

**Table 3-1. Specifications**

**FREQUENCY**

**Range:**

Sine: 1  $\mu$ Hz to 20.999 999 999 MHz

Square: 1  $\mu$ Hz to 10.999 999 999 MHz

Triangle/Ramps: 1  $\mu$ Hz to 10.999 999 999 kHz

**Resolution:**

1  $\mu$ Hz, <100 kHz

1 mHz  $\geq$  100 kHz (1  $\mu$ Hz available, not displayed)

**Accuracy:**

$\pm 5 \times 10^{-6}$  of selected value, 20°C to 30°C, at time of calibration, (Standard Instrument)

**Stability:**

$\pm 5 \times 10^{-6}$ /year, 20°C to 30°C, standard (See also option 001, high stability frequency reference)

**Warm-up Time:**

20 minutes to within specified accuracy.

**MAIN SIGNAL OUTPUT (all waveforms)**

**Impedance:**

50  $\Omega \pm 1\Omega$ , 0–10 kHz

**Return Loss:**

> 20 dB, 10 kHz to 20 MHz, except >10 dB for >3 V, 5 MHz to 20 MHz

**Connector:**

BNC; switchable to front or rear panel, non-switchable with option 002 except by internal cable change.

**Floating:**

Output may be floated up to 42V peak (AC + DC)

**AMPLITUDE (all waveforms)**

**Resolution:**

0.03% of full range or 0.01 dB (4 digits).

**Range:**

1 mV to 10 Vp-p in 8 amplitude ranges, 1–3–10 sequence. Ranges are 1 mV–2.999 mV, 3 mV–9.999 mV, 10 mV–29.99 mV, 30 mV–99.99 mV, .1 V–.2999 V, .3 V–.9999 V, 1V–2.999 V, 3 V–10V, (without DC offset).

Function	peak to peak	rms	dBm(50 $\Omega$ )
Sine	min.	1.000 mV	0.354 mV
	max.	10.00 V	3.536 V
Square	min.	1.000 mV	0.500 mV
	max.	10.00 V	5.000 V
Triangle/Ramps	min.	1.000 mV	0.289 mV
	max.	10.00 V	2.887 V

**Accuracy: (with 0 Vdc offset)**

**Sine:**

	.001 Hz	100 kHz	10 MHz	20 MHz
+23.98 dBm	$\pm .1$ dB	$\pm .4$ dB		
+13.52 dBm			$\pm .6$ dB	$\pm .9$ dB
-16.02 dBm	$\pm .2$ dB	$\pm .6$ dB		
-56.02 dBm				

**Square Wave:**

	.001 Hz	100 kHz	10 MHz
10 Vp-p	$\pm 1.0\%$	$\pm 11.1\%$	
3 Vp-p			
1 mVp-p	$\pm 2.2\%$	$\pm 13.6\%$	

**Triangle:**

	.001 Hz	2 kHz	10 kHz
10 Vp-p	$\pm 1.5\%$	$\pm 5.0\%$	
3 Vp-p			
1 mVp-p	$\pm 2.7\%$	$\pm 6.2\%$	

**Ramps:**

	.001 Hz	500 kHz	10 kHz
10 Vp-p	$\pm 1.5\%$	$\pm 10\%$	
3 Vp-p			
1 mVp-p	$\pm 2.7\%$	$\pm 11.2\%$	

With DC offset, increase all sinewave tolerances by .2 dB and all function tolerances by 2%.

**SINEWAVE SPECTRAL PURITY**

**Phase Noise:**

- 60 dBc for a 30 kHz band centered on a 20 MHz carrier (excluding  $\pm 1$ Hz about the carrier) with option 001 installed.

**Spurious:**

✓ All non-harmonically related output signals will be more than 70 dB below the carrier (- 60 dBc with DC offset), or less than - 90 dBm, whichever is greater.

**WAVEFORM CHARACTERISTICS**

**Sinewave Harmonic Distortion:**

Harmonically related signals will be less than the following levels relative to the fundamental:

Frequency Range	Harmonic Level
.1 Hz to 50 kHz	- 65 dBc
50 kHz to 200 kHz	- 60 dBc
200 kHz to 2 MHz	- 40dBc
2 MHz to 15 MHz	- 30 dBc
15 MHz to 20 MHz	- 25 dBc

**Squarewave Characteristics:**

Rise/fall time:  $\leq 20$  ns 10% to 90%, at full output.

Overshoot:  $\leq 5\%$  of peak to peak amplitude, at full output at 1MHz.

Settling time:  $< 1 \mu$ s to settle to within .05% of final value, tested at full output with no load, 10 Hz to 500 kHz.

Symmetry:  $\leq .02\%$  of period + 3 ns.

