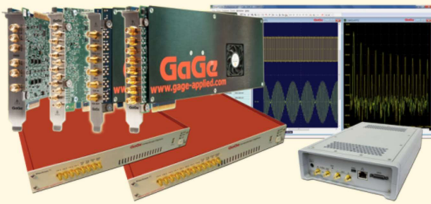


GaGe is a worldwide industry leader in high speed data acquisition solutions featuring a portfolio of the highest performance digitizers, PC oscilloscope software, powerful SDKs for custom application development, and turnkey integrated PC-based measurement systems.



## 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

## 4-Channel 16-Bit PCIe Gen3 RazorMax Express

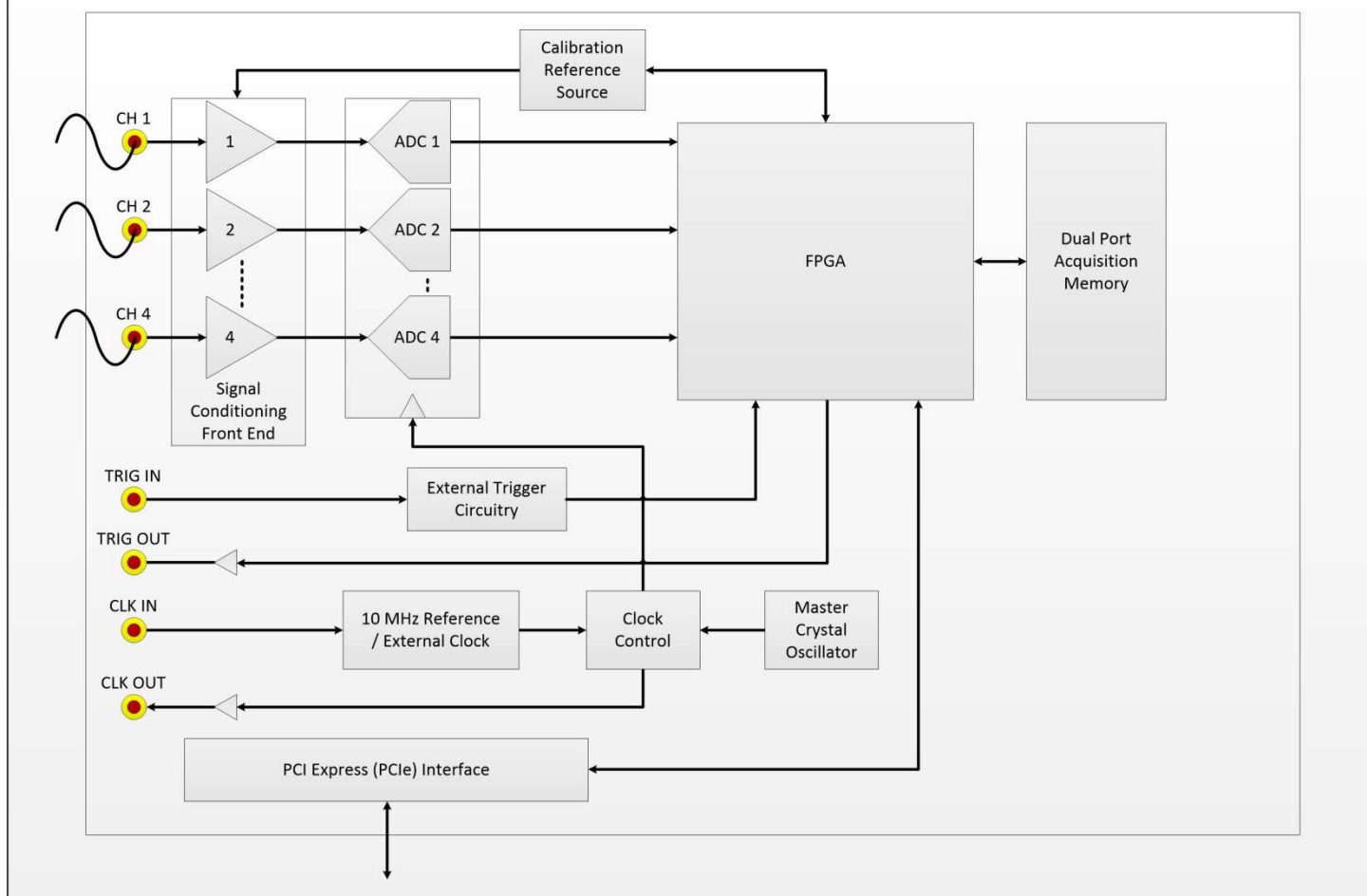
**Unprecedented Speed & Resolution in a 1 GS/s Streaming Digitizer  
700 MHz Bandwidth with Stream Rates at 4+ GB/s**



