

Specifications

This section lists the specifications for the Agilent 8360 B-Series swept signal generator. In an effort to improve these swept signal generators, Agilent Technologies has made changes to this product which are identified with changes in the serial number prefix.

To check if your swept signal generator specifications are the same as those listed in this section:

1. Locate your instrument model number and serial prefix number in the “Instrument History Changes” table in Chapter 5.
2. Check the right column of this table to determine whether any changes apply to your instrument’s model number/serial prefix number combination.
3. If a change is listed, check this change to determine if specifications other than those listed in this section apply. The changes are included in Chapter 5.

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.

Frequency

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

Resolution Standard: 1 kHz
Option 008: 1 Hz

Frequency Bands (for CW signals)

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 ¹	4
5	26.5 GHz to < 33.5 GHz ²	6
6	33.5 GHz to < 38 GHz ³	6
7	38 GHz to 50 GHz	8

¹ This band is 20 GHz to < 25.5 GHz on the 83640B.

² This band is 25.5 GHz to < 32 GHz on the 83640B.

³ This band is 32 GHz to < 40 GHz on the 83640B.

Frequency Modes:

CW and Manual Sweep Accuracy: Same as time base

Switching Time

For Steps Within a Frequency Band:

15 ms + (step size/1 GHz) × 5 ms

Maximum, or Across Band Switch Points: 50 ms

Step or List Modes within a frequency band:

5 ms + (step size/1 GHz) × 5 ms¹

¹ Frequencies < 2 GHz, switching time = 6 ms + (step size/1 GHz) × 5 ms.

Synthesized Step Sweep

Accuracy: Same as time base
Minimum Step Size: Same as frequency resolution
Number of Points: 2 to 801
Switching Time: Same as CW
Dwell Time: 100 μ s to 3.2 s

Synthesized List Mode

Accuracy: Same as time base
Minimum Step Size: Same as frequency resolution
Number of Points: 1 to 801
Switching Time: Same as CW
Dwell Time: 100 μ s to 3.2 s

Ramp Sweep Mode

Accuracy²: (sweep time \geq 100 ms and \leq 5 s):
Sweep Widths \leq n x 10 MHz: 0.1% of sweep width \pm time base accuracy.
Sweep Widths $>$ n x 10 MHz: Lesser of 1% of sweep width or n x 1 MHz + 0.1% of sweep width.
Sweep Time: 10 ms to 100 seconds, 300 MHz/ms maximum rate

Internal 10 MHz Time Base

Accuracy: Calibration \pm Aging Rate \pm Temperature Effects \pm Line Voltage Effects
Stability
Aging Rate: 5×10^{-10} /day, 1×10^{-7} /year
With Temperature: $1 \times 10^{-10}/^{\circ}$ C, typical
With Line Voltage: 5×10^{-10} for line voltage change of 10%, typical

² Sweeptime \geq 150 ms and \leq 5 s for Option 006 instruments.

RF Output

Output Power

Maximum Levelled ³	Standard	Option 006
83620B, 83622B	+13	+13
83623B	+17	+17
83624B	+20	+17
83630B		
Output Frequencies < 20 GHz	+13	+13
Output Frequencies ≥ 20 GHz	+10	+10
83640B		
Output Frequencies < 26.5 GHz	+10	+10
Output Frequencies > 26.5 GHz	+6	+6
83650B		
Output Frequencies < 26.5 GHz	+10	+10
Output Frequencies ≥ 26.5 GHz and < 40 GHz	+5	+5
Output Frequencies ≥ 40 GHz	+2.5	+2.5

With attenuator (Option 001): Minimum settable output power is -110 dBm. Maximum leveled output power is reduced by 1.5 dB to 20 GHz, 2.0 dB above 20 GHz, and 2.5 dB above 40 GHz.