**Triangle/Ramp Characteristics:**

Triangle/ramp linearity (10% to 90%, 10 kHz):  $\pm .05\%$  of full p-p output for each range.

Ramp retrace time:  $\leq 3 \mu$ s, 90% to 10%.

Period variation for alternate ramp cycles:  $\leq 1\%$  of period.

**DC OFFSET**

**Range:**

DC only (no AC signal): 0 to  $\pm 5.0$  V/50 $\Omega$

DC + AC: Maximum DC offset  $\pm 4.5$  V on highest range; decreasing to  $\pm 4.5$  mV on lowest range.

**Resolution:** 4 digits

**Accuracy:**

DC only:  $\pm .02$  mV to  $\pm 20$  mV, depends on offset chosen.

DC + AC, to 1MHz:  $\pm .06$  mV to  $\pm 60$  mV, depends on AC output level,  $\pm .2$  mV to  $\pm 120$  mV for ramps to 10 kHz.

DC + AC, 1MHz to 20 MHz:  $\pm 15$  mV to  $\pm 150$  mV, depends on AC output level.

**Table 3-1. Specifications (Cont'd)**

**PHASE OFFSET**

**Range:**  
 $\pm 719.9^\circ$  with respect to arbitrary starting phase, or assigned zero phase.  
**Resolution:** 0.1°  
**Increment Accuracy:**  $\pm 0.2^\circ$   
**Stability:**  $\pm 1.0$  degree of phase/°C

**SINEWAVE AMPLITUDE MODULATION**

**Modulation Depth (at full output for each range):**  
 0-100%  
**Modulation Frequency Range:**  
 DC to 400 kHz (0-21 MHz carrier frequency)  
**Envelope Distortion:**  
 - 30 dB to 80% modulation at 1 kHz, 0 VDC offset  
**Sensitivity:**  
 $\pm 5$  V peak for 100% modulation  
**Input Impedance:** 10 k $\Omega$   
**Connector:** Rear panel BNC

**PHASE MODULATION**

**Sine Function Range:**  
 $\pm 850^\circ$ ,  $\pm 5$ V input  
**Sine Function-Linearity:**  
 $\pm 0.5\%$ , best fit straight line  
**Squarewave Range:**  $\pm 425^\circ$   
**Triangle Range:**  $\pm 42.5^\circ$   
**Positive and Negative Ramps:**  
 $\pm 85^\circ$   
**Modulation Frequency Range:**  
 DC - 5 kHz  
**Input Impedance:** > 40 k $\Omega$   
**Connector:** Rear panel BNC

**FREQUENCY SWEEP**

**Sweep Time:**  
 Linear: 0.01s to 1000s  
 Logarithmic: 1s to 1000s single, 0.1s to 1000s continuous  
**Maximum Sweep Width:**  
 Full frequency range of the main signal output for the waveform in use except minimum log start frequency is 1 Hz.  
**Minimum Sweep Width:**

Function	Minimum sweep width	
	Sweep time .01 sec.	Sweep time 99.9 sec.
Sine:	.1 mHz	999.9 mHz
Square:	.05 mHz	499.5 mHz
Triangle:	.005 mHz	49.95 mHz
Ramps:	.01 mHz	99.99 mHz

Minimum log sweep width is 1 decade.  
**Phase Continuity:**  
 Sweep is phase continuous over the full frequency range of the main output.  
**Discrete Sweep:**  
 Number of segments: 100 maximum (Start and stop frequencies settable for each segment)  
 Time/segment: 0.01s to 1000s, 0.01s resolution

**MODULATION SOURCE:**

Frequency Range: Sine 0.1 Hz-10 kHz, Square 0.1 Hz-2 kHz  
 Frequency Resolution: 2 digits  
 Frequency Accuracy: Typically 0.1% (Sinewave)  
 Amplitude Range: 0.1 Vp-p to 12 Vp-p  
 Amplitude Resolution: 0.1 V  
 Amplitude Accuracy: Typically  $\pm 200$  mV  
 Impedance: Designed to drive  $\geq 10$  k $\Omega$  loads  
 Sinewave Purity: Typically better than -34 dBc  
 Standard Waveforms: Sine, Square  
 Arbitrary Waveforms: Vertical resolution 256 points, horizontal resolution 4096 points, 300,000 samples/sec, 10 kHz maximum.  
 Output Location: Rear Panel BNC

