

How to Change the Full Scale Energy Range and Calibrate the Software

A common task is to change the energy range of a system. This is done by adjusting the gain of the amplifier. A lower gain corresponds to a higher energy range, and a higher gain to a lower energy range. For example, in Amptek's digital systems a gain of x100 may correspond to a 15 keV full scale and a gain of x50 to a 30 keV full scale. To adjust the energy range it is always the gain of the system that must be changed. It is not enough to change the software calibration only. The software calibration is only in software. If the software's calibration is changed without the amplifier's gain changing appropriately, the software will be displaying the wrong energy range and peaks will be incorrectly identified.

If you are using one of Amptek's digital processors (PX4, DP4, X-123, Gamma-Rad), the gain is adjusted through the ADMCA software on the Gain & Pole Zero tab of the DPP Properties, or by using the gain buttons on the toolbar. It is necessary to readjust the thresholds whenever the gain is changed. This can be done automatically by starting an acquisition (pressing space bar) and clicking the "Tune Slow/Fast" button on the toolbar of the ADMCA application with no source exciting the detector. See the quick start guide of the appropriate product for more information.

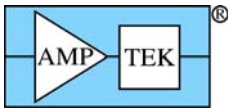
If you are using the PX2, the gain can be adjusted by the gain knob on the front panel. Again, a higher gain is a lower energy range and a lower gain is a higher energy range. With a PX2, a gain of x6 could be a full scale energy range of 8 keV and a gain of x2 could be a full scale energy range of 30 keV.

The MCA8000A multichannel analyzer is not an amplifier. It has no gain control. The energy range can therefore not be changed through the MCA8000A or its software. To change the gain of a system that utilizes the MCA8000A, adjust the gain with the gain knob on the PX2 if using an Amptek system, or with the gain adjustment on whatever other shaping amplifier is being used.

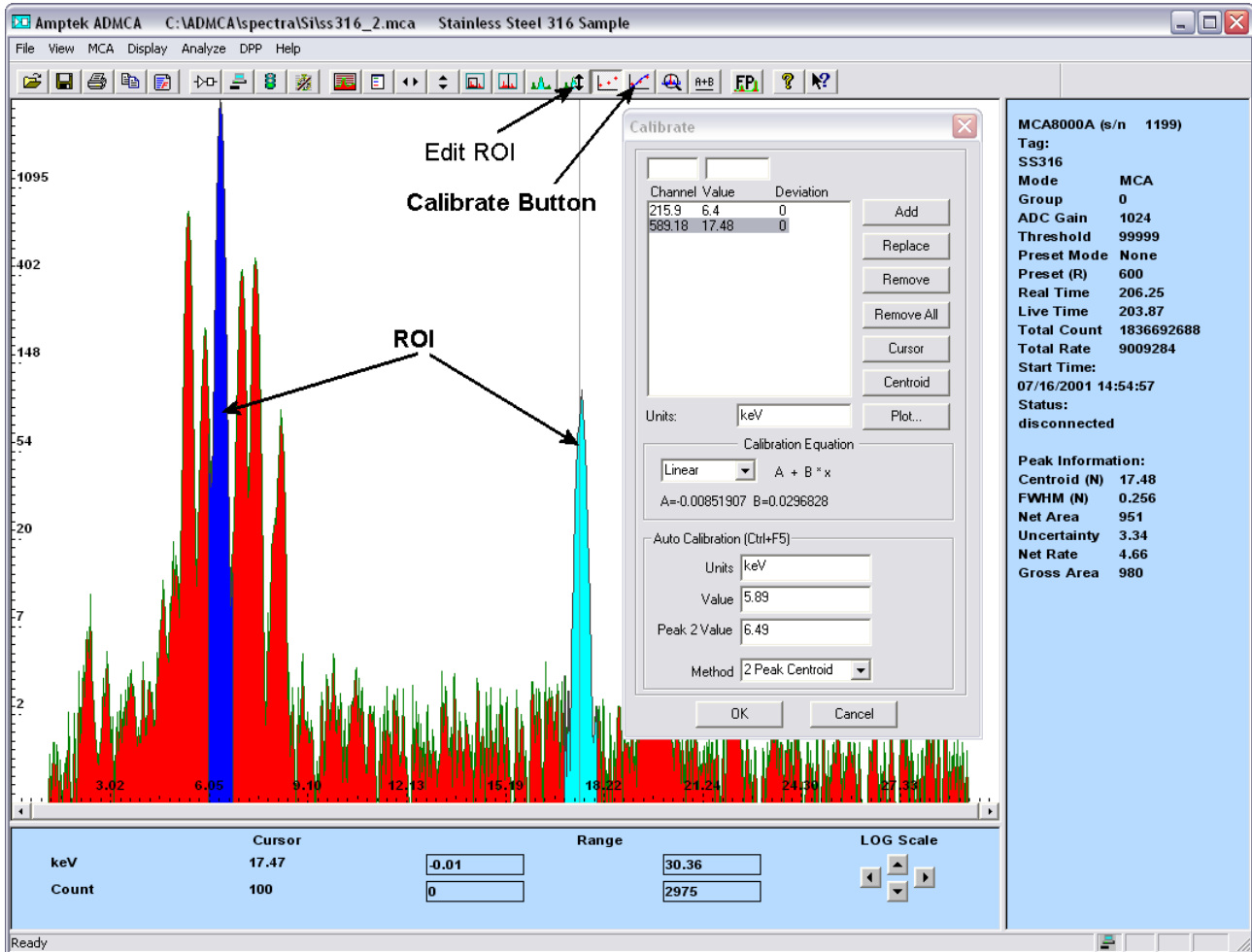
Once the appropriate gain (full scale energy) is found, the software can be calibrated. The software must always be calibrated in order to change the channel scale into an energy scale. To accurately calibrate a spectrum there must be at least two known peaks in the spectrum. For example, an iron (Fe) peak at 6.40 keV and molybdenum (Mo) peak at 17.48 keV. It is best to use peaks that are on the two ends of the energy range of interest. Peaks that are too close together may not produce an accurate calibration. For example, do not use Mn at 5.9 keV and Fe at 6.4 keV to calibrate a 30 keV full scale.

