HP 8341A
SYNTHESIZED SWEEPER
(Including Options 001, 002, 004, 005, 006, and 007)

CDCD

SERIAL NUMBERS

This manual applies directly to the HP Model 8341A Synthesized Sweeper having a serial number prefix of 2434A.

For additional information about serial numbers, refer to INSTRUMENTS COVERED BY MANUAL in Section I.

MANUAL PART NO. 08341-90001
Microfiche Part No. 08341-90002

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HEWLETT PACKARD

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CERTIFICATION

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

WARRANTY

This Hewlett-Packard instrument product is warranted against defects in material and workmanship for a period of one year from date of shipment, or, in the case of certain major components listed in section six of this Operating and Service manual, for the specified period. During the warranty period, Hewlett-Packard Company will, at its option, either repair or replace products which prove to be defective.

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

LIMITATION OF WARRANTY

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

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

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

ASSISTANCE

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

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

VOLUME 1 CONTENTS

VOLUME 1 CONTENTS (Cont'd)

TABLES

SAFETY CONSIDERATIONS

GENERAL

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

SAFETY SYMBOLS

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

Indicates hazardous voltages.

Indicates earth (ground) terminal.

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

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

SAFETY EARTH GROUND

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

BEFORE APPLYING POWER

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

If this product is to be energized via an autotransformer, make sure the common terminal is connected to the neutral (grounded) side of mains supply.

SERVICING

WARNING

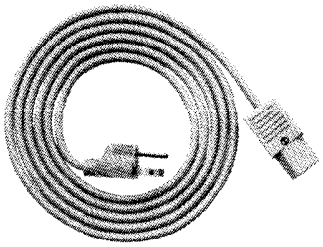
Any servicing, adjustment, maintenance, or repair of this product must be performed only by qualified personnel.

Adjustments described in this manual may be performed with power supplied to the product while protective covers are removed. Energy available at many points may, if contacted, result in personal injury.

Capacitors inside this product may still be charged even when disconnected from its power source.

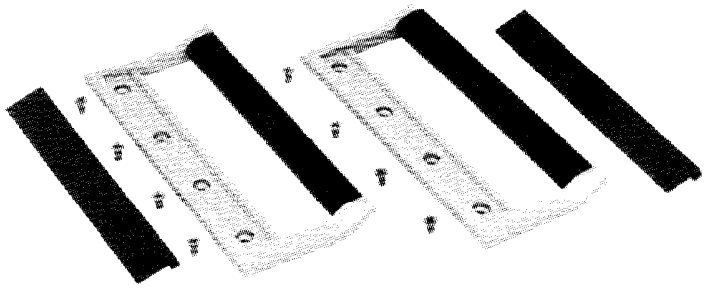
To avoid a fire hazard, only fuses with the required current rating and of the specified type (normal blow, time delay, etc.) are to be used for replacement.

HP 8341A SYNTHESIZED SWEEPER



POWER CABLE*

HP Part No. 1250-1854
50Ω TERMINATION
(For AUX OUTPUT)



HP Part No. 5061-0090
HANDLES KIT

* POWER CABLE/PLUG SUPPLIED DEPENDS ON COUNTRY OF SHIPMENT DESTINATION. REFER TO SECTION II, INSTALLATION FOR PART NUMBER INFORMATION.

Figure 1-1. Model HP 8341A with Accessories Supplied

SECTION I
GENERAL INFORMATION

1-1. INTRODUCTION

1-2. This Operating and Service Manual contains information required to install, operate, test, adjust, and service the Hewlett-Packard Model 8341A Synthesized Sweeper. Figure 1-1 shows the 8341A with accessories supplied.

1-3. The complete 8341A manual set consists of four volumes, divided into eight major sections, which provide the following information:

Volume 1

- SECTION I, GENERAL INFORMATION, includes a brief description of the instrument and its documentation layout, safety considerations, specifications and supplemental performance characteristics, instrument identification, options available, accessories available, and a list of recommended test equipment.
- SECTION II, INSTALLATION, provides information for initial inspection, preparation for use, storage, and shipment.
- SECTION III, OPERATION, is subdivided into five sections that describe the instruments features, how to manually and remotely control instrument operation, and how to interface the HP 8341A with other compatible instruments.
- SECTION IV, PERFORMANCE TESTS, presents procedures required to verify that the performance of the instrument is in accordance with published specifications. An HP-IB Operation Verification procedure is also included to test the ability of the HP 8341A to properly communicate on the HP-IB bus. A section is provided for Automated Test Procedures using a computing controller. These are additional or duplicate tests of the Performance Tests and/or Adjustment procedures.

Volume 2

- SECTION IV, PERFORMANCE TESTS, is duplicated in this section.
- AUTOMATED TEST PROCEDURE, provides the procedure for performing automated tests. Automated Test Procedure software is required for this test. Refer to Table 1-2 for further information.
- SECTION V, ADJUSTMENTS, presents procedures required to properly adjust and align the HP 8341A after repair.
- SECTION VI, REPLACEABLE PARTS, provides information required to order all parts and assemblies contained in the HP 8341A.
- SECTION VII, MANUAL BACKDATING CHANGES, provides backdating information required to make this manual compatible with earlier shipment configurations.

Volumes 3 and 4

- SECTION VIII, SERVICE, includes information to troubleshoot and repair instrument problems.

  The Service Section begins with a Service Introduction that describes the section layout and overall instrument theory and troubleshooting concepts. The Service Introduction section then leads the troubleshooter into one of eight Functional Groups, each describing a set of assemblies that serve as a functional unit.

  Each Functional Group area includes more detailed information that will lead the troubleshooter to a specific assembly within that group.

Each assembly is then supported with its own separate circuit description, schematic diagram, component location diagram, and trouble-shooting information to lead the trouble-shooter to the specific circuit or component at fault.

1-4. Supplied with this manual is a second Operating Manual. This copy is intended to be kept with the instrument for use by the instrument operator. Additional copies are available; refer to HP Part Number information on the title page of this volume.

1-5. On the title page of this volume is a "Microfiche" part number. This number may be used to order 10- by 15- centimeter (4- by 6-inch) microfilm transparencies of the complete manual. Each microfiche page contains up to 60 photo duplicates of the manual pages. The microfiche package also includes the latest Manual Changes sheet as well as all pertinent Service Notes.

1-6. Refer any questions regarding this manual, the Manual Changes sheet, or the instrument to the nearest HP Sales/ Service Office. Always identify the instrument by model number, complete name, and complete serial number in all correspondence. Refer to the last tab section in Volume 4 for a worldwide listing of HP Sales/ Service Offices.

1-7. SPECIFICATIONS

1-8. Listed in Table 1-1 are the specifications for the HP 8341A; specifications are shaded in the table. These specifications are the performance standards, or limits, against which the instrument may be tested. Also listed in Table 1-1 are the supplemental performance characteristics (not shaded). Supplemental performance characteristics are not specifications but are typical characteristics included as additional information for the user.

1-9. SAFETY CONSIDERATIONS

1-10. This product has been manufactured and tested in accordance with international safety standards. Before operation, this product and related documentation must be reviewed for familiarization with safety markings and instructions. A complete listing of Safety Considerations precedes Section I of this manual.

1-11. INSTRUMENTS COVERED BY MANUAL

1-12. Attached to the rear panel of the instrument is a serial number plate. A typical serial number plate is shown in Figure 1-2. The serial number is in two parts. The first four digits followed by a letter comprise the serial number prefix. The last five digits form the sequential suffix that is unique to each instrument. The content of this manual applies directly to instruments having the same serial number prefix as those listed on the title page of this manual under SERIAL NUMBER.

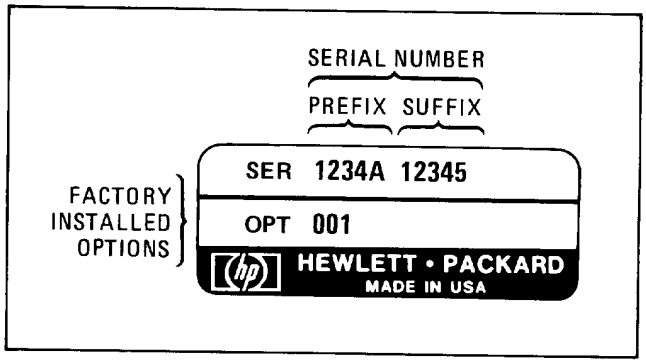


Figure 1-2. Typical Serial Number Plate

1-13. An instrument manufactured after the printing of this manual may have a serial prefix that is not listed on the title page. An unlisted serial prefix indicates that the instrument is different from those documented in this manual. The manual for the instrument is then supplied with a Manual Changes Supplement that documents the differences.

1-14. In addition to change information, the Manual Changes Supplement contains information for correcting errors in the manual. To keep this manual as current as possible, Hewlett-Packard recommends that you periodically request the latest Manual Changes Supplement. The supplement for this manual is keyed to the manual's print date and part number, both of which appear on the title page. Complimentary copies of the Manual Changes Supplement are available on request from Hewlett-Packard.

1-15. 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 Sales/Service Office.

1-16. DESCRIPTION

1-17. The HP Model 8341A Synthesized Sweeper is a broadband, analog sweep, frequency synthesizer with versatile modulation and output power control.

1-18. The HP 8341A generates synthesized output frequencies from 10 MHz to 20.0 GHz. Frequency resolution from 1 Hz at 10 MHz to 3 at 20.0 GHz is available. Frequency accuracy is a function of the internal time base accuracy or an external frequency standard. Harmonically-related signals are at least 35 dB below the carrier (−35 dBc) and nonharmonically-related spurious outputs are at least −55 dBc.

1-19. The HP 8341A features Optional AM modulation rates from dc to 100 kHz. Optional pulse modulation circuitry allows rise and fall times of <25 nanoseconds, an ON/OFF ratio of >80 dB, and will pass pulses as narrow as 100 nanoseconds.

1-20. Maximum calibrated output power from the Type N female RF OUTPUT connector is shown in Table 1-1, HP 8341A specifications and supplemental performance characteristics. The lowest output power available in all bands is −20 dBm. Displayed power resolution is 0.05 dB. A Power Sweep function provides the ability to sweep power up to 40 dB.

1-21. The HP 8341A is capable of generating a true analog sweep across its entire 10 MHz to 20.0 GHz frequency range. Additionally, a synthesized sweep mode allows precision analog sweeps as narrow as 100 Hz.

1-22. Additional features include five calibrated frequency markers and various sweep modes oriented around stored marker positions. The ability to Save and Recall up to 9 front panel settings also allows an Alternate Sweep function.

1-23. The front panel ENTRY DISPLAY shows the current active function and its appropriate values. Data entry is quickly accomplished through the use of the numeric keyboard, step keys, or RPG (Rotary Pulse Generator) control. All front panel functions, except the line switch, are programmable through the HP-IB bus.

1-24. Many serviceability features have also been incorporated in the HP 8341A. An internal SELF TEST is run each time the instrument is turned on or when the front panel INSTR PRESET KEY is pressed. Front panel diagnostic routines are accessible to aid in fault detection and isolation. Additional detailed information on troubleshooting and repair procedures is included in Appendix A In Case of Difficulty (in this volume), or in Section VIII, Service, (in Volumes 3 and 4).

1-25. OPTIONS

1-26. Option 001, Front Panel RF Output, With 90 dB Programmable Attenuator

1-27. The standard instrument configuration has a front panel RF OUTPUT connector with no attenuator. Option 001 instruments have the 90 dB programmable attenuator. The lower limit of the output power range is then −110 dBm.

1-28. Option 002, +13 dBm Output Power, 2.3 to 18.6 GHz.

1-29. Option 002 provides +13 dBm output power from 2.3 to 18.6 GHz on instruments with a front panel RF output connector and no programmable attenuator. Refer to Table 1-1 for Option 002 output power from instruments equipped with a rear panel RF output connector and/or a 90 dB programmable attenuator.

1-30. Option 004, Rear Panel RF Output with 90 dB Attenuator

1-31. Option 004 instruments have the RF OUTPUT connector mounted on the rear panel instead of the front panel. The 90 dB Programmable Attenuator is installed, thereby allowing the output power level to be set as low as −110 dBm.

1-32. Option 005, Rear Panel RF OUTPUT with No Attenuator

1-33. Option 005 instruments have the RF OUTPUT connector mounted on the rear panel and the 90 dB Programmable Attenuator is not installed. The lower limit of the output power level in then −20 dBm.

1-34. Option 006, Pulse Modulation

1-35. Option 006 provides external pulse modulation capability.

1-36. Option 007, Improved phase noise specifications

1-37. Instruments equipped with Option 007 are warranted to conform to more stringent phase noise specifications. Refer to Table 1-1 for actual specifications.

1-38. Option 806, Chassis Mount Slide Kit

1-39. This kit includes the necessary hardware to mount sliding rack mounts on the HP 8341A. This allows easier access to the HP 8341A when mounted in an equipment rack. It is necessary to remove the instrument side panels in order to install the kit. This is described in detail in Section II, Installation, in this volume.

1-40. Option 850, HP 8410B/C Interface Cable

1-41. This cable permits multi-octave operation of the HP 8410B/C Network Analyzer with the HP 8341A. This cable is also available separately as HP Part Number 08410-60146. Detailed operation instructions for the use of this cable are included in Section III, Operation, in this volume.

1-42. Option 908, Rack Flanges without Handles Kit

1-43. Option 908 contains a pair of flanges and the necessary hardware to mount the HP 8341A in the equipment rack with 482.6mm (19 inches) horizontal spacing. Refer to Section II, Installation, in this volume for a detailed description of the parts in this kit and for installation instructions.

1-44. Option 910, Extra Manual Set

1-45. Each instrument is supplied with one complete copy of the four-volume Operating and Service Manual binder set (refer to Option 914). Each Option 910 ordered provides one additional manual binder set. To obtain additional Operating and Service Manual binder sets after receiving the initial instrument shipment, order by manual part number, listed on the title page of this volume. The title page also lists part numbers of manual parts that are individually available.

1-46. Option 913, Rack Flanges with Handles Kit

1-47. Option 913 contains a pair of flanges, a pair of handles, and the necessary mounting hardware to mount the instrument in an equipment rack with 482.6mm (19 inches) horizontal spacing. This kit differs from Option 908 kits in that the flanges accommodate the added handles. This makes it easier to hold and position the instrument when installing or removing the instrument from the rack, or, when handling the instrument on a bench. Detailed installation instructions for this kit are included in Section II, Installation.

1-48. Option 914, Delete Service Documentation

1-49. Option 914 orders delete Volumes 2, 3, and 4. This allows customers with more than one instrument to reduce the cost and space requirements for duplicate documentation materials.

1-50. EQUIPMENT REQUIRED BUT NOT SUPPLIED

1-51. The HP 8341A is ready for use as received; no additional equipment is required for manual operation (from the front panel controls) other than standard cables and adapters required for the specific application.

1-52. To use the HP-IB capabilities of the HP 8341A, a computing controller, such as the HP 85, HP 9826, or HP 9836 is required.

1-53. EQUIPMENT AVAILABLE

1-54. Service Accessories

1-55. A Service Accessory Kit is available as HP Part Number 08340-60134. This kit includes a variety of extender boards, cables, and adapters that will aid in servicing the HP 8341A.

1-56. HP 8410C/8411A Network Analyzer

1-57. The HP 8341A is compatible with the HP HP 8410B/C Network Analyzer system. The combination of the HP 8410B/C Network Analyzer, the HP 8411A Frequency Converter, and an appropriate display plug-in forms a phasemeter and a ratiometer for direct phase and amplitude ratio measurements on RF voltages. These measurements can be made on single frequencies and on swept frequencies from 110 MHz to 18 GHz. The HP 8410B/C has an Auto-Frequency range mode which gives it the capability of automatically tracking the HP 8341A over octave and multi-octave frequency bands. Two interconnections to the HP 8341A are necessary to ensure that the HP 8410B/C will phase lock properly. The HP 8410B/C Source Control Cable (HP Part Number 08410-60146) connects the HP 8410B/C rear panel SOURCE CONTROL connector to the HP 8341A rear panel 8410B INTERFACE connector. Additionally, the HP 8341A rear panel 1V/GHz output connects to the HP 8410B/C rear panel FREQ REF INPUT. The HP 8410B INTERFACE connector pins and signals are illustrated in Section II, Installation, in this volume. Additional information on interfacing with the HP 8341A with the HP 8410 is included in Section III, Operation, in this volume.

1-58. HP Model 8756/55 Scalar Network Analyzers

1-59. The HP 8341A is directly compatible with the HP 8756A or HP 8755C scalar network analyzer for broadband swept scalar measurements. The HP 8756/55 provides a 27.8 KHz square wave AM modulation output. This output can be routed directly into the HP 8341A AM input connector. When **[SHIFT] [PULSE]** is selected on the HP 8341A, the RF OUTPUT will then be modulated at 27.8 KHz, thereby providing the correct modulation frequency for the HP 8756/55 ac detection scheme. Pressing **[SHIFT] [PULSE]** is not necessary when an HP 8756A is used with its System Interface connected to the HP 8341A's HP-IB connector. This built-in modulation feature eliminates the need for an external modulator.

1-60. The HP 8341A can also sequence alternate sweeps in the HP 8756/55 through the use of the ALT function. This works in conjunction with the channel switching circuits in the HP 8756/55. This permits Channel 1 on the HP 8756/55 to respond only to the HP 8341A current state and Channel 2 to the alternate state. In the case of an HP 8755C, a single cable (HP Part Number 8120-3174) connects between the HP 8341A rear panel 8755 INTERFACE connector and the HP 8755C front panel ALT SWP INTERFACE connector to provide the necessary signals for channel sequencing. The HP 8341A rear panel 8755 INTERFACE connector pins and signals are illustrated in Section II, Installation, in this volume. Additional information on interfacing the HP 8341A with the HP 8755C is included in Section III, Operation, in this volume. The HP 8755C is included in Section III, Operation, in this volume. The HP 8756A needs no special interface cable. All alternate sweep handshaking is done by means of the System Interface cable.

1-61. The HP 8756A Scalar Network Analyzer is a microprocessor-based analyzer capable of making scalar (magnitude only) reflection and transmission measurements at RF and microwave frequencies. The HP 8756A is completely programmable through HP-IB and can control the HP 8341A, the HP 8340A, HP 8350B Sweep Oscillator, or a plotter directly. In addition to the source, a complete HP 8756A measurement system requires the use of detectors and/or bridges to the R, A, or B inputs on the front panel.

1-62. Power Meters and Crystal Detectors

1-63. The RF output can be externally leveled using the HP Model 432, HP Model 435, or HP Model 436 Power Meters, or with positive or negative polarity output crystal detectors. Additional information on interfacing the HP 8341A with power meters and crystal detectors is included in Section III, Operation, in this volume.

1-64. RECOMMENDED TEST EQUIPMENT

1-65. Table 1-2 is a complete list of all required equipment for the tests and adjustments supplied in Section IV, Performance Tests, the Automated Test Procedures, and Section V, Adjustments. Test equipment that is used for automated tests is footnoted in the table for easy reference; some equipment is required only for the automated procedures. Test equipment other than that noted in the table may be substituted if it meets or exceeds the critical specifications indicated in the table.

1-66. Most of the procedures required to verify HP 8341A operation are provided in the manual test procedures in Section IV, Performance Tests. Performing the manual tests provide a high level of confidence that the instrument is performing within published specifications. However, these manual tests are not exhaustive. Exhaustive manual tests (e.g. frequency accuracy, harmonics, spurious signals, and verification of the optional 90 dB step attenuator) would be impractical due to the number of required measurement points. Automated tests are available that provide exhaustive performance verification. Frequency switching time can only be performed using an automated test.

1-67. The automated HP 8341A test programs are for use with an HP 9836A Desktop Computer. The test programs are available on five discs. The operating instructions supplied with the discs are also included in the Automated Test Procedures section of this manual. The part number of the Automated Test Procedure is shown in Table 1-2, Recommended Test Equipment.

Table 1-1. Model HP 8341A Specifications and Supplemental Performance Characteristics (1 of 15)

NOTE

HP 8341A Specifications are the performance standards, or limits, against which the instrument may be tested; specifications are shaded in this table. The following Specifications apply for temperatures between 0 and +55°C except where noted. Specifications apply with the PEAK function ON in the CW and MANUAL modes of operation, and with periodic use of AUTO TRACKING CALIBRATION in swept operation.

Supplemental Performance Characteristics are not shaded in this table and are intended to provide information useful in applying the instrument by giving typical, but non-warranted, performance parameters. These are denoted as "typical", "nominal", or "approximate".

FREQUENCY

CW MODE

Range: 0.01 to 20.0 GHz

Resolution: n X 1 Hz
Where n = harmonic multiplication number (1 to 3). Refer to Frequency ranges and Bandswitch Points description below.

Accuracy: Same as Time Base Accuracy

Time Base

Frequency: 10 MHz

Aging Rate:
1×10^{-9} per day, 2.5×10^{-7} per year after 72 hour warm up if HP 8341A has been disconnected from ac power for less than 24 hours. Aging rate is achieved after 7 to 30 days warm up if HP 8341A has been disconnected from ac power for greater than 24 hours.

Temperature Coefficient: Typically $< 1 \times 10^{-10}$ per °C

Change due to 10% line voltage change: Typically $< 1 \times 10^{-11}$

Accuracy:
Overall accuracy of internal time base is a function of time base calibration ± aging rate ± temperature effects ± line effects.

Switching Time: <50 msec (PEAK function off)
(Fast Phase Lock Mode reduces typical switching time to <20 msec.)

CENTER FREQUENCY/SWEEP WIDTH MODE (CF/ΔF)

Range: 10.00005 MHz to 19.999999995 GHz (**center frequency**)
100 Hz to 19.99 GHz (**sweep width**)

Resolution: Approximately 0.1% of sweep width (ΔF)

Readout Accuracy with respect to sweep out voltage (sweep time > 100 msec):
$\Delta \leq$ n x 5 MHz: ± 1% of indicated sweep width (ΔF) ± time base accuracy*
$\Delta >$ n x 5 MHz to < n x 100 MHz: ± 2% of indicated sweep width (ΔF)
$\Delta \geq$ n x 100 MHz: ± 1% of indicated sweep width (ΔF), or ± 50 MHz, whichever is less.

Where n = harmonic multiplication number (1 to 3). Refer to Frequency Ranges and Bandswitch Points description below.

*Time Base affects Center Frequency accuracy only, not sweep width accuracy.

Specifications are shaded; Supplemental Performance Characteristics are not.

Table 1-1. Model HP 8341A Specifications and Supplemental Performance Characteristics (2 of 15)

FREQUENCY (Cont'd)

START/STOP MODE

Range
Start: 10 MHz to 19.9999999
Stop: 10.0001 MHz to 20.0 GHz
Resolution: Typically, the same as Center Frequency/Sweep Width mode.

Readout Accuracy with respect to sweep out voltage (sweep time > 100 msec):
Same as Center Frequency/Sweep Width Mode.

FREQUENCY MARKERS

All 5 markers are independently variable and have the same specifications.

Range: 10 MHz to 20.0 GHz

Resolution: Approximately 0.1% of sweep width (ΔF)

Readout Accuracy (sweep time > 100 msec):
$\Delta \leq$ n x 5 MHz: ± 1% of indicated sweep width (ΔF) ± time base accuracy*.
$\Delta >$ n x 5 MHz to < n x 100 MHz: ± 2% of indicated sweep width (Δ).
$\Delta \geq$ n x 100 MHz: ± 1% of indicated sweep width (ΔF) or ± 50 MHz, whichever is less.

Where n = harmonic multiplication number (1 to 3). Refer to Frequency Ranges and Bandswitch Points Description below.

*Time base accuracy is not a factor in MKRΔ Mode.

TYPICAL FREQUENCY RANGES AND BANDSWITCH POINTS

For bands 0 and 1, the HP 8341A's output is derived from the fundamental frequency of its internal 2.3 to 7.0 GHz YIG-tuned oscillator (n = 1). For bands 2 and 3, the output is derived from the 2nd or 3rd harmonic of the oscillator (n = 2 or 3).

Bandswitch points in CW Mode (only) always occur at the following points:

Band 0 to 1: 2.3 GHz
Band 1 to 2: 7.0 GHz
Band 2 to 3: 13.5 GHz

Bandswitch points in each of the swept modes (CF/ΔF, START/STOP) and the MANUAL SWEEP mode normally occur at the following points (with the exception listed below):

Band 0 to 1: 2.4 GHz
Band 1 to 2: 7.0 GHz
Band 2 to 3: 13.5 GHz

The swept mode bandswitch points are illustrated in Figure 1.

Specifications are shaded; Supplemental Performance Characteristics are not.

Table 1-1. Model HP 8341A Specifications and supplemental Performance Characteristics (3 of 15)

FREQUENCY (Cont'd)

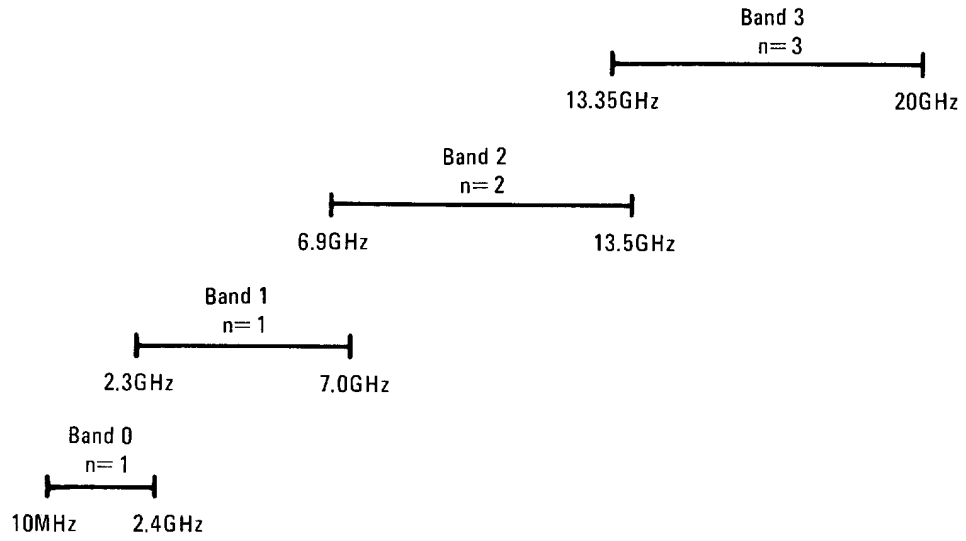


Figure 1. Typical Frequency Ranges and Bandswitch Points in Swept Modes

Note that the bands overlap. However, any sweep will be executed with the minimum number of bandswitch points. If the start frequency is above the lower limit for a given band, the sweep will start in that band and not the next lower one. If the stop frequency exceeds the upper limit of a given band by an amount greater than 0.004 x ΔF, a bandswitch will occur at that band's upper limit.

SPECTRAL PURITY

(Spectral Purity specifications apply for CW mode and all swept modes, unless otherwise stated.)

SPURIOUS SIGNALS (Expressed in dB relative to the carrier level (dBc) at ALC level of 0 dBm)	**Bands and Approximate Frequency Ranges (GHz)** (See Frequency Ranges and Bandswitch Points for complete description.)			
	Band 0 0.01 to <2.3	**Band 1 2.3 to <7.0**	**Band 2 7.0 to <13.5**	**Band 3 13.5 to 20.0**
Harmonics (up to 20.0 GHz)	< −35	< −35	< −35	< −35
Subharmonics and multiples thereof (up to 20.0 GHz)	–	–	< −25	< −25
Non-harmonically related spurious (CW and Manual Sweep mode only)	< −50	< −70	< −60	< −60

Specifications are shaded; Supplemental Performance Characteristics are not.

Table 1-1. Model HP 8341A Specifications and Supplemental Performance Characteristics (4 of 15)

SPECTRAL PURITY (Cont'd)

SPURIOUS SIGNALS (Cont'd)

Power line related and spurious due to fan rotation within 5 Hz below line frequency, and multiples thereof

(CW mode only, all power levels)	**Band 0 0.001 to <2.3**	**Band 1 2.3 to <7.0**	**Band 2 7.0 to <13.5**	**Band 3 13.5 to 20.0**
Offset <300 Hz from carrier	< −50	< −50	< −44	< −40
Offset 300 Hz to 1 kHz from carrier	< −60	< −60	< −54	< −50
Offset > 1 kHz from carrier	< −65	< −65	< −59	< −55

SINGLE-SIDEBAND PHASE NOISE (dBc/1 Hz BW, CW Mode, all power levels)

Offset 100 Hz from carrier	< −67	< −67	< −61	< −57
Offset 1 kHz from carrier	< −75	< −75	< −69	< −65
Offset 10 kHz from carrier	< −83	< −83	< −77	< −73
Offset 100 kHz from carrier	< −107	< −107	< −101	< −97
OPTION 007, (Improved Phase Noise Specifications)				
Offset 30 Hz from carrier	< −64	< −64	< −58	< −54
Offset 100 Hz from carrier	< −70	< −70	< −64	< −60
Offset 1 kHz from carrier	< −78	< −78	< −72	< −68
Offset 10 kHz from carrier	< −86	< −86	< −80	< −76
Offset 100 kHz from carrier	< −107	< −107	< −101	< −97

TYPICAL FREQUENCY STABILITY, 50 Hz – 15 kHz post detection bandwidth

Typical Residual FM in CW Mode: <n x 60 Hz rms

Typical Residual FM in Swept Mode:

$\Delta F >$ n x 5 MHz: < n x 25 kHz rms
$\Delta F \leq$ n x 5 MHz: Same as CW mode

Where n = harmonic multiplication number (1 to 3). Refer to Frequency Ranges and Bandswitch Points description above.

Specifications are shaded; Supplemental Performance Characteristics are not.

Table 1-1. Model HP 8341A Specifications and Supplemental Performance Characteristics (5 of 15)

RF OUTPUT

MAXIMUM LEVELED POWER (0°C to +35°C)[1]	**Bands and Approximate Frequency Ranges (GHz)** (see Frequency Ranges and Bandswitch Points for complete description)				
	Band 0 0.01 to <2.3	**Band 1 2.3 to <7.0**	**Band 2 7.0 to <13.5**	**Band 3 13.5 to <18.6**	**18.6 to 20.0**
STANDARD INSTRUMENT	+10.0 dBm	+10.0 dBm	+10.0 dBm	+10.0 dBm	+10.0 dBm
OPTION 001 (F.P. Out w/Atten.)	+10.0 dBm	+9.0 dBm	+8.0 dBm	+8.0 dBm	+8.0 dBm
OPTION 004 (R.P. Out w/Atten.)	+10.0 dBm	+9.0 dBm	+8.0 dBm	+7.0 dBm	+7.0 dBm
OPTION 005 (R.P. Out w/o Atten.)	+10.0 dBm	+10.0 dBm	+10.0 dBm	+9.0 dBm	+9.0 dBm
OPTION 002 (+13 dBm Output Power, 2.3 to 18.6 GHz)*	+10 dBm	+13 dBm	+13 dBm	+13 dBm	+10 dBm
OPTION 002 and OPTION 001 (Front Panel RF Output w/Atten.)	+10 dBm	+12 dBm	+11 dBm	+11 dBm	+8 dBm
OPTION 002 and OPTION 004 (Rear Panel RF Output w/Atten.)	+10 dBm	+11 dBm	+10 dBm	+10 dBm	+7 dBm
OPTION 002 and OPTION 005 (Rear Panel RF Output w/o Atten.)	+10 dBm	+12 dBm	+12 dBm	+12 dBm	+9 dBm

* Does not apply to instruments equipped with Options 001, 004, or 005

MINIMUM SETTABLE POWER

STANDARD and OPTION 005 (R.P. w/o Atten.): −20 dBm

OPTION 001 (F.P. Out w/Atten.) and 004 (R.P. Out w/Atten.): −110 dBm

RF OFF

When the RF key is turned OFF, the POWER dBm display will read OFF and a 0 dBm signal will typically be reduced to a level < −100 dBm.

OUTPUT POWER RESOLUTION

" ENTRY DISPLAY": 0.05 dB **"POWER dBm" Display:** 0.1 dB

OUTPUT POWER ACCURACY[2]	**Bands and Approximate Frequency Ranges (GHz)** (see Frequency Ranges and Bandswitch Points for complete description)	
	Band 0 0.01 to <2.3	**Bands 1 - 3 2.3 to 20**
STANDARD INSTRUMENT		
+18 to +10 dBm[4]	−	±1.6 dB
+10 to −10 dBm	±0.9 dB	±1.3 dB
−10 to −20 dBm	±1.7 dB	±2.1 dB
OPTION 004 (Rear Panel Output w/Atten.)		
+18 to +10 dBm[4]	−	±2.0 dB
+10 to −11.95 dBm	±1.0 dB	±1.7 dB
−12 to −21.95 dBm	±1.3 dB	±2.2 dB
−22 to −51.95 dBm	±1.6 dB	±2.5 dB
−52 to −81.95 dBm	±1.9 dB	±2.8 dB
−82 to −99.95 dBm	±2.2 dB	±3.1 dB
−100 to −110 dBm	±3.0 dB[3]	±3.9 dB[3]

Specifications are shaded; Supplemental Performance Characteristics are not

Table 1-1. Model HP 8341A Specifications and Supplemental Performance Characteristics (6 of 15)

RF OUTPUT (Cont'd)		
OUTPUT POWER ACCURACY (Cont'd)	**Band 0 0.01 to <2.3**	**Bands 1 - 3 2.3 to 20**
OPTION 001 (Front Panel Output w/Attenuator)		
+18 to +10 dBm[4]	–	±1.8 dB
+10 to −9.95 dBm	±0.9 dB	±1.5 dB
−10 to −19.95 dBm	±1.2 dB	±2.0 dB
−20 to −49.95 dBm	±1.5 dB	±2.3 dB
−50 to − 79.95 dBm	±1.8 dB	±2.6 dB
−80 to −99.95 dBm	±2.1 dB	±2.9 dB
−100 to −110 dBm	±2.9 dB[3]	±3.7 dB[3]
OPTION 005 (Rear Panel Output w/o Attenuator)		
+18 to +10 dBm[4]	–	±1.8 dB
+10 to −10 dBm	±1.0 dB	±1.5 dB
−10 to − 20 dBm	±1.8 dB	±2.3 dB
FLATNESS (Internally leveled)		
STANDARD INSTRUMENT		
+18 to +10 dBm[4]	–	±1.0 dB
+10 to −10 dBm	±0.6 dB	±0.9 dB
−10 to −20 dBm	±0.8 dB	±1.5 dB
OPTION 004 (Rear Panel Output w/Attenuator)		
+18 to +10 dBm[4]	–	±1.4 dB
+10 to −11.95 dBm	±0.7 dB	±1.3 dB
−12 to −21.95 dBm	±1.0 dB	±1.8 dB
−22 to −51.95 dBm	±1.3 dB	±2.1 dB
−52 to −81.95 dBm	±1.5 dB	±2.4 dB
−82 to −99.95 dBm	±1.8 dB	±2.7 dB
−100 to −110 dBm	±2.0 dB[3]	±3.3 dB[3]
OPTION 001 (Front Panel Output w/Attenuator)		
+18 to +10 dBm[4]	–	±1.2 dB
+10 to −9.95 dBm	±0.6 dB	±1.1 dB
−10 to −19.95 dBm	±0.9 dB	±1.6 dB
−20 to −49.95 dBm	±1.2 dB	±1.9 dB
−50 to −79.95 dBm	±1.4 dB	±2.2 dB
−80 to −99.95 dBm	±1.7 dB	±2.5 dB
−100 to −110 dBm	±1.9 dB[3]	±3.1 dB[3]
OPTION 005 (Rear Panel Output w/o Attenuator)		
+18 to +10 dBm[4]	–	±1.2 dB
+10 to − 10 dBm	±0.7 dB	±1.1 dB
−10 to −20 dBm	±0.9 dB	±1.7 dB

Specifications are shaded; Supplemental, Performance Characteristics are not.

Table 1-1. Model HP 8341A Specifications and Supplemental Performance Characteristics (7 of 15)

RF OUTPUT (Cont'd)

TYPICAL ALC INCREMENTAL ACCURACY

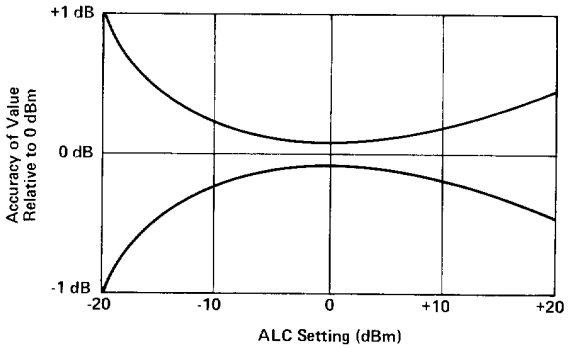


Figure 2. Typical ALC Incremental Accuracy

In instruments equipped with Option 001, the ALC does not operate below −9.95 dBm because the HP 8341A automatically increments the step attenuator at that point. However, when the ALC and step attenuator are independently controlled (DECOUPLED mode), the ALC May be operated over its full +20 dBm to −20 dBm range. Refer to Section III, Operation for a more detailed description. Pressing **[SHIFT] [PWR SWP]** places the instrument in the Decoupled Mode. In this mode the Data Entry keyboard and the RPG control the ALC level and the step up and step down keys control the attenuator.

RF OUTPUT CONNECTOR

Output Impedance: Nominally 50 Ohms

Typical Source SWR (Internally leveled only):
0.1 to <2.3 GHz: Typically <1.3:1
2.3 to <18.0 GHz: Typically <1.6:1
18.0 to 20.0 GHz: Typically <1.8:1

STABILITY WITH TEMPERATURE: Typically ±0.01 dB/°C

OUTPUT LEVEL SWITCHING TIME:

Typically <10 ms to be within 0.1 dB of final value with no attenuator range change (internally leveled only).

POWER SWEEP

Range:
Displayed: 0 to 40 dB/sweep
Actual: At least 10 dB at any given frequency (at least 20 dB in DECOUPLED mode: see Figure 3 below).

Resolution: 0.05 dB/sweep

Accuracy:
Starting Power Level: Same as Output Power Accuracy
Power Sweep Width and Linearity: See Figure 2.

Specifications are shaded; Supplemental Performance Characteristics are not.

