PerkinElmer instruments. ORTEC Products

572 Amplifier

- General-purpose amplifier for energy spectroscopy with all types of detectors
- Built-in pile-up rejector and gated BLR with automatic thresholds for excellent performances at high counting rates
- Unipolar and bipolar outputs with unipolar output delay
- Active filter networks with wide range of time constants
- Wide gain range

The ORTEC Model 572 Amplifier is ideally suited for use with germanium detectors, silicon charged-particle detectors, proportional counters, scintillation counters, and pulsed ion chambers. It includes an automatic gated baseline restorer and built-in pile-up rejector to provide exceptionally stable performance over a very wide dynamic range. System resolution is nearly independent of input counting rate (Fig. 1).

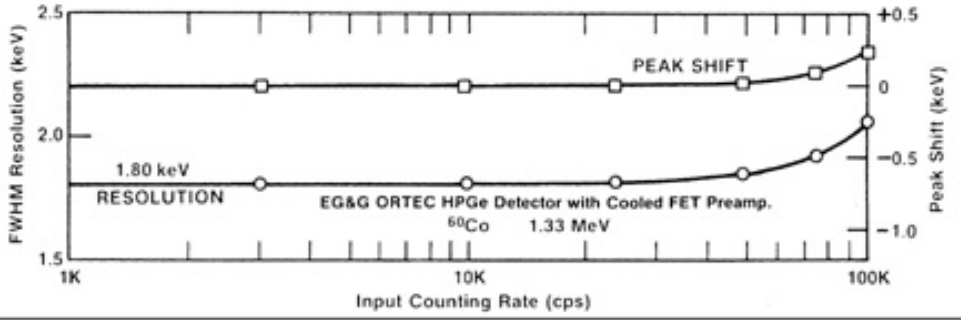

Fig. 1 Typical Resolution and Baseline Stability vs Counting Rate for the Model 572 in a Gamma Spectroscopy System

The gated baseline restorer (BLR) includes a discriminator that operates the sensing circuits that normally establish the baseline reference of the MCA. Performance of the spectrometer depends on the precision of the setting of the BLR threshold. The Model 572 offers the convenience of an automatic threshold control, which typically gives as good or better results than those the most experienced operator could achieve manually. The gate logic generates a Busy signal that can be used for dead-time correction.

The active filter networks permit the Model 572 to generate very symmetrical unipolar outputs with optimum signal-to-noise ratios over a wide range of time constants. The unipolar output can be internally delayed by 2 µs via a front-panel control when desired for gating purposes. The instrument also provides a bipolar output for timing and gating applications.

Any dc drift in an amplifier output causes spectrum broadening. The excellent dc stability of the Model 572 eliminates spectrum broadening caused by dc drift and ensures that the high resolution capability of germanium detectors is realized.

Pile-Up Rejector: The pile-up rejection circuit incorporated into the Model 572 generates an inspection period immediately following every signal equal to the duration of the Busy output. If a second event were to occur within this inspection interval, an inhibit signal, INH Output, would be generated to gate-off the MCA and thus discard the distorted amplifier output. Figure 2 shows the background reduction that takes place ina gamma ray spectrum as pile-up rejectionis used. Figure 3 illustrates the timing relationship between the amplifier input, output, and pile-up rejector logic signals.

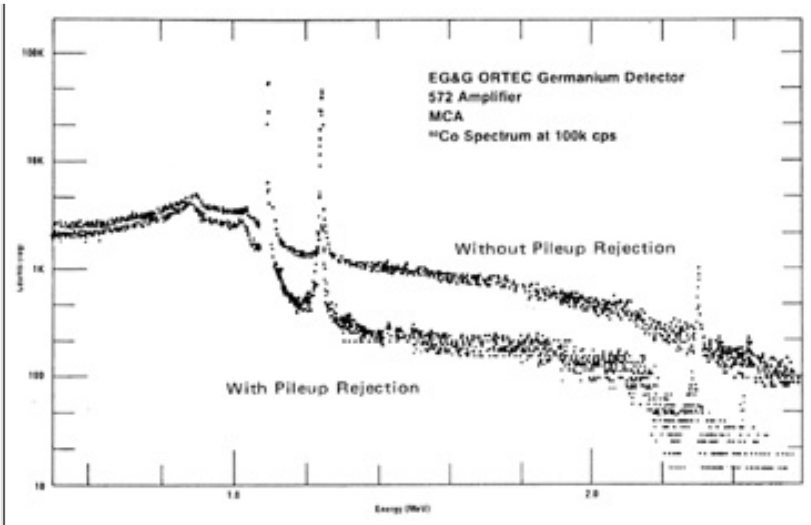

Fig. 2 Background Reduction Obtained from Pile-Up Rejection.