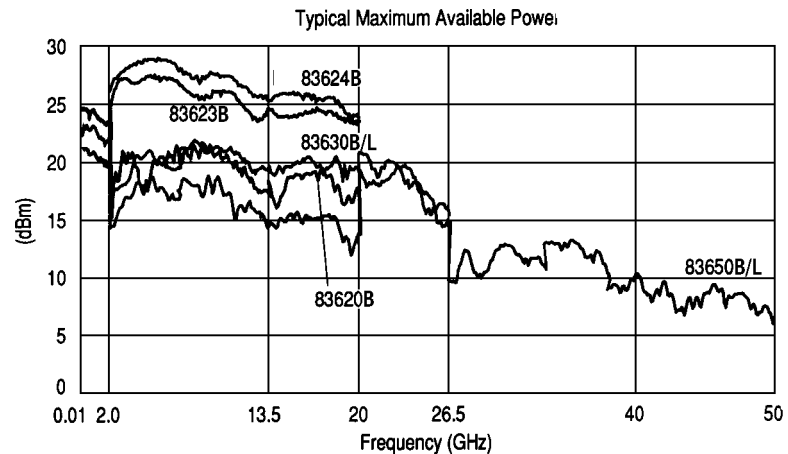
Minimum Settable

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



³ Specification applies over the 0 to 35 °C temperature range (0 to 25 °C for output frequencies > 20 GHz). Maximum leveled output power over the 35 to 55 °C temperature range typically degrades by less than 2 dB.

Accuracy (dB)⁴

Specifications apply in CW, step, list, manual sweep, and ramp sweep modes of operation.

Frequency (GHz)

Power	< 2.0	≥ 2.0 and ≤ 20	> 2.0 and ≤ 40	> 40
> +10 dBm	±1.2	±1.3		
> -10 dBm ⁵	±0.6	±0.7	±0.9	±1.7
> -60 dBm	±0.9	±1.0	±1.2	±2.0
≤ -60 dBm	±1.4	±1.5	±1.7	±2.5

Flatness (dB)

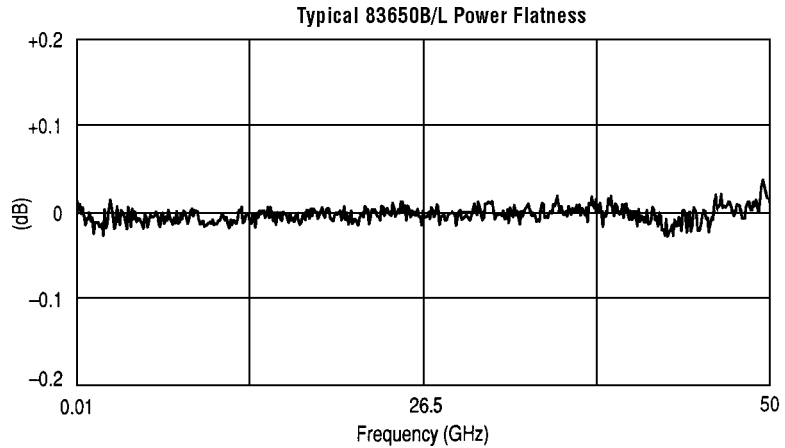
Specifications apply in CW, step, list, manual sweep, and ramp sweep modes of operation.

Frequency (GHz)

Power	< 2.0	≥ 2.0 and ≤ 20	> 2.0 and ≤ 40	> 40
> +10 dBm	±0.9	±1.0		
> -10 dBm ⁵	±0.5	±0.6	±0.8	±1.5
> -60 dBm	±0.7	±0.8	±1.0	±1.7
≤ -60 dBm	±1.1	±1.2	±1.4	±2.1

⁴ Specification applies over the 15 to 35 °C temperature range for output frequencies < 50 MHz.

⁵ Specification applies over the 15 to 35 °C temperature range and are degraded 0.3 dB outside of that range.



