Genie 2000
Spectroscopy System

Operations

9230846G 3/01

ISO 9001
SYSTEM CERTIFIED

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The information in this manual describes the product as accurately as possible, but is subject to change without notice.

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1. Introduction

Welcome to Genie–2000 Spectroscopy Software

Canberra is pleased that you have chosen to join the ranks of Genie–2000 users. We feel that Genie–2000 represents the true state of the art in spectroscopy software platforms. It offers the exceptional ease of use that gets you up and running quickly – combined with the extensive flexibility that lets you operate your system your way.

No matter what your application, you will find Genie 2000 to offer the power and flexibility you need. Whether you are using the software for simple spectral data collection and viewing – or for complete assay of complex samples, Genie 2000 gives you the tools to get the job done.

This manual is a comprehensive reference on the capabilities and operation of Genie 2000. We consider it to be an integral part of the product – an essential tool for you to take full advantage of the capabilities of the system. While others may consider the user manual to be an afterthought, Canberra considers it an integral part of the product. As such we are proud of the effort and consideration that went into the development of this user documentation.

The other chapters of this manual are dedicated to the details. This chapter is intended to give you an overview of the system and its architecture.

Note: This and other Genie 2000 manuals may also be available in computer readable format (PDF) in the <G2K Install Path>\PDFS\DOCS folder on your hard disk. <G2K Install Path> is the top level directory you have chosen for the installation of the Genie 2000 software (C:\GENIE2K by default). During the installation of Genie 2000 you may select whether the electronic manuals are copied and whether you want to install the application required to view these manuals (Adobe Acrobat® Reader®).

Overview of Genie 2000

Genie 2000 is a comprehensive set of capabilities for acquiring and analyzing spectra from Multichannel Analyzers (MCAs). Its functions include MCA control, spectral display and manipulation, basic spectrum analysis and reporting. Optional capabilities include comprehensive spectrum analysis for alpha and gamma spectroscopy, quality assurance, system automation and turnkey packages for specific, dedicated applications.

A block diagram of the Genie 2000 architecture is shown in Figure 1.

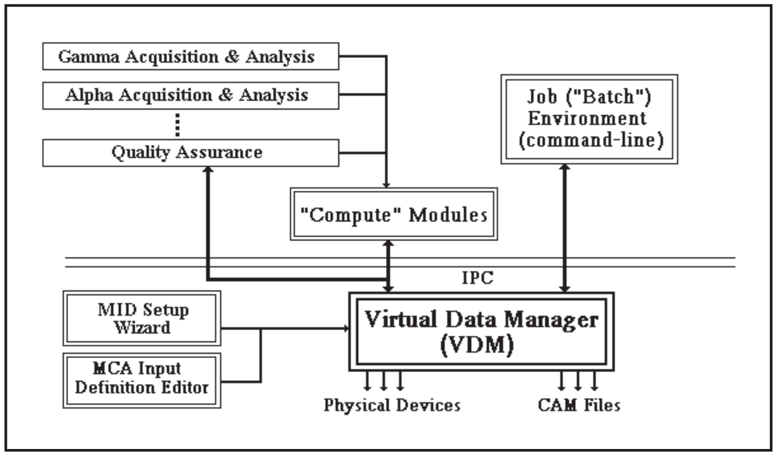


Figure 1 The Genie-2000's Architecture

The core of the Genie 2000 software is a module known as the Virtual Data Manager or VDM. The VDM manages all information flow within the system. It is responsible for communications with both data files and MCA devices – and for presenting information from them to the subsequent layers of software in a consistent manner. Thus, the VDM makes it possible for the user to operate on all spectra – whether from a data file or from one of the 10 or so different MCA hardware products supported – with consistent display, user interface and analysis. VDM and its attached hardware drivers maintain all the low level communications to MCAs as well as data transfer from MCAs to data files.

The VDM is designed to communicate to subsequent layers of software via a layer called inter process communication or IPC. IPC is designed to function both within a single computer and over a network. Thus an MCA hardware device connected to one computer's VDM can be accessed for control, display and analysis over a network from another computer.

The next layers are the compute modules. These are small modular programs that perform basic functions – start/stop of acquisition, transfer of spectrum from MCA to disk, peak search, etc. This modular nature makes possible the extensive flexibility in Genie 2000 – individual modules can be operated together in a sequence to meet specific application requirements.

Tying the compute modules together are two completely separate user interface environments – the interactive environment and the batch procedure environment. These distinct environments were developed for very different needs – in recognition of the fact that there can be very different uses of a single system.

The interactive environment – embodied in the Gamma Acquisition and Analysis Window and (optionally) in the Alpha Acquisition and Analysis Window – is intended for direct hands on operation of all aspects of the system. From an integrated window featuring pull down menus, a tool bar, status pages, a report window and spectral display, the user can do essentially anything with the system. Acquisition control, analysis, spectrum manipulation are all very interactive and are all available to the user all the time. This makes the environment very powerful for the knowledgeable user – the experienced spectroscopist reviewing difficult spectra, testing system performance on unique samples, optimizing analysis routines, etc.

However, many lab operations consist mostly of routine repetitive operations using less skilled operators – users who are not trained as scientists or radiochemists, but technicians who are trained to count samples by specific procedures. These users do not need immediate access to everything – in fact their access to sensitive setup functions needs to be controlled. For this group of users, the batch procedure environment provides a step by step guide through the process of counting samples – as well as other operations. Additionally, the batch procedure environment features a security system that prevents access to various functions by operators not qualified to operate them.

Both the interactive and batch user interface environments operate on a common set of compute modules – so consistency of operation and results is assured irrespective of the environment used. They can (and most typically do) exist side by side in a given system – with the batch environment used for routine operations and the interactive used for the non–routine.

The power of the batch environment is exploited by a range of special dedicated applications software products for specific applications. If you are involved in applications such as routine alpha and gamma sample counting, whole body counting, safeguards confirmatory measurements, waste assay or a host of others – applications packages built on the batch environment address the unique requirements of those applications very specifically. Consult your local Canberra office for information and availability.

We expect that you will find Genie 2000 to provide you a comprehensive set of capabilities for nuclear measurements. We also value your feedback – as this is the input that leads us to continuous improvement of our capabilities. Feel free to contact us with your comments at any time. Call and ask for the Genie 2000 Product Manager or visit our home page at http://www.canberra.com. We look forward to hearing from you.

Genie 2000 Support Services

We view support services as a key ingredient to your overall success with a spectroscopy system. Support services are widely varied and can be tailored to meet your specific requirements. A brief overview of available Genie 2000 support services appears below. For more details, see or Customer Services Catalog.

Training

Our training department offers a wide array of training courses for the Genie 2000 user. These range from basic and advanced operations courses, to customization/applications development courses and operations courses on dedicated application software. There are also related courses in basic nuclear measurements and techniques – gamma and alpha spectroscopy, health physics, etc. Training can be conducted either at our training center in Meriden, Connecticut, USA or at your site anywhere in the world.

Maintenance Contracts

Software maintenance contracts are available for Genie 2000 for an annual fee. The contract customer enjoys unlimited telephone and Internet support, newsletters containing useful information on using the software, Software Services Bulletins notifying them of any software problems and – most importantly – free copies of all software updates released during the contract period. Typically, releases occur twice per year. Thus the user who keeps up a service contract is always assured of running the very latest developments in spectroscopy software.

Updates

Updates are also available for users who do not choose to take a maintenance contract. Although most find the contract to be more cost effective, the availability of updates still assures that the Genie 2000 customer can use the latest technology.

About this Manual

If you bought a complete system from Canberra, you'll find the early chapters are designed to get you up and running quickly. If you're installing the software and hardware yourself, you'll first want to refer to Appendices A and B for installation information.

Operations

Volume 1, *Operations*, contains information for day to day operation of the Genie 2000 system.

Chapter 1, *Introduction*, this chapter, lists the software available for the Genie 2000, the typographic conventions used in the manual, and the keyboard conventions for using the program without a mouse.

Chapter 2, *The Acquisition and Analysis Window*, describes the appearance and function of the Genie 2000's main window.

Chapter 3, *MCA Input Definition*, takes you through system configuration, the definition of physical MCA inputs. The first part of the chapter discusses the MID Wizard, which will quickly and easily set up your system's MCA for most common situations. The remainder of the chapter is devoted to the MCA Input Definition Editor, which is available for those setups which will use other parameter settings.

Chapter 4, *Gamma Acquisition and Analysis*, provides a structured reference where you can easily locate specific information.

The Editors

The next four chapters discuss the Certificate File Editor, the Nuclide Library Editor, the Analysis Sequence File editor, and the Geometry Composer. These utilities create and edit calibration standard certificate files, nuclide library files, analysis sequence files and geometry descriptions for Cascade Summing Correction or the optional LabSOCS or ISOCS mathematical calibration packages. Comprehensive standard libraries are included with the package and can serve as the basis for easily defined custom libraries.

The Appendices

Software installation, a nearly automatic process, is covered in Appendix A, *Installing the Software*. Installation of acquisition boards is discussed in Appendix B, *Installing the Hardware*. Appendix C, *Genie 2000 Configuriation*, discusses many modifiable Windows® parameters. Though most users won't need to customize their Windows setup, the information in this section is useful for configuring Windows for specific situations. Appendix D, *Technical Information*, discusses the System 100 and AccuSpec boards, hardware troubleshooting, hardware adjustments, and the Genie 2000 Status Screen.

Customization Tools

Volume 2, *Customization Tools*, contains specialized material for advanced users. Chapter 1 describes how to program a report template to your needs, chapters 2 through 5 cover batch programming, and the appendices discuss CAM parameters, Genie 2000 algorithms, and the meaning of the system's error codes.

Genie 2000 Software

Genie 2000 software is available in several variations and with several layered optional packages, most of which are covered in this manual.

In the interest of clarity, this manual does not associate individual features of the Genie 2000 system with the model numbers purchased to implement those features. This section summarizes the differences between the various models.

Software Covered by This Manual

S500 Genie 2000 Basic Spectroscopy Software
Includes:

- Acquisition control for all Canberra acquisition devices.
- Gamma acquisition and analysis window.
- Batch procedure environment.
- Flexible reporting system.
- Second difference peak search.
- Library directed peak search.
- Tentative Nuclide Identification.
- User ROI peak definition.
- Summation and non-linear least squares fit.
- Complete calibration functions.
- Certificate file editor.
- Nuclide library editor and comprehensive gamma libraries.
- Ability to import efficiency calibration data generated by LabSOCS or ISOCS.

S501 Genie 2000 Gamma Analysis Software option
Includes:

- Peak area background subtract.
- Efficiency correction.
- Nuclide identification.
- Automatic interference correction.
- Weighted mean activity calculation.
- Minimum detectable activity.
- Post-NID processing (action levels).
- Cascade summing correction.
- Parent/Daughter decay correction.
- Requires S500 or S502.

S502 Genie 2000 Basic Spectroscopy Software (Standalone)
Same as S500, except:

- Supports one MCA Input only.
- Does not support Multiplexers.

S511 Genie 2000 Right to Copy (Standalone)

- Right to copy and execute S501, S502, S503, S505, S506 and S509 on one additional computer in the same location.
- Requires purchase of S502 and optionally S501, S503, S505, S506 or S509 for one computer at the location.

S520 Genie 2000 Right to Copy (Basic)
Including:

- Right to copy and execute S500, S501, S503, S505 and S510 on one additional networked computer.
- Requires purchase of S500, and optionally S501, S503, S505, S506 or S510 for one computer at the location.

Application Options

There are a large number of optional application software packages available for the Genie 2000 spectroscopy platform. Several of these optional applications are described below. While the manual for each application software is shipped with the option, software the user documentation for Models S505, S506, S509 and S574 are included in this Operations manual for easy reference.

S503 PROcount-PC Control Procedures

- Complete procedures for routine sample counts.
- Calibrate procedures.
- Quality control procedures (requires S505).
- Background counting procedures.
- System maintenance.
- Procedure for complete gamma analysis (requires S501).
- Requires S500 or S502.

S505 Genie 2000 Quality Assurance Software

- Tracks and reports on the performance of your Genie 2000 spectroscopy system.
- Interactively establishes a database of key system performance parameters

- Warns you if the parameters drift outside the allowable warning and error limits which you have set.
- Includes a comprehensive statistical analysis, reporting, and plotting facility for tracking system performance.

S506 Genie 2000 Interactive Peak Fit

- Displays peak fit information allowing review of peak search results.
- Allows user to adjust peak search results by adding/deleting peaks, adjusting fit regions, etc.
- Requires S500 or S502.

S509 Genie 2000 Alpha Analysis Software
Includes:

- Alpha acquisition and analysis window.
- Peak area and ROI background subtract.
- Reagent correction.
- Efficiency correction.
- Nuclide identification.
- Automatic interference correction.
- Weighted mean activity calculation.
- Minimum detectable activity.
- Post-NID processing (action levels).
- Requires S500 or S502.

S544 Genie 2000 NuCHART Chart of Nuclides

- Color-coded Chart of Nuclides
- Comprehensive compilation of nuclear data from the Brookhaven NuDat database.
- Presents data on alpha, beta, gamma, x-ray and neutron decay.
- Quick search by nuclide name.
- Comprehensive search by energy window, intensity, half-life, radiation type, etc.
- Shows parent/progeny relationship.
- Creates CAM file nuclide libraries for Genie.

S560 Genie 2000 Programming Library

- Allows a programmer to interact directly with Genie 2000 capabilities from a C++ language environment.
- Allows the addition of user-coded analysis engines to the Genie 2000 environment.
- The Programming Library also provides a set of ActiveX components which can easily be used with any ActiveX compliant programming environment like Microsoft® Visual Basic™ and others.
- Using the Programming Library assumes a basic knowledge of C++ or Microsoft Visual Basic programming and an understanding of the basic operation of 32-bit Windows environments and Genie 2000's data structures and architecture.

S561 Genie 2000 Batch Programming Support

- Provides REXX script language environment for advanced automated procedure development.
- Requires S500 or S502.

S574 Genie 2000 LabSOCS (Laboratory Sourceless Calibration Software)

- No radioactive sources needed for accurate efficiency calibrations.
- Works over a wide range of geometries.
- Calibrations valid from zero distance out to 500 meters.
- Calibrations valid from 50 keV to 7000 keV.
- Calibrations accurate to within a few percent.
- Calibrations accurate at any angle from detector, not just on centerline.
- Eliminates the cost of purchasing radioactive standards, creating custom distributions, and radioactive waste disposal.
- Results are available within a few seconds.
- Operates with any size or type of germanium detector which has been characterized by Canberra.
- Optimized for laboratory applications where complex shaped containers are used repetitively.
- Includes predefined geometry templates for common laboratory container shapes.
- Includes library of common commercially available containers, and tools for the user to create new containers.

- Includes library of common matrix/absorber materials and tools to create new materials.
- Custom templates can be provided to meet special application needs.
- Sample size can be point-like, or up to 500 meters in size.
- Easy to use fill-in-the blank operator interface.
- Ability to vary assumed sample characteristics (e.g. density, container wall thickness, etc.) makes it ideal for “What if...?” analyses.
- Resulting calibrations may be stored, recalled, and used just like those generated by traditional calibration.

Typographic Conventions

The following typographic conventions are used throughout this manual:

Key Names

This manual shows the names of the keyboard keys as they usually appear on a keyboard and are seen in small capital letters (for example, ESC, ENTER, CTRL).

Key Sequences

If a comma (,) separates the names of the keys, this means they must be pressed in sequence. For example, “Press ALT, SPACEBAR” means that you should press ALT and release it, then press and release the SPACEBAR.

Key Combinations

A plus sign (+) between two key names means that these keys must be pressed at the same time. For example, “Press ALT+ESC” means that you should press the ALT key and hold it down while you press the ESC key.

Windows Commands

Windows commands are shown in bold type (**Edit**).

User Entries

Text you are expected to type in is shown in `Courier` (typewriter style) type.

Titles

Titles of books and of manual chapters are shown in *italics*; titles of manual sections are enclosed in “quotes”.

Keyboard Access

The Genie 2000 programs, like any 32-bit Windows programs, can be used with or without a mouse. If you aren't using a mouse with your system, the keyboard conventions listed in this section will allow you to operate Genie 2000 programs from your computer's keyboard.

Accelerator Keys

Right Arrow

Move the channel cursor to the right

Left Arrow

Move the channel cursor to the left

Up Arrow

Increment the display VFS

Down Arrow

Decrement the display VFS

Ctrl + Ins

Create a ROI at the cursor

Ins

Create a ROI between the markers

Del

Delete the ROI between the markers

+

Index markers right to the next ROI

–

Index marker left to the previous ROI

PgUp

Display the previous Info page.

PgDn

Display the next Info page.

F4

Toggle Acquire on and off

F5
Toggle Autoscale on and off

F6
Select the next Datasource

Shift+F6
Select the previous Datasource

F7
Select the next Memory Group

Shift+F7
Select the previous Memory Group

F8
Toggle Expand on and off

Ctrl+C
Copy the spectrum window to the clipboard

Ctrl+L
Move the Left Marker to the cursor channel

Ctrl+R
Move the Right Marker to the cursor channel

Ctrl+M
Move both markers into the expand region

Ctrl+Right Arrow
Move expand window to the right

Ctrl+Left Arrow
Move expand window to the left

Ctrl+Up Arrow
Move expand window up

Ctrl+Down Arrow
Move expand window down

Alt+Right Arrow
Increase the width of the expand window

Alt+Left Arrow
: Decrease the width of the expand window

Alt+Up Arrow
: Increase the height of the expand window

Alt+Down Arrow
: Decrease the height of the expand window

Shift+Up Arrow
: Move the compare spectrum up

Shift+Down Arrow
: Move the compare spectrum down

Help Keys

F1
: Get help

Alt+F4
: Close the help window

System Keys

Alt+Tab
: Switch to the next windowed program

Ctrl+Alt+Del
: Switch to the Task List

Window Keys

F10
: Go to/from the action bar

Arrow keys
: Move among choices

Esc
: Cancel a pull-down or the system menu

PgUp
Scroll the contents of the window up one page

PgDn
Scroll the contents of the window down one page

Underlined letter
Move among the choices on the action bar and pull-downs

Alt
Go to/from the action bar

Alt+F4
Close the window

Ctrl+PgDn
Scroll the contents of the window right one page

Ctrl+PgUp
Scroll the contents of the window left one page

Alt+Spacebar
Go to the system menu

Pop-Up Window Keys

Enter
Complete the pop-up window

Esc
Cancel the pop-up window

Spacebar
Set a check box on/off or perform the task described on the select pushbutton

Tab
Move to the next entry field or check box

Editing Keys

Backspace (left arrow delete)
Delete the character to the left of the cursor

Del
    Delete the character to the right of the cursor

End or Ctrl+Right Arrow key
    Move to the end of a field

Home or Ctrl+Left Arrow key
    Move to the beginning of a field

2. The Acquisition and Analysis Window

Since the Gamma Acquisition and Analysis window is similar to other Genie 2000 application windows, it'll be used as a quick introduction to the parts of the window.

The Acquisition and Analysis window, shown in Figure 2, consists of the Title Bar, the Menu Bar, the Toolbar and the Display Status Line at the top of the screen, the Control Panel, the Spectral Display, the Status Pages, the Report Window and, at the bottom of the screen, the Analysis Status Line.

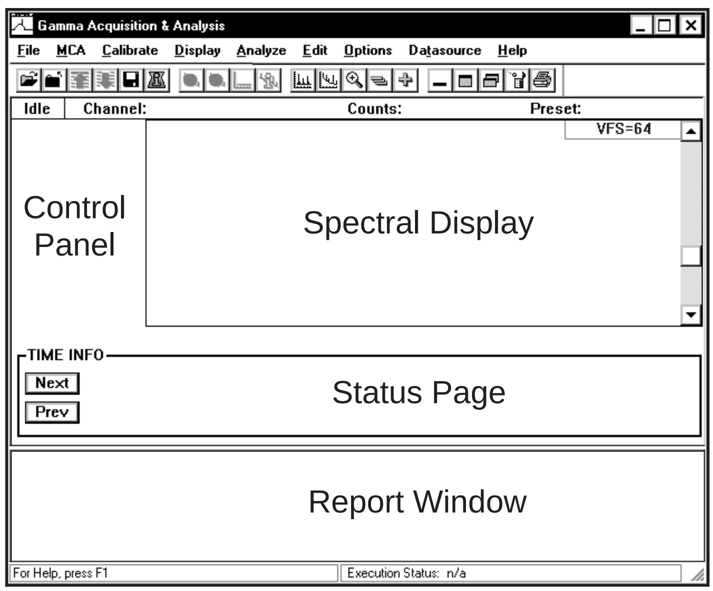


Figure 2 The Basic Acquisition and Analysis Window

The Top Four Lines

The four lines at the top of the screen are the Title Bar, the Menu Bar, the Toolbar and the Display Status Line.

Title Bar

The Title Bar always shows the application's name. If a datasource has been opened, the datasource's file name will be also be displayed. If more than one datasource is open, the name of the current one is displayed.

Menu Bar

The Menu Bar appears under the window's Title Bar and presents you with a choice of top-level menu functions. Each function is covered in detail in the remainder of this manual.

Toolbar

The Toolbar, which is directly under the Menu Bar, contains buttons corresponding to common menu commands. If you rest your cursor on an icon for a second or two, you'll see a label describing what the icon does.

Display Status Line

The Display Status Line is directly under the Menu Bar; it displays the current status, such as Idle, Busy or Done, and the cursor's current position, in terms of both channel and energy, the total counts at that location, and the preset and elapsed preset values. The Status field in this line will change to RED if an error is detected on the input datasource. You'll find more information in "Status" on page 91.

The Control Panel

The Control Panel can be seen on the left-hand side of the screen. It provides easy access to those functions which are commonly used in day-to-day operations: acquire start/stop, expand on/off, clear data and time, indexing through the ROIs, and moving forward/backward through the list of all open datasources.

You can make the spectral display area larger by hiding the Control Panel: select **Display** | **Preferences**, then remove the check from the **Control Panel Shown** check box.

Acquire Start/Stop

The **Acquire Start** and **Acquire Stop** buttons start and stop data acquisition. They are disabled for datasources that are opened for Read Only access and when the MCA Menu is disabled for CAM file datasources. See "Acquire Start" on page 80 for more information.

Expand On/Off

Clicking on this button toggles the state of the Expanded Display. See "Expand" on page 127 for more information.

Clear

Clicking the **Clear** button, which is enabled only for detector datasources, clears all spectral data and time information from the currently displayed datasource.

ROI Index

Clicking on one of these buttons will quickly move the markers from one ROI to the next (+) or previous (–) ROI. The keypad's (+) and (–) keys perform the same function.

Datasource

Click on **Next** or press the F6 key to change the display to the next datasource. Click on **Prev** or press SHIFT+F6 to change the display to the previous datasource. This button is not available unless more than one File or Detector datasource is open.

Up to 32 Detector and File Inputs in any combination may be opened and up to eight can be displayed simultaneously.

Similarly, other open Detector Inputs or File Inputs (as well as multiple memory groups) can be selected for display from the list of currently open Detector Inputs or File Inputs.

Status Pages

Detailed information about the current datasource can be seen in the Status Page display below the spectrum. You can move through the pages by selecting the **Next** or **Prev** button or by pressing keyboard's PG DN or PG UP key. You can make the spectral display area larger by hiding the Status Pages: select **Display** | **Preferences**, then remove the check from the **Status Page Shown** check box.

In addition, you can chose which status pages to display by selecting **Display** | **Preferences**, then the **Status Pages** button (see "Preferences" on page 131 for more information).

Note that some of the data shown on the Status Pages is the result of a rough calculation for the region between the markers. This means that this displayed data may not agree with the data you see in a report generated by your analysis application.

Marker Info

The **Marker Info** status page includes data related to the current Region of Interest (ROI): left and right marker channel and energy, centroid channel and energy, area and percent error, FWHM and FWTM, Gaussian ratio, ROI type, and integral.

The calculated values centroid, area, percent error, FWHM, FWTM, and Gaussian ratio are computed only when the size of the current ROI meets the following criteria:

Number of Spectral Data Channels	Size of ROI
256	≤ 256
512-2048	≤ 512
> 2048	≤ 1024

Time Info

The **Time Info** status page includes: acquire start time, dead time percentage, computational preset region, elapsed and preset values for the live time, real time, and computational presets.

Sample Info

The **Sample Info** status page includes sample-related information: Title, ID, sample type, quantity and units, sample geometry, geometry id, and buildup type.

Calibration Info

The **Calibration Info** status page includes energy and shape calibration information: energy equation, FWHM equation, low tail equation and efficiency/error at cursor position.

Display Info

The **Display Info** status page includes data related to the current display window and the current ROI defined by the markers: the display window's start and end channels and their energies, and the display VFS. The current ROI's width, net cps, and total cps are also shown.

If Expand is on, the display window data is for the expanded window. If Compare is on and the compare spectrum is currently selected, the data is for the compare spectrum.

Input Info

The **Input Info** status page includes data related to the configuration of the currently open input: number of channels, acquisition mode, and the type of MCA, Amp, ADC, and HVPS.

User Info

The **User Info** status page includes six extra CAM parameters which can be used for special purposes: CAM_T_DISSTR1 through CAM_T_DISSTR6. If none of these CAM parameters have been defined, this screen will be blank.

Nuclide Info

The **Nuclide Info** status page includes estimated nuclide information for the current cursor channel : Nuclide, Energy, Half-life, and Percent Yield. If the cursor is within an ROI then the FWHM, Area, and estimated Activity is also displayed.

Spectral Display Area

The Spectral Display Area shows the current spectrum. The upper right corner of this area will show the display's current vertical full scale (VFS). The scroll bar on the right side of this area lets you manually adjust the VFS.

The Display Area has three additional icons: the cursor and the left and right markers.

The Cursor

The Cursor selects a specific display channel and can be moved by pointing at a channel and clicking the mouse button, by clicking and dragging the cursor, or by moving the cursor with the left or right arrow keys.

Markers and ROIs

The Left and Right Markers are used to define temporary or permanent Regions of Interest (ROIs). A temporary ROI is simply the region between the markers. See "Add ROI", "Delete ROI" and "Load ROIs", starting on page 130 for information on permanent ROIs.

The Marker Info Status Page displays information on the current ROI (see "Marker Info" on page 18).

Moving the Markers

The markers can be moved by selecting the marker with the mouse and dragging it. The mouse pointer will change from an arrow to a marker pointer.

Another way to move the marker is by pressing either CTRL+L (left marker) or CTRL+R (right marker) to move that marker to the cursor's current position.

If you try to move one marker past the other, both markers will move together in the same direction. Reversing direction will leave one marker in place and let you move the other marker to the other end of the region.

If the Expanded display mode is on, pressing CTRL+M will move the markers up to the expanded part of the display. This is covered in detail in "Expand On" on page 127.

Report Window

The Report Window displays reports created automatically by the system or manually, at your command.

Analysis Status Line

The Analysis Status Line at the bottom of the screen displays the execution status for various phases of analysis.

The Menu Commands

The Gamma Acquisition and Analysis window's Menu Bar contains the title of each of eight main command groups: File, MCA, Calibrate, Display, Analyze, Edit, Options and Datasource.

The File Menu

The File Menu offers commands to open, close or save a datasource, print or copy a plot of the current spectrum, print the contents of the Report Window, and exit the program.

The MCA Menu

The MCA Menu's commands deal with data acquisition, setting up the acquisition parameters, clearing the spectral display, adjusting the hardware datasource's programmable commands, checking the status of all MCA devices, advancing to the next sample in a sample changer, and loading a data file into the current datasource.

The Calibrate Menu

The Calibrate Menu lets you set up calibration preferences, perform energy and efficiency calibrations, graphically display the results of a calibration, and load a calibration file into the current datasource or store the datasource's calibration as a file.

The Display Menu

In the Display Menu, you'll find commands for expanding and scaling the display, comparing two datasources, entering or deleting ROIs (regions of interest), and setting display preferences.

The Analyze Menu

The Analyze Menu's commands let you execute a single analysis phase or a sequence of analysis phases. Every Genie 2000 system includes the acquisition, peak locate, peak area, and reporting phases. If your system includes the Model S501 Gamma Analysis option, the area correction, efficiency correction, nuclide identification, detection limits, and post-NID processing phases are added.

The Edit Menu

The Edit Menu allows you to enter and edit Sample Information, define and edit Analysis Sequences, and enter or edit an Operator Name.

The Options Menu

The Options Menu lets you change the operator’s name, perform strip and smooth, and work with the report window.

The Datasource Menu

The Datasource menu lets you display one to eight of the currently open datasources. If the datasource is a multi-memory group input, you’ll be able to move from one group to another.

3. MCA Input Definition

The first step in using your Genie 2000 system is to let it know the number and types of MCAs that are installed in or connected to your system, by way of an MCA Input Definition (MID).

MID Wizard or MID Editor?

For most systems, you'll want to use the MID Wizard to help you set up your MCA's Input Definition quickly and easily.

If your Input Definition is more complex than the MID Wizard was designed to handle, you'll have to use the MID Editor to create your definition. It is covered in detail starting on page 27.

The MID Wizard

Restrictions:

The Wizard does not support:

- Definition of multiplexer (MXR) inputs. This includes devices such as the Alpha Analyst.
- Configuration of remote VDMs.
- Definition of two-ADC inputs from a single AIM device.

For these situations, you must use the MID Editor (page 27).

Using the Wizard

To use the MID Wizard, open the Genie 2000 folder and select the MID Wizard icon to see the Step 1 screen.

Step 1

The first screen (Figure 3) lets you select the MCA you want to create a definition for. Choose an MCA type, then select the **Next** button.

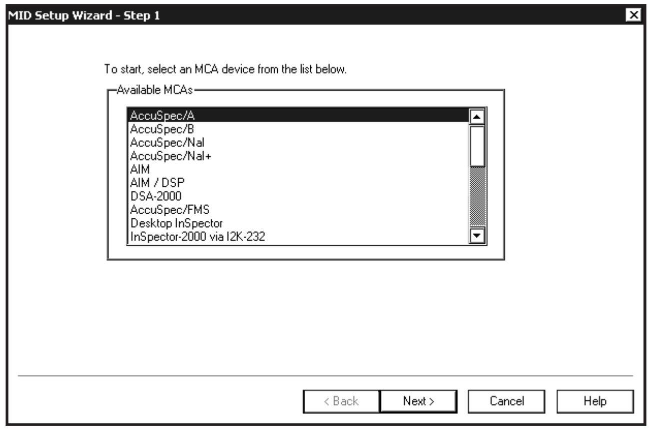


Figure 3 Step 1

Step 2

The next screen will ask you to define the MCA’s address and Full Memory assignment. How the address is defined depends on the MCA type you selected in Step 1. For instance, an InSpector will require a COM port and a baud rate, as shown Figure 4.

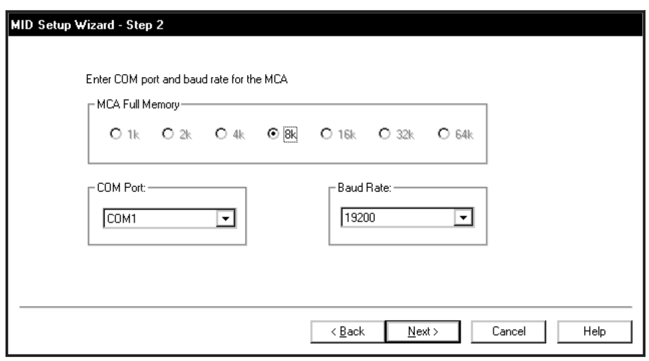


Figure 4 Step 2

Step 3

This screen will be seen only if you selected an AIM-type MCA. It lets you define which programmable Amplifier, ADC and HVPS are to be used with the MCA. Figure 5 shows that the drop-down list boxes default to “manual” devices. Open the lists one by one and select the correct devices for your setup.

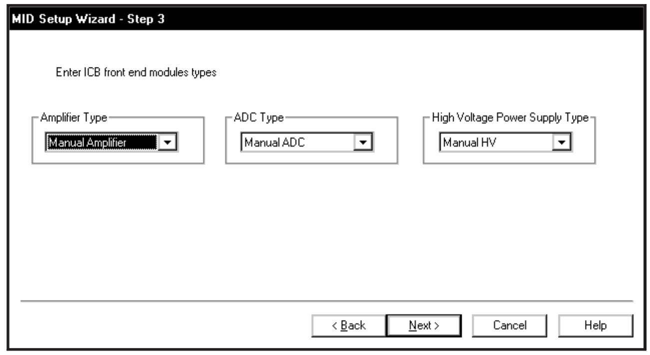


Figure 5 Step 3

Step 4

If you are defining an AIM-type MCA and have selected at least one programmable ICB device, the list boxes in the Step 4 screen (Figure 6) let you select an ICB address for each of these front-end devices.

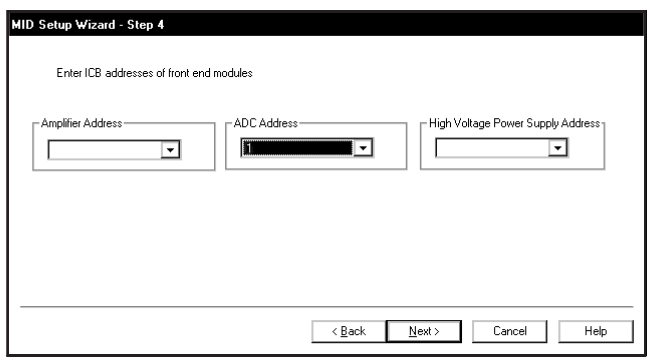


Figure 6 Step 4

Step 5

The screen in Figure 7 is displayed only if you selected a programmable HVPS in Step 3. It asks you to define the power supply's HV range, voltage limit, voltage and polarity. Note that the parameters you see may vary, depending on which power supply you chose.

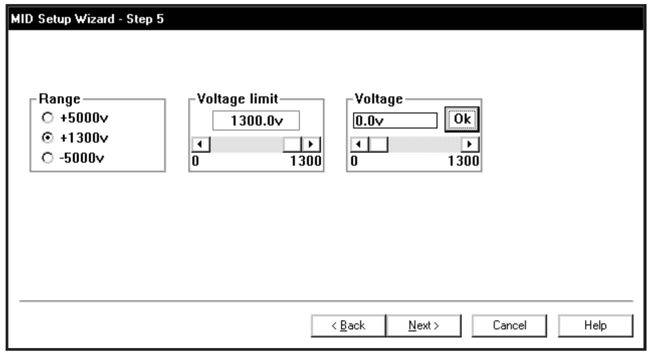


Figure 7 Step 5

Step 6

The screen in Figure 8 will always be seen, no matter which MCA and which devices you defined. This screen asks for a detector type and acquisition memory size, and requires that an Input Name be entered.

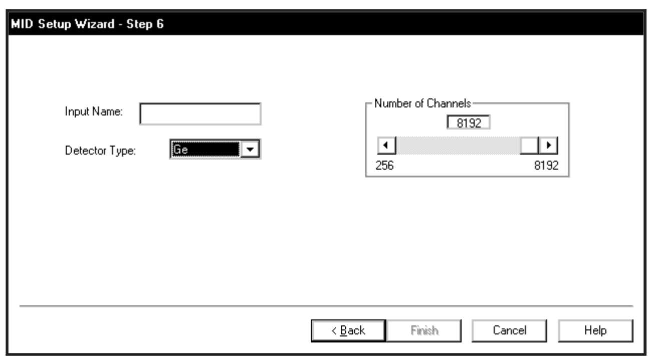


Figure 8 Step 6

Ending the Definition

To complete your Input Definition, select **Finish**. The input that you just defined will be stored as an MID file and automatically be loaded into the MCA Runtime Configuration Database (described on page 74). When you select **Finish**, you will be asked if you would like to define another input. Answering No will close the Wizard.

Note that if you didn't enter an Input Name, you won't be allowed to exit the Step 6 screen. If the name you entered is the same as the name of an existing MID file, the system will tell you so and go back to Step 6 to let you enter another name.

The MID Editor

Before using the MID Editor to create MID files, there are some basic concepts you should understand before defining your system's MCAs.

Genie 2000 supports a large variety of MCA devices through MCA drivers available to the Virtual Data Manager (VDM), Genie 2000's core component. MCA devices currently supported include:

- AIM module (Ethernet)
- DSA-2000 Digital Spectrum Analyzer (Ethernet)
- InSpector 2000 Portable DSP MCA (USB, RS-232)
- InSpector Portable MCA (RS-232)
- DeskTop InSpector MCA (RS-232)
- MultiPort MCA family (IEEE-488 GPIB)
- ASA-100 NaI MCA board (PCI bus)
- PCA3 and PCAP family of MCA boards (ISA bus)
- AccuSpec family of MCA boards (ISA bus)
- System 100 MCA board (ISA bus)

In addition, the definition of an MCA also includes things like the data acquisition mode (PHA+, PHA–, MCS, and so forth) and memory size. In short, the definition includes everything about the hardware that the software needs to know in order to use it to acquire data.

A point worth noting is that an MCA does not have to be physically installed at the time that you define it in the MCA Input Definition Editor. For example, you can define an MCA that is installed on another node of the network as "yours" even though that node happens to be off line when you set up the definition. (Of course, before you can actually use that MCA, the node must be brought on line.)

Multiple MCA Configurations

Since MCA definitions are saved in disk files, you can have as many different definitions as you want. For example, for a given System 100 board, you might have it defined as an 8K Germanium Spectroscopy MCA in one file, a 1K NaI(Tl) MCA in another file, and a four-input Alpha Spectroscopy System in a third file. Before you start an experiment you simply pick the configuration you want to use.

Because an MCA definition file can include any or all of the MCAs that are available to your system, you can use more than one MCA at a time. However, each MCA can be included only once in a given definition file and each MCA in that file must have a unique name.

Using the MCA Definition Files

To use an MCA Definition, it must first be a file; that is, you must have saved the definition to disk. Once you've done that, all you have to do is load that file into Genie 2000's internal MCA Runtime Configuration Database. From that point on all MCA operations will use the configuration information that was stored in the Definition File. To change to a new configuration, all you have to do is replace the database contents with a new file

Starting the MID Editor

Start the MCA Input Definition Editor (MID) by double clicking on its icon in the Genie 2000 Program Group. The result will be the application window shown in Figure 9.

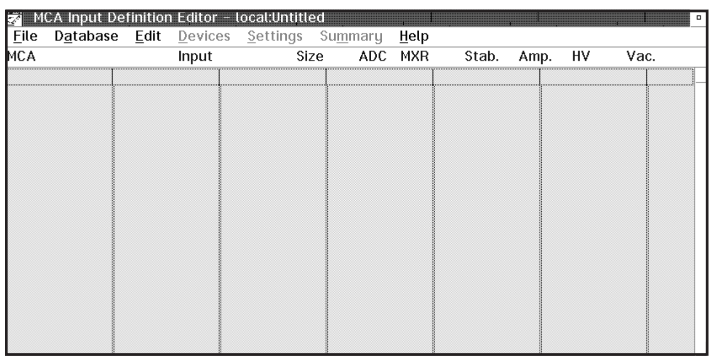


Figure 9 The MID Editor Window

Note that the Title Bar displays the name of the file you're currently working with. In the phrase "local:Untitled", "Untitled" means that no file is currently open and "local" means that the MID Editor is connected to the local VDM; this is the default condition in a non-networked environment. In an environment with multiple VDMs, you'll use **File** | **Node Connect** to specify which VDM is to be connected to the MID Editor for configuration purposes.

Building an MCA Definition

In this section we'll explain how to add (and delete) the MCA entries and will explain what the definition entry consists of, then we'll explain what Defining an MCA means in general. The next several sections cover the specific definition process for each of the MCAs supported by Genie 2000.

The remainder of this chapter discusses how the definition is saved to a disk file, how a definition can be edited, and how to use a definition by loading the file into the MCA Runtime Configuration Database.

Adding an MCA

The Edit menu, shown in Figure 10, is used to add MCA hardware to or delete MCA hardware from an MCA Input Definition. Note that the Delete MCA command is initially disabled, since the command has no meaning until there is at least one entry in the definition.

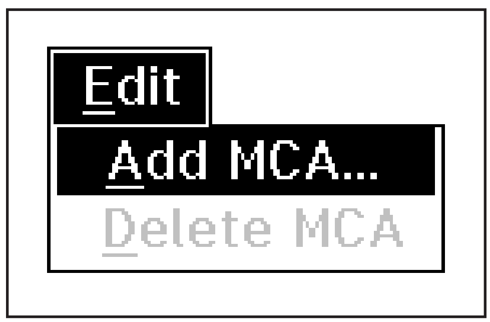


Figure 10 The Edit Menu

We'll begin our input definition by adding some MCAs. To do that, click on the **Add MCA** command in the **Edit** menu, which will pop up the "Add MCAs to Definition Table" Dialog Box.

Figure 11 shows a typical Add MCA list box, allowing you to choose one or more of the MCA types which Genie 2000 supports.

