ② **SERIAL NUMBER LABEL** Has a 10-digit serial number (use this in any correspondence concerning the instrument) and, if applicable, an option number.
- ③ **RF INPUT** Replaces the front panel RF input in options 001 and 002.
- ④ **RF OUTPUT** Replaces the front panel RF output in option 001.

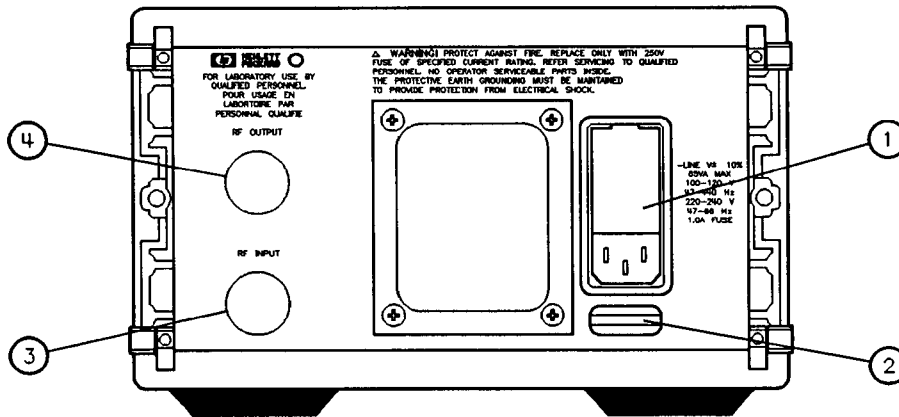


Figure 3-2. HP 8348A Rear Panel

Operator's Check

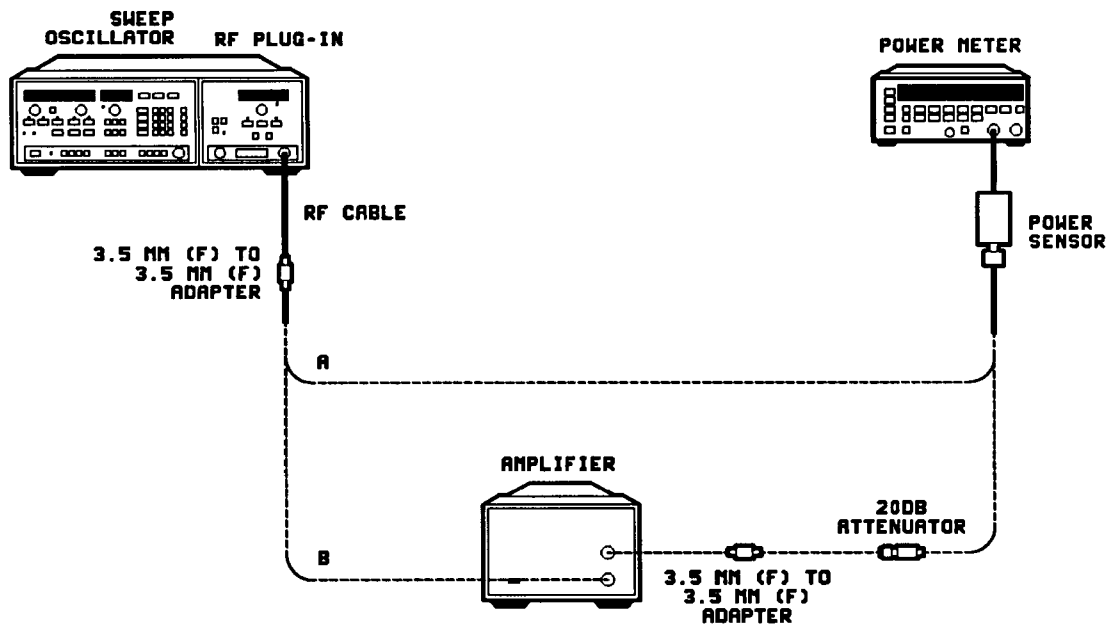


Figure 3-3. Operator's Check Test Setup

Description and Procedure

Use the operator's check to verify that the amplifier is operational. It is not intended to verify all specifications, but to verify basic operation by measuring the amplifier output power.

1. Calibrate the power meter:
 - a. Enter the power sensor calibration factor for 50 MHz (Ref CF).
 - b. Using the internal 50 MHz reference on the front panel of the power meter, calibrate the power sensor/power meter.
 - c. Enter the power sensor calibration constant at the CW frequency of interest.
 - d. Zero the power meter.
2. Connect the equipment as shown in Figure 3-3, point A, with the power sensor connected to the RF plug-in through a 3.5 mm(f) to 3.5 mm(f) adapter (without the amplifier, the second 3.5 mm(f) to 3.5 mm(f) adapter, or the 20 dB attenuator).
3. On the source:
 - a. Set a CW frequency between 2 and 20 GHz.
 - b. Set the power for a 0 dBm reading on the power meter.
4. Disconnect the power sensor from the adapter and connect the equipment as shown in Figure 3-3, point B, with the amplifier, the second 3.5 mm(f) to 3.5 mm(f) adapter, and the 20 dB attenuator connected between the first 3.5 mm(f) to 3.5 mm(f) adapter and the power sensor.
5. The power meter reading should be greater than 5 dBm (25 dBm – 20 dB).

6. Repeat the preceding steps with a CW frequency between 20 and 26.5 GHz. The power meter reading should be greater than 3 dBm (23 dBm – 20 dB).

In Case of Difficulty

If the amplifier fails this test, refer to Chapter 6 to troubleshoot the problem.

Performance Tests

This chapter provides the following information:

	Page
A list of test equipment.....	4-2
<p>Table 4-1 lists specifications and recommended model numbers of required test equipment. You may substitute other equipment if it meets or exceeds the critical specifications listed.</p>	
Instructions on what to do if the instrument fails a performance test	4-2
A test for maximum output power	4-3
<p>The specifications tested are listed in Table 1-1, and on the test record.</p>	
A test for small signal gain	4-7
<p>The specifications tested are listed in Table 1-1, and on the test record.</p>	
A test record.....	4-11
<p>Make a copy of Table 4-4, record the complete test results on the copy, and keep the copy for your calibration test record. This record can help you track gradual changes in test results over time.</p>	

Operator's Check



An operator's check is provided in Chapter 3. Use that check if you wish simply to verify that the amplifier is operational.

The equipment required for the operator's check is listed in Table 4-1. Other equipment may be substituted if it meets or exceeds the listed specifications.

Reducing ESD



- Before you connect a coaxial cable to an amplifier connector for the first time each day, momentarily ground the cable center and outer conductors.
 - Ground yourself with a resistor-isolated wrist strap before touching the center pin of *any* connector.
 - To prevent a buildup of static charge, ensure that all instruments are properly earth-grounded.
-

Table 4-1. Recommended Test Equipment

Instrument	Critical Specifications	Recommended HP Model or Part Number ¹	Use ²
RF Signal Source: Sweep Oscillator/RF Plug-in	Power Range: ≥ -15 dBm Frequency Range: 2.0 to 26.5 GHz	8350B with an 83595A Opt 002	O,P,T
Power Meter	Power Range: 1 μ W to 100 mW Accuracy: ± 0.02 dB	437A, or 438A	O,P,T
Power Sensor	Power Range: 1 μ W to 100 mW Frequency Range: 2.0 to 26.5 GHz	8485A	O,P,T
Adapter ³	3.5 mm(f) to 3.5 mm(f)	85027-60005	O,P,T
Attenuator	Attenuation: 20 dB	8493C Opt 020	O,P,T
Screwdriver	Phillips #0	8710-0978	T
Screwdriver	Small Pozi-driv	8710-0899	T
Screwdriver	Large Pozi-driv	8710-0900	T
Wrench	5/16-inch combination	8720-0015	T
Wrench	9/16-inch open-end	8720-0010	T
Wrench	5/8-inch open-end	8720-0010	T
Wrench	7-mm combination	8710-1258	T
Wrench	5/16 inch torque (8 in/lb)	8710-1765	T
Wire Cutter		8710-0012	T
Pliers	Long-nose	8710-0030	T
Cable	3.5 mm(f) to 3.5 mm(m), low-loss	08513-60009	O,P,T

¹ You may substitute other equipment if it meets or exceeds the critical specifications listed.

² O=Operator's Check; P=Performance Test; T=Troubleshooting

³ Two are supplied as accessories with the amplifier.

If the Amplifier Doesn't Meet Specifications

If the amplifier fails one or more specifications, complete all tests and record the results on a copy of the performance test record. Then refer to Chapter 6 for instructions on how to solve the problem.

Maximum Output Power

Description and Procedure

This performance test verifies worst-case output power.

