

We offer the widest range of high-speed 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.

Reduce development time and costs for testing complex applications such as radar, wireless communications, spectroscopy, etc. by using our GageScope software or SDKs.

APPLICATIONS

Non-destructive testing
Military & Aerospace
Communications & wireless
Electro-optic
Radar
Laser
High energy physics
Embedded digitizer

CompuScope 1610

Ultra-fast waveform digitizer card for PCI bus

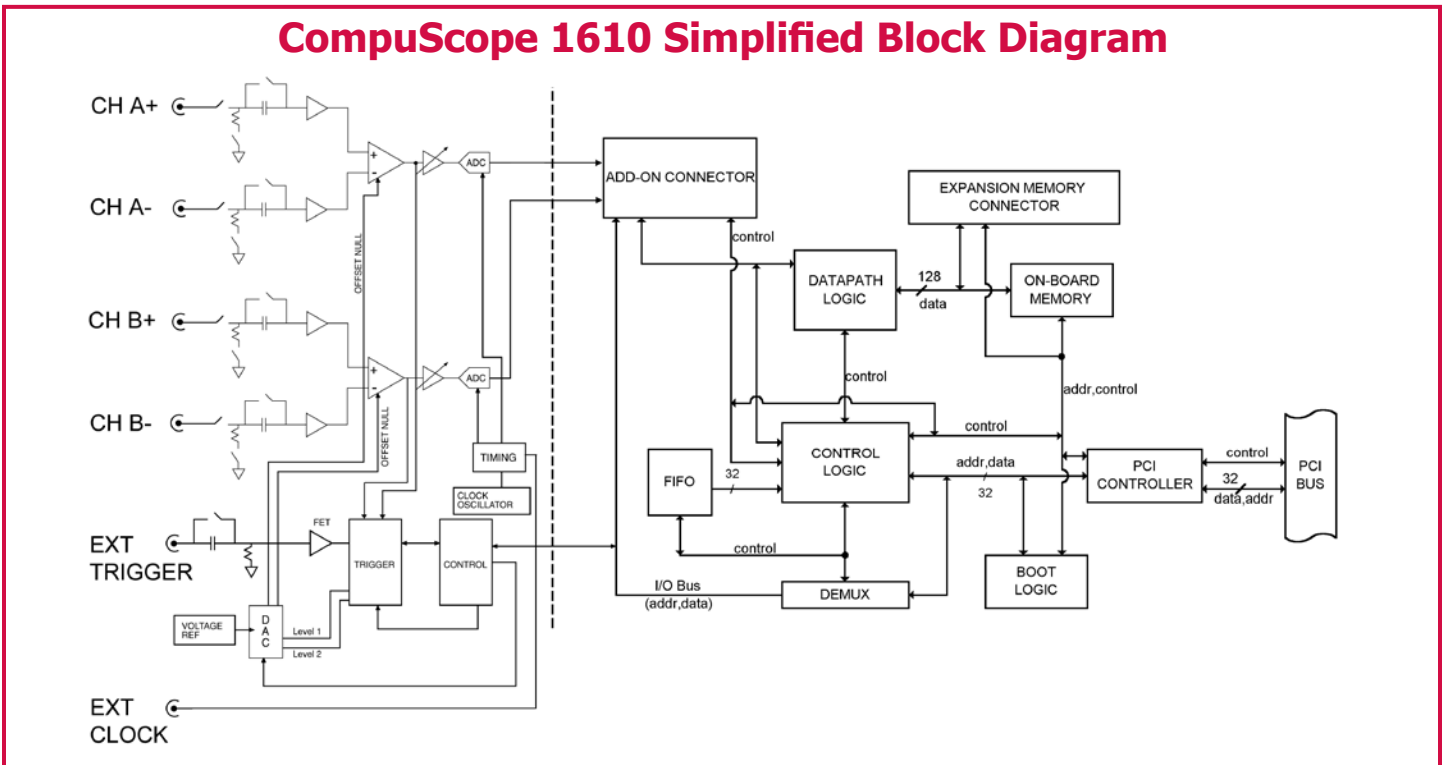


High dynamic performance digitizer for high precision measurements.

FEATURES

- 16 bit, 10 MS/s A/D sampling on two simultaneous channels
- Differential or single-ended inputs
- Up to 1 GigaSample of on-board acquisition memory
- 70 dB signal to noise ratio
- Multi-card systems of up to 16 simultaneous channels at 10 MS/s
- Fast data transfer rate to PC memory
- Programming-free operation with GageScope oscilloscope software
- Software Development Kits available for LabVIEW, MATLAB, C/C#

CompuScope 1610 Simplified Block Diagram



COMPUSCOPE 1610

A CompuScope 1610 card for PCI bus can simultaneously sample two analog signals at speeds up to 10 MS/s with 16 bit resolution and store the data in the on-board memory.

