CompuScope 14105 Comm Analyzer product introduction

The CompuScope 14105 Comm Analyzer is a 14 bit, 105 MS/s dual channel waveform digitizer card for the PCI Bus. It was designed specifically for Communications and Signal Intelligence applications.

The CompuScope 14105 Comm Analyzer has several key features:

- High Resolution
  The CompuScope 14105 Comm Analyzer has a nominal resolution of 14 bits.
- Input Coupling
  The CompuScope 14105 Comm Analyzer is equipped with transformer-coupled inputs which provide a unique 50 Ohm impedance AC input range of 0.5 V RMS.
- Frequency Response
  The CompuScope 14105 Comm Analyzer was designed to make precise In-Phase & Quadrature (I&Q) measurements for which phase distortions, introduced by the sampling as well as by the timing between the two channels, must be kept to a minimum.

  Much effort has gone into synchronizing the two channels and making the frequency response constant within 1 dB up to 100 MHz signal frequency.
- 2 synchronous channels at maximum sampling speed of 105 MS/s.
- Up to a total of 2 billion samples of on-board acquisition memory in a single full-length PCI slot format.
- Data transfer rates from CompuScope memory to PC memory as high as 200 MB/s through Bus Mastering on 66 MHz, 32 bit PCI bus.
- 180 kHz to 230 MHz bandwidth for communication applications.
- Ease of integration with External Clock In and Out, External Trigger In and Out.
- Ease of system development with Software Development Kits (SDKs) for C/C#, MATLAB, and LabVIEW. Operation under Visual Basic.NET and LabWindows/CVI is also possible from the C/C# Software Development Kit.
- Pre-Trigger Multiple Record functionality, which help optimize the use of the on-board memory by stacking data from successive acquisitions.
- Time-stamping acquired records using an on-board 44 bit counter that is clocked by a 66 MHz crystal oscillator. This is particularly useful in Multiple Record mode. Optionally, the time-stamp counter can use the sample clock as its reference.
- On-board Phase Lock Loop (PLL) circuitry allows an external 10 MHz clock reference to synchronize the on-board oscillator to provide the sampling clock signal.

CompuScope 14105 Comm Analyzer connectors and headers

CompuScope cards connect to the outside world through connectors, both analog (SMAs or BNCs) and digital (PCI bus). This section describes these connectors for the CS14105 Comm Analyzer card.

The connectors and headers on the CS14105 Comm Analyzer card are shown below:

