SPECTRUM TECHNIQUES, INC.
182 Midway Lane
Oak Ridge, TN 37830
USA.
Tel. (423) 482-9937 Fax. (423) 483-0473
e-mail. spectech@esper.com
Web Site. http://www.spectrumtechniques.com

SPECTECH

ICS 10W

Integrated Computer Spectrometer for Windows

Operating Manual

May 1998

Spectrum Techniques, Inc.

Oak Ridge, Tenn. USA

CAUTION
ELECTRICAL SHOCK HAZARD

TO AVOID POSSIBILITY OF ELECTRICAL SHOCK ALWAYS TURN OFF THE COMPUTER POWER BEFORE INSTALLING THE CARD OR CONNECTING THE EXTERNAL CABLES.
DANGEROUS HIGH VOLTAGE CAN EXIST ON THE CARD AND AT THE EXTERNAL HV CONNECTOR WHEN THE UNIT IS OPERATING,
DO NOT REMOVE THE CARD OR CABLES WITH THE COMPUTER POWER ON.

This version of ICS 10W software program is written in C++ language. It is designed for Microsoft Windows 3.1 or Windows 95 operating systems. It is compatible with all existing ICS 10 hardware that may presently be operating with a DOS based software program. Spectrum files, Data files and Library files can be transferred from the ICS 10 DOS program to the Windows version.

Most functions may be accessed by more than one method. All the functions can be accessed from the Pull Down Menu, some from the Tool Bar Buttons, or by the mouse. If the function has a Tool Bar Button, its symbol will be shown on the left hand side of the description.

TABLE OF CONTENTS

Tool Bar

- Open
- Close
- Print
- Copy
- Undo
- Amp/HV
- Preset
- Spectrum
- Peak Report
- Data Report
- Contents

Display Window

- Start
- Stop
- Erase
- Dead Time Meter
- Horizontal Expand
- Vertical Expand
- Live Time (LV)
- Real Time (RT)
- High Voltage (HV)

Technical Reference

- Dip Switch and Port Addressing
- Multiple Card Installation

Specifications

- Hardware
- Software

INSTALLATION

Your ICS 10 W card has been factory configured to operate internally in most IBM ® compatible PC's. System requirements; 486 or Pentium processor, 8 meg RAM, 640 x 480 VGA or SVGA graphics, Microsoft Windows® version 3.1 or higher, Window 95 and compatible mouse. The software requires requires 1.4 meg available disk space. Port addresses have been set at base 210, which will normally not conflict with other installed devices. If problems occur and the ICS 10 W card does not respond correctly to the software commands, refer to the technical reference section for other IO settings. If problems continue contact the factory.

The ICS 10 W card is shipped from the factory with the internal amplifier enabled. This configuration requires the use of a simple high voltage divider type photomultiplier tube base. The signal (anode) from the base may be connected directly to the ICS 10 W bottom Input (BNC) connector and the HV (high voltage) connected directly to the top HV (MHV) connector.

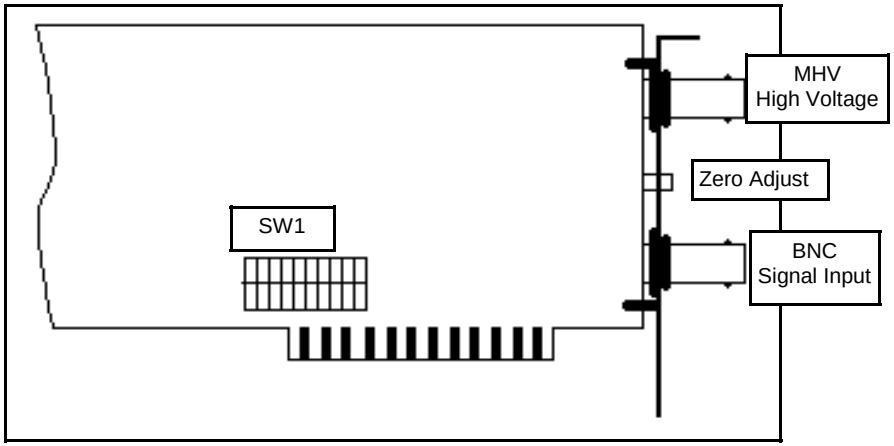


Fig 1

The BNC and MHV connectors appear to be similar, exercise care when making these connections.

SOFTWARE

System: Operates under Microsoft Windows ® with 1.5 meg available.disk space, 8 meg RAM , Microsoft Windows® 95 or higher, and compatible mouse.

Display: VGA or SVGA color graphics. 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 (ROI) 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 posi tion reading directly to energy units. (Time units in MCS mode.)

Bkgd Buffer: Used to store background spectrum for time normalized background subtraction.

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

Data Buffers: 3 additional software buffers for storing spectra. Used with COMPARE feature.

Compare: Overlays data memory spectrum with up to 3 additional spectra stored in Buffers.

Smooth: 3-point smoothing of selected displayed data.

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, or spreadsheet compatible formats.

Print: Prints current screen display to Windows printer.

ROI File: Saves ROI data, centroid, FWHM, gross and net integrals, and header information in spreadsheet compatible format.

ISOMATCH: Isotope library text file with peak markers and labeling for overlaying on spectrum for quick isotope identification. Library may be edited from Edit, IsoMatch pull down menu.

The ICS 10 W has a preamplifier/amplifier built into the unit. To use an external preamplifier/amplifier it is necessary to bypass the on board circuit by reconfiguring the jumper selector.

Jumper (JP1) Selection for preamplifier/amplifier

Normal mode selects the on board preamplifier/amplifier, the jumper is in the **PREAMP** position.
Use this mode with a detector containing a voltage divider type tube base.
The ICS 10 W amplifier is active and the system gain is controlled by the software.

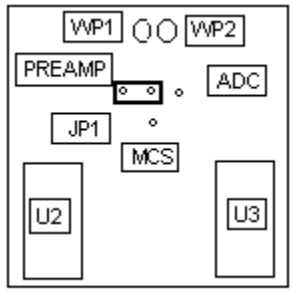


Fig 2

External preamplifier/amplifier allows direct access to the ADC.
Move the jumper to the ADC position.
In this mode the on board amplifier is bypassed and the software does not control the gain.

