Electronic Instrumentation for Nuclear, Astroparticle Physics and Industrial Electronics.

Spectrometric amplifier.

Model **NCB215(P).**

Manual Revision V4.0 30/05/2025

WARRANTY

NAICAM S.R.L. warrants this product to be free from defects in material and workmanship for a period of 1 year from date of shipment from headquarter in Italy.

NAICAM SRL warrants the following items for one year from the date of shipment: probes, cables, and documentation of specified equipment.

During the warranty period, we will, at our option, either repair or replace any product that proves to be defective.

To exercise this warranty, write or call your local NAICAM SRL representative, or contact NAICAM SRL headquarters in Italy. You will be given prompt assistance and return instructions. Send the product, transportation prepaid, to the indicated service facility. Repairs will be made and the product returned, transportation prepaid. Repaired or replaced products are warranted for the balance of the original warranty period.

LIMITATION OF WARRANTY

This warranty does not apply to defects resulting from product modification without NAICAM SRL express written consent, or misuse of any product or part.

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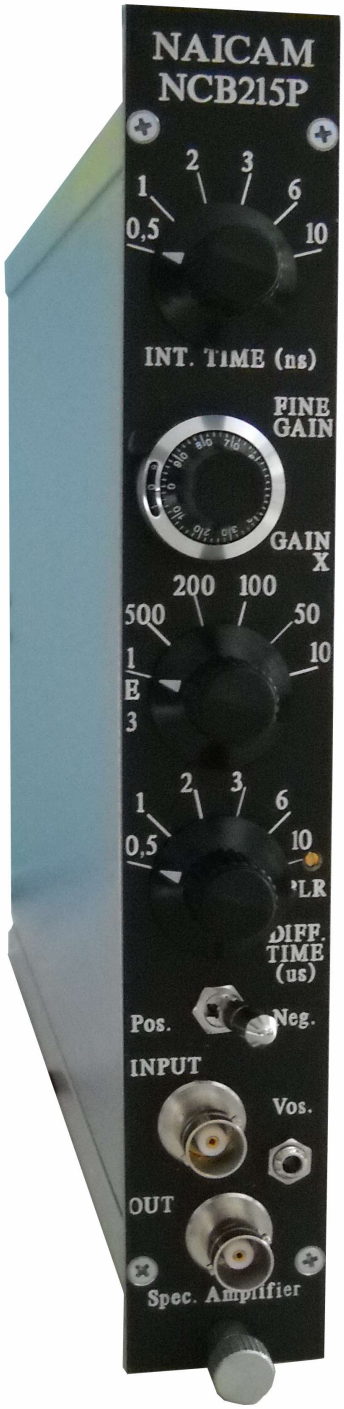

NAICAM
NCB215P
0,5
1
2
3
6
10
INT. TIME (ns)
FINE
GAIN
GAIN
X
500
200
100
50
10
1
E
3
0,5
1
2
3
6
10
DIFF.
TIME
(us)
Pos.
Neg.
INPUT
Vos.
OUT
Spec. Amplifier

1. GENERAL DESCRIPTION.

1.1 DESCRIPTION.

The NIM module **NCB215** is a general-purpose spectrometric amplifier for energy spectroscopy with all types of detectors. The module has unipolar output, low noise, wide-gain range and front-panel selectable time constant.

The Module NCB215 is general-purpose spectrometric amplifier and has active filter networks of circuit that generate a very symmetrical unipolar output with optimal signal-to-noise ratio over a wide range of time constants. The module NCB215 has a good output DC stability.

The module NCB215P is precise spectrometric amplifier with the same circuit of NCB215 but passive components are 0,1 % value and high temperature stability. The model NCB215P has gain up to 3000.

1.2 FUNCTIONAL BLOCK DIAGRAM

The module has 3 basic circuits low noise input amplifier with differentiation time constant control of the pulse circuit, amplification circuit and integration time constant to control circuit. The base line circuit is optional and can be integrated in NCB215 version (Fig.1). Pulse shape Semi-Gaussian on all ranges. Gain range continuously adjustable from 10 to 1500. (20 to 3000 NCB215P).