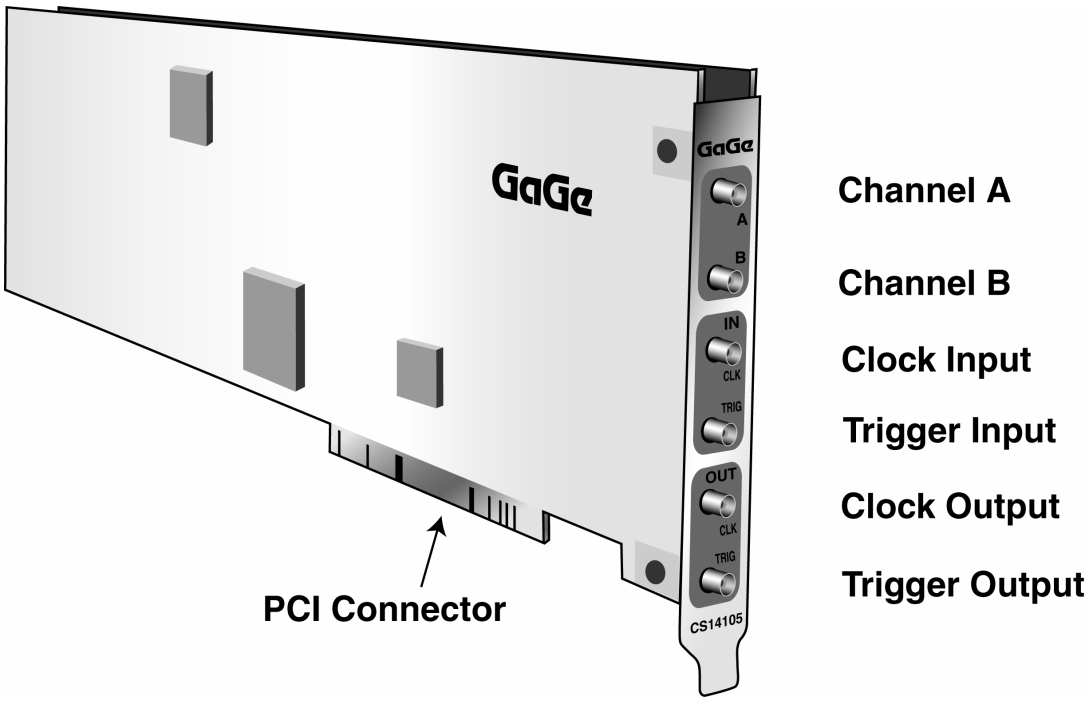

Figure 1: Connectors on CS14105 Comm Analyzer

- **Channel A SMA** connector is the single-ended signal input for Channel 1.
- **Channel B SMA** connector is the single-ended signal input for Channel 2.
- **Clock Input SMA** connector is used to input a signal to be used as the sampling clock. This signal is referred to as the External Clock signal.
- **Trigger Input SMA** connector is used to input a signal that is used as an External Trigger. External Trigger is defined exactly as in an oscilloscope. This signal can be used to trigger the system but cannot be viewed or digitized.
- **Clock Output SMA** connector is used to supply the clock signal, either from the internal oscillator or from the External Clock Input, to another module of the test system or experimental setup. The characteristics of the Output are detailed in the Specifications section.
- **Trigger Output SMA** connector is used to supply a trigger signal generated by the card to another module of the test system or experimental setup.

CompuScope 14105 Comm Analyzer frequency response

The inputs of the CS14105 are transformer coupled directly to their ADC chips. The input transformer attenuates both high and low frequency signal components. The CS14105 is, therefore, unlike most CompuScope cards, which provide a flat response at low frequencies all the way down to DC. Without input gain amplifiers, the CS14105 only has a single input range. For Communications and Signal Intelligence applications, however, low frequency response and flexible signal amplification are rarely necessary. The overwhelming advantage of transformer coupling is its superior performance as a method of transforming the single-ended input signals into the differential signals required by high-performance ADCs. Compared with solid-state single-ended to differential conversion circuitry, the transformer adds far less noise and distortion to the signal. With its high roll-off frequency of over 250 MHz, the CS14105 therefore is the ideal digitizer for the acquisition of high-speed communication signals.

Since it is designed to provide the input signals almost directly to the on-board ADCs, the CompuScope 14105 Comm Analyzer does not have the on-board auto-calibration circuitry of other GaGe CompuScope cards. Consequently, the absolute accuracy of the CS14105 is lower than for other high-resolution CompuScope digitizers. The linearity and noise performance, however, are almost as good as those of its ADCs. More detailed specifications of the accuracy and linearity can be found in the CS14105 specifications section.

The CS14105 has a very flat frequency response, minimizing the attenuation or amplification of frequency components. The signal paths of clocking signals to the two CS14105 ADCs are also designed to be as similar as possible. Consequently, acquisitions on both CS14105 channels is highly simultaneous, as required for Inphase and Quadrature (I&Q) communications applications.

The figure below illustrates the actual frequency response of the CS14105.

