Food-SSAFE

Spetrum / Sample Analysis and Food Examination Kit

Operation Manual

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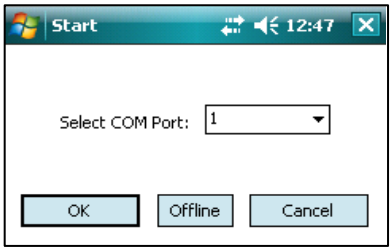
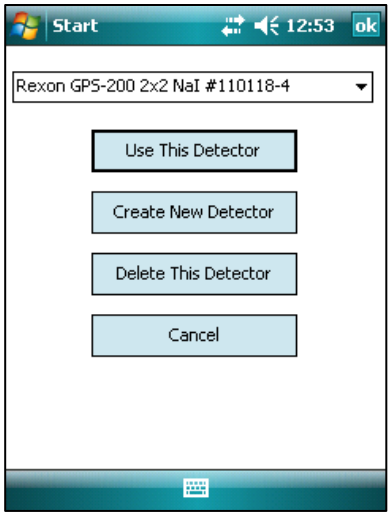
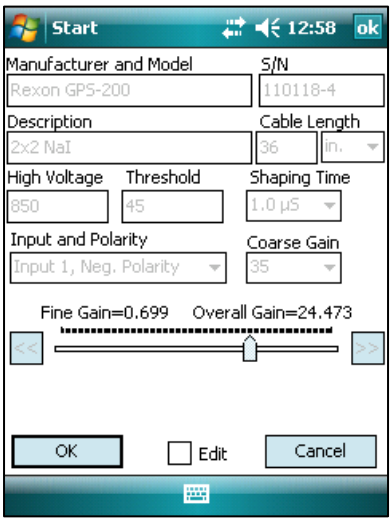
b. On the **Connection** screen confirm that COM 1 is indicated and tap **OK** to continue. The screen will close and after a few moments a message will pop up showing the serial number of the connected MODEL 970. Acknowledge that message by tapping **OK**.



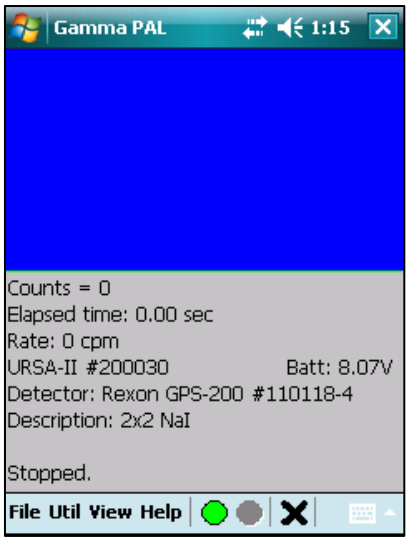
c. Next the **Detector Selection** screen will be shown. Confirm that your detector serial number is shown and tap **Use This Detector** to continue.



d. The **Detector Settings** screen is displayed. Tap the **OK** button to continue. This screen will disappear for a few moments (about four seconds) while the application transmits those settings to the MODEL 970.



e. When the **Main Screen** is displayed the system is ready to operate.

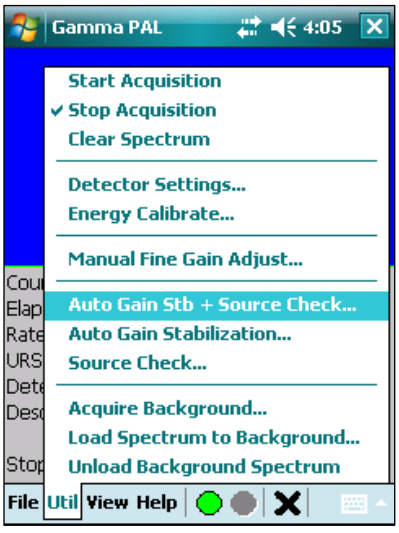


4. Gain Stabilization and Source Check

Note: Prior to measuring samples the software requires that a gain stabilization and source check be performed. It is possible to bypass or shorten these requirements by using the manual gain stabilization function instead of the automatic gain stabilization, **although bypassing the automatic gain stabilization is not recommended** (discussed later in the section *Bypassing Startup Requirements*). For this quick start guide only the automatic functions are discussed.

