

HP 8360 Synthesized Sweepers
(Including Options 001, 002, 003, 004, 006, and 008)

User's Handbook

SERIAL NUMBERS

This manual applies to any synthesized sweeper with the following model number and serial number prefix combinations. You may have to modify this manual so that it applies *directly* to your instrument version. Refer to the "Instrument History" chapter.

HP 83620A/22A	HP 83623A/24A	HP 83640A/42A	HP 83630A	HP 83650A
3036A	3036A	3036A	3101A	3052A
3044A	3044A	3044A		
3050A	3050A	3050A		
3102A	3102A	3102A		
3104A	3104A	3104A		
3108A	3108A	3108A		
3119A	3119A	3119A		



HP Part No. 08360-90070
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Edition 6

Frequency

Specifications describe warranted instrument performance over the 0 to 55°C temperature range, except as noted otherwise. Specifications apply after Full User Calibration, and in coupled attenuator mode of operation (ALC level greater than -10 dBm). Supplemental characteristics, denoted typical or nominal, are intended to provide information useful in applying the instrument, but are non-warranted parameters.

Range	HP 83620A: 10 MHz to 20 GHz
	HP 83622A: 2 to 20 GHz
	HP 83623A: 10 MHz to 20 GHz High Power
	HP 83624A: 2 to 20 GHz High Power
	HP 83630A: 10 MHz to 26.5 GHz
	HP 83640A: 10 MHz to 40 GHz
	HP 83642A: 2 to 40 GHz
	HP 83650A: 10 MHz to 50 GHz

Resolution	Standard: 1 kHz
	Option 008: 1 Hz

Frequency Bands (for CW signals)¹

HP 83620A, 83622A, 83623A, 83624A, 83640A, 83642A				
Band	Frequency Range			n
0	10 MHz	to	<2.3 GHz	1
1	2.3 GHz	to	<7 GHz	1
2	7 GHz	to	<13.5 GHz	2
3	13.5 GHz	to	20 GHz	3
4	>20 GHz	to	<25.5 GHz	4
5	25.5 GHz	to	<32 GHz	6
6	32 GHz	to	40 GHz	6

HP 83630A, 83650A				
Band	Frequency Range			n
0	10 MHz	to	<2 GHz	1
1	2 GHz	to	<7 GHz	1
2	7 GHz	to	<13.5 GHz	2
3	13.5 GHz	to	20 GHz	3
4	>20 GHz	to	<26.5 GHz	4
5	26.5 GHz	to	<33.4 GHz	6
6	33.4 GHz	to	<38 GHz	6
7	38 GHz	to	50 GHz	8

CW and Manual Sweep Modes

Accuracy: Same as time base

Internal 10 MHz Time Base

Accuracy

Calibration ± Aging Rate ± Temperature Effects ± Line Voltage Effects

Stability

Aging Rate: 5×10^{-10} /day, 1×10^{-7} /year

With Temperature: 1×10^{-10} /°C, typical

With Line Voltage: 5×10^{-10} for line voltage change of 10%, typical

Switching Time

For Steps Within a Frequency Band: 15 ms + 5 ms/GHz step size

Maximum, or Across Band Switch Points: 70 ms

Step or List Modes (steps ≤ 100 MHz within a frequency band): 5 ms

¹ In models with a lower frequency limit of 2 GHz, band 0 does not exist and band 1 begins at 2.0 GHz.

Swept Mode HP 83620A, 83622A, 83623A, 83624A, 83640A, 83642A

Accuracy (sweep time ≥ 100 ms and ≤ 5 s)

Upper Frequencies ≤ 20 GHz

Sweep Widths $\leq n \times 10$ MHz: 0.1% of sweep width $\pm$ time base accuracy

Sweep Widths $> n \times 10$ MHz and ≤ 300 MHz: 1% of sweep width

Sweep Widths > 300 MHz and ≤ 3 GHz: 3 MHz

Sweep Widths > 3 GHz: 0.1% of sweep width

Upper Frequencies > 20 GHz

Sweep Widths $\leq n \times 10$ MHz: 0.1% of sweep width $\pm$ time base accuracy

