Agilent Technologies

Manual Updating Supplement

Manual Supplement Part Number: 11975-90008
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This supplement updates the following document:

11975A Amplifier Operation and Service Manual

Manual Part Number: 11975-90001
Manual Print Date: June 1983

What are Manual Updating Supplements?

A Manual Updating Supplement keeps your documentation up-to-date. The supplement, which consists of a cover page and various replacement and/or additional pages for your documentation, is shipped with the documentation that it updates.

How to Use the Manual Updating Supplement

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The following information helps you select the applicable pages.

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The revision date of the supplement is updated each time the supplement changes, but the supplement part number stays the same. For each manual part number there is only one Manual Updating Supplement part number. For example, the manual with Part Number 70700-90001 always will have a Manual Updating Supplement with Part Number 70700-90047; however, there will be different revision dates of that supplement.

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A replacement page has the same page number as the page being replaced. Additional pages have page numbers with a decimal number. For example, if one additional page is added between pages 6-5 and 6-6, it will be numbered 6-5.1.

The revision date appearing in the bottom margin of each page is the date that the page *originally* was added to the supplement.

Replacement or additional pages may contain several different types of information:

- new information adds information that was not included in the original document.
- change information documents changes that have occurred since the printing of the manual.
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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.

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Printed: JUNE 1983

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.

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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.

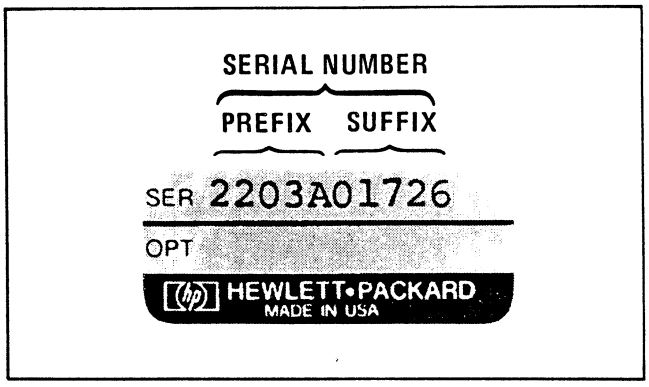


Figure 1-2. Typical Serial Number Plate

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 office 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 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.

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, 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 µA

Connector: BNC female

Maximum Voltage: [typically ± 3 Vdc]

Short Circuit Protection: typically ≤ 11 mA at 25°C]

GENERAL

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

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

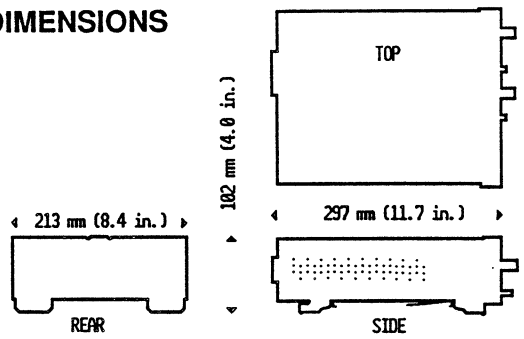
Temperature Range:
Operating: 0° to 55°C
Stored: -40° to 75°C

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



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.

4-8 Unless otherwise stated, the 11975A Rear Panel ALC should remain on for all tests.

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.

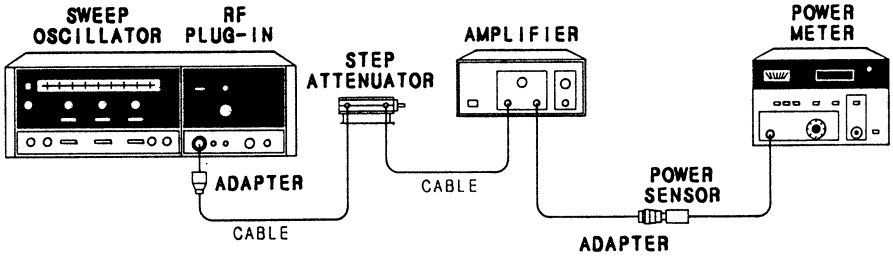


Figure 4-1. Frequency Response, Absolute Power Level Accuracy Test Setup

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

4-12. 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
4-8	Frequency Response Absolute Power Level Accuracy	±1.0 dB ±2.0 dB	
4-9	VSWR	1.7	
4-10	Minimum Input Power of 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.	
4-11	Small Signal Gain 2.0-4.5 GHz 4.5-6.1 GHz 6.1-8.0 GHz	 Gain = 15 Gain = 11 Gain = 9	
4-12	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 umber of the adjustment procedure. Included in the table is a brief description of the purpose of the adjustment. Unless otherwise stated, the 11975A Rear Panel ALC should remain on for all tests.

