Notice

Hewlett-Packard to Agilent Technologies Transition

This documentation supports a product that previously shipped under the Hewlett-Packard company brand name. The brand name has now been changed to Agilent Technologies. The two products are functionally identical, only our name has changed. The document still includes references to Hewlett-Packard products, some of which have been transitioned to Agilent Technologies.

Agilent Technologies

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Calibration Guide

HP 8590D Spectrum Analyzer

HEWLETT
PACKARD

HP Part No. 08590-90199
Printed in USA June 1992

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

Notice

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.

Regulatory Information

The specifications and characteristics chapter contains regulatory information.

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 *Before this instrument is switched on,* **make sure it has been properly grounded through the protective conductor of the ac power cable to a socket outlet provided with protective earth contact.**

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

Warning **There are many points in the instrument which can, if contacted, cause personal injury. Be extremely careful.**

Any adjustments or service procedures that require operation of the instrument with protective covers removed should be performed only by trained service personnel.

Caution *Before this instrument is switched on,* make sure its primary power circuitry has been adapted to the voltage of the ac power source.

Failure to set the ac power input to the correct voltage could cause damage to the instrument when the ac power cable is plugged in.

HP 8590 Series Spectrum Analyzer Documentation Description

The following guides are shipped with your spectrum analyzer:

HP 8590 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 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.

The Calibration Guide for your spectrum analyzer

- Tells you how to test your spectrum analyzer to determine if the spectrum analyzer meets its specifications.
- Lists specifications and characteristics for the spectrum analyzer.

Documentation Options

Option 910:

HP 8590 Series Spectrum Analyzer User's Guide
HP 8590 Series Spectrum Analyzer Quick Reference Guide
Calibration Guide (Model Specific)

Provides an additional copy of the HP 8590 Series User's, Programmer's, and Quick Reference Guides, and the Calibration Guide.

Option 915:

Service Guide (Model Specific)
HP 8590 Series Spectrum Analyzer Component-Level Information

The service guide describes assembly-level repair of the spectrum analyzer. Component-level information provides information for component-level repair of the spectrum analyzer.

Option 021 and Option 023:

HP 8590 Series Spectrum Analyzer Programmer's Guide

The programmer's guide describes spectrum analyzer operation via a remote controller (computer) for spectrum analyzers equipped with Options 021 or 023. This guide is provided when ordering spectrum analyzers equipped with either Option 021 or Option 023.

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 spectrum analyzer and want to get ready for use for the first time, do the following:

- Read Chapters 1 and 2 of the *HP 8590 Series Spectrum Analyzer User's Guide.*
- Perform the initial self-calibration routines described in Chapter 2 of the *HP 8590 Series Spectrum 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 Chapter 1 of this guide.

After completing the performance verification, use the *HP 8590 Series Spectrum Analyzer User's* Guide to learn how to use the spectrum analyzer and to find more detailed information about the spectrum 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.

Caution	The CAUTION symbol 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 symbol until the indicated conditions are fully understood and met.

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Calibrating

This chapter contains performance test procedures which test the electrical performance of the spectrum analyzer.

Allow the spectrum analyzer to warm up in accordance with the Temperature Stability specification in Chapter 2 before performing the tests in this chapter.

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

Calibration

Calibration verifies that the spectrum analyzer performance is within all specifications listed in Chapter 2. It is time consuming and requires extensive test equipment. Calibration consists of *all* the performance tests. See Table l-l for a complete listing of the performance tests.

Operation Verification

Operation verification consists of a subset of the performance tests. See Table l-l. Operation verification tests only the most critical specifications of the spectrum analyzer. These tests are recommended for incoming inspection, troubleshooting, or after repair. Operation verification requires less time and equipment than the calibration.

The following table lists the performance tests included in this chapter. Select the spectrum analyzer option being calibrated and perform the tests marked in the option column. Note that some of the tests are used for both calibration and operation verification (marked with ⊙).

Table 1-1. Performance Verification Tests

Performance Test Name	Calibration for Instrument Option:				
	Std[1]	001	010	011	013
1. Frequency Readout Accuracy	⊙	⊙	⊙	⊙	
2. Frequency Readout and Marker Count Accuracy for Option 013					⊙
3. Noise Sidebands	⊙	⊙	⊙	⊙	⊙
4. System Related Sidebands					
5. Frequency Span Readout Accuracy	•	•		•	•
6. Sweep Time Accuracy	•	•	•	•	•
7. Scale Fidelity	⊙	⊙	⊙	⊙	⊙
8. Reference Level Accuracy	⊙	⊙	⊙	⊙	⊙
9. Absolute Amplitude Calibration and Resolution Bandwidth Switching Uncertainties	⊙	⊙	⊙	⊙	⊙
10. Calibrator Amplitude and Frequency Accuracy	⊙	⊙	⊙	⊙	⊙
11. Frequency Response	⊙	⊙	⊙	⊙	⊙
12. Other Input Related Spurious Responses	•	•	•	•	•
13. Spurious Response[2]	⊙	⊙	⊙	⊙	⊙
14. Gain Compression	•	•	•	•	•
15. Displayed Average Noise Level	⊙	⊙	⊙	⊙	⊙
16. Residual Responses	•	•	•	•	•
17. Absolute Amplitude, Vernier, and Power Sweep Accuracy			•	•	
18. Tracking Generator Level Flatness			•	•	
19. Harmonic Spurious Outputs			•	•	
20. Non-Harmonic Spurious Outputs			•	•	
21. Tracking Generator Feedthrough			•	•	
22. 10 MHz Reference Output Accuracy					⊙

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.

Safety

Familiarize yourself with the safety symbols marked on the pulse generator, and read the general safety instructions and the symbol definitions given in the front of this manual before you begin verifying performance of the pulse generator.

Before You Start

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

- Switch the spectrum analyzer on and let it warm up in accordance with the Temperature Stability specification in Chapter 2.
- Read "Making a Measurement" in Chapter 2 of the *HP 8590 Series Spectrum Analyzer User's Guide.*
- After the spectrum analyzer has warmed up as specified, perform the Self-Calibration Procedure documented in "Improving Accuracy With Self-Calibration Routines" in Chapter 2 of the *HP 8590 Series Spectrum Analyzer* User's Guide. The performance of the spectrum analyzer is only specified after the spectrum analyzer calibration routines have been run and if the spectrum analyzer is autocoupled.
- Read the rest of this section before you start any of the tests, and make a copy of the Performance Test Record described in "Recording the Test Results."

Test equipment you will need

Tables l-2 through l-4 lists the recommended test equipment for the performance tests. The tables also lists recommended equipment for the spectrum analyzer adjustment procedures which are located in the *HP 85900 Spectrum Analyzer Service* Guide. Any equipment that meets the critical specifications given in the table can be substituted for the recommended model.

Recording the test results

A performance test record is provided at the end of this chapter.

Each test result is identified as a *TR Entry* in the performance tests and on the performance test record. We recommend that you make a copy of the performance 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.

If the spectrum analyzer doesn't meet specifications

If the spectrum analyzer fails a test, rerun the frequency calibration and amplitude calibration routines by pressing CAL FREQ & AMPTD . Press CAL STORE , then repeat the verification test. If the spectrum analyzer still fails one or more specifications, complete any remaining tests and record all test results on a copy of the test record. Then refer to Chapter 3, "If You Have a Problem," for instructions on how to solve the problem.

Periodically verifying operation

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

Table 1-2. Recommended Test Equipment

Equipment	Critical Specifications for Equipment Substitution	Recommended Model	Use[1]
Digital Voltmeter	Input Resistance: $\geq$ 10 megohms Accuracy: $\pm$10 mV on 100 V range	HP 3456A	P,A,T
DVM Test Leads	For use with HP 3456A	HP 34118	A,T
Frequency Standard	Frequency: 10 MHz Timebase Accy (Aging): < 1 x 10^{-9}/day	HP 5061B	P,A
Measuring Receiver	Compatible with Power Sensors dB Relative Mode Resolution: 0.01 dB Reference Accuracy: $\pm$ 1.2 %	HP 8902A	P,A,T
Microwave Frequency Counter	Frequency Range: 9 MHz to 7 GHz Timebase Accy (Aging): <5 x 10^{-10}/day	HP 5343A	P,A,T
Oscilloscope	Bandwidth: dc to 100 MHz Vertical Scale Factor of 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
Power Sensor[2]	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

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

2 Option 001 and Option 011 Only

Table 1-2. Recommended Test Equipment (continued)

Equipment	Critical Specifications for Equipment Substitution	Recommended Model	Use[1]
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	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
Synthesized Sweeper	Frequency Range: 10 MHz to 1.8 GHz Frequency Accuracy (CW): ± 0.02% Leveling Modes: Internal and External Modulation Modes: AM Power Level Range: -35 to + 16 dBm	HP 8340A/B	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

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

Table 1-3. Recommended Accessories

Equipment	Critical Specifications for Accessory Substitution	Recommended Model	Use[1]
Active Probe	5 Hz to 500 MHz 300 kHz to 3 GHz	HP 41800A HP 85024A	T
Adapter	APC 3.5 (f) to APC 3.5 (f)	5061-5311	P,A,T
Adapter	BNC (f) to dual banana plug	1251-1277	P,A,T
Adapter	BNC (m) to BNC (m)	1250-0216	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	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	Type N (m) to APC 3.5 (m)	1250-1743	P,A,T
Adapter	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	Type N (m) to N (m)	1250-1475	P,A,T
Adapter	Type N (f) to N (f), 75 Ω	1250-1529	P,A,T
Adapter[2]	Type N (f), 75 Ω, to Type N (m), 50 Ω	1250-0597	P,A,T
Adapter	SMB (f) to SMB (f)	1250-0692	A,T
Adapter	SMB (m) to SMB (m)	1250-0813	A,T
Adapter,[2] 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 Option 001 and Option 011 Only

Table 1-3. Recommended Accessories (continued)

Equipment	Critical Specifications for Accessory Substitution	Recommended Model	Use[1]
Attenuator, 10 dB	Type N (m to f) Frequency: 300 MHz	HP 8491A Option 010	P,A,T
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
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
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
Power Splitter	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
Termination, 50 Ω	Impedance: 50 Ω (nominal) *(2 required for Option 010)*	HP 908A	P,T
Termination, 75 Ω[2]	Impedance: 75 Ω (nominal) *(2 required for option 011)*	HP 909E Option 201	P,T

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

2 Option 001 and Option 011 Only

Table 1-4. Recommended Cables

Equipment	Critical Specifications for Cable Substitution	Recommended Model	Use[1]
Cable	Type N, 183 cm (72 in)	HP 11500A	P,A,T
Cable	Frequency Range: dc to 1 GHz Length: ≥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[2]	BNC, 75 Ω, 30 cm (12 in)	5062-6452	P,A,T
Cable[2]	BNC, 75 Ω, 120 cm (48 in)	15525-80010	P,A,T
Cable, Test	Length: ≥91 cm (36 in) Connectors: SMB (f) to BNC (m) *(2 reauired)*	85680-60093	A,T

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

2 Option 001 and Option 011 Only

1. Frequency Readout Accuracy

The frequency readout accuracy of the spectrum analyzer is tested with an input signal of known frequency.

There are no related adjustment procedures for this performance test.

If the spectrum analyzer is equipped with Option 013, Counterlock, perform the performance test "Frequency Readout and Marker Count Accuracy for Option 013" instead.

Equipment Required

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

Additional Equipment for Option 001

Adapter, minimum loss
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 001 or damage to the input connector will occur.

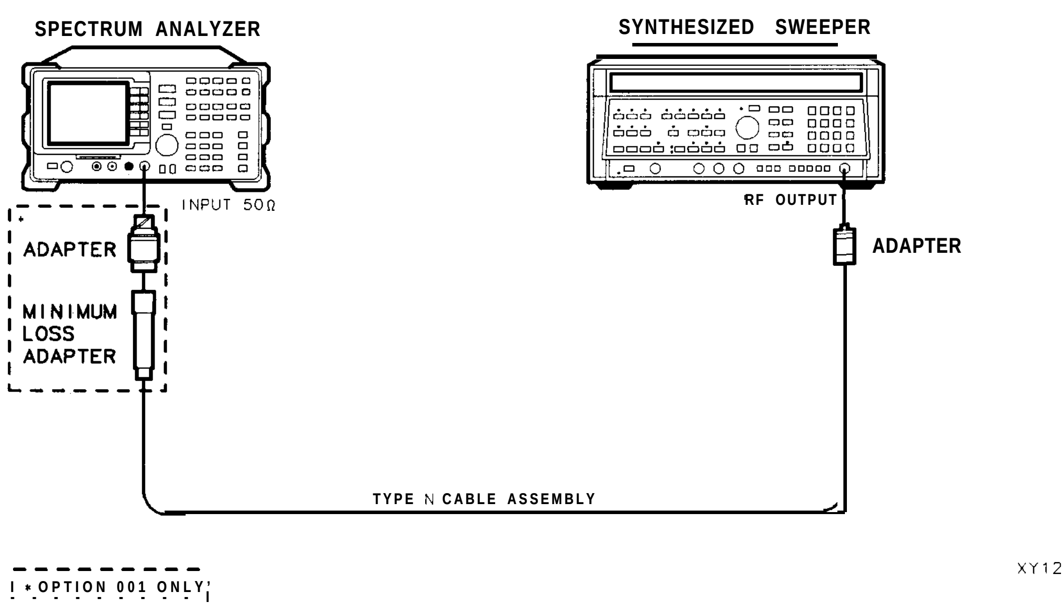

Figure 1-1. Frequency Readout Accuracy Test Setup

1. Frequency Readout Accuracy

Procedure

1. Connect the equipment as shown in Figure l-l.
2. Perform the following steps to set up the equipment:
   - Press INSTRUMENT PRESET on the synthesized sweeper, then set the controls as follows:

     CW .... 10 MHz
     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) 10 (MHz)
     (SPAN) 12 (MHz)

3. Set the spectrum analyzer to measure the frequency readout accuracy by pressing the following spectrum analyzer keys:

   (PEAK SEARCH)
   (MKR FCTN) MK TRACK ON OFF (ON)
   (SPAN) 200 (kHz)

4. Record the MKR frequency reading in the performance test record. The reading should be within the limits shown in Table 1-5.
5. Press (SPAN) 12 (MHz) on the spectrum analyzer.
6. Change to the next synthesized sweeper CW and spectrum analyzer center frequencies listed in Table 1-5.
7. Repeat steps 4 through 6 for each frequency setting listed in Table 1-5.

Table 1-5. Frequency Readout Accuracy

Synthesized Sweeper CW Frequency (MHz)	Spectrum Analyzer Center Frequency (MHz)	MKR Reading (MHz)		
		Min	TR Entry (Actual)	Max
10	10	4.9980	1-1	15.0020
50	50	44.9980	1-2	55.0020
100	100	94.9980	1-3	105.0020
500	500	494.9980	1-4	505.0020
1000	1000	994.9980	1-5	1005.0020
1800	1800	1794.9980	1-6	1805.0020

2. Frequency Readout and Marker Count Accuracy for Option 013

This procedure is only for spectrum analyzers equipped with Option 013.

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."

If the spectrum analyzer is *not* equipped with Option 013, Counterlock, perform the performance test "Frequency Readout Accuracy" instead.

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 Option 001

Adapter, minimum loss
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 001 or damage to the input connector will occur.

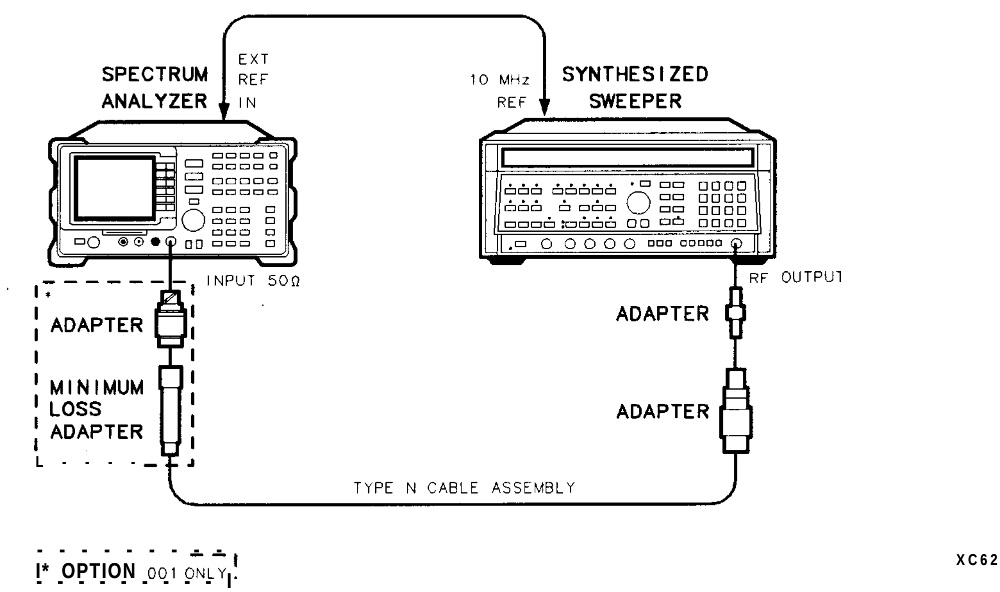

Figure 1-2. Frequency Readout Accuracy Test Setup for Option 013

2. Frequency Readout and Marker Count Accuracy for Option 013

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 l-2. 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)

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

Table l-6. Frequency Readout Accuracy

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

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 2-5 of the performance 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 2-6 of the performance test record. The reading should be within the limits of 1.49999989 GHz and 1.50000011 GHz.

3. Noise Sidebands

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 30 kHz above and below the carrier. The difference between these two measurements is compared to specification.

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 001

Adapter, minimum loss
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 001 or damage to the input connector will occur.

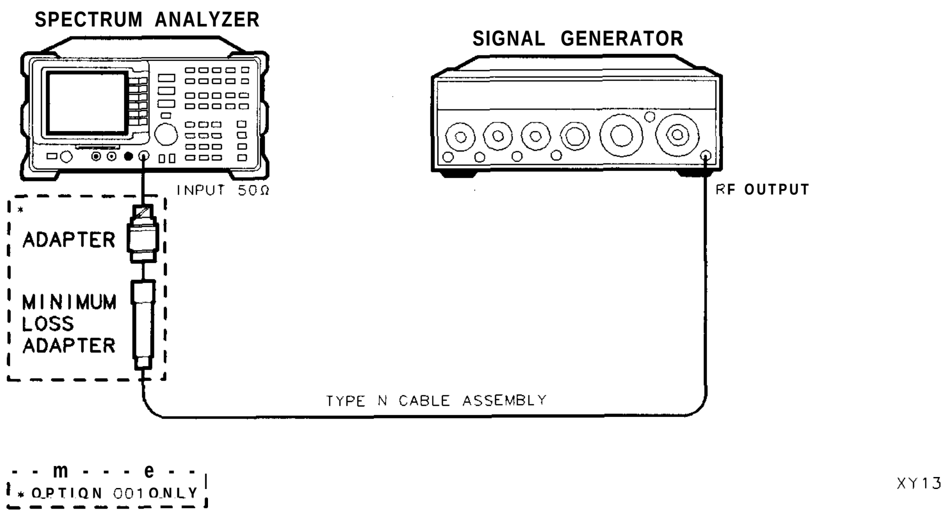

Figure 1-3. Noise Sidebands Test Setup

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 1-3.
   - Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish. Set the spectrum analyzer by pressing the following keys:

     (FREQUENCY) 5C (MHz)
     (SPAN) 10 (MHz)

2. Calculate the Noise Sideband Suppression by performing the following steps:

   - Press the following spectrum analyzer keys:

     [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)
     (PEAK SEARCH]

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

3. Noise Sidebands

- Press the following spectrum analyzer keys:

  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.

- Press the following spectrum analyzer keys:

  (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.

Noise Sideband Worksheet

Description	Measurement
Carrier Amplitude	________ dBm *or* dBmv
Noise Sideband Level at + 30 kHz	________ dBm *or* dBmv
Noise Sideband Level at -30 kHz	________ dBm or dBmv
Maximum Sideband Level	________ dBm *or* dBmv

- Record the more positive value, either Noise Sideband Level at +30 kHz or Noise Sideband Level at -30 kHz from above in the Noise Sideband Worksheet as the Maximum Noise Sideband Level.
- Subtract the Carrier Amplitude from the Maximum Noise Sideband Level using the equation below.