## FEATURES

- 4 or 2 Digitizing Input Channels
- 1 GS/s or 500 MS/s Maximum Sampling Rate per Channel
- 700 MHz Bandwidth @ 1 GS/s or 350 MHz Bandwidth @ 500 MS/s
- 16-Bit Vertical A/D Resolution
- 4 GS (8 GB) Onboard Sample Memory Standard
- FPGA Based Applications for Real-Time DSP Functions
- Dual Port Memory with Sustained PCIe Data Streaming at 4+ GB/s
- Full-Featured Front-End with DC or AC Coupling and 50  $\Omega$  Inputs
- Software Control of Input Voltage Ranges
- Ease of Integration with External or Reference Clock In & Clock Out
- External Trigger In & Trigger Out
- PCI Express (PCIe) Generation 3.0 x8 Single-Slot Card
- Programming-Free Operation with GaGeScope PC Oscilloscope Software
- Software Development Kits Available for C/C#, LabVIEW and MATLAB
- Windows 10/8/7 and Linux Operating Systems Supported

## RazorMax Express CompuScope Simplified Block Diagram



### MAIN SPECIFICATIONS

Model #	: <u>CSE16502</u>	<u>CSE16504</u>	<u>CSE161G2</u>	<u>CSE161G4</u>
# of Input Channels	: 2	4	2	4
Vertical A/D Resolution	: 16-bit	16-bit	16-bit	16-bit
Max. Rate per Channel	: 500 MS/s	500 MS/s	1 GS/s	1 GS/s

### A/D SAMPLING

Rates per Channel, Model dependent (software selectable)	: 1 GS/s, 875 MS/s, 800 MS/s, 750 MS/s, 650 MS/s, 600 MS/s, 525 MS/s, 500 MS/s, 425 MS/s, 400 MS/s, 375 MS/s, 325 MS/s, 300 MS/s, 250 MS/s, 200 MS/s, 100 MS/s, 50 MS/s, 20 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	: $\pm 1$ part-per-million (0° to 50° C ambient)

### ACQUISITION MEMORY

Acquisition memory size is shared and equally divided among all active input channels (1, 2 or 4).	
Standard Size	: 4 GS (8 GB)
Architecture	: Dual Port
Data Streaming	: Yes

The RazorMax Express can be combined with wideband downconverter models and PC solutions to be the heart of a wideband, multi-channel, RF/Microwave signal analysis and recording system covering frequencies up to 27 GHz.

The PCIe Gen3 x8 digitizer supports sustained stream rates at 4+ GB/s, allowing up to 4 synchronous 160 MHz bandwidth IF channels to be analyzed or recorded.

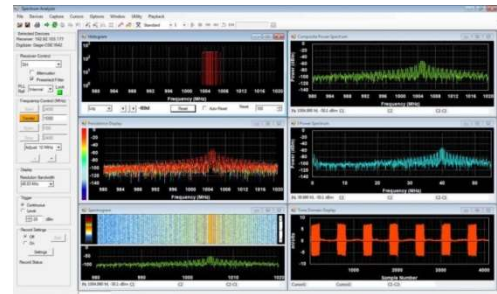
This capability is accomplished using a compact, portable or rackmount PC that contains the digitizer, display, and storage subsystem for recording. The entire solution is integrated and tested for both hardware and software functionality before shipment to customers. The result is a complete turn-key, mouse driven analysis and recording solution, out of the box.