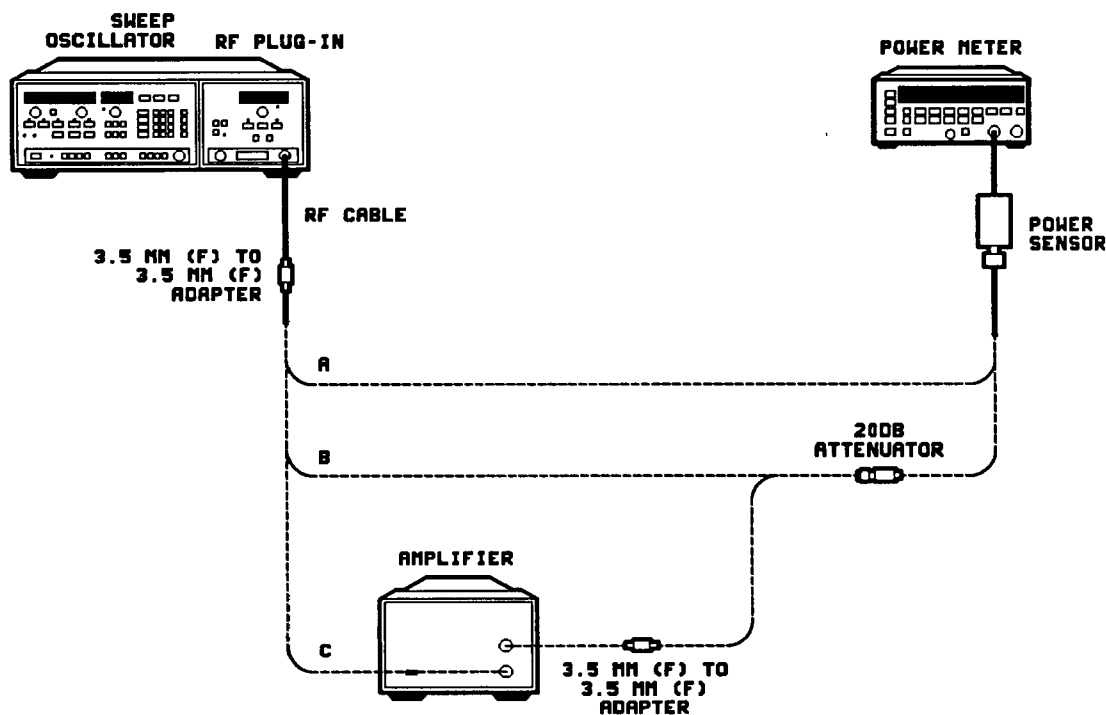


Figure 4-1. Maximum Output Power Test Setup

1. In column 2 of Table 4-2, record the power sensor calibration factors for the frequencies listed.
2. Calibrate the power meter:
 - a. Enter the power sensor calibration factor for 50 MHz (Ref CF).
 - b. Using the internal 50 MHz reference on the front panel of the power meter, calibrate the power sensor/power meter.
 - c. Zero the power meter.
3. Set the input power to the amplifier:
 - a. Connect the equipment as shown in Figure 4-1, point **A**, with the power sensor connected to the 3.5 mm(f) adapter (without the amplifier, the second 3.5 mm(f) adapter, or the 20 dB attenuator).
 - b. Set the source to a CW frequency of 2 GHz.
 - c. On the power meter, enter the calibration factor for the frequency to be measured (see Table 4-2).
 - d. Set the source power for a 0 dBm reading on the power meter.

Maximum Output Power

- e. In column 3 of Table 4-2, record the power reading displayed on the *source*.
- f. Repeat from step 3b for the remaining frequencies listed in Table 4-2.
4. Calculate the actual attenuation:
 - a. Connect the 20 dB attenuator between the adapter and the power sensor, as shown in Figure 4-1, point ③.
 - b. Set the source to a CW frequency of 2 GHz.
 - c. On the power meter, enter the calibration factor for the frequency to be measured (see Table 4-2).
 - d. Set the source power to the corresponding power value in *column 3* in Table 4-2.
 - e. Record the power meter reading in column 4.
 - f. Repeat from step 4b for the remaining frequencies.
 - g. In column 5, record the *absolute value* of numbers in column 4 (this gives the actual attenuation and will be used later).
5. Measure the amplifier output power:
 - a. Connect the equipment as shown in Figure 4-1, point ④, with the amplifier and the second 3.5 mm(f) adapter connected between the first 3.5 mm(f) adapter and the power sensor (you must use the same 20 dB attenuator as in the previous steps).
 - b. Set the source to a CW frequency of 2 GHz.
 - c. On the power meter, enter the calibration factor for the frequency to be measured (see Table 4-2).
 - d. Set the source power to the corresponding power value in *column 3* in Table 4-2.
 - e. Record the power meter reading in column 6.
 - f. Repeat from step 5b for the remaining frequencies.
 - g. Add the number in column 5 (the actual attenuation) to the number in column 6 (the amplifier output power) and record the sum in column 7.
6. On the test record, record the lowest value in column 7 for frequencies between 2 and 20 GHz.
7. On the test record, record the lowest value in column 7 for frequencies between 20 and 26.5 GHz.

Table 4-2. Maximum Output Power Data

1 Frequency (GHz)	2 Calibration Factor	3 Source Power (dBm)	4 Power Meter with 20 dB Pad	5 Actual Pad Attenuation	6 Output Power (dBm)	7 Actual Output (dBm)
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26.5						

Maximum Output Power

Small Signal Gain

Description and Procedure

This test measures the small signal gain of the amplifier over its frequency range. First, the source and power meter are connected without the amplifier in the circuit to establish a reference level. Then the amplifier is added to the circuit and the gain is compared to the original reference level.

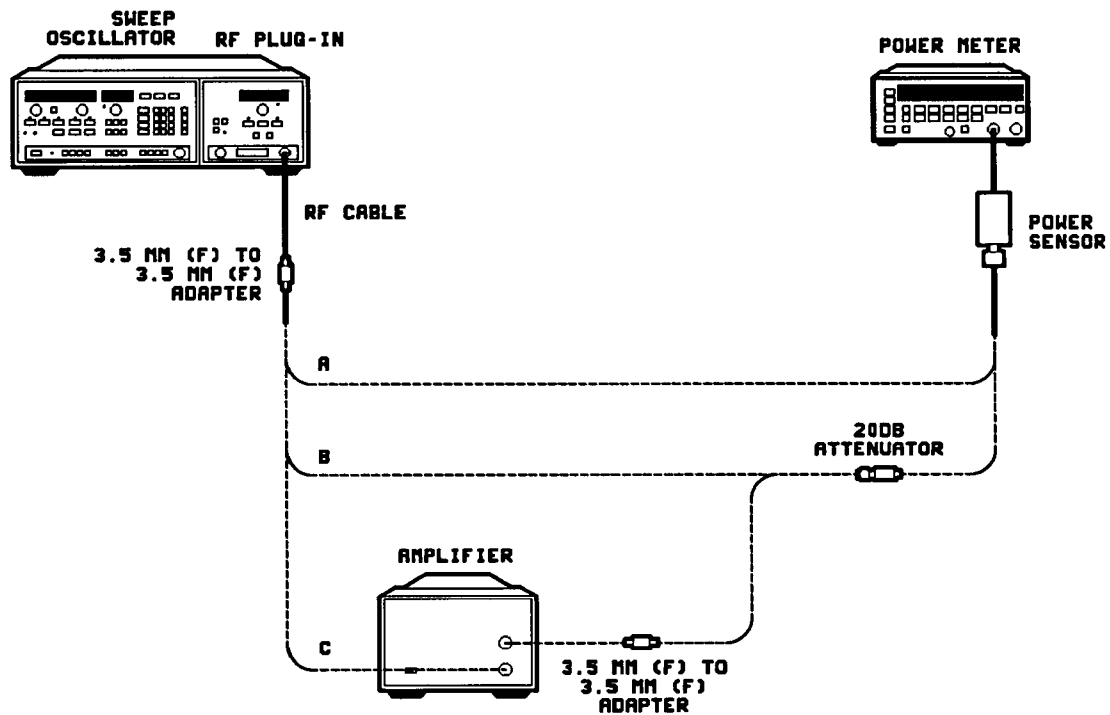


Figure 4-2. Small Signal Gain Test Setup

1. In column 2 of Table 4-3, record the power sensor calibration factors for the frequencies listed.
2. Calibrate the power meter:
 - a. Enter the power sensor calibration factor for 50 MHz (Ref CF).
 - b. Using the internal 50 MHz reference on the front panel of the power meter, calibrate the power sensor/power meter.
 - c. Zero the power meter.

Small Signal Gain

Table 4-3. Small Signal Gain Data

1 Frequency (GHz)	2 Calibration Factor	3 Source Power (dBm)	4 Power Meter with 20 dB Pad	5 Actual Pad Attenuation	6 Output Power (dBm)	7 Actual Output (dBm)
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26.5						

3. Set the input power to the amplifier:
 - a. Connect the equipment as shown in Figure 4-2, point **A**, with the power sensor connected to the 3.5 mm(f) adapter (without the amplifier, the second 3.5 mm(f) adapter, or the 20 dB attenuator).
 - b. Set the source to a CW frequency of 2 GHz.

