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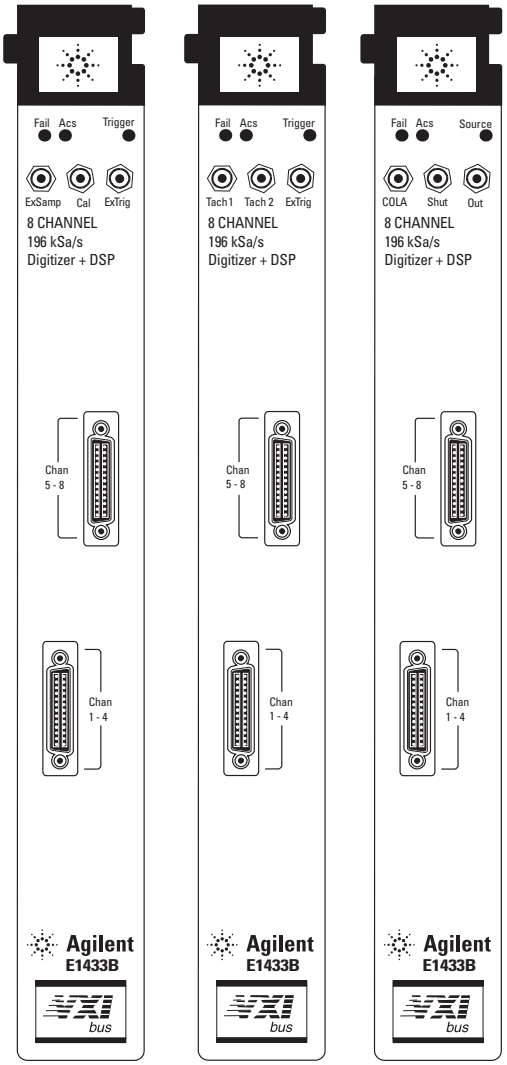
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Agilent E1433B

8-Channel 196 kSa/s Digitizer plus DSP

Technical Specifications



Agilent E1433B

Agilent E1433B with Tachometer Option AYF

Agilent E1433B with Arbitary Source Option 1D4

The Agilent E1433B 8-Channel 196 kSa/s Digitizer plus DSP is a C-size VXI module. “196 kSa/s” refers to the maximum sample rate of 196,608 samples per second per channel.

The E1433B may contain either one or two four-channel input assemblies so that the module may have a total of up to eight inputs.

