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FUNCTION GENERATORS & FREQUENCY SYNTHESIZERS

1 mHz to 20 MHz Function Generator with Arbitrary Waveforms

Model 3314A

- Lin/Log sweeps
- AM/FM/VCO
- Phase lock xN and ÷N
- Gate and Counted Burst
- 1/2 Cycle Mode
- Arbitrary Waveform Generator



NEW

DESIGNED FOR HP-IB SYSTEMS

3314A Multi-Waveform Generator

The 3314A is a Function/Waveform Generator with the precision and versatility to produce numerous waveforms. Its feature set includes accurage 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. Since complete programmability is provided, all of these capabilities are available for ATE systems, as well as bench applications.

Precise Functions

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

Continuous waveforms are provided with high accuracy and low distortion, with frequency accuracy on the upper ranges of 0.01% 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% to 95% symmetry range. This provides narrow pulses with 9 nsec 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 Ohms) can be added to any AC signal. A post-attenuator summing technique is used providing large ac signals with small offsets and vice versa.

Burst and Gate

The 3314A's 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 3314A output consists of complete cycles, pulses or Arbs 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.

New 1/2 Cycle and "Integer" Phase Lock Modes

The new 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 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. Since the 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 3314A versatile signal modifying capabilities. With 100 kHz bandwidths, AM and FM/VCO can be used separately or simultaneously to produce a multitude of waveforms.

Multi-frequency measurements can be made with the 3314A's 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, the 3314A's Arbitrary (ARB) waveform mode lets you 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. Arb 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 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 3314A to other devices.

Source for your System

Because all front panel controls are programmable, the 3314A's precision and versatility can be utilized in automated test systems.

System efficiency can be improved with standard features such as Service Request (SRQ) interrupt capability and buffered transfer mode.

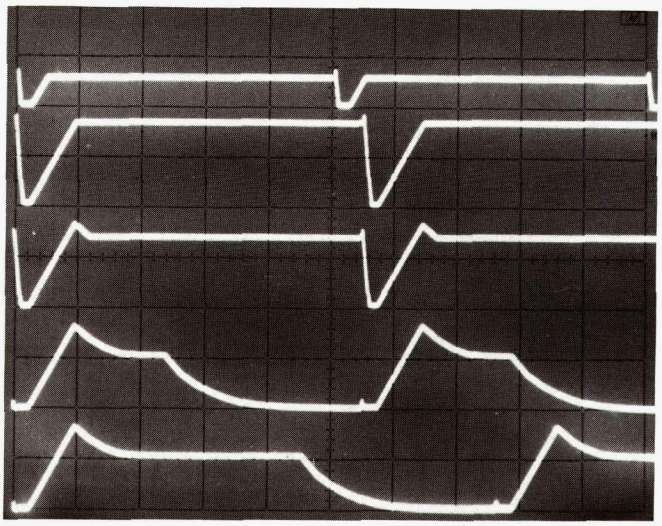
In production test environments, the 3314's Query commands can be used when an operator and computer are sharing control of the instrumentation. Parameters can be read from the 3314A into the computer where its computational capabilities can be utilized.

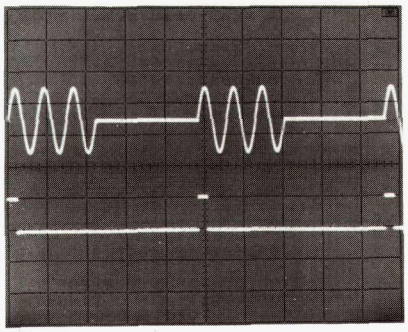
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Arbs Made Easy

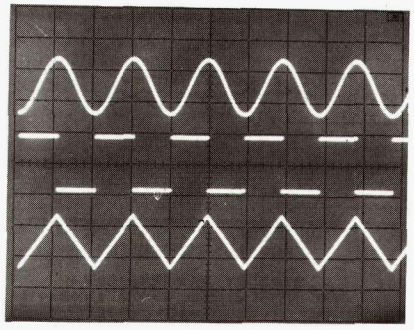
With complete control of each vector, the modify knob is used as a "pencil" to draw the waveform on an oscilloscope.

1. After ~20 unit vectors have been inserted, use modify to set the marker, VMKR, to #1. Then set the height of #1 to 400.
2. Press V LEN and use modify to set the length to 3.
3. Press V HGT twice, and set the height of #2 to −190.
4. Continue to use V HGT and V LEN to create the desired waveform, and INS (insert) or DEL (delete) vectors as needed. Amplitude and frequency can now be set without affecting the vector values. Waveform parameters are automatically stored in non-volatile memory while they are being created.
5. Later, if a slightly different waveform is needed, just use the marker to select an individual vector, and modify its height and length without affecting the height and length of other vectors!

