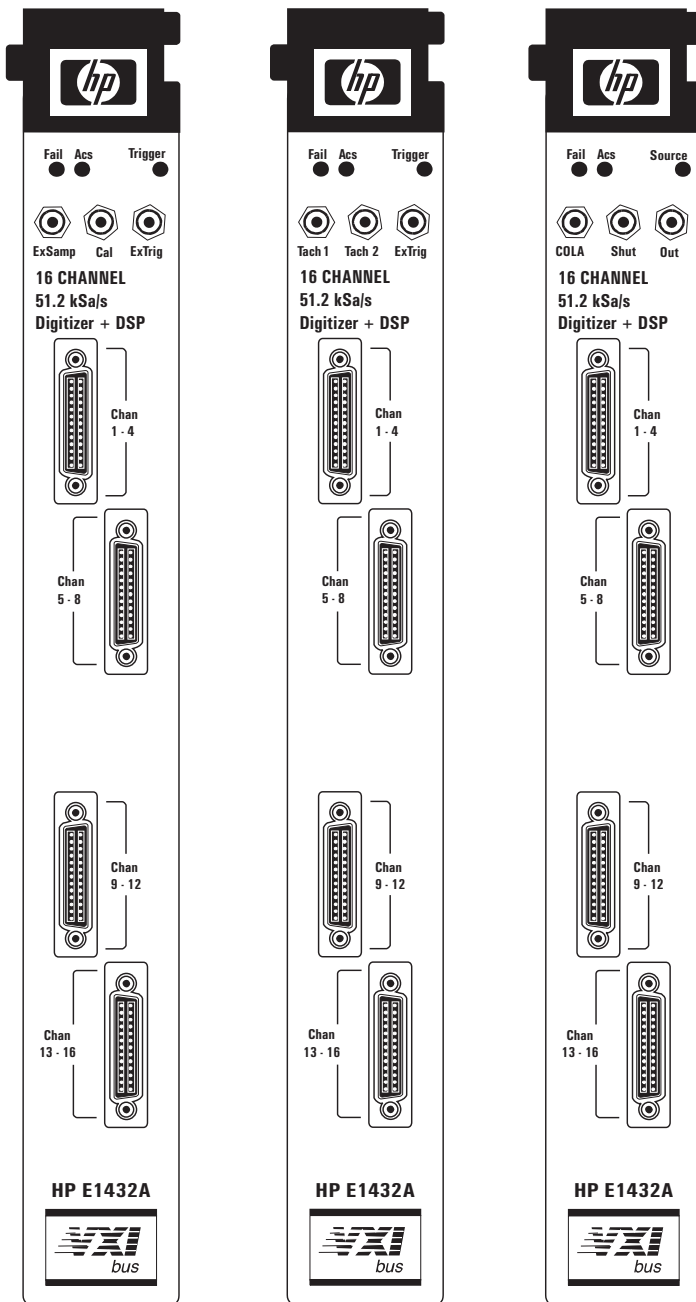


HP E1432A

Technical Specifications

4-16 Channel 51.2 kSa/s Digitizer plus DSP

Rev. July 1997



HP E1432A

HP E1432A
with
Tachometer
Option AYW

HP E1432A
with
Arbitrary Source
Option 1D4

The HP E1432A 16 Channel 51.2 kSa/s Digitizer plus DSP is a C-size VXI module. "51.2 kSa/s" refers to the maximum sample rate of 51,200 samples per second, per channel .

The HP E1432A may contain up to four 4-channel input assemblies so that the module may have a total of up to 16 inputs.

This module integrates transducer signal conditions, anti-alias protection, digitization and high speed measurement computation in a single slot VXI card. Onboard digital signal processing and up to 32 Mbytes of RAM maximizes total system performance and flexibility.

