Rev. 01 - 20/06/2020

A1427 KIT

Low Noise Fast Current Preamplifier & Discriminator

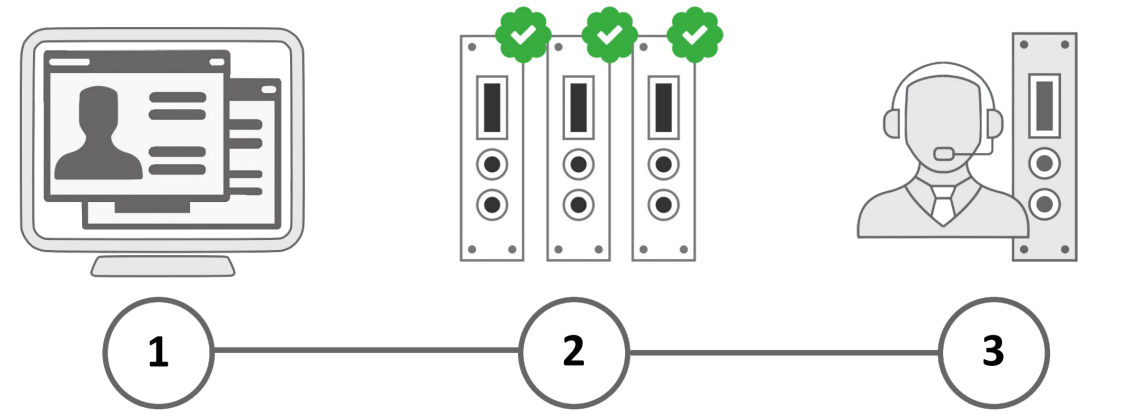
CAEN
Tools for Discovery

User Manual
UM6459

Register your device

Register your device to your **MyCAEN+** account and get access to our customer services, such as notification for new firmware or software upgrade, tracking service procedures or open a ticket for assistance. **MyCAEN+** accounts have a dedicated support service for their registered products. A set of basic information can be shared with the operator, speeding up the troubleshooting process and improving the efficiency of the support interactions.

MyCAEN+ dashboard is designed to offer you a direct access to all our after sales services. Registration is totally free, to create an account go to https://www.caen.it/become-mycaenplus-user and fill the registration form with your data.



https://www.caen.it/become-mycaenplus-user/

Purpose of this Manual

This document is the **A1427 - A1428 Low Noise Fast Current Preamplifier & Discriminator** User's Manual; it contains information about the installation, the configuration and the use of the unit

Change Document Record

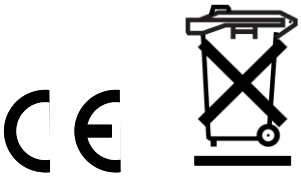
Date	Revision	Changes
13 April 2018	0	PRELIMINARY Release
22 June 2020	1	Updated Technical specifications

Symbols, abbreviated terms and notation

T.B.D.

Reference Documents

T.B.D.



Index

1. A1427 - A1428 Functional description

The A1427 is a fast and low noise current preamplifier with AC coupled input. It is suitable for fission chambers detectors and proton recoil counters.

The A1428 is a leading-edge discriminator designed for negative pulses, with thresholds values into the range from -1 mV to -100 mV.

Both A1427 and A1428 units are available in two different versions for the use with fission chambers (A1427-8 CF) and for the use with proton recoil (A1427-8 PR).

They are available either as separate modules or as stack-up kit.

The A1427 is designed to work with high counting rate and it is specifically studied to be insensible to the external electromagnetic fields.

The A1427 preamplifier provides two outputs:

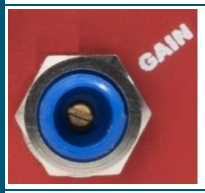
EOUT: negative unipolar output that can be integrated to calculate the energy associated to the input signal

FOUT: bipolar output that can be used to calculate the rate of the input signal, discriminating on its negative pulse; this can be achieved via the A1428 discriminator, that is specifically designed to fit with the A1427 preamplifier.

