

SPECTECH

UCS 10

Universal Computer
Spectrometer

Operating Manual

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TABLE OF CONTENTS

Overview

- Software Disk
- Menus
 - File
 - Edit
 - Mode
 - Calculations
 - Tools
 - Settings
 - Window
 - Other Features and Controls

Installation

- Setting SCSI Address
- Connecting Detectors
- Software

Operation

- High Voltage and Gain
- ADC Conversion Gain
- LLD and ULD
- Presets
 - Livetime
 - Realtime
 - Count
- Regions of Interest
- Gross and Net Integrals

Calculations

- Energy Calibrate
- Spectrum Smoothing
- Memory Buffers
- Spectrum Stripping

Multichannel Scaling

Peak Summary

IsoMatch

Saving and Printing Files

Using the Clipboard

OVERVIEW

The UCS-10 is a fully integrated multichannel analyzer for nuclear spectroscopy and time related studies on the Macintosh computer. The instrument contains a high voltage supply, amplifier, multichannel scaling, a 1024 channel analog-to-digital converter and 4096 channels of data memory divided into 4 x 1024 channel segments called buffers, capable of storing separate spectra and associated elapsed time.

Version 1.30 Software Disk

This disk contains the following items:

UCS for Mac version 1.30 - This is the MCA application program for the UCS-10 system.

SCSI Tools - This application may be run to determine where SCSI devices are currently connected to the Mac.

Cs137-Co60 - This is a spectrum acquired using the UCS-10 and saved to disk. It may be opened and viewed from within the UCS for Mac application.

UCS Settings. This is a sample UCS Setup file holding high voltage, amplifier gain, presets etc.

UCS Notes. A text file with latest additions and corrections.

UCS 10 - Menus

File

New - Opens a blank window that is not associated with any hardware or opened file. This window may be used to hold a spectrum pasted from the clipboard.

Open - Opens a UCS spectrum file in its own window or a UCS setup file containing all acquisition parameters and presets. Both file types will appear in the standard Open File dialog box. The spectrum files are represented by document style icons showing a miniature spectrum. Setup files are document style icons filled with simulated controls and indicators.

Select Active UCS Buffer - The UCS-10 contains four separate spectrum data buffers. Each buffer maintains its own data and elapsed times. All four buffers use the current amplifier and ADC settings. Data may be accumulated in only one buffer at a time. This selection activates a buffer and opens a window for its data if one is not already open. If more than one buffer window is open, mouse clicks will activate the windows normally. However the only buffer that is able to acquire data is the one selected from this menu choice. The selected buffer and the SCSI address of its UCS is always displayed under the acquire/erase controls in the system control window.

Close - Closes the current spectrum data window.

Save - Standard data file saving.

Save As - Standard data file renaming or changes saving.

Save Settings - This selection will save UCS setup parameters including detector voltage, amplifier gains, presets, etc.

Page Setup - Standard print out set up.

Print Preferences - The check boxes select or deselect the print out features. The selection of the channel data will cause all channels between the first and last selections to be printed.

Print - Activates printing as defined in Print Preferences.

Quit - Exit the UCS for Mac application.

Edit

Cut - Erases spectrum in current window and copies data to clipboard in the same formats as the Copy selection.

Copy - This selection copies the currently selected spectrum into the clipboard. Spectrum data may be directly pasted into another spectrum data window from the clipboard. Clipboard data also exists in tab separated ASCII format for direct pasting into spreadsheets or documents.

Paste - Pastes spectrum data into the current window.

Clear - This selection erases the spectrum in the front window even if the window shows a spectrum loaded from disk. Note that this is not possible using the Erase control in the system control window.

Copy Data Only - This selection only copies to the clipboard the ASCII channel data with no header or column titles.

Strip Clipboard Spectrum - Allows the spectrum currently residing in the clipboard to be subtracted channel by channel from the spectrum in the current data window. This is done using livetime normalization.

Add Clipboard Spectrum - Allows the spectrum currently residing in the clipboard to be added channel by channel to the spectrum in the current data window.

Experiment Text - Allows user information about the spectrum being collected to be entered and tagged with the spectrum.

Show Clipboard - A simple clipboard text viewer.

Mode

Pulse Height Analysis - Sets system into standard PHA mode (default).

Multichannel Scaling - Sets system into MCS mode where incoming events are counted for predetermined (Dwell) times and stored in sequential memory channels. This selection counts all events occurring between the upper and lower level discriminators. These are set using the sliders above the spectrum area in PHA mode.

External Multichannel Scaling - Same as above except that events are counted from rear panel external MCS connector.