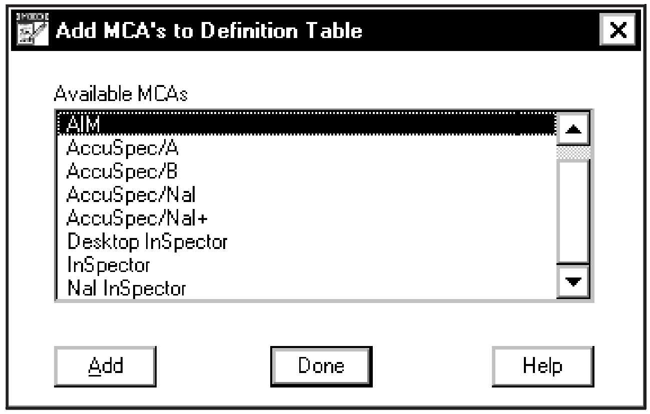


Figure 11 The Add MCA Dialog

To add an MCA to your definition, you can:

1. Click on your choice, then click on the **Add** button, or

2. Double click on your choice.

Either way, you'll see an entry added to the MCA Definition Table for each such selection you make. When you've finished selecting the MCAs you want to include in this definition, click on the **OK** button to return to the main MID window.

Figure 12 shows the result of using this process to add a System 100 MCA and an AccuSpec/NaI Plus MCA to the Definition Table. Please remember that this display, as well as many others in this chapter, are examples of what you *might* see; your display may not be identical.

Interpreting the Definition Entry

As you can see in Figure 12, adding the entry put more than just the name of the MCA in the definition table. We'll take a brief look at the other items in the entry now. As we get further into the definition process we'll cover them in greater detail. Note the letter following the unit number in each Definition Table item: an M indicates a manually controlled unit, and a P indicates a programmable unit.

MCA

This is the type of MCA device being used for this particular entry in the table.

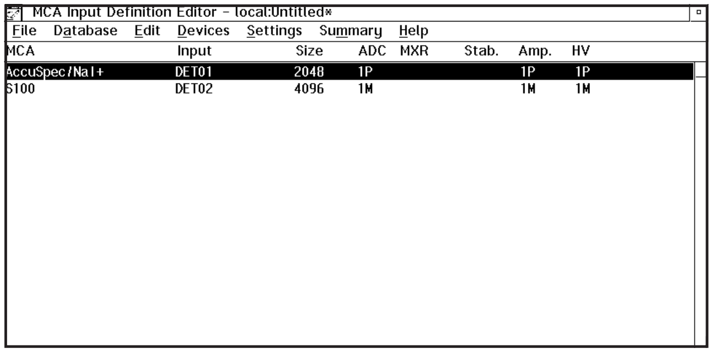


Figure 12 Two MCAs Have Been Added to the Table

Input

This is the name that will be used to refer to this specific hardware entry in the table. The MID Editor automatically assigns these names sequentially as DETnn, starting with nn=01. As we’ll see in the “Input” section for your specific MCA type, you can easily change these names to something you find more meaningful.

Size

This is the number of data channels assigned to this input.

ADC

The number and types of ADCs associated with the MCA are shown here.

MXR (Mixer/Router)

This column is used to display the current status of any Mixer/Router (also called Analog Multiplexer or AMX), if any, associated with the MCA.

Stab. (Stabilizer)

This column shows the type of Stablizer associated with the MCA.

Amp

This column shows the type of amplifier associated with the MCA.

HV

This column shows the type of High Voltage Power Supply associated with the MCA.

Deleting an MCA

To remove an MCA from the definition, click on the MCA line you want to delete, then select the **Edit** | **Delete MCA** command to see the Delete MCA dialog box in Figure 13. Clicking on **OK** removes the MCA from the definition.

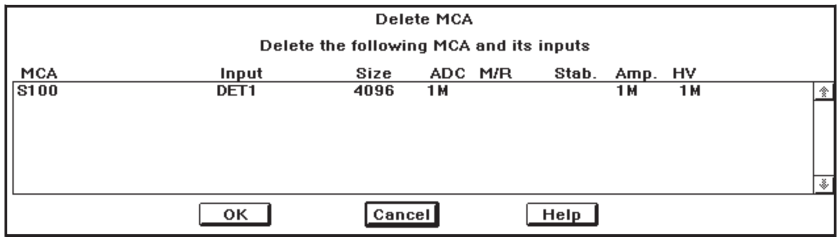


Figure 13 The Delete MCA Dialog

Defining an MCA

Once an MCA has been added to the Input Definition Table, defining the MCA is a two step process.

Assigning the Devices

First we use the Devices Menu to tell the system about the MCA's front end electronics. Here we define the physical hardware information, such as board number, ICB module address or Ethernet address, baud rates, sample changer connections, and so forth. You'll see that not all of the Device Menu's choices are enabled because what's offered here depends on the MCA we selected in "Adding an MCA" on page 29.

Setting the Controls

The second step is to use the Settings Menu to define the settings for the physical devices selected in the Device Menu. For example, we can use this menu to set the amplifier, ADC and high voltage controls. Again, the menu items you're allowed to choose from depend on the MCA you're setting up. For instance, you can't set the gain for an amplifier that doesn't have a programmable gain control. Most of the settings defined here are simply the initial values to be used when the MCA is later "opened" for use. Many of the settings can be adjusted from within the Acquisition and Analysis application as the need arises. These changes can then be saved for future use, if you like.

The Apply to All Button

The Apply to All button is used to apply the Device screen's parameter settings to all inputs defined for the current MCA.

The Specific MCAs

Because each of the various types of MCAs that can be used with Genie 2000 has a slightly different definition procedure, we've included an installation section for some of the MCAs supported by Genie 2000. For information on how a specific MCA is defined, read one of the following:

- "Defining an AccuSpec MCA" on page 33.
- "Defining a System 100 MCA", on page 43.
- "Defining an AIM MCA", on page 52.

Note: If you are installing a PCA3, PCAP, MultiPort, InSpector 2000, InSpector, DeskTop InSpector, or the ASA-100 NaI MCA, refer to that MCA's user's manual for details.

To get a full understanding of all of the MID editor's functions after you have installed your MCA, read the remainder of this chapter, starting with "Saving the Input Definition" on page 70.

Defining an AccuSpec MCA

This section discusses setting up an AccuSpec MCA. If you aren't installing an AccuSpec MCA, you should go on to the section which covers your MCA.

The AccuSpec/NaI Plus was chosen as the example for this tutorial because it has a fully programmable front end. That is, its Amplifier, ADC, and HVPS are all controlled from the PC rather than with front panel knobs and switches. Other AccuSpec MCA's are defined in a similar way.

To begin, click on the **AccuSpec/NaI+** entry in the Definition Table to select it as the MCA that is to be set up.

Device Setup

The Device menu sets the parameters for the system's hardware, starting with the MCA itself. There is a command in the **Device** menu, shown in Figure 14, for each of the hardware sections of the MCA. The disabled (grayed) commands do not apply to the MCA currently being set up.

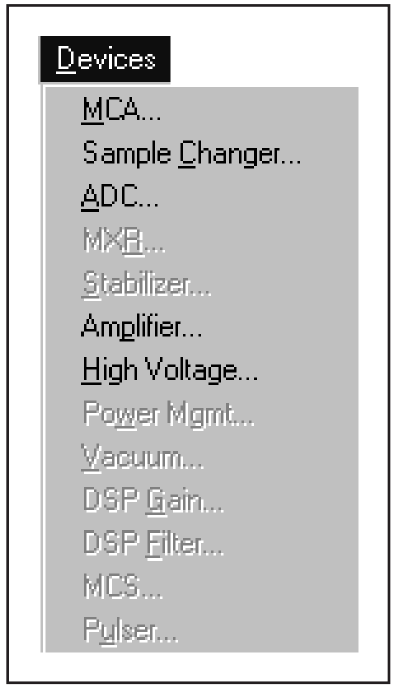


Figure 14 The Device Steup Menu

MCA

The **MCA** command in the **Device** menu pops up the Dialog Box shown in Figure 15.

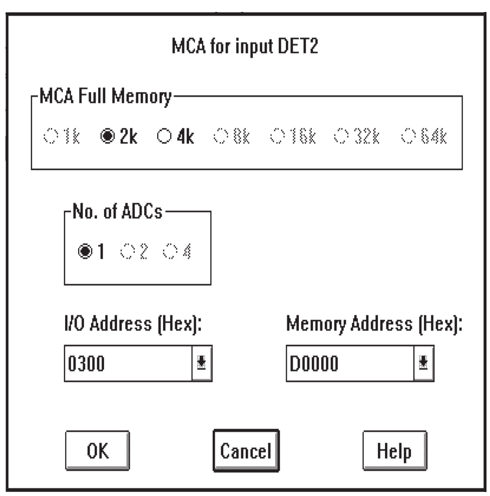


Figure 15 The MCA Device Setup Dialog

Full Memory and Number of ADCs

The Number of ADCs is fixed, since a single ADC system is the only configuration offered for the AccuSpec/NaI Plus. Full memory size may be selected as 2K or 4K.

I/O Address

Since there can be multiple AccuSpec boards installed in your system, you must specify the I/O Address for each board you want to use. You'll find address information for each type of AccuSpec board in "Installing AccuSpec Boards", starting on page 266.

Memory Address

Data is read from and written to your system's AccuSpec boards through a "window" in the computer's memory. The default address (D0000) is best for most situations; if you need to change the address, refer to "Selecting a Memory Address" on page 267.

Sample Changer

If you're going to be using a **Sample Changer**, select that command from the **Device** menu to see the Dialog Box shown in Figure 16.

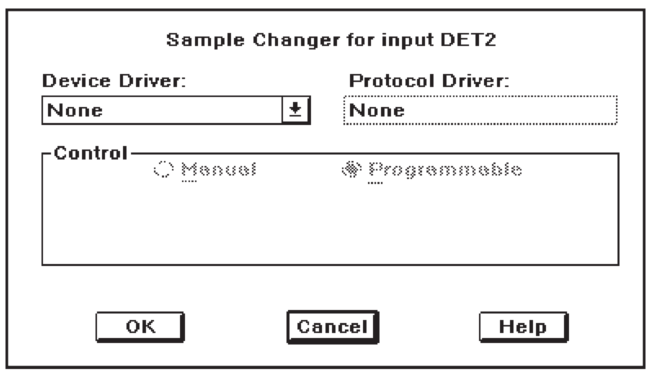


Figure 16 The Sample Changer Controls

Device Driver

Initially this is set to None, indicating that no Sample Changer is going to be used. To change the setting, click on the Down Arrow then click on the **LPT Sample Chgr** entry in the list. When you do that, the Dialog Box will change to look like the one in Figure 17.

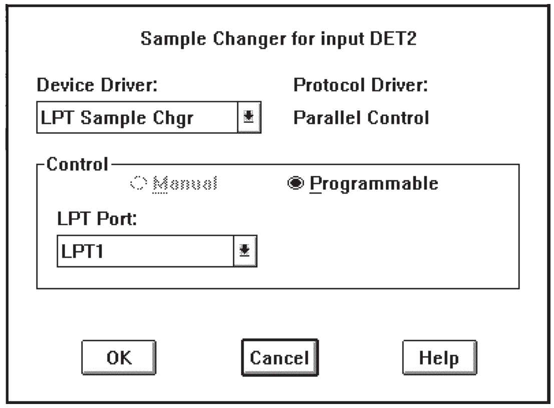


Figure 17 The Sample Changer Controls

Control

Only **Programmable** control is offered, since that is the only type of Sample Changer control available with the AccuSpec, but you do have a choice of the LPT Port which will be used.

The AccuSpec Sample Changer interfaces to the PC through a parallel (LPT) printer port, and the Drop Down list labeled **LPT Port** allows you to specify which port it is attached to. Click on the Drop Down Arrow, then click on your choice for the port.

ADC

Since the AccuSpec/NaI Plus can only use the internal ADC, you don't need to use this command.

Amplifier

Since the only amplifier which can be used with the AccuSpec/NaI Plus is the internal unit, there is no need to use this command.

High Voltage

The **High Voltage** command, shown in Figure 18, specifies which type of High Voltage Power Supply you'll be using for the Detector bias.

Device Driver

This box lets you specify whether you'll be using the built-in programmable HVPS or an external manually-controlled HVPS. Click on the Drop Down Arrow and choose the appropriate type from the list.

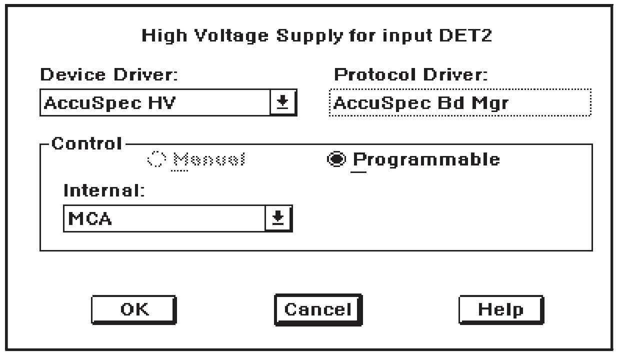


Figure 18 The High Voltage Device Dialog

Control

This section is really for information purposes only, and will change from **Programmable** to **Manual** if you choose an external manual HVPS rather than the built-in programmable unit.

The Settings

The commands in the Settings menu, shown in Figure 19, set the MCA's operating parameters. Since not all AccuSpec MCAs have completely programmable front ends, each of the sections which follow will be labelled with versions of the AccuSpec for which they are appropriate. Front end devices which are disabled (grayed) don't have any programmable controls.

Note that many of the parameters can also be adjusted from within the Acquisition and Analysis application. The following descriptions of each parameter specify which controls can be changed only from the MID Editor.

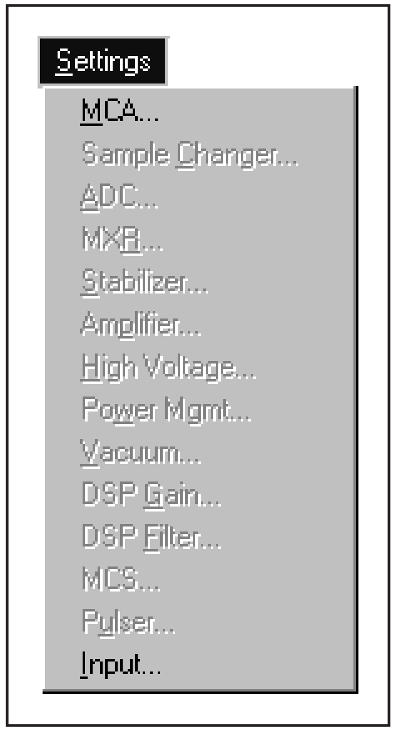


Figure 19 The Settings Menu

MCA

As Figure 20 shows, the AccuSpec/NaI Plus does not have any adjustable MCA controls.

Figure 20 No Adjustable Controls Dialog

ADC (AccuSpec/A, /NaI, and /NaI Plus)

Click on **ADC** to see the Dialog Box shown in Figure 21, which is used to set the initial operating parameters for the AccuSpec/NaI Plus's programmable ADC.

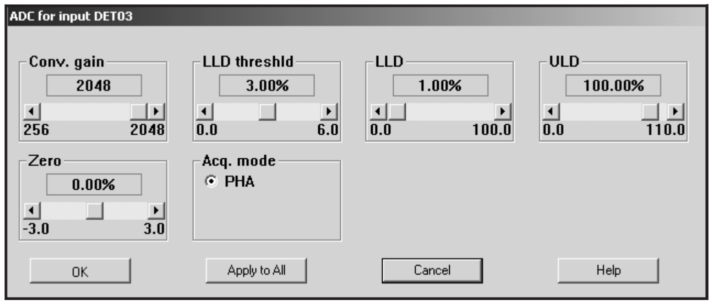


Figure 21 Controls for the Programmable ADC

Since many of the ADC's Scroll Bar controls may need to be changed often in the course of daily work, they can be adjusted both here and in the Acquisition and Analysis application. The Acquisition Mode, however, is not usually changed during the course of data acquisition, so it can only be changed here.

Conv. Gain

This control sets the Conversion Gain of the ADC. Clicking either on the arrows at the ends of the Scroll Bar will change the gain by a factor of two.

LLD Threshold

The ADC's threshold can be set from 0.00% to 6.0% of the ADC's full scale input.

LLD

The ADC's Lower Level Discriminator (LLD) can be set from 0.0% to 100.0% of the ADC's full scale input.

ULD

The ADC's Upper Level Discriminator (ULD) can be set from 0.0% to 110.0% of the ADC's full scale input.

The window between the ULD and the sum of the LLD Threshold and the LLD limits the energy range to be considered by the ADC. For example, setting the ULD at 90%, the

LLD Threshold at 3.0% and the LLD at 10.0% means that only the pulses between 13.0% (3.0% plus 10.0%) and 90% of full scale will be converted by the ADC.

Zero

This control sets the ADC Zero over the range of –3.0% to +3.0% of full scale.

Acq. Mode

The AccuSpec/NaI Plus offers only the PHA acquisition mode. (AccuSpec/A and /NaI offer both PHA and SCA, which can be chosen by clicking on the appropriate button. This control can only be changed here.)

Amplifier (AccuSpec/NaI Plus)

The **Amplifier** command is used to establish the initial settings for the programmable amplifier in the AccuSpec/NaI Plus much like the ADC command was used for the ADC. The Dialog Box is shown in Figure 22.

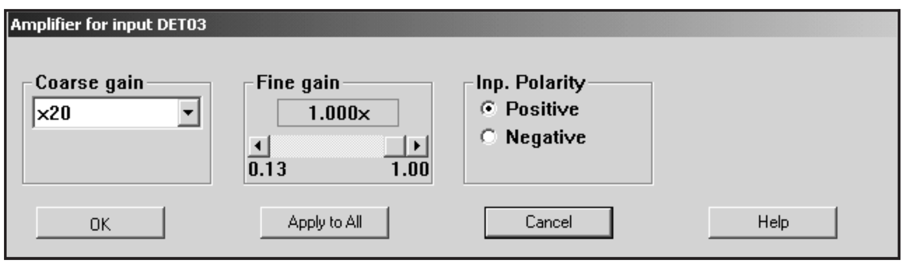


Figure 22 Controls for the Programmable Amplifier

While the Input Polarity for the Amplifier can be set in this menu only, the Coarse and Fine Gain Controls can also be set from within the Acquisition and Analysis application if it's necessary to adjust the amplifier during data acquisition.

Coarse Gain

The Amplifier's **Coarse gain** setting is selected from the drop down list.

Fine Gain

The **Fine gain** control, which is set by a Scroll Bar, multiplies the Coarse Gain setting by the chosen coefficient to yield the final gain setting of the Amplifier.

Inp Polarity

The **Inp Polarity** control sets the amplifier's input polarity to positive or negative.

High Voltage (AccuSpec/NaI Plus)

The **High Voltage** command, shown in Figure 23 provides the High Voltage Power Supply (HVPS) adjustments.

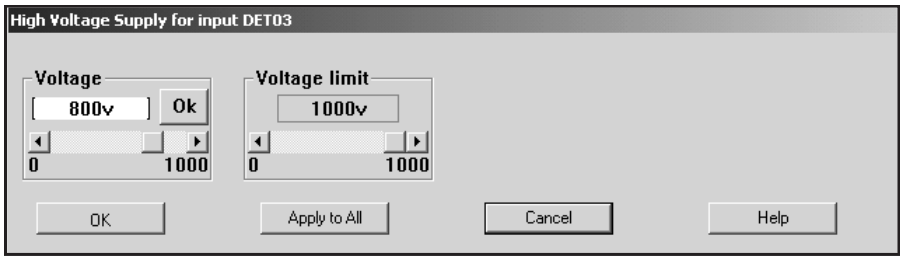


Figure 23 Controls for Programmable HVPS

Voltage Limit

The **Volt. limit** control establishes the HVPS's maximum output voltage. It *must* be set before the Voltage control is adjusted. This control can be set only in this Dialog Box; it cannot be changed in the Acquisition and Analysis application.

Voltage

After setting the Voltage Limit, the **Voltage** scroll bar sets the output of the HVPS anywhere between zero and the Voltage Limit (the voltage can also be set from the keyboard, then accepted with the Ok button within the control). The Acquisition and Analysis application allows you to change the output voltage, as well as turn the HVPS on and off.

MCS (AccuSpec/FMS)

The MCS setting (Figure 24) provides a single control (Disc. Mode) with three choices: ROI, TTL, and PHA.

TTL is used when the signals to be counted are from an external source. ROI is "normal" MCS operation, with discrimination. PHA is "special" and will be used on a temporary basis within the Acquisition and Analysis, refer to "Adjust" on page 82.

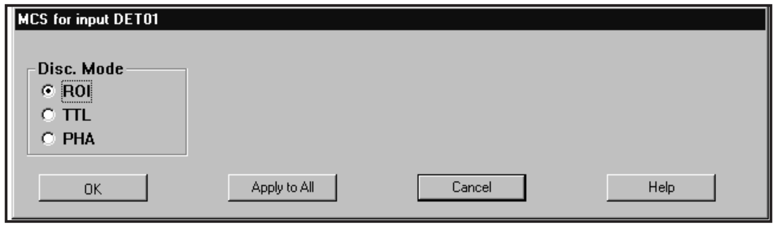


Figure 24 The MCS Input Dialog

Input

The **Input** command is used to change the name of the Input and set up the structure of its memory via the Dialog Box shown in Figure 25. These commands are not available in the Acquisition and Analysis application.

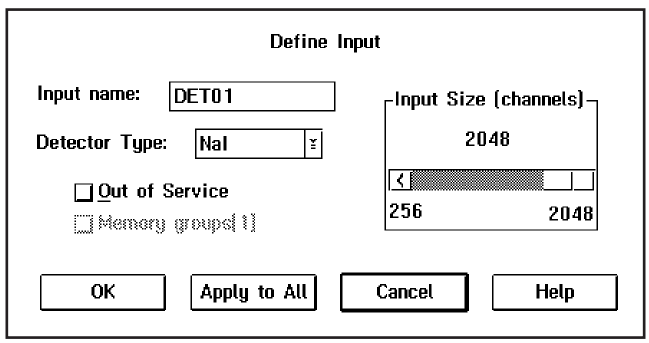


Figure 25 The Define Input Dialog

Input Name

The default DETnn name is initially assumed as the name for your Input. But since it is displayed in a Text Input box, you can easily change the name by clicking on the current name to select it, then typing in the new name, which can be up to eight characters long. This is the name by which the detector is referred to in all applications.

Detector Type

Use this drop-down list to select the type of detector to be used with this MCA; this also assigns appropriate default values to the spectrum display and analysis parameters.

Input Size

This parameter is normally set to the same number of channels that you selected during the Device setup of the MCA on the assumption that you'll be using "Full Memory" for your data acquisition.

Out of Service

Select the Out of Service Check Box when the MCA or its front end electronics are temporarily disconnected from the system. Though the MCA will still be listed in your MCA Definition File, it will not be available for data acquisition.

Memory Groups

This Check Box is used with the Input Size control to logically segment the Full Memory of the MCA into Halves, Quarters, and so forth. Note that this control is disabled when this ADC is associated with a Mixer/Router. Using it is a two step process:

1. First you must use the Input Size control to set the acquisition memory size to less than the Full Memory size of the MCA. For example, set to 1024 instead of the Full Memory size of 2048.

2. Enable Memory Groups by clicking on the Check Box. When you do that, the number of available groups will be displayed in the brackets to the right of the control. Using our 1024 out of 2048 example again, the number 2 would appear; the MCA is now set up to acquire 1024 channels of data into either half of its memory.

Defining a System 100 MCA

If you're not installing a System 100 MCA, go on to the section which covers your MCA.

Device Setup

Device setup covers setting the parameters for the system's hardware, starting with the MCA itself. Clicking on **Device** in the Menu bar shows the menu in Figure 26. There is a command in the menu for each of the hardware sections of the MCA. The disabled (grayed) commands do not apply to the MCA currently being set up.

Figure 26 The Device Settings Menu

MCA

Selecting the **MCA** command from the menu yields the Dialog Box shown in Figure 27, which is used to set the more global aspects of the MCA.

Full Memory

Buttons are used to select just how much of the available MCA memory you want to use. As shown in Figure 27, only 4K (4096 channels) of the available 16K channels are going to be used.

Number of ADCs

This box sets the number of ADCs for those MCAs that can have more than one. Since the System 100 can only have one ADC, that's the only choice that is offered and it has been selected.

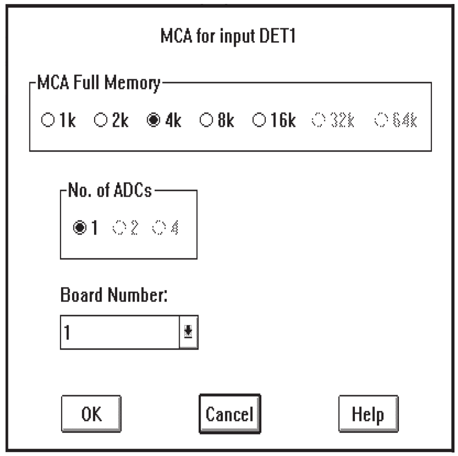


Figure 27 The MCA Device Dialog

Board Number

Up to four System 100 MCA boards may be installed in your PC. This parameter is used to tell the system which board you want this MCA definition to refer to. Select the required System 100 board by clicking on the Drop Down arrow, scrolling down the list to locate the board you want to use, and then clicking on it.

Sample Changer

The next command, **Sample Changer**, is used to set up the MCA's Sample Changer control; it can be ignored if you're not using a Sample Changer. But if you do want to include sample changer control in your MCA, clicking on the command will pop up the Dialog Box in Figure 28.

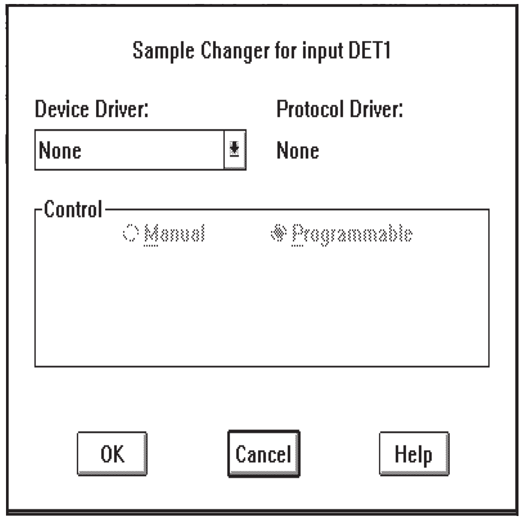


Figure 28 The Sample Changer Dialog

Device Driver

What this really means is “What kind of Sample Changer do you want to use?”, and you select the type via a standard Drop Down list. Since we’re setting up a System 100, that’s the type you’ll probably want to use. Click on that choice in the Drop Down list to select it. When you do, you’ll see the Dialog Box change to look like the one shown in Figure 29.

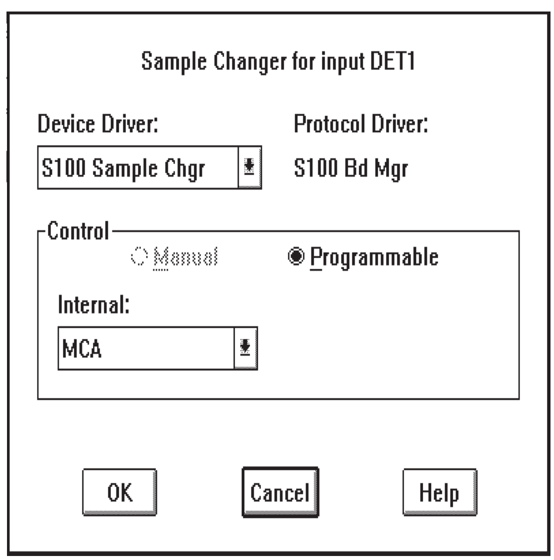


Figure 29 The Sample Changer Controls

Control

The Control of the Sample Changer was immediately set to Programmable because that's the only type of Sample Changer the System 100 supports. In addition, there's a Drop Down list labeled Internal that's currently set to MCA to let you know that the program which will control the Sample Changer will be under the control of the MCA's internal control logic. If you click on the Drop Down arrow, you'll discover that there are no other choices offered, since that's the only type of control logic that can be used with the System 100's Sample Changer.

The next two sections, **ADC** and **MXR** are only applicable if you're going to be using a Mixer/Router (also called Analog Multiplexer or AMX) with the System 100 MCA board. If you are not going to be using one, you are finished with the Device setup of the System 100. While there are still two commands remaining in the Device menu – Amplifier and High Voltage – they are only applicable to programmable front ends. Since the System 100 uses manually controlled Amps and Power Supplies, the commands are not needed to complete the setup.

ADC

Next in the **Device** menu is the **ADC** command, which shows the Dialog Box in Figure 30.

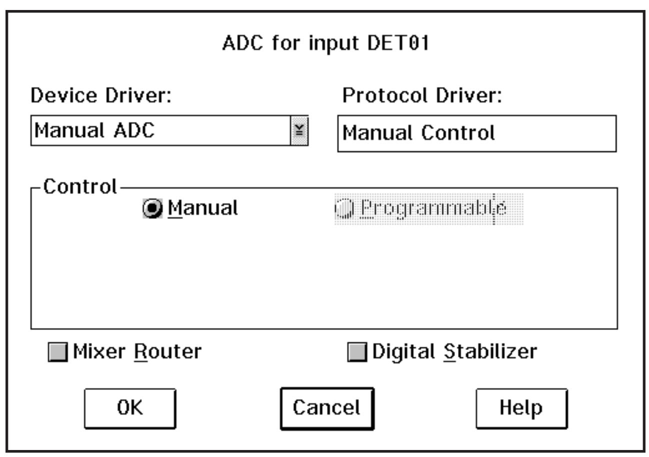


Figure 30 The ADC Device Dialog

Since the System 100 only uses a single manually controlled ADC, you can choose whether you're going to use a Mixer/Router (also called Analog Multiplexer or AMX) or a Stabilizer with it. If you choose Stabilizer, you'll notice that there are no selections to make under Stabilizer in the Device menu.

If you enabled a Mixer/Router, you'll notice that the MXR column of the System 100 entry in the MCA Definition Table now contains the entry 1-1M. This means that a Mixer/Router has been selected, is currently set to only one input, and the Mixer/Router is of the Manual control type.

MXR (Mixer/Router)

If you selected the Mixer/Router, choose the **Device** | **MXR** command to bring up the Dialog Box in Figure 31.

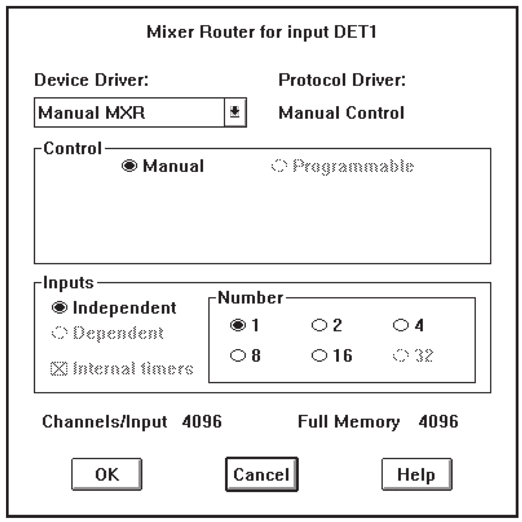


Figure 31 The MXR Device Dialog

Inputs

This dialog box sets up the number of inputs that are going to be used, which you do by clicking on the appropriate button. Note that as you change the number of inputs, the Channels/Input display will be automatically updated for you.

A Mixer/Router (also called Analog Multiplexer or AMX) always uses all of the full memory, which is divided evenly between the selected number of inputs. The minimum number of channels which can be assigned to an input is 256.

Note that the memory groups are not allowed to be used in conjunction with multiplexed inputs.

The Updated Definition Table

If you had decided to use two inputs on the Mixer/Router, exiting the Dialog Box via **OK** would result in a Definition Table like the one shown in Figure 32.

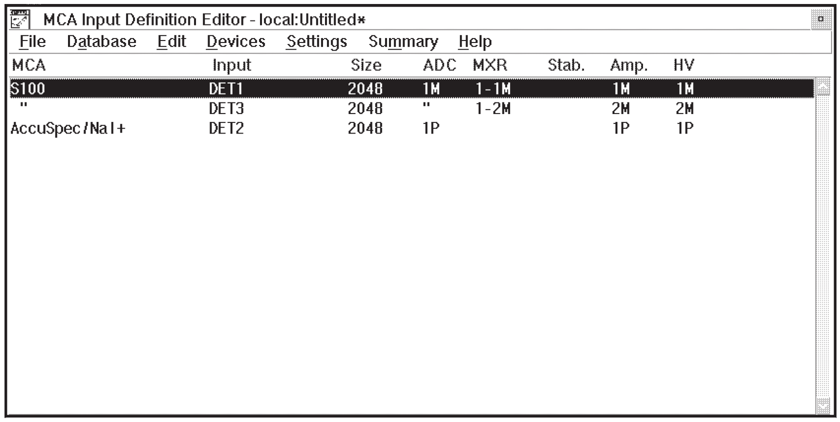


Figure 32 The Updated Definition Table

The first thing you'll probably notice is that an "extra" Input has been added to the table, a System 100 called DET03. This was done to allow you to refer to each of the Mixer/Router's inputs as logically separate entities even though they happen to be sharing the same physical MCA board.

In addition, the MXR column for the entries indicates which of the Mixer/Router's inputs is associated with which logical Input.

Amplifier and High Voltage

The Amplifier and High Voltage Device screens offer no selectable options for the System 100 MCA.

The Settings

The commands in the Settings menu, shown in Figure 33, set the MCA's operating parameters. Since the System 100 uses only manually controlled front ends only two commands – MCA and Input – are enabled.

Note that for many of the parameters, the initial values entered during Settings can be adjusted as necessary from within the Acquisition and Analysis application. The following

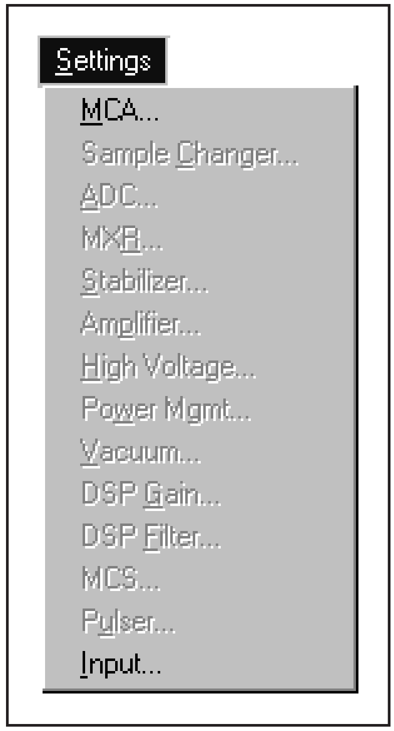


Figure 33 The Settings Menu

descriptions of each parameter specify which controls can be changed only from the MID Editor.

MCA

Selecting the **MCA** command pops up the Dialog Box shown in Figure 34. To change the acquisition mode, click on the Drop Down arrow, scroll to the mode you want to use, and click on it. If you're using a Mixer/Router (also called Analog Multiplexer or AMX), the mode you select will apply to *all* of the Mixer/Router's inputs. Note that the mode can be also be changed from within the Acquisition and Analysis Acquisition and Analysis application.

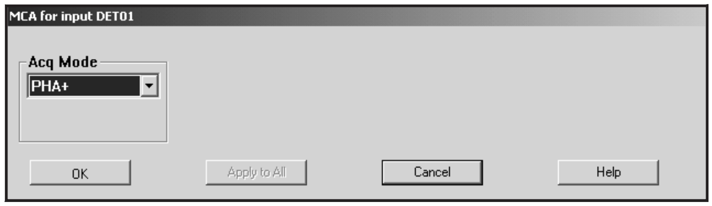


Figure 34 The MCA Sttings

Input

The **Input** command is used to change the name of the MCA and set up the structure of its memory via the Dialog Box shown in Figure 35. These commands are not available in the Acquisition and Analysis application.

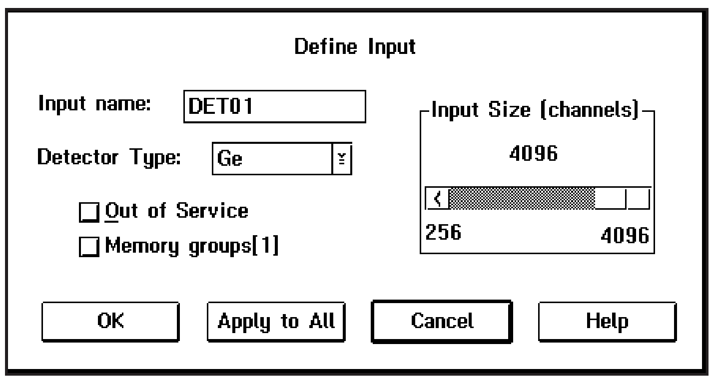


Figure 35 Define Input Dialog

Input Name

The default DET*nn* name is initially assumed as the name for your MCA. However, since it is displayed in a Text Input box, you can easily change the name by clicking on the current name to select it, then typing in the new name, which can be up to eight characters long. This is the name by which the detector is referred to in all applications.

Detector Type

Use this drop-down list to select the type of detector to be used with this MCA; this also assigns appropriate default values to the spectrum display and analysis parameters.

Input Size

This parameter is normally set to the same number of channels that you selected for use during the Device setup of the MCA on the assumption that you'll be using "Full Memory" for your data acquisition. To use less than the maximum available memory size, slide the Scroll bar to select the size you want to use.

Out of Service

Select the Out of Service Check Box when the MCA or its front end electronics are temporarily disconnected from the system. Though the MCA will still be listed in your MCA Definition File, it will not be available for data acquisition.

Memory Groups

This Check Box is used with the Input Size control to logically segment the Full Memory into halves, quarters, and so forth. Note that this control is disabled when this ADC is associated with a Mixer/Router. Using it is a two step process:

1. First you must use the Input Size control to set the acquisition memory size to less than the Full Memory size of the MCA. For example, set to 1024 instead of the Full Memory size of 4096.

2. Enable Memory Groups by clicking on the Check Box. When you do that, the number of available groups will be displayed in the brackets to the right of the control. Using our 1024 out of 4096 example again, the number 4 would appear; the System 100 is now set up to acquire 1024 channels of data into any of the four Quarters of its memory.

When we take a look at data acquisition in the next chapter you'll see that each group can be treated as an individual entity in the same way that a traditional MCA's memory can treat Halves, Quarters, and so forth, as individual entities.

Defining an AIM MCA

The AIM (Acquisition Interface Module) is connected to the system via an Ethernet link. Because of that, and because it can use ICB (Instrument Control Bus) programmable front end modules as well as manually controlled NIM, its definition is a little more complex than the others we've discussed. If you're not installing an AIM MCA, go on to the section which covers your MCA.

To begin, click on the entry in the definition table for the AIM module that you want to set up. That selects it as the MCA to be operated upon.

Address Settings

In the sections which follow you’ll be required to enter instrument address settings such as the AIM module’s Station (Ethernet) Address and the ICB Address for any programmable NIM you may be using. Refer to your NIM unit’s manual for information on setting the ICB address for each unit. The values you enter must correspond to the settings on the NIM unit(s) that you are going to use.

For information on setting and/or determining the LPT addresses, refer to “LPT Parallel Port Assignments” on page 287.

Device Setup

Device setup covers setting the parameters for the system’s hardware, starting with the MCA itself. Clicking on **Device** in the Menu bar shows the menu in Figure 36. There is a command in the menu for each of the hardware sections of the MCA. The disabled (grayed) commands do not apply to the MCA currently being set up.

You’ll notice that the **MXR** and **Stabilizer** commands are disabled, since there are no Digital Stabilizer functions which need to be specified, and the MXR command is only enabled when you specify that a Mixer/Router is to be used.

Figure 36 The Device Setup Menu

MCA

We’ll begin by defining the characteristics of the AIM MCA itself. This is done with the Dialog Box shown in Figure 37, which pops up when you select the **MCA** command from the **Device** menu.

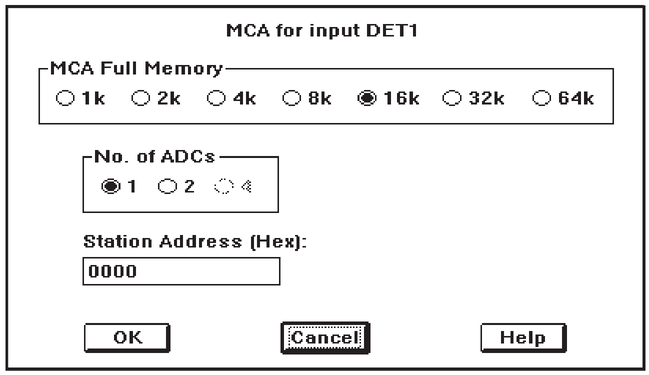


Figure 37 The MCA Settings Dialog

Full Memory and Number of ADCs

Radio buttons are used to specify the maximum number of data channels to be used and the number of ADCs to be connected to the module. Simply click on your choice for each, keeping in mind that if you’ll be using two ADCs, each will receive half of the Full Memory size that you select. For proper operation, the first input entry for the AIM must be connected to AIM ADC 1. If two ADCs are selected, the second input entry must be connected to AIM ADC 2.

This means that the Device Setup and Settings will have to be performed for each of the ADCs. Click on one of the inputs to set it up. After completing the setup for that input, click on the next input and repeat the process for that ADC.