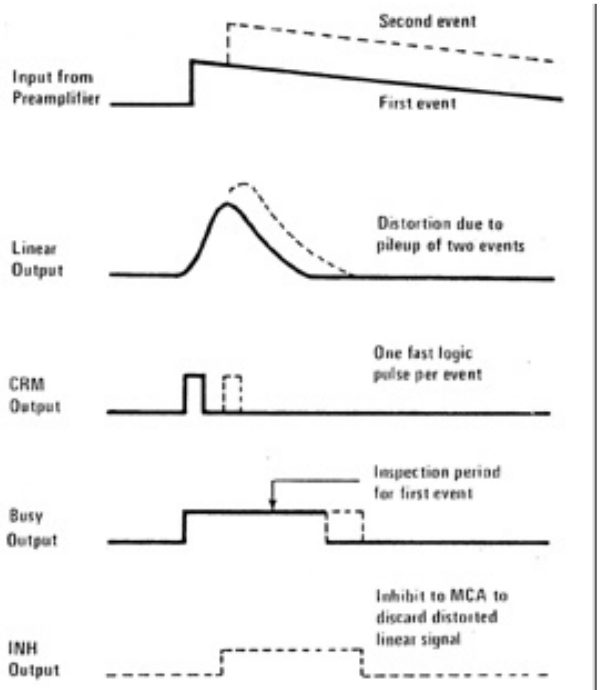

Fig. 3 Amplifier and Pile-Up Rejector Signals.

PERFORMANCE

Gain Range Continuously adjustable from 1 to 1500.

Pulse Shape Semi-Gaussian on all ranges with peaking time equal to 2.2τ and pulse width at 0.1% level equal to 2.9 times the peaking time.

Integral Nonlinearity For 2-µs shaping time, <±0.05%.

Noise Typically <5 µV for unipolar output referred to the input, using 2-µs shaping and Coarse Gain ≥100.

Temperature Instability
Gain ≤±0.0075%/°C, 0 to 50°C.
DC Level ≤±50 µV/°C, 0 to 50°C.

Bipolar Crossover Walk ≤±3 ns at 0.5 µs for 50:1 dynamic range, including contribution of an ORTEC Model 552 Single-Channel Analyzer.

Overload Recovery Recovers to within 2% of rated output from X300 overload in 2.5 nonoverloaded pulse widths using maximum gain for Unipolar Output. Same recovery from X1000 overload for bipolar.

Spectrum Broadening Typically <16% FWHM for a ^{60}Co 1.33 MeV gamma line at 85% of full scale for an incoming count rate of 1 to 100,000 counts/s (Unipolar Output, 2-µs shaping).

Spectrum Shift Peak position shifts typically <0.024% for a ^{60}Co 1.33-MeV gamma line at 85% of full scale measured from 1 to 100,000 counts/s (Unipolar Output, 2-µs shaping).

ELECTRICAL AND MECHANICAL

Power Required +12 V, 85 mA; -12 V, 50 mA; +24 V, 100 mA; -24 V, 105 mA.

Weight
Net 1.5 kg (3.3 lb.)
Shipping 3.1 kg (7.0 lb.)

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

CONTROLS

FINE GAIN 10-turn precision potentiometer with graduated dial for continuously variable direct-reading gain factor of X0.5 to X1.5.

COARSE GAIN 6-position switch selects feedback resistors for gain factors of 20, 50, 100, 200, 500, and 1k. Jumper on the printed wiring board (PWB) selects X0.1 attenuation.

INPUT Locking toggle switch selects either Pos or Neg input pulse polarity.

SHAPING TIME 6-position switch selects time constants for active pulse-shaping filter network from 0.5, 1, 2, 3, 6, and 10 µs.

DELAY Locking toggle switch selects either 2-µs delay (In) or prompt (Out) timing for unipolar output.

PZ ADJ Screwdriver adjustable potentiometer to set the pole-zero cancellation to compensate input decay times from 40 µs to infinity.

BLR 3-position locking toggle switch selects the source of control for the gated baseline restorer discriminator threshold from:
Auto The BLR threshold is automatically set to an optimum level, as a function of the signal noise, by an internal circuit.
PZ Adj The BLR threshold is determined by the threshold potentiometer. The BLR time constant is also greatly increased to facilitate pz adjustment; this position may give the lowest noise for count rates under 5000 counts/s and/or longer shaping times.
Threshold The BLR threshold is manually set by the threshold potentiometer.

DC Screwdriver adjustable potentiometer to set the Unipolar Output dc level; range ±100 mV.

INPUTS

BNC front- and rear-panel connectors accept either positive or negative pulses with rise times of 10 to 650 ns and decay times of 40 µs to infinity, $Z_{in} \cong 1000\ \Omega$ dc-coupled; linear maximum 10 V; absolute maximum 20 V.

OUTPUTS

UNI Front-panel BNC connector with $Z_o < 1\ \Omega$ and rear-panel connector with $Z_o = 93\ \Omega$, short-circuit proof; prompt or delayed with full-scale linear range of 0 to +10 V; active filter shaped; dc-restored; dc-level adjustable to ±100 mV.

BI Front-panel BNC connector with $Z_o < 1\ \Omega$ and rear-panel connector with $Z_o = 93\ \Omega$, short circuit proof; prompt output with positive lobe leading and linear range of ±10 V; active filter shaped.

CRM Rear-panel BNC connector with $Z_o < 10\ \Omega$ provides a nominally +5 V, 300 ns logic pulse every time the input signal exceeds the baseline restorer discriminator threshold.

INH Rear-panel BNC connector with $Z_o < 10\ \Omega$ provides a nominally +5 V (width equal to X6 shaping time) logic pulse when the internal pile-up rejection logic detects a distortion of the input signal due to pile-up.

BUSY Rear-panel BNC connector with $Z_o < 10\ \Omega$ provides a +5 V logic pulse for the duration that the input pulse exceeds the baseline restorer discriminator.

PREAMP POWER Rear-panel standard ORTEC power connector. Amphenol 17-10090, mates with captive and noncaptive power cords on all ORTEC preamplifiers.