  Noise Sideband Suppression = Maximum Noise Sideband Level − Carrier Amplitude

- Record the Noise Sideband Suppression in the performance test record as TR Entry 3-l. The suppression should be ≤ -65 dBc.

  The resolution bandwidth is normalized to 1 Hz as follows:

  1 Hz noise-power = (noise-power in dBc) − (10 × log(RBW))

  For example, -65 dBc in a 1 kHz resolution bandwidth is normalized to -95 dBc/Hz.

4. System Related Sidebands

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 001

Adapter, minimum loss
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 001 or damage to the input connector will occur.

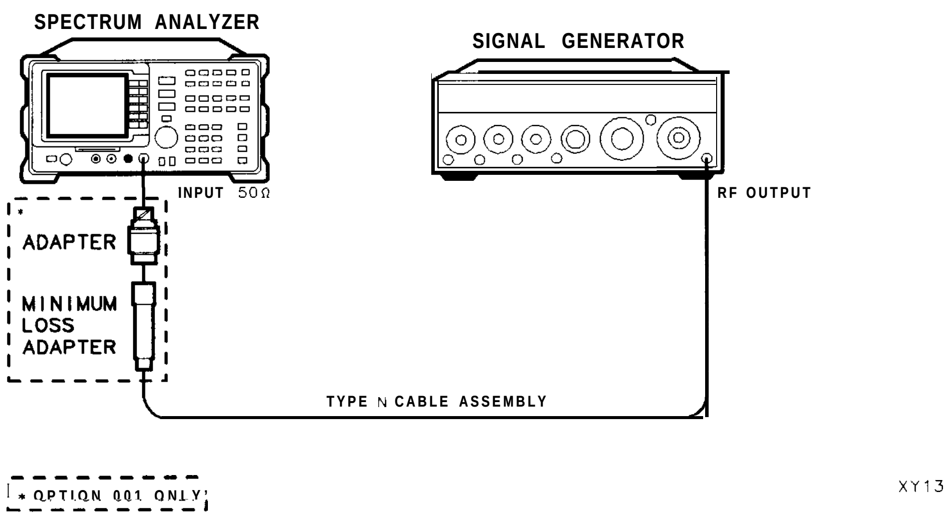

Figure 1-4. System Related Sidebands Test Setup

4. System Related Sidebands

Procedure

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

   - Set the signal generator controls as follows:

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

   - Connect the equipment as shown in Figure 1-4.
   - 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)

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

   (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)

3. Press (SGL SWP) and wait for the completion of the sweep. Press (PEAK SEARCH), then MARKER Δ.

4. Press the following spectrum analyzer keys:

   (FREQUENCY)
   (⇧) (step-up key)

5. 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).

6. Record the Marker A Amplitude in TR Entry 3-1 of the performance test record.

   The Marker A Amplitude above the signal should be <-65 dB.

7. 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)

8. 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 A Amplitude in TR Entry 3-2 of the performance test record.

   The Marker A Amplitude below the signal should be <-65 dB.

5. Frequency Span Readout Accuracy

For testing each frequency span, two 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
Signal generator
Power splitter
Adapter, Type N (m) to Type N (m)
Adapter, Type N (f) to APC 3.5 (m)
Cable, Type N, 183 cm (72 in)
Cable, Type N, 152 cm (60 in)

Additional Equipment for Option 001

Adapter, minimum loss
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 001 or damage to the input connector will occur.

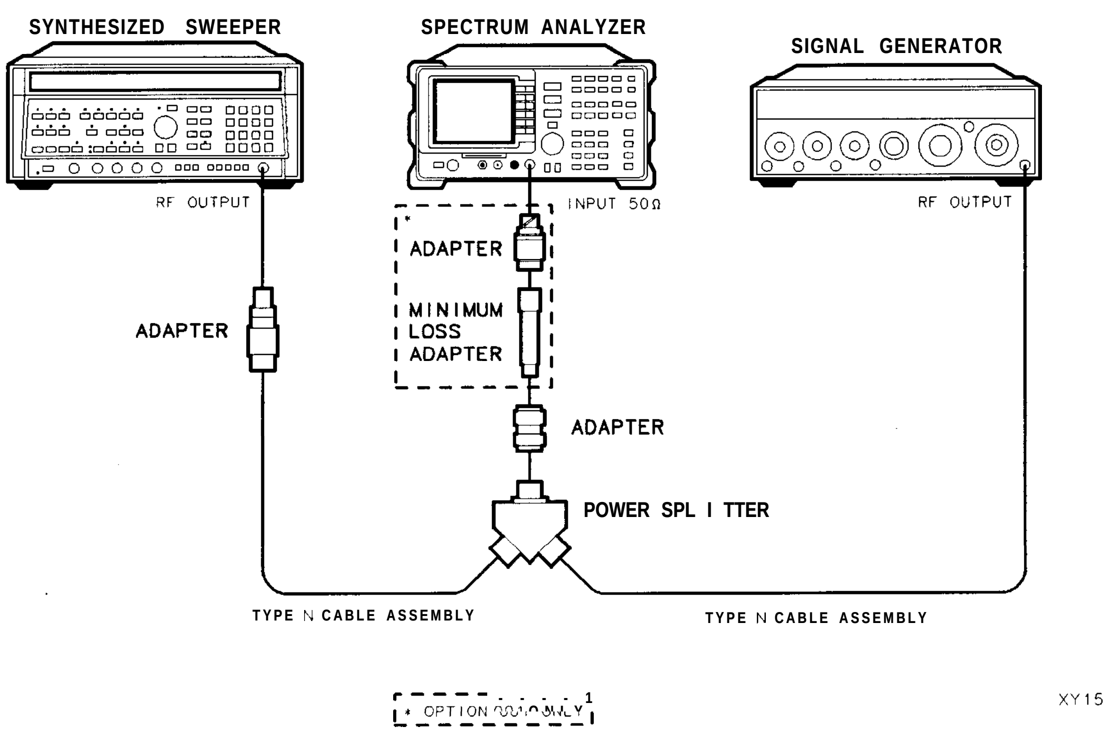

Figure 1-5. Frequency Span Accuracy Test Setup

Procedure

This performance test consists of two parts:

Part 1: Span 1800 MHz
Part 2: Spans <500 MHz

Perform "Part 1: Span 1800 MHz" before "Part# 2: Spans <500 MHz."

Part 1: Span 1800 MHz

1. Connect the equipment as shown in Figure l-5. Note that the power splitter is used as a combiner.
2. Press [PRESET) on the spectrum analyzer and wait for the preset 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 .... 1100 MHz
   POWERLEVEL .... -5 dBm

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

   FREQUENCY (LOCKED MODE) .... 200 MHz
   CWOUTPUT ....OdBm

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. Press (SGL SWP) then [PEAK SEARCH]. If necessary, continue pressing NEXT PEAK until the marker is on the left-most signal This is the "marked" signal.
7. Press MARKER Δ and continue pressing NEXT PK RIGHT . The marker delta should be on the right-most signal.
8. Record the MKR A frequency reading in the performance test record for the corresponding TR Entry listed in Table l-7. The MKR reading should be within the limits shown.

Part 2: Span<500 MHz

9. Press (PRESET) on the spectrum analyzer and wait for the PRESET to finish. Set the spectrum analyzer by pressing the following keys:

   (FREQUENCY) 70 (MHz)
   (SPAN) 100 (MHz)

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

    CW .... 110 MHz
    POWER LEVEL .... -5dBm

11. Set the signal generator controls as follows:

    FREQUENCY .... 30 MHz
    CW OUTPUT .... 0 dBm

12. If necessary, adjust the spectrum analyzer center frequency to center the two signals on the display.

13. On the spectrum analyzer, 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).

14. Record the MKR A frequency reading in the performance test record for the corresponding TR Entry listed in Table l-7. The MKR reading should be within the limits shown.

15. On the spectrum analyzer, press (MKR), More 1 of 2 , then MARKER ALL OFF.

16. Repeat steps 11 through 15 for the remaining span settings listed in Table l-7, setting the synthesized sweeper CW and signal generator Frequency as shown in the table.

Table 1-7. Frequency Span Readout Accuracy

Spectrum Analyzer Span Setting	Signal Generator Frequency (MHz)	Sythesized Sweeper Frequency (MHz)	MKR-A Reading		
			Min.	TR Entry (Actual)	Max.
1800 MHz	200	1700	1446 MHz	5-l	1554 MHz
100 MHz	30.0	110.0	77.0 MHz	5-2	83.0 MHz
20 MHz	62.0	78.0	15.40 MHz	5-3	16.60 MHz
10 MHz	66.0	74.0	7.70 MHz	5-4	8.30 MHz
100 kHz	69.96	70.04	77.0 kHz	5-5	83.0 kHz

6. Sweep Time Accuracy

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.

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 Option 001

Adapter, minimum loss
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 001 or damage to the input connector will occur.

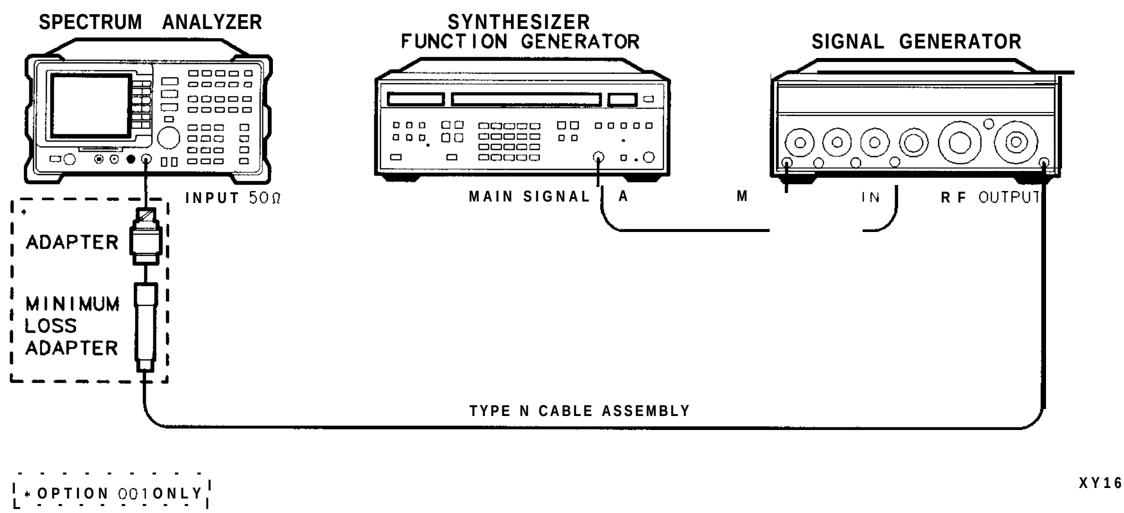

Figure 1-6. Sweep Time Accuracy Test Setup

Procedure

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

   Option 001 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 l-6.

4. Press (PRESET) on the spectrum analyzer and wait for the preset to finish. Set the controls as follows:

   (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 then press the following spectrum analyzer keys:

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

   Adjust signal amplitude for a mid-screen display.

5. Set the signal generator AM switch to the AC position.
6. On the spectrum analyzer, press the following keys:

   (TRIG) 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 PEAK until the marker is on the left most signal. This is the "marked signal."
8. Press MARKER A, MARKER A , then NEXT PK RIGHT until the marker A is on the eighth signal peak. Record the marker A reading in the performance test record as indicated in Table 1-8.
9. Repeat steps 6 through 8 for the remaining sweep time settings listed in Table l-8.

Table 1-8. Sweep Time Accuracy

Spectrum Analyzer Sweep Time Setting	Synthesizer/Level Generator Frequency	Minimum Reading	TR Entry (MKR A)	Maximum Reading
20 ms	500 Hz	15.4 ms	6-l	16.6 ms
100 ms	100 Hz	77.0 ms	6-2	83.0 ms
1 s	10 Hz	770.0 ms	6-3	830.0 ms
10 s	1 Hz	7.7 s	6-4	8.3 s

7. Scale Fidelity

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 001

Adapter, minimum loss
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 001 or damage to the input connector will occur.

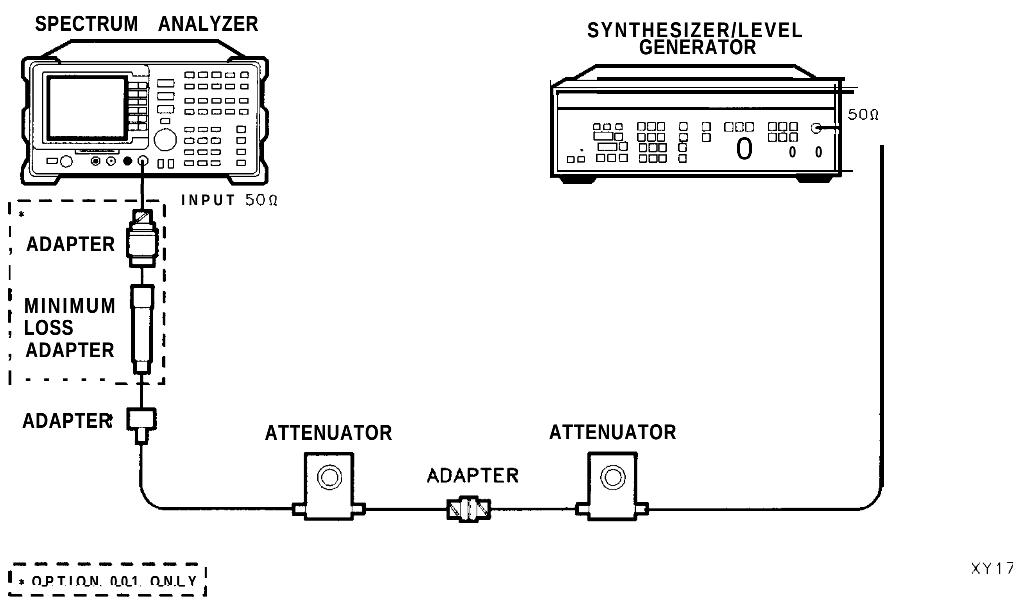

Figure 1-7. Scale Fidelity Test Setup

Procedure

Log Scale

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

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

2. Connect the equipment as shown in Figure l-7. Set the 10 dB step attenuator to 10 dB attenuation and the 1 dB step attenuator to 0 dB attenuation.

   Option 001 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)

   Option 001 only: Press [AMPLITUDE], Mare 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 l-9.
9. Record the Actual MKR A amplitude reading in the performance test record as indicated in Table l-9. 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 l-9.

11. For each Actual MKR A reading recorded in Table 1-9, subtract the previous Actual MKR A reading. Add 4 dB to the number and record the result as the incremental error in the performance test record as indicated in Table l-9. The incremental error should not exceed 0.4 dB/4 dB.

Table 1-9. Cumulative and Incremental Error, Log Mode

Synthesizer/Level Generator Nominal Amplitude (dBm)	dB from Ref Level (nominal)	TR Entry Cumulative Error (MKR A Reading)			TR Entry (Incrementi Error)
		Min. (dB)	Actual (dB)	Max. (dB)	TR Entry
+10	0	0 (Ref)	0 (Ref)	0 (Ref)	0 (Ref)
+6	-4	-4.44	7-l	-3.56	7-18
+2	-8	-8.48	7-2	-7.52	7-19
-2	-12	– 12.52	7-3	-11.48	7-20
-6	-16	-16.56	7-4	-15.44	7-21
-10	-20	-20.60	7-5	-19.40	7-22
-14	-24	-24.64	7-6	-23.36	7-23
-18	-28	-28.68	7-7	-27.32	7-24
-22	-32	-32.72	7-8	-31.28	7-25
-26	-36	-36.76	7-9	-35.24	7-26
-30	-40	-40.80	7-10	-39.20	7-27
-34	-44	-44.84	7-11	-43.16	7-28
-38	-48	-48.88	7-12	-47.12	7-29
-42	-52	-52.92	7-13	-51.08	7-30
-46	-56	-56.96	7-14	-55.04	7-31
-50	-60	-61 .OO	7-15	-59.00	7-32
-54	-64	-65.04	7-16	-62.96	N/A
-68	-68	-69.08	7-17	-66.92	N/A

Linear Scale

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

AMPLITUDE . . . . + 10 dBm
AMPTDINCR . . . .0.05 dB

13. Set the 1 dB step attenuator to 0 dB attenuation.

14. 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)

    Option 001 only: Press **Mare 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)

15. 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.
16. 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+/-0.4mV.
17. On the spectrum analyzer, press (PEAK SEARCH], (MKR FCTN), then MK TRACK ON OFF (OFF).
18. Set the synthesizer/level generator amplitude increment to 3 dB.
19. 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 l-10.
20. Record the MKR amplitude reading in the performance test record as indicated in Table l-10. The MKR amplitude should be within the limits shown.
21. Repeat steps 21 and 22 for the remaining synthesizer/level generator Nominal Amplitudes listed in Table l-10.

Table l-10. 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	7-33	165.01
+4 dBm	50	105.36	7-34	118.78
+1 dBm	35.48	72.63	7-35	86.05
-2 dBm	25	49.46	7-36	82.88

Log to Linear Switching

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

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

24. 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)

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

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

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

    Log Mode Amplitude Reading- dBm

27. 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.
28. Press (PEAK SEARCH), then record the peak marker amplitude reading in linear mode.

    Linear Mode Amplitude Reading- dBm

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

    Log/Linear Error________ dB

30. If the Log/Linear Error is less than 0 dB, record this value as TR Entry 7-37 in the performance 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.
31. On the spectrum analyzer, press the following keys:

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

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

    Linear Mode Amplitude Reading- dBm

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

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

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

Log Mode Amplitude Reading ______ dBm

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

Linear/Log Error ________ dB

36. Record the Linear/Log Error as TR Entry 7-37 in the performance test record. The absolute value of the reading should be less than 0.25 dB.

8. Reference Level Accuracy

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 Option 001

Adapter, minimum loss
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 001 or damage to the input connector will occur.

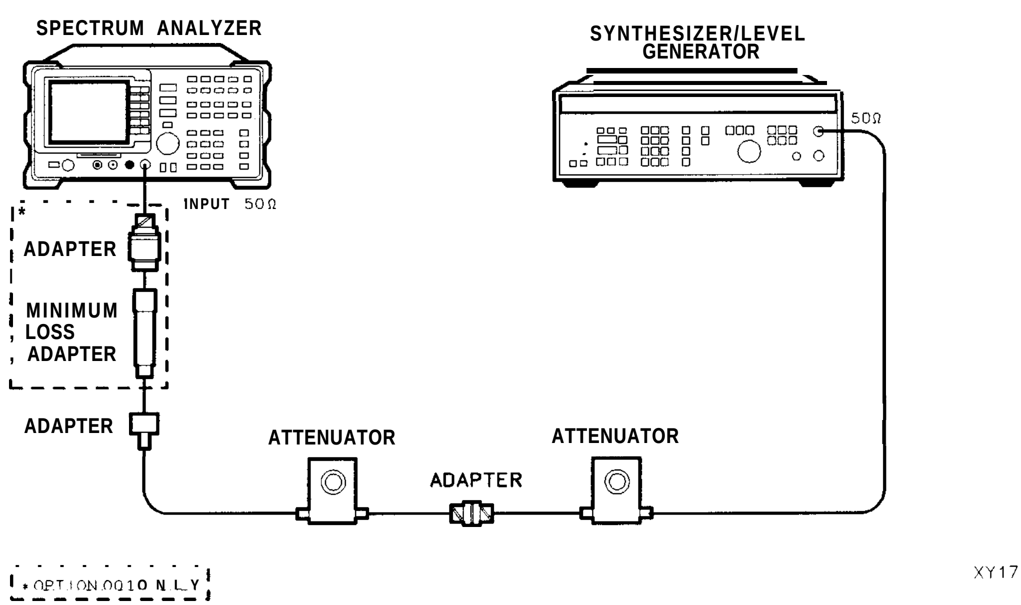

Figure 1-8. Reference Level Accuracy Test Setup

Procedure

Log Scale

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

   FREQUENCY .... 50 MHz
   AMPLITUDE .... -10 dBm
   AMPTDINCR .... 10 dB
   OUTPUT .... 50 Ω

2. Connect the equipment as shown in Figure 1-8. Set the 10 dB step attenuator to 10 dB attenuation and the 1 dB step attenuator to 0 dB attenuation.