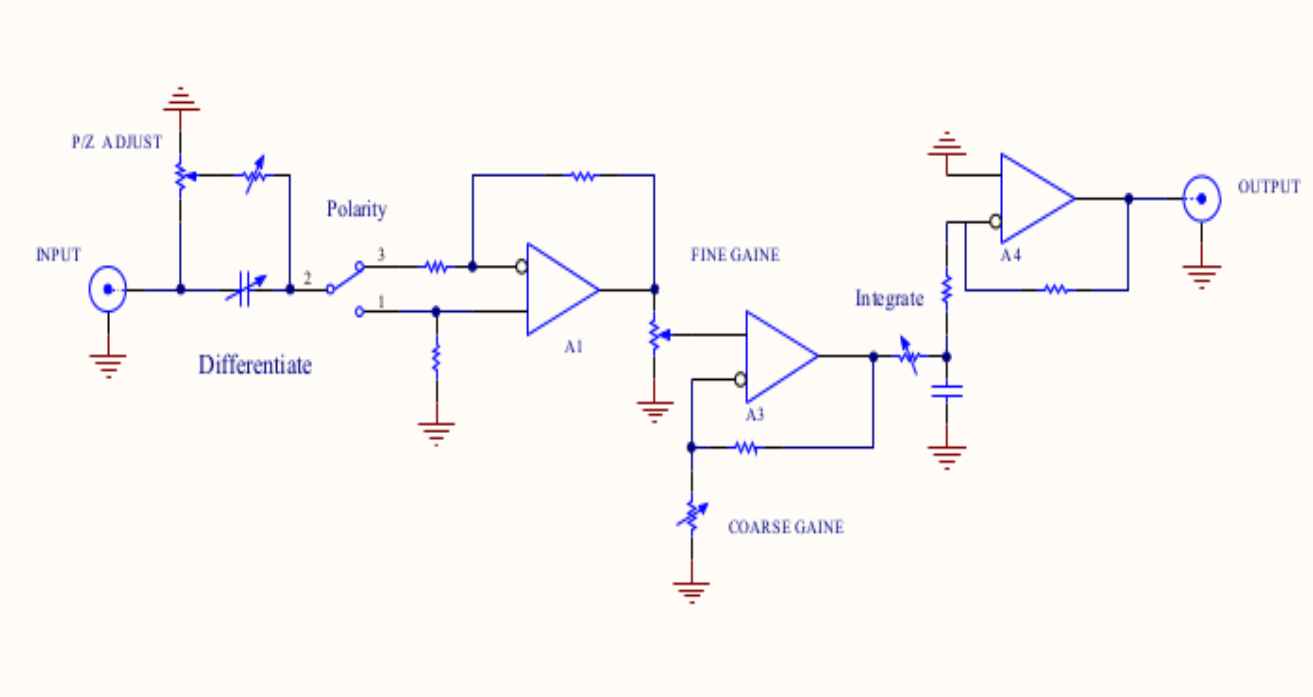


Figure. 1. Block Diagram of the NCB215 spectrometric amplifier.

1.3 PERFORMANCE.

INPUT AMPLITUDE RANGE	0 to ±1 V signal, 0 to ±5 V DC offset; maximum input ±12 V total.
OUTPUT AMPLITUDE RANGE	0 to ±10 V without termination. The output can be terminated to 50-**Ω** load.
NOISE RMS	≤ 8 µV. (2 us shaping time and maximum gain, positive polarity)
RISE TIME	x2.2 **τ** for shaping selections.
NONLINEARITY	≤±0.05% not over ±10 V range. Variation of nonlinearity in over range signal is less then 0,1%.
TEMPERATURE INSTABILITY	
NCB215	Gain ≤±0.01%/°C, 0 to 50°C. DC Level ≤±50 µV/C, 0 to 50°C.
NCB215P	Gain ≤±0.005%/°C, 0 to 50°C. DC Level ≤±20 µV/C, 0 to 50°C.
COARSE GAIN	Front-panel 6-position switch for selection of x10, x50, x100, x200, x500, or x1000.
GAIN STABILITY NCB215	less then 0,04 %/C in full range.
GAIN STABILITY NCB215P	less then 0,02 %/C in full range.
FINE GAIN	10-turn precision potentiometer variable gain factor of x0.5 to x1.5.
POLE ZERO ADJ (PLR)	Front-panel screwdriver adjustment to compensate for the preamplifier decay time constant from 25us to ∞.
TIME CONSTANT	Two 6-position switches on front panel: Integrate RC time constants: 0.5, 1, 2, 3, 6, and 10 us. Differentiate RC time constants: 0.5, 1, 2, 3, 6, and 10 us.
Pos./Neg.	Selects inversion or non inversion of the input