**AUXILIARY OUTPUTS**

**Auxiliary Frequency Output:**  
 Frequency Range: 21 MHz to 60.999 999 999 MHz, underrange coverage to 19.000 000 001 MHz, frequency selection from front panel.  
 Amplitude: 0 dBm; output impedance: 50 $\Omega$   
 Connector: Rear panel BNC  
**Sync Output:**  
 Square wave with  $V_{high} \geq 1.2$  V,  $V_{low} \leq 0.2$  V into 50 $\Omega$ . Frequency range is the same as the main signal output for front panel sync and DC-60 MHz for rear panel sync.  
 Output impedance: 50 $\Omega$   
 Connector: BNC front and rear panels.  
**X-Axis Drive:**  
 (0-100s sweeps only)  
 0 to +10 Vdc linear ramp proportional to sweep frequency; linearity, 10-90%,  $\pm .1\%$  of final value (applies for sweep widths which are integer multiples of the minimum sweep width).  
 Connector: Rear panel BNC.  
**Sweep Marker Output:**  
 High to low TTL compatible voltage transition at keyboard selected marker frequency. (Linear sweep only.)  
 Connector: Rear panel BNC.  
**Z-Axis Blank Output:**  
 TTL compatible voltage levels capable of sinking current from a positive source. Current 200 mA, voltage 45V, power dissipation 1 watt maximum.  
**1 MHz Reference Output:**  
 0 dBm output for phase-locking additional instruments to the HP 3325B.  
 Connector: Rear panel BNC.  
**10 MHz Oven Output:**  
 0 dBm internal high stability frequency reference output for phase-locking HP 3325B or other instruments (option 001 only).  
 Connector: Rear panel BNC.

**Table 3-1. Specifications (Cont'd)**

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**AUXILIARY INPUTS**

**Reference Input:**

For phase-locking HP 3325B to an external frequency reference. Signal from 0 dBm to +20 dBm into 50Ω. Reference signal must be a subharmonic of 10 MHz from 1 MHz to 10 MHz.

Connector: Rear panel BNC. With option 001 this input may be jumpered to the 10 MHz reference output.

**Amplitude Modulation Input:**

See modulation specifications.

**Phase Modulation Input:**

See modulation specifications.

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**REMOTE CONTROL**

**Frequency Switching Time (to within 1 Hz exclusive of programming time):**

≤10 ms for 100 kHz step; ≤25 msec for 1 MHz step; ≤70 msec for 20 MHz step.

**Phase Switching Time (to within 90° of phase lock exclusive of programming time):**

≤15 msec.

**Amplitude Switching Time (to within amplitude specifications, exclusive of programming time):**

<30 ms.

**HP-IB Interface Functions:**

SH1, AH1, T6, L3, SR1, RL1, PP0, DC1, DT1, C0, E1

**RS-232 Interface:**

Subset of ANSI/EIA-232D-1986, CCITT V.24

Type: DTE, 25 pin female "D" connector  
Baud Rate: 300-4800

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**OPTION 001 HIGH STABILITY FREQUENCY REFERENCE**

**Aging Rate:**

±5 × 10<sup>-8</sup>/week, after 72 hours continuous operation; ±1 × 10<sup>-7</sup> mo., after 15 days continuous operation.

**Warm-up time:**

Reference will be within ±1 × 10<sup>-7</sup> of final value 15 minutes after turn-on at 25°C for an off time of less than 24 hours.

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**OPTION 002 HIGH VOLTAGE OUTPUT**

**Frequency Range:** 1 μHz to 1 MHz

**Amplitude:**

Range: 4.00 mV to 40.00 Vp-p in 8 ranges, 4-12-40 sequence, into 500Ω < 500 pF load. Ranges are four times the standard instrument ranges, without DC offset.

Accuracy: ±2% of full output for each range at 2 kHz.

Flatness: ±10% relative to programmed amplitude.

**Sinewave Distortion:**

Harmonically related signals will be less than the following levels (relative to the fundamental full output into 500Ω, load):

10 Hz-50 kHz: -65 dB

50 kHz-200 kHz: -60 dB

200 kHz-1 MHz: -40 dB

**Square Wave Rise/Fall Time:**

±125 ns, 10% to 90% at full output, with 500Ω, 500 pF load.

**Square Wave Overshoot:**

±10% of peak to peak amplitude with 500Ω, 500 pF load.

**Output Impedance:**

<2Ω at DC, <10Ω at 1 MHz

**DC Offset:**

Range: 4 times the specified range of the standard instrument.

Accuracy: ±(1% of full output for each range + 25 mV).

**Maximum Output Current:**

±20 mA peak

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**GENERAL**

**Operating Environment:**

Temperature: 0°C to 55°C

Relative Humidity: 95%, 0°C to 40°C

Altitude: ≤15,000 ft.

**Power:**

100/120/220/240 V, +5%, -10%; 48 to 66 Hz; 90 VA, 120 VA with all options

**Weight:**

9 kg (20 lbs) net; 14.5 kg (32 lbs) shipping

**Dimensions:**

133.4 mm high × 425.5 mm wide × 498.5 mm deep (5¼" H × 16¾" W × 19⅝" D)