   Option 001 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.

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) 5C (MHz)
   (SPAN) 10 (MHz)
   [PEAK SEARCH)
   (MKR FCTN) MK TRACK ON OFF (ON)
   (SPAN) 50 (kHz)

   Option001 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 l-11. At each setting, press (SGL SWP) on the spectrum analyzer.

7. Record the MKR A amplitude reading in the performance test record as indicated in Table l-l 1. The MKR A reading should be within the limits shown.

8. Reference Level Accuracy

Table l-l 1. Reference Level Accuracy, Log Mode

Synthesizer/Level Generator Amplitude (dBm)	Spectrum Analyzer Reference Level (dBm)	MKR A Reading (dB)		
		Min.	TR Entry	Max.
-10	-20	0 (Ref)	0 (Ref)	0 (Ref)
0	-10	-0.4	8-1	+0.4
+10	0	-0.5	8-2	+0.5
-20	-30	-0.4	8-3	+0.4
-30	-40	-0.5	8-4	+0.5
-40	-50	-0.8	8-5	+0.8
-50	-60	-1.0	8-6	+1.0
-60	-70	-1.1	8-7	+1.1
-70	-80	-1.2	8-8	+1.2
-80	-90	-1.3	8-9	+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 1-12. At each setting, press (SGL SWP) on the spectrum analyzer.
14. Record the MKR A amplitude reading in Table 1-12. The MKR A reading should be within the limits shown.

Table 1-12. Reference Level Accuracy, Linear Mode

Synthesizer/Level Generator Amplitude (dBm)	Spectrum Analyzer Reference Level (dBm)	MKR Δ Reading (dB) Min.	TR Entry	Max.
-10	-20	0 (Ref)	0 (Ref)	0 (Ref)
0	-10	-0.4	8-10	+0.4
+10	0	-0.5	8-11	+0.5
-20	-30	-0.4	8-12	+0.4
-30	-40	-0.5	8-13	+0.5
-40	-50	-0.8	8-14	+0.8
-50	-60	-1.0	8-15	+1.0
-60	-70	-1.1	8-16	+1.1
-70	-80	-1.2	8-17	+1.2
-80	-90	-1.3	8-18	+1.3

9. Absolute Amplitude Calibration and Resolution Bandwidth Switching Uncertainties

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 001

Cable, BNC, 75 Ω, 30 cm (12 in)

Caution Use only 75 Ω cables, connectors, or adapters on the 75 Ω input of an Option 001 or damage to the input connector will occur.

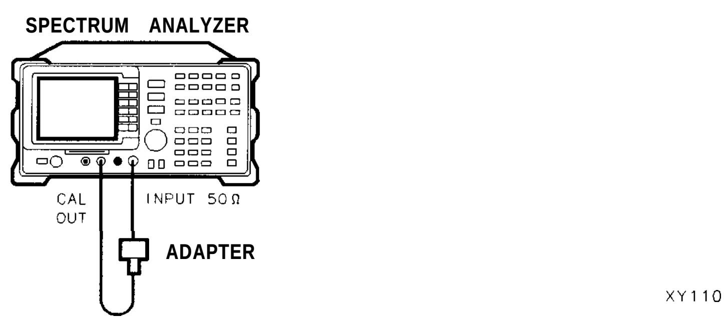

Figure 1-9. Uncertainty Test Setup

Procedure

1. Connect the CAL OUT to the spectrum analyzer input using the BNC cable and adapter, as shown in Figure l-9.

   Option 001 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)

   Option 001 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 9-l of the performance test record.

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

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)

   Option 001 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 (OFF)

6. Set the spectrum analyzer resolution bandwidth and span according to Table 1-13.

7. Press (PEAK SEARCH), then record the MKR Δ TRK amplitude reading in the performance test record as indicated in Table 1-13.

   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 1-13.

9. Absolute Amplitude Calibration and Resolution Bandwidth Switching Uncertainties

Table 1-13. 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	9-2	+0.5
9 kHz	50 kHz	-0.4	9-3	+0.4
10 kHz	50 kHz	-0.4	9-4	+0.4
30 kHz	500 kHz	-0.4	9-5	+0.4
100 kHz	500 kHz	-0.4	9-6	+0.4
120 kHz	500 kHz	-0.4	9-7	+0.4
300 kHz	5 MHz	-0.4	9-8	+0.4
1 MHz	10 MHz	-0.4	9-9	+0.4
3 MHz	10 MHz	-0.4	9-10	+0.4

10. Calibrator Amplitude and Frequency Accuracy

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. A frequency counter is used to measure the frequency accuracy of the CAL OUT signal and the measured frequency is compared to the specification.

The related adjustments for this procedure are:

Calibrator Amplitude Adjustment
Third Converter, 600 MHz Frequency Adjustment

Equipment Required

Microwave frequency counter
Low pass filter, 300 MHz
Synthesized sweeper
Measuring receiver (used as a power meter)
Power meter
Low power sensor with a 50 MHz reference attenuator
Power sensor
Power splitter
10 dB attenuator, Type N (m to f), dc-12.4 GHz Option 010
Cable, BNC, 121 cm (48 in)
Cable, Type N, 152 cm (60 in)
Adapter, APC 3.5 (f) to Type N (f)
Adapter, Type N (f) to BNC (m) (2 required)
Adapter, Type N (m) to BNC (f)

Additional Equipment for Option 001

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

10. Calibrator Amplitude and Frequency Accuracy

Caution Use only 75 Ω cables, connectors, or adapters on the 75 Ω input of an Option 001 or damage to the input connector will occur.

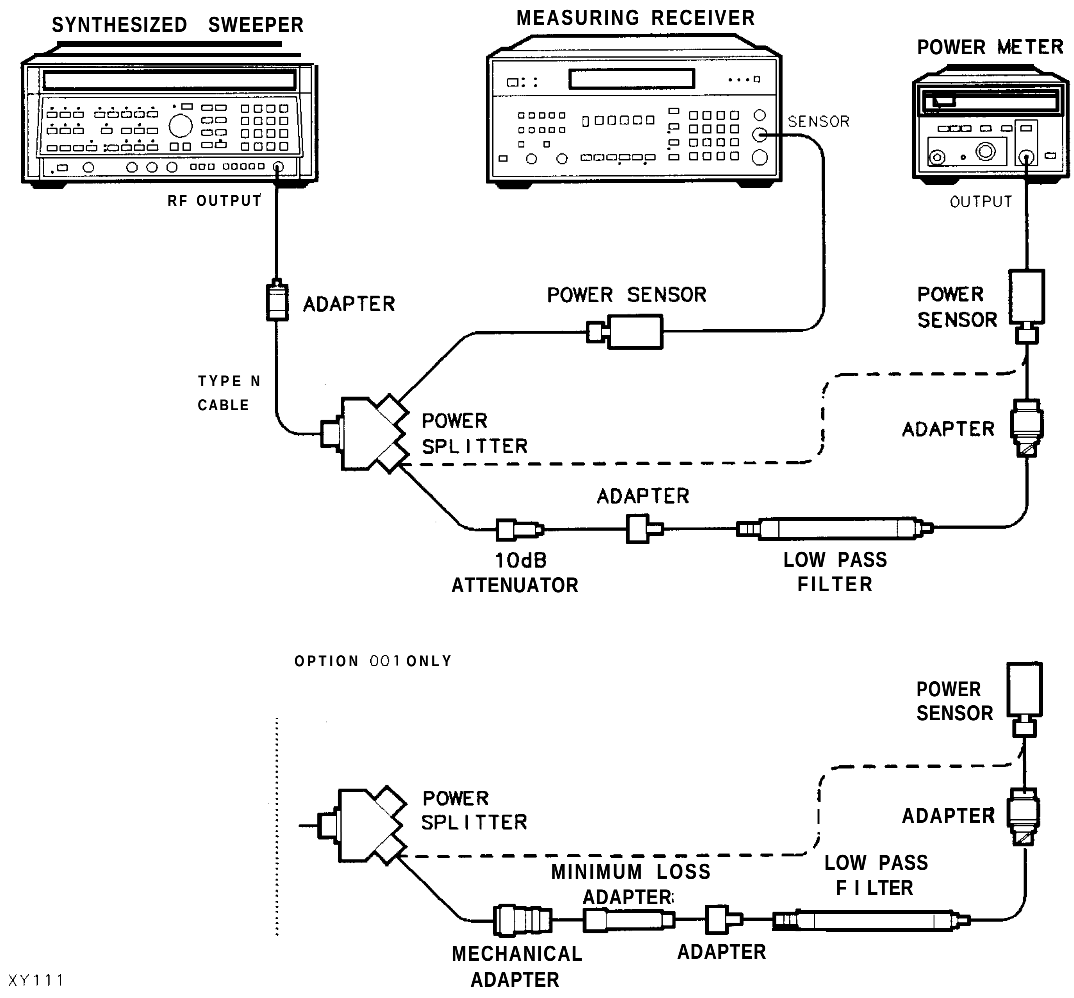

Figure 1-10. LPF Characterization

Procedure

Part 1: LPF, Attenuator, and Adapter Insertion Loss Characterization

1. Zero and calibrate the measuring receiver and power sensor in LOG mode as described in the measuring receiver operation manual.

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

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

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

4. Connect the equipment as shown in Figure l-10. Connect the low power sensor directly to the power splitter (bypass the LPF, attenuator, and adapters). Allow the power sensors to settle before proceeding.
5. On the measuring receiver, press RATIO mode. Power indication should be 0 dB.
6. On the power meter, press the dB REF mode key. Power indication should be 0 dB.
7. Connect the LPF, attenuator and adapters as shown in Figure l-10.
8. Record the measuring receiver reading in dB. This is the relative error due to mismatch.

   Mismatch Error ________ dB

9. Record the power meter reading in dB. This is the relative uncorrected insertion loss of the LPF, attenuator, and adapters.

   Uncorrected Insertion Loss ________ dB

10. Subtract the Mismatch Error (step 8) from the Uncorrected Insertion Loss (step 9). This is the Corrected Insertion Loss.

    Corrected Insertion Loss ________ dB

    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

Caution Use only 75 Ω cables, connectors, or adapters on the 75 Ω input of an Option 001 or damage to the input connector will occur.

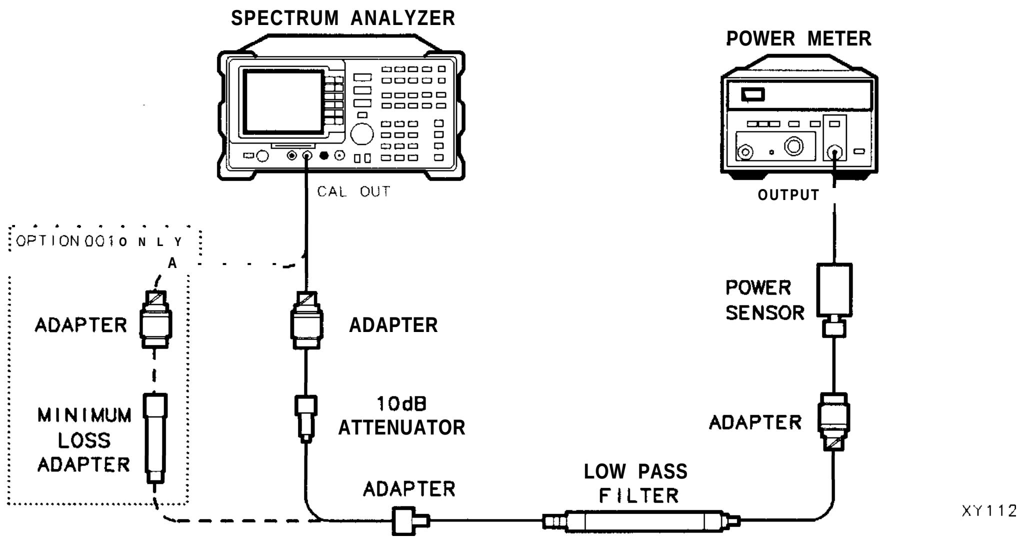


Figure l-11. Calibrator Amplitude Accuracy Test Setup

11. Connect the equipment as shown in Figure l-l 1. 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.
12. On the power meter, press the dBm mode key. Record the power meter Reading in dBm.

Power Meter Reading ________ dBm

13. Subtract the Corrected Insertion Loss (step 10) from the power meter Reading (step 12) and record this value as TR Entry 10-l in the performance test record. The CAL OUT should be -20 dBm f0.4 dB.

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

Option 001 only: 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. Record this value as TR Entry 10-l in the performance test record.

dBmV = dBm + 48.75 dB

Example: -20 + 48.75 = 28.75.

CAL OUT Power ________ dBmV

Skip Part 3 if your spectrum analyzer is equipped with Option 013 and do performance test number 22 "10 MHz Reference Output Accuracy" instead.

Part 3: Calibrator Frequency Accuracy

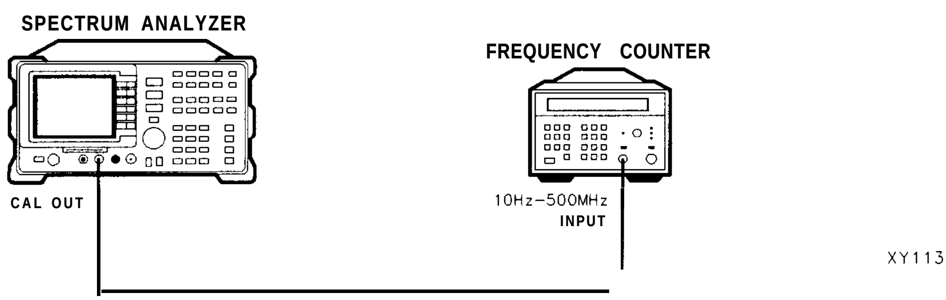


Figure 1-12. Calibrator Frequency Accuracy Test Setup

14. Connect the equipment as shown in Figure 1-12.

    Option 001 only: Use a 75 Ω cable instead of a 50 Ω cable.

15. Set the frequency counter controls as follows:

    SAMPLERATE .... Midrange
    50 Ω/ 1 M Ω SWITCH 5061
    10 Hz-500 MHz/500 MHz-26.5 GHz SWITCH .... 10 Hz-500 MHz

16. Wait for the frequency counter to settle. This may take two or three gate times.

17. Read the frequency counter display. Record this value as TR Entry 10-2 in the performance test record.

11. Frequency Response

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).

Testing the flatness of Option 001, INPUT 75 Ω, is accomplished by first characterizing the system flatness.

The related adjustment for this procedure is the "Frequency Response Error Correction."

Equipment Required

Synthesized sweeper
Measuring receiver (used as a power meter)
Synthesizer/level generator
Power sensor
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 Option 001

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

System Characterization Procedure for Option 001

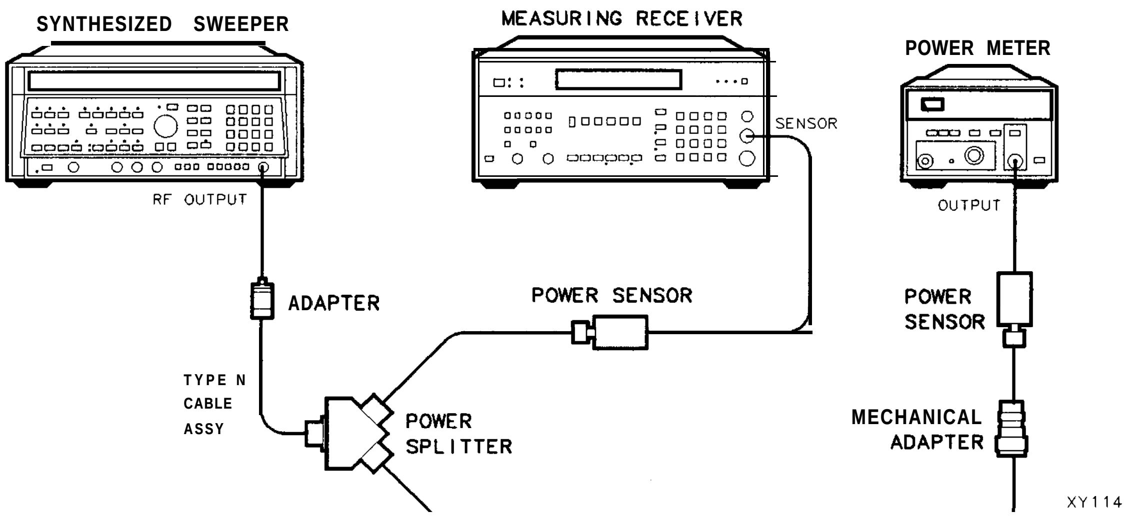


Figure 1-13. System Characterization Test Setup *(Option 001)*

1. Zero and calibrate the measuring receiver and the power sensor as described in the measuring receiver operation manual.
2. Zero and calibrate the power meter and the 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 .... 50 MHz
   FREQSTEP .... 50 MHz
   POWER LEVEL .... 5 dBm

4. Connect the equipment as shown in Figure 1-13.
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 1-14, taking into account the Cal Factors of both the power sensors.
7. On the synthesized sweeper, press (CW), and (⇧) (step-up key), to step through the remaining frequencies listed in Table 1-14. At each new frequency repeat steps 5 and 6, entering each power sensor's Cal Factor into the respective power meter.

Caution	Use only 75 Ω cables, connectors, or adapters on the 75 Ω input of an Option 001 or damage to the input connector will occur.

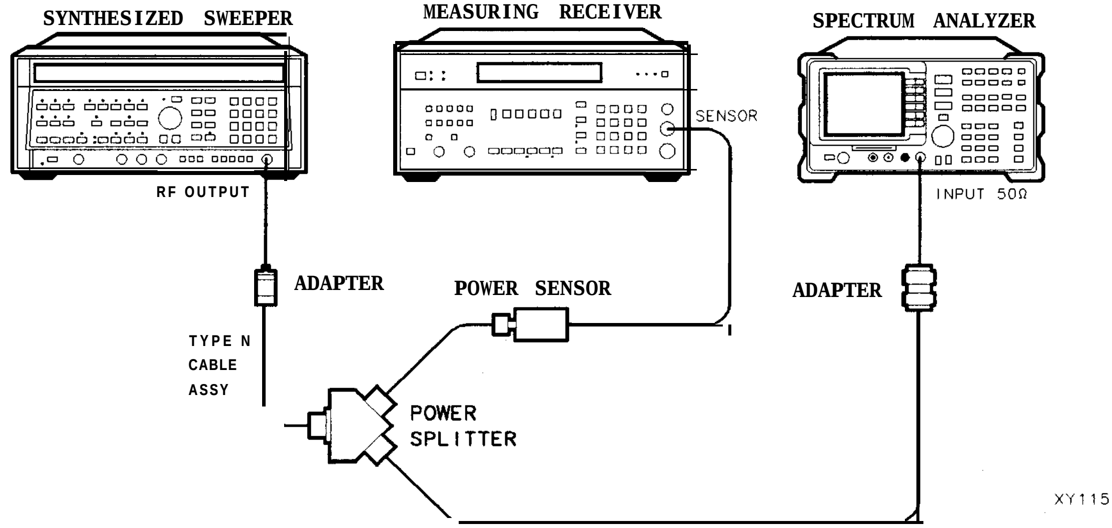


Figure 1-14. Frequency Response Test Setup, ≥50 MHz

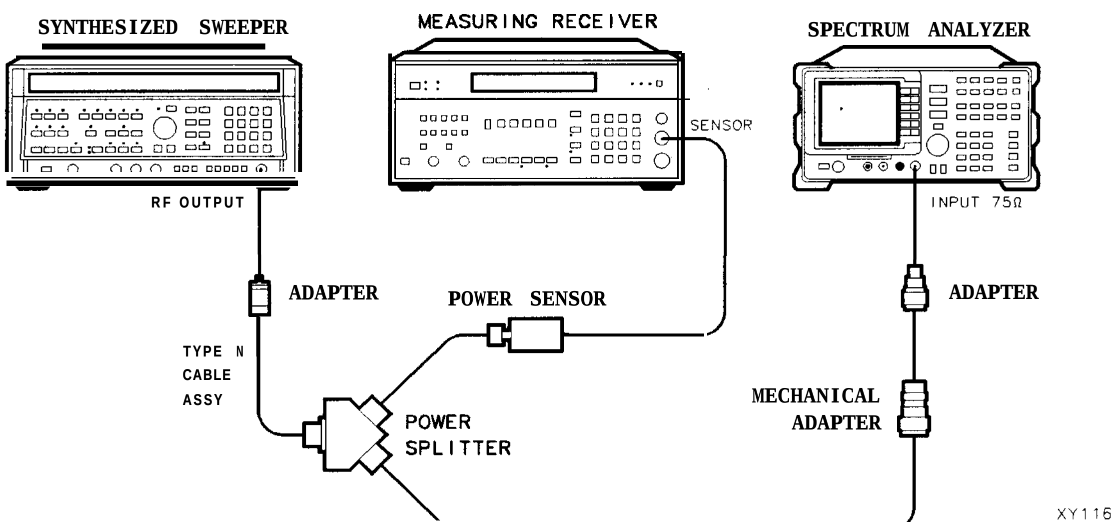


Figure 1-15. Frequency Response Test Setup, ≥50 MHz, for Option 001

Procedure

1. Zero and calibrate the measuring receiver and the power sensor in log mode as described in the measuring receiver operation manual.
2. Connect the equipment as shown in Figure 1-14.