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
A2R1/A2R64 (Block I)	DRAIN	5-10	Adjusts output level of drain regulator A2U9
A2R5 (Block A)	G3	5-14	Adjusts bias on gate 3 of Modulator/Amplifier A3
A2R6 (Block A)	G2	5-14	Adjusts bias on gate 2 of Modulator/Amplifier A3
A2R7 (Block A)	G1	5-14	Adjusts bias on gate 1 of Modulator/Amplifier A3
A2R34 (Block B)	HI-P	5-12	Calibrates the +16 dBm position of the OUTPUT POWER LEVEL control
A2R35 (Block B)	LO-P	5-12	Calibrates the +6 dBm position of the OUTPUT POWER LEVEL control
A2R43 (Block B)	MR	5-12	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	5-13	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 off the top cover.**

5-10. DRAIN VOLTAGE ADJUSTMENTS

Reference:

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

DESCRIPTION:

With DRAIN trimmer potentiometers A2R64 and A2R2, the output of DRAIN voltage regulator U9 is set to 2.4 ± 0.05V and 7.0 ± 0.05V respectively.

EQUIPMENT:

Digital Voltmeter	HP 3455A
Sweep Oscillator	HP 8620C
RF Plug-In	HP 86290B

PROCEDURE:

1. Connect voltmeter negative lead to A2TP5 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.

ADJUSTMENTS

3. Set the sweep oscillator controls as follows:

Front Panel

Band	2.0-6.2 GHz
CW Marker (white)	2.0 GHz
CW	Press push button
Power Level	to 3 o'clock position
Markers	OFF
ALC	INT
RF	ON

Rear Panel

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

4. Connect the sweep oscillator to the 11975A input and adjust DRAIN (A2R2) for a voltmeter reading of 7.0 ± 0.05V.

5. Disconnect the sweep oscillator from the 11975A input. Adjust DRAIN (A2R64) for a voltmeter reading of 2.4 ± 0.05V.

ADJUSTMENTS

5-11. 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.

ADJUSTMENTS

5-12 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 positions of the HP 11975A OUTPUT POWER LEVEL control: +16 dBm, +6 dBm, and +12 dBm. At each of these three positions of the OUTPUT POWER LEVEL control, the output level is adjusted with a particular one of three internal adjustment potentiometers.

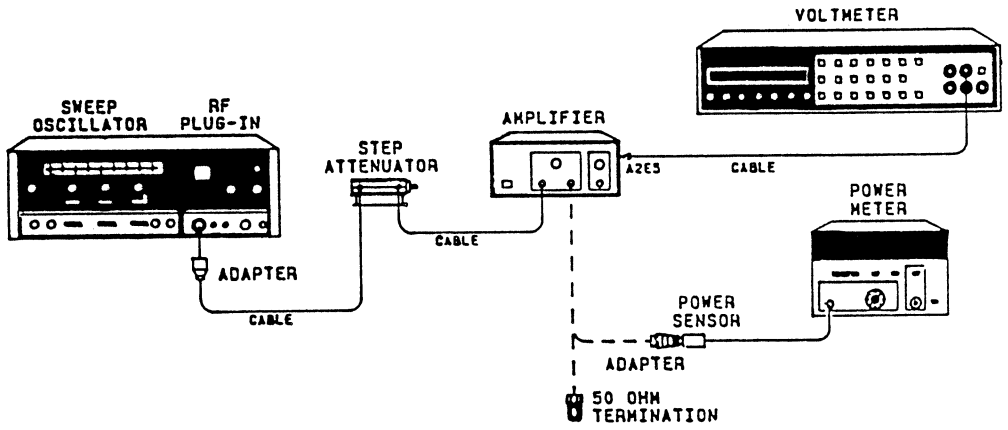


Figure 5-1. Adjustment Procedure Test Setup

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.