- c. On the power meter, enter the calibration factor for the frequency to be measured (see Table 4-3).
 - d. Set the source power for a -15 dBm reading on the power meter.
 - e. In column 3 of Table 4-3, record the power reading displayed on the *source*.
 - f. Repeat from step 3b for the remaining frequencies listed in Table 4-3.
4. Calculate the actual attenuation:

Note

If you are using the same attenuator in this test that was used to test the maximum output power in the previous test, copy the information from column 5 of Table 4-2 to column 5 of Table 4-3, and go to step 5.

- a. Connect the 20 dB attenuator between the adapter and the power sensor, as shown in Figure 4-2, point Ⓑ.
 - b. Set the source to a CW frequency of 2 GHz.
 - c. On the power meter, enter the calibration factor for the frequency to be measured (see Table 4-3).
 - d. Set the source power to the corresponding power value in *column 3* in Table 4-3.
 - e. Record the power meter reading in column 4.
 - f. Repeat from step 4b for the remaining frequencies.
 - g. Add 15 dB to each value in column 4 and record the *absolute value* of the results in column 5 (this gives the actual attenuation and will be used later).
5. Measure the amplifier gain:
- a. Connect the equipment as shown in Figure 4-2, point Ⓒ, with the amplifier and the second 3.5 mm(f) adapter connected between the first 3.5 mm(f) adapter and the power sensor (you must use the same 20 dB attenuator as in the previous steps).
 - b. Set the source to a CW frequency of 2 GHz.
 - c. On the power meter, enter the calibration factor for the frequency to be measured (see Table 4-3).
 - d. Set the source power to the corresponding power value in *column 3* in Table 4-3.
 - e. Record the power meter reading in column 6.
 - f. Repeat from step 5b for the remaining frequencies.
 - g. Add the number in column 5 (the actual attenuation) to the number in column 6 (the amplifier output power) and record the sum in column 7.
6. Add 15 dB (subtract -15 dB) to the lowest value in column 7 for frequencies between 2 and 20 GHz and record that number on the test record.
7. Add 15 dB (subtract -15 dB) to the lowest value in column 7 for frequencies between 20 and 26.5 GHz and record that number on the test record.

Small Signal Gain

Table 4-4. HP 8348A Test Record (1 of 3)

Test Facility: _____	
_____	Report Number _____
_____	Date _____
_____	Customer _____
_____	Tested by _____
Model _____	Ambient temperature _____ °C
Serial Number _____	Relative humidity _____ %
Options _____	Line frequency _____ Hz (nominal)
Special Notes:	

Test Record

Table 4-4. HP 8348A Test Record (2 of 3)

Model _____	Report Number _____	Date _____	
Test Equipment Used	Model Number	Trace Number	Cal Due Date
1. RF Signal Source	_____	_____	_____
2. Power Splitter	_____	_____	_____
3. Power Sensor	_____	_____	_____
4. Power Meter	_____	_____	_____
5. _____	_____	_____	_____
6. _____	_____	_____	_____
7. _____	_____	_____	_____
8. _____	_____	_____	_____
9. _____	_____	_____	_____
10. _____	_____	_____	_____
11. _____	_____	_____	_____
12. _____	_____	_____	_____
13. _____	_____	_____	_____
14. _____	_____	_____	_____
15. _____	_____	_____	_____
16. _____	_____	_____	_____
17. _____	_____	_____	_____
18. _____	_____	_____	_____
19. _____	_____	_____	_____
20. _____	_____	_____	_____

Table 4-4. Test Record HP 8348A (3 of 3)

Model/Options:	Report Number:		Date:
Test Description	Specification (dBm)	Measured Results	Measurement Uncertainty ¹ (dB)
MAXIMUM OUTPUT POWER Frequency Range: 2.0 to 20 GHz 20 to 26.5 GHz	≥ 25 ≥ 23	_____	± 1.1
		_____	± 1.1

GAIN Frequency Range: 2.0 to 20 GHz 20 to 26.5 GHz	≥ 25 ≥ 23	_____	± 0.9
		_____	± 0.9

¹ Using the equipment and procedures documented in this manual. With HP 8485A power sensor calibration uncertainties listed in power sensor manual (table 2) — traceable to NBS.

Replaceable Parts and Accessories

This chapter provides the following information:

	Page
Instructions on how to order replacement parts by mail	5-2
Instructions on how to order replacement parts by phone	5-2
A list of exchange assemblies	5-3
A list of assembly replacement kits	5-3
A list of replaceable parts	5-4
An illustration of replaceable assemblies	5-5
A list of static-safe accessories, troubleshooting tools, and cleaning supplies	5-6

Reducing ESD



- Ground yourself with a resistor-isolated wrist strap before touching the center pin of *any* connector, and before removing *any* assembly from the instrument.
-

Ordering Parts

To order a part or assembly, provide the Hewlett-Packard part number and the quantity required; send the order to the nearest Hewlett-Packard sales and service office (see Table 6-5).

To order a part that is not listed in the replaceable parts table, include the instrument model number, a description and function of the part, and the number of parts required. Send the order to the nearest Hewlett-Packard sales and service office (Table 6-5).

Direct Mail Order System

Within the USA, Hewlett-Packard can supply parts through a direct mail order system. Mail order forms and specific ordering information are available through your local Hewlett-Packard sales and service office.

Advantages of using the mail order system are as follows:

- Direct ordering and shipment from the Hewlett-Packard parts center.
- No maximum or minimum order on any mail order (there is a minimum order quantity for parts ordered through a local HP office when the orders require billing and invoicing).
- Prepaid transportation (there is a small handling charge for each order).
- No invoices.

Direct Phone Order System

Within the USA, a phone order system is available for regular and hotline replacement parts service. A toll-free phone number is available, and Mastercard and Visa are accepted.

Regular Orders The toll-free phone number, (800) 227-8164, is available from 6 AM to 5 PM, Pacific time, Monday through Friday; a separate number, (415) 968-2347, is available after-hours, weekends, and holidays. Regular orders have a 4-day delivery time.

Hotline Orders Hotline service for ordering emergency parts is available 24 hours a day, 365 days a year. Hotline orders are normally delivered the following business day. There is an additional hotline charge to cover the cost of freight and special handling.

Exchange Assemblies

The following assemblies are available on an exchange basis. Exchange, factory-repaired and tested assemblies are available only on a trade-in basis; you must return the defective assembly for credit. See Table 6-5 for part numbers.

- A1 Amplifier (Std)
- A1 Amplifier (Opt 001)
- A1 Amplifier (Opt 002)

Assembly Replacement Kits

The amplifier (A1) and the power supply (A2) are available only as *fully-assembled* replacement kits. Table 5-1 lists the contents of each.

Note



The cables and connectors in this instrument are part of a *fully-assembled* amplifier replacement kit (see Table 5-1).

Table 5-1. Assembly Replacement Kit Contents

Replacement Kit	Comprises
A1 Amplifier	Amplifier Amplifier Bias Assemblies Input Cable Output Cable Input Connector Output Connector Sheet Metal Parts Heat Sink Attaching Hardware
A2 Power Supply	Regulator Assembly Transistors ICs Fuses Heat Sink Attaching Hardware

Table 5-2. Replaceable Parts

Reference Designator	Description	Qty	HP Part Number
A1 (Includes J1 & J2)	Amplifier Kit (Std)	1	08348-60001
	Exchange Amplifier Kit (Std)		08348-69001
	Amplifier Kit (Opt 001)	1	08348-60002
	Exchange Amplifier Kit (Opt 001)		08348-69002
	Amplifier Kit (Opt 002)	1	08348-60003
	Exchange Amplifier Kit (Opt 002)		08348-69003
A2	Power Supply Kit	1	08348-60004
A2F1	Fuse 3A 125V	1	82110-0332
A2F2,5	Fuse 2A 125V	2	2110-0425
A2F3,6,7	Fuse 0.75A 125V	3	2110-0424
A2F4	Fuse 4A 125V	1	2110-0476
A3	Motherboard Assembly	1	08348-60095
FL1	Line Module Filter	1	9135-0217
F1	Line Fuse	1	2110-0001
MP3	Top Cover	1	08349-60088
MP4	Bottom Cover	1	5062-3872
MP5	Bottom Feet	4	5041-8801
MP6	Front Frame	1	5021-8415
MP7	Rear Frame	1	08349-20043
MP8	Trim Side	2	5001-0539
MP9	Strap Assembly	1	5062-3702
MP10	Front Panel	1	08348-00001
MP11	Rear Panel	1	08348-00005
MP12	Pushbutton Rod	1	08349-20012
MP13 (part of J1 & J2)	3.5 mm(m) Bulkhead Connector	2	5061-5316
MP14 (part of J1 & J2)	Washer	2	2190-0104
MP15 (part of J1 & J2)	Nut	2	2950-0132
MP16 (part of J1 & J2)	Spacer	2	83595-20004
MP17	Front Panel Plug (painted)	2	08348-20006
MP18	Rear Panel Plug (black)	2	6960-0024
Packaging Material	Outer Carton	1	9211-4893
	Foam Pads	2	5180-7809
S1	Switch-PB DPST	1	3101-2779
T1	Power Transformer	1	9100-4481
W1 (part of J1) W2 (part of J2)	Power Cable see Figure 2-5	1	
	Output Cable	1	08348-20002
	Input Cable (Std)	1	08348-20001
	Input Cable (Opt 001)	1	08348-20003
	Input Cable (Opt 002)	1	08348-20004

