Agilent Technologies

OPERATION AND SERVICE MANUAL

11975A AMPLIFIER

SERIAL NUMBERS

This manual applies directly to instruments with serial numbers prefixed 2304A.

For additional important information about serial numbers, see INSTRUMENTS COVERED BY MANUAL in Section I.

1424 FOUNTAIN GROVE PARKWAY, SANTA ROSA, CALIFORNIA, 95401, U.S.A.

MANUAL PART NO. 11975-90001
Microfiche Part No. 11975-90002

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Notice

Hewlett-Packard to Agilent Technologies Transition

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. To reduce potential confusion, the only change to product numbers and names has been in the company name prefix: where a product name/number was HP XXXX the current name/number is now Agilent XXXX. For example, model number HP8648 is now model number Agilent 8648.

Contacting Agilent Sales and Service Offices

The sales and service contact information in this manual may be out of date. The latest service and contact information for your location can be found on the Web at:

`http://www.agilent.com/find/assist`

If you do not have access to the Internet, contact your field engineer or the nearest sales and service office listed below. In any correspondence or telephone conversation, refer to your instrument by its model number and full serial number.

United States
(tel) 1 800 452 4844
(fax) 1 800 829 4433

Canada
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(fax) +1 888 900 8921

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Agilent Technologies

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SAFETY CONSIDERATIONS

Safety Symbols

The following safety symbols are used throughout this manual and in the instrument. Familiarize yourself with each of the symbols and its meaning before operating this instrument.

Instruction manual symbol: the apparatus will be marked with this symbol when it is necessary for the user to refer to the instruction manual in order to protect the apparatus against damage.

Indicates dangerous voltages.

CAUTION

The CAUTION sign denotes a hazard. It calls attention to an operation 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 equipment. Do not proceed beyond a CAUTION sign until the indicated conditions are fully understood and met.

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 injury or loss of life. Do not proceed beyond a WARNING sign until the indicated conditions are fully understood and met.

Operation

WARNING

BEFORE THIS INSTRUMENT IS SWITCHED ON, its rear panel power module protective earth terminal must be connected through the protective conductor of the ac power cable to a socket outlet provided with protective earth contact. Failure to ground the instrument can result in personal injury.

WARNING

The HP Model 11975A Amplifier should not be operated without protective covers. Adjustments, performance tests, and service procedures which require operation of the HP Model 11975A with the covers removed should be performed only by trained service personnel.

CAUTION

BEFORE THIS INSTRUMENT IS SWITCHED ON, make sure that its rear panel power module switch is set to the voltage of the ac power source. Failure to set the ac power input to the correct voltage could cause damage to the instrument when the ac power cable is plugged in.

Service and Adjustments

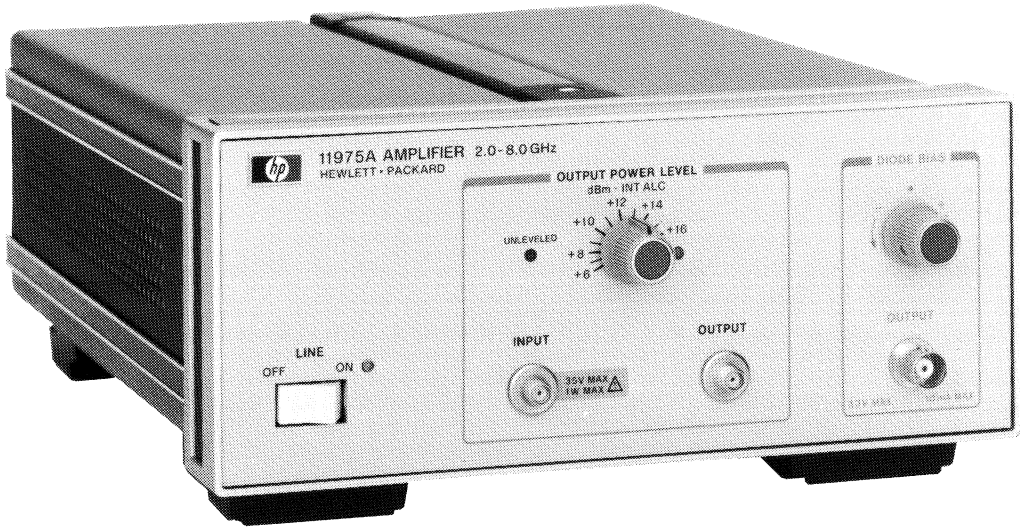
WARNING

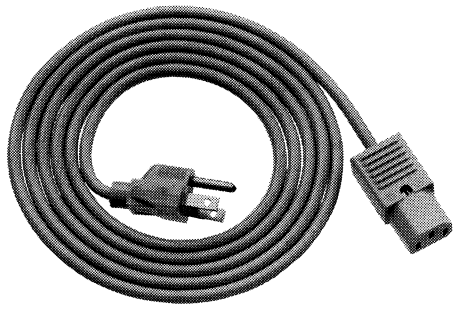
There are voltages at many points in the instrument which can, if contacted, cause personal injury. Be extremely careful. Service and adjustments should be performed only by trained service personnel.

WARNING

Any interruption of the protective (grounding) conductor, inside or outside the instrument, or disconnection of the protective earth terminal may cause personal injury.

11975A





LINE POWER CABLE
(See Table 2-2 for HP Part Number)

Figure 1-1. HP Model 11975A Amplifier with Accessories Supplied

SECTION I
GENERAL INFORMATION

1-1. INTRODUCTION

1-2. This manual contains all information required to install, operate, test, adjust, and service the Hewlett-Packard Model 11975A Amplifier. Figure 1-1 (opposite this page) shows the standard instrument and accessories supplied. Differences between this standard instrument and Option 001 are discussed later in this section.

1-3. Listed on the title page of this manual, below the manual part number, is a microfiche part number. This number can be used to order 4x6-inch microfilm transparencies. Each transparency contains up to 60 photoduplicate manual pages. The microfiche package also includes the latest Manual Changes supplement.

1-4. Where text changes are required in this manual to reflect Option 001, these changes are shown in italic type immediately following applicable text. Notes are also included in tables and illustrations where users of Option 001 need to be informed of differences from the standard instrument. Users of the standard instrument should ignore references to Option 001.

1-5. MANUAL ORGANIZATION

1-6. This manual is divided into eight sections as follows:

SECTION I, GENERAL INFORMATION, contains the instrument description and specifications, explains accessories and options, and lists recommended test equipment.

SECTION II, INSTALLATION, contains information concerning initial mechanical inspection, preparation for use, operating environment, packaging and shipping.

SECTION III, OPERATION, contains instructions for operation of the instrument.

SECTION IV, PERFORMANCE TESTS, contains the necessary tests to verify that the electrical operation of the instrument is in accordance with published specifications.

SECTION V, ADJUSTMENTS, contains the necessary adjustment procedures to properly adjust the instrument after repair.

SECTION VI, REPLACEABLE PARTS, contains the information necessary to order parts and/or assemblies for the instrument.

SECTION VII, MANUAL BACKDATING CHANGES, contains backdating information to make this manual compatible with earlier equipment configurations, if such configurations exist.

SECTION VIII, SERVICE, contains schematic diagrams, block diagrams, component location illustrations, circuit descriptions, and troubleshooting information to aid in repair of the instrument.

1-7. INSTRUMENTS COVERED BY MANUAL

1-8. Serial Numbers

1-9. Attached to the rear of your instrument is a serial number label (see Figure 1-2). The serial number is in two parts. The first four digits and the letter are the serial number prefix; the last five digits are the suffix. The prefix is the same for all identical instruments; it changes only when a change is made to the instrument. The suffix, however, is assigned sequentially and is different for each instrument. The contents of this manual apply to instruments with the serial number prefix(es) listed under SERIAL NUMBERS on the title page.

Figure 1-2. Typical Serial Number Plate

1-10. Manual Changes Supplement

1-11. An instrument manufactured after the printing of this manual may have a serial number prefix that is not listed on the title page. This unlisted serial number prefix indicates the instrument is different from those described in this manual. The manual for this newer instrument is accompanied by a yellow Manual Changes supplement. This supplement contains change information which tells you how to adapt the manual to the newer instrument.

1-12. In addition to change information, the supplement may contain information for correcting errors in the manual. To keep this manual as current and accurate as possible, Hewlett-Packard recommends that you periodically request the latest Manual Changes supplement. The supplement for this manual is identified with this manual's print date and part number, both of which appear on the manual title page. Complementary copies of the supplement are available from your nearest Hewlett-Packard office. Addresses of major offices worldwide are listed on the inside rear cover of this manual.

1-13. For information concerning a serial number prefix that is not listed on the title page or in the Manual Changes supplement, contact your nearest Hewlett-Packard office.

1-14. Manual Backdating Changes

1-15. Instruments manufactured before the printing of this manual have been assigned serial number prefixes other than those for which this manual was written directly. Manual backdating information is provided in Section VII to adapt this manual to any such earlier assigned serial number prefix.

1-16. This information should not be confused with information contained in the yellow Manual Changes supplement, which is intended to adapt this manual to instrument changes which occurred after its printing.

1-17. SAFETY CONSIDERATIONS

1-18. Before operating this instrument, you should familiarize yourself with the safety markings on the instrument and safety instructions in this manual. This instrument has been manufactured and tested according to international safety standards. However, to ensure safe operation of the instrument and personal safety of the user and service personnel, the cautions and warnings in this manual must be followed. Refer to the summary of safety considerations near the front of this manual. Refer also to individual sections of this manual for detailed safety notations concerning the use of the instrument as described in those individual sections.

1-19. SPECIFICATIONS

1-20. Specifications for the HP Model 11975A are listed in Table 1-1. These are the performance standards against which the amplifier is tested (performance tests are provided in Section IV). In some instances typical or nominal values are also listed in the table. These typical or nominal values, shown in brackets, are included as additional information only. They are not the warranted performance standards (specifications) for the instrument.

1-21. INSTRUMENT DESCRIPTION

1-22. The HP Model 11975A is a general purpose, fully self-contained microwave amplifier. Within its two-octave frequency range of 2 to 8 GHz, it delivers up to 40 milliwatts (+16 dBm) of leveled power, either swept or fixed-frequency, with a frequency response of ±1 dB and an absolute power accuracy of ±2 dB. Some common uses for this amplifier are:

- as a mixer LO (local oscillator) booster to increase the LO drive level for improved mixer performance.
- as an isolation amplifier for mixer port isolation, source isolation, or for any application requiring a leveled or unleveled buffer.
- as a low-noise, unleveled pre-amplifier to increase the signal drive level to counters and other equipment, or to reduce the front-end noise figure of broad-band receivers and spectrum analyzers.

1-23. OPTIONS

1-24. Option 001, Type N INPUT/OUTPUT Connectors

1-25. Option 001 substitutes Type N female connectors for the SMA female input and output connectors used on the standard instrument. Refer to Figure 6-5 for an illustrated breakdown of these Type N connectors.

1-26. Option 907, Front Handles

1-27. Instruments ordered with Option 907 are supplied with a front handle kit which contains a pair of handles, all necessary hardware, and instructions for installation. This handle kit is also available through your nearest Hewlett-Packard office by ordering HP Part Number 5061-0088.

Table 1-1. HP Model 11975A Specifications (1 of 2)

NOTE

Values shown in brackets are typical or nominal. They are not specifications; they are included only as information useful in the application of the instrument.

Values shown in italics are for Option 001.

FREQUENCY

Range: 2.0 to 8.0 GHz in one band.

OUTPUT

Harmonic (2nd and 3rd) Distortion: >20 dB below fundamental for power output of ≤+16 dBm.

Non-Harmonic Distortion: [typically >60 dB below fundamental for power output of ≤+16 dBm.]

Third Order Intercept (ALC off): [typically +25 dBm]

1 dB Compression (ALC off): [typically +18 dBm]

Noise Figure: [typically 13 dB]

Power Range: +6 dBm to +16 dBm, controlled by single-turn knob with 11 calibrated divisions in 1 dB steps.

Absolute Power Accuracy: ±2.0 dB, [typically ±1.5 dB]

Frequency Response: ±1.0 dB, [typically ±0.5 dB]

Uncalibrated Power Range: [typically +16.75 dBm to +19 dBm]

Reverse Isolation: [typically >40 dB for +16 dBm output]

SWR (ALC on): 1.7:1
SWR (ALC off): [typically 2.5:1]

Connector: (Std.) SMA female, [50 ohms nominal]
(Option 001) Type N female, 50 ohms nominal

INPUT

Minimum Power (i.e., minimum required for leveled output):

Frequency	Power
2.0 to 4.5 GHz	+2 dBm
4.5 to 6.1 GHz	+5 dBm
6.1 to 8.0 GHz	+8 dBm

Small Signal Gain (i.e., gain with less than minimum input required for leveled output, or with ALC off):

Frequency	Gain
2.0 to 4.5 GHz	15 dB
4.5 to 6.1 GHz	11 dB
6.1 to 8.0 GHz	9 dB

CAUTION

Maximum amplification of input occurs with ALC switch set to OFF. Whether ALC switch is OFF or ON, always measure output power level before connecting HP 11975A to sensitive external equipment.

Connector: (Std.) SMA female, [50 ohms nominal]
(Option 001) Type N female, 50 ohms nominal

SWR (ALC off): [typically 2.7:1]

Maximum Input:
Power: +30 dBm (1 watt)
Voltage: ±35 Vdc

Table 1-1. HP Model 11975A Specifications (2 of 2)

DIODE BIAS OUTPUT

Current Range: [typically 0 to ±10 mA for single diode load.] Controlled with five-turn potentiometer.

Bias Control Resolution: 10 uA

Connector: BNC female

Maximum Voltage: [typically ±3 Vdc]

Short Circuit Protection: [typically ≤10 mA]

GENERAL

AC Power Requirement: 100, 120, 220, or 240 volts +5 percent −10%; 48 to 440 Hz; less than 36 VA.

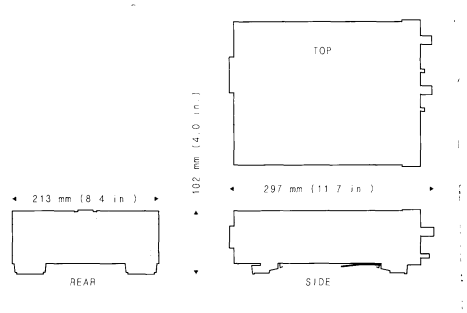
Environmental: Per MIL-T-28800C, Type III, Class 5, Style E

Temperature Range:
Operating: 0 to 55 degrees C
Stored: −40 to +75 degrees C

EMI: Conducted and radiated interferences are in compliance with methods CEO3 and REO2 of MIL STD 461A and CISPR Publication 11 (1975)

Weight:
Net: 3.04 kg (6.8 lbs)
Shipping: 5.45 kg (12.2 lbs)

Dimensions:



1-28. Option 910, Additional Operation and Service Manual

1-29. Instruments ordered with Option 910 are supplied with two Operation and Service Manuals. Additional manuals are also available through your nearest Hewlett-Packard office by ordering the HP Part Number listed on the title page.

1-30. RACK MOUNTING KITS AND CABINET ACCESSORIES

1-31. Rack mounting kits are available for mounting the instrument in a rack of 482.6 mm (19 inch) width. Other accessories such as filler panels, joining kits, shelves, and bail handles are also available. Refer to your current Hewlett-Packard Electronic Instruments catalog for details. All of these kits and accessories are available through your nearest Hewlett-Packard office.

1-32. RECOMMENDED TEST EQUIPMENT AND ACCESSORIES

1-33. Test equipment and accessories recommended for servicing the HP 11975A Amplifier are listed in Table 1-2. If substitute equipment is used, it must meet the minimum specifications shown in the table.

Table 1-2. Recommended Test Equipment (1 of 2)

Instrument	Critical Specifications	Recommended Model	Use*
Digital Voltmeter	HP-IB Compatible Accuracy: ±0.2% Range: ±20V	HP 3455A	A,T
Oscilloscope	Frequency: 100 MHz D'lyd. Trig.	HP 1741A	A,T
Probe	10:1 Divider	HP 10004D	A,T
Sweep Oscillator	HP-IB Compatible with Plug-Ins	HP 8620C Opt. 011	P,A,T
RF Plug-In	Frequency: 2–8 GHz Output Power: 10 dBm Harmonics: >30 dBc for fundamentals between 2–8.4 GHz Typically the HP 86290B meets this Harmonic requirement.	HP 86290B	P,A,T
Power Meter	HP-IB	HP 436A Opt. 022	
Power Sensor	Frequency: 2–8 GHz Range: –30 dBm to +20 dBm	HP 8481A	P,A,T
Directional Coupler	Coupling 16 ±1 dB Coupling Flatness ±0.25 dB VSWR (all ports) <1.35	HP 0955-0098	P
Termination	Impedance: 50Ω Connector: SMA (m)	HP 0960-0053	P
Step Attenuator	Frequency Range: DC–18 GHz Connectors: SMA (f) Steps: 1 dB	HP 8494B Opt. 002	P,A
Fixed Attenuator	Attenuation: 10 dB	HP 8491A Opt. 010	P
Bandpass Filter	Passband: 4–8 GHz	HP 0960-0402	P

Table 1-2. Recommended Test Equipment (2 of 2)

Instrument	Critical Specifications	Recommended Model	Use*
Bandpass Filter	Passband: 6–8 GHz	HP 0960-0200	P
Bandpass Filter	Passband: 8–12 GHz	HP 0960-0403	P
Adapter	SMA (m) to SMA (m)	HP 1250-1159	P
Adapter	N (m) to SMA (f)	HP 1250-1250	P,A,T
Adapter (2 required)	SMA (m) to SMA (f)	HP 1250-1462	A,T
Adapter	N (f) to SMA (m)	OSM P/N 3082-2241-00**	P,A,T
Adapter	SMA (f) to SMA (f)	HP 1250-1158	P,A,T
Cable Assembly	Dual banana plug to BNC (m)	HP 11001A	P
Coaxial Short	SMA (f)	HP 0960-0054	P
RF Cable (3 required)	Semi-rigid cable SMA (m) connectors Diameter > .36 mm (0.141 inches) Length 152 to 203 mm (6 to 8 inches)	HP 11975-20002	P,A
Spline Tool	.048 inch, square	HP 8710-0055	A

*P = Performance Test; A = Adjustment; T = Troubleshooting
**OMNI-SPECTRA INC, 21 CONTINENTAL BLVD., MERRIMACK, NH 03054

SECTION II
INSTALLATION

2-1. INTRODUCTION

2-2. This section includes information on initial inspection, preparation for use, storage and shipment of the HP Model 11975A Amplifier.

2-3. INITIAL INSPECTION

2-4. Inspect the shipping container for damage. If the shipping container or cushioning material is damaged it should be kept until the contents of the shipment have been checked for completeness and the instrument has been checked mechanically and electronically. The contents of the shipment should be as shown in Figure 1-1. Procedures for checking electrical performance are given in Section IV. If the contents are incomplete, if there is mechanical damage or defect, or if the instrument does not pass the electrical performance test, notify the nearest Hewlett-Packard office. If the shipping container is damaged, or the cushioning material shows signs of stress, notify the carrier as well as the Hewlett-Packard office. Keep the shipping materials for carrier's inspection. The HP office will arrange for repair or replacement without waiting for claim settlement.

2-5. PREPARATION FOR USE

2-6. Power Requirements

2-7. The HP Model 11975A requires a power source of 100, 120, 220, or 240 volts, +5 percent −10 percent; 48 to 440 Hz. Maximum power consumption is less than 36 VA.

2-8. Line Voltage and Fuse Selection

WARNING

BEFORE THIS INSTRUMENT IS SWITCHED ON, its protective earth terminals must be connected to the protective conductor of the mains power cable (cord). The mains power cable plug shall only be inserted in a socket outlet provided with a protective earth contact. DO NOT negate the earth-grounding protecting by using an extension cable, power cable, or autotransformer without a protective ground conductor. Failure to ground the instrument properly can result in serious personal injury.

CAUTION

BEFORE SWITCHING ON THIS INSTRUMENT, make sure it is adapted to the voltage of the ac power source. You must set the voltage selector switch correctly to adapt the HP 11975A to the power source. Failure to set the ac power input of the instrument for the correct voltage level could cause damage to the instrument when it is switched on.

2-9. Adapt the instrument to the ac line voltage level and select the fuse as follows:

a. Measure the ac line voltage.

b. Refer to Figure 2-1. At the instrument's rear panel power line module, select the line voltage on the ac line voltage selector card that is nearest the line voltage you measured in step a. Note that the available line voltage must be within +5 percent or −10 percent of the line voltage selected on the card. If it is not, you must use an autotransformer between the ac source and the HP Model 11975A.

c. The fuse rating depends on the ac line voltage level. Fuse requirements for the four selectable line voltage levels are shown in Table 2-1. HP Part Numbers needed for ordering these fuses are located in Table 6-3.

Table 2-1. Fuse Requirements

Line Voltage	Fuse
100V	375 mA Slow-Blow
120V	375 mA Slow-Blow
220V	200 mA Slow-Blow
240V	200 mA Slow-Blow

2-10. Power Cable

2-11. In accordance with international safety standards, this instrument is equipped with a three-wire power cable. When connected to an appropriate power line outlet, this cable grounds the instrument cabinet. Table 2-2 shows the styles of mains plugs available on power cables supplied with HP instruments. The numbers shown with the plugs are part numbers for complete power cables.

WARNING

The protection provided by grounding the instrument may be lost if any power cable other than the 3-pronged type is used to couple the ac line voltage to the instrument.