Analog Power Sweep

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

External Leveling

Range

At External HP/Agilent 33330D/E Detector: -36 to +4 dBm
 At External Leveling Input: -200 μ V to -0.5 volts

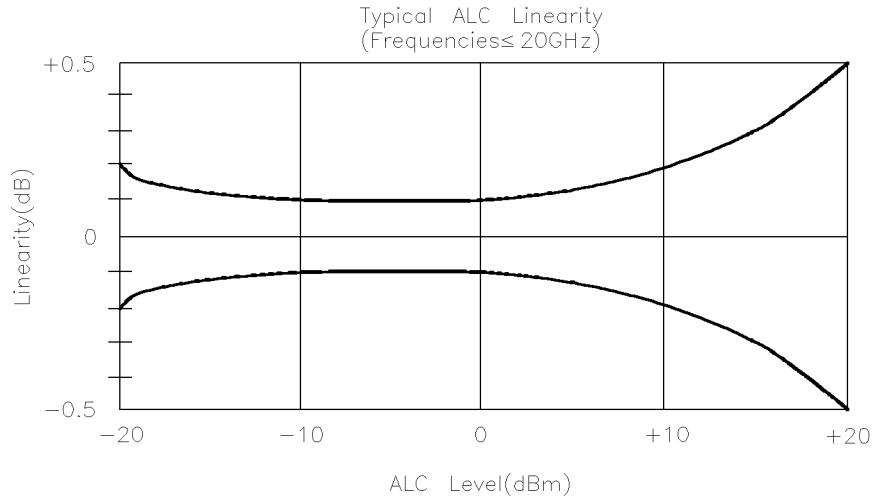
Bandwidth

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), typical⁶
 < 20 GHz 1.6:1 SWR
 < 40 GHz 1.8:1 SWR
 < 50 GHz 2.0:1 SWR

⁶ Typically 2.0:1 SWR at frequencies below 50 MHz.



Spectral Purity

Specifications apply in CW, step, list, and manual sweep modes of operation.

Spurious Signals Harmonics

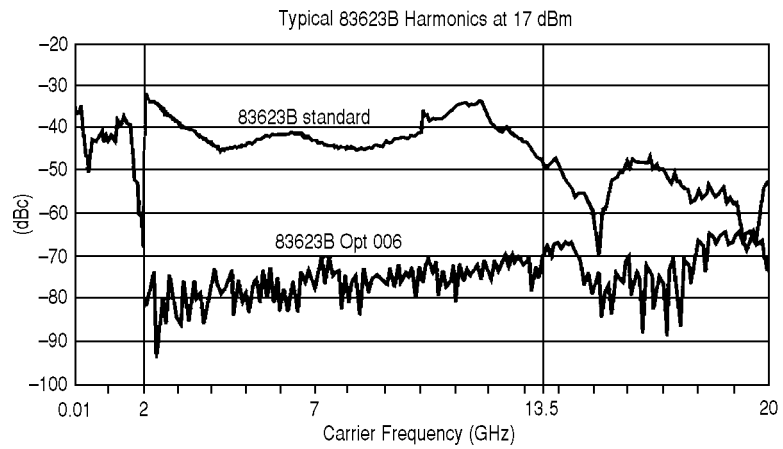
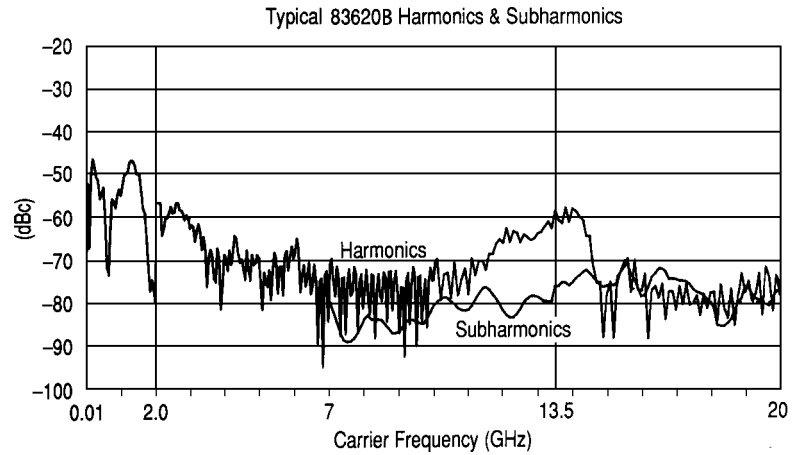
Output Frequencies	83620B 83622B	83623B 83624B	83630B	83640B	83650B
< 2.0 GHz					
Standard	-30 ⁷	-25 ⁷	-30 ⁷	-30 ⁷	-30 ⁷
Option 006	-30 ⁷	-25 ⁷	-30 ⁷	-30 ⁷	-30 ⁷
≥ 2.0 and < 26.5 GHz					
Standard	-50	-25	-50	-50	-50
Option 006	-60	-60	-60	-50	-50
≥ 26.5 GHz					
Standard				-40	-40
Option 006				-40	-40