Station Address

Since the AIM connects to the system via Ethernet, you must specify the network address that will be used to communicate with the module. Click on the **Station Address** Text Input Box to select it for editing, then enter the four digit address which has been assigned to the AIM module which you are setting up.

Sample Changer

If you’re going to be using a **Sample Changer**, select that command from the **Device** menu next. The result will be the Dialog Box shown in Figure 38.

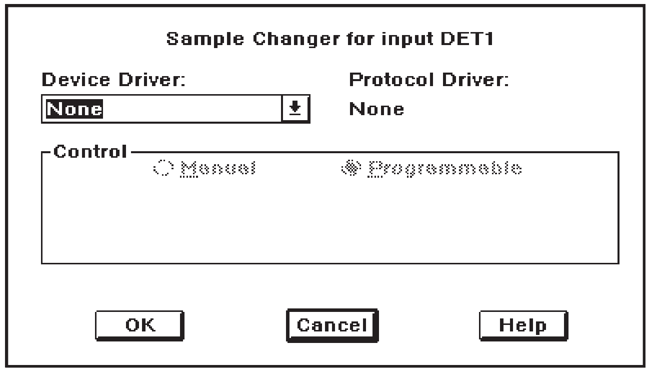


Figure 38 The Sample Changer Dialog

Device Driver

This parameter sets the type of sample changer, if any, that is going to be used. To see the available choices, click on the Down Arrow, then click on your choice in the list.

LPT Sample Changer

If you specified that the Sample Changer was going to be connected to one of your PC's parallel printer ports, the Dialog Box will change to that shown in Figure 39 to allow you select the port that is to be used. Click on the Down Arrow, then click on the port number (LPT1, LPT2, or LPT3) that is to be used.

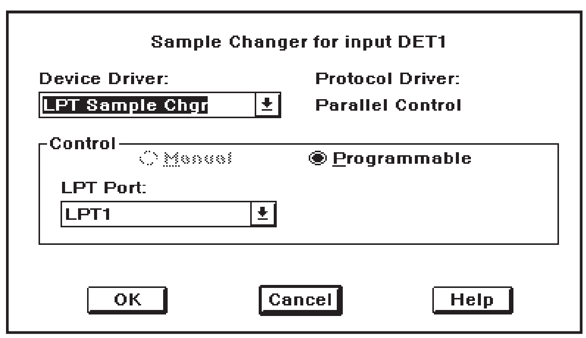


Figure 39 Setting an LPT Sample Changer

RPI Sample Changer

If you had selected the RPI (Remote Parallel Interface) Sample Changer, the Dialog Box you'd see would be similar to the one shown in Figure 39, but with "ICB Address" in place of "LPT Port" and with an additional text box called "Start with line".

Since RPI Sample Changers connect to the AIM's Instrument Control Bus (ICB), the first thing you have to specify is the sample changer's ICB address. Click on the **ICB Address** Down Arrow, then select an ICB address from the Drop Down List.

A similar process is used for the **Start with line** parameter, with the selected line number representing the number of the input/output line pair on the RPI that will be used for sample changer control.

ADC

To set up the AIM's ADC, click on the **Device** | **ADC** command to see the Dialog Box shown in Figure 40.

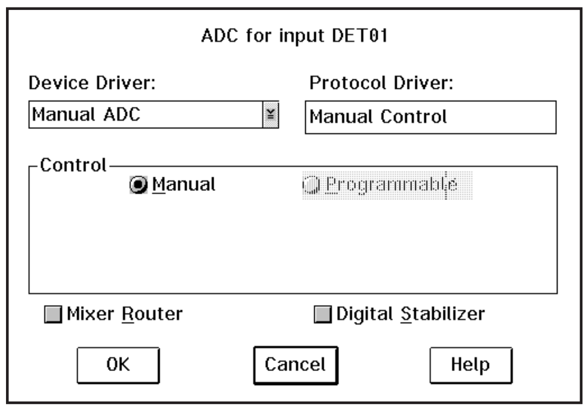


Figure 40 The ADC Device Dialog

You can choose whether you're going to use a Mixer/Router (also called Analog Multiplexer or AMX) or a Stabilizer with it. If you choose Stabilizer, you'll notice that there are no selections to make under Stabilizer in the Settings menu.

If you enabled a Mixer/Router, you'll notice that the MXR column of the System 100 entry in the MCA Definition Table now contains the entry 1-1M. This means that a Mixer/Router has been selected, is currently set to only one input, and the Mixer/Router is of the Manual control type.

Device Driver

Just as in the Sample Changer Dialog Box, a Drop Down list is used to specify the type of ADC which will be connected to the AIM. Click on the Down Arrow, then click on your choice from the list. Note that from a setup point of view, the only difference between the 9633 and the 9635 is the maximum conversion gain (16K vs. 8K).

ICB Address

Since the 9633 and 9635 ADCs also connect to the AIM's Instrument Control Bus, the first thing you have to specify is the ICB address. Click on the **ICB Address** Down Arrow, then select an ICB address from the Drop Down List. Note that each module connected to a given AIM must have a unique ICB address.

Mixer/Router

To use a Mixer/Router, also called an Analog Multiplexer or AMX, click on the **Mixer Router** Check Box to select it. (If you're not going to use a Mixer/Router, skip ahead to "Amplifier" on page 61.) Selecting Mixer/Router makes the AIM entry in the MID definition table look like the one shown in Figure 41; in the MXR column you'll see the entry 1-1M to indicate that a single-input manually controlled Mixer/Router is going to be used. The next section (MXR) will show you how to change that setting to the one you'll actually be using.

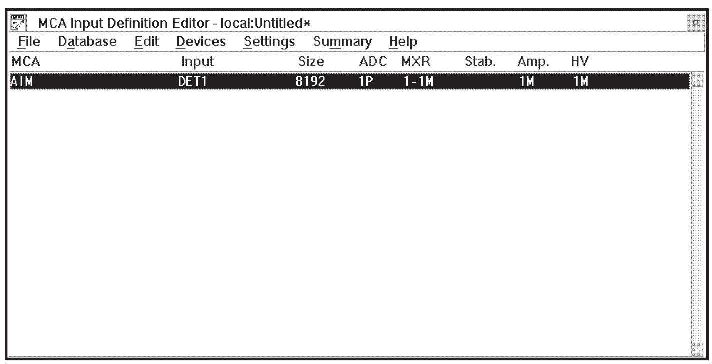


Figure 41 MID Definition Table with a Mixer/Router

MXR

With Mixer/Router selected in the ADC setup, you'll see the **MXR** command in the **Device** menu. Selecting it will result in the Dialog Box in Figure 42.

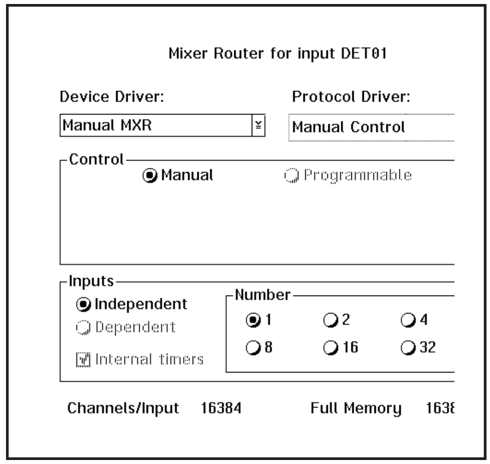


Figure 42 The Mixer/Router Drivers

Device Driver

Once again the first step is to tell the system about the type of device you're going to be using. Click on the Device Driver box's down arrow to see the list in Figure 43.

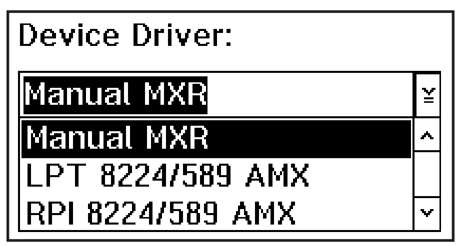


Figure 43 The Mixer/Router Drivers

The Model 8224/589 AMX can be connected to your system in one of two ways. If it's going to be controlled through one of your PC's parallel ports, click on **LPT 8224/589 AMX**; if the Mixer/Router is going to be connected to the AIM's ICB, click on **RPI 8224/589 AMX**.

Note that if you choose **RPI 8224/589 AMX**, you must have a Remote Parallel Interface (RPI) available on your AIM module's ICB to control the Mixer/Router.

LPT 8224/589 AMX

This choice changes the Dialog Box to that shown in Figure 44. Click on the LPT Port box's down arrow to specify the parallel printer port you're connecting the AMX to.

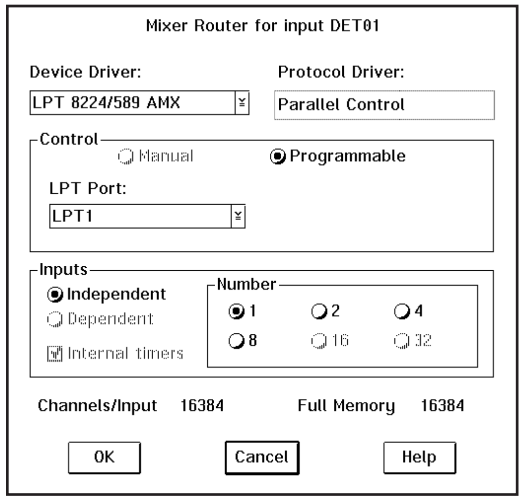


Figure 44 The LTP Controlled
Mixer/Router Dialog

Once that has been done, radio buttons are used to select the number of inputs to the Mixer/Router. Note the **Channels/Input** and **Full Memory** fields displayed just below the **Inputs** section of the Dialog Box. As you change the number of inputs, the **Channels/Input** display will automatically be updated to let you see exactly how the system will be configured.

RPI 8224/589 AMX

Selecting this changes the Dialog Box to the one shown in Figure 45. Drop Down Lists are used to set the module's **ICB Address** and **Start with line**. The "Start with line" parameter indicates which set of eight output lines on the RPI is going to be used for multiplexer (AMX) control. Now select the radio button for the **Number** of inputs that you'll be using.

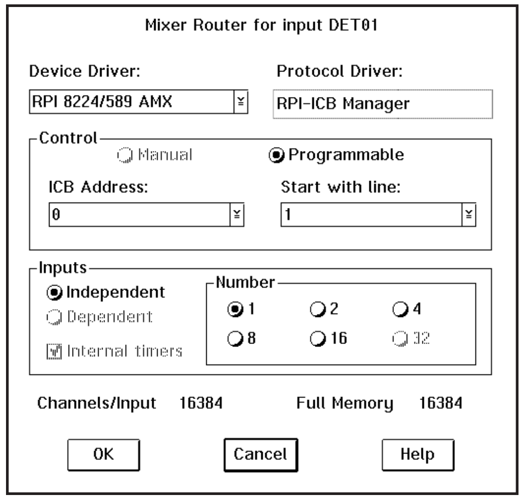


Figure 45 The RPI Controlled Mixer/Router Dialog

Note: If you are going to be using a Mixer/Router, each of the MXR's inputs will show up as a separate input in the MID's input definition table, as shown in Figure 46, and each will have its own Amplifier and High Voltage Bias Supply.

This means that the sections which follow will have to be performed for each of the MXR's inputs, so before going on, click on one of the Inputs to select it for setup. After completing the setup for that input, click on the next input and repeat the process until all of the MXR's inputs have been defined.

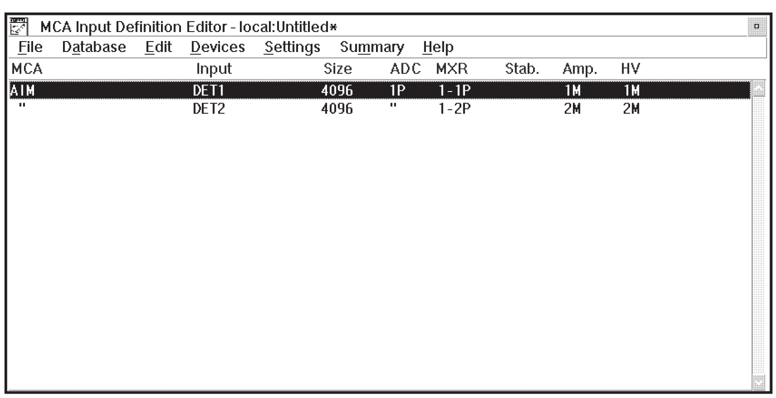


Figure 46 The RPI Controlled Mixer/Router Dialog

Amplifier

The spectroscopy amplifier that's going to be used is set up next with the **Amplifier** command in the **Device** menu, which uses the Dialog Box in Figure 47.

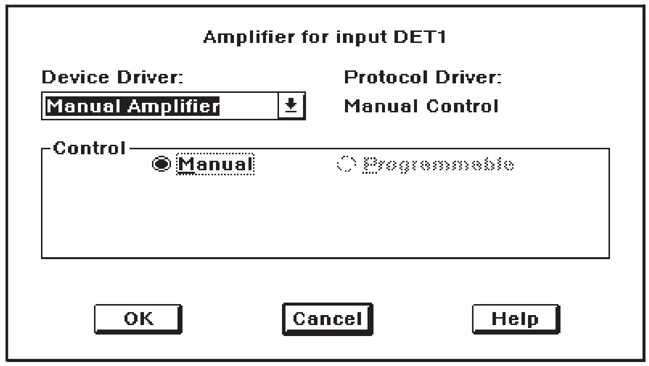


Figure 47 The Amplifier Device Dialog

Device Driver

A Drop Down List is used to select between a Manual Amplifier and the Model 9615 Programmable Spectroscopy Amplifier. If you'll be using a manually controlled amplifier, there are no settings to make.

If you select the 9615, the Dialog Control in Figure 48 will appear to allow you to specify the amplifier's **ICB Address**. As we've seen in the previous sections, it's set through a Drop Down List. Note that the amplifier, like all ICB modules connected to any one AIM, must have its own unique address.

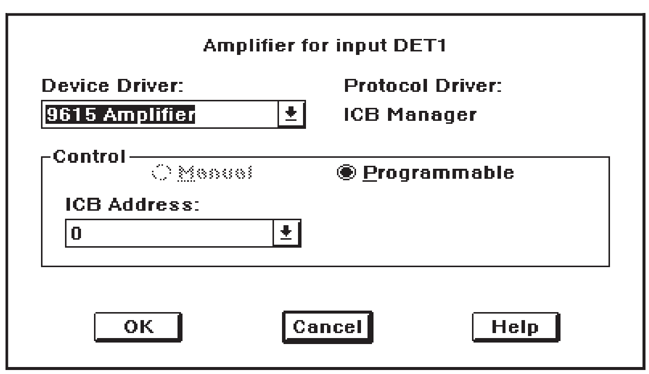


Figure 48 The ICB Amplifier Dialog

High Voltage

The last device to set up is the High Voltage Bias Supply for your Detector. This is done with the **High Voltage** command in the **Device** menu, which pops up the Dialog Box in Figure 49.

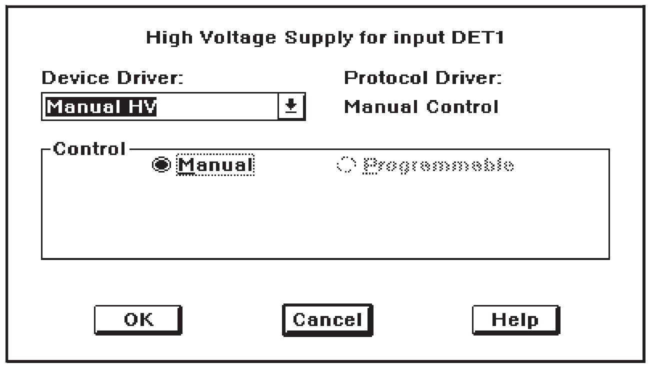


Figure 49 The High Voltage Dialog

Functionally, this Dialog Box operates just like the one for the amplifier. First you select the type of device, then – if it's an ICB device – you specify its unique **ICB Address**.

If you're using multiple ADCs and/or multiple inputs via a Mixer/Router you'll need multiple input definitions, so be sure you've set up *all* of your AIM's inputs as discussed in this section. Note that for many of the parameters, the initial values entered during Settings can be adjusted as necessary from within the Acquisition and Analysis Acquisition and Analysis application. The text will specify which controls can be changed only from the MID.

The Settings

The commands in the Settings menu set the MCA's operating parameters. Note that for many of the parameters, the initial values entered during Settings can be adjusted as necessary from within the Acquisition and Analysis Acquisition and Analysis application. The following descriptions of each parameter specify which controls can be changed only from the MID Editor.

Begin your Settings setup in the MID definition table by clicking on the AIM input that is to be set up. Once you've selected the input, the **Settings** menu, shown in Figure 50, is used to set its initial operating parameters. You'll notice that some commands are disabled here, since those functions are not available for an AIM. The **MXR** (Mixer/Router)

Figure 50 The Settings Menu

command will only be enabled when the Device description of the ADC includes a Mixer/Router.

MCA

Selecting the **Settings** | **MCA** command lets you set the MCA's data acquisition mode by clicking on the Drop Down arrow, scrolling to the mode you want to use, and clicking on it. Note that the mode can be also be changed from within the Acquisition and Analysis Acquisition and Analysis application.

ADC

The ADC command in the **Settings** menu uses the Dialog Box in Figure 51 to establish the initial control settings for the 9633 and 9635 ICB ADCs.

Since the ADC's Scroll Bar controls may need to be changed often in the course of daily work, they can be adjusted both here and in the Acquisition and Analysis application. Since some of the controls, such as Acquisition Mode, are not usually changed during the course of data acquisition, they can only be changed here.

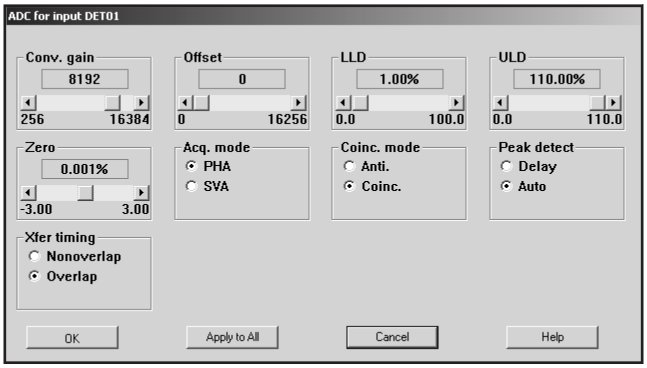


Figure 51 The ADC Settings Dialog

Conversion Gain

This Scroll Bar is used to set the **Conversion Gain** of the ADC. Clicking on the arrows at the ends of the Scroll Bar changes the gain by a factor of two.

Offset

TheADC's **Digital Offset** can be adjusted from 0 to 8064 channels in 128 channel steps (0 to 16 256 channels in 256 channel steps for a 16K ADC).

LLD

The ADC's Lower Level Discriminator (**LLD**) can be set from 0.0% to 100.0% of the ADC's full scale input.

ULD

The ADC's Upper Level Discriminator (**ULD**) can be set from 0.0% to 110.0% of the ADC's full scale input.

The window between the LLD and ULD settings is used as a "filter" to limit the energy range to be considered by the ADC. Only signals within this window will be converted.

Zero

The **ADC Zero** can be set between –3.0% and +3.0% of full scale.

Acquisition Mode

The Acquisition Mode is either **PHA** (Pulse Height Analysis) or **SVA** (Sample Voltage Analysis). This control can only be changed here.

Coincidence Mode

The ADC’s input gating tis either **Coincidence** mode or **Anticoincidence** mode. This control can only be changed here.

Coincidence Timing

If input gating is going to be used, it can be set to **Early** or **Late** Coincidence Timing. This control can only be changed here.

Peak Detect

If **Auto**matic peak detection is selected, the ADC will begin converting the input pulse at the peak’s maximum amplitude. Choosing **Delay** will cause the conversion to start at a fixed (front panel adjustable) time after the peak’s leading edge. This control can only be changed here.

Transfer Timing

For maximum throughput, you would normally want the ADC to operate in the **Overlap** mode. That is, the ADC will begin converting the next input pulse while the previous pulse is being stored. This control can only be changed here.

However, when you’re doing coincidence work or using a Mixer/Router, you need a precisely predictable ADC dead time. For those cases, choose **Nonoverlap** mode.

MXR

If you select this command, you’ll see a message telling you that there are currently no adjustable MXR controls. Click on **OK** to acknowledge it.

Amplifier

Selecting this command from the **Settings** menu will pop up the Dialog Box shown in Figure 52.

Though many of the Amplifier controls can also be adjusted in the Acquisition and Analysis application, the Preamp Type, Shaping Mode, Input Mode, Input Polarity, LTC Mode, and Inhibit polarity can only be changed in this Dialog Box.

Amplifier Gain

Three controls are used to set the amplifier’s gain: Coarse Gain, Fine Gain, and Superfine Gain. The total gain is the product of all three of these controls.

Coarse Gain

The Amplifier’s **Coarse gain** setting is selected from the drop down list.

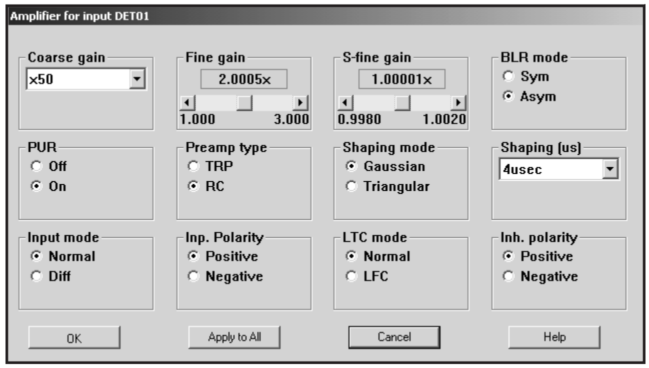


Figure 52 The Amplifier Settings Dialog

Fine Gain

The **Fine gain** control is set by a Scroll Bar.

S-fine Gain

The **S-fine Gain** control can be used to establish a specific gain (energy per channel).

BLR Mode

Radio buttons set the Baseline Restorer to either **Sym**metrical or **Asym**metrical Mode.

PUR Mode

Radio buttons enable the amplifier's Pulse Pileup Rejector (**On**) and Live Time Corrector or disable it (**Off**).

Preamp Type

Specify the preamplifier type: **TRP** (transistor reset preamp) or **RC** (RC coupled). This control can only be changed here.

Shaping Mode

Select either **Gaussian** or **Triangular** pulse shaping for the amplifier. This control can only be changed here.

Shaping Time

Set this control to the shaping time constant you want to use for this datasource. When the datasource is first opened, this setting is compared with the amplifier's setting. The system will remind you if the two settings are not the same so that you can correct the amplifier's setting.

Input Mode

Select either **Normal** or **Differential** input mode for the amplifier. This control can only be changed here.

Inp. Polarity

Select either **Positive** or **Negative** input polarity for the amplifier. This control can only be changed here.

LTC Mode

Select the amplifier's LTC (Live Time Correction) Mode: **Normal** or **LFC** (Loss Free Counting). This control can only be changed here.

Inh. Polarity

If you're using a reset-type preamplifier, such as a TRP, you'll have to select the polarity of its Inhibit signal: **Positive** or **Negative**. This control can only be changed here.

High Voltage

The **Settings** menu's **High Voltage** command sets up the High Voltage Power Supply. Of all of the controls shown in Figure 53, only the Voltage control can also be adjusted from within the Acquisition and Analysis Acquisition and Analysis application; all of the others can only be changed in this dialog box.

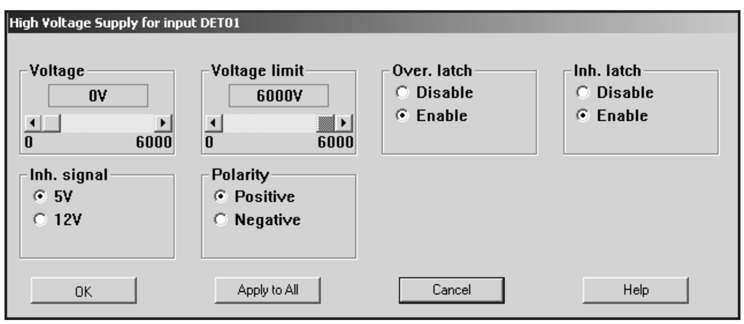


Figure 53 The High Voltage Settings Dialog

Voltage Limit

The **Voltage Limit** control establishes the maximum level to which the power supply may be set. This control must be set before the Voltage control is adjusted.

Voltage

The **Voltage** control sets the power supply's operating Voltage, which cannot exceed the limit set in Voltage Limit. This control can also be adjusted in the Acquisition and Analysis application.

Over. Latch

The **Overload Latch** command refers to the power supply's ability to shut itself down if an excess current condition is sensed. Select **Disable** to automatically restore the high voltage when the overload condition is corrected.

If you select **Enable**, the alarm will be latched. This means that the latch must be reset through the MCA Adjust (in the Acquisition and Analysis application) screen before high voltage will be restored.

Inhibit Latch

The Inhibit Latch command works in the same manner as the Overload Latch command, except that it is triggered by the Inhibit signal from the associated preamplifier.

Inh. Signal

The Inhibit Input Signal is compatible with all Canberra preamps; it isn't necessary to select the signal level to match the HV Inhibit level of your Canberra preamp.

The **5V** and **12V** selections are provided for compatibility with Inhibit signals from instruments made by other manufacturers. Please consult the manual provided with that preamp for its Inhibit Signal Level requirements.

Polarity

The Polarity setting must match the high voltage polarity expected by the associated detector.

Input

The **Input** command, Figure 54, is used to change the name of the Input and define the Input. These commands are not available in the Acquisition and Analysis application.

Input Name

The default DETnn name is initially assumed as the name for your Input. But since it is displayed in a Text Input box, you can easily change the name by clicking on the current name to select it, then typing in the new name, which can be up to eight characters long. This is the name by which the detector is referred to in all applications.

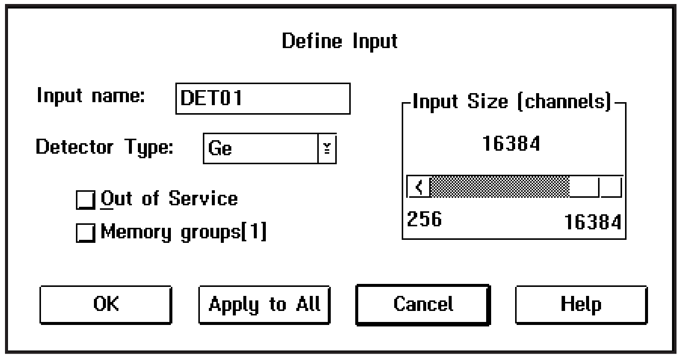


Figure 54 The Define Input Dialog

Detector Type

Use this drop-down list to select the type of detector to be used with this MCA; this also assigns appropriate default values to the spectrum display and analysis parameters.

Input Size

This parameter defaults to the number of channels that you selected during the MCA Device setup. To use less than the maximum available memory, slide the Scroll Bar to select the size you want.

Out of Service

Select the Out of Service Check Box when the MCA or its front end electronics are temporarily disconnected from the system. Though the MCA will still be listed in your MCA Definition File, it will not be available for data acquisition.

Memory Groups

This Check Box is used with the Input Size control to segment the memory of the MCA into Halves, Quarters, and so forth. This is a two-step process.

1. First, you'll have to set the Input Size to the desired group size. For example, to operate an 8192 channel MCA in quarters, set the Input Size to 2048.

2. Then click on the Memory groups Check Box to enable it. The numeral 4 will appear in the brackets to let you know that the MCA is set to four quarters of 2048 channels each.

Saving the Input Definition

Having completed our definition, the next step is to save it in a disk file so we can use it in the future. To remind you that you need to do this, you'll see an asterisk (*) in the Title Bar, next to the name of the current definition. The asterisk means that the definition has been changed but not yet saved. To save your definition, click on the **File** menu's **Save** command. When you do that, you'll see the Dialog Box shown in Figure 55.

CAUTION If you have changed an existing Input Definition, saving it will set its calibrations to default and will clear the Acquisition Start time.

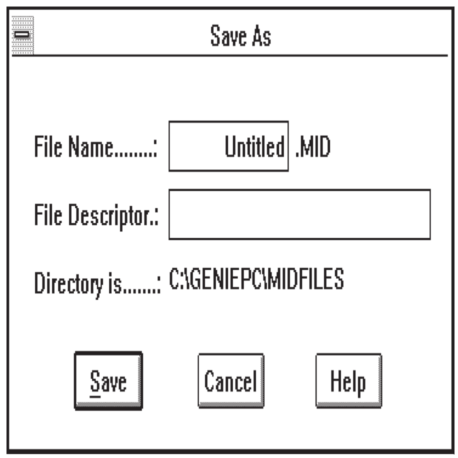


Figure 55 The Save As Dialog

Save and Save As

Even though you selected the Save command, you'll notice that the Dialog Box is labeled Save As. This is because the Save command is really a "Replace the old version with a new one" command, and we don't have an "old version" of our table to replace (ours is still labeled "Untitled", which means it has never been Saved). The system realizes this and automatically pops up the Save As Dialog Box so we can assign a name to our table.

Using Save As

Since the word Untitled displayed in the File Name Text Input box is already highlighted, all you have to do to replace it is type a file name, then press the TAB key to move to the File Descriptor input box.

The File Descriptor

The text cursor is now located in the input field called File Descriptor. This a 32-character description that is stored with your file to make it easier to locate it when you want to use it again.

Changing the Summary View

Before going on to see how to edit an existing Input Definition Table, one that you've built previously and saved to disk, there's one more menu to look at. This is the Summary menu, which is shown in Figure 56.

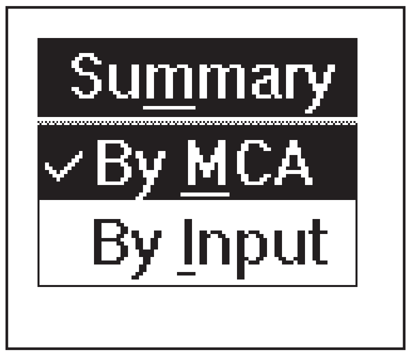


Figure 56 The Summary Menu

The **Summary** menu has two commands: **By MCA** and **By Input**, which change the order in which the information in the Input Definition Table is displayed. By MCA means that the first column of the table will display the MCA type that is being used for each entry. If you choose By Input, the MCA and Input columns will be reversed in the display and the Inputs will be sorted alphabetically.

You can choose either method, but in the case of systems with a large number of inputs, "By Input" is an easier display to understand than "By MCA".

Editing an MCA Definition

The procedures that we used in the previous sections can also be used to edit MCA Input Definitions that have already been saved to disk.

Opening an Input Definition File

To edit a file that has not been loaded into the MCA Runtime Configuration Database, all you have to do is read it into the Input Definition Editor with the **File** menu's **Open** command, which uses the Dialog Box shown in Figure 57. If you know which file you want to edit, double click on its name to open it in the editor.

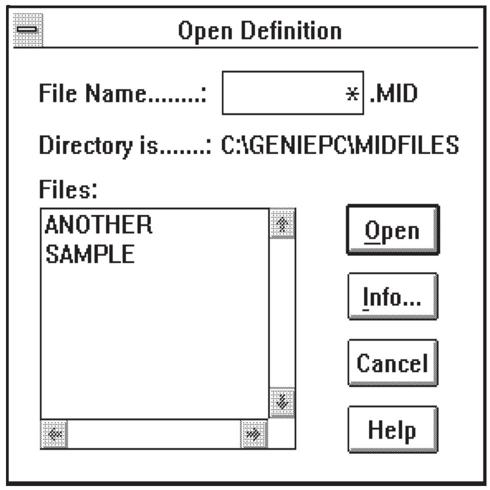


Figure 57 The File Open Dialog

If you have already loaded the definition into the MCA Runtime Configuration Database, it must first be unloaded before it can be opened in the editor. See "Unloading the Database" on page 75 for the procedure to use.

Looking at the File Details

If you're not sure which file you want to edit, click on the name of the file that you think is the correct one, then click on the **Info** button to see further information about the file. Doing that will pop up the Dialog Box shown in Figure 58.

The key piece of information here is the File Descriptor, which is the "extended file name" that you added when the file was originally saved. From this you should better be able to determine if the file you selected is the one you want.

When you're finished with the file details, click on **OK** to return to the Open Dialog Box. Now you can either click on the **Open** button to open the file you selected or select a different file and view its details.

Editing the Definition

All of the menus and commands available for defining an MCA are also used for editing a definition. Just click on the entry you want to change and apply the commands as before. When you've finished editing the definition, **Save** it. Note that you can't edit a database which is being used by the Runtime Database; you'll first have to unload it first, as described in "Unloading the Database" on page 75).

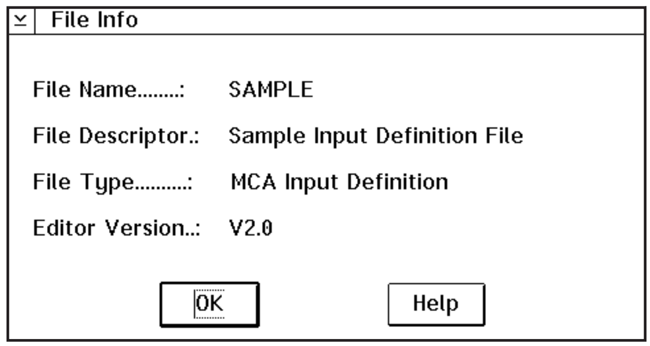


Figure 58 The File Info Display

The New Command

If you want to create a totally new MCA Definition, the **File** menu's **New** command clears the definition table so you can begin a new definition.

Because New is a destructive operation, selecting it will cause the program to ask for a confirmation in one of two ways:

1. If the Definition currently being displayed has not been changed since it was last saved (no asterisk in the Title Bar), you will be asked if you want to erase the current Definition. Click on **OK** to erase it, or **Cancel** to return to the Input Definition Editor.

2. If the Definition currently being displayed has been changed but *not* saved, you will be given a chance to save it.

The Input Definition Report

The **File** menu's **Report** command always saves to a disk file, but if you click on **Yes** in the dialog box that pops up, you can send the report to a disk file *and* print the report as well. Click on **No** to save it to a disk file without printing the report.

Using MCA Definition Tables

The whole purpose behind building MCA Input Definitions is to let Genie 2000 know the number and types of MCAs you'll be using with your system. You do this by loading one or more MCA Definition Files into the MCA Runtime Configuration Database.

This database is shared by all Genie 2000 programs and is used by those programs to gain access to the actual MCA hardware in your system. In this section we'll take a look at the procedures used for setting up that database.

Looking at the Current Database

To see the current contents of the database, click on the **Database** menu's **View** command, which will pop up the display shown in Figure 59. Click on a line in the list, then use the Device and Settings menus to look at the details of that definition. Click on **OK** to close the View window.

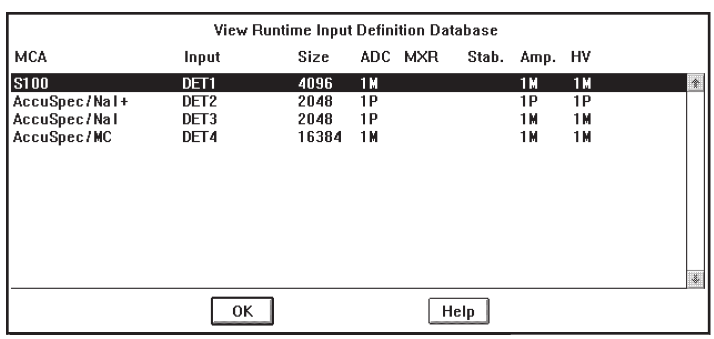


Figure 59 Veiwing the Database

Loading and Unloading Definitions

Before you can use an MCA Definition, you'll have to load it into the database, so we'll start with that process. Note that you can't edit a loaded database; you'll first have to unload it as described in "Unloading the Database" on page 75).

The Load/Unload functions will be disabled while any Acquisition and Analysis applications are running and have open datasources. This prevents one user from altering the runtime database while another user is accessing it.

Loading the Database

A new Definition can be loaded into the Database with the **Load to** command, which brings up the Dialog Box in Figure 60.

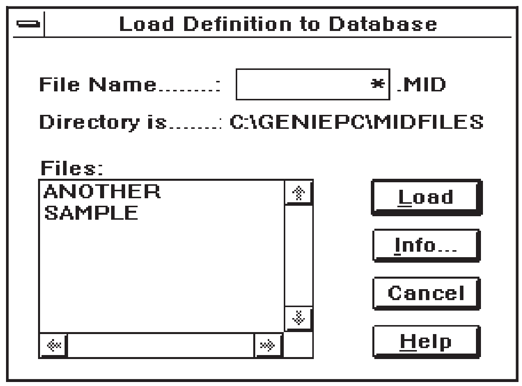


Figure 60 The Load to Dialog

Selecting the File

This Dialog Box works just like the File Open Dialog Box, but instead of opening the file for editing, it loads the file into the database.

Loading Multiple Definitions

Though you will usually use only one definition at a time, there may be times when you want to load more than one definition. To do this, be sure that each of the Input names in the Definition Files is unique and that any single MCA (for instance, System 100 Board #1) is defined only once. As long as both of these conditions are true, you can load as many Input Definitions as you like.

If you try to load an Input Definition which contains a duplicate Input name, the system will display a message telling you that the requested Load can't be done.

Unloading the Database

You'll recall that while the programmable front end controls, such as ADC Gain or Amplifier Gain, are initially set with the MCA Input Definition Editor, many of them may also be adjusted from within the Acquisition and Analysis application while you're collecting data.

Any adjustments you make in the Acquisition and Analysis application can be stored in the database (with File | Save) and, when you Unload the database, are saved into an Input Definition File. This saves all of the control settings for future sessions.

The Unload Process

To unload a Database, click on the **Database** menu's **Unload from** command, which will bring up the Dialog Box shown in Figure 61. If several choices are listed, there are multiple definitions in the database

Click on the one you want to unload, then click on the **Unload from** button. Note that this menu item is disabled if the MCA Runtime Configuration Database is currently being used by another application.

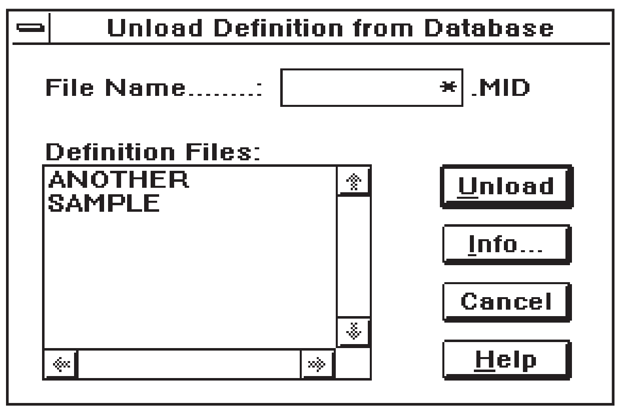


Figure 61 The Unload From Dialog

4. Gamma Acquisition and Analysis

This operations reference for the Model S501 Gamma Spectroscopy Acquisition and Analysis application lists all of its commands and their functions by menu and submenu.

File Menu

The **File** menu lets you open a datasource, close it, save it without closing it, and save it under another name (save as) without closing it.

Open Datasource

The **Open Datasource** command displays a dialog (Figure 62) which allows you to open a datasource.

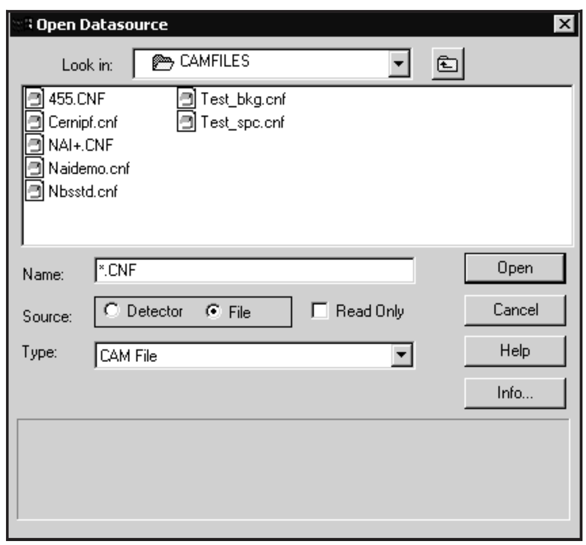


Figure 62 The Open Datasource Dialog

Datasource

When the Detector button is selected, the “Node is” dropdown will list all the available local and remote VDMs. The list box will show all of the currently selected nodes’ defined input names. If the datasource is a multiple memory group detector, you can display any of the groups by typing its name into the edit box. For example: MULTIPLE(3:4).

When the File button is selected, the “Look in” dropdown will list all the available drives. The list box will show all of the files and directories in the current directory. The file name can be typed into the Name edit box or it can be selected from the list box.

File Type

When the File button is selected, the “Type” dropdown will list the file format types you can open. The supported types are:

CAM	Oxford	AccuSpec
S100 File	Ortec-GammaVision	Silena
EasySpec	Intertechnique	Nucleus
Ortec-ADCAM	Sampo 90	PC-ToolKit
Gamma-AT	IEC 1455	Spectran-AT

The Info Button

The Info button (Figure 62) displays descriptive information on the currently selected datasource in the information window.

Close

Selecting **Close** lets you close the current datasource. If the open datasource has been changed but not saved, you will be asked if you want to save it.