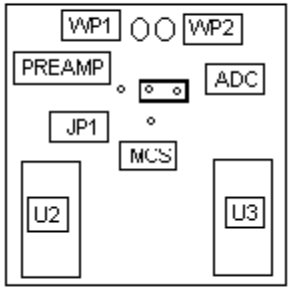


Fig 3

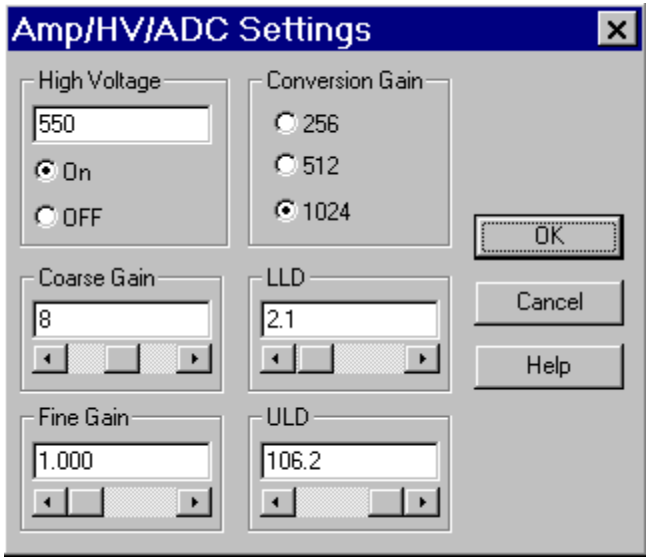
Card Installation
Install the ICS 10 W circuit card into the ISA bus of the computer. Ensure that the card is seated firmly into the slot. Attach the panel to chassis of the computer with screw.

After the card has been installed, connect the detector signal BNC and high voltage MHV to the ICS 10W connectors.

Software Installation
Place ICS 10W software disk into appropriate drive. From the Window Taskbar, click Start, click Run, type A:install. Continue to follow the instructions on the screen.

High Voltage and Amplifier Gain Setup

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. Cesium-137 (Cs-137) is a good choice. It has single peak at 662 keV.



Click on **Settings**, then click on **AMP/HV**
Set the high voltage to the voltage as listed by the detector manufacturer. As an example, set the high voltage to 600 volts, click **ON**.
DO NOT *exceed the maximum high voltage rating of the detector, usually 1200 volts.*
Set the amplifier **COARSE GAIN** to 8, and set the **FINE GAIN** to 1 as a starting position. Click on **OK**, to set adjustments and exit the menu.
Start the data acquisition and adjust the **amplifier gain** until the 662 keV peak is approximately mid-scale.
Once the acquisition is started, you may enter the **AMP/HV** menu, make adjustments while viewing the spectrum. This will allow you to position the peak in the desired channels.

SPECIFICATIONS

HARDWARE

Physical: Single IBM-XT compatible card includes preamplifier, amplifier, detector high voltage, 1024-channel multi channel analyzer with data memory, LLD and ULD. Fully compatible with many scintillation detectors and commercial tube bases.

Data Input: BNC connector for direct connection to PMT anode signal. On-board jumper to bypass amplifier for use with positive unipolar or bipolar signals from external amplifier or alpha/beta spectrometers, 0 - 8 volt range.

HV Output: MHV (or optional SHV) connector supplies positive 0 - 1280 volt @ 1mA maximum current to power scintillation detector. High voltage is fully regulated and computer controlled in 25 volt increments.

Amplifier: On-board combination preamplifier/amplifier for use with scintillation detectors and PMT's. Computer con trolled coarse and fine gain from (x) 2 to (x) 1000.

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

LLD & ULD: Independently computer controlled in 4-channel incre ments 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 1-second increments for PHA, or dwell times from 10 msec. to 600 seconds per channel in MCS mode.

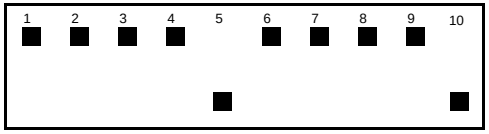
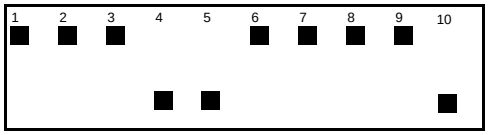
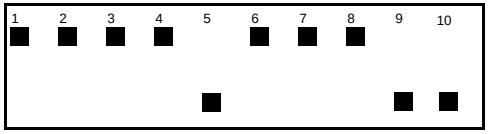
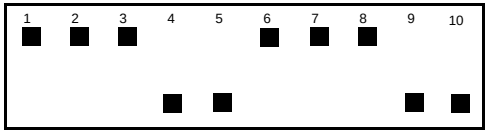
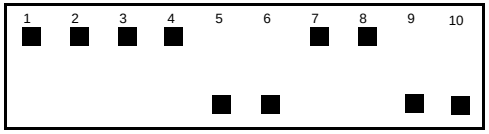
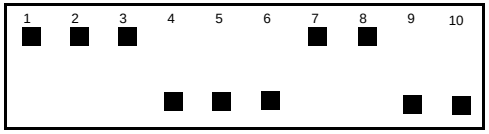
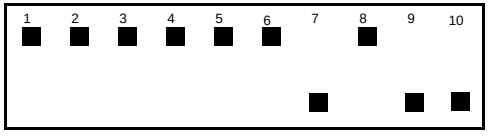
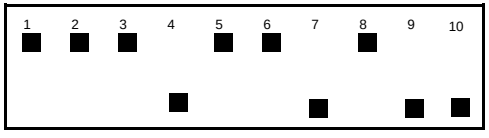
Data Memory: On-board static RAM, 1024 channel (x) 3 Bytes for data, plus region-of-interest flag.

Zero Level: 10-turn potentiometer, through panel.

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

Power: **(**+) 5V, (+) 12V from computer bus. On-board regulated for stability and noise rejection. 9-watts total.

