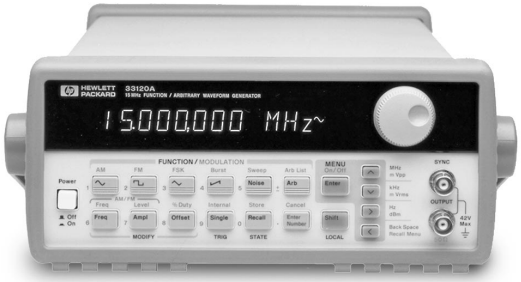
HP 33120A Function/Arbitrary Waveform Generator

Create custom waveforms easily and affordably

- **15 MHz sine and square wave outputs**
- **Sine, triangle, square, ramp, noise and more**
- **12-bit, 40MSa/s, 16,000-point deep arbitrary waveforms**
- **Direct Digital Synthesis for excellent stability**



Uncompromising performance for standard waveforms

The HP 33120A function/arbitrary waveform generator uses direct digital-synthesis techniques to create a stable, accurate output signal for clean, low-distortion sine waves. It also gives you fast rise- and fall-time square wave, and linear ramp waveforms down to 10 mHz.

Custom waveform generation

Use the HP 33120A to generate complex custom waveforms such as a heartbeat or the output of a mechanical transducer. With 12-bit resolution, and a sampling rate of 40 MSa/s, the HP 33120A gives you the flexibility to create any waveform you need. It also lets you store up to found 16,000-deep waveforms in nonvolatile memory.

Easy-to-use functionality

Front-panel operation of the HP 33120A is straightforward and intuitive. You can access any of ten major functions with a single key press or two, then use a simple knob to adjust frequency, amplitude and offset. To save time, you can enter voltage values directly in Vp-p, Vrms or dBm. Internal AM, FM, FSK and burst modulation make it easy to modulate waveforms without the need for a separate modulation source. Linear and log sweeps are also built in, with sweep rates selectable from 1ms to 500s. HP-IB and RS-232 interfaces are both standard, plus you get full programmability using SCPI commands.

Optional phase-lock capability

The Option 001 phase lock/TCXO timebase gives you the ability to generate synchronized phase-offset signals. An external clock input/output lets you synchronize with up to three other HP 33120As or with an external 10-MHz clock.

Option 001 also gives you a TCXO timebase for increased frequency stability. With accuracy of 4 ppm/yr, the TCXO timebase make an HP 33120A ideal for frequency calibrations and other demanding applications.

With Option 001, new commands let you perform phase changes on the fly, via the front panel or from a computer, allowing precise phase calibration and adjustment.

Link the HP 33120A to your PC

To further increase your productivity, use the HP 33120A in conjunction with HP 34811A BenchLink Arb software. The Windows®-based program lets you create and edit waveforms on your PC and download them to your HP 33120A with the click of a mouse. Create complex waveforms in a math or statistics program–or use the freehand drawing tool–then pass them into HP BenchLink Arb. Use in conjunction with HP BenchLink Scope, the software also lets you capture a waveform with your HP oscilloscope or DMM and send it to your HP 33120A for output.

3-year warranty

With your HP 33120A, you get operating and service manuals, a quick reference guide, test date, and a full 3-year warranty, all for one low price.

Waveforms

Standard	Sine, square, triangle, ramp, noise, sin(x)/x, exponential rise exponential fall, cardiac, dc volts.

Arbitrary

Waveform length	8 to 16,000 points
Amplitude resolution	12 bits (including sign)
Sample rate	40 MSa/s
Non-volatile memory	Four (4) 16,000 waveforms

Frequency Characteristics

Sine	100 µHz - 15 MHz
Square	100 µHz - 15 MHz
Triangle	100 µHz - 100 kHz
Ramp	100 µHz - 100 kHz
White noise	10 MHz bandwidth
Resolution	10 µHz or 10 digits
Accuracy	10 ppm in 90 days, 20 ppm in 1 year, 18°C - 28°C
Temp. Coeff	< 2 ppm/°C
Aging	< 10 ppm/yr

Sinewave Spectral Purity

Harmonic distortion

dc to 20 kHz	-70 dBc
20 kHz to 100 kHz	-60 dBc
100 kHz to 1 MHz	-45 dBc
1 MHz to 15 MHz	-35 dBc

Spurious (non-harmonic)

