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.

Printed in USA March 2000

By internet, phone, or fax, get assistance with all your test and measurement needs.

Table 1-1 Contacting Agilent

Online assistance: `www.agilent.com/find/assist`

United States
(tel) 1 800 452 4844

Latin America
(tel) (305) 269 7500
(fax) (305) 269 7599

Canada
(tel) 1 877 894 4414
(fax) (905) 282-6495

Europe
(tel) (+31) 20 547 2323
(fax) (+31) 20 547 2390

New Zealand
(tel) 0 800 738 378
(fax) (+64) 4 495 8950

Japan
(tel) (+81) 426 56 7832
(fax) (+81) 426 56 7840

Australia
(tel) 1 800 629 485
(fax) (+61) 3 9210 5947

Asia Call Center Numbers

Country	Phone Number	Fax Number
Singapore	1-800-375-8100	(65) 836-0252
Malaysia	1-800-828-848	1-800-801664
Philippines	(632) 8426802 1-800-16510170 (PLDT Subscriber Only)	(632) 8426809 1-800-16510288 (PLDT Subscriber Only)
Thailand	(088) 226-008 (outside Bangkok) (662) 661-3999 (within Bangkok)	(66) 1-661-3714
Hong Kong	800-930-871	(852) 2506 9233
Taiwan	0800-047-866	(886) 2 25456723
People's Republic of China	800-810-0189 (preferred) 10800-650-0021	10800-650-0121
India	1-600-11-2929	000-800-650-1101

HP 8664A, *HP* 8665A/B
SYNTHESIZED SIGNAL GENERATOR
(Including Options 001, *003, 004, 008, and* 010)

Operation and Calibration Manual

SERIAL NUMBERS

This manual applies directly to instruments with serial numbers prefixed:

3744A and below

For additional important information about serial numbers, refer to "INSTRUMENTS COVERED BY THIS MANUAL" in Section 1.

1400 Fountaingrove Parkway, Santa Rosa, CA 95403-1799, USA

Operation and Calibration Manual HP Part Number: 08665-90078

Printed in U.S.A.: January 2001
Supersedes: June 1998

HEWLETT PACKARD

Simultaneous Modulation – An Overview

If You Need to Know:	Refer to:
Simultaneous Modulation	
• *Some general information about simultaneous modulation*	*Simultaneous Modulation-An Introduction (2-39)*
• *How to simultaneously modulate FM with AM*	*Simultaneous Modulation-An Exercise (2-40 to 2-43)*
• *The key things to remember about simultaneous modulating the Signal Generator*	*Simultaneous Modulation–Things to Remember (2-45)*

Simultaneous Modulation – An Introduction

The Signal Generator generates simultaneous modulation in one of five ways:

1. Simultaneous FM and AM is selected using a common or separate audio source.
2. Simultaneous FM at two rates using both the internal and an external audio source.
3. Simultaneous FM and Ah4 using a common audio source (either internal or external), and FM from a separate audio source.
4. Pulse modulation may be selected and entered along with any of the three ways mentioned in statements 1-3.
5. Phase modulation may be selected with AM and/or Pulse modulation. If phase modulation is selected, FM is turned off.

Refer to appendix F to learn about the multifunction synthesis capabilities of the Signal Generator. Special Functions allow you to generate a subcarrier from complex audio signals that is applied, in turn, as a modulating wave to the RF carrier signal.

The AM, and ***FM*** Modulation Input connectors have an external input impedance of 600 Ω. The **ΦM** Modulation Input connector has an input impedance of 600 Ω. With Option 008, the ***PULSE*** Modulation Input connector has an input impedance of 50 Ω, or 100 kΩ (with Special Function 210 turned off).

