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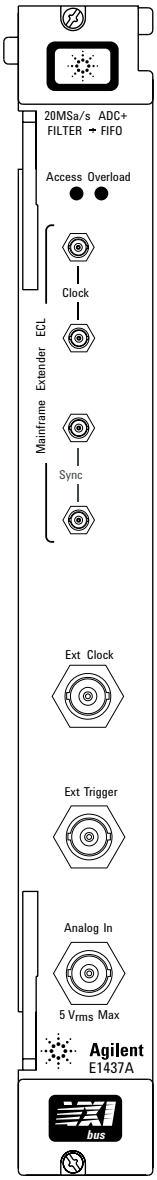
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Find the *Keysight / Agilent E1437A* at our website: ***Click HERE***

Agilent E1437A

20 MSample/Second ADC with Filter and FIFO

Product Overview



High-precision digitizing for time and frequency domain applications

- **Up to -110 dBfs spurious free dynamic range**
- **Noise density: -140 dBfs/Hz**
- **Input bandwidth: 8 MHz with alias filter, 40 MHz without alias filter**
- **Frequency tunable digital filters**
- **8 MB FIFO memory (64 MB optional)**
- **Full analog input signal conditioning**
- **Flexible triggering and synchronization**
- **Two sample clocks standard**
- **Local bus data transfers up to 60 MB/sec**
- **VXI*plug&play* compatible for Win3.1®, Win95, Windows NT®, Windows 2000 and HP-UX***

The Agilent E1437A VXI ADC module will uncover signal details you may never have seen before with its 23 bits of raw resolution and 20 MSa/s sample rate—twice as fast as the previous generation of this ADC.

With up to -110 dBfs (18 bits) of spurious free dynamic range the E1437A is the highest resolution 20 MSa/s digitizer available on the commercial market today.

This module is especially effective in systems that use digital signal processing to analyze signals. Such processing can range from simple averaging, to filtering, Fourier transforming, curve fitting, and demodulating. The high precision data samples supplied by the E1437A mean these processes will describe the signals under analysis more accurately than ever before.

A Remarkable Digitizer

Whether you are building a high dynamic range, wideband digital receiver or a precision waveform analysis system, success starts with the digitizer you select.

The heart of the E1437A is a 20 MSa/s digitizer with real-time distortion correction processing, and exceptionally low spurious and noise.

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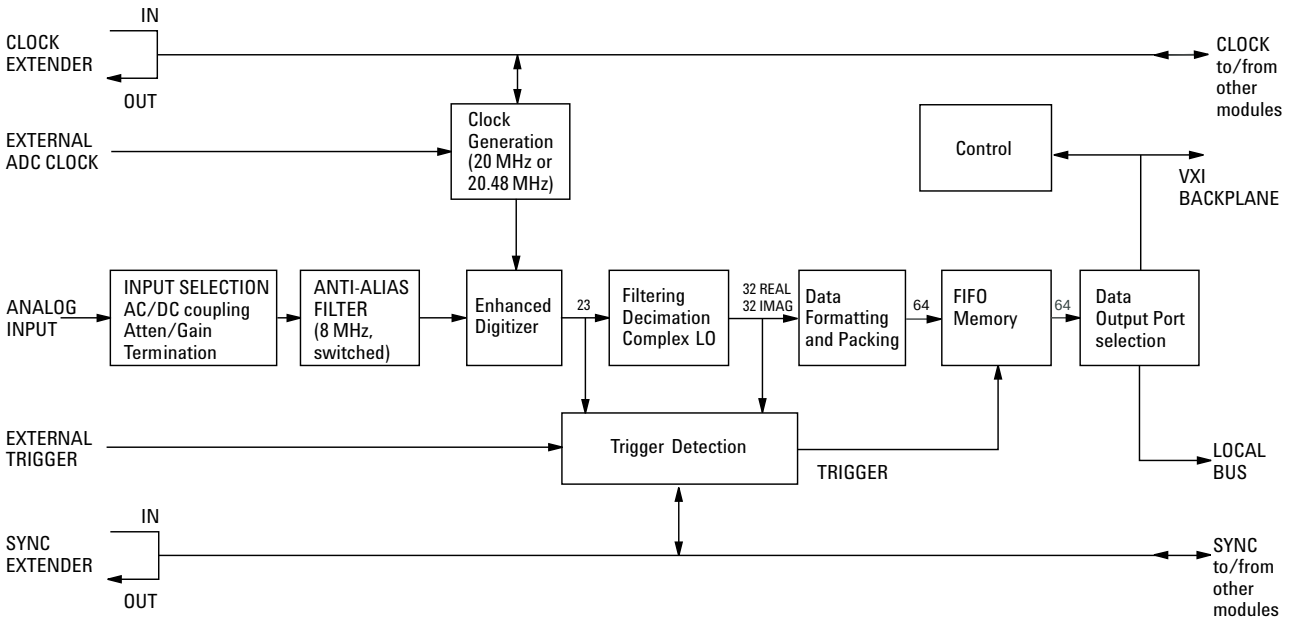
The distortion correction processing algorithm reduces the fixed nonlinearity's,caused by digital components in the ADC, to at least 110 dB below full scale (dBfs). The soft distortion, caused by analog components such as the buffer amplifiers, is at least 70 dB below the applied carrier level (dBc).

