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Errata

Title & Document Type:

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HP References in this Manual

This manual may contain references to HP or Hewlett-Packard. Please note that Hewlett-Packard's former test and measurement, semiconductor products and chemical analysis businesses are now part of Agilent Technologies. We have made no changes to this manual copy. The HP XXXX referred to in this document is now the Agilent XXXX. For example, model number HP8648A is now model number Agilent 8648A.

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CHAPTER 1

PERFORMANCE VERIFICATION

Introduction

The procedures in this chapter test the analyzer's electrical performance using the specifications of Table 1-1 in the *HP 8592A Spectrum Analyzer Installation Manual* (HP Part Number 08592-90003).

You must complete 16 tests to verify that analyzer performance meets all the specifications. The installation manual contains five tests that constitute Operation Verification. This chapter contains the remaining 11 tests. Table 1-1 lists all the tests and indicates which manual contains each test. You must do the tests in the order shown in the table.

None of the performance tests require access to the interior of the analyzer.

Table 1-1. HP 8592A Spectrum Analyzer Performance Tests

Test Name	Test Type	Location
Frequency Readout Accuracy	Operation Verification	Installation Manual
Displayed Average Noise Level	Operation Verification	Installation Manual
Frequency Response	Operation Verification	Installation Manual
Calibrator Amplitude and Frequency Accuracy	Operation Verification	Installation Manual
Frequency Span Readout Accuracy	Operation Verification	Installation Manual
1. Sweep Time Accuracy	Performance Verification	this chapter
2. Noise Sideband	Performance Verification	this chapter
3. Spurious Response	Performance Verification	this chapter
4. Residual Response	Performance Verification	this chapter
5. Reference Level Accuracy	Performance Verification	this chapter
6. Scale Fidelity	Performance Verification	this chapter
7. Resolution Bandwidth Switching	Performance Verification	this chapter
8. Gain Compression	Performance Verification	this chapter
9. Input Attenuator Accuracy	Performance Verification	this chapter
10. Image, Multiple, and Out-of-Band Responses	Performance Verification	this chapter
11. Comb Generator Frequency Accuracy	Performance Verification	this chapter

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Before You Start

There are five things you must do before attempting the performance tests in this chapter:

1. Switch the analyzer on and let it warm up. If the analyzer was stored in an area where the ambient temperature is within the specified operating range (0 to 50°C), a 30-minute warmup is required. If the storage temperature was less than 0°C, warm up the analyzer for at least 2 hours.

2. Read Chapter 1 of the *HP 8592A Spectrum Analyzer Operating Manual*, "Making Your First Measurement."

3. After the analyzer has warmed up as specified, perform the Calibration procedure documented in "Making Your First Measurement." The performance of the analyzer is specified only after the calibration routines have been run.

4. Complete the Operation Verification tests in the installation manual, and record test results on a copy of the specified test record.

5. Read the rest of this section before you start any of the tests, and make a copy of the Performance Test Record described below.

Test Equipment You'll Need

Table 1-2 lists the recommended test equipment needed to maintain and test the analyzer. Each test includes a list of the equipment and accessories required for that test. Although Hewlett-Packard equipment is recommended, equivalent equipment may be used provided it meets the critical specifications shown in Table 1-2.

Recording the Test Results

Record the results on a copy of the Performance Verification Test Record at the end of this chapter. The test record lists the specifications and acceptable limits for each analyzer test. The filled-out test record can be kept for later reference, if desired.

If the Analyzer Doesn't Meet Specifications

If the analyzer doesn't meet one of the specifications, complete any remaining tests in this chapter and record all test results on a copy of the test record. Troubleshooting information and adjustment procedures may be used to help determine what the trouble is.

Periodically Verifying Operation

The analyzer requires periodic verification of operation. Under most conditions of use, you should test the analyzer at least once a year. The Operation Verification tests in the installation manual can be done to check about 80% of analyzer functions. However, the additional tests in this chapter should be done to fully verify analyzer performance.

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Table 1-2. Recommended Test Equipment

Instrument	Critical Specification for Equipment Substitution	Recommended Model	Use*
Synthesized Sweeper	Frequency Range: 10 MHz to 22 GHz Frequency Accuracy (CW): < ±0.02% Levelling Modes: Internal & External Modulation Modes: AM Power Level Range: −35 to +16 dBm (2 required)	HP 8340A/B	P,A,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
AM/FM Signal Generator	Frequency Range: 1 MHz to 1000 MHz Amplitude Range: −35 to +16 dBm SSB Noise: < −120 dBc/Hz @ 20 kHz offset	HP 8640B	P,A,T
Measuring Receiver	Compatible with Power Sensors dB Relative Mode Resolution: 0.01 dB Reference Accuracy: < ±1.2%	HP 8902A	P,A,T
Power Sensor	Frequency Range: 1 MHz to 350 MHz Maximum SWR: 1.1 (1 MHz to 2.0 GHz) 1.30 (2.0 to 2.9 GHz)	HP 8482A	P,A,T
Power Sensor	Frequency Range: 50 MHz to 22 GHz Maximum SWR: 1.15 (50 to 100 MHz) 1.10 (100 MHz to 2 GHz) 1.15 (2.0 to 12.4 GHz) 1.20 (12.4 to 18.0 GHz) 1.25 (18 to 22 GHz)	HP 8485A	P,A,T
Scalar Network Analyzer	Dynamic Range: >30 dB Compatible with Synthesized Sweeper	HP 8756A	A
Microwave Frequency Counter	Frequency Range: 9 MHz to 7 GHz Timebase Accy (Aging): $<5\times10E^{-10}$/day	HP 5343A	P,A,T
Universal Counter	Time Interval A to B Mode Time Interval Range: 10 ms to 120 sec Timebase Accy (Aging): $< \pm3\times10E^{-7}$/day	HP 5316A	P
Oscilloscope	Bandwidth: dc to 100 MHz Vertical Scale Factor of 5 V/Div	HP 1741A	A,T
Digital Voltmeter	Input Resistance: ≥10 megohms Accuracy: < ±10 mV on 100 V range	HP 3456A	P,A,T

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Table 1-2. Recommended Test Equipment (Continued)

Instrument	Critical Specification for Equipment Substitution	Recommended Model	Use*
Power Splitter	Frequency Range: 50 kHz to 22 GHz Insertion Loss: 6 dB (nominal) Output Tracking: <0.25 dB Equivalent Output SWR: <1.22:1	HP 11667B	P,A
Detector	Frequency Range: 300 MHz to 4 GHz Compatible with Scalar Network Analyzer	HP 11664A/E	A
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
Directional Coupler	Frequency Range: 1.7 to 8 GHz Coupling: 16 dB (nominal) Max. Coupling Deviation: ±1 dB Directivity: 14 dB minimum Flatness: 0.75 dB maximum VSWR: <1.45 Insertion Loss: <1.3 dB	HP 0955-0125	P
Attenuator	Attenuation: 20 dB	HP 8491A Opt 020	A
1 dB Step Attenuator	Attenuation Range: 0 to 12 dB Frequency Range: 50 kHz to 325 MHz Connectors: BNC Female Selected Accuracy	HP 355C-H80	P,A
10 dB Step Attenuator	Attenuation Range: 0 to 70 dB Frequency Range: 50 kHz to 325 MHz Connectors: BNC Female Selected Accuracy	HP 355D-H82	P,A
Low Pass Filter	Cutoff Frequency: 4.4 GHz Rejection at 5.5 GHz: >40 dB (2 required)	HP 11689A	P
Low Pass Filter	Cutoff Frequency: 50 MHz Rejection at 65 MHz: >50 dB	HP 0955-0306	P
Low Pass Filter	Cutoff Frequency: 300 MHz Rejection at >500 MHz: >35 dB	HP 0955-0455	A
Termination	Impedance: 50 ohms (nominal)	HP 11593A	P
Logic Pulser	TTL voltage and current drive levels	HP 546A	T

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Table 1-2. Recommended Test Equipment (Continued)

Instrument	Critical Specification for Equipment Substitution	Recommended Model	Use*
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
Logic Clip	TTL voltage and current drive levels	HP 548A	T
Bandpass Filter Tuning Tool	Compatible with 2nd Converter	HP 8710-1728	A
Cable	Frequency Range: 50 kHz to 22 GHz Maximum SWR: <1.4 at 22 GHz Length: ≥91 cm (36 in.) Connectors: APC 3.5(m) both ends Maximum Insertion Loss (2 required)	HP 8120-4921	P,A
Cable	Frequency Range: 50 MHz to 7 GHz Length: ≥91 cm (36 in.) Connectors: SMA(m) both ends	HP 5061-5458	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	HP-IB Length: >61 cm (24 in.)	HP 10833A/B	A
Test Cable	Length: ≥91 cm (36 in.) Connectors: SMC(f) to BNC(m)	HP 11592-60001	A
Cable Assembly	BNC(f) to Alligator Clips Length: Approximately 15 cm (6 in.)	HP 8120-1292	A
Cable Assembly	Length: ≥91 cm (36 in.) Connectors: Banana Plug to Alligator Clips	HP 11102A	A
Adapter	Type N(m) to BNC(f) (4 required)	HP 1250-1476	P,A,T
Adapter	Type N(m) to BNC(m)	HP 1250-1473	P,A,T

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Table 1-2. Recommended Test Equipment (Continued)

Instrument	Critical Specification for Equipment Substitution	Recommended Model	Use*
Adapter	Type N(f) to BNC(m)	HP 1250-1477	P,A,T
Adapter	Type N(f) to Type N(f)	HP 1250-1472	P,A,T
Adapter	Type N(f) to SMA(f)	HP 1250-1772	P,A,T
Adapter	Type N(m) to APC 3.5(m)	HP 1250-1743	P,A,T
Adapter	Type N(m) to APC 3.5(f)	HP 1250-1744	P,A,T
Adapter	Type N(f) to APC 3.5(f)	HP 1250-1745	P,A,T
Adapter	APC 3.5(f) to APC 3.5(f)	HP 5061-5311	P,A,T
Adapter	SMA(f) to SMA(f)	HP 1250-1158	P,A,T
Adapter	SMA(m) to SMA(m)	HP 1250-1159	P,A,T
Adapter	BNC(f) to BNC(f)	HP 1250-0080	P,A,T
Adapter	BNC(m) to BNC(m)	HP 1250-0216	P,A,T
Adapter	BNC tee (m)(f)(f)	HP 1250-0781	A,T
Adapter	BNC(f) to SMB(m)	HP 1250-1237	A,T
Adapter	SMB(m) to SMB(m)	HP 1250-0669	A,T
Adapter	SMC(m) to SMC(m)	HP 1250-0827	A,T
Extender Board	Compatible with A7 Analog Interface Assembly	HP 70205-60023	T
Special Extender Board	6 pin, 12 contacts with 51.1 ohm resistors from pin 1 to pin 5	HP 08505-60109 w/HP 0757-0394	A
Crystal Shorts	Refer to Figure 2-10 (3 required)	----	A

* P=Performance Test, A=Adjustment/ Calibration, T=Troubleshooting

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1. Sweep Time Accuracy Test

This test uses a universal counter to measure the time interval during which the spectrum analyzer's HI SWEEP output is high. This time interval corresponds to the sweep time. The measured sweep time is compared to the specification.

Recommended Test Equipment

Universal Counter . . . . . HP 5316A

Cables:

BNC (122 cm; 48 in) . . . . . HP 10503A

Test Procedure

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

2. On the HP 8592A, press *PRESET* and wait for the preset to finish. Set the controls as follows:
   CENTER FREQUENCY . . . . . 300 MHz
   SPAN . . . . . 0 Hz
   [SWEEP TIME] . . . . . 20 msec

3. Set all buttons on the HP 5316A out, including the blue SHIFT button. Set the LEVEL/SENS controls for Channel A and Channel B fully counterclockwise. Set the GATE TIME control to MIN.

   a. Push the TI A→B button in.
   b. Push the AC/DC buttons for Channels A and B in.
   c. Push the Channel B Slope button in (negative edge trigger).
   d. Push the SEP/COM button in.
   e. Push the FILTER NORM/100 kHz button in.

