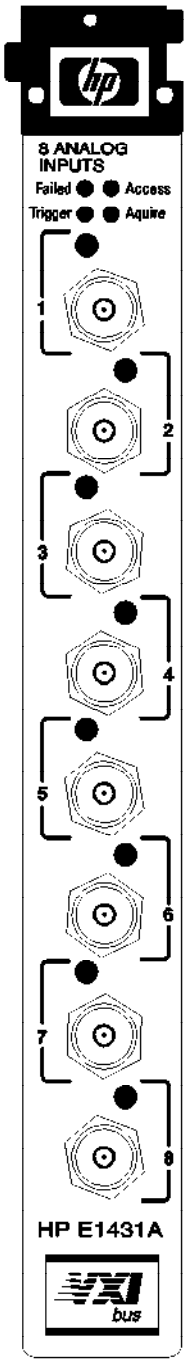
HEWLETT PACKARD

HP E1431A

Technical Specifications

An 8-Channel 25.6 kHz Measurement Frontend



Creating a VXI data acquisition system from several VXI modules can be complicated. Guaranteeing system-wide performance is even harder.

Creating a multi-channel data acquisition system just got easier

The HP E1431A simplifies system integration by implementing the entire measurement front-end - everything you need - all in a single-wide C-size VXI module. It's not only easier - it's smaller, more reliable, and less expensive than multi-module solutions.

- 8 differential/grounded inputs
- AC/DC coupling
- ICP® power for accelerometers
- Individually programmable gains
- Programmable digital filters
- Simultaneous sample and hold
- Separate 16-bit A/Ds for each channel

Versatile signal conditioning

The HP E1431A ensures data integrity. With full-scale ranges from 5 mVolts to 10 Volts in 1, 2, 5 steps, you can look at a wide variety of signals. Each range has 2 dB of headroom to help prevent overloads. And if an overload does occur, built-in overload detection notifies you, to prevent bad data from contaminating your measurement.

Input channels can either be grounded, or differential to remove contaminating common-mode signals from power lines. Tight cross-channel phase and time delay accuracy is maintained with simultaneous sample and hold amplifiers. And for mechanical vibration measurements, built-in ICP power for piezoelectric transducers saves the cost and complexity of external supplies.

Guaranteed system performance

When you build data acquisition systems from separate signal conditioning and A/D modules, measurement errors add up. With the HP E1431A, the entire signal path is contained in a single module. This has two big advantages - the number of places errors can enter the system is reduced, and the performance of the complete signal path can be

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guaranteed. You don't have to wonder what performance you're getting. With the HP E1431A complicated calibration with an external source is not required to achieve specified performance. It has an internal calibrator that guarantees measurement accuracy.

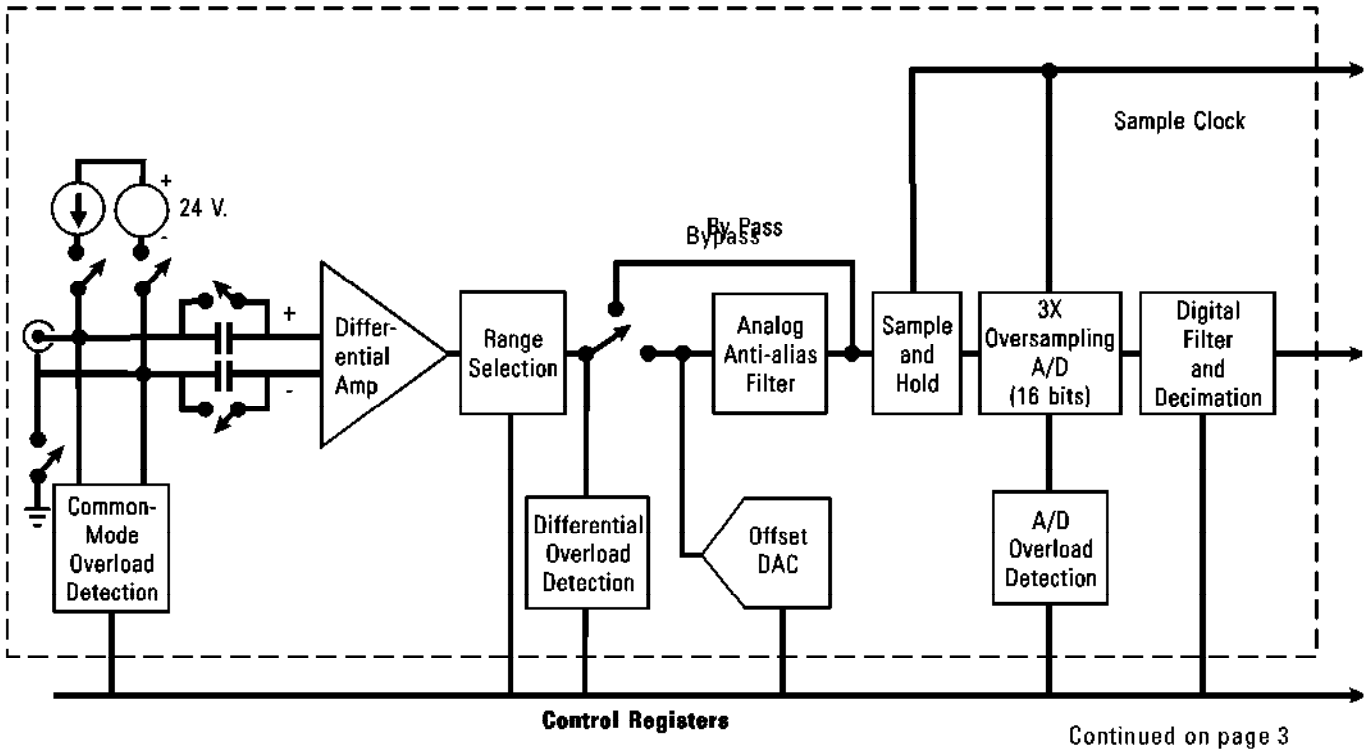
Performance in both frequency and time domains