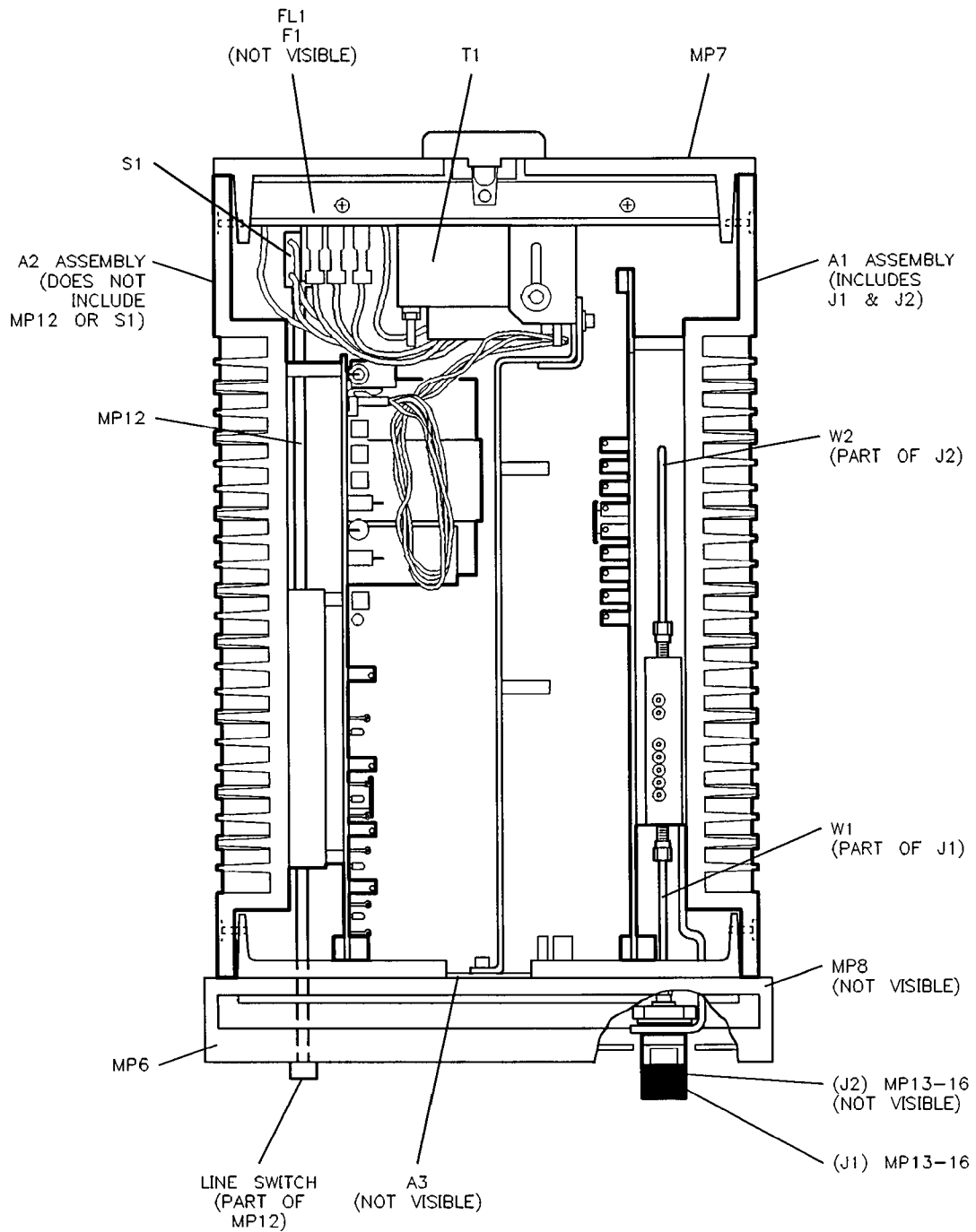


Figure 5-1. HP 8348A Assembly Locations

Table 5-3. Accessories and Cleaning Supplies

Item	Description	HP Part Number
Adapter ¹	3.5 mm(f) to 3.5 mm(f)	85027-60005
Touch-up paint	Dove gray (front frame)	6010-1146
	French gray (covers, heat sinks)	6010-1147
Static-control mat & ground wire	Set includes: 3M static-control mat, 0.6m x 1.2m (2 ft x 4 ft) Ground wire, 4.6m (15 ft) (The wrist strap and wrist-strap cord are <i>not</i> included. They must be ordered separately.)	9300-0797
Wrist strap	Black, stainless steel with 4 adjustable links and 7-mm post-type connector (The wrist-strap cord is <i>not</i> included).	9300-1383
Wrist-strap cord	1.5m (5 ft)	9300-0980
ESD heel strap	Reusable 6 to 12 months	9300-1169
Hard-surface static-control mat	Large, black, 1.2m x 1.5m (4 ft x 5 ft)	92175A
	Small, black, 0.9m x 1.2m (3 ft x 4 ft)	92175C
Soft-surface static-control mat	Brown, 1.2m x 2.4m (4 ft x 8 ft)	92175B
Tabletop static-control mat	58 cm x 76 cm (23 in x 30 in)	92175T
Antistatic carpet	Small, 1.2m x 1.8m (4 ft x 6 ft)	
	Natural color	92176A
	Russet color	92176C
	Large, 1.2m x 2.4m (4 ft x 8 ft)	
	Natural color	92176B
	Russet color	92176D
Compressed air		8500-5262
Isopropyl alcohol	30 ml squeeze bottle 99.5% pure	8500-5344
Foam swabs	500	9300-1270

¹ Two included with the instrument.

Service

This chapter provides the following information:

	Page
How to fix simple problems	6-3
How to isolate a problem to an assembly	6-5
How to check the power supply	6-6
How to adjust the regulator assembly	6-10
How to test the amplifier microcircuit	6-11
How to remove and replace assemblies	6-12
How to clean 3.5 mm connectors	6-18
A list of HP sales and service offices	6-19

Caution



This instrument contains static-sensitive components. Read the electrostatic discharge information in “Electrostatic Discharge” in Chapter 2 before you remove any assembly.

Troubleshooting Tools

Table 4-1 lists the tools you may need to troubleshoot the amplifier.

Assembly Locations

Figure 6-1 shows the location of the amplifier microcircuit and the power supply.

Caution



Avoid bending or distorting any semi-rigid cables when you remove or reinstall assemblies. Loosening the cables can cause power holes. Follow the procedures *exactly*.

Initial Troubleshooting

You can often solve a problem by rechecking what you were doing when the problem occurred. A few minutes spent performing simple checks can save you unnecessary downtime. Before you call Hewlett-Packard or return the amplifier for service, make the following checks:

- Is the amplifier connected to the proper ac power source?
- Does the line receptacle have power?
- Is the rear-panel voltage selector switch set correctly?
- Is the line fuse intact?
- Is the amplifier turned on?
- Are the four LEDs on the power supply regulator lit?

If not, go to “Checking the Fuses”.

- Are both 3.5 mm RF connectors clean and undamaged?

If a connector is dirty, go to “Cleaning 3.5 mm Connectors”, then go to chapter 4 and run the performance tests. Cleaning the connectors may solve the problem.

If a connector is damaged, go to “Removing and Replacing an RF Connector Assembly”, then go to chapter 4 and run the performance tests. Replacing the damaged connector may solve the problem.

- Are the equipment, cables, and connectors used with the amplifier connected properly and operating correctly?
- Review the test procedure you were following when the problem appeared. Are all switch settings correct?

If the answer to *all the above* is yes, and the amplifier is still not working properly, go to “Assembly-Level Troubleshooting”.