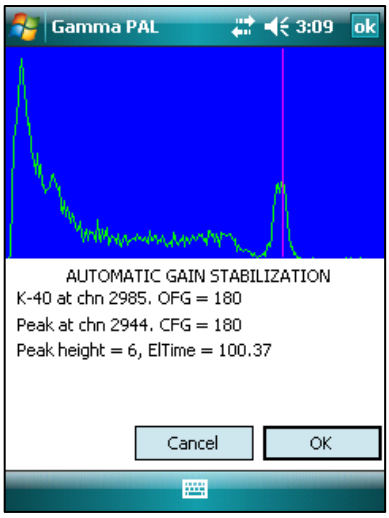
It is assumed that the K-40 Marinelli standard and detector are set up as described above in step 2. Since the same source is used for both gain stabilization and source checking it is possible

a. From the Util menu, select **Auto Gain Stb + Src Check…** A message pops up asking you to confirm that the K-40 source is on the detector. Tap **OK** to continue.



b. The Automatic Gain Stabilization screen will be displayed. The software will collect a spectrum until a sufficient number of counts exist to determine a statistically reliable peak center. If not within a few channels of the expected location the fine gain will be adjusted in the appropriate direction and an additional count started.

Displayed information includes the channel at which the K-40 peak is expected; the original fine gain setting; the centroid of the current peak; the current fine gain setting; the current peak height at the centroid; and the time elapsed in the current spectrum.

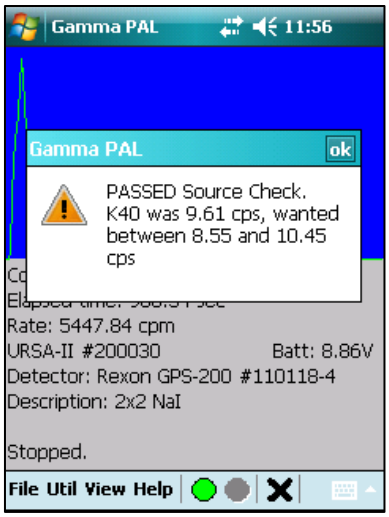


c. Once the software is satisfied with the location of the peak, the Automatic Gain Stabilization window will close and the K-40 source check will continue on the main screen. Allow this acquisition to continue until complete.

d. When the source check is complete a message will display showing the observed count rate for the source, the limits (±10% by default), and whether the test was passed or not.

Acknowledge the message by tapping **ok** and the system is ready to begin analyzing samples.

e. Use **File|Save Spectrum** to save a copy of the spectrum if desired.

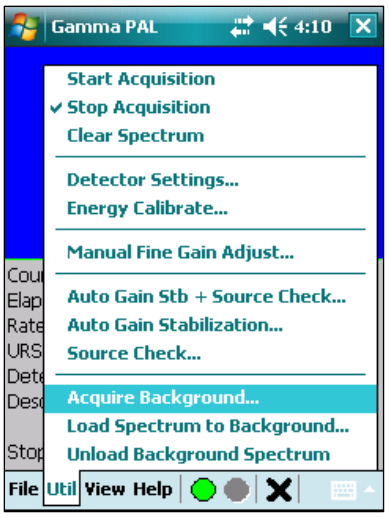


5. Taking a Background Measurement

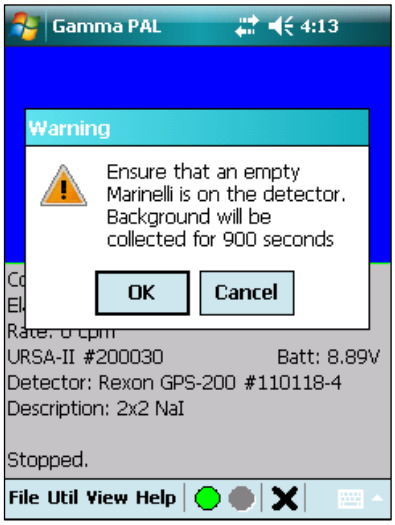
a. Remove the detector from the shield, take the lid off the shield, remove the K-40 standard, and recover the Marinelli spacer from the standard.

b. Place the spacer into a clean, empty Marinelli. Put the Marinelli into the shield, replace the cover, and put the detector through the hole in the shield.

c. From the Util menu select **Acquire Background…**



d. A message will pop up asking for confirm that an empty Marinelli is on the detector and stating how long the background acquisition will be for. The default time is 900 seconds.