   Option 001 only: Refer to Figure l-15.

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

   CW .... 300 MHz
   FREQSTEP .... 50 MHz
   POWERLEVEL .... -8 dBm

4. On the spectrum analyzer, press (PRESET) and wait for the preset to finish. Set the spectrum analyzer controls as follows:

   (FREQUENCY) 300 (MHz)
   CF STEP AUTO MAN 50 (MHz)
   (SPAN) 10 (MHz)

   (Option 001 only: Press (AMPLITUDE), More 1 of 2, Amptd Units , then dBm .

   (AMPLITUDE) 0 ____ (-dBm)
   SCALE LOG LIN (LOG) 1 (dB)
   (BW) 1 (MHz)
   VI5 BW AUTO #AN 3 (kHz)

5. On the spectrum analyzer, press (PEAK SEARCH], (MKR FCTN), then MK TRACK ON OFF (ON).
6. Adjust the synthesized sweeper power level for a MKR-TRK amplitude reading of -14 dBm ±0.05 dB.
7. Set the sensor Cal Factor on the measuring receiver and then press (RATIO).
8. Set the synthesized sweeper CW to 50 MHz.
9. Set the spectrum analyzer Center frequency to 50 MHz by pressing (FREQUENCY) 50 (MHz).
10. Adjust the synthesized sweeper power level for a spectrum analyzer MKR-TRK amplitude reading of -14 dBm ±0.05 dB.
11. Set the sensor Cal Factor on the measuring receiver and record the negative of the power ratio here and in Table 1-14.

    Negative of Measuring Receiver Reading at 50 MHz ________ dB

12. Set the synthesized sweeper CW to 100 MHz.
13. Set the spectrum analyzer center frequency to 100 MHz by pressing [FREQUENCY) 100 (MHz).
14. Adjust the synthesized sweeper power level for a spectrum analyzer MKR-TRK amplitude reading of -14 dBm f0.05 dB.
15. Set the sensor Cal Factor on the measuring receiver and record the negative of the power ratio displayed on the measuring receiver in Table 1-14 as the Error Relative to 300 MHz.
16. On the synthesized sweeper, press (CW), and (⇧) (step-up key), and on the spectrum analyzer, press (FREQUENCY), and (⇧) (step-up key), to step through the remaining frequencies listed in Table 1-14. At each new frequency repeat steps 14 through 16, entering the power sensor's Cal Factor into the measuring receiver as indicated in Table 1-14.

Frequency Respons(≤50 MHz)

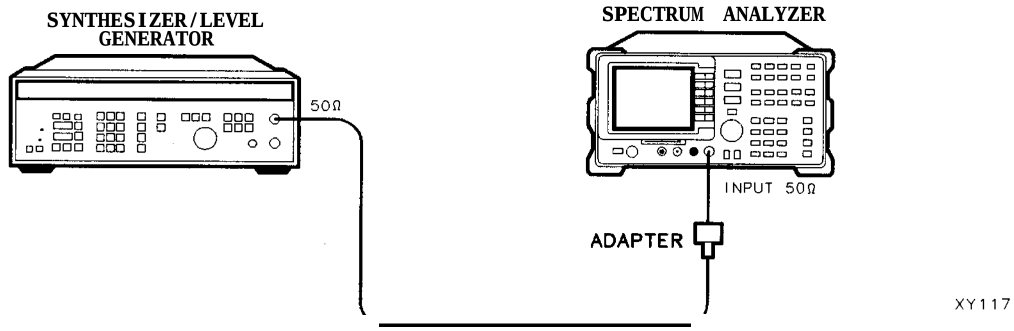


Figure 1-16. Frequency Response Test Setup (<50 MHz)

17. Using a cable, connect the synthesizer/level generator directly to the INPUT 50 Ω. Refer to Figure 1-16.

    Option 001 only: Using a 75 Ω cable, connect the synthesizer/level generator from the 75 Ω OUTPUT to the INPUT 75 Ω and set the 50-75 Ω switch to the 75 Ω position.

    Set the synthesizer/level generator controls as follows:

    FREQUENCY .... 50 MHz
    AMPTLITUDE .... -15dBm
    AMPTD INCR. .... 0.05 dB

18. On the spectrum analyzer press the following keys:

    (SPAN) 10 (MHz)
    (FREQUENCY) 50 [MHz)
    (PEAK SEARCH)
    (MKR FCTN) MK TRACK ON OFF (ON)
    (SPAN) 100 (kHz)

    Wait for AUTO ZOOM to finish, then press the following spectrum analyzer keys:

    (BW) 3 (kHz)
    VID BW AUTO MAN 1 (kHz)

19. Adjust the synthesizer/level generator Amplitude until the MKR-TRK reads -14 dBm. This corresponds to the amplitude at 50 MHz recorded in step 11. Record the synthesizer/level generator amplitude below.

    Amplitude Setting (50 MHz) ________ dBm

20. On the spectrum analyzer, press MARKER A , (MKR FCTN), then MK TRACK ON OFF (ON).
21. Set the synthesizer/level generator frequency to 20 MHz.
22. On the spectrum analyzer, press the following keys:

    (FREQUENCY)
    CF STEP AUTO MAN 30 (MHz)
    (FREQUENCY)
    (⇩) (step-down key)

23. Adjust the synthesizer/level generator amplitude for a MKR Δ-TRK amplitude reading of 0.00 ±0.05 dB. Record this amplitude setting in Table 1-15 in Column 2 at 20 MHz.
24. Repeat steps 21 through 23 for each of the frequencies listed in Table 1-15. Change the spectrum analyzers's center frequency step size to the relative frequency change for each new frequency (for example, use 10 MHz CF STEP size when changing from 20 MHz to 10 MHz).

    Option 001 only: Do not test below 1 MHz.

    When measuring the 50 kHz center-frequency flatness and below, there will be two signals on screen, the LO feedthrough and the signal from the synthesizer/level generator. Ensure that the marker is on the signal from the synthesizer/level generator (to the right of the LO feed through).
25. For each of the frequencies in Table 1-15, subtract the synthesizer/level generator Amplitude Reading (column 2) from the synthesizer/level generator Amplitude setting (50 MHz) recorded in step 19. Record the result as the Response Relative to 50 MHz (column 3) in Table 1-15.
26. Add to each of the Response Relative to 50 MHz entries in Table 1-15 the measuring receiver Reading at 50 MHz recorded in step 11. Record the results as the Response Relative to 300 MHz (column 4) in Table 1-15.
27. *Option 001 only:* Starting with the error at 50 MHz, subtract Column 4 (System Error) to Column 2 (Error Relative to 300 MHz) and record the result in Column 5 (Corrected Error Relative to 300 MHz).

Test Results

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

1. Enter the most positive number from Table 1-15, column 4: ________ dB
2. Enter the most positive number from Table 1-14, column 2: ________ dB
   (Option 001 only: Use column 5.)
3. Record the more positive of numbers from steps 1 and 2 in TR Entry 11-l of the performance test record.
4. Enter the most negative number from Table 1-15, column 4: ________ dB
5. Enter the most negative number from Table 1-14, column 2: ________ dB
   (Option 001 only: Use column 5.)
6. Record the more negative of numbers from steps 4 and 5 in TR Entry 1 l-2 of the performance test record.
7. Subtract the results of step 6 from the results of step 3. Record this value in TR Entry 11-3 of the performance 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.

11. Frequency ‘Response

Table 1-14. Frequency Response Errors Worksheet

Column 1 Frequency (MHz)	Column 2 Error Relative to 300 MHz (dB)	Column 3 Sensor CAL FACTOR Frequency (GHz)	Column 4 System Error (dB)	Column 5 (*Option* 001) Corrected Error Relative to 300 MHz (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		

Table 1-14. Frequency Response Errors Worksheet (continued)

Column 1 Frequency (MHz)	Column 2 Error Relative to 300 MHz (dB)	Column 3 Sensor CAL FACTOR Frequency (GHz)	Column 4 System Error (dB)	Column 5 *(Option 001)* Corrected Error Relative to 300 MHz (dB)
1400	______	1.0	______	______
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 1-15. Frequency Response (<50 MHz) Worksheet

Column 1 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	______	______	______
9 kHz	______	______	______

12. Other Input Related Spurious Responses

A synthesized source and the spectrum analyzer are set to the same frequency and the amplitude of the source is set to -10 dBm. A marker-amplitude reference is set on the analyzer. The source is then tuned to several different frequencies which should generate image responses. At each source frequency, the source amplitude is set to -10 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
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 Option 001

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

Caution Use only 75 Ω cables, connectors, or adapters on the 75 Ω input of an Option 001 or damage to the input connector will occur.

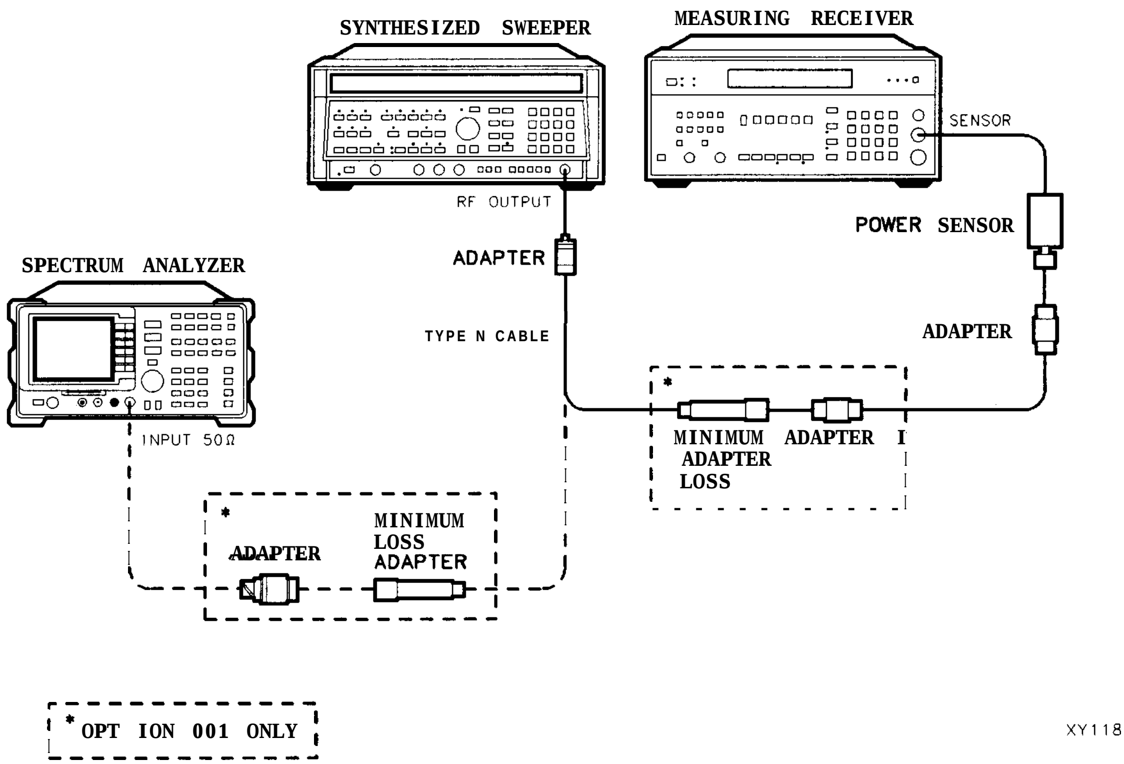


Figure 1-17. Other Input Related Spurious Test Setup

Procedure

1. Zero and calibrate the measuring receiver and the power sensor in log mode so that power is read out in dBm. Enter the power sensor's 542.8 MHz Cal Factor into the measuring receiver.

   Option 001 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 . . . . -10 dBm
   Option 001 only: POWER LEVEL . . . . -14.3 dBm

3. Connect the equipment as shown in Figure l-17. Connect the output of the synthesizer to the power sensor using adapters.

   Option 001 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 -10 dBm ±0. 1 dB reading on the measuring receiver.
5. On the synthesized sweeper, press SAVE 1.
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 – 10 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 – 10 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.

    Option 001 only: Use the minimum loss adapter and 75 Ω adapter as shown in Figure 1-17.
14. On the spectrum analyzer, press (PRESET) and wait for the preset to finish then set the controls as follows:

    (FREQUENCY) 500 (MHz)
    (SPAN) 10 (MHz)
    (AMPLITUDE) 0 (–dBm)

    Option 001 only: Press (AMPLITUDE), More 1 of 2, Amptd Units, then 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 1-16, 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 1148.8 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 1-16 as the Actual MKR ΔAmplitude.

       The Actual MKR Δ Amplitude should be less than the Maximum MKR Δ Amplitude listed in the table below.

    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 1-16. Image Responses Worksheet

'Synthesized Sweeper CW Frequency	Actual MKR A Amplitude (dBc)	Maximum MKR A Amplitude (dBc)
542.8 MHz		-55
1142.8 MHz		-55

17. Record the Maximum MKR A Amplitude from Table 1-16 as TR Entry 12-1 in the performance test record.

13. Spurious Response

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 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 SO1 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 TO1 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 TO1 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.

It is only necessary to perform "Part 1: Second Harmonic Distortion, 30 MHz" for operation verification.

Equipment Required

Synthesizer/level generator
Synthesized sweeper
Measuring receiver (used as a power meter)
Power sensor, 100 kHz to 1800 MHz
Low pass filter, 50 MHz
Directional bridge
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)
Cable, BNC, 120 cm (48 in) (2 required)

Additional Equipment for Option 001

Power sensor
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 the 75 Ω input of an Option 001 or damage to the input connector will occur.

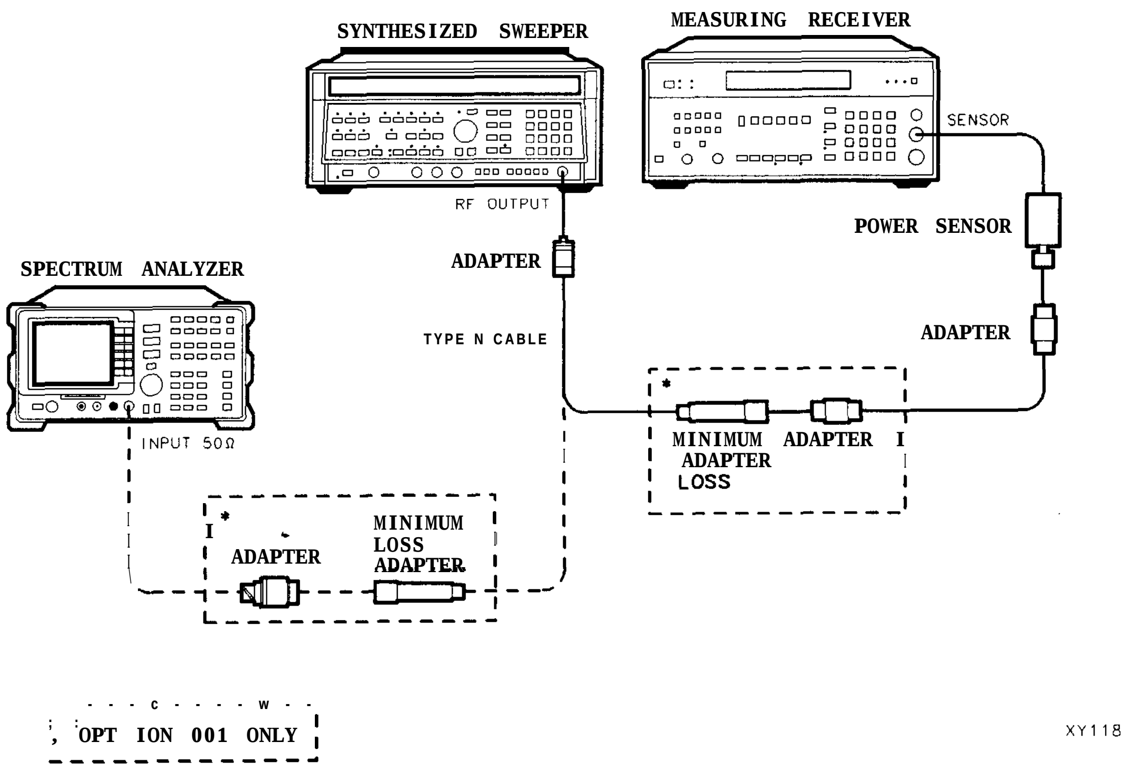


Figure 1-18. Second Harmonic Distortion Test Setup, 30 MHz

Procedure

Part 1: Second Harmonic Distortion, 30 MHz

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

   FREQUENCY . . . . 30 MHz
   AMPLITUDE . . . . −10 dBm
   AMPLITUDE *(Option 001)* . . . . -4.3 dBm

2. Connect the equipment as shown in Figure l-18.

   Option 001 only: Connect the minimum loss adapter between the LPF and INPUT 75 Ω.

3. Press (PRESET) on the spectrum analyzer and wait for the preset to finish then set the controls as follows:

   (FREQUENCY) 30 (MHz)
   (SPAN) 10 (MHz)

   Option 001 only: Press (AMPLITUDE), Mare 1 of 2, Amptd Units , then dBm .

   (AMPLITUDE) 10 (−dBm)
   (PEAK SEARCH)
   (MKR FCTN) MK TRACK ON OFF (ON)
   (SPAN) 1 (MHz)
   (MKR FCTN) MK TRACK ON OFF (OFF)
   (BW) 30 (kHz)

4. Adjust the synthesizer/level generator Amplitude to place the peak of the signal at the reference level (-10 dBm).

5. Set the spectrum analyzer controls as follows:

   (BW) 10 (kHz)
   VID BW AUTO MAN 300 (Hz)

6. Wait for two sweeps to finish, then press the spectrum analyzer keys as follows:

   (PEAK SEARCH) MARKER Δ
   (FREQUENCY)
   CF STEP AUTO MAN 30 [MHz)
   (FREQUENCY)

7. Press (⇑) (step-up key) on the spectrum analyzer to step to the second harmonic at *60* MHz. Press (PEAK SEARCH). Record the MKR A Amplitude reading as TR Entry 13-l in the performance test record.

Part 2: Third Order Intermodulation Distortion, 50 MHz

Perform this procedure for calibrating the spectrum analyzer. It is not necessary to perform this procedure for operation verification.

Caution — Use only 75 Ω cables, connectors, or adapters on the 75 Ω input of an Option 001 or damage to the input connector will occur.