Sweep Widths $> n \times 10$ MHz and ≤ 600 MHz: 1% of sweep width

Sweep Widths > 600 MHz and ≤ 6 GHz: 6 MHz

Sweep Widths > 6 GHz: 0.1% of sweep width

HP 83630A, 83650A

Accuracy (sweep time ≥ 100 ms and ≤ 5 s)

Upper Frequencies ≤ 26.5 GHz

Sweep Widths $\leq n \times 10$ MHz: 0.1% of sweep width $\pm$ time base accuracy

Sweep Widths $> n \times 10$ MHz and ≤ 400 MHz: 1% of sweep width

Sweep Widths > 400 MHz and ≤ 4 GHz: 4 MHz

Sweep Widths > 4 GHz: 0.1% of sweep width

Upper Frequencies > 26.5 GHz

Sweep Widths $\leq n \times 10$ MHz: 0.1% of sweep width $\pm$ time base accuracy

Sweep Widths $> n \times 10$ MHz and ≤ 800 MHz: 1% of sweep width

Sweep Widths > 800 MHz and ≤ 8 GHz: 8 MHz

Sweep Widths > 8 GHz: 0.1% of sweep width

Sweep Time: 10 ms to 100 seconds, 300 MHz/ms maximum rate

RF Output

Output Power

Maximum Levelled (dBm) ²	Standard	Option 006
HP 83620A, 83622A	+10	+13
HP 83623A	+17	
HP 83624A	+20	
HP 83630A		
Output Frequencies < 20 GHz	+13	
Output Frequencies ≥ 20 GHz	+10	
HP 83640A, 83642A		
Output Frequencies < 13.5 GHz	+7	+10
Output Frequencies > 20 GHz	+2	+2
Output Frequencies ≥ 13.5 GHz and ≤ 20 GHz	+2	+7
HP 83650A		
Output Frequencies < 20 GHz	+10	
Output Frequencies ≥ 20 GHz and < 26.5 GHz	+10	
Output Frequencies ≥ 26.5 GHz and < 40 GHz	+5	
Output Frequencies > 40 GHz	+2.5	

Option 001: Lowers maximum levelled output power by 1.5 dB to 20 GHz, 2.0 dB above 20 GHz, and 2.5 dB above 40 GHz.

Minimum Settable

Standard: -20 dBm Option 001: -110 dBm

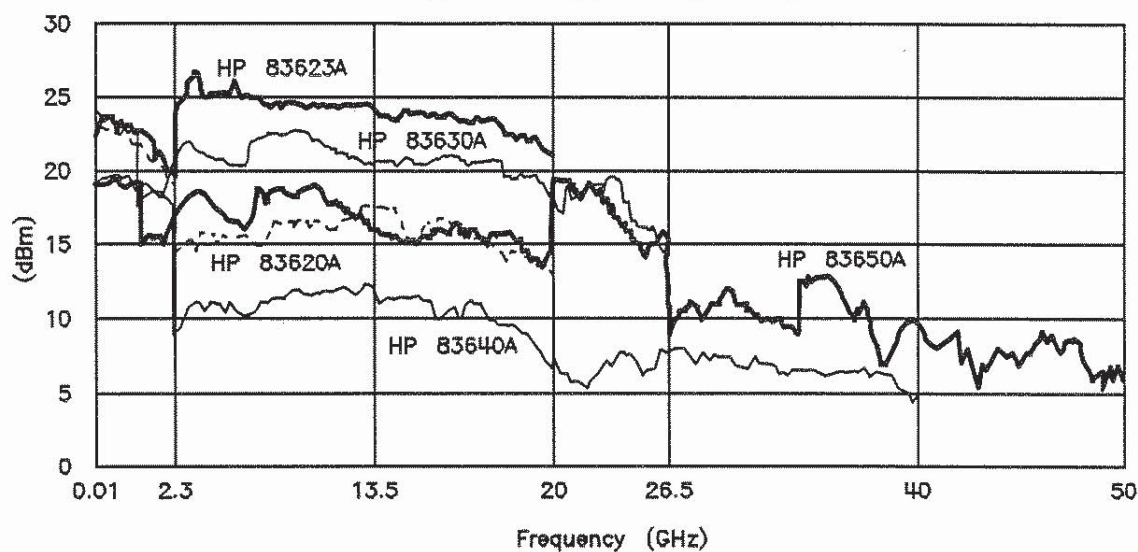
Resolution: 0.02 dB

Switching Time (without attenuator change): 10 ms, typical

Temperature Stability: 0.01 dB/°C, typical

² Specification applies over the 0 to 35 °C temperature range (0 to 25 °C for output frequencies > 20 GHz). Maximum levelled output power over the 35 to 55 °C temperature range typically degrades by less than 2 dB.

