Calibration Guide

HP 8590 E-Series Spectrum Analyzer and HP 8591C Cable TV Analyzer

HEWLETT PACKARD

HP Part No. 5962-5065 Supersedes 5962-5024
Printed in USA October 1994

Notice.

The information contained in this document is subject to change without notice.

Hewlett-Packard makes no warranty of any kind with regard to this material, including but not limited to, the implied warranties of merchantability and fitness for a particular purpose. Hewlett-Packard shall not be liable for errors contained herein or for incidental or consequential damages in connection with the furnishing, performance, or use of this material.

1212 Valley House Drive, Rohnert Park, CA 94928-4999, USA

Certification

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

Warranty

This Hewlett-Packard instrument product is warranted against defects in material and workmanship for a period of one year from date of shipment. 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 Hewlett-Packard. Buyer shall prepay shipping charges to Hewlett-Packard and Hewlett-Packard shall pay shipping charges to return the product to Buyer. However, Buyer shall pay all shipping charges, duties, and taxes for products returned to Hewlett-Packard from another country.

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

Limitation of Warranty

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

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

Exclusive Remedies

THE REMEDIES PROVIDED HEREIN ARE BUYER'S SOLE AND EXCLUSIVE REMEDIES. HEWLETT-PACKARD 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.

Safety Symbols

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

Caution The *caution* sign denotes a hazard. It calls attention to a procedure which, if not correctly performed or adhered to, could result in damage to or destruction of the instrument. Do not proceed beyond a *caution* sign until the indicated conditions are fully understood and met.

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

General Safety Considerations

Warning	**This is a Safety Class I product (provided with a protective earthing ground incorporated in the power cord). The mains plug shall only be inserted in a socket outlet provided with a protective earth contact. Any interruption of the protective conductor, inside or outside the instrument, is likely to make the instrument dangerous. Intentional interruption is prohibited.**
Warning	**No operator serviceable parts inside. Refer servicing to qualified personnel. To prevent electrical shock, do not remove covers.**
Caution	Before switching on this instrument, make sure that the line voltage selector switch is set to the voltage of the power supply and the correct fuse is installed.
Warning	**These servicing instructions are for use by qualified personnel only. To avoid electrical shock, do not perform any servicing unless you are qualified to do so.**
Warning	**The opening of covers or removal of parts is likely to expose dangerous voltages. Disconnect the instrument from all voltage sources while it is being opened.**
Warning	**The power cord is connected to internal capacitors that may remain live for 10 seconds after disconnecting the plug from its power supply.**
Warning	**For continued protection against fire hazard replace line fuse only with same type and rating (F 5A/250V). The use of other fuses or material is prohibited.**

HP 8590 E-Series and L-Series Spectrum Analyzer Documentation Description

Manuals Shipped with Your HP 8590 E-Series or L-Series Spectrum Analyzer:

The Calibration Guide for Your Spectrum Analyzer

Tells you how to test your spectrum analyzer to determine if the spectrum analyzer meets its specifications.

HP 8590 E-Series and L-Series Spectrum Analyzer User's Guide

- Tells you how to make measurements with your spectrum analyzer.
- Describes the spectrum analyzer features.
- Tells you what to do in case of a failure.

HP 8590 E-Series and L-Series Spectrum Analyzer Quick Reference Guide

- Describes how to make a simple measurement with your spectrum analyzer.
- Briefly describes the spectrum analyzer functions.
- Lists all the programming commands.

HP 8591C Cable TV Analyzer Documentation Description

The Following Guides are Shipped with Your Cable TV Analyzer:

HP 8590 E-Series Spectrum Analyzers and HP 8591C Cable TV Analyzer Calibration Guide

Tells you how to test your spectrum analyzer to determine if the spectrum analyzer meets its specifications.

HP 8591C Cable TV Analyzer User's Guides

Cable TV Measurements
- Tells you how to make cable TV measurements with your analyzer.
- Describes the cable TV analyzer mode features.

Spectrum Analyzer Reference
- Tells you how to make measurements using the spectrum analyzer mode.
- Describes the spectrum analyzer mode features.
- Tells you what to do in case of a failure.

HP 8591C Cable TV Analyzer Getting Started and Quick Reference Guide

- Describes how to make a simple measurement with your spectrum analyzer.
- Briefly describes the cable TV and spectrum analyzer functions.
- Provides a quick reference for cable TV and spectrum analyzer softkeys.

HP 8590 E-Series and L-Series Spectrum Analyzer, and HP 8591C Cable TV Analyzer Programmer's Guide

Describes analyzer operation via a remote controller (computer) for the RS-232 or HP-IB interface.

Documentation Options

Option 021 or 023: Programmer's Guide

HP 8590 E-Series and L-Series Spectrum Analyzer, and HP 8591C Cable TV Analyzer Programmer's Guide

Describes analyzer operation via a remote controller (computer) for the RS-232 or HP-IB interface.

Option 910: Additional User's Documentation

Provides an additional copy of the user's guides, the calibration guide, and the quick reference guide.

Option 915: Service Guide and Component-Level Information

Describes troubleshooting and repair of the spectrum analyzer.
Option 915 consists of two manuals:

HP 8590 E-Series and L-Series Spectrum Analyzer, and HP 8591C Cable TV Analyzer, Assembly-Level Repair, Service Guide

- Describes adjustment and assembly level repair of the analyzer.

HP 8590 E-Series and L-Series Spectrum Analyzer, and HP 8591C Cable TV Analyzer, Component-Level Repair, Service Guide

- Provides information for component-level repair of the spectrum analyzer.

How to Order Guides

Each of the guides listed above can be ordered individually. To order, contact your local HP Sales and Service Office.

How to Use This Guide

Where to Start

If you have just received your analyzer and want to get ready for use for the first time, do the following:

- Read Chapters 1 and 2 of your analyzer user's guide.
- Perform the initial self-calibration routines described in Chapter 2 of the analyzer user's guide (these are automatic self-checks and require no test equipment).
- If you need to verify the unit is operating within its specifications, perform the performance verification tests in this guide.

After completing the performance verification, use your user's guide to learn how to use the analyzer and to find more detailed information about the analyzer, its applications, and key descriptions.

This guide uses the following conventions:

(Front-Panel Key)	A boxed, uppercase name in this typeface represents a key physically located on the instrument.
Softkey	A boxed word written in this typeface indicates a "softkey," a key whose label is determined by the instrument's firmware.
Screen Text	Text printed in this typeface indicates text displayed on the spectrum analyzer screen.

Regulatory Information

The information on the following pages applies to the HP 8590 E-Series and L-Series spectrum analyzer and the HP 8591C cable TV analyzer products.

IEC Compliance

This instrument has been designed and tested in accordance with IEC Publication 348, Safety Requirements for Electronic Measuring Apparatus, and has been supplied in a safe condition. The instruction documentation contains information and warnings which must be follow ed by the user to ensure safe operation and to maintain the instrument in a safe condition.

Instrument Markings

"CE" The CE mark is a registered trademark of the European Community. (If accompanied by a year, it is when the design was proven.)

"ISM1-A" This is a symbol of an Industrial Scientific and Medical Group 1 Class A product.

"CSA" The CSA mark is a registered trademark of the Canadian Standards Association.

Notice for Germany: Noise Declaration

LpA < 70 dB
am Arbeitsplatz (operator position)
normaler Betrieb (normal position)
nach DIN 45635 T. 19 (per ISO 7779)

Declaration of Conformity

DECLARATION OF CONFORMITY
according to ISO/IEC Guide 22 and EN 45014

Manufacturer's Name:	Hewlett-Packard Co.
Manufacturer's Address:	1212 Valley House Drive Rohnert Park, California 94928-4999 U.S.A.
Manufacturer's Name:	Hewlett-Packard Ltd.
Manufacturer's Address:	South Queensferry West Lothian, EH30 9TG Scotland, United Kingdom

Declares that the product:

Product Name:	Spectrum Analyzer
Model Numbers:	HP 8590D, HP 8591E, HP 8592D, HP 8593E, HP 8594E, HP 8595E, and HP 8596E
Product Options:	This declaration covers all options of the above products.

Conforms to the following product specifications:

Safety:	IEC 348(1978) / HD 401 S1
EMC:	EN 55011 / CISPR 11(1990) Group 1, Class A EN 50082-1(1992) IEC 801-2(1991), 8 kV AD IEC 801-3(1984), 3 V/m IEC 801-4(1988), 500 V signal, 1 kV ac power

Supplementary Information:

Rohnert Park, California	4/7/92	Dixon Browder
Location	**Date**	**Dixon Browder / QA Manager**
South Queensferry, Scotland	15 April '92	Peter Rigby
Location	**Date**	**Peter Rigby / QA Manager**

DECLARATION OF CONFORMITY
according to ISO/IEC Guide 22 and EN 45014

Manufacturer's Name:	Hewlett-Packard Co.
Manufacturer's Address:	1212 Valleyhouse Drive Rohnert Park, California 94928-4999 U.S.A.
Manufacturer's Name:	Hewlett-Packard Ltd.
Manufacturer's Address:	South Queensferry West Lothian, EH30 9TG Scotland, United Kingdom

Declares that the product:

Product Name:	Cable TV Analyzer
Model Numbers:	HP 8591C
Product Options:	This declaration covers all options of the above products.

Conforms to the following product specifications:

Safety:	IEC 348:1978/HD 401:1980 CAN/CSA-22.2 No. 231 Series M89
EMC:	CISPR 11:1990 /EN 55011:1991, Group 1 Class A IEC 801-2:1991 /EN 50082-1:1992, 4 kV CD, 8 kV AD IEC 801-3:1984 /EN 50082-1:1992, 3V/m, 27-500 MHz IEC 801-4:1988 /EN 50082-1:1992, 500 V signal, 1000 V AC

Supplementary Information:

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

Rohnert Park, California	Oct 4, 1993	[signature]
Location	**Date**	**Dixon Browder / Quality Manager**
South Queensferry, Scotland	Oct. 11, 1993	[signature]
Location	**Date**	**Peter Rigby / Quality Manager**

European Contact:
Your local Hewlett-Packard Sales and Service Office or Hewlett-Packard GmbH, Department ZQ/Standards Europe, Herrenberger Straße 130, D-7030 Böblingen (FAX: +49-7031-143143)

THIS
PAGE
LEFT
BLANK

SCANS
By
Artek Media

Contents

Figures

Tables

1

Calibrating

This chapter identifies the performance test procedures which test the electrical performance of the analyzer.

Allow the analyzer to warm up in accordance with the temperature stability specifications before performing the tests in this chapter.

None of the test procedures involve removing the cover of the analyzer.

Calibration

Calibration verifies that the analyzer performance is within all specifications. It is time consuming and requires extensive test equipment. Calibration consists of *all* the performance tests. For a complete listing of the performance tests, see the performance verification tests table for your specific analyzer.

Operation Verification

Operation verification only tests the most critical specifications. These tests are recommended for incoming inspection, troubleshooting, or after repair. Operation verification requires less time and equipment than the calibration. See the performance verification tests table for your analyzer.

Calibration Cycle

The performance tests in Chapter 2 should be used to check the analyzer against its specifications once every year. Specifications are listed in this calibration guide.

The 300 MHz frequency of the CAL OUT signal must be checked at the same time and adjusted if necessary. Refer to the "10 MHz Frequency Reference Adjustment" procedure in the assembly-level repair service guide.

Performance Verification Test Tables

The tables on the following pages list the performance tests in chapter 2. Select the analyzer option being calibrated and perform the tests marked in the option column.

A dot indicates that the test is required for calibration. Note that some of the tests are used for both calibration and operation verification (marked with ⊡).

Table 1-1. HP 8591C Performance Verification Tests

Performance Test Name	Calibration for Instrument Option:					
	Std[1]	701	704	011	130	107
1. 10 MHz Reference Output Accuracy			•			
2. 10 MHz Precision Frequency Reference Output Accuracy	•	•		•	•	•
4. Frequency Readout and Marker Count Accuracy	⊡	⊡	⊡	⊡	⊡	⊡
6. Noise Sidebands	⊡	⊡	⊡	⊡	⊡	⊡
7. System Related Sidebands	•	•	•	•	•	•
8. Frequency Span Readout Accuracy	⊡	⊡	⊡	⊡	⊡	⊡
10. Residual FM	•	•	•	•	•	•
12. Sweep Time Accuracy	•	•	•	•	•	•
13. Scale Fidelity	⊡	⊡	⊡	⊡	⊡	⊡
14. Reference Level Accuracy	⊡	⊡	⊡	⊡	⊡	⊡
16. Absolute Amplitude Calibration and Resolution Bandwidth Switching Uncertainties	⊡	⊡	⊡	⊡	⊡	⊡
17. Resolution Bandwidth Accuracy	•	•	•	•	•	•
18. Calibrator Amplitude Accuracy	⊡	⊡	⊡	⊡	⊡	⊡
19. Frequency Response	⊡	⊡	⊡	⊡	⊡	⊡
24. Other Input Related Spurious Responses	•	•	•	•	•	•
29. Spurious Response[2]	⊡	⊡	⊡	⊡	⊡	⊡
34. Gain Compression	•	•	•	•	•	•
39. Displayed Average Noise Level	⊡	⊡	⊡	⊡		⊡
44. Displayed Average Noise Level for Option 130					⊡	
49. Residual Responses	•	•	•	•		•
54. Residual Responses for Option 130					•	
57. Fast Time Domain Sweeps	•		•			
59. Absolute Amplitude, Vernier, and Power Sweep Accuracy				•		
62. Tracking Generator Level Flatness				•		
64. Harmonic Spurious Outputs				•		
66. Non-Harmonic Spurious Outputs				•		
68. Tracking Generator Feedthrough				•		
73. Gate Delay Accuracy and Gate Length Accuracy	•	•	•			•
74. Gate Card Insertion Loss	•	•	•			•
75. TV Receiver, Video Tester						•

1 Use this column for all other options *not* listed in this table.

2 "Part 2: Third Order Intermodulation Distortion, 50 MHz" is not required for operation verification.

Table 1-2. HP 8591E Performance Verification Tests

Performance Test Name	Calibration for Instrument Option:									
	Std[1]	001	004	010	011	101	103	105	130	107
1. 10 MHz Reference Output Accuracy	•	•		•	•	•	•	•	•	•
2. 10 MHz Precision Frequency Reference Output Accuracy			•							
4. Frequency Readout and Marker Count Accuracy	⊡	⊡	⊡	⊡	⊡	⊡	⊡	⊡	⊡	⊡
6. Noise Sidebands	⊡	⊡	⊡	⊡	⊡	⊡	⊡	⊡	⊡	⊡
7. System Related Sidebands	•	•	•	•	•	•	•	•	•	•
8. Frequency Span Readout Accuracy	⊡	⊡	⊡	⊡	⊡	⊡	⊡	⊡	⊡	⊡
10. Residual FM	•	•	•	•	•	•	•	•	•	•
12. Sweep Time Accuracy	•	•	•	•	•	•	•	•	•	•
13. Scale Fidelity	⊡	⊡	⊡	⊡	⊡	⊡	⊡	⊡	⊡	⊡
14. Reference Level Accuracy	⊡	⊡	⊡	⊡	⊡	⊡	⊡	⊡	⊡	⊡
16. Absolute Amplitude Calibration and Resolution Bandwidth Switching Uncertainties	⊡	⊡	⊡	⊡	⊡	⊡	⊡	⊡	⊡	⊡
17. Resolution Bandwidth Accuracy	•	•	•	•	•	•	•	•	•	•
18. Calibrator Amplitude Accuracy	⊡	⊡	⊡	⊡	⊡	⊡	⊡	⊡	⊡	⊡
19. Frequency Response	⊡	⊡	⊡	⊡	⊡	⊡	⊡	⊡	⊡	⊡
24. Other Input Related Spurious Responses	•	•	•	•	•	•	•	•	•	•
29. Spurious Response[2]	⊡	⊡	⊡	⊡	⊡	⊡	⊡	⊡	⊡	⊡
34. Gain Compression	•	•	•	•	•	•	•	•	•	•
39. Displayed Average Noise Level	⊡	⊡	⊡	⊡	⊡	⊡	⊡	⊡		⊡
44. Displayed Average Noise Level for Option 130									⊡	
49. Residual Responses	•	•	•	•	•	•	•	•		
54. Residual Responses for Option 130									•	
57. Fast Time Domain Sweeps						•				
59. Absolute Amplitude, Vernier, and Power Sweep Accuracy				•	•					
62. Tracking Generator Level Flatness				•	•					
64. Harmonic Spurious Outputs				•	•					
66. Non-Harmonic Spurious Outputs				•	•					
68. Tracking Generator Feedthrough				•	•					
72. CISPR Pulse Response							•			
73. Gate Delay Accuracy and Gate Length Accuracy								•		
74. Gate Card Insertion Loss								•		
75. TV Receiver, Video Tester										⊡

1 Use this column for all other options *not* listed in this table.

2 "Part 2: Third Order Intermodulation Distortion, 50 MHz" is not required for operation verification.

Table 1-3. HP 8593E Performance Verification Tests

Performance Verification Test Name	Calibration for Instrument Option:									
	Std[1]	004	010	026	027	101	103	105	130	107
1. 10 MHz Reference Output Accuracy	•		•	•	•	•	•	•	•	•
2. 10 MHz Precision Frequency Reference Output Accuracy		•								
3. Comb Generator Frequency Accuracy	•	•	•	•	•	•	•	•	•	•
5. Frequency Readout and Marker Count Accuracy	⊡	⊡	⊡	⊡	⊡	⊡	⊡	⊡	⊡	⊡
6. Noise Sidebands	⊡	⊡	⊡	⊡	⊡	⊡	⊡	⊡	⊡	⊡
7. System Related Sidebands	•	•	•	•	•	•	•	•	•	•
9. Frequency Span Readout Accuracy	⊡	⊡	⊡	⊡	⊡	⊡	⊡	⊡	⊡	⊡
11. Residual FM	•	•	•	•	•	•	•	•	•	•
12. Sweep Time Accuracy	•	•	•	•	•	•	•	•	•	•
13. Scale Fidelity	⊡	⊡	⊡	⊡	⊡	⊡	⊡	⊡	⊡	⊡
15. Reference Level Accuracy	⊡	⊡	⊡	⊡	⊡	⊡	⊡	⊡	⊡	⊡
16. Absolute Amplitude Calibration and Resolution Bandwidth Switching Uncertainties	⊡	⊡	⊡	⊡	⊡	⊡	⊡	⊡	⊡	⊡
17. Resolution Bandwidth Accuracy	•	•	•	•	•	•	•	•	•	•
18. Calibrator Amplitude Accuracy	⊡	⊡	⊡	⊡	⊡	⊡	⊡	⊡	⊡	⊡
20. Frequency Response	⊡	⊡	⊡	⊡	⊡	⊡	⊡	⊡	⊡	⊡
25. Other Input Related Spurious Responses	•	•	•	•	•	•	•	•	•	•
30. Spurious Response[2]	⊡	⊡	⊡	⊡	⊡	⊡	⊡	⊡	⊡	⊡
35. Gain Compression	•	•	•	•	•	•	•	•	•	•
40. Displayed Average Noise Level	⊡	⊡	⊡	⊡	⊡	⊡	⊡	⊡		⊡
45. Displayed Average Noise Level for Option 130									⊡	
50. Residual Responses	•	•	•	•	•	•	•	•		
56. Residual Responses for Option 130									•	
58. Fast Time Domain Sweeps						•				
60. Absolute Amplitude Accuracy			•							
61. Power Sweep Range			•							
63. Tracking Generator Level Flatness			•							
65. Harmonic Spurious Outputs			•							
67. Non-Harmonic Spurious Outputs			•							
70. Tracking Generator Feedthrough			•							
71. Tracking Generator LO Feedthrough Amplitude			•							
72. CISPR Pulse Response							•			
73. Gate Delay Accuracy and Gate Length Accuracy								•		
74. Gate Card Insertion Loss								•		
75. TV Receiver, Video Tester										⊡

1 Use this column for all other options *not* listed in this table.

2 "Part 2: Third Order Intermodulation Distortion, 50 MHz" is not required for operation verification.

Table 1-4. HP 8594E Performance Verification Tests

Performance Verification Test Name	Calibration for Instrument Option:							
	Std[1]	004	010	101	103	105	130	107
1. 10 MHz Reference Output Accuracy	•		•	•	•	•	•	•
2. 10 MHz Precision Frequency Reference Output Accuracy		•						
4. Frequency Readout and Marker Count Accuracy	⊡	⊡	⊡	⊡	⊡	⊡	⊡	⊡
6. Noise Sidebands	⊡	⊡	⊡	⊡	⊡	⊡	⊡	⊡
7. System Related Sidebands	•	•	•	•	•	•	•	•
9. Frequency Span Readout Accuracy	⊡	⊡	⊡	⊡	⊡	⊡	⊡	⊡
11. Residual FM	•	•	•	•	•	•	•	•
12. Sweep Time Accuracy	•	•	•	•	•	•	•	•
13. Scale Fidelity	⊡	⊡	⊡	⊡	⊡	⊡	⊡	⊡
15. Reference Level Accuracy	⊡	⊡	⊡	⊡	⊡	⊡	⊡	⊡
16. Absolute Amplitude Calibration and Resolution Bandwidth Switching Uncertainties	⊡	⊡	⊡	⊡	⊡	⊡	⊡	⊡
17. Resolution Bandwidth Accuracy	•	•	•	•	•	•	•	•
18. Calibrator Amplitude Accuracy	⊡	⊡	⊡	⊡	⊡	⊡	⊡	⊡
21. Frequency Response	⊡	⊡	⊡	⊡	⊡	⊡	⊡	⊡
26. Other Input Related Spurious Responses	•	•	•	•	•	•	•	•
31. Spurious Response[2]	⊡	⊡	⊡	⊡	⊡	⊡	⊡	⊡
36. Gain Compression	•	•	•	•	•	•	•	•
41. Displayed Average Noise Level	⊡	⊡	⊡	⊡	⊡	⊡		⊡
46. Displayed Average Noise Level for Option 130							⊡	
51. Residual Responses	•	•	•	•	•	•		
55. Residual Responses for Option 130							•	
58. Fast Time Domain Sweeps				•				
60. Absolute Amplitude Accuracy			•					
61. Power Sweep Range			•					
63. Tracking Generator Level Flatness			•					
65. Harmonic Spurious Outputs			•					
67. Non-Harmonic Spurious Outputs			•					
69. Tracking Generator Feedthrough			•					
71. Tracking Generator LO Feedthrough Amplitude			•					
72. CISPR Pulse Response					•			
73. Gate Delay Accuracy and Gate Length Accuracy						•		
74. Gate Card Insertion Loss						•		
75. TV Receiver, Video Tester								⊡

1 Use this column for all other options *not* listed in this table.

2 "Third Order Intermodulation Distortion" is not required for operation verification.

Table 1-5. HP 8595E Performance Verification Tests

Performance Verification Test Name	Calibration for Instrument Option:							
	Std[1]	004	010	101	103	105	130	107
1. 10 MHz Reference Output Accuracy	•		•	•	•	•	•	•
2. 10 MHz Precision Frequency Reference Output Accuracy		•						
5. Frequency Readout and Marker Count Accuracy	⊡	⊡	⊡	⊡	⊡	⊡	⊡	⊡
6. Noise Sidebands	⊡	⊡	⊡	⊡	⊡	⊡	⊡	⊡
7. System Related Sidebands	•	•	•	•	•	•	•	•
9. Frequency Span Readout Accuracy	⊡	⊡	⊡	⊡	⊡	⊡	⊡	⊡
11. Residual FM	•	•	•	•	•	•	•	•
12. Sweep Time Accuracy	•	•	•	•	•	•	•	•
13. Scale Fidelity	⊡	⊡	⊡	⊡	⊡	⊡	⊡	⊡
15. Reference Level Accuracy	⊡	⊡	⊡	⊡	⊡	⊡	⊡	⊡
16. Absolute Amplitude Calibration and Resolution Bandwidth Switching Uncertainties	⊡	⊡	⊡	⊡	⊡	⊡	⊡	⊡
17. Resolution Bandwidth Accuracy	•	•	•	•	•	•	•	•
18. Calibrator Amplitude Accuracy	⊡	⊡	⊡	⊡	⊡	⊡	⊡	⊡
22. Frequency Response	⊡	⊡	⊡	⊡	⊡	⊡	⊡	⊡
27. Other Input Related Spurious Responses	•	•	•	•	•	•	•	•
32. Spurious Response[2]	⊡	⊡	⊡	⊡	⊡	⊡	⊡	⊡
37. Gain Compression	•	•	•	•	•	•	•	•
42. Displayed Average Noise Level	⊡	⊡	⊡	⊡	⊡	⊡		⊡
47. Displayed Average Noise Level for Option 130							⊡	
52. Residual Responses	•	•	•	•	•	•		
56. Residual Responses for Option 130							•	
58. Fast Time Domain Sweeps				•				
60. Absolute Amplitude Accuracy			•					
61. Power Sweep Range			•					
63. Tracking Generator Level Flatness			•					
65. Harmonic Spurious Outputs			•					
67. Non-Harmonic Spurious Outputs			•					
70. Tracking Generator Feedthrough			•					
71. Tracking Generator LO Feedthrough Amplitude			•					
72. CISPR Pulse Response					•			
73. Gate Delay Accuracy and Gate Length Accuracy						•		
74. Gate Card Insertion Loss						•		
75. TV Receiver, Video Tester								⊡

1 Use this column for all other options *not* listed in this table.

2 "Third Order Intermodulation Distortion" is not required for operation verification.

Table 1-6. HP 8596E Performance Verification Tests

Performance Verification Test Name	Calibration for Instrument Option:							
	Std[1]	004	010	101	103	105	130	107
1. 10 MHz Reference Output Accuracy	•		•	•	•	•	•	•
2. 10 MHz Precision Frequency Reference Output Accuracy		•						
3. Comb Generator Frequency Accuracy	⊡	⊡	⊡	⊡	⊡	⊡	⊡	⊡
5. Frequency Readout and Marker Count Accuracy	⊡	⊡	⊡	⊡	⊡	⊡	⊡	⊡
6. Noise Sidebands	⊡	⊡	⊡	⊡	⊡	⊡	⊡	⊡
7. System Related Sidebands	•	•	•	•	•	•	•	•
9. Frequency Span Readout Accuracy	⊡	⊡	⊡	⊡	⊡	⊡	⊡	⊡
11. Residual FM	•	•	•	•	•	•	•	•
12. Sweep Time Accuracy	•	•	•	•	•	•	•	•
13. Scale Fidelity	⊡	⊡	⊡	⊡	⊡	⊡	⊡	⊡
15. Reference Level Accuracy	⊡	⊡	⊡	⊡	⊡	⊡	⊡	⊡
16. Absolute Amplitude Calibration and Resolution Bandwidth Switching Uncertainties	⊡	⊡	⊡	⊡	⊡	⊡	⊡	⊡
17. Resolution Bandwidth Accuracy	•	•	•	•	•	•	•	•
18. Calibrator Amplitude Accuracy	⊡	⊡	⊡	⊡	⊡	⊡	⊡	⊡
22. Frequency Response	⊡	⊡	⊡	⊡	⊡	⊡	⊡	⊡
27. Other Input Related Spurious Responses	•	•	•	•	•	•	•	•
32. Spurious Response[2]	⊡	⊡	⊡	⊡	⊡	⊡	⊡	⊡
37. Gain Compression	•	•	•	•	•	•	•	•
42. Displayed Average Noise Level	⊡	⊡	⊡	⊡	⊡	⊡		⊡
47. Displayed Average Noise Level for Option 130							⊡	
52. Residual Responses	•	•	•	•	•	•		
56. Residual Responses for Option 130							•	
58. Fast Time Domain Sweeps				•				
60. Absolute Amplitude Accuracy			•					
61. Power Sweep Range			•					
63. Tracking Generator Level Flatness			•					
65. Harmonic Spurious Outputs			•					
67. Non-Harmonic Spurious Outputs			•					
70. Tracking Generator Feedthrough			•					
71. Tracking Generator LO Feedthrough Amplitude			•					
72. CISPR Pulse Response					•			
73. Gate Delay Accuracy and Gate Length Accuracy						•		
74. Gate Card Insertion Loss						•		
75. TV Receiver, Video Tester								⊡

1 Use this column for all other options *not* listed in this table.

2 "Third Order Intermodulation Distortion" is not required for operation verification.

Safety

Familiarize yourself with the safety symbols marked on the analyzer, and read the general safety instructions and the symbol definitions given in the front of this guide *before* you begin verifying performance of the spectrum analyzer.

Before You Start

There are four things you should do before starting a performance verification test:

- Switch the analyzer on and let it warm up in accordance with the temperature stability specification.
- Read "Making a Measurement" in your analyzer user's guide.
- After the analyzer has warmed up as specified, perform the self-calibration procedure documented in "Improving Accuracy With Self-Calibration Routines" in the *HP 8590 E-Series and L-Series Spectrum Analyzer User's Guide* or *HP 8591C Cable TV Analyzer, Spectrum Analyzer Reference User's Guide*. The performance of the analyzer is only specified after the analyzer calibration routines have been run and if the analyzer is autocoupled.
- Read the rest of this section before you start any of the tests, and make a copy of the Performance Verification Test Record described below in "Recording the test results."

Test equipment you will need

Tables 1-6 through 1-9 list the recommended test equipment for the performance tests. The tables also list recommended equipment for the analyzer adjustment procedures which are located in the *HP 8590 E-Series and L-Series Spectrum Analyzer, and HP 8591C Cable TV Analyzer, Assembly-Level Repair Service Guide*. Any equipment that meets the critical specifications given in the table can be substituted for the recommended model.

Recording the test results

Performance verification test records, for each spectrum analyzer, are provided in the chapter following the tests.

Each test result is identified as a *TR Entry* in the performance tests and on the performance verification test record. We recommend that you make a copy of the performance verification test record, record the test results on the copy, and keep the copy for your calibration test record. This record could prove valuable in tracking gradual changes in test results over long periods of time.

Frequency and amplitude self-calibration

Perform the frequency and amplitude self-calibration routines at least once per day, or if the analyzer fails a verification test. To perform self-calibration, press (CAL) then `CAL FREQ & AMPTD`. The instrument must be up to operating temperature in order for this test to be valid. Press `CAL STORE` when the test is complete. If the analyzer continuously fails one or more specifications, complete any remaining tests and record all test results on a copy of the test record. Then refer to the "If You Have a Problem" chapter for instructions on how to solve the problem.

Periodically verifying operation

The analyzer requires periodic verification of operation. Under most conditions of use, you should test the analyzer at least once a year with either operation verification or the complete set of performance verification tests.

Table 1-7. Recommended Test Equipment

Equipment	Critical Specifications for Equipment Substitution	Recommended Model	Use[1]
Digital Voltmeter	Input Resistance: $\geq$10 megohms Accuracy: ±10 mV on 100 V range	HP 3456A	P,A,T
DVM Test Leads	For use with HP 3456A	HP 34118B	A,T
Frequency Counter[2]	Frequency: 10 MHz Resolution: ±0.002 Hz External Timebase	HP 5334A/B	P,A,T
Frequency Standard	Frequency: 10 MHz Timebase Accy (Aging): $<1 \times 10^{-9}$/day	HP 5061B	P,A
Measuring Receiver	Compatible with Power Sensors dB Relative Mode Resolution: 0.01 dB Reference Accuracy: ±1.2%	HP 8902A	P,A,T
Microwave Frequency Counter	Frequency Range: 9 MHz to 7 GHz Timebase Accy (Aging): $<5 \times 10^{-10}$/day	HP 5343A	P,A,T
Oscilloscope	Bandwidth: dc to 100 MHz Vertical Scale Factor of 0.5 V to 5 V/Div	HP 54501A	T
Power Meter	Power Range: Calibrated in dBm and dB relative to reference power −70 dBm to +44 dBm, sensor dependent	HP 436A	P,A,T
Power Sensor	Frequency Range: 100 kHz to 1800 MHz Maximum SWR: 1.60 (100 kHz to 300 kHz) 1.20 (300 kHz to 1 MHz) 1.1 (1 MHz to 2.0 GHz) 1.30 (2.0 to 2.9 GHz)	HP 8482A	P,A,T

1 P = Performance Test, A = Adjustment, T = Troubleshooting

2 Precision Frequency Reference only

Table 1-7. Recommended Test Equipment (continued)

Equipment	Critical Specifications for Equipment Substitution	Recommended Model	Use[1]
Power Sensor[1]	Frequency Range: 1 MHz to 2 GHz Maximum SWR: 1.18 (600 kHz to 2.0 GHz) 75 Ω	HP 8483A	P,A,T
Power Sensor, Low Power	Frequency Range: 300 MHz Amplitude Range: −20 dBm to −70 dBm Maximum SWR: 1.1 (300 MHz)	HP 8484A	P,A,T
Power Sensor[2]	Frequency Range: 50 MHz to 26.5 GHz Maximum SWR: 1.10 (300 MHz) 1.15 (50 MHz to 100 MHz) 1.10 (100 MHz to 2.0 GHz) 1.15 (2.0 GHz to 12.4 GHz) 1.20 (12.4 GHz to 18.0 GHz) 1.25 (18.0 GHz to 26.5 GHz)	HP 8485A	P,A,T
Pulse Generator[3]	Period Range: 1 ms to 980 ms ±2%, single pulse mode Level −2 V to +2 V Transition Time: 6 ns ±10%, ±1 ns Pulse Width: 150 ns to 3 μs ±1% ±1 ns	HP 8161A	P,T
Pulse Generator[1]	Frequency: 100 Hz Duty Cycle: 50% Output: TTL	HP 8116A	P,T
Quasi-Peak[3] Detector Driver	Down-Loadable Program (DLP)	11946-10001	P,A,T
Signal Generator	Frequency Range: 1 MHz to 1000 MHz Amplitude Range: −35 to +16 dBm SSB Noise: <−120 dBc/Hz at 20 kHz offset	HP 8640B, Option 002 or HP 8642A	P,A,T
Spectrum Analyzer, Microwave	Frequency Range: 100 kHz to 7 GHz Relative Amplitude Accuracy: 100 kHz to 1.8 GHz: <±1.8 dB Frequency Accuracy: <±10 kHz @ 7 GHz	HP 8566A/B	P,A,T

1 HP 8591E and HP 8591C only

2 Not for HP 8591E or HP 8591C

3 For Option 103 or HP 8591C

Table 1-7. Recommended Test Equipment (continued)

Equipment	Critical Specifications for Equipment Substitution	Recommended Model	Use[1]
Synthesized Sweeper[1]	Frequency Range: 10 MHz to 22 GHz Frequency Accuracy (CW): ± 0.02% Leveling Modes: Internal and External Modulation Modes: AM Power Level Range: −35 to +16 dBm	HP 8340A/B or HP 83630A	P,A,T
Synthesizer/Function Generator	Frequency Range: 0.1 Hz to 500 Hz Frequency Accuracy: ±0.02% Waveform: Triangle	HP 3325B	P,T
Synthesizer/Level Generator	Frequency Range: 1 kHz to 80 MHz Amplitude Range: +12 to −85 dBm Flatness: ±0.15 dB Attenuator Accuracy: ±0.09 dB	HP 3335A	P,A,T
Universal Counter[2]	Time Interval Range: 25 ms to 100 ms Single Operation Range: +2.5 Vdc to −2.5 Vdc	HP 5316B	P,T
Base Band Signal Source[3]	Capable of providing the following VIT signals: FCC composite NTC7 composite or CCIR 17 and CCIR 330	Magni Signal Creator	P,T
Video Modulator[3]	Differential Gain: <2% Differential Phase: <0.5°	HP 8780A, Scientific Atlanta 6350 or 6351 with Option FAOC	P,T

1 For HP 8591E, HP 8591C, HP 8593E Option 026 or Option 027, HP 8594E, HP 8595E, and HP 8596E

2 For Option 105 and HP 8591C

3 For Option 107

Table 1-8. Recommended Accessories

Equipment	Critical Specifications for Accessory Substitution	Recommended Model	Use[1]
Active Probe[2]	5 Hz to 500 MHz	HP 41800A	T
Active Probe[2]	300 kHz to 3 GHz	HP 85024A	T
Attenuator, 3 dB[3]	Type N (m to f) Attenuation: 3 dB Frequency: dc to 12.4 GHz	HP 8491A Option 003	P
Attenuator, 10 dB	Type N (m to f) Frequency: 300 MHz	HP 8491A Option 010	P,A,T
Attenuator, 20 dB[4]	Type N (m to f) Attenuation: 20 dB Frequency: dc to 12.4 GHz	HP 8491A Option 020	A
Attenuator, 1 dB Step	Attenuation Range: 0 to 12 dB Frequency Range: 50 MHz Connectors: BNC female	HP 355C	P,A
Attenuator, 10 dB Step	Attenuation Range: 0 to 30 dB Frequency Range: 50 MHz Connectors: BNC female	HP 355D	P,A
Coupler, 9 dB[5]	Coupling: Nominal 9 dB Insertion Loss: <2 dB	0955-0704	P,T
Digital Current Tracer	Sensitivity: 1 mA to 500 mA Frequency Response: Pulse trains to 10 MHz Minimum Pulse Width: 50 ns Pulse Rise Time: <200 ns	HP 547A	T
Directional Bridge	Frequency Range: 0.1 to 110 MHz Directivity: >40 dB Maximum VSWR: 1.1:1 Transmission Arm Loss: 6 dB (nominal) Coupling Arm Loss: 6 dB (nominal)	HP 8721A	P,T
Logic Pulser	TTL voltage and current drive levels	HP 546A	T
Logic Clip	TTL voltage and current drive levels	HP 548A	T

1 P = Performance Test, A = Adjustment, T = Troubleshooting

2 HP 8591E only

3 Option 103 and HP 8591C only

4 HP 8593E, HP 8594E, HP 8595E, and HP 8596E

5 Option 107 only

Table 1-8. Recommended Accessories (continued)

Equipment	Critical Specifications for Accessory Substitution	Recommended Model	Use[1]
Directional Coupler	Frequency Range: 1.7 GHz to 8 GHz Coupling: 16 dB (nominal) Max. Coupling Deviation: ±1 dB Directivity: 14 dB minimum Flatness: 0.75 dB maximum VSWR: <1.45 Insertion Loss: <1.3 dB	0955-0125	P,T
Low Pass Filter, 50 MHz	Cutoff Frequency: 50 MHz Rejection at 80 MHz: >50 dB	0955-0306	P,T
Low Pass Filter, 300 MHz	Cutoff Frequency: 300 MHz Bandpass Insertion Loss: <0.9 dB at 300 MHz Stopband Insertion Loss: >40 dB at 435 MHz	0955-0455	P,A,T
Modulator Teletech SC35B	Frequency 50 MHz ON/OFF RATIO >70 dB Switching Speed 2 ns Insertion Loss: 5 dB	0955-0533	P,T
Power Splitter[1]	Frequency Range: 50 kHz to 1.8 GHz Insertion Loss: 6 dB (nominal) Output Tracking: <0.25 dB Equivalent Output SWR: <1.22:1	HP 11667A	P,A
Power Splitter[2]	Frequency Range: 50 kHz to 22 GHz Insertion Loss: 6 dB (nominal) Output Tracking: <0.25 dB Equivalent Output SWR: <1.22:1	HP 11667B	P,A
Termination, 50 Ω	Impedance: 50 Ω (nominal) *(2 required for Option 010)*	HP 908A	P,T
Termination[3]		HP 909D	
Termination, 75 Ω[4]	Impedance: 75 Ω (nominal) *(2 required for option 011)*	HP 909E Option 201	P,T

1 HP 8591C, HP 8591E, and HP 8593E

2 HP 8593E, HP 8594E, HP 8595E, and HP 8596E

3 HP 8595E and HP 8596E only

4 HP 8591E and HP 8591C only

Table 1-9. Recommended Adapters

Equipment	Critical Specifications for Accessory Substitution	Recommended Model	Use[1]
Adapter	APC 3.5 (f) to APC 3.5 (f)	5061-5311	P,A,T
Adapter[2]	BNC (f) to dual banana plug	1251-1277	P,A,T
Adapter[3]	SMA (f) to SMA (f)	1250-1158	P,A,T
Adapter	BNC (m) to BNC (m)	1250-0216	P,A,T
Adapter[3]	SMA (m) to SMA (m)	1250-1159	P, A, T
Adapter[2]	BNC (m) to BNC (m), 75 Ω	1250-1288	P,A,T
Adapter	BNC (f) to SMB (m)	1250-1237	A,T
Adapter	BNC tee (m) (f) (f)	1250-0781	T
Adapter[4]	MNC (m) to SMA (f)	1250-1700	P,A,T
Adapter	Type N (f) to APC 3.5 (f)	1250-1745	P,A,T
Adapter	Type N (f) to APC 3.5 (m)	1250-1750	P,A,T
Adapter[5]	Type N (f) to SMA (f)	1250-1772	P,A,T
Adapter	Type N (m) to APC 3.5 (m)	1250-1743	P,A,T
Adapter[5]	Type N (m) to APC 3.5 (f)	1250-1744	P,A,T
Adapter[6]	Type N (f) to BNC (f)	1250-1474	P,A,T
Adapter	Type N (f) to BNC (m)	1250-1477	P,A,T
Adapter[2]	Type N (f) to BNC (m), 75 Ω	1250-1534	P,A,T
Adapter	Type N (m) to BNC (f) *(4 required)*	1250-1476	P,A,T
Adapter	Type N (m) to BNC (m) *(2 required)*	1250-1473	P,A,T
Adapter	Type N (f) to N (f)	1250-1472	P,A,T
Adapter[6]	Type N (m) to N (m)	1250-1475	P,A,T
Adapter[2]	Type N (f) to N (f), 75 Ω	1250-1529	P,A,T
Adapter[7]	Type N (f), 75 Ω, to Type N (m), 50 Ω	1250-0597	P,A,T
Adapter[2]	SMB (f) to SMB (f)	1250-0692	A,T
Adapter[5]	SMC (m) to SMC (m)	1250-0827	A,T
Adapter	SMB (m) to SMB (m)	1250-0813	A,T
Adapter,[7] Minimum Loss	50 to 75 Ω, matching Frequency Range: dc to 2 GHz Insertion Loss: 5.7 dB	HP 11852B	P,A,T

1 P = Performance Test, A = Adjustment, T = Troubleshooting

2 HP 8591C and HP 8591E only

3 HP 8594E, HP 8595E, and HP 8596E only

4 HP 8593E only

5 HP 8593E, HP 8594E, HP 8595E, and HP 8596E only

6 HP 8591C, HP 8591E, HP 8594E, HP 8595E, and HP 8596E only

7 HP 8591E Option 001 and option 011 only

Table 1-10. Recommended Cables

Equipment	Critical Specifications for Cable Substitution	Recommended Model	Use[1]
Cable[2]	Cal Comb SMA (m) to (m)	08592-60061	P,A,T
Cable[2]	SMA (m) to (m), 61 cm (18 in)	8120-1578	P,A,T
Cable Assembly[3]	Length: approximately 15 cm (6 in) Connectors: BNC (f) to Alligator Clips	8120-1292	A
Cable Assembly[3]	Length: $\geq$91 cm (36 in) Connectors: Banana Plug to Alligator Clips	HP 11102A	A
Cable[3]	Frequency Range: dc to 1 GHz Length: $\geq$91 cm (36 in) Connectors: BNC (m) both ends *(4 required)*	HP 10503A	P,A,T
Cable[4]	Frequency Range: 10 MHz to 26.5 GHz Maximum SWR: <1.4 at 26.5 GHz Length: $\geq$91 cm (36 in) Connectors: APC 3.5 (m) both ends Maximum Insertion Loss 2 dB *(2 required)*	8120-4921	P,A
Cable[3]	Frequency Range: 50 MHz to 7 GHz Length: $\geq$91 cm (36 in) Connectors: SMA (m) both ends	5061-5458	P,A,T
Cable	Type N, 183 cm (72 in)	HP 11500A	P,A,T
Cable	Type N, 62 cm (24 in)	HP 11500B/C	P,A,T
Cable	Type N, 152 cm (60 in)	HP 11500D	P,A,T
Cable	Frequency Range: dc to 1 GHz Length: $\geq$91 cm (36 in) Connectors: BNC (m) both ends *(4 required)*	HP 10503A	P,A,T
Cable	Frequency Range: dc to 310 MHz Length: 20 cm (9 in) Connectors: BNC (m) both ends	HP 10502A	P,A,T
Cable[5]	BNC, 75 Ω, 30 cm (12 in)	5062-6452	P,A,T
Cable[5]	BNC, 75 Ω, 120 cm (48 in)	15525-80010	P,A,T
Cable, Test	Length: $\geq$91 cm (36 in) Connectors: SMB (f) to BNC (m) *(2 required)*	85680-60093	A,T

1 P = Performance Test, A = Adjustment, T = Troubleshooting

2 For HP 8593E only

3 Not for HP 8591E

4 For HP 8593E Option 026 or 027, or HP 8594E, HP 8595E, or HP 8596E only

5 For HP 8591E Option 001 and Option 011 only

2

Performance Verification Tests

These tests verify the electrical performance of the spectrum analyzer. Allow the spectrum analyzer to warm up in accordance with the temperature stability specifications before performing the tests.

1. 10 MHz Reference Output Accuracy, HP 8590 E-Series and HP 8591C Option 704

If your instrument is equipped with a Precision Frequency Reference, perform "10 MHz Precision Frequency Reference Output Accuracy," instead.

The settability is measured by changing the setting of the digital-to-analog converter (DAC) which controls the frequency of the timebase. The frequency difference per DAC step is calculated and compared to the specification.

The related adjustment for this performance verification test is the "10 MHz Frequency Reference Adjustment."

Equipment Required

Microwave frequency counter
Frequency standard
Cable, BNC, 122 cm (48 in) (2 required)

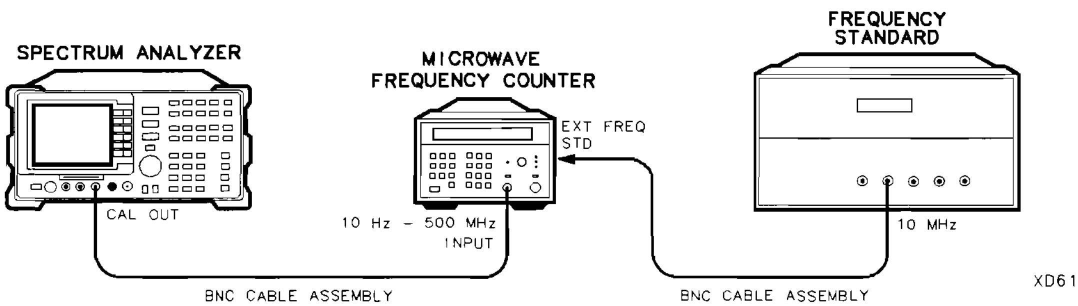


Figure 2-1. 10 MHz Reference Test Setup

Procedure

The test results will be invalid if REF UNLK is displayed at any time during this test. REF UNLK will be displayed if the internal reference oscillator is unlocked from the 10 MHz reference. A REF UNLK might occur if there is a hardware failure or if the jumper between 10 MHz REF OUTPUT and EXT REF IN on the rear panel is removed.

1. Connect the equipment as shown in Figure 2-1.
2. Set the frequency counter controls as follows:

SAMPLE RATE .... Midrange
50 Ω/1 Ω SWITCH .... 50 Ω
10 Hz-500 MHz/500 MHz-26.5 GHz SWITCH .... 10 Hz-500 MHz
FREQUENCY STANDARD (Rear panel) .... EXTERNAL

3. Wait for the frequency counter reading to stabilize. Record the frequency counter reading in the 10 MHz Reference Accuracy Worksheet as Counter Reading 1.
4. Set the spectrum analyzer by pressing the following keys:

   (FREQUENCY) −37 (Hz)
   (CAL) More 1 of 4 More 2 of 4 VERIFY TIMEBASE

5. Record the number in the active function block of the spectrum analyzer in the 10 MHz Reference Accuracy Worksheet as the Timebase DAC Setting.
6. Add one to the Timebase DAC Setting recorded in step 5, then enter this number using the DATA keys on the spectrum analyzer. For example, if the timebase DAC setting is 105, press 1,0,6 (Hz).
7. Wait for the frequency counter reading to stabilize. Record the frequency counter reading in the 10 MHz Reference Accuracy Worksheet as Counter Reading 2.
8. Subtract one from the Timebase DAC Setting recorded in step 5, then enter this number using the DATA keys on the spectrum analyzer. For example, if the timebase DAC setting is 105, press 1, 0, 4, (Hz).
9. Wait for the frequency counter reading to stabilize. Record the frequency counter reading in the 10 MHz Reference Accuracy Worksheet as Counter Reading 3.

10 MHz Reference Accuracy Worksheet

Description	Measurement
Counter Reading 1	______________ Hz
Timebase DAC Setting	______________
Counter Reading 2	______________ Hz
Counter Reading 3	______________ Hz

10. Calculate the frequency settability by performing the following steps:
    - Calculate the frequency difference between Counter Reading 2 and Counter Reading 1.
    - Calculate the frequency difference between Counter Reading 3 and Counter Reading 1.
    - Divide the difference with the greatest absolute value by two and record the value as TR Entry 1 of the performance verification test record. The settability should be less than ±150 Hz.
    - Press (PRESET) on the spectrum analyzer. The timebase DAC will be reset automatically to the value recorded in step 5.

2. 10 MHz Precision Freq. Ref. Output Accuracy, HP 8590 E-Series Opt. 004 and HP 8591C

If the spectrum analyzer is *not* equipped with a Precision Frequency Reference, perform "10 MHz Reference Output Accuracy," instead.

This test measures the warmup characteristics of the 10 MHz reference oscillator. The ability of the 10 MHz oscillator to meet its warmup characteristics gives a high level of confidence that it will also meet its yearly aging specification.

A frequency counter is connected to the 10 MHz REF OUTPUT. After the spectrum analyzer has been allowed to cool for at least 60 minutes, the spectrum analyzer is powered on. A frequency measurement is made five minutes after power is applied and the frequency is recorded. Another frequency measurement is made 25 minutes later (30 minutes after power is applied) and the frequency is recorded. A final frequency measurement is made 60 minutes after power is applied. The difference between each of the first two frequency measurements and the last frequency measurement is calculated and recorded.

The related adjustment for this procedure is "10 MHz Precision Frequency Reference Accuracy Adjustment."

Equipment Required

Frequency counter
Frequency standard
Cable, BNC, 122 cm (48 in) *(two required)*

Procedure

The spectrum analyzer must have been allowed to sit with the power off for at least 60 minutes before performing this procedure. This adequately simulates a cold start. A cold start is defined as the spectrum analyzer being powered on after being off for at least 60 minutes.

1. Allow the spectrum analyzer to sit with the power off for at least 60 minutes before proceeding. Connect the equipment as shown in Figure 2-2.
2. Set the spectrum analyzer LINE switch on. Record the Power On Time below.

Power On Time ________

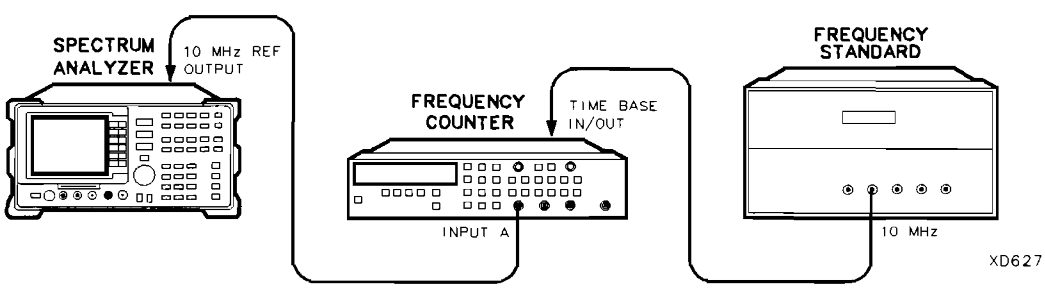


Figure 2-2. 10 MHz Precision Frequency Reference Accuracy Test Setup

3. Set the frequency counter controls as follows:

   FUNCTION/DATA .... FREQ A
   INPUT A
   X10 ATTN .... OFF
   AC .... OFF
   50 Ω Z .... OFF
   AUTO TRIG .... ON
   100 kHz FILTER A .... OFF

4. On the frequency counter select a 10 second gate time by pressing (GATE TIME) 10 (GATE TIME). Offset the displayed frequency by −10.0 MHz by pressing (MATH), (SELECT/ENTER), (CHS/EEX) 10 (CHS/EEX) 6 (SELECT/ENTER), (SELECT ENTER). The frequency counter should now display the difference between the INPUT A signal and 10.0 MHz with 0.001 Hz resolution.
5. Proceed with the next step 5 minutes after the Power On Time noted in step 2.
6. Wait at least two periods for the frequency counter to settle. Record the frequency counter reading in the 10 MHz Reference Accuracy Worksheet as Counter Reading 1 with 0.001 Hz resolution.
7. Proceed with the next step 30 minutes after the Power On Time noted in step 2.
8. Record the frequency counter reading in the 10 MHz Reference Accuracy Worksheet as Counter Reading 2 with 0.001 Hz resolution.
9. Proceed with the next step 60 minutes after the Power On Time noted in step 2.
10. Wait at least two periods for the frequency counter to settle. Record the frequency counter reading in the 10 MHz Reference Accuracy Worksheet as Counter Reading 3 with 0.001 Hz resolution.

10 MHz Reference Accuracy Worksheet

Description	Measurement
Counter Reading 1	________Hz
Counter Reading 2	________Hz
Counter Reading 3	________Hz

11. Calculate the 5 Minute Warmup Error by subtracting Reading 3 from Reading 1 and dividing the result by 10 MHz.

    5 Minute Warmup Error = (Reading 1 − Reading 3) / (10.0 × 10^6)

12. Record the results as TR Entry 1 of the performance verification test record.
13. Calculate the 30 Minute Warmup Error by subtracting Reading 3 from Reading 2 and dividing the result by 10 MHz.

    30 Minute Warmup Error = (Reading 2 − Reading 3) / (10.0 × 10^6)

14. Record the results as TR Entry 2 of the performance verification test record.

3. Comb Generator Frequency Accuracy, HP 8593E and HP 8596E

A 100 MHz signal from a synthesized source and the output from a comb generator are applied to the input of the spectrum analyzer. The source frequency is adjusted until the two signals appear at the same frequency. The frequency setting of the source is then equal to the comb generator frequency and this frequency is compared to the specification.

The related adjustment procedure for this performance verification test is "Comb Generator Frequency Adjustment."

Equipment Required

Synthesized sweeper
Power splitter
Cable, APC mm (m) 91 cm (36 in)
Cable, SMA 61 cm (18 in) (m) to (m)
Adapter, Type N (m) to APC 3.5 (m)
Adapter, 3.5 mm (f) to 3.5 mm (f)

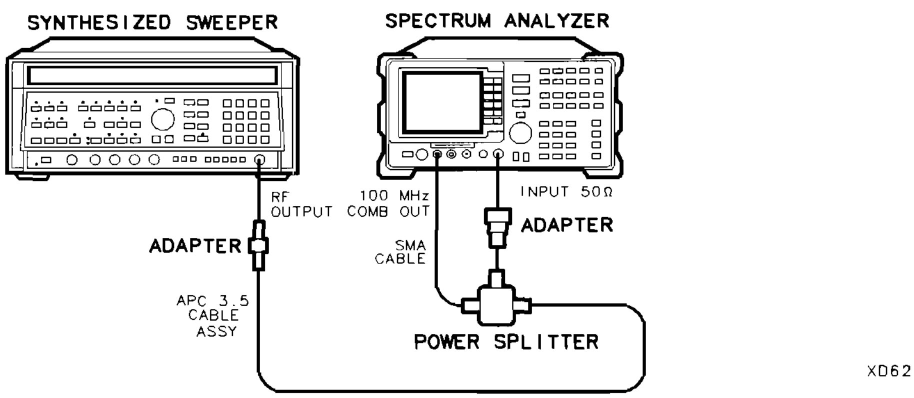


Figure 2-3. Comb Generator Frequency Accuracy Test Setup

Procedure

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

   Option 026 only: Omit the Type N to APC adapter.

2. Press instrument preset on the synthesized sweeper, then set the controls as follows:

   CW .... 100.025 MHz
   POWER LEVEL .... 0 dBm
   RF .... OFF

3. Press (PRESET) on the spectrum analyzer, then wait for preset routine to finish. Set the spectrum analyzer by pressing the following keys:

   (FREQUENCY) 100 (MHz)
   (AUX CTRL) COMB GEN ON OFF (ON)
   (SPAN) 10 (MHz)
   (AMPLITUDE) REF LVL 10 (dB)
   (BW) RES BW AUTO MAN 10 (kHz)

4. On the spectrum analyzer, press the following keys:

   (PEAK SEARCH)
   (MKR FCTN) MK TRACK ON OFF (ON)
   (SPAN) 100 (kHz)

5. Press (AMPLITUDE) and adjust the reference-level setting until the signal peak is 10 dB below the reference level

6. Set the synthesized sweeper RF on. Adjust the synthesized sweeper power level until the two signals are the same amplitude.

7. Set SCALE LOG LIN (LOG) to 2 dB on the spectrum analyzer.

8. If necessary, readjust the synthesized sweeper power level until the two signals are the same amplitude.

9. Set the synthesized sweeper CW to 100 MHz. A very unstable signal will probably appear. The peak amplitude should be at least 3 dB greater in amplitude than either of the individual signals.

10. Adjust the synthesized sweeper CW setting until a single signal appears to rise and fall in amplitude at the slowest rate (1 Hz frequency resolution will be necessary). The signal peak should be displayed approximately 6 dB above the amplitude of the individual signals.

11. Record the synthesized sweeper CW frequency setting as TR Entry 1 of the performance verification test record. The frequency should be between 99.993 MHz and 100.007 MHz.

4. Frequency Readout and Marker Count Accuracy, HP 8591C, HP 8591E, and HP 8594E

The frequency readout accuracy of the spectrum analyzer is tested with an input signal of known frequency. By using the same frequency standard for the spectrum analyzer and the synthesized sweeper, the frequency reference error is eliminated.

The related adjustment for this performance test is the "Sampler Match Adjustment."

Equipment Required

Synthesized sweeper
Adapter, Type N (f) to APC 3.5 (m)
Adapter, APC 3.5 (f) to APC 3.5 (f)
Cable, Type N, 183 cm (72 in)
Cable, BNC, 122 cm (48 in)

Additional Equipment for 75 Ω Input

Adapter, minimum loss
Adapter, Type N (f) to BNC (m), 75 Ω

Procedure

This performance test consists of two parts:

Part 1: Frequency Readout Accuracy
Part 2: Marker Count Accuracy

Perform "Part 1: Frequency Readout Accuracy" before "Part 2: Marker Count Accuracy."

Part 1: Frequency Readout Accuracy

1. Connect the equipment as shown in Figure 2-4. Remember to connect the 10 MHz REF OUT of the synthesized sweeper to the EXT REF IN of the spectrum analyzer.
2. Perform the following steps to set up the equipment:
   - Press INSTRUMENT PRESET on the synthesized sweeper, then set the controls as follows:

     CW .... 1.5 GHz
     POWER LEVEL .... −10 dBm

   - Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish. Set the spectrum analyzer by pressing the following keys:

     (FREQUENCY) 1.5 (GHz)
     (SPAN) 20 (MHz)

Caution Use only 75 Ω cables, connectors, or adapters on instruments with 75 Ω inputs, or damage to the input connector will occur.

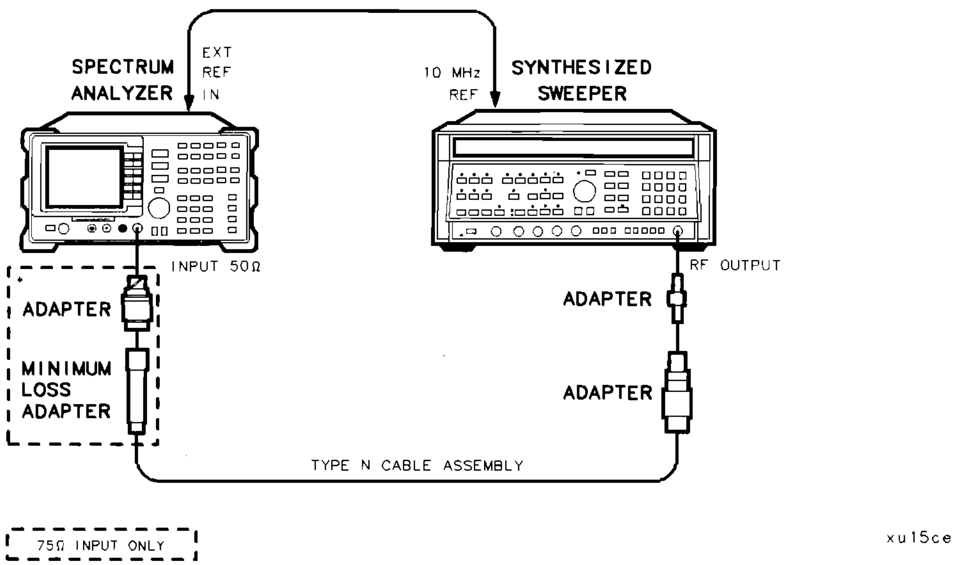


Figure 2-4. HP 8591E and HP 8591C Frequency Readout Accuracy Test Setup

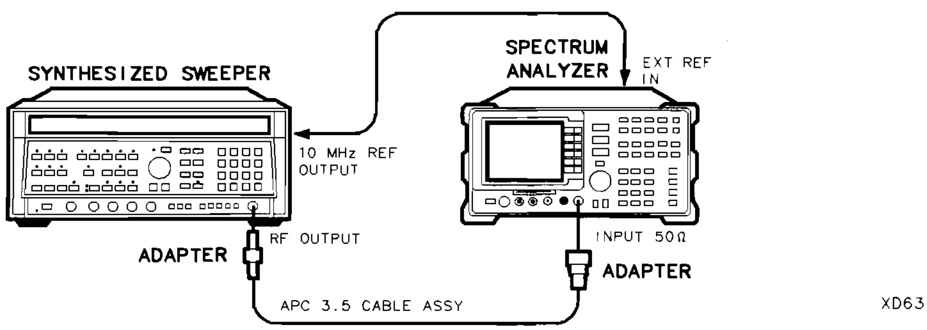


Figure 2-5. HP 8594E Frequency Readout Accuracy Test Setup

3. Press (PEAK SEARCH) on the spectrum analyzer to measure the frequency readout accuracy.
4. Record the MKR frequency reading in the performance verification test record. The reading should be within the limits shown in Table 2-1.

5. Change to the next spectrum analyzer span setting listed in Table 2-1.
6. Repeat steps 3 through 5 for each spectrum analyzer span setting listed in Table 2-1.

If you are testing a spectrum analyzer equipped with Option 130 continue with step 7.

"Part 1: Frequency Readout Accuracy" is now complete for all other spectrum analyzers. Continue with "Part 2: Marker Count Accuracy."

Table 2-1. Frequency Readout Accuracy

Spectrum Analyzer	MKR Reading		
Span (MHz)	Min. (MHz)	TR Entry (Actual)	Max. (MHz)
20	1.49918	1	1.50082
10	1.49958	2	1.50042
1	1.499968	3	1.500032

Additional Frequency Readout Accuracy Steps for Option 130

7. Set the spectrum analyzer by pressing the following keys:

   (BW) RES BW AUTO MAN 300 (Hz)
   (SPAN) 20 (kHz)

8. Press (PEAK SEARCH) on the spectrum analyzer.
9. Record the MKR frequency reading as TR Entry 4 of the performance verification test record. The reading should be within the limits of 1.49999924 GHz and 1.50000076 GHz.

"Part 1: Frequency Readout Accuracy" is now complete for the Option 130. Continue with "Part 2: Marker Count Accuracy."

Part 2: Marker Count Accuracy

Perform "Part 1: Frequency Readout Accuracy" before performing this procedure.

1. Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish. Set the spectrum analyzer to measure the marker count accuracy by pressing the following keys:

   (FREQUENCY) 1.5 (GHz)
   (SPAN) 20 (MHz)
   (BW) RES BW AUTO MAN 300 (kHz)
   (MKR FCTN) MK COUNT ON OFF (ON)
   More 1 of 2
   CNT RES AUTO MAN 100 (Hz)

2. Press (PEAK SEARCH), then wait for a count be taken (it may take several seconds).
3. Record the CNTR frequency reading as TR Entry 5 of the performance verification test record. The reading should be within the limits of 1.4999989 GHz and 1.5000011 GHz.
4. Change the spectrum analyzer settings by pressing the following keys:

   (SPAN) 1 (MHz)
   (MKR FCTN) MK COUNT ON OFF (ON)
   More 1 of 2
   CNT RES AUTO MAN 10 (Hz)

5. Press (PEAK SEARCH), then wait for a count be taken (it may take several seconds).
6. Record the CNTR frequency reading as TR Entry 6 of the performance verification test record. The reading should be within the limits of 1.49999989 GHz and 1.50000011 GHz.

If you are testing a spectrum analyzer equipped with Option 130 continue with step 7.

Performance test "2. Frequency Readout Accuracy and Marker Count Accuracy" is now complete for all other spectrum analyzers.

Additional Marker Count Accuracy Steps for Option 130

7. Set the spectrum analyzer by pressing the following keys:

   (BW) RES BW AUTO MAN 300 (Hz)
   (SPAN) 20 (kHz)

8. Press (PEAK SEARCH) on the spectrum analyzer.
9. Record the MKR frequency reading as TR Entry 7 of the performance verification test record. The reading should be within the limits of 1.49999989 GHz and 1.50000011 GHz.
10. Set the spectrum analyzer by pressing the following keys:
    - (BW) RES BW AUTO MAN 30 (Hz)
    - (SPAN) 2 (kHz)
11. Press (PEAK SEARCH) (MKR FCTN) Mk Track On Off (ON), then wait until the count is completed (it may take several seconds).
12. Record the MKR reading as TR Entry 8 of the Performance Test Record. The reading should be within the limits of 1.49999989 and 1.50000011.

Performance test "2. Frequency Readout Accuracy and Marker Count Accuracy" is now complete for spectrum analyzers equipped with Option 130.

5. Frequency Readout and Marker Count Accuracy, HP 8593E, HP 8595E, and HP 8596E

The frequency readout accuracy of the spectrum analyzer is tested with an input signal of known frequency. By using the same frequency standard for the spectrum analyzer and the synthesized sweeper, the frequency reference error is eliminated.

The related adjustments for this performance verification test are:

Sampler Match Adjustment
Frequency Reference Adjustment

Equipment Required

Synthesized sweeper
Adapter, Type N (f) to APC 3.5 (m)
Adapter, APC 3.5 (f) to APC 3.5 (f)
Cable, APC 3.5, 91 cm (36 in)
Cable, BNC, 122 cm (48 in)

Additional Equipment for Option 026

Adapter, 3.5 mm (f) to 3.5 mm (f)

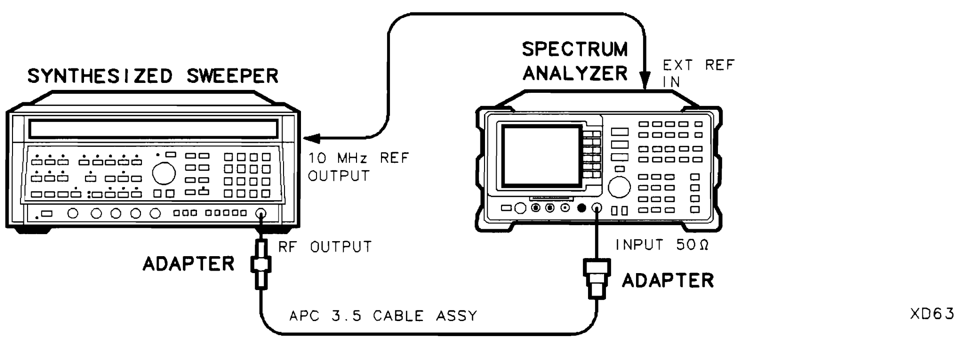


Figure 2-6. Frequency Readout Accuracy Test Setup

Procedure

This performance verification test consists of two parts:

Part 1: Frequency Readout Accuracy
Part 2: Marker Count Accuracy

Perform "Part 1: Frequency Readout Accuracy" before "Part 2: Marker Count Accuracy."

Part 1: Frequency Readout Accuracy

1. Connect the equipment as shown in Figure 2-6. Remember to connect the 10 MHz REF OUT of the synthesized sweeper to the EXT REF IN of the spectrum analyzer.

   Option 026 only: Use the 3.5 mm adapter to connect the cable to the spectrum analyzer input.

2. Perform the following steps to set up the equipment:

   - Press INSTRUMENT PRESET on the synthesized sweeper, then set the controls as follows:

     CW .... 1.5 GHz
     POWER LEVEL .... −10 dBm

   - Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish. Set the spectrum analyzer by pressing the following keys:

     (FREQUENCY) 1.5 (GHz)
     (SPAN) 20 (MHz)

3. Press (PEAK SEARCH) on the spectrum analyzer to measure the frequency readout accuracy.
4. Record the MKR frequency reading in the performance verification test record as indicated in Table 2-2. The reading should be within the limits shown.
5. Change to the next spectrum analyzer span setting listed in Table 2-2.
6. Repeat steps 3 through 5 for each spectrum analyzer span setting listed in Table 2-2.

If you are testing a spectrum analyzer equipped with Option 130 continue with step 7.

"Part 1: Frequency Readout Accuracy" is now complete for all other spectrum analyzers. Continue with "Part 2: Marker Count Accuracy."

Table 2-2. Frequency Readout Accuracy

Synthesized Sweeper CW Frequency (MHz)	Spectrum Analyzer Span (MHz)	Spectrum Analyzer Center Frequency (GHz)	Min. Frequency (GHz)	TR Entry Frequency (GHz)	Max. Frequency, (GHz)
1500	20	1.5	1.49918	**1**	1.50082
1500	10	1.5	1.49958	**2**	1.50042
1500	1	1.5	1.499968	**3**	1.500032
4000	20	4.0	3.99918	**4**	4.00082
4000	10	4.0	3.99958	**5**	4.00042
4000	1	4.0	3.999968	**6**	4.000032
Stop here for HP 8595E.					
9000	20	9.0	8.99918	**7**	9.00082
9000	10	9.0	8.99958	**8**	9.00042
9000	1	9.0	8.999968	**9**	9.000032
Stop here for HP 8596E.					
16000	20	16.0	15.99918	**10**	16.00082
16000	10	16.0	15.99958	**11**	16.00042
16000	1	16.0	15.999968	**12**	16.000032
21000	20	21.0	20.99918	**13**	21.00082
21000	10	21.0	20.99958	**14**	21.00042
21000	1	21.0	20.999968	**15**	21.000032

Additional Frequency Readout Accuracy Steps for Option 130

7. Set the synthesized sweeper CW to 1.5 GHz.
8. Set the spectrum analyzer by pressing the following keys:

   (FREQUENCY) 1.5 (GHz)
   (BW) 300 (Hz)
   (SPAN) 20 (kHz)

9. Press (PEAK SEARCH) on the spectrum analyzer.
10. Record the MKR frequency reading as TR Entry 16 of the performance verification test record. The reading should be within the limits of 1.49999924 GHz and 1.50000076 GHz.

"Part 1: Frequency Readout Accuracy" is now complete for the Option 130. Continue with "Part 2: Marker Count Accuracy."

Part 2: Marker Count Accuracy

Perform "Part 1: Frequency Readout Accuracy" before performing this procedure.

1. Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish.
2. Set the spectrum analyzer to measure the marker count accuracy by pressing the following keys:

   (FREQUENCY) 1.5 (GHz)
   (SPAN) 20 (MHz)
   (BW) RES BW AUTO MAN 300 (kHz)
   (MKR FCTN) MK COUNT ON OFF (ON)
   More 1 of 2
   CNT RES AUTO MAN 100 (Hz)

3. Press (PEAK SEARCH), then wait for a count be taken (it may take several seconds).
4. Record the CNTR frequency reading as TR Entry 17 of the performance verification test record. The reading should be within the limits shown in Table 2-3.
5. Change the spectrum analyzer settings by pressing the following keys:

   (SPAN) 1 (MHz)
   (MKR FCTN) MK COUNT ON OFF (ON)
   More 1 of 2
   CNT RES AUTO MAN 10 (Hz)

6. Press (PEAK SEARCH), then wait for a count be taken (it may take several seconds).
7. Record the CNTR frequency reading as TR Entry 18 of the performance verification test record. The reading should be within the limits shown in Table 2-3.
8. Repeat step 2 through step 7 for each spectrum analyzer setting listed in Table 2-3.

If you are testing a spectrum analyzer equipped with Option 130 continue with step 9.

Performance verification test "Frequency Readout Accuracy and Marker Count Accuracy" is now complete for all other spectrum analyzers.

5. **Frequency Readout and Marker Count Accuracy, HP 8593E, HP 8595E, and HP 8596E**

Table 2-3. Marker Count Accuracy

Synthesized Sweeper CW Frequency	Spectrum Analyzer Center Frequency	Spectrum Analyzer Span	Spectrum Analyzer Counter Resolution	CNT MKR Frequency		
MHz	GHz	MHz	Hz	Min. (GHz)	TR Entry	Max. (GHz)
1500	1.5	20	100	1.4999989	17	1.5000011
1500	1.5	1	10	1.49999989	18	1.50000011
4000	4.0	20	100	3.9999989	19	4.0000011
4000	4.0	1	10	3.99999989	20	4.00000011
If HP 8595E, stop here.						
9000	9.0	20	100	8.9999979	21	9.0000021
9000	9.0	1	10	8.999999979	22	9.00000021
If HP 8596E, stop here.						
16000	16.0	20	100	15.9999969	23	16.0000031
16000	16.0	1	10	15.99999969	24	16.00000031
21000	21.0	20	100	20.9999959	25	21.0000041
21000	21.0	1	10	20.99999959	26	21.00000041

Additional Marker Count Accuracy Steps for Option 130

9. Set the synthesized sweeper CW to 1.5 GHz.
10. Set the spectrum analyzer by pressing the following keys:

    (FREQUENCY) 1.5 (GHz)
    (BW) RES BW AUTO MAN 300 (Hz)
    (SPAN) 20 (kHz)

11. Press (PEAK SEARCH) on the spectrum analyzer.
12. Record the MKR frequency reading as TR Entry 27 of the performance verification test record. The reading should be within the limits of 1.49999989 GHz and 1.50000011 GHz.
13. Set the spectrum analyzer by pressing the following keys:
    - (BW) RES BW AUTO MAN 30 (Hz)
    - (SPAN) 2 (kHz)
14. Press (PEAK SEARCH) (MKR FCTN) Mk Track On Off (ON), then

    wait until the count is completed (it may take several seconds).
15. Record the MKR reading as TR Entry 28 of the Performance Test Record. The reading should be within the limits of 1.49999989 and 1.50000011.

Performance verification test "2. Frequency Readout Accuracy and Marker Count Accuracy" is now complete for spectrum analyzers equipped with Option 130.

6. Noise Sidebands, HP 8590 E-Series and HP 8591C

A 500 MHz CW signal is applied to the input of the spectrum analyzer. The marker functions are used to measure the amplitude of the carrier and the noise level 10 kHz, 20 kHz, and 30 kHz above and below the carrier. The difference between these two measurements is compared to specification after the result is normalized to 1 Hz.

There are no related adjustment procedures for this performance test.

Equipment Required

Signal generator
Cable, Type N, 183 cm (72 in)

Additional Equipment for Option 026

Adapter, APC 3.5 (f) to Type N (f)

Additional Equipment for 75 Ω Input

Adapter, minimum loss
Adapter, Type N (f) to BNC (m), 75 Ω

Caution Use only 75 Ω cables, connectors, or adapters on instruments with 75 Ω inputs, or damage to the input connector will occur.

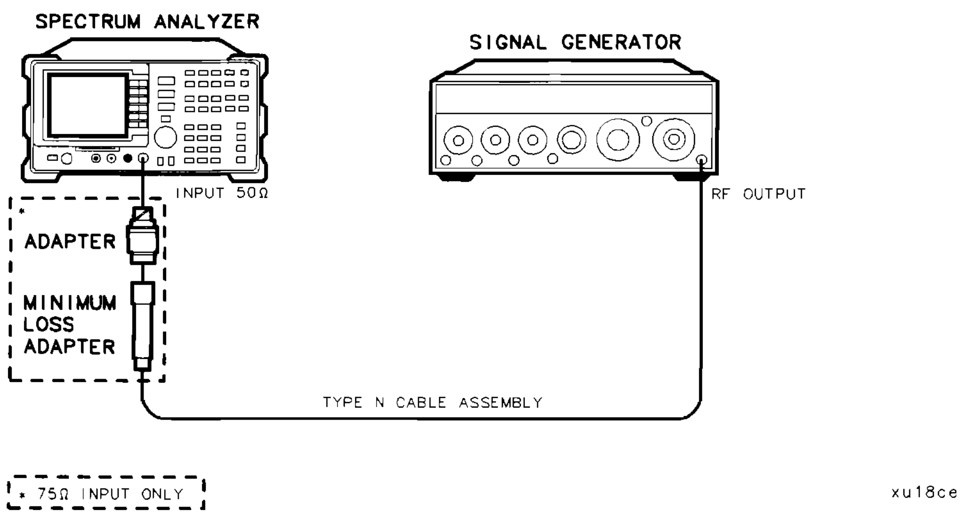


Figure 2-7. Noise Sidebands Test Setup

Procedure

This performance test consists of three parts:

Part 1: Noise Sideband Suppression at 10 kHz
Part 2: Noise Sideband Suppression at 20 kHz
Part 3: Noise Sideband Suppression at 30 kHz

Perform part 1 before performing part 2 or part 3 of this procedure.

A worksheet is provided at the end of this procedure for calculating the noise sideband suppression.

Part 1: Noise Sideband Suppression at 10 kHz

1. Perform the following steps to set up the equipment:
   - Set the signal generator controls as follows:

     FREQUENCY .... 500 MHz
     OUTPUT LEVEL .... 0 dBm
     AM .... OFF
     FM .... OFF
     COUNTER .... INT
     RF .... ON

   - Connect the equipment as shown in Figure 2-7.
   - Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish. Set the spectrum analyzer by pressing the following keys:

     (FREQUENCY) 500 (MHz)
     (SPAN) 10 (MHz)

2. Press the following spectrum analyzer keys to measure the carrier amplitude.

   (PEAK SEARCH)
   (MKR FCTN) MK TRACK ON OFF (ON)
   (SPAN) 200 (kHz)
   (BW) 1 (kHz)
   VID BW AUTO MAN 30 (Hz)
   (MKR FCTN) MK TRACK ON OFF (OFF)
   (SGL SWP)

   Wait for the completion of a sweep, then press (PEAK SEARCH).

   Record the MKR amplitude reading in the Noise Sideband Worksheet as the Carrier Amplitude.

3. Press the following spectrum analyzer keys to measure the noise sideband level at +10 kHz:

   MARKER Δ 10 (kHz)
   (MKR) MARKER NORMAL

   Record the MKR amplitude reading in the Noise Sideband Worksheet as the Noise Sideband Level at +10 kHz.

4. Press the following spectrum analyzer keys to measure the noise sideband level at −10 kHz:

   (PEAK SEARCH)
   MARKER Δ −10 (kHz)
   (MKR) MARKER NORMAL

   Record the MKR amplitude reading in the Noise Sideband Worksheet as the Noise Sideband Level at −10 kHz.

5. Record the more positive value, either Noise Sideband Level at +10 kHz or Noise Sideband Level at −10 kHz from the Noise Sideband Worksheet as the Maximum Noise Sideband Level.

6. Subtract the Carrier Amplitude from the Maximum Noise Sideband Level at 10 kHz using the equation below.

   Noise Sideband Suppression = Maximum Noise Sideband Level − Carrier Amplitude

7. Record the Noise Sideband Suppression at 10 kHz in the performance verification test record as TR Entry 1. The suppression should be ≤−60 dBc.

Part 2: Noise Sideband Suppression at 20 kHz

1. Press the following spectrum analyzer keys to measure the noise sideband level at +20 kHz:

   (MKR) MARKER Δ 20 (kHz)
   MARKER NORMAL

   Record the MKR amplitude reading in the Noise Sideband Worksheet as the Noise Sideband Level at +20 kHz.

2. Press the following spectrum analyzer keys to measure the noise sideband level at −20 kHz:

   (PEAK SEARCH)
   MARKER Δ −20 (kHz)
   (MKR) MARKER NORMAL

   Record the MKR amplitude reading in the Noise Sideband Worksheet as the Noise Sideband Level at −20 kHz.

3. Record the more positive value, either Noise Sideband Level at +20 kHz or Noise Sideband Level at −20 kHz from the Noise Sideband Worksheet as the Maximum Noise Sideband Level.

4. Subtract the Carrier Amplitude from the Maximum Noise Sideband Level at 20 kHz using the equation below.

   Noise Sideband Suppression = Maximum Noise Sideband Level − Carrier Amplitude

5. Record the Noise Sideband Suppression at 20 kHz in the performance verification test record as TR Entry 2. The suppression should be ≤−70 dBc.

Part 3: Noise Sideband Suppression at 30 kHz

1. Press the following spectrum analyzer keys to measure the noise sideband level at +30 kHz:

   (MKR) MARKER Δ 30 (kHz)

   MARKER NORMAL

   Record the MKR amplitude reading in the Noise Sideband Worksheet as the Noise Sideband Level at +30 kHz.

2. Press the following spectrum analyzer keys to measure the noise sideband level at −30 kHz:

   (PEAK SEARCH)

   MARKER Δ −30 (kHz)

   (MKR) MARKER NORMAL

   Record the MKR amplitude reading in the Noise Sideband Worksheet as the Noise Sideband Level at −30 kHz.

3. Record the more positive value, either Noise Sideband Level at +30 kHz or Noise Sideband Level at −30 kHz from the Noise Sideband Worksheet as the Maximum Noise Sideband Level.

4. Subtract the Carrier Amplitude from the Maximum Noise Sideband Level at 30 kHz using the equation below.

   Noise Sideband Suppression = Maximum Noise Sideband Level − Carrier Amplitude

5. Record the Noise Sideband Suppression at 30 kHz in the performance verification test record as TR Entry 3. The suppression should be ≤−75 dBc.

Noise Sideband Worksheet

Description	Measurement
Carrier Amplitude	______dBm *or* dBmV
Noise Sideband Level at +10 kHz	______dBm *or* dBmv
Noise Sideband Level at −10 kHz	______dBm *or* dBmv
Maximum Noise Sideband Level at ±10 kHz	______dBm *or* dBmv
Noise Sideband Level at +20 kHz	______dBm *or* dBmv
Noise Sideband Level at −20 kHz	______dBm *or* dBmv
Maximum Noise Sideband Level at ±20 kHz	______dBm *or* dBmv
Noise Sideband Level at +30 kHz	______dBm *or* dBmv
Noise Sideband Level at −30 kHz	______dBm *or* dBmv
Maximum Noise Sideband Level at ±30 kHz	______dBm *or* dBmv

Note that the resolution bandwidth is normalized to 1 Hz as follows:

1 Hz noise-power = (noise-power in dBc) - (10 x log[RBW])

For example, −60 dBc in a 1 kHz resolution bandwidth is normalized to −90 dBc/Hz.

7. System Related Sidebands, HP 8590 E-Series and HP 8591C

A 500 MHz CW signal is applied to the input of the spectrum analyzer. The marker functions are used to measure the amplitude of the carrier and the amplitude of any system related sidebands >30 kHz above and below the carrier. System related sidebands are any internally generated line related, power supply related or local oscillator related sidebands.

There are no related adjustment procedures for this performance test.

Equipment Required

Signal generator
Cable, Type N, 183 cm (72 in)

Additional Equipment for Option 026

Adapter, APC 3.5 (f) to Type N (f)

Additional Equipment for 75 Ω Input

Adapter, minimum loss
Adapter, Type N (f) to BNC (m), 75 Ω

Caution Use only 75 Ω cables, connectors, or adapters on instruments with 75 Ω inputs, or damage to the input connector will occur.

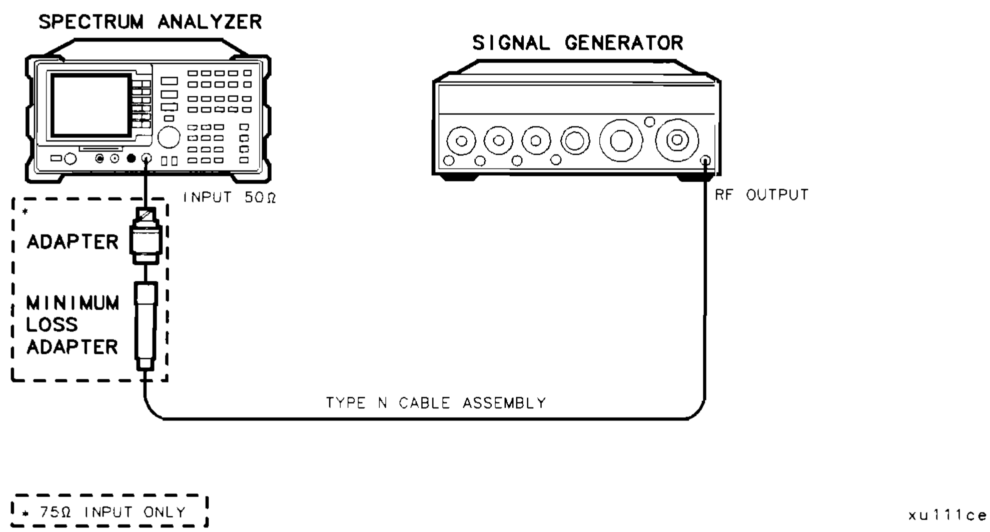


Figure 2-8. System Related Sidebands Test Setup

Procedure

1. Perform the following steps to set up the equipment:
   - Set the signal generator controls as follows:

     FREQUENCY .... 500 MHz
     OUTPUT LEVEL .... 0 dBm
     AM .... OFF
     FM .... OFF
     COUNTER .... INT
     RF .... ON

   - Connect the equipment as shown in Figure 2-8.

     Option 026 only: Use the APC adapter to connect the cable to the spectrum analyzer input.

   - Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish. Set the spectrum analyzer by pressing the following keys:

     (FREQUENCY) 500 (MHz)
     (SPAN) 10 (MHz)

2. Set the spectrum analyzer to measure the system related sideband above the signal by performing the following steps:
   - Press the following keys:

     (PEAK SEARCH)
     (MKR FCTN) `MK TRACK ON OFF` (ON)
     (SPAN) 200 (kHz)
     (BW) 1 (kHz)
     `VID BW AUTO MAN` 30 (Hz)

     Allow the spectrum analyzer to stabilize for approximately 1 minute. Then press the following keys:

     (MKR FCTN) `MK TRACK ON OFF` (OFF)
     (FREQUENCY) `CF STEP AUTO MAN` 130 (kHz)

   - Press (SGL SWP) and wait for the completion of the sweep. Press (PEAK SEARCH), then `MARKER Δ`.
   - Press the following spectrum analyzer keys:

     (FREQUENCY)
     (⇑) (step-up key)

3. Measure the system related sideband above the signal by pressing (SGL SWP) on the spectrum analyzer. Wait for the completion of a new sweep, then press (PEAK SEARCH).
4. Record the Marker-Δ Amplitude as TR Entry 1 of the performance verification test record.

   The system related sideband above the signal should be <−65 dB.

5. Set the spectrum analyzer to measure the system related sideband below the signal by pressing the following spectrum analyzer keys:

   (⇩) (step-down key)
   (⇩) (step-down key)

6. Measure the system related sideband below the signal by pressing (SGL SWP). Wait for the completion of a new sweep, then press (PEAK SEARCH).

   Record the Marker-Δ Amplitude as TR Entry 2 of the performance verification test record.

   The system related sideband below the signal should be <−65 dB.

8. Frequency Span Readout Accuracy, HP 8591E and HP 8591C

For testing each frequency span, two synthesized sources are used to provide two precisely-spaced signals. The spectrum analyzer marker functions are used to measure this frequency difference and the marker reading is compared to the specification.

There are no related adjustment procedures for this performance test.

Equipment Required

Synthesized Sweeper
Synthesizer/Level Generator
Signal Generator
Power Splitter
Adapter, Type N (m) to Type N (m)
Adapter, Type N (f) to APC 3.5 (f)
Cable, Type N, 183 cm (72 in)
Cable, Type N, 152 cm (60 in)

Additional Equipment for 75 Ω Input

Adapter, minimum loss
Adapter, Type N (f) to BNC (m), 75 Ω

Procedure

This performance test consists of two parts:

Part 1: 1800 MHz Frequency Span Readout Accuracy
Part 2: 10.1 MHz to 10 kHz Frequency Span Readout Accuracy

Perform "Part 1: 1800 MHz Frequency Span Readout Accuracy" before "Part 2: 10.1 MHz to 10 kHz Frequency Span Readout Accuracy."

Part 1: 1800 MHz Frequency Span Readout Accuracy

1. Connect the equipment as shown in Figure 2-9. Note that the Power Splitter is used as a combiner.
2. Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish.
3. Press INSTRUMENT PRESET on the synthesized sweeper and set the controls as follows:

   CW .... 1700 MHz
   POWER LEVEL .... −5 dBm

4. On the signal generator, set the controls as follows:

   FREQUENCY (LOCKED MODE) .... 200 MHz
   CW OUTPUT .... 0 dBm

Caution Use only 75 Ω cables, connectors, or adapters on instruments with 75 Ω inputs, or damage to the input connector will occur.

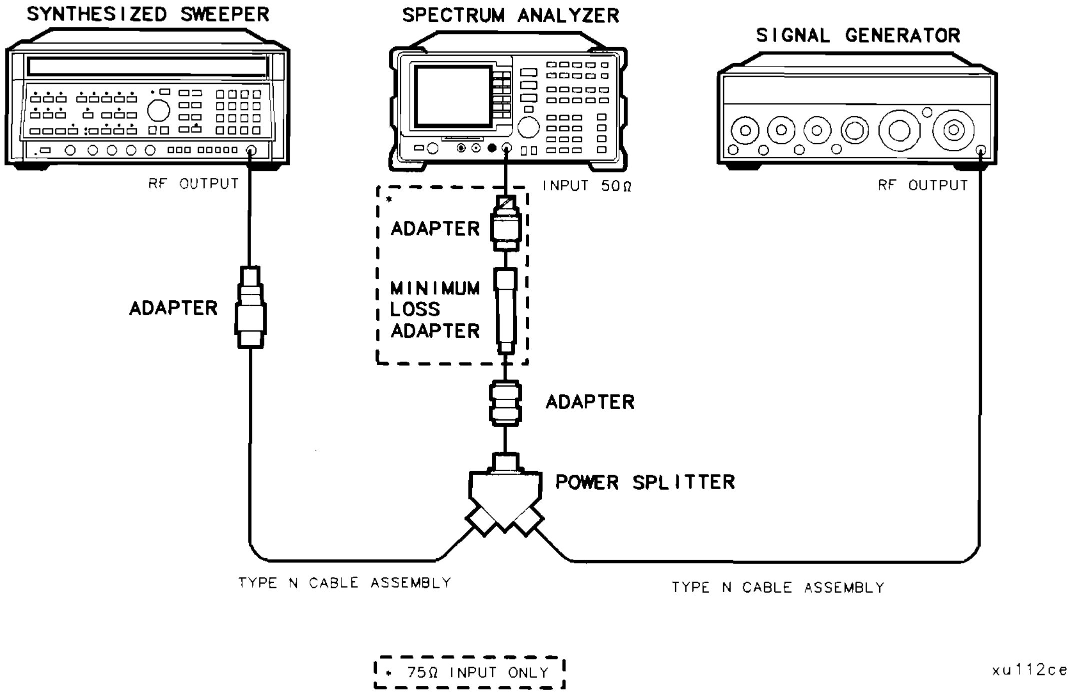


Figure 2-9. 1800 MHz Frequency Span Readout Accuracy Test Setup

5. Adjust the spectrum analyzer center frequency, if necessary, to place the lower frequency on the second vertical graticule line (one division from the left-most graticule line).
6. On the spectrum analyzer, press (SGL SWP). Wait for the completion of a new sweep, then press the following keys:

   (PEAK SEARCH) MARKER Δ NEXT PEAK

   The two markers should be on the signals near the second and tenth vertical graticule lines (the first graticule line is the left-most).
7. Press MARKER Δ, then continue pressing NEXT PK RIGHT until the marker Δ is on the right-most signal (1700 MHz).
8. Record the MKR Δ frequency reading as TR Entry 1 of the performance verification test record.

   The MKR reading should be within the 1446 MHz and 1554 MHz.

Caution Use only 75 Ω cables, connectors, or adapters on instruments with 75 Ω inputs, or damage to the input connector will occur.

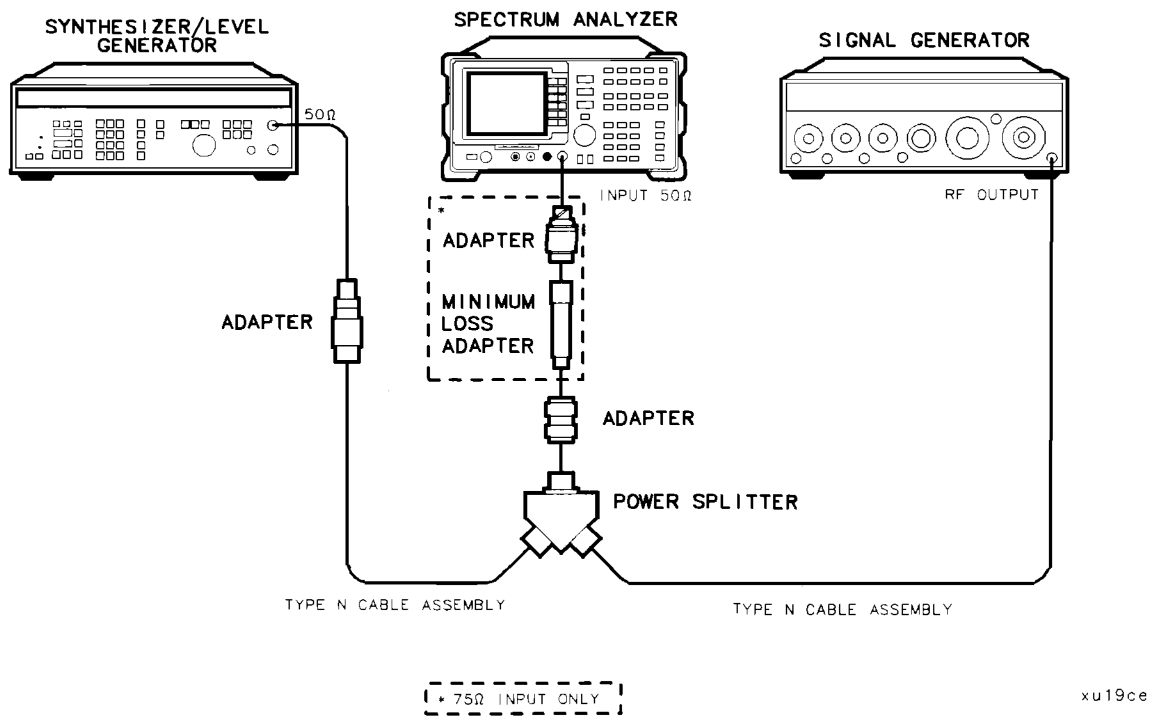


Figure 2-10. 10.1 MHz to 10 kHz Frequency Span Readout Accuracy Test Setup

Part 2: 10.1 MHz to 10 kHz Frequency Span Readout Accuracy

Perform "Part 1: 1800 MHz Frequency Span Readout Accuracy" before performing this procedure. An additional step to measure the frequency span accuracy at 1 kHz is included for spectrum analyzers equipped with Option 130.

1. Connect the equipment as shown in Figure 2-10. Note that the Power Splitter is used as a combiner.
2. Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish. Set the spectrum analyzer by pressing the following keys:

   (FREQUENCY) 70 (MHz)
   (SPAN) 10.1 (MHz)

3. Press INSTRUMENT PRESET on the synthesized sweeper, then set the controls as follows:

   CW .... 74 MHz
   POWER LEVEL .... −5 dBm

4. Set the synthesizer/level generator controls as follows:

   FREQUENCY .... 66 MHz
   AMPLITUDE .... 0 dBm

5. Adjust the spectrum analyzer center frequency to center the two signals on the display.
6. On the spectrum analyzer, press (SGL SWP). Wait for the completion of a new sweep, then press the following keys:

   (PEAK SEARCH) MARKER Δ NEXT PEAK

   The two markers should be on the signals near the second and tenth vertical graticule lines (the first graticule line is the left-most).

7. Record the MKR-Δ frequency reading in the performance test record as TR Entry 2. The MKR-Δ frequency reading should be within the limits shown.
8. Press (MKR), More 1 of 2, then MARKER ALL OFF on the spectrum analyzer.
9. Change to the next equipment settings listed in Table 2-4.
10. On the spectrum analyzer, press (SGL SWP). Wait for the completion of a new sweep, then press the following keys:

    (PEAK SEARCH) MARKER Δ NEXT PEAK

11. Record the MKR-Δ frequency reading in the performance test record.
12. Repeat steps 8 through 11 for the remaining spectrum analyzer span settings listed in Table 2-4.

If you are testing a spectrum analyzer equipped with Option 130 continue with step 13.

Performance test "6. Frequency Span Readout Accuracy" is now complete for all other spectrum analyzers.

Additional Steps for Option 130

13. Set the spectrum analyzer to measure the frequency span accuracy at 1 kHz by pressing the following keys:

    (MKR) More 1 of 2 MARKER ALL OFF
    (BW) 30 (Hz)

14. Change to the next spectrum analyzer span setting listed in Table 2-4. Be sure to set the synthesized sweeper CW and synthesizer/level generator frequencies as shown in the table.
15. On the spectrum analyzer, press (SGL SWP). Wait for the completion of a new sweep, then press the following keys:

    (PEAK SEARCH) MARKER Δ NEXT PEAK

16. Record the MKR-Δ frequency reading in the performance test record as TR Entry 8.

Performance test "6. Frequency Span Readout Accuracy" is now complete for the Option 130.

Table 2-4. Frequency Span Readout Accuracy

Spectrum Analyzer Span Setting	Synthesizer/Level Generator Frequency	Synthesized Sweeper Frequency	MKR-Δ Reading		
	MHz	MHz	Min.	TR Entry	Max.
10.10 MHz	66.000	74.000	7.70 MHz	2	8.30 MHz
10.00 MHz	66.000	74.000	7.80 MHz	3	8.20 MHz
100.00 kHz	69.960	70.040	78.00 kHz	4	82.00 kHz
99.00 kHz	69.960	70.040	78.00 kHz	5	82.06 kHz
10.00 kHz	69.996	70.004	7.80 kHz	6	8.20 kHz
1.00 kHz[1]	69.9996	70.0004	0.78 kHz	7	0.82 kHz
300.00 Hz[1,2]	69.99988	70.00012	225.00 Hz	8	255.00 Hz

1 For Option 130 only. See steps 13 through 16.

2 This is not a spectrum analyzer specification; however, the 300 Hz span is tested to ±5 % to keep the narrow bandwidth accuracy and residual FM measurement uncertainty at a minimum. If the 300 Hz span accuracy is >5% the additional measurement uncertainty may need to be included for the bandwidth accuracy and residual FM measurement uncertainties.

9.Frequency Span Readout Accuracy, HP 8593E, HP 8594E, HP 8595E, and HP 8596E

For testing each frequency span, two synthesized sources are used to provide two precisely-spaced signals. The spectrum analyzer marker functions are used to measure this frequency difference and the marker reading is compared to the specification.

There are no related adjustment procedures for this performance test.

Equipment Required

Synthesized sweeper
Synthesizer/level generator
Signal generator
Power splitter
Adapter, Type N (m) to Type N (m)
Adapter, Type N (f) to APC 3.5 (f)
Cable, Type N, 183 cm (72 in)
Cable, Type N, 152 cm (60 in) *or*
Adapter, APC 3.5 (f) to Type N (f)

Additional Equipment for Option 026

Adapter, APC 3.5 (f) to Type N (f)

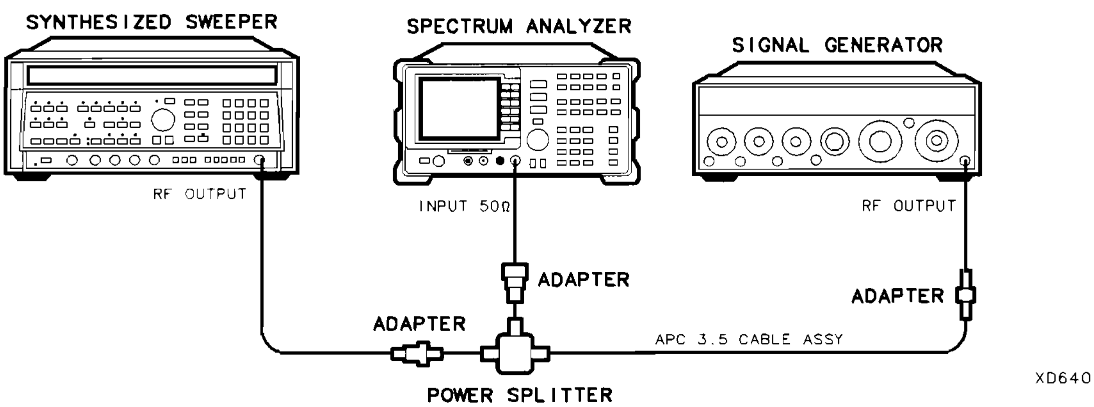


Figure 2-11. 1800 MHz Frequency Span Readout Accuracy Test Setup

Procedure

This performance verification test consists of two parts:

Part 1: 1800 MHz Frequency Span Readout Accuracy
Part 2: 10.1 MHz to 10 kHz Frequency Span Readout Accuracy

Perform "Part 1: 1800 MHz Frequency Span Readout Accuracy" before "Part 2: 10.1 MHz to 10 kHz Frequency Span Readout Accuracy."

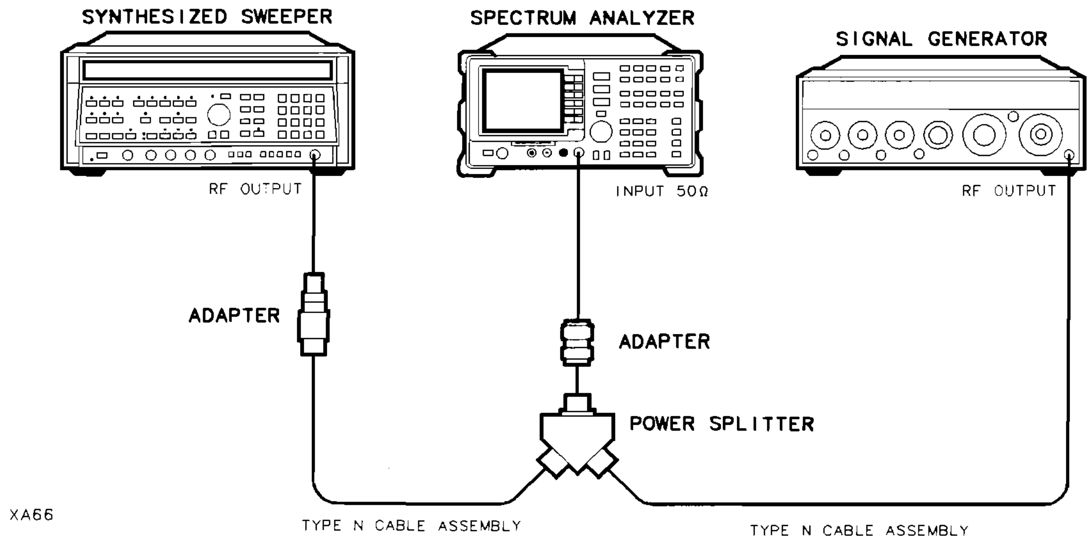


Figure 2-12. For HP 8594E Only - Frequency Span Readout Test Setup

Part 1: 1800 MHz Frequency Span Readout Accuracy

1. Connect the equipment as shown in Figure 2-11, Figure 2-12 for HP 8594E. Note that the Power Splitter is used as a combiner.
2. Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish. Set the spectrum analyzer by pressing the following keys:

   (FREQUENCY) 900 (MHz)
   (SPAN) 1800 (MHz)

3. Press INSTRUMENT PRESET on the synthesized sweeper and set the controls as follows:

   CW .... 1700 MHz
   POWER LEVEL .... −5 dBm

4. On the signal generator, set the controls as follows:

   FREQUENCY (LOCKED MODE) .... 200 MHz
   CW OUTPUT .... 0 dBm

5. Adjust the spectrum analyzer center frequency, if necessary, to place the lower frequency on the second vertical graticule line (one division from the left-most graticule line).
6. On the spectrum analyzer, press (SGL SWP). Wait for the completion of a new sweep, then press (PEAK SEARCH) (MARKER Δ) (NEXT PEAK).

   The two markers should be on the signals near the second and tenth vertical graticule lines (the first graticule line is the left-most).

7. Press `MARKER Δ`, then continue pressing `NEXT PK RIGHT`. The marker Δ should be on the right-most signal.
8. Record the MKR Δ frequency reading as TR Entry 1 of the performance verification test record.

   The MKR reading should be within the 1446 MHz and 1554 MHz.

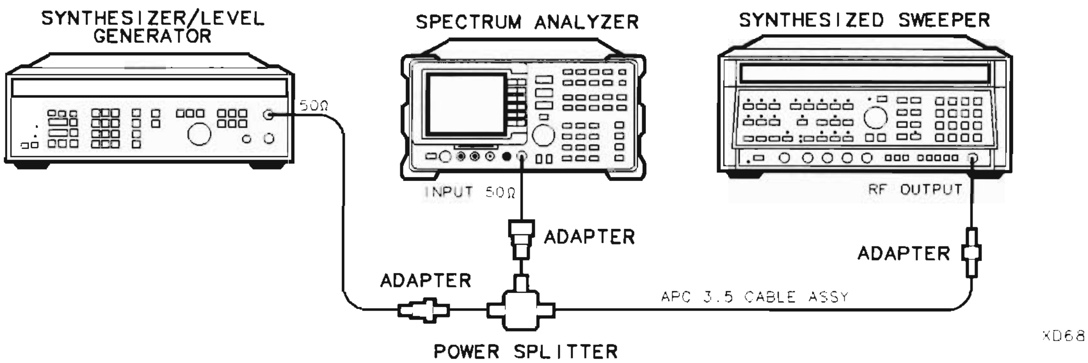


Figure 2-13. 10.1 MHz to 10 kHz Frequency Span Readout Accuracy Test Setup

Part 2: 10.1 MHz to 10 kHz Frequency Span Readout Accuracy

Perform "Part 1: 1800 MHz Frequency Span Readout Accuracy" before performing this procedure. An additional step to measure the frequency span accuracy at 1 kHz is included for spectrum analyzers equipped with Option 130.

1. Connect the equipment as shown in Figure 2-13. Note that the Power Splitter is used as a combiner.
2. Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish. Set the spectrum analyzer by pressing the following keys:

   (FREQUENCY) 70 (MHz)
   (SPAN) 10.1 (MHz)

3. Press INSTRUMENT PRESET on the synthesized sweeper, then set the controls as follows:

   CW .... 74 MHz
   POWER LEVEL .... −5 dBm

4. Set the synthesizer/level generator controls as follows:

   FREQUENCY .... 66 MHz
   AMPLITUDE .... 0 dBm

5. Adjust the spectrum analyzer center frequency to center the two signals on the display.

6. On the spectrum analyzer, press (SGL SWP). Wait for the completion of a new sweep, then press the following keys:

   (PEAK SEARCH) MARKER Δ NEXT PEAK

   The two markers should be on the signals near the second and tenth vertical graticule lines (the first graticule line is the left-most).
7. Record the MKR-Δ frequency reading in the performance verification test record as TR Entry 2. The MKR-Δ frequency reading should be within the limits shown.
8. Press (MKR), MARKER 1 ON OFF (OFF) on the spectrum analyzer.
9. Change to the next equipment settings listed in Table 2-5.
10. On the spectrum analyzer, press (SGL SWP). Wait for the completion of a new sweep, then press the following keys:

    (PEAK SEARCH) MARKER Δ NEXT PEAK
11. Record the MKR-Δ frequency reading in the performance verification test record.
12. Repeat steps 8 through 11 for the remaining spectrum analyzer span settings listed in Table 2-5.

If you are testing a spectrum analyzer equipped with Option 130 continue with step 13.

Performance verification test "Frequency Span Readout Accuracy" is now complete for all other spectrum analyzers.

Additional Steps for Option 130

13. Set the spectrum analyzer to measure the frequency span accuracy at 1 kHz by pressing the following keys:

    (MKR) More 1 of 2 MARKER ALL OFF
    (BW) 30 (Hz)

    If necessary, adjust the center frequency to display the two signals.
14. Change to the next spectrum analyzer span setting listed in Table 2-5. Be sure to set the synthesized sweeper CW and synthesizer/level generator frequencies as shown in the table.
15. On the spectrum analyzer, press (SGL SWP). Wait for the completion of a new sweep, then press the following keys:

    (PEAK SEARCH) MARKER Δ NEXT PEAK

16. Record the MKR-Δ frequency reading in the performance verification test record.
17. Repeat steps 14 and 15 for the 300 Hz spectrum analyzer span setting.
18. Verify that the 300 Hz span setting is within 225 Hz to 255 Hz.

Performance verification test "Frequency Span Readout Accuracy" is now complete for the Option 130.

Table 2-5. Frequency Span Readout Accuracy

Spectrum Analyzer Span Setting	Synthesizer/Level Generator Frequency	Synthesized Sweeper Frequency	MKR-Δ Reading		
	MHz	MHz	Min.	TR Entry	Max.
10.10 MHz	66.000	74.000	7.70 MHz	2	8.30 MHz
10.00 MHz	66.000	74.000	7.80 MHz	3	8.20 MHz
100.00 kHz	69.960	70.040	78.00 kHz	4	82.00 kHz
99.00 kHz	69.960	70.040	78.00 kHz	5	82.00 kHz
10.00 kHz	69.996	70.004	7.80 kHz	6	8.20 kHz
1.00 kHz[1]	69.9996	70.0004	0.78 kHz	7	0.82 kHz
300.00 Hz[1,2]	69.99988	70.00012	225.00 Hz	8	255.00 Hz

1 For Option 130 only. See steps 13 through 16.

2 This is not a spectrum analyzer specification; however, the 300 Hz span is tested to ±5 % to keep the narrow bandwidth accuracy and residual FM measurement uncertainty at a minimum. If the 300 Hz span accuracy is >5% the additional measurement uncertainty may need to be included for the bandwidth accuracy and residual FM measurement uncertainties.

10. Residual FM, HP 8591E and HP 8591C

This test measures the inherent short-term instability of the spectrum analyzer LO system. With the analyzer in zero span, a stable signal is applied to the input and slope-detected on the linear portion of the IF bandwidth filter skirt. Any instability in the LO transfers to the IF signal in the mixing process. The test determines the slope of the IF filter in Hz/dB and then measures the signal amplitude variation caused by the residual FM. Multiplying these two values yields the residual FM in Hz. The narrow bandwidth options use a 300 Hz span. This span is not specified, however, it is tested in "Frequency Span Accuracy."

There are no related adjustment procedures for this performance test.

Equipment Required

Signal generator
Cable, Type N, 183 cm (72 in)

Additional Equipment for 75 Ω Input

Adapter, minimum loss
Adapter, Type N (f) to BNC (m), 75 Ω

Caution Use only 75 Ω cables, connectors, or adapters on instruments with 75 Ω inputs, or damage to the input connector will occur.

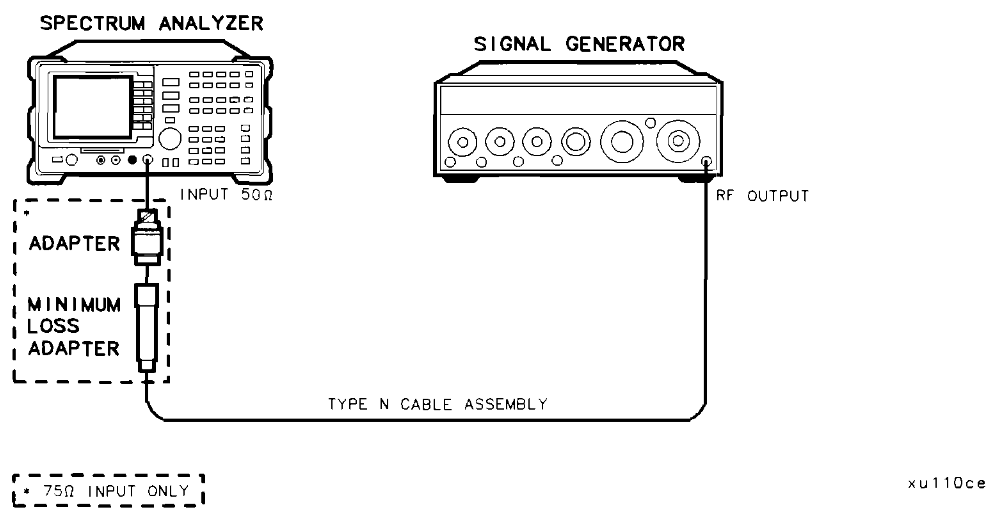


Figure 2-14. Residual FM Test Setup

Procedure

This performance test consists of two parts:

Part 1: Residual FM
Part 2: Residual FM Measurement for Option 130

Perform part 2 in addition to part 1 only if your spectrum analyzer is equipped with Option 130. All other spectrum analyzers only perform part 1.

Part 1: Residual FM

Determining the IF Filter Slope

1. Connect the equipment as shown in Figure 2-14.
2. Set the signal generator controls as follows:

   FREQUENCY .... 500 MHz
   CW OUTPUT .... −10 dBm
   CW OUTPUT *(75 Ω input only)* .... −4 dBm

3. Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish. Set the spectrum analyzer by pressing the following keys:

   (FREQUENCY) 500 (MHz)
   (SPAN) 1 (MHz)

   75 Ω input Only: Press (AMPLITUDE), `More 1 of 2`, `Amptd Units`, then `dBm`.

   (AMPLITUDE) −9 (dBm)
   `SCALE LOG LIN` (LOG) 1 (dB)
   (BW) 1 (kHz)

4. On the spectrum analyzer, press the following keys:

   (PEAK SEARCH)
   (MKR FCTN) `MK TRACK ON OFF` (ON)
   (SPAN) 10 (kHz)

   Wait for the `AUTO ZOOM` message to disappear. Press the following spectrum analyzer keys:

   (MKR →) `MARKER →REF LVL`
   (MKR) `MARKER 1 ON OFF` (OFF)

5. On the spectrum analyzer, press the following keys:

   (SGL SWP)
   (PEAK SEARCH) `MARKER Δ`

   If you have difficulty achieving the ±0.1 dB setting, then make the following spectrum analyzer settings:

   (SPAN) 5 (kHz)
   (BW) `VID BW AUTO MAN` 30 (Hz)

6. Rotate the spectrum analyzer knob counterclockwise until the MKR-Δ amplitude reads −1 dB ±0.1 dB. Press `MARKER Δ`. Rotate the knob counterclockwise until the MKR-Δ amplitude reads −4 dB ±0.1 dB.
7. Divide the MKR-Δ frequency in hertz by the MKR-Δ amplitude in dB to obtain the slope of the resolution bandwidth filter. For example, if the MKR-Δ frequency is 1.08 kHz and the MKR-Δ amplitude is 3.92 dB, the slope would be equal to 275.5 Hz/dB. Record the result below:

   Slope ________ Hz/ dB

Measuring the Residual FM

8. On the spectrum analyzer, press (MKR), More 1 of 2, MARKER ALL OFF, (PEAK SEARCH), then MARKER Δ. Rotate the knob counterclockwise until the MKR-Δ amplitude reads −3 dB ±0.1 dB.
9. On the spectrum analyzer, press the following keys:

   (MKR) MARKER NORMAL

   (MKR →) MARKER →CF

   (SGL SWP)

   (BW) VID BW AUTO MAN 1 (kHz)

   (SPAN) 0 (Hz)

   (SWEEP) 100 (ms)

   Press (SGL SWP).

Note The displayed trace should be about three divisions below the reference level. If it is not, press (TRIG), SWEEP CONT SGL (CONT), (FREQUENCY), and use the knob to place the displayed trace about three divisions below the reference level. Press (SGL SWP).

10. On the spectrum analyzer, press (MKR →), MORE 1 of 2, MARKER →PK-PK. Read the MKR-Δ amplitude, take its absolute value, and record the result as the Deviation.

   Deviation ________ dB

11. Calculate the Residual FM by multiplying the Slope recorded in step 7 by the Deviation recorded in step 10.

   Record this value as TR Entry 1 of the performance verification test record. The residual FM should be less than 250 Hz.

If you are testing a spectrum analyzer equipped with Option 130 continue with "Part 2: Residual FM Measurement for Option 130." The performance test, "4. Residual FM," is now complete for all other spectrum analyzers.

Part 2: Residual FM Measurement for Option 130

The following procedure is an additional test for testing the residual FM of spectrum analyzers equipped with Option 130. Perform "Part 1: Residual FM" before performing this procedure.

Determining the IF Filter Slope

1. Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish. Set the spectrum analyzer by pressing the following keys:

   (FREQUENCY) 500 (MHz)
   (SPAN) 1 (MHz)

   75 Ω input Only: Press (AMPLITUDE), `More 1 of 3`, `Amptd Units`, then `dBm`.

   (AMPLITUDE) −9 (dBm)
   `SCALE LOG LIN` (LOG) 1 (dB)

2. On the spectrum analyzer, press the following keys:

   (PEAK SEARCH)
   (MKR FCTN) `MK TRACK ON OFF` (ON)
   (SPAN) 300 (Hz)

   Wait for the `AUTO ZOOM` message to disappear. Press the following spectrum analyzer keys:

   (MKR →) `MARKER →REF LVL`
   (MKR) `MARKER 1 ON OFF` (OFF)
   (BW) 30 (Hz)
   (SGL SWP)

   Wait for the completion of a new sweep.

3. On the spectrum analyzer, press (PEAK SEARCH), `MARKER Δ`.

4. Rotate the spectrum analyzer knob counterclockwise until the MKR-Δ amplitude reads −1 dB ±0.2 dB. Press `MARKER Δ`. Rotate the knob counterclockwise until the MKR-Δ amplitude reads −4 dB ±0.3 dB.

5. Divide the MKR-Δ frequency in hertz by the MKR-Δ amplitude in dB to obtain the slope of the resolution bandwidth filter. For example, if the MKR-Δ frequency is 1.08 kHz and the MKR-Δ amplitude is 3.92 dB, the slope would be equal to 275.5 Hz/dB. Record the result below:

   Slope ________ Hz/ dB

Measuring the Residual FM

6. On the spectrum analyzer, press the following keys:

   (TRIG) SWEEP CONT SGL (CONT)

   (MKR) MARKER 1 ON OFF (OFF)

   (SPAN) ZERO SPAN

   (SWEEP) SWP TIME AUTO MAN 300 (ms)

7. On the spectrum analyzer, press (FREQUENCY).
8. Rotate the spectrum analyzer knob until the displayed trace is approximately 3 divisions below the reference level, then press (SGL SWEEP).
9. On the spectrum analyzer, press (MKR →), More 1 of 2, MARKER →PK-PK. Read the MKR-Δ amplitude, take its absolute value, and record the result as the Deviation.

   Deviation ________ dB

10. Calculate the Residual FM by multiplying the Slope recorded in step 5 by the Deviation recorded in step 9.

    Record this value as TR Entry 2 of the performance verification test record. The residual FM should be less than 30 Hz.

The performance test, "Residual FM," is now complete.

11. Residual FM, HP 8593E, HP 8594E, HP 8595E, and HP 8596E

This test measures the inherent short-term instability of the spectrum analyzer LO system. With the analyzer in zero span, a stable signal is applied to the input and slope-detected on the linear portion of the IF bandwidth filter skirt. Any instability in the LO transfers to the IF signal in the mixing process. The test determines the slope of the IF filter in Hz/dB and then measures the signal amplitude variation caused by the residual FM. Multiplying these two values yields the residual FM in Hz. The narrow bandwidth options use a 300 Hz span. This span is not specified, however, it is tested in "Frequency Span Accuracy."

There are no related adjustment procedures for this performance test.

Equipment Required

Signal generator
Cable, Type N, 183 cm (72 in)

Additional Equipment for Option 026

Adapter, APC 3.5 (f) to Type N (f)

Procedure

This performance verification test consists of two parts:

Part 1: Residual FM
Part 2: Residual FM Measurement for Option 130

Perform part 2 in addition to part 1 only if your spectrum analyzer is equipped with Option 130. All other spectrum analyzers only perform part 1.

Part 1: Residual FM

Determining the IF Filter Slope

1. Connect the equipment as shown in Figure 2-15.
2. Set the signal generator controls as follows:

   FREQUENCY .... 500 MHz
   CW OUTPUT .... −10 dBm

3. Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish. Set the spectrum analyzer by pressing the following keys:

   (FREQUENCY) 500 (MHz)
   (SPAN) 1 (MHz)
   (AMPLITUDE) −9 (dBm)
   SCALE LOG LIN (LOG) 1 (dB)
   (BW) 1 (kHz)

11. Residual FM, HP 8593E, HP 8594E, HP 8595E, and HP 8596E

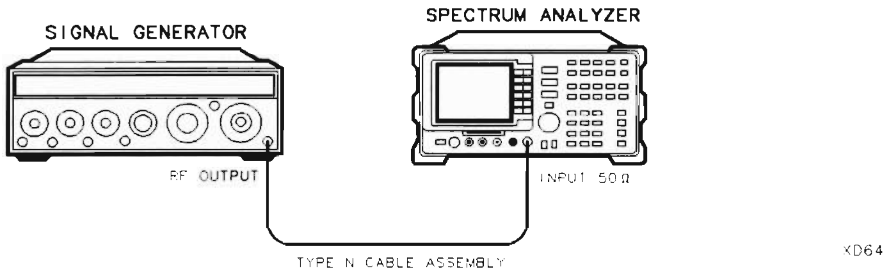


Figure 2-15. Residual FM Test Setup

4. On the spectrum analyzer, press the following keys:

   (PEAK SEARCH)
   (MKR FCTN) MK TRACK ON OFF (ON)
   (SPAN) 10 (kHz)

   Wait for the AUTO ZOOM message to disappear. Press the following spectrum analyzer keys:

   (MKR →) MARKER →REF LVL
   (MKR) MARKER 1 ON OFF (OFF)

5. On the spectrum analyzer, press the following keys:

   (SGL SWP)
   (PEAK SEARCH) MARKER Δ

   If you have difficulty achieving the ±0.1 dB setting, then make the following spectrum analyzer settings:

   (SPAN) 5 (kHz)
   (BW) VID BW AUTO MAN 30 (Hz)

6. Rotate the spectrum analyzer knob counterclockwise until the MKR-Δ amplitude reads −1 dB ±0.1 dB. Press MARKER Δ. Rotate the knob counterclockwise until the MKR-Δ amplitude reads −4 dB ±0.1 dB.

7. Divide the MKR-Δ frequency in hertz by the MKR-Δ amplitude in dB to obtain the slope of the resolution bandwidth filter. For example, if the MKR-Δ frequency is 1.08 kHz and the MKR-Δ amplitude is 3.92 dB, the slope would be equal to 275.5 Hz/dB. Record the result below:

Slope ________ Hz/ dB

Measuring the Residual FM

8. On the spectrum analyzer, press (MKR), `More 1 of 2`, `MARKER ALL OFF`, (PEAK SEARCH), then `MARKER Δ`. Rotate the knob counterclockwise until the MKR-Δ amplitude reads −3 dB ±0.1 dB.
9. On the spectrum analyzer, press the following keys:

   (MKR) `MARKER NORMAL`
   (MKR →) `MARKER →CF`
   (SGL SWP)
   (BW) 1 (kHz)
   (SPAN) 0 (Hz)
   (SWEEP) 100 (ms)

   Press (SGL SWP).

Note The displayed trace should be about three divisions below the reference level. If it is not, press (TRIG), `SWEEP CONT SGL` (CONT), (FREQUENCY), and use the knob to place the displayed trace about three divisions below the reference level. Press (SGL SWP).

10. On the spectrum analyzer, press (MKR →), `More 1 of 2`, `MARKER →PK-PK`. Read the MKR-Δ amplitude, take its absolute value, and record the result as the Deviation.

    Deviation ________ dB

11. Calculate the Residual FM by multiplying the Slope recorded in step 7 by the Deviation recorded in step 10.

    Record this value as TR Entry 1 of the performance verification test record. The residual FM should be less than 250 Hz.

If you are testing a spectrum analyzer equipped with Option 130 continue with "Part 2: Residual FM Measurement for Option 130." The performance verification test, "4. Residual FM," is now complete for all other spectrum analyzers.

Part 2: Residual FM Measurement for Option 130

The following procedure is an additional test for testing the residual FM of spectrum analyzers equipped with Option 130. Perform "Part 1: Residual FM" before performing this procedure.

Determining the IF Filter Slope

1. Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish. Set the spectrum analyzer by pressing the following keys:

   (FREQUENCY) 500 (MHz)
   (SPAN) 1 (MHz)
   (AMPLITUDE) −9 (dBm)
   SCALE LOG LIN (LOG) 1 (dB)

2. On the spectrum analyzer, press the following keys:

   (PEAK SEARCH)
   (MKR FCTN) MK TRACK ON OFF (ON)
   (SPAN) 300 (Hz)

   Wait for the AUTO ZOOM message to disappear. Press the following spectrum analyzer keys:

   (MKR →) MARKER →REF LVL
   (MKR) MARKER 1 ON OFF (OFF)
   (BW) 30 (Hz)
   (SGL SWP)

   Wait for the completion of a new sweep.

3. On the spectrum analyzer, press (PEAK SEARCH), MARKER Δ.
4. Rotate the spectrum analyzer knob counterclockwise until the MKR-Δ amplitude reads −1 dB ±0.2 dB. Press MARKER Δ. Rotate the knob counterclockwise until the MKR-Δ amplitude reads −4 dB ±0.3 dB.
5. Divide the MKR-Δ frequency in hertz by the MKR-Δ amplitude in dB to obtain the slope of the resolution bandwidth filter. For example, if the MKR-Δ frequency is 1.08 kHz and the MKR-Δ amplitude is 3.92 dB, the slope would be equal to 275.5 Hz/dB. Record the result below:

Slope ________ Hz/ dB

Measuring the Residual FM

6. On the spectrum analyzer, press the following keys:

   (TRIG) SWEEP CONT SGL (CONT)

   (MKR) MARKER 1 ON OFF (OFF)

   (SPAN) ZERO SPAN

   (SWEEP) SWP TIME AUTO MAN 300 (ms)

7. On the spectrum analyzer, press (FREQUENCY).
8. Rotate the spectrum analyzer knob until the displayed trace is approximately 3 divisions below the reference level, then press (SGL SWEEP).
9. On the spectrum analyzer, press (MKR →), More 1 of 2, MARKER →PK-PK. Read the MKR-Δ amplitude, take its absolute value, and record the result as the Deviation.

   Deviation __________ dB

10. Calculate the Residual FM by multiplying the Slope recorded in step 5 by the Deviation recorded in step 9.

    Record this value as TR Entry 2 of the performance verification test record. The residual FM should be less than 30 Hz.

The performance verification test, "Residual FM," is now complete.

12. Sweep Time Accuracy, HP 8590 E-Series and HP 8591C

This test uses a synthesizer function generator to amplitude modulate a 500 MHz CW signal from another signal generator. The spectrum analyzer demodulates this signal in zero span to display the response in the time domain. The marker delta frequency function on the spectrum analyzer is used to read out the sweep time accuracy.

If you are testing a spectrum analyzer equipped with Option 101, perform "Fast Time Domain Sweeps" in addition to this procedure.

There are no related adjustment procedures for this performance test.

Equipment Required

Synthesizer/function generator
Signal generator
Cable, Type N, 152 cm (60 in)
Cable, BNC, 120 cm (48 in)

Additional Equipment for 75 Ω Input

Adapter, minimum loss
Adapter, Type N (f) to BNC (m), 75 Ω

Caution Use only 75 Ω cables, connectors, or adapters on instruments with 75 Ω inputs, or damage to the input connector will occur.

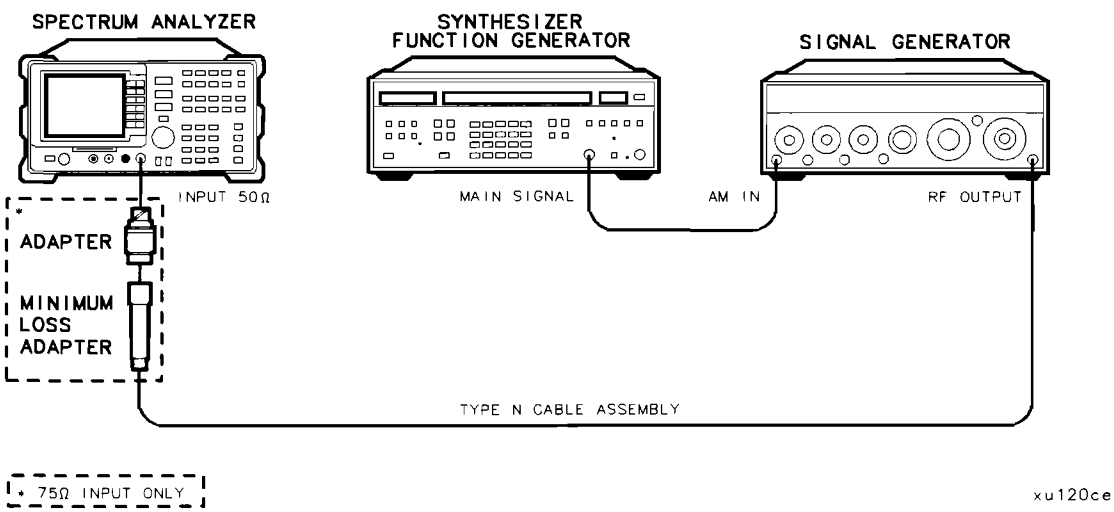


Figure 2-16. Sweep Time Accuracy Test Setup

Procedure

If you are testing a spectrum analyzer equipped with Option 101, perform "Fast Time Domain Sweeps," in addition to this test.

1. Set the signal generator to output a 500 MHz, −10 dBm, CW signal. Set the AM and FM controls to off.

   75 Ω input Only: Set the output to −4 dBm.

2. Set the synthesizer/function generator to output a 500 Hz, +5 dBm triangle waveform signal.

3. Connect the equipment as shown in Figure 2-16.

4. Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish. Set the spectrum analyzer by pressing the following keys:

   (FREQUENCY) 500 (MHz)
   (SPAN) 10 (MHz)
   (PEAK SEARCH)
   (MKR FCTN) MK TRACK ON OFF (ON)
   (SPAN) 50 (kHz)

   Wait for the AUTO ZOOM routine to finish. Press (SPAN), then ZERO SPAN.

   Press the following spectrum analyzer keys:

   (BW) 3 (MHz)
   (SWEEP) 20 (ms)
   (AMPLITUDE) SCALE LOG LIN (LIN)

   Adjust signal amplitude for a midscreen display.

5. Set the signal generator AM switch to the AC position.

6. On the spectrum analyzer, press (TRIG) then VIDEO. Adjust the video trigger so that the spectrum analyzer is sweeping.

7. Press (SGL SWP). After the completion of the sweep, press (PEAK SEARCH). If necessary, press NEXT PK LEFT until the marker is on the left-most signal. This is the "marked signal."

8. Press (MARKER DELTA) and press NEXT PK RIGHT 8 times so the marker delta is on the eighth signal peak from the "marked signal."

   Record the marker Δ reading in the performance verification test record.

9. Repeat steps 7 through 9 for the remaining sweep time settings listed in Table 2-6.

Table 2-6. Sweep Time Accuracy

Spectrum Analyzer Sweep Time Setting	Synthesizer/Function Generator Frequency	Minimum Reading	TR Entry (MKR Δ)	Maximum Reading
20 ms	500.0 Hz	15.4 ms	1	16.6 ms
100 ms	100.0 Hz	77.0 ms	2	83.0 ms
1 s	10.0 Hz	770.0 ms	3	830.0 ms
10 s	1.0 Hz	7.7 s	4	8.3 s

13. Scale Fidelity, HP 8590 E-Series and HP 8591C

A 50 MHz CW signal is applied to the INPUT 50 Ω of the analyzer through two step attenuators. The attenuators increase the effective amplitude range of the source. The amplitude of the source is decreased in 10 dB steps and the analyzer marker functions are used to measure the amplitude difference between steps. The source's internal attenuator is used as the reference standard. The test is performed in both log and linear amplitude scales.

The related adjustment for this performance test is "Log and Linear Amplitude Adjustment."

Equipment Required

Synthesizer/level generator
Attenuator, 1 dB step
Attenuator, 10 dB step
Cable, BNC, 122 cm (48 in)
Cable, BNC, 20 cm (9 in)
Adapter, Type N (m) to BNC (f)
Adapter, Type BNC (m) to BNC (m)

Additional Equipment for Option 026

Adapter, APC 3.5 (f) to Type N (f)

Additional Equipment for 75 Ω Input

Adapter, minimum loss
Adapter, Type N (f) to BNC (m), 75 Ω

Caution Use only 75 Ω cables, connectors, or adapters on instruments with 75 Ω inputs, or damage to the input connector will occur.

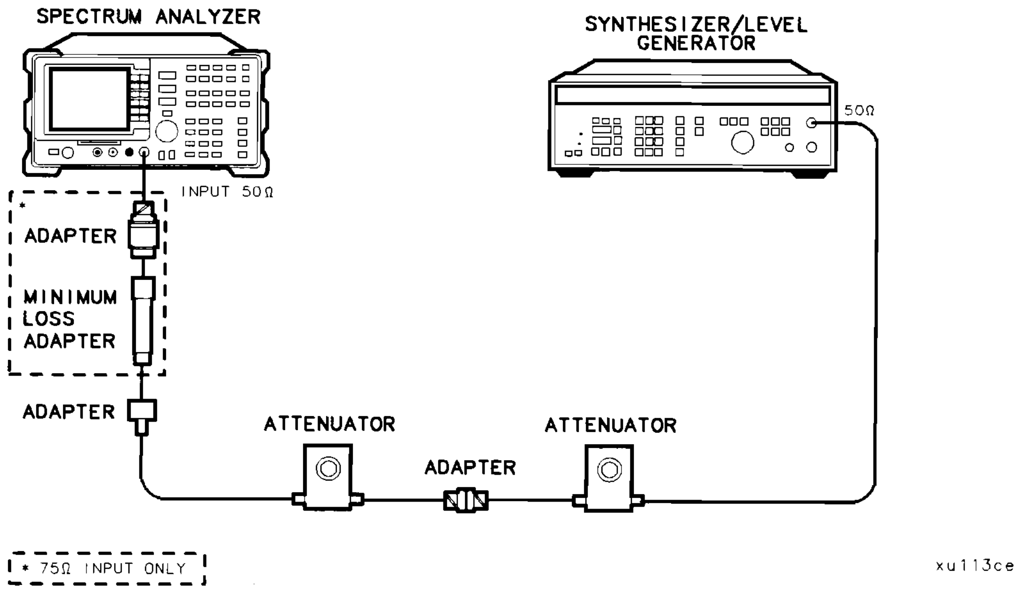


Figure 2-17. For HP 8591E Only - Scale Fidelity Test Setup

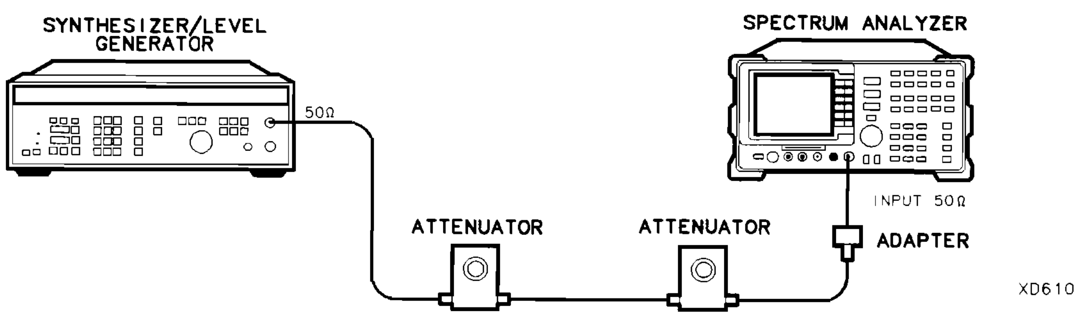


Figure 2-18. Scale Fidelity Test Setup

Procedure

Log Scale

1. Set the synthesizer/level generator controls as follows:

   FREQUENCY .... 50 MHz
   AMPLITUDE .... +10 dBm
   AMPTD INCR .... 0.05 dB
   OUTPUT .... 50 Ω

2. Connect the equipment as shown in Figure 2-17. Set the 10 dB step attenuator to 10 dB attenuation and the 1 dB step attenuator to 0 dB attenuation.

   75 Ω input only: Set the attenuation of the 10 dB step attenuator to 0 dB. Connect the minimum loss pad to the INPUT 75 Ω using adapters.

3. Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish. Set the spectrum analyzer by pressing the following keys:

   (FREQUENCY) 50 (MHz)
   (SPAN) 10 (MHz)

   75 Ω input only: Press (AMPLITUDE), More 1 of 2, Amptd Units, then dBm.

   (PEAK SEARCH)
   (MKR FCTN) MK TRACK ON OFF (ON)
   (SPAN) 50 (kHz)

   Wait for the auto zoom routine to finish, then set the resolution bandwidth and the video bandwidth by pressing the following keys:

   (BW)
   RES BW AUTO MAN 3 (kHz)
   VID BW AUTO MAN 30 (Hz)

4. If necessary, adjust the 1 dB step attenuator attenuation until the MKR amplitude reads between 0 dBm and −1 dBm.

5. On the synthesizer/level generator, press AMPLITUDE and use the increment keys to adjust the amplitude until the spectrum analyzer MKR amplitude reads 0 dBm ±0.05 dB.

   It may be necessary to decrease the resolution of the amplitude increment of the synthesizer/level generator to 0.01 dB to obtain a MKR reading of 0 dBm ±0.05 dB.

6. On the spectrum analyzer, press (PEAK SEARCH), then MARKER Δ.

7. Set the synthesizer/level generator AMPTD INCR to 4 dB.

8. On the synthesizer/level generator, press AMPLITUDE, then increment down to step the synthesizer/level generator to the next lowest nominal amplitude listed in Table 2-7.

9. Record the Actual MKR Δ amplitude reading in the performance verification test record as indicated in Table 2-7. The MKR amplitude should be within the limits shown.

10. Repeat steps 8 through 9 for the remaining synthesizer/level generator Nominal Amplitudes listed in Table 2-7.
11. For each Actual MKR Δ reading recorded in Table 2-7, subtract the previous Actual MKR Δ reading. Add 4 dB to the number and record the result as the incremental error in the performance verification test record as indicated in Table 2-7. The incremental error should not exceed 0.4 dB/4 dB.

Steps 12 and 13 are only for testing a spectrum analyzer equipped with Option 130. If the spectrum analyzer is *not* equipped with Option 130 continue with step 14.

Table 2-7. Cumulative and Incremental Error, Log Mode

Synthesizer/Level Generator Nominal Amplitude	dB from Ref Level (nominal)	TR Entry Cumulative Error (MKR Δ Reading)			TR Entry (Incremental Error)
		Min. (dB)	Actual (dB)	Max. (dB)	TR Entry
+10 dBm	0	0 (Ref)	0 (Ref)	0 (Ref)	0 (Ref)
+6 dBm	−4	−4.34	1	−3.66	18
+2 dBm	−8	−8.38	2	−7.62	19
−2 dBm	−12	−12.42	3	−11.58	20
−6 dBm	−16	−16.46	4	−15.54	21
−10 dBm	−20	−20.50	5	−19.50	22
−14 dBm	−24	−24.54	6	−23.46	23
−18 dBm	−28	−28.58	7	−27.42	24
−22 dBm	−32	−32.62	8	−31.38	25
−26 dBm	−36	−36.66	9	−35.34	26
−30 dBm	−40	−40.70	10	−39.30	27
−34 dBm	−44	−44.74	11	−43.26	28
−38 dBm	−48	−48.78	12	−47.22	29
−42 dBm	−52	−52.82	13	−51.18	30
−46 dBm	−56	−56.86	14	−55.14	31
−50 dBm	−60	−60.90	15	−59.10	32
−54 dBm	−64	−64.94	16	−63.06	N/A
−58 dBm	−68	−68.98	17	−67.02	N/A

Additional Steps for Option 130

12. Press the following spectrum analyzer keys:

    (BW) RES BW AUTO MAN 300 (Hz)
    (SPAN) 10 (kHz)

13. Repeat steps 4 through 11 for the narrow bandwidths. Record the results as indicated in Table 2-8.

    The scale fidelity in log mode is complete for spectrum analyzers equipped with Option 130. Continue with step 14.

Table 2-8. Cumulative and Incremental Error, Log Mode for Option 130

Synthesizer/Level Generator Nominal Amplitude	dB from Ref Level (nominal)	TR Entry Cumulative Error (MKR Δ Reading)			TR Entry (Incremental Error)
		Min. (dB)	Actual (dB)	Max. (dB)	TR Entry
+10 dBm	0	0 (Ref)	0 (Ref)	0 (Ref)	0 (Ref)
+6 dBm	−4	−4.44	**33**	−3.56	**50**
+2 dBm	−8	−8.48	**34**	−7.52	**51**
−2 dBm	−12	−12.52	**35**	−11.48	**52**
−6 dBm	−16	−16.56	**36**	−15.44	**53**
−10 dBm	−20	−20.60	**37**	−19.40	**54**
−14 dBm	−24	−24.64	**38**	−23.36	**55**
−18 dBm	−28	−28.68	**39**	−27.32	**56**
−22 dBm	−32	−32.72	**40**	−31.28	**57**
−26 dBm	−36	−36.76	**41**	−35.24	**58**
−30 dBm	−40	−40.80	**42**	−39.20	**59**
−34 dBm	−44	−44.84	**43**	−43.16	**60**
−38 dBm	−48	−48.88	**44**	−47.12	**61**
−42 dBm	−52	−52.92	**45**	−51.08	**62**
−46 dBm	−56	−56.96	**46**	−55.04	**63**
−50 dBm	−60	−61.00	**47**	−59.00	**64**
−54 dBm	−64	−65.04	**48**	−62.96	N/A
−58 dBm	−68	−69.08	**49**	−66.92	N/A

Linear Scale

14. Set the synthesizer/level generator controls as follows:

    AMPLITUDE .... +10 dBm
    AMPTD INCR .... 0.05 dB

15. Set the 1 dB step attenuator to 0 dB attenuation.
16. Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish. Set the spectrum analyzer by pressing the following keys:

    (AMPLITUDE) SCALE LOG LIN (LIN)

    75 Ω input only: Press More 1 of 2, INPUT Z 50 Ω 75 Ω (50 Ω).

    (FREQUENCY) 50 (MHz)
    (SPAN) 10 (MHz)
    (PEAK SEARCH)
    (MKR FCTN) MK TRACK ON OFF (ON)
    (SPAN) 50 (kHz)

    Wait for the auto zoom routine to finish, then set the resolution bandwidth and the video bandwidth by pressing the following keys:

    (BW)
    RES BW AUTO MAN 3 (kHz)
    VID BW AUTO MAN 30 (Hz)

17. If necessary, adjust the 1 dB step attenuator attenuation until the MKR reads approximately 223.6 mV. It may be necessary to decrease the resolution of the amplitude increment of the synthesizer/level generator to 0.01 dB to obtain a MKR reading of 223.6 mV ± 0.4 mV.
18. On the synthesizer/level generator, press AMPLITUDE, then use the increment keys to adjust the amplitude until the spectrum analyzer MKR amplitude reads 223.6 mV ±0.4 mV.
19. On the spectrum analyzer, press (PEAK SEARCH), (MKR FCTN), MK TRACK ON OFF (OFF).
20. Set the synthesizer/level generator amplitude increment to 3 dB.
21. On the synthesizer/level generator, press AMPLITUDE, then increment down to step the synthesizer/level generator to the next lowest Nominal Amplitude listed in Table 2-9.
22. Record the MKR amplitude reading in the performance verification test record as indicated in Table 2-9. The MKR amplitude should be within the limits shown.
23. Repeat steps 21 and 22 for the remaining synthesizer/level generator Nominal Amplitudes listed in Table 2-9.

13. Scale Fidelity, HP 8590 E-Series and HP 8591C

Table 2-9. Scale Fidelity, Linear Mode

Synthesizer/Level Generator Nominal Amplitude	% of Ref Level (nominal)	MKR Reading		
		Min. (mV)	TR Entry	Max. (mV)
+10 dBm	100	0 (Ref)	0 (Ref)	0 (Ref)
+7 dBm	70.7	151.59	**65**	165.01
+4 dBm	50	105.36	**66**	118.78
+1 dBm	35.48	72.63	**67**	86.05
−2 dBm	25	49.46	**68**	62.88

Steps 24 and 25 are only for testing a spectrum analyzer equipped with Option 130. If the spectrum analyzer is *not* equipped with Option 130 continue with step 26.

Additional Steps for Option 130

24. Press the following spectrum analyzer keys:

    (BW) `RES BW AUTO MAN` 300 (Hz)
    (SPAN) 10 (kHz)

25. Repeat steps 17 through 22 for the narrow bandwidths. Record the results as indicated in Table 2-10.

    The scale fidelity in linear mode is complete for spectrum analyzers equipped with Option 130. Continue with step 26.

Table 2-10. Scale Fidelity, Linear Mode for Option 130

Synthesizer/Level Generator Nominal Amplitude	% of Ref Level (nominal)	MKR Reading		
		Min. (mV)	TR Entry	Max. (mV)
+10 dBm	100	0 (Ref)	0 (Ref)	0 (Ref)
+7 dBm	70.7	151.59	**69**	165.01
+4 dBm	50	105.36	**70**	118.78
+1 dBm	35.48	72.63	**71**	86.05
−2 dBm	25	49.46	**72**	82.88

Log to Linear Switching

26. Set the 10 dB step attenuator to 10 dB attenuation and the 1 dB step attenuator to 0 dB attenuation.
27. Set the synthesizer controls as follows:

    FREQUENCY .... 50 MHz
    AMPLITUDE .... +6 dBm

28. On the spectrum analyzer, press (PRESET), then wait for the preset routine to finish. Set the spectrum analyzer by pressing the following keys:

    (FREQUENCY) 50 (MHz)
    (SPAN) 10 (MHz)
    (BW) 300 (kHz)

29. On the spectrum analyzer, press the following keys:

    (PEAK SEARCH)
    (MKR →) MARKER →REF LVL
    (PEAK SEARCH)

30. Record the peak marker reading in Log mode below.

    Log Mode Amplitude Reading________ dBm

31. Press (AMPLITUDE) SCALE LOG LIN (LIN) to change the scale to linear, then press More 1 of 2, Amptd Units, and dBm to set the amplitude units to dBm.
32. Press (PEAK SEARCH), then record the peak marker amplitude reading in linear mode.

    Linear Mode Amplitude Reading________ dBm

33. Subtract the Linear Mode Amplitude Reading from the Log Mode Amplitude Reading, then record this value as the Log/Linear Error.

    Log/Linear Error________ dB

34. If the Log/Linear Error is less than 0 dB, record this value as TR Entry 73 in the performance verification test record. The absolute value of the reading should be less than 0.25 dB. If the Log/Linear Error is greater than 0 dB, continue with the next step.
35. On the spectrum analyzer, press the following keys:

    (MKR →) MARKER →REF LVL
    (PEAK SEARCH)

36. Record the peak marker amplitude reading in linear mode.

Linear Mode Amplitude Reading_________ dBm

37. On the spectrum analyzer, press the following keys:

    (AMPLITUDE) SCALE LOG LIN (LOG)
    (PEAK SEARCH)

38. Record the peak marker reading in Log mode below.

Log Mode Amplitude Reading_________ dBm

39. Subtract the Log Mode Amplitude Reading from the Linear Mode Amplitude Reading, then record this value as the Linear/Log Error.

Linear/Log Error_________ dB

40. Record the Linear/Log Error as TR Entry 73 in the performance verification test record. The absolute value of the reading should be less than 0.25 dB.

    Steps 41 and 42 are only for testing a spectrum analyzer equipped with Option 130.

    Performance test, "Scale Fidelity" is complete for all other spectrum analyzers.

Additional Steps for Option 130

41. Press the following spectrum analyzer keys:

    (AMPLITUDE) SCALE LOG LIN (LOG)

    (BW) RES BW AUTO MAN 300 (Hz)
    (SPAN) 10 (kHz)

42. Repeat steps 29 through 39 for the narrow bandwidths. Record the results in the performance verification test record as TR Entry 74.

    Performance test, "Scale Fidelity" is complete for spectrum analyzers equipped with Option 130.

14. Reference Level Accuracy, HP 8591E and HP 8591C

A 50 MHz CW signal is applied to the INPUT 50 Ω of the spectrum analyzer through two step attenuators. The attenuators increase the effective amplitude range of the source. The amplitude of the source is decreased in 10 dB steps and the spectrum analyzer marker functions are used to measure the amplitude difference between steps. The source's internal attenuator is used as the reference standard. The test is performed in both log and linear amplitude scales.

It is only necessary to test reference levels as low as −90 dBm (with 10 dB attenuation) since lower reference levels are a function of the spectrum analyzer microprocessor manipulating the trace data. There is no error associated with the trace data manipulation.

The related adjustment for this procedure is "A12 Cal Attenuator Error Correction."

Equipment Required

Synthesizer/level generator
Attenuator, 1 dB steps
Attenuator, 10 dB steps
Cable, BNC 122 cm (48 in) *(two required)*
Adapter, Type N (m) to BNC (f)
Adapter, BNC (m) to BNC (m)

Additional Equipment for 75 Ω Input

Adapter, minimum loss
Adapter, Type N (f) to BNC (m) 75 Ω

Procedure

Log Scale

1. Set the synthesizer/level generator controls as follows:

   FREQUENCY .... 50 MHz
   AMPLITUDE .... −10 dBm
   AMPTD INCR .... 10 dB
   OUTPUT .... 50 Ω

2. Connect the equipment as shown in Figure 2-19. Set the 10 dB step attenuator to 10 dB attenuation and the 1 dB step attenuator to 0 dB attenuation.

