

HEWLETT-PACKARD
8563E

HP 8563E Specifications and Characteristics

Specifications and Characteristics

The following tables list the spectrum analyzer specifications. Unless stated otherwise, all specifications describe the analyzer warranty performance under the following conditions:

- Five-minute warmup for ambient conditions
- Autocoupled controls
- Preselector peaked at the signal of interest
- Digital trace display
- IF ADJ ON
- REF LVL CAL adjusted
- 1ST LO OUTPUT terminated in 50 ohms
- 2ND IF OUTPUT terminated in 50 ohms
- Two-year calibration cycle (See "Calibration Cycle" below.)
- Environmental requirements met

After a 30-minute warmup at a temperature between 20 °C and 30 °C, the preselector does not have to be peaked at each signal of interest. Factory preselector-peak values are sufficient to meet all specifications.

Note

REF LVL ADJ uses the CAL OUTPUT signal to calibrate the reference level. How often this adjustment should be performed depends on internal temperature changes. Amplitude temperature drift is a nominal 1 dB/10 °C. The nominal temperature drift is 10 °C, most of which occurs during the first 30 minutes after power-on. Internal temperature equilibrium is reached after 2 hours of operation at stable ambient temperature.

Characteristics provide useful information in the form of typical, nominal, or approximate values for analyzer performance. Tables of the spectrum analyzer characteristics follow the specifications.

Calibration Cycle

The performance tests located in Chapter 2 should be used every year to check the analyzer against the specifications listed in this chapter.

The frequency reference needs to be adjusted as well as checked the same time. Refer to the 10 MHz Frequency Reference Adjustment in the *HP 8561E and HP 8563E Spectrum Analyzers Service Guide*.

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Frequency Specifications

Frequency Range		
Internal Mixing		
	<i>Non-Option 006</i>	9 kHz to 26.5 GHz
	<i>Option 006</i>	30 Hz to 26.5 GHz
Internal Mixing Bands		Frequency Range
Band 0	<i>Non-Option 006</i>	9 kHz to 2.9 GHz
Band 0	<i>Option 006</i>	30 Hz to 2.9 GHz
Band 1		2.75 GHz to 6.46 GHz
Band 2		5.86 GHz to 13.2 GHz
Band 3		12.4 GHz to 26.5 GHz
External Mixing		18 GHz to 325 GHz
External Mixing Bands		
Frequency Band	Frequency Range	Harmonic Mixing Mode (N*)
		Preselected Unpreselected
K	18.0 to 26.5	n/a 6-
A	26.5 to 40.0	8+ 8-
Q	33.0 to 50.0	10+ 10-
U	40.0 to 60.0	10+ 10-
V	50.0 to 75.0	14+ 14-
E	60.0 to 90.0	n/a 16-
W	75.0 to 110.0	18+ 18-
F	90.0 to 140.0	n/a 24-
D	110.0 to 170.0	n/a 30-
G	140.0 to 220.0	n/a 36-
Y	170.0 to 260.0	n/a 44-
J	220.0 to 325.0	n/a 54-

* N is the harmonic mixing mode. For negative mixing modes (as indicated by the "-"), the desired 1st LO harmonic is higher than the tuned frequency by the 1st IF (3.9107 GHz for the 30 Hz to 2.9 GHz band, 310.7 MHz for all other bands). For positive mixing modes, the desired 1st LO harmonic is lower than the tuned frequency by 310.7 MHz.

Frequency Readout Accuracy	
Accuracy of START, CENTER, STOP or MARKER frequency	
SPAN > 2 MHz × N*	$< \pm(\text{frequency readout} \times \text{frequency reference accuracy}^{\dagger} + 5\% \text{ of frequency span} + 15\% \text{ of resolution bandwidth} + 10 \text{ Hz})$
SPAN ≤ 2 MHz × N*	$< \pm(\text{frequency readout} \times \text{frequency reference accuracy}^{\dagger} + 1\% \text{ of frequency span} + 15\% \text{ of resolution bandwidth} + 10 \text{ Hz})$

* N is the harmonic mixing mode.
† frequency reference accuracy = (aging × period of time since adjustment) + initial achievable accuracy + temperature stability.

Frequency Specifications

Frequency Count Marker	
Frequency Count Marker Resolution	Selectable from 1 Hz to 1 MHz
Frequency Count Marker Accuracy (for signal-to-noise ratio ≥ 25 dB)	$< \pm(\text{marker frequency} \times \text{frequency reference accuracy}^\dagger + 2 \text{ Hz} \times N^\ddagger + 1 \text{ LSD})$
Delta Frequency Count Accuracy (for signal-to-noise ratio ≥ 25 dB)	$< \pm(\text{delta frequency} \times \text{frequency reference accuracy}^\dagger + 4 \text{ Hz} \times N^\ddagger + 2 \text{ LSD})$

† N is the harmonic mixing mode.

‡ Frequency Reference Accuracy = (aging $\times$ period of time since adjustment + initial achievable accuracy + temperature stability).