4. On the HP 5316A, slowly rotate the Channel A *LEVEL/SENS* control clockwise until the yellow LED next to it begins to flash. Repeat for the Channel B *LEVEL/SENS* control.

5. Repeat the following steps for each sweep time setting listed in Table 1-3:

   a. Set the HP 8592A [SWEEP TIME] to the setting listed in Table 1-3.

   b. Wait for the HP 5316A display to settle (usually about three sweeps).

   c. Record the HP 5316A reading as the measured sweep time in Table 1-3. The measured sweep time should fall within the limits shown.

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NOTE

It might be necessary to readjust the *LEVEL/SENS* controls slightly for a stable display.

Table 1-3. Sweep Time Accuracy Test Settings

[SWEEP TIME] Setting	Minimum Reading	Measured Sweep Time	Maximum Reading
20 msec	18 msec	_____	22 msec
50 msec	45 msec	_____	55 msec
100 msec	90 msec	_____	110 msec
200 msec	180 msec	_____	220 msec
500 msec	450 msec	_____	550 msec
1 sec	900 msec	_____	1.1 sec
2 sec	1.8 sec	_____	2.2 sec
5 sec	4.5 sec	_____	5.5 sec
10 sec	9 sec	_____	11 sec
20 sec	18 sec	_____	22 sec
50 sec	45 sec	_____	55 sec
100 sec	90 sec	_____	110 sec

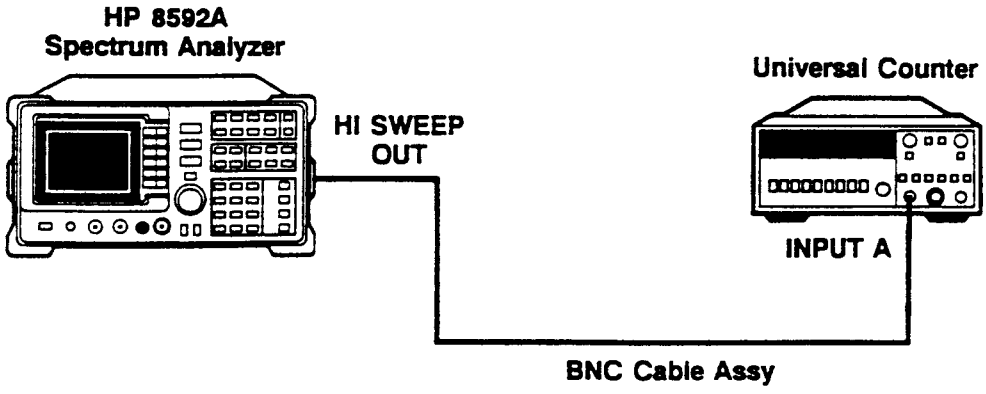


Figure 1-1. Sweep Time Accuracy Test Setup

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2. Noise Sideband Test

A 500 MHz, CW signal is applied to the 50 ohm input of the HP 8592A Spectrum Analyzer. The signal sidebands are examined for noise amplitude and unwanted responses.

Specification

<(−95 + 20 LogN) dBc/Hz, >30 kHz offset from CW signal (where N is the harmonic of the first LO)

Recommended Test Equipment

Signal Generator . . . . . HP 8640B

Cable Assemblies

SMA Cable (61 cm; 24 in) . . . . . HP 8120-1578

Adapters

Type N(m) to APC 3.5 (f) (2 required) . . . . . HP 1250-1744

Test Procedure

1. Set the signal generator to output a 500 MHz, −20 dBm, CW signal. Set the modulation control to OFF and the RF control to ON.

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

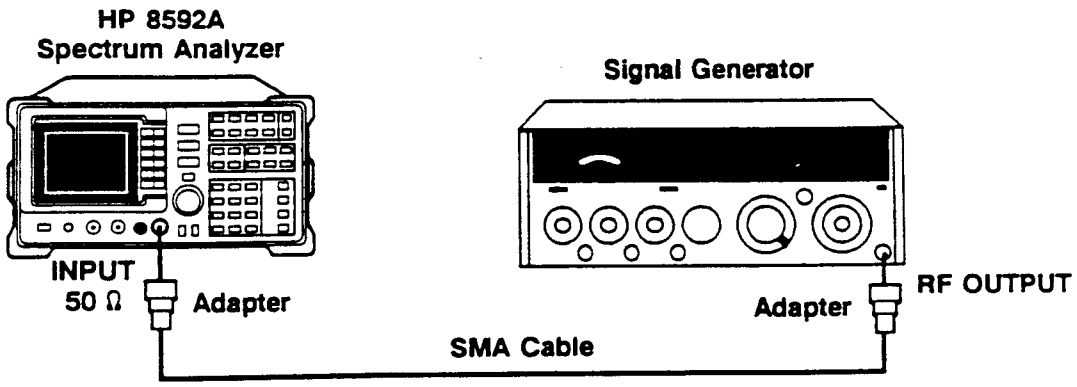


Figure 1-2. Noise Sideband Test Setup

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3. Press the following spectrum analyzer keys:
   PRESET
   SPAN 10 MHz
   FREQUENCY 500 MHz
   PEAK SEARCH
   SIGNAL TRACK
   SPAN 200 kHz
   SWP/BW [RES BW] *1 kHz*
   [VID BW] *30 Hz*
   AMPLITUDE 20 -dBM
   TRIG [SINGLE SWEEP]
   PEAK SEARCH

4. *Record the MKR* amplitude reading as the carrier amplitude.

   Carrier Amplitude = _____ dBm

5. Press the following spectrum analyzer keys:
   [MARKER DELTA] *30 kHz*
   MKR [MARKER NORMAL]
   [MKNOISE ON].

   Record the *MKR* amplitude reading as the noise sideband level at +30 kHz

   Noise Sideband Level at +30 kHz = _____ dBm (1 Hz)

6. Press:
   [MKNOISE OFF]
   PEAK SEARCH
   [MARKER DELTA] *-30 kHz*
   MKR [MARKER NORMAL]
   [MKNOISE ON]

   Record the MKR amplitude reading as the noise sideband level at -30 kHz.

   Noise Sideband Level at -30 kHz = _____ dBm (1 Hz)

7. Record the more positive value from steps 5 or 6 above as the max. noise sideband level.

   Max. Noise Sideband Level = _____ dBm (1 Hz)

8. Subtract the carrier amplitude (step 4) from the max. noise sideband level (step 7) and record as the noise sideband suppression. The suppression should be < -95 dBc/Hz.

   Noise Sideband Suppression = Max. Noise Sideband Level - Carrier Amplitude

   Noise Sideband Suppression = _____ dBc/Hz

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3. Spurious Response Test

This test is performed in two parts. The first part measures second-harmonic distortion; the second part measures third-order intermodulation distortion. Second-harmonic distortion and third-order intermodulation distortion are checked in both low band (50 kHz to 2.9 GHz) and high band (2.75 to 22 GHz).

To test second-harmonic distortion, 50 MHz and 4.4 GHz low pass filters are used to filter the source output, ensuring that harmonics read by the analyzer are internally generated and not coming from the source. The distortion products are measured using the analyzer's marker functions.

For third-order intermodulation distortion, two signals are combined in a directional coupler (for isolation) and are applied to the analyzer input. The power level of the two signals is 8 dB higher than specified, so the distortion products should be suppressed by 16 dB less than specified. In this manner, the equivalent Third Order Intercept (TOI) is measured.

With two −30 dBm signals at the input mixer and the distortion products suppressed by 70 dBc, the equivalent TOI is +5 dBm (−30 dBm +70 dBc/2). However, if two −22 dBm signals are present at the input mixer and the distortion products are suppressed by 54 dBc, the equivalent TOI is also +5 dBm (−22 dBm +54 dBc/2).

Performing the test with a higher power level maintains the measurement integrity while reducing both test time and the dependency upon the source's noise sideband performance.

Specification

Second-Harmonic Distortion

< −70 dBc, 10 MHz to 2.9 GHz, for −40 dBm total mixer power
< −100 dBc, 2.75 GHz to 22 GHz, for −10 dBm total mixer power

Third-Order Intermodulation Distortion

< −70 dBc, 10 MHz to 22 GHz, for −30 dBm total mixer power, >50 kHz signal separation

Recommended Test Equipment

Synthesized Sweeper (2 required)	HP 8340A/B
Measuring Receiver (or Power Meter)	HP 8902A
Power Sensor, 50 MHz to 26.5 GHz	HP 8485A
Power Splitter	HP 11667B
50 MHz Low Pass Filter	HP 0955-0306
4.4 GHz Low Pass Filter (2 required)	HP 11689A
Directional Coupler	HP 0955-0125

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Cable Assemblies

High Frequency Test Cable (2 required) . . . . . HP 8120-4921
BNC Cable (120 cm; 48 in) . . . . . HP 10503A

Adapters

Type N(m) to APC 3.5(m) . . . . . HP 1250-1743
APC 3.5(f) to APC 3.5(f) (2 required) . . . . . HP 5061-5311
Type N(f) to APC 3.5(f) . . . . . HP 1250-1745
Type N(m) to BNC(f) (2 required) . . . . . HP 1250-1476
Type N(m) to APC 3.5(f) . . . . . HP 1250-1744

Test Procedure

Second-Harmonic Distortion, <2.9 GHz

1. Press *PRESET* on the HP 8340A/B and set the controls as follows:
   CW . . . . . 30 MHz
   POWER LEVEL . . . . . −30 dBm

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

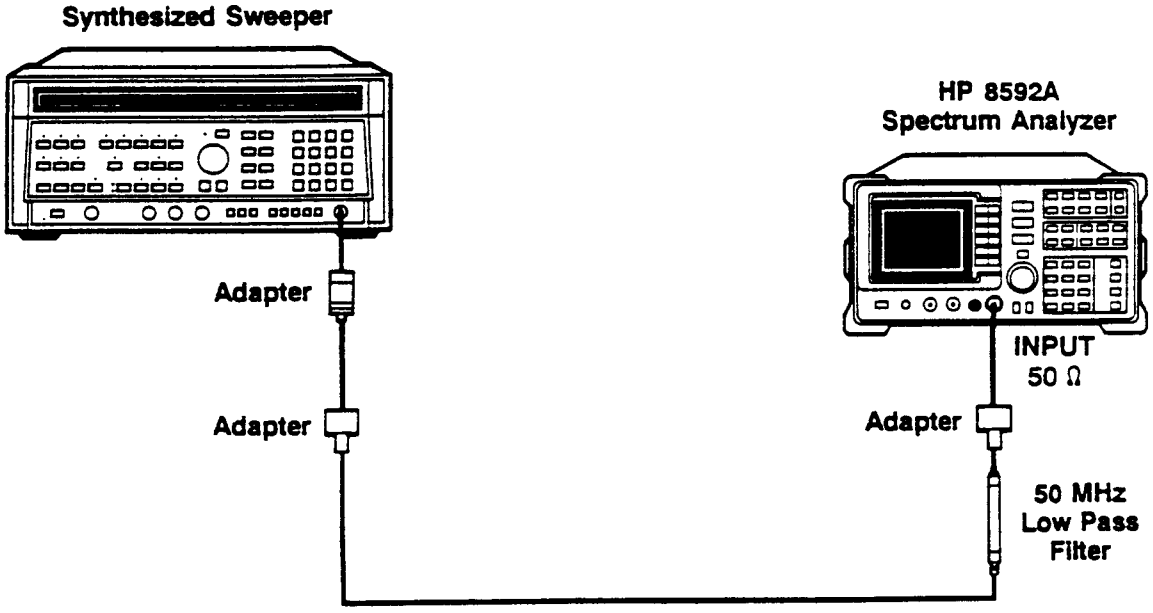


Figure 1-3. Second-Harmonic Distortion Test Setup (<2.9 GHz)

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3. Press the following HP 8592A keys:
   PRESET (wait until preset is complete)
   FREQUENCY 30 MHz
   PEAK SEARCH [NEXT PK RIGHT]
   SIGNAL TRACK (on)
   SPAN 1 MHz
   SIGNAL TRACK (off)
   AMPLITUDE −30 dBm
   SWP/BW [RES BW] *30 kHz*

4. Adjust the HP 8340A/B POWER LEVEL to place the peak of the signal at the reference level (−30 dBm).

5. Set the HP 8592A controls as follows:
   [RES BW] . . . . . 1 kHz
   [VID BW] . . . . . 100 Hz

6. Wait for two sweeps to finish. On the HP 8592A, press:
   PEAK SEARCH
   MKR→
   [MARKER→STEP]
   MKR
   [MARKER DELTA]
   FREQUENCY

7. Press the ↑ key on the HP 8592A to step to the second harmonic (at 60 MHz). Set the REF LEVEL to −50 dBm. Press *PEAK SEARCH*. Record the marker amplitude reading in Table 1-4 (at the end of this section). The marker amplitude reading should be less than the specified limit.

