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We offer the widest range of high-speed and high-resolution digitizers available on the market today. Our powerful PC-based instrumentation products allow you to create reliable, flexible and high-performance solutions quickly and easily.

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Communications & wireless
Military & Aerospace
Non-destructive testing
Synthetic instrumentation
Electro-optic
Laser/Radar
High energy physics
Embedded digitizer
Scope replacement

# CompuScope 82GC

## Ultra-fast waveform digitizer card for CompactPCI/PXI bus



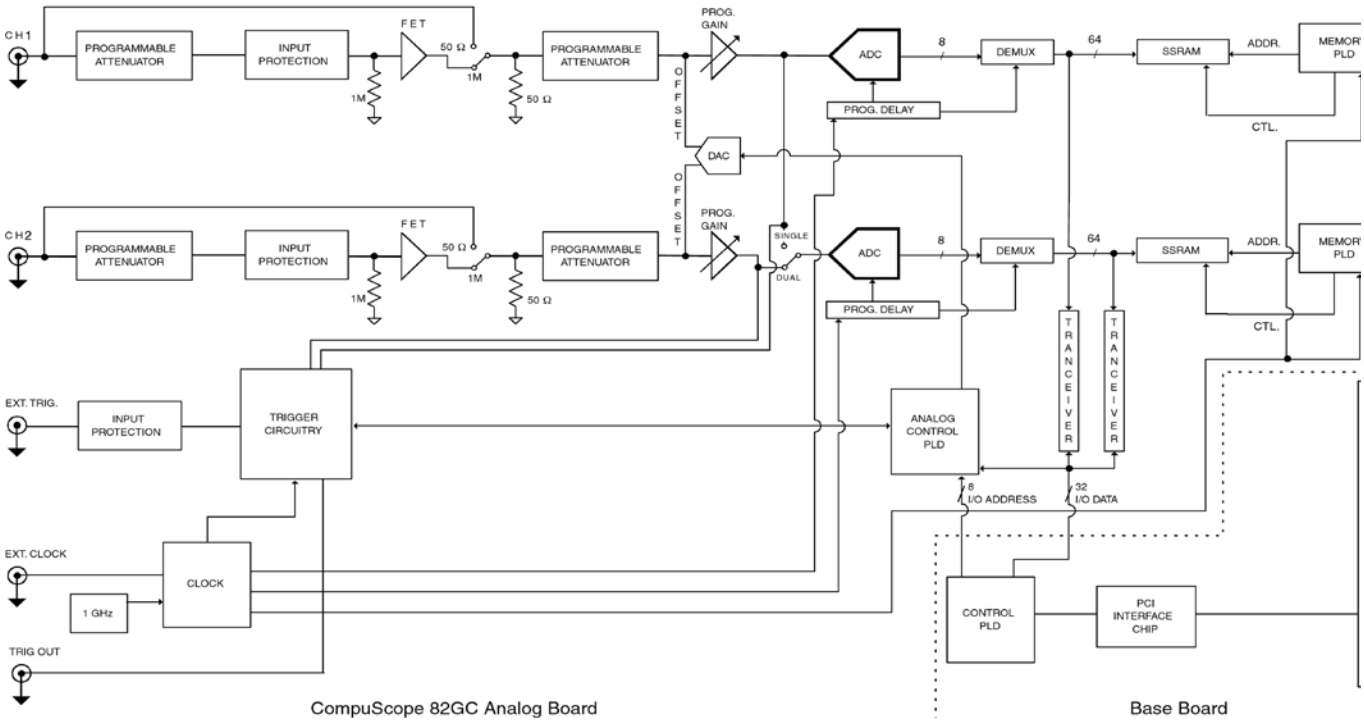
Top performance general-purpose digitizer with the versatility and ease of integration to satisfy the most demanding applications.

## FEATURES

- 2 GS/s A/D sampling
- 8 bit resolution
- Up to 16 MegaSamples acquisition memory
- Up to 1.3 GHz bandwidth
- Multi-card systems of up to 2 channels at 2 GS/s (4 channels at 1 GS/s)
- Pre-Trigger Multiple Record mode
- Fast data transfer rate to system RAM
- Programming-free operation with GageScope® oscilloscope software
- Software Development Kits available for LabVIEW, MATLAB, C/C#


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# CompuScope 82GC Simplified Block Diagram




**COMPUSCOPE 82GC**
CompuScope 82GC is a 6U form factor CompactPCI card that can sample analog signals at speeds up to 2 GS/s with 8 bit resolution and store the data in the on-board memory.