   75 Ω input only: Connect the minimum loss adapter to the RF input 75 Ω, using adapters, and set the 10 dB step attenuator to 0 dB attenuation.

Caution Use only 75 Ω cables, connectors, or adapters on instruments with 75 Ω inputs, or damage to the input connector will occur.

14. Reference Level Accuracy, HP 8591E and HP 8591C

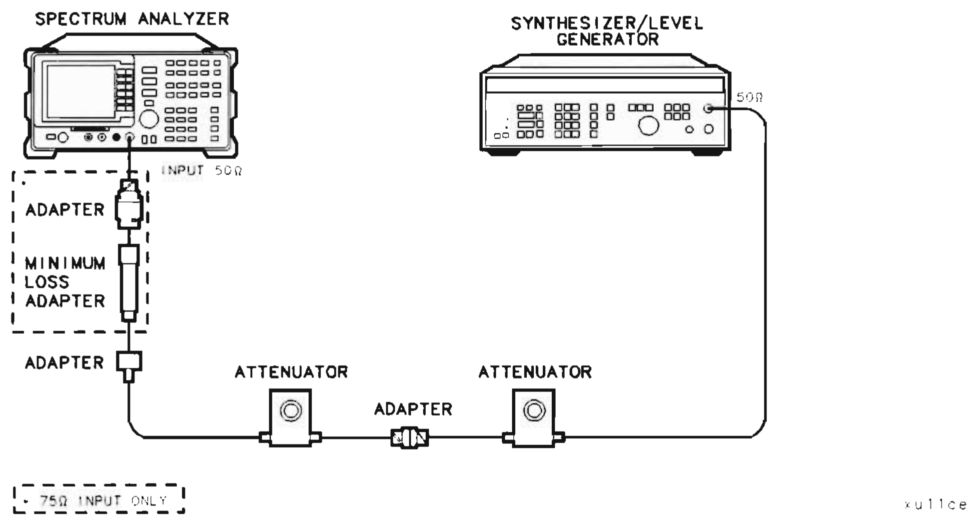


Figure 2-19. Reference Level Accuracy Test Setup

3. Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish. Set the spectrum analyzer by pressing the following keys:

   (FREQUENCY) 50 (MHz)
   (SPAN) 10 (MHz)
   (PEAK SEARCH)
   (MKR FCTN) MK TRACK ON OFF (ON)
   (SPAN) 50 (kHz)

   75 Ω input only: Press (AMPLITUDE), More 1 of 2, Amptd Units, then dBm.

   (AMPLITUDE) −20 (dBm) SCALE LOG LIN (LOG) 1 (dB)
   (BW) 3 (kHz) VID BW AUTO MAN 30 (Hz)

4. Set the 1 dB step attenuator to place the signal peak one to two dB (one to two divisions) below the reference level.

5. On the spectrum analyzer, press the following keys:

   (SGL SWP)
   (PEAK SEARCH) MARKER Δ

6. Set the synthesizer/level generator amplitude and spectrum analyzer reference level according to Table 2-11. At each setting, press (SGL SWP) on the spectrum analyzer.

7. Record the MKR Δ amplitude reading in the performance test record as indicated in Table 2-11. The MKR Δ reading should be within the limits shown.

Table 2-11. Reference Level Accuracy, Log Mode

Synthesizer/Level Generator Amplitude	Spectrum Analyzer Reference Level	MKR Δ Reading (dB)		
(dBm)	(dBm)	Min.	TR Entry	Max.
−10	−20	0 (Ref)	0 (Ref)	0 (Ref)
0	−10	−0.4	1	+0.4
+10	0	−0.5	2	+0.5
−20	−30	−0.4	3	+0.4
−30	−40	−0.5	4	+0.5
−40	−50	−0.8	5	+0.8
−50	−60	−1.0	6	+1.0
−60	−70	−1.1	7	+1.1
−70	−80	−1.2	8	+1.2
−80	−90	−1.3	9	+1.3

Linear Scale

8. Set the synthesizer/level generator amplitude to −10 dBm.
9. Set the 1 dB step attenuator to 0 dB attenuation.
10. Set the spectrum analyzer controls as follows:

    (AMPLITUDE) −20 (dBm)
    SCALE LOG LIN (LIN)
    (AMPLITUDE) More 1 of 2 Amptd Units dBm
    (SWEEP) SWEEP CONT SGL (CONT)
    (MKR) More 1 of 2 MARKER ALL OFF

11. Set the 1 dB step attenuator to place the signal peak one to two divisions below the reference level.
12. On the spectrum analyzer, press the following keys:

    (SGL SWP)
    (PEAK SEARCH) MARKER Δ
    (MKR FCTN) MK TRACK ON OFF (OFF)

13. Set the synthesizer/level generator amplitude and spectrum analyzer reference level according to Table 2-12. At each setting, press (SGL SWP) on the spectrum analyzer.

14. Record the MKR Δ amplitude reading in Table 2-12. The MKR Δ reading should be within the limits shown.

Table 2-12. Reference Level Accuracy, Linear Mode

Synthesizer/Level Generator Amplitude	Spectrum Analyzer Reference Level	MKR Δ Reading (dB)		
(dBm)	(dBm)	Min.	TR Entry	Max.
−10	−20	0 (Ref)	0 (Ref)	0 (Ref)
0	−10	−0.4	**10**	+0.4
+10	0	−0.5	**11**	+0.5
−20	−30	−0.4	**12**	+0.4
−30	−40	−0.5	**13**	+0.5
−40	−50	−0.8	**14**	+0.8
−50	−60	−1.0	**15**	+1.0
−60	−70	−1.1	**16**	+1.1
−70	−80	−1.2	**17**	+1.2
−80	−90	−1.3	**18**	+1.3

If you are testing a spectrum analyzer equipped with Option 130, continue with step 15.

Performance test "10. Reference Level Accuracy" is now complete for all other spectrum analyzers.

Additional Steps for Option 130

15. Press the following spectrum analyzer keys:

(AMPLITUDE) −20 (dBm) `SCALE LOG LIN` (LOG) 1 (dB)
(BW) `RES BW AUTO MAN` 300 (Hz)
(SPAN) 10 (kHz)
(SWEEP) `SWEEP CONT SGL` (CONT)

16. Set the synthesizer/level generator to −10 dBm.
17. Repeat steps 4 through 6, using Table 2-13 for the narrow resolution bandwidths.
18. Record the MKR Δ amplitude reading in the performance test record as indicated in Table 2-13. The MKR Δ reading should be within the limits shown.

Table 2-13. Reference Level Accuracy, Log Mode for Option 130

Synthesizer/Level Generator Amplitude	Spectrum Analyzer Reference Level	MKR Δ Reading (dB)		
(dBm)	(dBm)	Min.	TR Entry	Max.
−10	−20	0 (Ref)	0 (Ref)	0 (Ref)
0	−10	−0.4	**19**	+0.4
+10	0	−0.5	**20**	+0.5
−20	−30	−0.4	**21**	+0.4
−30	−40	−0.5	**22**	+0.5
−40	−50	−0.8	**23**	+0.8
−50	−60	−1.1	**24**	+1.1
−60	−70	−1.2	**25**	+1.2
−70	−80	−1.3	**26**	+1.3
−80	−90	−1.4	**27**	+1.4

19. Repeat steps 8 through 13, using Table 2-14 for the narrow resolution bandwidths.
20. Record the MKR Δ amplitude reading in the performance test record as indicated in Table 2-14. The MKR Δ reading should be within the limits shown.

Table 2-14. Reference Level Accuracy, Linear Mode for Option 130

Synthesizer/Level Generator Amplitude	Spectrum Analyzer Reference Level	MKR Δ Reading (dB)		
(dBm)	(dBm)	Min.	TR Entry	Max.
−10	−20	0 (Ref)	0 (Ref)	0 (Ref)
0	−10	−0.4	**28**	+0.4
+10	0	−0.5	**29**	+0.5
−20	−30	−0.4	**30**	+0.4
−30	−40	−0.5	**31**	+0.5
−40	−50	−0.8	**32**	+0.8
−50	−60	−1.1	**33**	+1.1
−60	−70	−1.2	**34**	+1.2
−70	−80	−1.3	**35**	+1.3
−80	−90	−1.4	**36**	+1.4

15. Reference Level Accuracy, HP 8593E, HP 8594E, HP 8595E, and HP 8596E

A 50 MHz CW signal is applied to the INPUT 50 Ω of the spectrum analyzer through two step attenuators. The attenuators increase the effective amplitude range of the source. The amplitude of the source is decreased in 10 dB steps and the spectrum analyzer marker functions are used to measure the amplitude difference between steps. The source internal attenuator is used as the reference standard. The test is performed in both log and linear amplitude scales.

It is only necessary to test reference levels as low as −90 dBm (with 10 dB attenuation) since lower reference levels are a function of the spectrum analyzer microprocessor manipulating the trace data. There is no error associated with the trace data manipulation.

The related adjustment for this procedure is "A12 Cal Attenuator Error Correction."

Equipment Required

Synthesizer/level generator
Attenuator, 1 dB steps
Attenuator, 10 dB steps
Cable, BNC 122 cm (48 in) *(two required)*
Adapter, Type N (m) to BNC (f)
Adapter, BNC (m) to BNC (m)

Additional Equipment for Option 026

Adapter, APC 3.5 (f) to Type N (f)
Adapter, BNC (f) to SMA (m)

Procedure

Log Scale

1. Set the synthesizer/level generator controls as follows:

   FREQUENCY .... 50 MHz
   AMPLITUDE .... −10 dBm
   AMPTD INCR .... 10 dB
   OUTPUT .... 50 Ω

2. Connect the equipment as shown in Figure 2-20. Set the 10 dB step attenuator to 10 dB attenuation and the 1 dB step attenuator to 0 dB attenuation.

15. Reference Level Accuracy, HP 8593E, HP 8594E, HP 8595E, and HP 8596E

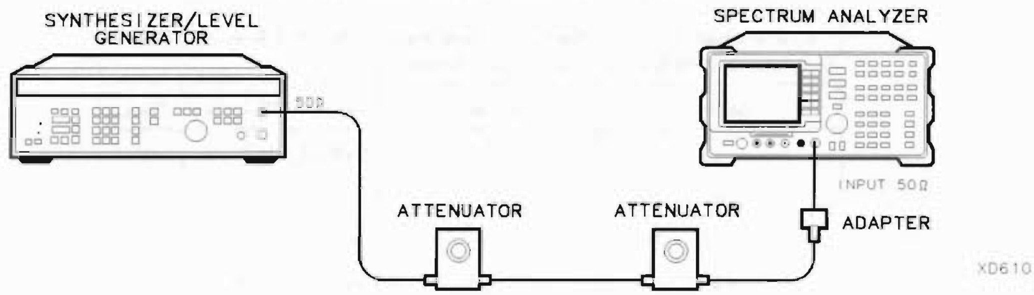


Figure 2-20. Reference Level Accuracy Test Setup

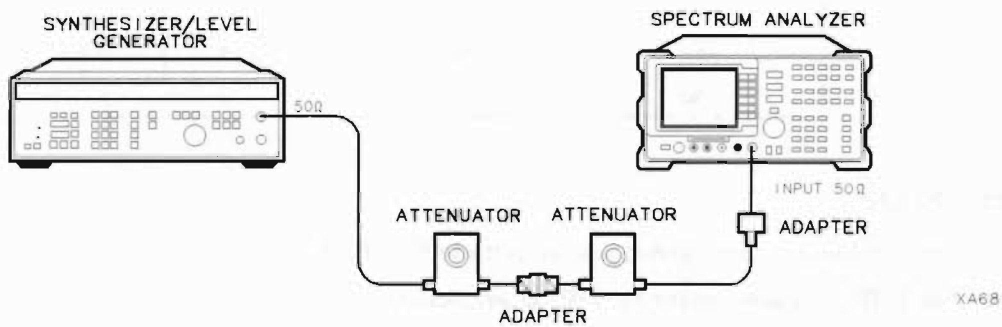


Figure 2-21. For HP 8594E Only - Ref Level Accuracy Test Setup

3. Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish. Set the spectrum analyzer by pressing the following keys:

   (FREQUENCY) 50 (MHz)
   (SPAN) 10 (MHz)
   (PEAK SEARCH)
   (MKR FCTN) MK TRACK ON OFF (ON)
   (SPAN) 50 (kHz)
   (AMPLITUDE) −20 (dBm) SCALE LOG LIN (LOG) 1 (dB)
   (BW) 3 (kHz) VID BW AUTO MAN 30 (Hz)

4. Set the 1 dB step attenuator to place the signal peak one to two dB (one to two divisions) below the reference level.
5. On the spectrum analyzer, press the following keys:

   (SGL SWP)
   (PEAK SEARCH) MARKER Δ

6. Set the synthesizer/level generator amplitude and spectrum analyzer reference level according to Table 2-15. At each setting, press (SGL SWP) on the spectrum analyzer.
7. Record the MKR Δ amplitude reading in the performance verification test record as indicated in Table 2-15. The MKR Δ reading should be within the limits shown.

15. Reference Level Accuracy, HP 8593E, HP 8594E, HP 8595E, and HP 8596E

Table 2-15. Reference Level Accuracy, Log Mode

Synthesizer/Level Generator Amplitude	Spectrum Analyzer Reference Level	MKR Δ Reading (dB)		
(dBm)	(dBm)	Min.	TR Entry	Max.
−10	−20	0 (Ref)	0 (Ref)	0 (Ref)
0	−10	−0.4	1	+0.4
+10	0	−0.5	2	+0.5
−20	−30	−0.4	3	+0.4
−30	−40	−0.5	4	+0.5
−40	−50	−0.8	5	+0.8
−50	−60	−1.0	6	+1.0
−60	−70	−1.1	7	+1.1
−70	−80	−1.2	8	+1.2
−80	−90	−1.3	9	+1.3

Linear Scale

8. Set the synthesizer/level generator amplitude to −10 dBm.
9. Set the 1 dB step attenuator to 0 dB attenuation.
10. Set the spectrum analyzer controls as follows:

    (AMPLITUDE) −20 (dBm)
    SCALE LOG LIN (LIN)
    (AMPLITUDE) More 1 of 2 Amptd Units dBm
    (SWEEP) SWEEP CONT SGL (CONT)
    (MKR) More 1 of 2 MARKER ALL OFF

11. Set the 1 dB step attenuator to place the signal peak one to two divisions below the reference level.
12. On the spectrum analyzer, press the following keys:

    (SGL SWP)
    (PEAK SEARCH) MARKER Δ

13. Set the synthesizer/level generator amplitude and spectrum analyzer reference level according to Table 2-16. At each setting, press (SGL SWP) on the spectrum analyzer.
14. Record the MKR Δ amplitude reading in Table 2-16. The MKR Δ reading should be within the limits shown.

15. Reference Level Accuracy, HP 8593E, HP 8594E, HP 8595E, and HP 8596E

Table 2-16. Reference Level Accuracy, Linear Mode

Synthesizer/Level Generator Amplitude	Spectrum Analyzer Reference Level	MKR Δ Reading (dB)		
(dBm)	(dBm)	Min.	TR Entry	Max.
−10	−20	0 (Ref)	0 (Ref)	0 (Ref)
0	−10	−0.4	**10**	+0.4
+10	0	−0.5	**11**	+0.5
−20	−30	−0.4	**12**	+0.4
−30	−40	−0.5	**13**	+0.5
−40	−50	−0.8	**14**	+0.8
−50	−60	−1.0	**15**	+1.0
−60	−70	−1.1	**16**	+1.1
−70	−80	−1.2	**17**	+1.2
−80	−90	−1.3	**18**	+1.3

If you are testing a spectrum analyzer equipped with Option 130, continue with step 15.

Performance verification test "Reference Level Accuracy" is now complete for all other spectrum analyzers.

Additional Steps for Option 130

15. Press the following spectrum analyzer keys:

    (AMPLITUDE) −20 (dBm) SCALE LOG LIN (LOG) 1 (dB)
    (BW) RES BW AUTO MAN 300 (Hz)
    (SPAN) 10 (kHz)
    (SWEEP) SWEEP CONT SGL (CONT)

16. Set the synthesizer/level generator to −10 dBm.
17. Set the 1 dB step attenuator to place the signal peak one to two dB (one to two divisions) below the reference level.
18. On the spectrum analyzer, press the following keys:

    (SGL SWP)
    (PEAK SEARCH) MARKER Δ

19. Set the synthesizer/level generator amplitude and spectrum analyzer reference level according to Table 2-15. At each setting, press (SGL SWP) on the spectrum analyzer.
20. Record the MKR Δ amplitude reading in the performance verification test record as indicated in Table 2-17. The MKR Δ reading should be within the limits shown.

15. **Reference Level Accuracy, HP 8593E, HP 8594E, HP 8595E, and HP 8596E**

Table 2-17. Reference Level Accuracy, Log Mode for Option 130

Synthesizer/Level Generator Amplitude	Spectrum Analyzer Reference Level	MKR Δ Reading (dB)		
(dBm)	(dBm)	Min.	TR Entry	Max.
−10	−20	0 (Ref)	0 (Ref)	0 (Ref)
0	−10	−0.4	**19**	+0.4
+10	0	−0.5	**20**	+0.5
−20	−30	−0.4	**21**	+0.4
−30	−40	−0.5	**22**	+0.5
−40	−50	−0.8	**23**	+0.8
−50	−60	−1.1	**24**	+1.1
−60	−70	−1.2	**25**	+1.2
−70	−80	−1.3	**26**	+1.3
−80	−90	−1.4	**27**	+1.4

21. Repeat steps 8 through 13 for the narrow resolution bandwidths, using Table 2-18.
22. Record the MKR Δ amplitude reading in the performance verification test record as indicated in Table 2-18. The MKR Δ reading should be within the limits shown.

Table 2-18. Reference Level Accuracy, Linear Mode for Option 130

Synthesizer/Level Generator Amplitude	Spectrum Analyzer Reference Level	MKR Δ Reading (dB)		
(dBm)	(dBm)	Min.	TR Entry	Max.
−10	−20	0 (Ref)	0 (Ref)	0 (Ref)
0	−10	−0.4	**28**	+0.4
+10	0	−0.5	**29**	+0.5
−20	−30	−0.4	**30**	+0.4
−30	−40	−0.5	**31**	+0.5
−40	−50	−0.8	**32**	+0.8
−50	−60	−1.1	**33**	+1.1
−60	−70	−1.2	**34**	+1.2
−70	−80	−1.3	**35**	+1.3
−80	−90	−1.4	**36**	+1.4

16. Absolute Amplitude Calibration and Resolution Bandwidth Switching Uncertainties

For HP 8590 E-Series and HP 8591C

To measure the absolute amplitude calibration uncertainty the input signal is measured after the self-cal routine is finished.

To measure the resolution bandwidth switching uncertainty an amplitude reference is taken with the resolution bandwidth set to 3 kHz using the marker-delta function. The resolution bandwidth is changed to settings between 3 MHz and 1 kHz and the amplitude variation is measured at each setting and compared to the specification. The span is changed as necessary to maintain approximately the same aspect ratio.

The related adjustment procedure for this performance test is "Crystal and LC Bandwidth Adjustment."

Equipment Required

Cable, BNC, 23 cm (9 in)
Adapter, Type N (m) to BNC (f)

Additional Equipment for Option 026

Adapter, APC 3.5 (f) to Type N (f)

Additional Equipment for 75 Ω Input

Cable, BNC, 75 Ω, 30 cm (12 in)

Caution Use only 75 Ω cables, connectors, or adapters on instruments with 75 Ω inputs, or damage to the input connector will occur.

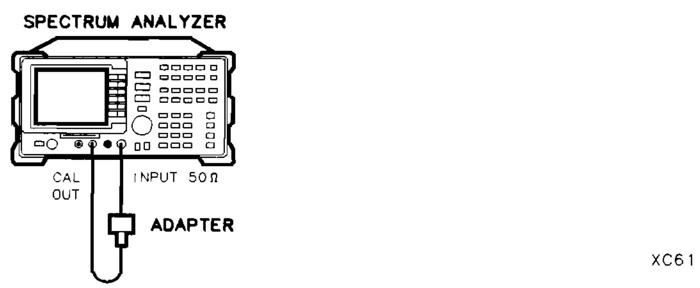


Figure 2-22. Uncertainty Test Setup

Absolute Amplitude Uncertainty

1. Connect the CAL OUT to the spectrum analyzer input using the BNC cable and adapter, as shown in Figure 2-22.

   75 Ω input only: Use the 75 Ω cable and omit the adapter.

2. Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish. Set the spectrum analyzer controls by pressing the following keys:

   (SPAN) 10 (MHz)
   (PEAK SEARCH)
   (MKR FCTN) MK TRACK ON OFF (ON)
   (FREQUENCY) 300 (MHz)
   (SPAN) 50 (kHz)
   (BW) 3 (kHz)
   (VID BW AUTO MAN) 300 (Hz)

   75 Ω input only: Press (AMPLITUDE), More 1 of 2, Amptd Units, then **dBm**.

   (AMPLITUDE) −20 (dBm)

3. Press (PEAK SEARCH), then record the marker reading in TR Entry 1 of the performance verification test record.

   The marker reading should be within −20.15 and −19.85 dB.

Resolution Bandwidth Switching Uncertainty

4. Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish. Set the spectrum analyzer controls by pressing the following keys:

   (FREQUENCY) 300 (MHz)
   (SPAN) 10 (MHz)
   (PEAK SEARCH)
   (MKR FCTN) MK TRACK ON OFF (ON)

   75 Ω input only: Press (AMPLITUDE), More 1 of 2, Amptd Units, then dBm.

   (SPAN) 50 (kHz)
   (AMPLITUDE) −20 (dBm)
   SCALE LOG LIN (LOG) 1 (dB)
   (BW) 3 (kHz)
   VID BW AUTO MAN 1 (kHz)

5. Press (AMPLITUDE) and use the knob to adjust the reference level until the signal appears one division below the reference level, then press the following keys:

   (PEAK SEARCH) MARKER Δ
   (MKR FCTN) MK TRACK ON OFF (ON)

6. Set the spectrum analyzer resolution bandwidth and span according to Table 2-19.
7. Press (PEAK SEARCH), then record the MKR Δ TRK amplitude reading in the performance verification test record as indicated in Table 2-19.

   The amplitude reading should be within the limits shown.
8. Repeat steps 6 through 7 for each of the remaining resolution bandwidth and span settings listed in Table 2-19.

Table 2-19. Resolution Bandwidth Switching Uncertainty

Spectrum Analyzer		MKR Δ TRK Amplitude Reading		
RES BW Setting	SPAN Setting	Min. (dB)	TR Entry	Max. (dB)
3 kHz	50 kHz	0 (Ref)	0 (Ref)	0 (Ref)
1 kHz	50 kHz	−0.5	2	+0.5
9 kHz	50 kHz	−0.4	3	+0.4
10 kHz	50 kHz	−0.4	4	+0.4
30 kHz	500 kHz	−0.4	5	+0.4
100 kHz	500 kHz	−0.4	6	+0.4
120 kHz	500 kHz	−0.4	7	+0.4
300 kHz	5 MHz	−0.4	8	+0.4
1 MHz	10 MHz	−0.4	9	+0.4
3 MHz	10 MHz	−0.4	10	+0.4

If you are testing a spectrum analyzer equipped with Option 130, continue with step 9.

Performance test "11. Resolution Bandwidth Switching Uncertainty" is now complete for all other spectrum analyzers.

Additional Steps for Option 130

9. Press the following spectrum analyzer keys:

   (SPAN) 50 (kHz)
   (BW) 3 (kHz)
   (PEAK SEARCH) MARKER Δ
   (MKR FCTN) MK TRACK ON OFF (ON)
10. Set the resolution bandwidth and span according to Table 2-20.

11. Press (PEAK SEARCH), then record the MKR Δ TRK amplitude reading in the performance verification test record as indicated in Table 2-19.

    The amplitude reading should be within the limits shown.

12. Repeat steps 10 through 11 for each of the remaining resolution bandwidth and span settings listed in Table 2-19.

Table 2-20.
Resolution Bandwidth Switching Uncertainty for Option 130

Spectrum Analyzer		MKR Δ TRK Amplitude Reading		
RES BW Setting	**SPAN Setting**	**Min. (dB)**	**TR Entry**	**Max. (dB)**
3 kHz	50 kHz	0 (Ref)	0 (Ref)	0 (Ref)
300 Hz	1 kHz	−0.6	**11**	+0.6
200 Hz	1 kHz	−0.6	**12**	+0.6
100 Hz	1 kHz	−0.6	**13**	+0.6
30 Hz	1 kHz	−0.6	**14**	+0.6

Note that it is normal for the 200 Hz resolution bandwidth shape to have a dip in the center of the response.

17. Resolution Bandwidth Accuracy, HP 8590 E-Series and HP 8591C

The output of a synthesizer/level generator is connected to the input of the spectrum analyzer. Measurements are performed in zero span to reduce the measurement uncertainty.

The frequency of the synthesizer/level generator is set to the center of the bandwidth-filter response. The synthesizer output is then reduced in amplitude by either 3 dB or 6 dB to determine the reference point. A marker reference is set and the synthesizer output is increased to its previous level.

The frequency of the synthesizer is reduced then recorded when the resulting marker amplitude matches the previously set marker reference. The synthesizer frequency is increased so that it is tuned on the opposite point on the skirt of the filter response. The frequency is once again recorded and the difference between the two frequencies is compared to the specification.

The related adjustments for this performance test are:

CAL AMPTD and CAL FREQ Self-Cal Routines
Crystal and LC Filter Adjustments

Equipment Required

Synthesizer/level generator
Cable, BNC, 122 cm (48 in)
Adapter, Type N (m) to BNC (f)

Additional Equipment for Option 026

Adapter, APC 3.5 (f) to Type N (f)

Additional Equipment for 75 Ω Input

Cable, BNC (75 Ω), 122 cm (48 in)

Caution Use only 75 Ω cables, connectors, or adapters on instruments with 75 Ω inputs, or damage to the input connector will occur.

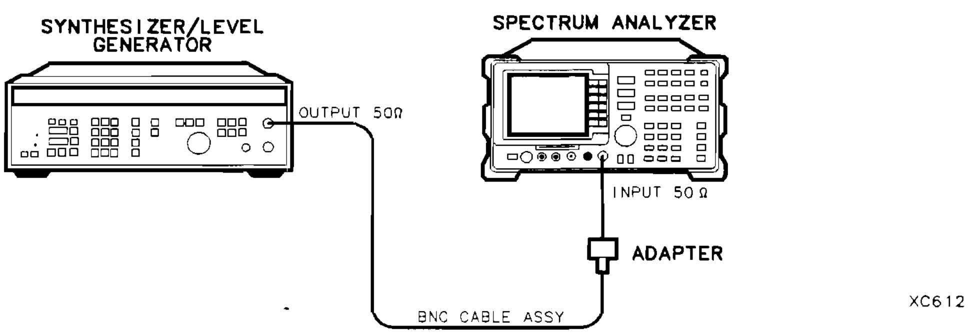


Figure 2-23. Resolution Bandwidth Accuracy Test Setup

Procedure

1. Connect the equipment as shown in Figure 2-23.

   75 Ω input: Connect the 75 Ω cable to the OUTPUT 75Ω connector of the synthesizer/level generator.

3 dB Bandwidths

2. Set the synthesizer/level generator controls as follows:

   75 Ω input: Set the 50 Ω/75 Ω switch to 75 Ω

   AMPLITUDE .... 0 dBm
   AMPTD INCR .... 3 dB
   FREQUENCY .... 50 MHz

3. Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish. Set the spectrum analyzer by pressing the following keys:

   (FREQUENCY) 50 (MHz)
   (SPAN) ZERO SPAN
   (BW) 3 (MHz)
   VID BW AUTO MAN 30 (Hz)
   (AMPLITUDE) SCALE LOG LIN (LOG) 1 (dB)

4. On the synthesizer/level generator set MANUAL TUNE ON/OFF to ON.
5. On the spectrum analyzer press (MKR).
6. Adjust the frequency of the synthesizer/level generator for a maximum marker reading.

   It will be necessary to adjust the MANUAL TUNE DIGIT resolution on the synthesizer/level generator for the best compromise between tuning speed and resolution.

   Adjust the synthesizer/level generator amplitude to place the peak of the signal at or below the top graticule.

7. On the synthesizer/level generator, press AMPLITUDE and INCR (⇩) (step-down key).
8. Press (MARKER Δ) on the spectrum analyzer.
9. On the synthesizer/level generator, press INCR (⇧) (step-up key).
10. On the synthesizer/level generator, press FREQUENCY. Lower the frequency of the synthesizer/level generator by adjusting the knob until the marker delta amplitude is 0.0 ± 0.05 dB.
11. Record the synthesizer/level generator frequency readout in column 1 of Table 2-21.
12. Using the synthesizer/level generator knob, raise the frequency so that the marker-delta amplitude is maximum. Continue increasing the frequency until the marker reads 0.0 ± 0.05 dB.
13. Record the synthesizer/level generator frequency readout in column 2 of Table 2-21.
14. Adjust the synthesizer/level generator frequency for maximum amplitude.
15. Repeat steps 5 through 14 for each of the RES BW settings listed in Table 2-21.

16. Subtract the Synthesizer Lower Frequency from the Synthesizer Upper Frequency. Record the difference as the Resolution Bandwidth Accuracy, in the performance verification test record as indicated in Table 2-21.

RES BW Accuracy = Upper Frequency − Lower Frequency

Table 2-21. 3 dB Resolution Bandwidth Accuracy

Spectrum Analyzer RES BW	Column 1 Synthesizer Lower Frequency	Column 2 Synthesizer Upper Frequency	TR Entry (Resolution Bandwidth Accuracy)
3 MHz	________	________	1
1 MHz	________	________	2
300 kHz	________	________	3
100 kHz	________	________	4
30 kHz	________	________	5
10 kHz	________	________	6
3 kHz	________	________	7
1 kHz	________	________	8

6 dB EMI Bandwidths

17. Set the synthesizer/level generator AMPTD INCR to 6 dB.
18. On the spectrum analyzer, press the following keys:

    (BW) EMI BW MENU 9 kHz EMI BW

    (MKR) MARKER NORMAL

19. On the synthesizer/level generator, press FREQUENCY. Adjust the frequency for a maximum marker reading.
20. On the synthesizer/level generator, press AMPLITUDE and INCR (⇩) (step-down key).
21. Press (MARKER DELTA) on the spectrum analyzer.
22. On the synthesizer/level generator, press INCR (⇧) (step-up key).
23. On the synthesizer/level generator, press FREQUENCY. Lower the frequency of the synthesizer/level generator by adjusting the knob until the marker-delta amplitude is 0.0 ± 0.05 dB.
24. Record the synthesizer/level generator frequency readout in column 1 of Table 2-22.
25. Using the synthesizer/level generator knob, increase the frequency so that the marker-delta amplitude is maximum. Continue increasing the frequency until the marker reads 0.0 ± 0.05 dB.

26. Record the synthesizer/level generator frequency readout in column 2 of Table 2-22.
27. Adjust the synthesizer/level generator frequency for maximum marker amplitude.
28. Repeat steps 18 through 26 for the `120 kHz EMI RES BW`.
29. Subtract the Synthesizer Lower Frequency from the Synthesizer Upper Frequency. Record the difference as the Resolution Bandwidth Accuracy, in the performance verification test record as indicated in Table 2-22.

    RES BW Accuracy = Upper Frequency − Lower Frequency

Table 2-22. EMI Resolution Bandwidth Accuracy

Spectrum Analyzer RES BW	Column 1 Synthesizer Lower Frequency	Column 2 Synthesizer Upper Frequency	TR Entry (Resolution Bandwidth Accuracy)
9 kHz	______	______	9
120 kHz	______	______	10

If you are testing a spectrum analyzer equipped with Option 130, continue with step 30.

Performance test "Resolution Bandwidth Accuracy" is now complete for all other spectrum analyzers.

Additional Steps for Option 130

30. Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish. Set the spectrum analyzer by pressing the following keys:

    (FREQUENCY) 50 (MHz)
    (SPAN) 1 (MHz)
    (PEAK SEARCH)
    (MKR FCTN) `MK TRACK ON OFF` (ON)
    (SPAN) 1 (kHz)

    Wait for the auto zoom routine to finish, then press the following keys:

    (MKR) `MARKER 1 ON OFF` (OFF)
    (MEAS/USER) `N dB PTS ON OFF` 3 (dB)
    (AMPLITUDE) `SCALE LOG LIN` (LOG) 1 (dB)
    (BW) 300 (Hz)

31. Set the spectrum analyzer resolution bandwidth and span according to Table 2-23.
32. Press (SGL SWP). Record the −3 dB POINTS: readout in the performance verification test record as indicated in Table 2-23.
33. Repeat steps 31 through 32 for each of the Resolution Bandwidth settings listed in Table 2-23.

Table 2-23. Resolution Bandwidth Accuracy for Option 130

Resolution Bandwidth	Frequency Span	TR Entry (−3 dB Readout)
300 Hz	1 kHz	11
100 Hz	1 kHz	12
30 Hz	300 Hz	13

6 dB EMI 200 Hz Bandwidths

It is normal for the 200 Hz resolution bandwidth shape to have a dip in the center of the response.

34. Press the following spectrum analyzer keys:

   (MEAS/USER) N dB PTS ON OFF 6 (dB)
   (BW) 200 (Hz)

35. Press (SGL SWP). Record the −6 dB POINTS: readout in the performance verification test record as TR Entry 14.

18. Calibrator Amplitude Accuracy, HP 8590 E-Series

This test measures the accuracy of the spectrum analyzer CAL OUT signal. The first part of the test characterizes the insertion loss of a Low Pass Filter (LPF) and 10 dB Attenuator. The harmonics of the CAL OUT signal are suppressed with the LPF before the amplitude accuracy is measured using a power meter.

Calibrator Frequency is not included in this procedure because it is a function of the Frequency Reference (CAL OUT Frequency = 300 MHz ± [300 MHz × Frequency Reference]). Perform the Frequency Reference Accuracy test to verify the CAL OUT frequency.

The related adjustment for this performance test is the "Calibrator Amplitude Adjustment."

Equipment Required

Synthesized sweeper
Measuring receiver *(used as a power meter)*
Power meter
Power sensor, low power with a 50 MHz reference attenuator
Power sensor, 100 kHz to 1800 MHz
Power splitter
10 dB Attenuator, Type N (m to f), dc-12.4 GHz
Filter, low pass (300 MHz)
Cable, Type N, 152 cm (60 in)
APC 3.5 (f) to Type N (f)
Adapter, Type N (f) to BNC (m) *(two required)*
Adapter, Type N (m) to BNC (f)

Additional Equipment for 75 Ω Input

Adapter, minimum loss
Adapter, mechanical, 75 Ω to 50 Ω
Adapter, Type N (f) 75 Ω to BNC (m) 75 Ω

Procedure

This performance test consists of two parts:

Part 1: LPF, Attenuator and Adapter Insertion Loss Characterization
Part 2: Calibrator Amplitude Accuracy

Perform "Part 1: LPF, Attenuator and Adapter Insertion Loss Characterization" before "Part 2: Calibrator Amplitude Accuracy."

A worksheet is provided at the end of this procedure for calculating the corrected insertion loss and the calibrator amplitude accuracy.

Part 1: LPF, Attenuator and Adapter Insertion Loss Characterization

1. Zero and calibrate the measuring receiver and 100 kHz to 1800 MHz power sensor in LOG mode as described in the measuring receiver operation manual.

Caution	Do not attempt to calibrate the low-power power sensor without the reference attenuator or damage to the low-power power sensor will occur.

2. Zero and calibrate the power meter and low-power power sensor, as described in the power meter operation manual.
3. Press INSTRUMENT PRESET on the synthesized sweeper, then set the controls as follows:

   CW .... 300 MHz
   POWER LEVEL .... −15 dBm

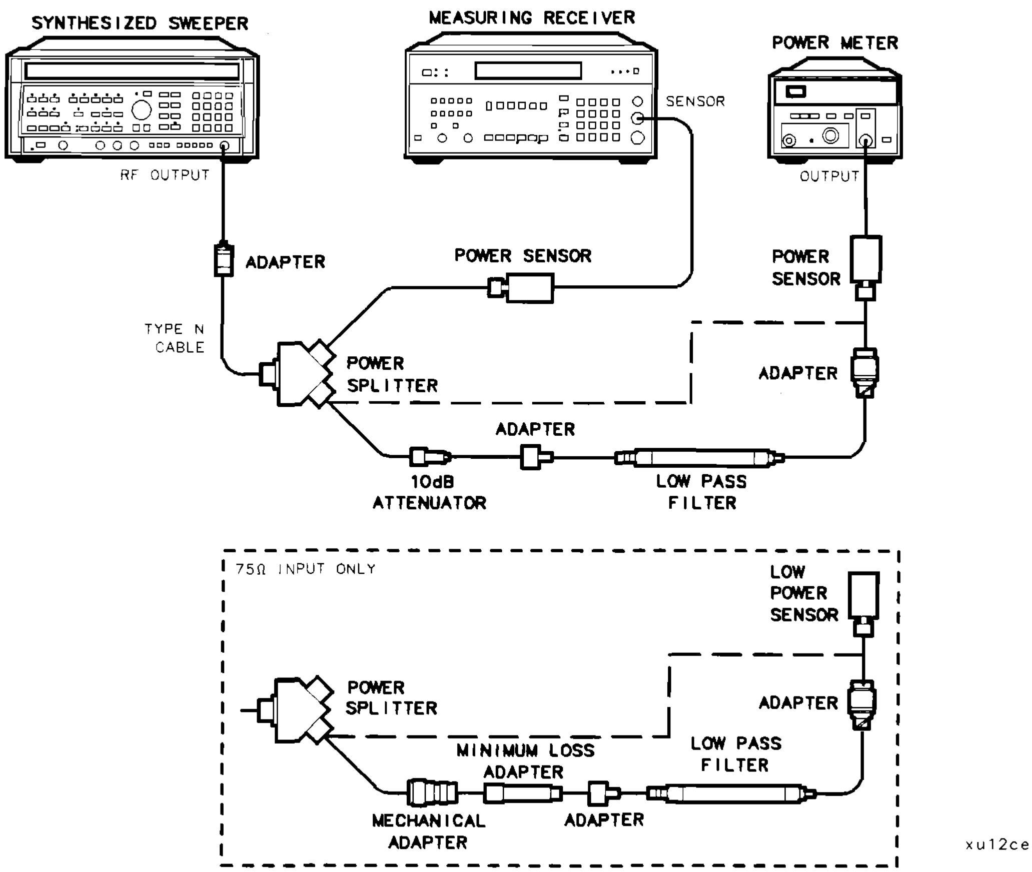


Figure 2-24. LPF Characterization

4. Connect the equipment as shown in Figure 2-24. Connect the low-power power sensor directly to the power splitter (bypass the LPF, attenuator, and adapters). Wait for the power sensor to settle before proceeding with the next step.
5. On the measuring receiver, press RATIO mode. The power indication should be 0 dB.
6. On the power meter, press the dB REF mode key. The power indication should be 0 dB.
7. Connect the LPF, attenuator and adapters as shown in Figure 2-24.
8. Record the measuring receiver reading in dB in the worksheet as the Mismatch Error. This is the relative error due to mismatch.
9. Record the power meter reading in dB in the worksheet as the Uncorrected Insertion Loss. This is the relative uncorrected insertion loss of the LPF, attenuator and adapters.
10. Subtract the Mismatch Error (step 8) from the Uncorrected Insertion Loss (step 9). This is the corrected insertion loss. Record this value in the worksheet as the Corrected Insertion Loss.

    Example: If the Mismatch Error is +0.3 dB and the Uncorrected Insertion Loss is −10.2 dB, subtract the mismatch error from the insertion loss to yield a corrected reading of −10.5 dB.

Part 2: Calibrator Amplitude Accuracy

Perform "Part 1: LPF, Attenuator and Adapter Insertion Loss Characterization" before performing this procedure.

Caution Use only 75 Ω cables, connectors, or adapters on instruments with 75 Ω inputs, or damage to the input connector will occur.

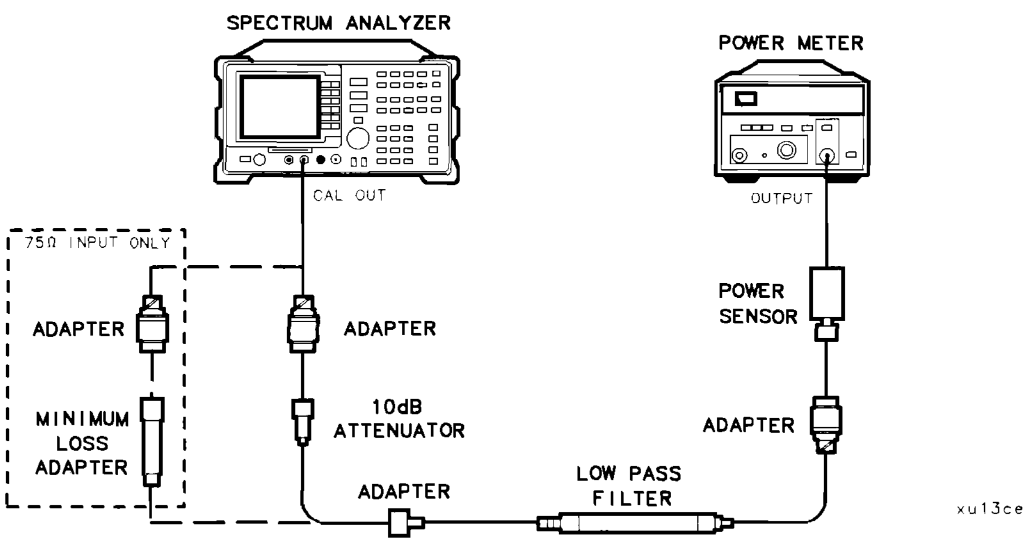


Figure 2-25. Calibrator Amplitude Accuracy Test Setup

1. Connect the equipment as shown in Figure 2-25. The spectrum analyzer should be positioned so that the setup of the adapters, LPF and attenuator do not bind. It may be necessary to support the center of gravity of the devices.
2. On the power meter, press the dBm mode key. Record the Power Meter Reading in dBm in the worksheet as the Power Meter Reading.
3. Subtract the Corrected Insertion Loss (step 10) from the Power Meter Reading (step 9).

   CAL OUT Power = Power Meter Reading − Corrected Insertion Loss

   Example: If the Corrected Insertion Loss is −10.0 dB, and the measuring receiver reading is −30 dB, then (−30 dB) − (−10.0 dB) = −20 dB

4. Record this value as TR Entry 1 of the performance verification test record as the CAL OUT power. The CAL OUT should be −20 dBm ±0.4 dB.

   75 Ω input: The CAL OUT power measured on 75 Ω instruments will be the same as 50 Ω instruments. To convert from dBm to dBmV use the following equation, then record this value as TR Entry 2 of the performance verification test record.

   dBmV = dBm + 48.75 dB

   Example: −20 + 48.75 = 28.75 dBmV

Calibrator Amplitude Accuracy Worksheet

Description	Measurement
Mismatch Error	____________dB
Uncorrected Insertion Loss	____________dB
Corrected Insertion Loss	____________dB
Counter Reading 3	____________Hz
Power Meter Reading	____________dBm

19. Frequency Response, HP 8591C and HP 8591E

The output of the synthesized sweeper is fed through a power splitter to a power sensor and the spectrum analyzer. The synthesized sweeper's power level is adjusted at 300 MHz to place the displayed signal at the spectrum analyzer center horizontal graticule line. The measuring receiver, used as a power meter, is placed in RATIO mode. At each new sweeper frequency and spectrum analyzer center frequency setting, the sweeper's power level is adjusted to place the signal at the center horizontal graticule line. The measuring receiver displays the inverse of the frequency response relative to 300 MHz (CAL OUT frequency).

The related adjustment for this performance test is "Frequency Response Error Correction."

Testing the flatness of HP 8591C's or spectrum analyzers equipped with INPUT 75 Ω, is accomplished by first performing a system flatness characterization.

Equipment Required

Synthesized sweeper
Measuring receiver *(used as a power meter)*
Synthesizer/level generator
Power sensor, 100 kHz to 1800 MHz
Power splitter
Adapter, Type N (f) to APC 3.5 (f)
Adapter, Type N (m) to Type N (m)
Cable, BNC, 122 cm (48 in)
Cable, Type N, 183 cm (72 in)

Additional Equipment for 75 Ω Input

Power meter
Power sensor, 1 MHz to 2 GHz
Cable, BNC, 120 cm (48 in) 75 Ω
Adapter, Type N (f) 75 Ω to Type N (m) 50 Ω
Adapter Type N (m) to BNC (m), 75 Ω

Procedure for System Characterization for 75 Ω Input

The following procedure is only for spectrum analyzers equipped with 75 Ω input. If your spectrum analyzer is *not* equipped with 75 Ω input, proceed with step 1 of "Frequency Response ≥50 MHz."

1. Zero and calibrate the measuring receiver and 100 kHz to 1800 MHz power sensor as described in the measuring receiver operation manual.
2. Zero and calibrate the power meter and 1 MHz to 2 GHz power sensor as described in the power meter operation manual.

Caution Use only 75 Ω cables, connectors, or adapters on instruments with 75 Ω inputs, or damage to the input connector will occur.

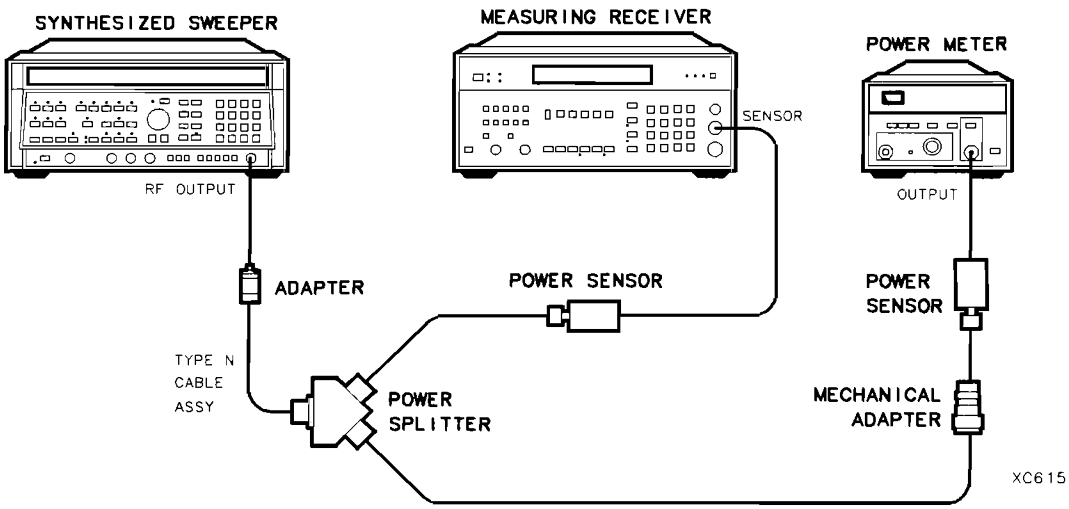


Figure 2-26. System Characterization Test Setup for 75 Ω Input

3. Press instrument preset on the synthesized sweeper, then set the controls as follows:

   CW .... 50 MHz
   FREQ STEP .... 50 MHz
   POWER LEVEL .... 5 dBm

4. Connect the equipment as shown in Figure 2-26.
5. Adjust the synthesized sweeper power level for a 0 dBm reading on the measuring receiver.
6. Record the power meter reading in column 4 of Table 2-24, taking into account the Cal Factors of both the 100 kHz to 4.2 GHz power sensor and the 1 MHz to 2 GHz power sensor.
7. On the synthesized sweeper, press CW, and (⇧) (step-up key), to step through the remaining frequencies listed in Table 2-24.

   At each new frequency repeat steps 5 and 6, entering each power sensor's Cal Factor into the respective power meter.

   System characterization is now complete for HP 8591C's or spectrum analyzers equipped with 75 Ω Input. Continue with step 1 of the "Frequency Response ≥50 MHz" below.

19. Frequency Response, HP 8591C and HP 8591E

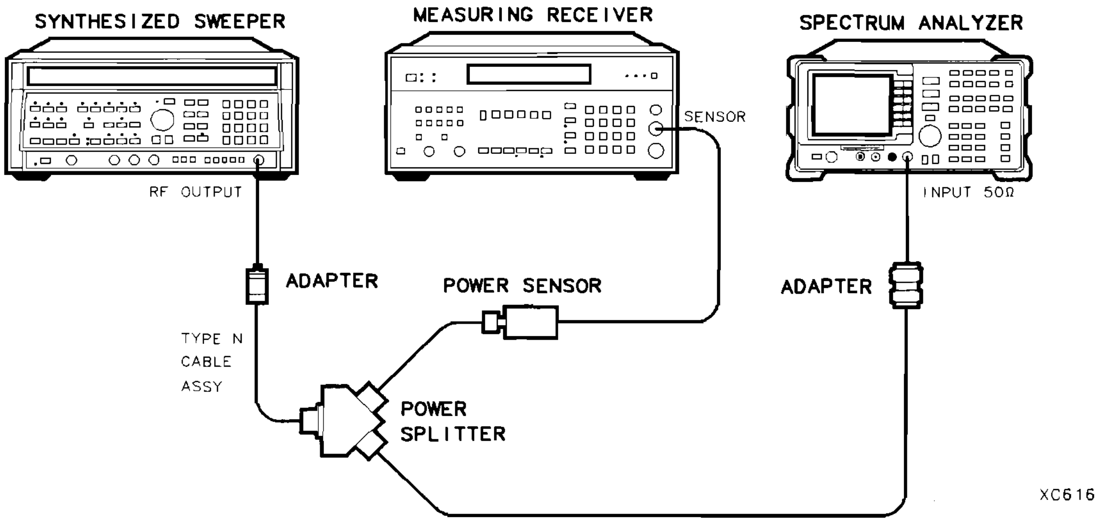


Figure 2-27. Frequency Response Test Setup, ≥50 MHz

Caution Use only 75 Ω cables, connectors, or adapters on instruments with 75 Ω inputs, or damage to the input connector will occur.

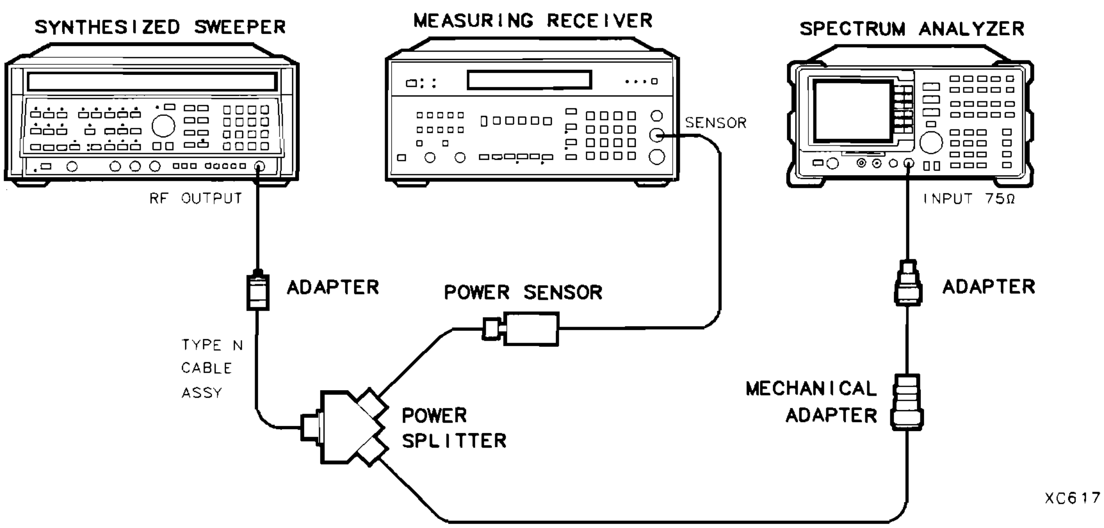


Figure 2-28. Frequency Response Test Setup, ≥50 MHz, for 75 Ω Input

Frequency Response, ≥50 MHz

If your spectrum analyzer is equipped with 75 Ω input, perform "Procedure for System Characterization for 75 Ω Input" before proceeding with this procedure.

1. Zero and calibrate the measuring receiver and 100 kHz to 1800 MHz power sensor in log mode as described in the measuring receiver operation manual.
2. Connect the equipment as shown in Figure 2-27.

   75 Ω Input only: Refer to Figure 2-28.
3. Press INSTRUMENT PRESET on the synthesized sweeper. Set the synthesized sweeper controls as follows:

   CW .... 300 MHz
   FREQ STEP .... 50 MHz
   POWER LEVEL .... −8 dBm
4. On the spectrum analyzer, press (PRESET) and wait for the preset routine to finish. Set the spectrum analyzer by pressing the following keys:

   (FREQUENCY) 300 (MHz)
   CF STEP AUTO MAN 50 (MHz)
   (SPAN) 5 (MHz)

   75 Ω input only: Press (AMPLITUDE), More 1 of 2, Amptd Units, then dBm).

   (AMPLITUDE) −10 (dBm)
   SCALE LOG LIN (LOG) 1 (dB)
   (BW) 1 (MHz)
   VID BW AUTO MAN 3 (kHz)
   (PEAK SEARCH)
   (MKR FCTN) MK TRACK ON OFF (ON)
5. Adjust the synthesized sweeper power level for a MKR-TRK amplitude reading of −14 dBm ±0.05 dB.
6. Set the sensor Cal Factor on the measuring receiver, then press RATIO.
7. Set the synthesized sweeper CW to 50 MHz.
8. Press (FREQUENCY) 50 (MHz) on the spectrum analyzer.
9. Adjust the synthesized sweeper power level for a spectrum analyzer MKR-TRK amplitude reading of −14 dBm ±0.05 dB.
10. Set the sensor Cal Factor on the measuring receiver, then record the negative of the power ratio displayed on the measuring receiver in column 2 of Table 2-24 as the Error Relative to 300 MHz at 50 MHz.
11. Set the synthesized sweeper CW to 100 MHz.
12. Press (FREQUENCY) 100 (MHz) on the spectrum analyzer.
13. Adjust the synthesized sweeper power level for a spectrum analyzer MKR-TRK amplitude reading of −14 dBm ±0.05 dB.
14. Set the sensor Cal Factor on the measuring receiver, then record the negative of the power ratio displayed on the measuring receiver in column 2 of Table 2-24 as the Error Relative to 300 MHz at 100 MHz.

15. On the synthesized sweeper, press CW, and ⇧ (step-up key), then on the spectrum analyzer, press (FREQUENCY), and ⇧ (step-up key).
16. Record the negative of the power ratio displayed on the measuring receiver in column 2 of Table 2-24.
17. Repeat steps 15 through 16 for each new frequency, entering the power sensor Cal Factor into the measuring receiver for each frequency setting as indicated in Table 2-24.

Caution Use only 75 Ω cables, connectors, or adapters on instruments with 75 Ω inputs, or damage to the input connector will occur.

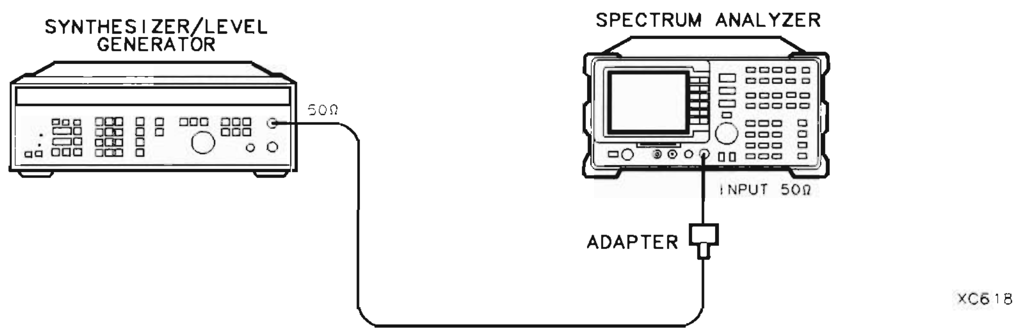


Figure 2-29. Frequency Response Test Setup, <50 MHz

Frequency Response, ≤50 MHz

18. Using a cable, connect the frequency synthesizer directly to the INPUT 50 Ω. Refer to Figure 2-29.

    75 Ω input only: Using a 75 Ω cable, connect the frequency synthesizer from the 75 Ω OUTPUT to the INPUT 75 Ω. Set the frequency synthesizer 50–75 Ω switch to the 75 Ω position.

    Set the frequency synthesizer controls as follows:

    FREQUENCY .... 50 MHz
    AMPLITUDE .... −15 dBm
    AMPTD INCR .... 0.05 dB

19. On the spectrum analyzer, press the following keys:

    (FREQUENCY) 50 (MHz)
    (SPAN) 10 (MHz)
    (BW) 3 (kHz) `VID BW AUTO MAN` 10 (kHz)
    (PEAK SEARCH)
    (MKR FCTN) `MK TRACK ON OFF` (ON)
    (SPAN) 100 (kHz)

    Wait for the AUTO ZOOM routine to finish.

20. Adjust the frequency synthesizer amplitude until the MKR-TRK reads −14 dBm. This corresponds to the amplitude at 50 MHz recorded in step 11. Record the frequency synthesizer amplitude in column 2 of Table 2-25 for Frequency Synthesizer Amplitude at 50 MHz.
21. On the spectrum analyzer, press (PEAK SEARCH), `MARKER Δ`.

22. Set the spectrum analyzer and the frequency synthesizer to the next frequency settings listed in Table 2-25.
23. At each frequency, adjust the frequency synthesizer amplitude for a MKR-Δ-TRK amplitude reading of 0.00 ±0.05 dB.
24. Record the frequency synthesizer amplitude setting in column 2 of Table 2-25 as the frequency synthesizer amplitude.

    75 Ω input only: Do not test below 1 MHz.
25. Repeat steps 22 through 24 for each frequency setting listed in Table 2-25.
26. For each of the frequencies in Table 2-25, subtract the Frequency Synthesizer Amplitude (column 2) from the Frequency Synthesizer Amplitude at 50 MHz recorded in step 19. Record the result as the Response Relative to 50 MHz (column 3) of Table 2-25.
27. Add to each of the Response Relative to 50 MHz entries in Table 2-25 the Error Relative to 300 MHz at 50 MHz recorded in step 11. Record the results as the Response Relative to 300 MHz (column 4) in Table 2-25.

    75 Ω input only: Starting with the error at 50 MHz, subtract column 4 (System Error) from column 2 (Error Relative to 300 MHz) and record the result in column 5 as the Corrected Error.

Test Results

Perform the following steps to verify the frequency response of the spectrum analyzer.

1. Enter the most positive number from Table 2-25, column 4:

    _________ dB
2. Enter the most positive number from Table 2-24, column 2:

    _________ dB
    (*75 Ω input only:* Use column 5)
3. Record the more positive of numbers from steps 1 and 2 in TR Entry 1 of the performance verification test record.
4. Enter the most negative number from Table 2-25, column 4:

    _________ dB
5. Enter the most negative number from Table 2-24, column 2:

    _________ dB
    (*75 Ω input only:* Use column 5)
6. Record the more negative of numbers from steps 4 and 5 in TR Entry 2 of the performance verification test record.
7. Subtract the results of step 6 from the results of step 3. Record this value in TR Entry 3 of the performance verification test record.

    The result should be less than 2.0 dB.

    The absolute values in steps 3 and 6 should be less than 1.5 dB.

19. Frequency Response, HP 8591C and HP 8591E

Table 2-24. Frequency Response Errors Worksheet

Column 1 Spectrum Analyzer Frequency (MHz)	Column 2 Error Relative to 300 MHz (dB)	Column 3 CAL FACTOR Frequency (GHz)	Column 4 System Error (*75 Ω input only*) (dB)	Column 5 Corrected Error (*75 Ω input only*) (dB)
50	______	0.03	______	______
100	______	0.1	______	______
150	______	0.1	______	______
200	______	0.3	______	______
250	______	0.3	______	______
300 (Ref)	______	0.3	______	______
350	______	0.3	______	______
400	______	0.3	______	______
450	______	0.3	______	______
500	______	0.3	______	______
550	______	1.0	______	______
600	______	1.0	______	______
650	______	1.0	______	______
700	______	1.0	______	______
750	______	1.0	______	______
800	______	1.0	______	______
850	______	1.0	______	______
900	______	1.0	______	______
950	______	1.0	______	______
1000	______	1.0	______	______
1050	______	1.0	______	______
1100	______	1.0	______	______
1150	______	1.0	______	______
1200	______	1.0	______	______
1250	______	1.0	______	______
1300	______	1.0	______	______
1350	______	1.0	______	______
1400	______	1.0	______	______

Table 2-24. Frequency Response Errors Worksheet (continued)

Column 1 Spectrum Analyzer Frequency (MHz)	Column 2 Error Relative to 300 MHz (dB)	Column 3 CAL FACTOR Frequency (GHz)	Column 4 System Error (*75 Ω input only*) (dB)	Column 5 Corrected Error (*75 Ω input only*) (dB)
1450	______	1.0	______	______
1500	______	1.0	______	______
1550	______	2.0	______	______
1600	______	2.0	______	______
1650	______	2.0	______	______
1700	______	2.0	______	______
1750	______	2.0	______	______
1800	______	2.0	______	______

Table 2-25. Frequency Response, ≤50 MHz Worksheet

Column 1 Spectrum Analyzer Frequency	Column 2 Frequency Synthesizer Amplitude (dBm)	Column 3 Response Relative to 50 MHz	Column 4 Response Relative to 300 MHz
50 MHz	______	0 (Ref)	______
20 MHz	______	______	______
10 MHz	______	______	______
5 MHz	______	______	______
1 MHz	______	______	______
200 kHz	______	______	______
50 kHz	______	______	______
9 kHz	______	______	______

20. Frequency Response, HP 8593E

The output of the synthesized sweeper is fed through a power splitter to a power sensor and the spectrum analyzer. The synthesized sweeper power level is adjusted at 300 MHz to place the displayed signal at the analyzer center horizontal graticule line. The measuring receiver, used as a power meter, is placed in RATIO mode. At each new synthesized sweeper frequency and analyzer center frequency setting, the synthesized sweeper power level is adjusted to place the signal at the center horizontal graticule line. The measuring receiver displays the inverse of the frequency response relative to 300 MHz (CAL OUT frequency).

The related adjustments for this performance verification test are:

YTF Adjustment
Dual Mixer Bias Adjustment
Frequency Response Adjustment

Equipment Required

Synthesized sweeper
Measuring receiver *(used as a power meter)*
Frequency synthesizer
Power sensor, 50 MHz to 26.5 GHz
Power splitter
Termination, 50 Ω
Adapter, Type N (m) to APC 3.5 (m)
Adapter, Type N (f) to BNC (f)
Adapter, 3.5 mm (f) to 3.5mm (f)
Adapter, Type BNC (f) to SMA (m)
Cable, BNC, 122 cm (48 in)
Cable, APC 3.5, 91 cm (36 in)

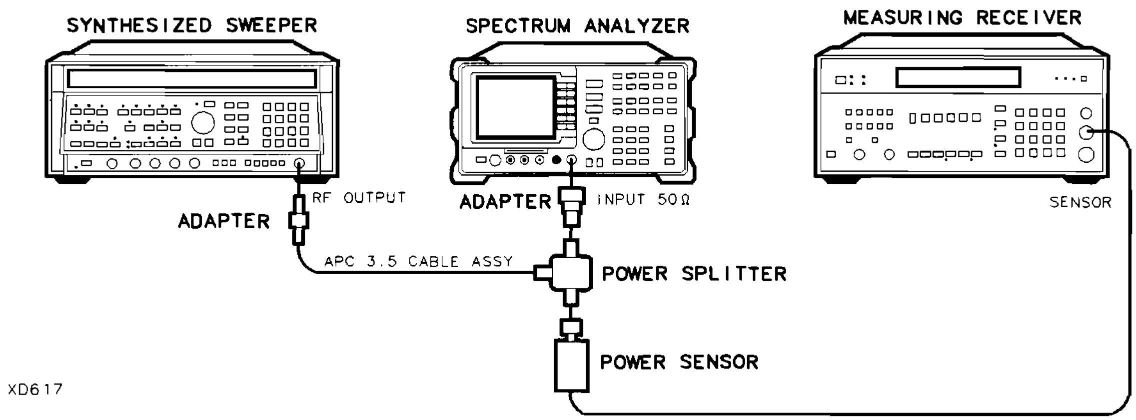


Figure 2-30. Frequency Response Test Setup, ≥50 MHz

 Scans by ArtekMedia => 2010

Procedure

1. Zero and calibrate the measuring receiver and 50 MHz to 26.5 GHz power sensor in LOG mode as described in the measuring receiver operation manual.
2. Connect the equipment as shown in Figure 2-30.

   75 Ω input only the output of the power splitter to the spectrum analyzer input directly.
3. Press instrument preset on the synthesized sweeper. Set the synthesized sweeper controls as follows:

   CW .... 300 MHz
   FREQ STEP .... 100 MHz
   POWER LEVEL .... −8 dBm
4. On the spectrum analyzer, press (PRESET), then wait for the preset routine to finish. Press the following analyzer keys:

   (FREQUENCY) Band Lock 0-2.9 Gz BAND 0
   (FREQUENCY) 300 (MHz)
   CF STEP AUTO MAN 100 (MHz)
   (SPAN) 10 (MHz)
   (AMPLITUDE) REF LVL 10 (−dBm)
   SCALE LOG LIN (LOG) 1 (dB)
   (BW) RES BW AUTO MAN 1 (MHz)
   VID BW AUTO MAN 10 (kHz)
5. On the spectrum analyzer, press (PEAK SEARCH), (MKR FCTN), MK TRACK ON OFF (ON).
6. Adjust the synthesized sweeper power level for a MKR-TRK amplitude reading of −14 dBm ±0.1 dB.
7. Press RATIO on the measuring receiver.

Frequency Response, Band 0, ≥50 MHz

8. Set the synthesized sweeper CW FREQUENCY to 50 MHz.
9. Set the spectrum analyzer CENTER FREQUENCY to 50 MHz.
10. Adjust the synthesized sweeper power level for a spectrum analyzer MKR-TRK amplitude reading of −14 dBm ±0.1 dB.
11. Record the negative of the power ratio displayed on the measuring receiver in column 2 of Table 2-26 as the Measuring Receiver Reading at 50 MHz.
12. Set the synthesized sweeper CW FREQUENCY to 100 MHz.
13. Set the spectrum analyzer CENTER FREQUENCY to 100 MHz.
14. Adjust the synthesized sweeper power level for a spectrum analyzer MKR-TRK amplitude reading of −14 dBm ±0.1 dB.
15. Record the negative of the power ratio displayed on the measuring receiver in Table 2-26 as the measuring receiver Reading.
16. On the synthesized sweeper, press (CW), and (⇧) (step up) key and on the spectrum analyzer, press (FREQUENCY), (⇧) (step up) key to step through the remaining frequencies listed in Table 2-26.

17. At each new frequency repeat steps 13 through 15, entering the power sensor Cal Factor into the measuring receiver as indicated in Table 2-26.

Frequency Response, Band 1

18. Press the following spectrum analyzer keys:

    (FREQUENCY) Band Lock 2.75 - 6.5 BAND 1
    (FREQUENCY) 2.75 (GHz)
    (SPAN) 10 (MHz)
    (BW) RES BW AUTO MAN 1 (MHz)
    VID BW AUTO MAN 10 (kHz)
    (PEAK SEARCH)
    (MKR FCTN) MK TRACK ON OFF (ON)

19. Set the synthesized sweeper CW to 2.75 GHz.
20. On the spectrum analyzer, press (AMPLITUDE), PRESEL PEAK .
21. Adjust the synthesized sweeper power level for a spectrum analyzer MKR-TRK amplitude reading of −14 dBm ±0.1 dB.
22. Record the negative of the power ratio displayed on the measuring receiver in Table 2-27, column 2.
23. Set the synthesized sweeper CW and the spectrum analyzer Center Frequency to 2.8 GHz. Repeat steps 20 through 22.
24. On the synthesized sweeper, press CW, and (⇑) (step up) key, then on the spectrum analyzer, press (FREQUENCY), (⇑) (step up) key to step through the remaining frequencies listed in Table 2-27.
25. At each new frequency repeat steps 19 through 21, entering the power sensor Cal Factor into the measuring receiver as indicated in Table 2-27.

Frequency Response, Band 2

26. Press the following spectrum analyzer keys:

    (FREQUENCY) Band Lock 6.0 -12.8 BAND 2
    (FREQUENCY) 6.0 (GHz)
    CF STEP AUTO MAN 200 (MHz)
    (SPAN) 10 (MHz)
    (BW) RES BW AUTO MAN 1 (MHz)
    VID BW AUTO MAN 10 (kHz)
    (PEAK SEARCH)
    (MKR FCTN) MK TRACK ON OFF (ON)

27. Set the synthesized sweeper CW to 6.0 GHz.
28. On the spectrum analyzer, press (AMPLITUDE) PRESEL PEAK .
29. Adjust the synthesized sweeper power level for a spectrum analyzer MKR-TRK amplitude reading of −14 dBm ±0.1 dB.
30. Record the negative of the power ratio displayed on the measuring receiver in Table 2-28, column 2.
31. On the synthesized sweeper, press (CW), and (⇧) (step up) key, then on the spectrum analyzer, press (FREQUENCY), and (⇧) (step up) key to step through the remaining frequencies listed in Table 2-28.
32. At each new frequency repeat steps 28 through 30, entering the power sensor Cal Factor into the measuring receiver as indicated in Table 2-28.

Frequency Response, Band 3

33. On the spectrum analyzer, press the following keys:

    (FREQUENCY) Band Lock 12.4-19. BAND 3
    (FREQUENCY) 12.4 (GHz)
    (SPAN) 10 (MHz)
    (BW) RES BW AUTO MAN 1 (MHz)
    VID BW AUTO MAN 10 (kHz)
    (PEAK SEARCH)
    (MKR FCTN) MK TRACK ON OFF (ON)

34. Set the synthesized sweeper CW to 12.4 GHz.
35. On the spectrum analyzer, press (AMPLITUDE), PRESEL PEAK .
36. Adjust the synthesized sweeper power level for a spectrum analyzer MKR-TRK amplitude reading of −14 dBm ±0.1 dB.
37. Record the negative of the power ratio displayed on the measuring receiver in Table 2-29, column 2.
38. On the synthesized sweeper, press CW, and (⇧) (step up), then on the spectrum analyzer, press (FREQUENCY), (⇧) (step up) to step through the remaining frequencies listed in Table 2-29.
39. At each new frequency repeat steps 35 through 37, entering the power sensor Cal Factor into the measuring receiver as indicated in Table 2-29.

Frequency Response, Band 4

40. On the spectrum analyzer, press the following keys:

 (FREQUENCY) Band Lock 19.1-22 BAND 4
 (FREQUENCY) 19.1 (GHz)
 CF STEP AUTO MAN 100 (MHz)
 CF STEP AUTO MAN *(Option 026)* 200 (MHz)
 (SPAN) 5 (MHz)
 (BW) RES BW AUTO MAN 1 (MHz)
 VID BW AUTO MAN 10 (kHz)
 (PEAK SEARCH)
 (MKR FCTN) MK TRACK ON OFF (ON)

41. Set the synthesized sweeper CW to 19.1 GHz.
42. On the spectrum analyzer, press (AMPLITUDE), PRESEL PEAK.
43. Adjust the synthesized sweeper power level for a spectrum analyzer MKR-TRK amplitude reading of −14 dBm ±0.1 dB.
44. Record the negative of the power ratio displayed on the measuring receiver in Table 2-30, column 2 (*Option 026 or 027 only:* use Table 2-31, column 2.)
45. On the synthesized sweeper, press CW, and (⇧) (step up) key, then on the spectrum analyzer, press (FREQUENCY), (⇧) (step up) key to step through the remaining frequencies listed in Table 2-30.
46. At each new frequency repeat steps 42 through 44, entering the power sensor Cal Factor into the measuring receiver as indicated in Table 2-30, column 2.

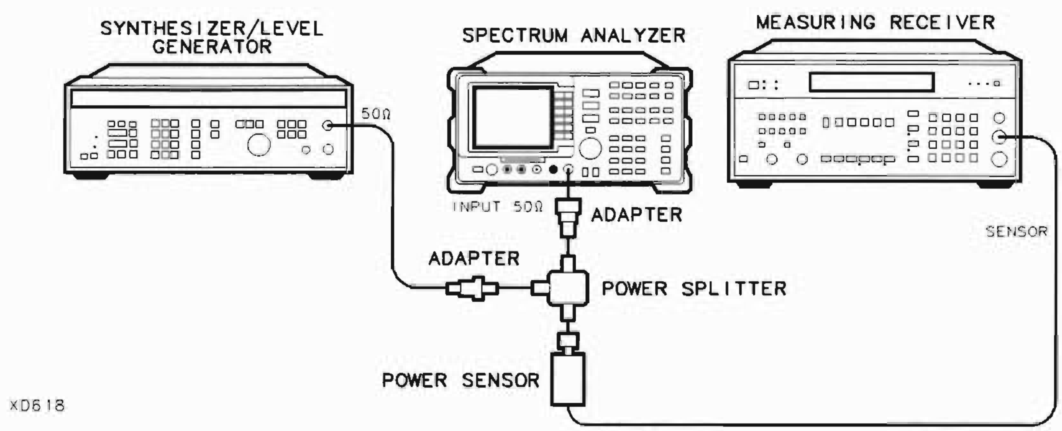


Figure 2-31. Frequency Response Test Setup, <50 MHz

Frequency Response, Band 0, <50 MHz

47. Set the frequency synthesizer controls as follows:

    FREQUENCY .... 50 MHz
    AMPLITUDE .... −8 dBm
    AMPTD INCR .... 0.05 dB

48. On the spectrum analyzer, press the following keys:

    (MKR) MARKERS OFF

    (FREQUENCY) Band Lock BND LOCK ON OFF (OFF)
    (FREQUENCY) 50 (MHz)
    (SPAN) 10 (MHz)
    (PEAK SEARCH)
    (MKR FCTN) MKR TRACK ON
    (SPAN) 100 (kHz)
    (BW) RES BW AUTO MAN 10 (kHz)

49. Connect the equipment as shown if Figure 2-31, with the power sensor connected to power splitter.

    Option 026 or 027 only: Connect the power splitter to the analyzer input directly.

50. Enter the power sensor 50 MHz Cal Factor into the measuring receiver.
51. Adjust the frequency synthesizer amplitude until the measuring receiver display reads the same value as recorded in step 11. Record the frequency synthesizer amplitude in Table 2-32.
52. Replace the 50 MHz to 26.5 GHz power sensor with the 50 Ω termination.
53. On the spectrum analyzer, press the following key:

    (PEAK SEARCH) MARKER Δ

    (MKR FCTN) MK TRACK ON OFF (ON)

54. Set the spectrum analyzer center frequency and the synthesizer frequency to the frequencies listed in Table 2-32.
55. At each frequency, adjust the frequency synthesizer amplitude for a MKR Δ-TRK amplitude reading of 0.00 ±0.05 dB. Record the frequency synthesizer Amplitude Setting in Table 2-32 as the frequency synthesizer Amplitude.
56. For each of the frequencies in Table 2-32, subtract the frequency synthesizer Amplitude Reading (column 2) from the frequency synthesizer Amplitude Setting (50 MHz) recorded in step 50. Record the result as the Response Relative to 50 MHz (column 3) of Table 2-32.
57. Add to each of the Response Relative to 50 MHz entries in Table 2-32 the measuring receiver Reading for 50 MHz listed in Table 2-26. Record the results as the Response Relative to 300 MHz (column 4) in Table 2-32.

Test Results

Frequency Response, Band 0

1. Enter the most positive number from Table 2-32, column 4:

   ________ dB

2. Enter the most positive number from Table 2-26, column 2:

   ________ dB

3. Enter the more positive of numbers from step 1 and step 2 as TR Entry 1 of the performance verification test record (absolute referenced to 300 MHz).

4. Enter the most negative number from Table 2-32, column 4:

   ________ dB

5. Enter the most negative number from Table 2-26, column 2:

   ________ dB

6. Enter the more negative of numbers from step 4 and step 5 as TR Entry 2 of the performance verification test record.

7. Subtract step 6 from step 3. Enter this value as TR Entry 3 of the performance verification test record (relative flatness).

Frequency Response, Band 1

1. Enter the most positive number from Table 2-27, column 2, as TR Entry 4 of the performance verification test record.
2. Enter the most negative number from Table 2-27, column 2, as TR Entry 5 of the performance verification test record.
3. Subtract step 2 from step 1. Enter this value as TR Entry 6 of the performance verification test record.

Frequency Response, Band 2

1. Enter the most positive number from Table 2-28, column 2, as TR Entry 7 of the performance verification test record.
2. Enter the most negative number from Table 2-28, column 2, as TR Entry 8 of the performance verification test record.
3. Subtract step 2 from step 1. Enter this value as TR Entry 9 of the performance verification test record.

Frequency Response, Band 3

1. Enter the most positive number from Table 2-29, column 2, as TR Entry 10 of the performance verification test record.
2. Enter the most negative number from Table 2-29, column 2, as TR Entry 11 of the performance verification test record.
3. Subtract step 2 from step 1. Enter this value as TR Entry 12 of the performance verification test record.

Frequency Response, Band 4

Option 026 or 027 only: Proceed to "Frequency Response, Band 4 for Option 026 or 027" if the spectrum analyzer is equipped with Option 026 or 027.

1. Enter the most positive number from Table 2-30, column 1, as TR Entry 13 of the performance verification test record.
2. Enter the most negative number from Table 2-30, column 2, as TR Entry 14 of the performance verification test record.
3. Subtract step 2 from step 1. Enter this value as TR Entry 15 of the performance verification test record.

Frequency Response, Band 4 for Option 026 or 027

1. Enter the most positive number from Table 2-31, column 2, as TR Entry 13 of the performance verification test record.
2. Enter the most negative number from Table 2-31, column 2, as TR Entry 14 of the performance verification test record.
3. Subtract step 2 from step 1. Enter this value as TR Entry 15 of the performance verification test record.

20. Frequency Response, HP 8593E

Table 2-26. Frequency Response Band 0, ≥50 MHz

Column 1 Frequency (MHz)	Column 2 Measuring Receiver Reading (dB)	Column 3 CAL FACTOR Frequency (GHz)	Column 1 Frequency (MHz)	Column 2 Measuring Receiver Reading (dB)	Column 3 CAL FACTOR Frequency (GHz)
50	________	0.05	1500	________	2.0
100	________	0.05	1600	________	2.0
200	________	0.05	1700	________	2.0
300	________	0.05	1800	________	2.0
400	________	0.05	1900	________	2.0
500	________	0.05	2000	________	2.0
600	________	0.05	2100	________	2.0
700	________	0.05	2200	________	2.0
800	________	0.05	2300	________	2.0
900	________	0.05	2400	________	2.0
1000	________	0.05	2500	________	3.0
1100	________	2.0	2600	________	3.0
1200	________	2.0	2700	________	3.0
1300	________	2.0	2800	________	3.0
1400	________	2.0	2900	________	3.0

Table 2-27. Frequency Response Band 1

Column 1 Frequency (GHz)	Column 2 Measuring Receiver Reading (dB) Preselector Peaked	Column 3 CAL FACTOR Frequency (GHz)
2.75	________	3.0
2.8	________	3.0
2.9	________	3.0
3.0	________	3.0
3.1	________	3.0
3.2	________	3.0
3.3	________	3.0
3.4	________	3.0
3.5	________	4.0
3.6	________	4.0
3.7	________	4.0
3.8	________	4.0
3.9	________	4.0
4.0	________	4.0
4.1	________	4.0
4.2	________	4.0
4.3	________	4.0
4.4	________	4.0
4.5	________	5.0
4.6	________	5.0
4.7	________	5.0
4.8	________	5.0
4.9	________	5.0
5.0	________	5.0
5.1	________	5.0
5.2	________	5.0
5.3	________	5.0
5.4	________	5.0
5.5	________	6.0
5.6	________	6.0
5.7	________	6.0
5.8	________	6.0
5.9	________	6.0
6.0	________	6.0
6.1	________	6.0
6.2	________	6.0
6.3	________	6.0
6.4	________	6.0
6.5	________	6.0

20. Frequency Response, HP 8593E

Table 2-28. Frequency Response Band 2

Column 1 Frequency (GHz)	Column 2 Measuring Receiver Reading (dB) Preselector Peaked	Column 3 CAL FACTOR Frequency (GHz)	Column 1 Frequency (GHz)	Column 2 Measuring Receiver Reading (dB) Preselector Peaked	Column 3 CAL FACTOR Frequency (GHz)
6.0	________	6.0	9.6	________	10.0
6.2	________	6.0	9.8	________	10.0
6.4	________	6.0	10.0	________	10.0
6.6	________	7.0	10.2	________	10.0
6.8	________	7.0	10.4	________	10.0
7.0	________	7.0	10.6	________	11.0
7.2	________	7.0	10.8	________	11.0
7.4	________	7.0	11.0	________	11.0
7.6	________	8.0	11.2	________	11.0
7.8	________	8.0	11.4	________	11.0
8.0	________	8.0	11.6	________	12.0
8.2	________	8.0	11.8	________	12.0
8.4	________	8.0	12.0	________	12.0
8.6	________	9.0	12.2	________	12.0
8.8	________	9.0	12.4	________	12.0
9.0	________	9.0	12.6	________	13.0
9.2	________	9.0	12.8	________	13.0
9.4	________	9.0			

Table 2-29. Frequency Response Band 3

Column 1 Frequency (GHz)	Column 2 Measuring Receiver Reading (dB) Preselector Peaked	Column 3 CAL FACTOR Frequency (GHz)	Column 1 Frequency (GHz)	Column 2 Measuring Receiver Reading (dB) Preselector Peaked	Column 3 CAL FACTOR Frequency (GHz)
12.4	________	12.0	16.0	________	16.0
12.6	________	13.0	16.2	________	16.0
12.8	________	13.0	16.4	________	16.0
13.0	________	13.0	16.6	________	17.0
13.2	________	13.0	16.8	________	17.0
13.4	________	13.0	17.0	________	17.0
13.6	________	14.0	17.2	________	17.0
13.8	________	14.0	17.4	________	17.0
.14.0	________	14.0	17.6	________	18.0
14.2	________	14.0	17.8	________	18.0
14.4	________	14.0	18.0	________	18.0
14.6	________	15.0	18.2	________	18.0
14.8	________	15.0	18.4	________	18.0
15.0	________	15.0	18.6	________	19.0
15.2	________	15.0	18.8	________	19.0
15.4	________	15.0	19.0	________	19.0
15.6	________	16.0	19.2	________	19.0
15.8	________	16.0	19.4	________	19.0

20. Frequency Response, HP 8593E

Table 2-30. Frequency Response Band 4

Column1 Frequency (GHz)	Column 2 Measuring Receiver Reading (dB) Preselector Peaked	Column 3 CAL FACTOR Frequency (GHz)	Column1 Frequency (GHz)	Column 2 Measuring Receiver Reading (dB) Preselector Peaked	Column 3 CAL FACTOR Frequency (GHz)
19.1	________	19.0	20.6	________	21.0
19.2	________	19.0	20.7	________	21.0
19.3	________	19.0	20.8	________	21.0
19.4	________	19.0	20.9	________	21.0
19.5	________	20.0	21.0	________	21.0
19.6	________	20.0	21.1	________	21.0
19.7	________	20.0	21.2	________	21.0
19.8	________	20.0	21.3	________	21.0
19.9	________	20.0	21.4	________	21.0
20.0	________	20.0	21.5	________	22.0
20.1	________	20.0	21.6	________	22.0
20.2	________	20.0	21.7	________	22.0
20.3	________	20.0	21.8	________	22.0
20.4	________	20.0	21.9	________	22.0
20.5	________	21.0	22.0	________	22.0

Table 2-31. Frequency Response Band 4, Option 026 or 027

Column 1 Frequency (GHz)	Column 2 Measuring Receiver Reading (dB) Preselector Peaked	Column 3 CAL FACTOR Frequency (GHz)	Column 1 Frequency (GHz)	Column 2 Measuring Receiver Reading (dB) Preselector Peaked	Column 3 CAL FACTOR Frequency (GHz)
19.1	______	19.0	22.9	______	23.0
19.3	______	19.0	23.1	______	23.0
19.5	______	20.0	23.3	______	23.0
19.7	______	20.0	23.5	______	24.0
19.9	______	20.0	23.7	______	24.0
20.1	______	20.0	23.9	______	24.0
20.3	______	20.0	24.1	______	24.0
20.5	______	21.0	24.3	______	24.0
.20.7	______	21.0	24.5	______	25.0
20.9	______	21.0	24.7	______	25.0
21.1	______	21.0	24.9	______	25.0
21.3	______	21.0	25.1	______	25.0
21.5	______	22.0	25.3	______	25.5
21.7	______	22.0	25.5	______	25.5
21.9	______	22.0	25.7	______	25.5
22.1	______	22.0	25.9	______	26.0
22.3	______	22.0	26.1	______	26.0
22.5	______	23.0	26.3	______	26.5
22.7	______	23.0	26.5	______	26.5

Table 2-32. Frequency Response Band 0, <50 MHz

Column 1 Spectrum Analyzer Frequency Synthesizer Frequency	Column 2 Frequency Synthesizer Amplitude (dBm)	Column 3 Response Relative to 50 MHz	Column 4 Response Relative to 300 MHz
50 MHz	______	0 (Reference)	______
20 MHz	______	______	______
10 MHz	______	______	______
5 MHz	______	______	______
1 MHz	______	______	______
200 kHz	______	______	______
50 kHz	______	______	______

21. Frequency Response, HP 8594E

The RF INPUT coupling is first set to the dc coupled mode. The output of the synthesized sweeper is fed through a power splitter to a power sensor and the spectrum analyzer. The synthesized sweeper's power level is adjusted at 300 MHz to place the displayed signal at the analyzer center horizontal graticule line. The measuring receiver, used as a power meter, is placed in RATIO mode. At each new sweeper frequency and analyzer center frequency setting, the sweeper's power level is adjusted to place the signal at the center horizontal graticule line. The measuring receiver displays the inverse of the frequency response relative to 300 MHz (CAL OUT frequency).

The related adjustments for this performance verification test are:

Dual Mixer Bias Adjustment
Frequency Response Adjustment

Equipment Required

Synthesized sweeper
Measuring receiver *(used as a power meter)*
Synthesizer/level generator
Power sensor, 50 MHz to 2.9 GHz
Power splitter
Termination, 50 Ω
Adapter, Type N (m) to APC 3.5 (m)
Adapter, Type N (f) to APC 3.5 (m)
Adapter, 3.5 mm (f) to 3.5mm (f)
Cable, BNC, 122 cm (48 in)
Cable, APC 3.5, 91 cm (36 in)

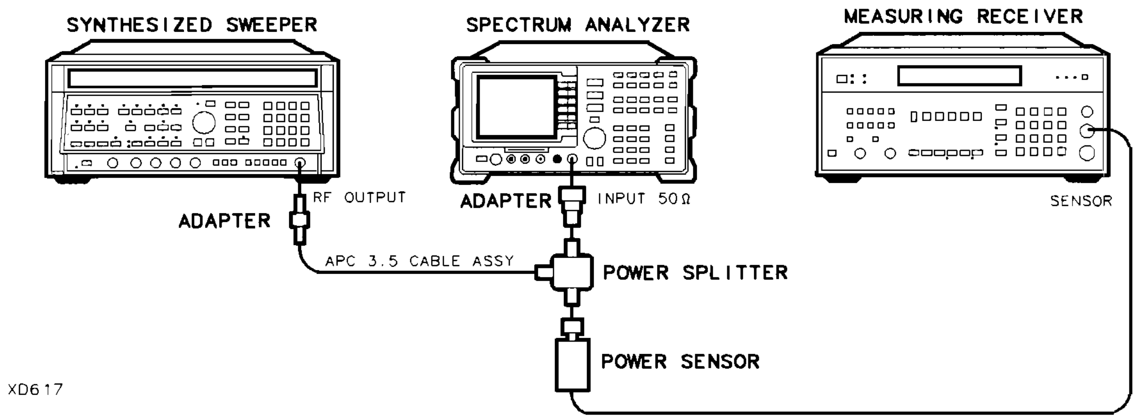


Figure 2-32. Frequency Response Test Setup, ≥50 MHz

Procedure

1. Zero and calibrate the measuring receiver and 50 MHz to 2.9 GHz power sensor in log mode as described in the measuring receiver operation manual.
2. Connect the equipment as shown in Figure 2-32.
3. Press (INSTR PRESET) on the synthesized sweeper, then set the controls as follows:

   CW .... 300 MHz
   FREQ STEP .... 100 MHz
   POWER LEVEL .... −8 dBm

4. On the spectrum analyzer, press (PRESET). Wait for the preset to finish, then set the spectrum analyzer controls by pressing the following keys:

   (FREQUENCY) 300 (MHz)
   CF STEP AUTO MAN 100 (MHz)
   (SPAN) 5 (MHz)
   (AMPLITUDE) −10 (dBm)
   SCALE LOG LIN (LOG) 1 (dB)

   (AMPLITUDE) More 1 of 3 More 2 of 3 COUPLE AC DC (DC)
   (BW) 1 (MHz)
   VID BW AUTO MAN 10 (kHz)

5. On the spectrum analyzer, press (PEAK SEARCH), (SIGNAL TRACK) (ON).
6. Adjust the synthesized sweeper power level for a MKR-TRK amplitude reading of −14 dBm ±0.1 dB.
7. Set the power sensor cal factor for the measuring receiver, then press RATIO.
8. Set the synthesized sweeper CW to 50 MHz.
9. Press (FREQUENCY), 50 (MHz) on the spectrum analyzer.
10. Adjust the synthesized sweeper power level for a spectrum analyzer MKR-TRK amplitude reading of −14 dBm ±0.1 dB.
11. Set the power sensor cal factor for the measuring receiver, then record the power ratio displayed on the measuring receiver below. Record the negative of the power ratio in Table 2-33.

    Measuring Receiver Reading at 50 MHz ________ dB

12. Set the synthesized sweeper CW to 100 MHz.
13. Press (FREQUENCY), 100 (MHz) on the spectrum analyzer.
14. Adjust the synthesized sweeper power level for a spectrum analyzer MKR-TRK amplitude reading of −14 dBm ±0.1 dB.
15. Set the power sensor cal factor for the measuring receiver, then record the negative of the power ratio displayed on the measuring receiver in Table 2-33 as the Measuring Receiver Reading at 100 MHz.
16. On the synthesized sweeper, press CW, and (⇑) (step up) key.

17. On the spectrum analyzer, press (FREQUENCY), (⇑) (step up) key to step through the remaining frequencies listed in Table 2-33.

    At each new frequency repeat steps 14 through 16, entering the power sensor's Cal Factor into the measuring receiver as indicated in Table 2-33.

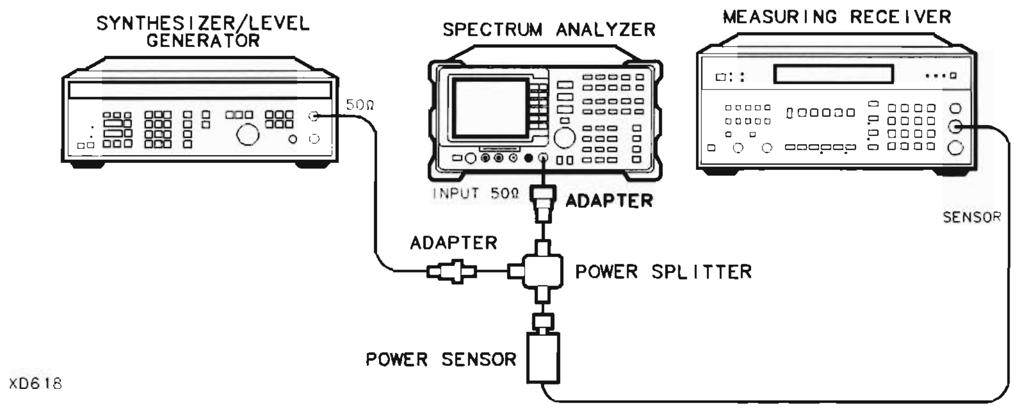


Figure 2-33. Frequency Response Test Setup, <50 MHz

18. Connect the equipment as shown in Figure 2-33, with the power sensor connected to power splitter.
19. Set the synthesizer/level generator controls as follows:

    FREQUENCY .... 50 MHz
    AMPLITUDE .... −8 dBm
    AMPTD INCR .... 0.05 dB

20. On the spectrum analyzer, press (MKR), `MARKERS OFF`, then set the controls by pressing the following keys:

    (FREQUENCY) 50 (MHz)
    (SPAN) 100 (kHz)
    (BW) 10 (kHz)

21. Enter the power sensor's 50 MHz Cal Factor into the measuring receiver.
22. Adjust the synthesizer/level generator amplitude until the measuring receiver display reads the same value as recorded in step 11. Record the synthesizer/level generator amplitude here and in Table 2-34.

    Synthesizer/Level Generator Amplitude Setting (50 MHz) ________ dBm

23. Replace the power sensor with the 50 Ω termination.
24. Press the following spectrum analyzer keys:

    (PEAK SEARCH)
    (MKR FCTN) `MK TRACK ON OFF` (ON)
    (MKR) `MARKER Δ`

25. Set the spectrum analyzer center frequency and the synthesizer/level generator frequency to the frequencies listed in Table 2-34. At each frequency, adjust the synthesizer/level generator amplitude for a MKR Δ-TRK amplitude reading of 0.00 ±0.05 dB. Record the synthesizer/level generator amplitude setting in Table 2-34 as the Synthesizer/Level Generator Amplitude.
26. For each of the frequencies in Table 2-34, subtract the Synthesizer/Level Generator Amplitude Reading (column 2) from the Synthesizer/Level Generator Amplitude Setting (50 MHz) recorded in step 20. Record the result as the Response Relative to 50 MHz (column 3) of Table 2-34.
27. Add to each of the Response Relative to 50 MHz entries in Table 2-34 the Measuring Receiver Reading for 50 MHz listed in Table 2-33. Record the results as the Response Relative to 300 MHz (column 4) in Table 2-34.
28. Record the test results in the performance verification test record by performing the following steps:
    a. Enter the most positive number from Table 2-34, column 4:

       ________ dB

    b. Enter the most positive number from Table 2-33, column 2:

       ________ dB

    c. Enter the more positive of numbers from (a) and (b) as TR Entry 1 of the performance verification test record. (Absolute referenced to 300 MHz.)
    d. Enter the most negative number from Table 2-34, column 4:

       ________ dB

    e. Enter the most negative number from Table 2-33, column 2:

       ________ dB

    f. Enter the more negative of numbers from (d) and (e) as TR Entry 2 of the performance verification test record.
    g. Subtract (f) from (c), then enter this value as TR Entry 3 of the performance verification test record. (Relative flatness.)

21. Frequency Response, HP 8594E

Table 2-33. Frequency Response, ≥50 MHz

Column 1 Frequency (MHz)	Column 2 Measuring Receiver Reading (dB)	Column 3 CAL FACTOR Frequency (GHz)	Column 1 Frequency (MHz)	Column 2 Measuring Receiver Reading (dB)	Column 3 CAL FACTOR Frequency (GHz)
50	________	0.05	1500	________	2.0
100	________	0.05	1600	________	2.0
200	________	0.05	1700	________	2.0
300	________	0.05	1800	________	2.0
400	________	0.05	1900	________	2.0
500	________	0.05	2000	________	2.0
600	________	0.05	2100	________	2.0
700	________	0.05	2200	________	2.0
800	________	0.05	2300	________	2.0
900	________	0.05	2400	________	2.0
1000	________	0.05	2500	________	3.0
1100	________	2.0	2600	________	3.0
1200	________	2.0	2700	________	3.0
1300	________	2.0	2800	________	3.0
1400	________	2.0	2900	________	3.0

Table 2-34. Frequency Response, <50 MHz

Column 1 Spectrum Analyzer Synthesizer/Level Generator Frequency	Column 2 Synthesizer Level Generator Amplitude (dBm)	Column 3 Response Relative to 50 MHz	Column 4 Response Relative to 300 MHz
50 MHz	________	0 (Reference)	________
20 MHz	________	________	________
10 MHz	________	________	________
5 MHz	________	________	________
1 MHz	________	________	________
200 kHz	________	________	________
50 kHz	________	________	________

22. Frequency Response, HP 8595E

The output of the synthesized sweeper is fed through a power splitter to a power sensor and the spectrum analyzer. The synthesized sweeper power level is adjusted at 300 MHz to place the displayed signal at the analyzer center horizontal graticule line. The measuring receiver, used as a power meter, is placed in RATIO mode. At each new synthesized sweeper frequency and analyzer center frequency setting, the synthesized sweeper power level is adjusted to place the signal at the center horizontal graticule line. The measuring receiver displays the inverse of the frequency response relative to 300 MHz (CAL OUT frequency).

The related adjustments for this performance verification test are:

YTF Adjustment
Dual Mixer Bias Adjustment
Frequency Response Adjustment

Equipment Required

Synthesized sweeper
Measuring receiver *(used as a power meter)*
Frequency synthesizer
Power sensor, 50 MHz to 6.5 GHz
Power splitter
Termination, 50 Ω
Adapter, Type N (m) to APC 3.5 (m)
Adapter, Type N (f) to BNC (f)
Adapter, 3.5 mm (f) to 3.5mm (f)
Adapter, Type BNC (f) to SMA (m)
Cable, BNC, 122 cm (48 in)
Cable, APC 3.5, 91 cm (36 in)

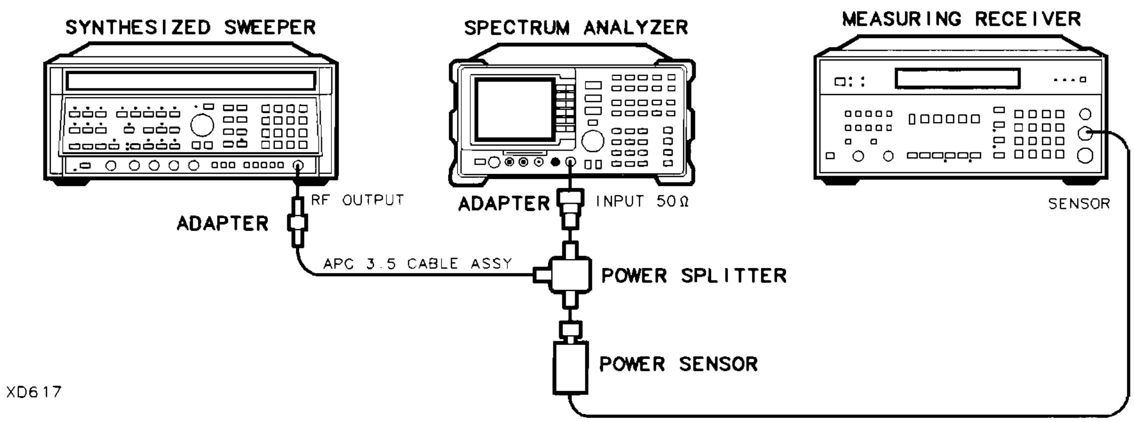


Figure 2-34. Frequency Response Test Setup, ≥50 MHz

Procedure

1. Zero and calibrate the measuring receiver and 50 MHz to 6.5 GHz power sensor in LOG mode as described in the measuring receiver operation manual.
2. Connect the equipment as shown in Figure 2-34.
3. Press instrument preset on the synthesized sweeper. Set the synthesized sweeper controls as follows:

   CW .... 300 MHz
   FREQ STEP .... 100 MHz
   POWER LEVEL .... −8 dBm

4. On the spectrum analyzer, press (PRESET), then wait for the preset routine to finish. Press the following analyzer keys:

   (FREQUENCY) Band Lock 0-2.9 Gz BAND 0
   (FREQUENCY) 300 (MHz)
   CF STEP AUTO MAN 100 (MHz)
   (SPAN) 10 (MHz)
   (AMPLITUDE) REF LVL 10 (−dBm)
   (AMPLITUDE) More 1 of 3 More 2 of 3 COUPLE AC DC (DC)
   SCALE LOG LIN (LOG) 1 (dB)
   (BW) RES BW AUTO MAN 1 (MHz)
   VID BW AUTO MAN 10 (kHz)

5. On the spectrum analyzer, press (PEAK SEARCH), (MKR FCTN), MK TRACK ON OFF (ON).
6. Adjust the synthesized sweeper power level for a MKR-TRK amplitude reading of −14 dBm ±0.1 dB.
7. Press RATIO on the measuring receiver.

Frequency Response, Band 0, ≥50 MHz

8. Set the synthesized sweeper CW FREQUENCY to 50 MHz.
9. Set the spectrum analyzer CENTER FREQUENCY to 50 MHz.
10. Adjust the synthesized sweeper power level for a spectrum analyzer MKR-TRK amplitude reading of −14 dBm ±0.1 dB.
11. Record the power ratio displayed on the measuring receiver below, then record the negative of this value in column 2 of Table 2-35 as the Measuring Receiver Reading at 50 MHz.

Measuring Receiver Reading at 50 MHz_________dB

12. Set the synthesized sweeper CW FREQUENCY to 100 MHz.
13. Set the spectrum analyzer CENTER FREQUENCY to 100 MHz.
14. Adjust the synthesized sweeper power level for a spectrum analyzer MKR-TRK amplitude reading of −14 dBm ±0.1 dB.
15. Record the negative of the power ratio displayed on the measuring receiver in Table 2-35 as the measuring receiver Reading.
16. On the synthesized sweeper, press (CW), and (⇑) (step up) key and on the spectrum analyzer, press (FREQUENCY), (⇑) (step up) key to step through the remaining frequencies listed in Table 2-35.
17. At each new frequency repeat steps 13 through 15, entering the power sensor Cal Factor into the measuring receiver as indicated in Table 2-35.

Frequency Response, Band 1

18. Press the following spectrum analyzer keys:

    (FREQUENCY) Band Lock 2.75 - 6.5 BAND 1
    (FREQUENCY) 2.75 (GHz)
    (SPAN) 10 (MHz)
    (BW) RES BW AUTO MAN 1 (MHz)
    VID BW AUTO MAN 10 (kHz)
    (PEAK SEARCH)
    (MKR FCTN) MK TRACK ON OFF (ON)

19. Set the synthesized sweeper CW to 2.75 GHz.
20. On the spectrum analyzer, press (AMPLITUDE), PRESEL PEAK .
21. Adjust the synthesized sweeper power level for a spectrum analyzer MKR-TRK amplitude reading of −14 dBm ±0.1 dB.
22. Record the negative of the power ratio displayed on the measuring receiver in Table 2-36, column 2.
23. Set the synthesized sweeper CW and the spectrum analyzer Center Frequency to 2.8 GHz. Repeat steps 20 through 22.
24. On the synthesized sweeper, press CW, and (⇑) (step up) key, then on the spectrum analyzer, press (FREQUENCY), (⇑) (step up) key to step through the remaining frequencies listed in Table 2-36.
25. At each new frequency repeat steps 20 through 22, entering the power sensor Cal Factor into the measuring receiver as indicated in Table 2-36.

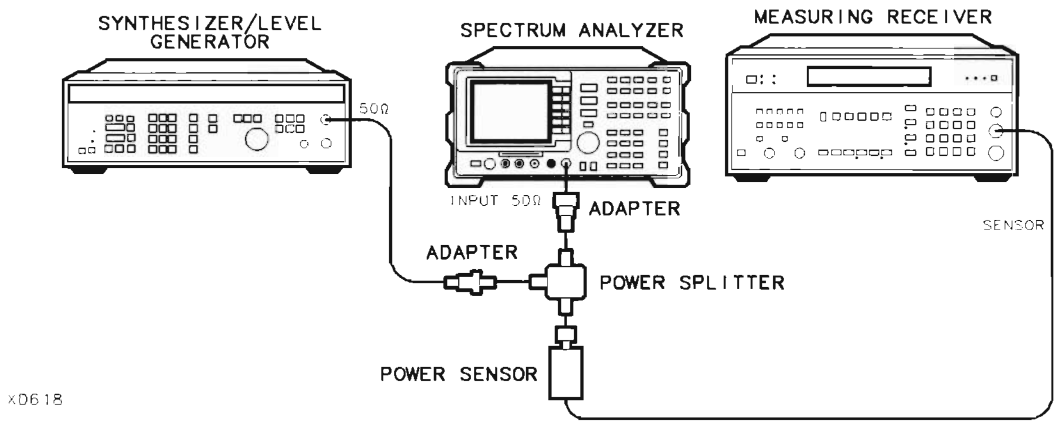


Figure 2-35. Frequency Response Test Setup, <50 MHz

Frequency Response, Band 0, <50 MHz

26. Set the frequency synthesizer controls as follows:

FREQUENCY	50 MHz
AMPLITUDE	–8 dBm
AMPTD INCR	0.05 dB

27. Connect the equipment as shown if Figure 2-35, with the power sensor connected to power splitter.
28. On the spectrum analyzer, press the following keys:

   (MKR) MARKER 1 ON OFF (OFF)
   (FREQUENCY) Band Lock BND LOCK ON OFF (OFF)
   (FREQUENCY) 50 (MHz)
   (SPAN) 10 (MHz)
   (PEAK SEARCH)
   (MKR FCTN) MKR TRACK ON
   (SPAN) 100 (kHz)
   (BW) RES BW AUTO MAN 10 (kHz)

29. Enter the power sensor 50 MHz Cal Factor into the measuring receiver.
30. Adjust the frequency synthesizer amplitude until the measuring receiver display reads the same value as recorded in step 11. Record the frequency synthesizer amplitude in Table 2-37.

31. Replace the power sensor with the 50 Ω termination.
32. On the spectrum analyzer, press the following key:

    (PEAK SEARCH) MARKER Δ

    (MKR FCTN) MK TRACK ON OFF (ON)

33. Set the spectrum analyzer center frequency and the synthesizer frequency to the frequencies listed in Table 2-37.
34. At each frequency, adjust the frequency synthesizer amplitude for a MKR Δ-TRK amplitude reading of 0.00 ±0.05 dB. Record the frequency synthesizer Amplitude Setting in Table 2-37 as the frequency synthesizer Amplitude.
35. For each of the frequencies in Table 2-37, subtract the frequency synthesizer Amplitude Reading (column 2) from the frequency synthesizer Amplitude Setting (50 MHz) recorded in step 50. Record the result as the Response Relative to 50 MHz (column 3) of Table 2-37.
36. Add to each of the Response Relative to 50 MHz entries in Table 2-37 the measuring receiver Reading for 50 MHz listed in Table 2-35. Record the results as the Response Relative to 300 MHz (column 4) in Table 2-37.

Test Results

Frequency Response, Band 0

1. Enter the most positive number from Table 2-37, column 4:

   ________ dB

2. Enter the most positive number from Table 2-35, column 2:

   ________ dB

3. Enter the more positive of numbers from step 1 and step 2 as TR Entry 1 of the performance verification test record (absolute referenced to 300 MHz).

4. Enter the most negative number from Table 2-37, column 4:

   ________ dB

5. Enter the most negative number from Table 2-35, column 2:

   ________ dB

6. Enter the more negative of numbers from step 4 and step 5 as TR Entry 2 of the performance verification test record.

7. Subtract step 6 from step 3. Enter this value as TR Entry 3 of the performance verification test record (relative flatness).

Frequency Response, Band 1

1. Enter the most positive number from Table 2-36, column 2, as TR Entry 4 of the performance verification test record.
2. Enter the most negative number from Table 2-36, column 2, as TR Entry 5 of the performance verification test record.
3. Subtract step 2 from step 1. Enter this value as TR Entry 6 of the performance verification test record.

Table 2-35. Frequency Response Band 0, ≥50 MHz

Column 1 Frequency (MHz)	Column 2 Measuring Receiver Reading (dB)	Column 3 CAL FACTOR Frequency (GHz)	Column 1 Frequency (MHz)	Column 2 Measuring Receiver Reading (dB)	Column 3 CAL FACTOR Frequency (GHz)
50	______	0.05	1500	______	2.0
100	______	0.05	1600	______	2.0
200	______	0.05	1700	______	2.0
300	______	0.05	1800	______	2.0
400	______	0.05	1900	______	2.0
500	______	0.05	2000	______	2.0
600	______	0.05	2100	______	2.0
700	______	0.05	2200	______	2.0
800	______	0.05	2300	______	2.0
900	______	0.05	2400	______	2.0
1000	______	0.05	2500	______	3.0
1100	______	2.0	2600	______	3.0
1200	______	2.0	2700	______	3.0
1300	______	2.0	2800	______	3.0
1400	______	2.0	2900	______	3.0

22. Frequency Response, HP 8595E

Table 2-36. Frequency Response Band 1

Column 1 Frequency (GHz)	Column 2 Measuring Receiver Reading (dB) Preselector Peaked	Column 3 CAL FACTOR Frequency (GHz)	Column 1 Frequency (GHz)	Column 2 Measuring Receiver Reading (dB) Preselector Peaked	Column 3 CAL FACTOR Frequency (GHz)
2.75		3.0	4.7		5.0
2.8		3.0	4.8		5.0
2.9		3.0	4.9		5.0
3.0		3.0	5.0		5.0
3.1		3.0	5.1		5.0
3.2		3.0	5.2		5.0
3.3		3.0	5.3		5.0
3.4		3.0	5.4		5.0
3.5		4.0	5.5		6.0
3.6		4.0	5.6		6.0
3.7		4.0	5.7		6.0
3.8		4.0	5.8		6.0
3.9		4.0	5.9		6.0
4.0		4.0	6.0		6.0
4.1		4.0	6.1		6.0
4.2		4.0	6.2		6.0
4.3		4.0	6.3		6.0
4.4		4.0	6.4		6.0
4.5		5.0	6.5		6.0
4.6		5.0			

Table 2-37. Frequency Response Band 0, <50 MHz

Column 1 Spectrum Analyzer Frequency Synthesizer Frequency	Column 2 Frequency Synthesizer Amplitude (dBm)	Column 3 Response Relative to 50 MHz	Column 4 Response Relative to 300 MHz
50 MHz		0 (Reference)	
20 MHz			
10 MHz			
5 MHz			
1 MHz			
200 kHz			
50 kHz			

23. Frequency Response, HP 8596E

The output of the synthesized sweeper is fed through a power splitter to a power sensor and the spectrum analyzer. The synthesized sweeper power level is adjusted at 300 MHz to place the displayed signal at the analyzer center horizontal graticule line. The measuring receiver, used as a power meter, is placed in RATIO mode. At each new synthesized sweeper frequency and analyzer center frequency setting, the synthesized sweeper power level is adjusted to place the signal at the center horizontal graticule line. The measuring receiver displays the inverse of the frequency response relative to 300 MHz (CAL OUT frequency).

The related adjustments for this performance verification test are:

YTF Adjustment
Dual Mixer Bias Adjustment
Frequency Response Adjustment

Equipment Required

Synthesized sweeper
Measuring receiver *(used as a power meter)*
Frequency synthesizer
Power sensor, 50 MHz to 12.8 GHz
Power splitter
Termination, 50 Ω
Adapter, Type N (m) to APC 3.5 (m)
Adapter, Type N (f) to BNC (f)
Adapter, 3.5 mm (f) to 3.5mm (f)
Adapter, Type BNC (f) to SMA (m)
Cable, BNC, 122 cm (48 in)
Cable, APC 3.5, 91 cm (36 in)

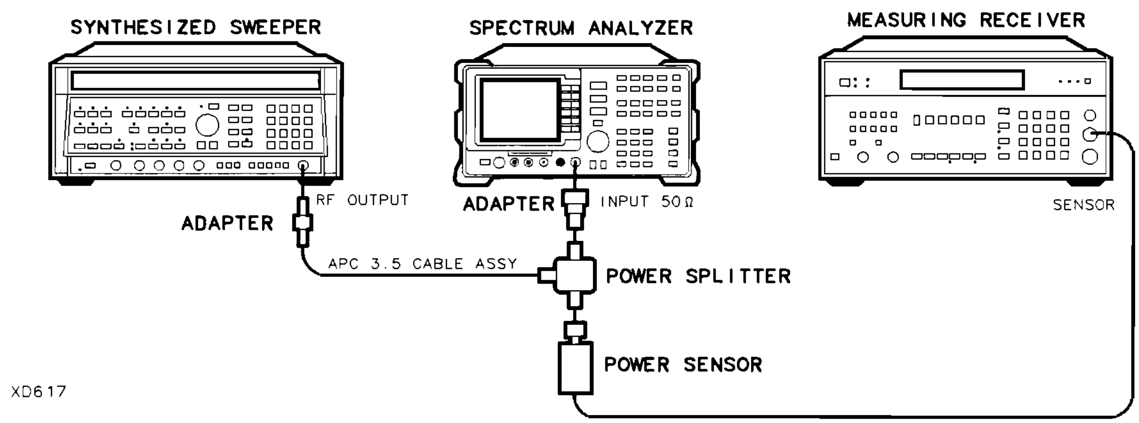


Figure 2-36. Frequency Response Test Setup, ≥50 MHz

Procedure

1. Zero and calibrate the measuring receiver and 50 MHz to 12.8 GHz power sensor in LOG mode as described in the measuring receiver operation manual.
2. Connect the equipment as shown in Figure 2-36.

   Option 026 only: Connect the output of the power splitter to the spectrum analyzer input directly.

   Option 027 only: Connect the output of the power splitter to the SMA adapter included with spectrum analyzer. Note that the SMA adapter is required to meet specifications.
3. Press instrument preset on the synthesized sweeper. Set the synthesized sweeper controls as follows:

   CW .... 300 MHz
   FREQ STEP .... 100 MHz
   POWER LEVEL .... −8 dBm
4. On the spectrum analyzer, press (PRESET), then wait for the preset routine to finish. Press the following analyzer keys:

   (FREQUENCY) Band Lock 0-2.9 Gz BAND 0
   (FREQUENCY) 300 (MHz)
   CF STEP AUTO MAN 100 (MHz)
   (SPAN) 10 (MHz)
   (AMPLITUDE) REF LVL 10 (−dBm)
   SCALE LOG LIN (LOG) 1 (dB)
   (BW) RES BW AUTO MAN 1 (MHz)
   VID BW AUTO MAN 10 (kHz)
5. On the spectrum analyzer, press (PEAK SEARCH), (MKR FCTN), MK TRACK ON OFF (ON).
6. Adjust the synthesized sweeper power level for a MKR-TRK amplitude reading of −14 dBm ±0.1 dB.
7. Press RATIO on the measuring receiver.

Frequency Response, Band 0, ≥50 MHz

8. Set the synthesized sweeper CW FREQUENCY to 50 MHz.
9. Set the spectrum analyzer CENTER FREQUENCY to 50 MHz.
10. Adjust the synthesized sweeper power level for a spectrum analyzer MKR-TRK amplitude reading of −14 dBm ±0.1 dB.
11. Record the power ratio displayed on the measuring receiver below, then record the negative of this value in column 2 of Table 2-38 as the Measuring Receiver Reading at 50 MHz.

Measuring Receiver Reading at 50 MHz__________dB

12. Set the synthesized sweeper CW FREQUENCY to 100 MHz.
13. Set the spectrum analyzer CENTER FREQUENCY to 100 MHz.
14. Adjust the synthesized sweeper power level for a spectrum analyzer MKR-TRK amplitude reading of −14 dBm ±0.1 dB.
15. Record the negative of the power ratio displayed on the measuring receiver in Table 2-38 as the measuring receiver Reading.
16. On the synthesized sweeper, press (CW), and (⇑) (step up) key and on the spectrum analyzer, press (FREQUENCY), (⇑) (step up) key to step through the remaining frequencies listed in Table 2-38.
17. At each new frequency repeat steps 13 through 15, entering the power sensor Cal Factor into the measuring receiver as indicated in Table 2-38.

Frequency Response, Band 1

18. Press the following spectrum analyzer keys:

    (FREQUENCY) `Band Lock` `2.75 - 6.5 BAND 1`
    (FREQUENCY) 2.75 (GHz)
    (SPAN) 10 (MHz)
    (BW) `RES BW AUTO MAN` 1 (MHz)
    `VID BW AUTO MAN` 10 (kHz)
    (PEAK SEARCH)
    (MKR FCTN) `MK TRACK ON OFF` (ON)

19. Set the synthesized sweeper CW to 2.75 GHz.
20. On the spectrum analyzer, press (AMPLITUDE), `PRESEL PEAK`.
21. Adjust the synthesized sweeper power level for a spectrum analyzer MKR-TRK amplitude reading of −14 dBm ±0.1 dB.
22. Record the negative of the power ratio displayed on the measuring receiver in Table 2-39, column 2.
23. Set the synthesized sweeper CW and the spectrum analyzer Center Frequency to 2.8 GHz. Repeat steps 20 through 22.
24. On the synthesized sweeper, press CW, and (⇑) (step up) key, then on the spectrum analyzer, press (FREQUENCY), (⇑) (step up) key to step through the remaining frequencies listed in Table 2-39.

25. At each new frequency repeat steps 20 through 22, entering the power sensor Cal Factor into the measuring receiver as indicated in Table 2-39.

Frequency Response, Band 2

26. Press the following spectrum analyzer keys:

    (FREQUENCY) Band Lock 6.0 -12.8 BAND 2
    (FREQUENCY) 6.0 (GHz)
    CF STEP AUTO MAN 200 (MHz)
    (SPAN) 10 (MHz)
    (BW) RES BW AUTO MAN 1 (MHz)
    VID BW AUTO MAN 10 (kHz)
    (PEAK SEARCH)
    (MKR FCTN) MK TRACK ON OFF (ON)

27. Set the synthesized sweeper CW to 6.0 GHz.
28. On the spectrum analyzer, press (AMPLITUDE) PRESEL PEAK .
29. Adjust the synthesized sweeper power level for a spectrum analyzer MKR-TRK amplitude reading of −14 dBm ±0.1 dB.
30. Record the negative of the power ratio displayed on the measuring receiver in Table 2-40, column 2.
31. On the synthesized sweeper, press (CW), and (⇑) (step up) key, then on the spectrum analyzer, press (FREQUENCY), and (⇑) (step up) key to step through the remaining frequencies listed in Table 2-40.
32. At each new frequency repeat steps 28 through 30, entering the power sensor Cal Factor into the measuring receiver as indicated in Table 2-40.

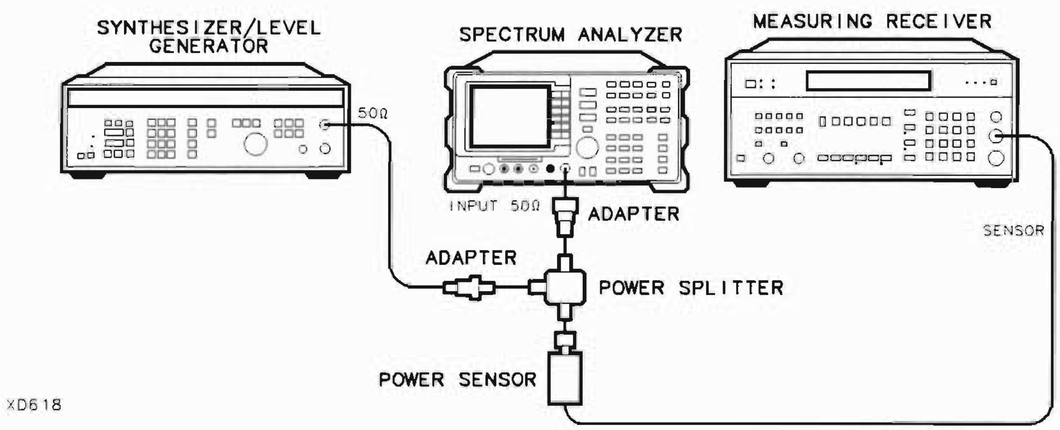


Figure 2-37. Frequency Response Test Setup, <50 MHz

Frequency Response, Band 0, <50 MHz

33. Set the frequency synthesizer controls as follows:

FREQUENCY	50 MHz
AMPLITUDE	−8 dBm
AMPTD INCR	0.05 dB

34. Connect the equipment as shown if Figure 2-37, with the power sensor connected to power splitter.

    Option 026 or 027 only: Connect the power splitter to the analyzer input directly.

35. On the spectrum analyzer, press the following keys:

    (MKR) MARKER 1 ON OFF (OFF)
    (FREQUENCY) Band Lock BND LOCK ON OFF (OFF)
    (FREQUENCY) 50 (MHz)
    (SPAN) 10 (MHz)
    (PEAK SEARCH)
    (MKR FCTN) MKR TRACK ON
    (SPAN) 100 (kHz)
    (BW) RES BW AUTO MAN 10 (kHz)

36. Enter the power sensor 50 MHz Cal Factor into the measuring receiver.
37. Adjust the frequency synthesizer amplitude until the measuring receiver display reads the same value as recorded in step 11. Record the frequency synthesizer amplitude in Table 2-41.
38. Replace the 50 MHz to 12.8 GHz power sensor with the 50 Ω termination.
39. On the spectrum analyzer, press the following key:

    (PEAK SEARCH) MARKER Δ
    (MKR FCTN) MK TRACK ON OFF (ON)

40. Set the spectrum analyzer center frequency and the synthesizer frequency to the frequencies listed in Table 2-41.
41. At each frequency, adjust the frequency synthesizer amplitude for a MKR Δ-TRK amplitude reading of 0.00 ±0.05 dB. Record the frequency synthesizer Amplitude Setting in Table 2-41 as the frequency synthesizer Amplitude.
42. For each of the frequencies in Table 2-41, subtract the frequency synthesizer Amplitude Reading (column 2) from the frequency synthesizer Amplitude Setting (50 MHz) recorded in step 37. Record the result as the Response Relative to 50 MHz (column 3) of Table 2-41.
43. Add to each of the Response Relative to 50 MHz entries in Table 2-41 the measuring receiver Reading for 50 MHz listed in Table 2-38. Record the results as the Response Relative to 300 MHz (column 4) in Table 2-41.

Test Results

Frequency Response, Band 0

1. Enter the most positive number from Table 2-41, column 4:

   ________ dB

2. Enter the most positive number from Table 2-38, column 2:

   ________ dB

3. Enter the more positive of numbers from step 1 and step 2 as TR Entry 1 of the performance verification test record (absolute referenced to 300 MHz).

4. Enter the most negative number from Table 2-41, column 4:

   ________ dB

5. Enter the most negative number from Table 2-38, column 2:

   ________ dB

6. Enter the more negative of numbers from step 4 and step 5 as TR Entry 2 of the performance verification test record.

7. Subtract step 6 from step 3. Enter this value as TR Entry 3 of the performance verification test record (relative flatness).

Frequency Response, Band 1

1. Enter the most positive number from Table 2-39, column 2, as TR Entry 4 of the performance verification test record.
2. Enter the most negative number from Table 2-39, column 2, as TR Entry 5 of the performance verification test record.
3. Subtract step 2 from step 1. Enter this value as TR Entry 6 of the performance verification test record.

Frequency Response, Band 2

1. Enter the most positive number from Table 2-40, column 2, as TR Entry 7 of the performance verification test record.
2. Enter the most negative number from Table 2-40, column 2, as TR Entry 8 of the performance verification test record.
3. Subtract step 2 from step 1. Enter this value as TR Entry 9 of the performance verification test record.

Table 2-38. Frequency Response Band 0, ≥50 MHz

Column 1 Frequency (MHz)	Column 2 Measuring Receiver Reading (dB)	Column 3 CAL FACTOR Frequency (GHz)	Column 1 Frequency (MHz)	Column 2 Measuring Receiver Reading (dB)	Column 3 CAL FACTOR Frequency (GHz)
50	______	0.05	1500	______	2.0
100	______	0.05	1600	______	2.0
200	______	0.05	1700	______	2.0
300	______	0.05	1800	______	2.0
400	______	0.05	1900	______	2.0
500	______	0.05	2000	______	2.0
600	______	0.05	2100	______	2.0
700	______	0.05	2200	______	2.0
800	______	0.05	2300	______	2.0
900	______	0.05	2400	______	2.0
1000	______	0.05	2500	______	3.0
1100	______	2.0	2600	______	3.0
1200	______	2.0	2700	______	3.0
1300	______	2.0	2800	______	3.0
1400	______	2.0	2900	______	3.0

23. Frequency Response, HP 8596E

Table 2-39. Frequency Response Band 1

Column 1 Frequency (GHz)	Column 2 Measuring Receiver Reading (dB) Preselector Peaked	Column 3 CAL FACTOR Frequency (GHz)	Column 1 Frequency (GHz)	Column 2 Measuring Receiver Reading (dB) Preselector Peaked	Column 3 CAL FACTOR Frequency (GHz)
2.75	______	3.0	4.7	______	5.0
2.8	______	3.0	4.8	______	5.0
2.9	______	3.0	4.9	______	5.0
3.0	______	3.0	5.0	______	5.0
3.1	______	3.0	5.1	______	5.0
3.2	______	3.0	5.2	______	5.0
3.3	______	3.0	5.3	______	5.0
3.4	______	3.0	5.4	______	5.0
3.5	______	4.0	5.5	______	6.0
3.6	______	4.0	5.6	______	6.0
3.7	______	4.0	5.7	______	6.0
3.8	______	4.0	5.8	______	6.0
3.9	______	4.0	5.9	______	6.0
4.0	______	4.0	6.0	______	6.0
4.1	______	4.0	6.1	______	6.0
4.2	______	4.0	6.2	______	6.0
4.3	______	4.0	6.3	______	6.0
4.4	______	4.0	6.4	______	6.0
4.5	______	5.0	6.5	______	6.0
4.6	______	5.0			

Table 2-40. Frequency Response Band 2

Column 1 Frequency (GHz)	Column 2 Measuring Receiver Reading (dB) Preselector Peaked	Column 3 CAL FACTOR Frequency (GHz)	Column 1 Frequency (GHz)	Column 2 Measuring Receiver Reading (dB) Preselector Peaked	Column 3 CAL FACTOR Frequency (GHz)
6.0	________	6.0	9.6	________	10.0
6.2	________	6.0	9.8	________	10.0
6.4	________	6.0	10.0	________	10.0
6.6	________	7.0	10.2	________	10.0
6.8	________	7.0	10.4	________	10.0
7.0	________	7.0	10.6	________	11.0
7.2	________	7.0	10.8	________	11.0
7.4	________	7.0	11.0	________	11.0
7.6	________	8.0	11.2	________	11.0
7.8	________	8.0	11.4	________	11.0
8.0	________	8.0	11.6	________	12.0
8.2	________	8.0	11.8	________	12.0
8.4	________	8.0	12.0	________	12.0
8.6	________	9.0	12.2	________	12.0
8.8	________	9.0	12.4	________	12.0
9.0	________	9.0	12.6	________	13.0
9.2	________	9.0	12.8	________	13.0
9.4	________	9.0			

Table 2-41. Frequency Response Band 0, <50 MHz

Column 1 Spectrum Analyzer Frequency Synthesizer Frequency	Column 2 Frequency Synthesizer Amplitude (dBm)	Column 3 Response Relative to 50 MHz	Column 4 Response Relative to 300 MHz
50 MHz	________	0 (Reference)	________
20 MHz	________	________	________
10 MHz	________	________	________
5 MHz	________	________	________
1 MHz	________	________	________
200 kHz	________	________	________
50 kHz	________	________	________

24. Other Input Related Spurious Responses, HP 8591C and HP 8591E

A synthesized source and the spectrum analyzer are set to the same frequency and the amplitude of the source is set to −20 dBm. A marker-amplitude reference is set on the spectrum analyzer. The source is then tuned to several different frequencies where image responses could occur. At each source frequency, the source amplitude is set to −20 dBm and the amplitude of the response, if any, is measured using the spectrum analyzer marker function. The marker-amplitude difference is then compared to the specification.

There are no related adjustment procedures for this performance test.

Equipment Required

Synthesized sweeper
Measuring receiver *(used as a power meter)*
Power sensor, 100 kHz to 1800 MHz
Adapter, Type N (f) to APC 3.5 (f)
Adapter, Type N (f) to Type N (f)
Cable, Type N, 183 cm (72 in)

Additional Equipment for 75 Ω Input

Power sensor, 75 Ω
Adapter, minimum loss
Adapter, Type N (f) to BNC (m), 75 Ω
Adapter, Type N (f) to Type N (f), 75 Ω

Procedure

1. Zero and calibrate the measuring receiver and 100 kHz to 1800 MHz power sensor in log mode (power reads out in dBm), as described in the measuring receiver operation manual. Enter the power sensor's 542.8 MHz Cal Factor into the measuring receiver.

   75 Ω only: Use 75 Ω power sensor.

2. Press INSTRUMENT PRESET on the synthesized sweeper and set the controls as follows:

   CW .... 542.8 MHz
   POWER LEVEL .... −20 dBm
   75 Ω input only: POWER LEVEL .... −14.3 dBm

3. Connect the equipment as shown in Figure 2-38. Connect the output of the synthesizer to the 100 kHz to 1800 MHz power sensor using adapters.

   75 Ω input only: Use the minimum loss adapter and 75 Ω adapter to connect to the 75 Ω power sensor.

4. Adjust the synthesized sweeper power level for a −20 dBm ±0.1 dB reading on the measuring receiver.

5. On the synthesized sweeper, press SAVE 1.

Caution Use only 75 Ω cables, connectors, or adapters on instruments with 75 Ω inputs, or damage to the input connector will occur.

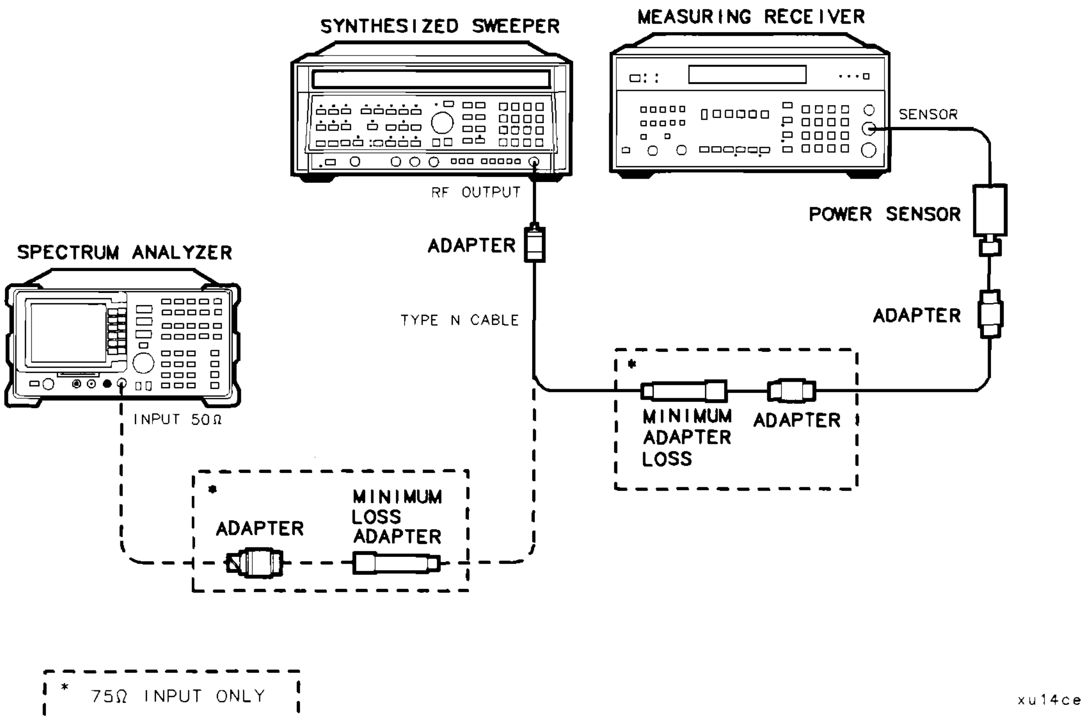


Figure 2-38. Other Input Related Spurious Responses Test Setup

6. Enter the power sensor's Cal Factor for 1142.8 MHz into the measuring receiver.
7. Set the CW frequency on the synthesized sweeper to 1142.8 MHz.
8. Adjust the synthesized sweeper power level for a −20 dBm ±0.1 dB reading on the measuring receiver.
9. On the synthesized sweeper, press SAVE 2.
10. Enter the power sensor's Cal Factor for 500 MHz into the measuring receiver.
11. Set the CW frequency on the synthesized sweeper to 500 MHz.
12. Adjust the synthesized sweeper power level for a −20 dBm ±0.1 dB reading on the measuring receiver.
13. Connect the synthesized sweeper to the RF INPUT of the spectrum analyzer using the appropriate cable and adapters.

    75 Ω input only: Use the minimum loss adapter and 75 Ω adapter as shown in Figure 2-38.

14. On the spectrum analyzer, press (PRESET), then wait for the preset routine to finish. Set the spectrum analyzer by pressing the following keys:

    (FREQUENCY) 500 (MHz)
    (SPAN) 10 (MHz)

    75 Ω input only: Press (AMPLITUDE), **More 1 of 2**, **Amptd Units**, then **dBm**.

    (AMPLITUDE) −10 (dBm)

15. On the spectrum analyzer, press the following keys:

    (PEAK SEARCH)
    (MKR FCTN) MK TRACK ON OFF (ON)
    (SPAN) 200 (kHz)

    Wait for the AUTO ZOOM message to disappear. Press the following spectrum analyzer keys:

    (PEAK SEARCH)
    (MKR →) MARKER →REF LVL
    (MKR FCTN) MK TRACK ON OFF (OFF)
    (PEAK SEARCH) **MARKER Δ**
    (AMPLITUDE) (⇩) (step-down key).
    (SGL SWP)

16. For each of the frequencies listed in Table 2-42, do the following:
    a. Set the synthesized sweeper to the listed CW frequency by pressing (RECALL) 1 for a CW frequency of 542.8 MHz or (RECALL) 2 for a CW frequency of 1142.8 MHz.
    b. Press (SGL SWP) and wait for the completion of a new sweep.
    c. On the spectrum analyzer, press (PEAK SEARCH) and record the marker-delta amplitude reading in Table 2-42 as the Actual MKR Δ Amplitude.

    The Actual MKR Δ Amplitude should be less than the Maximum MKR Δ Amplitude listed in the table below.

    Note that the Maximum MKR Δ Amplitude is 10 dB more positive than the specification. This is due to the 10 dB change in reference level made in step 15.

Table 2-42. Image Responses

Synthesized Sweeper CW Frequency	Actual MKR Δ Amplitude (dBc)	Maximum MKR Δ Amplitude (dBc)
542.8 MHz	______	−55
1142.8 MHz	______	−55

17. Record the Maximum MKR Δ Amplitude from Table 2-42 in the performance verification test record as TR Entry 1.

25. Other Input Related Spurious Responses, HP 8593E

A synthesized source and the spectrum analyzer are set to the same frequency and the amplitude of the source is set to 0 dBm. A marker-amplitude reference is set on the spectrum analyzer. The source is then tuned to several different frequencies which should generate image, multiple, and out-of-band responses. At each source frequency, the source amplitude is set to 0 dBm and the amplitude of the response, if any, is measured using the spectrum analyzer marker function. The marker-amplitude difference is then compared to the specification.

There are no related adjustment procedures for this performance test.

Equipment Required

Synthesized sweeper
Measuring receiver *(used as a power meter)*
Power sensor, 50 MHz to 26.5 GHz
Power splitter
Adapter, Type N (m) to APC 3.5 (m)
Adapter, APC 3.5 (f) to APC 3.5 (f)
Cable, APC 3.5, 91 cm (36 in)

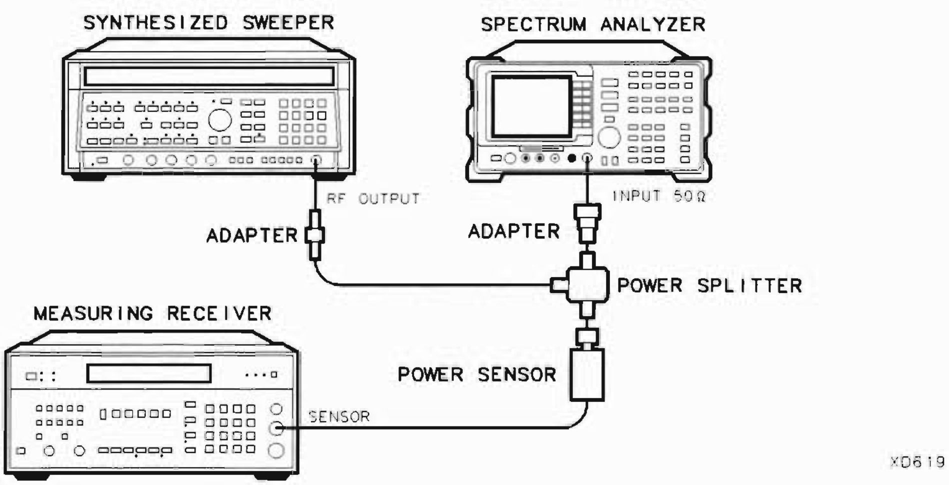


Figure 2-39. Other Input Related Spurious Responses Test Setup

Procedure

Band 0

1. Zero and calibrate the measuring receiver and 50 MHz to 26.5 GHz power sensor in log mode (power reads out in dBm), as described in the measuring receiver operation manual. Enter the power sensor 2 GHz Cal Factor into the measuring receiver.
2. Press INSTRUMENT PRESET on the synthesized sweeper and set the controls as follows:

   CW .... 2000 MHz
   POWER LEVEL .... −4 dBm
3. Connect the equipment as shown in Figure 2-39. Connect the output of the synthesizer to the 50 MHz to 26.5 GHz power sensor using adapters.

   Option 026 only: Connect the power splitter to the spectrum analyzer input directly.
4. Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish. Set the spectrum analyzer by pressing the following keys:

   (FREQUENCY) 2.0 (GHz)
   (SPAN) 1 (MHz)
   (AMPLITUDE) REF LVL 10 (−dBm)
   ATTEN AUTO MAN 0 (dB)
5. Adjust the synthesized sweeper power level for a −10 dBm ±0.1 dB reading on the measuring receiver.
6. On the spectrum analyzer, press the following keys:

   (PEAK SEARCH)
   (MKR FCTN) MK TRACK ON OFF (ON)
   (SPAN) 200 (kHz)

   Wait for the AUTO ZOOM message to disappear. Press the following spectrum analyzer keys:

   (PEAK SEARCH)
   (MKR →) MARKER →REF LVL
   (MKR FCTN) MK TRACK ON OFF (OFF)
   (PEAK SEARCH) MARKER Δ
   (AMPLITUDE) (⇓) (step-down key).
   (SGL SWP)

7. For each of the frequencies listed in Table 2-43, do the following:
   a. Set the synthesized sweeper to the listed CW frequency.
   b. Enter the appropriate power sensor CAL Factor into the measuring receiver.
   c. Set the synthesized sweeper power level for −10 dBm reading on the measuring receiver.
   d. Press (SGL SWP) and wait for the completion of a new sweep.
   e. On the spectrum analyzer, press (PEAK SEARCH) and record the marker-delta amplitude reading in Table 2-43 as the Actual MKR Δ Amplitude.

   The Actual MKR Δ Amplitude should be less than the Maximum MKR Δ Amplitude listed in Table 2-43.

   Note that the Maximum MKR Δ Amplitude is 10 dB more positive than the specification. This is due to the 10 dB change in reference level made in step 6.

8. Press the following spectrum analyzer keys:

   (MKR) MARKERS OFF
   (HOLD)
   (AUTO COUPLE) AUTO ALL
   (SPAN) 1 (MHz)
   (AMPLITUDE) REF LVL 10 (−dBm)
   ATTEN AUTO MAN 0 (dB)
   (SWEEP) SWEEP CONT SGL (CONT)

Band 1

9. On the spectrum analyzer, press (FREQUENCY), 4, (GHz).
10. Set the synthesized sweeper CW to 4 GHz.
11. Enter the power sensor 4 GHz CAL Factor into the measuring receiver.
12. Press the following spectrum analyzer keys:

    (PEAK SEARCH)
    (AMPLITUDE) PRESEL PEAK

    Wait for the CAL: PEAKING message to disappear, then press (MKR), MARKERS OFF .

13. Repeat steps 5 through 8 for the synthesized sweeper CW frequencies listed in Table 2-43 for Band 1.

Band 2

14. On the spectrum analyzer, press (FREQUENCY), 9, (GHz).
15. Set the synthesized sweeper CW to 9 GHz.
16. Enter the power sensor 9 GHz CAL Factor into the measuring receiver.
17. Press the following spectrum analyzer keys:

    (PEAK SEARCH)
    (AMPLITUDE) PRESEL PEAK

    Wait for the CAL: PEAKING message to disappear, then press (MKR), MARKERS OFF .
18. Repeat steps 5 through 8 for the synthesized sweeper CW frequencies listed in Table 2-43 for Band 2.

Band 3

19. On the spectrum analyzer, press (FREQUENCY), 15, (GHz).
20. Set the synthesized sweeper CW to 15 GHz.
21. Enter the power sensor 15 GHz CAL Factor into the measuring receiver.
22. Press the following spectrum analyzer keys:

    (PEAK SEARCH)
    (AMPLITUDE) PRESEL PEAK

    Wait for the CAL: PEAKING message to disappear, then press (MKR), MARKERS OFF .
23. Repeat steps 5 through 8 for the synthesized sweeper CW frequencies listed in Table 2-43 for Band 3.

Band 4

24. On the spectrum analyzer, press (FREQUENCY), 21, (GHz).
25. Set the synthesized sweeper CW to 21 GHz.
26. Enter the power sensor 21 GHz CAL Factor into the measuring receiver.
27. Press the following spectrum analyzer keys:

    (PEAK SEARCH)
    (AMPLITUDE) PRESEL PEAK

    Wait for the CAL: PEAKING message to disappear, then press (MKR), MARKERS OFF .
28. Repeat steps 5 through 8 for the synthesized sweeper CW frequencies listed in Table 2-43 for Band 4.

Band 4 for Option 026 or 027

Perform this section only if you spectrum analyzer is equipped with Option 026 or 027.

29. On the spectrum analyzer, press (FREQUENCY), 24, (GHz).
30. Set the synthesized sweeper CW to 24 GHz.
31. Enter the power sensor 24 GHz CAL Factor into the measuring receiver.
32. Press the following spectrum analyzer keys:

    (PEAK SEARCH)
    (AMPLITUDE) PRESEL PEAK

    Wait for the CAL: PEAKING message to disappear, then press (MKR), MARKERS OFF .

33. Repeat steps 5 through 8 for the synthesized sweeper CW frequencies listed in Table 2-43 for Band 4 for Option 026 or 027.

Specification Summary

1. Record the maximum Actual MKR Δ Amplitude from Table 2-43 for Band 0 as TR Entry 1 of the performance verification test record.
2. Record the maximum Actual MKR Δ Amplitude from Table 2-43 for Bands 1, 2, and 3 as TR Entry 2 of the performance verification test record.
3. Record the maximum Actual MKR Δ Amplitude from Table 2-43 for Band 4 as TR Entry 3 of the performance verification test record.

   Option 026 or 027 only: Record the maximum Actual MKR Δ Amplitude from Table 2-43 for band 4, Option 026 or 027 as TR Entry 3 of the performance verification test record.

25. Other Input Related Spurious Responses, HP 8593E

Table 2-43. Other Input Related Spurious Worksheet

Band	Spectrum Analyzer Center Frequency	Synthesized Sweeper CW Frequency	MKR Δ Amplitude	
	GHz	MHz	Actual (dBc)	Max. (dBc)
0	2.0	2042.8*	________	−55
	2.0	2642.8*	________	−55
	2.0	9842.8†	________	−55
	2.0	7921.4†	________	−55
	2.0	1820.8‡	________	−55
	2.0	278.5‡	________	−55
1	4.0	4042.8*	________	−55
	4.0	4642.8*	________	−55
	4.0	8321.4†	________	−55
	4.0	3742.9‡	________	−55
2	9.0	9042.8*	________	−55
	9.0	9642.8*	________	−55
	9.0	4982.1†	________	−55
	9.0	9342.8‡	________	−55
3	15.0	15042.8*	________	−55
	15.0	15642.8*	________	−55
	15.0	4785.8†	________	−55
	15.0	15669.65‡	________	−55
4	21.0	21042.8*	________	−50
	21.0	21642.8*	________	−50
	21.0	5008.95†	________	−55
	21.0	21342.8‡	________	−50
4	24	24042.8*	________	−50
Option 026	24	24642.8*	________	−50
or	24	11839.3†	________	−55
027 Only	24	20019.65‡	________	−50

* Image Response
† Out-of-Band Response
‡ Multiple Response

26. Other Input Related Spurious Responses, HP 8594E

A synthesized source and the spectrum analyzer are set to the same frequency and the amplitude of the source is set to 0 dBm. A marker amplitude reference is set on the analyzer. The source is then tuned to several different frequencies which should generate image, multiple, and out-of-band responses. At each source frequency, the source amplitude is set to 0 dBm and the amplitude of the response, if any, is measured using the analyzer marker function. The marker amplitude difference is then compared to the specification.

There are no related adjustment procedures for this performance verification test.

Equipment Required

Synthesized sweeper
Measuring receiver *(used as a power meter)*
Power sensor, 50 MHz to 2.9 GHz
Power splitter
Adapter, Type N (m) to APC 3.5 (m)
Adapter, APC 3.5 (f) to APC 3.5 (f)
Cable, APC 3.5 male connectors, 91 cm (36 in)

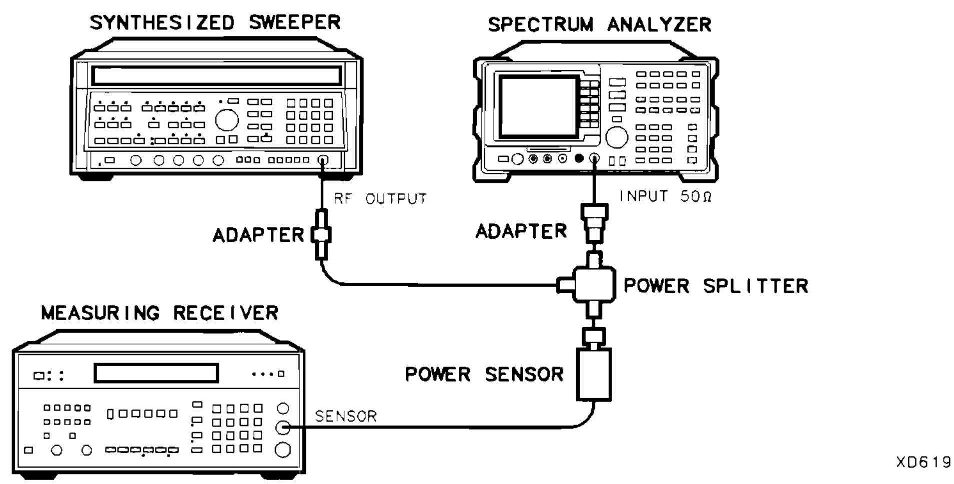


Figure 2-40. Other Input Related Spurious Responses Test Setup

Procedure

1. Zero and calibrate the measuring receiver and 50 MHz to 2.9 GHz power sensor in log mode (power reads out in dBm). Enter the power sensor 2 GHz Cal Factor into the measuring receiver.
2. Press INSTR PRESET on the synthesized sweeper, then set the controls as follows:

   CW .... 2000 MHz
   POWER LEVEL .... −4 dBm

3. Connect the equipment as shown in Figure 2-40.
4. On the spectrum analyzer, press (PRESET) and wait for the preset to finish. Set the spectrum analyzer by pressing the following keys:

   (FREQUENCY) 2.0 (GHz)
   (SPAN) 1 (MHz)
   (AMPLITUDE) −10 (dBm)
   ATTEN AUTO MAN 0 (dB)

5. Adjust the synthesized sweeper power level for a −10 dBm ±0.1 dB reading on the measuring receiver.
6. On the spectrum analyzer, press the following keys:

   (PEAK SEARCH)
   (MKR FCTN) MK TRACK ON OFF (ON)
   (SPAN) 200 (kHz)

   Wait for the AUTO ZOOM message to disappear. Press the following analyzer keys:

   (PEAK SEARCH) (MKR →) MARKER → REF LVL
   (PEAK SEARCH) MARKER Δ
   (AMPLITUDE) (⇩) (step-down key)
   (SGL SWP)

7. For each of the frequencies listed in Table 2-44 for a center frequency of 2.0 GHz, do the following:
   a. Set the synthesized sweeper to the listed CW frequency.
   b. Enter the appropriate power sensor Cal Factor into the measuring receiver.
   c. Set the synthesized sweeper power level for a −10 dBm reading on the measuring receiver.
   d. Press (SGL SWP) and wait for completion of a new sweep.
   e. On the spectrum analyzer, press (PEAK SEARCH) and record the MKR Δ amplitude reading in Table 2-44 as the Actual MKR Δ Amplitude.

      The Actual MKR Δ Amplitude should be less than the Max MKR Δ Amplitude listed in the table.

   Note that the Max MKR Δ Amplitude is 10 dB more positive than the specification. This is due to the 10 dB change in reference level made in step 6.

8. Record the maximum Actual MKR Δ Amplitude from Table 2-44 as TR Entry 1 of the performance verification test record.

Table 2-44. Other Input Related Spurious Worksheet

Spectrum Analyzer Center Frequency	Synthesized Sweeper CW Frequency	MKR Δ Amplitude	
GHz	MHz	Actual (dBc)	Max (dBc)
2.0	2042.8*	________	−55
2.0	2642.8*	________	−55
2.0	9842.8†	________	−55
2.0	7921.4†	________	−55
2.0	1820.8‡	________	−55
2.0	278.5‡	________	−55

* Image Response
† Out-of-Band Response
‡ Multiple Response

27. Other Input Related Spurious Responses, HP 8595E

A synthesized source and the spectrum analyzer are set to the same frequency and the amplitude of the source is set to 0 dBm. A marker-amplitude reference is set on the spectrum analyzer. The source is then tuned to several different frequencies which should generate image, multiple, and out-of-band responses. At each source frequency, the source amplitude is set to 0 dBm and the amplitude of the response, if any, is measured using the spectrum analyzer marker function. The marker-amplitude difference is then compared to the specification.

