Product Information Sheet

EC14150A

AC-Coupled, 14-Bit ExpressCard Digitizer

FEATURES

- 2 Analog Channels at up to 150 MHz Sample Rate per Channel
- 14 Bits of Resolution
- Bandwidth from 200 KHz to 200 MHz
- 512 Megabytes of On-Board Memory
- Compact ExpressCard design for Mobile Computer Applications
- Very Low Power Consumption at less than 4.5 Watts
- 266 MB/s PCIe Bus Implementation of ExpressCard
- PCIe Plug and Play Compatible Board

APPLICATIONS

- SIGINT
- RADAR
- LIDAR
- Spectroscopy
- Mass Spectrometry – Time of Flight
- RF Communications
- Ultrasound
    - Medical Diagnostics
    - Non Destructive Testing
- Laser Doppler Velocimetry
- High Speed / High Resolution Waveform Capture

OVERVIEW

The EC14150A (EC) is an AC-coupled dual channel waveform capture board that provides a remarkable combination of high speed and high resolution sampling along with a very large memory capacity all in a very compact and low power consuming ExpressCard form factor. At 4.5 W, the EC represents one of the lowest power consuming digitizer cards ever created for its class. Signal frequencies up to 200 MHz can be accurately captured either in baseband or in higher order Nyquist zones using under-sampling techniques. Where DC-coupling is required, the EC14150D should be considered.

The EC is an ExpressCard 54 mm sized compliant board equipped with standard 'Plug and Play' features common in PCI systems. The entire 512 MB memory may be used as an exceptionally large FIFO for acquiring data directly to the ExpressCard bus continuously non stop (referred to as "EC Continuous Record Mode") or in the more simpler 2-step block acquisition to RAM and transfer to PC modes. In either the EC Continuous Record Mode (where the 512 RAM FIFO is used) or Data Transfer Mode; the EC card is capable of sustaining 170 megabyte/sec transfers over the ExpressCard bus interface. Significant test data has shown that recordings with this large 512 MB FIFO buffering the recording process can be continuous at up to 85 MSPS even when operating in traditional non real-time environments such as the Windows operating system.

The EC was designed to maximize the quality of the captured signal in terms of signal-to-noise ratio and spurious-free dynamic range over a very wide frequency range. A 24 dB amplifier/attenuator circuit is at the input of both analog channels, where 20 dB of amplification and 4 dB of attenuation are available for selection in steps of 1 dB. Both input channels implement a transformer coupled input for best possible signal performance.

A frequency synthesized clock allows the ADC sampling rate to be set to virtually any clock value up to 150 MHz, offering maximum flexibility for sampling rate selection. This frequency selection flexibility comes at no cost to the acquisition clock quality/performance when locked to either the onboard 10 MHz, 5 PPM reference clock or to an externally provided 10 MHz reference clock via the onboard clock input connector. This same sync clock input connector can also be used for applying an external clock to the onboard EC ADCs.

The EC can be set to trigger from the input data channels, the external trigger signal input or via software command. The EC supports single shot, segmented, and pretrigger triggering modes.

HARDWARE DESCRIPTION

Overview

The block diagram on the following page shows a simplified mechanization for the EC14150A. The data input channels are AC coupled with a voltage range from 200mVp-p to 6.3Vp-p in 1 dB increments. At the amplifier/attenuator circuit output is a 200 MHz low pass filter to help reject higher frequency signals from aliasing into the data captured by the ADC.

ADC data can be captured in dual channel or single channel mode. In single channel mode the entire signal memory can be used to capture data from channel 1 only.

The Pretrigger Samples FIFO can be thought of as a programmable length shift register with a maximum length of 4k samples and can be used to capture signal data before the trigger event. Before a trigger is received, the digitizers are active and data is continuously written into the shift register. After receiving a trigger, data samples are then written into the Acquisition FIFO. See the section “Trigger Modes and Options” for trigger mode details.

Data is written into the SDRAM via the Acquisition FIFO and read from RAM via the I/O FIFO. Advanced Signatec power management processes are implemented at this stage of memory management and controlling to meet a demanding 4.5 W power limit for ExpressCard based technologies.

