

Table 3-1. Specifications

FREQUENCY

Range:

Sine: 1 μ Hz to 20.999 999 999 MHz

Square: 1 μ Hz to 10.999 999 999 MHz

Triangle/Ramps: 1 μ Hz to 10.999 999 999 kHz

Resolution:

1 μ Hz, <100 kHz

1 MHz \geq 100 kHz (1 μ 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 Ω)
Sine	min.	0.354 mV	-56.02
	max.	3.536 V	+23.98
Square	min.	0.500 mV	-53.01
	max.	5.000 V	+26.99
Triangle/Ramps	min.	0.289 mV	-57.78
	max.	2.887 V	+22.22

Accuracy: (with 0 Vdc offset)

Sine:

	.001 Hz	100 kHz	10 MHz	20 MHz
+ 23.98 dBm	$\pm .1$ dB	+ .4 dB		$\pm .6$ dB
+ 13.52 dBm				
-16.02 dBm	$\pm .2$ dB	$\pm .6$ dB		$\pm .9$ 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 ± 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: ≤ 20 ns 10% to 90%, at full output.

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

Settling time: <1 μ 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 ± 5.0 V/500

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

Resolution: 4 digits

Accuracy:

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

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

DC + AC, 1 MHz to 20 MHz: ± 15 mV to ± 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: ± 1.0 degree of phase/ $^\circ\text{C}$

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:
 ± 5 V peak for 100% modulation
Input Impedance: 10 k Ω
Connector: Rear panel BNC

PHASE MODULATION

Sine Function Range:
 $\pm 850^\circ$, ± 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 Ω
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 ± 200 mV
 Impedance: Designed to drive ≥ 10 k Ω 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 Ω
 Connector: Rear panel BNC
Sync Output:
 Square wave with $V_{high} \geq 1.2$ V, $V_{low} \leq 0.2$ V into 50 Ω . 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 Ω
 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)

AUXILIARY INPUTS

Reference Input:

For phase-locking HP 3325B to an external frequency reference. Signal from 0 dBm to +20 dBm into 50 Ω . 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.

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

OPTION 001 HIGH STABILITY FREQUENCY REFERENCE

Aging Rate:

$\pm 5 \times 10^{-8}$ /week, after 72 hours continuous operation; $\pm 1 \times 10^{-7}$ mo., after 15 days continuous operation.

Warm-up time:

Reference will be within $\pm 1 \times 10^{-7}$ of final value 15 minutes after turn-on at 25°C for an off time of less than 24 hours.

OPTION 002 HIGH VOLTAGE OUTPUT

Frequency Range: 1 μ Hz to 1 MHz

Amplitude:

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

Accuracy: $\pm 2\%$ of full output for each range at 2 kHz.

Flatness: $\pm 10\%$ relative to programmed amplitude.

Sinewave Distortion:

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

Square Wave Overshoot:

$\pm 10\%$ of peak to peak amplitude with 500 Ω , 500 pF load.

Output Impedance:

$< 2\Omega$ at DC, $< 10\Omega$ at 1 MHz

DC Offset:

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

Accuracy: $\pm 1\%$ of full output for each range + 25 mV).

Maximum Output Current:

± 20 mA peak

GENERAL

Operating Environment:

Temperature: 0°C to 55°C

Relative Humidity: 95%, 0°C to 40°C

Altitude: $\leq 15,000$ 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 \times 425.5 mm wide \times 498.5 mm deep (5 $\frac{1}{4}$ " H \times 16 $\frac{3}{4}$ " W \times 19 $\frac{5}{8}$ " D)