DT5780

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

2	16 K	2
Inputs	Channels	No. of LV Preamp. Outputs

The DT5780 is a compact desktop dual digital multichannel analyzer for high-resolution nuclear spectroscopy, integrating two independent 16k MCAs with 2 × 100 MS/s, 14-bit waveform digitizers, selectable input dynamic range and adjustable digital fine gain. Its DPP-PHA firmware provides energy, timestamp, waveform and trace data, with pulse-height, list and oscilloscope modes. It includes two selectable-polarity HV outputs, available as ±5 kV/300 µA, ±500 V/3 mA or ±4 kV 3 mA, plus ±12 V and ±24 V preamplifier supplies. USB 2.0 and Optical Link interfaces support acquisition and synchronization.

Overview

Product Highlights

- Dual Independent 16k Digital MCA
- Fully controlled by the CoMPASS Software
- 2 HV power supply outputs available in 3 options: ±5 kV/300 µA, ±500 V/3 mA or ±4 kV 3 mA
- HV Inhibit input
- Digital oscilloscope function for an easy setup and signal monitoring
- USB and Optical Link communication interfaces
- Suited for high resolution digital nuclear Spectroscopy
- Selectable Input Dynamic Range and adjustable Digital Fine Gain
- 2 DB9 connectors for preamplifiers power supply (±12 V, ±24 V)
- Features DPP-PHA firmware for energy and time stamp calculation
- Suited for high count rate applications
- Drivers, libraries and API for Windows and Linux 32/64-bit

Product Description

AT A GLANCE	
Inputs	**2**
Channels	**16 K**
No. of LV Preamp. Outputs	**2**
Coupling	**DC**
Package	**Desktop**
No. of HV Outputs	**2**

The CAEN **Mod.DT5780** is a compact desktop system integrating **2 Independent 16k Digital MCA** and featuring **HV/Preamp capabilities** for **digital nuclear Spectroscopy**. It is ideally suited for high energy resolution detectors, such as HPGe, connected to a Charge Sensitive Preamplifier (CSP), but it can also properly work with PMT-based detectors like **NaI**, providing an exponential tail of at least few hundreds of ns.

DT5780SD version has been designed specifically for Diamond and Silicon detectors coupled with a CSP, while **DT5780SC** is suited for Scintillators. All version 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 ±12 V 100 mA and ±24 V 50 mA bias outputs** for preamplifiers power supply through DB9 connectors.
- **2 x 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. Available the following versions:
  - DT5780: ±5 kV 300 µA
  - DT5780SD: ±500 V 3 mA
  - DT5780SC: ±4 kV 3 mA (4W limited)

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Overview (continued)

DT5780, DT5780SD and DT5780SC are equipped with a DPP-PHA Firmware, that is a Digital Pulse Processing algorithm making the board 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 module is able to manage coincidences and anticoincidence between a pair of detectors, allowing the user, for example, to easily take advantage of background rejection or anti-Compton techniques.
Multiple Dual Digital MCA boards can be synchronized to a common external clock working as a scalable multi-input, multi-board acquisition system.

The module 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.

Safety Features:

- Overvoltage/Undervoltage alarms
- Overcurrent/Overtemperature alarms (Kill or Ramp selectable esc modes)
- Channel Inhibit on DB9 and dedicated BNC connectors, configurable logic by panel switch
- Voltage limit, Vmax, software selectable with 20V resolution for DT5780 and DT5780SC models, 2V resolution for DT5780SD models[1]

1 Note: for HV firmware revisions less than 2.2, Vmax resolution for DT5780SD is 20V.

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:

- **CAENToolbox**: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.

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Technical Specifications

Mechanical

Dimensions

- 154 W x 50 H x 164 L mm³ (without connectors)
- 154 W x 50 H x 194 L mm³ (including connectors)

Weight

- 950 g

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 9.5 Vpp-3.7 Vpp-1.4 Vpp-0.6 Vpp 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 from x1 to x10 in steps of 0.01
- 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