2-12. Operating Environment

2-13. This instrument has been type tested for 95 percent relative humidity at 40°C for five days. The operating environment should be within the following limits:

Temperature ..... 0 to 55°C
Altitude ..... <4572 meters (15,000 feet)

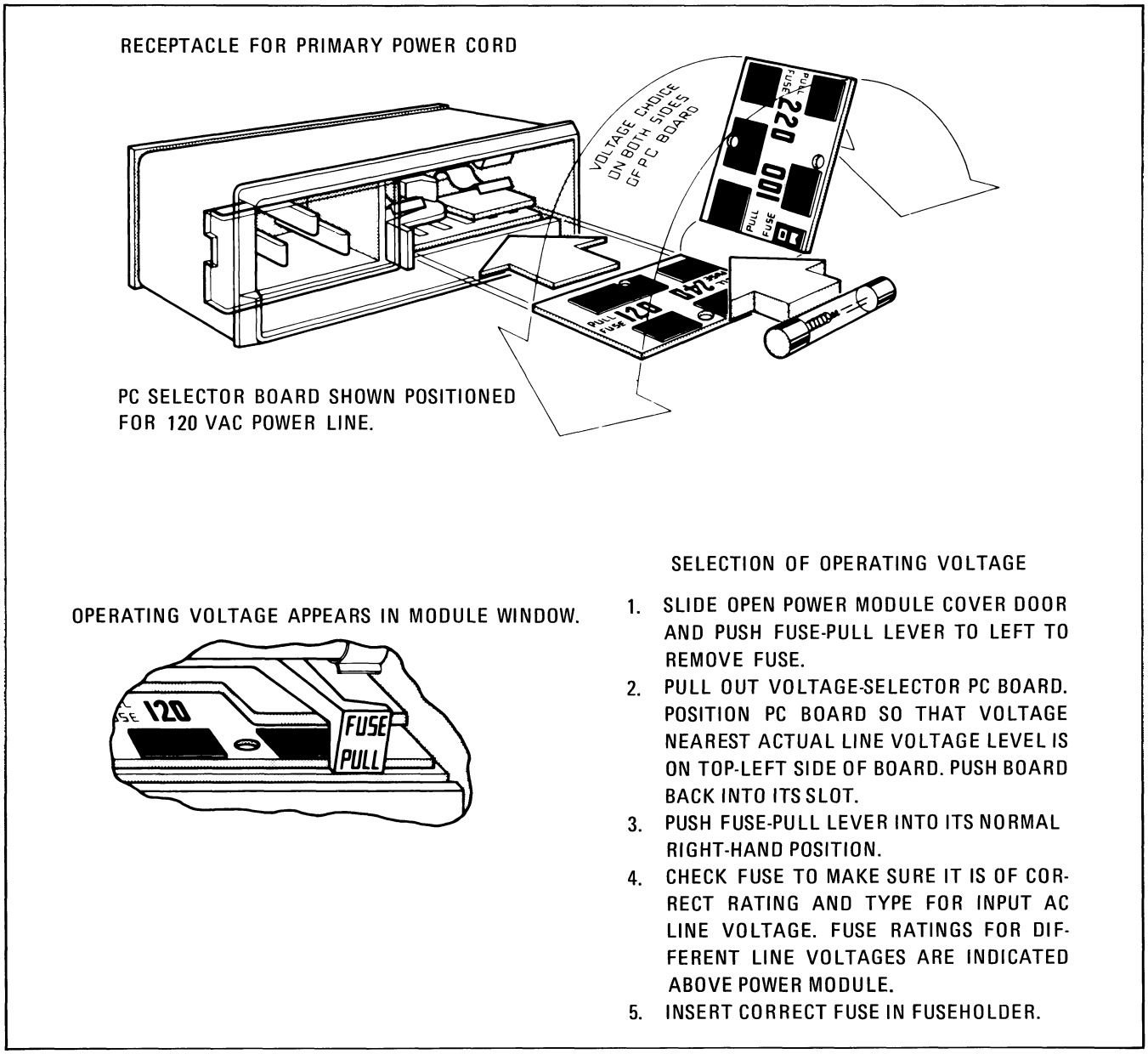
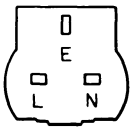
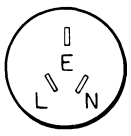
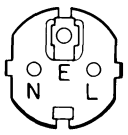
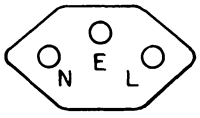
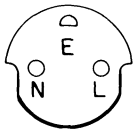


Figure 2-1. Line Voltage Selection with Power Module PC Board

Table 2-2. AC Power Cables and Plugs

Plug Type,* AC Source End	Cable,* HP Part Number	C D	Plug Description, Instrument End	Length cm (inches)	Color	Country of Use
250V  **BS1363A**	8120-1351 8120-1703	0 6	Straight 90°	229 (90) 229 (90)	Mint Gray Mint Gray	United Kingdom, Cyprus, Nigeria, Rhodesia, Singapore, South Africa, India
250V  **NZSS198/ASC112**	8120-3169 8120-0696	0 4	Straight 90°	201 (79) 221 (87)	Gray Gray	Australia, New Zealand
250V  **CEE7-Y11**	8120-1689 8120-1692	7 2	Straight 90°	201 (79) 201 (79)	Mint Gray Mint Gray	East and West Europe, Saudi Arabia, Egypt, South Africa, India, (unpolarized in many nations)
125V  **NEMA5-15P**	8120-1348 8120-1398 8120-1754 8120-1378 8120-1521 8120-1676	5 5 7 1 6 2	Straight 90° Straight Straight 90° Straight	293 (80) 203 (80) 91 (36) 203 (80) 203 (80) 91 (36)	Black Black Black Jade Gray Jade Gray Jade Gray	United States, Canada, Japan (100V or 200V), Mexico, Philippines, Taiwan
250V  **SEV1011 1959-24507 Type 12**	8120-2104	3	Straight	201 (79)	Gray	Switzerland
220V  **DHCK 107**	8120-1957 8120-2956	2 3	Straight 90°	201 (79) 201 (79)	Gray Gray	Denmark

*Part number shown for source end plug is industry identifier for plug only. Number shown for cable is HP Part Number for complete cable including plugs.
E = Earth Ground; L = Line; N = Neutral

2-14. STORAGE AND SHIPMENT

2-15. Environment

2-16. The instrument should be stored in a clean, dry environment. The following environmental limitations apply to both storage and shipment:

Temperature ..... −40 to +75°C
Altitude ..... <7620 meters (25,000 feet)

2-17. Packaging

2-18. Original Packaging. Containers and materials identical with those used in factory packaging are available through Hewlett-Packard offices. Figure 2-2 illustrates the proper method of packaging the instrument for shipment using factory packaging materials. If the instrument is being returned to Hewlett-Packard for servicing, attach a tag indicating the type of service required, return address, model number, and full serial number. A supply of these tags is provided at the end of this section. Also, mark the container FRAGILE to ensure careful handling. In any correspondence, refer to the instrument by model number and full serial number.

2-19. Other Packaging. The following general instructions should be used for repackaging with commercially available materials:

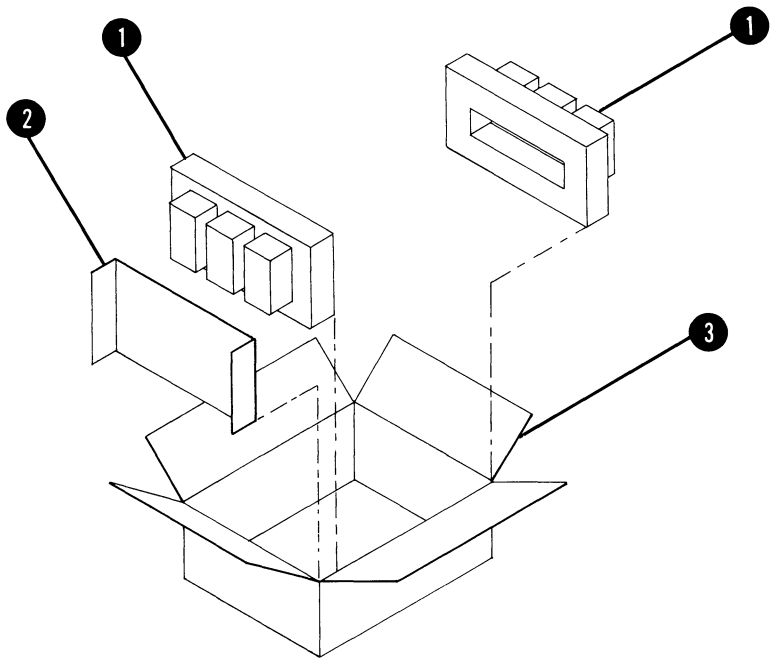
a. Wrap the instrument in heavy paper or plastic. (If shipping to a Hewlett-Packard office or service center, attach a tag indicating the type of service required, return address, model number, and full serial. A supply of these tags is included at the end of this section.)

b. Use a strong shipping container. A double-wall carton made of 350-pound test material is adequate.

c. 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.

d. Seal the shipping container securely.

e. Mark the shipping container FRAGILE to ensure careful handling.



Item	Qty	HP Part Number	CD	Description
1	1	9220-2734	8	END, PAD, POLYURETHANE FOAM, SET OF 2
2	1	9220-4133	5	INNER CARTON, CORRUGATED PAD
3	1	9211-4535	2	OUTER CARTON, CORRUGATED, DOUBLE WALL

Figure 2-2. HP Model 11975A Packaging

SECTION III
OPERATION

3-1. INTRODUCTION

3-2. This section provides information, both general and specific, that will enable you to utilize the HP Model 11975A Amplifier effectively in a variety of applications.

3-3. PANEL FEATURES

3-4. The amplifier's front and rear panel controls and connectors are identified and functionally described in Figure 3-5.

3-5. APPLICATIONS

3-6. The HP 11975A Amplifier is versatile enough to be used in many different applications. Figures 3-1 through 3-4 illustrate four specific applications.

3-7. Millimeter Wave Spectrum Analysis

3-8. The HP 11975A Amplifier improves millimeter wave spectrum analyzer measurements by boosting and leveling the LO (local oscillator) drive to a harmonic mixer (Figure 3-1). The flat frequency response and high output level of the HP 11975A improves mixer sensitivity, frequency response, and compression. It also can be used to compensate for LO line losses. The 2 to 8 GHz frequency range of the HP 11975A covers the LO range of many spectrum analyzers (for example the HP 8566A and HP 8569B). With an adjustable leveled-output range of +6 to +16 dBm, the amplifier can be set for various input level requirements of many harmonic mixers (for example the HP 11517A and the HP 11970 mixer series). For mixer diodes requiring external biasing, the HP 11975A's diode bias supply can be used to peak a mixer's conversion efficiency at any frequency desired.

3-9. General Purpose Amplifier

- **Low Noise Pre-Amplifier:** In the unleveled mode, the HP 11975A can be used as an amplifier to increase the signal drive level to frequency counters and other equipment to reduce the noise figure of broad-band receivers and spectrum analyzers (Figure 3-2).
- **LO Booster:** The HP 11975A can be used to increase LO drive level to improve mixer performance (Figure 3-3).
- **Isolation Amplifier:** The HP 11975A can serve as a buffer amplifier for mixer port isolation, source isolation, or any application requiring either a leveled or unleveled buffer (Figure 3-3).

3-10. Unleveled Source Power

3-11. Using the HP 11975A on the output of a low-level source results in a high-level calibrated power source for stimulus-response testing. For swept frequency applications, the HP 11975A's internal ALC provides both a good source match and flat frequency response.

3-12. Some instruments which are not normally used as microwave sources can be configured with the HP 11975A to provide calibrated power. For example, connecting the HP 11975A to the LO output of the HP 8566A Spectrum Analyzer produces a frequency-synthesized and calibrated power generator (Figure 3-4). The power level range can be extended by adding step attenuators to the HP 11975A's output. Through HP-IB control of the spectrum analyzer and the attenuators, both frequency and power settings can be automated.

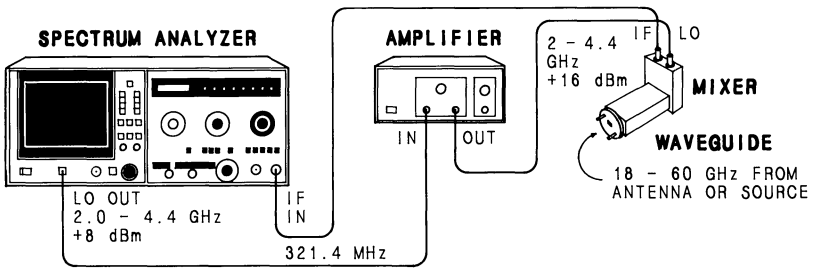


Figure 3-1. HP 11975A Boosts LO Output of HP 8569B to Improve Mixer Performance

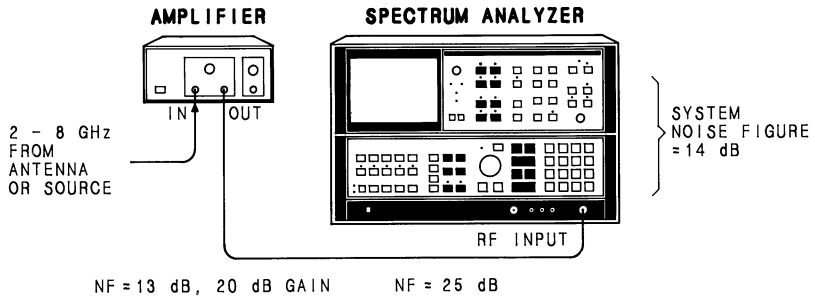


Figure 3-2. HP 11975A Used as Preamplifier for Improved System Sensitivity and Noise Figure

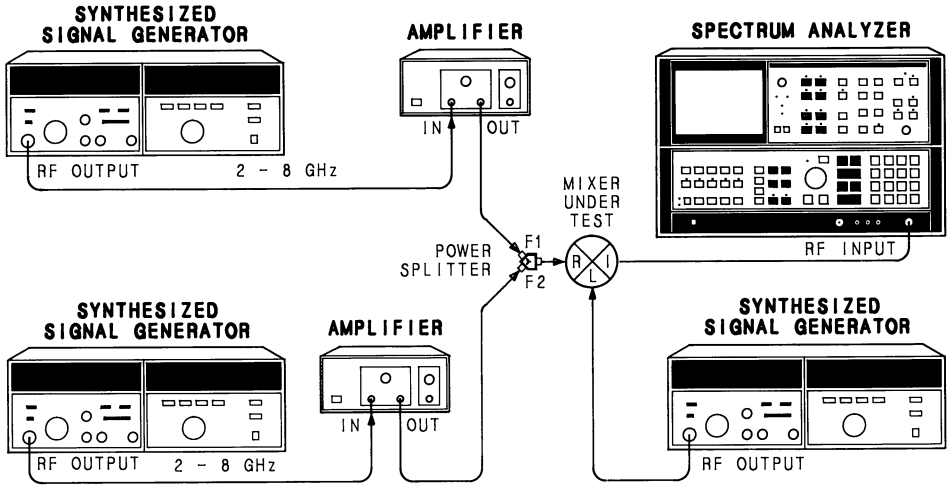


Figure 3-3. HP 11975A Used as an Isolation Amplifier and LO Booster for Mixer Characterization

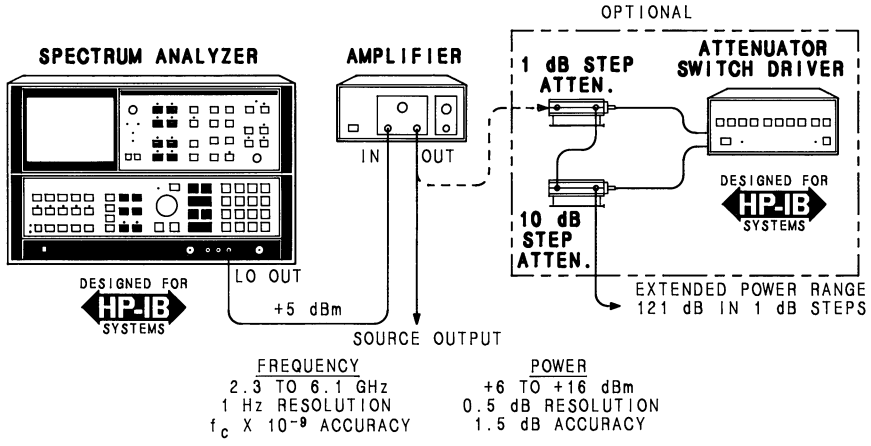


Figure 3-4. HP 11975A Levels HP 8566A LO Output in a Synthesized Power Generator Configuration

1 LINE OFF-ON. AC line switch. Turns the instrument primary power on and off. Amber LED lights when power is on.

2 INPUT. (Std.) An SMA (female) connector for applying an RF input to the amplifier.

INPUT. (Option 001) A Type N (female) connector for applying an RF input to the amplifier.

CAUTION

To avoid damaging the amplifier's internal circuitry, signals applied to the INPUT connector must not exceed 1 watt RF or 35 Vdc.

3 UNLEVELED. A red LED which lights when the RF input level is too low for proper ALC (automatic level control) operation, or when the load VSWR is too high.

4 dBm-INT ALC. A calibrated rotary control which selects the output level over a range of +6 to +16 dBm. The output selection is indicated in 1 dB increments. To avoid damage to sensitive mixers or other external equipment, a detent on the control prevents it from being accidentally rotated past the +16 dBm output level position. The detent can be defeated by pulling out on the control knob and rotating it past the +16 dBm position. This enables uncalibrated outputs at up to +19 dBm.

CAUTION

When the ALC switch on the rear panel is set to OFF, the front-panel dBm-INT ALC control is ineffective and amplification of the input signal is at maximum. Because of this, you must always measure the amplifier's output power before you connect it to sensitive external equipment.

5 HIGH POWER WARNING. An amber LED which lights when the output power level exceeds +16 dBm.

6 OUTPUT. (Std.) An SMA (female) connector for connecting the amplifier RF output to external equipment. If the rear panel ALC switch is set to ON, and the RF input and output are within specified limits, the RF output is leveled.

OUTPUT. (Option 001). A Type N (female) connector for connecting the amplifier RF output to external equipment.

7 DIODE-BIAS. A five-turn electrical, six-turn mechanical, front-panel-controlled potentiometer for adjusting the DIODE BIAS OUTPUT through its range (typical) of +10 to −10 mA with a resolution of 10 uA. (Maximum current is limited to approximately 10 mA.)

8 DIODE BIAS OUTPUT. A BNC (female) connector for applying the diode bias current to external mixers. Maximum voltage output is ± 3 volts.

9 AC Power Module. Contains three-wire ac power receptacle, line voltage (100, 120, 220, or 240 volts) selector pc board, and line fuse.

10 ALC OFF-ON. A two-position switch which, when set to ON, selects the automatic level control mode of operation to provide a leveled RF power output at the level selected with the dBm-INT ALC control. When the switch is set to OFF, the front-panel dBm-INT ALC control is disabled, and the amplifier operates with maximum gain and supplies unleveled power output. Maximum output power only occurs with sufficient input power. (See CAUTION at 4 .)

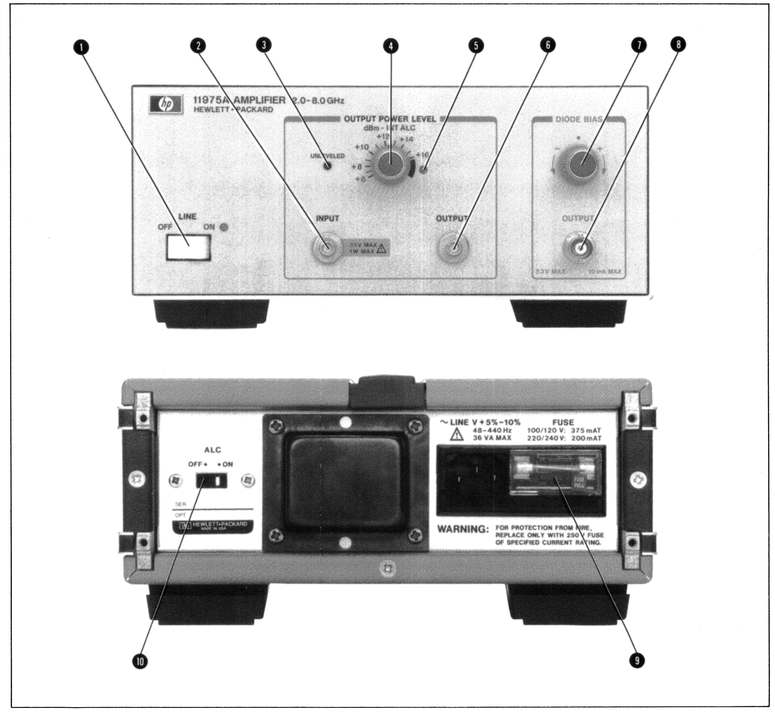


Figure 3-5. Front and Rear Panel Controls, Connectors, and Indicators

SECTION IV
PERFORMANCE TESTS

4-1. INTRODUCTION

4-2. This section contains instructions for testing the performance of the HP Model 11975A Amplifier. Performance tests are used to check the instrument at incoming inspection and for periodic evaluation. The tests verify the specifications listed for the instrument in Table 1-1.

4-3. Test equipment required for the performance tests is listed in Table 1-2 and at the beginning of each test procedure. Test instruments other than those listed may be used, provided their performance equals or exceeds the critical specifications listed in Table 1-1.

4-4. TEST RECORD

4-5. At the back of this section there is a Performance Test Record, Table 4-5, which can be used for recording the performance test data.

4-6. PERFORMANCE TEST PROCEDURES

4-7. Each performance test procedure is contained in a single paragraph. The first entry in each paragraph is the specification, as described in Table 1-1 (HP Model 11975A specifications), for the parameter being measured. This is followed by a general description of the test and any special instructions or problem areas. Preceding the step-by-step instructions is an illustration of the test setup. You should perform the tests and the steps within each test in the order given.

