R1443

Preamplifier Unit for ^{3}He and BF_3 Tubes

Data Sheet

Nuclear Physics

Particle Physics

The perfect solution for your ^{3}He and BF_3 neutron detector

R1443 is a 32/64 channels Charge Sensitive Preamplifier in a 19" rack unit. It has been developed in collaboration with Institut Laue-Langevin in Grenoble, France, and it is specifically designed for operating with neutron detectors as ^{3}He or BF_3 tubes. Given the number of input channels, it can handle up to 16/32 **position-sensitive tubes**, each tube having two outputs, one for each end. The pre-amplifier has an exponential time constant of 1 µs. This guarantees excellent performances even at high rates exceeding 100 kcps. The output of this preamplifier is typically readout by ADC and Digital Pulse Processing electronics in order to perform specific filtering to achieve the best charge, timing and axial position measurements. The R1443 is 120/230 V 50/60 Hz AC Powered.

- **Specifically designed for neutron detectors as ^{3}He in position sensitive application**
- **19'' rack unit (height = 2U)**
- **External HV input on SHV connector (feeding the internal decoupling circuits)**
- **Detector inputs on SHV connectors**
- **Test input on BNC (1 pF charge injection capacitors)**
- **Total gain 2.25 V/pc**
- **Rate capability: >100kHz per tube**
- **Differential outputs on RJ45 connectors**
- **Three available versions:**
  - **32 channels - R1443A**
  - **64 channels - R1443B**
  - **32 channels with 16 independent HV inputs (1 per tube) - R1443C**
- **Full position-sensitive ^{3}He acquisition system in combination with R5560 digitizer**
- **240 or 100 Vac, 50-60 Hz input available**

Specification

Mechanical

• Form Factor: enclosure 19" rack-mount (height: 2U; d: 360mm)
• Weight 8.8 kg (R1443C)

Power Consumption

• Voltage range: 120 or 230 Vac
• Frequency: 50/60 Hz
• Max Power: 2.5 W (32-ch version)

Detector input

Accepts positive and negative input charge pulses from detectors and supplies the HV bias to the detector itself;

• Input connector: SHV
• AC coupled - 22 MΩ to VBIAS
• Positive or Negative Charge Input polarity
• ESD protected input
• Charge range ± 0.8 pC

HV In (Detector Bias)

• Bias connector: SHV
• HV BIAS input/ Detector bias voltage ±2000 VMax
• HV BIAS input:

R1443A:	HV IN
R1143B:	HV IN Section A
	HV IN Section B
R1443C:	HV IN [0..15]
	HV IN [i] Bias DETECTOR IN [2i, 2i+1]

Test-In

• 2 input, one for even and one for odd channels
• Ctest: 1 pF
• 50 Ω Impedance
• Nr.2 BNC connector (per Section)
ODD/EVEN for A1443B (32-ch.)
ODD/EVEN for A1443A e A1442C (16-ch.)

Preamplifier (Analog Out)

• Charge sensitive preamplifier
• Sensitivity: 2.25 V/pC (preamp = 1 V/pC + 2nd gain stage = 2.25 V/V, customizable)
• Cross talk < 1%
• Output signal rise time: <20ns
• Output signal decay time: 1µs
• Input residual Noise: 0.8 fC (5000 e)
• Max output amplitude: 4 V differential on 100 Ω termination
• Resolution *(1):* ~20 keV (with a FSR of 36 MeV)
• RJ45 output connectors

(1): measured with a 2745 digitizer with DPP-PHA FW with trapezoidal filter parameters (Rise Time = 2 us, Flat Top = 0.6 us, Tau = 0.95 us)

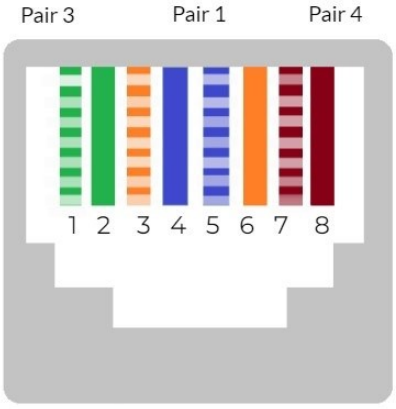
Specification

Environmental

Indoor use

- Operating Humidity: 10% ± 90% RH non condensing
- Storage Humidity: 5% ± 90% RH non condensing
- Pollution Degree: 2
- Altitude: <2000 m
- Overvoltage Category: II
- EMC Environmental Commercial
- Operating Temperature range: 0°C +50°C
- Storage Temperature range: -10°C +80°C