Subharmonics

Output Frequencies	83620B 83622B	83623B 83624B	83630B	83640B	83650B
< 7 GHz	None	None	None	None	None
≥ 7 and ≤ 20 GHz	-50	-50	-50	-50	-50
> 20 and ≤ 40 GHz			-50	-40 ⁸	-40 ⁸
> 40 GHz					-35 ⁸

⁷ Specification is -20 dBc below 50 MHz.

⁸ Specification typical below 0 dBm.



Non-Harmonically Related

Output Frequencies:

< 2.0 GHz ⁹	-60
≥ 2.0 and < 20 GHz	-60
≥ 20 GHz and ≤ 26.5 GHz	-58
> 26.5 and ≤ 40 GHz	-54
> 40 GHz	-52

⁹ Specification applies at output levels 0 dBm and below.

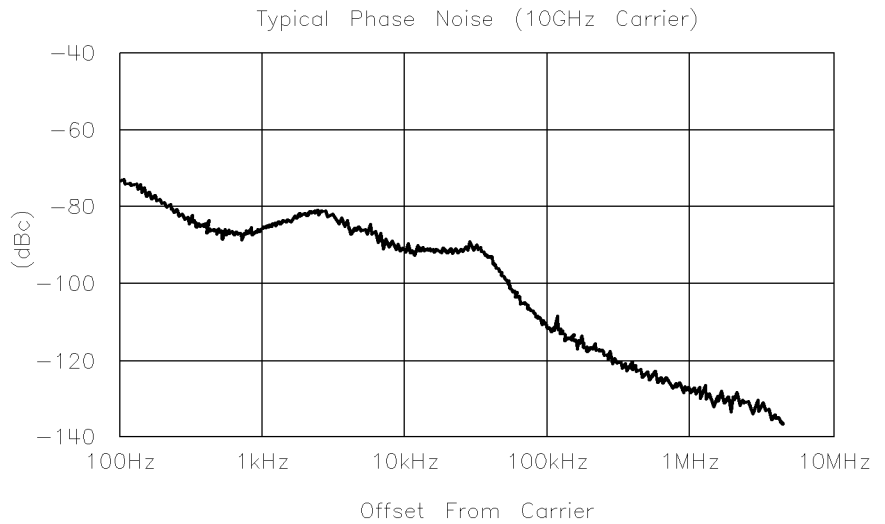
Power-Line Related (< 300 Hz offset from carrier)

10 MHz to < 7 GHz	-55
7 GHz to < 13.5 GHz	-49
13.5 GHz to 20 GHz	-45
> 20 GHz to < 26.5 GHz	-43
26.5 GHz to < 38 GHz ¹⁰	-39
38 GHz to 50 GHz	-37

**Single-Sideband
Phase Noise
(dBc/Hz)**

Offset from Carrier

Band(s)	100 Hz	1 kHz	10 kHz	100 kHz
10 MHz to < 7 GHz	-70	-78	-86	-107
7 GHz to < 13.5 GHz	-64	-72	-80	-101
13.5 GHz to 20 GHz	-60	-68	-76	-97
> 20 GHz to < 26.5 GHz	-58	-66	-74	-95
26.5 GHz to < 38 GHz ¹⁰	-54	-62	-70	-91
38 GHz to 50 GHz	-52	-60	-68	-89



**Residual FM
(RMS, 50 Hz to 15 kHz
bandwidth)**

CW Mode or Sweep Widths $\leq n \times 10$ MHz: $n \times 60$ Hz, typical
Sweep Widths $> n \times 10$ MHz: $n \times 15$ kHz, typical

¹⁰ Frequency range is 26.5 GHz to 40 GHz on the 83640B.

Modulation

Pulse Pulse modulation specifications apply for output frequencies 400 MHz and above.