6. Analyzing a sample

a. Remove the detector from the shield, take the lid off the shield, remove the empty Marinelli, and recover the Marinelli spacer from the standard.

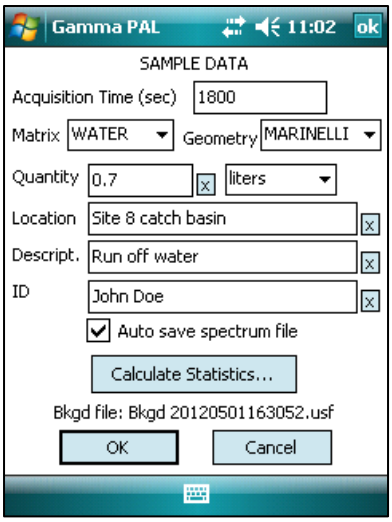
b. Place the sample to be analyzed in the shield. (If you are analyzing an air sample filter or wipe sample, insert the wipe/filter spacer first and put the sample into that.)

c. Place the Marinelli spacer into the cavity in the Marinelli.

d. Put the lid on the shield. Stick the detector through the hole and seat it on the spacer.

e. If a spectrum is currently displayed, tap the "**X**" button along the bottom of the screen (or use **Util|Clear Spectrum**) to clear it. If the spectrum hasn't been saved a warning to that effect will be displayed, giving you the opportunity to save it if desired.

f. Tap the green circle "GO" icon (or UTIL|Start Acquisition) along the bottom of the screen to begin analyzing a sample. The **Sample Data** screen will be displayed. Enter the acquisition time desired (default is 900 seconds or 15 minutes).

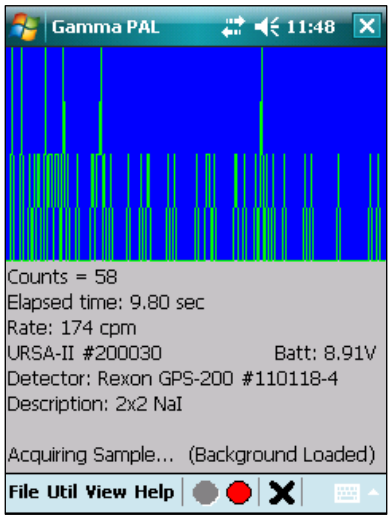


Select the appropriate sample matrix--SOIL, WATER, or FILTER--and the relevant sample geometry—MARINELLI or DISK.

Note: The Food-SSAFE comes calibrated for water and soil in a (nominal 500 mL) Marinelli geometry plus a 2" filter in a disk geometry.

Enter the quantity of the sample and units (e.g.,. 0.7 liters, 0.540 kg, etc.).

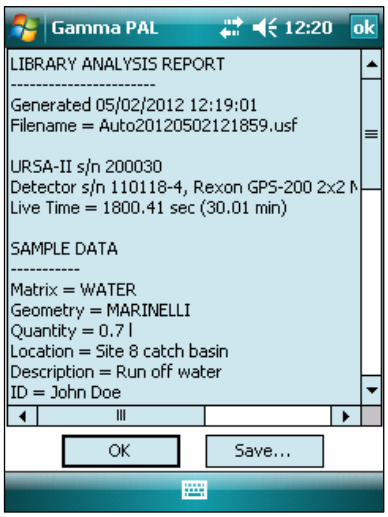
Three more fields are available: **Location**, **Description**, and **ID**. These can be used for whatever purpose makes sense to your program or the fields can be left blank. Check the box next to **Auto save spectrum file** to have the spectrum automatically saved at the end of the acquisition.



If a background file has been loaded, the **Calculate Statistics…** button can be pressed to determine the MDA (total Bq) and LLD (activity/quantity, e.g. Bq/liter or Bq/Kg) to ensure that the sample analysis can meet the statistical target.

