Information on the NIM bin and modules

To detect and count various particles, one typically uses some kind of detector that produces an electrical pulse, or a light pulse that is then converted to an electrical pulse, when a particle interacts with it. One then uses various electronics to distinguish between pulses due to the particles of interest, and those from noise, or from other particles that may also be present, and then to convert them to logic pulses. One can then send these logic pulses to counters, timers and various other electronic devices to obtain useful information about the particles in question.

In the first part of the muon experiment, you used a commercial apparatus that contained all the necessary electronics to perform the detection, counting and timing. In the second part, you will use a NIM bin and modules to assemble the appropriate electronic devices to perform the detection, counting and timing of the pulses generated by the muons. (This will be a somewhat more complicated experiment, in that you will be using two detectors instead of only the one that you used in the first part.) "NIM" originally stood for "Nuclear Instrumentation Modules." You can read about the history of this acronym, and about the NIM standard, here. (Click"View Full Text.") You can also read a shorter description of both the NIM and CAMAC standards here.

The NIM bin, into which the individual modules slide, provides power to the various modules. The modules available to you include amplifiers, discriminators, single-channel analyzers (SCA), logic units and a counter/timer. Below are brief descriptions of these modules, each with a link, either to the data sheet or to the manual for that particular module. **Note that in addition to the switches and connectors that are on the front panel, some modules have additional switches and/or connectors on the rear panel as well.**

LeCroy 365AL Dual 4-fold Majority Logic Unit, 622 Quad 2-input (coincidence) logic unit: A logic unit generates a pulse when its inputs correspond to preset logical conditions. For these modules, these conditions can be 4-fold, 3-fold, AND or OR. If you select only one input, you can use this module as a fan out. 365AL, 465, 622 datasheet [PDF], 365AL, 465, 622 technical data [PDF]

LeCroy 621AL Quad discriminator: A discriminator allows you to select a pulse only if it exceeds a particular voltage threshold. When an input pulse exceeds this threshold, the discriminator generates a logic pulse. 621AL datasheet [PDF]

LeCroy 623B Octal discriminator: This is similar to the 621AL, except that it has twice as many inputs (eight vs. four). 623B, 821, 4608 datasheet [PDF]

ORTEC 420 Timing SCA: A single-channel analyzer allows you to select a pulse only if it falls within the range between two adjustable thresholds (a "window"), according to certain criteria that you select (see the description below for the 550 SCA). A timing SCA, in addition to generating a pulse at the same time as an (accepted) input pulse occurs, generates a delayed pulse, whose delay is adjustable. There is an external input for this delay, so that you can extend the delay time somewhat beyond the maximum internal delay time. A manual for the 420 is not available, but one for the 551 Timing SCA is. Except for a small difference in the appearance of the controls, the 551 module is similar to the 420. 551 manual [PDF]

ORTEC 550 SCA: As noted above for the 420, an SCA allows you to select a pulse only if it falls within a specific amplitude window. This particular SCA can operate in any of four modes. In integral mode (INT), the unit generates an output pulse for any input pulse that exceeds the lower level of the window. In normal mode (NORM), it generates an output pulse only if an input pulse exceeds the lower level but not the upper level. In asymmetric window (ASYM WINDOW) mode, you can adjust the lower level from +20 mV to +10 V with the LOWER LEVEL dial, and the width of the window from 0 to 1 V with the WINDOW dial. In symmetric window (SYM WINDOW) mode, you adjust the center of the window from +20 mV to +10 V with the LOWER LEVEL dial, and the width of the window from 0 to 1 V with the WINDOW dial. In both of these last two modes, only an input pulse whose amplitude falls within the window gives rise to an output pulse. There is also an external input to adjust the lower level threshold. 550A manual [PDF]

ORTEC 776 Counter/Timer: As the name would suggest, a counter/timer allows you to count the number of pulses produced in an experiment, and/or the number of pulses received in a given time (and thus as a frequency meter). 776, 776H manual [PDF]

ORTEC 9302 Amplifier-Discriminator: This is an amplifier, whose gain you can set to either 20 or 200, with both a voltage discriminator and a rate discriminator/monitor. It registers pulses whose amplitude (after amplification) exceeds a threshold that is adjustable from 50 mV to 1 V. The rate discriminator output goes to ≥ +2.0 V when the frequency of input pulses exceeds the selected threshold (1 kHz, 10 kHz, 100 kHz or 1 MHz), and is 0 ±0.2 V when the frequency is below this threshold. 9302 manual [PDF]