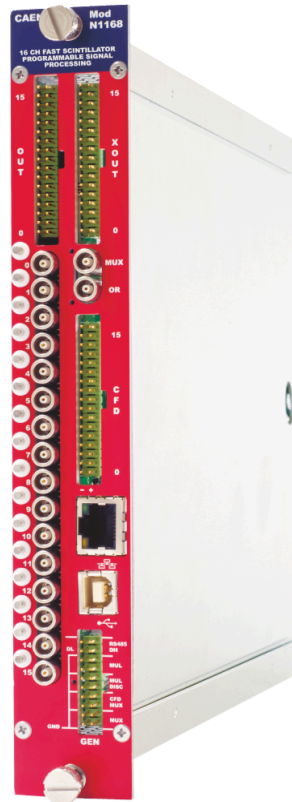




## Features



- 16 channels in a one unit wide NIM module
- Fast - Slow signal discrimination
- Fast Scintillator application
- Positive or negative inputs, hardware selectable
- Completely programmable via USB, RS485 and Ethernet
- 3 Programmable shaping time per channel
- 2 bit Coarse Gain and 8 bit Fine Gain, independent for Slow and Fast/Aux output
- Automatic DC Restorer for Fast/Aux and Slow output
- ECL CFD output, with Delay and Width Individually programmable
- CFD Crossing Delay hardware settable in 5 steps
- CFD Threshold Individually programmable with 12 bit resolution
- CFD walk automatically adjusted
- OR output with individual channel enabling
- Multiplicity output
- Multiplexed Slow, Fast/Aux and CFD output
- Multiplicity trigger output
- Pile-up rejector

## Description

The CAEN **Mod.N1168** is suitable for several type of scintillator detectors, particularly where different decay time of the scintillation light are present. This module allows to obtain the full handling of the detector signal, giving the total energy, amplitude of the fast component and the time information.

The analysis of the two dimensional spectrum (fast versus total) allows an excellent gamma-neutron separation for liquid scintillators or CLYC detectors, gamma-charged particle separation for BaF2 detectors, and to disentangle the gamma interaction in the different parts of a Phoswich detector.

For scintillator detectors with a single light component, the fast output can be used as a second total energy output, meeting the requirements of dual energy range experimental setups, avoiding the split of the signal on two shaping amplifiers.

The module is very simple to use and overcomes the inconveniences of the standard approach with two gates and QDC setup.

The board has two outputs for each input channel, where the first output is proportional to the integration charge (called SLOW output), and the second is proportional to the signal amplitude (called FAST output). The latter gives information of the shape of the input pulse, thus giving information to perform pulse shape discrimination with detectors that have a different response to particles, like gamma-neutrons.

For scintillator detectors with a single light component, the AUX output, that is a second slow output, can be used as a second total energy signal, meeting the requirements of dual energy range experimental setups, avoiding the split of the signal on two shaping amplifiers.

A gate-free fast stretcher circuit captures the leading-edge peak value of the signal, that is subsequently Gaussian shaped to allow simple acquisition by a peak-sensing ADC.

The total energy circuit basically consists of an integrator, followed by a Gaussian shaper amplifier. The time information is given by a Constant Fraction Discriminator, with selectable delay line and an automatically walk compensation circuit.

The very low noise level of the module matches the requirements of the new class of high energy resolution scintillators (LaBr3), over a large energy dynamics applications range, and also in a very low discrimination level.

A software tool that allows an easy management of all the functional parameters of the CAEN Spectroscopy Amplifiers is available too; supported operating systems are Windows and Linux.

(Designed in collaboration with INFN Milano).

## Technical Specifications

### Packaging

One unit wide NIM unit

### Power requirements

1.7 A @ +6V; 2.5 A @ -6V; 400 mA @ +12V; 220mA @ -12V

### Input

Positive or negative pulses, max. amplitude of  $\pm 3V$ , 50  $\Omega$  impedance. Input polarity jumper selectable

### Slow OUT

Unipolar gaussian; dynamic range 0  $\div$  +8V max (on 1M $\Omega$ ), 50  $\Omega$  back termination; offset adjust: -400  $\div$  +400 mV; 8-bit resolution; common to all channels

### Fast/Aux OUT

Unipolar gaussian; dynamic range 0  $\div$  +8V max (on 1M $\Omega$ ), 50  $\Omega$  back termination; offset adjust: -400  $\div$  +400 mV; 8-bit resolution; common to all channels

### CFD OUT

Diff. ECL output; width 50 $\div$ 1150 ns, 5 bit adjustable

### MUX

Output, on LEMO connector and on double row connector; options: Slow, Fast/Aux selectable, disabled; 0 $\div$ +8V max (on 1M $\Omega$ ); 50 $\Omega$  output impedance; high impedance when disabled. N.B. MUX out are attenuated by  $\sim 0.5$  factor versus SLOW & FAST/AUX OUT; when used, they must be terminated on HIGH impedance

### OR

Logical OR of the CFD Output, on LEMO connector, standard NIM output, width 145 $\div$ 1250 ns, 5 bit adjustable. Individually Enabled

### MUX CFD

CFD out of channel with MUX enabled. Std. NIM output on double row connector

### MUL

Multiplicity out: analog sum of CFD OUT, -800 $\mu A$  output per hit; -40mV on 50  $\Omega$

### MUL DISC

Standard NIM output on double row connector; Multiplicity Trigger Discriminator (Time over threshold) with Programmable Threshold.