ICS 10 PORT ADDRESS DECODING

A0 A1 A2 A3 A4 A5 A6 A7 A8	HEX	DEC.	Command Line
	210	528	ICSW16
	218	536	ICSW16 -i218
	310	784	ICSW16 -i310
	318	792	ICSW16 -i318
	330	816	ICSW16 -i330
	338	824	ICSW16 -i338
	340	832	ICSW16 -i340
	348	840	ICSW16 -i348

A0 A1 A2 A3 A4 A5 A6 A7 A8

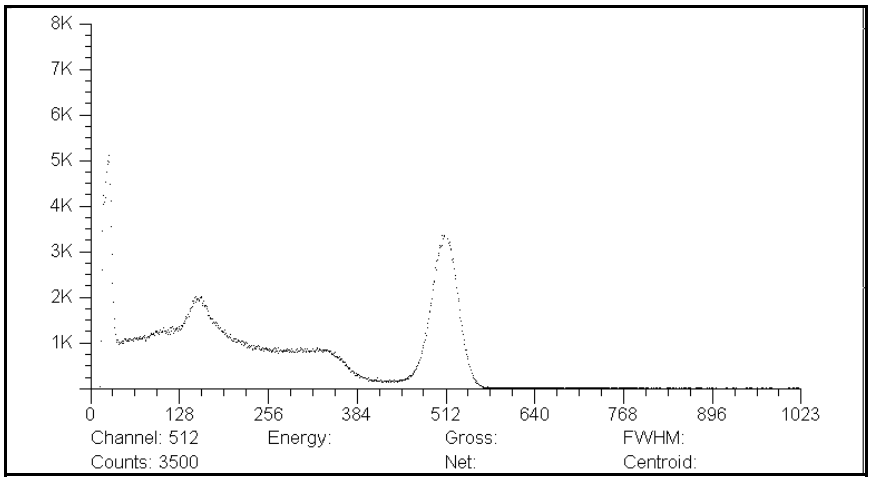
Lower (LLD) and Upper (ULD) Level Discriminator Adjustments

Two methods are available for adjusting the lower and upper level discriminators.
One is, click on **Settings**, click on **AMP/HV.**
Enter the number in the **lower** and **upper** level boxes. Click on **OK**, to set adjustment and exit the menu.
The other method is by moving the triangles for the lower and upper level

setting located on the energy line (horizontal line) of the spectrum display to the desired settings by dragging with the mouse.

Zero Adjustment

This control is accessed from the rear of the computer once the card has been installed. See Fig 1 for location of adjustment potentiometer. This control is factory set and normally does not require further adjustment. However, when operating in the Energy Calibration mode a zero offset may be noticed when the marker is positioned in the first channel of the spectrum. This offset may be eliminated be adjusting the ZERO control, but will require a complete energy recalibration after any adjustment. A small offset of a few keV is inconsequential and can be ignored.



Cs-137 spectrum

ADC Conversion Gain Adjustment

The conversion gain default setting is 1024 channels (maximum gain). This is preferred for most scintillation detector applications and generally no adjustment is required.
For certain applications such as alpha spectroscopy, it may be necessary to change this parameter to either 256 or 512 channels.
click on **Settings**, click on **AMP/HV**.
Enter the conversion gain in the correct box. Click on **OK**, to set adjustment and exit menu.

Preset Time Adjustments

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 real counting time may be more than doubled. Increasing the LLD setting can help reduce some high deadtime effects.

Preset Real Time sets the counting timer to run for actual clocktime and makes no correction for losses due to deadtime effects.

click on **Settings**, click on **Presets**
Enter the **LIVE** or **REAL** time in the correct box. Click on **OK**, to set adjustment and exit menu.
Both the **LIVE TIME** and **REAL TIME** values are displayed on the ICS 10 W display screen and saved in the file during data storage.

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 need to be separated by at least one channel for correct area calculation. Up to 14 different ROI's are possible using the color selector from the pull down **Settings** menu. Normally, peaks from a single isotope are marked in one color and separate colors used to differentiate different isotopes.

ROI Setting

Dip Switches and Port Addressing

The port address of your ICS 10W card is factory set to HEX 210, (DEC. 528).
This is an address field normally reserved for an XT expansion unit and is generally available for ASA plug-in cards.
If for any reason the software does not recognize the ICS 10W card or does not appear to function correctly, it is possible to reconfigure the port address as per the following table using **S1** (see Fig. 1) position 4 through 10. (A3-A9).

A command line switch must be included for addresses other than HEX 210

Multiple Card Installation

Up to a maximum of eight ICS 10W cards may be installed and operated with a single computer providing bus slots are available and sufficient power can be supplied from the power supply. When installing multiple cards, it is necessary to assign each card a different address using the card select **S1** (see Fig. 1) positions 1 through 3. (A0-A2).

Each card is accessed and controlled using the command line switch -c(*card #).*

Once a card has been started, it will continue to acquire data in an autonomous manner independent of the of the ICS 10W software until a new instruction set is downloaded to that particular card using the appropriate command line switch. In this way it is possible to switch between and control multiple cards installed in a single computer system.
A convenient way of accessing multiple ICS 10W cards is to use WINDOWS to set up individual icons or Desktop Shortcuts for each card in the system with the appropriate command line switch assigned to each icon. It is then possible to open each ICS 10W card application by clicking on the icons and switching between them using the Windows *Alt+Tab* command or Windows 95 Taskbar.

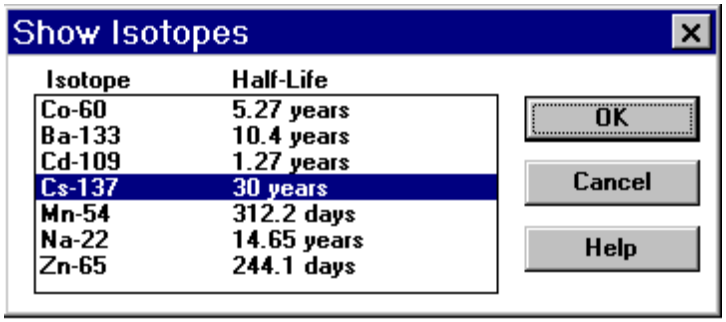
The *c* switch and *i* switch may be combined in a single command line as shown in the following example: **ICSW16 -i210 -c2.**

This will select card number three at address HEX 218.

