GaGe is a worldwide industry leader in high speed data acquisition solutions featuring a portfolio of the highest performance digitizers, PC oscilloscope software, powerful SDKs for custom application development, and turnkey integrated PC-based measurement systems.

RazorPlus Express – 16-Bit Digitizer

2-CHs @ 250 or 500 MS/s, 150 or 300 MHz Bandwidth,
PCIe Gen3 Real-Time Data Streaming

APPLICATIONS

Wideband Signal Analysis

RADAR Design and Test

Signals Intelligence (SIGINT)

Ultrasonic Non-Destructive Testing

LIDAR Systems

Communications

Optical Coherence Tomography

Spectroscopy

High-Performance Imaging

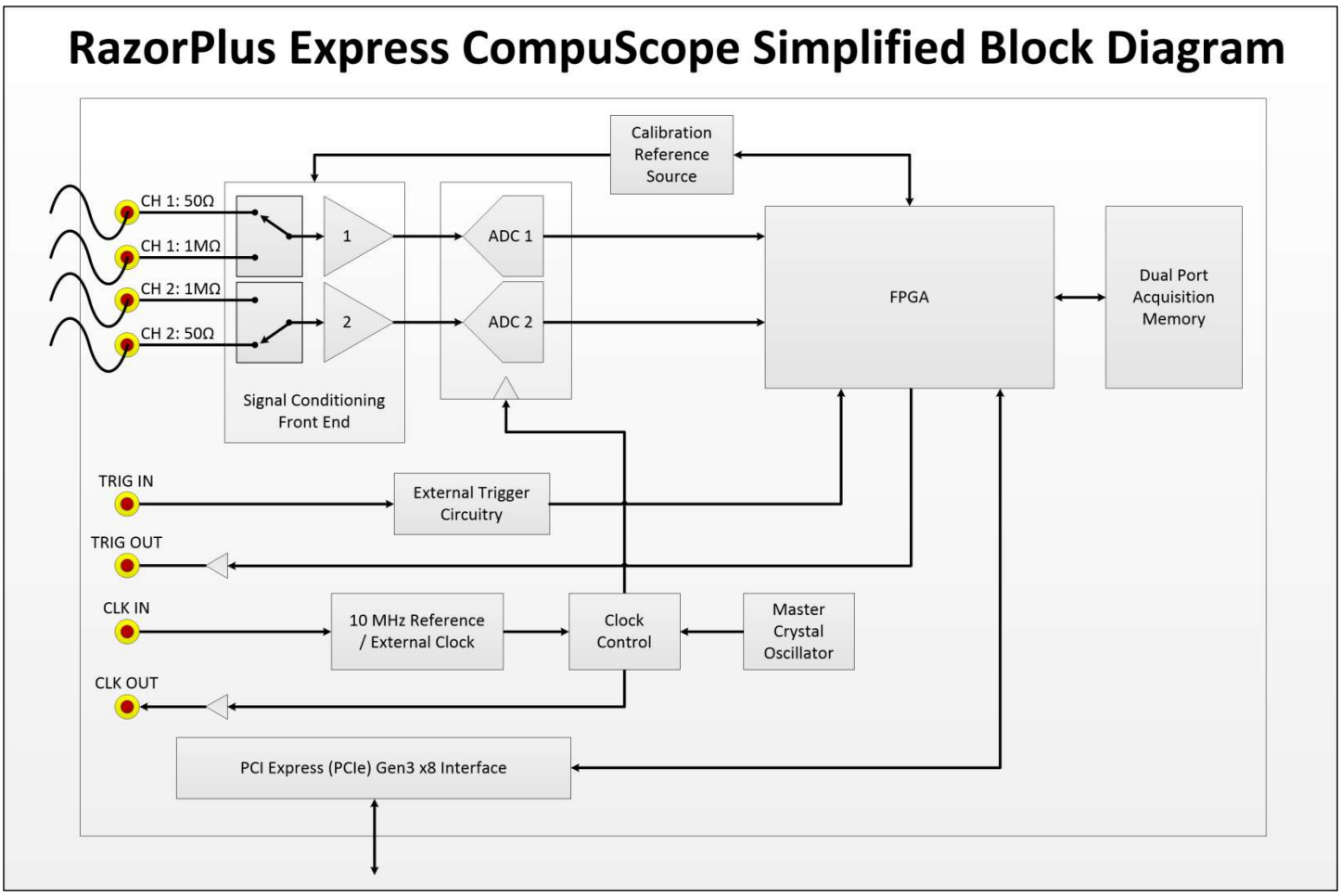
Time of Flight

Life Sciences

Particle Physics

FEATURES

- 16-Bit Vertical A/D Resolution with 2 Digitizing Input Channels
- 500 MS/s or 250 MS/s Maximum Sampling Rate per Channel
- Dedicated Set of 50 Ω Input Channel Pair and 1M Ω Input Channel Pair
- 30 Software Selectable A/D Sampling Rates from 1 kS/s to 500 MS/s
- 300 MHz Bandwidth @ 500 MS/s or 150 MHz Bandwidth @ 250 MS/s
- 4 GS (8 GB) Onboard Dual-Port Sample Memory Standard
- 6 GB/s PCIe Gen3 x8 Transfer Rate off Onboard Memory
- 2 GB/s PCIe Gen3 x8 Real-Time Sustained Streaming Rate to Host
- Stream Acquired Signal Data to GPU for In-Line Processing in Real-Time
- Stream Acquired Signal Data to Storage for Real-Time Recordings
- Front-End with DC Coupling (AC Optional) and 50 Ω / 1M Ω Inputs
- Ease of Integration with External or Reference Clock In & Clock Out
- External Trigger In & Trigger Out with Advanced Triggering Operations
- Programming-Free Operation with GaGeScope PC Oscilloscope
- Programming-Free Recording & Playback with DsScope & DsScopeView
- Software Development Kits Available for C/C#, LabVIEW and MATLAB
- Windows 10/8/7 and Linux Operating Systems Supported



Analog Input Front End

The RazorPlus Express is available in dual channel models supporting a maximum A/D sampling rate up to 500 MS/s or 250 MS/s. ADC data can be captured in dual channel or single channel modes with six software selectable input voltage ranges at ±100 mV, ±200 mV, ±500 mV, ±1 V, ±2 V, and ±5 V.

The RazorPlus has separate physical input channels that differ for input impedance. There is a pair of input channels that are dedicated to 50 Ω input impedance connections, and a pair of input channels that are dedicated to 1M Ω input impedance connections. All input channels are fixed for DC-coupling.

The analog input bandwidth is 300 MHz for the 500 MS/s sampling rate model with 50 Ω input impedance or 150 MHz with 1M Ω input impedance. For the 250 MS/s sampling rate model, the analog input bandwidth is 150 MHz for both 50 Ω and 1M Ω input impedance. The wider 300 MHz bandwidth is especially useful for RF based applications by enabling direct RF sampling of wider band signals.

AC-coupling is useful for applications in which a small AC signal is sitting upon a large DC bias. In these cases, the DC bias can be removed with AC-coupling to reduce the input range for better signal fidelity. A configuration for fixed AC-coupling for the input channels is available as an option. The coupling front end is factory hardware configured and is not software switchable.

Note that it is also possible to externally implement AC-coupling with the use of an external high-pass filter; in which case the fixed AC-coupling hardware configuration is not required.