16-BIT, 10 MS/S SAMPLING

CompuScope 1610 uses state-of-the-art data conversion technology to provide dual-channel simultaneous sampling rate of 10 MS/s with 16-bit resolution. Each channel has its own ADC chip, eliminating the need for multiplexing the inputs which invariably results in increased noise and lower performance.

DIFFERENTIAL INPUTS

Differential inputs allow the user to fully exploit the 16-bit A/D of the CompuScope 1610. Differential input circuitry automatically eliminates noise picked up by the signal and its reference. With over 80 dB CMRR (Common Mode Rejection Ratio) for low frequency inputs, differential inputs eliminate any ground loop problems.

Single-ended inputs are also available through a simple software command. This command simply connects the negative input of the differential pair to zero volts, allowing single-ended operation.

HIGH IMMUNITY TO DIGITAL NOISE

In order to isolate the high-frequency analog circuitry from PCI bus-related digital electronics, a two-board piggyback configuration is used.

This scheme allows maximum separation of analog and digital grounds, thereby providing high immunity to digital noise.

MEMORY DEPTH

CompuScope 1610 is available with memory depths of 1M, 8M, 128M, 512M and 1G (16-bit samples). This memory can be used as a circular buffer for storage of pre- and post-trigger data.

The memory is divided equally between the two input channels, i.e. a 1 Meg board provides 512 Ksamples of memory per channel.

The data stored in the CompuScope 1610 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 PCI bus allows the data from the on-board memory of the CompuScope 1610 to be transferred to the system RAM, or any other PCI destination, at sustained rates of up to 50 MB/s under single-tasking operating systems. Under Windows, this rate depends on the architecture of the user application. Under controlled conditions, it is still possible to achieve 50 MB/s recording speed to the system RAM.

BUS MASTERING

CompuScope 1610 is fully capable of becoming a PCI bus master in order to transfer data at the maximum rate of 50 MB/s.

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

FLEXIBLE TRIGGERING

CompuScope 1610 features flexible, oscilloscope-like analog triggering.

An analog comparator provides triggering from any one of the two input channels, 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.

MULTI-CHANNEL TRIGGERING

A very unique feature of CompuScope 1610 trigger system is the ability to trigger a multi-card Master/Slave system from any one of the input channels.

For example, in a 16 channel system, consisting of 8 Master/Slave CompuScope 1610 cards, the user can set the trigger conditions to be such that the system trigger from any channel.

Trigger level and slope can be defined independently for each channel. This capability is very powerful for applications in which the trigger signal can come from any one of the sensors being used. Examples are explosion test, material stress analysis, high energy particle detection, etc.

BUILT-IN DECIMATION FILTER

CompuScope 1610 uses a unique architecture to provide 16-bit resolution.

The input signal is over-sampled by a factor of 2 and the resulting data stream is fed into an on-chip decimation filter and error-correction circuitry which enhances the effective resolution and dynamic range by eliminating high frequency noise and by providing the lower order bits of the digital output.

EXTERNAL CLOCK

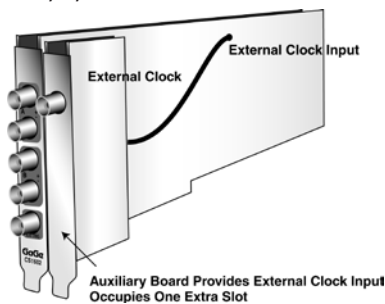
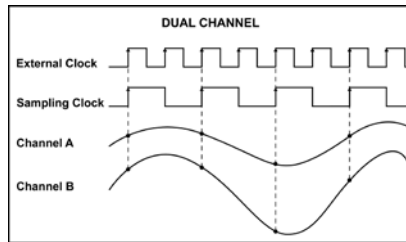
External clock is a standard feature on the CompuScope 1610. This feature is useful when A/D sampling must be done coherently with the rest of the system.

It is important to note, however, that the external clock must be 2 times faster than the required sample rate, i.e. if 1 MS/s sampling is required, the external clock must be 2 MHz.

The External Clock must be a TTL signal with a maximum frequency of 20 MHz and minimum frequency of 2 kHz.

It is very important to maintain the duty cycle of the external clock of 50% ± 5%. Failure to supply a clock with duty cycle in this range can result in invalid data.

The external clock is provided through a BNC connector which is housed on an auxiliary board attached to the CompuScope 1610 via a cable. The auxiliary board occupies an additional slot adjacent to the CS1610.