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

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Specifications

Frequency

Bandwidth (Hz)	Sample Rate (Hz)	Bandwidth (Hz)	Sample Rate (Hz)	Bandwidth (Hz)	Sample Rate (Hz)
88,320.00[1]	196,608.00	10,000.00	25,600.00	762.94	1,953.13
76,800.00	196,608.00	9,765.63	25,000.00	750.00	1,920.00
86,250.00[1]	192,000.00	9,600.00	24,576.00	651.04	1,666.67
75,000.00	192,000.00	9,375.00	24,000.00	640.00	1,638.40
73,600.00[1]	163,840.00	8,000.00	20,480.00	625.00	1,600.00
64,000.00	163,840.00	7,812.50	20,000.00	610.35	1,562.50
70,190.43[1]	156,250.00	7,680.00	19,660.80	600.00	1,536.00
61,035.16	156,250.00	7,629.39	19,531.25	585.94	1,500.00
69,000.00[1]	153,600.00	7,500.00	19,200.00	500.00	1,280.00
60,000.00[1]	153,600.00	6,510.42	16,666.67	488.28	1,250.00
59,895.83[1]	133,333.33	6,400.00	16,384.00	480.00	1,228.80
52,083.33	133,333.33	6,250.00	16,000.00	476.84	1,220.70
57,500.00[1]	128,000.00	6,103.52	15,625.00	468.75	1,200.00
50,000.00	128,000.00	6,000.00	15,360.00	406.90	1,041.67
56,152.34[1]	125,000.00	5,208.33	13,333.33	400.00	1,024.00
48,828.13	125,000.00	5,120.00	13,107.20	390.63	1,000.00
55,200.00[1]	122,880.00	5,000.00	12,800.00	381.47	976.56
48,000.00	122,880.00	4,882.81	12,500.00	375.00	960.00
46,000.00[1]	102,400.00	4,800.00	12,288.00	325.52	833.33
40,000.00	102,400.00	4,687.50	12,000.00	320.00	819.20
44,921.88[1]	100,000.00	4,000.00	10,240.00	312.50	800.00
39,062.50	100,000.00	3,906.25	10,000.00	305.18	781.25
44,160.00[1]	98,304.00	3,840.00	9,830.40	300.00	768.00
38,400.00	98,304.00	3,814.70	9,765.63	292.97	750.00
43,125.00[1]	96,000.00	3,750.00	9,600.00	250.00	640.00
37,500.00	96,000.00	3,255.21	8,333.33	244.14	625.00
36,800.00[1]	81,920.00	3,200.00	8,192.00	240.00	614.40
32,000.00	81,920.00	3,125.00	8,000.00	238.42	610.35
35,095.21[1]	78,125.00	3,051.76	7,812.50	234.38	600.00
30,517.58	78,125.00	3,000.00	7,680.00	203.45	520.83
34,500.00[1]	76,800.00	2,604.17	6,666.67	200.00	512.00
30,000.00	76,800.00	2,560.00	6,553.60	195.31	500.00
29,947.92[1]	66,666.67	2,500.00	6,400.00	190.73	488.28
26,041.67	66,666.67	2,441.41	6,250.00	187.50	480.00
29,440.00	65,536.00	2,400.00	6,144.00	162.76	416.67
25,600.00	65,536.00	2,343.75	6,000.00	160.00	409.60
28,750.00[1]	64,000.00	2,000.00	5,120.00	156.25	400.00
25,000.00	64,000.00	1,953.13	5,000.00	152.59	390.63
28,076.17[1]	62,500.00	1,920.00	4,915.20	150.00	384.00
24,414.06	62,500.00	1,907.35	4,882.81	146.48	375.00
27,600.00[1]	61,440.00	1,875.00	4,800.00	125.00	320.00
24,000.00	61,440.00	1,627.60	4,166.67	122.07	312.50
23,000.00[1]	51,200.00	1,600.00	4,096.00	120.00	307.20
20,000.00	51,200.00	1,562.50	4,000.00	119.21	305.18
22,460.94[1]	50,000.00	1,525.88	3,906.25	117.19	300.00
19,531.25	50,000.00	1,500.00	3,840.00	101.73	260.42
22,080.00[1]	49,152.00	1,302.08	3,333.33	100.00	256.00
19,200.00	49,152.00	1,280.00	3,276.80	97.66	250.00
21,562.50[1]	48,000.00	1,250.00	3,200.00	95.37	244.14
18,750.00	48,000.00	1,220.70	3,125.00	93.75	240.00
16,000.00	40,960.00	1,200.00	3,072.00	81.38	208.33
15,360.00	39,321.60	1,171.88	3,000.00	80.00	204.80
15,258.79	39,062.50	1,000.00	2,560.00	78.13	200.00
15,000.00	38,400.00	976.56	2,500.00	76.29	195.31
13,020.83	33,333.33	960.00	2,457.60	75.00	192.00
12,800.00	32,768.00	953.67	2,441.41	73.24	187.50
12,500.00	32,000.00	937.50	2,400.00	62.50	160.00
12,207.03	31,250.00	813.80	2,083.33	61.04	156.25
12,000.00	30,720.00	800.00	2,048.00	60.00	153.60
10,416.67	26,666.67	781.25	2,000.00	59.60	152.59

[1] These sample rates also have available bandwidths that are 1.15 times the bandwidth of this table

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Frequency (continued)