Typical Maximum Available Power



Accuracy (dB)³

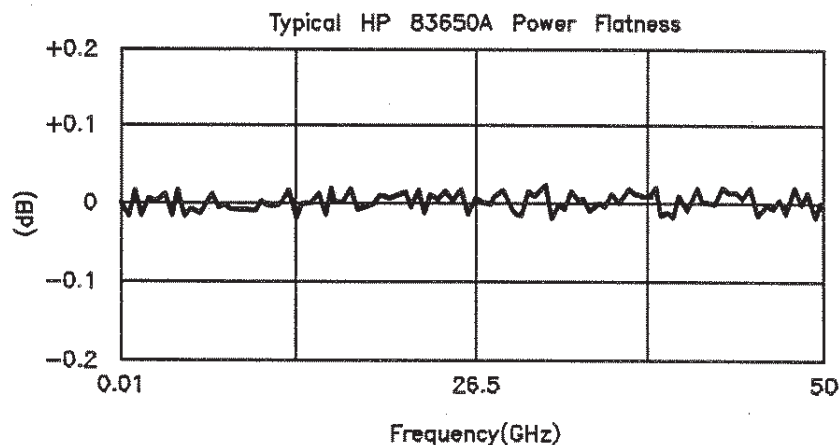
	HP 83620A HP 83622A	HP 83623A HP 83624A	HP 83630A	HP 83640A HP 83642A	HP 83650A
Output Frequencies < 2.3 GHz					
Power Levels > +10 dBm	±1.2	±1.2	±1.2	±1.4	±1.2
Power Levels > -10 dBm ⁴	±0.6	±0.6	±0.6	±0.8	±0.6
Power Levels > -60 dBm	±0.9	±0.9	±0.9	±1.0	±0.9
Power Levels ≤ -60 dBm	±1.4	±1.4	±1.4	±1.6	±1.4
Output Frequencies ≥ 2.3 GHz and ≤ 20 GHz					
Power Levels > +10 dBm	±1.3	±1.3	±1.3	±1.3	±1.3
Power Levels > -10 dBm ⁴	±0.7	±0.7	±0.7	±0.7	±0.7
Power Levels > -60 dBm	±1.0	±1.0	±1.0	±1.0	±1.0
Power Levels ≤ -60 dBm	±1.5	±1.5	±1.5	±1.5	±1.5
Output Frequencies > 20 GHz and ≤ 40 GHz					
Power Levels > +10 dBm					
Power Levels > -10 dBm ⁴			±0.9	±0.9	±0.9
Power Levels > -60 dBm			±1.2	±1.2	±1.2
Power Levels ≤ -60 dBm			±1.7	±1.7	±1.7
Output Frequencies > 40 GHz					
Power Levels > -10 dBm ⁴					±1.7
Power Levels > -60 dBm					±2.0
Power Levels ≤ -60 dBm					±2.5

³ Specifications apply over the 15 to 35°C temperature range for output frequencies < 50 MHz. In models with a lower frequency limit of 2 GHz, specifications < 2.3 GHz do not apply, and specifications ≥ 2.3 to ≤ 20.0 GHz apply over the range ≥ 2.0 to ≤ 20.0 GHz.

⁴ Specifications apply over the 15 to 35°C temperature range and are degraded 0.3 dB outside of that range.