There are no related adjustment procedures for this performance test.

Equipment Required

Synthesized sweeper
Measuring receiver *(used as a power meter)*
Power sensor, 50 MHz to 6.5 GHz
Power splitter
Adapter, Type N (m) to APC 3.5 (m)
Adapter, APC 3.5 (f) to APC 3.5 (f)
Cable, APC 3.5, 91 cm (36 in)

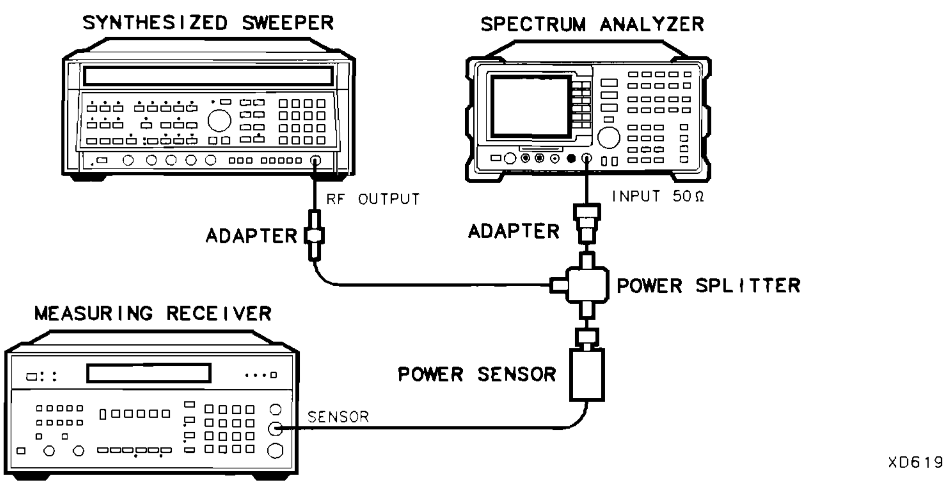


Figure 2-41. Other Input Related Spurious Responses Test Setup

Procedure

Band 0

1. Zero and calibrate the measuring receiver and 50 MHz to 6.5 GHz power sensor in log mode (power reads out in dBm), as described in the measuring receiver operation manual. Enter the power sensor 2 GHz Cal Factor into the measuring receiver.
2. Press INSTRUMENT PRESET on the synthesized sweeper and set the controls as follows:

   CW .... 2000 MHz
   POWER LEVEL .... −4 dBm
3. Connect the equipment as shown in Figure 2-41. Connect the output of the synthesizer to the 50 MHz to 6.5 GHz power sensor using adapters.
4. Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish. Set the spectrum analyzer by pressing the following keys:

   (FREQUENCY) 2.0 (GHz)
   (SPAN) 1 (MHz)
   (AMPLITUDE) REF LVL 10 (−dBm)
   ATTEN AUTO MAN 0 (dB)
5. Adjust the synthesized sweeper power level for a −10 dBm ±0.1 dB reading on the measuring receiver.
6. On the spectrum analyzer, press the following keys:

   (PEAK SEARCH)
   (MKR FCTN) MK TRACK ON OFF (ON)
   (SPAN) 200 (kHz)

   Wait for the AUTO ZOOM message to disappear. Press the following spectrum analyzer keys:

   (PEAK SEARCH)
   (MKR →) MARKER →REF LVL
   (PEAK SEARCH) MARKER Δ
   (AMPLITUDE) (⇓) (step-down key).
   (SGL SWP)

7. For each of the frequencies listed in Table 2-45, do the following:
   a. Set the synthesized sweeper to the listed CW frequency.
   b. Enter the appropriate power sensor CAL Factor into the measuring receiver.
   c. Set the synthesized sweeper power level for −10 dBm reading on the measuring receiver.
   d. Press (SGL SWP) and wait for the completion of a new sweep.
   e. On the spectrum analyzer, press (PEAK SEARCH) and record the marker-delta amplitude reading in Table 2-45 as the Actual MKR Δ Amplitude.

   The Actual MKR Δ Amplitude should be less than the Maximum MKR Δ Amplitude listed in Table 2-45.

   Note that the Maximum MKR Δ Amplitude is 10 dB more positive than the specification. This is due to the 10 dB change in reference level made in step 6.

8. Press the following spectrum analyzer keys:

   (MKR) MARKER 1 ON OFF (OFF)
   (HOLD)
   (AUTO COUPLE) AUTO ALL
   (SPAN) 1 (MHz)
   (AMPLITUDE) REF LVL 10 (−dBm)
   ATTEN AUTO MAN 0 (dB)
   (SWEEP) SWEEP CONT SGL (CONT)

Band 1

9. On the spectrum analyzer, press (FREQUENCY), 4, (GHz).
10. Set the synthesized sweeper CW to 4 GHz.
11. Enter the power sensor 4 GHz CAL Factor into the measuring receiver.
12. Press the following spectrum analyzer keys:

    (PEAK SEARCH)
    (AMPLITUDE) PRESEL PEAK

    Wait for the CAL: PEAKING message to disappear, then press (MKR), MARKERS OFF.

13. Repeat steps 5 through 8 for the synthesized sweeper CW frequencies listed in Table 2-45 for Band 1.

Specification Summary

1. Record the maximum Actual MKR Δ Amplitude from Table 2-45 for Band 0 as TR Entry 1 of the performance verification test record.
2. Record the maximum Actual MKR Δ Amplitude from Table 2-45 for Bands 1 as TR Entry 2 of the performance verification test record.

Table 2-45. Other Input Related Spurious Worksheet

Band	Spectrum Analyzer Center Frequency	Synthesized Sweeper CW Frequency	MKR Δ Amplitude	
	GHz	MHz	Actual (dBc)	Max. (dBc)
0	2.0	2042.8*	________	−55
	2.0	2642.8*	________	−55
	2.0	9842.8†	________	−55
	2.0	7921.4†	________	−55
	2.0	1820.8‡	________	−55
	2.0	278.5‡	________	−55
1	4.0	4042.8*	________	−55
	4.0	4642.8*	________	−55
	4.0	8321.4†	________	−55
	4.0	3742.9‡	________	−55

* Image Response
† Out-of-Band Response
‡ Multiple Response

28. Other Input Related Spurious Responses, HP 8596E

A synthesized source and the spectrum analyzer are set to the same frequency and the amplitude of the source is set to 0 dBm. A marker-amplitude reference is set on the spectrum analyzer. The source is then tuned to several different frequencies which should generate image, multiple, and out-of-band responses. At each source frequency, the source amplitude is set to 0 dBm and the amplitude of the response, if any, is measured using the spectrum analyzer marker function. The marker-amplitude difference is then compared to the specification.

There are no related adjustment procedures for this performance test.

Equipment Required

Synthesized sweeper
Measuring receiver *(used as a power meter)*
Power sensor, 50 MHz to 12.8 GHz
Power splitter
Adapter, Type N (m) to APC 3.5 (m)
Adapter, APC 3.5 (f) to APC 3.5 (f)
Cable, APC 3.5, 91 cm (36 in)

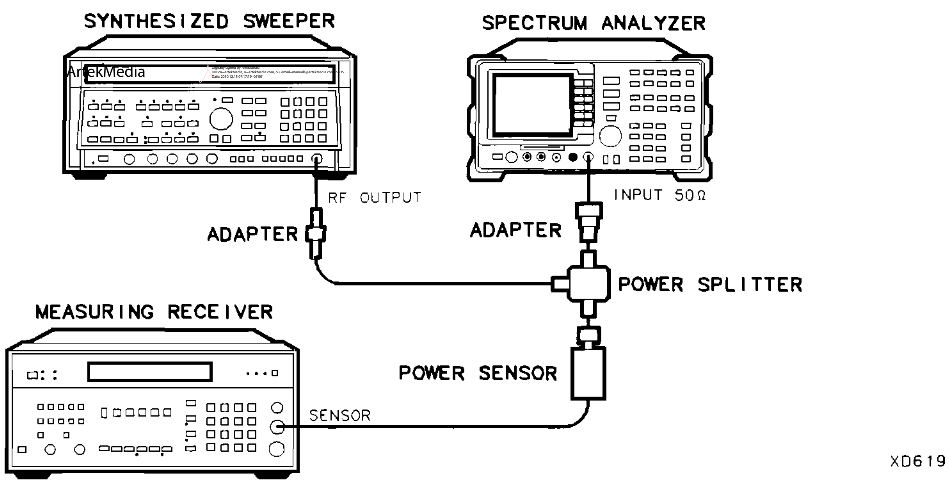


Figure 2-42. Other Input Related Spurious Responses Test Setup

Procedure

Band 0

1. Zero and calibrate the measuring receiver and 50 MHz to 12.8 GHz power sensor in log mode (power reads out in dBm), as described in the measuring receiver operation manual. Enter the power sensor 2 GHz Cal Factor into the measuring receiver.
2. Press INSTRUMENT PRESET on the synthesized sweeper and set the controls as follows:

   CW .... 2000 MHz
   POWER LEVEL .... −4 dBm
3. Connect the equipment as shown in Figure 2-42. Connect the output of the synthesizer to the 50 MHz to 12.8 GHz power sensor using adapters.
4. Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish. Set the spectrum analyzer by pressing the following keys:

   (FREQUENCY) 2.0 (GHz)
   (SPAN) 1 (MHz)
   (AMPLITUDE) REF LVL 10 (−dBm)
   ATTEN AUTO MAN 0 (dB)
5. Adjust the synthesized sweeper power level for a −10 dBm ±0.1 dB reading on the measuring receiver.
6. On the spectrum analyzer, press the following keys:

   (PEAK SEARCH)
   (MKR FCTN) MK TRACK ON OFF (ON)
   (SPAN) 200 (kHz)

   Wait for the AUTO ZOOM message to disappear. Press the following spectrum analyzer keys:

   (PEAK SEARCH)
   (MKR →) MARKER →REF LVL
   (PEAK SEARCH) MARKER Δ
   (AMPLITUDE) (⇩) (step-down key).
   (SGL SWP)

7. For each of the frequencies listed in Table 2-46, do the following:
   a. Set the synthesized sweeper to the listed CW frequency.
   b. Enter the appropriate power sensor CAL Factor into the measuring receiver.
   c. Set the synthesized sweeper power level for −10 dBm reading on the measuring receiver.
   d. Press (SGL SWP) and wait for the completion of a new sweep.
   e. On the spectrum analyzer, press (PEAK SEARCH) and record the marker-delta amplitude reading in Table 2-46 as the Actual MKR Δ Amplitude.

   The Actual MKR Δ Amplitude should be less than the Maximum MKR Δ Amplitude listed in Table 2-46.

   Note that the Maximum MKR Δ Amplitude is 10 dB more positive than the specification. This is due to the 10 dB change in reference level made in step 6.

8. Press the following spectrum analyzer keys:

   (MKR) MARKER 1 ON OFF (OFF)
   (DISPLAY)
   (HOLD)
   (AUTO COUPLE) AUTO ALL
   (SPAN) 1 (MHz)
   (AMPLITUDE) REF LVL 10 (−dBm)
   ATTEN AUTO MAN 0 (dB)
   (SWEEP) SWEEP CONT SGL (CONT)

Band 1

9. On the spectrum analyzer, press (FREQUENCY), 4, (GHz).
10. Set the synthesized sweeper CW to 4 GHz.
11. Enter the power sensor 4 GHz CAL Factor into the measuring receiver.
12. Press the following spectrum analyzer keys:

    (PEAK SEARCH)
    (AMPLITUDE) PRESEL PEAK

    Wait for the CAL: PEAKING message to disappear, then press (MKR), MARKERS OFF .

13. Repeat steps 5 through 8 for the synthesized sweeper CW frequencies listed in Table 2-46 for Band 1.

Band 2

14. On the spectrum analyzer, press (FREQUENCY), 9, (GHz).
15. Set the synthesized sweeper CW to 9 GHz.
16. Enter the power sensor 9 GHz CAL Factor into the measuring receiver.
17. Press the following spectrum analyzer keys:

    (PEAK SEARCH)
    (AMPLITUDE) PRESEL PEAK

    Wait for the CAL: PEAKING message to disappear, then press (MKR), MARKERS OFF .

18. Repeat steps 5 through 8 for the synthesized sweeper CW frequencies listed in Table 2-46 for Band 2.

Specification Summary

1. Record the maximum Actual MKR Δ Amplitude from Table 2-46 for Band 0 as TR Entry 1 of the performance verification test record.
2. Record the maximum Actual MKR Δ Amplitude from Table 2-46 for Bands 1 and 2 as TR Entry 2 of the performance verification test record.

Table 2-46. Other Input Related Spurious Worksheet

Band	Spectrum Analyzer Center Frequency	Synthesized Sweeper CW Frequency	MKR Δ Amplitude	
	GHz	MHz	Actual (dBc)	Max. (dBc)
0	2.0	2042.8*	______	−55
	2.0	2642.8*	______	−55
	2.0	9842.8†	______	−55
	2.0	7921.4†	______	−55
	2.0	1820.8‡	______	−55
	2.0	278.5‡	______	−55
1	4.0	4042.8*	______	−55
	4.0	4642.8*	______	−55
	4.0	8321.4†	______	−55
	4.0	3742.9‡	______	−55
2	9.0	9042.8*	______	−55
	9.0	9642.8*	______	−55
	9.0	4982.1†	______	−55
	9.0	9342.8‡	______	−55

* Image Response
† Out-of-Band Response
‡ Multiple Response

29. Spurious Response, HP 8591C and HP 8591E

This test is performed in two parts. Part 1 measures second harmonic distortion; part 2 measures third order intermodulation distortion.

To test second harmonic distortion, a 50 MHz low pass filter is used to filter the source output, ensuring that harmonics read by the spectrum analyzer are internally generated and not coming from the source. To measure the distortion products, the power at the mixer is set 25 dB higher than specified. New test limits have been developed based on this higher power.

With −45 dBm at the input mixer and the distortion products suppressed by 70 dBc, the equivalent Second Order Intercept (SOI) is +25 dBm (−45 dBm + 70 dBc). Therefore, with −20 dBm at the mixer, and the distortion products suppressed by 45 dBc, the equivalent SOI is also +25 dBm (−20 dBm + 45 dBc).

For third order intermodulation distortion, two signals are combined in a directional bridge (for isolation) and are applied to the spectrum analyzer input. The power level of the two signals is 8 dB higher than specified, so the distortion products should be suppressed by 16 dB less than specified. In this manner, the equivalent third order intercept (TOI) is measured.

With two −30 dBm signals at the input mixer and the distortion products suppressed by 70 dBc, the equivalent TOI is +5 dBm (−30 dBm + 70 dBc/2). However, if two −22 dBm signals are present at the input mixer and the distortion products are suppressed by 54 dBc, the equivalent TOI is also +5 dBm (−22 dBm + 54 dBc/2).

Performing the test with a higher power level maintains the measurement integrity while reducing both test time and the dependency upon the source's noise sideband performance.

There are no related adjustment procedures for this performance test.

Equipment Required

Synthesizer/level generator
Synthesized sweeper
Measuring receiver *(used as a power meter)*
Power sensor, 100 kHz to 1800 MHz
50 MHz low pass filter
Directional bridge
Cable, BNC, 120 cm (48 in) *(two required)*
Adapter, Type N (f) to APC 3.5 (f)
Adapter, Type N (f) to BNC (m)
Adapter, Type N (m) to BNC (f)
Adapter, Type N (m) to BNC (m)

Additional Equipment for 75 Ω Input

Power sensor, 75 Ω
Adapter, mechanical, 75 Ω to 50 Ω
Adapter, minimum loss
Adapter, Type N (f) to BNC (m), 75 Ω
Adapter, BNC (m) to BNC (m)

Caution Use only 75 Ω cables, connectors, or adapters on instruments with 75 Ω inputs, or damage to the input connector will occur.

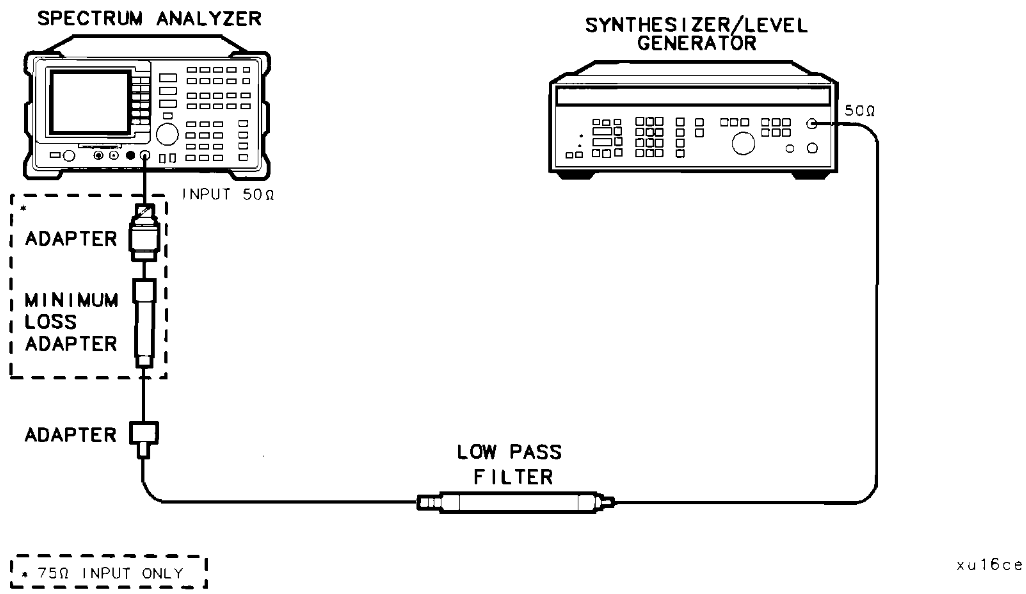


Figure 2-43. Second Harmonic Distortion Test Setup, 30 MHz

Procedure

This performance test consists of two parts:

Part 1: Second Harmonic Distortion, 30 MHz
Part 2: Third Order Intermodulation Distortion, 50 MHz

Perform "Part 1: Second Harmonic Distortion, 30 MHz" before "Part 2: Third Order Intermodulation Distortion, 50 MHz."

Part 1: Second Harmonic Distortion, 30 MHz

1. Set the synthesizer level generator controls as follows:

   FREQUENCY .... 30 MHz
   AMPLITUDE .... −10 dBm
   AMPLITUDE (*75 Ω input only:*) .... −4.3 dBm

2. Connect the equipment as shown in Figure 2-43.

   75 Ω input only: Connect the minimum loss adapter between the LPF and INPUT 75 Ω.

3. Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish. Set the spectrum analyzer by pressing the following keys:

   (FREQUENCY) 30 (MHz)
   (SPAN) 10 (MHz)

   75 Ω input only: Press (AMPLITUDE), More 1 of 2, Amptd Units, then dBm.

   (AMPLITUDE) −10 (dBm)
   (PEAK SEARCH)
   (MKR FCTN) MK TRACK ON OFF (ON)
   (SPAN) 1 (MHz)

4. Wait for the AUTO ZOOM message to disappear, then press the following spectrum analyzer keys:

   (MKR FCTN) MK TRACK ON OFF (OFF)
   (BW) 30 (kHz)

5. Adjust the synthesizer level generator amplitude to place the peak of the signal at the reference level (−10 dBm).
6. Set the spectrum analyzer control as follows:

   (BW) 1 (kHz)
   VID BW AUTO MAN 100 (Hz)

7. Wait for two sweeps to finish, then press the following spectrum analyzer keys:

   (PEAK SEARCH)
   (MKR →) MKR →CF STEP
   (MKR) MARKER Δ
   (FREQUENCY).

8. Press the (⇑), (step-up key) on the spectrum analyzer to step to the second harmonic (at 60 MHz). Press (PEAK SEARCH). Record the MKR Δ Amplitude reading in the performance verification test record as TR Entry 1.

Part 2: Third Order Intermodulation Distortion, 50 MHz

1. Zero and calibrate the measuring receiver and 100 kHz to 1800 MHz power sensor in log mode (power reads out in dBm), as described in the measuring receiver operation manual. Enter the power sensor's 50 MHz Cal Factor into the measuring receiver.

   75 Ω input only: Use a 75 Ω power sensor.

2. Connect the equipment as shown in Figure 2-44 with the output of the directional bridge connected to the 100 kHz to 1.8 GHZ power sensor.

   75 Ω input only: Use the 75 Ω power sensor with a Type N (f) to BNC (m) 75 Ω adapter and use a BNC (m) to BNC (m) 75 Ω adapter in place of the 50 Ω adapter.

   The power measured at the output of the 50 Ω directional bridge by the 75 Ω power sensor, is the equivalent power "seen" by the 75 Ω spectrum analyzer.

Caution Use only 75 Ω cables, connectors, or adapters on instruments with 75 Ω inputs, or damage to the input connector will occur.

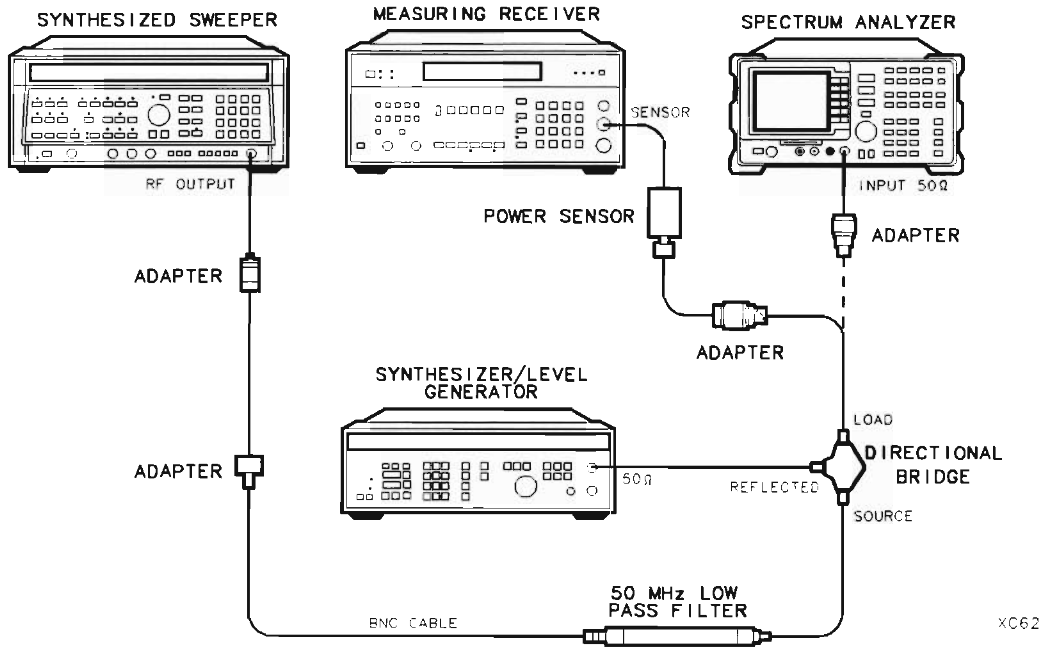


Figure 2-44. Third Order Intermodulation Distortion Test Setup

3. Press INSTRUMENT PRESET on the synthesized sweeper. Set the synthesized sweeper controls as follows:

   POWER LEVEL .... −6 dBm
   CW .... 50 MHz
   RF .... OFF

4. Set the synthesizer/level generator controls as follows:

   FREQUENCY .... 50.050 MHz
   AMPLITUDE .... −6 dBm
   50 Ω/75 Ω SWITCH .... 75 Ω (no RF output)

5. On the spectrum analyzer, press (PRESET), then wait until the preset routine is finished. Set the spectrum analyzer by pressing the following keys:

   (FREQUENCY) 50 (MHz)
   (SPAN) 10 (MHz)

   75 Ω input only: Press (AMPLITUDE), More 1 of 2, Amptd Units, then dBm.

   (AMPLITUDE) −10 (dBm)
   (PEAK SEARCH) More 1 of 2 PEAK EXCURSN 3 (dB)
   (DISPLAY) More 1 of 2 THRESHLD ON OFF (ON) 90 (−dBm)

6. On the synthesized sweeper, set RF on. Adjust the power level until the measuring receiver reads −12 dBm ±0.05 dB.

7. Disconnect the 100 kHz to 4.2 GHZ power sensor from the directional bridge. Connect the directional bridge directly to the spectrum analyzer RF INPUT using an adapter (do not use a cable).

   75 Ω input only: Use a 75 Ω adapter, BNC (m) to BNC (m).

8. On the spectrum analyzer, press the following keys:

   (PEAK SEARCH)
   (MKR FCTN) MK TRACK ON OFF (ON)
   (SPAN) 200 (kHz)

   Wait for the AUTO ZOOM message to disappear, then press the following spectrum analyzer keys:

   (MKR FCTN) MK TRACK ON OFF (OFF)
   (PEAK SEARCH)
   (MKR →) MARKER →REF LVL

9. On the synthesized level generator, set the 50 Ω/75 Ω switch to the 50 Ω position (RF on). Adjust the amplitude until the two signals are displayed at the same amplitude.

10. If necessary, adjust the spectrum analyzer center frequency until the two signals are centered on the display, the set the spectrum analyzer by pressing the following keys:

    (BW) 3 (kHz)
    VID BW AUTO MAN 300 (Hz)

11. Press (PEAK SEARCH), (DISPLAY), DSP LINE ON OFF (ON). Set the display line to a value 54 dB below the current reference level setting.

    The third order intermodulation distortion products should appear 50 kHz below the lower frequency signal and 50 kHz above the higher frequency signal. Their amplitude should be less than the display line.

12. If the distortion products can be seen, proceed as follows:

    a. On the spectrum analyzer, press (PEAK SEARCH), MARKER Δ.
    b. Repeated be less than −54 dBc.

13. If the distortion products cannot be seen, proceed as follows:

    a. On both the synthesized sweeper and the synthesized level generator, increase the POWER LEVEL by 5 dB. Distortion products should now be visible at this higher power level.
    b. On the spectrum analyzer, press (PEAK SEARCH), MARKER Δ.
    c. Repeatedly press NEXT PEAK until the active marker is on the highest distortion products.
    d. On both the synthesized sweeper and the synthesizer level generator, reduce the power level by 5 dB and wait for the completion of a new sweep.
    e. Record the MKR Δ amplitude reading as TR Entry 2 of the performance verification test record. The MKR Δ reading should be less than −54 dBc.

30. Spurious Response, HP 8593E

This test is performed in four parts. The first two parts measure the second harmonic distortion; the last two parts measure the third order intermodulation distortion. Second harmonic distortion and third order intermodulation distortion is checked in both low band (50 kHz to 2.9 GHz) and high band (2.75 to 22 GHz).

To test second harmonic distortion, 50 MHz and 4.4 GHz low pass filters are used to filter the source output, ensuring that harmonics read by the analyzer are internally generated and not coming from the source. The distortion products are measured using the spectrum analyzer marker functions.

For third order intermodulation distortion, two signals are combined in a directional coupler (for isolation) and are applied to the analyzer input. The power level of the two signals is 8 dB higher than specified, so the distortion products should be suppressed by 16 dB less than specified. In this manner, the equivalent Third Order Intercept (TOI) is measured.

With two −30 dBm signals at the input mixer and the distortion products suppressed by 70 dBc, the equivalent TOI is +5 dBm (−30 dBm + 70 dBc/2). However, if two −22 dBm signals are present at the input mixer and the distortion products are suppressed by 54 dBc, the equivalent TOI is also +5 dBm (−22 dBm + 54 dBc/2).

Performing the test with a higher power level maintains the measurement integrity while reducing both test time and the dependency upon the source noise sideband performance.

There are no related adjustments for this performance test.

Equipment Required

Synthesized sweeper *(two required)*
Measuring receiver *(used as a power meter)*
Power sensor, 50 MHz to 26.5 GHz
Power splitter
Low pass filter, 50 MHz
Low pass filter, 4.4 GHz *(two required)*
Directional coupler
Cable, APC 3.5 91 cm (36 in)
Cable, BNC 120 cm (48 in)
Adapter, Type N (m) to APC 3.5 (m)
Adapter, APC 3.5 (f) to APC 3.5 (f) *(two required)*
Adapter, Type N (f) to APC 3.5 (f)
Adapter, Type N (m) to BNC (f) *(two required)*
Adapter, Type N (m) to APC 3.5 (f)
Adapter, Type N (f) to BNC (m)

Additional Equipment for Option 026

Adapter, BNC (f) to SMA (m)

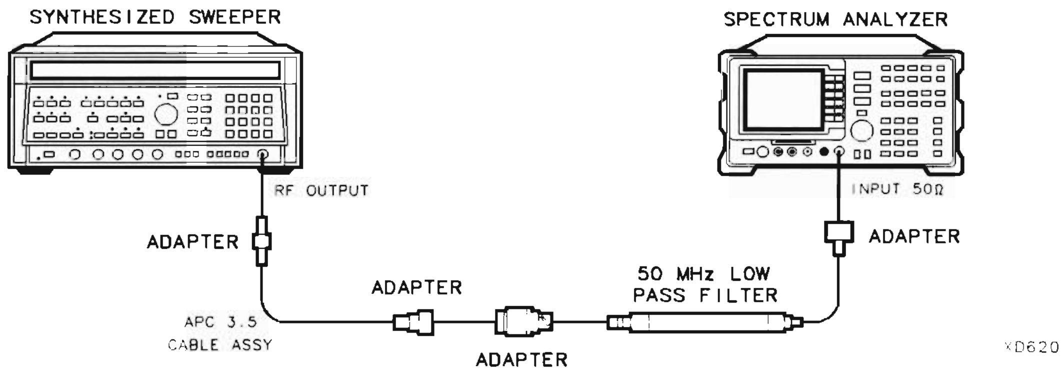


Figure 2-45. Second Harmonic Distortion Test Setup

Procedure

This performance verification test consists of four parts:

Part 1: Second Harmonic Distortion, <2.9 GHz
Part 2: Second Harmonic Distortion, >2.9 GHz
Part 3: Third Order Intermodulation Distortion, <2.9 GHz
Part 4: Third Order Intermodulation Distortion, >2.9 GHz

Part 1: Second Harmonic Distortion, <2.9 GHz

1. Press (PRESET) on the synthesized sweeper, then set the controls as follows:

   CW .... 30 MHz
   POWER LEVEL .... −30 dBm

2. Connect the equipment as shown in Figure 2-45.

   Option 026 only: Use the BNC to SMA adapter with an APC 3.5 (f) to (f) adapter.

3. Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish. Set the spectrum analyzer by pressing the following keys:

   (FREQUENCY) 30 (MHz)
   (SPAN) 1 (MHz)
   (AMPLITUDE) REF LVL 30 (−dBm)
   (BW) RES BW AUTO MAN 30 (kHz)

4. Adjust the synthesized sweeper power level to place the peak of the signal displayed on the spectrum analyzer at the reference level (−30 dBm).

5. Press the following spectrum analyzer keys:

   (BW) RES BW AUTO MAN 1 (kHz)
   VID BW AUTO MAN 100 (Hz)

6. Wait for two sweeps to finish, then press the following spectrum analyzer keys:

   (PEAK SEARCH)
   (MKR →) MKR → CF STEP
   (MKR) MARKER Δ
   (FREQUENCY)

7. Press the (⇧) (step up) key on the spectrum analyzer to step to the second harmonic (at 60 MHz). Set the reference level to −50 dBm.
8. Wait for one full sweep, then press (PEAK SEARCH).
9. Record the MKR Δ Amplitude reading as TR Entry 1 of the performance verification test record. The amplitude reading should be less than the specified limit.

Note that the Max. MKR Δ Amplitude Reading is 20 dB higher than the specification. This is a result of changing the reference level from −30 dBm to −50 dBm.

Part 2: Second Harmonic Distortion, >2.9 GHz

10. Zero and calibrate the measuring receiver and 50 MHz to 26.5 GHz power sensor in log mode (power reads out in dBm), as described in the measuring receiver operation manual. Enter the power sensor 3 GHz Cal Factor into the measuring receiver.
11. Measure the noise level at 5.6 GHz using the following steps:
    a. Remove any cable or adapters from the spectrum analyzer INPUT 50 Ω.
    b. Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish. Set the spectrum analyzer by pressing the following keys:

       (FREQUENCY) 5.6 (GHz)
       (SPAN) 0 (Hz)
       (AMPLITUDE) `REF LVL` 40 (−dBm)
       (BW) `RES BW AUTO MAN` 1 (kHz)
       `VID BW AUTO MAN` 30 (Hz)
       `VID AVG ON OFF` (ON) 10 (ENTER)
       (SWEEP) `SWP TIME AUTO MAN` 5.0 (sec)

    c. Press (SGL SWP). Wait until `AVG 10` is displayed along the left side of the CRT display.
    d. Press (PEAK SEARCH) on the spectrum analyzer and record the marker amplitude reading as the Noise Level at 5.6 GHz in Table 2-47.
12. Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish. Set the spectrum analyzer by pressing the following keys:

    (SPAN) `Band Lock` `2.75-6.5 BAND 1`
    (FREQUENCY) 2.8 (GHz)
    (SPAN) 10 (MHz)

13. Connect the equipment as shown in Figure 2-46, with the output of the synthesized sweeper connected to the input of the power splitter, and the power splitter outputs connected to the spectrum analyzer and the power sensor.

    Option 026 only: Use the BNC to SMA adapter with an APC 3.5 (f) to (f) adapter.
14. On the synthesized sweeper, press preset, then set the controls as follows:

    CW .... 2.8 GHz
    POWER LEVEL .... 0 dBm
15. On the spectrum analyzer, press the following keys:

    (PEAK SEARCH)
    (AMPLITUDE) `PRESEL PEAK`

    Wait for the `CAL: PEAKING` message to disappear.

16. Press (PEAK SEARCH), MARKER Δ, then record the power meter reading at 2.8 GHz in Table 2-47.
17. Set the synthesized sweeper CW to 5.6 GHz.
18. Press the following spectrum analyzer keys:

    (FREQUENCY) 5.6 (GHz)
    (PEAK SEARCH)
    (AMPLITUDE) PRESEL PEAK.

    Wait for the CAL: PEAKING message to disappear.

    (PEAK SEARCH)
    (MKR FCTN) MK TRACK ON OFF (ON)

19. Adjust the synthesized sweeper power level until the Marker Δ Amplitude reads 0 dB ±0.20 dB.
20. Enter the power sensor 6 GHz Cal Factor into the power meter.
21. Record the Power Meter Reading at 5.6 GHz in Table 2-47.
22. Subtract the Power Meter Reading at 5.6 GHz from the Power Meter Reading at 2.8 GHz, then record this value as the Frequency Response Error (FRE) in Table 2-47. For example, if the Power Meter Reading at 5.6 GHz is −6.45 dBm and the Power Meter Reading at 2.8 GHz is −7.05 dBm, the Frequency Response Error would be −7.05 dBm − (−6.45 dBm) = −0.60 dB.

    Power Meter Reading at 2.8 GHz - Power Meter Reading at 5.6 GHz = FRE

Table 2-47. Second Harmonic Distortion Worksheet

Description	Measurement
Noise Level at 5.6 GHz	______dBm
Power Meter Reading at 2.8 GHz	______dBm
Power Meter Reading at 5.6 GHz	______dBm
Frequency Response Error (FRE)	______dB
Distortion-limited Specification	______dBc
Noise-limited Specification	______dBc

23. Calculate the desired maximum marker amplitude reading as follows:
    a. Add the Frequency Response Error (FRE) to −60 dBc (specification is −100 dBc, but reference level will be changed by 40 dB to yield the required dynamic range), then record as the Distortion-limited Specification in Table 2-47.

       Distortion-limited Specification = −60 dBc + FRE

    b. Subtract −40 dBm (reference level setting) from Noise Level at 5.6 GHz, then record in Table 2-47.

       Noise-limited Specification = Noise Level at 5.6 GHz + 40 dBm

c. Record the more positive of the values recorded in a and b above as TR Entry 2 of the performance verification test record. For example, if the value in a is −59 dBc and the value in b is −61 dBc, record −59 dBc.

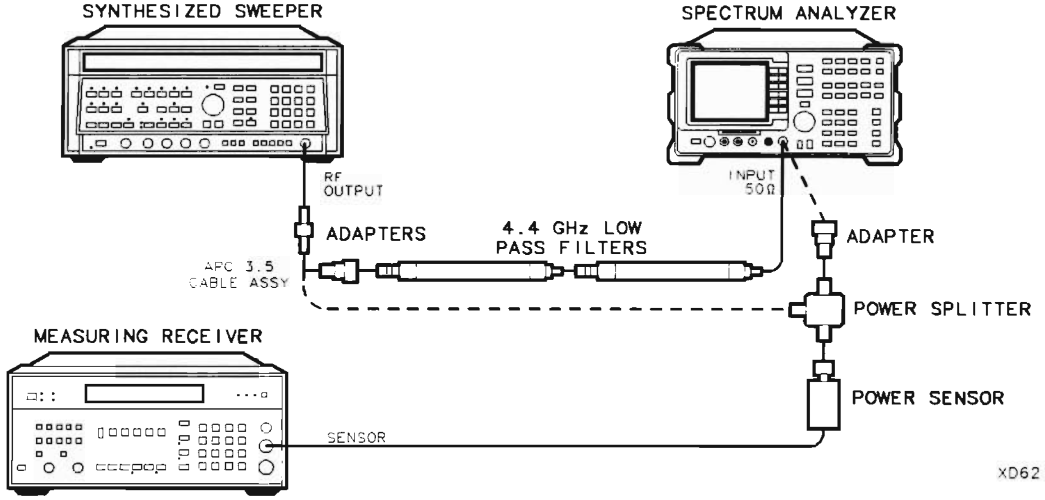


Figure 2-46. Second Harmonic Distortion Test Setup, >2.9 GHz

24. Connect the equipment as shown in Figure 2-46 with the filters in place.
25. Set the synthesized sweeper controls as follows:

    CW .... 2.8 GHz
    POWER LEVEL .... 0 dBm

26. Set the spectrum analyzer by pressing the following keys:

    (FREQUENCY) 2.8 (GHz)
    (MKR) MARKERS OFF
    (PEAK SEARCH)
    (AMPLITUDE) PRESEL PEAK

    Wait for the CAL: PEAKING message to disappear.

    (MKR FCTN) MK TRACK ON OFF (ON)
    (SPAN) 100 (kHz)

27. Adjust the synthesized sweeper power level for a spectrum analyzer marker amplitude reading of 0 dBm ±0.2 dB.
28. On the spectrum analyzer, press the following keys:

    (MKR FCTN) MK TRACK ON OFF (OFF)
    (PEAK SEARCH) MARKER Δ
    (FREQUENCY) 5.6 (GHz)
    (SPAN) 10 (MHz)

29. Remove the filters and connect the synthesized sweeper output directly to the spectrum analyzer INPUT 50 Ω.

30. On the spectrum analyzer, press the following keys:

 (PEAK SEARCH)

 (AMPLITUDE) PRESEL PEAK

 Wait for the CAL: PEAKING message to disappear.

 (MKR FCTN) MK TRACK ON OFF (ON)

 (SPAN) 100 (kHz)

31. Reinstall the filters between the synthesized sweeper output and the spectrum analyzer INPUT 50 Ω.
32. Set the spectrum analyzer by pressing the following keys:

 (AMPLITUDE) REF LVL 40 (-dBm)

 (BW) VID BW AUTO MAN 30 (Hz)

 VID AVG ON OFF (ON) 10 (ENTER)

 (SGL SWP)

 Wait until AVG 10 is displayed along the left side of the CRT display.

33. Press (PEAK SEARCH), then record the Marker Amplitude Reading as TR Entry 3 of the performance verification test record.

 The Marker Amplitude Reading should be more negative than the Specification previously recorded as TR Entry 2 of the performance verification test record.

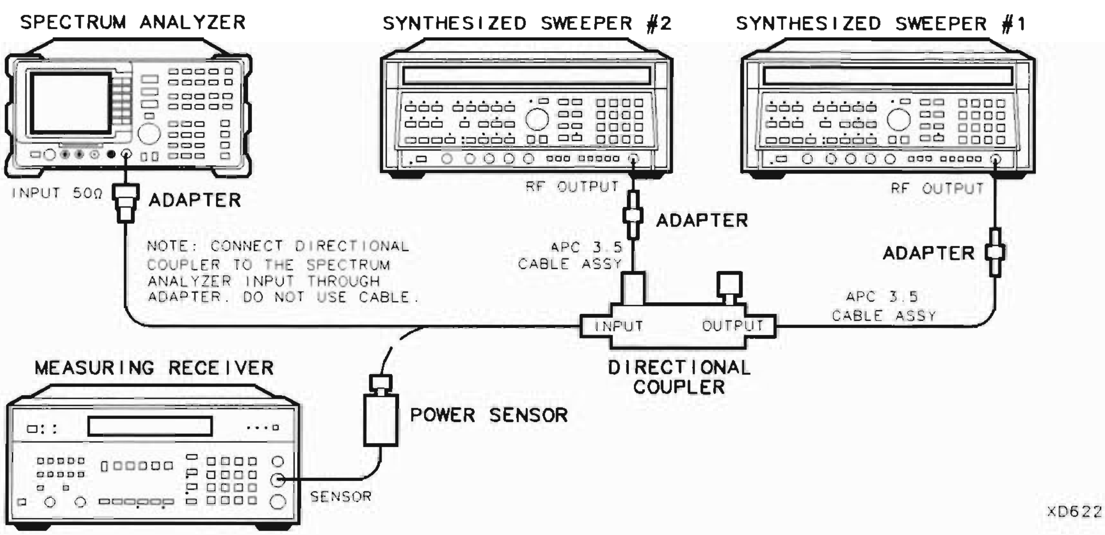


Figure 2-47. Third-Order Intermodulation Distortion Test Setup

Part 3: Third Order Intermodulation Distortion, <2.9 GHz

34. Zero and calibrate the measuring receiver and 50 MHz to 26.5 GHz power sensor in log mode (power reads out in dBm), as described in the measuring receiver operation manual. Enter the power sensor 3 GHz Cal Factor into the measuring receiver.
35. Connect the equipment as shown in Figure 2-47 with the input of the directional coupler connected to the power sensor.
36. Press instrument preset on each synthesized sweeper. Set each of the synthesized sweeper controls as follows:

    POWER LEVEL .... −15 dBm
    CW (synthesized sweeper #1) .... 2.800 GHz
    CW (synthesized sweeper #2) .... 2.80005 GHz
    RF .... OFF

37. On the spectrum analyzer, press (PRESET), then wait until the preset routine is finished. Set the controls as follows:

    (FREQUENCY) 2.8 (GHz)
    (SPAN) 1 (MHz)
    (AMPLITUDE) REF LVL 10 (−dBm)
    (PEAK SEARCH) PEAK EXCURSN 3 (dB)
    (DISPLAY) THRESHLD ON OFF (ON) 90 (−dBm)

38. On synthesized sweeper #1, set RF on. Adjust the power level until the measuring receiver reads −12 dBm ±0.05 dB.
39. Disconnect the power sensor from the directional coupler. Connect the directional coupler directly to the spectrum analyzer INPUT 50 Ω using an adapter (do not use a cable).

    Option 026 only: Connect the directional coupler directly to the spectrum analyzer INPUT 50 Ω.

40. On the spectrum analyzer, press the following keys:

    (PEAK SEARCH)
    (MKR FCTN) MK TRACK ON OFF (ON)
    (SPAN) 200 (kHz)

    Wait for the AUTO ZOOM message to disappear.

    (MKR FCTN) MK TRACK ON OFF (OFF)
    (FREQUENCY) (⇧) (step-up key)
    (PEAK SEARCH)
    (MKR →) MARKER → REF LVL

41. On synthesized sweeper #2, set RF on. Adjust the power level until the two signals are displayed at the same amplitude.

    If necessary, adjust the spectrum analyzer center frequency until the two signals are centered on the display.

42. Set the spectrum analyzer by pressing the following keys:

    (BW) RES BW AUTO MAN 1 (kHz)
    VID BW AUTO MAN 100 (Hz)

43. Press the following analyzer keys:

    (PEAK SEARCH) MARKER Δ

    (DISPLAY) DSP LINE ON OFF (ON)

    Set the display line to a value 54 dB below the current reference level setting.

44. The third-order intermodulation distortion products should appear 50 kHz below the lower frequency signal and 50 kHz above the higher frequency signal. Their amplitude should be less than the display line. See Figure 2-48.

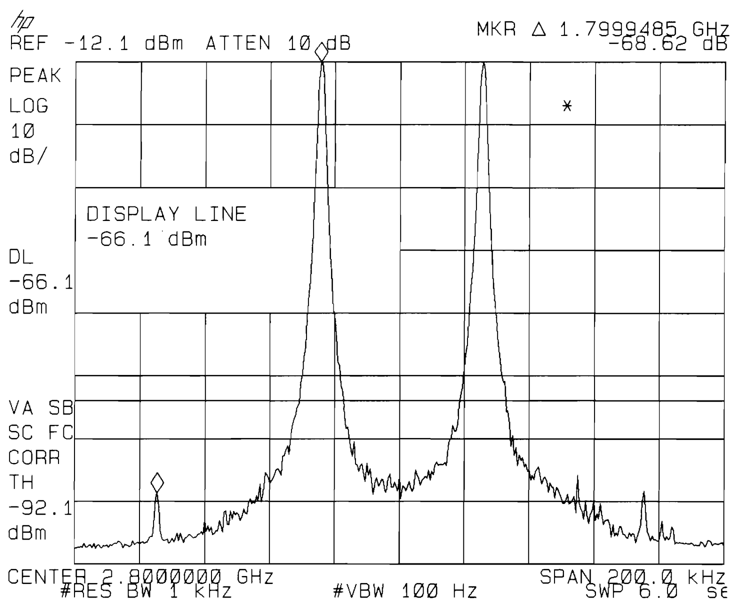


Figure 2-48. Third Order Intermodulation Distortion

45. If the distortion products can be seen, proceed as follows:
    a. On the spectrum analyzer, press (MKR →) and Peak Menu.
    b. Repeatedly press NEXT PEAK until the active marker is on the desired distortion product.
    c. Record the MKR Δ amplitude reading as TR Entry 4 in the performance verification test record. The MKR Δ reading should be less than the specified limit.

46. If the distortion products cannot be seen, proceed as follows:
    a. On each synthesized sweeper, increase the power level by 5 dB. Distortion products should now be visible at this higher power level.
    b. On the spectrum analyzer, press (MKR →) and Peak Menu.
    c. Repeatedly press NEXT PEAK until the active marker is on one of the distortion products.
    d. On each synthesized sweeper, reduce the power level by 5 dB and wait for completion of a new sweep.
    e. Record the MKR Δ amplitude reading in as TR Entry 4 in the performance verification test record. The MKR Δ reading should be less than the specified limit.

Part 4: Third Order Intermodulation Distortion, >2.9 GHz

47. Enter the Power Sensor 4 GHz Cal Factor into the measuring receiver.
48. Disconnect the directional coupler from the spectrum analyzer, then connect the power sensor to the output of the directional coupler.
49. Set each of the synthesized sweeper controls as follows:

    POWER LEVEL .... −15 dBm
    CW (synthesized sweeper #1) .... 4.000 GHz
    CW (synthesized sweeper #2) .... 4.00005 GHz
    RF .... OFF

50. On the spectrum analyzer, press (PRESET), then wait until the preset routine is finished. Set the spectrum analyzer by pressing the following keys:

    (FREQUENCY) 4.0 (GHz)
    (SPAN) 1 (MHz)
    (BW) REF LVL 10 (−dBm)
    (PEAK SEARCH) PEAK EXCURSN 3 (dB)
    (DISPLAY) THRESHLD ON OFF 90 (−dBm)

51. On synthesized sweeper #1, set RF on. Adjust the power level until the measuring receiver reads −12 dBm ±0.05 dB.
52. Disconnect the power sensor from the directional coupler. Connect the directional coupler directly to the spectrum analyzer INPUT 50 Ω using an adapter (do not use a cable).

    Option 026 only: Connect the directional coupler directly to the spectrum analyzer INPUT 50 Ω.

53. On the spectrum analyzer, press the following key:

    (PEAK SEARCH)
    (AMPLITUDE) PRESEL PEAK

    Wait for the CAL: PEAKING message to disappear.

    (MKR FCTN) MK TRACK ON OFF (ON)
    (SPAN) 200 (kHz)

    Wait for the AUTO ZOOM message to disappear, then press the following spectrum analyzer keys:

    (MKR FCTN) MK TRACK ON OFF (OFF)
    (FREQUENCY) (⇧) (step-up key)
    (PEAK SEARCH)
    (MKR →) MARKER → REF LVL

54. On synthesized sweeper #2, set RF on. Adjust the power level until the two signals are displayed at the same amplitude.

    If necessary, adjust the spectrum analyzer center frequency until the two signals are centered on the display.

55. Set the spectrum analyzer by pressing the following keys:

    (BW) RES BW AUTO MAN 1 (kHz)
    VID BW AUTO MAN 100 (Hz)

56. Press (PEAK SEARCH), **MARKER Δ** then set the DISPLAY

LINE to a value 54 dB below the current reference level setting.

The third-order intermodulation distortion products should appear 50 kHz below the lower frequency signal and 50 kHz above the higher frequency signal. Their amplitude should be less than the display line. See Figure 2-48.

57. If the distortion products can be seen, proceed as follows:

   a. On the spectrum analyzer, press (MKR →) and **Peak Menu**.
   b. Repeatedly press **NEXT PEAK** until the active marker is on the desired distortion product.
   c. Record the MKR Δ amplitude reading as TR Entry 5 of the performance verification test record. The MKR Δ reading should be less than the specified limit.

58. If the distortion products cannot be seen, proceed as follows:

   a. On each synthesized sweeper, increase the power level by 5 dB.

      Distortion products should now be visible at this higher power level.
   b. On the spectrum analyzer, press (MKR →) and **Peak Menu**.
   c. Repeatedly press **NEXT PEAK** until the active marker is on one of the distortion products.
   d. On each synthesized sweeper, reduce the power level by 5 dB, then wait for completion of a new sweep.
   e. Record the MKR Δ amplitude reading in as TR Entry 5 of the performance verification test record. The MKR Δ reading should be less than the specified limit.

31. Spurious Response, HP 8594E

This test is performed in two parts. The first part measures second harmonic distortion; the second part measures third order intermodulation distortion.

To test second harmonic distortion, a 50 MHz low pass filter is used to filter the source output, ensuring that harmonics read by the analyzer are internally generated and not coming from the source. The distortion products are measured using the analyzer marker functions.

For third order intermodulation distortion, two signals are combined in a directional coupler (for isolation) and are applied to the analyzer input. The power level of the two signals is 8 dB higher than specified, so the distortion products should be suppressed by 16 dB less than specified. In this manner, the equivalent Third Order Intercept (TOI) is measured.

With two −30 dBm signals at the input mixer and the distortion products suppressed by 70 dBc, the equivalent TOI is +5 dBm (−30 dBm + 70 dBc/2). However, if two −22 dBm signals are present at the input mixer and the distortion products are suppressed by 54 dBc, the equivalent TOI is also +5 dBm (−22 dBm + 54 dBc/2).

Performing the test with a higher power level maintains the measurement integrity while reducing both test time and the dependency upon the source's noise sideband performance.

There are no related adjustment procedures for this performance verification test.

Equipment Required

Synthesized sweeper *(two required)*
Measuring receiver *(used as a power meter)*
Power sensor, 50 MHz to 2.9 GHz
Power splitter
Low pass filter, 50 MHz
Directional coupler
Cable, APC 3.5 Cable 91 cm (36 in)
Cable, BNC 120 cm (48 in)
Adapter, Type N (m) to APC 3.5 (m)
Adapter, APC 3.5 (f) to APC 3.5 (f) *(two required)*
Adapter, Type N (f) to APC 3.5 (f)
Adapter, Type N (m) to BNC (f) *(two required)*
Adapter, Type N (m) to APC 3.5 (f)
Adapter, Type N (f) to BNC (m)

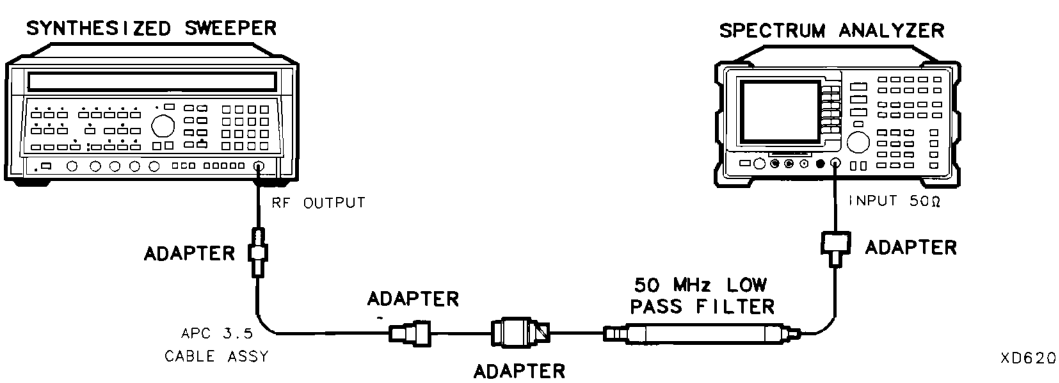


Figure 2-49. Second Harmonic Distortion Test Setup

Procedure

Second Harmonic Distortion

1. Press PRESET on the synthesized sweeper, then set the controls as follows:

   CW .... 30 MHz
   POWER LEVEL .... −30 dBm

2. Connect the equipment as shown in Figure 2-49.
3. Press (PRESET) on the spectrum analyzer, then wait for the preset to finish. Set the spectrum analyzer by pressing the following keys:

   (FREQUENCY) 30 (MHz)
   (SPAN) 1 (MHz)
   (AMPLITUDE) −30 (dBm)
   (BW) 30 (kHz)

4. Adjust the synthesized sweeper power level to place the peak of the signal at the reference level (−30 dBm).
5. Set the spectrum analyzer by pressing the following keys:

   (BW) 1 (kHz)
   VID BW AUTO MAN 100 (Hz)

6. Wait for two sweeps to finish, then press the following spectrum analyzer keys:

   (PEAK SEARCH)
   (MKR →) MKR → CF STEP
   (MKR) MARKER Δ
   (FREQUENCY)

7. Press the (⇧) (step up) key on the spectrum analyzer to step to the second harmonic (at 60 MHz). Set the reference level to −50 dBm. Wait for a full sweep to finish, then press (PEAK SEARCH).

8. Record the MKR Δ Amplitude reading as TR Entry 1 of the performance verification test record.

   Note that the Max MKR Δ Amplitude Reading is 20 dB higher than the specification. This is a result of changing the reference level from −30 dBm to −50 dBm.

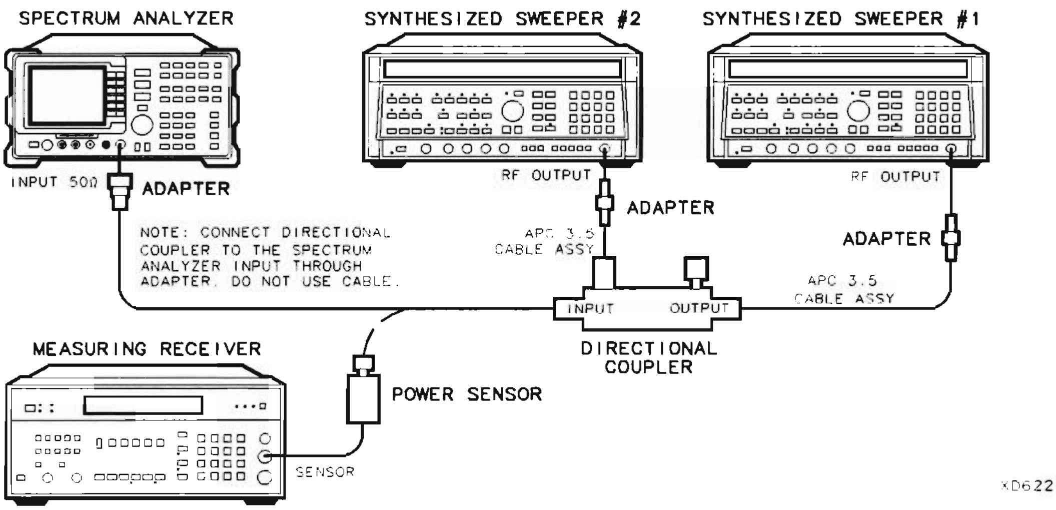


Figure 2-50. Third-Order Intermodulation Distortion Test Setup

Third Order Intermodulation Distortion

9. Zero and calibrate the measuring receiver and 50 MHz to 2.9 GHz power sensor combination in log mode (RF power readout in dBm). Enter the power sensor 3 GHz Cal Factor into the measuring receiver.
10. Connect the equipment as shown in Figure 2-50 with the input of the directional coupler connected to the power sensor.
11. Press INSTR PRESET on each synthesized sweeper. Set each of the synthesized sweeper controls as follows:

    POWER LEVEL .... −15 dBm
    CW (synthesized sweeper #1) .... 2.800 GHz
    CW (synthesized sweeper #2) .... 2.80005 GHz
    RF .... OFF

12. On the spectrum analyzer, press (PRESET) and wait until the preset routine is finished. Press the following spectrum analyzer keys:

    (FREQUENCY) 2.8 (GHz)
    (SPAN) 1 (MHz)
    (AMPLITUDE) −10 (dBm)
    (PEAK SEARCH) `More 1 of 2` `PEAK EXCURSN` 3 (dB)
    (DISPLAY) `More 1 of 2` `THRESHLD ON OFF` (ON) −90 (dBm)

13. On synthesized sweeper #1, set RF on. Adjust the power level until the measuring receiver reads −12 dBm ±0.05 dB.
14. Disconnect the power sensor from the directional coupler. Connect the directional coupler directly to the spectrum analyzer INPUT 50 Ω using an adapter (do not use a cable).

15. On the spectrum analyzer, press the following keys:

    (PEAK SEARCH)
    (MKR FCTN) MK TRACK ON OFF (ON)
    (SPAN) 200 (kHz)

    Wait for the AUTO ZOOM message to disappear, then press the following spectrum analyzer keys:

    (MKR FCTN) MK TRACK ON OFF (OFF)
    (FREQUENCY) (⇑) (step-up key)
    (PEAK SEARCH)
    (MKR →) MARKER → REF LVL

16. On synthesized sweeper #2, set RF on. Adjust the power level until the two signals are displayed at the same amplitude.

17. If necessary, adjust the spectrum analyzer Center Frequency until the two signals are centered on the display. Press the following spectrum analyzer keys:

    (BW) 1 (kHz)
    VID BW AUTO MAN 100 (Hz)
    (PEAK SEARCH) MARKER Δ
    (DISPLAY) DSP LINE ON OFF (ON)

    Set the display line to a value 54 dB below the current reference level setting.

18. The third-order intermodulation distortion products should appear 50 kHz below the lower frequency signal and 50 kHz above the higher frequency signal. Their amplitude should be less than the display line. See Figure 2-51.

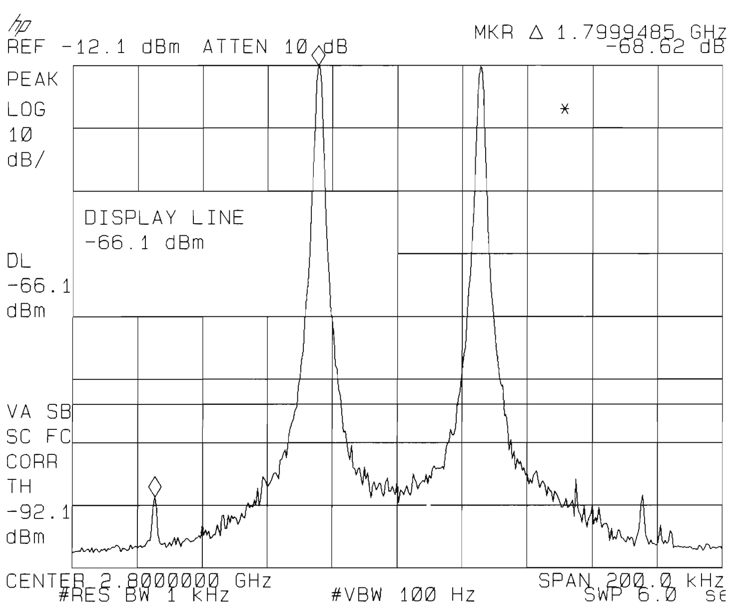


Figure 2-51. Third Order Intermodulation Distortion

19. If the distortion products can be seen, proceed as follows:
    a. On the spectrum analyzer, press (MKR →), More 1 of 2, PEAK MENU.
    b. Repeatedly press (PEAK SEARCH) until the active marker is on the desired distortion product.
    c. Record the MKR Δ amplitude reading as TR Entry 2 of the performance verification test record. The MKR Δ reading should be less than the specified limit.
20. If the distortion products cannot be seen, proceed as follows:
    a. On each synthesized sweeper, increase the power level by 5 dB. Distortion products should now be visible at this higher power level.
    b. On the spectrum analyzer, press (MKR →) and PEAK MENU.
    c. Repeatedly press (PEAK SEARCH) until the active marker is on one of the distortion products.
    d. On each synthesized sweeper, reduce the power level by 5 dB and wait for completion of a new sweep.
    e. Record the MKR Δ amplitude reading as TR Entry 2 of the performance verification test record. The MKR Δ reading should be less than the specified limit.

32. Spurious Response, HP 8595E

This test is performed in four parts. The first two parts measure the second harmonic distortion; the last two parts measure the third order intermodulation distortion. Second harmonic distortion and third order intermodulation distortion is checked in both low band (50 kHz to 2.9 GHz) and high band (2.75 to 22 GHz).

To test second harmonic distortion, 50 MHz and 4.4 GHz low pass filters are used to filter the source output, ensuring that harmonics read by the analyzer are internally generated and not coming from the source. The distortion products are measured using the spectrum analyzer marker functions.

For third order intermodulation distortion, two signals are combined in a directional coupler (for isolation) and are applied to the analyzer input. The power level of the two signals is 8 dB higher than specified, so the distortion products should be suppressed by 16 dB less than specified. In this manner, the equivalent Third Order Intercept (TOI) is measured.

With two −30 dBm signals at the input mixer and the distortion products suppressed by 70 dBc, the equivalent TOI is +5 dBm (−30 dBm + 70 dBc/2). However, if two −22 dBm signals are present at the input mixer and the distortion products are suppressed by 54 dBc, the equivalent TOI is also +5 dBm (−22 dBm + 54 dBc/2).

Performing the test with a higher power level maintains the measurement integrity while reducing both test time and the dependency upon the source noise sideband performance.

There are no related adjustments for this performance test.

Equipment Required

Synthesized sweeper *(two required)*
Measuring receiver *(used as a power meter)*
Power sensor, 50 MHz to 6.5 GHz
Power splitter
Low pass filter, 50 MHz
Low pass filter, 4.4 GHz *(two required)*
Directional coupler
Cable, APC 3.5 91 cm (36 in)
Cable, BNC 120 cm (48 in)
Adapter, Type N (m) to APC 3.5 (m)
Adapter, APC 3.5 (f) to APC 3.5 (f) *(two required)*
Adapter, Type N (f) to APC 3.5 (f)
Adapter, Type N (m) to BNC (f) *(two required)*
Adapter, Type N (m) to APC 3.5 (f)
Adapter, Type N (f) to BNC (m)

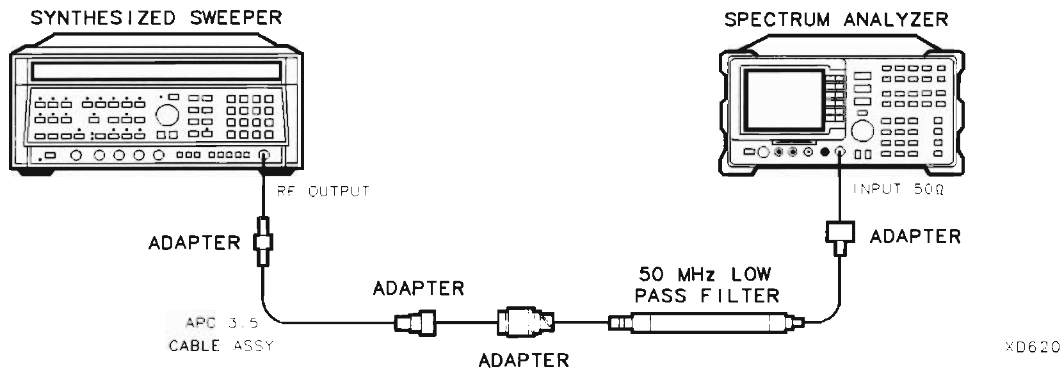


Figure 2-52. Second Harmonic Distortion Test Setup

Procedure

This performance verification test consists of four parts:

Part 1: Second Harmonic Distortion, <2.9 GHz
Part 2: Second Harmonic Distortion, >2.9 GHz
Part 3: Third Order Intermodulation Distortion, <2.9 GHz
Part 4: Third Order Intermodulation Distortion, >2.9 GHz

Part 1: Second Harmonic Distortion, <2.9 GHz

1. Press (PRESET) on the synthesized sweeper, then set the controls as follows:

   CW .... 30 MHz
   POWER LEVEL .... −30 dBm

2. Connect the equipment as shown in Figure 2-52.

3. Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish. Set the spectrum analyzer by pressing the following keys:

   (FREQUENCY) 30 (MHz)
   (SPAN) 1 (MHz)
   (AMPLITUDE) REF LVL 30 (−dBm)
   (BW) RES BW AUTO MAN 30 (kHz)

4. Adjust the synthesized sweeper power level to place the peak of the signal displayed on the spectrum analyzer at the reference level (−30 dBm).

5. Press the following spectrum analyzer keys:

   (BW) RES BW AUTO MAN 1 (kHz)
   VID BW AUTO MAN 100 (Hz)

6. Wait for two sweeps to finish, then press the following spectrum analyzer keys:

   (PEAK SEARCH)
   (MKR →) MKR → CF STEP
   (MKR) MARKER Δ
   (FREQUENCY)

7. Press the ⇧ (step up) key on the spectrum analyzer to step to the second harmonic (at 60 MHz). Set the reference level to −50 dBm.
8. Wait for one full sweep, then press PEAK SEARCH.
9. Record the MKR Δ Amplitude reading as TR Entry 1 of the performance verification test record. The amplitude reading should be less than the specified limit.

Note that the Max. MKR Δ Amplitude Reading is 20 dB higher than the specification. This is a result of changing the reference level from −30 dBm to −50 dBm.

Part 2: Second Harmonic Distortion, >2.9 GHz

10. Zero and calibrate the measuring receiver and 50 MHz to 6.5 GHz power sensor in log mode (power reads out in dBm), as described in the measuring receiver operation manual. Enter the power sensor 3 GHz Cal Factor into the measuring receiver.
11. Measure the noise level at 5.6 GHz using the following steps:
    a. Remove any cable or adapters from the spectrum analyzer INPUT 50 Ω.
    b. Press PRESET on the spectrum analyzer, then wait for the preset routine to finish. Set the spectrum analyzer by pressing the following keys:

       FREQUENCY 5.6 GHz
       SPAN 0 Hz
       AMPLITUDE REF LVL 40 −dBm
       BW RES BW AUTO MAN 1 kHz
       VID BW AUTO MAN 30 Hz
       VID AVG ON OFF (ON) 10 ENTER
       SWEEP SWP TIME AUTO MAN 5.0 sec

    c. Press SGL SWP. Wait until AVG 10 is displayed along the left side of the CRT display.
    d. Press PEAK SEARCH on the spectrum analyzer and record the marker amplitude reading as the Noise Level at 5.6 GHz in Table 2-48.
12. Press PRESET on the spectrum analyzer, then wait for the preset routine to finish. Set the spectrum analyzer by pressing the following keys:

    SPAN Band Lock 2.75-6.5 BAND 1
    FREQUENCY 2.8 GHz
    SPAN 10 MHz

13. Connect the equipment as shown in Figure 2-53, with the output of the synthesized sweeper connected to the input of the power splitter, and the power splitter outputs connected to the spectrum analyzer and the power sensor.
14. On the synthesized sweeper, press preset, then set the controls as follows:

    CW .... 2.8 GHz
    POWER LEVEL .... 0 dBm

15. On the spectrum analyzer, press the following keys:

    PEAK SEARCH
    AMPLITUDE PRESEL PEAK

    Wait for the CAL: PEAKING message to disappear.

16. Press (PEAK SEARCH), MARKER Δ, then record the power meter reading at 2.8 GHz in Table 2-48.
17. Set the synthesized sweeper CW to 5.6 GHz.
18. Press the following spectrum analyzer keys:

    (FREQUENCY) 5.6 (GHz)
    (PEAK SEARCH)
    (AMPLITUDE) PRESEL PEAK.

    Wait for the CAL: PEAKING message to disappear.

    (PEAK SEARCH)
    (MKR FCTN) MK TRACK ON OFF (ON)

19. Adjust the synthesized sweeper power level until the Marker Δ Amplitude reads 0 dB ±0.20 dB.
20. Enter the power sensor 6 GHz Cal Factor into the power meter.
21. Record the Power Meter Reading at 5.6 GHz in Table 2-48.
22. Subtract the Power Meter Reading at 5.6 GHz from the Power Meter Reading at 2.8 GHz, then record this value as the Frequency Response Error (FRE) in Table 2-48. For example, if the Power Meter Reading at 5.6 GHz is −6.45 dBm and the Power Meter Reading at 2.8 GHz is −7.05 dBm, the Frequency Response Error would be −7.05 dBm − (−6.45 dBm) = −0.60 dB.

    Power Meter Reading at 2.8 GHz - Power Meter Reading at 5.6 GHz = FRE

Table 2-48. Second Harmonic Distortion Worksheet

Description	Measurement
Noise Level at 5.6 GHz	____________dBm
Power Meter Reading at 2.8 GHz	____________dBm
Power Meter Reading at 5.6 GHz	____________dBm
Frequency Response Error (FRE)	____________dB
Distortion-limited Specification	____________dBc
Noise-limited Specification	____________dBc

23. Calculate the desired maximum marker amplitude reading as follows:
   a. Add the Frequency Response Error (FRE) to −60 dBc (specification is −100 dBc, but reference level will be changed by 40 dB to yield the required dynamic range), then record the Distortion-limited Specification in Table 2-48.

      Distortion-limited Specification = −60 dBc + FRE
   b. Subtract −40 dBm (reference level setting) from Noise Level at 5.6 GHz, then record in Table 2-48.

      Noise-limited Specification = Noise Level at 5.6 GHz + 40 dBm
   c. Record the more positive of the values recorded in a and b above as TR Entry 2 of the performance verification test record. For example, if the value in a is −59 dBc and the value in b is −61 dBc, record −59 dBc.

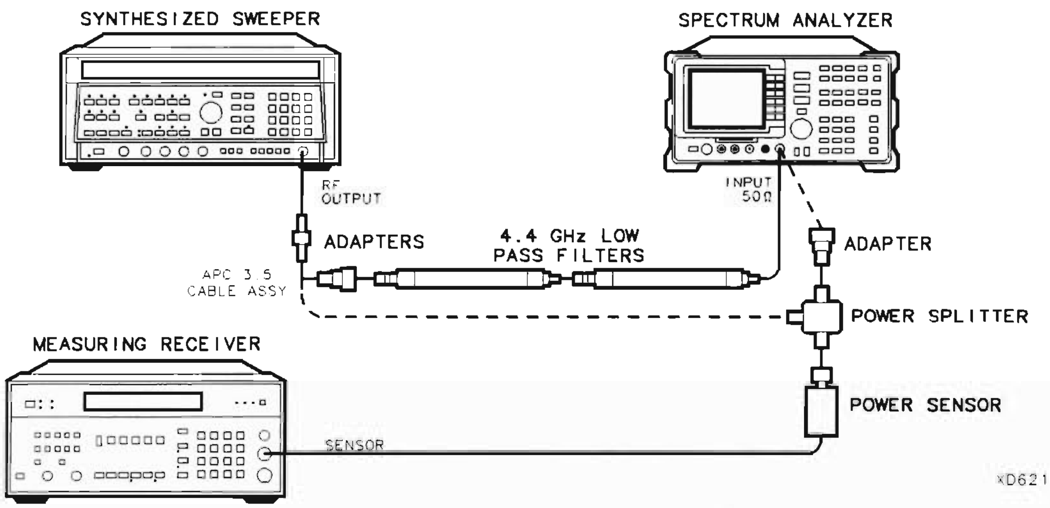


Figure 2-53. Second Harmonic Distortion Test Setup, >2.9 GHz

24. Connect the equipment as shown in Figure 2-53 with the filters in place.
25. Set the synthesized sweeper controls as follows:

   CW .... 2.8 GHz
   POWER LEVEL .... 0 dBm
26. Set the spectrum analyzer by pressing the following keys:

   (FREQUENCY) 2.8 (GHz)
   (MKR) MARKERS OFF
   (PEAK SEARCH)
   (AMPLITUDE) PRESEL PEAK

   Wait for the CAL: PEAKING message to disappear.

   (MKR FCTN) MK TRACK ON OFF (ON)
   (SPAN) 100 (kHz)

27. Adjust the synthesized sweeper power level for a spectrum analyzer marker amplitude reading of 0 dBm ±0.2 dB.
28. On the spectrum analyzer, press the following keys:

    (MKR FCTN) MK TRACK ON OFF (OFF)

    (PEAK SEARCH) MARKER Δ

    (FREQUENCY) 5.6 (GHz)
    (SPAN) 10 (MHz)

29. Remove the filters and connect the synthesized sweeper output directly to the spectrum analyzer INPUT 50 Ω.
30. On the spectrum analyzer, press the following keys:

    (PEAK SEARCH)
    (AMPLITUDE) PRESEL PEAK

    Wait for the CAL: PEAKING message to disappear.

    (MKR FCTN) MK TRACK ON OFF (ON)
    (SPAN) 100 (kHz)

31. Reinstall the filters between the synthesized sweeper output and the spectrum analyzer INPUT 50 Ω.
32. Set the spectrum analyzer by pressing the following keys:

    (AMPLITUDE) REF LVL 40 (−dBm)

    (BW) VID BW AUTO MAN 30 (Hz)

    VID AVG ON OFF (ON) 10 (ENTER)

    (SGL SWP)

    Wait until AVG 10 is displayed along the left side of the CRT display.

33. Press (PEAK SEARCH), then record the Marker Amplitude Reading as TR Entry 3 of the performance verification test record.

    The Marker Amplitude Reading should be more negative than the Specification previously recorded as TR Entry 2 of the performance verification test record.

Part 3: Third Order Intermodulation Distortion, <2.9 GHz

34. Zero and calibrate the measuring receiver and 50 MHz to 6.5 GHz power sensor in log mode (power reads out in dBm), as described in the measuring receiver operation manual. Enter the power sensor 3 GHz Cal Factor into the measuring receiver.
35. Connect the equipment as shown in Figure 2-54 with the input of the directional coupler connected to the power sensor.

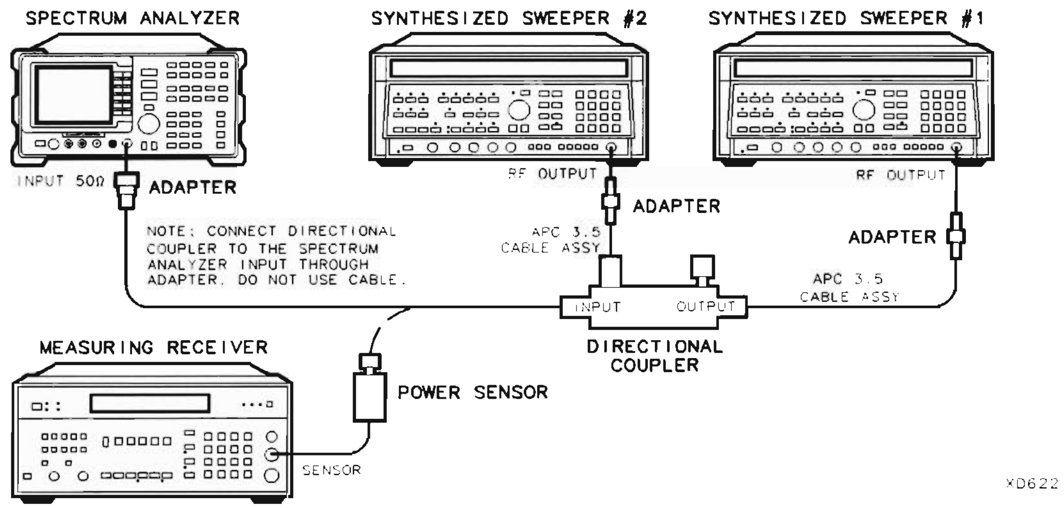


Figure 2-54. Third-Order Intermodulation Distortion Test Setup

36. Press instrument preset on each synthesized sweeper. Set each of the synthesized sweeper controls as follows:

    POWER LEVEL .... −15 dBm
    CW (synthesized sweeper #1) .... 2.800 GHz
    CW (synthesized sweeper #2) .... 2.80005 GHz
    RF .... OFF

37. On the spectrum analyzer, press (PRESET), then wait until the preset routine is finished. Set the controls as follows:

    (FREQUENCY) 2.8 (GHz)
    (SPAN) 1 (MHz)
    (AMPLITUDE) `REF LVL` 10 (−dBm)
    (PEAK SEARCH) `More 1 of 2` `PEAK EXCURSN` 3 (dB)
    (DISPLAY) `More 1 of 2` `THRESHLD ON OFF` (ON) 90 (−dBm)

38. On synthesized sweeper #1, set RF on. Adjust the power level until the measuring receiver reads −12 dBm ±0.05 dB.

39. Disconnect the power sensor from the directional coupler. Connect the directional coupler directly to the spectrum analyzer INPUT 50 Ω using an adapter (do not use a cable).

40. On the spectrum analyzer, press the following keys:

    (PEAK SEARCH)
    (MKR FCTN) `MK TRACK ON OFF` (ON)
    (SPAN) 200 (kHz)

    Wait for the `AUTO ZOOM` message to disappear.

    (MKR FCTN) `MK TRACK ON OFF` (OFF)
    (FREQUENCY) (⇑) (step-up key)
    (PEAK SEARCH)
    (MKR →) `MARKER → REF LVL`

41. On synthesized sweeper #2, set RF on. Adjust the power level until the two signals are displayed at the same amplitude.

    If necessary, adjust the spectrum analyzer center frequency until the two signals are centered on the display.

42. Set the spectrum analyzer by pressing the following keys:

    (BW) RES BW AUTO MAN 1 (kHz)

    VID BW AUTO MAN 100 (Hz)

43. Press the following analyzer keys:

    (PEAK SEARCH) MARKER Δ

    (DISPLAY) DSP LINE ON OFF (ON)

    Set the display line to a value 54 dB below the current reference level setting.

44. The third-order intermodulation distortion products should appear 50 kHz below the lower frequency signal and 50 kHz above the higher frequency signal. Their amplitude should be less than the display line. See Figure 2-55.

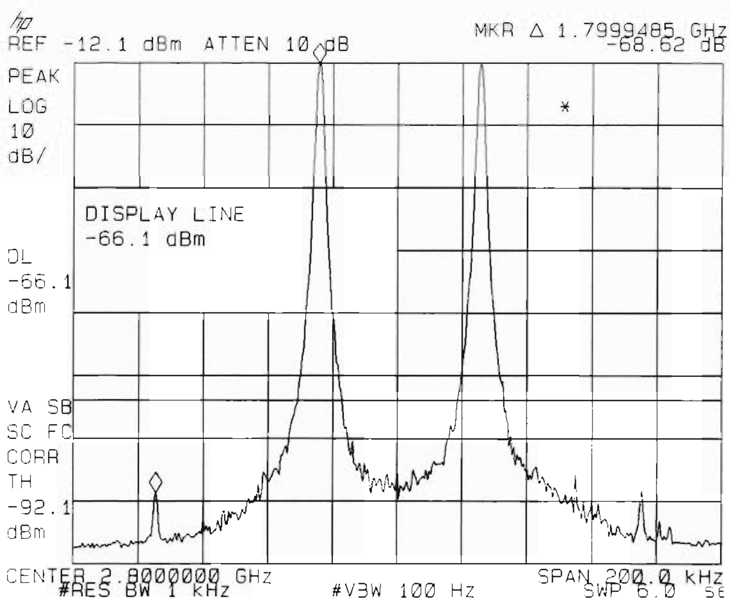


Figure 2-55. Third Order Intermodulation Distortion

45. If the distortion products can be seen, proceed as follows:

    a. On the spectrum analyzer, press (MKR →), More 1 of 2, and Peak Menu.

    b. Repeatedly press NEXT PEAK until the active marker is on the desired distortion product.

    c. Record the MKR Δ amplitude reading as TR Entry 4 in the performance verification test record. The MKR Δ reading should be less than the specified limit.

46. If the distortion products cannot be seen, proceed as follows:
    a. On each synthesized sweeper, increase the power level by 5 dB. Distortion products should now be visible at this higher power level.
    b. On the spectrum analyzer, press (MKR →), More 1 of 2, and Peak Menu.
    c. Repeatedly press NEXT PEAK until the active marker is on one of the distortion products.
    d. On each synthesized sweeper, reduce the power level by 5 dB and wait for completion of a new sweep.
    e. Record the MKR Δ amplitude reading in as TR Entry 4 in the performance verification test record. The MKR Δ reading should be less than the specified limit.

Part 4: Third Order Intermodulation Distortion, >2.9 GHz

47. Enter the Power Sensor 4 GHz Cal Factor into the measuring receiver.
48. Disconnect the directional coupler from the spectrum analyzer, then connect the power sensor to the output of the directional coupler.
49. Set each of the synthesized sweeper controls as follows:

    POWER LEVEL .... −15 dBm
    CW (synthesized sweeper #1) .... 4.000 GHz
    CW (synthesized sweeper #2) .... 4.00005 GHz
    RF .... OFF

50. On the spectrum analyzer, press (PRESET), then wait until the preset routine is finished. Set the spectrum analyzer by pressing the following keys:

    (FREQUENCY) 4.0 (GHz)
    (SPAN) 1 (MHz)
    (BW) REF LVL 10 (−dBm)
    (PEAK SEARCH) More 1 of 2 PEAK EXCURSN 3 (dB)
    (DISPLAY) THRESHLD ON OFF 90 (−dBm)

51. On synthesized sweeper #1, set RF on. Adjust the power level until the measuring receiver reads −12 dBm ±0.05 dB.
52. Disconnect the power sensor from the directional coupler. Connect the directional coupler directly to the spectrum analyzer INPUT 50 Ω using an adapter (do not use a cable).
53. On the spectrum analyzer, press the following key:

    (PEAK SEARCH)
    (AMPLITUDE) PRESEL PEAK

    Wait for the CAL: PEAKING message to disappear.

    (MKR FCTN) MK TRACK ON OFF (ON)
    (SPAN) 200 (kHz)

Wait for the AUTO ZOOM message to disappear, then press the following spectrum analyzer keys:

(MKR FCTN) MK TRACK ON OFF (OFF)
(FREQUENCY) (⇧) (step-up key)
(PEAK SEARCH)
(MKR →) MARKER → REF LVL

54. On synthesized sweeper #2, set RF on. Adjust the power level until the two signals are displayed at the same amplitude.

    If necessary, adjust the spectrum analyzer center frequency until the two signals are centered on the display.

55. Set the spectrum analyzer by pressing the following keys:

    (BW) RES BW AUTO MAN 1 (kHz)
    VID BW AUTO MAN 100 (Hz)

56. Press (PEAK SEARCH), MARKER Δ then set the DISPLAY LINE to a value 54 dB below the current reference level setting.

    The third-order intermodulation distortion products should appear 50 kHz below the lower frequency signal and 50 kHz above the higher frequency signal. Their amplitude should be less than the display line. See Figure 2-55.

57. If the distortion products can be seen, proceed as follows:

    a. On the spectrum analyzer, press (MKR →), More 1 of 2, and Peak Menu.
    b. Repeatedly press NEXT PEAK until the active marker is on the desired distortion product.
    c. Record the MKR Δ amplitude reading as TR Entry 5 of the performance verification test record. The MKR Δ reading should be less than the specified limit.

58. If the distortion products cannot be seen, proceed as follows:

    a. On each synthesized sweeper, increase the power level by 5 dB.

       Distortion products should now be visible at this higher power level.
    b. On the spectrum analyzer, press (MKR →), More 1 of 2, and Peak Menu.
    c. Repeatedly press NEXT PEAK until the active marker is on one of the distortion products.
    d. On each synthesized sweeper, reduce the power level by 5 dB, then wait for completion of a new sweep.
    e. Record the MKR Δ amplitude reading in as TR Entry 5 of the performance verification test record. The MKR Δ reading should be less than the specified limit.

33. Spurious Response, HP 8596E

This test is performed in four parts. The first two parts measure the second harmonic distortion; the last two parts measure the third order intermodulation distortion. Second harmonic distortion and third order intermodulation distortion is checked in both low band (50 kHz to 2.9 GHz) and high band (2.75 to 12.8 GHz).

To test second harmonic distortion, 50 MHz and 4.4 GHz low pass filters are used to filter the source output, ensuring that harmonics read by the analyzer are internally generated and not coming from the source. The distortion products are measured using the spectrum analyzer marker functions.

For third order intermodulation distortion, two signals are combined in a directional coupler (for isolation) and are applied to the analyzer input. The power level of the two signals is 8 dB higher than specified, so the distortion products should be suppressed by 16 dB less than specified. In this manner, the equivalent Third Order Intercept (TOI) is measured.

With two −30 dBm signals at the input mixer and the distortion products suppressed by 70 dBc, the equivalent TOI is +5 dBm (−30 dBm + 70 dBc/2). However, if two −22 dBm signals are present at the input mixer and the distortion products are suppressed by 54 dBc, the equivalent TOI is also +5 dBm (−22 dBm + 54 dBc/2).

Performing the test with a higher power level maintains the measurement integrity while reducing both test time and the dependency upon the source noise sideband performance.

There are no related adjustments for this performance test.

Equipment Required

Synthesized sweeper *(two required)*
Measuring receiver *(used as a power meter)*
Power sensor, 50 MHz to 12.8 GHz
Power splitter
Low pass filter, 50 MHz
Low pass filter, 4.4 GHz *(two required)*
Directional coupler
Cable, APC 3.5 91 cm (36 in)
Cable, BNC 120 cm (48 in)
Adapter, Type N (m) to APC 3.5 (m)
Adapter, APC 3.5 (f) to APC 3.5 (f) *(two required)*
Adapter, Type N (f) to APC 3.5 (f)
Adapter, Type N (m) to BNC (f) *(two required)*
Adapter, Type N (m) to APC 3.5 (f)
Adapter, Type N (f) to BNC (m)

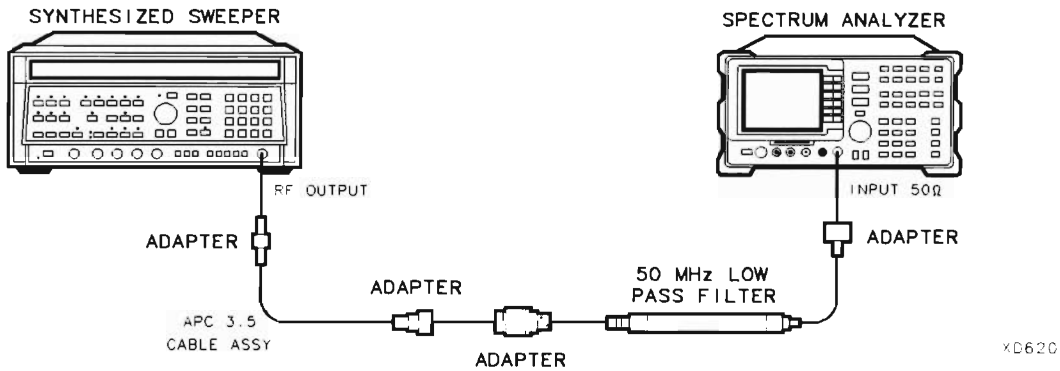


Figure 2-56. Second Harmonic Distortion Test Setup

Procedure

This performance verification test consists of four parts:

Part 1: Second Harmonic Distortion, <2.9 GHz
Part 2: Second Harmonic Distortion, >2.9 GHz
Part 3: Third Order Intermodulation Distortion, <2.9 GHz
Part 4: Third Order Intermodulation Distortion, >2.9 GHz

Part 1: Second Harmonic Distortion, <2.9 GHz

1. Press (PRESET) on the synthesized sweeper, then set the controls as follows:

   CW .... 30 MHz
   POWER LEVEL .... −30 dBm

2. Connect the equipment as shown in Figure 2-56.
3. Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish. Set the spectrum analyzer by pressing the following keys:

   (FREQUENCY) 30 (MHz)
   (SPAN) 1 (MHz)
   (AMPLITUDE) REF LVL 30 (−dBm)
   (BW) RES BW AUTO MAN 30 (kHz)

4. Adjust the synthesized sweeper power level to place the peak of the signal displayed on the spectrum analyzer at the reference level (−30 dBm).
5. Press the following spectrum analyzer keys:

   (BW) RES BW AUTO MAN 1 (kHz)
   VID BW AUTO MAN 100 (Hz)

6. Wait for two sweeps to finish, then press the following spectrum analyzer keys:

   (PEAK SEARCH)
   (MKR →) MKR → CF STEP
   (MKR) MARKER Δ
   (FREQUENCY)

7. Press the (⇧) (step up) key on the spectrum analyzer to step to the second harmonic (at 60 MHz). Set the reference level to −50 dBm.
8. Wait for one full sweep, then press (PEAK SEARCH).
9. Record the MKR Δ Amplitude reading as TR Entry 1 of the performance verification test record. The amplitude reading should be less than the specified limit.

Note that the Max. MKR Δ Amplitude Reading is 20 dB higher than the specification. This is a result of changing the reference level from −30 dBm to −50 dBm.

Part 2: Second Harmonic Distortion, >2.9 GHz

10. Zero and calibrate the measuring receiver and 50 MHz to 12.8 GHz power sensor in log mode (power reads out in dBm), as described in the measuring receiver operation manual. Enter the power sensor 3 GHz Cal Factor into the measuring receiver.
11. Measure the noise level at 5.6 GHz using the following steps:
    a. Remove any cable or adapters from the spectrum analyzer INPUT 50 Ω.
    b. Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish. Set the spectrum analyzer by pressing the following keys:

       (FREQUENCY) 5.6 (GHz)
       (SPAN) 0 (Hz)
       (AMPLITUDE) `REF LVL` 40 (−dBm)
       (BW) `RES BW AUTO MAN` 1 (kHz)
       `VID BW AUTO MAN` 30 (Hz)
       `VID AVG ON OFF` (ON) 10 (ENTER)
       (SWEEP) `SWP TIME AUTO MAN` 5.0 (sec)

    c. Press (SGL SWP). Wait until `AVG 10` is displayed along the left side of the CRT display.
    d. Press (PEAK SEARCH) on the spectrum analyzer and record the marker amplitude reading as the Noise Level at 5.6 GHz in Table 2-49.
12. Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish. Set the spectrum analyzer by pressing the following keys:

    (FREQUENCY) `Band Lock` `2.75-6.5 BAND 1`
    (FREQUENCY) 2.8 (GHz)
    (SPAN) 10 (MHz)

13. Connect the equipment as shown in Figure 2-57, with the output of the synthesized sweeper connected to the input of the power splitter, and the power splitter outputs connected to the spectrum analyzer and the power sensor.
14. On the synthesized sweeper, press preset, then set the controls as follows:

    CW .... 2.8 GHz
    POWER LEVEL .... 0 dBm

15. On the spectrum analyzer, press the following keys:

    (PEAK SEARCH)
    (AMPLITUDE) `PRESEL PEAK`

    Wait for the `CAL: PEAKING` message to disappear.

16. Press (PEAK SEARCH), MARKER Δ , then record the power meter reading at 2.8 GHz in Table 2-49.
17. Set the synthesized sweeper CW to 5.6 GHz.
18. Press the following spectrum analyzer keys:

    (FREQUENCY) 5.6 (GHz)
    (PEAK SEARCH)
    (AMPLITUDE) PRESEL PEAK .

    Wait for the CAL: PEAKING message to disappear.

    (PEAK SEARCH)
    (MKR FCTN) MK TRACK ON OFF (ON)

19. Adjust the synthesized sweeper power level until the Marker Δ Amplitude reads 0 dB ±0.20 dB.
20. Enter the power sensor 6 GHz Cal Factor into the power meter.
21. Record the Power Meter Reading at 5.6 GHz in Table 2-49.
22. Subtract the Power Meter Reading at 5.6 GHz from the Power Meter Reading at 2.8 GHz, then record this value as the Frequency Response Error (FRE) in Table 2-49. For example, if the Power Meter Reading at 5.6 GHz is −6.45 dBm and the Power Meter Reading at 2.8 GHz is −7.05 dBm, the Frequency Response Error would be −7.05 dBm − (−6.45 dBm) = −0.60 dB.

    Power Meter Reading at 2.8 GHz - Power Meter Reading at 5.6 GHz = FRE

Table 2-49. Second Harmonic Distortion Worksheet

Description	Measurement
Noise Level at 5.6 GHz	______dBm
Power Meter Reading at 2.8 GHz	______dBm
Power Meter Reading at 5.6 GHz	______dBm
Frequency Response Error (FRE)	______dB
Distortion-limited Specification	______dBc
Noise-limited Specification	______dBc

23. Calculate the desired maximum marker amplitude reading as follows:

a. Add the Frequency Response Error (FRE) to −60 dBc (specification is −100 dBc, but reference level will be changed by 40 dB to yield the required dynamic range), then record as the Distortion-limited Specification in Table 2-49.

Distortion-limited Specification = −60 dBc + FRE

b. Subtract −40 dBm (reference level setting) from Noise Level at 5.6 GHz, then record in Table 2-49.

Noise-limited Specification = Noise Level at 5.6 GHz + 40 dBm

c. Record the more positive of the values recorded in a and b above as TR Entry 2 of the performance verification test record. For example, if the value in a is −59 dBc and the value in b is −61 dBc, record −59 dBc.

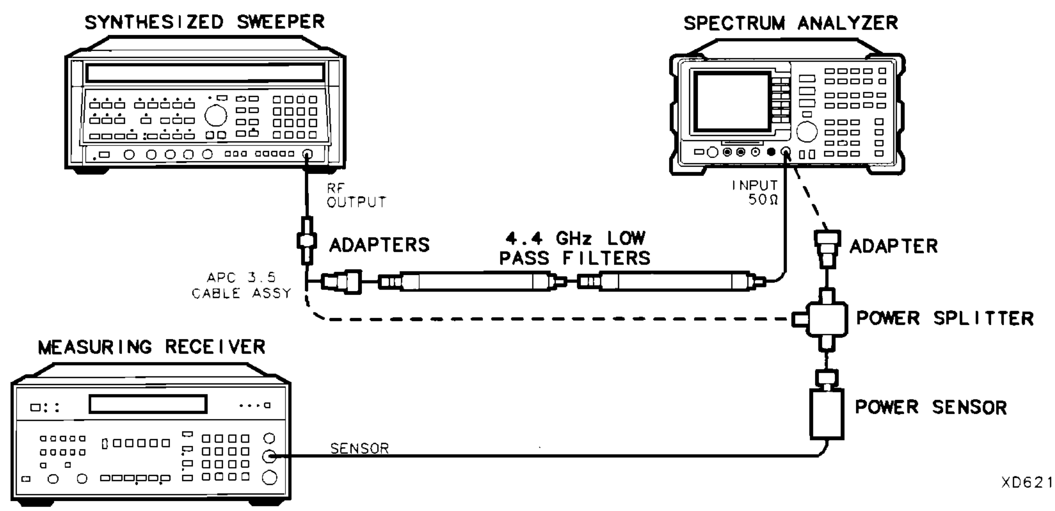


Figure 2-57. Second Harmonic Distortion Test Setup, >2.9 GHz

24. Connect the equipment as shown in Figure 2-57 with the filters in place.

25. Set the synthesized sweeper controls as follows:

CW .... 2.8 GHz
POWER LEVEL .... 0 dBm

26. Set the spectrum analyzer by pressing the following keys:

    (FREQUENCY) 2.8 (GHz)
    (MKR) MARKERS OFF
    (PEAK SEARCH)
    (AMPLITUDE) PRESEL PEAK

    Wait for the CAL: PEAKING message to disappear.

    (MKR FCTN) MK TRACK ON OFF (ON)
    (SPAN) 100 (kHz)

27. Adjust the synthesized sweeper power level for a spectrum analyzer marker amplitude reading of 0 dBm ±0.2 dB.
28. On the spectrum analyzer, press the following keys:

    (MKR FCTN) MK TRACK ON OFF (OFF)
    (PEAK SEARCH) MARKER Δ
    (FREQUENCY) 5.6 (GHz)
    (SPAN) 10 (MHz)

29. Remove the filters and connect the synthesized sweeper output directly to the spectrum analyzer INPUT 50 Ω.
30. On the spectrum analyzer, press the following keys:

    (PEAK SEARCH)
    (AMPLITUDE) PRESEL PEAK

    Wait for the CAL: PEAKING message to disappear.

    (MKR FCTN) MK TRACK ON OFF (ON)
    (SPAN) 100 (kHz)

31. Reinstall the filters between the synthesized sweeper output and the spectrum analyzer INPUT 50 Ω.
32. Set the spectrum analyzer by pressing the following keys:

    (AMPLITUDE) REF LVL 40 (-dBm)
    (BW) VID BW AUTO MAN 30 (Hz)
    VID AVG ON OFF (ON) 10 (ENTER)
    (SGL SWP)

    Wait until AVG 10 is displayed along the left side of the CRT display.

33. Press (PEAK SEARCH), then record the Marker Amplitude Reading as TR Entry 3 of the performance verification test record.

    The Marker Amplitude Reading should be more negative than the Specification previously recorded as TR Entry 2 of the performance verification test record.

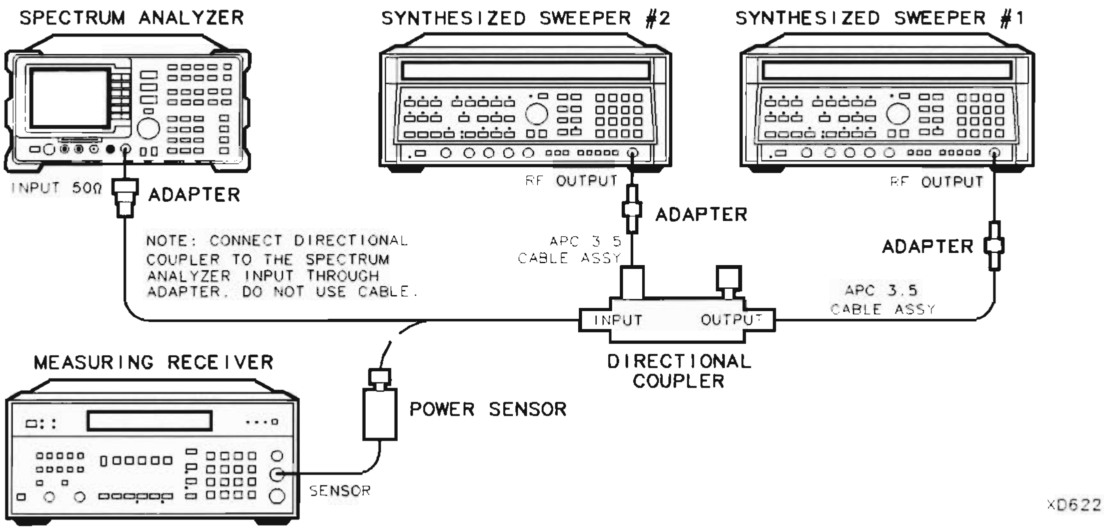


Figure 2-58. Third-Order Intermodulation Distortion Test Setup

Part 3: Third Order Intermodulation Distortion, <2.9 GHz

34. Zero and calibrate the measuring receiver and 50 MHz to 12.8 GHz power sensor in log mode (power reads out in dBm), as described in the measuring receiver operation manual. Enter the power sensor 3 GHz Cal Factor into the measuring receiver.
35. Connect the equipment as shown in Figure 2-58 with the input of the directional coupler connected to the power sensor.
36. Press instrument preset on each synthesized sweeper. Set each of the synthesized sweeper controls as follows:

    POWER LEVEL .... −15 dBm
    CW (synthesized sweeper #1) .... 2.800 GHz
    CW (synthesized sweeper #2) .... 2.80005 GHz
    RF .... OFF

37. On the spectrum analyzer, press (PRESET), then wait until the preset routine is finished. Set the controls as follows:

    (FREQUENCY) 2.8 (GHz)
    (SPAN) 1 (MHz)
    (AMPLITUDE) REF LVL 10 (−dBm)
    (PEAK SEARCH) More 1 of 2 PEAK EXCURSN 3 (dB)
    (DISPLAY) More 1 of 2 THRESHLD ON OFF (ON) 90 (−dBm)

38. On synthesized sweeper #1, set RF on. Adjust the power level until the measuring receiver reads −12 dBm ±0.05 dB.
39. Disconnect the power sensor from the directional coupler. Connect the directional coupler directly to the spectrum analyzer INPUT 50 Ω using an adapter (do not use a cable).

40. On the spectrum analyzer, press the following keys:

    (PEAK SEARCH)
    (MKR FCTN) MK TRACK ON OFF (ON)
    (SPAN) 200 (kHz)

    Wait for the AUTO ZOOM message to disappear.

    (MKR FCTN) MK TRACK ON OFF (OFF)
    (FREQUENCY) (⇑) (step-up key)
    (PEAK SEARCH)
    (MKR →) MARKER → REF LVL

41. On synthesized sweeper #2, set RF on. Adjust the power level until the two signals are displayed at the same amplitude.

    If necessary, adjust the spectrum analyzer center frequency until the two signals are centered on the display.

42. Set the spectrum analyzer by pressing the following keys:

    (BW) RES BW AUTO MAN 1 (kHz)
    VID BW AUTO MAN 100 (Hz)

43. Press the following analyzer keys:

    (PEAK SEARCH) MARKER Δ
    (DISPLAY) DSP LINE ON OFF (ON)

    Set the display line to a value 54 dB below the current reference level setting.

44. The third-order intermodulation distortion products should appear 50 kHz below the lower frequency signal and 50 kHz above the higher frequency signal. Their amplitude should be less than the display line. See Figure 2-59.

45. If the distortion products can be seen, proceed as follows:

    a. On the spectrum analyzer, press (MKR →), More 1 of 2, and Peak Menu.
    b. Repeatedly press NEXT PEAK until the active marker is on the desired distortion product.
    c. Record the MKR Δ amplitude reading as TR Entry 4 in the performance verification test record. The MKR Δ reading should be less than the specified limit.

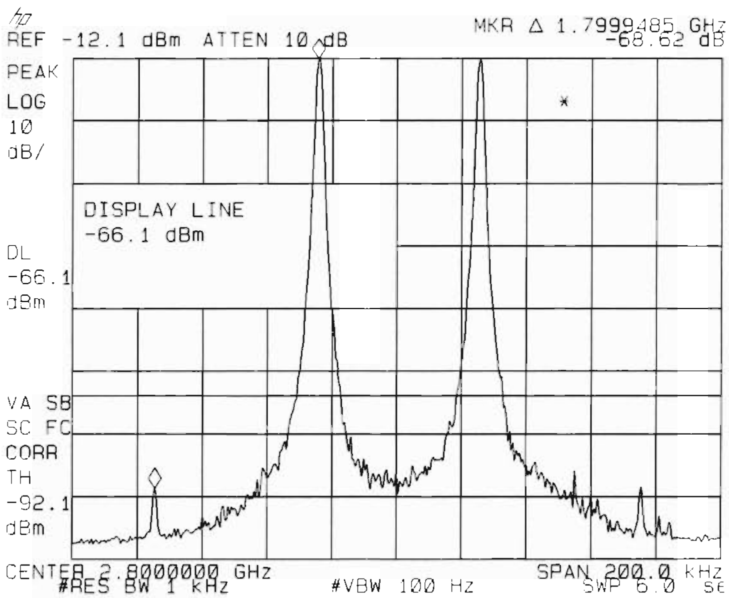


Figure 2-59. Third Order Intermodulation Distortion

46. If the distortion products cannot be seen, proceed as follows:
    a. On each synthesized sweeper, increase the power level by 5 dB. Distortion products should now be visible at this higher power level.
    b. On the spectrum analyzer, press (MKR →), `More 1 of 2`, and `Peak Menu`.
    c. Repeatedly press `NEXT PEAK` until the active marker is on one of the distortion products.
    d. On each synthesized sweeper, reduce the power level by 5 dB and wait for completion of a new sweep.
    e. Record the MKR Δ amplitude reading in as TR Entry 4 in the performance verification test record. The MKR Δ reading should be less than the specified limit.

Part 4: Third Order Intermodulation Distortion, >2.9 GHz

47. Enter the Power Sensor 4 GHz Cal Factor into the measuring receiver.
48. Disconnect the directional coupler from the spectrum analyzer, then connect the power sensor to the output of the directional coupler.

49. Set each of the synthesized sweeper controls as follows:

    POWER LEVEL .... −15 dBm
    CW (synthesized sweeper #1) .... 4.000 GHz
    CW (synthesized sweeper #2) .... 4.00005 GHz
    RF .... OFF

50. On the spectrum analyzer, press (PRESET), then wait until the preset routine is finished. Set the spectrum analyzer by pressing the following keys:

    (FREQUENCY) 4.0 (GHz)
    (SPAN) 1 (MHz)
    (AMPLITUDE) REF LVL 10 (−dBm)
    (PEAK SEARCH) More 1 of 2 PEAK EXCURSN 3 (dB)
    (DISPLAY) More 1 of 2 THRESHLD ON OFF 90 (−dBm)

51. On synthesized sweeper #1, set RF on. Adjust the power level until the measuring receiver reads −12 dBm ±0.05 dB.

52. Disconnect the power sensor from the directional coupler. Connect the directional coupler directly to the spectrum analyzer INPUT 50 Ω using an adapter (do not use a cable).

53. On the spectrum analyzer, press the following key:

    (PEAK SEARCH)
    (AMPLITUDE) PRESEL PEAK

    Wait for the CAL: PEAKING message to disappear.

    (MKR FCTN) MK TRACK ON OFF (ON)
    (SPAN) 200 (kHz)

    Wait for the AUTO ZOOM message to disappear, then press the following spectrum analyzer keys:

    (MKR FCTN) MK TRACK ON OFF (OFF)
    (FREQUENCY) (⇑) (step-up key)
    (PEAK SEARCH)
    (MKR →) MARKER → REF LVL

54. On synthesized sweeper #2, set RF on. Adjust the power level until the two signals are displayed at the same amplitude.

    If necessary, adjust the spectrum analyzer center frequency until the two signals are centered on the display.

55. Set the spectrum analyzer by pressing the following keys:

    (BW) RES BW AUTO MAN 1 (kHz)

    VID BW AUTO MAN 100 (Hz)

56. Press (PEAK SEARCH), MARKER Δ then set the DISPLAY LINE to a value 54 dB below the current reference level setting.

    The third-order intermodulation distortion products should appear 50 kHz below the lower frequency signal and 50 kHz above the higher frequency signal. Their amplitude should be less than the display line. See Figure 2-59.

57. If the distortion products can be seen, proceed as follows:

    a. On the spectrum analyzer, press (MKR →), More 1 of 2, and Peak Menu.
    b. Repeatedly press NEXT PEAK until the active marker is on the desired distortion product.
    c. Record the MKR Δ amplitude reading as TR Entry 5 of the performance verification test record. The MKR Δ reading should be less than the specified limit.

58. If the distortion products cannot be seen, proceed as follows:

    a. On each synthesized sweeper, increase the power level by 5 dB. Distortion products should now be visible at this higher power level.
    b. On the spectrum analyzer, press (MKR →), More 1 of 2, and Peak Menu.
    c. Repeatedly press NEXT PEAK until the active marker is on one of the distortion products.
    d. On each synthesized sweeper, reduce the power level by 5 dB, then wait for completion of a new sweep.
    e. Record the MKR Δ amplitude reading in as TR Entry 5 of the performance verification test record. The MKR Δ reading should be less than the specified limit.

34. Gain Compression, HP 8591C and HP 8591E

Gain compression is measured by applying two signals, separated by 3 MHz. First, the test places a −20 dBm signal at the input of the spectrum analyzer (the spectrum analyzer reference level is also set to −20 dBm). Then, a 0 dBm signal is applied to the spectrum analyzer, overdriving its input. The decrease in the first signal's amplitude (gain compression) caused by the second signal is the measured gain compression.

For spectrum analyzers equipped with Option 130 the signals are separated by 10 kHz, then the first signal is kept 10 dB below the reference level.

There are no related adjustment procedures for this performance test.

Equipment Required

Synthesized sweeper
Synthesizer/level generator
Measuring receiver *(used as a power meter)*
Power sensor, 100 kHz to 1800 MHz
Directional bridge
Cable, BNC, 120 cm (48 in) *(two required)*
Adapter, Type N (f) to BNC (m)
Adapter, Type N (m) to BNC (m)
Adapter, Type N (f) to APC 3.5 (f)
Adapter, Type N (m) to BNC (f)

Additional Equipment for 75 Ω Input

Power sensor, 75 Ω
Adapter, Type N (f) to BNC (m), 75 Ω
Adapter, Type BNC (m) to BNC (m), 75 Ω

Procedure

1. Zero and calibrate the measuring receiver and 100 kHz to 1800 MHz power sensor combination in log mode (power reads out in dBm) as described in the measuring receiver operation manual. Enter the power sensor's 50 MHz Cal Factor into the measuring receiver.

   75 Ω input only: Calibrate the 75 Ω power sensor.

2. Connect the equipment as shown in Figure 2-60, with the load of the directional bridge connected to the power sensor.

   75 Ω input only: Use the 75 Ω power sensor with a Type N (f) to BNC (m) 75 Ω adapter and a BNC (m) to BNC (m) adapter. The power measured at the output of the 50 Ω directional bridge by the 75 Ω power sensor, is the equivalent power "seen" by the 75 Ω spectrum analyzer.

Caution Use only 75 Ω cables, connectors, or adapters on the 75 Ω input of an 75 Ω input, or damage to the input connector will occur.

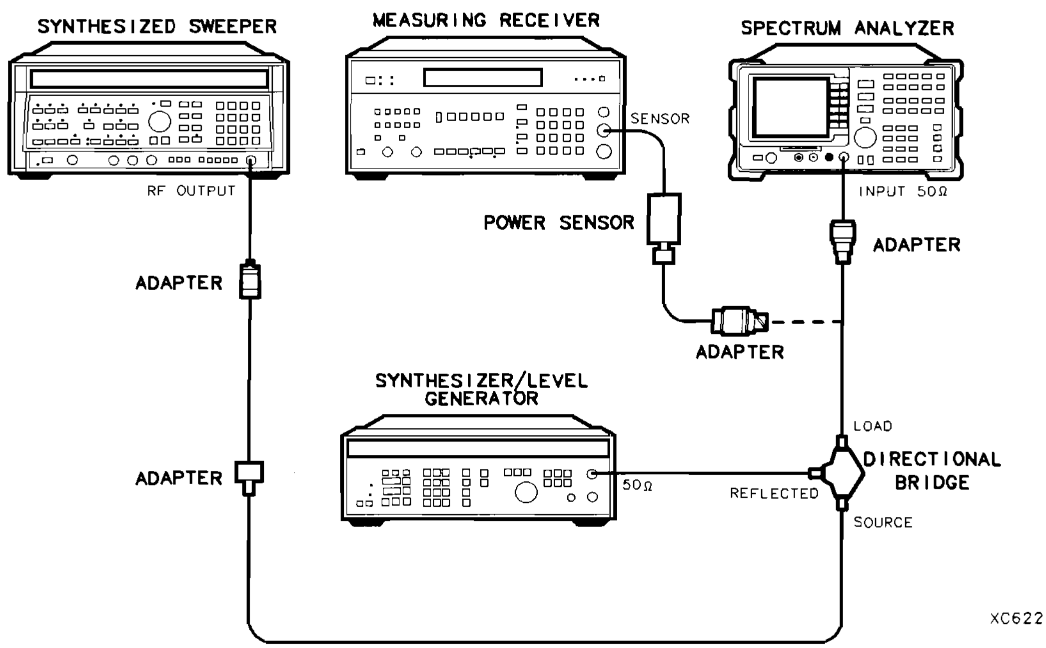


Figure 2-60. Gain Compression Test Setup

3. Press INSTRUMENT PRESET on the synthesized sweeper, then set the controls as follows:

   CW .... 53 MHz
   POWER LEVEL .... 6 dBm

4. Set the synthesized/level generator controls as follows:

   CW .... 50 MHz
   AMPLITUDE .... −14 dBm
   50 Ω/75 Ω SWITCH .... 75 Ω (no RF output)

5. On the spectrum analyzer, press (PRESET), then wait for the preset routine to finish. Press the spectrum analyzer keys as follows:

   (FREQUENCY) 50 (MHz)
   (SPAN) 20 (MHz)

   75 Ω input: Press (AMPLITUDE), **More 1 of 2**, **Amptd Units**, then **dBm**.

   (AMPLITUDE) −20 (dBm)
   SCALE LOG LIN (LOG) 1 (dB)
   (BW) 300 (kHz)

6. On the synthesized sweeper, adjust the power level for a 0 dBm reading on the measuring receiver. Set RF to off.
7. On the synthesizer/level generator, set the 50 Ω/75 Ω switch to 50 Ω.

   Note that the power level applied to the spectrum analyzer input is 10 dB greater than the specification to account for the 10 dB attenuation setting. A power level of 0 dBm at the spectrum analyzer input yields −10 dBm at the input mixer.
8. Disconnect the power sensor from the directional bridge and connect the directional bridge to the INPUT 50 Ω connector of the spectrum analyzer using an adapter. Do not use a cable.

   75 Ω input only: Use a 75 Ω adapter, BNC (m) to BNC (m).
9. On the spectrum analyzer, press the following keys:

   (PEAK SEARCH)
   (MKR FCTN) **MK TRACK ON OFF** (ON)
   (SPAN) 10 (MHz)

   Wait for the AUTO ZOOM routine to finish.
10. On the synthesizer/level generator, adjust the amplitude to place the signal 1 dB below the spectrum analyzer reference level.
11. On the spectrum analyzer, press (PEAK SEARCH), then **MARKER Δ**.
12. On the synthesized sweeper, set RF to ON.
13. On the spectrum analyzer, press (PEAK SEARCH), then **NEXT PEAK**.

    The active marker should be on the lower amplitude signal and not on the signal that is off the top of the screen. If it is not on the lower amplitude signal, reposition the marker to this peak using the spectrum analyzer knob.
14. Read the MKR Δ amplitude and record in the performance verification test record as TR Entry 1. The absolute value of this amplitude should be less than 0.5 dB.

    If you are testing a spectrum analyzer equipped with Option 130 continue with step 15.

    Performance test "Gain Compression" is now complete for all other spectrum analyzers.

Additional Steps for Option 130

15. Connect the equipment as shown in Figure 2-60.
16. Press INSTRUMENT PRESET on the synthesized sweeper, then set the controls as follows:

    CW .... 50.010 MHz
    POWER LEVEL .... 6 dBm

17. Set the synthesized/level generator controls as follows:

    FREQUENCY .... 50 MHz
    AMPLITUDE .... −14 dBm
    50 Ω/75 Ω SWITCH .... 75 Ω (no RF output)

18. On the synthesized sweeper, adjust the power level for a 0 dBm reading on the measuring receiver. Set RF to OFF.

19. On the synthesizer/level generator, set the 50 Ω/75 Ω switch to 50 Ω.

20. Disconnect the power sensor from the directional bridge and connect the directional bridge to the INPUT 50 Ω connector of the spectrum analyzer using an adapter. Do not use a cable.

    75 Ω input only: Use a 75 Ω adapter, BNC (m) to BNC (m).

21. On the spectrum analyzer, press (PRESET), then wait for the preset routine to finish. Press the spectrum analyzer keys as follows:

    (FREQUENCY) 50 (MHz)
    (SPAN) 10 (MHz)

    75 Ω input: Press (AMPLITUDE), **More 1 of 2**, **Amptd Units**, then **dBm**.

    (AMPLITUDE) −10 (dBm)
    (PEAK SEARCH)
    (MKR FCTN) **MK TRACK ON OFF** (ON)
    (SPAN) 2 (kHz)

    Wait for the auto zoom routine to finish.

22. On the synthesizer/level generator, adjust the amplitude to place the signal 10 dB below the spectrum analyzer reference level.

23. On the spectrum analyzer, press (SGL SWP), then wait for the completion of a new sweep. Press (PEAK SEARCH), then **MARKER Δ**.

24. On the synthesized sweeper, set RF to ON.

25. On the spectrum analyzer, press (SGL SWP), then wait for the completion of a new sweep. Press (PEAK SEARCH), **MARKER Δ**.

26. Read the MKR Δ amplitude and record in the performance verification test record as TR Entry 2.

35. Gain Compression, HP 8593E

This performance verification test measures gain compression in both low band and high band. Two signals, separated by 3 MHz, are used. First, the test places a −30 dBm signal at the input of the spectrum analyzer (the spectrum analyzer reference level is also set to −30 dBm). Then, a 0 dBm signal is applied to the spectrum analyzer, overdriving its input. The decrease in the first signal's amplitude (gain compression) caused by the second signal is the measured gain compression.

For spectrum analyzers equipped with Option 130 the signals are separated by 10 kHz, then the first signal is kept 10 dB below the reference level.

There are no related adjustment procedures for this performance test.

Equipment Required

Synthesized sweeper *(two required)*
Measuring receiver *(used as a power meter)*
Power sensor, 50 MHz to 26.5 GHz
Directional coupler
Cable, APC 3.5, 91 cm (36 in) *(two required)*
Adapter, Type N (m) to APC 3.5 (m)
Adapter, APC 3.5 (f) to APC 3.5 (f) *(two required)*

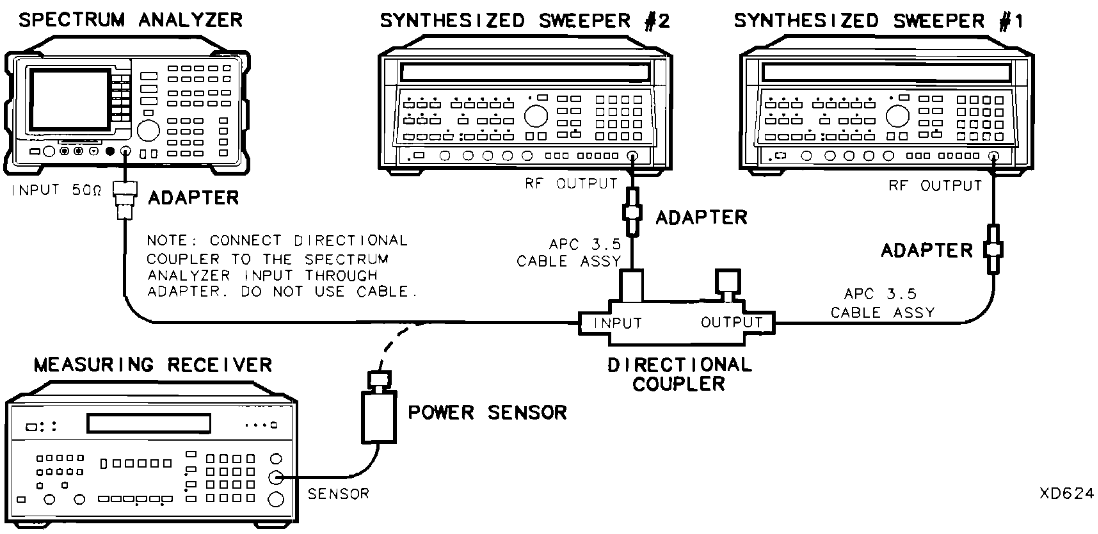


Figure 2-61. Gain Compression Test Setup

Procedure

Gain Compression, <2.9 GHz

1. Zero and calibrate the measuring receiver and 50 MHz to 26.5 GHz power sensor combination in log mode (power reads out in dBm) as described in the measuring receiver operation manual. Enter the power sensor 2 GHz Cal Factor into the measuring receiver.
2. Connect the equipment as shown in Figure 2-61, with the output of the directional coupler connected to the power sensor.

   Option 026 only: Connect the directional coupler to the spectrum analyzer directly.
3. Press INSTRUMENT PRESET on both synthesized sweepers.
4. Set synthesized sweeper #1 controls as follows:

   CW .... 2.003 GHz
   POWER LEVEL .... 0 dBm
5. Set synthesized sweeper #2 controls as follows:

   CW .... 2.0 GHz
   AMPLITUDE .... −14 dBm
6. On the spectrum analyzer, press (PRESET), then wait for the preset routine to finish. Press the spectrum analyzer keys as follows:

   (FREQUENCY) 2.0 (GHz)
   (SPAN) 20 (MHz)
   (AMPLITUDE) REF LVL 30 (−dBm)
   SCALE LOG LIN (LOG) 1 (dB)
   (BW) RES BW AUTO MAN 300 (kHz)
7. On synthesized sweeper #1, adjust the power level for a 0 dBm reading on the measuring receiver. Set RF to off.

   The power level applied to the spectrum analyzer input is 10 dB greater than the specification to account for the 10 dB attenuation setting. A power level of 0 dBm at the spectrum analyzer input yields −10 dBm at the input mixer.
8. Disconnect the power sensor from the directional coupler and connect the directional coupler to the INPUT 50 Ω connector of the spectrum analyzer using an adapter. Do not use a cable.
9. On the spectrum analyzer, press the following keys:

   (PEAK SEARCH)
   (MKR FCTN) MK TRACK ON OFF (ON)
   (SPAN) 10 (MHz)

   Wait for the AUTO ZOOM routine to finish.
10. On synthesized sweeper #2, adjust the power level to place the signal 1 dB below the spectrum analyzer reference level.
11. On the spectrum analyzer, press (PEAK SEARCH), then MARKER Δ.
12. On synthesized sweeper #1, set RF to ON.
13. On the spectrum analyzer, press (PEAK SEARCH), then NEXT PEAK.

The active marker should be on the lower amplitude signal and not on the signal that is off the top of the screen. If it is not on the lower amplitude signal, reposition the marker to this peak using the spectrum analyzer knob.

14. Read the MKR Δ amplitude and record in the performance verification test record as TR Entry 1. The absolute value of this amplitude should be less than 0.5 dB.

Gain Compression, >2.9 GHz

15. Disconnect the directional coupler from the spectrum analyzer input, then connect the directional coupler to the power sensor.
16. Set the spectrum analyzer by pressing the following key:

    (FREQUENCY) 4.0 (GHz)
    (SPAN) 20 (MHz)
    (MKR) MARKERS OFF

17. Set synthesized sweeper #1 controls as follows:

    CW .... 4.003 GHz
    POWER LEVEL .... 2 dBm

18. Set synthesized sweeper #2 controls as follows:

    CW .... 4.0 GHz
    POWER LEVEL .... −14 dBm

19. Enter the power sensor CAL Factor into the measuring receiver.
20. On synthesized sweeper #1, adjust the power level for a 0 dBm reading on the measuring receiver. Set RF to off.
21. Disconnect the power sensor from the directional coupler and connect the directional coupler to the INPUT 50 Ω connector of the spectrum analyzer using an adapter. Do not use a cable.
22. On the spectrum analyzer, press the following keys:

    (PEAK SEARCH)
    (MKR FCTN) MK TRACK ON OFF (ON)

    Wait for the signal to be centered on screen.

    (AMPLITUDE) PRESEL PEAK

    Wait for the CAL: PEAKING message to disappear.

    (SPAN) 10 (MHz)

    Wait for the AUTO ZOOM message to disappear.

23. On synthesized sweeper #2, adjust the power level to place the signal 1 dB below the spectrum analyzer reference level.
24. On the spectrum analyzer, press (PEAK SEARCH), then MARKER Δ .
25. On synthesized sweeper #1, set RF to ON.
26. On the spectrum analyzer, press (PEAK SEARCH), then NEXT PEAK .

    The active marker should be on the lower amplitude signal and not on the signal that is off the top of the screen. If it is not on the lower amplitude signal, reposition the marker to this peak using the spectrum analyzer knob.

27. Read the MKR Δ amplitude and record in the performance verification test record as TR Entry 2. The absolute value of this amplitude should be less than or equal to 0.5 dB.

    If you are testing a spectrum analyzer equipped with Option 130 continue with step 28.

    Performance verification test "Gain Compression" is now complete for all other spectrum analyzers.

Additional Steps for Option 130

28. Connect the equipment as shown in Figure 2-61.
29. Press INSTRUMENT PRESET on both synthesized sweepers.
30. Set synthesized sweeper #1 controls as follows:

    CW .... 2.000 010 MHz
    POWER LEVEL .... 0 dBm

31. Set synthesized sweeper #2 controls as follows:

    CW .... 2.0 GHz
    POWER LEVEL .... −14 dBm
    RF .... OFF

32. On synthesized sweeper #1, adjust the power level for a 0 dBm reading on the measuring receiver. Set RF to OFF.
33. On synthesized sweeper #2, set the RF to ON.
34. Disconnect the power sensor from the directional coupler and connect the directional coupler to the INPUT 50 Ω connector of the spectrum analyzer using an adapter. Do not use a cable.
35. On the spectrum analyzer, press (PRESET), then wait for the preset routine to finish. Press the spectrum analyzer keys as follows:

    (FREQUENCY) 2.0 (GHz)
    (SPAN) 10 (MHz)
    (AMPLITUDE) −10 (dBm)
    (PEAK SEARCH)
    (MKR FCTN) MK TRACK ON OFF (ON)
    (SPAN) 2 (kHz)

    Wait for the AUTO ZOOM message to disappear.

36. On synthesized sweeper #2, adjust the amplitude to place the signal 10 dB below the spectrum analyzer reference level.
37. On the spectrum analyzer, press (SGL SWP), then wait for the completion of a new sweep. Press (PEAK SEARCH), then MARKER Δ.
38. On synthesized sweeper #1, set RF to ON.
39. On the spectrum analyzer, press (SGL SWP), then wait for the completion of a new sweep. Press (PEAK SEARCH), MARKER Δ.
40. Read the MKR Δ amplitude and record in the performance verification test record as TR Entry 3.

36. Gain Compression, HP 8594E

This performance verification test measures gain compression. Two signals, separated by 3 MHz, are used. First, the test places a −30 dBm signal at the input of the spectrum analyzer (the spectrum analyzer reference level is also set to −30 dBm). Then, a 0 dBm signal is applied to the spectrum analyzer, overdriving its input. The decrease in the first signal's amplitude (gain compression) caused by the second signal is the measured gain compression.

For spectrum analyzers equipped with Option 130 the signals are separated by 10 kHz, then the first signal is kept 10 dB below the reference level.

There are no related adjustment procedures for this performance test.

Equipment Required

Synthesized sweeper *(two required)*
Measuring receiver *(used as a power meter)*
Power sensor, 50 MHz to 2.9 GHz
Directional coupler
Cable, APC 3.5, 91 cm (36 in) *(two required)*
Adapter, Type N (m) to APC 3.5 (m)
Adapter, APC 3.5 (f) to APC 3.5 (f) *(two required)*

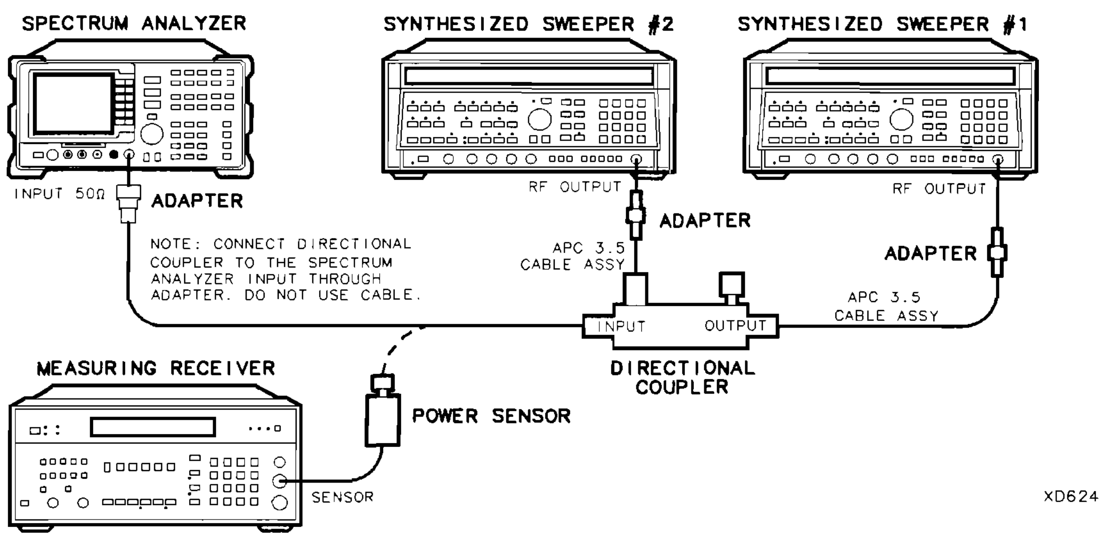


Figure 2-62. Gain Compression Test Setup

Procedure

Gain Compression, <2.9 GHz

1. Zero and calibrate the measuring receiver and 50 MHz to 2.9 GHz power sensor combination in log mode (power reads out in dBm) as described in the measuring receiver operation manual. Enter the power-sensor 2 GHz Cal Factor into the measuring receiver.
2. Connect the equipment as shown in Figure 2-62, with the output of the directional coupler connected to the power sensor.

3. Press INSTRUMENT PRESET on both synthesized sweepers.
4. Set synthesized sweeper #1 controls as follows:

   CW .... 2.003 GHz
   POWER LEVEL .... 0 dBm

5. Set synthesized sweeper #2 controls as follows:

   CW .... 2.0 GHz
   AMPLITUDE .... −14 dBm

6. On the spectrum analyzer, press (PRESET), then wait for the preset routine to finish. Press the spectrum analyzer keys as follows:

   (FREQUENCY) 2.0 (GHz)
   (SPAN) 20 (MHz)
   (AMPLITUDE) **REF LVL** 30 (−dBm)
   SCALE LOG LIN (LOG) 1 (dB)
   (BW) **RES BW AUTO MAN** 300 (kHz)

7. On synthesized sweeper #1, adjust the power level for a 0 dBm reading on the measuring receiver. Set RF to off.

   The power level applied to the spectrum analyzer input is 10 dB greater than the specification to account for the 10 dB attenuation setting. A power level of 0 dBm at the spectrum analyzer input yields −10 dBm at the input mixer.

8. Disconnect the power sensor from the directional coupler and connect the directional coupler to the INPUT 50 Ω connector of the spectrum analyzer using an adapter. Do not use a cable.
9. On the spectrum analyzer, press the following keys:

   (PEAK SEARCH)
   (MKR FCTN) **MK TRACK ON OFF** (ON)
   (SPAN) 10 (MHz)

   Wait for the **AUTO ZOOM** routine to finish.

10. On synthesized sweeper #2, adjust the power level to place the signal 1 dB below the spectrum analyzer reference level.
11. On the spectrum analyzer, press (PEAK SEARCH), then **MARKER Δ**.
12. On synthesized sweeper #1, set RF to ON.
13. On the spectrum analyzer, press (PEAK SEARCH), then **NEXT PEAK**.

    The active marker should be on the lower amplitude signal and not on the signal that is off the top of the screen. If it is not on the lower amplitude signal, reposition the marker to this peak using the spectrum analyzer knob.

14. Read the MKR Δ amplitude and record in the performance verification test record as TR Entry 1. The absolute value of this amplitude should be less than 0.5 dB.

Additional Steps for Option 130

15. Connect the equipment as shown in Figure 2-62.
16. Press INSTRUMENT PRESET on both synthesized sweepers.
17. Set synthesized sweeper #1 controls as follows:

    CW .... 2.000 010 GHz
    POWER LEVEL .... 0 dBm

18. Set synthesized sweeper #2 controls as follows:

    CW .... 2.0 GHz
    POWER LEVEL .... −14 dBm
    RF .... OFF

19. On synthesized sweeper #1, adjust the power level for a 0 dBm reading on the measuring receiver. Set RF to OFF.
20. On synthesized sweeper #2, set the RF to ON.
21. Disconnect the power sensor from the directional coupler and connect the directional coupler to the INPUT 50 Ω connector of the spectrum analyzer using an adapter. Do not use a cable.
22. On the spectrum analyzer, press (PRESET), then wait for the preset routine to finish. Press the spectrum analyzer keys as follows:

    (FREQUENCY) 2.0 (GHz)
    (SPAN) 10 (MHz)
    (AMPLITUDE) −10 (dBm)
    (PEAK SEARCH)
    (MKR FCTN) MK TRACK ON OFF (ON)
    (SPAN) 2 (kHz)

    Wait for the AUTO ZOOM message to disappear.
23. On synthesized sweeper #2, adjust the amplitude to place the signal 10 dB below the spectrum analyzer reference level.
24. On the spectrum analyzer, press (SGL SWP), then wait for the completion of a new sweep. Press (PEAK SEARCH), then MARKER Δ.
25. On synthesized sweeper #1, set RF to ON.
26. On the spectrum analyzer, press (SGL SWP), then wait for the completion of a new sweep. Press (PEAK SEARCH), MARKER Δ.
27. Read the MKR Δ amplitude and record in the performance verification test record as TR Entry 2.

37. Gain Compression, HP 8595E

This performance verification test measures gain compression in both low band and high band. Two signals, separated by 3 MHz, are used. First, the test places a −30 dBm signal at the input of the spectrum analyzer (the spectrum analyzer reference level is also set to −30 dBm). Then, a 0 dBm signal is applied to the spectrum analyzer, overdriving its input. The decrease in the first signal's amplitude (gain compression) caused by the second signal is the measured gain compression.

For spectrum analyzers equipped with Option 130 the signals are separated by 10 kHz, then the first signal is kept 10 dB below the reference level.

There are no related adjustment procedures for this performance test.

Equipment Required

Synthesized sweeper *(two required)*
Measuring receiver *(used as a power meter)*
Power sensor, 50 MHz to 6.5 GHz
Directional coupler
Cable, APC 3.5, 91 cm (36 in) *(two required)*
Adapter, Type N (m) to APC 3.5 (m)
Adapter, APC 3.5 (f) to APC 3.5 (f) *(two required)*

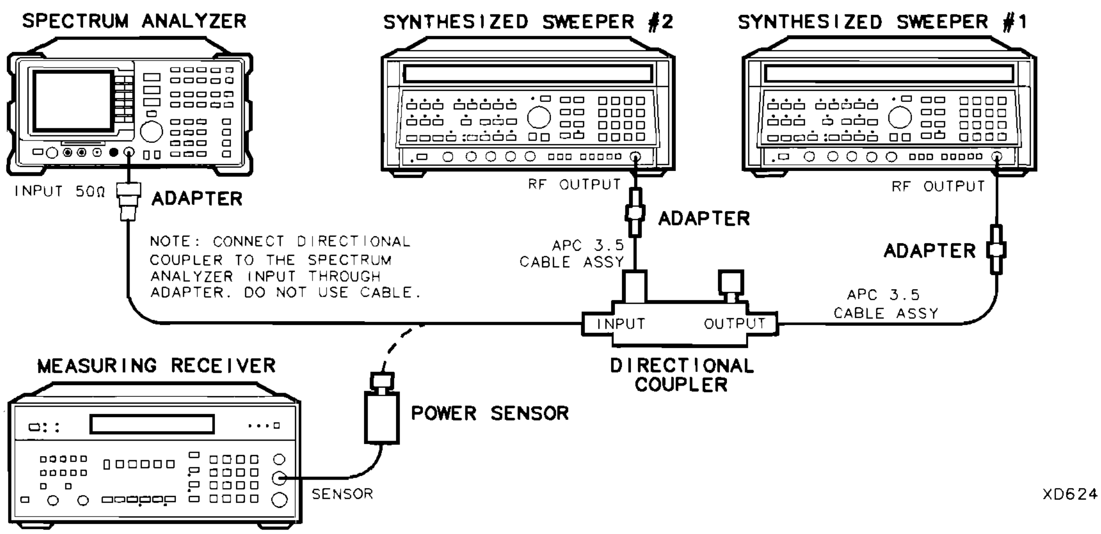


Figure 2-63. Gain Compression Test Setup

Procedure

Gain Compression, <2.9 GHz

1. Zero and calibrate the measuring receiver and 50 MHz to 6.5 GHz power sensor combination in log mode (power reads out in dBm) as described in the measuring receiver operation manual. Enter the power sensor 2 GHz Cal Factor into the measuring receiver.
2. Connect the equipment as shown in Figure 2-63, with the output of the directional coupler connected to the power sensor.
3. Press INSTRUMENT PRESET on both synthesized sweepers.
4. Set synthesized sweeper #1 controls as follows:

   CW .... 2.003 GHz
   POWER LEVEL .... 0 dBm
5. Set synthesized sweeper #2 controls as follows:

   CW .... 2.0 GHz
   AMPLITUDE .... −14 dBm
6. On the spectrum analyzer, press (PRESET), then wait for the preset routine to finish. Press the spectrum analyzer keys as follows:

   (FREQUENCY) 2.0 (GHz)
   (SPAN) 20 (MHz)
   (AMPLITUDE) REF LVL 30 (−dBm)
   SCALE LOG LIN (LOG) 1 (dB)
   (BW) RES BW AUTO MAN 300 (kHz)
7. On synthesized sweeper #1, adjust the power level for a 0 dBm reading on the measuring receiver. Set RF to off.

   The power level applied to the spectrum analyzer input is 10 dB greater than the specification to account for the 10 dB attenuation setting. A power level of 0 dBm at the spectrum analyzer input yields −10 dBm at the input mixer.
8. Disconnect the power sensor from the directional coupler and connect the directional coupler to the INPUT 50 Ω connector of the spectrum analyzer using an adapter. Do not use a cable.
9. On the spectrum analyzer, press the following keys:

   (PEAK SEARCH)
   (MKR FCTN) MK TRACK ON OFF (ON)
   (SPAN) 10 (MHz)

   Wait for the AUTO ZOOM routine to finish.
10. On synthesized sweeper #2, adjust the power level to place the signal 1 dB below the spectrum analyzer reference level.
11. On the spectrum analyzer, press (PEAK SEARCH), then MARKER Δ .
12. On synthesized sweeper #1, set RF to ON.
13. On the spectrum analyzer, press (PEAK SEARCH), then NEXT PEAK .

The active marker should be on the lower amplitude signal and not on the signal that is off the top of the screen. If it is not on the lower amplitude signal, reposition the marker to this peak using the spectrum analyzer knob.

14. Read the MKR Δ amplitude and record in the performance verification test record as TR Entry 1. The absolute value of this amplitude should be less than 0.5 dB.

Gain Compression, >2.9 GHz

15. Disconnect the directional coupler from the spectrum analyzer input, then connect the directional coupler to the power sensor.
16. Set the spectrum analyzer by pressing the following key:

    (FREQUENCY) 4.0 (GHz)
    (SPAN) 20 (MHz)
    (MKR) MARKER 1 ON OFF (OFF)

17. Set synthesized sweeper #1 controls as follows:

    CW .... 4.003 GHz
    POWER LEVEL .... 2 dBm

18. Set synthesized sweeper #2 controls as follows:

    CW .... 4.0 GHz
    POWER LEVEL .... −14 dBm

19. Enter the power sensor CAL Factor into the measuring receiver.
20. On synthesized sweeper #1, adjust the power level for a 0 dBm reading on the measuring receiver. Set RF to off.
21. Disconnect the power sensor from the directional coupler and connect the directional coupler to the INPUT 50 Ω connector of the spectrum analyzer using an adapter. Do not use a cable.
22. On the spectrum analyzer, press the following keys:

    (PEAK SEARCH)
    (MKR FCTN) MK TRACK ON OFF (ON)

    Wait for the signal to be centered on screen.

    (AMPLITUDE) PRESEL PEAK

    Wait for the CAL: PEAKING message to disappear.

    (SPAN) 10 (MHz)

    Wait for the AUTO ZOOM message to disappear.

23. On synthesized sweeper #2, adjust the power level to place the signal 1 dB below the spectrum analyzer reference level.
24. On the spectrum analyzer, press (PEAK SEARCH), then MARKER Δ .
25. On synthesized sweeper #1, set RF to ON.
26. On the spectrum analyzer, press (PEAK SEARCH), then NEXT PEAK .

    The active marker should be on the lower amplitude signal and not on the signal that is off the top of the screen. If it is not on the lower amplitude signal, reposition the marker to this peak using the spectrum analyzer knob.

27. Read the MKR Δ amplitude and record in the performance verification test record as TR Entry 2. The absolute value of this amplitude should be less than or equal to 0.5 dB.

    If you are testing a spectrum analyzer equipped with Option 130 continue with step 28.

    Performance verification test, "Gain Compression," is now complete for all other spectrum analyzers.

Additional Steps for Option 130

28. Connect the equipment as shown in Figure 2-63.
29. Press INSTRUMENT PRESET on both synthesized sweepers.
30. Set synthesized sweeper #1 controls as follows:

    CW .... 2.000 010 GHz
    POWER LEVEL .... 0 dBm

31. Set synthesized sweeper #2 controls as follows:

    CW .... 2.0 GHz
    POWER LEVEL .... −14 dBm
    RF .... OFF

32. On synthesized sweeper #1, adjust the power level for a 0 dBm reading on the measuring receiver. Set RF to OFF.
33. On synthesized sweeper #2, set the RF to ON.
34. Disconnect the power sensor from the directional coupler and connect the directional coupler to the INPUT 50 Ω connector of the spectrum analyzer using an adapter. Do not use a cable.
35. On the spectrum analyzer, press (PRESET), then wait for the preset routine to finish. Press the spectrum analyzer keys as follows:

    (FREQUENCY) 2.0 (GHz)
    (SPAN) 10 (MHz)
    (AMPLITUDE) −10 (dBm)
    (PEAK SEARCH)
    (MKR FCTN) MK TRACK ON OFF (ON)
    (SPAN) 2 (kHz)

    Wait for the AUTO ZOOM message to disappear.

36. On synthesized sweeper #2, adjust the amplitude to place the signal 10 dB below the spectrum analyzer reference level.
37. On the spectrum analyzer, press (SGL SWP), then wait for the completion of a new sweep. Press (PEAK SEARCH).
38. On synthesized sweeper #1, set RF to ON.
39. On the spectrum analyzer, press (SGL SWP), then wait for the completion of a new sweep. Press (PEAK SEARCH), MARKER Δ.
40. Read the MKR Δ amplitude and record in the performance verification test record as TR Entry 3.

38. Gain Compression, HP 8596E

This performance verification test measures gain compression in both low band and high band. Two signals, separated by 3 MHz, are used. First, the test places a −30 dBm signal at the input of the spectrum analyzer (the spectrum analyzer reference level is also set to −30 dBm). Then, a 0 dBm signal is applied to the spectrum analyzer, overdriving its input. The decrease in the first signal's amplitude (gain compression) caused by the second signal is the measured gain compression.

For spectrum analyzers equipped with Option 130 the signals are separated by 10 kHz, then the first signal is kept 10 dB below the reference level.

There are no related adjustment procedures for this performance test.

Equipment Required

Synthesized sweeper *(two required)*
Measuring receiver *(used as a power meter)*
Power sensor, 50 MHz to 12.8 GHz
Directional coupler
Cable, APC 3.5, 91 cm (36 in) *(two required)*
Adapter, Type N (m) to APC 3.5 (m)
Adapter, APC 3.5 (f) to APC 3.5 (f) *(two required)*

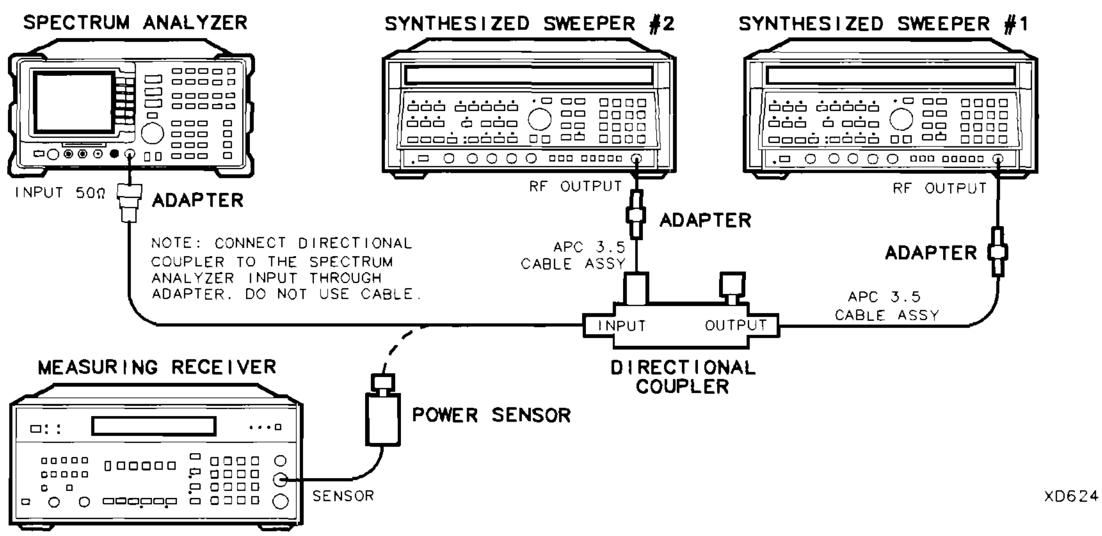


Figure 2-64. Gain Compression Test Setup

Procedure

Gain Compression, <2.9 GHz

1. Zero and calibrate the measuring receiver and 50 MHz to 12.8 GHz power sensor combination in log mode (power reads out in dBm) as described in the measuring receiver operation manual. Enter the power sensor 2 GHz Cal Factor into the measuring receiver.

2. Connect the equipment as shown in Figure 2-64, with the output of the directional coupler connected to the power sensor.
3. Press INSTRUMENT PRESET on both synthesized sweepers.
4. Set synthesized sweeper #1 controls as follows:

   CW .... 2.003 GHz
   POWER LEVEL .... 0 dBm

5. Set synthesized sweeper #2 controls as follows:

   CW .... 2.0 GHz
   AMPLITUDE .... −14 dBm

6. On the spectrum analyzer, press (PRESET), then wait for the preset routine to finish. Press the spectrum analyzer keys as follows:

   (FREQUENCY) 2.0 (GHz)
   (SPAN) 20 (MHz)
   (AMPLITUDE) REF LVL 30 (−dBm)
   SCALE LOG LIN (LOG) 1 (dB)
   (BW) RES BW AUTO MAN 300 (kHz)

7. On synthesized sweeper #1, adjust the power level for a 0 dBm reading on the measuring receiver. Set RF to off.

   The power level applied to the spectrum analyzer input is 10 dB greater than the specification to account for the 10 dB attenuation setting. A power level of 0 dBm at the spectrum analyzer input yields −10 dBm at the input mixer.

8. Disconnect the power sensor from the directional coupler and connect the directional coupler to the INPUT 50 Ω connector of the spectrum analyzer using an adapter. Do not use a cable.
9. On the spectrum analyzer, press the following keys:

   (PEAK SEARCH)
   (MKR FCTN) MK TRACK ON OFF (ON)
   (SPAN) 10 (MHz)

   Wait for the AUTO ZOOM routine to finish.

10. On synthesized sweeper #2, adjust the power level to place the signal 1 dB below the spectrum analyzer reference level.
11. On the spectrum analyzer, press (PEAK SEARCH), then MARKER Δ .
12. On synthesized sweeper #1, set RF to ON.
13. On the spectrum analyzer, press (PEAK SEARCH), then NEXT PEAK .

    The active marker should be on the lower amplitude signal and not on the signal that is off the top of the screen. If it is not on the lower amplitude signal, reposition the marker to this peak using the spectrum analyzer knob.

14. Read the MKR Δ amplitude and record in the performance verification test record as TR Entry 1. The absolute value of this amplitude should be less than 0.5 dB.

Gain Compression, >2.9 GHz

15. Disconnect the directional coupler from the spectrum analyzer input, then connect the directional coupler to the power sensor.
16. Set the spectrum analyzer by pressing the following key:

    (FREQUENCY) 4.0 (GHz)
    (SPAN) 20 (MHz)
    (MKR) MARKER 1 ON OFF (OFF)

17. Set synthesized sweeper #1 controls as follows:

    CW .... 4.003 GHz
    POWER LEVEL .... 2 dBm

18. Set synthesized sweeper #2 controls as follows:

    CW .... 4.0 GHz
    POWER LEVEL .... −14 dBm

19. Enter the power sensor CAL Factor into the measuring receiver.
20. On synthesized sweeper #1, adjust the power level for a 0 dBm reading on the measuring receiver. Set RF to off.
21. Disconnect the power sensor from the directional coupler and connect the directional coupler to the INPUT 50 Ω connector of the spectrum analyzer using an adapter. Do not use a cable.
22. On the spectrum analyzer, press the following keys:

    (PEAK SEARCH)
    (MKR FCTN) MK TRACK ON OFF (ON)

    Wait for the signal to be centered on screen.

    (AMPLITUDE) PRESEL PEAK

    Wait for the CAL: PEAKING message to disappear.

    (SPAN) 10 (MHz)

    Wait for the AUTO ZOOM message to disappear.

23. On synthesized sweeper #2, adjust the power level to place the signal 1 dB below the spectrum analyzer reference level.
24. On the spectrum analyzer, press (PEAK SEARCH), then MARKER Δ.
25. On synthesized sweeper #1, set RF to ON.
26. On the spectrum analyzer, press (PEAK SEARCH), then NEXT PEAK.

    The active marker should be on the lower amplitude signal and not on the signal that is off the top of the screen. If it is not on the lower amplitude signal, reposition the marker to this peak using the spectrum analyzer knob.

27. Read the MKR Δ amplitude and record in the performance verification test record as TR Entry 2. The absolute value of this amplitude should be less than or equal to 0.5 dB.

    If you are testing a spectrum analyzer equipped with Option 130 continue with step 28.

    Performance verification test, "Gain Compression" is now complete for all other spectrum analyzers.