Reducing ESD



- Before you connect a coaxial cable to an amplifier connector for the first time each day, momentarily ground the cable center and outer conductors.
 - Ground yourself with a resistor-isolated wrist strap before touching the center pin of *any* connector, and before removing *any* assembly from the instrument.
 - To prevent a buildup of static charge, ensure that all instruments are properly earth-grounded.
-

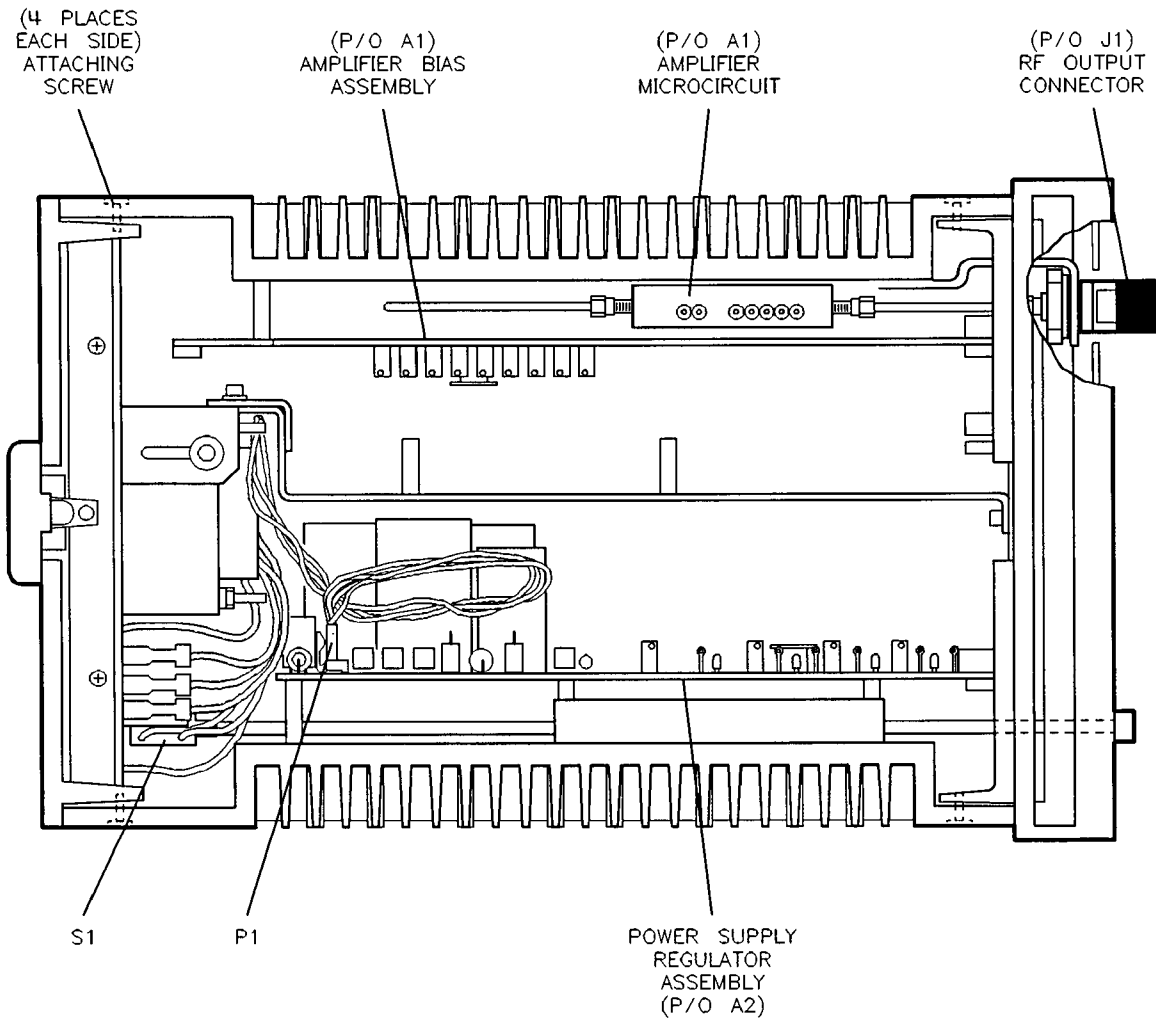


Figure 6-1. Assembly Locations

Assembly-Level Troubleshooting

The first step in troubleshooting is to check the items listed under “Initial Troubleshooting”. If the amplifier is still not working properly, continue with this section.

The amplifier has two basic internal elements (see Figure 6-2):

1. The amplifier microcircuit.
2. The power supply.

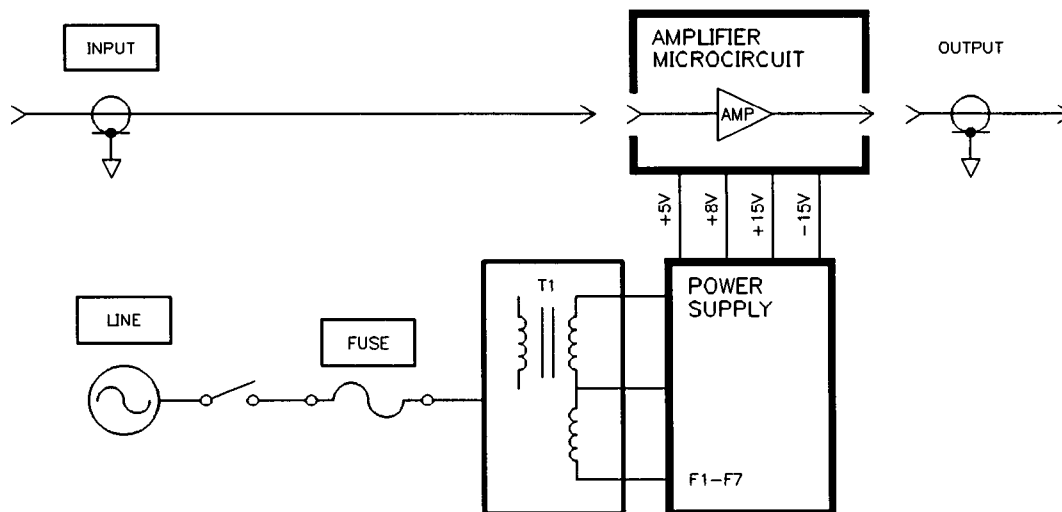


Figure 6-2. HP 8348A Amplifier Block Diagram

Except for the power supply fuses, neither of these elements is repairable. Each is also part of a larger unit, and that larger unit must be replaced if a component part fails (see Table 5-1). Begin troubleshooting with “Step 1. Run the Performance Tests”.

Step 1. Run the Performance Tests

Perform the tests in Chapter 4, and record *all* test results (for a quicker approximation of microcircuit operation, test only the low, high, and mid-frequency levels). If the performance tests fail, continue with “Step 2. Test the Power Supply”.

Step 2. Test the Power Supply

Warning



Service of this instrument should be performed only by trained personnel. Use extreme care; the exposed terminals on the power supply transformer carry ac line voltage; you can be killed or seriously injured if you contact them when power is applied.

Checking the Fuses

1. Are *all four* LEDs at the top of the power supply regulator assembly lit (you can see them through the top cover)? If they are, go to “Checking the Regulator Assembly Voltages”. If not, continue with step 2.
 2. Turn the amplifier off.
 3. Disconnect any input RF to the amplifier.
 4. Disconnect the amplifier from line power.
 5. Remove the top cover.
-

Caution



Do not remove the instrument handle screw that is closest to the front panel (refer to “Removing the Top Cover”).

6. Refer to Figure 6-3. Using long-nose pliers to remove the fuses, check each one and replace any that are open.
7. Reconnect the amplifier to line power.
8. Turn on the amplifier.
9. Are *all four* LEDs at the top of the power supply regulator assembly lit? If they are, replace the top cover and go to “Step 1. Run the Performance Tests”. If not, continue with “Checking the Transformer”.