Careful design and layout keep spurious signal contamination down at least -110 dBfs.

The noise density of the Agilent E1437A ADC is -140 dBfs/Hz, comparable to the best available ADCs at any sample rate. On the lowest input range the noise figure is 16 dB.

Signal analysis algorithms produce even more precise results with these highly linear and pure samples. The output precision of algorithms like RMS averaging, the Fast Fourier Transform, and various curve fitting algorithms is limited by spurs and distortion in the data. Reduce these contaminates, apply the algorithm longer, and you get more precise results. Sample linearity and purity are the key and the E1437A provides the answer.

Figure 1:
Agilent E1437A
Block Diagram



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Built-in digital filtering and LO

The E1437A has an analog alias protection filter as well as 24 digital filters. Call these filters into use at any time to vary your sampling bandwidth from 8 MHz to less than 1 Hz, in octave steps. Use this real time digital processing to reduce noise and improve signal to noise ratio, or to filter out unwanted signals. Input bandwidth without alias protection is 40 MHz (typical).

These filters also help your data efficiency. The data from each filter is decimated to reduce data rate and data quantity without sacrificing signal information.

Included in the filter section is a digital LO. Use this complex frequency shifter to tune the center frequency of the digital filters anywhere in the alias protected 8 MHz input bandwidth of the E1437A.

The LO is a big help when your downstream signal processing includes demodulating digital modulation formats. The LO automatically multiplies the incoming signal by sine and cosine waves producing the I/Q data needed for this task. These I and Q results are like the I/Q signals produced by analog means but are much better matched and have very low spurious content, less than -110 dBfs. And, the LO's 20 µHz tuning resolution will come in handy for the precise tuning needed to stop a rotating constellation diagram.

Analog signal conditioning includes alias protection

The E1437A comes standard with analog signal conditioning, including a bypassable 8 MHz anti-alias filter. The anti-alias filter assures the Nyquist compatible sampling needed by most signal processing algorithms. The signal conditioning makes it easy to match the E1437A operating point to your signal amplitude, protects the digitizer from harmful voltages, and has a "pseudo-floating" mode to break up signal contaminating ground loops.

Flexible triggering and synchronization

Select one of five ways to trigger the E1437A. Use immediate mode to begin sampling automatically. Select the external trigger mode when sampling must start coincident with an external event. Use the level mode to trigger on the level of the input signal itself. Use the log magnitude mode to trigger on the magnitude of the signal after it has been filtered by the E1437A. A software trigger command is also provided.

Large pre- and post-trigger delays (> 1 MSamples) are standard and the external trigger modes support slope selection.

Use the external synchronization and external clock features of the E1437A when your application requires closely coordinated sampling with multiple E1437As. Simply connect the ECL synchronization and clock ports between the modules, and start sampling. All sampling and digital filter timing will be coordinated between modules with less than 10 ns timing skew within a mainframe. This skew is a constant and can be measured and compensated if more precise timing is needed

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Selection of sample clocks

You have a choice of sample clocks with the E1437A. The module comes standard with two crystal controlled internal sample clocks. Select the 20 MHz clock for convenient, decimal compatible, time domain sampling. Use the 20.48 MHz internal clock when downstream signal processing, like the FFT algorithm, needs a binary compatible sample rate.

The E1437A ADC can run with an external clock, or lock sampling to a master 1 MHz, 5 MHz or 10 MHz timing reference.

Large built-in memory

Many digital signal processing algorithms use blocks of data. The E1437A comes standard with an 8 MByte FIFO memory to assemble these blocks so downstream DSP doesn't have to. The FIFO type design of the E1437A ensures that new data will not be lost while a data block is being transferred out.

The FIFO also acts as signal capture memory. With the 64 MB FIFO option installed the E1437A has a 1.6 sec long time capture buffer (20 MSa/s, 16 bit real data format). With the lower data rate 1 MHz decimating filter selected the FIFO will hold 12.8 seconds of data. Using the narrower filters will result in even longer signal capture times.

VXI*plug&play* programming

The E1437A is shipped with software and documentation to support a broad set of controllers, I/O interfaces, programming languages and operating systems.

Included standard with the E1437A are: compiled C libraries (with source code), example programs, on-line help files, and an installation program. An executable front panel program allows the E1437A to be turned on, verified, and used for simple tasks without writing any user programs.

The E1437A is fully VXI*plug&play* compliant and is easily controlled in Win3.1, WinNT, Win95, and Win2000, VXI*plug&play* frameworks.

