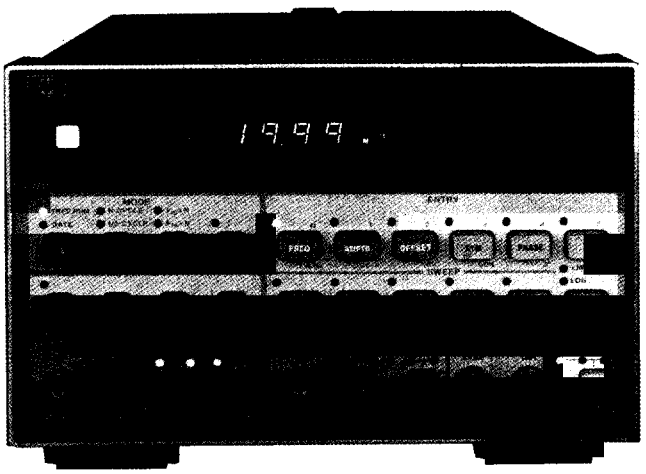
FUNCTION GENERATORS & WAVEFORM SYNTHESIZERS

Function Generator

HP 3314A

- Lin/Log sweeps, gate, counted burst, AM/FM/VCO
- Arbitrary waveform generator
- Phase lock xN and ÷N modes, 1/2-cycle mode



HP 3314A

DESIGNED FOR HP-IB SYSTEMS

HP 3314A Multi-Waveform Generator

The HP 3314A Function/Waveform Generator has the precision and versatility to produce numerous waveforms. Its feature set includes accurate sine, square, and triangle waves, with ramps and pulses available using variable symmetry. Additional features include counted bursts, gate, lin/log sweeps, AM, FM/VCO, dc offset, and phase lock. For increased versatility, the arbitrary waveform mode allows a countless number of user-defined waveforms. Because complete programmability is provided, all of these capabilities are available for ATE systems, as well as bench applications.

Precise Functions

The HP 3314A provides sine, square, and triangle waveforms from 0.001 Hz to 19.99 MHz with an amplitude range of 0.01 mV to 10Vp-p into 50 Ω with optional 30 Vp-p into > 500 Ω.

Continuous waveforms are provided with high accuracy and low distortion, with frequency accuracy on the upper range of 0.01 percent and sine distortion < −55 dBc to 50 kHz.

Pulses and ramps are provided to 2 MHz using the variable symmetry control over the full 5 percent to 95 percent symmetry range. This provides narrow pulses with 9 ns rise/fall times for digital circuit testing, and positive or negative ramps for amplifier testing and process control.

Independent dc offset to ±5 V (into 50 Ω) can be added to any ac signal. A post-attenuator summing technique is used to provide large ac signals with small offsets and vice versa.

Burst and Gate

The N cycle burst mode generates an integer number of complete cycles at each trigger. Bursts of 1 to 1999 cycles are possible for use in applications ranging from sonar testing to digital circuits. Variable symmetry and start/stop phase can be used to produce single ramps and haverwaves.

Like burst mode, gate mode can be triggered internally or externally. In gate, the HP 3314A output consists of complete cycles, pulses, or arbitrary waveforms which start when the trigger is true, and stop after the trigger goes false. In gate and burst modes, the full frequency range applies for sine, square, triangle, pulse, and ramp waveforms.

½ Cycle and Integer Phase Lock Modes

The ½ cycle burst mode allows simulation of specialized signals found in electronics. At each trigger, alternating ½ cycles of sines or triangles are produced. With the addition of variable start/stop phase and symmetry, pulses with variable rise/fall time and overshoot can be produced. Repetition rate, ½ cycle frequency, symmetry, and phase can be set independently to produce a variety of waveforms.

The Fin × N and Fin ÷ N modes provide powerful phase locking capability. With integer phase lock, fractions or multiples of the reference signal can be provided, and ±200 deg of phase offset is available. The HP 3314A phase locks to the plus or minus edge of the trigger signal; it can lock to a variety of signals such as sines, squares, pulses, ramps, and others, with complete control of output function, symmetry, N, phase, amplitude and offset.

Modulation and Sweep

Complete AM, FM/VCO modulation give the HP 3314A versatile signal modifying capabilities. With 100 kHz bandwidths, AM and FM/VCO can be used separately or simultaneously to produce many waveforms.

Multi-frequency measurements can be made with HP 3314A sweep capabilities. Linear, logarithmic, and manual sweep make measurements of filters, amplifiers, and other networks convenient and accurate. X drive, marker, and trigger output signals are also provided.