Frequency Reference Accuracy	
<i>Non-Option 103</i>	
Aging	$< \pm 0.5 \times 10^{-9} / \text{day}$ (after 7 day warmup) $< \pm 1 \times 10^{-7} / \text{year}$
Temperature Stability	$< \pm 1 \times 10^{-8}$, -10°C to $+55^\circ\text{C}$, referenced to 25°C
<i>Option 103</i>	
Aging	$< \pm 2 \times 10^{-6} / \text{year}$
Stability	$< \pm 1 \times 10^{-6}$
Temperature Stability	$< \pm 1 \times 10^{-6}$, -10°C to $+55^\circ\text{C}$, referenced to 25°C

Frequency Specifications

Stability		
Residual FM		
(zero span, 10 Hz RES BW)		
<i>Non-Option 103</i>		
<i>Option 103</i>		
< 1.0 Hz × N* peak-to-peak in 20 ms [†]		
< 10 Hz × N* peak-to-peak in 20 ms		
Noise Sidebands		
For Frequencies ≤ 1 GHz		
(Refer to the characteristics section for frequencies > 2.9 GHz)		
Offset	Non-Option 103	Option 103
100 Hz		
serial number prefix < 3436A	< -80 dBc/Hz [†]	< -70 dBc/Hz [†]
serial number prefix ≥ 3436A	< -88 dBc/Hz [†]	< -70 dBc/Hz [†]
1 kHz	< -97 dBc/Hz [†]	< -90 dBc/Hz [†]
10 kHz ^{††}	< -113 dBc/Hz [§]	< -113 dBc/Hz [§]
30 kHz ^{††}	< -113 dBc/Hz [#]	< -113 dBc/Hz [#]
100 kHz ^{††}		
serial number prefix < 3436A	< -113 dBc/Hz [§]	< -113 dBc/Hz [§]
serial number prefix ≥ 3436A	< -117 dBc/Hz ^{**}	< -117 dBc/Hz ^{**}

* N is the harmonic mixing mode.

[†] See Resolution Bandwidth Usability in "Frequency Characteristics" for further information.

[‡] Add 5.2 dB × ((f/1 GHz) - 1) for f > 1 GHz and f ≤ 2.9 GHz.

[§] Add 2.5 dB × ((f/1 GHz) - 1) for f > 1 GHz and f ≤ 2.9 GHz.

[#] Add 3.0 dB × ((f/1 GHz) - 1) for f > 1 GHz and f ≤ 2.9 GHz.

^{**} Add 2.0 dB for frequencies > 1 GHz and ≤ 2.9 GHz

^{††} For resolution bandwidth ≤ 1 kHz or frequency span ≤ 745 kHz.

^{‡‡} For resolution bandwidth ≥ 3 kHz or frequency span > 745 kHz.

Frequency Span	
Range	
Internal Mixing	0 Hz, 100 Hz × N* to 26.5 GHz over the 10-division CRT horizontal axis, variable in approximately 1% increments, or in a 1, 2, 5 sequence.
External Mixing [†]	Minimum span - 100 Hz × N*
Accuracy	
SPAN > 2 MHz × N*	< ±5%
SPAN ≤ 2 MHz × N*	< ±1%

* N is the harmonic mixing mode.

[†] Resolution bandwidths ≤ 100 Hz are not available in external mixing.

Frequency Specifications

Resolution Bandwidths (-3 dB)	
Range*	
<i>Non-Option 103</i>	1 Hz to 1 MHz (selectable in a 1, 3, 10 sequence) and 2 MHz (3 MHz at -6 dB)
<i>Option 103</i>	10 Hz to 1 MHz (selectable in a 1, 3, 10 sequence) and 2 MHz (3 MHz at -6 dB)
Accuracy	
1 Hz to 300 kHz RES BW	<±10%
1 MHz RES BW	<±25%
2 MHz RES BW	<+50%, -25%
Selectivity (60 dB/3 dB bandwidth ratio)	
RES BW ≥ 300 Hz	<15:1
RES BW ≤ 100 Hz	<5:1
Bandwidth Shape	
1 and 2 MHz RES BW	Approximately Gaussian
300 Hz to 300 kHz RES BW	Synchronously tuned, 4-pole filters
1 Hz to 100 Hz RES BW	Digital, approximately Gaussian
* Resolution bandwidths ≤ 100 Hz are not available in external mixing.	

Video Bandwidth	
(Post-detection low-pass filter averages displayed noise for a smooth trace.)*	
Range	1 Hz to 3 MHz [†] in a 1, 3, 10 sequence
* Video bandwidth filtering is not available in resolution bandwidths < 100 Hz when SPAN = 0 Hz with firmware revisions 930809 and earlier.	
[†] The video bandwidth upper limit is 450 kHz in sample detection mode.	

Frequency Specifications

Sweep

Sweep Time	
Range	
Span = 0	
<i>Non-Option 007</i>	
Analog display	50 μ s to <30 ms
Digital display	30 ms to 6,000 s*
<i>Option 007</i>	
Digital display	50 μ s to 6,000 s
Span = $\geq$ 100 Hz	
RES BW $\geq$ 800 Hz	50 ms to 2,000 s†
RES BW $\leq$ 100 Hz	50 ms to 100,000 s (span-dependent)
Accuracy (Span = 0 Hz)	
<i>Non-Option 007</i>	
Sweep time 30 ms to 6,000 s*	< $\pm$ 1%
Sweep time <30 ms	< $\pm$ 10%
<i>Option 007</i>	
Sweep time 30 ms to 6,000 s*	< $\pm$ 1%
Sweep time <30 ms	< $\pm$ 0.1%
Sweep Trigger	Delayed, Free Run, Single, Line, External, or Video#
* 30 ms to 100 s for analyzers with serial prefix <3310A.	
† 50 ms to 100 s for analyzers with serial prefix <3424A.	
# Video trigger is not available in RES BW settings $\leq$ 100 Hz.	