Operating Modes

The EC14150A has 5 operating modes as follows:

1. Off – the EC14150A is powered down consuming very little power to conserve product life and mobile PC battery charge.
2. Standby – the only passive mode with no data activity.
3. RAM Acquisition – waveform data is captured into the on-board RAM.
4. EC Continuous Record – waveform data is passed to the ExpressCard PCIe bus, using the on-board 512 MBs of RAM as a FIFO.
5. EC PCIe Transfer – transfer data to the PCIe bus after a RAM Acquisition.

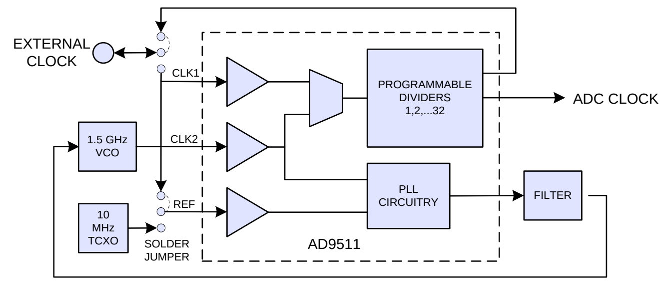
Of particular interest to most users is the EC Continuous Record mode, where the SDRAM is operated as a large FIFO for acquiring data directly to the ExpressCard PCIe bus. A large FIFO is necessary when acquiring large amounts of data to the PCIe bus in order to prevent data loss due to the host system’s intermittent bus management activity. Data may be put into RAM at a maximum rate of 170 MB/s for a single channel while also being extracted at this same rate by interleaving the write and read data packets from the onboard EC14150A RAM. Due to power constraints of the ExpressCard form factor, only channel 1 at a maximum acquisition rate of 85 MHz is supported for the EC Continuous Record mode.

External Inputs/Outputs

Besides the signal data inputs, the EC14150A also provides MMCX connections for a clock input and a trigger input. The clock input can be used to supply the source clock for the ADCs.

ADC Clock Circuit

An internal synthesized clock is the primary clock source for the ADCs. This synthesized clock on the EC14150A allows for users to dial in almost any frequency possible for the onboard ADCs with resulting sampling clock performance that matches or beats most fixed crystal oscillator performance. The ADC clock can also be supplied from the external clock input connector. The figure below shows the functionality of the ADC clock circuitry.



The synthesizer can generate any frequency from 45 to 128 MHz and most frequencies from 128 to 150 MHz. See the specification section for the range of un-settable frequencies.

If the external clock input is the ADC clock source, it may be divided by any integer value from 1 to 32. For all clock sources the effective digitization rate can be further reduced via sample discarding of the digitized data. This second divider can be set from 2 to 32 in factors of 2.

When the synthesized clock is selected, ADC clock jitter is extremely low at about 200 fS RMS. The jitter is independent of the clock divider setting. Clock jitter can reduce the SNR of the captured signal at high frequencies.

The synthesizer clock is locked to a 10 MHz reference clock. The internal reference clock is accurate to better than 5ppm. This sets the ADC clock accuracy to also be within 5ppm.

Triggering

The external trigger input can be used to synchronize the start of data acquisition with an external event. This is a digital input with TTL signal level. Triggering may be set to occur on either the positive or negative going edge of the signal.

Acquisition may also be set to occur based on the amplitude level of either of the two input signals exceeding a programmed trigger level. The triggering threshold is a digital value that is compared against the digitized signal. The detection is edge based with either positive or negative excursion being selectable.

Trigger Modes and Options

In data acquisition mode, two triggering modes are available: post trigger or segmented. In post trigger mode, following the detection of a trigger signal, all of the active memory is filled. In the segmented mode a separate trigger signal is required to successively fill each memory segment until all of the active memory is filled. The EC Continuous Record mode can be combined with the segmented trigger mode for creating high-speed continuous segment recordings.

Samples Settings

There are several board settings that affect the quantity and method of acquiring samples.

