

D-WAVE

Digitizer Waveform Recording Firmware



Features



- Time windowed waveform recording
- Dead-timeless acquisition
- Multi-buffer memories
- Multi-board synchronization
- High bandwidth data readout
- Free download

Description

This page contains the Waveform Recording Firmware packages of all CAEN Standard Digitizers

Principle of Operation

The basic operating mode of a digitizer running Waveform Recording FW is essentially the same as a digital oscilloscope: the analog signal, after an input stage of signal conditioning mainly used to adapt the dynamic range, is sampled by a flash ADC, whose output, i.e. the stream of digital samples, is continuously read by an FPGA and stored in a circular memory buffer of a programmable size. At the arrival of the trigger, the buffer is frozen and made available for the readout while the acquisition can continue in a new buffer. However, there are few important differences between a digitizer and a commercial digital oscilloscope:

A. The digitizers allow for dead-timeless acquisition

In fact, unlike most oscilloscopes, they have the ability to accept two consecutive triggers very close to each other thanks to the multi buffer memory management: **there is no dead time between an acquisition window and the next one.**

It is even possible to accept two trigger for which the acquisition windows overlap. The dead-timeless acquisition is a very important feature, especially in the case of events randomly distributed in time (in nuclear physics this is typically a Poissonian distribution), so that two of them, even at low rate, can occur at very short distance but you still want to capture both.

Except for 742 and 743 Series.

B. In the digitizers, all the channels are allowed to generate triggers independently

The individual trigger can be used locally by the channel that generated it (independent triggering) or can participate to the assertion of a global trigger for all the channels in the board, as well as to generate a pulse on the TRG-OUT.

C. Scalability and synchronization of multi-board systems

In most cases, the applications that require the use of several channels need to synchronize the acquisition across different digitizers. This is performed according to the following points:

Distribution of a common clock reference in order to have the same sampling clock on all the ADC channels. CAEN digitizers feature a programmable PLL able to generate the sampling clocks locked to an external clock input, whose distribution can be done in parallel from a common source, using a fan-out, as well as through an in-out daisy chain with the ability to use the first board as a clock master (VME models only).

Alignment of the time stamp associated with the triggers to allow off-line reconstruction of the events read from different boards. This can be done by using an external signal as well as through an in-out daisy chain. Distribution of the triggers from channel to channel and from board to board, according to a certain trigger logic. Each card has different trigger sources: external TRG-IN from the front panel, software trigger and channel self-triggers. All these triggers can be combined in order to make coincidences, majorities, global triggers and other functions.

D. High bandwidth data readout links

The digitizers are designed to provide high rate data transfer to a computer or an external data processing unit. CAEN digitizers have a bandwidth of $\approx 30\text{MB/s}$ in the case of the USB, about 80MB/s with CONET port up to more than 120MB/s for the VME with 2eSST.

The communication interfaces allow the user to operate post-processing data analysis.

All CAEN digitizers are equipped with their proper default firmware for waveform recording.

CAENScope and **WaveDump** softwares are available to manage the acquisition. Data can be saved in real time for offline analysis.

Furthermore, the **742** and **743** families, which come with two different switched capacitor chips, are well suitable for high precision time measurement of fast signals. **WaveDump** and the dedicated **WaveCatcher** software (free download) can control the acquisition of the two boards respectively.

Related Products

D-SCOPE



Digitizer 2.0 Waveform Recording Firmware



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CAEN S.p.A.

Via Vetraia 11
55049 - Viareggio
Italy

Phone +39.0584.388.398

Fax +39.0584.388.959

info@caen.it

www.caen.it

CAEN GmbH

Brunnenweg 9
64331 Weiterstadt, Germany

Phone +49 (0)212.254.4077

Mobile +49 (0)151.16.548.484

info@caen-de.com

www.caen-de.com

CAEN Technologies, Inc.

1 Edgewater Street - Suite 101
Staten Island, NY 10305
USA

Phone +1.718.981.0401

Fax +1.718.556.9185

info@caentechnologies.com

www.caentechnologies.com

CAENspa India Private Limited

B205, BLDG42, B Wing,
Azad Nagar Sangam CHS,
Mhada Layout, Azad Nagar, Andheri West
Mumbai, Maharashtra 400053, India

info@caen-india.in

www.caen-india.in