Calculations

Energy Calibrate - This selection changes the system control window to energy calibration display to allow the system to read channels in energy units.

Two (linear fit) or three (quadratic fit) points may be used do the calibration. The works by positioning the marker in a channel and clicking Energy to enter the energy for that channel. The radio buttons indicate which of the three points is being set. The energy units may also be set. When at least two points have been completed, clicking on Calibrate will do the calibration calculation and the marker and X axis can then be read in energy.

Spectrum Smooth - This selection does a three point averaging of the data. The new data will be displayed. The actual data collected in the hardware will not be affected and may be retrieved by choosing Raw Data or continuing acquisition.

Raw Data - Retrieves the true spectrum data after a smooth selection.

Tools

IsoMatch - The IsoMatch feature places markers in the spectrum window showing the significant gamma ray emissions for many common isotopes. This feature requires a properly energy calibrated spectrum so that the markers will not be misaligned. When this feature is selected a list box appears with the currently present isotope list. Use the mouse to click on isotopes to be labeled. To select multiple isotopes, hold down the Command key while clicking on an isotopes.

The isotope list and the corresponding energies may be edited by the user using ResEdit on the UCS for Mac application. Up to 128 isotopes may be added each with up to 5 energies.

Peak Summary - If regions of interest (ROIs) are currently set this selection changes the data display from spectral to text giving the summary information for each ROI.

Settings

View Settings - This selection displays a dialog box showing all the UCS hardware parameter settings. If the front window displays a spectrum loaded from disk, this dialog shows the parameters used to collect that data. The dialog may be exited with no action by clicking OK.

Presets - Several acquisition presets may be set when in standard PHA mode. After presets are set acquisition may be started and will stop automatically when the first preset is reached. Preset real and live times are available as well as preset peak counts and preset integral. When preset peak counts is selected the first channel to reach this number of counts will stop acquisition. Preset integral must be set while the marker resides in region of interest. When the counts in that region reach the preset value acquisition will stop. Note that the region will consist of all regions of the spectrum that are of the same type (color). To individually activate or deactivate presets use the check boxes in this dialog.

Dwell Time - In MCS or EMCS modes only this selects the time that events are counted in each channel.

Amplifier/High Voltage - This allows the coarse/fine gain and high voltage to be adjusted. The acquisition controls are made available within this dialog box

for convenience.

Conversion Gain - Sets the ADC full scale conversion channel.

ROI Indicator - Drag the mouse to the color/pattern of choice to make it the new active ROI type. All subsequent ROI settings will use this color/pattern until it is changed.

Window

Stack - Stacks vertically all open spectrum windows.

Tile - Tiles all open spectrum windows.

Window List - Provides access to selecting spectrum windows.

Other Features and Controls

Acquisition Controls

Acquisition in any mode may be started by clicking the Acquire check box in the system control window. Small indicators will blink when acquisition is on. Clicking on the check box again will stop acquisition. To erase all acquired data click the Erase button. This does not clear any regions of interest that have been set or any current acquisition presets.

Regions of Interest (ROIs)

Region of Interest selection provides instantaneous computation of peak gross and net counts. To set a region of interest click on the Set radio button in the system control window. The currently selected ROI color type will be displayed to the right of the Set indicator. Move the mouse to the left side of the spectrum area to be selected. Click and drag across the spectrum to the right until the right side of the desired region is reached. Release the mouse button and the enclosed area will highlight as a region of interest. To clear a region click the clear radio button and click and drag the cursor across a region. Release the mouse button and all channels marked as ROIs between the drag boundaries will be cleared. To quickly clear all ROIs select Clear and click the spectrum erase button. Only ROIs will be cleared. The data will remain. After setting or clearing ROIs be sure to click the Normal ROI radio button so that the marker will set or clear unwanted areas.

ULD / LLD

The upper and lower level discriminator settings are shown by the position of the sliders above the spectrum display area of a spectrum window. They may be changed by clicking and dragging these indicators.

INSTALLATION

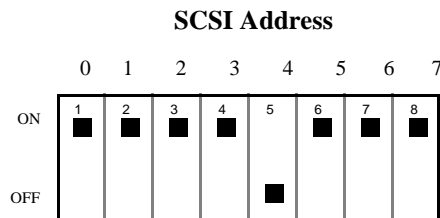
Your UCS-10 Universal Computer Spectrometer is designed to interface to most Macintosh computers running System 7 or higher. Communication is via the SCSI interface, so it will be necessary to first determine an unused SCSI address.