Additional Steps for Option 130

28. Connect the equipment as shown in Figure 2-64.
29. Press INSTRUMENT PRESET on both synthesized sweepers.
30. Set synthesized sweeper #1 controls as follows:

    CW .... 50.010 MHz
    POWER LEVEL .... 0 dBm

31. Set synthesized sweeper #2 controls as follows:

    CW .... 50 MHz
    POWER LEVEL .... −14 dBm
    RF .... OFF

32. On synthesized sweeper #1, adjust the power level for a 0 dBm reading on the measuring receiver. Set RF to OFF.
33. On synthesized sweeper #2, set the RF to ON.
34. Disconnect the power sensor from the directional coupler and connect the directional coupler to the INPUT 50 Ω connector of the spectrum analyzer using an adapter. Do not use a cable.
35. On the spectrum analyzer, press (PRESET), then wait for the preset routine to finish. Press the spectrum analyzer keys as follows:

    (FREQUENCY) 50 (MHz)
    (SPAN) 10 (MHz)
    (AMPLITUDE) −10 (dBm)
    (PEAK SEARCH)
    (MKR FCTN) MK TRACK ON OFF (ON)
    (SPAN) 2 (kHz)

    Wait for the AUTO ZOOM message to disappear.

36. On synthesized sweeper #2, adjust the amplitude to place the signal 10 dB below the spectrum analyzer reference level.
37. On the spectrum analyzer, press (SGL SWP), then wait for the completion of a new sweep. Press (PEAK SEARCH), then MARKER Δ .
38. On synthesized sweeper #1, set RF to ON.
39. On the spectrum analyzer, press (SGL SWP), then wait for the completion of a new sweep. Press (PEAK SEARCH).
40. Read the MKR Δ amplitude and record in the performance verification test record as TR Entry 3.

39. Displayed Average Noise Level, HP 8591C and HP 8591E

This performance test measures the displayed average noise level within the frequency range specified. The spectrum analyzer input is terminated in 50 Ω.

The LO feedthrough is used as a frequency reference for these measurements. The test tunes the spectrum analyzer frequency across the band, uses the marker to locate the frequency with the highest response, and then reads the average noise in zero span.

To reduce measurement uncertainty due to input attenuator switching and resolution bandwidth switching, a reference level offset is added. The CAL OUT signal is used as the amplitude reference for determining the amount of offset required. The offset is removed at the end of the test by pressing instrument preset.

The related adjustment for this procedure is "Frequency Response Adjustment."

If the spectrum analyzer is equipped with Option 130, narrow bandwidth, perform "Displayed Average Noise Level for Option 130," instead.

Equipment Required

Termination, 50 Ω
Cable, BNC, 23 cm (9 in)
Adapter, Type N (m) to BNC (f)

Additional Equipment for 75 Ω input

Cable, BNC 75 Ω, 30 cm (12 in)
Termination, 75 Ω, Type N (m)
Adapter, Type N (f) to BNC (m) 75 Ω

Caution Use only 75 Ω cables, connectors, or adapters on instruments with 75 Ω inputs or damage to the input connector will occur.

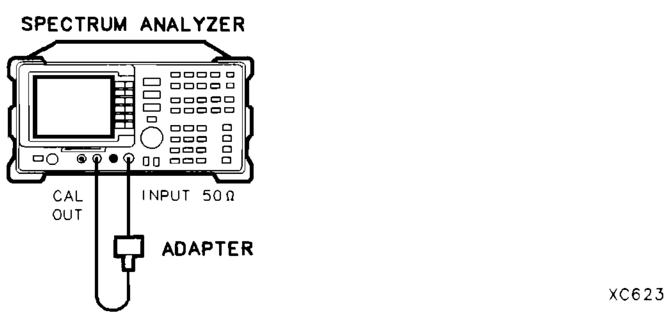


Figure 2-65. Displayed Average Noise Level Test Setup

400 kHz

If testing an instrument equipped with a 75 Ω input, omit steps 6 through 10, then proceed to step 10 ("1 MHz").

6. Press the following spectrum analyzer keys:

   (BW) VID BW AUTO MAN (AUTO)
   (FREQUENCY) 0 (Hz)
   (SPAN) 10 (MHz)
   (AMPLITUDE) −10 (dBm)
   (TRIG) SWEEP CONT SGL (CONT)

7. Press the following spectrum analyzer keys:

   (PEAK SEARCH)
   (MKR FCTN) MK TRACK ON OFF (ON)
   (SPAN) 800 (kHz)

   Wait for the AUTO ZOOM message to disappear, then press the following spectrum analyzer keys:

   (MKR FCTN) MK TRACK ON OFF (OFF)
   (BW) 3 (kHz)

8. Press (FREQUENCY) and adjust the center frequency until the LO feedthrough peak is on the left-most graticule line. Set the spectrum analyzer by pressing the following keys:

   (SPAN) 50 (kHz)
   (AMPLITUDE) −50 (dBm)
   (BW) 1 (kHz)
   VID BW AUTO MAN 30 (Hz)
   (SWEEP) 5 (sec)
   (TRACE) More 1 of 3 DETECTOR PK SP NG (SP)
   (SGL SWP)

   Wait for the completion of a new sweep.

9. Press the following spectrum analyzer keys:

   (DISPLAY) DSP LINE ON OFF (ON)

   Adjust the display line so that it is centered on the average trace noise, ignoring any residual responses (refer to the Residual Responses verification test for any suspect residuals).

10. Record the display line amplitude setting as TR Entry 1 of the performance verification test record as the noise level at 400 kHz. The average noise level should be less than the specified limit.

400 kHz

If testing an instrument equipped with a 75 Ω input, omit steps 6 through 10, then proceed to step 10 ("1 MHz").

6. Press the following spectrum analyzer keys:

   (BW) VID BW AUTO MAN (AUTO)
   (FREQUENCY) 0 (Hz)
   (SPAN) 10 (MHz)
   (AMPLITUDE) −10 (dBm)
   (TRIG) SWEEP CONT SGL (CONT)

7. Press the following spectrum analyzer keys:

   (PEAK SEARCH)
   (MKR FCTN) MK TRACK ON OFF (ON)
   (SPAN) 800 (kHz)

   Wait for the AUTO ZOOM message to disappear, then press the following spectrum analyzer keys:

   (MKR FCTN) MK TRACK ON OFF (OFF)
   (BW) 3 (kHz)

8. Press (FREQUENCY) and adjust the center frequency until the LO feedthrough peak is on the left-most graticule line. Set the spectrum analyzer by pressing the following keys:

   (SPAN) 50 (kHz)
   (AMPLITUDE) −50 (dBm)
   (BW) 1 (kHz)
   VID BW AUTO MAN 30 (Hz)
   (SWEEP) 5 (sec)
   (TRACE) More 1 of 3 DETECTOR PK SP NG (SP)
   (SGL SWP)

   Wait for the completion of a new sweep.

9. Press the following spectrum analyzer keys:

   (DISPLAY) DSP LINE ON OFF (ON)

   Adjust the display line so that it is centered on the average trace noise, ignoring any residual responses (refer to the Residual Responses verification test for any suspect residuals).

10. Record the display line amplitude setting as TR Entry 1 of the performance verification test record as the noise level at 400 kHz. The average noise level should be less than the specified limit.

1 MHz

11. Set the spectrum analyzer by pressing the following keys:

    (AUTO COUPLE) RES BW AUTO MAN (AUTO)

    VID BW AUTO MAN (AUTO)

    (FREQUENCY) 0 (Hz)
    (SPAN) 10 (MHz)
    (AMPLITUDE) −10 (dBm)

    75 Ω input only: (AMPLITUDE) +35 (dBmV)

    (TRIG) SWEEP CONT SGL (CONT)

12. Press the following spectrum analyzer keys:

    (PEAK SEARCH)
    (MKR FCTN) MK TRACK ON OFF (ON)
    (MKR →) MARKER →REF LVL
    (SPAN) 2 (MHz)

    Wait for the AUTO ZOOM message to disappear, then press (MKR FCTN) and MK TRACK ON OFF (OFF).

13. Press (FREQUENCY) and adjust the center frequency until the LO feedthrough peak is on the left-most graticule line, then press the following spectrum analyzer keys:

    (SPAN) 50 (kHz)
    (AMPLITUDE) −50 (dBm)

14. *75 Ω input only:* Press (AMPLITUDE) −1.2 (dBmV).

    (BW) VID BW AUTO MAN 30 (Hz)
    (SGL SWP)

    Wait for the completion of a new sweep.

15. Press the following spectrum analyzer keys:

    (DISPLAY) DSP LINE ON OFF (ON)

    Adjust the display line so that it is centered on the average trace noise, ignoring any residual responses (refer to the Residual Responses verification test for any suspect residuals).

16. Record the display line amplitude setting as TR Entry 2 of the performance verification test record as the noise level at 1 MHz. The average noise level should be less than the specified limit.

1 MHz to 1.5 GHz

17. Press the following spectrum analyzer keys:

    (FREQUENCY) START FREQ 1 (MHz)
    STOP FREQ 1.5 (GHz)
    (BW) 1 (MHz)
    VID BW AUTO MAN 10 (kHz)
    (TRIG) SWEEP CONT SGL (CONT)

18. Press (FREQUENCY) and adjust the center frequency setting, if necessary, to place the LO feedthrough just off-screen to the left.
19. Press the following spectrum analyzer keys:

    (SGL SWP)
    (TRACE) CLEAR WRITE A
    More 1 of 3 VID AVG ON OFF (ON) 10 (Hz)

    Wait until AVG 10 is displayed to the left of the graticule (the spectrum analyzer will take ten sweeps, then stop).
20. Press (PEAK SEARCH) and record the MKR frequency as the Measurement Frequency in Table 2-50 for 1 MHz to 1.5 GHz.
21. Press the following spectrum analyzer keys:

    (TRACE) More 1 of 3 VID AVG ON OFF (OFF)
    (AUTO COUPLE) RES BW AUTO MAN (AUTO)
    VID BW AUTO MAN (AUTO)
    (SPAN) 50 (kHz)
    (FREQUENCY)

22. Set the center frequency to the Measurement Frequency recorded in Table 2-50 for 1 MHz to 1.5 GHz.
23. Press the following spectrum analyzer keys:

    (BW) 1 (kHz)
    VID BW AUTO MAN 30 (Hz)
    (SGL SWP).

    Wait for the sweep to finish.
24. Press the following spectrum analyzer keys:

    (DISPLAY) DSP LINE ON OFF (ON)

    Adjust the display line so that it is centered on the average trace noise, ignoring any residual responses (refer to the Residual Responses verification test for any suspect residuals).
25. Record the display line amplitude setting as TR Entry 3 of the performance verification test record. The average noise level should be less than the specified limit.

1.5 GHz to 1.8 GHz

26. Press the following spectrum analyzer keys:

    (AUTO COUPLE) RES BW AUTO MAN (AUTO)

    VID BW AUTO MAN (AUTO)

    (SPAN) 10 (MHz)
    (AMPLITUDE) −50 (dBm)

    75 Ω input only: Press (AMPLITUDE) −1.2 (dBmV).

    (TRIG) SWEEP CONT SGL (CONT)

    (FREQUENCY) START FREQ 1.5 (GHz)

    STOP FREQ 1.8 (GHz)

27. Repeat steps 18 through 23 above for frequencies from 1.5 GHz to 1.8 GHz.

    If the Displayed Average Noise at 1.8 GHz is at or out of specification, it is recommended that a known frequency source be used as a frequency marker. This ensures that testing is within 1.8 GHz.

28. Record the display line amplitude setting as TR Entry 4 of the performance verification test record. The average noise level should be less than the specified limit.

Table 2-50. Displayed Average Noise Level Worksheet

Frequency Range	Measurement Frequency	TR Entry (Displayed Average Noise Level)
400 kHz	400 kHz	1
1 MHz	1 MHz	2
1 MHz to 1.5 GHz	________	3
1.5 GHz to 1.8 GHz	________	4

40. Displayed Average Noise Level, HP 8593E

This test measures the displayed average noise level in all five frequency bands. The spectrum analyzer input is terminated in 50 Ω. In Band 0 (9 kHz to 2.9 GHz), the test first measures the average noise at 400 kHz and 1 MHz in zero span. The LO feedthrough is used as a frequency reference for these measurements. For the rest of Band 0 and for all of the remaining bands, the test tunes the analyzer frequency across the band, uses the marker to locate the frequency with the highest response, and then reads the average noise in zero span.

To reduce measurement uncertainty due to input attenuator switching and resolution bandwidth switching, a reference level offset is added. The CAL OUT signal is used as the amplitude reference for determining the amount of offset required. The offset is removed at the end of the test by pressing (PRESET).

There are no related adjustments for this performance verification test.

If the spectrum analyzer is equipped with Option 130, narrow bandwidth, perform "Displayed Average Noise Level for Option 130," instead.

Equipment Required

Cable, BNC, 23 cm (9 in)
Termination, 50 Ω
Adapter, Type N (m) to BNC (f)
Adapter, Type N (m) to APC 3.5 (f)

Additional Equipment for Option 026

Adapter, APC 3.5 (f) to APC 3.5 (f)
Adapter, BNC (m) to SMA (f)
Cable, Cal Comb

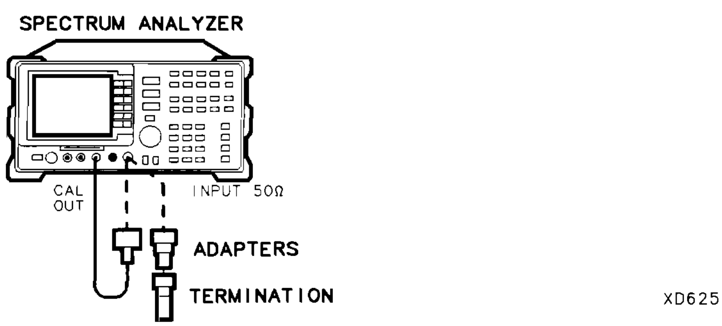


Figure 2-66. Displayed Average Noise Level Test Setup

Procedure

1. Connect a cable from the CAL OUT to the INPUT 50 Ω of the spectrum analyzer as shown in Figure 2-66.

   Option 026 only: Use the BNC to SMA adapter to connect the cal comb cable to CAL OUT. Use the APC 3.5 adapter to connect the cal cable to the INPUT 50 Ω.

2. Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish. Set the spectrum analyzer by pressing the following keys:

   (FREQUENCY) 300 (MHz)
   (SPAN) 10 (MHz)
   (AMPLITUDE) −20 (dBm)
   ATTEN AUTO MAN 0 (dB)

3. Press the following spectrum analyzer keys:

   (PEAK SEARCH)
   (MKR FCTN) MK TRACK ON OFF (ON)
   (SPAN) 100 (kHz)

   Wait for the AUTO ZOOM message to disappear, then press the following keys:

   (BW) VID BW AUTO MAN 30 (Hz)
   (MKR FCTN) MK TRACK ON OFF (OFF)

4. Press (SGL SWP), then wait for the completion of a new sweep. Press the following spectrum analyzer keys:

   (PEAK SEARCH)
   (AMPLITUDE) More 1 of 3 REF LVL OFFSET

   Subtract the MKR amplitude reading from −20 dBm and enter the result as the REF LVL OFFSET. For example, if the marker reads −20.21 dBm, enter +0.21 dB (−20 dBm − (−20.21 dBm) = +0.21 dB).

   REF LVL OFFSET ________ dB

5. Disconnect the cable from the INPUT 50 Ω connector of the spectrum analyzer. Connect the 50 Ω termination to the spectrum analyzer INPUT 50 Ω connector.

400 kHz

6. Press the following spectrum analyzer keys:

   (BW) VID BW AUTO MAN (AUTO)
   (FREQUENCY) 0 (Hz)
   (SPAN) 10 (MHz)
   (AMPLITUDE) REF LVL −10 (dBm)
   (TRIG) SWEEP CONT SGL (CONT)

7. Press the following spectrum analyzer keys:

   (PEAK SEARCH)
   (MKR FCTN) MK TRACK ON OFF (ON)
   (SPAN) 800 (kHz)

   Wait for the AUTO ZOOM message to disappear, then press the following spectrum analyzer keys:

   (MKR FCTN) MK TRACK ON OFF (OFF)
   (BW) 3 (kHz)

8. Press (FREQUENCY) and adjust the center frequency until the LO feedthrough peak is on the left-most graticule line. Set the spectrum analyzer by pressing the following keys:

   (SPAN) 50 (kHz)
   (AMPLITUDE) REF LVL −50 (dBm)
   (BW) RES BW AUTO MAN 1 (kHz)
   VID BW AUTO MAN 30 (Hz)
   (SWEEP) SWP TIME AUTO MAN 5 (sec)
   (TRACE) More 1 of 3 DETECTOR PK SP NG (SP)
   (SGL SWP)

   Wait for the completion of a new sweep.

9. Press the following spectrum analyzer keys:

   (DISPLAY) DSP LINE ON OFF (ON)

   Adjust the display line so that it is centered on the average trace noise, ignoring any residual responses (refer to the Residual Responses verification test for any suspect residuals).

10. Record the display line amplitude setting as TR Entry 1 of the performance verification test record as the noise level at 400 kHz. The average noise level should be less than the specified limit.

1 MHz

11. Set the spectrum analyzer by pressing the following keys:

    (AUTO COUPLE) RES BW AUTO MAN (AUTO)
    VID BW AUTO MAN (AUTO)
    (FREQUENCY) 0 (Hz)
    (SPAN) 10 (MHz)
    (AMPLITUDE) REF LVL −10 (dBm)
    (TRIG) SWEEP CONT SGL (CONT)

12. Press the following spectrum analyzer keys:

    (PEAK SEARCH)
    (MKR FCTN) MK TRACK ON OFF (ON)
    (SPAN) 2 (MHz)

    Wait for the AUTO ZOOM message to disappear, then press (MKR FCTN) and MK TRACK ON OFF (OFF).

13. Press (FREQUENCY) and adjust the center frequency until the LO feedthrough peak is on the left-most graticule line, then press the following spectrum analyzer keys:

    (SPAN) 50 (kHz)
    (AMPLITUDE) REF LVL −50 (dBm)
    (BW) RES BW AUTO MAN 1 (kHz)
    VID BW AUTO MAN 30 (Hz)
    (SGL SWP)

    Wait for the completion of a new sweep.

14. Press the following spectrum analyzer keys:

    (DISPLAY) DSP LINE ON OFF (ON)

    Adjust the display line so that it is centered on the average trace noise, ignoring any residual responses (refer to the Residual Responses verification test for any suspect residuals).

15. Record the display line amplitude setting as TR Entry 2 of the performance verification test record as the noise level at 1 MHz. The average noise level should be less than the specified limit.

1 MHz to 2.9 GHz

16. Press the following spectrum analyzer keys:

    (SPAN) Band Lock 0-2.9 Gz BAND 0

    (BW) RES BW AUTO MAN 1 (MHz)

    VID BW AUTO MAN 10 (kHz)

    (TRIG) SWEEP CONT SGL (CONT)

    Adjust the START FREQ setting, if necessary, to place the LO feedthrough just off-screen to the left.

17. Press the following spectrum analyzer keys:

    (SGL SWP)

    (TRACE) CLEAR WRITE A More 1 of 3

    VID AVG ON OFF (ON) 10 (Hz)

    Wait until AVG 10 is displayed to the left of the graticule (the analyzer will take ten sweeps, then stop).

18. Press (PEAK SEARCH) and record the MKR frequency as the Measurement Frequency in the appropriate band under test in Table 2-51.

19. Press the following spectrum analyzer keys:

    (TRACE) More 1 of 3 VID AVG (OFF)

    (AUTO COUPLE) RES BW AUTO MAN (AUTO)

    VID BW AUTO MAN (AUTO)

    (SPAN) 50 (kHz)

    (FREQUENCY)

    Set CENTER FREQ to the Measurement Frequency recorded in Table 2-51 in the previous step, then press the following keys:

    (BW) RES BW AUTO MAN 1 (kHz)

    VID BW AUTO MAN 30 (Hz)

20. Press (SGL SWP) on the spectrum analyzer, then wait for a new sweep to finish. Press the following spectrum analyzer keys:

    (DISPLAY) DSP LINE ON OFF (ON)

    Adjust the display line so that it is centered on the average noise trace, ignoring any residual responses (refer to Residual Response verification test for any suspected residuals).

    Record the display line amplitude setting in the performance verification test record as indicated in Table 2-51. The average noise level should be less than the specified limit.

21. Press (MKR) and MARKER 1 ON OFF (OFF) to turn the marker off.

2.75 to 6.5 GHz

22. Press the following spectrum analyzer keys:

    (SPAN) Band Lock 2.75-6.5 BAND 1

    (BW) RES BW AUTO MAN 1 (MHz)

    VID BW AUTO MAN 10 (kHz)

    (TRIG) SWEEP CONT SGL (CONT)

23. Repeat steps 17 through 21 above for Band 1 (2.75 to 6.5 GHz).

6.0 to 12.8 GHz

24. Press the following spectrum analyzer keys:

    (FREQUENCY) Band Lock 6.0-12.8 BAND 2

    (BW) RES BW AUTO MAN 1 (MHz)

    VID BW AUTO MAN 10 (kHz)

    (TRIG) SWEEP CONT SGL (CONT)

25. Repeat steps 17 through 21 above for Band 2 (6.0 to 12.8 GHz).

12.4 to 19.4 GHz

26. Press the following spectrum analyzer keys:

    (FREQUENCY) Band Lock 12.4-19. BAND 3

    (BW) RES BW AUTO MAN 1 (MHz)

    VID BW AUTO MAN 10 (kHz)

    (TRIG) SWEEP CONT SGL (CONT)

27. Repeat steps 17 through 21 above for Band 3 (12.4 to 19.4 GHz).

19.1 to 22 GHz

28. Press the following spectrum analyzer keys:

    (FREQUENCY) Band Lock 19.1-22 BAND 4

    Option 026 or 027 only: (FREQUENCY) START FREQ 19.1 (GHz) STOP FREQ 22 (GHz)

    (BW) RES BW AUTO MAN 1 (MHz)

    VID BW AUTO MAN 10 (kHz)

    (TRIG) SWEEP CONT SGL (CONT)

29. Repeat steps 17 through 21 above for Band 4.

22 GHz to 26.5 GHz *(Option 026 or 027)*

30. Press the following spectrum analyzer keys:

    (FREQUENCY) Band Lock 19.1 - 22 BAND 4

    (FREQUENCY) START FREQ 22 (GHz)

    STOP FREQ 26.5 (GHz)

31. Set the spectrum analyzer by pressing the following keys:

    (BW) RES BW AUTO MAN 1 (MHz)

    VID BW AUTO MAN 10 (kHz)

    (TRIG) SWEEP CONT SGL (CONT)

32. Repeat steps 17 through 21 for frequencies from 22 to 26.5 GHz.
33. Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish.

Table 2-51. Displayed Average Noise Level Worksheet

Frequency Range	Measurement Frequency	Displayed Average Noise Level TR Entry
400 kHz	400 kHz	1
1MHz	1 MHz	2
1 MHz to 2.9 GHz	________	3
2.75 to 6.5 GHz	________	4
6.0 to 12.8 GHz	________	5
12.4 to 19.4 GHz	________	6
19.1 to 22 GHz	________	7
19.1 to 26.5 GHz[1]	________	8

1 Option 026 or 027 only

41. Displayed Average Noise Level, HP 8594E

This performance test measures the displayed average noise level within the frequency range specified. The spectrum analyzer input is terminated in 50 Ω.

The test tunes the spectrum analyzer frequency across the band, uses the marker to locate the frequency with the highest response, and then reads the average noise in zero span.

To reduce measurement uncertainty due to input attenuator switching and resolution bandwidth switching, a reference level offset is added. The CAL OUT signal is used as the amplitude reference for determining the amount of offset required. The offset is removed at the end of the test by pressing instrument preset.

The related adjustment for this procedure is "Frequency Response Adjustment."

If the spectrum analyzer is equipped with Option 130, narrow bandwidth, perform verification test, "Displayed Average Noise Level for Option 130," instead.

Equipment Required

Termination, 50 Ω
Cable, BNC, 23 cm (9 in)
Adapter, Type N (m) to BNC (f)

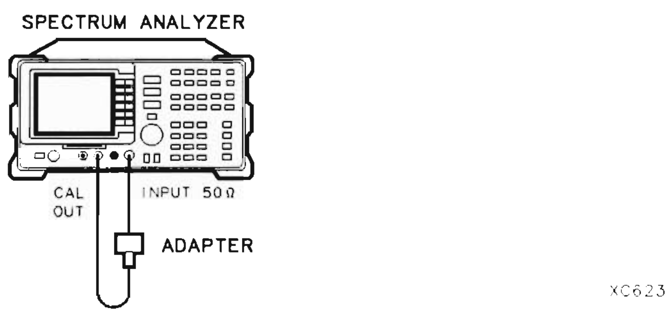


Figure 2-67. Displayed Average Noise Level Test Setup

Procedure

1. Connect a cable from the CAL OUT to the INPUT 50 Ω of the spectrum analyzer as shown in Figure 2-67.
2. Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish. Set the spectrum analyzer by pressing the following keys:

   (FREQUENCY) 300 (MHz)
   (SPAN) 10 (MHz)
   (AMPLITUDE) −20 (dBm)
   ATTEN AUTO MAN 0 (dB)

3. Press the following spectrum analyzer keys:

   (PEAK SEARCH)
   (MKR FCTN) MK TRACK ON OFF (ON)
   (SPAN) 100 (kHz)

   Wait for the AUTO ZOOM message to disappear, then press the following keys:

   (BW) 1 (kHz) VID BW AUTO MAN 30 (Hz)
   (MKR FCTN) MK TRACK ON OFF (OFF)

4. Press (SGL SWP), then wait for the completion of a new sweep. Press the following spectrum analyzer keys:

   (PEAK SEARCH)
   (AMPLITUDE) More 1 of 3 REF LVL OFFSET

   Subtract the MKR amplitude reading from −20 dBm and enter the result as the REF LVL OFFSET. For example, if the marker reads −20.21 dBm, enter +0.21 dB (−20 dBm − (−20.21 dBm) = +0.21 dB).

   REF LVL OFFSET ________ dB

5. Disconnect the cable from the INPUT 50 Ω connector of the spectrum analyzer. Connect the 50 Ω termination to the spectrum analyzer INPUT 50 Ω connector.

400 kHz

6. Press the following spectrum analyzer keys:

   (FREQUENCY) 400 (kHz)
   (SPAN) 50 (kHz)
   (AMPLITUDE) −90 (dBm)
   (TRIG) SWEEP CONT SGL (CONT)

7. Press the following spectrum analyzer keys:

   (BW) 1 (kHz)
   (TRACE) More 1 of 3 DETECTOR PK SP NG (SP)
   (SGL SWP)

   Wait for the completion of a new sweep.

8. Press the following spectrum analyzer keys:

   (DISPLAY) DSP LINE ON OFF (ON)

   Adjust the display line so that it is centered on the average trace noise, ignoring any residual responses (refer to the Residual Responses verification test for any suspect residuals).

9. Record the display line amplitude setting as TR Entry 1 of the performance test record as the noise level at 400 kHz. The average noise level should be less than the specified limit.

4 MHz

10. Press the following spectrum analyzer keys:

    (FREQUENCY) 4 (MHz)
    (SGL SWP)

    Wait for the completion of a new sweep.

11. Press the following spectrum analyzer keys:

    (DISPLAY) DSP LINE ON OFF (ON)

    Adjust the display line so that it is centered on the average trace noise, ignoring any residual responses (refer to the Residual Responses verification test for any suspect residuals).

12. Record the display line amplitude setting as TR Entry 2 of the performance test record as the noise level at 4 MHz. The average noise level should be less than the specified limit.

5 MHz to 2.9 GHz

13. Press the following spectrum analyzer keys:

    (FREQUENCY) START FREQ 5 (MHz)
    STOP FREQ 2.9 (GHz)
    (BW) 1 (MHz)
    VID BW AUTO MAN 10 (kHz)
    (TRIG) SWEEP CONT SGL (CONT)

14. Press (FREQUENCY) and adjust the start frequency setting, if necessary, to place the LO feedthrough just off-screen to the left.

15. Press the following spectrum analyzer keys:

    (SGL SWP)
    (TRACE) CLEAR WRITE A
    More 1 of 3 VID AVG ON OFF (ON) 10 (Hz)

    Wait until AVG 10 is displayed to the left of the graticule (the spectrum analyzer will take ten sweeps, then stop).

16. Press (PEAK SEARCH) and record the MKR frequency as the Measurement Frequency in Table 2-52 for 5 MHz to 2.9 GHz.

17. Press the following spectrum analyzer keys:

    (TRACE) More 1 of 3
    VID AVG ON OFF (OFF)
    DETECTOR PK SP NG (SP)
    (AUTO COUPLE) RES BW AUTO MAN (AUTO)
    VID BW AUTO MAN (AUTO)
    (SPAN) 50 (kHz)
    (FREQUENCY)

18. Set the center frequency to the Measurement Frequency recorded in Table 2-52 for 5 MHz to 2.9 GHz.
19. Press the following spectrum analyzer keys:

    (BW) 1 (kHz)
    VID BW AUTO MAN 30 (Hz)
    (SGL SWP).

    Wait for the sweep to finish.
20. Press the following spectrum analyzer keys:

    (DISPLAY) DSP LINE ON OFF (ON)

    Adjust the display line so that it is centered on the average trace noise, ignoring any residual responses (refer to the Residual Responses verification test for any suspect residuals).
21. Record the display line amplitude setting as TR Entry 3 of the performance test record. The average noise level should be less than the specified limit.

Table 2-52. Displayed Average Noise Level Worksheet

Frequency Range	Measurement Frequency	TR Entry (Displayed Average Noise Level)
400 kHz	400 kHz	1
4 MHz	4 MHz	2
5 MHz to 2.9 GHz	________	3

42. Displayed Average Noise Level, HP 8595E

This test measures the displayed average noise level in all five frequency bands. The spectrum analyzer input is terminated in 50 Ω. In Band 0 (9 kHz to 2.9 GHz), the test first measures the average noise at 400 kHz and 1 MHz in zero span. The LO feedthrough is used as a frequency reference for these measurements. For the rest of Band 0 and for all of the remaining bands, the test tunes the analyzer frequency across the band, uses the marker to locate the frequency with the highest response, and then reads the average noise in zero span.

To reduce measurement uncertainty due to input attenuator switching and resolution bandwidth switching, a reference level offset is added. The CAL OUT signal is used as the amplitude reference for determining the amount of offset required. The offset is removed at the end of the test by pressing (PRESET).

There are no related adjustments for this performance verification test.

If the spectrum analyzer is equipped with Option 130, narrow bandwidth, perform "Displayed Average Noise Level for Option 130," instead.

Equipment Required

Cable, BNC, 23 cm (9 in)
Termination, 50 Ω
Adapter, Type N (m) to BNC (f)
Adapter, Type N (m) to APC 3.5 (f)

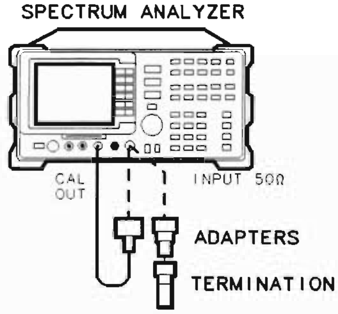


Figure 2-68. Displayed Average Noise Level Test Setup

Procedure

1. Connect a cable from the CAL OUT to the INPUT 50 Ω of the spectrum analyzer as shown in Figure 2-68.
2. Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish. Set the spectrum analyzer by pressing the following keys:

   (FREQUENCY) 300 (MHz)
   (SPAN) 10 (MHz)
   (AMPLITUDE) −20 (dBm)
   ATTEN AUTO MAN 0 (dB)

3. Press the following spectrum analyzer keys:

   (PEAK SEARCH)
   (MKR FCTN) MK TRACK ON OFF (ON)
   (SPAN) 100 (kHz)

   Wait for the AUTO ZOOM message to disappear, then press the following keys:

   (BW) VID BW AUTO MAN 30 (Hz)
   (MKR FCTN) MK TRACK ON OFF (OFF)

4. Press (SGL SWP), then wait for the completion of a new sweep. Press the following spectrum analyzer keys:

   (PEAK SEARCH)
   (AMPLITUDE) More 1 of 3 REF LVL OFFSET

   Subtract the MKR amplitude reading from −20 dBm and enter the result as the REF LVL OFFSET. For example, if the marker reads −20.21 dBm, enter +0.21 dB (−20 dBm − (−20.21 dBm) = +0.21 dB).

   REF LVL OFFSET ________ dB

5. Disconnect the cable from the INPUT 50 Ω connector of the spectrum analyzer. Connect the 50 Ω termination to the spectrum analyzer INPUT 50 Ω connector.

400 kHz

6. Press the following spectrum analyzer keys:

   (BW) VID BW AUTO MAN (AUTO)
   (FREQUENCY) 0 (Hz)
   (SPAN) 10 (MHz)
   (AMPLITUDE) REF LVL −10 (dBm)
   (TRIG) SWEEP CONT SGL (CONT)

7. Press the following spectrum analyzer keys:

   (PEAK SEARCH)
   (MKR FCTN) MK TRACK ON OFF (ON)
   (SPAN) 800 (kHz)

   Wait for the AUTO ZOOM message to disappear, then press the following spectrum analyzer keys:

   (MKR FCTN) MK TRACK ON OFF (OFF)
   (BW) 3 (kHz)

8. Press (FREQUENCY) and adjust the center frequency until the LO feedthrough peak is on the left-most graticule line. Set the spectrum analyzer by pressing the following keys:

   (SPAN) 50 (kHz)
   (AMPLITUDE) REF LVL −50 (dBm)
   (BW) RES BW AUTO MAN 1 (kHz)
   VID BW AUTO MAN 30 (Hz)
   (SWEEP) SWP TIME AUTO MAN 5 (sec)
   (TRACE) More 1 of 3 DETECTOR PK SMP (SMP)
   (SGL SWP)

   Wait for the completion of a new sweep.

9. Press the following spectrum analyzer keys:

   (DISPLAY) DSP LINE ON OFF (ON)

   Adjust the display line so that it is centered on the average trace noise, ignoring any residual responses (refer to the Residual Responses verification test for any suspect residuals).

10. Record the display line amplitude setting as TR Entry 1 of the performance verification test record as the noise level at 400 kHz. The average noise level should be less than the specified limit.

1 MHz

11. Set the spectrum analyzer by pressing the following keys:

   (AUTO COUPLE) RES BW AUTO MAN (AUTO)
   VID BW AUTO MAN (AUTO)
   (FREQUENCY) 0 (Hz)
   (SPAN) 10 (MHz)
   (AMPLITUDE) REF LVL −10 (dBm)
   (TRIG) SWEEP CONT SGL (CONT)

12. Press the following spectrum analyzer keys:

   (PEAK SEARCH)
   (MKR FCTN) MK TRACK ON OFF (ON)
   (SPAN) 2 (MHz)

   Wait for the AUTO ZOOM message to disappear, then press (MKR FCTN) and MK TRACK ON OFF (OFF).

13. Press (FREQUENCY) and adjust the center frequency until the LO feedthrough peak is on the left-most graticule line, then press the following spectrum analyzer keys:

   (SPAN) 50 (kHz)
   (AMPLITUDE) REF LVL −50 (dBm)
   (BW) RES BW AUTO MAN 1 (kHz)
   VID BW AUTO MAN 30 (Hz)
   (SGL SWP)

   Wait for the completion of a new sweep.

14. Press the following spectrum analyzer keys:

    (DISPLAY) DSP LINE ON OFF (ON)

    Adjust the display line so that it is centered on the average trace noise, ignoring any residual responses (refer to the Residual Responses verification test for any suspect residuals).

15. Record the display line amplitude setting as TR Entry 2 of the performance verification test record as the noise level at 1 MHz. The average noise level should be less than the specified limit.

1 MHz to 2.9 GHz

16. Press the following spectrum analyzer keys:

    (FREQUENCY) Band Lock 0-2.9 Gz BAND 0

    (BW) RES BW AUTO MAN 1 (MHz)

    VID BW AUTO MAN 10 (kHz)

    (TRIG) SWEEP CONT SGL (CONT)

    Adjust the START FREQ setting, if necessary, to place the LO feedthrough just off-screen to the left.

17. Press the following spectrum analyzer keys:

    (SGL SWP)

    (TRACE) CLEAR WRITE A More 1 of 3

    VID AVG ON OFF (ON) 10 (Hz)

    Wait until AVG 10 is displayed to the left of the graticule (the analyzer will take ten sweeps, then stop).

18. Press (PEAK SEARCH) and record the MKR frequency as the Measurement Frequency in the appropriate band under test in Table 2-53.

19. Press the following spectrum analyzer keys:

    (TRACE) More 1 of 3 VID AVG (OFF)

    (AUTO COUPLE) RES BW AUTO MAN (AUTO)

    VID BW AUTO MAN (AUTO)

    (SPAN) 50 (kHz)

    (FREQUENCY)

    Set CENTER FREQ to the Measurement Frequency recorded in Table 2-53 in the previous step, then press the following keys:

    (BW) RES BW AUTO MAN 1 (kHz)

    VID BW AUTO MAN 30 (Hz)

20. Press (SGL SWP) on the spectrum analyzer, then wait for a new sweep to finish. Press the following spectrum analyzer keys:

    (DISPLAY) DSP LINE ON OFF (ON)

    Adjust the display line so that it is centered on the average noise trace, ignoring any residual responses (refer to Residual Response verification test for any suspected residuals).

    Record the display line amplitude setting in the performance verification test record as indicated in Table 2-53. The average noise level should be less than the specified limit.

21. Press (MKR) and MARKER 1 ON OFF (OFF) to turn the marker off.

2.75 to 6.5 GHz

22. Press the following spectrum analyzer keys:

    (FREQUENCY) Band Lock 2.75-6.5 BAND 1

    (BW) RES BW AUTO MAN 1 (MHz)

    VID BW AUTO MAN 10 (kHz)

    (TRIG) SWEEP CONT SGL (CONT)

23. Repeat steps 17 through 21 above for Band 1 (2.75 to 6.5 GHz).

Table 2-53. Displayed Average Noise Level Worksheet

Frequency Range	Measurement Frequency	Displayed Average Noise Level TR Entry
400 kHz	400 kHz	1
1MHz	1 MHz	2
1 MHz to 2.9 GHz	________	3
2.75 to 6.5 GHz	________	4

43. Displayed Average Noise Level, HP 8596E

This test measures the displayed average noise level in all five frequency bands. The spectrum analyzer input is terminated in 50 Ω. In Band 0 (9 kHz to 2.9 GHz), the test first measures the average noise at 400 kHz and 1 MHz in zero span. The LO feedthrough is used as a frequency reference for these measurements. For the rest of Band 0 and for all of the remaining bands, the test tunes the analyzer frequency across the band, uses the marker to locate the frequency with the highest response, and then reads the average noise in zero span.

To reduce measurement uncertainty due to input attenuator switching and resolution bandwidth switching, a reference level offset is added. The CAL OUT signal is used as the amplitude reference for determining the amount of offset required. The offset is removed at the end of the test by pressing (PRESET).

There are no related adjustments for this performance verification test.

If the spectrum analyzer is equipped with Option 130, narrow bandwidth, perform "Displayed Average Noise Level for Option 130," instead.

Equipment Required

Cable, BNC, 23 cm (9 in)
Termination, 50 Ω
Adapter, Type N (m) to BNC (f)
Adapter, Type N (m) to APC 3.5 (f)

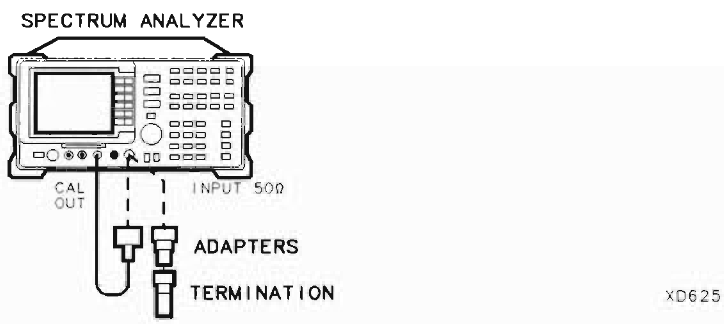


Figure 2-69. Displayed Average Noise Level Test Setup

Procedure

1. Connect a cable from the CAL OUT to the INPUT 50 Ω of the spectrum analyzer as shown in Figure 2-69.
2. Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish. Set the spectrum analyzer by pressing the following keys:

   (FREQUENCY) 300 (MHz)
   (SPAN) 10 (MHz)
   (AMPLITUDE) −20 (dBm)
   ATTEN AUTO MAN 0 (dB)

3. Press the following spectrum analyzer keys:

   (PEAK SEARCH)
   (MKR FCTN) MK TRACK ON OFF (ON)
   (SPAN) 100 (kHz)

   Wait for the AUTO ZOOM message to disappear, then press the following keys:

   (BW) VID BW AUTO MAN 30 (Hz)
   (MKR FCTN) MK TRACK ON OFF (OFF)

4. Press (SGL SWP), then wait for the completion of a new sweep. Press the following spectrum analyzer keys:

   (PEAK SEARCH)
   (AMPLITUDE) More 1 of 3 REF LVL OFFSET

   Subtract the MKR amplitude reading from −20 dBm and enter the result as the REF LVL OFFSET. For example, if the marker reads −20.21 dBm, enter +0.21 dB (−20 dBm − (−20.21 dBm) = +0.21 dB).

   REF LVL OFFSET ________ dB

5. Disconnect the cable from the INPUT 50 Ω connector of the spectrum analyzer. Connect the 50 Ω termination to the spectrum analyzer INPUT 50 Ω connector.

400 kHz

6. Press the following spectrum analyzer keys:

   (BW) VID BW AUTO MAN (AUTO)
   (FREQUENCY) 0 (Hz)
   (SPAN) 10 (MHz)
   (AMPLITUDE) REF LVL −10 (dBm)
   (TRIG) SWEEP CONT SGL (CONT)

7. Press the following spectrum analyzer keys:

   (PEAK SEARCH)
   (MKR FCTN) MK TRACK ON OFF (ON)
   (SPAN) 800 (kHz)

   Wait for the AUTO ZOOM message to disappear, then press the following spectrum analyzer keys:

   (MKR FCTN) MK TRACK ON OFF (OFF)
   (BW) 3 (kHz)

8. Press (FREQUENCY) and adjust the center frequency until the LO feedthrough peak is on the left-most graticule line. Set the spectrum analyzer by pressing the following keys:

   (SPAN) 50 (kHz)
   (AMPLITUDE) REF LVL −50 (dBm)
   (BW) RES BW AUTO MAN 1 (kHz)
   VID BW AUTO MAN 30 (Hz)
   (SWEEP) SWP TIME AUTO MAN 5 (sec)
   (TRACE) More 1 of 3 DETECTOR PK SMP (SMP)
   (SGL SWP)

   Wait for the completion of a new sweep.

9. Press the following spectrum analyzer keys:

   (DISPLAY) DSP LINE ON OFF (ON)

   Adjust the display line so that it is centered on the average trace noise, ignoring any residual responses. Refer to the Residual Responses verification test for any suspect residuals.

10. Record the display line amplitude setting as TR Entry 1 of the performance verification test record as the noise level at 400 kHz. The average noise level should be less than the specified limit.

1 MHz

11. Set the spectrum analyzer by pressing the following keys:

    (AUTO COUPLE) RES BW AUTO MAN (AUTO)
    VID BW AUTO MAN (AUTO)
    (FREQUENCY) 0 (Hz)
    (SPAN) 10 (MHz)
    (AMPLITUDE) REF LVL −10 (dBm)
    (TRIG) SWEEP CONT SGL (CONT)

12. Press the following spectrum analyzer keys:

    (PEAK SEARCH)
    (MKR FCTN) MK TRACK ON OFF (ON)
    (SPAN) 2 (MHz)

    Wait for the AUTO ZOOM message to disappear, then press (MKR FCTN) and MK TRACK ON OFF (OFF).

13. Press (FREQUENCY) and adjust the center frequency until the LO feedthrough peak is on the left-most graticule line, then press the following spectrum analyzer keys:

    (SPAN) 50 (kHz)
    (AMPLITUDE) REF LVL −50 (dBm)
    (BW) RES BW AUTO MAN 1 (kHz)
    VID BW AUTO MAN 30 (Hz)
    (SGL SWP)

    Wait for the completion of a new sweep.

14. Press the following spectrum analyzer keys:

    (DISPLAY) DSP LINE ON OFF (ON)

    Adjust the display line so that it is centered on the average trace noise, ignoring any residual responses. Refer to the Residual Responses verification test for any suspect residuals.

15. Record the display line amplitude setting as TR Entry 2 of the performance verification test record as the noise level at 1 MHz. The average noise level should be less than the specified limit.

1 MHz to 2.9 GHz

16. Press the following spectrum analyzer keys:

    (FREQUENCY) Band Lock 0-2.9 Gz BAND 0

    (BW) RES BW AUTO MAN 1 (MHz)

    VID BW AUTO MAN 10 (kHz)

    (TRIG) SWEEP CONT SGL (CONT)

    Adjust the START FREQ setting, if necessary, to place the LO feedthrough just off-screen to the left.

17. Press the following spectrum analyzer keys:

    (SGL SWP)

    (TRACE) CLEAR WRITE A More 1 of 3

    VID AVG ON OFF (ON) 10 (Hz)

    Wait until AVG 10 is displayed to the left of the graticule (the analyzer will take ten sweeps, then stop).

18. Press (PEAK SEARCH) and record the MKR frequency as the Measurement Frequency in the appropriate band under test in Table 2-54.

19. Press the following spectrum analyzer keys:

    (TRACE) More 1 of 3 VID AVG (OFF)

    (AUTO COUPLE) RES BW AUTO MAN (AUTO)

    VID BW AUTO MAN (AUTO)

    (SPAN) 50 (kHz)

    (FREQUENCY)

    Set CENTER FREQ to the Measurement Frequency recorded in Table 2-54 in the previous step, then press the following keys:

    (BW) RES BW AUTO MAN 1 (kHz)

    VID BW AUTO MAN 30 (Hz)

20. Press (SGL SWP) on the spectrum analyzer, then wait for a new sweep to finish. Press the following spectrum analyzer keys:

    (DISPLAY) DSP LINE ON OFF (ON)

    Adjust the display line so that it is centered on the average noise trace, ignoring any residual responses. Refer to Residual Response verification test for any suspected residuals.

    Record the display line amplitude setting in the performance verification test record as indicated in Table 2-54. The average noise level should be less than the specified limit.

21. Press (MKR) and MARKER 1 ON OFF (OFF) to turn the marker off.

2.75 to 6.5 GHz

22. Press the following spectrum analyzer keys:

    (FREQUENCY) Band Lock 2.75-6.5 BAND 1

    (BW) RES BW AUTO MAN 1 (MHz)

    VID BW AUTO MAN 10 (kHz)

    (TRIG) SWEEP CONT SGL (CONT)

23. Repeat steps 17 through 21 above for Band 1 (2.75 to 6.5 GHz).

6.0 to 12.8 GHz

24. Press the followings spectrum analyzer keys:

    (FREQUENCY) Band Lock 6.0-12.8 BAND 2

    (BW) RES BW AUTO MAN 1 (MHz)

    VID BW AUTO MAN 10 (kHz)

    (TRIG) SWEEP CONT SGL (CONT)

25. Repeat steps 17 through 21 above for Band 2 (6.0 to 12.8 GHz).

Table 2-54. Displayed Average Noise Level Worksheet

Frequency Range	Measurement Frequency	Displayed Average Noise Level TR Entry
400 kHz	400 kHz	1
1MHz	1 MHz	2
1 MHz to 2.9 GHz	________	3
2.75 to 6.5 GHz	________	4
6.0 to 12.8 GHz	________	5

44. Displayed Average Noise Level, HP 8591C and HP 8591E Option 130

This performance test measures the displayed average noise level within the frequency range specified. The spectrum analyzer input is terminated in 50 Ω.

The LO feedthrough is used as a frequency reference for these measurements. The test tunes the spectrum analyzer frequency across the band, uses the marker to locate the frequency with the highest response, and then reads the average noise in zero span.

To reduce measurement uncertainty due to input attenuator switching and resolution bandwidth switching, a reference level offset is added. The CAL OUT signal is used as the amplitude reference for determining the amount of offset required. The offset is removed at the end of the test by pressing instrument preset.

The related adjustment for this procedure is "Frequency Response Adjustment."

If the spectrum analyzer is *not* equipped with Option 130, narrow bandwidth, perform verification test, "Displayed Average Noise Level," instead.

Equipment Required

Termination, 50 Ω
Cable, BNC, 23 cm (9 in)
Adapter, Type N (m) to BNC (f)

Additional Equipment for 75 Ω input

Cable, BNC 75 Ω, 30 cm (12 in)
Termination, 75 Ω, Type N (m)
Adapter, Type N (f) to BNC (m) 75 Ω

Caution Use only 75 Ω cables, connectors, or adapters on the 75 Ω input of an instrument or damage to the input connector will occur.

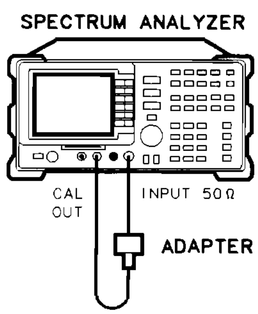


Figure 2-70. Displayed Average Noise Level Test Setup for Option 130

44. Displayed Average Noise Level, HP 8591C and HP 8591E Option 130

Procedure

1. Connect a cable from the CAL OUT to the INPUT 50 Ω of the spectrum analyzer as shown in Figure 2-70.

   75 Ω input only: Use a 75 Ω cable and omit the adapter.

2. Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish. Set the spectrum analyzer by pressing the following keys:

   (FREQUENCY) 300 (MHz)
   (SPAN) 10 (MHz)
   (AMPLITUDE) −20 (dBm)

   75 Ω input only: Press (AMPLITUDE) +28.75 (dBmV).

   ATTEN AUTO MAN 0 (dB)

3. Press the following spectrum analyzer keys:

   (PEAK SEARCH)
   (MKR FCTN) MK TRACK ON OFF (ON)
   (SPAN) 10 (kHz)

   Wait for the AUTO ZOOM message to disappear, then press the following keys:

   (BW) 300 (Hz) VID BW AUTO MAN 30 (Hz)
   (MKR FCTN) MK TRACK ON OFF (OFF)

4. Press (SGL SWP), then wait for the completion of a new sweep. Press the following spectrum analyzer keys:

   (PEAK SEARCH)
   (AMPLITUDE) More 1 of 3 REF LVL OFFSET

   Subtract the MKR amplitude reading from −20 dBm and enter the result as the REF LVL OFFSET. For example, if the marker reads −20.21 dBm, enter +0.21 dB (−20 dBm − (−20.21 dBm) = +0.21 dB).

   Example for 75 Ω input: If the marker reads 26.4 dBmV, enter +2.35 dBmV (28.75 dBmV − 26.4 dBmV = 2.35 dBmV).

   REF LVL OFFSET ________ dB

   75 Ω input: REF LVL OFFSET ________ dBmV

5. Disconnect the cable from the INPUT 50 Ω connector of the spectrum analyzer. Connect the 50 Ω termination to the spectrum analyzer INPUT 50 Ω connector.

   75 Ω input only: Use the 75 Ω termination.

400 kHz

If testing an instrument equipped with a 75 Ω input, omit steps 6 through 9, then proceed to step 10 ("1 MHz").

6. Press the following spectrum analyzer keys:

   (FREQUENCY) 400 (kHz)
   (SPAN) 20 (kHz)
   (AMPLITUDE) −70 (dBm)
   (TRIG) SWEEP CONT SGL (CONT)

7. Press the following spectrum analyzer keys:

   (BW) 30 (Hz)
   (TRACE) More 1 of 3 DETECTOR PK SP NG (SP)
   (SGL SWP)

   Wait for the completion of a new sweep.

8. Press the following spectrum analyzer keys:

   (DISPLAY) DSP LINE ON OFF (ON)

   Adjust the display line so that it is centered on the average trace noise, ignoring any residual responses (refer to the Residual Responses verification test for any suspect residuals).

9. Record the display line amplitude setting as TR Entry 1 of the performance verification test record as the noise level at 400 kHz. The average noise level should be less than the specified limit.

1 MHz

10. Press the following spectrum analyzer keys:

    (FREQUENCY) 1 (MHz)
    (SGL SWP)

    Wait for the completion of a new sweep.

11. Press the following spectrum analyzer keys:

    (DISPLAY) DSP LINE ON OFF (ON)

    Adjust the display line so that it is centered on the average trace noise, ignoring any residual responses (refer to the Residual Responses verification test for any suspect residuals).

12. Record the display line amplitude setting as TR Entry 2 of the performance verification test record as the noise level at 1 MHz. The average noise level should be less than the specified limit.

1 MHz to 1.5 GHz

13. Press the following spectrum analyzer keys:

    (FREQUENCY) START FREQ 1 (MHz)
    STOP FREQ 1.5 (GHz)
    (BW) 1 (MHz)
    VID BW AUTO MAN 10 (kHz)
    (TRIG) SWEEP CONT SGL (CONT)

14. Press (FREQUENCY) and adjust the center frequency setting, if necessary, to place the LO feedthrough just off-screen to the left.
15. Press the following spectrum analyzer keys:

    (SGL SWP)
    (TRACE) CLEAR WRITE A
    More 1 of 3 VID AVG ON OFF (ON) 10 (Hz)

    Wait until AVG 10 is displayed to the left of the graticule (the spectrum analyzer will take ten sweeps, then stop).
16. Press (PEAK SEARCH) and record the MKR frequency as the Measurement Frequency in Table 2-55 for 1 MHz to 1.5 GHz.
17. Press the following spectrum analyzer keys:

    (TRACE) More 1 of 3
    VID AVG ON OFF (OFF)
    DETECTOR PK SP NG (SP)
    (AUTO COUPLE) RES BW AUTO MAN (AUTO)
    VID BW AUTO MAN (AUTO)
    (SPAN) 20 (kHz)
    (FREQUENCY)

18. Set the center frequency to the Measurement Frequency recorded in Table 2-55 for 1 MHz to 1.5 GHz.
19. Press the following spectrum analyzer keys:

    (BW) 30 (Hz)
    VID BW AUTO MAN 30 (Hz)
    (SGL SWP)

    Wait for the sweep to finish.
20. Press the following spectrum analyzer keys:

    (DISPLAY) DSP LINE ON OFF (ON)

    Adjust the display line so that it is centered on the average trace noise, ignoring any residual responses (refer to the Residual Responses verification test for any suspect residuals).
21. Record the display line amplitude setting as TR Entry 3 of the performance verification test record. The average noise level should be less than the specified limit.

1.5 GHz to 1.8 GHz

22. Press the following spectrum analyzer keys:

    (AUTO COUPLE) RES BW AUTO MAN (AUTO)
    VID BW AUTO MAN (AUTO)
    (SPAN) 10 (MHz)
    (TRIG) SWEEP CONT SGL (CONT)
    (FREQUENCY) START FREQ 1.5 (GHz)
    STOP FREQ 1.8 (GHz)

23. Repeat steps 15 through 20 above for frequencies from 1.5 GHz to 1.8 GHz.

    If the Displayed Average Noise at 1.8 GHz is at or out of specification, it is recommended that a known frequency source be used as a frequency marker. This ensures that testing is within 1.8 GHz.

24. Record the display line amplitude setting as TR Entry 4 of the performance verification test record. The average noise level should be less than the specified limit.

Table 2-55. Displayed Average Noise Level

Frequency Range	Measurement Frequency	TR Entry (Displayed Average Noise Level)
400 kHz	400 kHz	1
1 MHz	1 MHz	2
1 MHz to 1.5 GHz	________	3
1.5 GHz to 1.8 GHz	________	4

45. Displayed Average Noise Level, HP 8593E Option 130

This test measures the displayed average noise level in all five frequency bands. The spectrum analyzer input is terminated in 50 Ω. In Band 0 (9 kHz to 2.9 GHz), the test first measures the average noise at 400 kHz and 1 MHz in zero span. The LO feedthrough is used as a frequency reference for these measurements. For the rest of Band 0 and for all of the remaining bands, the test tunes the analyzer frequency across the band, uses the marker to locate the frequency with the highest response, and then reads the average noise in zero span.

To reduce measurement uncertainty due to input attenuator switching and resolution bandwidth switching, a reference level offset is added. The CAL OUT signal is used as the amplitude reference for determining the amount of offset required. The offset is removed at the end of the test by pressing (PRESET).

There are no related adjustments for this performance verification test.

If the spectrum analyzer is *not* equipped with Option 130, narrow bandwidth, perform "Displayed Average Noise Level," instead.

Equipment Required

Cable, BNC, 23 cm (9 in)
Termination, 50 Ω
Adapter, Type N (m) to BNC (f)
Adapter, Type N (m) to APC 3.5 (f)

Additional Equipment for Option 026

Adapter, APC 3.5 (f) to APC 3.5 (f)
Adapter, BNC (m) to SMA (f)
Cable, Cal Comb

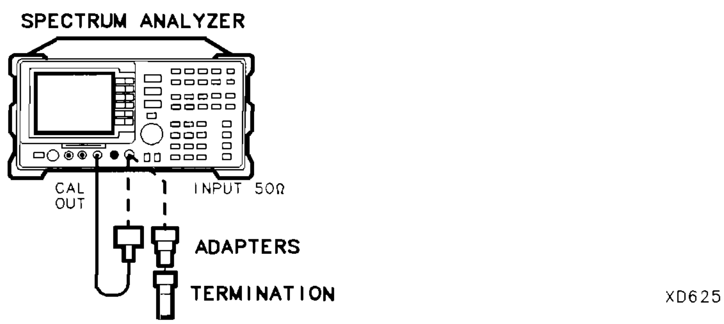


Figure 2-71. Displayed Average Noise Level Test Setup for Option 130

Procedure

1. Connect a cable from the CAL OUT to the INPUT 50 Ω of the spectrum analyzer as shown in Figure 2-71.

   Option 026 only: Use the BNC to SMA adapter to connect the cal comb cable to CAL OUT. Use the APC 3.5 adapter to connect the cal cable to the INPUT 50 Ω.

2. Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish. Set the spectrum analyzer by pressing the following keys:

   (FREQUENCY) 300 (MHz)
   (SPAN) 10 (MHz)
   (AMPLITUDE) −20 (dBm)
   `ATTEN AUTO MAN` 0 (dB)

3. Press the following spectrum analyzer keys:

   (PEAK SEARCH)
   (MKR FCTN) `MK TRACK ON OFF` (ON)
   (SPAN) 10 (kHz)

   Wait for the `AUTO ZOOM` message to disappear, then press the following keys:

   (BW) 300 (Hz) `VID BW AUTO MAN` 30 (Hz)
   (MKR FCTN) `MK TRACK ON OFF` (OFF)

4. Press (SGL SWP), then wait for the completion of a new sweep. Press the following spectrum analyzer keys:

   (PEAK SEARCH)
   (AMPLITUDE) `More 1 of 3` `REF LVL OFFSET`

   Subtract the MKR amplitude reading from −20 dBm and enter the result as the REF LVL OFFSET. For example, if the marker reads −20.21 dBm, enter +0.21 dB (−20 dBm − (−20.21 dBm) = +0.21 dB).

   REF LVL OFFSET ________ dB

5. Disconnect the cable from the INPUT 50 Ω connector of the spectrum analyzer. Connect the 50 Ω termination to the spectrum analyzer INPUT 50 Ω connector.

400 kHz

6. Press the following spectrum analyzer keys:

   (FREQUENCY) 400 (kHz)
   (SPAN) 20 (kHz)
   (AMPLITUDE) −70 (dBm)
   (TRIG) SWEEP CONT SGL (CONT)

7. Press the following spectrum analyzer keys:

   (BW) 30 (Hz)
   (TRACE) More 1 of 3 DETECTOR PK SP NG (SP)
   (SGL SWP)

   Wait for the completion of a new sweep.

8. Press the following spectrum analyzer keys:

   (DISPLAY) DSP LINE ON OFF (ON)

   Adjust the display line so that it is centered on the average trace noise, ignoring any residual responses (refer to the Residual Responses verification test for any suspect residuals).

9. Record the display line amplitude setting as TR Entry 1 of the performance verification test record as the noise level at 400 kHz. The average noise level should be less than the specified limit.

1 MHz

10. Press the following spectrum analyzer keys:

    (FREQUENCY) 1 (MHz)
    (SGL SWP)

    Wait for the completion of a new sweep.

11. Press the following spectrum analyzer keys:

    (DISPLAY) DSP LINE ON OFF (ON)

    Adjust the display line so that it is centered on the average trace noise, ignoring any residual responses (refer to the Residual Responses verification test for any suspect residuals).

12. Record the display line amplitude setting as TR Entry 2 of the performance verification test record as the noise level at 1 MHz. The average noise level should be less than the specified limit.

1 MHz to 2.9 GHz

13. Press the following spectrum analyzer keys:

    (FREQUENCY) Band Lock 0-2.9 Gz BAND 0

    (FREQUENCY) START FREQ 1 (MHz)

    STOP FREQ 2.9 (MHz)

    (BW) RES BW AUTO MAN 1 (MHz)

    VID BW AUTO MAN 10 (kHz)

    (TRIG) SWEEP CONT SGL (CONT)

14. Press (FREQUENCY), then adjust the center frequency, if necessary, to place the LO feedthrough just off-screen to the left.
15. Press the following spectrum analyzer keys:

    (SGL SWP)

    (TRACE) CLEAR WRITE A More 1 of 3

    VID AVG ON OFF (ON) 10 (Hz)

    Wait until AVG 10 is displayed to the left of the graticule (the analyzer will take ten sweeps, then stop).

16. Press (PEAK SEARCH) and record the MKR frequency as the Measurement Frequency in the appropriate band under test in Table 2-56.
17. Press the following spectrum analyzer keys:

    (TRACE) More 1 of 3 VID AVG (OFF)

    DETECTOR PK SP NG (SP)

    (AUTO COUPLE) RES BW AUTO MAN (AUTO)

    VID BW AUTO MAN (AUTO)

    (SPAN) 10 (kHz)

    (FREQUENCY)

    Set CENTER FREQ to the Measurement Frequency recorded in Table 2-56 in the previous step, then press the following keys:

    (BW) RES BW AUTO MAN 30 (Hz)

    VID BW AUTO MAN 30 (Hz)

18. Press (SGL SWP) on the spectrum analyzer, then wait for a new sweep to finish. Press the following spectrum analyzer keys:

    (DISPLAY) DSP LINE ON OFF (ON)

    Adjust the display line so that it is centered on the average noise trace, ignoring any residual responses (refer to Residual Response verification test for any suspected residuals).

    Record the display line amplitude setting in the performance verification test record as indicated in Table 2-56. The average noise level should be less than the specified limit.

19. Press (MKR) and MARKER 1 ON OFF (OFF) to turn the marker off.

2.75 to 6.5 GHz

20. Press the following spectrum analyzer keys:

    (FREQUENCY) Band Lock 2.75-6.5 BAND 1
    (BW) RES BW AUTO MAN 1 (MHz)
    VID BW AUTO MAN 10 (kHz)
    (TRIG) SWEEP CONT SGL (CONT)

21. Repeat steps 15 through 19 above for Band 1 (2.75 to 6.5 GHz).

6.0 to 12.8 GHz

22. Press the following spectrum analyzer keys:

    (FREQUENCY) Band Lock 6.0-12.8 BAND 2
    (BW) RES BW AUTO MAN 1 (MHz)
    VID BW AUTO MAN 10 (kHz)
    (TRIG) SWEEP CONT SGL (CONT)

23. Repeat steps 15 through 19 above for Band 2 (6.0 to 12.8 GHz).

12.4 to 19.4 GHz

24. Press the following spectrum analyzer keys:

    (FREQUENCY) Band Lock 12.4-19. BAND 3
    (BW) RES BW AUTO MAN 1 (MHz)
    VID BW AUTO MAN 10 (kHz)
    (TRIG) SWEEP CONT SGL (CONT)

25. Repeat steps 15 through 19 above for Band 3 (12.4 to 19.4 GHz).

19.1 to 22 GHz

26. Press the following spectrum analyzer keys:

    (FREQUENCY) Band Lock 19.1-22 BAND 4

    Option 026 or 027 only: (FREQUENCY) START FREQ 19.1 (GHz) STOP FREQ 22 (GHz)

    (BW) RES BW AUTO MAN 1 (MHz)
    VID BW AUTO MAN 10 (kHz)
    (TRIG) SWEEP CONT SGL (CONT)

27. Repeat steps 15 through 19 above for Band 4.

22 GHz to 26.5 GHz *(Option 026 or 027)*

28. Press the following spectrum analyzer keys:

    (FREQUENCY) Band Lock 19.1 - 22 BAND 4

    (FREQUENCY) START FREQ 22 (GHz)

    STOP FREQ 26.5 (GHz)

29. Set the spectrum analyzer by pressing the following keys:

    (BW) RES BW AUTO MAN 1 (MHz)

    VID BW AUTO MAN 10 (kHz)

    (TRIG) SWEEP CONT SGL (CONT)

30. Repeat steps 15 through 19 for frequencies from 22 to 26.5 GHz.
31. Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish.

Table 2-56. Displayed Average Noise Level Worksheet for Option 130

Frequency Range	Measurement Frequency	Displayed Average Noise Level TR Entry
400 kHz	400 kHz	1
1MHz	1 MHz	2
1 MHz to 2.9 GHz	________	3
2.75 to 6.5 GHz	________	4
6.0 to 12.8 GHz	________	5
12.4 to 19.4 GHz	________	6
19.1 to 22 GHz	________	7
19.1 to 26.5 GHz[1]	________	8

1 Option 026 or 027 only

46. Displayed Average Noise Level, HP 8594E Option 130

This performance test measures the displayed average noise level within the frequency range specified. The spectrum analyzer input is terminated in 50 Ω.

The test tunes the spectrum analyzer frequency across the band, uses the marker to locate the frequency with the highest response, and then reads the average noise in zero span.

To reduce measurement uncertainty due to input attenuator switching and resolution bandwidth switching, a reference level offset is added. The CAL OUT signal is used as the amplitude reference for determining the amount of offset required. The offset is removed at the end of the test by pressing instrument preset.

The related adjustment for this procedure is "Frequency Response Adjustment."

If the spectrum analyzer is *not* equipped with Option 130 narrow bandwidth, perform verification test, "Displayed Average Noise Level," instead.

Equipment Required

Termination, 50 Ω
Cable, BNC, 23 cm (9 in)
Adapter, Type N (m) to BNC (f)

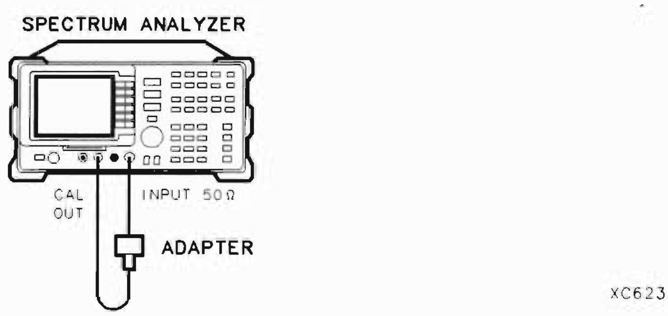


Figure 2-72. Displayed Average Noise Level Test Setup for Option 130

Procedure

1. Connect a cable from the CAL OUT to the INPUT 50 Ω of the spectrum analyzer as shown in Figure 2-72.
2. Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish. Set the spectrum analyzer by pressing the following keys:

   (FREQUENCY) 300 (MHz)
   (SPAN) 10 (MHz)
   (AMPLITUDE) −20 (dBm)
   ATTEN AUTO MAN 0 (dB)

3. Press the following spectrum analyzer keys:

   (PEAK SEARCH)
   (MKR FCTN) MK TRACK ON OFF (ON)
   (SPAN) 10 (kHz)

Wait for the AUTO ZOOM message to disappear, then press the following keys:

(BW) 300 (Hz) VID BW AUTO MAN 30 (Hz)

(MKR FCTN) MK TRACK ON OFF (OFF)

4. Press (SGL SWP), then wait for the completion of a new sweep. Press the following spectrum analyzer keys:

   (PEAK SEARCH)

   (AMPLITUDE) More 1 of 3 REF LVL OFFSET

   Subtract the MKR amplitude reading from −20 dBm and enter the result as the REF LVL OFFSET. For example, if the marker reads −20.21 dBm, enter +0.21 dB (−20 dBm − (−20.21 dBm) = +0.21 dB).

   REF LVL OFFSET ________ dB

5. Disconnect the cable from the INPUT 50 Ω connector of the spectrum analyzer. Connect the 50 Ω termination to the spectrum analyzer INPUT 50 Ω connector.

400 kHz

6. Press the following spectrum analyzer keys:

   (FREQUENCY) 400 (kHz)
   (SPAN) 20 (kHz)
   (AMPLITUDE) −90 (dBm)
   (TRIG) SWEEP CONT SGL (CONT)

7. Press the following spectrum analyzer keys:

   (BW) 30 (Hz)
   (TRACE) More 1 of 3 DETECTOR PK SP NG (SP)
   (SGL SWP)

   Wait for the completion of a new sweep.

8. Press the following spectrum analyzer keys:

   (DISPLAY) DSP LINE ON OFF (ON)

   Adjust the display line so that it is centered on the average trace noise, ignoring any residual responses (refer to the Residual Responses verification test for any suspect residuals).

9. Record the display line amplitude setting as TR Entry 1 of the performance test record as the noise level at 400 kHz. The average noise level should be less than the specified limit.

4 MHz

10. Press the following spectrum analyzer keys:

    (FREQUENCY) 4 (MHz)
    (SGL SWP)

    Wait for the completion of a new sweep.

11. Press the following spectrum analyzer keys:

    (DISPLAY) DSP LINE ON OFF (ON)

    Adjust the display line so that it is centered on the average trace noise, ignoring any residual responses (refer to the Residual Responses verification test for any suspect residuals).

12. Record the display line amplitude setting as TR Entry 2 of the performance test record as the noise level at 4 MHz. The average noise level should be less than the specified limit.

5 MHz to 2.9 GHz

13. Press the following spectrum analyzer keys:

    (FREQUENCY) START FREQ 5 (MHz)
    STOP FREQ 2.9 (GHz)
    (BW) 1 (MHz)
    VID BW AUTO MAN 10 (kHz)
    (TRIG) SWEEP CONT SGL (CONT)

14. Press (FREQUENCY) and adjust the start frequency setting, if necessary, to place the LO feedthrough just off-screen to the left.

15. Press the following spectrum analyzer keys:

    (SGL SWP)
    (TRACE) CLEAR WRITE A
    More 1 of 3 VID AVG ON OFF (ON) 10 (Hz)

    Wait until AVG 10 is displayed to the left of the graticule (the spectrum analyzer will take ten sweeps, then stop).

16. Press (PEAK SEARCH) and record the MKR frequency as the Measurement Frequency in Table 2-57 for 5 MHz to 2.9 GHz.

17. Press the following spectrum analyzer keys:

    (TRACE) More 1 of 3
    VID AVG ON OFF (OFF)
    DETECTOR PK SP NG (SP)
    (AUTO COUPLE) RES BW AUTO MAN (AUTO)
    VID BW AUTO MAN (AUTO)
    (SPAN) 20 (kHz)
    (FREQUENCY)

18. Set the center frequency to the Measurement Frequency recorded in Table 2-57 for 5 MHz to 2.9 GHz.

19. Press the following spectrum analyzer keys:

    (BW) 30 (Hz)
    VID BW AUTO MAN 30 (Hz)
    (SGL SWP).

    Wait for the sweep to finish.

20. Press the following spectrum analyzer keys:

    (DISPLAY) DSP LINE ON OFF (ON)

    Adjust the display line so that it is centered on the average trace noise, ignoring any residual responses (refer to the Residual Responses verification test for any suspect residuals).

21. Record the display line amplitude setting as TR Entry 3 of the performance test record. The average noise level should be less than the specified limit.

Table 2-57. Displayed Average Noise Level Worksheet

Frequency Range	Measurement Frequency	TR Entry (Displayed Average Noise Level)
400 kHz	400 kHz	1
4 MHz	4 MHz	2
5 MHz to 2.9 GHz	__________	3

47. Displayed Average Noise Level, HP 8595E Option 130

This test measures the displayed average noise level in all five frequency bands. The spectrum analyzer input is terminated in 50 Ω. In Band 0 (9 kHz to 2.9 GHz), the test first measures the average noise at 400 kHz and 1 MHz in zero span. The LO feedthrough is used as a frequency reference for these measurements. For the rest of Band 0 and for all of the remaining bands, the test tunes the analyzer frequency across the band, uses the marker to locate the frequency with the highest response, and then reads the average noise in zero span.

To reduce measurement uncertainty due to input attenuator switching and resolution bandwidth switching, a reference level offset is added. The CAL OUT signal is used as the amplitude reference for determining the amount of offset required. The offset is removed at the end of the test by pressing (PRESET).

There are no related adjustments for this performance verification test.

If the spectrum analyzer is *not* equipped with Option 130, narrow bandwidth, perform "Displayed Average Noise Level," instead.

Equipment Required

Cable, BNC, 23 cm (9 in)
Termination, 50 Ω
Adapter, Type N (m) to BNC (f)
Adapter, Type N (m) to APC 3.5 (f)

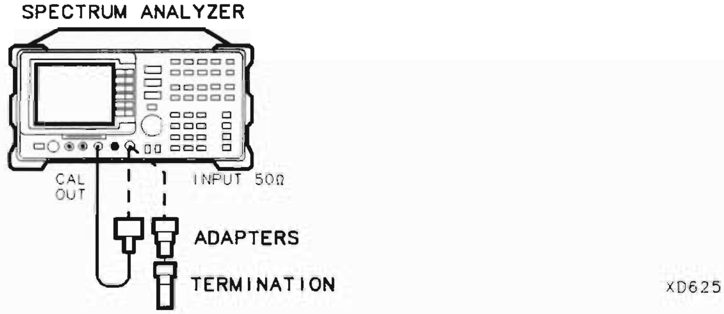


Figure 2-73. Displayed Average Noise Level Test Setup for Option 130

Procedure

1. Connect a cable from the CAL OUT to the INPUT 50 Ω of the spectrum analyzer as shown in Figure 2-73.
2. Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish. Set the spectrum analyzer by pressing the following keys:

   (FREQUENCY) 300 (MHz)
   (SPAN) 10 (MHz)
   (AMPLITUDE) −20 (dBm)
   ATTEN AUTO MAN 0 (dB)

3. Press the following spectrum analyzer keys:

   (PEAK SEARCH)
   (MKR FCTN) MK TRACK ON OFF (ON)
   (SPAN) 10 (kHz)

   Wait for the AUTO ZOOM message to disappear, then press the following keys:

   (BW) 300 (Hz) VID BW AUTO MAN 30 (Hz)
   (MKR FCTN) MK TRACK ON OFF (OFF)

4. Press (SGL SWP), then wait for the completion of a new sweep. Press the following spectrum analyzer keys:

   (PEAK SEARCH)
   (AMPLITUDE) More 1 of 3 REF LVL OFFSET

   Subtract the MKR amplitude reading from −20 dBm and enter the result as the REF LVL OFFSET. For example, if the marker reads −20.21 dBm, enter +0.21 dB (−20 dBm − (−20.21 dBm) = +0.21 dB).

   REF LVL OFFSET ________ dB

5. Disconnect the cable from the INPUT 50 Ω connector of the spectrum analyzer. Connect the 50 Ω termination to the spectrum analyzer INPUT 50 Ω connector.

400 kHz

6. Press the following spectrum analyzer keys:

   (FREQUENCY) 400 (kHz)
   (SPAN) 20 (kHz)
   (AMPLITUDE) −70 (dBm)
   (TRIG) SWEEP CONT SGL (CONT)

7. Press the following spectrum analyzer keys:

   (BW) 30 (Hz)
   (TRACE) More 1 of 3 DETECTOR PK SMP (SMP)
   (SGL SWP)

   Wait for the completion of a new sweep.

8. Press the following spectrum analyzer keys:

   (DISPLAY) DSP LINE ON OFF (ON)

   Adjust the display line so that it is centered on the average trace noise, ignoring any residual responses (refer to the Residual Responses verification test for any suspect residuals).

9. Record the display line amplitude setting as TR Entry 1 of the performance verification test record as the noise level at 400 kHz. The average noise level should be less than the specified limit.

1 MHz

10. Press the following spectrum analyzer keys:

    (FREQUENCY) 1 (MHz)
    (SGL SWP)

    Wait for the completion of a new sweep.

11. Press the following spectrum analyzer keys:

    (DISPLAY) DSP LINE ON OFF (ON)

    Adjust the display line so that it is centered on the average trace noise, ignoring any residual responses (refer to the Residual Responses verification test for any suspect residuals).

12. Record the display line amplitude setting as TR Entry 2 of the performance verification test record as the noise level at 1 MHz. The average noise level should be less than the specified limit.

1 MHz to 2.9 GHz

13. Press the following spectrum analyzer keys:

    (FREQUENCY) Band Lock 0-2.9 Gz BAND 0

    (FREQUENCY) START FREQ 1 (MHz)

    STOP FREQ 2.9 (MHz)

    (BW) RES BW AUTO MAN 1 (MHz)

    VID BW AUTO MAN 10 (kHz)

    (TRIG) SWEEP CONT SGL (CONT)

14. Press (FREQUENCY), then adjust the center frequency, if necessary, to place the LO feedthrough just off-screen to the left.

15. Press the following spectrum analyzer keys:

    (SGL SWP)

    (TRACE) CLEAR WRITE A More 1 of 3

    VID AVG ON OFF (ON) 10 (Hz)

    Wait until AVG 10 is displayed to the left of the graticule (the analyzer will take ten sweeps, then stop).

16. Press (PEAK SEARCH) and record the MKR frequency as the Measurement Frequency in the appropriate band under test in Table 2-58.

17. Press the following spectrum analyzer keys:

    (TRACE) More 1 of 3 VID AVG (OFF)

    DETECTOR PK SMP (SMP)

    (AUTO COUPLE) RES BW AUTO MAN (AUTO)

    VID BW AUTO MAN (AUTO)

    (SPAN) 10 (kHz)
    (FREQUENCY)

    Set CENTER FREQ to the Measurement Frequency recorded in Table 2-58 in the previous step, then press the following keys:

    (BW) RES BW AUTO MAN 30 (Hz)

    VID BW AUTO MAN 30 (Hz)

18. Press (SGL SWP) on the spectrum analyzer, then wait for a new sweep to finish. Press the following spectrum analyzer keys:

    (DISPLAY) DSP LINE ON OFF (ON)

    Adjust the display line so that it is centered on the average noise trace, ignoring any residual responses (refer to Residual Response verification test for any suspected residuals).

    Record the display line amplitude setting in the performance verification test record as indicated in Table 2-58. The average noise level should be less than the specified limit.

19. Press (MKR) and MARKER 1 ON OFF (OFF) to turn the marker off.

2.75 to 6.5 GHz

20. Press the following spectrum analyzer keys:

    (FREQUENCY) Band Lock 2.75-6.5 BAND 1

    (BW) RES BW AUTO MAN 1 (MHz)

    VID BW AUTO MAN 10 (kHz)

    (TRIG) SWEEP CONT SGL (CONT)

21. Repeat steps 15 through 19 above for Band 1 (2.75 to 6.5 GHz).

Table 2-58. Displayed Average Noise Level Worksheet for Option 130

Frequency Range	Measurement Frequency	Displayed Average Noise Level TR Entry
400 kHz	400 kHz	1
1MHz	1 MHz	2
1 MHz to 2.9 GHz	________	3
2.75 to 6.5 GHz	________	4

48. Displayed Average Noise Level, HP 8596E Option 130

This test measures the displayed average noise level in all five frequency bands. The spectrum analyzer input is terminated in 50 Ω. In Band 0 (9 kHz to 2.9 GHz), the test first measures the average noise at 400 kHz and 1 MHz in zero span. The LO feedthrough is used as a frequency reference for these measurements. For the rest of Band 0 and for all of the remaining bands, the test tunes the analyzer frequency across the band, uses the marker to locate the frequency with the highest response, and then reads the average noise in zero span.

To reduce measurement uncertainty due to input attenuator switching and resolution bandwidth switching, a reference level offset is added. The CAL OUT signal is used as the amplitude reference for determining the amount of offset required. The offset is removed at the end of the test by pressing (PRESET).

There are no related adjustments for this performance verification test.

If the spectrum analyzer is *not* equipped with Option 130, narrow bandwidth, perform "Displayed Average Noise Level," instead.

Equipment Required

Cable, BNC, 23 cm (9 in)
Termination, 50 Ω
Adapter, Type N (m) to BNC (f)
Adapter, Type N (m) to APC 3.5 (f)

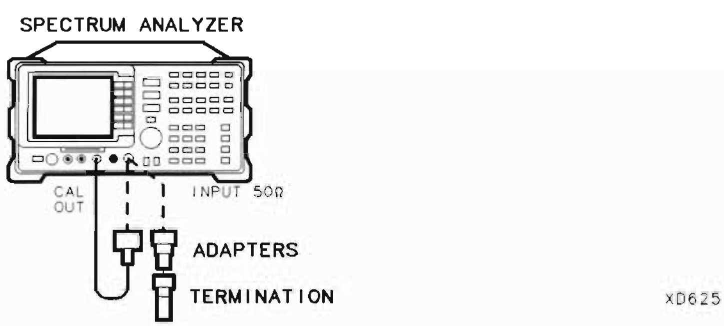


Figure 2-74. Displayed Average Noise Level Test Setup for Option 130

Procedure

1. Connect a cable from the CAL OUT to the INPUT 50 Ω of the spectrum analyzer as shown in Figure 2-74.
2. Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish. Set the spectrum analyzer by pressing the following keys:

   (FREQUENCY) 300 (MHz)
   (SPAN) 10 (MHz)
   (AMPLITUDE) −20 (dBm)
   ATTEN AUTO MAN 0 (dB)

3. Press the following spectrum analyzer keys:

   (PEAK SEARCH)
   (MKR FCTN) MK TRACK ON OFF (ON)
   (SPAN) 10 (kHz)

   Wait for the AUTO ZOOM message to disappear, then press the following keys:

   (BW) 300 (Hz) VID BW AUTO MAN 30 (Hz)
   (MKR FCTN) MK TRACK ON OFF (OFF)

4. Press (SGL SWP), then wait for the completion of a new sweep. Press the following spectrum analyzer keys:

   (PEAK SEARCH)
   (AMPLITUDE) More 1 of 3 REF LVL OFFSET

   Subtract the MKR amplitude reading from −20 dBm and enter the result as the REF LVL OFFSET. For example, if the marker reads −20.21 dBm, enter +0.21 dB (−20 dBm − (−20.21 dBm) = +0.21 dB).

   REF LVL OFFSET ________ dB

5. Disconnect the cable from the INPUT 50 Ω connector of the spectrum analyzer. Connect the 50 Ω termination to the spectrum analyzer INPUT 50 Ω connector.

400 kHz

6. Press the following spectrum analyzer keys:

   (FREQUENCY) 400 (kHz)
   (SPAN) 20 (kHz)
   (AMPLITUDE) −70 (dBm)
   (TRIG) SWEEP CONT SGL (CONT)

7. Press the following spectrum analyzer keys:

   (BW) 30 (Hz)
   (TRACE) More 1 of 3 DETECTOR PK SMP (SMP)
   (SGL SWP)

   Wait for the completion of a new sweep.

8. Press the following spectrum analyzer keys:

   (DISPLAY) DSP LINE ON OFF (ON)

   Adjust the display line so that it is centered on the average trace noise, ignoring any residual responses. Refer to the Residual Responses verification test for any suspect residuals.

9. Record the display line amplitude setting as TR Entry 1 of the performance verification test record as the noise level at 400 kHz. The average noise level should be less than the specified limit.

1 MHz

10. Press the following spectrum analyzer keys:

    (FREQUENCY) 1 (MHz)
    (SGL SWP)

    Wait for the completion of a new sweep.

11. Press the following spectrum analyzer keys:

    (DISPLAY) DSP LINE ON OFF (ON)

    Adjust the display line so that it is centered on the average trace noise, ignoring any residual responses. Refer to the Residual Responses verification test for any suspect residuals.

12. Record the display line amplitude setting as TR Entry 2 of the performance verification test record as the noise level at 1 MHz. The average noise level should be less than the specified limit.

1 MHz to 2.9 GHz

13. Press the following spectrum analyzer keys:

    (FREQUENCY) Band Lock 0-2.9 Gz BAND 0

    (FREQUENCY) START FREQ 1 (MHz)

    STOP FREQ 2.9 (GHz)

    (BW) RES BW AUTO MAN 1 (MHz)

    VID BW AUTO MAN 10 (kHz)

    (TRIG) SWEEP CONT SGL (CONT)

14. Press (FREQUENCY), then adjust the center frequency, if necessary, to place the LO feedthrough just off-screen to the left.

15. Press the following spectrum analyzer keys:

    (SGL SWP)
    (TRACE) CLEAR WRITE A More 1 of 3

    VID AVG ON OFF (ON) 10 (Hz)

    Wait until AVG 10 is displayed to the left of the graticule (the analyzer will take ten sweeps, then stop).

16. Press (PEAK SEARCH) and record the MKR frequency as the Measurement Frequency in the appropriate band under test in Table 2-59.

17. Press the following spectrum analyzer keys:

    (TRACE) More 1 of 3 VID AVG (OFF)

    DETECTOR PK SMP (SMP)

    (AUTO COUPLE) RES BW AUTO MAN (AUTO)

    VID BW AUTO MAN (AUTO)

    (SPAN) 10 (kHz)
    (FREQUENCY)

Set CENTER FREQ to the Measurement Frequency recorded in Table 2-59 in the previous step, then press the following keys:

(BW) RES BW AUTO MAN 30 (Hz)

VID BW AUTO MAN 30 (Hz)

18. Press (SGL SWP) on the spectrum analyzer, then wait for a new sweep to finish. Press the following spectrum analyzer keys:

(DISPLAY) DSP LINE ON OFF (ON)

Adjust the display line so that it is centered on the average noise trace, ignoring any residual responses. Refer to Residual Response verification test for any suspected residuals.

Record the display line amplitude setting in the performance verification test record as indicated in Table 2-59. The average noise level should be less than the specified limit.

19. Press (MKR) and MARKER 1 ON OFF (OFF) to turn the marker off.

2.75 to 6.5 GHz

20. Press the following spectrum analyzer keys:

(FREQUENCY) Band Lock 2.75-6.5 BAND 1

(BW) RES BW AUTO MAN 1 (MHz)

VID BW AUTO MAN 10 (kHz)

(TRIG) SWEEP CONT SGL (CONT)

21. Repeat steps 15 through 19 above for Band 1 (2.75 to 6.5 GHz).

6.0 to 12.8 GHz

22. Press the followings spectrum analyzer keys:

(FREQUENCY) Band Lock 6.0-12.8 BAND 2

(BW) RES BW AUTO MAN 1 (MHz)

VID BW AUTO MAN 10 (kHz)

(TRIG) SWEEP CONT SGL (CONT)

23. Repeat steps 15 through 19 above for Band 2 (6.0 to 12.8 GHz).

Table 2-59. Displayed Average Noise Level Worksheet for Option 130

Frequency Range	Measurement Frequency	Displayed Average Noise Level TR Entry
400 kHz	400 kHz	1
1MHz	1 MHz	2
1 MHz to 2.9 GHz	________	3
2.75 to 6.5 GHz	________	4
6.0 to 12.8 GHz	________	5

49. Residual Responses, HP 8591C and HP 8591E

The spectrum analyzer input is terminated and the spectrum analyzer is swept from 150 kHz to 1 MHz. Then the spectrum analyzer is swept in 10 MHz spans throughout the 1 MHz to 1.8 GHz range. Any responses above the specification are noted.

If the spectrum analyzer is equipped with Option 130, narrow bandwidth, perform "Residual Responses for Option 130," instead.

There are no related adjustment procedures for this performance test.

Equipment Required

Termination, 50 Ω

Additional Equipment for 75 Ω input

Termination, 75 Ω, Type N (m)
Adaptor, Type N (f) to BNC (m), 75 Ω

Caution Use only 75 Ω cables, connectors, or adapters on instruments with 75 Ω input, or damage to the input connector will occur.

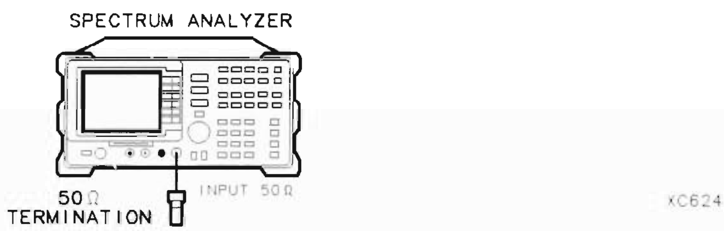


Figure 2-75. Residual Response Test Setup

Procedure

150 kHz to 1 MHz

1. Connect the termination to the spectrum analyzer input as shown in Figure 2-75.

   75 Ω input only: Use the adapter to connect the 75 Ω termination, and proceed with step 5.

2. Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish. Press the following spectrum analyzer keys:

   (PEAK SEARCH)
   (MKR FCTN) MK TRACK ON OFF (ON)
   (SPAN) 1 (MHz)

   Wait for the AUTO ZOOM message to disappear, then press (MKR FCTN) MK TRACK ON OFF (OFF).

3. Press (FREQUENCY), then adjust the center frequency until the LO feedthrough peak is on the left-most vertical graticule line. Set the spectrum analyzer by pressing the following keys:

   (PEAK SEARCH)

   (MKR) MARKER Δ 150 (kHz)

   MARKER NORMAL

   (AMPLITUDE) −60 (dBm)

   75 Ω input only: Press (AMPLITUDE) −11.25 (dBmV).

   ATTEN AUTO MAN 0 (dB)

   (BW) 3 (kHz)

   VID BW AUTO MAN 1 (kHz)

   (DISPLAY) DSP LINE ON OFF −90 (dBm)

   75 Ω input only: (DISPLAY) DSP LINE ON OFF −38 (dBmV).

4. Press (SGL SWP) and wait for a new sweep to finish. Look for any residual responses at or above the display line.

   If a residual is suspected, press (SGL SWP) again. A residual response will persist on successive sweeps, but a noise peak will not. Note the frequency and amplitude of any residual responses above the display line and to the right of the marker in Table 2-60.

1 MHz to 1.8 GHz

5. Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish. Press the following keys:

   (FREQUENCY) 5 (MHz)
   (SPAN) 10 (MHz)
   (AMPLITUDE) −60 (dBm)

   75 Ω input only: Press (AMPLITUDE) −11.25 (dBmV).

   ATTEN AUTO MAN 0 (dB)

6. Press (FREQUENCY), then adjust the center frequency until the LO feedthrough (the "signal" near the left of the screen) is just off the left-most vertical graticule line. Press the following spectrum analyzer keys:

   (FREQUENCY) CF STEP AUTO MAN 9.8 (MHz)

   (BW) 10 (kHz)

   VID BW AUTO MAN 3 (kHz)

   (DISPLAY) DSP LINE ON OFF (ON) −90 (dBm)

   75 Ω input only: Press (DISPLAY) DSP LINE ON OFF (ON) −38 (dBmV).

7. Press (SGL SWP) and wait for a new sweep to finish. Look for any residual responses at or above the display line. If a residual is suspected, press (SGL SWP) again. A residual response will persist on successive sweeps, but a noise peak will not. Note the frequency and amplitude of any residual responses above the display line in Table 2-60.
8. Press (FREQUENCY), (⇑) (step-up key), to step to the next frequency and repeat step 7.
9. Repeat step 8 until the range from 1 MHz to 1.8 GHz has been checked. (This requires 183 additional frequency steps.) The test for this band requires about 10 minutes to complete if no residuals are found.

   If there are any residuals at or near the frequency specification limits (1 MHz or 1.8 GHz), it is recommended that a known frequency source be used as a frequency marker. This will ensure that testing is done at or below the specification limits.
10. Record the highest residual from Table 2-60 as TR Entry 1 in the performance verification test record. If no residuals are found, then record "N/A" in the performance verification test record.

Table 2-60. Residual Responses above Display Line Worksheet

Frequency (MHz)	Amplitude (dBm)
______	______
______	______
______	______
______	______
______	______

50. Residual Responses, HP 8593E

The spectrum analyzer input is terminated and the spectrum analyzer is swept from 150 kHz to 5 MHz. Then the spectrum analyzer is swept in 10 MHz spans throughout the 5 MHz to 6.5 GHz range. Any responses above the specification are noted.

If the spectrum analyzer is equipped with Option 130, narrow bandwidth, perform "Residual Responses for Option 130," instead.

There are no related adjustment procedures for this performance test.

Equipment Required

Termination, 50 Ω
Adapter, Type N (m) to APC 3.5 (f)

Additional Equipment for Option 026

Adapter, APC 3.5 (f) to APC (f)

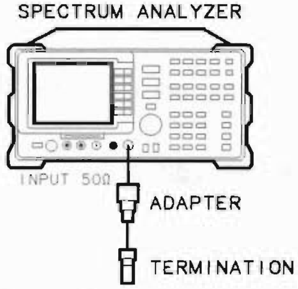


Figure 2-76. Residual Response Test Setup

Procedure

150 kHz to 5 MHz

1. Connect the termination to the spectrum analyzer input as shown in Figure 2-76.
2. Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish. Press the following spectrum analyzer keys:

   (FREQUENCY) Band Lock 0-2.9 Gz BAND 0
   (PEAK SEARCH)
   (MKR FCTN) MK TRACK ON OFF (ON)
   (SPAN) 6 (MHz)

   Wait for the AUTO ZOOM message to disappear, then press (MKR FCTN) MK TRACK ON OFF (OFF).

3. Press (FREQUENCY), then adjust the center frequency until the LO feedthrough peak is on the left-most vertical graticule line. Set the spectrum analyzer by pressing the following keys:

   (PEAK SEARCH) MARKER Δ 150 (kHz)

   (MKR) MARKER NORMAL

   (AMPLITUDE) REF LVL −60 (dBm)

   ATTEN AUTO MAN 0 (dB)

   (BW) RES BW AUTO MAN 3 (kHz)

   VID BW AUTO MAN 1 (kHz)

   (DISPLAY) DSP LINE ON OFF (ON) −90 (dBm)

4. Press (SGL SWP) and wait for a new sweep to finish. Look for any residual responses at or above the display line, to the right of the marker.

   If a residual is suspected, press (SGL SWP) again. A residual response will persist on successive sweeps, but a noise peak will not. Note the frequency and amplitude of any residual responses above the display line and to the right of the marker in Table 2-61.

5 MHz to 2.75 GHz

5. Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish. Press the following keys:

   (FREQUENCY) Band Lock 0-2.9 Gz BAND 0
   (FREQUENCY) 10 (MHz)
   (FREQUENCY) CF STEP SIZE AUTO MAN 9.8 (MHz)
   (SPAN) 10 (MHz)
   (AMPLITUDE) REF LVL −60 (dBm)

   ATTEN AUTO MAN 0 (dBm)

   (BW) RES BW AUTO MAN 10 (kHz)

   VID BW AUTO MAN 3 (kHz)

   (DISPLAY) DSP LINE ON OFF −90 (dBm)

6. Press (SGL SWP) and wait for a new sweep to finish. Look for any residual responses at or above the display line.

   If a residual is suspected, press (SGL SWP) again. A residual response will persist on successive sweeps, but a noise peak will not. Note the frequency and amplitude of any residual responses above the display line in Table 2-61.

7. Press (FREQUENCY), (⇧) (step-up key), to step to the next frequency and repeat step 6.

8. Repeat step 7 until the range from 5 MHz to 2.9 GHz has been checked. (This requires 295 additional frequency steps.)

2.75 GHz to 6.5 GHz

9. Press the following spectrum analyzer keys:

   (FREQUENCY) Band Lock 2.75-6.5 BAND 1
   (FREQUENCY) 2755 (MHz)
   (DISPLAY) DSP LINE ON OFF −90 (dBm)
   (SPAN) 10 (MHz)
   (BW) RES BW AUTO MAN 10 (kHz)
   VID BW AUTO MAN 3 (kHz)

10. Press (SGL SWP) and wait for a new sweep to finish. Look for any residual responses at or above the display line.

    If a residual is suspected, press (SGL SWP) again. A residual response will persist on successive sweeps, but a noise peak will not. Note the frequency and amplitude of any residual responses above the display line in Table 2-61.

11. Press (FREQUENCY), (⇑) (step-up key), to step to the next frequency and repeat step 10.
12. Repeat step 11 until the range from 2.75 GHz to 6.5 GHz has been checked. (This requires 372 additional frequency steps.)
13. Record the highest residual from Table 2-61 as TR Entry 21-1 in the performance verification test record. If no residuals are found, then record "N/A" in the performance verification test record.

Table 2-61. Residual Responses above Display Line Worksheet

Frequency (MHz)	Amplitude (dBm)
______	______
______	______
______	______
______	______
______	______

51. Residual Responses, HP 8594E

The spectrum analyzer input is terminated and the spectrum analyzer is swept from 150 kHz to 5 MHz. Then the spectrum analyzer is swept in 10 MHz spans throughout the 5 MHz to 2.9 GHz range. Any responses above the specification are noted.

If the spectrum analyzer is equipped with Option 130, narrow bandwidth, perform "Residual Responses for Option 130," instead.

There are no related adjustment procedures for this performance test.

Equipment Required

Termination, 50 Ω
Adapter, Type N (m) to APC 3.5 (f)

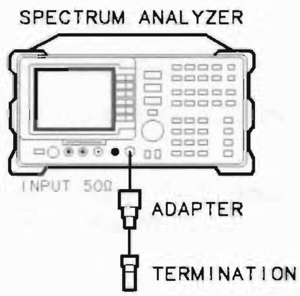


Figure 2-77. Residual Response Test Setup

Procedure

150 kHz to 5 MHz

1. Connect the termination to the spectrum analyzer input as shown in Figure 2-77.
2. Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish. Press the following spectrum analyzer keys:

   (PEAK SEARCH)
   (MKR FCTN) MK TRACK ON OFF (ON)
   (SPAN) 6 (MHz)

   Wait for the AUTO ZOOM message to disappear, then press (MKR FCTN) MK TRACK ON OFF (OFF).

3. Press (FREQUENCY), then adjust the center frequency until the LO feedthrough peak is on the left-most vertical graticule line. Set the spectrum analyzer by pressing the following keys:

   (PEAK SEARCH) MARKER Δ 150 (kHz)
   (MKR) MARKER NORMAL
   (AMPLITUDE) REF LVL −60 (dBm)
   ATTEN AUTO MAN 0 (dB)
   (BW) RES BW AUTO MAN 3 (kHz)
   VID BW AUTO MAN 1 (kHz)
   (DISPLAY) DSP LINE ON OFF (ON) −90 (dBm)

4. Press (SGL SWP) and wait for a new sweep to finish. Look for any residual responses at or above the display line, to the right of the marker.

   If a residual is suspected, press (SGL SWP) again. A residual response will persist on successive sweeps, but a noise peak will not. Note the frequency and amplitude of any residual responses above the display line and to the right of the marker in Table 2-62.

5 MHz to 2.9 GHz

5. Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish. Press the following keys:

   (FREQUENCY) 10 (MHz)
   (FREQUENCY) CF STEP SIZE AUTO MAN 9.8 (MHz)
   (SPAN) 10 (MHz)
   (AMPLITUDE) REF LVL −60 (dBm)
   ATTEN AUTO MAN 0 (dBm)
   (BW) RES BW AUTO MAN 10 (kHz)
   VID BW AUTO MAN 3 (kHz)
   (DISPLAY) DSP LINE ON OFF −90 (dBm)

6. Press (SGL SWP) and wait for a new sweep to finish. Look for any residual responses at or above the display line.

   If a residual is suspected, press (SGL SWP) again. A residual response will persist on successive sweeps, but a noise peak will not. Note the frequency and amplitude of any residual responses above the display line in Table 2-62.

7. Press (FREQUENCY), (⇧) (step-up key), to step to the next frequency and repeat step 6.

8. Repeat step 7 until the range from 5 MHz to 2.9 GHz has been checked. (This requires 295 additional frequency steps.)
9. Record the highest residual from Table 2-62 as TR Entry 1 in the performance verification test record. If no residuals are found, then record "N/A" in the performance verification test record.

Table 2-62. Residual Responses above Display Line Worksheet

Frequency (MHz)	Amplitude (dBm)
______	______
______	______
______	______
______	______
______	______

52. Residual Responses, HP 8595E

The spectrum analyzer input is terminated and the spectrum analyzer is swept from 150 kHz to 5 MHz. Then the spectrum analyzer is swept in 10 MHz spans throughout the 5 MHz to 6.5 GHz range. Any responses above the specification are noted.

If the spectrum analyzer is equipped with Option 130, narrow bandwidth, perform "Residual Responses for Option 130," instead.

There are no related adjustment procedures for this performance test.

Equipment Required

Termination, 50 Ω
Adapter, Type N (m) to APC 3.5 (f)

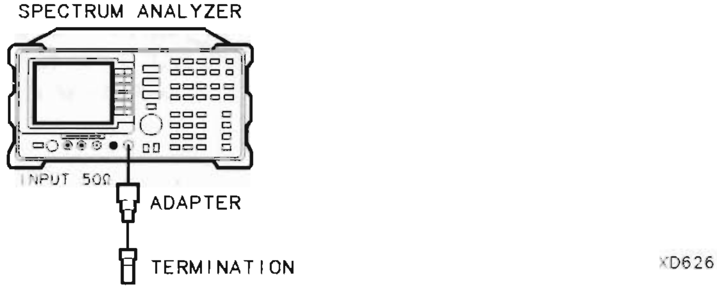


Figure 2-78. Residual Response Test Setup

Procedure

150 kHz to 5 MHz

1. Connect the termination to the spectrum analyzer input as shown in Figure 2-78.
2. Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish. Press the following spectrum analyzer keys:

   (FREQUENCY) Band Lock 0-2.9 Gz BAND 0
   (PEAK SEARCH)
   (MKR FCTN) MK TRACK ON OFF (ON)
   (SPAN) 6 (MHz)

   Wait for the AUTO ZOOM message to disappear, then press (MKR FCTN) MK TRACK ON OFF (OFF).

3. Press (FREQUENCY), then adjust the center frequency until the LO feedthrough peak is on the left-most vertical graticule line. Set the spectrum analyzer by pressing the following keys:

   (PEAK SEARCH) MARKER Δ 150 (kHz)
   (MKR) MARKER NORMAL
   (AMPLITUDE) REF LVL −60 (dBm)
   ATTEN AUTO MAN 0 (dB)
   (BW) RES BW AUTO MAN 3 (kHz)
   VID BW AUTO MAN 1 (kHz)
   (DISPLAY) DSP LINE ON OFF (ON) −90 (dBm)

4. Press (SGL SWP) and wait for a new sweep to finish. Look for any residual responses at or above the display line, to the right of the marker.

   If a residual is suspected, press (SGL SWP) again. A residual response will persist on successive sweeps, but a noise peak will not. Note the frequency and amplitude of any residual responses above the display line and to the right of the marker in Table 2-63.

5 MHz to 2.9 GHz

5. Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish. Press the following keys:

   (FREQUENCY) Band Lock 0-2.9 Gz BAND 0
   (FREQUENCY) 10 (MHz)
   (FREQUENCY) CF STEP SIZE AUTO MAN 9.8 (MHz)
   (SPAN) 10 (MHz)
   (AMPLITUDE) REF LVL −60 (dBm)
   ATTEN AUTO MAN 0 (dBm)
   (BW) RES BW AUTO MAN 10 (kHz)
   VID BW AUTO MAN 3 (kHz)
   (DISPLAY) DSP LINE ON OFF −90 (dBm)

6. Press (SGL SWP) and wait for a new sweep to finish. Look for any residual responses at or above the display line.

   If a residual is suspected, press (SGL SWP) again. A residual response will persist on successive sweeps, but a noise peak will not. Note the frequency and amplitude of any residual responses above the display line in Table 2-63.

7. Press (FREQUENCY), (⇑) (step-up key), to step to the next frequency and repeat step 6.

8. Repeat step 7 until the range from 5 MHz to 2.9 GHz has been checked. (This requires 295 additional frequency steps.)

2.75 GHz to 6.5 GHz

9. Press the following spectrum analyzer keys:

   (FREQUENCY) Band Lock 2.75-6.5 BAND 1
   (FREQUENCY) 2755 (MHz)
   (DISPLAY) DSP LINE ON OFF −90 (dBm)
   (SPAN) 10 (MHz)
   (BW) RES BW AUTO MAN 10 (kHz)
   VID BW AUTO MAN 3 (kHz)

10. Press (SGL SWP) and wait for a new sweep to finish. Look for any residual responses at or above the display line.

    If a residual is suspected, press (SGL SWP) again. A residual response will persist on successive sweeps, but a noise peak will not. Note the frequency and amplitude of any residual responses above the display line in Table 2-63.

11. Press (FREQUENCY), (⇑) (step-up key), to step to the next frequency and repeat step 10.
12. Repeat step 11 until the range from 2.75 GHz to 6.5 GHz has been checked. (This requires 372 additional frequency steps.)
13. Record the highest residual from Table 2-63 as TR Entry 1 in the performance verification test record. If no residuals are found, then record "N/A" in the performance verification test record.

Table 2-63. Residual Responses above Display Line Worksheet

Frequency (MHz)	Amplitude (dBm)
________	________
________	________
________	________
________	________
________	________

53. Residual Responses, HP 8596E

The spectrum analyzer input is terminated and the spectrum analyzer is swept from 150 kHz to 5 MHz. Then the spectrum analyzer is swept in 10 MHz spans throughout the 5 MHz to 6.5 GHz range. Any responses above the specification are noted.

If the spectrum analyzer is equipped with Option 130, narrow bandwidth, perform "Residual Responses for Option 130," instead.

There are no related adjustment procedures for this performance test.

Equipment Required

Termination, 50 Ω
Adapter, Type N (m) to APC 3.5 (f)

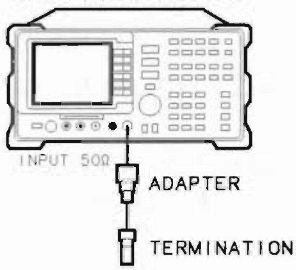


Figure 2-79. Residual Response Test Setup

Procedure

150 kHz to 5 MHz

1. Connect the termination to the spectrum analyzer input as shown in Figure 2-79.
2. Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish. Press the following spectrum analyzer keys:

   (FREQUENCY) `Band Lock` `0-2.9 Gz BAND 0`
   (PEAK SEARCH)
   (MKR FCTN) `MK TRACK ON OFF` (ON)
   (SPAN) 6 (MHz)

   Wait for the `AUTO ZOOM` message to disappear, then press (MKR FCTN) `MK TRACK ON OFF` (OFF).

3. Press (FREQUENCY), then adjust the center frequency until the LO feedthrough peak is on the left-most vertical graticule line. Set the spectrum analyzer by pressing the following keys:

   (PEAK SEARCH) MARKER Δ 150 (kHz)
   (MKR) MARKER NORMAL
   (AMPLITUDE) REF LVL −60 (dBm)
   ATTEN AUTO MAN 0 (dB)
   (BW) RES BW AUTO MAN 3 (kHz)
   VID BW AUTO MAN 1 (kHz)
   (DISPLAY) DSP LINE ON OFF (ON) −90 (dBm)

4. Press (SGL SWP) and wait for a new sweep to finish. Look for any residual responses at or above the display line, to the right of the marker.

   If a residual is suspected, press (SGL SWP) again. A residual response will persist on successive sweeps, but a noise peak will not. Note the frequency and amplitude of any residual responses above the display line and to the right of the marker in Table 2-64.

5 MHz to 2.9 GHz

5. Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish. Press the following keys:

   (FREQUENCY) Band Lock 0-2.9 Gz BAND 0
   (FREQUENCY) 10 (MHz)
   (FREQUENCY) CF STEP SIZE AUTO MAN 9.8 (MHz)
   (SPAN) 10 (MHz)
   (AMPLITUDE) REF LVL −60 (dBm)
   ATTEN AUTO MAN 0 (dBm)
   (BW) RES BW AUTO MAN 10 (kHz)
   VID BW AUTO MAN 3 (kHz)
   (DISPLAY) DSP LINE ON OFF −90 (dBm)

6. Press (SGL SWP) and wait for a new sweep to finish. Look for any residual responses at or above the display line.

   If a residual is suspected, press (SGL SWP) again. A residual response will persist on successive sweeps, but a noise peak will not. Note the frequency and amplitude of any residual responses above the display line in Table 2-64.

7. Press (FREQUENCY), (⇑) (step-up key), to step to the next frequency and repeat step 6.
8. Repeat step 7 until the range from 5 MHz to 2.9 GHz has been checked. (This requires 295 additional frequency steps.)

2.75 GHz to 6.5 GHz

9. Press the following spectrum analyzer keys:

   (FREQUENCY) Band Lock 2.75-6.5 BAND 1
   (FREQUENCY) 2755 (MHz)
   (DISPLAY) DSP LINE ON OFF −90 (dBm)
   (SPAN) 10 (MHz)
   (BW) RES BW AUTO MAN 10 (kHz)
   VID BW AUTO MAN 3 (kHz)

10. Press (SGL SWP) and wait for a new sweep to finish. Look for any residual responses at or above the display line.

    If a residual is suspected, press (SGL SWP) again. A residual response will persist on successive sweeps, but a noise peak will not. Note the frequency and amplitude of any residual responses above the display line in Table 2-64.

11. Press (FREQUENCY), (⇑) (step-up key), to step to the next frequency and repeat step 10.

12. Repeat step 11 until the range from 2.75 GHz to 6.5 GHz has been checked. (This requires 372 additional frequency steps.)

13. Record the highest residual from Table 2-64 as TR Entry 1 in the performance verification test record. If no residuals are found, then record "N/A" in the performance verification test record.

Table 2-64. Residual Responses above Display Line Worksheet

Frequency (MHz)	Amplitude (dBm)
________	________
________	________
________	________
________	________
________	________

54. Residual Responses, HP 8591E and HP 8591C Option 130

The spectrum analyzer input is terminated and the spectrum analyzer is swept from 150 kHz to 1 MHz. Then the spectrum analyzer is swept in 10 MHz spans throughout the 1 MHz to 1.8 GHz range. Any responses above the specification are noted.

If the spectrum analyzer is *not* equipped with Option 130, narrow bandwidth, perform "Residual Responses," instead.

There are no related adjustment procedures for this performance test.

Equipment

Termination, 50 Ω

Additional Equipment for 75 Ω input

Termination, 75 Ω, Type N (m)
Adapter, Type N (f) to BNC (m), 75 Ω

Caution Use only 75 Ω cables, connectors, or adapters on instruments with 75 Ω inputs, or damage to the input connector will occur.

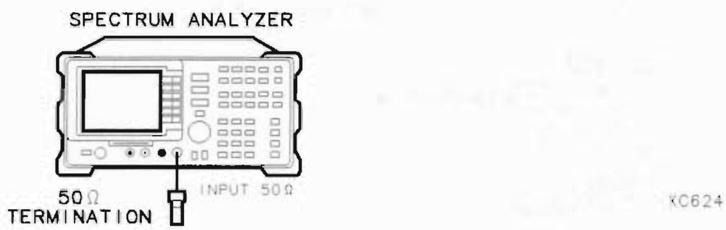


Figure 2-80. Residual Response Test Setup

Procedure

150 kHz to 1 MHz

1. Connect the termination to the spectrum analyzer input as shown in Figure 2-80.

   75 Ω input only: Use the adapter to connect the 75 Ω termination, and proceed with step 3.

2. Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish. Press the following spectrum analyzer keys:

   (FREQUENCY)
   START FREQ 150 (kHz)
   STOP FREQ 1 (MHz)
   (AMPLITUDE) −60 (dBm) ATTN 0 Hz
   (BW) 300 (Hz)
   (DISPLAY) DISPLAY LINE ON OFF −90 (dBm)

3. Press (SGL SWP) and wait for a new sweep to finish. Look for any residual responses at or above the display line.

If a residual is suspected, press (SGL SWP) again. A residual response will persist on successive sweeps, but a noise peak will not. Note the frequency and amplitude of any residual responses above the display line and to the right of the marker in Table 2-65.

1 MHz to 1.8 GHz

4. Connect the 300 MHz CAL OUT to the RF INPUT as shown in Figure 2-80

5. Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish. Press the following keys:

   (FREQUENCY) 300 (MHz)
   (SPAN) 10 (MHz)
   (PEAK SEARCH)
   (MKR FCTN) MK TRACK ON OFF (ON)
   (SPAN) 1 (kHz)

   Wait for the AUTO ZOOM message to disappear, then press

6. Press the following spectrum analyzer keys:

   (BW) 300 (Hz)
   (SWEEP) 1 (sec)
   (AMPLITUDE) −20 (dBm)
   ATTN AUTO MAN 0 (dB)

7. Press the following spectrum analyzer keys:

   (SGL SWP)
   (PEAK SEARCH) MARKER Δ
   (SPAN) 10 (MHz)
   (SGL SWP)
   (PEAK SEARCH)

8. Record the marker-Δ reading below as the MEAS UNCAL Amplitude Error.

   MEAS UNCAL Amplitude Error ________ dB

9. Remove the cable from the spectrum analyzer input.

10. Reconnect the termination to the spectrum analyzer input as shown in Figure 2-80.

11. Press the following spectrum analyzer keys:

    (FREQUENCY) 5 (MHz)
    (AMPLITUDE) −60 (dBm)

    75 Ω input only: Press (AMPLITUDE) −11.25 (dBmV).

    (TRIG) SWEEP CONT SGL (CONT)

12. Press (FREQUENCY), then adjust the center frequency until the LO feedthrough (the "signal" near the left of the screen) is just off the left-most vertical graticule line. Press the following spectrum analyzer keys:

    (FREQUENCY) `CF STEP AUTO MAN` 9.8 (MHz)

    (DISPLAY) `DSP LINE ON OFF` −90 (dBm)

    Add −90 dBm to the MEAS UNCAL Amplitude Error (recorded in step 8), then set the display line to this value.

    For example, if the amplitude error in step 8 is −19.5 dB, add −90 dBm to this value for a result of −109.5 dBm. Enter −109.5 dBm as the display line value.

    75 Ω input only: Set the display line to −38 dBmV + the MEAS UNCAL Amplitude Error (recorded in step 8).

13. Press (SGL SWP) and wait for a new sweep to finish. Look for any residual responses at or above the display line.

    If a residual is suspected, press (SGL SWP) again. A residual response will persist on successive sweeps, but a noise peak will not. Note the frequency and amplitude of any residual responses above the display line and to the right of the marker in Table 2-65.

14. Press (FREQUENCY), then (⇧) (step-up key) to step to the next frequency and repeat step 13.

15. Repeat 14 until the range from 1 MHz to 1.8 GHz has been checked. (This requires 183 additional steps.)

Table 2-65.
Residual Responses above Display Line Worksheet for Option 130

Frequency (MHz)	Amplitude (dBm)
________	________
________	________
________	________
________	________
________	________

Confirming Residuals

16. Set the spectrum analyzer center frequency to a residual frequency recorded in Table 2-65, the press the following keys:

    (PRESET)
    (AMPLITUDE) −60 (dBm) ATTN 0 Hz
    (SPAN) 20 (kHz)
    (SGL SWP)
    (DISPLAY) DISPLAY LINE ON OFF −90 (dBm)

    75 Ω input only: Press (DISPLAY) DISPLAY LINE ON OFF −38 (dBmV)

17. Press (SGL SWP) and wait for a new sweep to finish. Look for any residual responses at or above the display line.

    If a residual is suspected, press (SGL SWP) again. A residual response will persist on successive sweeps, but a noise peak will not. Note the frequency and amplitude of any residual responses above the display line and to the right of the marker in Table 2-66.

18. Repeat steps 16 through 17 for all residuals recorded in Table 2-65.

19. Record the highest residual from Table 2-66 as TR Entry 1 in the performance verification test record. If no residuals are found, then record "N/A" in the performance verification test record.

Table 2-66. Confirmed Residual Responses above Display Line for Option 130

Frequency (MHz)	Amplitude (dBm)
________	________
________	________
________	________
________	________
________	________

55. Residual Responses, HP 8594E Option 130

The spectrum analyzer input is terminated and the spectrum analyzer is swept from 150 kHz to 1 MHz. Then the spectrum analyzer is swept in 10 MHz spans throughout the 1 MHz to 2.9 GHz range. Any responses above the specification are noted.

If the spectrum analyzer is *not* equipped with Option 130, narrow bandwidth, perform, "Residual Responses," instead.

There are no related adjustment procedures for this performance test.

Equipment

Termination, 50 Ω
Adapter, Type N (m) to APC 3.5 (f)

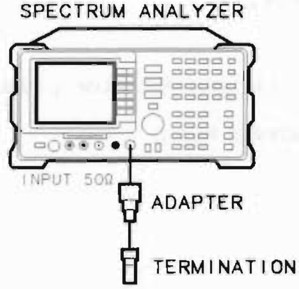


Figure 2-81. Residual Response Test Setup for Option 130

Procedure

150 kHz to 1 MHz

1. Connect the termination to the spectrum analyzer input as shown in Figure 2-81.
2. Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish. Press the following spectrum analyzer keys:

   (FREQUENCY)
   START FREQ 150 (kHz)
   STOP FREQ 1 (MHz)
   (AMPLITUDE) −60 (dBm) ATTEN AUTO MAN 0 (dBm)
   (BW) 300 (Hz)
   VID BW AUTO MAN 300 (Hz)
   (DISPLAY) DSP LINE ON OFF −90 (dBm)

3. Press (SGL SWP) and wait for a new sweep to finish. Look for any residual responses at or above the display line.

   If a residual is suspected, press (SGL SWP) again. A residual response will persist on successive sweeps, but a noise peak will not. Note the frequency and amplitude of any residual responses above the display line and to the right of the marker in Table 2-67.

1 MHz to 2.9 GHz

4. Connect the 300 MHz CAL OUT to the RF INPUT as shown in Figure 2-81
5. Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish. Press the following keys:

   (FREQUENCY) 300 (MHz)
   (SPAN) 10 (MHz)
   (PEAK SEARCH)
   (MKR FCTN) MK TRACK ON OFF (ON)
   (SPAN) 1 (kHz)

   Wait for the AUTO ZOOM message to disappear, then press
6. Press the following spectrum analyzer keys:

   (BW) 300 (Hz)
   (SWEEP) 1 (SEC)
   (AMPLITUDE) −20 (dBm)
   ATTN AUTO MAN 0 (dB)
7. Press the following spectrum analyzer keys:

   (SGL SWP)
   (PEAK SEARCH) MARKER Δ
   (SPAN) 10 (MHz)
   (SGL SWP)
   (PEAK SEARCH)
8. Record the marker-Δ reading below as the MEAS UNCAL Amplitude Error.

   MEAS UNCAL Amplitude Error ________ dB

9. Remove the cable from the spectrum analyzer input.
10. Reconnect the termination to the spectrum analyzer input as shown in Figure 2-81.
11. Press the following spectrum analyzer keys:

    (FREQUENCY) 5 (MHz)
    (AMPLITUDE) −60 (dBm)
    (TRIG) SWEEP CONT SGL (CONT)

12. Press (FREQUENCY), then adjust the center frequency until the LO feedthrough (the "signal" near the left of the screen) is just off the left-most vertical graticule line. Press the following spectrum analyzer keys:

    (FREQUENCY) CF STEP AUTO MAN 9.8 (MHz)

    (DISPLAY) DSP LINE ON OFF −90 (dBm)

    Add −90 dBm to the MEAS UNCAL Amplitude Error (recorded in step 8), then set the display line to this value.

    For example, if the amplitude error in step 8 is −19.5 dB, add −90 dBm to this value for a result of −109.5 dBm. Enter −109.5 dBm as the display line value.

13. Press (SGL SWP) and wait for a new sweep to finish. Look for any residual responses at or above the display line.

    If a residual is suspected, press (SGL SWP) again. A residual response will persist on successive sweeps, but a noise peak will not. Note the frequency and amplitude of any residual responses above the display line and to the right of the marker in Table 2-67.

14. Press (FREQUENCY), then (⇑) (step-up key) to step to the next frequency and repeat step 13.

15. Repeat step 14 until the range from 1 MHz to 2.9 GHz has been checked. (This requires 295 additional steps.)

Table 2-67.
Residual Responses above Display Line Worksheet for Option 130

Frequency (MHz)	Amplitude (dBm)
________	________
________	________
________	________
________	________
________	________

Confirming Residuals

16. Set the spectrum analyzer center frequency to a residual frequency recorded in Table 2-67, the press the following keys:

    (PRESET)
    (AMPLITUDE) −60 (dBm) ATTEN 0 Hz
    (SPAN) 20 (kHz)
    (SGL SWP)
    (DISPLAY) DISPLAY LINE ON OFF −90 (dBm)

17. Press (SGL SWP) and wait for a new sweep to finish. Look for any residual responses at or above the display line.

    If a residual is suspected, press (SGL SWP) again. A residual response will persist on successive sweeps, but a noise peak will not. Note the frequency and amplitude of any residual responses above the display line and to the right of the marker in Table 2-67.

18. Repeat steps 20 through 21 for all residuals recorded in Table 2-68.
19. Record the highest residual from Table 2-68 as TR Entry 1 in the performance verification test record. If no residuals are found, then record "N/A" in the performance verification test record.

Table 2-68. Confirmed Residual Responses above Display Line

Frequency (MHz)	Amplitude (dBm)
________	________
________	________
________	________
________	________
________	________

56. Residual Responses, HP 8593E, 95E, and 96E Option 130

The spectrum analyzer input is terminated and the spectrum analyzer is swept from 150 kHz to 1 MHz. Then the spectrum analyzer is swept in 10 MHz spans throughout the 1 MHz to 6.5 GHz range. Any responses above the specification are noted.

If the spectrum analyzer is *not* equipped with Option 130, narrow bandwidth, perform, "Residual Responses," instead.

There are no related adjustment procedures for this performance test.

Equipment

Termination, 50 Ω
Adapter, Type N (m) to APC 3.5 (f)

Additional Equipment for Option 026

Adapter, APC 3.5 (f) to APC 3.5 (f)

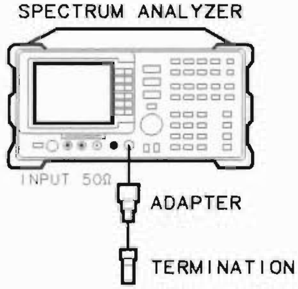


Figure 2-82. Residual Response Test Setup for Option 130

Procedure

150 kHz to 1 MHz

1. Connect the termination to the spectrum analyzer input as shown in Figure 2-82.
2. Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish. Press the following spectrum analyzer keys:

   (FREQUENCY) Band Lock 0-2.9 Gz BAND 0
   (FREQUENCY)
   START FREQ 150 (kHz)
   STOP FREQ 1 (MHz)
   (AMPLITUDE) −60 (dBm)] ATTEN 0 Hz
   (BW) 300 (Hz)
   VID BW AUTO MAN 300 (Hz)
   (DISPLAY) DSP LINE ON OFF −90 (dBm)

3. Press (SGL SWP) and wait for a new sweep to finish. Look for any residual responses at or above the display line.

   If a residual is suspected, press (SGL SWP) again. A residual response will persist on successive sweeps, but a noise peak will not. Note the frequency and amplitude of any residual responses above the display line and to the right of the marker in Table 2-69.

1 MHz to 2.75 GHz

4. Connect the 300 MHz CAL OUT to the RF INPUT as shown in Figure 2-82
5. Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish. Press the following keys:

   (FREQUENCY) 300 (MHz) BAND LOCK ON OFF (ON)
   (SPAN) 10 (MHz)
   (PEAK SEARCH)
   (MKR FCTN) MK TRACK ON OFF (ON)
   (SPAN) 1 (kHz)

   Wait for the AUTO ZOOM message to disappear, then press
6. Press the following spectrum analyzer keys:

   (BW) 300 (Hz)
   (SWEEP) 1 (SEC)
   (AMPLITUDE) −20 (dBm)
   ATTN AUTO MAN 0 (dB)
7. Press the following spectrum analyzer keys:

   (SGL SWP)
   (PEAK SEARCH) MARKER Δ
   (SPAN) 10 (MHz)
   (SGL SWP)
   (PEAK SEARCH)
8. Record the marker-Δ reading below as the MEAS UNCAL Amplitude Error.

   MEAS UNCAL Amplitude Error ________ dB

9. Remove the cable from the spectrum analyzer input.
10. Reconnect the termination to the spectrum analyzer input as shown in Figure 2-82.
11. Press the following spectrum analyzer keys:

   (FREQUENCY) 5 (MHz)
   (AMPLITUDE) −60 (dBm)
   (TRIG) SWEEP CONT SGL (CONT)

12. Press (FREQUENCY), then adjust the center frequency until the LO feedthrough (the "signal" near the left of the screen) is just off the left-most vertical graticule line. Press the following spectrum analyzer keys:

    (FREQUENCY) CF STEP AUTO MAN 9.8 (MHz)

    (DISPLAY) DSP LINE ON OFF −90 (dBm)

    Add −90 dBm to the MEAS UNCAL Amplitude Error (recorded in step 8), then set the display line to this value.

    For example, if the amplitude error in step 8 is −19.5 dB, add −90 dBm to this value for a result of −109.5 dBm. Enter −109.5 dBm as the display line value.

13. Press (SGL SWP) and wait for a new sweep to finish. Look for any residual responses at or above the display line.

    If a residual is suspected, press (SGL SWP) again. A residual response will persist on successive sweeps, but a noise peak will not. Note the frequency and amplitude of any residual responses above the display line and to the right of the marker in Table 2-69.

14. Press (FREQUENCY), then (⇑) (step-up key) to step to the next frequency and repeat step 13.

15. Repeat step 14 until the range from 1 MHz to 2.9 GHz has been checked. (This requires 295 additional steps.)

2.75 GHz to 6.5 GHz

16. Press the following spectrum analyzer keys:

    (FREQUENCY) Band Lock 2.75-6.5 BAND 1
    (SPAN) 10 (MHz)
    (SWEEP) 1 (SEC)
    (FREQUENCY) 2755 (MHz)
    (BW) 300 (Hz)

17. Press (SGL SWP) and wait for a new sweep to finish. Look for any residual responses at or above the display line.

    If a residual is suspected, press (SGL SWP) again. A residual response will persist on successive sweeps, but a noise peak will not. Note the frequency and amplitude of any residual responses above the display line in Table 2-69.

18. Press (FREQUENCY), (⇑) (step-up key), to step to the next frequency and repeat step 17.

19. Repeat step 18 until the range from 2.75 GHz to 6.5 GHz has been checked. (This requires 372 additional frequency steps.)

Table 2-69.
Residual Responses above Display Line Worksheet for Option 130

Frequency (MHz)	Amplitude (dBm)
______	______
______	______
______	______
______	______
______	______

Confirming Residuals

20. Set the spectrum analyzer center frequency to a residual frequency recorded in Table 2-69, the press the following keys:

    (PRESET)
    (AMPLITUDE) −60 (dBm) ATTEN 0 Hz
    (SPAN) 20 (kHz)
    (SGL SWP)
    (DISPLAY) DISPLAY LINE ON OFF −90 (dBm)

21. Press (SGL SWP) and wait for a new sweep to finish. Look for any residual responses at or above the display line.

    If a residual is suspected, press (SGL SWP) again. A residual response will persist on successive sweeps, but a noise peak will not. Note the frequency and amplitude of any residual responses above the display line and to the right of the marker in Table 2-69.

22. Repeat steps 20 through 21 for all residuals recorded in Table 2-70.
23. Record the highest residual from Table 2-70 as TR Entry 1 in the performance verification test record. If no residuals are found, then record "N/A" in the performance verification test record.

Table 2-70. Confirmed Residual Responses above Display Line

Frequency (MHz)	Amplitude (dBm)
______	______
______	______
______	______
______	______
______	______

57. Fast Time Domain Sweeps, HP 8591E Option 101 and HP 8591C

The CAL OUT signal is used to compare the amplitude level of a normal sweep time (20 ms) to a fast sweep time (18 ms) using the marker delta function.

A synthesizer/level generator is used to amplitude modulate a 500 MHz, CW signal from another signal generator. The spectrum analyzer demodulates this signal in zero span to display the response in the time domain. The marker delta frequency function on the spectrum analyzer is used to read out the sweep time.

There are no related adjustment procedures for this performance test.

Equipment Required

Synthesizer/level generator
Signal generator
Cable, BNC, 122 cm (48 in)
Cable, BNC, 23 cm (9 in)
Cable, Type N, 152 cm (60 in)
Adapter, Type N (m) to BNC (f)

Additional Equipment for 75 Ω input

Cable, BNC, 75 Ω, 30 cm (12 in)
Adapter, minimum loss
Adapter, Type N (f) to BNC (m), 75 Ω

Caution Use only 75 Ω cables, connectors, or adapters on instruments with 75 Ω inputs, or damage to the input connector will occur.

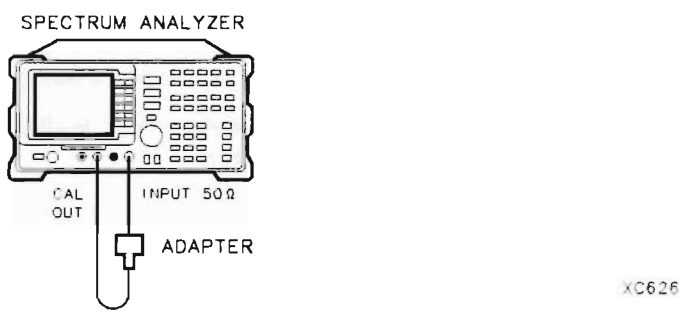


Figure 2-83. Fast Sweep Time Amplitude Test Setup

Procedure

Fast Sweep Time Amplitude Accuracy

1. Connect the equipment as shown in Figure 2-83.

   75 Ω input only: Use the 75 Ω cable and omit the adapter.

2. On the spectrum analyzer, press (PRESET), then wait for the preset routine to finish. Set the spectrum analyzer by pressing the following keys:

   (FREQUENCY) 300 (MHz)
   (SPAN) 0 (Hz)
   (SWEEP) 20 (ms)
   (AMPLITUDE) SCALE LOG/LIN (LIN)
   REF LVL 25 (mV)

   75 Ω input only: Press REF LVL 30 (mV).

   (MKR FCTN) MK NOISE ON OFF (ON)
   (SGL SWP)
   (MKR) MARKER Δ

3. Set the sweep time to 18 ms. Press (SGL SWP) and read the MKR Δ amplitude. Record the marker-Δ reading as TR Entry 1 of the performance verification test record. The amplitude should be within 1.007X and 0.993X.

Fast Sweep Time Accuracy

4. Connect the equipment as shown in Figure 2-84.

5. Set the signal generator to output a 300 MHz, −4 dBm, CW signal. Set the AM and FM controls to OFF.

   75 Ω input only: Set the output to +2 dBm.

6. Set the synthesizer/level generator to output a 556 Hz, +5 dBm, signal.

7. Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish. Press the following spectrum analyzer keys:

   (FREQUENCY) 300 (MHz)
   (SPAN) ZERO SPAN
   (AMPLITUDE) SCALE LOG LIN (LIN)

Caution Use only 75 Ω cables, connectors, or adapters on instruments with 75 Ω inputs, or damage to the input connector will occur.

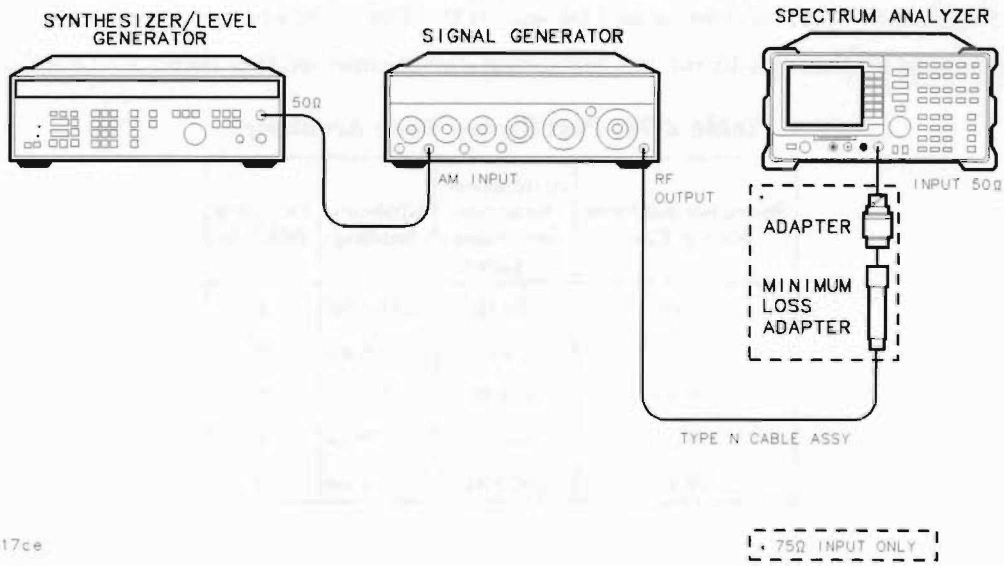


Figure 2-84. Fast Sweep Time Test Setup, 75 Ω input

8. Set the signal generator AM switch to the AC position. If necessary, adjust the output amplitude of the signal generator to position the top of the modulated waveform approximately one division below top screen.
9. Set the spectrum analyzer controls by pressing the following keys:

   (TRIG) VIDEO
   (SWEEP) 18 (ms)

10. Press the following spectrum analyzer keys:

    (SGL SWP)
    (PEAK SEARCH)

    If necessary, press NEXT PEAK or NEXT PK LEFT until the marker is on the left-most complete signal peak. This is the "marked signal."

11. Press MARKER Δ, MARKER Δ, then press NEXT PK RIGHT until the marker Δ is on the eighth signal.

12. Record the MKR Δ frequency reading in the performance test record as shown in Table 2-71. The MKR reading should be within the limits shown.
13. Repeat steps 10 through 12 for the remaining sweep time settings listed in Table 2-71.

Table 2-71. Fast Sweep Time Accuracy

Spectrum Analyzer Sweep Time	Synthesizer Function Generator Frequency	Minimum Reading	TR Entry (MKR Δ)
18 ms	556 Hz	14.04 ms	1
10 ms	1 kHz	7.8 ms	2
1.0 ms	10 kHz	780 μs	3
100 μs	100 kHz	78 μs	4
20 μs	500 kHz	15.6 μs	5

58. Fast Time Domain Sweeps, HP 8593E, HP 8594E, HP 8595E, and HP 8596E Opt. 101

The CAL OUT signal is used to compare the amplitude level of a normal sweep time (20 ms) to a fast sweep time (18 ms) using the marker delta function.

A synthesizer/level generator is used to amplitude modulate a 500 MHz, CW signal from another signal generator. The spectrum analyzer demodulates this signal in zero span to display the response in the time domain. The marker delta frequency function on the spectrum analyzer is used to read out the sweep time.

There are no related adjustment procedures for this performance test.

Equipment Required

Synthesizer/level generator
Signal generator
Cable, BNC, 122 cm (48 in)
Cable, BNC, 23 cm (9 in)
Cable, Type N, 152 cm (60 in)
Adapter, Type N (m) to BNC (f)

Additional Equipment for Option 026

Adapter, APC 3.5 (f) to Type N (f)

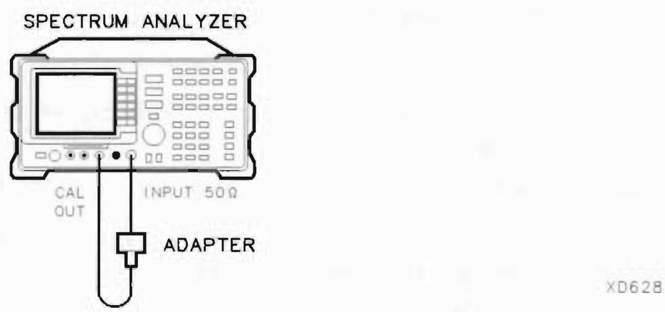


Figure 2-85. Fast Sweep Time Amplitude Test Setup

Procedure

Fast Sweep Time Amplitude Accuracy

1. Connect the equipment as shown in Figure 2-85.

   Option 026 only: Use the APC to Type N adapter.

2. On the spectrum analyzer, press (PRESET), then wait for the preset routine to finish. Set the spectrum analyzer by pressing the following keys:

   (FREQUENCY) 300 (MHz)
   (SPAN) 0 (Hz)
   (SWEEP) 20 (ms)
   (AMPLITUDE) SCALE LOG/LIN (LIN)
   REF LVL 25 (mV)
   (MKR FCTN) MK NOISE ON OFF (ON)
   (SGL SWP)
   (MKR) MARKER Δ

3. Set the sweep time to 18 ms. Press (SGL SWP) and read the MKR Δ amplitude. Record the marker-Δ reading as TR Entry 1 of the performance verification test record. The amplitude should be within 1.007X and 0.993X.

Fast Sweep Time Accuracy

4. Connect the equipment as shown in Figure 2-86.

   Option 026 only: Use the APC to Type N adapter.

5. Set the signal generator to output a 300 MHz, −4 dBm, CW signal. Set the AM and FM controls to OFF.

6. Set the synthesizer/level generator to output a 556 Hz, +5 dBm, signal.

7. Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish. Press the following spectrum analyzer keys:

   (FREQUENCY) 300 (MHz)
   (SPAN) 0 (Hz)
   (AMPLITUDE) SCALE LOG LIN (LIN)

8. Set the signal generator AM switch to the AC position. If necessary, adjust the output amplitude of the signal generator to position the top of the modulated waveform approximately one division below top screen.

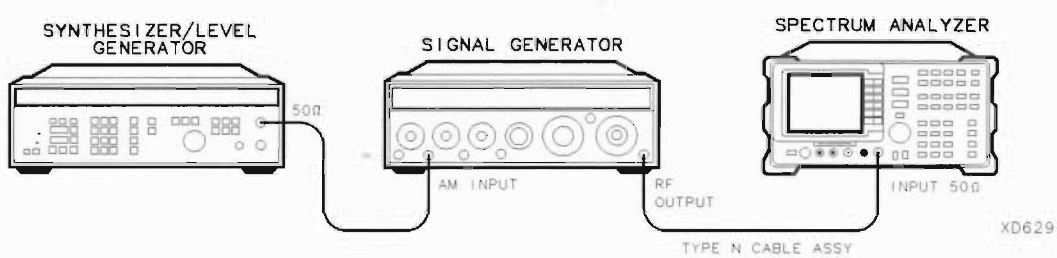


Figure 2-86. Fast Sweep Time Accuracy Test Setup

9. Set the spectrum analyzer controls by pressing the following keys:

   (TRIG) VIDEO
   (SWEEP) 18 (ms)

10. Press the following spectrum analyzer keys:

    (SGL SWP)
    (PEAK SEARCH)

    If necessary, press NEXT PEAK or NEXT PK LEFT until the marker is on the left-most complete signal peak. This is the "marked signal."

11. Press MARKER Δ, MARKER Δ, then press NEXT PK RIGHT until the marker Δ is on the eighth signal.
12. Record the MKR Δ frequency reading in the performance verification test record as shown in Table 2-72. The MKR reading should be within the limits shown.
13. Repeat steps 10 through 12 for the remaining sweep time settings listed in Table 2-72.

Table 2-72. Fast Sweep Time Accuracy

Spectrum Analyzer Sweep Time	Synthesizer Function Generator Frequency	Min. Reading	TR Entry (MKR Δ)
18 ms	556 Hz	14.04 ms	1
10 ms	1 kHz	7.8 ms	2
1.0 ms	10 kHz	780 μs	3
100 μs	100 kHz	78 μs	4
20 μs	500 kHz	15.6 μs	5

59. Absolute Amplitude, Vernier, and Power Sweep Accy., HP 8591C and 91E Opt. 010 or 011

The tracking generator output is connected to the spectrum analyzer input and the tracking is adjusted at 300 MHz for a maximum signal level. A calibrated power sensor is then connected to the tracking generator output to measure the power level at 300 MHz.

The measuring receiver is set for RATIO mode so that future power level readings are in dB relative to the power level at −10 dBm (*Option 011 only:* +38.8 dBmV). The output power level setting is decreased in 1 dB steps and the power level is measured at each step. The difference between the ideal and actual power levels is calculated at each step.

Since a power sweep is accomplished by stepping through the vernier settings, the peak-to-peak variation of the vernier accuracy is equal to the power sweep accuracy.

The related adjustment for this procedure is "Modulator Gain and Offset Adjustment."

Equipment Required

Measuring receiver
Power sensor, 100 kHz to 1800 MHz
Cable, Type N, 62 cm (24 in)

Additional Equipment for Option 011

Power sensor, 75 Ω
Cable, BNC, 75 Ω
Adapter, Type N (f) to BNC (m), 75 Ω
Adapter, mechanical, Type N, 50 Ω (m) to 75 Ω (f)

Procedure

1. Connect the Type N cable between the RF OUT 50 Ω and INPUT 50 Ω connectors on the spectrum analyzer. See Figure 2-87.

   Option 011 only: Connect the BNC cable between the RF OUT 75 Ω and INPUT 75 Ω connectors on the spectrum analyzer.

2. Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish. Set the spectrum analyzer by pressing the following keys:

   (FREQUENCY) 300 (MHz)
   (SPAN) ZERO SPAN
   (MKR)
   (AUX CTRL) Track Gen
   SRC PWR ON OFF (ON) −5 (dBm)

   Option 011 only: Press (AUX CTRL), Track Gen, SRC PWR ON OFF (ON), 42 (dBm).

Caution Use only 75 Ω cables, connectors, or adapters on the 75 Ω input of an Option 011 or damage to the input connector will occur.

59. Absolute Amplitude, Vernier, and Power Sweep Accy., HP 8591C and 91E Opt. 010 or 011

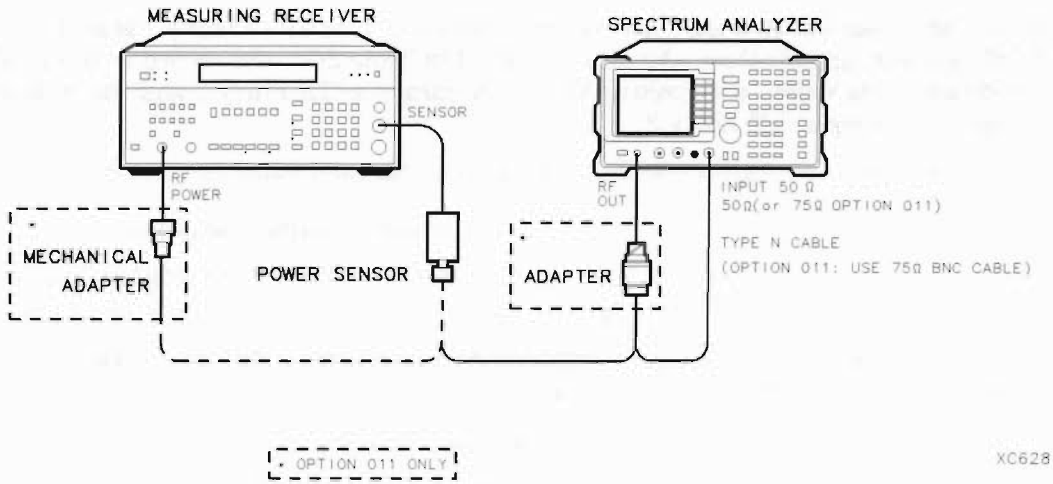


Figure 2-87. Absolute Amplitude, Vernier, and Power Sweep Accuracy Test Setup

3. On the spectrum analyzer, press TRACKING PEAK. Wait for the PEAKING message to disappear.
4. Zero and calibrate the measuring receiver and 100 kHz to 1800 MHz power sensor in log mode (power reads out in dBm), as described in the measuring receiver operation manual. Enter the power sensor's 300 MHz Cal Factor into the measuring receiver.
5. Disconnect the Type N cable from the RF OUT 50 Ω and connect the 100 kHz to 1800 MHz power sensor to the RF OUT 50 Ω as shown in Figure 2-87.

   Option 011 only: Disconnect the BNC cable from the RF OUT 75 Ω and connect the 75 Ω power sensor to the RF OUT 75 Ω using an adapter.
6. On the spectrum analyzer, press −20 (dBm), (SGL SWP).

   Option 011 only: Press 28.76 (dBm) (+28.76 dBmV), (SGL SWP).

   Press (AUX CTRL), Track Gen, SRC ATN MAN AUTO (MAN).
7. Subtract −20 dBm from the power level displayed on the measuring receiver and record the result as TR Entry 1 of the performance verification test record as the Absolute Amplitude Accuracy.
8. On the spectrum analyzer, press (AUX CTRL), Track Gen, SRC ATN MAN AUTO (MAN), 0 (dBm) (SRC PWR) −10 (dBm).

   Option 011 only: Press +38.76 (dBm) (+38.76 dBmV).
9. Press RATIO on the measuring receiver. Power levels now readout in dB relative to the power level just measured at the −10 dBm output power level setting.
10. Set the SRC POWER to the settings indicated in Table 2-73. At each setting, record the power level displayed on the measuring receiver in Table 2-73.
11. Calculate the absolute vernier accuracy by subtracting the SRC POWER setting and 10 dB from the Measured Power Level for each SRC POWER setting in Table 2-73.

    Vernier Accuracy = Measured Power Level − SRC POWER − 10 dB

    Option 011 only: Calculate the vernier accuracy by subtracting the SRC POWER setting from the Measured Power Level, adding 38.76 dB to each SRC POWER setting in Table 2-73.

Vernier Accuracy = Measured Power Level − SRC POWER + 38.76 dB

12. Locate the most positive and most negative absolute vernier accuracy values for SRC POWER levels greater than −10 dBm recorded in Table 2-73 and record in the performance verification test record the Positive Vernier Accuracy as TR Entry 2 and the Negative Vernier Accuracy as TR Entry 3.

    Option 011 only: For SRC POWER levels greater than and equal to +38.76 dBmV.

    Positive Vernier Accuracy ____________dB

    Negative Vernier Accuracy ____________dB

13. Locate the most positive and most negative Absolute Vernier Accuracy values for all SRC POWER levels in Table 2-73 and record below.

    Positive Power Sweep Accuracy ____________dB

    Negative Power Sweep Accuracy ____________dB

14. Calculate the power sweep accuracy by subtracting the Negative Power Sweep Accuracy recorded in the previous step from the Positive Power Sweep Accuracy recorded in the previous step. Record this value as TR Entry 4 of the performance verification test record as the Power Sweep Accuracy.

    Power Sweep Accuracy = Positive Power Sweep Accuracy − Negative Power Sweep Accuracy

Table 2-73. Vernier Accuracy Worksheet

SRC POWER Setting		Measured Power Level	Vernier Accuracy
Opt 011, dBmV	Opt 010, dBm	(dB)	(dB)
+38.76	−10	0 (Ref)	0 (Ref)
+39.76	−9		
+40.76	−8		
+41.76	−7		
+42.76	−6		
+43.76	−5		
+44.76	−4		
+45.76	−3		
+46.76	−2		
+47.76	−1		
+33.76	−15		
+34.76	−14		
+35.76	−13		
+36.76	−12		
+37.76	−11		

60. Absolute Amplitude Accuracy, HP 8593E, HP 8594E, HP 8595E, HP 8596E Opt. 010

The tracking generator output is connected to the spectrum analyzer INPUT 50 Ω and the tracking is adjusted at 300 MHz for a maximum signal level. A calibrated power sensor is then connected to the tracking generator output to measure the power level at 300 MHz.

The measuring receiver is then set into RATIO mode so that future power level readings will be in dB relative to the power level at 300 MHz. The output power level setting is decreased in 1 dB steps and the power level is measured at each step. The difference between the ideal and actual power levels is calculated at each step. The step-to-step error is also calculated.

The related adjustment for this performance verification test is the "Tracking Generator Power Level Adjustments."

Equipment Required

Measuring receiver
Power sensor, 100 kHz to 2.9 GHz
Cable, Type N, 62 cm (24 in)

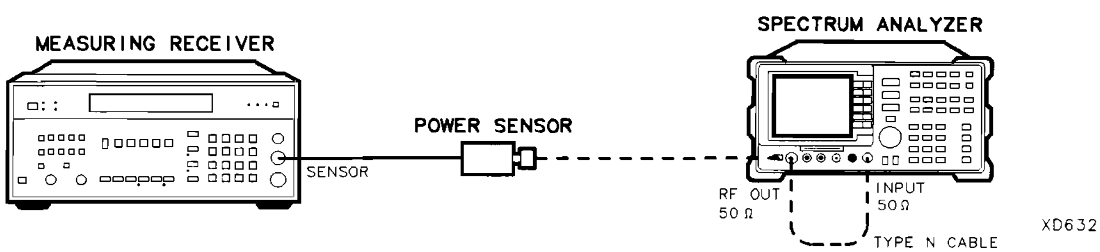


Figure 2-88. Absolute Amplitude Accuracy Test Setup

Procedure

1. Connect the Type N cable between the RF OUT 50 Ω and INPUT 50 Ω connectors on the spectrum analyzer. See Figure 2-88.
2. Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish. Set the spectrum analyzer by pressing the following keys:

   (FREQUENCY) 300 (MHz)
   (SPAN) 0 (Hz)
   (BW) RES BW AUTO MAN 30 (kHz)
   (MKR)
   (AUX CTRL) TRACK GEN SRC POWER ON OFF (ON) −5 (dBm)

3. Press TRACKING PEAK on the spectrum analyzer, then wait for the PEAKING message to disappear.
4. Zero and calibrate the measuring-receiver/power-sensor combination in log mode (power levels readout in dBm). Refer to the measuring receiver operation manual. Enter the power sensor 300 MHz Cal Factor into the measuring receiver.
5. Disconnect the Type N cable from the RF OUT 50 Ω and connect the 100 kHz to 2.9 GHz power sensor to the RF OUT 50 Ω. See Figure 2-88.
6. On the spectrum analyzer, press SRC POWER ON OFF (ON), −20 (dBm), SRC POWER MAN AUTO (MAN), 16 (dBm), (SGL SWP).
7. Record the power level displayed on the measuring receiver as the Absolute Amplitude Accuracy in the performance verification test record as TR Entry 1.
8. Press RATIO on the measuring receiver. Power levels will now readout in dB relative to the power level just measured at the −20 dBm output power level setting.
9. Set the spectrum analyzer SRC POWER to the settings indicated in Table 2-74. At each setting, record the power level displayed on the measuring receiver.
10. Calculate the Absolute Vernier Accuracy by subtracting the SRC POWER setting from the Measured Power Level for each SRC POWER setting in Table 2-74.