Save

Save allows you to save the datasource, with all related information, to its original location.

Save as

Save as displays a dialog box (Figure 63) which prompts you for a file name to save the current datasource to. The file types supported by this operation are:

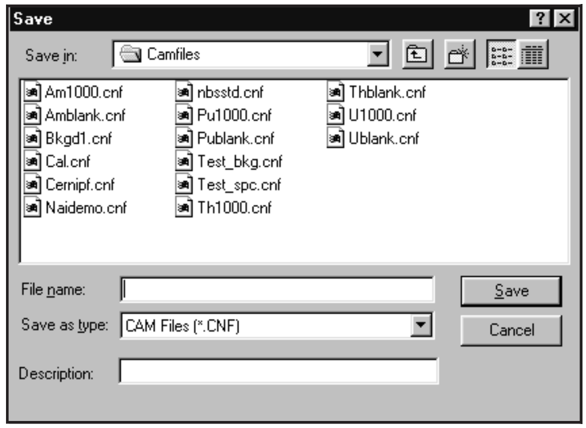


Figure 63 The Save As Dialog

CAM files (.CNF)
Toolkit files (.TKA)
IEC1455 files (.IEC)

The **Description** text field lets you add a file description of up to 32 characters to be saved with the file. This information, which you'll see in the File Descriptor field in the Open Datasource dialog box (Figure 62), makes it easier to identify this specific data file.

Data Plot

Data Plot sends a plot of the data in the spectral display to the printer device. The scale type (linear or log) and VFS are determined by the current settings of the spectral display. The x-axis is labeled in energy units if there is an energy calibration, otherwise it is labeled in channels. ROIs have their area shaded according to the ROI type.

For Expand mode, only the expanded portion of the spectrum is plotted; for Compare mode both spectra are plotted. The datasource name, live and real time, acquisition start time, and the start and stop channels and energy are printed at the bottom of the plot. When in Compare mode a text block for the compare spectrum is also printed.

Plot to Clipboard

Plot to Clipboard will copy the current spectral display (including expand window, cursors, markers…) to the Windows clipboard as a bitmap. This image may then be pasted into other applications such as word processors and paint programs. This command may also be invoked using the accelerator keys CTRL+C.

Print Report Window

Selecting **Print Report Window** will print the contents of the report window to the Windows default printer.

Exit

Select **Exit** to close the Gamma Acquisition and Analysis window. You will be asked if you want to save a changed open datasource if it has not already been saved.

MCA Menu

The **MCA** menu, which is available only when the currently selected datasource is a Detector Input, contains the set of operations to be performed on the MCA and electronic front-end hardware.

Acquire Start

Select **Acquire start** or press the F4 key to initiate data acquisition on the current datasource. This command is disabled for datasources that are already acquiring data.

Acquire Stop

Select **Acquire stop** or press the F4 key to issue an unconditional Stop command to a currently collecting datasource.

Acquire Setup

Selecting **Acquire setup** displays a dialog box (Figure 64) which allows you to define default acquisition parameters to be used when starting data collection on hardware datasources.

Mode

The available acquisition modes depend on the MCA being used and the time and computational preset options depend on the current acquisition mode. For instance, time and computational presets are available only in PHA or LFC mode, MCS presets are available only in MCS mode.

Time Preset

The time presets are available only when the MCA is set to PHA mode or LFC mode. **Live time** preset for the current hardware datasource in seconds, minutes or hours. Live

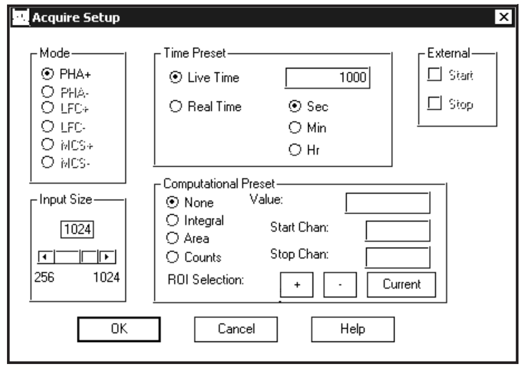


Figure 64 Typical PHA Acquire Setup

time is mutually exclusive with real time, but can be combined with any one computational preset.

Real time preset for the current hardware datasource in seconds, minutes, and hours. Real time is mutually exclusive with live time, but can be combined with any one computational preset.

External Start/Stop

These controls are enabled when a hardware datasource is opened that supports triggering of collect via an external source. When selected, the chosen operation will be acted upon when the external source is triggered. For example, if external start is enabled and OK is selected, collect will not start until the external collect trigger is received.

Input Size

The **Input Size** control lets you alter the displayed size of the input of the current detector input, and what is saved to a disk file. It does not change the input size in the detector input definition.

Computational Presets

The Computational Presets are available only when the MCA is set to PHA mode or LFC mode. **None** turns off computational presets. Only the time preset will be used.

Integral is a computational preset for the integral of any one ROI. The integral value and the ROI's Start and Stop channels must be specified. The ROI channels will default to the current computational preset if there is one, otherwise the default ROI channels will be 1 to the highest channel number. You may replace the default by entering Start and Stop channel values or by using the ROI Index buttons to scroll through currently defined

ROIs. The integral preset is mutually exclusive with all other computational presets, but can be combined with either a live time or real time preset.

Area is a computational preset for the area of any one ROI. The area value and the ROI's Start and Stop channels must be specified. The ROI channels will default to the current computational preset if there is one, otherwise the default ROI channels will be 1 to the highest channel number. You may replace the default by entering Start and Stop channel values manually or by using the ROI Index buttons to scroll through currently defined ROIs. The area preset is mutually exclusive with all other computational presets, but can be combined with either a live time or real time preset.

Counts is a computational preset for total counts in a single channel within the channel range specified by the Start and Stop channels. The Value, which must be specified, indicates the number of counts which will stop acquisition. The counts preset is mutually exclusive with all other computational presets, but can be combined with either a live time or real time preset.

MCS Preset

The MCS Preset is available only when the MCA is set to MCS mode. **Sweep counts** selects the number of sweeps to be performed during MCS data acquisition. Dwell time is set on the hardware MCS unit for the S100; it is set in MCS Adjust (refer to "MCS" on page 90) for other MCAs.

Clear

There are two options for clearing the spectral display:

Select **Data** to remove all spectral data, including the time information in channels one and two, from the display.

Select **Data & ROIs** to remove both the data and all ROIs from the display.

Adjust

Adjust allows you to adjust the controls of the current hardware datasource's programmable front-end electronics. This section shows typical adjust screens, but only those which are applicable to the current datasource will be available to you and the controls they show will not necessarily be those shown in the illustrations.

As adjustments are made in the dialog box, the new values are sent to the hardware. To save the adjustments to the datasource's CAM file, use the **File** | **Save** command so that the next time this datasource is selected, the proper setting will be loaded into the MCA.

The **Next** and **Prev**(ious) buttons at the left side of the dialog box are used to move to the next (or previous) "page" of the controls when there are more control elements than will fit in the basic box.

ADC

Click on the **ADC** button to see the dialog box in Figure 65, which shows a typical ADC adjust screen. The controls you see on your adjust screen may vary, depending on which ADC you assigned to this datasource.

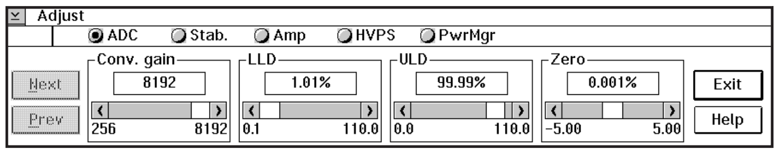


Figure 65 Typical ADC Adjust Dialog

Conv. Gain

Clicking either on the arrows at the ends of the Scroll Bar or in the area to either side of the Scroll Bar's "Slider" will change the gain by a factor of two over the control's range of 256 channels to the maximum number of channels supported by the MCA.

LLD

The ADC's Lower Level Discriminator (LLD) can be set as a percentage of the ADC's full scale input.

ULD

The ADC's Upper Level Discriminator (ULD) can be set as a percentage of the ADC's full scale input.

The window between the LLD and ULD settings is used as a "filter" to limit the energy range to be considered by the ADC. Only signals within this window will be converted.

Zero

The ADC's Zero is factory set for each conversion gain, so that a Zero setting of 0% corresponds to zero intercept (zero energy input stores in channel 3, the first channel used for spectral data storage) for that conversion gain. The Zero control can be used to change the zero intercept to another channel.

Offset

The ADC's Digital Offset shifts the memory assignment of the ADC's conversions. With no (zero) offset, the ADC's channel numbers are the same as the memory assignment's channel numbers. For example, if the Gain is programmed to 8192 and the memory assignment is only 4096, an Offset of zero will allow only the lower half of the full-scale conversions to be stored. But if the Offset were set to 4096, channel 4096 of the ADC would be shifted down to correspond to channel zero of the memory. This offset would allow the upper half of the full-scale conversions to be stored in the assigned MCA memory.

Stabilizer

Click on the **Stab.** button to see the Stabilizer Gain dialog box in Figure 66, which shows a typical stabilizer adjust screen. The controls you see on your adjust screen may vary, depending on which stabilizer you assigned to this datasource.

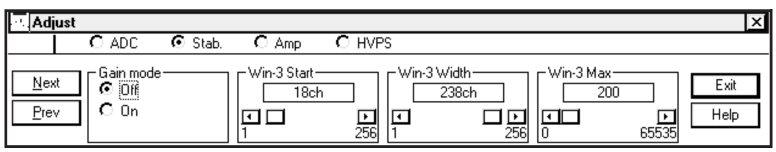


Figure 66 Typical Stabilizer Adjust Dialog

Figure 67 shows the relationship between several of the Stabilizer's functions.

After setting the Stabilizer's controls, perform a **File** | **Save** so that the next time this datasource is selected, the proper setting will be loaded into the MCA.

Gain Centroid

This control sets the reference channel at the high end of the spectrum for gain stabilization, since gain drift is more pronounced in the upper channels. The centroid's channel number can also be typed in from the keyboard, then accepted with the Ok button within the control. To allow the stabilizer to correct for gain drift, the count rate in the gain reference peak must be significantly higher than the count rate in the background.

Zero Centroid

This control sets the reference channel at the low end of the spectrum for zero intercept stabilization, which prevents interference from the effects of gain drift. The centroid's channel number can also be typed in from the keyboard, then accepted with the Ok button

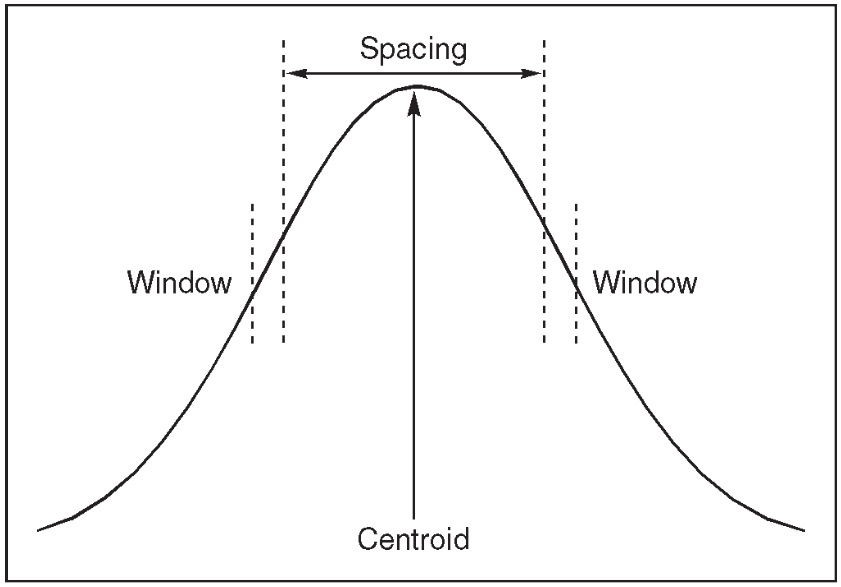


Figure 67 Relationship Between Stabilizer Functions

within the control. To allow the stabilizer to correct for zero drift, the count rate in the zero reference peak must be significantly higher than the count rate in the background.

Gain and Zero Window Controls

These controls set the width (in channels) of the upper and lower sampling windows for each Mode. The operation of the stabilizer depends on measuring the count rate in these two windows, detecting a difference, then providing a correction to equalize count rates.

Gain and Zero Spacing Controls

These two controls set the spacing (in channels) between the upper and lower sampling windows for each Mode. The windows should be placed so that a shift in the reference peak reflects a significant change in count rate through the windows. For broad peaks, the spacing should be set so that the windows edges are not on the flat part of the peak.

Gain and Zero Mode Controls

The Stabilizer’s Gain and Zero, or both, can be set to Off, On or Hold.

If the drift in either mode (zero or gain) exceeds the Correction Range, the overrange flag will be set and that mode will be changed to *hold*. Set that mode to *off* to clear the overrange flag, then correct the cause of the excessive drift before returning the mode to *on*.

On enables stabilization for the specified mode, allowing the Stabilizer to compare the incoming data to the Mode's Centroid and Window settings, then compensate for data below (or above) the Centroid.

Off disables stabilization for the specified mode and sets the correction adjustment to zero and clears the overrange flag if it was set.

Hold disables stabilization for the specified mode, but maintains the current correction adjustment at the Stabilizer's output.

Amplifier

Click on the **Amp** button to see the dialog box in Figure 68, which shows a typical adjust screen for a programmable amplifier. The controls you see on your adjust screen may vary, depending on which amplifier you assigned to this datasource. Click on the **Next** button to see the PUR and Pole/Zero controls.

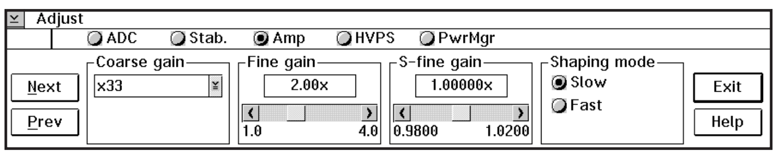


Figure 68 Typical Amplifier Adjust Dialog

Coarse Gain

The Amplifier's Coarse gain setting is selected from the drop down list. For most configurations, it's best to choose the highest Coarse Gain which, combined with the Fine and S-Fine Gains, will produce the total desired gain.

Fine Gain and S-fine Gain

The Fine Gain and Super Fine Gain controls are set with their Scroll Bars.

Shaping Mode

This control sets the amplifier's shaping time constant for use with different detectors.

PUR

This control, turns the amplifier's Pileup Rejector (PUR) **On** or **Off**. When PUR is *on*, a Live Time correction is performed for pulses that are piled up. A procedure for adjusting the Pileup Rejector for optimum performance is described in "Adjusting the PUR/LTC" on page 334.

BLR Mode

The BLR (baseline restorer) control’s Asymmetrical mode normally offers superior high count rate performance for high resolution Ge spectroscopy. The Symmetrical mode is used on Ge systems with high noise levels, scintillation and proportional detectors, and Si systems.

The Symmetrical mode should always be used for detector systems which exhibit baseline discontinuities resulting from excessive noise and/or high voltage effects, preamp reset pulses and preamp secondary time constants. Secondary preamp fall time constants result in unipolar output undershoots making it difficult to optimize the amplifier preamp matching.

Pole/Zero

The amplifier’s pole/zero, which must be changed whenever the Amplifier’s Shaping is changed or a different detector is used, can be adjusted automatically or manually.

Auto P/Z: Click on **Start** to start the amplifier’s automatic pole/zero optimization process, which is required before acquiring spectra with RC-type preamps.

For auto pole/zero to function properly, the incoming counts should be between 25% and 100% of full scale. For a 0-2 MeV setup, this generally means that at 500 keV or higher, the incoming count rate in this window should be greater than 100 cps. The maximum count rate over the full ADC range should be < 2 kcps. If the pole/zero fails to converge, check for the proper count rate.

The pole/zero adjustment will be more accurate if the spectrum contains a significant count rate above 70% of full scale.

After adjusting the pole/zero, you can see the current pole/zero setting by selecting a different Adjust screen, such as ADC, then reselecting Amp. This will update the number above the slider control. If, after performing an Auto P/Z and refreshing the screen, the setting has changed significantly, try to do another Auto P/Z cycle; the P/Z circuits may need more time to find the optimum setting.

Manual P/Z: In some situations the auto pole/zero may fail to converge to an optimal value, so a slider control is provided which allows you to manually adjust the pole/zero setting. The adjustment procedure is described in detail in the “Manual Pole/Zero” on page 334.

TRP Preamps

When a Transistor Reset Preamp (TRP) is used, the pole/zero is fixed (at 0), but you may have to make an adjustment on the TRP preamp so that the amplifier and ADC are gated off during the preamp’s reset time. This procedure is described in the “Adjusting the TRP Reset Pulse” on page 337.

High Voltage

Click on the **HVPS** button to see the dialog box in Figure 69, which shows a typical HVPS adjust screen. The controls you see on your adjust screen may vary, depending on which HVPS you assigned to this datasource.

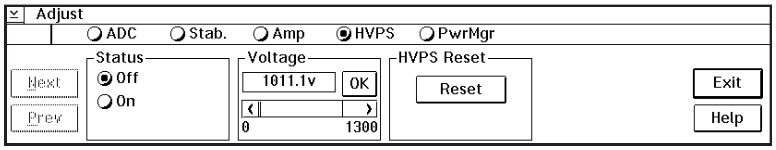


Figure 69 Typical High Voltage Adjust Dialog

Voltage

The **Voltage** scroll bar sets the output of the HVPS between the minimum and maximum settings of the Voltage Limit control set in the MID Editor. The voltage can also be typed in from the keyboard, then accepted with the Ok button within the control.

Status

If the Power Manager, described in the next section, is in the Battery Full mode or the AC Full mode, you can turn the HVPS **On** or **Off**. In the Battery Save mode, you can set the HVPS to **Armed** or **Off**. If Armed is selected, the HVPS will be automatically turned on when acquisition starts.

HVPS Reset

The HVPS is turned Off when a fault caused by an overload or an Inhibit occurs with an Inspector HVPS. After the fault condition has been cleared, click on **HVPS Reset** to reset the HVPS, then turn it On again with the Status control.

Clear Ov/In Latches

When a fault caused by an overload or an inhibit occurs with an ICB HVPS, its Overload and Inhibit latches are set. After the fault condition has been cleared, click on **Clear Ov/In Latches** to reset the latches.

Power Manager

Click on the **PwrMgr** button to see the dialog box in Figure 70, which shows a typical power manager adjust screen. The controls you see on your adjust screen may vary, depending on which power manager you assigned to this datasource.

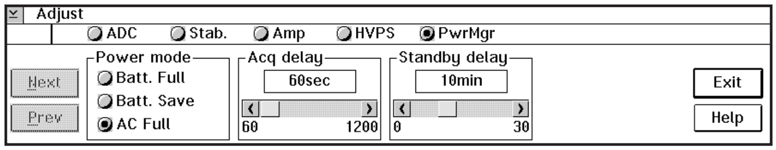


Figure 70 Typical Power Manager Adjust Dialog

Power Mode

Click on a **Power mode** button to select one of the device's power modes.

The **Battery Full** mode keeps the system electronics on at all times using power from the device's batteries.

The **Battery Save** mode minimizes battery drain by turning off some of the device's circuits whenever possible. When data acquisition is initiated, the system changes to the Battery Full mode and data acquisition begins after the Acquisition Delay time has elapsed, which allows time for the high voltage to reach its preset value and for the internal electronics to become thermally stable. When acquisition is finished, the system returns to the Battery Save mode.

In the **AC Full** mode, the device operates from battery port A. If the AC Power Adapter is connected to this port, it will supply power to the device. The AC Adapter's User's Manual tells you how to connect it to the battery port with the supplied connecting cable. If ac power is lost, the Power Manager will automatically switch to port B, allowing its battery to continue supplying power. When ac power is restored, the Power Manager will switch back to port A.

Acq. Delay

The **Acq. Delay** control (enabled only in the Battery Save mode) sets a delay time which holds off actual data acquisition until the high voltage has reached its preset value and the internal electronics are thermally stable. A minimum delay of one minute is provided to allow the high voltage to increase to its preset value and the internal electronics to warm up. The internal electronics will stabilize to within 0.1% of their final settings in less than five minutes.

Standby Delay

The **Standby delay** control sets the amount of time that the system can remain idle (neither acquiring data nor communicating with the host computer) before it automatically changes to Standby. In Standby, all electronics except the Power Manager are shut down until the next command is received from the host. A setting of 0 minutes will prevent the device from switching to Standby.

MCS

The MCS Adjust (Figure 71) allows you to set parameters such as Dwell time, Mode and ROI limits for the MCS device. The controls you see on your adjust screen may vary, depending on which MCS you assign to this datasource.

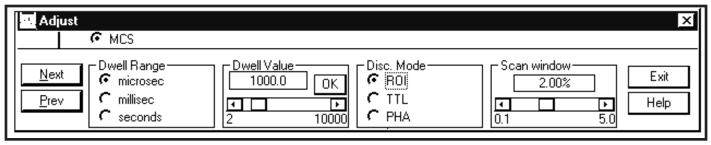


Figure 71 MCS Adjust Dialog

Dwell Range

Choose seconds, milliseconds, or microseconds as the Range for the dwell time.

Dwell Value

Sets the dwell-time, within the selected Range.

Disc. Mode

This can be TTL, FDisc or ROI. TTL picks up the signals to be counted from the external connector; FDisc sees any counts converted by the DSP; ROI counts only those events in a limited Region of Interest.

For the AccuSpec FMS board there is a special mode of operation that emulates PHA acquisition. For this detector, PHA replaces FDisc as a possible mode, and the following controls (to support “psedo-PHA”) appear:

Scan Window

The percent of the start/end window used to set the discriminator ROI.

Scan Start

Percent of full scale where the scan for PHA data will start.

Scan End

Percent of full scale where the scan for PHA data will end.

Set ROI

The FMS board uses SCA LLD and ULD (as percent of full scale) instead of ROI Start and End. This button picks up the current Left and Right Marker positions and sets those values from them. Those settings will then be used for any subsequent ROI-mode acquisition.

Pseudo-PHA

Pseudo-PHA is intended to be used to collect a pseudo spectrum to be used for defined discrimination window to be used during ROI mode of MCS. When you select PHA mode and then Start Acquire, the values for scan window, scan start, and scan end will be used as follows:

- With a fixed dwell time (2 ms).
- The discrimination ROI is set to the scan window, limited by (and scaled to) the scan start and scan end.
- That “scan window” moves across the spectrum, synchronized with the dwell time.

When collect ends, either by preset (sweeps) reached or manual Stop, you can place the Left and Right markers on either side of the peak of interest, and then use the **Set ROI** button to pick up those positions and (using the values of scan start and end) convert those positions into a discrimination ROIs (SCA LLD and SCA ULD) that will be used for subsequent MCS acquisition. Or you can try again, moving your scan start and/or scan end *in* so that the board will see a smaller part of the full scale allowing you to get better resolution.

Status

Selecting **Status** shows a Status Report of all devices (MCA and programmable front-end electronics) associated with the current hardware datasource. Figure 72 shows a typical Status Report, which includes device type, serial number, and any programmable settings that are obtainable from each device. An asterisk next to the parameter means that the setting read from the device was different than expected.

Though the majority of the entries in the Status Report are direct reflections of the MCA Input Definition Editor settings or the spectral display Adjust settings, a few of them are explained in greater detail in the “Status Screen Entries” on page 338.

The **Update** button sends all programmable parameters to the devices and verifies them, updates the Status Screen, and, if the Status field had been changed to red because an error was detected on the datasource, changes the field to white if the reported error has been corrected (remember that a datasource includes an MCA and various front-end devices). You’ll find more information on possible errors in “Genie 2000 Input Datasource Errors” in Appendix C, *Error Codes*, in the *Genie 2000 Customization Tools Manual*.

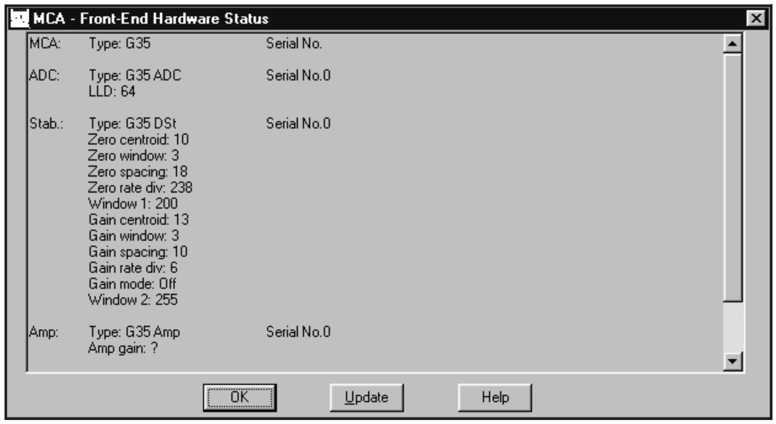


Figure 72 Typical Status Report

Advance

Selecting **Advance** issues an advance command to a sample changer assigned to the current hardware datasource. If this datasource does not have a sample changer assigned to it in the MID configuration file, the command will not be issued.

Load

If you are displaying a Detector (hardware) datasource and you have at least one CAM File datasource open, you can copy spectral data and energy calibration information from the selected CAM File datasource to the Detector datasource.

Selecting **Load** displays the dialog box in Figure . Use the “Load from:” list box to choose one of the open CAM File datasources. If you want to copy the energy calibration information as well, select the “Include Energy Calibration” check box.

Calibrate Menu

The **Calibrate** menu provides several options for calibrating the energy and efficiency of the datasource, graphically displaying the calibration, setting preferences for the calibration, and loading and storing calibration files.

Setup

Setup displays a dialog screen (Figure 73) which allows you to select preferences and calibration settings to be used throughout the calibration and analysis processes.

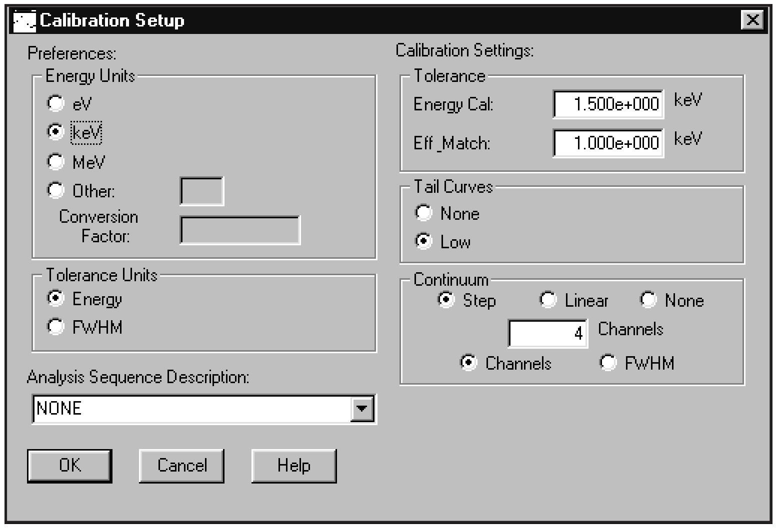


Figure 73 Calibration Setup

Preferences

Energy Units: Though energies are stored in keV, you can change how energy units are shown in the display's dialog boxes and in reports: eV, keV, MeV or Other.

The proper Conversion Factor for "other" units is defined as the number of keV units equal to 1 "other unit". For example, the conversion factor for MeV would be 1000 because there are 1000 keV units in 1 MeV.

Tolerance Units: For the units to be used for entering tolerances, chose either Energy (a constant energy value across the spectrum) or FWHM (the energy varies according to the FWHM calibration).

Calibration Settings

Tolerance: Energy Calibration and Peak Match values can be set in terms of energy (in the selected energy units) or FWHM.

Energy Calibration Tolerance is used during energy calibration in matching spectrum peaks to the current populated list, plus or minus the tolerance value.

Efficiency and Match Tolerance is used during efficiency calibration to match calculated peaks with the peaks in the specified certificate file, plus or minus the tolerance value. It is also used to match energies and peaks during later analysis.

Tail curves: None or Low. A germanium detector (for instance) tends to exhibit tailing on the low energy side of its peaks, so you'd normally choose Low to take this into account during calibration. None is usually appropriate for NaI spectra.

Continuum: Linear, Step, None. You can establish the continuum by selecting either a Linear function or a Step function. The **Linear** function is adequate when the continuum is relatively flat. It is a simple, straightforward equation that estimates the continuum under the peaks as a trapezoid. The **Step** function should be chosen if there are any regions in the spectrum where the continuum is significantly higher on the left side of a peak region than on the right side. This function automatically reduces to a flat line when the continuum is flat. **None** is typically used only with Alpha spectra.

The value in the **Channels text box** establishes the continuum under the peak ROIs. If you have two peaks that are close together, reducing the number of continuum channels may give better results. If you have poor peak statistics and there are no other peaks nearby, increasing the number of continuum channels establishes the continuum more accurately but makes it more likely that close lying peaks will be considered as a multiplet instead of as a singlet.

FWHM or Channels. Choose **FWHM** to let the continuum vary according to the shape calibration. Choose **Channels** to keep the continuum fixed across the spectrum. The specified number of FWHMs or the specified number of continuum channels will be used on both sides of the peak to establish the continuum under the peak ROIs.

If you plan to use either the Cursor or the Marker method and the calibration peaks are very close to other peaks, you should set the continuum mode to Channels and set the value in the Channels text box to a small number. The Cursor and Marker methods *do not* use the expected FWHM information, even when it is available. If you plan to use the Auto button, you may set the continuum mode to FWHM. If you plan to use a mixture of both modes, both parameters should be set appropriately.

Analysis Sequence Description

The Analysis Sequence Description dropdown is a list of the currently defined analysis sequence on your system. Selecting one of the sequences will direct efficiency calibration to execute the peak locate and peak area engines of the selected sequence when the Auto button is pressed. The default selection is NONE.

Energy Only Calibration

The standard energy calibration includes low-tail and FWHM values. For a simpler energy calibration, this function (Figure 74) allows you to enter the calibration using only energy/channel pairs, either by the Cursor method or the Manual Method. If only one energy/channel pair is entered, a second pair will automatically be generated as <energy/channel, 1> when you exit the dialog with an **OK**.

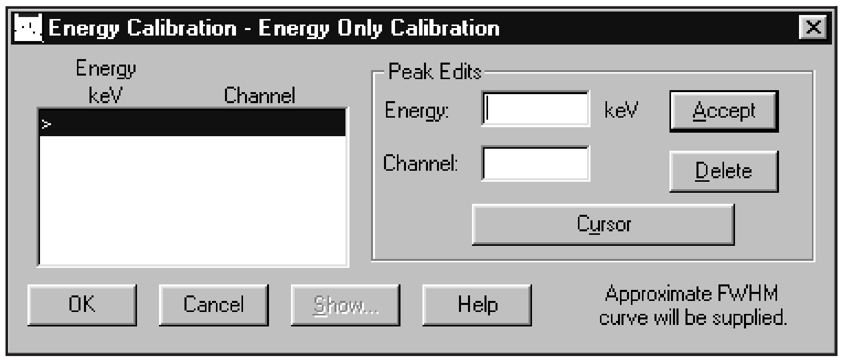


Figure 74 Energy Only Calibration

Manual Method

To add an entry to the list box, type an energy value into the Energy text box and the corresponding channel number in the Channel text box, then select **Accept**. You can add these energy/channel pairs in any order; they will always be displayed in ascending energy order.

Cursor Method

To use this method, there must be a spectrum in the Spectral Display area and its cursor must be on the peak that is being used for calibration.

Select the **Cursor** button to add the window's cursor channel position to the Channel text box. Now enter an energy value in the Energy text box and press **Accept** to add the data to the list box.

Show

This function is available only when at least two energy/channel pairs have been entered, either by you or by the system. When you select the **Show** button, the energy calibration curve will be displayed as a graph. Please refer to "Energy Show" on page 105 for a complete discussion and an illustration of this function.

Delete

To remove a line and its values from the list box, highlight the line, then select the **Delete** button.

Energy Coefficients

Selecting **Energy Coefficients** displays a dialog box (Figure 75) which allows you to edit or manually enter known energy calibration coefficients for the energy vs. channel, FWHM vs. energy, and tail vs. energy curves.

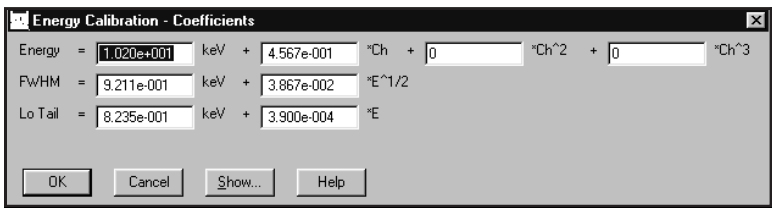


Figure 75 The Energy Coefficients Dialog

If you edit an existing calibration curve, any points previously used to generate that curve will be deleted and will not be available for further Populate operations on the current datasource.

Show Button

Select the **Show** button to display the energy calibration curve as a graph. Please refer to “Energy Show” on page 105 for a complete discussion and an illustration of this function.

Energy Full

When you select **Energy Full**, its menu lets you choose how energies are to be entered for spectrum calibration:

- By Certificate File, which allows you to select a certificate file containing the energies.
- By Nuclide List, which allows you to select a list of nuclides and their energies from a specified library.
- By Calibration File, which allows you to select a calibration file defining the list of energies.

- By Entry, which lets you manually enter each energy, its channel number, and its FWHM and Low Tail values.

By Certificate File

Calibrating **By Certificate File** lets you choose either of two types of a certificate file (Figure 76) as a source of calibration energies: full or partial. The partial certificate file (.CTP) is similar to the full certificate file (.CTF), lacking only the assay date and time and the activity units for each nuclide. See “Save as Certificate” on page 98 for more information.

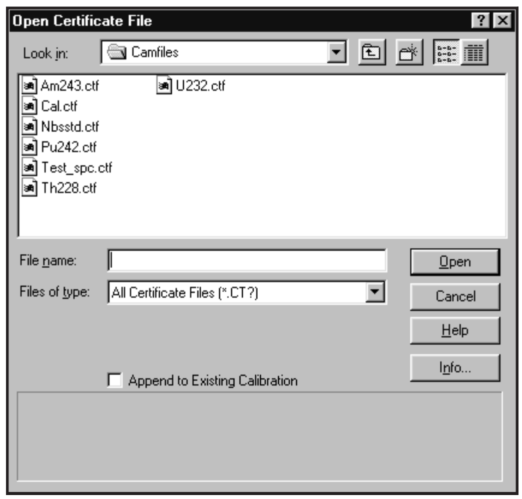


Figure 76 Calibrate by Certificate File

When you have highlighted the certificate file name you want to use, you can either select **Info** to see more information on the file, or select **OK** to load the file’s energy data into the energy line editor.

Append to Existing Calibration

When adding energy points to the current datasource from a file, such as in constructing a composite energy file, there may be common energy points in the two files. If the **Append to Existing Calibration** checkbox is selected, the system will ask if you want to append to the existing calibration. If you answer “yes”, it will tell you each time it finds a duplicate entry.

Editing the List

When you select **OK**, you'll see the "Energy Calibration – Full" screen, which allows you to examine and, if necessary, edit the data in any of the lines. Please refer to "Energy Calibration – Full" on page 102 for an illustration and explanation of this screen.

By Nuclide List

Calibrating **By Nuclide List** lets you choose a nuclide list (Figure 77) as a source of nuclide lines. You can accept all nuclides in the list by choosing **OK** to move to the "Energy Calibration – Full" screen, which allows you to examine and, if necessary, edit the data in any of the lines. Please refer to "Energy Calibration – Full" on page 102 for an illustration and explanation of this screen.

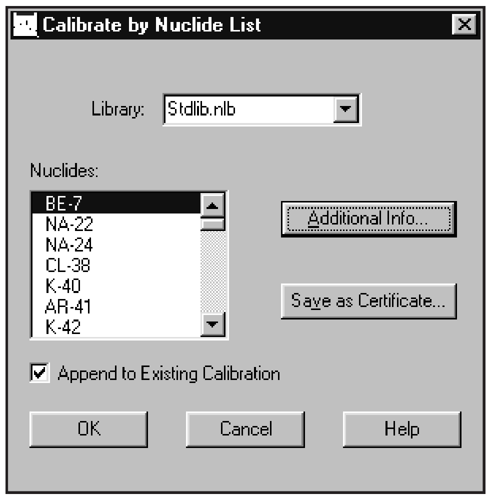


Figure 77 Calibrate by Nuclide List

Save as Certificate

If you highlight one or more nuclides, then choose **Save as Certificate** you'll create a "partial" certificate file (.CTP) which can be used for energy calibration.

This certificate file is similar to the "full" certificate file (.CTF) created in the Certificate File Editor (page 191), lacking only the assay date and time and the activity units for each nuclide.

Append to Existing Calibration

When adding energy points to the current datasource from a file, such as in constructing a composite energy file, there may be common energy points in the two files. If the **Append to Existing Calibration** checkbox is selected, the system will ask if you want to append to the existing calibration. If you answer “yes”, it will tell you each time it finds a duplicate entry.

You can select **OK** to save this limited data as a “partial” certificate file. If you want to add the missing information, making this a “full” certificate file, highlight one or more nuclides, then choose **Additional Info** to enter the additional data .

Additional Nuclide Information

In addition to entering the nuclide’s assay date and time and its activity units, this screen (Figure 78) lets you enter the percent uncertainty and change the activity units.

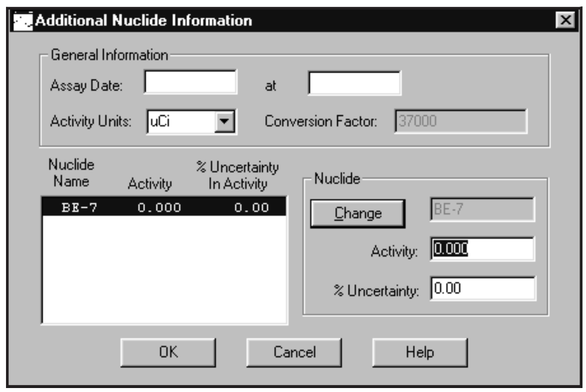


Figure 78 Entering Additional Nuclide Information

General Information: These text boxes let you enter or change assay date and time and the activity units.

The **Assay Date** is the date and time when the source was measured (you must enter both).

Though **Activity Units** defaults to µCi, you can choose another unit for reporting nuclide activities. The **Conversion Factor** defaults to the proper value for converting Bq to µCi. If you choose the last item in the Activity Unit list, < >, you can type in the name of any other unit, then enter the Conversion Factor that will convert your units to µCi.

Nuclides: Highlight a nuclide in the list box to enter or edit its Activity and Percent Uncertainty data. When you’ve finished editing that nuclide, select **Change**. This will copy the data to the list file and move the highlight to the next nuclide.

When you've finished, select **OK** to save this as a "full" (.CTF) certificate file and return to the Calibrate by Nuclide List screen. You'll see that all nuclides which have Additional Nuclide Information added are marked by a double asterisk (**).

If you are satisfied that all data in the Calibrate by Nuclide List screen is correct, you can select this screen's **OK** to load the file into the energy line editor.

Editing the List

When you select **OK**, you'll see the "Energy Calibration – Full" screen, which allows you to examine and, if necessary, edit the data in any of the lines. Please refer to "Energy Calibration – Full" on page 102 for an illustration and explanation of this screen.

By Calibration File

Choosing to calibrate **By Calibration File** displays a dialog box (Figure 79) which lets you select a Calibration File defining the list of energy/channel pairs to be used for calibration. The **Info** button displays descriptive information for the selected file.

Figure 79 Calibrate by Calibration File

Append to Existing Calibration

When adding energy points to the current datasource from a file, such as in constructing a composite energy file, there may be common energy points in the two files. If the **Append to Existing Calibration** checkbox is selected, the system will ask if you want to append to the existing calibration. If you answer "yes", it will tell you each time it finds a duplicate entry.

Editing the List

When you select **OK**, you'll see the "Energy Calibration – Full" screen, which allows you to examine and, if necessary, edit the data in any of the lines. Please refer to "Energy Calibration – Full" on page 102 for an illustration and explanation of this screen.

By Entry

Choosing to calibrate **By Entry** displays a dialog box (Figure 80) which lets you manually enter energy/channel pairs to be used in generating the energy calibration coefficients for the energy vs. channel equation.

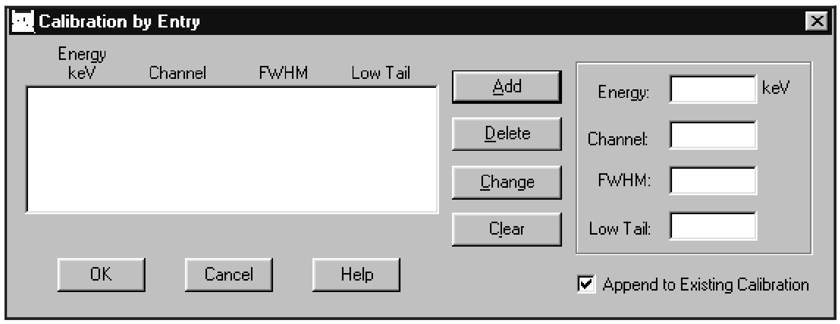


Figure 80 Calibrate by Entry

You must also manually enter FWHM values to be used in generating the shape calibration coefficients for the FWHM vs. energy equations.