Active Memory Size – In Post Trigger mode this is the number of samples that will be taken after which the memory will be considered “full” and the acquisition is terminated. When a full condition is detected, a flag is set which may be read by the PC or software selected to cause a PC interrupt. The amount of memory that is activated for data acquisition may be set from 8 bytes to the full 512 megabytes in steps of 8 bytes. In EC Continuous Record mode it is also possible to operate in a “free run” mode whereby data is collected until the board is commanded to terminate the acquisition.

Segment Size – In Segmented Mode this is the number of samples that will be taken each time a valid trigger signal is detected.

Pretrigger Samples – In Post Trigger or Segmented Modes, this is the number of samples that will be recorded into RAM that occurred before the trigger.

ExpressCard PCIe Operation

The EC14150A implements a PCIe x1 lane version data link for the ExpressCard specification. This bus has a theoretical transfer bandwidth of up to 266 MB/s. In EC PCIe Transfer mode, the EC14150A will be capable of transferring data from the onboard RAM across this bus to the mobile PC RAM at a rate that is close to the 266 MB/s theoretical maximum (though this is PC dependant). Due to power restrictions, the long-term data-transfer rate over the ExpressCard PCIe bus in EC Continuous Record mode is limited to 85 MSPS (for single channel use only).

Under-Sampling and Anti-alias Filtering

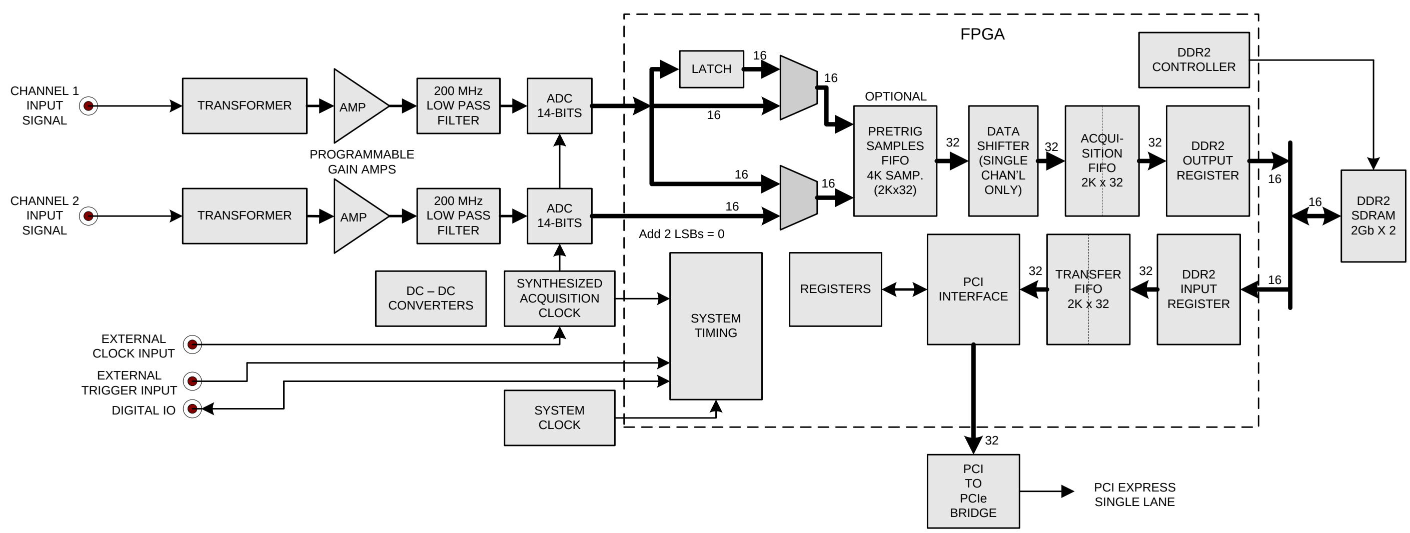
The EC14150A has a maximum digitization rate of 150 MHz but has an analog bandwidth (filtered) of 200 MHz. The wide analog bandwidth provides the capability of acquiring signals at frequencies beyond the first Nyquist zone of the converter. Assuming a maximum digitizing rate of 150 MHz, the actual bandwidth of signals that can be captured is still limited to a maximum of 75 MHz but that band can be located anywhere in the 200 KHz to 200 MHz space, subject to the limitations imposed by the sampling frequency itself. Capturing signal frequencies that are more than one-half the sample rate is referred to as Under-Sampling.