	Standard	Option 006
On/Off Ratio¹¹	80 dB	80 dB
Rise/Fall Times	25 ns	10 ns
Minimum Width		
Internally Leveled	1 μ s	1 μ s
Search Mode		
Output Frequencies < 2.0 GHz	50 ns	50 ns
Output Frequencies \geq 2.0 GHz	50 ns	15 ns
ALC Off Mode		
Output Frequencies < 2.0 GHz	50 ns	50 ns
Output Frequencies \geq 2.0 GHz	50 ns	15 ns
Minimum Repetition Frequency		
Internally leveled	10 Hz	10 Hz
Search Mode	DC	DC
ALC Off Mode	DC	DC
Level Accuracy		
(dB, relative to CW level)		
Widths \geq 1 μ s	± 0.3	± 0.3
Widths < 1 μ s (Search Mode)	± 0.5 , typical	± 0.5 , typical
Video Feedthrough		
Output Frequencies < 2.0 GHz		
Power Levels \leq 10 dBm	2%	2%
Power Levels > 10 dBm	5%	5%
Output Frequencies \geq 2.0 GHz		
83620B/22B/30B	0.2%	1%
83623B/24B/40B/50B	1%	1%
Overshoot, Ringing	15%, typical	10%, typical
Delay¹²		
Output Frequencies < 2.0 GHz	80 ns, typical	80 ns, typical
Output Frequencies \geq 2.0 GHz	80 ns, typical	60 ns, typical
Compression		
Output Frequencies < 2.0 GHz	± 10 ns, typical	± 10 ns, typical
Output Frequencies \geq 2.0 GHz	± 10 ns, typical	± 5 ns, typical

¹¹ In the 83623B/24B, 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.

¹² Option 002 adds 30 ns delay and ± 5 ns pulse compression for external pulse inputs.

Internal Pulse Generator

Width Range: 1 μ s to 65 ms

Period Range: 2 μ s to 65 ms

Resolution: 1 μ s

AM and Scan

Bandwidth (3 dB, 30% depth, modulation peaks 3 dB below maximum rated power):
DC to 100 kHz (typically DC to 300 kHz)

Modulation Depth

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

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

Deep Mode^{13, 15}: 50 dB below maximum available power

Unleveled Mode^{14, 15}: 50 dB below maximum available power

Sensitivity

Linear: 100%/volt

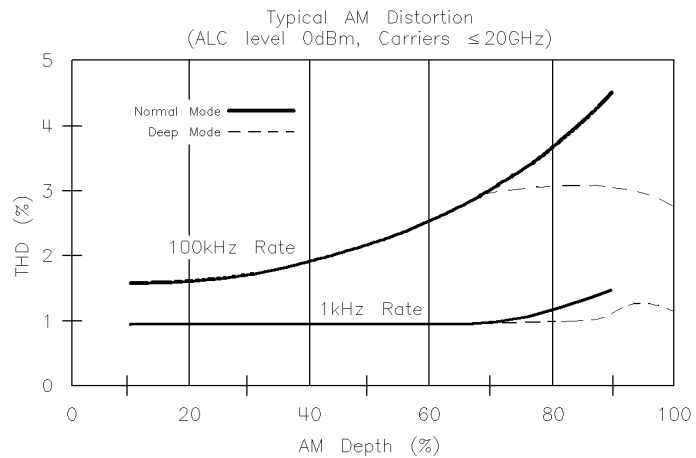
Accuracy (1 kHz rate, 30% depth, normal mode): 5%