**2 GS/S SAMPLING**
CompuScope 82GC uses two monolithic A/D converters, each running at 1 GS/s, to provide a dual-channel simultaneous sampling rate of 1 GS/s.

In the single-channel mode the two ADCs are clocked in a "ping-pong" mode to achieve up to 2 GS/s sampling. An on-board crystal-controlled timing circuit ensures timebase accuracy and long-term thermal stability.

**HIGH IMMUNITY TO DIGITAL NOISE**
In order to isolate the high-frequency analog circuitry from CompactPCI bus–related digital electronics, a two-board piggy-back configuration is used. This scheme allows maximum separation of analog and digital grounds, thereby providing high immunity to digital noise.

**MEMORY DEPTH**
CompuScope 82GC is available with memory depths of 2 Megasamples, 8 Megasamples and 16 Megasamples (8-bit samples). This memory can be used as a circular buffer for storage of pre- and post-trigger data.

In the single-channel mode, the maximum number of sample points is equal to the memory depth of the CompuScope 82GC model being used, whereas in the dual-channel mode the maximum number of sample points is half the memory depth.

The data stored in the CompuScope 82GC memory can be transferred to the system RAM for post-processing, display or storage to hard disk without any interface bus (no GPIB bus required).

**FAST BUS THROUGHPUT**
The high-speed, 32 bit, bus-mastering interface to the CompactPCI bus allows the data from the on-board memory of the CompuScope 82GC to be transferred to system RAM, or any other CompactPCI destination, at sustained rates of up to 80 MB/s under single-tasking operating systems. Under Windows, this rate depends on the architecture of the user application. Under controlled conditions, it is possible to achieve 80 MB/s transfer speed to the system RAM.

**BUS MASTERING**
CompuScope 82GC is fully capable of becoming a CompactPCI bus master in order to transfer data at the maximum rate of 80 MB/s.

A CompactPCI bus Master is a card which can take control of the bus and transfer data to any CompactPCI target device such as system RAM without any involvement from the CPU.

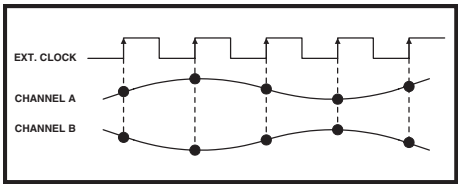
**FLEXIBLE TRIGGERING**
CompuScope 82GC features state-of-the-art analog triggering.

An analog comparator provides triggering from either one of the input channels, or from an external signal or from software.

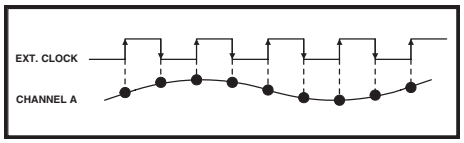
In addition to the trigger source, trigger level and slope are also selectable by software, making the trigger system similar to traditional oscilloscopes.

**EXTERNAL CLOCK**
An external clock input is included as standard on the CS82GC as an SMA input for situations where a special sampling frequency is required.

In dual-channel mode, input signals are sampled at every rising edge of the External Clock.




In single-channel mode, Channel 1 is sampled on rising and falling edge of the External clock. Therefore, the sample rate is double that of the external clock supplied.




The External Clock must be a sine wave with a minimum amplitude of 225 mV RMS and a maximum amplitude of 500 mV RMS.

The allowed external clock frequency range is 10 MHz to 1 GHz.

The duty cycle of the External Clock signal must be 50% ± 5% for single and dual channel modes. Any deviation in the duty cycle will create timing errors in the sampling process

## TRIGGER OUT

CompuScope 82GC provides a TTL output that signifies the occurrence of a trigger event on the card. This signal can be used to synchronize other parts of the measurement system to the CompuScope 82GC.

