PerkinElmer instruments.
ORTEC Products

460
Delay Line Amplifier

- Delay-line shaping for energy and time spectroscopy with scintillation detectors
- Ideal for n-γ discrimination by pulse-shape analysis
- Excellent high-counting rate performance
- Optimum timing capabilities
- Selectable integration time constants

The Model 460 Delay Line Shaping Amplifier is intended for energy and time spectroscopy with scintillation detectors. It can also be used with proportional counters, semiconductor detectors and position-sensitive proportional counters. Its delay-line shaped output signal is particularly well suited for high-counting rate and timing applications. This particular type of output signal offers a more rapid baseline recovery than is possible with semi-Gaussian shaping amplifiers. The Model 460 provides excellent timing capabilities, either for leading-edge or zero-crossing timing techniques, particularly when it is used with an ORTEC Model 552 Pulse-Shape Analyzer/Timing Single-Channel Analyzer. Double-delay-line shaping exhibits less time jitter when compared with either the classical RC-shaping network or active-filter networks, primarily due to the fast rise time and fall time of the double-delay-line shaped output pulse.

The Model 460 also offers the unique feature of a selectable integration time constant to optimize the signal-to-noise ratio in any particular experimental configuration. The optimum integration time constant depends on such factors as the noise in the system and the counting rate in the particular experiment. The Model 460 is well suited for applications where overload pulses are involved, as it will recover to within 2% of its rated maximum output in <5 nonoverloaded pulse widths from a X500 overload.

The Model 460 exhibits <1 ns of crossover walk for a 20:1 dynamic range of its output signal. Therefore it is useful in precise fast coincidence timing applications that employ the crossover timing or constant-fraction timing techniques. The Model 460 offers both prompt and delayed outputs and therefore can store the unipolar outputs temporarily if desired for energy analysis after the timing and coincidence evaluation has taken place. The baseline-restorer unipolar output can be either delayed or prompt as selected by a switch on the rear panel.

The Model 460 is the amplifier recommended for use with pulse-shape analysis applications such as neutron-gamma separation when using the ORTEC Model 552 Pulse Shape Analyzer/Timing SCA.

PERFORMANCE

Gain Range 7-position Coarse Gain selection from 10 through 1000 and single-turn Fine Gain control from 0.3 through 1; total gain is the product of Coarse and Fine Gain settings.

Shaping Filter Front-panel switch permits selection of integration time constant with τ = 0.04, 0.1, or 0.25 µs (40, 100, or 250 ns).

Integral Nonlinearity ≤±0.05%.

Noise ≤20 µV rms referred to input using 0.25 µs Integrate and maximum Gain of 1000; ≤25 µV for Gain = 50; ≤60 µV for Gain = 10.

Crossover Walk For constant gain, walk <±1 ns for 20:1 dynamic range; <±2 ns for 50:1; <±2.5 ns for 100:1. Crossover shifts <±4 ns for any adjacent Coarse Gain switch settings.

Count Rate Stability A pulser peak at 85% of analyzer range shifts <0.2% in the presence of 0 to 10^5 random counts/s from a ^{137}Cs source with its peak stored at 75% of the analyzer range.

Temperature Instability
Gain ≤±0.01%/°C, 0 to 50°C.
DC Level ≤±0.1 mV/°C, 0 to 50°C.

Overload Recovery Bipolar recovers to within 2% of rated maximum output in <5 nonoverloaded pulse widths from X500 overload; unipolar recovers in same time from X100 overload.

Delay Line Shaping 1-µs. Both delay lines have the same value.

ELECTRICAL AND MECHANICAL

Power Required +24 V, 90 mA; -24 V, 90 mA; +12 V, 75 mA; -12 V, 60 mA.

Dimensions Standard single-width NIM module 3.43 x 22.13 cm (1.35 x 8.714 in.) per DOE/ER-0457T.

Weight
Net 1 kg (2.25 lb)
Shipping 1.9 kg (4.25 lb)

CONTROLS

FINE GAIN Front-panel single-turn potentiometer for continuously variable gain factor of X0.3 to X1.

COARSE GAIN Front-panel seven-position switch selects gain factors of X10, 20, 50, 100, 200, 500, and 1000.

INTEG Front-panel slide switch selects an integration time constant of 0.04, 0.1, or 0.25 µs. For 0.04-µs setting amplifier rise time is <75 ns.

PZ ADJ Front-panel potentiometer adjusts pole-zero cancellation for decay times from 25 µs to infinity.

POS/NEG Front-panel slide switch sets input circuit for either input polarity.

DC ADJ Front-panel potentiometer adjusts the dc-level for single-delay-line shaped unipolar output pulses.

DELAY IN/OUT Rear-panel slide switch selects either delayed (In) or prompt (Out) timing for unipolar output pulses. Delay is equal to the width of the unipolar output pulse.

INPUTS

BNC Connector on front panel accepts either positive or negative inputs with rise time of 10 to 1000 ns and decay time of 25 to 2000 µs; Z_{in} ≅ 1000 Ω, dc-coupled; linear maximum 3.3 V; absolute maximum 20 V.

OUTPUTS

UNIPOLAR Prompt or delayed with full-scale linear range from 0 to +10 V; single-delay-line shaped; baseline restored level adjustable to ±1 V; Z_o <1 Ω, dc-coupled through front-panel BNC connector; Z_o = 93 Ω, dc-coupled through rear-panel BNC connector. Short-circuit protected.

BIPOLAR Prompt output with positive lobe leading, double-delay-line shaped with full-scale linear range of 0 to 10 V; Z_o <1 Ω, dc-coupled through front-panel BNC connector; Z_o = 93 Ω, dc-coupled through rear-panel BNC connector. Short-circuit protected.

Preamp Standard ORTEC power connector for mating preamplifier; rear-panel Amphenol 17-10090 connector.