At a sample rate of 100 MHz the EC14150A is capable of capturing 4 Nyquist zones (frequency bands, all numbers in Megahertz):

0 – 50	50 - 100	100 - 150	150 - 200

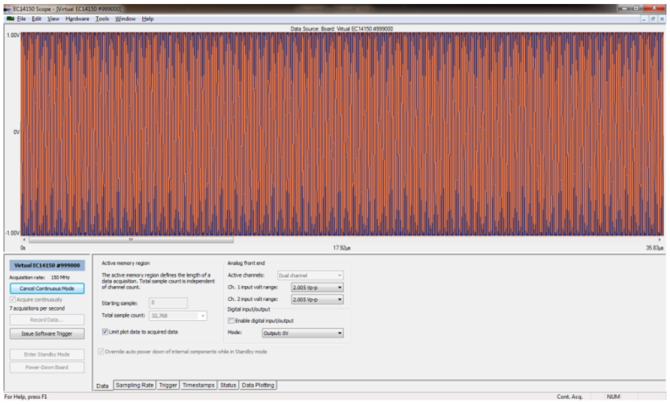
Operation in any of the frequency bands requires that signal frequencies from outside the band not be allowed to reach the ADC. This may involve the application of external band-pass filters to properly reject the out-of-band signals.

To capture frequency bands that span across two of the bands as shown in the table above, the ADC clock frequency would need to be reduced to shift the resulting Nyquist bands so as to completely capture the desired frequency range. Reducing the sampling frequency will reduce the bandwidth that can be captured.



EC14150A Functionality Block Diagram

EC14150A Scope Application



The EC14150A Scope Application software is a virtual oscilloscope application that allows the operator to view or edit all digitizer hardware settings as well as record and display acquisition data.

When the Scope Application starts, it will automatically connect to all local digitizer devices. Note that when the application starts up, the digitizer hardware is not accessed. This allows the Scope Application to run without directly affecting any digitizer operation that may be in progress with other software.

The Scope Application may be used to modify any of the various hardware settings that affect how the digitizer behaves. These settings are distributed over the tabbed view at the bottom of the main device form. The main interface is divided into three resizable panels.

The top panel is the 'Scope' panel and is used to display digitizer acquisition data, data recording snapshots, and previously recorded data files. The plot area can display multiple channels of independent or interleaved data of varying sample sizes (8-, 12-, 14-, 16-, 32- bit) and types (signed, unsigned, floating point) simultaneously. The units displayed for the data are time (horizontally) and voltage (vertically). Plotted data is read-only; there are no facilities to modify data with this interface.

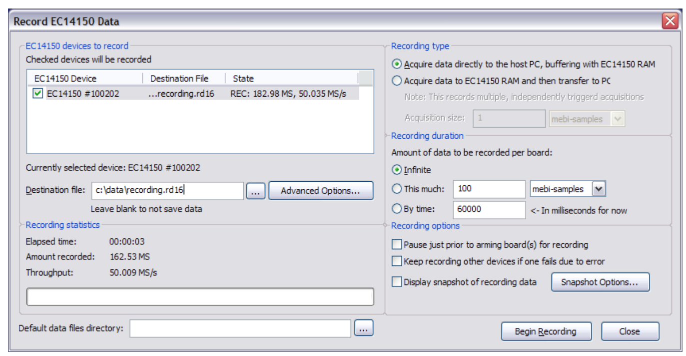
The 'Data Plotting' tab in the Settings area controls many of the data plotting parameters. This includes scaling parameters, channel visibility, and channel source information. In addition, the mouse may be used to alter the horizontal and vertical scaling of the data as well as panning through the data.

The bottom-left panel is the 'Control' panel and is used to start and stop data acquisitions and recordings. The options on this panel have to do with controlling the digitizer operating mode such as acquire data for a single instance, acquire data continuously, initiate a record data session, issue software trigger, or enter standby mode.