Delayed Sweep	
Trigger Modes	Free Run, Line, External, Video*
Range	
Span = 0	
<i>Non-Option 007</i>	
	+2 μ s to +65.535 ms
<i>Option 007</i>	
Sweep time $\geq$ 30 ms	+2 μ s to +65.535 ms
Sweep time < 30 ms	-9.9 ms to +65.535 ms††
Span $\geq$ 100 Hz	
	+2 μ s to +65.535 ms
Resolution	
	1 μ s
Accuracy*	
Serial prefix 3310A and above	$\pm$ 1 μ s
Serial prefix <3310A	
20 °C to 30 °C	$\pm$ (1 μ s + (0.05% $\times$ DELAY SWEEP setting))
-10 °C to +55 °C	$\pm$ (1 μ s + (0.12% $\times$ DELAY SWEEP setting))
* Video trigger is not available in RES BW settings $\leq$ 100 Hz.	
†† Negative delayed sweep (pre-trigger) is also limited to 50 $\times$ sweep time.	
# Without Option 007, the delay time will experience up to $\pm$ 0.5 μ s of jitter due to synchronization of the input edge trigger to the internal 1 MHz timebase. With Option 007 and using sweep times <30 ms, the delay time will experience up to $\pm$ 83 ns of jitter due to synchronization of the input edge trigger to the internal 12 MHz timebase.	

Time-Gated Spectrum Analysis

Gate Delay*	Edge Mode	Level Mode
Range	3 μ s to 65.535 ms	$\leq 0.5 \mu$ s
Resolution	1 μ s	
Accuracy†		
Serial prefix 3310A and above	$< \pm 1 \mu$ s	
Serial prefix <3310A		
20 °C to 30 °C	$\pm (1 \mu$ s + (0.05% $\times$ GATE DELAY setting))	
-10 °C to 55 °C	$\pm (1 \mu$ s + (0.12% $\times$ GATE DELAY setting))	

* Time from GATE TRIGGER INPUT to positive edge of GATE OUTPUT.
† The gate delay time will experience up to $\pm 0.5 \mu$ s of jitter due to synchronization of the input edge trigger to the internal 1 MHz timebase.

Gate Length*	
Range	1 μ s to 65.535 ms
Resolution	1 μ s
Accuracy	
Serial prefix 3310A and above	$< \pm 1 \mu$ s
Serial prefix <3310A	
20 °C to 30 °C	$\pm (0.2 \mu$ s + (0.05% $\times$ GATE LENGTH setting))
-10 °C to 55 °C	$\pm (0.2 \mu$ s + (0.12% $\times$ GATE LENGTH setting))

* Time from positive edge to negative edge of GATE OUTPUT.

Marker Frequency Resolution	SPAN/600 to a minimum of 1 Hz
Marker Time Resolution	Sweep time/600

Amplitude Specifications

Measurement Range

Maximum Safe Input Power	
Average Continuous Power (input attenuation ≥ 10 dB)	+30 dBm (1 W)
Peak Pulse Power (input attenuation ≥ 30 dB)	+50 dBm (100 W) for pulse widths $< 10 \mu\text{s}$ and $< 1\%$ duty cycle.
DC Voltage	$< \pm 0.2$ V

Gain Compression	
10 MHz to 2.9 GHz (≤ -5 dBm at input mixer) [†]	< 1.0 dB
2.9 GHz to 6.46 GHz (≤ 0 dBm at input mixer) [†]	< 1.0 dB
6.46 GHz to 26.5 GHz (≤ -3 dBm at input mixer) [†]	< 1.0 dB
[†] Mixer level – input level – input attenuation.	

Displayed Average Noise Level		
With no signal at input, 1 Hz video bandwidth and 0 dB input attenuation		
Frequency Range	10 Hz RES BW (Option 103)	1 Hz RES BW (Non-Option 103)
30 Hz (Option 006)	< -80 dBm	< -90 dBm
1 kHz (Option 006)	< -95 dBm	< -105 dBm
10 kHz	< -110 dBm	< -120 dBm
100 kHz	< -110 dBm	< -120 dBm
1 MHz to 10 MHz	< -130 dBm	< -140 dBm
10 MHz to 2.9 GHz		
serial number prefix $< 3246\text{A}$	< -135 dBm	< -145 dBm
serial number prefix 3246A to $< 3645\text{A}$	< -134 dBm	< -144 dBm
serial number prefix $\geq 3645\text{A}$	< -139 dBm	< -149 dBm
Option H13	< -139 dBm	< -149 dBm
2.9 GHz to 6.46 GHz	< -138 dBm	< -148 dBm
6.46 GHz to 13.2 GHz	< -135 dBm	< -145 dBm
13.2 GHz to 22.0 GHz	< -130 dBm	< -140 dBm
22.0 GHz to 26.5 GHz	< -129 dBm	< -139 dBm

Amplitude Specifications

Spurious Responses	
All input related spurious responses, except as noted below.	
10 MHz to 26.5 GHz	
Second Harmonic Distortion	
Applied Signal Frequency Range	
1 MHz to 1.45 GHz (serial number prefix <3645A)	-40 dBm
20 MHz to 1.45 GHz (serial number prefix ≥3645A)	-40 dBm
20 MHz to 1.45 GHz (Option H13)	-40 dBm
1.45 GHz to 2.0 GHz	-10 dBm
2.0 GHz to 13.25 GHz	-10 dBm
Third Order Intermodulation Distortion	
(with two signals at the input mixer, spaced by ≥1 kHz)*	
Frequency Range	
1 MHz to 2.9 GHz (serial number prefix <3645A)	-30 dBm each
20 MHz to 2.9 GHz (serial number prefix ≥3645A)	-30 dBm each
20 MHz to 2.9 GHz (Option H13)	-30 dBm each
2.9 GHz to 6.46 GHz	-30 dBm each
6.46 GHz to 26.5 GHz	-30 dBm each
Image, Multiple, and Out-of-Band Responses	
Frequency Range	
10 MHz to 26.5 GHz	-10 dBm
Mixer Level*	
-40 dBm	
Distortion	
<(-75 + 20 log N [†]) dBc	
<-72 dBc	
<-79 dBc	
<-79 dBc	
<-85 dBc	
<-100 dBc	
* Mixer level - input level - input attenuation.	
† N - harmonic mixing number	