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Preamplifier Power Supply

Preamp Features

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

Extra Features

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

Preamp Outputs

2

High Voltage Power Supply

HV Features	DT5780	DT5780SD	DT5780SC	HV Outputs
Vset	5 kV	500 V	4 kV	2
Iset	300 µA	3 mA	3 mA	
Vset, Vmon resolution	0.1 V	0.01 V	0.1 V	
Iset, Imon resolution	10 nA	50 nA	50 nA	
Ripple (20 ÷ 1000 Hz) Typ	< 8 mVpp	< 3 mVpp	< 4 mVpp	
Ripple (20 ÷ 1000 Hz) Max	< 10 mVpp	< 5 mVpp	< 10 mVpp	
Ripple (1 ÷ 20000 kHz) Typ	< 2 mVpp	< 2 mVpp	< 2 mVpp	
Ripple (1 ÷ 20000 kHz) Max	< 5 mVpp	< 5 mVpp	< 5 mVpp	
Additional Features				
SHV connector				
HV polarity configurable by ordering option				
User configurable Ramp-Up/Ramp-Down rates independently for each channel: 1÷ 500 V/s range for DT5780 – DT5780SC, and 1÷100 V/S for DT5780SD, in steps of 1 V/s				
User configurable HV parameters independently for each channel				
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
- Signal Inspector: input and internal filters waveforms

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Technical Specifications (continued)

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:** 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	Consumptions (@ +12 VDC)
+12 VDC ± 10%	3.3 A (Typ.) for DT5780 (± 10% tolerance) 3.5 A (Typ.) for DT5780SD and DT5780SC (± 10% tolerance)

The module is powered by external AC/DC stabilized power supply included in the kit (12 VDC, 45 W)

Environmental

- **Operational Conditions**
  0 – 50°C Temperature Range – EMC compliant

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Ordering Information

ORDERING CODE	DESCRIPTION
WDT5780SCXMA	DT5780SCM – Dual Digital MCA – 1 HVPS +4kV/3mA, 1 HVPS -4kV/3mA, 2 LVPS ±12V/100mA ±24V/50mA
WDT5780SCXNA	DT5780SCN – Dual Digital MCA – 2 HVPS -4kV/3mA, 2 LVPS ±12V/100mA, ±24V/50mA
WDT5780SCXPA	DT5780SCP – Dual Digital MCA – 2 HVPS +4kV/3mA, 2 LVPS ±12V/100mA, ±24V/50mA
WDT5780SDXMA	DT5780SDM – Dual Digital MCA – 1 HVPS +500V/3mA, 1 HVPS -500V/3mA, 2 LVPS ±12V/100mA ±24V/50mA
WDT5780SDXNA	DT5780SDN – Dual Digital MCA – 2 HVPS -500V/3mA, 2 LVPS ±12V/100mA, ±24V/50mA
WDT5780SDXPA	DT5780SDP – Dual Digital MCA – 2 HVPS +500V/3mA, 2 LVPS ±12V/100mA, ±24V/50mA
WDT5780XMAAA	DT5780M – Dual Digital MCA – 1 HVPS +5kV/300uA, 1 HVPS -5kV/300uA, 2 LVPS ±12V/100mA, ±24V/50mA
WDT5780XNAAA	DT5780N – Dual Digital MCA – 2 HVPS -5kV/300uA, 2 LVPS ±12V/100mA, ±24V/50mA
WDT5780XPAAA	DT5780P – Dual Digital MCA – 2 HVPS +5kV/300uA, 2 LVPS ±12V/100mA, ±24V/50mA

1. Ordering codes and descriptions are reproduced from the product record. Availability is confirmed at order entry.

Accessories

A317 — Cable assembly for Clock distribution 3-pin AMPMODU IV female terminations – 18 cm / 25cm

A318 — Adapter for Clock signal FISCHER S101A004 male to 3-pin AMPMODU IV female – 10 cm

A386 — AC coupler BNC female to BCN male

A387 — Input Filter cable BNC female to BNC male – 25 cm

A1422 — Low-Noise Fast-Rise-Time Charge-Sensitive Preamplifiers (Boxed)

A1424 — Scintillation Preamplifier

DT4700 — Clock Generator and FAN-OUT

Related Products

A4818 — USB 3.0 to CONET2 Adapter

A5818 — CONET2 Controller based on PCI Express Gen 3 interface

Software & Control Tools

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

CAENDPP Library — High level library for CAEN Digitizers running DPP firmware

COMPASS — Multiparametric DAQ Software for Physics Applications

Firmware

DPP-PHA — Digital Pulse Processing for the Pulse Height Analysis

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