

# DT5781

## Dual/Quad Digital Multi Channel Analyzer - Desktop



## Features



- Dual or Quad Independent 16k Digital MCA
- Suited for high resolution digital nuclear Spectroscopy
- Fully controlled by the **CoMPASS** Software
- Selectable Input Dynamic Range and adjustable Digital Fine Gain
- 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.DT5781** is a compact desktop system integrating **4 Independent 16k Digital MCA** for **digital nuclear Spectroscopy**. A version with **2 independent 16k MCA** is also available (**DT5781A**). 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 **4x (or 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.

The DT5781 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 DT5781 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 DT5781 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 (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.

### 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

- 154 W x 50 H x 164 L mm<sup>3</sup> (without connectors)
- 154 W x 50 H x 183 L mm<sup>3</sup> (including connectors)

#### Weight

- 800 g (DT5781 version)

### Analog Input

#### Input Features

- BNC connector
- Single-ended, DC coupled
- Impedance: 1 k $\Omega$
- Positive and negative signals accepted
- Programmable 4-step analog coarse gain (x1, x3, x10, x33) corresponding to 10 V<sub>pp</sub>-3 V<sub>pp</sub>-1 V<sub>pp</sub>-0.3 V<sub>pp</sub>
- Bandwidth: DC to 5 MHz
- Programmable DC offset adjustment on each input in the full scale range

#### Number of Inputs

- 4 inputs: DT5781
- 2 inputs: DT5781A

### 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  $\mu$ s and flat top in the range 0 - 5  $\mu$ s
- 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

### 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

### GPO (LEMO)

General Purpose Output: NIM/TTL,  $Z_{in} = 50 \Omega$

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,  $Z_{in} = 50 \Omega$

Can be used as SYNC/START in multi-board synchronization or Run ON/OFF Control.

### CLK-IN (AMP Modu II)

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

### TRG-IN (LEMO)

External Trigger Input: NIM/TTL,  $Z_{in} = 50 \Omega$

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 +12 VDC  $\pm 10\%$
- **Consumptions (@ +12 VDC):** 1.75 A (Typ.) for DT5781 (  $\pm 10\%$  tolerance) 1.15 A (Typ.) for DT5781A (  $\pm 10\%$  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

## Ordering Options

Code	Description	
WDT5781AXAAA	DT5781A - Dual Digital MCA	RoHS
WDT5781XAAAA	DT5781 - Quad Digital MCA	RoHS

## Accessories

### A317



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

### A386



AC coupler BNC female to BCN male

### A318



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

### A1422



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

### DT4700



Clock Generator and FAN-OUT

**A1424**



Scintillation Preamplifier

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**A387**



Input Filter cable BNC female to BNC male - 25 cm

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## 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 Software Libraries

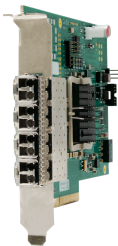
### CAENDPP Library



High level library for CAEN Digitizers running DPP firmware

## Related Products

### A5818



CONET2 Controller based on PCI Express Gen 3 interface

### A4818



USB 3.0 to CONET2 Adapter

# Gallery



DT5781 Featured Image



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