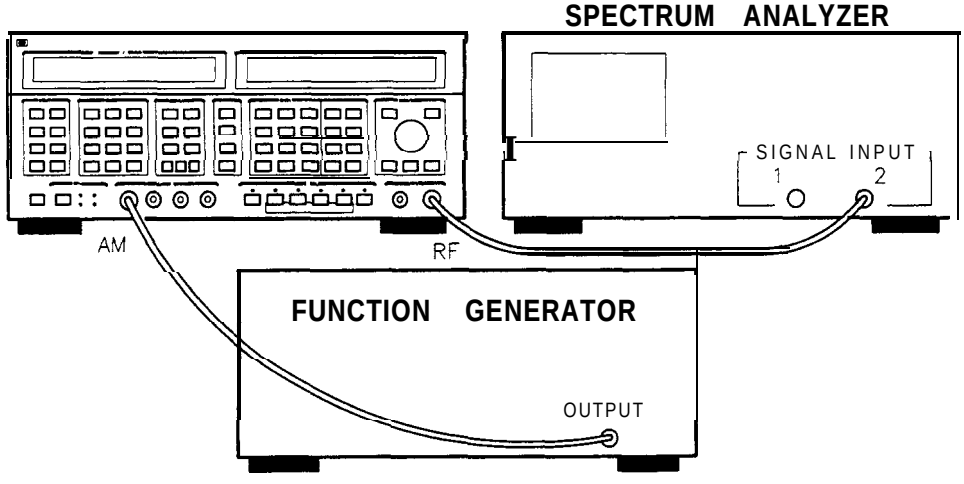

Figure 2-13. Equipment Setup for Simultaneous FM and AM Procedure.

Simultaneous Modulation - An Exercise

There are many possible combinations and applications for simultaneous modulation. In this exercise, the Signal Generator simultaneously modulates FM with AM. The application for this exercise represents an FM radio signal fading 30 dB as a result of interference. This procedure takes about 15 minutes.

Equipment Needed

This procedure requires use of the following equipment:

Equipment	Recommended Model Numbers
Spectrum Analyzer	HP 8562A/B, or HP 8566B. or HP 8568B
Function Generator	HP 3312A, or HP 3314A, or HP 8111 A, HP8116A,orHP8904A

Procedure - Simultaneous FM and AM

In the procedure, you will set up the Signal Generator with a wanted FM signal modulated by the internal audio source, and then introduce an AM signal used for fading, which is modulated with an external audio source.

Simultaneous Modulation – Things to Remember

The following list is a summary of the most important points discussed in the simultaneous modulation section:

- There are five ways simultaneous modulation can be generated, to page 2-39.
- The **AM**, and **FM** Modulation Input connectors have an external input impedance of 600 Ω. The **ΦM** Modulation Input connector has an input impedance of 600 Ω. With Option 008, the PULSE Modulation Input connector has an input impedance of 50 Ω, or 100 kΩ (with Special Function 210 turned off, the preset condition).
- All features and limitations previously described for FM, AM, and Pulse apply when simultaneously modulating the Signal Generator.
- During simultaneous internal and external FM, the typical input voltage allowed is +0.4 Vpk to +1 Vpk. Under these conditions, the amount of available external deviation is reduced. (Read the following note for further information.)

Note

You may want to reduce the output level of the internal audio source during simultaneous internal and external AM andlor FM modulation. Doing so would allow you to increase the amount of external modulation. The sum of the internal and external voltages should not exceed 1.4 Vpk or clipping may occur.

The output level of the internal audio source can be adjusted from 0 V dc to 1 V dc in 1 mV steps. Adjusting the output level affects the amount of internal modulation such that a decrease in output level proportionately decreases the amount of internal modulation.

Vary the output level of the internal audio source by first pressing the blue SHIFT key, and then the AUDIO LEVEL key. Turn the knob or press one of the ⇧ ⇩ keys to change the output level.

Table 1-1. HP 8664A/65A/65B Specifications (2 of 4)

Output Level	
Range:	+13 to -139.9 dBm +9 dBm, Opt. 008
Resolution:	0.1dB
Absolute accuracy:	±1 dB, output ≥-119.9 dBm, 1 – 1000 MHz ±1.5 dB, output ≥-119.9 dBm, 1000 to 3000 MHz ±2 dB, output ≥-119.9 dBm, 3000 to 6000[1] ±3 dB, output ≥-129.9 dBm, <1 MHz
Reverse power protection:	25 watts[2], .1 – 2060 MHz 1 watt, >2060 MHz
Amplitude Modulation	
Depth:	0 – 100%, output ≤+7 dBm
Resolution:	.1%
Bandwidth (3 dB):	dc to >10 kHz for > 10 MHz
Accuracy: 1 kHz rate	±(6% of setting + 1%) up to 90% depth
Distortion: 30% depth, 1 kHz rate	<4%
Incidental phase modulation: (at 30% depth, 1 kHz rate)	<0.2 radians peak, ≤2000 MHz <0.4 radians peak, >2000 MHz
Frequency Modulation	
Maximum peak deviation:	20 MHz, 3000 – 6000[1] MHz 10 MHz, 1500 – 3000 MHz 5 MHz, 750 – 1500 MHz 2.5 MHz, 375 – 750 MHz 1.25 MHz, 187.5 – 375 MHz 5 MHz, 10 – 187.5 MHz
Resolution:	2.5% of setting
Bandwidth (3 dB):	dc to 800 kHz
Carrier accuracy in FM:	±0.6% of setting
Indicator accuracy:	±9%, <20 kHz rates ±11%, <20 kHz rates, Opt. 004
Distortion:	<1%, 20 Hz to 20 kHz rates
Incidental AM:	<0.3%, deviation ≤20 kHz