PERFORMANCE TESTS

4-8. FREQUENCY RESPONSE, ABSOLUTE POWER LEVEL ACCURACY TEST

SPECIFICATION:

Frequency Response: ±1.0 dB
Absolute Power Level: ±2.0 dB

DESCRIPTION:

Frequency response and absolute power level are checked by applying to the amplifier input a power level greater than the minimum required for ALC operation, and then measuring the corresponding output power with a power meter. Because the CAL FACTOR of the power sensor is relatively constant in the 2–8 GHz range, an average CAL FACTOR is used.

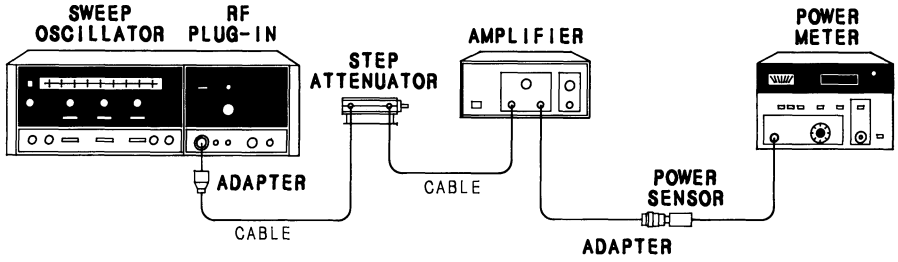


Figure 4-1. Frequency Response, Absolute Power Level Accuracy Test Setup

EQUIPMENT:

Sweep Oscillator	HP 8620C
RF Plug-In	HP 86290B
Step Attenuator	HP 8494B
Power Sensor	HP 8481A
Power Meter	HP 436A
Adapter, N (m) to SMA (f)	HP 1250-1250
Adapter, N (f) to SMA (m)	OSM P/N 3082-2241-00
Cable	HP 11975-20002

1. Connect the equipment as shown in Figure 4-1, leaving the HP 11975A unconnected.

2. Set the sweep oscillator and RF plug-in controls as follows:

Rear Panel

DISPLAY BLANKING	OFF
RF BLANKING	OFF
1 kHz SQ WV	OFF
FM-NORM-PL	NORM

Front Panel

MARKERS	OFF
CW	Press button
ALC	INT
SLOPE	OFF (counterclockwise)
RF	ON

PERFORMANCE TESTS

4-8. FREQUENCY RESPONSE, ABSOLUTE POWER LEVEL ACCURACY TEST (Cont'd)

3. On the sweep oscillator, set BAND to 2.0 – 6.2 GHz, then move the CW MARKER to 2.0 GHz.

4. Calibrate the power meter. Connect it by means of the semi-rigid cable (shown connected to HP 11975A in Figure 4-1) to the step attenuator. Set step attenuator to 0 dB.

5. Set the power meter mode switch to dBm, then set the CAL FACTOR % switch to the average of the CAL FACTORS shown on the power sensor (HP 8481A)label for 2 – 8 GHz. This should be approximately 98 percent.

6. Adjust the RF plug-in power level for a reading of + 10 dBm on the power meter.

7. Connect the HP 11975A to the test equipment as shown in Figure 4-1. On the HP 11975A, set the OUTPUT POWER LEVEL control to the + 16 dBm position.

8. Record the resulting power meter reading in column 2 of Table 4-1.

9. On the sweep oscillator, increase the CW MARKER by 100 MHz (0.1 GHz) and record the new power meter reading in column 2 of Table 4-1.

10. Repeat step 9 until CW marker is at 6.0 GHz, then switch sweep oscillator BAND to 6.0 – 12.4 GHz. Continue with step 9 for frequencies from 6.0 – 8.0 GHz.

11. Note the power meter readings listed in column 2 of Table 4-1. They must be within ± 2.0 dB of the output power level indication on the HP 11975A. This is the Absolute Power Level accuracy.

12. Subtract the smallest power meter reading in column 2 of Table 4-1 from the largest reading. The difference is the frequency response variation and must be less than 2.0 dB.

13. On the sweep oscillator, set BAND to 2.0 – 6.2 GHz, and CW MARKER to 2.0 GHz.

14. On the HP 11975A, set OUTPUT POWER LEVEL to + 12 dBm. Repeat steps 8 through 12, recording the power meter readings in column 3 (instead of column 2) of Table 4-1.

15. On the sweep oscillator, set BAND to 2.0 – 6.2 GHz and CW MARKER to 2.0 GHz.

16. On the HP 11975A, set OUTPUT POWER LEVEL to + 6 dBm. Repeat steps 8 through 12, recording the power meter readings in column 4 of Table 4-1.

PERFORMANCE TESTS

4-8. FREQUENCY RESPONSE, ABSOLUTE POWER LEVEL ACCURACY TEST (Cont'd)

Table 4-1. Frequency Response, Absolute Power Level Accuracy

Frequency (GHz)	Power Meter Reading (dBm) +16 dBm Output	Power Meter Reading (dBm) +12 dBm Output	Power Meter Reading (dBm) +6 dBm Output	Frequency (GHz)	Power Meter Reading (dBm) +16 dBm Output	Power Meter Reading (dBm) +12 dBm Output	Power Meter Reading (dBm) +6 dBm Output
2.0 2.1 2.2 2.3 2.4 2.5				5.1 5.2 5.3 5.4 5.5			
2.6 2.7 2.8 2.9 3.0				5.6 5.7 5.8 5.9 6.0			
3.1 3.2 3.3 3.4 3.5				6.1 6.2 6.3 6.4 6.5			
3.6 3.7 3.8 3.9 4.0				6.6 6.7 6.8 6.9 7.0			
4.1 4.2 4.3 4.4 4.5				7.1 7.2 7.3 7.4 7.5			
4.6 4.7 4.8 4.9 5.0				7.6 7.7 7.8 7.9 8.0			

PERFORMANCE TESTS

4-9. OUTPUT VSWR TEST

SPECIFICATION:

VSWR: 1.7 (ALC on)

DESCRIPTION:

Output VSWR is measured by connecting a short circuit to the output of the HP 11975A through a cable one wavelength long. The output power level ripple caused by this mismatched load is measured on a power meter connected to the coupled port of a directional coupler. The mismatch ripple is then used to determine the equivalent output VSWR.

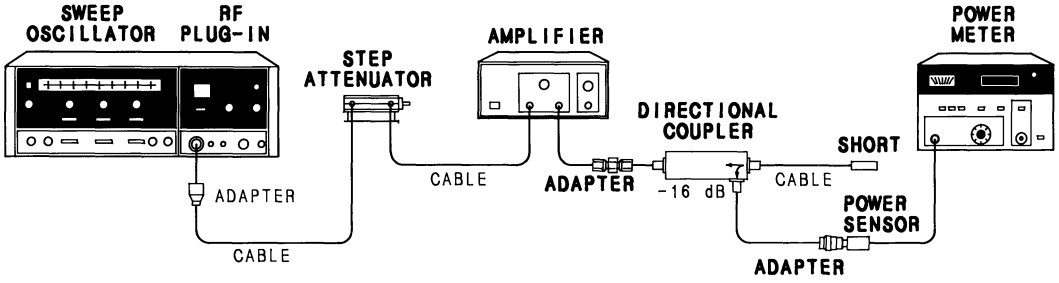


Figure 4-2. Output VSWR Test Setup

EQUIPMENT:

Sweep Oscillator	HP 8620C
RF Plug-In	HP 86290B
Step Attenuator	HP 8494B
Directional Coupler	HP 0955-0098
Power Meter	HP 436A
Power Sensor	HP 8481A
Adapter, N (m) to SMA (f)	HP 1250-1250
Adapter, N (f) to SMA (m)	OSM P/N 3082-2241-00
Coaxial Short, SMA (f)	HP 0960-0054
RF Cable (3 required)	HP 11975-20002

1. Calibrate the power meter, then set its MODE switch to dBm and the CAL FACTOR % switch to the average of the CAL FACTORS shown on the power sensor (HP 8481A) label for 2 – 8 GHz. This should be approximately 98 percent.

2. Connect the equipment as shown in Figure 4-2. Set step attenuator to 0 dB.

3. Set the HP 11975A OUTPUT POWER LEVEL control to + 16 dBm.

4-9. OUTPUT VSWR TEST (Cont'd)

4. Set the sweep oscillator and RF plug-in controls as follows:

Front Panel

BAND	2.0 – 6.2 GHz
START MARKER (green)	2.0 GHz
STOP MARKER (red)	6.0 GHz
MARKER SWEEP	Press push button
MODE	MANUAL
MODE MANUAL vernier	CCW
RF	ON
SLOPE	OFF (CCW)
ALC	INT
POWER LEVEL	to 3 o'clock position

Rear Panel

DISPLAY BLANKING	OFF
RF BLANKING	OFF
1 kHz SQ WV	OFF
FM-NORM-PL	NORM

5. Slowly rotate MODE MANUAL vernier clockwise. The power meter indication should vary approximately 3 dB. Record each maximum and minimum reading in Table 4-2. Note that the analog meter on the power meter is helpful in locating the maximums and minimums.

6. With sweep oscillator MODE MANUAL vernier fully clockwise, set sweep oscillator BAND to 6.0 – 12.4 GHz. Set STOP MARKER to 8.0 GHz, then rotate MODE MANUAL vernier to full counterclockwise position.

7. Repeat step 5 for the frequency range of 6.0 – 8.0 GHz.

8. The readings recorded in Table 4-2 show a number of maximums (peaks) and minimums (valleys). To determine the output VSWR, take the average of two adjacent maximums (peaks) and subtract the minimum that occurred between them. Record this value in column 4 of Table 4-2. The recorded value must be less than 4.2 dB, the equivalent of an output VSWR of 1.7. A table of equivalent VSWRs for measured mismatch errors is shown as Table 4-3.

NOTE

If multiple adapters, such as Type N (f) to SMA (f) and a SMA (m) to SMA (m), are used in place of the specified Type N (f) to SMA (m) adapter, the maximum variation must be reduced from 4.2 dB to 3.8 dB.

4-9. OUTPUT VSWR TEST (Cont'd)

Table 4-2. Output VSWR

N	Maximum (dBm)	Minimum (dBm)	Mismatch Error (dB) = $\frac{\text{Maximum}_N + \text{Maximum}_{N+1}}{2} - \text{Minimum}_N$
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			

Table 4-3. Equivalent VSWR

Equivalent VSWR	Mismatch Error (dB)
1.0:1	0.0
1.1:1	0.8
1.2:1	1.4
1.3:1	2.1
1.4:1	2.6
1.5:1	3.2
1.6:1	3.7
1.7:1	4.2
1.8:1	4.6
1.9:1	5.0
2.0:1	5.4

4-10. MINIMUM INPUT POWER FOR ALC OPERATION

SPECIFICATION:

2.0–4.5 GHz: +2 dBm minimum
4.5–6.1 GHz: +5 dBm minimum
6.1–8.0 GHz: +8 dBm minimum

DESCRIPTION:

The minimum input power required for ALC operation is determined by manually sweeping the input signal source while varying the input power with a step attenuator. ALC operation at the minimum input power level is confirmed by observing the HP 11975A UNLEVELED indicator (LED).

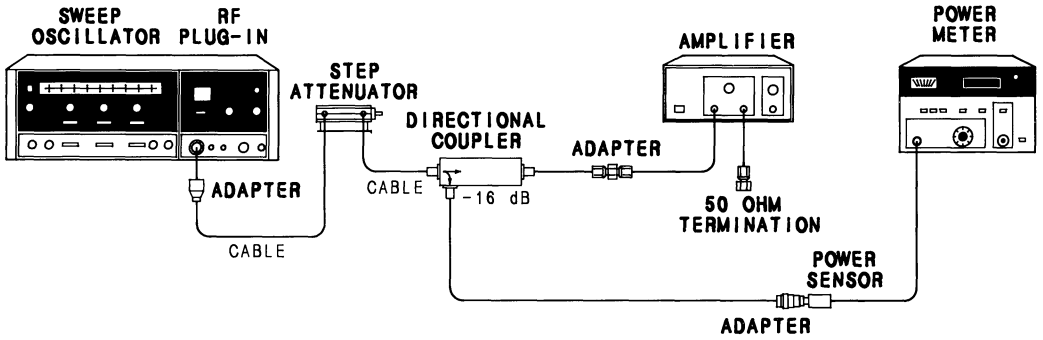


Figure 4-3. Minimum Input Power for ALC Operation Test Setup

EQUIPMENT:

Sweep Oscillator	HP 8620C
RF Plug-In	HP 86290B
Step Attenuator	HP 8494B
Directional Coupler	HP 0955-0098
Power Meter	HP 436A
Power Sensor	HP 8481A
Adapter, N (m) to SMA (f)	HP 1250-1250
Adapter, N (f) to SMA (m)	OSM P/N 3082-2241-00
Adapter, SMA (m) to SMA (m)	HP 1250-1159
50-ohm Termination	HP 0960-0053
RF Cable (2 required)	HP 11975-20002

1. Calibrate the power meter, then set its MODE switch to dBm. Set the CAL FACTOR % switch to the average of the CAL FACTORS shown on the power sensor (HP 8481A) label for 2 – 8 GHz. This should be approximately 98 percent.

2. Connect the equipment as shown in Figure 4-3.

3. Set the HP 11975A OUTPUT POWER LEVEL control for + 16 dBm. Set the step attenuator to 11 dB.

PERFORMANCE TESTS

4-10. MINIMUM INPUT POWER FOR ALC OPERATION (Cont'd)

4. Set the sweep oscillator and RF plug-in controls as follows:

Front Panel

BAND	6.0 – 12.4 GHz
START MARKER (green)	6.1 GHz
STOP MARKER (red)	8.0 GHz
MODE	MANUAL
MODE MANUAL vernier	CCW
POWER LEVEL	to 3 o'clock position
ALC	INT
RF	ON
SLOPE	OFF (CCW)

Rear Panel

DISPLAY BLANKING	OFF
RF BLANKING	OFF
1 kHz SQ WV	OFF
FM-NORM-PL	NORM

5. Rotate the SWEEP FUNCTIONS MODE MANUAL vernier slowly to full clockwise.

6. If the UNLEVELED indicator (LED) on the HP 11975A remains lighted, decrease the step attenuator setting 1 dB and repeat step 5. As the attenuation is decreased, the UNLEVELED indicator remains lighted for only a small portion of the sweep. When the attenuation has been decreased to the point where the UNLEVELED indicator remains off for the total sweep, increase the attenuation 1 dB. Then rotate the sweep oscillator SWEEP FUNCTIONS MODE MANUAL vernier until the HP 11975A UNLEVELED indicator lights. Now rotate the MODE MANUAL vernier through the unleveled output range (that is, the frequency range extending from the point the UNLEVELED indicator lights and the point where it turns off). Stop rotating the MODE MANUAL vernier at the point where the power meter reading is minimum.

7. Decrease the attenuation 1 dB with the step attenuator. The HP 11975A UNLEVELED indicator should turn off; if it does not, decrease the step attenuation until it does. Record the power meter reading.

_____ dBm

8. To the power meter reading recorded in step 7, add 16 dB. The result must be less than +8 dBm.

_____ dBm

9. Set the sweep oscillator controls as follows:

BAND	2.0 – 6.2 GHz
START MARKER (green)	4.5 GHz
STOP MARKER (red)	6.1 GHz
MODE MANUAL vernier	CCW

10. Set the step attenuator to 11 dB.

PERFORMANCE TESTS

4-10. MINIMUM INPUT POWER FOR ALC OPERATION (Cont'd)

11. Repeat steps 5, 6, and 7, and record the power meter reading.

_____ dBm

12. Add 16 dB to the power meter reading recorded in step 11. The result must be less than +5 dBm.

_____ dBm

13. Set the sweep oscillator controls as follows:

START MARKER (green)	2.0 GHz
STOP MARKER (red)	4.5 GHz
POWER LEVEL	to 9 o'clock position
MODE MANUAL vernier	CCW

14. Set step attenuator to 11 dB.

15. Repeat steps 5, 6, and 7, and record the power meter reading.

_____ dBm

16. Add 16 dB to the power meter reading recorded in step 15. The result must be less than +2 dBm.

_____ dBm

PERFORMANCE TESTS

4-11. SMALL SIGNAL GAIN TEST

SPECIFICATION:

Frequency Range (GHz)	Gain (dB)
2.0 – 4.5	15
4.5 – 6.1	11
6.1 – 8.0	9

DESCRIPTION:

Small signal gain is determined by applying a signal to the HP 11975A output. The signal has an amplitude low enough to ensure that the HP 11975A output stage does not reach saturation. During this test, the HP 11975A ALC loop is disabled. The gain is measured at only one frequency in each range.

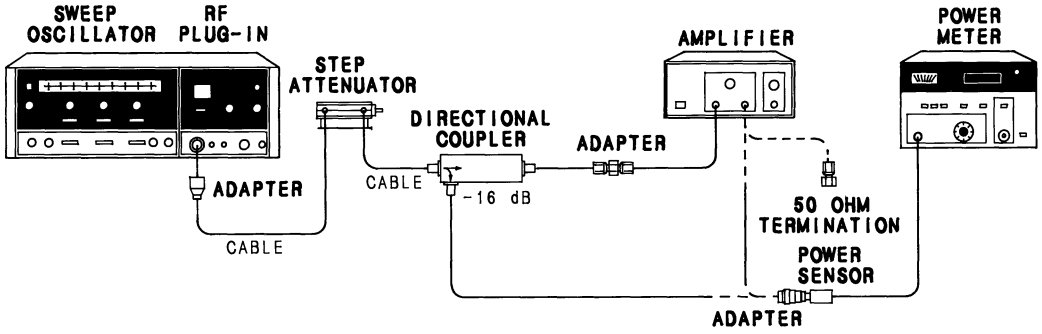


Figure 4-4. Small Signal Gain Test Setup

EQUIPMENT:

Sweep Oscillator	HP 8620C
RF Plug-In	HP 86290B
Step Attenuator	HP 8494B
Directional Coupler	HP 0955-0098
Power Meter	HP 436A
Power Sensor	HP 8481A
Adapter, N (m) to SMA (f)	HP 1250-1250
Adapter, N (f) to SMA (m)	OSM P/N 3082-2241-00
Adapter, SMA (m) to SMA (m)	HP 1250-1159
50-ohm Termination	HP 0960-0053
RF Cable (2 required)	HP 11975-20002

1. Calibrate the power meter, then set its MODE switch to dBm. Set the CAL FACTOR % switch to the CAL FACTOR % shown on the label for 3.0 GHz.

2. Set the step attenuator to 8 dB.

3. Connect the equipment as shown in Figure 4-4.

4-11. SMALL SIGNAL GAIN TEST (Cont'd)

4. Set the sweep oscillator controls as follows:

Front Panel
- BAND ..... 2.0 – 6.2 GHz
- CW MARKER ..... 3.5 GHz
- CW ..... Press push button
- POWER LEVEL ..... to 9 o'clock position
- RF ..... ON
- ALC ..... INT
- SLOPE ..... OFF (CCW)

Rear Panel
- DISPLAY BLANKING ..... OFF
- RF BLANKING ..... OFF
- 1 kHz SQ WV ..... OFF
- FM-NORM-PL ..... NORM

5. Set the HP 11975A ALC switch (rear panel) to OFF.

6. Connect the power sensor to the OUTPUT of the HP 11975A and record the power meter reading in column 2 of Table 4-4.

7. Disconnect the power sensor from the HP 11975A OUTPUT and connect it to the coupled port of the directional coupler. Connect a 50-ohm termination to the HP 11975A OUTPUT. Record the power meter reading in column 3 of Table 4-4.

8. Add 16 dB to the value recorded in step 7. Record this value in column 4 of Table 4-4.

9. Subtract the value (in column 4) recorded in step 8 from the value recorded (in column 2) in step 6. Record this value, the small signal gain, in column 5 of Table 4-4. The small signal gain recorded in column 5 must be greater than the value shown in column 6.

10. Set the sweep oscillator CW MARKER to 6.0 GHz and repeat steps 6 through 9.

11. Set the sweep oscillator BAND selector to 6.0 – 12.4 GHz and the CW MARKER to 8.0 GHz. Repeat steps 6 through 9.

12. Set HP 11975A ALC switch (rear panel) to ON.

Table 4-4. Small Signal Gain

Frequency (GHz)	HP 11975A Output (dBm)	Directional Coupler Output (dBm)	Input Power (dBm)	Small Signal Gain (dB)	Specification (dB)
2.0–4.5					15
4.5–6.1					11
6.1–8.0					9

4-12. HARMONIC DISTORTION

SPECIFICATION:

Less than −20 dBc for output power ≤ +16 dBm.

DESCRIPTION:

A source with harmonics greater than 30 dB below the fundamental frequency is applied to the HP 11975A INPUT. A bandpass filter on the HP 11975A is used to attenuate the fundamental frequency output. The harmonics are then measured with a power meter. A 10 dB fixed attenuator between the HP 11975A OUTPUT connector and the bandpass filter ensures proper operation of the ALC circuitry.

NOTE

A source with harmonics a minimum of 30 dBc with respect to a fundamental signal in the 2 – 8 GHz range is required for this test. Before the HP 86290B can be used as this source, its output harmonic content must be measured with a spectrum analyzer, or alternatively by performing this test procedure without the HP 11975A. The HP 86240B RF plug-in meets the requirements for source harmonics, and is recommended. A source with 35 dBc harmonic content is required for quantitative measurement of the HP 11975A output harmonics.

