N6780

Dual Digital Multi Channel Analyzer (HV & Preamplifier PS) - NIM

Features

- Dual Independent 16k Digital MCA in 2U NIM module
- Suited for high resolution digital nuclear Spectroscopy
- Fully controlled by the **CoMPASS** Software
- Selectable Input Dynamic Range and adjustable Digital Fine Gain
- 2 HV power supply outputs (±5 kV/300 µA)
- 2 DB9 connectors for preamplifiers power supply (±12 V, ±24 V)
- HV Inhibit input
- Features DPP-PHA firmware for energy and time stamp calculation
- Digital oscilloscope function for an easy setup and signal monitoring
- Counting Rate up to 1 Mcps
- USB and Optical Link communication interfaces
- Drivers, libraries and API for Windows and Linux 32/64-bit

Description

The CAEN **Mod.N6780** is a 2-unit wide standard NIM module integrating **2 Independent 16k Digital MCA** and featuring **HV/Preamp capabilities** for **digital nuclear Spectroscopy**. It is ideally suited for high energy resolution semiconductor detectors, like HPGe and Silicon, connected to a Charge Sensitive Preamplifier (CSP) but it can also properly work directly connected to a PMT with inorganic scintillators (NaI, CsI) and other types of crystal, provided that the pulse shape is exponential and the decay time is long enough (typ. > 200 ns).

The module houses:

- **2x 100 MS/s 14-bit waveform digitizer (based on 724 series)** on single-ended inputs with BNC connectors, featuring 4-step software configurable input range and adjustable DC offset via a 16-bit DAC on each input in the full range.
- **2x ±5 kV 300 µA software configurable HV bias outputs** on SHV connectors. Output inhibit configuration logic selectable through dedicated external switches. NEGATIVE, POSITIVE or MIXED HV polarity selectable by ordering options.
- **2x ±12 V 100 mA** and **±24 V 50 mA bias outputs** for preamplifiers power supply through DB9 connectors.

The N6780 is equipped with a FPGA featuring the real-time Digital Pulse Processing for Pulse Height Analysis (**DPP-PHA firmware**) making the module a spectroscopy acquisition system providing energy (i.e. pulse height) and timing information as well as portions of the waveform and other traces for the fine tuning of the PHA settings.

Thanks to its two independent inputs of simultaneous acquisition, the N6780 is able to manage coincidences and anticoincidences between a pair of detectors, allowing the user, for example, to easily take advantage of background rejection or anti-Compton techniques.
The module has been designed to operate as a scalable multi-input, multi-board acquisition system, offering synchronization capabilities.

The N6780 houses **USB 2.0** and **Optical Link** interfaces. USB 2.0 allows data transfers up to **30 MB/s**. The Optical Link supports transfer rate of **80 MB/s** and offers Daisy-chain capability. Therefore, it is possible to connect up to 8/32 MCA modules to a single Optical Link Controller (Mod. **A5818**/**A4818**).

Operating modes:

- **"Pulse Height Analysis":** pulse height histogram (1k-2k-4k-8k-16k) built at software level.
- **"List":** pulse height and time stamp for each event.
- **"Oscilloscope":** input and internal filters waveforms.

Software available (Windows and Linux):

CAEN provides drivers for all the different types of physical communication channels, a set of C and LabView libraries (**CAENComm, CAENDigitizer, CAENDPP**), demo applications and utilities:

- **CAEN Toolbox**: GUI-based utility allowing users to update the firmware of digitizers, modify PLL settings, load licenses for paid firmware (when required), and access other useful features.
- **CoMPASS**: Multiparametric DAQ Software for Physics Applications designer for CAEN Digitizers running Pulse Shape Discrimination and Pulse Height Analysis, CAEN Pulse processors and MCAs.

Technical Specifications

Mechanical

- **Dimensions:** 2-unit wide NIM
- **Weight:** 1300g

Analog Input

Input Features

- BNC connector
- Single-ended, DC coupled
- Impedance: 1 kΩ
- Positive and negative signals accepted
- Programmable 4-step analog coarse gain (x1, x3, x7, x16) corresponding to 9.5Vpp-3.7Vpp-1.4Vpp-0.6Vpp ranges
- Bandwidth: DC to 40 MHz
- Programmable DC offset adjustment on each input in the full scale range

Number of Inputs:
2

ADC

- **Resolution:** 14 bits
- **Sampling rate:** 100 MS/s simultaneously on each channel

Digital Signal Processing

- Trapezoidal filter for the energy calculation with adjustable rise time in the range 0 - 10 µs and flat top in the range 0 - 5 µs
- Manual and automated trigger threshold adjustment
- Manual and automated Pole-Zero cancellation; decay time up to 6.5 ms
- Digital decimation in steps of 2-4-8 allows to extend the time parameters range
- Digital fine gain
- Pile-up rejection and Live Time correction
- Baseline restorer with programmable averaging
- Trigger and Timing filter based on integrative-derivative component
- Time Stamp: 10 ns resolution, 31 bit and rollover tracking event
- Adjustable moving average low pass filter to reduce the high frequency noise

Preamplifier Power Supply

Input Features

- DB9 connector
- ± 12 V, 100 mA output
- ± 24 V, 50 mA output
- Output voltage tolerance: 2%
- Voltage ripple < 5 mVpp