Bandwidth (Hz)	Sample Rate (Hz)	Bandwidth (Hz)	Sample Rate (Hz)	Bandwidth (Hz)	Sample Rate (Hz)
58.59	150.00	5.09	13.02	0.49	1.25
50.86	130.21	5.00	12.80	0.48	1.22
50.00	128.00	4.88	12.50	0.47	1.20
48.83	125.00	4.77	12.21	0.47	1.19
47.68	122.07	4.69	12.00	0.46	1.17
46.88	120.00	4.58	11.72	0.40	1.02
40.69	104.17	3.91	10.00	0.39	1.00
40.00	102.40	3.81	9.77	0.38	0.98
39.06	100.00	3.75	9.60	0.37	0.95
38.15	97.66	3.73	9.54	0.37	0.94
37.50	96.00	3.66	9.38	0.32	0.81
36.62	93.75	3.18	8.14	0.31	0.80
31.25	80.00	3.13	8.00	0.31	0.78
30.52	78.13	3.05	7.81	0.30	0.76
30.00	76.80	2.98	7.63	0.29	0.75
29.80	76.29	2.93	7.50	0.29	0.73
29.30	75.00	2.54	6.51	0.24	0.63
25.43	65.10	2.50	6.40	0.24	0.61
25.00	64.00	2.44	6.25	0.23	0.60
24.41	62.50	2.38	6.10	0.23	0.59
23.84	61.04	2.34	6.00	0.20	0.50
23.44	60.00	2.29	5.86	0.19	0.48
20.35	52.08	1.95	5.00	0.18	0.47
20.00	51.20	1.91	4.88	0.16	0.41
19.53	50.00	1.88	4.80	0.16	0.40
19.07	48.83	1.86	4.77	0.15	0.39
18.75	48.00	1.83	4.69	0.15	0.38
18.31	46.88	1.59	4.07	0.15	0.38
15.63	40.00	1.56	4.00	0.12	0.31
15.26	39.06	1.53	3.91	0.12	0.30
15.00	38.40	1.49	3.81	0.11	0.29
14.90	38.15	1.46	3.75	0.10	0.25
14.65	37.50	1.27	3.26	0.09	0.24
12.72	32.55	1.25	3.20	0.09	0.23
12.50	32.00	1.22	3.13	0.08	0.20
12.21	31.25	1.19	3.05	0.07	0.19
11.92	30.52	1.17	3.00	0.06	0.16
11.72	30.00	1.14	2.93	0.06	0.15
10.17	26.04	0.98	2.50		
10.00	25.60	0.95	2.44		
9.77	25.00	0.94	2.40		
9.54	24.41	0.93	2.38		
9.38	24.00	0.92	2.34		
9.16	23.44	0.79	2.03		
7.81	20.00	0.78	2.00		
7.63	19.53	0.76	1.95		
7.50	19.20	0.75	1.91		
7.45	19.07	0.73	1.88		
7.32	18.75	0.64	1.63		
6.36	16.28	0.63	1.60		
6.25	16.00	0.61	1.56		
6.10	15.63	0.60	1.53		
5.96	15.26	0.59	1.50		
5.86	15.00	0.57	1.46		

Frequency Accuracy	± 0.012% (120 ppm)

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Input	
Full Scale Input Ranges (in volts peak)	5 mV to 10 V (1,2,5 steps)
Maximum Input Level	42 Vp
Input Impedance (dc coupled or ac coupled above 10 Hz)	
Differential	2 MΩ nominal
Either side-to-chassis	1 MΩ nominal
Programmable AC Coupling **3 dB Corner Frequency** (two-pole, 12 dB/octave)	1 to 100 Hz
Common Mode Rejection Ratio	
ac or dc coupled, 10 Hz to 1 kHz	> 70 dB
Maximum signal, low side to chassis	± 10 Vpk
Maximum signal, high side to chassis (V_T =0)	± 11.5 Vp
Maximum signal, high side to chassis	VT ± 10 Vpk (must be ≤ 20V) (V_T = transducer offset cancellation voltage setting)
Amplitude Over-Range Detection	
Common mode overload	± 11.5 Vp (typical)
Differential mode overload (dc coupled)	105% of full scale
Differential mode overload (ac coupled) for cutoff frequency ≤ 6 Hz for cutoff frequency > 6 Hz	 100% of full scale 50% of full scale, worst case
Residual DC	1% of full scale +2 mV

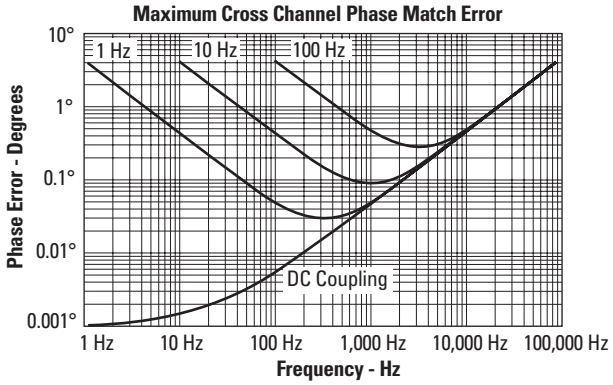
Amplitude	
Amplitude Accuracy at 1 kHz	± 0.5% of reading, ± 0.01% of full scale
Flatness (relative to 1 kHz, at full scale)	
< 29 kHz	± 1%(± 0.09 dB)
< 88 kHz	± 2% (± 0.17 dB) for > 100 mV range
< 88 kHz	± 5% (± 0.42 dB) 5 mV to 100 mV range
Amplitude Resolution	16 bits, less 5.5 dB over-range (typical)

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Cross-Channel Matching (any E1433B module in the same mainframe)

Cross-Channel Amplitude Match	
up to 29 kHz	± 0.1 dB
(freq > 2x AC HPF corner freq when AC coupled)	
29 kHz to 88 kHz	± 0.2 dB