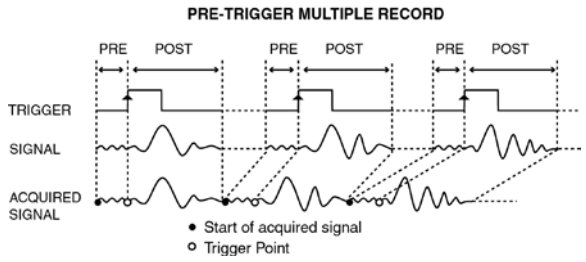
## MULTIPLE RECORD

Even though the CompactPCI bus allows very fast data throughput to system RAM, there may still be applications in which data bursts cannot be off-loaded either because of very fast trigger repeat frequency or because of software limitations.

Multiple Recording allows CompuScope 82GC to capture data on successive triggers and stack it in the on-board memory.

The minimum record size is 256 samples in dual channel mode and 512 samples in single channel mode. CompuScope 82GC models with 16M of acquisition memory provide up to 21,845 records which can be captured in Multiple Record mode.

The CompuScope 82GC is capable of capturing pre-trigger data in Multiple Record Mode. Software can configure the CompuScope 82GC to capture between 0 to 32K points of pre-trigger data.




GageScope Software can display the stacked data as individual acquisitions. Software drivers also provide support for accessing Multiple Record data.

Once the CS82GC has finished capturing a Multiple Record segment, the trigger circuitry is automatically re-armed within 152 sample clock cycles in dual channel mode (304 sample clock cycles in single channel mode) to start looking for the next trigger. No software intervention is required.

Multiple Recording is useful for applications in which a series of bursts of data have to be captured in quick succession and there is not enough time to off-load the data to the system RAM.

Another situation in which Multiple Recording may be used is when data storage has to be optimized. These are cases in which only certain portions of the incoming signal are of interest and data capture during the dead-time between successive portions is not useful.

Examples of these situations are radar pulses, ultrasound data, lightning pulses, imaging signals and explosion testing.

## PROGRAMMABLE INPUT AMPLIFIERS

CompuScope 82GC offers completely programmable input amplifiers, including coupling, impedance, gain and offset.

Each channel is independently programmable, allowing different settings on different channels.

Use of proprietary amplifier circuitry has allowed Gage to provide such optimal performance combined with flexibility, all programmable using high level commands.

## ADVANCED WINDOWS DRIVERS

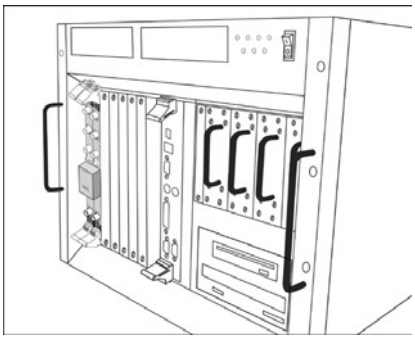
CompuScope 82GC is supported by Gage's advanced, 32 bit Windows drivers which are fully compatible with Windows 98/ME/NT/2000/XP and allow fast data throughput.

With over 30 man-years of register-level programming as well as operating system related coding, these drivers are the most advanced in the industry.

## MULTI-CARD SYSTEMS

One of the most unique features of the CompuScope cards is the Multi-Card system that can be configured.

A Multi-Card system, comprised of one Master and one Slave CS82GC boards can be ordered if the user wants to capture more than two channels with a common clock and trigger.



A board-to-board interconnect is supplied with the system. This interconnect carries all the signals needed for proper synchronization.

The following CompuScope 82GC Master/Slave Sets can be configured:

- 2 Card Master/Slave Set

GageScope software can then display all channels from these boards on the same screen. Software drivers also support such Master/Slave systems.

Another class of Multi-Card systems is the Multiple/Independent type.

A Multiple/Independent system does not have common clock and triggering but can consist of CompuScope boards of different types and memory depths.

## 1-GHz Bandwidth Version of CompuScope 82GC

A version of CompuScope 82GC is available with 1 GHz enhanced bandwidth.