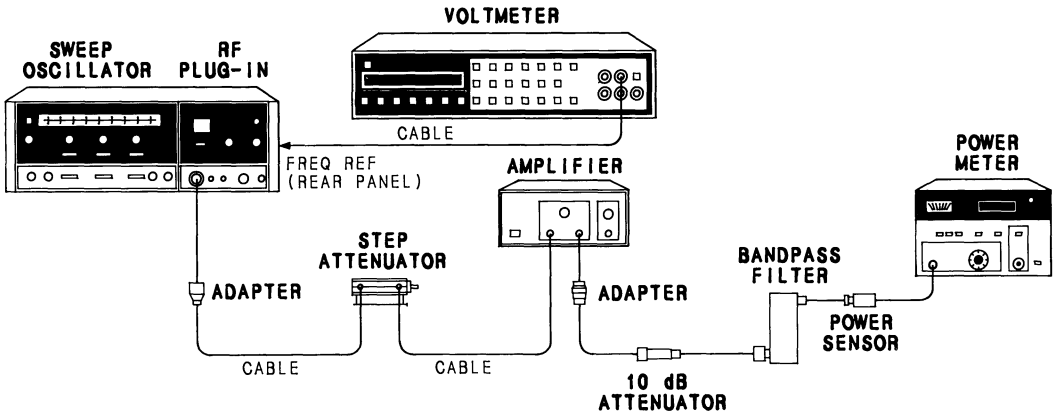


Figure 4-5. Harmonic Distortion Test Setup

EQUIPMENT:

Sweep Oscillator	HP 8620C
RF Plug-In	HP 86290B
Step Attenuator	HP 8494B
Power Meter	HP 436A
Power Sensor	HP 8481A
Adapter, N (m) to SMA (f)	HP 1250-1250
Adapter, N (f) to SMA (m)	OSM P/N 3082-2241-00
RF Cable (2 required)	HP 11975-20002
Fixed Attenuator (10 dB)	HP 8491A Opt. 010
4 – 8 GHz Bandpass Filter	HP 0960-0402
6 – 8 GHz Bandpass Filter	HP 0960-0200
8 – 12 GHz Bandpass Filter	HP 0960-0403
Digital Voltmeter	HP 3455A
Cable, dual banana to BNC (m)	HP 11001A

4-12. HARMONIC DISTORTION (Cont'd)

1. Calibrate the power meter, then set its MODE switch to dBm. Set the power meter CAL FACTOR % switch to the average of the CAL FACTOR shown on the HP 8481A label for 2 – 8 GHz. This should be approximately 98%.

2. Connect the equipment as shown in Figure 4-5. Use the 4 – 8 GHz (HP P/N 0960-0402) bandpass filter in the setup.

3. Set the step attenuator to 0 dB.

4. Set the OUTPUT POWER LEVEL control on the HP 11975A to +16 dBm. Make sure the rear panel ALC switch is set to ON. Set voltmeter to DC volts (⎓V). (The voltmeter is used to indicate frequency: 1V/GHz.)

5. Set the sweep oscillator controls as follows:

Front Panel

BAND	2.0 – 18.6
START MARKER (green)	2.0 GHz
STOP MARKER (red)	8.4 GHz
MARKER SWEEP	Press push button
SWEEP FUNCTION MODE	MANUAL
MODE MANUAL vernier	Full CCW
RF	ON
ALC	INT
SLOPE	OFF (CCW)
POWER LEVEL	to 3 o'clock position

Rear Panel

DISPLAY BLANKING	OFF
RF BLANKING	OFF
1 kHz SW WV	OFF
FM-NORM-PL	NORM

6. Slowly rotate the SWEEP FUNCTION MANUAL MODE vernier clockwise. The power meter indication shows a fluctuating level. The analog meter is helpful in locating the maximum reading.

7. Record the maximum reading for a frequency sweep from 2.0 to 3.5 GHz.

_____ dBm

8. Record the minimum reading for the frequencies between 4.2 and 8.0 GHz.

_____ dBm

4-12. HARMONIC DISTORTION (Cont'd)

9. Subtract the value recorded in step 7 from the value recorded in step 8. The result must be greater than 20 dB.

_____ dBc

10. Set the SWEEP FUNCTION MANUAL MODE vernier fully CCW. Remove the 4 – 8 GHz bandpass filter and install the 6 – 8 GHz bandpass filter.

11. Rotate the SWEEP FUNCTION MANUAL MODE vernier clockwise.

12. Record the maximum power meter reading for the frequency range of 2.0 to 4.5 GHz.

_____ dBm

13. Record the minimum power meter reading for the frequency range of 6.5 to 8.0 GHz.

_____ dBm

14. Subtract the value recorded in step 12 from the value recorded in step 13. The result must be greater than 20 dB.

_____ dBc

15. Set the SWEEP FUNCTION MANUAL MODE vernier fully CCW. Remove the 6 – 8 GHz bandpass filter and install the 8 – 12 GHz bandpass filter.

16. Slowly rotate the MANUAL MODE vernier clockwise.

17. Record the maximum power meter reading for the frequency range of 2.0 to 6.5.

_____ dBm

18. Record the minimum power meter reading for the frequency range of 8.1 to 8.4 GHz.

_____ dBm

19. Subtract the value recorded in step 17 from the value recorded in step 18. The result must be greater than 20 dB.

_____ dBc

Table 4-5. Performance Test Record

Paragraph No.	Test	Specification	Actual Measurement
4-10	Frequency Response Absolute Power Level Accuracy	±1.0 dB ±2.0 dB	
4-11	VSWR	1.7	
4-12	Minimum Input Power for ALC Operation 2.0–4.5 GHz 4.5–6.1 GHz 6.1–8.0 GHz	 +2 dBm min. +5 dBm min. +8 dBm min.	
4-13	Small Signal Gain 2.0–4.5 GHz 4.5–6.1 GHz 6.1–8.0 GHz	 Gain = 15 Gain = 11 Gain = 9	
4-14	Harmonic Distortion	Less than –20 dBc at output power ≤16 dBm	

SECTION V
ADJUSTMENTS

5-1. INTRODUCTION

5-2. This section describes the adjustments used to restore the HP 11975A to its peak operating condition after a repair, or to compensate for changes resulting from component aging. Table 5-1 lists all the adjustments by adjustment name, adjustment reference designator, and by the paragraph number of the adjustment procedure. Included in the table is a brief description of the purpose of the adjustment.

5-3. Data taken during an adjustment should be recorded in the spaces provided in the procedure. Comparison of initial data with data taken during later adjustments is useful for preventative maintenance and troubleshooting.

WARNING

When the covers of the instrument are removed, terminals are exposed that have voltages capable of causing death. The adjustments in this section should, therefore, be performed only by a skilled person who knows the hazard involved.

NOTE

Before performing any adjustments, allow one-half hour warm-up time.

5-4. EQUIPMENT REQUIRED

5-5. Test equipment and accessories required for the adjustment procedures are listed in Table 1-2. If the listed equipment is not available, substitute equipment may be used provided it meets the minimum specifications given in the table.

5-6. Adjustment Tools

5-7. For adjustments that require a non-metallic tuning tool, use fiber tuning tool, HP Part Number 8710-0033 (Check Digit 4). When a non-metallic tuning tool is not required, you may use an ordinary small, flat-bladed screwdriver or other suitable tool. A spline tool, HP Part Number 8710-0055 (Check Digit 0), is required to adjust the OUTPUT POWER LEVEL control knob. Regardless of the tool used, do not try to force any adjustment control. Slug-tuning inductors and variable capacitors especially, are easily damaged by excessive force.

CAUTION

The SMA INPUT and OUTPUT connectors on the HP 11975A are easily damaged. For this reason, Hewlett-Packard recommends that SMA (m) to SMA (f) adapters (HP Part Number 1250-1462) be used on these connectors.

5-8. INITIAL CONTROL SETTINGS

5-9. Before starting the adjustment procedures, set DRAIN potentiometer A2R2 (see Figure 8-3 for location), G1 potentiometer A2R7, G2 potentiometer A2R6, and G3 potentiometer A2R5 to the full counter clockwise position (zero volts). Set the other four trimmer potentiometers (A2R23 HI-P, A2R35 LO-P, A2R43 MR, and A2R44 HI-L) to approximately the mid-point of their range.

NOTE

The adjustments in this section are intended to be a complete unit, performed in the order given.

Table 5-1. Internal Adjustments

Reference Designator	Adjustment Name	Adjustment Paragraph	Description
A2R2 (Block I)	DRAIN	5-10	Adjusts output level of drain regulator A2U9
A2R5 (Block A)	G3	5-16	Adjusts bias on gate 3 of Modulator/Amplifier A3
A2R6 (Block A)	G2	5-16	Adjusts bias on gate 2 of Modulator/Amplifier A3
A2R7 (Block A)	G1	5-16	Adjusts bias on gate 1 of Modulator/Amplifier A3
A2R20 (Block H)	GAIN	5-15	Adjusts the gain to the ALC Loop to set the time required for full ALC to be achieved
A2R22	BAL	5-11	Adjusts the unity gain buffer A2U3 (Block E) for 0 volts of offset.
A2R34 (Block B)	HI-P	5-13	Calibrates the +16 dBm position of the OUTPUT POWER LEVEL control
A2R35 (Block B)	LO-P	5-13	Calibrates the +6 dBm position of the OUTPUT POWER LEVEL control
A2R43 (Block B)	MR	5-13	Adjusts the mid-range power out of the HP 11975A to match the calibration marks on the OUTPUT POWER LEVEL control
A2R44 (Block D)	HI-L	5-14	Adjusts the High Power Warning LED turn-on threshold

ADJUSTMENTS

NOTE

Removal of the top cover involves the following:

1. **Remove the counter-sunk Pozi-Head screw securing the end of the instrument carrying strap that is closest to the rear panel.**
2. **Remove the trim under the screw and pull the free end of the handle toward the rear of the instrument.**
3. **Lift the top cover off.**

5-10. DRAIN VOLTAGE ADJUSTMENTS

Reference:

HP 11975A ALC-Bias Board Assembly Parts Locations Diagram and HP 11975A Schematic.

DESCRIPTION:

With DRAIN trimmer potentiometer A2R2, the output of DRAIN voltage regulator U9 is set to 7.0 ±0.05V.

EQUIPMENT:

Digital Voltmeter ..... HP 3455A

PROCEDURE:

1. Connect voltmeter negative lead to A2TP6 and positive lead to E5.

CAUTION

Test point E5 is connected to the drain of the GaAs FET amplifier which is susceptible to static damage. Ground the positive lead of the voltmeter to the HP 11975A chassis before connecting it to E5.

2. Turn LINE switch to ON on 11975A.
3. Adjust Drain (A2R2) for a reading of 7.0 ±0.05V.

5-11. BUFFER BALANCE ADJUSTMENTS

REFERENCE:

HP 11975A ALC-Bias Board Assembly Parts Locations Diagram and HP 11975A Schematic.

DESCRIPTION:

The input to the unity gain buffer A2U3 is grounded and the buffer output is set to 0 volts with balance (BAL) potentiometer A2R22.

EQUIPMENT:

Digital Voltmeter ..... HP 3455A

PROCEDURE:

1. Jumper A2TP2 to A2TP6 (ground).
2. Connect voltmeter positive lead to A2TP3 and the negative lead to A2TP6. Adjust A2R22 (Bal) for a reading of 0.000 ± .001V.
3. Disconnect voltmeter leads and remove jumper.

5-12. OUTPUT POWER LEVEL CONTROL ADJUSTMENTS

REFERENCE:

HP 11975A ALC-Bias Board Assembly Parts Locations Diagram and HP 11975A Schematic.

DESCRIPTION:

An ohmmeter is connected between the variable contact arm and one side of the OUTPUT POWER LEVEL control potentiometer (A1W2R1). The OUTPUT POWER LEVEL control knob is rotated to the point where a reading of 100 ±6 ohms is obtained. Next, the control knob is refixed to the potentiometer shaft with pointer at the +6 dBm position.

EQUIPMENT:

Digital Voltmeter (ohmmeter)	HP 3455A
Spline Tool	HP 8710-0055

PROCEDURE:

1. Turn LINE switch to OFF.
2. Unplug main wiring harness A1W2 from connector A2J5.
3. Set voltmeter to 2-wire ohms and connect leads to terminals of A1W2R1 (Output Power Level control) that are connected to the white/red wire (92) and the white/violet wire (97).
4. Rotate Output Power Level control until a reading of 100 ±6 ohms is obtained.
5. If knob pointer is not positioned at +6 dBm indication, remove knob and reposition it. Spline tool, HP Part Number 8710-0055, is needed to remove knob.
6. Repeat steps 4 and 5 until a 100 ±6 ohm reading is obtained with the Output Power Level control set to +6 dBm.
7. Reconnect A1W2 to A2J5.

5-13. HIGH, LOW AND MR ADJUSTMENTS

REFERENCE:

HP 11975A ALC-Bias Board Assembly Parts Locations Diagram and HP 11975A Schematic.

DESCRIPTION:

The power output of the HP 11975A is measured and adjusted at three position of the HP 11975A OUTPUT POWER LEVEL control: +16 dBm, +6 dBm, and +12 dBm. At each of the three positions of the OUTPUT POWER LEVEL control, the output level is adjusted with a particular one of three internal adjustment potentiometers.

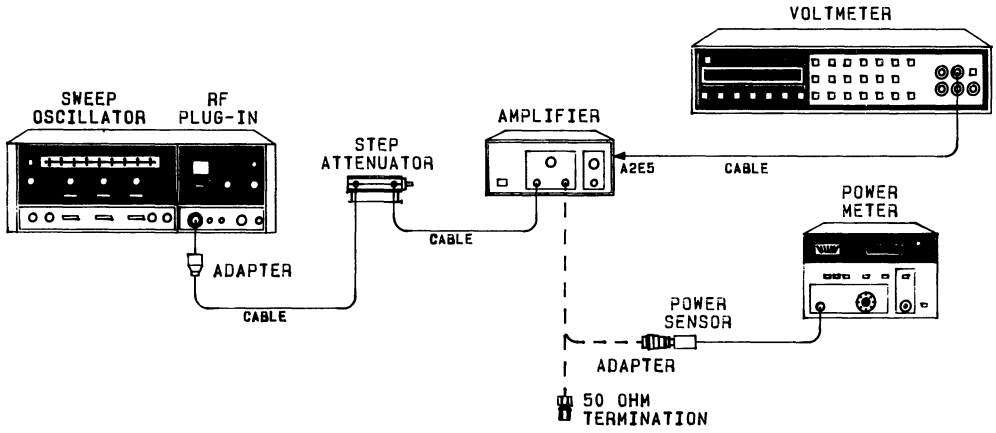


Figure 5-1. Adjustment Procedure Test Setup

EQUIPMENT:

Sweep Oscillator	HP 8620C
RF Plug-In	HP 86290B
Step Attenuator	HP 8494B
Power Meter	HP 436A
Power Sensor	HP 8481A
Adapter, N (m) to SMA (f)	HP 1250-1250
Adapter, N (f) to SMA (m)	OSM P/N 3082-2241-00
RF Cable (2 required)	HP 11975-20002
Adapter, SMA (f) to SMA (f)	HP 1250-1158

PROCEDURE:

1. Set up equipment as shown in Figure 5-1, but do not make any connections to the HP 11975A.

2. Calibrate power meter and then set CAL FACTOR % to reading shown on power sensor CAL FACTOR % chart for 6.0 GHz.

3. Set power meter to dBm MODE. Set the step attenuator to 0 dB.

5-13. HIGH, LOW AND MR ADJUSTMENTS (Cont'd)

4. Set sweep oscillator and plug-in controls as follows:

Front Panel
- Band ..... 2.0 – 6.2 GHz
- CW Marker (white) ..... 6.1 GHz
- CW ..... Press push button
- Markers ..... OFF
- ALC ..... INT
- Slope ..... OFF (CCW)
- RF ..... OFF
- Mode ..... AUTO

Rear Panel
- DISPLAY BLANKING ..... OFF
- RF BLANKING ..... OFF
- 1 kHz SQ WV ..... OFF
- FM-NORM-PL ..... NORM

5. Connect Power Sensor to 11975-20002 semi-rigid cable that is connected to step attenuator (an SMA (f) to SMA (f) adapter is required).

6. On sweep oscillator, turn RF to ON and adjust Power Level control for a reading of +9.0 dBm.

7. Finish connecting equipment as shown in Figure 5-1.

8. On 11975A set Output Power Level control to +16 dBm and rear panel ALC switch to ON.

9. On 11975A turn LINE switch to ON.

10. Adjust HI-P (A2R34) for a power meter reading of +16.0 ±0.2 dBm.

11. On 11975A set Output Power Level control to +6 dBm and adjust LO-P (A2R37) for a power meter reading of +6.0 ±0.2 dBm.

12. On 11975A set Output Power Level control to +12 dBm and adjust MR (A2R43) for a power meter reading of +12.0 ±0.2 dBm.

13. Repeat steps 10, 11, and 12 until all power meter readings are correct for the associated OUTPUT POWER LEVEL control position.

5-14. HIGH LEVEL WARNING LED ADJUSTMENTS

REFERENCE:

HP 11975A ALC-Bias Board Assembly Parts Locations Diagram and HP 11975A Schematic.

DESCRIPTION:

The High Level Warning LED is adjusted to turn on at +16.75 dBm with HI-L adjustment potentiometer (A2R44).

EQUIPMENT:

Sweep Oscillator	HP 8620C
RF Plug-In	HP 86290B
Step Attenuator	HP 8494B
Power Meter	HP 436A
Power Sensor	HP 8481A
Adapter, N (m) to SMA (f)	HP 1250-1250
Adapter, N (f) to SMA (m)	OSM P/N 3082-2241-00
RF Cable (2 required)	HP 11975-20002

PROCEDURE:

1. Set up equipment as shown in Figure 5-1, but do not make any connections to the HP 11975A.

2. Calibrate power meter and then set CAL FACTOR % to reading shown on power sensor CAL FACTOR % chart for 6.0 GHz.

3. Set power meter to dBm MODE.

4. Set sweep oscillator and plug-in controls as follows:

Front Panel

Band	2.0 – 6.2 GHz
CW Marker (white)	6.1 GHz
CW	Press push button
Markers	OFF
ALC	INT
Slope	OFF (CCW)
RF	OFF

Rear Panel

DISPLAY BLANKING	OFF
RF BLANKING	OFF
1 kHz SQ WV	OFF
FM-NORM-PL	NORM

5-14. HIGH LEVEL WARNING LED ADJUSTMENTS (Cont'd)

5. On HP 11975A, pull out on Output Power Level control to over-ride detent. Rotate knob until a power meter reading of +16.75 dBm is obtained.

6. Adjust HI-L (A2R44) so that the AMBER LED just turns on.

7. Return OUTPUT Power Level control to +16 dBm setting. If Amber LED does not turn off repeat steps 5 and 6.

5-15. ALC GAIN ADJUSTMENT

REFERENCE:

HP 11975A ALC-Bias Board Assembly Parts Locations Diagram and HP 11975A Schematic.

DESCRIPTION:

An HP 1741A Oscilloscope is connected to A2TP4. GAIN adjustment potentiometer (A2R20) is adjusted to obtain a rise time of 7.5 to 10 microseconds.

EQUIPMENT:

Oscilloscope	HP 1741A
Probe 10:1 Divider	HP 10004D
Sweep Oscillator	HP 8620C
RF Plug-In	HP 86290B
Step Attenuator	HP 8494B
Power Meter	HP 436A
Power Sensor	HP 8481A
Adapter, N (m) to SMA (f)	HP 1250-1250
Adapter, N (f) to SMA (m)	OSM P/N 3082-2241-00
RF Cable (2 required)	HP 11975-20002

PROCEDURE:

1. Set sweep oscillator controls as follows:

Front Panel START MARKER (green)	2.0 GHz
STOP MARKER (red)	6.0 GHz
MARKER SWEEP	Press Switch
MARKERS	OFF
MODE	AUTO
TRIGGER	INT
TIME	.01 – .1 (Vernier Full CW)
RF	ON
ALC	INT
SLOPE	OFF
POWER LEVEL	3 o'clock
Rear Panel	
RF BLANKING	ON

NOTE

The UNLEVELED light on the HP 11975A will be on.

5-15. ALC GAIN ADJUSTMENT (Cont'd)

2. Connect oscilloscope 10:1 probe to A2TP4.

3. Set oscilloscope controls as follows:

CHAN A	.02V/DIV
DISPLAY	A
TRIGGER	A
DLY'D TRIGGER	
DELAYED SWEEP	2 μsec/div
MAIN SWEEP	5 msec/div
ALL OTHER BUTTONS	OUT

4. Set Chan A to GND and adjust POSN to place trace at mid screen.

5. Set Chan A to DC coupling and adjust Trigger level for stable display.

6. Rotate DELAY control until waveform similar to Figure 5-2 is observed. (It might be necessary to change sweep time settings.)

7. Adjust Gain (A2R20) for a risetime of 7.5 to 10 microseconds.

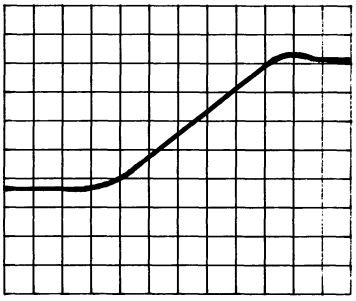


Figure 5-2. Waveform for ALC Gain Adjustment

5-16. GATE VOLTAGE ADJUSTMENTS

REFERENCE:

HP 11975A ALC-Bias Board Assembly Parts Locations Diagram and HP 11975 Schematic.

DESCRIPTION:

The gate voltages of the 2 – 8 GHz Modulator/Amplifier Assembly A3 is adjusted with potentiometers G1 (A2R7), G2 (A2R6), and G3 (A2R5).