    Measured Power Level − SRC POWER − 20 = Absolute Vernier Accuracy

    For example: At SRC POWER = −21; −0.9(−)(−21) −20 = 0.1

11. Calculate the Step-to-Step Accuracy for the −17 dBm to −26 dBm SRC POWER settings by subtracting the previous Absolute Vernier Accuracy from the current Absolute Vernier Accuracy. Start by subtracting the Absolute Vernier Accuracy for the −17 dBm SRC POWER setting from the Absolute Vernier Accuracy for the −18 dBm setting. Record this calculation in the Step-to-Step Accuracy column for SRC POWER −18 dBm.
12. Locate the most positive Absolute Vernier Accuracy value in Table 2-74 and record as TR Entry 2 of the performance verification test record.
13. Locate the most negative Absolute Vernier Accuracy value in Table 2-74 and record as TR Entry 3 of the performance verification test record.
14. Locate the largest Step-to-Step Accuracy values in Table 2-74 and record as TR Entry 4 of the performance verification test record.
15. Locate the smallest Step-to-Step Accuracy values in Table 2-74 and record as TR Entry 5 of the performance verification test record.

60. Absolute Amplitude Accuracy, HP 8593E, HP 8594E, HP 8595E, HP 8596E Opt. 010

Table 2-74. Vernier Accuracy

SRC POWER	Measured Power Level (dB)	Absolute Vernier Accuracy (dB)	Step-to-Step Accuracy (dB)
−17	______	______	(n/a)
−18	______	______	______
−19	______	______	______
−20	0 (Ref)	0 (Ref)	______
−21	______	______	______
−22	______	______	______
−23	______	______	______
−24	______	______	______
−25	______	______	______
−26	______	______	______

61. Power Sweep Range, HP 8593E, HP 8594E, HP 8595E, and HP 8596E

The tracking generator output is connected to the spectrum analyzer INPUT 50 Ω through a power splitter and the tracking is adjusted at 300 MHz for a maximum signal level. The other output of the power splitter is connected to a measuring receiver. The tracking generator is set to do a power sweep from −10 dBm to −1 dBm.

The markers are used to measure the displayed amplitude at the beginning and end of the sweep. The power sweep is then turned off and the power level of the tracking generator is adjusted until the displayed amplitude is the same as at the start of the sweep. This power level is measured on the measuring receiver and recorded. The tracking generator is then adjusted until the displayed amplitude is the same as at the end of the sweep. This power level is measured and recorded. The difference between the two measured power levels is calculated and recorded.

The related adjustment for this performance verification test is the "Tracking Generator Power Level Adjustments."

Equipment Required

Measuring receiver
Power sensor, 100 kHz to 2.9 GHz
Power splitter
Cable, Type N, 62 cm (24 in)
Adapter, Type N (m) to Type N (m)

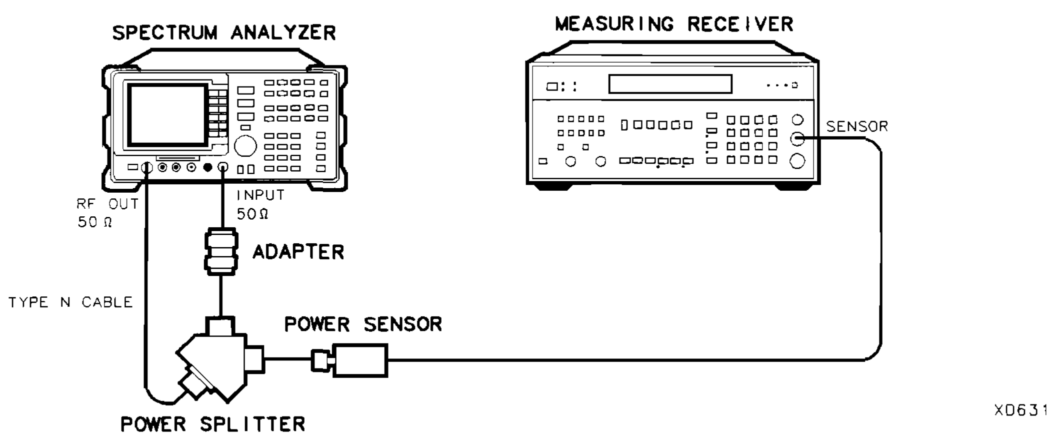


Figure 2-89. Power Sweep Range Test Setup

Procedure

1. Connect the equipment as shown in Figure 2-89. Do not connect the power sensor to the power splitter at this time.
2. Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish. Set the spectrum analyzer by pressing the following keys:

   (FREQUENCY) Band Lock 0-2.9 Gz BAND 0
   The HP 8594E does not need to be band locked.
   (FREQUENCY) 300 (MHz)
   (SPAN) 0 (Hz)
   (BW) RES BW AUTO MAN 30 (kHz)
   (MKR)
   (AUX CTRL) TRACK GEN SRC PWR ON OFF (ON) −5 (dBm)

3. On the spectrum analyzer, press TRACKING PEAK, then wait for the PEAKING! message to disappear.
4. Zero and calibrate the power-sensor/measuring-receiver in log mode (power levels read out in dBm). Refer to the measuring receiver operation manual. Enter the power sensor 300 MHz Cal Factor into the measuring receiver. Connect the power sensor to the power splitter. See Figure 2-89.
5. On the spectrum analyzer, press the following keys:

   SRC PWR ON OFF (ON) −10 (dBm)
   SCR ATN MAN AUTO 0 (dB)
   PWR SWP ON OFF (ON) 10 (dB)
   (AMPLITUDE) SCALE LOG LIN (LOG) 2 (dB)

   Press REF LVL on the spectrum analyzer, then adjust the reference level until the peak of the displayed ramp (along the right-most graticule) is one-half division down from the reference level.
6. Press (MKR), MARKER NORMAL. Use the knob to place the marker at the left-most graticule line. The marker should read 0 picosecond. Press MARKER Δ.
7. Press (AUX CTRL), TRACK GEN, PWR SWP ON OFF (OFF) to set power sweep off. The ΔMKR should read 0 dB ±0.1 dB. If it does not, press SRC PWR ON OFF (ON), and adjust the power level until the marker reads 0 dB ±0.1 dB.
8. Record the power level displayed on the measuring receiver as TR Entry 1 of the performance verification test record.
9. Press PWR SWP ON OFF (ON) to set power sweep on. Wait for completion of a new sweep.
10. Press (MKR), MARKER NORMAL. Use the knob to place the marker at the right-most graticule line. Press MARKER Δ.

Procedure

1. Connect the equipment as shown in Figure 2-89. Do not connect the power sensor to the power splitter at this time.
2. Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish. Set the spectrum analyzer by pressing the following keys:

   (FREQUENCY) Band Lock 0-2.9 Gz BAND 0
   The HP 8594E does not need to be band locked.
   (FREQUENCY) 300 (MHz)
   (SPAN) 0 (Hz)
   (BW) RES BW AUTO MAN 30 (kHz)
   (MKR)
   (AUX CTRL) TRACK GEN SRC PWR ON OFF (ON) −5 (dBm)

3. On the spectrum analyzer, press TRACKING PEAK , then wait for the PEAKING! message to disappear.
4. Zero and calibrate the power-sensor/measuring-receiver in log mode (power levels read out in dBm). Refer to the measuring receiver operation manual. Enter the power sensor 300 MHz Cal Factor into the measuring receiver. Connect the power sensor to the power splitter. See Figure 2-89.
5. On the spectrum analyzer, press the following keys:

   SRC PWR ON OFF (ON) −10 (dBm)
   SCR ATN MAN AUTO 0 (dB)
   PWR SWP ON OFF (ON) 10 (dB)
   (AMPLITUDE) SCALE LOG LIN (LOG) 2 (dB)

   Press REF LVL on the spectrum analyzer, then adjust the reference level until the peak of the displayed ramp (along the right-most graticule) is one-half division down from the reference level.

6. Press (MKR), MARKER NORMAL . Use the knob to place the marker at the left-most graticule line. The marker should read 0 picosecond. Press MARKER Δ .
7. Press (AUX CTRL), TRACK GEN , PWR SWP ON OFF (OFF) to set power sweep off. The ΔMKR should read 0 dB ±0.1 dB. If it does not, press SRC PWR ON OFF (ON), and adjust the power level until the marker reads 0 dB ±0.1 dB.
8. Record the power level displayed on the measuring receiver as TR Entry 1 of the performance verification test record.
9. Press PWR SWP ON OFF (ON) to set power sweep on. Wait for completion of a new sweep.
10. Press (MKR), MARKER NORMAL . Use the knob to place the marker at the right-most graticule line. Press MARKER Δ .

11. Press (AUX CTRL), `TRACK GEN`, `PWR SWP ON OFF` (OFF) to set power sweep off. Press `SRC PWR ON OFF` (ON) and adjust the SRC POWER level until the ΔMKR reads −1 dB ±0.1 dB.

    Be sure to wait for the completion of a new sweep after each adjustment of the SRC POWER level.

12. Record the power level displayed on the measuring receiver as TR Entry 2 of the performance verification test record.

13. Subtract Start Power Level (TR Entry 1) from the Stop Power Level (TR Entry 2) and record as the Power Sweep Range in the performance verification test record as TR Entry 3.

    Power Sweep Range = Stop Power Level − Start Power Level

62. Tracking Generator Level Flatness, HP 8591C and HP 8591E Option 010 or 011

The tracking generator output is connected to the spectrum analyzer input and the tracking is adjusted at 300 MHz for a maximum signal level. A calibrated power sensor is then connected to the tracking generator output to measure the power level at 300 MHz. The measuring receiver is set for RATIO mode so that future power level readings are in dB relative to the power level at 300 MHz.

The tracking generator is then stepped to several frequencies throughout its range. The output power difference relative to the power level at 300 MHz is measured at each frequency and recorded.

The related adjustment for this procedure is "Modulator Gain and Offset Adjustment."

Equipment Required

Measuring receiver
Power sensor, 100 kHz to 1800 MHz
Cable, Type N, 62 cm (24 in)

Additional Equipment for Option 011

Power sensor, 75 Ω
Cable, BNC, 75 Ω
Adapter, Type N (f) to BNC (m), 75 Ω
Adapter, mechanical, Type N, 50 Ω (m) to 75 Ω (f)

Caution Use only 75 Ω cables, connectors, or adapters on the 75 Ω input of an Option 011 or damage to the input connector will occur.

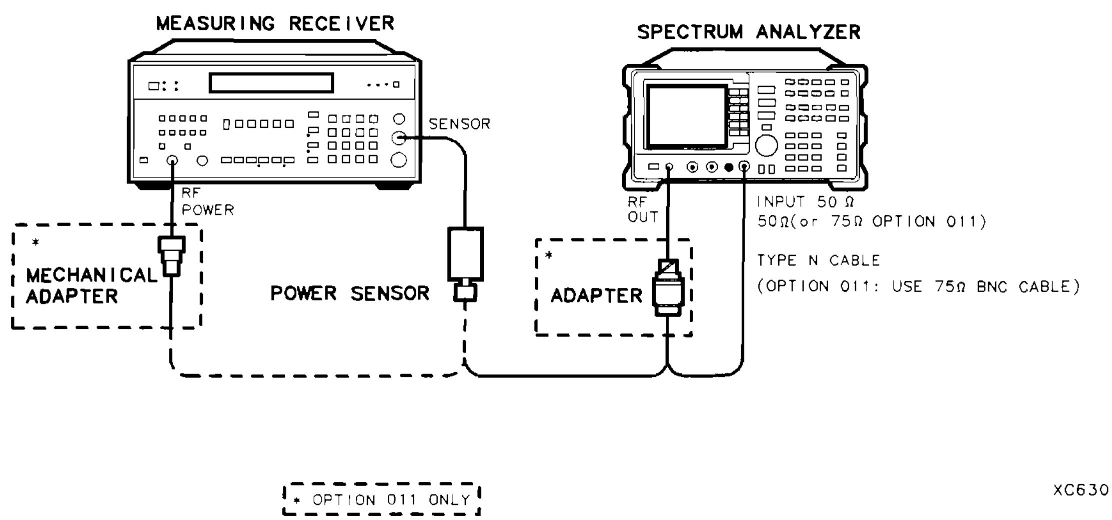


Figure 2-90. Tracking Generator Level Flatness Test Setup

62. Tracking Generator Level Flatness, HP 8591C and HP 8591E Option 010 or 011

Procedure

1. Connect the Type N cable between the RF OUT 50 Ω and INPUT 50 Ω connectors on the spectrum analyzer. See Figure 2-90.

   Option 011 only: Connect the BNC cable between the RF OUT 75 Ω and INPUT 75 Ω connectors on the spectrum analyzer.

2. Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish. Set the spectrum analyzer by pressing the following keys:

   (FREQUENCY) 300 (MHz)
   CF STEP AUTO MAN 100 (MHz)
   (SPAN) ZERO SPAN

3. On the spectrum analyzer, press (MKR), (AUX CTRL), Track Gen , SRC PWR ON OFF (ON), and enter −5 (dBm).

   Option 011 only: Press 42 (dBm) (+42 dBmV).

4. On the spectrum analyzer, press TRACKING PEAK . Wait for the PEAKING message to disappear.

5. Zero and calibrate the measuring receiver and 100 kHz to 1800 MHz power sensor in log mode (power reads out in dBm), as described in the measuring receiver operation manual. Enter the power sensor's 300 MHz Cal Factor into the measuring receiver.

6. Disconnect the Type N cable from the RF OUT 50 Ω and connect the 100 kHz to 4.2 GHz power sensor to the RF OUT 50 Ω.

   Option 011 only: Disconnect the BNC cable from the RF OUT 75 Ω and connect the 75 Ω power sensor to the RF OUT 75 Ω using an adapter.

7. On the spectrum analyzer, press −11 (dBm), (SGL SWP).

   Option 011 only: Press 31.8 (dBm) (+31.76 dBmV).

8. Press RATIO on the measuring receiver. The measuring receiver readout is now in power levels relative to the power level at 300 MHz.

9. Set the spectrum analyzer center frequency to 100 kHz. Press (SGL SWP).

   Option 011 only: Set the spectrum analyzer center frequency to 1 MHz. Press (SGL SWP).

10. Enter the appropriate power sensor Cal Factor into the measuring receiver as indicated in Table 2-75.

11. Record the power level displayed on the measuring receiver as the Level Flatness in Table 2-75.

12. Repeat steps 9 through 11 to measure the flatness at each center frequency setting listed in Table 2-75. The (⇧) (step-up key) may be used to tune to center frequencies above 100 MHz.

    Spectrum analyzers equipped with Option 011 should be tested only at frequencies of 1 MHz to 1.8 GHz.

62. Tracking Generator Level Flatness, HP 8591C and HP 8591E Option 010 or 011

Table 2-75. Tracking Generator Level Flatness Worksheet

Center Freq	Level Flatness (dB)	Cal Factor (MHz)	Center Freq	Level Flatness (dB)	Cal Factor (MHz)
100 kHz*	______	0.1	600 MHz	______	300
300 kHz*	______	0.3	700 MHz	______	1000
500 kHz*	______	0.3	800 MHz	______	1000
1 MHz	______	1	900 MHz	______	1000
2 MHz	______	3	1000 MHz	______	1000
5 MHz	______	3	1100 MHz	______	1000
10 MHz	______	10	1200 MHz	______	1000
20 MHz	______	30	1300 MHz	______	1000
50 MHz	______	50	1400 MHz	______	1000
100 MHz	______	100	1500 MHz	______	2000
200 MHz	______	300	1600 MHz	______	2000
300 MHz	0 (Ref)	300	1700 MHz	______	2000
400 MHz	______	300	1800 MHz	______	2000
500 MHz	______	300			

* These frequencies are tested on spectrum analyzers equipped with Option 010 only.

13. Locate the most positive Level Flatness reading in Table 2-75 for the frequency ranges listed in Table 2-76 and record as the Maximum Flatness in the performance verification test record as shown in Table 2-76.

Table 2-76. Maximum Flatness

Description	TR Entry (Maximum Flatness)
For Option 010	
100 kHz	1
300 kHz to 5 MHz	2
10 MHz to 1800 MHz	3
For Option 011	
1 MHz to 1800 MHz	1

14. Locate the most negative Level Flatness reading in Table 2-75 for the frequency ranges listed in Table 2-77 and record as the Minimum Flatness in the performance verification test record as shown in Table 2-77.

Table 2-77. Minimum Flatness

Description	TR Entry (Minimum Flatness)
For Option 010	
100 kHz	4
300 kHz to 5 MHz	5
10 MHz to 1800 MHz	6
For Option 011	
1 MHz to 1800 MHz	2

15. Press (PRESET) on the spectrum analyzer.

Procedure

1. Connect the Type N cable between the RF OUT 50 Ω and INPUT 50 Ω connectors on the spectrum analyzer. See Figure 2-91.
2. Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish. Set the spectrum analyzer by pressing the following keys:

   (FREQUENCY) Band Lock 0-2.9 Gz BAND 0
   The HP 8594E does not need to be band locked.
   (FREQUENCY) 300 (MHz)
   CF STEP AUTO MAN 100 (MHz)
   (SPAN) 0 (Hz)
   (BW) RES BW AUTO MAN 30 (kHz)

3. On the spectrum analyzer, press the following keys:

   (MKR)
   (AUX CTRL) Track Gen SRC PWR ON OFF (ON) −5 (dBm)

4. On the spectrum analyzer, press TRACKING PEAK . Wait for the PEAKING message to disappear.
5. Zero and calibrate the measuring receiver and 100 kHz to 2.9 GHz power sensor in log mode (power reads out in dBm), as described in the measuring receiver operation manual. Enter the power sensor 300 MHz Cal Factor into the measuring receiver.
6. Disconnect the Type N cable from the RF OUT 50 Ω and connect the 100 kHz to 2.9 GHz power sensor to the RF OUT 50 Ω.
7. On the spectrum analyzer, press SRC PWR ON OFF (ON), −20 (dBm), (SGL SWP).
8. Press RATIO on the measuring receiver. The measuring receiver readout is now in power levels relative to the power level at 300 MHz.
9. Set the spectrum analyzer center frequency to 100 kHz. Press (SGL SWP).
10. Enter the appropriate power sensor Cal Factor into the measuring receiver as indicated in Table 2-78.
11. Record the power level displayed on the measuring receiver as the Level Flatness in Table 2-78.
12. Repeat steps 9 through 11 to measure the flatness at each center frequency setting listed in Table 2-78. The (⇧) (step-up key) may be used to tune to center frequencies above 100 MHz.

63. Tracking Generator Level Flatness, HP 8593E, HP 8594E, HP 8595E, HP 8596E Opt. 010

Table 2-78. Tracking Generator Level Flatness Worksheet

Center Frequency	Level Flatness (dB)	Cal Factor (MHz)	Center Frequency	Level Flatness (dB)	Cal Factor (MHz)
100 kHz	________	0.1	1000 MHz	________	1000
300 kHz	________	0.3	1100 MHz	________	1000
500 kHz	________	0.3	1200 MHz	________	1000
1 MHz	________	1	1300 MHz	________	1000
2 MHz	________	3	1400 MHz	________	1000
5 MHz	________	3	1500 MHz	________	2000
10 MHz	________	10	1600 MHz	________	2000
20 MHz	________	30	1700 MHz	________	2000
40 MHz	________	50	1800 MHz	________	2000
50 MHz	________	10	1900 MHz	________	2000
80 MHz	________	100	2000 MHz	________	2000
100 MHz	________	100	2100 MHz	________	2000
200 MHz	________	300	2200 MHz	________	2000
300 MHz	________	300	2300 MHz	________	2000
400 MHz	________	300	2400 MHz	________	2000
500 MHz	________	100	2500 MHz	________	3000
600 MHz	________	300	2600 MHz	________	3000
700 MHz	________	1000	2700 MHz	________	3000
800 MHz	________	1000	2800 MHz	________	3000
900 MHz	________	1000	2900 MHz	________	3000

13. Disconnect the Power Sensor from the RF OUT 50 Ω and connect the equipment as shown in Figure 2-92.

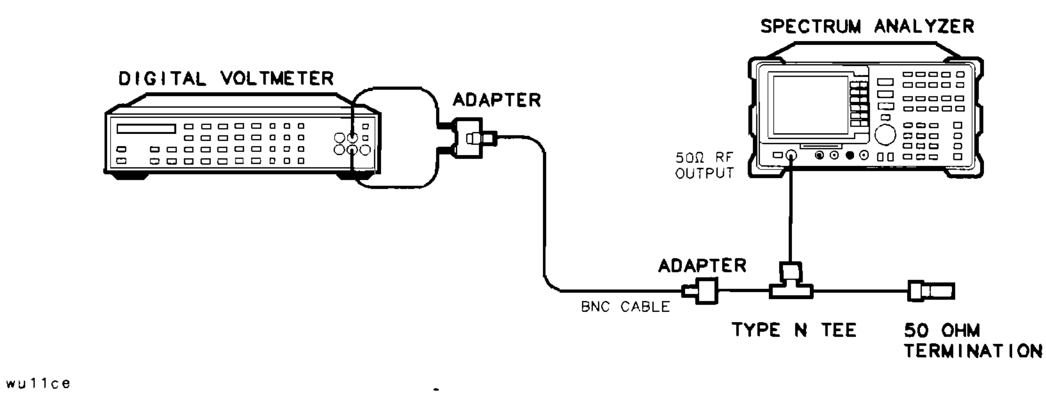


Figure 2-92. Tracking Generator Level Flatness, Center Frequency <100 kHz

14. Set the DVM to measure AC Volts. Press the following DVM keys so that it reads out in dBm:

    50 (STORE) 4
    (MATH) 4

15. Set the spectrum analyzer center frequency to 9 kHz and press (SGL SWP). Record the DVM readout in column 2 of Table 2-79.
16. Repeat step 15 for all center frequencies listed in Table 2-79

Table 2-79. Tracking Generator Level Flatness Worksheet, <100 kHz

Center Frequency	DVM Readout dBm	Corrected Level Flatness dBm
9 kHz	______	______
20 kHz	______	______
40 kHz	______	______
60 kHz	______	______
80 kHz	______	______
100 kHz	______	______

17. Subtract the 100 kHz Level Flatness readout in Table 2-78 from the 100 kHz DVM Readout in Table 2-79 and record as the DVM Offset at 100 kHz.

    DVM Offset ______ dB

18. For example, if the Level Flatness reading from Table 2-78 is +1.0 dB and the DVM Readout from Table 2-79 is −15.0 dBm, the DVM offset would be +16.0 dB.

    (DVM) − (Power Meter) = DVM Offset

19. Add the DVM Offset from Step 16 to each of the DVM Readouts in Table 2-79 and record as the Corrected Level Flatness in column 3.

    For example, if the DVM Readout from Table 2-79 is −15 dBm, and the DVM Offset is +16.0 dB, the corrected readout would be +1 dBm.

    (DVM) + (DVM Offset) = Corrected Readout

20. Locate the most positive Level Flatness readings in Table 2-78 and Table 2-79 and record these values as TR Entry 1 and TR Entry 2 of the performance verification test record.
21. Locate the most negative Level Flatness readings in Table 2-78 and Table 2-79 and record this value as TR Entry 3 and TR Entry 4 of the performance verification test record.

64. Harmonic Spurious Outputs, HP 8591C and HP 8591E Option 010 or 011

The tracking generator output is connected to the spectrum analyzer input and the tracking is adjusted at 300 MHz for a maximum signal level. The tracking generator output is then connected to the input of a microwave spectrum analyzer. The tracking generator is tuned to several different frequencies and the amplitude of the second and third harmonics relative to the fundamental are measured at each frequency.

There are no related adjustment procedures for this performance test.

Equipment Required

Spectrum analyzer, microwave
Cable, Type N, 62 cm (24 in)
Cable, BNC, 23 cm (9 in)
Adapter, Type N (m) to BNC (f)

Additional Equipment for Option 011

Adapter, minimum loss
Cable, BNC, 75 Ω
Adapter, Type N (f) to BNC (m), 75 Ω

Caution Use only 75 Ω cables, connectors, or adapters on the 75 Ω input of an Option 011 or damage to the input connector will occur.

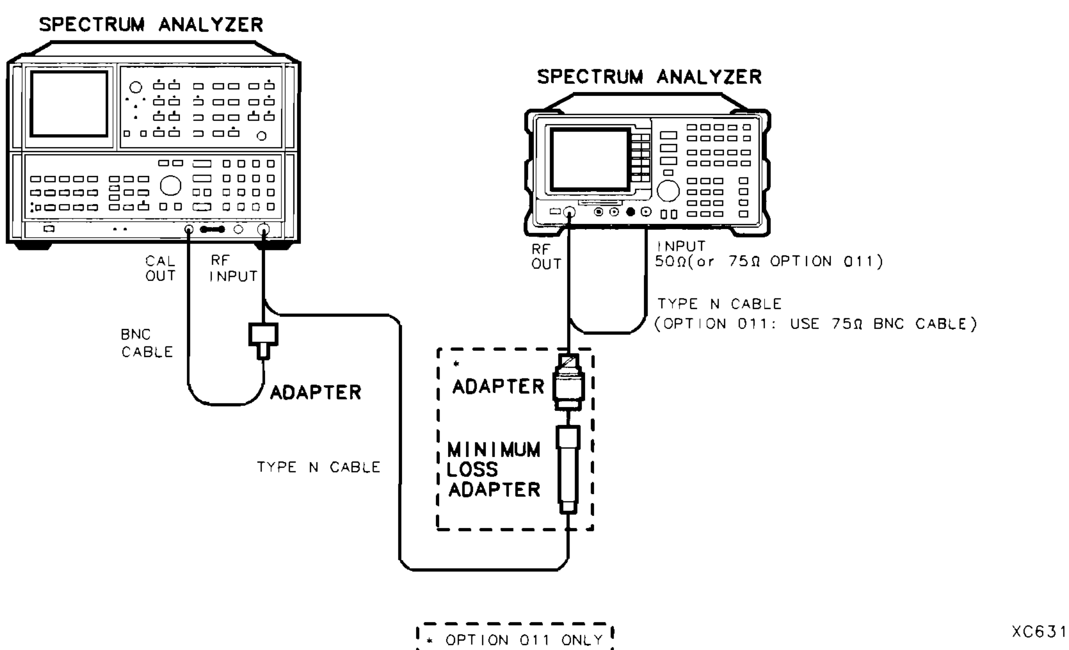


Figure 2-93. Harmonic Spurious Outputs Test Setup

Procedure

1. Connect the Type N cable between the RF OUT 50 Ω and INPUT 50 Ω connectors on the spectrum analyzer. See Figure 2-93.

   Option 011 only: Connect the 75 Ω BNC cable between the RF OUT 75 Ω and INPUT 75 Ω connectors on the spectrum analyzer.

2. Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish. Set the spectrum analyzer by pressing the following keys:

   (FREQUENCY) 300 (MHz)
   (SPAN) ZERO SPAN
   (MKR)
   (AUX CTRL) Track Gen
   SRC PWR ON OFF (ON) −5 (dBm)

   Option 011 only: Press (AUX CTRL), Track Gen , SRC PWR ON OFF , then enter 42 (dBm) (+42 dBmV).

3. On the spectrum analyzer, press TRACKING PEAK . Wait for the PEAKING message to disappear, then press the following keys:

   0 (dBm)

   Option 011 only: Press 42.8 (dBm) (42.8 dBmV).

   (FREQUENCY) 10 (MHz)
   (SGL SWP)

   It is only necessary to perform the next step if more than two hours have elapsed since a front-panel calibration of the microwave spectrum analyzer was performed.

   The microwave spectrum analyzer should be allowed to warm up for at least 30 minutes before proceeding.

4. Perform a front-panel calibration of the microwave spectrum analyzer by performing the following steps:

   Note that the following steps are for an HP 8566A/B microwave spectrum analyzer, the steps may be different if you are using another microwave spectrum analyzer.

   - Connect a BNC cable between the CAL OUTPUT and the RF INPUT.
   - Press (2 − 22 GHz) (INSTR PRESET), (RECALL), 8. Adjust AMPTD CAL for a marker amplitude reading of −10 dBm.
   - Press (RECALL), 9. Adjust FREQ ZERO for a maximum amplitude response.

5. Connect the Type N cable from the tracking generator output to the microwave spectrum analyzer RF INPUT as shown in Figure 2-93.

   Option 011 only: Use the minimum loss adapter and Type N (f) to BNC (m) adapter.

6. Set the microwave spectrum analyzer controls as follows:

   CENTER FREQUENCY .... 10 MHz
   SPAN .... 100 kHz
   REFERENCE LEVEL .... +5 dBm
   RES BW .... 30 kHz
   LOG dB/DIV .... 10 dB

7. Set up the microwave spectrum analyzer by performing the following steps:

   Note that the following steps are for an HP 8566A/B microwave spectrum analyzer, the steps may be different if you are using another microwave spectrum analyzer.

   - Press PEAK SEARCH and SIGNAL TRACK (ON). Wait for the signal to be displayed at center screen.
   - Press PEAK SEARCH, CF STEP SIZE 10 MHz, CENTER FREQUENCY, then SIGNAL TRACK (OFF).
   - Press CENTER FREQUENCY and the step-up key to tune to the second harmonic. Press PEAK SEARCH. Record the marker amplitude reading in Table 2-80 as the 2nd Harmonic Level for the 10 MHz Tracking Generator Output Frequency.
   - Perform this step only if the Tracking Generator Output Frequency is less than 600 MHz. Press CENTER FREQUENCY and the step-up key to tune to the third harmonic. Press PEAK SEARCH. Record the marker amplitude reading in Table 2-80 as the 3rd Harmonic Level for the 10 MHz Tracking Generator Output Frequency.
   - Press MARKER (OFF).

8. Change the microwave spectrum analyzer center frequency to the next frequency listed in Table 2-80, then repeat step 7. Note that the microwave spectrum analyzer frequency is the same as the Tracking Generator Output Frequency (*STEP SIZE = TG FREQ*).

Table 2-80. Harmonic Spurious Responses Worksheet

Tracking Generator Frequency	2nd Harmonic Level (dBc)	3rd Harmonic Level (dBc)
10 MHz	________	________
100 MHz	________	________
300 MHz	________	________
850 MHz	________	N/A

9. Locate the most positive 2nd Harmonic Level in Table 2-80 and record as TR Entry 1 of the performance verification test record.

10. Locate the most positive 3rd Harmonic Level in Table 2-80 and record as TR Entry 2 of the performance verification test record.

65. Harmonic Spurious Outputs, HP 8593E, HP 8594E, HP 8595E, and HP 8596E Option 010

The tracking generator output is connected to the spectrum analyzer input and the tracking is adjusted at 300 MHz for a maximum signal level. The tracking generator output is then connected to the input of a microwave spectrum analyzer. The tracking generator is tuned to several different frequencies and the amplitude of the second and third harmonics relative to the fundamental are measured at each frequency.

There are no related adjustment procedures for this performance verification test.

Equipment Required

Spectrum analyzer, microwave
Cable, Type N, 62 cm (24 in)
Cable, BNC, 23 cm (9 in)
Adapter, Type N (m) to BNC (f)

Procedure

Note It is only necessary to perform Step 1 if more than two hours have elapsed since a front-panel calibration of the microwave spectrum analyzer was performed.

The microwave spectrum analyzer should be allowed to warm up for at least 30 minutes before proceeding.

1. Perform a front-panel calibration of the microwave spectrum analyzer by performing the following steps:

   Note that the following steps are for an HP 8566A/B microwave spectrum analyzer, the steps may be different if you are using another microwave spectrum analyzer.

   - Connect a BNC cable between the CAL OUTPUT and the RF INPUT.
   - Press (2 – 22 GHz) (INSTR PRESET), (RECALL), 8. Adjust AMPTD CAL for a marker amplitude reading of −10 dBm.
   - Press (RECALL), 9. Adjust FREQ ZERO for a maximum amplitude response.
   - Press (SHIFT), (FREQUENCY SPAN) to start the 30 second internal error correction routine.
   - When the CALIBRATING! message disappears, press (SHIFT), (START FREQ) to use the error correction factors just calculated.

2. Connect the Type N cable between the RF OUT 50 Ω and INPUT 50 Ω connectors on the spectrum analyzer. See Figure 2-94.

65. Harmonic Spurious Outputs, HP 8593E, HP 8594E, HP 8595E, and HP 8596E Option 010

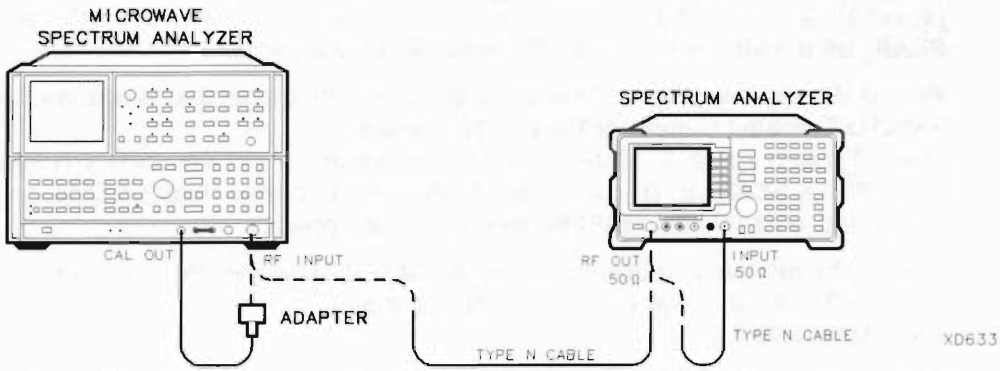


Figure 2-94. Harmonic Spurious Outputs Test Setup

3. Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish. Set the spectrum analyzer by pressing the following keys:

   (FREQUENCY) `Band Lock` `0-2.9 Gz BAND 0`
   The HP 8594E does not need to be band locked.
   (FREQUENCY) 300 (MHz)
   (SPAN) 0 (Hz)
   (BW) 30 (kHz)
   (MKR)
   (AUX CTRL) `TRACK GEN`
   `SRC PWR ON OFF` (ON) −5 (dBm)
   `TRACKING PEAK`

   Wait for the `PEAKING` message to disappear, then press the following keys:

   `SRC PWR ON OFF` (ON) −1 (dBm)
   (FREQUENCY) 300 (kHz)
   (SGL SWP)

4. Connect the Type N cable from the tracking generator output to the microwave spectrum analyzer RF INPUT as shown in Figure 2-94.
5. Set the microwave spectrum analyzer controls as follows:

   CENTER FREQUENCY .... 300 kHz
   SPAN .... 20 kHz
   REFERENCE LEVEL .... +5 dBm
   RES BW .... 1 kHz
   LOG dB/DIV .... 10 dB

6. Set up the microwave spectrum analyzer by performing the following steps:

   Note that the following steps are for an HP 8566A/B microwave spectrum analyzer, the steps may be different if you are using another microwave spectrum analyzer.

   a. Press PEAK SEARCH and SIGNAL TRACK (ON). Wait for the signal to be displayed at center screen.
   b. Press PEAK SEARCH, CF STEP SIZE 10 MHz, CENTER FREQUENCY, then SIGNAL TRACK (OFF).
   c. Press PEAK SEARCH, MKR/Δ —STP SIZE, MARKER Δ.

d. Press CENTER FREQUENCY and ⇧ (step-up key) to tune to the second harmonic, then press PEAK SEARCH. (If the center frequency is greater than 2.5 GHz, press PRESEL PEAK, then wait for the PEAKING! message to disappear.)

   Record the marker amplitude reading in Table 2-81 as the 2nd Harmonic Level for the 300 kHz Tracking Generator Output Frequency.

e. Press ⇧ (step-up key). If the Tracking Generator Output Frequency is less than 1 GHz. Press PEAK SEARCH. (If the center frequency is greater than 2.5 GHz, press PRESEL PEAK and wait for the PEAKING message to disappear.)

   Record the marker amplitude reading in Table 2-81 as the 3rd Harmonic Level for the 300 kHz Tracking Generator Output Frequency.

f. Press MARKER (OFF).

7. Change the tracking generator and microwave spectrum analyzer frequency to the next frequency listed in Table 2-81, then repeat step 6. Note that the microwave spectrum analyzer frequency is the same as the Tracking Generator Output Frequency.
8. Locate the 2nd Harmonic Level for 9 kHz in Table 2-81 and record as TR Entry 1 of the performance verification record.
9. Locate the most positive 2nd Harmonic Level in Table 2-81 and record as TR Entry 2 of the performance verification test record.
10. Locate the 2nd Harmonic Level for 1.4 GHz in Table 2-81 and record as TR Entry 3 of the performance verification test record.
11. Locate the 3rd Harmonic Level for 9 kHz in Table 2-81 and record as TR Entry 4 of the performance verification record.
12. Locate the most positive 3rd Harmonic Level in Table 2-81 and record as TR Entry 5 of the performance verification test record.

Table 2-81. Harmonic Spurious Responses Worksheet

Tracking Generator Frequency	2nd Harmonic Level (dBc)	3rd Harmonic Level (dBc)
9 kHz	________	________
25 kHz	________	________
300 kHz	________	________
100 MHz	________	________
300 MHz	________	________
900 MHz	________	________
1.4 GHz	________	N/A

66. Non-Harmonic Spurious Outputs, HP 8591C and HP 8591E Option 010 or 011

The tracking generator output is connected to the spectrum analyzer input and the tracking is adjusted at 300 MHz for a maximum signal level. The tracking generator output is then connected to the input of a microwave spectrum analyzer. The tracking generator is set to several different output frequencies.

For each output frequency, several sweeps are taken on the microwave spectrum analyzer over different frequency spans and the highest displayed spurious response is measured in each span. Responses at the fundamental frequency of the tracking generator output or their harmonics are ignored. The amplitude of the highest spurious response is recorded.

There are no related adjustments for this performance test.

Equipment Required

Spectrum analyzer, microwave
Cable, Type N, 62 cm (24 in)
Cable, BNC, 23 cm (9 in)
Adapter, Type N (m) to BNC (f)

Additional Equipment for Option 011:

Adapter, minimum loss
Cable, BNC, 75 Ω
Adapter, Type N (f) to BNC (m), 75 Ω

Procedure

1. Connect the Type N cable between the RF OUT 50 Ω and INPUT 50 Ω connectors on the spectrum analyzer. See Figure 2-95.

   Option 011 only: Connect the 75 Ω BNC cable between the RF OUT 75 Ω and INPUT 75 Ω on the spectrum analyzer.

2. Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish. Set the spectrum analyzer by pressing the following keys:

   (FREQUENCY) 300 (MHz)
   (SPAN) ZERO SPAN
   (BW) RES BW AUTO MAN 30 (kHz)
   (MKR)
   (AUX CTRL) Track Gen
   SRC PWR ON OFF (ON) −5 (dBm)

   Option 011 only: Press (AUX CTRL), Track Gen , SRC PWR ON OFF (ON), then enter 42 (dBm) (+42 dBmV).

3. On the spectrum analyzer, press TRACKING PEAK , then wait for the PEAKING message to disappear.

Caution Use only 75 Ω cables, connectors, or adapters on the 75 Ω input of an Option 011 or damage to the input connector will occur.

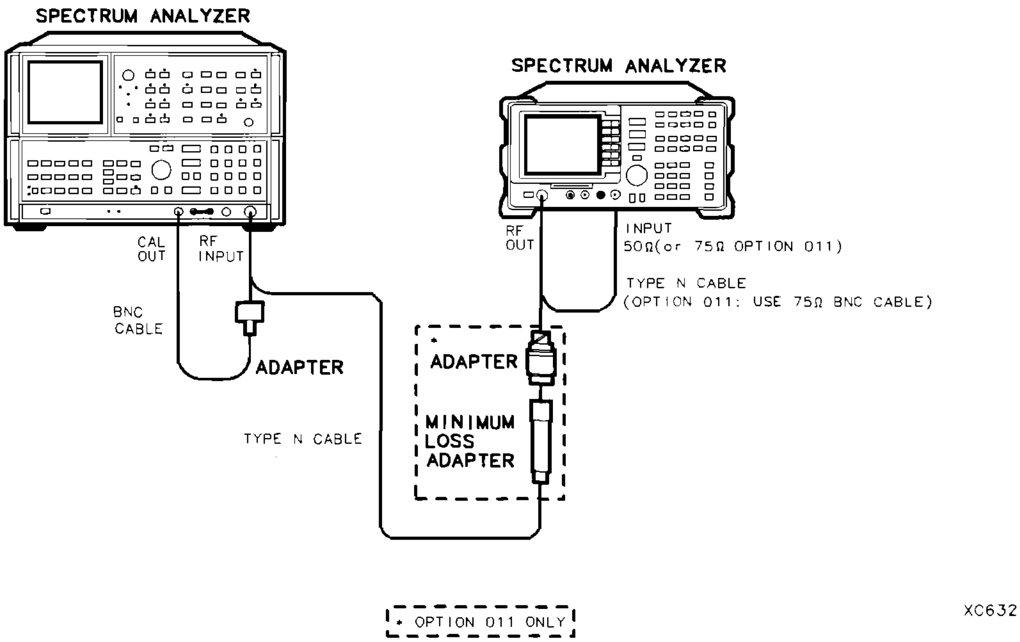


Figure 2-95. Non-Harmonic Spurious Outputs Test Setup

4. On the spectrum analyzer, press 0 (dBm) then (SGL SWP).

   Option 011 only: Press 42.8 (dBm) (+42.8 dBmV) then (SGL SWP).

   It is only necessary to perform the next step if more than 2 hours have elapsed since a front-panel calibration of the microwave spectrum analyzer has been performed.

   The microwave spectrum analyzer should be allowed to warm up for at least 30 minutes before proceeding.

5. Perform a front-panel calibration of the microwave spectrum analyzer by performing the following steps:

   Note that the following steps are for an HP 8566A/B microwave spectrum analyzer, the steps may be different if you are using another microwave spectrum analyzer.

   - Connect a BNC cable between CAL OUTPUT and RF INPUT.
   - Press (2 – 22 GHz) (INSTR PRESET), (RECALL), 8. Adjust AMPTD CAL for a marker amplitude reading of −10 dBm.
   - Press (RECALL), 9. Adjust FREQ ZERO for a maximum amplitude response.
   - Press (SHIFT), (FREQUENCY SPAN) to start the 30 second internal error correction routine.
   - Press (SHIFT), (START FREQ) to use the error correction factors just calculated.

6. Connect the Type N cable from the tracking generator output to the microwave spectrum analyzer RF INPUT as shown in Figure 2-95.

   Option 011 only: Use the minimum loss adapter and Type N (f) to BNC (m) adapter.

Measuring Fundamental Amplitudes

7. Set the spectrum analyzer center frequency to the Fundamental Frequency listed in Table 2-82.
8. Set the microwave spectrum analyzer controls as follows:

   SPAN .... 100 kHz
   REFERENCE LEVEL .... +5 dBm
   ATTEN .... 20 dB

9. Set the microwave spectrum analyzer CENTER FREQUENCY to the Fundamental Frequency listed in Table 2-82.
10. On the microwave spectrum analyzer, press PEAK SEARCH. Press MARKER →REF LVL. Wait for another sweep to finish.
11. Record the microwave spectrum analyzer marker amplitude reading in Table 2-82 as the Fundamental Amplitude.
12. Repeat steps 8 through 11 for all Fundamental Frequency settings in Table 2-82.

Table 2-82. Fundamental Response Amplitudes Worksheet

Fundamental Frequency	Fundamental Amplitude (dBm)
10 MHz	________
900 MHz	________
1.8 GHz	________

Measuring Non-Harmonic Responses

13. On the spectrum analyzer, set the center frequency to 10 MHz.
14. Set the microwave spectrum analyzer START FREQ, STOP FREQ, and RES BW as indicated in the first row of Table 2-83.
15. Press SINGLE on the microwave spectrum analyzer and wait for the sweep to finish. Press (PEAK SEARCH).
16. Verify that the marked signal is not the fundamental or a harmonic of the fundamental by performing the following steps:

    Note that the following steps are for an HP 8566A/B microwave spectrum analyzer, the steps may be different if you are using another microwave spectrum analyzer.

    a. Divide the marker frequency by the fundamental frequency (the spectrum analyzer center frequency setting). For example, if the marker frequency is 30.3 MHz and the fundamental frequency is 10 MHz, dividing 30.3 MHz by 10 MHz yields 3.03.
    b. Round the number calculated in step a the nearest whole number. In the example above, 3.03 should be rounded to 3.
    c. Multiply the fundamental frequency by the number calculated in step b. Following the example, multiplying 10 MHz by 3 yields 30 MHz.

d. Calculate the difference between the marker frequency and the frequency calculated in step c above. Continuing the example, the difference would be 300 kHz.

e. Due to span accuracy uncertainties in the microwave spectrum analyzer, the marker frequency might not equal the actual frequency. Given the marker frequency, check if the difference calculated in step d is within the appropriate tolerance:

For marker frequencies <5 MHz, tolerance = ±200 kHz
For marker frequencies <55 MHz, tolerance = ±750 kHz
For marker frequencies >55 MHz, tolerance = ±10 MHz

f. If the difference in step d is within the indicated tolerance, the signal in question is the fundamental signal (if the number in step b = 1) or a harmonic of the fundamental (if the number in step b >1). This response should be ignored.

17. Verify that the marked signal is a true response and not a random noise peak by pressing SINGLE to trigger a new sweep and press PEAK SEARCH. A true response will remain at the same frequency and amplitude on successive sweeps but a noise peak will not.

    If the marked signal is *not* the fundamental or a harmonic of the fundamental (see step 16) and is a true response (see step 17), proceed with step 20.

18. If the marked signal is either the fundamental or a harmonic of the fundamental (see step 16) or a noise peak (see step 17), move the marker to the next highest signal by pressing SHIFT, PEAK SEARCH. Repeat step 16.

The following step is only performed if the marker signal is not the fundamental or harmonic of the fundamental and is a true response.

19. Calculate the difference between the amplitude of marked signal and the Fundamental Amplitude as listed in Table 2-82.

    For example, if the Fundamental Amplitude for a fundamental frequency of 10 MHz is +1.2 dBm and the marker amplitude is −40.8 dBm, the difference is −42 dBc.

    Record this difference as the Non-Harmonic Response Amplitude for the appropriate spectrum analyzer center frequency and microwave spectrum analyzer start and stop frequency settings in Table 2-83.

    Non-Harmonic Amplitude = Marker Amplitude − Fundamental Amplitude

20. If a true non-harmonic spurious response is not found, record "NOISE" as the Non-Harmonic Response Amplitude in Table 2-83 for the appropriate spectrum analyzer center frequency and microwave spectrum analyzer start and stop frequency settings.

21. Repeat steps 15 through 20 for the remaining microwave spectrum analyzer settings for start frequency, stop frequency, and resolution bandwidth; and for the spectrum analyzer center frequency setting of 10 MHz.

22. Repeat steps 14 through 21 with the spectrum analyzer center frequency set to 900 MHz.

23. Repeat steps 14 through 21 with the spectrum analyzer center frequency set to 1.8 GHz.

24. Locate in Table 2-83 the most-positive Non-Harmonic Response Amplitude. Record this amplitude as the Highest Non-Harmonic Response Amplitude in TR Entry 1 of the performance verification test record.

66. Non-Harmonic Spurious Outputs, HP 8591C and HP 8591E Option 010 or 011

Table 2-83. Non-Harmonic Responses Worksheet

Microwave Spectrum Analyzer Settings			Non-Harmonic Response Amplitude (dBc)		
Start Freq (MHz)	**Stop Freq (MHz)**	**Resolution Bandwidth**	**at 10 MHz Center Freq**	**at 900 MHz Center Freq**	**at 1.8 GHz Center Freq**
0.1*	5.0	10 kHz	______	______	______
5.0	55	100 kHz	______	______	______
55	1240	1 MHz	______	______	______
1240	1800	1 MHz	______	______	______

* Option 011: Set the START FREQ to 1 MHz.

67. Non-Harmonic Spurious Outputs, HP 8593E, HP 8594E, HP 8595E, HP 8596E Opt. 010

The tracking generator output is connected to the spectrum analyzer input and the tracking is adjusted at 300 MHz for a maximum signal level. The tracking generator output is then connected to the input of a microwave spectrum analyzer. The tracking generator is tuned to several different frequencies, then the amplitude of the second and third harmonics relative to the fundamental are measured at each frequency.

For each output frequency, several sweeps are taken on the microwave spectrum analyzer over different frequency spans and the highest displayed spurious response is measured in each span. Responses at the fundamental frequency of the tracking generator output or its harmonics are ignored; they are tested in the "Harmonic Spurious Responses" performance verification test. The amplitude of the highest spurious response is recorded.

There are no related adjustments for this performance verification test.

Equipment Required

Spectrum analyzer, microwave
Cable, Type N, 62 cm (24 in)
Cable, BNC, 23 cm (9 in)
Adapter, Type N (m) to BNC (f)

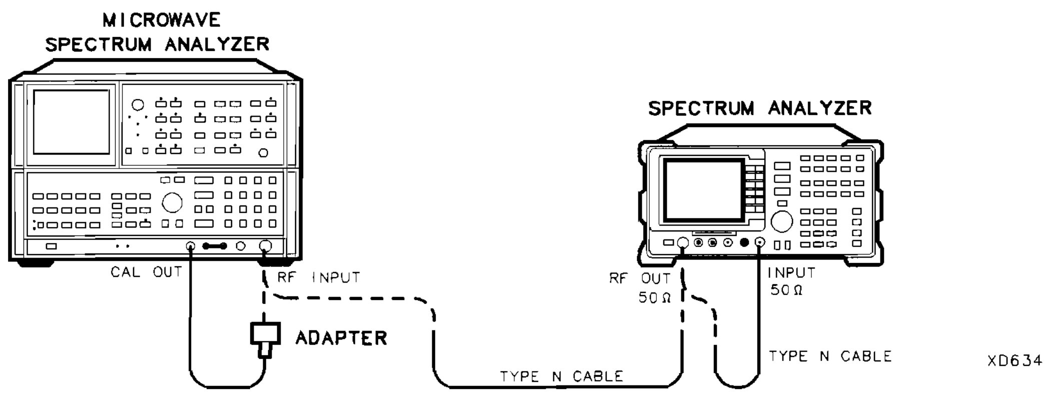


Figure 2-96. Non-Harmonic Spurious Outputs Test Setup

67. Non-Harmonic Spurious Outputs, HP 8593E, HP 8594E, HP 8595E, HP 8596E Opt. 010

Procedure

It is only necessary to perform step 1 if more than 2 hours have elapsed since a front-panel calibration of the microwave spectrum analyzer has been performed.

The microwave spectrum analyzer should be allowed to warm up for at least 30 minutes before proceeding.

1. Perform a front-panel calibration of the microwave spectrum analyzer by performing the following steps:

   Note that the following steps are for an HP 8566A/B microwave spectrum analyzer, the steps may be different if you are using another microwave spectrum analyzer.

   - Connect a BNC cable between CAL OUTPUT and RF INPUT.
   - Select the 2 – 22 GHz band, then press INSTR PRESET, (RECALL), 8. Adjust AMPTD CAL for a marker amplitude reading of −10 dBm.
   - Press (RECALL), 9. Adjust FREQ ZERO for a maximum amplitude response.
   - Press SHIFT, FREQUENCY SPAN to start the 30 second internal error correction routine.
   - When the CALIBRATING! message disappears, press SHIFT, START FREQ to use the error correction factors just calculated.

2. Connect the Type N cable between the RF OUT 50 Ω and INPUT 50 Ω connectors on the spectrum analyzer. See Figure 2-96.

3. Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish. Set the spectrum analyzer by pressing the following keys:

   (FREQUENCY) Band Lock 0-2.9 Gz BAND 0
   The HP 8594E does not need to be band locked.
   (FREQUENCY) 300 (MHz)
   (SPAN) 0 (Hz)
   (BW) RES BW AUTO MAN 30 (kHz)
   (MKR)
   (AUX CTRL) TRACK GEN SRC PWR ON OFF (ON) −5 (dBm)
   TRACKING PEAK

   Wait for the PEAKING message to disappear, then press the following keys:

   SRC PWR ON OFF (ON) −1 (dBm)
   (SGL SWP)

4. Connect the Type N cable from the tracking generator output to the microwave spectrum analyzer RF INPUT as shown in Figure 2-96.

Measuring Fundamental Amplitudes

5. Set the spectrum analyzer center frequency to the Fundamental Frequency listed in Table 2-84.

6. Set the microwave spectrum analyzer controls as follows:

   SPAN .... 100 kHz
   REFERENCE LEVEL .... +5 dBm
   ATTEN .... 20 dB
   LOG dB/DIV .... 10 dB

7. Set the microwave spectrum analyzer CENTER FREQUENCY to the Fundamental Frequency listed in Table 2-84.
8. On the microwave spectrum analyzer, press PEAK SEARCH. If the marker frequency is greater than 2.5 GHz, press PRESEL PEAK and wait for the PEAKING! message to disappear. Press MARKER →REF LVL. Wait for another sweep to finish.
9. Record the microwave spectrum analyzer marker amplitude reading in Table 2-84 as the Fundamental Amplitude.
10. Repeat steps 5 through 9 for all Fundamental Frequency settings in Table 2-84.

Table 2-84. Fundamental Response Amplitudes Worksheet

Fundamental Frequency	Fundamental Amplitude (dBm)
9 kHz	________
1.5 GHz	________
2.9 GHz	________

Measuring Non-Harmonic Responses

11. On the spectrum analyzer, set the center frequency to 9 kHz.
12. Set the microwave spectrum analyzer START FREQ, STOP FREQ, and RES BW as indicated in the first row of Table 2-85.
13. Press SINGLE on the microwave spectrum analyzer and wait for the sweep to finish. Press PEAK SEARCH. If the marker frequency is greater than 2.5 GHz, press PRESEL PEAK and wait for the PEAKING! message to disappear.
14. Verify that the marked signal is not the fundamental or a harmonic of the fundamental by performing the following steps:

    Note that the following steps are for an HP 8566A/B microwave spectrum analyzer, the steps may be different if you are using another microwave spectrum analyzer.

    a. Divide the marker frequency by the fundamental frequency (the spectrum analyzer center frequency setting). For example, if the marker frequency is 26.5 kHz and the fundamental frequency is 9 kHz, dividing 26.5 kHz by 9 kHz yields 2.944.
    b. Round the number calculated in step a the nearest whole number. In the example above, 2.944 should be rounded to 3.
    c. Multiply the fundamental frequency by the number calculated in step b. Following the example, multiplying 9 kHz by 3 yields 27 kHz.
    d. Calculate the difference between the marker frequency and the frequency calculated in step c above. Continuing the example, the difference would be 500 Hz.
    e. Due to span accuracy uncertainties in the microwave spectrum analyzer, the marker frequency might not equal the actual frequency. Given the marker frequency, check if the difference calculated in step d is within the appropriate tolerance:

        For marker frequencies <5 MHz, tolerance = ±200 kHz
        For marker frequencies <55 MHz, tolerance = ±750 kHz
        For marker frequencies >55 MHz, tolerance = ±10 MHz

f. If the difference in step d is within the indicated tolerance, the signal in question is the fundamental signal (if the number in step b = 1) or a harmonic of the fundamental (if the number in step b >1). This response should be ignored.

15. Verify that the marked signal is a true response and not a random noise peak by pressing SINGLE to trigger a new sweep and press PEAK SEARCH. A true response will remain at the same frequency and amplitude on successive sweeps but a noise peak will not.

    If the marked signal is *not* the fundamental or a harmonic of the fundamental (see step 14) and is a true response (see step 15), proceed with step 17.

16. If the marked signal is either the fundamental or a harmonic of the fundamental (see step 14) or a noise peak (see step 15), move the marker to the next highest signal by pressing SHIFT, PEAK SEARCH. Repeat step 14.

    The following step is only performed if the marker signal is not the fundamental or harmonic of the fundamental and is a true response.

17. Calculate the difference between the amplitude of marked signal and the Fundamental Amplitude as listed in Table 2-84.

    For example, if the Fundamental Amplitude for a fundamental frequency of 9 kHz is +1.2 dBm and the marker amplitude is −30.8 dBm, the difference is −32 dBc.

    Record this difference as the Non-Harmonic Response Amplitude for the appropriate spectrum analyzer center frequency and microwave spectrum analyzer start and stop frequency settings in Table 2-85.

    Non-Harmonic Amplitude = Marker Amplitude − Fundamental Amplitude

18. If a true non-harmonic spurious response is not found, record "NOISE" as the Non-Harmonic Response Amplitude in Table 2-85 for the appropriate spectrum analyzer center frequency and microwave spectrum analyzer start and stop frequency settings.

19. Repeat steps 14 through 19 for the remaining microwave spectrum analyzer settings for start frequency, stop frequency, and resolution bandwidth; and for the spectrum analyzer center frequency setting of 9 kHz.

20. Repeat steps 12 through 18 with the spectrum analyzer center frequency set to 1.5 GHz.

21. Repeat steps 12 through 18 with the spectrum analyzer center frequency set to 2.9 GHz.

22. Locate in Table 2-85 the most-positive Non-Harmonic Response Amplitude for the microwave spectrum analyzer STOP frequency settings of less than or equal to 2000 MHz. Record this amplitude as the Highest Non-Harmonic Response Amplitude ≤2000 MHz as TR Entry 28-1 of the performance verification test record.

23. Locate in Table 2-85 the most-positive Non-Harmonic Response Amplitude for the microwave spectrum analyzer START frequency settings of greater than or equal to 2000 MHz. Record this amplitude as the Highest Non-Harmonic Response Amplitude ≥2000 MHz as TR Entry 28-2 of the performance verification test record.

67. Non-Harmonic Spurious Outputs, HP 8593E, HP 8594E, HP 8595E, HP 8596E Opt. 010

Table 2-85. Non-Harmonic Responses Worksheet

Microwave Spectrum Analyzer Settings			Non-Harmonic Response Amplitude (dBc)		
Start Freq (MHz)	Stop Freq (MHz)	Resolution Bandwidth	at 9 kHz Center Frequency	at 1.5 GHz Center Frequency	at 2.9 GHz Center Frequency
0.003*	0.2	3 kHz	________	________	________
0.2	5.0	30 kHz	________	________	________
5.0	55	100 kHz	________	________	________
55	1240	1 MHz	________	________	________
1240	2000	1 MHz	________	________	________
2000	2900	1 MHz	________	________	________

* Adjust start frequency until the LO is just off the left side of the screen.

68. Tracking Generator Feedthrough, HP 8591C and HP 8591E Option 010 or 011

The tracking generator output is connected to the spectrum analyzer input and the tracking is adjusted at 300 MHz for a maximum signal level. The tracking generator output is terminated and set for 0 dBm output power (maximum output power). The spectrum analyzer input is also terminated. The noise level of the spectrum analyzer is then measured at several frequencies.

There are no related adjustments for this performance test.

Equipment Required

50 Ω Termination *(two required)*
Cable, Type N, 62 cm (24 in)
Cable, BNC, 23 cm (9 in)
Cable, Type N (m) to BNC (f)

Additional Equipment for Option 011:

Termination, 75 Ω, Type N (m) *(two required)*
Cable, BNC, 75 Ω
Adapter, Type N (f) to BNC (m), 75 Ω *(two required)*

Caution Use only 75 Ω cables, connectors, or adapters on the 75 Ω input of an Option 011 or damage to the input connector will occur.

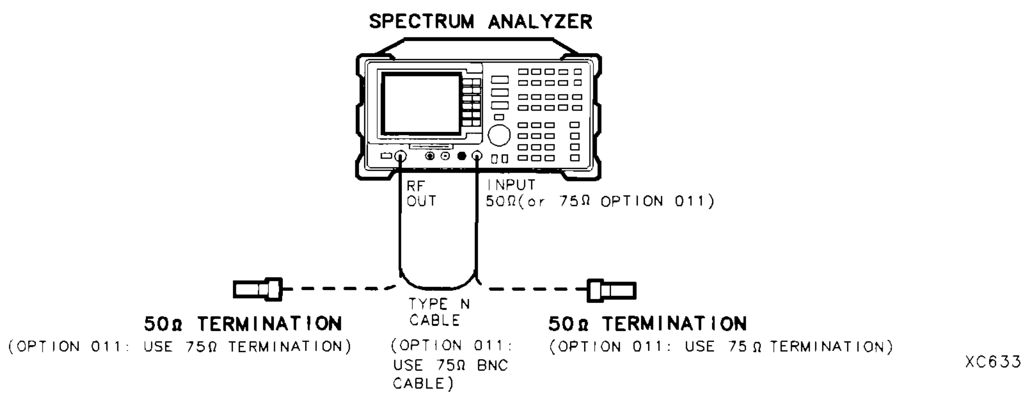


Figure 2-97. Tracking Generator Feedthrough Test Setup

68. Tracking Generator Feedthrough, HP 8591C and HP 8591E Option 010 or 011

Procedure

1. Connect the Type N cable between the RF OUT 50 Ω and INPUT 50 Ω connectors on the spectrum analyzer. See Figure 2-97.

   Option 011 only: Connect the 75 Ω BNC cable between the RF OUT 75 Ω and INPUT 75 Ω connectors on the spectrum analyzer.

2. Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish. Set the spectrum analyzer by pressing the following keys:

   (FREQUENCY) 300 (MHz)
   (SPAN) 1 (MHz)
   (MKR)
   (AUX CTRL) Track Gen
   SRC PWR ON OFF (ON) −5 (dBm)

   Option 011 only: Press (AUX CTRL), Track Gen, SRC PWR ON OFF, then enter 42 (dBm) (+42 dBmV).

3. On the spectrum analyzer, press TRACKING PEAK. Wait for the PEAKING message to disappear.

4. Connect the CAL OUTPUT to the INPUT 50 Ω.

   Option 011 only: Connect the CAL OUTPUT to the INPUT 75 Ω.

5. Set the spectrum analyzer by pressing the following keys:

   (AMPLITUDE) −20 (dBm)

   Option 011 only: Press (AMPLITUDE) +28.75 (dBmV).

   ATTEN AUTO MAN 0 (dB)
   (SPAN) 10 (MHz)
   (PEAK SEARCH)
   (MKR FCTN) MK TRACK ON OFF (ON)
   (SPAN) 100 (kHz)

   Wait for the AUTO ZOOM message to disappear, then set the spectrum analyzer as follows:

   (BW) VID BW AUTO MAN 30 (Hz)
   (MKR FCTN) MK TRACK ON OFF (OFF)

6. Press (SGL SWP), wait for the completion of a new sweep, then press (PEAK SEARCH).

   Subtract the MKR amplitude reading from −20 dBm, then enter the result in the spectrum analyzer as the REF LVL OFFSET. For example, if the marker reads −20.21 dBm, enter +0.21 dB.

   −20 dBm − (−20.21 dBm) = +0.21 dB

   Example for *Option 011:*

   If the marker reads 26.4 dBmV, enter +2.35 (dB)

   28.75 dBmV − 26.4 dBmV = 2.35 dB

   Then press the following spectrum analyzer keys:

   (AMPLITUDE) More 1 of 3 REF LVL OFFSET (enter calculated value)

7. Connect one 50 Ω termination to the spectrum analyzer INPUT 50 Ω and another to the tracking generator's RF OUT 50 Ω.

   Option 011 only: Connect one 75 Ω termination to the spectrum analyzer INPUT 75 Ω and another to the tracking generator's RF OUT 75 Ω.

8. Press (AUX CTRL), `Track Gen`, then `SRC PWR ON OFF` (OFF).

9. Set the spectrum analyzer by pressing the following keys:

   (FREQUENCY) 0 (Hz)
   (SPAN) 10 (MHz)
   (AMPLITUDE) −10 (dBm)

   Option 011 only: Press (AMPLITUDE) +38.75 (dBmV).)

   (BW) `VID BW AUTO MAN` (AUTO)

   (MKR) `More 1 of 2` `MARKER ALL OFF`

   (TRIG) `SWEEP CONT SGL` (CONT)

10. Press the following spectrum analyzer keys:

    (PEAK SEARCH)
    (MKR FCTN) `MK TRACK ON OFF` (ON)
    (MKR →) `MARKER →REF LVL`
    (SPAN) 2 (MHz)

    Wait for the AUTO ZOOM message to disappear, then press (MKR FCTN) `MK TRACK ON OFF` (OFF).

11. Press (FREQUENCY) and adjust the center frequency until the LO feedthrough peak is on the left-most graticule line, then set the spectrum analyzer as follows:

    (SPAN) 50 (kHz)
    (AMPLITUDE) −50 (dBm)

    Option 011 only: Press (AMPLITUDE) −1.25 (dBmV).

    (BW) `VID BW AUTO MAN` 30 (Hz)

12. Press (AUX CTRL), `Track Gen`, `SRC PWR ON OFF` (ON), and enter 0 (dBm).

    Option 011 only: Press (AUX CTRL), `Track Gen`, `SRC PWR ON OFF` (ON), and enter 42.8 (dBm) (+42.8 dBmV).

13. Press (SGL SWP), then wait for completion of a new sweep. Press (DISPLAY), `DSP LINE ON OFF` (ON).

14. Adjust the display line so that it is centered on the average trace noise, ignoring any residual responses. Record the display line amplitude setting in Table 2-86 as the noise level at 1 MHz.

15. Repeat steps 13 and 14 for the remaining Tracking Generator Output Frequencies (spectrum analyzer center frequency) listed in Table 2-86.

16. In Table 2-86, locate the most positive Noise Level Amplitude. Record this amplitude as TR Entry 1 of the performance verification test record.

68. Tracking Generator Feedthrough, HP 8591C and HP 8591E Option 010 or 011

Table 2-86. TG Feedthrough Worksheet

Tracking Generator Output Frequency	Noise Level Amplitude (dbm or dBmV)
1 MHz	____________
20 MHz	____________
50 MHz	____________
100 MHz	____________
250 MHz	____________
400 MHz	____________
550 MHz	____________
700 MHz	____________
850 MHz	____________
1000 MHz	____________
1150 MHz	____________
1300 MHz	____________
1450 MHz	____________
1600 MHz	____________
1750 MHz	____________

69. Tracking Generator Feedthrough, HP 8594E Option 010

The tracking generator output is connected to the spectrum analyzer input and the tracking is adjusted at 300 MHz for a maximum signal level. The tracking generator output is terminated and set for 1 dBm output power (maximum output power). The spectrum analyzer input is also terminated. The noise level of the spectrum analyzer is then measured at several frequencies.

There are no related adjustments for this performance verification test.

Equipment Required

Termination, 50 Ω *(two required)*
Cable, Type N, 62 cm (24 in)
Cable, BNC, 23 cm (9 in)
Cable, Type N (m) to BNC (f)

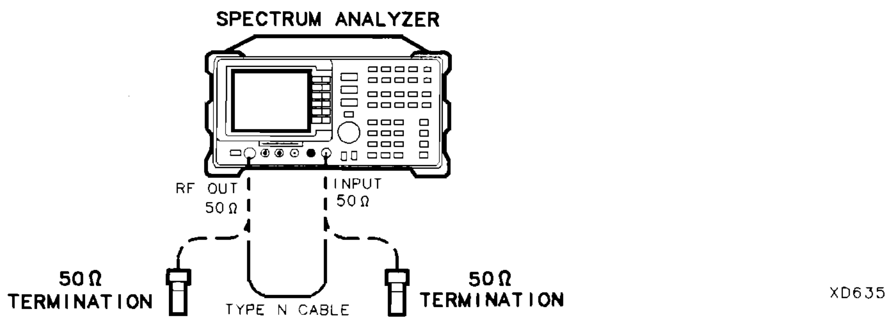


Figure 2-98. Tracking Generator Feedthrough Test Setup

Procedure

1. Connect the Type N cable between the RF OUT 50 Ω and INPUT 50 Ω connectors on the spectrum analyzer. See Figure 2-98.
2. Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish. Set the spectrum analyzer by pressing the following keys:

   (FREQUENCY) 300 (MHz)
   (SPAN) 0 (Hz)
   (BW) RES BW AUTO MAN 30 (kHz)
   (MKR)
   (AUX CTRL) TRACK GEN
   SRC PWR ON OFF (ON) −5 (dBm)

3. On the spectrum analyzer, press TRACKING PEAK. Wait for the PEAKING message to disappear.
4. Connect the CAL OUTPUT to the INPUT 50 Ω.

5. Set the spectrum analyzer by pressing the following keys:

   (SPAN) 10 (MHz)
   (AMPLITUDE) REF LVL −20 (dBm)
   ATTEN AUTO MAN 0 (dB)
   (PEAK SEARCH)
   (MKR FCTN) MK TRACK ON OFF (ON)
   (SPAN) 100 (kHz)

   Wait for the AUTO ZOOM message to disappear, then set the spectrum analyzer as follows:

   (BW) VID BW AUTO MAN 30 (Hz)
   (MKR FCTN) MK TRACK ON OFF (OFF)

6. Press (SGL SWP), wait for the completion of a new sweep, then press (PEAK SEARCH).

   Subtract the MKR amplitude reading from −20 dBm, then enter the result in the spectrum analyzer as the REF LVL OFFSET. For example, if the marker reads −20.21 dBm, enter +0.21 dB.

   −20 dBm − (−20.21 dBm) = +0.21 dB

   Press the following spectrum analyzer keys:

   (AMPLITUDE) More 1 of 3 REF LVL OFFSET (enter calculated value)

7. Connect one 50 Ω termination to the spectrum analyzer INPUT 50 Ω and another to the tracking generator RF OUT 50 Ω.

8. Press (AUX CTRL), Track Gen , then SRC PWR ON OFF (OFF).

9. Set the spectrum analyzer by pressing the following keys:

   (FREQUENCY) 0 (Hz)
   (SPAN) 10 (MHz)
   (AMPLITUDE) REF LVL −10 (dBm)
   (MKR) MARKER 1 ON OFF (OFF)
   (BW) VID BW AUTO MAN (AUTO)
   (TRIG) SWEEP CONT SGL (CONT)

10. Press the following spectrum analyzer keys:

   (PEAK SEARCH)
   (MKR FCTN) MK TRACK ON OFF (ON)
   (MKR →) MARKER →REF LVL
   (SPAN) 800 (kHz)

   Wait for the AUTO ZOOM message to disappear, then press (MKR FCTN) MK TRACK ON OFF (OFF).

11. Press (FREQUENCY) and adjust the center frequency until the LO feedthrough peak is on the left-most graticule line, then set the spectrum analyzer as follows:

    (SPAN) 50 (kHz)
    (AMPLITUDE) REF LVL −50 (dBm)
    (BW) RES BW AUTO MAN 1 (kHz)
    VID BW AUTO MAN 30 (Hz)
    (TRACE) More 1 of 3 DETECTOR SMP PK (SMP)

12. Press (AUX CTRL), TRACK GEN, SRC PWR ON OFF (ON), then enter −1 (dBm).
13. Press (SGL SWP), then wait for completion of a new sweep. Press (DISPLAY), DSP LINE ON OFF (ON).
14. Adjust the display line so that it is centered on the average trace noise, ignoring any residual responses. Record the display line amplitude setting in Table 2-87 as the noise level at 400 kHz.
15. Repeat steps 13 and 14 for the remaining Tracking Generator Output Frequencies (spectrum analyzer center frequency) listed in Table 2-87.
16. In Table 2-87, locate the most positive Noise Level Amplitude from 400 kHz to 5 MHz. Record this amplitude as TR Entry 1 of the performance verification test record.
17. In Table 2-87, locate the most positive Noise Level Amplitude from 5 MHz to 2900 MHz. Record this amplitude as TR Entry 2 of the performance verification test record.

Table 2-87. TG Feedthrough Worksheet

Tracking Generator Output Frequency	Noise Level Amplitude (dB)	Tracking Generator Output Frequency	Noise Level Amplitude (dB)
400 kHz	________	1000 MHz	________
500 kHz	________	1150 MHz	________
1 MHz	________	1300 MHz	________
20 MHz	________	1450 MHz	________
50 MHz	________	1600 MHz	________
100 MHz	________	1750 MHz	________
250 MHz	________	2000 MHz	________
400 MHz	________	2300 MHz	________
550 MHz	________	2600 MHz	________
700 MHz	________	2900 MHz	________
850 MHz	________		

70. Tracking Generator Feedthrough, HP 8593E, HP 8595E, and HP 8596E Option 010

The tracking generator output is connected to the spectrum analyzer input and the tracking is adjusted at 300 MHz for a maximum signal level. The tracking generator output is terminated and set for −1 dBm output power (maximum output power). The spectrum analyzer input is also terminated. The noise level of the spectrum analyzer is then measured at several frequencies.

There are no related adjustments for this performance verification test.

Equipment Required

Termination, 50 Ω *(two required)*
Cable, Type N, 62 cm (24 in)
Cable, BNC, 23 cm (9 in)
Cable, Type N (m) to BNC (f)

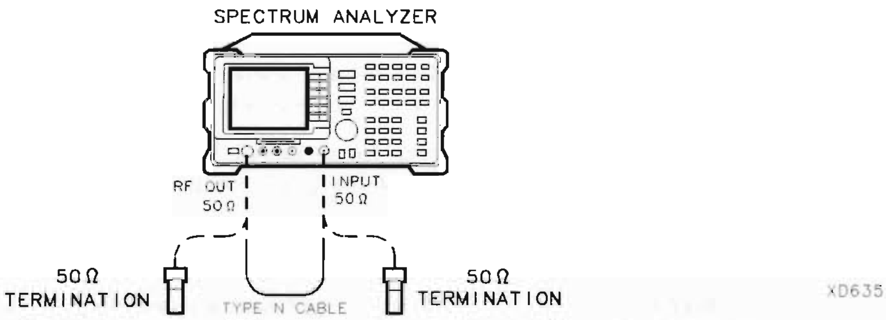


Figure 2-99. Tracking Generator Feedthrough Test Setup

Procedure

1. Connect the Type N cable between the RF OUT 50 Ω and INPUT 50 Ω connectors on the spectrum analyzer. See Figure 2-99.
2. Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish. Set the spectrum analyzer by pressing the following keys:

   (FREQUENCY) Band Lock 0-2.9 Gz BAND 0
   (FREQUENCY) 300 (MHz)
   (SPAN) 0 (Hz)
   (BW) RES BW AUTO MAN 30 (kHz)
   (MKR)
   (AUX CTRL) TRACK GEN
   SRC PWR ON OFF (ON) −5 (dBm)

3. On the spectrum analyzer, press TRACKING PEAK . Wait for the PEAKING message to disappear.
4. Connect the CAL OUTPUT to the INPUT 50 Ω.

5. Set the spectrum analyzer by pressing the following keys:

   (SPAN) 10 (MHz)
   (AMPLITUDE) REF LVL −20 (dBm)
   ATTEN AUTO MAN 0 (dB)
   (PEAK SEARCH)
   (MKR FCTN) MK TRACK ON OFF (ON)
   (SPAN) 100 (kHz)

   Wait for the AUTO ZOOM message to disappear, then set the spectrum analyzer as follows:

   (BW) VID BW AUTO MAN 30 (Hz)
   (MKR FCTN) MK TRACK ON OFF (OFF)

6. Press (SGL SWP), wait for the completion of a new sweep, then press (PEAK SEARCH).

   Subtract the MKR amplitude reading from −20 dBm, then enter the result in the spectrum analyzer as the REF LVL OFFSET. For example, if the marker reads −20.21 dBm, enter +0.21 dB.

   −20 dBm − (−20.21 dBm) = +0.21 dB

   Press the following spectrum analyzer keys:

   (AMPLITUDE) More 1 of 3 REF LVL OFFSET (enter calculated value)

7. Connect one 50 Ω termination to the spectrum analyzer INPUT 50 Ω and another to the tracking generator RF OUT 50 Ω.

8. Press (AUX CTRL), Track Gen, then SRC PWR ON OFF (OFF).

9. Set the spectrum analyzer by pressing the following keys:

   (FREQUENCY) 0 (Hz)
   (SPAN) 10 (MHz)
   (AMPLITUDE) REF LVL −10 (dBm)
   (MKR) MARKER 1 ON OFF (OFF)
   (BW) VID BW AUTO MAN (AUTO)
   (TRIG) SWEEP CONT SGL (CONT)

10. Press the following spectrum analyzer keys:

    (PEAK SEARCH)
    (MKR FCTN) MK TRACK ON OFF (ON)
    (MKR →) MARKER →REF LVL
    (SPAN) 800 (kHz)

    Wait for the AUTO ZOOM message to disappear, then press (MKR FCTN) MK TRACK ON OFF (OFF).

11. Press (FREQUENCY) and adjust the center frequency until the LO feedthrough peak is on the left-most graticule line, then set the spectrum analyzer as follows:

    (SPAN) 50 (kHz)
    (AMPLITUDE) REF LVL −50 (dBm)
    (BW) RES BW AUTO MAN 1 (kHz)
    VID BW AUTO MAN 30 (Hz)
    (TRACE) More 1 of 3 DETECTOR SMPL PK

12. Press (AUX CTRL), TRACK GEN, SRC PWR ON OFF (ON), then enter −1 (dBm).
13. Press (SGL SWP), then wait for completion of a new sweep. Press (DISPLAY), DSP LINE ON OFF (ON).
14. Adjust the display line so that it is centered on the average trace noise, ignoring any residual responses. Record the display line amplitude setting in Table 2-88 as the noise level at 400 kHz.
15. Repeat steps 13 and 14 for the remaining Tracking Generator Output Frequencies (spectrum analyzer center frequency) listed in Table 2-88.
16. In Table 2-88, locate the most positive Noise Level Amplitude. Record this amplitude as TR Entry 1 of the performance verification test record.

Table 2-88. TG Feedthrough Worksheet

Tracking Generator Output Frequency	Noise Level Amplitude (dB)	Tracking Generator Output Frequency	Noise Level Amplitude (dB)
400 kHz	______	1000 MHz	______
500 kHz	______	1150 MHz	______
1 MHz	______	1300 MHz	______
20 MHz	______	1450 MHz	______
50 MHz	______	1600 MHz	______
100 MHz	______	1750 MHz	______
250 MHz	______	2000 MHz	______
400 MHz	______	2300 MHz	______
550 MHz	______	2600 MHz	______
700 MHz	______	2900 MHz	______
850 MHz	______		

71. Tracking Generator LO Feedthrough Amplitude, HP 8593E, 94E, 95E, and 96E Opt. 010

The tracking generator output is connected to the spectrum analyzer INPUT 50 Ω and the tracking is adjusted at 300 MHz for a maximum signal level. The tracking generator output is then connected to the input of a microwave spectrum analyzer. The tracking generator is tuned to several different frequencies and the LO Feedthrough is measured at the frequency extremes of the LO.

There are no related adjustment procedures for this performance verification test.

Equipment Required

Microwave spectrum analyzer
Cable, Type N, 62 cm (24 in)
Cable, BNC, 23 cm (9 in)
Adapter, Type N (m) to BNC (f)

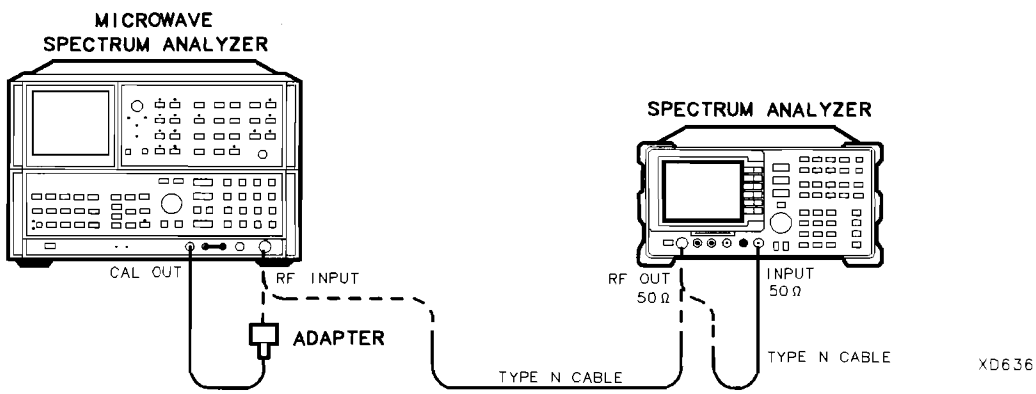


Figure 2-100. LO Feedthrough Amplitude Test Setup

Procedure

It is only necessary to perform step 1 if more than 2 hours have elapsed since a front-panel calibration of the microwave spectrum analyzer has been performed.

The microwave spectrum analyzer should be allowed to warm up for at least 30 minutes before proceeding.

1. Perform a front-panel calibration of the microwave spectrum analyzer by performing the following steps:

   Note that the following steps are for an HP 8566A/B microwave spectrum analyzer, the steps may be different if you are using another microwave spectrum analyzer.

   a. Connect a BNC cable between CAL OUTPUT and RF INPUT.

   b. Press 2 - 22 GHz (INSTR PRESET), (RECALL), 8. Adjust AMPTD CAL for a marker-amplitude reading of −10 dBm.

   c. Press (RECALL), 9. Adjust FREQ ZERO for a maximum amplitude response.

   d. Press SHIFT, FREQUENCY SPAN to start the 30 second internal error correction routine.

   e. After the CALIBRATING! message disappears, press SHIFT, START FREQ to use the error correction factors just calculated.

2. Connect the Type N cable between the RF OUT 50 Ω and INPUT 50 Ω connectors on the spectrum analyzer. See Figure 2-100.

3. Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish. Set the spectrum analyzer by pressing the following keys:

   (FREQUENCY) Band Lock 0-2.9 Gz BAND 0
   The HP 8594E does not need to be band locked.
   (FREQUENCY) 300 (MHz)
   (SPAN) 0 (Hz)
   (BW) RES BW AUTO MAN 30 (kHz)
   (MKR)
   (AUX CTRL) TRACK GEN SRC PWR ON OFF (ON) −5 (dBm)

4. Press TRACKING PEAK , then wait for the PEAKING! message to disappear.

5. Press the following spectrum analyzer keys:

   SRC PWR ON OFF (ON) −1 (dBm)
   (FREQUENCY) 9 (kHz)
   (SGL SWP)

6. Connect the Type N cable from the tracking generator output to the microwave spectrum analyzer RF INPUT. See Figure 2-100.

7. Set the microwave spectrum analyzer controls as follows:

   CENTER FREQUENCY .... 3.9217 GHz
   SPAN .... 100 kHz
   REFERENCE LEVEL .... 0 dBm
   RES BW .... 1 kHz
   LOG dB/DIV .... 10 dB

8. On the microwave spectrum analyzer, press PEAK SEARCH and SIGNAL TRACK (ON), then wait for the signal to be displayed at center screen. Press SIGNAL TRACK (OFF).

9. On the microwave spectrum analyzer, press PEAK SEARCH, PRESEL PEAK, then wait for the PEAKING! message to disappear.

10. Record the microwave spectrum analyzer marker amplitude in Table 2-89 as the LO Feedthrough Amplitude for 3.9217 GHz.
11. Repeat steps 8 through 10 for the remaining Spectrum Analyzer CENTER FREQ and Microwave Spectrum Analyzer CENTER FREQUENCY settings listed in Table 2-89.
12. Locate in Table 2-89 the LO Feedthrough Amplitude with the greatest amplitude 9 kHz to 1.5 GHZ, then record the amplitude as TR Entry 1 of the performance verification test record.
13. Locate in Table 2-89 the LO Feedthrough Amplitude for 2.9 GHz, then record the amplitude as TR Entry 2 of the performance verification test record.

Table 2-89. LO Feedthrough Amplitude

Spectrum Analyzer CENTER FREQUENCY	Microwave Spectrum Analyzer CENTER FREQUENCY	LO Feedthrough Amplitude (dBm)
9 kHz	3.9214 GHz	______
70 MHz	3.9914 GHz	______
150 MHz	4.0714 GHz	______
1.5 GHz	5.4214 GHz	______
2.9 GHz	6.8214 GHz	______

72. CISPR Pulse Response, HP 8590 E-Series Option 103

This CISPR Pulse Response measurement is made using a pulsed RF input signal rather than a pulse signal because the equipment is readily available, easily calibrated, and flexible in use. Pulsed RF setup considerations as well as the relationship between the two techniques are explained in Application Note 150-2.

The CISPR Pulse Response test measures the spectrum analyzer quasi-peak detector receiver system's response to a pulsed RF input signal relative to that of a CW input signal and as a function of pulse repetition frequency. The output of the synthesizer/level generator is modulated by the pulse generator using the pulse modulator to yield the pulsed RF signal. The output of the pulse modulator is connected to the input of the device under test (DUT) with a BNC cable through a 3 dB attenuator. The 3 dB attenuator provides a controlled source match. Amplitude accuracy is ensured by measuring the output signal of the 3 dB attenuator using the power meter with the pulse modulator dc biased to provide a CW signal. This measured CW amplitude also corresponds to the burst amplitude of the pulsed RF input signal when the pulse modulator is appropriately driven.

The system is tested, through the 9 kHz and 120 kHz EMI bandwidth filters with a pulse repetition frequency (PRF) corresponding to CISPR specifications. (Additional steps are included to test the 200 Hz EMI bandwidth filter for spectrum analyzers equipped with Option 130.) The required CW amplitude for the tests are calculated based on the device under test's impulse bandwidth, the pulse width of the pulsed RF, and the CISPR specified spectral intensity.

There are no related adjustment procedures for this performance test.

Equipment

Pulse generator
Synthesizer/level generator
Power meter
Power sensor, 100 kHz to 1800 MHz
Attenuator, 3 dB
Modulator, TeleTech
Quasi-peak detector driver
Cable, BNC, 122 cm (48 in) *(three required)*
Adapter, Type N (m) to BNC (f)
Adapter, Type N (f) to Type N (f)

Procedure

Be sure the quasi-peak detector driver (DLP) is installed before performing this procedure.

Input Amplitude Calibration

1. Zero and Calibrate the power meter and 100 kHz to 1800 MHz power sensor, as described in the power meter operation manual.

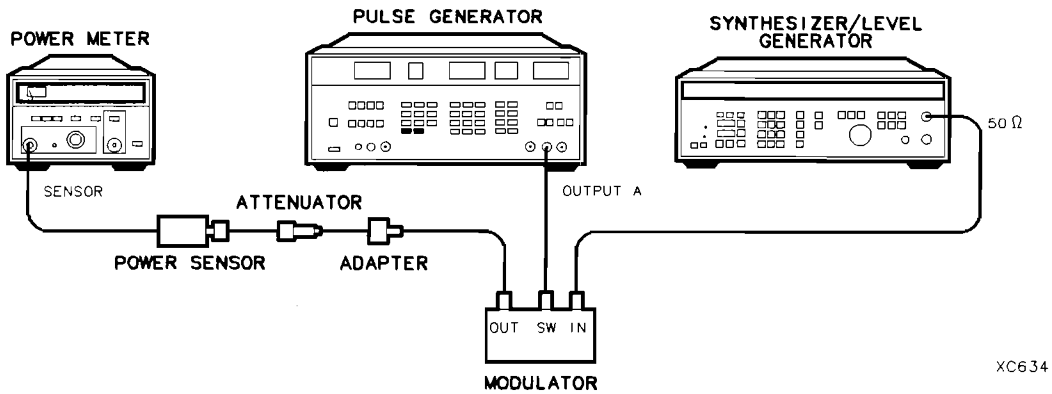


Figure 2-101. Input Amplitude Calibration Test Setup

2. Connect the equipment as shown in Figure 2-101.
3. Press (RECALL) 0 on the pulse generator to preset the pulse generator. To bias the modulator on, set the pulse generator to the following settings:

   Parameters:

   LEE .... 3 ns
   TRE .... 3 ns
   HIL .... +2 V
   LOL .... +1.8 V
   DEL .... 0 ns

   Output Mode: Enabled

   Channel A .... 50 Ω
   Channel A .... NORM

4. Press (STORE) 1 on the pulse generator to store the settings in storage register 1.
5. Set the synthesizer/level generator to the following settings:

   FREQUENCY .... 50 MHz
   AMPLITUDE .... −3 dBm

6. Set the power meter to the following settings:

   MODE .... dBm
   CAL FACTOR .... power sensor Ref Cal Factor for 50 MHz

7. Adjust synthesizer/level generator power level for a −6.99 dBm (±0.03) reading on the power meter.

8. Record the synthesizer/level generator amplitude setting in Table 2-90 under Reference Amplitude at 50 MHz for the 200 Hz, 9 kHz and 120 kHz EMI bandwidths. Calculate the Required Amplitude for the 200 Hz, 9 kHz and 120 kHz resolution bandwidths using the following formula:

Reference Amplitude at 50 MHz + Amplitude Offset = Required Amplitude

Note that the reference amplitude is the same for the 9 kHz, 120 kHz, and 200 Hz filters.

9. Enter the calculated 200 Hz, 9 kHz and 120 kHz Required Amplitude values in Table 2-90.

10. On the synthesizer/level generator, press (STORE) 1 to store the previous setting of the synthesizer/level generator in storage register 1.

Isolation Check

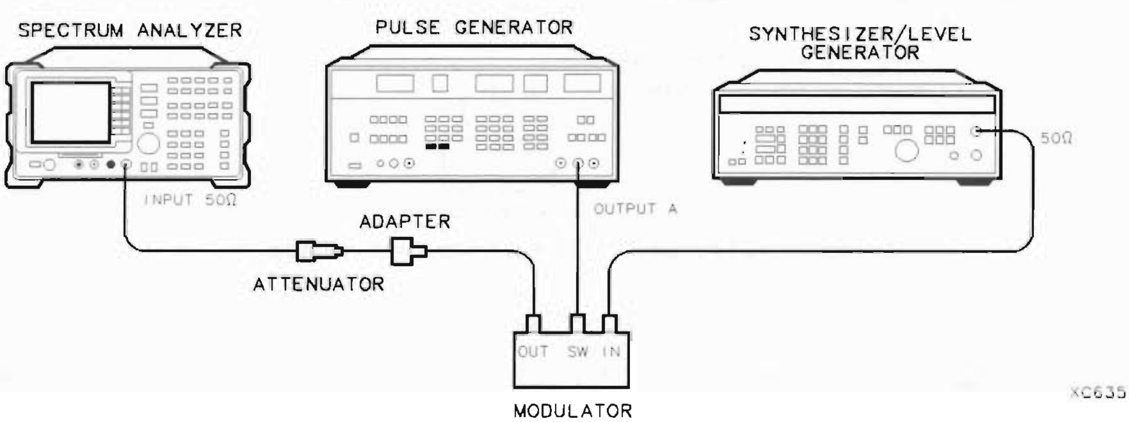


Figure 2-102. Isolation Check Test Setup

11. Connect the equipment as shown in Figure 2-102.

12. Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish. Set the spectrum analyzer by pressing the following keys:

(FREQUENCY) 50 (MHz)
(SPAN) 1 (MHz)
(PEAK SEARCH)
(SAVE) STATE → INTRNL 1
(MKR →) MARKER →REF LVL
(MKR) MARKER Δ

13. Press (RECALL) 1 on the pulse generator. Set the pulse generator to the following settings to bias the modulator off:

HIL .... −1.5 V
LOL .... −1.7 V

Use the (CHS) key to change signs of the entered value on the pulse generator.

14. Verify that the isolation of the modulator (the marker-delta reading) exceeds 70 dBc.

CW Measurement for 9 kHz EMI Bandwidth

15. Press (RECALL) 1 on the pulse generator.
16. Subtract 40 dB from the Reference Amplitude at 50 MHz in Table 2-90. Set the synthesizer/level generator amplitude to the calculated value by pressing (AMPLITUDE), (enter the calculated value), (−dBm).
17. Press (STORE) 2 on the synthesizer/level generator.
18. Press the following keys on the spectrum analyzer:

    (MKR) `MARKER NORMAL`

    (BW) `EMI BW Menu 9 kHz EMI BW`

    (AUX CTRL) `Quasi Peak AUTO QP AT MKR`

    A message will be displayed warning that an improper bandwidth is selected. Disregard the message and press `CONTINUE`.
19. Record the quasi-peak reading displayed below the signal on the spectrum analyzer screen in Table 2-91, under the Measured CW Amplitude for 9 kHz.

9 kHz Pulse RF Signal Setup

20. Press (RECALL) 1 on the pulse generator. Set the pulse generator to the following conditions:

    PER .... 10 ms
    WID .... 2.2 μs
    LOL .... −1.7 V

    Use the (CHS) key to change the sign of the value entered on the pulse generator.
21. Press (RECALL) 1 on the synthesizer/level generator. Set the synthesizer/level generator amplitude to the required amplitude value for the 9 kHz filter recorded in Table 2-90 by pressing (AMPLITUDE), (enter the Required Amplitude for 9 kHz), (−dBm).
22. Press `MAN QP AT MKR` on the spectrum analyzer.

    A message will be displayed warning that an improper bandwidth is selected. Disregard the message and press `CONTINUE`.
23. Record the marker amplitude reading in Table 2-91 and the performance verification record as the Measured 100 Hz Amplitude for 9 kHz. Record the marker amplitude reading in Table 2-92 as the Measured Relative Equivalent Level of Pulse for Band B, 100 Hz Repetition Frequency.
24. Set the PERIOD to 1 ms on the pulse generator. On the spectrum analyzer, press `MARKER NORM PK` (so that PK is underlined), then press (SGL SWP).

    Record the marker amplitude reading in Table 2-92 as the Measured Relative Equivalent Level of Pulse for Band B, 1000 Hz Repetition Frequency.
25. Set the PERIOD to 50 ms on the pulse generator. Press (SGL SWP) on the spectrum analyzer.

    Record the marker amplitude reading in Table 2-92 as the Measured Relative Equivalent Level of Pulse for Band B, 20 Hz Repetition Frequency.

26. Set the PERIOD to 100 ms on the pulse generator. Press (SGL SWP) on the spectrum analyzer.

    Record the marker amplitude reading in Table 2-92 as the Measured Relative Equivalent Level of Pulse for Band B, 10 Hz Repetition Frequency.

27. Set the PERIOD to 500 ms on the pulse generator. On the spectrum analyzer, press QP X10 ON OFF so that ON is underlined, then press (SGL SWP).

    Record the marker amplitude reading in Table 2-92 as the Measured Relative Equivalent Level of Pulse for Band B, 2 Hz Repetition Frequency.

28. Set the PERIOD to 980 ms on the pulse generator. Press (SGL SWP) on the spectrum analyzer.

    Record the marker amplitude reading in Table 2-92 as the Measured Relative Equivalent Level of Pulse for Band B, 1 Hz Repetition Frequency.

29. Press TRIG on the pulse generator. Press (SGL SWP) on the spectrum analyzer. Let the spectrum analyzer sweep 3 divisions then press MAN on the pulse generator. Record the Marker reading for Isolated Pulse Measurement for Band B in Table 2-92.

Continue with "CW Measurement for 120 kHz EMI Bandwidth."

CW Measurement for 120 kHz EMI Bandwidth

30. Press (RECALL) 1 on the pulse generator.
31. Press (RECALL) 2 on the synthesizer/level generator.
32. Press (RECALL), INTRNL → STATE 1 on the spectrum analyzer.
33. On the spectrum analyzer, press the following keys:

    (MKR) MARKER NORMAL

    (AUX CTRL) Quasi Peak RETURN AUTO QP AT MKR 120 kHz EMI BW CONTINUE

34. Record the reading displayed below signal on the spectrum analyzer screen in Table 2-91 under the Measured CW Amplitude for 120 kHz.

120 kHz Pulse RF Signal Setup

35. Set the pulse generator to the following conditions:

    PER .... 10 ms
    WID .... 167 ns
    LOL .... −1.7 V

36. Press (RECALL) 1 on the synthesizer/level generator. Set the synthesizer/level generator amplitude to the required amplitude value for the 120 kHz filter recorded in Table 2-90 by pressing (AMPLITUDE), (enter the Required Amplitude value for the 120 kHz EMI bandwidth), (dBm).

37. Press Quasi Peak, MAN QP AT MKR on the spectrum analyzer.

38. Record the marker reading in Table 2-91 and in the performance verification test record as the Measured 100 Hz Amplitude for the 120 kHz EMI bandwidth. Record the marker amplitude reading in Table 2-92 as the Measured Relative Equivalent Level of Pulse for Bands C and D, 100 Hz Repetition Frequency.

39. Set PERIOD to 1 ms on the pulse generator. Press **MARKER NORM PK** (so that PK is underlined), (SGL SWP) on the spectrum analyzer.

    Record the marker amplitude reading in Table 2-92 as the Measured Relative Equivalent Level of Pulse for Bands C and D, 1000 Hz Repetition Frequency.

    Set the PERIOD to 50 ms on the pulse generator. Press **QP X10 ON OFF** so that ON is underlined on the spectrum analyzer. Press (SGL SWP) on the spectrum analyzer.

    Record the marker amplitude reading in Table 2-92 as the Measured Relative Equivalent Level of Pulse for Bands C and D, 20 Hz Repetition Frequency.

40. Set PERIOD to 100 ms on the pulse generator. Press (SGL SWP) on the spectrum analyzer.

    Record the marker amplitude reading in Table 2-92 as the Measured Relative Equivalent Level of Pulse for Bands C and D, 10 Hz Repetition Frequency.

41. Set the PERIOD to 500 ms on the pulse generator. Press (SGL SWP) on the spectrum analyzer.

    Record the marker amplitude reading in Table 2-92 as the Measured Relative Equivalent Level of Pulse for Bands C and D, 2 Hz Repetition Frequency.

42. Set PERIOD to 980 ms on the pulse generator. Press (SGL SWP) on the spectrum analyzer.

    Record the marker amplitude reading in Table 2-92 as the Measured Relative Equivalent Level of Pulse for Bands C and D, 1 Hz Repetition Frequency.

43. Press (TRIG) on the pulse generator. Press (SGL SWP) on the spectrum analyzer. Let the spectrum analyzer sweep three divisions then press (MAN) on the pulse generator. Record the marker reading as the Isolated Pulse for Bands C and D in Table 2-92.

Table 2-90. Input Amplitude Calibration Worksheet

EMI Bandwidth	Reference Amplitude at 50 MHz	Amplitude Offset	Required Amplitude
9 kHz	________	0.05	____________
120 kHz	________	5.42	____________
200 Hz	________	−0.40	____________

44. Enter the Measured value for the Band B 100 Hz Repetition Frequency as the Reference value for all the Repetition Frequencies listed for Band B.

45. Enter the Measured value for the Bands C and D 100 Hz Repetition Frequency as the Reference value for all the Repetition Frequencies listed for Bands C and D.

46. Calculate the Amplitude Error for each of the frequencies listed in Table 2-92 using the following formula: Measured − Reference = Error

Table 2-91. Quasi-Peak Detector Reference Accuracy Worksheet

EMI Bandwidth	Measured CW Amplitude	Measured Amplitude for 25 Hz or 100 Hz	Error (TR Entry)
9 kHz	________	________	(1) ________
120 kHz	________	________	(2) ________
200 Hz	________	________	(3) ________

47. Record these calculated values in the performance verification test record as indicated in Table 2-92.

If you are testing a spectrum analyzer equipped with Option 130 continue with "Additional Steps for Option 130."

Performance verification test "CISPR Pulse Response" is now complete for all other spectrum analyzers.

Additional Steps for Option 130

CW Measurement for 200 Hz EMI Bandwidth

48. Press (RECALL) 1 on the pulse generator.
49. Press (RECALL) 2 on the synthesizer/level generator.
50. Press (PRESET) on the spectrum, then wait for the preset routine to finish. Press the following spectrum analyzer keys:

    (RECALL) `INTRNL — STATE 1`

    (MKR) `MARKER NORMAL`

    (BW) `EMI BW Menu` `200 Hz EMI BW`

    (AUX CTRL) `Quasi Peak` `AUTO QP AT MKR`

    A message will be displayed warning that an improper bandwidth is selected. Disregard the message and press `CONTINUE`.

    Note that this routine will take 1 to 2 minutes to execute.

51. Record the quasi-peak reading displayed below the signal on the spectrum analyzer screen in Table 2-91, under the Measured CW Amplitude for 200 Hz.

200 Hz Pulse RF Signal Setup

52. Press (RECALL) 1 on the pulse generator. Set the pulse generator to the following conditions:

    PER .... 40 ms
    WID .... 0.1 ms
    LOL .... −1.7 V

    Use the (CHS) key to change the sign of the value entered on the pulse generator.

53. Press (RECALL) 1 on the synthesizer/level generator. Set the synthesizer/level generator amplitude to the required amplitude value for the 200 Hz filter recorded in Table 2-90 by pressing (AMPLITUDE), (enter the Required Amplitude for 200 Hz), (−dBm).

54. Press MAN QP AT MKR on the spectrum analyzer.

    A message will be displayed warning that an improper bandwidth is selected. Disregard the message and press CONTINUE.

    Note that this routine will take 1 to 2 minutes to execute.

55. Record the marker amplitude reading in Table 2-91 and the performance verification test record as the Measured 25 Hz Amplitude for 200 Hz. Record the marker amplitude reading in Table 2-92 as the Measured Relative Equivalent Level of Pulse for Band A, 25 Hz Repetition Frequency.

56. Set the PERIOD to 10 ms on the pulse generator. On the spectrum analyzer, press MARKER NORM PK (so that PK is underlined), then (SGL SWP).

    Record the marker amplitude reading in Table 2-92 as the Measured Relative Equivalent Level of Pulse for Band A, 100 Hz Repetition Frequency.

57. Set the PERIOD to 16.7 ms on the pulse generator. Press (SGL SWP) on the spectrum analyzer.

    Record the marker amplitude reading in Table 2-92 as the Measured Relative Equivalent Level of Pulse for Band A, 60 Hz Repetition Frequency.

58. Set the PERIOD to 100 ms on the pulse generator. Press (SGL SWP) on the spectrum analyzer.

    Record the marker amplitude reading in Table 2-92 as the Measured Relative Equivalent Level of Pulse for Band A, 10 Hz Repetition Frequency.

59. Set the PERIOD to 200 ms on the pulse generator. Press (SGL SWP) on the spectrum analyzer.

    Record the marker amplitude reading in Table 2-92 as the Measured Relative Equivalent Level of Pulse for Band A, 5 Hz Repetition Frequency.

60. Set the PERIOD to 500 ms on the pulse generator. On the spectrum analyzer, press QP X10 ON OFF so that ON is underlined, then press (SGL SWP).

    Record the marker amplitude reading in Table 2-92 as the Measured Relative Equivalent Level of Pulse for Band A, 2 Hz Repetition Frequency.

61. Set the PERIOD to 980 ms on the pulse generator. Press (SGL SWP) on the spectrum analyzer.

    Record the marker amplitude reading in Table 2-92 as the Measured Relative Equivalent Level of Pulse for Band A, 1 Hz Repetition Frequency.

62. Press (TRIG) on the pulse generator. Press (SGL SWP) on the spectrum analyzer. Let the spectrum analyzer sweep 3 divisions then press (MAN) on the pulse generator. Record the Marker reading for Isolated Pulse Measurement for Band A in Table 2-92.

Table 2-92. Quasi-Peak Detector Accuracy

Repetition Frequency	Relative Equivalent Level of Pulse Band B (9 kHz EMI BW)		
(Hz)	Measured (dBμV)	Reference (dBμV)	TR Entry (Error)
1000	_______	_______	4
100	_______	_______	5
20	_______	_______	6
10	_______	_______	7
2	_______	_______	8
1	_______	_______	9
Isolated pulse	_______	_______	10
Repetition Frequency	**Relative Equivalent Level of Pulse Bands C and D (120 kHz EMI BW)**		
(Hz)	**Measured (dBμV)**	**Reference (dBμV)**	**TR Entry (Error)**
1000	_______	_______	11
100	_______	_______	12
20	_______	_______	13
10	_______	_______	14
2	_______	_______	15
1	_______	_______	16
Isolated pulse	_______	_______	17
Repetition Frequency	**Relative Equivalent Level of Pulse Band A (200 Hz EMI BW)**		
(Hz)	**Measured (dBμV)**	**Reference (dBμV)**	**TR Entry (Error)**
100	_______	_______	18
60	_______	_______	19
25	_______	_______	20
10	_______	_______	21
5	_______	_______	22
2	_______	_______	23
1	_______	_______	24
Isolated pulse	_______	_______	25

73. Gate Delay Accy./Gate Length Accy., HP 8590 E-Series Opt. 105 and HP 8591C Opt. 107

The method used for measuring the gate length times is determined by the length of the gate. Shorter gate-length times are measured with an oscilloscope, and longer gate-length times are measured with a counter.

For shorter gate-length times, the output signal of a pulse generator is used to trigger the gate circuitry. To measure the gate delay, Δt markers are used. There is often up to 1 μs of jitter due to the 1 μs resolution of the gate delay clock. The "define measure" feature of the oscilloscope is used to measure and calculate the average length of the gate output automatically.

For longer gate-length times, a counter is used to measure the time period from the rising edge of the gate output to its falling edge. Because the gate-length time is equivalent to the clock accuracy of the spectrum analyzer, the gate-length time is compared to the specification for clock accuracy.

There are no related adjustments for this procedure.

Equipment Required

Universal counter
Pulse/function generator
Digitizing oscilloscope
Cable, BNC, 120 cm (48 in) *(four required)*
Adapter, BNC tee (m) (f) (f) *(two required)*

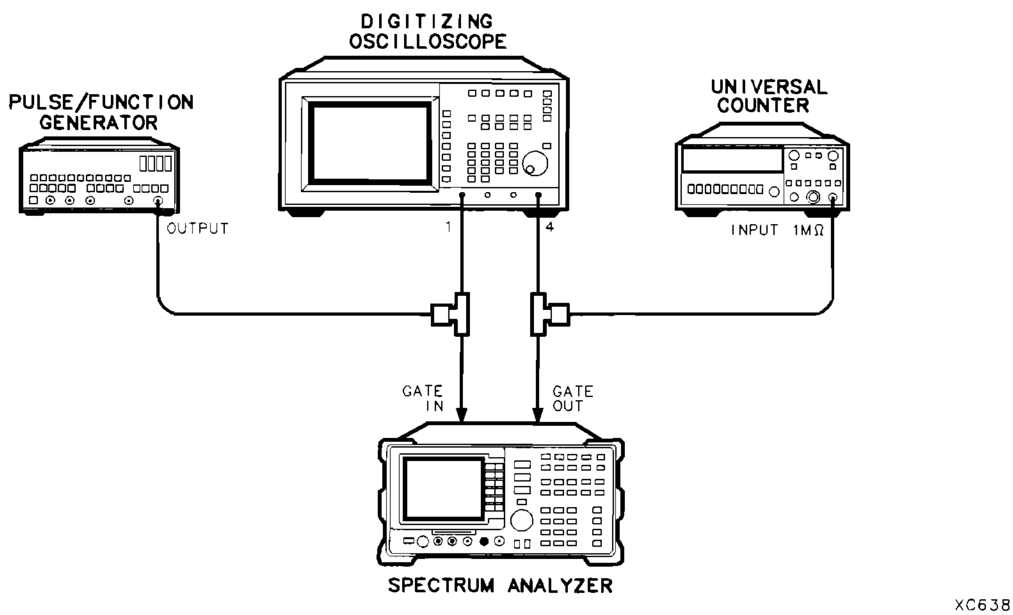


Figure 2-103. Gate Delay and Gate Length Test Setup

Procedure

To determine small gate delay and gate length (jitter-term)

1. Connect the equipment as shown in Figure 2-103.
2. Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish. Set the spectrum analyzer by pressing the following keys:

   (SPAN) ZERO SPAN

   (SWEEP) 20 (ms) GATE ON OFF (underline ON) GATE MENU GATE DELAY 1 (μs)

   GATE LENGTH 1 (μs)

3. Activate the square wave output on the function generator.
4. Set the pulse/function generator controls as follows:

   MODE .... NORM
   FRQ .... 100 Hz
   DTY 50%
   HIL .... 2.5 V
   LOL .... 0.0 V

5. Press the following keys on the oscilloscope:

   (RECALL)
   (CLEAR)
   (DISPLAY)
   off frame axes grid .... highlight grid
   connect dots off on .... highlight on
   (TRIG)
   source 1 2 3 4 .... highlight 4
   level .... 2 V
   (TIMEBASE) .... 500 ηs/div
   (CHAN)
   CHANNEL 1 2 3 4 off on
   highlight CHANNEL 1 on
   set V/div to 1 V and offset to 2 V
   highlight CHANNEL 4 on
   set V/div to 1 V and offset to 3 V
   (DISPLAY)
   DISPLAY norm avg env .... highlight env

6. Press (CLEAR DISPLAY) on the oscilloscope. Wait for the trace to fill in, then press the following keys:

   (Δt ΔV)
   Δt markers off on .... highlight on
   stop marker .... 0 μs

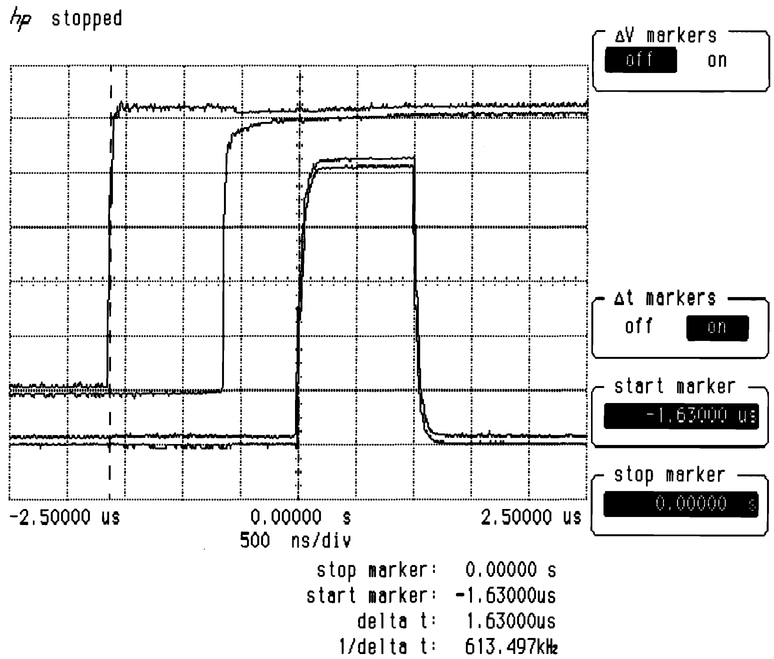


Figure 2-104. Oscilloscope Display of Minimum and Maximum Gate Delay Values

To record the minimum and maximum gate delay values

7. On the oscilloscope, press `start marker`. Use the knob to position the start marker on the right edge of the upper trace on the oscilloscope display. Figure 2-104 shows position for maximum gate delay.
8. Record the Δt value of the start marker reading as the MIN Gate Delay in TR Entry 1 of the performance verification test record. The expected value is greater than 0.0 μs, but less than 2.0 μs.
9. Use the oscilloscope knob to position the start marker on the left edge of the upper trace.
10. Record the Δt value of the start marker reading as the MAX Gate Delay in TR Entry 2 of the performance verification test record. The expected value is greater than 0.0 μs, but less than 2.0 μs.

To determine small gate length

11. Press the following keys on the oscilloscope:

    (BLUE) (+WIDTH) 4

    (DEFINE MEAS)

    statistics off on .... highlight ON

12. Read the average + width (4) displayed on the oscilloscope in the bottom right-hand annotation area.

13. Record this value as the 1 μs Gate Length value in TR Entry 3 of the performance verification test record. The 1μs gate length minimum width should be greater than 800 ηs and maximum width should be less than 1200 ηs.

To determine large gate length (clock accuracy term)

14. Press the following spectrum analyzer keys:

    (SWEEP) 150 (ms) GATE MENU GATE DELAY 10 (ms) GATE LENGTH 65 (ms)

15. Set the universal counter controls as follows:

    TI .... A → B
    GATE TIME delay .... mid-range
    CHANNEL A .... rising edge, dc couple, SENSITIVITY mode
    CHANNEL B .... falling edge, dc couple, SENSITIVITY mode
    COM A

16. Adjust LEVEL/SENS on the universal counter for best triggering.

17. Record the universal counter readout value as the 65 ms Gate Length in TR Entry 4 of the performance verification test record. The minimum gate length width should be greater than 64.99 ms and maximum width should be less than 65.01 ms.

74. Gate Card Insertion Loss, HP 8590 E-Series Option 105 and HP 8591C Option 107

Use this procedure to verify that the insertion loss for the Option 105 card is within the specifications. See the specifications for the log and linear scale additional amplitude error due to Gate-On enabled. The insertion loss is measured as follows:

1. HIGH SWEEP output on the spectrum analyzer is connected to GATE INPUT to provide a trigger signal for the gate circuitry.
2. The gate is turned off and a marker reading is taken.
3. The gate is then turned on and the synthesizer/level generator amplitude is adjusted to match the marker reading taken while the gate was off.

The difference between the two synthesizer/level generator readings is the measured insertion loss of the gate card.

Equipment Required

Synthesizer/level generator
Cable, BNC, 122 cm (48 in) *(two required)*

Additional Equipment for 75 Ω input

Cable, BNC, 75 Ω, 120 cm (48 in)

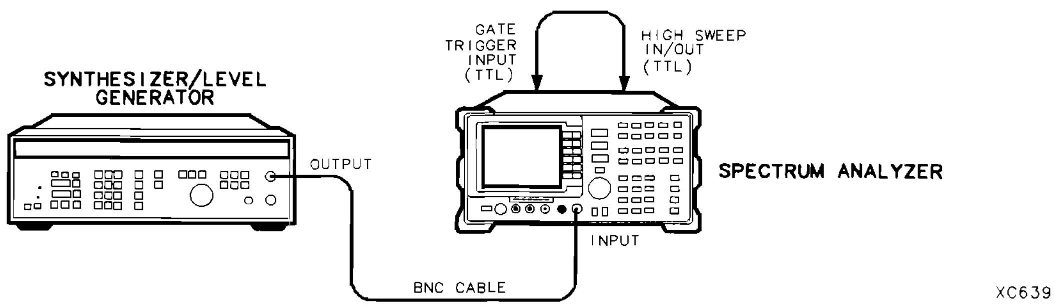


Figure 2-105. Gate Delay and Gate Length Test Setup

Procedure

To determine the card insertion loss

1. Connect the equipment as shown in Figure 2-105.

   75 Ω input only: Attach the 75 Ω cable to the spectrum analyzer RF input connector rather than the 50 Ω cable.)

2. Set the synthesizer/level generator controls as follows:

   FREQUENCY .... 50 MHz
   AMPTD INCR .... 0.01 dB
   AMPLITUDE .... −5 dBm

3. On the spectrum analyzer, press (PRESET). Wait for preset to complete.

4. Press the following spectrum analyzer keys:

   (FREQUENCY) 50 (MHz)
   (SPAN) 1 (MHz)
   (BW) 100 (kHz)
   (SWEEP) 100 (ms) GATE ON OFF (underline OFF) GATE MENU GATE DELAY 20 (ms)
   GATE LENGTH 65 (ms)
   (PEAK SEARCH) MARKER Δ
   (SWEEP) GATE ON OFF (underline ON)
   (PEAK SEARCH)

5. Use the step INCR (⇧) or (⇩) key on the synthesizer/level generator to adjust the output amplitude for a spectrum analyzer MKR Δ reading of 0.0 ±0.05 dB.

6. Record the amplitude displayed on the synthesizer/level generator as the Synthesizer/Level Generator Reading.

   Synthesizer/Level Generator Reading ______________

7. Subtract the synthesizer/level generator from the previous step from −5.0 dBm. Record the result as the Gate Card Insertion loss in TR Entry 1 of the performance verification test record. The insertion loss should be between −0.3 dB and +0.3 dB.

   For example, if the synthesizer/level generator reading is −4.96 dBm, then the result is −0.04 dBm as shown below:

   −5.0 dB minus the synthesizer reading is equal to the Gate Card Insertion Loss

   (−5.0) − (−4.96) = −0.04 dBm

75. TV Receiver, Video Tester, HP 8590 E-Series and HP 8591C

Equipment Required

Base Band Signal Source
Video Modulator
Cable, 75 Ω BNC, *(four required)*
10 dB coupler
HP 85721A Cable TV Measurements Personality

Differential Gain and Differential Phase Procedure

If the analyzer has not been self calibrated today, perform the self calibration procedure in chapter 1 of this manual.

1. Load the HP 85721A Cable TV Measurements Personality (if necessary).
   a. Insert the card with the card's arrow matching the raised arrow on the bezel around the card-insertion slot.
   b. Press (CONFIG), MORE 1 of 3, Dispose User Mem, Erase DLP MEM, Erase DLP MEM. Press (PRESET).
   c. Press (RECALL). Press the INTERNAL CARD softkey so that CARD is underlined.
   d. Press the following keys to load the HP 85721A: Catalog Card, CATALOG ALL, then LOAD FILE.
2. Connect equipment as shown in Figure 2-106

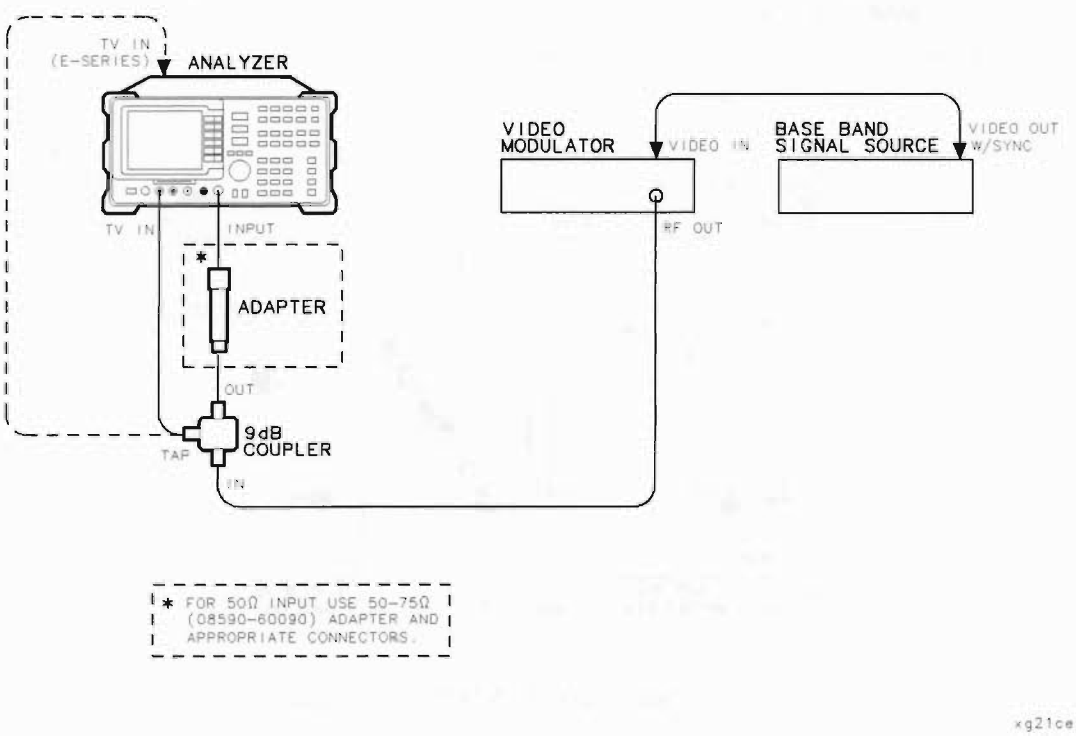


Figure 2-106. Differential Gain/Phase Setup

3. Set up the cable TV analyzer by pressing:

   (MODE)
   CABLE TV ANALYZER
   CHANNEL MEAS

4. Perform steps 4 through 6 for channels 2, 7, 14, 23, 38, and 77.
5. Select the channel on the video modulator: 2, 7, 14, 23, 38, or 77.
6. Select the same channel on the cable TV analyzer by pressing:

   CHANNEL SELECT
   2, 7, 14, 23, 38, or 77 (ENTER)
   Main 1 of 3
   Main 2 of 3
   DIF GAIN DIF PHAZ
   28
   (ENTER) This selects the first vertical line.

7. Press Select Test Sig , then select the appropriate test signal, by pressing one of the following softkeys:

   NTC 7 COMPOSIT to select the NTC 7 composite test signal
   FCC COMPOSIT to select the FCC composite test signal
   CCIR 17 to select the PAL test signal

   See Figure 2-107 and Figure 2-108.

Note The ability to select from these three test signals will depend on the revision of your software.

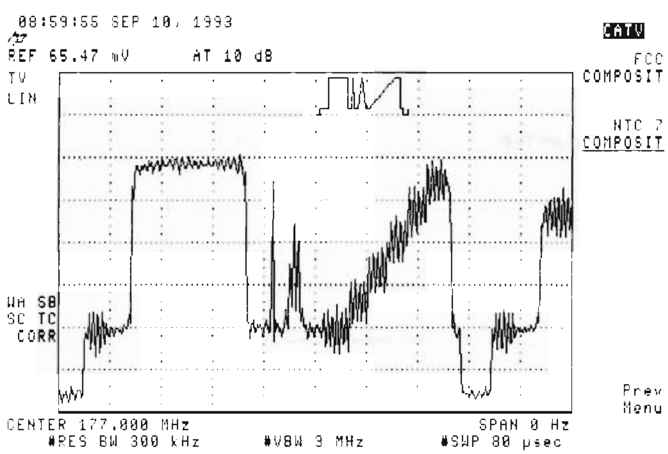


Figure 2-107. NTC7 Composite

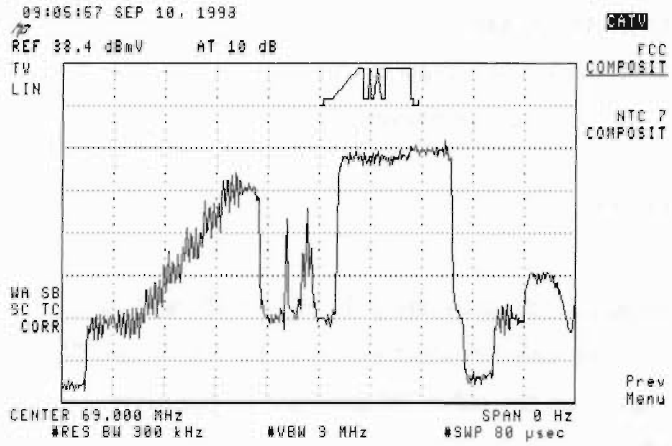


Figure 2-108. FCC Composite

8. Press `Prev Menu`, then `CONTINUE`
9. Record the DIFFERENTIAL GAIN value as TR Entry 1 through 6 of the performance test record.
10. Record the DIFFERENTIAL PHASE value as TR Entry 7 through 12 of the performance test record. See Figure 2-109.

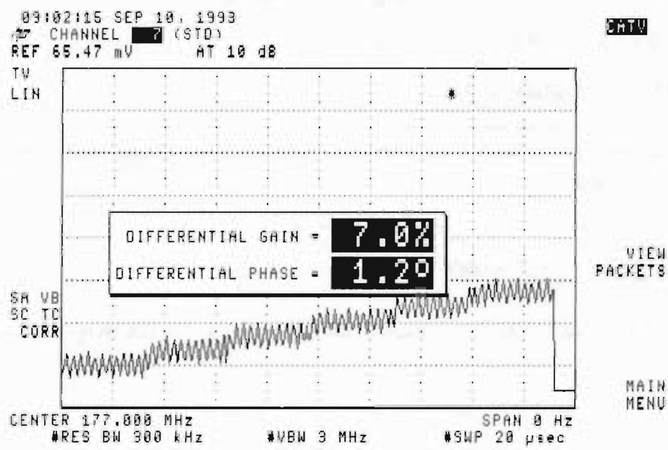


Figure 2-109. Differential Gain/Phase

11. Press: `MAIN MENU` then `Main 3 of 3` to select another channel.

Chroma-Luminance Delay Procedure

If the cable TV analyzer has not been self calibrated today, perform the self calibration procedure in chapter 1 of this manual.

1. Connect equipment as shown in Figure 2-106
2. Set up the cable TV analyzer by pressing:

   (MODE)
   CABLE TV ANALYZER
   CHANNEL MEAS

3. Perform steps 4 through 6 for channels 2, 7, 14, 23, 38, and 77.
4. Select the channel on the video modulator: 2, 7, 14, 23, 38, or 77.
5. Select the same channel on the cable TV analyzer by pressing:

   CHANNEL SELECT
   2, 7, 14, 23, 38, or 77 (ENTER)
   Main 1 of 3
   Main 2 of 3
   C/L DELAY
   28
   (ENTER) This selects the first vertical line.

6. Press Select Test Sig , then select the appropriate test signal, by pressing one of the following softkeys:

   NTC 7 COMPOSIT to select the NTC 7 composite test signal
   FCC COMPOSIT to select the FCC composite test signal
   CCIR 330 to select the PAL test signal

   See Figure 2-107 and Figure 2-108.

Note The ability to select from these three test signals will depend on the revision of your software.

7. Press Prev Menu , then CONTINUE
8. Record the CHROMA-LUMA DELAY value as TR Entry 13 through 18 of the performance test record.

   See Figure 2-110.

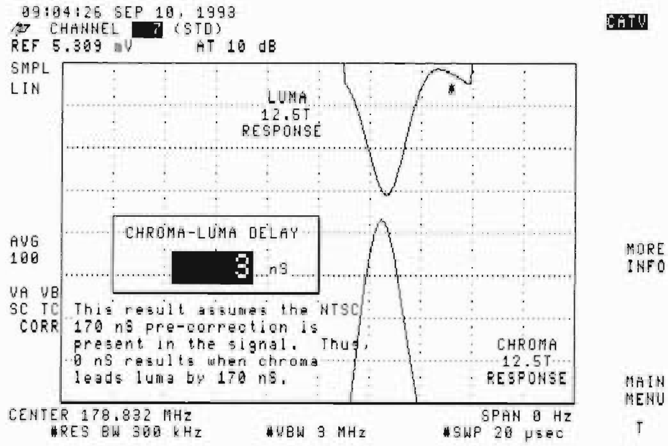


Figure 2-110. Chroma-Luminance Delay

9. Press: `MAIN MENU` then `Main 3 of 3` to select another channel.

3

Performance Test Records

HP 8591C Performance Test Record

Only the tests for HP 8591C are included in this test record, therefore not all test numbers are included.

Table 3-41. HP 8591C Performance Verification Test Record

Hewlett-Packard Company

Address: ______________________ Report No. ______________________

____

______________________ Date ______________________

______________________ (e.g. 10 SEP 1989)

Model HP 8591C

Serial No. ______________________

Options ______________________

Firmware Revision ______________

Customer ______________________ Tested by ______________________

Ambient temperature ______________ °C Relative humidity ______________ %

Power mains line frequency ______________ Hz (nominal)

Test Equipment Used:

Description	**Model No.**	**Trace No.**	**Cal Due Date**
Synthesized Sweeper			
Synthesizer/Function Generator			
Synthesizer/Level Generator			
AM/FM Signal Generator			
Measuring Receiver			
Power Meter			
RF Power Sensor			
High-Sensitivity Power Sensor			
Pulse Generator			
Microwave Frequency Counter			
Universal Frequency Counter			
Frequency Standard			
Power Splitter			
Minimum Loss Adapter			
50 MHz Low Pass Filter			
75Ω Termination			
Base Band Signal Source			
Video Modulator			
Microwave Spectrum Analyzer (Option 011 only)			

Notes/Comments: ______________________

HP 8591C Performance Verification Test Record (page 2 of 11)

Hewlett-Packard Company **Model HP 8591C** **Serial No.** ______________	**Report No.** ______________ **Date** ______________

Test Description	Results Measured Min.	(TR Entry)	Max.	Measurement Uncertainty
1. 10 MHz Frequency Reference Accuracy	Frequency Error			
Option 704 only:				
Settability	−150 Hz	(1)______	+150 Hz	$\pm 4.2 \times 10^{-9}$
2. 10 MHz Precision Frequency Reference Accuracy	Frequency Error			
5 Minute Warmup Error	-1×10^{-7}	(1)______	$+1 \times 10^{-7}$	$\pm 2.004 \times 10^{-9}$
30 Minute Warmup Error	-1×10^{-8}	(2)______	$+1 \times 10^{-8}$	$\pm 2.002 \times 10^{-9}$
4. Frequency Readout Accuracy and Marker Count Accuracy				
Frequency Readout Accuracy	Frequency (MHz)			
SPAN				
20 MHz	1.49918	(1)______	1.50082	±1 Hz
10 MHz	1.49958	(2)______	1.50042	±1 Hz
1 MHz	1.4999680	(3)______	1.500032	±1 Hz
Option 130 only: 20 kHz	1.49999924	(4)______	1.50000076	±1 Hz
Marker Count Accuracy				
SPAN				
(CNT RES = 100 Hz) 20 MHz	1.4999989	(5)______	1.5000011	±1.0 Hz
(CNT RES = 10 Hz) 1 MHz	1.49999989	(6)______	1.50000011	±1.0 Hz
Option 130 only:				
(CNT RES = 10 Hz) 20 kHz	1.49999989	(7)______	1.50000011	±1.0 Hz
(CNT RES = 10 Hz) 2 kHz	1.49999989	(8)______	1.50000011	±1.0 Hz
6. Noise Sidebands				
Suppression at 10 kHz		(1)______	−60 dBc	±1.0 dB
Suppression at 20 kHz		(2)______	−70 dBc	±1.0 dB
Suppression at 30 kHz		(3)______	−75 dBc	±1.0 dB
7. System Related Sidebands				
Sideband Below Signal		(1)______	−65 dBc	±1.0 dB
Sideband Above Signal		(2)______	−65 dBc	±1.0 dB
8. Frequency Span Readout Accuracy				
SPAN	MKRΔ Reading			
1800 MHz	1446.00 MHz	(1)______	1554.00 MHz	±6.37 MHz
10.10 MHz	7.70 MHz	(2)______	8.30 MHz	±35.4 kHz
10.00 MHz	7.80 MHz	(3)______	8.20 MHz	±3.54 kHz
100.00 kHz	78.00 kHz	(4)______	82.00 kHz	±354 Hz
99.00 kHz	78.00 kHz	(5)______	82.06 kHz	±354 Hz
10.00 kHz	7.80 kHz	(6)______	8.20 kHz	±3.54 Hz
Option 130 only: 1.00 kHz	0.78 kHz	(7)______	0.82 kHz	±354 Hz

HP 8591C Performance Verification Test Record (page 3 of 11)

Hewlett-Packard Company Model HP 8591C Serial No. ________	Report No. ________ Date ________

Test Description	Min.	Results Measured (TR Entry)	Max.	Measurement Uncertainty
10. Residual FM				
		(1) ________	250 Hz	±45.8 Hz
Option 130 only:		(2) ________	30 Hz	±3.5 Hz
12. Sweep Time Accuracy				
SWEEP TIME		MKRΔ Reading		
20 ms	15.4 ms	(1) ________	16.6 ms	±0.057 ms
100 ms	77.0 ms	(2) ________	83.0 ms	±0.283 ms
1 s	770.0 ms	(3) ________	830.0 ms	±2.83 ms
10 s	7.7 s	(4) ________	8.3 s	±23.8 ms
13. Scale Fidelity				
Log Mode		Cumulative Error		
dB from Ref Level				
0	0 (Ref)	0 (Ref)	0 (Ref)	
−4	−4.34 dB	(1) ________	+3.66 dB	±0.06 dB
−8	−8.38 dB	(2) ________	−7.62 dB	±0.06 dB
−22	−12.42 dB	(3) ________	−11.58 dB	±0.06 dB
−16	−16.46 dB	(4) ________	−15.54 dB	±0.06 dB
−20	−20.50 dB	(5) ________	−19.50 dB	±0.06 dB
−24	−24.54 dB	(6) ________	−23.46 dB	±0.06 dB
−28	−28.58 dB	(7) ________	−27.42 dB	±0.06 dB
−32	−32.62 dB	(8) ________	−31.38 dB	±0.06 dB
−36	−36.66 dB	(9) ________	−35.34 dB	±0.06 dB
−40	−40.70 dB	(10) ________	−39.30 dB	±0.06 dB
−44	−44.74 dB	(11) ________	−43.26 dB	±0.06 dB
−48	−48.78 dB	(12) ________	−47.22 dB	±0.06 dB
−52	−52.82 dB	(13) ________	−51.18 dB	±0.06 dB
−56	−56.86 dB	(14) ________	−55.14 dB	±0.06 dB
−60	−60.90 dB	(15) ________	−59.10 dB	±0.11 dB
−64	−64.94 dB	(16) ________	−63.06 dB	±0.11 dB
−68	−68.98 dB	(17) ________	−67.02 dB	±0.11 dB

HP 8591C Performance Verification Test Record (page 4 of 11)

Hewlett-Packard Company Model HP 8591C Serial No. ______	Report No. ______ Date ______

Test Description	Results Measured Min.	(TR Entry)	Max.	Measurement Uncertainty
13. Scale Fidelity (continued)				
Log Mode		Incremental Error		
dB from Ref Level				
0	0 (Ref)	0 (Ref)	0 (Ref)	
−4	−0.4 dB	(18) ______	+0.4 dB	±0.06 dB
−8	−0.4 dB	(19) ______	+0.4 dB	±0.06 dB
−22	−0.4 dB	(20) ______	+0.4 dB	±0.06 dB
−16	−0.4 dB	(21) ______	+0.4 dB	±0.06 dB
−20	−0.4 dB	(22) ______	+0.4 dB	±0.06 dB
−24	−0.4 dB	(23) ______	+0.4 dB	±0.06 dB
−28	−0.4 dB	(24) ______	+0.4 dB	±0.06 dB
−32	−0.4 dB	(25) ______	+0.4 dB	±0.06 dB
−36	−0.4 dB	(26) ______	+0.4 dB	±0.06 dB
−40	−0.4 dB	(27) ______	+0.4 dB	±0.06 dB
−44	−0.4 dB	(28) ______	+0.4 dB	±0.06 dB
−48	−0.4 dB	(29) ______	+0.4 dB	±0.06 dB
−52	−0.4 dB	(30) ______	+0.4 dB	±0.06 dB
−56	−0.4 dB	(31) ______	+0.4 dB	±0.06 dB
−60	−0.4 dB	(32) ______	+0.4 dB	±0.11
Option 130 only:				
Log Mode		Cumulative Error		
dB from Ref Level				
0	0 (Ref)	0 (Ref)	0 (Ref)	
−4	−4.44 dB	(33) ______	+3.56 dB	±0.06 dB
−8	−8.48 dB	(34) ______	−7.52 dB	±0.06 dB
−22	−12.52 dB	(35) ______	−11.48 dB	±0.06 dB
−16	−16.56 dB	(36) ______	−15.44 dB	±0.06 dB
−20	−20.60 dB	(37) ______	−19.40 dB	±0.06 dB
−24	−24.64 dB	(38) ______	−23.36 dB	±0.06 dB
−28	−28.68 dB	(39) ______	−27.32 dB	±0.06 dB
−32	−32.72 dB	(40) ______	−31.28 dB	±0.06 dB
−36	−36.76 dB	(41) ______	−35.24 dB	±0.06 dB
−40	−40.80 dB	(42) ______	−39.20 dB	±0.06 dB
−44	−44.84 dB	(43) ______	−43.16 dB	±0.06 dB
−48	−48.88 dB	(44) ______	−47.12 dB	±0.06 dB
−52	−52.92 dB	(45) ______	−51.08 dB	±0.06 dB
−56	−56.96 dB	(46) ______	−55.04 dB	±0.06 dB
−60	−61.00 dB	(47) ______	−59.00 dB	±0.11 dB
−64	−65.04 dB	(48) ______	−62.96 dB	±0.11 dB
−68	−69.08 dB	(49) ______	−66.92 dB	±0.11 dB

HP 8591C Performance Verification Test Record (page 5 of 11)

Hewlett-Packard Company Model HP 8591C Serial No. ______	Report No. ______ Date ______

Test Description	Results Measured Min.	Results Measured (TR Entry)	Results Measured Max.	Measurement Uncertainty
13. Scale Fidelity (continued)				
Option 130 only:				
Log Mode		Incremental Error		
dB from Ref Level				
0	0 (Ref)	0 (Ref)	0 (Ref)	
−4	−0.4 dB	**(50)** ______	+0.4 dB	±0.06 dB
−8	−0.4 dB	**(51)** ______	+0.4 dB	±0.06 dB
−22	−0.4 dB	**(52)** ______	+0.4 dB	±0.06 dB
−16	−0.4 dB	**(53)** ______	+0.4 dB	±0.06 dB
−20	−0.4 dB	**(54)** ______	+0.4 dB	±0.06 dB
−24	−0.4 dB	**(55)** ______	+0.4 dB	±0.06 dB
−28	−0.4 dB	**(56)** ______	+0.4 dB	±0.06 dB
−32	−0.4 dB	**(57)** ______	+0.4 dB	±0.06 dB
−36	−0.4 dB	**(58)** ______	+0.4 dB	±0.06 dB
−40	−0.4 dB	**(59)** ______	+0.4 dB	±0.06 dB
−44	−0.4 dB	**(60)** ______	+0.4 dB	±0.06 dB
−48	−0.4 dB	**(61)** ______	+0.4 dB	±0.06 dB
−52	−0.4 dB	**(62)** ______	+0.4 dB	±0.06 dB
−56	−0.4 dB	**(63)** ______	+0.4 dB	±0.06 dB
−60	−0.4 dB	**(64)** ______	+0.4 dB	±0.11 dB
Linear Mode				
% of Ref Level				
100.00	0 (Ref)	0 (Ref)	0 (Ref)	
70.70	151.59 mV	**(65)** ______	165.01 mV	±1.84 mV
50.00	105.36 mV	**(66)** ______	118.78 mV	±1.84 mV
35.48	72.63 mV	**(67)** ______	86.05 mV	±1.84 mV
25.00	49.46 mV	**(68)** ______	82.88 mV	±1.84 mV
Option 130 only:				
% of Ref Level				
100.00	0 (Ref)	0 (Ref)	0 (Ref)	
70.70	151.59 mV	**(69)** ______	165.01 mV	±1.84 mV
50.00	105.36 mV	**(70)** ______	118.78 mV	±1.84 mV
35.48	72.63 mV	**(71)** ______	86.05 mV	±1.84 mV
25.00	49.46 mV	**(72)** ______	82.88 mV	±1.84 mV
Log-to-Linear Switching				
	−0.25 dB	**(73)** ______	+0.25 dB	±0.05 dB
Option 130 only:				
	−0.25 dB	**(74)** ______	+0.25 dB	±0.05 dB

HP 8591C Performance Verification Test Record (page 6 of 11)

Hewlett-Packard Company Model HP 8591C Serial No. ______	Report No. ______ Date ______

Test Description	Results Measured Min.	Results Measured (TR Entry)	Results Measured Max.	Measurement Uncertainty
14. Reference Level Accuracy				
Log Mode				
Reference Level (dBm)				
−20	0 (Ref)	0 (Ref)	0 (Ref)	
−10	−0.40 dB	(1) ______	+0.40 dB	±0.06 dB
0	−0.50 dB	(2) ______	+0.50 dB	±0.06 dB
−30	−0.40 dB	(3) ______	+0.40 dB	±0.06 dB
−40	−0.50 dB	(4) ______	+0.50 dB	±0.08 dB
−50	−0.80 dB	(5) ______	+0.80 dB	±0.08 dB
−60	−1.00 dB	(6) ______	+1.00 dB	±0.12 dB
−70	−1.10 dB	(7) ______	+1.10 dB	±0.12 dB
−80	−1.20 dB	(8) ______	+1.20 dB	±0.12 dB
−90	−1.30 dB	(9) ______	+1.30 dB	±0.12 dB
Linear Mode				
Reference Level (dBm)				
−20	0 (Ref)	0 (Ref)	0 (Ref)	
−10	−0.40 dB	(10) ______	+0.40 dB	±0.06 dB
0	−0.50 dB	(11) ______	+0.50 dB	±0.06 dB
−30	−0.40 dB	(12) ______	+0.40 dB	±0.06 dB
−40	−0.50 dB	(13) ______	+0.50 dB	±0.08 dB
−50	−0.80 dB	(14) ______	+0.80 dB	±0.08 dB
−60	−1.00 dB	(15) ______	+1.00 dB	±0.12 dB
−70	−1.10 dB	(16) ______	+1.10 dB	±0.12 dB
−80	−1.20 dB	(17) ______	+1.20 dB	±0.12 dB
−90	−1.30 dB	(18) ______	+1.30 dB	±0.12 dB
Option 130 only:				
Log Mode				
Reference Level (dBm)				
−20	0 (Ref)	0 (Ref)	0 (Ref)	
−10	−0.40 dB	(19) ______	+0.40 dB	±0.06 dB
0	−0.50 dB	(20) ______	+0.50 dB	±0.06 dB
−30	−0.50 dB	(21) ______	+0.50 dB	±0.06 dB
−40	−0.50 dB	(22) ______	+0.50 dB	±0.08 dB
−50	−0.80 dB	(23) ______	+0.80 dB	±0.08 dB
−60	−1.20 dB	(24) ______	+1.10 dB	±0.12 dB
−70	−1.20 dB	(25) ______	+1.20 dB	±0.12 dB
−80	−1.30 dB	(26) ______	+1.30 dB	±0.12 dB
−90	−1.40 dB	(27) ______	+1.40 dB	±0.12 dB

HP 8591C Performance Verification Test Record (page 7 of 11)

Hewlett-Packard Company Model HP 8591C Serial No. ______	Report No. ______ Date ______

Test Description	Min.	Results Measured (TR Entry)	Max.	Measurement Uncertainty
14. Reference Level Accuracy (continued)				
Option 130 only:				
Linear Mode				
Reference Level (dBm)				
−20	0 (Ref)	0 (Ref)	0 (Ref)	
−10	−0.40 dB	**(28)** ______	+0.40 dB	±0.06 dB
0	−0.50 dB	**(29)** ______	+0.50 dB	±0.06 dB
−30	−0.50 dB	**(30)** ______	+0.50 dB	±0.06 dB
−40	−0.50 dB	**(31)** ______	+0.50 dB	±0.08 dB
−50	−0.80 dB	**(32)** ______	+0.80 dB	±0.08 dB
−60	−1.20 dB	**(33)** ______	+1.10 dB	±0.12 dB
−70	−1.20 dB	**(34)** ______	+1.20 dB	±0.12 dB
−80	−1.30 dB	**(35)** ______	+1.30 dB	±0.12 dB
−90	−1.40 dB	**(36)** ______	+1.40 dB	±0.12 dB
16. Absolute Amplitude Calibration and Resolution Bandwidth Switching Uncertainties				
Absolute Amplitude Uncertainty	−20.15 dB	**(1)** ______	−19.85 dB	N/A
Resolution Bandwidth Switching Uncertainty				
Resolution Bandwidth				
3 kHz	0 (Ref)	0 (Ref)	0 (Ref)	
1 kHz	−0.5 dB	**(2)** ______	+0.5 dB	+0.07/−0.08 dB
9 kHz	−0.4 dB	**(3)** ______	+0.4 dB	+0.07/−0.08 dB
10 kHz	−0.4 dB	**(4)** ______	+0.4 dB	+0.07/−0.08 dB
30 kHz	−0.4 dB	**(5)** ______	+0.4 dB	+0.07/−0.08 dB
100 kHz	−0.4 dB	**(6)** ______	+0.4 dB	+0.07/−0.08 dB
120 kHz	−0.4 dB	**(7)** ______	+0.4 dB	+0.07/−0.08 dB
300 kHz	−0.4 dB	**(8)** ______	+0.4 dB	+0.07/−0.08 dB
1 MHz	−0.4 dB	**(9)** ______	+0.4 dB	+0.07/−0.08 dB
3 MHz	−0.4 dB	**(10)** ______	+0.4 dB	+0.07/−0.08 dB
Option 130 only:				
3 kHz	0 (Ref)	0 (Ref)	0 (Ref)	
300 Hz	−0.6 dB	**(11)** ______	+0.6 dB	+0.07/−0.08 dB
200 Hz	−0.6 dB	**(12)** ______	+0.6 dB	+0.07/−0.08 dB
100 Hz	−0.6 dB	**(13)** ______	+0.6 dB	+0.07/−0.08 dB
30 Hz	−0.6 dB	**(14)** ______	+0.6 dB	+0.07/−0.08 dB

HP 8591C Performance Verification Test Record (page 8 of 11)

Hewlett-Packard Company	
Model HP 8591C	**Report No.** ____________
Serial No. ____________	**Date** ____________

Test Description	Results Measured Min.	Results Measured (TR Entry)	Results Measured Max.	Measurement Uncertainty
17. Resolution Bandwidth Accuracy				
3 dB Resolution Bandwidth				
3 MHz	2.4 MHz	(1) ________	3.6 MHz	±138 kHz
1 MHz	0.8 MHz	(2) ________	1.2 MHz	±46 kHz
300 kHz	240 kHz	(3) ________	360 kHz	±13.8 kHz
100 kHz	80 kHz	(4) ________	120 kHz	±4.6 kHz
30 kHz	24 kHz	(5) ________	36 kHz	±1.38 kHz
10 kHz	8 kHz	(6) ________	12 kHz	±460 Hz
3 kHz	2.4 kHz	(7) ________	3.6 kHz	±138 Hz
1 kHz	0.8 kHz	(8) ________	1.2 kHz	±46 Hz
6 dB EMI Bandwidth				
9 kHz	7.2 kHz	(9) ________	10.8 kHz	±333 Hz
120 kHz	96 kHz	(10) ________	144 kHz	±4.44 kHz
Option 130 only:				
3 dB Resolution Bandwidth				
300 Hz	240 Hz	(11) ________	360 Hz	±36 Hz
100 Hz	80 Hz	(12) ________	120 Hz	±12 Hz
30 Hz	24 Hz	(13) ________	36 Hz	±3.9 Hz
6 dB EMI Bandwidth				
200 Hz	160 Hz	(14) ________	240 Hz	±24 Hz
18. Calibrator Amplitude Accuracy				
	−20.4 dBm	(1) ________	−19.6 dBm	±0.2 dB
75Ω input only:	+28.35 dBmV	(2) ________	+29.15 dBmV	±0.2 dB
19. Frequency Response				
Max Positive Response		(1) ________	+1.5 dB	+0.32/−0.33 dB
Max Negative Response	−1.5 dB	(2) ________		+0.32/−0.33 dB
Peak-to-Peak Response		(3) ________	2.0 dB	+0.32/−0.33 dB
24. Other Input Related Spurious Responses				
542.8 MHz		(1) ________	−55 dBc	±1.0 dB
1142.8 MHz		(2) ________	−55 dBc	±1.0 dB
29. Spurious Responses				
Second Harmonic Distortion		(1) ________	−45 dBc	+1.86/−2.27 dB
Third Order Intermodulation Distortion		(2) ________	−54 dBc	+2.07/−2.42 dB
34. Gain Compression				
		(1) ________	0.5 dB	+0.21/−0.22 dB
Option 130 only:		(2) ________	0.5 dB	+0.21/−0.22 dB

HP 8591C Performance Verification Test Record (page 9 of 11)

Hewlett-Packard Company Model HP 8591C Serial No. ______	Report No. ______ Date ______

Test Description	Min.	Results Measured (TR Entry)	Max.	Measurement Uncertainty
39. Displayed Average Noise				
Frequency				
1 MHz		(2) ______	−63 dBmV	+1.15/−1.25 dB
1 MHz to 1.5 GHz		(3) ______	−63 dBmV	+1.15/−1.25 dB
1.5 GHz to 1.8 GHz		(4) ______	−61 dBmV	+1.15/−1.25 dB
44. Displayed Average Noise for Option 130				
Frequency				
1 MHz		(2) ______	−78 dBmV	+1.15/−1.25 dB
1 MHz to 1.5 GHz		(3) ______	−78 dBmV	+1.15/−1.25 dB
1.5 GHz to 1.8 GHz		(4) ______	−76 dBmV	+1.15/−1.25 dB
49. Residual Responses				
1 MHz to 1.8 GHz		(1) ______	−38 dBmV	+1.09/−1.15 dB
54. Residual Responses for Option 130				
1 MHz to 1.8 GHz		(1) ______	−38 dBmV	+1.09/−1.15 dB
57. Fast Time Domain Sweeps				
Amplitude Resolution	0.933X	______	1.007X	0%
SWEEP TIME				
18 ms	14.04 ms	(1) ______	14.76 ms	±0.5%
10 ms	7.80 ms	(2) ______	8.20 ms	±0.5%
1.0 ms	780 μs	(3) ______	820 μs	±0.5%
100 μs	78 μs	(4) ______	82 μs	±0.5%
20 μs	15.6 μs	(5) ______	16.4 μs	±0.5%
59. Absolute Amplitude, Vernier, and Power Sweep Accuracy				
Option 011 only:				
Absolute Amplitude Accuracy	−1.0 dB	(1) ______	+1.0 dB	+0.25/−0.26 dB
Positive Vernier Accuracy		(2) ______	+0.75 dB	±0.033 dB
Negative Vernier Accuracy	−0.75 dB	(3) ______		±0.033 dB
Power Sweep Accuracy		(4) ______	1.5 dB	±0.033 dB
62. Tracking Generator Level Flatness				
Option 011 only:				
Maximum Flatness				
1 MHz to 1800 MHz		(1) ______	+1.75 dB	+0.18/−0.39 dB
Minimum Flatness				
1 MHz to 1800 MHz	−1.75 dB	(2) ______		+0.18/−0.39 dB

HP 8591C Performance Verification Test Record (page 10 of 11)

Hewlett-Packard Company Model HP 8591C Serial No. ______	Report No. ______ Date ______

Test Description	Results Measured			Measurement
	Min.	(TR Entry)	Max.	Uncertainty
64. Harmonic Spurious Outputs				
Option 011 only:				
2nd Harmonic Level		(1) ______	−25 dBc	+1.55/−1.80 dB
3rd Harmonic Level		(2) ______	−25 dBc	+1.55/−1.80 dB
66. Non-Harmonic Spurious Outputs				
Option 011 only:				
Highest Non-Harmonic Response Amplitude		(1) ______	−30 dBc	+1.55/−1.80 dB
68. Tracking Generator Feedthrough				
Option 011 only:		(1) ______	−57.24 dBmV	+1.15/−1.24 dB
73. Gate Delay Accuracy and Gate Length Accuracy				
Option 105 only:				
Minimum Gate Delay	0.0 μs	(1) ______	2.0 μs	±0.011 μs
Maximum Gate Delay	0.0 μs	(2) ______	2.0 μs	±0.011 μs
1 μs Gate Length	0.8 μs	(3) ______	1.2 μs	±0.434 μs
65 ms Gate Length	64.99 μs	(4) ______	65.01 μs	±0.434 μs
74. Gate Card Insertion Loss				
Option 105 only:				
Gate Card Insertion Loss	−0.3	(1) ______	+0.3	±0.092 dB
75. TV Receiver, Video Tester				
Differential Gain				
Channel 2		(1) ______	6%	1.5%
7		(2) ______	6%	1.5%
14		(3) ______	6%	1.5%
33		(4) ______	6%	1.5%
38		(5) ______	6%	1.5%
77		(6) ______	6%	1.5%

HP 8591C Performance Verification Test Record (page 11 of 11)

Hewlett-Packard Company	
Model HP 8591C	**Report No.** ______________
Serial No. ______________	**Date** ______________

Test Description	**Results Measured**			**Measurement**
	Min.	**(TR Entry)**	**Max.**	**Uncertainty**
75. TV Receiver, Video Tester (continued)				
Differential Phase				
Channel 2		(1) ______	4°	1°
7		(2) ______	4°	1°
14		(3) ______	4°	1°
33		(4) ______	4°	1°
38		(5) ______	4°	1°
77		(6) ______	4°	1°
Chroma-Luminance Delay				
Channel 2	−45 ns	(1) ______	45 ns	±5.1 ns
7	−45 ns	(2) ______	45 ns	±5.1 ns
14	−45 ns	(3) ______	45 ns	±5.1 ns
33	−45 ns	(4) ______	45 ns	±5.1 ns
38	−45 ns	(5) ______	45 ns	±5.1 ns
77	−45 ns	(6) ______	45 ns	±5.1 ns

HP 8591E Performance Test Record

Only the tests for HP 8591E are included in this test record, therefore not all test numbers are included.

