

# FUNCTION GENERATORS & WAVEFORM SYNTHESIZERS

Synthesizer/Function Generators, 1  $\mu$ Hz to 21 MHz

HP 3325B

449

- Fully synthesized microhertz resolution
- Functions—sine, square, triangle, ramps, arbs, dc offset
- Internal programmable modulation source
- LOG, LIN, discrete sweep
- Excellent signal purity
- dc to 60 MHz sync output



HP 3325B



DESIGNED FOR  
MATE  
SYSTEMS

## HP 3325B Synthesizer/Function Generator

### Synthesizer Precision, Function Generator Versatility

HP 3325B frequency accuracy is determined by a precision frequency reference and can be set with a resolution of 1  $\mu$ Hz. The phase of the output signal can be precisely controlled  $\pm 719.9^\circ$  with 0.1° resolution, and multiple HP 3325Bs can be locked together for multi-phase applications.

Use the modulation source as an arbitrary function generator via HP-IB to provide user-defined waveshapes. Save-recall memory includes ten nonvolatile memory locations for simple and rapid access to frequently used test setups.

A built-in programmable modulation source provides sine, square, and arbitrary waveshapes for internal amplitude or phase modulation, or for use as a second source. In addition, a rear panel sync output provides a TTL compatible dc to 60 MHz signal.

All functions, including frequency, amplitude, phase, modulation, sweep, and waveshapes, are programmable via HP-IB or RS-232 interface. The HP 3325B is fully compatible in form, fit, and function with the HP 3325A. All HP-IB programs written for the HP 3325A are fully compatible with the HP 3325B.

### Specifications

**Waveforms:** Sine, square, triangle, negative, and positive ramps

#### Frequency

##### Range

- Sine:** 1  $\mu$ Hz to 20.999 999 999 MHz
- Square, triangle/ramps:** 1  $\mu$ Hz to 10.999 999 999 MHz
- Resolution:** 1  $\mu$ Hz, < 100 kHz; 1 mHz  $\geq$  100 kHz
- Accuracy:**  $\pm 5 \times 10^{-6}$ , 20° to 30° C at time of calibration
- Warm-up time:** 20 minutes to within specified accuracy

#### Main Signal Output (all waveforms)

- Impedance:** 50  $\Omega$
- Connector:** BNC; switchable to front or rear panel, nonswitchable with Opt 002, except by internal cable change.

#### Amplitude

- Range:** 1 mV to 10 V p-p in 8 amplitude ranges, 1-3-10 sequence (10 dB steps), into 50  $\Omega$  load

Function	Sine		Square		Triangle/ramps	
	Min	Max	Min	Max	Min	Max
Units displayed						
Peak-peak	1.000 mV	10.00 V	1.000 mV	10.00 V	1.000 mV	10.00 V
rms	0.354 mV	3.536 V	0.500 mV	5.000 V	0.289 mV	2.887 V
dBm (50 $\Omega$ )	-56.02	+23.98	-53.01	+26.99	-57.78	+22.22

**Resolution:** 0.03% of full range or 0.01 dB (4 digits)

#### Amplitude accuracy

(without dc offset, relative to programmed amplitude and accuracy)

#### Sine wave amplitude accuracy

- 1 MHz to 100 kHz:  $\pm 0.1$  dB,  $\geq 3$  V p-p;  $\pm 0.2$  dB, < 3 V p-p
- 100 kHz to 20 MHz:  $\pm 0.4$  dB,  $\geq 3$  V p-p;  $\pm 0.6$  dB, 0.1 to 3 V p-p

#### Sine Wave Spectral Purity

**Phase noise:** -60 dB for a 30 kHz band centered on a 20 MHz carrier (excluding  $\pm 1$  Hz about the carrier) with high-stability Opt 001 installed.

