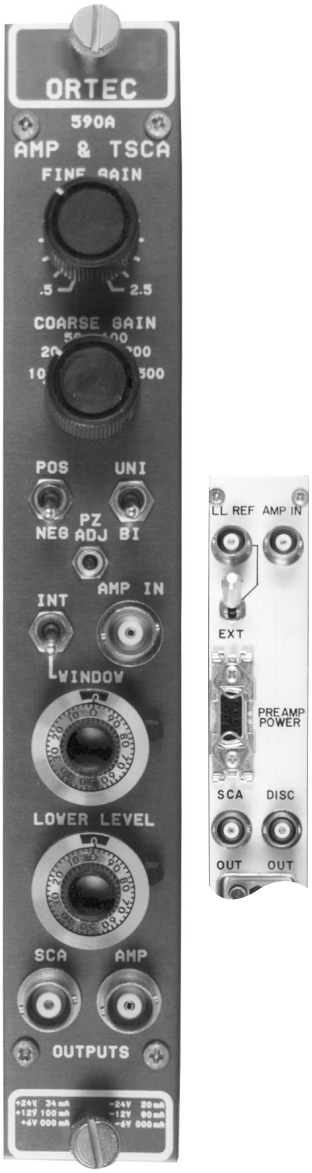
ORTEC®

AMETEK®

590A
Amplifier and Timing Single-Channel Analyzer

- **For counting, timing, and energy spectroscopy with scintillation detectors and proportional counters**
- **Selectable shaping times (0.5, 1.5, and 3.0 µs)**
- **High count-rate capability**
- **Gated active baseline restorer**
- **Selectable window range**
- **Integral/Window mode**



The ORTEC Model 590A Amplifier and Timing Single-Channel Analyzer includes both a low-noise shaping amplifier and a timing single-channel analyzer.

The amplifier employs active-filter shaping (0.5, 1.5, and 3.0 µs shaping times) for use with various types of radiation detectors. It is particularly well suited for use with the proportional counters and scintillation detectors normally used in x-ray and nuclear spectroscopy, as well as in x-ray diffraction and Mössbauer experiments. High amplifier gain improves operation of proportional counters because they can be used with lower operating potentials, thus improving the stability of gas gain vs count rate. The amplifier's short resolving time provides high count-rate capability without sacrificing the energy resolution of the proportional counter.

The amplifier has a single output that can be switch-selected for either unipolar or bipolar pulse shaping. The unipolar output is used for spectroscopy in systems where DC-coupling can be maintained from the Model 590A to the analyzer. A baseline restorer, (BLR) circuit is included in the amplifier for improved performance at all count rates. Baseline correction is applied only during intervals between input pulses, and the discriminator level to identify input pulses is automatically adjusted. The unipolar output DC-level is within the range from –5 mV to +5 mV. This output permits the use of the direct-coupled input of the analyzer with a minimum amount of interface problems.

The timing single-channel analyzer, (TSCA), in the Model 590A is DC-coupled to maintain the peak in an adjusted window without shifts due to changes of count rates. This permits stable operation with narrow window widths over wide variations of count rates, such as those that are usually present during x-ray diffraction studies. The lower level can be adjusted with a front-panel control, or it can be set by an external voltage.

The TSCA output occurs ~500 ns after the peak of the amplifier output signal. The walk of this signal is very small over a wide range of input amplitudes, making the Model 590A ideal for use in slow coincidence or gating applications.

The External Lower Level, (Ext LLD), input of the Model 590A can be used with an external voltage to set the lower level. It can also be used with a slowly varying voltage to change the lower level as a function of time or other measurement parameters.

Specifications

Amplifier

PERFORMANCE

SHAPING Semi-Gaussian on all ranges with peaking time equal to 2.2τ and pulse width at 0.1% level equal to 4 times the peaking time. Bipolar crossover equal to 1.5τ.

GAIN RANGE Continuously adjustable from X5 through X1250.

INTEGRAL NONLINEARITY <±0.05% using 1.5-µs shaping.

NOISE <5 µV rms referred to the input using 3-µs unipolar shaping, and ≤7 µV using 1.5-µs shaping, both for gain ≥100.

TEMPERATURE INSTABILITY

Gain ≤±0.0075%/°C, 0 to 50°C.

DC Level <±50 µV/°C, 0 to 50°C.

COUNT-RATE STABILITY The 1.33-MeV gamma-ray peak for a ^{60}Co source, positioned at 85% of the analyzer range, typically shifts <0.02%, and its FWHM broadens <10% when its incoming count rate changes from 1000 to 50,000 counts/s using 1.5-µs shaping. The amplifier will hold the baseline reference up to count rates in excess of 75,000 counts/s.

OVERLOAD RECOVERY Recovers to within 2% of rated output from X300 overload in 2.5 non-overloaded unipolar pulse widths using maximum gain; same recovery from X500 overload for bipolar pulses.