The bottom-right panel is the 'Settings' panel and is a tabbed view with various tabs that control the various digitizer hardware settings. Certain tabs are only displayed if the underlying digitizer device supports those features. Tabbed settings include:

Data	Settings that control how much data to acquire for RAM acquisitions as well as analog front end settings.
Sampling Rate	Settings that affect the digitizer acquisition clock, which defines the sampling rate.
Trigger	Settings that affect the digitizer trigger. These settings relate how data is collected relative to external events.
Status	Contains an interface to read hardware status items with version and configuration information for various hardware, firmware, and software entities displayed.
Data Plotting	Settings that affect how data is displayed in the Scope panel. Also provides interface for opening previously saved signal data files into the scope.

The Scope Application allows for saving all digitizer hardware settings to a file that can be opened and applied to the hardware at a later time, thus saving time from manually re-applying settings for repetitive configurations. The Scope Application's Record Data interface is used to conduct data acquisition recordings.



The Scope Application supports two types of data recordings:

Acquire Data Directly to Host PC, Buffering with RAM	Used to record one long continuous stream of data, or one long continuous stream of discrete data segments if in segmented mode, in which the digitizer RAM is used to buffer the data during recording. This is the most common type of data recording. In this RAM-buffered PCI recording mode, the underlying destination data storage system must be able to sustain the acquisition data rate. If the acquisition rate is too fast, or the data storage system performance is too slow, then the digitizer RAM FIFO will overflow and data will be lost. In this case, the digitizer software will detect this condition and end the recording with an indicated error message.

Acquire Data to RAM and then Transfer to PC	This type of recording is used to record a series of non-contiguous acquisitions. First, new data is acquired to RAM and then when the acquisition has completed, the data is transferred to the host system. It's important to note here that while data is being transferred to the system no new data is being acquired. This type of recording is good for recording at the full acquisition rate which may be too fast for a RAM-buffered PCI recording mode.

The following recording durations can be specified:

Infinite	Recording goes on indefinitely until manually stopped by the operator.
This much (data amount)	Records the amount of data specified in gib-samples, mebi-samples, or kibi-samples. Note: gibi-, mebi-, and kibi- prefixes denote 1073741824 (2^{30}), 1048576 (2^{20}), and 1024 (2^{10}) respectively.
By time	Converts the given time into an equivalent sample count (which is a function of acquisition rate) and then records that much data. It should be noted that this time is entire time of recorded data, not including the time to wait for a trigger event.

Regardless of the recording duration type selected, a recording may be manually stopped by clicking the 'Stop Recording' button in the Recording window.

Snapshots of the recording data can be displayed in the scope plot area during live recordings. An 8192 point snapshot is obtained roughly once a second by default. The snapshot setting can be modified to specify the desired targeted size in samples and desired targeted frequency in milliseconds.

Recording statistics are displayed during the live recording detailing the current elapsed time, the amount recorded, and the throughput rate.

Various destination file data saving options include:

Append Data if it Already Exists	Data will be appended to the end of the specified destination file if it already exists.
De-Interleave this Data into Separate Files	Data will be de-interleaved into two separate files. Channel 1 data will be written to the primary pathname specified on the parent window. Channel 2 data will be written to the file specified in the adjacent edit box. Note that that software is responsible for de-interleaving the data. This means that if data is being saved as part of a data acquisition recording, this option may decrease the overall data throughput. The processing involved in de-interleaving data at high rates can be very demanding.
Span Data Over Multiple, Statically Sized Files	Used to span acquisition data over multiple files instead of a single file. This can be useful in situations where multiple, smaller files are preferred over a single large file. When this item is checked, the specified destination file name is used as a template. The software will take the template filename and append a '_#' (number) for each file generated where # is an incrementing value starting with 0. The size of the file segment is defined by the 'Static file size' item. For acquisition recordings, it is recommended to use an integer number of mebi-samples (1 mebi-sample = 2^{20} = 1048576 samples) and to not create new data files anymore frequent than about once per gigabyte when recording at very high data rates.
Convert Data to Signed Format before Writing	All digitizer data will be converted to signed format prior to writing. The digitizer can only acquire unsigned data, so this conversion is done entirely in the software. Enabling this feature for acquisition recordings can result in decreased data throughput.
Leave Room for Application-Specific Data	This option applies when writing binary files. A specified number of bytes will be set aside for user-defined header data. The bytes are reserved by advancing the file pointer prior to writing file data; this will result in zeroes being written. Other software can then write application-specific data to the front of the file at a later time. If the 'Skip even when appending data to an existing file' option is selected then the user-defined header data will always be reserved, regardless of whether a new file is being created or an existing file is being appended to. By default, if this option is not checked, the user-defined data region will only be used when creating a new file.
Save Data as Text	Data will be saved in ASCII text format instead of the default binary format. This option can be demanding on the CPU and might not be sustainable for high data rate recordings. When saving as text, sample values will be written to the file in decimal format, one sample per line. That is, each sample will be newline ("\r\n") delimited. *Use hexadecimal output* – If selected, samples will be written in hexadecimal. *Assumed dual channel data; column per channel* – If selected, data will be written two samples per line: Channel 1 <tab> Channel 2 <newline>.

SOFTWARE DESCRIPTION (Continued)

Various destination file data saving options (continued):

Signatec Recorded Data Context (SRDC) Information	*Save details in auxiliary Signatec Recorded Data Context (.srdc) file* – If selected, SRDC information will be written to an external file. The pathname of the SRDC file will be the full pathname of the recording destination file appended with a '.srdc' extension. *Operator notes* – This is an optional note that will be saved in the SRDC file. This is intended for user-defined notes that are relevant to the recording.

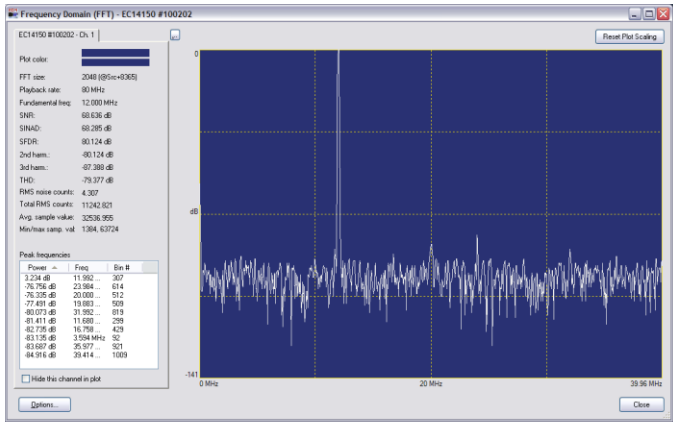
The native file format for recorded acquisition data is the RD16 file format. The RD16 moniker is derived from "Raw Data 16-bit". RD16 files are identified by the '.rd16' file extension. RD16 files are binary files that contain only acquisition data. There is no file header or additional information in the file. The first two bytes of the file are the first data sample. Samples in .rd16 files are 16-bits in size; however, for recorded 14-bit data, only the lower 14-bits are relevant (the upper two bits will always be zero).

The simple R16 file format has two big advantages. First, it's very fast to write these files since data is written to the file exactly as it is received from the digitizer. The second advantage is that this file format is very generic which makes it easy for other software to use the data. This includes custom software, or other software environments like MATLAB or LabVIEW.

The RD16 file format does not store any context information about the details of the data in the file. Therefore an option is provided to create a Signatec Recorded Data Context (SRDC) file. A SRDC file is a small generated XML-based formatted file that contains information about the associated RD16 data file that includes channel count, input voltage range, sampling rate, source board, operator notes, or any other user-defined data. SRDC files are identified by the '.srdc' file extension and reside in the same storage location of the RD16 file when generated. SRDC files are easily read by any XML-aware software.

The Scope Application has the ability to do FFT analysis on digitizer (or file) data. FFT operations are performed on data sources that are currently displayed in the Scope panel and are displayed on the Frequency Domain (FFT) window. The FFT window is displayed by selecting the 'Frequency Domain Window' option in the View menu.

