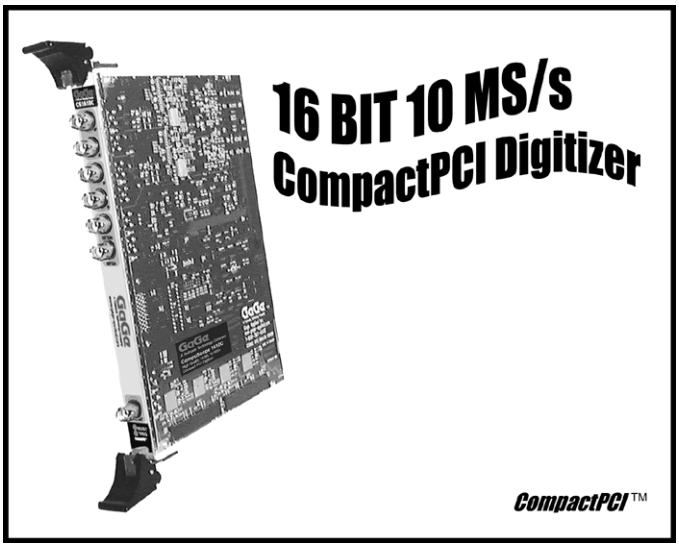
CompuScope 1610C

Ultra-fast high resolution digitizer card for CompactPCI/PXI bus



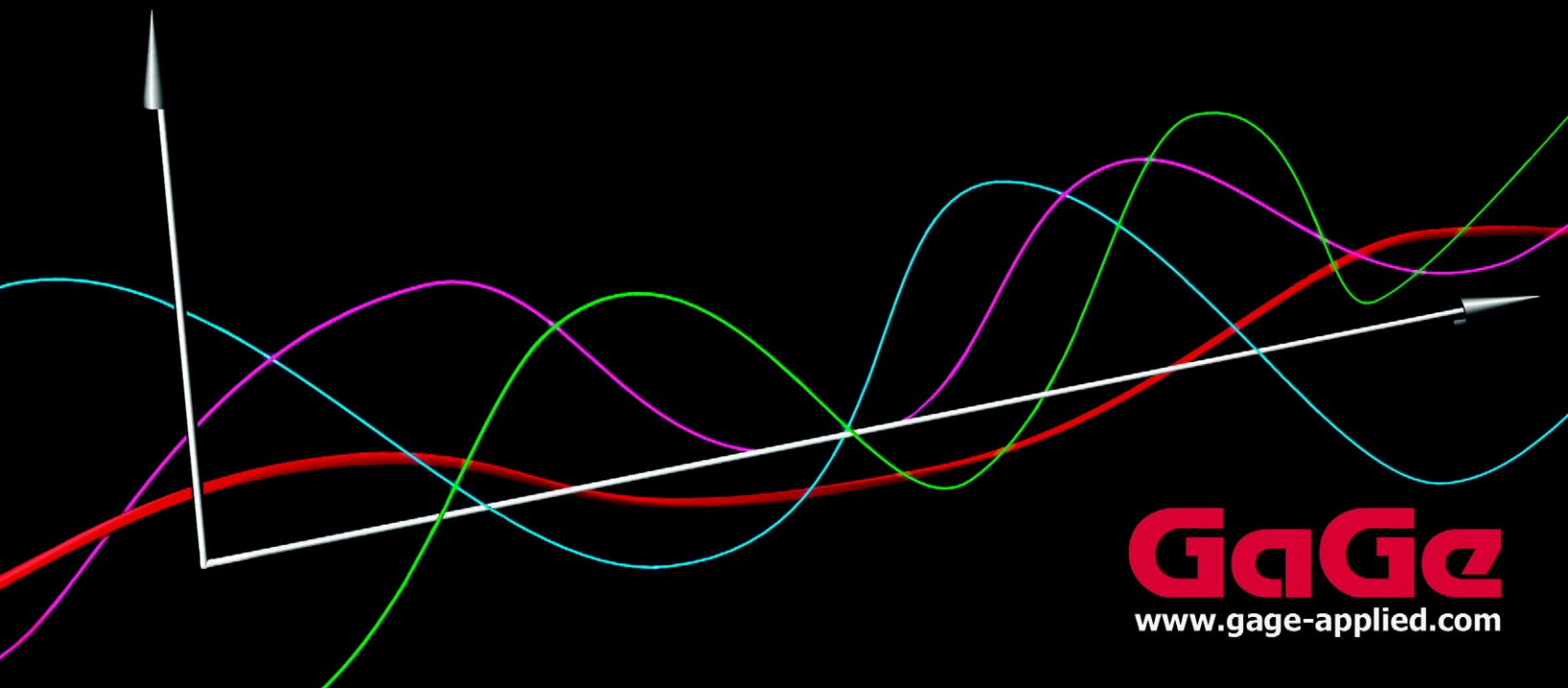
High dynamic performance digitizer for high precision measurements.