ADC Clock Circuit

The RazorPlus Express utilizes an onboard fixed master crystal oscillator as the primary internal clock source for the ADCs combined with clock control to effectively produce 30 software selectable A/D sampling rates ranging from 1 kS/s to 500 MS/s with a rate accuracy of ±1 Part Per Million (PPM).

The ADC clock can also be supplied by an external clock input source, allowing for variable clock sample frequencies from 250 MHz to 500 MHz. External clock input signals are routed almost directly to the ADC chips so that each clock edge causes the ADC chips to produce exactly one sample. No re-clocking or Phase Lock Loop circuitry is used, since these methods may lead to extra or missing ADC clocks.

Use of an external clocking signal that is synchronous with the signal to be acquired achieves the best possible trigger stability with intrinsic jitter typically ¼ of a data point or better. Compared to using an internal clock source that is asynchronous (unrelated) to the signal trigger that can result in a 1 point trigger jitter between acquisitions.

When internally clocking, the ADC clocking signal is produced by a Voltage Controlled Crystal Oscillator (VCXO) within an on-board Phase Lock Loop (PLL) circuit. The PLL is disciplined by an on-board 10 MHz reference signal that has a frequency accuracy of order ±1 PPM. This circuitry ensures that the frequency of the VCXO is reset every 100 nanoseconds so that the ADC sampling clock inherits the accuracy and stability of the 10 MHz reference input.

The ±1 PPM internal sampling rate accuracy is sufficient for most digitizer applications. However some applications (notably communications), require ultra-high ADC clocking accuracy and stability. External atomic or IRIG sources can provide 10 MHz reference frequency accuracies and stabilities that are measured in Parts-Per-Billion. For these requirements, an external 10 MHz reference clocking signal source can be applied to the external clock input. Activating reference clocking from the controlling software will switch the PLL/VXCO input from the digitizer's 10 MHz reference signal to the supplied external 10 MHz reference signal. The ADC sampling will then inherit the accuracy and stability of the supplied external 10 MHz reference signal.

A clock output connector can be used to provide a clock out signal to serve as an external clocking source for other external devices. The clock out signal frequencies range from 250 MHz to 500 MHz, or can be configured to output the onboard 10 MHz reference signal.

Acquisition Memory

The RazorPlus Express includes 4 GS (8 GB) of onboard acquisition sample memory. The onboard acquisition memory size is shared and equally divided among all active input channels (2 or 1) when acquiring data to onboard memory.

With the optional eXpert PCIe Data Streaming FPGA Firmware package, the dual-port architecture of the onboard memory is utilized as a large FIFO buffer for streaming acquired data to host PC memory via the digitizer's PCIe Gen3 x8 interface at sustained rates up to 2 GB/s (2-CHs * 500 MS/s per CH * 2 bytes per sample for 16-bit data). This streaming mode can be effectively utilized to conduct real-time sustained host-based signal processing and/or signal recording operations of the acquired data.

