How to do a setup file for the MCA527?

2.7.2013
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Or similar question: How to get the MCA527 running with an arbitrary spectroscopical gamma detector?

This short step-by-step guide considers the most common detectors in safeguards, as NaI, LaBr, CZT and HPGe. It is assumed that you start with a reset if you connect to the MCA.

1. Check high voltage polarity needed for the detector and compare it to the HV module in the MCA (red: +, blue: -). If its wrong, exchange it.

2. Connect the detector (high voltage, preamplifier supply, signal). If the detector is a HPGe and has a BNC cable „HV inhibit“, use the HV inhibit adapter to connect it also to the preamp supply connector.

3. In WinSpec, set the high voltage written on the detector. In case of a HPGE and HV inhibit connected, set HV inhibit to Ortec if it is an Ortec detector, and to Canberra for every other HPGe.

4. Go to MCA setup menu and choose the number of channels you want to work with. For a NaI 512 is typical, for a LaBr or CZT 1024 and for a HPGe 4096. But channel number can also be chosen higher depending on application.

5. Now go to Amplifier setup menu, choose here Oscilloscope and have preferably a source in front of the detector. Check for the signal. You should expect spikes with sharp rise time (<2µs) and slow decay (>40µs). If the signals are downward, the input polarity should be changed to negative.

6. Adjust now coarse gain. The results are best if the signal uses the input range, but does not exceed it.

7. Now go back to Amplifier menu and set the time constants. Flattop corresponds to the signal rise time. Reasonable values are 0.8 µs for HPGe, CZT and LaBr. For the slower NaI 1.6µs is more appropriate. Optimum shaping time depends on detector type, although there also may compromises concerning count rate. Choose 0.2µs for NaI or LaBr and 0.7µs for CZT. For HPGe, choose 1µs, for not too high count rates also 2µs may be chosen for improved resolution.

8. The trigger filter setting can be left in most cases at the standard setting, only in special cases (extremely high count rates:1-21, extremely low energies: -101) other settings are better.

9. Make PZC adjustment. Use Automatic PZC by offset minimization.

10. Make fine gain adjustment using Visual amplifier adjustment. Use the auto function to move a peak to a peak to a certain channel.

11. Ignore all other setting possibilities. They are to solve special problems.

12. Measure a test spectrum, preferably at the highest count rate to be used, and check that there is no overflow rate warning.

Solutions for special problems:

Overflow rate warning: Decrease coarse gain and increase fine gain by the same factor. If fine gain cannot be increased more, increase channel numbers. Readjust fine gain.

PZC cannot be fully adjusted, 2499 is not enough: Check signal in oscilloscope mode. Is the decay time very short, < 40µs, or are there even needle shaped signals? Try Setup-MCA-ADC input: direct. This mode is normally second choice, but it can process output signals from shaping amplifier or signals with short decay time. Avoid too high count rates.

Noise peak at the low end of the spectrum, count rate too high: This may occur at high amplifications or when external disturbing signals (switch mode power supplies ect.) are present. Goto Setup-Amplifier-Trigger threshold setup and increase threshold.

Microphonics, low frequency noise: You may reduce baseline restorer settings down to 1/1 or try the LF rejection filter.

Preamplifier signal has overshoot/ringing, higher parts of spectrum missing: Ringing is typically interpreted as two close pulses to be rejected by the Pile up rejector. Switch pile up rejection off.