If you are programming in Microsoft Visual Basic, the E1437A offers a .bas file to simplify your use of the VXI*plug&play* libraries.

For those preferring the UNIX® operating system, the same set of software is provided for HP-UX running on HP series 700 workstations.

If you are programming in C in a non-VXI*plug&play* environment you will want to use the E1437A C libraries. The source code is shipped with these libraries so you can modify them to work with your specific I/O and processor.

The VXI*plug&play* libraries use the E1437A register based interface for highest performance. A lower speed message based interface is also supported for programmers familiar with instrument control using ASCII string commands. The ASCII commands are IEEE-488.2 compatible and are similar to the Standard Commands for Progammable Instruments (SCPI) protocol. The ASCII command interface can be used on any computer/interface platform capable of message based VXI interfacing. It does not need the VXI*plug&play* library.

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High speed data transfer

Sample linearity and signal processing features are wasted if the data stream has gaps because the module output ports can not keep up with the data generation processes. The E1437A provides two ports to move data to other VXI modules.

The VXIbus port on the P1 connector will move data at 1 MB/s (typical). This is sufficient for continuous sampling of signals with bandwidths below 250 kHz.

For wider signal bandwidths, or multi-channel applications, the Local Bus is key. Using this port, the E1437A can move data at 60 MB/s in bursts, 40.96 MB/s continuously.

Data transfer is further aided by a selection of data output formats. Select from four choices:

Component/Sample	Format
Real only (I)	16 bit
Real & imaginary (I/Q)	16 bit
Real only (I)	32 bit
Real & imaginary (I/Q)	32 bit

Technical Specification

Summary

(refer to Agilent E1437A Technical Specification, publication number 5965-9774E for more data)

Input		
	Ranges:	+30 dBm to -24 dBm, 6 dB steps
	Impedance:	50 Ω
	Bandwidth:	8 MHz (alias filter in), 40 MHz (alias filter out)
Accuracy		
	Raw resolution:	23 bits
	Absolute accuracy:	±0.03 dB (<100 kHz, 25°C, analog alias filter on, digital decimation filter off, DC coupled)
Dynamic Range		
	Harmonics: • input < -6 dBfs • input > -6 dBfs	 <-75 dBc or <-110 dBfs <-70 dBc or <-110 dBfs
	Spurious:	-110 dBfs
	Noise:	-140 dBfs/Hz (-6 dBm input range)
Clock		
	Internal:	20 MHz, 20.48 MHz, 20 MHz phase lock to external reference.
	External:	DC to 20 MHz
Trigger		
	Sources:	Immediate, Level, Log Magnitude, External, Software
Filter		
	One analog anti-alias filter (8 MHz), 23 digital decimation filters (4 MHz to 0.95 Hz, octave steps) with digital LO (20 µHz tuning resolution)	
Memory		
	Type:	FIFO
	Capacity:	8 MB (4 MSa, 16 bits) 16 MB 32 MB 64 MB

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Warranty

This product is distributed, warranted, and supported by Agilent Technologies.

The E1437A comes with a 1-year warranty. During that period, the unit will either be replaced or repaired, at Agilent Technologies' option, and returned to the customer without charge.

Accessories Available

The E1437A sync and clk connectors may be connected to other E1437A modules in synchronized multichannel applications. The following cable and terminator are available from Agilent to connect the modules. (See the Agilent VXI Source Book for more additional cables.)

1250-0676	SMB 50 Ω load
8120-5623	175 mm cable with SMB connectors

Backplane Connector Shields

Required for RFI compliance specified in standards EN55011 and CISPR11; order optional RFI back plane shields for your VXI mainframe. They are not required for MFRAME1.

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Ordering Information

E1437A	20 MSa/s AD with filter and FIFO
E1437A-UFC	16 MB FIFO memory
E1437A-ANC	32 MB FIFO memory
E1437A-ANE	64 MB FIFO memory
E1437A-0B0	Delete manual set
E1437A-0B1	Add manual set

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Related Agilent Literature

E1437A 20 MSample/Second ADC with Filter and FIFO Technical Specifications
literature number 5965-9774E

E1438A/B 100 MSample/Second Digitizer with DSP and Memory Product Overview
literature number 5968-7348E

E1438A/B 100 MSample/Second Digitizer with DSP and Memory Technical Specifications
literature number 5968-8233E

E1439A/B VXI 70MHz IF ADC with Filters and Memory Product Overview
literature number 5980-1261E

E1439A/B VXI 70MHz IF ADC with Filters and Memory Technical Specifications
literature number 5980-1260E

E9830A Delay Memory Module Product Overview
literature number 5968-7349E

Test Systems and VXI Products Catalog
literature number 5980-0307E

Visit our Websites

Agilent Communications Intelligence Information — **www.agilent.com/find/AD**

Agilent VXI Product Information — **www.agilent.com/find/vxi**

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