Table 1-1. Model HP 8341A Specifications and Supplemental Performance Characteristics (8 of 15)

RF OUTPUT (Cont'd)

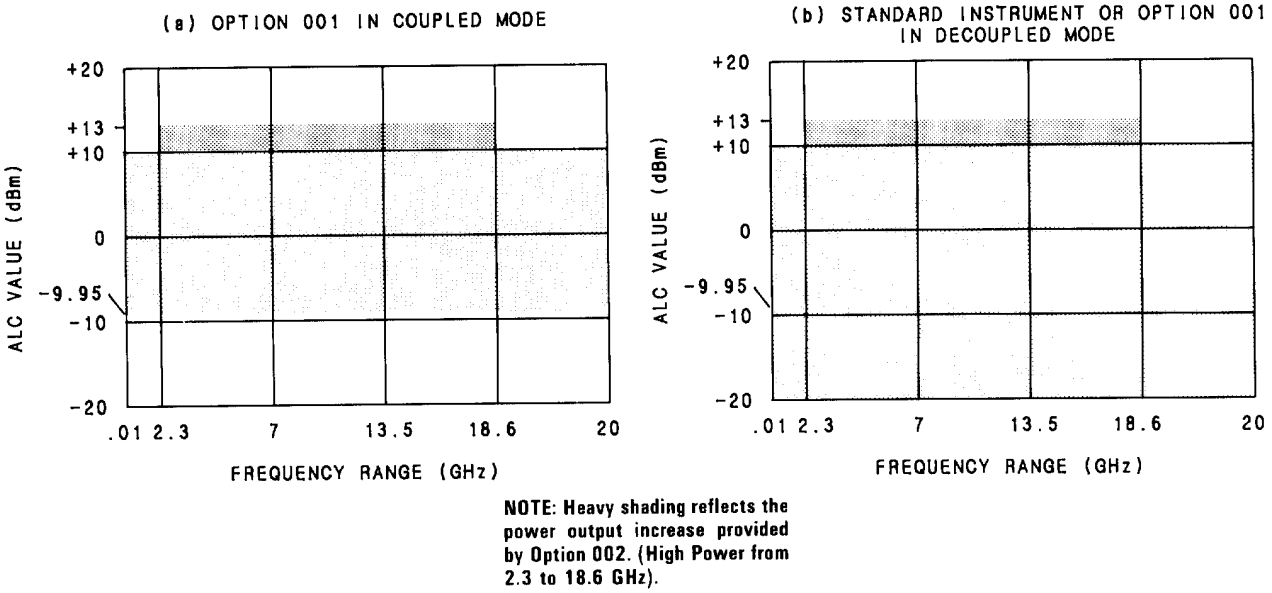


Figure 3. Typical Power Sweep Range

In instruments equipped with Option 001 (a), the ALC does not operate below −9.95 dBm (unless the instrument is placed in the Decoupled Mode by pressing **[SHIFT] [PWR SWP]**. See Figure 2), and so the maximum power sweep range is the difference of −9.95 dBm and the maximum leveled power available at the frequency of interest (specified leveled power shown in the diagram). In the DECOUPLED mode (b), the power sweep range is extended because the ALC can operate down to −20 dBm.

SLOPE COMPENSATION

Calibrated Range: 0 to 1.5 dB/GHz **Resolution:** 0.0001 dB/GHz

EXTERNAL LEVELING

XTAL: Allows the HP 8341A to be externally leveled by crystal detectors of positive or negative polarity.

METER: Allows power meter leveling with any HP power meter.

Range (XTAL or METER): 500 microvolts (−66 dBV) to 2.0 volts (±6 dBV)

Accuracy of voltage at EXT INPUT connector relative to the displayed level (leveling voltage is shown in ENTRY DISPLAY in dBV): ±0.5 dB ±0.2 mV

Loop Bandwidth:
XTAL Mode: Nominally 30 kHz METER Mode: Nominally 0.7 Hz

Input Impedance: Nominally 1 M Ohm.

Specifications are shaded; Supplemental Performance Characteristics are not.

Table 1-1. Model HP 8341A Specifications and Supplemental Performance Characteristics (9 of 15)

PULSE MODULATION

(Pertains only to instruments equipped with Option 006)
(CW mode, and all specifications are typical for frequencies <400 MHz)

ON/OFF RATIO: >80 dB

RISE (T_R) AND FALL (T_F) TIMES: ≤25 nanoseconds

MINIMUM INTERNALLY LEVELED RF PULSE WIDTH (T_{RF}): 100 nanoseconds

MINIMUM UNLEVELED RF PULSE WIDTH: Typically 25 nanoseconds

PULSE REPETITION FREQUENCY (PRF)

Non-leveled operation (SHIFT METER: Typically dc to 20 MHz.

Internally leveled operation: 100 Hz to 5 MHz (typically 100 Hz to 500 kHz for RF frequencies <400 MHz.

If **[SHIFT] [AM]** is pressed (see Settling Time), minimum PRF must be ≥ 1 kHz rather than 100 Hz.

MAXIMUM PEAK POWER: Same as specified maximum leveled power. (See RF OUTPUT).

ACCURACY OF INTERNALLY LEVELED RF PULSE V_P (relative to CW mode level):

(Note that the ALC attempts to hold pulse amplitude to same level as leveled CW signal.)

Bands and Approximate Frequency Ranges (GHz)
(see Frequency Ranges and Bandswitch Points for complete description)

Pulse Width	Band 0		Bands 1 - 3
	0.01 to 0.4	0.4 to <2.3	2.3 to 0.0
100 to <200 ns	–	+3/−0.3 dB*	+1.5/−0.3 dB*
200 to <500 ns	–	+1.5/−0.3 dB*	±0.3 dB
≥500 ns	–	±0.3 dB	±0.3 dB
1 to <2 μs	+3/−0.3 dB[3]	–	–
2 to <5 μs	+1.5/−0.3 dB[3]	–	–
≥5 μs	±0.3 dB[3]	–	–

*+15 to +55°C. Duty Cycle must be > 0.01%.

Specifications are shaded; Supplemental Performance Characteristics are not.

Table 1-1. Model HP 8341A Specifications and Supplemental Performance Characteristics (10 of 15)

PULSE MODULATION (Cont'd)

(Pertains only to instruments equipped with Option 006)

SIMULTANEOUS AM AND PULSE (Parameters shown are typical)

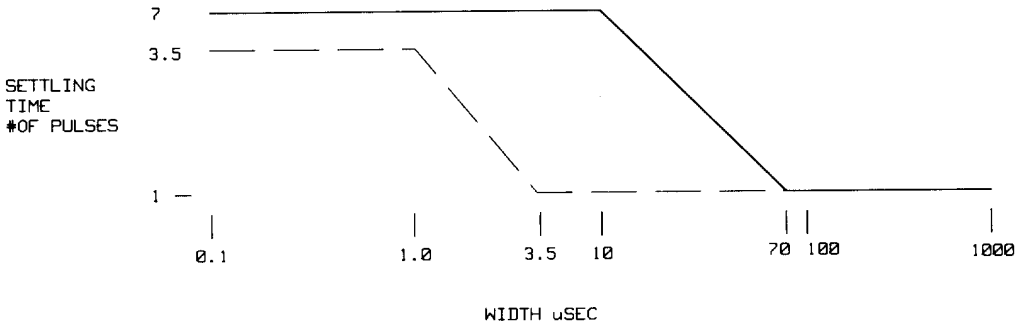
AM BANDWIDTH AT 30% DEPTH

DC coupled, typical 3 dB point:

Mode	Internally Leveled	Unleveled (Shift Meter***)
Normal	PRF/20**, to a maximum of 5 kHz	5 kHz
SHIFT AM*	PRF/10**, to a maximum of 100 kHz	100 kHz

SETTLING TIME TO A STEP INPUT, 10%-90%, TYP:

Normal	The greater of: 70 μsec, or the time for the number of pulses indicated by the solid line below.	70 μsec
SHIFT AM*	The greater of: 3.5 μsec, or the time for the number of pulses indicated by the dashed line below.	3.5 μsec



* **[SHIFT] [AM]** increases AM bandwidth in pulse mode, but also causes slight degradation of the pulse envelope and raises the minimum PRF to 1 kHz.

** PRF = PULSE REPETITION FREQUENCY.

*** **[SHIFT] [METER]** is an unleveled operating mode, power is controllable, but not flat over frequency. AM bandwidth in this mode is independent of pulse rate and width. See Section I.

OVERSHOOT, RINGING (V_{OR}/V_P): <15% typically

PULSE WIDTH COMPRESSION ($T_V - T_{RF}$): ±5 nanoseconds typically

DELAY TIME (T_D): 50 nanoseconds typically

VIDEO FEEDTHROUGH (V_F/V_P):

0.01 to <0.4 GHz (Band 0): <100% typically
0.4 to <2.3 GHz (Band 0): ≤5% (for output power levels ≤+8 dBm)
2.3 to 20.0 GHz (Bands 1 – 3): ≤0.2%

SIDEBANDS (caused by a pulse input when PULSE is OFF):

Typically −50 dBc with a 30 kHz squarewave input from0.01 to 7.0 GHz.

Specifications are shaded; Supplemental Performance Characteristics are not.

Table 1-1. Model HP 8341A Specifications and Supplemental Characteristics (11 of 15)

PULSE MODULATION (Cont'd)

(Pertains only to instruments equipped with Option 006)

PULSE INPUT CONNECTOR:

TTL compatible. (Open circuit is TTL high level and keeps RF on.) Damage level is +12 Vdc, −20 Vdc. Refer to Section III, Operation, for input circuit diagram.

PULSE DEFINITIONS:

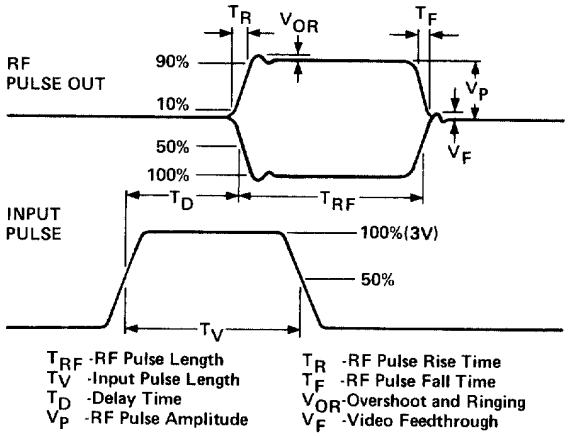


Figure 4. Pulse Definitions

AMPLITUDE MODULATION

(The following specifications apply when the HP 8341A is internally leveled, for waveforms whose envelope peak is at least 1 dB below maximum specified power. Unless noted, pulse modulation must be OFF; however, the HP 8341A is capable of simultaneous amplitude and pulse modulation. See Section III, Operation.)

AM DEPTH: 0 to 90%

AM SENSITIVITY (at 1 kHz rate and 30% Depth):

DC coupled, 3 dB point ≥ 100 kHz

PULSE on: DC coupled, 3 dB point ≥ PRF/20, typically.
(Refer to Pulse Modulation specs for a more complete description.)

AM FREQUENCY RESPONSE (FLATNESS) (relative to a 1 kHz rate at 30% depth, DC to 10 kHz): ±0.20 dB

DISTORTION: Typical distortion values are given in Figure 5.

Specifications are shaded; Supplemental Performance Characteristics are not.

Table 1-1. Model HP 8341A Specifications and Supplemental Performance Characteristics (12 of 15)

AMPLITUDE MODULATION (Cont'd)

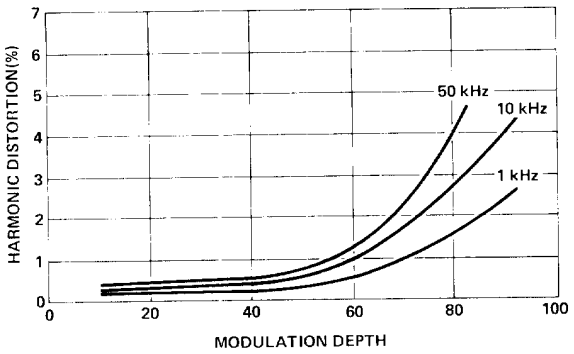


Figure 5. Typical HP 8341A AM Distortion for Various Modulation Rates and Depths

INCIDENTAL PHASE MODULATION (in peak radians) (Rates ≤10 kHz, 30% Depth): <0.4 typically

INCIDENTAL FM: Incidental Phase Modulation x Modulation Frequency

AM INPUT IMPEDANCE: Nominally 600 Ohms.

SWEEP TIME

RANGE:
10 milliseconds to 200 seconds forward sweep times
Fastest possible sweep typically cycles once every 40 ms; fastest possible full band sweep typically cycles once every 150 ms.

RESOLUTION: Approximately 0.1% of current sweep time value.

ACCURACY: ± 5% (sweeptimes ≤50 seconds)

INPUTS

PULSE MODULATION INPUT (Pertains only to instruments equipped with Option 006)
Front panel BNC female input connector. TTL compatible (open circuit is TTL high level and keeps RF on). Damage level is +12 Vdc, −20 Vdc.

AM MODULATION INPUT
Front panel BNC female input connector. Nominal input impedance is 600 Ohms.

LEVELING EXT INPUT
Front panel BNC female input connector. Used for power meter leveling or crystal detector leveling. Input impedance in XTAL or METER modes is nominally 1 MOhm. Refer to EXTERNAL LEVELING specifications.

FREQUENCY STANDARD EXT
Rear panel BNC female connector. Accepts 5 or 10 MHz signal from internal or external timebase. A BNC jumper connects this input to the HP 8341A's FREQUENCY STANDARD INT output for operation from HP 8341A's internal timebase. External signal input must be 5 MHz ±50 Hz or 10 MHz ±100 Hz, 0 to + dBm. Nominal input impedance is 50 ohms.

Specifications are shaded; Supplemental Performance Characteristics are not.

Table 1-1. HP Model 8341A Specifications and Supplemental Performance Characteristics (13 of 15)

INPUTS (Cont'd)

EXT TRIGGER INPUT
Rear panel BNC female connector. Triggers single sweep. Trigger signal must be > 2 Vdc (10 Vdc max) and wider than 0.5 microseconds. Nominal input impedance is 2 kOhms.

STOP SWP IN/OUT:
Rear panel BNC female connector. TTL high while sweeping, stops sweep when grounded externally. TTL low when HP 8341A stops sweep.

HP 8755C INTERFACE
Rear panel. Connects via cable (HP Part No. 8120-3174) to HP 8755C Scalar Network Analyzer to provide Alternate Sweep function.

HP 8410B INTERFACE
Rear panel 25-pin D-type connector. Permits multi-octave operation of HP 8410B/C Network Analyzer with HP 8341A, via interface cable (HP Part No. 08410-60146). Also provides duplicates of these functions: **Ext Trigger Input, Mute Output, Penlift Output, Neg Blank**, and **Z-Axis Blank/Mkrs**. Also provides an input for a switch closure to execute the UP key function.

OUTPUTS

RF OUTPUT
Front panel Type N Female connector. Frequency output range is 10 MHz to 20.0 GHz. Nominal output impedance is 50 Ohms. SWR is shown in RF OUTPUT characteristics.

SWEEP OUTPUT
Front and rear panel BNC female connectors. supplies a voltage proportional to the sweep that ranges from approximately 0 Vdc (at start of sweep) to approximately +10 Vdc (at end of sweep), regardless of sweep width. In CW mode, the dc voltage is proportional to percentage of full 10 MHz to 20.0 GHz range.

1 V/GHz (19V Max)
Rear panel BNC female connector. Outputs a voltage proportional to output frequency at 1V/GHz, up to a maximum of 19 Vdc. Nominal load impedance should be ≥4 KOhms. Accuracy of 1V/GHz is ±1% ±2mV.

10 MHz REF OUTPUT
Rear panel BNC female connector. Output power level is nominally 0 dBm. Output impedance is nominally 50 Ohms.

FREQUENCY STANDARD INT
Rear panel BNC connector. Output frequency 10 MHz, output power nominally 3 dBm, 50 Ohm nominal output impedance. Jumpered to **FREQUENCY STANDARD EXT** for operation from HP 8341A's internal timebase.

MUTE OUTPUT
Rear panel BNC female connector. Mutes servo motor of X-Y recorder when the HP 8341A crosses a band switchpoint.

PENLIFT OUTPUT J13
For operation with X-Y recorders. PENLIFT disables an X-Y recorder's ability to lower its pen during sweep retrace. If **[SHIFT] [LINE]** is pressed on the front panel, PENLIFT will also disable the pen during forward sweep band switchpoints. Because of X-Y recorder limitations PENLIFT will always disable the X-Y recorder's pen at sweep times under 5 seconds.

PENLIFT enables pen operation by providing a current path to ground for the X-Y recorder's pen solenoid. The voltage at the PENLIFT output in this state will be approximately 0 Vdc. Circuit impedance in this state is approximately .5 Ohms.

PENLIFT disables pen operation by not providing a current path to ground for the X-Y recorder's pen solenoid. The voltage on the PENLIFT output will be equal to the X-Y recorder's pen solenoid supply voltage. Circuit impedance in this state is very high.

Specifications are shaded; Supplemental Performance Characteristics are not.

Table 1-1. Model HP 8341A Specifications and Supplemental Performance Characteristics (14 of 15)

OUTPUTS (Cont'd)

NEG BLANK
Rear panel BNC female connector. Supplies negative rectangular pulse (approximately −5 Vdc into 2 kOhm load) during the retrace and band switchpoints of the RF output.

Z-AXIS BLANK/MKRS
Rear panel BNC female connector. Supplies positive rectangular pulse (approximately +5 Vdc into 2 kOhms) during the retrace and band switchpoints of the RF output. Also, supplies a −5 Vdc pulse when the RF is coincident with a marker frequency (intensity markers only).

AUX OUT
Rear panel Type-N female connector. Provides a 2.3 to 7.0 GHz fundamental oscillator output, nominally 0 dBm and 50 Ohm output impedance.

NOTE

For further information refer to the Front/Rear Panel functional group in Section VIII.

REMOTE OPERATION

All functions (except line power) may be programmed via the Hewlett-Packard Interface Bus (HP-IB). Detailed Remote operation information is included in Section III, Operation.

GENERAL

ENVIRONMENTAL

Temperature: Operation at 0 to +55°C, except as noted in electrical specifications.

Humidity: Passes 5 day cycling, +40°C, 95% relative humidity.

EMI: Controlled and radiated interference is within the requirements of CE03 and RE02 (relaxed by 10 dB) of MIL STD 461A, and within the requirements of VDE 0871/1978, Level B and CISPR publication 11 (1975).

WARM-UP TIME

Operation: Requires 30-minute warmup from cold start, 0 to +55°C. Internal temperature equilibrium is reached after 2-hour warmup at stable outside temperature.

Frequency Reference: Reference time base is kept at operating temperature in STANDBY mode with the instrument connected to the ac power. For instruments disconnected from ac power for less than 24 hours, the aging rate is $<1 \times 10^{-9}$/day after a 72-hour warmup.

POWER REQUIREMENTS

Standard Instrument:

47.5 to 66 Hz; 100, 120, 220, or 240 volts (±10%); Typically, 500 VA maximum (40 VA in **STANDBY**).

Specifications are shaded; Supplemental Performance Characteristics are not.

Table 1-1. Model HP 8341A Specifications and Supplemental Performance Characteristics (15 of 15)

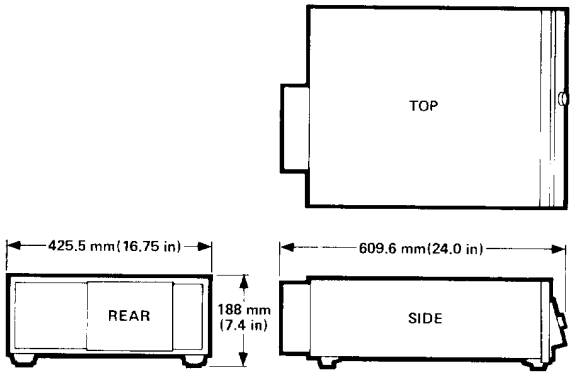
GENERAL (Cont'd)

WEIGHT

Net Weight: 34 kg (75 lb)

Shipping Weight: 52 kg (112 lb)

DIMENSIONS



NOTES

1. Maximum leveled power from 35°C to 55°C will typically be degraded from these specifications by no more than 2 dB.
2. Internally leveled, AM off. The POWER dBm display monitors the actual output power, giving accurate readings when unleveled, externally leveled, or when amplitude modulating with a signal that has a dc component. In these modes, the accuracy typically degrades by ±0.1 dB over the tabulated values. The ENTRY DISPLAY shows the desired power level, or the desired external detector output voltage, exclusive of modulation.
3. Typical.
4. The ALC loop typically operates up to +20 dBm to enhance usability at those frequencies where leveled power greater than the maximum specified is available.

Specifications are shaded; Supplemental Performance Characteristics are not.

Table 1-2. Recommended Test Equipment (1 of 5)

Instrument	Critical Specifications	Recommended Model	Use[1]
Signature Multimeter	Clock Frequency: ≥20 MHz	HP 5005A	T
Oscilloscope	Dual Channel Bandwidth: dc to 100 MHz Vertical Sensitivity: ≤5 mV/Div Horizontal Sensitivity: 50 ns/Div 10 Magnifier External Sweep Capability 50 Ohm Vertical Input	HP 1741A	P,AT,A,T
Oscilloscope Probe	10:1 Divider Probe	HP 10004D	AT,T,A
Digital Voltmeter (DVM)	Range: −50 to +50 Vdc Accuracy: ±0.01% Input Impedance: ≥10 MOhms	HP 3455/56	P,AT,A,T
Power Meter	Power Range: 1μW to 100 mW Accuracy: ±0.02 dB	HP 436A	P,AT,A,T
Power Sensors	Frequency Range: 10 to 50 MHz Power Range: 1μW to 100 mW	HP 8481A	P,AT,A,T
	Frequency Range: 50 MHz to 20 GHz Power Range: 1μW to 100 mW	HP 8485A	P,AT,A,T
Frequency Counter	Frequency Range: 10 MHz to 20 GHz Input Impedance: 50 Ohms Frequency Accuracy: Time Base Accuracy ±1 count	HP 5343A	P,AT,A,T
Universal Counter	Time Interval Range: 100 ns to 200 s	HP 5316A	P,AT,T
Spectrum Analyzers	Frequency Range: 0.01 to 20 GHz Must have External Time Base Input Center Frequency Accuracy in 0 Hz Span: Same as Time Base Accuracy Minimum Resolution Bandwidth: ≤300 Hz Residual FM: <100 Hz Log Fidelity: ≤ 1 dB Must have Video Output	HP 8566A	P,AT,A,T
	Frequency Range: 20 Hz to 40 MHz Resolution Bandwidth: ≤Hz	HP 3585A	P,AT,T
Frequency Standard	Frequency: 10 MHz Stability: >1 x 10^{-10}/yr	HP 5061A	P,A
Synthesized Sweeper (used as Local Oscillator in P[1] and A[1], and Sweep Generator in A[1])	Frequency range: 10 MHz to 20 GHz Must have External Time Base Input Frequency Accuracy: Same as Time Base Accuracy RF Power Output: ≥ +9 dBm	HP 8341A* or HP 8340A**	P,AT,A

*Instruments equipped with both Option 001 and 004 are not recommended

**Option 004 instrument is not recommended

Table 1-2. Recommended Test Equipment (2 of 5)

Instrument	Critical Specifications	Recommended Model	Use[1]
Signal Generator	Frequency: 300 to 400 MHz RF Output Power: ≥ 0 dBm Resolution: ± 50 kHz	HP 8654A, HP 8340A or HP 8341A	A
Desktop Computer	Equipped with 750K memory Substitute: (Used only for HP-IB Operation Verification; HP 85F. Includes HP 83936A ROM Drawer, HP 82937A HP-IB Interface, and I/O ROM HP Part No. 00085-15003.)	HP 9836A/26A HP 85F	HP-IB, AT HP-IB
Plotter/Printer ROM	For HP 85F, no substitute.	HP Part No. 00085-15002	HP-IB
Printer	Must have graphics capability	HP 2671G	AT
Automated Test Procedures Software	No Substitute (Includes five programmed discs with documentation)	HP Part No. 08340-10010	AT
Modulation Analyzer	No Substitute	HP 8901A/8902A	P,AT
Pulse Generator	Pulse Width: ≤ 100 nS Rise Time: ≤ 10 nS Frequency: 20 Hz to 50 kHz	HP 8012B	P,A,AT,T
Function Generator	Sinewave Amplitude: ≥ 1 Vrms Sinewave Frequency: dc to 100 kHz	HP 3325A	P,A,AT,T
Amplifier	Frequency Range: 100 kHz to 1.3 GHz Gain: >20 dB	HP 8447F	P,AT
Scalar Network Analyzer/Detector	Frequency Range: 10 MHz to 20 GHz Connector: APC-3.5	HP 8755C/56A HP 11664B	A
Storage Normalizer	Compatible with HP 8755C (Needed only if HP 8755C is used in adjustment procedure)	HP 8750A	A
Power Supply	0 to 50 Vdc Voltage Drift (in 1 Hour): ≤ 0.1% + 2.5 mV	HP 6294A	P,A,AT
Mixer	Frequency Range: 1 to 20 GHz	RHG DMS 1 – 26	P,AT,A
Feedthrough Termination	50 Ohm feedthrough	HP 10100C	P
Attenuators	Frequency Range: 0.01 to 20 GHz Maximum Input Power: >+10 dBm Attenuation: 10 dB Connectors: APC-3.5	HP 8493C Opt. 010	P,AT,A
	Frequency Range: 0.01 to 20 GHz Maximum Input Power: >+10 dBm Attenuation: 20 dB Connectors: APC-3.5	HP 8493C Opt. 020	P,AT

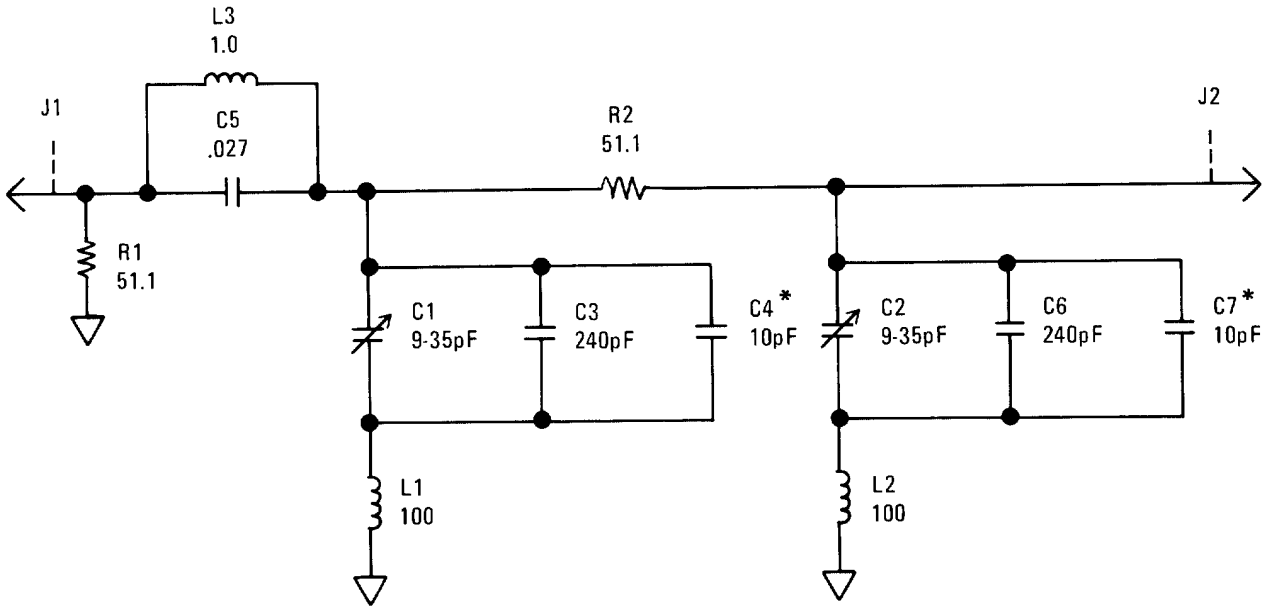
Table 1-2. Recommended Test Equipment (3 of 5)

Instrument	Critical Specifications	Recommended Model	Use[1]
Step Attenuator	Calibrated at 50 MHz 0 to 70 dB in 10 dB steps	HP 355D	AT
		HP Part No.	
Directional Coupler	Frequency Range: 1.7 to 20 GHz Coupling: 16 dB Maximum Input Power: 100 mW	0955-0125	A,AT
		HP Part No.	
Adapters	APC-3.5 Female to Type N Male (2 required)	1250-1744	P,A,T,AT
	APC-3.5 Female to Female	5061-5311[2]	P,A,AT
	BNC Female to Dual Banana	1251-2277	P,AT
	SMB Male to SMB Male	1250-0069	A
	SMA Male to BNC Female	1250-1200	P,A,AT
	APC 3.5 Male to Type N Male	1250-1743	P,A,AT
	APC 3.5 Male to Type N Female	1250-1750	P,A,AT
	Type N Male to BNC Female	1250-1476	P,AT
		HP Part No.	
Adapter Tees	BNC Male-Female-Female	1250-0781	P
	SMB Male-Male-Male	1250-0670[2]	T
Active Probe	Input Impedance: 100KOhms Output Impedance: 50 Ohms	HP 1121A	T,A
Probe Power Supply	For HP 1121A	HP 1122A	T,A
		HP Part No.	
Low Pass filter	Pass 100 MHz and below Reject 150 MHz and above	9135-0260	P,AT
Crystal Detector	Positive	HP 8473C (Option 003)	P,T
	Negative	HP 8473C	P,AT,T
		HP Part No.	
Diode (2 required)	Peak Inverse Voltage: 400V Average Forward Current: 750 mA	1901-0028	P,AT
		HP Part No.	
Capacitors	1000 pF (±10%), 100 VDC	0160-4574	P,AT
	0.1 μF (±10%), 200 VDC	0160-0168	A
		HP Part No.	
Resistors	1 MOhm, 1% 0.5 Watt	0757-0059	A
	1 KOhm 1%, 0.25 Watt	0757-0280	AT
		HP Part No.	
PC Board Extenders	24-pin	08340-60095[2]	T
	30-pin	08505-60041[2]	T
	36-pin	08505-60042[2]	T
	44-pin	08350-60031[2]	T
	48-pin	08340-60050[2]	T
	62-pin	08340-60096[2]	T
	110-pin	08340-60033[2]	T

Table 1-2. Recommended Test Equipment (4 of 5)

Instrument	Critical Specifications	Recommended Model	Use[1]
IC Test Clip		HP Part No.	
	16-pin	1400-0734[2]	T
	20-pin	1400-0979[2]	T
Adjustment Tool	Fits adjustment slot on components	HP Part No. 8830-0024[2]	T T
Service Cables		HP Part No.	
	BNC (Male) to SMB (Female) (2 required)	085680-60093[2]	T
	61mm (2 ft), 0.85 in., semi-rigid, SMA Male to SMA Male (2 required)	08340-20124[2]	P,AT,A,T
	30 mm (12 in) SMB (Female) to SMB (Female)	5061-1022[2]	T
Nut Driver	9/16 inch, to replace front panel BNC nuts	HP Part No. 08340-20099[2]	T
Wrench	5/16-inch slotted box/open end	HP Part No. 08555-20097[2]	T
Notch Filter	A least 35 dB rejection at 1 MHz Construct as shown below. The filter rejection should be: ≥ 35 dB at 1 MHz < 26 dB at 1.01 MHz	Locally Fabricate	P

Table 1-2. Recommended Test Equipment (5 of 5)



Reference Designator	Description	HP Part No.	Qty
C1,2	CAPACITOR-VAR CER 9-35PF	0121-0046	2
C3,6	CAPACITOR-MICA 240PF 300V	0140-0199	2
C4,7	CAPACITOR-CERAMIC 10 PF 100V	0160-4791	2
C5	CAPACITOR-PE .027 μF 200V	0170-0066	1
J1,2	CONNECTOR RF FEMALE BNC	1250-0212	2
	LOCKWASHER	2190-0016	2
	NUT	2950-0001	2
L1,2	COIL100μH5%	9140-0210	2
L3	COIL 1.0μH 5%	9100-3551	1
R1,2	RESISTOR 51.1 1% .125W	0757-0394	2

1. P=Performance Tests, HP-IB=HP-IB Operation Verification Test, AT=Automated Tests, A=Adjustments, T=Troubleshooting. Refer to the Recommended Test Equipment text in Section I for further information on the Automated Test Procedure's equipment requirements.

2. These parts are included in Service Kit HP Part Number 08340-60134.

SECTION II
INSTALLATION

2-1. INTRODUCTION

2-2. This section provides installation instructions for the HP 8341A Synthesized Sweeper. This section also includes information about initial inspection, damage claims, preparation for use, packaging, storage and shipment, and Operation Verification.

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 electrically. The contents of the shipment should be as shown in Figure 1-1. Procedures for checking electrical performance are given in Section IV, Performance Tests, in this volume. Performance Test limits are also given in Section IV of this volume. If the instrument combination does not pass the electrical Performance Tests, refer to Section V, Adjustments, in this volume. If, after the adjustments have been made, the instrument combination still fails to meet specifications, and a circuit malfunction is suspected, refer to troubleshooting procedures in Section VIII, Service, in Volumes 3 and 4. If the instrument does not pass the above electrical tests, if the shipment contents are incomplete, or if there is mechanical damage or defect, notify the nearest Hewlett-Packard office. If the shipping container is damaged, or if 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 8341A Synthesized Sweeper requires a power source of 100, 120, 220, or 240 Vac (±10%), 47.5 to 66 Hz, single-phase. Power consumption is approximately 500 VA (40 VA in STANDBY).

2-8. Line Voltage and Fuse Selection

CAUTION

To prevent damage to the instrument, make the correct line voltage and fuse selection before connecting line power to the instrument.

2-9. Figure 2-1 illustrates the line voltage selection card and fuse location in the power line module on the rear panel of the HP 8341A. Select the line voltage and fuse rating as follows:

a. Measure the ac line voltage available.

b. Refer to Table 2-1. Select the correct position of the printed circuit line voltage selection card (shown in Figure 2-1) by matching the measured ac line value to the correct range indicated in the table. Note that the line voltage ranges given are within ±10% of the voltage indicated on the printed circuit card. If it is not, you must use an autotransformer between the power source and the HP 8341A to match the ac line input to one of the available ranges.

c. Install the printed circuit line voltage selector card in the power line module as shown in Figure 2-1.

d. Select the proper fuse to install. The fuse ratings are indicated in Table 2-1 as well as next to the power line module on the rear panel of the instrument.

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 th styles of plugs available on power cables supplied with Hewlett-Packard instruments. The HP Part Numbers indicated are part numbers for the complete power cable/plug set. The specific type

of power cable/plug shipped with the instrument depends upon the country of shipment destination.

Table 2-1. Line Voltage/Fuse Selection

Measured ac Line Voltage	PC Selector Board Position	Fuse/ HP Part Number
90 to 110 volts	100	5.0A 2110-0010
108 to 132 volts	120	4.0A 2110-0055
198 to 242 volts	220	3.0A 2110-0003
216 to 264 volts	240	2.0A 2110-0002

2-12. The offset prong of the three-prong connector is the grounding pin. The protective grounding feature may be preserved when operating the HP 8341A from a two-contact outlet by using a three-prong to two-prong adapter and connecting the green wire of the adapter to ground. An adapter is available (for US connectors only) as HP Part Number 1251-0048.

2-13. HP-IB Address Selection

2-14. The HP 8341A is addressed by an instrument controller on the HP-IB bus by means of a two-digit numerical HP-IB address. This address is set at the factory to 19 but it may be reset by the user to any value between 0 and 31. The HP-IB address is displayed in the ENTRY DISPLAY window upon power up. Pressing **[SHIFT] [LOCAL]** will also cause the current HP-IB address of the HP 8341A to be displayed in the ENTRY DISPLAY. The HP-IB address may be changed by entering the key sequence: **[SHIFT] [LOCAL]** (new address value; between 0 and 31) **[Hz]**. For example, to set the HP-IB Address to 12, press **[SHIFT] [LOCAL] [1] [2] [Hz]**. The HP-IB address is retained in memory when the instrument is in STANDBY as well as when ac line power is removed from the instrument (as long as the battery on the A60 Processor assembly has the proper capacity).

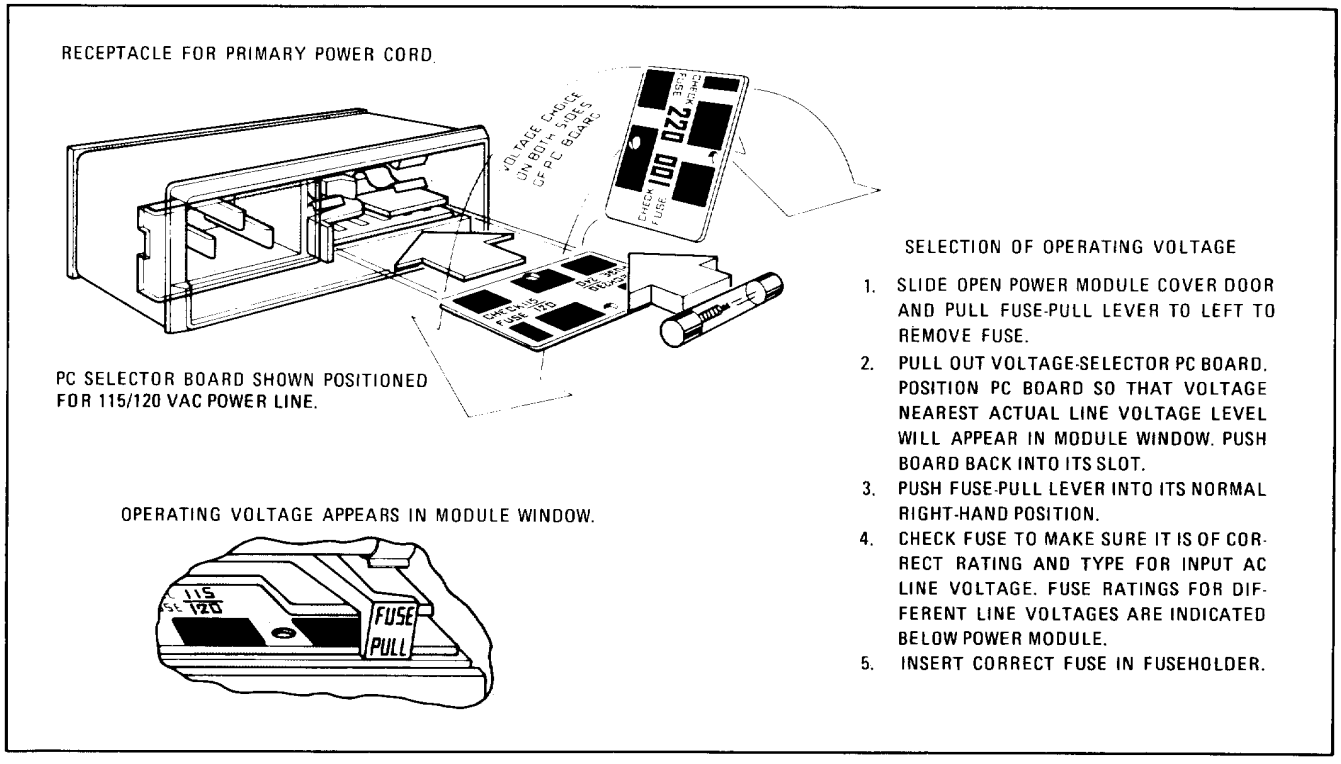
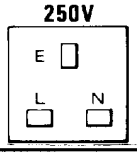
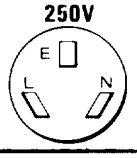
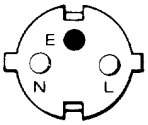
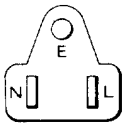
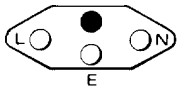
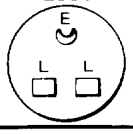
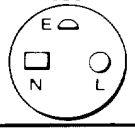
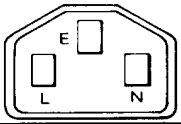


Figure 2-1. Power Line Module

Table 2-2. AC Power Cables Available

Plug Type [1]	Cable HP Part Number [2]	CD [3]	Plug Description [2]	Cable Length (inches)	Cable Color	For Use in Country
250V 	8120-1351 8120-1703	0 6	Straight BS1363A 90°	90 90	Mint Gray Mint Gray	United Kingdom, Cyprus, Nigeria, Zimbabwe, Singapore
250V 	8120-1369 8120-0696	0 4	Straight NZSS198/ASC112 90°	79 87	Gray Gray	Australia, New Zealand
250V 	8120-1689 8120-1692	7 2	Straight CEE7-VII 90°	79 79	Mint Gray Mint Gray	East and West Europe, Saudi Arabia, Egypt, Republic of So. Africa, India (unpolarized in many nations)
125V 	8120-1348 8120-1398 8120-1754 8120-1378 8120-1521 8120-1676	5 5 7 1 6 2	Straight NEMA5-15P 90° Straight NEMA5-15P Straight NEMA5-15P 90° Straight NEMA5-15P	80 80 36 80 80 36	Black Black Black Jade Gray Jade Gray Jade Gray	United States, Canada, Japan (100V or 200V), Mexico, Philippines, Taiwan
250V 	8120-2104	3	Straight SEV1011.1959 24507, Type 12	79	Gray	Switzerland
250V 	8120-0698	6	Straight NEMA6-15P			United States, Canada
220V 	8120-1957 8120-2956	2 3	Straight DHCK 107 90°	79 79	Gray Gray	Denmark
250V 	8120-1860	6	Straight CEE22-VI (System Cabinet Use)			

1. E = Earth Ground; L = Line; N = Neutral
2. Part number shown for plug is industry identifier for plug only. Number shown for cable is HP Part Number for complete cable including plug.
3. The Check Digit (CD) is a coded digit that represents the specific combination of numbers used in the HP Part Number. It should be supplied with the HP Part Number when ordering any of the power assemblies listed above, to expedite speedy delivery.

