

Four-Channel CAMAC Spectrometer and Waveform Digitizer

OVERVIEW

The DGF-4C is a 4-channel all-digital waveform acquisition and spectrometer card. It combines spectroscopy with waveform digitizing and on-line pulse shape analysis. The DGF-4C accepts signals from virtually any radiation detector. Incoming signals are digitized by a 14-bit 40MSPS ADC. Waveforms of up to 100 μ s in length for each event can be stored in a FIFO. The waveforms are available for on board pulse shape analysis, which can be customized by adding user functions to the core processing software. Waveforms, timestamps, and the results of the pulse shape analysis can be read out by the host system for further off-line processing. The DGF-4C can process up to 200,000 counts per second (combined for all 4 channels) into spectra with up to 32K channels. It supports coincidence spectroscopy and can recognize complex hit patterns. Front panel I/O connections allow external vetoing and provide trigger and multiplicity information. Several DGF-4C modules can be combined into groups with distributed timing and trigger signals.

FEATURES

- Designed for high precision γ -ray spectroscopy with HPGe detectors.
- Directly compatible with scintillator/PMT combinations: NaI, CsI, BGO, and many others.
- Input signal decay time: as fast as 150ns and up to 10ms, exponentially decaying.
- Wide range of filter rise times: from 50 ns to 45 μ s, equivalent to 22 ns to 20 μ s shaping.
- Selectable spectrum length: from 1K to 32K channels, $16.7 \cdot 10^6$ counts per bin.
- Sustained count rate into spectra: up to 200,000 cps per module.
- Excellent pile up inspection: double pulse resolution of 100 ns.
- Automatic optimization of instrument settings to match detector characteristics.
- Digital oscilloscope and FFT for health-of-system analysis.
- Triggered synchronous waveform acquisition across channels, modules and crates. The module operates at 14-bit, 40 MSPS, 100 μ s trace length on each channel.



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SPECIFICATIONS

Input (Analog)

Signal Input: 4 inputs. Selectable input impedance: 50 Ω , 250 Ω and 1k Ω , \pm 5V pulsed, \pm 2V DC. Selectable input attenuation 1:21, 1:5 and 1:1.

Inputs (Digital)

Clock Input/Output: Daisy-chained 40MHz clock on auxiliary bus.

Triggers: Two wired-or trigger buses on auxiliary bus. One for synchronous waveform acquisition, one for event triggers.

Next-neighbor logic: One pair of next-neighbor signals for distributed next-neighbor logic, on auxiliary bus.

Busy-Synch pair: NIM level output (Busy) and input (Synch). Used to synchronize timers and run start/stop to 50ns.

Multiplicity in/out: Analog multiplicity signal, 37mV/hit; can be daisy-chained.

GFLT: Global first level trigger/veto. Suppresses event triggering.

GSLT: Global second-level triggering. Stores arrival time of GSLT signal.

DSP Trigger: Signal to indicate DSP busy time.

Interface:

CAMAC: 16-bit Read/Write, fast CAMAC level-1, 5Mbyte/s

Firewire: S200, 13Mbyte/s

Digital Controls

Gain: 100:1 gain range in fine steps.

Shaping: Digital trapezoidal filter. Rise time and flat top set independently: 0.050 ns - 45 μ s in small steps.

Data reported

Spectrum: 1024-32768 channels, 24-bit deep (16,777,215 counts/bin).

Other: Real time, live time, input and through put counts. List data comprising of energies, time stamps, waveform data, pulse shape analysis results and ancillary data like hit patterns.

Software: All software necessary for operation of the DGF-4C card is included. Operation requires external computer.