Residual Responses	
>200 kHz with no signal at input, 0 dB input attenuation, N [†] - 1	<-90 dBm
† N - harmonic mixing number	

Display Range

Amplitude Scale	10 vertical CRT divisions, with the reference level (0 dB) at the top graticule line.
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Calibration	
LOG	10 dB/DIV for 100 dB display from reference level.* 5 dB/DIV for 50 dB display expanded from reference level.† 2 dB/DIV for 20 dB display expanded from reference level. 1 dB/DIV for 10 dB display expanded from reference level.†
LINEAR	10% of reference level per division over the top nine divisions (all 10 divisions for RES BW ≤100 Hz) when calibrated in voltage.
* 10 dB/DIV for 70 dB display from reference level for RES BW ≤100 Hz when SPAN = 0 Hz.	
† These scales are not available in sweep times < 30 ms without Option 007.	

Amplitude Specifications

Accuracy

Reference Level Range	
LOG, adjustable in 0.1 dB steps	
Frequency Band	Range
30 Hz to 26.5 GHz (<i>Option 006</i>)	-120 dBm to +30 dBm
9 kHz to 26.5 GHz (<i>Non-Option 006</i>)	-120 dBm to +30 dBm
LINEAR, settable in 1% steps	
30 Hz to 26.5 GHz (<i>Option 006</i>)	2.2 μ V to 7.07 V
9 kHz to 26.5 GHz (<i>Non-Option 006</i>)	2.2 μ V to 7.07 V

Reference Level Uncertainty

Frequency Response		
(with 10 dB input attenuation)		
Relative (referenced to midpoint between highest and lowest peak excursions)		Typical (20 °C to 30 °C)
30 Hz to 2.9 GHz (<i>Option 006</i>)	< $\pm$ 1.25 dB	< $\pm$ 0.8 dB
9 kHz to 2.9 GHz (<i>Non-Option 006</i>)	< $\pm$ 1.25 dB	< $\pm$ 0.8 dB
100 MHz to 2.0 GHz (serial number prefix $\geq$ 3645A)	< $\pm$ 1.0 dB	< $\pm$ 0.8 dB
2.9 GHz to 6.46 GHz	< $\pm$ 1.5 dB	< $\pm$ 1.0 dB
6.46 GHz to 13.2 GHz	< $\pm$ 2.2 dB	< $\pm$ 1.5 dB
13.2 GHz to 22.0 GHz	< $\pm$ 2.5 dB	< $\pm$ 1.5 dB
22.0 GHz to 26.5 GHz	< $\pm$ 3.3 dB	< $\pm$ 2.2 dB
Absolute (referenced to 300 MHz CAL OUTPUT)		
30 Hz to 2.9 GHz (<i>Option 006</i>)	< $\pm$ 1.8 dB	< $\pm$ 1.0 dB
9 kHz to 2.9 GHz (<i>Non-Option 006</i>)	< $\pm$ 1.8 dB	< $\pm$ 1.0 dB
2.9 GHz to 6.46 GHz	< $\pm$ 2.4 dB	< $\pm$ 1.5 dB
6.46 GHz to 13.2 GHz	< $\pm$ 2.9 dB	< $\pm$ 2.0 dB
13.2 GHz to 26.5 GHz	< $\pm$ 4.0 dB	< $\pm$ 2.5 dB
30 Hz to 26.5 GHz (<i>Option 006</i>)	< $\pm$ 4.0 dB	< $\pm$ 2.5 dB
9 kHz to 26.5 GHz (<i>Non-Option 006</i>)	< $\pm$ 4.0 dB	< $\pm$ 2.5 dB

Band Switching Uncertainty	
(Additional uncertainty added to Relative Frequency Response for measurements between any two bands)	< $\pm$ 1.0 dB

Calibrator Uncertainty	
-10 dBm, 300 MHz	< $\pm$ 0.3 dB

Input Attenuator Switching Uncertainty	
(20 to 70 dB settings, referenced to 10 dB attenuation)	
Frequency Range	
9 kHz to 2.9 GHz	< $\pm$ 0.6 dB/10 dB step, $\pm$ 1.8 dB max.
30 Hz to 2.9 GHz (<i>Option 006</i>)	< $\pm$ 0.6 dB/10 dB step, $\pm$ 1.8 dB max.

Amplitude Specifications

IF Gain Uncertainty (0 dBm to -80 dBm reference levels with 10 dB input attenuation)	$<\pm 1.0$ dB
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Resolution Bandwidth Switching Uncertainty (Referenced to 300 kHz resolution bandwidth at the reference level.)*	$<\pm 0.5$ dB
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* Scale fidelity is not the same for RES BW ≤ 100 Hz as for RES BW ≥ 300 Hz. Therefore, signals not at the reference level will experience an additional amplitude difference when switching between these two sets of RES BW settings, due to differences in scale fidelity.