[1] 3000 MHz - HP8664A, 4200 MHz - HP8665A, 6000 MHz - HP8665B

Table 1-1. HP 8664A/65A/65B Specifications (3 of 4)

Pulse Modulation, Option 008	
On/off ratio:	>80dB
Rise/fall time, 10 – 90%:	<8 ns
Repetition rate:	dc to 10 MHz
Internal width/delay:	Variable from 50 ns to 1s. Accuracy: ± 10% ± 2 nsec.
Output level accuracy:	Same as standard
Internal Modulation Source	
Number of sources:	Two sources simultaneously available through summation, independently adjustable in frequency, phase, amplitude and waveform. Source One may also be internally modulated with AM, FM, phase modulation and pulse modulation to create a subcarrier waveform.
Waveforms and rates:	Sine, white Gaussian noise; 0.1 Hz to 400 kHz Triangle, Sawtooth, Square; 0.1 Hz to 50 kHz
Frequency accuracy:	Same as timebase
Output level (into 600Ω):	1 Vpk
Output resolution:	2 mV pk
Total Harmonic Distortion:	<0.2%,rates < 20 kHz
Frequency Sweep	
Digital sweep:	Digitally stepped sweep over entire frequency range. Linear/log selection. .5 to 1000 sec sweeps.
Markers/Z axis output:	Three markers available /Z axis ouput nominally +5 V/X axis output nominally 0 to 10V.
Phase continuous sweep:	40 MHz of span available at maximum carrier frequency. 20 ms to 10 sec sweep times.
Remote Programming	
Interface:	HP-IB (IEEE 488.2-1987).
Control language:	Hewlett-Packard Systems Language (HP-SL). All functions controlled except power.
IEEE-488 functions:	SH1, AH1, T6, TEO, L4, LEO, SR1, RL1, PPO, DC1, DTO, CO, E2.

DECLARATION OF CONFORMITY

According to ISO/IEC Guide 22 and CEN/CENELEC EN 45014

Manufacturer's Name:	Agilent Technologies, Inc.
Manufacturer's Address:	1400 Fountaingrove Parkway Santa Rosa, CA 95403-1799 USA

Declares that the products

Product Name:	Synthesized Signal Generator
Model Number:	8644B, 8645A, 8664A, 8665A, 8665B
Product Options:	This declaration covers all options of the above products.

Conform to the following product specifications:

	Standard	Limit
EMC:	CISPR 11:1990 / EN 55011-1991	Group 1, Class A
	IEC 801-2:1984/EN 50082-1:1992	4 kV CD, 8 kV AD
	IEC 801-3:1984/EN 50082-1:1992	3 V/m, 80 - 1000 MHz
	IEC 801-4:1988/EN 50082-1:1992	0.5 kV sig., 1 kV power

Safety: IEC 61010-1:1990 + A1:1992 + A2:1995 / EN 61010-1:1993 +A2:1995
CAN/CSA-C22.2 No. 1010.1-92

Supplementary Information:
The products herewith comply with the requirements of the Low Voltage Directive 73/23/EEC and the EMC Directive 89/336/EEC and carry the CE-marking accordingly.

Santa Rosa, CA, USA 2 September 2000

Greg Pfeiffer/Quality Engineering Manager

For further information, please contact your local Agilent Technologies sales office, agent or distributor.

Low-Frequency, Low-Amplitude Accuracy

5. On the Signal Generator, perform the following steps.
   a. Key in FREQ 1000 MHz and AMPTD 6 dBm.
   b. Key in SPECIAL 101 ENTER. The FREQUENCY/STATUS display should show an attenuation of +0.0 dB.
   c. Key in INCR SET 5 dB to set the attenuation increment to 5 dB.
6. On the measuring receiver, press the automatic operation key then select the tuned RF level measurement mode with units of dBm. (For the moment, ignore the uncalibrated and recalibrate annunciators if showing.)
7. On the Signal Generator, increment the attenuation (using the ⇧ key) in 5 dB steps and note the level displayed on the measuring receiver. The carrier amplitude should be within the limits given in the following table.