If Low Tail Curve was selected in Calibration Setup (page 93), you are also allowed to manually enter Low Tail values to be used in generating the shape calibration coefficients for the Low Tail vs. Energy equations.

Add Button

To create an entry in the list box, type an energy value into the Energy text box, then the corresponding channel number, FWHM value (in channels), and Tail value (in channels) in their text boxes. When the values have been entered, select **Add**. You can add these energy/channel pairs in any order; they will always be displayed in ascending energy order.

Delete Button

To remove a line and all its values from the list box, highlight the line, then select the **Delete** button.

Change Button

To change any of the values for a line, highlight the line, edit any of the values, then select the **Change** button to move the changes to the list box.

Clear Button

Instead of editing the values one by one, you can remove all values from the text boxes for the highlighted line by selecting the **Clear** button. This will clear all entries at the once.

Append to Existing Calibration

When adding energy points to the current datasource from a file, such as in constructing a composite energy file, there may be common energy points in the two files. If the **Append to Existing Calibration** checkbox is selected, the system will ask if you want to append to the existing calibration. If you answer “yes”, it will tell you each time it finds a duplicate entry.

Editing the List

When you select **OK**, you’ll see the “Energy Calibration – Full” screen, which allows you to examine and, if necessary, edit the data in any of the lines. Please refer to “Energy Calibration – Full” on page 102 for an illustration and explanation of this screen.

Energy Calibration – Full

The **Energy Calibration – Full** dialog (Figure 81) allows you to mark calibration peaks in a reference spectrum, then calculate the energy vs. channel, FWHM vs. energy, and tail vs. energy curves. You can enter Calibration peaks into the list box by the Cursor Method or the Marker Method, described in the following subsections.

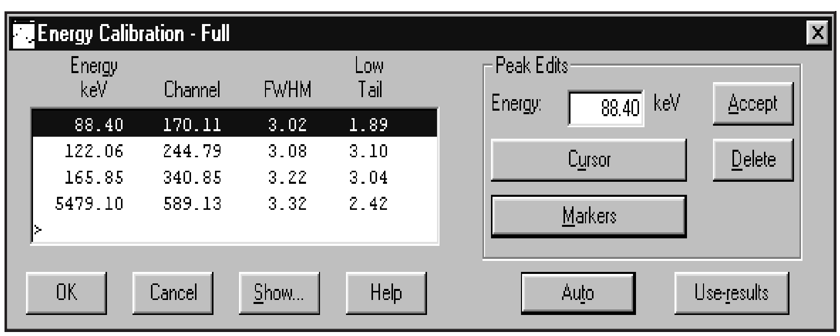


Figure 81 The Energy Calibration – Full Dialog

Peak Edits

In the Peak Edits box, you'll see the **Cursor** button, which is used with the Cursor Method, the **Markers** button, which is used with the Marker Method, and for both methods, the **Accept** button, used to add the entry in the Energy text box to the list box, and the **Delete** button, used to delete the highlighted entry from the list box.

You'll also see the **Ref Pk** button, which selects/deselects the currently highlighted entry in the list box as the reference peak. Only one peak, from a pulser for instance, may be assigned as a reference peak. The reference peak will not be used during the calculation of the calibration coefficients.

Cursor Method

To use the Cursor Method, there must be a spectrum in the Spectral Display area and its cursor must be on the peak that is being used for calibration.

Select the **Cursor** button to use the window's cursor channel position to determine an approximate FWHM in order to establish a computed (as opposed to displayed) ROI and attempt to fit the peak. The computed peak centroid, computed FWHM, and tail values will be calculated and displayed in the list box.

Now enter an energy value in the Energy text box and choose **Accept** to add the data to the highlighted list box entry.

Note that because the Cursor Method uses a relatively unsophisticated routine to determine ROI limits, it is not the best choice in certain calibrations, such as for NaI spectra. The Marker Method is recommended for NaI spectra.

Marker Method

To use the Marker Method, there must be a spectrum in the Spectral Display area and its markers must be around the peak that is being used for calibration.

Select the **Markers** button to use the window's markers to establish an ROI and attempt to fit the peak. The computed peak centroid, computed FWHM, and tail values will be calculated and displayed in the list box.

Now enter an energy value in the Energy text box and choose **Accept** to add the data to the highlighted list box entry.

The Marker Method is recommended for spectra where there are other peaks close to the calibration peak or when calibrating NaI spectra.

Auto Buttons

The **Auto** button performs an automatic peak locate on the reference spectrum. The list box is then populated with those energies found in both the populate file and the reference spectrum with their associated channel values.

Use-Results Button

The **Use-results** button will retrieve energy/channel/FWHM/tail results directly from the current datasource and populate the list box. This button will be disabled if peak area analysis results are not present.

Show Button

Select the **Show** button to display the energy calibration curve as a graph. Please refer to “Energy Show” on page 105 for a complete discussion and an illustration of this function.

Energy Recalibration

Selecting **Energy recalibration** displays a dialog box (Figure 82) which lets you recompute the energy vs. channel calibration curve. Shape calibrations (FWHM and Low Tail) are not affected by this command; note that the FWHM/energy and Low Tail/energy pairs used by the shape calibration curves are zeroed out.

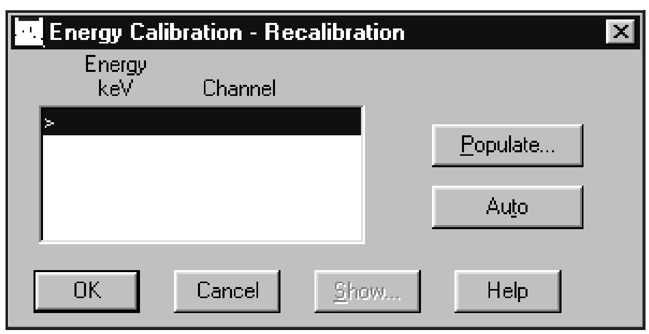


Figure 82 The Energy Recal Dialog

Populate

The **Populate** button invokes a dialog screen, similar to the one in Figure 83, which allows you to populate the list box with the energies from the current datasource, a certificate file, or a previously stored calibration file.

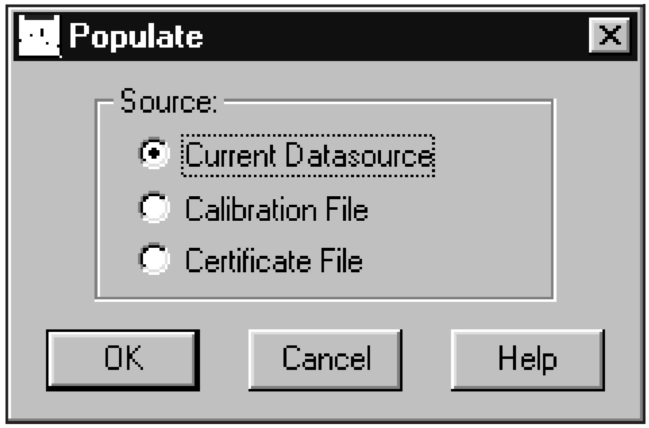


Figure 83 The Populate Screen

If the certificate or calibration population option is invoked when the list box already contains energies, there may be a duplication of energy entries. If a duplicate is found, you will be asked if you want to replace the existing energy entry.

Auto

The **Auto** button performs an automatic peak locate on the reference spectrum. The list box is then populated with those energies found in both the populate file and the reference spectrum with their associated channel values.

Show Button

Select the **Show** button to display the energy calibration curve as a graph. Please refer to “Energy Show” on page 105 for a complete discussion and an illustration of this function.

Energy Show

Selecting the Energy Show menu item (or the **Show** button on some screens) will display the calculated energy calibration curve as a graph, as seen in Figure 84. You can select the **Energy** button to show the energy curve or you can select the **Shape** button to show the FWHM and Low Tail curves.

The Show Energy Calibration Curves display contains a Peak text box so that you can eliminate outlying peaks one at a time. Enter the number of the peak to be dropped, then select **Drop Pk**. The peak will be deleted from the list and both the curve and the equation will be regenerated. You may repeat Drop Peak until satisfactory results are obtained but you can’t reduce the number of data points to less than two.

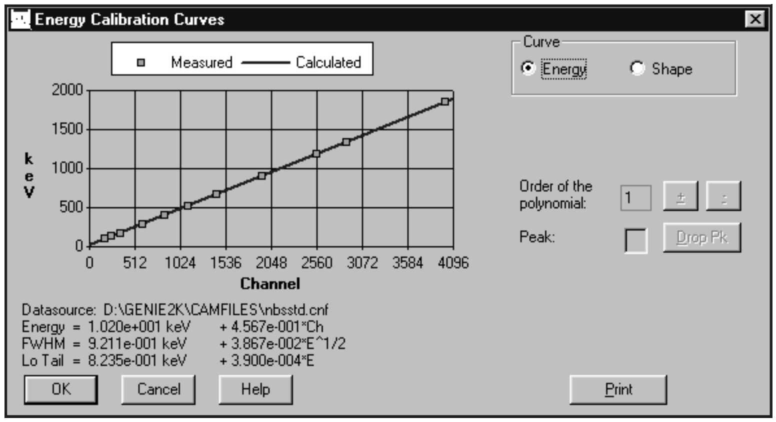


Figure 84 A Typical Energy Show Display

Note that the "Order of the polynomial" is limited by the number of data points present. For instance, at least two points are required for a first order curve and at least four points are required for a third order curve.

The "Order of the polynomial" field is enabled for the energy curve only. Click on the '+' ('–') button to increase (decrease) the order value.

Select the **Print** button to send an output of the currently displayed curve(s) to the default print queue.

Peak-to-Total Calibration

A Peak-to-Total efficiciency calibration is required prior to using the Cascade Summing Correction feature (refer to "Cascade Correction" on page 159).

Guidelines for Improving Accuracy

The following are provided as guidelines for performing an accurate Peak-to-Total (P/T) calibration.

Calibration Sources

In order to carry out a P/T calibration we recommend a set of low cost point sources with the following nuclides: ^{109}Cd, ^{57}Co, ^{113}Sn, ^{137}Cs, ^{54}Mn and ^{65}Zn. The Model S-PTC P/T Calibration Source Set, available from Canberra, is a convenient set of radioactive sources suitable for the P/T calibration of any detector.

Note that the peak-to-total ratios at ^{109}Cd (88 keV) and ^{113}Sn (392 keV) gamma ray energies could be inaccurate because of X-ray contributions to the total counts in these spectra. To filter out the X rays, either a thin absorber foil may be placed between the source and the detector, or the ‘extrapolation channel’ parameter (page 108) may be used to cut off the X ray and noise contributions to the total.

Background Compensation

When the ambient background in the counting area is not negligible, it is recommended that a background spectrum be acquired, and used while performing the P/T calibration.

Calibration Curve Fitting

The cascade summing correction factors obtained using Genie 2000 software could be in serious error if you’re not careful in fitting the P/T calibration curve. The error due to extrapolating the curve beyond the last empirical P/T data point could be significant. To avoid this, it is highly recommended that a dual-curve fit with a crossover energy of 122 keV (^{57}Co) be used. It is further recommended that the default order of 2 be used for the high energy polynomial. This would provide a linear and a predictable extrapolation in the log-log scale.

Keeping the above in mind, you can correctly use the Peak-to-Total Calibration procedure described in the following sections.

Performing a Peak-to-Total Calibration

Selecting the **Peak-to-Total** command opens the dialog box shown in Figure 85.

Selecting the Calibration Spectra

The first step is to select the spectra that will be used for the Peak-to-Total (P/T) calibration. These spectra must each have been generated by a single line nuclide (or a nuclide which does not give rise to coincidence summing effects), and have these characteristics:

- The files must all be stored in the same subdirectory on your hard drive or network.
- The files must all be of the same size (e.g. 4K channels, 8K channels, etc.).
- The files must all be Energy Calibrated, though they’re not required to have the same energy calibration.
- All spectra used for the P/T calibration (including the optional background file) must be acquired under similar conditions (geometry, background, etc.).

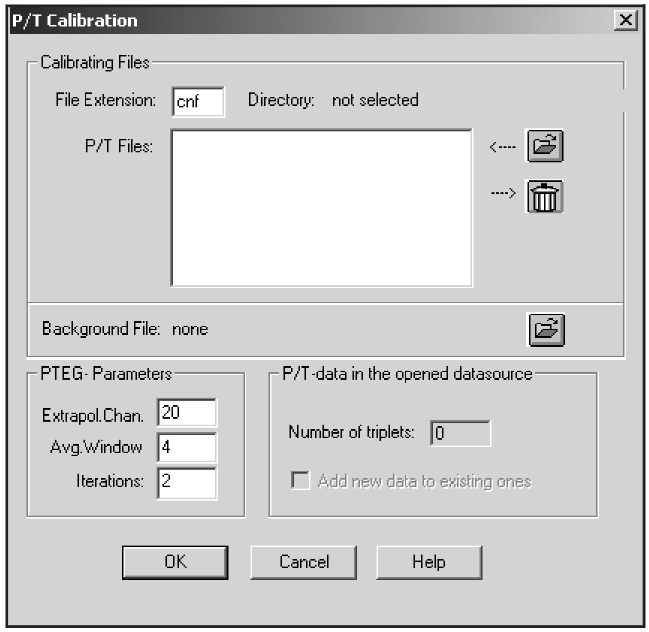


Figure 85 The Peak-to-Total Dialog

Click the **File Folder** button (uppermost button on the right) to navigate to the directory where the P/T calibration files are stored. Hold down the CTRL key and select as many files as you want to work on, then select **OK**.

The list of selected files will be displayed in the P/T dialog box (Figure 86). If you don't want to use one of the files, it can be removed by selecting it, then clicking on the **Garbage Can** button.

Selecting the Background Spectrum

It is recommended that a background spectrum be selected for subtraction during the P/T calibration process. Click the **File Folder** button to the right of Background File field to select this file.

Note: The background file must be the same size (number of channels) as the calibration files and must be energy calibrated.

Parameters

The defaults for the three PTEG parameters are best for most situations, but may be changed if necessary.

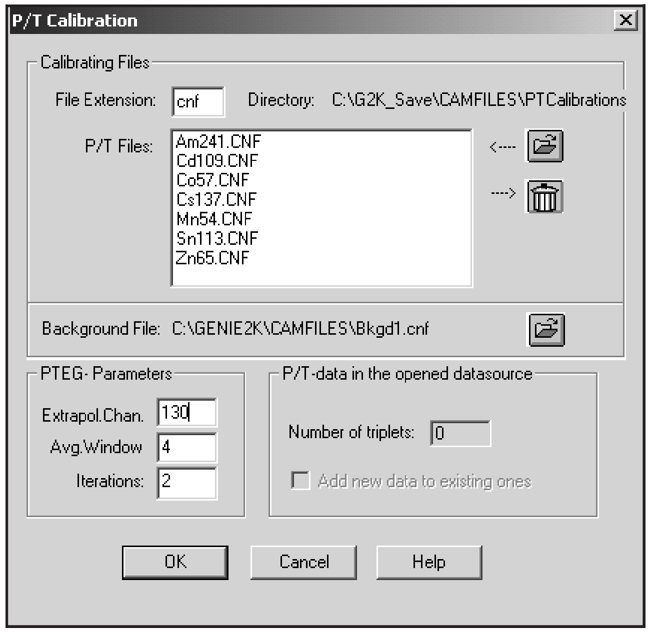


Figure 86 The Selected Spectra

Extrapol. Chan.

This parameter defines a lower limit (LLD) channel for the P/T calibration spectra. Spectral data below the extrapolation channel are replaced by a computed (predicted) value. Use this lower limit adjustment to discard unwanted low energy content (i.e. noise, etc.).

Avg. Window

The average window width to be used during peak analysis. This parameter sets the number of channels to the left and right of the extrapolation channel, and is used to determine the an average count to be placed in all channels from zero to the Extrapolation Channel.

Iterations

This parameter displays the maximum number of iterations being used to correct for side-peaks on the P/T ratio during calibration. Ten iterations are more than sufficient to insure convergence to within 0.1%.

Peak-to-Total Data in the Opened Datasource

The **Number of triplets** (energy/efficiency/error) used will be displayed if the datasource is already P/T calibrated and **Add new data to existing ones** will be enabled. Select the checkbox to add the new data to be incorporated into the existing P/T calibration. Deselect it to replace the existing P/T calibration.

Performing the Peak-to-Total Calibration

After you've entered all of the parameters, click on **OK** to perform the calibration. While the calibration is being performed, an "in progress" message is displayed. Figure 87 shows the calibration results.

Editing the Peak to Total Calibration Results

Figure 87 shows how the results of the P/T calibration can be reviewed and edited as needed. At this stage of the process, the effect of the side-peaks on the P/T ratios for ^{57}Co, ^{113}Sn, and ^{65}Zn has not yet been corrected for the effect of side peaks. The displayed P/T ratios shown are therefore still uncorrected values.

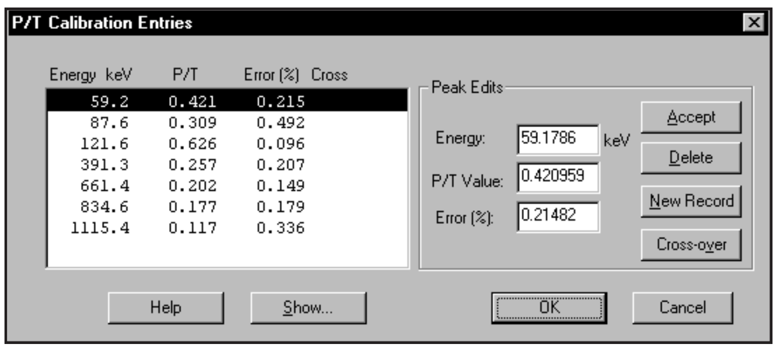


Figure 87 The P/T Calibration Results

Click on either the **Show** or **OK** button to correct for the effect of the side peaks, using the selected number of **Iterations**.

Editing an Entry

To edit an entry, highlight it to transfer its data into the **Peak Edits** text entry fields. Make any needed edits, then click on the **Accept** button to store the revisions.

Deleting an Entry

Select an entry, then click on the **Delete** button.

Note: There is no confirmation dialog; the peak and its data will be removed from the list and cannot be recovered.

Adding a New Entry

To add a new entry to the list:

1. Click on **New Record** to clear the Peak Edit fields.

2. Enter the new entry’s values into the appropriate fields.

3. Click on **Accept** to insert the new entry into the list.

Establishing a Crossover Energy

For fitting the peak-to-total calibration curve, it is recommended that a dual polynomial curve fit be used. To do this, a crossover energy must be specified. The recommended crossover energy is 122 keV.

Click the **Cross-over** button to select the currently highlighted entry in the list box as the crossover energy point. Only one crossover point may be assigned. The selection of a crossover energy point indicates that two curves will be generated for the dual polynomial curve. If no crossover energy point is selected, a single curve will be generated. The result of doing this can be seen in Figure 88. Note that at least two data points must exist on each side of the crossover energy point for dual curves to be generated.

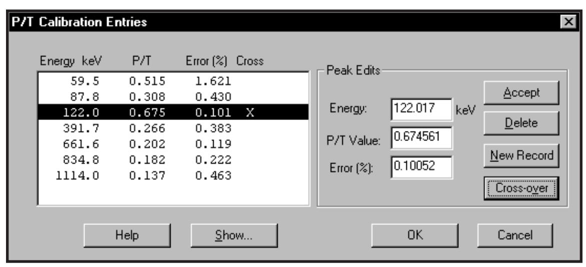


Figure 88 A Crossover Peak has Been Selected

Clicking either **Show** or **OK** starts the correction, with the software performing the iterations to correct the peak-to-total ratios for the effect of the side-peaks. By clicking on the **List** button in the Show display shown in Figure 88, the iterated or final values of the peak-to-total ratios may be displayed.

Peak-to-Total Show

Select the **Show** button to display the Peak-to-Total calibration curve as a graph (Figure 89). Please refer to “Efficiency Show” on page 120 for a complete discussion of this function. Note that the default order for the polynomial is two (2) for both the low energy and high energy curves

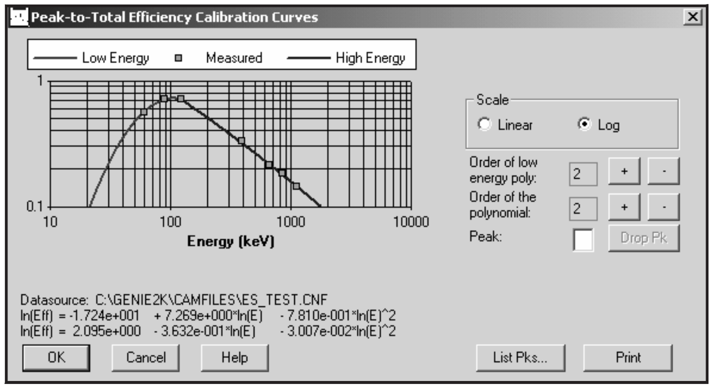


Figure 89 Show the Peak-to-Total Calibration

Efficiency

When you select **Efficiency**, its menu lets you choose how energies are to be entered for spectrum calibration:

- By Certificate File, which allows you to select a certificate file containing the energies.
- By Nuclide List, which allows you to select a list of nuclides and their energies from a specified library.
- By Calibration File, which allows you to select a calibration file defining the list of energies.
- By Entry, which lets you manually enter each energy and its Efficiency and %Error values.

By Certificate File

Calibrating **By Certificate File** lets choose a certificate file (Figure 90) as a source of calibration energies and their efficiencies. When you have highlighted the certificate file name you want to use, you can select either **Info** to see more information on the file, or **OK** to load the file into the energy line editor.

Append to Existing Calibration

When adding energy points to the current datasource from a file, such as in constructing a composite efficiency file, there may be common energy points in the two files. If the **Append to Existing Calibration** checkbox is selected, the system will ask if you want to append to the existing calibration. If you answer “yes”, it will tell you each time it finds a duplicate entry.

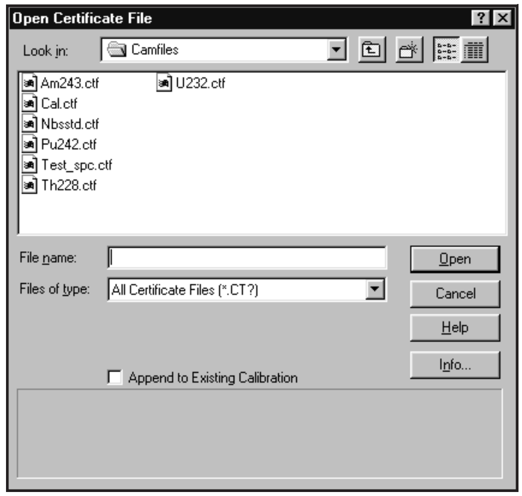


Figure 90 Calibrate by Certificate File

Editing the List

When you select **OK**, you'll see the "Energy Calibration – Full" screen, which allows you to examine and, if necessary, edit the data in any of the lines. Please refer to "Efficiency Calibration" on page 117 for an illustration and explanation of this screen.

By Nuclide List

Calibrating **By Nuclide List** lets you choose a nuclide list (Figure 91) as a source of nuclide lines. You can accept all nuclides in the list by choosing **OK** to move to the "Efficiency Calibration" screen, which allows you to examine and, if necessary, edit the data in any of the lines. Please refer to "Efficiency Calibration" on page 117 for an illustration and explanation of this screen.

Save as Certificate

If you highlight one or more nuclides, then choose **Save as Certificate**, you'll create a "partial" certificate file (.CTP), which is similar to the "full" certificate file (.CTF) created in the Certificate File Editor, lacking only the assay date and time and the activity units for each nuclide.

To save this as a "full" certificate file (to use for efficiency calibration), you'll have to add the missing information. Highlight one or more nuclides, then choose **Additional Info** to enter the additional information.

Append to Existing Calibration

When adding energy points to the current datasource from a file, such as in constructing a composite efficiency file, there may be common energy points in the two files. If the **Ap-**

Figure 91 Calibrate by Nuclide List

pend to Existing Calibration checkbox is selected, the system will ask if you want to append to the existing calibration. If you answer “yes”, it will tell you each time it finds a duplicate entry.

Additional Nuclide Information

In addition to entering the nuclide’s assay date and time and its activity units, the screen in Figure 92 lets you enter the percent uncertainty and change the activity units.

General Information: These text boxes let you enter or change assay date and time and the activity units.

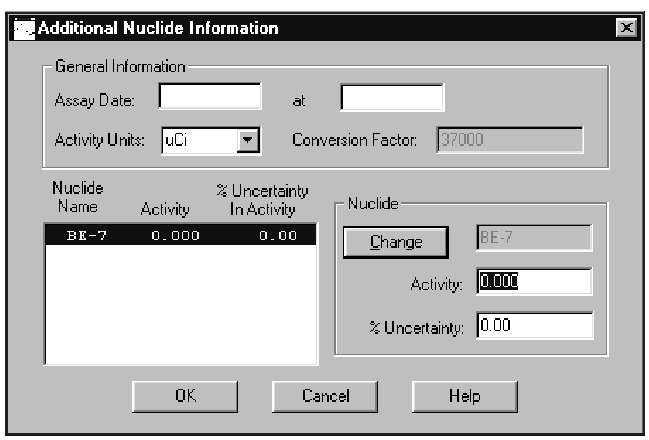


Figure 92 Editing Additional Nuclide Information

The **Assay Date** is the date and time at which the source was measured (you must enter both).

Though **Activity Units** defaults to µCi, you can choose another unit for reporting nuclide activities. Since the activities are stored in microcuries, the **Conversion Factor** defaults to the proper value for converting microcuries to other units. If you choose < >, you can type in the name of an Activity Unit not shown in the list, then enter the Conversion Factor that will convert your units to µCi.

Nuclides: Highlight a nuclide in the list box to enter or edit its Activity and Percent Uncertainty data. When you've finished editing that nuclide, select **Change**. This will copy the data to the list file and move the highlight to the next nuclide.

When you've finished, select **OK** to save this as a "full" (.CTF) certificate file and return to the Calibrate by Nuclide List screen. You'll see that all nuclides which have Additional Nuclide Information added are marked by a double asterisk (**).

If you are satisfied that all data in the Calibrate by Nuclide List screen is correct, you can select this screen's **OK** to load the file into the energy line editor.

Editing the List

When you select **OK**, you'll see the "Efficiency Calibration" screen, which allows you to examine and, if necessary, edit the data in any of the lines. Please refer to "Efficiency Calibration" on page 117 for an illustration and explanation of this screen.

By Calibration File

Choosing to calibrate **By Calibration File** displays a dialog box (Figure 93) which lets you select a Calibration File defining the list of energy/efficiency/error triplets to be used for calibration. The **Info** button displays descriptive information for the selected file.

Append to Existing Calibration

When adding energy points to the current datasource from a file, such as in constructing a composite efficiency file, there may be common energy points in the two files. If the **Append to Existing Calibration** checkbox is selected, the system will ask if you want to append to the existing calibration. If you answer "yes", it will tell you each time it finds a duplicate entry.

Editing the List

When the values for all nuclides have been entered, select **OK** to move to the Efficiency Calibration screen. This screen allows you to examine and, if neccesary, edit any of the lines. Please refer to "Efficiency Calibration" on page 117 for an illustration and explanation of this screen.

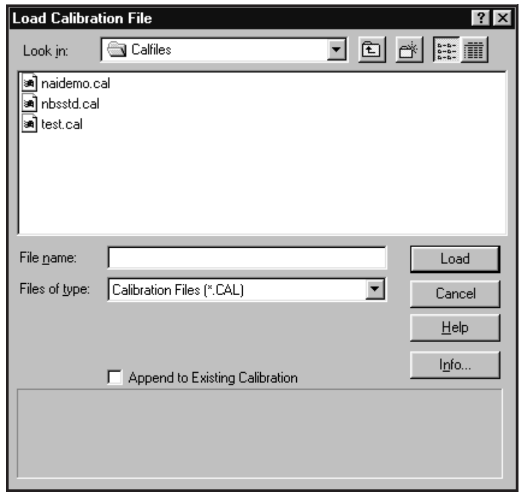


Figure 93 Calibrate by Calibration File

By Entry

Choosing to calibrate **By Entry** displays a dialog box (Figure 94) which lets you manually enter energy, efficiency and percent error values to be used in generating the efficiency calibration. Note that you can use up to 20 calibration data sets for calibration; any more than that will be ignored.

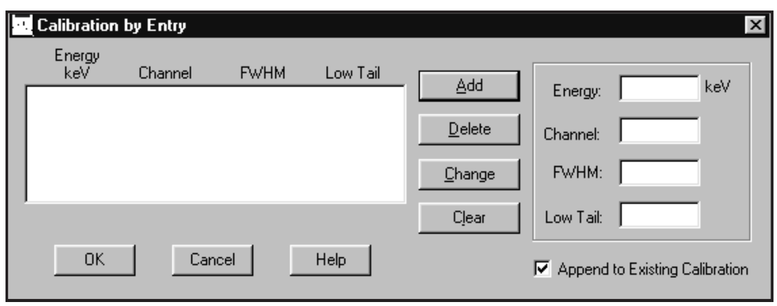


Figure 94 Calibrate by Entry

Add Button

To create an entry in the list box, type an energy value in the Energy text box, then the corresponding Efficiency and Percent Error values in their text boxes. When the values have been entered, select **Add**. You can add these values in any order; they will always be displayed in ascending energy order.

Delete Button

To remove a line and all its values from the list box, highlight the line, then select the **Delete** button.

Change Button

To change any of the values for a line, highlight the line, edit any of the values, then select the **Change** button to move the changes to the list box.

Clear Button

Instead of editing the values one by one, you can remove all values from the text boxes for the highlighted line by selecting the **Clear** button. This will clear all entries at the once.

Append to Existing Calibration

When adding energy points to the current datasource from a file, such as in constructing a composite efficiency file, there may be common energy points in the two files. If the **Append to Existing Calibration** checkbox is selected, the system will ask if you want to append to the existing calibration. If you answer “yes”, it will tell you each time it finds a duplicate entry.

Editing the List

When the values for all nuclides have been entered, select **OK** to move to the Efficiency Calibration screen. This screen allows you to examine and, if neccesary, edit any of the lines. Please refer to “Efficiency Calibration” on page 117 for an illustration and explanation of this screen.

Efficiency Calibration

Efficiency Calibration (Figure 95) lets you enter **Energy**, **Efficiency**, and **Error (%)** data by hand. You can use up to 45 calibration data sets for calibration; any more than that will be ignored.

Since Efficiency Calibration always executes the Peak Locate and Peak Area algorithms, you should first choose the algorithms you want to use from the Analyze Menu (“Peak Locate” on page 140 and “Peak Area” on page 147) . If you don’t specify your own choices, Efficiency Calibration will use the first Peak Locate and Peak Area algorithms it finds in the spectroscopy application’s .AEF file (which may not always be the ones you want to use). Note that these choices apply to all open datasources.

Accept

The **Accept** button verifies the entered values and displays them in the list box.

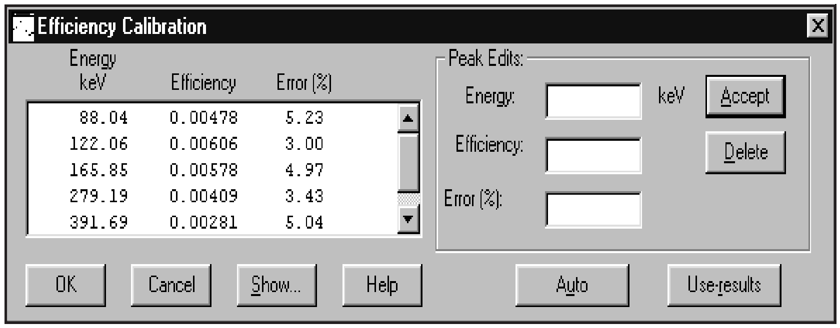


Figure 95 Efficiency Calibration

Delete

The **Delete** button is used to delete the highlighted entry from the list box.

Cross-over

The **Cross-over** button selects/deselects the currently highlighted entry in the list box as the crossover energy point. Only one crossover point may be assigned. The selection of a crossover energy point indicates that two curves will be generated for the dual polynomial curve. If no crossover energy point is selected, a single curve will be generated. Note that at least two data points must exist on each side of the crossover energy point for dual curves to be generated.

Auto Button

If population was done from a certificate file, the **Auto** button will perform a peak locate with area analysis for each peak in the current datasource. The list box is then populated with the peak areas in the datasource that match those in the certificate file.

Note the peak locate and peak area analysis algorithms are determined by the analysis sequence selected from the Calibration Setup Dialog. If “NONE” was selected, then the algorithms default to the ones last chosen from the Analyze Menu.

CAUTION Analysis sequence (.ASF) files contain their own algorithm definitions. It is up to the user to ensure that the algorithms called in these sequences are the same as the algorithms used for efficiency calibration. Failure to do so may greatly affect the accuracy of the results.

Use-results Button

The **Use-results** button will retrieve peak analysis results directly from the current data source and populate the list box. This button will be disabled if peak area analysis results are present.

Show Button

Select the **Show** button to display the efficiency calibration curve as a graph. Please refer to “Efficiency Show” on page 120 for a complete discussion and an illustration of this function.

Supported Curves

All supported efficiency curves will be generated so that any one can be used for later analysis. The supported curves are:

- Dual Polynomial, using ln() of energies for low and high curve on each side of a crossover point. A minimum of 2nd order (ln-ln) polynomial is allowed, and
  - For Dual in the single-curve mode and for the high energy curve in the two-curve mode, a maximum of 9th order (ln-ln) polynomial is allowed.
  - For the low energy curve in the two-curve mode, a maximum of 5th order (ln-ln) polynomial is allowed.
- Linear Polynomial, using linear 1/E coefficients. A minimum of 2nd order and a maximum of 9th order polynomial are allowed.
- Empirical Polynomial, using ln() of scaling-factor/E coefficients. A minimum of 2nd order and a maximum of 5th order polynomial are allowed.
- Interpolated, using a straight-line interpolation in the ln-ln domain.

The default order of the polynomial (n) for both the high-energy and low-energy curves will be determined as follows:

n = 5 for ten or more calibration points.
n = 4 for eight or nine calibration points.
n = 3 for six or seven calibration points.
n = 2 for three to five calibration points.

Once an order has been determined by the program or has been adjusted in the Show screen, that order will be used as the default for future calibrations.

Efficiency Show

Selecting the Show Efficiency menu item (or the **Show** button on some screens) will display the efficiency calibration as a graph (Figure 96).

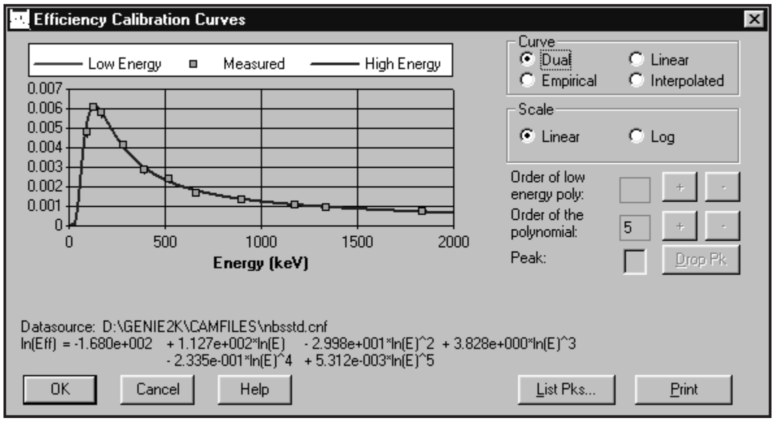


Figure 96 Show Efficiency Calibration

You can choose which curve to display (Dual, Empirical, Linear or Interpolated) in the Curve box and the scale of the graph (Linear or Log/Log) in the Scale box.

The order of the polynomial settings can be changed up (+) or down (–) as required. The “Order of the low polynomial” will be enabled for use only if Dual curve has been chosen and a low-energy curve is present.

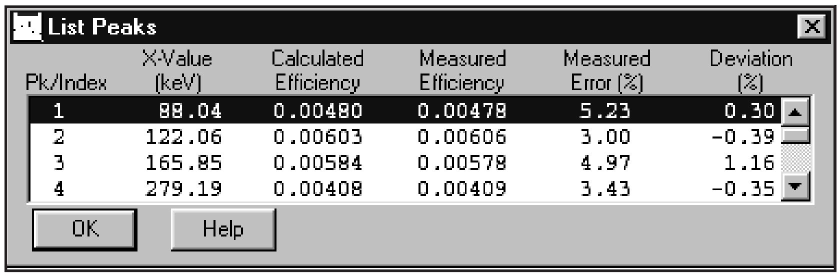
Note that when a crossover point is specified, the low energy curve can only be adjusted up to a 5th order polynomial. The high energy curve can be adjusted up to a 9th order polynomial.

Peak

The Peak text box lets you eliminate outlying peaks one at a time. Enter the number of the peak to be dropped, then select **Drop Pk**. The peak will be deleted from the list and both the curve and the equation will be regenerated. You may repeat Drop Peak until satisfactory results are obtained but you can’t reduce the number of data points to less than three (or five if a crossover peak for Dual Polynomial was specified).

List Peaks

Select the **List Pks** button to display a list of the peaks used in the calibration, as shown in Figure 97. The measured vs. calculated efficiencies are listed to show how accurately the curve follows the measured points.



Pk/Index	X-Value (keV)	Calculated Efficiency	Measured Efficiency	Measured Error (%)	Deviation (%)
1	88.04	0.00480	0.00478	5.23	0.30
2	122.06	0.00603	0.00606	3.00	-0.39
3	165.85	0.00584	0.00578	4.97	1.16
4	279.19	0.00408	0.00409	3.43	-0.35

Figure 97 The List Peaks Dialog

You can leave the list on screen while working in the Show Efficiency Calibration Curve dialog box so that you can easily change the graph's scale, change curve type, change the order of the polynomial or drop peaks. If you highlight a peak in the List Peaks box, its number will automatically be placed in the Peak text box so that you can easily drop it.

Print

Select the **Print** button to send an output of the currently displayed curve(s) to the default print queue.

By ISOCS/LabSOCS

This function is available only on systems with Model S573 ISOCS or Model S574 LabSOCS installed. If neither ISOCS nor LabSOCS is installed on your system, this command will be grayed out.

Choose **Efficiency | Calibrate | By ISOCS/LabSOCS to see the dialog box shown in Figure 98. The Run Geometry Composer** button launches the Geometry Composer described in Chapter 9.

Selecting the Input File

To import and use an efficiency file generated by ISOCS or LabSOCS (.ECC) file either browse to the desired directory and file by clicking on the **Select** button or pull it down from the File Name field if it has already been used. When the file has been selected, click on **Nex**t.

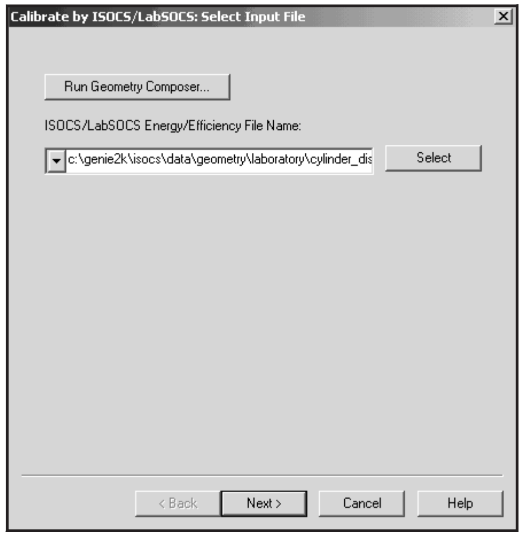


Figure 98 The ISOCS Efficiency Calibration Dialog

Selecting an Efficiency Factor

The dialog in Figure 99 lets you select the desired efficiency calibration type. For 'traditional' calibrations, select Efficiency and the results will be calculated in Activity. To convert to concentration, the activity can be divided by the mass in the geometry tem-

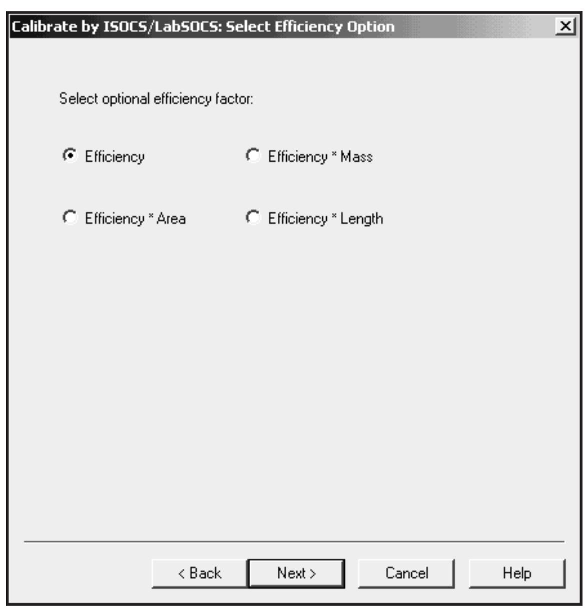


Figure 99 Select Efficiency Option

plate. Alternatively, if you want to compute the Activity per mass (gram) directly, select Efficiency*Mass. Other options are Efficiency*Length and Efficiency*Area.