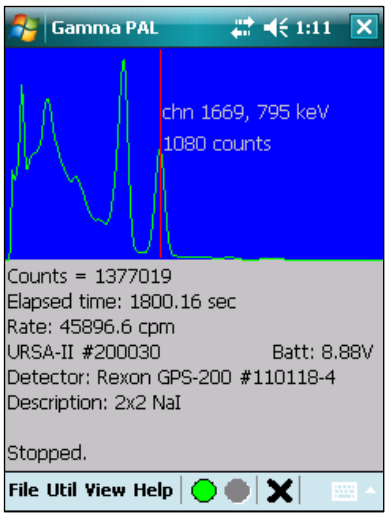
g. Tap the **OK** button to begin the acquisition. The main screen will be displayed with the data updated approximately each second.

h. Once the acquisition time has been met (or if the acquisition is terminated by either tapping the "STOP" icon, or using **Util|Stop Acquisition,** along the bottom of the screen), an analysis of the spectrum will be performed and the report screen will be opened. Use the scroll bars to see the complete report. Tap the **Save…** button to save to a text file. Reports are not saved unless explicitly directed.



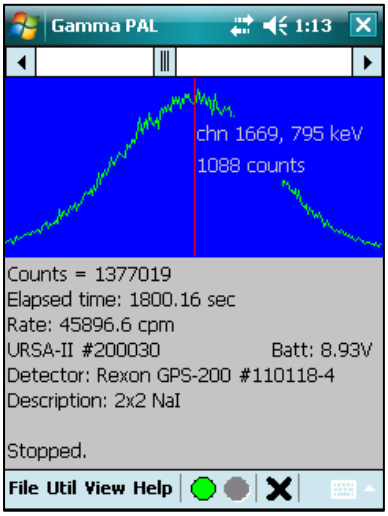
Basic Functions of the Main Screen

The Main Screen is divided into three sections. The top section (colored blue by default) is the Spectrum Display.

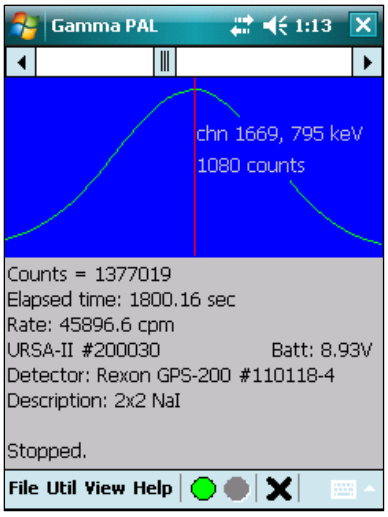


a. Colors for the background and spectrum trace (as well as for other items) can be changed using **View|Preferences.**

b. Tapping the Spectrum Display will cause a line to be displayed at the tapped location. The channel number and number of counts in that channel will be displayed. If an energy calibration has been performed the energy (in keV) will also be displayed. Tapping in the area beneath the Spectrum Display will hide the line. Alternately, use **View|View Preferences** to set a timed line display where the line will be hidden after a set number of seconds.



c. An MODEL 970 spectrum (4096 channels) contains more data than can be displayed, as the PPC screen is only 240 pixels wide. This means that in normal (Full Screen) mode, each screen pixel represents the sum of about 17 channels. To view a section of the spectrum in the greatest detail (one channel per pixel) select **View|Zoom**. If the Spectrum Display has been tapped the zoomed display will be centered on the tapped channel. When zoomed, using the scroll bar on the top of the zoomed display can move the section being viewed. The display will automatically scale to the channel with the greatest number of counts in the displayed region. Return to the normal view by tapping **View|Zoom** again to uncheck the item.



d. The spectrum display can also be smoothed by selecting **View|Smoothed Spectrum**. Select **View|Smoothed Spectrum** again to uncheck the item and go back to the raw data display.

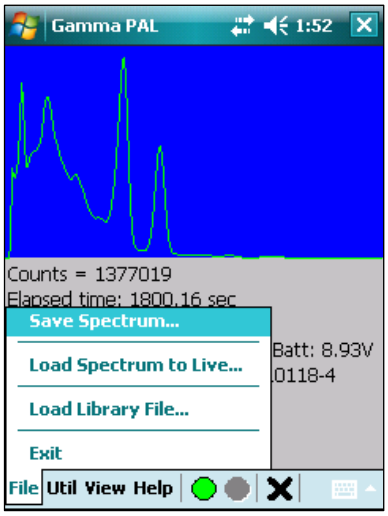
e. The lower area (gray background by default) contains information about the current MODEL 970 and detector as well as sample acquisition information. The top line contains the total number of counts in the entire spectrum. The second line is the total elapsed spectrum acquisition time. The third line is the count rate (in cpm) from about the most recent 20 seconds of the acquisition. The fourth, fifth, and sixth lines contain the MODEL 970 serial number, the detector

manufacturer, model, serial number, and the detector description. The final line contains relevant information on acquisition status, background status, etc.

f. The bottom section of the screen contains the menu items and button bar. The menu items will be discussed in detail in the next section. The button bar consists of a green circle (grayed out when an acquisition is active), a red circle (grayed out when not actively acquiring a spectrum), and a black X. Tapping the green circle will begin an acquisition, the red circle stops an acquisition, and the black X will clear the spectrum (after giving a warning and opportunity to cancel the deletion).