EQUIPMENT:

Digital Voltmeter	HP 3455A

PROCEDURE:

1. Connect voltmeter negative lead A2TP6 and positive lead to test point E1. Set voltmeter function to ⎓V (dc voltage).
2. Adjust G1 (A2R7) for reading of 0V.
3. Connect voltmeter positive lead to test point E2. Adjust G2 (A2R6) for reading of 0V.
4. Connect voltmeter positive lead to test point E3. Adjust G3 (A2R5) for reading of 0V.
5. Disconnect voltmeter leads.

SECTION VI
REPLACEABLE PARTS

6-1. INTRODUCTION

6-2. This section contains information for ordering replacement parts. Table 6-1 includes a list of reference designations and a list of abbreviations used in the parts list. Table 6-2 lists names and addresses that correspond to the manufacturer code numbers in the parts list. Table 6-3 lists all replaceable electrical parts in alpha-numerical order by reference designation. Table 6-4 lists chassis-mounted parts. All replaceable mechanical parts are shown in Figures 6-1 through 6-5.

6-3. REPLACEABLE PARTS

6-4. The following information is listed for each part:

1. The Hewlett-Packard part number.
2. The part number check digit (CD).
3. The total quantity (Qty) in the instrument. This quantity is given only once, at the first appearance of the part in the list.
4. The description of the part.
5. A five-digit code indicating a typical manufacturer of the part.
6. The manufacturer's part number.

6-5. ORDERING INFORMATION

6-6. To order a part listed in the replaceable parts tables, quote the Hewlett-Packard part number (with check digit), indicate the quantity required, and address the order to the nearest Hewlett-Packard office. The check digit will ensure accurate and timely processing of your order.

6-7. To order a part that is not listed in the replaceable parts tables, include the instrument model number, instrument serial number, the description and function of the part, and number of parts required. Address the order to the nearest Hewlett-Packard office.

Table 6-1. Reference Designations and Abbreviations (1 of 3)

REFERENCE DESIGNATIONS

A . . . . . Assembly
AT . . . . . Attenuator, Isolator, Limiter, Termination
B . . . . . Fan, Motor
BT . . . . . Battery
C . . . . . Capacitor
CP . . . . . Coupler
CR . . . . . Diode, Diode Thyristor, Step Recovery Diode (SCR), Varactor
DC . . . . . Directional Coupler
DL . . . . . Delay Line
DS . . . . . Annunciator, Lamp, Light Emitting Diode (LED), Signaling Device (Audible or Visible)
E . . . . . Miscellaneous Electrical Part
F . . . . . Fuse
FL . . . . . Filter
H . . . . . Hardware
HY . . . . . Circulator
J . . . . . Electrical Connector (Stationary Portion), Jack
K . . . . . Relay
L . . . . . Coil, Inductor
M . . . . . Meter
MP . . . . Miscellaneous Mechanical Part
P . . . . . Electrical Connector (Movable Portion), Plug
Q . . . . . Silicon Controlled Rectifier (SCR), Transistor, Triode Thyristor
R . . . . . Resistor
RT . . . . . Thermistor
S . . . . . Switch
T . . . . . Transformer
TB . . . . . Terminal Board
TC . . . . . Thermocouple
TP . . . . . Test Point
U . . . . . Integrated Circuit, Microcircuit
V . . . . . Electron Tube
VR . . . . . Breakdown Diode (Zener), Voltage Regulator
W . . . . . Cable, Transmission Path, Wire
X . . . . . Socket
Y . . . . . Crystal Unit (Piezoelectric, Quartz)
Z . . . . . Tuned Cavity, Tuned Circuit

ABBREVIATIONS

A

A . . . . . Across Flats, Acrylic, Air (Dry Method), Ampere
ADJ . . . . . Adjust, Adjustment
ANSI . . . . . American National Standards Institute (formerly USASI-ASA)
ASSY . . . . . Assembly
AWG . . . . . American Wire Gage

B

BCD . . . . . Binary Coded Decimal
BD . . . . . Board, Bundle
BE-CU . . . . . Beryllium Copper
BNC . . . . . Type of Connector
BRG . . . . . Bearing, Boring
BRS . . . . . Brass
BSC . . . . . Basic
BTN . . . . . Button

C

C . . . . . Capacitance, Capacitor, Center Tapped, Centistoke, Cermet, Circular Mil Foot, Closed Cup, Cold, Compression
CCP . . . . . Carbon Composition Plastic
CD . . . . . Cadmium, Card, Cold-Drawn, Cord
CER . . . . . Ceramic
CHAM . . . . . Chamfer
CHAR . . . . . Character, Characteristic, Charcoal
CMOS . . . . . Complementary Metal Oxide Semiconductor
CNDCT . . . . . Conducting, Conductive, Conductivity, Conductor
CONT . . . . . Contact, Continuous, Control, Controller
CONV . . . . . Converter
CPRSN . . . . . Compression
CUP-PT . . . . . Cup Point
CW . . . . . Clockwise, Continuous Wave

D

D . . . . . Deep, Depletion, Depth, Diameter, Direct Current
DA . . . . . Darlington
DAP-GL . . . . . Diallyl Phthalate Glass
DBL . . . . . Double
DCDR . . . . . Decoder
DEG . . . . . Degree
D-HOLE . . . . . D-Shaped Hole
DIA . . . . . Diameter
DIP . . . . . Dual In-Line Package
DIP-SLDR . . . . . Dip Solder
D-MODE . . . . . Depletion Mode
DO . . . . . Package Type Designation
DP . . . . . Deep, Depth, Diametric Pitch, Dip
DP3TMINTR . . . . . Double Pole Three Throw, Miniature
DPDTMINTR . . . . Double Pole Double Throw, Miniature
DWL . . . . . Dowel

E

E-R . . . . . E-Ring
EXT . . . . . Extended, Extension, External, Extinguish

F

F . . . . . Fahrenheit, Farad, Female, Film (Resistor), Fixed, Flange, Flint, Fluorine, Frequency
FC . . . . . Carbon Film / Composition, Edge of Cutoff Frequency, Face
FDTHRU . . . . . Feed Through
FEM . . . . . Female
FIL-HD . . . . . Fillister Head
FL . . . . . Flash, Flat, Fluid
FLAT-PT . . . . . Flat Point
FR . . . . . Front
FREQ . . . . . Frequency
FT . . . . . Current Gain Bandwidth Product (Transition Frequency); Feet, Foot
FXD . . . . . Fixed

G

GEN . . . . . General, Generator
GND . . . . . Ground
GP . . . . . General Purpose, Group

H

H . . . . . Henry, Hermaphrodite, High, Hole Diameter, Hot, Hub Inside Diameter, Hydrogen
HDW . . . . . Hardware
HEX . . . . . Hexadecimal, Hexagon, Hexagonal
HLCL . . . . . Helical
HP . . . . . Hewlett-Packard Company, High Pass, Horsepower

I

IC . . . . . Collector Current, Integrated Circuit
ID . . . . . Identification, Inside Diameter
IF . . . . . Forward Current, Intermediate Frequency
IN . . . . . Inch, Indium
INCL . . . . . Including
INT . . . . . Integral, Intensity, Internal
INTL . . . . . Internal, International

J

J-FET . . . . . Junction Field Effect Transistor
JFET . . . . . Junction Field Effect Transistor

K

K . . . . . Kelvin, Key, Kilo, Potassium
KNRLD . . . . . Knurled
KVDC . . . . . Kilovolts Direct Current

Table 6-1. Reference Designations and Abbreviations (2 of 3)

L

LED . . . . . Light Emitting Diode
LG . . . . . Length, Long
LIN. . . . Linear, Linear Taper, Linearity
LK . . . . . Link, Lock
LKG . . . . . Leakage, Locking
LOGO . . . . . Logotype
LUM . . . . . Luminous

M

M . . . . . Male, Maximum, Mega, Mil, Milli, Mode, Momentary, Mounting Hole Centers, Mounting Hole Diameter, Metric
MA . . . . . Milliampere
MACH . . . . . Machined
MAX . . . . . Maximum
MC . . . . . Hot Molded Carbon Composition, Megacycle, Microcircuit, Molded Carbon Composition
MET . . . . . Metal, Metallic, Metallized, Metallurgical
MHZ . . . . . Megahertz
MIT . . . . . Miter
MLD . . . . . Mold, Molded
MM . . . . . Magnetized Material (Restricted Articles Code); Millimeter
MOM . . . . . Momentary
MTG . . . . . Mounting
MTLC . . . . . Metallic
MUW . . . . . Music Wire
MW . . . . . Milliwatt

N

N . . . . . Fan Out, Intrinsic Stand Off Ratio, Nano, Nanosecond, Nitrogen, None
N-CHAN . . . . . N-Channel
NH . . . . . Nanohenry
NM . . . . . Nanometer, Nonmetallic
NO . . . . . Normally Open, Number
NOM . . . . . Nominal
NPN . . . . . Negative Positive Negative (Transistor)
NS. . . Nanosecond, Non-Shorting, Nose
NUM . . . . . Numeric, Numerical
NYL . . . . . Nylon (Polyamide)

O

OA . . . . . Other Restricted Articles, Group A (Restricted Articles Code); Over-All
OD . . . . . Olive Drab, Outside Diameter
OP AMP. . . . . Operational Amplifier
OPT . . . . . Optical, Option, Optional

P

PA . . . . . Picoampere, Power Amplifier, Pressure Angle, Protactinium
PAN-HD . . . . . Pan Head
PAR . . . . . Parallel, Parity
PB . . . . . Lead (Metal), Push Button
PC . . . . . Picocoulomb, Piece, Printed Circuit
PCB . . . . . Printed Circuit Board
P-CHAN . . . . . P-Channel
PD . . . . . Pad, Palladium, Pitch Diameter, Power Dissipation
PF . . . . . Picofarad; Pipe, Female Connection; Power Factor
PKG . . . . . Package
PLSTC . . . . . Plastic
PNL . . . . . Panel
PNP . . . . . Positive Negative Positive (Transistor)
POLYC . . . . . Polycarbonate
POLYE . . . . . Polyester
POT . . . . . Potentiometer
POZI . . . . . Pozidriv Recess
PREC . . . . . Precision
PRP . . . . . Purple, Purpose
PSTN . . . . . Piston
PT . . . . . Part, Pint, Platinum, Point, Pulse Time
PW . . . Power Wirewound, Pulse Width

Q

Q . . . . . Figure of Merit

R

R . . . . . Range, Red, Resistance, Resistor, Right, Ring, Rosin, Rubber-Resin, Run Torque
REF . . . . . Reference
RES . . . . Research, Resistance, Resistor
RF . . . . . Radio Frequency
RGD . . . . . Rigid
RND . . . . . Round
RR . . . . . Rear
RVT . . . . . Rivet, Riveted

S

SAWR . . . . . Surface Acoustic Wave Resonator
SEG . . . . . Segment
SGL . . . . . Single
SI . . . . . Silicon, Square Inch
SL . . . . . Slide, Slow
SLT . . . . . Slate, Slot, Slotted
SMA . . . . . Subminiature, A Type (Threaded Connector)
SMC . . . . . Subminiature, C Type (Threaded Connector)
SPCG . . . . . Spacing
SPDTSUBMIN . . . . Single Pole Double Throw, Subminiature
SPST . . . . . Single Pole Single Throw
SQ . . . . . Square
SST . . . . . Stainless Steel
STL . . . . . Steel
SZ . . . . . Size

T

T . . . . . Tab Width, Taper, Teeth, Temperature, Tera, Tesla, Thermoplastic (Insulation), Thickness, Time, Timed, Tooth, Turns Ratio, Typical
TA . . . . . Ambient Temperature, Tantalum
TC . . . . . Thermoplastic
THD . . . . . Thread, Threaded
THK . . . . . Thick
TO . . . . . Package Type Designation, Troy Ounce
TPG . . . . . Tapping
TR-HD . . . . . Truss Head
TRMR . . . . . Trimmer
TRN . . . . . Turn, Turns
TRSN . . . . . Torsion

U

UCD . . . . . Microcandela
UF . . . . . Microfarad
UH . . . . . Microhenry
UL . . . . . Microiiter, Underwriters' Laboratories, Inc.
UNHDND . . . . . Unhardened

V

V . . . . . Vanadium, Variable, Violet, Volt, Voltage
VAC . . . . . Vacuum; Volts, Alternating Current
VAC/DC . . . . . Volts, Alternating and Direct Current
VAR . . . . . Variable
VDC . . . . . Volts, Direct Current

W

W . . . . . Watt, Wattage, White, Wide, Width, Wire
W/CP . . . . . Wire / Conductive Plastic
W/SW . . . . . With Switch
WW . . . . . Wire Wound

X

X . . . . . By (Used With Dimensions), Reactance
XSTR . . . . . Transistor

Y

YIG . . . . . Yttrium-Iron-Garnet

Z

ZNR . . . . . Zener

Table 6-1. Reference Designations and Abbreviations (3 of 3)

MULTIPLIERS

Abbreviation	Prefix	Multiple
T	tera	10^{12}
G	giga	10^{9}
M	mega	10^{6}
k	kilo	10^{3}
da	deka	10
d	deci	10^{-1}
c	centi	10^{-2}
m	milli	10^{-3}
μ	micro	10^{-6}
n	nano	10^{-9}
p	pico	10^{-12}
f	femto	10^{-15}
a	atto	10^{-18}

Table 6-2. Manufacturers Code List

Mfr. No.	Manufacturer Name	Address	Zip Code
00000	ANY SATISFACTORY SUPPLIER		
01295	TEXAS INSTR INC SEMICOND CMPNT DIV	DALLAS, TX	75222
04713	MOTOROLA SEMICONDUCTOR PRODUCTS	PHOENIX, AZ	85008
07263	FAIRCHILD SEMICONDUCTOR DIV	MOUNTAIN VIEW, CA	94042
19701	MEPCO/ELECTRA CORP	MINERAL WELLS, TX	76067
24546	CORNING GLASS WORKS (BRADFORD)	BRADFORD, PA	16701
27014	NATIONAL SEMICONDUCTOR CORP	SANTA CLARA, CA	95051
28480	HEWLETT-PACKARD CO CORPORATE HQ	PALO ALTO, CA	94304
56289	SPRAGUE ELECTRIC CO	NORTH ADAMS, MA	01247
75915	LITTELFUSE INC	DES PLAINES, IL	60016

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A1(STD)	11975-60002	5	1	FRONT PANEL ASSY (STD. ONLY)	28480	11975-60002
A1(OPT.001)	11975-60014	9	1	FRONT PANEL ASSY (OPT. 001 ONLY)	28480	11975-60014
A1DS1	1990-0487	7	2	LED-LAMP LUM INT=1MCD IF=20MA-MAX BVR=5V	28480	5082-4584
A1DS2	1990-0487	7		LED-LAMP LUM-INT=1MCD IF=20MA-MAX BVR=5V	28480	5082-4584
A1DS3	1990-0486	6	1	LED-LAMP LUM-INT=1MCD IF=20MA-MAX BVR=5V	28480	5082-4684
A1J1(STD)	1250-1753	4	2	ADAPTER-COAX STR F-SMA F-SMA (STD ONLY) (INCLUDES HEX NUT AND LOCK WASHER).	28480	1250-1753
A1J1(OPT.001)	1250-0914	7	2	CONNECTOR-RF APC-N FEM UNMTD 50-OHM (OPT. 001 ONLY) (REFER TO FIGURE 6-5 FOR ILLUSTRATED BREAKDOWN OF PARTS).	28480	1250-0914
A1J2(STD)	1250-1753	4		ADAPTER-COAX STR F-SMA F-SMA (STD ONLY) (INCLUDES HEX NUT AND LOCK WASHER.)	28480	1250-1753
A1J2(OPT.001)	1250-0914	7		CONNECTOR RF APC-N(F) (OPT. 001 ONLY) (REFER TO FIGURE 6-5 FOR ILLUSTRATED BREAKDOWN OF PARTS.)	28480	1250 0914
A1J3	1250-0083	1	1	CONNECTOR-RF BNC FEM SGL-HOLE-FR 50-OHM	28480	1250 0083
A1W1	11975-60009	2	1	CABLE ASSEMBLY-POWER	28480	11975-60009
A1W1S1	3101-2025	2	1	SWITCH-RKR SUBMIN DPDT 2A 250VAC	28480	3101-2025
A1W2	11975-60006	9	1	CABLE HARNESS ASSY-MAIN	28480	11975-60006
A1W2R1	2100-3564	3	1	RESISTOR-VAR CONTROL C 1K 10% LIN	28480	2100-3564
A1W2R2	2100-4021	9	1	R-VP 2K 3% 5T (DIODE BIAS)	28480	2100-4021
A1W2S2	3101-2677	0	1	SW-SLIDE (ALC)	28480	3101-2677
A1XDS1	85680-40004	4	3	LED MOUNT	28480	85680-40004
A1XDS2	85680-40004	4		LED MOUNT	28480	85680-40004
A1XDS3	85680-40004	4		LED MOUNT	28480	85680-40004
A2	11975-60011	6	1	BD ASSY ALC-BIAS	28480	11975-60011
A2C1	0180-3132	7	2	CAPACITOR-FXD 4700UF+-20% 35VDC AL	28480	0180-3132
A2C2	0180-3132	7		CAPACITOR-FXD 4700UF+-20% 35VDC AL	28480	0180-3132
A2C3	0180-0197	8	3	CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A2C4	0180-0197	8		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A2C5	0180-0291	3	2	CAPACITOR-FXD 1UF+-10% 35VDC TA	56289	150D105X9035A2
A2C6	0180-0291	3		CAPACITOR-FXD 1UF+-10% 35VDC TA	56289	150D105X9035A2
A2C7	0180-0552	9	1	CAPACITOR-FXD 220UF+-20% 10VDC TA	28480	0180-0552
A2C8	0180-0197	8		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A2C9	0160-3534	1	1	CAPACITOR-FXD 510PF +-5% 100VDC MICA	28480	0160-3534
A2C10	0160-3877	5	1	CAPACITOR-FXD 100PF +-20% 200VDC CER	28480	0160-3877
A2C11	0160-0127	2	1	CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-0127
A2C12	0160-4441	1	1	CAPACITOR-FXD .47UF +-10% 50VDC CER	28480	0160-4441
A2C13	0180-0094	4	1	CAPACITOR-FXD 100UF+75-10% 25VDC AL	56289	30D107G025DD2
A2C14	0160-3878	6	1	CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A2C15	0160-0575	4	1	CAPACITOR-FXD .047UF +-20% 50VDC CER	28480	0160-0575
A2CR1	1901-0028	5	4	DIODE-PWR RECT 400V 750MA DO-29	28480	1901-0028
A2CR2	1901-0028	5		DIODE-PWR RECT 400V 750MA DO-29	28480	1901-0028
A2CR3	1901-0028	5		DIODE-PWR RECT 400V 750MA DO-29	28480	1901-0028
A2CR4	1901-0028	5		DIODE-PWR RECT 400V 750MA DO-29	28480	1901-0028
A2CR5	1901-0033	2	1	DIODE-GEN PRP 180V 200MA DO-7	28480	1901 0033
A2CR6	1901-0518	8	4	DIODE-SM SIG SCHOTTKY	28480	1901-0518
A2CR7	1901-0518	8		DIODE-SM SIG SCHOTTKY	28480	1901-0518
A2CR8	1901-0518	8		DIODE-SM SIG SCHOTTKY	28480	1901-0518
A2CR9	1901-0518	8		DIODE-SM SIG SCHOTTKY	28480	1901-0518
A2E1	1251-3172	7	5	CONNECTOR-SGL CONT SKT .03-IN-BSC-SZ RND	28480	1251-3172
A2E2	1251-3172	7		CONNECTOR-SGL CONT SKT .03-IN-BSC-SZ RND	28480	1251-3172
A2E3	1251-3172	7		CONNECTOR-SGL CONT SKT .03-IN-BSC-SZ RND	28480	1251-3172
A2E4	1251-3172	7		CONNECTOR-SGL CONT SKT .03-IN-BSC-SZ RND	28480	1251-3172
A2E5	1251-3172	7		CONNECTOR-SGL CONT SKT .03-IN-BSC-SZ RND	28480	1251-3172
A2J1	1251-4385	6	1	CONNECTOR 15-PIN M POST TYPE	28480	1251-4385
A2J2	1251-3825	7	1	CONNECTOR 5-PIN M POST TYPE	28480	1251-3825
A2J3	1250-0257	1	1	CONNECTOR-RF SMB M PC 50-OHM	28480	1250-0257
A2Q1	1854-0637	1	2	TRANSISTOR NPN 2N2219A SI TO-5 PD=800MW	01295	2N2219A
A2Q2	1854-0637	1		TRANSISTOR NPN 2N2219A SI TO-5 PD=800MW	01295	2N2219A
A2Q3	1855-0020	8	1	TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0020
A2R1	0698-3443	0	2	RESISTOR 287 1% .125W F TC=0+-100	24546	C4-1/8-TO-287R-F
A2R2	2100-0567	0	1	RESISTOR-TRMR 2K 10% C TOP-ADJ 1-TRN	28480	2100-0567
A2R3	0757-0346	2	1	RESISTOR 10 1% .125W F TC=0+-100	24546	C4 1/8-T0-10R0 F
A2R5	2100-3212	8	4	RESISTOR-TRMR 200 10% C TOP-ADJ 1-TRN	28480	2100-3212
A2R6	2100-3212	8		RESISTOR-TRMR 200 10% C TOP-ADJ 1-TRN	28480	2100-3212
A2R7	2100-3212	8		RESISTOR-TRMR 200 10% C TOP-ADJ 1-TRN	28480	2100-3212
A2R8	0757-0421	4	3	RESISTOR 825 1% .125W F TC=0+-100	24546	C4-1/8-T0-825R-F
A2R9	0757-0421	4		RESISTOR 825 1% .125W F TC=0+-100	24546	C4-1/8-T0-825R F
A2R10	0757-0421	4		RESISTOR 825 1% .125W F TC=0+-100	24546	C4-1/8-T0-825R F
A2R11	0757-0280	3	5	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F

