

## Features

- Excellent dc stability
- Automatic BLR threshold control
- Gated baseline restorer
- High count rate capability
- Multiple shaping time constants

## Description

The Canberra Model 241 is a high performance, economical spectroscopy amplifier in a single-width NIM module. The low noise and high count rate characteristics of the 241 are ideally suited for semiconductor detectors, proportional counters, and scintillation detectors.

The 241 incorporates four active integration networks that generate very symmetrical, near-Gaussian, unipolar signals. Switch selectable peaking times of 1, 3, and 6  $\mu$ s (0.5, 1.5, and 3.0  $\mu$ s shaping times) allow the 241 to match the signal processing requirements of most detectors. The symmetry of the pulse-shaping network optimizes the signal-to-noise ratio while allowing excellent count rate capability.

A gated baseline restorer (BLR) with automatic threshold and restorer rate circuits provides superb high count rate performance without degrading ultimate resolution.

The excellent dc stability of the 241 eliminates spectrum broadening often caused by dc shift of the amplifier output, thus ensuring superior performance.



## Specifications

### INPUT

**INPUT** – Accepts either positive or negative pulses with rise times less than the selected peaking time and decay times of 35  $\mu$ s to  $\infty$ ;  $Z_{in} = 1000 \Omega$ ; dc coupled; protected to +25 V max; front and rear-panel BNC connectors.

### OUTPUTS

**UNIPOLAR** – Full scale range is 0 to +10 V (+11.5 V max.);  $Z_{out} < 1 \Omega$  or 50  $\Omega$ , switch selectable; dc-restored and short-circuit protected; front and rear-panel BNC connectors.

**BIPOLAR** – Full scale range is 0 to +10 V (+11.5 V max.);  $Z_{out} < 1 \Omega$  or 50  $\Omega$ , switch selectable; short-circuit protected; front and rear-panel BNC connectors.

### FRONT PANEL CONTROLS

**COARSE GAIN** – Six-position rotary switch selects gain factors from 10 to 500 in a 1-2-5 sequence.

**FINE GAIN** – Ten-turn precision potentiometer with linear calibration from 500 to 1500 corresponding to multipliers of 0.5 and 1.5, respectively; extends the total gain range from 5 to 750.

**POLE-ZERO** – Multi-turn screwdriver adjustable control for cancellation of preamplifier decay times from 35  $\mu$ s to  $\infty$ .

**POS-NEG** – Two-position toggle switch selects the polarity of the incoming signals.

**BLR-P/Z** – Two-position toggle switch; BLR enables the baseline restorer; P/Z disables the baseline restorer for accurate pole/zero cancellation adjustment.

### INTERNAL CONTROLS

**PEAKING TIME** – Four individual three-position slide switches select unipolar peaking time of 1, 3 or 6  $\mu$ s; bipolar peaking time equals 0.78 of selected unipolar peaking time.

**OUTPUT IMPEDANCE** – Individual two-position slide switches select  $Z_{out}$  of  $< 1 \Omega$  or 50  $\Omega$  for either the UNIPOLAR or BIPOLAR outputs.

### PERFORMANCE

**PULSE SHAPING** – Active shaping networks produce near-Gaussian shaped unipolar pulses with selectable peaking times ( $T_p$ ) of 1, 3, or 6  $\mu$ s (0.5, 1.5, or 3.0  $\mu$ s shaping time). The unipolar pulse width is equal to 2.8 times the selected peaking time. The bipolar pulse zero crossover is delayed from the prompt unipolar peak by 0.32 times the selected peaking time.

**GAIN RANGE** – Continuously variable from X5 to X750.

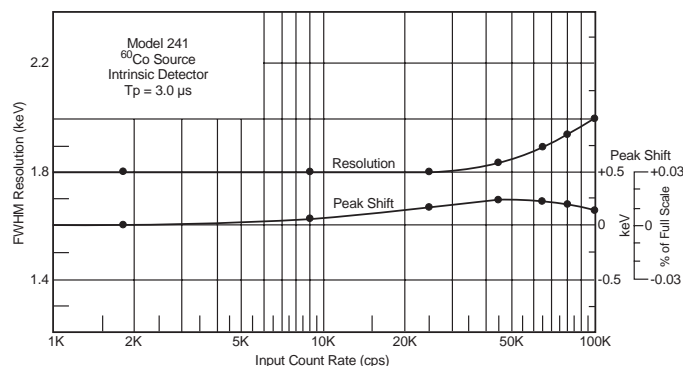
**INTEGRAL NONLINEARITY** –  $\leq \pm 0.05\%$  over 0 to +10 V output range for 3  $\mu$ s peaking time.

**NOISE** – Less than 3.0  $\mu$ V referred to the input for 6  $\mu$ s peaking time, unipolar shaping, and maximum gain; typically less than 3.2  $\mu$ V for gain greater than 100. Bipolar typically less than 5.0  $\mu$ V for gain greater than 100.

**TEMPERATURE COEFFICIENTS** – UNipolar: Gain  $\leq \pm 0.01\%/^{\circ}\text{C}$ ; dc level  $\leq \pm 10 \mu\text{V}/^{\circ}\text{C}$ ; BIpolar: Gain  $\leq \pm 0.01\%/^{\circ}\text{C}$ ; dc level  $\leq \pm 30 \mu\text{V}/^{\circ}\text{C}$ .

**WALK** –  $\leq \pm 3$  ns over a 50:1 dynamic range for 3  $\mu$ s peaking time.

**OVERLOAD RECOVERY** – Unipolar output recovers to within 2% of rated output from X300 overload in less than 2.5 non-overloaded pulse widths at maximum gain. Bipolar output recovers to within 2% of rated output from X300 overload in less than 2.0 non-overloaded pulse widths at maximum gain.



SPECTRUM BROADENING – Unipolar FWHM typically changes less than 10% for a  $^{60}\text{Co}$  1.33 MeV gamma line at 85% of rated output, 3  $\mu\text{s}$  peaking time and incoming rate from 1 to 100 kcps.\*

SPECTRUM SHIFT – Unipolar peak position typically shifts less than 0.02% for a  $^{60}\text{Co}$  1.33 MeV gamma line at 85% of rated output, 3  $\mu\text{s}$  peaking time and incoming rate from 1 to 100 kcps.\*

\*These results may not be reproducible if measurements are made with a detector which exhibits a large number of slow rise-time signals.

#### POWER REQUIREMENTS

|               |               |
|---------------|---------------|
| +24 V – 40 mA | +12 V – 65 mA |
| –24 V – 30 mA | –12 V – 75 mA |

#### PHYSICAL

SIZE – Standard single-wide NIM module 3.43 x 22.13 cm (1.35 x 8.71 in.) per DOE/ER-0457T.

NET WEIGHT – 1.1 kg (2.5 lb).

SHIPPING WEIGHT – 2.3 kg (5.0 lb).

#### ENVIRONMENTAL

OPERATING TEMPERATURE – 0 to 50 °C.

OPERATING HUMIDITY – 0 to 80% relative, non-condensing.

Tested to the environmental conditions specified by EN 61010, Installation Category I, Pollution Degree 2.