ADJUSTMENTS

5-12. 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. Center potentiometers HI-P (A2R34), LO-P (A2R35), and MR (A2R43).

10. On 11975A, turn LINE switch to ON.

11. Adjust HI-P (A2R34) for a power meter reading of +16.0 ±0.2 dBm. If HI-P runs out of range and +16.0 dBm cannot be reached, pad A2*R31. If the output power is too high, decrease A2*R31.

12. On 11975A, set Output Power Level control to +6.0 dBm and adjust LO-P (A2R35) for a power meter reading of +6.0 ±0.2 dBm. If LO-P runs out of range and +6 dBm cannot be reached, pad A2*R36. Increase A2*R36 in all cases, but not more than 51.1 ohms.

13. 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. If MR runs out of range and +12 dBm cannot be reached, pad A2*R42. If output power is too high, decrease A2*R42.

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

NOTE

Factory selected resistors A2*R34, A2*R35, and A2*R42 should not require padding more than two standard resistor values up or down. If padding does not help significantly, the A3 Amplifier, A5 Detector, or the ALC loop circuitry may be defective.

ADJUSTMENTS

5-13. 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, 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	ON

Rear Panel

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

ADJUSTMENTS

5-13. 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.

ADJUSTMENTS

5-14. 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 HP3455A

PROCEDURE:

1. Connect voltmeter negative lead A2TP5 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.

5-15. ALC GAIN ADJUSTMENT

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ADJUSTMENTS

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

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ADJUSTMENTS

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.

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 & 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 FSMA (STD ONLY) (INCLUDES HEX NUT & LOCK WAHSER)	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	11975-60028	5	1	BD ASSY ALC-BIAS	28480	11975-60028
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	0160-4535	4	1	CAPACITOR-FXD 1.0uF +- 10% 50VDC CER	28480	0162-4535
A2C8	0180-0197	8		CAPACITOR-FXD 2.2uF+-10% 20VDC TA	56289	150D225X9020A2
A2C9	0140-0198	5	1	CAPACITOR-FXD 200PF+-5% 300VDC MICA	72136	DM15F201J0300WV1CR
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
A2C16	0160-4832	4		CAPACITOR-FXD .01uF CER		
A2C17	0160-4832	4		CAPACITOR-FXD .01uF CER		
A2C18	0160-4832	4		CAPACITOR-FXD .01uF CER		
A2C19	0160-4832	4		CAPACITOR-FXD .01uF CER		
A2C20	0160-4832	4		CAPACITOR-FXD .01uF CER		
A2C21	0160-4832	4		CAPACITOR-FXD .01uF CER		
A2C22	0160-4832	4		CAPACITOR-FXD .01uF CER		
A2C23	0160-4832	4		CAPACITOR-FXD .01uF CER		
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

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

Table 6-3. Replaceable Parts (con't)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
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	4	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	1855-0414	8	2	TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0414
A2Q4	1855-0414	4		TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	04713	2N4393
A2Q5	1854-0477	7		TRANSISTOR, NPN TO-18 SI PD=500MW	0223G	2N2222A
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-TO-10RO-F
A2R5	2100-3212	8	3	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-TO-825R-F
A2R9	0757-0421	4		RESISTOR 825 1% .125W F TC=0+-100	24546	C4-1/8-TO-825R-F
A2R10	0757-0421	4		RESISTOR 825 1% .125W F TC=0+-100	24546	C4-1/8-TO-825R-F
A2R11	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	28480	C4-1/8-TO-1001-F
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	28480	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 .125W F TC=0+-100	28480	C4-1/8-TO-1001-F
A2R21	0698-0084	9		RESISTOR 2.15K 1% .125W F TC=0+-100	24546	C4-1/8-TO-2151-F
A2R22	0698-3150	6	1	RESISTOR 2.37K 1% .125W F TC=0+-100	24546	C4-1/8-TO-2371-F
A2R23	0757-0279	0	2	RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-TO-3161-F
A2R24	0757-0280	3		RESISTOR TK 1% .125W F TC=0+-100	28480	C4-1/8-TO-1001-F
A2R25	0757-0288	1	1	RESISTOR 9.09K 1% .125W F TC=0+-100	19701	MF401/8-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
A2*R31	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	28480	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	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	28480	C4-1/8-TO-1001-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
A2*R36	0698-7533	7		RESISTOR 30 1% .125W F TC=0+-100	28480	0698-7533
A2R37	0757-0280	3		RESISTOR 1K 1% .125WF TC=0+-100	28480	C4-1/8-TO-1001-F