See introduction to this section for ordering information
*Indicates factory selected value

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A2R12	0757-0290	5	1	RESISTOR 6.19K 1% .125W F TC=0+ 100	19701	MF4C1/8 TO 6191 F
A2R13	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4 1/8 TO 1001 F
A2R14	0698-3152	8	2	RESISTOR 3.48K 1% .125W F TC=0+ 100	24546	C4 1/8 TO 3481 F
A2R15	0757-0401	0	1	RESISTOR 100 1% .125W F TC=0+-100	24546	C4 1/8-TO 101 F
A2R16	0698-3445	2	1	RESISTOR 348 1% .125W F TC=0+-100	24546	C4 1/8 TO 348R F
A2R17	0757-0416	7	2	RESISTOR 511 1% .125W F TC=0+-100	24546	C4 1/8-TO 511R F
A2R18	0757 0442	9	5	RESISTOR 10K 1% .125W F TC=0+ 100	24546	C4-1/8 TO 1002 F
A2R19	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4 1/8 TO 1001 F
A2R20	2100-3252	6	2	RESISTOR TRMR 5K 10% C TOP ADJ 1-TRN	28480	2100 3252
A2R21	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4 1/8 TO 511R F
A2R22	2100 3211	7	1	RESISTOR TRMR 1K 10% C TOP ADJ 1 TRN	28480	2100 3211
A2R23	0698-0084	9	2	RESISTOR 2.15K 1% .125W F TC=0+-100	24546	C4-1/8 TO 2151 F
A2R24	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+ 100	24546	C4 1/8 TO 1001 F
A2R25	0757-0288	1	1	RESISTOR 9.09K 1% .125W F TC=0+ 100	19701	MF4C1/8 TO 9091-F
A2R26	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+ 100	24546	C4 1/8 TO 1002 F
A2R27	0757-0467	8	1	RESISTOR 121K 1% .125W F TC=0+-100	24546	C4 1/8 TO 1213 F
A2R28	0757-1094	9	2	RESISTOR 1.47K 1% .125W F TC=0+ 100	24546	C4 1/8 TO 1471 F
A2R29	0698-3152	8		RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4 1/8-TO 3481 F
A2R30	0698-3441	8	1	RESISTOR 215 1% .125W F TC=0+ 100	24546	C4 1/8-TO 215R F
A2R31	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4 1/8 TO 1001 F
A2R32	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+ 100	24546	C4 1/8-TO-1002 F
A2R33	0757-0438	3	2	RESISTOR 5.11K 1% .125W F TC=0+ 100	24546	C4 1/8 TO 5111 F
A2R34	2100-3252	6		RESISTOR TRMR 5K 10% C TOP ADJ 1 TRN	28480	2100-3252
A2R35	2100-0558	9	1	RESISTOR-TRMR 20K 10% C TOP-ADJ 1 TRN	28480	2100 0558
A2R36	0757 0394	0	1	RESISTOR 51.1 1% .125W F TC=0+ 100	24546	C4 1/8 TO 51R1 F
A2R37	0698-0084	9		RESISTOR 2.15K 1% .125W F TC=0+ 100	24546	C4-1/8-TO 2151 F
A2R38	0757 1094	9		RESISTOR 1.47K 1% .125W F TC=0+ 100	24546	C4 1/8 TO 1471 F
A2R39	0757-0159	5	2	RESISTOR 1K 1% .5W F TC=0+ 100	28480	0757 0159
A2R40	0757-0159	5		RESISTOR 1K 1% .5W F TC=0+ 100	28480	0757-0159
A2R41	0757-0439	4	1	RESISTOR 6.81K 1% .125W F TC=0+ 100	24546	C4 1/8-TO 6811 F
A2R42	0698-3443	0		RESISTOR 287 1% .125W F TC=0+ 100	24546	C4 1/8 TO 287R F
A2R43	2100-0554	5	2	RESISTOR-TRMR 500 10% C TOP-ADJ 1 TRN	28480	2100-0554
A2R44	2100-0554	5	1	RESISTOR TRMR 500 10% C TOP-ADJ 1 TRN	28480	2100-0554
A2R45	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4 1/8-TO 1002 F
A2R46	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4 1/8-TO 1002 F
A2R47	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4 1/8 TO 5111 F
A2R48	0757 0199	3	1	RESISTOR 21.5K 1% .125W F TC=0+ 100	24546	C4-1/8 TO 2152 F
A2R49	0757-0440	7	1	RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4 1/8-TO 750 F
A2R50	0757-0317	7	1	RESISTOR 1.33K 1% .125W F TC=0+ 100	24546	C4 1/8-TO 133 F
A2R51	0757-0442	9	1	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-TO-1002-F
A2TP1	0360-0535	0	6	TERMINAL TEST POINT PCB	28480	0360-0535
A2TP2	0360-0535	0		TERMINAL TEST POINT PCB	28480	0360-0535
A2TP3	0360-0535	0		TERMINAL TEST POINT PCB	28480	0360-0535
A2TP4	0360-0535	0		TERMINAL TEST POINT PCB	28480	0360-0535
A2TP5	0360-0535	0		TERMINAL TEST POINT PCB	28480	0360-0535
A2TP6	0360-0535	0		TERMINAL TEST POINT PCB	28480	0360-0535
A2U1	1826-0458	5	3	IC OP AMP TO-99 PKG	27014	LF255H
A2U2	1826-0458	5		IC OP AMP TO-99 PKG	27014	LF255H
A2U3	1826-0021	8	1	IC OP AMP GP TO 99 PKG	27014	LM301H
A2U4	1826-0371	1	2	IC OP AMP LOW BIAS H IMPD TO 99 PKG	27014	LF256H
A2U5	1826-0371	1		IC OP AMP LOW BIAS H IMPD TO-99 PKG	27014	LF256H
A2U6	1826-0458	5		IC OP AMP TO 99 PKG	27014	LF255H
A2U6MP1	1251-3999	6		CONNECTOR SGL CONT SKT .032 IN BSC-SZ	28480	1251-3999
A2U6MP2	1251-3999	6		CONNECTOR SGL CONT SKT .032 IN BSC SZ	28480	1251-3999
A2U7	1826-0203	8	1	IC 7815 V RGLTR TO 3	07263	7815KC
A2U7MP1	1251-3999	6		CONNECTOR-SGL CONT SKT .032 IN BSC SZ	28480	1251 3999
A2U7MP2	1251-3999	6		CONNECTOR-SGL CONT SKT .032-IN BSC SZ	28480	1251-3999
A2U8	1826-0451	8	1	IC 7915 V RGLTR TO 3	04713	MC7915CK
A2U8MP1	1251-3999	6		CONNECTOR SGL CONT SKT .032 IN BSC SZ	28480	1251-3999
A2U8MP2	1251-3999	6		CONNECTOR-SGL CONT SKT .032-IN-BSC SZ	28480	1251 3999
A2U9	1826-0423	4	1	IC V RGLTR TO-3	27014	LM317K
A2VR1	1902-3002	3	3	DIODE ZNR 2.37V 5% DO 7 PD=.4W TC= .074%	28480	1902 3002
A2VR2	1902-3002	3		DIODE ZNR 2.37V 5% DO 7 PD=.4W TC= .074%	28480	1902 3002
A2VR3	1902-3002	3		DIODE-ZNR 2.37V 5% DO 7 PD=.4W TC= .074%	28480	1902-3002
A2VR4	1902-0041	4	1	DIODE-ZNR 5.11V 5% DO 35 PD=.4W	28480	1902 0041
A3	5086-7722	4	1	AMPLIFIER 2 8 GHZ	28480	5086-7722
A4	0955-0098	1	1	COUPLER 2.0–8.6 GHZ SMA	28480	0955 0098
A5	86290-60045	5	1	DETECTOR	28480	86290 60045
A6	11975-60013	8	1	REAR PANEL ASSY	28480	11975 60013

See introduction to this section for ordering information
*Indicates factory selected value

Table 6-3. Replaceable Parts

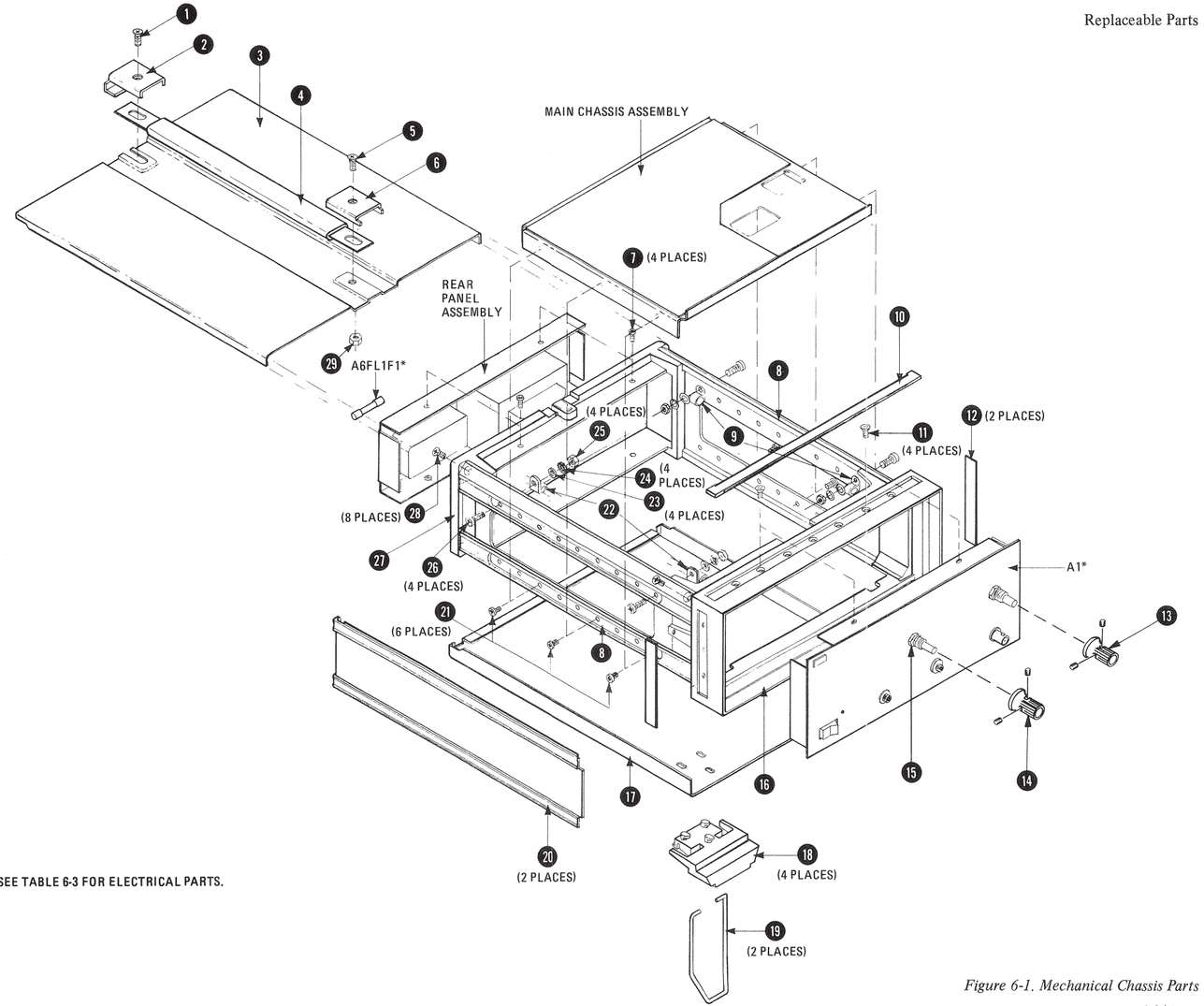
Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A6F1	2110-0421	6	1	FUSE .375A 250V TD 1.25X.25 UL (110/120V)	75915	313.375
A6F1	2110-0235	0	1	FUSE .2A 250V TD 1.25X.25 UL (220/240V)	75915	313.200
A6FL1	0960-0444	2	1	LINE MODULE-UNFILTERED	28480	0960-0444
A6FL1TB1				P/O A6FL1-NOT SEPARATELY REPLACEABLE		
A6T1	9100-4317	3	1	TRANSFORMER	28480	9100-4317

See introduction to this section for ordering information
*Indicates factory selected value

Table 6-4. Chassis Parts

Reference Designator	HP Part Number	C D	Qty	Description	Mfr. Code	Mfr. Part Number
DS1				SEE A1DS1		
DS2				SEE A1DS2		
DS3				SEE A1DS3		
F1				SEE A6FL1F1		
FL1				SEE A6FL1		
J1				SEE A1J1 OR A2J1		
J2				SEE A1J2 OR A2J2		
J3				SEE A1J3 OR A2J3		
T1				SEE A6T1		
W1	11975-20001	0	1	CABLE-INPUT	28480	11975-20001
W2	11975-20001	0	1	CABLE-OUTPUT	28480	11975-20001
W3	11975-20002	1	1	CABLE-AMPLIFIER/COUPLER	28480	11975-20002
W4	11975-60007	0	1	CABLE-DETECTOR/ALC	28480	11975-60007
W5			1	AC POWER CABLE. REFER TO TABLE 2-2 FOR STYLES AND PART NUMBERS.		

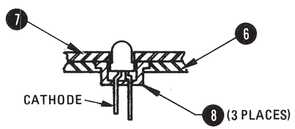
Reference Designator	HP Part Number	C D	Qty	Description	Mfr. Code	Mfr. Part Number
1	2680-0118	5	1	SCREW, MACH 10-32 .500 IN LG	28480	2680-0118
2	5040-7220	1	1	COVER, STRAP HANDLE, REAR	28480	5040-7220
3	5001-0428	5	1	COVER, TOP	28480	5001-0428
4	5060-9801	0	1	HANDLE, STRAP	28480	5060-9801
5	2510-0123	3	1	SCREW, MACH 8-32 .500 IN LG	28480	2510-0123
6	5040-7219	8	1	COVER, STRAP HANDLE, FRONT	28480	5040-7219
7	0515-0406	3	4	SCREW, MACH M3.0	28480	0515-0406
8	5020-8829	6	2	STRUT, SIDE	28480	5020-8829
9	1400-0082	9	2	CLIP, CABLE	28480	1400-0082
10	5040-7203	0	1	TRIM, TOP	28480	5040-7203
11	0515-0772	6	4	SCREW, MACH M3.0	28480	0515-0772
12	5001-0438	7	2	TRIM, SIDE	28480	5001-0438
13	0370-1091	6	1	KNOB, DIODE BIAS CONTROL	28480	0370-1091
14	11975-60010	5	1	KNOB ASSY, OUTPUT LEVEL CONTROL	28480	11975-60010
15	11975-20008	7	1	NUT, POT STOP	28280	11975-20008
16	5020-8813	8	1	FRAME, FRONT	28480	5020-8813
17	5060-9840	7	1	COVER, BOTTOM	28480	5060-9840
18	5040-7201	8	4	FOOT, BOTTOM	28480	5040-7201
19	1460-1345	5	2	SPR, WFR 3.00 IN LG	28480	1460-1345
20	5060-9904	4	2	COVER, SIDE	28480	5060-9904
21	0515-0210	7	6	SCREW, MACH M4.0	28480	0515-0210
22	1400-0017	0	2	CLIP, CABLE	28480	1400-0017
23	3050-0893	9	4	WASHER, FL M4.0 ID	28480	3050-0893
24	2190-0017	4	4	WASHER, LK .168 ID	28480	2190-0017
25	0535-0006	1	4	NUT, HEX M4.0	28480	0535-0006
26	0515-0107	1	4	SCREW, MACH M4.0	28480	0515-0107
27	5020-8814	9	1	FRAME, REAR	28480	5020-8814
28	2510-0192	6	8	SCREW, MACH 8-32 .250 IN LG	28480	2510-0192
29	0590-0049	8	1	NUT, HEX 8-32	28480	0590-0049



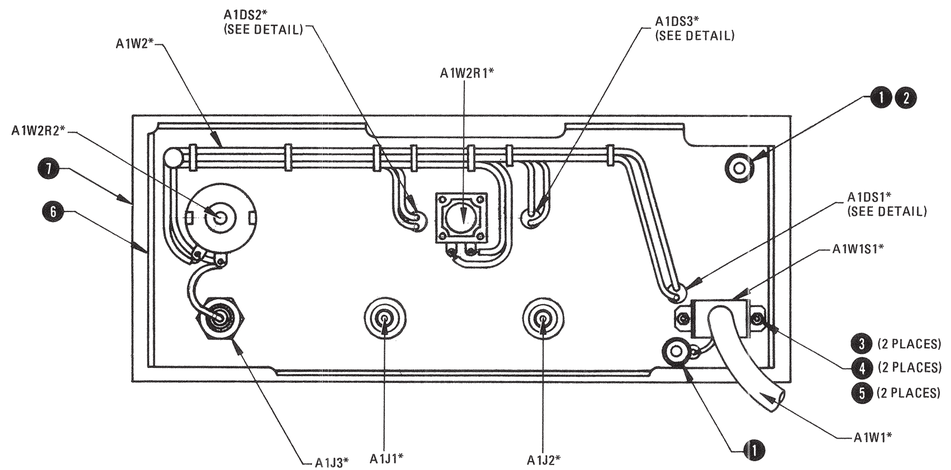
*SEE TABLE 6-3 FOR ELECTRICAL PARTS.

Figure 6-1. Mechanical Chassis Parts

LED MOUNTING DETAIL



Reference Designator	HP Part Number	C D	Qty	Description	Mfr. Code	Mfr. Part Number
				MISCELLANEOUS CHASSIS PARTS FOR A1		
1	2420-0003	7	2	NUT, HEX 6-32	28480	2420-0003
2	2190-0006	1	1	WASHER, LK .141 ID	28480	2190-0006
3	0380-0019	7	2	SPACER .188 LG .116 ID	28480	0380-0019
4	0610-0001	6	2	NUT, HEX 2-56	28480	0610-0001
5	2190-0014	1	2	WASHER, LK .089 ID	28480	2190-0014
6	11975-00002	9	1	PANEL, SUB (STD)	28480	11975-00002
	11975-00007	4		PANEL, SUB (OPT 001)	28480	11975-00007
7	11975-00001	8	1	PANEL, FRONT DRESS (STD)	28480	11975-00001
	11975-00006	3		PANEL, FRONT DRESS (OPT 001)	28480	11975-00006
8	85680-40004	4	3	MOUNT, LED	28480	85680-40004

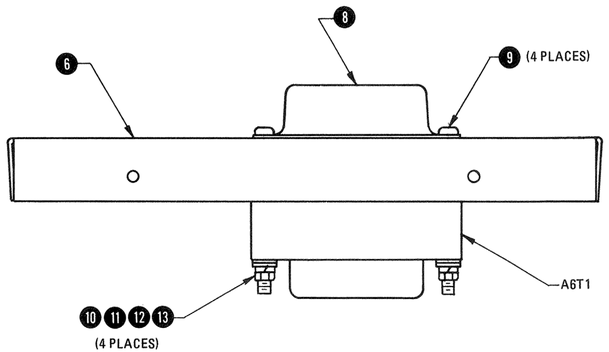


*SEE TABLE 6-3 FOR ELECTRICAL PARTS.

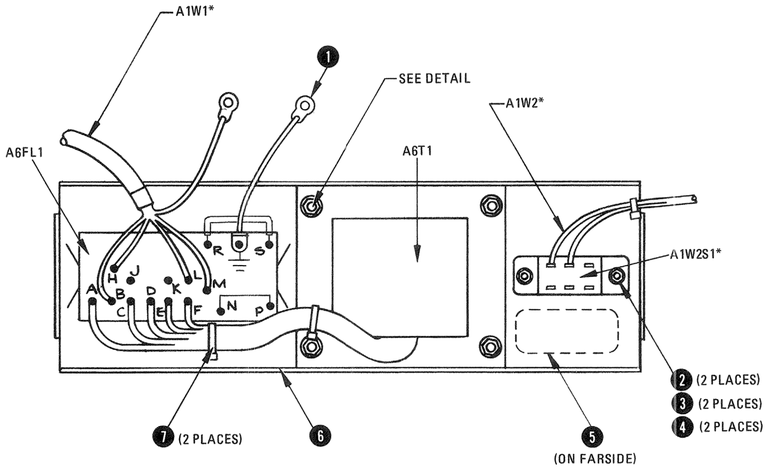
WIRE LIST	
Color Code on A1W2	Destination on A1
2	W2R2 pin 3
3	W2R2 pin 2 & A1J3
7	W2R2 pin 1
0 (2 wires)	DS3 (CATHODE)
91	DS3 (ANODE)
93	W1R1 pin 3
92	W1R1 pin 2
97	W1R1 pin 1
96	DS3 (CATHODE)
6	DS3 (ANODE)
0	DS1 (CATHODE)
90	DS1 (ANODE)

Figure 6-2. Front Panel Assembly Mechanical Parts

TRANSFORMER MOUNTING DETAIL



Reference Designator	HP Part Number	C D	Qty	Description	Mfr. Code	Mfr. Part Number
1	0360-0016	2	1	LUG, SOLDER	28480	0360-0016
2	0515-0062	7	2	SCREW, MACH M2.5	28480	0515-0062
3	2190-0583	9	2	WASHER, M2.5 ID	28480	2190-0583
4	0535-0008	3	2	NUT, HEX M2.5	28480	0535-0008
5	7121-2380	8	1	LABEL, ID, TYPABLE, MYLAR	28480	7121-2380
6	11975-00005	2	1	PANEL, REAR	28480	11975-00005
7	1400-0249	0	2	TIE, CABLE	28480	1400-0249
8	7100-0389	9	1	COVER, TRANSFORMER	28480	7100-0389
9	2360-0139	2	4	SCREW, MACH 6-32	28480	2360-0139
10	3050-0005	5	4	WASHER, FL .140 ID	28480	3050-0005
11	3050-0227	3	4	WASHER, FL .149 ID	28480	3050-0227
12	2190-0006	1	4	WASHER, LK .141 ID	28480	2190-0006
13	2420-0002	6	4	NUT, HEX 6-32	28480	2420-0002

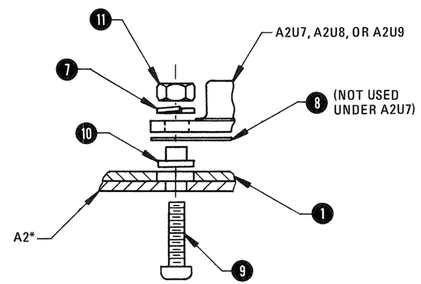


*SEE TABLE 6-3 FOR ELECTRICAL PARTS.