Second-Harmonic Distortion, >2.9 GHz

8. Zero and calibrate the HP 8902A and HP 8485A combination in log mode (RF Power readout in dBm). Enter the power sensor's 3 GHz Cal Factor into the HP 8902A.

9. Measure the noise level at 5.6 GHz as follows:

   a. Remove any cable or adapters from the HP 8592A INPUT 50Ω.

   b. Press *PRESET* on the HP 8592A and set the controls as follows:
      CENTER FREQUENCY . . . . . 5.6 GHz
      SPAN . . . . . 0 Hz
      REF LEVEL . . . . . −40 dBm
      [RES BW] . . . . . 1 kHz
      [VID BW] . . . . . 30 Hz
      [VIDEO AVERAGE] 10
      [SWEEP TIME] . . . . . 5.0 sec

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c. Press *TRIG* and [SINGLE SWEEP]. Wait until AVG 10 is displayed along the left side of the CRT. Press *PEAK SEARCH* on the HP 8592A and record the marker amplitude reading as the noise level at 5.6 GHz:

Noise Level at 5.6 GHz = _____ dBm

10. Press *PRESET* on the HP 8592A. Set the controls as follows:
[BAND LOCK] [*2.75–6.2* BAND 1]
CENTER FREQUENCY . . . . . 2.8 GHz
SPAN . . . . . 10 MHz

11. Connect equipment as shown in Figure 1-4, with the output of the HP 8340A/B connected to the input of the power splitter, and the power splitter outputs connected to the HP 8592A and the power sensor.

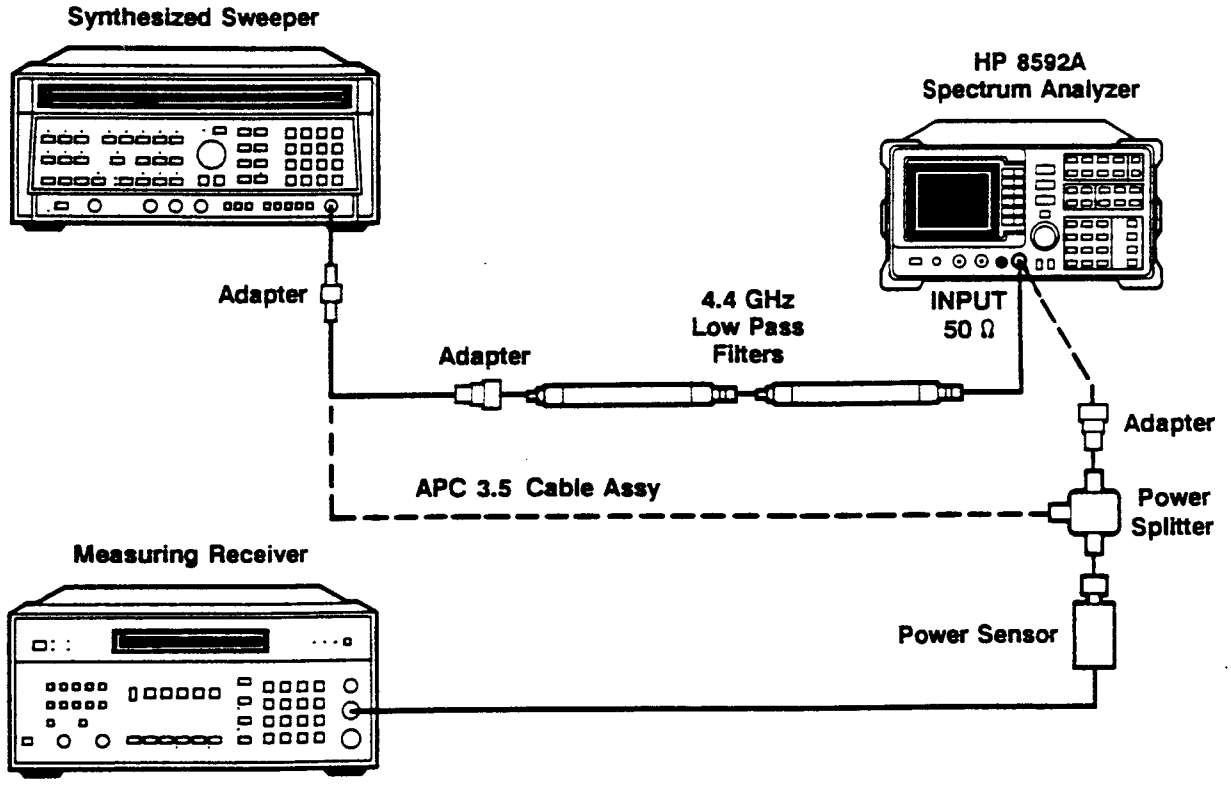


Figure 1-4. Second-Harmonic Distortion Test Setup (>2.9 GHz)

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12. On the HP 8340A/B, press *PRESET* and set the controls as follows:
    CW . . . . . 2.8 GHz
    POWER LEVEL . . . . . 0 dBm

13. On the HP 8592A, press:
    PEAK SEARCH
    AMPLITUDE
    [PRESEL PEAK]

    Wait for the CAL:PEAKING message to disappear. Press *PEAK SEARCH* and [MARKER DELTA].

14. Note the power meter reading:

    Power Meter reading at 2.8 GHz = _____ dBm

15. Set the HP 8340A/B *CW* to 5.6 GHz.

16. Set the HP 8592A CENTER FREQUENCY to 5.6 GHz. Press:
    PEAK SEARCH
    AMPLITUDE
    [PRESEL PEAK]

    Wait for the CAL:PEAKING message to disappear. Press *PEAK SEARCH* and *SIGNAL TRACK (on).*

17. Adjust the HP 8340A/B *POWER LEVEL* until the marker amplitude reads 0 dB ±0.20 dB.

18. Enter the power sensor's 6 GHz Cal Factor into the power meter. Note the power meter reading:

    Power Meter reading at 5.6 GHz = _____ dBm

19. Subtract the reading in step 18 from the reading in step 13 and record as the frequency response error. For example, if the reading in step 18 is −6.45 dBm and the reading in step 13 is −7.05 dBm, the frequency response error would be −7.05 dm −(−6.45 dBm) = −0.60 dB.

    Frequency Response Error (FRE) = _____ dB

20. Calculate the desired maximum marker amplitude reading as follows:

    a. Add frequency response error (FRE) recorded in step 19 to −60 dBc; (specification is −100 dBc, but *REF LEVEL* will be changed by 40 dB to yield the required dynamic range) and record below:

    Distortion-limited Specification = −60 dBc + FRE

    Distortion-limited Specification = _____ dBc

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b. Subtract −40 dBm (*REF LEVEL* setting) from noise level at 5.6 GHz (step 9) and record below:

Noise-limited Specification = noise level at 5.6 GHz + 40 dBm

Noise-limited Specification = _____ dBc

c. Record the more positive of the values recorded in a and b above. For example, if the value in a. is −59 dBc and the value in b. is −61 dBc, record −59 dBc.

Specification = _____ dBc

21. Connect the equipment as shown in Figure 1-4 with the filters in place.

22. Set the HP 8340A/B controls as follows:
CW . . . . . 2.8 GHz
POWER LEVEL . . . . . 0 dBm

23. On the HP 8592A, set the CENTER FREQUENCY to 2.8 GHz. Press:
MKR
[MARKERS OFF]
PEAK SEARCH
AMPLITUDE
[PRESEL PEAK]

Wait for the CAL:PEAKING message to disappear. Press:
SIGNAL TRACK (on)
SPAN 100 kHz.

24. Adjust the HP 8340A/B *POWER LEVEL* for an HP 8592A marker amplitude reading of 0 dBm ±0.2 dB.

25. On the HP 8592A, press *SIGNAL TRACK (off)*, *PEAK SEARCH* [MARKER DELTA]. Set the controls as follows:
CENTER FREQUENCY *5.6 GHz*
SPAN 10 MHz

26. Remove the filters and connect the HP 8340A/B output directly to the HP 8592A INPUT 50Ω.

27. On the HP 8592A, press:
PEAK SEARCH
AMPLITUDE
[PRESEL PEAK]

Wait for the CAL:PEAKING message to disappear. Press:
SIGNAL TRACK (on)
SPAN 100 kHz
SIGNAL TRACK (off)

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28. Reinstall the filters between the HP 8340A/B output and the HP 8592A INPUT 50Ω.

29. Set the HP 8592A controls as follows:
    REF LEVEL . . . . . 40 −dBm
    [VID BW] . . . . . 30 Hz
    [VIDEO AVERAGE] 10

    Press *TRIG* and [SINGLE SWEEP]. Wait until AVG10 is displayed along the left side of the CRT. Press *PEAK SEARCH*. Record the marker amplitude reading below:

    Marker Amplitude Reading = _____ dBc

30. The marker amplitude reading should be more negative than the specification recorded in step 20c. Record both the specification from step 20c and the marker amplitude reading in step 29 in Table 1-4. Also record the specification from step 20c in Table 1-13, Performance Test Record (at the end of this chapter).

Third-Order Intermodulation Distortion, <2.9 GHz

31. Zero and calibrate the HP 8902A and HP 8485A combination in log mode (RF Power readout in dBm). Enter the power sensor's 3 GHz Cal Factor into the HP 8902A.

32. Connect the equipment as shown in Figure 1-5, with the output of the directional coupler connected to the power sensor.

33. Press *INSTR PRESET* on each HP 8340A/B. Set each of the HP 8340A/B controls as follows:
    POWER LEVEL . . . . . 15 −dBm
    (HP 8340A/B #1): *CW* . . . . . 2.800 GHz
    (HP 8340A/B #2): *CW* . . . . . 2.80005 GHz
    RF . . . . . OFF

34. On the HP 8592A, press *PRESET* and wait until the preset is finished. Set the controls as follows:
    CENTER FREQUENCY . . . . . 2.8 GHz
    SPAN . . . . . 10 MHz
    [REF LEVEL] . . . . . 10 −dBm
    [PEAK EXCURSION] . . . . . 3 dB
    [THRESHOLD] . . . . . 90 −dBm

35. On HP 8340A/B #1, set *RF ON*. Adjust the *POWER LEVEL* until the HP 8902A reads −12 dBm ±0.05 dB.

36. Disconnect the power sensor from the directional coupler. Connect the directional coupler directly to the HP 8592A INPUT 50Ω using an adapter (do not use a cable).