GaGe wideband downconverter systems 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 RazorMax digitizer's 16-bit resolution and variable sample rate up to 1 GS/s.

The 4 channel RazorMax Express models can support 2 downconverters in baseband mode (IQ outputs) or 4 downconverters in superhet mode (IF outputs). 10 MHz reference inputs and outputs on both the digitizers and downconverter units provide a single frequency reference for synchronized system performance.

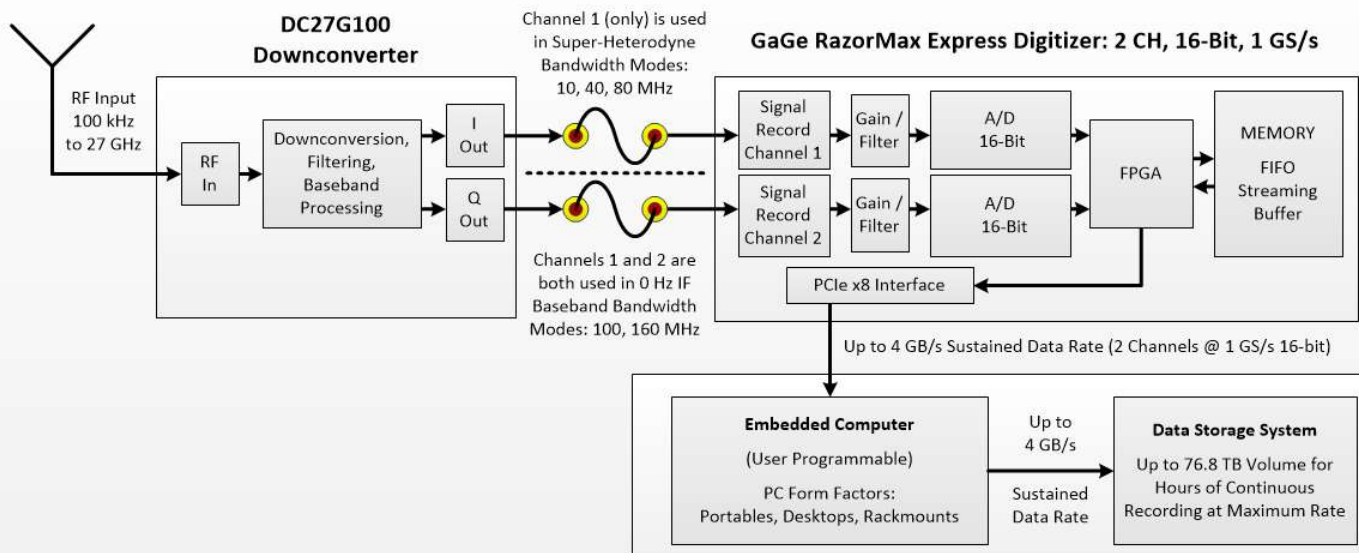
The digitizers and downconverters have full control and data acquisition support via Mathworks MATLAB, with example programs furnished to facilitate rapid signal processing and modulation analysis program development. Additional software SDK and example programs are available for C/C# and LabVIEW.

The DynamicSignals Spectrum Analyzer software, SpectraScopeRT, requires no programming and allows for control of receiver center frequency, bandwidth, plus signal recording, and playback. SpectraScopeRT features real-time FFT power spectrums (with peak hold and persistence), spectrograms, histograms, and time domain displays while recording, and upon recording playback.



SpectraScopeRT also supports dual receiver, double bandwidth operation for both real-time display and gap-free recording. This allows 2 downconverters feeding a single digitizer to display and record parallel side by side bandwidths, effectively doubling the available bandwidth, up to 320 MHz.

