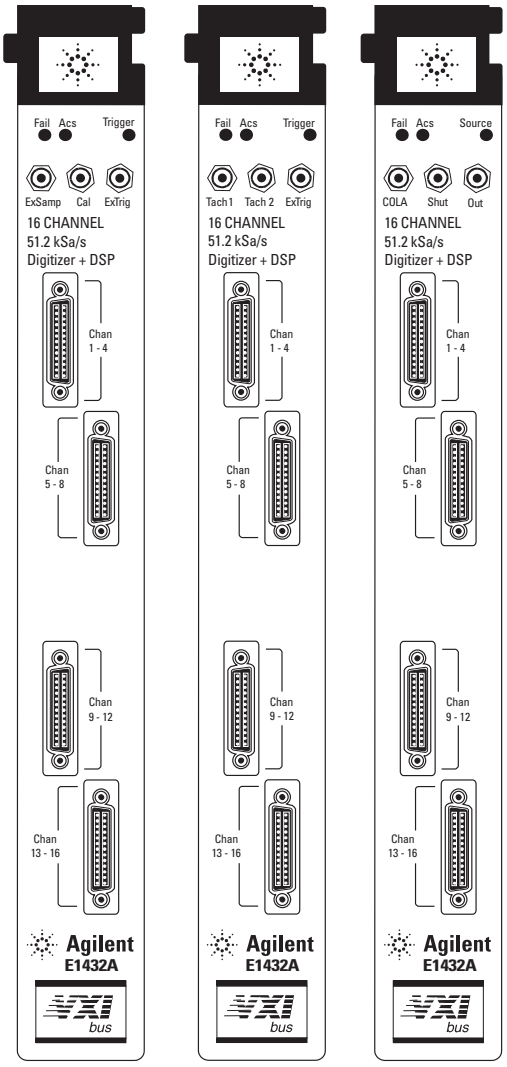
Agilent E1432A

4-16 Channel 51.2 kSa/s Digitizer plus DSP

Technical Specifications



Agilent E1432A

Agilent E1432A with Tachometer Option AYF

Agilent E1432A with Arbitary Source Option 1D4

The Agilent 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 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.

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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, 1V, 2V, 5V, 10V, 20V[3] Add 23% to include over-range capability.
Maximum Input Level	42 Vp
Input Impedance (dc coupled or ac coupled above 10 Hz)	
Differential Either side-to-chassis	1 MΩ nominal 500 kΩ, 35 pF nominal
Input Resistance (measured at dc while ac coupled)	
Either side-to-chassis	350 kΩ 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	± 20 Vpk
Amplitude Over-Range Detection	
Over-range indication after:	
Common mode overload	± 22.5V (typical)
Differential overload	± 130% of range (typical)
Residual DC	± 1% of range, ±10 mV
Amplitude	
Amplitude Accuracy at 1 kHz	± 0.7% of reading, ± 0.01% of full scale[4]
Flatness (relative to 1 kHz, at full scale)	± 1% (0.09 dB)
Amplitude Resolution	16 bits, less 2.3 dB over-range
Cross Channel Matching (any E1432A module in the same mainframe)	
Cross Channel Amplitude Match (full-scale signal, input ranges equal, frequency above 10 Hz if ac coupled)	± 0.1 dB
Cross Channel Phase Match (full-scale signal, input ranges equal)	
20 kHz	± 2.5° (or ± 350 ns)
F_{HZ} = 800 Hz to 20 kHz	± ($F_{HZ} \times 125 \times 10^{-6}$)°
100 Hz to 800 Hz	± 0.1°
dc to 100 Hz, dc couple	± 0.1°
50 Hz to 100 Hz, ac couple	± 0.2°

3 The 20V range is not specified for dynamic range.

4 The minimim frequency span for any Fs 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 = 50Ω)	< -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 = 50Ω, low side grounded, full scale, < 10 kHz signal on other channels, input ranges within 20 dB)	< -80 dBfs (typical)
Noise (input terminated with 50Ω, 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 AYF)

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	± 0.012% (120 ppm)

Signal Output	
Number of Output Channels	1
Maximum Amplitude	10 Vp nominal
Output Impedance	< 0.5Ω (typical)
Maximum Output Current	100 mA (typical)
Maximum Capacitive Load	0.01 µF (typical)
Amplitude Control (signal amplitude = range × 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 nV/$\sqrt{\text{Hz}}$
Residual DC Offset	
Offset after autozero	± 2 mV
Offset after shutdown	± 20 mV
Zeroing resolution	100 µV
Output Overload Trip	> 17V
Amplitude Ramp-down Time (Programmable)	0 to 30 seconds
Shutdown	
Shutdown input	TTL levels
Shutdown time	< 5s
Shutdown time, ac fail	< 4 ms

