CAEN
Tools for Discovery

DT5790

Dual Digital Aquisition System for Charge Integration and Pulse Shape Discrimination

Features

- 2 x 250 MS/s 12-bit Waveform Digitizer
- Suited for detectors based on Organic, Inorganic and Liquid Scintillators
- 2 x HV bias outputs for detector driving up to ± 4 kV, 3 mA, (4 W)
- 2 x Low Voltage bias outputs for preamps driving (± 12 V, ± 24 V)
- On-line Digital Pulse Processing for Charge Integration and Pulse Shape Discrimination (DPP-PSD)
- Oscilloscope operating mode for an easy setup and signal monitoring
- Energy and Time histograms and 2-D Scatter plots of PSD parameter
- Waveform or lists of energy & time stamp (4 ns resolution) events
- Synchronization, coincidences & anti-coincidences capabilities
- Windows and Linux, 32 and 64 bit OS supported
- Fully controlled by the **CoMPASS** Software
- C/C++ and LabVIEW libraries for an easy interface to custom DAQ systems
- USB and Optical Link communication interfaces
- Firmware upgradeable

Description

The CAEN **Mod.**

DT5790

is a complete digital acquisition system for scintillators and other detectors. It is ideally suited for **Organic**, **Inorganic** and **Liquid Scintillators** coupled to photodetectors like **PMTs** and **SiPMs** whose pulses can be directly accepted by the board.

In a compact desktop form factor, the DT5790 houses:

- **2x 250 MS/s and 12-bit waveform digitizer** with single-ended analog inputs on BNC connectors. 2 Vpp of input dynamics and adjustable DC offset via a 16-bit DAC on each channel in the full range.
- **2x ±4 kV 3 mA (4 W max.) HV bias outputs** on SHV connectors for detectors driving. HV polarity NEGATIVE, POSITIVE or MIXED selectable by ordering options.
- **2x ±12 V 100 mA and ±24 V 50 mA Low Voltage bias outputs** on DB9 connectors for preamplifiers driving.

The DT5790 operates upon the **DPP-PSD** firmware, specially developed for **Charge Integration and Pulse Shape Discrimination**. DPP-PSD is based on an advanced on line **Digital Dual Gate Charge Integration** allowing an effective data analysis even at high count rate. It performs input signal baseline calculation, self-triggering and double-gate charge integration with programmable parameters, double integration of both prompt and total charge for Pulse Shape Discrimination and pedestal subtraction for energy calculation.

Thanks to the 2-input simultaneous acquisition, the DT5790 is able to manage coincidence and anti-coincidence 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. A CLK IN front panel connector is provided to synchronize the clocks from different boards, as well as digital I/Os can serve for trigger propagation and Start/Stop acquisition management.

Safety features allows the module to perform as a current generator and includes:

- Over Voltage / Under Voltage alarms.
- Overcurrent / Over Temperature alarms (Kill or Ramp selectable esc modes).
- Channel Inhibit on DB9 and dedicated BNC connectors, configurable logic by panel switch.

The DT5790 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 DT5790 boards can be connected in daisy chain to a single link of the **A2818** PCI Controller or **A4818** USB3-to-CONET adapter, while a maximum of 32 boards by the 4-link A3818 PCIe Controller.

Operating modes:

- Oscilloscope”: makes possible to acquire waveforms, either input signals or the outputs of the internal digital filters, for monitoring and parameters tuning.
- “List”: charge, PSD and time stamp are extracted from the pulses.
- “Pulse Shape Discrimination (PSD)”: histogram of the total charge (16k) and 2-D scatter plot of PSD parameter are built at software level.

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** and **CAENDigitizer**), demo applications and utilities:

- **CAENUpgrader**: tool that allows the user to update the firmware of the digitizers, change the PLL settings, load, when requested, the license for the pay firmware and other utilities.
- **CoMPASS**: Multiparametric DAQ Software for Physics Applications supporting CAEN digitizers, pulse processors and MCAs.