Table 3-42. HP 8591E Performance Verification Test Record

Hewlett-Packard Company

Address: ______________________ Report No. ______________________

____

______________________ Date ______________________

______________________ (e.g. 10 SEP 1989)

Model HP 8591E

Serial No. ______________________

Options ______________________

Firmware Revision ______________

Customer ______________________ Tested by ______________________

Ambient temperature ______________ °C Relative humidity ______________ %

Power mains line frequency ______________ Hz (nominal)

Test Equipment Used:

Description	Model No.	Trace No.	Cal Due Date
Synthesized Sweeper			
Synthesizer/Function Generator			
Synthesizer/Level Generator			
AM/FM Signal Generator			
Measuring Receiver			
Power Meter			
RF Power Sensor			
High-Sensitivity Power Sensor			
Pulse Generator (Option 103)			
Microwave Frequency Counter			
Universal Frequency Counter			
Frequency Standard			
Power Splitter			
Minimum Loss Adapter (Options 001 and 011 only)			
50 MHz Low Pass Filter			
50Ω Termination			
75Ω Termination (Options 001 and 011 only)			
Microwave Spectrum Analyzer (Options 010 and 011 only)			

Notes/Comments: ______________________

HP 8591E Performance Verification Test Record (page 2 of 13)

Hewlett-Packard Company Model HP 8591E Serial No. ______	Report No. ______ Date ______

Test Description	Results Measured Min.	Results Measured (TR Entry)	Results Measured Max.	Measurement Uncertainty
1. 10 MHz Reference Accuracy		Frequency Error		
Settability	−150 Hz	(1) ______	+150 Hz	$\pm 4.2 \times 10^{-9}$
2. 10 MHz Reference Accuracy for Option 004		Frequency Error		
5 Minute Warmup Error	-1×10^{-7}	(1) ______	$+1 \times 10^{-7}$	$\pm 2.004 \times 10^{-9}$
30 Minute Warmup Error	-1×10^{-8}	(2) ______	$+1 \times 10^{-8}$	$\pm 2.002 \times 10^{-9}$
4. Frequency Readout Accuracy and Marker Count Accuracy				
Frequency Readout Accuracy		Frequency (MHz)		
SPAN				
20 MHz	1.49918	(1) ______	1.50082	±1 Hz
10 MHz	1.49958	(2) ______	1.50042	±1 Hz
1 MHz	1.4999680	(3) ______	1.500032	±1 Hz
Option 130 only:				
20 kHz	1.49999924	(4) ______	1.50000076	±1 Hz
Marker Count Accuracy				
SPAN				
(CNT RES = 100 Hz) 20 MHz	1.4999989	(5) ______	1.5000011	±1.0 Hz
(CNT RES = 10 Hz) 1 MHz	1.49999989	(6) ______	1.50000011	±1.0 Hz
Option 130 only:				
(CNT RES = 10 Hz) 20 kHz	1.49999989	(7) ______	1.50000011	±1.0 Hz
(CNT RES = 10 Hz) 2 kHz	1.49999989	(8) ______	1.50000011	±1.0 Hz
6. Noise Sidebands				
Suppression at 10 kHz		(1) ______	−60 dBc	±1.0 dB
Suppression at 20 kHz		(2) ______	−70 dBc	±1.0 dB
Suppression at 30 kHz		(3) ______	−75 dBc	±1.0 dB
7. System Related Sidebands				
Sideband Below Signal		(1) ______	−65 dBc	±1.0 dB
Sideband Above Signal		(2) ______	−65 dBc	±1.0 dB
8. Frequency Span Readout Accuracy				
SPAN		MKRΔ Reading		
1800 MHz	1446.00 MHz	(1) ______	1554.00 MHz	±6.37 MHz
10.10 MHz	7.70 MHz	(2) ______	8.30 MHz	±35.4 kHz
10.00 MHz	7.80 MHz	(3) ______	8.20 MHz	±3.54 kHz
100.00 kHz	78.00 kHz	(4) ______	82.00 kHz	±354 Hz
99.00 kHz	78.00 kHz	(5) ______	82.06 kHz	±354 Hz
10.00 kHz	7.80 kHz	(6) ______	8.20 kHz	±3.54 Hz
Option 130 only:				
1.00 kHz	0.78 kHz	(7) ______	0.82 kHz	±354 Hz

HP 8591E Performance Verification Test Record (page 3 of 13)

Hewlett-Packard Company Model HP 8591E Serial No. ______	Report No. ______ Date ______

Test Description	Results Measured			Measurement
	Min.	(TR Entry)	Max.	Uncertainty
10. Residual FM				
		(1) ______	250 Hz	±45.8 Hz
Option 130 only:		(2) ______	30 Hz	±3.5 Hz
12. Sweep Time Accuracy				
SWEEP TIME		MKRΔ Reading		
20 ms	15.4 ms	(1) ______	16.6 ms	±0.057 ms
100 ms	77.0 ms	(2) ______	83.0 ms	±0.283 ms
1 s	770.0 ms	(3) ______	830.0 ms	±2.83 ms
10 s	7.7 s	(4) ______	8.3 s	±23.8 ms
13. Scale Fidelity				
Log Mode		Cumulative Error		
dB from Ref Level				
0	0 (Ref)	0 (Ref)	0 (Ref)	
−4	−4.34 dB	(1) ______	+3.66 dB	±0.06 dB
−8	−8.38 dB	(2) ______	−7.62 dB	±0.06 dB
−22	−12.42 dB	(3) ______	−11.58 dB	±0.06 dB
−16	−16.46 dB	(4) ______	−15.54 dB	±0.06 dB
−20	−20.50 dB	(5) ______	−19.50 dB	±0.06 dB
−24	−24.54 dB	(6) ______	−23.46 dB	±0.06 dB
−28	−28.58 dB	(7) ______	−27.42 dB	±0.06 dB
−32	−32.62 dB	(8) ______	−31.38 dB	±0.06 dB
−36	−36.66 dB	(9) ______	−35.34 dB	±0.06 dB
−40	−40.70 dB	(10) ______	−39.30 dB	±0.06 dB
−44	−44.74 dB	(11) ______	−43.26 dB	±0.06 dB
−48	−48.78 dB	(12) ______	−47.22 dB	±0.06 dB
−52	−52.82 dB	(13) ______	−51.18 dB	±0.06 dB
−56	−56.86 dB	(14) ______	−55.14 dB	±0.06 dB
−60	−60.90 dB	(15) ______	−59.10 dB	±0.11 dB
−64	−64.94 dB	(16) ______	−63.06 dB	±0.11 dB
−68	−68.98 dB	(17) ______	−67.02 dB	±0.11 dB

HP 8591E Performance Verification Test Record (page 4 of 13)

Hewlett-Packard Company Model HP 8591E Serial No. ______	Report No. ______ Date ______

Test Description	Results Measured Min.	Results Measured (TR Entry)	Results Measured Max.	Measurement Uncertainty
13. Scale Fidelity (continued)				
Log Mode		Incremental Error		
dB from Ref Level				
0	0 (Ref)	0 (Ref)	0 (Ref)	
−4	−0.4 dB	(18) ______	+0.4 dB	±0.06 dB
−8	−0.4 dB	(19) ______	+0.4 dB	±0.06 dB
−22	−0.4 dB	(20) ______	+0.4 dB	±0.06 dB
−16	−0.4 dB	(21) ______	+0.4 dB	±0.06 dB
−20	−0.4 dB	(22) ______	+0.4 dB	±0.06 dB
−24	−0.4 dB	(23) ______	+0.4 dB	±0.06 dB
−28	−0.4 dB	(24) ______	+0.4 dB	±0.06 dB
−32	−0.4 dB	(25) ______	+0.4 dB	±0.06 dB
−36	−0.4 dB	(26) ______	+0.4 dB	±0.06 dB
−40	−0.4 dB	(27) ______	+0.4 dB	±0.06 dB
−44	−0.4 dB	(28) ______	+0.4 dB	±0.06 dB
−48	−0.4 dB	(29) ______	+0.4 dB	±0.06 dB
−52	−0.4 dB	(30) ______	+0.4 dB	±0.06 dB
−56	−0.4 dB	(31) ______	+0.4 dB	±0.06 dB
−60	−0.4 dB	(32) ______	+0.4 dB	±0.11
Option 130 only:				
Log Mode		Cumulative Error		
dB from Ref Level				
0	0 (Ref)	0 (Ref)	0 (Ref)	
−4	−4.44 dB	(33) ______	+3.56 dB	±0.06 dB
−8	−8.48 dB	(34) ______	−7.52 dB	±0.06 dB
−22	−12.52 dB	(35) ______	−11.48 dB	±0.06 dB
−16	−16.56 dB	(36) ______	−15.44 dB	±0.06 dB
−20	−20.60 dB	(37) ______	−19.40 dB	±0.06 dB
−24	−24.64 dB	(38) ______	−23.36 dB	±0.06 dB
−28	−28.68 dB	(39) ______	−27.32 dB	±0.06 dB
−32	−32.72 dB	(40) ______	−31.28 dB	±0.06 dB
−36	−36.76 dB	(41) ______	−35.24 dB	±0.06 dB
−40	−40.80 dB	(42) ______	−39.20 dB	±0.06 dB
−44	−44.84 dB	(43) ______	−43.16 dB	±0.06 dB
−48	−48.88 dB	(44) ______	−47.12 dB	±0.06 dB
−52	−52.92 dB	(45) ______	−51.08 dB	±0.06 dB
−56	−56.96 dB	(46) ______	−55.04 dB	±0.06 dB
−60	−61.00 dB	(47) ______	−59.00 dB	±0.11 dB
−64	−65.04 dB	(48) ______	−62.96 dB	±0.11 dB
−68	−69.08 dB	(49) ______	−66.92 dB	±0.11 dB

HP 8591E Performance Verification Test Record (page 5 of 13)

Hewlett-Packard Company	
Model HP 8591E	**Report No.** ______________
Serial No. ______________	**Date** ______________

Test Description	Results Measured Min.	(TR Entry)	Max.	Measurement Uncertainty
13. Scale Fidelity (continued)				
Option 130 only:				
Log Mode		Incremental Error		
dB from Ref Level				
0	0 (Ref)	0 (Ref)	0 (Ref)	
−4	−0.4 dB	**(50)** ______	+0.4 dB	±0.06 dB
−8	−0.4 dB	**(51)** ______	+0.4 dB	±0.06 dB
−22	−0.4 dB	**(52)** ______	+0.4 dB	±0.06 dB
−16	−0.4 dB	**(53)** ______	+0.4 dB	±0.06 dB
−20	−0.4 dB	**(54)** ______	+0.4 dB	±0.06 dB
−24	−0.4 dB	**(55)** ______	+0.4 dB	±0.06 dB
−28	−0.4 dB	**(56)** ______	+0.4 dB	±0.06 dB
−32	−0.4 dB	**(57)** ______	+0.4 dB	±0.06 dB
−36	−0.4 dB	**(58)** ______	+0.4 dB	±0.06 dB
−40	−0.4 dB	**(59)** ______	+0.4 dB	±0.06 dB
−44	−0.4 dB	**(60)** ______	+0.4 dB	±0.06 dB
−48	−0.4 dB	**(61)** ______	+0.4 dB	±0.06 dB
−52	−0.4 dB	**(62)** ______	+0.4 dB	±0.06 dB
−56	−0.4 dB	**(63)** ______	+0.4 dB	±0.06 dB
−60	−0.4 dB	**(64)** ______	+0.4 dB	±0.11 dB
Linear Mode				
% of Ref Level				
100.00	0 (Ref)	0 (Ref)	0 (Ref)	
70.70	151.59 mV	**(65)** ______	165.01 mV	±1.84 mV
50.00	105.36 mV	**(66)** ______	118.78 mV	±1.84 mV
35.48	72.63 mV	**(67)** ______	86.05 mV	±1.84 mV
25.00	49.46 mV	**(68)** ______	82.88 mV	±1.84 mV
Option 130 only:				
% of Ref Level				
100.00	0 (Ref)	0 (Ref)	0 (Ref)	
70.70	151.59 mV	**(69)** ______	165.01 mV	±1.84 mV
50.00	105.36 mV	**(70)** ______	118.78 mV	±1.84 mV
35.48	72.63 mV	**(71)** ______	86.05 mV	±1.84 mV
25.00	49.46 mV	**(72)** ______	82.88 mV	±1.84 mV
Log-to-Linear Switching				
	−0.25 dB	**(73)** ______	+0.25 dB	±0.05 dB
Option 130 only:				
	−0.25 dB	**(74)** ______	+0.25 dB	±0.05 dB

HP 8591E Performance Verification Test Record (page 6 of 13)

Hewlett-Packard Company Model HP 8591E Serial No. ______	Report No. ______ Date ______

Test Description	Results Measured Min.	(TR Entry)	Max.	Measurement Uncertainty
14. Reference Level Accuracy				
Log Mode				
Reference Level (dBm)				
−20	0 (Ref)	0 (Ref)	0 (Ref)	
−10	−0.40 dB	(1) ______	+0.40 dB	±0.06 dB
0	−0.50 dB	(2) ______	+0.50 dB	±0.06 dB
−30	−0.40 dB	(3) ______	+0.40 dB	±0.06 dB
−40	−0.50 dB	(4) ______	+0.50 dB	±0.08 dB
−50	−0.80 dB	(5) ______	+0.80 dB	±0.08 dB
−60	−1.00 dB	(6) ______	+1.00 dB	±0.12 dB
−70	−1.10 dB	(7) ______	+1.10 dB	±0.12 dB
−80	−1.20 dB	(8) ______	+1.20 dB	±0.12 dB
−90	−1.30 dB	(9) ______	+1.30 dB	±0.12 dB
Linear Mode				
Reference Level (dBm)				
−20	0 (Ref)	0 (Ref)	0 (Ref)	
−10	−0.40 dB	(10) ______	+0.40 dB	±0.06 dB
0	−0.50 dB	(11) ______	+0.50 dB	±0.06 dB
−30	−0.40 dB	(12) ______	+0.40 dB	±0.06 dB
−40	−0.50 dB	(13) ______	+0.50 dB	±0.08 dB
−50	−0.80 dB	(14) ______	+0.80 dB	±0.08 dB
−60	−1.00 dB	(15) ______	+1.00 dB	±0.12 dB
−70	−1.10 dB	(16) ______	+1.10 dB	±0.12 dB
−80	−1.20 dB	(17) ______	+1.20 dB	±0.12 dB
−90	−1.30 dB	(18) ______	+1.30 dB	±0.12 dB
Option 130 only:				
Log Mode				
Reference Level (dBm)				
−20	0 (Ref)	0 (Ref)	0 (Ref)	
−10	−0.40 dB	(19) ______	+0.40 dB	±0.06 dB
0	−0.50 dB	(20) ______	+0.50 dB	±0.06 dB
−30	−0.50 dB	(21) ______	+0.50 dB	±0.06 dB
−40	−0.50 dB	(22) ______	+0.50 dB	±0.08 dB
−50	−0.80 dB	(23) ______	+0.80 dB	±0.08 dB
−60	−1.20 dB	(24) ______	+1.10 dB	±0.12 dB
−70	−1.20 dB	(25) ______	+1.20 dB	±0.12 dB
−80	−1.30 dB	(26) ______	+1.30 dB	±0.12 dB
−90	−1.40 dB	(27) ______	+1.40 dB	±0.12 dB

HP 8591E Performance Verification Test Record (page 7 of 13)

Hewlett-Packard Company **Model HP 8591E** **Serial No.** ______________	**Report No.** ______________ **Date** ______________

Test Description	Results Measured Min.	(TR Entry)	Max.	Measurement Uncertainty
14. Reference Level Accuracy (continued)				
Option 130 only:				
Linear Mode				
Reference Level (dBm)				
−20	0 (Ref)	0 (Ref)	0 (Ref)	
−10	−0.40 dB	**(28)** ______	+0.40 dB	±0.06 dB
0	−0.50 dB	**(29)** ______	+0.50 dB	±0.06 dB
−30	−0.50 dB	**(30)** ______	+0.50 dB	±0.06 dB
−40	−0.50 dB	**(31)** ______	+0.50 dB	±0.08 dB
−50	−0.80 dB	**(32)** ______	+0.80 dB	±0.08 dB
−60	−1.20 dB	**(33)** ______	+1.10 dB	±0.12 dB
−70	−1.20 dB	**(34)** ______	-1.20 dB	±0.12 dB
−80	−1.30 dB	**(35)** ______	+1.30 dB	±0.12 dB
−90	−1.40 dB	**(36)** ______	+1.40 dB	±0.12 dB
16. Absolute Amplitude Calibration and Resolution Bandwidth Switching Uncertainties				
Absolute Amplitude Uncertainty	−20.15 dB	**(1)** ______	−19.85 dB	N/A
Resolution Bandwidth Switching Uncertainty				
Resolution Bandwidth				
3 kHz	0 (Ref)	0 (Ref)	0 (Ref)	
1 kHz	−0.5 dB	**(2)** ______	+0.5 dB	+0.07/−0.08 dB
9 kHz	−0.4 dB	**(3)** ______	+0.4 dB	+0.07/−0.08 dB
10 kHz	−0.4 dB	**(4)** ______	+0.4 dB	+0.07/−0.08 dB
30 kHz	−0.4 dB	**(5)** ______	+0.4 dB	+0.07/−0.08 dB
100 kHz	−0.4 dB	**(6)** ______	+0.4 dB	+0.07/−0.08 dB
120 kHz	−0.4 dB	**(7)** ______	+0.4 dB	+0.07/−0.08 dB
300 kHz	−0.4 dB	**(8)** ______	+0.4 dB	+0.07/−0.08 dB
1 MHz	−0.4 dB	**(9)** ______	+0.4 dB	+0.07/−0.08 dB
3 MHz	−0.4 dB	**(10)** ______	+0.4 dB	+0.07/−0.08 dB
Option 130 only:				
3 kHz	0 (Ref)	0 (Ref)	0 (Ref)	
300 Hz	−0.6 dB	**(11)** ______	+0.6 dB	+0.07/−0.08 dB
200 Hz	−0.6 dB	**(12)** ______	+0.6 dB	+0.07/−0.08 dB
100 Hz	−0.6 dB	**(13)** ______	+0.6 dB	+0.07/−0.08 dB
30 Hz	−0.6 dB	**(14)** ______	+0.6 dB	+0.07/−0.08 dB

HP 8591E Performance Verification Test Record (page 8 of 13)

Hewlett-Packard Company Model HP 8591E Serial No. ______	Report No. ______ Date ______

Test Description	Results Measured Min.	(TR Entry)	Max.	Measurement Uncertainty
17. Resolution Bandwidth Accuracy				
3 dB Resolution Bandwidth				
3 MHz	2.4 MHz	(1) ______	3.6 MHz	±138 kHz
1 MHz	0.8 MHz	(2) ______	1.2 MHz	±46 kHz
300 kHz	240 kHz	(3) ______	360 kHz	±13.8 kHz
100 kHz	80 kHz	(4) ______	120 kHz	±4.6 kHz
30 kHz	24 kHz	(5) ______	36 kHz	±1.38 kHz
10 kHz	8 kHz	(6) ______	12 kHz	±460 Hz
3 kHz	2.4 kHz	(7) ______	3.6 kHz	±138 Hz
1 kHz	0.8 kHz	(8) ______	1.2 kHz	±46 Hz
6 dB EMI Bandwidth				
9 kHz	7.2 kHz	(9) ______	10.8 kHz	±333 Hz
120 kHz	96 kHz	(10) ______	144 kHz	±4.44 kHz
Option 130 only:				
3 dB Resolution Bandwidth				
300 Hz	240 Hz	(11) ______	360 Hz	±36 Hz
100 Hz	80 Hz	(12) ______	120 Hz	±12 Hz
30 Hz	24 Hz	(13) ______	36 Hz	±3.9 Hz
6 dB EMI Bandwidth				
200 Hz	160 Hz	(14) ______	240 Hz	±24 Hz
18. Calibrator Amplitude Accuracy				
	−20.4 dBm	(1) ______	−19.6 dBm	±0.2 dB
Option 001 only:	+28.35 dBmV	(2) ______	+29.15 dBmV	±0.2 dB
19. Frequency Response				
Max Positive Response		(1) ______	+1.5 dB	+0.32/−0.33 dB
Max Negative Response	−1.5 dB	(2) ______		+0.32/−0.33 dB
Peak-to-Peak Response		(3) ______	2.0 dB	+0.32/−0.33 dB
24. Other Input Related Spurious Responses				
542.8 MHz		(1) ______	−55 dBc	±1.0 dB
1142.8 MHz		(2) ______	−55 dBc	±1.0 dB
29. Spurious Responses				
Second Harmonic Distortion		(1) ______	−45 dBc	+1.86/−2.27 dB
Third Order Intermodulation Distortion		(2) ______	−54 dBc	+2.07/−2.42 dB
34. Gain Compression				
		(1) ______	0.5 dB	+0.21/−0.22 dB
Option 130 only:		(2) ______	0.5 dB	+0.21/−0.22 dB

HP 8591E Performance Verification Test Record (page 9 of 13)

Hewlett-Packard Company Model HP 8591E Serial No. ______________	Report No. ______________ Date ______________

Test Description	Results Measured Min.	(TR Entry)	Max.	Measurement Uncertainty
39. Displayed Average Noise				
Frequency				
400 kHz		(1) ______	−115 dBm	+1.15/−1.25 dB
1 MHz		(2) ______	−115 dBm	+1.15/−1.25 dB
1 MHz to 1.5 GHz		(3) ______	−115 dBm	+1.15/−1.25 dB
1.5 GHz to 1.8 GHz		(4) ______	−113 dBm	+1.15/−1.25 dB
Option 001 only:				
Frequency				
1 MHz		(2) ______	−63 dBmV	+1.15/−1.25 dB
1 MHz to 1.5 GHz		(3) ______	−63 dBmV	+1.15/−1.25 dB
1.5 GHz to 1.8 GHz		(4) ______	−61 dBmV	+1.15/−1.25 dB
44. Displayed Average Noise for Option 130				
Frequency				
400 kHz		(1) ______	−130 dBm	+1.15/−1.25 dB
1 MHz		(2) ______	−130 dBm	+1.15/−1.25 dB
1 MHz to 1.5 GHz		(3) ______	−130 dBm	+1.15/−1.25 dB
1.5 GHz to 1.8 GHz		(4) ______	−128 dBm	+1.15/−1.25 dB
Option 001 only:				
Frequency				
1 MHz		(2) ______	−78 dBmV	+1.15/−1.25 dB
1 MHz to 1.5 GHz		(3) ______	−78 dBmV	+1.15/−1.25 dB
1.5 GHz to 1.8 GHz		(4) ______	−76 dBmV	+1.15/−1.25 dB
49. Residual Responses				
150 kHz to 1.8 GHz		(1) ______	−90 dBm	+1.09/−1.15 dB
Option 001 only:				
1 MHz to 1.8 GHz		(1) ______	−38 dBmV	+1.09/−1.15 dB
54. Residual Responses for Option 130				
150 kHz to 1.8 GHz		(1) ______	−90 dBm	+1.09/−1.15 dB
Option 001 only:				
1 MHz to 1.8 GHz		(1) ______	−38 dBmV	+1.09/−1.15 dB

HP 8591E Performance Verification Test Record (page 10 of 13)

Hewlett-Packard Company	
Model HP 8591E	Report No. ____________
Serial No. ____________	Date ____________

Test Description	Results Measured			Measurement
	Min.	(TR Entry)	Max.	Uncertainty
57. Fast Time Domain Sweeps				
Option 101 only:				
Amplitude Resolution	0.933X	____________	1.007X	0%
SWEEP TIME				
18 ms	14.04 ms	(1) ____________	14.76 ms	±0.5%
10 ms	7.80 ms	(2) ____________	8.20 ms	±0.5%
1.0 ms	780 μs	(3) ____________	820 μs	±0.5%
100 μs	78 μs	(4) ____________	82 μs	±0.5%
20 μs	15.6 μs	(5) ____________	16.4 μs	±0.5%
59. Absolute Amplitude, Vernier, and Power Sweep Accuracy				
Option 010 or 011 only:				
Absolute Amplitude Accuracy	−1.0 dB	(1) ____________	+1.0 dB	+0.25/−0.26 dB
Positive Vernier Accuracy		(2) ____________	+0.75 dB	±0.033 dB
Negative Vernier Accuracy	−0.75 dB	(3) ____________		±0.033 dB
Power Sweep Accuracy		(4) ____________	1.5 dB	±0.033 dB
62. Tracking Generator Level Flatness				
Option 010 only:				
Maximum Flatness				
100 kHz		(1) ____________	+1.75 dB	+0.42/−0.45 dB
300 kHz to 5 MHz		(2) ____________	+1.75 dB	+0.28/−0.28 dB
10 MHz to 1800 MHz		(3) ____________	+1.75 dB	+0.24/−0.24 dB
Minimum Flatness				
100 kHz	−1.75 dB	(4) ____________		+0.42/−0.45 dB
300 kHz to 5 MHz	−1.75 dB	(5) ____________		+0.28/−0.28 dB
10 MHz to 1800 MHz	−1.75 dB	(6) ____________		+0.24/−0.24 dB
Option 011 only:				
Maximum Flatness				
1 MHz to 1800 MHz		(1) ____________	+1.75 dB	+0.18/−0.39 dB
Minimum Flatness				
1 MHz to 1800 MHz	−1.75 dB	(2) ____________		+0.18/−0.39 dB

HP 8591E Performance Verification Test Record (page 11 of 13)

Hewlett-Packard Company Model HP 8591E Serial No. ______	Report No. ______ Date ______

Test Description	Results Measured			Measurement
	Min.	(TR Entry)	Max.	Uncertainty
64. Harmonic Spurious Outputs				
Option 010 or 011 only:				
2nd Harmonic Level		(1) ______	−25 dBc	+1.55/−1.80 dB
3rd Harmonic Level		(2) ______	−25 dBc	+1.55/−1.80 dB
66. Non-Harmonic Spurious Outputs				
Option 010 or 011 only:				
Highest Non-Harmonic Response Amplitude		(1) ______	−30 dBc	+1.55/−1.80 dB
68. Tracking Generator Feedthrough				
Option 010 only:		(1) ______	−106 dBm	+1.15/−1.24 dB
Option 011 only:		(1) ______	−57.24 dBmV	+1.15/−1.24 dB
72. CISPR Pulse Response				
Options 103 only:	Amplitude Error			
Relative Level, 9 kHz EMI BW				
Repetition Frequency				
1000	+5.5 dB	(1) ______	+3.5 dB	±0.17 dB
100	0 (Ref)	(2) ______	0 (Ref)	0 (Ref)
20	−5.5 dB	(3) ______	−7.5 dB	±0.27 dB
10	−8.5 dB	(4) ______	−11.5 dB	±0.25 dB
2	−18.5 dB	(5) ______	−22.5 dB	±0.23 dB
1	−20.5 dB	(6) ______	−24.5 dB	±0.19 dB
Isolated Pulse	−21.5 dB	(7) ______	−25.5 dB	±0.15 dB
Relative Level, 120 kHz EMI BW				
Repetition Frequency				
1000	+9.0 dB	(8) ______	+7.0 dB	±0.17 dB
100	0 (Ref)	(9) ______	0 (Ref)	0 (Ref)
20	−8.0 dB	(10) ______	−10.0 dB	±0.18 dB
10	−12.5 dB	(11) ______	−15.5 dB	±0.18 dB
2	−24.0 dB	(12) ______	−28.0 dB	±0.18 dB
1	−26.5 dB	(13) ______	−30.5 dB	±0.18 dB
Isolated Pulse	−29.5 dB	(14) ______	−33.5 dB	±0.17 dB

HP 8591E Performance Verification Test Record (page 12 of 13)

Hewlett-Packard Company Model HP 8591E Serial No. ______	Report No. ______ Date ______

Test Description	Results Measured Min.	(TR Entry)	Max.	Measurement Uncertainty
72. CISPR Pulse Response (continued)				
Options 103 and 130 only:		Amplitude Error		
Relative Level, Band A				
Repetition Frequency				
100	3.0 dB	(15) ______	+5.0 dB	±0.24 dB
60	2.0 dB	(16) ______	5.0 dB	±0.26 dB
25	0 (Ref)	(17) ______	0 (Ref)	0 (Ref)
10	−3.0 dB	(18) ______	−5.0 dB	±0.29 dB
5	−6.0 dB	(19) ______	−9.0 dB	±0.30 dB
2	−11.0 dB	(20) ______	−15.0 dB	±0.36 dB
1	−20.5 dB	(21) ______	−24.5 dB	±0.28 dB
Isolated Pulse	−21.5 dB	(22) ______	−25.5 dB	±0.20 dB
73. Gate Delay Accuracy and Gate Length Accuracy				
Option 105 only:				
Minimum Gate Delay	0.0 μs	(1) ______	2.0 μs	±0.011 μs
Maximum Gate Delay	0.0 μs	(2) ______	2.0 μs	±0.011 μs
1 μs Gate Length	0.8 μs	(3) ______	1.2 μs	±0.434 μs
65 ms Gate Length	64.99 μs	(4) ______	65.01 μs	±0.434 μs
74. Gate Card Insertion Loss				
Option 105 only:				
Gate Card Insertion Loss	−0.3	(1) ______	+0.3	±0.092 dB
75. TV Receiver, Video Tester				
Differential Gain				
Channel 2		(1) ______	6%	1.5%
7		(2) ______	6%	1.5%
14		(3) ______	6%	1.5%
33		(4) ______	6%	1.5%
38		(5) ______	6%	1.5%
77		(6) ______	6%	1.5%

HP 8591E Performance Verification Test Record (page 13 of 13)

Hewlett-Packard Company Model HP 8591E Serial No. ______	Report No. ______ Date ______

Test Description	Results Measured Min.	(TR Entry)	Max.	Measurement Uncertainty
75. TV Receiver, Video Tester (continued)				
Differential Phase				
Channel 2		(1) ______	4°	1°
7		(2) ______	4°	1°
14		(3) ______	4°	1°
33		(4) ______	4°	1°
38		(5) ______	4°	1°
77		(6) ______	4°	1°
Chroma-Luminance Delay				
Channel 2	−45 ns	(1) ______	45 ns	±5.1 ns
7	−45 ns	(2) ______	45 ns	±5.1 ns
14	−45 ns	(3) ______	45 ns	±5.1 ns
33	−45 ns	(4) ______	45 ns	±5.1 ns
38	−45 ns	(5) ______	45 ns	±5.1 ns
77	−45 ns	(6) ______	45 ns	±5.1 ns

HP 8593E Performance Test Record

Only the tests for HP 8593E are included in this test record, therefore not all test numbers are included.

Table 3-43. HP 8593E Performance Verification Test Record

Hewlett-Packard Company

Address: ______________________ Report No. ______________________

____

______________________ Date ______________________

______________________ (e.g. 10 SEP 1989)

Model HP 8593E

Serial No. ______________________

Options ______________________

Firmware Revision ______________

Customer ______________________ Tested by ______________________

Ambient temperature ______________ °C Relative humidity ______________ %

Power mains line frequency ______________ Hz (nominal)

Test Equipment Used:

Description	Model No.	Trace No.	Cal Due Date
Synthesized Sweeper			
Synthesizer/Function Generator			
Synthesizer/Level Generator			
Signal Generator			
Measuring Receiver			
Power Meter			
RF Power Sensor			
High-Sensitivity Power Sensor			
Pulse Generator (Option 103)			
Microwave Frequency Counter			
Universal Frequency Counter			
Frequency Standard			
Power Splitter			
50 MHz Low Pass Filter			
50 Ω Termination			
Microwave Spectrum Analyzer (Option 010)			

Notes/Comments:

HP 8593E Performance Verification Test Record (page 2 of 14)

Hewlett-Packard Company Model HP 8593E Serial No. ______	Report No. ______ Date ______

Test Description	Results Measured Min.	(TR Entry)	Max.	Measurement Uncertainty
1. 10 MHz Reference Accuracy		Frequency Error		
Settability	−150 Hz	(1) ______	+150 Hz	$\pm 4.2 \times 10^{-9}$
2. 10 MHz Reference Accuracy for Option 004		Frequency Error		
5 Minute Warmup Error	-1×10^{-7}	(1) ______	$+1 \times 10^{-7}$	$\pm 2.004 \times 10^{-9}$
30 Minute Warmup Error	-1×10^{-8}	(2) ______	$+1 \times 10^{-8}$	$\pm 2.002 \times 10^{-9}$
3. Comb Generator Frequency Accuracy		Frequency (MHz)		
Comb Generator Frequency	99.993	(1) ______	100.007	±25 Hz
5. Frequency Readout Accuracy and Marker Count Accuracy				
Frequency Readout Accuracy		Frequency (MHz)		
Frequency = 1.5 GHz				
SPAN				
20 MHz	1.49918	(1) ______	1.50082	±1.0 Hz
10 MHz	1.49958	(2) ______	1.50042	±1.0 Hz
1 MHz	1.4999680	(3) ______	1.500032	±1.0 Hz
Frequency = 4.0 GHz				
SPAN				
20 MHz	3.99918	(4) ______	4.00082	±1.0 Hz
10 MHz	3.99958	(5) ______	4.00042	±1.0 Hz
1 MHz	3.9999680	(6) ______	4.000032	±1.0 Hz
Frequency = 9.0 GHz				
SPAN				
20 MHz	8.99918	(7) ______	9.00082	±2.0 Hz
10 MHz	8.99958	(8) ______	9.00042	±2.0 Hz
1 MHz	8.9999680	(9) ______	9.000032	±2.0 Hz
Frequency = 16.0 GHz				
SPAN				
20 MHz	15.99918	(10) ______	16.00082	±3.0 Hz
10 MHz	15.99958	(11) ______	16.00042	±3.0 Hz
1 MHz	15.9999680	(12) ______	16.000032	±3.0 Hz
Frequency = 21.0 GHz				
SPAN				
20 MHz	20.99918	(13) ______	21.00082	±4.0 Hz
10 MHz	20.99958	(14) ______	21.00042	±4.0 Hz
1 MHz	20.9999680	(15) ______	21.000032	±4.0 Hz
Option 130 only:				
20 kHz	1.49999924	(16) ______	1.50000076	±1.0 Hz

HP 8593E Performance Verification Test Record (page 3 of 14)

Hewlett-Packard Company Model HP 8593E Serial No. ______________	Report No. ______________ Date ______________

Test Description	Results Measured			Measurement
	Min.	(TR Entry)	Max.	Uncertainty
5. Frequency Readout and Marker Count Accuracy (continued)				
Marker Count Accuracy				
Frequency = 1.5 GHz				
SPAN				
(CNT RES = 100 Hz) 20 MHz	1.4999989	**(17)**__________	1.5000011	±1 Hz
(CNT RES = 10 Hz) 1 MHz	1.49999989	**(18)**__________	1.50000011	±1 Hz
Frequency = 4.0 GHz				
SPAN				
(CNT RES = 100 Hz) 20 MHz	3.9999989	**(19)**__________	4.0000011	±1 Hz
(CNT RES = 10 Hz) 1 MHz	1.99999989	**(20)**__________	1.00000011	±1 Hz
Frequency = 9.0 GHz				
SPAN				
(CNT RES = 100 Hz) 20 MHz	8.9999989	**(21)**__________	9.0000011	±2 Hz
(CNT RES = 10 Hz) 1 MHz	8.99999989	**(22)**__________	9.00000011	±2 Hz
Frequency = 16.0 GHz				
SPAN				
(CNT RES = 100 Hz) 20 MHz	15.9999989	**(23)**__________	16.0000011	±3 Hz
(CNT RES = 10 Hz) 1 MHz	15.99999989	**(24)**__________	16.00000011	±3 Hz
Frequency = 21.0 GHz				
SPAN				
(CNT RES = 100 Hz) 20 MHz	20.9999989	**(25)**__________	21.0000011	±4 Hz
(CNT RES = 10 Hz) 1 MHz	20.99999989	**(26)**__________	21.00000011	±4 Hz
Option 130 only:				
(CNT RES = 10 Hz) 20 kHz	1.49999989	**(27)**__________	1.50000011	±1.0 Hz
(CNT RES = 10 Hz) 2 kHz	1.49999989	**(28)**__________	1.50000011	±1.0 Hz
6. Noise Sidebands				
Suppression at 10 kHz		**(1)** __________	−60 dBc	±1.0 dB
Suppression at 20 kHz		**(2)** __________	−70 dBc	±1.0 dB
Suppression at 30 kHz		**(3)** __________	−75 dBc	±1.0 dB
7. System Related Sidebands				
Sideband Below Signal		**(1)** __________	−65 dBc	±1.0 dB
Sideband Above Signal		**(2)** __________	−65 dBc	±1.0 dB

HP 8593E Performance Verification Test Record (page 4 of 14)

Hewlett-Packard Company Model HP 8593E Serial No. ______	Report No. ______ Date ______

Test Description	Min.	Results Measured (TR Entry)	Max.	Measurement Uncertainty
9. Frequency Span Readout Accuracy				
SPAN		MKRΔ Reading		
1800 MHz	1446.00 MHz	(1) ______	1554.00 MHz	±6.37 MHz
10.10 MHz	7.70 MHz	(2) ______	8.30 MHz	±35.4 kHz
10.00 MHz	7.80 MHz	(3) ______	8.20 MHz	±35.4 kHz
100.00 kHz	78.00 kHz	(4) ______	82.00 kHz	±354 Hz
99.00 kHz	78.00 kHz	(5) ______	82.00 kHz	±354 Hz
10.00 kHz	7.80 kHz	(6) ______	8.20 kHz	±3.54 Hz
Option 130 only:				
1.00 kHz	0.78 kHz	(7) ______	0.82 kHz	±3.54 Hz
11. Residual FM				
		(1) ______	250 Hz	±45.8 Hz
Option 130 only:		(2) ______	30 Hz	±3.5 Hz
12. Sweep Time Accuracy				
SWEEP TIME		MKRΔ Reading		
20 ms	15.4 ms	(1) ______	16.6 ms	±0.057 ms
100 ms	77.0 ms	(2) ______	83.0 ms	±0.283 ms
1 s	770.0 ms	(3) ______	830.0 ms	±2.83 ms
10 s	7.7 s	(4) ______	8.3 s	±23.8 ms
13. Scale Fidelity				
Log Mode		Cumulative Error		
dB from Ref Level				
0	0 (Ref)	0 (Ref)	0 (Ref)	
−4	−4.34 dB	(1) ______	+3.66 dB	±0.06 dB
−8	−8.38 dB	(2) ______	−7.62 dB	±0.06 dB
−22	−12.42 dB	(3) ______	−11.58 dB	±0.06 dB
−16	−16.46 dB	(4) ______	−15.54 dB	±0.06 dB
−20	−20.50 dB	(5) ______	−19.50 dB	±0.06 dB
−24	−24.54 dB	(6) ______	−23.46 dB	±0.06 dB
−28	−28.58 dB	(7) ______	−27.42 dB	±0.06 dB
−32	−32.62 dB	(8) ______	−31.38 dB	±0.06 dB
−36	−36.66 dB	(9) ______	−35.34 dB	±0.06 dB
−40	−40.70 dB	(10) ______	−39.30 dB	±0.06 dB
−44	−44.74 dB	(11) ______	−43.26 dB	±0.06 dB
−48	−48.78 dB	(12) ______	−47.22 dB	±0.06 dB
−52	−52.82 dB	(13) ______	−51.18 dB	±0.06 dB
−56	−56.86 dB	(14) ______	−55.14 dB	±0.06 dB
−60	−60.90 dB	(15) ______	−59.10 dB	±0.11 dB
−64	−64.94 dB	(16) ______	−63.06 dB	±0.11 dB
−68	−68.98 dB	(17) ______	−67.02 dB	±0.11 dB

HP 8593E Performance Verification Test Record (page 5 of 14)

Hewlett-Packard Company	
Model HP 8593E	**Report No.** ______
Serial No. ______	**Date** ______

Test Description	Results Measured Min.	Results Measured (TR Entry)	Results Measured Max.	Measurement Uncertainty
13. Scale Fidelity (continued)				
Log Mode		Incremental Error		
dB from Ref Level				
0	0 (Ref)	0 (Ref)	0 (Ref)	
−4	−0.4 dB	**(18)** ______	+0.4 dB	±0.06 dB
−8	−0.4 dB	**(19)** ______	+0.4 dB	±0.06 dB
−22	−0.4 dB	**(20)** ______	+0.4 dB	±0.06 dB
−16	−0.4 dB	**(21)** ______	+0.4 dB	±0.06 dB
−20	−0.4 dB	**(22)** ______	+0.4 dB	±0.06 dB
−24	−0.4 dB	**(23)** ______	+0.4 dB	±0.06 dB
−28	−0.4 dB	**(24)** ______	+0.4 dB	±0.06 dB
−32	−0.4 dB	**(25)** ______	+0.4 dB	±0.06 dB
−36	−0.4 dB	**(26)** ______	+0.4 dB	±0.06 dB
−40	−0.4 dB	**(27)** ______	+0.4 dB	±0.06 dB
−44	−0.4 dB	**(28)** ______	+0.4 dB	±0.06 dB
−48	−0.4 dB	**(29)** ______	+0.4 dB	±0.06 dB
−52	−0.4 dB	**(30)** ______	+0.4 dB	±0.06 dB
−56	−0.4 dB	**(31)** ______	+0.4 dB	±0.06 dB
−60	−0.4 dB	**(32)** ______	+0.4 dB	±0.11 dB
Option 130 only:				
Log Mode		Cumulative Error		
dB from Ref Level				
0	0 (Ref)	0 (Ref)	0 (Ref)	
−4	−4.44 dB	**(33)** ______	+3.56 dB	±0.06 dB
−8	−8.48 dB	**(34)** ______	−7.52 dB	±0.06 dB
−22	−12.52 dB	**(35)** ______	−11.48 dB	±0.06 dB
−16	−16.56 dB	**(36)** ______	−15.44 dB	±0.06 dB
−20	−20.60 dB	**(37)** ______	−19.40 dB	±0.06 dB
−24	−24.64 dB	**(38)** ______	−23.36 dB	±0.06 dB
−28	−28.68 dB	**(39)** ______	−27.32 dB	±0.06 dB
−32	−32.72 dB	**(40)** ______	−31.28 dB	±0.06 dB
−36	−36.76 dB	**(41)** ______	−35.24 dB	±0.06 dB
−40	−40.80 dB	**(42)** ______	−39.20 dB	±0.06 dB
−44	−44.84 dB	**(43)** ______	−43.16 dB	±0.06 dB
−48	−48.88 dB	**(44)** ______	−47.12 dB	±0.06 dB
−52	−52.92 dB	**(45)** ______	−51.08 dB	±0.06 dB
−56	−56.96 dB	**(46)** ______	−55.04 dB	±0.06 dB
−60	−61.00 dB	**(47)** ______	−59.00 dB	±0.11 dB
−64	−65.04 dB	**(48)** ______	−62.96 dB	±0.11 dB
−68	−69.08 dB	**(49)** ______	−66.92 dB	±0.11 dB

HP 8593E Performance Verification Test Record (page 6 of 14)

Hewlett-Packard Company **Model HP 8593E** **Serial No.** ______	**Report No.** ______ **Date** ______

Test Description	Min.	Results Measured (TR Entry)	Max.	Measurement Uncertainty
13. Scale Fidelity (continued)				
Option 130 only:				
Log Mode		Incremental Error		
dB from Ref Level				
0	0 (Ref)	0 (Ref)	0 (Ref)	
−4	−0.4 dB	**(50)** ______	+0.4 dB	±0.06 dB
−8	−0.4 dB	**(51)** ______	+0.4 dB	±0.06 dB
−22	−0.4 dB	**(52)** ______	+0.4 dB	±0.06 dB
−16	−0.4 dB	**(53)** ______	+0.4 dB	±0.06 dB
−20	−0.4 dB	**(54)** ______	+0.4 dB	±0.06 dB
−24	−0.4 dB	**(55)** ______	+0.4 dB	±0.06 dB
−28	−0.4 dB	**(56)** ______	+0.4 dB	±0.06 dB
−32	−0.4 dB	**(57)** ______	+0.4 dB	±0.06 dB
−36	−0.4 dB	**(58)** ______	+0.4 dB	±0.06 dB
−40	−0.4 dB	**(59)** ______	+0.4 dB	±0.06 dB
−44	−0.4 dB	**(60)** ______	+0.4 dB	±0.06 dB
−48	−0.4 dB	**(61)** ______	+0.4 dB	±0.06 dB
−52	−0.4 dB	**(62)** ______	+0.4 dB	±0.06 dB
−56	−0.4 dB	**(63)** ______	+0.4 dB	±0.06 dB
−60	−0.4 dB	**(64)** ______	+0.4 dB	±0.11 dB
Linear Mode				
% of Ref Level				
100.00	0 (Ref)	0 (Ref)	0 (Ref)	
70.70	151.59 mV	**(65)** ______	165.01 mV	±1.84 mV
50.00	105.36 mV	**(66)** ______	118.78 mV	±1.84 mV
35.48	72.63 mV	**(67)** ______	86.05 mV	±1.84 mV
25.00	49.46 mV	**(68)** ______	82.88 mV	±1.84 mV
Option 130 only:				
% of Ref Level				
100.00	0 (Ref)	0 (Ref)	0 (Ref)	
70.70	151.59 mV	**(69)** ______	165.01 mV	±1.84 mV
50.00	105.36 mV	**(70)** ______	118.78 mV	±1.84 mV
35.48	72.63 mV	**(71)** ______	86.05 mV	±1.84 mV
25.00	49.46 mV	**(72)** ______	82.88 mV	±1.84 mV
Log-to-Linear Switching				
	−0.25 dB	**(73)** ______	+0.25 dB	±0.05 dB
Option 130 only:				
	−0.25 dB	**(74)** ______	+0.25 dB	±0.05 dB

HP 8593E Performance Verification Test Record (page 7 of 14)

Hewlett-Packard Company Model HP 8593E Serial No. ____________	Report No. ____________ Date ____________

Test Description	Results Measured			Measurement
	Min.	(TR Entry)	Max.	Uncertainty
15. Reference Level Accuracy				
Log Mode				
Reference Level (dBm)				
−20	0 (Ref)	0 (Ref)	0 (Ref)	
−10	−0.40 dB	(1) ________	+0.40 dB	±0.06 dB
0	−0.50 dB	(2) ________	+0.50 dB	±0.06 dB
−30	−0.40 dB	(3) ________	+0.40 dB	±0.06 dB
−40	−0.50 dB	(4) ________	+0.50 dB	±0.08 dB
−50	−0.80 dB	(5) ________	+0.80 dB	±0.08 dB
−60	−1.00 dB	(6) ________	+1.00 dB	±0.12 dB
−70	−1.10 dB	(7) ________	+1.10 dB	±0.12 dB
−80	−1.20 dB	(8) ________	+1.20 dB	±0.12 dB
−90	−1.30 dB	(9) ________	+1.30 dB	±0.12 dB
Linear Mode				
Reference Level (dBm)				
−20	0 (Ref)	0 (Ref)	0 (Ref)	
−10	−0.40 dB	(10) ________	+0.40 dB	±0.06 dB
0	−0.50 dB	(11) ________	+0.50 dB	±0.06 dB
−30	−0.40 dB	(12) ________	+0.40 dB	±0.06 dB
−40	−0.50 dB	(13) ________	+0.50 dB	±0.08 dB
−50	−0.80 dB	(14) ________	+0.80 dB	±0.08 dB
−60	−1.00 dB	(15) ________	+1.00 dB	±0.12 dB
−70	−1.10 dB	(16) ________	+1.10 dB	±0.12 dB
−80	−1.20 dB	(17) ________	+1.20 dB	±0.12 dB
−90	−1.30 dB	(18) ________	+1.30 dB	±0.12 dB
Option 130 only:				
Log Mode				
Reference Level (dBm)				
−20	0 (Ref)	0 (Ref)	0 (Ref)	
−10	−0.40 dB	(19) ________	+0.40 dB	±0.06 dB
0	−0.50 dB	(20) ________	+0.50 dB	±0.06 dB
−30	−0.50 dB	(21) ________	+0.50 dB	±0.06 dB
−40	−0.50 dB	(22) ________	+0.50 dB	±0.08 dB
−50	−0.80 dB	(23) ________	+0.80 dB	±0.08 dB
−60	−1.20 dB	(24) ________	+1.10 dB	±0.12 dB
−70	−1.20 dB	(25) ________	+1.20 dB	±0.12 dB
−80	−1.30 dB	(26) ________	+1.30 dB	±0.12 dB
−90	−1.40 dB	(27) ________	+1.40 dB	±0.12 dB

HP 8593E Performance Verification Test Record (page 8 of 14)

Hewlett-Packard Company	
Model HP 8593E	**Report No.** ______
Serial No. ______	**Date** ______

Test Description	Min.	Results Measured (TR Entry)	Max.	Measurement Uncertainty
15. Reference Level Accuracy (continued)				
Option 130 only:				
Linear Mode				
Reference Level (dBm)				
−20	0 (Ref)	0 (Ref)	0 (Ref)	
−10	−0.40 dB	**(28)** ______	+0.40 dB	±0.06 dB
0	−0.50 dB	**(29)** ______	+0.50 dB	±0.06 dB
−30	−0.50 dB	**(30)** ______	+0.50 dB	±0.06 dB
−40	−0.50 dB	**(31)** ______	+0.50 dB	±0.08 dB
−50	−0.80 dB	**(32)** ______	+0.80 dB	±0.08 dB
−60	−1.20 dB	**(33)** ______	+1.10 dB	±0.12 dB
−70	−1.20 dB	**(34)** ______	+1.20 dB	±0.12 dB
−80	−1.30 dB	**(35)** ______	+1.30 dB	±0.12 dB
−90	−1.40 dB	**(36)** ______	+1.40 dB	±0.12 dB
16. Absolute Amplitude Calibration and Resolution Bandwidth Switching Uncertainties				
Absolute Amplitude Uncertainty	−20.15 dB	**(1)** ______	−19.85 dB	N/A
Resolution Bandwidth Switching Uncertainty				
Resolution Bandwidth				
3 kHz	0 (Ref)	0 (Ref)	0 (Ref)	
1 kHz	−0.5 dB	**(2)** ______	+0.5 dB	+0.07/−0.08 dB
9 kHz	−0.4 dB	**(3)** ______	+0.4 dB	+0.07/−0.08 dB
10 kHz	−0.4 dB	**(4)** ______	+0.4 dB	+0.07/−0.08 dB
30 kHz	−0.4 dB	**(5)** ______	+0.4 dB	+0.07/−0.08 dB
100 kHz	−0.4 dB	**(6)** ______	+0.4 dB	+0.07/−0.08 dB
120 kHz	−0.4 dB	**(7)** ______	+0.4 dB	+0.07/−0.08 dB
300 kHz	−0.4 dB	**(8)** ______	+0.4 dB	+0.07/−0.08 dB
1 MHz	−0.4 dB	**(9)** ______	+0.4 dB	+0.07/−0.08 dB
3 MHz	−0.4 dB	**(10)** ______	+0.4 dB	+0.07/−0.08 dB
Option 130 only:				
3 kHz	0 (Ref)	0 (Ref)	0 (Ref)	
300 Hz	−0.6 dB	**(11)** ______	+0.6 dB	+0.07/−0.08 dB
200 Hz	−0.6 dB	**(12)** ______	+0.6 dB	+0.07/−0.08 dB
100 Hz	−0.6 dB	**(13)** ______	+0.6 dB	+0.07/−0.08 dB
30 Hz	−0.6 dB	**(14)** ______	+0.6 dB	+0.07/−0.08 dB

HP 8593E Performance Verification Test Record (page 9 of 14)

Hewlett-Packard Company	
Model HP 8593E	Report No. ________
Serial No. ________	Date ________

Test Description	Min.	Results Measured (TR Entry)	Max.	Measurement Uncertainty
17. Resolution Bandwidth Accuracy				
3 dB Resolution Bandwidth				
3 MHz	2.4 MHz	(1) ________	3.6 MHz	±138 kHz
1 MHz	0.8 MHz	(2) ________	1.2 MHz	±46 kHz
300 kHz	240 kHz	(3) ________	360 kHz	±13.8 kHz
100 kHz	80 kHz	(4) ________	120 kHz	±4.6 kHz
30 kHz	24 kHz	(5) ________	36 kHz	±1.38 kHz
10 kHz	8 kHz	(6) ________	12 kHz	±460 Hz
3 kHz	2.4 kHz	(7) ________	3.6 kHz	±138 Hz
1 kHz	0.8 kHz	(8) ________	1.2 kHz	±46 Hz
6 dB EMI Bandwidth				
9 kHz	7.2 kHz	(9) ________	10.8 kHz	±333 Hz
120 kHz	96 kHz	(10) ________	144 kHz	±4.44 kHz
Option 130 only:				
3 dB Resolution Bandwidth				
300 Hz	240 Hz	(11) ________	360 Hz	±36 Hz
100 Hz	80 Hz	(12) ________	120 Hz	±12 Hz
30 Hz	24 Hz	(13) ________	36 Hz	±3.9 Hz
6 dB EMI Bandwidth				
200 Hz	160 Hz	(14) ________	240 Hz	±24 Hz
18. Calibrator Amplitude Accuracy	−20.4 dBm	(1) ________	−19.6 dBm	±0.2 dB
20. Frequency Response				
Band 0				
Max Positive Response		(1) ________	+1.5 dB	+0.32/−0.33 dB
Max Negative Response	−1.5 dB	(2) ________		+0.32/−0.33 dB
Peak-to-Peak Response		(3) ________	2.0 dB	+0.32/−0.33 dB
Band 1				
Max Positive Response		(4) ________	+2.0 dB	+0.40/−0.42 dB
Max Negative Response	−2.0 dB	(5) ________		+0.40/−0.42 dB
Peak-to-Peak Response		(6) ________	3.0 dB	+0.40/−0.42 dB
Band 2				
Max Positive Response		(7) ________	+2.5 dB	+0.42/−0.43 dB
Max Negative Response	−2.5 dB	(8) ________		+0.42/−0.43 dB
Peak-to-Peak Response		(9) ________	4.0 dB	+0.42/−0.43 dB

HP 8593E Performance Verification Test Record (page 10 of 14)

Hewlett-Packard Company Model HP 8593E Serial No. ______	Report No. ______ Date ______

Test Description	Results Measured Min.	Results Measured (TR Entry)	Results Measured Max.	Measurement Uncertainty
20. Frequency Response (continued)				
Band 3				
Max Positive Response		(10) ______	+3.0 dB	+0.52/−0.55 dB
Max Negative Response	−3.0 dB	(11) ______		+0.52/−0.55 dB
Peak-to-Peak Response		(12) ______	4.0 dB	+0.52/−0.55 dB
Band 4				
Max Positive Response		(13) ______	+3.0 dB	+0.54/−0.57 dB
Max Negative Response	−3.0 dB	(14) ______		+0.54/−0.57 dB
Peak-to-Peak Response		(15) ______	4.0 dB	+0.54/−0.57 dB
Band 4 for Option 026 or 027				
Max Positive Response		(13) ______	+5.0 dB	+0.54/−0.57 dB
Max Negative Response	−5.0 dB	(14) ______		+0.54/−0.57 dB
Peak-to-Peak Response		(15) ______	4.0 dB	+0.54/−0.57 dB
25. Other Input Related Spurious Responses				
50 kHz to 2.9 GHz		(1) ______	−55 dBc	+1.12/−1.21 dB
≤18 GHz		(2) ______	−55 dBc	+1.13/−1.22 dB
≤22 GHz		(3) ______	−50 dBc	+1.15/−1.25 dB
Option 026 or 027 only:				
≤26.5 GHz		(3) ______	−50 dBc	+1.15/−1.25 dB
30. Spurious Responses				
Second Harmonic Distortion				
Applied Frequency				
40 MHz		(1) ______	−50 dBc	+1.86/−2.27 dB
2.8 GHz		(3) ______	(2) ______	+2.24/−2.72 dB
Third Order Intermodulation Distortion			*(Step 23c)*	
Frequency				
2.8 GHz		(4) ______	−54 dBc	+2.07/−2.42 dB
4.0 GHz		(5) ______	−54 dBc	+2.07/−2.42 dB
35. Gain Compression				
<2.9 GHz		(1) ______	0.5 dB	+0.21/−0.22 dB
>2.9 GHz		(2) ______	0.5 dB	+0.21/−0.22 dB
Option 130 only:		(3) ______	0.5 dB	+0.21/−0.22 dB

HP 8593E Performance Verification Test Record (page 11 of 14)

Hewlett-Packard Company	
Model HP 8593E	**Report No.** ____________
Serial No. ____________	**Date** ____________

Test Description	Min.	Results Measured (TR Entry)	Max.	Measurement Uncertainty
40. Displayed Average Noise				
Frequency				
400 kHz		(1) ________	−112 dBm	+1.15/−1.25 dB
1 MHz		(2) ________	−112 dBm	+1.15/−1.25 dB
1 MHz to 2.9 GHz		(3) ________	−112 dBm	+1.15/−1.25 dB
2.75 to 6.4 GHz		(4) ________	−114 dBm	+1.15/−1.25 dB
6.0 to 12.8 GHz		(5) ________	−102 dBm	+1.15/−1.25 dB
12.4 to 19.4 GHz		(6) ________	−98 dBm	+1.15/−1.25 dB
19.1 to 22 GHz		(7) ________	−92 dBm	+1.15/−1.25 dB
Option 026 or 027 only:				
19.1 to 26.5 GHz		(8) ________	−87 dBm	+1.15/−1.25 dB
45. Displayed Average Noise for Option 130				
Frequency				
400 kHz		(1) ________	−127 dBm	+1.15/−1.25 dB
1 MHz		(2) ________	−127 dBm	+1.15/−1.25 dB
1 MHz to 2.9 GHz		(3) ________	−127 dBm	+1.15/−1.25 dB
2.75 to 6.4 GHz		(4) ________	−129 dBm	+1.15/−1.25 dB
6.0 to 12.8 GHz		(5) ________	−117 dBm	+1.15/−1.25 dB
12.4 to 19.4 GHz		(6) ________	−113 dBm	+1.15/−1.25 dB
19.1 to 22 GHz		(7) ________	−107 dBm	+1.15/−1.25 dB
Option 026 or 027 only:				
19.1 to 26.5 GHz		(8) ________	−102 dBm	+1.15/−1.25 dB
50. Residual Responses				
150 kHz to 6.4 GHz		(1) ________	−90 dBm	+1.09/−1.15 dB
56. Residual Responses for Option 130				
150 kHz to 6.4 GHz		(1) ________	−90 dBm	+1.09/−1.15 dB
58. Fast Time Domain Sweeps				
Option 101 only:				
Amplitude Resolution	0.933X	________	1.007X	0%
SWEEP TIME				
18 ms	14.04 ms	(1) ________	14.76 ms	±0.5%
10 ms	7.80 ms	(2) ________	8.20 ms	±0.5%
1.0 ms	780 μs	(3) ________	820 μs	±0.5%
100 μs	78 μs	(4) ________	82 μs	±0.5%
20 μs	15.6 μs	(5) ________	16.4 μs	±0.5%

HP 8593E Performance Verification Test Record (page 12 of 14)

Hewlett-Packard Company	
Model HP 8593E	**Report No.** ______________
Serial No. ______________	**Date** ______________

Test Description	Results Measured Min.	(TR Entry)	Max.	Measurement Uncertainty
60. Absolute Amplitude Accuracy				
Option 010 only:				
Absolute Amplitude Accuracy	−20.75 dBm	(1) ______	−19.25 dBm	+.155/−.161 dB
Positive Vernier Accuracy		(2) ______	+0.50 dB	±0.03 dB
Negative Vernier Accuracy	−0.50 dB	(3) ______		±0.03 dB
Positive Step-to-Step Accuracy		(4) ______	+1.20 dB	±0.03 dB
Negative Step-to-Step Accuracy	−0.80 dB	(5) ______		±0.03 dB
61. Power Sweep Range				
Option 010 only:				
Start Power Level		(1) ______		
Stop Power Level		(2) ______		
Power Sweep Range	9.0 dB	(3) ______		±0.03 dB
63. Tracking Generator Level Flatness				
Option 010 only:				
Maximum Flatness				
9 kHz to 100 kHz		(1) ______	+2.0 dB	+0.42/−0.45 dB
100 kHz to 2900 MHz		(2) ______	+2.0 dB	+0.42/−0.45 dB
Minimum Flatness				
9 kHz to 100 kHz	−2.0 dB	(3) ______		+0.42/−0.45 dB
100 kHz to 2900 MHz	−2.0 dB	(4) ______		+0.42/−0.45 dB
65. Harmonic Spurious Outputs				
Option 010 only:				
2nd Harmonic Level, 9 kHz		(1) ______	−15 dBc	+1.55/−1.80 dB
2nd Harmonic Level, 25 kHz to 900 MHz		(2) ______	−25 dBc	+1.55/−1.80 dB
2nd Harmonic Level, 1.4 GHz		(3) ______	−25 dBc	+3.45/−4.01 dB
3rd Harmonic Level, 9 kHz		(4) ______	−15 dBc	+1.55/−1.80 dB
3rd Harmonic Level, 25 kHz to 900 MHz		(5) ______	−25 dBc	+1.55/−1.80 dB
67. Non-Harmonic Spurious Outputs				
Option 010 only:				
Highest Non-Harmonic Response Amplitude				
9 kHz to 2000 MHz		(1) ______	−27 dBc	+1.55/−1.80 dB
2000 MHz to 2900 MHz		(2) ______	−23 dBc	+3.45/−4.01 dB
70. Tracking Generator Feedthrough				
Option 010 only:				
400 kHz to 2.9 GHz		(1) ______	−112 dBm	+1.59/−1.70 dB

HP 8593E Performance Verification Test Record (page 13 of 14)

Hewlett-Packard Company Model HP 8593E Serial No. ______	Report No. ______ Date ______

Test Description	Results Measured Min.	(TR Entry)	Max.	Measurement Uncertainty
71. Tracking Generator LO Feedthrough Amplitude				
Option 010 only:				
9 kHz to 1.5 GHz		(1) ______	−16 dBm	±2.02/−2.50 dB
2.9 GHz		(2) ______	−16 dBm	±2.10/−2.67 dB
72. CISPR Pulse Response				
Options 103 only:	Amplitude Error			
Measured Amplitude				
9 kHz EMI BW	−1.5 dB	(1) ______	+1.5 dB	±0.34 dB
120 kHz EMI BW	−1.5 dB	(2) ______	+1.5 dB	±0.50 dB
Options 103 and 130 only:				
200 Hz EMI BW	−1.5 dB	(3) ______	+1.5 dB	±0.34 dB
Options 103 only:				
Relative Level, 9 kHz EMI BW				
Repetition Frequency				
1000	+5.5 dB	(4) ______	+3.5 dB	±0.17 dB
100	0 (Ref)	(5) ______	0 (Ref)	0 (Ref)
20	−5.5 dB	(6) ______	−7.5 dB	±0.27 dB
10	−8.5 dB	(7) ______	−11.5 dB	±0.25 dB
2	−18.5 dB	(8) ______	−22.5 dB	±0.23 dB
1	−20.5 dB	(9) ______	−24.5 dB	±0.19 dB
Isolated Pulse	−21.5 dB	(10) ______	−25.5 dB	±0.15 dB
Relative Level, 120 kHz EMI BW				
Repetition Frequency				
1000	+9.0 dB	(11) ______	+7.0 dB	±0.17 dB
100	0 (Ref)	(12) ______	0 (Ref)	0 (Ref)
20	−8.0 dB	(13) ______	−10.0 dB	±0.18 dB
10	−12.5 dB	(14) ______	−15.5 dB	±0.18 dB
2	−24.0 dB	(15) ______	−28.0 dB	±0.18 dB
1	−26.5 dB	(16) ______	−30.5 dB	±0.18 dB
Isolated Pulse	−29.5 dB	(17) ______	−33.5 dB	±0.17 dB
Options 103 and 130 only:	Amplitude Error			
Relative Level, Band A				
Repetition Frequency				
100	3.0 dB	(18) ______	+5.0 dB	±0.24 dB
60	2.0 dB	(19) ______	5.0 dB	±0.26 dB
25	0 (Ref)	(20) ______	0 (Ref)	0 (Ref)
10	−3.0 dB	(21) ______	−5.0 dB	±0.29 dB
5	−6.0 dB	(22) ______	−9.0 dB	±0.30 dB
2	−11.0 dB	(23) ______	−15.0 dB	±0.36 dB
1	−20.5 dB	(24) ______	−24.5 dB	±0.28 dB
Isolated Pulse	−21.5 dB	(25) ______	−25.5 dB	±0.20 dB

HP 8593E Performance Verification Test Record (page 14 of 14)

Hewlett-Packard Company **Model HP 8593E** **Serial No.** ______________	**Report No.** ______________ **Date** ______________

Test Description	Results Measured Min.	(TR Entry)	Max.	Measurement Uncertainty
73. Gate Delay Accuracy and Gate Length Accuracy				
Option 105 only:				
Minimum Gate Delay	0.0 μs	(1) ______	2.0 μs	±0.011 μs
Maximum Gate Delay	0.0 μs	(2) ______	2.0 μs	±0.011 μs
1 μs Gate Length	0.8 μs	(3) ______	1.2 μs	±0.434 μs
65 ms Gate Length	64.99 μs	(4) ______	65.01 μs	±0.434 μs
74. Gate Card Insertion Loss				
Option 105 only:				
Gate Card Insertion Loss	−0.3 dB	(1) ______	+0.3 dB	±0.092 dB
75. TV Receiver, Video Tester				
Differential Gain				
Channel 2		(1) ______	6%	1.5%
7		(2) ______	6%	1.5%
14		(3) ______	6%	1.5%
33		(4) ______	6%	1.5%
38		(5) ______	6%	1.5%
77		(6) ______	6%	1.5%
Differential Phase				
Channel 2		(1) ______	4°	1°
7		(2) ______	4°	1°
14		(3) ______	4°	1°
33		(4) ______	4°	1°
38		(5) ______	4°	1°
77		(6) ______	4°	1°
Chroma-Luminance Delay				
Channel 2	−45 ns	(1) ______	45 ns	±5.1 ns
7	−45 ns	(2) ______	45 ns	±5.1 ns
14	−45 ns	(3) ______	45 ns	±5.1 ns
33	−45 ns	(4) ______	45 ns	±5.1 ns
38	−45 ns	(5) ______	45 ns	±5.1 ns
77	−45 ns	(6) ______	45 ns	±5.1 ns

HP 8594E Performance Test Record

Only the tests for HP 8594E are included in this test record, therefore not all test numbers are included.

Table 3-44. HP 8594E Performance Verification Test Record

Hewlett-Packard Company

Address: ______________________ Report No. ______________________

____

______________________ Date ______________________

______________________ (e.g. 10 SEP 1989)

Model HP 8594E

Serial No. ______________________

Options ______________________

Firmware Revision ______________________

Customer ______________________ Tested by ______________________

Ambient temperature __________ °C Relative humidity __________ %

Power mains line frequency __________ Hz (nominal)

Test Equipment Used:

Description	Model No.	Trace No.	Cal Due Date
Frequency Counter			
Frequency Standard			
Low Pass Filter, 50 MHz			
Low Pass Filter, 300 MHz			
Measuring Receiver			
Microwave Frequency Counter			
Microwave Spectrum Analyzer (Option 010)			
Power Meter			
Power Sensor			
Power Sensor			
Power Splitter			
Pulse Generator (Option 103)			
Signal Generator			
Synthesized Sweeper			
Synthesizer/Function Generator			
Synthesizer/Level Generator			
Termination, 50 Ω			

Notes/Comments:

____

____

____

____

HP 8594E Performance Verification Test Record (page 2 of 12)

Hewlett-Packard Company Model HP 8594E Serial No. ________	Report No. ________ Date ________

Test Description	Results Measured Min.	(TR Entry)	Max.	Measurement Uncertainty
1. 10 MHz Reference Accuracy		Frequency Error		
Settability	−150 Hz	(1) ______	+150 Hz	$\pm 4.2 \times 10^{-9}$
2. 10 MHz Reference Accuracy for Option 004		Frequency Error		
5 Minute Warmup Error	-1×10^{-7}	(1) ______	$+1 \times 10^{-7}$	$\pm 2.004 \times 10^{-9}$
30 Minute Warmup Error	-1×10^{-8}	(2) ______	$+1 \times 10^{-8}$	$\pm 2.002 \times 10^{-9}$
4. Frequency Readout Accuracy and Marker Count Accuracy				
Frequency Readout Accuracy		Frequency (MHz)		
Frequency = 1.5 GHz				
SPAN				
20 MHz	1.49918	(1) ______	1.50082	±1.0 Hz
10 MHz	1.49958	(2) ______	1.50042	±1.0 Hz
1 MHz	1.4999680	(3) ______	1.500032	±1.0 Hz
Option 130 only:				
20 kHz	1.49999924	(4) ______	1.50000076	±1.0 Hz
Frequency = 1.5 GHz				
SPAN				
(CNT RES = 100 Hz) 20 MHz	1.4999989	(5) ______	1.5000011	±1.0 Hz
(CNT RES = 10 Hz) 1 MHz	1.49999989	(6) ______	1.50000011	±1.0 Hz
Option 130 only:				
(CNT RES = 10 Hz) 20 kHz	1.49999989	(7) ______	1.50000011	±1.0 Hz
(CNT RES = 10 Hz) 2 kHz	1.49999989	(8) ______	1.50000011	±1.0 Hz
6. Noise Sidebands				
Suppression at 10 kHz		(1) ______	−60 dBc	±1.0 dB
Suppression at 20 kHz		(2) ______	−70 dBc	±1.0 dB
Suppression at 30 kHz		(3) ______	−75 dBc	±1.0 dB
7. System Related Sidebands				
Sideband Above Signal		(1) ______	−65 dBc	±1.0 dB
Sideband Below Signal		(2) ______	−65 dBc	±1.0 dB

HP 8594E Performance Verification Test Record (page 3 of 12)

Hewlett-Packard Company Model HP 8594E Serial No. ______	Report No. ______ Date ______

Test Description	Results Measured Min.	Results Measured (TR Entry)	Results Measured Max.	Measurement Uncertainty
9. Frequency Span Readout Accuracy				
SPAN		MKRΔ Reading		
1800 MHz	1446.00 MHz	(1) ______	1554.00 MHz	±6.37 MHz
10.10 MHz	7.70 MHz	(2) ______	8.30 MHz	±35.4 kHz
10.00 MHz	7.80 MHz	(3) ______	8.20 MHz	±35.4 kHz
100.00 kHz	78.00 kHz	(4) ______	82.00 kHz	±354 Hz
99.00 kHz	78.00 kHz	(5) ______	82.00 kHz	±354 Hz
10.00 kHz	7.80 kHz	(6) ______	8.20 kHz	±3.54 Hz
Option 130 only:				
1.00 kHz	780 Hz	(7) ______	820 Hz	±3.54 Hz
11. Residual FM				
		(1) ______	250 Hz	±45.8 Hz
Option 130 only:		(2) ______	30 Hz	±3.5 Hz
12. Sweep Time Accuracy				
SWEEP TIME		MKRΔ Reading		
20 ms	15.4 ms	(1) ______	16.6 ms	±0.057 ms
100 ms	77.0 ms	(2) ______	83.0 ms	±0.283 ms
1 s	770.0 ms	(3) ______	830.0 ms	±2.83 ms
10 s	7.7 s	(4) ______	8.3 s	±23.8 ms
13. Scale Fidelity				
Log Mode		Cumulative Error		
dB from Ref Level				
0	0 (Ref)	0 (Ref)	0 (Ref)	
−4	−4.34 dB	(1) ______	+3.66 dB	±0.06 dB
−8	−8.38 dB	(2) ______	−7.62 dB	±0.06 dB
−12	−12.42 dB	(3) ______	−11.58 dB	±0.06 dB
−16	−16.46 dB	(4) ______	−15.54 dB	±0.06 dB
−20	−20.50 dB	(5) ______	−19.50 dB	±0.06 dB
−24	−24.54 dB	(6) ______	−23.46 dB	±0.06 dB
−28	−28.58 dB	(7) ______	−27.42 dB	±0.06 dB
−32	−32.62 dB	(8) ______	−31.38 dB	±0.06 dB
−36	−36.66 dB	(9) ______	−35.34 dB	±0.06 dB
−40	−40.70 dB	(10) ______	−39.30 dB	±0.06 dB
−44	−44.74 dB	(11) ______	−43.26 dB	±0.06 dB
−48	−48.78 dB	(12) ______	−47.22 dB	±0.06 dB
−52	−52.82 dB	(13) ______	−51.18 dB	±0.06 dB
−56	−56.86 dB	(14) ______	−55.14 dB	±0.06 dB
−60	−60.90 dB	(15) ______	−59.10 dB	±0.11 dB
−64	−64.94 dB	(16) ______	−63.06 dB	±0.11 dB
−68	−68.98 dB	(17) ______	−67.02 dB	±0.11 dB

HP 8594E Performance Verification Test Record (page 4 of 12)

Hewlett-Packard Company Model HP 8594E Serial No. ______	Report No. ______ Date ______

Test Description	Results Measured Min.	(TR Entry)	Max.	Measurement Uncertainty
13. Scale Fidelity (continued)				
Log Mode		Incremental Error		
dB from Ref Level				
0	0 (Ref)	0 (Ref)	0 (Ref)	
−4	−0.4 dB	**(18)** ______	+0.4 dB	±0.06 dB
−8	−0.4 dB	**(19)** ______	+0.4 dB	±0.06 dB
−12	−0.4 dB	**(20)** ______	+0.4 dB	±0.06 dB
−16	−0.4 dB	**(21)** ______	+0.4 dB	±0.06 dB
−20	−0.4 dB	**(22)** ______	+0.4 dB	±0.06 dB
−24	−0.4 dB	**(23)** ______	+0.4 dB	±0.06 dB
−28	−0.4 dB	**(24)** ______	+0.4 dB	±0.06 dB
−32	−0.4 dB	**(25)** ______	+0.4 dB	±0.06 dB
−36	−0.4 dB	**(26)** ______	+0.4 dB	±0.06 dB
−40	−0.4 dB	**(27)** ______	+0.4 dB	±0.06 dB
−44	−0.4 dB	**(28)** ______	+0.4 dB	±0.06 dB
−48	−0.4 dB	**(29)** ______	+0.4 dB	±0.06 dB
−52	−0.4 dB	**(30)** ______	+0.4 dB	±0.06 dB
−56	−0.4 dB	**(31)** ______	+0.4 dB	±0.06 dB
−60	−0.4 dB	**(32)** ______	+0.4 dB	±0.11 dB
Option 130 only:				
Log Mode		Cumulative Error		
dB from Ref Level				
0	0 (Ref)	0 (Ref)	0 (Ref)	
−4	−4.44 dB	**(33)** ______	+3.56 dB	±0.06 dB
−8	−8.48 dB	**(34)** ______	−7.52 dB	±0.06 dB
−12	−12.52 dB	**(35)** ______	−11.48 dB	±0.06 dB
−16	−16.56 dB	**(36)** ______	−15.44 dB	±0.06 dB
−20	−20.60 dB	**(37)** ______	−19.40 dB	±0.06 dB
−24	−24.64 dB	**(38)** ______	−23.36 dB	±0.06 dB
−28	−28.68 dB	**(39)** ______	−27.32 dB	±0.06 dB
−32	−32.72 dB	**(40)** ______	−31.28 dB	±0.06 dB
−36	−36.76 dB	**(41)** ______	−35.24 dB	±0.06 dB
−40	−40.80 dB	**(42)** ______	−39.20 dB	±0.06 dB
−44	−44.84 dB	**(43)** ______	−43.16 dB	±0.06 dB
−48	−48.88 dB	**(44)** ______	−47.12 dB	±0.06 dB
−52	−52.92 dB	**(45)** ______	−51.08 dB	±0.06 dB
−56	−56.96 dB	**(46)** ______	−55.04 dB	±0.06 dB
−60	−61.00 dB	**(47)** ______	−59.00 dB	±0.11 dB
−64	−65.04 dB	**(48)** ______	−62.96 dB	±0.11 dB
−68	−69.08 dB	**(49)** ______	−66.92 dB	±0.11 dB

HP 8594E Performance Verification Test Record (page 5 of 12)

Hewlett-Packard Company	
Model HP 8594E	**Report No.** ______
Serial No. ______	**Date** ______

Test Description	Min.	Results Measured (TR Entry)	Max.	Measurement Uncertainty
13. Scale Fidelity (continued)				
Option 130 only:				
Log Mode		Incremental Error		
dB from Ref Level				
0	0 (Ref)	0 (Ref)	0 (Ref)	
−4	−0.4 dB	**(50)** ______	+0.4 dB	±0.06 dB
−8	−0.4 dB	**(51)** ______	+0.4 dB	±0.06 dB
−12	−0.4 dB	**(52)** ______	+0.4 dB	±0.06 dB
−16	−0.4 dB	**(53)** ______	+0.4 dB	±0.06 dB
−20	−0.4 dB	**(54)** ______	+0.4 dB	±0.06 dB
−24	−0.4 dB	**(55)** ______	+0.4 dB	±0.06 dB
−28	−0.4 dB	**(56)** ______	+0.4 dB	±0.06 dB
−32	−0.4 dB	**(57)** ______	+0.4 dB	±0.06 dB
−36	−0.4 dB	**(58)** ______	+0.4 dB	±0.06 dB
−40	−0.4 dB	**(59)** ______	+0.4 dB	±0.06 dB
−44	−0.4 dB	**(60)** ______	+0.4 dB	±0.06 dB
−48	−0.4 dB	**(61)** ______	+0.4 dB	±0.06 dB
−52	−0.4 dB	**(62)** ______	+0.4 dB	±0.06 dB
−56	−0.4 dB	**(63)** ______	+0.4 dB	±0.06 dB
−60	−0.4 dB	**(64)** ______	+0.4 dB	±0.11 dB
Linear Mode				
% of Ref Level				
100.00	0 (Ref)	0 (Ref)	0 (Ref)	
70.70	151.59 mV	**(65)** ______	165.01 mV	±1.84 mV
50.00	105.36 mV	**(66)** ______	118.78 mV	±1.84 mV
35.48	72.63 mV	**(67)** ______	86.05 mV	±1.84 mV
25.00	49.46 mV	**(68)** ______	82.88 mV	±1.84 mV
Option 130 only:				
% of Ref Level				
100.00	0 (Ref)	0 (Ref)	0 (Ref)	
70.70	151.59 mV	**(69)** ______	165.01 mV	±1.84 mV
50.00	105.36 mV	**(70)** ______	118.78 mV	±1.84 mV
35.48	72.63 mV	**(71)** ______	86.05 mV	±1.84 mV
25.00	49.46 mV	**(72)** ______	82.88 mV	±1.84 mV
Log-to-Linear Switching				
	−0.25 dB	**(73)** ______	+0.25 dB	±0.05 dB
Option 130 only:				
	−0.25 dB	**(74)** ______	+0.25 dB	±0.05 dB

HP 8594E Performance Verification Test Record (page 6 of 12)

Hewlett-Packard Company Model HP 8594E Serial No. ______	Report No. ______ Date ______

Test Description	Results Measured Min.	(TR Entry)	Max.	Measurement Uncertainty
15. Reference Level Accuracy				
Log Mode				
Reference Level (dBm)				
−20	0 (Ref)	0 (Ref)	0 (Ref)	
−10	−0.40 dB	(1) ______	+0.40 dB	±0.06 dB
0	−0.50 dB	(2) ______	+0.50 dB	±0.06 dB
−30	−0.40 dB	(3) ______	+0.40 dB	±0.06 dB
−40	−0.50 dB	(4) ______	+0.50 dB	±0.08 dB
−50	−0.80 dB	(5) ______	+0.80 dB	±0.08 dB
−60	−1.00 dB	(6) ______	+1.00 dB	±0.12 dB
−70	−1.10 dB	(7) ______	+1.10 dB	±0.12 dB
−80	−1.20 dB	(8) ______	+1.20 dB	±0.12 dB
−90	−1.30 dB	(9) ______	+1.30 dB	±0.12 dB
Linear Mode				
Reference Level (dBm)				
−20	0 (Ref)	0 (Ref)	0 (Ref)	
−10	−0.40 dB	(10) ______	+0.40 dB	±0.06 dB
0	−0.50 dB	(11) ______	+0.50 dB	±0.06 dB
−30	−0.40 dB	(12) ______	+0.40 dB	±0.06 dB
−40	−0.50 dB	(13) ______	+0.50 dB	±0.08 dB
−50	−0.80 dB	(14) ______	+0.80 dB	±0.08 dB
−60	−1.00 dB	(15) ______	+1.00 dB	±0.12 dB
−70	−1.10 dB	(16) ______	+1.10 dB	±0.12 dB
−80	−1.20 dB	(17) ______	+1.20 dB	±0.12 dB
−90	−1.30 dB	(18) ______	+1.30 dB	±0.12 dB
Option 130 only:				
Log Mode				
Reference Level (dBm)				
−20	0 (Ref)	0 (Ref)	0 (Ref)	
−10	−0.40 dB	(19) ______	+0.40 dB	±0.06 dB
0	−0.50 dB	(20) ______	+0.50 dB	±0.06 dB
−30	−0.50 dB	(21) ______	+0.50 dB	±0.06 dB
−40	−0.50 dB	(22) ______	+0.50 dB	±0.08 dB
−50	−0.80 dB	(23) ______	+0.80 dB	±0.08 dB
−60	−1.20 dB	(24) ______	+1.10 dB	±0.12 dB
−70	−1.20 dB	(25) ______	+1.20 dB	±0.12 dB
−80	−1.30 dB	(26) ______	+1.30 dB	±0.12 dB
−90	−1.40 dB	(27) ______	+1.40 dB	±0.12 dB

HP 8594E Performance Verification Test Record (page 7 of 12)

Hewlett-Packard Company Model HP 8594E Serial No. ____________	Report No. ____________ Date ____________

Test Description	Results Measured Min.	(TR Entry)	Max.	Measurement Uncertainty
15. Reference Level Accuracy (continued)				
Option 130 only:				
Linear Mode				
Reference Level (dBm)				
−20	0 (Ref)	0 (Ref)	0 (Ref)	
−10	−0.40 dB	**(28)** ____________	+0.40 dB	±0.06 dB
0	−0.50 dB	**(29)** ____________	+0.50 dB	±0.06 dB
−30	−0.50 dB	**(30)** ____________	+0.50 dB	±0.06 dB
−40	−0.50 dB	**(31)** ____________	+0.50 dB	±0.08 dB
−50	−0.80 dB	**(32)** ____________	+0.80 dB	±0.08 dB
−60	−1.20 dB	**(33)** ____________	+1.10 dB	±0.12 dB
−70	−1.20 dB	**(34)** ____________	+1.20 dB	±0.12 dB
−80	−1.30 dB	**(35)** ____________	+1.30 dB	±0.12 dB
−90	−1.40 dB	**(36)** ____________	+1.40 dB	±0.12 dB
16. Absolute Amplitude Calibration and Resolution Bandwidth Switching Uncertainties				
Absolute Amplitude Uncertainty	−20.15 dB	**(1)** ____________	−19.85 dB	N/A
Resolution Bandwidth Switching Uncertainty				
Resolution Bandwidth				
3 kHz	0 (Ref)	0 (Ref)	0 (Ref)	
1 kHz	−0.5 dB	**(2)** ____________	+0.5 dB	+0.07/−0.08 dB
9 kHz	−0.4 dB	**(3)** ____________	+0.4 dB	+0.07/−0.08 dB
10 kHz	−0.4 dB	**(4)** ____________	+0.4 dB	+0.07/−0.08 dB
30 kHz	−0.4 dB	**(5)** ____________	+0.4 dB	+0.07/−0.08 dB
100 kHz	−0.4 dB	**(6)** ____________	+0.4 dB	+0.07/−0.08 dB
120 kHz	−0.4 dB	**(7)** ____________	+0.4 dB	+0.07/−0.08 dB
300 kHz	−0.4 dB	**(8)** ____________	+0.4 dB	+0.07/−0.08 dB
1 MHz	−0.4 dB	**(9)** ____________	+0.4 dB	+0.07/−0.08 dB
3 MHz	−0.4 dB	**(10)** ____________	+0.4 dB	+0.07/−0.08 dB
Option 130 only:				
3 kHz	0 (Ref)	0 (Ref)	0 (Ref)	
300 Hz	−0.6 dB	**(11)** ____________	+0.6 dB	+0.07/−0.08 dB
200 Hz	−0.6 dB	**(12)** ____________	+0.6 dB	+0.07/−0.08 dB
100 Hz	−0.6 dB	**(13)** ____________	+0.6 dB	+0.07/−0.08 dB
30 Hz	−0.6 dB	**(14)** ____________	+0.6 dB	+0.07/−0.08 dB

HP 8594E Performance Verification Test Record (page 8 of 12)

Hewlett-Packard Company Model HP 8594E Serial No. ______	Report No. ______ Date ______

Test Description	Results Measured Min.	(TR Entry)	Max.	Measurement Uncertainty
17. Resolution Bandwidth Accuracy				
3 dB Resolution Bandwidth				
3 MHz	2.4 MHz	(1) ______	3.6 MHz	±138 kHz
1 MHz	0.8 MHz	(2) ______	1.2 MHz	±46 kHz
300 kHz	240 kHz	(3) ______	360 kHz	±13.8 kHz
100 kHz	80 kHz	(4) ______	120 kHz	±4.6 kHz
30 kHz	24 kHz	(5) ______	36 kHz	±1.38 kHz
10 kHz	8 kHz	(6) ______	12 kHz	±460 Hz
3 kHz	2.4 kHz	(7) ______	3.6 kHz	±138 Hz
1 kHz	0.8 kHz	(8) ______	1.2 kHz	±46 Hz
6 dB EMI Bandwidth				
9 kHz	7.2 kHz	(9) ______	10.8 kHz	±333 Hz
120 kHz	96 kHz	(10) ______	144 kHz	±4.44 kHz
Option 130 only:				
3 dB Resolution Bandwidth				
300 Hz	240 Hz	(11) ______	360 Hz	±36 Hz
100 Hz	80 Hz	(12) ______	120 Hz	±12 Hz
30 Hz	24 Hz	(13) ______	36 Hz	±3.9 Hz
6 dB EMI Bandwidth				
200 Hz	160 Hz	(14) ______	240 Hz	±24 Hz
18. Calibrator Amplitude Accuracy	−20.4 dBm	(1) ______	−19.6 dBm	±0.2 dB
21. Frequency Response				
Max Positive Response		(1) ______	+1.5 dB	+0.32/−0.33 dB
Max Negative Response	−1.5 dB	(2) ______		+0.32/−0.33 dB
Peak-to-Peak Response		(3) ______	2.0 dB	+0.32/−0.33 dB
26. Other Input Related Spurious Responses				
50 kHz to 2.9 GHz		(1) ______	−55 dBc	+1.12/−1.21 dB
31. Spurious Responses				
Second Harmonic Distortion		(1) ______	−55 dBc	=1.12/−1.21 dB
Third Order Intermodulation Distortion			*(Step 23c)*	
Frequency				
2.8 GHz		(2) ______	−54 dBc	+2.07/−2.42 dB

HP 8594E Performance Verification Test Record (page 9 of 12)

Hewlett-Packard Company Model HP 8594E Serial No. ______________	Report No. ______________ Date ______________

Test Description	Results Measured			Measurement
	Min.	(TR Entry)	Max.	Uncertainty
36. Gain Compression				
<2.9 GHz		(1) ______	0.5 dB	+0.21/−0.22 dB
Option 130 only:		(3) ______	0.5 dB	+0.21/−0.22 dB
41. Displayed Average Noise				
Frequency				
400 kHz		(1) ______	−107 dBm	+1.15/−1.25 dB
4 MHz		(2) ______	−107 dBm	+1.15/−1.25 dB
5 MHz to 2.9 GHz		(3) ______	−112 dBm	+1.15/−1.25 dB
46. Displayed Average Noise for Option 130				
Frequency				
400 kHz		(1) ______	−122 dBm	+1.15/−1.25 dB
4 MHz		(2) ______	−122 dBm	+1.15/−1.25 dB
5 MHz to 2.9 GHz		(3) ______	−127 dBm	+1.15/−1.25 dB
51. Residual Responses				
150 kHz to 2.9 GHz		(1) ______	−90 dBm	+1.09/−1.15 dB
55. Residual Responses for Option 130				
150 kHz to 2.9 GHz		(1) ______	−90 dBm	+1.09/−1.15 dB
58. Fast Time Domain Sweeps				
Option 101 only:				
Amplitude Resolution	0.933X	(1) ______	1.007X	0%
SWEEP TIME				
18 ms	14.04 ms	(2) ______	14.76 ms	±0.5%
10 ms	7.80 ms	(3) ______	8.20 ms	±0.5%
1.0 ms	780 μs	(4) ______	820 μs	±0.5%
100 μs	78 μs	(5) ______	82 μs	±0.5%
20 μs	15.6 μs	(6) ______	16.4 μs	±0.5%
60. Absolute Amplitude Accuracy				
Option 010 only:				
Absolute Amplitude Accuracy	−20.75 dBm	(1) ______	−19.25 dBm	+.155/−.161 dB
Positive Vernier Accuracy		(2) ______	+0.50 dB	±0.03 dB
Negative Vernier Accuracy	−0.50 dB	(3) ______		±0.03 dB
Positive Step-to-Step Accuracy		(4) ______	+1.20 dB	±0.03 dB
Negative Step-to-Step Accuracy	−0.80 dB	(5) ______		±0.03 dB

HP 8594E Performance Verification Test Record (page 10 of 12)

Hewlett-Packard Company **Model HP 8594E** **Serial No.** ______	**Report No.** ______ **Date** ______

Test Description	Results Measured Min.	(TR Entry)	Max.	Measurement Uncertainty
61. Power Sweep Range				
Option 010 only:				
Start Power Level		(1) ______		
Stop Power Level		(2) ______		
Power Sweep Range	9.0 dB	(3) ______		±0.03 dB
63. Tracking Generator Level Flatness				
Option 010 only:				
Maximum Flatness				
9 kHz to 100 kHz		(1) ______	+2.0 dB	+0.42/−0.45 dB
100 kHz to 2900 MHz		(2) ______	+2.0 dB	+0.42/−0.45 dB
Minimum Flatness				
9 kHz to 100 kHz	−2.0 dB	(3) ______		+0.42/−0.45 dB
100 kHz to 2900 MHz	−2.0 dB	(4) ______		+0.42/−0.45 dB
65. Harmonic Spurious Outputs				
Option 010 only:				
2nd Harmonic Level, 9 kHz		(1) ______	−15 dBc	+1.55/−1.80 dB
2nd Harmonic Level, 25 kHz to 900 MHz		(2) ______	−25 dBc	+1.55/−1.80 dB
2nd Harmonic Level, 1.4 GHz		(3) ______	−25 dBc	+3.45/−4.01 dB
3rd Harmonic Level, 9 kHz		(4) ______	−15 dBc	+1.55/−1.80 dB
3rd Harmonic Level, 25 kHz to 900 MHz		(5) ______	−25 dBc	+1.55/−1.80 dB
67. Non-Harmonic Spurious Outputs				
Option 010 only:				
Highest Non-Harmonic Response Amplitude				
9 kHz to 2000 MHz		(1) ______	−27 dBc	+1.55/−1.80 dB
2000 MHz to 2900 MHz		(2) ______	−23 dBc	+3.45/−4.01 dB
70. Tracking Generator Feedthrough				
Option 010 only:				
400 kHz to 2.9 GHz		(1) ______	−112 dBm	+1.59/−1.70 dB
69. Tracking Generator Feedthrough				
Option 010 only:				
400 kHz to 5 MHz		(1) ______	−107 dBm	+1.59/−1.70 dB
5 MHz to 2.9 GHz		(2) ______	−112 dBm	+1.59/−1.70 dB
71. Tracking Generator LO Feedthrough Amplitude				
Option 010 only:				
9 kHz to 1.5 GHz		(1) ______	−16 dBm	±2.02/−2.50 dB
2.9 GHz		(2) ______	−16 dBm	±2.10/−2.67 dB

HP 8594E Performance Verification Test Record (page 11 of 12)

Hewlett-Packard Company **Model HP 8594E** **Serial No.** ______________	**Report No.** ______________ **Date** ______________

Test Description	Min.	Results Measured (TR Entry)	Max.	Measurement Uncertainty
72. CISPR Pulse Response				
Options 103 only:		Amplitude Error		
Measured Amplitude				
9 kHz EMI BW	−1.5 dB	(1) ______	+1.5 dB	±0.34 dB
120 kHz EMI BW	−1.5 dB	(2) ______	+1.5 dB	±0.50 dB
Options 103 and 130 only:				
200 Hz EMI BW	−1.5 dB	(3) ______	+1.5 dB	±0.34 dB
Options 103 only:				
Relative Level, 9 kHz EMI BW				
Repetition Frequency				
1000	+5.5 dB	(4) ______	+3.5 dB	±0.17 dB
100	0 (Ref)	(5) ______	0 (Ref)	0 (Ref)
20	−5.5 dB	(6) ______	−7.5 dB	±0.27 dB
10	−8.5 dB	(7) ______	−11.5 dB	±0.25 dB
2	−18.5 dB	(8) ______	−22.5 dB	±0.23 dB
1	−20.5 dB	(9) ______	−24.5 dB	±0.19 dB
Isolated Pulse	−21.5 dB	(10) ______	−25.5 dB	±0.15 dB
Relative Level, 120 kHz EMI BW				
Repetition Frequency				
1000	+9.0 dB	(11) ______	+7.0 dB	±0.17 dB
100	0 (Ref)	(12) ______	0 (Ref)	0 (Ref)
20	−8.0 dB	(13) ______	−10.0 dB	±0.18 dB
10	−12.5 dB	(14) ______	−15.5 dB	±0.18 dB
2	−24.0 dB	(15) ______	−28.0 dB	±0.18 dB
1	−26.5 dB	(16) ______	−30.5 dB	±0.18 dB
Isolated Pulse	−29.5 dB	(17) ______	−33.5 dB	±0.17 dB
Options 103 and 130 only:		Amplitude Error		
Relative Level, Band A				
Repetition Frequency				
100	3.0 dB	(18) ______	+5.0 dB	±0.24 dB
60	2.0 dB	(19) ______	5.0 dB	±0.26 dB
25	0 (Ref)	(20) ______	0 (Ref)	0 (Ref)
10	−3.0 dB	(21) ______	−5.0 dB	±0.29 dB
5	−6.0 dB	(22) ______	−9.0 dB	±0.30 dB
2	−11.0 dB	(23) ______	−15.0 dB	±0.36 dB
1	−20.5 dB	(24) ______	−24.5 dB	±0.28 dB
Isolated Pulse	−21.5 dB	(25) ______	−25.5 dB	±0.20 dB

HP 8594E Performance Verification Test Record (page 12 of 12)

Hewlett-Packard Company Model HP 8594E Serial No. ______	Report No. ______ Date ______

Test Description	Min.	Results Measured (TR Entry)	Max.	Measurement Uncertainty
73. Gate Delay Accuracy and Gate Length Accuracy				
Option 105 only:				
Minimum Gate Delay	0.0 μs	(1) ______	2.0 μs	±0.011 μs
Maximum Gate Delay	0.0 μs	(2) ______	2.0 μs	±0.011 μs
1 μs Gate Length	0.8 μs	(3) ______	1.2 μs	±0.434 μs
65 ms Gate Length	64.99 μs	(4) ______	65.01 μs	±0.434 μs
74. Gate Card Insertion Loss				
Option 105 only:				
Gate Card Insertion Loss	−0.3	(1) ______	+0.3	±0.092 dB
75. TV Receiver, Video Tester				
Differential Gain				
Channel 2		(1) ______	6%	1.5%
7		(2) ______	6%	1.5%
14		(3) ______	6%	1.5%
33		(4) ______	6%	1.5%
38		(5) ______	6%	1.5%
77		(6) ______	6%	1.5%
Differential Phase				
Channel 2		(1) ______	4°	1°
7		(2) ______	4°	1°
14		(3) ______	4°	1°
33		(4) ______	4°	1°
38		(5) ______	4°	1°
77		(6) ______	4°	1°
Chroma-Luminance Delay				
Channel 2	−45 ns	(1) ______	45 ns	±5.1 ns
7	−45 ns	(2) ______	45 ns	±5.1 ns
14	−45 ns	(3) ______	45 ns	±5.1 ns
33	−45 ns	(4) ______	45 ns	±5.1 ns
38	−45 ns	(5) ______	45 ns	±5.1 ns
77	−45 ns	(6) ______	45 ns	±5.1 ns

HP 8595E Performance Test Record

Only the tests for HP 8595E are included in this test record, therefore not all test numbers are included.

Table 3-45. HP 8595E Performance Verification Test Record

Hewlett-Packard Company

Address: ____________________ Report No. ____________________

____

____________________ Date ____________________

____________________ (e.g. 10 SEP 1989)

Model HP 8595E

Serial No. ____________________

Options ____________________

Firmware Revision ____________________

Customer ____________________ Tested by ____________________

Ambient temperature __________ °C Relative humidity __________ %

Power mains line frequency __________ Hz (nominal)

Test Equipment Used:

Description	Model No.	Trace No.	Cal Due Date
Frequency Counter			
Frequency Standard			
Low Pass Filter, 50 MHz			
Low Pass Filter, 300 MHz			
Measuring Receiver			
Microwave Frequency Counter			
Microwave Spectrum Analyzer (Option 010)			
Power Meter			
Power Sensor			
Power Sensor			
Power Splitter			
Pulse Generator (Option 103)			
Signal Generator			
Synthesized Sweeper			
Synthesizer/Function Generator			
Synthesizer/Level Generator			
Termination, 50 Ω			

Notes/Comments:

____

____

____

____

HP 8595E Performance Verification Test Record (page 2 of 12)

Hewlett-Packard Company Model HP 8595E Serial No. ______	Report No. ______ Date ______

Test Description	Results Measured Min.	(TR Entry)	Max.	Measurement Uncertainty
1. 10 MHz Reference Accuracy		Frequency Error		
Settability	−150 Hz	(1) ______	+150 Hz	±4.2 x 10^{-9}
2. 10 MHz Reference Accuracy for Option 004		Frequency Error		
5 Minute Warmup Error	−1 x 10^{-7}	(1) ______	+1 x 10^{-7}	±2.004 x 10^{-9}
30 Minute Warmup Error	−1 x 10^{-8}	(2) ______	+1 x 10^{-8}	±2.002 x 10^{-9}
5. Frequency Readout Accuracy and Marker Count Accuracy				
Frequency Readout Accuracy		Frequency (MHz)		
Frequency = 1.5 GHz				
SPAN				
20 MHz	1.49918	(1) ______	1.50082	±1.0 Hz
10 MHz	1.49958	(2) ______	1.50042	±1.0 Hz
1 MHz	1.4999680	(3) ______	1.500032	±1.0 Hz
Frequency = 4.0 GHz				
SPAN				
20 MHz	3.99918	(4) ______	4.00082	±1.0 Hz
10 MHz	3.99958	(5) ______	4.00042	±1.0 Hz
1 MHz	3.9999680	(6) ______	4.000032	±1.0 Hz
Option 130 only:				
20 kHz	1.49999924	(16) ______	1.50000076	±1.0 Hz
Marker Count Accuracy				
Frequency = 1.5 GHz				
SPAN				
(CNT RES = 100 Hz) 20 MHz	1.4999989	(17) ______	1.5000011	±1 Hz
(CNT RES = 10 Hz) 1 MHz	1.49999989	(18) ______	1.50000011	±1 Hz
Frequency = 4.0 GHz				
SPAN				
(CNT RES = 100 Hz) 20 MHz	3.9999989	(19) ______	4.0000011	±1 Hz
(CNT RES = 10 Hz) 1 MHz	+4.99999989	(20) ______	4.00000011	±1 Hz
Option 130 only:				
(CNT RES = 10 Hz) 20 kHz	1.49999989	(27) ______	1.50000011	±1.0 Hz
(CNT RES = 10 Hz) 2 kHz	1.49999989	(28) ______	1.50000011	±1.0 Hz
6. Noise Sidebands				
Suppression at 10 kHz		(1) ______	−60 dBc	±1.0 dB
Suppression at 20 kHz		(2) ______	−70 dBc	±1.0 dB
Suppression at 30 kHz		(3) ______	−75 dBc	±1.0 dB
7. System Related Sidebands				
Sideband Above Signal		(1) ______	−65 dBc	±1.0 dB
Sideband Below Signal		(2) ______	−65 dBc	±1.0 dB

HP 8595E Performance Verification Test Record (page 3 of 12)

Hewlett-Packard Company	
Model HP 8595E	**Report No.** ________
Serial No. ________	**Date** ________

Test Description	Results Measured Min.	Results Measured (TR Entry)	Results Measured Max.	Measurement Uncertainty
9. Frequency Span Readout Accuracy				
SPAN		MKRΔ Reading		
1800 MHz	1446.00 MHz	(6-1) ________	1554.00 MHz	±6.37 MHz
10.10 MHz	7.70 MHz	(2) ________	8.30 MHz	±35.4 kHz
10.00 MHz	7.80 MHz	(3) ________	8.20 MHz	±35.4 kHz
100.00 kHz	78.00 kHz	(4) ________	82.00 kHz	±354 Hz
99.00 kHz	78.00 kHz	(5) ________	82.00 kHz	±354 Hz
10.00 kHz	7.80 kHz	(6) ________	8.20 kHz	±3.54 Hz
Option 130 only:				
1.00 kHz	780 Hz	(7) ________	820 Hz	±3.54 Hz
11. Residual FM				
		(1) ________	250 Hz	±45.8 Hz
Option 130 only:		(2) ________	30 Hz	±3.5 Hz
12. Sweep Time Accuracy				
SWEEP TIME		MKRΔ Reading		
20 ms	15.4 ms	(1) ________	16.6 ms	±0.057 ms
100 ms	77.0 ms	(2) ________	83.0 ms	±0.283 ms
1 s	770.0 ms	(3) ________	830.0 ms	±2.83 ms
10 s	7.7 s	(4) ________	8.3 s	±23.8 ms
13. Scale Fidelity				
Log Mode		Cumulative Error		
dB from Ref Level				
0	0 (Ref)	0 (Ref)	0 (Ref)	
−4	−4.34 dB	(1) ________	+3.66 dB	±0.06 dB
−8	−8.38 dB	(2) ________	−7.62 dB	±0.06 dB
−12	−12.42 dB	(3) ________	−11.58 dB	±0.06 dB
−16	−16.46 dB	(4) ________	−15.54 dB	±0.06 dB
−20	−20.50 dB	(5) ________	−19.50 dB	±0.06 dB
−24	−24.54 dB	(6) ________	−23.46 dB	±0.06 dB
−28	−28.58 dB	(7) ________	−27.42 dB	±0.06 dB
−32	−32.62 dB	(8) ________	−31.38 dB	±0.06 dB
−36	−36.66 dB	(9) ________	−35.34 dB	±0.06 dB
−40	−40.70 dB	(10) ________	−39.30 dB	±0.06 dB
−44	−44.74 dB	(11) ________	−43.26 dB	±0.06 dB
−48	−48.78 dB	(12) ________	−47.22 dB	±0.06 dB
−52	−52.82 dB	(13) ________	−51.18 dB	±0.06 dB
−56	−56.86 dB	(14) ________	−55.14 dB	±0.06 dB
−60	−60.90 dB	(15) ________	−59.10 dB	±0.11 dB
−64	−64.94 dB	(16) ________	−63.06 dB	±0.11 dB
−68	−68.98 dB	(17) ________	−67.02 dB	±0.11 dB

HP 8595E Performance Verification Test Record (page 4 of 12)

Hewlett-Packard Company Model HP 8595E Serial No. ______	Report No. ______ Date ______

Test Description	Results Measured Min.	(TR Entry)	Max.	Measurement Uncertainty
13. Scale Fidelity (continued)				
Log Mode		Incremental Error		
dB from Ref Level				
0	0 (Ref)	0 (Ref)	0 (Ref)	
−4	−0.4 dB	**(18)** ______	+0.4 dB	±0.06 dB
−8	−0.4 dB	**(19)** ______	+0.4 dB	±0.06 dB
−12	−0.4 dB	**(20)** ______	+0.4 dB	±0.06 dB
−16	−0.4 dB	**(21)** ______	+0.4 dB	±0.06 dB
−20	−0.4 dB	**(22)** ______	+0.4 dB	±0.06 dB
−24	−0.4 dB	**(23)** ______	+0.4 dB	±0.06 dB
−28	−0.4 dB	**(24)** ______	+0.4 dB	±0.06 dB
−32	−0.4 dB	**(25)** ______	+0.4 dB	±0.06 dB
−36	−0.4 dB	**(26)** ______	+0.4 dB	±0.06 dB
−40	−0.4 dB	**(27)** ______	+0.4 dB	±0.06 dB
−44	−0.4 dB	**(28)** ______	+0.4 dB	±0.06 dB
−48	−0.4 dB	**(29)** ______	+0.4 dB	±0.06 dB
−52	−0.4 dB	**(30)** ______	+0.4 dB	±0.06 dB
−56	−0.4 dB	**(31)** ______	+0.4 dB	±0.06 dB
−60	−0.4 dB	**(32)** ______	+0.4 dB	±0.11 dB
Option 130 only:				
Log Mode		Cumulative Error		
dB from Ref Level				
0	0 (Ref)	0 (Ref)	0 (Ref)	
−4	−4.44 dB	**(33)** ______	+3.56 dB	±0.06 dB
−8	−8.48 dB	**(34)** ______	−7.52 dB	±0.06 dB
−12	−12.52 dB	**(35)** ______	−11.48 dB	±0.06 dB
−16	−16.56 dB	**(36)** ______	−15.44 dB	±0.06 dB
−20	−20.60 dB	**(37)** ______	−19.40 dB	±0.06 dB
−24	−24.64 dB	**(38)** ______	−23.36 dB	±0.06 dB
−28	−28.68 dB	**(39)** ______	−27.32 dB	±0.06 dB
−32	−32.72 dB	**(40)** ______	−31.28 dB	±0.06 dB
−36	−36.76 dB	**(41)** ______	−35.24 dB	±0.06 dB
−40	−40.80 dB	**(42)** ______	−39.20 dB	±0.06 dB
−44	−44.84 dB	**(43)** ______	−43.16 dB	±0.06 dB
−48	−48.88 dB	**(44)** ______	−47.12 dB	±0.06 dB
−52	−52.92 dB	**(45)** ______	−51.08 dB	±0.06 dB
−56	−56.96 dB	**(46)** ______	−55.04 dB	±0.06 dB
−60	−61.00 dB	**(47)** ______	−59.00 dB	±0.11 dB
−64	−65.04 dB	**(48)** ______	−62.96 dB	±0.11 dB
−68	−69.08 dB	**(49)** ______	−66.92 dB	±0.11 dB

HP 8595E Performance Verification Test Record (page 5 of 12)

Hewlett-Packard Company	
Model HP 8595E	**Report No.** ____________
Serial No. ____________	**Date** ____________

Test Description	Results Measured Min.	(TR Entry)	Max.	Measurement Uncertainty
13. Scale Fidelity (continued)				
Option 130 only:				
Log Mode		Incremental Error		
dB from Ref Level				
0	0 (Ref)	0 (Ref)	0 (Ref)	
−4	−0.4 dB	**(50)** ______	+0.4 dB	±0.06 dB
−8	−0.4 dB	**(51)** ______	+0.4 dB	±0.06 dB
−12	−0.4 dB	**(52)** ______	+0.4 dB	±0.06 dB
−16	−0.4 dB	**(53)** ______	+0.4 dB	±0.06 dB
−20	−0.4 dB	**(54)** ______	+0.4 dB	±0.06 dB
−24	−0.4 dB	**(55)** ______	+0.4 dB	±0.06 dB
−28	−0.4 dB	**(56)** ______	+0.4 dB	±0.06 dB
−32	−0.4 dB	**(57)** ______	+0.4 dB	±0.06 dB
−36	−0.4 dB	**(58)** ______	+0.4 dB	±0.06 dB
−40	−0.4 dB	**(59)** ______	+0.4 dB	±0.06 dB
−44	−0.4 dB	**(60)** ______	+0.4 dB	±0.06 dB
−48	−0.4 dB	**(61)** ______	+0.4 dB	±0.06 dB
−52	−0.4 dB	**(62)** ______	+0.4 dB	±0.06 dB
−56	−0.4 dB	**(63)** ______	+0.4 dB	±0.06 dB
−60	−0.4 dB	**(64)** ______	+0.4 dB	±0.11 dB
Linear Mode				
% of Ref Level				
100.00	0 (Ref)	0 (Ref)	0 (Ref)	
70.70	151.59 mV	**(65)** ______	165.01 mV	±1.84 mV
50.00	105.36 mV	**(66)** ______	118.78 mV	±1.84 mV
35.48	72.63 mV	**(67)** ______	86.05 mV	±1.84 mV
25.00	49.46 mV	**(68)** ______	82.88 mV	±1.84 mV
Option 130 only:				
% of Ref Level				
100.00	0 (Ref)	0 (Ref)	0 (Ref)	
70.70	151.59 mV	**(69)** ______	165.01 mV	±1.84 mV
50.00	105.36 mV	**(70)** ______	118.78 mV	±1.84 mV
35.48	72.63 mV	**(71)** ______	86.05 mV	±1.84 mV
25.00	49.46 mV	**(72)** ______	82.88 mV	±1.84 mV
Log-to-Linear Switching				
	−0.25 dB	**(73)** ______	+0.25 dB	±0.05 dB
Option 130 only:				
	−0.25 dB	**(74)** ______	+0.25 dB	±0.05 dB

HP 8595E Performance Verification Test Record (page 6 of 12)

Hewlett-Packard Company Model HP 8595E Serial No. ______	Report No. ______ Date ______

Test Description	Results Measured Min.	(TR Entry)	Max.	Measurement Uncertainty
15. Reference Level Accuracy				
Log Mode				
Reference Level (dBm)				
−20	0 (Ref)	0 (Ref)	0 (Ref)	
−10	−0.40 dB	(1) ______	+0.40 dB	±0.06 dB
0	−0.50 dB	(2) ______	+0.50 dB	±0.06 dB
−30	−0.40 dB	(3) ______	+0.40 dB	±0.06 dB
−40	−0.50 dB	(4) ______	+0.50 dB	±0.08 dB
−50	−0.80 dB	(5) ______	+0.80 dB	±0.08 dB
−60	−1.00 dB	(6) ______	+1.00 dB	±0.12 dB
−70	−1.10 dB	(7) ______	+1.10 dB	±0.12 dB
−80	−1.20 dB	(8) ______	+1.20 dB	±0.12 dB
−90	−1.30 dB	(9) ______	+1.30 dB	±0.12 dB
Linear Mode				
Reference Level (dBm)				
−20	0 (Ref)	0 (Ref)	0 (Ref)	
−10	−0.40 dB	(10) ______	+0.40 dB	±0.06 dB
0	−0.50 dB	(11) ______	+0.50 dB	±0.06 dB
−30	−0.40 dB	(12) ______	+0.40 dB	±0.06 dB
−40	−0.50 dB	(13) ______	+0.50 dB	±0.08 dB
−50	−0.80 dB	(14) ______	+0.80 dB	±0.08 dB
−60	−1.00 dB	(15) ______	+1.00 dB	±0.12 dB
−70	−1.10 dB	(16) ______	+1.10 dB	±0.12 dB
−80	−1.20 dB	(17) ______	+1.20 dB	±0.12 dB
−90	−1.30 dB	(18) ______	+1.30 dB	±0.12 dB
Option 130 only:				
Log Mode				
Reference Level (dBm)				
−20	0 (Ref)	0 (Ref)	0 (Ref)	
−10	−0.40 dB	(19) ______	+0.40 dB	±0.06 dB
0	−0.50 dB	(20) ______	+0.50 dB	±0.06 dB
−30	−0.50 dB	(21) ______	+0.50 dB	±0.06 dB
−40	−0.50 dB	(22) ______	+0.50 dB	±0.08 dB
−50	−0.80 dB	(23) ______	+0.80 dB	±0.08 dB
−60	−1.20 dB	(24) ______	+1.10 dB	±0.12 dB
−70	−1.20 dB	(25) ______	+1.20 dB	±0.12 dB
−80	−1.30 dB	(26) ______	+1.30 dB	±0.12 dB
−90	−1.40 dB	(27) ______	+1.40 dB	±0.12 dB

HP 8595E Performance Verification Test Record (page 7 of 12)

Hewlett-Packard Company Model HP 8595E Serial No. ______	Report No. ______ Date ______

Test Description	Results Measured Min.	(TR Entry)	Max.	Measurement Uncertainty
15. Reference Level Accuracy (continued)				
Option 130 only:				
Linear Mode				
Reference Level (dBm)				
−20	0 (Ref)	0 (Ref)	0 (Ref)	
−10	−0.40 dB	**(28)** ______	+0.40 dB	±0.06 dB
0	−0.50 dB	**(29)** ______	+0.50 dB	±0.06 dB
−30	−0.50 dB	**(30)** ______	+0.50 dB	±0.06 dB
−40	−0.50 dB	**(31)** ______	+0.50 dB	±0.08 dB
−50	−0.80 dB	**(32)** ______	+0.80 dB	±0.08 dB
−60	−1.20 dB	**(33)** ______	+1.10 dB	±0.12 dB
−70	−1.20 dB	**(34)** ______	+1.20 dB	±0.12 dB
−80	−1.30 dB	**(35)** ______	+1.30 dB	±0.12 dB
−90	−1.40 dB	**(36)** ______	+1.40 dB	±0.12 dB
16. Absolute Amplitude Calibration and Resolution Bandwidth Switching Uncertainties				
Absolute Amplitude Uncertainty	−20.15 dB	**(1)** ______	−19.85 dB	N/A
Resolution Bandwidth Switching Uncertainty				
Resolution Bandwidth				
3 kHz	0 (Ref)	0 (Ref)	0 (Ref)	
1 kHz	−0.5 dB	**(2)** ______	+0.5 dB	+0.07/−0.08 dB
9 kHz	−0.4 dB	**(3)** ______	+0.4 dB	+0.07/−0.08 dB
10 kHz	−0.4 dB	**(4)** ______	+0.4 dB	+0.07/−0.08 dB
30 kHz	−0.4 dB	**(5)** ______	+0.4 dB	+0.07/−0.08 dB
100 kHz	−0.4 dB	**(6)** ______	+0.4 dB	+0.07/−0.08 dB
120 kHz	−0.4 dB	**(7)** ______	+0.4 dB	+0.07/−0.08 dB
300 kHz	−0.4 dB	**(8)** ______	+0.4 dB	+0.07/−0.08 dB
1 MHz	−0.4 dB	**(9)** ______	+0.4 dB	+0.07/−0.08 dB
3 MHz	−0.4 dB	**(10)** ______	+0.4 dB	+0.07/−0.08 dB
Option 130 only:				
3 kHz	0 (Ref)	0 (Ref)	0 (Ref)	
300 Hz	−0.6 dB	**(11)** ______	+0.6 dB	+0.07/−0.08 dB
200 Hz	−0.6 dB	**(12)** ______	+0.6 dB	+0.07/−0.08 dB
100 Hz	−0.6 dB	**(13)** ______	+0.6 dB	+0.07/−0.08 dB
30 Hz	−0.6 dB	**(14)** ______	+0.6 dB	+0.07/−0.08 dB

HP 8595E Performance Verification Test Record (page 8 of 12)

Hewlett-Packard Company	
Model HP 8595E	**Report No.** ______
Serial No. ______	**Date** ______

Test Description	Results Measured Min.	(TR Entry)	Max.	Measurement Uncertainty
17. Resolution Bandwidth Accuracy				
3 dB Resolution Bandwidth				
3 MHz	2.4 MHz	(1) ______	3.6 MHz	±138 kHz
1 MHz	0.8 MHz	(2) ______	1.2 MHz	±46 kHz
300 kHz	240 kHz	(3) ______	360 kHz	±13.8 kHz
100 kHz	80 kHz	(4) ______	120 kHz	±4.6 kHz
30 kHz	24 kHz	(5) ______	36 kHz	±1.38 kHz
10 kHz	8 kHz	(6) ______	12 kHz	±460 Hz
3 kHz	2.4 kHz	(7) ______	3.6 kHz	±138 Hz
1 kHz	0.8 kHz	(8) ______	1.2 kHz	±46 Hz
6 dB EMI Bandwidth				
9 kHz	7.2 kHz	(9) ______	10.8 kHz	±333 Hz
120 kHz	96 kHz	(10) ______	144 kHz	±4.44 kHz
Option 130 only:				
3 dB Resolution Bandwidth				
300 Hz	240 Hz	(11) ______	360 Hz	±36 Hz
100 Hz	80 Hz	(12) ______	120 Hz	±12 Hz
30 Hz	24 Hz	(13) ______	36 Hz	±3.9 Hz
6 dB EMI Bandwidth				
200 Hz	160 Hz	(14) ______	240 Hz	±24 Hz
18. Calibrator Amplitude Accuracy	−20.4 dBm	(1) ______	−19.6 dBm	±0.2 dB
22. Frequency Response				
Band 0				
Max Positive Response		(1) ______	+1.5 dB	+0.32/−0.33 dB
Max Negative Response	−1.5 dB	(2) ______		+0.32/−0.33 dB
Peak-to-Peak Response		(3) ______	2.0 dB	+0.32/−0.33 dB
Band 1				
Max Positive Response		(4) ______	+2.0 dB	+0.40/−0.42 dB
Max Negative Response	−2.0 dB	(5) ______		+0.40/−0.42 dB
Peak-to-Peak Response		(6) ______	3.0 dB	+0.40/−0.42 dB
27. Other Input Related Spurious Responses				
50 kHz to 6.5 GHz		(1) ______	−55 dBc	+1.12/−1.21 dB

HP 8595E Performance Verification Test Record (page 9 of 12)

Hewlett-Packard Company	
Model HP 8595E	**Report No.** ______
Serial No. ______	**Date** ______

Test Description	Min.	Results Measured (TR Entry)	Max.	Measurement Uncertainty
32. Spurious Responses				
Second Harmonic Distortion				
Applied Frequency				
40 MHz		(1) ______	−50 dBc	+1.86/−2.27 dB
2.8 GHz		(3) ______	(2) ______	+2.24/−2.72 dB
Third Order Intermodulation Distortion			*(Step 23c)*	
Frequency				
2.8 GHz		(4) ______	−54 dBc	+2.07/−2.42 dB
4.0 GHz		(5) ______	−54 dBc	+2.07/−2.42 dB
37. Gain Compression				
<2.9 GHz		(1) ______	0.5 dB	+0.21/−0.22 dB
>2.9 GHz		(2) ______	0.5 dB	+0.21/−0.22 dB
Option 130 only:		(3) ______	0.5 dB	+0.21/−0.22 dB
42. Displayed Average Noise				
Frequency				
400 kHz		(1) ______	−110 dBm	+1.15/−1.25 dB
1 MHz		(2) ______	−110 dBm	+1.15/−1.25 dB
1 MHz to 2.9 GHz		(3) ______	−110 dBm	+1.15/−1.25 dB
2.75 to 6.5 GHz		(4) ______	−112 dBm	+1.15/−1.25 dB
47. Displayed Average Noise for Option 130				
Frequency				
400 kHz		(1) ______	−125 dBm	+1.15/−1.25 dB
1 MHz		(2) ______	−125 dBm	+1.15/−1.25 dB
1 MHz to 2.9 GHz		(3) ______	−125 dBm	+1.15/−1.25 dB
2.75 to 6.5 GHz		(4) ______	−127 dBm	+1.15/−1.25 dB
52. Residual Responses				
150 kHz to 6.5 GHz		(1) ______	−90 dBm	+1.09/−1.15 dB
56. Residual Responses for Option 130				
150 kHz to 6.5 GHz		(1) ______	−90 dBm	+1.09/−1.15 dB
58. Fast Time Domain Sweeps				
Option 101 only:				
Amplitude Resolution	0.933X	______	1.007X	0%
SWEEP TIME				
18 ms	14.04 ms	(1) ______	14.76 ms	±0.5%
10 ms	7.80 ms	(2) ______	8.20 ms	±0.5%
1.0 ms	780 μs	(3) ______	820 μs	±0.5%
100 μs	78 μs	(4) ______	82 μs	±0.5%
20 μs	15.6 μs	(5) ______	16.4 μs	±0.5%

HP 8595E Performance Verification Test Record (page 10 of 12)

Hewlett-Packard Company Model HP 8595E Serial No. ______	Report No. ______ Date ______

Test Description	Results Measured Min.	Results Measured (TR Entry)	Results Measured Max.	Measurement Uncertainty
60. Absolute Amplitude Accuracy				
Option 010 only:				
Absolute Amplitude Accuracy	−20.75 dBm	(1) ______	−19.25 dBm	+.155/−.161 dB
Positive Vernier Accuracy		(2) ______	+0.50 dB	±0.03 dB
Negative Vernier Accuracy	−0.50 dB	(3) ______		±0.03 dB
Positive Step-to-Step Accuracy		(4) ______	+1.20 dB	±0.03 dB
Negative Step-to-Step Accuracy	−0.80 dB	(5) ______		±0.03 dB
61. Power Sweep Range				
Option 010 only:				
Start Power Level		(1) ______		
Stop Power Level		(2) ______		
Power Sweep Range	9.0 dB	(3) ______		±0.03 dB
63. Tracking Generator Level Flatness				
Option 010 only:				
Maximum Flatness				
9 kHz to 100 kHz		(1) ______	+2.0 dB	+0.42/−0.45 dB
100 kHz to 2900 MHz		(2) ______	+2.0 dB	+0.42/−0.45 dB
Minimum Flatness				
9 kHz to 100 kHz	−2.0 dB	(3) ______		+0.42/−0.45 dB
100 kHz to 2900 MHz	−2.0 dB	(4) ______		+0.42/−0.45 dB
65. Harmonic Spurious Outputs				
Option 010 only:				
2nd Harmonic Level, 9 kHz		(1) ______	−15 dBc	+1.55/−1.80 dB
2nd Harmonic Level, 25 kHz to 900 MHz		(2) ______	−25 dBc	+1.55/−1.80 dB
2nd Harmonic Level, 1.4 GHz		(3) ______	−25 dBc	+3.45/−4.01 dB
3rd Harmonic Level, 9 kHz		(4) ______	−15 dBc	+1.55/−1.80 dB
3rd Harmonic Level, 25 kHz to 900 MHz		(5) ______	−25 dBc	+1.55/−1.80 dB
67. Non-Harmonic Spurious Outputs				
Option 010 only:				
Highest Non-Harmonic Response Amplitude				
9 kHz to 2000 MHz		(1) ______	−27 dBc	+1.55/−1.80 dB
2000 MHz to 2900 MHz		(2) ______	−23 dBc	+3.45/−4.01 dB
70. Tracking Generator Feedthrough				
Option 010 only:				
400 kHz to 2.9 GHz		(1) ______	−112 dBm	+1.59/−1.70 dB

HP 8595E Performance Verification Test Record (page 11 of 12)

Hewlett-Packard Company Model HP 8595E Serial No. ____________	Report No. ____________ Date ____________

Test Description	Results Measured Min.	(TR Entry)	Max.	Measurement Uncertainty
71. Tracking Generator LO Feedthrough Amplitude				
Option 010 only:				
9 kHz to 1.5 GHz		(1) ________	−16 dBm	±2.02/−2.50 dB
2.9 GHz		(2) ________	−16 dBm	±2.10/−2.67 dB
72. CISPR Pulse Response				
Options 103 only:	Amplitude Error			
Measured Amplitude				
9 kHz EMI BW		(1) ________		±0.44/−0.48 dB
120 kHz EMI BW		(2) ________		±0.80/−0.98 dB
Options 103 and 130 only:				
200 Hz EMI BW		(3) ________		
Options 103 only:				
Relative Level, 9 kHz EMI BW				
Repetition Frequency				
1000	+5.5 dB	(4) ________	+3.5 dB	±0.17 dB
100	0 (Ref)	(5) ________	0 (Ref)	0 (Ref)
20	−5.5 dB	(6) ________	−7.5 dB	±0.27 dB
10	−8.5 dB	(7) ________	−11.5 dB	±0.25 dB
2	−18.5 dB	(8) ________	−22.5 dB	±0.23 dB
1	−20.5 dB	(9) ________	−24.5 dB	±0.19 dB
Isolated Pulse	−21.5 dB	(10) ________	−25.5 dB	±0.15 dB
Relative Level, 120 kHz EMI BW				
Repetition Frequency				
1000	+9.0 dB	(11) ________	+7.0 dB	±0.17 dB
100	0 (Ref)	(12) ________	0 (Ref)	0 (Ref)
20	−8.0 dB	(13) ________	−10.0 dB	±0.18 dB
10	−12.5 dB	(14) ________	−15.5 dB	±0.18 dB
2	−24.0 dB	(15) ________	−28.0 dB	±0.18 dB
1	−26.5 dB	(16) ________	−30.5 dB	±0.18 dB
Isolated Pulse	−29.5 dB	(17) ________	−33.5 dB	±0.17 dB
Options 103 and 130 only:	Amplitude Error			
Relative Level, Band A				
Repetition Frequency				
100	3.0 dB	(18) ________	+5.0 dB	±0.24 dB
60	2.0 dB	(19) ________	5.0 dB	±0.26 dB
25	0 (Ref)	(20) ________	0 (Ref)	0 (Ref)
10	−3.0 dB	(21) ________	−5.0 dB	±0.29 dB
5	−6.0 dB	(22) ________	−9.0 dB	±0.30 dB
2	−11.0 dB	(23) ________	−15.0 dB	±0.36 dB
1	−20.5 dB	(24) ________	−24.5 dB	±0.28 dB
Isolated Pulse	−21.5 dB	(25) ________	−25.5 dB	±0.20 dB

HP 8595E Performance Verification Test Record (page 12 of 12)

Hewlett-Packard Company Model HP 8595E Serial No. ______________	Report No. ______________ Date ______________

Test Description	Results Measured Min.	(TR Entry)	Max.	Measurement Uncertainty
73. Gate Delay Accuracy and Gate Length Accuracy				
Option 105 only:				
Minimum Gate Delay	0.0 μs	(1) ______	2.0 μs	±0.011 μs
Maximum Gate Delay	0.0 μs	(2) ______	2.0 μs	±0.011 μs
1 μs Gate Length	0.8 μs	(3) ______	1.2 μs	±0.434 μs
65 ms Gate Length	64.99 μs	(4) ______	65.01 μs	±0.434 μs
74. Gate Card Insertion Loss				
Option 105 only:				
Gate Card Insertion Loss	−0.3 dB	(1) ______	+0.3 dB	±0.092 dB
75. TV Receiver, Video Tester				
Differential Gain				
Channel 2		(1) ______	6%	1.5%
7		(2) ______	6%	1.5%
14		(3) ______	6%	1.5%
33		(4) ______	6%	1.5%
38		(5) ______	6%	1.5%
77		(6) ______	6%	1.5%
Differential Phase				
Channel 2		(1) ______	4°	1°
7		(2) ______	4°	1°
14		(3) ______	4°	1°
33		(4) ______	4°	1°
38		(5) ______	4°	1°
77		(6) ______	4°	1°
Chroma-Luminance Delay				
Channel 2	−45 ns	(1) ______	45 ns	±5.1 ns
7	−45 ns	(2) ______	45 ns	±5.1 ns
14	−45 ns	(3) ______	45 ns	±5.1 ns
33	−45 ns	(4) ______	45 ns	±5.1 ns
38	−45 ns	(5) ______	45 ns	±5.1 ns
77	−45 ns	(6) ______	45 ns	±5.1 ns

HP 8596E Performance Test Record

Only the tests for HP 8596E are included in this test record, therefore not all test numbers are included.

Table 3-46. HP 8596E Performance Verification Test Record

Hewlett-Packard Company

Address: ______________________ Report No. ______________________

____

______________________ Date ______________________

______________________ (e.g. 10 SEP 1989)

Model HP 8596E

Serial No. ______________________

Options ______________________

Firmware Revision ______________________

Customer ______________________ Tested by ______________________

Ambient temperature ____________ °C Relative humidity ____________ %

Power mains line frequency ____________ Hz (nominal)

Test Equipment Used:

Description	Model No.	Trace No.	Cal Due Date
Frequency Counter			
Frequency Standard			
Low Pass Filter, 50 MHz			
Low Pass Filter, 300 MHz			
Measuring Receiver			
Microwave Frequency Counter			
Microwave Spectrum Analyzer (Option 010)			
Power Meter			
Power Sensor			
Power Sensor			
Power Splitter			
Pulse Generator (Option 103)			
Signal Generator			
Synthesized Sweeper			
Synthesizer/Function Generator			
Synthesizer/Level Generator			
Termination, 50 Ω			

Notes/Comments:

____

____

____

____

HP 8596E Performance Verification Test Record (page 2 of 13)

Hewlett-Packard Company
Model HP 8596E
Serial No. ______________________

Report No. ______________________
Date ______________________

Test Description	Min.	Results Measured (TR Entry)	Max.	Measurement Uncertainty
1. 10 MHz Reference Accuracy		Frequency Error		
Settability	−150 Hz	(1) ________	+150 Hz	±4.2 x 10^{-9}
2. 10 MHz Reference Accuracy for Option 004		Frequency Error		
5 Minute Warmup Error	−1 x 10^{-7}	(1) ________	+1 x 10^{-7}	±2.004 x 10^{-9}
30 Minute Warmup Error	−1 x 10^{-8}	(2) ________	+1 x 10^{-8}	±2.002 x 10^{-9}
3. Comb Generator Frequency Accuracy		Frequency (MHz)		
Comb Generator Frequency	99.993	(1) ________	100.007	±25 Hz
5. Frequency Readout Accuracy and Marker Count Accuracy				
Frequency Readout Accuracy		Frequency (MHz)		
Frequency = 1.5 GHz				
SPAN				
20 MHz	1.49918	(1) ________	1.50082	±1.0 Hz
10 MHz	1.49958	(2) ________	1.50042	±1.0 Hz
1 MHz	1.4999680	(3) ________	1.500032	±1.0 Hz
Frequency = 4.0 GHz				
SPAN				
20 MHz	3.99918	(4) ________	4.00082	±1.0 Hz
10 MHz	3.99958	(5) ________	4.00042	±1.0 Hz
1 MHz	3.9999680	(6) ________	4.000032	±1.0 Hz
Frequency = 9.0 GHz				
SPAN				
20 MHz	8.99918	(7) ________	9.00082	±2.0 Hz
10 MHz	8.99958	(8) ________	9.00042	±2.0 Hz
1 MHz	8.9999680	(9) ________	9.000032	±2.0 Hz
Option 130 only:				
20 kHz	1.49999924	(16) ________	1.50000076	±1.0 Hz
Marker Count Accuracy				
Frequency = 1.5 GHz				
SPAN				
(CNT RES = 100 Hz) 20 MHz	1.4999989	(17) ________	1.5000011	±1 Hz
(CNT RES = 10 Hz) 1 MHz	1.49999989	(18) ________	1.50000011	±1 Hz
Frequency = 4.0 GHz				
SPAN				
(CNT RES = 100 Hz) 20 MHz	3.9999989	(19) ________	4.0000011	±1 Hz
(CNT RES = 10 Hz) 1 MHz	4.99999989	(20) ________	4.00000011	±1 Hz

HP 8596E Performance Verification Test Record (page 3 of 13)

Hewlett-Packard Company	
Model HP 8596E	**Report No.** ________
Serial No. ________	**Date** ________

Test Description	Results Measured			Measurement
	Min.	(TR Entry)	Max.	Uncertainty
5. Frequency Readout and Marker Count Accuracy (continued)				
Frequency = 9.0 GHz				
SPAN				
(CNT RES = 100 Hz) 20 MHz	8.9999989	(21)________	9.0000011	±2 Hz
(CNT RES = 10 Hz) 1 MHz	8.99999989	(22)________	9.00000011	±2 Hz
Option 130 only:				
(CNT RES = 10 Hz) 20 kHz	1.49999989	(27)________	1.50000011	±1.0 Hz
(CNT RES = 10 Hz) 2 kHz	1.49999989	(28)________	1.50000011	±1.0 Hz
6. Noise Sidebands				
Suppression at 10 kHz		(1) ________	−60 dBc	±1.0 dB
Suppression at 20 kHz		(2) ________	−70 dBc	±1.0 dB
Suppression at 30 kHz		(3) ________	−75 dBc	±1.0 dB
7. System Related Sidebands				
Sideband Above Signal		(1) ________	−65 dBc	±1.0 dB
Sideband Below Signal		(2) ________	−65 dBc	±1.0 dB
9. Frequency Span Readout Accuracy				
SPAN		MKRΔ Reading		
1800 MHz	1446.00 MHz	(1) ________	1554.00 MHz	±6.37 MHz
10.10 MHz	7.70 MHz	(2) ________	8.30 MHz	±35.4 kHz
10.00 MHz	7.80 MHz	(3) ________	8.20 MHz	±35.4 kHz
100.00 kHz	78.00 kHz	(4) ________	82.00 kHz	±354 Hz
99.00 kHz	78.00 kHz	(5) ________	82.00 kHz	±354 Hz
10.00 kHz	7.80 kHz	(6) ________	8.20 kHz	±3.54 Hz
Option 130 only:				
1.00 kHz	780 Hz	(7) ________	820 Hz	±3.54 Hz
11. Residual FM				
		(1) ________	250 Hz	±45.8 Hz
Option 130 only:		(2) ________	30 Hz	±3.5 Hz
12. Sweep Time Accuracy				
SWEEP TIME		MKRΔ Reading		
20 ms	15.4 ms	(1) ________	16.6 ms	±0.057 ms
100 ms	77.0 ms	(2) ________	83.0 ms	±0.283 ms
1 s	770.0 ms	(3) ________	830.0 ms	±2.83 ms
10 s	7.7 s	(4) ________	8.3 s	±23.8 ms

HP 8596E Performance Verification Test Record (page 4 of 13)

Hewlett-Packard Company Model HP 8596E Serial No. ______	Report No. ______ Date ______

Test Description	Results Measured Min.	(TR Entry)	Max.	Measurement Uncertainty
13. Scale Fidelity				
Log Mode		Cumulative Error		
dB from Ref Level				
0	0 (Ref)	0 (Ref)	0 (Ref)	
−4	−4.34 dB	(1) ______	−3.66 dB	±0.06 dB
−8	−8.38 dB	(2) ______	−7.62 dB	±0.06 dB
−12	−12.42 dB	(3) ______	−11.58 dB	±0.06 dB
−16	−16.46 dB	(4) ______	−15.54 dB	±0.06 dB
−20	−20.50 dB	(5) ______	−19.50 dB	±0.06 dB
−24	−24.54 dB	(6) ______	−23.46 dB	±0.06 dB
−28	−28.58 dB	(7) ______	−27.42 dB	±0.06 dB
−32	−32.62 dB	(8) ______	−31.38 dB	±0.06 dB
−36	−36.66 dB	(9) ______	−35.34 dB	±0.06 dB
−40	−40.70 dB	(10) ______	−39.30 dB	±0.06 dB
−44	−44.74 dB	(11) ______	−43.26 dB	±0.06 dB
−48	−48.78 dB	(12) ______	−47.22 dB	±0.06 dB
−52	−52.82 dB	(13) ______	−51.18 dB	±0.06 dB
−56	−56.86 dB	(14) ______	−55.14 dB	±0.06 dB
−60	−60.90 dB	(15) ______	−59.10 dB	±0.11 dB
−64	−64.94 dB	(16) ______	−63.06 dB	±0.11 dB
−68	−68.98 dB	(17) ______	−67.02 dB	±0.11 dB
Log Mode		Incremental Error		
dB from Ref Level				
0	0 (Ref)	0 (Ref)	0 (Ref)	
−4	−0.4 dB	(18) ______	+0.4 dB	±0.06 dB
−8	−0.4 dB	(19) ______	+0.4 dB	±0.06 dB
−12	−0.4 dB	(20) ______	+0.4 dB	±0.06 dB
−16	−0.4 dB	(21) ______	+0.4 dB	±0.06 dB
−20	−0.4 dB	(22) ______	+0.4 dB	±0.06 dB
−24	−0.4 dB	(23) ______	+0.4 dB	±0.06 dB
−28	−0.4 dB	(24) ______	+0.4 dB	±0.06 dB
−32	−0.4 dB	(25) ______	+0.4 dB	±0.06 dB
−36	−0.4 dB	(26) ______	+0.4 dB	±0.06 dB
−40	−0.4 dB	(27) ______	+0.4 dB	±0.06 dB
−44	−0.4 dB	(28) ______	+0.4 dB	±0.06 dB
−48	−0.4 dB	(29) ______	+0.4 dB	±0.06 dB
−52	−0.4 dB	(30) ______	+0.4 dB	±0.06 dB
−56	−0.4 dB	(31) ______	+0.4 dB	±0.06 dB
−60	−0.4 dB	(32) ______	+0.4 dB	±0.11 dB

HP 8596E Performance Verification Test Record (page 5 of 13)

Hewlett-Packard Company Model HP 8596E Serial No. ______________	Report No. ______________ Date ______________

Test Description	Results Measured Min.	(TR Entry)	Max.	Measurement Uncertainty
13. Scale Fidelity (continued)				
Option 130 only:				
Log Mode		Cumulative Error		
dB from Ref Level				
0	0 (Ref)	0 (Ref)	0 (Ref)	
−4	−4.44 dB	**(33)** ______	+3.56 dB	±0.06 dB
−8	−8.48 dB	**(34)** ______	−7.52 dB	±0.06 dB
−12	−12.52 dB	**(35)** ______	−11.48 dB	±0.06 dB
−16	−16.56 dB	**(36)** ______	−15.44 dB	±0.06 dB
−20	−20.60 dB	**(37)** ______	−19.40 dB	±0.06 dB
−24	−24.64 dB	**(38)** ______	−23.36 dB	±0.06 dB
−28	−28.68 dB	**(39)** ______	−27.32 dB	±0.06 dB
−32	−32.72 dB	**(40)** ______	−31.28 dB	±0.06 dB
−36	−36.76 dB	**(41)** ______	−35.24 dB	±0.06 dB
−40	−40.80 dB	**(42)** ______	−39.20 dB	±0.06 dB
−44	−44.84 dB	**(43)** ______	−43.16 dB	±0.06 dB
−48	−48.88 dB	**(44)** ______	−47.12 dB	±0.06 dB
−52	−52.92 dB	**(45)** ______	−51.08 dB	±0.06 dB
−56	−56.96 dB	**(46)** ______	−55.04 dB	±0.06 dB
−60	−61.00 dB	**(47)** ______	−59.00 dB	±0.11 dB
−64	−65.04 dB	**(48)** ______	−62.96 dB	±0.11 dB
−68	−69.08 dB	**(49)** ______	−66.92 dB	±0.11 dB
Option 130 only:				
Log Mode		Incremental Error		
dB from Ref Level				
0	0 (Ref)	0 (Ref)	0 (Ref)	
−4	−0.4 dB	**(50)** ______	+0.4 dB	±0.06 dB
−8	−0.4 dB	**(51)** ______	+0.4 dB	±0.06 dB
−12	−0.4 dB	**(52)** ______	+0.4 dB	±0.06 dB
−16	−0.4 dB	**(53)** ______	+0.4 dB	±0.06 dB
−20	−0.4 dB	**(54)** ______	+0.4 dB	±0.06 dB
−24	−0.4 dB	**(55)** ______	+0.4 dB	±0.06 dB
−28	−0.4 dB	**(56)** ______	+0.4 dB	±0.06 dB
−32	−0.4 dB	**(57)** ______	+0.4 dB	±0.06 dB
−36	−0.4 dB	**(58)** ______	+0.4 dB	±0.06 dB
−40	−0.4 dB	**(59)** ______	+0.4 dB	±0.06 dB
−44	−0.4 dB	**(60)** ______	+0.4 dB	±0.06 dB
−48	−0.4 dB	**(61)** ______	+0.4 dB	±0.06 dB
−52	−0.4 dB	**(62)** ______	+0.4 dB	±0.06 dB
−56	−0.4 dB	**(63)** ______	+0.4 dB	±0.06 dB
−60	−0.4 dB	**(64)** ______	+0.4 dB	±0.11 dB

HP 8596E Performance Verification Test Record (page 6 of 13)

Hewlett-Packard Company Model HP 8596E Serial No. ______________	Report No. ______________ Date ______________

Test Description	Results Measured Min.	(TR Entry)	Max.	Measurement Uncertainty
13. Scale Fidelity (continued)				
Linear Mode				
% of Ref Level				
100.00	0 (Ref)	0 (Ref)	0 (Ref)	
70.70	151.59 mV	**(65)** ______	165.01 mV	±1.84 mV
50.00	105.36 mV	**(66)** ______	118.78 mV	±1.84 mV
35.48	72.63 mV	**(67)** ______	86.05 mV	±1.84 mV
25.00	49.46 mV	**(68)** ______	82.88 mV	±1.84 mV
Option 130 only:				
% of Ref Level				
100.00	0 (Ref)	0 (Ref)	0 (Ref)	
70.70	151.59 mV	**(69)** ______	165.01 mV	±1.84 mV
50.00	105.36 mV	**(70)** ______	118.78 mV	±1.84 mV
35.48	72.63 mV	**(71)** ______	86.05 mV	±1.84 mV
25.00	49.46 mV	**(72)** ______	82.88 mV	±1.84 mV
Log-to-Linear Switching				
	−0.25 dB	**(73)** ______	+0.25 dB	±0.05 dB
Option 130 only:				
	−0.25 dB	**(74)** ______	+0.25 dB	±0.05 dB
15. Reference Level Accuracy				
Log Mode				
Reference Level (dBm)				
−20	0 (Ref)	0 (Ref)	0 (Ref)	
−10	−0.40 dB	**(1)** ______	+0.40 dB	±0.06 dB
0	−0.50 dB	**(2)** ______	+0.50 dB	±0.06 dB
−30	−0.40 dB	**(3)** ______	+0.40 dB	±0.06 dB
−40	−0.50 dB	**(4)** ______	+0.50 dB	±0.08 dB
−50	−0.80 dB	**(5)** ______	+0.80 dB	±0.08 dB
−60	−1.00 dB	**(6)** ______	+1.00 dB	±0.12 dB
−70	−1.10 dB	**(7)** ______	+1.10 dB	±0.12 dB
−80	−1.20 dB	**(8)** ______	+1.20 dB	±0.12 dB
−90	−1.30 dB	**(9)** ______	+1.30 dB	±0.12 dB

HP 8596E Performance Verification Test Record (page 7 of 13)

Hewlett-Packard Company Model HP 8596E Serial No. ______	Report No. ______ Date ______

Test Description	Results Measured Min.	Results Measured (TR Entry)	Results Measured Max.	Measurement Uncertainty
15. Reference Level Accuracy (continued)				
Linear Mode				
Reference Level (dBm)				
−20	0 (Ref)	0 (Ref)	0 (Ref)	
−10	−0.40 dB	**(10)** ______	+0.40 dB	±0.06 dB
0	−0.50 dB	**(11)** ______	+0.50 dB	±0.06 dB
−30	−0.40 dB	**(12)** ______	+0.40 dB	±0.06 dB
−40	−0.50 dB	**(13)** ______	+0.50 dB	±0.08 dB
−50	−0.80 dB	**(14)** ______	+0.80 dB	±0.08 dB
−60	−1.00 dB	**(15)** ______	+1.00 dB	±0.12 dB
−70	−1.10 dB	**(16)** ______	+1.10 dB	±0.12 dB
−80	−1.20 dB	**(17)** ______	+1.20 dB	±0.12 dB
−90	−1.30 dB	**(18)** ______	+1.30 dB	±0.12 dB
Option 130 only:				
Log Mode				
Reference Level (dBm)				
−20	0 (Ref)	0 (Ref)	0 (Ref)	
−10	−0.40 dB	**(19)** ______	+0.40 dB	±0.06 dB
0	−0.50 dB	**(20)** ______	+0.50 dB	±0.06 dB
−30	−0.50 dB	**(21)** ______	+0.50 dB	±0.06 dB
−40	−0.50 dB	**(22)** ______	+0.50 dB	±0.08 dB
−50	−0.80 dB	**(23)** ______	+0.80 dB	±0.08 dB
−60	−1.20 dB	**(24)** ______	+1.10 dB	±0.12 dB
−70	−1.20 dB	**(25)** ______	+1.20 dB	±0.12 dB
−80	−1.30 dB	**(26)** ______	+1.30 dB	±0.12 dB
−90	−1.40 dB	**(27)** ______	+1.40 dB	±0.12 dB
Option 130 only:				
Linear Mode				
Reference Level (dBm)				
−20	0 (Ref)	0 (Ref)	0 (Ref)	
−10	−0.40 dB	**(28)** ______	+0.40 dB	±0.06 dB
0	−0.50 dB	**(29)** ______	+0.50 dB	±0.06 dB
−30	−0.50 dB	**(30)** ______	+0.50 dB	±0.06 dB
−40	−0.50 dB	**(31)** ______	+0.50 dB	±0.08 dB
−50	−0.80 dB	**(32)** ______	+0.80 dB	±0.08 dB
−60	−1.20 dB	**(33)** ______	+1.10 dB	±0.12 dB
−70	−1.20 dB	**(34)** ______	+1.20 dB	±0.12 dB
−80	−1.30 dB	**(35)** ______	+1.30 dB	±0.12 dB
−90	−1.40 dB	**(36)** ______	+1.40 dB	±0.12 dB

HP 8596E Performance Verification Test Record (page 8 of 13)

Hewlett-Packard Company Model HP 8596E Serial No. ______	Report No. ______ Date ______

Test Description	Results Measured Min.	(TR Entry)	Max.	Measurement Uncertainty
16. Absolute Amplitude Calibration and Resolution Bandwidth Switching Uncertainties				
Absolute Amplitude Uncertainty	−20.15 dB	(1) ______	−19.85 dB	N/A
Resolution Bandwidth Switching Uncertainty				
Resolution Bandwidth				
3 kHz	0 (Ref)	0 (Ref)	0 (Ref)	
1 kHz	−0.5 dB	(2) ______	+0.5 dB	+0.07/−0.08 dB
9 kHz	−0.4 dB	(3) ______	+0.4 dB	+0.07/−0.08 dB
10 kHz	−0.4 dB	(4) ______	+0.4 dB	+0.07/−0.08 dB
30 kHz	−0.4 dB	(5) ______	+0.4 dB	+0.07/−0.08 dB
100 kHz	−0.4 dB	(6) ______	+0.4 dB	+0.07/−0.08 dB
120 kHz	−0.4 dB	(7) ______	+0.4 dB	+0.07/−0.08 dB
300 kHz	−0.4 dB	(8) ______	+0.4 dB	+0.07/−0.08 dB
1 MHz	−0.4 dB	(9) ______	+0.4 dB	+0.07/−0.08 dB
3 MHz	−0.4 dB	(10) ______	+0.4 dB	+0.07/−0.08 dB
Option 130 only:				
3 kHz	0 (Ref)	0 (Ref)	0 (Ref)	
300 Hz	−0.6 dB	(11) ______	+0.6 dB	+0.07/−0.08 dB
200 Hz	−0.6 dB	(12) ______	+0.6 dB	+0.07/−0.08 dB
100 Hz	−0.6 dB	(13) ______	+0.6 dB	+0.07/−0.08 dB
30 Hz	−0.6 dB	(14) ______	+0.6 dB	+0.07/−0.08 dB
17. Resolution Bandwidth Accuracy				
3 dB Resolution Bandwidth				
3 MHz	2.4 MHz	(1) ______	3.6 MHz	±138 kHz
1 MHz	0.8 MHz	(2) ______	1.2 MHz	±46 kHz
300 kHz	240 kHz	(3) ______	360 kHz	±13.8 kHz
100 kHz	80 kHz	(4) ______	120 kHz	±4.6 kHz
30 kHz	24 kHz	(5) ______	36 kHz	±1.38 kHz
10 kHz	8 kHz	(6) ______	12 kHz	±460 Hz
3 kHz	2.4 kHz	(7) ______	3.6 kHz	±138 Hz
1 kHz	0.8 kHz	(8) ______	1.2 kHz	±46 Hz
6 dB EMI Bandwidth				
9 kHz	7.2 kHz	(9) ______	10.8 kHz	±333 Hz
120 kHz	96 kHz	(10) ______	144 kHz	±4.44 kHz

HP 8596E Performance Verification Test Record (page 9 of 13)

Hewlett-Packard Company Model HP 8596E Serial No. ______	Report No. ______ Date ______

Test Description	Results Measured Min.	(TR Entry)	Max.	Measurement Uncertainty
17. Resolution Bandwidth Accuracy (continued)				
Option 130 only:				
3 dB Resolution Bandwidth				
300 Hz	240 Hz	(11) ______	360 Hz	±36 Hz
100 Hz	80 Hz	(12) ______	120 Hz	±12 Hz
30 Hz	24 Hz	(13) ______	36 Hz	±3.9 Hz
6 dB EMI Bandwidth				
200 Hz	160 Hz	(14) ______	240 Hz	±24 Hz
18. Calibrator Amplitude Accuracy	−20.4 dBm	(1) ______	−19.6 dBm	±0.2 dB
23. Frequency Response				
Band 0				
Max. Positive Response		(1) ______	+1.5 dB	+0.32/−0.33 dB
Max. Negative Response	−1.5 dB	(2) ______		+0.32/−0.33 dB
Peak-to-Peak Response		(3) ______	2.0 dB	+0.32/−0.33 dB
Band 1				
Max. Positive Response		(4) ______	+2.0 dB	+0.40/−0.42 dB
Max. Negative Response	−2.0 dB	(5) ______		+0.40/−0.42 dB
Peak-to-Peak Response		(6) ______	3.0 dB	+0.40/−0.42 dB
Band 2				
Max. Positive Response		(7) ______	+2.5 dB	+0.42/−0.43 dB
Max. Negative Response	−2.5 dB	(8) ______		+0.42/−0.43 dB
Peak-to-Peak Response		(9) ______	4.0 dB	+0.42/−0.43 dB
28. Other Input Related Spurious Responses				
50 kHz to 12.8 GHz		(1) ______	−55 dBc	+1.12/−1.21 dB
33. Spurious Responses				
Second Harmonic Distortion				
Applied Frequency				
40 MHz		(1) ______	−50 dBc	+1.86/−2.27 dB
2.8 GHz		(3) ______	(2) ______ *(Step 23c)*	+2.24/−2.72 dB
Third Order Intermodulation Distortion				
Frequency				
2.8 GHz		(4) ______	−54 dBc	+2.07/−2.42 dB
4.0 GHz		(5) ______	−54 dBc	+2.07/−2.42 dB
38. Gain Compression				
<2.9 GHz	-	(1) ______	0.5 dB	+0.21/−0.22 dB
>2.9 GHz		(2) ______	0.5 dB	+0.21/−0.22 dB
Option 130 only:		(3) ______	0.5 dB	+0.21/−0.22 dB

HP 8596E Performance Verification Test Record (page 10 of 13)

Hewlett-Packard Company Model HP 8596E Serial No. ______	Report No. ______ Date ______

Test Description	Results Measured Min.	(TR Entry)	Max.	Measurement Uncertainty
43. Displayed Average Noise				
Frequency				
400 kHz		(1) ______	−110 dBm	+1.15/−1.25 dB
1 MHz		(2) ______	−110 dBm	+1.15/−1.25 dB
1 MHz to 2.9 GHz		(3) ______	−110 dBm	+1.15/−1.25 dB
2.75 to 6.5 GHz		(4) ______	−112 dBm	+1.15/−1.25 dB
6.0 to 12.8 GHz		(5) ______	−100 dBm	+1.15/−1.25 dB
48. Displayed Average Noise for Option 130				
Frequency				
400 kHz		(1) ______	−125 dBm	+1.15/−1.25 dB
1 MHz		(2) ______	−125 dBm	+1.15/−1.25 dB
1 MHz to 2.9 GHz		(3) ______	−125 dBm	+1.15/−1.25 dB
2.75 to 6.5 GHz		(4) ______	−127 dBm	+1.15/−1.25 dB
6.0 to 12.8 GHz		(5) ______	−115 dBm	+1.15/−1.25 dB
53. Residual Responses				
150 kHz to 6.5 GHz		(1) ______	−90 dBm	+1.09/−1.15 dB
56. Residual Responses for Option 130				
150 kHz to 6.5 GHz		(1) ______	−90 dBm	+1.09/−1.15 dB
58. Fast Time Domain Sweeps				
Option 101 only:				
Amplitude Resolution	0.933X	______	1.007X	0%
SWEEP TIME				
18 ms	14.04 ms	(1) ______	14.76 ms	±0.5%
10 ms	7.80 ms	(2) ______	8.20 ms	±0.5%
1.0 ms	780 μs	(3) ______	820 μs	±0.5%
100 μs	78 μs	(4) ______	82 μs	±0.5%
20 μs	15.6 μs	(5) ______	16.4 μs	±0.5%

HP 8596E Performance Verification Test Record (page 11 of 13)

Hewlett-Packard Company Model HP 8596E Serial No. ____________	Report No. ____________ Date ____________

Test Description	Min.	Results Measured (TR Entry)	Max.	Measurement Uncertainty
60. Absolute Amplitude Accuracy				
Option 010 only:				
Absolute Amplitude Accuracy	−20.75 dBm	(1) ________	−19.25 dBm	+.155/−.161 dB
Positive Vernier Accuracy		(2) ________	+0.50 dB	±0.03 dB
Negative Vernier Accuracy	−0.50 dB	(3) ________		±0.03 dB
Positive Step-to-Step Accuracy		(4) ________	+1.20 dB	±0.03 dB
Negative Step-to-Step Accuracy	−0.80 dB	(5) ________		±0.03 dB
61. Power Sweep Range				
Option 010 only:				
Start Power Level		(1) ________		
Stop Power Level		(2) ________		
Power Sweep Range	9.0 dB	(3) ________		±0.03 dB
63. Tracking Generator Level Flatness				
Option 010 only:				
Maximum Flatness				
9 kHz to 100 kHz		(1) ________	+2.0 dB	+0.42/−0.45 dB
100 kHz to 2900 MHz		(2) ________	+2.0 dB	+0.42/−0.45 dB
Minimum Flatness				
9 kHz to 100 kHz	−2.0 dB	(3) ________		+0.42/−0.45 dB
100 kHz to 2900 MHz	−2.0 dB	(4) ________		+0.42/−0.45 dB
65. Harmonic Spurious Outputs				
Option 010 only:				
2nd Harmonic Level, 9 kHz		(1) ________	−15 dBc	+1.55/−1.80 dB
2nd Harmonic Level, 25 kHz to 900 MHz		(2) ________	−25 dBc	+1.55/−1.80 dB
2nd Harmonic Level, 1.4 GHz		(3) ________	−25 dBc	+3.45/−4.01 dB
3rd Harmonic Level, 9 kHz		(4) ________	−15 dBc	+1.55/−1.80 dB
3rd Harmonic Level, 25 kHz to 900 MHz		(5) ________	−25 dBc	+1.55/−1.80 dB
67. Non-Harmonic Spurious Outputs				
Option 010 only:				
Highest Non-Harmonic Response Amplitude				
9 kHz to 2000 MHz		(1) ________	−27 dBc	+1.55/−1.80 dB
2000 MHz to 2900 MHz		(2) ________	−23 dBc	+3.45/−4.01 dB
70. Tracking Generator Feedthrough				
Option 010 only:				
400 kHz to 2.9 GHz		(1) ________	−110 dBm	+1.59/−1.70 dB

HP 8596E Performance Verification Test Record (page 12 of 13)

Hewlett-Packard Company Model HP 8596E Serial No. ______	Report No. ______ Date ______

Test Description	Results Measured Min.	(TR Entry)	Max.	Measurement Uncertainty
71. Tracking Generator LO Feedthrough Amplitude				
Option 010 only:				
9 kHz to 1.5 GHz		(1) ______	−16 dBm	±2.02/−2.50 dB
2.9 GHz		(2) ______	−16 dBm	±2.10/−2.67 dB
72. CISPR Pulse Response				
Options 103 only:		Amplitude Error		
Measured Amplitude				
9 kHz EMI BW		(1) ______		±0.34 dB
120 kHz EMI BW		(2) ______		±0.50 dB
Options 103 and 130 only:				
200 Hz EMI BW		(3) ______		±0.34 dB
Options 103 only:				
Relative Level, 9 kHz EMI BW				
Repetition Frequency				
1000	+5.5 dB	(4) ______	+3.5 dB	±0.17 dB
100	0 (Ref)	(5) ______	0 (Ref)	0 (Ref)
20	−5.5 dB	(6) ______	−7.5 dB	±0.27 dB
10	−8.5 dB	(7) ______	−11.5 dB	±0.25 dB
2	−18.5 dB	(8) ______	−22.5 dB	±0.23 dB
1	−20.5 dB	(9) ______	−24.5 dB	±0.19 dB
Isolated Pulse	−21.5 dB	(10) ______	−25.5 dB	±0.15 dB
Relative Level, 120 kHz EMI BW				
Repetition Frequency				
1000	+9.0 dB	(11) ______	+7.0 dB	±0.17 dB
100	0 (Ref)	(12) ______	0 (Ref)	0 (Ref)
20	−8.0 dB	(13) ______	−10.0 dB	±0.18 dB
10	−12.5 dB	(14) ______	−15.5 dB	±0.18 dB
2	−24.0 dB	(15) ______	−28.0 dB	±0.18 dB
1	−26.5 dB	(16) ______	−30.5 dB	±0.18 dB
Isolated Pulse	−29.5 dB	(17) ______	−33.5 dB	±0.17 dB
Options 103 and 130 only:		Amplitude Error		
Relative Level, Band A				
Repetition Frequency				
100	3.0 dB	(18) ______	+5.0 dB	±0.24 dB
60	2.0 dB	(19) ______	5.0 dB	±0.26 dB
25	0 (Ref)	(20) ______	0 (Ref)	0 (Ref)
10	−3.0 dB	(21) ______	−5.0 dB	±0.29 dB
5	−6.0 dB	(22) ______	−9.0 dB	±0.30 dB
2	−11.0 dB	(23) ______	−15.0 dB	±0.36 dB
1	−20.5 dB	(24) ______	−24.5 dB	±0.28 dB
Isolated Pulse	−21.5 dB	(25) ______	−25.5 dB	±0.20 dB

HP 8596E Performance Verification Test Record (page 13 of 13)

Hewlett-Packard Company	
Model HP 8596E	**Report No.** ________________
Serial No. ________________	**Date** ________________

Test Description	Min.	Results Measured (TR Entry)	Max.	Measurement Uncertainty
73. Gate Delay Accuracy and Gate Length Accuracy				
Option 105 only:				
Minimum Gate Delay	0.0 μs	(1) ________	2.0 μs	±0.011 μs
Maximum Gate Delay	0.0 μs	(2) ________	2.0 μs	±0.011 μs
1 μs Gate Length	0.8 μs	(3) ________	1.2 μs	±0.434 μs
65 ms Gate Length	64.99 μs	(4) ________	65.01 μs	±0.434 μs
74. Gate Card Insertion Loss				
Option 105 only:				
Gate Card Insertion Loss	−0.3 dB	(1) ________	+0.3 dB	±0.092 dB
75. TV Receiver, Video Tester				
Differential Gain				
Channel 2		(1) ________	6%	1.5%
7		(2) ________	6%	1.5%
14		(3) ________	6%	1.5%
33		(4) ________	6%	1.5%
38		(5) ________	6%	1.5%
77		(6) ________	6%	1.5%
Differential Phase				
Channel 2		(1) ________	4°	1°
7		(2) ________	4°	1°
14		(3) ________	4°	1°
33		(4) ________	4°	1°
38		(5) ________	4°	1°
77		(6) ________	4°	1°
Chroma-Luminance Delay				
Channel 2	−45 ns	(1) ________	45 ns	±5.1 ns
7	−45 ns	(2) ________	45 ns	±5.1 ns
14	−45 ns	(3) ________	45 ns	±5.1 ns
33	−45 ns	(4) ________	45 ns	±5.1 ns
38	−45 ns	(5) ________	45 ns	±5.1 ns
77	−45 ns	(6) ________	45 ns	±5.1 ns

4

HP 8591C Specifications and Characteristics

This chapter contains specifications and characteristics for the HP 8591C cable TV analyzer.