NOTE

When the recalibration annunciator appears on the measuring receiver's display, press the measuring receiver's CALIBRATE *key, wait for completion of the calibration, then proceed.*

Signal Generator Display		Amplitude Limits (dB REL)		
Attenuation (dB)	Amplitude (dBm)	Minimum	Actual	Maximum
+5	+1	0	_____	+2
+10	−4	−5	_____	−3
+15	−9	−10	_____	−8
+20	−14	−15	_____	−13
+25	−19	−20	_____	−18
+30	−24	−25	_____	−23
+35	−29	−30	_____	−28
+40	−34	−35	_____	−33
+45	−39	−40	_____	−38
+50	−44	−45	_____	−43
+55	−49	−50	_____	−48
+60	−54	−55	_____	−53
+65	−59	−60	_____	−58
+70	−64	−65	_____	−63
+75	−69	−70	_____	−68
+80	−74	−75	_____	−73
+85	−79	−80	_____	−78
+90	−84	−85	_____	−83
+95	−89	−90	_____	−88
+100	−94	−95	_____	−93
+105	−99	−100	_____	−98
+110	−104	−105	_____	−103
+115	−109	−110	_____	−108
+120	−114	−115	_____	−113
+125	−119	−120	_____	−118

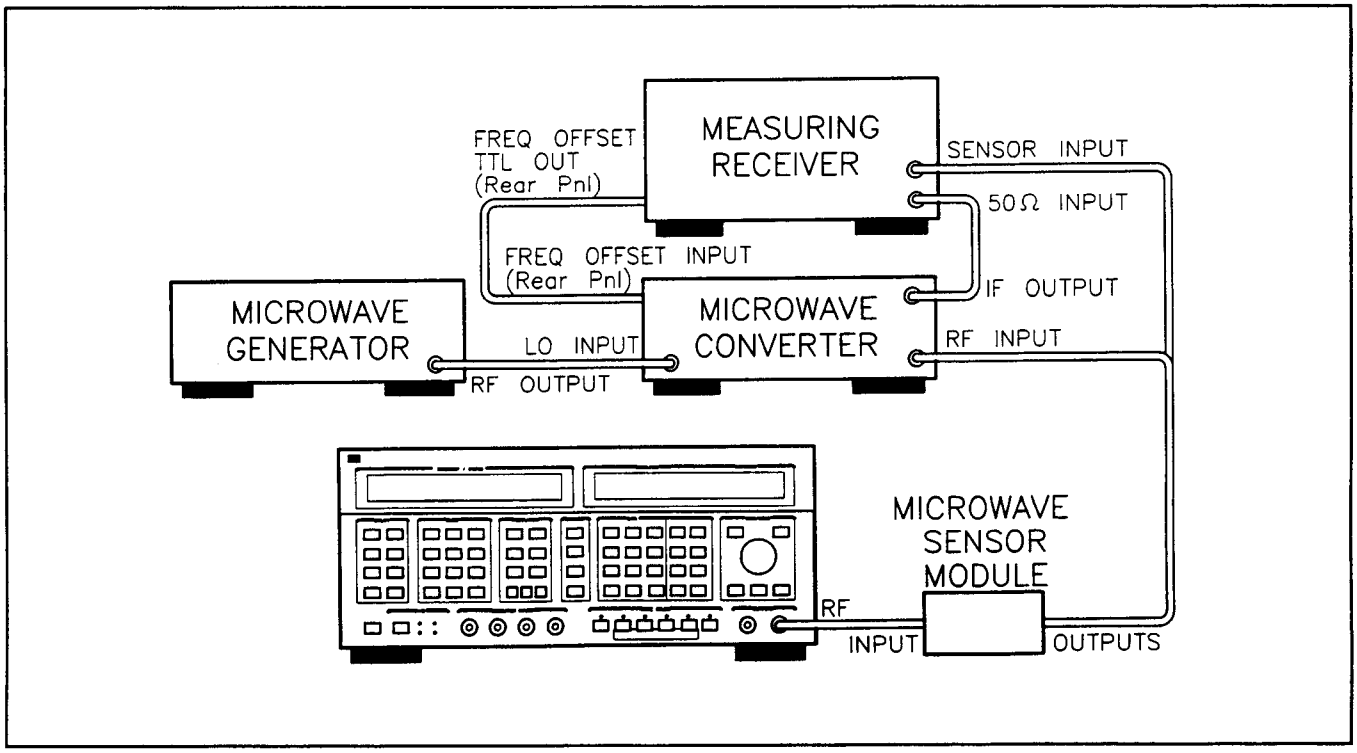

Figure 3-2. Carrier Amplitude (Down-Converted) Test Setup

High-Frequency, Maximum Level

10. Connect the equipment to the microwave converter as shown in figure 3-2. (Connect the microwave input of the sensor module directly to the Signal Generator's RF output connector.)

NOTE

Verify that the measuring receiver's calibration factors match the sensor module. To select the calibration factors for the microwave sensor module, invoke Special Function 27.1. (The calibration factors must encompass a frequency range of 1000 to 6000 MHz.) Also zero the sensor module and calibrate the power measurement.