Most simple A/D modules either don't provide anti-alias filters, or have only one filter at the maximum input frequency. As you decrease the sample rate, alias products can contaminate your measurement. The HP E1431A uses a fixed high frequency analog filter followed by programmable digital filters to guarantee alias protection down to frequency spans as low as 0.39 Hz. Since the filters are digital, they are stable and repeatable. The analog anti-alias filter cutoff frequency is 56.2 kHz, high enough to make its effects negligible below 25.6 kHz. For especially critical time domain measurements, the analog and digital filters can be turned off.

High-speed local bus support

The HP E1431A supports high-speed data transfers to other VXI modules over the VXI local bus. Use it with the HP E1562A/B Data Disk Module to attain transient captures with aggregate sample rates up to 2.62 Msamples/sec - that's 40 channels at 25.6 kHz bandwidth, or 80 channels at 12.8 kHz. Or use it with the HP E1485A/B signal processor module to create custom high-speed digital signal processing applications. The data rate to an embedded HP V743 computer over the VXI backplane is 1.38 Mbytes per second.

Block Diagram



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Versatile software support

Hardware requires software to control it. The HP E1431A is accessible from HP-UX, MS-DOS®, and Microsoft® Windows. C programming using libraries provides complete functionality and the highest data transfer speed. SCPI and compiled SCPI provide the simplicity and familiarity of ASCII programming at reduced functionality and data transfer speeds. If you need to create a solution in the least time, use HP VEE. Its graphical programming lets you quickly integrate the HP E1431A's dynamic measurements with static measurements from the HP E1413B 64 Channel Scanning A/D.

Software Support for the HP E1431A

	HP-UX	DOS
C Libraries	X[1]	
SCPI	X	X[2]
Compiled SCPI	X[2]	
VEE	X	X[3]
C Demo programs	X	