WIRE LIST	
Color Code on A1W1	**Pin Designation on A6FL1**
8	B
54	FRAME SCREW
98	M
918	H
928	L
Color Code on A6T1	**Pin Designations on A6FL1**
0	C
02	F
3	A
04	E
05	D
BARE WIRE	N TO P
BARE WIRE WITH TUBING	R TO S

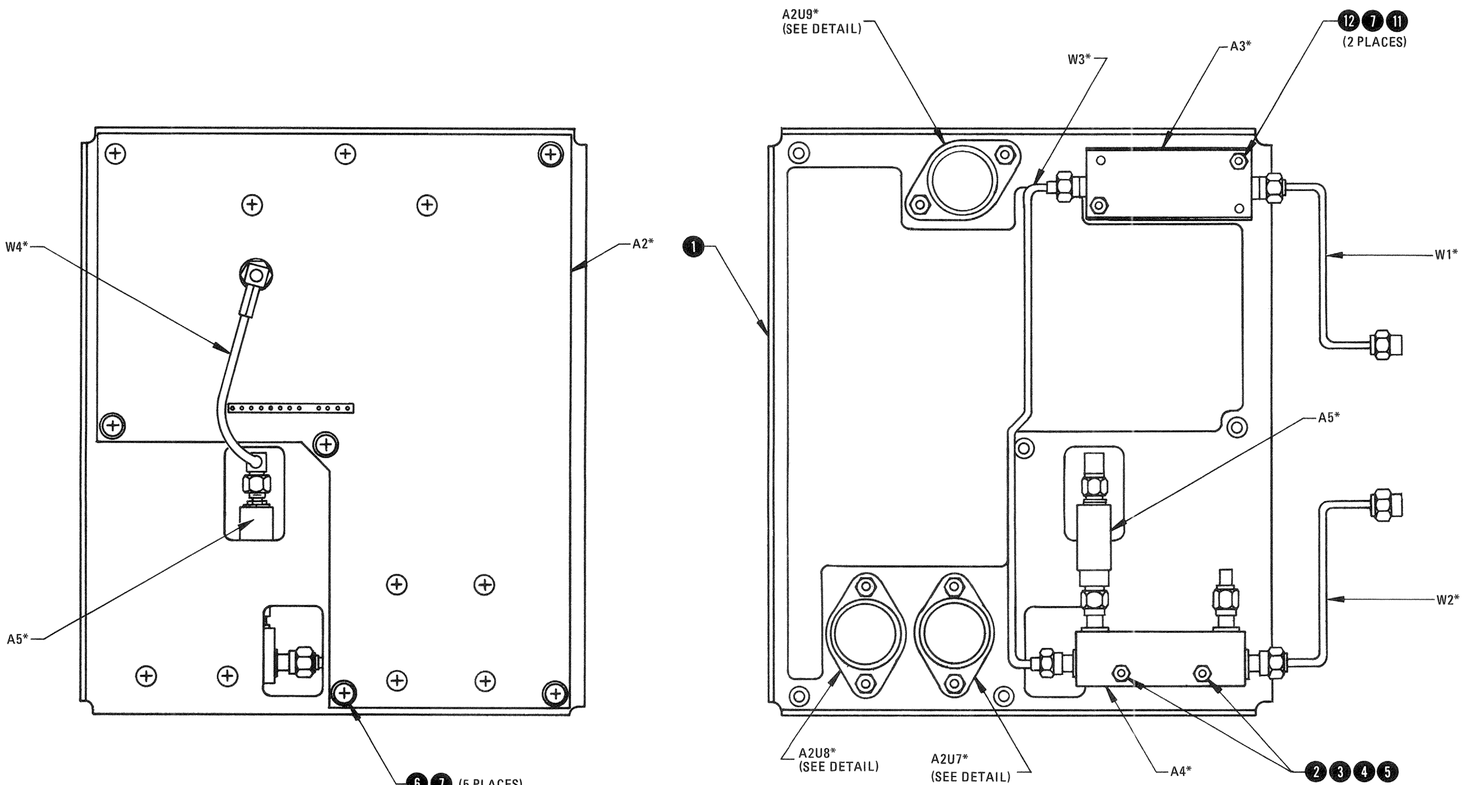
Figure 6-3. Rear Panel Assembly Mechanical Parts

MOUNTING DETAIL



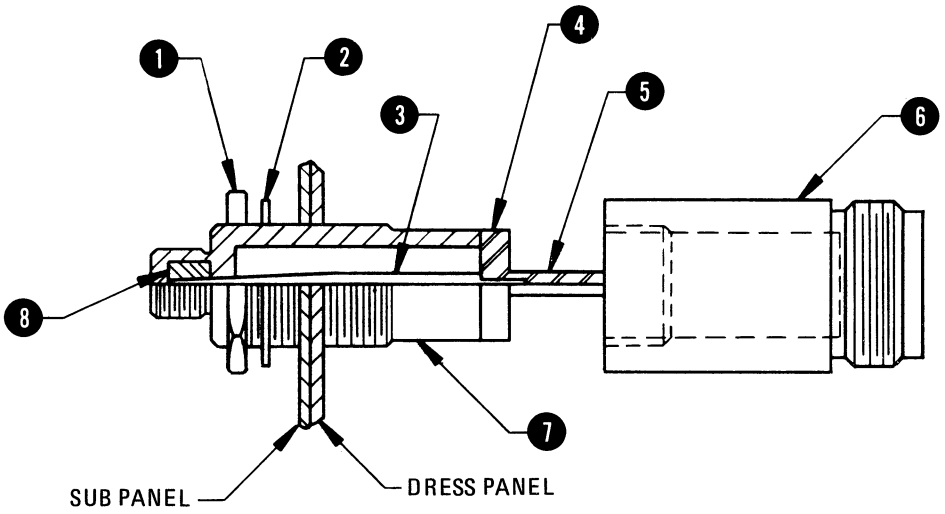
*SEE TABLE 6-3 FOR ELECTRICAL PARTS.

Reference Designator	HP Part Number	C D	Qty	Description	Mfr. Code	Mfr. Part Number
1	11975-00004	1	1	CHASSIS, MAIN	28480	11975-00004
2	0515-0455	2	2	SCREW, MACH M2.5	28480	0515-0455
3	3050-0890	6	2	WASHER, FL M2.5 ID	28480	3050-0890
4	2190-0583	9	2	WASHER, LK M2.5 ID	28480	2190-0583
5	0535-0008	3	2	NUT, HEX M2.5	28480	0535-0008
6	0515-0104	8	5	SCREW, MACH M3.0	28480	0515-0104
7	2190-0005	0	13	WASHER, LK .116 ID	28480	2190-0005
8	0340-0664	4	2	INSULATOR, XSTR TO-3	28480	0340-0664
9	0515-0105	9	6	SCREW, MACH M3.0	28480	0515-0105
10	0340-0433	5	6	INSULATOR, BUSHING .115 ID	28480	0340-0433
11	0535-0004	9	8	NUT, HEX M3.0	28480	0353-0004
12	0515-0057	0	2	SCREW, MACH M3.0	28480	0515-0057



*SEE TABLE 6-3 FOR ELECTRICAL PARTS.

Figure 6-4. Main Chassis Assembly Mechanical Parts



Reference Designator	HP Part Number	C D	Qty	Description	Mfr. Code	Mfr. Part Number
1	2950-0132	6	2	NUT, HEX 7/16-28	28480	2950-0132
2	2190-0104	0	2	WASHER, LK .439 ID	28480	2190-0104
3	08555-20093	5	2	CONTACT, JACK	28480	08555-20093
4	5040-0306	0	2	INSULATOR	28480	5040-0306
5	1250-0915	8	2	CONN, RF CONT F	28480	1250-0915
6	1250-0914	7	2	CONN, RF APC-N	28480	1250-0914
7	08555-20094	6	2	BODY, BULK HEAD	28480	08555-20094
8	08761-2027	4	2	INSULATOR	28480	08761-2027

Figure 6-5. Option 001 Connector Mechanical Parts

SECTION VII
MANUAL BACKDATING CHANGES

7-1. INTRODUCTION

7-2. This manual applies directly to HP 11975A Amplifiers with the serial number prefix shown under SERIAL NUMBERS on its title page. As time passes, an HP instrument manual might be revised to reflect design changes incorporated into the instrument. In that event, information is provided in this section that enables the user of an older instrument (i.e., one with a serial number prefix lower than the serial number prefix shown on the revised manual's title page) to change the revised manual so that it pertains to his instrument.

7-3. Because the HP 11975A is a new instrument, no such change information is required in this manual. For additional information about the applicability of the manual relative to the instrument serial number, refer to the paragraph headed INSTRUMENTS COVERED BY MANUAL in Section I.

SECTION VIII
SERVICE

8-1. INTRODUCTION

8-2. This section provides instructions for troubleshooting and repairing the Hewlett-Packard Model 11975A Amplifier. It includes general servicing information, a block diagram of the instrument, circuit descriptions, parts identification illustrations, and a schematic diagram.

WARNING

Maintenance described in this section is performed with power supplied to the instrument and with the protective covers removed. Such maintenance should be performed only by service-trained personnel who are aware of the hazards involved. Where maintenance can be accomplished without power applied to the instrument, the power should be removed. When you have completed a repair, make sure all safety features are intact and functioning, and that all protective grounds are connected.

8-3. SCHEMATIC DIAGRAM SYMBOLS AND TERMS

8-4. Symbols and terms used on the schematic diagrams are explained in Table 8-1, Schematic Diagram Notes.

8-5. TEST EQUIPMENT

8-6. Test instruments and accessories used to maintain the Model 11975A Amplifier are listed in Table 1-2. If a listed instrument is not available, another instrument that meets the required minimum specifications may be substituted.

8-7. GENERAL TROUBLESHOOTING

8-8. Troubleshooting is most easily accomplished by using the block diagram to follow the signal path. Once the problem is isolated to a particular circuit, the circuit description and schematic diagram can be used to locate the faulty component.

8-9. GENERAL MAINTENANCE

8-10. Rigid Cables

8-11. When you have to loosen or remove one of the rigid RF cables, be very careful not to bend it. Bending one of these cables can change its electrical characteristics.

8-12. Repairs on the Circuit Board

8-13. Component mounting holes on the circuit board are plated through to both sides of the board. Because of this, you can solder or unsolder, from either side.

CAUTION

Do not use a high-wattage soldering iron on the etched circuit board. Excessive heat can lift the printed wiring or burn the board. Also avoid using sharp metal objects to clean solder from plated-through component mounting holes. You may damage the plating and cause an open circuit. Use an anti-static type suction device or a toothpick for solder removal.

Use only mildly active rosin core solder (RMA) when repairing the circuit board. Do not attempt to clean excess flux from the soldered connections, this can release chlorides that will cause corrosion. Always use a soldering iron with a grounded tip and an anti-static work station to prevent static discharge damage during repairs.

8-14. Transistor and Diode Markings. Figure 8-1 shows diode and transistor marking methods. In addition, the emitter lead for a bipolar transistor is

identified on the printed circuit board by connecting it to a square rather than a round pad.

8-15. Printed Circuit Board Markings. On the printed circuit board, a square pad is etched around one pin of some components to facilitate identification of the component terminals. The square pad indicates the following:

a. Cathode of a diode

b. Emitter of a transistor

c. Source terminal of an FET

d. Pin one of an integrated circuit

e. Pin one of an integrated circuit socket

f. Pin one of a cable connector.

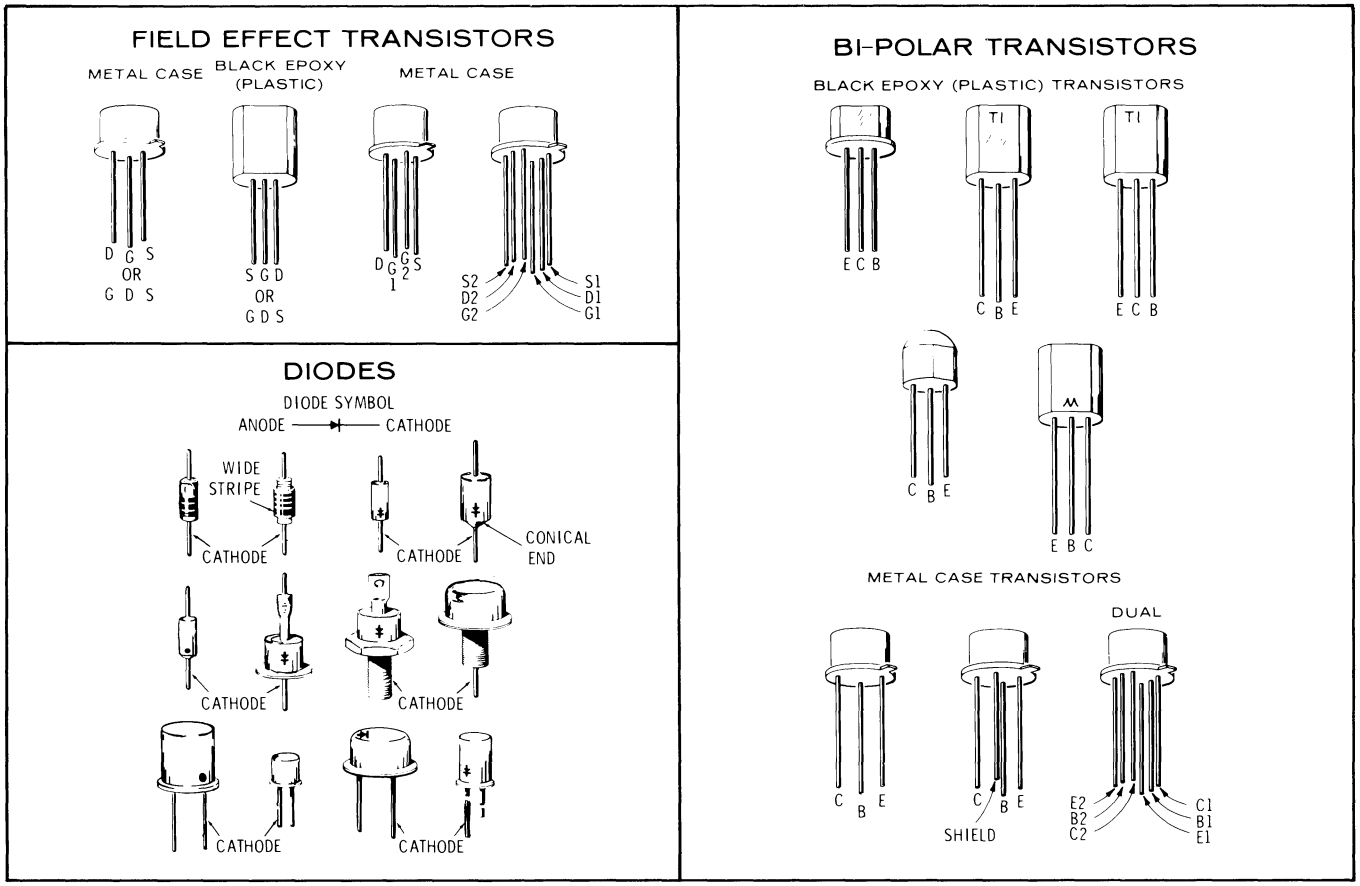


Figure 8-1. Examples of Diode and Transistor Marking Methods

Table 8-1. Graphic Symbols Used in Schematic and Block Diagrams (1 of 2)

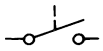
GRAPHIC SYMBOLS USED IN SCHEMATICS AND BLOCK DIAGRAMS

BASIC COMPONENT SYMBOLS

Variable Resistor: CW indicates clockwise rotation of shaft moves wiper towards location of CW.

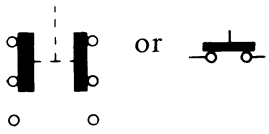
Electrolytic capacitor

Variable capacitor

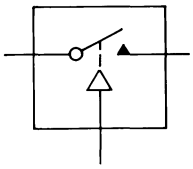


Slide, toggle, or rocker switch

Ferrite bead (prevents high frequency parasitic oscillations)



Pushbutton switch



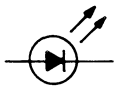
Relay

Crystal

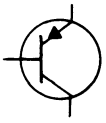
Speaker

Breakdown diode: Zener

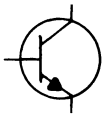
Schottky diode



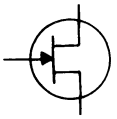
Light-emitting diode



Transistor, PNP



Transistor, NPN



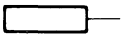
MOS–FET, N-Channel

* Indicates a factory-select component

Indicates shielding conductor for cables

Indicates a plug-in connection

Indicates a soldered or mechanical connection



Indicates a single pin of a PC board edge connector

Connection symbol indicating a Jack (except for PC board edge connectors)

Table 8-1. Graphic Symbols Used in Schematic and Block Diagrams (2 of 2)

GRAPHIC SYMBOLS USED IN SCHEMATICS AND BLOCK DIAGRAMS

BASIC COMPONENT SYMBOLS

Connection symbol indicating a Plug (except for PC board edge connectors)

Earth ground

Test Point: Terminal provided for test probe.

Instrument chassis ground. May be accompanied by a number or letter to specify a particular ground.

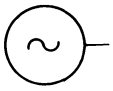
Measurement Point: Used to indicate a convenient point for measurement. No terminal provided for test probe.

Screwdriver adjustment

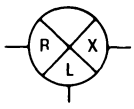
Indicates wire or cable color code. Color code same as resistor color code. First number indicates base color, second and third numbers indicate colored stripes.

Front-panel control

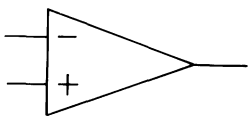
COMMONLY USED ASSEMBLY AND CIRCUIT SYMBOLS



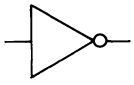
Oscillator



Mixer



Operational amplifier



Inverter, buffer

2 – 8 GHz Modulator/Amplifier Assembly A3 Ⓐ

The 2 – 8 GHz Modulator/Amplifier Assembly A3 consists of a microcircuit assembly and associated bias circuitry. The microcircuit assembly contains a 3-stage GaAs FET amplifier. Overall gain through the microcircuit assembly is controlled by a shunt PIN diode modulator at the input of the GaAs FET amplifier. Adjustable resistors A2R5, A2R6, and A2R7 set gate bias of the GaAs FET amplifier to minimize harmonic output level. These are normally set to produce 0V at A2E1, A2E2, and A2E3.

CAUTION

Disassembly of W1 and W3 should be made at a grounded work station using antistatic procedures.

Output Power Level Control Ⓑ

Calibration of front panel OUTPUT POWER LEVEL control A1W2R1 is accomplished with HI-P potentiometer A2R34 and LO-P potentiometer A2R35. The interaction of these two potentiometers is held to a minimum by the buffering and attenuation provided by A2U5. The shape or "fit" of the actual power out versus the panel calibration marks is controlled by MR potentiometer A2R43, which in series with A2R42 loads the OUTPUT POWER LEVEL potentiometer to correct for its unit-to-unit variations.

Operational amplifier A2U5 is an inverting buffer with a gain of 0.1. Adjustment potentiometer HI-P is used to calibrate the + 16 dBm level; LO-P is used to calibrate the + 6 dBm level. The detent on A1W2R1 prevents accidental application of power greater than + 16 dBm at J2.

CAUTION

Replacement of A1W2R1 or removal of knob on A1W2R1 requires recalibration of A2R34, A2R35, and A2R43. See adjustment paragraph 5-13.

ALC Select Ⓒ

Rear panel ALC select switch A2W2S1 allows the internal ALC to be switched on or off by biasing the gate of A2Q3 with zero or – 15V respectively. With 0V on its gate, A2Q3 presents a low resistance (approximately 20 ohms) between its drain and source terminals. This enables the detector's output to be fed to the noninverting terminal of unity gain buffer A2U3, closing the ALC loop. With – 15V on its gate, A2Q3 presents a very high resistance between its drain and source terminals and the detector's output does not influence the noninverting input of A2U3. The ALC loop is effectively open and the 2 – 8 GHz Modulator/Amplifier Assembly A3 produces maximum output.

Power supply ground currents are prevented from flowing along the case of detector A5 by A2R3. A high current level flowing through the case of the detector can induce a signal that the ALC loop responds to, resulting in the output signal being amplitude modulated (AM) with twice the line frequency.

