FUNCTION GENERATORS & WAVEFORM SYNTHESIZERS

Universal Source

HP 3245A

- Precision dc outputs with 6½ digits of resolution
- Synthesized ac with 0.4% amplitude accuracy
- Sine, Square, Triangle, and ARB to 1 MHz
- Floating outputs
- New 100-Volt option
- Nonvolatile storage of up to 14 setups
- Second-channel output available
- Phase-continuous frequency changes
- Optional software for waveform modification
- Downloadable subroutines

HP 3245A

HP-IB SYSTEMS

Description

The HP 3245A Universal Source combines precision dc capabilities with versatile ac performance, including arbitrary waveform generation. This creates versatility on the bench, where the HP 3245A may be all the source you ever need. The HP 3245A can also fit into your Computer-Aided Test System, providing the capabilities of ac, dc, ARB, and second-channel options in a single 3.5" tall instrument.

Precision dc

The HP 3245A provides precision dc outputs of both voltage and current. In the high-resolution mode, you get 24-bit resolution with 60-ppm, 90-day accuracy. The low-resolution mode provides 12-bit resolution with 100 μsec settling times. This type of precision means you can use the HP 3245A to test A/D converters, Voltage to Frequency converters, VCOs, transducers, and other equipment needing highly accurate dc voltage or current. There are two output ranges in the high-resolution mode: ±1 volt and ±10 volts. In the low resolution mode, there are seven ranges. In current, there are four ranges of output, from 0.1 mA to 100 mA. Output impedance is selectable as either zero ohms or 50 ohms.

Accurate AC

The HP 3245A can generate ac voltage outputs, including sine, triangle, and square waves, at frequencies of up to 1 MHz. Variable duty-cycle pulse and ramp outputs can be generated at up to 100 kHz. In the ac mode, the HP 3245A can make phase-continuous frequency changes "on-the-fly." All ac waveforms are synthesized and have 0.001-Hz resolution and 50-ppm frequency accuracy. Ninety-day amplitude accuracy for sine, ramp, and ARB is 0.35% of output + 0.41% of range.

Arbitrary Waveform

The HP 3245A offers arbitrary waveform operation at a full 1-MHz bandwidth. This is accomplished by a sampling technique in which the values loaded into RAM are sampled at approximately 4.3 MHz and then run through a 1.25-MHz 5-pole low-pass filter. This allows full 1-MHz repetition rate while maintaining 0.001-Hz resolution at any frequency. The HP 3245A can also store multiple arrays that can be accessed for arbitrary waveform generation. Array depth is 2048 bytes.

Second Channel Option

The addition of a second channel allows you to generate two waveforms, either independent or phase related to each other. The second channel output can be phase synchronized to the first channel or to an external input. Such capabilities are especially useful if you are doing modem testing, tone-sequence generation, DTMF generation, FSK generation, or other operations where two outputs are required.

Waveform-Generation Software

A powerful software package for creating specialized waveforms is available as an option to the HP 3245A. This menu-driven software facilitates the capture of a waveform using a separate hardware digitizer, such as the HP 3458A. The waveform can then be modified, if desired, and played back via the HP 3245A. The use of a graphics tablet makes it easy to modify waveforms. The software also contains a library of standard waveforms that can be used as is or mixed with other waveforms to generate complex outputs.

NEW! Option 002 High-Voltage Output

Option 002 is a precision voltage amplifier that increases the output voltage 10-fold. Maximum voltage is now ±100 volts, or 200 volts peak-to-peak in ac mode. The second channel slot is used for the high-voltage option. It is not possible to have both second channel and high-voltage options in the same instrument.

System Operation

The HP 3245A includes features that make it especially powerful in system applications. Because it contains many BASIC-like constructs, such as IF..THEN and FOR..NEXT, the HP 3245A can do much of the work that normally falls to the host computer. Now, subroutines can be downloaded to the HP 3245A and run standalone, minimizing host interaction. Built-in math capabilities add to the power of the HP 3245A. Electronic calibration is both easy and accurate and does not require the instrument to be removed from a rack or opened to perform a calibration.

All these features combine to make the HP 3245A a universal source, combining precision dc outputs, accurate ac waveforms, and arbitrary waveform capabilities in a single instrument.

dc Volts Output

High-resolution (24-bit) mode

Range	0 Ω Mode Resolution	50 Ω Mode Resolution
1 V	1 μV	0.5 μV
10 V	10 μV	5 μV

Low-resolution (12-bit) mode

Range	0 Ω Mode Resolution	50 Ω Mode Resolution
0.078125 V	–	40 μV
0.15625 V	79 μV	79 μV
0.3125 V	157 μV	157 μV
0.625 V	313 μV	313 μV
1.25 V	625 μV	625 μV
2.5 V	1250 μV	1250 μV
5 V	2.5 μV	2.5 mV
10 V	5.0 mV	–

Current compliance: 100 mA on all ranges

Settling time (Delay 0):

High-resolution mode:

0.1% of step: 20 ms

0.001% of step: 40 ms

(1 s if function changed)

Low-resolution mode:

0.1% of step (0 Ω Mode): 100 μs

(50 Ω Mode): 25 μs

0.5% of step (50 Ω Mode): 5 μs

Overshoot:

High-resolution mode: <5% of step + 0.15% of range

Low-resolution mode: <30% of step + 2% of range

dc Volts Accuracy (<10 Hz noise): ± (% of programmed output + volts), impedance mode, >1 MΩ load. Tcal is the temperature of calibration from 18° C to 28° C. One hour warm-up.