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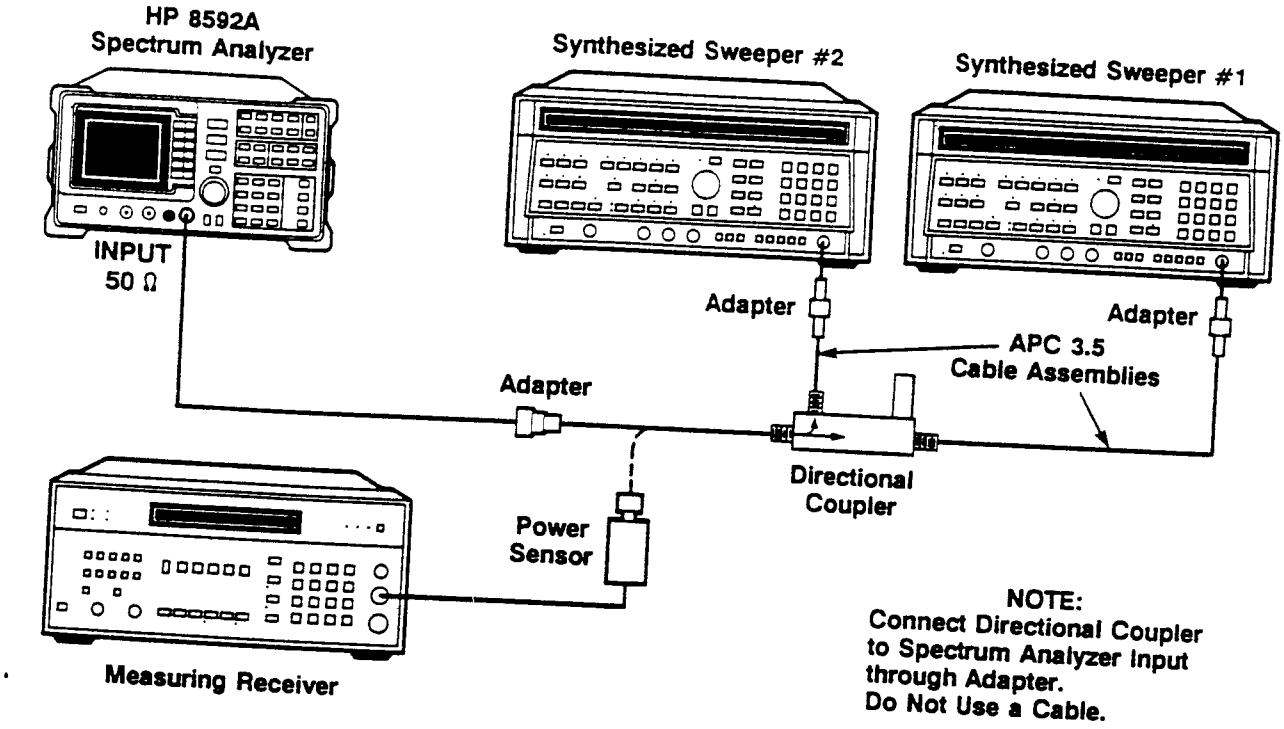


Figure 1-5. Third-Order Intermodulation Distortion Test Setup

37. On the HP 8592A, press:
    PEAK SEARCH
    SIGNAL TRACK (on)
    SPAN 200 kHz

    Wait for the AUTOZOOM message to disappear. Press:
    SIGNAL TRACK (off)
    FREQUENCY ↑
    PEAK SEARCH MKR→
    [MARKER→RL]

38. On HP 8340A/B #2, set *RF ON*. Adjust the *POWER LEVEL* until the two signals are displayed at the same amplitude.

40. If necessary, adjust the HP 8592A CENTER FREQUENCY until the two signals are centered on the display. Set the controls as follows:
    [RES BW] . . . . . 1 kHz
    [VID BW] . . . . . 100 Hz

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41. Press *PEAK SEARCH* and [MARKER DELTA]. Set the [DISPLAY LINE] to a value 54 dB below the current *REF LEVEL* setting.

42. The third-order intermodulation distortion products should appear 50 kHz below the lower frequency signal and 50 kHz above the higher frequency signal. Their amplitude should be less than the display line. See Figure 1-6.

43. If the distortion products can be seen, proceed as follows:

    a. On the HP 8592A, press *MKR→* and [MORE].

    b. Repeatedly press [NEXT PEAK] until the active marker is on the desired distortion product.

    c. Record the MKR Δ amplitude reading in Table 1-5 (at the end of this section). The reading should be less than the specified limit.

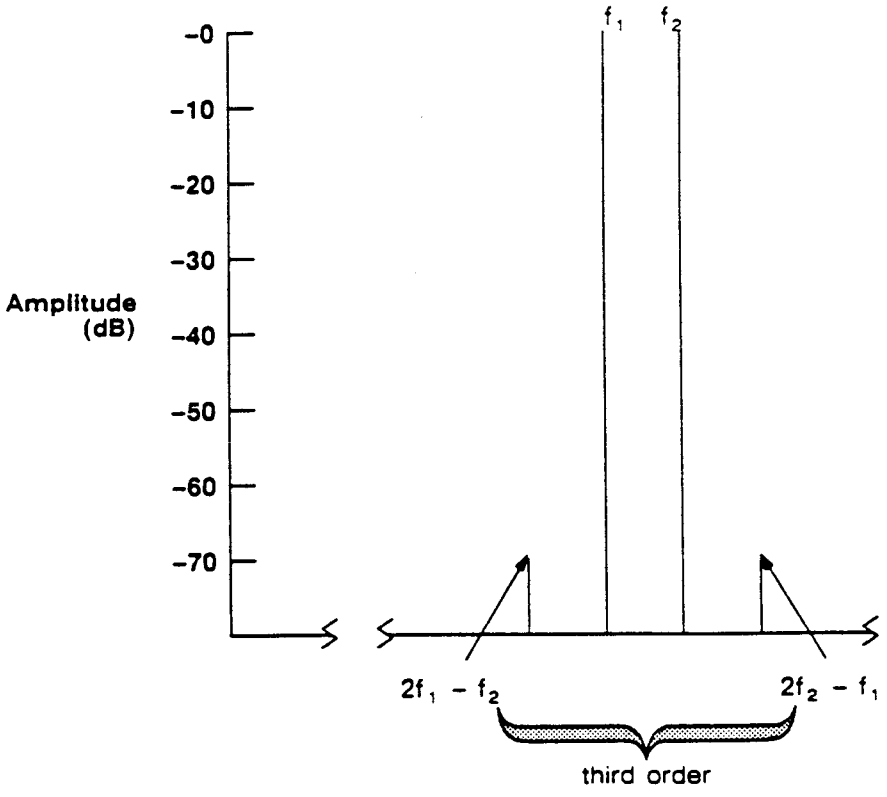


Figure 1-6. Spurious Response-Intermodulation Distortion Products

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44. If the distortion products cannot be seen, proceed as follows:

    a. On each HP 8340A/B, increase the *POWER LEVEL* by 5 dB. Distortion products should now be visible at this higher power level.

    b. On the HP 8592A, press *MKR→* and [MORE].

    c. Repeatedly press [NEXT PEAK] until the active marker is on one of the distortion products.

    d. On each HP 8340A/B, reduce the *POWER LEVEL* by 5 dB and wait for completion of a new sweep.

    e. Record the MKR Δ amplitude reading in Table 1-5. The reading should be less than the specified limit.

Third-Order Intermodulation Distortion, >2.9 GHz

45. Enter the power sensor's 4 GHz Cal Factor into the HP 8902A.

46. Disconnect the directional coupler from the HP 8592A and connect the power sensor to the output of the directional coupler.

47. Set each of the HP 8340A/B controls as follows:

POWER LEVEL	−15 dBm
(HP 8340A/B #1): *CW*	4.000 GHz
(HP 8340A/B #2): *CW*	4.00005 GHz
RF OFF	

48. On the HP 8592A, press *PRESET* and wait until the preset is finished. Set the controls as follows:

CENTER FREQUENCY	4.0 GHz
SPAN	10 MHz
REF LEVEL	10 −dBm
[PEAK EXCURSION]	3 dB
[THRESHOLD]	90 −dBm

49. On HP 8340A/B #1, set *RF ON*. Adjust the *POWER LEVEL* until the HP 8902A reads −12 dBm ±0.05 dB.

50. Disconnect the power sensor from the directional coupler. Connect the directional coupler directly to the HP 8592A INPUT 50Ω using an adapter (do not use a cable).

51. On the HP 8592A, press:
    PEAK SEARCH
    AMPLITUDE
    [PRESEL PEAK]

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Wait for the CAL: PEAKING message to disappear. Press:
SIGNAL TRACK (on)
SPAN 200 kHz

Wait for the AUTOZOOM message to disappear. Press:
SIGNAL TRACK (off)
FREQUENCY ↑
PEAK SEARCH
MKR→
[MARKER→RL].

52. On HP 8340A/B #2, set *RF ON*. Adjust the POWER LEVEL until the two signals are displayed at the same amplitude.

53. If necessary, adjust the HP 8592A CENTER FREQUENCY until the two signals are centered on the display. Set the controls as follows:
    [RES BW] . . . . . 1 kHz
    [VID BW] . . . . . 100 Hz

54. Press *PEAK SEARCH* and [MARKER DELTA]. Set the [DISPLAY LINE] to a value 54 dB below the current REF LEVEL setting.

55. The third-order intermodulation distortion products should appear 50 kHz below the lower frequency signal and 50 kHz above the higher frequency signal. Their amplitude should be less than the display line. See Figure 1-6.

56. If the distortion products can be seen, proceed as follows:

    a. On the HP 8592A, press *MKR→* and [MORE].

    b. Repeatedly press [NEXT PEAK] until the active marker is on the desired distortion product.

    c. Record the MKR Δ amplitude reading in Table 1-5. The reading should be less than the specified limit.

57. If the distortion products cannot be seen, proceed as follows:

    a. On each HP 8340A/B, increase the POWER LEVEL by 5 dB. Distortion products should now be visible at this higher power level.

    b. On the HP 8592A, press *MKR→* and [MORE].

    c. Repeatedly press [NEXT PEAK] until the active marker is on one of the distortion products.

    d. On each HP 8340A/B, reduce the *POWER LEVEL* by 5 dB and wait for completion of a new sweep.

    e. Record the MKR Δ amplitude reading in Table 1-5. The reading should be less than the specified limit.

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Table 1-4. Second Harmonic Distortion

Input CW FREQUENCY (MHz)	Distortion Suppression (MKR)	
	Measured (dBc)	Spec (dBc)
30	_____	−50
2800	_____	_____ (from step 20c)

Table 1-5. Third-Order Intermodulation Distortion

HP 8340A/B #1 CW FREQUENCY (GHz)	HP 8340A/B #284 CW FREQUENCY (GHz)	MKR Δ Amplitude Reading	
		ACTUAL (dBc)	MAX (dBc)
2.80000	2.80005	_____	−54
4.00000	4.00005	_____	−54

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4. Residual Response Test

Residual response is checked by terminating the INPUT 50Ω of the HP 8592A Spectrum Analyzer, setting the input attenuator to 0 dB, and measuring any residuals across the instrument's input frequency range. The residual responses are measured on the CRT display.

Specifications

< −95 dBm from 5 MHz to 2.9 GHz (with 0 dB input attenuation and no input signal)
< −90 dBm from 2.75 to 6.2 GHz (with 0 dB input attenuation and no input signal)

Recommended Test Equipment

50 ohm Termination . . . . . HP 11593A

Test Procedure

NOTE

The following procedure requires approximately 15 minutes to complete using the frequency-step size and span given for both bands tested.