Output Connector Pair Map



Pin	Channels	T568 color code
1	Ch0 -	Green/White
2	Ch0+	Green
3	Ch1-	Orange/White
4	Ch2+	Blue
5	Ch2-	Blue/White
6	Ch1+	Orange
7	Ch3-	Red/White
8	Ch3+	Red

Ordering Option

Ordering code	Description
WR1443XAAAAA	R1443A 32 channels Preamplifier unit for ^{3}He tubes
WR1443XBAAAA	R1443B 64 channels Preamplifier unit for ^{3}He tubes
WR1443XCAAAA	R1443C 32 channel Preamplifier unit for ^{3}He tubes with independent HV

⚠ ⚠ **WARNING** During normal operation, a potentially hazardous high voltage bias is applied to a detector via the preamplifier.

Only qualified personnel should carry out installation, operation and maintenance procedures of this unit.
Furthermore, the preamplifier bias circuit has a very long time constant and therefore this circuitry can remain at high voltage for a very long time. If the user does not exercise adequate caution, this voltage can cause per-sonal injury due to electrical shock.
Pease observe the following precautions:

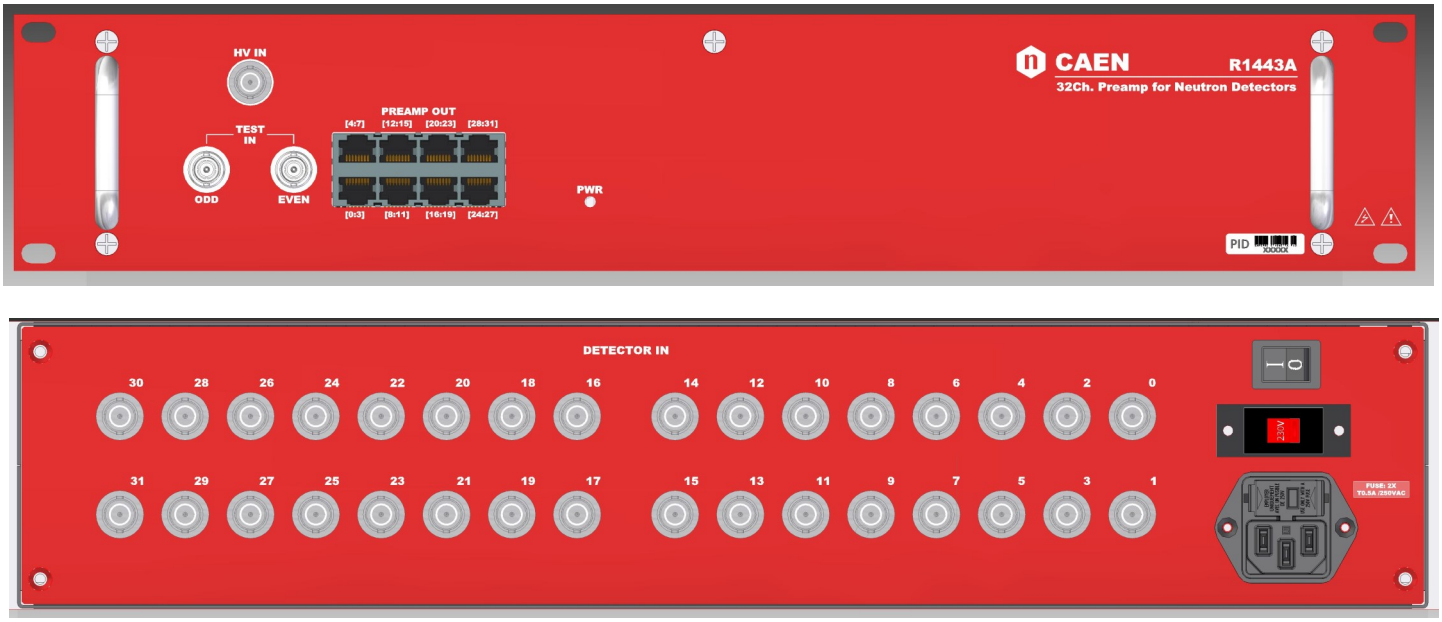
- Completely discharge the detector bias circuit by switching off the bias supply before connecting a cable, to the Input/Detector connector.
- If you are using a variable power supply, bring the voltage value to zero and wait for at least 30-60 seconds. The bias circuitry will discharge itself through the output of the bias supply.