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

Table 6-3. Replaceable Parts (con't)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
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	0		RESISTOR 1K 1% .5W F TC=0+-100	28480	0757-0159
A2R41	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-TO-1002-F
A2*R42	0698-3443	0		RESISTOR 287 1% .125 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		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-7501-F
A2R50	0757-0317	7	1	RESISTOR 1.33K 1% .125W F TC=0+-100	24546	C4-1/8-TO-1331-F
A2R51	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-TO-1002-F
A2R52	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-TO-1002-F
A2R53	0698-0085	0		RESISTOR 2.61K 1% .125W	28480	0698-0085
A2R54	0757-0458	7		RESISTOR 51.1K 1% .125W	24546	C4-1/8-TO-5112-F
A2R55	0698-3439	4		RESISTOR 178 1% .125W	28480	0698-3439
A2R56	0698-8958	2		RESISTOR 511K 1% .125W	28480	0698-8958
A2R57	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-TO-1002-F
A2R58	0698-3439	4		RESISTOR 178 1% .125W	28480	0698-3439
A2R59	0698-3431	6		RESISTOR 23.7 1% .125W	03888	PME55-1/8-TO-23R7-F
A2R60	0757-0199	3		RESISTOR 21.5K 1% .125W	24546	C4-1/8-TO-2152-F
A2R61	0757-0419	0		RESISTOR 681 1% .125W	24546	C4-1/8-TO-681R-F
A2R62	0698-3449	6	1	RESISTOR 28.7K 1% .125W	24546	C4-1/8-TO-2872-F
A2R63	0757-0199	3		RESISTOR 21.5K 1% .125W	24546	C4-1/8-TO-2152-F
A2R64	2100-0554	5		RESISTOR TRMR 500 10% C TOP-ADJ 1-TRN	28480	2100-0554
A2TP1	0360-0535	0	5	TERMINAL TEST POINT PCB	28480	0380-0535
A2TP2	0360-0535	0		TERMINAL TEST POINT PCB	28480	0380-0535
A2TP3	0360-0535	0		TERMINAL TEST POINT PCB	28480	0380-0535
A2TP4	0360-0535	0		TERMINAL TEST POINT PCB	28480	0380-0535
A2TP5	0360-0535	0		TERMINAL TEST POINT PCB	28480	0380-0535
A2U1	1826-0915	4		IC OP AMP LOW BIAS H-IMPD 8DIP-C-PKG	04713	MC3400 I BU
A2U2	1826-0915	4		IC OP AMP LOW BIAS H-IMPD 8DIP-C-PKG	04713	MC3400 I BU
A2U3	1826-1049	2		IC OP AMP PRCN 8DIP-C-PKG	06665	OP27GZ
A2U4	1826-1049	2		IC OP AMP PRCN 8DIP-C-PKG	06665	OP27GZ
A2U5	1826-0915	4		IC OP AMP TO-99 PKG	27014	LF255H
A2U6	1826-0915	4		IC OP AMP LOW BIAS H-IMPD 8DIP-C-PKG	04713	MC3400 I BU
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	07263	7815KC
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
A2U10	1826-1049	8		IC OP AMP PRCN 8DIP-C-PKG	06665	OP27G
A2U11	1826-1049	8		IC OP AMP PRCN 8DIP-C-PKG	06665	OP27G
A2U12	1826-1221	2		IC COMPT 8DIP-C-PKG	28480	1826-1221
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=-.07R%	28480	1902-3002
A2VR4	1902-0041	4	1	DIODE-ZNR 5.11V 5% DO-35 PD=.4W	28480	1902-0041

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

Table 6-3. Replaceable Parts (con't)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
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	11975-60021	8	1	DETECTOR	28480	11975-60021
A6	11975-60013	8	1	REAR PANEL ASSY	28480	11975-60013
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

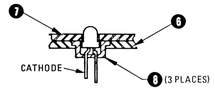
See introduction to this section for ordering information.
*Indicates factory selected value.

