



FREQUENCY, FUNCTION & WAVEFORM SYNTHESIZERS
Two-Channel Synthesizer, DC to 13 MHz
Model 3326A



HP 3326A



The HP 3326A Two-Channel Synthesizer combines two independent synthesizers, flexible modulation, and control circuitry into a single, powerful package.

Complete Two-Phase Solution

The HP 3326A can provide two signals whose phase is adjustable and calibrated anywhere in its 13 MHz frequency range without an external phasemeter.

Self-calibration can be performed internally or externally and yields accuracy of +/-0.2 degrees below 100 kHz.

Powerful Two-Tone Capability

The HP 3326A is the single-source answer for producing a wide variety of broadband two-tone signals.

Channel amplitudes and functions (sine or square) can be selected independently and provided from separate outputs or through the built-in signal combiner.

Versatile ATE Source

With two complete synthesizers in a single instrument, rack space and power are conserved.

All functions, modes, and parameters of the HP 3326A are completely programmable over the HP-IB.

High Performance Modulation and Pulses

Precise amplitude and phase modulation is easy with both channels of the HP 3326A.

In the pulse mode both pulse and pulse-complement outputs are provided. Symmetry range is 1% to 99% and is settable in 0.1% increments.

Other Features

The HP 3326A has a host of convenience features to speed and simplify signal generation.

frequency pairs with dwell times individually selectable for each frequency and each channel.

DC offset is available in all modes, and all outputs are floating.

Specifications

For complete specifications refer to the HP 3326A data sheet.

Operating Modes

- Two Channel: Channels A and B are independent
Two-Phase: Channels A and B are the same frequency, with calibrated phase offset between the two signals
Two-Tons: Channel B frequency offset 0 to 100 kHz from channel A frequency
Pulse: Channel B is the complement of Channel A

Frequency (Waveforms are Sine, Square, Pulse, and DC)

- Range: 0 Hz to 13 MHz
Resolution: 1 MHz below 100 kHz, 1 mHz at and above 100 kHz
Stability: +/-5x10^-6/year, 20 to 30C. See also option 001, High Stability Frequency Reference.
Accuracy: +/-5x10^-6 of selected value, 20 to 30C, at time of calibration with standard frequency reference

Sinewave Spectral Purity

Harmonics: Harmonically related signals will be less than the following levels relative to the fundamental, or <-90 dBm, whichever is greater:

Table with 5 columns: Frequency (10 Hz, 50 kHz, 100 kHz, 1 MHz, 13 MHz) and three rows of dBm levels (+23.98, +13.98, -56.02 dBm).

Integrated Phase noise: -66 dBc (Option 001 only, for a 30 kHz band centered on a 10 MHz carrier excluding +/-1 Hz about the carrier)

Main Signal Outputs (Channels A and B, All Waveforms Unless Noted)

- Connectors: Front panel BNC female
Impedance: 50 Ohm; output may be floated to +/-42 V peak
Sync A: TTL level squarewave at Channel A frequency.

Output Amplitude (Sine Mode)

- Range: 1 mVpp to 10 Vpp in 8 ranges without DC offset. See also option 002 High Voltage Output
Units: Volts peak-peak, Volts rms, dBm (50 Ohm), dBV

Resolution: 0.1% of full range for peak-peak entry
0.3% of full range for rms entry
0.01 dB for dBm or dBV entry

Accuracy: Relative to programmed value after self-calibration

Power Level	0.001 Hz	100 kHz	1 MHz	13 MHz
+23.98 dBm	±0.1 dB		±0.3 dB	±0.6 dB
+3.98 dBm	±0.2 dB		±0.5 dB	±0.8 dB
-36.02 dBm	±0.2 dB		±0.5 dB	+1.0 dB
-56.02 dBm	±0.2 dB		±0.5 dB	+1.0 dB

Squarewave and Pulse Characteristics

Rise/fall time: :515 ns, 10% to 90% at full output
Overshoot: < 5% of peak-to-peak amplitude at full output
Pulse width range: 1% to 99% of period or 20 ns, whichever is greater
Pulse width resolution: 0.01% of period
Pulse width accuracy: <±1% of period ±20 ns
Amplitude accuracy: ±2%, 0.001 Hz to 100 kHz

DC Offset

Range: (See also option 002, high voltage output)
DC only: 0 to ±5 V
DC+AC: DC+AC peak <5V; Max. DC offset is affected by AC range, Maximum is 4.5 V decreasing to 4.5 mV on lowest range
Resolution: 3 digits
Accuracy: (After self-calibration)
DC only: ±75 mV
DC+AC: (Sinewave) 10 Hz to 1 MHz: *2% of range
1 MHz to 13 MHz: ±5% of range