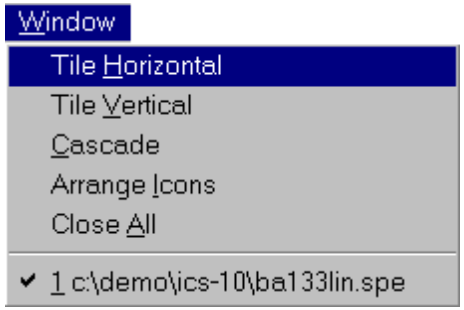
IsoMatch Selection

Show Isotopes...allows the user to select the isotopes to be marked in the spectrum. The isotope library may be modified by clicking on **Edit...** clicking on **Iso Match...**see page 17.

Click on **Iso Match...**select isotope or isotopes to be marked, click **OK** enters data and returns to the spectrum screen.



Window... allows the user to arrange and view all the open buffers.
Horizontal... stacked one on top of another,
Vertical... side by side,
Cascade... stacked over each other/selected one brings it to the front.
TO SELECT
click on **Window...**click on the desire method.



Help Menu

The help menu provides a convenient operator reference for the ICS 10W. Key phrases and words are highlighted in green indicating hypertext. Clicking on these words or phrases opens a direct link to that section of the help document.

Mouse Operation
Set ROI
To set an ROI around a peak, click the *right* mouse button, click on **ROI**, click on **Set ROI**, move the marker to either side of the peak . Hold down the left mouse button and drag the marker to the other side of the peak, release mouse button.

Clear all ROIs
Click the *right* mouse button, click on **ROI**, click on **Clear All ROIs.**

Clear Individual ROI
Move marker to the **ROI** to be cleared, click the *right* mouse button, Click on **ROI**, click on **Clear ROI**.

Pull Down Menu
Click on **Settings**, click on **ROI** follow the same procedure as for the **Mouse** operation.

Integrals and Preset Count

When the marker is positioned in a region of interest (ROI), the ICS 10W 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 this interpolation are subtracted to arrive at the **Net** area of the peak. Gross counts is the sum of all channels in the **ROI.**

Position the marker in the peak of interest. The **Gross** and **Net** areas are automatically computed and displayed on the spectrum screen.

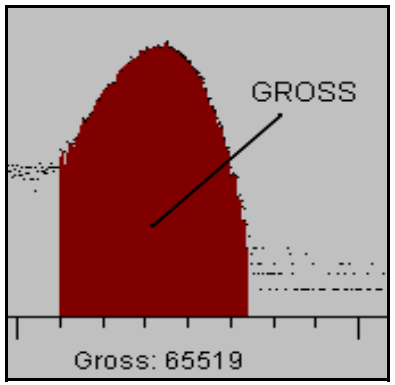


Fig. 4 Gross counts, sum of all counts from all channels in the ROI

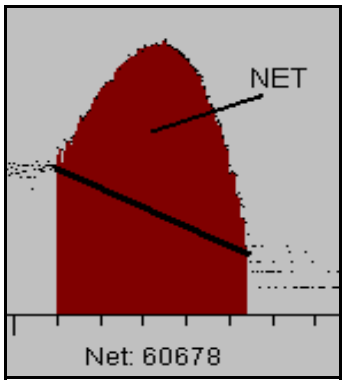


Fig. 5 Net counts, sum of all counts from all channels in the ROI (-) minus counts below the Compton edge line

Set Peak
Counting will terminate when the content of any channel in the entire spectrum reaches the preset value.

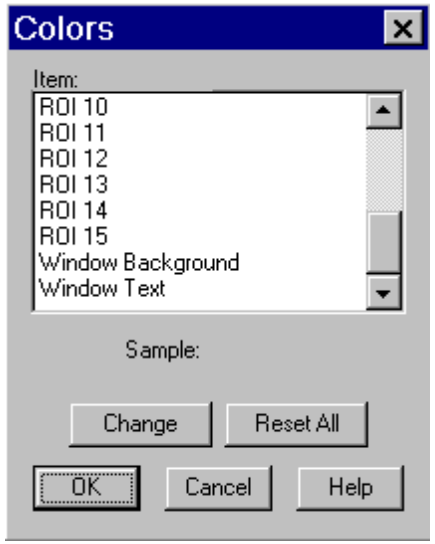
Set Integral
To set an integral count it is necessary to first establish a ROI and then position the marker within the region.

To set **Peak** or **Integral,** click on **Settings**, click on **Presets**, enter the preset number in the correct box, click on **OK**, to set the adjustment and exit menu.

Peak and **Integral** presets can also be entered by moving the pointer into the **ROI** and pressing the right mouse button. Follow the same procedure as listed above.

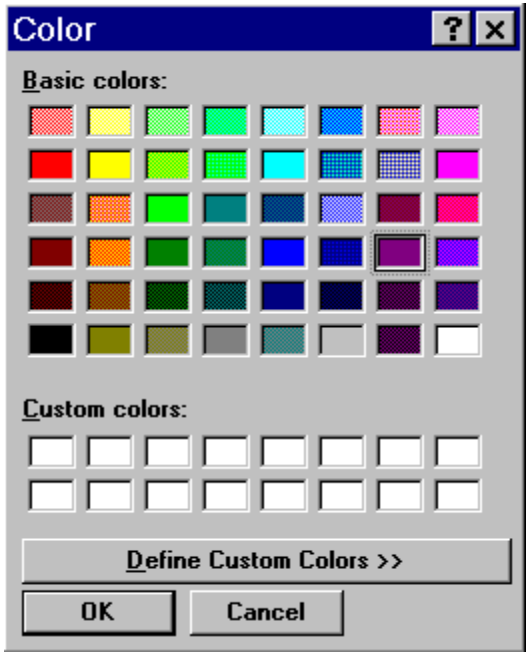
Window, Text and ROI Color Adjustment

Colors... allows the user to select custom colors for **ROIs, Background** and **Text.**
Click on **Settings...** click on **Colors...**select the item to change, click on **Change...**select the desire color, click on **OK**, returns to the **Color** screen, make additional color changes, when all color changes have been made, click on **OK,** enters data and returns to spectrum screen.