NOTE

An instrument address that is input by the above [SHIFT] [LOCAL] sequence is is stored in a memory area referred to as "USER" memory. This address will remain in effect as long as the battery backup circuit is operating properly or until the address is changed with another [SHIFT] [LOCAL] sequence. In the event of an instrument memory problem, the value stored in "USER" may be replaced by the value "19" (a default value). If this occurs, an instrument failure may have occured. Refer to detailed information regarding Calibration Constants in Section VIII, Service in this manual.

2-15. Interface Function Codes

2-16. The Interface Function Codes for the HP 8341A are an alphanumerical coded set that describes its operational capabilitites on the HP-IB bus. The codes for the HP 8341A are:

SH1, AH1, T6, TE0, L4, LE0, SR1, RL1, PP0, DC1, DT1, C0, C1, C2, C3, C28, E1.

2-17. Mating Connectors

2-18. All of the externally mounted connectors on the HP 8341A are listed in Table 2-3. Opposite each connector is an industry identification, the HP part number of a mating connector, and the part number of an alternate source for the mating connector. For HP part numbers of the externally mounted connectors themselves, refer to Section VI, Replaceable Parts, of this manual.

2-19. HP-IB, HP 8410, and HP 8755 INTERFACE Connectors

2-20. Figure 2-2 shows the signal/pin configuration of the rear panel HP-IB connector. The same information is shown for the HP 8410 INTERFACE connector in Figure 2-3 and for the HP 8755C INTERFACE connector in Figure 2-4.

2-21. Internal Oscillator Selection and Warmup Time

2-22. The rear panel FREQUENCY STANDARD toggle switch (shown in Figure 2-5) must be in the INT position and the rear panel BNC jumper cable must be connected between the INT and EXT connectors for the instrument to operate properly when using the internal time base standard. By disconnecting the jumper from the INT connector, setting the switch to EXT, and injecting a 10 MHz signal (approximately +3 dBm, 50 Ohm nominal input impedance) from an external source, the HP 8341A can be phase locked to other instruments in a specific test setup. Sharing a common frequency reference will eliminate frequency errors between the instruments due to varying internal oscillator frequencies.

2-23. The instrument must be connected to the ac power line in order to keep the HP 8341A internal time base frequency standard oven operating at temperature. The instrument requires approximately 30 minutes to warm up from a cold start before the front panel **OVEN** annunciator goes out. Internal temperature equilibrium is reached after approximately 2 hours with a stable outside temperature. Refer to the instrument specifications in Section I, General Information, in this volume for additional information on warm up times.

2-24. Operating Environment

2-25. Temperature. The instrument may be operated in temperatures from 0°C to +55°C.

2-26. Humidity. The instrument may be operated in environments with humidity from 5% to 80% relative at +25°C to +40°C. However, the instrument should also be protected from temperature extremes that could cause condensation within the instrument.

2-27. Altitude. The instrument may be operated at pressure altitudes up to 4572 meters (approximately 15,000 feet).

2-28. Cooling. The HP 8341A obtains all of its cooling airflow by forced ventilation from the fan mounted on the rear panel. The cooling

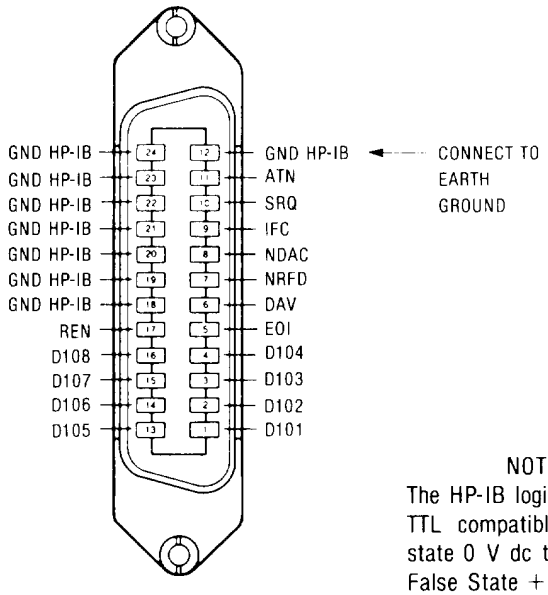
Table 2-3. Model HP 8341A Mating Connectors

8340A Connector		Mating Connector	
Connector Name	**Industry Indentification**	**HP Part Number**	**Alternate Source**
J1 SWEEP OUTPUT J2 PULSE (Opt. 006 only) J3 AM J4 EXT (Leveling) INPUT	BNC (female)	1251-0256	Speciality Connector 25-P118-1
J5 RF OUTPUT**	Type N (female)	Any industry standard Type N (male)	
J6 1V/GHz J7 SWEEP OUTPUT J8 10 MHz REF OUTPUT J9 INT J10 EXT J11 EXT TRIGGER INPUT J12 MUTE OUTPUT J13 PEN LIFT OUTPUT J14 NEG BLANK J15 Z-AXIS BLANK/MKRS J16 STOP SWP IN/OUT	BNC (female)	1251-0256	Specialty Connector 25-P118-1
J17 8755C INTERFACE*	Audio 3-Pin Connector	N/A	Switchcraft TA-3F
J18 8410 INTERFACE	25-Pin D Series	1251-0063	ITT Cannon DBM-25P
J19 AUX OUTPUT	Type N (female) (50 ohm)	Any industry standard 50 ohm Type N (male).	
J20 RF OUTPUT**	Type N (female)	Any industry standard Type N (male)	
J21 HP-IB***	24-Pin Micro Ribbon	1251-0293	Amphenol 57-30240

* A 1219mm (48 inch) cable assembly with a Switchcraft TA-3F Audio 3-pin connector on each end is supplied with the Model 8755C Swept Amplitude Analyzer as the Alternate Sweep Interface Cable. The complete cable may be ordered separately as HP Part Number 8120-3174. The ALT SWP INTERFACE connector J17 signal/pin configuration is shown in Figure 2-4.

** Options 004 and 005 only, delete J5, add J20.

*** HP-IB interface connector J21 signal/pin configuration is shown in Figure 2-2.

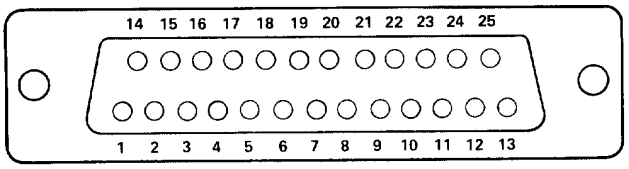


NOTE
The HP-IB logic levels are TTL compatible, ie., true state 0 V dc to 0.4 V dc, False State +2.5 V dc to +5 V dc.

Mnemonics Table	
Mnemonic	**Description**
L ATN	LOW = Attention control line
L DAV	LOW = Data Valid control line
L DIO1 thru 8	LOW = Data Input/Output control lines
L EOI	LOW = End Or Identify control line
L IFC	LOW = Inferface Clear control line
L NDAC	LOW = Data Not Accepted control line
L NRFD	LOW = Not Ready For Data control line
L REN	LOW = Remote Enable control line
L SRQ	LOW = Service Request control line

Figure 2-2. HP-IB Connector Signal/Pin Configuration

8410C INTERFACE CONNECTOR J17
(As seen from rear panel)



Pin	Mnemonic	Description[1]	In/Out[2]
1		No Connection	
2	Z-AXIS	LOW=Marker Pulse (±5V)	Output
3		No Connection	
4	LALTSEL	Alternate Sweep (LSTTL)	Output
5	LSSP	LOW=Stop Forward Sweep Request	Input/Output[3]
6	+5.2V	+5 Volts (100 mA Max.)	Output
7		No Connection	
8	MUTE	LOW=RF Blank Request (LSTTL)	Input
9	EXT TRIG	HIGH=External Trigger Sweep (LSTTL)	Input
10	PEN LIFT	HIGH=Pen Lift	Output[3]
11		No Connection	
12		No Connection	
13		No Connection	
14	NEG BLANK	LOW=Blanking Pulse (−5V)	Output
15		No Connection	
16	LRETRACE	LOW=Retrace Strobe (LSTTL)	Output
17	LALTEN	LOW=Alternate Sweep Enable (LSTTL)	Output
18		No Connection	
18	GND	Digital Ground/Pen Lift Return	
20		No Connection	
21		No Connection	
22	LSTEPUP	LOW=Step Advance (SW. to GND (0.4V)	Input
23		No Connection	
24	8410B TRIG	HIGH=Synchronizer Trigger (LSTTL)	Output
25		No Connection	

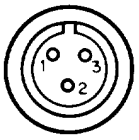
1. LSTTL Logic Levels. INPUTS: Low ≤0.8 Vcd, High ≥2.0 Vdc.
   OUTPUTS: Low ≤0.4 Vdc, High ≥2.4 Vdc.

2. Control of input lines can be accomplished by contact closure to ground for a logic low level and open circuit for a logic high level.

3. Open Collector Output

Figure 2-3. 8410 INTERFACE Connector Signal/Pin Configuration

ALTERNATE SWEEP INTERFACE CONNECTOR J17



(viewed from rear of instrument)

Pin	Mnemonic	Description	Level	Wire Color Code	A62J31 Pin	Source
1	LALTEN	LOW to Externally Enable ALT SWP Mode in HP 8755C	TTL OUTPUT	9 - 1 - 5	23	A57P1-60
2	LALTSEL	Channel Select (HIGH =Channel 1, LOW =Channel 2)	TTL OUTPUT	9 - 1- 6	24	A57P1-59
3	LRETRACE	LOW During Retrace	TTL OUTPUT	9 - 1 - 7	25	A57P1-58

Figure 2-4. HP 8755C INTERFACE Connector Signal/Pin Configuration

airflow path is as follows: into the fan from the rear of the instrument, past the internal circuitry, and out the vents in the right side panel and the rear panel heat sink assembly.

CAUTION

Ensure that all airflow passages at the rear and sides of the HP 8341A are clear before installing the instrument in its operating environment. This is especially important when using the HP 8341A in a rack mounted instrument configration.

2-29. Front Handles Kit

2-30. All standard instruments are supplied with a front handles kit. This kit must be installed by the user as illustrated in Figure 2-6.

2-31. Chassis Slide Kit (Option 806)

2-32. Option 806 instruments are supplied with a Chassis Slide Kit that must be installed by the user. This kit and its mounting instructions are illustrated in Figure 2-7.

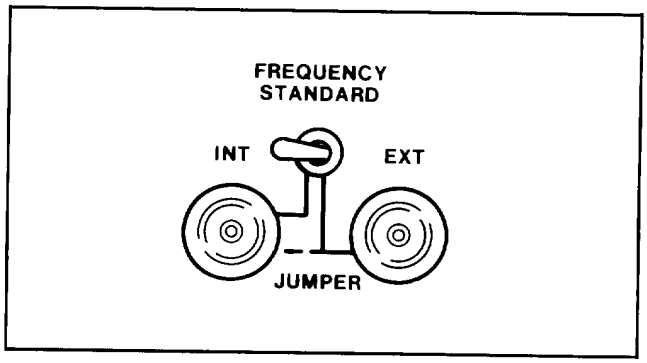


Figure 2-5. Rear Panel FREQUENCY STANDARD Switch

2-33. Rack Flange Kit (Option 908)

2-34. Option 908 instruments are supplied with a Rack Flange Kit. This kit includes only rack flanges; it does not include handles. Mounting instructions are illustrated in Figure 2-8.

2-35. Rack Mounting with Handles (Option 913)

2-36. Option 913 instruments are supplied with rack mount flanges and front handles. This kit may be installed by the user as illustrated in Figure 2-9.

2-37. STORAGE AND SHIPMENT

2-38. Environment

2-39. The instrument may be stored or shipped in environments within the following limits:

Temperature	−40°C to +75°C
Humidity	5% to 95% relative at 0° to +40°C
Altitude	Up to 15240 meters
(Pressure)	(approximately 50,000 feet)

2-40. The instrument should also be protected from temperature extremes that could cause condensation in the instrument.

2-41. Packaging

2-42. Original Packaging. Containers and materials identical to those used in factory packaging are available through Hewlett-Packard offices. Original packaging items are shown in Figure 2-10. The instrument front handles must be replaced by the shipping bars when the original packaging materials are used. 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 (located on rear panel serial plate). Mark the container FRAGILE to assure careful handling. In any correspondence, refer to the instrument by model number and full serial number.

2-43. Other Packaging. The following general instructions should be used for repackaging with commercially available packaging 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 number.

b. Use a strong shipping container.

c. Use enough shock-absorbing material around all sides of the instrument to provide a firm cushion and to prevent movement inside the container. Protect the control panel with cardboard.

d. Seal the shipping container securely.

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

f. In any correspondence, refer to the instrument by model number and full serial number.

2-44. Blue Service Tags

2-45. Before sending the instrument back to the HP Service organization, attach a blue service tag, located at the rear of this section, to the instrument. Fill out the tag thoroughly to aid the service technician in isolating the specific fault(s) as quickly as possible.

2-46. INCOMING INSPECTION PROCEDURE

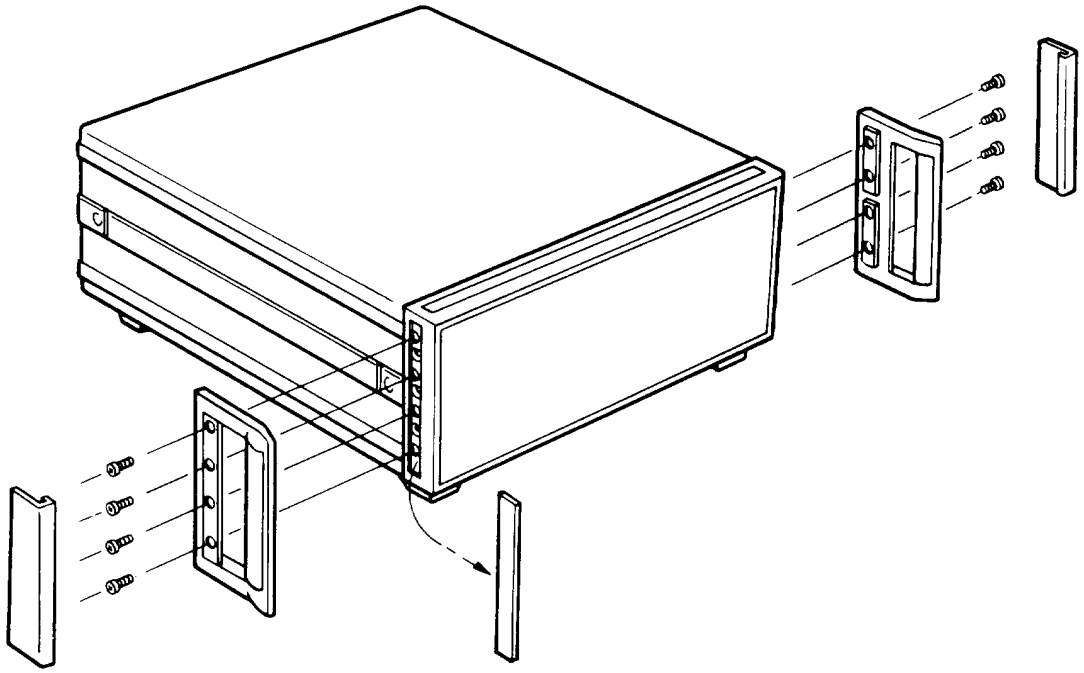
2-47. Several forms of an incoming inspection procedure are available in this manual. Section III, Operation, in this volume includes a section on "Getting Acquainted with the HP 8341A" that may be used to quickly verify operational functions when the instrument is first received. Section IV, Performance Tests, and the HP-IB Operation Verification procedure (also located in Section IV) should be used to verify that the instrument matches its published specifications and performance characteristics.

FRONT HANDLE KIT

HP PART NUMBER 5061-0090

CONTENTS

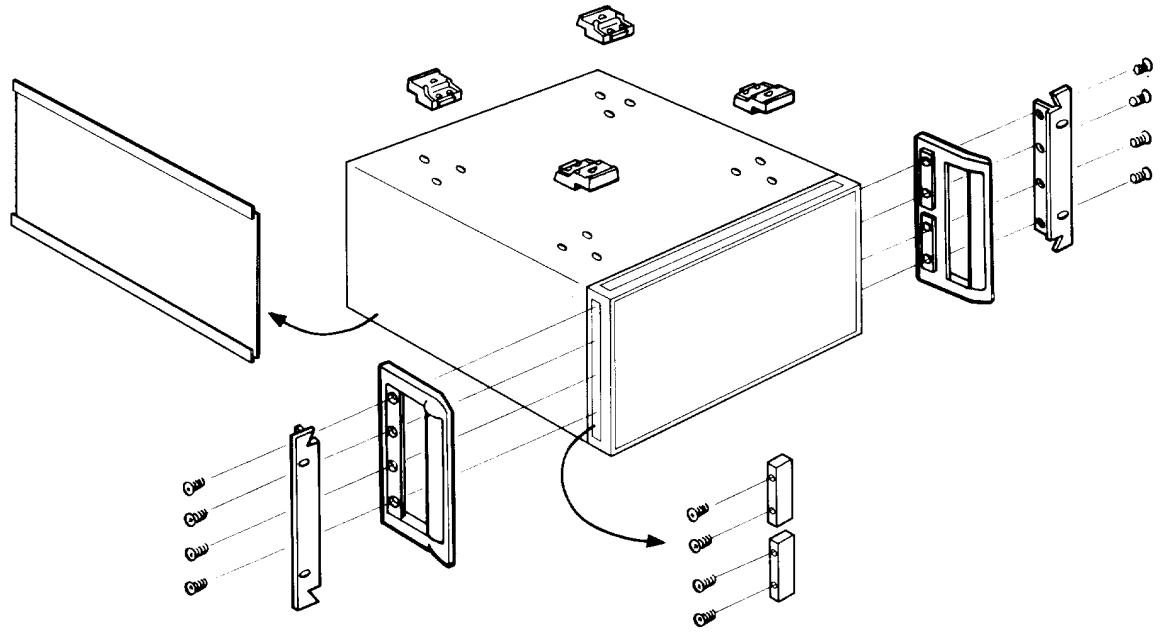
QTY.		PART NO.
2	FRONT HANDLE ASS'Y	5060-9900
2	FRONT HANDLE TRIM	5020-8897
8	=8-32 x 3/8 SCREW	2510-0195



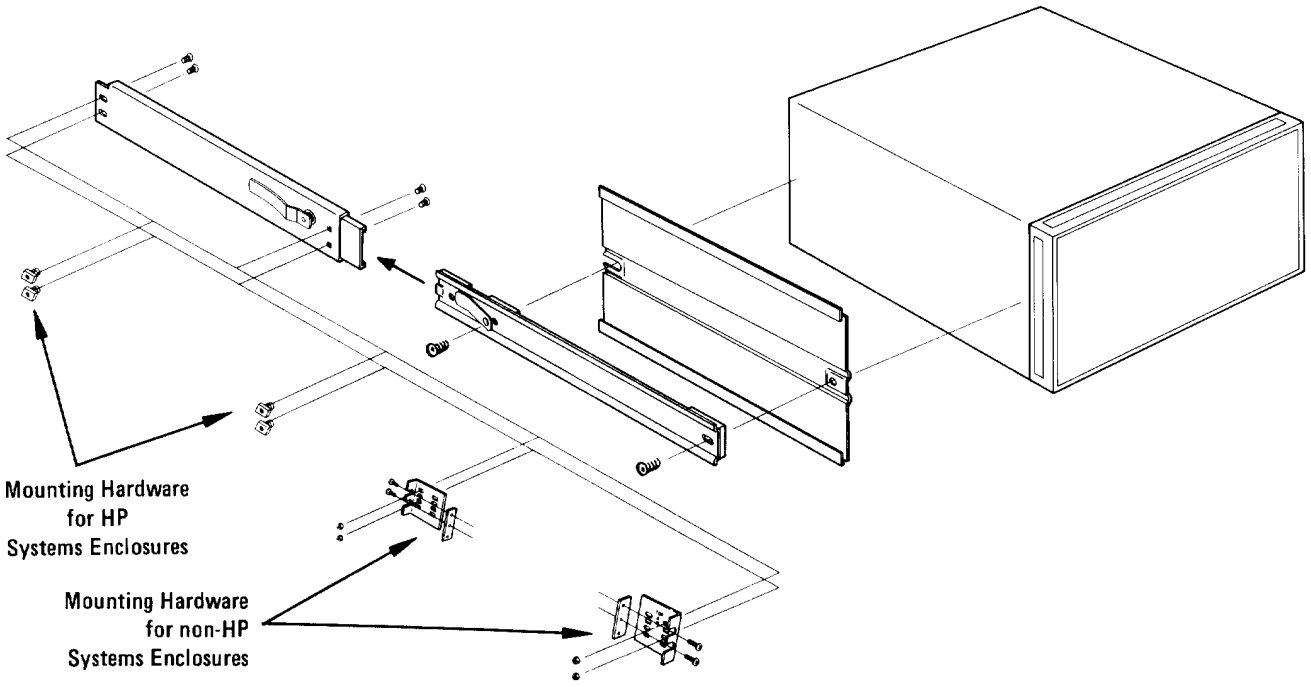
INSTRUCTIONS

1. REMOVE SIDE TRIM STRIPS.
2. ATTACH FRONT HANDLE ASS'Y WITH 4 SCREWS PER SIDE.
3. PRESS FRONT HANDLE TRIM IN PLACE.

Figure 2-6. Mounting the Front Handles Kit



1. Remove feet assemblies, shipping bars, information card tray(not shown), and side covers.
2. Install new rack flanges and handles. Use screws packaged with rack flange kit.



3. Install new side covers (perforated cover is mounted on right side of instrument as seen from front).
4. Remove inner slide assemblies from outer slide assemblies.
5. Secure side covers in place by mounting inner slide assemblies to instrument.
6. Install outer slide assemblies to system enclosure using the appropriate hardware.
7. Lift instrument into position. Align inner and outer slide assemblies. Slide instrument into rack. Realign hardware as needed for smooth operation.

Figure 2-7. Chassis Slide Kit Mounting Instructions (Option 806) (1 of 2)

HP Part Number	Qty	CD	Description
5061-2072	1	5	Rack Mount Kit (Includes the following parts)
5020-8875	2	2	RACK MOUNT FLANGE
2510-0194	8	8	SCREW-MACH 8-32 .625-IN-LG PAN-HD-POZI
5061-0090	1	3	Handles Kit (Refer to Figure 2-6)
5060-9884	1	9	SIDE COVER – LEFT
5060-9942	1	0	SIDE COVER – RIGHT (PERFORATED)
1494-0017	1	7	Slide Kit (HP Systems Enclosures) (Includes the following parts)
1494-0017	1	7	MODIFIED SLIDE ASSEMBLY (Includes Inner and Outer Slides)
2510-0105	4	1	SCREW-MACH 8-32 .438-IN-LG PAN-HD-POZI
2510-0104	4	0	SCREW-MACH 8-32 .438-IN-LG 100 DEG
0590-0818	8	9	NUT-CHANNEL 8-32-THD .406-WD STL
2680-0143	4	6	SCREW-MACH 10-32 .562-IN-LG PAN-HD-POZI
1494-0023	1	5	Slide Adapter Kit (NON-HP Systems Enclosures) (Includes the following parts)
1494-0023	2	5	ADAPTER BRACKETS
— —	4	—	BAR NUTS 10-32
2680-0103	8	8	SCREW-MACH 10-32 .5-IN-LG PAN-HD-POZI
2580-0003	8	5	NUT-HEX-W/LKWR 8-32-THD .125-IN-THK
2510-0100	4	6	SCREW-MACH 8-32 .312-IN-LG 100 DEG
2510-0101	4	7	SCREW-MACH 8-32 .312-IN-LG PAN-HD-POZI
All above parts may be ordered as the Chassis Slide Kit. HP Part Number 08340-60136.			

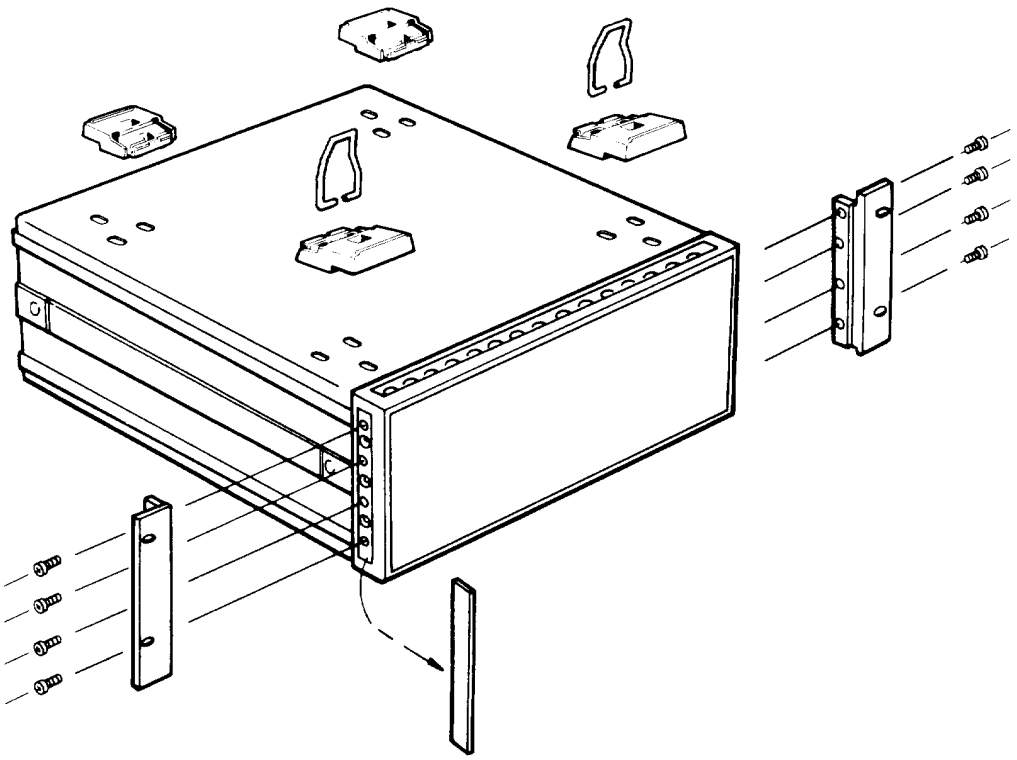
Figure 2-7. Chassis Slide Kit Mounting Instructions (Option 806) (2 of 2)

RACK MOUNT KIT WITHOUT FRONT HANDLES

HP PART NUMBER 5061-0078 (OPTION 908)

CONTENTS

QTY.		PART NO.
2	RACK MOUNT FLANGE	5020-8863
8	#8-32 x 3/8 SCREW	2510-0193



INSTRUCTIONS

1. REMOVE SIDE TRIM STRIPS.
2. ATTACH RACK MOUNT FLANGE WITH 4 SCREWS PER SIDE.
3. REMOVE FEET AND TILT STANDS BEFORE RACK MOUNTING.

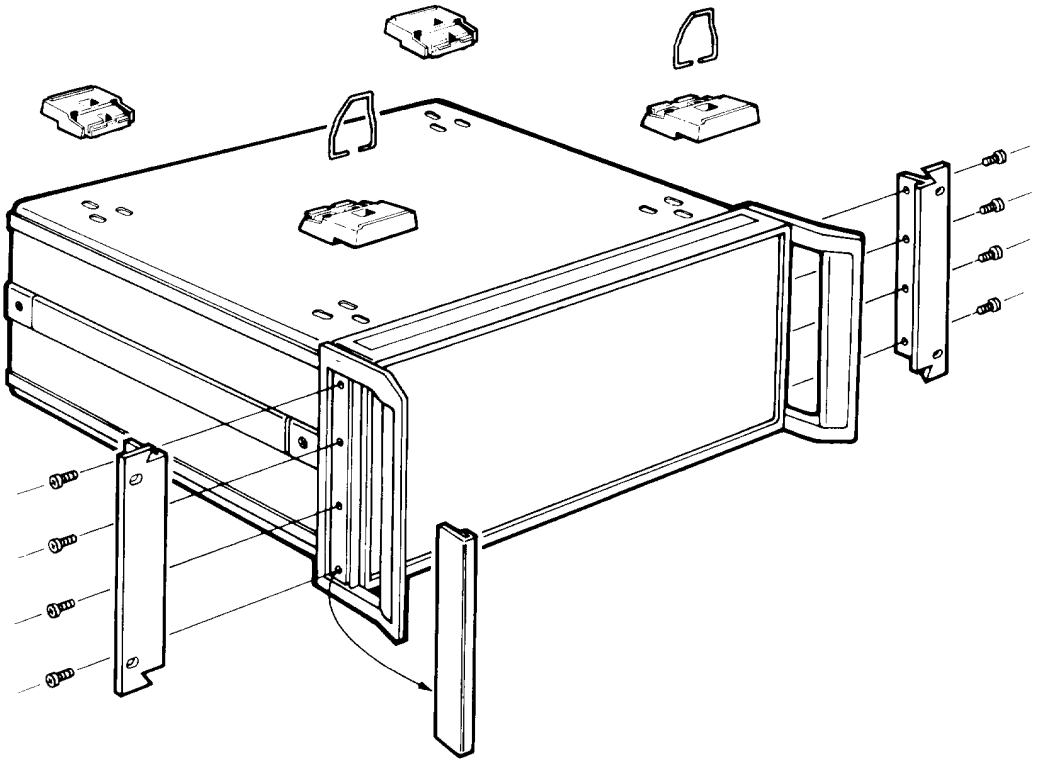
Figure 2-8. Rack Flange Kit Mounting Instructions (Option 908)

RACK MOUNT KIT FOR CABINETS WITH PREVIOUSLY ATTACHED FRONT HANDLES

HP PART NUMBER 5061-2072 (OPTION 913)

CONTENTS

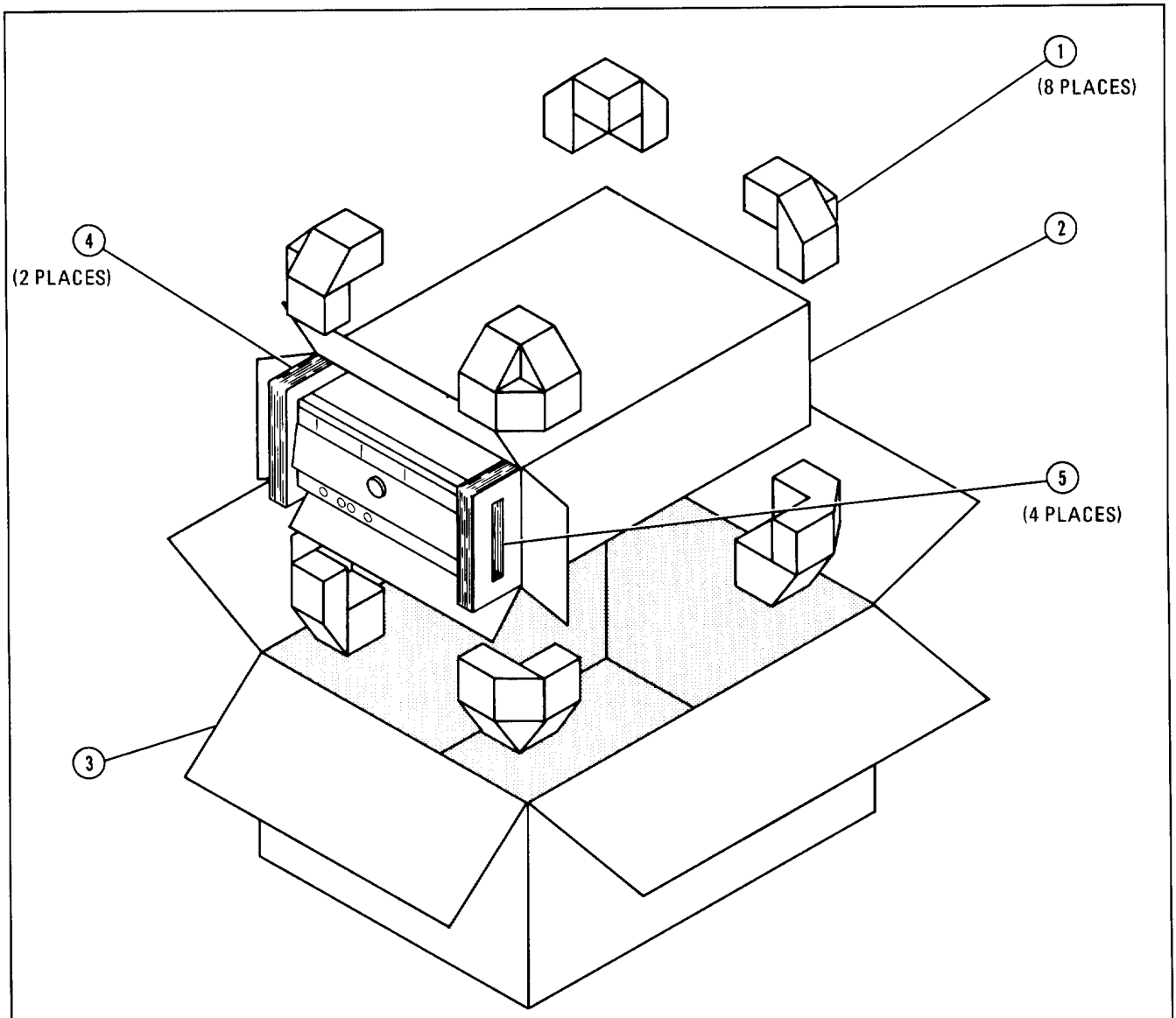
QTY.		PART NO.
2	RACK MOUNT FLANGE	5020-8875
8	#8-32 x 5/8 SCREW	2510-0194



INSTRUCTIONS

1. REMOVE SIDE TRIM STRIPS.
2. REMOVE 4 SCREWS PER SIDE.
3. ATTACH RACK MOUNT FLANGE AND FRONT HANDLE ASS'Y WITH 4 NEW LONGER SCREWS PER SIDE.
4. REMOVE FEET AND TILT STANDS BEFORE RACK MOUNTING.

Figure 2-9. Rack Mounting Kit with Handles (Option 913)



Item	Qty	HP Part No.	C D	Description
1	8	9220-2733	7	FOAM PADS – TOP CORNERS; BOTTOM CORNERS
2	1	9211-4369	2	CARTON – INNER
3	1	9211-4370	3	CARTON – OUTER
3	1	9220-4060	7	SIDE PADS – CORRUGATED CARDBOARD
–	1	9222-0069	2	POLY BAG – TO COVER INSTRUMENT (NOT SHOWN)
5	4	4040-1738	3	SHIPPING BARS
–	8	2510-0101	7	SCREW – #8-32x.312 PAN HD (TO MOUNT SHIPPING BARS)

Figure 2-10. Packaging for Shipment using Factory Packaging Materials

SECTION III
OPERATION

The Operation section of this manual consists of the following subsections:

GETTING ACQUAINTED GUIDE[1] describes the basic features and essential operating procedures for local (front panel) and remote (HP-IB) operation of the HP 8341A. Personnel using the HP 8341A for the first time should begin with this Guide.

OPERATION: FRONT/REAR PANEL DESCRIPTIONS, HP-IB PROGRAMMING INFORMATION, and POWER CONTROL/MODULATION FEATURES explains the functions of all front and rear panel keys, switches, connectors, indicators and displays, all HP-IB codes and programming procedures, and all the special features associated with power control and modulation. The front/rear panel information is grouped according to the physical layout of the HP 8341A: Figure 3-1 provides a visual index to the front panel functions, Figure 3-2 is an index to the rear panel functions, and Table 3-1 provides a cross reference between functions/modes and the front panel keys. The HP-IB programming information begins with Table 3-2, which lists all code mnemonics, and the codes and procedures are explained in the subsequent text. The power control and modulation information describes the special procedures that can be used to enhance the performance of these functions.

PROGRAMMING NOTES contain supplemental HP-IB programming information. Two Programming Notes are included:

Quick Reference Guide for the HP 8340A Synthesized Sweeper[1] succinctly lists the input programming codes, and was written for the experienced operator.

Introductory Operating Guide[1] for use with the HP 9826A or HP 9836A BASIC-language computers provides a detailed explanation of HP-IB programming.

OPERATING GUIDES contain specialized application information. This section contains four Operating Guides (in addition to the Getting Acquainted Guide):

Use with X-Y Recorders[1] explains interfacing of the HP 8341A to HP X-Y recorders.

External Leveling[1] of the HP 8341A, describes using crystal detectors or power meters.

Use with the HP 8410B/C Network Analyzer[1] shows interconnections between the HP 8341A, the Network Analyzer, polar and rectangular displays, and transmission/reflection test sets.

Use with the HP 8755 Frequency Response Test Set[1] describes interfacing procedures for the HP 8341A and this scalar network analyzer system.

Contact the nearest HP Sales and Service Office for copies of other Programming Notes and Operating Guides as they become available.

SAFETY

Before applying power, refer to SAFETY CONSIDERATIONS in Section I of this manual. The information, cautions, and warnings in this manual must be followed to ensure safe operating conditions for the instrument and the human operator

WARNING

Before the instrument's line power cord is plugged in, all protective earth terminals ("ground" connections), extension cords, auto-transformers and other devices that are connected to the HP 8341A should be connected to a protective earth-ground socket. Any interruption of the protective earth grounding will cause a potential shock hazard that could result in personal injury.

Only fuses with the required current rating and specified type should be used. Do not use repaired fuses or short circuit the fuse holder; to do so could cause a shock or fire hazard.

CAUTION

Before the instrument's line power cord is plugged in, the line power module must be set to the voltage of the power source or damage to the instrument may result.

ADDITIONAL OPERATING INFORMATION

Located underneath the HP 8341A Synthesized Sweeper are pullout information cards that summarize the operating procedures and programming codes for the instrument.

If further information is necessary, contact the nearest Hewlett-Packard Sales and Service Office. The world-wide locations of HP offices are listed inside of the back cover of this manual.

1. This document will also serve for the HP 8341A with the following considerations:
   a. The HP 8341A has a frequency range of 10 MHz to 20 GHz instead of the HP 8340A's 10 MHz to 26.5 GHz.
   b. The 90 dB step attenuator is optional on the HP 8341A as opposed to being standard on the HP 8340A. It is present on the HP 8341A options 001 or 004.
   c. Pulse modulation is optional on the HP 8341A as opposed to being standard on the HP 8340A. It is present on the HP 8341A option 006.
   d. The HP 8341A has a Type-N female RF output connector as opposed to the male APC-3.5 on the HP 8340A.