The specifications and characteristics in this chapter are listed separately. The specifications are described first, followed by the characteristics.

General	General specifications and characteristics.
Cable TV	Cable TV measurement specifications and characteristics.
Frequency	Frequency-related specifications and characteristics.
Amplitude	Amplitude-related specifications and characteristics.
Option	Option-related specifications and characteristics.
Physical	Input, output and physical characteristics.

The distinction between specifications and characteristics is described as follows.

- Specifications describe warranted performance over the temperature range 0 °C to +50 °C (unless otherwise noted). The spectrum analyzer will meet its specifications under the following conditions:
  - The instrument is within the one year calibration cycle.
  - 2 hours of storage at a constant temperature within the operating temperature range.
  - 30 minutes after the spectrum analyzer is turned on.
  - After the CAL frequency, and CAL amplitude routines have been run.
- Characteristics provide useful, but nonwarranted information about the functions and performance of the spectrum analyzer. Characteristics are specifically identified.
- Typical Performance, where listed, is not warranted, but indicates performance that most units will exhibit.
- Nominal Value indicates the expected, but not warranted, value of the parameter.

General Specifications

Temperature Range	
Operating	0 °C to +50 °C
Storage	−40 °C to +75 °C

EMI Compatibility	Conducted and radiated emission is in compliance with CISPR Pub. 11/1990 Group 1 Class A.

Audible Noise	<37.5 dBA pressure and <5.0 Bels power (ISODP7779)

Power Requirements	
ON (LINE 1)	90 to 132 V rms, 47 to 440 Hz
	195 to 250 V rms, 47 to 66 Hz
	Power consumption <500 VA; <180 W
Standby (LINE 0)	Power consumption <7 W

Environmental Specifications	Type tested to the environmental specifications of Mil-T-28800 class 5

Cable TV Measurement Specifications

These specifications describe warranted performance of the HP 8591C cable TV analyzer and the HP 85721A cable TV measurements personality.

Input Configuration	75 Ω BNC Female

Channel Selection	Analyzer tunes to specified channels based upon selected tune configuration.
Tune Configuration	Standard, Off-the Air, HRC, IRC (T and FM channels also in channel mode)
Channel Range	1 to 158 and 201 to 300 (channel mode) 1 to 158 (system mode)
Channel Frequencies	Defined by Code of Federal Regulations, Title 47, Telecommunications, Parts 73.603, 76.605, 76.612
Frequency Range	5 to 1002 MHz (channel mode) 54 to 896 MHz (system mode)
Amplitude Range	−15 to +70 dBmV for S/N > 30 dB

Visual-Carrier Frequency	Visual-carrier frequency is counted

Precision Frequency Reference *(Standard)*	
Resolution	100 Hz
Accuracy	$\pm(1.2 \times 10^{-7}$ x carrier frequency + 110 Hz)
@55.25 MHz (Ch. 2)	±117 Hz
@325.25 MHz (Ch. 41)	±149 Hz
@643.25 MHz (Ch. 94)	±187 Hz

Option 704 Frequency Reference*	
Resolution	1 kHz
Accuracy	$\pm(7.5 \times 10^{-6}$ x carrier frequency + 110 Hz)
@55.25 MHz (Ch. 2)	±524 Hz
@325.25 MHz (Ch. 41)	±2.55 kHz
@643.25 MHz (Ch. 94)	±4.93 kHz
* Will not meet FCC frequency accuracy requirements.	

Visual-to-Aural Carrier Frequency Difference	Frequency difference between visual and aural carriers is counted.
Difference Range	4.1 to 4.9 MHz
Resolution	100 Hz
Accuracy	±221 Hz for precision frequency ref (std) ±254 Hz for Option 704 frequency ref

Visual-Carrier Level	The peak amplitude of the visual carrier is measured to an absolute standard traceable to the National Institute of Standards and Technology.
Amplitude Range	−15 to +70 dBmV
Resolution	0.1 dB
Absolute Accuracy	±2.0 dB for S/N > 30 dB
Relative Accuracy	±1.0 dB relative to adjacent channels in frequency ±1.5 dB relative to all other channels

Cable TV Measurement Specifications

Visual-to-Aural Carrier Level Difference	The difference between peak amplitudes of the visual and aural carrier is measured.
Difference Range	0 to 25 dB
Resolution	0.1 dB
Accuracy	±0.75 dB for S/N > 30 dB

Hum/Low-Frequency Disturbance	Power-line frequency and low-frequency disturbance measured on modulated and/or unmodulated carriers. May not be valid for scrambled channels.
AM Range	0.5 to 10%
Resolution	0.1%
Accuracy	±0.4% for hum ≤3% ±0.7% for hum ≤5% ±1.3% for hum ≤10%

Visual Carrier-to-Noise Ratio (C/N)*	The C/N is calculated from the visual-carrier peak level and the minimum noise level, normalized to 4 MHz noise bandwidth.
Optimum Input Range	See the graphs in the characteristics section of this chapter.
Maximum C/N Range	Input level dependent - See graphs
C/N Resolution	0.1 dB
C/N Accuracy	Input level and measured C/N dependent ±1.0 to ±3.5 dB over optimum input range
* A preamplifier and preselector filter may be required to achieve specifications.	

CSO and CTB Distortion†	Manual composite second order (CSO) and composite triple beat (CTB) distortions are measured relative to the visual carrier peak and require momentary disabling of the carrier. Automatic measurements are made in the channel above the channel selected and assumes that it is unused. If the analyzer has Option 107, a non- interfering CSO measurement can be made.
Optimum Input Range	See the graphs in the characteristics section of this chapter.
Maximum CSO/CTB Range	Input level dependent - see graphs. 66 to 73 dB over optimum input range
Manual CSO/CTB Resolution	0.1 dB
System CSO/CTB Resolution	1 dB
CSO/CTB Accuracy	Input level and measured CSO/CTB dependent - See graphs ±1.5 dB to ±4.0 dB over optimum input range
† A preamplifier and preselector filter may be required to achieve specifications.	

System Frequency Response (flatness)

System amplitude variations are measured relative to a reference trace stored during the setup.

Frequency Response Setup	
Fast Sweep Time	2 s (default) for no scrambling
Slow Sweep Time	8 s (default) for fixed-amplitude scrambling
Reference-trace Storage	50 traces that include analyzer states

Frequency Response Test	
Range	1.0 dB/Div to 20 dB/Div (2 dB default)
Resolution	0.05 dB
Trace-flatness Accuracy	±0.1 dB per dB deviation from a flat line and ±0.75 dB maximum cumulative error
Trace-position Accuracy	0.0 dB for equal temperature at test locations and ±0.4 dB maximum for different ambient temperatures

Frequency Specifications

Frequency Range	
75 Ω	1 MHz to 1.8 GHz

Precision Frequency Reference	
Aging	±1 x 10^{-7}/year
Settability	±2.2 x 10^{-8}
Temperature Stability	±1 x 10^{-8}

Frequency Reference *(Option 704)*	
Aging	±2 x 10^{-6}/year
Settability	±0.5 x 10^{-6}
Temperature Stability	±5 x 10^{-6}

Frequency Readout Accuracy	
(Start, Stop, Center, Marker)	±(frequency readout x frequency reference error* + span accuracy + 1% of span + 20% of RBW + 100 Hz)‡

* frequency reference error = (aging rate x period of time since adjustment + initial achievable accuracy + temperature stability). See "Frequency Characteristics."
‡ See "Drift" under "Stability" in Frequency Characteristics.

Marker Count Accuracy†	
Frequency Span ≤ 10 MHz	±(marker frequency x frequency reference error* + counter resolution + 100 Hz)
Frequency Span >10 MHz	±(marker frequency x frequency reference error* + counter resolution + 1 kHz)
Counter Resolution	
Frequency Span ≤ 10 MHz	Selectable from 10 Hz to 100 kHz
Frequency Span > 10 MHz	Selectable from 100 Hz to 100 kHz

* frequency reference error = (aging rate x period of time since adjustment + initial achievable accuracy and temperature stability). See "Frequency Characteristics."
† Marker level to displayed noise level > 25 dB, RBW/Span ≥ 0.01. Span ≤ 300 MHz. Reduce SPAN annotation is displayed when RBW/Span < 0.01.

Frequency Span	
Range	0 Hz (zero span), 10 kHz to 1.8 GHz
(Option 130)	0 Hz (zero span), 1 kHz to 1.8 GHz
Resolution	Four digits or 20 Hz, whichever is greater.
Accuracy	
Span ≤ 10 MHz	±2% of span§
Span > 10 MHz	±3% of span

§ *(Option 130)* For spans < 10 kHz, add an additional 10 Hz resolution error.

Frequency Sweep Time	
Range	
	20 ms to 100 s
(Option 101)	20 μs to 100 s for span = 0 Hz
Accuracy	
20 ms to 100 s	±3%
20 μs to <20 ms *(Option 101)*	±2%
Sweep Trigger	Free Run, Single, Line, Video, External

Resolution Bandwidth	
Range	1 kHz to 3 MHz, 8 selectable resolution (3 dB) bandwidths in 1-3-10 sequence. 9 kHz and 120 kHz (6 dB) EMI bandwidths.
(Option 130)	Adds 30, 100 and 300 Hz (3 dB) bandwidths and 200 Hz (6 dB) EMI bandwidth.
Accuracy	
3 dB bandwidths	±20%

Stability	
Noise Sidebands	(1 kHz RBW, 30 Hz VBW and sample detector)
>10 kHz offset from CW signal	≤−90 dBc/Hz
>20 kHz offset from CW signal	≤−100 dBc/Hz
>30 kHz offset from CW signal	≤−105 dBc/Hz
Residual FM	
1 kHz RBW, 1 kHz VBW	≤250 Hz pk-pk in 100 ms
30 Hz RBW, 30 Hz VBW *(Option 130)*	≤30 Hz pk-pk in 300 ms
System-Related Sidebands	
>30 kHz offset from CW signal	≤−65 dBc

Calibrator Output Frequency	300 MHz ±(freq. ref. error* x 300 MHz)
* frequency reference error = (aging rate x period of time since adjustment + initial achievable accuracy + temperature stability). See "Frequency Characteristics."	

Amplitude Specifications

Amplitude specifications do not apply for Analog+ mode and negative peak detector mode except as noted in "Amplitude Characteristics."

Amplitude Range	
75 Ω	−63 dBmV to +75 dBmV
75 Ω *(Option 130)*	−78 dBmV to +75 dBmV

Maximum Safe Input Level	(Input attenuator ≥10 dB)	
	50 Ω	**75 Ω** *(Option 001)*
Average Continuous Power	+30 dBm (1 W)	+75 dBmV (0.4 W)
Peak Pulse Power	+30 dBm (1 W)	+75 dBmV (0.4 W)
dc	25 Vdc	100 Vdc

Gain Compression‡	
>10 MHz	≤0.5 dB (total power at input mixer* = −10 dBm)

* Mixer Power Level (dBm) = Input Power (dBm) − Input Attenuation (dB).
‡ (Option 130) If RBW ≤ 300 Hz, this applies only if signal separation ≥ 4 kHz and signal amplitudes ≤ Reference Level + 10 dB.

Displayed Average Noise Level	(Input terminated, 0 dB attenuation, 30 Hz VBW, sample detector)
1 kHz RBW	**75 Ω**
400 kHz to 1 MHz	N/A
1 MHz to 1.5 GHz	≤−63 dBmV
1.5 GHz to 1.8 GHz	≤−61 dBmV
30 Hz RBW *(Option 130)*	
400 kHz to 1 MHz	N/A
1 MHz to 1.5 GHz	≤−78 dBmV
1.5 GHz to 1.8 GHz	≤−76 dBmV

Spurious Responses	
Second Harmonic Distortion	
5 MHz to 1.8 GHz	<−70 dBc for −45 dBm tone at input mixer.*
Third Order Intermodulation Distortion	
5 MHz to 1.8 GHz	<−70 dBc for two −30 dBm tones at input mixer* and >50 kHz separation.
Other Input Related Spurious	<−65 dBc at ≥30 kHz offset, for −20 dBm tone at input mixer ≤1.8 GHz.

* Mixer Power Level (dBm) = Input Power (dBm) − Input Attenuation (dB). (For analyzers with Input 75 Ω, add another 5.7 dB to the Input Attenuator.)

Residual Responses	(Input terminated and 0 dB attenuation)
	75 Ω
1 MHz to 1.8 GHz	<−38 dBmV

Display Range	
Log Scale	0 to −70 dB from reference level is calibrated; 0.1, 0.2, 0.5 dB/division and 1 to 20 dB/division in 1 dB steps; eight divisions displayed.
Linear Scale	eight divisions
Scale Units	dBm, dBmV, dBμV, mV, mW, nV, nW, pW, μV, μW, V, and W

Marker Readout Resolution	0.05 dB for log scale
	0.05% of reference level for linear scale
Fast Sweep Times for Zero Span	
20 μs to 20 ms *(Option 101 or 301)*	
Frequency ≤ 1 GHz	0.7% of reference level for linear scale
Frequency > 1 GHz	1.0% of reference level for linear scale

Reference Level	
Range	
Log Scale	Minimum amplitude to maximum amplitude**
Linear Scale	−99 dBm to maximum amplitude**
Resolution	
Log Scale	±0.01 dB
Linear Scale	±0.12% of reference level
Accuracy	(referenced to −20 dBm reference level, 10 dB input attenuation, at a single frequency, in a fixed RBW)
0 dBm to −59.9 dBm	±(0.3 dB + .01 x dB from −20 dBm)
−60 dBm and below	
1 kHz to 3 MHz RBW	±(0.6 dB + .01 x dB from −20 dBm)
30 Hz to 300 Hz RBW *(Option 130)*	±(0.7 dB + .01 x dB from −20 dBm)

** See "Amplitude Range."

Frequency Response	(10 dB input attenuation)	
	Absolute§	**Relative Flatness**†
1 MHz to 1.8 GHz	±1.5 dB	±1.0 dB

† Referenced to midpoint between highest and lowest frequency response deviations.
§ Referenced to 300 MHz CAL OUT.

Calibrator Output Amplitude	
75 Ω	+28.75 dB mV ±0.4 dB

Absolute Amplitude Calibration Uncertainty‡‡	±0.15 dB

‡‡ Uncertainty in the measured absolute amplitude of the CAL OUT signal at the reference settings after CAL FREQ and CAL AMPTD self-calibration. Absolute amplitude reference settings are: Reference Level −20 dBm; Input Attenuation 10 dB; Center Frequency 300 MHz; Res BW 3 kHz; Video BW 300 Hz; Scale Linear; Span 50 kHz; Sweep Time Coupled, Top Graticule (reference level), Corrections ON.

Input Attenuator	
Range	0 to 60 dB, in 10 dB steps

Amplitude Specifications

Resolution Bandwidth Switching Uncertainty	(At reference level, referenced to 3 kHz RBW)
3 kHz to 3 MHz RBW	±0.4 dB
1 kHz RBW	±0.5 dB
30 Hz to 300 Hz *(Option 130)*	±0.6 dB

Linear to Log Switching	±0.25 dB at reference level

Display Scale Fidelity	
Log Maximum Cumulative	
0 to −70 dB from Reference Level	
3 kHz to 3 MHz RBW	± (0.3 dB + 0.01 x dB from reference level)
RBW ≤ 1 kHz	± (0.4 dB + 0.01 x dB from reference level)
Log Incremental Accuracy	
0 to −60 dB from Reference Level	±0.4 dB/4 dB
Linear Accuracy	±3% of reference level

Option Specifications

Tracking Generator Specifications (Option 010 or 011)

All specifications apply over 0 °C to +50 °C. The spectrum-analyzer/tracking-generator combination will meet its specifications after 2 hours of storage at a constant temperature within the operating temperature range, 30 minutes after the spectrum-analyzer/tracking-generator is turned on and after CAL FREQ, CAL AMPTD, CAL TRK GEN, and TRACKING PEAK have been run.

Warm-Up	30 minutes

Output Frequency	
Range	
75 Ω *(Option 011)*	1 MHz to 1.8 GHz

Output Power Level	
Range	
75 Ω *(Option 011)*	+42.8 to −27.2 dBmV
Resolution	0.1 dB
Absolute Accuracy	±1.0 dB (at 300 MHz, +28.8 dBmV, and coupled source attenuator)
Vernier	
Range	10 dB‡
Accuracy	±0.75 dB over 10 dB range (referenced to +28.8 dBmV for coupled source attenuator setting)‡
Output Attenuator	
Range	0 to 60 dB in 10 dB steps
‡ See the Output Accuracy table in "Option Characteristics."	

Output Power Sweep	
Range	
75 Ω *(Option 011)*	(+27.8 to 42.8 dBmV) − (Source Attenuator Setting)
Resolution	0.1 dB
Accuracy (zero span)	<1.5 dB peak-to-peak

Output Flatness (referenced to 300 MHz, 10 dB attenuator)	±1.75 dB

Spurious Outputs	
75 Ω *(Option 011)*	(+42.8 dBmV output, 1 MHz to 1.8 GHz)
Harmonic Spurs	<−25 dBc
Nonharmonic Spurs	<−30 dBc

Option Specifications

Dynamic Range	
Tracking Generator Feedthrough	
75 Ω *(Option 011)*	<−57.24 dBmV

Time Gated Spectrum Analysis Specifications (Option 107)

GATE DELAY	
Range	1 μs to 65.535 ms
Resolution	1 μs
Accuracy	±(1 μs + (0.01% x GATE DELAY Readout))†
(From GATE TRIGGER INPUT to positive edge of GATE OUTPUT)	
GATE LENGTH	
Range	1 μs to 65.535 ms
Resolution	1 μs
Accuracy	±(0.2 μs +(0.01% x GATE LENGTH Readout))
(From positive edge to negative edge of GATE OUTPUT)	
Additional Amplitude Error§	
Log Scale	±0.3 dB
Linear Scale	±0.4% of REFERENCE LEVEL

† Up to 1 μs jitter due to 1 μs resolution of gate delay clock.
§ With GATE ON enabled and triggered, CW Signal, Peak Detector Mode.

TV Receiver/Video Tester (Option 107)

Non-interfering color	(requires FCC composite, NTC-7, or CCIR 17 and CCIR 330 test signal)
Differential Gain Accuracy	6% 50 averages (default)
Differential Phase Accuracy	4° 50 averages (default)
Chroma-luminance Delay Inequality Accuracy	±45 ns
Frequency Range	50 MHz to 850 MHz
Amplitude Range	+10 dBmV to +50 dBmV at coupler input (10 dB loss)
Coupler (HP part number 0955-0704)	Insertion loss: < 2 dB
	Coupled output: −10 dB ±0.5 dB

Non-Interfering Tests with Gate On*	
C/N and CSO	See graphs for accuracy
(quiet line must be selected)	
In-channel Frequency Response Accuracy	±0.5 dB within channel

* A preamplifier and preselector filter may be required to achieve specifications.

Cable TV Measurement Characteristics

Depth of Modulation	Percent AM is measured from horizontal sync tip to maximum video level; measurement requires a white-reference VITS and may not be valid for scrambled channels.
AM Range	50 to 93%
Resolution	0.1%
Accuracy	±2.0% for C/N > 40 dB

FM Deviation	Peak reading of FM deviation
Range	±100 kHz
Resolution	100 Hz
Accuracy	±1.5 kHz

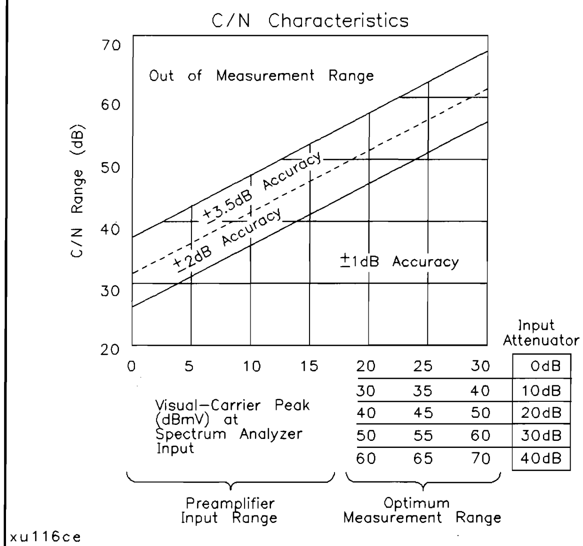


Figure 2-1

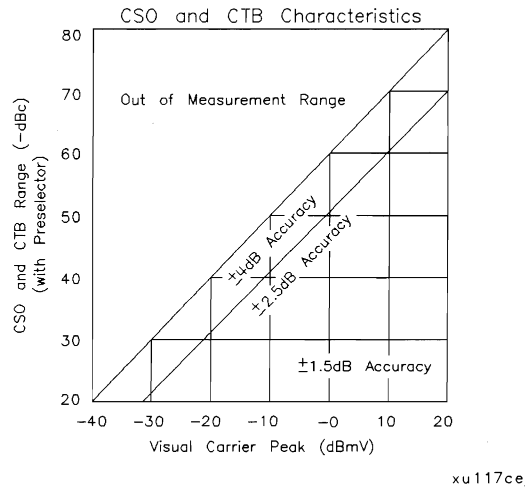


Figure 2-2

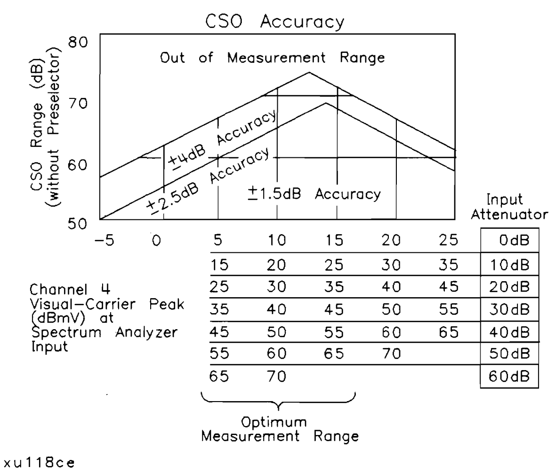


Figure 2-3

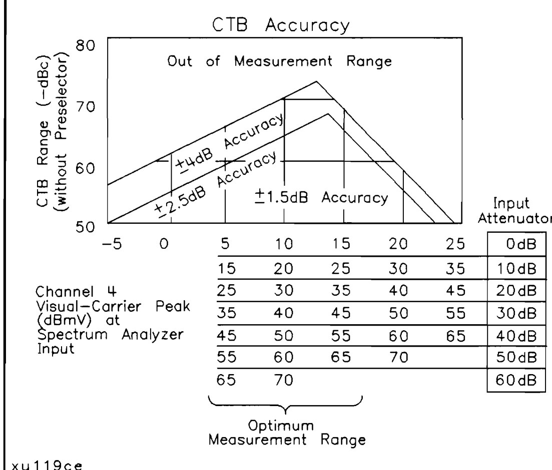


Figure 2-4

C/N, CSO, and CTB Measurements

The four graphs summarize the combined HP 8591C cable TV analyzer or HP 8590 E-Series spectrum analyzers, and HP 85721A characteristics for C/N, CSO, and CTB testing on cable TV systems with up to 99 channels and up to +9 dB amplitude tilt. C/N, CSO, and CTB measurement accuracies and ranges can be read from the relevant graphs. They depend upon the visual carrier peak level and the measurement reading. For C/N measurements with a preselector, there is no optimum range and the accuracy boundaries drop by the preselector's insertion loss (typically 2 dB).

Crossmodulation	Horizontal-line (15.7 kHz) related AM is measured on the unmodulated visual carrier.
Range	60 dB, usable to 65 dB
Resolution	0.1 dB
Accuracy	±2.0 dB for xmod. <40 dB, C/N >40 dB ±2.6 dB for xmod. <50 dB, C/N >40 dB ±4.6 dB for xmod. <60 dB, C/N >40 dB

Frequency Characteristics

These are not specifications. Characteristics provide useful but nonwarranted information about instrument performance.

Precision Frequency Reference *(Option 004)*	
Aging	5 x 10^{-10}/day, 7-day average after being powered on for 7 days.
Warm-Up	1 x 10^{-8} after 30 minutes on.
Initial Achievable Accuracy	±2.2 x 10^{-8} after being powered on for 24 hours.

Frequency Reference *(Option 704)*	
Aging	±2 x 10^{-6}/year
Settability	±0.5 x 10^{-6}
Temperature Stability	±5 x 10^{-6}

Stability	
Drift* (after warmup at stabilized temperature)	
Frequency Span ≤10 MHz, Free Run	<2 kHz/minute of sweep time
* Because the analyzer is locked at the center frequency before each sweep, drift occurs only during the time of one sweep. For Line, Video or External trigger, additional drift occurs while waiting for the appropriate trigger signal.	

Resolution Bandwidth (−3 dB)	
Range	1 kHz to 3 MHz, selectable in 1, 3 and 10 increments, and 5 MHz. Resolution bandwidths may be selected manually, or coupled to frequency span.
(Option 130)	Adds 30 Hz, 100 Hz, and 300 Hz bandwidths.
Shape	Synchronously tuned four poles. Approximately Gaussian shape.
60 dB/3 dB Bandwidth Ratio	
Resolution Bandwidth	
100 kHz to 3 MHz	15:1
30 kHz	16:1
3 kHz to 10 kHz	15:1
1 kHz	16:1
40 dB/3 dB Bandwidth Ratio *(Option 130)*	
Resolution Bandwidth	
30 Hz to 300 Hz	10:1

Video Bandwidth (−3 dB)	
Range	30 Hz to 1 MHz, selectable in 1, 3, 10 increments, accuracy ±30% and 3 MHz. Video bandwidths may be selected manually, or coupled to resolution bandwidth and frequency span.
(Option 130)	Adds 1, 3, and 10 Hz bandwidths.
Shape	Post detection, single pole low-pass filter used to average displayed noise.
(Option 130)	Bandwidths below 30 Hz are digital bandwidths with anti-aliasing filtering.

FFT Bandwidth Factors	FLATTOP	HANNING	UNIFORM
Noise Equivalent Bandwidth†	3.63x	1.5x	1x
3 dB Bandwidth†	3.60x	1.48x	1x
Sidelobe Height	<-90 dB	-32 dB	-13 dB
Amplitude Uncertainty	0.10 dB	1.42 dB	3.92 dB
Shape Factor (60 dB BW/3 dB BW)	2.6	9.1	>300

† Multiply entry by one-divided-by-sweep time.

FM Demodulation

Input Level	> (−60 dBm + attenuator setting)
Signal Level	0 to −30 dB below reference level
FM Offset	
Resolution	400 Hz nominal
FM Deviation (FM GAIN)	
Resolution	1 kHz nominal
Range	10 kHz to 1 MHz
Bandwidth	FM deviation/2
FM Linearity (for modulating frequency < bandwidth/100)	≤ 1% of FM deviation + 290 Hz

Amplitude Characteristics

These are not specifications. Characteristics provide useful but nonwarranted information about instrument performance.

Log Scale Switching Uncertainty	Negligible error

Demod Tune Listen	Internal speaker, rear panel earphone jack and front-panel volume control. Adjustable squelch control mutes the audio signal to the speaker/earphone jack based on the level of the demodulated signal above 22 kHz. An uncalibrated demodulated signal is available on the AUX VIDEO OUT connector at the rear panel.

TV Trigger	Triggers sweep of the analyzer after the sync pulse of a selected line of a TV video field.
Carrier Level for Trigger	Top 60% of linear display
Compatible Formats	NTSC, PAL, SECAM
Field Selection	Even, odd, non-interlaced
Trigger Polarity	Positive, negative
Line Selection	10 to 1021

Input Attenuation Uncertainty*	
Attenuator Setting	
0 dB	±0.5 dB
10 dB	Reference
20 dB	±0.5 dB
30 dB	±0.6 dB
40 dB	±0.8 dB
50 dB	±1.0 dB
60 dB	±1.2 dB

* Referenced to 10 dB input attenuator setting from 9 kHz to 1.8 GHz. See the "Specifications" table under "Frequency Response."

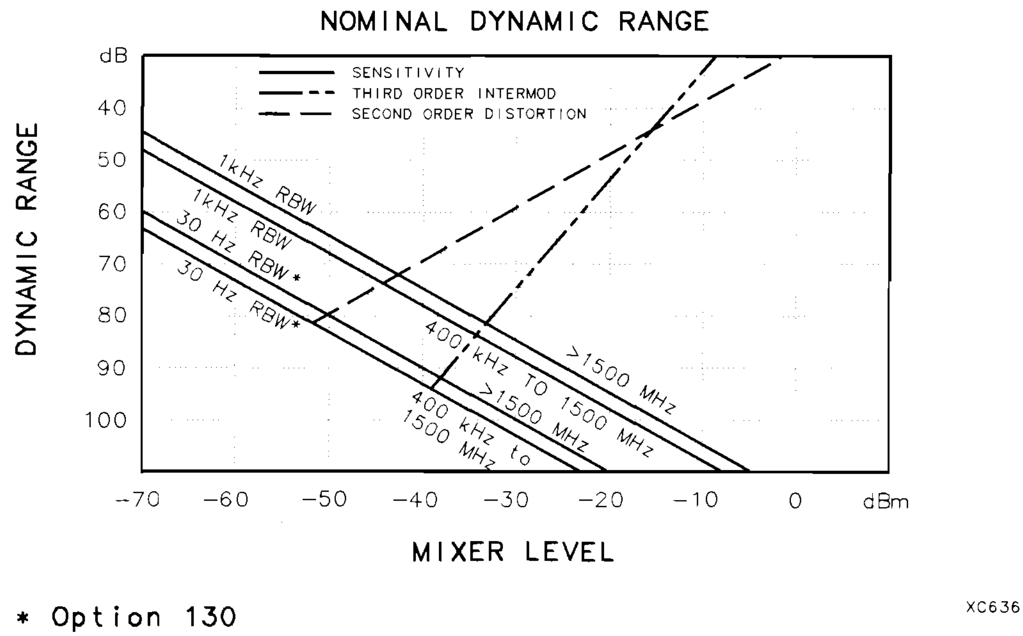
Input Attenuator Repeatability	
300 MHz	±0.03 dB
1.8 GHz	±1.0 dB

Input Attenuator Preamplifier	
Gain: 1 MHz to 1 GHz	27 dB
1 GHz to 1.8 GHz	20 dB

Noise Figure	<5.5 dB

RF Input SWR	(Attenuator setting 10 to 60 dB) 1.35:1

DYNAMIC RANGE



Dynamic Range

Immunity Testing	
Radiated Immunity	When tested at 3 V/m according to IEC 801-3/1984 the displayed average noise level will be within specifications over the full immunity test frequency range of 27 to 500 MHz except that at immunity test frequencies of 278.6 MHz ± selected resolution bandwidth and 321.4 MHz ± selected resolution bandwidth the displayed average noise level may be up to −45 dBm. When the analyzer tuned frequency is identical to the immunity test signal frequency there may be signals of up to −70 dBm displayed on the screen.
Electrostatic Discharge	When an air discharge of up to 8 kV according to IEC 801-2/1991 occurs to the shells of the BNC connectors on the rear panel of the instrument spikes may be seen on the CRT display. Discharges to center pins of any of the connectors may cause damage to the associated circuitry.

Analog + Mode and Negative Peak Detector Mode (Options 101 and 301)

These modes do not utilize the full set of internal amplitude corrections. Therefore, in these modes, some analyzer amplitude specifications are reduced to characteristics. Characteristics provide useful but nonwarranted information about instrument performance.

In these modes, the following analyzer specifications remain as specifications:

- **Amplitude Range**
- **Maximum Safe Input Level**
- **Calibrator Output**

In these modes, the following analyzer specifications are reduced to characteristics:

- **Gain Compression**
- **Displayed Average Noise Level**
- **Spurious Responses**
- **Residual Responses**
- **Display Range**
- **Reference Level**
- **Resolution Bandwidth Switching**
- **Linear to Log Switching**
- **Display Scale Fidelity**
- **Display Scale Fidelity for Narrow Bandwidths**

Finally, the following analyzer specifications:

- **Marker Readout Resolution**
- **Frequency Response**

are replaced by the characteristics which follow in this subsection.

Marker Readout Resolution	
(digitizing resolution)	
Log Scale	±0.31 dB
Linear Scale	
frequency ≤ 1 GHz	±0.59% of reference level
frequency > 1 GHz	±1.03% of reference level

Frequency Response in Analog + Mode	(10 dB input attenuation, for spans ≤ 20 MHz)	
	Absolute§	**Relative Flatness**†
	±1.9 dB	±1.4 dB

† Referenced to midpoint between highest and lowest frequency response deviations.
§ Referenced to 300 MHz CAL OUT.

Option Characteristics

Tracking Generator Characteristics (Option 010 or 011)

Output Tracking	
Drift (usable in 10 kHz bandwidth after 30-minute warmup)	1 kHz/5 minutes

Spurious Outputs (>1.8 GHz to 4.0 GHz)	
75 Ω *(Option 011)*	
+42.8 dBmV, output	
Harmonic	<−20 dBc
Nonharmonic	<−40 dBc
2121.4 MHz Feedthrough *(Option 011)*	<+42.8 dBmV

RF Power-Off Residuals	
1 MHz to 1.8 GHz *(Option 011)*	<−66.2 dBmV

Output Attenuator	
Repeatability	±0.2 dB

Output VSWR	
0 dB Attenuator	<2.5:1
10 dB Attenuator	<1.6:1

Dynamic Range (difference between maximum power out and tracking generator feedthrough)	
1 MHz to 1.8 GHz *(Option 011)*	>100 dB

Tracking Generator Characteristics (Option 010)

TRACKING GENERATOR OUTPUT ACCURACY, Option 011 (after CAL TRK GEN in auto-coupled mode)					
TG Output Power Level	**Attenuator Setting**	**Relative Accuracy (at 300 MHz referred to +28.8 dBmV)**	**Absolute Accuracy (at 300 MHz)**	**Relative Accuracy (referred to +28.8 dBmV) (+0.2 dB/GHz)***	**Absolute Accuracy (+0.2 dB/GHz)***
+42.76 to +31.77 dBmV	0 dB	±1.25 dB	±2.25 dB	±2.75 dB	±3.75 dB
+31.76 to +21.77 dBmV	10 dB	±0.75 dB	±1.75 dB	±2.25 dB	±3.25 dB
+28.76 dBmV	10 dB	0 dB Reference	±1.0 dB	±1.50 dB	±2.50 dB
+21.76 to +11.77 dBmV	20 dB	±1.25 dB	±2.25 dB	±2.75 dB	±3.75 dB
+11.76 to +1.77 dBmV	30 dB	±1.35 dB	±2.35 dB	±2.85 dB	±3.85 dB
+1.76 to −8.23 dBmV	40 dB	±1.55 dB	±2.55 dB	±3.05 dB	±4.05 dB
−8.24 to −18.23 dBmV	50 dB	±1.75 dB	±2.75 dB	±3.25 dB	±4.25 dB
−18.24 to −27.23 dBmV	60 dB	±1.95 dB	±2.95 dB	±3.45 dB	±4.45 dB

* Add 0.2 dB/GHz of tuned frequency to the value in this column for complete accuracy specification relative to frequency.

Physical Characteristics

Front-Panel Inputs and Outputs

INPUT 75Ω	
Connector	BNC female
Impedance	75 Ω nominal

RF OUT *(Option 010, 011)*	
Connector	
(Option 011)	BNC female
Impedance	
(Option 011)	75 Ω nominal
Maximum Safe Reverse Level	
(Option 011)	+69 dBmV (0.1 W), 100 Vdc

TV IN *(Option 107)*	
Connector	BNC female
Impedance	75 Ω nominal

PROBE POWER‡	
Voltage/Current	+15 Vdc, ±7% at 150 mA max.
	−12.6 Vdc ±10% at 150 mA max.

‡ Total current drawn from the +15 Vdc on the PROBE POWER and the AUX INTERFACE cannot exceed 150 mA. Total current drawn from the −12.5 Vdc on the PROBE POWER and the −15 Vdc on the AUX INTERFACE cannot exceed 150 mA.

Rear-Panel Inputs and Outputs

10 MHz REF OUTPUT	
Connector	BNC female
Impedance	50 Ω nominal
Output Amplitude	>0 dBm

EXT REF IN	
Connector	BNC female Note: Analyzer noise sideband and spurious response performance may be affected by the quality of the external reference used.
Input Amplitude Range	−2 to +10 dBm
Frequency	10 MHz

AUX IF OUTPUT	
Frequency	21.4 MHz
Amplitude Range	−10 to −60 dBm
Impedance	50 Ω nominal

Physical Characteristics

AUX VIDEO OUTPUT	
Connector	BNC female
Amplitude Range	0 to 1 V (uncorrected)

EARPHONE *(Option 102 or 103)*	
Connector	1/8 inch monaural jack

EXT ALC INPUT *(Option 011)*	
Impedance	1 MΩ
Polarity	Positive or negative
Range	−66 dBV to +6 dBV
Connector	BNC

EXT KEYBOARD *(Option 021, 023 or 024)*	Interface compatible with HP part number C1405 Option ABA and most IBM/AT non-auto switching keyboards.

EXT TRIG INPUT	
Connector	BNC female
Trigger Level	Positive edge initiates sweep in EXT TRIG mode (TTL).

GATE TRIGGER INPUT	
Connector	BNC female
Trigger Level	minimum pulse width >30 ns (TTL)
GATE OUTPUT	
Connector	BNC female
Output Level	High = gate on; Low = gate off (TTL)

HI-SWEEP IN/OUT	
Connector	BNC female
Output	High = sweep, Low = retrace (TTL)
Input	Open collector, low stops sweep.

MONITOR OUTPUT *(Spectrum Analyzer Display)*	
Connector	BNC female
Format	
SYNC NRM	Internal Monitor
SYNC NTSC	NTSC Compatible 15.75 kHz horizontal rate 60 Hz vertical rate
SYNC PAL	PAL Compatible 15.625 kHz horizontal rate 50 Hz vertical rate

REMOTE INTERFACE	
HP-IB *(Option 021)*	
HP-IB Codes	SH1, AH1, T6, SR1, RL1, PP0, DC1, C1, C2, C3 and C28
RS-232 *(Option 023)*	25 pin subminiature D-shell, female
Parallel *(Option 024)*	25 pin subminiature D-shell, female

SWEEP OUTPUT	
Connector	BNC female
Amplitude	0 to +10 V ramp

TV MON OUTPUT *(Option 107)*	
Connector	BNC female
Output	Baseband video output from TV Receiver

TV TRIG OUT *(Options 101 and 102)*	
Connector	BNC female
Amplitude	Negative edge corresponds to start of the selected TV line after sync pulse (TTL).

AUX INTERFACE

Connector Type: 9 Pin Subminiature "D"
Connector Pinout

Pin #	Function	Current	"Logic" Mode	"Serial Bit" Mode
1	Control A	—	TTL Output Hi/Lo	TTL Output Hi/Lo
2	Control B	—	TTL Output Hi/Lo	TTL Output Hi/Lo
3	Control C	—	TTL Output Hi/Lo	Strobe
4	Control D	—	TTL Output Hi/Lo	Serial Data
5	Control I	—	TTL Input Hi/Lo	TTL Input Hi/Lo
6	Gnd	—	Gnd	Gnd
7†	−15 Vdc ±7%	150 mA	—	—
8*	+5 Vdc ±5%	150 mA	—	—
9†	+15 Vdc ±5%	150 mA	—	—

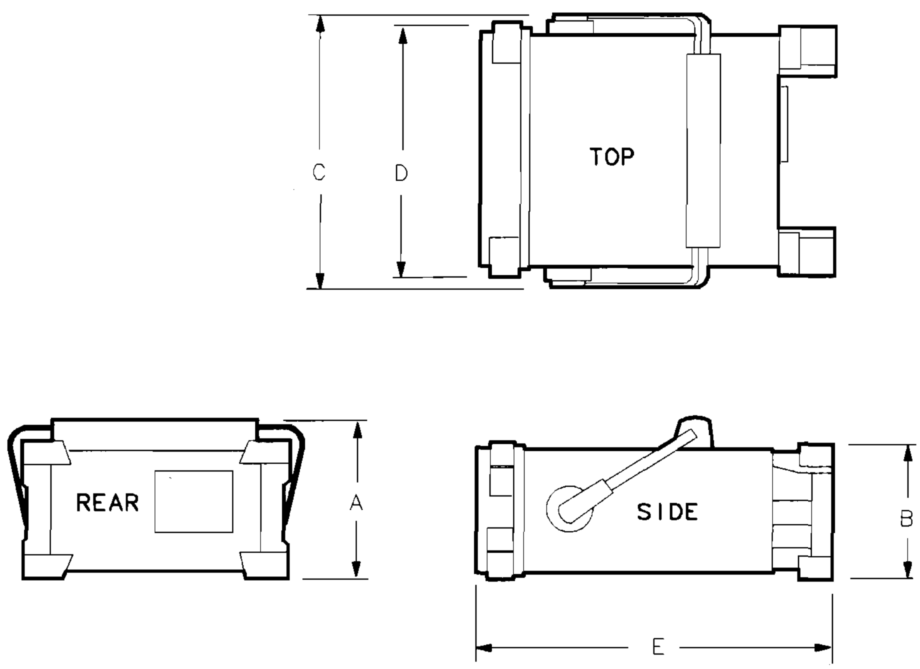
* Exceeding the +5 V current limits may result in loss of factory correction constants.
† Total current drawn from the +15 Vdc on the PROBE POWER and the AUX INTERFACE cannot exceed 150 mA. Total current drawn from the −12.6 Vdc on the PROBE POWER and the −15 Vdc on the AUX INTERFACE cannot exceed 150 mA.

Physical Characteristics

WEIGHT	
Net	
HP 8591C	14.1 kg (31 lb)
Shipping	
HP 8591C	16.8 kg (37 lb)

DIMENSIONS

A = 8 in (200 mm)
B = 7.25 in (184 mm)
C = 14.69 in (373 mm)
D = 13.25 in (337 mm)
E = 18.12 in (460.5 mm)



5

HP 8591E Specifications and Characteristics

This chapter contains specifications and characteristics for the HP 8591E spectrum analyzer.

The specifications and characteristics in this chapter are listed separately. The specifications are described first, followed by the characteristics.

General	General specifications and characteristics.
Frequency	Frequency-related specifications and characteristics.
Amplitude	Amplitude-related specifications and characteristics.
Cable TV	Cable TV measurement specifications and characteristics.
Option	Option-related specifications and characteristics.
Physical	Input, output and physical characteristics.

The distinction between specifications and characteristics is described as follows.

- Specifications describe warranted performance over the temperature range 0 °C to +55 °C* (unless otherwise noted). The spectrum analyzer will meet its specifications under the following conditions:
  - The instrument is within the one year calibration cycle.
  - 2 hours of storage at a constant temperature within the operating temperature range.
  - 30 minutes after the spectrum analyzer is turned on.
  - After the CAL frequency, and CAL amplitude routines have been run.
- Characteristics provide useful, but nonwarranted information about the functions and performance of the spectrum analyzer. Characteristics are specifically identified.
- Typical Performance, where listed, is not warranted, but indicates performance that most units will exhibit.
- Nominal Value indicates the expected, but not warranted, value of the parameter.

*0 °C to +50 °C with Option 015 or Option 016 operating/carrying case.

General Specifications

Temperature Range	
Operating	0 °C to +55 °C*
Storage	−40 °C to +75 °C
* 0 °C to +50 °C with Option 015 or Option 016 operating and carrying case.	

EMI Compatibility	Conducted and radiated emission is in compliance with CISPR Pub. 11/1990 Group 1 Class A.

Audible Noise	<37.5 dBA pressure and <5.0 Bels power (ISODP7779)

Power Requirements	
ON (LINE 1)	90 to 132 V rms, 47 to 440 Hz
	195 to 250 V rms, 47 to 66 Hz
	Power consumption <500 VA; <180 W
Standby (LINE 0)	Power consumption <7 W

Environmental Specifications	Type tested to the environmental specifications of Mil-T-28800 class 5

Frequency Specifications

Frequency Range	
50 Ω	9 kHz to 1.8 GHz
75 Ω *(Option 001)*	1 MHz to 1.8 GHz

Frequency Reference	
Aging	$\pm 2 \times 10^{-6}$/year
Settability	$\pm 0.5 \times 10^{-6}$
Temperature Stability	$\pm 5 \times 10^{-6}$

Precision Frequency Reference *(Option 004)*	
Aging	$\pm 1 \times 10^{-7}$/year
Settability	$\pm 1 \times 10^{-8}$
Temperature Stability	$\pm 1 \times 10^{-8}$

Frequency Readout Accuracy	
(Start, Stop, Center, Marker)	±(frequency readout × frequency reference error* + span accuracy + 1% of span + 20% of RBW + 100 Hz)‡

* frequency reference error = (aging rate × period of time since adjustment + initial achievable accuracy + temperature stability). See "Frequency Characteristics."
‡ See "Drift" under "Stability" in Frequency Characteristics.

Marker Count Accuracy†	
Frequency Span ≤ 10 MHz	±(marker frequency × frequency reference error* + counter resolution + 100 Hz)
Frequency Span >10 MHz	±(marker frequency × frequency reference error* + counter resolution + 1 kHz)
Counter Resolution	
Frequency Span ≤ 10 MHz	Selectable from 10 Hz to 100 kHz
Frequency Span > 10 MHz	Selectable from 100 Hz to 100 kHz

* frequency reference error = (aging rate × period of time since adjustment + initial achievable accuracy and temperature stability). See "Frequency Characteristics."
† Marker level to displayed noise level > 25 dB, RBW/Span ≥ 0.01. Span ≤ 300 MHz. Reduce SPAN annotation is displayed when RBW/Span < 0.01.

Frequency Span	
Range	0 Hz (zero span), 10 kHz to 1.8 GHz
(Option 130)	0 Hz (zero span), 1 kHz to 1.8 GHz
Resolution	Four digits or 20 Hz, whichever is greater.
Accuracy	
Span ≤ 10 MHz	±2% of span§
Span > 10 MHz	±3% of span

§*(Option 130)* For spans < 10 kHz, add an additional 10 Hz resolution error.

Frequency Specifications

Frequency Sweep Time	
Range	
	20 ms to 100 s
(Option 101)	20 μs to 100 s for span = 0 Hz
Accuracy	
20 ms to 100 s	±3%
20 μs to <20 ms *(Option 101)*	±2%
Sweep Trigger	Free Run, Single, Line, Video, External

Resolution Bandwidth	
Range	1 kHz to 3 MHz, 8 selectable resolution (3 dB) bandwidths in 1-3-10 sequence. 9 kHz and 120 kHz (6 dB) EMI bandwidths.
(Option 130)	Adds 30, 100 and 300 Hz (3 dB) bandwidths and 200 Hz (6 dB) EMI bandwidth.
Accuracy	
3 dB bandwidths	±20%

Stability	
Noise Sidebands	(1 kHz RBW, 30 Hz VBW and sample detector)
>10 kHz offset from CW signal	≤−90 dBc/Hz
>20 kHz offset from CW signal	≤−100 dBc/Hz
>30 kHz offset from CW signal	≤−105 dBc/Hz
Residual FM	
1 kHz RBW, 1 kHz VBW	≤250 Hz pk-pk in 100 ms
30 Hz RBW, 30 Hz VBW *(Option 130)*	≤30 Hz pk-pk in 300 ms
System-Related Sidebands	
>30 kHz offset from CW signal	≤−65 dBc

Calibrator Output Frequency	300 MHz ±(freq. ref. error* x 300 MHz)
* frequency reference error = (aging rate x period of time since adjustment + initial achievable accuracy + temperature stability). See "Frequency Characteristics."	

Amplitude Specifications

Amplitude specifications do not apply for Analog+ mode and negative peak detector mode except as noted in "Amplitude Characteristics."

Amplitude Range	
50 Ω	−115 dBm to +30 dBm
50 Ω *(Option 130)*	−130 dBm to +30 dBm
75 Ω	−63 dBmV to +75 dBmV
75 Ω *(Options 001 and 130)*	−78 dBmV to +75 dBmV

Maximum Safe Input Level	(Input attenuator ≥10 dB)	
	50 Ω	**75 Ω** *(Option 001)*
Average Continuous Power	+30 dBm (1 W)	+75 dBmV (0.4 W)
Peak Pulse Power	+30 dBm (1 W)	+75 dBmV (0.4 W)
dc	25 Vdc	100 Vdc

Gain Compression‡	
>10 MHz	≤0.5 dB (total power at input mixer* = −10 dBm)

* Mixer Power Level (dBm) = Input Power (dBm) − Input Attenuation (dB).
‡ (Option 130) If RBW ≤ 300 Hz, this applies only if signal separation ≥ 4 kHz and signal amplitudes ≤ Reference Level + 10 dB.

Displayed Average Noise Level	(Input terminated, 0 dB attenuation, 30 Hz VBW, sample detector)	
1 kHz RBW	**50 Ω**	**75 Ω** *(Option 001)*
400 kHz to 1 MHz	≤−115 dBm	N/A
1 MHz to 1.5 GHz	≤−115 dBm	≤−63 dBmV
1.5 GHz to 1.8 GHz	≤−113 dBm	≤−61 dBmV
30 Hz RBW *(Option 130)*		
400 kHz to 1 MHz	≤−130 dBm	N/A
1 MHz to 1.5 GHz	≤−130 dBm	≤−78 dBmV
1.5 GHz to 1.8 GHz	≤−128 dBm	≤−76 dBmV

Spurious Responses	
Second Harmonic Distortion	
5 MHz to 1.8 GHz	<−70 dBc for −45 dBm tone at input mixer.*
Third Order Intermodulation Distortion	
5 MHz to 1.8 GHz	<−70 dBc for two −30 dBm tones at input mixer* and >50 kHz separation.
Other Input Related Spurious	<−65 dBc at ≥30 kHz offset, for −20 dBm tone at input mixer ≤1.8 GHz.

* Mixer Power Level (dBm) = Input Power (dBm) − Input Attenuation (dB). (For analyzers with Input 75 Ω, add another 5.7 dB to the Input Attenuator.)

Amplitude Specifications

Residual Responses	(Input terminated and 0 dB attenuation)	
	50 Ω	**75 Ω** *(Option 001)*
150 kHz to 1 MHz	<−90 dBm	N/A
1 MHz to 1.8 GHz	<−90 dBm	<−38 dBmV

Display Range	
Log Scale	0 to −70 dB from reference level is calibrated; 0.1, 0.2, 0.5 dB/division and 1 to 20 dB/division in 1 dB steps; eight divisions displayed.
Linear Scale	eight divisions
Scale Units	dBm, dBmV, dBμV, mV, mW, nV, nW, pW, μV, μW, V, and W

Marker Readout Resolution	0.05 dB for log scale
	0.05% of reference level for linear scale
Fast Sweep Times for Zero Span	
20 μs to 20 ms *(Option 101 or 301)*	
Frequency ≤ 1 GHz	0.7% of reference level for linear scale
Frequency > 1 GHz	1.0% of reference level for linear scale

Reference Level	
Range	
Log Scale	Minimum amplitude to maximum amplitude**
Linear Scale	−99 dBm to maximum amplitude**
Resolution	
Log Scale	±0.01 dB
Linear Scale	±0.12% of reference level
Accuracy	(referenced to −20 dBm reference level, 10 dB input attenuation, at a single frequency, in a fixed RBW)
0 dBm to −59.9 dBm	±(0.3 dB + .01 x dB from −20 dBm)
−60 dBm and below	
1 kHz to 3 MHz RBW	±(0.6 dB + .01 x dB from −20 dBm)
30 Hz to 300 Hz RBW *(Option 130)*	±(0.7 dB + .01 x dB from −20 dBm)

** See "Amplitude Range."

Frequency Response	(10 dB input attenuation)	
	Absolute§	**Relative Flatness**†
9 kHz to 1.8 GHz	±1.5 dB	±1.0 dB

† Referenced to midpoint between highest and lowest frequency response deviations.
§ Referenced to 300 MHz CAL OUT.

Calibrator Output Amplitude	
50 Ω	−20 dBm ±0.4 dB
75 Ω *(Option 001)*	+28.75 dB mV ±0.4 dB

Absolute Amplitude Calibration Uncertainty‡‡	±0.15 dB
‡‡ Uncertainty in the measured absolute amplitude of the CAL OUT signal at the reference settings after CAL FREQ and CAL AMPTD self-calibration. Absolute amplitude reference settings are: Reference Level −20 dBm; Input Attenuation 10 dB; Center Frequency 300 MHz; Res BW 3 kHz; Video BW 300 Hz; Scale Linear; Span 50 kHz; Sweep Time Coupled, Top Graticule (reference level), Corrections ON.	

Input Attenuator	
Range	0 to 60 dB, in 10 dB steps

Resolution Bandwidth Switching Uncertainty	(At reference level, referenced to 3 kHz RBW)
3 kHz to 3 MHz RBW	±0.4 dB
1 kHz RBW	±0.5 dB
30 Hz to 300 Hz *(Option 130)*	±0.6 dB

Linear to Log Switching	±0.25 dB at reference level

Display Scale Fidelity	
Log Maximum Cumulative	
0 to −70 dB from Reference Level	
3 kHz to 3 MHz RBW	± (0.3 dB + 0.01 × dB from reference level)
RBW ≤ 1 kHz	± (0.4 dB + 0.01 × dB from reference level)
Log Incremental Accuracy	
0 to −60 dB from Reference Level	±0.4 dB/4 dB
Linear Accuracy	±3% of reference level

Cable TV Measurement Specifications

These specifications describe warranted performance of the spectrum analyzer and the HP 85721A cable TV measurements personality.

Input Configuration	75 Ω BNC Female

Channel Selection	Analyzer tunes to specified channels based upon selected tune configuration.
Tune Configuration	Standard, Off-the Air, HRC, IRC (T and FM channels also in channel mode)
Channel Range	1 to 158 and 201 to 300 (channel mode) 1 to 158 (system mode)
Channel Frequencies	Defined by Code of Federal Regulations, Title 47, Telecommunications, Parts 73.603, 76.605, 76.612
Frequency Range	5 to 1002 MHz (channel mode) 54 to 896 MHz (system mode)
Amplitude Range	−15 to +70 dBmV for S/N > 30 dB

Visual-Carrier Frequency	Visual-carrier frequency is counted

Frequency Reference* *(Standard)*	
Resolution	1 kHz
Accuracy	±(7.5 x 10^{-6} x carrier frequency + 110 Hz)
@55.25 MHz (Ch. 2)	±524 Hz
@325.25 MHz (Ch. 41)	±2.55 kHz
@643.25 MHz (Ch. 94)	±4.93 kHz
* Will not meet FCC frequency accuracy requirements.	

Precision Frequency Reference *Option 004*	
Resolution	100 Hz
Accuracy	±(1.2 x 10^{-7} x carrier frequency + 110 Hz)
@55.25 MHz (Ch. 2)	±117 Hz
@325.25 MHz (Ch. 41)	±149 Hz
@643.25 MHz (Ch. 94)	±187 Hz

Visual-to-Aural Carrier Frequency Difference	Frequency difference between visual and aural carriers is counted.
Difference Range	4.1 to 4.9 MHz
Resolution	100 Hz
Accuracy	±221 Hz for precision frequency ref (std) ±254 Hz for Option 704 frequency ref

Visual-Carrier Level	The peak amplitude of the visual carrier is measured to an absolute standard traceable to the National Institute of Standards and Technology.
Amplitude Range	−15 to +70 dBmV
Resolution	0.1 dB
Absolute Accuracy	±2.0 dB for S/N > 30 dB
Relative Accuracy	±1.0 dB relative to adjacent channels in frequency ±1.5 dB relative to all other channels

Visual-to-Aural Carrier Level Difference	The difference between peak amplitudes of the visual and aural carrier is measured.
Difference Range	0 to 25 dB
Resolution	0.1 dB
Accuracy	±0.75 dB for S/N > 30 dB

Hum/Low-Frequency Disturbance	Power-line frequency and low-frequency disturbance measured on modulated and/or unmodulated carriers. May not be valid for scrambled channels.
AM Range	0.5 to 10%
Resolution	0.1%
Accuracy	±0.4% for hum ≤3% ±0.7% for hum ≤5% ±1.3% for hum ≤10%

Visual Carrier-to-Noise Ratio (C/N)*	The C/N is calculated from the visual-carrier peak level and the minimum noise level, normalized to 4 MHz noise bandwidth.
Optimum Input Range	See the graphs in the characteristics section of this chapter.
Maximum C/N Range	Input level dependent - See graphs
C/N Resolution	0.1 dB
C/N Accuracy	Input level and measured C/N dependent ±1.0 to ±3.5 dB over optimum input range

* A preamplifier and preselector filter may be required to achieve specifications.

CSO and CTB Distortion†	Manual composite second order (CSO) and composite triple beat (CTB) distortions are measured relative to the visual carrier peak and require momentary disabling of the carrier. Automatic measurements are made in the channel above the channel selected and assumes that it is unused. If the analyzer has Option 107, a non- interfering CSO measurement can be made.
Optimum Input Range	See the graphs in the characteristics section of this chapter.
Maximum CSO/CTB Range	Input level dependent - see graphs. 66 to 73 dB over optimum input range
Manual CSO/CTB Resolution	0.1 dB
System CSO/CTB Resolution	1 dB
CSO/CTB Accuracy	Input level and measured CSO/CTB dependent - See graphs ±1.5 dB to ±4.0 dB over optimum input range

† A preamplifier and preselector filter may be required to achieve specifications.

System Frequency Response (flatness)

System amplitude variations are measured relative to a reference trace stored during the setup.

Frequency Response Setup	
Fast Sweep Time	2 s (default) for no scrambling
Slow Sweep Time	8 s (default) for fixed-amplitude scrambling
Reference-trace Storage	50 traces that include analyzer states

Frequency Response Test	
Range	1.0 dB/Div to 20 dB/Div (2 dB default)
Resolution	0.05 dB
Trace-flatness Accuracy	±0.1 dB per dB deviation from a flat line and ±0.75 dB maximum cumulative error
Trace-position Accuracy	0.0 dB for equal temperature at test locations and ±0.4 dB maximum for different ambient temperatures

Option Specifications

Tracking Generator Specifications (Option 010 or 011)

All specifications apply over 0 °C to +55 °C*. The spectrum-analyzer/tracking-generator combination will meet its specifications after 2 hours of storage at a constant temperature within the operating temperature range, 30 minutes after the spectrum-analyzer/tracking-generator is turned on and after CAL FREQ, CAL AMPTD, CAL TRK GEN, and TRACKING PEAK have been run.

* 0 °C to +50 °C with Option 015 or Option 016 operating and carrying

Warm-Up	30 minutes

Output Frequency	
Range	
50 Ω *(Option 010)*	100 kHz to 1.8 GHz
75 Ω *(Option 011)*	1 MHz to 1.8 GHz

Output Power Level	
Range	
50 Ω *(Option 010)*	0 to −70 dBm
75 Ω *(Option 011)*	+42.8 to −27.2 dBmV
Resolution	0.1 dB
Absolute Accuracy	±1.0 dB (at 300 MHz, −20 dBm, and coupled source attenuator) *(Option 011: use +28.8 dBmV instead of −20 dBm)*
Vernier	
Range	10 dB‡
Accuracy	±0.75 dB over 10 dB range (referenced to −20 dBm for coupled source attenuator setting)‡ *(Option 011: referenced to +28.8 dBmV instead of −20 dBm)*
Output Attenuator	
Range	0 to 60 dB in 10 dB steps
‡ See the Output Accuracy table in "Option Characteristics."	

Output Power Sweep	
Range	
50 Ω *(Option 010)*	(−15 dBm to 0 dBm) − (Source Attenuator Setting)
75 Ω *(Option 011)*	(+27.8 to 42.8 dBmV) − (Source Attenuator Setting)
Resolution	0.1 dB
Accuracy (zero span)	<1.5 dB peak-to-peak

Output Flatness (referenced to 300 MHz, 10 dB attenuator)	±1.75 dB

Option Specifications

Spurious Outputs	
50 Ω *(Option 010)*	(0 dBm output, 100 kHz to 1.8 GHz)
75 Ω *(Option 011)*	(+42.8 dBmV output, 1 MHz to 1.8 GHz)
Harmonic Spurs	<−25 dBc
Nonharmonic Spurs	<−30 dBc

Dynamic Range	
Tracking Generator Feedthrough	
50 Ω *(Option 010)*	<−106 dBm
75 Ω *(Option 011)*	<−57.24 dBmV

Quasi-Peak Detector Specifications (Option 103)

The Option 103 specifications and characteristics are not valid with Option 001 or 011.

The specifications for Quasi-Peak Detector (Option 103) have been based on the following:

- The spectrum analyzer displays the quasi-peak amplitude of pulsed radio frequency (RF) or continuous wave (CW) signals.
- Amplitude response conforms with Publication 16 of Comité International Spécial des Perturbations Radioélectriques (CISPR) Section 1, Clause 2.

The 200 Hz bandwidth is available only with Option 130. The 1 kHz resolution bandwidth may be used to approximate a quasi-peak measurement without Option 130. A quasi-peak measurement using the 1 kHz bandwidth will be greater than or equal to a quasi-peak measurement using a 200 Hz bandwidth.

Absolute amplitude accuracy is the sum of the pulse amplitude response relative to the reference, plus the reference pulse amplitude accuracy, plus the spectrum analyzer amplitude accuracy (calibrator output, reference level, frequency response, input attenuator, resolution bandwidth switching, linear display scale fidelity, and gain compression).

Relative Quasi-Peak Response to a CISPR Pulse (dB)	**Frequency Band**		
			(Option 130)
Pulse Repetition Frequency (Hz)	**120 kHz EMI BW 0.03 to 1 GHz**	**9 kHz EMI BW 0.15 to 30 MHz**	**200 Hz EMI BW 10 to 150 kHz**
1000	+8.0 ± 1.0	+4.5 ± 1.0	—
100	0 dB (reference)*	0 dB (reference)*	+4.0 ± 1.0
60	—	—	+3.0 ± 1.0
25	—	—	0 dB (reference)*
20	−9.0 ± 1.0	−6.5 ± 1.0	—
10	−14.0 ± 1.5	−10.0 ± 1.5	−4.0 ± 1.0
5	—	—	−7.5 ± 1.5
2	−26.0 ± 2.0	−20.5 ± 2.0	−13.0 ± 2.0
1	−28.5 ± 2.0	−22.5 ± 2.0	−17.0 ± 2.0
Isolated Pulse	−31.5 ± 2.0	−23.5 ± 2.0	−19.0 ± 2.0

* Reference pulse amplitude accuracy relative to a 66 dBμV CW signal is <1.5 dB. CISPR reference pulse: 0.044 μVs for 0.03 to 1 GHz, 0.316 μVs for 0.15 to 30 MHz, 13.5 ± 1.5 μVs for 10 to 150 kHz *(Option 130)*.

Time Gated Spectrum Analysis Specifications (Option 105)

GATE DELAY	
Range	1 μs to 65.535 ms
Resolution	1 μs
Accuracy	±(1 μs + (0.01% x GATE DELAY Readout))†
(From GATE TRIGGER INPUT to positive edge of GATE OUTPUT)	
GATE LENGTH	
Range	1 μs to 65.535 ms
Resolution	1 μs
Accuracy	±(0.2 μs +(0.01% x GATE LENGTH Readout))
(From positive edge to negative edge of GATE OUTPUT)	
Additional Amplitude Error§	
Log Scale	±0.3 dB
Linear Scale	±0.4% of REFERENCE LEVEL

† Up to 1 μs jitter due to 1 μs resolution of gate delay clock.
§ With GATE ON enabled and triggered, CW Signal, Peak Detector Mode.

TV Receiver/Video Tester (Option 107)

Non-interfering color	(requires FCC composite, NTC-7, or CCIR 17 and CCIR 330 test signal)
Differential Gain Accuracy	6% 50 averages (default)
Differential Phase Accuracy	4° 50 averages (default)
Chroma-luminance Delay Inequality Accuracy	±45 ns
Frequency Range	50 MHz to 850 MHz
Amplitude Range	+10 dBmV to +50 dBmV at coupler input (10 dB loss)
Coupler (HP part number 0955-0704)	Insertion loss: < 2 dB
	Coupled output: −10 dB ±0.5 dB

Non-Interfering Tests with Gate On*	
C/N and CSO	See graphs for accuracy
(quiet line must be selected)	
In-channel Frequency Response Accuracy	±0.5 dB within channel

* A preamplifier and preselector filter may be required to achieve specifications.

Frequency Characteristics

These are not specifications. Characteristics provide useful but nonwarranted information about instrument performance.

Frequency Reference	
Initial Achievable Accuracy	$\pm 0.5 \times 10^{-6}$
Aging	$\pm 1.0 \times 10^{-7}$/day

Precision Frequency Reference *(Option 004)*	
Aging	5×10^{-10}/day, 7-day average after being powered on for 7 days.
Warm-Up	1×10^{-8} after 30 minutes on.
Initial Achievable Accuracy	$\pm 2.2 \times 10^{-8}$ after being powered on for 24 hours.

Stability	
Drift* (after warmup at stabilized temperature)	
Frequency Span ≤10 MHz, Free Run	<2 kHz/minute of sweep time

* Because the analyzer is locked at the center frequency before each sweep, drift occurs only during the time of one sweep. For Line, Video or External trigger, additional drift occurs while waiting for the appropriate trigger signal.

Resolution Bandwidth (−3 dB)	
Range	1 kHz to 3 MHz, selectable in 1, 3 and 10 increments, and 5 MHz. Resolution bandwidths may be selected manually, or coupled to frequency span.
(Option 130)	Adds 30 Hz, 100 Hz, and 300 Hz bandwidths.
Shape	Synchronously tuned four poles. Approximately Gaussian shape.
60 dB/3 dB Bandwidth Ratio	
Resolution Bandwidth	
100 kHz to 3 MHz	15:1
30 kHz	16:1
3 kHz to 10 kHz	15:1
1 kHz	16:1
40 dB/3 dB Bandwidth Ratio *(Option 130)*	
Resolution Bandwidth	
30 Hz to 300 Hz	10:1

Video Bandwidth (−3 dB)	
Range	30 Hz to 1 MHz, selectable in 1, 3, 10 increments, accuracy ±30% and 3 MHz. Video bandwidths may be selected manually, or coupled to resolution bandwidth and frequency span.
(Option 130)	Adds 1, 3, and 10 Hz bandwidths.
Shape	Post detection, single pole low-pass filter used to average displayed noise.
(Option 130)	Bandwidths below 30 Hz are digital bandwidths with anti-aliasing filtering.

Frequency Characteristics

FFT Bandwidth Factors	FLATTOP	HANNING	UNIFORM
Noise Equivalent Bandwidth†	3.63x	1.5x	1x
3 dB Bandwidth†	3.60x	1.48x	1x
Sidelobe Height	<−90 dB	−32 dB	−13 dB
Amplitude Uncertainty	0.10 dB	1.42 dB	3.92 dB
Shape Factor (60 dB BW/3 dB BW)	2.6	9.1	>300
† Multiply entry by one-divided-by-sweep time.			

Input Level	> (−60 dBm + attenuator setting)
Signal Level	0 to −30 dB below reference level
FM Offset	
Resolution	400 Hz nominal
FM Deviation (FM GAIN)	
Resolution	1 kHz nominal
Range	10 kHz to 1 MHz
Bandwidth	FM deviation/2
FM Linearity (for modulating frequency < bandwidth/100)	≤ 1% of FM deviation + 290 Hz

Amplitude Characteristics

These are not specifications. Characteristics provide useful but nonwarranted information about instrument performance.

Log Scale Switching Uncertainty	Negligible error

Demod Tune Listen	Internal speaker, rear panel earphone jack and front-panel volume control. Adjustable squelch control mutes the audio signal to the speaker/earphone jack based on the level of the demodulated signal above 22 kHz. An uncalibrated demodulated signal is available on the AUX VIDEO OUT connector at the rear panel.

Input Attenuation Uncertainty*	
Attenuator Setting	
0 dB	±0.5 dB
10 dB	Reference
20 dB	±0.5 dB
30 dB	±0.6 dB
40 dB	±0.8 dB
50 dB	±1.0 dB
60 dB	±1.2 dB

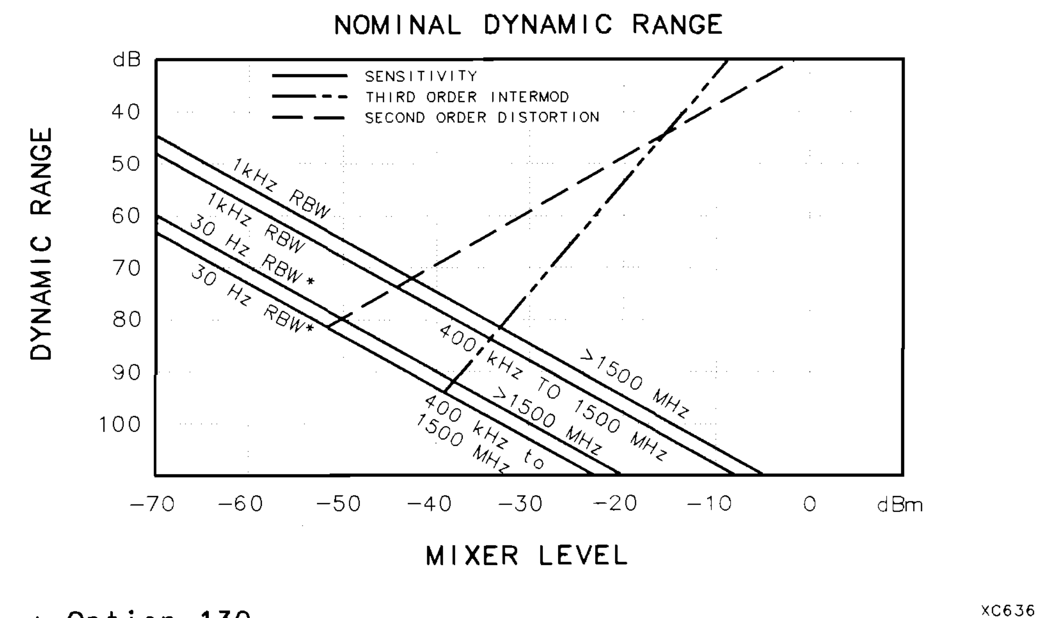
* Referenced to 10 dB input attenuator setting from 9 kHz to 1.8 GHz. See the "Specifications" table under "Frequency Response."

Input Attenuator Repeatability	
300 MHz	±0.03 dB
1.8 GHz	±1.0 dB

RF Input SWR	(Attenuator setting 10 to 60 dB) 1.35:1

Amplitude Characteristics

DYNAMIC RANGE



* Option 130

Dynamic Range

Immunity Testing	
Radiated Immunity	When tested at 3 V/m according to IEC 801-3/1984 the displayed average noise level will be within specifications over the full immunity test frequency range of 27 to 500 MHz except that at immunity test frequencies of 278.6 MHz ± selected resolution bandwidth and 321.4 MHz ± selected resolution bandwidth the displayed average noise level may be up to −45 dBm. When the analyzer tuned frequency is identical to the immunity test signal frequency there may be signals of up to −70 dBm displayed on the screen.
Electrostatic Discharge	When an air discharge of up to 8 kV according to IEC 801-2/1991 occurs to the shells of the BNC connectors on the rear panel of the instrument spikes may be seen on the CRT display. Discharges to center pins of any of the connectors may cause damage to the associated circuitry.

Analog+ Mode and Negative Peak Detector Mode (Options 101 and 301)

These modes do not utilize the full set of internal amplitude corrections. Therefore, in these modes, some analyzer amplitude specifications are reduced to characteristics. Characteristics provide useful but nonwarranted information about instrument performance.

In these modes, the following analyzer specifications remain as specifications:

Amplitude Range | **Calibrator Output**
Maximum Safe Input Level

In these modes, the following analyzer specifications are reduced to characteristics:

Gain Compression	**Reference Level**
Displayed Average Noise Level	**Resolution Bandwidth Switching**
Spurious Responses	**Linear to Log Switching**
Residual Responses	**Display Scale Fidelity**
Display Range	**Display Scale Fidelity for Narrow Bandwidths**

Finally, the following analyzer specifications:

Marker Readout Resolution | **Frequency Response**

are replaced by the characteristics which follow in this subsection.

Marker Readout Resolution	
(digitizing resolution)	
Log Scale	±0.31 dB
Linear Scale	
frequency ≤ 1 GHz	±0.59% of reference level
frequency > 1 GHz	±1.03% of reference level

Frequency Response in Analog+ Mode	(10 dB input attenuation, for spans ≤ 20 MHz)	
	Absolute§	**Relative Flatness**†
	±1.9 dB	±1.4 dB

† Referenced to midpoint between highest and lowest frequency response deviations.
§ Referenced to 300 MHz CAL OUT.

Cable TV Measurement Characteristics

Depth of Modulation	Percent AM is measured from horizontal sync tip to maximum video level; measurement requires a white-reference VITS and may not be valid for scrambled channels.
AM Range	50 to 93%
Resolution	0.1%
Accuracy	±2.0% for C/N > 40 dB

FM Deviation	Peak reading of FM deviation
Range	±100 kHz
Resolution	100 Hz
Accuracy	±1.5 kHz

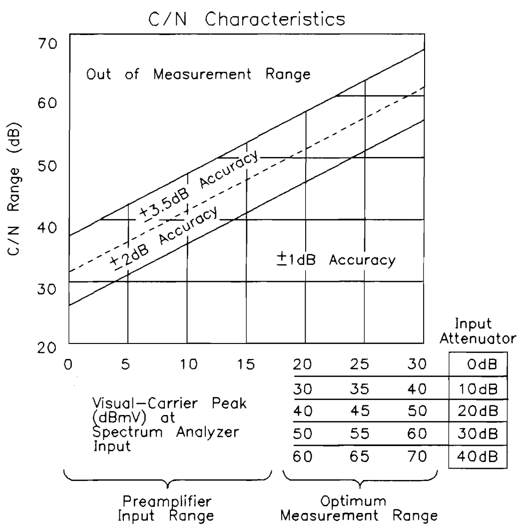


Figure 2-1

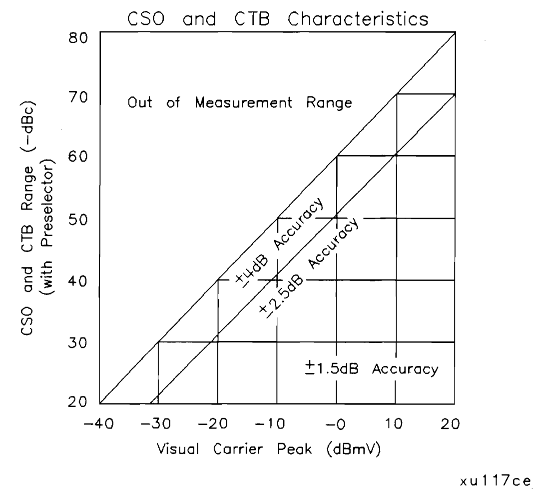


Figure 2-2

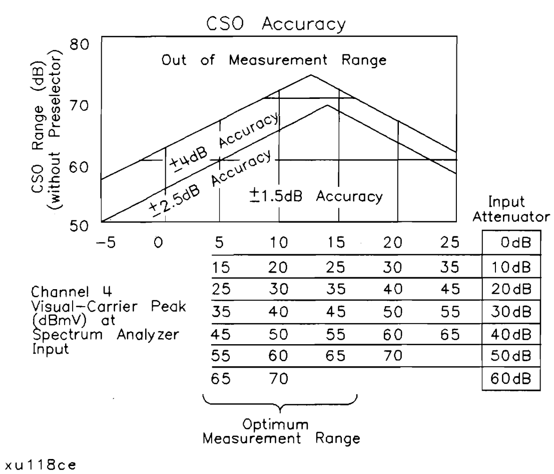


Figure 2-3

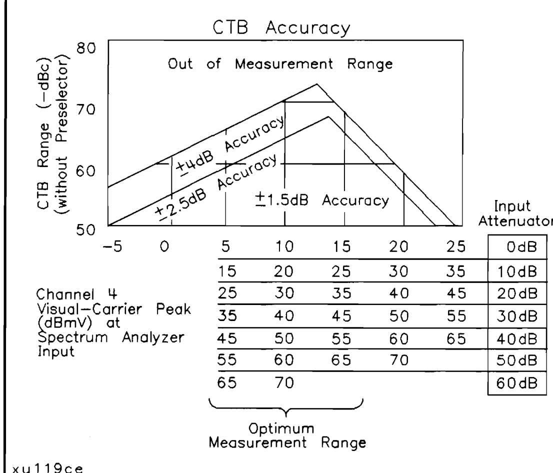


Figure 2-4

C/N, CSO, and CTB Measurements

The four graphs summarize the combined HP 8591C cable TV analyzer or HP 8590 E-Series spectrum analyzers, and HP 85721A characteristics for C/N, CSO, and CTB testing on cable TV systems with up to 99 channels and up to +9 dB amplitude tilt. C/N, CSO, and CTB measurement accuracies and ranges can be read from the relevant graphs. They depend upon the visual carrier peak level and the measurement reading. For C/N measurements with a preselector, there is no optimum range and the accuracy boundaries drop by the preselector's insertion loss (typically 2 dB).

Cable TV Measurement Characteristics

Crossmodulation	Horizontal-line (15.7 kHz) related AM is measured on the unmodulated visual carrier.
Range	60 dB, usable to 65 dB
Resolution	0.1 dB
Accuracy	±2.0 dB for xmod. <40 dB, C/N >40 dB ±2.6 dB for xmod. <50 dB, C/N >40 dB ±4.6 dB for xmod. <60 dB, C/N >40 dB

Option Characteristics

Demod Tune Listen *(Option 102 or 103)*	Internal speaker, rear panel earphone jack and front-panel volume control. Adjustable squelch control mutes the audio signal to the speaker/earphone jack based on the level of the demodulated signal above 22 kHz. An uncalibrated demodulated signal is available on the AUX VIDEO OUT connector at the rear panel.

TV Trigger *(Options 101 and 102)*	Triggers sweep of the analyzer after the sync pulse of a selected line of a TV video field.
Carrier Level for Trigger	Top 60% of linear display
Compatible Formats	NTSC, PAL, SECAM
Field Selection	Even, odd, non-interlaced
Trigger Polarity	Positive, negative
Line Selection	10 to 1021

Tracking Generator Characteristics (Option 010 or 011)

Output Tracking	
Drift (usable in 10 kHz bandwidth after 30-minute warmup)	1 kHz/5 minutes

Spurious Outputs (>1.8 GHz to 4.0 GHz)	
50 Ω *(Option 010)*	
0 dBm output	
75 Ω *(Option 011)*	
+42.8 dBmV, output	
Harmonic	<−20 dBc
Nonharmonic	<−40 dBc
2121.4 MHz Feedthrough	
(Option 010)	<−45 dBm
(Option 011)	<+42.8 dBmV

RF Power-Off Residuals	
100 kHz to 1.8 GHz *(Option 010)*	<−115 dBm
1 MHz to 1.8 GHz *(Option 011)*	<−66.2 dBmV

Output Attenuator	
Repeatability	±0.2 dB

Output VSWR	
0 dB Attenuator	<2.5:1
10 dB Attenuator	<1.6:1

Option Characteristics

Dynamic Range (difference between maximum power out and tracking generator feedthrough)	
100 kHz to 1.8 GHz *(Option 010)*	>106 dB
1 MHz to 1.8 GHz *(Option 011)*	>100 dB

Tracking Generator Characteristics (Option 010)

TRACKING GENERATOR OUTPUT ACCURACY, Option 010 (after CAL TRK GEN in auto-coupled mode)					
TG Output Power Level	**Attenuator Setting**	**Relative Accuracy (at 300 MHz referred to −20 dBm)**	**Absolute Accuracy (at 300 MHz)**	**Relative Accuracy (referred to −20 dBm) (+0.2 dB/GHz)***	**Absolute Accuracy (+0.2 dB/GHz)***
0 to −10.9 dBm	0 dB	±1.25 dB	±2.25 dB	±2.75 dB	±3.75 dB
−11 to −20.9 dBm	10 dB	±0.75 dB	±1.75 dB	±2.25 dB	±3.25 dB
−20 dBm	10 dB	0 dB Reference	±1.0 dB	±1.50 dB	±2.50 dB
−21 to −30.9 dBm	20 dB	±1.25 dB	±2.25 dB	±2.75 dB	±3.75 dB
−31 to −40.9 dBm	30 dB	±1.35 dB	±2.35 dB	±2.85 dB	±3.85 dB
−41 to −50.9 dBm	40 dB	±1.55 dB	±2.55 dB	±3.05 dB	±4.05 dB
−51 to −60.9 dBm	50 dB	±1.75 dB	±2.75 dB	±3.25 dB	±4.25 dB
−61 to −70 dBm	60 dB	±1.95 dB	±2.95 dB	±3.45 dB	±4.45 dB
* Add 0.2 dB/GHz of tuned frequency to the value in this column for complete accuracy specification relative to frequency.					

TRACKING GENERATOR OUTPUT ACCURACY, Option 011 (after CAL TRK GEN in auto-coupled mode)					
TG Output Power Level	**Attenuator Setting**	**Relative Accuracy (at 300 MHz referred to +28.8 dBmV)**	**Absolute Accuracy (at 300 MHz)**	**Relative Accuracy (referred to +28.8 dBmV) (+0.2 dB/GHz)***	**Absolute Accuracy (+0.2 dB/GHz)***
+42.76 to +31.77 dBmV	0 dB	±1.25 dB	±2.25 dB	±2.75 dB	±3.75 dB
+31.76 to +21.77 dBmV	10 dB	±0.75 dB	±1.75 dB	±2.25 dB	±3.25 dB
+28.76 dBmV	10 dB	0 dB Reference	±1.0 dB	±1.50 dB	±2.50 dB
+21.76 to +11.77 dBmV	20 dB	±1.25 dB	±2.25 dB	±2.75 dB	±3.75 dB
+11.76 to +1.77 dBmV	30 dB	±1.35 dB	±2.35 dB	±2.85 dB	±3.85 dB
+1.76 to −8.23 dBmV	40 dB	±1.55 dB	±2.55 dB	±3.05 dB	±4.05 dB
−8.24 to −18.23 dBmV	50 dB	±1.75 dB	±2.75 dB	±3.25 dB	±4.25 dB
−18.24 to −27.23 dBmV	60 dB	±1.95 dB	±2.95 dB	±3.45 dB	±4.45 dB

* Add 0.2 dB/GHz of tuned frequency to the value in this column for complete accuracy specification relative to frequency.

Quasi-Peak Detector Characteristics (Option 103)

Quasi-Peak Measurement Range	
Displayed	70 dB
Total	115 dB

FM Demodulation (Option 102, 103, or 301)

Input Level	> (−60 dBm + attenuator setting)
Signal Level	0 to −30 dB below reference level
FM Offset	
Resolution	400 Hz nominal
FM Deviation (FM GAIN)	
Resolution	1 kHz nominal
Range	10 kHz to 1 MHz
Bandwidth	FM deviation/2
FM Linearity (for modulating frequency < bandwidth/100)	≤ 1% of FM deviation + 290 Hz

Physical Characteristics

Front-Panel Inputs and Outputs

INPUT 50Ω	
Connector	Type N female
Impedance	50 Ω nominal
INPUT 75Ω *(Option 001)*	
Connector	BNC female
Impedance	75 Ω nominal

RF OUT *(Option 010, 011)*	
Connector	
(Option 010)	Type N female
(Option 011)	BNC female
Impedance	
(Option 010)	50 Ω nominal
(Option 011)	75 Ω nominal
Maximum Safe Reverse Level	
(Option 010)	+20 dBm (0.1 W), 25 Vdc
(Option 011)	+69 dBmV (0.1 W), 100 Vdc

PROBE POWER‡	
Voltage/Current	+15 Vdc, ±7% at 150 mA max.
	−12.6 Vdc ±10% at 150 mA max.
‡ Total current drawn from the +15 Vdc on the PROBE POWER and the AUX INTERFACE cannot exceed 150 mA. Total current drawn from the −12.5 Vdc on the PROBE POWER and the −15 Vdc on the AUX INTERFACE cannot exceed 150 mA.	

Rear-Panel Inputs and Outputs

10 MHz REF OUTPUT	
Connector	BNC female
Impedance	50 Ω nominal
Output Amplitude	>0 dBm

EXT REF IN	
Connector	BNC female Note: Analyzer noise sideband and spurious response performance may be affected by the quality of the external reference used.
Input Amplitude Range	−2 to +10 dBm
Frequency	10 MHz

Physical Characteristics

AUX IF OUTPUT	
Frequency	21.4 MHz
Amplitude Range	−10 to −60 dBm
Impedance	50 Ω nominal

AUX VIDEO OUTPUT	
Connector	BNC female
Amplitude Range	0 to 1 V (uncorrected)

EARPHONE *(Option 102 or 103)*	
Connector	1/8 inch monaural jack

EXT ALC INPUT *(Option 010 or 011)*	
Impedance	1 MΩ
Polarity	Positive or negative
Range	−66 dBV to +6 dBV
Connector	BNC

EXT KEYBOARD *(Option 021, 023 or 024)*	Interface compatible with HP part number C1405 Option ABA and most IBM/AT non-auto switching keyboards.

EXT TRIG INPUT	
Connector	BNC female
Trigger Level	Positive edge initiates sweep in EXT TRIG mode (TTL).

GATE TRIGGER INPUT *(Option 105)*	
Connector	BNC female
Trigger Level	minimum pulse width >30 ns (TTL)
GATE OUTPUT *(Option 105)*	
Connector	BNC female
Output Level	High = gate on; Low = gate off (TTL)

HI-SWEEP IN/OUT	
Connector	BNC female
Output	High = sweep, Low = retrace (TTL)
Input	Open collector, low stops sweep.

MONITOR OUTPUT *(Spectrum Analyzer Display)*	
Connector	BNC female
Format	
SYNC NRM	Internal Monitor
SYNC NTSC	NTSC Compatible 15.75 kHz horizontal rate 60 Hz vertical rate
SYNC PAL	PAL Compatible 15.625 kHz horizontal rate 50 Hz vertical rate

REMOTE INTERFACE	
HP-IB *(Option 021)*	
HP-IB Codes	SH1, AH1, T6, SR1, RL1, PP0, DC1, C1, C2, C3 and C28
RS-232 *(Option 023)*	25 pin subminiature D-shell, female
Parallel *(Option 024)*	25 pin subminiature D-shell, female

SWEEP OUTPUT	
Connector	BNC female
Amplitude	0 to +10 V ramp

TV IN *(Option 107)*	
Connector	BNC female
Impedance	75 Ω nominal

TV MON OUTPUT *(Option 107)*	
Connector	BNC female
Output	Baseband video output from TV Receiver

TV TRIG OUT *(Options 101 and 102)*	
Connector	BNC female
Amplitude	Negative edge corresponds to start of the selected TV line after sync pulse (TTL).

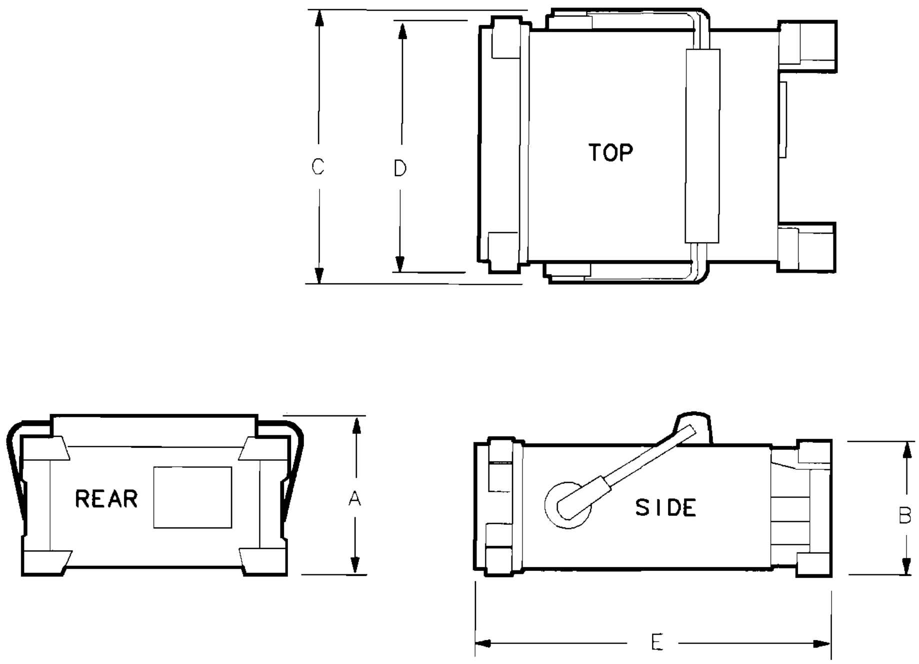
Physical Characteristics

AUX INTERFACE				
Connector Type: 9 Pin Subminiature "D" Connector Pinout				
Pin #	Function	Current	"Logic" Mode	"Serial Bit" Mode
1	Control A	—	TTL Output Hi/Lo	TTL Output Hi/Lo
2	Control B	—	TTL Output Hi/Lo	TTL Output Hi/Lo
3	Control C	—	TTL Output Hi/Lo	Strobe
4	Control D	—	TTL Output Hi/Lo	Serial Data
5	Control I	—	TTL Input Hi/Lo	TTL Input Hi/Lo
6	Gnd	—	Gnd	Gnd
7†	−15 Vdc ±7%	150 mA	—	—
8*	+5 Vdc ±5%	150 mA	—	—
9†	+15 Vdc ±5%	150 mA	—	—

* Exceeding the +5 V current limits may result in loss of factory correction constants.
† Total current drawn from the +15 Vdc on the PROBE POWER and the AUX INTERFACE cannot exceed 150 mA. Total current drawn from the −12.6 Vdc on the PROBE POWER and the −15 Vdc on the AUX INTERFACE cannot exceed 150 mA.

WEIGHT	
Net	
HP 8591E	14.1 kg (31 lb)
Shipping	
HP 8591E	16.8 kg (37 lb)

DIMENSIONS
A = 8 in (200 mm) B = 7.25 in (184 mm) C = 14.69 in (373 mm) D = 13.25 in (337 mm) E = 18.12 in (460.5 mm)



6

HP 8593E Specifications and Characteristics

This chapter contains specifications and characteristics for the HP 8593E spectrum analyzer.

The specifications and characteristics in this chapter are listed separately. The specifications are described first, then followed by the characteristics.

General	General specifications and characteristics.
Frequency	Frequency-related specifications and characteristics.
Amplitude	Amplitude-related specifications and characteristics.
Cable TV	Cable TV measurement specifications and characteristics.
Option	Option-related specifications and characteristics.
Physical	Input, output and physical characteristics.

The distinction between specifications and characteristics is described as follows.

- Specifications describe warranted performance over the temperature range 0 °C to +55 °C* (unless otherwise noted). The spectrum analyzer will meet its specifications under the following conditions:
  - The instrument is within the one year calibration cycle.
  - 2 hours of storage at a constant temperature within the operating temperature range.
  - 30 minutes after the spectrum analyzer is turned on.
  - After the CAL frequency, and CAL amplitude routines have been run.
- Characteristics provide useful, but nonwarranted information about the functions and performance of the spectrum analyzer. Characteristics are specifically identified.
- Typical Performance, where listed, is not warranted, but indicates performance that most units will exhibit.
- Nominal Value indicates the expected, but not warranted, value of the parameter.

*0 °C to +50 °C with Option 015 or Option 016 operating/carrying case.

General Specifications

Temperature Range	
Operating	0 °C to +55 °C*
Storage	−40 °C to +75 °C
* 0 °C to +50 °C with Option 015 or Option 016 operating and carrying case.	

EMI Compatibility	Conducted and radiated emission is in compliance with CISPR Pub. 11/1990 Group 1 Class A.

Audible Noise	<37.5 dBA pressure and <5.0 Bels power (ISODP7779)

Power Requirements	
ON (LINE 1)	90 to 132 V rms, 47 to 440 Hz
	195 to 250 V rms, 47 to 66 Hz
	Power consumption <500 VA; <180 W
Standby (LINE 0)	Power consumption <7 W

Environmental Specifications	Type tested to the environmental specifications of Mil-T-28800 class 5

Frequency Specifications

Frequency Range		9 kHz to 22.0 GHz
	(Options 026 or 027)	9 kHz to 26.5 GHz
Band	**LO Harmonic (N)**	
0	1−	9 kHz to 2.9 GHz
1	1−	2.75 GHz to 6.5 GHz
2	2−	6.0 GHz to 12.8 GHz
3	3−	12.4 GHz to 19.4 GHz
4	4−	19.1 GHz to 22.0 GHz
(Options 026 or 027)		
4	4−	19.1 GHz to 26.5 GHz

Frequency Reference	
Aging	$\pm 2 \times 10^{-6}$/year
Settability	$\pm 0.5 \times 10^{-6}$
Temperature Stability	$\pm 5 \times 10^{-6}$

Precision Frequency Reference *(Option 004)*	
Aging	$\pm 1 \times 10^{-7}$/year
Settability	$\pm 1 \times 10^{-8}$
Temperature Stability	$\pm 1 \times 10^{-8}$

Frequency Readout Accuracy	
(Start, Stop, Center, Marker)	±(frequency readout × frequency reference error* + span accuracy + 1% of span + 20% of RBW + 100 Hz × N††)‡

* frequency reference error = (aging rate × period of time since adjustment + initial achievable accuracy + temperature stability). See "Frequency Characteristics."
†† N = LO harmonic. See "Frequency Range."
‡ See "Drift" under "Stability" in Frequency Characteristics.

Marker Count Accuracy†	
Frequency Span ≤10 MHz × N††	±(marker frequency × frequency reference error* + counter resolution + 100 Hz × N††)
Frequency Span >10 MHz × N††	±(marker frequency × frequency reference error* + counter resolution + 1 kHz × N††)
Counter Resolution	
Frequency Span ≤ 10 MHz × N††	Selectable from 10 Hz to 100 kHz
Frequency Span > 10 MHz × N††	Selectable from 100 Hz to 100 kHz

* frequency reference error = (aging rate × period of time since adjustment + initial achievable accuracy and temperature stability). See "Frequency Characteristics."
† Marker level to displayed noise level > 25 dB, RBW/Span ≥ 0.01. Span ≤ 300 MHz. Reduce SPAN annotation is displayed when RBW/Span < 0.01.
†† N = LO harmonic. See "Frequency Range."

Frequency Specifications

Frequency Span	
Range	0 Hz (zero span), (10 kHz x N††) to 19.25 GHz**
(Option 130)	0 Hz (zero span), (1 kHz x N††) to 19.25 GHz**
Resolution	Four digits or 20 Hz x N††, whichever is greater.
Accuracy (single band spans)	
Span ≤10 MHz x N††	±2% of span§
Span >10 MHz x N††	±3% of span

** Maximum span is 23.25 GHz for Option 026 or 027.
†† N = LO harmonic. See "Frequency Range."
§ *(Option 130)* For spans < 10 kHz x N††, add an additional 10 Hz x N†† resolution error.

Frequency Sweep Time	
Range	
	20 ms to 100 s
(Option 101)	20 μs to 100 s for span = 0 Hz
Accuracy	
20 ms to 100 s	±3%
20 μs to <20 ms *(Option 101)*	±2%
Sweep Trigger	Free Run, Single, Line, Video, External

Resolution Bandwidth	
Range	1 kHz to 3 MHz, 8 selectable resolution (3 dB) bandwidths in 1-3-10 sequence. 9 kHz and 120 kHz (6 dB) EMI bandwidths.
(Option 130)	Adds 30, 100 and 300 Hz (3 dB) bandwidths and 200 Hz (6 dB) EMI bandwidth.
Accuracy	
3 dB bandwidths	±20%

Stability	
Noise Sidebands	(1 kHz RBW, 30 Hz VBW and sample detector)
>10 kHz offset from CW signal	≤−90 dBc/Hz + 20 Log N††
>20 kHz offset from CW signal	≤−100 dBc/Hz + 20 Log N††
>30 kHz offset from CW signal	≤−105 dBc/Hz + 20 Log N††
Residual FM	
1 kHz RBW, 1 kHz VBW	≤(250 x N††) Hz pk-pk in 100 ms
30 Hz RBW, 30 Hz VBW *(Option 130)*	≤(30 x N††) Hz pk-pk in 300 ms
System-Related Sidebands	
>30 kHz offset from CW signal	≤−65 dBc + 20 Log N††

†† N = LO harmonic. See "Frequency Range."

Calibrator Output Frequency	300 MHz ±(freq. ref. error* x 300 MHz)

* frequency reference error = (aging rate x period of time since adjustment + initial achievable accuracy + temperature stability). See "Frequency Characteristics."

Comb Generator Frequency	100 MHz fundamental frequency
Accuracy	±0.007% of comb tooth frequency

Amplitude Specifications

Amplitude specifications do not apply for Analog+ mode and negative peak detector mode except as noted in "Amplitude Characteristics."

Amplitude Range	−114 dBm to +30 dBm
(Option 130)	−129 dBm to +30 dBm

Maximum Safe Input Level	
Average Continuous Power	+30 dBm (1 W, 7.1 V rms), input attenuation ≥10 dB in bands 1 through 4.
Peak Pulse Power	+50 dBm (100 W) for <10 μs pulse width and <1% duty cycle, input attenuation ≥30 dB.
dc	0 Vdc

Gain Compression‡	
>10 MHz	≤0.5 dB (total power at input mixer* = −10 dBm)

* Mixer Power Level (dBm) = Input Power (dBm) − Input Attenuation (dB).
‡ (Option 130) If RBW ≤ 300 Hz, this applies only if signal separation ≥ 4 kHz and signal amplitudes ≤ Reference Level + 10 dB.

Displayed Average Noise Level	(Input terminated, 0 dB attenuation, 30 Hz VBW, sample detector)	
	1 kHz RBW	**30 Hz RBW** *(Option 130)*
400 kHz to 2.9 GHz	≤−112 dBm	≤−127 dBm
2.75 GHz to 6.5 GHz	≤−114 dBm	≤−129 dBm
6.0 GHz to 12.8 GHz	≤−102 dBm	≤−117 dBm
12.4 GHz to 19.4 GHz	≤−98 dBm	≤−113 dBm
19.1 GHz to 22 GHz	≤−92 dBm	≤−107 dBm
19.1 GHz to 26.5 GHz *(Options 026 and 027)*	≤−87 dBm	≤−102 dBm

Spurious Responses	
Second Harmonic Distortion	
10 MHz to 2.9 GHz	<−70 dBc for −40 dBm tone at input mixer.*
> 2.75 GHz	<−100 dBc for −10 dBm tone at input mixer* (or below displayed average noise level).
Third Order Intermodulation Distortion	
>10 MHz	<−70 dBc for two −30 dBm tones at input mixer* and >50 kHz separation.
Other Input Related Spurious	
9 kHz to 18 GHz	<−65 dBc at ≥30 kHz offset, for −20 dBm tone at input mixer ≤18 GHz.
18 GHz to 22 GHz	<−60 dBc at ≥30 kHz, for −20 dBm tone at input mixer ≤22 GHz.

* Mixer Power Level (dBm) = Input Power (dBm) − Input Attenuation (dB).

Residual Responses	(Input terminated and 0 dB attenuation)
150 kHz to 2.9 GHz (Band 0)	<−90 dBm
2.75 GHz to 6.5 GHz (Band 1)	<−90 dBm

Amplitude Specifications

Display Range	
Log Scale	0 to −70 dB from reference level is calibrated; 0.1, 0.2, 0.5 dB/division and 1 to 20 dB/division in 1 dB steps; eight divisions displayed.
Linear Scale	eight divisions
Scale Units	dBm, dBmV, dBμV, mV, mW, nV, nW, pW, μV, μW, V, and W

Marker Readout Resolution	0.05 dB for log scale
	0.05% of reference level for linear scale
Fast Sweep Times for Zero Span	
20 μs to 20 ms *(Option 101 or 301)*	
Frequency ≤ 1 GHz	0.7% of reference level for linear scale
Frequency > 1 GHz	1.0% of reference level for linear scale

Reference Level	
Range	
Log Scale	Minimum amplitude to maximum amplitude**
Linear Scale	−99 dBm to maximum amplitude**
Resolution	
Log Scale	±0.01 dB
Linear Scale	±0.12% of reference level
Accuracy	(referenced to −20 dBm reference level, 10 dB input attenuation, at a single frequency, in a fixed RBW)
0 dBm to −59.9 dBm	±(0.3 dB + .01 x dB from −20 dBm)
−60 dBm and below	
1 kHz to 3 MHz RBW	±(0.6 dB + .01 x dB from −20 dBm)
30 Hz to 300 Hz RBW *(Option 130)*	±(0.7 dB + .01 x dB from −20 dBm)

** See "Amplitude Range."

Frequency Response	(10 dB input attenuation)	
Preselector peaked in band > 0	**Absolute**§	**Relative Flatness**†
9 kHz to 2.9 GHz	±1.5 dB	±1.0 dB
2.75 GHz to 6.5 GHz	±2.0 dB	±1.5 dB
6.0 GHz to 12.8 GHz	±2.5 dB	±2.0 dB
12.4 GHz to 19.4 GHz	±3.0 dB	±2.0 dB
19.1 GHz to 22 GHz	±3.0 dB	±2.0 dB
19.1 GHz to 26.5 GHz *(Options 026 and 027)*	±5.0 dB	±2.0 dB

† Referenced to midpoint between highest and lowest frequency response deviations.
§ Referenced to 300 MHz CAL OUT.

Calibrator Output	
Amplitude	−20 dBm ±0.4 dB

Absolute Amplitude Calibration Uncertainty‡‡	±0.15 dB
‡‡ Uncertainty in the measured absolute amplitude of the CAL OUT signal at the reference settings after CAL FREQ and CAL AMPTD self-calibration. Absolute amplitude reference settings are: Reference Level −20 dBm; Input Attenuation 10 dB; Center Frequency 300 MHz; Res BW 3 kHz; Video BW 300 Hz; Scale Linear; Span 50 kHz; Sweep Time Coupled, Top Graticule (reference level), Corrections ON.	

Input Attenuator	
Range	0 to 70 dB, in 10 dB steps

Resolution Bandwidth Switching Uncertainty	(At reference level, referenced to 3 kHz RBW)
3 kHz to 3 MHz RBW	±0.4 dB
1 kHz RBW	±0.5 dB
30 Hz to 300 Hz *(Option 130)*	±0.6 dB

Linear to Log Switching	±0.25 dB at reference level

Display Scale Fidelity	
Log Maximum Cumulative	
0 to −70 dB from Reference Level	
3 kHz to 3 MHz RBW	± (0.3 dB + 0.01 x dB from reference level)
RBW ≤ 1 kHz	± (0.4 dB + 0.01 x dB from reference level)
Log Incremental Accuracy	
0 to −60 dB from Reference Level	±0.4 dB/4 dB
Linear Accuracy	±3% of reference level

Cable TV Measurement Specifications

These specifications describe warranted performance of the spectrum analyzer and the HP 85721A cable TV measurements personality.

Input Configuration	75 Ω BNC Female

Channel Selection	Analyzer tunes to specified channels based upon selected tune configuration.
Tune Configuration	Standard, Off-the Air, HRC, IRC (T and FM channels also in channel mode)
Channel Range	1 to 158 and 201 to 300 (channel mode) 1 to 158 (system mode)
Channel Frequencies	Defined by Code of Federal Regulations, Title 47, Telecommunications, Parts 73.603, 76.605, 76.612
Frequency Range	5 to 1002 MHz (channel mode) 54 to 896 MHz (system mode)
Amplitude Range	−15 to +70 dBmV for S/N > 30 dB

Visual-Carrier Frequency	Visual-carrier frequency is counted

Frequency Reference* *(Standard)*	
Resolution	1 kHz
Accuracy	±(7.5 x 10^{-6} x carrier frequency + 110 Hz)
@55.25 MHz (Ch. 2)	±524 Hz
@325.25 MHz (Ch. 41)	±2.55 kHz
@643.25 MHz (Ch. 94)	±4.93 kHz
* Will not meet FCC frequency accuracy requirements.	

Precision Frequency Reference *Option 004*	
Resolution	100 Hz
Accuracy	±(1.2 x 10^{-7} x carrier frequency + 110 Hz)
@55.25 MHz (Ch. 2)	±117 Hz
@325.25 MHz (Ch. 41)	±149 Hz
@643.25 MHz (Ch. 94)	±187 Hz

Visual-to-Aural Carrier Frequency Difference	Frequency difference between visual and aural carriers is counted.
Difference Range	4.1 to 4.9 MHz
Resolution	100 Hz
Accuracy	±221 Hz for precision frequency ref (std) ±254 Hz for Option 704 frequency ref

Visual-Carrier Level	The peak amplitude of the visual carrier is measured to an absolute standard traceable to the National Institute of Standards and Technology.
Amplitude Range	−15 to +70 dBmV
Resolution	0.1 dB
Absolute Accuracy	±2.0 dB for S/N > 30 dB
Relative Accuracy	±1.0 dB relative to adjacent channels in frequency ±1.5 dB relative to all other channels

Visual-to-Aural Carrier Level Difference	The difference between peak amplitudes of the visual and aural carrier is measured.
Difference Range	0 to 25 dB
Resolution	0.1 dB
Accuracy	±0.75 dB for S/N > 30 dB

Hum/Low-Frequency Disturbance	Power-line frequency and low-frequency disturbance measured on modulated and/or unmodulated carriers. May not be valid for scrambled channels.
AM Range	0.5 to 10%
Resolution	0.1%
Accuracy	±0.4% for hum ≤3% ±0.7% for hum ≤5% ±1.3% for hum ≤10%

Visual Carrier-to-Noise Ratio (C/N)*	The C/N is calculated from the visual-carrier peak level and the minimum noise level, normalized to 4 MHz noise bandwidth.
Optimum Input Range	See the graphs in the characteristics section of this chapter.
Maximum C/N Range	Input level dependent - See graphs
C/N Resolution	0.1 dB
C/N Accuracy	Input level and measured C/N dependent ±1.0 to ±3.5 dB over optimum input range

* A preamplifier and preselector filter may be required to achieve specifications.

CSO and CTB Distortion†	Manual composite second order (CSO) and composite triple beat (CTB) distortions are measured relative to the visual carrier peak and require momentary disabling of the carrier. Automatic measurements are made in the channel above the channel selected and assumes that it is unused. If the analyzer has Option 107, a non- interfering CSO measurement can be made.
Optimum Input Range	See the graphs in the characteristics section of this chapter.
Maximum CSO/CTB Range	Input level dependent - see graphs. 66 to 73 dB over optimum input range
Manual CSO/CTB Resolution	0.1 dB
System CSO/CTB Resolution	1 dB
CSO/CTB Accuracy	Input level and measured CSO/CTB dependent - See graphs ±1.5 dB to ±4.0 dB over optimum input range

† A preamplifier and preselector filter may be required to achieve specifications.

System Frequency Response (flatness)

System amplitude variations are measured relative to a reference trace stored during the setup.

Frequency Response Setup	
Fast Sweep Time	2 s (default) for no scrambling
Slow Sweep Time	8 s (default) for fixed-amplitude scrambling
Reference-trace Storage	50 traces that include analyzer states

Frequency Response Test	
Range	1.0 dB/Div to 20 dB/Div (2 dB default)
Resolution	0.05 dB
Trace-flatness Accuracy	±0.1 dB per dB deviation from a flat line and ±0.75 dB maximum cumulative error
Trace-position Accuracy	0.0 dB for equal temperature at test locations and ±0.4 dB maximum for different ambient temperatures

Option Specifications

Tracking Generator Specifications (Option 010)

All specifications apply over 0 °C to +55 °C.* The spectrum-analyzer/tracking-generator combination will meet its specifications after 2 hours of storage at a constant temperature within the operating temperature range, 30 minutes after the spectrum-analyzer/tracking-generator is turned on and after CAL FREQ, CAL AMPTD, CAL TRK GEN, and TRACKING PEAK have been run.

* 0 °C to +50 °C with Option 015 or Option 016 operating and carrying case.

Warm-Up	30 minutes

Output Frequency	
Range	9 kHz to 2.9 GHz

Output Power Level	
Range	−1 dBm to −66 dBm
Resolution	0.1 dB
Absolute Accuracy (at 25 °C ±10 °C)	
(−20 dBm at 300 MHz)	±0.75 dB
Vernier‡	
Range	9 dB
Accuracy (at 25 °C ±10 °C)	
(−20 dBm at 300 MHz, 16 dB attenuation)	
Incremental	±0.20 dB/dB
Cumulative	±0.50 dB total
Output Attenuator	
Range	0 to 56 dB in 8 dB steps
‡ See the Output Accuracy table in “Option Characteristics.”	

Output Power Sweep	
Range	(−10 dBm to −1 dBm) − (Source Attenuator Setting)
Resolution	0.1 dB

Output Flatness	
(referenced to 300 MHz, −20 dBm)	
Frequency > 10 MHz	±2.0 dB
Frequency ≤ 10 MHz	±3.0 dB

Option Specifications

Spurious Output (−1 dBm output)	
Harmonic Spurs from 9 kHz to 2.9 GHz	
TG Output 9 kHz to 20 kHz	≤−15 dBc
TG Output 20 kHz to 2.9 GHz	≤−25 dBc
Nonharmonic Spurs from 9 kHz to 2.9 GHz	
TG Output 9 kHz to 2.0 GHz	≤−27 dBc
TG Output 2.0 GHz to 2.9 GHz	≤−23 dBc
LO Feedthrough	
LO Frequency 3.9217 to 6.8214 GHz	≤−16 dBm

Tracking Generator Feedthrough	
400 kHz to 2.9 MHz	<−112 dBm

Quasi-Peak Detector Specifications (Option 103)

The specifications for Quasi-Peak Detector (Option 103) have been based on the following:

- The spectrum analyzer displays the quasi-peak amplitude of pulsed radio frequency (RF) or continuous wave (CW) signals.
- Amplitude response conforms with Publication 16 of Comité International Spécial des Perturbations Radioélectriques (CISPR) Section 1, Clause 2.

The 200 Hz bandwidth is available only with Option 130. The 1 kHz resolution bandwidth may be used to approximate a quasi-peak measurement without Option 130. A quasi-peak measurement using the 1 kHz bandwidth will be greater than or equal to a quasi-peak measurement using a 200 Hz bandwidth.

Absolute amplitude accuracy is the sum of the pulse amplitude response relative to the reference, plus the reference pulse amplitude accuracy, plus the spectrum analyzer amplitude accuracy (calibrator output, reference level, frequency response, input attenuator, resolution bandwidth switching, linear display scale fidelity, and gain compression).

Relative Quasi-Peak Response to a CISPR Pulse (dB)	Frequency Band		
			(Option 130)
Pulse Repetition Frequency (Hz)	120 kHz EMI BW 0.03 to 1 GHz	9 kHz EMI BW 0.15 to 30 MHz	200 Hz EMI BW 10 to 150 kHz
1000	+8.0 ± 1.0	+4.5 ± 1.0	–
100	0 dB (reference)*	0 dB (reference)*	+4.0 ± 1.0
60	–	–	+3.0 ± 1.0
25	–	–	0 dB (reference)*
20	−9.0 ± 1.0	−6.5 ± 1.0	–
10	−14.0 ± 1.5	−10.0 ± 1.5	−4.0 ± 1.0
5	–	–	−7.5 ± 1.5
2	−26.0 ± 2.0	−20.5 ± 2.0	−13.0 ± 2.0
1	−28.5 ± 2.0	−22.5 ± 2.0	−17.0 ± 2.0
Isolated Pulse	−31.5 ± 2.0	−23.5 ± 2.0	−19.0 ± 2.0

* Reference pulse amplitude accuracy relative to a 66 dBμV CW signal is <1.5 dB. CISPR reference pulse: 0.044 μVs for 0.03 to 1 GHz, 0.316 μVs for 0.15 to 30 MHz, 13.5 ± 1.5 μVs for 10 to 150 kHz *(Option 130)*.

Time Gated Spectrum Analysis Specifications (Option 105)

GATE DELAY	
Range	1 μs to 65.535 ms
Resolution	1 μs
Accuracy	±(1 μs + (0.01% x GATE DELAY Readout))†
(From GATE TRIGGER INPUT to positive edge of GATE OUTPUT)	
GATE LENGTH	
Range	1 μs to 65.535 ms
Resolution	1 μs
Accuracy	±(0.2 μs +(0.01% x GATE LENGTH Readout))
(From positive edge to negative edge of GATE OUTPUT)	
Additional Amplitude Error§	
Log Scale	±0.3 dB
Linear Scale	±0.4% of REFERENCE LEVEL

† Up to 1 μs jitter due to 1 μs resolution of gate delay clock.
§ With GATE ON enabled and triggered, CW Signal, Peak Detector Mode.

TV Receiver/Video Tester (Option 107)

Non-interfering color	(requires FCC composite, NTC-7, or CCIR 17 and CCIR 330 test signal)
Differential Gain Accuracy	6% 50 averages (default)
Differential Phase Accuracy	4° 50 averages (default)
Chroma-luminance Delay Inequality Accuracy	±45 ns
Frequency Range	50 MHz to 850 MHz
Amplitude Range	+10 dBmV to +50 dBmV at coupler input (10 dB loss)
Coupler (HP part number 0955-0704)	Insertion loss: < 2 dB
	Coupled output: −10 dB ±0.5 dB

Non-Interfering Tests with Gate On*	
C/N and CSO	See graphs for accuracy
(quiet line must be selected)	
In-channel Frequency Response Accuracy	±0.5 dB within channel

* A preamplifier and preselector filter may be required to achieve specifications.

Frequency Characteristics

These are not specifications. Characteristics provide useful but nonwarranted information about instrument performance.

Frequency Reference	
Initial Achievable Accuracy	$\pm 0.5 \times 10^{-6}$
Aging	$\pm 1.0 \times 10^{-7}$/day

Precision Frequency Reference *(Option 004)*	
Aging	5×10^{-10}/day, 7-day average after being powered on for 7 days.
Warm-Up	1×10^{-8} after 30 minutes on.
Initial Achievable Accuracy	$\pm 2.2 \times 10^{-8}$ after being powered on for 24 hours.

Stability	
Drift* (after warmup at stabilized temperature)	
Frequency Span $\leq (10 \times N^{\dagger})$ MHz	$\leq (2 \times N^{\dagger\dagger})$ kHz/minute of sweep time*

* Because the analyzer is locked at the center frequency before each sweep, drift occurs only during the time of one sweep. For Line, Video, or External trigger, additional drift occurs while waiting for the appropriate trigger signal.
†† N = LO harmonic. See "Frequency Range."

Resolution Bandwidth (−3 dB)	
Range	1 kHz to 3 MHz, selectable in 1, 3 and 10 increments, and 5 MHz. Resolution bandwidths may be selected manually, or coupled to frequency span.
(Option 130)	Adds 30 Hz, 100 Hz, and 300 Hz bandwidths.
Shape	Synchronously tuned four poles. Approximately Gaussian shape.
60 dB/3 dB Bandwidth Ratio	
Resolution Bandwidth	
100 kHz to 3 MHz	15:1
30 kHz	16:1
3 kHz to 10 kHz	15:1
1 kHz	16:1
40 dB/3 dB Bandwidth Ratio *(Option 130)*	
Resolution Bandwidth	
30 Hz to 300 Hz	10:1

Video Bandwidth (−3 dB)	
Range	30 Hz to 1 MHz, selectable in 1, 3, 10 increments, accuracy ±30% and 3 MHz. Video bandwidths may be selected manually, or coupled to resolution bandwidth and frequency span.
(Option 130)	Adds 1, 3, and 10 Hz bandwidths.
Shape	Post detection, single pole low-pass filter used to average displayed noise.
(Option 130)	Bandwidths below 30 Hz are digital bandwidths with anti-aliasing filtering.

Frequency Characteristics

FFT Bandwidth Factors	FLATTOP	HANNING	UNIFORM
Noise Equivalent Bandwidth†	3.63x	1.5x	1x
3 dB Bandwidth†	3.60x	1.48x	1x
Sidelobe Height	<−90 dB	−32 dB	−13 dB
Amplitude Uncertainty	0.10 dB	1.42 dB	3.92 dB
Shape Factor (60 dB BW/3 dB BW)	2.6	9.1	>300
† Multiply entry by one-divided-by-sweep time.			

Input Level	> (−60 dBm + attenuator setting)
Signal Level	0 to −30 dB below reference level
FM Offset	
Resolution	400 Hz nominal
FM Deviation (FM GAIN)	
Resolution	1 kHz nominal
Range	10 kHz to 1 MHz
Bandwidth	FM deviation/2
FM Linearity (for modulating frequency < bandwidth/100)	≤ 1% of FM deviation + 290 Hz

Amplitude Characteristics

These are not specifications. Characteristics provide useful but nonwarranted information about instrument performance.

Log Scale Switching Uncertainty	Negligible error

Demod Tune Listen	Internal speaker, rear panel earphone jack and front-panel volume control. Adjustable squelch control mutes the audio signal to the speaker/earphone jack based on the level of the demodulated signal above 22 kHz. An uncalibrated demodulated signal is available on the AUX VIDEO OUT connector at the rear panel.

Input Attenuation Uncertainty*			
Attenuator Setting	**9 kHz to 12.4 GHz**	**12.4 to 19 GHz**	**19 to 22 GHz**
0 dB	±0.75 dB	±1.0 dB	±1.0 dB
10 dB	Reference	Reference	Reference
20 dB	±0.75 dB	±0.75 dB	±1.0 dB
30 dB	±0.75 dB	±1.0 dB	±1.25 dB
40 dB	±0.75 dB	±1.25 dB	±2.0 dB
50 dB	±1.0 dB	±1.5 dB	±2.5 dB
60 dB	±1.5 dB	±2.0 dB	±3.0 dB
70 dB	±2.0 dB	±2.5 dB	±3.5 dB

* Referenced to 10 dB input attenuator setting. See the "Specifications" table under "Frequency Response."

Input Attenuator 10 dB Step Uncertainty	(Attenuator setting 10 to 70 dB)
Center Frequency	
9 kHz to 19 GHz	±1.0 dB/10 dB
19 GHz to 22 GHz	±1.5 dB/10 dB

Input Attenuator Repeatability	±0.05 dB

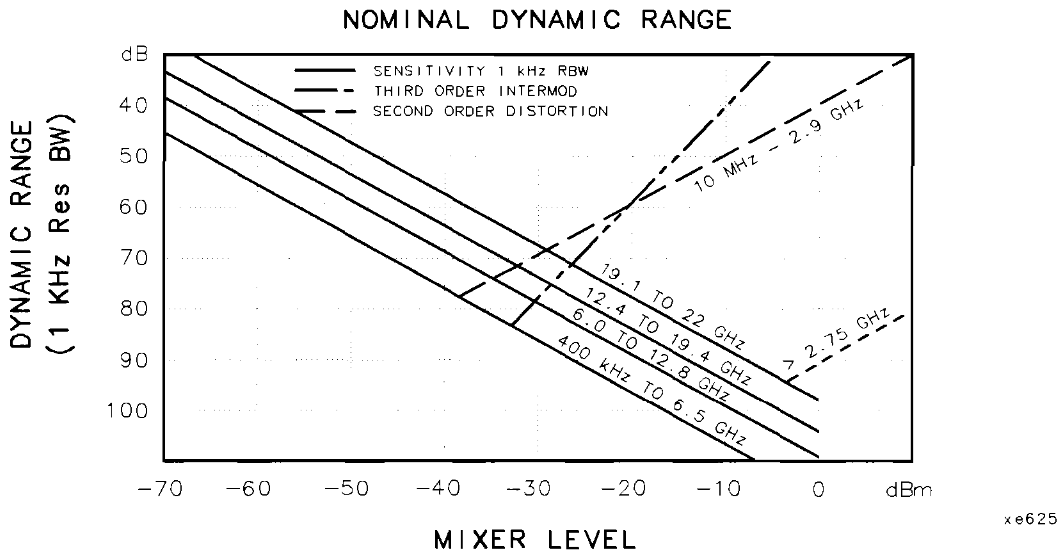
RF Input SWR	
10 dB attenuation	
Frequency	
300 MHz	1.15:1
10 dB to 70 dB attenuation	
Band	
9 kHz to 2.9 GHz	1.3:1
2.75 GHz to 6.5 GHz	1.5:1
6.0 GHz to 12.8 GHz	1.6:1
12.4 GHz to 19.4 GHz	2.0:1
19.1 GHz to 22.0 GHz	3.0:1

Amplitude Characteristics

Unpeaked Frequency Response	(10 dB input attenuation)	
Without Preselector Peaking, Span ≤ 50 MHz	Absolute§	Relative Flatness†
2.75 GHz to 6.5 GHz	±4.0 dB	±3.5 dB
6.0 GHz to 12.8 GHz	±4.5 dB	±4.0 dB
12.4 GHz to 19.4 GHz	±6.0 dB	±5.0 dB
19.1 GHz to 22 GHz	±6.0 dB	±5.0 dB

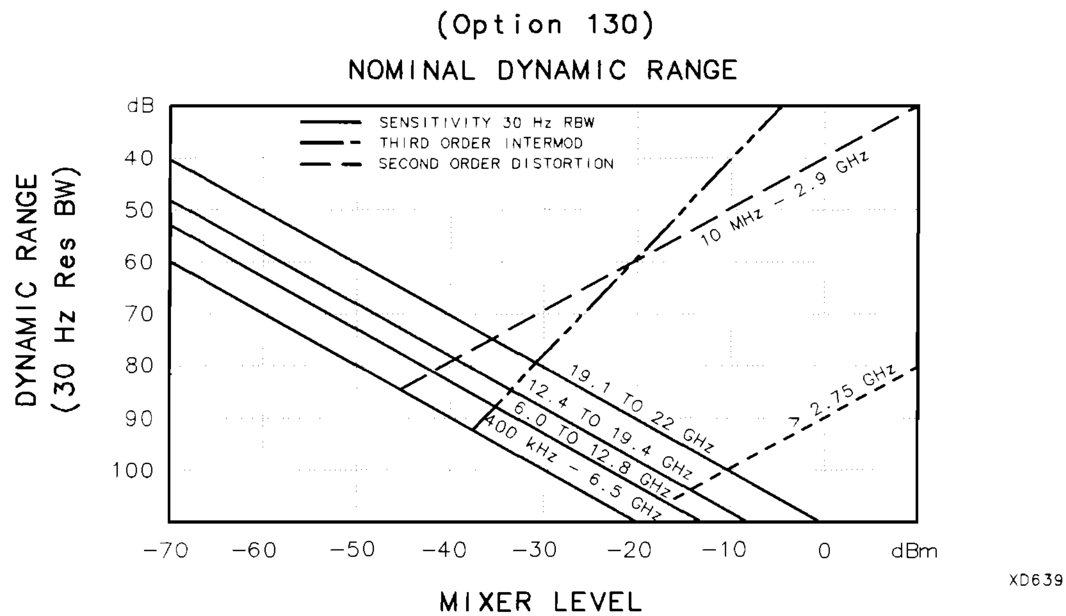
† Referenced to midpoint between highest and lowest frequency response deviations.
§ Referenced to 300 MHz CAL OUT.

DYNAMIC RANGE



Dynamic Range

DYNAMIC RANGE



Option 130 Dynamic Range

Immunity Testing	
Radiated Immunity	When tested at 3 V/m according to IEC 801-3/1984 the displayed average noise level will be within specifications over the full immunity test frequency range of 27 to 500 MHz except that at immunity test frequencies of 278.6 MHz ± selected resolution bandwidth and 321.4 MHz ± selected resolution bandwidth the displayed average noise level may be up to −45 dBm. When the analyzer tuned frequency is identical to the immunity test signal frequency there may be signals of up to −70 dBm displayed on the screen.
Electrostatic Discharge	When an air discharge of up to 8 kV according to IEC 801-2/1991 occurs to the shells of the BNC connectors on the rear panel of the instrument spikes may be seen on the CRT display. Discharges to center pins of any of the connectors may cause damage to the associated circuitry.

Analog+ Mode and Negative Peak Detector Mode (Options 101 and 301)

These modes do not utilize the full set of internal amplitude corrections. Therefore, in these modes, some analyzer amplitude specifications are reduced to characteristics. Characteristics provide useful but nonwarranted information about instrument performance.

In these modes, the following analyzer specifications remain as specifications:

Amplitude Range
Calibrator Output
Maximum Safe Input Level

In these modes, the following analyzer specifications are reduced to characteristics:

Gain Compression
Displayed Average Noise Level
Spurious Responses
Residual Responses
Display Range
Reference Level
Resolution Bandwidth Switching
Linear to Log Switching
Display Scale Fidelity
Display Scale Fidelity for Narrow Bandwidths

Finally, the following analyzer specifications:

Marker Readout Resolution
Frequency Response

are replaced by the characteristics which follow in this subsection.

Marker Readout Resolution	
(digitizing resolution)	
Log Scale	±0.31 dB
Linear Scale	
frequency ≤ 1 GHz	±0.59% of reference level
frequency > 1 GHz	±1.03% of reference level

Frequency Response in Analog+ Mode	(10 dB input attenuation, for spans ≤ 20 MHz)	
Preselector peaked in band > 0		
	Absolute§	**Relative Flatness**†
9 kHz to 2.9 GHz	±2.0 dB	±1.5 dB
2.75 GHz to 6.4 GHz	±2.5 dB	±2.0 dB
6.0 GHz to 12.8 GHz	±3.0 dB	±2.5 dB
12.4 GHz to 19.4 GHz	±3.5 dB	±2.5 dB
19.1 GHz to 22 GHz	±3.5 dB	±2.5 dB
19.1 GHz to 26.5 GHz *(Option 026 or 027)*	±5.5 dB	±2.5 dB

† Referenced to midpoint between highest and lowest frequency response deviations.
§ Referenced to 300 MHz CAL OUT.

Cable TV Measurement Characteristics

Depth of Modulation	Percent AM is measured from horizontal sync tip to maximum video level; measurement requires a white-reference VITS and may not be valid for scrambled channels.
AM Range	50 to 93%
Resolution	0.1%
Accuracy	±2.0% for C/N > 40 dB

FM Deviation	Peak reading of FM deviation
Range	±100 kHz
Resolution	100 Hz
Accuracy	±1.5 kHz

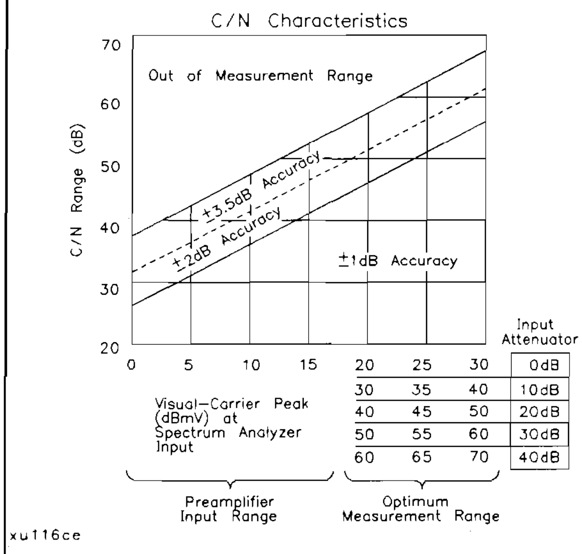


Figure 2-1

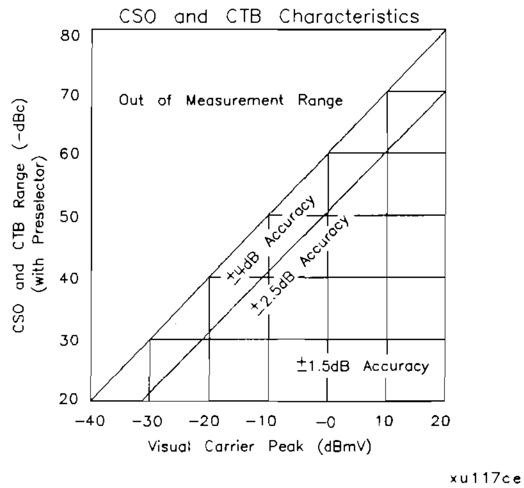


Figure 2-2

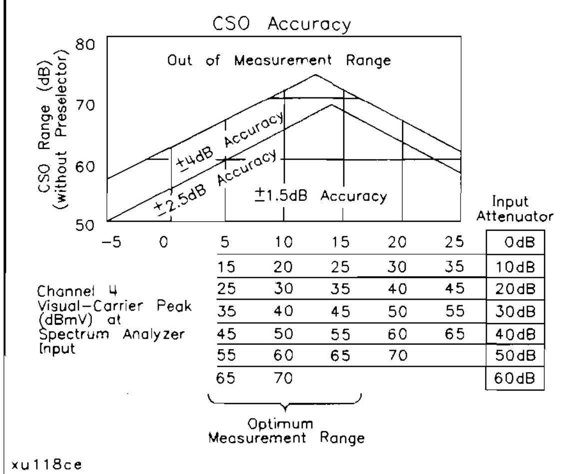


Figure 2-3

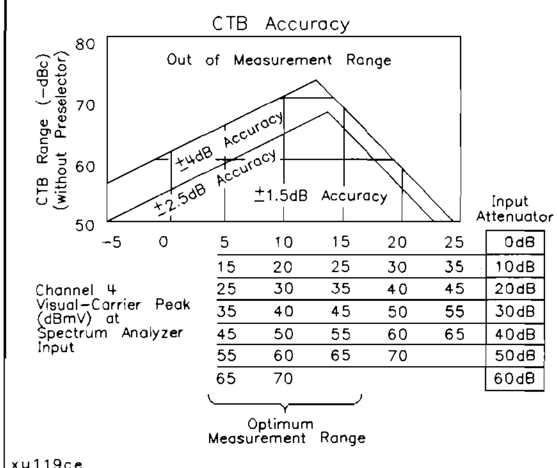


Figure 2-4

C/N, CSO, and CTB Measurements

The four graphs summarize the combined HP 8591C cable TV analyzer or HP 8590 E-Series spectrum analyzers, and HP 85721A characteristics for C/N, CSO, and CTB testing on cable TV systems with up to 99 channels and up to +9 dB amplitude tilt. C/N, CSO, and CTB measurement accuracies and ranges can be read from the relevant graphs. They depend upon the visual carrier peak level and the measurement reading. For C/N measurements with a preselector, there is no optimum range and the accuracy boundaries drop by the preselector's insertion loss (typically 2 dB).

Crossmodulation	Horizontal-line (15.7 kHz) related AM is measured on the unmodulated visual carrier.
Range	60 dB, usable to 65 dB
Resolution	0.1 dB
Accuracy	±2.0 dB for xmod. <40 dB, C/N >40 dB ±2.6 dB for xmod. <50 dB, C/N >40 dB ±4.6 dB for xmod. <60 dB, C/N >40 dB

Option Characteristics

Demod Tune Listen *(Option 102 or 103)*	Internal speaker, rear panel earphone jack and front-panel volume control. Adjustable squelch control mutes the audio signal to the speaker/earphone jack based on the level of the demodulated signal above 22 kHz. An uncalibrated demodulated signal is available on the AUX VIDEO OUT connector at the rear panel.

TV Trigger *(Options 101 and 102)*	Triggers sweep of the analyzer after the sync pulse of a selected line of a TV video field.
Carrier Level for Trigger	Top 60% of linear display
Compatible Formats	NTSC, PAL, SECAM
Field Selection	Even, odd, non-interlaced
Trigger Polarity	Positive, negative
Line Selection	10 to 1021

Tracking Generator Characteristics (Option 010)

Tracking Drift	
(Usable in a 1 kHz RBW after 5-minute warmup)	1.5 kHz/5 minute

RF Power Off Residuals	
9 kHz to 2.9 GHz	<−120 dBm

Dynamic Range (difference between maximum power out and tracking generator feedthrough)	>111 dB

Output Attenuator Repeatability	
9 kHz to 300 MHz	±0.1 dB
300 MHz to 2.0 GHz	±0.2 dB
2.0 GHz to 2.9 GHz	±0.3 dB

Output VSWR	
0 dB Attenuator	<3.0:1
8 dB Attenuator	<1.5:1

TRACKING GENERATOR OUTPUT ACCURACY, Option 010 (after CAL TRK GEN in auto-coupled mode, Frequency > 10 MHz, 25°C ± 10°C)					
TG Output Power Level	**Attenuator Setting**	**Relative Accuracy (at 300 MHz referred to −20 dBm)**	**Absolute Accuracy (at 300 MHz)**	**Relative Accuracy (referred to −20 dBm)**	**Absolute Accuracy**
−1 to −10 dBm	0 dB	1.0 dB	1.75 dB	3.0 dB	3.75 dB
−10 to −18 dB	8 dB	1.5 dB	2.25 dB	3.5 dB	4.25 dB
−20 dBm	16 dB	Reference	0.75 dB	2.0 dB	2.75 dB
−18 to −26 dBm	16 dB	1.0 dB	1.75 dB	3.0 dB	3.75 dB
−26 to −34 dBm	24 dB	1.5 dB	2.25 dB	3.5 dB	4.25 dB
−34 to −42 dBm	32 dB	1.6 dB	2.35 dB	3.6 dB	4.35 dB
−42 to −50 dBm	40 dB	1.8 dB	2.55 dB	3.8 dB	4.55 dB
−50 to −58 dBm	48 dB	2.0 dB	2.75 dB	4.0 dB	4.75 dB
−58 to −66 dBm	56 dB	2.1 dB	2.85 dB	4.1 dB	4.85 dB

Quasi-Peak Detector Characteristics (Option 103)

Quasi-Peak Measurement Range	
Displayed	70 dB
Total	115 dB

FM Demodulation (Option 102, 103, or 301)

Input Level	> (−60 dBm + attenuator setting)
Signal Level	0 to −30 dB below reference level
FM Offset	
Resolution	400 Hz nominal
FM Deviation (FM GAIN)	
Resolution	1 kHz nominal
Range	10 kHz to 1 MHz
Bandwidth	FM deviation/2
FM Linearity (for modulating frequency < bandwidth/100)	≤ 1% of FM deviation + 290 Hz

Physical Characteristics

Front-Panel Inputs and Outputs

INPUT 50Ω	
Connector	Type N female
Impedance	50 Ω nominal
INPUT 50Ω *(Option 026)*	
Connector	APC 3.5 male
Impedance	50 Ω nominal
INPUT 50Ω *(Option 027)*	
Connector	Type N female with adapter to SMA female
Impedance	50 Ω nominal

100 MHz COMB OUT	
Connector	SMA female
Output Level	+27 dBm
Frequency	100 MHz fundamental

RF OUT *(Option 010)*	
Connector	Type N female
Impedance	50 Ω nominal

PROBE POWER‡	
Voltage/Current	+15 Vdc, ±7% at 150 mA max. −12.6 Vdc ±10% at 150 mA max.
‡ Total current drawn from the +15 Vdc on the PROBE POWER and the AUX INTERFACE cannot exceed 150 mA. Total current drawn from the −12.5 Vdc on the PROBE POWER and the −15 Vdc on the AUX INTERFACE cannot exceed 150 mA.	

Rear-Panel Inputs and Outputs

10 MHz REF OUTPUT	
Connector	BNC female
Impedance	50 Ω nominal
Output Amplitude	>0 dBm

EXT REF IN	
Connector	BNC female Note: Analyzer noise sideband and spurious response performance may be affected by the quality of the external reference used.
Input Amplitude Range	−2 to +10 dBm
Frequency	10 MHz

Physical Characteristics

AUX IF OUTPUT	
Frequency	21.4 MHz
Amplitude Range	−10 to −60 dBm
Impedance	50 Ω nominal

AUX VIDEO OUTPUT	
Connector	BNC female
Amplitude Range	0 to 1 V (uncorrected)

EARPHONE *(Option 102 or 103)*	
Connector	1/8 inch monaural jack

EXT ALC INPUT *(Option 010)*	
Input Impedance	>10 kΩ
Polarity	Use with negative detector

EXT KEYBOARD *(Option 021, 023 or 024)*	Interface compatible with HP part number C1405 Option ABA and most IBM/AT non-auto switching keyboards.

EXT TRIG INPUT	
Connector	BNC female
Trigger Level	Positive edge initiates sweep in EXT TRIG mode (TTL).

GATE TRIGGER INPUT *(Option 105)*	
Connector	BNC female
Trigger Level	minimum pulse width >30 ns (TTL)
GATE OUTPUT *(Option 105)*	
Connector	BNC female
Output Level	High = gate on; Low = gate off (TTL)

LO OUTPUT *(Option 009 or 010)*	Note: LO output must be terminated in 50 Ω.
Connector	SMA female
Impedance	50 Ω nominal
Frequency Range	3.0 to 6.8214 GHz
Output Level	+11 to +18 dBm

SWEEP + TUNE OUTPUT *(Option 009)*	
Connector	BNC female
Impedance (dc coupled)	2 kΩ
Range	0 to +10 V
Sweep + Tune Output	0.36 V/GHz of center frequency

HI-SWEEP IN/OUT	
Connector	BNC female
Output	High = sweep, Low = retrace (TTL)
Input	Open collector, low stops sweep.

MONITOR OUTPUT *(Spectrum Analyzer Display)*	
Connector	BNC female
Format	
SYNC NRM	Internal Monitor
SYNC NTSC	NTSC Compatible 15.75 kHz horizontal rate 60 Hz vertical rate
SYNC PAL	PAL Compatible 15.625 kHz horizontal rate 50 Hz vertical rate

REMOTE INTERFACE	
HP-IB *(Option 021)*	
HP-IB Codes	SH1, AH1, T6, SR1, RL1, PP0, DC1, C1, C2, C3 and C28
RS-232 *(Option 023)*	25 pin subminiature D-shell, female
Parallel *(Option 024)*	25 pin subminiature D-shell, female

SWEEP OUTPUT	
Connector	BNC female
Amplitude	0 to +10 V ramp

TV IN *(Option 107)*	
Connector	BNC female
Impedance	75 Ω nominal

TV MON OUTPUT *(Option 107)*	
Connector	BNC female
Output	Baseband video output from TV Receiver

TV TRIG OUT *(Options 101 and 102)*	
Connector	BNC female
Amplitude	Negative edge corresponds to start of the selected TV line after sync pulse (TTL).