Table 6-4. Chassis Parts

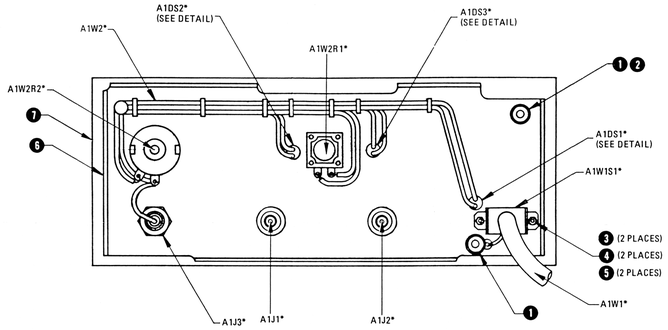
Reference Designator	HP Part Number	C D	Qty	Description	Mfr. Code	Mfr. Part Number
DS1				SEE A1DS1		
DS2				SEE A1DS2		
DS3				SEE A1DS3		
F1				SEE A6FL1F1		
FL1				SEE A6FL1		
J1				SEE A1J1 OR A2J1		
J2				SEE A1J2 OR A2J2		
J3				SEE A1J3 OR A2J3		
T1				SEE A6T1		
W1	11975-20001	0	1	CABLE-INPUT	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	0515-1132	4	1	SCREW, M5 X 0.8 X 10 FLAT HEAD, 90 DEGREE	28480	0515-1132
2	5041-6820	7	1	COVER, STRAP HANDLE, REAR	28480	5041-6820
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	5041-6819	4	1	COVER, STRAP HANDLE, FRONT	28480	5041-6819
7	0515-0406	3	4	SCREW, MACH M3.0	28480	0515-0406
8	5021-5813	2	2	STRUT, SIDE	28480	5021-5813
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	28480	11975-20008
16	5021-5813	4	1	FRAME, FRONT	28480	5021-5813
17	5061-9440	5	1	COVER, BOTTOM	28480	5061-9440
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	5061-9504	2	2	COVER, SIDE	28480	5061-9504
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	5021-5814	5	1	FRAME, REAR	28480	5021-5814
28	0515-1331	5	8	SCREW, M4 X 0.7 X 6 FLAT HEAD 98 DEG	28480	0515-1331
29	0535-0081	2	1	HEX NUT, M5 X 0.8, W/LOCK WASHER	28480	0535-0081

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

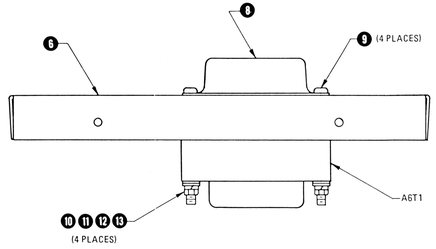


*SEE TABLE 6-3 FOR ELECTRICAL PARTS.

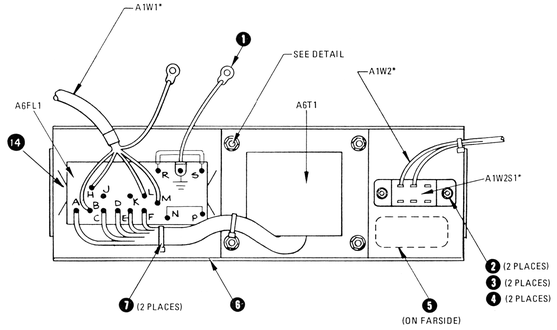
WIRE LIST	
Color Code on A1W2	Destination on A1
2	W2R2 pin3
3	W2R2 pin 2& A1J3
7	W2R2 pin 1
0 (2 wires)	DS2 (CATHODE)
91	DS2 (ANODE)
93	W1R1 pin3
92	W1R1 pin 2
97	W1R1 pin 1
96	DS3 (CATHODE)
6	DS3 (ANODE)
0	DS1 (CATHODE)

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	0515-006
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
14	11975-00009	6	1	SHIM	28480	11975-00009



*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

SERVICE

2 - 8 GHz Modulator/Amplifier Assembly A3 (A)

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 normally are 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 (B)

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 5-12.

ALC Select (C)

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 summed with the Output Power Level Control signal at 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 Non-inverting Summer input of A2U3. The ALC loop is effectively open and the 2 - 8 GHz Modulator/Amplifier Assembly A3 produces maximum output, determined by the Power Supply Drain Voltage.

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.