Number of Inputs

- Aux. analog input: 0 ÷ 10 V
- Ext. input for detector’s temperature readout

Preamp Outputs:
2

High Voltage Power Supply

HV Features

- Vset 5 kV
- Iset 300 µA
- Vset, Vmon resolution 0.1 V
- Iset, Imon resolution 10 nA
- Ripple (20 ÷ 1000 Hz) Typ < 8 mVpp
- Ripple (20 ÷ 1000 Hz) Max < 10 mVpp
- Ripple (1 ÷ 20000 kHz) Typ < 2 mVpp
- Ripple (1 ÷ 20000 kHz) Max < 5 mVpp

HV Outputs: 2

Safety Features

- OverVoltage/UnderVoltage alarms
- Overcurrent/OverTemperature alarms (Kill or Ramp selectable exit modes)
- Channel Inhibit on DB9 and dedicated BNC connectors, configurable logic by panel switch

Operating Modes

- **Pulse Height Analysis (PHA):** pulse height histogram (1k-2k-4k-8k 16k) built at software level
- **List mode:** pulse height and time stamp for each event
- **Oscilloscope mode:** input and internal filters waveforms

Trigger Modes

- **Uncorrelated:** each channel operates independently (based on channel self-trigger)
- **Correlated:** coincidence/anticoincidence among channels and/or an external trigger (TRG-IN)
- **External:** channels are triggered by external trigger only (TRG-IN)

Front Panel Digital I/O

CLK-IN (AMP Modu II)

AC coupled differential Input Clock: LVDS, ECL, PECL, LVPECL, CML (single ended NIM/TTL available by orderable cable); Jitter<100ppm requested; can be used as external clock reference for single board or to synchronize the clocks of multiple boards, provided through a Fan In

GPO (LEMO)

General Purpose Output: NIM/ TTL, Zin = 50 Ω
Can be used to propagate the global trigger in multi-board synchronization (in combination with TRG-IN), as output register or Run ON/OFF status;

GPI (LEMO)

General Purpose Input: NIM/TTL, Zin = 50 Ω
Can be used as SYNC/START in multi-board synchronization or Run ON/OFF Control

TRG-IN (LEMO)

External Trigger Input: NIM/TTL, Zin = 50 Ω
Can be used to force the event acquisition from all the channels of the board, to gate/veto the individual channel triggers, or to propagate the common trigger in multi-board synchronization (in combination with GPO)

Communication Interface

- **Optical Link**: CAEN CONET proprietary protocol Up to 80 MB/s transfer rate
- **Daisy chain capability**: it is possible to connect up to 8 or 32 ADC modules to a single Optical Link Controller (**A4818** or **A5818** respectively).

USB interface

- USB 2.0 compliant, Up to 30 MB/s transfer rate.

Firmware

- Firmware can be upgraded via USB/Optical Link

Software

- Fully controlled by CoMPASS Software
- For developers: general purpose C libraries with demo samples available

Power Requirements

- Operating Supply Voltage (nominal ± 10% tolerance): + 6 VDC, -6 VDC
- Consumptions (Typ. @ full load): 2.2 A, 35 mA

Environmental

- Operational Conditions: 0 - 50°C Temperature Range - EMC compliant

Accessories

A386

AC coupler BNC female to BCN male

A317

Cable assembly for Clock distribution 3-pin AMPMODU IV female terminations – 18 cm / 25cm

A1422

Low-Noise Fast-Rise-Time Charge-Sensitive Preamplifiers (Boxed)

DT4700

Clock Generator and FAN-OUT

A387

Input Filter cable BNC female to BNC male – 25 cm

A1424

Scintillation Preamplifier

A318

Adapter for Clock signal FISCHER S101A004 male to 3-pin AMPMODU IV female – 10 cm

Related Software

COMPASS

Multiparametric DAQ Software for Physics Applications

CAEN Toolbox

Multi-Functional Software Suite for the Upgrade of Front-end Boards, Bridges and Power Supplies

Related Firmware

DPP-PHA

Digital Pulse Processing for the Pulse Height Analysis

Related Software Libraries

CAENDPP Library

High level library for CAEN Digitizers running DPP firmware

Related Products

NV8020

7U CRATE VME/NIM 6 slot VME64 400W, 5 slot NIM 150W

NIM8304

7U 12 slot smart fan unit Switching 2000 W Crate

NIM8306

2 Slot Switching 750 W Mini Crate

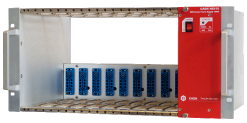
NIM8302P

5U 5 slot 150 W Portable Crate

A4818

USB 3.0 to CONET2 Adapter

NIM8302



5U 10 slot 150 W Compact Crate

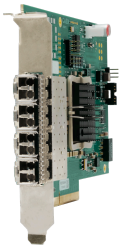
NIM8303

5U 12 slot 300/600 W Crate

A2818

PCI CONET Controller

A5818



CONET2 Controller based on PCI Express Gen 3 interface

NIM8305

2 Slot Switching 450 W Mini Crate

A3818

PCI Express CONET2 Controller

Gallery


CAEN
Mod
N6780
Dual Digital MCA
LINK
CLK IN
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HV 1
IN 0
IN 1
S/N
0025


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