Color allows the user to select a range of **Basic Colors** or create **Custom Colors**.

Note:
Setup of computer graphic may effect the true color of the color selected.



Multichannel Scaling Mode

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 ICS 10W 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 662 keV peak from Cs-137 can eliminate unwanted background and produce a superior decay curve when using a Cs-137/Ba-137 mini-generator.)
Click on **MODE...**click on **MCS...**
Click on **Setting...**click on **MCS...**
Enter the **DWELL TIME** 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 10W 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. An **MCS Jumper Selector** is included on the card and when set to the **EXT** position (Figs 6 & 7), 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, >150 ns duration).

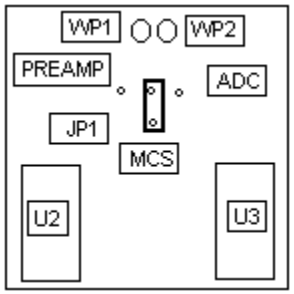


Fig 6

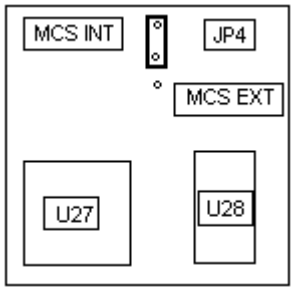
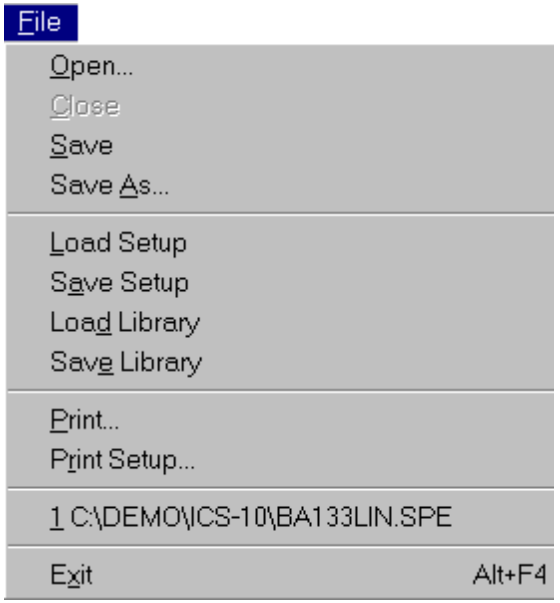


Fig 7

MENU BAR

Many advanced functions are possible via the pulldown menus. This section describes each operation in the sequence they appear. Black letters indicate the function is operational, gray indicates not-operational, highlighted indicates the function the be be activated.

File Menu




Open...allows user to go the DATA FILE, retrieve stored spectrum (spe) or (ssf) file, open file in a selected buffer.


Close...allows user to close a open buffer
Save...allows user to save data to a file using its previous file name
Save As...allows user to save data to a file using a new or previous file name. Choose binary or spreadsheet format.

Load Setup...
Save Setup...
Once the ICS 10 W has been setup and calibrated, all operating parameters may be stored (SAVE SETUP) as a disk file for subsequent retrieval. If power has been turn off, it is a simple and convenient process to reload the setup file and quickly restore (LOAD SETUP) the analyzer to its previous operating condition.

High Voltage must be turned on after loading setup !

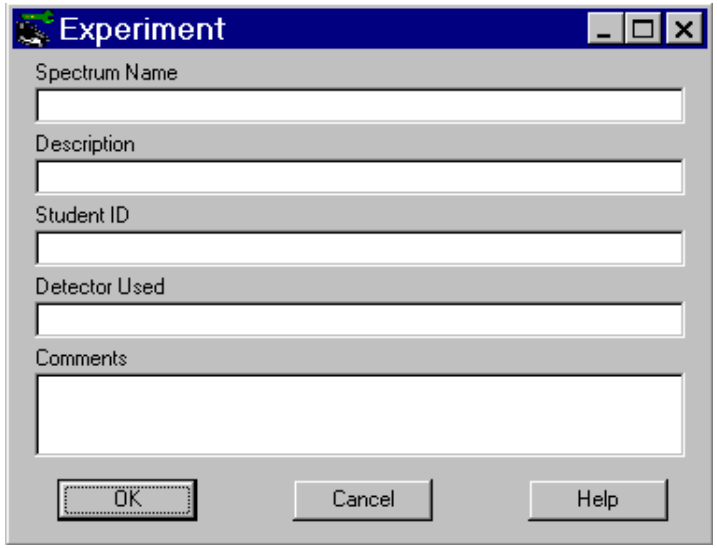
Load Library...allows user to LOAD from file the default library or a customs library into the IsoMatch directory.
Save Library...allows user to SAVE to file a new library for the IsoMatch directory.

Print...allows user to print the data that is displayed on the ICS 10W screen, either graphics, data or ROI.
Print Setup...allows user to set up printer parameters per printer specifications.

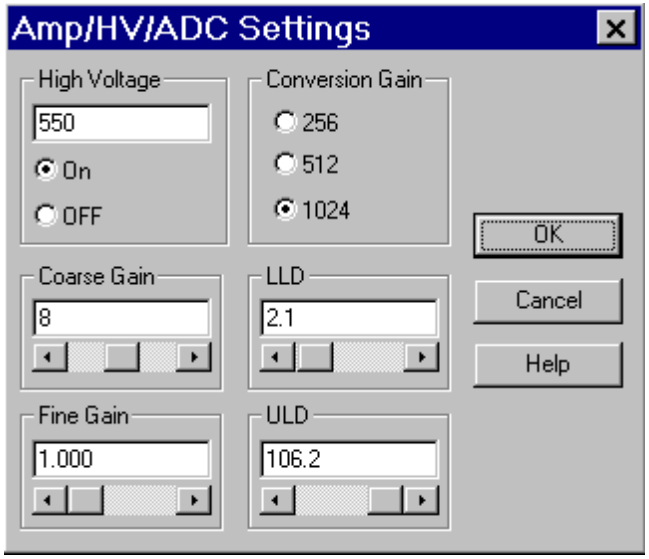
Exit...(Alt+F4)...allows user to exit ICS 10W program, will prompt user to save data.

