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HEWLETT® PACKARD

Synthesized Function/Sweep Generator VXI Module HP E1440A

Technical Specifications

- **Five different waveforms**
- **Multi-interval sweep and multimarker mode**
- **Amplitude and phase modulation**
- **1 µHz - 60 MHz TTL clock**
- **High-voltage output option, isolated (floating) outputs**



HP E1440A

Description

The HP E1440A function/sweep generator is a **C-size, 2-slot, message-based VXI module.** It provides low-distortion sinewaves and a variety of waveforms for applications requiring high frequency stability and resolution (11 digits). A programmable relative phase output synchronized to a companion module is also available. Two or more HP E1440A modules can be used for generating multi-phase related signals.

With this module, you can use the modulation source as an arbitrary function generator via HP-IB to provide user-defined waveforms, or use the save-recall memory that includes nonvolatile memory locations for simple and rapid access to frequently used test setups. Additionally, you can produce five different waveforms including: sine, square, triangle, negative, and positive ramps.

Refer to the HP Website for instrument driver availability and downloading instructions, as well as for recent product updates, if applicable.

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Product Specifications

Those specifications indicated as "typical" describe the instrument's typical performance; all others describe the instrument's warranted performance.

Waveforms

Standard waveforms: Sine, square, triangle, negative and positive Ramps, dc, TTL clock
Arbitrary waveform function: No

Frequency Range

Frequency bandwidth: 21 MHz (sine)
Sine: 1 µHz-21 MHz
Square: 1 µHz-11 MHz
Triangle: 1 µHz-11 kHz
Ramps: 1 µHz-11 kHz
TTL clock: 1 µHz-60 MHz
Resolution: 11 digits
Accuracy: ± 5 ppm of selected value, 20 to 30 °C, at time of calibration with standard frequency reference
Stability: ± 5 ppm/year, 20 to 30 °C
Modulation: AM, PM

Main Signal Output

(Typical)

Impedance: 50 Ω ± 1 Ω
Max. external voltages: 42 V pk (ac+dc) max. (chassis ground to circuit ground, 0-10 kHz)
± 10 V max. (floating ground to signal output)
Connector: BNC

Amplitude

(50 Ω all waveforms except TTL clock, without dc offset)

Range: 1 mV to 10 Vp-p in 8 amplitude ranges, 1–3–10 sequence, amplitude can also be set up in Vrms and dBm
Resolution: 4 digits (0.03% of full range)
Amplitude accuracy (AC): ± 2% FS
Amplitude accuracy (DC): n/a

Sinewave Spectral Purity

Phase noise: –55 dB for a 30 kHz band centered on a 20 MHz carrier (excluding ± 1 Hz about the carrier)
Spurious: –60 dBc or –85 dBm, whichever is greater
Sinewave harmonic distortion:

Frequency Range	Harmonic Level
0.1 Hz - 199 kHz	–60 dBc
200 kHz - 1.99 MHz	–40 dBc
2 MHz - 14.9 MHz	–30 dBc
15 MHz - 20 MHz	–25 dBc

Squarewave Characteristics

(Typical)

Rise/fall time: ≤20 ns *(10% to 90% of p-p output voltage)*
Overshoot: 5% of p-p amplitude at full output
Triangle/ramp linearity: ± 0.05% of full p-p output voltage for each range *(10% - 90%, 10 kHz)*

DC Offset Range (50 Ω)

dc only: 0 to ± 5 V
dc + ac: max. ± 4.5 V
Resolution: 4 digits

Phase Offset

(Related to another HP E1440A or equivalent)

Range: ± 719.9°
Resolution: 0.1°
Increment accuracy: ± 0.5°
Stability: ± 1° of phase/° C

Sinewave Amplitude Modulation

(Typical)

Modulation depth: 0-98%
Modulation frequency range: dc to 350 kHz *(1 µHz-21 MHz carrier frequency)*
Envelope distortion: –30 dB for modulation to 80% at 1kHz (0 Vdc Offset)
Sensitivity: ± 5 V peak for maximum modulation

Phase Modulation

(Typical)

Sinewave range: ± 900°, ± 5 V input
Sinewave linearity: ± 0.5%, best fit straight line up to ± 720° of modulation range
Squarewave range: ± 450°
Triangle range: ± 45°
Positive and negative ramps range: ± 90°
Modulation frequency range: DC to 5 kHz

Sweep

Sweep: Frequency
Sweep sequence modes: Single, continuous
Sweep function modes:
Multi-Interval: (Up to 50 different intervals can be sequenced and repeated in any order in a sequence that can contain up to 100 intervals)
Linear or logarithmic sweep: (Can be set for each interval)
Sweep time:
Linear: 0.01 s to 105 s
Logarithmic: 0.1 s to 105 s
Minimum sweep width:
Linear: 0 Hz
Logarithmic: 1 decade
Maximum sweep width: Full frequency range
Minimum sweep rate:
Linear: 0.2 Hz/s
Phase continuity: Sweep is phase continuous over the full frequency range of the main output for all sweep modes
Multi-marker:
Linear sweep only: Up to nine markers can be set in this one dedicated interval
Sweep time: 0.01 s to 105 s
Sweep width: From 0 Hz to full frequency range

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Auxiliary Outputs
(Typical)

SYNC-OUT TTL:

