# GaGe

# eXpert™ FFT
## Advanced On-board FPGA Technology

Fourier Transform Analysis is a powerful signal-processing technique used in a wide variety of applications. GaGe's eXpert FFT firmware allows CompuScope hardware to perform Fourier Analysis within its on-board processing FPGA.
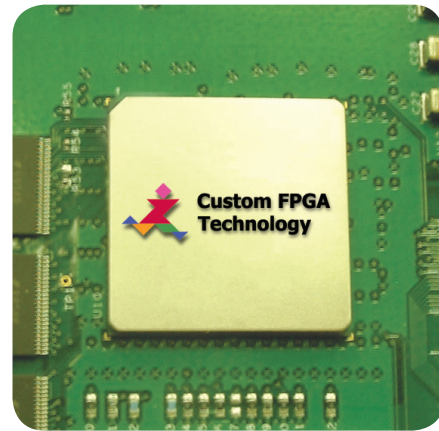
Transfer multiple Fourier Spectra in a single PCI transfer without burdening your host PC!

Typically, Fourier transformation of time-domain waveforms requires the execution of the computationally-intensive Fast Fourier Transform (FFT) algorithm on a host PC. Gage's eXpert FFT firmware now removes this computational load from the host PC and performs the FFT calculations on waveforms acquired by CompuScope hardware during PCI transfer.

## APPLICATIONS

Broadband Communications
Frequency-domain Ultrasonics
Radar
Optical Spectroscopy
Optical Coherence Tomography
Noise Analysis
Signal Fidelity Measurements

## FEATURES

- Performs 512, 1024 or 2048 point FFTs on time-domain waveforms acquired by CompuScope hardware

- Removes FFT calculation load from host PC

- Downloads multiple FFT spectra in a single PCI transfer

- Real and Imaginary FFT amplitude components are separately available

- Standard and customized time-domain Windowing included

- Dedicated FFT Sample Program included in CompuScope Software Development Kits (SDKs) for C/C#, LabVIEW and MATLAB.

## eXpert FFT Simplified Block Diagram
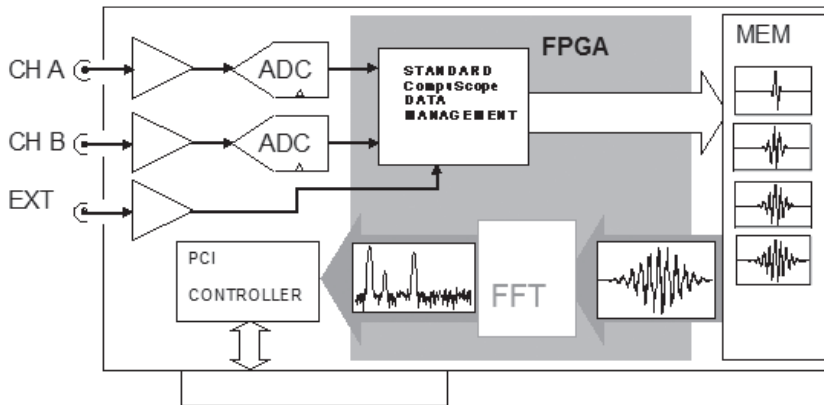
Unlike comparatively simple processing operations such as signal averaging or FIR filtering, FFT calculation is computationally intensive and therefore puts a heavy processing load on a host PC. With the eXpert FFT firmware, a CompuScope may be configured to directly download FFT Spectra without loading the host CPU.

Using the eXpert FFT firmware, CompuScope time-domain waveform acquisition is performed as usual in Single or Multiple Record acquisition modes. Once waveform data reside in on-board CompuScope acquisition memory after acquisition, these data are downloaded through an FFT algorithm within the CompuScope's on-board FPGA so that the host PC directly receives FFT spectra into its PC RAM target buffer. The eXpert FFT firmware allows FFT analysis of 512, 1024 or 2048 time-domain waveform points. A bypass mode is also provided that allows regular download of time-domain data are transferred.

The FFT firmware separately provides both the Real and the Imaginary spectral components, from which both amplitude and phase spectra may easily be derived, are often respectively called the In-phase and Quadrature spectral components (I&Q). A scaling Exponent Factor that ensures that the dynamic range of the FFT values is optimally exploited is also provided.

The user may select to apply a time-domain Windowing function to the time-domain waveform data before the FFT calculation. The user may select one of several standard Windowing functions, such as Hamming and Blackman-Harris Windowing functions or may also configure an arbitrary Windowing function.

The real power of the FFT firmware is its ability to download multiple FFT spectra in a single PCI transfer. The user may select to use one of two multi-spectral modes: One that downloads multiple spectra from contiguous portions within the same waveform and one that downloads a single spectrum from the same position within many acquired waveforms. For example, a user might choose to download 100 spectra of 2048 points each from a 300,000 points waveform acquisition. Alternately, a user might choose to download 100 spectra of 2048 points each from 100 separate waveforms acquired in CompuScope Multiple Record Mode.

The FFT firmware may be operated from any of Gage's three SDKs: C/C#, MATLAB or LABVIEW. Each SDK includes a specific sample program that illustrates usage of the FFT firmware in its various operating modes.

### ORDERING INFORMATION

Note: Refer to the Advanced Functionality Matrix on the GaGe Web site for CompuScope card compatibility information.

eXpert FFT                                    250-181-004
Firmware Option

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