Physical Characteristics

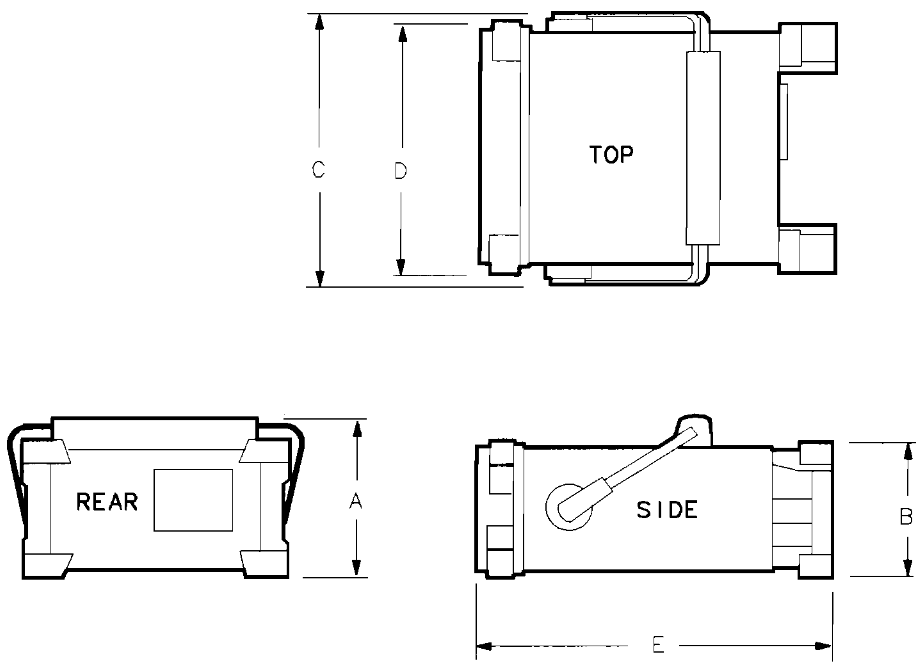
AUX INTERFACE				
Connector Type: 9 Pin Subminiature "D" Connector Pinout				
Pin #	Function	Current	"Logic" Mode	"Serial Bit" Mode
1	Control A	—	TTL Output Hi/Lo	TTL Output Hi/Lo
2	Control B	—	TTL Output Hi/Lo	TTL Output Hi/Lo
3	Control C	—	TTL Output Hi/Lo	Strobe
4	Control D	—	TTL Output Hi/Lo	Serial Data
5	Control 1	—	TTL Input Hi/Lo	TTL Input Hi/Lo
6	Gnd	—	Gnd	Gnd
7†	−15 Vdc ±7%	150 mA	—	—
8*	+5 Vdc ±5%	150 mA	—	—
9†	+15 Vdc ±5%	150 mA	—	—

* Exceeding the +5 V current limits may result in loss of factory correction constants.
† Total current drawn from the +15 Vdc on the PROBE POWER and the AUX INTERFACE cannot exceed 150 mA. Total current drawn from the −12.6 Vdc on the PROBE POWER and the −15 Vdc on the AUX INTERFACE cannot exceed 150 mA.

WEIGHT	
Net	
HP 8593E	16.4 kg (36 lb)
Shipping	
HP 8593E	19.1 kg (42 lb)

DIMENSIONS

A = 8 in (200 mm)
B = 7.25 in (184 mm)
C = 14.69 in (373 mm)
D = 13.25 in (337 mm)
E = 18.12 in (460.5 mm)



7

HP 8594E Specifications and Characteristics

This chapter contains specifications and characteristics for the HP 8594E spectrum analyzer.

The specifications and characteristics in this chapter are listed separately. The specifications are described first, then followed by the characteristics.

General	General specifications and characteristics.
Frequency	Frequency-related specifications and characteristics.
Amplitude	Amplitude-related specifications and characteristics.
Cable TV	Cable TV measurement specifications and characteristics.
Option	Option-related specifications and characteristics.
Physical	Input, output and physical characteristics.

The distinction between specifications and characteristics is described as follows.

- Specifications describe warranted performance over the temperature range 0 °C to +55 °C* (unless otherwise noted). The spectrum analyzer will meet its specifications under the following conditions:
  - □ The instrument is within the one year calibration cycle.
  - □ 2 hours of storage at a constant temperature within the operating temperature range.
  - □ 30 minutes after the spectrum analyzer is turned on.
  - □ After the CAL frequency, and CAL amplitude routines have been run.
- Characteristics provide useful, but nonwarranted information about the functions and performance of the spectrum analyzer. Characteristics are specifically identified.
- Typical Performance, where listed, is not warranted, but indicates performance that most units will exhibit.
- Nominal Value indicates the expected, but not warranted, value of the parameter.

*0 °C to +50 °C with Option 015 or Option 016 operating/carrying case.

General Specifications

Temperature Range	
Operating	0 °C to +55 °C*
Storage	−40 °C to +75 °C
* 0 °C to +50 °C with Option 015 or Option 016 operating and carrying case.	

EMI Compatibility	Conducted and radiated emission is in compliance with CISPR Pub. 11/1990 Group 1 Class A.

Audible Noise	<37.5 dBA pressure and <5.0 Bels power (ISODP7779)

Power Requirements	
ON (LINE 1)	90 to 132 V rms, 47 to 440 Hz
	195 to 250 V rms, 47 to 66 Hz
	Power consumption <500 VA; <180 W
Standby (LINE 0)	Power consumption <7 W

Environmental Specifications	Type tested to the environmental specifications of Mil-T-28800 class 5

Frequency Specifications

Frequency Range	
dc Coupled	9 kHz to 2.9 GHz
ac Coupled	100 kHz to 2.9 GHz

Frequency Reference	
Aging	±2 x 10^{-6}/year
Settability	±0.5 x 10^{-6}
Temperature Stability	±5 x 10^{-6}

Precision Frequency Reference *(Option 004)*	
Aging	±1 x 10^{-7}/year
Settability	±1 x 10^{-8}
Temperature Stability	±1 x 10^{-8}

Frequency Readout Accuracy	
(Start, Stop, Center, Marker)	±(frequency readout x frequency reference error* + span accuracy + 1% of span + 20% of RBW + 100 Hz)‡

* frequency reference error = (aging rate x period of time since adjustment + initial achievable accuracy + temperature stability). See "Frequency Characteristics."
‡ See "Drift" under "Stability" in Frequency Characteristics.

Marker Count Accuracy†	
Frequency Span ≤ 10 MHz	±(marker frequency x frequency reference error* + counter resolution + 100 Hz)
Frequency Span >10 MHz	±(marker frequency x frequency reference error* + counter resolution + 1 kHz)
Counter Resolution	
Frequency Span ≤ 10 MHz	Selectable from 10 Hz to 100 kHz
Frequency Span > 10 MHz	Selectable from 100 Hz to 100 kHz

* frequency reference error = (aging rate x period of time since adjustment + initial achievable accuracy and temperature stability). See "Frequency Characteristics."
† Marker level to displayed noise level > 25 dB, RBW/Span ≥ 0.01. Span ≤ 300 MHz. Reduce SPAN annotation is displayed when RBW/Span < 0.01.

Frequency Span	
Range	0 Hz (zero span), 10 kHz to 2.9 GHz
(Option 130)	0 Hz (zero span), 1 kHz to 2.9 GHz
Resolution	Four digits or 20 Hz, whichever is greater.
Accuracy	
Span ≤10 MHz	±2% of span§
Span >10 MHz	±3% of span

§ *(Option 130)* For spans < 10 kHz, add an additional 10 Hz resolution error.

Frequency Specifications

Frequency Sweep Time	
Range	
	20 ms to 100 s
(Option 101)	20 μs to 100 s for span = 0 Hz
Accuracy	
20 ms to 100 s	±3%
20 μs to <20 ms *(Option 101)*	±2%
Sweep Trigger	Free Run, Single, Line, Video, External

Resolution Bandwidth	
Range	1 kHz to 3 MHz, 8 selectable resolution (3 dB) bandwidths in 1-3-10 sequence. 9 kHz and 120 kHz (6 dB) EMI bandwidths.
(Option 130)	Adds 30, 100 and 300 Hz (3 dB) bandwidths and 200 Hz (6 dB) EMI bandwidth.
Accuracy	
3 dB bandwidths	±20%

Stability	
Noise Sidebands	(1 kHz RBW, 30 Hz VBW and sample detector)
>10 kHz offset from CW signal	≤−90 dBc/Hz
>20 kHz offset from CW signal	≤−100 dBc/Hz
>30 kHz offset from CW signal	≤−105 dBc/Hz
Residual FM	
1 kHz RBW, 1 kHz VBW	≤250 Hz pk-pk in 100 ms
30 Hz RBW, 30 Hz VBW *(Option 130)*	≤30 Hz pk-pk in 300 ms
System-Related Sidebands	
>30 kHz offset from CW signal	≤−65 dBc

Calibrator Output Frequency	300 MHz ±(freq. ref. error* x 300 MHz)
* frequency reference error = (aging rate x period of time since adjustment + initial achievable accuracy + temperature stability). See "Frequency Characteristics."	

Amplitude Specifications

Amplitude specifications do not apply for Analog+ mode and negative peak detector mode except as noted in "Amplitude Characteristics."

Amplitude Range	−112 dBm to +30 dBm
(Option 130)	−127 dBm to +30 dBm

Maximum Safe Input Level	
Average Continuous Power	+30 dBm (1 W, 7.1 V rms), input attenuation ≥10 dB.
Peak Pulse Power	+50 dBm (100 W) for <10 μs pulse width and <1% duty cycle, input attenuation ≥30 dB.
dc	0 V (dc coupled)
	50 V (ac coupled)

Gain Compression‡	
>10 MHz	≤0.5 dB (total power at input mixer* = −10 dBm)
* Mixer Power Level (dBm) = Input Power (dBm) − Input Attenuation (dB). ‡ (Option 130) If RBW ≤ 300 Hz, this applies only if signal separation ≥ 4 kHz and signal amplitudes ≤ Reference Level + 10 dB.	

Displayed Average Noise Level	(Input terminated, 0 dB attenuation, 30 Hz VBW, sample detector)	
	1 kHz RBW	**30 Hz RBW** *(Option 130)*
400 kHz to <5 MHz	≤−107 dBm	≤−122 dBm
5 MHz to 2.9 GHz	≤−112 dBm	≤−127 dBm

Spurious Responses	
Second Harmonic Distortion	
>10 MHz	<−70 dBc for −40 dBm tone at input mixer.*
Third Order Intermodulation Distortion	
>10 MHz	<−70 dBc for two −30 dBm tones at input mixer* and >50 kHz separation.
Other Input Related Spurious	<−65 dBc at ≥30 kHz offset, for −20 dBm tone at input mixer ≤2.9 GHz.
* Mixer Power Level (dBm) = Input Power (dBm) − Input Attenuation (dB).	

Residual Responses	(Input terminated and 0 dB attenuation)
150 kHz to 2.9 GHz	<−90 dBm

Display Range	
Log Scale	0 to −70 dB from reference level is calibrated; 0.1, 0.2, 0.5 dB/division and 1 to 20 dB/division in 1 dB steps; eight divisions displayed.
Linear Scale	eight divisions
Scale Units	dBm, dBmV, dBμV, mV, mW, nV, nW, pW, μV, μW, V, and W

Amplitude Specifications

Marker Readout Resolution	0.05 dB for log scale 0.05% of reference level for linear scale
Fast Sweep Times for Zero Span	
20 μs to 20 ms *(Option 101 or 301)*	
Frequency ≤ 1 GHz	0.7% of reference level for linear scale
Frequency > 1 GHz	1.0% of reference level for linear scale

Reference Level	
Range	
Log Scale	Minimum amplitude to maximum amplitude**
Linear Scale	−99 dBm to maximum amplitude**
Resolution	
Log Scale	±0.01 dB
Linear Scale	±0.12% of reference level
Accuracy	(referenced to −20 dBm reference level, 10 dB input attenuation, at a single frequency, in a fixed RBW)
0 dBm to −59.9 dBm	±(0.3 dB + .01 x dB from −20 dBm)
−60 dBm and below	
1 kHz to 3 MHz RBW	±(0.6 dB + .01 x dB from −20 dBm)
30 Hz to 300 Hz RBW *(Option 130)*	±(0.7 dB + .01 x dB from −20 dBm)

** See "Amplitude Range."

Frequency Response (dc coupled)	(10 dB input attenuation)	
	Absolute§	**Relative Flatness**†
9 kHz to 2.9 GHz	±1.5 dB	±1.0 dB

† Referenced to midpoint between highest and lowest frequency response deviations.
§ Referenced to 300 MHz CAL OUT.

Calibrator Output	
Amplitude	−20 dBm ±0.4 dB

Absolute Amplitude Calibration Uncertainty ‡‡	±0.15 dB

‡‡ Uncertainty in the measured absolute amplitude of the CAL OUT signal at the reference settings after CAL FREQ and CAL AMPTD self-calibration. Absolute amplitude reference settings are: Reference Level −20 dBm; Input Attenuation 10 dB; Center Frequency 300 MHz; Res BW 3 kHz; Video BW 300 Hz; Scale Linear; Span 50 kHz; Sweep Time Coupled, Top Graticule (reference level), Corrections ON, DC Coupled.

Input Attenuator	
Range	0 to 70 dB, in 10 dB steps

Resolution Bandwidth Switching Uncertainty	(At reference level, referenced to 3 kHz RBW)
3 kHz to 3 MHz RBW	±0.4 dB
1 kHz RBW	±0.5 dB
30 Hz to 300 Hz *(Option 130)*	±0.6 dB

Linear to Log Switching	±0.25 dB at reference level

Display Scale Fidelity	
Log Maximum Cumulative	
0 to −70 dB from Reference Level	
3 kHz to 3 MHz RBW	± (0.3 dB + 0.01 × dB from reference level)
RBW ≤ 1 kHz	± (0.4 dB + 0.01 × dB from reference level)
Log Incremental Accuracy	
0 to −60 dB from Reference Level	±0.4 dB/4 dB
Linear Accuracy	±3% of reference level

Cable TV Measurement Specifications

These specifications describe warranted performance of the spectrum analyzer and the HP 85721A cable TV measurements personality.

Input Configuration	75 Ω BNC Female

Channel Selection	Analyzer tunes to specified channels based upon selected tune configuration.
Tune Configuration	Standard, Off-the Air, HRC, IRC (T and FM channels also in channel mode)
Channel Range	1 to 158 and 201 to 300 (channel mode) 1 to 158 (system mode)
Channel Frequencies	Defined by Code of Federal Regulations, Title 47, Telecommunications, Parts 73.603, 76.605, 76.612
Frequency Range	5 to 1002 MHz (channel mode) 54 to 896 MHz (system mode)
Amplitude Range	−15 to +70 dBmV for S/N > 30 dB

Visual-Carrier Frequency	Visual-carrier frequency is counted

Frequency Reference* *(Standard)*	
Resolution	1 kHz
Accuracy	±(7.5 x 10^{-6} x carrier frequency + 110 Hz)
@55.25 MHz (Ch. 2)	±524 Hz
@325.25 MHz (Ch. 41)	±2.55 kHz
@643.25 MHz (Ch. 94)	±4.93 kHz
* Will not meet FCC frequency accuracy requirements.	

Precision Frequency Reference *Option 004*	
Resolution	100 Hz
Accuracy	±(1.2 x 10^{-7} x carrier frequency + 110 Hz)
@55.25 MHz (Ch. 2)	±117 Hz
@325.25 MHz (Ch. 41)	±149 Hz
@643.25 MHz (Ch. 94)	±187 Hz

Visual-to-Aural Carrier Frequency Difference	Frequency difference between visual and aural carriers is counted.
Difference Range	4.1 to 4.9 MHz
Resolution	100 Hz
Accuracy	±221 Hz for precision frequency ref (std) ±254 Hz for Option 704 frequency ref

Visual-Carrier Level	The peak amplitude of the visual carrier is measured to an absolute standard traceable to the National Institute of Standards and Technology.
Amplitude Range	−15 to +70 dBmV
Resolution	0.1 dB
Absolute Accuracy	±2.0 dB for S/N > 30 dB
Relative Accuracy	±1.0 dB relative to adjacent channels in frequency ±1.5 dB relative to all other channels

Visual-to-Aural Carrier Level Difference	The difference between peak amplitudes of the visual and aural carrier is measured.
Difference Range	0 to 25 dB
Resolution	0.1 dB
Accuracy	±0.75 dB for S/N > 30 dB

Hum/Low-Frequency Disturbance	Power-line frequency and low-frequency disturbance measured on modulated and/or unmodulated carriers. May not be valid for scrambled channels.
AM Range	0.5 to 10%
Resolution	0.1%
Accuracy	±0.4% for hum ≤3% ±0.7% for hum ≤5% ±1.3% for hum ≤10%

Visual Carrier-to-Noise Ratio (C/N)*	The C/N is calculated from the visual-carrier peak level and the minimum noise level, normalized to 4 MHz noise bandwidth.
Optimum Input Range	See the graphs in the characteristics section of this chapter.
Maximum C/N Range	Input level dependent - See graphs
C/N Resolution	0.1 dB
C/N Accuracy	Input level and measured C/N dependent ±1.0 to ±3.5 dB over optimum input range

* A preamplifier and preselector filter may be required to achieve specifications.

CSO and CTB Distortion†	Manual composite second order (CSO) and composite triple beat (CTB) distortions are measured relative to the visual carrier peak and require momentary disabling of the carrier. Automatic measurements are made in the channel above the channel selected and assumes that it is unused. If the analyzer has Option 107, a non- interfering CSO measurement can be made.
Optimum Input Range	See the graphs in the characteristics section of this chapter.
Maximum CSO/CTB Range	Input level dependent - see graphs. 66 to 73 dB over optimum input range
Manual CSO/CTB Resolution	0.1 dB
System CSO/CTB Resolution	1 dB
CSO/CTB Accuracy	Input level and measured CSO/CTB dependent - See graphs ±1.5 dB to ±4.0 dB over optimum input range

† A preamplifier and preselector filter may be required to achieve specifications.

System Frequency Response (flatness)

System amplitude variations are measured relative to a reference trace stored during the setup.

Frequency Response Setup	
Fast Sweep Time	2 s (default) for no scrambling
Slow Sweep Time	8 s (default) for fixed-amplitude scrambling
Reference-trace Storage	50 traces that include analyzer states

Frequency Response Test	
Range	1.0 dB/Div to 20 dB/Div (2 dB default)
Resolution	0.05 dB
Trace-flatness Accuracy	±0.1 dB per dB deviation from a flat line and ±0.75 dB maximum cumulative error
Trace-position Accuracy	0.0 dB for equal temperature at test locations and ±0.4 dB maximum for different ambient temperatures

Option Specifications

Tracking Generator Specifications (Option 010)

All specifications apply over 0 °C to +55 °C.* The spectrum-analyzer/tracking-generator combination will meet its specifications after 2 hours of storage at a constant temperature within the operating temperature range, 30 minutes after the spectrum-analyzer/tracking-generator is turned on and after CAL FREQ, CAL AMPTD, CAL TRK GEN, and TRACKING PEAK have been run.

* 0 °C to +50 °C with Option 015 or Option 016 operating and carrying case.

Warm-Up	30 minutes

Output Frequency	
Range	9 kHz to 2.9 GHz

Output Power Level	
Range	−1 dBm to −66 dBm
Resolution	0.1 dB
Absolute Accuracy (at 25 °C ±10 °C)	
(−20 dBm at 300 MHz)	±0.75 dB
Vernier‡	
Range	9 dB
Accuracy (at 25 °C ±10 °C)	
(−20 dBm at 300 MHz, 16 dB attenuation)	
Incremental	±0.20 dB/dB
Cumulative	±0.50 dB total
Output Attenuator	
Range	0 to 56 dB in 8 dB steps

‡ See the Output Accuracy table in "Option Characteristics."

Output Power Sweep	
Range	(−10 dBm to −1 dBm) − (Source Attenuator Setting)
Resolution	0.1 dB

Output Flatness	
(referenced to 300 MHz, −20 dBm)	
Frequency > 10 MHz	±2.0 dB
Frequency ≤ 10 MHz	±3.0 dB

Option Specifications

Spurious Output (−1 dBm output)	
Harmonic Spurs from 9 kHz to 2.9 GHz	
TG Output 9 kHz to 20 kHz	≤−15 dBc
TG Output 20 kHz to 2.9 GHz	≤−25 dBc
Nonharmonic Spurs from 9 kHz to 2.9 GHz	
TG Output 9 kHz to 2.0 GHz	≤−27 dBc
TG Output 2.0 GHz to 2.9 GHz	≤−23 dBc
LO Feedthrough	
LO Frequency 3.9217 to 6.8214 GHz	≤−16 dBm

Tracking Generator Feedthrough	
400 kHz to 5 MHz	<−107 dBm
5 MHz to 2.9 GHz	<−112 dBm

Quasi-Peak Detector Specifications (Option 103)

The specifications for Quasi-Peak Detector (Option 103) have been based on the following:

- The spectrum analyzer displays the quasi-peak amplitude of pulsed radio frequency (RF) or continuous wave (CW) signals.
- Amplitude response conforms with Publication 16 of Comité International Spécial des Perturbations Radioélectriques (CISPR) Section 1, Clause 2.

The 200 Hz bandwidth is available only with Option 130. The 1 kHz resolution bandwidth may be used to approximate a quasi-peak measurement without Option 130. A quasi-peak measurement using the 1 kHz bandwidth will be greater than or equal to a quasi-peak measurement using a 200 Hz bandwidth.

Absolute amplitude accuracy is the sum of the pulse amplitude response relative to the reference, plus the reference pulse amplitude accuracy, plus the spectrum analyzer amplitude accuracy (calibrator output, reference level, frequency response, input attenuator, resolution bandwidth switching, linear display scale fidelity, and gain compression).

Relative Quasi-Peak Response to a CISPR Pulse (dB)	**Frequency Band**		
Pulse Repetition Frequency (Hz)	**120 kHz EMI BW 0.03 to 1 GHz**	**9 kHz EMI BW 0.15 to 30 MHz**	*(Option 130)* **200 Hz EMI BW 10 to 150 kHz**
1000	+8.0 ± 1.0	+4.5 ± 1.0	—
100	0 dB (reference)*	0 dB (reference)*	+4.0 ± 1.0
60	—	—	+3.0 ± 1.0
25	—	—	0 dB (reference)*
20	−9.0 ± 1.0	−6.5 ± 1.0	—
10	−14.0 ± 1.5	−10.0 ± 1.5	−4.0 ± 1.0
5	—	—	−7.5 ± 1.5
2	−26.0 ± 2.0	−20.5 ± 2.0	−13.0 ± 2.0
1	−28.5 ± 2.0	−22.5 ± 2.0	−17.0 ± 2.0
Isolated Pulse	−31.5 ± 2.0	−23.5 ± 2.0	−19.0 ± 2.0

* Reference pulse amplitude accuracy relative to a 66 dBμV CW signal is <1.5 dB. CISPR reference pulse: 0.044 μVs for 0.03 to 1 GHz, 0.316 μVs for 0.15 to 30 MHz, 13.5 ± 1.5 μVs for 10 to 150 kHz *(Option 130)*.

Time Gated Spectrum Analysis Specifications (Option 105)

GATE DELAY	
Range	1 μs to 65.535 ms
Resolution	1 μs
Accuracy	±(1 μs + (0.01% x GATE DELAY Readout))†
(From GATE TRIGGER INPUT to positive edge of GATE OUTPUT)	
GATE LENGTH	
Range	1 μs to 65.535 ms
Resolution	1 μs
Accuracy	±(0.2 μs +(0.01% x GATE LENGTH Readout))
(From positive edge to negative edge of GATE OUTPUT)	
Additional Amplitude Error§	
Log Scale	±0.3 dB
Linear Scale	±0.4% of REFERENCE LEVEL

† Up to 1 μs jitter due to 1 μs resolution of gate delay clock.
§ With GATE ON enabled and triggered, CW Signal, Peak Detector Mode.

TV Receiver/Video Tester (Option 107)

Non-interfering color	(requires FCC composite, NTC-7, or CCIR 17 and CCIR 330 test signal)
Differential Gain Accuracy	6% 50 averages (default)
Differential Phase Accuracy	4° 50 averages (default)
Chroma-luminance Delay Inequality Accuracy	±45 ns
Frequency Range	50 MHz to 850 MHz
Amplitude Range	+10 dBmV to +50 dBmV at coupler input (10 dB loss)
Coupler (HP part number 0955-0704)	Insertion loss: < 2 dB
	Coupled output: −10 dB ±0.5 dB

Non-Interfering Tests with Gate On*	
C/N and CSO	See graphs for accuracy
(quiet line must be selected)	
In-channel Frequency Response Accuracy	±0.5 dB within channel

* A preamplifier and preselector filter may be required to achieve specifications.

Frequency Characteristics

These are not specifications. Characteristics provide useful but nonwarranted information about instrument performance.

Frequency Reference	
Initial Achievable Accuracy	$\pm 0.5 \times 10^{-6}$
Aging	$\pm 1.0 \times 10^{-7}$/day

Precision Frequency Reference *(Option 004)*	
Aging	5×10^{-10}/day, 7-day average after being powered on for 7 days.
Warm-Up	1×10^{-8} after 30 minutes on.
Initial Achievable Accuracy	$\pm 2.2 \times 10^{-8}$ after being powered on for 24 hours.

Stability	
Drift* (after warmup at stabilized temperature)	
Frequency Span ≤10 MHz, Free Run	<2 kHz/minute of sweep time

* Because the analyzer is locked at the center frequency before each sweep, drift occurs only during the time of one sweep. For Line, Video or External trigger, additional drift occurs while waiting for the appropriate trigger signal.

Resolution Bandwidth (−3 dB)	
Range	1 kHz to 3 MHz, selectable in 1, 3 and 10 increments, and 5 MHz. Resolution bandwidths may be selected manually, or coupled to frequency span.
(Option 130)	Adds 30 Hz, 100 Hz, and 300 Hz bandwidths.
Shape	Synchronously tuned four poles. Approximately Gaussian shape.
60 dB/3 dB Bandwidth Ratio	
Resolution Bandwidth	
100 kHz to 3 MHz	15:1
30 kHz	16:1
3 kHz to 10 kHz	15:1
1 kHz	16:1
40 dB/3 dB Bandwidth Ratio *(Option 130)*	
Resolution Bandwidth	
30 Hz to 300 Hz	10:1

Video Bandwidth (−3 dB)	
Range	30 Hz to 1 MHz, selectable in 1, 3, 10 increments, accuracy ±30% and 3 MHz. Video bandwidths may be selected manually, or coupled to resolution bandwidth and frequency span.
(Option 130)	Adds 1, 3, and 10 Hz bandwidths.
Shape	Post detection, single pole low-pass filter used to average displayed noise.
(Option 130)	Bandwidths below 30 Hz are digital bandwidths with anti-aliasing filtering.

Frequency Characteristics

FFT Bandwidth Factors	FLATTOP	HANNING	UNIFORM
Noise Equivalent Bandwidth†	3.63×	1.5×	1×
3 dB Bandwidth†	3.60×	1.48×	1×
Sidelobe Height	<−90 dB	−32 dB	−13 dB
Amplitude Uncertainty	0.10 dB	1.42 dB	3.92 dB
Shape Factor (60 dB BW/3 dB BW)	2.6	9.1	>300
† Multiply entry by one-divided-by-sweep time.			

Input Level	> (−60 dBm + attenuator setting)
Signal Level	0 to −30 dB below reference level
FM Offset	
Resolution	400 Hz nominal
FM Deviation (FM GAIN)	
Resolution	1 kHz nominal
Range	10 kHz to 1 MHz
Bandwidth	FM deviation/2
FM Linearity (for modulating frequency < bandwidth/100)	≤ 1% of FM deviation + 290 Hz

Amplitude Characteristics

These are not specifications. Characteristics provide useful but nonwarranted information about instrument performance.

Log Scale Switching Uncertainty	Negligible error

Demod Tune Listen	Internal speaker, rear panel earphone jack and front-panel volume control. Adjustable squelch control mutes the audio signal to the speaker/earphone jack based on the level of the demodulated signal above 22 kHz. An uncalibrated demodulated signal is available on the AUX VIDEO OUT connector at the rear panel.

Input Attenuation Uncertainty*	
Attenuator Setting	
0 dB	±0.2 dB
10 dB	Reference
20 dB	±0.4 dB
30 dB	±0.5 dB
40 dB	±0.7 dB
50 dB	±0.8 dB
60 dB	±1.0 dB
70 dB	±1.0 dB

* Referenced to 10 dB input attenuator setting. See the "Specifications" table under "Frequency Response."

ac Coupled Insertion Loss‡	
100 kHz to 300 kHz	0.7 dB
300 kHz to 1 MHz	0.7 dB
1 MHz to 100 MHz	0.05 dB
100 MHz to 2.9 GHz	0.05 dB + (0.06 x F)† dB

† F = frequency in GHz.
‡ Referenced to dc coupled mode.

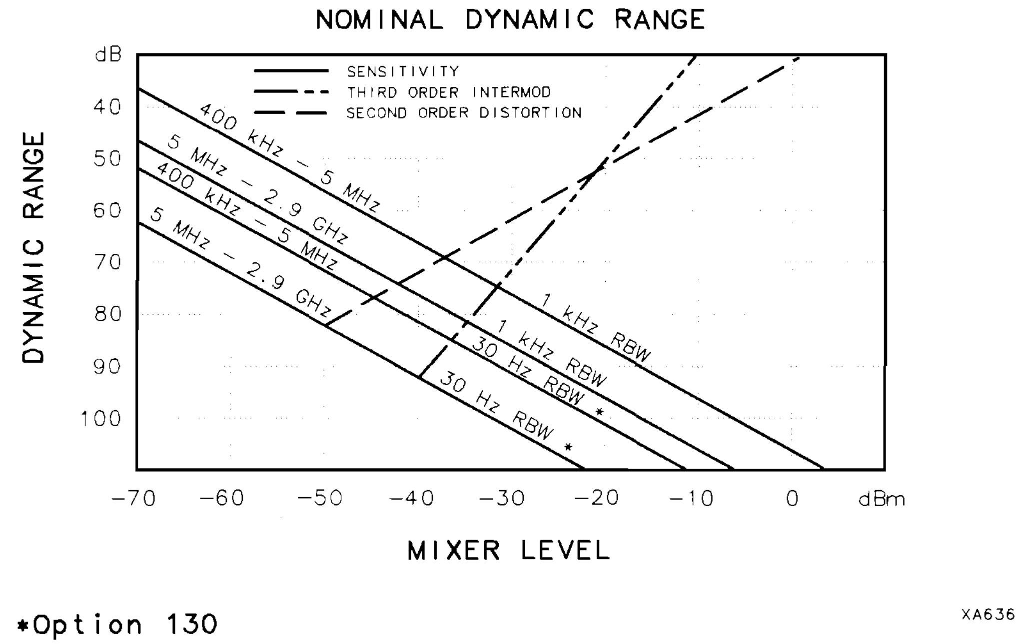
Input Attenuator 10 dB Step Uncertainty	(Attenuator setting 10 to 70 dB) ±0.8 dB/10 dB

Input Attenuator Repeatability	±0.05 dB

RF Input SWR		
10 dB attenuation	**dc Coupled**	**ac Coupled**
300 MHz	1.15:1	1.4:1
10 dB to 70 dB attenuation		
100 kHz to 300 kHz	1.3:1	2.3:1
300 kHz to 1 MHz	1.3:1	1.4:1
1 MHz to 2.9 GHz	1.3:1	1.3:1

Amplitude Characteristics

DYNAMIC RANGE



Dynamic Range

Immunity Testing	
Radiated Immunity	When tested at 3 V/m according to IEC 801-3/1984 the displayed average noise level will be within specifications over the full immunity test frequency range of 27 to 500 MHz except that at immunity test frequencies of 278.6 MHz ± selected resolution bandwidth and 321.4 MHz ± selected resolution bandwidth the displayed average noise level may be up to −45 dBm. When the analyzer tuned frequency is identical to the immunity test signal frequency there may be signals of up to −70 dBm displayed on the screen.
Electrostatic Discharge	When an air discharge of up to 8 kV according to IEC 801-2/1991 occurs to the shells of the BNC connectors on the rear panel of the instrument spikes may be seen on the CRT display. Discharges to center pins of any of the connectors may cause damage to the associated circuitry.

Analog+ Mode and Negative Peak Detector Mode (Options 101 and 301)

These modes do not utilize the full set of internal amplitude corrections. Therefore, in these modes, some analyzer amplitude specifications are reduced to characteristics. Characteristics provide useful but nonwarranted information about instrument performance.

In these modes, the following analyzer specifications remain as specifications:

Amplitude Range	**Calibrator Output**
Maximum Safe Input Level	

In these modes, the following analyzer specifications are reduced to characteristics:

Gain Compression	**Reference Level**
Displayed Average Noise Level	**Resolution Bandwidth Switching**
Spurious Responses	**Linear to Log Switching**
Residual Responses	**Display Scale Fidelity**
Display Range	**Display Scale Fidelity for Narrow Bandwidths**

Finally, the following analyzer specifications:

Marker Readout Resolution	**Frequency Response**

are replaced by the characteristics which follow in this subsection.

Marker Readout Resolution	
(digitizing resolution)	
Log Scale	±0.31 dB
Linear Scale	
frequency ≤ 1 GHz	±0.59% of reference level
frequency > 1 GHz	±1.03% of reference level

Frequency Response in Analog+ Mode (dc coupled)	(10 dB input attenuation, for spans ≤ 20 MHz)	
	Absolute§	**Relative Flatness†**
9 kHz to 2.9 GHz	±2.0 dB	±1.5 dB

† Referenced to midpoint between highest and lowest frequency response deviations.
§ Referenced to 300 MHz CAL OUT.

Cable TV Measurement Characteristics

Depth of Modulation	Percent AM is measured from horizontal sync tip to maximum video level; measurement requires a white-reference VITS and may not be valid for scrambled channels.
AM Range	50 to 93%
Resolution	0.1%
Accuracy	±2.0% for C/N > 40 dB

FM Deviation	Peak reading of FM deviation
Range	±100 kHz
Resolution	100 Hz
Accuracy	±1.5 kHz

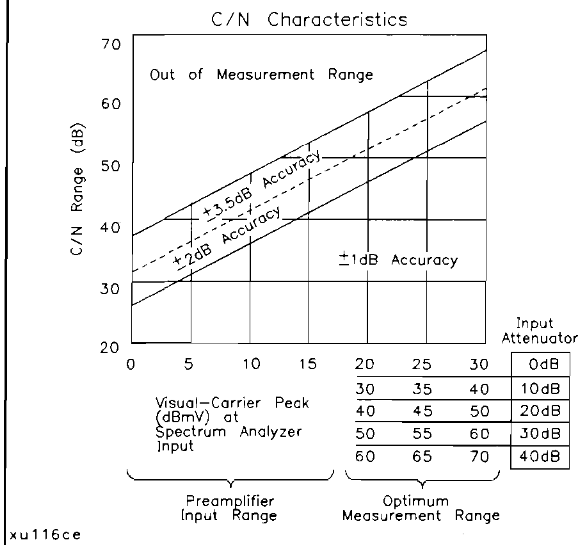


Figure 2-1

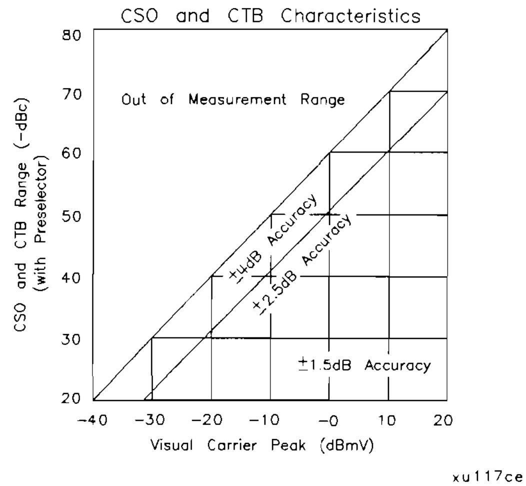


Figure 2-2

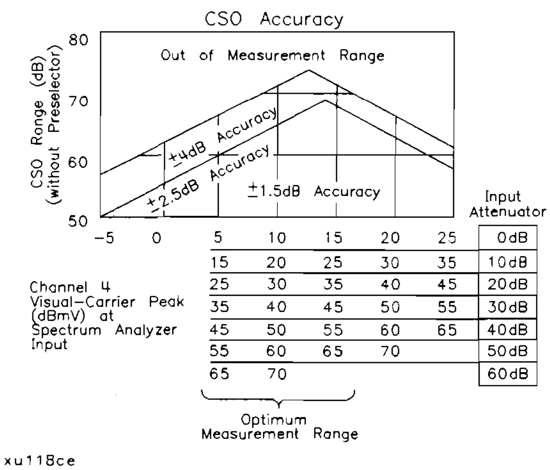


Figure 2-3

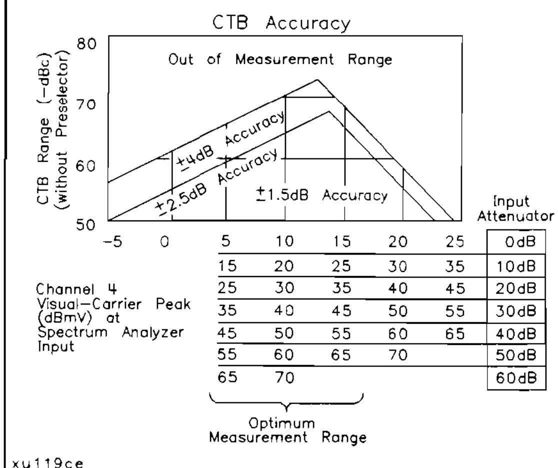


Figure 2-4

C/N, CSO, and CTB Measurements

The four graphs summarize the combined HP 8591C cable TV analyzer or HP 8590 E-Series spectrum analyzers, and HP 85721A characteristics for C/N, CSO, and CTB testing on cable TV systems with up to 99 channels and up to +9 dB amplitude tilt. C/N, CSO, and CTB measurement accuracies and ranges can be read from the relevant graphs. They depend upon the visual carrier peak level and the measurement reading. For C/N measurements with a preselector, there is no optimum range and the accuracy boundaries drop by the preselector's insertion loss (typically 2 dB).

Cable TV Measurement Characteristics

Crossmodulation	Horizontal-line (15.7 kHz) related AM is measured on the unmodulated visual carrier.
Range	60 dB, usable to 65 dB
Resolution	0.1 dB
Accuracy	±2.0 dB for xmod. <40 dB, C/N >40 dB ±2.6 dB for xmod. <50 dB, C/N >40 dB ±4.6 dB for xmod. <60 dB, C/N >40 dB

Option Characteristics

Demod Tune Listen *(Option 102 or 103)*	Internal speaker, rear panel earphone jack and front-panel volume control. Adjustable squelch control mutes the audio signal to the speaker/earphone jack based on the level of the demodulated signal above 22 kHz. An uncalibrated demodulated signal is available on the AUX VIDEO OUT connector at the rear panel.

TV Trigger *(Options 101 and 102)*	Triggers sweep of the analyzer after the sync pulse of a selected line of a TV video field.
Carrier Level for Trigger	Top 60% of linear display
Compatible Formats	NTSC, PAL, SECAM
Field Selection	Even, odd, non-interlaced
Trigger Polarity	Positive, negative
Line Selection	10 to 1021

Tracking Generator Characteristics (Option 010)

Tracking Drift	
(Usable in a 1 kHz RBW after 5-minute warmup)	1.5 kHz/5 minute

RF Power Off Residuals	
9 kHz to 2.9 GHz	<−120 dBm

Dynamic Range (difference between maximum power out and tracking generator feedthrough)	
Frequency < 5 MHz	>106 dB
Frequency ≥ 5 MHz	>111 dB

Output Attenuator Repeatability	
9 kHz to 300 MHz	±0.1 dB
300 MHz to 2.0 GHz	±0.2 dB
2.0 GHz to 2.9 GHz	±0.3 dB

Output VSWR	
0 dB Attenuator	<3.0:1
8 dB Attenuator	<1.5:1

Option Characteristics

TRACKING GENERATOR OUTPUT ACCURACY, Option 010 (after CAL TRK GEN in auto-coupled mode, Frequency > 10 MHz, 25°C ± 10°C)					
TG Output Power Level	**Attenuator Setting**	**Relative Accuracy (at 300 MHz referred to −20 dBm)**	**Absolute Accuracy (at 300 MHz)**	**Relative Accuracy (referred to −20 dBm)**	**Absolute Accuracy**
−1 to −10 dBm	0 dB	1.0 dB	1.75 dB	3.0 dB	3.75 dB
−10 to −18 dB	8 dB	1.5 dB	2.25 dB	3.5 dB	4.25 dB
−20 dBm	16 dB	Reference	0.75 dB	2.0 dB	2.75 dB
−18 to −26 dBm	16 dB	1.0 dB	1.75 dB	3.0 dB	3.75 dB
−26 to −34 dBm	24 dB	1.5 dB	2.25 dB	3.5 dB	4.25 dB
−34 to −42 dBm	32 dB	1.6 dB	2.35 dB	3.6 dB	4.35 dB
−42 to −50 dBm	40 dB	1.8 dB	2.55 dB	3.8 dB	4.55 dB
−50 to −58 dBm	48 dB	2.0 dB	2.75 dB	4.0 dB	4.75 dB
−58 to −66 dBm	56 dB	2.1 dB	2.85 dB	4.1 dB	4.85 dB

Quasi-Peak Detector Characteristics (Option 103)

Quasi-Peak Measurement Range	
Displayed	70 dB
Total	115 dB

FM Demodulation (Option 102, 103, or 301)

Input Level	> (−60 dBm + attenuator setting)
Signal Level	0 to −30 dB below reference level
FM Offset	
Resolution	400 Hz nominal
FM Deviation (FM GAIN)	
Resolution	1 kHz nominal
Range	10 kHz to 1 MHz
Bandwidth	FM deviation/2
FM Linearity (for modulating frequency < bandwidth/100)	≤ 1% of FM deviation + 290 Hz

Physical Characteristics

Front-Panel Inputs and Outputs

INPUT 50Ω	
Connector	Type N female
Impedance	50 Ω nominal

RF OUT *(Option 010)*	
Connector	Type N female
Impedance	50 Ω nominal

PROBE POWER‡	
Voltage/Current	+15 Vdc, ±7% at 150 mA max. −12.6 Vdc ±10% at 150 mA max.
‡ Total current drawn from the +15 Vdc on the PROBE POWER and the AUX INTERFACE cannot exceed 150 mA. Total current drawn from the −12.5 Vdc on the PROBE POWER and the −15 Vdc on the AUX INTERFACE cannot exceed 150 mA.	

Rear-Panel Inputs and Outputs

10 MHz REF OUTPUT	
Connector	BNC female
Impedance	50 Ω nominal
Output Amplitude	>0 dBm

EXT REF IN	
Connector	BNC female Note: Analyzer noise sideband and spurious response performance may be affected by the quality of the external reference used.
Input Amplitude Range	−2 to +10 dBm
Frequency	10 MHz

AUX IF OUTPUT	
Frequency	21.4 MHz
Amplitude Range	−10 to −60 dBm
Impedance	50 Ω nominal

AUX VIDEO OUTPUT	
Connector	BNC female
Amplitude Range	0 to 1 V (uncorrected)

EARPHONE *(Option 102 or 103)*	
Connector	1/8 inch monaural jack

EXT ALC INPUT *(Option 010)*	
Input Impedance	>10 kΩ
Polarity	Use with negative detector

EXT KEYBOARD *(Option 021, 023 or 024)*	Interface compatible with HP part number C1405 Option ABA and most IBM/AT non-auto switching keyboards.

EXT TRIG INPUT	
Connector	BNC female
Trigger Level	Positive edge initiates sweep in EXT TRIG mode (TTL).

GATE TRIGGER INPUT *(Option 105)*	
Connector	BNC female
Trigger Level	minimum pulse width >30 ns (TTL)
GATE OUTPUT *(Option 105)*	
Connector	BNC female
Output Level	High = gate on; Low = gate off (TTL)

LO OUTPUT *(Option 009 or 010)*	Note: LO output must be terminated in 50 Ω.
Connector	SMA female
Impedance	50 Ω nominal
Frequency Range	3.0 to 6.8214 GHz
Output Level	+11 to +18 dBm

SWEEP + TUNE OUTPUT *(Option 009)*	
Connector	BNC female
Impedance (dc coupled)	2 kΩ
Range	0 to +10 V
Sweep + Tune Output	0.36 V/GHz of center frequency

HI-SWEEP IN/OUT	
Connector	BNC female
Output	High = sweep, Low = retrace (TTL)
Input	Open collector, low stops sweep.

Physical Characteristics

MONITOR OUTPUT *(Spectrum Analyzer Display)*	
Connector	BNC female
Format	
SYNC NRM	Internal Monitor
SYNC NTSC	NTSC Compatible 15.75 kHz horizontal rate 60 Hz vertical rate
SYNC PAL	PAL Compatible 15.625 kHz horizontal rate 50 Hz vertical rate

REMOTE INTERFACE	
HP-IB *(Option 021)*	
HP-IB Codes	SH1, AH1, T6, SR1, RL1, PP0, DC1, C1, C2, C3 and C28
RS-232 *(Option 023)*	25 pin subminiature D-shell, female
Parallel *(Option 024)*	25 pin subminiature D-shell, female

SWEEP OUTPUT	
Connector	BNC female
Amplitude	0 to +10 V ramp

TV IN *(Option 107)*	
Connector	BNC female
Impedance	75 Ω nominal

TV TRIG OUT *(Options 101 and 102)*	
Connector	BNC female
Amplitude	Negative edge corresponds to start of the selected TV line after sync pulse (TTL).

AUX INTERFACE				
Connector Type: 9 Pin Subminiature "D" Connector Pinout				
Pin #	Function	Current	"Logic" Mode	"Serial Bit" Mode
1	Control A	—	TTL Output Hi/Lo	TTL Output Hi/Lo
2	Control B	—	TTL Output Hi/Lo	TTL Output Hi/Lo
3	Control C	—	TTL Output Hi/Lo	Strobe
4	Control D	—	TTL Output Hi/Lo	Serial Data
5	Control I	—	TTL Input Hi/Lo	TTL Input Hi/Lo
6	Gnd	—	Gnd	Gnd
7†	−15 Vdc ±7%	150 mA	—	—
8*	+5 Vdc ±5%	150 mA	—	—
9†	+15 Vdc ±5%	150 mA	—	—

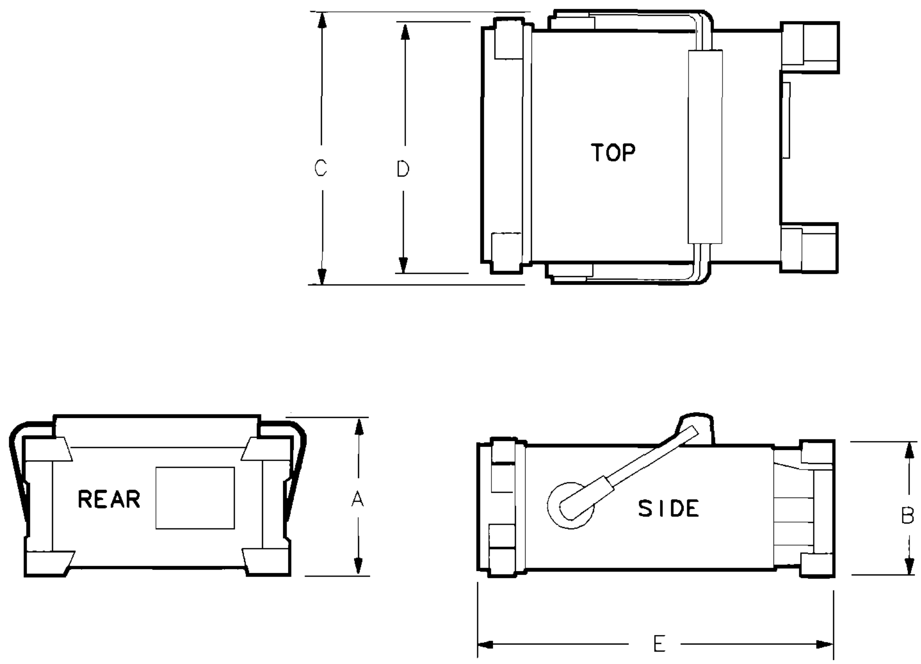
* Exceeding the +5 V current limits may result in loss of factory correction constants.
† Total current drawn from the +15 Vdc on the PROBE POWER and the AUX INTERFACE cannot exceed 150 mA. Total current drawn from the −12.6 Vdc on the PROBE POWER and the −15 Vdc on the AUX INTERFACE cannot exceed 150 mA.

WEIGHT	
Net	
HP 8594E	16.4 kg (36 lb)
Shipping	
HP 8594E	19.1 kg (42 lb)

Physical Characteristics

DIMENSIONS

A = 8 in (200 mm)
B = 7.25 in (184 mm)
C = 14.69 in (373 mm)
D = 13.25 in (337 mm)
E = 18.12 in (460.5 mm)



8

HP 8595E Specifications and Characteristics

This chapter contains specifications and characteristics for the HP 8595E spectrum analyzer.

The specifications and characteristics in this chapter are listed separately. The specifications are described first, then followed by the characteristics.

General	General specifications and characteristics.
Frequency	Frequency-related specifications and characteristics.
Amplitude	Amplitude-related specifications and characteristics.
Option	Option-related specifications and characteristics.
Physical	Input, output and physical characteristics.

The distinction between specifications and characteristics is described as follows.

- Specifications describe warranted performance over the temperature range 0 °C to +55 °C* (unless otherwise noted). The spectrum analyzer will meet its specifications under the following conditions:
  - □ The instrument is within the one year calibration cycle.
  - □ 2 hours of storage at a constant temperature within the operating temperature range.
  - □ 30 minutes after the spectrum analyzer is turned on.
  - □ After the CAL frequency, and CAL amplitude routines have been run.
- Characteristics provide useful, but nonwarranted information about the functions and performance of the spectrum analyzer. Characteristics are specifically identified.
- Typical Performance, where listed, is not warranted, but indicates performance that most units will exhibit.
- Nominal Value indicates the expected, but not warranted, value of the parameter.

*0 °C to +50 °C with Option 015 or Option 016 operating/carrying case.

General Specifications

Temperature Range	
Operating	0 °C to +55 °C*
Storage	−40 °C to +75 °C
* 0 °C to +50 °C with Option 015 or Option 016 operating and carrying case.	

EMI Compatibility	Conducted and radiated emission is in compliance with CISPR Pub. 11/1990 Group 1 Class A.

Audible Noise	<37.5 dBA pressure and <5.0 Bels power (ISODP7779)

Power Requirements	
ON (LINE 1)	90 to 132 V rms, 47 to 440 Hz
	195 to 250 V rms, 47 to 66 Hz
	Power consumption <500 VA; <180 W
Standby (LINE 0)	Power consumption <7 W

Environmental Specifications	Type tested to the environmental specifications of Mil-T-28800 class 5

Frequency Specifications

Frequency Range	
dc Coupled	9 kHz to 6.5 GHz
ac Coupled	100 kHz to 6.5 GHz

Frequency Reference	
Aging	$\pm 2 \times 10^{-6}$/year
Settability	$\pm 0.5 \times 10^{-6}$
Temperature Stability	$\pm 5 \times 10^{-6}$

Precision Frequency Reference *(Option 004)*	
Aging	$\pm 1 \times 10^{-7}$/year
Settability	$\pm 1 \times 10^{-8}$
Temperature Stability	$\pm 1 \times 10^{-8}$

Frequency Readout Accuracy	
(Start, Stop, Center, Marker)	±(frequency readout x frequency reference error* + span accuracy + 1% of span + 20% of RBW + 100 Hz)‡

* frequency reference error = (aging rate x period of time since adjustment + initial achievable accuracy + temperature stability). See "Frequency Characteristics."
‡ See "Drift" under "Stability" in Frequency Characteristics.

Marker Count Accuracy†	
Frequency Span ≤ 10 MHz	±(marker frequency x frequency reference error* + counter resolution + 100 Hz)
Frequency Span >10 MHz	±(marker frequency x frequency reference error* + counter resolution + 1 kHz)
Counter Resolution	
Frequency Span ≤ 10 MHz	Selectable from 10 Hz to 100 kHz
Frequency Span > 10 MHz	Selectable from 100 Hz to 100 kHz

* frequency reference error = (aging rate x period of time since adjustment + initial achievable accuracy and temperature stability). See "Frequency Characteristics."
† Marker level to displayed noise level > 25 dB, RBW/Span ≥ 0.01. Span ≤ 300 MHz. Reduce SPAN annotation is displayed when RBW/Span < 0.01.

Frequency Span	
Range	0 Hz (zero span), 10 kHz to 6.5 GHz
(Option 130)	0 Hz (zero span), 1 kHz to 6.5 GHz
Resolution	Four digits or 20 Hz, whichever is greater.
Accuracy (single band spans)	
Span ≤10 MHz	±2% of span§
Span >10 MHz	±3% of span

§ *(Option 130)* For Spans < 10 kHz, add an additional 10 Hz resolution error.

Frequency Specifications

Frequency Sweep Time	
Range	
	20 ms to 100 s
(Option 101)	20 μs to 100 s for span = 0 Hz
Accuracy	
20 ms to 100 s	±3%
20 μs to <20 ms *(Option 101)*	±2%
Sweep Trigger	Free Run, Single, Line, Video, External

Resolution Bandwidth	
Range	1 kHz to 3 MHz, 8 selectable resolution (3 dB) bandwidths in 1-3-10 sequence. 9 kHz and 120 kHz (6 dB) EMI bandwidths.
(Option 130)	Adds 30, 100 and 300 Hz (3 dB) bandwidths and 200 Hz (6 dB) EMI bandwidth.
Accuracy	
3 dB bandwidths	±20%

Stability	
Noise Sidebands	(1 kHz RBW, 30 Hz VBW and sample detector)
>10 kHz offset from CW signal	≤−90 dBc/Hz
>20 kHz offset from CW signal	≤−100 dBc/Hz
>30 kHz offset from CW signal	≤−105 dBc/Hz
Residual FM	
1 kHz RBW, 1 kHz VBW	≤250 Hz pk-pk in 100 ms
30 Hz RBW, 30 Hz VBW *(Option 130)*	≤30 Hz pk-pk in 300 ms
System-Related Sidebands	
>30 kHz offset from CW signal	≤−65 dBc

Calibrator Output Frequency	300 MHz ±(freq. ref. error* x 300 MHz)

* frequency reference error = (aging rate x period of time since adjustment + initial achievable accuracy + temperature stability). See "Frequency Characteristics."

Amplitude Specifications

Amplitude specifications do not apply for Analog+ mode and negative peak detector mode except as noted in "Amplitude Characteristics."

Amplitude Range	−112 dBm to +30 dBm
(Option 130)	−127 dBm to +30 dBm

Maximum Safe Input Level	
Average Continuous Power	+30 dBm (1 W, 7.1 V rms), input attenuation ≥10 dB above 2.75 GHz.
Peak Pulse Power	+50 dBm (100 W) for <10 μs pulse width and <1% duty cycle, input attenuation ≥30 dB.
dc	0 V (dc coupled)
	50 V (ac coupled)

Gain Compression‡	
>10 MHz	≤0.5 dB (total power at input mixer* = −10 dBm)

* Mixer Power Level (dBm) = Input Power (dBm) − Input Attenuation (dB).
‡ (Option 130) If RBW ≤ 300 Hz, this applies only if signal separation ≥ 4 kHz and signal amplitudes ≤ Reference Level + 10 dB.

Displayed Average Noise Level	(Input terminated, 0 dB attenuation, 30 Hz VBW, sample detector)	
	1 kHz RBW	**30 Hz RBW** *(Option 130)*
400 kHz to 2.9 GHz	≤−110 dBm	≤−125 dBm
2.75 GHz to 6.5 GHz	≤−112 dBm	≤−127 dBm

Spurious Responses	
Second Harmonic Distortion	
>10 MHz	<−70 dBc for −40 dBm tone at input mixer.*
>2.75 GHz	<−100 dBc for −10 dBm tone at input mixer*
	(or below displayed average noise level).
Third Order Intermodulation Distortion	
>10 MHz	<−70 dBc for two −30 dBm tones at input mixer* and >50 kHz separation.
Other Input Related Spurious	
	<−65 dBc at ≥30 kHz offset, for −20 dBm tone at input mixer ≤6.5 GHz.

* Mixer Power Level (dBm) = Input Power (dBm) − Input Attenuation (dB).

Residual Responses	(Input terminated and 0 dB attenuation)
150 kHz to 6.5 GHz	<−90 dBm

Amplitude Specifications

Display Range	
Log Scale	0 to −70 dB from reference level is calibrated; 0.1, 0.2, 0.5 dB/division and 1 to 20 dB/division in 1 dB steps; eight divisions displayed.
Linear Scale	eight divisions
Scale Units	dBm, dBmV, dBμV, mV, mW, nV, nW, pW, μV, μW, V, and W

Marker Readout Resolution	0.05 dB for log scale
	0.05% of reference level for linear scale
Fast Sweep Times for Zero Span	
20 μs to 20 ms *(Option 101 or 301)*	
Frequency ≤ 1 GHz	0.7% of reference level for linear scale
Frequency > 1 GHz	1.0% of reference level for linear scale

Reference Level	
Range	
Log Scale	Minimum amplitude to maximum amplitude**
Linear Scale	−99 dBm to maximum amplitude**
Resolution	
Log Scale	±0.01 dB
Linear Scale	±0.12% of reference level
Accuracy	(referenced to −20 dBm reference level, 10 dB input attenuation, at a single frequency, in a fixed RBW)
0 dBm to −59.9 dBm	±(0.3 dB + .01 x dB from −20 dBm)
−60 dBm and below	
1 kHz to 3 MHz RBW	±(0.6 dB + .01 x dB from −20 dBm)
30 Hz to 300 Hz RBW *(Option 130)*	±(0.7 dB + .01 x dB from −20 dBm)

** See "Amplitude Range."

Frequency Response (dc coupled)	(10 dB input attenuation)	
	Absolute§	**Relative Flatness**†
9 kHz to 2.9 GHz	±1.5 dB	±1.0 dB
2.75 GHz to 6.5 GHz (preselector peaked)	±2.0 dB	±1.5 dB

† Referenced to midpoint between highest and lowest frequency response deviations.
§ Referenced to 300 MHz CAL OUT.

Calibrator Output	
Amplitude	−20 dBm ±0.4 dB

Absolute Amplitude Calibration Uncertainty ‡‡	±0.15 dB

‡‡ Uncertainty in the measured absolute amplitude of the CAL OUT signal at the reference settings after CAL FREQ and CAL AMPTD self-calibration. Absolute amplitude reference settings are: Reference Level −20 dBm; Input Attenuation 10 dB; Center Frequency 300 MHz; Res BW 3 kHz; Video BW 300 Hz; Scale Linear; Span 50 kHz; Sweep Time Coupled, Top Graticule (reference level), Corrections ON, DC Coupled.

Input Attenuator	
Range	0 to 70 dB, in 10 dB steps

Resolution Bandwidth Switching Uncertainty	(At reference level, referenced to 3 kHz RBW)
3 kHz to 3 MHz RBW	±0.4 dB
1 kHz RBW	±0.5 dB
30 Hz to 300 Hz *(Option 130)*	±0.6 dB

Linear to Log Switching	±0.25 dB at reference level

Display Scale Fidelity	
Log Maximum Cumulative	
0 to −70 dB from Reference Level	
3 kHz to 3 MHz RBW	± (0.3 dB + 0.01 × dB from reference level)
RBW ≤ 1 kHz	± (0.4 dB + 0.01 × dB from reference level)
Log Incremental Accuracy	
0 to −60 dB from Reference Level	±0.4 dB/4 dB
Linear Accuracy	±3% of reference level

Cable TV Measurement Specifications

These specifications describe warranted performance of the spectrum analyzer and the HP 85721A cable TV measurements personality.

Input Configuration	75 Ω BNC Female

Channel Selection	Analyzer tunes to specified channels based upon selected tune configuration.
Tune Configuration	Standard, Off-the Air, HRC, IRC (T and FM channels also in channel mode)
Channel Range	1 to 158 and 201 to 300 (channel mode) 1 to 158 (system mode)
Channel Frequencies	Defined by Code of Federal Regulations, Title 47, Telecommunications, Parts 73.603, 76.605, 76.612
Frequency Range	5 to 1002 MHz (channel mode) 54 to 896 MHz (system mode)
Amplitude Range	−15 to +70 dBmV for S/N > 30 dB

Visual-Carrier Frequency	Visual-carrier frequency is counted

Frequency Reference* *(Standard)*	
Resolution	1 kHz
Accuracy	±(7.5 x 10^{-6} x carrier frequency + 110 Hz)
@55.25 MHz (Ch. 2)	±524 Hz
@325.25 MHz (Ch. 41)	±2.55 kHz
@643.25 MHz (Ch. 94)	±4.93 kHz
* Will not meet FCC frequency accuracy requirements.	

Precision Frequency Reference *Option 004*	
Resolution	100 Hz
Accuracy	±(1.2 x 10^{-7} x carrier frequency + 110 Hz)
@55.25 MHz (Ch. 2)	±117 Hz
@325.25 MHz (Ch. 41)	±149 Hz
@643.25 MHz (Ch. 94)	±187 Hz

Visual-to-Aural Carrier Frequency Difference	Frequency difference between visual and aural carriers is counted.
Difference Range	4.1 to 4.9 MHz
Resolution	100 Hz
Accuracy	±221 Hz for precision frequency ref (std) ±254 Hz for Option 704 frequency ref

Visual-Carrier Level	The peak amplitude of the visual carrier is measured to an absolute standard traceable to the National Institute of Standards and Technology.
Amplitude Range	−15 to +70 dBmV
Resolution	0.1 dB
Absolute Accuracy	±2.0 dB for S/N > 30 dB
Relative Accuracy	±1.0 dB relative to adjacent channels in frequency ±1.5 dB relative to all other channels

Visual-to-Aural Carrier Level Difference	The difference between peak amplitudes of the visual and aural carrier is measured.
Difference Range	0 to 25 dB
Resolution	0.1 dB
Accuracy	±0.75 dB for S/N > 30 dB

Hum/Low-Frequency Disturbance	Power-line frequency and low-frequency disturbance measured on modulated and/or unmodulated carriers. May not be valid for scrambled channels.
AM Range	0.5 to 10%
Resolution	0.1%
Accuracy	±0.4% for hum ≤3% ±0.7% for hum ≤5% ±1.3% for hum ≤10%

Visual Carrier-to-Noise Ratio (C/N)*	The C/N is calculated from the visual-carrier peak level and the minimum noise level, normalized to 4 MHz noise bandwidth.
Optimum Input Range	See the graphs in the characteristics section of this chapter.
Maximum C/N Range	Input level dependent - See graphs
C/N Resolution	0.1 dB
C/N Accuracy	Input level and measured C/N dependent ±1.0 to ±3.5 dB over optimum input range

* A preamplifier and preselector filter may be required to achieve specifications.

CSO and CTB Distortion†	Manual composite second order (CSO) and composite triple beat (CTB) distortions are measured relative to the visual carrier peak and require momentary disabling of the carrier. Automatic measurements are made in the channel above the channel selected and assumes that it is unused. If the analyzer has Option 107, a non- interfering CSO measurement can be made.
Optimum Input Range	See the graphs in the characteristics section of this chapter.
Maximum CSO/CTB Range	Input level dependent - see graphs. 66 to 73 dB over optimum input range
Manual CSO/CTB Resolution	0.1 dB
System CSO/CTB Resolution	1 dB
CSO/CTB Accuracy	Input level and measured CSO/CTB dependent - See graphs ±1.5 dB to ±4.0 dB over optimum input range

† A preamplifier and preselector filter may be required to achieve specifications.

System Frequency Response (flatness)

System amplitude variations are measured relative to a reference trace stored during the setup.

Frequency Response Setup	
Fast Sweep Time	2 s (default) for no scrambling
Slow Sweep Time	8 s (default) for fixed-amplitude scrambling
Reference-trace Storage	50 traces that include analyzer states

Frequency Response Test	
Range	1.0 dB/Div to 20 dB/Div (2 dB default)
Resolution	0.05 dB
Trace-flatness Accuracy	±0.1 dB per dB deviation from a flat line and ±0.75 dB maximum cumulative error
Trace-position Accuracy	0.0 dB for equal temperature at test locations and ±0.4 dB maximum for different ambient temperatures

Option Specifications

Tracking Generator Specifications (Option 010)

All specifications apply over 0 °C to +55 °C.* The spectrum-analyzer/tracking-generator combination will meet its specifications after 2 hours of storage at a constant temperature within the operating temperature range, 30 minutes after the spectrum-analyzer/tracking-generator is turned on and after CAL FREQ, CAL AMPTD, CAL TRK GEN, and TRACKING PEAK have been run.

* 0 °C to +50 °C with Option 015 or Option 016 operating and carrying case.

Warm-Up	30 minutes

Output Frequency	
Range	9 kHz to 2.9 GHz

Output Power Level	
Range	−1 dBm to −66 dBm
Resolution	0.1 dB
Absolute Accuracy (at 25 °C ±10 °C)	
(−20 dBm at 300 MHz)	±0.75 dB
Vernier‡	
Range	9 dB
Accuracy (at 25 °C ±10 °C)	
(−20 dBm at 300 MHz, 16 dB attenuation)	
Incremental	±0.20 dB/dB
Cumulative	±0.50 dB total
Output Attenuator	
Range	0 to 56 dB in 8 dB steps
‡ See the Output Accuracy table in "Option Characteristics."	

Output Power Sweep	
Range	(−10 dBm to −1 dBm) − (Source Attenuator Setting)
Resolution	0.1 dB

Output Flatness	
(referenced to 300 MHz, −20 dBm)	
Frequency > 10 MHz	±2.0 dB
Frequency ≤ 10 MHz	±3.0 dB

Option Specifications

Spurious Output (−1 dBm output)	
Harmonic Spurs from 9 kHz to 2.9 GHz	
TG Output 9 kHz to 20 kHz	≤−15 dBc
TG Output 20 kHz to 2.9 GHz	≤−25 dBc
Nonharmonic Spurs from 9 kHz to 2.9 GHz	
TG Output 9 kHz to 2.0 GHz	≤−27 dBc
TG Output 2.0 GHz to 2.9 GHz	≤−23 dBc
LO Feedthrough	
LO Frequency 3.9217 to 6.8214 GHz	≤−16 dBm

Tracking Generator Feedthrough	
400 kHz to 2.9 GHz	<−110 dBm

Quasi-Peak Detector Specifications (Option 103)

The specifications for Quasi-Peak Detector (Option 103) have been based on the following:

- The spectrum analyzer displays the quasi-peak amplitude of pulsed radio frequency (RF) or continuous wave (CW) signals.
- Amplitude response conforms with Publication 16 of Comité International Spécial des Perturbations Radioélectriques (CISPR) Section 1, Clause 2.

The 200 Hz bandwidth is available only with Option 130. The 1 kHz resolution bandwidth may be used to approximate a quasi-peak measurement without Option 130. A quasi-peak measurement using the 1 kHz bandwidth will be greater than or equal to a quasi-peak measurement using a 200 Hz bandwidth.

Absolute amplitude accuracy is the sum of the pulse amplitude response relative to the reference, plus the reference pulse amplitude accuracy, plus the spectrum analyzer amplitude accuracy (calibrator output, reference level, frequency response, input attenuator, resolution bandwidth switching, linear display scale fidelity, and gain compression).

Relative Quasi-Peak Response to a CISPR Pulse (dB)	Frequency Band		
			(Option 130)
	120 kHz EMI BW	**9 kHz EMI BW**	**200 Hz EMI BW**
Pulse Repetition Frequency (Hz)	**0.03 to 1 GHz**	**0.15 to 30 MHz**	**10 to 150 kHz**
1000	+8.0 ± 1.0	+4.5 ± 1.0	—
100	0 dB (reference)•	0 dB (reference)•	+4.0 ± 1.0
60	—	—	+3.0 ± 1.0
25	—	—	0 dB (reference)•
20	−9.0 ± 1.0	−6.5 ± 1.0	—
10	−14.0 ± 1.5	−10.0 ± 1.5	−4.0 ± 1.0
5	—	—	−7.5 ± 1.5
2	−26.0 ± 2.0	−20.5 ± 2.0	−13.0 ± 2.0
1	−28.5 ± 2.0	−22.5 ± 2.0	−17.0 ± 2.0
Isolated Pulse	−31.5 ± 2.0	−23.5 ± 2.0	−19.0 ± 2.0

• Reference pulse amplitude accuracy relative to a 66 dBμV CW signal is <1.5 dB. CISPR reference pulse: 0.044 μVs for 0.03 to 1 GHz, 0.316 μVs for 0.15 to 30 MHz, 13.5 ± 1.5 μVs for 10 to 150 kHz *(Option 130)*.

Time Gated Spectrum Analysis Specifications (Option 105)

GATE DELAY	
Range	1 μs to 65.535 ms
Resolution	1 μs
Accuracy	±(1 μs + (0.01% x GATE DELAY Readout))†
(From GATE TRIGGER INPUT to positive edge of GATE OUTPUT)	
GATE LENGTH	
Range	1 μs to 65.535 ms
Resolution	1 μs
Accuracy	±(0.2 μs +(0.01% x GATE LENGTH Readout))
(From positive edge to negative edge of GATE OUTPUT)	
Additional Amplitude Error§	
Log Scale	±0.3 dB
Linear Scale	±0.4% of REFERENCE LEVEL

† Up to 1 μs jitter due to 1 μs resolution of gate delay clock.
§ With GATE ON enabled and triggered, CW Signal, Peak Detector Mode.

TV Receiver/Video Tester (Option 107)

Non-interfering color	(requires FCC composite, NTC-7, or CCIR 17 and CCIR 330 test signal)
Differential Gain Accuracy	6% 50 averages (default)
Differential Phase Accuracy	4° 50 averages (default)
Chroma-luminance Delay Inequality Accuracy	±45 ns
Frequency Range	50 MHz to 850 MHz
Amplitude Range	+10 dBmV to +50 dBmV at coupler input (10 dB loss)
Coupler (HP part number 0955-0704)	Insertion loss: < 2 dB
	Coupled output: −10 dB ±0.5 dB

Non-Interfering Tests with Gate On*	
C/N and CSO	See graphs for accuracy
(quiet line must be selected)	
In-channel Frequency Response Accuracy	±0.5 dB within channel

* A preamplifier and preselector filter may be required to achieve specifications.

Frequency Characteristics

These are not specifications. Characteristics provide useful but nonwarranted information about instrument performance.

Frequency Reference	
Initial Achievable Accuracy	$\pm0.5 \times 10^{-6}$
Aging	$\pm1.0 \times 10^{-7}$/day

Precision Frequency Reference *(Option 004)*	
Aging	5×10^{-10}/day, 7-day average after being powered on for 7 days.
Warm-Up	1×10^{-8} after 30 minutes on.
Initial Achievable Accuracy	$\pm2.2 \times 10^{-8}$ after being powered on for 24 hours.

Stability	
Drift* (after warmup at stabilized temperature)	
Frequency Span ≤10 MHz, Free Run	<2 kHz/minute of sweep time
* Because the analyzer is locked at the center frequency before each sweep, drift occurs only during the time of one sweep. For Line, Video or External trigger, additional drift occurs while waiting for the appropriate trigger signal.	

Resolution Bandwidth (−3 dB)	
Range	1 kHz to 3 MHz, selectable in 1, 3 and 10 increments, and 5 MHz. Resolution bandwidths may be selected manually, or coupled to frequency span.
(Option 130)	Adds 30 Hz, 100 Hz, and 300 Hz bandwidths.
Shape	Synchronously tuned four poles. Approximately Gaussian shape.
60 dB/3 dB Bandwidth Ratio	
Resolution Bandwidth	
100 kHz to 3 MHz	15:1
30 kHz	16:1
3 kHz to 10 kHz	15:1
1 kHz	16:1
40 dB/3 dB Bandwidth Ratio *(Option 130)*	
Resolution Bandwidth	
30 Hz to 300 Hz	10:1

Video Bandwidth (−3 dB)	
Range	30 Hz to 1 MHz, selectable in 1, 3, 10 increments, accuracy ±30% and 3 MHz. Video bandwidths may be selected manually, or coupled to resolution bandwidth and frequency span.
(Option 130)	Adds 1, 3, and 10 Hz bandwidths.
Shape	Post detection, single pole low-pass filter used to average displayed noise.
(Option 130)	Bandwidths below 30 Hz are digital bandwidths with anti-aliasing filtering.

Frequency Characteristics

FFT Bandwidth Factors	FLATTOP	HANNING	UNIFORM
Noise Equivalent Bandwidth†	3.63x	1.5x	1x
3 dB Bandwidth†	3.60x	1.48x	1x
Sidelobe Height	<−90 dB	−32 dB	−13 dB
Amplitude Uncertainty	0.10 dB	1.42 dB	3.92 dB
Shape Factor (60 dB BW/3 dB BW)	2.6	9.1	>300
† Multiply entry by one-divided-by-sweep time.			

Input Level	> (−60 dBm + attenuator setting)
Signal Level	0 to −30 dB below reference level
FM Offset	
Resolution	400 Hz nominal
FM Deviation (FM GAIN)	
Resolution	1 kHz nominal
Range	10 kHz to 1 MHz
Bandwidth	FM deviation/2
FM Linearity (for modulating frequency < bandwidth/100)	≤ 1% of FM deviation + 290 Hz

Amplitude Characteristics

These are not specifications. Characteristics provide useful but nonwarranted information about instrument performance.

Log Scale Switching Uncertainty	Negligible error

Demod Tune Listen	Internal speaker, rear panel earphone jack and front-panel volume control. Adjustable squelch control mutes the audio signal to the speaker/earphone jack based on the level of the demodulated signal above 22 kHz. An uncalibrated demodulated signal is available on the AUX VIDEO OUT connector at the rear panel.

Input Attenuation Uncertainty*	
Attenuator Setting	
0 dB	±0.2 dB
10 dB	Reference
20 dB	±0.4 dB
30 dB	±0.5 dB
40 dB	±0.7 dB
50 dB	±0.8 dB
60 dB	±1.0 dB
70 dB	±1.0 dB

* Referenced to 10 dB input attenuator setting. See the "Specifications" table under "Frequency Response."

ac Coupled Insertion Loss‡	
100 kHz to 300 kHz	0.7 dB
300 kHz to 1 MHz	0.2 dB
1 MHz to 100 MHz	0.07 dB
100 MHz to 2.9 GHz	0.05 dB + (0.06 x F)‡‡ dB
2.9 GHz to 6.5 GHz	0.05 dB + (0.13 x F)‡‡ dB

‡ Referenced to dc coupled mode.
‡‡ F = frequency in GHz

Input Attenuator 10 dB Step Uncertainty	(Attenuator setting 10 to 70 dB) ±0.8 dB/10 dB

Input Attenuator Repeatability	±0.05 dB

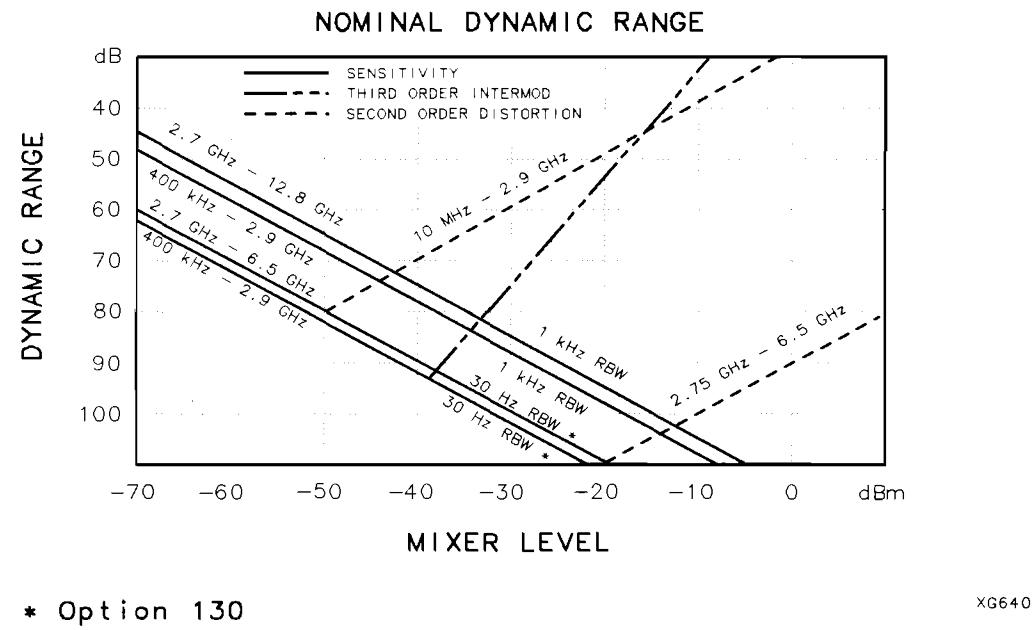
RF Input SWR		
10 dB attenuation	**dc Coupled**	**ac Coupled**
300 MHz	1.15:1	1.4:1
10 dB to 70 dB attenuation		
100 kHz to 300 kHz	1.3:1	2.3:1
300 kHz to 1 MHz	1.3:1	1.4:1
1 MHz to 2.9 GHz	1.3:1	1.3:1
2.9 GHz to 6.5 GHz	1.5:1	1.6:1

Amplitude Characteristics

Unpeaked Frequency Response (dc coupled)	(10 dB input attenuation)	
Without Preselector Peaking, Span ≤ 50 MHz	**Absolute**§	**Relative Flatness**†
2.75 GHz to 6.5 GHz	±4.0 dB	±3.5 dB

† Referenced to midpoint between highest and lowest frequency response deviations.
§ Referenced to 300 MHz CAL OUT.

DYNAMIC RANGE



Dynamic Range

Immunity Testing	
Radiated Immunity	When tested at 3 V/m according to IEC 801-3/1984 the displayed average noise level will be within specifications over the full immunity test frequency range of 27 to 500 MHz except that at immunity test frequencies of 278.6 MHz ± selected resolution bandwidth and 321.4 MHz ± selected resolution bandwidth the displayed average noise level may be up to −45 dBm. When the analyzer tuned frequency is identical to the immunity test signal frequency there may be signals of up to −70 dBm displayed on the screen.
Electrostatic Discharge	When an air discharge of up to 8 kV according to IEC 801-2/1991 occurs to the shells of the BNC connectors on the rear panel of the instrument spikes may be seen on the CRT display. Discharges to center pins of any of the connectors may cause damage to the associated circuitry.

Analog + Mode and Negative Peak Detector Mode (Options 101 and 301)

These modes do not utilize the full set of internal amplitude corrections. Therefore, in these modes, some analyzer amplitude specifications are reduced to characteristics. Characteristics provide useful but nonwarranted information about instrument performance.

In these modes, the following analyzer specifications remain as specifications:

- **Amplitude Range**
- **Maximum Safe Input Level**
- **Calibrator Output**

In these modes, the following analyzer specifications are reduced to characteristics:

- **Gain Compression**
- **Displayed Average Noise Level**
- **Spurious Responses**
- **Residual Responses**
- **Display Range**
- **Reference Level**
- **Resolution Bandwidth Switching**
- **Linear to Log Switching**
- **Display Scale Fidelity**
- **Display Scale Fidelity for Narrow Bandwidths**

Finally, the following analyzer specifications:

- **Marker Readout Resolution**
- **Frequency Response**

are replaced by the characteristics which follow in this subsection.

Marker Readout Resolution	
(digitizing resolution)	
Log Scale	±0.31 dB
Linear Scale	
frequency ≤ 1 GHz	±0.59% of reference level
frequency > 1 GHz	±1.03% of reference level

Frequency Response in Analog + Mode (dc coupled)	(10 dB input attenuation, for spans ≤ 20 MHz)	
	Absolute§	**Relative Flatness**†
9 kHz to 2.9 GHz	±2.0 dB	±1.5 dB
2.75 GHz to 6.5 GHz (preselector peaked)	±2.5 dB	±2.0 dB

† Referenced to midpoint between highest and lowest frequency response deviations.
§ Referenced to 300 MHz CAL OUT.

Cable TV Measurement Characteristics

Depth of Modulation	Percent AM is measured from horizontal sync tip to maximum video level; measurement requires a white-reference VITS and may not be valid for scrambled channels.
AM Range	50 to 93%
Resolution	0.1%
Accuracy	±2.0% for C/N > 40 dB

FM Deviation	Peak reading of FM deviation
Range	±100 kHz
Resolution	100 Hz
Accuracy	±1.5 kHz

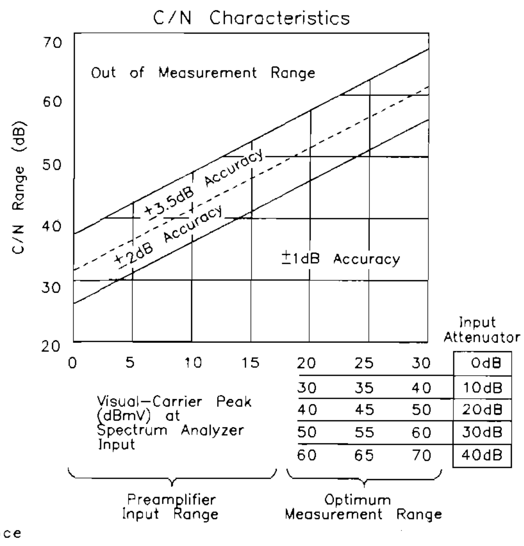


Figure 2-1

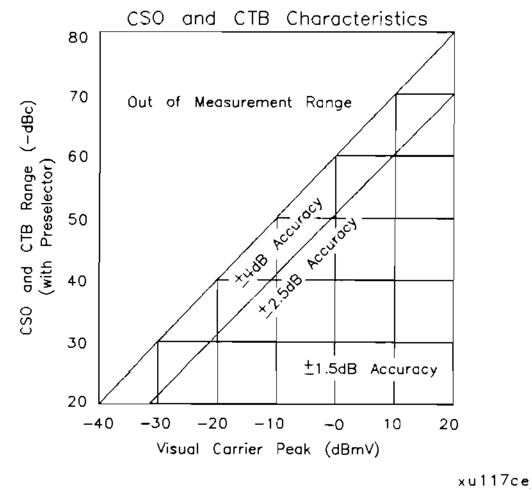


Figure 2-2

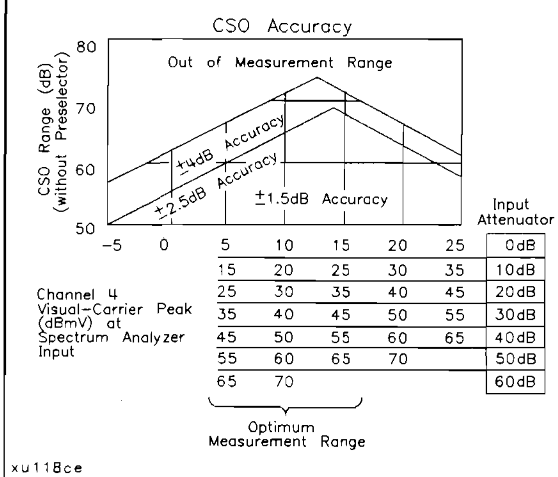


Figure 2-3

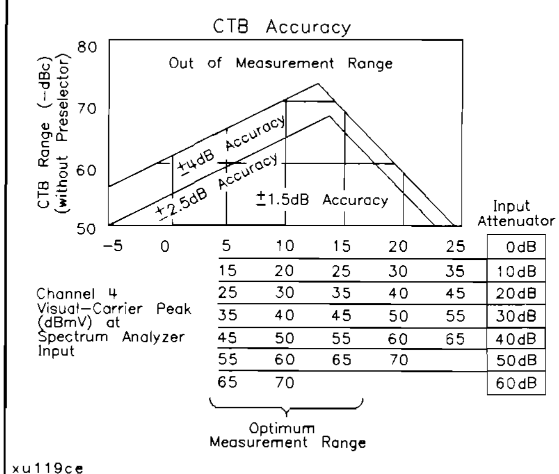


Figure 2-4

C/N, CSO, and CTB Measurements

The four graphs summarize the combined HP 8591C cable TV analyzer or HP 8590 E-Series spectrum analyzers, and HP 85721A characteristics for C/N, CSO, and CTB testing on cable TV systems with up to 99 channels and up to +9 dB amplitude tilt. C/N, CSO, and CTB measurement accuracies and ranges can be read from the relevant graphs. They depend upon the visual carrier peak level and the measurement reading. For C/N measurements with a preselector, there is no optimum range and the accuracy boundaries drop by the preselector's insertion loss (typically 2 dB).

Cable TV Measurement Characteristics

Crossmodulation	Horizontal-line (15.7 kHz) related AM is measured on the unmodulated visual carrier.
Range	60 dB, usable to 65 dB
Resolution	0.1 dB
Accuracy	±2.0 dB for xmod. <40 dB, C/N >40 dB ±2.6 dB for xmod. <50 dB, C/N >40 dB ±4.6 dB for xmod. <60 dB, C/N >40 dB

Option Characteristics

Demod Tune Listen *(Option 102 or 103)*	Internal speaker, rear panel earphone jack and front-panel volume control. Adjustable squelch control mutes the audio signal to the speaker/earphone jack based on the level of the demodulated signal above 22 kHz. An uncalibrated demodulated signal is available on the AUX VIDEO OUT connector at the rear panel.

TV Trigger *(Options 101 and 102)*	Triggers sweep of the analyzer after the sync pulse of a selected line of a TV video field.
Carrier Level for Trigger	Top 60% of linear display
Compatible Formats	NTSC, PAL, SECAM
Field Selection	Even, odd, non-interlaced
Trigger Polarity	Positive, negative
Line Selection	10 to 1021

Tracking Generator Characteristics (Option 010)

Tracking Drift	
(Usable in a 1 kHz RBW after 5-minute warmup)	1.5 kHz/5 minute

RF Power Off Residuals	
9 kHz to 2.9 GHz	<−120 dBm

Dynamic Range (difference between maximum power out and tracking generator feedthrough)	>109 dB

Output Attenuator Repeatability	
9 kHz to 300 MHz	±0.1 dB
300 MHz to 2.0 GHz	±0.2 dB
2.0 GHz to 2.9 GHz	±0.3 dB

Output VSWR	
0 dB Attenuator	<3.0:1
8 dB Attenuator	<1.5:1

Option Characteristics

TRACKING GENERATOR OUTPUT ACCURACY, Option 010 (after CAL TRK GEN in auto-coupled mode, Frequency > 10 MHz, 25°C ± 10°C)					
TG Output Power Level	**Attenuator Setting**	**Relative Accuracy (at 300 MHz referred to −20 dBm)**	**Absolute Accuracy (at 300 MHz)**	**Relative Accuracy (referred to −20 dBm)**	**Absolute Accuracy**
−1 to −10 dBm	0 dB	1.0 dB	1.75 dB	3.0 dB	3.75 dB
−10 to −18 dB	8 dB	1.5 dB	2.25 dB	3.5 dB	4.25 dB
−20 dBm	16 dB	Reference	0.75 dB	2.0 dB	2.75 dB
−18 to −26 dBm	16 dB	1.0 dB	1.75 dB	3.0 dB	3.75 dB
−26 to −34 dBm	24 dB	1.5 dB	2.25 dB	3.5 dB	4.25 dB
−34 to −42 dBm	32 dB	1.6 dB	2.35 dB	3.6 dB	4.35 dB
−42 to −50 dBm	40 dB	1.8 dB	2.55 dB	3.8 dB	4.55 dB
−50 to −58 dBm	48 dB	2.0 dB	2.75 dB	4.0 dB	4.75 dB
−58 to −66 dBm	56 dB	2.1 dB	2.85 dB	4.1 dB	4.85 dB

Quasi-Peak Detector Characteristics (Option 103)

Quasi-Peak Measurement Range	
Displayed	70 dB
Total	115 dB

FM Demodulation (Option 102, 103, or 301)

Input Level	> (−60 dBm + attenuator setting)
Signal Level	0 to −30 dB below reference level
FM Offset	
Resolution	400 Hz nominal
FM Deviation (FM GAIN)	
Resolution	1 kHz nominal
Range	10 kHz to 1 MHz
Bandwidth	FM deviation/2
FM Linearity (for modulating frequency < bandwidth/100)	≤ 1% of FM deviation + 290 Hz

Physical Characteristics

Front-Panel Inputs and Outputs

INPUT 50Ω	
Connector	Type N female
Impedance	50 Ω nominal

RF OUT *(Option 010)*	
Connector	Type N female
Impedance	50 Ω nominal

PROBE POWER‡	
Voltage/Current	+15 Vdc, ±7% at 150 mA max. −12.6 Vdc ±10% at 150 mA max.
‡ Total current drawn from the +15 Vdc on the PROBE POWER and the AUX INTERFACE cannot exceed 150 mA. Total current drawn from the −12.5 Vdc on the PROBE POWER and the −15 Vdc on the AUX INTERFACE cannot exceed 150 mA.	

Rear-Panel Inputs and Outputs

10 MHz REF OUTPUT	
Connector	BNC female
Impedance	50 Ω nominal
Output Amplitude	>0 dBm

EXT REF IN	
Connector	BNC female Note: Analyzer noise sideband and spurious response performance may be affected by the quality of the external reference used.
Input Amplitude Range	−2 to +10 dBm
Frequency	10 MHz

AUX IF OUTPUT	
Frequency	21.4 MHz
Amplitude Range	−10 to −60 dBm
Impedance	50 Ω nominal

AUX VIDEO OUTPUT	
Connector	BNC female
Amplitude Range	0 to 1 V (uncorrected)

EARPHONE *(Option 102 or 103)*	
Connector	1/8 inch monaural jack

EXT ALC INPUT *(Option 010)*	
Input Impedance	>10 kΩ
Polarity	Use with negative detector

EXT KEYBOARD *(Option 021, 023 or 024)*	Interface compatible with HP part number C1405 Option ABA and most IBM/AT non-auto switching keyboards.

EXT TRIG INPUT	
Connector	BNC female
Trigger Level	Positive edge initiates sweep in EXT TRIG mode (TTL).

GATE TRIGGER INPUT *(Option 105)*	
Connector	BNC female
Trigger Level	minimum pulse width >30 ns (TTL)
GATE OUTPUT *(Option 105)*	
Connector	BNC female
Output Level	High = gate on; Low = gate off (TTL)

LO OUTPUT *(Option 009 or 010)*	Note: LO output must be terminated in 50 Ω.
Connector	SMA female
Impedance	50 Ω nominal
Frequency Range	3.0 to 6.8214 GHz
Output Level	+11 to +18 dBm

SWEEP + TUNE OUTPUT *(Option 009)*	
Connector	BNC female
Impedance (dc coupled)	2 kΩ
Range	0 to +10 V
Sweep + Tune Output	0.36 V/GHz of center frequency

HI-SWEEP IN/OUT	
Connector	BNC female
Output	High = sweep, Low = retrace (TTL)
Input	Open collector, low stops sweep.

Physical Characteristics

MONITOR OUTPUT *(Spectrum Analyzer Display)*	
Connector	BNC female
Format	
SYNC NRM	Internal Monitor
SYNC NTSC	NTSC Compatible 15.75 kHz horizontal rate 60 Hz vertical rate
SYNC PAL	PAL Compatible 15.625 kHz horizontal rate 50 Hz vertical rate

REMOTE INTERFACE	
HP-IB *(Option 021)*	
HP-IB Codes	SH1, AH1, T6, SR1, RL1, PP0, DC1, C1, C2, C3 and C28
RS-232 *(Option 023)*	25 pin subminiature D-shell, female
Parallel *(Option 024)*	25 pin subminiature D-shell, female

SWEEP OUTPUT	
Connector	BNC female
Amplitude	0 to +10 V ramp

TV IN *(Option 107)*	
Connector	BNC female
Impedance	75 Ω nominal

TV TRIG OUT *(Options 101 and 102)*	
Connector	BNC female
Amplitude	Negative edge corresponds to start of the selected TV line after sync pulse (TTL).

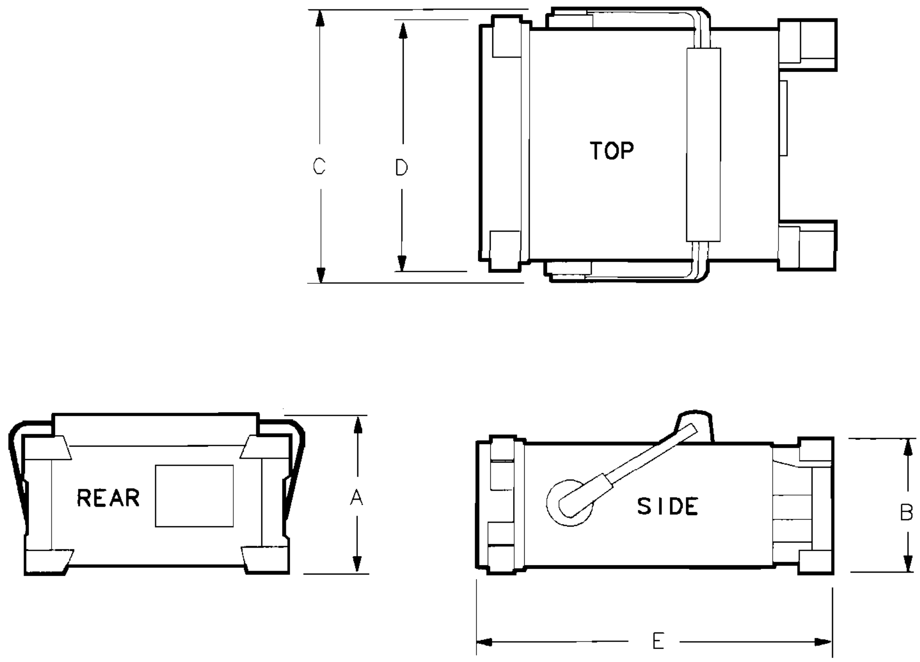
AUX INTERFACE				
Connector Type: 9 Pin Subminiature "D" Connector Pinout				
Pin #	Function	Current	"Logic" Mode	"Serial Bit" Mode
1	Control A	—	TTL Output Hi/Lo	TTL Output Hi/Lo
2	Control B	—	TTL Output Hi/Lo	TTL Output Hi/Lo
3	Control C	—	TTL Output Hi/Lo	Strobe
4	Control D	—	TTL Output Hi/Lo	Serial Data
5	Control I	—	TTL Input Hi/Lo	TTL Input Hi/Lo
6	Gnd	—	Gnd	Gnd
7†	−15 Vdc ±7%	150 mA	—	—
8*	+5 Vdc ±5%	150 mA	—	—
9†	+15 Vdc ±5%	150 mA	—	—

* Exceeding the +5 V current limits may result in loss of factory correction constants.
† Total current drawn from the +15 Vdc on the PROBE POWER and the AUX INTERFACE cannot exceed 150 mA. Total current drawn from the −12.6 Vdc on the PROBE POWER and the −15 Vdc on the AUX INTERFACE cannot exceed 150 mA.

WEIGHT	
Net	
HP 8595E	16.4 kg (36 lb)
Shipping	
HP 8595E	19.1 kg (42 lb)

Physical Characteristics

DIMENSIONS
A = 8 in (200 mm) B = 7.25 in (184 mm) C = 14.69 in (373 mm) D = 13.25 in (337 mm) E = 18.12 in (460.5 mm)



9

HP 8596E Specifications and Characteristics

This chapter contains specifications and characteristics for the HP 8596E spectrum analyzer.

The specifications and characteristics in this chapter are listed separately. The specifications are described first, then followed by the characteristics.

General	General specifications and characteristics.
Frequency	Frequency-related specifications and characteristics.
Amplitude	Amplitude-related specifications and characteristics.
Cable TV	Cable TV measurement specifications and characteristics.
Option	Option-related specifications and characteristics.
Physical	Input, output and physical characteristics.

The distinction between specifications and characteristics is described as follows.

- Specifications describe warranted performance over the temperature range 0 °C to +55 °C (unless otherwise noted). The spectrum analyzer will meet its specifications after 2 hours of storage at a constant temperature, within the operating temperature range, 30 minutes after the spectrum analyzer is turned on and after the CAL frequency, and CAL amplitude routines have been run.
- Characteristics provide useful, but nonwarranted information about the functions and performance of the spectrum analyzer. Characteristics are specifically identified.
- Typical Performance, where listed, is not warranted, but indicates performance that most units will exhibit.
- Nominal Value indicates the expected, but not warranted, value of the parameter.

General Specifications

Temperature Range	
Operating	0 °C to +55 °C*
Storage	−40 °C to +75 °C
* 0 °C to +50 °C with Option 015 or Option 016 operating and carrying case.	

EMI Compatibility	Conducted and radiated emission is in compliance with CISPR Pub. 11/1990 Group 1 Class A.

Audible Noise	<37.5 dBA pressure and <5.0 Bels power (ISODP7779)

Power Requirements	
ON (LINE 1)	90 to 132 V rms, 47 to 440 Hz
	195 to 250 V rms, 47 to 66 Hz
	Power consumption <500 VA; <180 W
Standby (LINE 0)	Power consumption <7 W

Environmental Specifications	Type tested to the environmental specifications of Mil-T-28800 class 5

Frequency Specifications

Frequency Range		
dc Coupled		9 kHz to 12.8 GHz
ac Coupled		100 kHz to 12.8 GHz
Band	**LO Harmonic (N)**	
0	1−	9 kHz to 2.9 GHz (dc coupled)
0	1−	100 kHz to 2.9 GHz (ac coupled)
1	1−	2.75 GHz to 6.5 GHz
2	2−	6.0 GHz to 12.8 GHz

Frequency Reference	
Aging	$\pm 2 \times 10^{-6}$/year
Settability	$\pm 0.5 \times 10^{-6}$
Temperature Stability	$\pm 5 \times 10^{-6}$

Precision Frequency Reference *(Option 004)*	
Aging	$\pm 1 \times 10^{-7}$/year
Settability	$\pm 1 \times 10^{-8}$
Temperature Stability	$\pm 1 \times 10^{-8}$

Frequency Readout Accuracy	
(Start, Stop, Center, Marker)	±(frequency readout x frequency reference error* + span accuracy + 1% of span + 20% of RBW + 100 Hz x N††)‡

* frequency reference error = (aging rate x period of time since adjustment + initial achievable accuracy + temperature stability). See "Frequency Characteristics."
†† N = LO harmonic. See "Frequency Range."
‡ See "Drift" under "Stability" in Frequency Characteristics.

Marker Count Accuracy†	
Frequency Span ≤10 MHz x N††	±(marker frequency x frequency reference error* + counter resolution + 100 Hz x N††)
Frequency Span >10 MHz x N††	±(marker frequency x frequency reference error* + counter resolution + 1 kHz x N††)
Counter Resolution	
Frequency Span ≤ 10 MHz x N††	Selectable from 10 Hz to 100 kHz
Frequency Span > 10 MHz x N††	Selectable from 100 Hz to 100 kHz

* frequency reference error = (aging rate x period of time since adjustment + initial achievable accuracy and temperature stability). See "Frequency Characteristics."
† Marker level to displayed noise level > 25 dB, RBW/Span ≥ 0.01. Span ≤ 300 MHz. Reduce SPAN annotation is displayed when RBW/Span < 0.01.
†† N = LO harmonic. See "Frequency Range."

Frequency Specifications

Frequency Span	
Range	0 Hz (zero span), (10 kHz x N††) kHz to 12.8 GHz
(Option 130)	0 Hz (zero span), (1 kHz x N††) to 12.8 GHz
Resolution	Four digits or 20 Hz x N††, whichever is greater.
Accuracy (single band spans)	
Span ≤10 MHz x N††	±2% of span§
Span >10 MHz x N††	±3% of span

†† N = LO harmonic. See "Frequency Range."
§*(Option 130)* For spans < 10 kHz x N††, add an additional 10 Hz x N†† resolution error.

Frequency Sweep Time	
Range	
	20 ms to 100 s
(Option 101)	20 μs to 100 s for span = 0 Hz
Accuracy	
20 ms to 100 s	±3%
20 μs to <20 ms *(Option 101)*	±2%
Sweep Trigger	Free Run, Single, Line, Video, External

Resolution Bandwidth	
Range	1 kHz to 3 MHz, 8 selectable resolution (3 dB) bandwidths in 1-3-10 sequence. 9 kHz and 120 kHz (6 dB) EMI bandwidths.
(Option 130)	Adds 30, 100 and 300 Hz (3 dB) bandwidths and 200 Hz (6 dB) EMI bandwidth.
Accuracy	
3 dB bandwidths	±20%

Stability	
Noise Sidebands	(1 kHz RBW, 30 Hz VBW and sample detector)
>10 kHz offset from CW signal	≤−90 dBc/Hz + 20 Log N††
>20 kHz offset from CW signal	≤−100 dBc/Hz + 20 Log N††
>30 kHz offset from CW signal	≤−105 dBc/Hz + 20 Log N††
Residual FM	
1 kHz RBW, 1 kHz VBW	≤(250 x N††) Hz pk-pk in 100 ms
30 Hz RBW, 30 Hz VBW *(Option 130)*	≤(30 x N††) Hz pk-pk in 300 ms
System-Related Sidebands	
>30 kHz offset from CW signal	≤−65 dBc + 20 Log N††

†† N = LO harmonic. See "Frequency Range."

Calibrator Output Frequency	300 MHz ±(freq. ref. error* x 300 MHz)

* frequency reference error = (aging rate x period of time since adjustment + initial achievable accuracy + temperature stability). See "Frequency Characteristics."

Comb Generator Frequency	100 MHz fundamental frequency
Accuracy	±0.007% of comb tooth frequency

Amplitude Specifications

Amplitude specifications do not apply for Analog+ mode and negative peak detector mode except as noted in "Amplitude Characteristics."

Amplitude Range	−112 dBm to +30 dBm
(Option 130)	−127 dBm to +30 dBm

Maximum Safe Input Level	
Average Continuous Power	+30 dBm (1 W, 7.1 V rms), input attenuation ≥10 dB above 2.75 GHz.
Peak Pulse Power	+50 dBm (100 W) for <10 μs pulse width and <1% duty cycle, input attenuation ≥30 dB.
dc	0 V (dc coupled)
	50 V (ac coupled)

Gain Compression‡	
>10 MHz	≤0.5 dB (total power at input mixer* = −10 dBm)

* Mixer Power Level (dBm) = Input Power (dBm) − Input Attenuation (dB).
‡ (Option 130) If RBW ≤ 300 Hz, this applies only if signal separation ≥ 4 kHz and signal amplitudes ≤ Reference Level + 10 dB.

Displayed Average Noise Level	(Input terminated, 0 dB attenuation, 30 Hz VBW, sample detector)	
	1 kHz RBW	**30 Hz RBW** *(Option 130)*
400 kHz to 2.9 GHz	≤−110 dBm	≤−125 dBm
2.75 GHz to 6.5 GHz	≤−112 dBm	≤−127 dBm
6.0 GHz to 12.8 GHz	≤−100 dBm	≤−115 dBm

Spurious Responses	
Second Harmonic Distortion	
>10 MHz	<−70 dBc for −40 dBm tone at input mixer.*
>2.75 GHz	<−100 dBc for −10 dBm tone at input mixer* (or below displayed average noise level).
Third Order Intermodulation Distortion	
>10 MHz	<−70 dBc for two −30 dBm tones at input mixer* and >50 kHz separation.
Other Input Related Spurious	<−65 dBc at ≥30 kHz offset, for −20 dBm tone at input mixer ≤12.8 GHz.

* Mixer Power Level (dBm) = Input Power (dBm) − Input Attenuation (dB).

Residual Responses	(Input terminated and 0 dB attenuation)
150 kHz to 2.9 GHz (Band 0)	<−90 dBm
2.75 GHz to 6.5 GHz (Band 1)	<−90 dBm

Amplitude Specifications

Display Range	
Log Scale	0 to −70 dB from reference level is calibrated; 0.1, 0.2, 0.5 dB/division and 1 to 20 dB/division in 1 dB steps; eight divisions displayed.
Linear Scale	eight divisions
Scale Units	dBm, dBmV, dBμV, mV, mW, nV, nW, pW, μV, μW, V, and W

Marker Readout Resolution	0.05 dB for log scale 0.05% of reference level for linear scale
Fast Sweep Times for Zero Span	
20 μs to 20 ms *(Option 101 or 301)*	
Frequency ≤ 1 GHz	0.7% of reference level for linear scale
Frequency > 1 GHz	1.0% of reference level for linear scale

Reference Level	
Range	
Log Scale	Minimum amplitude to maximum amplitude**
Linear Scale	−99 dBm to maximum amplitude**
Resolution	
Log Scale	±0.01 dB
Linear Scale	±0.12% of reference level
Accuracy	(referenced to −20 dBm reference level, 10 dB input attenuation, at a single frequency, in a fixed RBW)
0 dBm to −59.9 dBm	±(0.3 dB + .01 x dB from −20 dBm)
−60 dBm and below	
1 kHz to 3 MHz RBW	±(0.6 dB + .01 x dB from −20 dBm)
30 Hz to 300 Hz RBW *(Option 130)*	±(0.7 dB + .01 x dB from −20 dBm)

** See "Amplitude Range."

Frequency Response (dc coupled)	(10 dB input attenuation)	
	Absolute§	**Relative Flatness†**
9 kHz to 2.9 GHz	±1.5 dB	±1.0 dB
2.75 GHz to 6.5 GHz (preselector peaked)	±2.0 dB	±1.5 dB
6.0 GHz to 12.8 GHz (preselector peaked)	±2.5 dB	±2.0 dB

† Referenced to midpoint between highest and lowest frequency response deviations.
§ Referenced to 300 MHz CAL OUT.

Calibrator Output	
Amplitude	−20 dBm ±0.4 dB

Absolute Amplitude Calibration Uncertainty ‡‡	±0.15 dB

‡‡ Uncertainty in the measured absolute amplitude of the CAL OUT signal at the reference settings after CAL FREQ and CAL AMPTD self-calibration. Absolute amplitude reference settings are: Reference Level −20 dBm; Input Attenuation 10 dB; Center Frequency 300 MHz; Res BW 3 kHz; Video BW 300 Hz; Scale Linear; Span 50 kHz; Sweep Time Coupled, Top Graticule (reference level), Corrections ON, DC Coupled.

Input Attenuator	
Range	0 to 70 dB, in 10 dB steps

Resolution Bandwidth Switching Uncertainty	(At reference level, referenced to 3 kHz RBW)
3 kHz to 3 MHz RBW	±0.4 dB
1 kHz RBW	±0.5 dB
30 Hz to 300 Hz *(Option 130)*	±0.6 dB

Linear to Log Switching	±0.25 dB at reference level

Display Scale Fidelity	
Log Maximum Cumulative	
0 to −70 dB from Reference Level	
3 kHz to 3 MHz RBW	± (0.3 dB + 0.01 × dB from reference level)
RBW ≤ 1 kHz	± (0.4 dB + 0.01 × dB from reference level)
Log Incremental Accuracy	
0 to −60 dB from Reference Level	±0.4 dB/4 dB
Linear Accuracy	±3% of reference level

Cable TV Measurement Specifications

These specifications describe warranted performance of the spectrum analyzer and the HP 85721A cable TV measurements personality.

Input Configuration	75 Ω BNC Female

Channel Selection	Analyzer tunes to specified channels based upon selected tune configuration.
Tune Configuration	Standard, Off-the Air, HRC, IRC (T and FM channels also in channel mode)
Channel Range	1 to 158 and 201 to 300 (channel mode) 1 to 158 (system mode)
Channel Frequencies	Defined by Code of Federal Regulations, Title 47, Telecommunications, Parts 73.603, 76.605, 76.612
Frequency Range	5 to 1002 MHz (channel mode) 54 to 896 MHz (system mode)
Amplitude Range	−15 to +70 dBmV for S/N > 30 dB

Visual-Carrier Frequency	Visual-carrier frequency is counted

Frequency Reference* *(Standard)*	
Resolution	1 kHz
Accuracy	±(7.5 x 10^{-6} x carrier frequency + 110 Hz)
@55.25 MHz (Ch. 2)	±524 Hz
@325.25 MHz (Ch. 41)	±2.55 kHz
@643.25 MHz (Ch. 94)	±4.93 kHz
* Will not meet FCC frequency accuracy requirements.	

Precision Frequency Reference *Option 004*	
Resolution	100 Hz
Accuracy	±(1.2 x 10^{-7} x carrier frequency + 110 Hz)
@55.25 MHz (Ch. 2)	±117 Hz
@325.25 MHz (Ch. 41)	±149 Hz
@643.25 MHz (Ch. 94)	±187 Hz

Visual-to-Aural Carrier Frequency Difference	Frequency difference between visual and aural carriers is counted.
Difference Range	4.1 to 4.9 MHz
Resolution	100 Hz
Accuracy	±221 Hz for precision frequency ref (std) ±254 Hz for Option 704 frequency ref

Visual-Carrier Level	The peak amplitude of the visual carrier is measured to an absolute standard traceable to the National Institute of Standards and Technology.
Amplitude Range	−15 to +70 dBmV
Resolution	0.1 dB
Absolute Accuracy	±2.0 dB for S/N > 30 dB
Relative Accuracy	±1.0 dB relative to adjacent channels in frequency ±1.5 dB relative to all other channels

Visual-to-Aural Carrier Level Difference	The difference between peak amplitudes of the visual and aural carrier is measured.
Difference Range	0 to 25 dB
Resolution	0.1 dB
Accuracy	±0.75 dB for S/N > 30 dB

Hum/Low-Frequency Disturbance	Power-line frequency and low-frequency disturbance measured on modulated and/or unmodulated carriers. May not be valid for scrambled channels.
AM Range	0.5 to 10%
Resolution	0.1%
Accuracy	±0.4% for hum ≤3% ±0.7% for hum ≤5% ±1.3% for hum ≤10%

Visual Carrier-to-Noise Ratio (C/N)*	The C/N is calculated from the visual-carrier peak level and the minimum noise level, normalized to 4 MHz noise bandwidth.
Optimum Input Range	See the graphs in the characteristics section of this chapter.
Maximum C/N Range	Input level dependent - See graphs
C/N Resolution	0.1 dB
C/N Accuracy	Input level and measured C/N dependent ±1.0 to ±3.5 dB over optimum input range
* A preamplifier and preselector filter may be required to achieve specifications.	

CSO and CTB Distortion†	Manual composite second order (CSO) and composite triple beat (CTB) distortions are measured relative to the visual carrier peak and require momentary disabling of the carrier. Automatic measurements are made in the channel above the channel selected and assumes that it is unused. If the analyzer has Option 107, a non- interfering CSO measurement can be made.
Optimum Input Range	See the graphs in the characteristics section of this chapter.
Maximum CSO/CTB Range	Input level dependent - see graphs. 66 to 73 dB over optimum input range
Manual CSO/CTB Resolution	0.1 dB
System CSO/CTB Resolution	1 dB
CSO/CTB Accuracy	Input level and measured CSO/CTB dependent - See graphs ±1.5 dB to ±4.0 dB over optimum input range
† A preamplifier and preselector filter may be required to achieve specifications.	

System Frequency Response (flatness)

System amplitude variations are measured relative to a reference trace stored during the setup.

Frequency Response Setup	
Fast Sweep Time	2 s (default) for no scrambling
Slow Sweep Time	8 s (default) for fixed-amplitude scrambling
Reference-trace Storage	50 traces that include analyzer states

Frequency Response Test	
Range	1.0 dB/Div to 20 dB/Div (2 dB default)
Resolution	0.05 dB
Trace-flatness Accuracy	±0.1 dB per dB deviation from a flat line and ±0.75 dB maximum cumulative error
Trace-position Accuracy	0.0 dB for equal temperature at test locations and ±0.4 dB maximum for different ambient temperatures

Option Specifications

Tracking Generator Specifications (Option 010)

All specifications apply over 0 °C to +55 °C.* The spectrum-analyzer/tracking-generator combination will meet its specifications after 2 hours of storage at a constant temperature within the operating temperature range, 30 minutes after the spectrum-analyzer/tracking-generator is turned on and after CAL FREQ, CAL AMPTD, CAL TRK GEN, and TRACKING PEAK have been run.

* 0 °C to +50 °C with Option 015 or Option 016 operating and carrying case.

Warm-Up	30 minutes

Output Frequency	
Range	9 kHz to 2.9 GHz

Output Power Level	
Range	−1 dBm to −66 dBm
Resolution	0.1 dB
Absolute Accuracy (at 25 °C ±10 °C)	
(−20 dBm at 300 MHz)	±0.75 dB
Vernier‡	
Range	9 dB
Accuracy (at 25 °C ±10 °C)	
(−20 dBm at 300 MHz, 16 dB attenuation)	
Incremental	±0.20 dB/dB
Cumulative	±0.50 dB total
Output Attenuator	
Range	0 to 56 dB in 8 dB steps
‡ See the Output Accuracy table in "Option Characteristics."	

Output Power Sweep	
Range	(−10 dBm to −1 dBm) − (Source Attenuator Setting)
Resolution	0.1 dB

Output Flatness	
(referenced to 300 MHz, −20 dBm)	
Frequency > 10 MHz	±2.0 dB
Frequency ≤ 10 MHz	±3.0 dB

Option Specifications

Spurious Output (−1 dBm output)	
Harmonic Spurs from 9 kHz to 2.9 GHz	
TG Output 9 kHz to 20 kHz	≤−15 dBc
TG Output 20 kHz to 2.9 GHz	≤−25 dBc
Nonharmonic Spurs from 9 kHz to 2.9 GHz	
TG Output 9 kHz to 2.0 GHz	≤−27 dBc
TG Output 2.0 GHz to 2.9 GHz	≤−23 dBc
LO Feedthrough	
LO Frequency 3.9217 to 6.8214 GHz	≤−16 dBm

Tracking Generator Feedthrough	
400 kHz to 2.9 GHz	<−110 dBm

Quasi-Peak Detector Specifications (Option 103)

The specifications for Quasi-Peak Detector (Option 103) have been based on the following:

- The spectrum analyzer displays the quasi-peak amplitude of pulsed radio frequency (RF) or continuous wave (CW) signals.
- Amplitude response conforms with Publication 16 of Comité International Spécial des Perturbations Radioélectriques (CISPR) Section 1, Clause 2.

The 200 Hz bandwidth is available only with Option 130. The 1 kHz resolution bandwidth may be used to approximate a quasi-peak measurement without Option 130. A quasi-peak measurement using the 1 kHz bandwidth will be greater than or equal to a quasi-peak measurement using a 200 Hz bandwidth.

Absolute amplitude accuracy is the sum of the pulse amplitude response relative to the reference, plus the reference pulse amplitude accuracy, plus the spectrum analyzer amplitude accuracy (calibrator output, reference level, frequency response, input attenuator, resolution bandwidth switching, linear display scale fidelity, and gain compression).

Relative Quasi-Peak Response to a CISPR Pulse (dB)	Frequency Band		
			(Option 130)
Pulse Repetition Frequency (Hz)	120 kHz EMI BW 0.03 to 1 GHz	9 kHz EMI BW 0.15 to 30 MHz	200 Hz EMI BW 10 to 150 kHz
1000	+8.0 ± 1.0	+4.5 ± 1.0	—
100	0 dB (reference)*	0 dB (reference)*	+4.0 ± 1.0
60	—	—	+3.0 ± 1.0
25	—	—	0 dB (reference)*
20	−9.0 ± 1.0	−6.5 ± 1.0	—
10	−14.0 ± 1.5	−10.0 ± 1.5	−4.0 ± 1.0
5	—	—	−7.5 ± 1.5
2	−26.0 ± 2.0	−20.5 ± 2.0	−13.0 ± 2.0
1	−28.5 ± 2.0	−22.5 ± 2.0	−17.0 ± 2.0
Isolated Pulse	−31.5 ± 2.0	−23.5 ± 2.0	−19.0 ± 2.0

* Reference pulse amplitude accuracy relative to a 66 dBμV CW signal is <1.5 dB. CISPR reference pulse: 0.044 μVs for 0.03 to 1 GHz, 0.316 μVs for 0.15 to 30 MHz, 13.5 ± 1.5 μVs for 10 to 150 kHz *(Option 130)*.

Time Gated Spectrum Analysis Specifications (Option 105)

GATE DELAY	
Range	1 μs to 65.535 ms
Resolution	1 μs
Accuracy	±(1 μs + (0.01% x GATE DELAY Readout))†
(From GATE TRIGGER INPUT to positive edge of GATE OUTPUT)	
GATE LENGTH	
Range	1 μs to 65.535 ms
Resolution	1 μs
Accuracy	±(0.2 μs +(0.01% x GATE LENGTH Readout))
(From positive edge to negative edge of GATE OUTPUT)	
Additional Amplitude Error§	
Log Scale	±0.3 dB
Linear Scale	±0.4% of REFERENCE LEVEL

† Up to 1 μs jitter due to 1 μs resolution of gate delay clock.
§ With GATE ON enabled and triggered, CW Signal, Peak Detector Mode.

TV Receiver/Video Tester (Option 107)

Non-interfering color	(requires FCC composite, NTC-7, or CCIR 17 and CCIR 330 test signal)
Differential Gain Accuracy	6% 50 averages (default)
Differential Phase Accuracy	4° 50 averages (default)
Chroma-luminance Delay Inequality Accuracy	±45 ns
Frequency Range	50 MHz to 850 MHz
Amplitude Range	+10 dBmV to +50 dBmV at coupler input (10 dB loss)
Coupler (HP part number 0955-0704)	Insertion loss: < 2 dB
	Coupled output: −10 dB ±0.5 dB

Non-Interfering Tests with Gate On*	
C/N and CSO	See graphs for accuracy
(quiet line must be selected)	
In-channel Frequency Response Accuracy	±0.5 dB within channel

* A preamplifier and preselector filter may be required to achieve specifications.

Frequency Characteristics

These are not specifications. Characteristics provide useful but nonwarranted information about instrument performance.

Frequency Reference	
Initial Achievable Accuracy	$\pm0.5 \times 10^{-6}$
Aging	$\pm1.0 \times 10^{-7}$/day

Precision Frequency Reference *(Option 004)*	
Aging	5×10^{-10}/day, 7-day average after being powered on for 7 days.
Warm-Up	1×10^{-8} after 30 minutes on.
Initial Achievable Accuracy	$\pm2.2 \times 10^{-8}$ after being powered on for 24 hours.

Stability	
Drift* (after warmup at stabilized temperature)	
Frequency Span $\leq$ (10 x N†) MHz	$\leq$(2 x N††) kHz/minute of sweep time*

* Because the analyzer is locked at the center frequency before each sweep, drift occurs only during the time of one sweep. For Line, Video, or External trigger, additional drift occurs while waiting for the appropriate trigger signal.
†† N = LO harmonic. See "Frequency Range."

Resolution Bandwidth (−3 dB)	
Range	1 kHz to 3 MHz, selectable in 1, 3 and 10 increments, and 5 MHz. Resolution bandwidths may be selected manually, or coupled to frequency span.
(Option 130)	Adds 30 Hz, 100 Hz, and 300 Hz bandwidths.
Shape	Synchronously tuned four poles. Approximately Gaussian shape.
60 dB/3 dB Bandwidth Ratio	
Resolution Bandwidth	
100 kHz to 3 MHz	15:1
30 kHz	16:1
3 kHz to 10 kHz	15:1
1 kHz	16:1
40 dB/3 dB Bandwidth Ratio *(Option 130)*	
Resolution Bandwidth	
30 Hz to 300 Hz	10:1

Video Bandwidth (−3 dB)	
Range	30 Hz to 1 MHz, selectable in 1, 3, 10 increments, accuracy ±30% and 3 MHz. Video bandwidths may be selected manually, or coupled to resolution bandwidth and frequency span.
(Option 130)	Adds 1, 3, and 10 Hz bandwidths.
Shape	Post detection, single pole low-pass filter used to average displayed noise.
(Option 130)	Bandwidths below 30 Hz are digital bandwidths with anti-aliasing filtering.

Frequency Characteristics

FFT Bandwidth Factors	FLATTOP	HANNING	UNIFORM
Noise Equivalent Bandwidth†	3.63×	1.5×	1×
3 dB Bandwidth†	3.60×	1.48×	1×
Sidelobe Height	<−90 dB	−32 dB	−13 dB
Amplitude Uncertainty	0.10 dB	1.42 dB	3.92 dB
Shape Factor (60 dB BW/3 dB BW)	2.6	9.1	>300

† Multiply entry by one-divided-by-sweep time.

Input Level	> (−60 dBm + attenuator setting)
Signal Level	0 to −30 dB below reference level
FM Offset	
Resolution	400 Hz nominal
FM Deviation (FM GAIN)	
Resolution	1 kHz nominal
Range	10 kHz to 1 MHz
Bandwidth	FM deviation/2
FM Linearity (for modulating frequency < bandwidth/100)	≤ 1% of FM deviation + 290 Hz

Amplitude Characteristics

These are not specifications. Characteristics provide useful but nonwarranted information about instrument performance.

Log Scale Switching Uncertainty	Negligible error

Demod Tune Listen	Internal speaker, rear panel earphone jack and front-panel volume control. Adjustable squelch control mutes the audio signal to the speaker/earphone jack based on the level of the demodulated signal above 22 kHz. An uncalibrated demodulated signal is available on the AUX VIDEO OUT connector at the rear panel.

Input Attenuation Uncertainty*	
Attenuator Setting	
0 dB	±0.2 dB
10 dB	Reference
20 dB	±0.4 dB
30 dB	±0.5 dB
40 dB	±0.7 dB
50 dB	±0.8 dB
60 dB	±1.0 dB
70 dB	±1.0 dB

* Referenced to 10 dB input attenuator setting. See the "Specifications" table under "Frequency Response."

ac Coupled Insertion Loss‡	
100 kHz to 300 kHz	0.7 dB
300 kHz to 1 MHz	0.2 dB
1 MHz to 100 MHz	0.07 dB
100 MHz to 2.9 GHz	0.05 dB + (0.06 × F)‡‡ dB
2.9 GHz to 6.5 GHz	0.05 dB + (0.13 × F)‡‡ dB
6.5 GHz to 12.8 GHz	0.65 dB + (0.04 × F)‡‡ dB

‡ Referenced to dc coupled mode.
‡‡ F = frequency in GHz.

Input Attenuator 10 dB Step Uncertainty	(Attenuator setting 10 to 70 dB) ±0.8 dB/10 dB

Input Attenuator Repeatability	±0.05 dB

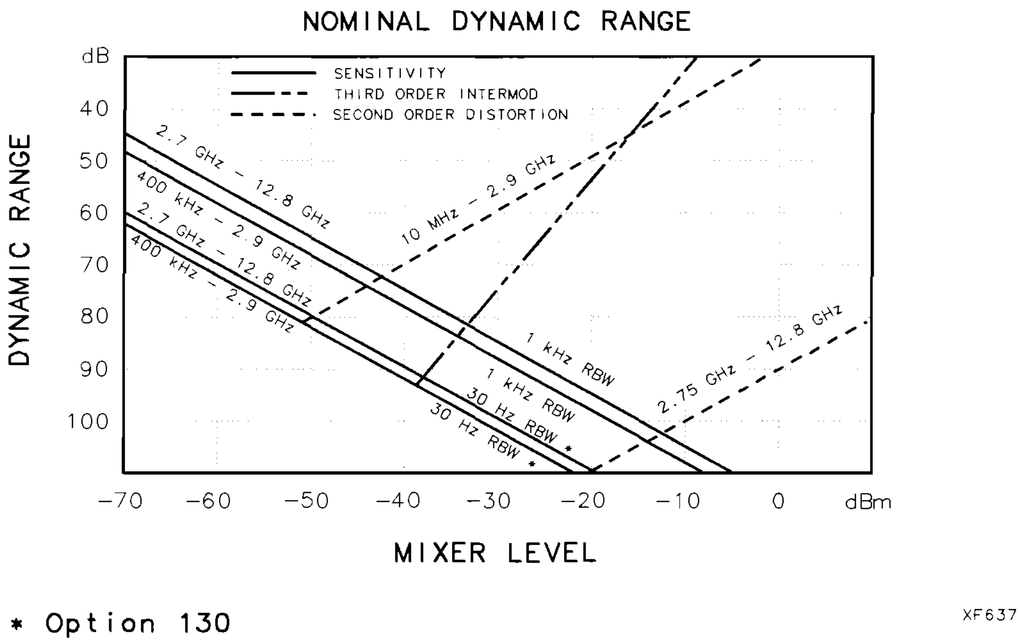
RF Input SWR		
10 dB attenuation	**dc Coupled**	**ac Coupled**
300 MHz	1.15:1	1.4:1
10 dB to 70 dB attenuation		
100 kHz to 300 kHz	1.3:1	2.3:1
300 kHz to 1 MHz	1.3:1	1.4:1
1 MHz to 2.9 GHz	1.3:1	1.3:1
2.9 GHz to 6.5 GHz	1.5:1	1.6:1
6.5 GHz to 12.8 GHz	1.6:1	1.9:1

Amplitude Characteristics

Unpeaked Frequency Response (dc coupled)	(10 dB input attenuation)	
Without Preselector Peaking, Span ≤ 50 MHz	**Absolute**§	**Relative Flatness**†
2.75 GHz to 6.5 GHz	±4.0 dB	±3.5 dB
6.0 GHz to 12.8 GHz	±4.5 dB	±4.0 dB

† Referenced to midpoint between highest and lowest frequency response deviations.
§ Referenced to 300 MHz CAL OUT.

DYNAMIC RANGE



Dynamic Range

Immunity Testing	
Radiated Immunity	When tested at 3 V/m according to IEC 801-3/1984 the displayed average noise level will be within specifications over the full immunity test frequency range of 27 to 500 MHz except that at immunity test frequencies of 278.6 MHz ± selected resolution bandwidth and 321.4 MHz ± selected resolution bandwidth the displayed average noise level may be up to −45 dBm. When the analyzer tuned frequency is identical to the immunity test signal frequency there may be signals of up to −70 dBm displayed on the screen.
Electrostatic Discharge	When an air discharge of up to 8 kV according to IEC 801-2/1991 occurs to the shells of the BNC connectors on the rear panel of the instrument spikes may be seen on the CRT display. Discharges to center pins of any of the connectors may cause damage to the associated circuitry.

Analog + Mode and Negative Peak Detector Mode (Options 101 and 301)

These modes do not utilize the full set of internal amplitude corrections. Therefore, in these modes, some analyzer amplitude specifications are reduced to characteristics. Characteristics provide useful but nonwarranted information about instrument performance.

In these modes, the following analyzer specifications remain as specifications:

Amplitude Range	**Calibrator Output**
Maximum Safe Input Level	

In these modes, the following analyzer specifications are reduced to characteristics:

Gain Compression	**Reference Level**
Displayed Average Noise Level	**Resolution Bandwidth Switching**
Spurious Responses	**Linear to Log Switching**
Residual Responses	**Display Scale Fidelity**
Display Range	**Display Scale Fidelity for Narrow Bandwidths**

Finally, the following analyzer specifications:

Marker Readout Resolution	**Frequency Response**

are replaced by the characteristics which follow in this subsection.

Marker Readout Resolution	
(digitizing resolution)	
Log Scale	±0.31 dB
Linear Scale	
frequency ≤ 1 GHz	±0.59% of reference level
frequency > 1 GHz	±1.03% of reference level

Frequency Response in Analog + Mode (dc coupled)	(10 dB input attenuation, for spans ≤ 20 MHz) **Absolute**§	**Relative Flatness**†
9 kHz to 2.9 GHz	±2.0 dB	±1.5 dB
2.75 GHz to 6.5 GHz (preselector peaked)	±2.5 dB	±2.0 dB
6.0 GHz to 12.8 GHz (preselector peaked)	±3.0 dB	±2.5 dB

† Referenced to midpoint between highest and lowest frequency response deviations.
§ Referenced to 300 MHz CAL OUT.

Cable TV Measurement Characteristics

Depth of Modulation	Percent AM is measured from horizontal sync tip to maximum video level; measurement requires a white-reference VITS and may not be valid for scrambled channels.
AM Range	50 to 93%
Resolution	0.1%
Accuracy	±2.0% for C/N > 40 dB

FM Deviation	Peak reading of FM deviation
Range	±100 kHz
Resolution	100 Hz
Accuracy	±1.5 kHz

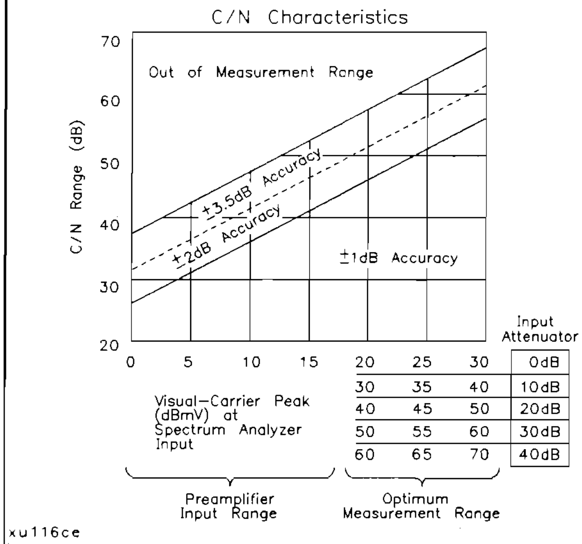


Figure 2-1

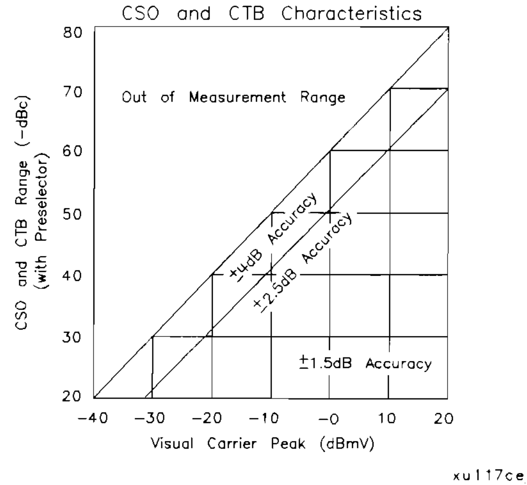


Figure 2-2

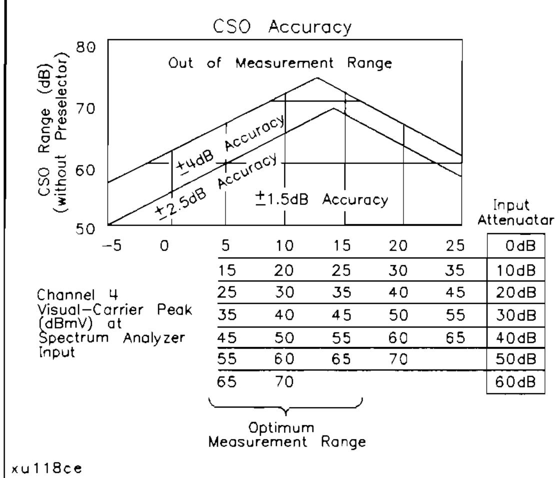


Figure 2-3

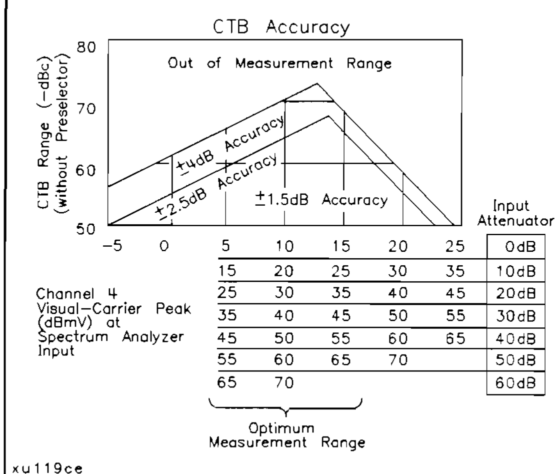


Figure 2-4

C/N, CSO, and CTB Measurements

The four graphs summarize the combined HP 8591C cable TV analyzer or HP 8590 E-Series spectrum analyzers, and HP 85721A characteristics for C/N, CSO, and CTB testing on cable TV systems with up to 99 channels and up to +9 dB amplitude tilt. C/N, CSO, and CTB measurement accuracies and ranges can be read from the relevant graphs. They depend upon the visual carrier peak level and the measurement reading. For C/N measurements with a preselector, there is no optimum range and the accuracy boundaries drop by the preselector's insertion loss (typically 2 dB).

Cable TV Measurement Characteristics

Crossmodulation	Horizontal-line (15.7 kHz) related AM is measured on the unmodulated visual carrier.
Range	60 dB, usable to 65 dB
Resolution	0.1 dB
Accuracy	±2.0 dB for xmod. <40 dB, C/N >40 dB ±2.6 dB for xmod. <50 dB, C/N >40 dB ±4.6 dB for xmod. <60 dB, C/N >40 dB

Option Characteristics

Demod Tune Listen *(Option 102 or 103)*	Internal speaker, rear panel earphone jack and front-panel volume control. Adjustable squelch control mutes the audio signal to the speaker/earphone jack based on the level of the demodulated signal above 22 kHz. An uncalibrated demodulated signal is available on the AUX VIDEO OUT connector at the rear panel.

TV Trigger *(Options 101 and 102)*	Triggers sweep of the analyzer after the sync pulse of a selected line of a TV video field.
Carrier Level for Trigger	Top 60% of linear display
Compatible Formats	NTSC, PAL, SECAM
Field Selection	Even, odd, non-interlaced
Trigger Polarity	Positive, negative
Line Selection	10 to 1021

Tracking Generator Characteristics (Option 010)

Tracking Drift	
(Usable in a 1 kHz RBW after 5-minute warmup)	1.5 kHz/5 minute

RF Power Off Residuals	
9 kHz to 2.9 GHz	<−120 dBm

Dynamic Range (difference between maximum power out and tracking generator feedthrough)	>109 dB

Output Attenuator Repeatability	
9 kHz to 300 MHz	±0.1 dB
300 MHz to 2.0 GHz	±0.2 dB
2.0 GHz to 2.9 GHz	±0.3 dB

Output VSWR	
0 dB Attenuator	<3.0:1
8 dB Attenuator	<1.5:1

Option Characteristics

TRACKING GENERATOR OUTPUT ACCURACY, Option 010 (after CAL TRK GEN in auto-coupled mode, Frequency > 10 MHz, 25°C ± 10°C)					
TG Output Power Level	**Attenuator Setting**	**Relative Accuracy (at 300 MHz referred to −20 dBm)**	**Absolute Accuracy (at 300 MHz)**	**Relative Accuracy (referred to −20 dBm)**	**Absolute Accuracy**
−1 to −10 dBm	0 dB	1.0 dB	1.75 dB	3.0 dB	3.75 dB
−10 to −18 dB	8 dB	1.5 dB	2.25 dB	3.5 dB	4.25 dB
−20 dBm	16 dB	Reference	0.75 dB	2.0 dB	2.75 dB
−18 to −26 dBm	16 dB	1.0 dB	1.75 dB	3.0 dB	3.75 dB
−26 to −34 dBm	24 dB	1.5 dB	2.25 dB	3.5 dB	4.25 dB
−34 to −42 dBm	32 dB	1.6 dB	2.35 dB	3.6 dB	4.35 dB
−42 to −50 dBm	40 dB	1.8 dB	2.55 dB	3.8 dB	4.55 dB
−50 to −58 dBm	48 dB	2.0 dB	2.75 dB	4.0 dB	4.75 dB
−58 to −66 dBm	56 dB	2.1 dB	2.85 dB	4.1 dB	4.85 dB

Quasi-Peak Detector Characteristics (Option 103)

Quasi-Peak Measurement Range	
Displayed	70 dB
Total	115 dB

FM Demodulation (Option 102, 103, or 301)

Input Level	> (−60 dBm + attenuator setting)
Signal Level	0 to −30 dB below reference level
FM Offset	
Resolution	400 Hz nominal
FM Deviation (FM GAIN)	
Resolution	1 kHz nominal
Range	10 kHz to 1 MHz
Bandwidth	FM deviation/2
FM Linearity (for modulating frequency < bandwidth/100)	≤ 1% of FM deviation + 290 Hz

Physical Characteristics

Front-Panel Inputs and Outputs

INPUT 50Ω	
Connector	Type N female
Impedance	50 Ω nominal

100 MHz COMB OUT	
Connector	SMA female
Output Level	+27 dBm
Frequency	100 MHz fundamental

RF OUT *(Option 010)*	
Connector	Type N female
Impedance	50 Ω nominal

PROBE POWER‡	
Voltage/Current	+15 Vdc, ±7% at 150 mA max. −12.6 Vdc ±10% at 150 mA max.
‡ Total current drawn from the +15 Vdc on the PROBE POWER and the AUX INTERFACE cannot exceed 150 mA. Total current drawn from the −12.5 Vdc on the PROBE POWER and the −15 Vdc on the AUX INTERFACE cannot exceed 150 mA.	

Rear-Panel Inputs and Outputs

10 MHz REF OUTPUT	
Connector	BNC female
Impedance	50 Ω nominal
Output Amplitude	>0 dBm

EXT REF IN	
Connector	BNC female Note: Analyzer noise sideband and spurious response performance may be affected by the quality of the external reference used.
Input Amplitude Range	−2 to +10 dBm
Frequency	10 MHz

AUX IF OUTPUT	
Frequency	21.4 MHz
Amplitude Range	−10 to −60 dBm
Impedance	50 Ω nominal

AUX VIDEO OUTPUT	
Connector	BNC female
Amplitude Range	0 to 1 V (uncorrected)

EARPHONE *(Option 102 or 103)*	
Connector	1/8 inch monaural jack

EXT ALC INPUT *(Option 010)*	
Input Impedance	>10 kΩ
Polarity	Use with negative detector

EXT KEYBOARD *(Option 021, 023 or 024)*	Interface compatible with HP part number C1405 Option ABA and most IBM/AT non-auto switching keyboards.

EXT TRIG INPUT	
Connector	BNC female
Trigger Level	Positive edge initiates sweep in EXT TRIG mode (TTL).

GATE TRIGGER INPUT *(Option 105)*	
Connector	BNC female
Trigger Level	minimum pulse width >30 ns (TTL)
GATE OUTPUT *(Option 105)*	
Connector	BNC female
Output Level	High = gate on; Low = gate off (TTL)

LO OUTPUT *(Option 009 or 010)*	Note: LO output must be terminated in 50 Ω.
Connector	SMA female
Impedance	50 Ω nominal
Frequency Range	3.0 to 6.8214 GHz
Output Level	+11 to +18 dBm

SWEEP + TUNE OUTPUT *(Option 009)*	
Connector	BNC female
Impedance (dc coupled)	2 kΩ
Range	0 to +10 V
Sweep + Tune Output	0.36 V/GHz of center frequency

HI-SWEEP IN/OUT	
Connector	BNC female
Output	High = sweep, Low = retrace (TTL)
Input	Open collector, low stops sweep.

Physical Characteristics

MONITOR OUTPUT *(Spectrum Analyzer Display)*	
Connector	BNC female
Format	
SYNC NRM	Internal Monitor
SYNC NTSC	NTSC Compatible 15.75 kHz horizontal rate 60 Hz vertical rate
SYNC PAL	PAL Compatible 15.625 kHz horizontal rate 50 Hz vertical rate

REMOTE INTERFACE	
HP-IB *(Option 021)*	
HP-IB Codes	SH1, AH1, T6, SR1, RL1, PP0, DC1, C1, C2, C3 and C28
RS-232 *(Option 023)*	25 pin subminiature D-shell, female
Parallel *(Option 024)*	25 pin subminiature D-shell, female

SWEEP OUTPUT	
Connector	BNC female
Amplitude	0 to +10 V ramp

TV IN *(Option 107)*	
Connector	BNC female
Impedance	75 Ω nominal

TV TRIG OUT *(Options 101 and 102)*	
Connector	BNC female
Amplitude	Negative edge corresponds to start of the selected TV line after sync pulse (TTL).

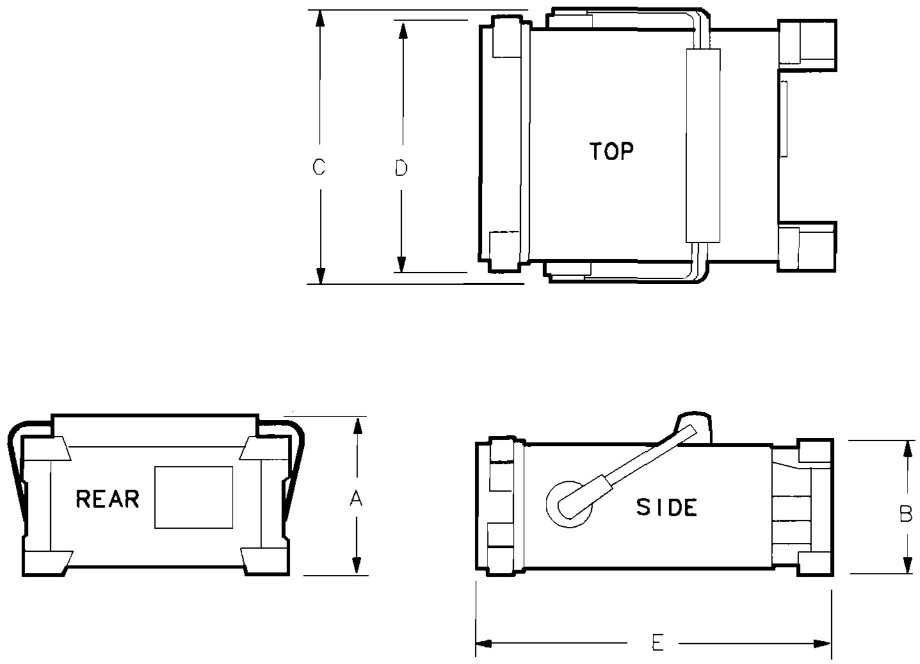
AUX INTERFACE				
Connector Type: 9 Pin Subminiature "D" Connector Pinout				
Pin #	Function	Current	"Logic" Mode	"Serial Bit" Mode
1	Control A	—	TTL Output Hi/Lo	TTL Output Hi/Lo
2	Control B	—	TTL Output Hi/Lo	TTL Output Hi/Lo
3	Control C	—	TTL Output Hi/Lo	Strobe
4	Control D	—	TTL Output Hi/Lo	Serial Data
5	Control I	—	TTL Input Hi/Lo	TTL Input Hi/Lo
6	Gnd	—	Gnd	Gnd
7†	−15 Vdc ±7%	150 mA	—	—
8*	+5 Vdc ±5%	150 mA	—	—
9†	+15 Vdc ±5%	150 mA	—	—

* Exceeding the +5 V current limits may result in loss of factory correction constants.
† Total current drawn from the +15 Vdc on the PROBE POWER and the AUX INTERFACE cannot exceed 150 mA. Total current drawn from the −12.6 Vdc on the PROBE POWER and the −15 Vdc on the AUX INTERFACE cannot exceed 150 mA.

WEIGHT	
Net	
HP 8596E	16.4 kg (36 lb)
Shipping	
HP 8596E	19.1 kg (42 lb)

Physical Characteristics

DIMENSIONS
A = 8 in (200 mm) B = 7.25 in (184 mm) C = 14.69 in (373 mm) D = 13.25 in (337 mm) E = 18.12 in (460.5 mm)



10

If You Have a Problem

Your spectrum analyzer is built to provide dependable service. It is unlikely that you will experience a problem. However, Hewlett-Packard's worldwide sales and service organization is ready to provide the support you need.

Calling HP Sales and Service Offices

Sales and service offices are located around the world to provide complete support for your spectrum analyzer. To obtain servicing information or to order replacement parts, contact the nearest Hewlett-Packard Sales and Service office listed in Table 10-1. In any correspondence or telephone conversations, refer to the spectrum analyzer by its model number and full serial number. With this information, the HP representative can quickly determine whether your unit is still within its warranty period.

Before calling Hewlett-Packard

Before calling Hewlett-Packard or returning the spectrum analyzer for service, please make the checks listed in "Check the basics." If you still have a problem please read the warranty printed at the front of this guide. If your spectrum analyzer is covered by a separate maintenance agreement, please be familiar with its terms.

Hewlett-Packard offers several maintenance plans to service your spectrum analyzer after warranty expiration. Call your HP Sales and Service Office for full details.

If you want to service the spectrum analyzer yourself after warranty expiration, contact your HP Sales and Service Office to obtain the most current test and maintenance information.

Check the basics

In general, a problem can be caused by a hardware failure, a software error, or a user error. Often problems may be solved by repeating what was being done when the problem occurred. A few minutes spent in performing these simple checks may eliminate time spent waiting for instrument repair.

- □ Check that the spectrum analyzer is plugged into the proper ac power source.
- □ Check that the line socket has power.
- □ Check that the rear-panel voltage selector switch is set correctly.
- □ Check that the line fuse is good.
- □ Check that the spectrum analyzer is turned on.
- □ Check that the light above (LINE) is on, indicating that the power supply is on.
- □ Check that the other equipment, cables, and connectors are connected properly and operating correctly.
- □ Check the equipment settings in the procedure that was being used when the problem occurred.
- □ Check that the test being performed and the expected results are within the specifications and capabilities of the spectrum analyzer. Refer to the appropriate specifications chapter in this guide.
- □ Check the spectrum analyzer display for error messages. Refer to the *HP 8590 E-Series and L-Series Spectrum Analyzer User's Guide.*
- □ Check operation by performing the verification procedures in this guide. Record all results in the appropriate performance test record.
- □ Check for problems similar to those described in the *HP 8590 E-Series and L-Series Spectrum Analyzer User's Guide.*

Table 10-1. Hewlett-Packard Sales and Service Offices

US FIELD OPERATIONS

Headquarters
Hewlett-Packard Company
19320 Pruneridge Avenue
Cupertino, CA 95014, USA
(800) 752-0900

California, Northern
Hewlett-Packard Co.
301 E. Evelyn
Mountain View, CA 94041
(415) 694-2000

California, Southern
Hewlett-Packard Co.
1421 South Manhattan Ave.
Fullerton, CA 92631
(714) 999-6700

Colorado
Hewlett-Packard Co.
24 Inverness Place, East
Englewood, CO 80112
(303) 649-5000

Georgia
Hewlett-Packard Co.
2000 South Park Place
Atlanta, GA 30339
(404) 955-1500

Illinois
Hewlett-Packard Co.
5201 Tollview Drive
Rolling Meadows, IL 60008
(708) 255-9800

New Jersey
Hewlett-Packard Co.
150 Green Pond Road
Rockaway, NJ 07866
(201)627-6400

Texas
Hewlett-Packard Co.
930 E. Campbell Rd.
Richardson, TX 75081
(214) 231-6101

EUROPEAN FIELD OPERATIONS

Headquarters
Hewlett-Packard S.A.
150, Route du Nant-d'Avril
1217 Meyrin 2/Geneva
Switzerland
(41 22) 780.8111

France
Hewlett-Packard France
1 Avenue Du Canada
Zone D'Activite De Courtaboeuf
F-91947 Les Ulis Cedex
France
(33 1) 69 82 60 60

Germany
Hewlett-Packard GmbH
Hewlett-Packard Strasse
6380 Bad Homburg v.d.H
Germany
(49 6172) 16-0

Great Britain
Hewlett-Packard Ltd
Eskdale Road, Winnersh Triangle
Wokingham, Berkshire RF11 5DZ
England
(44 734) 696622

INTERCON FIELD OPERATIONS

Headquarters
Hewlett-Packard Company
3495 Deer Creek Rd.
Palo Alto, California 94304-1316
(415) 857-5027

Australia
Hewlett-Packard Australia Ltd.
31-41 Joseph Street
Blackburn, Victoria 3130
(61 3) 895-2895

Canada
Hewlett-Packard (Canada) Ltd.
17500 South Service Road
Trans-Canada Highway
Kirkland, Quebec H9J 2X8
Canada
(514) 697-4232

China
China Hewlett-Packard Co.
38 Bei San Huan X1 Road
Shuang Yu Shu
Hai Dian District
Beijing, China
(86 1) 256-6888

Japan
Yokogawa-Hewlett-Packard Ltd.
1-27-15 Yabe, Sagamihara
Kanagawa 229, Japan
(81 427) 59-1311

Singapore
Hewlett-Packard Singapore (Pte.) Ltd
1150 Depot Road
Singapore 0410
(65) 273-7388

Taiwan
Hewlett-Packard Taiwan
8th Floor, H-P Building
337 Fu Hsing North Road
Taipei, Taiwan
(886 2) 712-0404

Returning the Spectrum Analyzer for Service

Use the information in this section if it is necessary to return the spectrum analyzer to Hewlett-Packard.

Package the spectrum analyzer for shipment

Use the following steps to package the spectrum analyzer for shipment to Hewlett-Packard for service:

1. Fill in a service tag located at the end of this guide and attach it to the instrument. Please be as specific as possible about the nature of the problem. Send a copy of any or all of the following information:
   - Any error messages that appeared on the spectrum analyzer display.
   - A completed Performance Test record. Located in Chapter 1 of this guide.
   - Any other specific data on the performance of the spectrum analyzer.

Caution Spectrum analyzer damage can result from using packaging materials other than those specified. Never use styrene pellets in any shape as packaging materials. They do not adequately cushion the instrument or prevent it from shifting in the carton. Styrene pellets cause equipment damage by generating static electricity and by lodging in the spectrum analyzer fan.

2. Use the original packaging materials or a strong shipping container that is made of double-walled, corrugated cardboard with 159 kg (350 lb) bursting strength. The carton must be both large enough and strong enough to accommodate the spectrum analyzer and allow at least 3 to 4 inches on all sides of the spectrum analyzer for packing material.
3. If you have a front-panel cover, install it on the instrument; if not, protect the front panel with cardboard.
4. Surround the instrument with at least 3 to 4 inches of packing material, or enough to prevent the instrument from moving in the carton. If packing foam is not available, the best alternative is SD-240 Air Cap™ from Sealed Air Corporation (Commerce, CA 90001). Air Cap looks like a plastic sheet covered with 1-1/4 inch air-filled bubbles. Use the pink Air Cap to reduce static electricity. Wrap the instrument several times in the material to both protect the instrument and prevent it from moving in the carton.
5. Seal the shipping container securely with strong nylon adhesive tape.
6. Mark the shipping container "FRAGILE, HANDLE WITH CARE" to ensure careful handling.
7. Retain copies of all shipping papers.