SEMIPLANE
XCD amplifier/Discriminator
Specifications & Operating Notes

(front)   (rear)

Ion Input: 50 ohm Lemo
Gain: user selectable from front panel X1, X5, X10, X20, X50, X100
Analog Bandwidth: Utilizes 4GHz MMIC amplifiers, BW independent of Gain Setting
Analog Output: 50 ohm Lemo, 350MHz BW to monitor signal quality and set threshold.
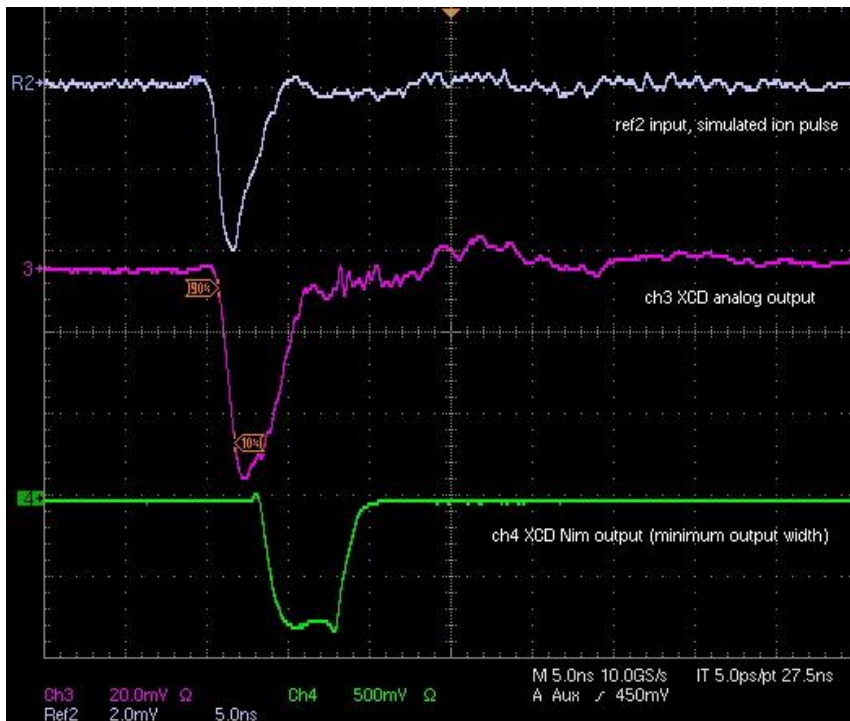**NIM Outputs:** 50 ohm Lemo and 50 ohm BNC may be used simultaneously.
NIM Output Width: adjustable from 5 – 70 nS
Threshold range: 11mV – 110mV
Minimum discriminated ion pulse: approx 200 microvolts (X100 gain, thr 18mV)

Power: External 12 VDC supply with Universal input 100 – 240 VAC, 2A, 50-60 Hz
Size: 4.125in. x 1.52in. x 11.00in., 105mm x 38.6mm x 279.4mm

Input signal and corresponding output sample.

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Note: threshold meter reading readings are without polarity sign, for example threshold will not read negative millivolts as expected with negative ion signal input.

Operation and threshold adjustment:

Amplified analog output of detector is available on XCD rear panel (LEMO connector) for routing to oscilloscope or external signal processing.   NIM output on (LEMO and BNC connectors) is screw driver adjustable for output width on the back panel.

To set thresholds you must use a good quality digital multi-meter (DMM). Set the DMM to the millivolt scale and measure the voltage between ground (marked with ground symbol) and threshold (marked Thr.). The minimum threshold for discrimination can be read directly off the DMM in millivolts.

One way to properly set the threshold on a TOF is to take the analog output of the XCD and connect to an oscilloscope (500 Mhz bandwidth minimum) and adjust the triggering level with pulsing disabled and detector at normal operating voltage. Adjust oscilloscope trigger to find the minimum voltage that will stop the scope from triggering on noise.

You may have to change the gain setting to either increase or decrease the analog output so that the signal is large enough to be discriminated yet not so large that the noise level is out of the threshold adjustment range.

Adjust XCD front panel (thr. Adj.) with a screwdriver while watching the DMM. Adjust the threshold to the value found with scope triggering. Clockwise turning of the threshold adjustment will decrease the detection level (increase the sensitivity).

Operation notes:

1. For best performance the ToF and preamp/discriminator should be grounded (earthed).
2. We have found that some detectors pickup a large amount of noise from the extractor pulses. In some cases, the noise is so large that the preamplifier saturates and causes a broad "peak" in the low mass region (several microseconds after the extraction pulse). This can be eliminated by decreasing gain on the preamp and adjusting the threshold level down to compensate.

3. The XCD contains a wideband (MMIC) amplifier with considerable gain at several GHz. It may be desirable to limit the bandwidth so that it is no larger than the expected ion signal bandwidth. Doing this will eliminate out of band noise and allow a lower threshold to be set. We have used a Mini-circuits inline 100 MHz low pass filter with good results. The Mini-circuits low pass filter has minimal ring and preserves 50 ohm impedance. P/N SLP-100

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4. Alternative threshold, gain setting procedure.

    a. ToF spectrometer HV supplies on and detector at operating voltage.
    b. Counter connected to Nim output of XCD
    c. XCD gain set to X50
    d. Adjust threshold until counter registers several counts/sec.
    e. Evaluate threshold setting – if near upper range of threshold then decrease gain. If near lower range of threshold then increase gain. This process may be iterated several times as necessary.
    f. Apply a source of ions, i.e. ionization gauge, verify that counts increase as expected.