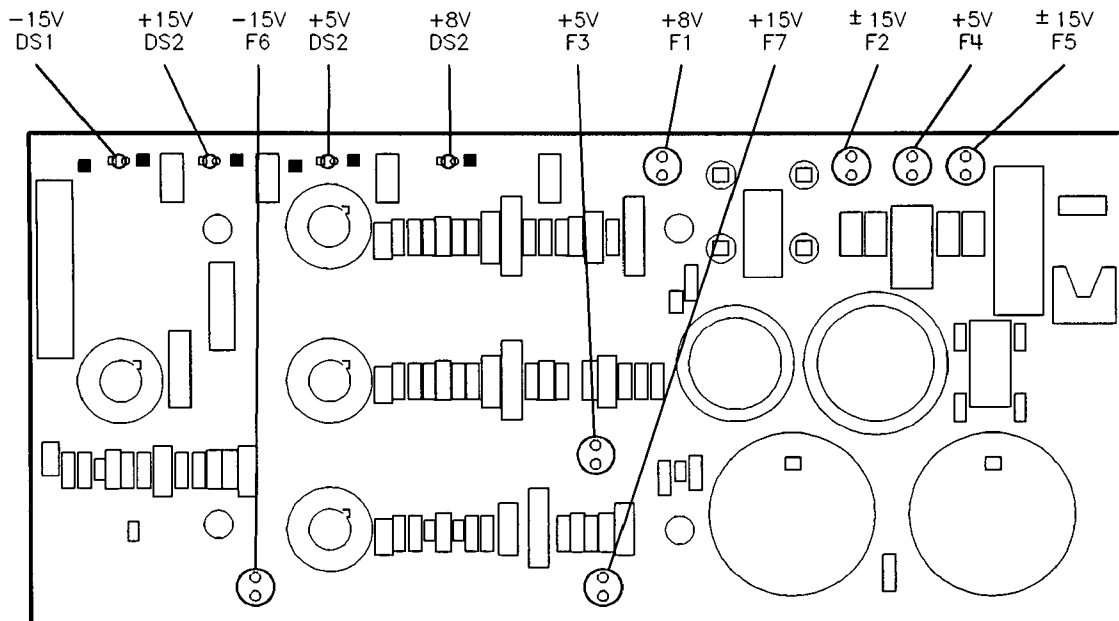


Figure 6-3. Power Supply LED and Fuse Locations

Assembly-Level Troubleshooting

Checking the Transformer

1. Turn the instrument off.
2. Disconnect any RF input to the amplifier.
3. Disconnect the amplifier from line power.
4. Remove the top cover.
5. Remove the transformer connector (P1) from the regulator assembly.
6. Reconnect the amplifier to line power and turn the instrument on.
7. Measure the points listed in Table 6-1. If any value is incorrect, replace the transformer and run the performance tests in chapter 4.
8. If the values are correct, continue with "Checking the Regulator Assembly Voltages".

Table 6-1. Transformer Voltage Values

P1 Pins	Correct Value (V_{pp})	Supply Checked (Vdc)
1 and 2	±13	+8
3 and 4	±13	+5
5 and 6	±22	±15

Checking the Regulator Assembly Voltages

1. Turn the instrument off.
2. Disconnect any RF input to the amplifier.
3. Disconnect the amplifier from line power.
4. Remove the top cover.
5. Reconnect the amplifier to line power and turn the instrument on.
6. Measure the points listed in Table 6-2. If any value is incorrect, go to "Step 3. Adjust the Regulator Assembly".

Table 6-2. Regulator Assembly Voltage Values

Reference Point	Measured Point	Correct Value (Vdc)
TP1	TP2	-15 ±0.015
	TP3	+15 ±0.015
	TP6	+8 ±0.015
TP4	TP5	+5 ±0.015

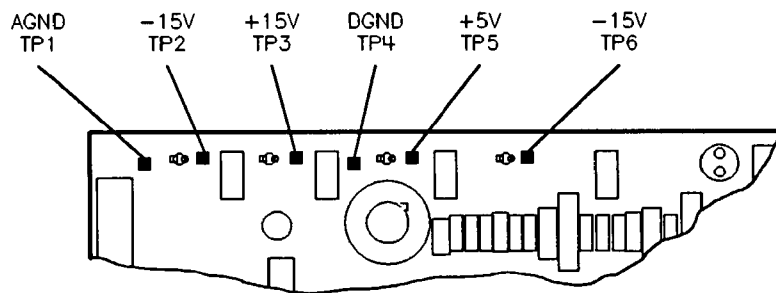


Figure 6-4. Power Supply Regulator Test Point Locations

Step 3. Adjust the Regulator Assembly

1. Ensure that there is no RF input to the amplifier.
2. Ensure that the amplifier is connected to line power.
3. Turn on the amplifier.
4. Make the adjustments listed in Table 6-3.

Table 6-3. Power Supply Regulator Voltage Adjustments

Reference Point	Measured Point	Adjustment	Value (Vdc)
TP1	TP2	R36	-15 ±0.002
	TP3	R39	+15 ±0.002
	TP6	R35	+8 ±0.002
TP4	TP5	R38	+5 ±0.005

5. Return to "Checking the Regulator Assembly Voltages" and recheck the values.
6. If you cannot bring the power supply regulator assembly output voltages within tolerance, replace the complete power supply assembly (A2).
7. If the voltages are correct and the performance test results still are not within specification, check the RF cable connections. If problems still persist, continue with "Step 4. Check the Amplifier Microcircuit Bias".

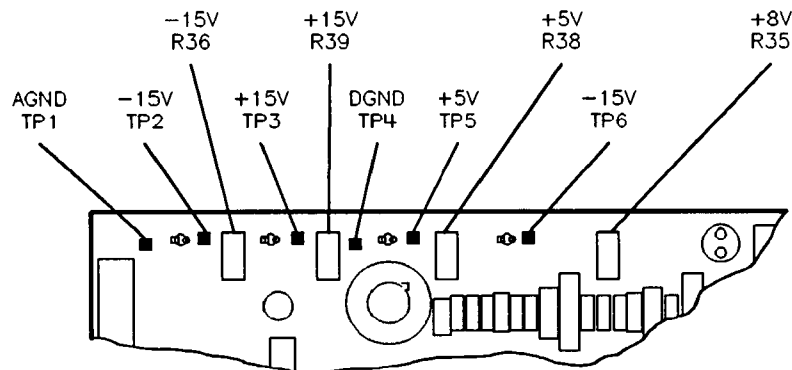


Figure 6-5. Power Supply Regulator Test Point and Adjustment Locations

Step 4. Check the Amplifier Microcircuit Bias

1. Turn the instrument off.
2. Disconnect any RF input to the amplifier.

Note To successfully troubleshoot the amplifier microcircuit, it is *critical* that you remove any RF input to the instrument.



3. Disconnect the amplifier from line power.
4. Remove the top cover.
5. Reconnect the amplifier to line power.
6. Turn on the amplifier.
7. Measure the points listed in Table 6-4. If any value is incorrect, replace the amplifier microcircuit (see “Removing and Replacing the A1 Assembly”) and return to “Step 1. Run the Performance Tests”.
8. If all measurements are correct but the instrument still does not meet specifications, suspect the RF input and output connector assemblies.

Table 6-4. Amplifier Bias Voltage and Current Values

Reference Point	Measured Point	Correct Value	
		(Vdc) ¹	(mA) ¹
TP1	TP2	0.75	250
	TP3	0.225	225
	TP4	0.225	450
	TP5	0.23	460
	TP6	0.23	460
	TP7	8.0 ±0.05	—

¹ With no RF input applied to the instrument.

Removing & Replacing Assemblies

Removing and Replacing Assemblies

Removing the Top Cover

Use the following procedure to remove the instrument's top cover.

Caution Do not remove the instrument handle screw that is closest to the front panel.



1. Remove the *rear* screw on the instrument handle (see Figure 6-6).

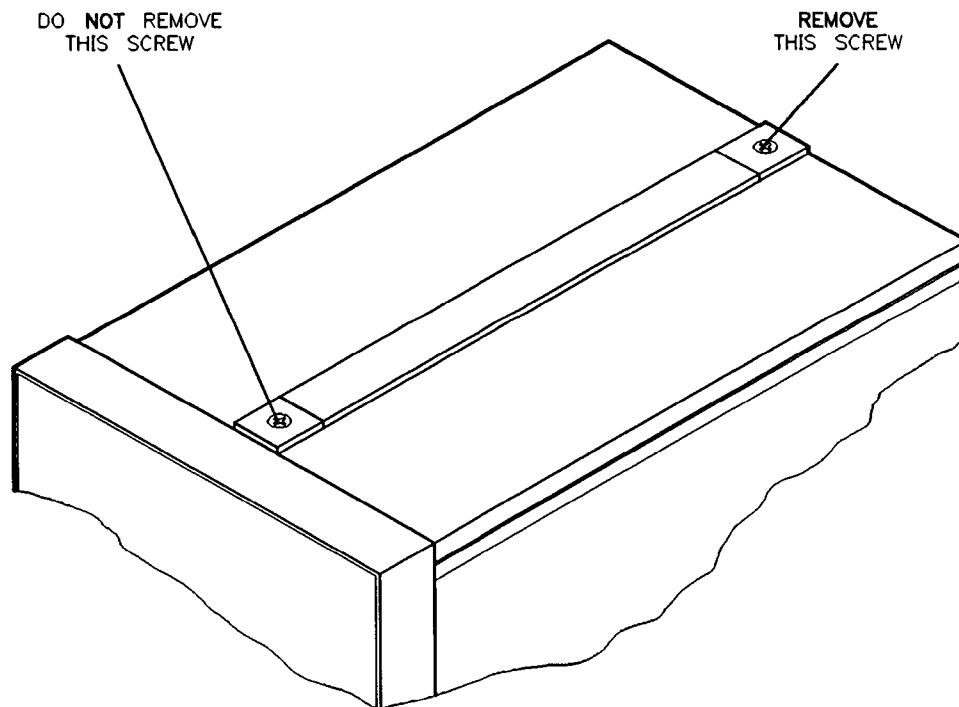


Figure 6-6. Locating the Top Cover Screw

2. Set both the screw and the plastic end-piece aside (Figure 6-7(A)).
3. Place just the tip of the screwdriver down through the hole in the instrument handle (Figure 6-7(B)).
4. Using the screwdriver as a lever, carefully slide the top cover out from under the front panel casting.
5. Lift the top cover off the instrument from the *front* edge.