Specifications

Frequency

Bandwidth (Hz) ¹	Sample Rate (samples/second)	Bandwidth (Hz) ¹	Sample Rate (samples/second)
23000 ²	51200	488.2813	1250
20000	51200	468.75	1200
19531.25	50000	400	1024
18750	48000	390.625	1000
16000	40960	320	819.2
15625	40000	312.5	800
12800	32768	305.1758	781.25
10000	25600	292.9688	750
9765.625	25000	250	640
9375	24000	244.1406	625
8000	20480	234.375	600
7812.5	20000	200	512
6400	16384	195.3125	500
5000	12800	160	409.6
4882.8125	12500	156.25	400
4687.5	12000	152.5879	390.625
4000	10240	146.4844	375
3906.25	10000	125	320
3750	9600	122.07031	312.5
3200	8192	117.1875	300
3125	8000	100	256
2560	6553.6	97.65625	250
2500	6400	80	-- 204.8
2441.4063	6250	78.125	200
2343.75	6000	76.293945	195.3125
2000	5120	73.242188	187.5
1953.125	5000	62.5	160
1875	4800	61.035156	156.25
1600	4096	58.59375	150
1562.5	4000	50	128
1280	3276.8	48.828125	125
1250	3200	40	102.4
1220.7031	3125	31.25	80
1171.875	3000	30.517578	78.125
1000	2560	29.296875	75
976.5625	2500	25	64
937.5	2400	24.414063	62.5
800	2048	20	51.2
781.25	2000	15.625	40
640	1638.4	15.258789	39.0625
625	1600	14.648438	37.5
610.3516	1562.5	12.5	32
585.9375	1500	12.207031	31.25
500	1280	10	25.6

Frequency Accuracy ± 0.012% (120 ppm)

¹ Bandwidth is 400 lines of 512 line FFT spectrum unless noted otherwise.

² Bandwidth is 460 lines of 512 line FFT spectrum.

Input

Full Scale Input Ranges (in volts peak)	100 mV, 200 mV, 500 mV, 1 V, 2 V, 5 V, 10 V, 20 V ³ Add 23% to include over-range capability.
--	---

Maximum Input Level	42 Vp
----------------------------	-------

Input Impedance

(dc coupled or ac coupled above 10 Hz)

Differential	1 M Ω nominal
Either side-to-chassis	500 k Ω , 35 pF nominal

Input Resistance (measured at dc while ac coupled)

Either side-to-chassis	350 k Ω nominal
------------------------	------------------------

AC Coupling 3 dB Corner Frequency	< 1 Hz
--	--------

Common Mode Rejection Ratio

dc coupled, dc to 1 kHz	> 50 dB
ac coupled, 40 Hz to 1 kHz	> 45 dB
Maximum signal, either side-to-chassis	\pm 20 Vpk

Amplitude Over-Range Detection

Over-range indication after:

Common mode overload	\pm 22.5 V (typical)
Differential overload	\pm 130% of range (typical)

Residual DC	\leq \pm 1% of range, \pm 10 mV
--------------------	---------------------------------------

Amplitude

Amplitude Accuracy at 1 kHz	\pm 0.7% of reading, \pm 0.01% of full scale ⁴
------------------------------------	---

Flatness (relative to 1 kHz, at full scale)	\pm 1% (0.09 dB)
--	--------------------

Amplitude Resolution	16 bits, less 2.3 dB over-range
-----------------------------	---------------------------------

Cross Channel Matching (any HP E1432A module in the same mainframe)

Cross Channel Amplitude Match	\pm 0.1 dB
--------------------------------------	--------------

(full-scale signal, input ranges equal, frequency above 10 Hz if ac coupled)

Cross Channel Phase Match

(full-scale signal, input ranges equal)

20 kHz	\pm 2.5 $^{\circ}$ (or \pm 350 ns)
F_{Hz} = 800 Hz to 20 kHz	\pm ($F_{Hz} \times 125 \times 10^{-6}$) $^{\circ}$
100 Hz to 800 Hz	\pm 0.1 $^{\circ}$
dc to 100 Hz, dc couple	\pm 0.1 $^{\circ}$
50 Hz to 100 Hz, ac couple	\pm 0.2 $^{\circ}$

³ The 20 V range is not specified for dynamic range.⁴ The minimum frequency span for any F_s has an amplitude accuracy of 2.5% of reading.

Dynamic Range

Resolution	16 bits
Spurious Free Dynamic Range (includes spurs, harmonic distortion, intermodulation distortion, alias products) (source impedance = 50 Ω)	< - 80 dBfs (0.01% fs), - 90 dBfs (typical)
Spurious and Residual Responses	< - 80 dBfs
Harmonic Distortion	< - 80 dBfs, - 90 dBfs (typical)
Aliased Responses (≤ 0 dBfs, ≤ 1 MHz)	< - 80 dBfs
Crosstalk (receiving channel source impedance = 50 Ω , low side grounded, full scale, < 10 kHz signal on other channels, input ranges within 20 dB)	< - 80 dBfs (typical)
Noise (input terminated with 50 Ω , 100 mV range)	
Noise density above 100 Hz	< 300 nVrms/ $\sqrt{\text{Hz}}$
Noise density at 10 Hz	< 1000 nVrms/ $\sqrt{\text{Hz}}$
Total rms noise, 23 kHz span	< 45 μVrms