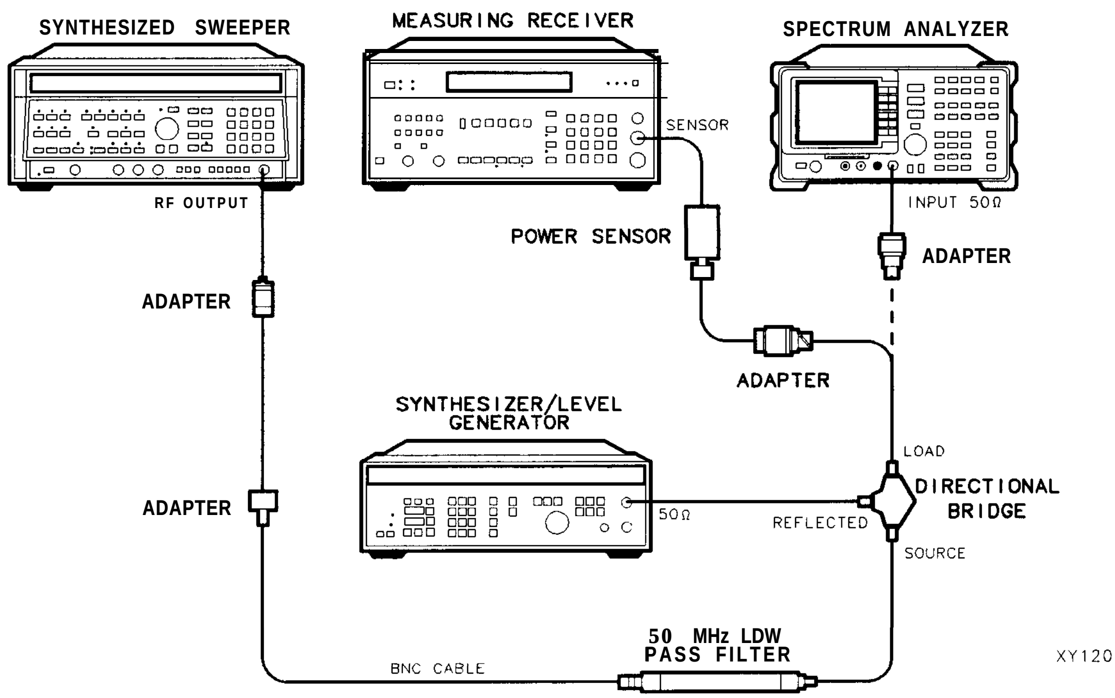


Figure 1-19. Third Order Intermodulation Distortion Test Setup

1. Zero and calibrate the measuring receiver and the power sensor in log mode so the power reads out in dBm. Enter the power sensor's 50 MHz Cal Factor into the measuring receiver.

   Option 001 only: Calibrate the 75 Ω power sensor.

2. Connect the equipment as shown in Figure l-19 with the output of the directional bridge connected to the power sensor.

   Option 001 only: 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. Use the 75 Ω power sensor with the 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.

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

   POWERLEVEL .... -6dBm
   CW .... 50 MHz
   RF .... OFF

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

   FREQUENCY .... 50.050 MHz
   AMPLITUDE .... -6dBm
   50 Ω/75 Ω switch .... 75 Ω (no RF output)

5. On the spectrum analyzer, press (PRESET) and wait until the preset is finished then set the controls as follows:

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

   Option 001 only: Press (AMPLITUDE), More 1 of 2, Amptd Units, then dBm .

   (AMPLITUDE) 0 (-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 the RF to ON. Adjust the power level until the measuring receiver reads -12 dBm f0.05 dB.

7. Disconnect the power sensor from the directional bridge. Connect the directional bridge directly to the spectrum analyzer RF INPUT using an adapter and *not* a cable.

   Option 001 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 synthesizer/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. Set the controls as follows:

    (BW) 1 (kHz)
    VID BW AUTO MAN 100 (Hz)

11. Press (PEAK SEARCH), (DISPLAY), then DSP LINE ON OFF (ON). Set the display line to a value 54 dB below the current reference level setting.

12. 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.

13. If the distortion products can be seen, proceed as follows:
    a. On the spectrum analyzer, press (SGL SWP), wait for completion of the sweep, then press [PEAK SEARCH] and MARKER Δ.
    b. Repeatedly press NEXT PEAK until the active marker is on the highest distortion product.
    c. Record the MKR Δ amplitude reading as TR Entry 13-2 in the performance test record. The MKR Δ reading should be less than -54 dBc.
14. If the distortion products cannot be seen, proceed as follows:
    a. On both the synthesized sweeper and the synthesizer/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 (SGL SWP), (PEAK SEARCH), then 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 13-2 in the performance test record. The MKR Δ reading should be less than -54 dBc.

14. Gain Compression

Gain Compression is measured by applying two signals, separated by 3 MHz. 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.

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
Directional bridge
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)
Cable, BNC, 120 cm (48 in) (2 required)

Additional Equipment for Option 001

Power sensor, 75 Ω
Adapter, Type N (f) to BNC (m), 75 Ω
Adapter, BNC (m) to BNC (m), 75 Ω

Caution Use only 75 Ω cables, connectors, or adapters on the 75 Ω input of an Option 001 or damage to the input connector will occur.

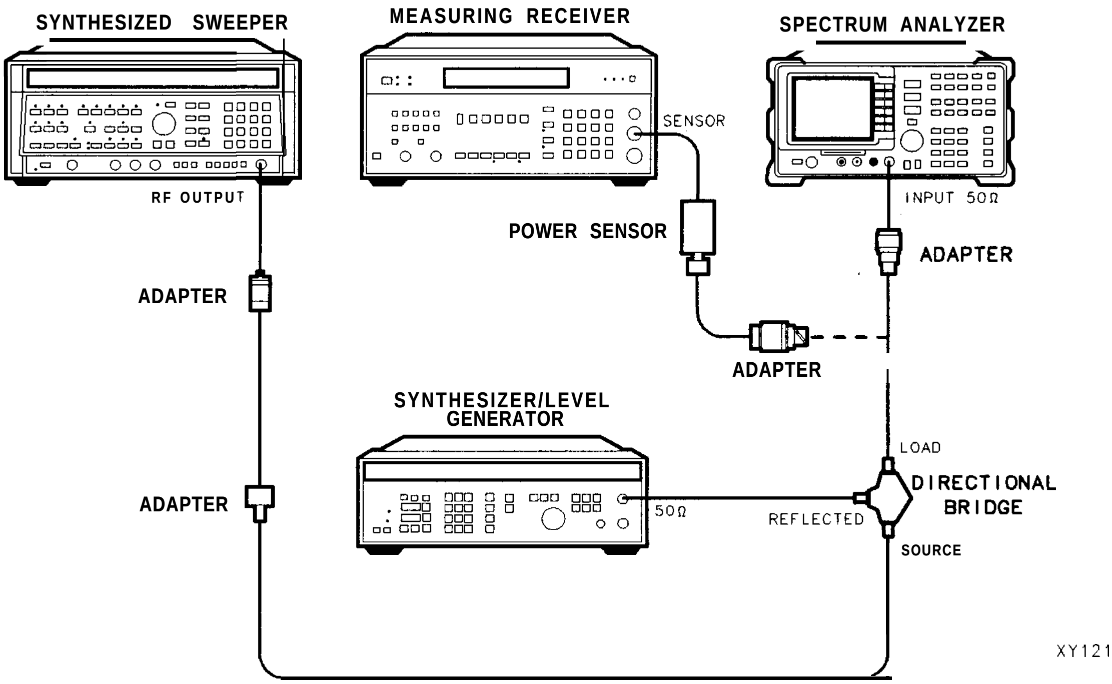


Figure l-20. Gain Compression Test Setup

Procedure

1. Zero and calibrate the measuring receiver and the power sensor in log mode so the power reads out in dBm. Enter the power sensor's 50 MHz Cal Factor into the measuring receiver.

   Option 001 only: Calibrate the 75 Ω power sensor.

2. Connect the equipment as shown in Figure l-20, with the load (reflected) of the directional coupler connected to the power sensor.

   Option 001 only: 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. 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.

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

   CW .... 53 MHz
   POWERLEVEL .... 6 dBm

4. Set the synthesizer/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) and wait for the preset to finish then set the controls as follows:

   (FREQUENCY) 5C (MHz)
   (SPAN) 20 (MHz)

   Option 001: 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 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.

7. 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 and *not* a cable.

   Option 001 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]10 (MHz)

   Wait for the AUTO ZOOM message to disappear.

9. On the synthesizer/level generator, adjust the Amplitude to place the signal 1 dB below the spectrum analyzer reference level.

10. On the spectrum analyzer, press (SGL SWP), (PEAK SEARCH), then MARKER A .

11. On the synthesized sweeper, set RF to ON.

12. On the spectrum analyzer, press (SGL SWP), (PEAK SEARCH), 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.

13. Read the MKR A amplitude and record as TR Entry 14-1 in the performance test record. The absolute value of this amplitude should be less than or equal to 0.5 dB.

15. Displayed Average Noise Level

This 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 (PRESET).

The related adjustment for this procedure is the "Frequency Response Adjustment."

Equipment Required

Termination, 50 Ω
Adapter, Type N (m) to BNC (f)
Cable, BNC, 23 cm (9 in)

Additional Equipment for Option 001

Termination, 75 Ω Type N (m)
Adapter, 75 Ω, Type N (f) to BNC (m)
Cable, BNC, 75 Ω, 30 cm (12 in)

Caution Use only 75 Ω cables, connectors, or adapters on the 75 Ω input of an Option 001 or damage to the input connector will occur.

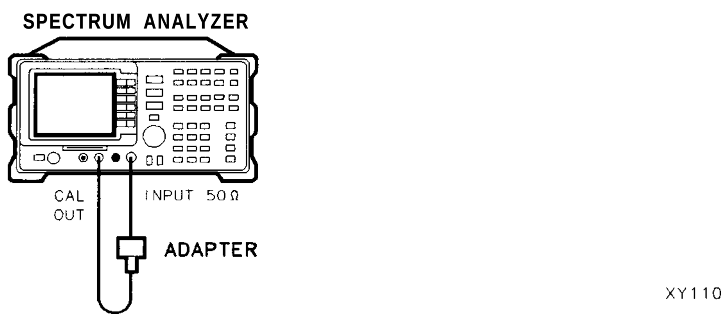


Figure 1-21. Displayed Average Noise Level Test Setup

Procedure

1. Connect a cable from the CAL OUT to the INPUT 50 Ω of the spectrum analyzer as shown in Figure 1-21.

   Option 001 only: Use a 75 Ω cable and omit the adapter.

   Press (PRESET) and wait for the preset to finish. Set the controls as follows:

   (FREQUENCY) 300 (MHz)
   (SPAN) 10 (MHz)
   (AMPLITUDE) 20 (−dBm)

   Option 001 only: (AMPLITUDE) REF LVL 28.75 (+dBm)

   ATTEN AUTO MAN 0 (dB)

2. 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. Set the controls as follows:

   (BW)
   VID BW AUTO MAN 30 (Hz)
   (MKR FCTN) MK TRACK ON OFF (OFF)

3. Press (SGL SWP) and wait for completion of a new sweep, then press the following spectrum analyzer keys:

   (PEAK SEARCH)
   (AMPLITUDE) More 1 af 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 Option 001:* If the marker reads 26.4 dBmV, enter +2.35 dBmV (28.75 dBmV − 26.4 dBmV = 2.35 dBmV).

   REF LVL OFFSET ________ dB

   Option 001: REF LVL OFFSET ________ dBmV

4. 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.

   Option 001 only: Use the 75 Ω termination.

400 kHz

If testing a spectrum analyzer equipped with Option 001, omit steps 5 through 9 and proceed to step 10.

5. Press the following spectrum analyzer keys:

   (AUTO COUPLE)
   VID BW AUTO MAN (AUTO)
   (FREQUENCY) 0 (Hz)
   (SPAN) 10 (MHz)
   (AMPLITUDE) 10 (−dBm)
   (TRIG) SWEEP CONT SGL

6. 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)
   (FREQUENCY)

7. Adjust the center frequency until the LO feedthrough peak is on the left-most graticule line. Set the controls as follows:

   (SPAN) 0 (Hz)
   (AMPLITUDE) 50 (−dBm)
   (BW) 1 (kHz)
   VID BW AUTO MAN 30 (Hz)
   (SWEEP) SWP TIME AUTO MAN 5 (sec)

   Press (TRACE), More 1 of 3, DETECTOR SMP PK (SMP), then (SGL SWP).

   Wait for 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 15-1 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:

    (AUTO COUPLE)
    RES BW AUTO MAN (AUTO)
    VID BW AUTO RAN (AUTO)
    (FREQUENCY) 0 (Hz)
    (SPAN) 10 (MHz)
    (AMPLITUDE) 10 (-dBm)
    Option 001 only: (AMPLITUDE) REF LVL 35 (-dBm)
    (TRIG) SWEEP CONT SGL (CONT)

11. 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. Press (MKR FCTN) then MK TRACK ON OFF (OFF).

12. Press (FREQUENCY) and adjust the center frequency until the LO feedthrough peak is on the left-most graticule line. Set the controls as follows:

    (SPAN) 50 (kHz)
    (AMPLITUDE) 50 (-dBm)
    Option 001 only: (AMPLITUDE) REF LVL 1.2 (-dBm)
    (BW)
    VID BW AUTO MAN 30 (Hz)

13. Press (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 15-2 in the performance test record as the noise level at 1 MHz. The average noise level should be less than the specified limit.

1 MHz to 1.5GHz

16. 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)

17. Adjust the spectrum analyzer start frequency setting, if necessary, to place the LO feedthrough just off-screen to the left.
18. 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).
19. Press (PEAK SEARCH) and record the MKR frequency as the Measurement Frequency in Table 1-17 for 1 MHz to 1.5 GHz.
20. 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) CENTER FREQ

    Set the center frequency to the measurement frequency recorded in Table 1-17 for 1 MHz to 1.5 GHz. Set the controls as follows:

    (BW) 1 (kHz)
    VID BW AUTO MAN 30 (Hz)

21. Press (SGL SWP).

    Wait for the 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 trace noise, ignoring any residual responses. Refer to the Residual Responses verification test for any suspect residuals.
22. Record the display line amplitude setting as TR Entry 15-3 in the performance test record. The average noise level should be less than the specified limit.

1.5 GHz to 1.8 GHz

23. Press the following spectrum analyzer keys:

    (AUTO COUPLE)
    RES BW AUTO MAN (AUTO)
    VID BW AUTO MAN (AUTO)
    (SPAN) 10 (MHz)
    (AMPLITUDE) 50 (−dBm)
    Option 001 only: (AMPLITUDE) REF LVL 1.2 (−dBm)
    (TRIG) SWEEP CONT SGL (CONT)
    (FREQUENCY)
    START FREQ 1.5 (GHz)
    STOP FREQ 1.8 (GHz)

24. Repeat steps 18 through 21 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 done at or below 1.8 GHz.

Table 1-17. Displayed Average Noise Level

Frequency Range	Measurement Frequency	Displayed Average Noise Level (dBm or dBmV) TR Entry	Specification
400 kHz	400 kHz	15-1	-115 dBm
1 MHz	1 MHz	15-2	-115 dBm (Option 001: ≤-63 dBmV)
1 MHz to 1.5 GHz		15-3	-115 dBm (Option 001: <-63 dBmV)
1.5 GHz to 1.8 GHz		15-4	-113 dBm (Option 001: ≤−61 dBmV)

25. Record the display line amplitude setting as TR Entry 15-4 in the performance test record. The average noise level should be less than the specified limit.

16. Residual Responses

The spectrum analyzer input is terminated and the spectrum analyzer is swept from 150 kHz above the LO to 1 MHz. Then the spectrum analyzer is swept in 50 MHz spans throughout the 1 MHz to 1.8 GHz range. Any responses above the specification are noted.

There are no related adjustment procedures for this performance test.

Equipment Required

Termination, 50 Ω

Additional Equipment for Option 001

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

Caution Use only 75 Ω cables, connectors, or adapters on the 75 Ω input of an Option 001 or damage to the input connector will occur.

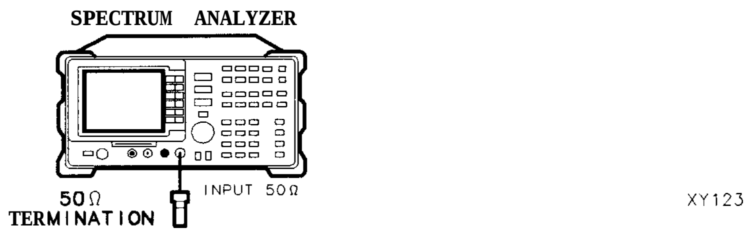


Figure 1-22. Residual Response Test Setup

Procedure

150 kHz to 1 MHz

1. Connect the termination to the spectrum analyzer input as shown in Figure 1-22.

   Option 001 only: Use the 75 Ω termination with the adapter, skip steps 2 through 4, and proceed with step 5.

2. Press (PRESET) on the spectrum analyzer and wait for the preset 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) and MK TRACK ON OFF (OFF).

3. Adjust the center frequency until the LO feedthrough peak is on the left-most vertical graticule line. Press the following spectrum analyzer keys as follows:

   (PEAK SEARCH)
   (MKR)
   MARKER Δ 150 (kHz)
   MARKER NORMAL
   (AMPLITUDE) 0 ____ (−dBm)
   ATTEN AUTO MAN 0 (dB)
   (BW) 3 (kHz)
   VID BW AUTO MAN 1 (kHz)
   (DISPLAY)
   DSP LINE ON OFF 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. 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 1-18.

1 MHz to 1.8GHz

5. Press (PRESET) on the spectrum analyzer and wait for the preset to finish. Set the controls as follows:

   (FREQUENCY) 25 (MHz)
   (SPAN) 50 (MHz)
   (AMPLITUDE) 60 (−dBm)
   Option 001 only: (AMPLITUDE) REF LVL 11.25 (−dBm)
   ATTEN AUTO MAN 0 (dB)

6. Press (FREQUENCY) and 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. Set the controls as follows:

   CF STEP AUTO MAN 45 (MHz)
   (BW) 10 (kHz)
   VID BW AUTO MAN 3 (kHz)
   (DISPLAY)
   DSP LINE ON OFF 90 (−dBm)

   Option 001 only: Press (DISPLAY), DSP LINE ON OFF , then 38 (−dBm)

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 1-18.

8. Press (FREQUENCY), (⇑) (step-up key), to step to the next frequency and repeat step 7.
9. Repeat steps 7 and 8 until the range from 1 MHz to 1.8 GHz has been checked. This requires 40 additional frequency steps. The test for this band requires about 6 minute 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 within the specification limits.
10. Record the highest residual from Table 1-18 as TR Entry 16-1 in the performance test record. If no residuals are found, then record N/A in the performance test record.

Table 1-18. Residual Responses Above Display Line

Frequency (MHz)	Amplitude (dBm)
________	________
________	________
________	________
________	________
________	________

17. Absolute Amplitude, Vernier, and Power Sweep Accuracy

This procedure is only for spectrum analyzers equipped with 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 then set for RATIO mode so that future power level readings are in dB relative to the power level at -10 dBm (Option 011: + 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 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 the "Modulator Offset and Gain Adjustment."

Equipment Required

Measuring receiver
Power sensor
Cable, Type N, 62 cm (24 in)

Additional Equipment for Option 011

Power sensor
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.

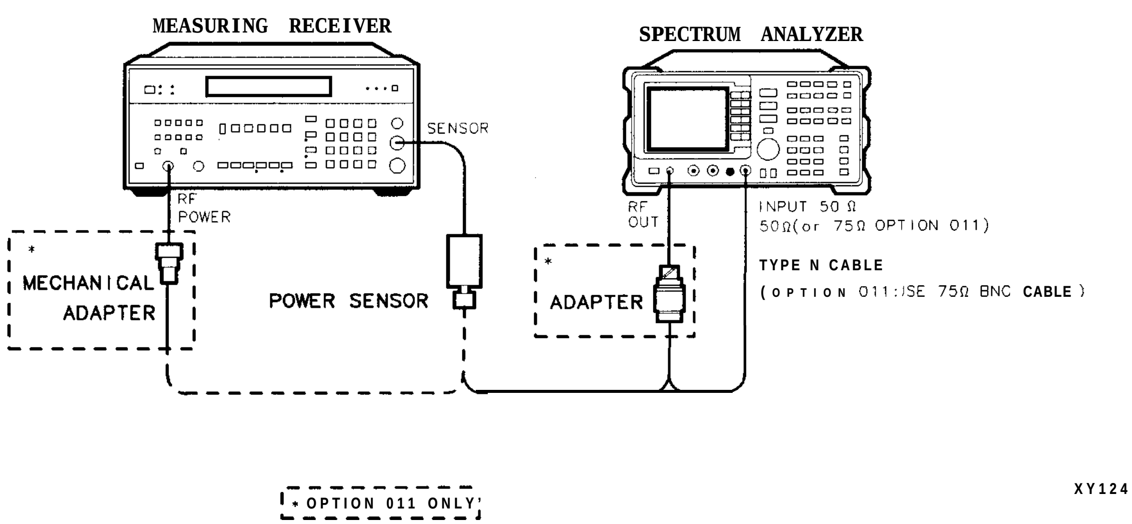


Figure 1-23. Absolute Amplitude, Vernier, and Power Sweep Accuracy Test Setup

Procedure

1. Connect the Type N cable between the RF OUT 50 Ω and INPUT 50 Ω connectors on the spectrum analyzer. See Figure l-23.

   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 and set the controls as follows:

   (FREQUENCY) 300(MHz)
   (SPAN) 0 (Hz)

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

   (MKR)
   (AUX CTRL) Track Gen
   SRC PWR ON OFF (ON) 5 (-dBm)
   Option 011 only: SRC PWR ON OFF (ON) 38 (+dBm)

4. On the spectrum analyzer, press TRACKING PEAK . Wait for the PEAKING message to disappear.

5. Zero and calibrate the measuring receiver/power sensor combination in log mode (power levels readout in dBm). 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 power sensor to the RF OUT 50 Ω as shown in Figure l-23.