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
- Input range: 2 Vpp
- Impedance: 50 Ω
- Positive and negative signals accepted
- Bandwidth: DC to 125 MHz
- Programmable DC offset adjustment on each input in the full scale range

Number of Inputs 2

ADC

Resolution: 12 bits
Sampling Rate: 250 MS/s simultaneously on each channel

Digital Signal Processing

- Input baseline calculation and subtraction
- Manual trigger threshold adjustment
- Dual gate charge integration
- Pile-up detection and rejection
- Online PSD calculation
- Configurable PSD threshold for Neutron Gamma discrimination
- Time Stamp: 4 ns resolution, 32 bit

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

- SHV connector
- 4 kV Vset, 3 mA Iset (4 W power limited)
- HV polarity configurable by ordering option
- Vset, Vmon resolution: 0.1 V
- Iset, Imon resolution: 0.05 µA
- User configurable Ramp-Up/Ramp-Down rates independently for each channel: 1÷ 500 V/s range in steps of 1 V/s
- User configurable HV parameters independently for each channel

HV Outputs: 2 **Voltage Ripple**

- 3 mVpp (Typ.), 5 mVpp (Max.) @ 1 kV/500 µA
- 3 mVpp (Typ.), 5 mVpp (Max.) @ 2 kV/1 mA
- 10 mVpp (Typ.), 15 mVpp (Max.) @ 4 kV/1 mA

Operating Modes

- Pulse Shape Discrimination (PSD): histogram of Total Charge (16k) and 2-D Scatter Plot of PSD parameter (built at SW level)
- List Mode: Total Charge, Prompt Charge and Time Stamp for each event
- Oscilloscope mode: input and internal filters waveforms

Trigger Modes

- Uncorrelated: each channel operates independently (basing on channel self-trigger)
- Correlated: coincidences & anticoincidences among channels AND/OR an external trigger (TRG IN)
- External: channels are triggered by external trigger only (TRG IN)

Front Panel Digital I/Os

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, Zin = 50 Ω can be used either to force the event acquisition from all the board channels, or to GATE/VETO the individual channel self-triggers, or in coincidence/anticoincidence with the self-triggers, or to propagate the common trigger in multi-board synchronization (in combination with GPO)

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

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 (**A2818** or **A3838** respectively)

USB: USB2.0 compliant, Up to 30 MB/s transfer rate

Firmware

Firmware upgradeable via USB/Optical Link

Software

- Controlled by the CoMPASS Software
- For developers: general purpose C libraries with demo samples available

Power Requirements

Operating Supply Voltage
+12 VDC ± 10%

Consumptions (@ +12 VDC)
3.2 A(*) Typ. (± 10% tolerance)

The module is powered by external AC/DC stabilized power supply included in the kit (12 VDC, 45 W)
(*) *measured with maximum current charge on preamp outputs and 1kV/1mA (1W) charge on HV outputs*

Environmental

Operating Conditions

- 0 - 50°C Temperature range
- EMC compliant

Ordering Options

Code	Description	
WDT5790XMAAA	DT5790M - Dual Digital Pulse Analyzer - 1HVPS +4kV, 1HVPS -4kV, (3mA 4W), 2LVPS ±12V/100mA ±24V/50mA	RoHS
WDT5790XNAAA	DT5790N - Dual Digital Pulse Analyzer - 2 HVPS -4kV/3mA (4W), 2 LVPS ±12V/100mA, ±24V/50mA	RoHS
WDT5790XPAAA	DT5790P - Dual Digital Pulse Analyzer - 2 HVPS +4kV/3mA (4W), 2 LVPS ±12V/100mA, ±24V/50mA	RoHS

Accessories

DT4700

Clock Generator and FAN-OUT

A318

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

A317

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

Related Software

CAEN Toolbox

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

COMPASS

Multiparametric DAQ Software for Physics Applications

Related Firmware

DPP-PSD

Digital Pulse Processing for Charge Integration and Pulse Shape Discrimination

Related Software Libraries

CAENDigitizer Library

Library of functions for CAEN Digitizers high level management

Gallery


www.caen.it
CAEN
Tools for Discovery
NEGATIVE
NEGATIVE
DIGITAL PULSE ANALYZER
HV 0
HV 1
DET 0
DET 1
CAEN
ON
OVC
ON
OVC
LINK
CLK IN
GPO
TRG IN
GPI
TTL
NIM
PLL LOCK
PLL BYPS
RUN
TRG
DRDY
BUSY


PREAMP 1
PREAMP 0
INHIBIT
SPARE LINK
DT5790N
SN 679
12V


NEGATIVE
NEGATIVE
DIGITAL PULSE ANALYZER
DET 0
DET 1
CAEN
LINK
CLK IN
GPO
TRG IN
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