Triggering

Advanced triggering operations include Simple, Complex, Windowed, and Multi-channel Boolean ORed.

Simple triggering uses a single trigger source from any input channel, external trigger, or software with software controls for trigger level and trigger slope (positive or negative). Each time the selected trigger source signal crosses the set trigger level with set trigger slope, a digital trigger is generated to initiate acquisition.

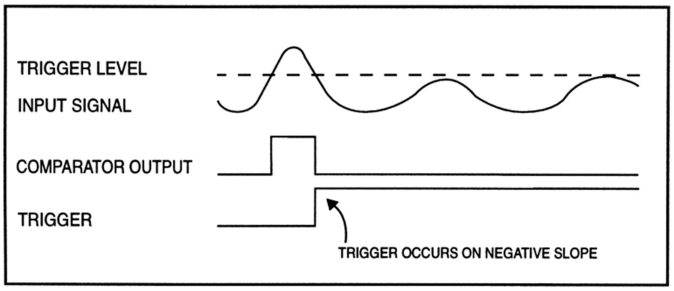


Figure: Generation of a Trigger Signal – Negative Slope

In order to avoid triggering on noise, the RazorPlus Express features a trigger sensitivity value of ±2% of Full Scale Input Range (FSIR) of the trigger source. This value specifies the minimum amount by which the trigger signal must swing through the trigger level in order to cause a trigger event.

An optional Trigger Timeout value can also be specified to establish the amount of time that the digitizer will wait for a trigger event before the driver forces a trigger event to occur.

Complex triggering makes use of multiple trigger engines and their configurations. Trigger configurations for each logical triggering engine require three specifications: the engine's source, the engine's trigger level and the engine's trigger conditions. The outputs of each logical triggering engine are Boolean ORed together to create the overall triggering signal. There are two trigger engines for each input channel plus one trigger engine for the external trigger input. Usage of complex triggering allows for Windowed Trigging and Multi-channel Boolean ORed triggering.

Windowed Triggering uses two trigger engines in such a way that a trigger event occurs if the signal voltage leaves a range of voltages specified by an upper limit and a lower limit. Windowed triggering is implemented by selecting the same input channel as the trigger source for two trigger engines.

The levels for the two engines are then selected as the upper and lower limit with positive and negative slopes, respectively. In this way, if the signal voltage rises above the upper limit, the first engine triggers and if the signal voltage falls below the lower limit, the second engine triggers.

Since the outputs of both trigger engines are Boolean ORed together, a trigger on either engine will cause a global trigger event to occur.

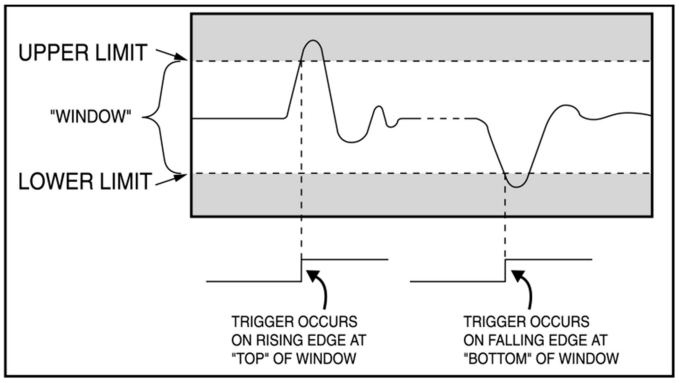


Figure: Windowed Triggering

Multiple Record Mode

Multiple Record Mode uses the digitizer onboard memory to allow ultra-rapid repetitive waveform acquisition. In Multiple Record Mode, sequentially acquired waveforms are stacked in onboard memory, so that data transfer to host PC RAM is not required between waveforms.

Furthermore, in Multiple Record Mode, re-arming of trigger circuitry is done in hardware with no software intervention required. The RazorPlus Express features sub-microsecond re-arm times that allow for ultrafast trigger rates in the MHz range.

Pre-trigger data can also be captured in Multiple Record Mode. Memory usage is well optimized in Multiple Record Mode since only the small amount of pre- and post-trigger data containing the pulse of interest are stored to memory. Memory is not wasted in the acquisition of the entire signal between pulses, which is not of interest.

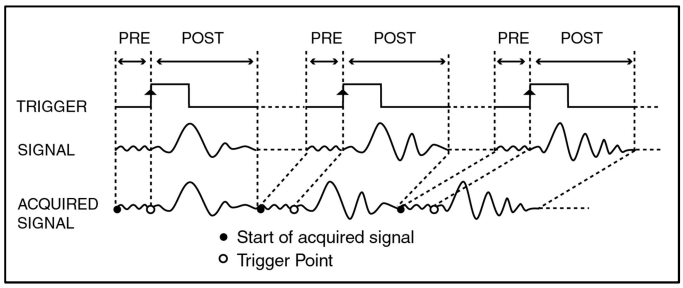


Figure: Multiple Record Mode with Pre-Trigger Data

Timestamping

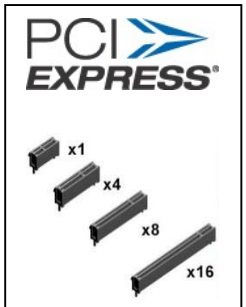
Timestamping is a feature used to determine the arrival time of waveform trigger events and is most useful when used in Multiple Record Mode. The digitizer has a 44-bit on-board numerical counter. The clock source for the counter may be selected as the digitizer sampling clock or a fixed on-board clock source. The value of the timestamp counter can be reset to zero at the beginning of each acquisition sequence or can be alternatively reset from software at some referenced time.