Pulse Digitization Uncertainty (Pulse response mode, PRF > 720 /sweep time)	
LOG	
Resolution Bandwidth ≤ 1 MHz	<1.25 dB peak-to-peak
Resolution Bandwidth = 2 MHz	<3 dB peak-to-peak
LINEAR	
Resolution Bandwidth ≤ 1 MHz	$<4\%$ of reference level peak-to-peak
Resolution Bandwidth = 2 MHz	$<12\%$ of reference level peak-to-peak

IF Alignment Uncertainty (additional uncertainty when using 300 Hz RES BW only)	$<\pm 0.5$ dB
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Scale Fidelity*	
LOG	
Incremental	
0 to -90 dB range†	
RES BW ≥ 300 Hz	$<\pm 0.1$ dB/dB
RES BW ≤ 100 Hz	$<\pm 0.2$ dB/2 dB
Cumulative	
0 to -90 dB range†	
RES BW ≥ 300 Hz	$<\pm 0.1$ dB/dB from the reference level to a maximum of ± 0.85 dB
RES BW ≤ 100 Hz	$<\pm 0.2$ dB/2 dB from the reference level to a maximum of ± 0.85 dB
0 to -100 dB range†	
RES BW ≥ 300 Hz	± 2.5 dB characteristic
RES BW ≤ 100 Hz	maximum of ± 1.5 dB
LINEAR	
	$<\pm 3\%$ of reference level
* Scale fidelity is not the same for RES BW ≤ 100 Hz as for RES BW ≥ 300 Hz. Therefore, signals not at the reference level will experience an additional amplitude difference when switching between these two sets of RES BW settings due to the differences in scale fidelity.	
† 0 to -70 dB range for RES BW ≤ 100 Hz when SPAN = 0 Hz.	

Amplitude Specifications

Marker Amplitude Resolution*	
(Sweep time $\geq$ 30 ms)	
Scale: LOG 10 dB/DIV	(1/6) dB
LOG 5 dB/DIV	(1/12) dB
LOG 2 dB/DIV	(1/30) dB
LOG 1 dB/DIV	(1/60) dB
LINEAR	Reference Level/600
* Markers are not available for sweep times < 30 ms with RES BW $\geq$ 300 Hz without Option 007. For Option 007, see the characteristics section.	

Inputs and Outputs Specifications

Caution

Any electrostatic discharge according to IEC 801-2/1991 to the center pins of any of the connectors may cause damage to the associated circuitry.

IF INPUT	
Connector	SMA female, front panel
Input level for full-screen deflections (external mixing mode, 0 dBm reference level, 30 dB conversion loss)	-30 dBm $\pm$ 1.5 dB

HP-IB	
Connector	IEEE-488 bus connector
Interface Functions	SH1, AH1, T6, TE0, L4, LE0, SR1, RL1, PP1, DC1, DT1, C1, C28
Direct Plotter Output	Supports HP 7225A, HP 7440A, HP 7470A, HP 7475A, HP 7550A
Direct Printer Output	Supports HP 3630A PaintJet, HP 2225A ThinkJet

CAL OUTPUT	
Connector	BNC female, front panel
Frequency	300 MHz $\pm$ (300 MHz $\times$ frequency reference accuracy [†])
Amplitude	-10 dBm $\pm$ 0.3 dB
[†] Frequency Reference Accuracy - (aging $\times$ period of time since adjustment + initial achievable accuracy + temperature stability).	

1ST LO OUTPUT	
Connector	SMA female, front panel
Amplitude	+16.5 dBm $\pm$ 2.0 dB

10 MHz REF IN/OUT	
Connector	BNC female, rear panel
Output Frequency	10 MHz $\pm$ (10 MHz $\times$ frequency reference accuracy [†])
[†] Frequency Reference Accuracy - (aging $\times$ period of time since adjustment + initial achievable accuracy + temperature stability).	

General Specifications

Environmental Specifications	
<i>Military Specification per MIL-T-28800, Type III, Class 3, Style C, as follows:</i>	
Calibration Interval	2 years
Warmup	5 minutes from ambient conditions*
Temperature	
Operating	-10 °C to +55 °C
Non-operating	-51 °C to +71 °C
Humidity	95% at 40 °C for 5 days
Altitude	
Operating	15,000 feet
Non-operating	50,000 feet
Rain resistance	Drip-proof at 16 liters/hour/square foot
Vibration	
5 to 15 Hz	0.060 inch peak-to-peak excursion
16 to 25 Hz	0.040 inch peak-to-peak excursion
26 to 55 Hz	0.020 inch peak-to-peak excursion
Pulse Shock	
Half Sine	30 g for 11 ms duration
Transit Drop	8 inch drop on 6 faces and 8 corners
Power Main	Voltage fluctuations within the range specified in the spectrum analyzer "Power Requirements."
Power Main	Operating environment within the limits of installation category II according to IEC 1010.
Pollution	Operating environment within the limits of pollution degree 2 according to IEC 664.

* Two hours for conditions of internal condensation, 30 minutes to meet frequency response specifications without preselector peaking. When operating outside the 20 °C to 30 °C ambient temperature range, preselector peaking is always required to meet frequency response specifications.

General Specifications

Electromagnetic Compatibility	Conducted and radiated interference is in compliance with CISPR, Publication 11 (1990).
Military Specification	Meets the requirements of MIL-STD-461C, Part 2, with the exceptions shown below:
Conducted Emissions	
CE01 (Narrowband)	1 kHz to 15 kHz only
CE03 (Narrowband)	Full limits
CE03 (Broadband)	20 dB relaxation from 15 kHz to 100 kHz
Conducted Susceptibility	
CS01	Full Limits
CS02	Full Limits with 40 dB relaxation at IF frequencies. Refer also to "Radiated Immunity" in Amplitude Characteristics.
CS06	Full Limits
Radiated Emissions	
RE01	Test probe at 15 cm, front and rear panel search excluded.
RE02	Full limits to 1 GHz
Radiated Susceptibility	
RS03	Limited to 3 V/m from 14 kHz to 1 GHz with 40 dB relaxation at IF frequencies. Refer also to "Radiated Immunity" in Amplitude Characteristics.