SERVICE

High Power Level Warning (D)

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 –15V 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.

Non-inverting Summer (E)

The Non-inverting Summer provides the net control voltage for the ALC Amplifier and Modulator Driver by summing the Detector A5 (a negative detector) and the Output Power Level Control output signals at A2U3, and provides the proper gain relationships between the two signals given by A2R22/A2R23 and A2R22/A2R41 respectively. Since A2U3 is an inverting amplifier, A2U10 is necessary to invert the net control voltage to correct the phase.

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 no longer can 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 +6.8V. A positive output of A2U6 will charge A2C8 through A2 CR8. These components form a simple sample-and-hold circuit that allows even the briefest unleveled condition during a fastest sweep to charge A2C8 to 0.7V and turns on A2Q2. During an unleveled state, A2R48 and A2 R47 make up a voltage divider that limits the maximum voltage applied to the base of A2Q2 to +1V. 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 criterion 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, 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 A2R21 x A2C9. The drift characteristics of A2U4 are controlled by A2R19. Diode A2CR6 clamps the output of A2U4 to –0.7V when the loop no longer can maintain ALC because of insufficient input power. This clamping action allows the integrator to respond more quickly, since it has only to go from –0.7V to +0.8V when the amplifier input goes from zero to maximum RF level.

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 A2U4 and the PIN drive (A2TP3) 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 quickly can 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 (I)

The incoming ac from A6T1 (22Vrms) 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 ± 0.6Vdc. The +15V level is then the input for A2U9, a three-terminal adjustable (by means of A2R64 and 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 (more slowly than the ALC loop responds) upon instrument turn-on; this helps prevent excessive output power from the amplifier during turn-on, and RF input switching or modulation.

A2U11, A2U12, A2Q5, and A2Q4 control the bilevel state of the drain supply by sensing the Detector A5 output. When RF power at the input to the instrument goes just below the instrument's minimum input range for ALC operation, corresponding to a detector output level of approximately 1.8 mV, the drain supply is switched from 7.0V to 2.4V, to provide minimum 2 - 8 GHz Modulator/Amplifier Assembly A3 gain. This prevents a high power spike (as much as +26 dBm) from being produced at the instrument output, in the event the RF input level changes faster than the ALC's bandwidth allows it to respond. When the RF input is within the minimum input, the drain supply is returned to 7.0V for normal operation.

When the detector output level is below minimum (<1.8 mV), this level is amplified by A2U10 giving <35.5 mV at its output pin 6. A2U12 compares the A2U10 output with the reference voltage (A2R57 and A2R59) at 35.5 mV, and toggles its output pin 1 from 0.0V to –15V. A2Q5 turns off and charges the gate of A2Q4 from –15V to 0V through A1W2S1 (ALC switch in ON position). A2Q4 is turned on and A2R64 in parallel with A2R2 sets the drain supply for 2.4V.

When the detector output level is above 1.8V, A2U12 output pin 1 is at 0V. A2Q5 is turned ON, which supplies –15V to the gate of A2Q4. Therefore, A2Q4 is off, A2R64 is out of the A2U9 regulator circuit, and A2R2 is set to give a drain supply voltage of 7.0V. If the ALC (A1W2S1) switch is OFF, this forces the gate of A2Q4 and A2Q3 always to remain at –15V, regardless of the RF input power, resulting in maximum gain from the 2 - 8 GHz Modulator/Amplifier Assembly A3 at all times.