Menu Items

1. **File Menu**
The **File Menu** contains functions generally related to storage and retrieval of data.



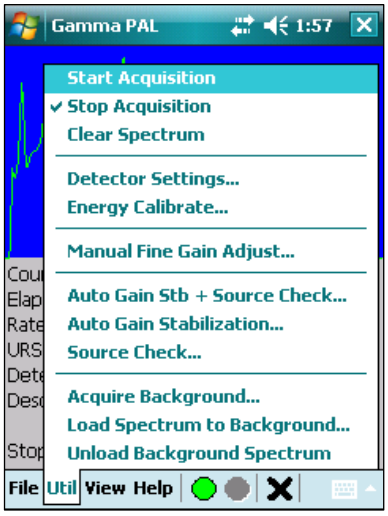
a. **File|Save Spectrum** allows the current spectrum to be saved to a standard ".usf" file, compatible with the MODEL 970 MCA software for the PC.

b. **File|Load Spectrum to Live** loads a stored spectrum into the "live" acquisition display. This is especially useful in offline mode to view and re-analyze stored spectra.

c. **File|Load Library File** loads a different library file to be used for analyzing samples for radioactivity.

d. **File|Exit** will terminate the connection and exit the application (after presenting a warning and an opportunity to cancel).

2. **Util Menu**
The **Util Menu** contains functions generally related to calibration, detector settings, and analysis.

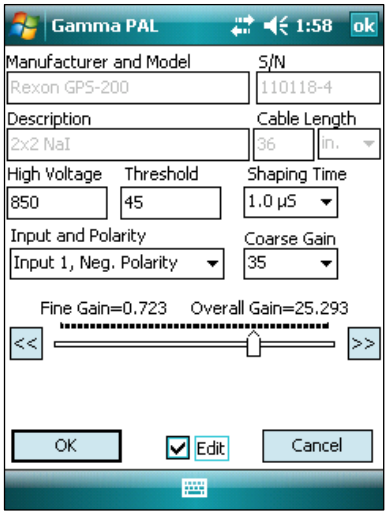


a. **Util|Start Acquisition** performs an identical function to the green circle on the button bar; it begins a sample acquisition. A checkmark will appear next to this menu item while an acquisition is active.

b. **Util|Stop Acquisition** performs an identical function to the red circle on the button bar; it stops a sample acquisition. A checkmark will appear next to this menu item when the MODEL 970 is not actively acquiring data.

c. **Util|Clear Spectrum** performs an identical function to the black X on the button bar; it will clear the spectrum (after giving a warning and an opportunity to cancel the deletion).

d. **Util|Detector Settings** opens the Detector Settings screen. The hardware settings (HV, Threshold, Shaping Time, Input and Polarity, Coarse Gain, and Fine Gain) can be modified as needed to make the spectrum display suit your needs and purposes. The proper settings for these items were set when the initial calibration and should generally not be altered. This is because changes to these hardware settings will dramatically affect detector response, **invalidating any calibrations done so far**. The exception to this is the fine gain, which can be used to compensate for drift in the spectrum caused by changes in temperature, etc. **Note:** A separate function exists for adjusting the fine gain, covered below under **Util|Fine Gain Adjust**.

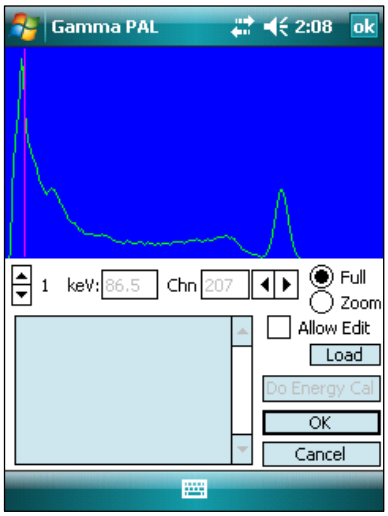


Tap the **OK** button to load these settings to the MODEL 970 and update the detector configuration file. **Note:** If the high voltage has been changed you will need to wait up to four seconds (while the MODEL 970 ramps the high voltage to the new setting) before you can begin a new acquisition.