Before connecting the UCS-10 to the Macintosh, insert the UCS for Mac disk and run the small utility "SCSI Tools". A window will appear with a row of eight indicators that correspond to the eight possible SCSI addresses that the Macintosh can accommodate. As SCSI devices are found the indicators for their SCSI addresses will "light up". Typically two or three SCSI devices are already installed in the computer. The Mac's internal SCSI controller will always show up at SCSI ID 7. If a CD-ROM drive is installed, it is typically at SCSI address 3. Some Macs contain one or more SCSI hard drives and they are usually installed beginning at SCSI address 0. Note that the SCSI address for any device except the internal controller may be changed by the user, so your SCSI Tools display may not look exactly like this description. The UCS-10 may now be set to any unused SCSI address on your system using

Setting the UCS-10 SCSI Address

Note: The power to the UCS-10 must be OFF while setting the SCSI ID switches.

Before connecting the UCS-10 SCSI interface cable to the Macintosh, determine a SCSI address to use as described above. Turn the UCS-10 over so that you are looking at the bottom of the chassis with the front panel facing to the rear, notice the small slot giving access to a row of eight switches. The switches are numbered 1 through 8. Switch 1 corresponds to SCSI address 0 and switch 8 corresponds to SCSI address 7. The switches are activated when they are in the OFF position. There may be one and only one SCSI ID switch active on the UCS-10. Select an unused SCSI address and place the corresponding switch in the active (Off) position. Make sure all other switches are inactive (On). Connect a Macintosh SCSI cable to the UCS-10 from the 25 pin SCSI connector on the back of the Macintosh.



Setting shown for SCSI address #4

Connecting the Detector.

The UCS-10 is equipped with an internal Amplifier/Preamplifier allowing direct connection of a scintillation detector. If you plan to use this feature, connect the signal (anode) output of the detector tube base to the PREAMP IN connector on the rear of the instrument using a BNC cable and connect the high voltage to HIGH VOLTAGE with a MHV cable.

These connectors appear similar with the MHV being slightly longer than the BNC

WARNING - ELECTRICAL SHOCK HAZARD

TO AVOID ANY POSSIBILITY OF ELECTRICAL SHOCK, ALWAYS TURN OFF THE COMPUTER POWER BEFORE CONNECTING THE EXTERNAL CABLES. DANGEROUS HIGH VOLTAGE CAN EXIST ON THE THE EXTERNAL HV CONNECTOR WHEN THE UNIT IS OPERATING. NEVER REMOVE OR CONNECT CABLES WITH THE COMPUTER RUNNING.

SERVICE BY AUTHORIZED PERSONNEL ONLY.

When using an external amplifier system, connect the amplifier unipolar or bipolar output to the DIRECT IN connector.

Software Disk.

This disk contains the following items:

UCS for Mac version 1.20 - This is the MCA application program for the UCS-10 system.

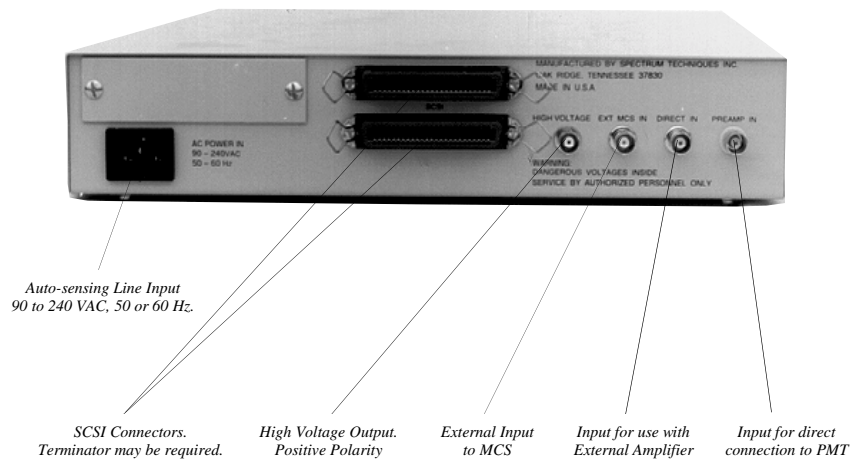
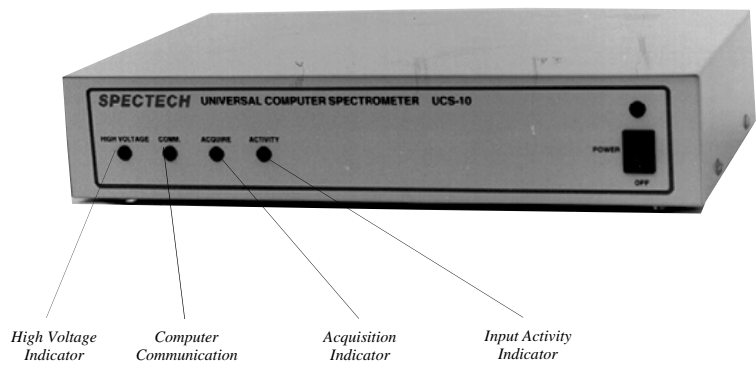
SCSI Tools - This application may be run to determine where SCSI devices are currently connected to the Mac.