BASELINE RESTORER (BLR) Gated active baseline stabilizer, with automatic threshold circuit, which provides the threshold level as a function of signal noise to the baseline restorer discriminator.

CONTROLS

COARSE GAIN Six-position switch to select Coarse Gain factor for amplifier; factors are 10, 20, 50, 100, 200, and 500.

FINE GAIN Single-turn potentiometer for direct reading, continuous adjustment of Fine Gain factor from 0.5 to 2.5.

PZ ADJ Front-panel screwdriver adjustment to match the amplifier shaping to the preamplifier decay time; adjustable for preamplifier decay times from 30 µs to ∞.

Factory set at 50 µs.

SHAPING Three, 3-position printed wiring board (PWB) switches, easily accessible through the side panel, select shaping times of 0.5, 1.5, and 3.0 µs.

POS/NEG Front-panel toggle switch selects input circuit for either polarity of input pulses from the preamplifier.

UNI-BI Front-panel toggle switch selects unipolar or bipolar output shape.

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INPUT

AMP INPUT BNC front- and rear-panel connectors accept either positive or negative pulses, selectable by front-panel toggle switch, with rise times in the range from 10 to 650 ns and decay times from 30 µs to ∞; Z_{in} = 1000 Ω, DC-coupled; linear maximum, 2 V; absolute maximum, 20 V.

OUTPUT

AMP Front-panel BNC, Z_o <1 Ω. Short-circuit proof; prompt full-scale linear range, 0 to +10 V; active filter shaped and DC-restored for unipolar output; DC level 0 to ±5 mV.

PREAMPLIFIER POWER

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

Timing Single-Channel Analyzer

PERFORMANCE

INPUT DYNAMIC RANGE 200:1.

PULSE-PAIR RESOLVING TIME Minimum pulse-pair resolving time ≤2 µs with 0.5-µs shaping time.

OUTPUT TIMING ≅500 ns after peak of output pulse from amplifier.

TIME SHIFT vs PULSE HEIGHT (Walk) Walk <±10 ns for a 50:1 change in output amplitude for 0.5-µs shaping time.

THRESHOLD TEMPERATURE INSTABILITY ≤±0.01%/°C of full scale (1 mV/°C). 0 to 50°C using a NIM Class A power supply (referenced to –12 V).

DISCRIMINATOR NONLINEARITY ≤±0.25% of full scale (integral) for both discriminators.

WINDOW WIDTH CONSTANCY <0.1% variation of full-scale window width over the linear 0 to 10-V range.

MINIMUM INPUT THRESHOLD 50 mV for lower-level discriminator.

EXT LLD When the rear-panel-mounted Lower-Level Reference switch is on EXT, this rear-panel BNC connector accepts the lower-level biasing (an input of 0 to –10 V on this connector corresponds to a signal in the range of 0 to +10 V for the lower-level discriminator setting). Input impedance 2000 Ω .

CONTROLS

LOWER LEVEL Front-panel 10-turn potentiometer adjustable from 0 to +10 V; when the rear-panel LL Ref mode switch is set on INT, determines the threshold setting for the lower-level discriminator. When the LL Ref mode switch on the rear panel is in the EXT position, this control is ineffective.

WINDOW 10-turn precision potentiometer on front panel for adjustment of analyzer window width (0 to 10 V or 0 to 1 V as selected by an internal jumper. Factory set at 0 to 10 V).

INT/WINDOW Front-panel toggle switch selects operating mode.

Window LL sets the baseline level (0 to 10 V) and the Window control sets the window width between 0 to 1 V or 0 to 10 V.

INT Integral LL sets a single discriminator threshold (0 to 10 V) and the Window control is disabled.

LOWER-LEVEL REFERENCE Toggle switch mounted on the rear panel selects the source of lower-level bias. INT position selects front-panel control; EXT selects lower-level bias through rear-panel connector.

INPUTS

SCA Internally connected to amplifier output; impedance level of 1000 Ω .

EXT LLD Input from 0 to –10 V, 2000-Ω input impedance; rear-panel connector.

OUTPUTS

SCA OUT Front- and rear-panel BNC connectors provide NIM standard output nominally +5 V, 500 ns wide; typically 50-Ω output impedance.

DISC OUT Rear-panel BNC connector provides NIM standard output, nominally +5 V, 500 ns wide; typically 50-Ω output impedance. Output occurs as leading edge of linear input crosses the window threshold.

ELECTRICAL AND MECHANICAL

POWER REQUIRED +24 V, 35 mA; –24 V, 25 mA; +12 V, 115 mA; –12 V, 85 mA.

WEIGHT
Net 1.3 kg (3.0 lb).
Shipping 2.25 kg (5.0 lb).

DIMENSIONS Single-width NIM-standard module 3.43 X 22.13 cm (1.35 X 8.714 in.) per DOE/ER-0457T.

Ordering Information

Model	Description
590A	Amplifier and Timing Single-Channel Analyzer

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Specifications subject to change
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