Trigger

Trigger Detection	Digital
Trigger Modes	Input, external, source, TTL, TRG, RPM (requires option AYP)

Option 1D4 Arbitrary Source Specifications

General

Output Modes	Sine and pseudo random with burst and band translation, arbitrary waveform with loop or continuous output
---------------------	---

Frequency Bands

Sine, noise modes

Reconstruction filter bandwidth	0 to 25.6 kHz
DSP data rate (Fs)	48.00 kHz to 65.536 kHz
Data word size	16 bits

Arb modes

Reconstruction filter bandwidth	0 to 6.4 kHz
Data word size	20 bits

Frequency Accuracy	$\pm 0.012\%$ (120 ppm)
---------------------------	-------------------------

Signal Output

Number of Output Channels	1
----------------------------------	---

Maximum Amplitude	10 Vp nominal
--------------------------	---------------

Output Impedance	$< 0.5 \Omega$ (typical)
-------------------------	--------------------------

Maximum Output Current	100 mA (typical)
-------------------------------	------------------

Maximum Capacitive Load	0.01 μ F (typical)
--------------------------------	------------------------

Amplitude Control

(signal amplitude = range \times scale factor)

Maximum amplitude	10 Vp nominal
Amplitude ranges	79 mVp to 10 Vp in 0.375 dB steps
Amplitude scale factor	0.0 to 1.0, with 20-bit resolution

Residual Output Noise Voltage (Freq > 500 Hz)	$< 500 \text{ nV}/\sqrt{\text{Hz}}$
---	-------------------------------------

Residual DC Offset

Offset after autozero	$\pm 2 \text{ mV}$
Offset after shutdown	$\pm 20 \text{ mV}$
Zeroing resolution	100 μ V

Output Overload Trip	$> 17 \text{ V}$
-----------------------------	------------------

Amplitude Ramp-down Time (Programmable)	0 to 30 seconds
--	-----------------

Shutdown

Shutdown input	TTL levels
Shutdown time	$< 5 \text{ s}$
Shutdown time, ac fail	$< 4 \text{ ms}$

Sine Output Mode

Sine Frequency (65536 Hz Fs)

Frequency range	0 to 25.6 kHz
Frequency resolution	244 μ Hz

Amplitude Accuracy

(1 kHz sine wave, into $\geq 200 \Omega$)

10 Vp to 0.158 Vp ranges	± 0.20 dB (2.3 %)
0.152 Vp to 79 mVp ranges	± 0.40 dB (4.7 %)

Flatness (relative to 1 kHz)	± 0.5 dB
-------------------------------------	--------------

Harmonic and Aliased-harmonic Distortion

($\geq 1 \text{ k}\Omega$ load)

1 Vp range, 1.0 scale factor, 0 to 6.4 kHz	< -80 dBc
2 to 10 Vp range, 0.05 to 1.0 scale factor, 0 to 25.6 kHz	< -70 dBc

Spurious responses	< -60 dBVp
---------------------------	--------------

Constant Level Output

Output Level at 1 kHz

(after 1 second settling, amplitude scale factor > 1 Vp (nominal)
0.001)

Output Impedance 1.2 k Ω (typical)

Flatness

25 Hz to 5 kHz, amplitude scale factor 0.001 to 1.0 1.13 Vp to 0.50 Vp (+10, -6.0 dB) (typical)
5 Hz to 20 kHz, amplitude scale factor 0.01 to 1.0 1.13 Vp to 0.44 Vp (+10, -7.0 dB) (typical)
5 Hz to 20 kHz, amplitude scale factor 0.1 to 1.0 1.13 Vp to 0.88 Vp (\pm 1.0 dB) (typical)

Sine Wave Distortion

(at 1 kHz, amplitude scale factor 0.1 to 1.0) - 40 dBc (typical)

Residual dc Offset < 5 mV (typical)

Summer Input

Maximum Input Level 10 Vp

Gain, Summer Input to Signal Output 0 \pm 0.5 dB at 1 kHz

Input Impedance > 10 k Ω (typical)

Flatness, dc to 25.6 kHz \pm 0.5 dB (typical)

Sine Wave Distortion - 80 dBc (typical)

Residual dc Offset 1 mV (typical)

Option AYF Tachometer Input Specifications

General

Option AYF, Tachometer Input, provides two tachometer inputs. When this option is installed, 2 of the 3 SMB connectors on the VXI module are used for tachometer inputs. When this option is not installed, these connectors are normally used for "External Sample" and "Trigger."