1. Connect the 50 ohm termination to the INPUT 50Ω of the analyzer.

2. Press the following spectrum analyzer keys:
   PRESET (wait until preset is complete)
   FREQUENCY 25 MHz
   SPAN 50 MHz
   AMPLITUDE 60 −dBm
   [ATTEN] *0 dB*
   SWP/BW [RES BW] *10 kHz*
   [VID BW] *3 kHz*
   DISPLAY [DISPLAY LINE] *95 −dBm*
   FREQUENCY [CF STEP SIZE] *45 MHz*

3. After pressing *TRIG* and [SINGLE SWEEP], wait for the sweep to complete, then look for any residual responses at or above the display line on the display CRT. If a residual is suspected, press the [SINGLE SWEEP] key again to determine if the response persists. A residual will remain on repeated sweeps, but a noise peak will not. Any residual responses must be at or below the display line.

4. Press *FREQUENCY*, then the ↑ key to step to the next higher center frequency, which is 45 MHz above the last setting. Repeat step 3.

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5. Repeat steps 3 and 4 until the complete 2.9 GHz frequency range has been evaluated. This requires 60 additional frequency steps. There should be no residual response at or above the display line at frequencies below 2.9 GHz. The test for this band requires about six minutes to complete.

6. For frequencies from 2.75 to 6.2 GHz (< −90 dBm), repeat steps 2 through 5, starting at *FREQUENCY 2750 MHz*, and set *DISPLAY* [DISPLAY LINE] to −90 dBm. This band requires 77 additional frequency steps and takes about seven minutes to complete.

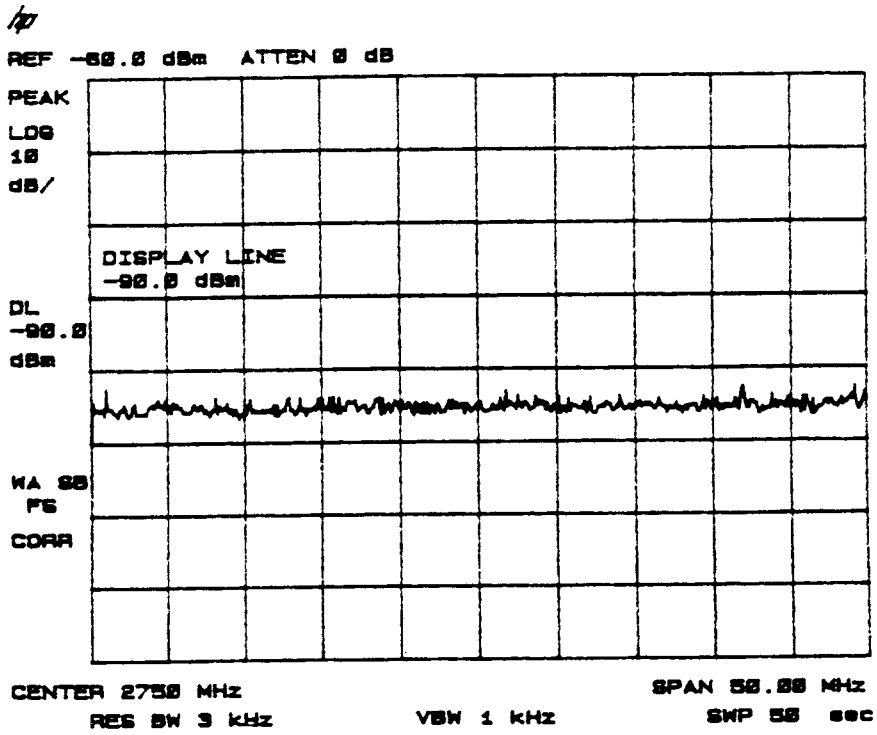


Figure 1-7. Residual Response Display Example

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5. Reference Level Accuracy Test

A 50 MHz CW signal is applied to the INPUT 50Ω of the HP 8592A 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 HP 8592A 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 ATTEN) since lower reference levels are a function of the HP 8592A's microprocessor manipulating the trace data. There is no error associated with the trace data manipulation.

Accuracy of the reference levels above 0 dBm are a function of the input attenuator accuracy. Input attenuator accuracy is specified as being < ± 0.5 dB over the 0 to 60 dB attenuation range. If the attenuator meets this accuracy and the reference level accuracy for reference levels less than 0 dBm is < ± 1.0 dB, the specification for reference level accuracy from +30 dBm to −120 dBm will also be met.

Specification

< ± 1.5 dB for +30 to −120 dBm range (0 to 60 dB ATTEN settings)
< ± 1.0 dB for 0 to −120 dBm range (10 dB ATTEN setting)
< ± 0.5 dB for 0 to −59 dBm range (10 dB ATTEN setting)

Recommended Test Equipment

Synthesizer/Level Generator	HP 3335A
Step Attenuator, 10 dB steps	HP 355D
Step Attenuator, 1 dB steps	HP 355C

Cable Assemblies

BNC Cable (23 cm; 9 in)	HP 10502A
BNC Cable (122 cm; 48 in)(2 required)	HP 10503A

Adapter

Type N(m) to BNC(f)	HP 1250-1476

Test Procedure

Log Scale

1. Set the HP 3335A controls as follows:

FREQUENCY	50 MHz
AMPLITUDE	+10 dBm
AMPTD INCR	10 dB
OUTPUT	50 ohms

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2. Connect the equipment as shown in Figure 1-8. Set the HP 355D to 10 dB attenuation and the HP 355C to 0 dB attenuation.

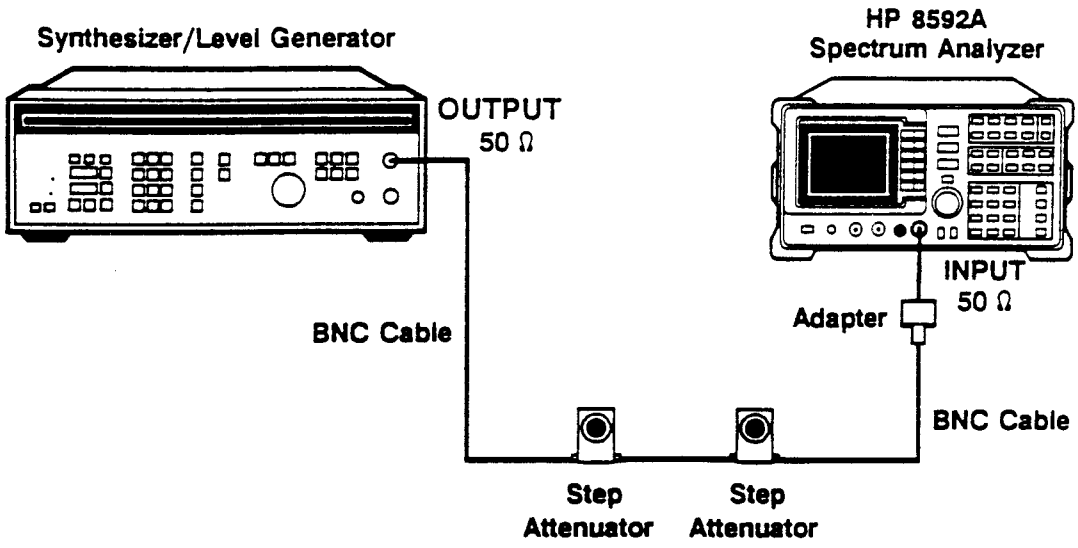


Figure 1-8. Reference Level Accuracy Test Setup

3. Press *PRESET* on the HP 8592A and wait for the preset to finish. Set the controls as follows:

   CENTER FREQUENCY . . . . . 50 MHz
   SPAN . . . . . 10 MHz

4. On the HP 8592A, press:
   PEAK SEARCH
   SIGNAL TRACK (on)
   SPAN 50 kHz

   After the AUTO ZOOM procedure is finished, press:
   AMPLITUDE
   [LOG dB/DIV] *1 dB*

   Set the [RES BW] to 3 kHz and [VID BW] to 30 Hz.

5. Set the HP 355C attenuation to place the signal peak 1 to 2 dB (1 to 2 divisions) below the reference level.

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6. On the HP 8592A, press:
   TRIG
   [SINGLE SWEEP]
   SIGNAL TRACK (off)
   PEAK SEARCH
   [MARKER DELTA]

7. Set the HP 3335A *AMPLITUDE* and HP 8592A REF LEVEL according to Table 1-6. At each setting, press *TRIG* [SINGLE SWEEP] *PEAK SEARCH* on the HP 8592A. Record the MKR Δ amplitude reading in Table 1-6. The reading should be within the limits shown.

Linear Scale

8. Set the HP 3335A *AMPLITUDE* to +10 dBm.

9. Set the HP 355C to 0 db attenuation.

10. Press *PRESET* on the HP 8592A and wait for the preset to finish. Set the controls as follows:

CENTER FREQUENCY	50 MHz
SPAN	10 MHz

11. On the HP 8592A, press:
    PEAK SEARCH
    SIGNAL TRACK (on)
    SPAN 50 kHz

    After the AUTO ZOOM procedure is finished, press:
    AMPLITUDE
    LINEAR
    DISPLAY
    DISPLAY UNITS dBm

    Set the [RES BW] to 3 kHz and [VID BW] to 30 Hz.

12. Set the HP 355C attenuation to place the signal peak one to two divisions below the reference level.

13. On the HP 8592A, press:
    TRIG
    [SINGLE SWEEP]
    SIGNAL TRACK (off)
    PEAK SEARCH
    [MARKER DELTA]

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14. Set the HP 3335A *AMPLITUDE* and HP 8592A REF LEVEL according to Table 1-7. At each setting, press *TRIG* [SINGLE SWEEP] and *PEAK SEARCH* on the HP 8592A. Record the MKR Δ amplitude reading in Table 1-7. The reading should be within the limits shown.

15. In Table 1-6, locate the Actual MKR Δ reading for REF LEVEL settings from 0 to −50 dBm with the greatest deviation (positive or negative) from 0 dB and record the result below.

    Log Mode Reference Level Accuracy (0 to −50 dBm settings) _____ dB

16. In Table 1-6, locate the Actual MKR Δ reading for REF LEVEL settings from 0 to −90 dBm with the greatest deviation (positive or negative) from 0 dB and record the result below.

    Log Mode Reference Level Accuracy (0 to −90 dBm settings) _____ dB

17. In Table 1-7, locate the Actual MKR Δ reading for REF LEVEL settings from 0 to −50 dBm with the greatest deviation (positive or negative) from 0 dB and record the result below.

    Linear Mode Reference Level Accuracy (0 to −50 dBm settings) _____ dB

18. In Table 1-7, locate the Actual MKR Δ reading for REF LEVEL settings from 0 to −90 dBm with the greatest deviation (positive or negative) from 0 dB and record the result below.

    Linear Mode Reference Level Accuracy (0 to −90 dBm settings) _____ dB

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Table 1-6. Reference Level Accuracy, Log Mode

HP 3335A AMPLITUDE (dBm)	HP 8592A REF LEVEL (dBm)	MKR Δ Reading		
		Min (dB)	Actual (dB)	Max (dB)
+10	0	0(Ref)	0(Ref)	0(Ref)
0	−10	−0.5	____	+0.5
−10	−20	−0.5	____	+0.5
−20	−30	−0.5	____	+0.5
−30	−40	−0.5	____	+0.5
−40	−50	−0.5	____	+0.5
−50	−60	−1.0	____	+1.0
−60	−70	−1.0	____	+1.0
−70	−80	−1.0	____	+1.0
−80	−90	−1.0	____	+1.0

Table 1-7. Reference Level Accuracy, Linear Mode

HP 3335A AMPLITUDE (dBm)	HP 8592A REF LEVEL (dBm)	MKR Δ Reading		
		Min (dB)	Actual (dB)	Max (dB)
+10	0	0(Ref)	0(Ref)	0(Ref)
0	−10	−0.5	____	+0.5
−10	−20	−0.5	____	+0.5
−20	−30	−0.5	____	+0.5
−30	−40	−0.5	____	+0.5
−40	−50	−0.5	____	+0.5
−50	−60	−1.0	____	+1.0
−60	−70	−1.0	____	+1.0
−70	−80	−1.0	____	+1.0
−80	−90	−1.0	____	+1.0

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6. Scale Fidelity Test

This test is performed in two parts. The first part measures log scale fidelity and the second part checks linear scale fidelity. Both procedures use the same test method.