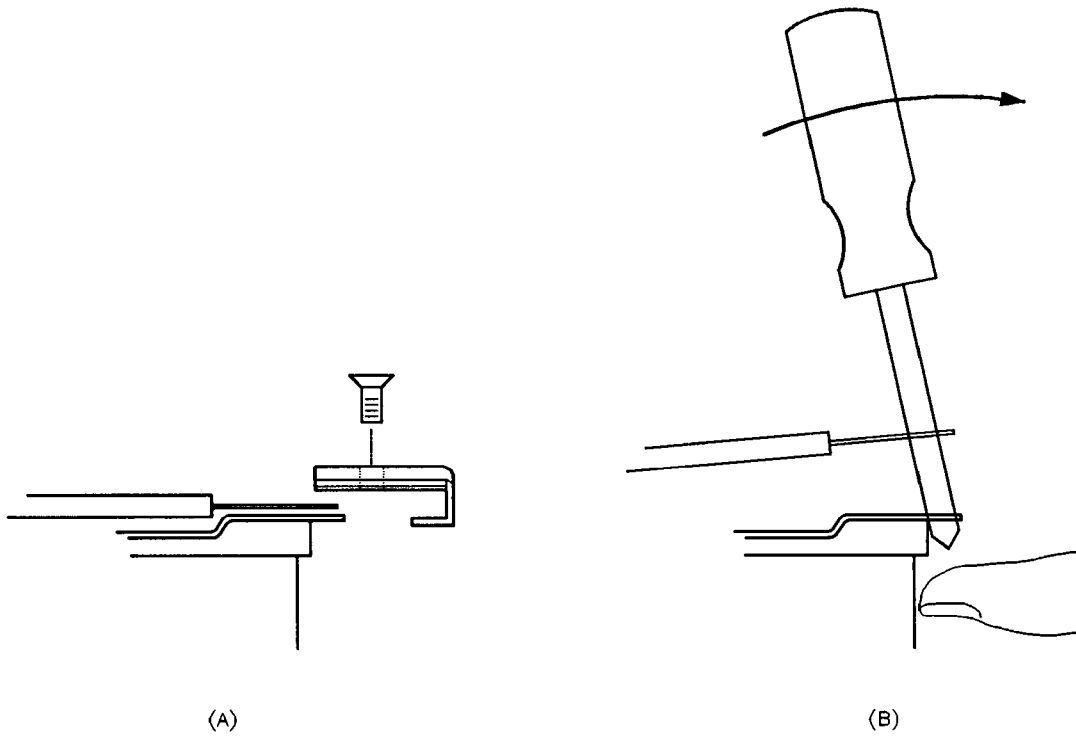


Figure 6-7. Removing the Top Cover

Removing & Replacing Assemblies

Removing and Replacing the Power Supply Assembly

1. Refer to Figure 6-8.
2. Disconnect the transformer from the power supply regulator assembly (P1).
3. Remove the four screws that attach the side casting to the front and rear castings (see ③, two places).

Caution Be careful not to damage S1 as you perform the next step.



4. Carefully slide out the assembly, pulling at an angle, toward the rear of the instrument.
5. To reinstall the assembly, reverse this procedure.

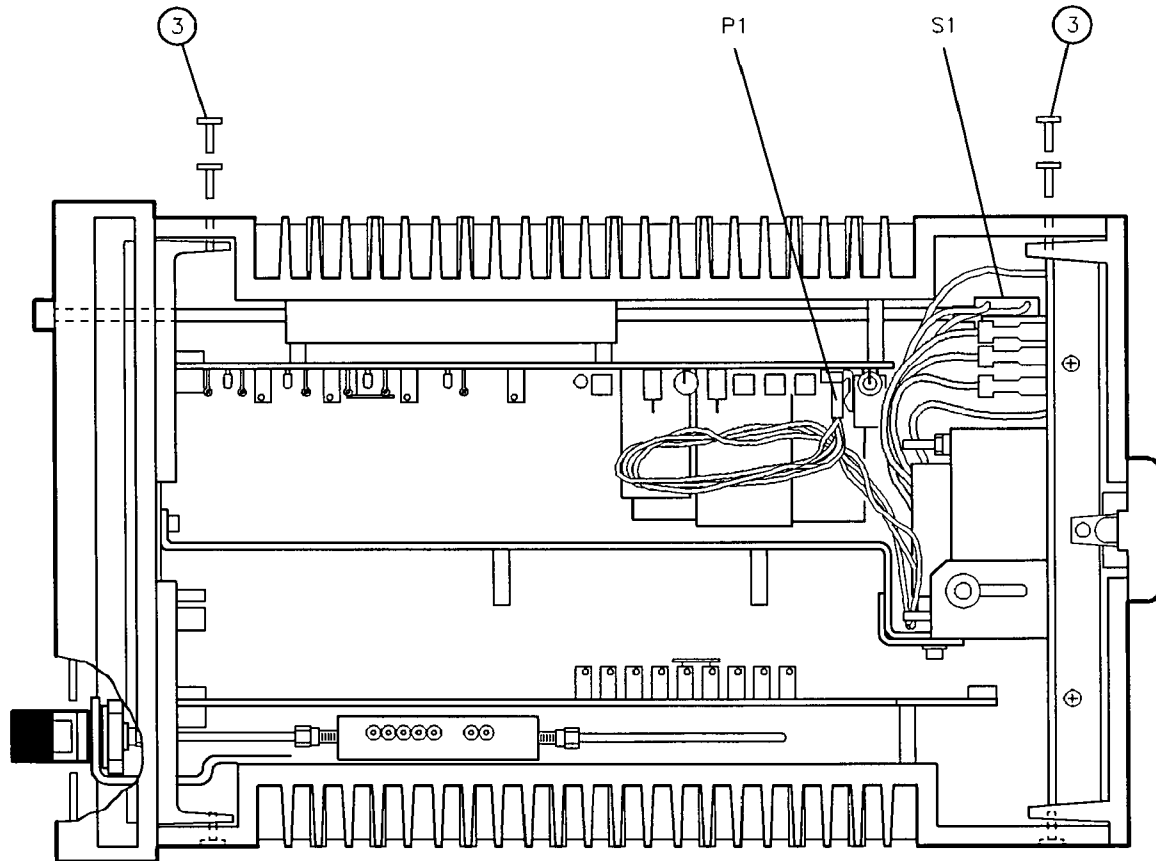


Figure 6-8. Removing the Power Supply Assembly

Removing and Replacing the A1 Assembly

1. Place the instrument on its right side, as shown in Figure 6-9.
2. Remove the four screws that attach the side casting to the front and rear castings (see ②).
3. *Partially* disconnect the amplifier bias assembly from the motherboard connector (see ③).
4. Lift the assembly up so that the amplifier bias assembly clears the rear casting (see ④).
5. Completely disconnect the amplifier bias assembly from the motherboard connector, and pull the assembly straight out. Be very careful as you move the RF connectors through the front panel (see ⑤).
6. To reinstall the new assembly, reverse this procedure.