   Option 011 only: Disconnect the BNC cable from the RF OUT 75 Ω and connect the power sensor to the RF OUT 75 Ω using an adapter.

7. On the spectrum analyzer, press 10 (-dBm), (SGL SWP).

   Option 011 only: 38.8 (+dBm) (+38.8 dBmV).

8. Subtract -10 dBm from the power level displayed on the measuring receiver and record the result in the performance test record as TR Entry 17-1.

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.

   Option 011 only: +38.8 dBmV output power level setting.

10. Set the SRC POWER to the settings indicated in Table 1-19. At each setting, record the power level displayed on the measuring receiver.

11. Calculate the Vernier Accuracy by subtracting the SRC POWER setting and 10 dB from the Measured Power Level for each SRC POWER setting in Table 1-19.

    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 38.8 dB to each SRC POWER setting in Table l-19.

    Vernier Accuracy = Measured Power Level – SRC POWER – 38.8 dB.

12. Locate the most positive and most negative Absolute Vernier Accuracy values in Table 1-19 and record as TR Entries 17-2 and 17-3 in the performance test record.

17. Absolute Amplitude, Vernier, and Power Sweep Accuracy

13. Calculate the power sweep accuracy by subtracting the Negative Vernier Accuracy recorded in step 12 from the Positive Vernier Accuracy recorded in step 12. Record the result in the performance test record as TR Entry 17-4.

Power Sweep Accuracy = Positive Vernier Accuracy – Negative Vernier Accuracy

Table 1-19. Vernier Accuracy Worksheet

SRC POWER Setting		Measured Power Level	Vernier Accuracy	Measurement Uncertainty
Opt 011, dBmV	Opt 010, dBm	(dB)	(dB)	(dB)
+ 38.8	-10	0 (Ref)	0 (Ref)	0
+ 39.8	- 9			f0.033
+40.8	- 8			f0.033
+41.8	- 7			f0.033
+42.8	- 6			f0.033
+ 37.8	- 5			f0.033
+ 36.8	- 4			f0.033
+ 35.8	- 3			±0.033
+ 34.8	- 2			f0.033
+ 33.8	- 1			f0.033
+32.8	0			f0.033
+31.8	-1.5			f0.033
+ 30.8	-14			f0.033
+29.8	-13			f0.033
+28.8	-12			f0.033
+27.8	-11			f0.033

18. Tracking Generator Level Flatness

This procedure is only for spectrum analyzers equipped with 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 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 the "Modulator Offset and Gain Adjustment."

Equipment Required

Measuring receiver
Power sensor
Cable, Type N, 62 cm (24 in)

Additional Equipment for Option 011

Power sensor
Adapter, Type N (f) to BNC (m), 75 Ω
Adapter, mechanical, Type N, 50 Ω (m) to 75 Ω (f)
Cable, BNC, 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.

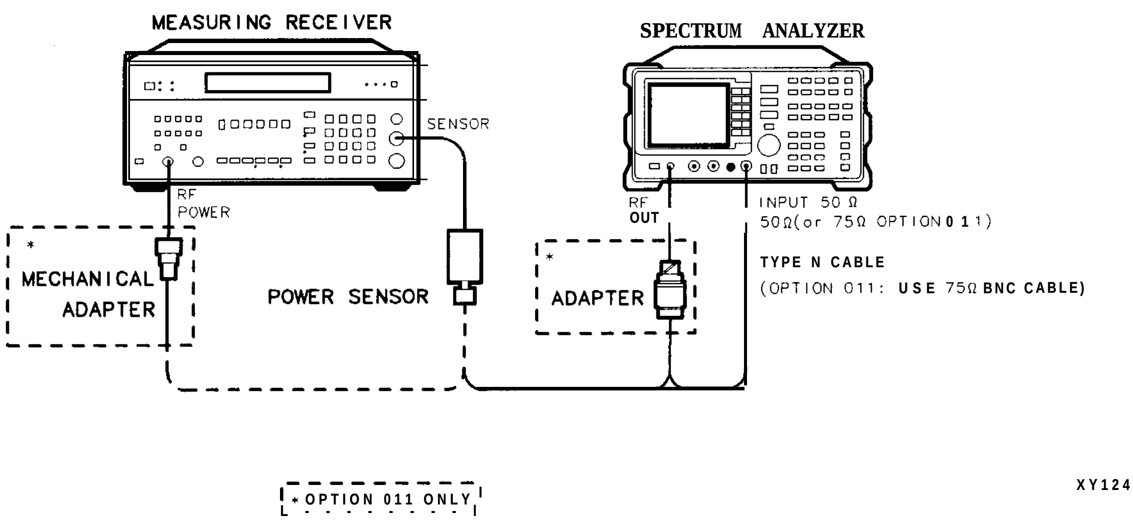


Figure l-24. Tracking Generator Level Flatness Test Setup

Procedure

1. Connect the Type N cable between the RF OUT 50 Ω and INPUT 50 Ω connectors on the spectrum analyzer. See Figure l-24.

   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. Set the controls as follows:

   (FREQUENCY) 0 (Hz)
   (SPAN) 15 (MHz)

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. Press (FREQUENCY), FREQ OFFSET. Enter the negative of the MKR-TRK frequency displayed in the upper right-hand corner of the display. For example, if the MKR-TRK frequency is 132 kHz, enter -132 kHz.

   Set the spectrum analyzer controls as follows:

   (MKR FCTN) MK TRACK ON OFF (OFF)
   (SPAN) ZERO SPAN
   (BW) 1 (MHz)

4. Set the spectrum analyzer controls as follows:

   (FREQUENCY) 300 (MHz)
   CF STEP AUTO MAN 100 (MHz)
   (SPAN) 0 (Hz)

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

   (MKR)
   (AUX CTRL) Track Gen
   SRC PWR ON OFF 5 (−dBm)

   Option 011 only: SRC PWR ON OFF 38 (+dBm) (+ 38 dBmV).

6. On the spectrum analyzer, press TRACKIWG PEAK . Wait for the PEAKING message to disappear.

7. Zero and calibrate the measuring-receiver/power-sensor combination in log mode (power levels readout in dBm). Enter the power sensor's 300 MHz Cal Factor into the measuring receiver.

8. Disconnect the Type N cable from the RF OUT 50 Ω and connect the power sensor to the RF OUT 50 0.

   Option 011 only: Disconnect the BNC cable from the RF OUT 75 Ω and connect the power sensor to the RF OUT 75 Ω using an adapter.

9. On the spectrum analyzer, press (AUX CTRL), Track Gen , SRC PWR ON OFF , 10 (−dBm), then (SGL SWP).

   Option 011 only: SRC PWR ON OFF 38.8 (+dBm).

10. Press RATIO on the measuring receiver. The measuring receiver readout is now for power levels relative to the power level at 300 MHz.
11. Set the spectrum analyzer center frequency to 100 kHz then press (SGL SWP).

    Option 011 only: Set the spectrum analyzer center frequency to 1 MHz then press (SGL SWP).
12. Enter the appropriate power sensor Cal Factor into the measuring receiver as indicated in Table l-20.
13. Record the power level displayed on the measuring receiver as the Level Flatness in Table l-20.
14. Repeat steps 11 through 13 above to measure the flatness at each center frequency setting listed in Table l-20. 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.
15. Locate the most positive Level Flatness reading in Table l-20 for the indicated frequency ranges and record as the Maximum Flatness.

Option 010:

Maximum Flatness, 100 kHz____________dB (TR Entry 18-l)

Maximum Flatness, 300 kHz to 5 MHz____________dB (TR Entry 18-2)

Maximum Flatness, 10 MHz to 1800 MHz____________dB (TR Entry 18-3)

Option 011:

Maximum Flatness, 1 MHz to 1800 MHz____________dB (TR Entry 18-1)

16. Locate the most negative Level Flatness reading in Table l-20 for the indicated frequency ranges as the Minimum Flatness.

Option 010:

Minimum Flatness, 100 kHz____________dB (TR Entry 18-4)

Minimum Flatness, 300 kHz to 5 MHz____________dB (TR Entry 18-5)

Minimum Flatness, 10 MHz to 1800 MHz____________dB (TR Entry 18-6)

Option 011:

Minimum Flatness, 1 MHz to 1800 MHz____________dB (TR Entry 18-2)

17. Press (PRESET) on the spectrum analyzer.

18. Tracking Generator Level Flatness

Table 1-20. Level Flatness Relative to 300 MHz Worksheet

Center Freq	Level Flatness (dB)	Cal Factor Freq (MHz)	Measurement Uncertainty (dB)	
			Option 010	Option 011
100 kHz*		0.1	+0.42/−0.45	N/A
300 kHz*		0.3	+0.28/−0.28	N/A
500 kHz*		0.3	+0.28/−0.28	N/A
1 MHz		1	+0.28/−0.28	+0.18/−0.39
2 MHz		3	+0.28/−0.28	+0.18/−0.39
5 MHz		3	+0.28/−0.28	+0.18/−0.39
10 MHz		10	+0.24/−0.24	+0.18/−0.39
20 MHz		30	+0.24/−0.24	+0.18/−0.39
50 MHz		50	+0.24/−0.24	+0.18/−0.39
100 MHz		100	+0.24/−0.24	+0.18/−0.39
200 MHz		300	+0.24/−0.24	+0.18/−0.39
300 MHz	0 (Ref)	300	0 (Ref)	0 (Ref)
400 MHz		300	+0.24/−0.24	+0.18/−0.39
500 MHz		300	+0.24/−0.24	+0.18/−0.39
600 MHz		300	+0.24/−0.24	+0.18/−0.39
700 MHz		1000	+0.24/−0.24	+0.18/−0.39
800 MHz		1000	+0.24/−0.24	+0.18/−0.39
900 MHz		1000	+0.24/−0.24	+0.18/−0.39
000 MHz		1000	+0.24/−0.24	+0.18/−0.39
100 MHz		1000	+0.24/−0.24	+0.18/−0.39
200 MHz		1000	+0.24/−0.24	+0.18/−0.39
300 MHz		1000	+0.24/−0.24	+0.18/−0.39
400 MHz		1000	+0.24/−0.24	+0.18/−0.39
500 MHz		2000	+0.24/−0.24	+0.18/−0.39
600 MHz		2000	+0.24/−0.24	+0.18/−0.39
700 MHz		2000	+0.24/−0.24	+0.18/−0.39
800 MHz		2000	+0.24/−0.24	+0.18/−0.39

These frequencies are tested on Option 010 spectrum analyzers only.

19. Harmonic Spurious Outputs

This procedure is only for spectrum analyzers equipped with 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 an microwave spectrum analyzer. The tracking generator is tuned to several 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

Microwave spectrum analyzer
Adapter, Type N (m) to BNC (f)
Cable, Type N, 62 cm (24 in)
Cable, BNC, 23 cm (9 in)

Additional Equipment for Option 011

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

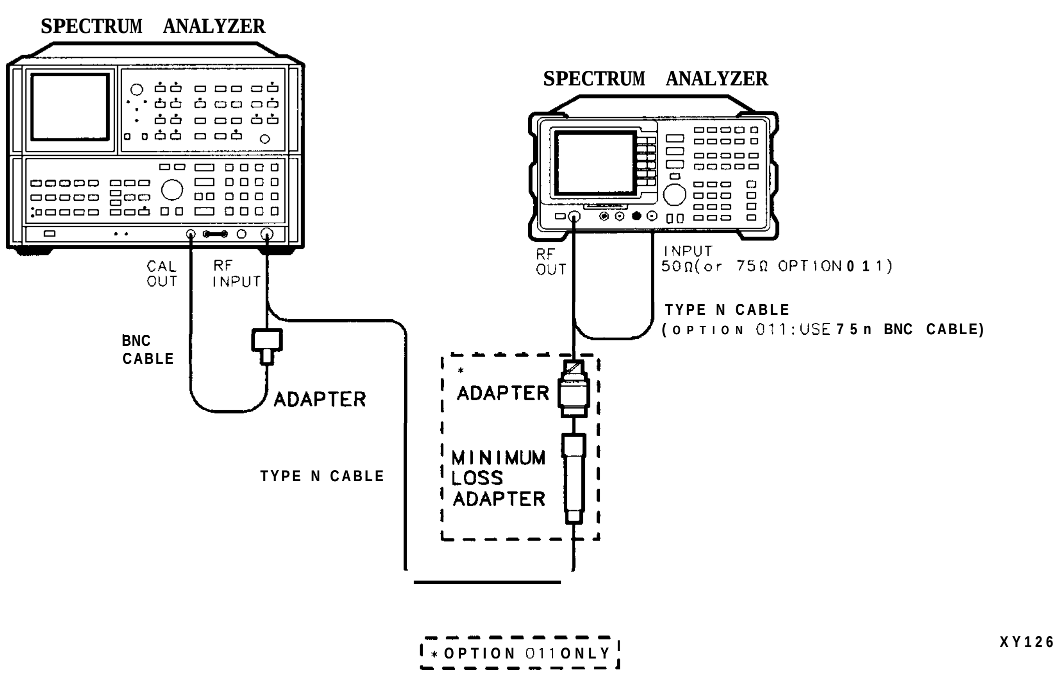


Figure 1-25. Harmonic Spurious Outputs Test Setup

19. Harmonic Spurious Outputs

Procedure

1. Connect the Type N cable between the RF OUT 50 Ω and INPUT 50 Ω connectors on the spectrum analyzer. See Figure l-25.

   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 and set the controls as follows:

   (FREQUENCY) 300 (MHz)
   (SPAN) 0 (Hz)

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

   (MKR)

   (AUX CTRL) Track Gen

   SRC PWR ON OFF 5 (-dBm)

   Option 011 only: SRC PWR ON OFF 42 (+dBm) (+ 42 dBmV).

4. On the spectrum analyzer, press TRACKING PEAK . Wait for the PEAKING message to disappear.

5. On the spectrum analyzer, press 0 (+dBm), (FREQUENCY), 10 (MHz), then (SGL SWP).

   Option 011 only: 42.8 (+dBm).

   It is only necessary to perform step 6 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.

6. Perform a front-panel calibration of the microwave spectrum analyzer as follows:

   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.

7. Connect the Type N cable from the tracking generator output to the microwave spectrum analyzer RF INPUT. See Figure l-25.

   Option 011 only: Use the minimum loss adapter and Type N (f) to BNC (m) adapter.

8. Set the microwave spectrum analyzer controls as follows:

   CENTER FREQUENCY .... 10 MHz
   SPAN .... 10 MHz
   REFERENCE LEVEL .... +5 dBm
   RESBW 30kHz
   LOGdB/DIV .... 10 dB

9. On the microwave spectrum analyzer, do the following:
   a. Press (PEAK SEARCH) and (SIGNAL TRACK) (ON). Wait for the signal to be displayed at center screen.
   b. Press (PEAK SEARCH), (MKR -> CF STEP), (Δ), and (SIGNAL TRACK) (OFF).
   c. Press (CENTER FREQUENCY), (⇧) (step-up key) to tune to the second harmonic. Press (PEAK SEARCH). Record the marker amplitude reading in Table 1-21 as the 2nd Harmonic Level for the 10 MHz Tracking Generator Output Frequency.
   d. Perform this step only if the tracking generator output frequency is less than 600 MHz. Press (CENTER FREQUENCY), (⇧) (step-up) key to tune to the third harmonic. Press (PEAK SEARCH). Record the marker amplitude reading in Table 1-21 as the 3rd Harmonic Level for the 10 MHz Tracking Generator Output Frequency.
   e. Press MARKER (OFF).
10. Repeat steps 8 and 9 above for the remaining Tracking Generator Output Frequencies listed in Table 1-21. Note that the spectrum analyzer CENTER FREQ is the same as the Tracking Generator Output Frequency,
11. Locate the most positive 2nd Harmonic Level in Table 1-21 and record as TR Entry 19-1 in the performance test record.
12. Locate the most positive 3rd Harmonic Level in Table 1-21 and record as TR Entry 19-2 in the performance test record.

Table 1-21. Harmonic Spurious Responses Worksheet

Tracking Generator Frequency	2nd Harmonic Level (dBc)	3rd Harmonic Level (dBc)	Measurement Uncertainty (dB)
10 MHz	______	______	+1.55/−1.80
100 MHz	______	______	+1.55/−1.80
300 MHz	______	______	+1.55/−1.80
850 MHz	______	N/A	+1.55/−1.80

20. Non-Harmonic Spurious Outputs

This procedure is only for spectrum analyzers equipped with 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 adjustment procedures for this performance test.

Equipment Required

Microwave spectrum analyzer
Adapter, Type N (m) to BNC (f)
Cable, Type N, 62 cm (24 in)
Cable, BNC, 23 cm (9 in)

Additional Equipment for Option 011

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

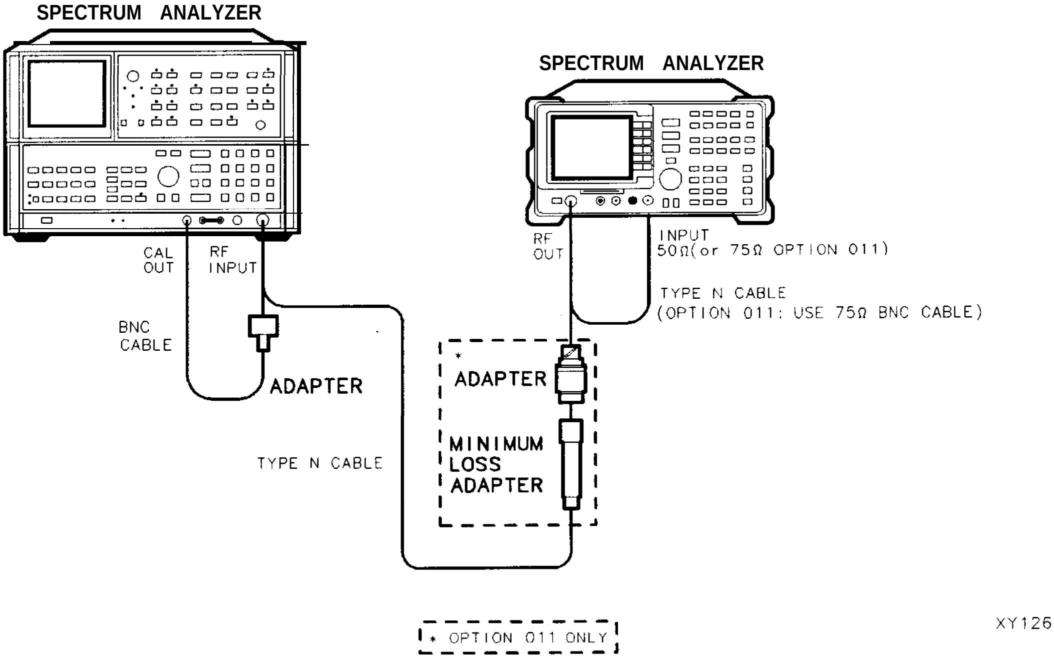


Figure l-26. Non-Harmonic Spurious Outputs Test Setup

Procedure

1. Connect the Type N cable between the RF OUT 50 Ω and INPUT 50 Ω connectors on the spectrum analyzer. See Figure l-26.

   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 and set the controls as follows:

   (FREQUENCY) 300 (MHz)
   (SPAN) 0 (Hz)
   (BW) 30 (MHz)

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

   (MKR)
   (AUX CTRL) Track Gen
   SRC PWR ON OFF 5 (−dBm)

   Option 011 only: SRC PWR ON OFF 38 (+dBm) (+38 dBmV).