Flatness (dB)

	HP 83620A HP 83622A	HP 83623A HP 83624A	HP 83630A	HP 83640A HP 83642A	HP 83650A
Output Frequencies < 2.3 GHz					
Power Levels > +10 dBm	±0.9	±0.9	±0.9	±1.1	±0.9
Power Levels > -10 dBm	±0.5	±0.5	±0.5	±0.7	±0.5
Power Levels > -60 dBm	±0.7	±0.7	±0.7	±0.9	±0.7
Power Levels ≤ -60 dBm	±1.1	±1.1	±1.1	±1.3	±1.1
Output Frequencies ≥ 2.3 GHz and ≤ 20 GHz					
Power Levels > +10 dBm	±1.0	±1.0	±1.0	±1.0	±1.0
Power Levels > -10 dBm	±0.6	±0.6	±0.6	±0.6	±0.6
Power Levels > -60 dBm	±0.8	±0.8	±0.8	±0.8	±0.8
Power Levels ≤ -60 dBm	±1.2	±1.2	±1.2	±1.2	±1.2
Output Frequencies > 20 GHz and ≤ 40 GHz					
Power Levels > +10 dBm					
Power Levels > -10 dBm			±0.8	±0.8	±0.8
Power Levels > -60 dBm			±1.0	±1.0	±1.0
Power Levels ≤ -60 dBm			±1.4	±1.4	±1.4
Output Frequencies > 40 GHz					
Power Levels > -10 dBm					±1.5
Power Levels > -60 dBm					±1.7
Power Levels ≤ -60 dBm					±2.1



Analog Power Sweep

Range: -20 dBm to maximum available power, can be offset using step attenuator.

External Leveling

Range

At External HP 33330D/E Detector: -36 to +4 dBm

At External Leveling Input: -200 μ V to -0.5 volts

Bandwidth

External Detector Mode: 10 or 100 kHz (sweep speed and modulation mode dependent), nominal

Power Meter Mode: 0.7 Hz, nominal

Source Match

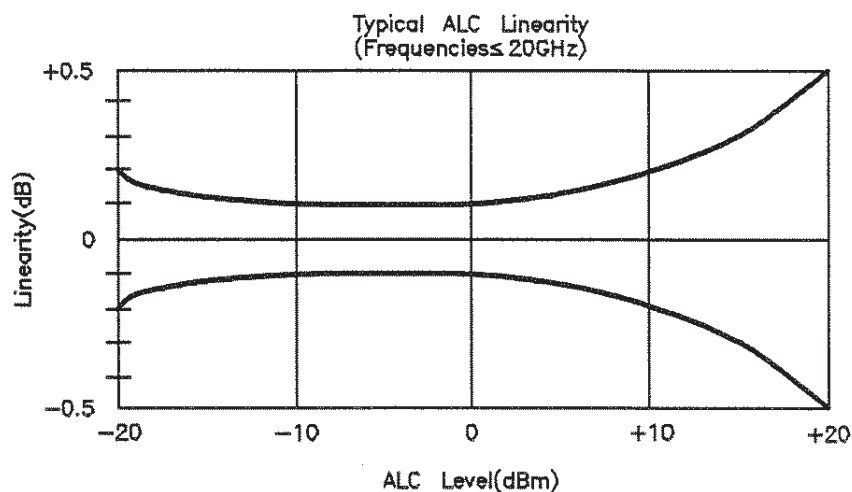
(internally leveled), typical⁵

< 20 GHz 1.3:1 SWR

< 40 GHz 1.8:1 SWR

< 50 GHz 2.0:1 SWR

⁵ Typically 1.8:1 SWR at frequencies below 2.3 GHz in HP 83640A.