Edit Menu

Experiment...provides a means of inserting text into spectral file headers for referencing specific measurements. This text is saved along with data and parameter information in .SPE and .TSV files.

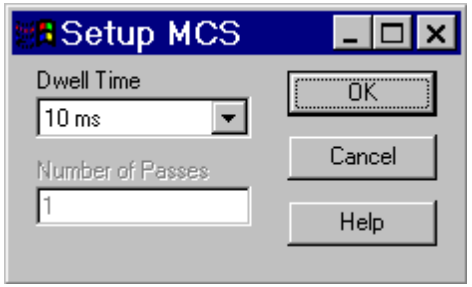


Amplifier/High Voltage/ ADC Settings

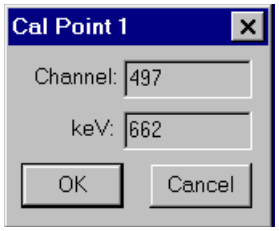


Click on **Setting...**click on **Amp/HV...**enter the detector manufacturers recommended high voltage value, click on **On/Off** to desired position. Set **Course** and **Fine Gain** by either entering number or by moving sliding scale. Click on desire **Conversion Gain**. Set **LLD** and **ULD** by either entering number or by moving sliding scale. When all setting are entered click on **OK**, this will set the adjustments and exit menu to spectrum screen.

MCS operation must by selected in the **Mode** pull down menu before **Setup...MCS** can be activated
click on **Setting...**click on **MCS...**select **Dwell Time...** enter **Number of Passes...** click on **OK** to enter data and exit menu



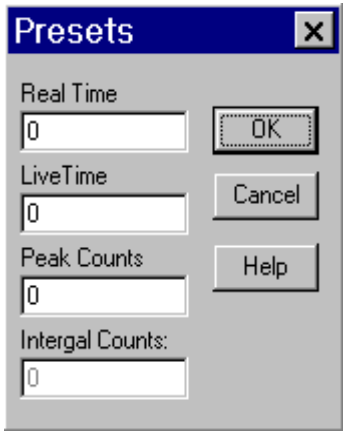
Energy Calibrate... The energy calibration feature allows the marker to read directly in energy units. Two calibration functions are possible, a 2-point linear, or a 3-point quadratic fit.
In order to perform an energy calibration, it is first necessary to acquire a spectrum using known isotopes. Cs-137 together with Co-60 works well for many applications, producing gamma lines at 32 keV, 662 keV, 1173 keV and 1332 keV.



Select 2-point or 3-point mode and enter the calibration units to be used, (keV or MeV). Position the marker at the highest channel of the first peak and enter the peak energy value. Move the marker to the high point on the second peak to be used for the calibration, enter energy number. 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 OK. The system will now be calibrated and the marker position will read directly in energy.
If ROI's are set around each peak used in the calibration, it is necessary only to place the marker in the ROI for the peak. The software automatically calculates the peak centroid and uses this value for the peak position in the calibration routine.
To return to the channel number mode, click on **Settings**, click on **Uncalibrate.**
Energy Calibration may also be selected using the right mouse button.

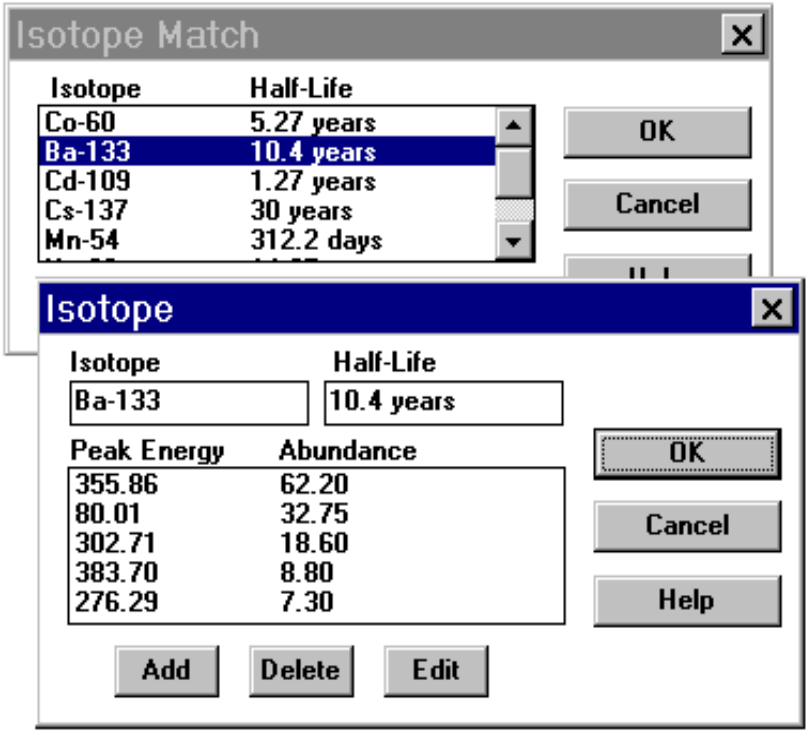
Presets

Click on **Settings...**click on **Preset...**click on the desired preset condition and enter the number, click on **OK** to enter data and exit menu.



Isotope Match...allows the user to create a library of isotopes that may be used in routine sample analysis, when the file is loaded into ISO-MATCH, isotope and marker lines are placed over the peak in the spectrum.

Isotope Match Edit...allows the user to edit isotope data, add and delete isotopes from library.



Erase...allows the user to erase the spectrum when in stop mode...this can also be accomplished by clicking on the **Eraser Icon** on the display screen.