Cs137-Co60 - This is a spectrum acquired using the UCS-10 and saved to disk. It may be opened and viewed from within the UCS for Mac application.

UCS Notes - This file.

UCS Settings. This is a sample UCS Setup file.

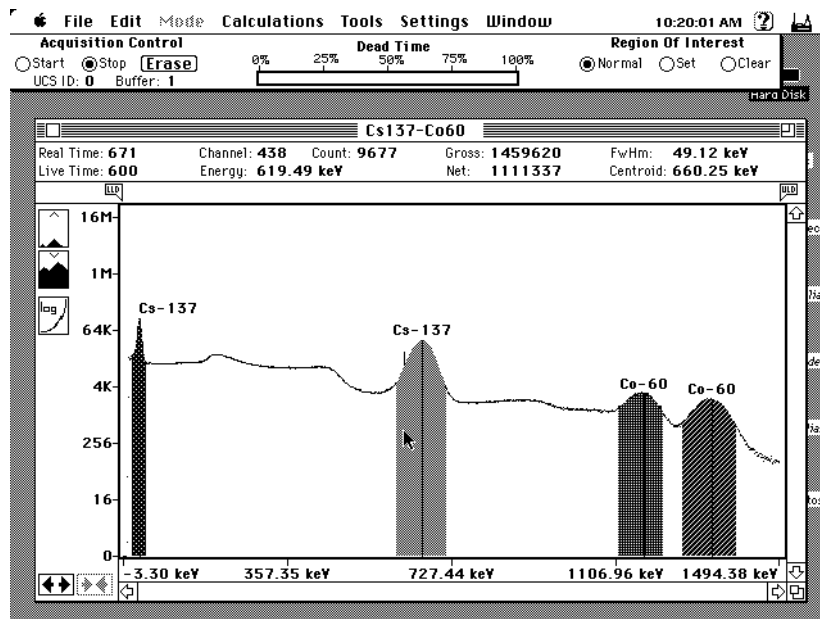
The software is not copy protected and making a backup copy is recommended prior to installing the programs on the Mac hard drive.



OPERATION

Once the program is running it will be necessary to configure the system parameters for correct operation and calibration.

Place a gamma emitting check source near the detector face. Cs-137 is a good choice for many applications but other isotopes or combinations may be used.



Setting High Voltage and Gain.

If you are using an integral NaI(Tl) detector with a voltage divider base such as the SPECTECH model GP-38, it will be necessary to set the high voltage and amplifier gain. From the menu bar select **Settings, High Voltage/Amplifier**. The following control box will appear.

The control dialog box contains the following settings and controls:

- Detector Voltage:** Off On Lock
- Voltage Level:** volts
- Coarse Gain:** 1 2 4 8 16 32 64
- Fine Gain:**
- Buttons:** Start, Stop, Erase, Cancel, OK

Set the high voltage to the recommended operating value found on the manufacturers data sheet (normally around 500v for the GP-38).

Click the ON button.

Set the amplifier coarse gain to 8 as an initial starting value and start acquisition by clicking the **Start** button. The UCS-10 should begin collecting data and a spectrum of the calibration source will build on the screen. Using the course and fine gain controls align the photopeak(s) to the desired channel (s).

If the 662 keV peak is set to channel 662, this will yield an approximate calibration of 1 keV per channel and a maximum energy range of 1.23 MeV which may not be sufficient for many experiments. Some measurements require an energy range of 2.8 MeV and the calibration should be set accordingly.

Set ADC Conversion Gain.

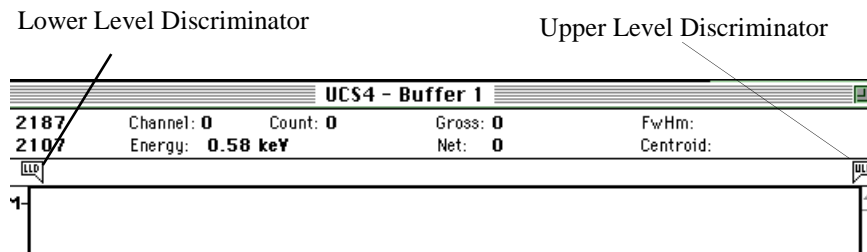
The default setting is 1024 channels (maximum gain). This is preferred for most scintillation detector applications and generally no adjustment is required. For certain uses such as alpha spectroscopy, it may be necessary to change this parameter to either 512 or 256 channels.