High Power Level Warning Ⓓ

The high power level warning circuit monitors the detector's output voltage and compares it with a preset dc level. When the output voltage exceeds the preset level, the High Power Warning LED turns on. The detector's dc output voltage appears at A2TP1 and is amplified by a factor of ten by A2U1. The output of A2U1 is approximately – 1.5V for + 16 dBm of output power. Comparator stage A2U2 has the amplified negative detector voltage fed through A2R26 to its inverting input. A negative voltage, set by the HI-L adjustment, A2R44 in series with A2R29 and A2R30, is applied to its non-inverting input. When the magnitude of the detector's voltage is less than the preset voltage, A2U2's high open-loop gain tries to drive its output to the negative supply voltage. But CR9 turns on and clamps the output at approximately – 2V. This keeps A1DS2 OFF and safe from excessive reverse bias. When the magnitude of the detector's voltage exceeds the preset voltage, the output of A2U2 is driven to the positive supply, effectively + 13.5V, and turns A1DS2 on; A2R28

limits the current to approximately 8 mA. Switching hysteresis for A2U2 is provided by positive feedback through A2R27 which gives approximately 60 mV of hysteresis. To keep A2U2 from switching when the power supply is turned on or off, A2C15, in conjunction with A2R26, gives A2U2 a 0.5 millisecond time constant.

Unity Gain Buffer (E)

The Unity Gain Buffer provides isolation between the net control voltage from Detector Assembly A5 (and the Output Power Level Control) and the ALC amplifier (block (H)). The net control voltage appears at the high impedance input of A2U3, which is a unity gain voltage follower with the feedback path internally connected. The offset voltage of A2U3 can be removed by the balance (BAL) adjustment A2R22.

Unleveled Output Indicator (F)

The Unleveled Output Indicator monitors the output of the ALC amplifier (A2U4) and lights the unleveled output LED (A1DS3) when the output of A2U4 goes to a negative potential (indicating that the ALC loop can no longer respond to the power variation). Amplifier A2U6 acts as a zero crossing detector (detecting the zero crossing of A2U4's output) whose output is clamped by A2VR3 and A2VR4 to approximately -2.5V. When the ALC can respond, the output of A2U6 is approximately -2.5V; when it cannot respond, it is about $+6.8$V. A positive output of A2U6 will charge A2C8 through A2CR8. These components form a simple sample-and-hold circuit that allows even the briefest unleveled condition during the fastest sweep to charge A2C8 to 0.7V and turns A2Q2 on. During an unleveled state, A2R48 and A2R47 make up a voltage divider that limits the maximum voltage applied to the base of A2Q2 to $+1$V. When the unleveled state is removed, and A2CR8 and A2Q2 turn off, A2R47 and A2R48 discharge A2C8 to ground.

The response time of this circuit has been slowed by the addition of A2R45 and A2C14, which make A2U6 an integrating, zero-crossing detector. Using the criteria that the output of A2U6 must exceed 0.6V before A2CR8 is turned on sufficiently to charge A2C8, the circuit's response time is approximately 1.5 μsec.

External Diode Bias (G)

Positive or negative diode bias can be supplied through A1J3 by adjusting A1W2R2, a multiturn potentiometer. The maximum current delivered to a diode is ± 10 mA because of the limiting action of A2R40 and A2R39. The maximum voltage is limited to ± 3V because of the shunting action of A2VR1 and A2VR2.

ALC Amplifier and Modulator Driver (H)

Three characteristics important to the ALC loop's operation are provided by this circuit: high dc gain, bandwidth limiting for loop stability, and high current drive capability to drive the PIN diodes in the modulator. The combination of A2U4, A2R20, A2R21, and A2C9 forms an integrator. The high dc gain is provided by the open-loop gain of A2U4. The ALC loop bandwidth is set by the reciprocal of (A2R20 + A2R21) x A2C9. The high frequency stability and drift characteristics of A2U4 are controlled by A2C10 and A2R19 respectively. Diode A2CR6 clamps the output of A2U6 to -0.7V when the loop can no longer maintain ALC because of insufficient input power. This clamping action allows the integrator to respond more quickly, since it only has to go from -0.7V to $+0.8$V when the amplifier input goes from zero to maximum RF level. The GAIN adjustment, A2R20, is set so full ALC can be achieved in 8 to 10 microseconds.

Since the output current capability of A2U4 is not sufficient to supply the 40 mA maximum that the PIN modulator needs, A2Q1 is added as a current driver. Diode A2CR5 compensates for the base-emitter drop of Q1. This keeps the output of A2Q1 and the PIN drive (A2TP4) at the same voltage level. Without A2CR5 there would be approximately a 0.6V "dead-zone" in the ALC loop's control of the modulator.

The combination of A2CR7 and A2C13 acts as a simple sample-and-hold circuit for the collector supply of A2Q1. When the power line switch is turned on, A2Q1 can quickly supply current to the PIN modulator giving maximum attenuation before the FET amplifier's drain supply comes up. When the line switch is turned off, A2C13 supplies current through A2Q1 to the PIN diodes keeping some attenuation until the FET amplifier's drain supply has gone down. This operation helps avoid output power transients when the instrument is turned on and off with an input signal present.

Power Supply ❶

The incoming ac from A6T1 (22 Vrms) is rectified by the full-wave bridge composed of A2CR1 – 4 yielding a dc level of approximately ±28V across A2C1 and A2C2 respectively. This level of dc is applied to the input of A2U7 and A2U8 which are three-terminal non-adjustable voltage regulators with outputs of + and −15.0 ±0.6 Vdc. The +15V level is then the input for A2U9, a three-terminal adjustable (by means of A2R2) voltage regulator that sets the drain supply voltage for the 2 – 8 GHz Modulator/Amplifier Assembly A3. The presence of A2C7 causes the drain voltage to come up slowly upon instrument turn-on; this helps prevent excessive output power from the amplifier during turn on.

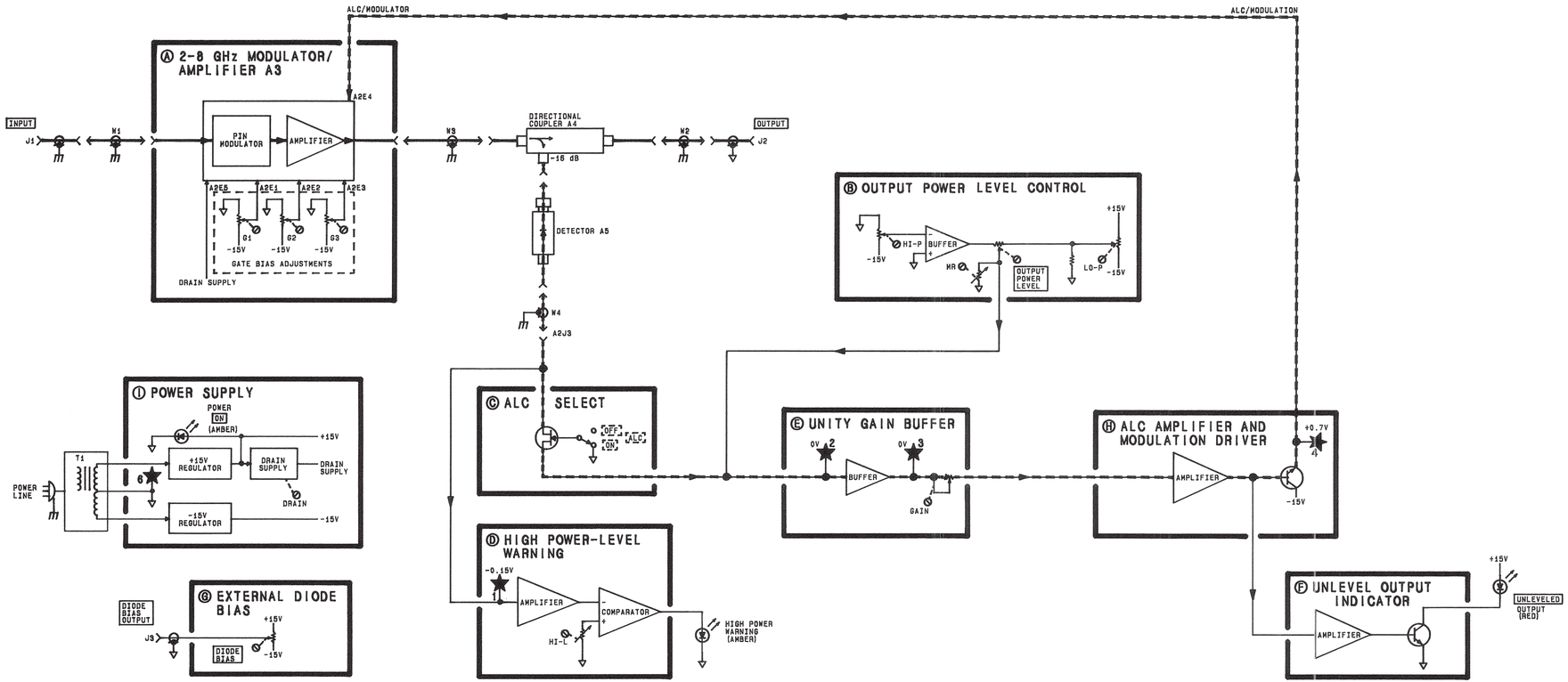


FIGURE 8-2. MODEL 11975A AMPLIFIER, BLOCK DIAGRAM

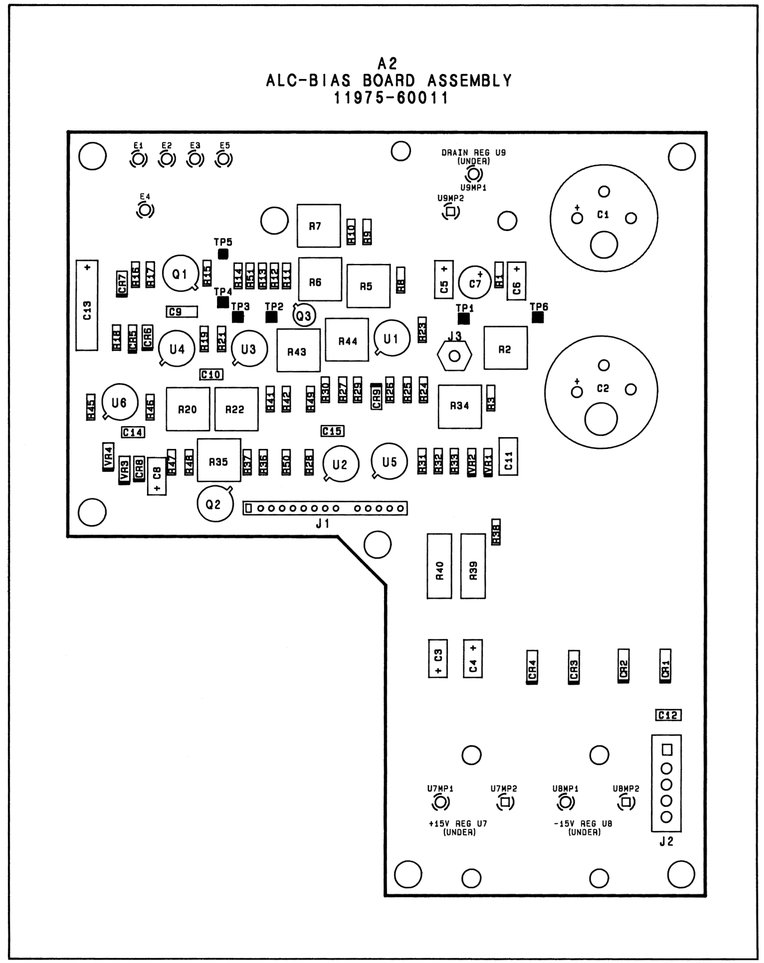
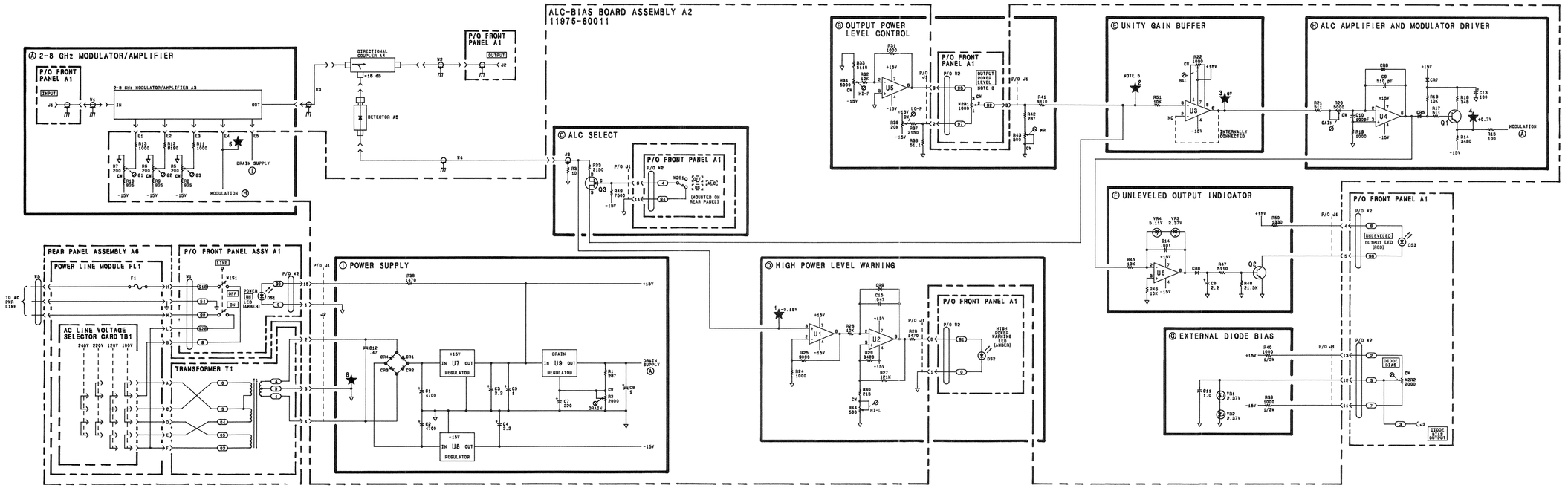


Figure 8-3. ALC-Bias Board Assembly Parts Locations



NOTES:

1. REFERENCE DESIGNATORS WITHIN EACH ASSEMBLY ARE ABBREVIATED. FOR COMPLETE REFERENCE DESIGNATION, PREFIX ABBREVIATION WITH ASSEMBLY DESIGNATION.
2. UNLESS OTHERWISE INDICATED: RESISTANCE IS IN OHMS (Ω) CAPACITANCE IS IN MICROFARADS (µF) INDUCTANCE IS IN MICROHENRIES (µH)
3. IF OUTPUT POWER LEVEL CONTROL POTENTIOMETER A1R351 IS REPLACED OR THE CONTROL KNOB REMOVED, TRIMMER POTENTIOMETERS A8R34 (HI-P), A8R35 (LO-P), AND A8R43 (HN) MUST BE READJUSTED. SEE ADJUSTMENT PARAGRAPH 5-19.
4. ALL TEST POINT VOLTAGES ARE WITH FRONT PANEL OUTPUT POWER LEVEL CONTROL A1R351 SET TO THE +16 dBm POSITION, ALC SWITCH (REAR PANEL) A1K251 SET TO ON, AND WITH AN INPUT POWER LEVEL GREATER THAN THE MINIMUM REQUIRED FOR ALC OPERATION. VOLTAGE LEVELS SHOWN ARE APPROXIMATE.
5. APPROXIMATE VOLTAGES WITH NO POWER APPLIED TO INPUT.

SETTING OF A1R251	VOLTAGE AT A2TP2
+8	-0.03V
+9	-0.35V
+10	-0.72V
+12	-0.98V
+14	-0.99V
+16	-0.16V

FIGURE 8-4. MODEL 11975A AMPLIFIER, SCHEMATIC DIAGRAM

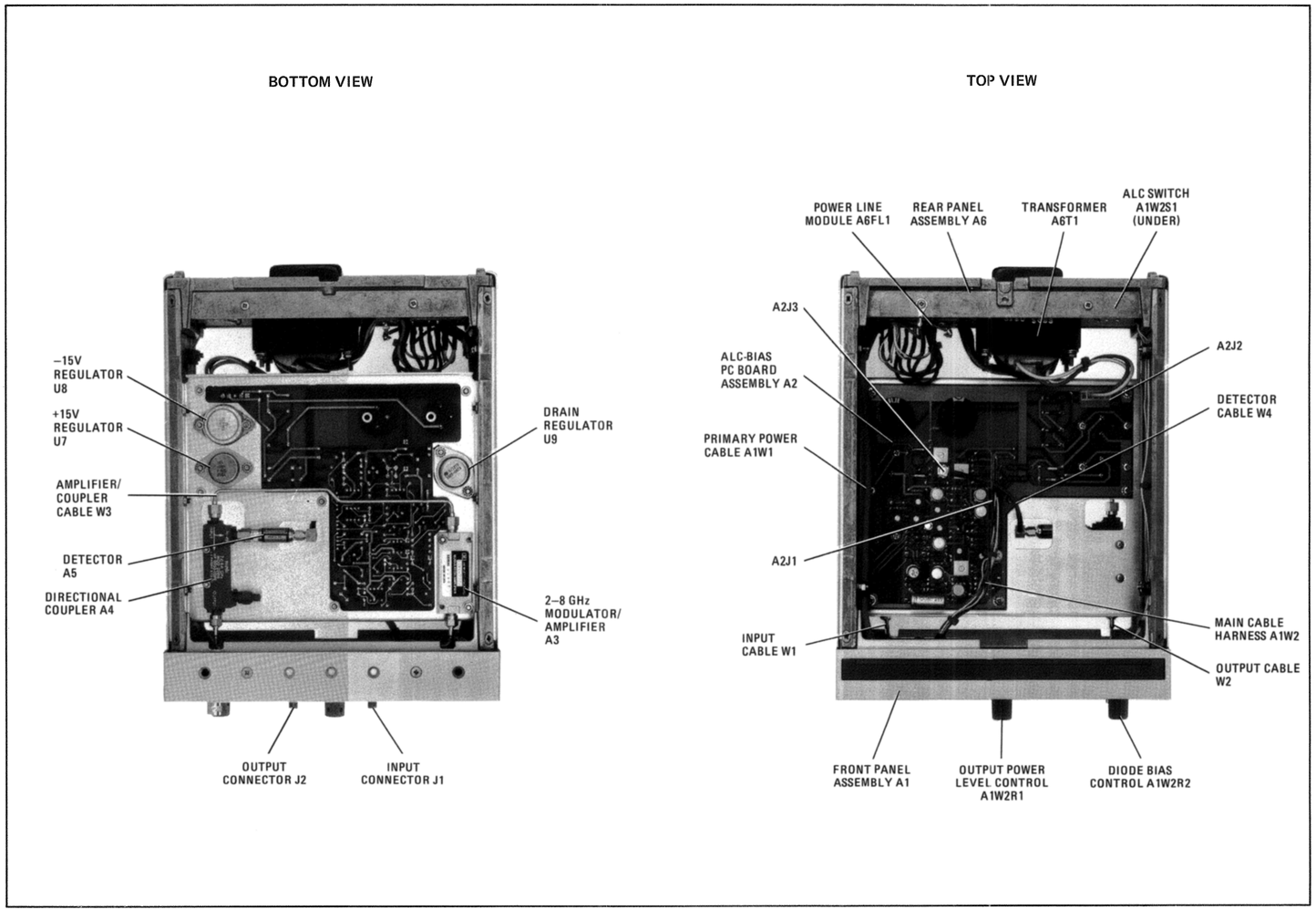


Figure 8-5. Major Assembly and Component Locations

By internet, phone, or fax, get assistance with all your test and measurement needs.

Contacting Agilent

Online assistance: `www.agilent.com/find/assist`

United States
(tel) 1 800 452 4844

Latin America
(tel) (305) 269 7500
(fax) (305) 269 7599

Canada
(tel) 1 877 894 4414
(fax) (905) 282-6495

Europe
(tel) (+31) 20 547 2323
(fax) (+31) 20 547 2390

New Zealand
(tel) 0 800 738 378
(fax) (+64) 4 495 8950

Japan
(tel) (+81) 426 56 7832
(fax) (+81) 426 56 7840

Australia
(tel) 1 800 629 485
(fax) (+61) 3 9210 5947

Asia Call Center Numbers

Country	Phone Number	Fax Number
Singapore	1-800-375-8100	(65) 836-0252
Malaysia	1-800-828-848	1-800-801664
Philippines	(632) 8426802 1-800-16510170 (PLDT Subscriber Only)	(632) 8426809 1-800-16510288 (PLDT Subscriber Only)
Thailand	(088) 226-008 (outside Bangkok) (662) 661-3999 (within Bangkok)	(66) 1-661-3714
Hong Kong	800-930-871	(852) 2506 9233
Taiwan	0800-047-866	(886) 2 25456723
People's Republic of China	800-810-0189 (preferred) 10800-650-0021	10800-650-0121
India	1-600-11-2929	000-800-650-1101

DECLARATION OF CONFORMITY

According to ISO/IEC Guide 22 and EN 45014

Manufacturer's Name: Agilent Technologies, Inc.

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

Declares that the product:

Product Name: 2-8 GHz Power Amplifier

Model Number: HP 11975A

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

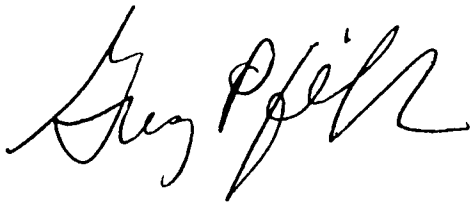
Conforms to the following product specifications:

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

EMC: CISPR 11:1990/EN 55011:1991 Group 1, Class A
IEC 801-2:1984/EN 50082-1:1992 4 kV CD, 8 kV AD
IEC 801-3:1984/EN 50082-1:1992 3 V/m, 27-500 MHz
IEC 801-4:1988/EN 50082-1:1992 0.5 kV sig. lines, 1 kV power lines
IEC 1000-3-2:1995 / EN 61000-3-2:1995
IEC 1000-3-3:1994 / EN 61000-3-3: 1994

Supplementary Information:

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



Santa Rosa, CA, USA 10 Nov. 1998

Greg Pfeiffer/Quality Engineering Manager