

Model 7611/L Spectroscopy Amplifier

The POLE ZERO ADVISER turns high-precision adjustment into a semi-automated operation, easily performed directly on radiation detector pulses, without requiring auxiliary equipment (oscilloscope, pulse generator, etc.) A GATED ACTIVE BASELINE RESTORER (BLR) provides excellent performance over a very wide range of input pulse count rates. Internal circuits automatically optimize its operating conditions by controlling the gate-driving threshold and the restoring rate; the controls are function of noise level and of count-rate and shaping time, that is, of the percent busy time of the amplifier, which can be monitored at a front-panel output.

Standard non-automatic BLR controls are also available for special purposes. A PILE UP REJECTOR (PUR) improves the resolution and avoids spectrum distortions at high-count rates. The associated LIVE TIME CORRECTOR (LTC), directly connected to SILENA ADCs, provides the capability of performing direct quantitative gamma spectrum analysis, almost independent of input count rate. Performance depending on the shape of the unipolar pulses (overload recovery, etc.). Optimized by an almost symmetrical quasi Gaussian pulse shape with excellent baseline recovery free from appreciable undershoots and tails. Rational distribution of shaping time values over a wide range, taking into account the dependence law of signal-to-noise ratio (SNR) on shaping time, allows the experimenter to quickly find in all instances the optimum SNR condition. An internal circuit stabilizes the DC operating point without introducing a secondary pulse-shaping time constant. The excellent DC stability, high linearity and low noise level over a wide gain range eliminate contributions of the amplifier to spectrum distortion and broadening; the superior performance of today's Germanium detectors can thus be fully exploited. The unipolar output can be delayed by 2 μ S via an internal control when required for gating purposes. A bipolar output is also provided for timing and gating applications. The design of Model 7611/L employs almost exclusively integrated circuits with only a few discrete components, and no special hybrid microcircuits. Highest performances are obtained together with high reliability, easy servicing and compactness.

- Pole Zero Adviser for high precision pole-zero cancellation without using oscilloscope
- Active filter networks with wide range of shaping times
- Gated baseline restorer with automatic controls of threshold and restoring rate
- Pile-up rejector and live-time corrector
- Integrated circuit design, no special hybrids
- Internal DC stabilizer, no secondary pulse shaping constants
- Wide gain range, high linearity, low noise
- Full power available simultaneously
- Compact size

PERFORMANCE

- Amplifier and Baseline Restorer
- Gain Range continuously variable from 2.5 to 3000 (product of COARSE and FINE GAIN controls)
- Integral non-linearity $< \pm 0.025\%$ for 2 μ s shaping time
- Temperature instability 0 to 50°C
- Gain $< \pm 50$ ppm/°C
- DC level Unipolar output $< \pm 10$ μ V/°C
- Bipolar output $< \pm 30$ μ V/°C
- Pulse Shaping Input differentiator and two active filter integrators for Unipolar, pulse output differentiator for Bipolar, variable shaping time T_s . Unipolar shape: quasi Gaussian, peaking time 2.4 T_s pulse width at 0.1% level equal to 2.9 times the peaking time.
- Bipolar shape: approximate derivative, time to crossover 3 T_s .



FRONT PANEL CONTROLS

- Coarse gain 9-position rotary switch selects gain factors of 5, 10, 20, 50, 100, 200, 500, 1000, 2000.
- Fine gain 10-turn precision potentiometer with locking, graduate dial, selects continuously variable direct-reading gain factor of X 0.5 to X 1.5
- Shaping time 6-position rotary switch selects characteristic shaping time T_s from 0.25, 0.5, 1, 2, 3, 6ms. (10 ms optional instead of 6 mS)
- Input polarity 2- position toggle switch selects either Positive or Negative input pulse polarity
- PZ Adviser Visual Indicator leading to high precision adjustment of the pole-zero cancellation, for exact compensation of the decay time of the preamplifier signal. Left LED signals overcompensation, right LED under compensation, light intensity proportional to adjustment. Setting the BLR RATE switch to the Adjust position activates the PZ ADVISER.
- PZ ADJ 22-turn screwdriver adjustable potentiometer to set the pole-zero cancellation; to be turned towards the lighted LED of the PZ ADVISER (i.e. clockwise when under compensated, counterclockwise when over compensated). Decay time compensation range: 40 ms to infinity for all shaping times T_s
- 3- position toggle switch to select the control of the baseline restoring rate (slew rate)
- AUTO: the rate is automatically optimized as a function of the percent busy time, that is by taking into account both the count rate and the selected shaping time
- HIGH the rate is set to a constant high value;
- ADJ the rate is set to a constant very low value to be used for PZ adjustment only and not for data acquisition.
- 2- position toggle switch selects the control of the gated BLR discriminator threshold AUTO the BLR threshold is automatically optimized as a function of the noise level of the unipolar signal output.
- Threshold the BLR threshold is manually set by a 22-turn screwdriver adjustable potentiometer, adjustment range 0 to 200 mV. An LED indicator is lighted every time the threshold is exceeded.
- 2- position toggle switch selects Symmetrical or asymmetrical mode for BLR operation.
- 2-position toggle switch to enable (PUR) or disable (OFF) the pile-up rejector and live time corrector.
- 2-position slide switch sets Unipolar output to prompt (OUT) or delayed 2mS (IN). Shipped in the prompt (OUT) position.
- DC Level Unipolar output: 22-turn screwdriver adjustable potentiometer adjusts within ± 150 mV the dc levels at the dc-restorer output; shipped in the 0 ± 5 mV setting.