From the menu bar select **Setting, Conversion Gain**. The ADC conversion may now be selected as desired.

Set LLD/ULD.

At this stage it may be convenient to set the LOWER and UPPER discriminator levels to eliminate unwanted noise and high energy signals. If the LLD is set too low, detector noise may produce excessive system deadtime. Setting a counting window around a peak of interest can also be useful when performing decay studies using the MCS mode.

The upper and lower level discriminators are shown by the position of the sliders above the spectrum display area. They may be changed by clicking and dragging these indicators.



Presets.

Two preset time modes are available with the UCS-10

PRESET LIVE TIME provides automatic correction for counting losses caused by the system deadtime. Events which occur during the pulse processing cycle are lost to the system so the timer is automatically updated to compensate for these losses. When operating at excessively high count-rates the deadtime meter will indicate a high value and the actual counting time may be more than doubled. Increasing the LLD setting can help reduce some high deadtime effects and is described later in this manual.

PRESET REAL TIME sets the counting timer to run for actual clocktime and makes no correction for losses due to deadtime effects.

Both the LIVE TIME and REAL TIME values are record on the UCS-10 screen and saved in the file during data storage.

From the menu bar select **Setting, Presets**. The following screen will appear.

The screenshot shows a dialog box titled "Set Acquisition Presets". It contains two main sections: "Preset Times" and "Preset Counts". In the "Preset Times" section, there are two options: "Preset Real Time" with a checked checkbox and a dark input field, and "Preset Live Time" with a checked checkbox and an input field containing "0". In the "Preset Counts" section, there are two options: "Preset Channel Count" with a checked checkbox and an input field containing "0", and "Preset Integral Count" with a checked checkbox and an input field containing "0". At the bottom of the dialog are "Cancel" and "OK" buttons.

Click the button to select the preset mode and enter the time in seconds.

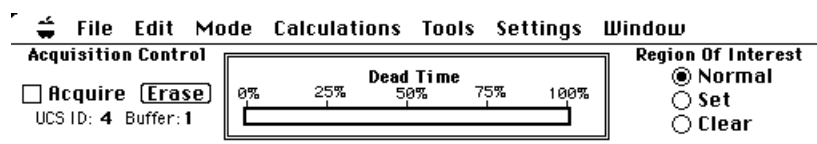
PRESET COUNT.

From this menu you may also set a preset value for the current marker channel or the total counts in a region of interest where the marker resides. This mode can be useful for acquiring spectra with the same counting statistics.

Regions of Interest.

Region of interest (ROI) selection is an advanced feature which provides instantaneous computation of peak gross and net counts. These values may be used along with isotope decay tables and detection efficiency to calculate absolute or relative isotopic activities. ROI's must not overlap and be separated by at least one channel for correct area calculation. Up to 8 different groups of multiple ROI's are possible using the color selector. Normally, peaks from a single isotope are marked in one color with separate colors used to differentiate different isotopes.

Regions may be setup and cleared using the mouse controls.



Setting Regions of Interest.

Regions may be set around areas in a spectrum to totalise the number of events that fall in each region. Normally ROI;s are set around peaks of interest in order to determine the gross and net counts in each peak. ROI's may be of different colors but should not overlap.

SETTING ROI's

Click on the ***Set Button.***

Move the marker to the left edge of the peak. Click and drag the mouse over the peak and release the button. This will color the channels covered. Move to the next peak and repeat the process. A different color from the SETTINGS menu may be chosen if required.

After all ROI's are set, click the ***Normal Button.***

CLEARING ROI's

Click on the ***Clear Button.***

Move the marker to the left of the ROI. Click and drag the mouse across the ROI. Release the mouse button and all ROI's in the drag boundaries will be cleared

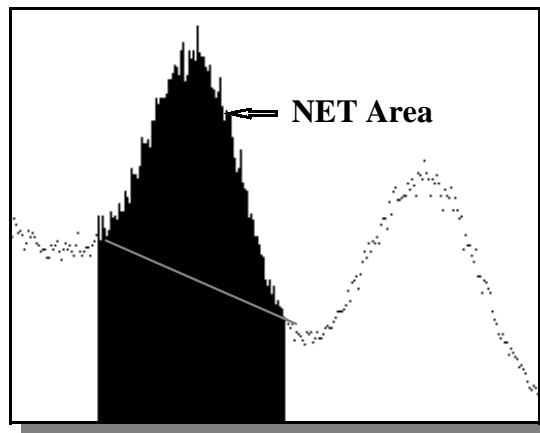
To clear all ROI's, click the ***Clear Button*** and click the main spectrum ***Erase Button.*** Only ROI's will be cleared, the data will remain. After clearing ROI's, click the ***Normal Button.***

When the marker is positioned in a ROI, the software computes the the gross

and net integrals in the region and displays this data along with other computed information in the text area directly above the main spectrum display.