A 30 MHz, CW signal is passed to the HP 8592A Spectrum Analyzer through a 10 dB step attenuator. The generator output level is adjusted to place the signal peak at the selected analyzer reference level. The signal amplitude is then reduced using the step attenuator. The scale fidelity figure is determined by calculating the error between the actual display and the theoretical amplitude levels. The calculations are performed using the analyzer marker-amplitude difference function and the selected attenuation value.

Specification

Log Incremental Accuracy
< ±0.1 dB/dB change over 70 dB range

Log Maximum Cumulative Error
±0.75 dB maximum over 60 dB range from reference level
±1.0 dB maximum over 70 dB range from reference level

Linear Accuracy
< ±3% of reference level setting

Recommended Test Equipment

Signal Generator	HP 8640A
10 dB Step Attenuator (calibrated at 30 MHz)	HP 355D-H82
1.0 dB Step Attenuator (calibrated at 30 MHz)	HP355C-H80

Cable Assemblies

BNC Cable (20 cm; 9 in)	HP 10502A
BNC Cable (120 cm; 48 in)	HP 10503A

Test Procedure - Log Scale Fidelity

1. Set the signal generator output signal to CW at 30 MHz, 0 dBm. Set the counter control to INT ON, the modulation controls to OFF, and the RF control to ON.

2. Connect the equipment as shown in Figure 1-9, set the step attenuator to 10 dB, and press the following spectrum analyzer keys:
   PRESET (wait until preset is complete)
   FREQUENCY 30 MHz
   SPAN 10 MHz
   PEAK SEARCH
   SIGNAL TRACK

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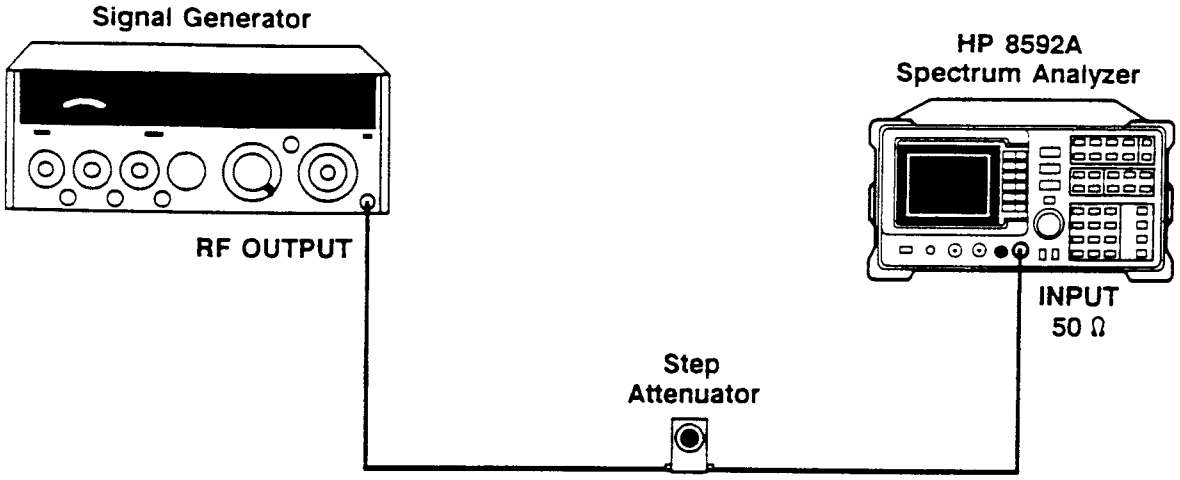


Figure 1-9. Scale Fidelity Test Setup

3. Continue by pressing these analyzer keys:
   SPAN 50 kHz
   SWP/BW [RES BW] *3 kHz* [VID BW] *300 Hz*
   MKR→
   AMPLITUDE [MARKER→RL]
   [ATTEN] *0 dB*
   [LOG dB/DIV] *10 dB*
   PEAK SEARCH [MARKER DELTA]
   SIGNAL TRACK

NOTE

The MKR Δ readout should be 0.0 ±0.02 dB. Repeat step 3 if not.

4. Set the step attenuator to the next 10 dB step up, specified in Table 1-8. Record the MKR Δ readout.

5. Repeat step 4 until the 70 dB attenuator setting is obtained. The difference between any two adjacent steps should be 10 dB ± 1.0 dB (0.1 dB/dB).

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Test Procedure - Linear Scale Fidelity

1. As necessary, reset the signal generator to output a 30 MHz, 0 dBm, CW signal. Replace the 10 dB step attenuator in the test setup with the 1.0 dB step attenuator.

2. Set the 1.0 dB step attenuator to 0 dB, then press the following spectrum analyzer keys:
   PRESET (wait until preset is complete)
   AMPLITUDE [LINEAR]
   SWP/BW [RES BW] *1 MHz* [VID BW] *1 MHz*
   SPAN 5 MHz
   FREQUENCY 30 MHz
   PEAK SEARCH
   SIGNAL TRACK
   SPAN 10 kHz

3. Set the generator output level as needed to place the trace on the display to the top graticule line. Note the marker amplitude readout on the display at the reference level. A theoretical level of 0 dBm should correspond with a displayed level of 223.6 mV.

NOTE

When changing step attenuator settings in the following steps, allow the analyzer to sweep the signal several times before recording the marker amplitude. This delay allows the video bandwidth filter in the analyzer to fully charge and thus improve overall test measurement accuracy.

4. Set the step attenuator to 6 dB. The displayed signal-peak trace should be four graticule divisions above the baseline. The marker amplitude should read one-half as much as in step 3, ±3%, of the reference level amplitude (i.e., 111.8 mV ±6.69 mV). Record the test result in Table 1-9, Linear Scale Fidelity Settings.

5. Set the step attenuator to 12 dB. The displayed signal-peak trace should be two graticule divisions above the baseline. The marker amplitude should read one-half as much as in step 4, ±3%, of the reference level amplitude (i.e., 55.9 mV, ±6.69 mV). Record the test results.

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Table 1-8. Log Scale Fidelity Test Settings

Attenuator Settings (dB)	Max. Amplitude (dB)	Actual Amplitude (dB)	Min. Amplitude (dB)
0	0	0 (Ref)	0
10	−9.25	_____	−10.75
20	−19.25	_____	−20.75
30	−29.25	_____	−30.75
40	−39.25	_____	−40.75
50	−49.25	_____	−50.75
60	−59.25	_____	−60.75
70	−69.00	_____	−71.00

Table 1-9. Linear Scale Fidelity Test Settings

Attenuator Settings (dB)	Min. Amplitude (mV)	Actual Amplitude (mV)	Max. Amplitude (mV)
0	223.6	223.6 (Ref)	223.6
6	105.11	_____	118.49
12	49.21	_____	62.59

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7. Resolution Bandwidth Switching Test

In this test the HP 8592A Spectrum Analyzer CAL OUTPUT signal is applied to its INPUT 50Ω. The peak search function is used to measure the amplitude deviation of each IF resolution bandwidth filter as displayed on the CRT display.

Specification

Resolution Bandwidth Switching (Amplitude Variation)
< ±0.25 dB for 3 kHz to 3 MHz range

Recommended Equipment

Cable Assembly

BNC(m) to BNC(m) . . . . . HP 10502A

Test Procedure

1. Connect the BNC cable from the CAL OUTPUT to the INPUT 50Ω of the spectrum analyzer.

2. Press the following spectrum analyzer keys:
   PRESET (wait until preset is complete)
   FREQUENCY 300 MHz
   SPAN 5 MHz
   PEAK SEARCH
   SIGNAL TRACK
   SWP/BW [RES BW] 1 MHz
   [VID BW] 1 kHz
   AMPLITUDE 20 –dBm
   [LOG dB/DIV] *1 dB*
   AMPLITUDE

3. Use the RPG to adjust the signal to the seventh graticule line on the display. Press:
   PEAK SEARCH
   [MARKER DELTA]
   SIGNAL TRACK (on).

4. Select the next resolution bandwidth setting indicated in Table 1-10 by pressing the following keys:
   SWP/BW [RES BW] *3 MHz*
   SPAN 10 MHz

5. Press *PEAK SEARCH* and record the MKR Δ TRK amplitude reading in Table 1-10. The amplitude read in should be within the limits shown.

6. Repeat steps 4 and 5 for each of the remaining resolution bandwidths and spans. Record the measurements in Table 1-10.

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Table 1-10. Resolution Bandwidth Switching Test Settings

Resolution Bandwidth	Span	MKR Δ TRK	
		Amplitude Reading	Measurement Limit (dB)
1 MHz	5 MHz	0(Ref)	0(Ref)
3 MHz	10 MHz	———	±0.25 dB
300 kHz	5 MHz	———	±0.25 dB
100 kHz	500 kHz	———	±0.25 dB
30 kHz	500 kHz	———	±0.25 dB
10 kHz	50 kHz	———	±0.25 dB
3 kHz	50 kHz	———	±0.25 dB

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8. Gain Compression Test

Signals from the signal generator and frequency synthesizer are applied to the spectrum analyzer input mixer, via a directional bridge. The frequency synthesizer is set to output an 80 MHz, −18 dBm, CW signal. The directional bridge causes a 6 dB loss and this signal must be at least 20 dB below the compression level threshold which is 40 dBm. The signal generator is set to output a 100 MHz, 0 dBm, CW signal at the load connector of the directional bridge.

First, the signal generator and frequency synthesizer output levels are calibrated with a power meter. Next, the frequency synthesizer output is connected to the directional bridge and measured by the spectrum analyzer to establish a reference level. The signal generator and frequency synthesizer are connected to the directional bridge for the compression level evaluation. The gain compression level is determined by using the spectrum analyzer marker delta function.

Specifications

Gain Compression
INPUT 50Ω <0.5 dB for ≤4.0 dBm total power at the input mixer

Recommended Equipment

Frequency Synthesizer	HP 3335A
Signal Generator	HP 8640B
Directional Bridge	HP 8721A
Power Meter	HP 436A
Power Sensor	HP 8482A
50 ohm Termination	HP 11593A

Cable Assembly

BNC Cable (120 cm; 48 in)	HP 10503A

Adapter

Type N(m) to BNC(m)	HP 1250-0082

Test Procedure

1. Set the signal generator to output a 100 MHz, CW signal.

2. Connect the signal generator to the SOURCE connector and the power sensor to the LOAD connector of the directional bridge. Terminate the REFLECTED port of the directional bridge with the 50 ohm termination. Set the signal generator output power level for +6 dBm at the LOAD connector of the directional bridge.

3. Temporarily disconnect the signal generator from the directional bridge and terminate the SOURCE port with the 50 ohm termination.

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4. Set the frequency synthesizer to output an 80 MHz, CW signal. Connect the BNC cable to the frequency synthesizer RF OUTPUT, then to the REFLECTED port of the directional bridge. Use the power meter and power sensor to set the frequency synthesizer output level to −24 dBm at the directional bridge LOAD connector.

5. Connect the spectrum analyzer to the directional bridge LOAD port and press the following keys:
   PRESET (wait until preset is complete)
   FREQUENCY 80 MHz
   SPAN 10 MHz
   PEAK SEARCH
   SIGNAL TRACK
   SWP/BW [RES BW] *3 MHz*
   [VID BW] *300 Hz*
   AMPLITUDE [LOG dB/DIV] *5 dB*
   MKR [MARKER DELTA]

6. Connect the signal generator back to the directional bridge SOURCE port. Note the MKR Δ readout on the display. There should be no more than 0.5 dB amplitude deviation.