SECTION IV
PERFORMANCE TESTS

4-1. INTRODUCTION

4-2. The procedures in this section and the following section (Automated Test Procedures) test the HP 8341A's electrical performance using the specifications of Table 1-1 as the performance standards. All tests can be performed without access to the interior of the instrument. An HP-IB Operation Verification procedure is also provided at the end of this section to verify proper HP-IB operation of the instrument.

NOTE

The Automated Test Procedures provided include additional tests that would be impossible or too tedious to test with a manual procedure (Frequency Switching Time and RF Attenuator Performance). The automated tests also include several tests that allow adjustments to be made or calibration constants to be accessed or changed.

4-3. EQUIPMENT REQUIRED

4-4. Equipment required for the manual Performance Test Procedures documented in this section is listed in the Recommended Test Equipment table in Section I of this manual. Any equipment that satisfies the critical specifications given the table may be substituted for the recommended model listed. Additional test equipment required for the Automated Performance Tests is included in that section (following this section) as well as in the Recommended Test Equipment List in Section I.

4-5. TEST RECORD

4-6. Results of the manual Performance Test procedures may be tabulated on the test record card located at the end of this section. Results of the Automated Test Procedures are tabulated automatically at the end of each procedure. A complete test record card consists of the manual and automatic test results. Each test lists all of the tested specifications and their acceptable limits. The results recorded at incoming inspection can be used for comparison in periodic maintenance and troubleshooting and after repairs or adjustments have been made. Refer to the Automated Test Procedures section for more detailed information on how to access the data included in those tests.

4-7. CALIBRATION CYCLE

4-8. This instrument requires periodic verification of performance. The instrument should be checked using the following performance tests at least once every year.

Table 4-1. List of Manual Performance Tests[1]

Paragraph	Performance Test Title	Page
4-9	Internal Time Base Aging Rate	4-3
4-10	Frequency Range and CW Mode Accuracy	4-6
4-11	Sweep Time Accuracy	4-12
4-12	Swept Frequency Accuracy	4-14
4-13	Maximum Leveled Output Power and Power Accuracy	4-18
4-14	External Leveling	4-26
4-15	Spurious Signals Test (10 MHz to 20 GHz)	4-30
4-17	Single Sideband Phase Noise	4-36
4-18	Power Sweep Test	4-43
4-19	Pulse Modulation ON/OFF Ratio Test	4-46
4-20	Pulse Modulation Rise and Fall Time Test	4-48
4-21	Pulse Modulation Accuracy Test	4-52
4-22	Pulse Modulation Video Feedthrough Test	4-56
4-23	Amplitude Modulation Test	4-60
4-24[2]	HP-IB Operation Verification Test	4-65

1. This list does not include the automated tests for Frequency Switching Time and RF Attenuator Performance, each of which are also required to complete the performance testing of the HP 8341A.

2. This is not a Performance Test. It is included as an additional aid to determine that the HP-IB circuitry is operating properly.

4-9. INTERNAL TIME BASE AGING RATE

NOTE

The overall accuracy of the HP 8341A 10 MHz internal time base is a function of time base calibration ± aging rate ± temperature effects ± line effects.

For greatest frequency accuracy, the time base should be allowed to warm up until the output frequency has stabilized (usually 7 to 30 days) before calibrating (adjusting the time base frequency to a known standard). After calibration, the change in time base frequency should remain within the aging rate if: the time base oven is not allowed to cool down, the instrument orientation with respect to the earth's magnetic field is maintained, and the instrument does not sustain any mechanical shock. Frequency changes due to orientation with respect to the earth's magnetic field and altitude changes will usually be nullified when the instrument is returned to its original position. Frequency changes due to mechanical shock will usually appear as a fixed frequency error.

If the instrument is disconnected from ac power allowing the time base oven to cool down, it may be necessary to readjust the time base frequency after a new warmup cycle; however, in most cases, the time base frequency will return to within ± 1 Hz of the original frequency.

Specification

Table 4-2. Internal Time Base Aging Rate Specifications

Aging Rate: $1x10^{-9}$ per day, $2.5x10^{-7}$ per year after 72-hour warm up if HP 8341A has been disconnected from ac power for less than 24 hours. Aging rate is achieved after 7 to 30 days warm-up if HP 8341A has been disconnected from ac power for greater than 24 hours.
Accuracy: Overall accuracy of internal time base is a function of time base calibration ± aging rate ± temperature effects ± line effects.

Description

A reference signal from the HP 8341A under test is connected to the oscilloscope's vertical input. A frequency standard (with long term stability greater than $1x10^{-10}$ is connected to the oscilloscope trigger input. The time required for a specific phase change is measured immediately and after a period of time. The aging rate is inversely proportional to the absolute value of the difference in the measured times.

Equipment

Frequency Standard	HP 5061A
Oscilloscope*	HP 1741A

* A 50 Ohm Feedthrough Termination (such as the HP 10100C) is required when using an oscilloscope without a 50 Ohm input. It is not required with the HP 1741A.

4-9. INTERNAL TIME BASE AGING RATE (Cont'd)

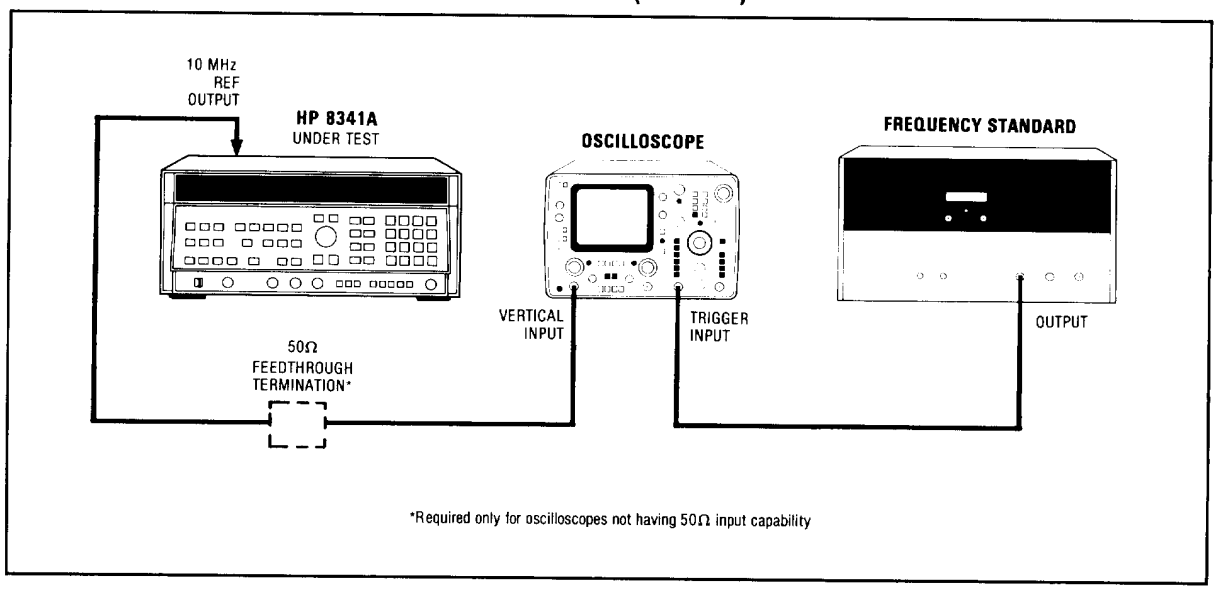


Figure 4-1. Internal Time Base Aging Rate Test Setup

NOTE

Be sure the HP 8341A has had 30 days to warmup before beginning this test. If the HP 8341A was disconnected from the ac power line for less than 24 hours, only a 24 hour warmup is required.

Procedure

1. Connect the equipment as shown in Figure 4-1.
2. Adjust the oscilloscope external triggering controls for a stable display of the HP 8341A 10 MHz REF OUTPUT signal.
3. Measure the time required for a phase change of 360 degrees. Record the time (T1) in seconds.

   T1 =_____ seconds (s)

4. Wait for a period of time (from 3 to 24 hours) and remeasure the phase change time (repeat step 3). Record the period of time between measurements (T2) in hours and the new phase change time (T3) in seconds.

   T2 =_____ hours (h)

   T3 =_____ seconds (s)

5. Calculate the aging rate from the following equation:

   Aging Rate = (1 cycle/f)(1/T1 − 1/T3)(T/T2)

   Where: 1 cycle = the phase change reference for the time measurement. (in this case, 360 degrees)
   f = HP 8341A Time Base output frequency (10 MHz)
   T = specified time for aging rate (24 hours)
   T1 = initial time measurement (s) for 360 degree (1 cycle change
   T2 = time between measurements (h)
   T3 = final time measurement (s) for a 360 degree (1 cycle) change

4-9. INTERNAL TIME BASE AGING RATE (Cont'd)

For example, if:

T1 = 351s
T2 = 3h
T3 = 349s

Then:

Aging Rate = (1 cycle/10 MHz)(1/351s − 1/349s)(24h/3h)

$= 1.306 \times 10^{-11}$ per day

6. Verify that the aging rate is less than 1×10^{-9} per day

NOTE

If the absolute frequencies of the frequency standard and the HP 8341A Time Base oscillator are extremely close, the measurement time in steps 3 and 4 (T1 and T3) can be reduced by measuring the time required for a phase change of less than 360 degrees. Change "1 cycle" in the equation accordingly (i.e., 180 degrees = 1/2 cycle, or 90 degrees = 1/4 cycle).

7. If the aging rate is not within the required tolerance, be sure sufficient warmup time has been allowed and that the environmental conditions have not changed throughout the test, then check the Time Base heater circuit and, if necessary, replace the Time Base. Refer to service and repair information for the A51 10 MHz Reference Oscillator in the Reference Loop − M/N Loop portion of Section VIII, Service.

4-10. FREQUENCY RANGE AND CW MODE ACCURACY

Specification

Table 4-3. Frequency Range and CW Mode Accuracy Specifications

Range: 0.01 to 20.00 GHz
Resolution: n x 1 Hz Where n = harmonic multiplication number (1 to 3). Refer to Frequency Ranges and Bandswitch Points description in Table 1-1.
Accuracy: Same as Time Base Accuracy (refer to Table 1-1).

Description

The HP 8341A RF output is fed to a frequency counter. The frequency counter internal time base is used as the reference for the HP 8341A to eliminate time base error from the measurement. The HP 8341A frequency display and the counter display should agree, within the resolution of each instrument. This procedure does not test for CW mode accuracy as a funtion of the time base accuracy.

NOTE

A fault in the HP 8341A could cause the two displays to be different. Any fault that would cause one of the phase lock loops to be unlocked would be indicated by a front-panel FAULT indication; however, all HP 8341A internal phase lock loops could be locked and the HP 8341A output frequency could be in error (i.e., a phase lock loop frequency divider bit could be stuck). If all the dividers work normally, then CW mode frequency accuracy is essentially guaranteed.

In the following procedure, the test frequencies are selected first to test the maximum frequency range and then to exercise each frequency related circuit throughout its CW range while holding all remaining circuits constant. The test frequencies are grouped so that an abnormal indication would point to the circuit most likely causing the problem.

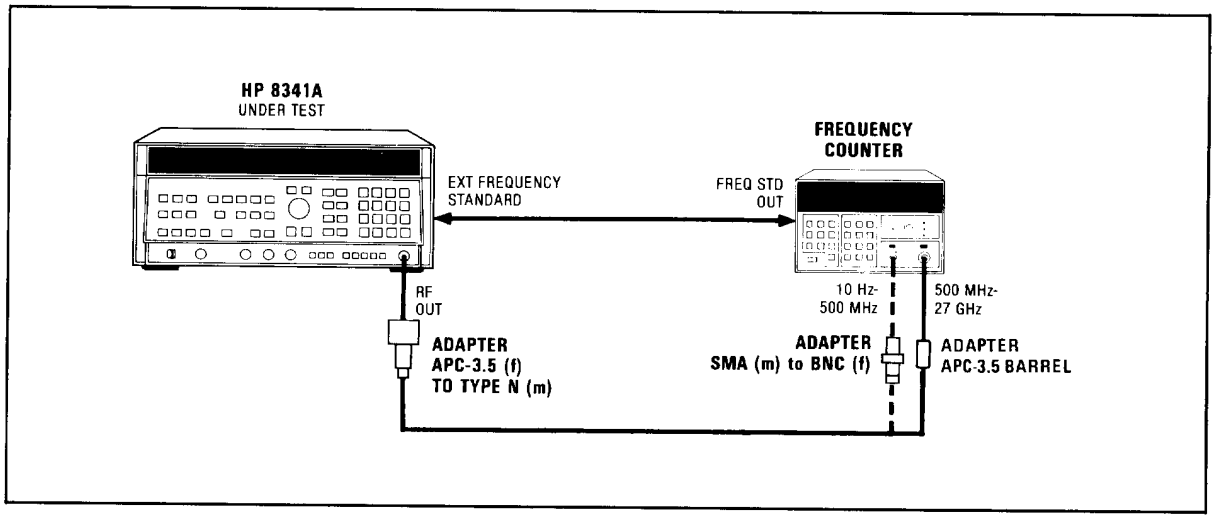


Figure 4-2. Frequency Range Test Setup

4-10. FREQUENCY RANGE AND CW MODE ACCURACY (Cont'd)

Equipment

Frequency Counter ..... HP 5343A
Adapter (APC 3.5 Female to Type N (Male)) ..... HP P/N 1250-1744
Adapter SMA (M) to BNC (F) ..... HP P/N 1250-1200
Adapter APC 3.5 Female to Female barrel ..... HP P/N 5061-5311
Cable ..... HP P/N 8340-20124 (Semi-rigid SMA Male to SMA Male)

Procedure

1. Connect the equipment as shown in Figure 4-2. Connect the HP 8341A RF Output to the 10 MHz-500 MHz counter input. Allow at least 30 minutes warm up time. The HP 8341A under test and the Frequency Counter use the same frequency standard to eliminate time base error from the measurement. Set the HP 8341A rear panel FREQUENCY STANDARD switch to EXT.

2. Press HP 8341A **[INSTR PRESET]**, then **[CW]** and enter **[1] [0] [MHz]**. Press **[POWER LEVEL]** and enter **[−] [2] [0] [dBm]**. The counter should indicate 10 MHz ± 1Hz ± the resolution of the counter.

3. Connect the HP 8341A RF output to the 500 MHz-26.5 GHZ counter input. Press the HP 8341A **[CW]** key and enter **[2] [0] [.] [0] [GHz]**. The counter should indicate 20.0 GHz ± 3 Hz ± the resolution of the counter.

NOTE

Since the same time base is used for both the HP 8341A and the frequency counter, only the displayed frequency is checked. The actual frequency error is ± (HP 8341A output frequency/ 10 MHz) X time base error ± 3 Hz.

4. Check the M/N Divider frequencies as follows:

NOTE

Pressing [SHIFT] [M1] displays, from left to right, the:
M divide number,
N divide number,
M/N Loop output frequency,
20/30 Loop output frequency.
Press [SHIFT] [M5] to exit this diagnostic mode. The instrument continues to operate normally while in the diagnostic dispay mode.

   a. Press the **[CW]** key and enter **[2] [4] [9] [0] [MHz]**. Select a step size of 10 MHz by pressing **[SHIFT] [CF] [1] [0] [MHz]**. Press **[SHIFT] [M1]** to display, from left to right, the M divide number, the N divide number, the M/N Loop output frequency, and the 20/30 Loop output frequency. Press the **[CW]** key to display the CW frequency in the **[ENTRY DISPLAY]**.

   b. Using the down arrow key, step down to 2 300.000000 MHz. Check the counter indication at each step. The counter should indicate the HP 8341A frequency ± 1Hz ± the resolution of the counter at each step.

4-10. FREQUENCY RANGE AND CW MODE ACCURACY (Cont'd)

NOTE

The above step sets and holds the N Divider to 13 and programs the M Divider through its full range of 8 to 27. Any frequency error as a result of a problem in the M Divider will probably be a multiple of 10 MHz.

c. If a significant frequency error is evident, note the conditions under which the error occured and continue this procedure to determine if any other conditions produce an error.

5. Check the M/N N Divider frequencies as follows:

a. Select a step size of 200 MHz by pressing **[SHIFT] [CF] [2] [0] [0] [MHz]**. Press **[CW]** to display the CW frequency in the **[ENTRY DISPLAY]**. The CW frequency should be 2 300.000000 MHz.

b. Using the up arrow key, step up to 6 900.000000 MHz. Check the counter indication at each step. the counter should indicate the HP 8341A frequency ± 1 Hz ± the resolution of the counter.

NOTE

The above step sets and holds the M Divider to 27 and programs the N Divider through its full range of 13 to 36. Any frequency error as a result of a problem in the M Divider will probably be a multiple of 10 MHz.

c. If a significant frequency error is evident, note the conditions under which the error occurred and continue this procedure to determine if any other conditions produce an error.

6. Check the 20/30 MHz N2 loop frequencies as follows:

a. Press **[INSTR PRESET]**. Press **[CF]** key and enter **[2] [3] [1] [0] [.] [5] [MHz]**. Press the **[ΔF]** key and enter **[1] [MHz]**. Select a step size of 1 kHz by pressing **[SHIFT] [CF] [1] [kHz]**.

b. Press **[SINGLE]** sweep key to set the HP 8341A to be phase-locked at the start of sweep (2.310 GHz). Press **[SHIFT] [M1]** to enter the diagnostic display mode. Press **[CF]** to display the center frequency in the **[ENTRY DISPLAY]**. The center frequency should be 2.310500 GHz.

c. Using the up arrow key, step the center frequency up to 2.310510 GHz. Check the counter indication at each step. The counter should indicate the HP 8341A start frequency (CF − 0.0005 GHz) ± 1 Hz ± the resolution of the counter.

4-10. FREQUENCY RANGE AND CW MODE ACCURACY (Cont'd)

NOTE

The above steps set the output of the M/N loop to 180 MHz where M=26 and N=13. The YO start frequency (2310 MHz) is then 20 to 30 MHz below the Nth harmonic (N=13) of 180 MHz (180 X 13 = 2340). The 20/30 MHz output is then 30 MHz. Since the ΔF frequency (1 MHz) is between 0.1 to 5 MHz, the 20/30 MHz frequency is derived from the PLL2 75 to 150 MHz VCO output divided by 5 (150 MHz / 5 = 30 MHz). The PLL2 VCO frequency is stepped down in 5 KHz steps which steps the 20/30 frequency from 30 MHz down to 29.990 MHz in 1 kHz steps. Since the M/N frequency remains constant and the HP 8341A output frequency is mixed with a harmonic (13th) of the M/N signal and the resultant output is phase compared to the 20/30 output, the HP 8341A output frequency must increase by 1 kHz/step to satisfy the 20/30 phase lock loop. This checks the least significant (BCD) N2 programming bits.

To observe the N2 PLL2 VCO frequency changes, repeat the N2 loop frequency check (Step 6a through 6c) pressing [SHIFT] [M3] in step 6b rather than [SHIFT] [M1]. [SHIFT] [M3] will display, from left to right, the PLL2 VCO frequency and the PLL3 Up Converter frequency (the PLL3 Up Converter frequency display will be 0 since the PLL3 is not used in the swept mode).

d. Select a step size of 10 kHz by pressing **[SHIFT] [CF] [1] [0] [kHz]**. Press **[CF]** to display the center frequency in the **[ENTRY DISPLAY]**; the display should indicate 2.310510 GHz.

e. Using the up arrow key, step the center frequency up to 2.310600 GHz. Check the counter indication at each step. The counter should indicate the HP 8341A start frequency (CF − 0.0005 GHz) ± 1 Hz ± the resolution of the counter.

NOTE

The above steps program the 20/30 frequency from 29.99 MHz to 29.90 MHz in 0.01 MHz steps and checks additional N2 Divider programming bits.

f. Select a step size of 100 kHz by pressing **[SHIFT] [CF] [1] [0] [0] [kHz]**. Press **[CF]** to dislay the center frequency in the **[ENTRY DISPLAY]**. The CF should be at 2.310600 GHz.

g. Using the up arrow key, step the center frequency up to 2.311500 GHz. Check the counter indication at each step. The counter should indicate the HP 8341A start frequency (CF − 0.0005 GHz) ± 1 Hz ± the resolution of the counter.

NOTE

The above steps program the 20/30 frequency from 29.9 to 29.0 in 0.1 MHz steps and check additional N2 Divider programming bits.

4-10. FREQUENCY RANGE AND CW MODE ACCURACY (Cont'd)

h. Select a step size of 1 MHz (i.e., press blue **[SHIFT]** key and then **[CF]** key and enter **[1] [MHz]**). Press **[CF]** to display the center frequency in the **[ENTRY DISPLAY]**. The CF should be at 2.311500 GHz.

i. Using the up arrow key, step the center frequency up to 2.320500 GHz. Check the counter indication at each step. The counter should indicate the HP 8341A start frequency (CF − 0.0005 GHz) ± 1 Hz ± the resolution of the counter.

NOTE

The above steps program the 20/30 frequency from 29.0 MHz to 21.0 MHz in 1 MHz steps. The last CF step programs the 20/30 to 30 MHz and the M/N frequency to 180.769231 MHz. This checks the remaining N2 Divider programming bits.

j. If a significant frequency error is evident, note the conditions under which the error occurred and continue this procedure to determine if any other conditions produce an error.

7. Check the 20/30 MHz N1 loop frequencies as follows:

a. Press **[INSTR PRESET]**. Select a step size of 10 kHz by pressing **[SHIFT] [CF] [1] [0] [kHz]**. Press **[CW]** and enter **[2] [3] [1] [9] [.] [9] [7] [MHz]**.

b. Press **[SHIFT] [M1]** to display, from left to right, the M divide number, the N divide number, the M/N Output frequency, and the 20/30 Output frequency.

c. Using the down arrow key, step the CW frequency down to 2 319.870000 MHz. Check the counter indication at each step. The counter should indicate the HP 8341A CW frequency ± 1 Hz ± the resolution of the counter.

NOTE

The above steps set the output of the M/N loop to 180 MHz where M=26 and N=13. The PLL1 VCO frequency is stepped up in 100 kHz steps. This steps the 20/30 frequency up from 20.03 MHz in 10 kHz steps to 20.13 MHz. The M/N frequency remains constant and the YO frequency is mixed with a harmonic (13th) of the M/N signal. The resultant output is phase compared to the 20/30 output. The HP 8341A output frequency must decrease by 10 kHz/step to satisfy the YO phase lock loop. This checks the least significant N1 programming bits.

d. Select a step size of 100 kHz by pressing **[SHIFT] [CF] [1] [0] [0] [kHz]**. Press the **[CW]** key to view the CW frequency in the **[ENTRY DISPLAY]**. The CW frequency should be at 2319.870000 MHz.

e. Using the down arrow key, step the CW frequency down to 2 318.970000 MHz. Check the counter indication at each step. The counter should indicate the HP 8341A CW frequency ± 1 Hz ± the resolution of the counter.

4-10. FREQUENCY RANGE AND CW MODE ACCURACY (Cont'd)

NOTE

The above steps program the 20/30 frequency from 20.13 up to 21.03 in 0.1 MHz steps and checks additional N1 Divider programming bits.

f. Select a step size of 1 MHz by pressing **[SHIFT] [CF] [1] [MHz]**. Press the **[CW]** key to view the CW frequency in the **[ENTRY DISPLAY]**. The CW frequency should be at 2318.970000 MHz.

g. Using the down arrow key, step the CW frequency down to 2310.970000 MHz. Check the counter indication at each step. The counter should indicate the HP 8341A CW frequency ± 1 Hz ± the resolution of the counter.

NOTE

The above steps program the 20/30 frequency from 21.03 MHz to 29.03 MHz in 1 MHz steps and check the remaining N1 Divider programming bits.

8. If frequency errors occurred, determine what frequency related circuit is most likely to have caused the symptom (i.e., M/N Loop or 20/30 Loop) then refer to the appropriate troubleshooting Functional Group in Section VIII, Service.

4-11. SWEEP TIME ACCURACY

Specification

Table 4-4. Sweep Time Accuracy Specifcations

Range: 10 milliseconds to 200 seconds forward sweep times
Accuracy: ±5% (sweeptimes ≤ 50 seconds)

Description

The HP 8341A is swept from 3 GHz to 7 GHz at 6 different sweep times, ranging from 10 ms to 200 sec. The rear panel STOP SWEEP IN/OUT signal of the HP 8341A is used to trigger INPUT A and B on an HP 5316A Universal Counter used in the time interval mode. At the start of a sweep, the STOP SWEEP IN/OUT signal changes from TTL low to TTL high. This pulse triggers INPUT A on the Universal Counter (selected for leading edge triggering) and the count begins. At the end of a sweep, the STOP SWEEP IN/OUT signal changes from TTL high to TTL low. At this point, INPUT B is triggered (selected for trailing edge triggering) and the count is complete. After the Universal Counter has made several counts, an accurate reading of the HP 8341A sweep time is indicated on its display.

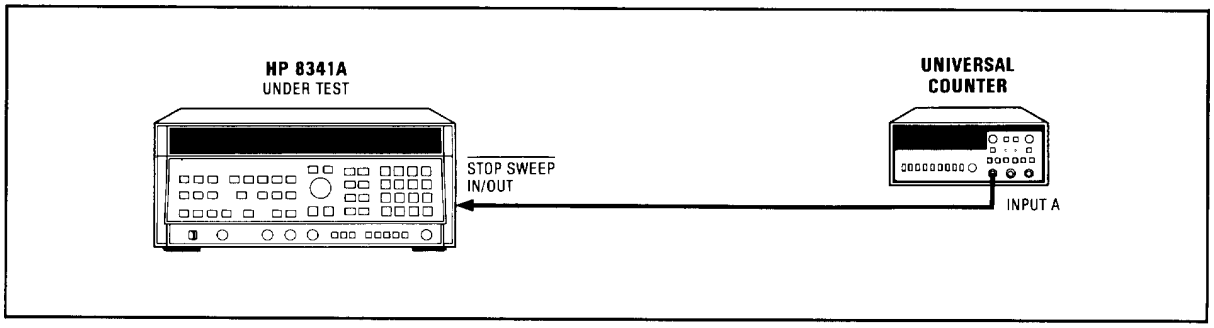


Figure 4-3. Sweep Time Accuracy Test Setup

Equipment

Universal Counter ..... HP 5316A

Procedure

1. Connect equipment as shown in Figure 4-3. Switch the HP 8341A POWER to ON. Allow the equipment to warm up for 30 minutes.
2. On the HP 8341A, press **[INSTR PRESET] [START FREQ] [3] [GHz] [STOP FREQ] [7] [GHz] [POWER LEVEL] [0] [dBm]**.
3. Set up the HP 5316A as follows:

TI A → B ..... IN
GATE TIME ..... MIN
LEVEL/SENSE (CHANNEL A and B) ..... +MAX
TRIGGER (CHANNEL A and B) ..... LEVEL
AC/DC (CHANNEL A and B) ..... DC
ATTN (CHANNEL A and B) X1
FILTER ..... NORM
SEP/COM A ..... COM A
Channel A Triggering ..... Leading Edge
Channel B Triggering ..... Trailing Edge

4-11. SWEEP TIME ACCURACY (Cont'd)

NOTE

To ensure that an accurate sweep time indication is obtained from the HP 5316A in step 4, allow the HP 8341A to complete at least three sweeps.

4. On the HP 8341A, press **[SWEEP TIME] [1] [0] [msec]**. Verify that the sweep time displayed by the HP 5316A is within the limits shown in Table 4-5.

5. Repeat step 4 for values shown in Table 4-5.

Table 4-5. Sweep Time Accuracy Limits

Selected	Lower Limit	Upper Limit
10 msec	9.5 msec	10.5 msec
100 msec	95 msec	105 msec
1 sec	.95 sec	1.05 sec
10 sec	9.5 sec	10.5 sec
50 sec	47.5 sec	52.5 sec

4-12. SWEPT FREQUENCY ACCURACY

Specification

Table 4-6. Swept Frequency Accuracy Specifications

Center Frequency/Sweep Width Mode (CF/ΔF)

Readout Accuracy with respect to sweep out voltage (sweep time > 100 milliseconds):

ΔF ≤ n x 5 MHz: ± 1% of indicated sweep width (ΔF) ± time base accuracy*

ΔF > n x 5 MHz to < n x 100 MHz: ± 2% of indicated sweep width (ΔF)

ΔF ≥ n x 100 MHz: ± 1% of indicated sweep width (ΔF), or ± 50 MHz, whichever is less

Where n = harmonic multiplication number (1 to 3). Refer to Frequency Ranges and Bandswitch Points description in Table 1-1.

* Time Base affects Center Frequency accuracy only, not Sweep Width Accuracy.

Start/Stop Mode

Readout Accuracy with respect to sweep out voltage (sweep time > 100 milliseconds):

Same as Center Frequency/Sweep Width Mode.

Description

The HP 8341A (DUT) RF output is connected to the HP 8566A Spectrum Analyzer input. The spectrum analyzer is set for zero Hz span at a CW frequency within the HP 8341A swept frequency range. The spectrum analyzer VIDEO OUT (applied to the oscilloscope vertical input) will have a response as the HP 8341A output passes through the frequency that the spectrum analyzer is tuned to. The selected spectrum analyzer bandwidth filter will determine the shape of the response.

The HP 8341A SWEEP OUT, in series with a power supply, is applied to an oscilloscope's horizontal input. The input to the oscilloscope is clamped at ±0.7 V by two diodes to prevent overdriving the oscilloscope's input. The oscilloscope is calibrated by setting the HP 8341A and the spectrum analyzer to the same CW frequency (e.g., 20% of Band). To set the HP 8341A to have a SWEEP OUT voltage and at the same time a phase locked CW frequency that is proportional to a percentage of a swept frequency band, the START and STOP frequencies are selected, MANUAL SWEEP is selected, and a frequency equivalent to the desired percentage of band is selected (e.g., START 3 GHz, STOP 5 GHz, MANUAL 3.4 GHZ, for 20%). The power supply is adjusted for a DVM indication of zero volts and the oscilloscope horizontal position control is used to position the dot to the center graticule line. With the oscilloscope horizontal sensitivity set to 0.05 V/Division, the CRT horizontal axis is now calibrated to approximately 0.5% of the swept frequency range per division. The spectrum analyzer VIDEO OUT voltage to the oscilloscope is then maximum and the scope vertical position is adjusted to place the dot near the top of the CRT.

The HP 8341A can now be set to sweep any frequency range and the oscilloscope center graticule line will represent the calibrated percentage (e.g., 20%) of the sweep range. The spectrum analyzer center frequency is set to a frequency that is the desired percentage (e.g., 20%) of the HP 8341A swept frequency range. If the HP 8341A swept frequency accuracy is perfect, the oscilloscope trace will be the response of the spectrum analyzer's bandwidth filter, centered on the CRT. If the trace is not centered, the spectrum analyzer center frequency is adjusted to position the response to the center of the oscilloscope CRT. The amount of spectrum analyzer frequency change is the HP 8341A Swept Frequency Accuracy error.

4-12. SWEPT FREQUENCY ACCURACY (Cont'd)

Since the circuitry that determines swept frequency accuracy is the same for both ΔF Mode and Start/Stop Mode, only Start/Stop Mode swept frequency accuracy is tested.

NOTE

The spectrum analyzer resolution bandwidth, and HP 8341A sweep time must be compatible to obtain the desired oscilloscope response. In the test set-up below, 2 APC 3.5 (F) TO TYPE N (M) adapters are used with SMA semi-rigid cable. This set-up must be used instead of simply connecting the DUT to the HP 8566A/B with a Type N cable because Type N cables have much greater power loss.

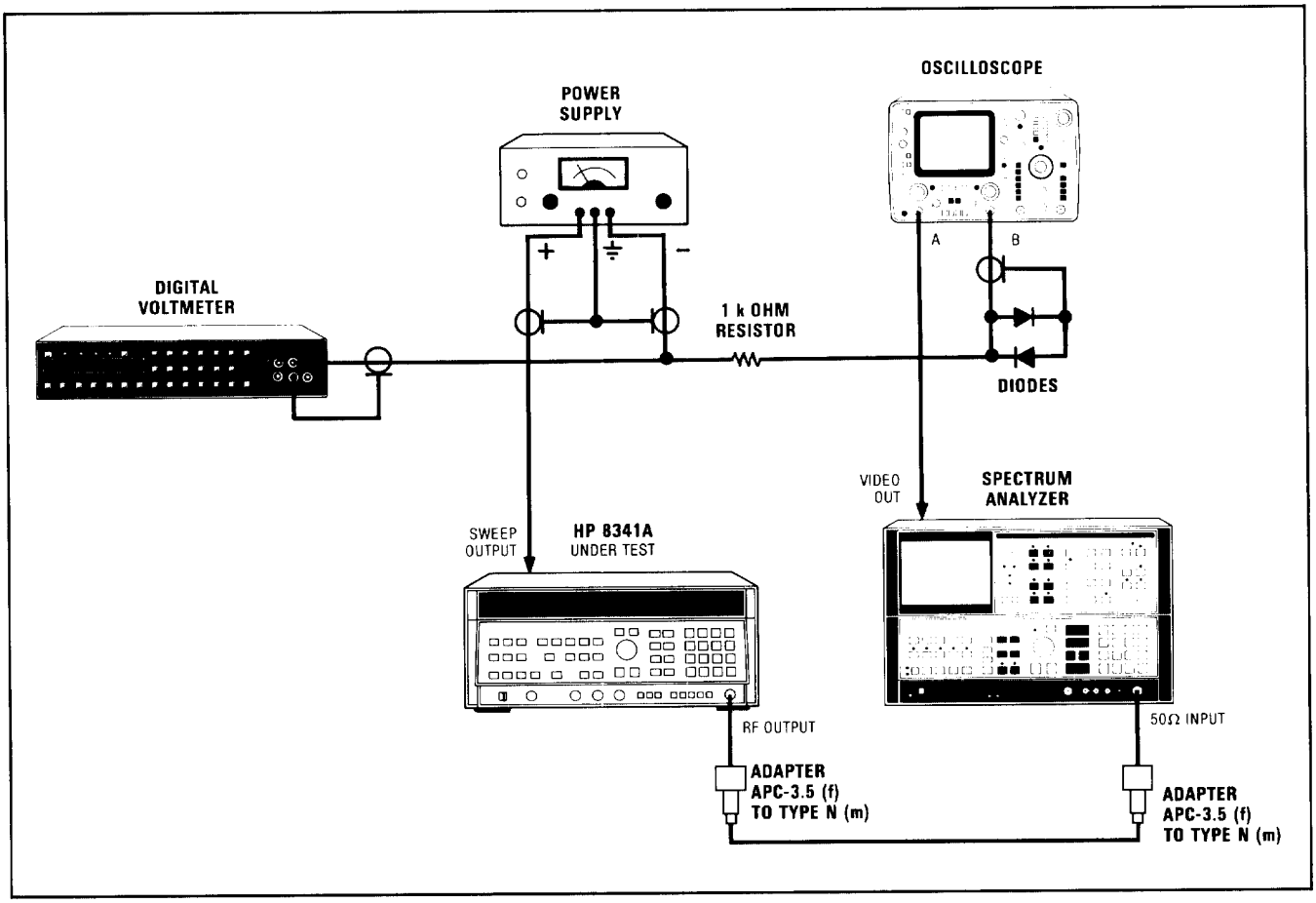


Figure 4-4. Swept Frequency Accuracy Test Setup

Equipment

Spectrum Analyzer	HP 8566A/B
Oscilloscope	HP 1741A
Power Supply	HP 6294A
Adapter (2 required)	HP P/N 1250-1744 Type N (male) to APC 3.5 (female)
Cable	HP P/N 08340-20124 (SMA male to SMA male)
Diode (2 required)	HP P/N 1901-0028
Digital Voltmeter	HP 3455A
1 KOhm Resistor	HP P/N 0757-0280

4-12. SWEPT FREQUENCY ACCURACY (Cont'd)

Procedure

1. Connect the equipment as shown in Figure 4-4 (with the power supply output set to 0 Vdc). Allow the equipment to warm up for one hour.

2. Press HP 8341A **[INSTR PRESET]**. Set the oscillocope to display amplitude versus sweep out voltage (A vs B). Set channel A sensitivity to 0.2V/Div.

3. Set the spectrum analyzer REFERENCE LEVEL to 20 dBm. Set CENTER FREQUENCY to 3.4 GHz for 20% (4 GHz for 50%, or 4.6 GHz for 80%). Set FREQUENCY SPAN to zero. Set RES BW (resolution bandwidth) to 3 MHz.

4. Set HP 8341A to have a sweep out voltage and at the same time, a phase locked CW frequency that is proportional to a percentage of band as follows:

   a. Press **[START]** and enter **[3] [GHz]**

   b. Press **[STOP]** and enter **[5] [GHz]**.

   c. Press **[MANUAL]** SWEEP and enter **[3] [.] [4] [GHz]** for 20% (4 GHz for 50%, or 4.6 GHz for 80%).

CAUTION

Do not adjust the power supply for greater than ±10 Vdc in this procedure.

5. Adjust the oscilloscope's Channel B sensitivity for 0.05 V/DIV and the horizontal position control for midrange. Adjust the power supply voltage for a DVM indication of 0 ±10 mVdc.

6. Adjust oscilloscope horizontal position control to position the dot on the center graticule. Adjust the oscilloscope vertical position to place the dot near the top of the CRT.

NOTE

The oscilloscope is now calibrated for 0.5%/Division and for the desired percentage of band (i.e., 20%, 50%, or 80%). Measurements can now be made at this percentage of band for any Start/Stop frequency and any frequency span.

7. Refer to Table 4-7, press the HP 8341A **[START FREQ]** key and enter the start frequency shown in Table 4-7. Press the **[STOP FREQ]** key and enter the appropriate stop frequency. Press the **[SWEEP TIME]** key and enter the appropriate sweep time. Select the appropriate spectrum analyzer resolution bandwith. Set the spectrum analyzer center frequency to the appropriate frequency for the percentage of band being tested. Press the HP 8341A **[CONT]** key to return the HP 8341A to the swept mode.

8. Ideally, the oscilloscope response will be at the center graticule line, if not, adjust the spectrum analyzer center frequency to bring the oscilloscope response to the center graticule line. The difference between the original center frequency setting and present center frequency is the HP 8341A swept frequency error. This error should be within the test limit shown in Table 4-7.

4-12. SWEPT FREQUENCY ACCURACY (Cont'd)

Table 4-7. Swept Frequency Accuracy Test Frequencies

HP 8341A			Spectrum Analyzer				Test Limit (kHz)
Start Freq (GHz)	Stop Freq (GHz)	Sweep Time (ms)	Center Frequency (GHz)			Res BW (kHz)	
			20% of Band	50% of Band	80% of Band		
2.3	2.300099	3000	2.3000198	2.3000495	2.3000792	0.3	±0.99
2.3	2.300101	3000	2.3000202	2.3000505	2.3000808	0.3	±1.01
2.3	2.300499	1000	2.3000998	2.3002495	2.3003992	1.0	±4.99
2.3	2.300501	1000	2.3001002	2.3002505	2.3004008	1.0	±5.01
2.3	2.30499	300	2.300998	2.302495	2.303992	3.0	±49.9
2.3	2.30501	300	2.301002	2.302505	2.304008	3.0	±100.02
2.3	2.31	300	2.302	2.305	2.308	3.0	±200
2.3	2.32	100	2.304	2.310	2.316	10	±400
2.3	2.33	100	2.306	2.315	2.324	10	±600
2.3	2.34	100	2.308	2.320	2.332	30	±800
2.3	2.349	100	2.3098	2.3245	2.3392	30	±998
2.3	2.3501	100	2.31002	2.32505	2.34008	30	±1020
2.3	2.36	100	2.312	2.33	2.348	30	±1200
2.3	2.37	100	2.314	2.335	2.356	30	±1400
2.3	2.38	100	2.316	2.34	2.364	30	±1600
2.3	2.39	100	2.318	2.345	2.372	30	±1800
2.3	2.3999	100	2.31998	2.34995	2.37992	30	±1980
2.3	2.4001	100	2.32002	2.35005	2.38008	100	±1001
2.3	2.799	100	2.3998	2.5495	2.6992	1000	±4990
2.3	2.801	100	2.4002	2.5505	2.7008	1000	±5010
2.3	7.29	100	3.298	4.795	6.292	3000	±49900
2.3	7.31	100	3.302	4.805	6.308	3000	±50000
2.3	8.3	100	3.500	5.300	7.100	3000	±50000
2.3	16.452	100	5.1304	9.376	13.6216	3000	±50000
2.3	20.0	100	5.84	11.15	16.46	3000	±50000

9. Repeat steps 3 through 8 to test at 50% and 80% of band.

NOTE

If the swept frequency accuracy error exceeds the test limit, refer to the Sweep Gain and Delay Adjustments in Section V, Adjustments.