Gross and Net Integrals.

When the marker is positioned in a region of interest, the UCS-10 software automatically calculates the gross and net area of the region. In order to minimize statistical effects at the ROI endpoints, a 3-point averaging technique is applied. The contents of channels $(n-1)$, (n) , and $(n+1)$ are summed and averaged to derive the content of the endpoint channel for the net area computation. A linear interpolation is performed between these averaged endpoint values and counts below the Compton edge are subtracted to arrive at the net area of the peak.

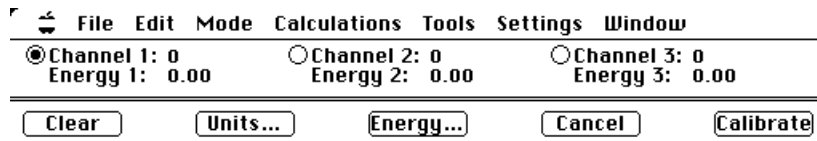


CALCULATIONS.

The *Calculations* menu makes it possible to perform many advanced operations with the UCS-10.

Energy Calibrate.

The energy calibration feature allows the marker to read directly in energy units. Two calibration functions are possible, a 2-point linear, or a 3-point quadratic fit. In order to perform an energy calibration, it is first necessary to acquire a spectrum using known isotopes. Cs-137 together with Co-60 works well for many applications, producing gamma lines at 32keV, 662keV, 1173keV and 1332.5keV.



First clear any residual data from the calibration screen by clicking the *Clear Button*.

Click the *Units Button* and select the units to be used.

Position the marker at the highest channel of the first peak and click the *Channel 1 Button*. Next click the *Energy Button* and enter the peak energy value. Move the marker to the high point on the second peak to be used for the calibration and repeat the procedure. At this stage, if only a 2-point calibration is to be used, exit by clicking on the *Calibrate Button*. If a 3-point calibration is required, continue by moving the marker to the peak channel of the third peak, enter its energy and click on *Calibrate*. The system will now be calibrated and the marker position will read directly in energy.

To return to the channel mode, restore the menu and click the *Clear Button*.

Spectrum Smooth.

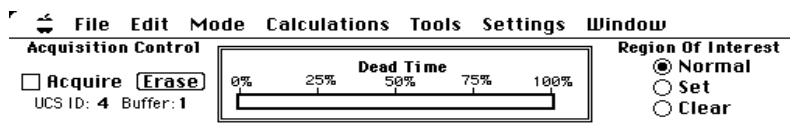
Selecting this feature performs a 3-point smoothing on the spectrum. The smoothing function only works on the buffer currently being displayed and does not modify data stored in the UCS-10 memory. When executed, smoothing performs a 3-point averaging of the data using the algorithm

$$\frac{(n-1)+(n)+(n+1)}{3}$$

Using the Memory Buffers.

The UCS-10 contains four memory buffers each capable of acquiring and storing a 1024 channel spectrum with the elapsed time. These buffers may be used to store a background spectrum and other data spectra use for comparison and stripping. Data may be accumulated in only one buffer at a time. The buffers are accessed through the file menu.

From **File**, select **Active UCS Buffer** and choose the buffer you wish to display. You may open several buffers at any time, but only the buffer being displayed will be active and capable of acquiring data. The selected buffer and the SCSI address of its UCS-10 is displayed on the system screen in the control window.



Spectrum Stripping and Background Subtraction.

Spectrum stripping is method of subtracting one spectrum from another to show the residual. It is normally performed on a channel by channel basis using "Normalized Livetime". If spectrum B has been accumulated for 1000 sec. and spectrum A is accumulated for 100 sec., when spectrum B is stripped from A only 10% of the channel content of B is subtracted from A.

This function can be useful for subtracting a background spectrum which has been accumulated over a long counting time from data accumulated over much shorter times.

Stripping only effects the data in the display memory and never changes the contents of the UCS-10 memory buffers. To strip a spectrum you must first transfer the spectrum that will used for the stripping into the clipboard.