During an acquisition and upon each trigger event, the current output value of the timestamping counter is latched and is stored in onboard memory as a footer to the current record. After acquisition, the timestamp value associated with each acquired record may be downloaded. When dividing the timestamp value by the known counter source frequency, the occurrence time of each trigger event is obtained.

PCI Express (PCIe) Generation 3 x8 Interface

The RazorPlus Express utilizes a PCIe Gen3 x8 (8-lane) interface to the host PC and thus requires an open available physical PCIe x8 or larger x16 size slot on the host PC system for installation.

The RazorPlus Express is fully backwards compatible with previous PCIe Gen2 and Gen1 based slots.



PCIe I/O Slots

It is also possible to operate the RazorPlus Express in PCIe slots that are physically x8 or x16 in size but electrically operate at slower x1 or x4 PCIe speeds.

For maximum data transfer rate performance, it is best to install the RazorPlus Express in a dedicated (non-switched) PCIe Gen3 x8 or larger PCIe Gen3 x16 slot. The host system should provide good cooling air flow for the installed RazorPlus Express card location with ideally an empty adjacent slot to prevent blockage of the card's onboard cooling fan.

With the optional eXpert PCIe Data Streaming FPGA Firmware package, acquired data can be streamed to host PC memory via the PCIe Gen3 x8 interface at real-time sustained rates up to 2 GB/s (2-CHs * 500 MS/s per CH * 2 bytes per sample for 16-bit data) for targeted host-based signal processing and/or signal recording operations.

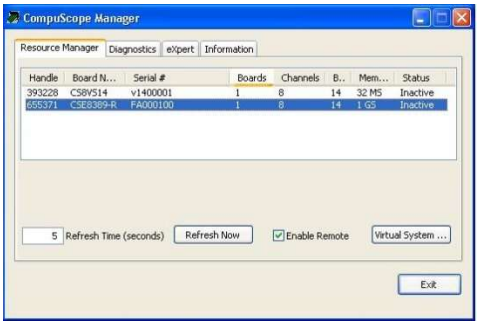
Device Drivers and Utility Software

The RazorPlus Express is supplied with 64-bit/32-bit device drivers supporting Windows 10/8/7 and Linux distributions for Red Hat and Ubuntu. Note that other Linux distributions can be supported as well.

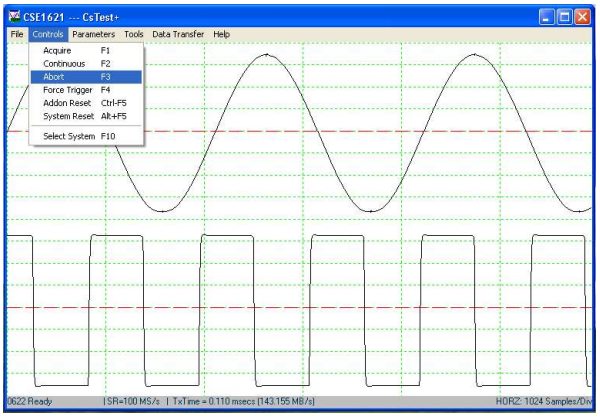
For Linux: Device Drivers, C Application Programming Interface (API), and C Software Development Kit (SDK) examples are included.

For Windows: Device Drivers, a CompuScope Manager Utility application, and a CSTest+ Utility application are included:

The CompuScope Manager Utility is used to enable and verify certain hardware configurations of the digitizer and provides details on resource usage, diagnostics, eXpert features, and hardware/software/firmware versioning information.



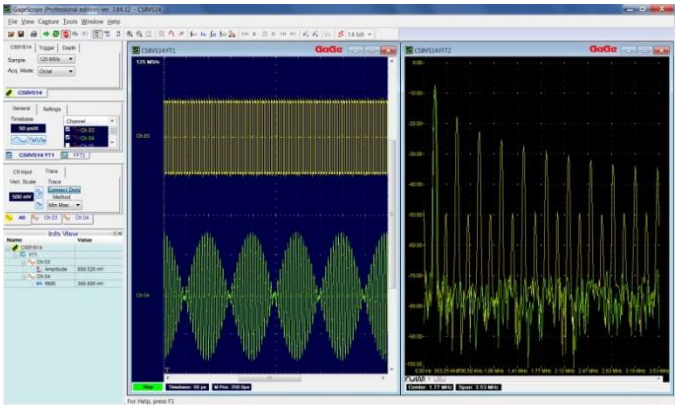
The CSTest+ Utility is a simple application to conduct basic capture of signals and to verify basic correct operation of the digitizer.