DC to 1 MHz	< -65 dBc
1 MHz to 15 MHz	< -65 dBc + 6 dB/octave

Total harmonic distortion

DC to 20 kHz	<0.04%

Phase noise <-55 dBc in a 30 kHz band

Signal Characteristics

Squarewave

Rise/Fall time	< 20 ns
Overshoot	4%
Asymmetry	1% + 5ns
Duty cycle	20% to 80% (to 5 MHz) 40% to 60% (to 15 MHz)

Triangle, Ramp, Arb

Rise/Fall time	40 ns (typical)
Linearity	<0.1% of peak output
Setting Time	<250 ns to 0.5% of final value
Jitter	<25ns

Output Characteristics

Amplitude (into 50Ω)	50 mVpp - 10 Vpp [1]
Accuracy (at 1 kHz)	± 1% of specified output
Flatness *(sinewave relative to 1 kHz)*	
< 100 kHz	± 1% (0.1 dB)
100 kHz to 1 MHz	± 1.5% (0.15 dB)
1 Mz to 15 MHz	± 2% (0.2 dB) Ampl ≥ 3Vrms
	± 3.5% (0.3 dB) Ampl < 3Vrms
Output Impedance	50Ω (fixed)
Offset (into 50Ω) [2]	+ 5 Vpk ac + dc
Accuracy	± 2% of setting + 2 mV
Resolution	3 digits, amplitude and offset
Units	Vpp, Vrms, dBm
Isolation	42 Vpk maximum to earth
Protection	Short circuit protected ± 15 Vpk overdrive < 1 minute

Modulation

AM

Carrier -3dB Freq.	10 MHz (typical)
Modulation	any internal waveform including Arb
Frequency	10 mHz - 20 kHz
Depth	0% - 120%
Source	Internal/External

FM

Modulation	any internal waveform including Arb
Frequency	10 mHz - 10 kHz
Deviation	10 mHz - 15 MHz
Source	Internal only

FSK

Internal rate	10 mHz - 50 kHz
Frequency Range	10 mHz - 15 MHz
Source	Internal/External (1 MHz max.)

Burst

Carrier Freq.	5 MHz max.
Count	1 to 50,000 cycles or infinite
Start Phase	-360° to +360°
Internal Rate	10 mHz - 50 kHz ± 1%
Gate Source	Internal/External Gate
Trigger	Single, External or Internal Rate

Sweep

Type	Linear or Logarithmic
Direction	Up or Down
Start F/Stop F	10 mHz - 15 MHz
Speed	1 ms to 500 s ± 0.1%
Trigger	Single, External, or Internal

Rear Panel Inputs

Ext. AM Modulation	± 5 Vpk = 100% modulation 5kΩ input resistance
External Trigger/ FSK/Burst Gate	TTL low true

System Characteristics [3]

Configuration Times[4]

Function Change: [5]	80 ms
Frequency Change: [5]	30 ms
Amplitude Change:	30 ms
Offset Change:	10 ms
Select User Arb:	100 ms
Modulation Parameter Change:	<350 ms

Arb Download Times over HP-IB

Arb Length	Binary	ASCII Integer	ASCII Real[6]
16,000 points	8 sec	81 sec	100 sec
8,192 points	4 sec	42 sec	51 sec
4,096 points	2.5 sec	21 sec	26 sec
2,048 points	1.5 sec	11 sec	13 sec

Arb Download Times over RS-232 at 9600 Baud:[7]

Arb Length	Binary	ASCII Integer	ASCII Real[8]
16,000 points	35 sec	101 sec	134 sec
8,192 points	18 sec	52 sec	69 sec
4,096 points	10 sec	27 sec	35 sec
2,048 points	6 sec	14 sec	18 sec

[1] 100 mVpp - 20 Vpp into open circuit

[2] Offset ≤ 2x pk - pk amplitude

[3] Times are typical. May vary based on controller performance

[4] time to change parameter and output the new signal.

[5] Modulation or sweep off.

[6] Times for 5-digit and 12-digit numbers.

[7] For 4800 baud, multiply the download times by two; For 2400 baud, multiply the download times by four, etc.

[8] Time for 5-digit numbers. For 12-digit numbers, multiply the 5-digit numbers by two.