[1] Libraraies for Hewlett-Packard Series 300, 700, and HP E1485A/B provided

[2] Not all functionality available with C libraries is available from SCPI

[3] VEE for Windows support requires Windows 3.1

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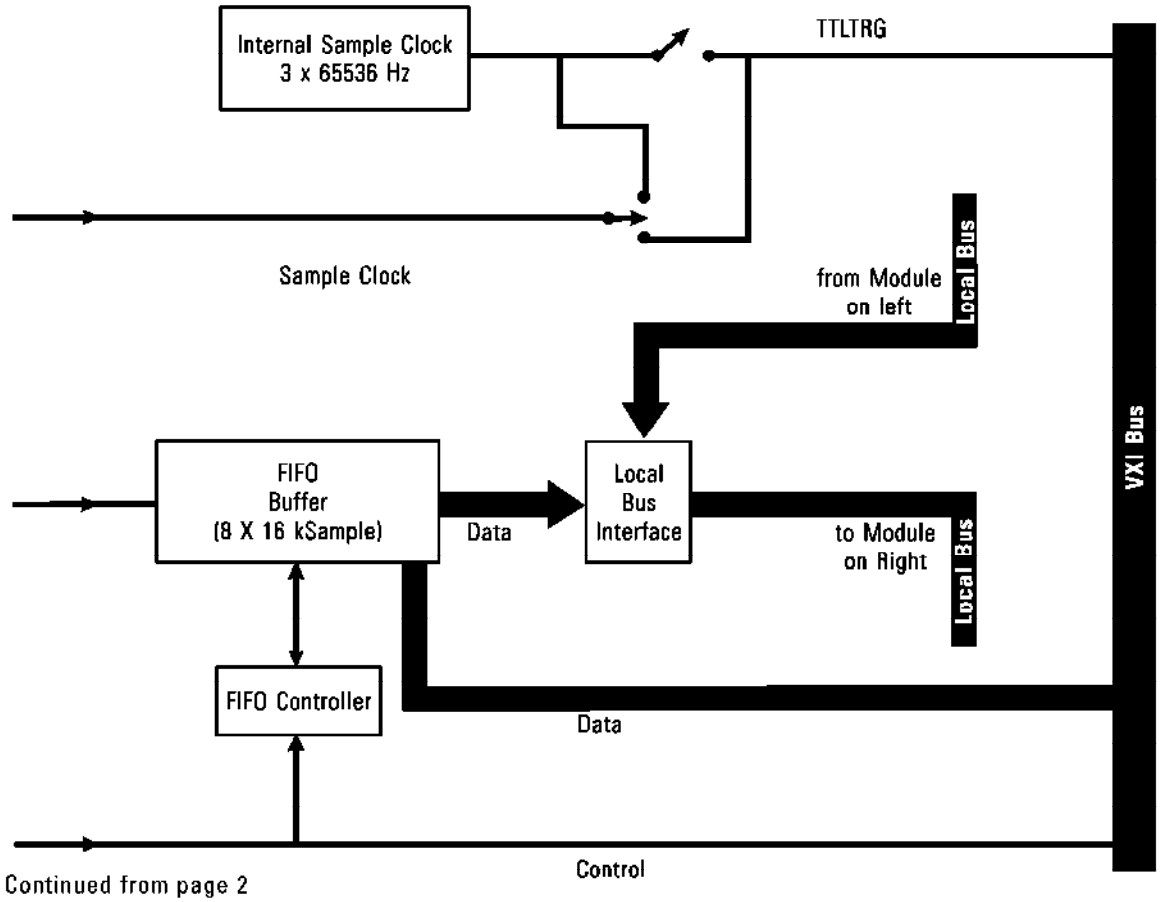

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Specifications

Frequency

Input Frequency Range	dc to 25.6 kHz
Frequency Spans[1]	25.6 kHz to 0.39 Hz in 2X steps
Sampling Frequency	
Fixed Internal Sample Rate	65,536 Hz
External Sample Rate[2]	≤ 65,536 Hz
External Sample Clock[3]	3 × External Sample Rate
Sample Clock Accuracy	±0.01% (100 ppm)
Block Sizes	1 to 16384 samples in integer steps
Word Sizes	16 or 32 bit word transfers
FIFO Size	8 x 16 KSamples

[1] Digital filters are used to change frequency spans and sampling rates by factors of 2.

[2] Requires user-provided external alias filters for external sample rates < 65,536 Hz. Internal anti-alias filters can be turned off with a software command.

[3] The user must provide an external sample clock that is three times the desired sample rate.

Input

Full Scale Input Ranges	5 mVpk to 10 Vpk in 1, 2, 5 steps
Input Impedance (DC Coupled)	
Differential	2MΩ Nominal
High Side to Chassis — Floating Mode	1MΩ, 35 pF Nominal
Low Side to Chassis — Floating Mode	1MΩ, 0.01µF Nominal
Low Side to Chassis —Grounded Mode	< 90Ω Typical
AC Coupling 3 dB Corner Frequency	< 1 Hz
Common Mode Rejection Ratio	
DC coupled < 67 Hz	≥65 dB
DC coupled 67 Hz to 1000 Hz	≥55 dB
AC coupled 45 Hz to 1000 Hz	≥45 dB
AC coupled Common Mode Voltage Range[4]	± 10 Vpk Maximum
Amplitude Over-Range Detection[5]	
Common Mode Overload	±12.5 Vpk
Differential Mode Overload, Broadband Detector	+3 dBfs nominal (at 100 kHz)
ADC Overload	+3 dBfs nominal
Residual DC (after auto-zero)	≤1 % of Full Scale, or ≤1 mVdc

[4] Maximum signal present on either the high or low side of the input connector relative to chassis ground.

[5] If an overload of any kind occurs, a status register is set indicating the type of overload, and the overload LED on the front panel lights. The register can be read with a C library function.

Amplitude

Amplitude Accuracy at 1 kHz[6]	±1% (±0.086dB) ±0.035% of Full Scale
Flatness relative to 1 kHz, at full scale	±0.5% (±0.043 dB)

[6] A combination of full scale accuracy and amplitude linearity.