9. On the Signal Generator, press INSTR PRESET.
10. Preset the measuring receiver, then select the RF power measurement with units of dBm. Key in 27.1 SPCL to select the calibration factors for the microwave sensor module.
11. Set the Signal Generator's carrier frequency and amplitude as indicated in the following table. Also key the frequency into the measuring receiver. The carrier amplitude should be within the limits given in the table.

High-Frequency, High-Amplitude Accuracy

12. Set the Signal Generator's carrier frequency and amplitude as indicated in the following table. Also key the frequency into the measuring receiver. The output power should be within the limits given in the table.

Signal Generator Carrier		Amplitude Limits (dBm)		
Frequency (MHz)	Amplitude (dBm)	Minimum	Actual	Maximum
5955.5[3]	+9	+7.0	_____	+11.0
4155.5[2]	+9	+7.0	_____	+11.0
4155.5[1],[2]	+13	+11.0	_____	+15.0
2955.5[1]	+13	+11.5	_____	+14.5
2955.5	+9	+7.5	_____	+10.5

(1) Except Option 008.
(2) HP8665A and HP8665B only.
(3) HP8665B only.

High-Frequency, Low-Amplitude Accuracy (2955.5 MHz)

13. On the Signal Generator under test, key in SPECIAL 101 ENTER then key in 0 dB. Also key in INCR SET 5 dB.
14. On the microwave signal generator, set the frequency to 3155.5 MHz and amplitude to +13 dBm. (Ignore amplitude overranging messages.)
15. On the measuring receiver, perform the following steps.
    a. Preset the instrument.
    b. Key in 27.3 SPCL (to set the measuring receiver and microwave converter to the frequency offset mode).
    c. Key in 3155.5 MHz (to input the LO frequency information into the measuring receiver).
    d. Select the tuned RF level measurement mode with units of dBm.
16. On the Signal Generator under test, key in SPECIAL ENTER then increment the attenuation in 5 dB steps and note the level displayed on the measuring receiver. The carrier amplitude should be within the limits given in the following table.

NOTE

If the recalibration annunciator appears, press the measuring receiver's CALIBRATE *key, wait for completion of the calibration, then proceed.*

Signal Generator Display		Amplitude Limits (dB REL)		
Attenuation (dB)	Amplitude (dBm)	Minimum	Actual	Maximum
+5	+1	−0.5	_____	+2.5
+10	−4	−5.5	_____	−2.5
+15	−9	−10.5	_____	−7.5
+20	−14	−15.5	_____	−12.5
+25	−19	−20.5	_____	−17.5
+30	−24	−25.5	_____	−22.5
+35	−29	−30.5	_____	−27.5
+40	−34	−35.5	_____	−32.5
+45	−39	−40.5	_____	−37.5
+50	−44	−45.5	_____	−42.5
+55	−49	−50.5	_____	−47.5
+60	−54	−55.5	_____	−52.5
+65	−59	−60.5	_____	−57.5
+70	−64	−65.5	_____	−62.5
+75	−69	−70.5	_____	−67.5
+80	−74	−75.5	_____	−72.5
+85	−79	−80.5	_____	−77.5
+90	−84	−85.5	_____	−82.5
+95	−89	−90.5	_____	−87.5
+100	−94	−95.5	_____	−92.5
+105	−99	−100.5	_____	−97.5
+110	−104	−105.5	_____	−102.5

High-Frequency, Low-Amplitude Accuracy (4155.5 MHz; HP8665A only)

17. On the Signal Generator under test, key in FREQ 4166.6 MHz and SPECIAL ENTER 0 dB.
18. On the microwave signal generator, set the frequency to 4355.5 MHz.
19. On the measuring receiver, perform the following steps.
    a. Select the frequency measurement mode.
    b. Key in 27.3 SPCL.
    c. Key in 4355.5 MHz. (The measuring receivers display should read 4155.5 MHz.)
    d. Select the tuned RF level measurement mode.
20. On the Signal Generator under test, increment the attenuation in 5 dB steps and note the level displayed on the measuring receiver. The carrier amplitude should be within the limits given in the following table.