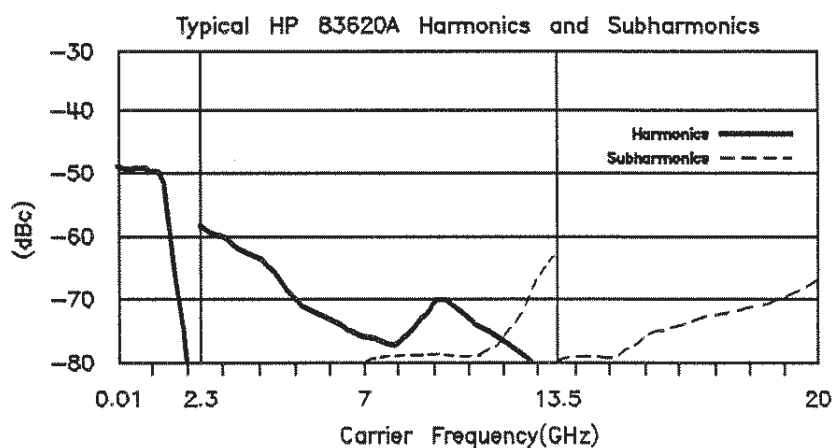
Spectral Purity

Spurious Signals

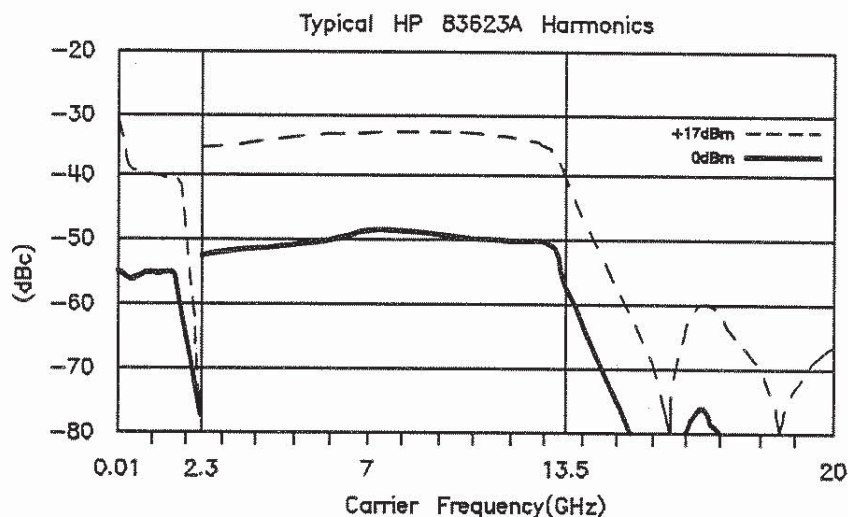
Specifications apply in CW, Step, List, and Manual Sweep Modes of operation.

Harmonics

	HP 83620A HP 83622A	HP 83623A HP 83624A	HP 83630A	HP 83640A	HP 83650A
Output Frequencies < 1.8 GHz					
Standard	-35	-25 ⁶	-30	-30 ⁶	-35 ⁶
Option 006	-25			-25 ⁶	
Output Frequencies ≤ 1.8 GHz					
Standard	-50	-25	-50	-50	-45
Option 006	-20			-20	



⁶ Specification is degraded 5 dB below 50 MHz.



Subharmonics

	HP 83620A HP 83622A	HP 83623A HP 83624A	HP 83630A	HP 83640A HP 83642A	HP 83650A
Output Frequencies < 7 GHz	None	None	None	None	None
Output Frequencies ≥ 7 and ≤ 20 GHz	-50	-50	-50	-50	-50
Output Frequencies > 20 GHz and ≤ 40 GHz			-50	-40	-40
Output Frequencies > 40 GHz					-35

Non-Harmonically Related

Output Frequencies < 2.3 GHz ⁷	-60	-60	-60	-54	-60
Output Frequencies ≥ 2.3 and < 20 GHz	-60	-60	-60	-60	-60
Output Frequencies ≥ 20 and < 40 GHz			-58	-54	-54
Output Frequencies ≥ 40 GHz					-52

Power-Line Related (< 300 Hz offset from Carrier)