The FFT window is divided up into two regions. The left side is a tab control that contains various FFT and time-domain statistics. There is one tab for each channel of data. The right side contains the frequency domain plots of all channels.



Reported FFT and time-domain statistics include:

FFT Size	The number of time-domain samples used in the FFT operation. The FFT size can be changed on the FFT Options dialog.
Playback Rate	This is the underlying acquisition rate, in MHz, used to obtain the time domain data. When the digitizer is the data source, the current acquisition rate is used. When an external file is the data source, this information is obtained from SRDC data. If acquisition rate information is not available this item will be 0.
Fundamental Frequency	This is the frequency component with the highest power. In order for this to be calculated properly, the underlying acquisition rate must be known.
SNR	This is the signal-to-noise ratio and is a ratio of the signal power to the noise power.
SINAD	This is the signal-to-noise and distortion ratio and is a ratio of the signal power to the sum of the noise, 2nd, and 3rd harmonic power.
SFDR	This is the spurious free dynamic range and is a ratio between the fundamental power and the next highest spur power.
2nd Harmonic	This is the power of the second harmonic.
3rd Harmonic	This is the power of the third harmonic.
THD	This is the total harmonic distortion and is a ratio of the sum of the 2nd and 3rd harmonics to the fundamental signal power.
RMS Noise Counts	This is the root mean square of the noise power.
Total RMS Counts	This is the root mean square of the signal power.
Average Sample Value	This is the average time-domain sample value in the data used for the FFT operation.
Minimum / Maximum Sample Value	This is the minimum and maximum time-domain sample values from the data used for the FFT operation.
Peak Frequencies	This list tracks the highest power spurs in the current frequency domain data. Double clicking on any of these items will move the selection in the frequency domain plot to that peak.

Reported FFT and time-domain statistics include (continued):

Hide This Channel in Plot	If this item is checked then the currently selected data channel (relative to the tab) will be hidden from the plot.

The frequency domain data plots can be zoomed and panned like the time domain data in the Scope panel of the main application window. A Reset Plot Scaling button can be used to reset the horizontal and vertical scaling of the frequency domain data.

FFT options are also available that affect FFT operations:

FFT Size	This item controls the size of the FFT operation.
Windowing Method	This item defines how the time-domain data will be windowed prior to the FFT operation. Available option selections are Blackman-Harris, Rectangular, Hanning, and Hamming.
Obtain Time-Domain Data from	This item controls where the source time-domain data will be obtained: *Beginning of data source/acquisition* – Time-domain data is obtained from the start of channel's data. For digitizer sources this will be the start of the acquisition or recording snapshot. For file sources this will be the start of the time-domain data in the file. *Selection on time-domain plot* – Time-domain data is obtained starting at the location of the current selection in the time-domain data plot in the Scope panel. If no selection has been made, the start of the data source will be used. *Always use this offset* – Time-domain data will be obtained from the specific given offset into the data source.
Enable FFT Averaging	When selected, the Scope Application will average and track the resultant magnitude-squared FFT results. As FFT operations are performed, this will average out any ambient noise in the frequency-domain. When enabled, this will result in a new tab being added to the Frequency Domain (FFT) window and a new plot added. *Restart averaging after* – This item specifies the number of FFT operations after which FFT averaging will be reset. If this value is 0 then the average will never reset.
Enable Tracking of Peak FFT Frequencies	When enabled, the Scope Application will track a number of the highest energy spurs. These peaks are displayed in the 'Peak Frequencies' list of each channel's tab. The number of peaks to track is defined by the adjacent edit control.
Ignore Noise Margin Outside of Fundamental	This item specifies the noise margin to be ignored outside of the specified entered % of the fundamental frequency.

EC14150A Software Libraries

Complete documented Application Programming Interfaces (APIs) with C/C++ callable function libraries for the EC14150A are included for custom software development.

In addition, the complete source code for the Scope Application is included along with additional project examples that illustrate how to use the function libraries for building custom applications.

Future manual and software updates are available for download for registered users at no additional charge for the lifetime of the products.

