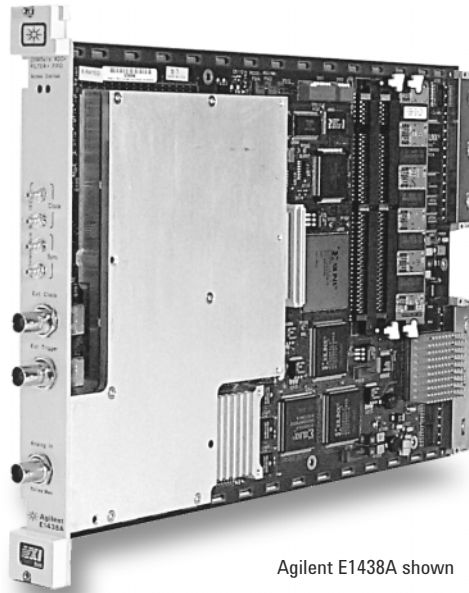


Agilent E1438A/B 100 MSa/s Digitizer with DSP and Memory

Product Overview

High resolution sampling for frequency- and time-domain applications

The Agilent E1438A/B is ideal for signal acquisition and analysis, high resolution ATE and radar testing applications. This single-channel 100 MSa/s digitizer combines exceptional spurious-free dynamic range with alias-protected signal conditioning, center-frequency tunable digital filtering, and a large signal capture memory. The only difference between the A and B versions is the E1438B includes a 2.5 Gbit/sec optical front panel data port. The E1438A/B is a single-slot C-size VXI module.



Agilent E1438A shown

- **0–40 MHz input bandwidth**
- **–90 dBfs spurious-free dynamic range**
- **Anti-alias filter and signal conditioning**
- **Digital decimation filters with tunable center frequency**
- **18MB RAM FIFO memory (expandable to 1.2 GB)**
- **Local bus and VXIbus outputs**
- **Optical front panel data port (E1438B only)**
- **Multi-channel compatible**
- **VXI plug&play compatible**
- **Single-slot, C-size module**

A new digitizer

The heart of the E1438A/B is a new, Agilent-designed, 100 MSa/s digitizer. This high performance monolithic component provides clean, low-distortion samples at a higher sample rate than offered previously from Agilent.

Signal analysis algorithms produce better results when supplied with precise samples. The output precision of algorithms such as RMS averaging, the Fast Fourier Transform, and various curve fitting algorithms, is limited by spurs and distortion in the data. Reducing those contaminants ensures more precise results.

The E1438A/B delivers high sample linearity. Spurious signal contamination is at least –90 dBfs (below full scale). Harmonic distortion is less than –65 dBc. Noise density is –133 dBfs/Hz.



Built-in digital filtering and LO

The standard E1438A/B includes digital decimation filtering and a programmable LO.

Use the real-time filters to reduce noise and improve signal to noise ratio, or to filter out unwanted signals. The 17 filters provided reduce the analysis bandwidth of the E1438A/B from 40 MHz to 305 Hz in octave steps.

These filters also improve data efficiency. The data from each filter is decimated to reduce data rate and data quantity without losing any signal information.

The filter section also includes a digital LO. This complex frequency shifter can be used to tune the center frequency of each digital filter anywhere in the 40 MHz input bandwidth of the E1438A/B.

The LO is a helpful for processing digital modulation formats. The LO action is implemented using quadrature mixing, which produces the I/Q data needed for this task. These digital I and Q results are better matched and, at -90 dBfs, have lower spurious content than I/Q signals produced by analog means. The LO's 0.001 Hz resolution is vital for the precise tuning needed to stop a rotating constellation diagram.

Analog signal conditioning includes alias protection

The E1438A/B comes with analog signal conditioning, including a bypassable 40 MHz anti-alias filter. The anti-alias filter ensures the Nyquist-compatible sampling needed by most signal processing algorithms. The signal conditioning makes it easy to match the E1438A/B

operating point to the signal amplitude. It also protects the digitizer from harmful voltages. Input bandwidth without alias protection is typically 100 MHz.

Flexible triggering and synchronization

The *immediate trigger* begins sampling automatically. The *external trigger* mode is used when sampling must start coincident with an external event. The *level* mode triggers on the level of the input signal itself. A *software trigger* command is also provided.

Large pre- and post-trigger delays (>100 MSamples with the memory option) are standard. The external trigger modes support slope selection.

The external synchronization and external clock features of the E1438A/B may be used when an application requires closely coordinated sampling with multiple E1438A/Bs. The user simply connects the ECL synchronization and clock ports between the modules and starts sampling. All sampling and digital filter timing will be coordinated between modules, providing less than 10 ns timing skew within a VXI mainframe. This skew is a constant and can be measured and compensated if more precise timing is required.

Selection of sample clocks

The E1438A/B provides several crystal-controlled internal sample clocks. The 100 MHz clock offers convenient, decimal compatible, time domain sampling. The 102.4 MHz internal clock option is the optimal choice when downstream signal processing, like the FFT algorithm, needs a binary-compatible sample rate.

It is also possible to run the E1438A/B ADC with an external reference clock. This will lock sampling to a master 10 MHz timing reference for single-channel sample timing accuracy or phase-coherent multi-channel sampling.