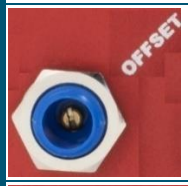
The A1427 and the A1428 are developed in collaboration with CEA Saclay. A1427CA and A1428CA are special versions designed for the Cabri reactor.

2. Technical specifications

A1427 Features

Packaging	Shielded box; 120x94x30mm	
Detector IN		SHV connector; accepts negative charge pulses, AC coupled, 50 Ohm input impedance. **A1427CA** models: ATI INTERCO HN Connector 22323
HV IN		SHV connector, up to 3 KV for the detector bias, RBIAS 200 kOhm. **A1427CA** models: Itt Cannon 011-2049-040FB9 Terminal
TEST IN		LEMO connector, negative input, 50 Ohm input impedance; GAIN = 1/100 of Detector IN
Fast OUT		LEMO connector, bipolar output, high impedance (must be externally terminated with 50 Ohm impedance), dynamic range -2 V÷+1.3 V max, Total duration (negative and positive lobe) A1427FC 120 ns, A1427PR 160 ns; Width Out negative lobe: A1427FC 27.5 ns FWHM, A1427PR 40 ns FWHM; risetime negative lobe ≤12 ns; (measured with TEST IN negative pulse, -13 mVpp vs. GND, across 50Ohm, 10ns rise/fall time, 50ns FWHM, 100kHz frequency)
Energy OUT		LEMO connector, non-inverting unipolar negative output, high impedance (must be externally terminated with 50 Ohm impedance), dynamic range 0÷-350 mV max, width Out 50 ns FWHM, risetime ≤19 ns; (measured with TEST IN negative pulse, -13 mVpp vs. GND, across 50Ohm, 10ns rise/fall time, 50ns FWHM, 100kHz frequency)
GAIN		Trimmer adjustable; range: 700÷2500 on A1427FC; 500÷1500 on A1427PR (referred to amplitude of FOUT negative lobe, with DET IN signal); with TEST IN input, GAIN = 1/100 of nominal value; FOUT/EOUT amplitude ratio: A1427FC = 4 A1427PR = 5.6
Output noise	≤ 40 mV p.p. (measured with gain =1000 on FOUT A1427FC) ≤ 30 mV p.p. (measured with gain =700 on FOUT A1427PR) ≤ 7 mV p.p. (measured with gain =1000 on EOUT A1427FC) ≤ 4 mV p.p. (measured with gain =700 on EOUT A1427PR)	
Power requirements		External power supply Switchbox FRA045-S12-4 (12 VDC, 3.75 A, 45 W); Universal Input C14 receptacle; INPUT Voltage range 100-240VAC 1.2A 50-60Hz. Inrush current 40A at 115VAC / 80A at 230VAC max. Dielectric withstand Input/output 3,000VDC. OUTPUT Output voltage +12V. Ripple and noise 2% p-p max. Load regulation ±5% max. No load stand by power <0.5W@ 230VAC. Efficiency >=85% for CEC requirement. Hold up time 10ms at nominal line. Protections OCP, OVP, over power & short circuit. GENERAL Std output connector Dc barrel jack. Std output cable/length UL1185, #18AWG / 5 ft. ENVIRONMENTAL Operating temperature 0°C to +40°C. Storage temperature –20°C to +85°C. STANDARDS Safety standards IEC/UL/EN60950-1, CE, CB. EMC EN55022 (CISPR 22) class B, FCC class B. **A1427CA** models: TE 282834-5; 1 GND, 2 +12V