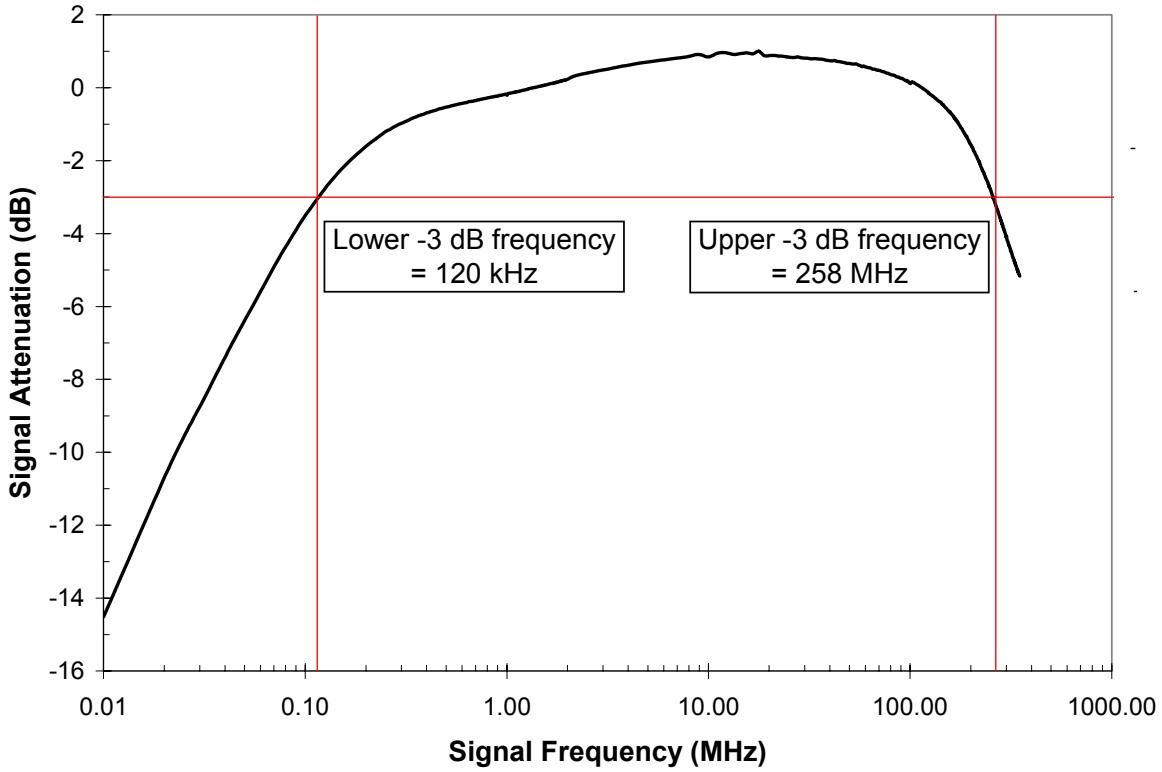

Figure 2: Illustration of the frequency response

CompuScope 14105 Comm Analyzer throughput & maximum PRF

A number of applications require the CompuScope 14105 Comm Analyzer to acquire data based on a rapidly occurring trigger signal. These high Pulse Repeat Frequency (PRF) applications include radio, radar and ultrasound signal capture.

We have performed extensive repetitive capture benchmarks in Single Record mode. In this mode, the signal is captured into on-board CompuScope memory and the captured data are transferred through the PCI bus using PCI bus mastering to PC RAM.

Please note that much higher PRFs will be achieved using CompuScope Multiple Record mode.

The following test results were obtained using a computer configured as follows:

- Dual Pentium II, 400 MHz processor,
- LX400 Intel motherboard
- 512 MB RAM
- 20 GB disk drive
- Windows 2000
- NT File System
- 66 MHz, 32 bit PCI bus
- All slots support bus mastering

The application software used for throughput measurements was CSTest.

The CS14105 was operated using CSTest in both single and dual channel mode for many different capture depths and the results are plotted as points in the graph below. The PCI transfer rates were calculated from the linear portion of the curves at high depths.

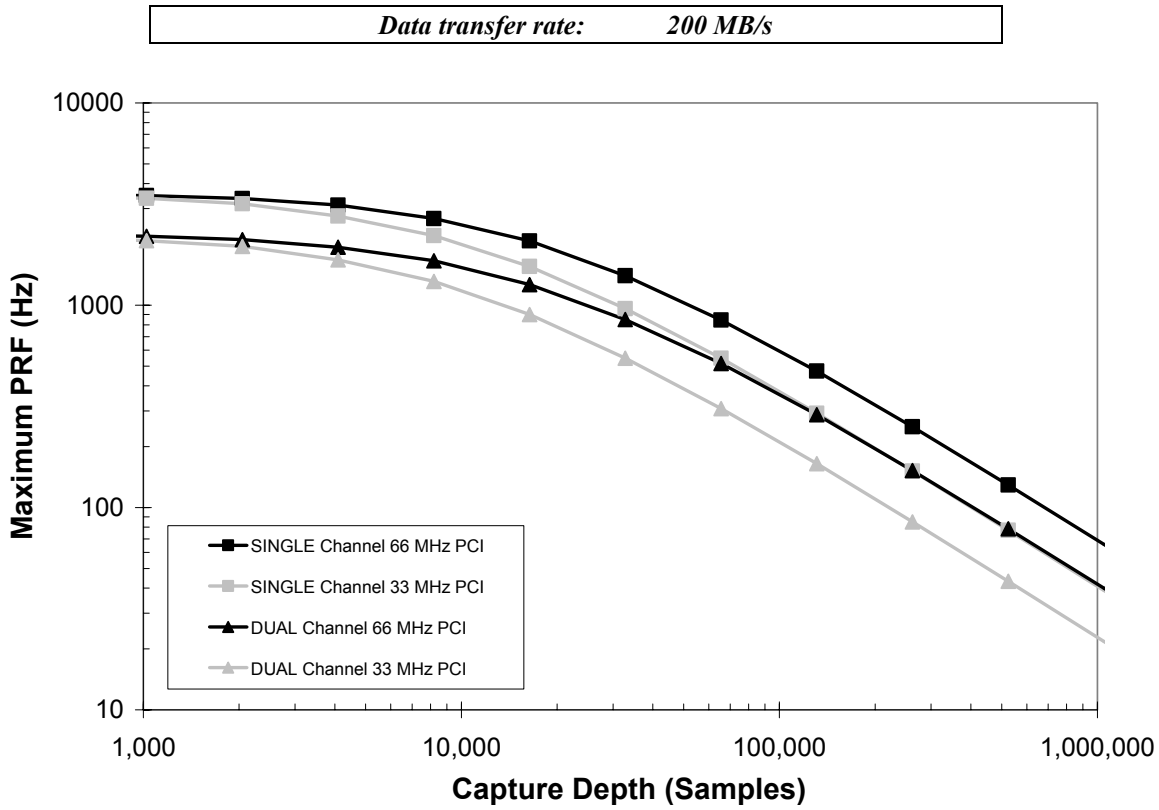

Figure 3: Maximum PRF vs. acquisition length