Large built-in memory

Many digital signal processing algorithms use blocks of data. The E1438A/B has an 18 MByte FIFO memory (144 MB, 288 MB, and 1.2 GB options available) to assemble data into blocks so the downstream DSP doesn't have to perform that task. The FIFO type design of the E1438A/B ensures that new data will not be lost while a data block is transferred out.

The FIFO also acts as signal capture memory. With the 1.2 GB FIFO option installed the E1438A/B has an eight-second time capture buffer (100 MSa/s, 12-bit real data format). With the lower data-rate 1 MHz decimating filter selected, the FIFO will store twelve minutes of data. Using the narrower filters will result in even longer signal capture times.

High-speed data transfer

The E1438A/B generates data at rates up to 200 MB/sec. There are three ways to transfer the data out of the module. The simplest way is to use the VXI-bus. It can transfer data at 2-4 MB/sec. This can be used for continuous sampling at 500 kHz or less, or for unloading full-bandwidth data saved in the RAM FIFO. The VXI local bus is faster, transferring data at up to 50 MB/sec, or 25 MSa/sec. For continuous sampling at the E1438A/B maximum sample rate of 100 MSa/sec, use the E1438B. Its optical front panel data port can transfer data continuously at 200 MB/sec.

Technical Specification Summary

(refer to Agilent E1438A/B Technical Specification for more data)

VXI *plug&play* programming

The E1438A/B is shipped with software and documentation to support a broad set of controllers, I/O interfaces, programming languages and operating systems.

Compiled C libraries (with source code), example programs, on-line help files, and an installation program are included as standard items with the E1438A/B. An executable front panel program allows the E1438A/B to be turned on, verified, and used for simple tasks without the requirement to write user programs.

The E1438A/B is fully VXI *plug&play* compliant and is easily controlled in 32-bit Windows® based VXI *plug&play* frameworks.

For those preferring the UNIX® operating system, a VXI *plug&play* C API function library is provided for HP-UX* running on HP Series 700 workstations.

If programming is done in C in a non-VXI *plug&play* environment it is recommended to use the E1438A/B C libraries. The source code is shipped with these libraries and can be modified to work with a specific I/O and processor.

Other Agilent VXI ADCs

E1430A
E1437A
E1439A/B

Standard Input	
Ranges	+30 dBm to -21 dBm, 3 dB steps
Impedance	50Ω
Bandwidth	40 MHz (alias filter in), 100 MHz (alias filter out)
Distortion products	<-65 dBc or -90 dBfs, whichever is greater (for fin <30 MHz)
Spurious	-90 dBfs
Noise density	-133 dBfs/Hz
Accuracy	
Raw resolution	12 bits
Absolute accuracy	±0.7 dB
Clock	
Internal	100 MHz or 102.4 MHz
External reference	10 MHz for 100 MSa/s, 10.24 MHz for 102.4 MSa/s (10—102.4 MHz clock range)
Trigger	
Sources	Immediate, level, external, software
Filter	One analog anti-alias filter (40 MHz), 17 digital decimation filters (40 MHz to 305 Hz, octave steps) with digital LO (0.023 mHz tuning resolution)
Memory	
Type	FIFO
Capacity	18 MB, 144 MB, 288 MB, or 1.2 GB
Optical serial front panel data port (E1438B only)	
Standard support	Draft standard VITA 17.1, 1 Gbit/sec and 2.5 Gbit/sec
Connector	Dual LC receptacle
Optical type	Multi-mode fiber, 850 nm wavelength
Maximum length	100 meters

* HP-UX Release 10.20 and later and HP-UX Release 11.00 and later (in both 32- and 64-bit configurations) on all HP 9000 computers are Open Group UNIX 95 branded products.

UNIX is a registered trademark of the Open Group

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

Agilent accessories available

The E1438A/B “sync” and “clk” connectors may be connected to other E1438A/B modules in synchronized multi-channel applications. The following cable and terminator to connect the modules are available from Agilent. (See the Agilent VXI Source Book for additional cables.)

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

Backplane connector shields

The backplane connector shields are required for RFI compliance with the EN55011 and CISPR11 standards. Specify one Option 918 with the purchase of an Agilent VXI mainframe. Specify this kit for retrofitting an existing mainframe (E1400-80920 or E1421-80920).

Warranty

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

The E1438A/B comes with a 3-year warranty. During that period, the unit will either be replaced or repaired, at Agilent Technologies' option, and returned to the customer without charge.

Ordering Information

Agilent E1438A/B	100 MSa/s AD with filter and memory
Option 001	1.2 GB FIFO memory
Option 144	144 MB FIFO memory
Option 288	288 MB FIFO memory

Related Agilent Literature

E1437A 20 MSample/Second ADC with Filter and FIFO Product Overview
literature number 5965-6893E

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 Data Sheet
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 Data Sheet
literature number 5980-1260E

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

Agilent Test System and VXI Products Catalog
literature number 5980-0307E

Visit our Websites

Agilent Communications Intelligence Information – www.agilent.com/find/COMINT

Agilent VXI Product Information – www.agilent.com/find/vxi

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