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.

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

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

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

HEWLETT® PACKARD

For more information about Hewlett-Packard test & measurement products, applications, services, and for a current sales office listing, visit our website, *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, 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
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

Latin America:
Hewlett-Packard
Latin American Region Headquarters
5200 Blue Lagoon Drive, 9th Floor
Miami, Florida 33126
U.S.A.
Tel: (305) 267-4245
(305) 267-4220
Fax: (305) 267-4288

Australia/New Zealand:
Hewlett-Packard Australia Ltd.
31-41 Joseph Street
Blackburn, Victoria 3130
Australia
1 800 629 485

Asia Pacific:
Hewlett-Packard Asia Pacific Ltd.
17-21/F Shell Tower, Times Square,
1 Matheson Street, Causeway Bay,
Hong Kong
Tel: (852) 2599 7777
Fax: (852) 2506 9285

HP Publication No.: 5965-5535E