Exponential: 10 dB/volt

Accuracy (Normal Mode): 0.25 dB \pm 5% of depth in dB

Incidental Phase Modulation (30% depth): 0.2 radians peak, typical

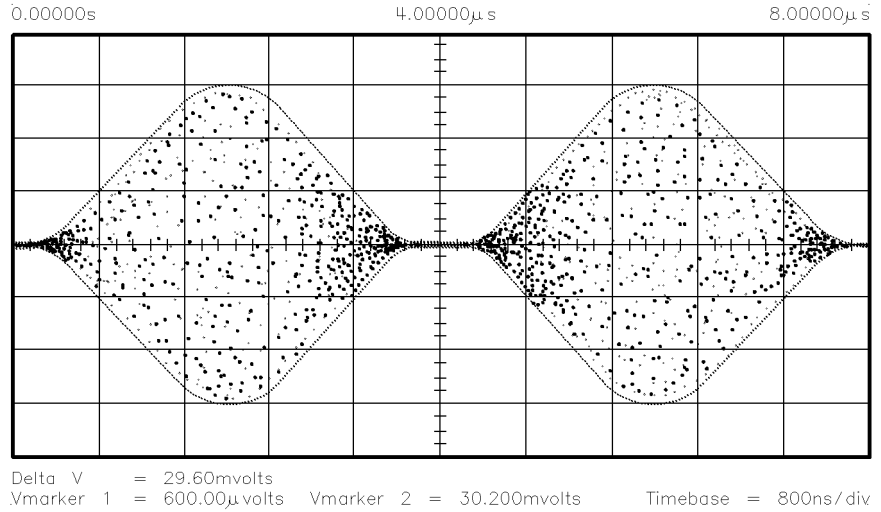
Incidental FM: Incidental phase modulation x modulation rate



¹³ 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.

¹⁴ The 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 to an entered value, then opens the ALC loop while maintaining that modulator drive setting. Neither of these modes is feedback leveled.

¹⁵ Modulation depth is 40 dB below maximum available power for frequencies > 20 GHz on 83640B and 83650B.



FM Locked Mode

Maximum Deviation: ± 8 MHz

Rates (3 dB bandwidth, 500 kHz deviation): 100 kHz to 8 MHz

Maximum Modulation Index (deviation/rate): $n \times 5$

Unlocked Mode

Maximum Deviation

At rates ≤ 100 Hz: ± 75 MHz

At rates > 100 Hz: ± 8 MHz

Rates (3 dB bandwidth, 500 kHz deviation): DC to 8 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 Generator Option 002

AM, FM **Internal 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 to 400 ms

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

General

Environmental	<p>Operating Temperature Range: 0 to 55 °C</p> <p>Altitude: Up to 4572 meters</p> <p>Humidity: 5 to 80% relative at +25 to 40 °C</p> <p>Enclosure Protection: IP20, according to IEC 529</p> <p>This product is designed for use in INSTALLATION CATEGORY II and POLLUTION DEGREE 2, per IEC 1010 and 664 respectively.</p> <p>EMC: Within limits of CISPR Pub. 11/1990 Group 1, Class A, and Mil-Std-461C Part 7 RE02.</p>
Warmup Time	<p>Operation: Requires 30 minute warmup from cold start at 0 to 55 °C. Internal temperature equilibrium reached over 2 hour warmup at stable ambient temperature.</p> <p>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.</p>
Power Requirements	<p>48 to 66 Hz; 115 volts (+10/−25%) or 230 volts (+10/−15%); 400 VA maximum (30 VA in standby)</p>
Weight & Dimensions	<p>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)</p>

Inputs & Outputs

Auxiliary Output

Provides an unmodulated reference signal from 2 to 26.5 GHz at a typical minimum power level of -10 dBm. Nominal output impedance 50 ohms. (SMA female, rear panel)

RF Output

Nominal output impedance 50 ohms. (Precision 3.5 mm male on 20 and 26.5 GHz models, 2.4 mm male on 40 and 50 GHz models, front panel.)

External ALC Input

Used for negative external detector or power meter leveling. Nominal input impedance 120 k Ω , damage level ± 15 volts. See RF output specifications. (BNC female, front panel.)

Pulse Input/Output

TTL-low-level signal turns RF off. When using the standard internal pulse generator, a TTL-level pulse sync signal preceding the RF pulse by nominally 80 ns is output at this connector. Nominal input impedance 50 ohms, damage level $+5.5$, -0.5 volts. See modulation specifications. (BNC female, front panel.)

AM Input

Nominal input impedance 50 ohms (internally switchable to 2 k Ω), damage level ± 15 volts. See modulation specifications. (BNC female, front panel.)

FM Input

Nominal input impedance 50 ohms (internally switchable to 600 ohms), damage level ± 15 volts. See modulation specifications. (BNC female, front panel.)