With 1 GHz bandwidth, the CompuScope 82GC widens the precision and range of applications of fast digitizers. The enhanced bandwidth minimizes the distortion of high frequency components, improving the characterization of very fast transients from laser pulses and high-speed electronic signals. While sampling at 2 GS/s, the new CompuScope 82GC-1GHz allows undersampling, all the way up to the Nyquist frequency, of continuous periodic signals to extract important spectral information. A better frequency response also enables more reliable I&Q measurements in communication systems. The CompuScope 82GC is the tool of choice for your critical test and measurements applications.

Internal Triggering is optional for the CompuScope 82GC equiped with the 1 GHz bandwidth.

Some of the standard CompuScope 82G specifications are affected when purchasing the 1-GHz bandwidth version. Please see the detailed specifications below for more information.

### 1-GHz Bandwidth Version

†Specification changes for CS82GC cards featuring 1 GHz bandwidth:

Impedance: 50 Ω

Coupling: DC

Input Voltage Ranges: Single-Channel Mode: ±500 mV
Dual-Channel Mode: ±250 mV

Absolute Maximum Input: ±1 V

Input Protection: Diode Clamped

### Specifications Without Internal Triggering:

Bandwidth (Typical): Single-Channel Mode: 1.3 GHz
Dual-Channel Mode: 1.0 GHz

Typical Dynamic Parameters:
Measured at specified input at 2 GS/s / 1 GS/s (Single / Dual)

| | Single Channel | | Dual Channel | |
|---|---|---|---|---|
| | 15 MHz | 100 MHz | 10 MHz | 100 MHz |
| SNR (dB): | 43 | 42 | 42 | 43 |
| SFDR (dB): | 55 | 55 | 54 | 54 |
| SINAD (dB): | 43 | 43 | 44 | 43 |
| THD (dB): | -56 | -55 | -53 | -52 |
| ENOB (bits): | 6.8 | 6.7 | 7.2 | 7.0 |

### Specifications With Internal Triggering:

Internal Triggering: Optional
(External Triggering functionality is still provided)

Bandwidth (Typical): Single-Channel Mode: 1 GHz
Dual-Channel Mode: 380 MHz

Typical Dynamic Parameters:
Measured at specified input at 2 GS/s / 1 GS/s (Single / Dual)

| | Single Channel | | Dual Channel | |
|---|---|---|---|---|
| | 15 MHz | 100 MHz | 10 MHz | 100 MHz |
| SNR (dB): | 43 | 42 | 44 | 43 |
| SFDR (dB): | 52 | 50 | 53 | 51 |
| SINAD (dB): | 43 | 41 | 44 | 42 |
| THD (dB): | -56 | -52 | -53 | -50 |
| ENOB (bits): | 6.8 | 6.7 | 7.0 | 6.8 |

### SYSTEM REQUIREMENT

CompactPCI PICMG-compliant system with at least one free 6U slot; controller or PC with 128 MB RAM, 50 MB hard disk & SVGA video.

There must be at least 10A of 5V and 3.3A of 3.3V power available for each CS82GC card.

The CompuScope 82GC must be installed in a slot that supports bus mastering to achieve stated performance.

### SIZE

6U CompactPCI: Occupies 1 slot

### POWER (IN WATTS)

| | Worst case | Typical | Power Down |
|---|---|---|---|
| **+5 V** | 50 | 46 | 7 |
| **+12 V** | 5 | 4 | 4 |
| **+3.3 V** | 11 | 10 | 1 |
| **-12 V** | 3 | 3 | 3 |

### CHANNELS 1 & 2

Inputs per card: 2

†Impedance: 1 MΩ, 25 pF or 50 Ω; software-selectable

†Coupling: AC or DC

Resolution: 8 bits

†Typical DC Coupled Bandwidth:

| | 50Ω BW Dual | 50Ω BW Single | 1MΩ BW Dual | 1MΩ BW Single |
|---|---|---|---|---|
| **±100 mV** | N/A | N/A | 250 MHz | 200 MHz |
| **±200 mV** | 250 MHz | 150 MHz | 300 MHz | 200 MHz |
| **±500 mV** | 400 MHz | 300 MHz | 300 MHz | 250 MHz |
| **±1 V** | 400 MHz | 300 MHz | 300 MHz | 250 MHz |
| **±2 V** | 400 MHz | 300 MHz | 300 MHz | 250 MHz |
| **±4 V** | 400 MHz | 300 MHz | N/A | N/A |
| **±5 V** | N/A | N/A | 300 MHz | 250 MHz |
| **±10 V** | N/A | N/A | 300 MHz | 250 MHz |