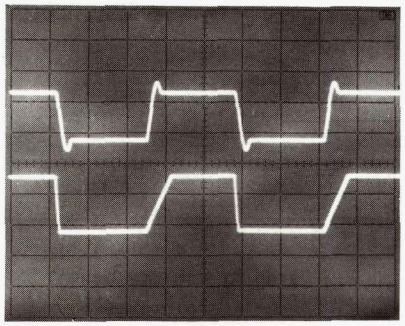




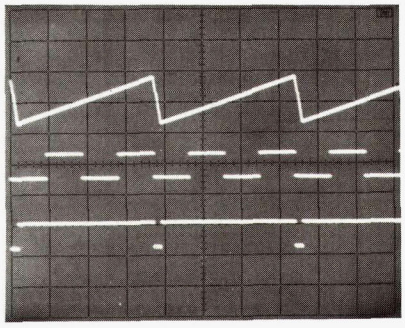
Counted burst with ext. trigger



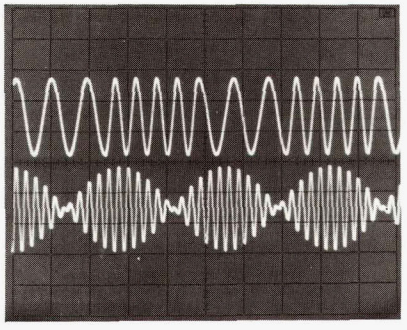
Sine, square, and triangle to 20 MHz



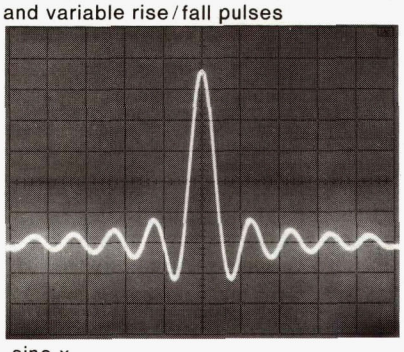
1/2 cycle mode simulating overshoot and variable rise/fall pulses



Ramp output phase locked to internal trigger. Shown with sync output.



FM and AM (suppressed carrier)



$\frac{\sin x}{x}$ using ARB's

Specifications

Frequency

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

Frequency Accuracy:

HP-IB #	Range	Minimum Frequency: Range Hold	Minimum Frequency: Autorange	Maximum Frequency	Accuracy
1	2 Hz	.001 Hz	.001 Hz	1.999 Hz	±(0.4% setting + 0.2% range)
2	20 Hz	0.01 Hz	1.50 Hz	19.99 Hz	
3	200 Hz	00.1 Hz	15.0 Hz	199.9 Hz	
4	2 kHz	001. kHz	150. Hz	1999. Hz	±(0.2% setting + 0.1% range)
5	20 kHz	0.01 kHz	1.50 kHz	19.99 kHz	
6	200 kHz	00.1 kHz	15.0 kHz	199.9 kHz	
		Synthesized			
7	2 MHz	001. kHz	150. kHz	1999. kHz	±(0.01% setting +50 ppm/year)
8	20 MHz	0.01 MHz	1.50 MHz	19.99 MHz	

Accuracy applies in the Free Run mode, with VCO Off, and Symmetry = 50% (Fixed)

Amplitude

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

Resolution: 3½ digits

HP-IB #	Range	Minimum	Maximum	Step Attenuator
1	10 mV	0.01 mV	10.00 mV	60 dB
2	100 mV	10.0 mV	100.0 mV	40 dB
3	1 V	.100 V	1.000 V	20 dB
4	10 V	1.00 V	10.00 V	0 dB

Absolute Amplitude Accuracy:
±(1% of display + 0.035 Vp-p), sine and square wave
±(1% of display + 0.06 Vp-p), triangle

Amplitudes: 1.00 Vp-p to 10.00 Vp-p (Range 4)

Frequency: 10 kHz, Autorange ON

Flatness-sine wave: Relative to 10 kHz, 1.00 V to 10.0 V (Range 4)

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

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FUNCTION GENERATORS & FREQUENCY SYNTHESIZERS

1 mHz to 20 MHz Function Generator with Arbitrary Waveforms

Model 3314A (cont.)