A1428 Features

Packaging	Shielded box; 120x94x30mm	
Threshold		Vishay 11A11B10 Dial, with brake lever (LOCK); range: -1 mV to -100 mV, settable on 10 turns of the dial (10 mV/turn; 1 mV/division, e.g.: 5.40 on dial, leads to Threshold = -54.0 mV).
Discriminator IN		LEMO connector, negative polarity, AC coupled, 50 Ohm input impedance, minimum discriminated input: -4 mV.
Discriminator OUT		LEMO connector, std. TTL signals (must be externally terminated with 50 Ohm impedance), rise time ≤ 6 ns, fall time ≤ 6 ns
Width		Trimmer settable; A1428FC: 45÷100 ns FWHM; A1428PR: 45÷200 ns FWHM
Offset		Trimmer settable; range -40÷+15 mV
Power requirements		External power supply Switchbox FRA045-S12-4 (12 VDC, 3.75 A, 45 W); Universal Input C14 receptacle; INPUT Voltage range 100-240VAC 1.2A 50-60Hz. Inrush current 40A at 115VAC / 80A at 230VAC max. Dielectric withstand Input/output 3,000VDC. OUTPUT Output voltage +12V. Ripple and noise 2% p-p max. Load regulation ±5% max. No load stand by power <0.5W@ 230VAC. Efficiency >=85% for CEC requirement. Hold up time 10ms at nominal line. Protections OCP, OVP, over power & short circuit. GENERAL Std output connector Dc barrel jack. Std output cable/length UL1185, #18AWG / 5 ft. ENVIRONMENTAL Operating temperature 0°C to +40°C. Storage temperature –20°C to +85°C. STANDARDS Safety standards IEC/UL/EN60950-1, CE, CB. EMC EN55022 (CISPR 22) class B, FCC class B. **A1428CA** models: TE 282834-5; 1 GND, 2 +12V

Safety requirements

Read carefully the "Precautions for Handling, Storage and Installation" document provided with the product before starting any operation!

The following HAZARD SYMBOLS are reported on the unit:

CAUTION: indicates the need to consult the "Precautions for Handling, Storage and Installation" document provided with the product. **A potential risk exists if the operating instructions are not followed**

HIGH VOLTAGE: indicates the presence of electric shock hazards. Enclosures marked with these symbols should only be opened by CAEN authorized personnel.

To avoid risk of injury from electric shock, do not open this enclosure

To avoid potential hazards, use the product only as specified. Only qualified personnel should perform service procedures.

Avoid Electric Overload. To avoid electric shock or fire hazard, do not power a load outside of its specified range.

Avoid Electric Shock. To avoid injury or loss of life, do not connect or disconnect cables while they are connected to a voltage source.

Do Not Operate without Covers. To avoid electric shock or fire hazard, do not operate this product with covers or panels removed.

Do Not Operate in Wet/Damp Conditions. To avoid electric shock, do not operate this product in wet or damp conditions.

Do Not Operate in an Explosive Atmosphere. To avoid injury or fire hazard, do not operate this product in an explosive atmosphere.

Do Not Operate with Suspected Failures. If you suspect this product to be damaged, have it inspected by qualified service personnel.

Prior to shipment this unit was inspected and found free of mechanical or electrical defects. Upon unpacking of the unit, inspect for any damage, which may have occurred in transport. The inspection should confirm that there is no exterior damage to the unit, such as broken knobs or connectors, and that the panels are not scratched or cracked. Keep all packing material until the inspection has been completed. If damage is detected, file a claim with carrier immediately and notify CAEN. Before installing the unit, make sure you have read thoroughly the safety rules and installation requirements, then place the package content onto your bench; you shall find the following parts:

- A1427/ A1428 desktop units;
- External AC/DC power supply with separate power cord (not suitable for A1427CA / A1428CA)

The input circuit includes a protection network to prevent damage to the input circuit from transient generated in the IN/DETECTOR and HV network: this protection circuit provides a limited amount of protection against transients, for this reason, care must be taken in the use of A1427 with high voltage detectors.

Please remember to:

- Turn down gradually bias voltage prior to connect or disconnect preamp input
- Avoid fast changes in bias voltage

CAEN GmbH
Brunnenweg 9
64331 Weiterstadt
Germany
Tel. +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

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

CAENspa INDIA Private Limited
B205, BLDG42, B Wing,
Azad Nagar Sangam CHS,
Mhada Layout, Azad Nagar, Andheri (W)
Mumbai, Mumbai City,
Maharashtra, India, 400053
info@caen-india.in
www.caen-india.in