Lower Frequency Limit, AC Coupled:
1 MΩ Input: 10 Hz
50 Ω Input: 20 kHz

†Input Voltage Ranges:
1 MΩ: ±100 mV, ±200 mV, ±500 mV, ±1 V, ±2 V, ±5 V, ±10 V
50 Ω: ±200 mV, ±500 mV, ±1 V, ±2 V, ±4 V

Absolute Maximum Amplitude:
1 MΩ: ±15 Volts (continuous)
50 Ω: ±5 Volts (continuous)

DC Accuracy relative to full scale input (All ranges): ±2 % of full scale

Sampling Rate
Single-channel Mode (Channel 1 only):
GS/s: 2, 1
MS/s: 500, 250, 200, 100, 40, 20
Dual-Channel Mode (Channels 1 and 2 simultaneously):
GS/s: 1
MS/s: 500, 250, 125, 100, 50, 20, 10, 5, 2, 1
kS/s: 500, 200, 100

†Input Protection:
1 MΩ Impedance: Diode Clamped
50 Ω Impedance: No Protection

Connector: BNC


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## †DYNAMIC PARAMETERS

Measured using a sine wave input at 1 GS/s, dual channel mode with amplitude of 95% of full scale on the ±1 V range with a 50 Ω input. Typical values listed below:

| | 10 MHz Input | 100 MHz Input |
|---|---|---|
| SNR | 45 dB | 43 dB |
| SFDR | 54 dB | 50 dB |
| SINAD | 44 dB | 42 dB |
| THD | -52 dB | -48 dB |
| ENOB | 7.2 bits | 6.85 bits |

## ACQUISITION MEMORY

Data Storage: In on-board memory
Memory Sizes: 2M, 8M, 16M (8 bit samples)
Maximum Memory Depth:
Single-channel: Up to full on-board memory
Dual-Channel: Up to half on-board memory per channel

## †TRIGGERING

Number of Trigger Inputs: 1 per system
Trigger Source: CH 1, CH 2, EXT or Software
Type: Analog triggering
Sensitivity: ± 10% of full scale
Level Accuracy: ± 5% of full scale
Slope: Positive or Negative; software-selectable
Post Trigger Data: 256 *(512)* points min.
Can be defined with a 128 *(256)* point resolution in dual *(single)* channel mode

## EXTERNAL TRIGGER

Impedance: 1 MΩ, 25 pF
Amplitude: Absolute Maximum ±15 V
Voltage Range: ±1 V and ±5 V
Bandwidth: 300 MHz
Coupling: AC or DC
Connector: BNC

## TRIGGER OUTPUT

Signal Type: TTL
Active Edge: Rising (low-to-high)
Synchronization: Synchronized to on-board system clock

## INTERNAL CLOCK

Source: 1 GHz SAW oscillator
Accuracy: ±200 ppm

## EXTERNAL CLOCK

Maximum Frequency: 1 GHz
Minimum Frequency: 10 MHz
Signal Type: Sine Wave
Connector: SMA
Signal Level: MINIMUM 225 mV RMS
MAXIMUM 500 mV RMS
Impedance: 50Ω
Sampling Edge: Single: Rising and Falling
Dual: Rising
Coupling: AC
Duty Cycle: 50% ± 5% Single/Dual

## MULTIPLE RECORD

Pre-trigger Data: Up to 32K points
Record Length: 256 *(512)* points minimum;
Can be defined with a 128 *(256)* point resolution in dual *(single)* channel mode
Maximum # Triggers: 21,845 (with 16M model)
Re-Arm Time: 152 *(304)* sample clock cycles in dual *(single)* channel mode

## MULTI-CARD SYSTEMS

Operating Mode: Master/Slave or Multiple Independent
Number of Cards:
Master/Slave: 2 cards
Multiple/Independent: Limited by backplane
Maximum Number of Channels in Master/Slave Mode: 4 at 1 GS/s
2 at 2 GS/s
Power Required: At least 10A of 5V and 3.3A of 3.3V for each card