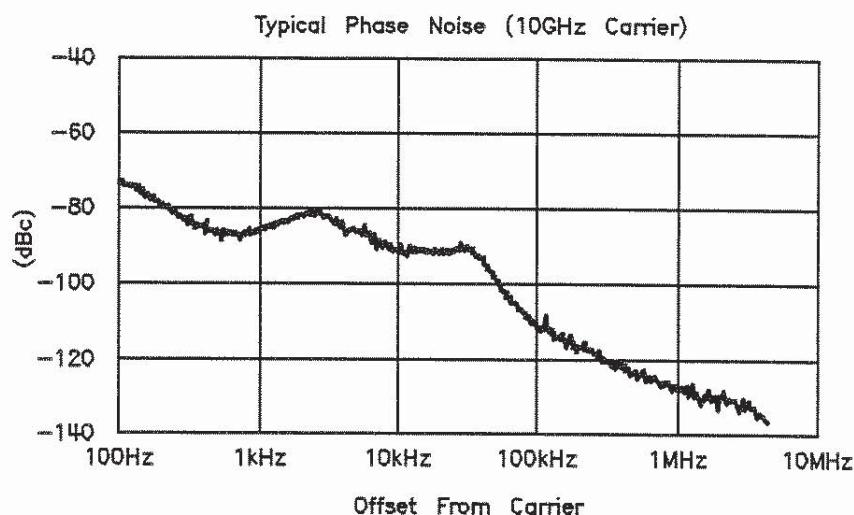
Bands 0,1:	-55
Band 2:	-49
Band 3:	-45
Band 4:	-43
Bands 5, 6:	-39
Band 7:	-37

Offset from Carrier

Band(s)	100 Hz	1 kHz	10 kHz	100 kHz
0,1	-70	-78	-86	-107
2	-64	-72	-80	-101
3	-60	-68	-76	-97
4	-58	-66	-74	-95
5,6	-54	-62	-70	-91
7	-52	-60	-68	-89

⁷ Specification applies at output levels 0 dBm and below

Single-Sideband Phase Noise (dBc/Hz)



Residual FM CW Mode or Sweep Widths $\leq n \times 10$ MHz: $n \times 60$ Hz, typical
 (RMS, 50 Hz to 15 kHz bandwidth) Sweep Widths $> n \times 10$ MHz: $n \times 15$ kHz, typical

Modulation

Pulse HP 83620A, 83622A, 83623A, 83624A, 83640A, 83642A
 Pulse modulation specifications apply for output frequencies 400 MHz and above.

	Standard	Option 006
On/Off Ratio	80 dB ⁸	80 dB
Rise/Fall Times	50 ns	10 ns
Minimum Width		
Internally Leveled	1 μ s	1 μ s
Unleveled		
Output Frequencies < 2.3 GHz	50 ns	50 ns
Output Frequencies ≥ 2.3 GHz	100 ns	20 ns
Minimum Repetition Frequency		
Internally Leveled	10 Hz	10 Hz
Unleveled	DC	DC
Level Accuracy (dB, relative to CW level)		
Widths ≥ 1 μ s	± 0.3 , leveled	± 0.3 , leveled
Widths < 1 μ s (Search Mode)	± 0.5 , typical	± 0.5 , typical
Video Feedthrough		
Output Frequencies < 2.3 GHz		
Power Levels ≤ 10 dBm	2%	2%
Power Levels > 10 dBm	5%	5%
Output Frequencies		
≥ 2.3 GHz and ≤ 20 GHz	2 mv	20 mv
Output Frequencies > 20 GHz	0.3%	2%
Overshoot, Ringing	15%, typical	10%, typical
Delay⁹		
Output Frequencies < 2.3 GHz	65 ns, typical	65 ns, typical
Output Frequencies ≥ 2.3 GHz	95 ns, typical	30 ns, typical
Compression	± 10 ns, typical	± 5 ns, typical

⁸ In the HP 83623A/83624A, specification applies at ALC levels 0 dBm and above, and over the 20 to 55°C temperature range. Specification degrades 5 dB below 20°C, and 1 dB per dB below ALC level 0 dBm in those models.

Pulse HP 83630A, 83650A

	Standard
On/Off Ratio	80 dB
Rise/Fall Times	25 ns
Minimum Width	
Internally Leveled	1 μ s
Unleveled	
Output Frequencies < 2 GHz	50 ns
Output Frequencies $\geq$ 2 GHz	100 ns
Minimum Repetition Frequency	
Internally Leveled	10 Hz
Unleveled	DC
Level Accuracy	
(dB, relative to CW level)	
Widths $\geq$ 1 μ s	± 0.3 , leveled
Widths < 1 μ s (Search Mode)	± 0.5 , typical
Video Feedthrough	
Output Frequencies < 2 GHz	
Power Levels $\leq$ 10 dBm	2%
Power Levels > 10 dBm	5%
Output Frequencies	
$\geq$ 2 GHz and $\leq$ 26.5 GHz	2 mV
> 26.5 GHz and $\leq$ 50 GHz	0.3%
Overshoot, Ringing	15%, typical
Delay⁹	
Output Frequencies < 2 GHz	65 ns, typical
Output Frequencies $\geq$ 2 GHz	95 ns, typical
Compression	± 10 ns, typical