Signal Generator Display		Amplitude Limits (dB REL)		
Attenuation (dB)	Amplitude (dBm)	Minimum	Actual	Maximum
+5	+1	−1.0	_____	+3.0
+10	−4	−6.0	_____	−2.0
+15	−9	−11.0	_____	−7.0
+20	−14	−16.0	_____	−12.0
+25	−19	−21.0	_____	−17.0
+30	−24	−26.0	_____	−22.0
+35	−29	−31.0	_____	−27.0
+40	−34	−36.0	_____	−32.0
+45	−39	−41.0	_____	−37.0
+50	−44	−46.0	_____	−42.0
+55	−49	−51.0	_____	−47.0
+60	−54	−56.0	_____	−52.0
+65	−59	−61.0	_____	−57.0
+70	−64	−66.0	_____	−62.0
+75	−69	−71.0	_____	−67.0
+80	−74	−76.0	_____	−72.0
+85	−79	−81.0	_____	−77.0
+90	−84	−86.0	_____	−82.0
+95	−89	−91.0	_____	−87.0
+100	−94	−96.0	_____	−92.0
+105	−99	−101.0	_____	−97.0
+110	−104	−106.0	_____	−102.0

High-Frequency, Low-Amplitude Accuracy (5955.5 MHz; HP8665B only)

21. On the Signal Generator under test, key in FREQ 5955.5 MHz and SPECIAL ENTER 0 dB.
22. On the microwave signal generator, set the frequency to 5755.5 MHz.
23. On the measuring receiver, perform the following steps.
    a. Select the frequency measurement mode.
    b. Key in 27.3 SPCL.
    c. Key in 5755.5 MHz. (The measuring receivers display should read 5955.5 MHz.)
    d. Select the tuned RF level measurement mode.
24. On the Signal Generator under test, increment the attenuation in 5 dB steps and note the level displayed on the measuring receiver. The carrier amplitude should be within the limits given in the following table.

Signal Generator Display		Amplitude Limits (dB REL)		
Attenuation (dB)	Amplitude (dBm)	Minimum	Actual	Maximum
+5	+1	−1.0	_____	+3.0
+10	−4	−6.0	_____	−2.0
+15	−9	−11.0	_____	−7.0
+20	−14	−16.0	_____	−12.0
+25	−19	−21.0	_____	−17.0
+30	−24	−26.0	_____	−22.0
+35	−29	−31.0	_____	−27.0
+40	−34	−36.0	_____	−32.0
+45	−39	−41.0	_____	−37.0
+50	−44	−46.0	_____	−42.0
+55	−49	−51.0	_____	−47.0
+60	−54	−56.0	_____	−52.0
+65	−59	−61.0	_____	−57.0
+70	−64	−66.0	_____	−62.0
+75	−69	−71.0	_____	−67.0
+80	−74	−76.0	_____	−72.0
+85	−79	−81.0	_____	−77.0
+90	−84	−86.0	_____	−82.0
+95	−89	−91.0	_____	−87.0
+100	−94	−96.0	_____	−92.0
+105	−99	−101.0	_____	−97.0
+110	−104	−106.0	_____	−102.0

Signal Generator Settings			FM Deviation Limits (kHz peak)			FM Distortion Limits (%)	
Carrier Freq. (MHz)	Peak FM Dev. (kHz)	Mode	Minimum	Actual	Maximum	Actual	Maximum
375	200	1	182	_____	218	_____	1
500	200	1	182	_____	218	_____	1
749	200	1	182	_____	218	_____	1
1030	100	2(1)	89	_____	111	_____	1
770	100	2(1)	89	_____	111	_____	1
515	10	2(1)	8.9	_____	11.1	_____	1
(1) Option 004							

16. Record the FM Deviation for the 375 MHz carrier and Mode 1 for use in Performance Test 4.

FM Deviation for 375 MHz carrier in Mode 1: _____ kHz

Incidental AM

17. Set the Signal Generator under test as follows.
    a. Press MODE 1.
    b. Key in FREQ 187 MHz, AMPTD 0 dBm.
    c. Key in FM 20 kHz.
18. Preset the measuring receiver then set it to read AM. The AM depth should read 0.3% or less.

Incidental AM Limit in Mode 1: _____ 0.3%

Carrier Frequency Accuracy in FM

19. Set the measuring receiver to measure carrier frequency. Set the counter resolution to 10 Hz (special function 7.1).
20. On the Signal Generator under test, press INT (to turn off the internal modulation oscillator) and set MODE SELECT to MODE 1.
21. On the Signal Generator under test, set the carrier frequency and the FM peak deviation as indicated in the following table. For each step press FM OFF then press FM ON and note the shift in carrier frequency as read on the measuring receiver. (The frequency error measurement mode in the measuring receiver can also be used to measure carrier shift.) The carrier shift should be within the limits shown in the table.

NOTE

The FM system in the Signal Generator is turned on but no actual FM is generated because the audio source is turned off.