⚠ ⚠ **WARNING** Do not connect the DETECTOR IN to exposed circuitry. Connect the preamplifier to a Detector/Power Supply properly grounded to safety hearth.

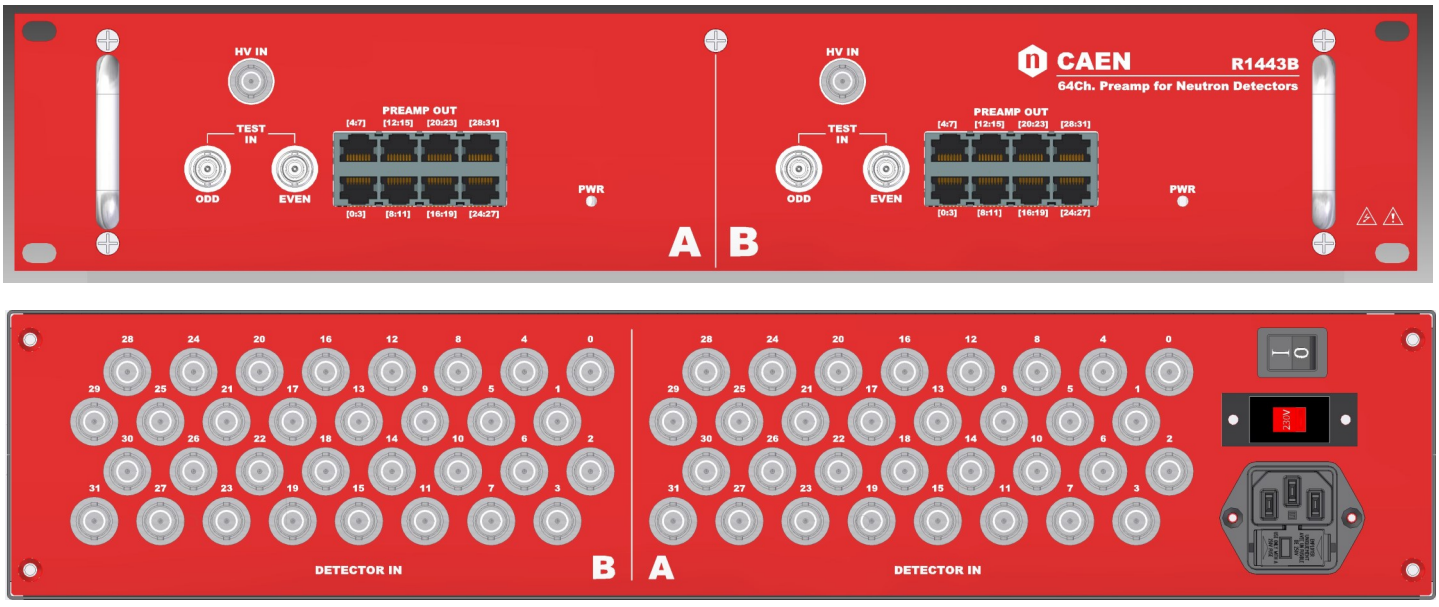
Operation

Care must be taken in the use of R1443 with high voltage detectors.
Please remember to:

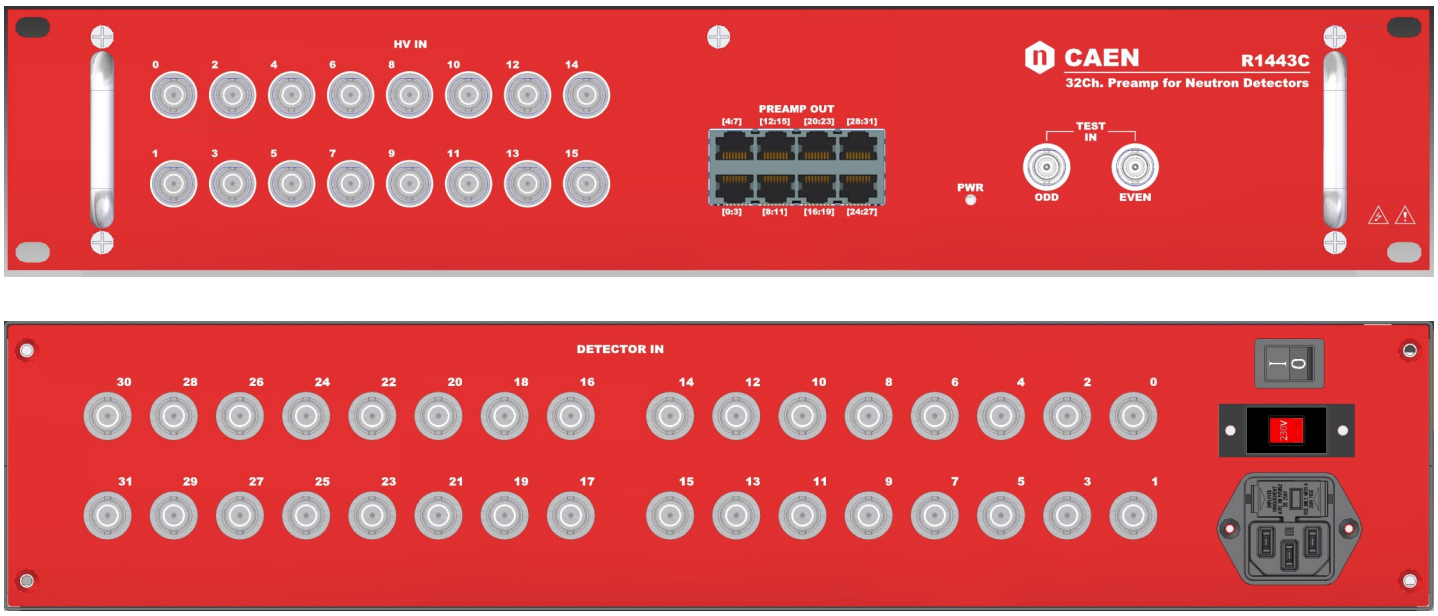
- Turn down gradually bias voltage prior to connect or disconnect preamp input
- Avoid fast changes in bias voltage
- Avoid Detector breakdown or discharge



R1443A front and rear panel



R1443B front and rear panel



R1443C front and rear panel

CAEN SpA
Via Vetraia 11
55049 – Viareggio Italy
Tel +39.0584.388.398
Fax +39.0584.388.959
info@caen.it www.caen.it

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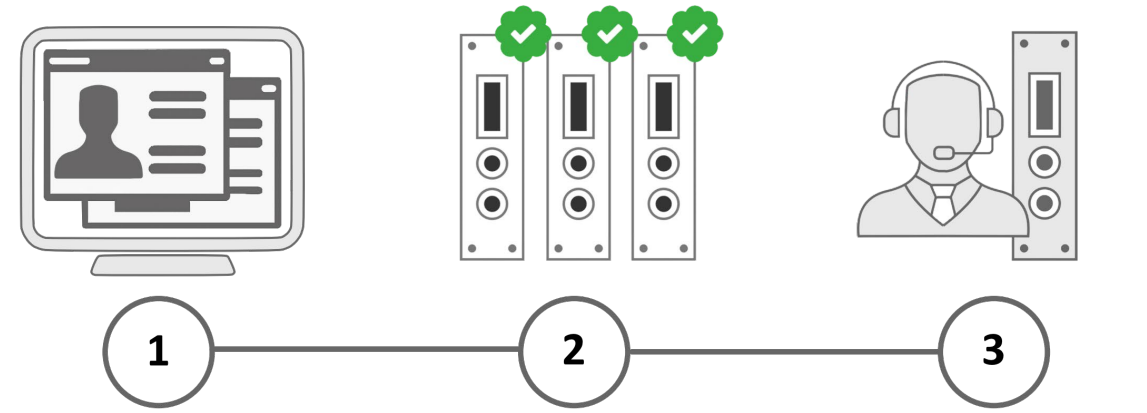

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Tools for Discovery

Electronic Instrumentation

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
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

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