From the **Edit** menu select the **Active UCS Buffer** of the spectrum that will be used for the stripping to display it on the screen. Copy the spectrum into the clipboard using **Edit, Copy**. Now select and display the spectrum to be stripped and from the **Edit** menu select **Strip Clipboard Spectrum**. The display window will now show the residual after the normalized spectra are subtracted channel by channel.

MULTICHANNEL SCALING.

Multichannel Scaling provides a means of recording time correlated data such as half-life decay or single photon counting. In this mode the ADC is bypassed and incoming events are routed directly into memory.

The UCS-10 is factory configured to use its internal amplifier and discriminators to process detector signals prior to routing to the MCS counter. This scheme presents a convenient method of counting the complete spectrum or a selected range such as a single photopeak.

First acquire a spectrum of the sample to be counted using the Pulse Height Analysis mode. While acquiring the spectrum, adjust the LLD and ULD to select the energy range of interest (For example, selecting only the 662keV peak from Cs-137 can eliminate unwanted background and produce a superior decay curve from the Cs-137/Ba-137 generator.)

From the ***Mode*** menu select ***MCS***.

Select the ***Dwell Time*** from the ***Settings*** menu for each memory location (channel). Remember the total pass time will be (1024 x dwell time).

Erase any current memory data and click start. The ICS 10 will proceed to count incoming events for the selected dwell time, store the total in the first channel location, reset the counter and repeat the cycle storing each total in sequential channels.

If you wish to use an external pulse generation system such as a coincidence circuit, it will be necessary to bypass the on-board amplifier and discriminators. This mode may be selected from the ***Settings, EMCS*** menu. When set to the EXT position, the input BNC connector is routed directly to the MCS counter. When operating in this mode, the MCS input requires positive TTL signals (>2.5v, >150ns duration).

PEAK SUMMARY

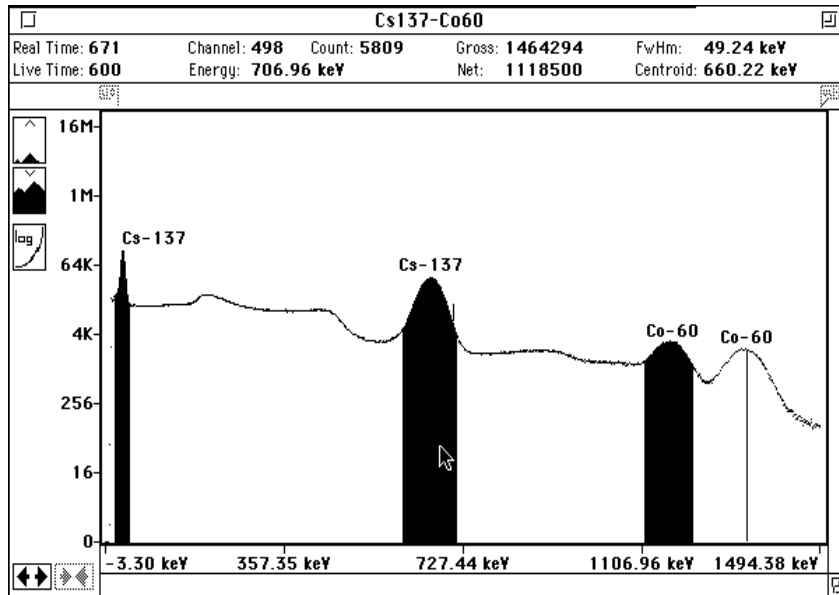
If regions of interest are currently set, a table of ROI data may be displayed by selecting the Peak Summary report.

From the ***Tools menu*** select ***Peak Summary***.

The list of ROI data for the currently selected buffer will be displayed on the screen in place of the spectrum. Normal acquisition may be run while in this mode.

ISOMATCH.

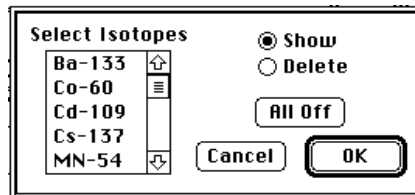
The IsoMatch feature proves a convenient method of quickly identifying isotopic peaks in a spectrum relative to a master library. When the isotope is selected from the library, markers with the associated isotope label are superimposed on the spectrum at the appropriate energy positions. Prior to running IsoMatch, the UCS-10 must be accurately energy calibrated otherwise the peak markers will be misaligned.



To select IsoMatch Click **Tools, IsoMatch**.

The IsoMatch library contains a listing of significant gamma ray emissions for many common isotopes.