### Gain

Product of coarse and fine gain setting. Coarse: 4-step adjustable (nominal: 1x, 4x, 16x, 64x); Fine: 0  $\div$  191 steps adjustable. Total range: 2.3 $\div$ 312 for Negative inputs. With positive inputs, all values are halved

### Shaping time

Slow Out-AUX: 0.2, 0.4, 0.8  $\mu s$ ; Fast Out: 0.2, 0.4  $\mu s$

### Integral non linearity

t.b.d

### FAST-SLOW Crosstalk

<-50 dB measured on FAST OUT, induced by SLOW OUT on same channel

### Slow equivalent Input Noise

< 92  $\mu$ V (Gain=100x; (0.2  $\mu$ s shaping time)

### Fast equivalent Input Noise

< 135  $\mu$ V (Gain=100x; (0.2  $\mu$ s shaping time)

### FAST-SLOW rejection

< 30 dB

### CFD Threshold

0 ÷ 4095 mV; 1mV step (12 bit resolution)

### CFD Zero Crossing Delay

Selectable by jumper (5 steps): 1.5ns, 3ns, 4.5ns, 6ns, 7.5ns

### Delay on CFD ECL Output

Range: (20ns - 1100 ns) 5-bit resolution, individually programmable and disable

### Pile-up rejection

Individually selectable; when a pile-up event occurs within 3T output saturation is forced

### CFD Threshold

0 ÷ 4095 mV (12 bit resolution)

### CFD Zero Crossing Delay

Selectable by jumper (5 steps): 1.5ns, 3ns, 4.5ns, 6ns, 7.5ns

### Delay on CFD ECL Output

Range: (20ns - 1100 ns) 5 bit resolution, individually programmable and disabled

### Interfaces

- USB: USB B type female connector; USB 2.0 compliant
- ETH: 10/100 Base-T female connector; TTL signals (TCP/IP)
- RS485 on 10+10 pin header General I/O

## Ordering Options

Code	Description
WN1168XAAAAA	N1168 - 16 Ch Fast Scintillator Programmable Signal Processor and 16 ch CFD <span data-bbox="1385 250 1465 302">RoHS</span>

## Accessories

### A952



Cable assembly 2.54mm 34 pin female to 2.54mm 34 pin female - 50 cm

---

### A385



Adapter 2.54mm 34-pin female to 16x LEMO 00 female (or MCX male) - 50 cm / 1 m

---

## Related Software Libraries

### CAEN HV Wrapper Library



Library for CAEN Power Supply Control

---

## Related Products

### NIM8302P



5U 5 slot 150 W Portable Crate

### N6741



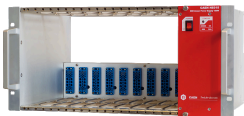
32 Ch Peak Sensing ADC

### N1068



16 ch Programmable Spectroscopy Amplifier and 16ch CFD

### NIM8302



5U 10 slot 150 W Compact Crate

### NIM8304



7U 12 slot smart fan unit Switching 2000 W Crate

## NIM8303



5U 12 slot 300/600 W Crate

---

## NIM8306



2 Slot Switching 750 W Mini Crate

---

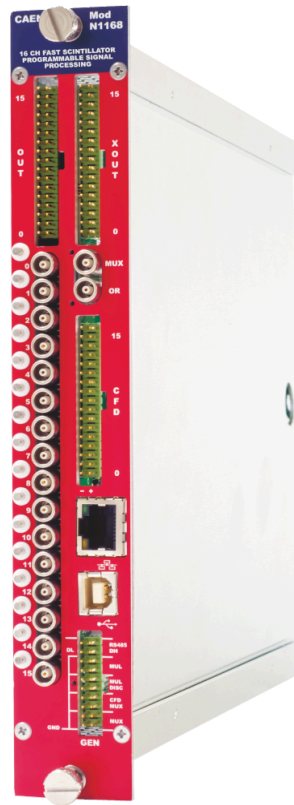
## NIM8305



2 Slot Switching 450 W Mini Crate

---

# Gallery



**This document, or parts thereof, may not be reproduced in any form or by any means without written permission from Caen S.p.A. Although every effort has been made to ensure the accuracy of information presented in this catalog, Caen S.p.A reserves the right to modify its products specifications without giving any notice; for up to date information please visit [www.caen.it](http://www.caen.it) © Caen S.p.A - 2024**

**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**