Phase Offset

(Channel A vs B in Two-Phase mode)
Range: ±720 degrees
Resolution: 0.01 degree
Accuracy: After self-calibration, for equal-level sinewaves 1 V to 10 V peak-peak

0.1 Hz to 10 Hz	±0.5 degrees
10 Hz to 100 kHz	±0.2 degrees
100 kHz to 1 MHz	±0.3 degrees
1 MHz to 13 MHz	±2.0 degrees

Amplitude Modulation

Specifications apply to Channel A and Channel B with external modulation or to Channel A internal modulation with Channel B as the modulation source. External modulation is allowed in all modes; internal modulation is allowed only in the two-channel mode.
Waveforms: Sine, square, or (external only) pulse, DC, etc.
Frequency Range: Carrier: DC to 13 MHz
Modulation: DC to 100 kHz
Modulation Depth: 0 to 100%

Phase Modulation

Specifications apply to Channel A and Channel B with external modulation or to Channel A internal modulation with Channel B as the modulation source. External modulation is allowed in all modes; internal modulation is allowed only in the two-channel mode.
Waveforms: Sine, square, or (external only) pulse
Frequency Range: Carrier: DC to 13 MHz
Modulation: DC to 5 kHz
Phase Deviation: 0° to 360°

Frequency Sweep

Sweep Types: Linear, discrete
Sweep Forms: Triangle, ramp
Sweep Time: 5 ms to 1000 s
Sweep Elements (Discrete): 2 to 63 frequency pairs and dwell times, user defined; dwell times = 5 ms to 1000 s/element
Maximum Sweep Width: 13 MHz

Output Combiner

Channel A and B are combined on the Channel A output. B output is off. Combiner may be used in the two-channel, two-phase, and two-tone modes. DC offset is automatically set to 0 V.

Frequency Range: DC to 13 MHz

Return Loss: >20 dB

Auxiliary Outputs (All Connectors are Rear-Panel BNC)

10 MHz reference- +3 dBm output to phase lock other instruments to the HP 3326A

10 MHz oven output: +3 dBm oven-stabilized frequency reference (option 001 only)

X-axis drive: Linear ramp proportional to sweep time

Z-axis blank: TTL low during sweep

Sweep Marker TTL low at selected marker frequency in sweep

20-33 MHz LO: >100 mV square wave output offset 20 MHz from Channel B output

Auxiliary Inputs (All Connectors are Rear-Panel BNC)

Reference Input: For phase-locking to an external frequency reference. Signal of 1,2,5, or 10 MHz, ±10 ppm, 0 to +20 dBm

External Trigger Input: TTL level to initiate linear or discrete sweep on high to low transition

Channel A and B external phase calibration inputs

Channel A and B external amplitude modulation inputs

Channel A and B external phase modulation inputs

HP-IB Remote Control

Compatible with IEEE Standard 488-1978

Interface Functions:

SH I, AH I, T6, L4, SRI, RLI, PPO, DC 1, DTI, CO, EI

Option 001 High Stability Frequency Reference

Stability: ±5X10⁻⁶/week after 72 hours continuous operation
±1X10⁻⁷/month after 15 days continuous operation

Option 002 High Voltage Output

Multiplies the output level by 4 and expands the allowable DC offset range. Specifications apply to both channels in all modes with the internal combiner off.

Frequency range: DC to 1 MHz

Output Impedance: <20, DC to 50 kHz; <100, 50 kHz to 1 MHz

Amplitude range: 4 mV to 40 Vpp into >1 kΩ, <200 pF load without DC offset (must be entered in peak-to-peak units only)

DC offset: ±20 V, independent of amplitude range. DC + AC peak must not exceed 20 V

Option 003 Rear Terminal Outputs

Provides Channel A and B main outputs only on rear panel BNC's. Front panel main outputs are removed. Specifications unchanged.

General

Power. 100/120/220/240 V, +5%, -10%, 48 to 66 Hz; 120 VA, 150 VA with all options, 10 VA standby

Weight: 27 kg (60 lb) net, 37 kg (81 lb) shipping

Dimensions: 177 mm H x 425.5 mm W x 497.8 mm D (7 x 16³/₈ x 19³/₈"

Accessories Available

HP 15507A Isolator. For isolation of signal ground between frequency reference and instrument input/output

HP 9211-2656 transit case for protection in transportation and storage

Ordering Information

	Price
HP 3326A Two-Channel Synthesizer	\$9,760
Option 001 High Stability Frequency Reference	\$665
Option 002 High Voltage Output	\$305
Option 003 Rear Terminal Outputs (Rear only)	N/C
Option 907 Front Handle Kit	\$61
Option 908 Rack Flange Kit	\$36
Option 909 Rack Flange and Handle Combination Kit	\$92
Option 910 Extra Operating Manual	\$102
Option 914 Delete Service Manual	less \$115
Option W30 Ext. Warranty	\$190