4-13. MAXIMUM LEVELED OUTPUT POWER AND POWER ACCURACY TEST

Specification

Table 4-8. Maximum Leveled Output Power and Power Accuracy Specifications (1 or 3)

RF OUTPUT					
MAXIMUM LEVELED POWER (0°C to +35°C)[1]	**Bands and Approximate Frequency Ranges (GHz)** (see Frequency Ranges and Bandswitch Points for complete description)				
	Band 0 0.01 to <2.3	**Band 1 2.3 to <7.0**	**Band 2 7.0 to <13.5**	**Band 3 13.5 to <18.6**	**Band 3 18.6 to 20.0**
STANDARD INSTRUMENT	+10.0 dBm	+10.0 dBm	+10.0 dBm	+10.0 dBm	+10.0 dBm
OPTION 001 (F.P. Out w/Atten.)	+10.0 dBm	+9.0 dBm	+8.0 dBm	+8.0 dBm	+8.0 dBm
OPTION 004 (R.P. Out w/Atten.)	+10.0 dBm	+9.0 dBm	+8.0 dBm	+7.0 dBm	+7.0 dBm
OPTION 005 (R.P. Out w/o Atten.)	+10.0 dBm	+10.0 dBm	+10.0 dBm	+9.0 dBm	+9.0 dBm
OPTION 002 (+13 dBm Output Power, 2.3 to 18.6 GHz)*	+10 dBm	+13 dBm	+13 dBm	+13 dBm	+10 dBm
OPTION 002 and OPTION 001 (Front Panel RF Output w/Atten.)	+10 dBm	+12 dBm	+11 dBm	+11 dBm	+8 dBm
OPTION 002 and OPTION 004 (Rear Panel RF Output w/Atten.)	+10 dBm	+11 dBm	+10 dBm	+10 dBm	+7 dBm
OPTION 002 and OPTION 005 (Rear Panel RF Output w/o Atten.)	+10 dBm	+12 dBm	+12 dBm	+12 dBm	+9 dBm
* Does not apply to instruments equipped with Options 001, 004, or 005					
MINIMUM SETTABLE POWER STANDARD and OPTION 005 (R.P. w/o Atten.): −20 dBm OPTION 001 (F.P. Out w/Atten.) and 004 (R.P. Out w/Atten.): −110 dBm					
RF OFF When the RF key is turned OFF, the POWER dBm display will read OFF and a 0 dBm signal will typically be reduced to a level < −100 dBm.					
OUTPUT POWER RESOLUTION **" ENTRY DISPLAY":** 0.05 dB **"POWER dBm" Display:** 0.1 dB					

OUTPUT POWER ACCURACY[2]	**Bands and Approximate Frequency Ranges (GHz)** (see Frequency Ranges and Bandswitch Points for complete description)	
	Band 0 0.01 to <2.3	**Bands 1 - 3 2.3 to 20**
STANDARD INSTRUMENT		
+18 to +10 dBm[4]	−	±1.6 dB
+10 to −10 dBm	±0.9 dB	±1.3 dB
−10 to −20 dBm	±1.7 dB	±2.1 dB
OPTION 004 (Rear Panel Output w/Atten.)		
+18 to +10 dBm[4]	−	±2.0 dB
+10 to −11.95 dBm	±1.0 dB	±1.7 dB
−12 to −21.95 dBm	±1.3 dB	±2.2 dB
−22 to −51.95 dBm	±1.6 dB	±2.5 dB
−52 to −81.95 dBm	±1.9 dB	±2.8 dB
−82 to −99.95 dBm	±2.2 dB	±3.1 dB
−100 to −110 dBm	±3.0 dB[3]	±3.9 dB[3]

4-13. MAXIMUM LEVELED OUTPUT POWER AND POWER ACCURACY TEST (Cont'd)

Table 4-8. Maximum Leveled Output Power and Power Accuracy Specifications (2 of 3)

RF OUTPUT (Cont'd)		
OUTPUT POWER ACCURACY (Cont'd)	**Band 0 0.01 to <2.3**	**Bands 1 - 3 2.3 to 20**
OPTION 001 (Front Panel Output w/Attenuator)		
+18 to +10 dBm[4]	–	±1.8 dB
+10 to −9.95 dBm	±0.9 dB	±1.5 dB
−10 to −19.95 dBm	±1.2 dB	±2.0 dB
−20 to −49.95 dBm	±1.5 dB	±2.3 dB
−50 to − 79.95 dBm	±1.8 dB	±2.6 dB
−80 to −99.5 dBm	±2.1 dB	±2.9 dB
−100 to −110 dBm	±2.9 dB[3]	±3.7 dB[3]
OPTION 005 (Rear Panel Output w/o Attenuator)		
+18 to +10 dBm[4]	–	±1.8 dB
+10 to −10 dBm	±1.0 dB	±1.5 dB
−10 to − 20 dBm	±1.8 dB	±2.3 dB
FLATNESS (Internally leveled)		
STANDARD INSTRUMENT		
+18 to +10 dBm[4]	–	±1.0 dB
+10 to −10 dBm	±0.6 dB	±0.9 dB
−10 to −20 dBm	±0.8 dB	±1.5 dB
OPTION 004 (Rear Panel Output w/Attenuator)		
+18 to +10 dBm[4]	–	±1.4 dB
+10 to −11.95 dBm	±0.7 dB	±1.3 dB
−12 to −21.95 dBm	±1.0 dB	±1.8 dB
−22 to −51.95 dBm	±1.3 dB	±2.1 dB
−52 to −81.95 dBm	±1.5 dB	±2.4 dB
−82 to −99.5 dBm	±1.8 dB	±2.7 dB
−100 to −110 dBm	±2.0 dB[3]	±3.3 dB[3]
OPTION 001 (Front Panel Output w/Attenuator)		
+18 to +10 dBm[4]	–	±1.2 dB
+10 to −9.95 dBm	±0.6 dB	±1.1 dB
−10 to −19.95 dBm	±0.9 dB	±1.6 dB
−20 to −49.95 dBm	±1.2 dB	±1.9 dB
−50 to −79.95 dBm	±1.4 dB	±2.2 dB
−80 to −99.5 dBm	±1.7 dB	±2.5 dB
−100 to −110 dBm	±1.9 dB[3]	±3.1 dB[3]
OPTION 005 (Rear Panel Output w/o Attenuator)		
+18 to +10 dBm[4]	–	±1.2 dB
+10 to − 10 dBm	±0.7 dB	±1.1 dB
−10 to −20 dBm	±0.9 dB	±1.7 dB

4-13. MAXIMUM LEVELED OUTPUT POWER AND POWER ACCURACY TEST (Cont'd)

Table 4-8. Maximum Leveled Output Power and Power Accuracy Specifications (3 of 3)

NOTES
1. Maximum leveled power from 35°C to 55°C will typically be degraded from these specifications by no more than 2 dB.
2. Internally leveled, AM off. The POWER dBm display monitors the actual output power, giving accurate readings when unleveled, externally leveled, or when amplitude modulating with a signal that has a dc component. In these modes, the accuracy typically degrades by ±0.1 dB over the tabulated values. The ENTRY DISPLAY shows the desired power level, or the desired external detector output voltage, exclusive of modulation.
3. Typical.
4. The ALC loop typically operates up to +20 dBm to enhance usability at those frequencies where leveled power greater than the maximum specified is available.

Description

MAXIMUM LEVELED POWER

For maximum leveled power, a crystal detector and an oscilloscope are used to monitor the swept response. The HP 8341A is set to sweep a given frequency band. The power level is increased until the HP 8341A UNLEVELED indicator comes on, then decreased until the UNLEVELED indicator just goes out. The maximum leveled power may differ with sweep mode and sweep time. To find the worst case, the maximum leveled power is checked in three modes: single sweep with auto sweep time, single sweep with a two second sweep time, and continuous sweep. The worst case mode is selected, and a frequency marker is positioned at the minimum power point on the swept display. The HP 8341A is set to CW at the marker frequency and the power is measured using a power meter. The power meter indication should be greater than or equal to the maximum leveled power specification. This procedure is repeated for each frequency band.

FLATNESS

Flatness is measured with the RF output level at 0 dBm. Flatness is primarily a function of the RF path; therefore, the response will be essentially the same at all ALC levels. However, in instruments equipped with Option 001 or 004, the response will most likely change when the RF Attenuator is stepped to a different attenuation level. (An automated test is available to adjust the RF attenuator correction factors and verify attenuator flatness; refer to Automated Test Procedures, following this section.)

A power meter is used to measure the RF signal level. An oscilloscope, connected to the power meter recorder output, is used to find the frequencies where the maximum and minimum points of the response occur. The HP 8341A is set to a slow sweep to allow the power meter to respond to any power variations. A marker is positioned at the maximum and minimum points on the oscilloscope display. The HP 8341A is then set to CW at each of the marker frequencies and the power indications are recorded. The maximum power level minus the minimum power level should be within the flatness specification.

ACCURACY

The absolute power level at the maximum and minimum points should be within the accuracy specification.

Two different Power Sensors may be required to cover the complete frequency range. The HP 8481A Power Sensor is used from 10 MHz to 50 MHz and the HP 8485A Power Sensor is used for the other frequency bands covering 50 MHz to 20.0 GHz. The HP 8485A Power Sensor can be used down to 10 MHz, but if a minimum or maximum that is close to the test limits occurs in this frequency range, the HP 8481A Power Sensor should be used.

4-13. MAXIMUM LEVELED OUTPUT POWER AND POWER ACCURACY TEST (Cont'd)

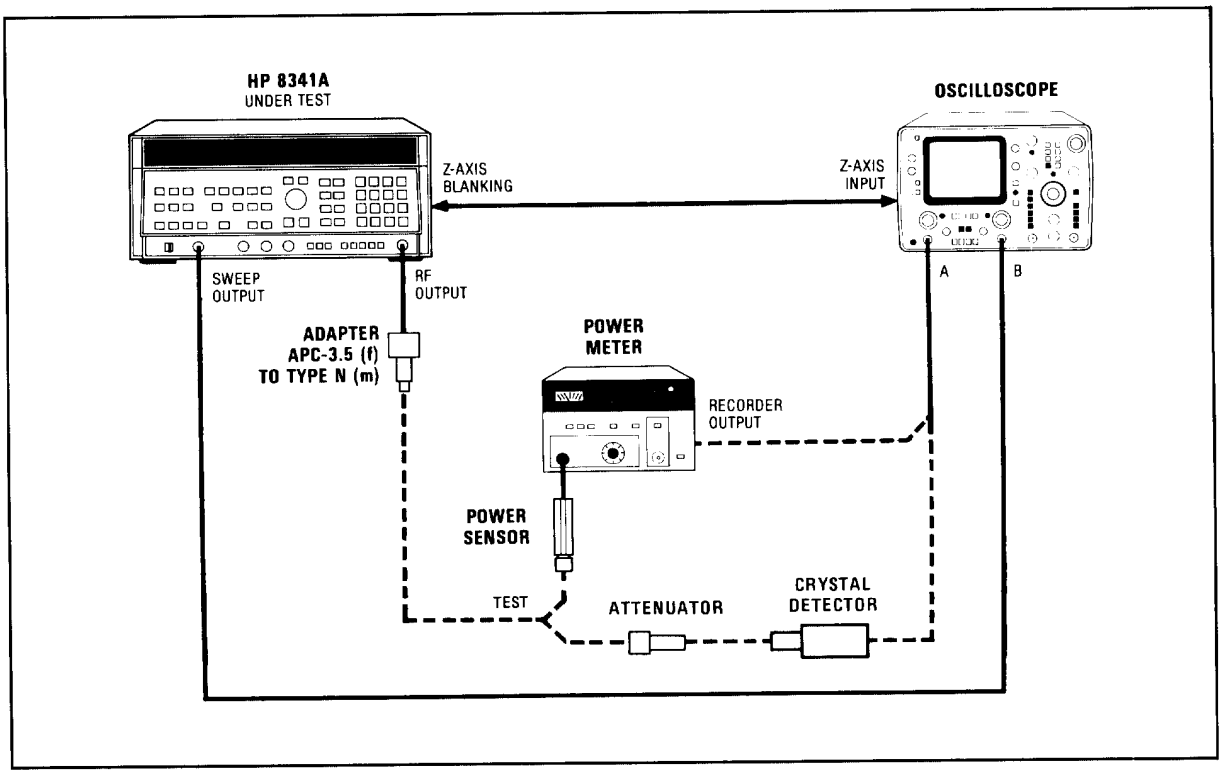


Figure 4-5. Maximum Leveled Output Power and Power Accuracy Test Setup.

Equipment

Oscilloscope	HP 1741A
Attenuator	HP 8493C Opt. 010
Crystal Detector	HP 8473A
Power Meter	HP 436A
Power Sensor	HP 8481A
Power Sensor	HP 8485A
Adapter (APC-3.5 female to Type N male)	HP P/N 1250-1744

Procedure

MAXIMUM LEVELED POWER

1. Connect the equipment as shown in Figure 4-5. Connect the 10 dB pad and crystal detector to the HP 8341A RF output and connect the detector output to the oscilloscope channel A input. Allow at least 30 minutes warm up time.

2. Press **[INSTR PRESET]**. Press **[STOP FREQUENCY]** and enter **[2] [.] [3] [GHz]**. Adjust the oscilloscope to view the swept output of the crystal detector.

   In Band 0 (10 MHz to 2.3 GHz), the crystal detector may pass a portion of the RF signal. This RF feedthrough may be visible on the low frequency portion of the oscilloscope trace.

   Also, as the power in Band 0 is increased toward maximum leveled, the level of the harmonics may increase and cause a perturbation in the swept response. This will cause the maximum power indication on the oscillosope to increase without causing the UNLEVELED indicator to light. Therefore, flatness is only specified at $\leq +10$ dBm in Band 0.

4-13. MAXIMUM LEVELED OUTPUT POWER AND POWER ACCURACY TEST (Cont'd)

3. Press the **[POWER LEVEL]** key and, using the front panel rotory knob, increase the power level until the UNLEVELED indicator comes on. Slowly decrease the power level until the UNLEVELED indicator just goes off. Note the ENTRY DISPLAY power indication.

NOTE

The maximum leveled power indication may differ with sweep mode and sweep time. To find the worst case, the maximum leveled power is checked in continuous sweep with auto sweep time (step 3), single sweep with auto sweep time (step 4), and single sweep with a two second sweep time (step 5).

4. Press **[SINGLE SWEEP]** repeatedly and repeat step 3.

5. Press **[SWEEP TIME]** and enter **[2] [sec]**. Repeat step 3.

6. Select the HP 8341A mode that gave the worst case maximum leveled power indication (lowest ENTRY DISPLAY indication). Press **[M2]** and position the marker, using the rotary knob, to the minimum power level point on the oscilloscope trace (for a negative polarity crystal detector, this is the highest point on the display, for a positive polarity detector, this is the lowest point on the display). Using the oscilloscope vertical position control, position the marker on a horizontal graticule line. Note the marker frequency. Press **[MANUAL]** and enter the frequency noted for M2. Due to SYTM tracking, the RF output level at a single frequency may be greater than in a swept mode; therefore, if the oscilloscope now indicates a higher power level than the swept response (for a positive polarity detector, the trace moves down), press **[POWER LEVEL]** and using the rotary knob adjust the power level to return the dot on the oscilloscope to the horizontal reference line for the minimum swept power point.

7. Disconnect the 10 dB pad and crystal detector and connect the Power Sensor to the HP 8341A RF output. Set the Power Meter's calibration factor switch to include the frequency noted for M2.

   To obtain the most accurate Power Meter reading, zero the Power Meter on the range being used. To zero the Power Meter, press the Power Meter RANGE HOLD, press HP 8341A **[RF]** off, zero the Power Meter, and press **[RF]** on.

   The Power Meter indication should be equal to or greater than the maximum leveled power specification. If the HP 8341A does not meet its maximum leveled power specification, refer to SRD Bias and SYTM Tracking adjustments in Section V.

8. Press the **[START FREQ]** key and enter the start frequency for the next band. Press the **[STOP FREQUENCY]** key and enter the stop frequency for the next band. Repeat steps 3 through 7 until all frequency bands have been checked.

FLATNESS

9. Flatness is measured with the RF output level at 0 dBm. Flatness is primarily a function of the RF path; therefore, the response will be essentially the same at all ALC levels. Although the ALC accuracy is not specified separately, the ALC accuracy is typically <0.15 dB for RF output levels from +10 dBm to −9.95 dBm.

4-13. MAXIMUM LEVELED OUTPUT POWER AND POWER ACCURACY TEST (Cont'd)

To test ALC accuracy:

Place the instrument in CW Mode. Press **[SHIFT] [POWER SWEEP]**. This allows the user control of the ALC power level over its entire power range (−20 to +20 dBm), via the front panel. Press **[0] [dBm]**. Note the actual power level shown on the power meter. Press **[1] [0] [dBm]**. The difference between the actual power level (power meter reading) at 0 dBm and the power meter reading at +10 dBm should be 10 dB ±0.15 dB.

In this fashion test the ALC at 1 dB steps from +10 dBm to −10 dBm. Use the data entry keyboard to change the ALC power level. Do not use the step up or step down keys. In instruments equipped with Option 001 or 004, these keys cause a 10 dB change in the step attenuator setting. Press **[POWER LEVEL]** to exit the direct-ALC-control mode.

Also it should be noted that the power level in the ENTRY DISPLAY is merely the power level requested by the operator. In normal ALC modes, the instrument processor duplicates the ENTRY DISPLAY power level in the POWER dBm display with 0.1 dB resolution; however, if AM is selected, the processor reads the ALC level with an A/D converter, calculates the associated power level, and displays the calculated value in the POWER dBm display.

10. Press **[INSTR PRESET]**. Press **[STOP FREQUENCY]** and enter **[2] [.] [3] [GHz]**. Press **[POWER LEVEL]** and enter **[0] [dBm]**.

11. Press the **[SWEEP TIME]** key and enter **[2] [sec]**.

12. Adjust the oscilloscope controls to view the Power Meter RECORDER OUTPUT voltage versus the HP 8341A SWEEP OUTPUT voltage (A versus B). The oscilloscope vertical gain and position must be changed as a function of the power meter range and RECORDER OUTPUT voltage.

13. Press Frequency Marker key **[M2]** and, using the rotary knob, vary the marker frequency to position the (intensified) marker on the lowest point on the oscilloscope trace. It may be necessary to adjust the oscilloscope INTENSITY to view the marker dot.

14. Note the marker frequency. Press the **[MANUAL]** key and enter the frequency noted for M2. Reset the power meter calibration factor switch to include this frequency. The power meter indication is the minimum power point. Record the power meter indication on the work sheet provided in Table 4-9.

NOTE

For Band 0 (10 MHz to 2.3 GHz), if the minimum or maximum power occured below 50 MHz, use the HP 8481A Power Sensor to measure the power level.

15. Press the **[CONT]** key to return to the sweep mode. Press **[M1]** and, using the rotary knob, vary the marker frequency to position the marker on the highest point on the oscilloscope trace. Note the marker frequency. Press the **[MANUAL]** key and enter the frequency noted for M1. Reset the power meter calibration factor switch to include this frequency. The power meter indication is the maximum power point. Record the power meter indication on the work sheet.

4-13. MAXIMUM LEVELED OUTPUT POWER AND POWER ACCURACY TEST (Cont'd)

Table 4-9. Maximum Leveled Output Power Test Work Sheet

Frequency Range: 10 MHz to 2.3 GHz

		Power Meter Indication	HP 8341A Entry Display	
Steps 13, 14	Minimum	_____	_____	
Step 15	Maximum	_____	_____	
Step 18	Flatness: Maximum – Minimum	_____		(≤1.2 dB, Standard) (≤1.4 dB, Option 004) (≤1.2 dB, Option 001) (≤1.4 dB, Option 005)

Frequency Range: 2.3 GHz to 7.0 GHz

		Power Meter Indication	HP 8341A Entry Display	
Steps 13, 14	Minimum	_____	_____	
Step 15	Maximum	_____	_____	
Step 18	Flatness: Maximum – Minimum	_____		(≤1.8 dB, Standard) (≤2.6 dB, Option 004) (≤2.2 dB, Option 001) (≤2.2dB, Option 005)

Frequency Range: 7.0 GHz to 13.5 GHz

		Power Meter Indication	HP 8341A Entry Display	
Steps 13, 14	Minimum	_____	_____	
Step 15	Maximum	_____	_____	
Step 18	Flatness: Maximum – Minimum	_____		(≤1.8 dB, Standard) (≤2.6 dB, Option 004) (≤2.2 dB, Option 001) (≤2.2 dB, Option 005)

Frequency Range: 13.5 GHz to 20.0 GHz

		Power Meter Indication	HP 8341A Entry Display	
Steps 13, 14	Minimum	_____	_____	
Step 15	Maximum	_____	_____	
Step 18	Flatness: Maximum – Minimum	_____		(≤1.8 dB, Standard) (≤2.6 dB, Option 004) (≤2.2 dB, Option 001) (≤2.2 dB, Option 005)

4-13. MAXIMUM LEVELED OUTPUT POWER AND POWER ACCURACY TEST (Cont'd)

16. Press the **[CONT]** key to return to the swept mode. Press the **[START FREQ]** key and enter the start frequency for the next frequency band. Press the **[STOP FREQ]** key and enter the stop frequency for the next frequency band.

17. Repeat steps 12 through 16 to measure the flatness until all frequency bands have been checked.

18. The maximum minus the minimum power meter indications should be within the flatness specifications. If the HP 8341A does not meet its flatness specification, refer to Flatness Adjustments in Section V.

ACCURACY

19. The absolute power level at the maximum and minimum points should be within the accuracy specification. This test may be repeated at other ALC power levels (+10 dBm to −10 dBm) to verify flatness and accuracy specifications over the ALC range.

4-14. EXTERNAL LEVELING

Specification

Table 4-10. External Leveling Specifications

XTAL: Allows the HP 8341A to be externally leveled by crystal detectors of positive or negative polarity.
METER: Allows power meter leveling with any HP power meter.
Range (XTAL or METER): 500 microvolts (−66 dBV) to 2.0 volts (+6 dBV)
Accuracy of voltage at EXT INPUT connector relative to the displayed level (leveling voltage is shown in ENTRY DISPLAY in dBV): ±0.5 dB ± 200 microvolts

Description

The HP 8341A external leveling circuit is designed to maintain a constant voltage at the EXT INPUT BNC. This is achieved by first selecting a voltage (in dBV) to which the EXT INPUT will be leveled. This establishes a reference voltage for the ALC. The voltage at the EXT INPUT is then routed through the external leveling circuitry to the ALC and compared to the reference. If a difference between the two voltages exist, the HP 8341A RF OUTPUT power will be adjusted to compensate for the difference.

The HP 8341A's external leveling circuit allows a positive or negative crystal detector to be used in the external leveling loop. A positive crystal detector (HP 8473A) is used in this test but a negative crystal detector may be substituted.

The HP 8341A XTAL Leveling mode is selected to verify the HP 8341A's external leveling specification. Nine different dBV values, ranging from +6 dBV to −66 dBV, are selected and the voltage accuracy at the EXT INPUT is checked with a DVM.

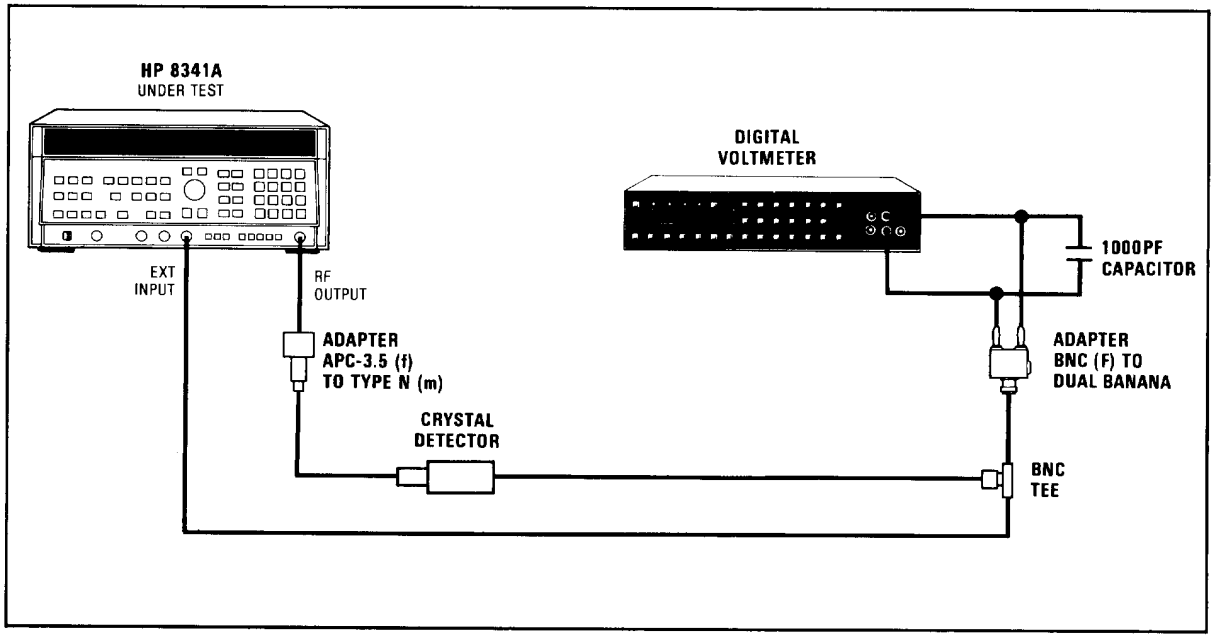


Figure 4-6. External Leveling Test Setup

4-18. POWER SWEEP TEST

Specification

Table 4-22. Power Sweep Test Specifications

Power Sweep

Range

Displayed: 0 to 40 dB/sweep

Actual: At least 10 dB at any given frequency (at least 20 dB in DECOUPLED mode; see Figure A below.)

Accuracy

Starting Power Level: Same as Output Power Accuracy

Power Sweep Width and Linearity: See Figure 2 in Table 1-1.

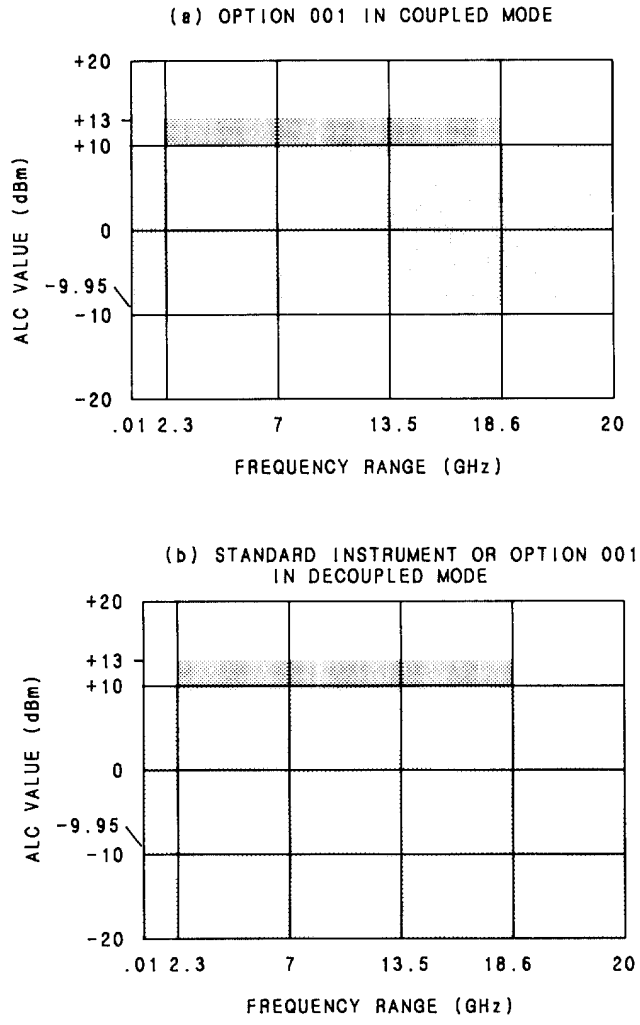


Figure A. Power Sweep Range

In instruments equipped with Option 001 (a), the ALC does not operate below −9.95 dBm unless the instrument is placed in the decoupled mode by pressing **[SHIFT] [PWR SWP]**, (see Figure 2 in Table 1-1), and so the maximum power sweep range is the difference of −9.95 dBm and the maximum leveled power available at the frequency of interest (specified leveled power shown in diagram). In the DECOUPLED mode (b), the power sweep range is extended because the ALC can operate down to −20 dBm.

4-18. POWER SWEEP TEST (Cont'd)

Description

The ALC in a standard HP 8341A will operate to −20 dBm. However, in normal operation the ALC in an HP 8341A Option 001 (front panel RF output with step attenuator) will only go down to −9.95 dBm, after which the ALC goes to 0 dBm and the step attenuator switches in 10 dB of attenuation. Instruments equipped with Option 004 (Rear Panel RF output with step attenuator) has this same feature. However, with this option the ALC power level will go down to about −12 dBm before it resets to 0 dBm, with the step attenuator switching in attenuation. This operating feature is called the COUPLED MODE (the ALC is **coupled** to the step attenuator). To disable this automatic feature place the instrument in the DECOUPLED mode by pressing **[SHIFT] [PWR SWP]** The ALC can now be controlled independently of the step attenuator by means of the front panel **DATA ENTRY** keyboard or RPG. The **STEP UP** and **STEP DOWN** keys control the step attenuator in this mode.

The HP 8341A is set to do a 20 dB power sweep from − 20 dBm to 0 dBm at a CW frequency (instruments equipped with Option 001 or 004 are placed in the DECOUPLED mode to allow this). The HP 8341A is set to do a manual sweep. The HP 8341A output power is measured at the two end points, −20 dBm and 0 dBm, using a power meter.

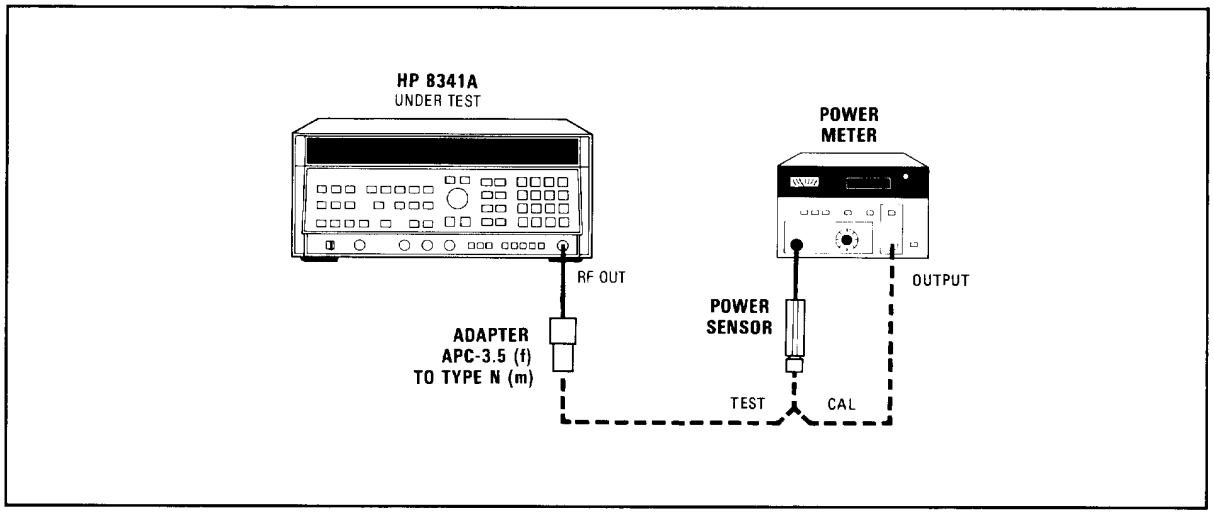


Figure 4-10. Power Sweep Test Setup

Equipment

Power Meter	HP 436A
Power Sensor	HP 8485A
Adapter (APC 3.5 female to Type N (m))	HP P/N 1250-1744

Procedure

1. Connect equipment as shown in Figure 4-10. Connect the HP 8485A Power Sensor to the Power Meter. Allow at least 30 minutes warm up time. Set the Power Meter's calibration factor switch to include 1 GHz, then zero and calibrate the Power Meter before connecting the Power Sensor to the HP 8341A.
2. Press HP 8341A **[INSTR PRESET]**. Press the **[CW]** key and enter **[1] [GHz]**.
3. Press **[SHIFT] [PWR SWP]** if necessary to set an HP 8341A Option 001 or 004 to allow the ALC and RF step attenuator to be independently controlled.

4-18. POWER SWEEP TEST (Cont'd)

NOTE

The step up and step down keys control the RF attenuator. The numeric key pad and rotary knob control the ALC power level.

4. Enter **[−] [2] [0] [dBm]** ALC power level to set the start of the power sweep at −20 dBM. Press **[PWR SWP]** and enter **[2] [1] [dBm]** to set the power sweep range to >20 dB (The maximum power sweep range is from −20 dBm to maximum power).

5. Press the **[MANUAL]** key. Turn the rotary knob counterclockwise to find the beginning of the power sweep (i.e., the power meter indication is at minimum and no longer changing). Record the power meter indication.

NOTE

The POWER dBm display will indicate the approximate output power during a very slow or manual sweep.

6. Rotate the rotary knob clockwise to find the end of the power sweep (i.e., the power meter indication is at maximum and no longer changing). Record the power meter indication.

7. The difference between the power meter indications recorded in step 5 and step 6 must be ≥20 dB.

8. Press the **[CW]** key and enter **[5] [GHz]**. Set the power meter's calibration factor switch to include this frequency. Repeat steps 5 through 7 at CW frequencies of 10, and 15 GHz.

4-19. PULSE MODULATION ON/OFF RATIO TEST
(Applies only to instruments equipped with Option 006, Pulse Modulation)

Specification

Table 4-23. Pulse Modulation ON/OFF Ratio Test Specifications

For CW mode and RF frequencies ≥400 MHz only:
On/Off Ratio: >80 dB

Description

The HP 8341A (Option 006)under test is set to a CW frequency at 0 dBm. The RF output level is viewed on a spectrum analyzer. A reference level is set on the spectrum analyzer display, the HP 8341A PULSE key is pressed (ON).

NOTE

The 50 ohm termination on the HP 8341A (Option 006) PULSE input simulates the RF OFF state when PULSE is selected (ON). In the test set-up below, 2 APC 3.5 (f) to Type N (m) adapters are used with SMA semi-rigid cable. This set-up is used instead of simply connecting the DUT to the HP 8566A/B with a Type N cable because Type N cables have much greater power loss.

The difference between the two spectrum analyzer displayed levels is the pulse ON/OFF ratio.

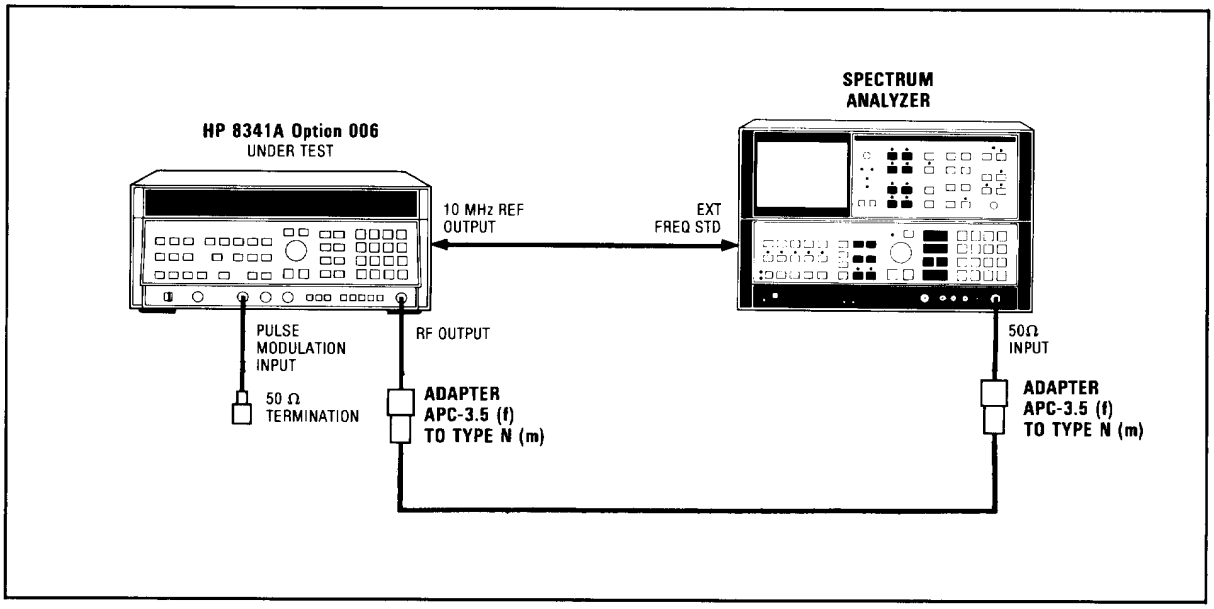


Figure 4-11. Pulse Modulation ON/OFF Ratio Test Setup

Equipment

Spectrum Analyzer	HP 8566A/B
50 Ohm Termination	HP 10100C
Cable SMA (m) to SMA (m)	HP P/N 08340-20124
Adapter	HP P/N 1250-1744
APC 3.5 (f) to Type N (m) (2 required)	

4-19. PULSE MODULATION ON/OFF RATIO TEST (Cont'd) (Applies only to instruments equipped with Option 006, Pulse Modulation)

Procedure

1. Connect equipment as shown in Figure 4-11. Allow at least 30 minutes warm up time.
2. Press HP 8341A **[INSTR PRESET]** then **[CW]** and enter **[1] [GHz]**. RF power level should be 0 dBm.
3. Set the spectrum analyzer CENTER FREQUENCY to equal the HP 8341A CW frequency, FREQUENCY SPAN 200 Hz, RES BW 30 Hz, PEAK SEARCH, MKR→CF, MKR→REF LVL, MKRΔ.
4. Press HP 8341A **[PULSE]** key (ON). The spectrum analyzer marker delta amplitude level should be greater than 80 dB.
5. Repeat steps 2 through 4 at CW frequencies of 3, 9, and 15 GHz.

NOTE

For further verification of the ON/OFF Ratio, steps 2 through 4 may be repeated for other frequencies of interest.