4. On the spectrum analyzer, press TRACKING PEAK . Wait for the PEAKING message to disappear.

5. On the spectrum analyzer, press 0 (+dBm) then (SGL SWP).

   Option 011 only: 42.8 (+dBm).

   It is only necessary to perform step 6 if more than two 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.

6. Perform a front-panel calibration on the microwave spectrum analyzer as follows:

   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.

      Press (SHIFT), [FREQUENCY SPAN] to start the 30 second internal error correction routine.
   d. Press (SHIFT), [START FREQ] to use the error correction factors just calculated.

7. Connect the Type N cable from the tracking generator output to the microwave spectrum analyzer RF INPUT as shown in Figure l-26.

   Option 011 only: Use the minimum loss adapter and Type N (f) to BNC (m) adapter.

8. Set the spectrum analyzer CENTER FREQ to the Fundamental Frequency listed in Table l-22.

9. Set the microwave spectrum analyzer controls as follows:

   SPAN .... 100 kHz
   REFERENCE LEVEL .... +5 dBm
   ATTEN 20dB
   LOGdB/DIV .... 10 dB

10. Set the microwave spectrum analyzer CENTER FREQUENCY to the Fundamental Frequency listed in Table l-22.

11. On the microwave spectrum analyzer, press (PEAK SEARCH). Press (MKR -> CF), (MKR -> REF LVL). Wait for another sweep to finish.
12. Record the microwave spectrum analyzer marker-amplitude reading in Table 1-22 as the Fundamental Amplitude.
13. Set the microwave spectrum analyzer (START FREQ), (STOP FREQ), and (RES BW) as indicated in the first row of Table 1-23.
14. Press (SINGLE) on the microwave spectrum analyzer and wait for the sweep to finish. Press (PEAK SEARCH).
15. Verify that the marked signal is not the fundamental or a harmonic of the fundamental as follows:
    a. Divide the marker frequency by the fundamental frequency (the spectrum analyzer CENTER FREQ 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 and center frequency uncertainties in the 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 <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.
16. 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.
17. If the marked signal is either the fundamental or a harmonic of the fundamental (see step 15) or a noise peak (see step 16), move the marker to the next highest signal by pressing (SHIFT), (PEAK SEARCH). Continue with step 19.
18. If the marked signal is not the fundamental or a harmonic of the fundamental (see step 15) and is a true response (see step 16), calculate the difference between the amplitude of marked signal and the Fundamental Amplitude as listed in Table 1-22.

    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 FREQ and microwave spectrum analyzer START and STOP FREQ settings in Table 1-23.

    Non-Harmonic Amplitude = Marker Amplitude – Fundamental Amplitude
19. If a true non-harmonic spurious response is not found, record "NOISE" as the Non-Harmonic Response Amplitude in Table 1-23 for the appropriate spectrum analyzer CENTER FREQ and microwave spectrum analyzer START and STOP FREQ settings.

20. Repeat steps 14 through 19 for the remaining microwave spectrum analyzer settings for (START FREQ), (STOP FREQ), and (RES BW) for the spectrum analyzer CENTER FREQ setting of 10 MHz.
21. Repeat steps 8 through 20 with the spectrum analyzer CENTER FREQ set to 900 MHz.
22. Repeat steps 8 through 20 with the spectrum analyzer CENTER FREQ set to 1.8 GHz.
23. Locate in Table l-23 the most-positive Non-Harmonic Response Amplitude. Record this amplitude as TR Entry 20-l in the performance test record.

Table l-22. Fundamental Response Amplitudes Worksheet

Fundamental Frequency	Fundamental Amplitude (dBm)
10 MHz	______
900 MHz	______
1.8 GHz	______

Table l-23. Non-Harmonic Responses Worksheet

Microwave Spectrum Analyzer Settings			Non-Harmonic Response Amplitude (dBc)			Measurement Uncertainty
Start Freq (MHz)	stop Freq (MHz)	Res BW	@10 MHz Center Freq	@900 MHz Center Freq	@1.8 GHz Center Freq	(dB)
0.1*	5.0	10 kHz	______	______	______	+1.55/−1.80
5.0	55	100 kHz	______	______	______	+1.55/−1.80
55	1240	1 MHz	______	______	______	+1.55/−1.80
1240	1800	1 MHz	______	______	______	+1.55/−1.80

* Option 011: Set START FREQ to 1 MHz.

21. Tracking Generator Feedthrough

This procedure is only for spectrum analyzers equipped with 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 is no related adjustment procedure for this performance test.

Equipment Required

Termination, 50 Ω (2 required)
Adapter, Type N (m) to BNC (f)
Cable, Type N, 62 cm (24 in)
Cable, 23 cm (9 in)

Additional Equipment for Option 011

Termination, 75 Ω Type N (m) (2 required)
Adapter, Type N (f) to BNC (m), 75 Ω (2 required)
Cable, BNC, 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.

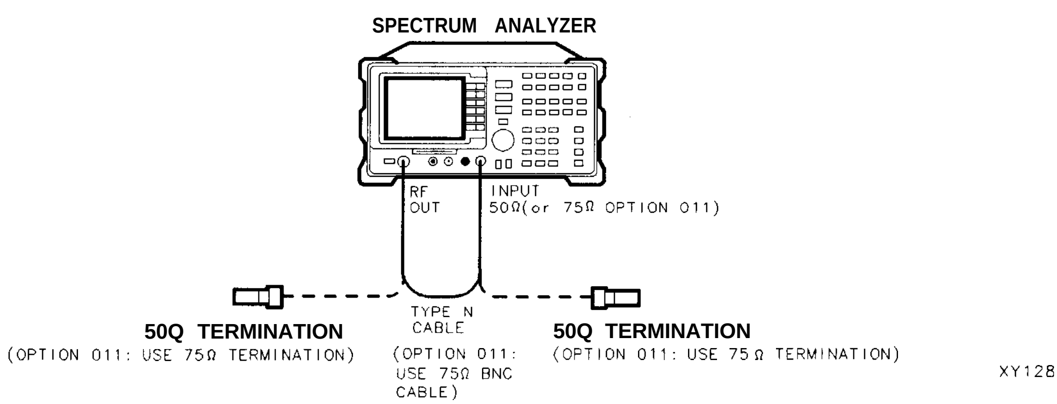


Figure 1-27. Tracking Generator Feedthrough Test Setup

Procedure

1. Connect the Type N cable between the RF OUT 50 Ω and INPUT 50 Ω connectors on the spectrum analyzer. See Figure 1-27.

   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 and set the controls as follows:

   (FREQUENCY) 300 (MHz)
   (SPAN) 1 (MHz)

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

   (MKR)

   (AUX CTRL) Track Gen

   SRC PWR ON OFF 5 (−dBm)

   Option 011 only: 42 + dBm (+ 42 dBmV).

4. On the spectrum analyzer, press TRACKING PEAK . Wait for the PEAKING message to disappear.

5. Connect the CAL OUTPUT to the INPUT 50 Ω.

   Option 011 only: Connect the CAL OUTPUT to the INPUT 75 Ω.

   Set the spectrum analyzer controls as follows:

   (AMPLITUDE) 20 (−dBm)
   Option 011 only: (AMPLITUDE) REF LVL 28.75 (+dBm)
   (SPAN) 10 (MHz)
   (AMPLITUDE)
   ATTEN AUTO MAN 0 (dB)

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

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

   Wait for the AUTO ZOOM message to disappear then set the controls as follows:

   (BW) VID BW AUTO MAN 30 (Hz)

   (MKR FCTN) MK TRACK ON OFF (OFF)

7. Press (SGL SWP) and wait for 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 ***Option 011:*** If the marker reads 26.4 dBmV, enter +2.35 dB

   (28.75 dBmV – 26.4 dBmV = 2.35 dB).

   REF LVL OFFSET ________dB

8. 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.

9. Press (AUX CTRL), Track Gen , then SRC PWR ON OFF (OFF) on the spectrum analyzer.

10. Set the spectrum analyzer controls as follows:

    (FREQUENCY) 0 (Hz)
    (SPAN) 10 (MHz)
    (AMPLITUDE) 10 (−dBm)
    Option 011 only: (AMPLITUDE) REF LVL 38.75 (+dBm)
    (BW)
    VID BW AUTO MAN (AUTO)
    (MKR) More 1 of 2
    MARKER ALL OFF
    (TRIG)
    SWEEP CONT SGL (CONT)

11. 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).

12. Press [FREQUENCY] and adjust the center frequency until the LO feedthrough peak is on the left-most graticule line. Set the spectrum analyzer controls as follows:

    (SPAN) 50 (kHz)
    (AMPLITUDE) 50 (−dBm)
    Option 011 only: (AMPLITUDE) REF LVL 1.25 (−dBm)
    (BW)
    VID BW AUTO MAN 30 (Hz)

13. On the spectrum analyzer, press (AUX CTRL), Track Gen , SRC PWR ON OFF 0 (+dBm).

    Option 011 only: 42.8 (+dBm) (+42.8 dBmV).

14. Press (SGL SWP) and wait for completion of a new sweep. Press (DISPLAY) then DSP LINE ON OFF (ON).

15. 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 1-24 as the noise level at 1 MHz.

16. Repeat steps 14 and 15 for the remaining Tracking Generator Output Frequencies (spectrum analyzer CENTER FREQ) listed in Table 1-24.

17. In Table 1-24, locate the most positive Noise Level Amplitude. Record this amplitude as TR Entry 21-1 in the performance test record.

Table 1-24. TG Feedthrough Worksheet

Tracking Generator Output Frequency	Noise Level Amplitude (dBm or dBmV)	Measurement Uncertainty (dB)
1 MHz		+1.15/−1.24
20 MHz		+1.15/−1.24
50 MHz		+1.15/−1.24
100 MHz		+1.15/−1.24
250 MHz		+1.15/−1.24
400 MHz		+1.15/−1.24
550 MHz		+1.15/−1.24
700 MHz		+1.15/−1.24
850 MHz		+1.15/−1.24
1000 MHz		+1.15/−1.24
1150 MHz		+1.15/−1.24
1300 MHz		+1.15/−1.24
1450 MHz		+1.15/−1.24
1600 MHz		+1.15/−1.24
1750 MHz		+1.15/−1.24

22. 10 MHz Reference Output Accuracy

This procedure is only for spectrum analyzers equipped with Option 013.

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 test is the "10 MHz Frequency Reference Adjustment."

Equipment Required

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

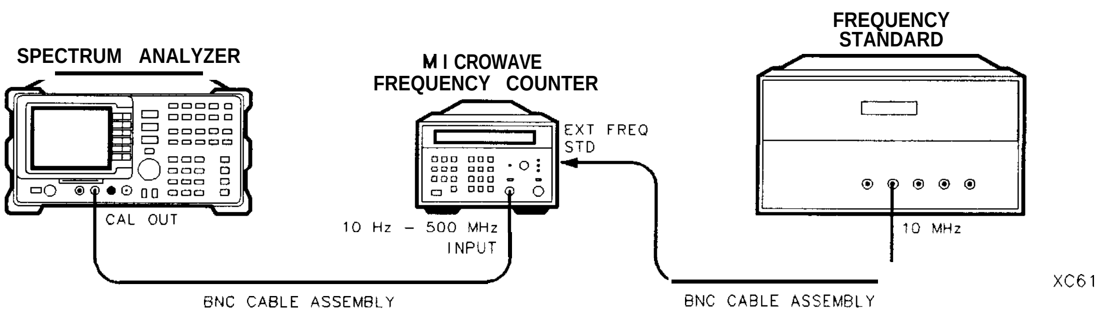


Figure l-28. 10 MHz Reference Test Setup

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 to 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 l-28.
2. Set the frequency counter controls as follows:

   SAMPLERATE .... Midrange
   50 Ω/1Ω SWITCH .... 50 Ω
   10Hz-500MHz/500MHz-26.5GHz SWITCH 10Hz-500MHz
   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	____________Hz
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 22-l of the performance 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.

Performance Verification Test Record

Table 1-25. Performance Verification Test Record

Hewlett-Packard Company

Address: ______________________ Report No. ______________________

____

______________________ Date ______________________

______________________ (e.g. 10 SEP 1989)

Model HP 8590D

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			
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:

Table 1-25. Performance Verification Test Record (page 2 of 7)

Hewlett-Packard Company Model HP 8590D	Report No. ______
Serial No. ______	Date ______

Test Description	Results Measured Min	(TR Entry)	Max	Measurement Uncertainty
1. Frequency Readout Accuracy				
Frequency Readout Accuracy		Frequency (MHz)		
FREQUENCY				
10 MHz	4.9980	(1-1) ______	15.0020	±2.5 Hz
50 MHz	44.9980	(1-2) ______	55.0020	±12.5 Hz
100 MHz	94.9980	(1-3) ______	1.50000076	±25.0 Hz
500 MHz	494.9980	(1-4) ______	505.0020	±125.0 Hz
1000 MHz	994.9980	(1-5) ______	1005.0020	±250.0 Hz
1800 MHz	1794.9980	(1-6) ______	1805.0020	±450.0 Hz
2. Frequency Readout Accuracy and Marker Count Accuracy				
Frequency Readout Accuracy		Frequency (MHz)		
SPAN				
20 MHz	1.49918	(2-1) ______	1.50082	±2.5 Hz
10 MHz	1.49958	(2-2) ______	1.50042	±12.5 Hz
1 MHz	1.4999680	(2-3) ______	1.500032	±25.0 Hz
Marker Count Accuracy				
SPAN				
(CNT RES = 10 Hz) 1 MHz	1.49999989	(2-4) ______	1.50000011	± 1 Hz
(CNT RES = 100 Hz) 20 MHz	1.4999989	(2-5) ______	1.5000011	± 1 Hz
3. Noise Sidebands				
Suppression		(3-1) ______	-65 dBc	± 1.0 dB
4. System Related Sidebands				
Sideband Below Signal		(4-1) ______	-65 dBc	± 1.0 dB
Sideband Above Signal		(4-2) ______	-65 dBc	± 1.0 dB
5. Frequency Span Readout Accuracy				
SPAN		Reading		
1800 MHz	1446.00 MHz	______	1554.00 MHz	±6.37 MHz
100.00 MHz	77.00 MHz	______	83.00 MHz	± 637 kHz
20.00 MHz	15.40 MHz	______	16.60 MHz	± 70.8 kHz
10.00 MHz	7.40 MHz	______	8.30 MHz	± 35.4 kHz
100.00 kHz	77.00 kHz	______	83.00 kHz	±354 Hz

Table l-25. Performance Verification Test Record (page 3 of 7)

Hewlett-Packard Company	
Model HP 8590D	Report No. ______
Serial No. ______	Date ______

Test Description	Results Measured Min	(TR Entry)	Max	Measurement Uncertainty
6. Sweep Time Accuracy				
SWEEP TIME		MKRA Reading		
20 ms	15.4 ms	(6-1) ______	16.6 ms	±0.057 ms
100 ms	77.0 ms	(6-2) ______	83.0 ms	±0.283 ms
1 s	770.0 ms	(6-3) ______	830.0 ms	±2.83 ms
10 s	7.7 s	(6-4) ______	8.3 s	±23.8 ms
7. Scale Fidelity				
Log Mode		Cumulative Error		
dB from Ref Level				
0	0 (Ref)	0 (Ref)	0 (Ref)	
-4	-4.44 dB	(7-1) ______	-3.56 dB	±0.06 dB
-8	-8.48 dB	(7-2) ______	-7.52 dB	±0.06 dB
-22	-12.52 dB	(7-3) ______	-11.48 dB	±0.06 dB
-16	-16.56 dB	(7-4) ______	-15.44 dB	±0.06 dB
-20	-20.60 dB	(7-5) ______	-19.40 dB	±0.06 dB
-24	-24.64 dB	(7-6) ______	-23.36 dB	±0.06 dB
-28	-28.68 dB	(7-7) ______	-27.32 dB	±0.06 dB
-32	-32.72 dB	(7-8) ______	-31.28 dB	±0.06 dB
-36	-36.76 dB	(7-9) ______	-35.24 dB	±0.06 dB
-40	-40.80 dB	(7-10) ______	-39.20 dB	±0.06 dB
-44	-44.84 dB	(7-11) ______	-43.16 dB	±0.06 dB
-48	-48.88 dB	(7-12) ______	-47.12 dB	±0.06 dB
-52	-52.92 dB	(7-13) ______	-51.08 dB	±0.06 dB
-56	-56.96 dB	(7-14) ______	-55.04 dB	±0.06 dB
-60	-61.00 dB	(7-15) ______	-59.00 dB	±O.11 dB
-64	-65.04 dB	(7-16) ______	-62.96 dB	±0.11 dB
-68	-69.08 dB	(7-17) ______	-66.92 dB	±O.11 dB

Table l-25. Performance Verification Test Record (page 4 of 7)

Hewlett-Packard Company Model HP 8590D	Report No. ______
Serial No. ______	Date ______

Test Description	Results Measured Min	(TR Entry)	Max	Measurement Uncertainty
7. Scale Fidelity (continued)				
Log Mode	- Incremental Error			
dB from Ref Level				
0	0 (Ref)	0 (Ref)	0 (Ref)	
-4	-0.4 dB	(7-18) ______	+0.4 dB	±0.06 dB
-8	-0.4 dB	(7-19) ______	+0.4 dB	±0.06 dB
-22	-0.4 dB	(7-20) ______	+0.4 dB	±0.06 dB
-16	-0.4 dB	(7-21) ______	+0.4 dB	±0.06 dB
-20	-0.4 dB	(7-22) ______	+0.4 dB	±0.06 dB
-24	-0.4 dB	(7-23) ______	+0.4 dB	±0.06 dB
-28	-0.4 dB	(7-24) ______	+0.4 dB	±0.06 dB
-32	-0.4 dB	(7-25) ______	+0.4 dB	±0.06 dB
-36	-0.4 dB	(7-26) ______	+0.4 dB	±0.06 dB
-40	-0.4 dB	(7-27) ______	+0.4 dB	±0.06 dB
-44	-0.4 dB	(7-28) ______	+0.4 dB	±0.06 dB
-48	-0.4 dB	(7-29) ______	+0.4 dB	±0.06 dB
-52	-0.4 dB	(7-30) ______	+0.4 dB	±0.06 dB
-56	-0.4 dB	(7-31) ______	+0.4 dB	±0.06 dB
-60	-0.4 dB	(7-32) ______	+0.4 dB	±O.11
Linear Mode				
% of Ref Level				
100.00	0 (Ref)	0 (Ref)	0 (Ref)	
70.70	151.59 mV	(7-33) ______	165.01 mV	±1.84 mV
50.00	105.36 mV	(7-34) ______	118.78 mV	±1.84 mV
35.48	72.63 mV	(7-36) ______	86.05 mV	±1.84 mV
25.00	49.46 mV	(7-36) ______	82.88 mV	±1.84 mV
Log-to-Linear Switching				
	-0.25 dB	(7-37) ______	+0.25 dB	±0.05 dB

Table l-25. Performance Verification Test Record (page 5 of 7)

Hewlett-Packard Company Model HP 8590D	Report No. ______
Serial No. ______	Date ______