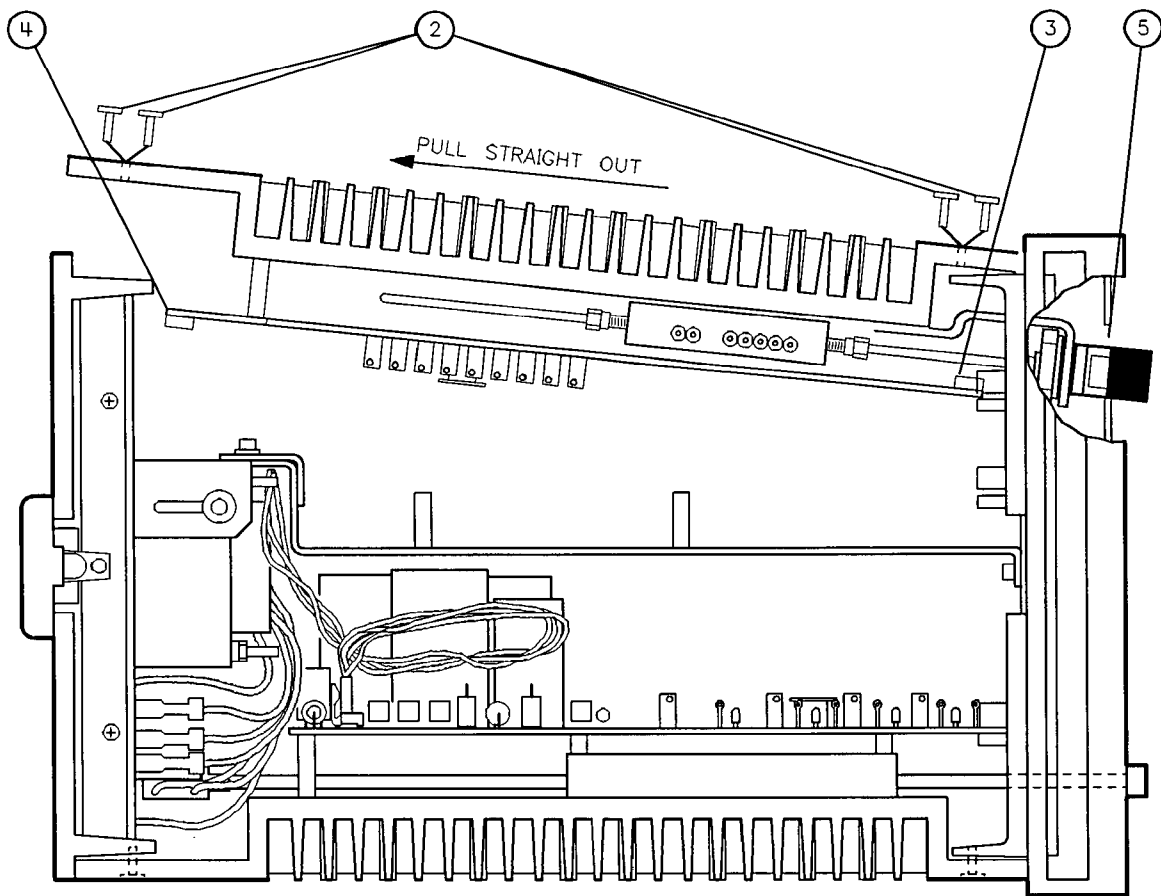


Figure 6-9. Removing the A1 Assembly

Removing & Replacing Assemblies

Removing and Replacing an RF Connector Assembly

1. Remove the A1 assembly (see "Removing and Replacing the A1 Assembly").
2. Refer to Figure 6-10.
3. To remove either RF connector:
 - a. At the connector-end, *loosen* the RF cable.
 - b. Disconnect the large nut behind the connector bracket.
 - c. Slide off the large nut and washer.
 - d. Loosen the cable at the microcircuit end.
 - e. Gently rocking the connector to disengage it from the cable, slide the connector and spacer out the front of the connector bracket.
4. To reinstall a connector assembly, reverse this procedure.

Note



When you slide the connector into the bracket, ensure that the flat on the threaded portion of the connector lines up properly with the flat portion of the hole in the bracket (refer to Figure 6-11).

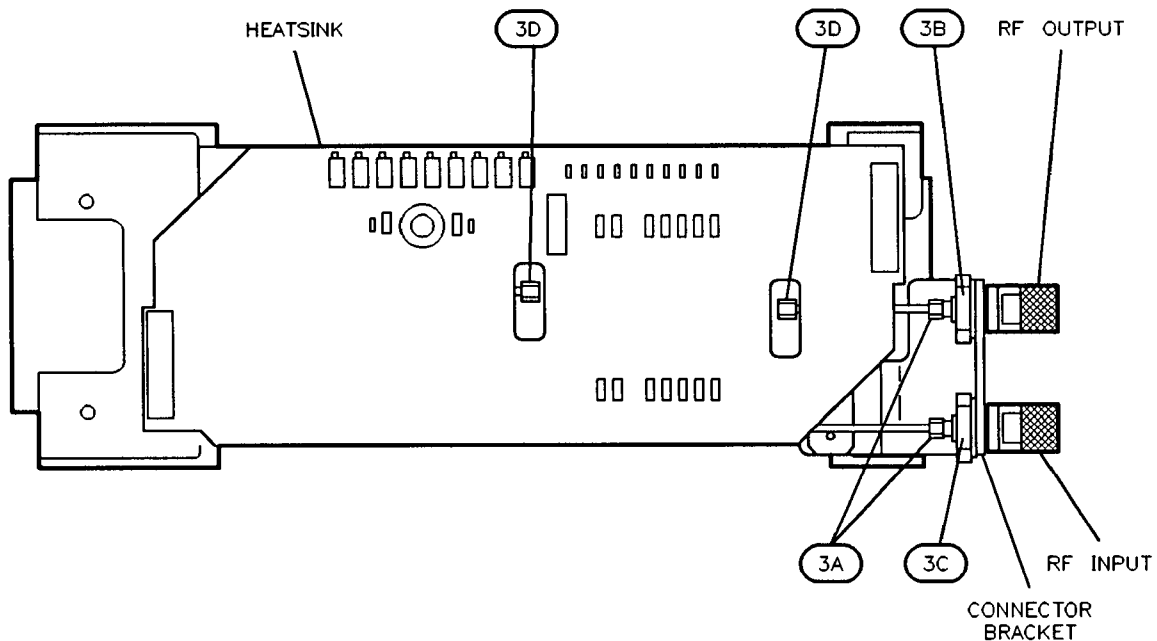


Figure 6-10. Removing a Connector Assembly

Removing & Replacing Assemblies

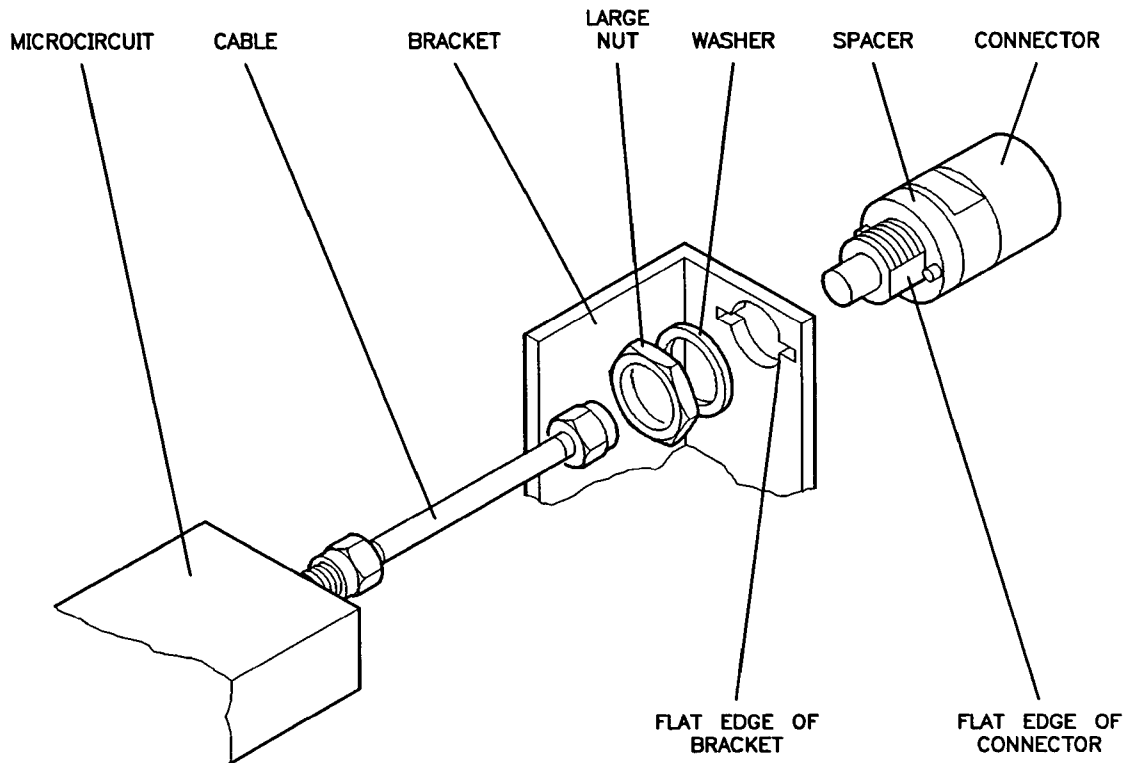


Figure 6-11. Connector Assembly Details

Preventive Maintenance

Cleaning 3.5 mm Connectors

To assure long, reliable connector life carefully clean all connectors. Part numbers for recommended cleaning supplies are listed in Chapter 5.

1. Try compressed air first.

Use compressed air to loosen particles on the connector mating plane surfaces. Clean air cannot damage a connector, or leave particles or residues behind.

2. If a solvent is necessary, use *only* isopropyl alcohol.

If there is dirt or stubborn contaminants on a connector that you cannot removed with compressed air, try a foam swab or lint-free cleaning cloth moistened with isopropyl alcohol.

- a. Use the smallest amount of alcohol possible.
- b. Do not wet any plastic parts in the connectors with the alcohol.
- c. Never spray alcohol directly into a connector.