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**
- RADAR Design and Test
- Signals Intelligence (SIGINT)
- Ultrasonic Non-Destructive Testing
- LIDAR Systems
- Communications
- Spectroscopy
- High-Performance Imaging
- Time of Flight
- Life Sciences
- Particle Physics

**FEATURES**
- 2 or 1 Digitizing Input Channels with 8-Bit Vertical A/D Resolution
- 2 GS/s, 1 GS/s, or 500 MS/s Maximum Sampling Rates
- 20 Software Selectable A/D Sampling Rates from 2 kS/s to 2 GS/s
- 500 MHz Analog Input Bandwidth
- 2 GS (2 GB) Onboard Memory Standard, Expandable up to 16 GS (16 GB)
- Dual Port Memory with Sustained PCIe Data Streaming at 2 GB/s
- Full-Featured Front-End with AC/DC Coupling and 50 Ω Inputs
- Software Control of Input Voltage Ranges and Coupling
- Ease of Integration with External or Reference Clock In & Clock Out
- External Trigger In & Trigger Out with Advanced Triggering Operations
- Synchronized Multi-Card Systems up to 8 Cards for 16 Channels
- Full-Height Full-Length PCI Express (PCIe) Generation 2.0 x8 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
Cobra Express CompuScope Simplified Block Diagram

**MAIN SPECIFICATIONS**

<table>
<thead>
<tr>
<th>Model #</th>
<th>CSE21G8</th>
<th>CSE22G8</th>
</tr>
</thead>
<tbody>
<tr>
<td># of Input Channels</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Vertical A/D Resolution</td>
<td>8-bit</td>
<td>8-bit</td>
</tr>
<tr>
<td>Max. Rate per Channel</td>
<td>1-CH @ 1 GS/s 2-CH @ 500 MS/s</td>
<td>1-CH @ 2 GS/s 2-CH @ 1 GS/s</td>
</tr>
</tbody>
</table>

**DYNAMIC PARAMETER PERFORMANCE**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>CSE21G8</th>
<th>CSE22G8</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENOB</td>
<td>7.4 Bits</td>
<td>7.4 Bits</td>
</tr>
<tr>
<td>SNR</td>
<td>46 dB</td>
<td>46 dB</td>
</tr>
<tr>
<td>THD</td>
<td>-60 dB</td>
<td>-60 dB</td>
</tr>
<tr>
<td>SINAD</td>
<td>46 dB</td>
<td>46 dB</td>
</tr>
<tr>
<td>SFDR</td>
<td>60 dB</td>
<td>60 dB</td>
</tr>
</tbody>
</table>

Dynamic parameter measurements are done by acquiring a high purity 10 MHz sine wave with amplitude of 95% of the input range sampling at 1 GS/s. These measurements were taken on the ±500 mV input range using 50 Ω termination and DC coupling and with applied anti-aliasing filter. Dynamic parameter calculations are done from a 16 kiloSample Fourier Spectrum after applying a 7-term Blackman Harris Windowing Function to the time-domain waveform.

**A/D SAMPLING**

| Rates per Channel, (software selectable) | 2 GS/s, 1 GS/s, 500 MS/s, 250 MS/s, 125 MS/s, 100 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 |
| Rate Accuracy | ±1 part-per-million (0° to 50° C ambient) |

**ACQUISITION MEMORY**

| Standard Size | 2 GS (2 GB) |
| Optional Sizes | 16 GS (16 GB) |
| Architecture | Dual Port |
| Data Streaming | Yes |
### ANALOG INPUT CHANNELS
- **Connectors**: SMA
- **Impedance**: 50 Ω
- **Coupling**: DC or AC (software selectable)
- **Analog Bandwidth**:
  - DC (50 Ω): DC to 500 MHz
  - AC (50 Ω): 20 kHz to 500 MHz
- **Voltage Ranges**: ±50 mV, ±100 mV, ±200 mV, ±500 mV, ±1 V, ±2 V, ±5 V (software selectable)
- **Flatness**: Within ±0.5 dB of ideal response to 100 MHz.
- **DC Accuracy**: ±1% on all input ranges
- **DC User Offset**: ±100 % on all input ranges, except ±5V that is ±20 %
- **Absolute Max. Input**: 6 V RMS on all input ranges, except ±5V that is 8.5V RMS

### LOW-PASS FILTER
- **Type**: 3-pole, 1 per Channel
- **Cut-Off Frequency**: 200 MHz
- **Operation**: Individually Software Selectable

### 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**: ±5% of Full Scale Input Range of Trigger Source. This implies that signal amplitude must be at least 5% of full scale to cause a trigger to occur. Smaller signals are rejected as noise.
- **Accuracy**: Internal: ±2% of Full Scale
  Externally: ±10% of Full Scale
- **Post-Trigger Data**: 64 points minimum. Can be defined with 64 point resolution.