Each tachometer input has a programmable trigger level. Each tach pulse causes a "Tach Edge Time" to be recorded in a 16384-word FIFO. A "Tach Edge Time" is the instantaneous value of the 32-bit "Tach Counter". A "Decimate" number can be set to ignore a number of tach pulses before recording each Tach Edge Time. A "Holdoff" time can be set to avoid false triggering due to ringing.

One of the tachometer inputs can be programmed for use as a trigger input rather than a tachometer input. In this mode, the tachometer option can trigger the system and measure the time between the trigger and the next sample clock edge.

The analog signal from either of the Tachometer inputs can be routed to an input channel using the internal calibration path.

Tach Counter	32-bit counter with roll-over detector bit
Decimate Counter	16-bit counter
Input Signal Trigger Level (typical)	
Voltage Range	- 25 V to + 25 V
Resolution, levels < ± 5V	40 mV
Resolution, levels > ± 5V	200 mV
Hysteresis	Programmable, 0 to 250 mV
Slope	Programmable, positive or negative
Input Signal Timing	
Minimum pulse width	5 μs
Maximum pulse rate	100 kHz
Trigger holdoff	1 to 65536 clock periods
Input Impedance	20 kΩ (typical)

VXI System Level Specifications

Features

VXI Standard Information	Conforms to VXI revision 1.4 C-size, single slot width Register-based programming "Slave" Data Transfer Bus functionality A24 address capability D32 data capability Optional Local Bus capability SMBUS driver and receiver Requires 2 or 4 TTLTRG_ lines for multi-module synchronization
Signal Processing	33 MHz Motorola 96002 DSP 2 banks of 128 K word static RAM 4 M bytes dynamic RAM (32 M bytes with option ANC) 128 K bytes Flash ROM Direct Memory Access (DMA) data transfer

Software Drivers

Driver Type	C libraries with source code
Supported Operating Systems	HP-UX 9.05
Supply Media	DAT tape
Plug & Play Compliance	C libraries support the preliminary Plug & Play standard for HP-UX, but will be updated later to full Plug & Play compliance when the HP-UX Plug & Play specification has been finalized. Plug & Play support for MS Windows® will be added at that time. There will be no charge for driver upgrades.

HP-UX 9.X and 10.X for HP 9000 Series 700 and 800 computers are X/Open Company UNIX 93 branded products.

MS Windows is a U.S. registered trademark of Microsoft Corporation.

Regulatory Compliance

Safety Standards	Designed for compliance to: UL 1244, 4th Edition IEC 348, 2nd Edition, 1978 CSA C22.2, No. 231
Radiated Emissions (tested in a "typical" system configuration, consisting of an HP E1401B Mainframe, HP V743 Controller, and HP E1432A module with option 1D4 or AYF)	CISPR 11: 1990, Group 1, Class A (requires connector shields HP E1400-80920 or HP E1421-80920) Tested for compliance to the European Economic Area's EMC directive
Electrostatic Discharge	Tested for compliance to the European Economic Area's EMC directive
Radiated Immunity	Tested for compliance to the European Economic Area's EMC directive

Environmental

Operating Restrictions	
Ambient Temperature	0° to 55°C
Humidity, Non-condensing	20% RH to 90% RH at 40°C
Maximum Altitude	4600 meters (15,000 feet)
Storage and Transport Restrictions	
Ambient Temperature	- 20° to 65°C
Humidity, Non-condensing	20% RH to 90% RH at 40°C
Maximum Altitude	4600 meters (15,000 feet)