Frequency Sweep

	Range (decades)	Start Freq	Stop Freq	Sweep Time
linear	0 to 2	≥.001 Hz	≤19.99 MHz	7.2 ms to 1999 s/sweep
log	1 to 7 (integer only)	≥.2 Hz	≤19.99 MHz	40 ms to 1999 s/decade

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

X Drive Start/Stop Voltage:
−5 V to +5 V into 1 KΩ load

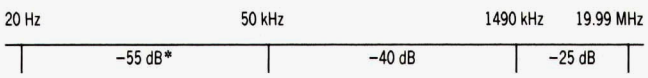
Z Axis Output:
Blanking Pulse, > +5 V
Baseline, 0V ± 1 V
Marker Pulse, < −5 V into 1 KΩ load

Modulation Inputs:

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

Waveform Characteristics

Sine Harmonic Distortion:
Individual harmonics will be below these levels, relative to the fundamental. Offset = 0V. Function Invert = OFF. Range Hold = OFF.



*add 4 dB for ambient temperature 0 to 5°C and 45 to 55°C, 20 Hz to 50 kHz

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
Sine, square, triangle, ramp, pulse, and ARBs
Does not affect Sync and Trigger outputs or dc offset setting

Phase

Phase Offset—Phase lock Modes:
Resolution: 0.1°
Range: ±199.9°
Accuracy: ±2° (50 Hz to 15 kHz)
Phase Offset is referenced to:
signal output for Fin ÷ N
signal input for Fin × N

Start/Stop Phase—Burst Modes:
Resolution: 0.1°
Range: ±90.0° for frequencies to 19.99 MHz
Accuracy: ±3° (applies from .001 Hz to 1 kHz)

Trigger

Internal Trigger:
Range: .002 ms (500 kHz) to 1999 s (.5 mHz) square wave.
Period Accuracy:
± (0.01% + 50 ppm/year) of displayed interval (excluding sweep intervals)
Trigger Output: Low <.5 V, high > 2.5 V Output Resistance 1 kΩ

External Trigger:
For Gate, N Cycle, ½ Cycle, Fin × N, Fin ÷ N, and external sweep triggers
Frequency Range: 50 Hz to 20 MHz
Trigger Slope: Selectable-positive or negative
Trigger Level: Selectable to 0 V or +1 V
Trigger Level Hysteresis: ±0.15 V
Input Resistance = 1 kΩ

Symmetry

Symmetry Range: 5% to 95% of period
Frequency Range: 2 Hz to 2 MHz ranges

Arbitrary Waveforms

Output consists of a series of voltage ramps called Vectors. Arbitrary Waveforms can be comprised 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 (#1 and return-to-start vectors).

Waveform Parameters:

Key	Range	Description
Δt	.2 ms to 19.99 ms	sets the time value for each unit of V LEN (length)
V HGT	0 to ±1999	sets the relative height of an individual vector
V LEN	1 to 127	sets the length in time of an individual vector in integral multiples of Δt
V MKR	1 to 150	marker is used to select an individual vector
INS		insert is used to add a vector before the marker location
DEL		deletes the vector at marker location
FREQ	.002 Hz to 2.5 kHz	$\text{Freq} = \frac{1}{\Delta t(VLEN_1 + VLEN_2 + \ldots VLEN_n)}$
AMPTD	.01 mV to 10 Vp-p	sets amplitude window for ARB waveform
OFFSET	0 to ± 5 Vdc	offsets the ARB waveform independent of AMPTD setting
PHASE	+90° to −90°	sets wave start/stop voltage within the window defined by AMPTD

Marker Output: Located on Z axis rear panel connector
Sync Output: Low during the return-to-start vector
Gate Mode: Allows external gating of ARB output-complete ARB waveforms only

Option 001

Simultaneous ×3 output (into > 500 Ω).
30 Vp-p max.

General

Specifications apply when:
Main signal output terminated into 50 ± 0.1 Ω
Warm-up > 30 min
Within ±5°C and 24 hours of last internal calibration
Temperature: 0 to 55°C
Relative Humidity: <95% at 40°C
Altitude: <15,000 ft
Storage Temperature: −40 to +75°C
Power:
100/120/220/240 V + 5% −10%, 48 to 66 Hz
90 VA maximum
Weight: net, 7.3 kg = (16 lb). Shipping, 10.5 kg = (23 lb).
Dimensions: 132.6 mm (5.22 in) H x 212.3 mm (8.36 in) W x 419.0 mm (16.50 in) D
HP-IB:
IEEE Standard 488-1978 abbreviated definition
SH1 AH1 T6 TE0 L3 LE0 SR1 RL1 PP0 DC1 DT1 C0 E2
Accessories Included:
11048C 50 Ω feed-through termination
50 ±.1 Ω
Accessories:
Transit case for one 3314A
HP #9211-2677

Ordering Information

	Price
3314A Function Generator	$3985.00
Option 001: simultaneous X3 output	+$250.00

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