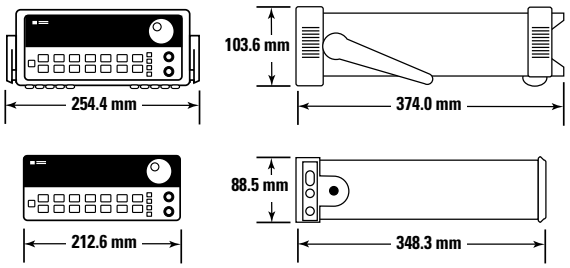
Option 001 Phaselock/TCXO Timebase

Timebase Accuracy	
Setability	< 0.01 ppm
Stability	± 1 ppm 0° - 50°
Aging	< 2ppm in first 30 days (continuous operation) 0.1 pm/month (after first 30 days)
External Reference Input	
Lock Range	10 MHz ± 50 Hz
Level	-10 dBm to + 15 dBm +25 dBm or 10 Vpp max input
Impedance	50Ω ± 2%, 42 Vpk isolation to earth
Lock Time	< 2 seconds
Internal Reference Output	
Frequency	10 MHz
Level	> 1 Vpp into 50 Ω
Phase Offset	
Range	+ 360° to - 360°
Resolution	0.001°
Accuracy	25 ns
Trigger Output	
Level	5V zero-going pulse
Pulse Width	> 2µs typical
Fanout	Capable of driving up to three 33120As

Ordering Information
HP 33120A Function/Arb Generator
Opt. 001 Phase Lock/TCXO Timebase Option

General

Power Supply	110V/120V/220V/240V ± 10%
Power Line Frequency	45 Hz to 66 Hz and 360 Hz to 440 Hz
Power Consumption	50VA peak (28 W average)
Operating Environment	0°C to 55°C
Storage Environment	-40°C to 70°C
State Storage Memory	Power Off state automatically saved, 3 User Configurable Stored States
Interface	IEEE-488 and RS-232 standard
Language	SCPI - 1993, IEEE-488.2
Dimensions (W x H x D)	
Bench top	254.4mm x 103.6mm x 374mm
Rack mount	212.6mm x 88.5mm x 348.3mm
Weight	4 kg (8.8 lbs)
Safety Designed to	UL-1244, CSA 1010, EN61010
EMC Tested to	MIL-461C, EN55011, EN50082-1
Vibration and Shock	MIL-T-28800, Type III, Class 5
Acoustic Noise	30 dBa
Warm-up Time	1 hour
Warranty	3 years standard



HEWLETT® PACKARD

Ordering Information

HP 33120A Function/Arbitrary Waveform Generator

Accessories included

Operating manual, service manual, quick reference guide, test data, and power cord.

Options

Opt. 001 Phase lock/TCXO timebase
Opt. 106 HP BenchLink Arb software (HP 34811A)
Opt. 1CM Rack Mount Kit (P/N 5062-3972)*
Opt. W50 Additional 2-year warranty (5-year total)
Opt. 910 Extra manual set

Manual language options (please specify one)

ABA US English
ABD German
ABE Spanish
ABF French
ABJ Japanese
ABZ Italian
ABO Taiwan Chinese
AB1 Korean

Accessories

HP 34161A Accessory pouch
HP 34811A BenchLink Arb software

*For racking two side-by-side, order both items below
Lock-link Kit (P/N 5061-9694)
Flange Kit (P/N 5062-3974)

For more information about HP's waveform generators and all other Hewlett-Packard basic instruments, and for a current sales office listing, visit our web site at **http://www.hp.com/go/tmdir.**
You can also contact one of the following centers and ask for a test and measurement sales representative.

United States:
Hewlett-Packard Company
Test and Measurement Call Center
P.O. Box 4026
Englewood, Colorado 80155-4026
1 800 452 4844

Canada:
Hewlett-Packard Canada Ltd.
5150 Spectrum Way
Mississauga, Ontario
L4W 5G1
(905) 206 4725

Europe:
Hewlett-Packard
European Marketing Centre
P.O. Box 999
1180 AZ Amstelveen
The Netherlands
(31 20) 547 9900

Japan:
Hewlett-Packard Japan Ltd.
Measurement Assistance Center
9-1, Takakura-Cho,
Hachioji-Shi,
Tokyo 192, Japan
Tel: (81) 426 56 7832
Fax: (81) 426 56 7840

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Hewlett-Packard
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Blackburn, Victoria 3130
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