Undo...allows the user to undo the last action performed.

Copy...allows the user to copy a spectrum from one buffer to another.

Start...allows the user to start the acquire mode of a spectrum...this can also be accomplished by clicking on the green start icon on the display screen.

Stop...allows the user to stop the acquire mode of a spectrum...this can also be accomplished by clicking on the red stop icon on the display.

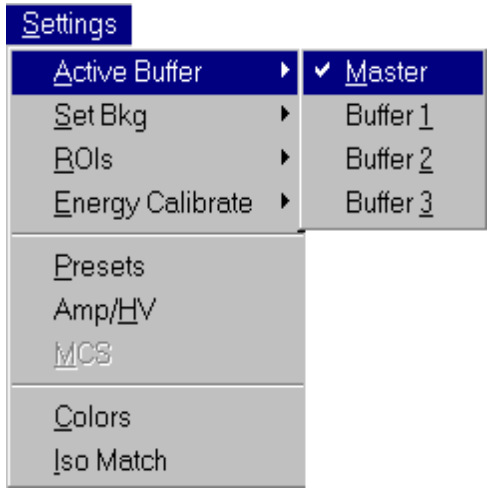
Mode Menu

Pulse Height... The normal operating mode for collecting sample emission spectra. The amplitude of each detector pulse is measured by the ADC and stored as an amplitude (energy) spectrum.

Multichannel Scaling... This mode is used for measuring time related phenomena such as half-life decay or single photon counting. Incoming events are counted for specific predetermined times (dwell time) and stored in sequential memory locations. The card is factory set with the internal preamplifier/amplifier enabled for counting events directly from a NaI(Tl) detector. When using an external signal, it will be necessary to change jumper setting on the card.

(See section MULTICHANNEL SCALING, page 26.)

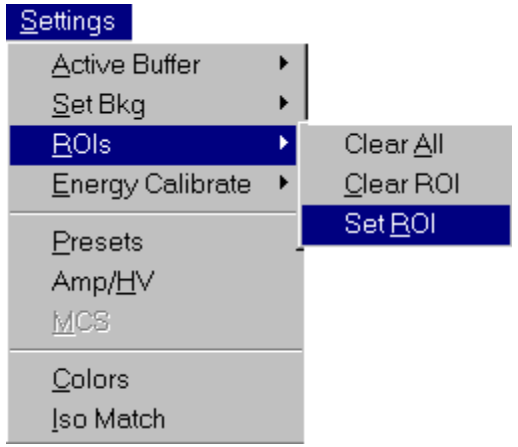
Settings Menu



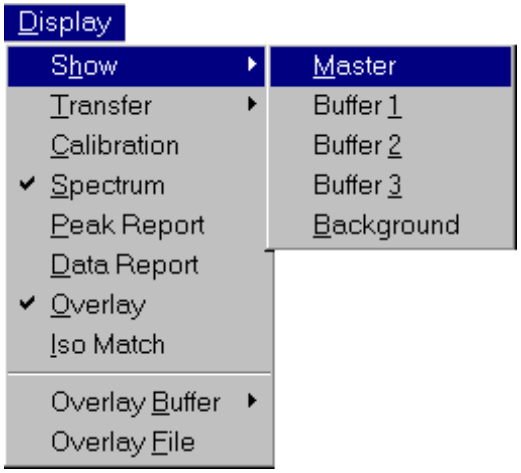
Active Buffer...allows the user to select (make active) the buffer to acquire a spectrum, or to select buffer to load a stored spectrum file.
Set Bkg...allows the user to select (make active) the buffer to acquire a background spectrum, or to select a buffer to load a stored background spectrum file.

ROIs

Click on **Settings**... click on **ROIs**...
Click on **Clear All,...**clears all ROIs previously set...
Click on **Clear ROI...**clears ROI that the marker is in...
Click on **Set ROI...**move the marker to either side of the peak to set an ROI around. Hold down the left mouse button and drag the marker to the other side of the peak, release mouse button.



Show...allows the user to select the spectrum buffer to be displayed..multiple buffers may be displayed at the same time
Transfer...allows the user to move spectrum from master buffer to one of the other buffers
Calibration...allows the user to switch between on/off in calibration mode and channel numbers or energy is displayed on the horizontal line.



Display Mode

Spectrum... Switches the display to Spectrum if the user has been in either Peak or Data Report mode.

Peak Report... If regions of interest have been set around peaks in a spectrum, the **Peak Report** provides a convenient method of displaying peak information in tabular form. Readout will be in energy units if the energy calibration is active.

Data Report... Reports includes all hardware setting, counting parameters and spectrum data. ROI data is reported by lower and upper channels set, gross, net, FWHM, centroid, all channels and corresponding counts.

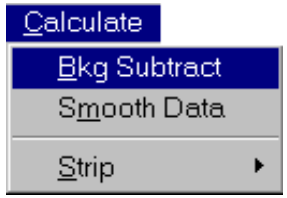
Overlay...allows the user to turn the **Overlay** function on/off.

Iso Match...allows the user to turn the **IsoMatch Marker** on/off once the isotopes have been selected using **Show Isotope Menu.**

Overlay Buffer... The four data storage buffers may be sequentially superimposed over each other for visual comparison.

Overlay File... Stored spectrum files may be opened into data storage buffers and may be sequentially superimposed over each other for visual comparison.