Signal Generator Settings		Carrier Shift Limits (kHz)	
Carrier Frequency (MHz)	FM Deviation (MHz peak)	Actual	Maximum
516	2.5	_____	15
1030	2.5	_____	15

Performance Test 4

FM TEST (HIGH DEVIATIONS AND RATES)

Specification

Characteristic	Performance Limits	Conditions
Frequency Modulation		
Maximum Peak Deviation	20 MHz	3000 to 6000 MHz carrier
	10 MHz	1500 to 3000 MHz carrier
	5 MHz	750 to 1500 MHz carrier
	2.5 MHz	375 to 750 MHz carrier
	1.25 MHz	187.5 to 375 MHz carrier
	5 MHz	10 to 187.5 MHz carrier
		low-noise mode (Option 004)
	400 kHz	3000 to 6000 MHz carrier
	200 kHz	1500 to 3000 MHz carrier
	100 kHz	750 to 1500 MHz carrier
	50 kHz	375 to 750 MHz carrier
	25 kHz	187.5 to 375 MHz carrier
	100 kHz	10 to 187.5 MHz carrier
Maximum Rate (3 dB Bandwidth)	800 kHz	
Indicator Accuracy		dc to 20 kHz rates
	±9% of FM deviation setting	
	±11% of FM deviation setting	low-noise mode (Option 004)

Description

Measurements are made on signals with FM peak deviations up to 20 MHz and rates up to 800 kHz. These signals cannot be made directly by the HP 8902A Measuring Receiver which was used in Performance Test 3. (However, Performance Tests 3 and 4 have some overlap.)

FM is demodulated by an HP 3048A Phase Noise Measurement System. A power splitter and delay line (both supplied with the system) and an RF phase detector (built into the system's interface) are used as a delay-line FM discriminator. The demodulated FM is analyzed by an RF spectrum analyzer (optionally supplied with the system). The test is not run by a system program; rather, the system's interface is manually controlled from the controller's keyboard.

b. Use the system's cursor control keys to move the cursor to the "GAIN2:" line then key in 20.

c. Press the [Send Command] softkey to initiate the commands. (The display should now appear as in figure 3–6.)

7. Fine tune the Signal Generator's carrier frequency until the front-panel meter of the system's interface reads approximately 0. This establishes quadrature in the interface's phase detector to make it function as a linear phase detector. The Signal Generator's carrier frequency may be in the range of 350-500 MHz to establish quadrature.

8. Set the RF spectrum analyzer to span from 0 to 100 kHz. Set the input impedance to 1 MΩ.

Indicator Accuracy

9. Let *D* equal the value in kHz of FM deviation measured in Performance Test 3, step 16, for a 375 MHz carrier in Mode 1. Calculate 700 – *D*. (For example, if the value for *D* is 340 kHz, 700 – 340 = 360.)

700 Minus the Value of *D*: _____ kHz

10. Set the Signal Generator as follows.

a. Key in FM then the value (700 – *D*) calculated in step 9 above (for example 360) then press kHz.

b. Key in AUDIO FREQ 20 kHz.

11. Adjust the RF spectrum analyzer's reference level so that the 20 kHz signal is at a convenient graticule line near the center of the display. (This line represents 350 kHz peak deviation.)

12. On the Signal Generator, key in FM 2.5 MHz. The 20 kHz signal should increase between 16.4 and 17.8 dB (that is, 17.1 ± 0.7 dB or 2.5 MHz/350 kHz ± 9% expressed in dB).

Indicator Accuracy: 16.4 _____ 17.8 dB

Maximum Rate (3 dB Bandwidth)

14. On the Signal Generator, press the INT key to turn the internal FM off then press the EXT AC key.

15. On the audio source, set the frequency to 20 kHz, and set the amplitude to 4.67 dBm (1 Vpk into 600 Ω from a 50 Ω source).

NOTE

The EXT HI *or* EXT LO *annunciators on the Signal Generator may or may not be on. Either condition is acceptable. The level of the modulation input signal is set more accurately by the audio source setting than by the annunciators.*

16. Set the RF spectrum analyzer to span from 0 to 1 MHz. Note the level of the 20 kHz signal.

17. On the audio source, set the frequency to 800 kHz. The 800 kHz signal viewed on the spectrum analyzer should be within 3 dB of the level of the signal which was at 20 kHz.