EC14150A Optional Software Packages

Optional software packages available for separate purchase for the EC14150A include:

LabVIEW Interfaces	LabVIEW Interface software packages include supplied LabVIEW virtual instruments (VIs) for the EC14150A with full VI reference documentation for use within the LabVIEW environment.

EC14150A SPECIFICATIONS AND ORDERING INFORMATION

External Signal Connections

Analog Input, Channel 1	: MMCX (miniature RF)
Analog Input, Channel 2	: MMCX
Clock Input	: MMCX
Trigger Input	: MMCX
Digital I/O	: MMCX

Analog Inputs

Full-Scale Volt. Ranges	: 200mV to 6.3V (1 dB increments)
Impedance	: 50 ohms
Bandwidth	: 200 MHz (LP filter)
Coupling	: AC

External Trigger

Signal Type	: digital, TTL signal level
Impedance	: >10k ohms
Bandwidth	: 50 MHz

Internal Synthesized Clock

Frequency range	: 45.0 - 150 MHz
Resolution	: better than 5 PPM
Accuracy	: better than 5 PPM
Unsettable ranges	: 128.9-129.8, 140.6-142.8 MHz

External Clock

Signal Type	: sine wave or square wave
Coupling	: AC
Impedance	: 50 ohms
Frequency	: 10 MHz to 150 MHz
Amplitude	: 100 mV p-p to 2.0 V p-p

Post ADC Clock Divider

Divider Settings	: 1, 2, 4, 8, 16, 32

Reference Clock

Internal	: 10.0 MHz, ± 5 ppm max.

Digitizer

Resolution	: 14 bits
Aperture Jitter	: 0.07 pS typical
Clock Rate	: 45 to 150 MHz

Trigger Modes

Post Trigger	: single start trigger fills active memory
Segmented	: start trigger for each memory segment

Trigger Options

Pretrigger Samples	: samples prior to trigger are stored; Single Channel: 8k max.; Dual Channel: 4k max per channel

Memory

Active Size	: Up to 256 MegaSamples
Segment Size	: Up to 128 Megasamples
Segment re-arm time[1]	: 150 nanoseconds
Addressing	: DMA transfer from starting address

I/O Addressing

PCI Controller Address	: 64 bytes, Plug and Play selected
Control/Status Registers	: 32 bytes, Plug and Play selected

Performance

SFDR	: 80dB, 1 to 50 MHz
	: 78dB @ 100 MHz
	: 77dB @ 170 MHz
SNR (1-200 MHz)	: 67dB @ 20dB gain
	: 66dB @ 10dB gain
	: 65dB @ 0dB gain

Power Requirements

+3.3V	: 1.5 Amps max.

Absolute Maximum Ratings

Analog Inputs	: ±5 volts
Trigger Input	: -0.2 to +4.0 volts DC
Clock Input	: 5 volts peak to peak
Ambient Temperature	: 0 to 50°C

Definition of Terms

SNR: Signal to Noise Ratio - The ratio of the fundamental sinusoidal power to the noise power. For this data sheet, noise power is considered to be the power from all spectral components with the exception of the fundamental signal, the first harmonic, and the second harmonic.

SFDR: Spurious Free Dynamic Range - The ratio of the fundamental sinusoidal power to the power of the next highest spurious signal. Normally the highest spurious signal is the second or third harmonic.

EC14150A Part Numbers

EC14150A

Documentation & Accessories

The EC14150A is supplied with a comprehensive operator's manual, which thoroughly describes the operation of both the hardware and the software. Also supplied are two four-foot coaxial cables with MMCX to BNC connectors. Additional cables may be purchased. Supplied software disks contain a function library for Microsoft Visual C/C++, example programs, and all source code to examples.

Product Warranty

All Signatec products carry a standard full 2-year warranty. During the warranty period, DynamicSignals will repair or replace any defective product at no cost to the customer. Warranties do not cover customer misuse or abuse of the products.

Notes:

1. In segmented mode, time from the end of a segment until a trigger will be accepted to begin another segment acquisition.

DynamicSignals reserves the right to make changes in this specification at any time without notice. The information furnished herein is believed to be accurate, however no responsibility is assumed for its use.

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