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Agilent E1439C/D
95 MSa/s Digitizer with DSP and Memory

Product Overview

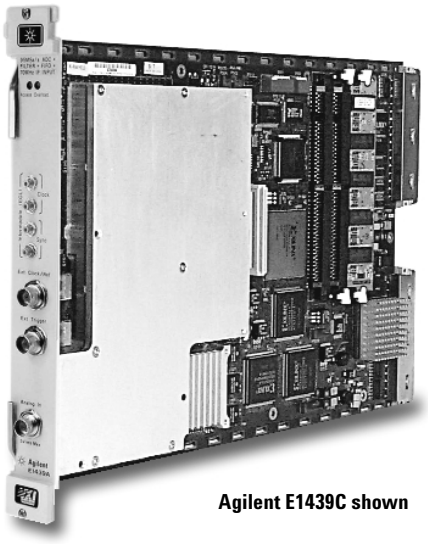
High resolution sampling with a 70 MHz IF input

The Agilent E1439C/D is ideal for RF communication applications. Its 70 MHz IF input connects to common VHF/UHF and µwave tuners. This single-channel 95 MSa/s digitizer combines exceptional spurious-free dynamic range with alias-protection, signal conditioning, center-frequency tunable digital filtering, and a large signal capture memory. The only difference between the C and D versions is the E1439D includes a 2.5 Gbit/sec optical front panel data port and support for the VXI local bus. The E1439C/D is a single slot C-size VXI module.

A new digitizer

The heart of the E1439C/D is a new, Agilent-designed, 95 MSa/s digitizer. This high performance monolithic component provides clean, low-distortion samples at a wider bandwidth than offered previously from Agilent.

The E1439C/D delivers high sample linearity. Residual spurious signal contamination is at least –90 dBfs. Distortion is less than –62 dBc for full scale inputs and –70 dBc at lower levels. Noise density is –132 dBfs/Hz.



Agilent E1439C shown

- **0–36 MHz baseband bandwidth**
- **70 MHz IF input with 36 MHz bandwidth**
- **–90 dBfs residual spurious-free dynamic range**
- **Anti-alias filter and signal conditioning**
- **Digital decimation filters with tunable center frequency**
- **144 MB RAM FIFO memory (expandable to 1.2 GB)**
- **Local bus (E1439D only)**
- **Optical front panel data port (E1439D only)**
- **Multi-channel compatible**
- **VXI*plug&play* compatible**
- **Single-slot, C-size module**

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70 MHz IF input

The E1439C/D can be switched in software between a 70 MHz IF input with 1 dB stepped attenuators and a baseband input with no attenuators.

The E1439C/D is a perfect match for VHF, UHF, and µwave tuners since 70 MHz is a common IF output for these devices. The IF input offers 36 MHz alias-protected bandwidth. When paired with a high quality tuner, the E1439C/D generates wideband, sampled data with very high dynamic range. This is ideal for digital radios and spectrum analysis.

The baseband input has 36 MHz alias protection, but has no programmable gain. Users not requiring a 70 MHz IF input should consider the E1438C/D 100 MSa/sec ADC. The E1438C/D has stepped attenuators on its baseband-only input.

Built-in digital filtering and LO

The standard E1439C/D 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 E1439C/D from 280 Hz to full bandwidth 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. Use this complex frequency shifter to tune the center frequency of each digital filter anywhere in the 36 MHz input bandwidth of the E1439C/D.

The LO is 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 E1439C/D comes with analog signal conditioning, including a bypassable 36 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 E1439C/D operating point to the signal amplitude. It can be extended for time domain applications by turning off alias protection.

Flexible triggering and synchronization

The E1439C/D can be triggered one of five ways. 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.

Use the external synchronization and external clock features of the E1439C/D when your application requires closely coordinated sampling with multiple E1439C/Ds. 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.

Large built-in memory

Many digital signal processing algorithms use blocks of data. The E1439C/D has a 144 MByte FIFO memory (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 E1439C/D 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 E1439C/D 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.

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High-speed data transfer

The E1438C/D generates data at rates up to 190 MB/sec. The simplest way to transfer data 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 E1439D has two additional ways to transfer data at very high rates. Its VXI local bus can transfer data at up to 50 MB/sec, or 25 MSa/sec. For continuous sampling at the E1439C/D maximum sample rate of 95 MSa/sec, use the E1439D. Its optical front panel data port can transfer data continuously at 190 MB/sec.

VXI*plug&play* programming

The E1439C/D 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 E1439C/D. An executable front panel program allows the E1439C/D to be turned on, verified, and used for simple tasks without the requirement to write user programs.

The E1439C/D is fully VXI*plug&play* compliant and is easily controlled in 32-bit Windows® based VXI*plug&play* frameworks.

If programming is done in C in a non-VXI*plug&play* environment it is recommended to use the E1439C/D 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
E1438C/D

Agilent accessories available

The E1439C/D “sync” and “clk” connectors may be connected to other E1439C/D 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 50 Ω 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. Order optional RFI backplane shields for your VXI mainframe. They are not required for MFRAME1.

Warranty

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

The E1439C/D 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

E1439C/D	95 MSa/s AD with filter and memory
E1439C/D-001	1.2 GB FIFO memory
E1439C/D-144	144 MB FIFO memory
E1439C/D-288	288 MB FIFO memory

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Technical Specification Summary
(refer to Agilent E1439C/D Technical Specification for more data)

Standard Input

Ranges	
IF input	+12 dBm to –36 dBm, 1 dB steps
Baseband input	–21 dBm
Impedance	50 Ω
Bandwidth	36 MHz (alias filter in), 95 MHz (alias filter out)
Distortion products	< –62 dBc or –90 dBfs, whichever is greater
Residual spurious	–90 dBfs
Noise density	–132 dBfs/Hz

Accuracy

Raw resolution	12 bits
Absolute accuracy	
IF input	±1.5 dB
Baseband input	±0.7 dB

Clock

Internal	95 MHz
External reference	10 MHz

Trigger

Sources	Immediate, level, external, software
Filter	One analog anti-alias filter (36 MHz), 17 digital decimation filters (36 MHz to 276 Hz, octave steps) with digital LO (0.023 mHz tuning resolution)

Memory

Type	FIFO
Capacity	144 MB, 288 MB, or 1.2 GB

Optical serial front panel data port (E1439D 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 mm wavelength
Maximum length	100 meters

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Related Literature

Publication Title	Publication Type	Publication Number
E1437A 20 MSample/Second ADC with Filter and FIFO	Product Overview	5965-6893E
E1437A 20 MSample/Second ADC with Filter and FIFO	Technical Specifications	5965-9774E
E1438C/D 100 MSample/Second Digitizer with DSP and Memory	Product Overview	5968-7348E
E1438C/D 100 MSample/Second Digitizer with DSP and Memory	Data Sheet	5968-8233E
E1439C/D VXI 70 MHz IF ADC with Filters and Memory	Data Sheet	5980-1260E
E9830A Delay Memory Module	Product Overview	5968-7349E
Agilent Test System and VXI	Products Catalog	5980-0307E

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Product Web site

For the most up-to-date and complete application and product information, please visit our product Web site at:
www.agilent.com/find/vxi

Agilent Communications Intelligence Information:
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