

## **Pulse Shape Analyzer (PSA)**

The pulse produced at the output of a radiation detector has to be modified or shaped for better performance of the counting system.

The technical specifications of the PSA instrument, along with input, output and circuit controls are given below.

### 1. Performance

- Input dynamic range: 1-200
- Output pulse pair resolving time plus delay (as selected by the front-panel delay potentiometer or external strobe input), plus 200 ns for negative NIM output or plus 750 ns for low positive NIM output. Minimum resolving time is 260 and 800 ns for negative output and positive output, respectively.
- Threshold temperature instability:  $\leq \pm 0.005\%/^{\circ}\text{C}$  of full scale, 0 to 50 °C
- Discriminator nonlinearity:  $\leq \pm 0.25\%$  of full scale (integral) for both discriminators
- Delay temperature instability:  $\leq \pm 0.01\%/^{\circ}\text{C}$  of full scale, 0 to 50°C
- Delay nonlinearity:  $\leq \pm 2\%$  from delay range
- Window width instability: variation  $\leq \pm 0.1\%$  of full-scale window width over the linear range 0 to 10 V.
- Minimum input threshold: 40 mV
- Time shift VS pulse (walk): specified for channels A and B at 50% fraction

Walk (ns)

System 2	System 1	Input dynamic range
$\pm 2.0$	$\pm 0.5$	10:1
$\pm 2.5$	$\pm 1.5$	50:1
$\pm 3.0$	$\pm 2.0$	100:1
$\pm 4.0$	$\pm 2.5$	200:1

### 2. Controls

- Upper level control: Front-panel 10-turn potentiometer determines the window width (0 to +1 V) when the operating mode switch is set at WIN or the upper level threshold (0 to +10 V) when the operating mode switch is set at NORM.
- Lower level control: Front-panel 10-turn potentiometer adjustable from 40 mV to 10 V. The potentiometer determines the threshold setting for the lower-level discriminator when the rear-panel LL REF mode switch is set on. When the LL REF mode switch is in the EXT position, this control is ineffective.
- Mode Controls

Front-panel 3-position switch that selects one of the following operating modes:

- INT: It determines the lower-level (LL) threshold voltage of a discriminator (40 mV to +10 V).
- NORM: The upper-level and lower-level controls can both be adjusted, independently.
- WIN: The lower-level control defines the baseline and can be set from 40 mV to +10 V and the upper-level control defines the window width.

### 3. Inputs

- Input: Front-panel dc-coupled BNC connector accepts positive unipolar or bipolar signals, 0 to +10 V linear range,  $\pm 12$  V maximum; width  $\geq 100$  ns;  $1000 \Omega$  input impedance.
- LL REF input: When the rear-panel LL REF mode switch is on EXT, the rear-panel LL REF in BNC connector accepts the lower-level voltage (an input of 0 to  $-10$  V on this connector corresponds to a range of 0 to +10 V for the lower-level discriminator setting); input protected to  $\pm 24$  V.
- Strobe input: When the rear-panel strobe locking toggle switch is in the EXT position, the rear-panel BNC connector accepts a positive NIM-standard input, nominally +5 V, 500 ns wide, to cause an output to occur in the B channel. The external strobe should be given within 10  $\mu$ s of the linear input. If this does not occur, at the end of this period, the reset will happen.

### 4. Outputs

- SCA output, A negative: front-panel BNC connectors provide negative NIM-standard output pulses thorough channel A; nominally  $-16$  mA ( $-800$  mV on  $50 \Omega$  load); rise time  $\leq 5$  ns; width  $\leq 20$  ns. The A output occurs at the trigger point of the A channel constant fraction.

- SCA output, B negative: front-panel BNC connectors provide negative NIM-standard output pulses thorough channels B; nominally  $-16\text{ mA}$  ( $-800\text{ mV}$  on  $50\ \Omega$  load); rise time  $\leq 5\text{ ns}$ ; width  $\leq 20\text{ ns}$ . Output immediately occurs at the time of the strobe signal.
- SCA output, B positive: Front and rear-panel BNC connectors provide positive NIM-standard outputs for channel B, nominally  $+5\text{ V}$ ;  $500\text{ ns}$  wide;  $\leq 20\text{ ns}$  rise time;  $Z_0 \leq 10\ \Omega$ ; Output immediately occurs at the time of the strobe signal.
- LL output: Rear-panel BNC connector provides positive NIM-standard output pulses, nominally  $+5\text{ V}$ ,  $500\text{ ns}$  wide;  $Z_0 \leq 10\ \Omega$ . Output occurs as leading edge of input crosses the lower-level threshold.
- UL output: Rear-panel BNC connector provides NIM standard output pulses, nominally  $+5\text{ V}$ ,  $500\text{ ns}$  wide;  $\leq 10\ \Omega$  output impedance. Output occurs as leading edge of output crosses the upper-level threshold.
- LL REF: Rear-panel 2-position locking toggle switch (INT/EXT) selects either the front-panel lower-level potentiometer or the voltage signal applied to the rear-panel LL REF EXT connector as the lower-level-discriminator reference threshold.
- Strobe: Rear-panel 2 position locking toggle switch (INT/EXT) selects either internal or external source for the SCA output-signal strobe function. The automatic reset time is  $\sim 10\ \mu\text{s}$ .

### 5. Electrical And Mechanical Specification

- Net weight:  $0.9\text{ Kg}$
- Shipping weight:  $1.8\text{ Kg}$
- TID-20893 NIM standard single width module:  $3.43 \times 22.13\text{ cm}$  ( $1.35 \times 8.714\text{ in.}$ )
- Power required

83 mA	+24V
83 mA	-24V
166 mA	+12V
166 mA	-12V