GaGeScope – PC Oscilloscope Software

GaGeScope is a solutions oriented PC oscilloscope software package that allows users to quickly and easily control GaGe's advanced CompuScope digitizers without having to write a single line of code. Data can be displayed, analyzed, printed and saved with an easy-to-use Windows-based user interface.

GaGeScope Lite Edition is included and provided free of charge with any CompuScope digitizer model. Optional upgrades to the Standard or Professional Editions of GaGeScope provide access to more advanced features and functionalities.



DsScope/DsScopeView – Signal Recording & Playback Viewer Oscilloscope Software

DsScope is a Windows based PC oscilloscope application that allows the operator to view/edit all digitizer hardware settings, display acquired signal data, and conduct real-time monitored signal recording operations to high-speed storage systems; all with no programming required.

Analysis displays include Time Domain, Frequency Domain, Spectrogram, Persistence, and Histograms with support for scope cursors to navigate through the displays and obtain measurements.

DsScopeView allows an operator to open/view and conduct playback of previous signal recordings to the display monitor for analysis.

The non-proprietary file format of the raw binary data files allow for other 3rd party applications to import and utilize the data easily, with separate associated XML-based header files that contain the context information on the data file.

Software Development Kits

GaGe provides extensive software for custom application development with optional Software Development Kits (SDKs) for C/C#, MATLAB, and LabVIEW. All SDKs provide several powerful programming examples illustrating the use of the digitizer hardware in different operating modes. These sample programs serve as a starting point for users to develop customized software applications optimized for their specific application requirements.

eXpert FPGA Processing Firmware Options

The default RazorPlus Express configuration can store raw acquired waveform data and transfer them quickly to the user for analysis, display and/or storage.

The addition of optional eXpert FPGA processing firmware features allow for some signal processing analysis to be performed on the digitizer hardware itself within its onboard Field Programmable Gate Array (FPGA).

There are three primary advantages to the processing of waveform data using an eXpert firmware option. First, data can be processed at full sampling rate speeds, where data rates may exceed what can be sustained for streaming over the PCIe bus to other targeted processing devices. Second, processing data onboard the digitizer hardware reduces the data processing load on the host computer. Third, onboard processing may provide data reduction that reduces the data transfer traffic on the host bus and allow for a greater raw data acquisition rate.

eXpert FPGA feature packages are loaded from an onboard flash memory module and are designed to be transparent to the standard digitizer drivers for Windows/Linux. Only one eXpert FPGA feature can be utilized at a time.

eXpert FPGA feature packages can be purchased at any time and can be implemented on digitizers already in use in the field by existing customers without requiring the digitizer to be returned to GaGe for reprogramming.

GaGe can also develop customized firmware to meet specific customer application requirements. Please contact us with a summarized listing of application requirements to evaluate for design feasibility. Pricing for customized FPGA development is highly dependent on the scope of the project work and on expected product volume.

Current eXpert FPGA features available for the RazorPlus Express include:

eXpert FPGA Feature	Feature Description
PCIe Data Streaming	Allows for data streaming mode of acquired data directly through the PCIe interface to the host PC RAM and on to targeted host based CPU or dedicated processing cards for analysis and/or to high-speed storage systems for real-time signal recordings.
Signal Averaging	Allows for detection of very small repetitive signals in a noisy environment. Using rapid signal averaging, small signals can be extracted from a background of high amplitude noise, which may even be larger than the actual signal itself.
Optical Coherence Tomography (OCT)	Supports variable rate k-clocking or inactive external clock by simultaneously digitizing the interferometer signal with the returned optical signal for use with OCT applications.
Fast Fourier Transform (FFT)	Performs 8192 point FFT calculation analysis directly on the digitizer and transfer of multiple Fourier Spectra to the host PC in a single PCIe transfer.

CompuScope GPU CUDA Processing

Optionally stream acquired data from the RazorPlus Express to high-performance Graphic Processing Units (GPUs) for signal processing and data recording in real-time!

Utilize high-performance GPU cards to take advantage of the familiar C programming development environment with powerful multi-core parallelized vector processing for real-time signal processing routines on the streamed signal data.

Gage CompuScope C SDK ready-made compiled sample programs illustrate PCIe data streaming to GPU and effective exploitation of GPU parallelized vector processing to attain 10X ~ 100X faster analysis rates than host CPU.

This enables end users to quickly and easily begin working with GPU cards, focusing on the development of their custom in-line processing routines that is unique to their application. Projects can be developed rapidly and are more transportable working in a C programming environment with the GPU CUDA library.

Multi-Card Systems

Multiple RazorPlus Express cards can work together either within a single system or across multiple systems in three possible configurations: Independent, Synchronized Cascade, or Synchronized Split.

In an Independent configuration, each card simply operates independently within the system.

In a Synchronized Cascade configuration, each card operates together as a group by cascading the trigger signal via the Trigger Out. The Clock Out can be similarly cascaded if synchronous clocking is required. This mode has a small constant delay between each channel but requires no external clocking source or RF splitters.