To calibrate the scale in the Amptek ADMCA software follow these steps:

1. Chose the two peaks that will be used for the calibration and make note of their energies.
2. Mark an ROI (region of interest) around each peak. This can be done by clicking the cursor at the left base of the first peak and then holding down the "U" key on the keyboard until the whole peak is highlighted, or by using the Edit ROI button on the toolbar and then clicking and dragging across the peak until it is highlighted. For more information on marking ROIs please see the Help file under Analyzing Data with the ADMCA Software → Regions of Interest and How to Define Them.
3. Now click in the toolbar button "Calibrate" to open the calibration dialog box.
4. Move the dialog box such that both peaks are visible and then click the cursor into the first peak. The peak should be highlighted and the Peak Information section on the right-hand information



- panel should be filled in. If the peak is highlighted and there is no peak information, then the ROI is not marked correctly. Try adjusting the start and end points of the ROI.
5. Click the Centroid button on the dialog box. This will enter the center position of the peak into the Channel box. Then enter the energy of that peak into the Value box, e.g. 6.4, and click Add.
 6. Now click the cursor into the second peak (it will highlight). Click on Centroid, enter the second energy, e.g. 17.48, and click Add. There should now be two lines in the box.
 7. In the Units box type in the energy units, e.g. keV.
 8. Click OK. The scale should now be in energy. If it is not press F7, this toggles between calibrated units and channels.



If the same energy range is to be used (i.e. the gain has not changed), ADMCA can be set to load a calibration automatically on startup. Save a spectrum that has been calibrated by following the steps above. Click on the View menu and select Preferences. On the General tab in Spectrum Template enter in the path and file name of the file that was just saved. Check Load Calibration on Startup and click OK. ADMCA will now automatically load that calibration every time it opens.

In addition, a calibration can be applied from one file to another. For this procedure see the Help file (F1) under Analyzing Data with the ADMCA Software -> Calibrating a Spectrum / Applying a Calibration.