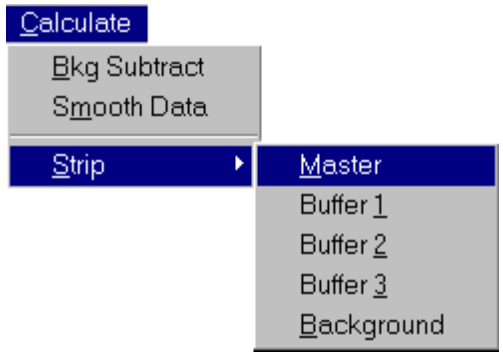
Calculate Menu



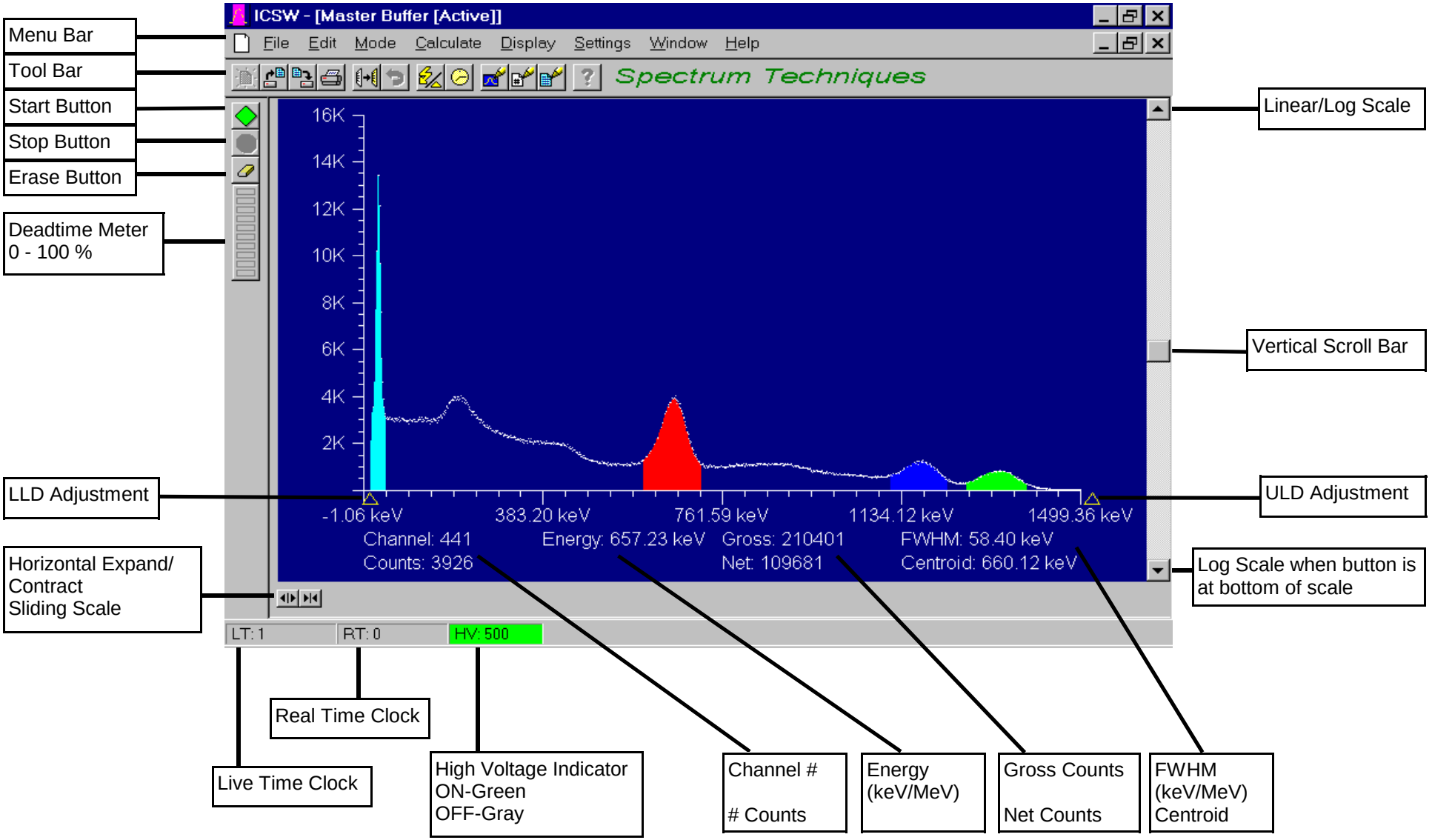
Background Subtract...
This is a special case of spectrum stripping. The detector background is stored in the background buffer, usually for a long collection time. When background subtract is executed, the livetime fraction of the background spectrum is automatically subtracted from the contents of the master buffer. This provides a convenient method of removing naturally occurring background from a sample spectrum and can be very useful when working with low level environmental samples.

Smooth Data... When executed, smoothing performs a 3-point averaging of the data currently being displayed. The function uses the following algorithm to average data in each channel.

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



Spectrum Stripping... The ICS 10W is organized with four on-card 1024 channel data memory buffers, plus a separate computer memory Background buffer.
The on-card memory is used for collecting spectral data from the ADC by setting one of the four memory groups *active*. Different spectra may therefore be collected and subtracted from one another using the **Strip** function. For example, if a spectrum containing isotope A is collected in **Buffer 1**, and another spectrum containing isotopes A & B is collected in **Master** with the same live time, when **Buffer 1** is stripped from the *active* **Master**, the master buffer will now contain only spectrum B.
Stripping is particularly useful for subtracting a background spectrum from the *active* memory group. In this special case, **Background** is selected as **Strip** and only the amount of the background spectrum corresponding to the fraction of the two live times is subtracted


Menu Bar
Tool Bar
Start Button
Stop Button
Erase Button
Deadtime Meter
0 - 100 %
LLD Adjustment
Horizontal Expand/
Contract
Sliding Scale
ICSW - [Master Buffer [Active]]
File Edit Mode Calculate Display Settings Window Help
Spectrum Techniques
16K
14K
12K
10K
8K
6K
4K
2K
-1.06 keV
383.20 keV
761.59 keV
1134.12 keV
1499.36 keV
Channel: 441
Counts: 3926
Energy: 657.23 keV
Gross: 210401
Net: 109681
FWHM: 58.40 keV
Centroid: 660.12 keV
LT: 1
RT: 0
HV: 500
Linear/Log Scale
Vertical Scroll Bar
ULD Adjustment
Log Scale when button is
at bottom of scale
Real Time Clock
Live Time Clock
High Voltage Indicator
ON-Green
OFF-Gray
Channel #
Counts
Energy
(keV/MeV)
Gross Counts
Net Counts
FWHM
(keV/MeV)
Centroid