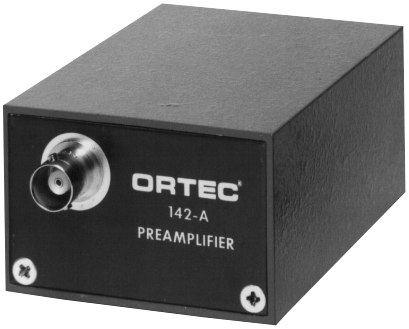
ORTEC®

AMETEK®

142A, B, and C
Preamplifiers

- **Optimum performance for (A) low-, (B) medium-, and (C) high-capacitance charged-particle or heavy-ion detectors**
- **Extremely low noise**
- **Accepts 0 to ±1 kV bias**
- **Separate fast-timing output signal with rise time from <5 ns**
- **Operates in vacuum**
- **Small size**







The ORTEC Models 142A, 142B, and 142C Preamplifiers are low-noise, fast-rise-time, charge-sensitive preamplifiers designed for optimum performance with charged-particle or heavy-ion detectors.

The Model 142A is optimized for extremely low noise and fast timing for detectors with capacitance up to 100 pF. This makes it the ideal selection for high-resolution alpha- and beta-particle spectroscopy applications.

Model 142B is optimized for extremely low noise and fast timing for detectors with capacitance greater than 100 pF but less than 400 pF.

Model 142C is optimized for extremely low noise and fast timing for detectors with capacitance greater than 400 pF.

These preamplifiers have a separate fast-timing output with pulse widths of ~50 ns and rise times ranging from less than 5 ns for 0 pF detectors to less than 20 ns for 1000 pF detectors. This timing output, when used in conjunction with ORTEC's standard electronics, provides excellent time resolution (Fig. 1); also, its fast-differentiated shape often permits direct coupling to the timing discriminator.

The performance of many spectroscopy systems can be enhanced by these preamplifiers being able to operate in vacuum enclosures. This allows the input cable length to be minimized. The small size of the preamplifiers is of significant importance when operating in such enclosures due to the limited space available.

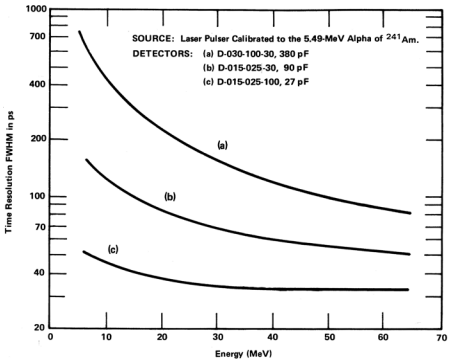


Fig. 1. Typical Time Resolution vs. Energy for Different Capacitance Detectors Using ORTEC Standard Electronics

Specifications

PERFORMANCE*

NOISE (see Fig. 2)

Model	Detector Capacitance (pF)	Maximum Noise (keV) (Si)
142A	0	1.60
142A	100	3.40
142B	100	3.20
142B	1000	19.00
142C	400	7.20
142C	1000	14.50
142C	2000	27.00

INTEGRAL NONLINEARITY ≤0.03%, 0 to ±7 V open circuit or ±3.5 V terminated in 93 Ω.

TEMPERATURE INSTABILITY
142A <±50 ppm/°C from 0 to 50°C.
142B <±100 ppm/°C from 0 to 50°C.
142C <±100 ppm/°C from 0 to 50°C.

OPEN LOOP GAIN
142A >40,000.
142B >80,000.
142C >80,000.

CHARGE SENSITIVITY (Si equivalent)
142A Nominally 45 mV/MeV.
142B Nominally 20 mV/MeV.
142C Nominally 20 mV/MeV.

ENERGY RANGE
142A 0–200 MeV.
142B 0–400 MeV.
142C 0–400 MeV.

E_2CRP Maximum energy-squared count-rate product:
142A 2 X 10^7 MeV^2/s.
142B 5 X 10^7 MeV^2/s.
142C 5 X 10^7 MeV^2/s.

RISE TIME (0 to 0.5 V pulse at E output on 93-Ω load)
142A <5 ns at 0 pF; <12 ns at 100 pF.
142B <5 ns at 100 pF; <25 ns at 1000 pF.
142C <11 ns at 400 pF; <20 ns at 1000 pF.

DECAY TIME
142A Nominally 500 µs.
142B Nominally 1000 µs.
142C Nominally 1000 µs.

RECOMMENDED RANGE OF INPUT CAPACITANCE
142A 0 to 100 pF.
142B 100 to 400 pF.
142C 400 to 2000 pF.

DETECTOR BIAS VOLTAGE ±1000 V maximum.

*Performance specifications apply to E output unless stated otherwise.