	signal.
INPUT	Positive or negative polarity selectable by front-panel switch; amplitude 0 to ±1 V; impedance 1k**Ω**, DC-coupled; front-panel BNC connector. Accepts a ±12 V DC maximum input signal.
OUTPUT	Front-panel BNC connector. Amplitude 0 to ±10 V (without termination); Output impedance Zo = 100 **Ω**, rise time 2.2 **τ** filter selections.
OUTPUT ZERO ADJ (Vos)	Front-panel screwdriver adjustment to compensate output offset in range +/- 20 mV. In optional version this front panel screwdriver adjustment regulate automatic base line restorer threshold (BLZ).
SPECTRUM BROADENING	Typically <20% FWHM.
SPECTRUM SHIFT	Peak position shifts typically <0.03%.
PREAMPLIFIER POWER	Rear-panel standard DSUB power connector.

2. TECHNICAL SPECIFICATIONS.

The module on the front panel has BNC input and out connectors, fine gain trimmer zero pole trimmer, Locking toggle switch pulse polarity and Vout offset regulation. On the rear panel there are two connectors: Power NIM connector and DSUB connector for preamplifier.

2.1 OPERATING INSTRUCTIONS

Signal Polarity control.

Pos./Neg Selects inversion or non-inversion input signal.

Gain control.

COARSE GAIN on the front-panel is 6-position switch for selection of x10, x50, x100, x200, x500, or x1000.

FINE GAIN on the front-panel is 10-turn potentiometer, continuous from x0,5 to x1,5

Time Constant control.

One 6-position switch on front panel control Integrate RC time constants: 0.5, 1, 2, 3, 6, and 10 us.

One 6-position switch on front panel control Differentiate RC time constants: 0.5, 1, 2, 3, 6, and 10 us.

Front-panel Pole zero control screwdriver adjustment to compensate for the preamplifier decay time constant from 25us to ∞ (PLR).

Buffer output offset control.

This front panel screwdriver near to Output BNC connector permit adjustment output DC level by automatic base line restorer (BLR) in range +/- 20mV (Vos).

2.2 INPUT/OUTPUT CONNECTIONS AND SIGNAL CHARACTERISTIC.

INPUT: Front-panel BNC connector accepts positive or negative pulses with rise times of 15 to 1000 ns and decay times of 30µs to ∞, Zin ≅ 1 K**Ω** dc-coupled; maximum +/-10 V; absolute maximum +/-12V.

OUTPUT: UNIPOLAR Front-panel BNC connector with Zo = 100 **Ω**, short-circuit proof; prompt with full scale linear range of +/-10 V; active filter shaped; dc-restored; dc-level adjustable to ±20 mV.

2.3 INTERNAL HARDWARE SETTINGS.

No any internal settings.

2.4 POWER REQUIREMENTS.

The NAICAM Model NCB215 operates only with ±12 V power that must be furnished from a nuclear standard NIM crate with power supply such as the NCB305 or NCB150 series. If the equipment is to be rack mounted, be sure that there is ventilation to prevent any localized heating of the components. The temperature of the equipment mounted in racks could not exceed the limit of 50°C.

PREAMP POWER: Rear-panel has one standard DSUB9 power connector for connection one preamplifier. Connector has standard pin out and provide +/-24V, +/-12 V.

Power supply pin out:

Pin number	Function
7	+24 Volt
6	-24 Volt
4	+12 Volt
9	-12 Volt
1	Ground

.

POWER SUPPLY REQUIREMENTS:

The module has NIM standard power supply.

P. Voltage (V)	Current (mA)
+12	90
-12	90

Bin/Module Connector Pin Assignments
For Standard Nuclear Instrument
Modules per DOE/ER-0457T.

PIN	Function	PIN	Function
1	+3 V	23	Reserved
2	- 3 V	24	Reserved
3	Spare bus	25	Reserved
4	Reserved bus	26	Spare
5	Coaxial	27	Spare
6	Coaxial	28	+24 V
7	Coaxial	29	- 24 V
8	200 V DC	30	Spare bus
9	Spare	31	Spare
10	+6 V	32	Spare
11	- 6 V	33	117 V AC
12	Reserved bus	34	Power return ground
13	Spare	35	Reset (Scaler)
14	Spare	36	Gate
15	Reserved	37	Reset (Auxiliary)

16	+12 V	38	Coaxial
17	- 12 V	39	Coaxial
18	Spare bus	40	Coaxial
19	Reserved bus	41	117 V AC (neutral)
20	Spare	42	High-quality ground
21	Spare	G	Ground guide pin
22	Reserved		