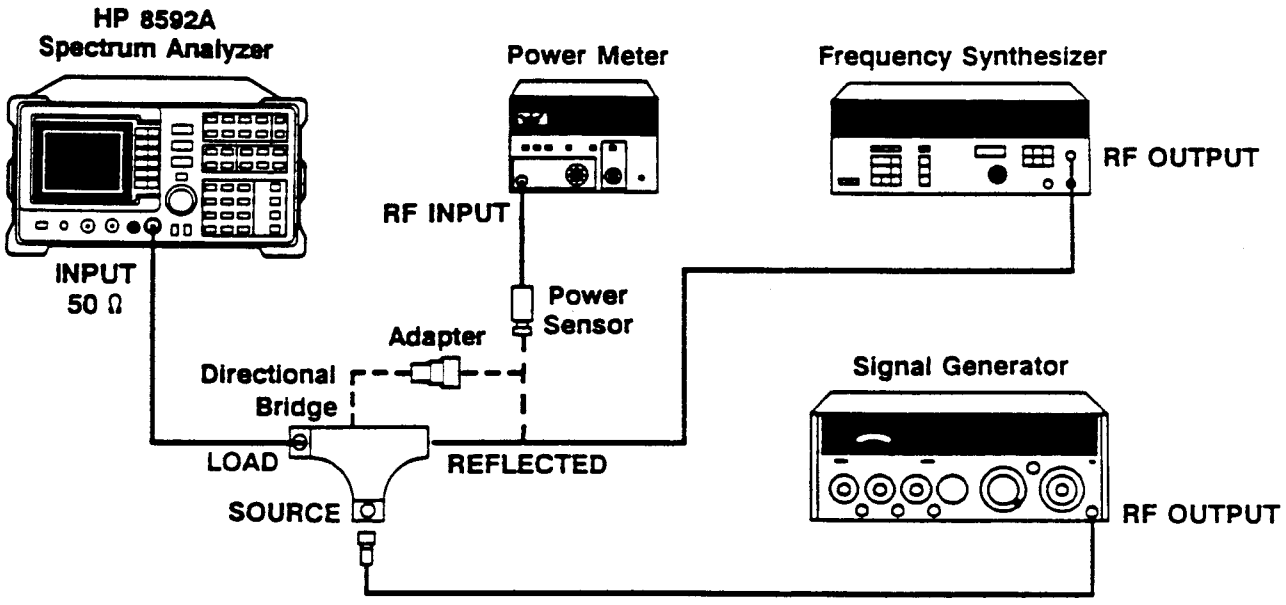


Figure 1-10. Gain Compression Test Setup

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9. Input Attenuator Accuracy Test

The input attenuator's switching accuracy is tested over the full 0 dB to 70 dB range. Switching accuracy is referenced to the 10 dB attenuator setting. The attenuator in the synthesizer/level generator is the measurement standard.

Specification

< ±0.5 dB over 0 to 60 dB range
< ±0.75 dB over 0 to 70 dB range

Recommended Equipment

Synthesizer/Level Generator . . . . . HP 3335A
Step Attenuator, 1 dB steps . . . . . HP 355C
Step Attenuator, 10 dB steps . . . . . HP 355D

Cable Assembly

BNC Cable (120 cm, 48 in) (2 required) . . . . . HP 10503A

Adapters

Type N(m) to BNC(f) . . . . . HP 1250-1476

Test Procedure

1. Connect the equipment as shown in Figure 1-11. Set the HP 355D to 20 dB attenuation and the HP 355C to 0 dB attenuation.

2. Set the HP 3335A controls as follows:
   FREQUENCY . . . . . 50 MHz
   AMPLITUDE . . . . . −50 dBm
   AMPTD INCR . . . . . 10 dB
   OUTPUT . . . . . 50 ohms

3. On the HP 8592A, press *PRESET* and wait for the preset to finish. Set the controls as follows:
   CENTER FREQUENCY . . . . . 50 MHz
   SPAN . . . . . 10 MHz
   REF LEVEL . . . . . −70 dBm
   [LOG dB/DIV] . . . . . 1 dB
   [RES BW] . . . . . 10 kHz

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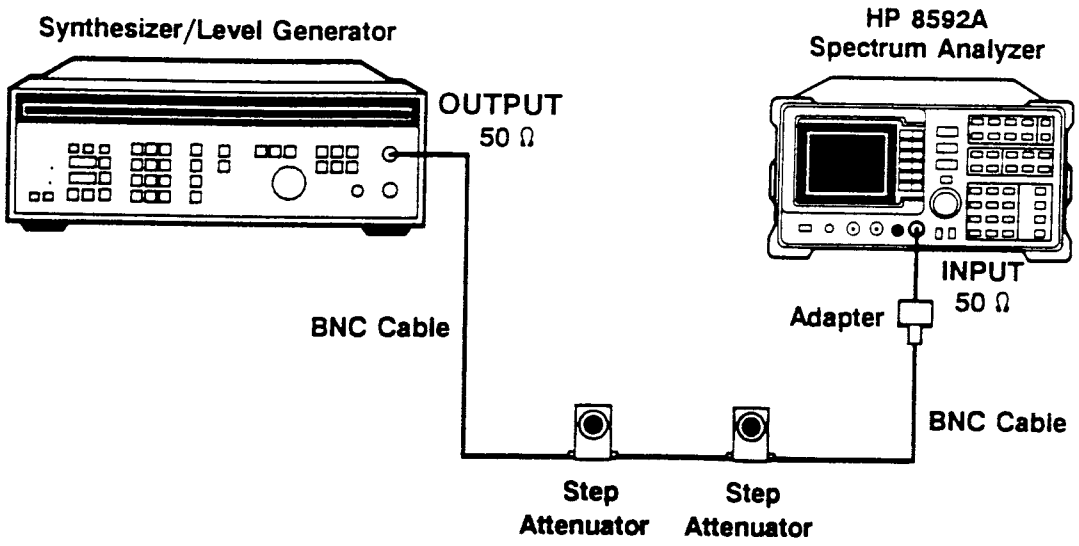


Figure 1-11. Input Attenuator Accuracy Test Setup

4. On the HP 8592A, press:
   PEAK SEARCH
   SIGNAL TRACK (on)
   SPAN 100 kHz

   Set the [VID BW] to 100 Hz.

5. Set the HP 355C attenuation to place the signal peak 2 to 3 dB (2 to 3 divisions) below the reference level.

6. On the HP 8592A, press:
   TRIG
   [SINGLE SWEEP]
   PEAK SEARCH
   [MARKER DELTA]

7. Set the HP 3335A *AMPLITUDE* to −60 dBm as indicated in row 2 of Table 1-11.

8. Set the HP 8592A *REF LEVEL* to −80 dBm and [ATTEN] to 0 dB as indicated in row 2 of Table 1-11.

9. On the HP 8592A, press *TRIG* and [SINGLE SWEEP], and wait for a new sweep to finish. Press *PEAK SEARCH* and record the MKR Δ amplitude in Table 1-11 as the Actual reading. The MKR Δ amplitude reading should be within the limits shown.

10. Repeat steps 7 through 10 using the HP 3335A *AMPLITUDE* and HP 8592A *REF LEVEL* and [ATTEN] settings listed in Table 1-11.

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Table 1-11. Input Attenuator Accuracy Settings/Readings

HP 3335A AMPLITUDE (dBm)	HP 8592A REF LEVEL (dBm)	HP 8592A ATTEN (dB)	MKR Δ Reading		
			Min (dB)	Actual (dB)	Max (dB)
−50	−70	10	0(Ref)	0(Ref)	0(Ref)
−60	−80	0	−0.5	_____	+0.5
−40	−60	20	−0.5	_____	+0.5
−30	−50	30	−0.5	_____	+0.5
−20	−40	40	−0.5	_____	+0.5
−10	−30	50	−0.5	_____	+0.5
0	−20	60	−0.5	_____	+0.5
10	−10	70	−0.75	_____	+0.75

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10. Image, Multiple, and Out-of-Band Responses Test

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, multiple, and out-of-band responses. At each source frequency, the source amplitude is set to 0 dBm and the amplitude of the response, if any, is measured using the analyzer's marker function. The marker amplitude difference is then compared to the specification.

Specification

< −70 dBc (Tuned Frequency 50 kHz to 2.9 GHz; Applied Frequency < 10 GHz)
< −70 dBc (Tuned Frequency 2.75 to 22 GHz; Applied Frequency ≤18 GHz)
< −60 dBc (Tuned Frequency 2.75 to 22 GHz; Applied Frequency ≤22 GHz)

Recommended Test Equipment

Synthesized Sweeper	HP 8340A/B
Measuring Receiver (or Power Meter)	HP 8902A
Power Sensor	HP 8485A
Power Splitter	HP 11667B

Adapters

Type N(m) to APC 3.5(m)	HP 1250-1743
APC 3.5(f) to APC 3.5(f)	HP 5061-5311

Cables

APC 3.5 male connectors, 91 cm (36 in)	HP 8120-4921

Test Procedure

Band 0

1. Zero and calibrate the HP 8902A and HP 8485A in log mode (power reads out in dBm). Enter the power sensor's 2 GHz Cal Factor into the HP 8902A.

2. Press *INSTR PRESET* on the HP 8340A/B and set the controls as follows:

CW	2000 MHz
POWER LEVEL	−10 dBm

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

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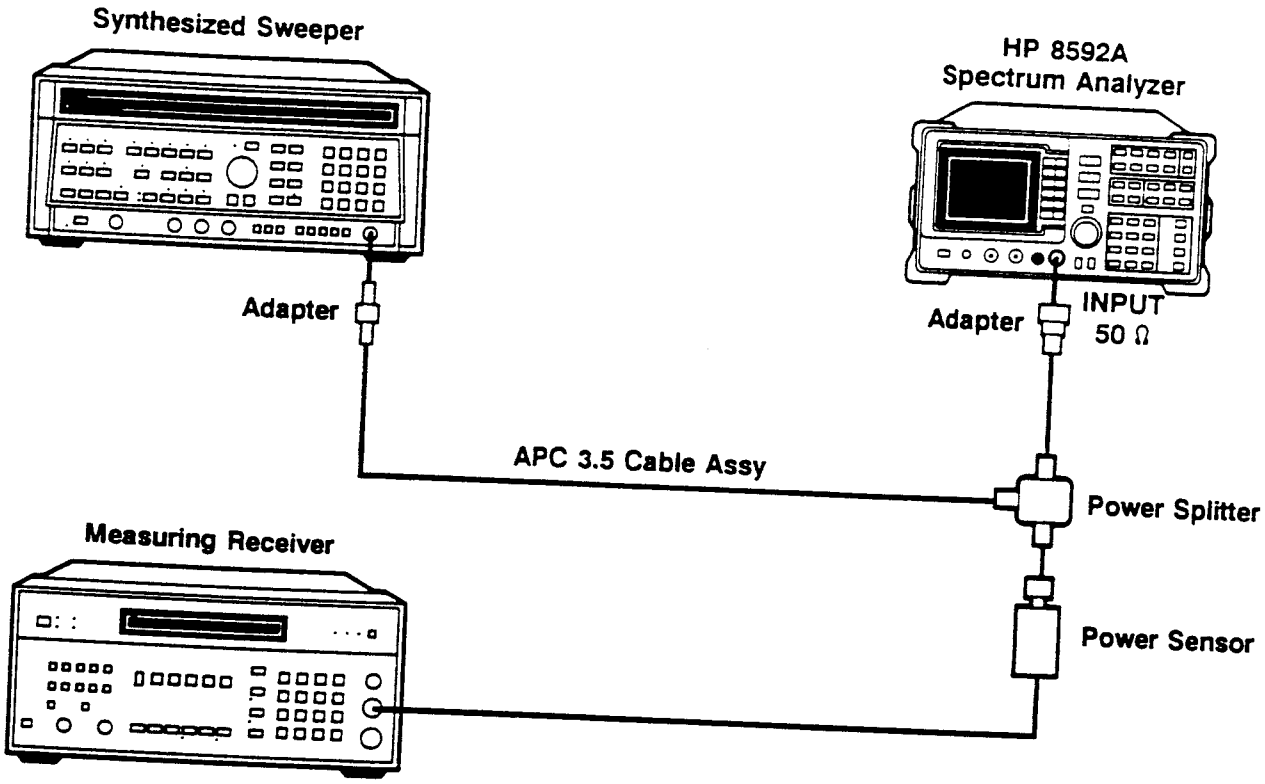