FEATURES

- 16 bit, 10 MS/s A/D on two simultaneous channels
- Differential or single-ended inputs
- Up to 1 GigaSample acquisition memory
- 70 dB SNR
- Multi-card systems of up to 16 simultaneous channels at 10 MS/s
- Fast data transfer rate to system RAM
- GageScope compatible
- SDKs for C/C++, MATLAB, LabVIEW & LabWindows/CVI under Win 95/ 98/ME and Win NT/2000/XP

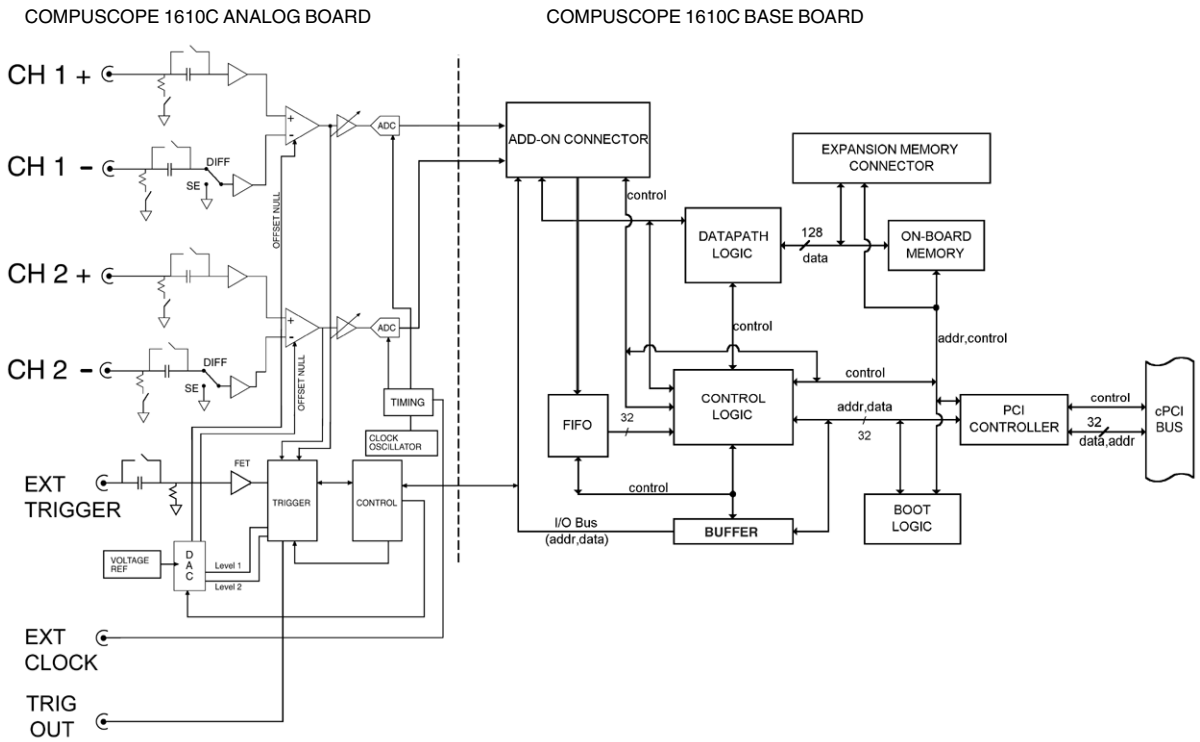
APPLICATIONS

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



GaGe
www.gage-applied.com

CompuScope 1610C Simplified Block Diagram



COMPUSCOPE 1610C

CompuScope 1610C is a 6U form factor CompactPCI card that 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 1610C 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 1610C. 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 CompactPCI 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 1610C is available with memory depth of 1 Megasample, 8 Megasamples, 128 Megasamples and 1 Gigasample (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 Msample board provides 512 Ksamples of memory per channel.