4-20. PULSE MODULATION RISE AND FALL TIME (Applies only to instruments equipped with Option 006, Pulse Modulation)

Specification

Table 4-24. Pulse Modulation Rise and Fall Time Test Specification

For CW mode and frequencies ≥400 MHz only:
Rise (T_R) and Fall (T_F) Times: <25 nanoseconds

Description

The HP 8341A (Option 006) under test RF output frequency is down converted to 50 MHz using a mixer and a second HP 8341A (or HP 8340A, Option 001) as a local oscillator. The 50 MHz IF signal is amplified and applied to an oscilloscope. The HP 8341A under test is pulsed using a pulse generator. The pulse generator output is also applied to the oscilloscope. The oscilloscope is used to measure the pulse envelope rise and fall times. Refer to Figure 4-12 Pulse Definitions.

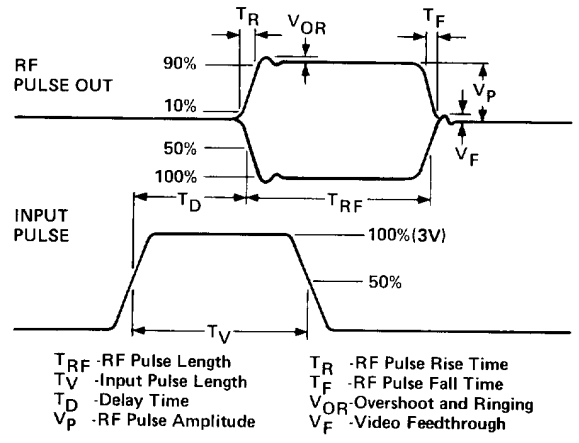


Figure 4-12. Pulse Definitions

Equipment

Local Oscillator	HP 8341A orHP 8340A Opt. 001
Pulse Generator	HP 8012B
Amplifier	HP 8447F
Oscilloscope	HP 1741A
Adapter APC 3.5 (f) to Type N (m)	HP P/N 1250-1744
Adapter SMA (m) to BNC (f)	HP P/N 1250-1200
Adapter APC 3.5 (m) to Type N (m) (For HP 8341A LO)	HP P/N 1250-1743
10 dB Attenuator	HP 8493C Opt. 010
Mixer	RHG DMS 1-26
Low Pass Filter (LPF)	HP P/N 08340-60176

Procedure

1. Connect equipment as shown in Figure 4-13. Connect the mixer directly to the local oscillator RF output to obtain maximum LO drive to the mixer. Connect the BNC tee directly to the HP 8341A PULSE IN connector. Allow at least 30 minutes warm up time.

4-20. PULSE MODULATION RISE AND FALL TIME (Cont'd)
(Applies only to instruments equipped with Option 006, Pulse Modulation)

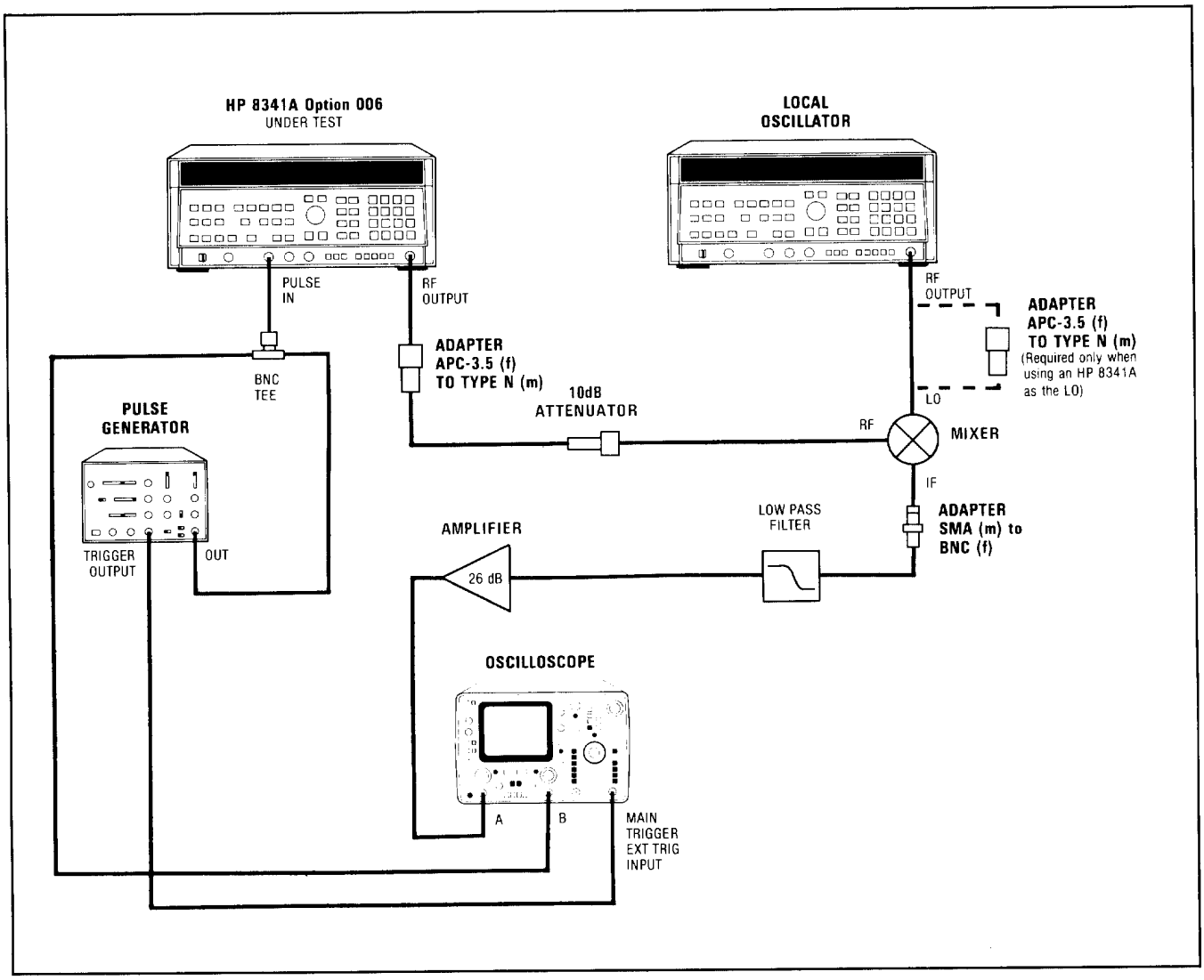


Figure 4-13. Pulse Modulation Rise and Fall Time Test Setup

2. Set up the HP 8012B Pulse Generator as follows:

OFFSET ..... OFF
POLARITY ..... +
OUTPUT ..... NORMAL
INT LOAD ..... IN
PULSE PERIOD slide switch 1μ–.1m
TRANSITION TIME slide switch ..... minimum (5n)
AMPLITUDE slide switch ..... top position (5.0)
PULSE DOUBLE/NORMAL ..... NORMAL
PULSE DELAY slide switch ..... minimum
Pulse Delay VERNIER ..... fully CCW
LEADING EDGE control ..... fully CCW
PULSE WIDTH slide switch 10n–1μ
TRAILING EDGE control ..... fully CCW

4-20. PULSE MODULATION RISE AND FALL TIME (Cont'd)
(Applies only to instruments equipped with Option 006, Pulse Modulation)

3. Set both oscilloscope channels A and B for 50 ohm input. Set the oscilloscope to view the pulse generator output waveform. Adjust the HP 8012B pulse width VERNIER for a 100 nanosecond pulse. Adjust the pulse period VERNIER for a 10 microsecond period. Adjust the amplitude VERNIER for about a 3V pulse amplitude (TTL level). Set the oscilloscope to trigger on this pulse (trigger on channel B)

4. Press **[INSTR PRESET]** on both the HP 8341A under test and the local oscillator HP 8341A. Press the HP 8341A under test **[CW]** key and enter **[1] [GHz]** and press the **[PULSE]** modulation key. Press the local oscillator HP 8341A **[CW]** key and enter **[.] [9] [5] [GHz]**. The IF frequency is then 50 MHz. Set the local oscillator HP 8341A for +10 dBm or maximum leveled output. The HP 8341A under test RF power should be 0 dBm.

NOTE

For best accuracy in this test, the Local Oscillator drive to the mixer should be ≥ +6 dBm. An HP 8340A Option 001 used as the LO will typically produce +10 dBm from 10 MHz to 20 GHz. An HP 8341A (Std) will produce +10 dBm over its entire frequency range.

5. Set the oscilloscope horizontal for 50 nanoseconds/division and select channel A input only. Adjust the channel A (pulsed IF input signal) vertical gain and position so that the pulse OFF is at the 0% graticule line and the pulse ON is at 100% graticule line. Select the horizontal MAG X10. The oscilloscope is now calibrated for 5 nanoseconds/division. Adjust the horizontal position control to position the modulation envelope so that the 10% point of the envelope rise time is at the center vertical graticule line similar to Figure 4-14.

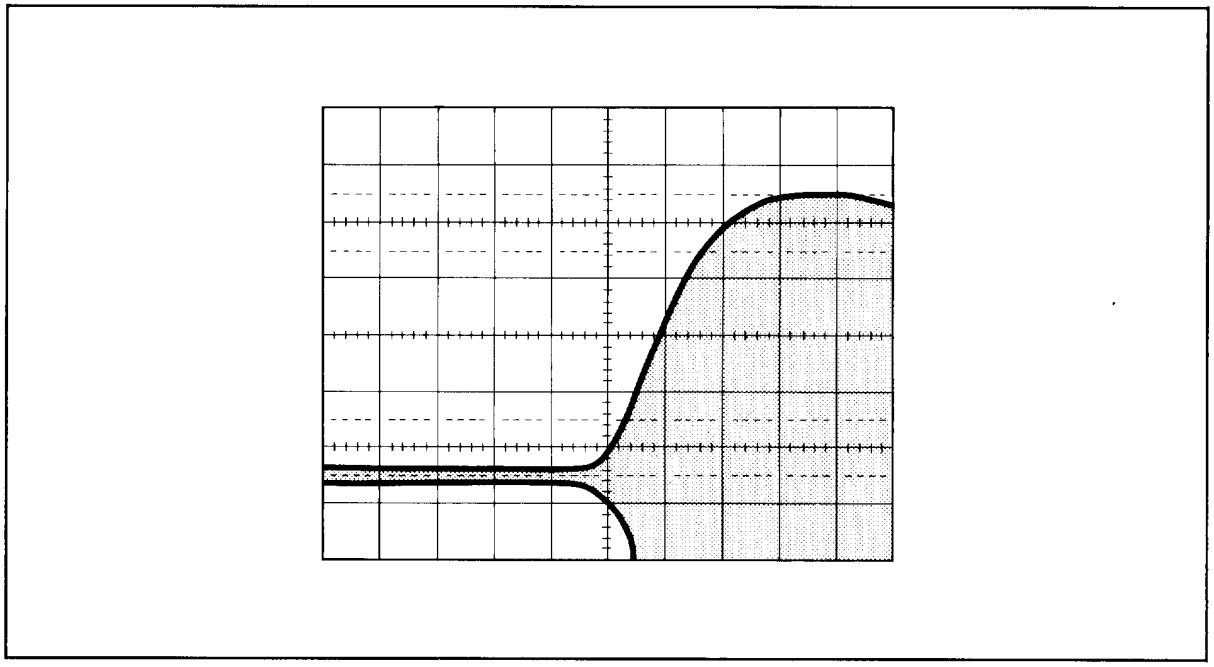


Figure 4-14. Pulse Modulation Rise Time Waveform

4-20. PULSE MODULATION RISE AND FALL TIME (Cont'd) (Applies only to instruments equipped with Option 006, Pulse Modulation)

6. The 90% point of the envelope rise time should be less than 25 nanoseconds (5 horizontal divisions) from the 10% point.

7. Adjust the oscilloscope horizontal position control to view the modulation envelope fall time. Position the waveform so that the modulation envelope crosses the 90% graticule at a verticle graticule line similar to Figure 4-15.

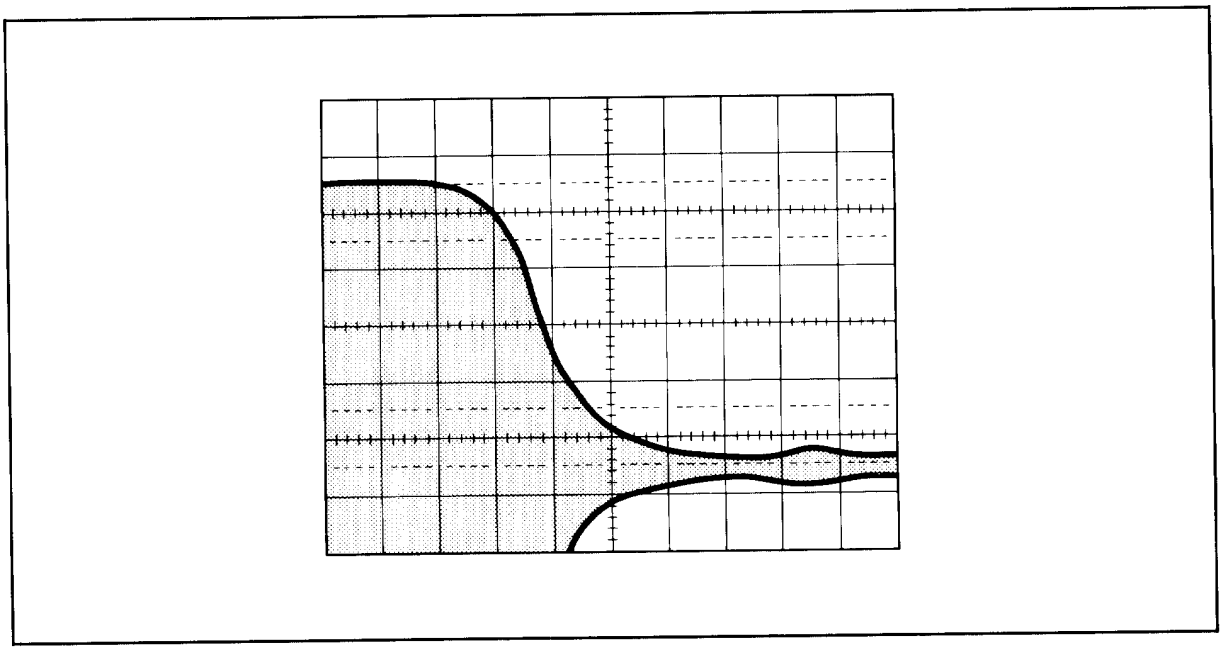


Figure 4-15. Pulse Modulation Fall Time Waveform.

8. The 10% point should be <25 nanoseconds (5 divisions) from the 90% point.

9. Repeat steps 5 through 8 at CW frequencies of 3, 9, and 15 GHz. Set the local oscillator HP 8341A CW frequency to be 50 MHz below the HP 8341A under test frequency.

4-21. PULSE MODULATION ACCURACY TEST
(Applies only to instruments equipped with Option 006, Pulse Modulation)

Specification

Table 4-25. Pulse Modulation Accuracy Test Specification

For CW mode and frequencies ≥400 MHz only:

Minimum Internally Leveled RF Pulse Width (TI, RFI): 100 nanoseconds

Pulse Repetition Frequency
Internally leveled: 100 Hz to 5 MHz

Accuracy of Internally Leveled RF Pulse VI, PI (relative to CW mode level):

NOTE

ALC attempts to hold pulse amplitude to same level as leveled CW signal.

Bands and Approximate Frequency Ranges (GHz) (see Frequency Ranges and Bandswitch Points for complete description)		
Pulse Width	**Band 0 0.4 to <2.3**	**Bands 1-3 2.3 to 20.0**
100 to <200 ns	+3/−0.3 dB*	+1.5/−0.3 dB*
200 to <500 ns	+1.5/−0.3 dB*	±0.3 dB
≥500 ns	±0.3 dB	±0.3 dB
* +15 to +55°C. Duty Cycle must be > 0.01%.		

Description

The HP 8341A (Option 006)under test RF output frequency is down converted to 50 MHz using a mixer and a second HP 8341A (or an HP 8340A, Option 001) as a local oscillator. The 50 MHz IF signal is amplified and applied to an oscilloscope. The HP 8341A under test is pulsed using a pulse generator. The IF modulation envelope is positioned to convenient horizontal graticule lines. The pulse is turned OFF and the HP 8341A output power level is adjusted so that the IF carrier is at the horizontal graticule lines established when the HP 8341A was being pulsed. The change in HP 8341A output power level is the accuracy error of the leveled RF pulse.

Equipment

Local Oscillator	HP 8341A orHP 8341A Opt. 001
Pulse Generator	HP 8012B
Amplifier	HP 8447F
Oscilloscope	HP 1741A
Adapter APC 3.5 (m) to Type N (m) (for HP 8341A LO)	HP P/N 1250-1743
Adapter APC 3.5 (f) to Type N (m)	HP P/N 1250-1744
Adapter SMA (m) to BNC (f)	HP P/N 1250-1200
10 dB Attenuator	HP 8493C Opt. 010
Mixer	RHG DMS 1-26
Low Pass Filter (LPF)	HP P/N 08340-60176

4-21. PULSE MODULATION ACCURACY TEST (Cont'd)
(Applies only to instruments equipped with Option 006, Pulse Modulation)

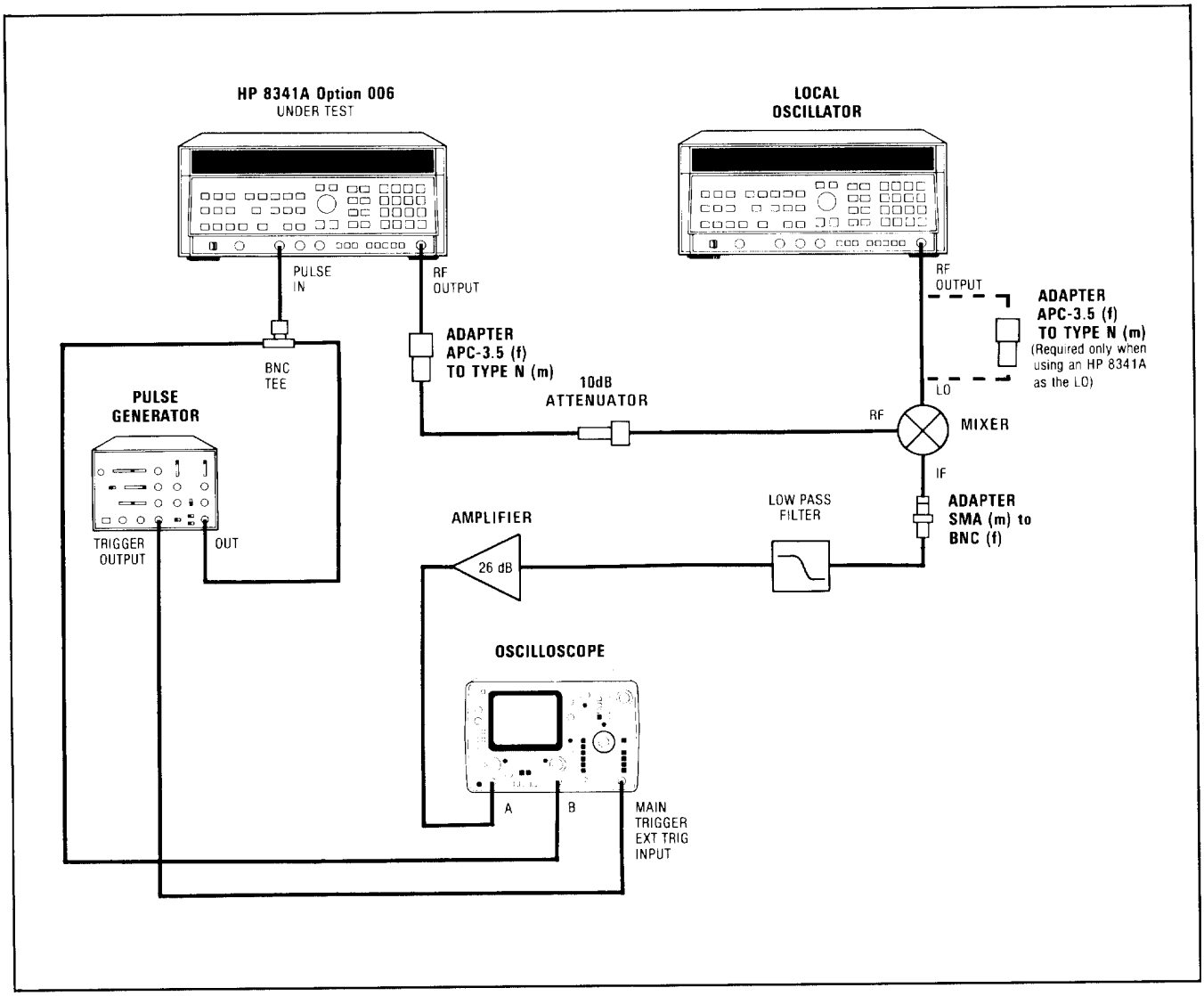


Figure 4-16. Pulse Modulation Accuracy Test Setup

Procedure

1. Connect equipment as shown in Figure 4-16. Connect the mixer directly to the LO HP 8341A RF output connector to obtain the maximum mixer LO input level. Connect the BNC tee directly to the HP 8341A PULSE IN connector. Allow at least 30 minutes warm up time.

4-21. PULSE MODULATION ACCURACY TEST (Cont'd)
(Applies only to instruments equipped with Option 006, Pulse Modulation)

2. Set up the HP 8012B Pulse Generator as follows:

PULSE PERIOD slide switch	1μ–.1m
TRANSITION TIME slide switch	minimum (5n)
AMPLITUDE slide switch	top position (5.0)
PULSE DOUBLE/NORMAL	NORMAL
PULSE DELAY slide switch	minimum
Pulse Delay VERNIER	fully CCW
LEADING EDGE control	fully CCW
PULSE WIDTH slide switch	10n-1μ
TRAILING EDGE control	fully CCW
OFFSET	OFF
POLARITY	+
OUTUT	NORMAL
INT LOAD	IN

3. Set both oscilloscope channels (A and B) for 50 Ohm input. Set the oscilloscope to view the pulse generator output waveform. Adjust the HP 8012B pulse width VERNIER for a 100 nanosecond pulse. Adjust the pulse period VERNIER for a 10 microsecond period. Adjust the amplitude VERNIER for about a 3V pulse amplitude (TTL level).

4. Press **[INSTR PRESET]** on both the HP 8341A under test and the local oscillator. Press the HP 8341A under test **[CW]** key and enter **[1] [GHz]**. Press **[POWER LEVEL]** and enter **[–] [1] [0] [dBm]**. Press the local oscillator **[CW]** key and enter **[.] [9] [5] [GHz]**. The IF frequency is then 50 MHz. Set the local oscillator for +10 dBm or maximum leveled output.

5. Set the oscilloscope horizontal for 50 nanoseconds/division and select channel A input only. Adjust the channel A (IF carrier input signal) vertical sensitivity to view the entire RF envelope.

NOTE

It may be necessary to reduce the vertical sensitivity and/or adjust the HP 8341A RF output level at some frequencies.

6. Press the **[PULSE]** key on the HP 8341A under test (pulse ON). Adjust the oscilloscope vertical position and sensitivity to place the modulation envelope on convenient horizontal graticule lines. Press the **[PULSE]** key to turn pulse OFF. Press the **[POWER LEVEL]** key on the HP 8341A under test. Note the power level in the **ENTRY DISPLAY**.

7. Adjust the HP 8341A under test power level using the rotary knob so that the IF carrier signal aligns with the horizontal graticule lines established in step 6 for the modulation envelope. Note the **ENTRY DISPLAY** power level.

8. The difference between the power levels noted in step 6 and 7 should be less than the specification for this pulse width and RF frequency.

9. Repeat steps 5 through 8 for pulse widths of 200, 500, and 1000 nanoseconds.

4-21. PULSE MODULATION ACCURACY TEST (Cont'd)
(Applies only to instruments equipped with Option 006, Pulse Modulation)

10. To test the Pulse Repetition Frequency range (100 Hz to 5 MHz), set the pulse generator period to 10 milliseconds (100 Hz) and pulse width to 1 microsecond (duty cycle of 0.01%). Repeat steps 5 through 8. Set the pulse generator period to 200 nanoseconds (5 MHz) and pulse width to 100 nanoseconds (minimum specified PW). Repeat steps 5 through 8.

11. Set the pulse generator period to 10 microseconds and pulse with to 100 nanoseconds. Repeat steps 5 through 10 at CW frequencies of 3, 9, and 15 GHz. Set the local oscillator CW frequency to be 50 MHz below the HP 8341A under test frequency. For the HP 8341A 15 GHz test frequency, press **[PEAK]** to ON.

4-22. PULSE MODULATION VIDEO FEEDTHROUGH TEST (Applies only to instruments equipped with Option 006, Pulse Modulation)

Specification

Table 4-26. Pulse Modulation Video Feedthrough Test Specification

For CW mode and frequencies ≥400 MHz only:
Video Feedthrough (V_F/V_P):
0.4 to <2.3 GHz (Band 0): <5% for output power levels ≤ +8 dBm)
2.3 to 20.0 GHz (Bands 1-3): ≤ 0.2%

Description

NOTE

Video feedthrough is any component of the pulse generator signal that appears at the HP 8341A RF output connector.

The HP 8341A (Option 006) under test is set to a CW frequency at 0 dBm. The HP 8341A is pulsed using a pulse generator. The pulsed RF output signal is fed through a 10 dB attenuator and a low pass filter that will pass only the low frequency (video feedthrough) component of the modulation envelope. The video feedthrough is measured using an oscilloscope. The measured voltage is related to the RF power by:

$$P = 10 \log (V^2/R/1 \text{ mW})$$

Where:

P = HP 8341A RF output level minus 10 dB, and

R = 50 Ohms.

Equipment

Pulse Generator	HP 8012B
Oscilloscope	HP 1741A
Adapter APC 3.5 (f) to Type N (m)	HP 1250-1744
Adapter SMA (m) to BNC (f)	HP P/N 1250-1200
10 dB Attenuator	HP 8493C Opt. 010
Low Pass Filter (LPF)	HP P/N 08340-60176

Procedure

1. Connect equipment as shown in Figure 4-17. Attach the BNC tee directly to the HP 8341A PULSE input connector. Allow at least 30 minutes warm up time.

4-22. PULSE MODULATION VIDEO FEEDTHROUGH TEST (Cont'd)
(Applies only to instruments equipped with Option 006, Pulse Modulation)

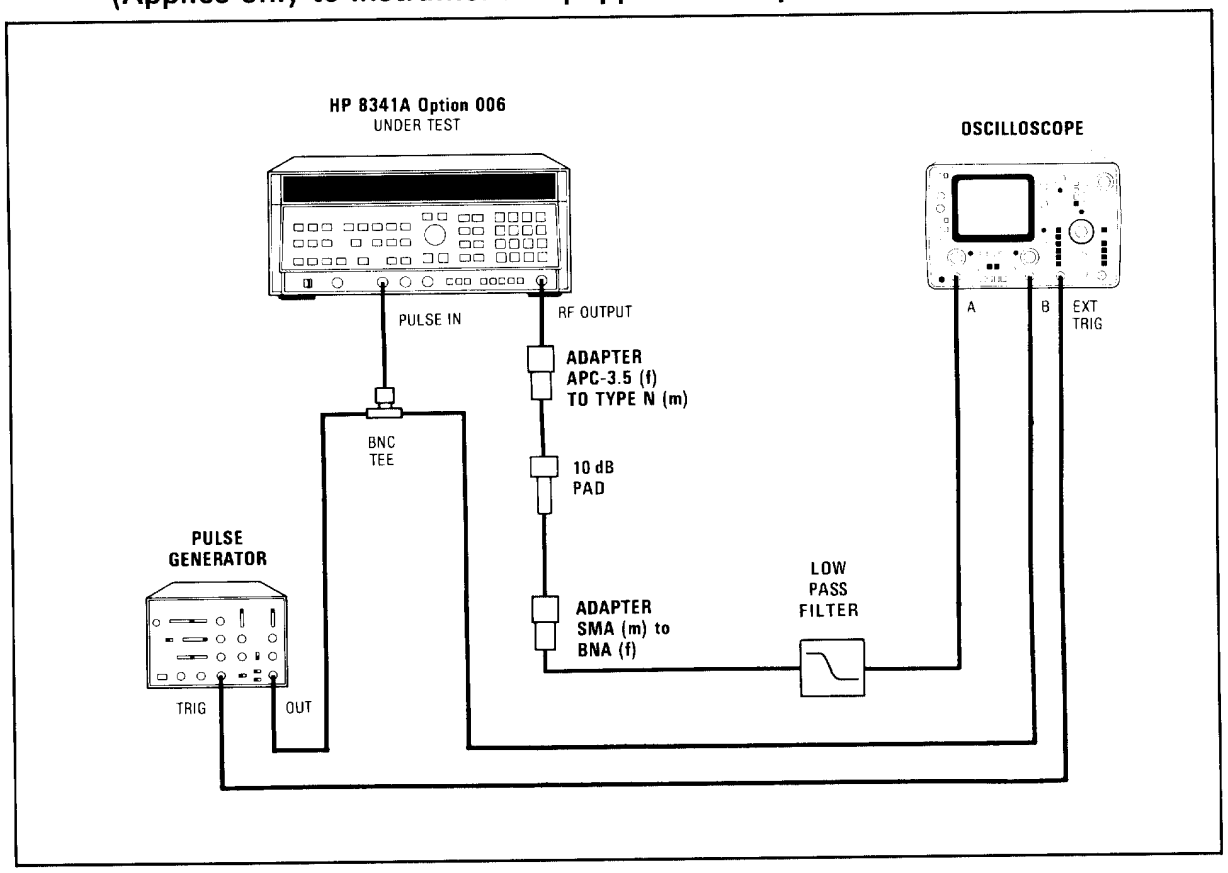


Figure 4-17. Pulse Modulation Video Feedthrough Test Setup

2. Set up the HP 8012B Pulse Generator as follows:

PULSE PERIOD slide switch	1μ–.1m
TRANSITION TIME slide switch	minimum (5n)
AMPLITUDE slide switch	top position (5.0)
PULSE DOUBLE/NORMAL	NORMAL
PULSE DELAY slide switch	minimum
Pulse Delay VERNIER fully	CCW
LEADING EDGE control	fully CCW
PULSE WIDTH slide switch	10n–1μ
TRAILING EDGE control	fully CCW
OFFSET	OFF
POLARITY	+
OUTPUT	NORMAL
INT LOAD	IN

3. Set both oscilloscope channels (A and B) to 50 Ohm input. Set the oscilloscope to view the pulse generator output waveform. Adjust the HP 8012B pulse width VERNIER for a 100 nanosecond pulse. Adjust the pulse period VERNIER for a 100 microsecond period. Adjust the amplitude VERNIER for about a 3V pulse amplitude (TTL level). Set the oscilloscope horizontal for 50 nanoseconds/division and select channel A input only.

4. Press **[INSTR PRESET]** on the HP 8341A under test. Press the HP 8341A **[CW]** key and enter **[.] [5] [GHz]**. Press the **[PULSE]** key (pulse ON).

5. Press the **[POWER LEVEL]** key enter the first power level, **[8] [dBm]**.

4-22. PULSE MODULATION VIDEO FEEDTHROUGH TEST (Cont'd)
(Applies only to instruments equipped with Option 006, Pulse Modulation)

6. Adjust the oscilloscope channel A vertical sensitivity and vertical position to view the video feedthrough signal similar to Figure 4-18.

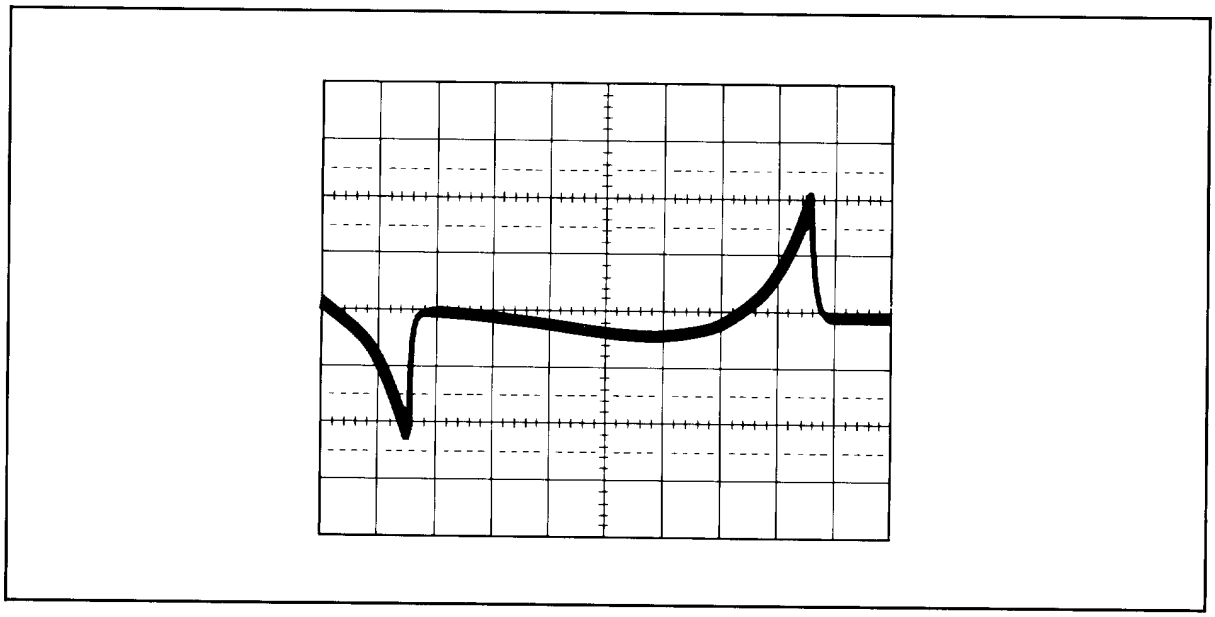


Figure 4-18. Pulse Modulation Video Feedthrough Waveform

7. The test limits for the three power levels are shown in Table 4-27. (Note that the test limit is 5% of Vpk.)

Table 4-27. Pulse Modulation Video Feedthrough Test Limits

HP 8341A RF Output Level (dBm)	P = (dBm)	Vpk	TEST LIMIT (pk voltage)
+8	−2	0.2511	12 mV
0	−10	0.0999	5 mV
−10	−20	0.03162	1.6 mV

The test limits are derived using the following equation:

$P = 10 \log (Vrms^2/R/1\ mW$

Where:

P = HP 8341A RF koutput level −10 dB, and,

R = 50 Ohms.

4-22. PULSE MODULATION VIDEO FEEDTHROUGH TEST (Cont'd) (Applies only to instruments equipped with Option 006, Pulse Modulation)

Example:

For HP 8341A set to 0 dBm the output of the 10 dB pad is − 10 dBm.

$P = 10 \log (Vrms^2/R/1\ mW)$

$-10 = 10 \log (Vrms^2/50/0.001)$ (divide through by 10)

$-1 = \log (Vrms^2/50/0.001)$ (take antilog of both sides)

$10^{-1} = 0.1 = (Vrms^2/50/0.001)$ (cross multiply)

$0.0001 = Vrms^2/50$ (cross multiply again)

$\sqrt{0.005} = Vrms = 0.0707$ rms

Test Limit = Vpk x 5% = 0.0707 x 1.414 x 5% = 5 mV

8. Repeat steps 6 and 7 for HP 8341A output power levels of 0 and − 10 dBm.

9. Repeat steps 5 through 8 at CW frequencies of 1, 1.5 and 2 GHz.

NOTE

For HP 8341A frequencies above 2.3 GHz the video feedthrough is typically so small that it is difficult to measure. The following steps provide a means to verify that the video feedthrough is negligible.

10. Remove the 10 dB pad between the HP 8341A Under Test and low pass filter. Press the HP 8341A **[CW]** key and enter any frequency from >2.3 GHz to 20 GHz. Press the **[POWER LEVEL]** key and enter **[−] [1] [0] [dBm]**.

11. Select the oscilloscope X5 vertical magnifier. The test limit is now 0.2 mV or 1 minor division on the oscilloscope.

12. Select several HP 8341A CW frequencies >2.3 GHz and verify that the video feedthrough is less than 1 minor division on the oscilloscope.

4-23. AMPLITUDE MODULATION TEST

Specification

Table 4-28. Amplitude Modulation Test Specifications

The following specifications apply when the HP 8341A is internally leveled, for waveforms whose envelope peak is at least 1 dB below maximum specified power. Unless noted, pulse modulation must be OFF; however, the HP 8341A (Option 006) is capable of simultaneous amplitude and pulse modulation. See Section III, Operation.

AM Depth: 0 to 90%

AM Sensitivity at 1 kHz rate and 30% depth: 100%/Volt ± 5%

AM Bandwidth relative to 1 kHz rate at 30% Depth:DC coupled, 3 dB point ≥ 100 kHz

AM Frequency Response (Flatness) Relative to a 1 kHz rate at 30% depth, DC to 10 kHz:
±0.20 dB

Description

AM sensitivity and accuracy is determined by simulating a modulation signal (i.e., setting the function generator to a dc voltage). The unmodulated HP 8341A RF output is measured using a power meter. A dc voltage representing ±30% modulation (±0.3 Vdc) is applied to the HP 8341A under test AM input. The power meter indication should change by:

20 log (1 + (dc voltage ± (0.05 times the dc voltage)))

The sensitivity and accuracy is tested at several HP 8341A CW frequencies.

The AM frequency response and bandwidth is measured by down converting the HP 8341A under test RF frequency to an IF frequency within the range of the modulation analyzer. The HP 8341A is amplitude modulated using a function generator. The modulation analyzer is set to indicate 0 dB at the reference modulation frequency of 1 kHz. The modulation frequency is varied and the flatness is indicated on the modulation analyzer. The modulating frequency is then set to the bandwidth specification (100 kHz) and the modulation analyzer should indicate > −3 dB. This shows that the actual 3 dB point will occur at a frequency >100 kHz.

Finally, the function generator output level is increased to obtain >90% modulation depth.