Power Requirements	
115 Vac Operation	
Voltage	90 V to 140 V rms
Current	3.2 A rms maximum
Frequency	47 Hz to 440 Hz
230 Vac Operation	
Voltage	180 V to 250 V rms
Current	1.8 A rms maximum
Frequency	47 Hz to 66 Hz
Maximum Power Dissipation	180 W

Audible Noise	<5.0 Bels, 20 °C to 30 °C (ISO DP7779)
Weight	20 kg (44 lb)

General Specifications

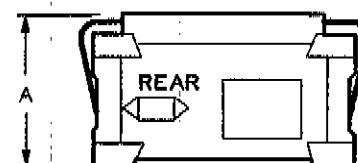
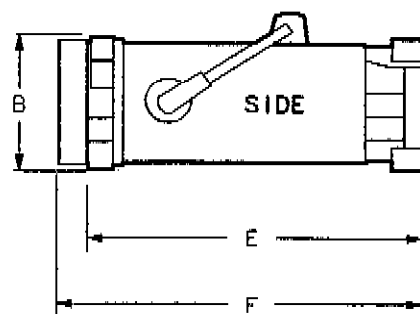
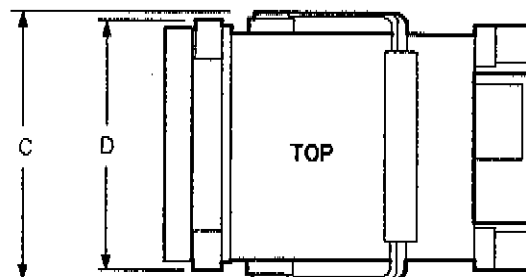
Dimensions

With Handle and Front Cover:

- (A) 202 mm (7-15/16 in) high
- (C) 866 mm (34-1/16 in) wide
- (F) 503 mm (19-13/16 in) deep

Without Handle and Front Cover:

- (B) 187 mm (7-3/8 in) high
- (D) 837 mm (33-1/4 in) wide
- (E) 461 mm (18-1/8 in) deep



FORMAT1

Frequency Characteristics

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

Frequency Reference Accuracy	
<i>Non-Option 103</i>	
Initial Achievable Accuracy (includes gravitational sensitivity, retrace, and settability)	$< \pm 2.2 \times 10^{-8}$
Daily Aging (average over 7 days after being powered on for 7 days)	$< \pm 5 \times 10^{-10}$
Warmup	
(Internal frequency reference selected)	
After 5 minutes	$< \pm 1 \times 10^{-7}$ of final frequency* (0 °C to +55 °C)
	$< \pm 1 \times 10^{-6}$ of final frequency* (-10 °C)
After 15 minutes	$< \pm 1 \times 10^{-8}$ of final frequency* (-10 °C to +55 °C)
<i>Option 103</i>	
Initial Achievable Accuracy	$< \pm 1 \times 10^{-6}$
* Final frequency is defined as frequency 60 minutes after power-on with analyzer set to internal frequency reference.	

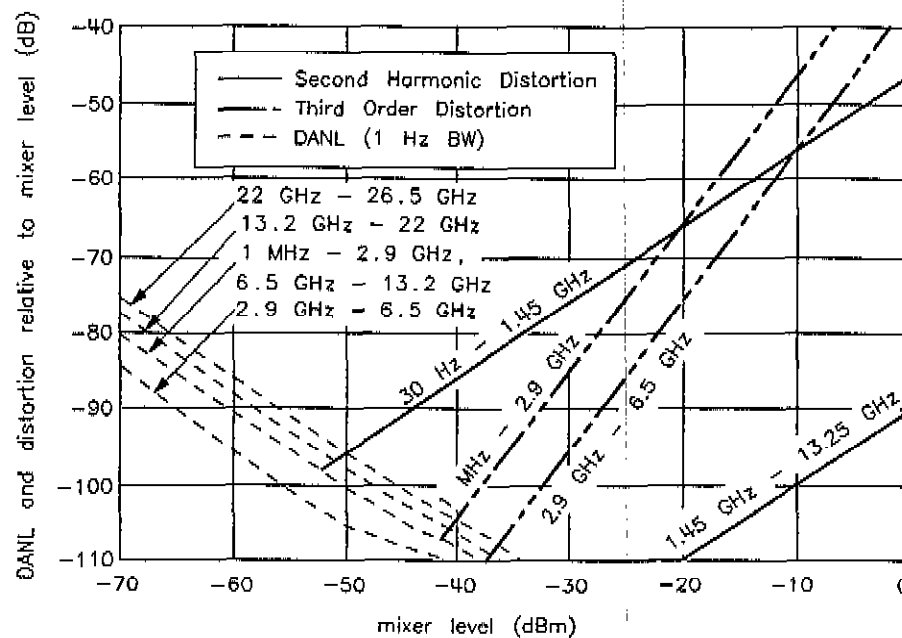
Bandwidth Selectivity	
RES BW $\leq$ 100 Hz	$< 4.5:1$
RES BW = 1 MHz	$< 8:1$
RES BW = 2 MHz	$< 5.5:1$

Impulse Bandwidth	
RES BW = 2 MHz	2.93 MHz $\pm$ 10%
RES BW = 1 MHz	1.60 MHz $\pm$ 7%
RES BW = 300 kHz	491 kHz $\pm$ 7%
300 Hz $\leq$ RES BW $\leq$ 100 kHz	1.62 $\times$ RES BW $\pm$ 10%

Stability	
Noise Sidebands	
For frequencies $\leq$ 1 GHz, 100 kHz offset from carrier, and frequency span $>$ 2 MHz	≤ 121 dBc/Hz