In a Synchronized Split configuration, each card operates together as a group by splitting the trigger signal to each card's Trigger In using an RF power splitter (not a BNC Tee) and same equal length cables. This can also be done with the External Clock input if synchronous clocking is required. This mode requires more external hardware but provides the best simultaneity between multiple cards.

Thunderbolt 3 Options

Utilize the RazorPlus Express via the Thunderbolt 3 interface for PC system device form factors with either limited or no PCIe expansion slots such as:

Laptops **2-in-1s** **Tablets** **All-in-Ones** **Mini PCs**

In Thunderbolt 3 mode, up to four lanes of PCIe Gen3 is supported for a maximum rate of 32 Gbps (4 GB/s); making it an ideal match for optimal data transfer performance of the RazorPlus Express PCIe Gen3 Digitizer to connected PC devices.

Sig-Station System Options

Optional Sig-Stations are available for providing complete turn-key systems for the RazorPlus Express. Sig-Stations are high-performance PC workstations that are designed specifically for integrating GaGe advanced instruments and maximizing their operational performance.

For real-time operations, it is critical that the underlying host platform is fully capable of sustaining high-speed PCIe data streaming rates to and from multiple instruments. Traditional lower cost desktop based platforms often restrict performance capabilities by placing multiple PCIe slots behind shared PCIe switches. Sig-Station systems utilize dedicated bandwidth PCIe slot architecture for maximum sustained PCIe streaming rates for multiple instruments operating together simultaneously.

Sig-Stations come with all GaGe cards, features, and software fully tested and installed so that the user can be up and running with their system solution right out of the box; thus saving time and minimizing risks of self-integrated systems. Custom system configurations can be defined to meet specific customer application requirements.

These systems incorporate the latest in PC-based technology and utilize workstation class motherboards with multiple dedicated bandwidth PCIe slots, high multi-core count Xeon CPUs, and large system memory capacity. Integrated high-speed data storage systems for real-time signal recording applications requiring a guaranteed continuous sustained data streaming rate with no missing data can be included.

Contact us to configure a system tailored for your application.

Wideband RF Signal Analyzer Recorders

The RazorPlus can be combined with wideband downconverters and PC solutions to be the heart of a wideband, multi-channel, RF/Microwave signal analysis and recording system covering signal frequencies up to 27 GHz with 160 MHz bandwidth.

GaGe wideband receivers feature up to 3 software selectable IF bandwidths, from 10 MHz to 160 MHz. The RF signal tuning covers 50 MHz to 27 GHz to provide unparalleled real-time signal recording and analysis capability ideally suited for use with the RazorPlus 16-bit 250 or 500 MS/s sample rate.

The 2 channel RazorPlus Express models can support 1 receiver in baseband mode (IQ outputs) or 2 receivers in superhet mode (IF outputs). 10 MHz reference inputs and outputs on both the digitizers and receivers provide a single frequency reference for synchronized system performance.

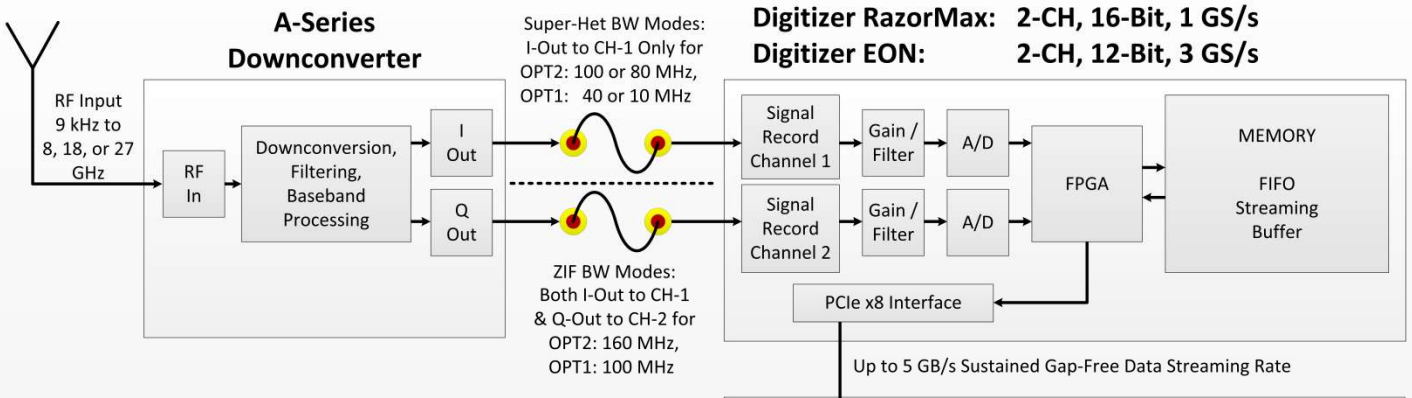
SpectraScopeRT is a Windows based spectrum analyzer application that requires no programming and allows for integrated operational control of both the Downconverter and the Digitizer for signal capture, analysis, recordings.