## MASTER/SLAVE SYSTEM TRIGGERING

Number of Trigger Inputs: 1 per system
Trigger Source: CH 1, CH 2, EXT or Software (Master Card Only)
Sensitivity: ± 10% of full scale
Level Accuracy: ± 5% of full scale
Trigger Slope: Positive or Negative; software-selectable

## OPERATING SYSTEMS SUPPORTED

Windows 98/ME/NT* CompuScope Driver version 3.60.22
* Version 4, SP3 or higher
Windows 2000**/XP CompuScope Driver version 4.xx.xx
** SP1 or higher

## APPLICATION SOFTWARE

GageScope: Windows-based software for programming-free operation
LITE Edition: Included with purchase, provides basic functionality
Standard Edition: Provides limited functionality of advanced analysis tools, except for Extended Math
Professional Edition: Provides full functionality of all advanced analysis tools

## SOFTWARE DEVELOPMENT KITS (SDK)

CompuScope SDK for C/C# for Windows*
CompuScope SDK for MATLAB for Windows
CompuScope SDK for LabVIEW for Windows

*C/C# SDK is compatible with LabWindows/CVI 7.0+ compiler. Visual Basic.NET support available with purchase of C/C# SDK.

Contact your Gage Sales Agent for information on Linux support.

## ENVIRONMENTAL

Operating Temperature: 5°C to 40°C
Relative Humidity: Less than 80%, non-condensing
Maximum Altitude: 2,000 meters


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## ELECTROMAGNETIC COMPATIBILITY

| | |
|---|---|
| 1 Card: | CE Compliant |
| 2 Card M/S Set: | CE Compliant |

CE Compliant

## WARRANTY

One year parts and labor

Certificate of NIST Traceable Calibration is included.

All specifications subject to change without notice; specifications are not guaranteed under all possible combinations of modes of operation

†These specs differ slightly on the CompuScope 82GC - 1 GHz Bandwidth version. Please refer to the *1 GHz Bandwidth version* section on page 4 of this datasheet for specs on this model.

## ORDERING INFORMATION

| | |
|---|---|
| **Hardware & Upgrades** | |
| CompuScope 82GC - 2M | 782-001-002 |
| CompuScope 82GC - 8M | 782-001-003 |
| CompuScope 82GC - 16M | 782-001-004 |
| Memory Upgrade | Contact Factory |
| CS82G: Master/Slave Mod. Charge | 782-181-005 |
| CS82G: Upgrade to 1GHz Bandwidth | 782-181-006 |
| CS82GC-2M: 2 Card Master/Slave Set | 782-001-010 |
| CS82GC-8M: 2 Card Master/Slave Set | 782-001-020 |
| CS82GC-16M: 2 Card Master/Slave Set | 782-001-030 |
| 1 GHz Bandwidth Models | |
| CS82G-1GHz BW-2M | 782-001-202 |
| CS82G-1GHz BW-8M | 782-001-203 |
| CS82G-1GHz BW-16M | 782-001-204 |
| CS82G-1GHz BW-2M with Internal Trigger | 782-001-205 |
| CS82G-1GHz BW-8M with Internal Trigger | 782-001-206 |
| CS82G-1GHz BW-16M with Internal Trigger | 782-001-207 |
| CS82GC-1GHz-2M: 2 Card Master/Slave Set | 782-001-110 |
| CS82GC-1GHz-8M: 2 Card Master/Slave Set | 782-001-120 |
| CS82GC-1GHz-16M: 2 Card Master/Slave Set | 782-001-130 |
| CS82GC-1GHz-2M: 2 Card Master/Slave Set with Internal Trigger | 782-001-210 |
| CS82GC-1GHz-8M: 2 Card Master/Slave Set with Internal Trigger | 782-001-220 |
| CS82GC-1GHz-16M: 2 Card Master/Slave Set with Internal Trigger | 782-001-230 |
| **GageScope® Software** | |
| GageScope: Lite Edition | Included |
| GageScope: Standard Edition (with Purchase of CompuScope Hardware) | 300-100-351 |
| GageScope: Professional Edition (with Purchase of CompuScope Hardware) | 300-100-354 |
| **Software Development Kits (SDKs)** | |
| Gage SDK Pack on CD | 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 |

*All Upgrades performed at the factory.*

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