Select the isotope of interest and click **Show**. Markers will be superimposed over the spectrum at the corresponding energies of gamma emissions for the selected isotope. Multiple isotopes may be displayed simultaneously by selecting and clicking **Show**. The IsoMatch library may be edited use a resource editor such as ResEdit.



SAVING and PRINTING FILES

Data files may be saved and restored in binary format from disk using the ***Save***, ***Save As***, and ***Open*** commands accessed from the ***File*** menu.

A ***Save Settings*** command is also included which saves all current operating parameters such as high voltage, amplifier gain, ADC settings and presets. This feature can be very useful for saving and restoring specific setups and calibrations for different experiments. It also provides a convenient way of quickly restoring operating conditions after power has been removed from the UCS-10.

Print Preferences provides a means of setting the data channels to be printed if the entire spectrum is not required to be outputted.

Print sends the selected data to the printer.

USING THE CLIPBOARD

Data files may be pasted into another spectrum window or transferred in ASCII format to spreadsheets using the Clipboard function. Once in a spreadsheet, data may be manipulated and graphed for analysis and outputting to reports. Two copy commands are provided through the ***Edit*** menu.

Copy. This command transfers the entire spectrum and header data to the clipboard.

Copy Data Only. This command transfers only the spectrum channel data to the clipboard and is often preferred when moving data to mathematical analysis programs. Header information is not copied with this function.

SPECIFICATIONS

Physical: Fully shielded benchtop metal enclosure, 9x13x2.5 in.

Preamp In: BNC connector for direct connection to PMT anode signal. Utilizes on-board amplifier/preamplifier.

Direct In: BNC connector bypasses internal amplifier and connects directly to ADC input. Accepts unipolar or bipolar signals 0-8volt range.

Ext MCS In: BNC connector bypasses internal amplifier Accepts positive TTL signals >150nsec., 5MHz aximum rate.

HV Output: MHV (or optional SHV) connector supplies positive 0-1275volt @ 1mA maximum current to power scintillation detector. High voltage is fully regulated and computer controlled in 5volt increments.

SCSI: 50 pin SCSI-1 input and output connectors for interfacing to Macintosh.

Amplifier: On-board combination preamp./ amplifier for use with scintillation detectors and PMT's. Computer controlled coarse and fine gain from x2 to x1000.

ADC: Wilkinson type with 80MHz clock and computer selected conversion gain of 1024, 512, or 256 channels. Direct input accepts pulse peaking times of 1sec. to 10sec. Includes deadtime correction when used in Live-Time mode.

LLD & ULD: Independently computer controlled in 4-channel increments over entire input range. Operates prior to ADC for reduced system dead time.

Modes: MCA for pulse height analysis, or MCS for half-life decay or other time related studies.

Timers: Real-Time or Live-Time operation, selectable in 1sec increments and from 1msec. to 60sec. per channel in MCS mode.

Data Memory: On-board dynamic RAM, 4 x 1024 channel x 3 Bytes for data, plus region-of-interest flag.

Deadtime: System dead-time is computed and displayed on screen during acquisition.

Power: AC line, 100-250VAC, 50/60Hz, autosensing internal power supply with Universal Power Cord input.

Status Indicators: High voltage, Communication, Acquire, Activity.

System: Operates under Macintosh System 7 or higher.

Display: Color or monochrome monitor, Vertical scale adjust from 32 to 16M and LOG display. Horizontal 1024 channels with expansion down to 128 channels.

Time Mode: Preset live-time or preset real-time selection. Both times are recorded and displayed.

Count Mode: Preset count mode for selected channel or gross Region-of-Interest.

ROI'S: Multiple Regions-of Interest using color coding.

Integral: When cursor is in ROI, computes gross area, net area with end point averaging, centroid and FWHM.

Energy Cal: 2-point linear or 3-point quadratic converts cursor position reading directly to energy units. (Time units in MCS mode.)

Subtract: Subtracts channel-by-channel time normalized data stored in Clipboard from display data.

Data Buffers: 4x1024 channel buffers for storing spectra. Used with Spip and Overlap features. Overlays data memory spectrum with up to 3 additional spectra stored in Buffers.

Smooth: 3-point smoothing of displayed data. Does not modify data in acquisition memory.

Control: Software control of High Voltage, Amplifier Gain, Lower and Upper level discriminators, and ADC Conversion Gain.

File: Save or load data file and header information in binary format.

Clipboard: Clips data and header information, ROI data containing, centroid, FWHM, gross and net integrals, and header information in spreadsheet compatible format for transferring into other applications.

ISOMATCH: Isotope library with peak markers and labeling for overlaying on spectrum. Provides quick isotope identification. Libraries may be edited and extended using Resource Editor.

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