Cross-Channel Phase Match
(full-scale signal, input ranges equal)



Dynamic Range

Resolution	16 bits
Spurious-Free Dynamic Range* (includes spurs, harmonic distortion, intermodulation distortion, alias products and sidebands > 300 Hz) (source impedance = 50Ω)	
51.2 kSa/s Fs, ≤ 1 Vpk	< -90 dBfs (typical)
48 kSa/s to 65.536 Sa/s Fs	< -80 dBfs
above 65.536 Sa/s Fs	< -74 dBfs
Residual Response with No Input	< -76 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, 5 mV range)	
Noise density above 100 Hz	< 70 nVrms/$\sqrt{\text{Hz}}$
Total rms noise, 10 Hz to 10 kHz	< 7 µVrms

Triggering

Trigger Detection	Digital
Trigger Modes	Input, external, source, TTL TRG, software, RPM (requires option AYF)
Maximum Trigger Delay (8 channels active)	
Pre-trigger delay	2 MSa (32 MB RAM)
Post-trigger delay	16 MSa

* 5 mV range degrades 6 dB.

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Option 1D4 Arbitary Source Specifications

General	
Output Modes	Sine and pseudo random with burst; arbitrary waveform with 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

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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 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 > 0.001)	1 Vp (nominal)
Output Impedance	1.2 kΩ (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 (± 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)

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Option AYF Tachometer Input Specifications

Option AYF, Tachometer Input, provides two tachometer inputs. When this option is installed, two of the three 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.

General	
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, levels < ± 5V	0 to 250 mV
Hysteresis, levels > ± 5V	0 to 1.25 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)

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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 two or four TTLTRG_ lines for multi-module synchronization
Signal Processing	33 MHz Motorola 96002 DSP
	Two banks of 128 Kword static RAM
	32 Mbytes dynamic RAM
	128 Kbytes Flash ROM
	Direct Memory Access (DMA) data transfer
Software Drivers	
Driver Type	C libraries with source code
Supported Operating Systems	MS Windows 95® and NT®, and HP-UX 10.20
Supply Media	CD-ROM
VXI *Plug & Play* Compliance	C libraries support MS Windows 95 and NT, and HP-UX.
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 50 °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)

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General Characteristics

VXI Power Requirements	**DC Current**
No options installed	
+5.0V	5.50A
+12.0V	0.56A
-12.0V	0.05A
+24.0V	0.44A
-24.0V	0.42A
-5.2V	0.95A
-2.0V	0.03A
Tachometer option installed (AYF)	
+5.0V	0.14A
+12.0V	0.00A
-12.0V	0.00A
+24.0V	0.10A
-24.0V	0.06A
-5.2V	0.00A
-2.0V	0.00A
Source option installed (1D4)	
+5.0V	0.60A
+12.0V	0.19A
-12.0V	0.18A
+24.0V	0.03A
-24.0V	0.03A
-5.2V	0.00A
-2.0V	0.00A
Dynamic Current +12.0 V	
+5.0V	0.20A
+12.0V	0.02A
-12.0V	0.01A
+24.0V	0.01A
-24.0V	0.01A
-5.2V	0.02A
-2.0V	0.01A
VXI Cooling Requirements	5.08 liters/second 0.51 mm H_2O
Warm-up Time	15 minutes

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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 E1433B DRAM to VXI V743 Controller	6.5 MB/s
From E1433B DRAM to MXI to external Series 700 Controller	1.5 MB/s
From E1433B DRAM to VXLink interface	345 KB/s
From E1433B DRAM to E6233B Pentium Controller	1.6 MB/s
From E1433B DRAM to National MXI-2 to external 200 MHz Pentium® Pro	1.2 MB/s
Local Bus Data Transfer Rate	
From E1433B DRAM, one block, during continuous acquisition.	15.7 MB/s
From E1433B's DRAM to E1562D	5 MB/s to 7.8 MB/s
From E1433B's DRAM to E1562E	10 MB/s to 15.7 MB/s
Maximum number of input channels for continuous throughput at 196 kSa/s sample rate	40 channels
FIFO Memory	
(Maximum FIFO size, 32 MB DRAM installed)	16 MSa/number active channels (opt. ANC)

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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

This product is distributed, warranted, and supported by Agilent Technologies. The E1432A comes with a three year warranty. During that period, the unit will either be replaced or repaired, at Agilent Technologies’ option, and returned to the customer without charge.

Related Agilent Literature

Agilent E1432A/33B/34A
Product Overview
5965-9834E

http://www.tm.agilent.com/tmo/pia/data_acq/PIATop/English/index.html

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