Test Description	Results Measured Min	(TR Entry)	Max	Measurement Uncertainty
8. Reference Level Accuracy				
Reference Level (dBm)		Log Mode		
-20	0 (Ref)	0 (Ref)	0 (Ref)	
-10	-0.40 dB	(8-1) ______	+ 0.40 dB	±0.06 dB
0	-0.50 dB	(8-2) ______	+ 0.50 dB	±0.06 dB
-30	-0.40 dB	(8-3) ______	+ 0.40 dB	±0.06 dB
-40	-0.50 dB	(8-4) ______	+ 0.50 dB	±0.08 dB
-50	-0.80 dB	(8-5) ______	+ 0.80 dB	±0.08 dB
-60	-1.00 dB	(8-6) ______	+ 1.00 dB	±0.12 dB
-70	-1.10 dB	(8-7) ______	+ 1.10 dB	±0.12 dB
-80	-1.20 dB	(8-8) ______	+ 1.20 dB	±0.12 dB
-90	-1.30 dB	(8-9) ______	+ 1.30 dB	±0.12 dB
Reference Level (dBm)		Linear Mode		
-20	0 (Ref)	0 (Ref)	0 (Ref)	
-10	-0.40 dB	(S-10) ______	+ 0.40 dB	f0.06 dB
0	-0.50 dB	(8-11) ______	+ 0.50 dB	±0.06 dB
-30	-0.40 dB	(8-12) ______	+ 0.40 dB	f0.06 dB
-40	-0.50 dB	(8-13) ______	+ 0.50 dB	f0.08 dB
-50	-0.80 dB	(8-14) ______	+ 0.80 dB	f0.08 dB
-60	-1.00 dB	(8-15) ______	+ 1.00 dB	f0.12 dB
-70	-1.10 dB	(S-16) ______	+ 1.10 dB	±0.12 dB
-80	-1.20 dB	(8-17) ______	+ 1.20 dB	±0.12 dB
-90	-1.30 dB	(8-18) ______	+ 1.30 dB	±0.12 dB
9. Absolute Amplitude Calibration and Resolution Bandwidth Switching Uncertainties				
Absolute Amplitude Uncertainty	-20.15 dB	(9-1) ______	-19.85 dB	n/a
Resolution Bandwidth Switching Uncertainty				
Resolution Bandwidth				
3 kHz	0 (Ref)	0 (Ref)	0 (Ref)	
1 kHz	-0.5 dB	(9-2) ______	+ 0.5 dB	+0.07/−0.08 dB
9 kHz	-0.4 dB	(9-3) ______	+ 0.4 dB	+0.07/−0.08 dB
10 kHz	-0.4 dB	(9-4) ______	+ 0.4 dB	+0.07/−0.08 dB
30 kHz	-0.4 dB	(9-5) ______	+ 0.4 dB	+0.07/−0.08 dB
100 kHz	-0.4 dB	(9-6) ______	+ 0.4 dB	+0.07/−0.08 dB
120 kHz	-0.4 dB	(9-7) ______	+ 0.4 dB	+0.07/−0.08 dB
300 kHz	-0.4 dB	(9-8) ______	+ 0.4 dB	+0.07/−0.08 dB
1 MHz	-0.4 dB	(9-9) ______	+ 0.4 dB	+0.07/−0.08 dB
3 MHz	-0.4 dB	(9-10) ______	+ 0.4 dB	+0.07/−0.08 dB

Table l-25. Performance Verification Test Record (page 6 of 7)

Hewlett-Packard Company Model HP 8590D	Report No. ______________
Serial No. ______________	Date ______________

Test Description	Results Measured			Measurement
	Min	(TR Entry)	Max	Uncertainty
10. Calibrator Amplitude and Frequency Accuracy				
Output Power	-20.4 dBm	(10-l) ______	− 19.6 dBm	±0.2 dB
Output Power for *Option 001*	+ 28.35 dBmv	(10-2) ______	+29.15 dBmv	±0.2 dB
Frequency Output		(10-3) ______		±75 HzA
11. Frequency Response				
Max Positive Response		(11-l) ______	+ 1.5 dB	+ 0.32/−0.33 dB
Max Negative Response	-1.5 dB	(11-2) ______		t 0.32/−0.33 dB
Peak-to-Peak Response		(11-3) ______	2.0 dB	+ 0.32/−0.33 dB
12. **Other Input Related Spurious Responses**				
542.8 MHz		(12-l) ______	-55 dBc	±l.O dB
1142.8 MHz		(12-2) ______	-55 dBc	±l.O dB
13. Spurious Responses				
Second Harmonic Distortion		(13-l) ______	-45 dBc	+ 1.86/−2.27 dB
Third Order Intermodulation Distortion		(13-2) ______	-54 dBc	+2.07/−2.42 dB
14. **Gain Compression**		(14-l) ______	0.5 dB	+ 0.21/−0.22 dB
15. Displayed Average Noise				
Frequency				
400 kHz		(15-l) ______	-115 dBm	+ 1.15/−1.25 dB
1 MHz		(15-2) ______	-115 dBm	+ 1.15/−1.25 dB
1 MHz to 1.5 GHz		(15-3) ______	-115 dBm	+ 1.15/−1.25 dB
1.5 GHz to 1.8 GHz		(15-4) ______	-113 dBm	+ 1.15/−1.25 dB
***Option 001* only:**				
Frequency				
1 MHz		(15-2) ______	-63 dBmV	+ 1.15/−1.25 dB
1 MHz to 1.5 GHz		(15-3) ______	-63 dBmV	+ 1.15/−1.25 dB
1.5 GHz to 1.8 GHz		(15-4) ______	-61 dBmV	+ 1.15/−1.25 dB
16. **Residual Responses**				
150 kHz to 1.8 GHz		(16-l) ______	-90 dBm	+ 1.09/−1.15 dB
Option 001 only:				
1 MHz to 1.8 GHz		(16-l) ______	-38 dBmV	+ 1.09/−1.15 dB

Table 1-25. Performance Verification Test Record (page 7 of 7)

Hewlett-Packard Company Model HP 8590D	Report No. ______________
Serial No. ______________	Date ______________

Test Description	Results Measured Min	(TR Entry)	Max	Measurement Uncertainty
17. Absolute Amplitude, Vernier, and Power Sweep Accuracy				
Option 010 or 011 only:				
Absolute Amplitude Accuracy	-1.0 dB	(17-1) ______	+ 1.0 dB	+ 0.25/−0.26 dB
Positive Vernier Accuracy		(17-2) ______	+ 0.75 dB	±0.033 dB
Negative Vernier Accuracy	-0.75 dB	(17-3) ______		±0.033 dB
Power Sweep Accuracy		(17-4) ______	1.5 dB	±0.033 dB
18. Tracking Generator Level Flatness				
Option 010 only:				
Maximum Flatness				
100 kHz		(18-1) ______	+ 1.75 dB	+ 0.42/−0.45 dB
300 kHz to 5 MHz		(18-2) ______	+ 1.75 dB	+ 0.28/−0.28 dB
10 MHz to 1800 MHz		(18-3) ______	+ 1.75 dB	+ 0.24/−0.24 dB
Minimum Flatness				
100 kHz	-1.75 dB	(18-4) ______		+ 0.42/−0.45 dB
300 kHz to 5 MHz	-1.75 dB	(18-5) ______		+ 0.28/−0.28 dB
10 MHz to 1800 MHz	-1.75 dB	(18-6) ______		+ 0.24/−0.24 dB
Option 011 only:				
Maximum Flatness				
1 MHz to 1800 MHz		(18-1) ______	+ 1.75 dB	+ 0.18/−0.39 dB
Minimum Flatness				
1 MHz to 1800 MHz	-1.75 dB	(18-2) ______		+ 0.18/−0.39 dB
19. Harmonic Spurious Outputs				
Option 010 or 011 only:				
2nd Harmonic Level		(19-1) ______	-25 dBc	+ 1.55/−1.80 dB
3rd Harmonic Level		(19-2) ______	-25 dBc	+ 1.55/−1.80 dB
20. Non-Harmonic Spurious outputs				
Option 010 or 011 only:				
Highest Non-Harmonic Response Amplitude		(20-1) ______	-30 dBc	+1.55/− 1.80 dB
21. Tracking Generator Feedthrough				
Option 010 only:		(21-1) ______	− 106 dBm	+ 1.15/−1.24 dB
Option 011 only:		(21-1) ______	-57.24 dBmV	+ 1.15/− 1.24 dB
22. 10 MHz Reference Accuracy	Frequency Error ______			
Option 013 only:				
Settability	-150 Hz	(22-1) ______	+ 150 Hz	$\pm 4.2 \times 10^{-9}$

2

Specifications and Characteristics

This chapter contains specifications and characteristics for the HP 8590D 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 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

All specifications apply over 0 °C to + 55 °C. The analyzer will meet its specifications after 2 hours of storage at a constant temperature, within the operating temperature range, 30 minutes after the analyzer is turned on and after CAL FREQ and CAL AMPTD have been run.

Temperature Range	
Operating	0 °C to +55 °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

Frequency Specifications

Frequency Range	
50 Ω	9 kHz to 1.8 GHz
75 Ω (Option *001*)	1 MHz to 1.8 GHz

Frequency Accuracy	
Readout Accuracy	±(5 MHz + 1% of frequency span)
Resolution	Four digits

Frequency Reference *(Option 013)*	
Aging	$\pm 2 \times 10^{-6}$/year
Settability	$\pm 0.5 \times 10^{-6}$
Temperature Stability	$\pm 5 \times 10^{-6}$

Frequency Readout Accuracy *(Option 013)*	
(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† *(Option 013)*	
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), 50 kHz to 1.8 GHz
Resolution	Four digits
Accuracy	±3% of span

Frequency Sweep Time	
Range	20 ms to 100 s
Accuracy	±3%
Sweep Trigger	Free Run, Single, Line, Video, External

. Frequency Specifications

Stability	
Noise Sidebands	(1 kHz RBW, 30 Hz VBW and sample detector)
>30 kHz offset from CW signal	≤ -95 dBc/Hz
System-Related Sidebands	
>30 kHz offset from CW signal	≤-65 dBc

Calibrator Output Frequency	300 MHz fundamental frequency
Accuracy	±30 kHz

Amplitude Specifications

Amplitude Range	
50 Ω	-115 dBm to +30 dBm
75 Ω (Option 001)	-63 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).	

Displayed Average Noise Level	(Input terminated, 0 dB attenuation, 1 kHz RBW, 30 Hz VBW, sample detector)	
	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

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).	

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

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, V, and W

Marker Readout Resolution	0.05 dB for log scale 0.05% 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	±(0.6 dB + .01 x dB from -20 dBm)

** See "Amplitude Range."

Frequency Response	(10 dB input attenuation)	
	Absolute§	**Relative Flatness†**
	±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

Linear to Log Switching	±0.25 dB at reference level

Display Scale Fidelity	
Log Maximum Cumulative	
0 to -70 dB from Reference Level	± (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 + 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.

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)	Oto-15dBm
75 Ω (Option 011)	+ 42.8 to + 27.8 dBmV
Resolution	0.1 dB
Absolute Accuracy	± 1.5 dB (at 300 MHz and − 10 dBm source power) ***(Option 011: use +38.8 dBmV instead of -10 dBm)***
Vernier	
Range	15 dB
Accuracy	± 1 .O dB (referenced to − 10 dBm source power) ***(Option 011: referenced to*** t38.8 ***dBmV instead of -10 dBm)***

Output Power Sweep	
Range	
50 Ω (Option 010)	− 15 dBm to 0 dBm
75 Ω (Option *011)*	+27.8 to t 42.8 dBmV
Resolution	0.1 dB
Accuracy (zero span)	<2 dB peak-to-peak

Output Flatness	
(referenced to 300 MHz)	±1.75 dB

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

Frequency Characteristics

These are not specifications. Characteristics provide useful but nonwarranted information about instrument performance.

Stability	
Drift	≤75 kHz/5 minutes after 2 hour warmup and 5 minutes after setting center frequency
Drift* (Option 013)	
Frequency Span ≤ 10 MHz, Free Run	<2 kHz/minute of sweep time

* *(Option 013)* 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 Handwidth (-3 dB)	
Range	1 kHz to 3 MHz, selectable in 1, 3 and 10 increments, accuracy ±20% and 5 MHz. Resolution bandwidths may be selected manually, or coupled to frequency span.
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

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.
Shape	Post detection, single pole low-pass filter used to average displayed noise.

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.

Amplitude Characteristics

These are not specifications. Characteristics provide useful but nonwarranted information about instrument performance.

Log Scale Switching Uncertainty	Negligible error

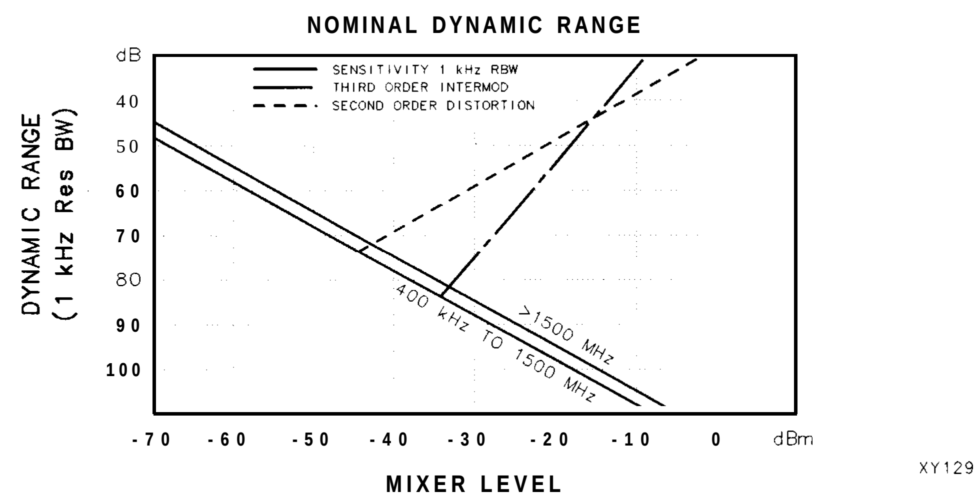
Input Attenuation Uncertainty*	
Attenuator Setting	
0 dB	±0.5 dB
10 dB	Reference
20 dB	±0.5 dB
30 dB	±0.6 dB
40 dB	±0.8 dB
50 dB	±1.0 dB
60 dB	±1.2 dB

* Referenced to 10 dB input attenuator setting from 9 kHz to 1.8 GHz. See the “Specifications” table under “Freauencv Resoonse.”

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

DYNAMIC RANGE



Dynamic Range .

Amplitude Characteristics

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.

Option Characteristics

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)*	<–65 dBm
1 MHz to 1.8 GHz *(Option 011)*	<-16.2 dBmV

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

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

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)

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* **or 023)**	Interface compatible with HP part number Cl405 Option ABA and most IBM/AT non-auto switching kevboards.

EXT TRIG INPUT	
Connector	BNC female
Trigger Level	Positive edge initiates sweep in EXT TRIG mode (TTL).

HI-SWEEP IN/OUT	
Connector	BNC female
output	High = sweep, Low = retrace (TTL)
Input	Open collector, low stops sweep.

MONITOR OUTPUT	
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, PPO, DC1, Cl, C2, C3 and C28
RS-232 (Option 023)	

SWEEP OUTPUT	
Connector	BNC female
Amplitude	0 to + 10 V ramp

Physical Characteristics

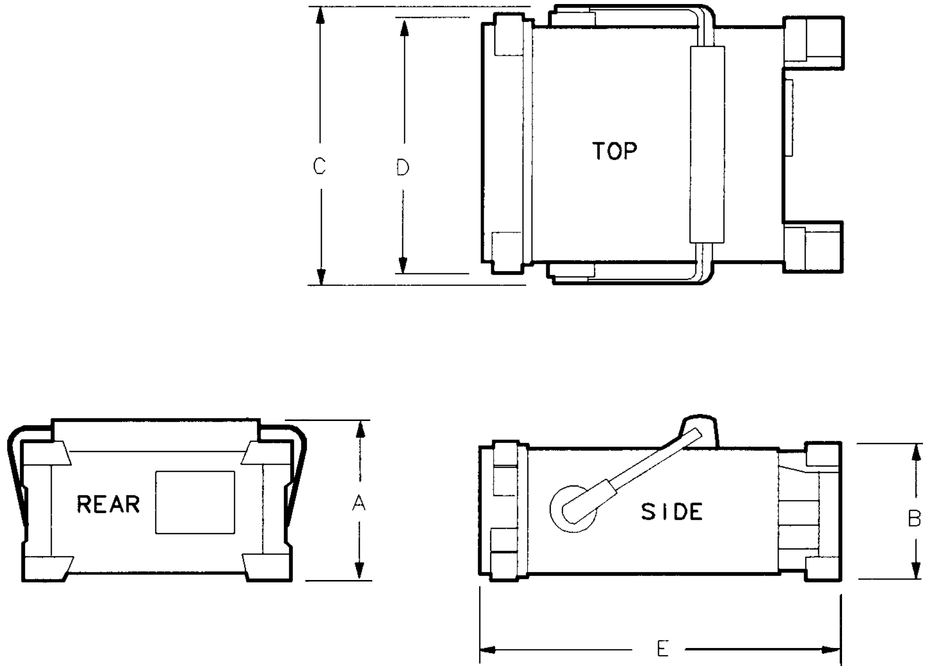
AUX INTERFACE				
Connector Type: 9 Pin Subminiature "D" Connector Pinout				
Pin #	Function	Current	"Logic" Mode	"Serial Bit" Mode
1	Control A	—	TTL Output Hi/Lo	TTL Output Hi/Lo
2	Control B	—	TTL Output Hi/Lo	TTL Output Hi/Lo
3	Control C	—	TTL Output Hi/Lo	Strobe
4	Control D	—	TTL Output Hi/Lo	Serial 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 8590D	14.1 kg (31 lb)
Shipping	
HP 8590D	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)



Regulatory Information

The information on the following pages apply to the HP 8590 Series spectrum analyzer products.

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 85913, 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	
Location	Date	Dixon Browder / QA Manager
South Queensferry, Scotland	15 April '92	
Location	Date	Peter Rigby / QA Manager

Notice for Germany: Noise Declaration

LpA < 70 dB
am Arbeitsplatz (operator position)
normaler Betrieb (normal position)
nach DIN 45635 T. 19 (per IS0 7779)

3

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 3-l. 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 Chapter 2 of this guide.
- ❑ Check the spectrum analyzer display for error messages. Refer to the ***HP 8590 Series Spectrum Analyzer User's Guide.***
- ❑ Check operation by performing the verification procedures in Chapter 1 of this guide. Record all results in the performance test record.
- ❑ Check for problems similar to those described in the ***HP 8590 Series Spectrum Analyzer User's Guide.***

Table 3-1. Hewlett-Packard Sales and Service Offices

US FIELD OPERATIONS

Customer Information
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
120 W. Century Road
Paramus, NJ 07653
(201)599-5000

Texas
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
Berner Strasse 117
6000 Frankfurt 56
West Germany
(49 69) 500006-O

Great Britain
Hewlett-Packard Ltd
Eskdale Road, Winnersh Triangle
Wokingham, Berkshire RF1 1 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
Blackbum, 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 Xl 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

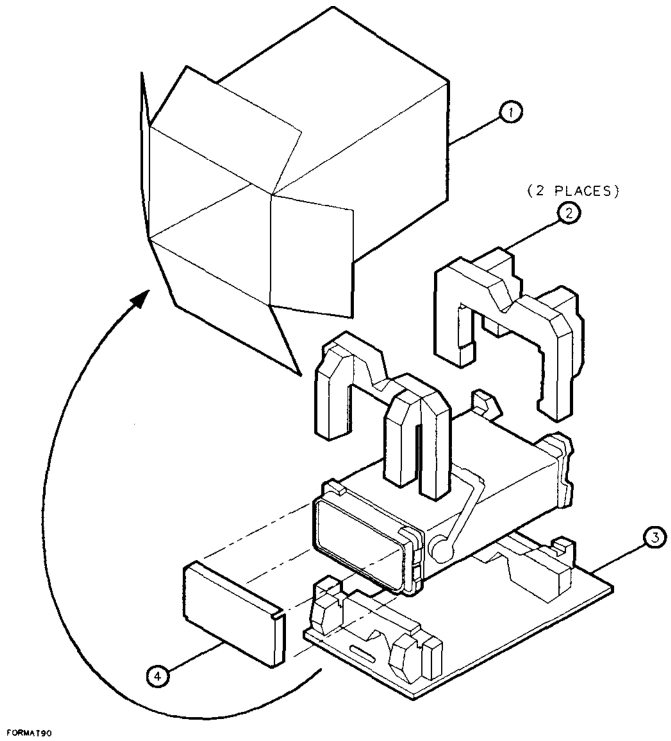
Use the following steps to package the spectrum analyzer for shipment to Hewlett-Packard for service:

1. Fill in a service tag (available in the ***HP 8590 Series Spectrum Analyzer User's 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 (see Figure 3-1) 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.

Use the following illustration and table to help you package a tracking source for shipment.



Item	Description	HP Part Number
1	Outer Carton	9211-5636
2	Inner Foam Pad Set	08590-80013
3	Bottom Skid Tray	08590-80014
4	Front Frame Insert	9220-4488

Figure 3-l. Spectrum Analyzer Packaging Materials