MULTIPLE RECORD

Even though the PCI 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 1610 to capture data on successive triggers and stack it in the on-board memory. Up to 4,194,304 triggers can be captured in multiple record mode.

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

Once the CompuScope 1610 has finished capturing a Multiple Record segment, the trigger circuitry is automatically re-armed within 5 sample clock cycles 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 PC memory.

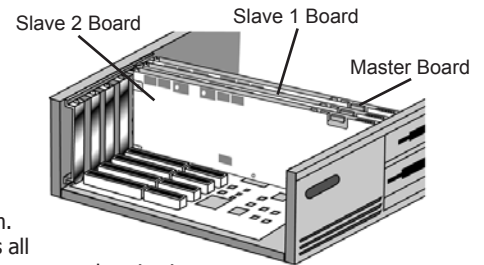
Another situation in which Multiple Recording may be used is when data storage has to be optimized. These are cases in which only certain portions of the incoming signal are of interest and data capture during the dead-time between successive portions is not useful.

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

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 up to 7 Slave CS1610 boards, can be ordered from the factory 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 Master/Slave systems can be configured.

- For 1M Memory Models: 2, 4, 6 or 8 cards can be configured
- For 8M Memory Models: 2, 3 or 4 cards can be configured
- For 128M and higher Memory Models: 2 or 3 cards can be configured

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

SYSTEM REQUIREMENT

PCI-based computer with at least one free full length PCI slot, 128 MB RAM, 50 MB hard disk and SVGA video.

SIZE

Plugs into one full length PCI Slot, 13 inch x 4.1 inch. External Clock is supplied on an Auxiliary board, which plugs into an adjacent PCI slot and connects to the CS1610 card using the cable supplied with it.

| Memory Depth | Independent or Master Card | Slave Card |
|----------------|----------------------------|----------------------|
| 1M | 2 slots | 1 slots |
| 8M | 3 slots | 2 slots |
| 128M, 512M, 1G | 4 [†] slots | 3 [*] slots |

[†]Contact factory for optional 3-slot deep memory solution for master or independent cards.

^{*}Contact factory for optional 2-slot deep memory solution for slave cards.

POWER (IN WATTS)

| +5 V | | |
|--------------|------------|---------|
| Memory Depth | Worst case | Typical |
| 1M | 25.0 | 17.5 |
| 8M | 28.0 | 20.5 |
| 128M | 32.5 | 23.5 |
| 512M | 32.5 | 23.5 |
| 1G | 32.5 | 23.5 |

Note: Power connector on 128M, 512M and 1 G models must be connected using a Y-cable



CHANNELS A & B

| | |
|---|--|
| Inputs per card: | 2 differential inputs |
| Impedance: | 1 M Ω , 35 pF or 50 Ω ; software-selectable |
| Coupling: | AC or DC |
| Resolution: | 16 bits |
| A/D Type: | Monolithic, 16-bit oversampling with decimation filter |
| Analog Bandwidth: | DC to 4 MHz (DC) 10 Hz to 4 MHz (AC) DSP FIR filter limits the signal bandwidth to Nyquist Frequency |
| Single-Ended Input Voltage Range: | ± 500 mV, ± 1 V, ± 2 V, ± 5 V, ± 10 V |
| Common Mode Input Voltage: | ± 7.5 V (DC + peak AC), maximum |
| Common Mode Rejection Ratio: | 80 dB at 60 Hz |
| Absolute Maximum Amplitude: | |
| 1 M Ω Impedance: | ± 15 Volts (continuous) |
| 50 Ω Impedance: | ± 5 Volts (continuous) ± 15 Volts (for 1 ms duration) |
| DC Accuracy relative to full scale input: | $\pm 0.5\%$ of full scale |
| Sampling Rate: | MS/s: 10, 5, 2.5, 1 kS/s: 500, 200, 100, 50, 20, 10, 5, 2, 1 |
| Protection: | |
| 1 M Ω Impedance: | Diode Clamped |
| 50 Ω Impedance: | No protection |
| Connector: | 2 BNCs per input |

DYNAMIC PARAMETERS

Measured using 1 MHz sine wave input at 10 MS/s with amplitude of 95% of full scale on the ± 1 V range. Typical values listed below.

| | |
|--------|------------|
| SNR: | 70 dB |
| SFDR: | 71 dB |
| SINAD: | 66 dB |
| THD: | -68 dB |
| ENOB: | 11.15 bits |

ACQUISITION MEMORY

| | |
|----------------|---|
| Data Storage: | In on-board memory |
| Memory Sizes: | 1M, 8M, 128M, 512M, 1G (16-bit samples) |
| Maximum Depth: | Up to half on-board memory per channel |