Sine Output Mode	
Sine Frequency (65536 Hz Fs)	
Frequency range	0 to 25.6 kHz
Frequency resolution	244 µHz
Amplitude Accuracy (1 kHz sine wave, into ≥ 200Ω)	
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 (≥ 1 kΩ load)	
1 Vp range, 1.0 scale factor, 0 to 6.4 kH	< -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 > 0.001)	1 Vp (nominal)
Output Impedance	1.2 kΩ (typical)
Flatness	
25 Hz to 5 kH, 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 (±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 ± 0.5 dB at 1 kHz
Input Impedance	> 10 kΩ (typical)
Flatness, dc to 25.6 kHz	± 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	-25V to +25V
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
	SUMBUS driver and receiver
	Requires 2 or 4 TTLTRG_ lines for multi-module synchronization
Signal Processing	33 MHz Motorola 96002 DSP
	2 banks of 128K word static RAM
	4 Mbytes dynamic RAM (32 Mbytes with option ANC)
	128 Kbytes Flash ROM
	Direct Memory Access (DMA) data transfer

Software Drivers	
Driver Type	C libraries with source code
Supported Operating Systems	HP-UX 10.20, Windows 95, Windows NT
Supply Media	CD-ROM
Plug & Play Compliance	C libraries support the Plug & Play standard for HP-UX, MS Windows® 95 and Windows NT®

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

MS Windows and Windows NT are U.S. registered trademarks 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 E1401B Mainframe, V743 Controller, and E1432A module with option 1D4 or AYF)	CISPR 11: 1990, Group 1, Class A (requires connector shields E1400-80920 or 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				
+5V	5.20A	4.93A	4.66A	4.39A
+12V	0.38A	0.38A	0.38A	0.38A
-12V	0.23A	0.23A	0.23A	0.23A
+24V	0.85A	0.84A	0.83A	0.82A
-24V	0.50A	0.49A	0.48A	0.47A
-5.2V	0.28A	0.28A	0.28A	0.28A
-2V	0.03A	0.03A	0.03A	0.03A
Tachometer option installed				
+5V	4.80A	4.53A	4.26A	3.99A
+12V	0.30A	0.30A	0.30A	0.30A
-12V	0.09A	0.09A	0.09A	0.09A
+24V	0.56A	0.55A	0.54A	0.53A
-24V	0.21A	0.20A	0.19A	0.18A
-5.2V	0.28A	0.28A	0.28A	0.28A
-2V	0.03A	0.03A	0.03A	0.03A
No options installed				
+5V	4.60A	4.33A	4.06A	3.79A
+12V	0.30A	0.30A	0.30A	0.30A
-12V	0.09A	0.09A	0.09A	0.09A
+24V	0.55A	0.54A	0.53A	0.52A
-24V	0.20A	0.19A	0.18A	0.17A
-5.2V	0.28A	0.28A	0.28A	0.28A
-2V	0.03A	0.03A	0.03A	0.03A
Dynamic Current				
+5V	0.10A			
+12V	0.02A			
-12V	0.01A			
+24V	0.01A			
-24V	0.01A			
-5.2V	0.01A			
-2V	0.01A			

VXI Cooling Requirements	4.24 liters/second 0.33 mm H_2O
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 E1432A DRAM to VXI V743 Controller	6.5 MB/s
From E1432A DRAM to MXI to external Series 700 Controller	1.5 MB/s
From E1432A DRAM to VXLink interface	345 kB/s
From E1432A DRAM to E6233A Pentium Controller	1.6 MB/s
From E1432A DRAM to National MXI-2 to external 200 MHz Pentium Pro	1.2 MB/s
Local Bus Data Transfer Rate	
From E1432A DRAM, one block, during continuous acquisition	15.7 M Bytes/s
From E1432A's DRAM to E1562D	5 MB/s to 7.8 MB/s
From E1432A's DRAM to E1562E	10 MB/s to 15.7 MB/s
Maximum number of input channels for continuous throughput at 51.2 kHz sample rate	144 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

Fs = sample rate of ADC.

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

dBfs = dB relative to full scale amplitude range.

dBc = dB relative to carrier amplitude.

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

Warranty Information

The E1433A comes with a three-year warranty. During that period, the unit will either be replaced or repaired, at Agilent’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.

Related Agilent Literature

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

www.agilent.com/find/data_acq

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