Maximum Rate: –3 _____ +3 dB

Performance Test 5

SPECTRAL PURITY TEST (SSB PHASE NOISE)

Specification

Characteristic	Performance Limits	Conditions
Spectral Purity		
SSB Phase Noise		CW, AM, or FM (FM at minimum specified deviation)
		20 kHz frequency offset
	−105 dBc/Hz	3000 to 6000 MHz carrier
	−111 dBc/Hz	1500 to 3000 MHz carrier
	−117 dBc/Hz	750 to 1500 MHz carrier
	−122 dBc/Hz	375 to 750 MHz carrier
	−128 dBc/Hz	187.5 to 375 MHz carrier
	−117 dBc/Hz	0.1 to 187.5 MHz carrier
Spectral Purity		
SSB Phase Noise (cont'd)		20 kHz frequency offset; Mode 2; Option 004
	−116 dBc/Hz	4120 to 6000 MHz carrier
	−122 dBc/Hz	2060 to 4120 MHz carrier
	−128 dBc/Hz	1030 to 2060 MHz carrier
	−134 dBc/Hz	515 to 1030 MHz carrier
	−139 dBc/Hz	257.5 to 515 MHz carrier
	−144 dBc/Hz	187.5 to 257.5 MHz carrier
	−131 dBc/Hz	0.1 to 30 MHz carrier
Nonharmonic Spurious Signals		>10 kHz offset frequency
	< −100 dBc	187.5 to 2060 MHz carrier
	< −90 dBc	0.1 to 187.5 MHz carrier
	< −90 dBc	2060 to 6000 MHz carrier

Description

The single-sideband (SSB) phase noise and non-harmonic spurious signals are measured by a system that is specifically designed to measure these parameters—the HP 3048A Phase Noise Measurement System. Measurements are made using a phase detector in a phase lock loop.

This method requires a reference signal generator that must have lower phase noise than the source being tested. A second HP 8664A or HP 8665A/B can be used as this source (and thus both sources are measured as a pair) but the following considerations apply: (1) If the measured results are within specification, both generators meet the specification individually. (2) If the measured results are out of specification, at least one generator is out of specification and a third source must be measured against the first two to determine which one is faulty.

Table 3-2. Performance Test Record (11 of 15)

Test No.	Test Description	Results		
		Minimum	Actual	Maximum
3	**FM TEST (LOW DEVIATIONS AND RATES) (Cont'd)**			
	Incidental AM		_____	0.4%
	Carrier Frequency Accuracy in FM			
	Carrier Frequency and FM Deviation Settings			
	150 MHz; 5 MHz pk		_____	30 kHz
	300 MHz; 1.25 MHz pk		_____	7.5 kHz
	600 MHz; 2.5 MHz pk		_____	15 kHz
	1200 MHz; 5 MHz pk		_____	30 kHz
4	**FM TEST (HIGH DEVIATIONS AND RATES)**			
	Indicator Accuracy	16.4 dB	_____	17.8 dB
	Maximum Rate (3 dB Bandwidth)	−3 dB	_____	+3 dB
5	**SPECTRAL PURITY TEST (SSB PHASE NOISE)**			
	SSB Phase Noise			
	Frequency and Mode Select Settings and Offset			
	1100 MHz; Mode 1; 20 kHz		_____	−117 dBc
	1100 MHz; Mode 2 (Option 004); 20 kHz		_____	−128 dBc
	550 MHz; Mode 2 (Option 004); 20 kHz		_____	−134 dBc
	550 MHz; Mode 1; 20 kHz		_____	−122 dBc
	300 MHz; Mode 1; 20 kHz		_____	−128 dBc
	300 MHz; Mode 2 (Option 004); 20 kHz		_____	−139 dBc

Table 3-2. Performance Test Record (12 of 15)

Test No.	Test Description	Results		
		Minimum	Actual	Maximum
5	**SPECTRAL PURITY TEST (SSB PHASE NOISE) (Cont'd)**			
	SSB Phase Noise (cont'd)			
	Frequency and Mode Select Settings and Offset (cont'd)			
	200 MHz; Mode 2 (Option 004); 20 kHz		_____	−144 dBc
	150 MHz; Mode 2 (Option 004); 20 kHz		_____	−128 dBc
	150 MHz; Mode 1; 20 kHz		_____	−117 dBc
	40 MHz; Mode 2 (Option 004); 20 kHz		_____	−131 dBc
	Non-Harmonic Spurious (worst case)			
	>10 kHz offset; 187.5 to 1100 MHz		_____	−100 dBc
	>10 kHz offset; 0.1 to 187.5 MHz		_____	−90 dBc
	4150 MHz; Mode 1; 20 kHz		_____	−105 dBc
	4150 MHz; Mode 2 (Option 004); 20 kHz		_____	−116 dBc
	2100 MHz; Mode 2 (Option 004); 20 kHz		_____	−122 dBc
	2100 MHz; Mode 1; 20 kHz		_____	−111 dBc
	Non-Harmonic Spurious (worst case)			
	>10 kHz offset; 2100 to 6000 MHz		_____	−90 dBc