When you've selected an efficiency type, click on **Next.** The calibration information will be extracted from the LabSOCS/ISOCS efficiency output file (.ECC) and presented as in Figure 100.

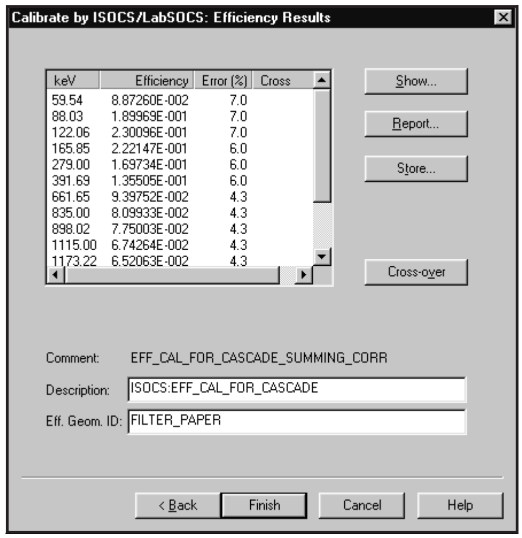


Figure 100 Results of an Efficiency Calibration

If you have selected an 'Efficiency*Mass', 'Efficiency*Length' or 'Efficiency*Area' calibration type, the screen shown in Figure 101 will be displayed. Check the default value for the mass (or length, area) and correct it to the appropriate value, if needed. Press the **Recalculate** button to see the new values.

For a discussion on how the mass, area and length of the various geometry definitions impact the analysis results, refer to Appendix G, *LabSOCS/ISOCS Technical Notes*, in the *Genie 2000 Customization Tools Manual*.

Efficiency Results

The list box shows the efficiency calculated for each of the energy points.

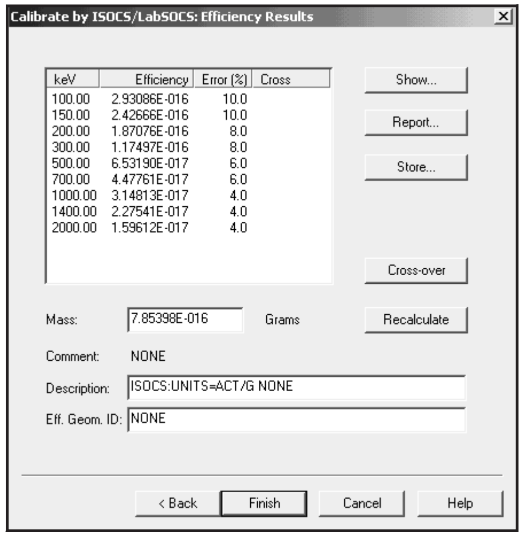


Figure 101 Results of an Efficiency*Mass Calibration

Show

Select the **Show** button to view the calibration graphically, as shown in Figure 102. Please refer to “Efficiency Show” on page 120 for a complete discussion of this function.

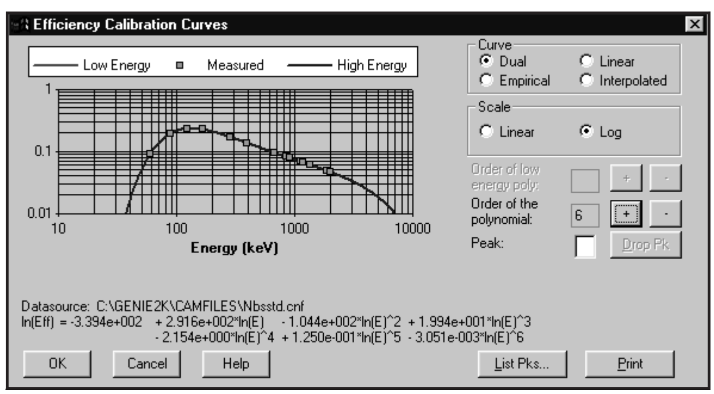


Figure 102 Show ISOCS Efficiency Calibration

Cross-over

Select the **Cross-over** button to select the currently highlighted entry in the list box as the crossover energy, the point where the low energy curve and high energy curve intersect. Only one crossover point may be assigned.

The selection of a crossover energy point indicates that two curves will be generated for the dual polynomial curve. If no crossover energy point is selected, a single curve will be generated. Note that at least two data points must exist on each side of the crossover energy point for dual curves to be generated.

Store

To save the calibration results for later use (using the standard Genie 2000 Calibrate | Load function), select the **Store** button in Figure 100.

Report

Select the **Report** button in Figure 100 to display the complete calibration report shown in Figure 103.

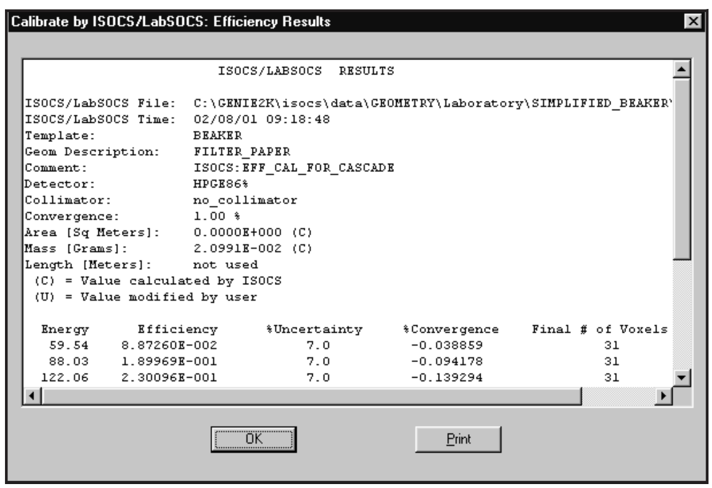


Figure 103 The Calibration Report

Print

Select the **Print** button to send an output of the currently displayed curve(s) to the default print queue.

Using the Calibration

Select the **Finish** button, which will then load this newly created efficiency calibration into the currently open datasource. If the calibration was **Store**d then you can also use the **Calibrate | Load** or the **Calibrate | Efficiency | By Calibration File** command to load the file you just created.

Load

Selecting **Load** displays a dialog which lets you load a previously stored calibration file (.CAL) into the current datasource (Figure 104). You can load any combination of the Energy/Shape, Efficiency or Peak-to-Total calibration data by checking the corresponding checkboxes.

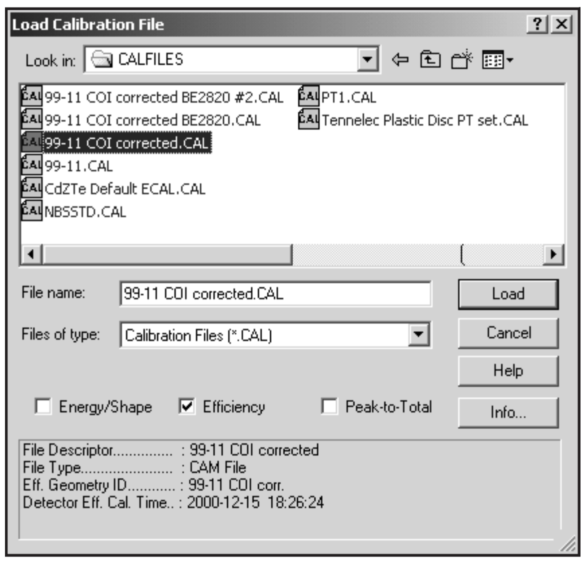


Figure 104 Load Calibration File Dialog

The **Info** button displays a dialog box which shows descriptive information for the currently selected file, provided such information was entered when storing the calibration file.

Store

Selecting **Store** displays a dialog which prompts you to save the current calibration into a .CAL file which can later be retrieved through **Calibrate** | **Load**. An Efficiency Geometry ID is required and must be entered. You may optionally enter a Calibration Description to be saved with the file.

Display Menu

The **Display** menu contains several functions for the data display: Expand, Scale, Compare, ROIs, and Preferences.

Expand

The expanded display, shown in Figure 105, is a split-screen display, with the whole spectrum in the lower half of the display and the expanded portion in the upper half. The Expand window may be resized by placing the mouse over the splitter bar between the main spectrum window and the expand window. Then click on the left mouse button and move the mouse while holding the button down. When the expand window is the desired height release the mouse button. The minimum height for the expand window is 50 pixels. Note that Expand and Compare (page 129) can be enabled simultaneously.

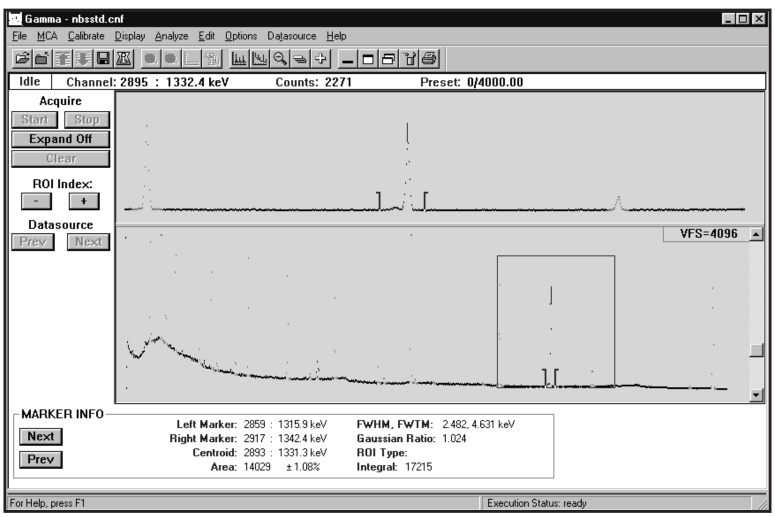


Figure 105 A Typical Expanded Display

Expand On

The Expand mode can easily be turned on by clicking on the Control Panel's **Expand On** button or by pressing the F8 key. You can also choose **Display** | **Expand** to turn the expanded display mode on or off.

Expand Off

The Expand mode can easily be turned off by clicking on the Control Panel's **Expand Off** button or by pressing the F8 key. You can also choose **Display** | **Expand** to turn off the expand function and return the display to the normal state.

The Expanded Spectrum

Spectrum expansion takes place around the current cursor location. The spectrum's expanded data is the data inside the "rubber rectangle" (dash-outlined box) in the lower half of the display.

The expanded half of the display can be moved through the spectrum by putting the mouse pointer inside the rubber rectangle (in the lower half) and dragging it to a new location. When the mouse pointer is inside the rubber rectangle, it will change to a four-way arrow, as seen in Figure 105.

The rectangle can be resized by moving the mouse pointer to an edge of the rectangle. The mouse pointer will change to a outlined arrow with two heads. Using the cursor, the rectangle can be grabbed at a corner or side and stretched to a new height or width (or both).

Rescaling With the Rectangle

Changing the height of the rectangle will automatically rescale the expanded display to accommodate the data in the rectangle. The normal (unexpanded) display's VFS will not change.

From the keyboard, press CTRL+M to move the markers to the expanded region.

Scale

The Scale menu lets you select the method of setting the display's vertical full scale (auto or manual) and the scale type (linear or log). The scale type you choose can be saved as a permanent setting; see "Display Preferences | Save" on page 131.

Manual

Manual lets you adjust the display's vertical full scale, either by using a mouse to change the scroll bar at the right side of the spectrum display or by pressing the keyboard's up arrow or down arrow key. Pressing the F5 key will toggle between Manual and Auto.

Auto

Selecting **Auto** lets the program automatically set the display's vertical full scale (VFS). As the spectrum grows, the VFS is automatically reset to show all of the data. Pressing the F5 key will toggle between Auto and Manual.

Note that if you use the scroll bar while Auto is enabled, the program will change the scale mode to Manual.

Linear

Linear defines the vertical scale of the display as a linear scale.

Log

Log defines the vertical scale of the display as a logarithmic scale.

Compare

The Compare command lets you turn the compare function on or off and, when on, lets you position the compare spectrum by specifying its vertical full scale (VFS).

On

Selecting **On** displays a dialog box (Figure 106) which allows you to visually compare the current, reference, spectrum with spectral data from another open datasource. This function is not available if only one datasource is open. Note that Compare and Expand (page 127) can be enabled simultaneously.

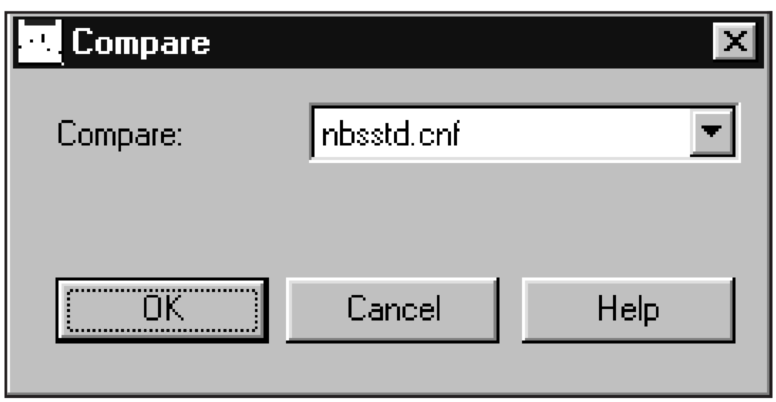


Figure 106 The Compare Dialog

The spectrum selected for compare will automatically be energy normalized to the reference spectrum. That is, the compare spectrum's energies will be aligned with the same energies in the reference spectrum.

Once the compare datasource is selected, you'll see the compare spectrum displayed in the currently selected compare spectrum color ("Display Preferences" on page 131) just above the reference spectrum.

If you change the reference datasource by selecting a different spectrum, the Marker Info status page information changes accordingly. Only one energy calibration (that of the reference spectrum) is meaningful for the set of compared spectra.

Move the Compare Spectrum

When Compare has been turned on, you can move the compare spectrum by clicking on the VFS box in the upper right-hand corner of the display window (the VFS box will change to the color of the compare spectrum) or by selecting **Display** | **Compare VFS**. The mouse cursor will change to a solid double-headed vertical arrow. Use the mouse or the cursor keys to position the compare spectrum anywhere within the spectral display.

When the compare spectrum is enabled, the VFS scroll bar controls the compare spectrum's scale. With the reference spectrum enabled (VFS box returned to its original color), the VFS scroll bar controls the reference spectrum's scale.

Off

Select **Off** to disable the compare mode and return to the current display mode, normal or expanded, whichever was in effect before Compare was turned on.

VFS

When Compare has been turned on, selecting **VFS** will let you position the compare spectrum vertically within the spectral display as described in "Move the Compare Spectrum" on page 130. It also allows independent VFS control of the compare spectrum.

ROIs

The choices offered by the ROI menu are: Add or Delete an ROI, Clear All ROIs, and Load or Store an ROI file.

Add ROIs

Select **Add ROIs** or press the keyboard's INS key to enter an ROI between the current marker positions. The ROI will be of the current ROI type as defined in the Preferences dialog (page 131).

Auto ROI

Select **Auto ROI** or press the keyboard's **Ctrl+Ins** to add an ROI at the current cursor position. The ROI's width will be determined by the current energy and shape calibration. The left channel will be 2 FWHM and 1 Low Tail to the left of the cursor. The right channel will be 2 FWHM to the right of the cursor. The ROI will be of the current ROI type defined in the Preference's dialog.

Delete ROIs

Select **Delete ROIs** or press the keyboard's DEL key to delete the ROI between the markers. The item is disabled if the markers are not positioned at the limits of a previously defined ROI.

Clear All

Selecting the **Clear All** command clears all ROIs in the current database.

Load

Selecting **Load** displays a dialog box which lets you select a datasource whose ROIs are to be loaded into the current datasource. These ROIs will replace the currently defined ROIs, if there are any. Select the "By Energy" check box to load ROIs by energy. This will attempt to use the energies stored in the ROI file rather than the channel values. If the check box is not selected or those values are not defined, then the ROIs will be loaded by channel value. Note that only ROI files stored using **Store ROIs** will contain energy values.

Store

Selecting **Store** displays a dialog which lets you select the name of a datasource which will be used to store the currently defined ROIs. Note that ROI files created using **Store ROIs** will now store ROIs by energy and channel. This allows you to load ROIs using the energy values if so desired.

Display Preferences

Preferences presents you with a dialog screen (Figure 107) which lets you set the display to your own preferences.

Save

You can **Save** these preferences so that your display will always be set the way you want it to be. In addition to the settings shown on this screen, selecting Save will save the display's Scale Type (page 128), the chosen Status Pages (page 135), and the Report Window's size (page 172).

OK

Selecting **OK** will use the settings during this session only; they will not be saved for future use.

Default

The **Default** button resets all parameters to the factory default state.

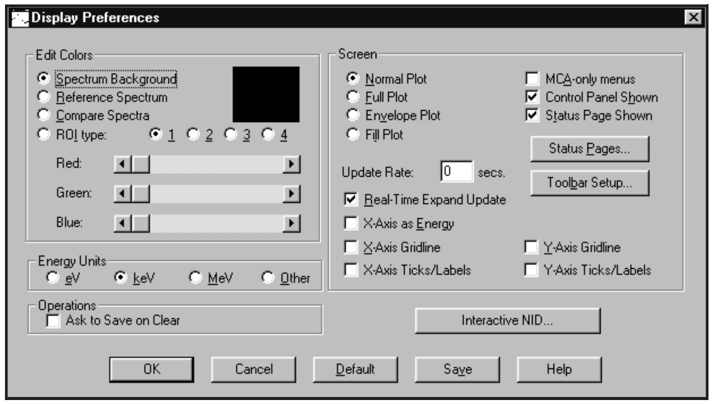


Figure 107 Display Preferences Dialog

Edit Colors

You can edit the display colors for:

- Spectrum Background
- Reference Spectrum
- Compare Spectra
- ROI type.

Selecting an ROI type by number allows you to select both the color of each type and the type itself. For instance, selecting type 3 means that all of the ROIs you enter from now on will be known as type 3. You may use any combination of the four types and colors for ROIs which you add to the spectrum.

Note that the Peak Area Analysis algorithm sets regions around the peaks when it is run. If you selected “Show ROIs in MCA View” in the algorithm’s dialog box, these ROIs will replace the currently displayed ROIs. The type and color of each of these ROIs depends on the Peak Area Analysis algorithm used. “Peak Area” on page 147 discusses the Peak Area routines and describes how they use ROI colors.

Screen

The “Screen” section of the Preferences dialog lets you adjust what is shown on the screen: the Menus, the Control Panel and the Status Pages.

Normal Plot

The **Normal Plot** mode shows a maximum of 1024 data points. For example, in a 4K spectrum, the plot routine considers groups of four channels at a time and displays the channel in each group which has the highest number of counts. Note that for spectra with more than 1024 channels, selecting Full will slow down the display update rate.

Full Plot

The **Full Plot** mode shows a data point for every channel in the spectrum being viewed.

Envelope Plot

The **Envelope Plot** mode shows the normal plot with the data points connected.

Fill Plot

The **Fill Plot** mode shows the envelope plot with a color fill of the data.

Toolbar Setup

The Toolbar Setup dialog screen (Figure 108) allows you to tailor the display of the Acquisition and Analysis toolbars. The dialog is divided into three panes: Toolbars, Commands, and Customize Buttons.

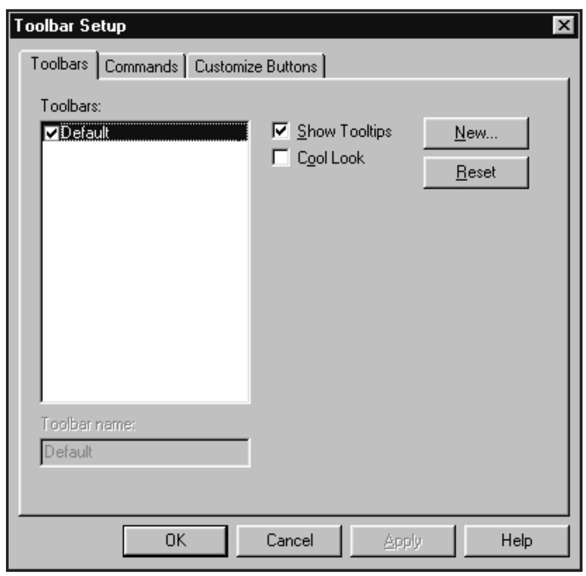


Figure 108 Toolbar Setup Dialog

The Toolbars pane allows you to create, rename, and delete toolbars:

- To create a new toolbar, select the **New** button. This will prompt you to input a name for the toolbar. The new toolbar will initially be empty.
- To rename a toolbar, highlight it in the list and edit the name in the edit box below the list.
- To delete a toolbar, highlight it in the list and select the **Delete** button.

You may also enable/disable the Tooltips and Cool Look features of the toolbar.

The Commands pane allows you to customize the command buttons that will appear on your toolbars. The list on the left contains a variety of categories of commands organized in a similar fashion as the main menu. Selecting a category will change the command buttons that appear in the Button area of the pane. Selecting a command button will show that button's description in the Description field. To modify the toolbars:

- To add a command button to a tool bar, select the button you wish to add from the Buttons area of the pane. Then, hold the left mouse button down, drag the command button to the exact place on your toolbar you wish to place it. Then release the left mouse button.
- To remove a command button from a toolbar, select the button from the toolbar and drag it off the toolbar. Then release the left mouse button.
- To add a separator between command buttons on your toolbar, select the command button you wish to have on the right of the separator and drag it slightly to the right.

The Customize Button pane allows you to associate certain command buttons with Analysis Sequences and Executable programs. There are 10 special "Analysis" buttons and 10 special "Executable" buttons. These can be added to any toolbar from the Commands pane. Then, using the Customize Buttons pane, select the appropriate item from alist box and:

- To change an Analysis Sequence button select the sequence from the drop-down Analysis Sequence combo box.
- To change an Executable button edit the command line in the Executable edit field. To browse for a specific program use the Browse button.

Select **OK** from the dialog will confirm all changes. **Cancel** will discard all changes. The settings only be permanently saved if the **Save** button is selected in Display Preferences. Otherwise the toolbars will return to the last saved state upon the next invocation of the Acquisition and Analysis window.

MCA-Only Menus

Select the **MCA-only menus** checkbox to remove the Analyze menu from the application's menu bar and the Efficiency items from the Calibrate menu.

Control Panel/Status Page Shown

Removing the check from the **Control Panel** or the **Status Page** checkbox will remove the Control Panel or the Status Page from the display, leaving more room for the spectrum

Update Rate

The screen **Update rate** can be set for the number of seconds between updates of spectral data during data acquisition. The range is 0 (as quickly as possible) to 60 seconds, with the actual rate affected by how busy the processor is at the end of any given update interval. It is usually best to set this to a value of 3 to 5 to allow an operator's key presses or mouse movements to be serviced promptly.

Status Pages

If the Status Page checkbox is checked, you can choose which **Status Pages** will be displayed (Figure 109). The available pages include: Marker Info, Time Info, Sample Info, Calibration Info, Display Info, Input Info, User Info and Nuclide Info. The Status Pages you choose to display can be saved as a permanent setting; see "Display Preferences | Save" on page 131.

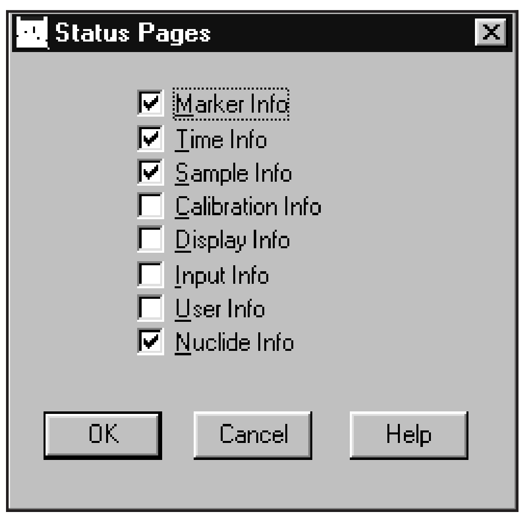


Figure 109 Selecting the Status Pages

Gridlines

Real Time Expand Update

If the real time expand update checkbox is selected, the expand window will refresh as the expand rectangle is moved in the main spectral display. If the box is not checked the expand window does not update until the mouse movement is complete.

X-Axis Gridline

Selecting **X-Axis Gridline** displays X-Axis gridlines on the spectrum display.

X-Axis Ticks/Labels

Selecting **X-Axis Ticks/Labels** displays X-Axis labels on the spectrum display. These may be displayed in terms of Channel or Energy. See **X-Axis as Energy.**

X-Axis as Energy

Selecting **X-Axis as Energy** displays X-Axis labels in terms of energy. If this is not selected, the X-Axis will be displayed in terms of channel.

Y-Axis Gridline

Selecting **Y-Axis Gridline** displays Y-Axis gridlines on the spectrum display.

Y-Axis Ticks/Labels

Selecting **Y-Axis Ticks/Labels** displays Y-Axis labels on the spectrum display.

Energy Units

Select the **Energy Units** to be used for reporting the energy for the cursor, markers, FWHM, and so forth, on the various status pages. Select Other to use the calibration units and conversion factor stored in the current datasource.

Operations

Select **Ask to Save on Clear** to be asked to save changes when clearing a detector’s spectrum. If this option is disabled then the clear will be done unconditionally.

Interactive NID

Selecting **Interactive NID…** will display the Interactive NID preferences dialog as shown in Figure 110.

Use this dialog to set the desired settings for Interactive NID and the Nuclide Info status page.

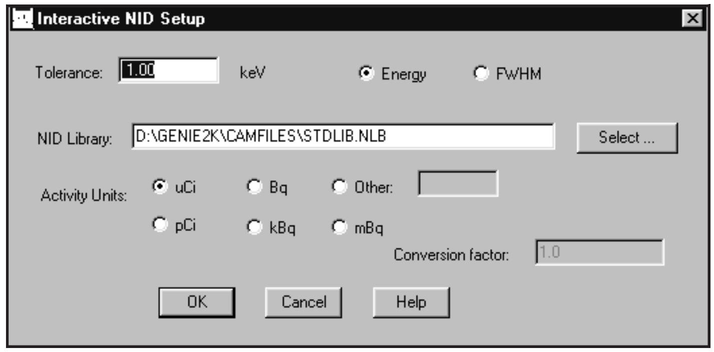


Figure 110 The Interactive NID Setup

Tolerance

Tolerance controls the search range around the cursor. This may be specified in terms of energy or variable (FWHM) tolerance.

NID Library

The **NID Library** field determines which Nuclide Library is used for the search. Click the **Select…** button to browse avaliable Nuclide Libraries.

Activity Units

The selected **Activity Units** determines the activity units used for reporting on the Nuclide Info status page. If none of the provided activity units (uCi, pCi, Bq, kBq, mBq) are sufficient, then select **Other** and fill out a label and **Conversion factor**.

Analyze Menu

The **Analyze** menu lets you select and execute or abort (stop) a single analysis phase, such as “Acquistion”, or a predefined sequence of analysis phases. A phase includes all of the parameters the needed for its successful execution. A sequence is a list of phases, including the algorithms for a given phase, processing parameters required for each algorithm, and so forth, needed to perform a given set of analyses and generate reports.

Execute Sequence

Select **Execute Sequence** to see a menu of all currently defined analysis sequences on your system (Figure 111 shows both the default sequences and those installed with the S501 Gamma Analysis option). Selecting one of the sequences will execute it. Please refer to “Analysis Sequence” on page 167 for information on creating and editing a sequence.

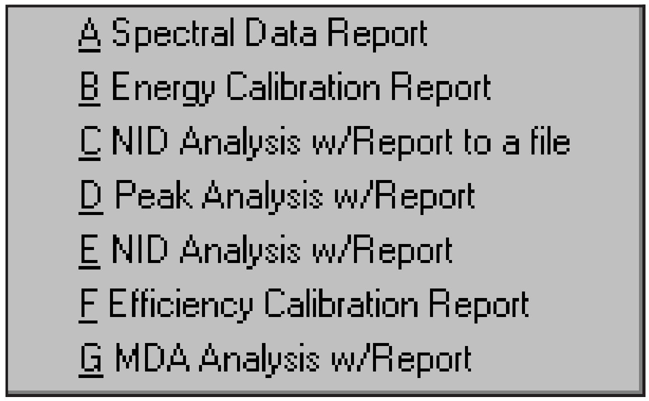


Figure 111 The Analysis Sequences

Abort Sequence

Selecting **Abort Sequence** allows you to abort execution of the current sequence. Note that the sequence may not stop immediately; it will continue until the analysis step already in progress has finished.

Analysis Phase Selection

Choosing an analysis phase in Figure 112 lets you select one of the algorithms associated with that phase, then assign and save the parameters for the algorithm, execute the algorithm, or do both.

The following sections discuss each of the phases, their algorithms and the required parameters. For more detailed information on the algorithms, refer to the “Algorithms” chapter in the *Genie 2000 Customization Tools Manual*.

In each algorithm’s setup screen, selecting **OK** saves the setup parameters for the algorithm associated with the phase, but does not execute the algorithm. Selecting **Execute** starts the algorithm using the defined parameters.

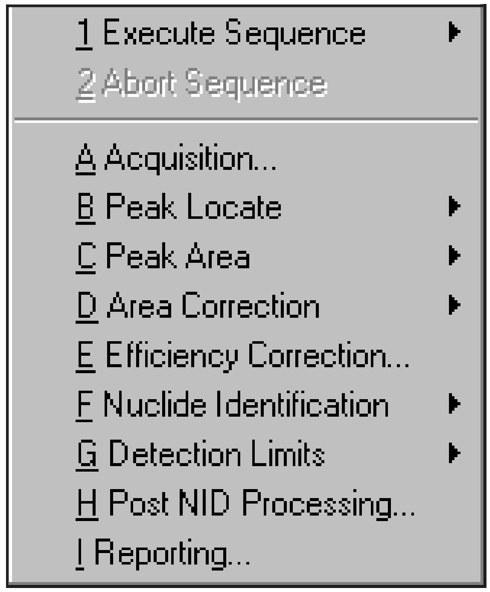


Figure 112 Selecting a Phase

Acquisition

The Acquire Setup dialog box (Figure 113) allows you to define default acquisition parameters to be use when starting data collection on hardware datasources.

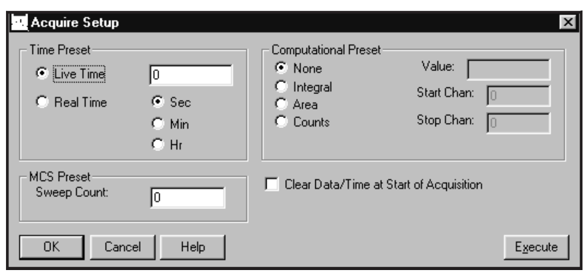


Figure 113 The Acquire Setup

Time Preset

You can set the **Live time** or **Real time** preset for the current hardware datasource in seconds, minutes or hours. Live time and Real time are mutually exclusive, but the chosen time preset can be combined with any one computational preset (see next subsection).

Computational Presets

These presets stop acquisition when a computed value you specify is reached. When a computational preset is defined, the chosen time preset is still acquire stop command is issued by the preset that is reached first. If you want to use a computational preset alone, set the time preset to a very large value, such as 9000 hours (more than one year). This insures that the computational preset will be reached first. There are four computational presets.

- **None** turns off computational presets and uses only a time preset.
- **Integral** is a computational preset for the integral of any one . The integral Value and the ROI's Start and Stop Channels must be specified. The integral preset can't be used with any other computational presets, but can be combined with either time preset.
- **Area** is a computational preset for the area of any one . The area Value and the ROI's Start and Stop Channels must be specified. The area preset can't be used with any other computational presets, but can be combined with either time preset.
- **Counts** is a computational preset for total counts in any one channel within the range specified by the Start Channel and Stop Channel. The Value, which must be specified, indicates the number of counts which will stop acquisition. The counts preset can't be used with any other computational preset, but can be combined with either time preset.

MCS Preset

Sweep Count selects the number of sweeps to be made during multichannel scaling data acquisition. Both Time and MCS Presets can be set here, but which is used depends on the Mode Setup of the hardware input you acquire data from.

Clear Data/Time

Select "Clear Data/Time at Start of Acquisiton" to automatically clear both data and elapsed time at the start of acquisition.

Peak Locate

The Peak Locate phase contains the algorithms which locate the peaks of interest in the spectrum. In addition to the usual library locate parameters, there are several occasionally useful "More Peak Locate Parameters" starting on page 144.

Unidentified Second Difference

The generalized second difference method (Figure 114) locates all peaks in the **Search Region** that are significantly above the continuum, as described in the "Generalized Second Difference Method" section of the "Algorithms" chapter in the *Genie 2000 Customization Tools Manual*.

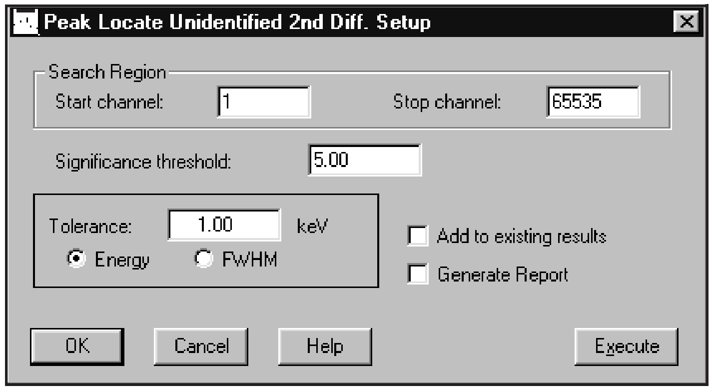


Figure 114 Second Difference Peak Locate Setup

Significance Threshold

The second difference algorithm automatically calculates a significance value for each peak it considers. The larger the peak with respect to the continuum that it rests on, the larger the significance value.

Only peaks that exceed the **Significance Threshold** will be accepted as valid. For less sensitivity, for example to pick out just the large peaks for calibration, the Significance Threshold may be raised. For more sensitivity, the significance limit may be lowered. However, experience has shown that threshold values below 3.00 produce increasing numbers of false peaks.

Add to Existing Results and Tolerance

If the **Add to existing results** box is checked, each found peak will be compared with peaks listed in the peak results table. A found peak that is closer to an existing peak than the specified **Tolerance** value (either fixed Energy or variable FWHM) is assumed to be the listed peak and will be discarded. A found peak that is farther away from an existing peak than the specified tolerance is considered to be a separate peak and will be merged with the existing peak results table. If the “Add to existing results” box is *not* checked, the current peak results table will be replaced by this search.

Generate Report

If the **Generate Report** box is checked, a predefined report will be generated when this phase is executed and will be displayed in the application’s report window. The report is defined in the AEF file as the Report Template Name and Section Name associated with this phase.

User Specified

This method, using the parameters in Figure 115, calculates the peak centroid for each displayed in the Search Region, as described in the “User Specified Peak Locate” section of the “Algorithms” chapter in the *Genie 2000 Customization Tools Manual*.

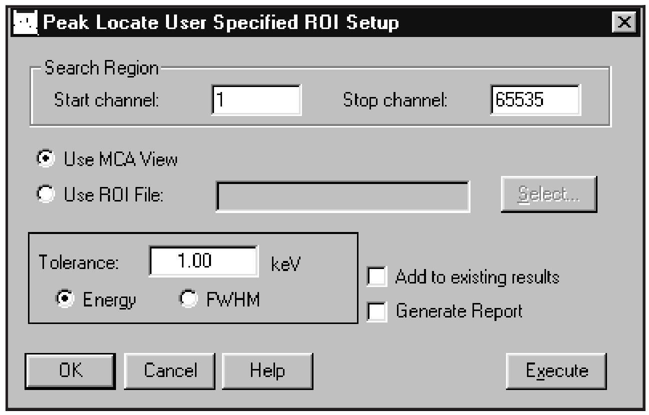


Figure 115 The User Specified Peak Locate Setup

Use MCA View

Select this button to perform the Peak Locate using the ROIs displayed in the spectral display.

Use ROI File

Select this button to use an ROI file for Peak Locate. Enter the name of the file in the Use ROI File text box or click on **Select** and choose a file from the file open dialog box.

Add to Existing Results and Tolerance

If the **Add to existing results** box is checked, each found peak will be compared with peaks listed in the peak results table. A found peak that is closer to an existing peak than the specified **Tolerance** value (either fixed Energy or variable FWHM) is assumed to be the listed peak and will be discarded. A found peak that is farther away from an existing peak than the specified tolerance is considered to be a separate peak and will be merged with the existing peak results table. If the “Add to existing results” box is *not* checked, the current peak results table will be replaced by this search.

Generate Report

If the **Generate Report** box is checked, a predefined report will be generated when this phase is executed and will be displayed in the application’s report window. The report is defined in the AEF file as the Report Template Name and Section Name associated with this phase.

Library Locate (Gamma-M)

The Gamma-M Library Peak Locate setup screen is shown in Figure 116. The analysis will include the library energies included within the Search Region or that are equal to either region limit. The current energy calibration will be used to determine whether a library peak falls within the Search Region.

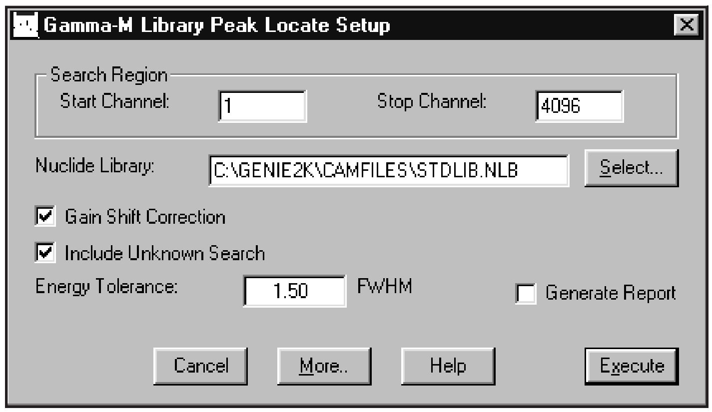


Figure 116 The Gamma-M Library Locate Setup

Nuclide Library

The name of the library in the current datasource will be shown in the Nuclide Library text box. To select another library, click on **Select**, then choose a library file from the file open dialog box.

Include Unknown Search

Peaks found by the Unknown Search algorithm that are farther away from existing library locations than the Energy Tolerance are treated as separate peaks. Peaks that are closer to the existing library locations than the Energy Tolerance are assumed to be the library peaks already assigned. The Library Locate will be followed by the Unknown Locate, which is governed by the Search Region.

The Energy Tolerance value, which is accessible only if the Include Unknown Search box is checked, specifies the Energy Tolerance as a full width at half maximum (FWHM) multiplier. This determines whether a peak found during the Unknown Locate is one of the peaks already assigned during the Library Locate.

Gain Shift Correction

Gain Shift Correction is a technique for moving the peaks so that their centroids are correctly placed. It is normally enabled (checked) because NaI peaks, in particular, tend to shift from their original calibrated positions as a function of temperature.

More Peak Locate Parameters

Selecting the **More** button brings up the screen in Figure 117, which lets you set several other parameters affecting Gamma-M Library Peak Locate. The description of each parameter lists the default value for both Ge and NaI detectors.

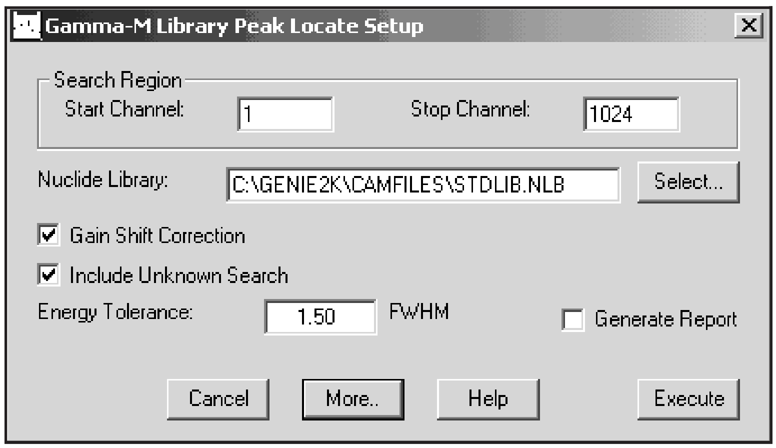


Figure 117 The Peak Locate "More" Setup Showing Ge Detector Defaults

Window Settings

Area specifies the FWHM multiplier which establishes the left and right ROI limits around the peaks for a fit to determine whether the peak is present in the spectrum. Default: 2.5 for Ge; 1 for NaI.

Interference specifies the FWHM multiplier which establishes the limit beyond which two adjacent peaks are no longer considered to interfere with each other when determining whether a peak is present. Default: 3 for Ge; 1.5 for NaI.

Overlap specifies the FWHM multiplier which establishes the limit below which two adjacent peaks are considered as one; that is, one of the two peaks is deleted. Default: 0.3 for both Ge and NaI.

Reject Factors

Variance specifies the peak height variance rejection factor. Only peaks whose height is larger than this factor times the uncertainty of the height (at 1 sigma) will be accepted as valid peaks. Default: 0 for Ge; 1 for NaI.

Background specifies the peak rejection factor based on the height of the background. Only peaks whose square of the height is larger than this factor times the height of the background will be accepted as valid peaks. Default: 0 for Ge; 1 for NaI.