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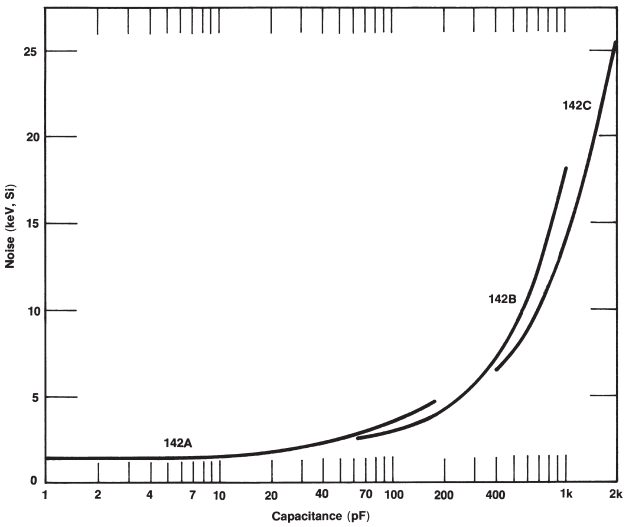


Fig. 2. Typical Noise as a Function of Input Capacitance Measured with an ORTEC Model 572 Amplifier and 2-µs Time Constant.

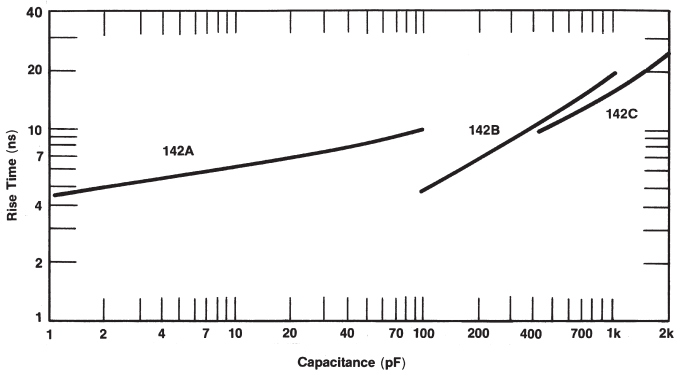
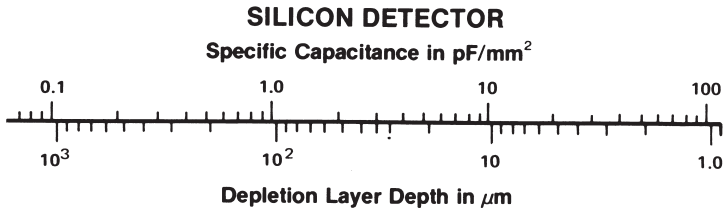


Fig. 3. Typical Rise Time as a Function of Input Capacitance with Rise Time Compensation Optimized at Each Data Point.
(Values given are for a +0.5-V signal into 93 Ω from the E channel.)



INPUTS

INPUT Accepts positive or negative charge input (normally from a semiconductor detector) from any type detector; BNC connector.

BIAS Accepts detector bias from bias supply and applies it to detector through the INPUT connector; maximum ±1000 V; SHV connector or ORTEC type C-38.

TEST Input for pulse generator to test and calibrate the system; BNC connector.

POWER Input power through 10-ft captive power cable from ORTEC main amplifier or ORTEC Model 4002P Portable Power Supply.

OUTPUTS

E Positive or negative linear tail pulse for energy measurement. BNC connector.

T Negative or positive linear fast-clipped pulse for timing. This output is generated using an inverting transformer that differentiates the energy output. Its rise time ranges from <5 ns to <25 ns. BNC connector.

ELECTRICAL AND MECHANICAL

POWER REQUIRED
142A +24 V, 20 mA; –24 V, 10 mA; +12 V, 15 mA; –12 V, 15 mA.

142B +24 V, 40 mA; –24 V, 10 mA; +12 V, 15 mA; –12 V, 15 mA.

142C +24 V, 40 mA; –24 V, 10 mA; +12 V, 15 mA; –12 V, 15 mA.

WEIGHT
Net 0.32 kg (0.75 oz).
Shipping 1.25 kg (2.75 lb).

DIMENSIONS 3.81 X 6.10 X 13.3 cm (1.5 X 2.4 X 5.25 in.).

SELECTION GUIDE TO 142A, 142B, OR 142C

To choose among Models 142A, 142B, or 142C:

1. Find the depletion depth of your detector. If it is an ORTEC detector, the last group of 2 to 4 digits is the depth in µm.

2. Find the depletion depth on the graph above and read the capacitance in pF/mm^2 on the top of the chart.

3. Multiply by the area of your detector in mm^2. This is the middle 3-digit number for an ORTEC detector.

Choose a Model 142A if the capacitance is less than 100 pF, a Model 142B if the capacitance is more than 100 pF but less than 400 pF, or a Model 142C if the capacitance is greater than 400 pF. Example: An ORTEC D-025-200-100 detector will have about 1 pF/mm^2 for its 100-µm depletion depth. This, then, is 200 pF for the 200 mm^2 area, and a Model 142B Preamplifier is preferred.

Ordering Information

To order, specify:

Model	Description
142A	Preamplifier (for 0 to 100 pF)
142B	Preamplifier (for 100 to 400 pF)
142C	Preamplifier (for 400 to 2000 pF)

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Specifications subject to change
24-0805