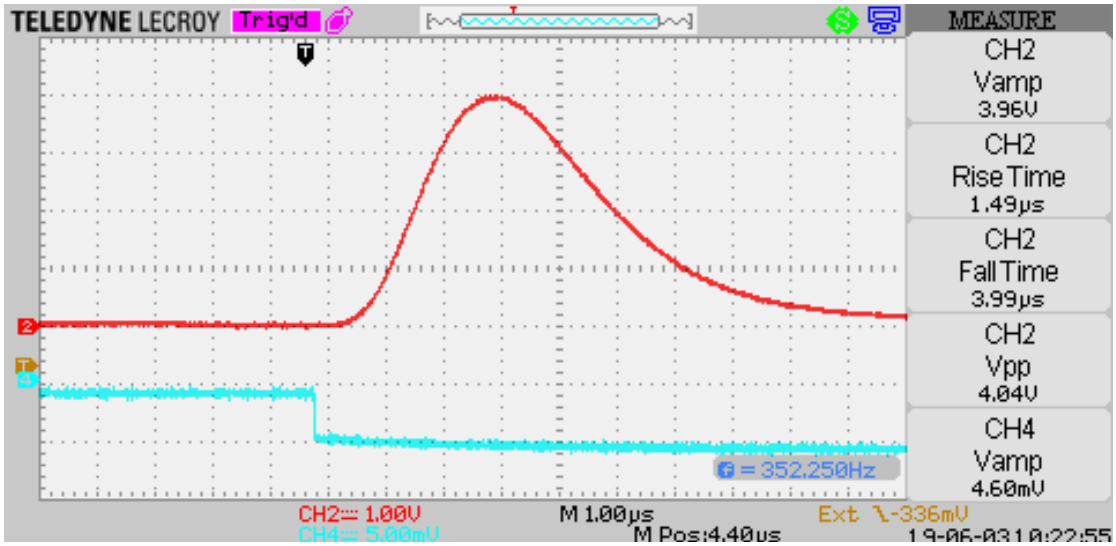
2.5 DIMENSION AND WEIGHT

WEIGHT:
Net 0.9 kg.

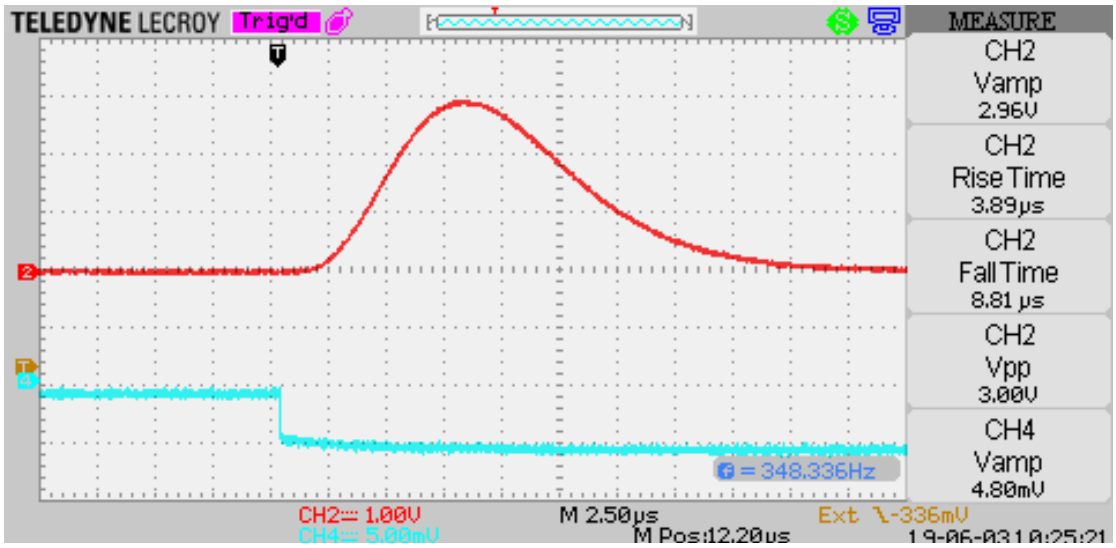
DIMENSIONS:

NIM-standard single-width module 3.43 X 22.13 cm.

Appendix:



Picture 1. Output signal: switch are set in 1 us positions, output signal is terminated to 1MOhms.



Picture 2. Output signal: switch are set in 2 us positions, output signal is terminated to 1MOhms.

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