Number of Background Terms defines whether the fits are to be made with an added constant or linear continuum. 0 means that no additional continuum term will be used, 1 means that only a constant continuum will be used, and 2 means that a linear continuum will be used. Default: 2 for both Ge and NaI.

Gain Correction

The Gain Shift Correction check box on the Gamma-M Library Peak Locate Setup screen must be checked for these parameters to be used in the calculations.

Maximum Number of Gain Passes is used to specify the maximum number of iterations allowed for peak fitting with automatic gain correction. Default: 10 for both.

Reject Gain Factor specifies the convergence criterion. When consecutive iterations produce a change in the chi-square less than this value, convergence has been achieved. Default: 0.0001 for Ge; 0.005 for NaI.

Reject MDA

Sigma specifies the multiplier of the MDA equation used to accept or reject a library peak in the spectrum. Default: 2.5 for both Ge and NaI.

Constant specifies the constant term of the MDA equation used to accept or reject a library peak in the spectrum. Default: 3 for both Ge and NaI.

Generate Report

If the **Generate Report** box is checked, a predefined report will be generated when this phase is executed and will be displayed in the application’s report window. The report is defined in the AEF file as the Report Template Name and Section Name associated with this phase.

Library Locate (Simple)

The Simple Library Peak Locate setup screen is shown in Figure 118. The analysis will include the library energies included within the Search Region or that are equal to either region limit. The current energy calibration will be used to determine whether a library peak falls within the Search Region.

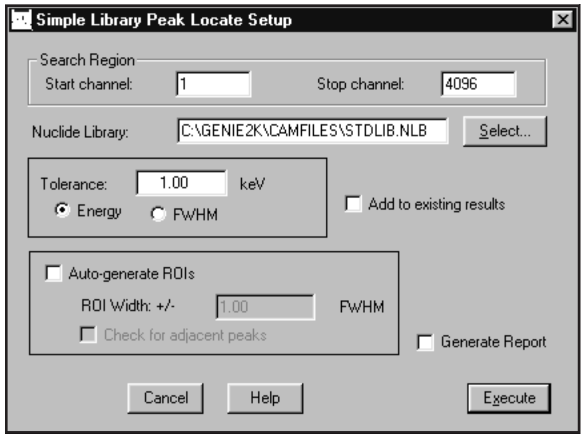


Figure 118 The Simple Library Locate Setup

Nuclide Library

The name of the library in the current datasource will be shown in the Nuclide Library text box. To select another library, click on **Select**, then choose a library file from the file open dialog box.

Add to Existing Results and Tolerance

If the “Add to existing results” box is checked, peaks outside the specified Tolerance (either fixed Energy or variable FWHM) of a peak in the datasource’s peak results table will be added to the table. Peaks within the Tolerance of an existing peak will not be added. If the “Add to existing results” box is *not* checked, the current peak results table will be replaced by this search.

Generate Report

If the **Generate Report** box is checked, a predefined report will be generated when this phase is executed and will be displayed in the application’s report window. The report is defined in the AEF file as the Report Template Name and Section Name associated with this phase.

Auto Generate ROIs

If this option is selected, then the peak locate engine will automatically generate ROIs based on the FWHM calibration. The user can also specify a multiplier to be applied to the ROI width. In addition, an option for checking for adjacent peaks can be enabled – this will flag any peak ROI that may be affected by an adjacent peak.

Peak Area

The peak area phase contains the algorithms to calculate the net peak areas of all peaks found by the peak locate phase (independent of the peak locate method).

Sum/Non-Linear Least Squares Fit Peak Area

Selecting Sum/Non-Linear LSQ Fit brings up the setup screen shown in Figure 119.

The Peak Area Non-Linear Least Squares Fit algorithm calculates peak areas of multiplets using the fitting method described in the "Peak Area for Multiplets" section of the "Algorithms" chapter in the *Genie 2000 Customization Tools Manual*.

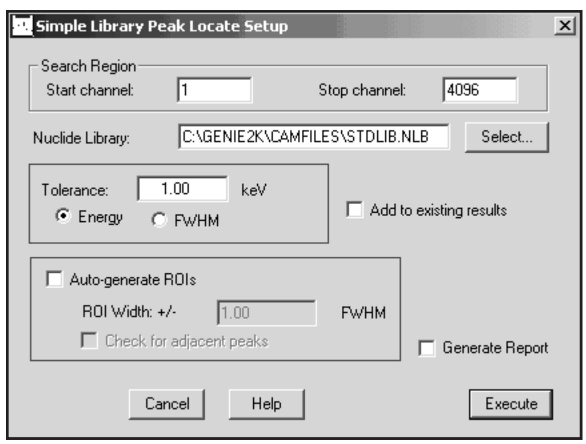


Figure 119 The Sum/Non-Linear LSQ Fit Setup

It normally calculates the peak areas of single peaks using a summation method (described in the "Peak Area for Single Peaks" section of the "Algorithms" chapter), but you can choose the peak fitting method instead.

This method also automatically determines the region-of-interest () around each peak found by the peak locate method in use. Peaks that are close to each other are automatically grouped into multiplet ROIs and analyzed as multiplets. The method of determining the ROIs is described in more detail in the “Determination of Peak Region Limits” section of the “Algorithms” chapter in the *Genie 2000 Customization Tools Manual*.

If the peak locate results already contain ROI definitions, such as after a User Specified Peak Locate, these ROIs will be used without changes. No multiplet analysis will be performed. If the peak locate results do not contain ROI definitions (that is, they include peak centroids only) the ROI limits will be calculated automatically.

Peak Area Region

You can limit the region to be searched by specifing the Start and Stop channels.

Continuum

Selecting the Channels button fixes the number of continuum channels added to each ROI throughout the spectrum at the value entered in the text box. For most spectra, especially those acquired with a sodium iodide detector, it’s usually better to select the FWHM button so that the continuum channels are added as a function of each peak’s FWHM. The channels/FWHM parameter and its value can also be specified in “Continuum” in **Calibrate | Setup** on page 93). If you have two peaks that are close together, reducing the number of continuum channels may give better results. If you have poor peak statistics and there are no other peaks nearby, increasing the number of continuum channels establishes the continuum more accurately but makes it more likely that close lying peaks will be considered as a multiplet instead of as a singlet.

Continuum Function

You can establish the continuum of a spectrum by selecting either a Linear function or a Step function. The Linear function is adequate when the spectrum’s continuum is relatively flat. It is a simple, straightforward equation that estimates the continuum under the peaks as a trapezoid. The Step function should be chosen if there are any regions in the spectrum where the continuum is significantly higher on the left side of a peak region than on the right side; this function automatically reduces to a flat line if the continuum is flat. None is normally not used with Gamma spectra; it is typically used only with Alpha spectra. This parameter can also be specified in “Continuum” in **Calibrate | Setup** on page 93.

95% Critical Level Test

If the 95% Critical Level test is enabled, the net peak area of a singlet is examined to see if it exceeds the 95% Critical Level value as described in the “Critical Level Testing” section of the “Algorithms” chapter in the *Genie 2000 Customization Tools Manual*.

Peaks that do not pass this test will be deleted from the peak results table. If the Critical Level test is not enabled, all peak areas are accepted regardless of their size, even negative areas.

Fixed Parameters

Selecting the Fixed FWHM Parameter or Fixed Tail Parameter check box causes the chosen parameter(s) to be used for all multiplet peaks instead of allowing the value to vary for best fit. If either or both of these check boxes is not checked, the specified parameter will be allowed to vary.

Fit Singlets

Normally, the Peak Area routine fits only multiplet peaks, but if you check the Fit Singlets check box, singlets will also be fitted, rather than calculated using the summation method.

Display ROIs

If the “Display ROIs” check box is checked, the ROIs resulting from the analysis will be copied to the Display ROIs block in the datasource.

The ROI color conventions are:
Color 1: Singlet peaks
Color 2: Multiplet peaks
Color 3: Not used
Color 4: Not used

Reject Zero Area Peaks

If the “Reject zero area peaks” check box is checked, any peaks with negative or zero peak areas will be deleted from the peak results table.

Residual Search

When the Perform Search checkbox is selected, the algorithm will examine the current datasource’s ROIs for “hidden” components in a peak region, those that would otherwise not be found by the Peak Locate algorithm. A new peak will be added at the highest residual which is separated from the nearest established peak by at least the specified Minimum Separation (in FWHM) and the limits for that ROI will be re-established. This process will be repeated until there are no more peaks to be added. In most situations, the residual search works best when the Fixed FWHM, Fixed Tail and Fit Singlets check boxes are selected.

ROI Limits Determination

The Sum/Non-Linear LSQ peak area calculations rely on these three parameters in determining whether multiplets are to be included in an ROI. Peaks that are no farther apart than the Maximum Number of FWHMs Between Peaks are seen as part of a multiplet and will be included in the ROI.

The calculation of the left and right ROI boundaries is influenced by the Maximum Number of FHWMs for Left (Right) Limit values. The ROI will not be extended beyond these limits even if the data has not leveled out.

Generate Report

If the **Generate Report** box is checked, a predefined report will be generated when this phase is executed and will be displayed in the application's report window. The report is defined in the AEF file as the Report Template Name and Section Name associated with this phase.

Library (Gamma-M)

The Gamma-M Library Peak Area algorithms include steps for defining the background continuum using the erosion technique, as well as calculating the peak areas and their uncertainties. The Gamma-M Library Peak Area setup screen is shown in Figure 120.

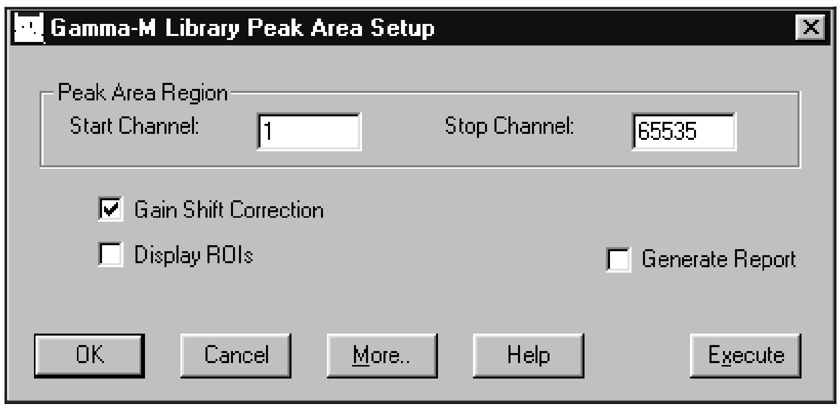


Figure 120 The Gamma-M Library Peak Area Setup

Peak Area Region

The analysis will include the energies included within the Peak Area Region or that are equal to either limit. The current peak locate table will be used to determine whether a peak falls within the specified Region.

Gain Shift Correction

Gain Shift Correction is a technique for moving the peaks so that their centroids are correctly placed. It is normally enabled (checked) because NaI peaks, in particular, tend to shift from their original calibrated positions as a function of temperature.

Display ROIs

If the "Display ROIs" check box is checked, the ROIs resulting from the analysis will be copied to the Display ROIs block in the datasource.

The ROI color conventions are:
Color 1: Non-interfered library peaks.
Color 2: Non-interfered unknown peaks.
Color 3: Interfered library peaks.
Color 4: Interfered unknown peaks.

More Peak Area Parameters

Selecting the **More** button brings up the screen in Figure 121, which lets you set several other parameters affecting Library Peak Area. The description of each parameter lists the default value for both Ge and NaI detectors.

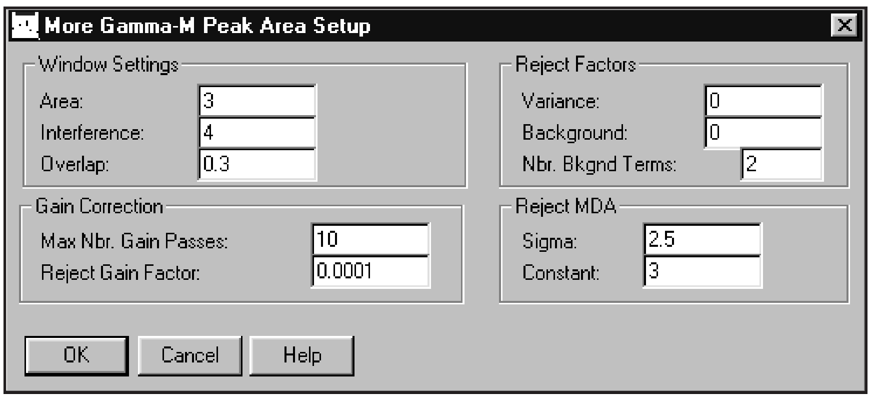


Figure 121 The Peak Area "More" Setup Showing Ge Detector Defaults

Window Settings

Area specifies the FWHM multiplier to establish the left and right ROI limit around the peaks for a fit to calculate the peak area. Default: 3 for Ge; 1.5 for NaI.

Interference specifies the FWHM multiplier to establish the limit beyond which two adjacent peaks are no longer considered to interfere with each other for the purpose of determining their areas. Default: 4 for Ge; 2.5 for NaI.

Overlap specifies the FWHM multiplier to establish the limit below which two adjacent peaks are considered as one; that is, one of the two peaks is deleted. Default: 0.3 for both Ge and NaI.

Reject Factors

Variance specifies the area variance rejection factor. Only peaks whose area is larger than this factor times the uncertainty of the area (at 1 sigma) will be accepted as valid peaks. Default: 0 for Ge; 1 for NaI.

Background specifies the peak rejection factor based on the area of the background. Only peaks whose square of the area is larger than this factor times the area of the background will be accepted as valid peaks. Default: 0 for Ge; 1 for NaI.

Number of Background Terms defines whether the fits are to be made with an added constant or linear continuum. 0 means that no additional continuum term will be used. 1 means that only a constant continuum will be used, and 2 means that a linear continuum will be used. Default: 2 for both Ge and NaI.

Gain Correction

The Gain Shift Correction check box on the Gamma-M Library Peak Area Setup screen must be checked for these parameters to be used in the calculations.

Maximum Number of Gain Passes specifies the maximum number of iterations allowed for the fits with the automatic gain correction. Default: 10 for both Ge and NaI.

Reject Gain Factor specifies the convergence criterion. When consecutive iterations produce a change in the chi-square less than this value, a convergence has been achieved. Default: 0.0001 for Ge; 0.005 for NaI.

Reject MDA

Sigma specifies the multiplier of the MDA equation used to accept or reject a peak area in the spectrum. Default: 2.5 for both Ge and NaI.

Constant specifies the constant term of the MDA equation used to accept or reject a peak area in the spectrum. Default: 3 for both Ge and NaI.

Area Correction

The area correction phase contains algorithms to correct the net peak areas before further calculations are made. You can choose either Background Subtract or Reference Peak Correction with or without Background Subtract.

Standard Background Subtract

The Standard Background Subtract algorithm (Figure 122) allows you to subtract background peak areas from matching peak areas in the current datasource as described in the

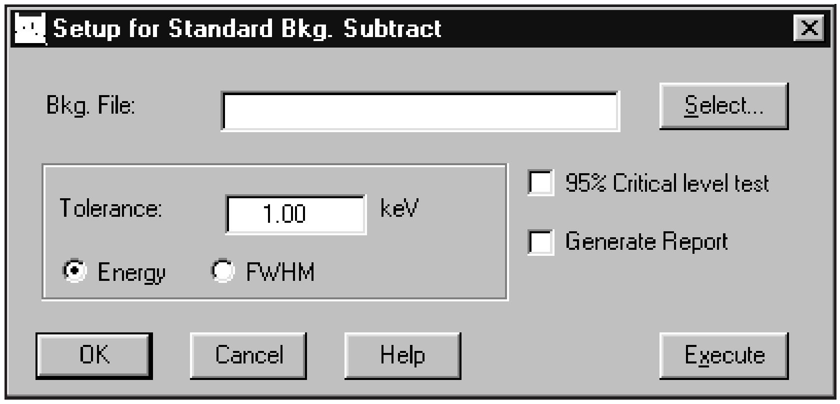


Figure 122 The Standard Background Subtract Setup

"Subtraction of Peak Environmental Background" section of the "Algorithms" chapter in the *Genie 2000 Customization Tools Manual*.

Background File

Type in the fully specified name of a background (.CNF) file to be used in the subtraction or click on **Select**, then choose a file from the file open dialog box.

Note: Do not enter a file name when using one of Canberra's automatic applications, such as PROcount. They use a specific background file. See the application's user's manual for more specific information.

95% Critical Level Test

The 95% Critical Level test may be enabled or disabled for this phase of the calculations. If the test is enabled, the net peak area of a singlet after the background subtract must exceed the 95% Critical Level value as described in the "Critical Level Testing" section of the "Algorithms" chapter in the *Genie 2000 Customization Tools Manual*.

If the Critical Level test is not enabled, all peaks are retained even if their areas are zero or negative after the background subtract.

Tolerance

Enter a tolerance value (either fixed Energy or variable FWHM) to define how large a difference can be allowed between a peak in the current datasource and a peak in the background datasource and still be considered the same peak.

The tolerance value can also be specified from within Calibration Setup (page 93) as Peak Match Tolerance.

Generate Report

If the **Generate Report** box is checked, a predefined report will be generated when this phase is executed and will be displayed in the application's report window. The report is defined in the AEF file as the Report Template Name and Section Name associated with this phase.

Reference Peak Correction

The Reference Peak Correction algorithm (Figure 123) uses a reference peak of a known count rate to normalize the areas of all other peaks in the spectrum. The reference source can be either an electronic pulser or an external stationary source. If both a reference peak correction and an environmental background subtract are to be applied, the reference peak correction must always be applied first. Therefore, this algorithm provides both of these corrections in the proper order as described in the "Reference Peak Correction" section of the "Algorithms" chapter in the *Genie 2000 Customization Tools Manual*.

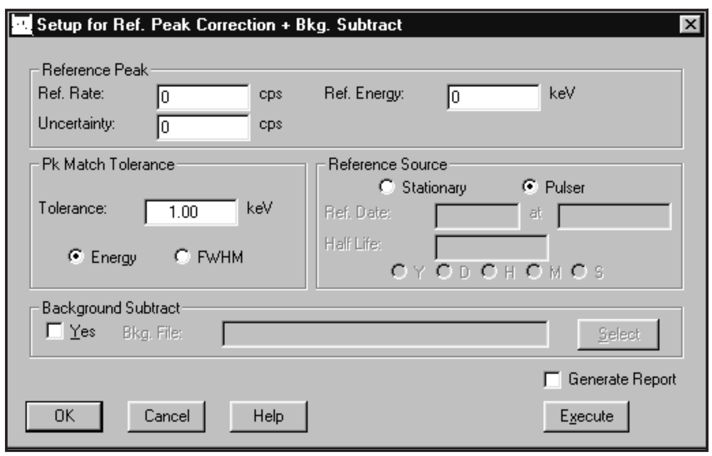


Figure 123 The Reference Peak Correction Setup

Reference Peak

The Reference Rate in counts per second is the emission rate of the reference source at the reference energy. The Reference Energy is the energy of the reference peak. Enter the Uncertainty of the reference peak in counts per second.

Peak Match Tolerance

Enter the Peak Match Tolerance value either in energy or in FWHM units to define how large a difference to allow between a peak in the current spectrum and a peak in the background spectrum and still be considered the same peak.

Reference Source

You can choose either a Stationary reference source or a Pulser. For a stationary source, the Reference Date is the date and time at which the source was measured.

Enter the Half Life of the nuclide which caused the reference peak. and choose the half-life's time units: **Y**ears, **D**ays, **H**ours, **M**inutes or **S**econds.

Background Subtract

Select the **Yes** checkbox to perform background subtraction. For the location of the background datasource, enter a fully specified pathname in the Bkg. File text box. If you like, press the **Select** button to look for a .CNF background file to load.

Efficiency Correction

The efficiency correction phase contains the algorithms to calculate the efficiency values for each of the peaks with calculated net areas. You can select one of four modes from the drop down list: Dual, Linear, Empirical or Interpolated (Figure 124).

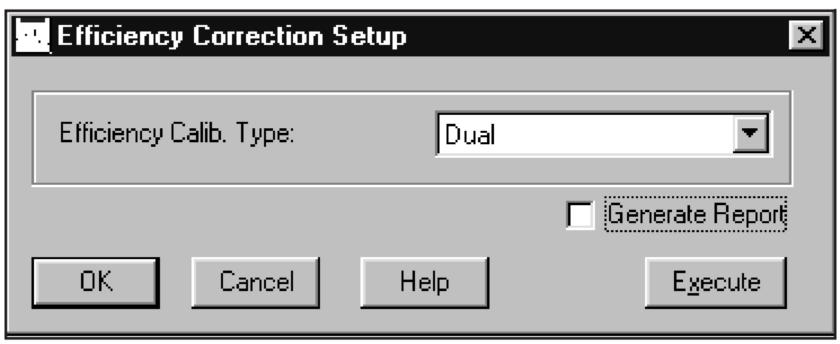


Figure 124 The Efficiency Correction Setup

Dual

Dual efficiency correction calculates the efficiency at each peak energy using the Dual efficiency curve as described in the "Efficiency Correction Using the Dual Curve" section of the "Algorithms" chapter in the *Genie 2000 Customization Tools Manual*.

Linear

Linear efficiency correction calculates the efficiency at each peak energy using the Linear efficiency curve as described in the "Efficiency Correction Using the Linear Curve" section of the "Algorithms" chapter in the *Genie 2000 Customization Tools Manual*.

Empirical

Empirical efficiency correction calculates the efficiency at each peak energy using the Empirical efficiency curve as described in the “Efficiency Correction Using the Empirical Curve” section of the “Algorithms” chapter in the *Genie 2000 Customization Tools Manual*.

Interpolated

Interpolated efficiency correction calculates the efficiency using a straight-line interpolation (in the ln-ln domain) between the two points on either side of the requested energy. If the energy is outside the range of calibration points, the nearest point is used.

Generate Report

If the **Generate Report** box is checked, a predefined report will be generated when this phase is executed and will be displayed in the application’s report window. The report is defined in the AEF file as the Report Template Name and Section Name associated with this phase.

Nuclide Identification

The nuclide identification step contains the algorithms to perform the nuclide identification and activity calculations.

Note that the MDA Confidence Factor is used both here and in the Detection Limits algorithm (page 161). If the Confidence Factor is changed here, the Detection Limits calculations are affected too, unless the factor is changed again *before* performing the MDA calculation.

Tentative NID

The Tentative Nuclide Identification (NID) algorithm (Figure 125) will generate a tentative nuclide identification. The algorithm looks at each of the peaks established by the Peak Area step of the analysis, and attempts to find a match in the specified nuclide library. It uses the specified tolerance to perform the search; all nuclides that satisfy that tolerance are recorded for reporting. The nearest match will be reported first, followed by any ‘more distant’ matches in order.

NID Library

This selection specifies the file whose nuclide library information is to be searched for each of the peaks. You can use the **Select** button to browse for nuclide libraries.

Tolerance

This is used to specify what value is to be used to decide if an energy line in the given library matches the peak being searched for. The tolerance can be a fixed energy (in keV),

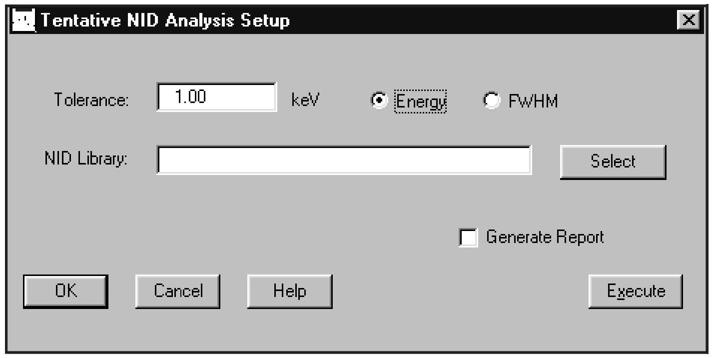


Figure 125 The Tentative NID Analysis Setup

or variable. If you choose variable (FWHM) the tolerance becomes the number entered multiplied by FWHM calculated at the energy of the peak.

Generate Report

If checked, a report will automatically be generated and displayed in the report window after the analysis has executed. The name of the report template file, and the name of section to be used, are defined in the Analysis Engine File.

NID

If the current spectrum already includes peak area and efficiency correction results, the Nuclide Identification (NID) algorithm (Figure 126) identifies the spectrum's nuclides, as described in the "Basic Calculations" section of the "Algorithms" chapter in the *Genie 2000 Customization Tools Manual*.

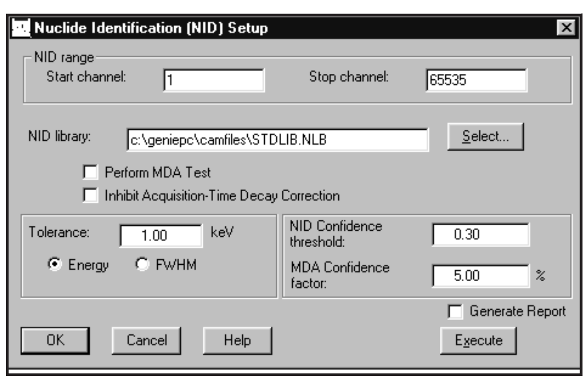


Figure 126 The NID Setup

NID Range

The identification is limited to the specifed NID Range; only peaks within those limits will be considered for identification. Note that though the stop channel initially defaults to a large value, the algorithm will only search to the spectrum's highest channel.

NID Library

Type in the fully specified name of a library (.NLB) file to be used in the identification or click on **Select**, then choose a file from the file open dialog box.

Perform MDA Test

The Perform MDA Test is most useful in cases where a nuclide has many peaks with small branching ratios that would result in peaks that are below the MDA level, such as in most low activity samples. Enabling this function will ignore small peaks when calculating the identification confidence so that expected peaks below the MDA will not penalize the confidence test results.

Inhibit Acquisition-Time Decay Correction

If this option is enabled, decay correction will not be performed during the count time. Decay correction will still be performed for wait time (the time between sample time and the start of the count) and for build up time (the time the sample is building up on a filter), if any.

Tolerance Value

You must set the tolerance value in either energy or FWHM units (this value can also be specified as Eff & Match Tolerance in **Calibration | Setup** on page 93).

NID Confidence Threshold

The NID Confidence Threshold is used to accept or reject peaks for identification; this parameter's range is 0 (low) to 1 (high).

MDA Confidence Factor

In the standard NID, the MDA Confidence Factor is used as the designated MDA confidence during the MDA test only if Perform MDA Test is enabled.

Generate Report

If the **Generate Report** box is checked, a predefined report will be generated when this phase is executed and will be displayed in the application's report window. The report is defined in the AEF file as the Report Template Name and Section Name associated with this phase.

NID with Interference Correction

If the current spectrum already includes peak area and efficiency correction results, the Nuclide Identification with Interference Correction algorithm (Figure 127) identifies the spectrum's nuclides and automatically performs an interference correction and weighted mean calculation on them, as described in the "Basic Calculations" and "Activity Corrections" sections of Appendix B, *Algorithms*, in the *Genie 2000 Customization Tools Manual*.

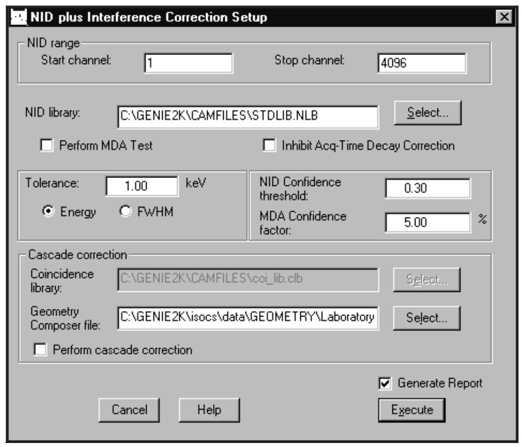


Figure 127 The NID/Interference Correction Setup

MDA Confidence Factor

The MDA Confidence factor for NID with Interference Correction is the same that used for standard NID, except that there is an added function. This factor governs the allowed uncertainty of the activity results, which must exceed its own uncertainty times a factor related to the MDA Confidence Factor. The smaller the MDA Confidence Factor, the larger the multiplier. Note that this factor is applied only if the 95% Critical Level test, which is set in either the Sum Non/Linear LSQ Fit Peak Area screen (page 147) or the Standard Background Subtract screen (page 152), is enabled.

Cascade Correction

The Cascade Correction feature lets you correct nuclide activities for losses or gains due to the cascade summing effect of gamma rays. The Cascade Correction can be enabled/disabled in the **NID with Interference Correction** dialog.

For information on setting up and using Cascade Correction, please refer Chapter 8, *Using Cascade Correction* on page 204.

For cascade correction to work, the gamma ray spectrum must include a valid peak-to-total calibration and a valid efficiency calibration that is free from cascade summing effects. Refer to Appendix E, *Correcting an Efficiency Calibration for Cascade Summing*, on page 341 for details on correcting an empirical efficiency calibration.

Other components that are necessary for running the cascade correction are the **Coincidence library** and a **Geometry file** that contains the source-detector geometry information for the given measurement.

Generate Report

If the **Generate Report** box is checked, a predefined report will be generated when this phase is executed and will be displayed in the application's report window. The report is defined in the AEF file as the Report Template Name and Section Name associated with this phase.

Parent-Daughter Correction

The Parent-Daughter Correction algorithm loops through the identified nuclides in the datasource, searching for nuclides in parent-daughter pairs. It performs corrections to the activities of the daughter nuclides (where appropriate) to account for possible feeding from a parent nuclide. The algorithm only treats parent-daughter pairs. It does not handle multiple generation (e.g. parent-daughter-granddaughter) nuclide chains.

Note that it is necessary to execute the "NID plus Interference Correction" analysis step on the datasource prior to running this algorithm. The NID plus Interference Correction step calculates the activity of each identified nuclide at the Sample Time by treating it as a standalone decay. That is, it does not account for parental feeding.

The definition of the parent or daughter for a given nuclide is established in the nuclide library (NLB) file used in the NID plus Interference Correction step. These definitions are editable in the Nuclide Library Editor (see "The Optional Nuclide Data" on page 177). Note that while defining a parent-daughter relationship you must specify the Decay Ratio (the fractional probability for the parent to decay into the daughter) and the Error in the Decay Ratio while editing the *daughter* nuclide.

The Parent-Daughter Correction algorithm first examines each nuclide as a potential daughter. If the nuclide has a parent defined in the nuclide library and the parent was found in the datasource, the nuclide's activity at the Sample Time is corrected for feeding from the parent.

The algorithm then makes a second pass through the list of identified nuclides, this time examining each as a potential parent. If the nuclide has a daughter defined in the nuclide library but the daughter was *not* found in the datasource, an activity record is created for the daughter and its activity is calculated (assuming 0 for the uncorrected activity) and stored.

The mathematical expressions used for the corrected activities and their uncertainties are given in the "Parent-Daughter Correction" section of Appendix B, *Algorithms*, in the *Genie 2000 Customization Tools Manual*.

Generate Report

If the **Generate Report** checkbox is checked, a report will automatically be generated and displayed in the report window after the analysis has executed. In this report, if a nuclide's activity has been corrected by the Parent-Daughter Correction algorithm, it is flagged with a special symbol in the left-hand margin. The name of the report template file, and the name of section to be used, are defined in the Analysis Engine File entry for this algorithm.

Detection Limits

The Detection Limits step contains the algorithms to perform MDA or KTA MDA (used for German regulatory compliance) and LLD calculations. If applied to a spectrum collected with a blank sample or in an empty shield, the Detection Limits calculation is equivalent to an LLD calculation.

The MDA algorithm (Figure 128) calculates the MDA values for all the nuclides as described in the "MDA Calculations" section of Appendix B, *Algorithms*, in the *Genie 2000 Customization Tools Manual*.

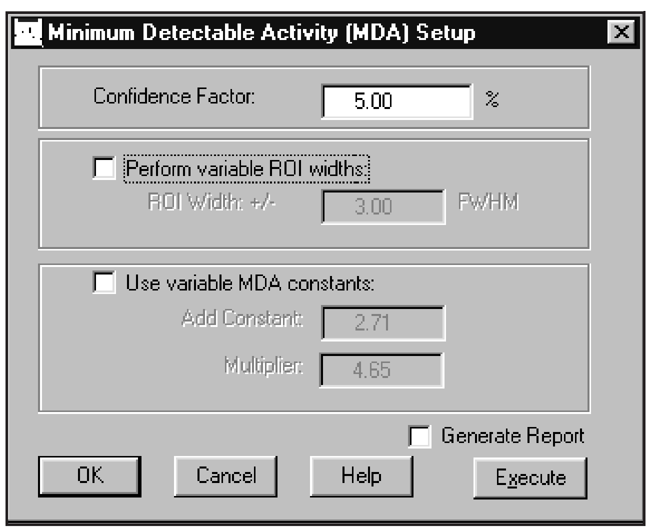


Figure 128 Detection Limit Setup

Note: When a Cascade Correction is applied to the data before the MDA step, the MDA algorithm will take the cascade corrected results into account.

Confidence Factor

The MDA Setup screen lets you select the MDA Confidence Factor, which can be set to any value between 0.1% (high) and 40% (low) for calculating detection limit values. For instance, to use the NRC 95% confidence factor, you would enter 5.00% here.

Note that the Confidence Factor is used both here and for the Nuclide Identification algorithms described in the “Basic Calculations” section of the “Algorithms” chapter in the *Genie 2000 Customization Tools Manual*.

If the Confidence Factor is changed here, the NID calculations are affected too, unless the factor is changed again in the NID Setup screen *before* performing the NID calculation.

Perform Variable ROI Width

Selecting this checkbox extends the MDA ROI to the left and right of the expected location of the energy line by the number of expected FWHMs entered in the ROI Width text box. If not selected, 4.0 FWHM will be used for Currie MDA calculations or 1.25 FWHM for KTA MDA calculations.

ROI Width

This parameter establishes the width of the ROI as plus and minus the specified number of FWHMs from the expected location of an unidentified peak. The minimum setting is 0.8 FWHM.

Use Variable MDA Constants

Selecting this allows the user to specify the values for the Add Constant and the Multiplier used in the MDA calculations, as described in the “Currie MDA” section or the “KTA MDA” section the “Algorithms” chapter in the *Genie 2000 Customization Tools Manual*.

If the checkbox is not selected, the “normal” equation of $L_D = k^2 + 2L_C$ is used. At the typical 95% confidence level the “normal” equation is equivalent to specifying 2.71 for the Add Constant and 3.29 for the Multiplier.

Add Constant

This parameter specifies the Add Constant used in the MDA calculation if the “Use Variable MDA Constants” option has been checked.

Multiplier

This parameter specifies the Multiplier used in the MDA calculation if the “Use Variable MDA Constants” option has been checked.

Generate Report

If the **Generate Report** box is checked, a predefined report will be generated when this phase is executed and will be displayed in the application's report window. The report is defined in the AEF file as the Report Template Name and Section Name associated with this phase.

Post NID Processing

The Post Processing algorithm will perform Action Level calculations on identified and unidentified nuclides, as described in the "Post-NID Processing Algorithms" section of the "Algorithms" chapter in the *Genie 2000 Customization Tools Manual*.

In addition, it will total the number of identified nuclides and unidentified peaks. The Post NID Processing setup parameters are shown in Figure 129.

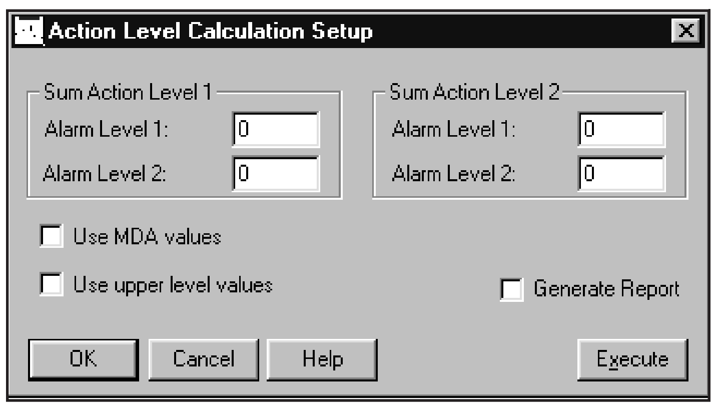


Figure 129 The Post NID Processing Setup

Sum Action Level 1

Specifies Alarm Limits 1 and 2 for the sum of Action Level 1 values for all nuclides.

Sum Action Level 2

Specifies Alarm Limits 1 and 2 for the sum of Action Level 2 values for all nuclides.

Use MDA Values

When this checkbox is selected, the action level calculation will include MDA values for those nuclides that were not identified, and therefore had no activity values calculated. If not selected, the action level calculations will not include those nuclides for which no activity was found.

Use Upper Level Values

When this checkbox is selected, the activity plus its error or the MDA value plus its error will be used as the upper bound value for the action level calculation. If not selected, action level calculations will simply use activity or MDA values.

Generate Report

If the **Generate Report** box is checked, a predefined report will be generated when this phase is executed and will be displayed in the application's report window. The report is defined in the AEF file as the Report Template Name and Section Name associated with this phase.

Reporting

The reporting phase contains the routines to output analysis results as well as any other information contained in the datasource. The Genie 2000 Report System is covered in detail in the "Report Module and Template Files" chapter of the *Genie 2000 Customization Tools Manual*.

Template Name and Section Name

To output the analysis results, choose both a Template Name and a Section Name within that file, as shown in Figure 130 (note that a section named <all> is available if you want to use the entire template file).

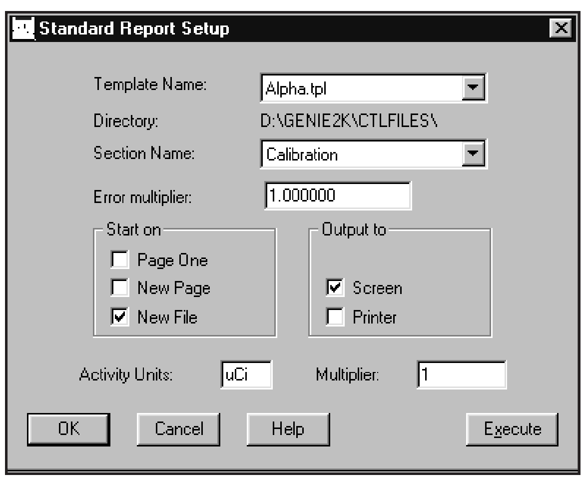


Figure 130 The Standard Report Setup

Error Multiplier

Though uncertainty values are always calculated and stored at 1 sigma, errors can be reported at a different sigma level by entering a specific Error Multiplier here. For instance, if you'd like errors to be reported at 3 sigma, type in 3 as the Error Multiplier.

Start On

You should check one of the boxes in the "Start on" section:

- **Page One** means that the first page of the next report section will be numbered as one.
- **New page** means that the new results will be appended to existing results and start on a new page.
- **New file** means that any previous report file (spectrum file name with an extension of .RPT) will be overwritten; if this box is *not* checked, the data will be appended to the existing file.

Output To

The report is always written to a disk file (the default path is C:\GENIE2K\REPFILES\name.RPT, where name is the name of the datasource being reported on). In addition, the "Output to" box lets you also send the file to the Screen or to a Printer, or to both.

Activity Units and Multiplier

Activity Units is normally µCi; if you want to use another unit for reporting nuclide activities, enter that unit here. Since the activities are stored in microcuries, you'll have to enter a factor to convert microcuries to your units (if you want to use Bq, for instance, enter 37000 here).

Edit Menu

The **Edit** Menu allows you to enter and edit Sample Information, define and edit Analysis Sequences.

Sample Info

Sample info presents you with a dialog screen (Figure 131) for entering sample information for the current datasource. This is the same dialog you'll see if you select the Edit | Sample Info menu item in the spectral display application.

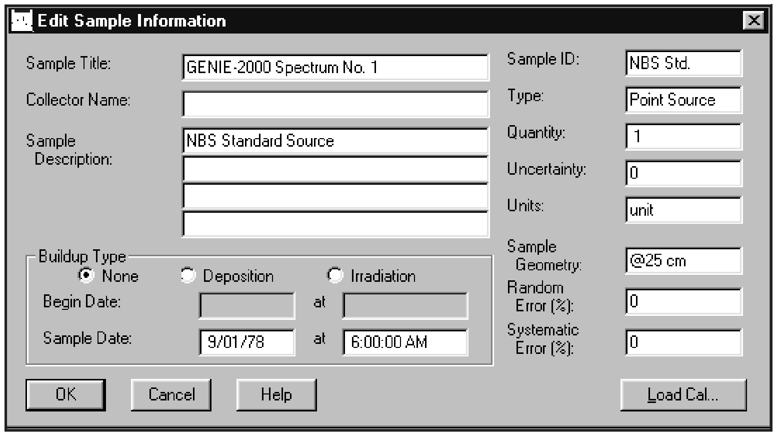


Figure 131 Editing Sample Information

The Text Fields

The text fields allow you to enter descriptive data for your sample. You can enter up to 64 characters in the Sample Title field and all four of the Sample Description fields. You can enter up to 16 characters in the Sample ID, Type, and Sample Geometry fields and up to 24 characters in the Collector Name field.