Internal Pulse Generator

Width Range: 1 μ s to 65 ms

Period Range: 2 μ s to 65 ms

Resolution: 1 μ s

⁹ Option 002 adds 30 ns delay

AM and Scan Bandwidth (3 dB): DC to 100 kHz

Dynamic Range

(ALC levels noted, can be offset using step attenuator)

Normal Mode: -20 dBm to 1 dB below maximum available power

Deep Mode¹⁰: 50 dBm below maximum leveled power

Unleveled Mode¹¹: -50 dBm to 1 dB below maximum available power

Sensitivity

Linear: 100%/volt

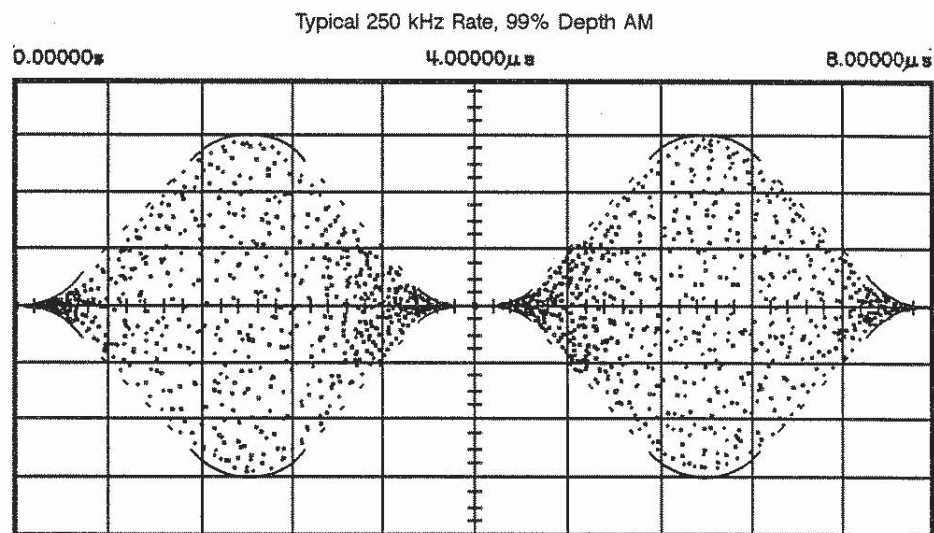
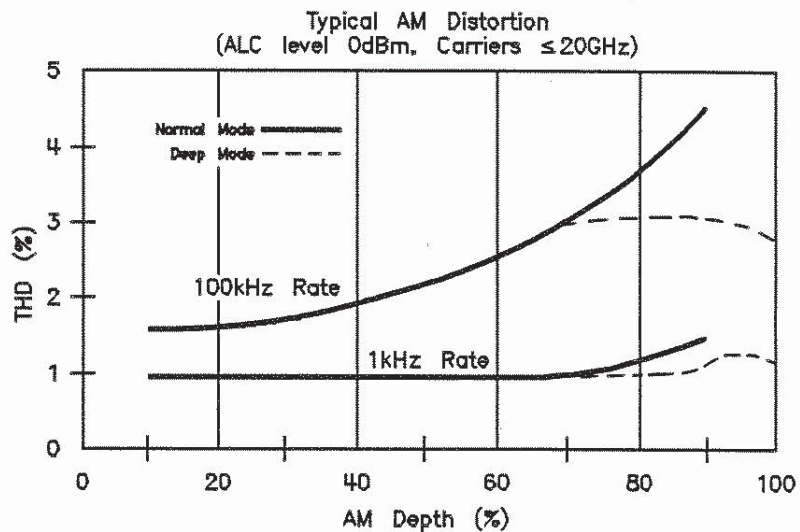
Accuracy (1 kHz rate, 30% depth): 5%

Exponential: 10 dB/volt

Accuracy: 0.25 dB $\pm$ 5% of depth in dB

Incident Phase Modulation: 0.2 radians peak, typical

Incident FM: Incident phase modulation x modulation rate, typical



Delta V = 29.60mvolts
Vmarker 1 = 600.00μvolts Vmarker 2 = 30.200mvolts Timebase = 800ns/div

10 Deep mode offers reduced distortion for very deep AM. Waveform is DC-coupled and feedback-leveled at ALC levels above -13 dBm. At ALC levels below -13 dBm, output is DC-controllable, but subject to typical sample-and-hold drift of 0.25 dB/second. 40 dB for output frequencies greater than 20 GHz in HP 83650A.

