

Features

- Low noise design: less than 10^{-15} coulombs rms
- High charge rate capacity (up to 9 $\mu\text{C/s}$) for high count rate applications
- FET input, diode protected
- Fast risetime: less than 15 ns

Description

The Canberra Model 2005 is a charge sensitive preamplifier which collects the charge output from scintillation/photomultiplier detectors for presentation to a pulse shaping main amplifier. For the typical application with input from the decoupled anode signal from a photomultiplier tube base, the preamplifier generates a positive polarity energy pulse output.

Functionally the unit operates as an integrator utilizing an operational type configuration by which the potential difference across the feedback capacitor is directly proportional to the charge accumulated from the detector input. The integrator is followed by a pole/zero cancellation circuit for optimum overload performance, and a differentiator to provide the 50 μs tail pulse. In addition, a buffer stage allows the Model 2005 to drive a long cable length without pulse degradation.

Charge conversion gains of nominally 4.5 or 22.7 millivolts per picocoulomb may be selected by a jumper plug on the printed circuit board inside the unit. Power for the unit is usually supplied from the associated main amplifier through the 3 m (10 ft) power cable provided with the preamp.

Specifications

INPUTS

DETECTOR INPUT – Accepts charge pulse from scintillation/photomultiplier detector.

TEST INPUT – Charge coupled to preamp input at 33 pC/V; $Z_{in} = 93 \Omega$.

OUTPUTS

ENERGY OUTPUT – Inverted tail pulse; rise time as in Table 1; 50 μs fall time constant, up to $\pm 10 \text{ V}$; $Z_{out} = 93 \Omega$; direct coupled.

PERFORMANCE

OPERATING TEMPERATURE RANGE – 0 to 50 $^{\circ}\text{C}$.

INTEGRAL NONLINEARITY – $< \pm 0.02\%$ for up to $\pm 10 \text{ V}$ output.

GAIN DRIFT – $< \pm 0.01\%$ per $^{\circ}\text{C}$ ($\pm 100 \text{ ppm}/^{\circ}\text{C}$).

NOISE OUTPUT PERFORMANCE – See Table 1.

CHARGE SENSITIVITY – 4.5 mV/pC or 22.7 mV/pC, internally selected.

HIGH CHARGE RATE CAPABILITY – Up to 9 $\mu\text{C/s}$.

CONNECTORS

POWER – Amphenol 17-20090.

DETECTOR INPUT, TEST INPUT, ENERGY OUTPUT – BNC.

3 m (10 ft) compatible preamplifier power cable with required connectors is supplied with the preamp.

POWER REQUIREMENTS

+24 V dc – 20 mA +12 V dc – 2 mA

–24 V dc – 14 mA –12 V dc – 2 mA

PHYSICAL

SIZE – 7.6 x 10.2 x 4.4 cm (3 x 4 x 1.75 in.).



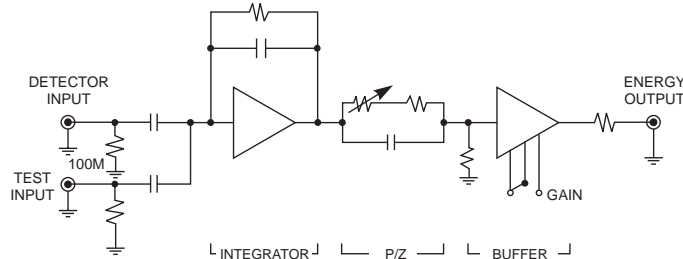
NET WEIGHT – 0.31 kg (0.69 lb).

SHIPPING WEIGHT – Approximately 0.48 kg (1.06 lb).

Table 1

Model	C_{source} in Picofarads	Noise in Coulombs rms	Rise Time in Nanoseconds
2005	0	1×10^{-15}	< 15
	500	1.5×10^{-15}	< 16

Noise performance measured using Canberra Model 2020 Spectroscopy Amplifier set at 2 μs unipolar, near-Gaussian shaping.



Functional Schematic