INPUTS

- Input BNC type front panel and rear panel connectors.
- Input resistance 1 Kohm. Accepts positive or negative pulses from an associated preamplifier. Pre-amp amplitude linear range $\pm 10V$ divided by the selected gain, absolute maximum $\pm 20V$; for obtaining good output pulse shape it requires risetime $< SHAPING TIME$; for good operation of the BLR and PUR risetime < 600 nS, decay time constant 40 ms to infinity.

OUTPUTS

- Unipolar output: front-panel BNC type connector with impedance approximately 1 Ohm and rear panel connector with impedance of 93 Ohm, short-circuit proof, prompt or delayed positive pulse, +10V linear range + 11V maximum, active filter shaped, dc-restored, output dc-level adjustable, factory calibrated to 0 ± 5 mV.
- Bipolar output: front-panel BNC type connector with impedance approximately 1 Ohm and rear panel BNC TYPE connector with impedance approximately 93 Ohm, short-circuit proof prompt output with positive lobe leading, +10V linear range, +11V maximum; active filter shaped, dc coupled, output dc-level $0 + 25$ mV.
- %B.T. (%BUSY TIME): Test point on the front panel; provides a quasi dc signal, 1 Kohm output impedance; the value in Volts multiplied by 10 gives the measure of the percent busy time or duty-cycle of the amplifier (percent of real time covered by the pulses in the amplifier).
- CRM Count Rate Meter: Rear panel BNC type connector with impedance approximately 10 Ohm provides a nominally + 5V, 500 nS logic pulse every time the input signal exceeds the threshold of the baseline restorer discriminator.
- CONNECTOR FOR PUR AND LIVE TIME CORRECTOR: CANNON DE 9 P multi-pin connector, on the rear panel.
- Pin 7 BUSY OUTPUT: Provides a negative logic signal which when "WIRED OR" with the ADC dead time output at the ADC live timer, provides live time correction taking into account the pile-up rejector action. Output TTL compatible, open collector with 3.3 Kohm pull-up resistor. Logic low when system is busy, logic high otherwise (complement logic by internal jumper, shipped in the negative logic position).
- Pin 8 INHIBIT OUTPUT: Provides a logic signal used to inhibit ADC conversion for piled up input events that occur during ADC "Rise Time Protection" (RTP) – TTL compatible (complement logic by internal jumper, shipped in the positive logic position)
- Pin 9 RTP INPUT: Rise Time Protection- Used to communicate to the amplifier that the ADC lower level threshold is exceeded and to define the time interval where piled-up pulses must be rejected (complement logic by internal jumper, shipped in the positive logic position)
- Pin 5 GND: GROUND

- PREAMPLIFIER MULTIPIN CONNECTOR:
- Amphenol type 17-0090 on the rear panel mates with the power cords on most preamplifier types.

Pin

1	GND
2	CLGND
4	+ 12 Volt
6	- 24 Volt
7	+ 24 Volt
9	- 12 Volt
5	PRS Input - Receives a logic pulse from associated pulsed optical feedback preamplifier used to extend the BUSY signal, inhibit and reset the PUR during the preamplifier's reset cycle. TTL compatible signal (complement logic by internal jumper, shipped in the positive logic position).

POWER, WEIGHT, DIMENSIONS**Power requirements**

- + 24 V 215 mA - 24V 180 mA
- + 6 V 200 mA or +12V 210 mA
- (An internal circuit is provided to automatically disable the +12V in the presence of the + 6Volt).
- The 7611/L can operate with USA manufactured NIM power supplies which do not provide the + 6 Volt.

Weight

Net 1 Kg. (2.2 lb)
Shipping 2.2 Kg. (4.9 lb)

Dimensions

Standard single-width NIM module (3.43x22.14 cm or 1.35x8.714 in) per TID -20893 (Rev.).