Equipment

Local Oscillator	HP 8341A or HP 8340A Opt. 001
Modulation Analyzer	HP 8901A
Function Generator	HP 3325A
Digital Voltmeter	HP 3455A
Amplifier	HP 8447F
Power Meter	HP 436A
Power Sensor	HP 8485A
Adapter APC 3.5 (f) to Type N (m)	HP P/N 1250-1744
Adapter APC 3.5 (m) to Type N (m) (for HP 8341A LO)	HP P/N 1250-1743
Adapter SMA (m) to BNC (f)	HP P/N 1250-1200
Adapter type N (m) to BNC (f)	HP P/N 1250-1476
20 dB Attenuator	HP 8493C Opt. 020
Mixer	RHG DMS 1-26

4-23. AMPLITUDE MODULATION TEST (Cont'd)

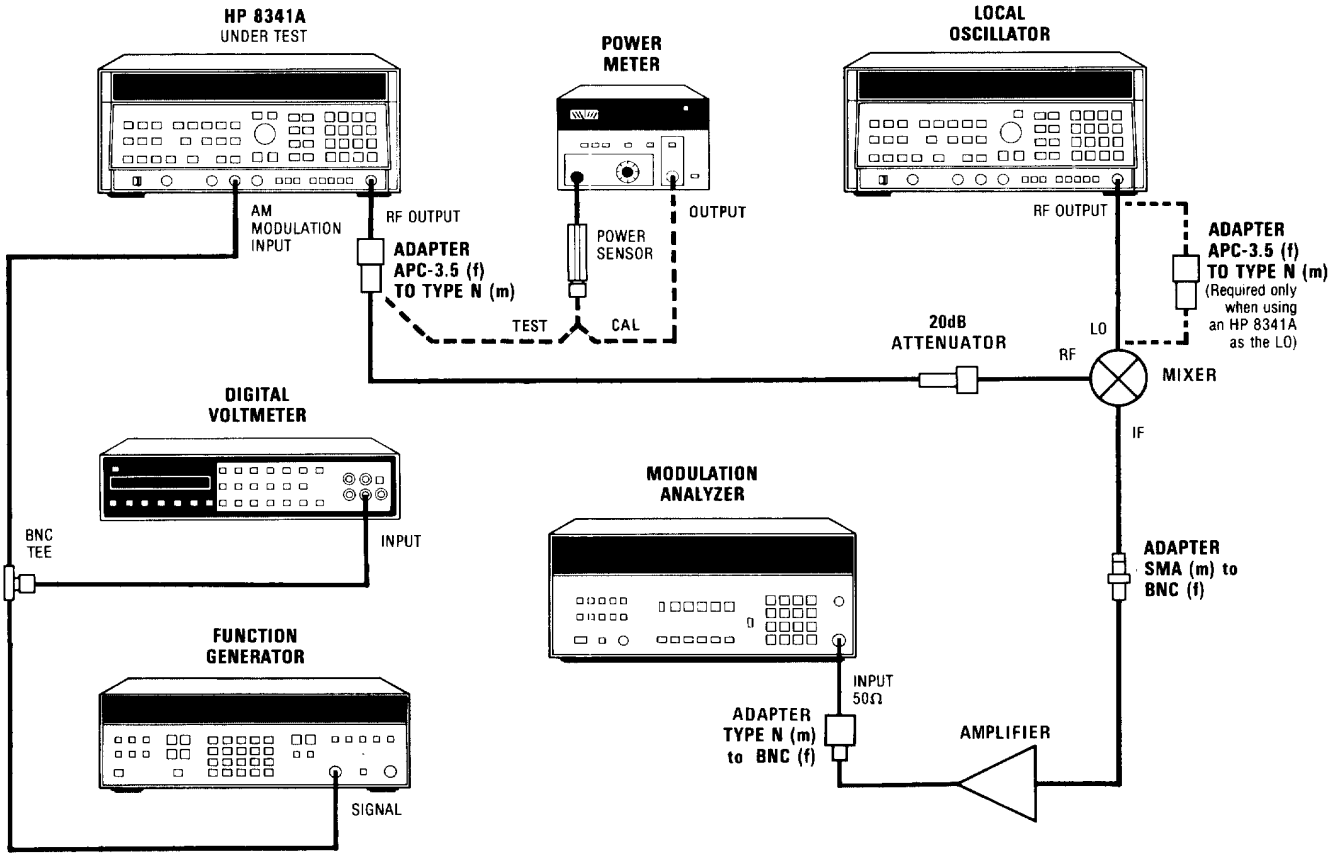


Figure 4-19. Amplitude Modulation Test Setup

Procedure

AM SENSITIVITY AND ACCURACY

1. Connect equipment as shown in Figure 4-19. Connect the mixer LO port at the local oscillator HP 8341A RF output. Connect the HP 8485A Power Sensor to the power meter. Allow at least 30 minutes warm up time. Set the power meter's calibration factor switch to include 1.5 GHz, then zero and calibrate the power meter. Connect the power sensor to the HP 8341A under test RF output.

2. Press HP 8341A under test **[INSTR PRESET]**. Press the **[CW]** key and enter **[1] [.] [5] [GHz]**. Press the **[POWER LEVEL]** key and enter **[−] [5] [dBm]**.

NOTE

The function generator output impedance is 50 Ohms and its output indication accuracy assumes a 50 Ohm load. The HP 8341A AM input impedance is 600 Ohms; therefore, a high impedance DVM is used to measure and set the function generator output level.

4-23. AMPLITUDE MODULATION TEST (Cont'd)

3. Zero the power meter as follows:

   With power applied to the sensor, press the power meter RANGE HOLD. Press the HP 8341A **[RF]** key to turn the RF OFF. Zero the power meter. Press the **[RF]** key to turn the RF ON.

4. Using the DVM as an indicator, set the function generator to output 0 Vdc (If the function generator being used does not have this feature, use a dc power supply). Press the HP 8341A under test **[AM]** key (AM ON). Note the power meter indication.

5. Simulate +30% modulation by setting the function generator output to +0.3 volts dc as indicated on the DVM. The power meter indication should increase by 2.18 to 2.38 dB from the value noted in step 4.

   20 log (1 + (0.3 − (0.05 times 0.3))) = 2.18 dB

   to

   20 log (1 + (0.3 + (0.05 times 0.3))) = 2.38 dB

6. Simulate −30% modulation by setting the function generator output to −0.3 volts dc as indicated on the DVM. The power meter should decrease by 2.91 to 3.29 dB from the value noted in step 4.

   20 log (1 + (−0.3 − (0.05 times −0.3))) = −2.91 dB

   to

   20 log (1 + (−0.3 + (0.05 times −0.3))) = −3.29 dB

NOTE

The HP 8341A test power levels are selected to avoid power meter range changes at the +30 and −30% modulation settings.

7. Press the HP 8341A under test **[POWER LEVEL]** key and enter **[+] [5] [dBm]**. Press the **[AM]** key to turn AM OFF. Repeat steps 3 through 6 for this HP 8341A power level setting.

8. Press the HP 8341A under test **[CW]** key and enter **[4] [.] [5] [GHz]**. Press the **[AM]** key to turn AM OFF. Set the power meter's calibration factor switch to include 4.5 GHz. Repeat steps 3 through 6 for HP 8341A power level settings of −5 and +5 dBm.

AM FREQUENCY RESPONSE AND BANDWIDTH

9. Disconnect the power sensor and connect the HP 8341A under test RF output to the 20 dB attenuator.

10. Press the HP 8341A under test **[CW]** key and enter **[1] [.] [5] [GHz]**. Press the **[POWER LEVEL]** key and enter **[0] [dBm]**. Press the local oscillator INSTR PRESET, CW and enter 1.45 GHz. Press POWER LEVEL, enter 10 dBm, and press PEAK (ON). (The output may be unleveled; this will not affect the test.) The IF frequency is now 50 MHz.

NOTE

For best accuracy in the Amplitude Modulation test, the Local Oscillator drive to the mixer should be ≥ +6 dBm. An HP 8340A Option 001 used as the LO will typically produce +10 dBm from 10 MHz to 20 GHz. An HP 8341A (std.) will produce +10 dBm over its entire frequency range.

4-23. AMPLITUDE MODULATION TEST (Cont'd)

11. Set the function generator for a sine wave at a reference frequency of 1 kHz at 0.2121 Vrms (0.3 times 0.707) ±0.05 Vrms. For example: 0.25 Vrms, as indicated on the DVM, would fall in this range. Set the modulation analyzer input frequency to 50 MHz (by pressing FREQ 50 MHz), then press AM and AVE on the HP 8901A. The modulation analyzer should indicate about 21%. Note the DVM indication.

12. Press the dB key. As the modulating frequency is changed the modulation analyzer will indicate the flatness in dB relative to the 1 kHz reference.

13. Set the function generator to 100, 200, 500 Hz, then 1, 2, 5, and 10 kHz. Check the DVM indication and adjust the level of the modulating signal at each frequency to eliminate any flatness error of the function generator. Observe the flatness indication on the modulation analyzer. The flatness indication should be ≤ ±0.20 dB.

14. Check the AM bandwidth by setting the function generator to 100 kHz. Adjust the function generator output level to the value noted in step 11. The modulation analyzer should indicate ≥ −3 dB.

AM DEPTH

15. Set the function generator to 1 kHz. Set the modulation analyzer to indicate percent modulation by setting the controls as follows:

AUTOMATIC OPERATION	ON
AM	ON
RATIO %	OFF
RATIO dB	OFF
PEAK	+

Increase the function generator output amplitude to obtain >90% modulation depth.

16. Repeat steps 11 through 15 at HP 8341A RF frequencies of 3, 9, and 15 GHz. Set the local oscillator HP 8341A CW frequency to be 50 MHz below the HP 8341A under test frequency.

4-24. HP 8341A HP-IB OPERATION VERIFICATION TEST

NOTE

This HP-IB test is an automated test; a Desktop Computer is required.

Two software listings are supplied. Table 4-30 gives a BASIC program listing for the HP 85F; Table 4-31 gives a BASIC program listing for the HP 9826A or HP 9836A.and 4-16. The test procedure applies to either test program used.

Description

The test program given in Table 4-30 is written to verify the HP 8341A HP-IB interface by writing to and reading from the HP 8341A. The program also displays the HP 8341A status bytes similar to the format shown in Table 4-29, HP 8341A Status Byte Descriptions. Upon running the program the status bits displayed will change initially as the program outputs an IP (INSTR PRESET), S2 (Single sweep), and two TS (Take Sweep) commands. After about two passes through the output loop (program lines 120 to 300 for the HP 85F, program lines 130 to 350 for the HP 9826A/9836A), the status bits should all be zero's and the HP 8341A should be in LOCAL mode. The procedure instructs the operator to press specific HP 8341A front panel keys and perform certain functions which should set specific bits of the status bytes. This procedure will test most of the bits in the two status bytes. However, if the HP 8341A is working properly, the status bit for the Fault Indicator On, the Oven Cold, and the Self Test Failed will not be tested for the set state. By pressing a controller soft key, the program will test the data bits by outputting a series of binary numbers to the HP 8341A and reading back each number that it outputs. If a bit is held HIGH or LOW, the number read will not agree with the number written and the program will display an error message. This procedure does not test all of the HP-IB control lines.

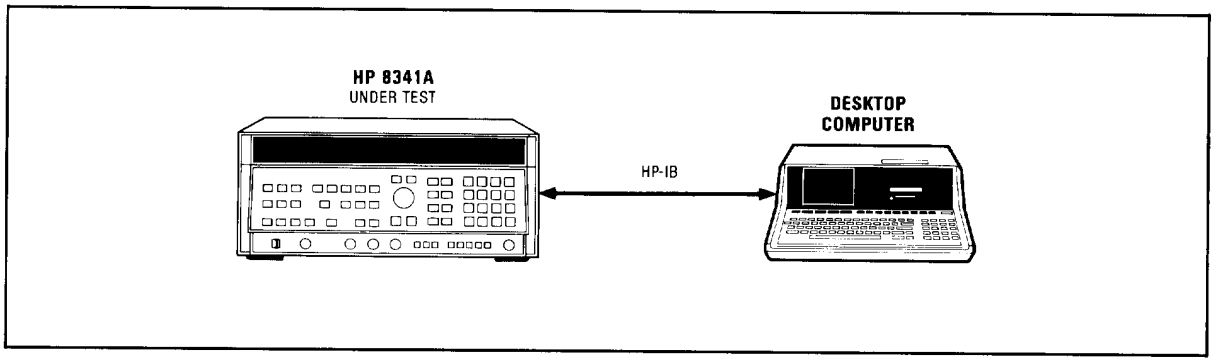


Figure 4-20. HP 8341A HP-IB Operation and Verification Test Setup

Equipment

Desktop Computer ..... HP 85F
(Includes HP 82937A HP-IB Interface and
I/O ROM HP P/N 00085-15002 and
HP 82936 ROM Drawer)
Plotter/Printer ROM ..... HP P/N 00085-15002

or

Desktop Computer ..... HP 9826A/9836A
(With BASIC language and 512K byte memory)

4-24. HP 8341A HP-IB OPERATION VERIFICATION TEST (Cont'd)

Procedure

1. Connect the equipment as shown in Figure 4-20. Enter the program shown in Table 4-30 if the HP 85F is used, or the program in Table 4-31 if the HP 9826A or 9836A is used. Press the RUN key. The program will display the HP 8341A status bytes similar to Table 4-29. After the program goes through the output loop routine about two times, all status bits should be "0" and the HP 8341A should be in LOCAL mode (front panel REMOTE indicator not ON).

2. Press the HP 8341A **[INSTR PRESET]** key. After going through the output loop about three times, status byte 1 decimal value should be 24 (bits 4 and 3 set).

NOTE

After pressing an HP 8341A front panel key, watch the displayed decimal value. When the decimal value changes, press the controller PAUSE key. Note the status bits that are set and press CONT.

3. Press the HP 8341A **[CW]** key. After the program goes through the output loop about three times all status bits should be "0"; however, status byte 1, bit 1, should have been set during one of the output loop passes. Enter **[1] [5] [GHz]** and the byte 1 status bits will change, but after about 2 passes all status bits should be "0".

4. Press the **[POWER LEVEL]** key and increase the HP 8341A output power level using the rotary knob until the UNLEVELED light comes on. Status byte 2 decimal value should be 64 (bit 6 set). Decrease the output power level until the UNLEVELED light goes out. All status bits should be "0".

5. Switch the HP 8341A rear panel FREQUENCY REFERENCE switch to EXT. Status byte 2 value should be 24 (bits 4 and 3 set). Return the switch to INT.

6. Press the controller softkey K1 (SYNTAX).

NOTE

There will be about a 6 second delay before the status bits change.

The program will output the character string "XYZ" to the HP 8341A. The HP 8341A should not recognize this string and should set status byte 1, bit 5 (SRQ on HP-IB Syntax Error).

7. Press the controller softkey K4 (DATA BIT). The program will test all data bits and display an error message if any bits fail the test, or if all bits pass the test, the program will display "ALL DATA BITS WORKING".

4-24. HP 8341A HP-IB OPERATION VERIFICATION TEST (Cont'd)

Table 4-29. HP 8341A Status Byte Description

STATUS BYTE (#1)								
BIT #	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
DECIMAL VALUE	**128**	**64**	**32**	**16**	**8**	**4**	**2**	**1**
FUNCTION	SRQ on New frequencies or Sweep Time in Effect	REQUEST SERVICE (RQS)	SRQ on HP-IB Syntax Error	SRQ on End of Sweep	SRQ on RF Settled	SRQ on Changed in Extended Status Byte	SRQ on Numeric Entry Completed (HP-IB or Front Panel)	SRQ on Any Front Panel Key Pressed
EXTENDED STATUS BYTE (#2)								
BIT #	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
DECIMAL VALUE	**128**	**64** (L)	**32** (L)	**16** (L)	**8**	**4**	**2**	**1** (L)
FUNCTION	Fault Indicator On	RF Unleveled	Power Failure	RF Unlocked	External Freq. Ref. Selected	Oven Cold	Over Modulation	Self Test Failed
(L) See Note 3								

Table 4-30. HP 8341A HP-IB Operation Verification Programming Listing (For Use With HP 85F)

```
10    ! 8340A HP-IB OPERATION VERIFICATION
20    !   VERIFICATION TEST
30    !
40    !       14 SEPT 82
50    !
60    I1=719
70    OUTPUT I1 ;"IP S2 TSTS"
80    !
90    ON KEY# 1,"SYNTAX" GOSUB 370
100   ON KEY# 4,"DATA BIT" GOSUB 400
110   LOCAL 7
120   OUTPUT I1 ;"OS"
130   DISP "8340A STATUS BYTE 1 AND 2"
140   DISP
150   DISP "BYTE -------BIT------------"
160   DISP " #  7  6  5  4  3  2  1  0 VALUE"
170   DISP "---------------------------------"
180   DISP
190   ENTER I1 USING "#,B" ; E,F
200   FOR I=1 TO 2
210   DISP I;
220   IF I=1 THEN N=E
230   IF I=2 THEN N=F
240   FOR J=7 TO 0 STEP -1
250   A=BIT(N,J)
260   DISP A;
270   NEXT J
280   DISP N
290   DISP
300   NEXT I
310   DISP USING "4/,A" ; " "
320   KEY LABEL
330   GOTO 120
340   !
350   !  Syntax Test
360   !
370   OUTPUT I1 ; "XYZ"
380   RETURN
390   !
400   ! Test Data Bits
410   !
420   CLEAR
430   DSP USNG "/,K" ; "    TEST DATA BITS"
440   FOR C=0 TO 7
450   B=2  C
460   OUTPUT I1 USING "K,B" , "TI",B
470   WAIT 100
480   ENTER I1 USING "#,B" , D
490   IF B#D THEN DISP "    DATA BIT";I;"NOT WORKING"
500   NEXT C
510   DISP "ALL DATA BITS WORKING"
520   DISP "PRESS CONT"
530   PAUSE
540   RETURN
550   END
```

Table 4-31. HP 8341A HP-IB Operation Verification Programming Listing (For use with HP 9826A or 9836A)

```
10      ! 8340A HP-IB OPERATION
20      !  VERIFICATION TEST
30      !
40      !    7 APRIL 83
50      !
60      I1=719
70      OUTPUT I1;"IP S2 TSTS"
80      !
90      OFF KEY
100     ON KEY 1 LABEL "SYNTAX" GOTO Syntax
110     ON KEY 4 LABEL "DATA BIT" GOTO Data_bit
120     LOCAL 7
130     OUTPUT 1;CHR$(12);
140     !
150 Read_status: !
160     OUTPUT I1;"OS"
170     !
180     PRINT TABXY(1,1);"8340A STATUS BYTE 1 AND 2"
190     PRINT
200     PRINT "BYTE ------BIT-----------"
210     PRINT " #  7 6 5 4 3 2 1 0   VALUE"
220     PRINT "-----------------------------------"
230     PRINT
240     ENTER I1 USING "#,B";E,F
250     FOR I=1 TO 2
260       PRINT I;
270       IF I=1 THEN N=E
280       IF I=2 THEN N=F
290       FOR J=7 TO 0 STEP -1
300         A=BIT(N,J)
310         PRINT A;
320       NEXT J
330       PRINT USING "X,5D";N
340       PRINT
350     NEXT I
360     BEEP 200,.01
370     GOTO Read_status
380     !
390 Syntax: !
400     !
410     OUTPUT I1;"XYZ"
420     GOTO Read_status
430     !
440 Data_bit:!
450     !
460     OUTPUT 1;CHR$(12); ! Clear screen
470     DISP USING "/,K";"    TEST DATA BITS"
480     FOR C=0 TO 7
490       B=2^C
500       OUTPUT I1 USING "K,B";"TI",B
510       WAIT .1
520       ENTER I1 USING "#,B";D
530       IF B-D<1 THEN GOTO 550
540       IF B<>D THEN DISP "    DATA BIT ";I;" NOT WORKING"
550     NEXT C
560     !
570     PRINT "ALL DATA BITS WORKING"
580     DISP "PRESS CONTINUE"
590     PAUSE
600     DISP
610     GOTO Read_status
620     END
```

Table 4-32. HP 8341A Test Record Card (1 of 25)

Hewlett-Packard 8341A
Synthesized Sweeper

Date: _____

Serial Number: _____ **Tested By:** _____

Temperature: _____ **Humidity:** _____
(as required) **(as required)**

SPECIFICATIONS TESTED Limits	Step	TEST Conditions	Lower Limit	Measured Value	Upper Limit
4-9. Internal Time Base Aging Rate					
T_1 = Time for 360 degree phase change	3			_____ seconds	
T_2 = Time between T_1 and T_3	4			_____ hours	
T_3 = Time for 360 degree phase change	5			_____ seconds	
Calculated Aging Rate				_____ per day	

Table 4-32. HP 8341A Test Record Card (2 of 25)

SPECIFICATIONS TESTED Limits	Step	TEST Conditions	Lower Limit	Measured Value	Upper Limit
4-10. Frequency Range and CW Mode Accuracy					
Frequency Range Check					
10 MHz	2	Freq. ±1 Hz ± Counter Resolution		_____ MHz	
20 GHz	3	Freq. ±3 Hz ± Counter Resolution		_____ GHz	
M/N Divider Check	4b				
(M Divider)		Freq. ±1 Hz ± Counter Resolution			
M = 8 N = 13		2490 MHz		_____ MHz	
9		2480 MHz		_____ MHz	
10		2470 MHz		_____ MHz	
11		2460 MHz		_____ MHz	
12		2450 MHz		_____ MHz	
13		2440 MHz		_____ MHz	
14		2430 MHz		_____ MHz	
15		2420 MHz		_____ MHz	
16		2410 MHz		_____ MHz	
17		2400 MHz		_____ MHz	
18		2390 MHz		_____ MHz	
19		2380 MHz		_____ MHz	
20		2370 MHz		_____ MHz	
21		2360 MHz		_____ MHz	
22		2350 MHz		_____ MHz	
23		2340 MHz		_____ MHz	
24		2330 MHz		_____ MHz	
25		2320 MHz		_____ MHz	
26		2310 MHz		_____ MHz	
27		2300 MHz		_____ MHz	

Table 4-32. HP 8341A Test Record Card (3 of 25)

SPECIFICATIONS TESTED Limits	Step	TEST Conditions	Lower Limit	Measured Value	Upper Limit
4-10. Frequency Range and CW Mode Accuracy (cont'd)					
M/N Divider Check (N Divider)	56	Freq. ±1 Hz ± Counter Resolution			
M = 27 N = 13		2300 MHz		_____ MHz	
14		2500 MHz		_____ MHz	
15		2700 MHz		_____ MHz	
16		2900 MHz		_____ MHz	
17		3100 MHz		_____ MHz	
18		3300 MHz		_____ MHz	
19		3500 MHz		_____ MHz	
20		3700 MHz		_____ MHz	
21		3900 MHz		_____ MHz	
22		4100 MHz		_____ MHz	
23		4300 MHz		_____ MHz	
24		4500 MHz		_____ MHz	
25		4700 MHz		_____ MHz	
26		4900 MHz		_____ MHz	
27		5100 MHz		_____ MHz	
28		5300 MHz		_____ MHz	
29		5500 MHz		_____ MHz	
30		5700 MHz		_____ MHz	
31		5900 MHz		_____ MHz	
32		6100 MHz		_____ MHz	
33		6300 MHz		_____ MHz	
34		6500 MHz		_____ MHz	
35		6700 MHz		_____ MHz	
36		6900 MHz		_____ MHz	

Table 4-32. HP 8341A Test Record Card (4 of 25)

SPECIFICATIONS TESTED Limits	Step	TEST Conditions	Lower Limit	Measured Value	Upper Limit
4-10. Frequency Range and CW Mode Accuracy (cont'd)					
20-30 Loop Check (N2 Divider)					
HP 8341A ENTRY DISPLAY CF Frequency:		HP 8341A START Frequency Freq. ±1 Hz ± Counter Resolution			
2.310500 GHz	6b	2.310000 GHz		_____ GHz	
2.310501	6c	2.310001		_____ GHz	
2.310502		2.310002		_____ GHz	
2.310503		2.310003		_____ GHz	
2.310504		2.310004		_____ GHz	
2.310505		2.310005		_____ GHz	
2.310506		2.310006		_____ GHz	
2.310507		2.310007		_____ GHz	
2.310508		2.310008		_____ GHz	
2.310509		2.310009		_____ GHz	
2.310510		2.310010		_____ GHz	
2.310510	6d	2.310010		_____ GHz	
2.310520	6e	2.310020		_____ GHz	
2.310530		2.310030		_____ GHz	
2.310540		2.310040		_____ GHz	
2.310550		2.310050		_____ GHz	
2.310560		2.310060		_____ GHz	
2.310570		2.310070		_____ GHz	
2.310580		2.310080		_____ GHz	
2.310590		2.310090		_____ GHz	
2.310600		2.310100		_____ GHz	
2.310600	6f	2.310100		_____ GHz	
2.310700	6g	2.310200		_____ GHz	
2.310800		2.310300		_____ GHz	
2.310900		2.310400		_____ GHz	
2.311000		2.310500		_____ GHz	
2.311100		2.310600		_____ GHz	
2.311200		2.310700		_____ GHz	
2.311300		2.310800		_____ GHz	
2.311400		2.310900		_____ GHz	
2.311500		2.311000		_____ GHz	
2.311500	6h	2.311000		_____ GHz	
2.312500	6i	2.312000		_____ GHz	
2.313500		2.313000		_____ GHz	
2.314500		2.314000		_____ GHz	
2.315500		2.315000		_____ GHz	
2.316500		2.316000		_____ GHz	
2.317500		2.317000		_____ GHz	
2.318500		2.318000		_____ GHz	
2.319500		2.319000		_____ GHz	
2.320500		2.320000		_____ GHz	

Table 4-32. HP 8341A Test Record Card (5 of 25)

SPECIFICATIONS TESTED Limits	Step	TEST Conditions	Lower Limit	Measured Value	Upper Limit
4-10. Frequency Range and CW Mode Accuracy (cont'd)					
20-30 Loop Check (N1 Divider)					
HP 8341A ENTRY DISPLAY	7a	Frequency Counter Indicator			
CW Frequency:	7c	Freq. ±1 Hz ± Counter Resolution		_____ MHz	
2319.97 MHz	7d			_____ MHz	
2319.96	7e			_____ MHz	
2319.95				_____ MHz	
2319.94				_____ MHz	
2319.93				_____ MHz	
2319.92				_____ GHz	
2319.91				_____ MHz	
2319.90				_____ MHz	
2319.89				_____ MHz	
2319.88				_____ MHz	
2319.87				_____ MHz	
2319.87				_____ MHz	
2319.77				_____ MHz	
2319.67				_____ MHz	
2319.57				_____ MHz	
2319.47				_____ MHz	
2319.37				_____ MHz	
2319.27				_____ MHz	
2319.17				_____ MHz	
2319.07					
2318.97					
2318.97	7f			_____ MHz	
2317.97	7g			_____ MHz	
2316.97				_____ MHz	
2315.97				_____ MHz	
2314.97				_____ MHz	
2313.97				_____ MHz	
2312.97				_____ MHz	
2311.97				_____ MHz	
2310.97				_____ MHz	

Table 4-32. HP 8341A Test Record Card (6 of 25)

SPECIFICATIONS TESTED Limits	Step	TEST Conditions	Lower Limit	Measured Value	Upper Limit
4-11. Sweep Time Accuracy					
10 milliseconds	4		9.5 msec	_____ msec	10.5 msec
100 milliseconds			9.5 msec	_____ msec	105 msec
1 second			0.95 sec	_____ sec	1.05 sec
10 seconds			9.5 sec	_____ sec	10.5 sec
50 seconds			47.5 sec	_____ sec	52.5 sec

Table 4-32. HP 8341A Test Record Card (7 of 25)

SPECIFICATIONS TESTED Limits		Step	TEST Conditions		Lower Limit	Measured Value	Upper Limit
4-12. Swept Frequency Accuracy 20% of Band Accuracy		8					
HP 8341A Start Freq. (GHz)	**HP 8341A Stop Freq. (GHz)**		**20% of Band**	**Test Limit (KHz)**	**Spectrum Analyzer Center Freq. (GHz)**	**Spectrum Analyzer Center Freq. (GHz)**	**Spectrum Analyzer Center Freq. (GHz)**
2.3	2.300099		2.3000198	±0.99	2.30001881	_____	2.30002079
2.3	2.300101		2.3000202	±1.01	2.30001919	_____	2.30002121
2.3	2.300499		2.3000998	±4.99	2.30009481	_____	2.30010479
2.3	2.300501		2.3001002	±5.01	2.30009519	_____	2.30010521
2.3	2.30499		2.300998	±49.9	2.3009481	_____	2.3010479
2.3	2.30501		2.301002	±100.02	2.30090198	_____	2.30110202
2.3	2.31		2.302	±200	2.3018	_____	2.3022
2.3	2.32		2.304	±400	2.3036	_____	2.3044
2.3	2.33		2.306	±600	2.3054	_____	2.3066
2.3	2.34		2.308	±800	2.3072	_____	2.3088
2.3	2.349		2.3098	±998	2.308802	_____	2.310798
2.3	2.3501		2.31002	±1020	2.309	_____	2.31104
2.3	2.36		2.312	±1200	2.3108	_____	2.3132
2.3	2.37		2.314	±1400	2.3126	_____	2.3154
2.3	2.38		2.316	±1600	2.3144	_____	2.3176
2.3	2.39		2.318	±1800	2.3162	_____	2.3198
2.3	2.3999		2.31998	±1980	2.318	_____	2.32196
2.3	2.4001		2.32002	±1001	2.319019	_____	2.31021
2.3	2.799		2.3998	±4990	2.39481	_____	2.40479
2.3	2.801		2.4002	±5010	2.39519	_____	2.40521
2.3	7.29		3.298	±49900	3.2481	_____	3.3479
2.3	7.31		3.302	±50000	3.252	_____	3.352
2.3	8.3		3.500	±50000	3.45	_____	3.55
2.3	16.452		5.1304	±50000	5.0804	_____	5.1804
2.3	20.0		5.84	±50000	5.79	_____	5.89

Table 4-32. HP 8341A Test Record Card (8 of 25)

SPECIFICATIONS TESTED Limits		Step	TEST Conditions		Lower Limit	Measured Value	Upper Limit
4-12. Swept Frequency Accuracy (cont'd) 50% of Band Accuracy		8					
HP 8341A Start Freq. (GHz)	**HP 8341A Stop Freq. (GHz)**		**50% Band**	**Test Limit (KHz)**	**Spectrum Analyzer Center Freq. (GHz)**	**Spectrum Analyzer Center Freq. (GHz)**	**Spectrum Analyzer Center Freq. (GHz)**
2.3	2.300099		2.3000495	±0.99	2.30004851	_____	2.30005049
2.3	2.300101		2.3000505	±1.01	2.30004949	_____	2.30005151
2.3	2.300499		2.3002495	±4.99	2.30024451	_____	2.30025449
2.3	2.300501		2.3002505	±5.01	2.30024549	_____	2.30025551
2.3	2.30499		2.302495	±49.9	2.3024451	_____	2.3025449
2.3	2.30501		2.302505	±100.02	2.30240498	_____	2.30260502
2.3	2.31		2.305	±200	2.3048	_____	2.3052
2.3	2.32		2.310	±400	2.3096	_____	2.3104
2.3	2.33		2.315	±600	2.3144	_____	2.3156
2.3	2.34		2.320	±800	2.3192	_____	2.3208
2.3	2.349		2.3245	±998	2.323502	_____	2.325498
2.3	2.3501		2.32505	±1020	2.32403	_____	2.32607
2.3	2.36		2.33	±1200	2.3288	_____	2.3312
2.3	2.37		2.335	±1400	2.3336	_____	2.3364
2.3	2.38		2.34	±1600	2.3384	_____	2.3416
2.3	2.39		2.345	±1800	2.3432	_____	2.3468
2.3	2.3999		2.34995	±1980	2.34797	_____	2.35193
2.3	2.4001		2.35005	±1001	2.349049	_____	2.351051
2.3	2.799		2.5495	±4990	2.54451	_____	2.55449
2.3	2.801		2.5505	±5010	2.54549	_____	2.55551
2.3	7.29		4.795	±49900	4.7451	_____	4.8449
2.3	7.31		4.805	±50000	4.755	_____	4.855
2.3	8.3		5.300	±50000	5.250	_____	5.350
2.3	16.452		9.376	±50000	9.326	_____	9.426
2.3	20.0		11.15	±50000	11.10	_____	11.202

Table 4-32. HP 8341A Test Record Card (9 of 25)

SPECIFICATIONS TESTED Limits		Step	TEST Conditions		Lower Limit	Measured Value	Upper Limit
4-12. Swept Frequency Accuracy (cont'd)							
80% of Band Accuracy		8					
HP 8341A Start Freq. (GHz)	**HP 8341A Stop Freq. (GHz)**		**80% of Band**	**Test Limit (KHz)**	**Spectrum Analyzer Center Freq. (GHz)**	**Spectrum Analyzer Center Freq. (GHz)**	**Spectrum Analyzer Center Freq. (GHz)**
				±0.99			
2.3	2.300099		2.3000792	±1.01	2.30007821	_____	2.30008019
2.3	2.300101		2.3000808	±4.99	2.30007979	_____	2.30008181
2.3	2.300499		2.3003992	±5.01	2.30039421	_____	2.30040419
2.3	2.300501		2.3004008	±49.9	2.30039579	_____	2.30040581
2.3	2.30499		2.303992	±100.02	2.3039421	_____	2.3040419
2.3	2.30501		2.304008	±200	2.30390798	_____	2.30410802
2.3	2.31		2.308	±400	2.3078	_____	2.3082
2.3	2.32		2.316	±600	2.3156	_____	2.3164
2.3	2.33		2.324	±800	2.3234	_____	2.3246
2.3	2.34		2.332	±998	2.3312	_____	2.3328
2.3	2.349		2.3392	±1020	2.338202	_____	2.340198
2.3	2.3501		2.34008	±1200	2.33906	_____	2.3411
2.3	2.36		2.348	±1400	2.3468	_____	2.3492
2.3	2.37		2.356	±1600	2.3546	_____	2.3574
2.3	2.38		2.364	±1800	2.3624	_____	2.3656
2.3	2.39		2.372	±1980	2.3702	_____	2.3738
2.3	2.3999		2.37992	±1001	2.37794	_____	2.3819
2.3	2.4001		2.38008	±4990	2.379079	_____	2.381081
2.3	2.799		2.6992	±5010	2.69421	_____	2.70419
2.3	2.801		2.7008	±49900	2.69579	_____	2.70581
2.3	7.29		6.292	±50000	6.2421	_____	6.3419
2.3	7.31		6.308	±50000	6.258	_____	6.358
2.3	8.3		7.1	±50000	7.05	_____	7.15
2.3	16.452		13.6216	±50000	13.5716	_____	13.6716
2.3	20.0		16.46	±50000	16.41	_____	16.51

Table 4-32. HP 8341A Test Record Card (10 of 25)

SPECIFICATIONS TESTED Limits	Step	TEST Conditions	Lower Limit	Measured Value	Upper Limit
4-13. Maximum Leveled Output Power and Power Accuracy					
Maximum Leveled Power Band 0					
ENTRY DISPLAY Power Indication	3	Continuous Sweep, Auto Sweep Time		_____ dBm	
	4	Single Sweep, Auto Sweep Time		_____ dBm	
	5	Single Sweep, 2 Second Sweep Time		_____ dBm	
Lowest power level recorded in step 3, 4, or 5	6			_____ dBm	
Minimum Power Frequency		M2 Frequency		_____ GHz	
Power Meter Indication	7	Standard Instrument (F.P. Out No Atten.)	+10 dBm	_____ dBm	
		Option 001 (F.P. Out With Atten.)	+10 dBm (+10 dBm)[1]	_____ dBm	
		Option 002 (High Power, 2.3 to 18.6 GHz)	+10 dBm	_____ dBm	
		Option 004 (R.P. Out With Atten.)	+10 dBm (+10 dBm)[1]	_____ dBm	
		Option 005 (R.P. Out No Atten.)	+10 dBm (+10 dBm)[1]	_____ dBm	
Maximum Leveled Power Band 1					
ENTRY DISPLAY Power Indication	3	Continuous Sweep, Auto Sweep Time		_____ dBm	
	4	Single Sweep, auto Sweep Time		_____ dBm	
	5	Single Sweep, 2 Second Sweep Time		_____ dBm	
Lowest power level recorded in step 3, 4, or 5	6			_____ dBm	
Minimum Power Frequency		M2 Frequency		_____ GHz	
Power Meter Indication	7	Standard Instrument (F.P. Out No Atten.)	+10 dBm	_____ dBm	
		Option 001 (F.P. Out With Atten.)	+9 dBm (+12 dBm)[1]	_____ dBm	
		Option 002 (High Power, 2.3 to 18.6 GHz)	+13 dBm	_____ dBm	
		Option 004 (R.P. Out with atten.)	+9 dBm (+11 dBm)[1]	_____ dBm	
		Option 005 (R.P. Out No Atten.)	+10 dBm (+12 dBm)[1]	_____ dBm	

[1] With Option 002, High Power, 2.3 to 18.6 GHz.

Table 4-32. HP 8341A Test Record Card (11 of 25)

SPECIFICATIONS TESTED Limits	Step	TEST Conditions	Lower Limit	Measured Value	Upper Limit
4-13. Maximum Leveled Output Power and Power Accuracy (cont'd)					
Maximum Leveled Power Band 2					
ENTRY DISPLAY Power Indication	3	Continuous Sweep, Auto Sweep Time		_____ dBm	
	4	Single Sweep, Auto Sweep Time		_____ dBm	
	5	Single Sweep, 2 Second Sweep Time		_____ dBm	
Lowest power level recorded in step 3, 4, or 5	6			_____ dBm	
Minimum Power Frequency		M2 Frequency		_____ GHz	
Power Meter Indication	7	Standard Instrument (F.P. Out No Atten.)	+10 dBm	_____ dBm	
		Option 001 (F.P. Out With Atten.)	+8 dBm (+11 dBm)[1]	_____ dBm	
		Option 002 (High Power, 2.3 to 18.6 GHz)	+13 dBm	_____ dBm	
		Option 004 (R.P. Out With Atten.)	+8 dBm (+10 dBm)[1]	_____ dBm	
		Option 005 (R.P. Out No Atten.)	+10 dBm (+12 dBm)[1]	_____ dBm	
Maximum Leveled Power Band 3 (13.5-18.6 GHz)					
ENTRY DISPLAY Power Indication	3	Continuous Sweep, Auto Sweep Time		_____ dBm	
	4	Single Sweep, Auto Sweep Time		_____ dBm	
	5	Single Sweep, 2 Second Sweep Time		_____ dBm	
Lowest Power Level recorded in step 3, 4, or 5	6			_____ dBm	
Minimum Power Frequency		M2 Frequency		_____ GHz	
Power Meter Indication	7	Standard Instrument (F.P. Out No Atten.)	+10 dBm	_____ dBm	
		Option 001 (F.P. Out With Atten.)	+8 dBm (+11 dBm)[1]	_____ dBm	
		Option 002 (High Power, 2.3 to 18.6 GHz)	+13 dBm	_____ dBm	
		Option 004 (R.P. Out With Atten.)	+7 dBm (+10 dBm)[1]	_____ dBm	
		Option 005 (R.P. Out No Atten.)	+9 dBm (+12 dBm)[1]	_____ dBm	

[1] With Option 002, High Power, 2.3 to 18.6 GHz.

Table 4-32. HP 8341A Test Record Card (12 of 25)

SPECIFICATIONS TESTED Limits	Step	TEST Conditions	Lower Limit	Measured Value	Upper Limit
4-13 Maximum Leveled Output Power and Power Accuracy (cont'd)					
Maximum Leveled Power Band 3 (18.6-20.0 GHz)					
ENTRY DISPLAY Power Indication	3	Continuous Sweep, Auto Sweep Time		_____ dBm	
	4	Single Sweep, Auto Sweep Time		_____ dBm	
	5	Single Sweep, 2 Second Sweep Time		_____ dBm	
Lowest power level recorded in step 3, 4, or 5	6				
Minimum Power Frequency		M2 Frequency		_____ GHz	
Power Meter Indication	7	Standard Instrument (F.P. Out No Atten.)	+10 dBm	_____ dBm	
		Option 001 (F.P. Out With Atten.)	+8 dBm (+8 dBm)[1]	_____ dBm	
		Option 002 (High Power, 2.3 to 18.6 GHz)	+10 dBm	_____ dBm	
		Option 004 (R.P. Out With Atten.)	+7 dBm (+7 dBm)[1]	_____ dBm	
		Option 005 (R.P. Out No Atten.)	+9 dBm (+9 dBm)[1]	_____ dBm	

[1]With Option 002, High Power, 2.3 to 18.6 GHz.