TRIGGERING

| | |
|---------------------------|--|
| Number of Trigger Inputs: | 2 per card |
| Trigger Source: | CH A, CH B, EXT or Software |
| Input combination: | Wired-OR |
| Type: | Analog triggering |
| Sensitivity: | $\pm 20\%$ of full scale |
| Level Accuracy: | $\pm 10\%$ of full scale |
| Slope: | Positive or Negative; software-selectable |
| Post Trigger Data: | 64 points minimum in single record acquisition 128 points minimum in multiple record acquisition. Can be defined with a 64 point resolution. |

EXTERNAL TRIGGER

| | |
|-------------|-----------------------------|
| Impedance: | 1 M Ω , 30 pF |
| Input Type: | Single-ended analog |
| Amplitude: | Absolute Maximum ± 15 V |

| | |
|----------------|-------------------------|
| Voltage Range: | ± 1 V and ± 5 V |
| Bandwidth: | 10 MHz |
| Connector: | BNC |

INTERNAL CLOCK

| | |
|-----------|---------------------------|
| Source: | 20 MHz Clock Oscillator |
| Accuracy: | ± 50 ppm (0 to 70° C) |

EXTERNAL CLOCK

| | |
|------------------------|--|
| Maximum Frequency: | 20 MHz, maximum using 2x decimation filter (10 MS/s). |
| Minimum Frequency: | 2 kHz |
| Signal Level: | TTL |
| Termination Impedance: | 50 Ω |
| Required Duty Cycle: | 50% $\pm 5\%$, -0% at 20 MHz |
| Coupling: | DC |

MULTIPLE RECORD

| | |
|-----------------------------|---|
| Pre-Trigger Data: | None |
| Record Length: | 128 points minimum. Can be defined with a 64 point resolution. |
| Maximum Number of Triggers: | 4,194,304 |

MULTI-CARD SYSTEMS

| | |
|--|--------------------------------------|
| Operating Modes: | Master/Slave or Multiple Independent |
| Number of Cards in: | |
| Master/Slave Mode: | |
| 1M models: | 2, 4, 6 or 8 cards |
| 8M models: | 2, 3 or 4 cards |
| 128M, 512M & 1G models: | 2 or 3 cards |
| Multiple Independent Mode: | Limited by backplane |
| Maximum Number of Channels in Master/Slave Mode: | 16 at 10 MS/s (1M models) |

MASTER/SLAVE SYSTEM TRIGGERING

| | |
|---------------------------|---|
| Number of Trigger Inputs: | 2 per card |
| Trigger Source: | Ch A, Ch B, EXT or Software |
| Input Combination: | Wired OR |
| Sensitivity: | $\pm 20\%$ of full scale |
| Level Accuracy: | $\pm 10\%$ of full scale |
| Slope: | Positive or Negative; Software-selectable |

PCI BUS INTERFACE

| | |
|----------------|---------------------------|
| Plug-&-Play: | Fully supported |
| Bus Width: | 32 bits |
| Bus Speed: | 33 MHz |
| Compatibility: | 5 Volt PCI-compliant slot |

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

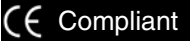
*C/C# SDK is compatible with LabWindows/CVI 7.0+ compiler. Visual Basic.NET support available with purchase of C/C# SDK.

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

ELECTROMAGNETIC COMPATIBILITY

EC Council Directive 89/336/EEC 

- EN 61326 Class A
- IEC 61000-4-2 Electrostatic Discharge (Performance Criterion B)
- IEC 61000-4-3 RF Electromagnetic Field (Performance Criterion A)
- IEC 61000-4-4 Electrical Fast Transient/Burst (Performance Criterion B)
- IEC 61000-4-5 Power Surge (Performance Criterion B)
- IEC 61000-4-6 Conducted RF (Performance Criterion A)
- IEC 61000-4-11 Voltage Dips and Interruptions (Performance Criterion B)
- EN 61000-3-2 AC Power Line Harmonics Emissions

AS/NZS 2064
Australian emissions standard for Industrial, Scientific and Medical Equipment
Compliance demonstrated on a single card configuration

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.

ORDERING INFORMATION

Hardware & Upgrades

| | |
|---------------------------|-----------------|
| CompuScope 1610-1M | 161-001-002 |
| CompuScope 1610-8M | 161-001-003 |
| CompuScope 1610-128M | 161-001-004 |
| CompuScope 1610-512M | 161-001-005 |
| CompuScope 1610-1G | 161-001-006 |
| CS1610 Memory Upgrades | Contact Factory |
| Master Multi-Card Upgrade | 161-181-002 |
| Slave Multi-Card Upgrade | 161-181-003 |

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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www.gage-applied.com

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