### EXTERNAL TRIGGER
- **Connector**: SMA
- **Impedance**: 2k Ω or 50 Ω
- **Coupling**: AC or DC
- **Bandwidth**: >300 MHz
- **Voltage Range**: ±1 V, ±5 V (software selectable)
- **Amplitude**: Absolute Maximum 6 V RMS

### CLOCK IN
- **Connector**: SMA
- **Signal Level**: Minimum 200 mV RMS, Maximum 500 mV RMS
- **Impedance**: 50 Ω
- **Coupling**: AC
- **Duty Cycle**: 50% ±5%
- **Input Modes**: External Clock or 10 MHz Reference Clock
- **External Clock**: Minimum 200 MHz to Maximum 1 GHz
- **Mode Rates**: External Reference Clock Mode Rate:
  - 10 MHz ±50 ppm; the external reference time base is used to synchronize the internal sampling clock.

### CLOCK OUT
- **Connector**: SMA
- **Signal Level**: ±300 mV
- **Impedance**: 50 Ω
- **Output Modes**: Maximum Sampling Clock Frequency or 10 MHz Reference Clock
- **Max. Frequency**: 1 GHz
- **Min. Frequency**: 10 MHz from External Clock, 200 MHz from Internal Clock

### MULTIPLE RECORD
- **Pre-Trigger Data**: Up to almost full on-board memory
- **Record Length**: 64 points minimum. Can be defined with 64 point resolution.

### TIME-STAMPING
- **Timing Resolution**: One Sample Clock Cycle
- **Counter Turnover**: >24 Hours Continuous

### MULTI-CARD SYSTEMS
- **Master/Slave Mode**: Provides synchronized triggering and sampling on all channels for all cards to create larger multi-channel systems.
- **Independent Mode**: Each card operates independently within the system.
- **Number of Cards**: 2 to 8 Cards for up to 16 Channels Total

### DIMENSIONS
- **Size**: Single Slot, Full Height, Full Length

### POWER CONSUMPTION
- **Power**: 33.8 Watts (typical)

### PC SYSTEM REQUIREMENTS
- **PCI Express (PCIe) Slot**: 1 Free Full-Height Full-Length 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

<table>
<thead>
<tr>
<th>Model Number</th>
<th>A/D Resolution</th>
<th># of Channels</th>
<th>Max. Sampling Rate per Channel</th>
<th>Memory Size</th>
<th>Order Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSE21G8</td>
<td>8-bit</td>
<td>2</td>
<td>1-CH: 1 GS/s 2-CH: 500 MS/s</td>
<td>2 GS (2 GB)</td>
<td>CBE-021-000</td>
</tr>
<tr>
<td>CSE22G8</td>
<td>8-bit</td>
<td>2</td>
<td>1-CH: 2 GS/s 2-CH: 1 GS/s</td>
<td>2 GS (2 GB)</td>
<td>CBE-022-000</td>
</tr>
</tbody>
</table>

### Memory Upgrades

- Memory Upgrade: 2 GS (2 GB) to 4 GS (4 GB) | MEM-181-101
- Memory Upgrade: 2 GS (2 GB) to 8 GS (8 GB) | MEM-181-103
- Memory Upgrade: 2 GS (2 GB) to 16 GS (16 GB) | MEM-181-105

### Cable Accessories

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

### Master/Slave Upgrades

- Master Multi-Card Upgrade | CBE-181-012
- Slave Multi-Card Upgrade | CBE-181-013

### eXpert FPGA Firmware Options

- eXpert PCIe Data Streaming | STR-181-000
- eXpert Signal Averaging | 250-181-001

### 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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