The data stored in the CompuScope 1610C 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 DATA THROUGHPUT

The high-speed, 32 bit, bus-mastering interface to the CompactPCI bus allows the data from the on-board memory of the CompuScope 1610C to be transferred to system RAM, or any other CompactPCI destination, at sustained rates of 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 transfer speed to the system RAM.

BUS MASTERING

CompuScope 1610C is fully capable of becoming a CompactPCI bus master in order to transfer data at rates of 50 MB/s from the 2 input channels.

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 1610C 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 1610C 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 1610C

cards, the user can set the trigger conditions to be such that the system can 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

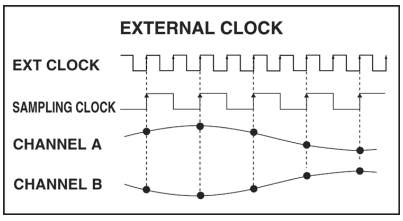
CompuScope 1610C uses a unique architecture to provide 16 bit resolution.

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 1610C. This feature is useful if 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 in the range of 50% to 55%. Failure to supply a clock with duty cycle in this range can result in invalid data.

TRIGGER OUT

CompuScope 1610C provides a TTL output that signifies the occurance of a trigger event on the card. This signal can be used to synchronize other parts of the measurement system to the CompuScope 1610C.

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 1610C to capture data on successive triggers and stack it in the on-board memory.

It should be noted that only post-trigger data 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 1610C has finished capturing a Multiple Record segment, the trigger circuitry is automatically re-armed within 16 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 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.

ORDERING INFORMATION

Hardware

CompuScope 1610C-1M	761-001-002
CompuScope 1610C-8M	761-001-003
CompuScope 1610C-128M	761-001-004
CompuScope 1610C-1G	761-001-006
CS1610C-1M: 2 Card Master/Slave Set	761-001-010
CS1610C-1M: 4 Card Master/Slave Set	761-001-011
CS1610C-1M: 6 Card Master/Slave Set	761-001-012
CS1610C-1M: 8 Card Master/Slave Set	761-001-013
CS1610C-8M: 2 Card Master/Slave Set	761-001-020
CS1610C-8M: 3 Card Master/Slave Set	761-001-021
CS1610C-8M: 4 Card Master/Slave Set	761-001-022
CS1610C: Memory Upgrade Charge	761-181-004

GageScope Software

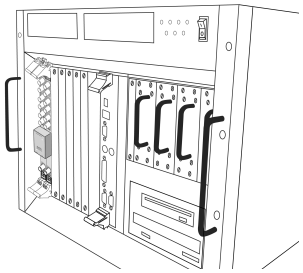
GageScope: Lite Edition	Included
GageScope: Standard Edition with purchase of hardware	300-100-351
GageScope: Standard Edition purchased independently	300-100-352
GageScope: Professional Edition with purchase of hardware	300-100-354
GageScope: Professional Edition purchased independently	300-100-355

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
CompuScope SDK for LabWindows/CVI	200-200-103

All Upgrades performed at the factory.

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 CS1610C 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 CompuScope 1610C-1M Master/Slave Sets can be configured:

- 2 Card Master/Slave Set
- 4 Card Master/Slave Set
- 6 Card Master/Slave Set
- 8 Card Master/Slave Set

The following CompuScope 1610C-8M Master/Slave Sets can be configured:

- 2 Card Master/Slave Set
- 3 Card Master/Slave Set
- 4 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.

COMPUSCOPE 1610C SPECIFICATIONS

SYSTEM REQUIREMENT

CompactPCI-based computer with the required number of free 6U slot, 128 MB RAM, 50 MB hard disk and SVGA video.

The CompuScope 1610C must be installed in a slot that supports bus mastering to achieve stated performance.