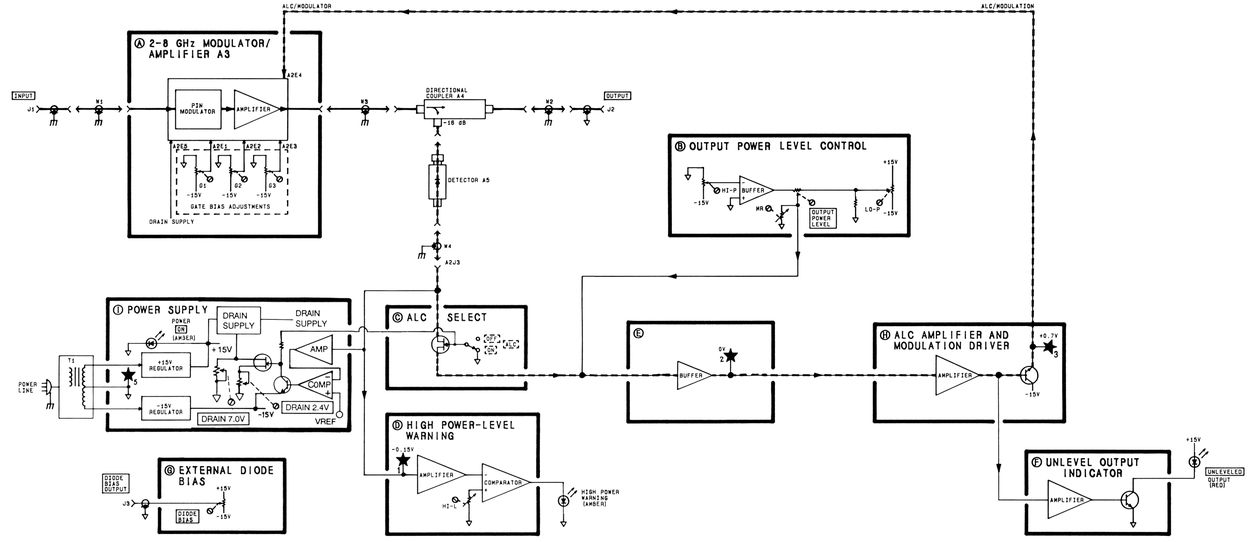


Figure 8-2. Model 11975A Amplifier, Block Diagram

A2
ALC-BIAS BOARD ASSEMBLY
11975-60011

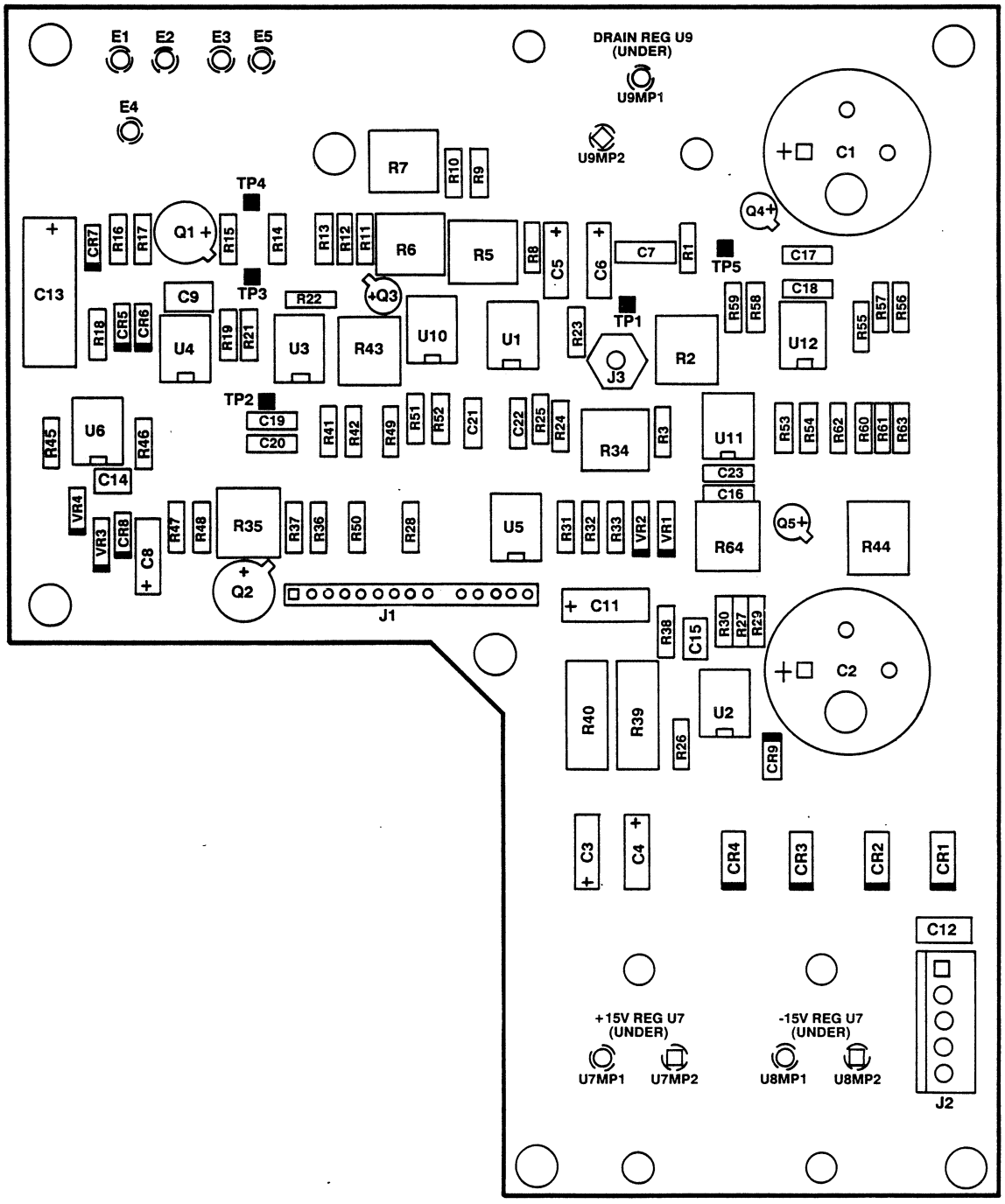
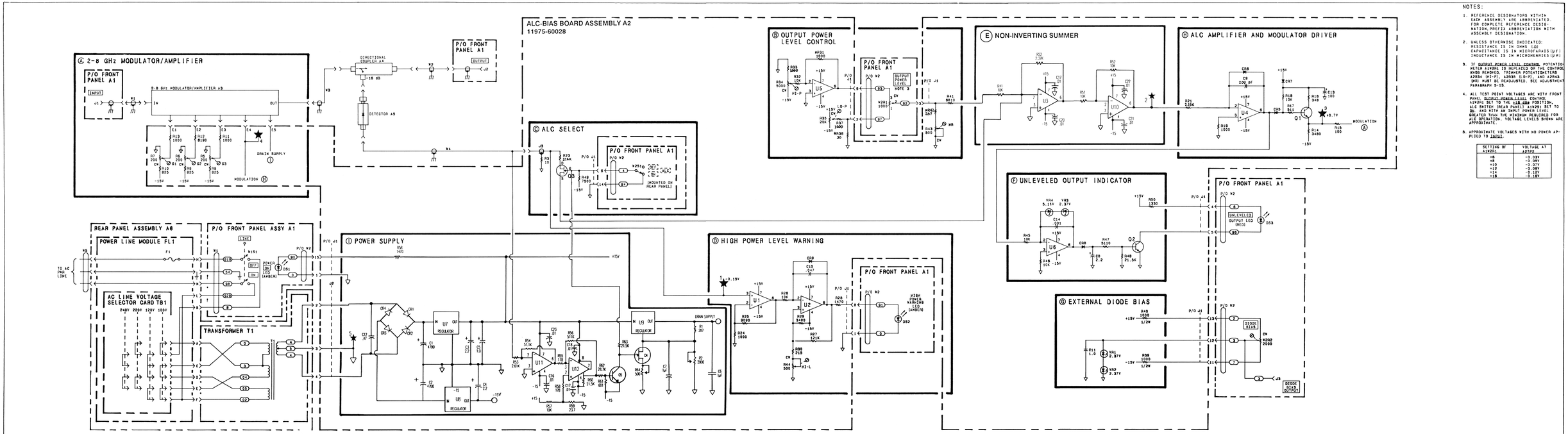


Figure 8-3. ALC-Bias Board Assembly Parts Locations



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 A3R34 IS REPLACED OR THE CONTROL KNOB REMOVED, TRIMMER POTENTIOMETERS A3R34, A3R35, A3R36, A3R37, AND A3R43 (R40) MUST BE READJUSTED. SEE ADJUSTMENT PARAGRAPH 8-13.
4. ALL TEST POINT VOLTAGES ARE WITH FRONT PANEL OUTPUT POWER LEVEL CONTROL A1KP1 SET TO THE +18 dBm POSITION, ALC SWITCH (REAR PANEL) A1KP51 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 A1KP201	VOLTAGE AT A2TP2
+8	-0.03V
+9	-0.05V
+10	-0.07V
+12	-0.09V
+14	-0.12V
+16	-0.19V

Figure 8-4. Model 11975A Amplifier, Schematic Diagram