Signal:	Phase synchronous squarewave with same frequency as the main signal output, or 1 µHz to 60 MHz TTL clock (main signal output switched off)
Output impedance:	50 Ω
Connector:	BNC and TTL trigger bus

X-Drive 0 to 10 V:

Signal:	0 - 100 s sweeps only (proportional ramp to the entire sweep time)
Output impedance:	650 Ω
Output level:	0 to + 10 V (into open circuit)
Connector:	BNC

Pen lift:

Signal:	TTL-compatible voltage levels capable of sinking current from a positive source. Current 200 mA, voltage 45 V
Connector:	BNC

Marker TTL:

Signal:	High-to-low transitions at selected marker frequencies. TTL-and CMOS_ compatible output levels
Pulsewidth in multimarker mode:	1 ms
Connector:	BNC & TTL trigger bus
Fan out:	4

REF out 10 MHz:

Signal:	10 MHz squarewave for phase-locking additional instruments to the HP E1440A.
Output impedance:	50 Ω
Output levels (into 50 Ω):	High level >2 V, low level <0.2 V
AC-coupled output levels:	10 dBm
Connector:	BNC

Auxiliary Inputs
(Typical)

External REF in 1/10 MHz:
(For phase locking the HP E1440A to an external frequency reference)

Signal:	From 0 dBm to 20 dBm into 50 Ω *(reference signal must be a subharmonic of 10 MHz from 1 MHz to 10 MHz)*
Connector:	BNC or VXI-system clock

AM:

Input impedance:	10 kΩ
Connector:	BNC
Max. external voltage:	± 15 V

PM:

Input impedance:	>40 kΩ
Connector:	BNC
Max. external voltage:	± 15 V

Option 001 High-Voltage Output

Frequency range:	1 µHz to 1 MHz
Ampitude:	
Range:	4 mV to 40 V p-p in eight ranges, 4-12-40 sequence into 500 Ω, <500 pF load; ranges are four times the standard instrument ranges, without dc offset
Accuracy:	± 2% of full output for each range at 2 kHz
Flatness:	± 10% relative to programmed amplitude

Sinewave harmonic distortion:

Frequency Range	Harmonic Level
10 Hz - 199 kHz	–60 dBc
200 kHz - 1 MHz	–40 dBc

Output impedance:	<3 Ω at DC, <10 Ω at 1 MHz *(load impedance 500 Ω, 500 pF, max. output current 40 mA peak)*
DC offset range:	Four times the specified range of the standard instrument

General Specifications

VXI Characteristics

VXI device type:	Message based
Data transfer bus:	A16/A24, D16 Master, A16/D16 Slave
Size:	C
Slots:	2
Connectors:	P1/2
Shared memory:	n/a
VXI busses:	TTL Trigger Bus (T)
C-size compatibility:	n/a

Instrument Drivers
See the HP Website (http://www.hp.com/go/inst_drivers) for driver availability and downloading.

Command module firmware:	n/a
Command module firmware rev:	n/a
I-SCPI Win 3.1:	n/a
I-SCPI Series 700:	n/a
C-SCPI LynxOS:	n/a
C-SCPI Series 700:	n/a
HP Panel Drivers:	Yes
VXI*plug&play* Win Framework:	Yes
VXI*plug&play* Win 95/NT Framework:	Planned 1998
VXI*plug&play* HP-UX Framework:	No

Module Current

	I_{PM}	I_{DM}
+5 V:	1	0.01
+12 V:	0	0
–12 V:	0	0
+24 V:	0.55	0.05
–24 V:	0.6	0.05
–5.2 V:	0.14	0.03
–2 V:	0	0

Cooling/Slot

Watts/slot:	18.00
∆P mm H_2O:	0.40
Air Flow liter/s:	2.00

Ordering Information

Description	Product No.
Synth. Funct/Sweep Generator VXI-Module	HP E1440A
High-Voltage Output	HP E1440A 001
Operation Manual	HP E1440A 0B2
Service Manual	HP E1440A 0B3
Refurbished Equipment	HP E1440A 8ZE

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Related Literature

1998 Test System and VXI Products Data Book,
HP Pub. No. 5966-2812E

1998 Test System and VXI Products Catalog,
HP Pub. No. 5966-2815

Warranty

Standard Hewlett-Packard VXIbus hardware products are warranted against defects in materials and workmanship for a period of three years unless otherwise noted. HP software and firmware products that are designated by HP for use with a hardware product, when properly installed on that hardware product, are warranted not to fail to execute their programming instructions due to defects in materials and workmanship.

For a complete and detailed warranty statement please see the HP *Test System and VXI Products Data Book* or visit the HP Website at http://www.hp.com/go/vxi.

HP Website Directory

Main HP Website
http://www.hp.com

HP Test and Measurement
http://www.hp.com/go/tmdir

HP VXI Product Information
http://www.hp.com/go/vxi

HP VXI Channel Partners
http://www.hp.com/go/vxichanpart

HP VEE Application Website
http://www.hp.com/go/hpvee

Data Acquisition and Control Website
http://www.hp.com/go/data_acq

HP Instrument Driver Downloads
http://www.hp.com/go/inst_drivers

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Test and Measurement Call Center
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Englewood, CO 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
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The Netherlands
(31 20) 547 9900

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