Table 4-32. HP 8341A Test Record Card (13 of 25)

SPECIFICATIONS TESTED Limits	Step	TEST Conditions	Lower Limit	Measured Value	Upper Limit
4-13. Maximum Leveled Output Power and Power Accuracy (cont'd)					
Flatness	0				
Band 0 Measurement					
Minimum Power Frequency	13	M2 Frequency		_____ GHz	
Minimum Power Level	14	M2 Power Level		_____ dBm	
Maximum Power Frequency	15	M1 Frequency		_____ GHz	
Maximum Power Level		M1 Power Level		_____ dBm	
Band 1 Measurement					
Minimum Power Frequency	13	M2 Frequency		_____ GHz	
Minimum Power Level	14	M2 Power Level		_____ dBm	
Maximum Power Frequency	15	M1 Frequency		_____ GHz	
Maximum Power Level		M1 Power Level		_____ dBm	
Band 2 Measurement					
Minimum Power Frequency	13	M2 Frequency		_____ GHz	
Minimum Power Level	14	M2 Power Level		_____ dBm	
Maximum Power Frequency	15	M1 Frequency		_____ GHz	
Maximum Power Level		M1 Power Level		_____ dBm	
Band 3 Measurement					
Minimum Power Frequency	13	M2 Frequency		_____ GHz	
Minimum Power Level	14	M2 Power Level		_____ dBm	
Maximum Power Frequency	15	M1 Frequency		_____ GHz	
Maximum Power Level		M1 Power Level		_____ dBm	

Table 4-32. HP 8341A Test Record Card (14 of 25)

SPECIFICATIONS TESTED Limits	Step	TEST Conditions	Lower Limit	Measured Value	Upper Limit
4-13. Maximum Leveled Output Power and Power Accuracy (cont'd)					
Flatness (Maximum minum Minimum Calculations)	18				
Band 0 Calculation		≤1.2 dB (Standard) ≤1.4 dB (Option 004) ≤1.2 dB (Option 001) ≤1.4 dB (Option 005)		_____ dB	
Band 1 Calculation		≤1.8 dB (Standard) ≤2.6 dB (Option 004) ≤2.2 dB (Option 001) ≤2.2 dB (Option 005)		_____ dB	
Band 2 Calculation		≤1.8 dB (Standard) ≤2.6 dB (Option 004) ≤2.2 dB (Option 001) ≤2.2 dB (Option 005)		_____ dB	
Band 3 Calculation		≤1.8 dB (Standard) ≤2.6 dB (Option 004) ≤2.2 dB (Option 001) ≤2.2 dB (Option 005)		_____ dB	

Table 4-32. HP 8341A Test Record Card (15 of 25)

SPECIFICATIONS TESTED Limits	Step	TEST Conditions	Lower Limit	Measured Value	Upper Limit
4-14. External Leveling		(Using Positive Crystal Detector)			
Leveling Voltage (dBv)					
+6	3		1.883 V	_____ V	2.114 V
0			0.944 V	_____ V	1.059 V
−10			0.2983 V	_____ V	0.3352 V
−20			0.0942 V	_____ V	0.1061 V
−30			29.65 mV	_____ mV	33.70 mV
−40			9.24 mV	_____ mV	10.79 mV
−50			2.785 mV	_____ mV	3.550 mV
−60			0.744 mV	_____ mV	1.259 mV
−66			0.273 mV	_____ mV	0.731 mV

Table 4-32. HP 8341A Test Record Card (16 of 25)

SPECIFICATIONS TESTED Limits	Step	TEST Conditions	Lower Limit	Measured Value	Upper Limit
4-15. Spurious Signals (10 MHz to 20 GHz)					
Frequency of Interest Selected	4				
	6	Refer to Table 4-15 for Specifications			

Table 4-32. HP 8341A Test Record Card (17 of 25)

SPECIFICATIONS TESTED Limits	Step	TEST Conditions	Lower Limit	Measured Value	Upper Limit	
					Standard	Option 007
4-17. Single Sideband Phase Noise Calculated Phase Noise from Steps 11 through 38 (Using Tables 4-18, 4-19, and 4-21)	38					
2.202 GHz						
Offset = 30 Hz				_____ dBc	–	<– 64 dBc
100 Hz				_____ dBc	<– 67 dBc	<– 70 dBc
1 kHz				_____ dBc	<– 75 dBc	<– 78 dBc
10 kHz				_____ dBc	<– 83 dBc	<– 86 dBc
100 kHz				_____ dBc	<– 107 dBc	<– 107 dBc
6.902 GHz						
Offset = 30 Hz				_____ dBc	–	<– 64 dBc
100 Hz				_____ dBc	<– 67 dBc	<– 70 dBc
1 kHz				_____ dBc	<– 75 dBc	<– 78 dBc
10 kHz				_____ dBc	<– 83 dBc	<– 86 dBc
100 kHz				_____ dBc	<– 107 dBc	<– 107 dBc
13.402 GHz						
Offset = 30 Hz				_____ dBc	–	<– 58 dBc
100 Hz				_____ dBc	<– 61 dBc	<– 64 dBc
1 kHz				_____ dBc	<– 69 dBc	<– 72 dBc
10 kHz				_____ dBc	<– 77 dBc	<– 80 dBc
100 kHz				_____ dBc	<– 101 dBc	<– 101 dBc
19.502 GHz						
Offset = 30 Hz				_____ dBc	–	<– 54 dBc
100 Hz				_____ dBc	<– 57 dBc	<– 60 dBc
1 kHz				_____ dBc	<– 65 dBc	<– 68 dBc
10 kHz				_____ dBc	<– 73 dBc	<– 76 dBc
100 kHz				_____ dBc	<– 97 dBc	<– 97 dBc

Table 4-32. HP 8341A Test Record Card (18 of 25)

SPECIFICATIONS TESTED Limits	Step	TEST Conditions	Lower Limit	Measured Value	Upper Limit
4-18. Power Sweep					
1 GHz					
Start Level	5			_____ dBm	
End Level	6			_____ dBm	
Power Sweep Range	7	Must be ≥20 dB difference	20 dB	_____ dB	
5 GHz					
Start Level	5			_____ dBm	
End Level	6			_____ dBm	
Power Sweep Range	7	Must be ≥20 dB difference	20 dB	_____ dB	
10 GHz					
Start Level	5			_____ dBm	
End Level	6			_____ dBm	
Power Sweep Range	7	Must be ≥20 dB difference	20 dB	_____ dB	
15 GHz					
Start Level	5			_____ dBm	
End Level	6			_____ dBm	
Power Sweep Range	7	Must be ≥20 dB difference	20 dB	_____ dB	

Table 4-32. HP 8341A Test Record Card (19 of 25)

SPECIFICATIONS TESTED Limits	Step	TEST Conditions	Lower Limit	Measured Value	Upper Limit
4-19. Pulse Modulation ON/OFF Ratio (Applies only to instruments with Option 006, Pulse Modulation)					
1 GHz	4	Δ Amplitude must be >80 dB	80 dB	_____ dB	
3 GHz			80 dB	_____ dB	
9 GHz			80 dB	_____ dB	
15 GHz			80 dB	_____ dB	
4-20. Pulse Modulation Rise and Fall Time					
1 GHz					
Rise Time	6	Rise Times: 90% point should be		_____ nsec	25 nsec
Fall Time	8	<25 nanoseconds from 10% point		_____ nsec	25 nsec
3 GHz					
Rise Time	6			_____ nsec	25 nsec
Fall Time	8	Fall Times: 10% point should be <25 nanoseconds from 90% point		_____ nsec	25 nsec
9 GHz					
Rise Time	6			_____ nsec	25 nsec
Fall Time	8			_____ nsec	25 nsec
15 GHz					
Rise Time	6			_____ nsec	25 nsec
Fall Time	8			_____ nsec	25 nsec

Table 4-32. HP 8341A Test Record Card (20 of 25)

SPECIFICATIONS TESTED Limits	Step	TEST Conditions	Lower Limit	Measured Value	Upper Limit
4-21. Pulse Modulation Accuracy (Applies only to instruments equipped with Option 006, Pulse Modulation)					
HP 8341A CW Freq. = 1 GHz PRF = 100 kHz					
Pulse Width = 100 nsec	6	ENTRY DISPLAY Power Level		_____ dBm	
	7	ENTRY DISPLAY Power Level		_____ dBm	
	8	Δ Power between steps 6 and 7	>−0.3 dB	_____ dB	<+3 dB
Pulse Width = 200 nsec	6	ENTRY DISPLAY Power Level		_____ dBm	
	7	ENTRY DISPLAY Power Level		_____ dBm	
	8	Δ Power between steps 6 and 7	>−0.3 dB	_____ dB	<+1.5 dB
Pulse Width = 500 nsec	6	ENTRY DISPLAY Power Level		_____ dBm	
	7	ENTRY DISPLAY Power Level		_____ dBm	
	8	Δ Power between steps 6 and 7	>−0.3 dB	_____ dB	<+0.3 dB
Pulse Width = 1000 nsec	6	ENTRY DISPLAY Power Level		_____ dBm	
	7	ENTRY DISPLAY Power Level		_____ dBm	
	8	Δ Power between steps 6 and 7	>−0.3 dB	_____ dB	<+0.3 dB
Pulse Repetition Freq. Range HP 8341A CW Freq. = 1 GHz	10				
Minimum PRF PRF = 100 Hz PW = 1 microsecond	6	ENTRY DISPLAY Power Level		_____ dBm	
	7	ENTRY DISPLAY Power Level		_____ dBm	
	8	Δ Power between steps 6 and 7	>−0.3 dB	_____ dB	<+0.3 dB
Maximum PRF PRF = 5 MHz PW = 100 nanosceonds	6	ENTRY DISPLAY Power Level		_____ dBm	
	7	ENTRY DISPLAY Power Level		_____ dBm	
	8	Δ Power between steps 6 and 7	>−0.3 dB	_____ dB	<+3 dB
HP 8341A CW Freq. = 3 GHz PRF = 100 kHz					
Pulse Width = 100 nsec	6	ENTRY DISPLAY Power Level		_____ dBm	
	7	ENTRY DISPLAY Power Level		_____ dBm	
	8	Δ Power between steps 6 and 7	>−0.3 dB	_____ dB	<+1.5 dB
Pulse Width = 200 nsec	6	ENTRY DISPLAY Power Level		_____ dBm	
	7	ENTRY DISPLAY Power Level		_____ dBm	
	8	Δ Power between steps 6 and 7	>−0.3 dB	_____ dB	<+0.3 dB
Pulse Width = 500 nsec	6	ENTRY DISPLAY Power Level		_____ dBm	
	7	ENTRY DISPLAY Power Level		_____ dBm	
	8	Δ Power between steps 6 and 7	>−0.3 dB	_____ dB	<+0.3 dB
Pulse Width = 1000 nsec	6	ENTRY DISPLAY Power Level		_____ dBm	
	7	ENTRY DISPLAY Power Level		_____ dBm	
	8	Δ Power between steps 6 and 7	>−0.3 dB	_____ dB	<+0.3 dB

Table 4-32. HP 8341A Test Record Card (21 of 25)

SPECIFICATIONS TESTED Limits	Step	TEST Conditions	Lower Limit	Measured Value	Upper Limit
4-21. Pulse Modulation Accuracy (Applied only to instruments equipped with Option 006, Pulse Modulation), (cont'd)					
Pulse Repetition Freq. Range HP 8341A CW Freq. = 3 GHz	10				
Minimum PRF PRF = 100 Hz PW = 1 microsecond	6	ENTRY DISPLAY Power Level		_____ dBm	
	7	ENTRY DISPLAY Power Level		_____ dBm	
	8	Δ Power between steps 6 and 7	>− 0.3 dB	_____ dB	<+0.3 dB
Maximum PRF PRF = 5 MHz PW = 100 nanoseconds	6	ENTRY DISPLAY Power Level		_____ dBm	
	7	ENTRY DISPLAY Power Level		_____ dBm	
	8	Δ Power between steps 6 and 7	>−0.3 dB	_____ dB	<+1.5 dB
HP 8341A CW Freq. = 9 GHz PRF = 100 kHz					
Pulse Width = 100 nsec	6	ENTRY DISPLAY Power Level		_____ dBm	
	7	ENTRY DISPLAY Power Level		_____ dBm	
	8	Δ Power between steps 6 and 7	>−0.3dB	_____ dB	<+1.5 dB
Pulse Width = 200 nsec	6	ENTRY DISPLAY Power Level		_____ dBm	
	7	ENTRY DISPLAY Power Level		_____ dBm	
	8	Δ Power between steps 6 and 7	>−0.3 dB	_____ dB	<+0.3 dB
Pulse Width = 500 nsec	6	ENTRY DISPLAY Power Level		_____ dBm	
	7	ENTRY DISPLAY Power Level		_____ dBm	
	8	Δ Power between steps 6 and 7	>−0.3 dB	_____ dB	<+0.3 dB
Pulse Width = 1000 nsec	6	ENTRY DISPLAY Power Level		_____ dBm	
	7	ENTRY DISPLAY Power Level		_____ dBm	
	8	Δ Power between steps 6 and 7	>−0.3 dB	_____ dB	<+0.3 dB
Pulse Repetition Freq. Range HP 8341A CW Freq. = 9 GHz	10				
Minimum PRF PRF = 100 Hz PW = 1 microsecond	6	ENTRY DISPLAY Power Level		_____ dBm	
	7	ENTRY DISPLAY Power Level		_____ dBm	
	8	Δ Power between steps 6 and 7	>−0.3 dB	_____ dB	<+0.3 dB
Maximum PRF PRF = 5 MHz PW = 100 nanoseconds	6	ENTRY DISPLAY Power Level		_____ dBm	
	7	ENTRY DISPLAY Power Level		_____ dBm	
	8	Δ Power between steps 6 and 7	>−0.3 dB	_____ dB	<+1.5 dB

Table 4-32. HP 8341A Test Record Card (22 of 25)

SPECIFICATIONS TESTED Limits	Step	TEST Conditions	Lower Limit	Measured Value	Upper Limit
4-21. Pulse Modulation Accuracy (Applies only to instruments equipped with Option 006, Pulse Modulation), (cont'd)					
HP 8341A CW Freq. = 15 GHz PRF = 100 kHz					
Pulse Width = 100 nsec	6	ENTRY DISPLAY Power Level		_____ dBm	
	7	ENTRY DISPLAY Power Level		_____ dBm	
	8	Δ Power between steps 6 and 7	>−0.3 dB	_____ dB	<+1.5 dB
Pulse Width = 200 nsec	6	ENTRY DISPLAY Power Level		_____ dBm	
	7	ENTRY DISPLAY Power Level		_____ dBm	
	8	Δ Power between steps 6 and 7	>−0.3 dB	_____ dB	<+0.3 dB
Pulse Width = 500 nsec	6	ENTRY DISPLAY Power Level		_____ dBm	
	7	ENTRY DISPLAY Power Level		_____ dBm	
	8	Δ Power between steps 6 and 7	>−0.3 dB	_____ dB	<+0.3 dB
Pulse Width = 1000 nsec	6	ENTRY DISPLAY Power Level		_____ dBm	
	7	ENTRY DISPLAY Power Level		_____ dBm	
	8	Δ Power between steps 6 and 7	>−0.3 dB	_____ dB	<+0.3 dB
Pulse Repetition Freq. Range HP 8341A CW Freq. = 15 GHz	10				
Minimum PRF PRF = 100 Hz PW = 1 microsecond	6	ENTRY DISPLAY Power Level		_____ dBm	
	7	ENTRY DISPLAY Power Level		_____ dBm	
	8	Δ Power between steps 6 and 7	>−0.3 dB	_____ dB	<+0.3 dB
Maximum PRF PRF = 5 MHz PW = 100 nanoseconds	6	ENTRY DISPLAY Power Level		_____ dBm	
	7	ENTRY DISPLAY Power Level		_____ dBm	
	8	Δ Power between steps 6 and 7	>−0.3 dB	_____ dB	<+1.5 dB

Table 4-32. HP 8341A Test Record Card (23 of 25)

SPECIFICATIONS TESTED Limits	Step	TEST Conditions	Lower Limit	Measured Value	Upper Limit
4-22. Pulse Modulation Video Feedthrough					
HP 8341A CW Freq. = 0.5 GHz Power Level = +8 dBm 0 dBm −10 dBm	7	Oscilloscope peak-to-peak voltage		_____ mV _____ mV _____ mV	<12 mV <5 mV <1.6 mV
HP 8341A CW Freq. = 1 GHz Power Level = +8 dBm 0 dBm −10 dBm	7			_____ mV _____ mV _____ mV	<12 mV <5 mV <1.6 mV
HP 8341A CW Freq. = 1.5 GHz Power Level = +8 dBm 0 dBm −10 dBm	7			_____ mV _____ mV _____ mV	<12 mV <5 mV <1.6 mV
HP 8341A CW Freq. = 2 GHz Power Level = +8 dBm 0 dBm −10 dBm	7 10			_____ mV _____ mV _____ mV	<12 mV <5 mV <1.6 mV
HP 8341A CW Freq. = >2.3 GHz Power Level = −10 dBm (Any Frequency Selected)	10			_____ mV	<0.2 mV

Table 4-32. HP 8341A Test Record Card (24 of 25)

SPECIFICATIONS TESTED Limits	Step	TEST Conditions	Lower Limit	Measured Value	Upper Limit
4-23. Amplitude Modulation					
AM Sensitivity					
HP 8341A Freq. = 1.5 GHz	2				
PPower = −5 dBm					
	4	Power Meter Indication		_____ dB	
+30% Modulation	5	Power Meter Change	>2.18 dB	_____ dB	<2.38 dB
−30% Modulation	6	Power Meter Change	>2.91 dB	_____ dB	<3.29 dB
HP 8341A Freq. = 1.5 GHz	7				
Power = +5 dBm					
	4	Power Meter Indication		_____ dB	
+30% Modulation	5	Power Meter Change	>2.18 dB	_____ dB	<2.38 dB
−30% Modulation	6	Power Meter Change	>2.91dB	_____ dB	<3.29 dB
HP 8341A Freq. = 4.5 GHz	8				
Power = −5 dBm					
	4	Power Meter Indication		_____ dB	
+30% Modulation	5	Power Meter Change	>2.18 dB	_____ dB	<2.38 dB
−30% Modulation	6	Power Meter Change	>2.91 dB	_____ dB	<3.29 dB
HP 8341A Freq. = 4.5 GHz	8				
Power = +5 dBm					
	4	Power Meter Indication	>2.18 dB	_____ dB	
+30% Modulation	5	Power Meter Change	>2.91 dB	_____ dB	<2.38 dB
−30% Modulation	6	Power Meter Change		_____ dB	<3.29 dB
HP 8341A Freq. = 1.5 GHz					
AM Frequency Response	11	Note DVM Indication		_____ Vrms	
Funct. Gen. = 1 kHz	12	Flatness (read on Modulation		_____ dB	≤±0.2 dB
100 Hz	13	Analyzer)		_____ dB	≤±0.2 dB
200 Hz				_____ dB	≤±0.2 dB
500 Hz				_____ dB	≤±0.2 dB
2 kHz				_____ dB	≤±0.2 dB
5 kHz				_____ dB	≤±0.2 dB
10 kHz				_____ dB	≤±0.2 dB
AM Bandwidth	14	Modulation Analyzer	≥−3 dB	_____ dB	
Funct. Gen. = 100 kHz		Indication			
Adjust output level to that noted in Step 11					
AM Depth					
Funct. Gen. = 1kHz	15	Maximum Modulation Depth	>90%	_____ %	

Table 4-32. HP 8341A Test Record Card (25 of 25)

SPECIFICATIONS TESTED Limits	Step	TEST Conditions	Lower Limit	Measured Value	Upper Limit
4-23. Amplitude Modulation (cont'd)					
HP 8341A Freq. = 3 GHz					
AM Frequency Response	11	Note DVM Indication		_____ Vrms	
Funct. Gen. = 1 kHz	12	Flatness (read on Modulation Analyzer)		_____ dB	≤±0.2 dB
100 Hz	13			_____ dB	≤±0.2 dB
200 Hz				_____ dB	≤±0.2 dB
500 Hz				_____ dB	≤±0.2 dB
2 kHz				_____ dB	≤±0.2 dB
5 kHz				_____ dB	≤±0.2 dB
10 kHz				_____ dB	≤±0.2 dB
AM Bandwidth Funct. Gen. = 100 kHz Adjust output level to that noted in Step 11	14	Modulation Analyzer Indication	≥−3 dB	_____ dB	
AM Depth Funct. Gen. = 1 kHz	15	Maximum Modulation Depth	>90%	_____ %	
HP 8341A Freq. = 9 GHz					
AM Frequency Response	11	Note DVM Indication		_____ Vrms	
Funct. Gen. = 1 kHz	12	Flatness (read on Modulation Analyzer)		_____ dB	≤±0.2 dB
100 Hz	13			_____ dB	≤±0.2 dB
200 Hz				_____ dB	≤±0.2 dB
500 Hz				_____ dB	≤±0.2 dB
2 kHz				_____ dB	≤±0.2 dB
5 kHz				_____ dB	≤±0.2 dB
10 kHz				_____ dB	≤±0.2 dB
AM Bandwidth Funct. Gen. = 100 kHz Adjust output level to that noted in Step 11	14	Modulation Analyzer Indication	≥−3 dB	_____ dB	
AM Depth Funct. Gen. = 1 kHz	15	Maximum Modulation Depth	>90%	_____ %	
HP 8341A Freq. = 15 GHz					
AM Frequency Response	11	Note DVM Indication		_____ Vrms	
Funct. Gen. = 1 kHz	12	Flatness (read on Modulation Analyzer)		_____ dB	≤±0.2 dB
100 Hz	13			_____ dB	≤±0.2 dB
200 Hz				_____ dB	≤±0.2 dB
500 Hz				_____ dB	≤±0.2 dB
2 kHz				_____ dB	≤±0.2 dB
5 kHz				_____ dB	≤±0.2 dB
10 kHz				_____ dB	≤±0.2 dB
AM Bandwidth Funct. Gen. = 100 kHz Adjust output level to that noted in Step 11	14	Modulation Analyzer Indication	≥−3 dB	_____ dB	
AM Depth Funct. Gen. = 1 kHz	15	Maximum Modulation Depth	>90%	_____ %	

HP 8341A AUTOMATED TEST PROCEDURES

Two software products are available that provide automated tests for the HP 8341A.

The Basic Package (HP part number 08340-10009) provides an automated means to:

Measure Frequency Switching Time. Frequency Switching time is the time it takes the instrument to implement an HB-IB initiated CW frequency change. The measurement determines the period of time elapsed from when the HP-IB command is received, to the time the instrument frequency settles to within 1 Hz in Band 0 or Band 1, 2 Hz in Band 2, or 3 Hz in Band 3. It is not possible to measure this specification manually.

Calibrate and verify the optional 90 dB Step Attenuator. Calibration and verification of the optional 90 dB attenuator can be done with a high level of accuracy by means of this automated test.

The Advanced Package (HP part number 08340-10010) provides the two tests described above, as well as exhaustive performance verification (calibration) of the instrument. These tests provide the user with a higher level of confidence than the manual performance tests. This software package reduces the time required to verify instrument performance by greater than 50%.

Either software package operates with an HP 9826 or 9836 controller. The part numbers listed above include the 5 1/4 inch disc and software documentation required to run the tests. Both software packages allow the user to print out test results if desired.

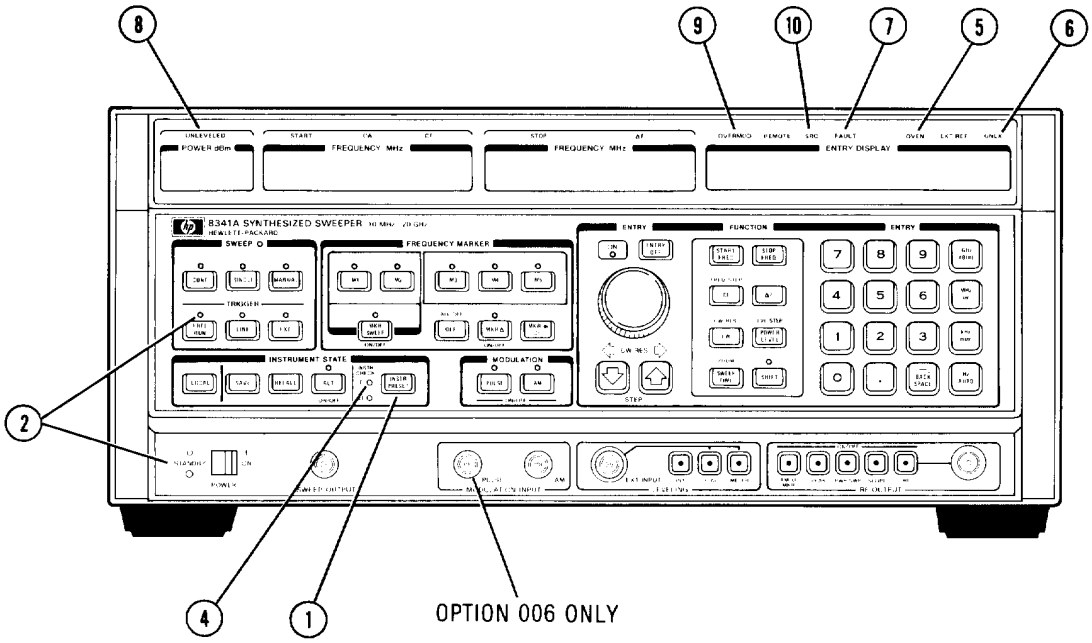
APPENDIX A
IN CASE OF DIFFICULTY: ERROR ANNUNCIATORS

This section explains what to do when one of the HP 8341A front panel annunciators comes on. It tells you how to tell the difference between a procedural error and actual instrument failure.

Detailed service information and an Overall Instrument Trouble- shooting Guide is available in the Introduction to Section VIII (Service) of the HP 8341A manual, volume 3 of the 4-volume HP 8341A manual set.

Figure A-1, on the next page, shows where the front and rear panel annunciators are located.

Front View



Rear View

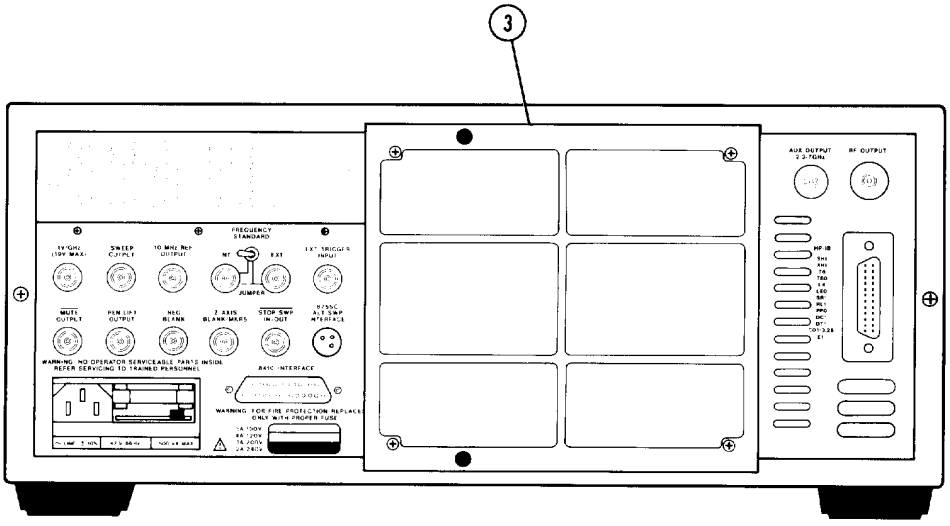


Figure A-1. HP 8341A Error Annunciators

1. INSTRUMENT PRESET CONDITIONS [INSTR PRESET]

Press **[INSTR PRESET]** and check that the following settings exist. If any instrument contition is not as shown below, the instrument requires service.

POWER dBm display = 0.0

Factory setting, determined by cal constant #56.

A different power level can be set by changing calibration constant #56. See step 7 of this appendix: Calibration Constant Access Procedure.

FREQUENCY MHz display = 10.000000
START annunciator lit

FREQUENCY MHz display = 20.000000
STOP annunciator lit

ENTRY display = Blank (off)

SWEEP block = Green LED flashing
CONT LED on
FREE RUN LED on

FREQUENCY MARKER block = All LED's off

INSTRUMENT STATE block = All LED's off

MODULATION block = All LED's off

ENTRY block = All LED's off

LEVELING block = **INT** LED on

RF OUTPUT block = **RF** LED on

The RF output should be a swept 10 MHz to 20 GHz signal, leveled at 0 dBm.

EXT REF annunciator = off.

If the rear panel **INT** or **EXT REFERENCE** switch is in the **EXT** position, the **EXT REF** annunciator above the **ENTRY DISPLAY** will be on.

2. INCORRECT FRONT PANEL STATES after [INSTR PRESET]

All LED's Off.

FAN IS OPERATING - If all annunciators and LED's are off (but the instrument's fan is operating), check the thermal shutdown switch (A62S1) in the HP 8341A power supply. If the switch has engaged, make sure the fan is supplying proper airflow to

the interior of the instrument. Make sure the fan filter is not blocked by dust build-up, a piece of paper, etc. If the instrument's airflow is good, suspect a power supply failure.

FAN IS NOT OPERATING, LED'S COME ON AT POWER ON, THEN GO OUT LATER - Refer to the **FAN** section, below.

FAN IS NOT OPERATING, LED'S OFF AT POWER ON - If all instrument LED's are off and the fan is not operating, suspect a problem in the instrument causing complete loss of ac mains, ie transformer, wiring, or line filter module related problems. Check the line filter module voltage select card (Refer to Section II, Installation).

SOME LED's OFF. If some LED's that should be on are off, the HP 8341A front panel section is probably the cause.

ALL LED's ON. If all of the LED's and annunciators are on, the HP 8341A processor, memory, or power supply is probably the cause.

CHARACTER MARCH. If the four display windows have strings of characters marching across them, the HP 8314A processor or memory is probably the cause.

3. FAN

FAN DOES NOT TURN ON. When the **POWER** switch is turned **ON**, the instrument fan should start running. If it does not, the fan, power supply, or K1 Relay (inside the instrument near the rear panel) is probably the cause.

If the instrument has run for some time with the fan not running, the interior temperature may have risen to the point that the A62S1 thermal switch has turned the instrument off. If so, all front panel LED's will have gone off. The switch will reset itself when the instrument cools down.

FAN DOES NOT TURN OFF. When the HP 8341A is in the **STANDBY** mode, the fan should not be running. If it is, the Fan Relay (K1) may be stuck, or it the +22V supply has failed. The fan relay solenoid is *energized* when the instrument is in the **STANDBY** mode, turning the fan *off*. If the power to the relay solenoid fails (+22V supply), the solenoid will *de-energize*, turning the fan *on*.

4. INSTR CHECK LED's REMAIN ON

INSTR CHECK LED's I and II show the results of the instrument Self-Test sequence. This test sequence is carried out every time the **POWER** switch is turned on or when **[INSTR PRESET]** is pressed. It takes about 00 seconds and begins by turning both check LED's on. Both LED's should be off after about 00 seconds.

INSTR CHECK LED I REMAINS ON. If so, the A60 Processor board is the cause.

INSTR CHECK LED II REMAINS ON. If so, the A60 Processor board or the HP 8341A instrument data bus or address bus is the cause.

5. OVEN ANNUNCIATOR

The front panel **OVEN** light is used to indicate the status of the internal frequency standard. When the **OVEN** annunciator is on, the frequency is more than 100 Hz from 10 MHz.

If the internal 10 MHz standard is being used, this will cause the frequency of the RF output to be inaccurate. The **OVEN** annunciator should go out within one half hour after the instrument is connected to ac mains. If the **OVEN** annunciator stays on, the instrument requires service.

If the instrument is using an external 10 MHz standard, this indication will have no effect on instrument performance.

6. UNLK ANNUNCIATOR

The **UNLK** light is used to indicate that that one or more of the six instrument phase lock loops is unlocked. Press **|SHIFT| |EXT|**. The **ENTRY DISPLAY** will show the following:

OSC: REF M/N HET YO N2 N1

The name of the phase lock loop that is unlocked will be flashing. The different loops are listed below along with information about what to do if one of them is unlocked.

REF - If **REF** (reference loop) is flashing, inspect the rear panel, one of two conditions should exist:

A. If instrument is in internal 10 MHz mode:

Make sure the **INT STANDARD** BNC and the **EXT STANDARD** BNC are connected together with a jumper cable. Ensure that the rear panel **REFERENCE** switch is in the **INT** position. If this is the case and **REF** is flashing, the instrument requires service. Suspect a problem in the Reference Loop.

B. If instrument is in external 10 MHz mode:

An external 10 MHz standard should be connected to the **EXT STANDARD** BNC with the rear panel **REFERENCE** switch in the **EXT** position. If this is the case and **REF** is flashing, connect the instrument as described in step A, above. Press **|SHIFT| |EXT|**.

If REF keeps flashing, the instrument requires service. Suspect a problem in the Reference Loop.

If REF stops flashing the problem is being caused by the external 10 MHz Reference Standard.

M/N - If M/N is flashing, the instrument requires service. Suspect the M/N Loop.

HET - If **HET** is flashing the instrument requires service. Suspect a problem in the 3.7 GHz Oscillator in the RF section.

YO - If **YO** is flashing, the instrument requires service. Suspect the YO loop.

N1 - If N1 is flashing, the instrument requires service. Suspect a problem in the PLL1 or PLL3 Loops in the 20-30 Loops.

N2 - If N2 is flashing, the instrument requires service. Suspect a problem in the PLL2 loop in the 20-30 Loops.

7. FAULT ANNUNCIATOR

The **FAULT** light is used to monitor the status of 5 different internal functions. These functions are described below. If the **FAULT** light is on, press **[SHIFT] [MANUAL]**. The **ENTRY DISPLAY** will show the following:

FAULT: CAL KICK ADC PEAK TRK

The name of the function that has a problem will be flashing.

CAL - This refers to the calibration constants stored in memory (on the A60 Processor board). The calibration constants are checked only when an **[INSTR PRESET]** is done. If **CAL** is flashing the instrument has resorted to default calibration constant data. The major effect of this condition will be RF power output flatness and accuracy degradation. To remedy this situation, the factory-determined calibration constants must be re-entered into the instruments memory. Remove the top cover of the instrument. Get the print-out of the calibration constants from the plastic jacket located on the left-hand side of the instrument. Replace the instrument's top cover. The following procedure must be performed to enter the calibration constants back into memory. When this procedure is complete, place the calibration constant print-out back into the instrument.

CAUTION

The following procedure affects data required for optimum performance of the instrument. Care should be taken when accessing or changing calibration data.

Calibration Constant Access Procedure

1. Press **[SHIFT] [GHz] [1] [Hz]**
   [SHIFT] [MHz] [1] [2] [Hz]
   [SHIFT] [KHz] [2] [2] [HZ]

   The value of calibration Constant #1 will be displayed in the **ENTRY DISPLAY**.

2. Compare the value on the **ENTRY DISPLAY** with the value listed in the print-out. If the values do not match, enter the value from the print-out via the **DATA ENTRY** keyboard and then press **[Hz]**. Press the up **STEP** key to view the next calibration constant.

3. Repeat step 2 until all the instrument calibration constants are the same as those shown on the print-out.

4. Store the entered calibration constants into protected memory by pressing the following keys:

|SHIFT| |MHz| |1| |4| |Hz|
|SHIFT| |MHZ| |1| |9| |4| |6| |Hz|

The "**CALIBRATION STORED**" message will appear in the **ENTRY DISPLAY**.

Press **|INSTR PRESET|**, the **FAULT** indicator should be off. If it is still on, suspect a problem with the instrument's memory.

KICK - This refers to the kick pulses used to reset the YO (YIG Oscillator) and SYTM (Switched YIG-Tuned Multiplier). Suspect a problem in the A54 YIG Oscillator Pretune assembly or the A28 SYTM Driver board.

ADC - This refers to a check performed on the ADC (analog to digital converter) circuits on the A27 Level Control board. This check is done at **|INSTR PRESET|** or power on. ADC indicates that the **POWER dBm** display may indicate a different power than the instrument is actually producing. Also, an ADC failure will not allow the Peak (**|PEAK|**) and Auto Tracking (**|SHIFT| |PEAK|**) functions to operate properly. If this annunciator is on, suspect a problem on the A27 Level Control board.

PEAK - This refers to an instrument function that peaks the RF output power at a **CW frequency** by fine tuning the SYTM (the SYTM is tuned to the YO frequency). This fault can only come on if the **|PEAK|** button is pushed. If **PEAK** is flashing, something is wrong with the circuitry that peaks the SYTM. **PEAK** indicates that the instrument is not able to optimize its output power. This is an instrument failure which requires service to correct. However, the optimum power may not be adversely affected and may still acceptable to the operator.

TRK - This refers to an instrument function that peaks the RF output power while the instrument is **sweeping**. This fault can only occur if **|SHIFT| |PEAK|** has been pushed. The **TRK** light indicates the same things as if **PEAK** were flashing.

8. UNLEVELED ANNUNCIATOR

The **UNLEVELED** light is used to indicate the status of the RF output power. If the **UNLEVELED** light is off, the output power is leveled and if the light is on, the power is unleveled.

A. Make sure that the correct leveling mode is selected. If internal leveling is desired, the **INT** light should be on. If external leveling is desired, the **XTAL** light should be on. If power meter leveling is desired, the **METER** light should be on. The three lights just mentioned are located on the associated front panel keys.

B. The power level requested should not be greater than the maximum power specification at a given frequency. If the instrument is sweeping, make sure that the power requested does not exceed the maximum power specification for the entire band or bands that are being swept.

C. If the output power is unleveled at all power levels and all frequencies, suspect a problem on the A25 ALC Detector board, the A26 Linear Modulator board, or the RF path.

D. If the power will level at some frequencies and not others while the instrument is sweeping, the SYTM may not be tracking correctly. Try the AUTO TRACKING feature by pressing **[SHIFT] [PEAK]**.

E. If the power will level at some CW frequencies and not at others, press **[PEAK]** to optimize the SYTM tracking at the frequency of interest.

F. If the power is unleveled in Band 0 (10 MHz to 2.3 GHz) only, suspect a problem in the switching circuits on the A25 ALC Detector board, the A26 Linear Modulator board, the A12 Band 0 detector, or the associated microcircuits.

G. If the power is unleveled in bands 1-3 (2.3 GHz to 20.0 GHz) only, suspect a problem in the switching circuits on the A25 ALC Detector board, A26 Linear Modulator board, the A11 Band 1-3 Detector, or the associated microcircuits.

NOTE

Refer to the ALC Loop Overview in Section III of this volume.

9. OVERMOD ANNUNCIATOR

Overmod indicates that the RF power is turned completely off and a signal (AM or, if instrument is so equipped, Pulse Modulation) is attempting to shut it off even further. Make sure an external AM signal is not exceeding specified voltage limits (the AM input allows a 0 to +-1 volt signal).

10. SRQ ANNUNCIATOR

To understand the **SRQ** annunciator, a brief description of SRQ (Service Request) is necessary. The way the SRQ works is described below:

SRQ is only used when the HP 8341A is connected to an external controller (via HP-IB). The controller picks one or more conditions under which the HP 8341A will send out a service request (SRQ). The controller then programs the HP 8341A to send an SRQ when one of these conditions occurs.

When one of the programmed conditions occurs, the HP 8341A sends out an SRQ signal and activates the **SRQ** annunciator.

When the controller responds to the SRQ (by doing a serial poll command) the HP 8341A turns the **SRQ** annunciator off. This entire process takes but a fraction of a second, so the time the **SRQ** annunciator stays on is normally very brief.

SRQ Annunciator Stays On

If the **SRQ** annunciator goes on and stays on it usually indicates that one of the following conditions exists:

A. IF THE HP 8341A IS CONNECTED TO AN EXTERNAL CONTROLLER: the computer controller is not able to service the SRQ interrupt. This problem is usually caused by the controller being stuck in a loop, etc, and not by a fault in the HP 8341A.

B. IF THE HP 8341A IS NOT CONNECTED TO AN EXTERNAL CONTROLLER:
This usually happens when a controller has programmed the HP 8341A to send an SRQ and has subsequently been disconnected.