Trigger Input

Activated on a TTL rising edge. Used to externally initiate an analog sweep or to advance to the next point in step or list mode. Damage level $+5.5$, -0.5 volts. (BNC female, rear panel.)

Trigger Output

Outputs a one-microsecond-wide TTL-level pulse at 1601 points evenly spaced across an analog sweep, or at each point in step or list mode. (BNC female, rear panel.)

10 MHz Reference Input

Accepts 10 MHz ± 100 Hz, 0 to +10 dBm reference signal for operation from external time base. Nominal input impedance 50 ohms. Damage level +10, -5 volts. (BNC female, rear panel.)

10 MHz Reference Output

Nominal signal level 0 dBm, nominal output impedance 50 ohms. (BNC female, rear panel.)

Sweep Output

Supplies a voltage proportional to the sweep ranging from 0 volts at start of sweep to +10 volts at end of sweep, regardless of sweep width. In CW mode, voltage is proportional to percentage of full instrument frequency range. Minimum load impedance 3 kilohms. Accuracy $\pm 0.25\%$, ± 10 mV, typical. (BNC female, rear panel.)

Stop Sweep Input/Output

Sweep will stop when grounded externally. TTL-high while sweeping, TTL-low when 8360 stops sweeping. Damage level +5.5, -0.5 volts. (BNC female, rear panel.)

Z-Axis Blanking/Markers Output

Supplies positive rectangular pulse (Approximately +5 volts into 2 k Ω) during the retrace and bandswitch points of the RF output. Also supplies a negative pulse (-5 volts) when the RF is at a marker frequency (intensity markers only). (BNC female, rear panel.)

Volts/GHz Output

Supplies voltage proportional to output frequency at 0.5 volts/GHz (internally switchable to 0.25 or 1 volt/GHz). Maximum output 18 volts. Minimum load impedance 2 k Ω . Accuracy $\pm 0.5\%$, ± 10 mV, typical. (BNC female, rear panel.)

Source Module Interface

Provides bias, flatness correction, and leveling connections to HP/Agilent 83550-series millimeter-wave source modules (Special, front and rear panels.)

Auxiliary Interface

Provides control signal connections to HP/Agilent 8516A S-parameter Test Set. (25-pin D-subminiature receptacle, rear panel.)

Pulse Video Output (Option 002 only)

Outputs the pulse modulation waveform that is supplied to the modulator. This can be either the internally or externally generated pulse modulation signal. (BNC female, rear panel.)

Pulse Sync Out (Option 002 only)

Outputs a 50 ns wide TTL pulse synchronized to the leading edge of the internally-generated pulse. (BNC female, rear panel.)

AM/FM Output (Option 002 only)

Outputs the internally-generated AM or FM waveform. This output can drive 50 ohms or greater. The AM output is scaled the same as it is generated, either 100%/V or 10 dB/V. The FM scaling depends on the FM deviation selected. (BNC female, rear panel.)

Models

83620B: 10 MHz to 20 GHz
83622B: 2 to 20 GHz
83623B: 10 MHz to 20 GHz High Power
83624B: 2 to 20 GHz High Power
83630B: 10 MHz to 26.5 GHz
83640B: 10 MHz to 40 GHz
83650B: 10 MHz to 50 GHz

Options

Option 001 Add Step Attenuator

With this option, minimum settable output power is -110 dBm. Maximum leveled output power is lowered by 1.5 dB to 20 GHz, and 2 dB above 20 GHz, and 2.5 dB above 40 GHz.

Option 002 Add Internal Modulation Generator

Adds a digitally-synthesized internal modulation waveform source-on-a-card to the 8360. It provides signals that would otherwise be supplied to the external modulation inputs.

Option 004 Rear Panel RF Output

Moves the RF Output, External ALC Input, Pulse Input/Output, AM Input, and FM Input connectors to the rear panel.

Option 006 Fast Pulse Modulation

Improves pulse rise/fall time to 10 ns. Also effects maximum leveled output power and harmonic performance.

Option 008 1 Hz Frequency Resolution

Provides frequency resolution of 1 Hz.

Option 700 MATE System Compatibility

Provides CII programming commands for MATE system compatibility.