24 Hour: T_{cal} ±1° C

Range	High-Resolution Mode	Low-Resolution Mode
10 V	0.0007% + 85 μV	0.09% of Output + 0.02% of range (for all ranges)
1 V	0.0008% + 15 μV	

90 Day: T_{cal} ±5° C

High-Resolution Mode		Low-Resolution Mode	
Range	Accuracy	Range	Accuracy
10 V	0.0038% + 180 μV	10 V	0.17% + 37 mV
1V	0.0042% + 31 μV	5 V	0.17% + 19 mV
		2.5 V	0.17% + 9.2 mV
		1.25 V	0.17% + 4.6 mV
		0.625 V	0.17% + 2.5 mV
		0.3125 V	0.17% + 1.3 mV
		0.15625 V	0.17% + 0.73 mV

dc Volts Accuracy with Option 002: Ninety-day accuracy in the low-resolution mode is ±(0.2% of output + 370 mV) for 10-volt range. (10x amplifier; 100 volts output)

dc Current Output

Resolution

Range	High Resolution	Low Resolution
0.1 mA	0.1 nA	50 nA
1 mA	1 nA	500 nA
10 mA	10 nA	5 μA
100 mA	100 nA	50 μA

90 DAY: T_{cal} ±5° C. After one hour warm-up.

High-Resolution Mode		Low-Resolution Mode	
Range	Accuracy	Range	Accuracy
100 mA	0.0202% + 3.3 μA	100 mA	0.32% + 400 μA
10 mA	0.0074% + 220 nA	10 mA	0.30% + 52 μA
1 mA	0.0052% + 20 nA	1 mA	0.25% + 3.7 μA
0.1 mA	0.0052% + 3.3 nA	0.1 mA	0.25% + 0.38 μA

ac Volts Output Characteristics

(sine, square, ramp, arbitrary)

Frequency range:

0 to 1 MHz for sine, arbitrary, and square (at 50% duty cycle)

0 to 100 kHz for ramp

0 to 100 kHz for square w/duty cycle not equal to 50%

Amplitude and/or offset resolution

Range (Peak-Peak)	50 Ω Mode Resolution	0 Ω Mode Resolution
.15625 V	79 μV	–
.3125 V	157 μV	157 μV
.625 V	313 μV	313 μV
1.25 V	625 μV	625 μV
2.5 V	1250 μV	1250 μV
5 V	2.5 mV	2.5 mV
10 V	5.0 mV	5.0 mV
20 V	–	10.0 mV

Amplitude can be set from 10% to 100% of range.

ac Amplitude Accuracy (sine, ramp, arbitrary):

24 Hour: T_{cal} ±1C 0.16% of output + .25% of range

90 Day: T_{cal} ±5C 0.29% of output + .36% of range

ac Amplitude Accuracy with Option 002: Ninety-day accuracy is ±(0.32% of output + 3.6% of range) for 10-volt range. (10x amplifier; 100 volts output)

Sinewave characteristics (50 Ω Mode)

Frequency	Harmonic and Spurious Levels (ampl ≥ 50%) of range)*	THD (ampl ≥ 50% of range)	Flatness in reference to 1 kHz
<3 kHz	< –62 dB	< –56 dB	.07 dB
to 10 kHz	< –62 dB	< –50 dB	.07 dB
to 30 kHz	< –52 dB	< –48 dB	.07 dB
to 100 kHz	< –46 dB	< –46 dB	.20 dB
to 300 kHz	< –40 dB	–	.60 dB
to 1 MHz	< –37 dB	–	2.00 dB

*Additional fixed spurious response > 4 MHz: 500 μVrms.

Squarewave characteristics (50 Ω Mode):

Rise time: < 250 ns, 10% to 90%

Settling time: < 1 μs to 1% of amplitude

Overshoot: < 5% of peak-to-peak amplitude

Duty cycle range: 5% to 95%, 0 to 100 kHz

50% above 100 kHz

Duty cycle accuracy: ±(0.8% of period + 120 ns)

Frequency resolution: 0.001 Hz

Frequency accuracy: ±50 ppm, 18 to 28° C

Frequency temperature Coefficient: ±1 ppm/° C

Phase offset:

Range: –360 to +360° C

Resolution: <0.001° C

Ramp linearity to 1 kHz (50 Ω Mode):

0.3% of peak-to-peak value measured @ 50% duty cycle from 10% to 90% point

Ramp duty cycle range: 5% to 95% with < 0.1% resolution

Ordering Information

	Price
HP 3245A Universal Source	$4,550
Opt 001 Second Channel Output	+$2,690
Opt 002 High-Voltage Amplifier	+$1,500
Opt 005 Waveform Generation Software	+$410
Opt 907 Front Handle Kit	+$60
Opt 908 Rack Flange Kit	+$40
Opt 909 Rack Flange and Handle Combination Kit	+$90
Opt W30 Extended Warranty	+$126