Amplitude Characteristics

Dynamic Range



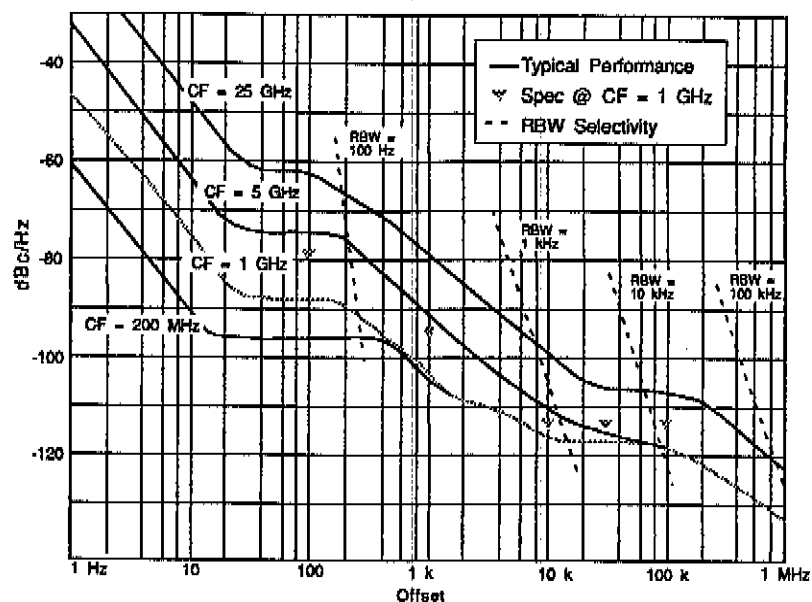
dp130e

Nominal Dynamic Range

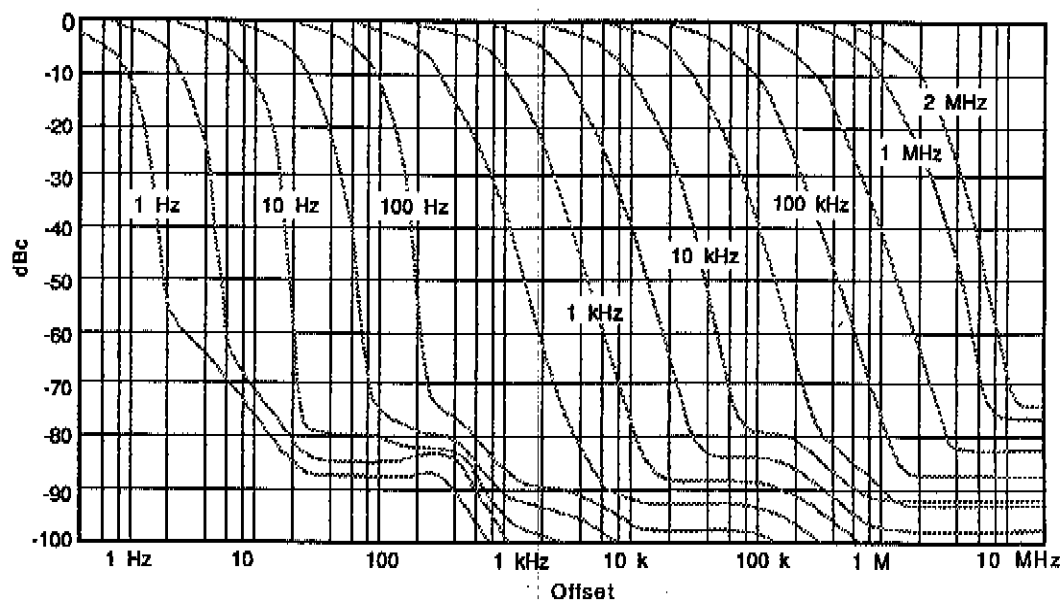
Amplitude Measurement Range

Spurious Responses	Frequency Range	Distortion
(all input related spurious responses < 1 kHz from the carrier)	10 MHz to 2.9 GHz	< -55 dBc

Frequency Characteristics



Noise Sidebands Normalized to 1 Hz BW versus Offset from Carrier



Typical On-Screen Dynamic Range versus Offset from 1 GHz Center Frequency for all RBW's

Amplitude Character

Amplitude Accuracy

Band-to-Band Frequency Response		Band-to-Band Frequency Response (dB)					
Frequency response uncertainty for measurements between any two internal mixing bands. Equivalent to the sum of the two Relative Frequency Response values plus Band Switching Uncertainty.	Band 0	n/a	3.75 dB	4.45 dB	4.75 dB	5.55 dB	
	Band 1	3.75 dB	n/a	4.7 dB	5.0 dB	5.8 dB	
	Band 2	4.45 dB	4.7 dB	n/a	5.7 dB	6.5 dB	
	Band 3A	4.75 dB	5.0 dB	5.7 dB	n/a	6.8 dB	
	Band 3B	5.55 dB	5.8 dB	6.5 dB	6.8 dB	n/a	
Band 0	30 Hz to 2.9 GHz						
Band 1	2.9 GHz to 6.46 GHz						
Band 2	6.46 GHz to 13.2 GHz						
Band 3A	13.2 GHz to 22 GHz						
Band 3B	22 GHz to 26.5 GHz						

Input Attenuator Repeatability	<±0.2 dB
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Input Attenuator Accuracy	
2.9 GHz to 18 GHz	<±1.5 dB/10 dB step, ±3.0 dB max.
18 GHz to 26.5 GHz	<±3.0 dB/10 dB step, ±6.0 dB max.

Pulse Digitization Uncertainty (Pulse response mode, PRF > 720/sweep time)	
Standard Deviation	<0.2 dB

Marker Amplitude Resolution (Option 007, sweep time < 80 ms, zero span)	
Scale: LOG 10 dB/DIV	≤ (1/2) dB
LOG 5 dB/DIV	≤ (1/4) dB
LOG 2 dB/DIV	≤ (1/10) dB
LOG 1 dB/DIV	≤ (1/20) dB
LINEAR	≤ Reference Level/200

Amplitude Characteristics

Demodulation

Spectrum Demodulation	
Modulation Type	AM and FM (5 kHz peak deviation)
Audio Output	Internal speaker and phone jack with volume control.
Pause Time at Marker Frequency	100 ms to 60 s

Radiated Immunity

Radiated Immunity	
When tested at 3 V/m according to IEC 801-3/1984 the displayed average noise level will be within specifications over the full immunity test frequency range of 27 to 500 MHz except that at the immunity test frequency of 310.7 MHz $\pm$ selected resolution bandwidth the displayed average noise level may be up to -80 dBm. When the analyzer tuned frequency is identical to the immunity test signal frequency there may be signals of up to -90 dBm displayed on the screen.	