## 27 GHz Wideband Signal Analyzer System





### ANALOG INPUT CHANNELS

Connectors	: SMA
Impedance	: 50 $\Omega$
Coupling	: DC (standard) or AC (option)
Analog Bandwidth	: DC to 700 MHz at 1 GS/s Sample Rate DC to 350 MHz at 500 MS/s Sample Rate
Voltage Ranges	: $\pm 200$ mV, $\pm 500$ mV, $\pm 1$ V (software selectable)
DC User Offset	: Spans Full Scale Input Range (FSIR) (software selectable)
Absolute Max. Input	: $\pm 3$ V (over-voltage protection included)

### 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	: Positive or Negative (software selectable)
Sensitivity	: $\pm 5\%$ of Full Scale Input Range of Trigger Source. Signal amplitude must be at least 10% of full scale to cause a trigger to occur. Smaller signals are rejected as noise.
Post-Trigger Data	: 32 points minimum. Can be defined with 32 point resolution.

### EXTERNAL TRIGGER

Connector	: SMA
Impedance	: $\approx 1k \Omega$
Coupling	: AC
Bandwidth	: $>100$ MHz
Voltage Range	: 0-3 V (unipolar)

### TRIGGER OUT

Connector	: SMA
Impedance	: 50 $\Omega$
Amplitude	: 0 – TTL

### CLOCK IN

Connector	: SMA
Signal Level	: Minimum 0.2 V RMS, Maximum 0.5 V RMS
Impedance	: 50 $\Omega$
Coupling	: DC
Duty Cycle	: 50% $\pm 5\%$
Input Modes	: External Clock or 10 MHz Reference Clock
External Clock Mode Rates	: Minimum 250 MHz, Maximum 1 GHz
External Reference Clock Mode Rate	: 10 MHz $\pm 1000$ 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	: 0 – 1.5 V
Impedance	: 50 $\Omega$ Compatible
Duty Cycle	: 50%
Output Modes	: Maximum Sampling Clock Frequency or 10 MHz Reference Clock
Max. Frequency	: 1 GHz
Min. Frequency	: 250 MHz
10 MHz Reference Clock Mode Rate	: 10 MHz from Internal Reference

### MULTIPLE RECORD

Pre-Trigger Data	: Up to FPGA Memory Size
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### TIME-STAMPING

Timing Resolution	: One Sample Clock Cycle
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### MULTI-CARD SYSTEMS

SYNC Card Option	: Provides synchronized clocking and triggering on all channels for up to 5 cards for larger multi-channel systems.
Independent Mode	: Each card operates independently within the system.

### DIMENSIONS

Size	: Single Slot, Full Height, $\frac{3}{4}$ Length
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### POWER CONSUMPTION

Power	: 25 Watts (typical)
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### PC SYSTEM REQUIREMENTS

PCI Express (PCIe) Slot	: 1 Free Full-Height PCIe Gen1, Gen2 or Gen3, x8 or x16 Slot
Operating System	: Windows 10/8/7 (32-bit/64-bit), Linux – Requires SDK for C/C#



## ORDERING INFORMATION

### Hardware

Model Number	A/D Resolution	# of Channels	Max. Sampling Rate per Channel	Input Bandwidth	Memory Size	Order Part Number
CSE16502	16-bit	2	500 MS/s	350 MHz	4 GS (8 GB)	RMX-165-020
CSE16504	16-bit	4	500 MS/s	350 MHz	4 GS (8 GB)	RMX-165-040
CSE161G2	16-bit	2	1 GS/s	700 MHz	4 GS (8 GB)	RMX-161-G20
CSE161G4	16-bit	4	1 GS/s	700 MHz	4 GS (8 GB)	RMX-161-G40

### Front End Options

AC-Coupled Front End Option (Hardware configured at factory.)	RMX-FAC-001
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### 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	Included
GaGeScope: Standard Edition	300-100-351
GaGeScope: Professional Edition	300-100-354

### 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

## WARRANTY

Standard two years parts and labor.

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

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