SIZE

6U CompactPCI

1M Memory:	Occupies 1 Slot
8M Memory:	Occupies 2 Slots
128M Memory:	Occupies 2 Slots
1G Memory:	Occupies 2 Slots

POWER (IN WATTS)

5 V		
	Worst	Typical
All Memory Models	25	17.5

CHANNELS 1 & 2

Inputs per card: 2 differential inputs

Impedance: 1 MΩ, 35 pF or 50 Ω, software selectable

Coupling: AC or DC

Resolution: 16 bits

A/D Type: Monolithic, 16 bit over sampling 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

Full Scale Single-Ended Input Range: ±500mV, ±1V, ±2V, ±5V, ±10V

Common Mode Input Voltage: ±7.5 Volts (DC + peak AC), maximum

Common Mode Rejection Ratio: 80 dB at 60 Hz

Absolute Max. Amplitude: 1 MΩ Impedance: ±15 Volts (continuous) 50 Ω Impedance: ±5 Volts (continuous) ±15 Volts (for 1 ms duration)

DC Accuracy relative to full scale input: 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: Diode Clamped

Connector: 2 BNCs per channel

DYNAMIC PARAMETERS

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

SNR:	70 dB
SFDR:	71 dB
SINAD:	66 dB
THD:	-68 dB
ENOB:	11.5 bits

ACQUISITION MEMORY

Data Storage: In on-board memory

Memory Sizes: 1M , 8M, 128M, 1G (16 bit samples)

Maximum memory for each channel: Up to half on-board memory per channel

TRIGGERING

of Trigger Inputs: 2 per card

Source: CH 1, CH 2, EXT or Software

Type: Analog triggering

Sensitivity: ± 20% of full scale

Level Accuracy: ± 10% of full scale

Slope: Positive or Negative, software selectable

Post Trigger Data: 128 points minimum. Can be defined with a 64 point resolution

EXTERNAL TRIGGER

Impedance: 1 MΩ, 30 pF

Input Type: Single-ended analog

Amplitude: Absolute Max ±15V

Voltage Range: ±1V and ±5V

Bandwidth: 10 MHz

Connector: BNC

TRIGGER OUTPUT

Signal Type: TTL

Active Edge: Rising (low-to-high)

Synchronization: Synchronized to sampling clock

INTERNAL CLOCK

Source: Clock oscillator

Accuracy: ±50 ppm (0 to 70 deg C)

EXTERNAL CLOCK

Max. Freq.: 20 MHz, maximum using 2x decimation filter. Clock must be present during initialization

Min. Freq.: 2 kHz

Signal Level: TTL

Required Duty Cycle: 50% +5% at 20 MHz

MULTIPLE RECORD

Record Length: 256 points minimum can be defined with a 64 point resolution

MULTI-CARD SYSTEMS

Operating Mode: Master/Slave or Multiple/Independent

Number of Cards:

Master/Slave: 2, 4, 6 or 8 cards for 1M memory models 2, 3 or 4 cards for 8M memory models

Multiple/Ind: Limited by backplane

Max. # Channels in Master/Slave Mode: 16 at 10 MS/s

MASTER/SLAVE SYSTEM TRIGGERING

Number of Trigger Inputs: 2 per card

Source for each input: CH 1, CH 2, EXT or Software

Combination of all inputs: Wired OR

Sensitivity for each input: ± 20% of full scale

Level Accuracy for each input: ± 5% of full scale

Slope for each input: Positive or Negative, software selectable

OPERATING SYSTEMS SUPPORTED

Windows 95/98/ME/NT*/2000/XP

*Version 4, SP3 or higher

ELECTROMAGNETIC COMPATIBILITY

CE Compliant

The following CS1610C configurations have been tested for CE Compliance:

For 1M memory models:

1 Card Independent: CE Compliant

2 & 4 Card M/S Set: CE Compliant

6 & 8 Card M/S Set: Contact Gage for details

For 8M memory models:

1 Card Independent: CE Compliant

2 Card M/S Sets: CE Compliant

3 & 4 Card M/S Set: Contact Gage for details

For Extreme memory models (128M & more): Contact Gage for details

MATERIALS SUPPLIED

One CompuScope 1610C card

One Hardware Manual

One Gage Software Disk on CD

One GageScope Lite Edition Software

WARRANTY

One year parts and labor

All specifications subject to change without notice

Specification Last Updated: February 2004