Figure 1-12. Image, Multiple, and Out-of-Band Responses Test Setup

4. On the HP 8592A, press *PRESET* and wait for the preset to finish. Set the controls as follows:

   CENTER FREQUENCY . . . . . 2.0 GHz
   SPAN . . . . . 10 MHz
   REF LEVEL . . . . . −10 dBm
   [ATTEN] . . . . . 0 dB

5. Adjust the HP 8340A/B *POWER LEVEL* for a −10 dBm ±0.1 dB reading on the HP 8902A.

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6. On the HP 8592A, press:
   PEAK SEARCH
   SIGNAL TRACK (on)
   SPAN 200 kHz

   Wait for the AUTOZOOM message to disappear. Press:
   PEAK SEARCH
   MKR→
   [MARKER→RL]
   SIGNAL TRACK (off)
   PEAK SEARCH
   [MARKER DELTA]
   AMPLITUDE ↓

7. For each of the frequencies listed in Table 1-12 for band 0, do the following:

   a. Set the HP 8340A/B to the listed CW frequency.

   b. Enter the appropriate power sensor Cal Factor into the HP 8902A.

   c. Set the HP 8340A/B *POWER LEVEL* for a −10 dBm reading on the HP 8902A.

   d. Wait for completion of a new sweep.

   e. On the HP 8592A, press *PEAK SEARCH* and record the MKR Δ amplitude reading in Table 1-12 as the Actual MKR Δ amplitude. The actual MKR Δ amplitude should be less than the max. MKR Δ amplitude listed in the table.

NOTE

The max. MKR Δ amplitude is 10 dB more positive than the specification. This is due to the 10 dB change in reference level made in step 6.

8. On the HP 8592A, press *MKR* and [MARKERS OFF] *HOLD AUTO COUPLE*. Set the controls as follows:
   SPAN . . . . . 100 MHz
   REF LEVEL . . . . . −10 dBm
   [ATTEN] . . . . . 0 dB

Band 1

9. Set the HP 8592A CENTER FREQUENCY to *4 GHz*.

10. Set the HP 8340A/B *CW* to *4 GHz*.

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11. Enter the power sensor's 4 GHz Cal Factor into the HP 8902A.

12. On the HP 8592A, press:
    PEAK SEARCH
    AMPLITUDE
    [PRESEL PEAK]

    Wait for the CAL: PEAKING message to disappear.
    Press *MKR* and [MARKERS OFF].

13. Repeat steps 5 through 8 for the HP 8340A/B CW frequencies listed in Table 1-12 for band 1.

Band 2

14. Set the HP 8592A CENTER FREQUENCY to *9 GHz*.

15. Set the HP 8340A/B *CW* to *9 GHz*.

16. Enter the power sensor's 9 GHz Cal Factor into the HP 8902A.

17. On the HP 8592A, press:
    PEAK SEARCH
    AMPLITUDE
    [PRESEL PEAK]

    Wait for the CAL: PEAKING message to disappear.
    Press *MKR* and [MARKERS OFF].

18. Repeat steps 5 through 8 for the HP 8340A/B *CW* frequencies listed in Table 1-12 for band 2.

Band 3

19. Set the HP 8592A CENTER FREQUENCY to *15 GHz*.

20. Set the HP 8340A/B *CW* to *15 GHz*.

21. Enter the power sensor's 15 GHz Cal Factor into the HP 8902A.

22. On the HP 8592A, press:
    PEAK SEARCH
    AMPLITUDE
    [PRESEL PEAK]

    Wait for the CAL: PEAKING message to disappear.
    Press *MKR* and [MARKERS OFF].

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23. Repeat steps 5 through 8 for the HP 8340A/B CW frequencies listed in Table 1-12 for band 3.

Band 4

24. Set the HP 8592A CENTER FREQUENCY to *21 GHz*.

25. Set the HP 8340A/B *CW* to *21 GHz*.

26. Enter the power sensor's 21 GHz Cal Factor into the HP 8902A.

27. On the HP 8592A, press:
    PEAK SEARCH
    AMPLITUDE
    [PRESEL PEAK]

    Wait for the CAL: PEAKING message to disappear. Press *MKR* and [MARKERS OFF].

28. Repeat steps 5 through 8 for the HP 8340A/B CW frequencies listed in Table 1-12 for band 4.

Specification Summary

29. Record the maximum Actual MKR Δ Amplitude from Table 1-12 for band 0.

    Maximum Response Amplitude, 50 kHz to 2.9 GHz = _____ dBc

30. Record the maximum Actual MKR Δ Amplitude from Table 1-12 for bands 1, 2 and 3.

    Maximum Response Amplitude, 2.75 to 22 GHz,
    (Applied Frequency ≤ 18 GHz) = _____ dBc

31. Record the maximum Actual MKR Δ Amplitude from Table 1-12 for band 4.

    Maximum Response Amplitude, 2.75 to 22 GHz,
    (Applied Frequency ≤ 22 GHz) = _____ dBc

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Table 1-12. Image, Multiple, and Out-of-Band Responses

Band	HP 8592A CENTER FREQUENCY (GHz)	HP 8340A/B CW FREQUENCY (MHz)	MKR Δ Amplitude	
			Actual (dBc)	Max (dBc)
0	2.0	2042.8 (1)	_____	−60
	2.0	2642.8 (1)	_____	−60
	2.0	9821.4 (2)	_____	−60
	2.0	7331.9 (2)	_____	−60
	2.0	1820.8 (3)	_____	−60
	2.0	278.5 (3)	_____	−60
1	4.0	4042.8 (1)	_____	−60
	4.0	4642.8 (1)	_____	−60
	4.0	8963.9 (2)	_____	−60
	4.0	3742.9 (3)	_____	−60
2	9.0	9042.8 (1)	_____	−60
	9.0	9642.8 (1)	_____	−60
	9.0	4682.5 (2)	_____	−60
	9.0	9942.5 (3)	_____	−60
3	15.0	15042.8 (1)	_____	−60
	15.0	15642.8 (1)	_____	−60
	15.0	4785.8 (2)	_____	−60
	15.0	14700.1 (3)	_____	−60
4	21.0	21042.8 (1)	_____	−50
	21.0	21642.8 (1)	_____	−50
	21.0	5009.025 (2)	_____	−50
	21.0	20007.1 (3)	_____	−50

(1) Image Response
(2) Out-of-Band Response
(3) Multiple Response

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Table 1-13. Performance Test Record

Hewlett-Packard Company **HP Model 8592A** **Spectrum Analyzer 50 kHz to 22 GHz**	Tested by: _____ Date: _____ Serial No. _____

Test Description	Results		
	Min.	Actual	Max.
Sweep Time Accuracy			
20 msec	18 msec	_____	22 msec
50 msec	45 msec	_____	55 msec
100 msec	90 msec	_____	110 msec
200 msec	180 msec	_____	220 msec
500 msec	450 msec	_____	550 msec
1 sec	900 msec	_____	1.1 sec
2 sec	1.8 sec	_____	2.2 sec
5 sec	4.5 sec	_____	5.5 sec
10 sec	9 sec	_____	11 sec
20 sec	18 sec	_____	22 sec
50 sec	45 sec	_____	55 sec
100 sec	90 sec	_____	110 sec
Noise Sidebands			
Noise Sideband Suppression at 30 kHz offset from 500 MHz CW signal.		_____	−95 dBc/Hz
Spurious Responses			
Second Harmonic Distortion			
<2.9 GHz		_____	−50 dBc
2.75 to 22 GHz		_____ (Step 20c)	_____
Third Order Intermodulation Distortion			
<2.9 GHz		_____	−54 dBc
2.75 to 22 GHz		_____	−54 dBc
Residual Responses			
5 MHz to 2.9 GHz		_____	−95 dBm
2.75 to 6.2 GHz		_____	−90 dBm
Reference Level Accuracy			
Log Mode			
0 to −50 dBm REF LEVEL settings	−0.5 dB	_____	+0.5 dB
0 to −100 dBm REF LEVEL settings	−1.0 dB	_____	+1.0 dB
Linear mode			
0 to −50 dBm REF LEVEL settings	−0.5 dB	_____	+0.5 dB
0 to −100 dBm REF LEVEL settings	−1.0 dB	_____	+1.0 dB

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Table 1-13. Performance Test Record (Continued)

Hewlett-Packard Company
HP Model 8592A
Spectrum Analyzer 50 kHz to 22 GHz

Tested by: _____
Date: _____
Serial No. _____

Test Description	Results		
	Min.	Actual	Max.
Scale Fidelity			
10 dB/ Div Log Scale Mode			
10 dB from REF LEVEL	−9.25 dB	_____	−10.75 dB
20 dB from REF LEVEL	−19.25 dB	_____	−20.75 dB
30 dB from REF LEVEL	−29.25 dB	_____	−30.75 dB
40 dB from REF LEVEL	−39.25 dB	_____	−40.75 dB
50 dB from REF LEVEL	−49.25 dB	_____	−50.75 dB
60 dB from REF LEVEL	−59.25 dB	_____	−60.75 dB
70 dB from REF LEVEL	−69.00 dB	_____	−71.00 dB
Linear Scale Mode			
6 dB from REF LEVEL	105.11 mV	_____	118.49 mV
12 dB from REF LEVEL	49.21 mV	_____	62.59 mV
Resolution Bandwidth Switching			
Referenced to 1 MHz RES BW setting			
3 MHz RES BW	−0.25 dB	_____	+0.25 dB
300 kHz RES BW	−0.25 dB	_____	+0.25 dB
100 kHz RES BW	−0.25 dB	_____	+0.25 dB
30 kHz RES BW	−0.25 dB	_____	+0.25 dB
10 kHz RES BW	−0.25 dB	_____	+0.25 dB
3 kHz RES BW	−0.25 dB	_____	+0.25 dB
Gain Compression Test			
Compression with −4 dBm at input mixer		_____	0.5 dB
Input Attenuator Accuracy			
Referenced to 10 dB INPUT ATTEN setting			
0 dB ATTEN	−0.5 dB	_____	+0.5 dB
20 dB ATTEN	−0.5 dB	_____	+0.5 dB
30 dB ATTEN	−0.5 dB	_____	+0.5 dB
40 dB ATTEN	−0.5 dB	_____	+0.5 dB
50 dB ATTEN	−0.5 dB	_____	+0.5 dB
60 dB ATTEN	−0.5 dB	_____	+0.5 dB
70 dB ATTEN	−0.75 dB	_____	+0.75 dB

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Table 1-13. Performance Test Record (Continued)

Hewlett-Packard Company
HP Model 8592A
Spectrum Analyzer 50 kHz to 22 GHz

Tested by: _____
Date: _____
Serial No. _____

Test Description	Results		
	Min.	Actual	Max.
Image, Multiple, and Out-of-Band Responses			
Tuned Frequency:			
50 kHz to 2.9 GHz		_____	−60 dBc
2.75 to 22 GHz (Applied Frequency ≤18 GHz)		_____	−60 dBc
2.75 to 22 GHz (Applied Frequency ≤22 GHz)		_____	−50 dBc
Comb Generator Frequency Accuracy			
Comb Generator Frequency	99.993 MHz	_____	100.007 MHz

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