Operation of NIM modules

These summaries of NIM module operation should help you set up the experiments. More information and complete specifications for the commercial equipment can be found in the manufacturers' manuals.

A. Analog devices

Pre-amp, Ortec 113

The pre-amp integrates the pulse of charge from the photomultiplier and produces a voltage pulse proportional to the time-integral. The constant of proportionality is set by switch-selection of the integrating capacitor.

Delay Amplifier, Ortec 427A

The unit accepts linear or logic pulses and produces a delayed duplicate of the input pulse. The delay time from input to output is the sum of the front panel switch settings.

Amplifier, Ortec 485

This unit accepts a voltage pulse of either polarity (switch selected) from the preamp and increases the magnitude by a set factor (COARSE GAIN, FINE GAIN). UNIPOLAR output is a positive pulse with specified time dependence, usually used for energy measurement. BIPOLAR pulses have a zero-crossing at a specified time after start and are useful in timing applications.

The module also supplies electrical power for the pre-amp through a special cable.

B. Analog-digital interfaces

Single Channel Analyzer, Ortec 488

The module detects input pulses which exceed a set threshold E (INTegral mode) or which fall into a range E to E + ΔE (DIFFerential mode). A switch allows recognition of either UNIpolar or BIpolar pulses. Both fast negative NIM and slow positive-NIM output pulses are provided. The time delay from input to output is adjustable from 0.1 to 1.1 μs.

Amplifier and Single Channel Analyzer, Ortec 490A, B

The amplifier section accepts a voltage pulse of either polarity (switch selectable through side cover) from the preamp and increases the magnitude by a set factor (COARSE GAIN, FINE GAIN). Unipolar or bipolar output is switch selectable through the side cover.

The SCA section produces a positive NIM output when the amplifier input pulse falls in a specified amplitude range. When the panel switch is set to DIFF, LOWER LEVEL sets the baseline and WINDOW sets the window width above the lower level. When set to INT, the LOWER LEVEL control sets a single threshold, and the WINDOW control is disabled.

The module also supplies electrical power for the pre-amp through a special cable.

Discriminator, LRS 621BL

This device accepts phototube pulses and produces fast NIM logic pulses. The output is triggered when the input crosses a preset threshold. Four independent discriminator circuits are provided in each module.

The threshold is set with a screwdriver-adjust pot located behind the front panel. The threshold voltage, multiplied by a factor of ten, can be read with a voltmeter connected between the white-insulated monitor point and chassis ground.

Each section of the module provides two pairs of coupled outputs, a single output and a single logical-complement output. If only one of the paired outputs is used, terminate the other member of that pair. Output pulse width is adjusted with the width pot. All outputs from a section are synchronous and have the same width.

C. Digital devices

Gate and delay generator, Ortec 416A

The module is triggered by a positive NIM logic pulse or by a fast negative NIM pulse. After an adjustable delay time, it produces a fast NIM pulse at the DLY'D MARKER output and an adjustable-width slow-NIM pulse of either polarity at the DELAYED OUT connectors.

For most purposes, the slow-NIM pulse should be set for maximum amplitude and minimum width.

The maximum delay is set with a three position switch. A ten-turn pot selects a fraction of the maximum delay, so that one turn corresponds to 0.1 of the switch setting and so on. Do not force the pot: The minimum setting is one turn, corresponding to 0.1 x the full scale range set on the switch.

Universal coincidence, Ortec 418A

The unit accepts positive NIM pulses at each of 5 inputs. Each input can be set for COINC, OFF, or ANTI. An output pulse is produced when the number of COINC inputs set by COINCIDENCE REQUIREMENTS are all positive within the resolving time of the module. A positive pulse at an input set for ANTI will prevent all outputs. Inputs set to OFF are ignored.

Timer, Ortec 719

The timer produces NIM logic pulses of specified duration from the INTERVAL connector. The pulse duration is the product of PRESET, MULTIPLIER and TIME BASE settings. Pulses may be started or stopped manually using the front-panel buttons. The output can also be triggered with positive NIM logic levels at the input connectors. The EXTERNAL INPUT accepts an external clock signal when desired.

Counter, Ortec 775

The counter accepts positive NIM logic pulses which exceed the discriminator threshold setting. Counting is enabled manually with the COUNT/STOP switch when the gate input is disconnected. A positive logic level at the GATE input will also enable counting if the switch is set to COUNT, while a zero logic level will inhibit counting. The other controls are self-explanatory.

4-Fold logic gate, LRS 364AL

The logic gate accepts fast NIM logic pulses at A, B, C, D and VETO. Fast NIM output pulses correspond to various logical combinations of the inputs, as specified by the setting of pins in the front panel. All six outputs are paired, and an unused member of a pair should be terminated. Each module contains two independent logic gates.

Inputs A, B, C, D are equivalent. A pin placed in a lettered hole disables the corresponding input. All unused inputs must be disabled. A "true" pulse at the VETO input forces a "false" (no pulse) output regardless of the state of A, B, C, D. When VETO is false the output is determined by the other inputs. The COINC LEVEL pin determines how many inputs must be true to get a true output. For example, coincidence level 1 is logical OR, level 2 requires any two inputs to be true, and so forth. When the coincidence level is equal to the number of inputs the output is a logical AND.

Only one pin is used in COINC LEVEL. One to four pins may be used for inputs. Store excess pins in the white area. Do not lose the pins!

D. Special purpose modules

Time to pulse-height converter, Ortec 437A

      The TPHC or Time-to-Amplitude Converter produces an analog pulse output whose amplitude is proportional to the time difference between fast-NIM logic pulses applied to the start and stop inputs. Provisions have also been made to externally gate the inputs and to externally trigger the output pulse after the conversion.

      The various controls and inputs are used as follows:

START/STOP	Fast NIM inputs
GATE	Slow-NIM logic input. TPHC accepts inputs when GATE is true (false) and switch is set to COINC (ANTI-COINC). If gating is not desired set to ANTI-COINC and leave input unconnected.
STROBE	Slow-NIM logic input. If set for EXT, TPHC produces output when STROBE goes true. If set for INT, output is produced at a fixed delay time after STOP signal. Delay time is set with OUTPUT DELAY. If strobing is not desired, set to INT and leave input disconnected.
RANGE	Product of RANGE and MULTIPLIER sets the full scale time range the TPHC will accept.
AMPLITUDE	Sets the pulse voltage corresponding to full-scale time interval.
CONVERTER	The output signal. A variable analog pulse at low- or matched-impedance.
TRUE START	Slow-NIM logic output. Indicates TPHC has accepted a START pulse.

Time Calibrator, Ortec 462

      A time calibrator produces start and stop pulses separated by known time intervals. Since the pulse separation is determined by an accurate clock the device is useful for calibrating other instruments such as TPHCs.

      The outputs are fast NIM pulses from START and STOP. The time between start and stop pulses is $n\tau$ where n is an integer and τ is set with the PERIOD switch. The range switch determines the maximum $n\tau$ produced. The repetition rate of START pulses is set with the RATE knob.

High-voltage power supply, Ortec 556

      Caution: This module is connected to the AC line independently of the NIM bin. HV is present whenever the module switch is ON, even if the bin power is off.

      Output HV is the sum of the knob settings. The meter can be switched to read output voltage or current.