Cross Channel Matching (any HP E1431A module in the same VXI mainframe)

Cross Channel Magnitude[7]	± 3% (±0.26 dB)
Cross Channel Phase Match[8]	
At 25.6 kHz span	±1.0°
At 12.8 kHz span	±0.5°
At 1kHz	±0.1°
Cross Channel Time Delay Match[8]	
At 25.6 kHz span	±200 nSec
At 12.8 kHz span	±100 nSec
At < 1 kHz	±100 nSec
Cross-Mainframe Time Delay Match	70 nSec delay typical plus 6 nSec per meter of cable

[7] DC coupled, AC coupled above 10 Hz, full scale.

[8] DC coupled, AC coupled above 500 Hz, accurate within ±5°C of temperature when calibration was run.

Dynamic Range

Resolution	16 bits
FFT Noise floor[9]	<-90 dB
Spurious-free Dynamic Range[10]	>80 dB
Channel to Channel Crosstalk[11]	-125 dB
Input Noise Level (≥100 Hz)	< 40 nVrms/√Hz

[9] Hanning window, 800 lines resolution, 16 RMS averages.

[10] Includes all spurious responses, intermodulation distortion, and alias products. Harmonic distortion for measurements less than 5 kHz.

[11] Any combination of ranges, source impedance = 50 Ω

Trigger

Trigger Modes	Input Channel (Same HP E1431A module) Input Channel (Other HP E1431A)
Maximum Trigger Delay	
Pre Trigger	16383 Sample Periods
Post Trigger	> 10^6 Sample Periods
Input Channel Trigger Level Resolution	14 bits
Trigger Uncertainty	±0.5 x 1/65,536 Hz

ICP Current Source

Current Source Accuracy	4.5 mA, ±0.5 mA
Open Circuit Voltage	≥24 Vdc
Harmonic Distortion [12]	<-80 dBfs
Intermodulation Distortion	<-75 dBfs

[12] For measurements less than 5 kHz.

VXI System Level Specifications

General Specifications

Safety Standards	CSA Certified for Electronic Test and Measurement Equipment per CSA C22.2, No. 231 This product is designed for compliance to: UL1244, Fourth Edition IEC 348, 2nd Edition, 1978	
EMI / RFI Standards	CISPR 11, Group 1, Class A[12]	
VXI bus Standards	VXI (Rev. 1.4); Register based; A16/D16, VME bus slave; requires two TTLTRG lines for multi-module synchronization	
VXI Power Requirement	DC	Dynamic Current
+5 V	1.05 A	0.27 A
-5.2V	0.66 A	0.03 A
-2 V	0.23 A	0.15 A
+12V	1.50 A	0.01 A
-12 V	0.52 A	0.00 A
+24V	0.22 A	0.01 A
-24 V	0.24 A	0.00 A
+5 VStandby	0.00 A	0.00 A
VXI Cooling Requirement (10°C rise)	3.5 liters/second 0.5 mm H_20	
Warm-Up Time	60 minutes	
Weight	4.6 lbs., 2.09 kg	
Dimensions	Single slot, C-size VXI module	

[12] Requires VXI mainframe, RFI boots, and single slot filler panels.

Environmental

Operating Restrictions	
Ambient Temperature	0° to 55°C
Humidity, Non-condensing	20% RH to 95% RH at 40°C
Maximum Altitude	2300 meters (7,500 feet)
Storage and Transport Restrictions	
Ambient Temperature	-40° to 65°C
Humidity, Non-condensing	20% RH to 90% RH at 65°C
Maximum Altitude	4600 meters (15,000 feet)

Benchmarks

E1431A Module Count for Real Time Data Transmission at Full Span		
Local Bus		5 modules
VXI Bus [13]	V743	1 Module
	V382	1 Module
	S715/50 with MXI	<1 Module
Transmission Rate		
Local Bus		2.62 Msamples/second
VXI Bus [13]	V743	1.38 Mbytes/second
	V382	1.07 Mbytes/second
	S715/50 with MXI	777 Kbytes/second

[13] The number of bytes per sample can be 2, 4, or 8 depending on the data transfer mode selected.

Abbreviations:

Vpk = Peak of the AC Voltage.

dBfs, %fs = Relative to full scale of a particular range. (0 dBfs = 100% of Full Scale)

FS, fs = Full Scale; synonymous with Input Range. The Full Scale measure is a limit to the peak input voltage.

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

Signal "High" side refers to input BNC center pin.

Signal "Low" side refers to input BNC shell.

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