11 The HP 8360 has two unleveled modes, ALC Off and Search. In ALC Off mode, the modulator drive can be controlled from the front panel to vary quiescent RF output level. In Search mode, the instrument microprocessor momentarily closes the ALC loop to find the modulator drive setting necessary to make the quiescent RF output level equal an entered value, then opens the ALC loop while maintaining that modulator drive setting. Neither of these modes is feedback leveled.

FM **Locked Mode**
 Maximum Deviation: $\pm 8\text{MHz}$
 Rates (6 dB bandwidth, 1 MHz deviation): 50 kHz to 10 MHz
 Maximum Modulation Index (deviation/rate): $n \times 5$

Unlocked Mode
 Maximum Deviation
 At rates $\leq 100\text{ Hz}$: $\pm 75\text{ MHz}$
 At Rates $> 100\text{ Hz}$: $\pm 8\text{ MHz}$
 Rates (6 dB bandwidth, 1 MHz deviation): DC to 10 MHz

Sensitivity
 100 kHz, 1 MHz, or 10 MHz/volt, switchable.
 Accuracy (1 MHz rate, 1 MHz deviation): 10%

Simultaneous Modulations Full AM bandwidth and depth is typically available at any pulse rate or width. FM is completely independent of AM and pulse modulation.

Internal Modulation Option 002

AM, FM **Waveforms:** sine, square, triangle, ramp, noise

Rate
Range
 Sine: 1 Hz to 1 MHz
 Square, triangle, ramp: 1 Hz to 100 kHz
Resolution: 1 Hz

Depth, deviation
Range: same as base instrument
Resolution: 0.1%
Accuracy: same as base instrument

Pulse **Modes:** free-run, gated, triggered, delayed
Period range: 300 ns to 400 ms
Width range: 25 ns to 400 ms
Resolution: 25 ns
Accuracy: 5 ns
Video delay
 Internal sync pulse: 0 to 400 ms
 Externally-supplied sync pulse: 225 ns to 400 ms

Modulation Meter **Accuracy** (rates $\leq 100\text{ kHz}$): 5% of range

General

Environmental

Operating Temperature Range: 0 to 55° C

EMC: Within limits of VDE 0871/6.78 Level B, FTZ 1046/1984, and Mil-Std-461B Part 7 RE02

Warm-Up Time

Operation: Requires 30 minute warm-up from cold start at 0 to 55° C. Internal temperature equilibrium reached after 2 hour warm-up at stable ambient temperature.

Frequency Reference: Reference time base is kept at operating temperature with the instrument connected to AC power. Instruments disconnected from AC power for more than 24 hours require 30 days to achieve time base aging specification. Instruments disconnected from AC power for less than 24 hours require 24 hours to achieve time base aging specification.

Power Requirements

48 to 66 Hz; 115 volts (+10/-25%) or 230 volts (+10/-15%); 400 VA maximum (30 VA in STANDBY)

Weight & Dimensions

Net Weight: 27 kg (60 lb)

Shipping Weight: 36 kg (80 lb)

Dimensions: 178 H x 425 W x 648 mm D (7.0 x 16.75 x 25.5 inches)

Adapters Supplied

HP 83620A, 83622A, 83623A, 83624A, 83630A

Type N (female) - 3.5mm (female)

Part Number 1250-1745

3.5mm (female) - 3.5mm (female)

Part Number 5061-5311

HP 83640A, 83642A, 83650A

2.4mm (female) - 2.92mm (female)

Part Number 1250-2187

2.4mm (female) - 2.4mm (female)

Part Number 1250-2188