General Characteristics**VXI Power Requirements**

dc Current	16 Channels	12 Channels	8 Channels	4 Channels
Source option installed				
+5 V	5.20 A	4.93 A	4.66 A	4.39 A
+12 V	0.38 A	0.38 A	0.38 A	0.38 A
-12 V	0.23 A	0.23 A	0.23 A	0.23 A
+24 V	0.85 A	0.84 A	0.83 A	0.82 A
-24 V	0.50 A	0.49 A	0.48 A	0.47 A
-5.2 V	0.28 A	0.28 A	0.28 A	0.28 A
-2 V	0.03 A	0.03 A	0.03 A	0.03 A
Tachometer option installed				
+5 V	4.80 A	4.53 A	4.26 A	3.99 A
+12 V	0.30 A	0.30 A	0.30 A	0.30 A
-12 V	0.09 A	0.09 A	0.09 A	0.09 A
+24 V	0.56 A	0.55 A	0.54 A	0.53 A
-24 V	0.21 A	0.20 A	0.19 A	0.18 A
-5.2 V	0.28 A	0.28 A	0.28 A	0.28 A
-2 V	0.03 A	0.03 A	0.03 A	0.03 A
No options installed				
+5 V	4.60 A	4.33 A	4.06 A	3.79 A
+12 V	0.30 A	0.30 A	0.30 A	0.30 A
-12 V	0.09 A	0.09 A	0.09 A	0.09 A
+24 V	0.55 A	0.54 A	0.53 A	0.52 A
-24 V	0.20 A	0.19 A	0.18 A	0.17 A
-5.2 V	0.28 A	0.28 A	0.28 A	0.28 A
-2 V	0.03 A	0.03 A	0.03 A	0.03 A
Dynamic Current				
+5 V	0.10 A			
+12 V	0.02 A			
-12 V	0.01 A			
+24 V	0.01 A			
-24 V	0.01 A			
-5.2 V	0.01 A			
-2 V	0.01 A			

VXI Cooling Requirements	4.24 liters/second 0.33 mm H ₂ O
---------------------------------	--

Warm-up Time	15 minutes
---------------------	------------

Performance Benchmarks

Because these performance benchmarks depend on the software and hardware configuration, they are included as supplemental, non-warranted characteristics.

VXI Data Transfer Rate (P1 connector)

From HP E1432A DRAM to VXI V743 Controller	6.5 MB/s
From HP E1432A DRAM to MXI to external HP Series 700 Controller	1.5 MB/s
From HP E1432A DRAM to VXLink interface	345 kB/s
From HP E1432A DRAM to E6233A Pentium Controller	1.6 MB/s
From HP E1432A DRAM to National MXI-2 to external 200 MHz Pentium Pro	1.2 MB/s

Local Bus Data Transfer Rate

From HP E1432A DRAM, one block, during continuous acquisition	10 M Bytes/s
From HP E1432A's DRAM to HP E1562D	5 MB/s, 2.5 MSa/s
From HP E1432A's DRAM to HP E1562E	10 MB/s, 5 MSa/s
Maximum number of input channels for continuous throughput at 51.2 kHz sample rate	96 Channels

FIFO Memory

(Maximum FIFO size, 4M Bytes DRAM installed)	2 MSa/number active channels (standard)
(Maximum FIFO size, 32 MB DRAM installed)	16 MSa/number active channels (opt. ANC)

Specification Note

Specifications describe warranted performance over the temperature range of 0° to 50°C, after a 15-minute warm-up from ambient conditions. Supplemental characteristics identified as "typical", provide useful information by giving non-warranted performance parameters. Typical performance is applicable from 20° to 30°C.

Abbreviations

F_s = sample rate of ADC.

F_c = cut off frequency of high pass or low pass filters.

dB_f = dB relative to full scale amplitude range.

dB_c = dB relative to carrier amplitude.

Typical = typical, non-warranted, performance specification included to provide general product information.

Warranty Information

The HP E1433A comes with a 3-yr warranty. During that period, the unit will either be replaced or repaired, at HP's option, and returned to the customer without charge. There is an option available at extra cost which extends the repair support to five years.

For More Information

www.hp.com/go/data_acq

HP E1432/33/34A
Product Overview
5965-9834E

For more information on Hewlett-Packard test & measurement products, applications, services, and for a current sales office listing, visit our web site, <http://www.hp.com/go/tmdir>. You can also contact one of the following centers and ask for a test and measurement representative.

United States:

Hewlett-Packard Company
Test and Measurement Call Center
P.O. Box 4026
Englewood, CA 90155-4026
1 800 452 4844

Canada:

Hewlett-Packard Canada Ltd.
5150 Spectrum Way
Mississauga, Ontario
L4W 5G1
Tel: (905) 206 4725

Europe:

Hewlett-Packard
European Marketing Centre
P.O. Box 999
1180 AZ Amstelveen
The Netherlands
Tel: (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 4245/4220

Australia/New Zealand:

Hewlett-Packard Australia Ltd.
31-41 Joseph Street
Blackburn, Victoria 3130
Australia
Tel: 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