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

**Sine wave harmonic distortion:** Harmonically related signals will be less than the following levels (relative to the fundamental) at full output for each range:

0.1 Hz	50 kHz	200 kHz	2 MHz	15 MHz	20 MHz
-65 dB	-60 dB	-40 dB	-30 dB	-30 dB	-25 dB

### Square Wave Characteristics

- Rise/fall time:**  $\leq 20$  ns, 10% to 90% at full output
- Overshoot:**  $\leq 5\%$  of peak-to-peak amplitude, at full output
- Settling time:**  $< 1 \mu$ s to settle to within .05% of final value

### 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

### Sine Wave Amplitude Modulation

- Modulation depth at full output for each range:** 0 to 100%
- Modulation frequency range:** dc to 400 kHz (for 0 to 21 MHz carrier)
- Sensitivity:**  $\pm 5$  V peak for 100% modulation

### Sine Wave Phase Modulation

- Range:**  $\pm 850^\circ$ ,  $\pm 5$  V input
- Modulation frequency range:** dc - 5 kHz

### Frequency Sweep

#### Sweep Time

- Linear:** 0.01 s to 1000s
- Logarithmic:** 1 s to 1000s single, 0.1 s to 1000s continuous

#### Discrete Sweep

- Number of segments:** 100 maximum
- Time/Segment:** 0.01 s to 1000s, 0.01 s resolution
- Maximum Sweep Width:** Full frequency range for the waveform in use; min log start frequency 1 Hz.
- Phase:** Continuous over the full frequency range

### Modulation Source

- Frequency Range:** Sine 0.1 Hz to 10 kHz, square 0.1 Hz to 2 kHz
- Frequency Accuracy:** 0.1%, typical
- Impedance:** Drives 10 k $\Omega$  or greater load
- Sinewave Purity:** -34 dBc or better, typical
- Waveforms:** Sine, square, arbitrary

### Auxiliary Inputs and Outputs

**Auxiliary Frequency Output:** 21 MHz to 60.999 999 999 MHz; 0 dBm; output impedance 50  $\Omega$ .

**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 main signal for front panel sync and dc to 60 MHz for rear panel sync.

**X-Axis Drive:** 0 to  $> +10$  Vdc linear ramp proportional to sweep frequency, linearity, 10-90%,  $\pm 0.1\%$  of final value

### Opt 001 High Stability Frequency Reference

- Aging Rate:**  $\pm 5 \times 10^{-8}$ /week (72 hr warm up);  $\pm 1 \times 10^{-7}$ /month (after 15 days continuous operation).
- Ambient Stability:**  $\pm 5 \times 10^{-8}$  (0° C to +55° C)
- Warm-Up Time:** Reference will be within  $\pm 1 \times 10^{-7}$  of final value 15 minutes after turn-on for an off time of less than 24 hours.

### Opt 002 High Voltage Output

**Frequency Range:** 1  $\mu$ Hz to 1 MHz

#### Amplitude

- Range:** 4.00 mV p-p to 40.00 V p-p ( $\geq 500 \Omega$ ,  $\leq 500$  pF load)
- Accuracy:**  $\pm 2\%$  of full output for each range at 2 kHz
- Output impedance:**  $< 2 \Omega$  at dc,  $< 10 \Omega$  at 1 MHz
- dc offset range:** Four times the specified range of the standard instrument.

### General Specifications

- Weight:** Net, 9 kg (20 lb); shipping, 14.5 kg (32 lb)
- Size:** 132.6 mm H  $\times$  425.5 mm W  $\times$  497.8 mm D (5.25 in  $\times$  16.75 in  $\times$  19.63 in)

### Ordering Information\*

HP 3325B Frequency Synthesizer	Price
Opt 001 High Stability Frequency Reference	\$5,500
Opt 002 High Voltage Output	+ \$850
Opt H05 Internal MATE Programming	+ \$350
Opt W30 Extended Repair Service (see page 624)	(call HP) + \$115

\*HP-IB cable not supplied.

☎ For off-the-shelf shipment, call 800-452-4844.

For the most current prices and product information, contact your local Hewlett-Packard sales office—see page 654.