Inputs and Outputs Characteristics

Caution

Any electrostatic discharge according to IEC 801-2/1991 to the center pins of any of the connectors may cause damage to the associated circuitry.

INPUT 50Ω	
Connector Type	Precision Type N female, front panel
Impedance	50 Ω
VSWR (at tuned frequency)	<1.5:1 for <2.9 GHz and ≥10 dB input attenuation <2.3:1 for > 2.9 GHz and ≥10 dB input attenuation <3.0:1 for 0 dB input attenuation
LO Emission Level* (average) 10 dB Input Attenuation	<-80 dBm
* Level of 1st LO, 3.0 to 6.8 GHz, present at INPUT 50Ω connector.	

IF INPUT (2nd IF input for use with external mixers)	
Connector	SMA female, front panel
Impedance (dc coupled)	50 Ω
Frequency	310.7 MHz
Noise Figure	7 dB
1 dB Gain Compression Level	-23 dBm
Full Screen Level	-30 dBm
(Gain Compression and Full Screen Levels apply with 30 dB conversion loss setting and 0 dBm reference level.)	

1ST LO OUTPUT	
Connector	SMA female, front panel
Impedance	50 Ω
Frequency Range	3.0000 GHz to 6.8107 GHz [†]
[†] 3.8107 GHz to 6.8107 GHz for analyzers equipped with Option 002.	

CAL OUTPUT	
Connector	BNC female, front panel
Impedance	50 Ω

Inputs and Outputs Characteristics

10 MHz REF IN/OUT	
Connector	BNC female, rear panel
Impedance	50 Ω
Output Amplitude	0 dBm
Input Frequency	10 MHz $\times (1 \pm 2 \times 10^{-5})$
Input Amplitude	-2 to +10 dBm
External Reference Phase Noise	
Analyzer noise sideband performance will not be degraded if the external reference phase noise is within the limits given below.	
Non-Option 103	< -135 dBc/Hz at 100 Hz offset
Option 103	< -110 dBc/Hz at 100 Hz offset

VIDEO OUTPUT*	
Connector	BNC female, rear panel
Impedance (dc coupled)	50 Ω
Amplitude (RES BW ≥ 300 Hz)	0 to +1 V full scale
Scaling	
RES BW ≥ 300 Hz	linear or log 100 dB/V
RES BW < 100 Hz	4.8 kHz, auto-ranged level with dc offset
* The VIDEO OUTPUT is a video signal for RES BW ≥ 300 Hz with switching transients and IF ADJ signals between sweeps. For RES BW ≤ 100 Hz the output is an IF signal with transients and IF ADJ signals between and during sweeps.	

LO SWP FAV OUTPUT and LO SWP 0.5 V/GHz OUTPUT*	
Connector	BNC female, rear panel
Impedance (dc coupled)	120 Ω
LO SWP OUTPUT (no load)	0 to +10 V
0.5 V/GHz OUTPUT	
Internal Mixer Mode	0.5 V/GHz of tuned frequency (no load)
External Mixer Mode	$[(1.5 \text{ V/GHz}) \times \text{LO frequency}] - 0.2054 \text{ V} \pm 50 \text{ mV}$
0.25 V/GHz OUTPUT†	0.25 V/GHz of tuned frequency (no load)
* This connector is labeled LO SWP 0.5 V/GHz OUTPUT on older spectrum analyzers and LO SWP FAV OUTPUT on newer spectrum analyzers.	
† The 0.25 V/GHz output is available only in the HP 8564E and HP 8565E.	

BLKG/GATE OUTPUT	
Connector	BNC female, rear panel
Impedance	50 Ω
Blanking Mode	
Amplitude during sweep	Low TTL Level
Amplitude during retrace	High TTL Level
Gate Mode	
Gate On	High TTL level
Gate Off	Low TTL level

Inputs and Outputs Character

EXT/GATE TRIG INPUT	
Connector	BNC female, rear panel
Impedance	10 k Ω
Trigger Level	Settable to high TTL, or low TTL, or edge triggered

PROBE POWER (front panel)	
Voltage	+ 15 V dc, -12.6 V dc
Current	150 mA maximum, each

EARPHONE	
Connector	1/8 inch miniature monophonic jack, rear panel
Power Output	0.2 W into 4 Ω

2ND IF OUT <i>(Option 001 instruments only)</i>			
Connector	SMA female, rear panel		
Impedance	50 Ω		
Frequency	310.7 MHz		
Frequency Range	3 dB BW Noise Figure Conversion		
10 kHz to 2.9 GHz			
serial number prefix <3645A	>28 MHz	25 dB	-6 dB
serial number prefix $\geq$ 3645A	>28 MHz	20 dB	1 dB
2.9 GHz to 6.5 GHz	>80 MHz	22 dB	-3 dB
6.5 GHz to 13.2 GHz	>30 MHz	26 dB	-7 dB
13.2 GHz to 22 GHz	>30 MHz	30 dB	-11 dB
22 GHz to 26.5 GHz	>80 MHz	32 dB	-13 dB

ALT SWEEP OUT <i>(Option 005 analyzers only)</i>	
Connector	BNC female, rear panel
Impedance	100 Ω