Arbitrary Waveforms

For specialized low frequency applications, you can use the HP 3314A arbitrary (ARB) waveform mode to create custom waveforms as a series of voltage ramps or vectors. Values are easy to enter from the front panel, using the modify knob as a pencil and an oscilloscope as a pad. For remote programming, use a desktop or mainframe computer to calculate the values, then program them using the HP-IB. Arbitrary waveforms are automatically stored in non-volatile memory for quick recall.

Two Sources in One

A square-wave trigger source is included for generation of complex waveforms with a single HP 3314A. The 0.5 MHz to 500 kHz internal trigger is useful in gated, burst, and phase locked waveforms. This signal is provided as an output for synchronizing the HP 3314A to other devices.

Specifications

Frequency

Range: 0.001 Hz to 19.99 MHz—sine, square, and triangle waveforms, 0.001 Hz through 2 MHz range when symmetry ≠ 50%

Resolution: 3½ digits

Accuracy

Autorange	Range Hold	Accuracy
0.001 Hz to 19.99 Hz	0.001 Hz to 19.99 Hz	± (0.4% setting + 0.2% range)
15 Hz to 199.9 kHz	0.1 Hz to 199.9 kHz	± (0.2% setting + 0.1% range)
150 Hz to 19.99 MHz	1 kHz to 19.99 MHz	± (0.01% setting + 50 ppm/yr)

Amplitude

Range: 0.01 mVp-p to 10 Vp-p into 50 Ω

Resolution: 3½ digits

Absolute Amplitude Accuracy: 10 kHz, 1.00-10.00 Vp-p, Autorange ON

± (1% of display + 0.035 Vp-p), sine and square wave

± (1% of display + 0.06 Vp-p), triangle

Flatness-sinewave: Relative to 10 kHz, 1.00V to 10.0V (range 4)

20Hz	50 kHz	1 MHz	19.99 MHz
± .07 dB	± .33 dB	± 1.5 dB	

Frequency Sweep

Linear: 0 to 2 decades, 7.2 ms to 1999 s/sweep

Log: 1 to 7 decades (integer only), 40 ms to 1999 s/decade

Manual sweep: Modify knob tunes between start and stop frequencies. X drive follows sweep.

Modulation Inputs:

Bandwidth	Sensitivity	Range	Z
AM: dc to 100 kHz	2 Vp-p for 100% −1 Vdc for suppressed carrier	>100%	10 k Ω
FM: 100 Hz to 100 kHz	±1 Vp for 1% of range deviation	±1% of freq. range	10 k Ω
VCO: dc to 100 kHz	10%/volt	+1 to −10V	10 k Ω

Waveform Characteristics
Sine harmonic distortion: individual harmonics will be below these levels, relative to the fundamental.

20 Hz	50 kHz	1999 KHz	19.99 MHz
−55 dB	−40 dB	−25 dB	

Square wave rise/fall time:
< 9 ns, 10% to 90% at 10 Vp-p output
N integer:
N = 1 to 1999, Preset to 1
For Phase-lock Fin ÷ N, Fin × N
or N CYCLE (counted burst)
Function invert: Inverts ac portion of signal outputs

Phase
Phase offset–phase lock modes
Resolution: 0.1°
Range: ±199.9°
Start/stop phase-burst modes
Resolution: 0.1°
Range: ±90.0° for frequencies to 19.99 MHz

Trigger
Internal trigger
Range: .002 ms (500 kHz) to 1999 s (0.5 mHz) square wave
Period accuracy: ± (0.01% (+ 50 ppm/year) of displayed interval (excluding sweep intervals)
Trigger output: Low <0.5 V, high >2.5 V; output resistance 1 kΩ
External trigger
For Gate, N Cycle, ½ Cycle, Fin X N, Fin ÷ N, and external sweep triggers
Frequency range: 50 Hz to 20 MHz
Trigger slope: Selectable, positive or negative

Symmetry
Symmetry range: 5% to 95% of period, 2 Hz to 2 MHz ranges

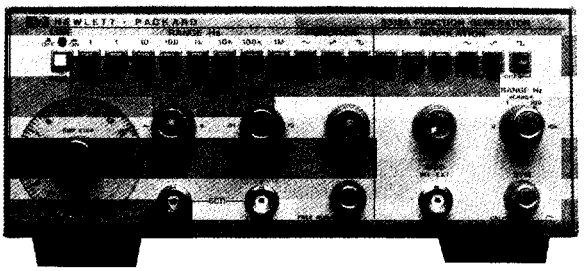
Arbitrary waveforms
Output consists of a series of voltage ramps called vectors. Arbitrary waveforms can be composed of 2 to 150 vectors. A maximum of 160 vectors can be stored in six available storage registers with a minimum of 2 vectors per waveform. Features include MARKER and SYNC outputs and a GATE mode. Practical frequencies are 0.002 Hz to 2.5 kHz.