Analysis displays include IQ Time Domain, Frequency Domain, I Spectrum, IQ Power Spectrum, Constellation Plot, Spectrogram Plot, Persistence Plot, and Histogram Plot. Multiple display type windows can be opened and shown simultaneously with auto tile and cascade options or manually sized and placed as desired.

The primary advantage of SpectraScopeRT is the ability to conduct real-time streaming signal recordings to drive storage with provided monitoring capability to ensure the recording process is operating with expected signal data and without errors. SpectraViewRT allows an operator to open/view and conduct playback of previous signal recordings to the display monitor for analysis.

RF Wideband Signal Analyzer Recording System

Digitizer Razor: 2-CH, 16-Bit, 200 MS/s
Digitizer RazorPlus: 2-CH, 16-Bit, 250 or 500 MS/s
Digitizer RazorMax: 2-CH, 16-Bit, 1 GS/s
Digitizer EON: 2-CH, 12-Bit, 3 GS/s



- **Integrated Receiver/Digitizer Operational Control**
- **RF 9 kHz to 27 GHz Frequency Coverage**
- **Up to 160 MHz Bandwidth Centered at 0 Hz IF**
- **16-Bit A/D up to 1 GS/s or 12-Bit A/D up to 3 GS/s**
- **Real-Time Signal Recording with Live Monitoring**
- **Playback Viewer with Spectrum Analysis Displays**

MAIN SPECIFICATIONS

Model #	:	**CSE25216**	**CSE50216**
# of Input Channels	:	2	2
Vertical Resolution	:	16-bit	16-bit
Max. Rate per Channel	:	250 MS/s	500 MS/s

ANALOG INPUT CHANNELS

Connectors	:	SMA
Impedance	:	2 x 50 Ω Inputs 2 x 1M Ω Inputs
Coupling	:	DC (standard) or AC (option)
Bandwidth – 50 Ω – DC	:	DC to 300 MHz @ 500 MS/s DC to 150 MHz @ 250 MS/s
Bandwidth – 50 Ω – AC	:	200 kHz to 300 MHz @ 500 MS/s 200 kHz to 150 MHz @ 250 MS/s
Bandwidth – 1M Ω – DC	:	DC to 150 MHz @ 250 / 500 MS/s
Bandwidth – 1M Ω – AC	:	10 Hz to 150 MHz @ 250 / 500 MS/s
Voltage Ranges (software selectable)	:	±100 mV, ±200 mV, ±500 mV, ±1 V, ±2 V, and ±5 V
Flatness – 500 MS/s	:	Within ±0.5 dB of Ideal Response to 250 MHz
Flatness – 250 MS/s	:	Within ±0.5 dB of Ideal Response to 125 MHz
DC Accuracy	:	±1%
DC User Offset (software selectable)	:	Spans Full Scale Input Range (FSIR)
Absolute Max. Input	:	±10 V (over-voltage protection included)

A/D SAMPLING

Rates per Channel (software selectable)	:	500 MS/s, 425 MS/s, 400 MS/s, 375 MS/s, 365 MS/s, 300 MS/s, 260 MS/s, 250 MS/S, 200 MS/s, 185 MS/s, 160 MS/s, 150 MS/s, 125 MS/s, 100 MS/s, 75 MS/s, 50 MS/s, 25 MS/s, 10 MS/s, 5 MS/s, 2 MS/s, 1 MS/s, 500 kS/s, 200 kS/s, 100 kS/s, 50 kS/s, 20 kS/s, 10 kS/s, 5 kS/s, 2 kS/s, 1 kS/s
Rate Accuracy	:	±1 part-per-million (0° to 50° C ambient)

ACQUISITION MEMORY

Acquisition memory size is shared and equally divided among all active input channels (2 or 1).

Standard Size	:	4 GS (8 GB)
Architecture	:	Dual Port
Data Streaming	:	Yes

PERFORMANCE

GaGe high-performance digitizers are also renowned for sustaining the maximum effective number of bits (ENOB) over a wide signal frequency range with quality signal conditioning and signal fidelity features.

Signal Frequency	10 MHz
ENOB	11.8 Bits
SNR	74 dB
THD	-79 dB
SINAD	73 dB
SFDR	86 dB

RMS Noise	:	~0.7 mV RMS

TRIGGERING

Engines	:	2 per Channel, 1 for External Trigger
Source	:	Any Input Channel, External Trigger or Software
Input Combination	:	All Combinations of Sources Logically OR'ed
Slope (software selectable)	:	Positive or Negative
Sensitivity	:	±2% of Full Scale Input Range of Trigger Source. Signal amplitude must be at least 4% of full scale to cause a trigger to occur. Smaller signals are rejected as noise.
Accuracy	:	Less than ±2% of Full Scale for Channel Triggering
Post-Trigger Data	:	32 points minimum. Can be defined with 32 point resolution.
Pre-Trigger Data	:	Up to 128 kS Total

EXTERNAL TRIGGER

Connector	:	SMA
Impedance	:	2k Ω
Coupling	:	AC or DC
Bandwidth	:	>100 MHz
Voltage Range (software selectable)	:	±1 V, ±5 V