There can only be one set of parameters for any MODEL 970/detector combination; these settings are loaded following the selection of the detector to use at program startup. You can force a single detector to have multiple settings by creating a "new" detector and changing the description, serial number, and/or manufacturer.

Tap the **Cancel** button to exit the screen without applying any of the changes made.

e. **Util|Energy Calibrate** opens the Energy Calibration dialog. The energy calibration has been performed during the factory setup and calibration. **Changing any of these settings will invalidate that calibration.** Instead, use the fine gain adjustment to compensate for any drift that has occurred.



In order to perform an energy calibration you should be displaying a spectrum of a known isotope. The energy calibration routine involves identifying two or more peaks and associating the channel numbers with the peak energies.

To perform an energy calibration check the **Allow Edit** box to enable the energy calibration controls.

Next, tap the first peak you know the energy for and a vertical line will appear. Use the right and left arrow buttons to move the line to the center of the peak—it may also be helpful to zoom the view. Enter the energy for the peak in the box marked **keV:**. You are not limited to whole numbers for energy values.

Use the up arrow to change the energy calibration point to 2. Un-zoom the display by checking **Full** and tap the second peak for which you know the energy. Use the left and

right arrows to adjust the location of the line to the center of the second peak, and then enter the energy. Repeat this process for up to 12 energy calibration points.

Note: It is not strictly necessary to enter the calibration points in any order. When the energy calibration is performed the calibration points will be sorted in order of the channel values, from lowest to highest.

When all energy calibration points have been entered, tap the **Do Energy Calibration** button. A summary of the channels and associated energy values will be displayed in the list box. Review these for accuracy, as out-of-order values will cause strange results in later analyses.

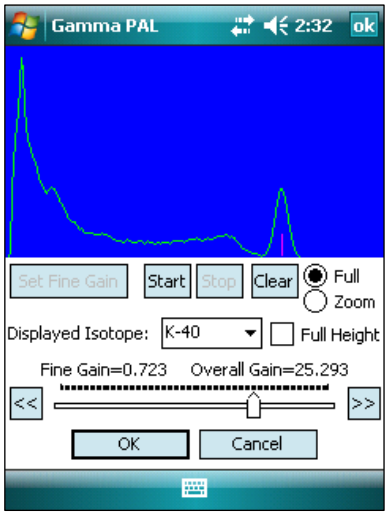
The energy calibration is not actually stored and made active until the **OK** button is tapped. **If the Cancel button is tapped any new values entered will be lost.**

The **Load** button can be used to load a stored spectrum into the Spectrum Display.

When **Allow Edit** is not checked, it is still possible to use the up and down arrow buttons to scroll through the energy calibration settings.

This screen can, of course, also be used to edit any existing energy calibration. There can only be one energy calibration for any MODEL 970/detector combination. The energy calibration is loaded following the selection of the detector to use at program startup. You can force a single detector to have multiple settings by creating a new detector and changing the description. When in Offline mode, however, the energy calibration stored in the detector file (.usf) will be applied each time a new spectrum file is loaded. This does not occur when not in Offline mode.

f. **Util|Manual Fine Gain Adjust** opens the Manual Fine Gain Adjustment screen. An energy calibration must be performed before this function can be used (see below). The fine gain adjustment is intended to provide an easier way to compensate for energy drift in the detector (typically caused by temperature changes) than using the Detector Settings screen.



Use the **Start**, **Stop**, and **Clear** buttons as on the Main Screen. Acquire a spectrum of a known source and select the isotope from the dropdown list. This will cause the library energies for that isotope to be displayed on the spectrum. Checking **Full Height** will cause the lines to extend to the full height of the display instead of being proportional to the abundance. If the energy line does not match up with the peak, increase or decrease the fine gain control a little bit and tap the **Set Fine Gain** button. Then **Clear** the spectrum and begin another acquisition. Repeat this until the vertical line and peak line up with one another.

Tap the **OK** button when the fine gain adjustment is complete or tap **Cancel** to revert to the original fine gain.