Option 001 - Voltage Multiplier
Simultaneous X3 amplitude output on rear panel (into > 500 Ω.
30 Vp-p max, dc to 1 MHz.

General
Power: 100, 120, 220, 240 V + 5% −10%, 48 to 66 Hz 95 VA maximum
Weight: Net, 7.3kg (16lb); shipping, 10.5kg (23lb)
Size: 132.6 mm H × 212.3 mm W × 419.0 mm D (5.22 in × 8.36 in × 16.50 in)
HP-IB
IEEE Standard 488-1978 abbreviated definition.
SH1 AH1 T6 TE0 L3 LE0 SR1 RL1 PP0 DC1 DT1 C0 E2.

Ordering Information	Price
HP 3314A Function Generator	$4,950
Opt 001 Simultaneous X3 Output	+$265
Opt W30 Extended Repair Service. See page 671.	+$115

- Two function generators in one instrument
- AM-FM, sweep, trigger, gate and burst (int & ext)



HP 3312A

HP 3312A Function Generator

The HP 3312A Function Generator combines two separate, independent function generators with a modulator section in one compact instrument. The main generator can, via pushbutton control, be triggered by the modulation generator to provide sweep functions, AM, FM, or tone burst, and includes dc offset up to 10 volts p-p into 50 Ω.

Specification Summary

Output waveforms: Sine, square, triangle, ±ramp, pulse, AM, FM, sweep, triggered, and gated
Frequency characteristics
Range: 0.1 Hz to 13 MHz in 8 decade ranges
Dial accuracy: ±5% of full scale. Unspecified in Uncal Mode
Square wave rise or fall time (10% to 90%): <20 ns
Variable symmetry: 80:20:80 to 1 MHz
Sine wave distortion: <0.5% (−46 dB) THD from 10 Hz to 50 kHz. (10 kHz range maximum). (>30 dB below fundamental from 50 kHz to 13 MHz, at full-rated output.)
Output characteristics
Impedance: 50 Ω ± 10%
Level: 20 Vp-p into open circuit, >10 Vp-p into 50 Ω at 1 kHz
Level flatness (sine wave): < ±3% from 10 Hz to 100 kHz at full rated output (1 kHz reference). < ± from 100 kHz to 10 MHz
Sync output: Impedance: 50 Ω ±10% > 1 Vp-p square wave into open circuit. Duty cycle varies with symmetry control
dc offset: Variable up to ±10 volts. Instantaneous ac voltage + Vdc offset cannot exceed ±10 V (open circuit) or ± 5 V (50 Ω)
Modulation characteristics
Types: Internal and external AM, FM, sweep, trigger, gate, or burst
Waveforms: Sine, square, triangle, ramp, or variable symmetry pulse
Frequency range: 0.01 Hz to 10 kHz
Amplitude and frequency modulation
Depth: 0 to 100% (AM), 0 to 5% (internal FM)
Modulation frequency: 0.01 Hz to 10 kHz (internal), dc to >1 MHz (AM external), dc to >50 kHz (FM external)
Sweep characteristics
Sweep width: >100:1 on any range
Sweep rate: 0.01 Hz to 10 kHz, 90:10 ramp
Gate characteristics
Start/stop phase range: +90° to −80°
Frequency range: 0.1 Hz to 1 MHz (useful to 10 MHz)
External frequency control and FM
Range: 1000: 1 on any range
Linearity: 0.5% of Fmax for Fmax ≤ 1 MHz, freq. span ≤ 100:1
General
Power: 100, 120, 220, 240 V, +5%, −10%, switchable; 48 Hz to 440 Hz; ≤30 V A
Size: 102 mm H × 213 mm W × 377 mm D (4 in × 8.4 in × 14.8 in)
Weight: Net, 3.8 kg (8.4 lb); shipping, 5.9 kg (13 lb)

Ordering Information	Price
HP 3312A Function Generator	$1,800 ☎
Opt W30 Extended Repair Service. See page 671.	$50

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