TRIGGER OUT

Connector	:	SMA
Impedance	:	50 Ω
Amplitude	:	0 – 1.8 V

CLOCK IN

Connector	:	SMA
Signal Level	:	Minimum 1 V RMS, Maximum 2 V RMS
Impedance	:	50 Ω
Coupling	:	AC
Duty Cycle	:	50% ±5%
Input Modes	:	External Clock or 10 MHz Reference Clock
External Clock Mode Rates – 500 MS/s	:	Minimum 250 MHz, Maximum 500 MHz
External Clock Mode Rates – 250 MS/s	:	Minimum 125MHz, Maximum 250 MHz
External Reference Clock Mode Rate	:	10 MHz ±1000 ppm; the external reference time base is used to synchronize the internal sampling clock.
Variable/Inactive External Clock Mode	:	Supports variable rate k-clocking or inactive external clock, particularly useful for OCT applications.

CLOCK OUT

Connector	:	SMA
Signal Level	:	±750 mV
Impedance	:	50 Ω Compatible
Duty Cycle	:	50% ±10%
Output Modes	:	Maximum Sampling Clock Frequency or 10 MHz Reference Clock
Max. Frequency	:	500 MHz
Min. Frequency	:	250 MHz
10 MHz Reference Clock Mode Rate	:	10 MHz from Internal Reference

TIME-STAMPING

Timing Resolution	:	One Sample Clock Cycle
Counter Rollover	:	>48 Hours Continuous

MULTI-CARD SYSTEMS

Independent	:	Each card operates independently within the system.
Synchronized Cascade	:	Each card operates together as a group by cascading the trigger signal via the Trigger Out. The Clock Out can be similarly cascaded if synchronous clocking is required. This mode has a small constant delay between each channel but requires no external clocking source or RF splitters.
Synchronized Split	:	Each card operates together as a group by splitting the trigger signal to each card's Trigger In using an RF power splitter (not a BNC Tee) and same equal length cables. This can also be done with the External Clock input if synchronous clocking is required. This mode requires more external hardware but provides the best simultaneity between multiple cards.

DIMENSIONS

Size	:	Single Slot PCIe, Full Height, 6.7 in (170.18 mm) Length

POWER CONSUMPTION

Power	:	25 Watts (typical)

PC SYSTEM REQUIREMENTS

PCI Express (PCIe) Slot	:	1 Free Full-Height PCIe x8 or x16 Gen3, Gen2 or Gen1 Slot.
Host System Cooling	:	Provide good cooling air flow for installed RazorPlus Express location with ideally an empty adjacent slot to prevent blockage of card's onboard cooling fan.
Operating System	:	Windows 10/8/7 (64-bit/32-bit) Linux – Requires SDK for C/C# – for Red Hat, CentOS or Ubuntu (Note that other Linux distributions can be supported as well.)

ORDERING INFORMATION

Hardware

Model Number	A/D Resolution	# of Input Channels	Max. Sampling Rate per Channel	Max. Input Bandwidth	Onboard Memory Size	Order Part Number
CSE25216	16-bit	2	250 MS/s	150 MHz	4 GS (8 GB)	RZP-252-016
CSE50216	16-bit	2	500 MS/s	300 MHz	4 GS (8 GB)	RZP-502-016

Front End Options

AC-Coupled Front End Option (Hardware configured at factory.)	RZP-FAC-001

Cable Accessories

Set 1 Cable SMA to BNC	ACC-001-031
Set 4 Cable SMA to BNC	ACC-001-033

eXpert FPGA Firmware Options

eXpert PCIe Data Streaming	STR-181-000
eXpert Signal Averaging	250-181-001
eXpert Fast Fourier Transform (FFT)	250-181-004
eXpert Optical Coherence Tomography (OCT)	250-181-006

GaGeScope Software

GaGeScope: Lite Edition – PC Oscilloscope Software	Included
GaGeScope: Standard Edition – PC Oscilloscope Software	300-100-351
GaGeScope: Professional Edition – PC Oscilloscope Software	300-100-354

DsScope Software

DsScope – Real-Time Streaming Signal Recording Oscilloscope Software	DYN-DSS-000
DsScopeView – Signal Recording Playback Viewer Oscilloscope Software	DYN-DSV-000

Software Development Kits (SDKs)

GaGe SDK Pack (includes C/C#, MATLAB, LabVIEW SDKs)	200-113-000
CompuScope SDK for C/C#	200-200-101
CompuScope SDK for MATLAB	200-200-102
CompuScope SDK for LabVIEW	200-200-103

CompuScope GPU CUDA Processing

CompuScope GPU CUDA Processing Package Includes: • eXpert PCIe Data Streaming Firmware for 1 x Digitizer (STR-181-000) • CompuScope SDK for C/C# (200-200-101) NOTE: GPU Card NOT Included	BDL-GPU-000

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www.gage-applied.com

WARRANTY

Standard two years parts and labor.

Unless otherwise specified, all dynamic performance specs have been qualified on engineering boards. All specifications are subject to change without notice.

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