This dialog also asks for the sample Quantity, its Uncertainty and its Units, and the user-defined percent Random Error and percent Systematic Error, all of which are used in calculating the uncertainty for the nuclide line activity, as described in the "Basic Calculations" section of the "Algorithms" chapter in the *Genie 2000 Customization Tools Manual*.

Buildup Type

Selecting **None** will allow entry of the Sample Date and time; that is, the time you collected the sample. The Begin Date is not available for this Type.

Selecting **Deposition** or **Irradiation** lets you enter the Begin Date and time and End Date and time for your sample's deposition or irradiation time.

Load Cal

The **Load Cal** button lets you load a calibration file (.CAL) into the datasource. You have the option of loading the source's Energy/Shape calibration, Efficiency calibration, or both. The **Info** button displays a dialog box which shows descriptive information for the currently selected file, if any is available.

More

The **More** button lets you define or customize a dialog which allows editing of additional sample information parameters. The content/format of this dialog screen is defined via a .FDS file named GAAINFO.FDS (this must be in the directory defined by the environment variable EXEFILES). Only CAM sample class parameters are supported by this mechanism. If the required .FDS file is not present in the required directory, the More button will not be shown on the Edit Sample Information dialog screen.

Note: If a .FDS file is defined that contains sample parameters already present on the main edit sample information dialog, any value entries for those duplicate parameters will be overridden by values entered in the main dialog screen.

Analysis Sequence

The **Analysis sequence** command allows you to create or edit analysis sequences that you can use to automatically analyze your spectra (Figure 132).

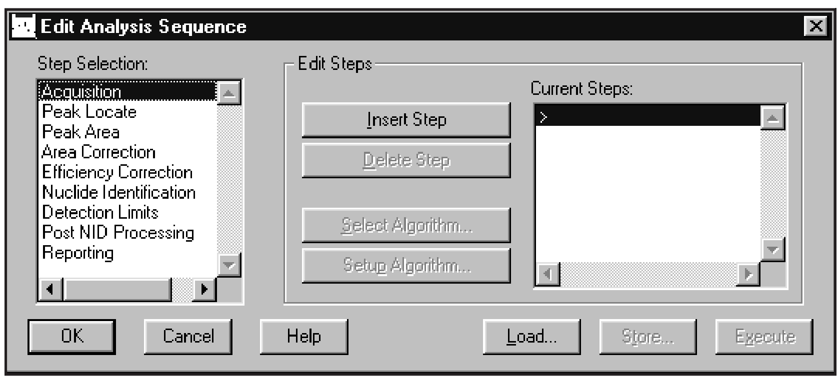


Figure 132 A Typical Edit Analysis Sequence Dialog

Inserting a Step

To add a step to the sequence, highlight a step in the Step Selection list box, then click on the **Insert Step** button. The step will be added to the Current Steps list.

Deleting a Step

To remove a step from the sequence, highlight the step in the Current Steps list that you want to remove, then click on the **Delete Step** button.

Selecting an Algorithm

To choose an algorithm for the current step, press the **Select Algorithm** button. For instance, if you had inserted and highlighted the Peak Locate phase step, pressing the Select Algorithm button would bring up a window similar to Figure 133, which shows the Peak Locate phase's algorithms. To associate one of the algorithms with the phase, highlight the algorithm then press **OK** to save the association.

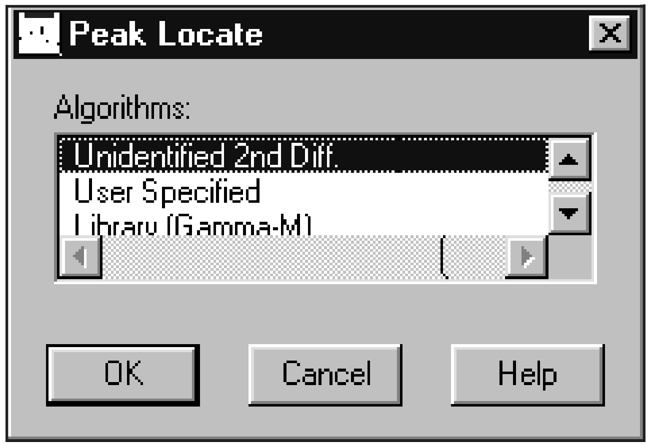


Figure 133 Selecting an Algorithm

Note that the Peak Locate and Peak Area algorithms' Start Channel and Stop Channel parameters and all Report algorithm parameters can be specified differently each time one of those algorithms occurs in a sequence (the Report algorithm's "Standard" step has an asterisk beside it to indicate this). All other algorithms, steps and parameters *cannot* be specified independently. This means that each time one of those is used in a sequence, a common set of parameters will be used.

Setting the Algorithm's Parameters

After you have associated an algorithm with the phase, press the **Setup Algorithm** button and verify or change the algorithm's parameters. The setup screens and parameter choices for each of the analysis phases are described in detail in "Analyze Menu", starting on page 137.

Loading a Sequence File

Load (Figure 134) allows you to load either the steps from the last executed analysis sequence file, shown in the File Name box, or the sequence of steps from the **Current** datasource. Either of these functions will populate the Current Steps list box with the sequence's steps and will load their associated setup parameters.

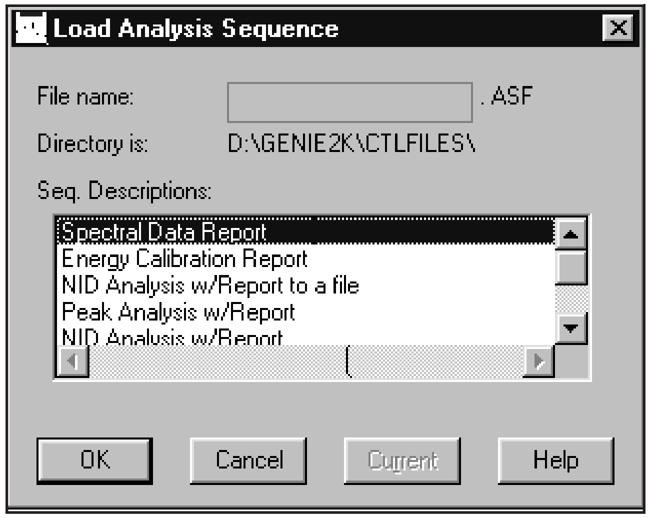


Figure 134 Loading the Sequence

Any other sequence file can be edited with the Analysis Sequence Editor, which is described in detail in the “Using the Analysis Sequence File Editor” chapter in the *Genie 2000 Operations Manual*.

Storing a Defined Sequence

Store allows you to save an analysis sequence as a file on disk. These files will appear in both the Analyze menu (page 137) and the Load screen’s sequence descriptions.

Execute

The **Execute** button executes the currently defined analysis sequence, which is the sequence of steps listed in the Current Steps list box.

Options Menu

The **Options** Menu lets you Change the Operator’s Name, perform Strip and Smooth, and work with the Report Window.

Change Operator Name

Selecting **Change Operator Name** lets you enter or edit an operator name. This name will be stored in all currently opened datasources whenever various phases of analysis and calibration are performed.

Interactive NID

The Interactive Nuclide Indentification (NID) option (Figure 135) brings up a modeless dialog, allowing you to see a graphical connection between the location of the spectrum cursor and the nuclides in a library.

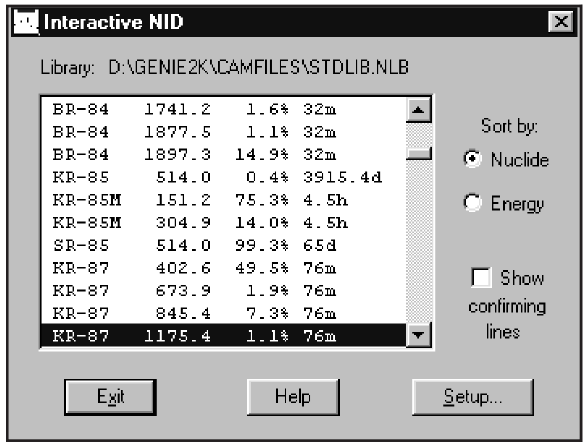


Figure 135 The Interactive NID Dialog

As you may move the cursor in the spectrum window Interactive NID will attempt to find the closest matching line (within tolerance) in the nuclide library and select that line in the list box. Alternatively, you may select a line in the list box and this will automatically move the spectrum cursor (if possible) to that energy.

The nuclide information for the currently selected line will also be displayed in the **Nuclide Info** status page. If the cursor is within an ROI, an activity will be calculated using the current efficiency calibration and displayed in that page.

Sort By Nuclide or Energy

The list can be sorted either by nuclide name, or by line energy. Use these radio buttons to toggle between the two modes.

Show Confirming Lines

If the Confirming Lines box is checked, the energies of any other lines for the selected nuclide will be marked in the spectrum window.

Setup…

The Setup button lets you change the Interactive NID preferences. This includes nuclide library, tolerance, and activity units.

Geometry Composer

This menu entry will be available if the S501 Gamma Analysis, S573 ISOCS or S574 LabSOCS application option is installed. Refer to Chapter 9, *Using the Geometry Composer*, for details.

Strip

The **Strip** command (Figure 136), lets you choose the Background Datasource, which is multiplied by the constant entered in the text box, then is subtracted from the Current Datasource, channel by channel.

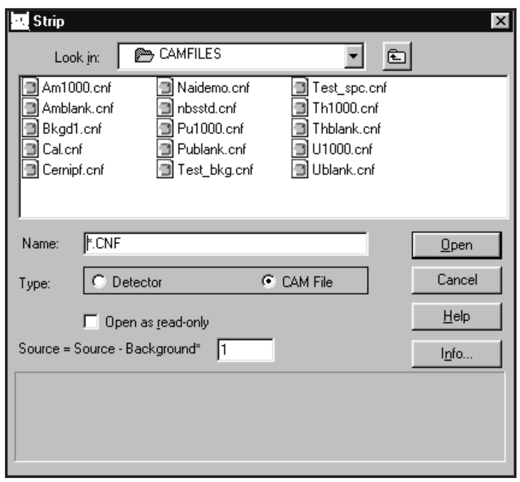


Figure 136 The Strip Dialog

The Background Datasource is chosen by clicking on one of the **Datasource Type** buttons, then selecting a .CNF file using the **Files** list and **Directories** list in the center of the dialog box.

When you have chosen the Background Datasource and entered the strip factor in the text box at the top of the window, click on **OK** to start the strip process.

Smooth

Choosing **Smooth** (Figure 137) lets you smooth the current datasource to decrease or eliminate random data fluctuations. You can choose one of six weighted-average smoothing algorithms, from 3 point to 13 point.

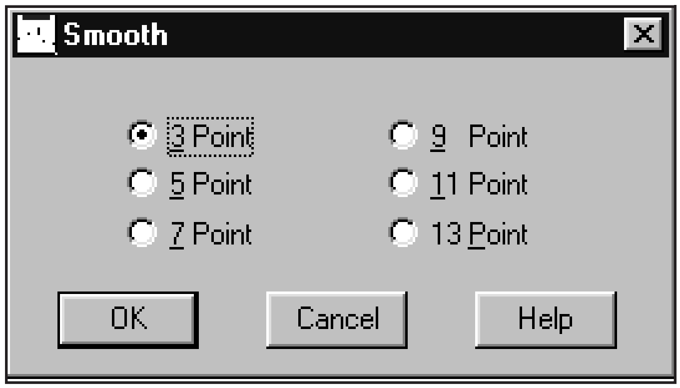


Figure 137 The Smooth Dialog

How Smoothing Works

As an example of how smoothing works, let's consider **3 Point** smoothing, which weight-averages three channels at a time: the current channel and one channel to either side. The weighted-average value is placed in the current channel, then the algorithm moves on to the next channel, repeating the process until the entire spectrum has been smoothed.

Report Window

The **Report Window** menu item lets you choose among several commands: three of these are for the window's contents, the others control the window's size. The window size you choose can be saved as a permanent setting; see "Display Preferences | Save" on page 131.

Copy Highlighted Contents to Clipboard

This command copies the highlighted contents of the Report Window to the system clipboard so you can paste the data in another application, such as a word processor or a presentation program.

Copy Contents to Clipboard

This command copies the entire contents of the Report Window to the system clipboard.

Clear Contents

Selecting this command will remove all data from the Report Window.

Default Size

If you have changed the size of the Report Window, either by dragging a window border or by using one of the sizing commands in this menu, this command will return the window to its default size.

Maximize

The Maximize command will enlarge the Report Window to full screen, allowing you to read the data more easily.

Minimize

This command removes the Report Window from the display and maximizes the spectral display.

Datasource Menu

The **Datasource** menu doesn't appear in the Menu Bar until at least one datasource has been opened. It can show up to eight datasource file names. If more than eight datasources are currently open, the "More" item will be added to the menu. Selecting **More** brings up a list of all open datasources, letting you choose the one of interest (Figure 138). The maximum number of datasources which can be open at one time is 32.

When one of the datasource file names is selected, the spectral display area changes to show the selected datasource.

Next Group

Select **Next Group** to index to and display the next memory group. This menu item is available only if the datasource is a multi-memory group input.

For example, if you open a Detector Input called MULTI(1:4), the spectral displays will display the first memory group. Selecting **Next Group** will display memory group 2 and the Title Bar will show MULTI(2:4), and so on.

Previous Group

The **Prev Group** menu item, which is available only if the datasource is a multi-memory group input, indexes to and displays the previous memory group.

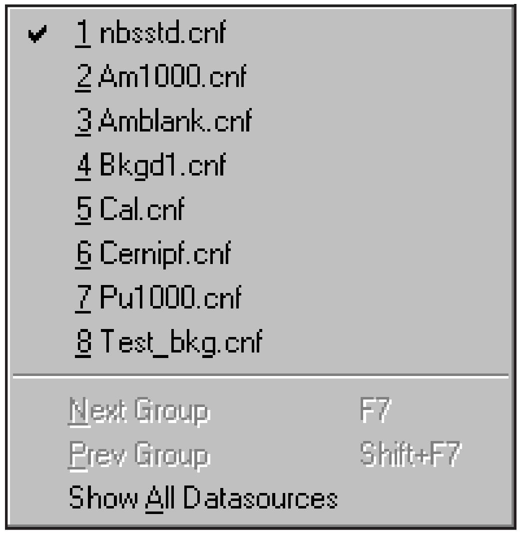


Figure 138 The Datasource Menu

For example, if you open a Detector Input called MULTI(1:4), the spectral displays will display the first memory group. Selecting **Prev Group** will display memory group 4 and the Title Bar will show MULTI(4:4), and so on.

Show All Datasources

Show All Datasources is available only if more than one datasource is open. Selecting it will simultaneously display up to eight open datasources.

You can get to a different set of eight either by using F6 (next datasource) or by selecting the **Datasource** | **More** menu item and choosing any of the open datasources.

The current datasource has a heavy border around its display and its name is displayed in the Title Bar.

Single click on any one of the display areas to make it the current datasource. Double click on any one of the display areas to make that datasource a full screen display.

5. Using the Nuclide Library Editor

Included with the Genie 2000 Basic Spectroscopy software is an editor for creating and maintaining the nuclide libraries that are used for both qualitative and quantitative radionuclide analysis. In this chapter we'll take a look at how to use that editor to modify existing and create new nuclide libraries.

Getting Started

To start the Editor, double click on its icon in the Genie 2000 folder. This will start the program and will bring up the Dialog Box shown in Figure 139.

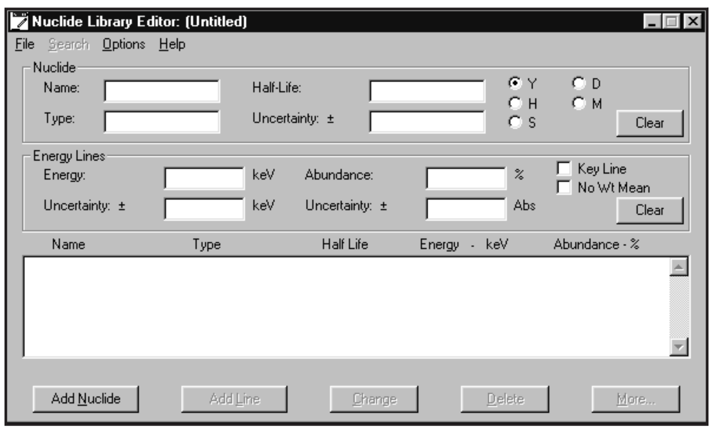


Figure 139 The Nuclide Library Editor

Editing a Nuclide Library

Genie 2000 includes a Standard Nuclide Library, a NaI Detector (example) Library, a Demo Nuclide Library and four Master Libraries. The Demo Nuclide Library, DEMOLIB.NLB, contains 17 nuclides and 60 lines. The "No MDA" flag (page 178) is not set for any of the nuclides in the Demo Nuclide Library. Table 1 lists the library.

The Standard Nuclide Library STDLIB.NLB contains 109 nuclides and 511 lines; the "No MDA" flag is set for all nuclides *except* those listed in the Demo Nuclide Library.

Table 1 The Demo Nuclide Library

K-40	Co-57	Co-60	Se-75	Sr-85
Y-88	Cd-109	Sn-113	Cs-134	Cs-137
Cs-138	Ce-139	Hg-203	Kr-85	Sc-46

The four Master Libraries are included to help you build tailored libraries for specific situations. For more information on these libraries, their origin and their use, refer to “The Master Libraries” on page 189.

We’ll edit the Demo Nuclide Library to see how to use the Nuclide Library Editor.

Opening a Nuclide Library

The **Open** command in the **File** menu is used to select a file for editing. From the standard File Open dialog box, open the file DEMOLIB.NLB. This will result in a screen like the one in Figure 140; the first nuclide – Be-7 – is selected for editing. Note that a scroll bar is provided for scrolling through the library list.

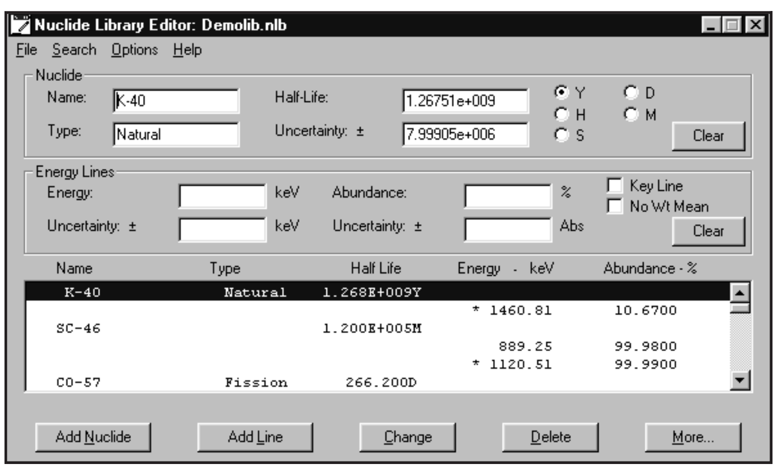


Figure 140 A Library Opened for Editing

The Nuclide Data

For each radionuclide in the library, there is both a basic set of data that must be present plus optional sets of permissible limit data. In addition, there are editing buttons that are used to deal with nuclide entries as a whole (as opposed to operating upon just one energy line of a nuclide).

The Basic Nuclide Data

The first entry for each nuclide in the library is general information about the nuclide itself. These fields include:

1. **Name.** This is an eight-character field that is used for the name of the nuclide.

2. **Type.** This is a 16-character field that can be used to enter a type or classification for the nuclide if you like.

3. **Half-Life.** Enter the nuclide's half-life in this field, then choose the time units: Years, Days, Hours, Minutes, or Seconds.

4. **Uncertainty.** This is the uncertainty in the half-life, expressed in the same time units as the half-life.

The Optional Nuclide Data

Clicking on the **More** button pops up the Dialog Box shown in Figure 141, which is used to add nuclide information related to decay chain information, Parent/Daughter information, Health Physics analyses and more.

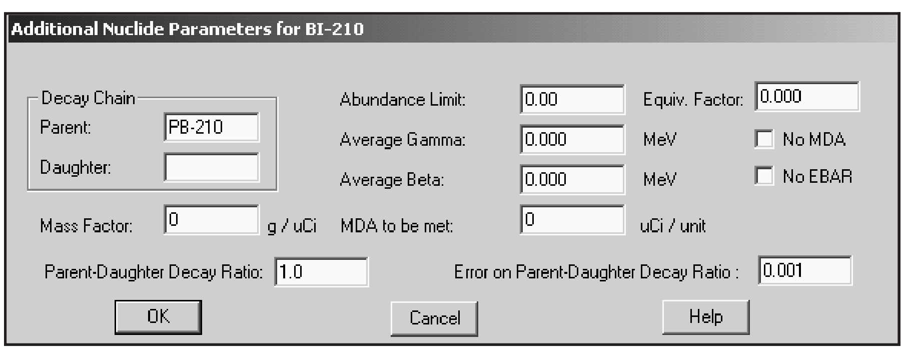


Figure 141 The Optional Data Dialog

1. **Decay Chain.** These fields specify the parent and daughter nuclides, if any, of the current nuclide. They are used by Genie 2000's Parent-Daughter function.

2. **Abundance Limit.** This field is reserved for future use.

3. **Average Gamma.** This is the average gamma energy that is emitted by this nuclide.

4. **Average Beta.** This is the average beta energy that is emitted for this nuclide.

5. **MDA to be met.** The value entered here is used by the MDAPRESET Job Function, which is described in section with that title in the "Batch Procedure Reference" chapter of the *Genie 2000 Customization Tools Manual*.

6. **Equiv. Factor.** This field is used for ^{131}I or ^{137}Cs equivalency calculations.

7. **No EBAR.** If this check box is selected, this nuclide will not be included in any EBAR calculations that are made.

8. **No MDA.** If this check box is selected, the "No MDA" flag will be set and this nuclide will not be included in any Minimum Detectable Activity calculations that are performed.

9. The **Parent-Daughter Decay Ratio** and the **Error on Parent-Daughter Decay Ratio** specify the parent nuclide's fractional decay probability and its error (uncertainty), specified in the Decay Chain – Parent field of this dialog, to decay into the current nuclide. Note that this is an absolute fraction, not a percentage.

For all of these fields that require a text entry, click in the field, then enter the values you want to use.

Clear

The **Clear** button clears the edit boxes so that new values can be entered without having to delete the box's contents first.

Adding a Nuclide

To add a new nuclide to the library, edit the nuclide data as above, then click on the **Add Nuclide** button. This will position the nuclide in the library so that the library remains sorted by mass number and nuclide name.

Changing the Nuclide Entry

Once you've made all your edits to an existing nuclide entry, clicking on the **Change** button will update the entry in the list with the values from the edit fields.

Deleting a Nuclide

To delete a nuclide from the library, select it by clicking on it, then click on the **Delete** button. This pops up a query box to confirm the deletion.

The Energy Line Data

In addition to the general nuclide data, each library entry also contains one or more Energy Line entries. There will be one such entry for each Energy Line that you want to have associated with that nuclide.

Editing an Energy Line Entry

To edit an existing Energy Line entry, click on it in the library list to select it. When you do that its parameters will be copied into the Energy Line edit area, as shown in Figure 142. The parameters for each line are:

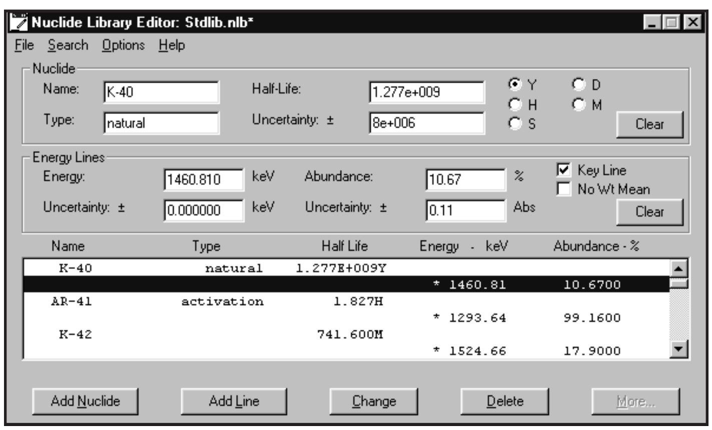


Figure 142 Editing Energy Line Data

1. **Energy.** This is the energy of the line. In this case the energy is displayed in keV.

2. **Uncertainty.** This is the uncertainty in the energy, expressed in the same units as the energy.

3. **Abundance.** This is the percentage of the total events emitted by the nuclide at this particular energy. Abundance is also called branching ratio or yield in the literature.

4. **Uncertainty.** This is the uncertainty in the abundance, expressed in Absolute terms. For example, in Figure 142 the abundance is 10.67 ± 0.11%.

5. **Key Line.** This check box is used to select or deselect this line as the “Key Line” for the nuclide. It is used for reporting purposes, and is normally selected for the highest abundance line for a nuclide with multiple lines.

6. **No Wt Mean.** Check the No Weighted Mean checkbox if you want to omit this line from the weighted mean activity calculations, as described in the Activity Corrections section of the “Algorithms” appendix in the *Genie 2000 Customization Tools Manual*.

Once you’ve made all your edits to an Energy Line, clicking on the **Change** button will update the entry in the list with the values from the edit fields.

Adding an Energy Line

To add a new line to the nuclide, edit the line data as above, then click on the **Add Line** button. This will add the line in its proper energy position in the list of lines for the nuclide.

Deleting a Line

To delete a line from a nuclide, select it by clicking on it, then click on the **Delete** button. There is no confirmation query, so make sure you have selected the correct line before clicking on Delete.

The Options Menu

The Options Menu contains several commands that can be used to further tailor the Nuclide Library.

Extract

This command lets you extract nuclides and their associated energy lines and information from an existing nuclide library file.

Select **Extract**, then click on **Open** and double click on a nuclide library name in the Files list box. The Extract Library Nuclides list box will be populated with the nuclides from the selected library, as seen in Figure 143.

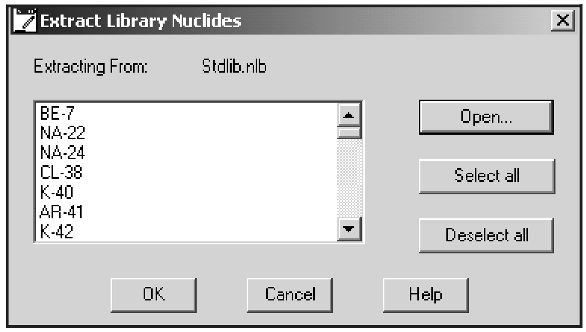


Figure 143 The Extract List Has Been Populated

Single nuclides can be extracted simply by clicking on the nuclide name in the list box, or click on **Select all** to extract all lines.

Energy Units

Though energies are stored in keV, the **Energy Units** command can change how energy units are shown in the editor's dialog boxes and in reports. The dialog box in Figure 144 allows you to select which energy units you want to display: **eV**, **keV**, **MeV**, or **Other**.

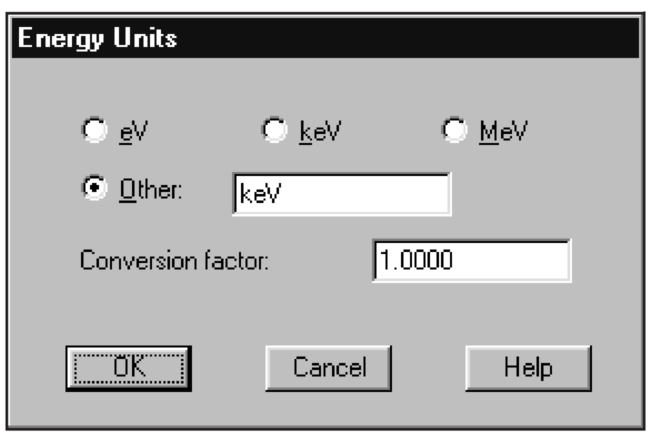


Figure 144 Energy Units Dialog

The proper Conversion Factor for “other” units is defined as the number of keV units equal to 1 “other unit”. For example, the conversion factor for MeV would be 1000 because there are 1000 keV units in 1 MeV.

MPC Units

To set the MPC units, click on **MPC Units** in the Option Menu. You’ll see the dialog box shown in Figure 145, where you can select the MPC Activity Units (μCi or Bq) for the library and the Volume Units (cm^3, m^3, ml or l) for each of the MPC limit variables in the library.

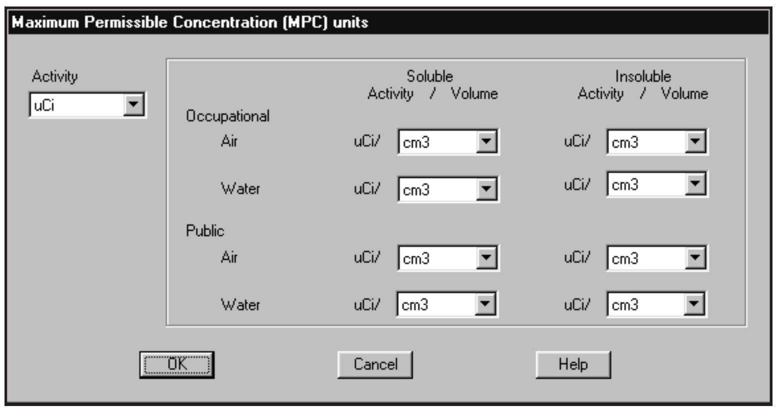


Figure 145 The MPC Units Dialog

Drop down lists are used for the selection. For each item you want to change, click on the Down Arrow, then click on your choice from the list.

MPC Values

This command is used to set the MPC values for the currently selected radionuclide. Click on **MPC Values** in the Option Menu to see the dialog box shown in Figure 146. Now you can set values for each of the eight Maximum Permissible Concentration limits. The units for these MPC values are the ones set under MPC Units in the Options menu (page 182).

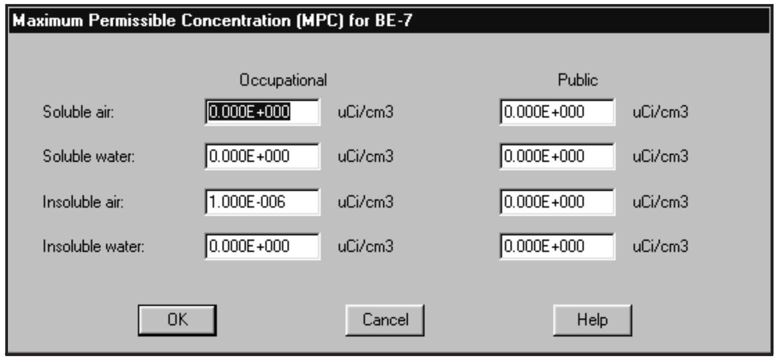


Figure 146 The MPC Values Dialog

Effl./DAC Units

This command is used to set the Effluent and DAC limit units. Click on **Effl./DAC Units** in the Option Menu to see the dialog box shown in Figure 147. Now you can set the Effluent and DAC limit Activity Units (µCi or Bq) for the library and the volume units (cm^3, m^3, ml, l) for each of the Effluent and DAC limit variables in the library.

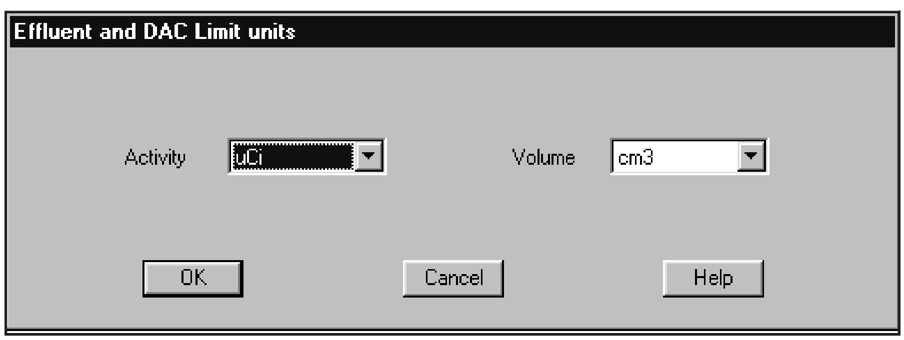


Figure 147 Effluent and DAC Limit Units Dialog

Drop down lists are used for the selection. For each item you want to change, click on the Down Arrow, then click on your choice from the list.

Effl./DAC Values

This command sets the Effluent and DAC limit values for the currently selected radionuclide. Click on **Effl./DAC Values** in the Option Menu to see the dialog box shown in Figure 148. Now you can set values for each of the four Effluent and DAC limits for regulation 10CFR20. The units for these Effluent and DAC values are the ones set under Effl./DAC Units in the Options menu (page 183).

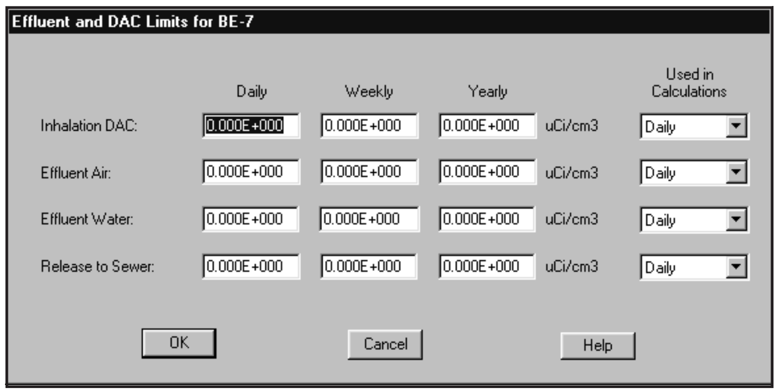


Figure 148 The Effluent/DAC Values Dialog

Action Level/Derived Units

To set the Action Level values, open a library file, then choose this command to specify the unit for either or both of the Action Levels (Figure 149). Because activities are stored in microcuries, you'll have to enter a Conversion Factor to convert microcuries to your unit. The conversion factor must include any necessary mass (or volume) conversion, as might happen if Concentration is selected and its unit is different from that of the current sample.

Activity vs. Concentration

Select Activity if the action level is to be based on total activity (such as uCi) or Concentration if the action level is to be based on activity per unit quantity (such as Bq/kg).

Examples

Example 1: If the Action Level 1 Unit is microcuries and it is activity based, Conversion Factor 1 *must* be set to 1.

Example 2: If the Action Level 2 Unit is Bq/kg, it is concentration based, and sample quantity values have been entered in grams (g), the Conversion Factor 2 is 0.000027/0.001 or 0.027.

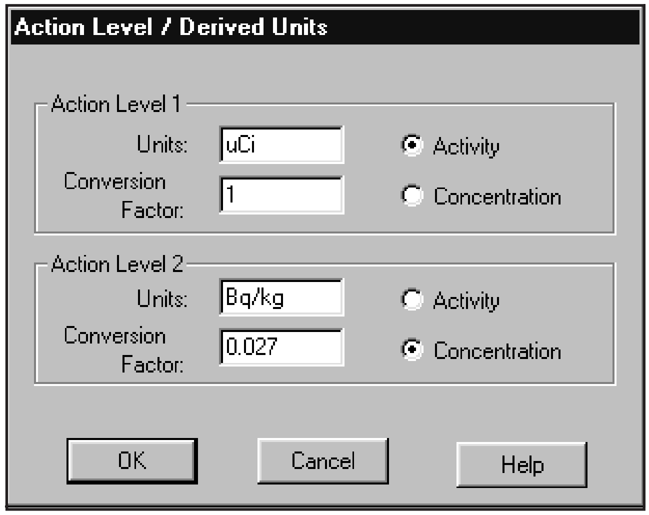


Figure 149 The Action Levels Unit Dialog

Action Level/Derived Values

With a nuclide library open and appropriate Action Level Units defined, the dialog box shown in Figure 150 will let you set the Derived Nuclide parameters and Action Levels for a nuclide. Note that the Action Level units displayed are those which were defined in “Action Level Units” on page 184).

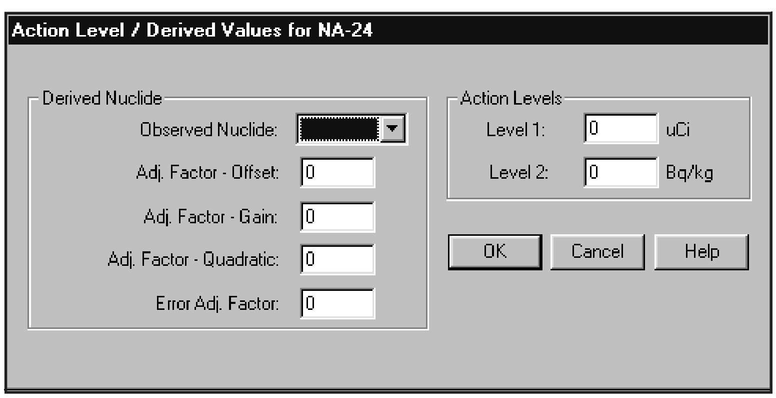


Figure 150 The Action Level Values Dialog

Derived Nuclide

An observed nuclide, which represents the nuclide from which activity data will be derived, must be specified. The “Observed Nuclide” drop down list lets you choose a nuclide from the current library.

For the Derived Nuclide calculation, four factors are required. The first three factors, Adj. Factor – Offset, Adj. Factor – Gain, and Adj. Factor – Quadratic, are coefficients from an efficiency curve fitted through a set of data representing “observed vs. derived” activity pairs.

To find the values for the three Adjust Factors, use your spectroscopy application’s Efficiency Calibration window to enter each derived nuclide’s Energy and Efficiency values from your own data table (you don’t need to enter the percent error value and you *must not* select a Crossover Energy).

When you have finished entering your data, press the Show button to see the curve generated from your data (the Dual button at the top of the Show screen should be selected). At the bottom of the Show screen you’ll see the calibration equation. The equation’s first three terms, left to right, are the Offset, Gain and Quadratic Adjust Factors.

The Error Adjust Factor is taken from the Show screen’s List Peaks dialog box. It is the larger of: the largest Measured Error *or* the Deviation (the maximum difference between the known and fitted values).

Action Level

The two values required for the Action Level calculation are the levels that nuclide activity (or concentration) can be tested against. These values are typically application-specific, such as MPBB or ALI values for Whole Body Counting or release levels for Q2 users.

The Search Menu

To aid you in locating specific entries in a large library, the Search menu contains the commands Find Name, Find Energy and Find Mass Number.

Find Name

Click on **Find Name** to see the dialog box in Figure 151, which is used to search the library for a specific nuclide name. Type the name (full or partial) into the **Name** text input, then click on the **First** button.

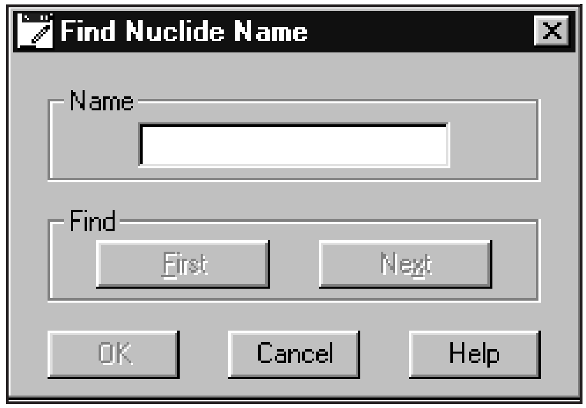


Figure 151 The Find Name Dialog

The library will be searched until either the name is matched or the end is reached. If the end is reached, a message will tell that there was no match. When a matching entry is found the search will stop and the nuclide will be selected for editing.

To search for the next entry that matches the search criterion, click on the **Next** button.

The searching is done by comparing the name you entered to each name in the library in turn, starting with the first character of the nuclide name and stopping when the last character in the "search for" name has been used. If all of the characters up to that point match, a match is declared to have been found. Because of this, partial searches are very easy to make.

For example, a search for "CO" will match any Cobalt entry, or searching for "S" will find any nuclide name begining with the that letter.

If you want to leave the last entry you found selected for editing, click on **OK**. Click on **Cancel** to restore the name selected before you brought up Find.

Find Energy

The **Find Energy** command uses the dialog box in Figure 152.

Once you've entered the energy (and changed the tolerance, if you like), click on the **First** button. The library will be searched until either the energy is matched, plus or minus the specified tolerance, or the end is reached. If the end is reached, a message will tell you that there was no match. When a matching entry is found the search will stop and the energy line will be selected for editing.

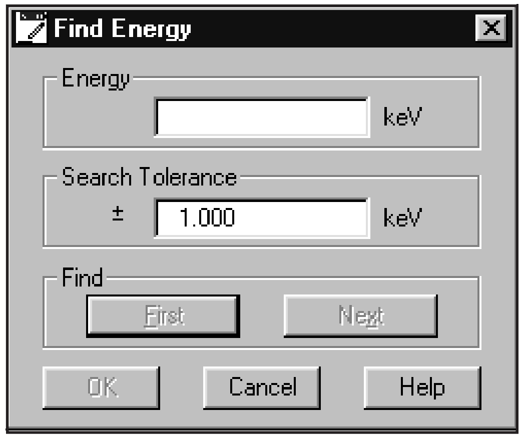


Figure 152 The Find Energy Dialog

To search for the next entry that matches the search criterion, click on the **Next** button.

If you want to leave the last entry you found selected for editing, click on **OK**. Click on **Cancel** to restore the name selected before you brought up Find.

Find Mass Number

The **Find Mass Number** command uses the dialog box in Figure 153 to locate a specific mass number in the library. It searches for the value you enter in the Mass Number text box.

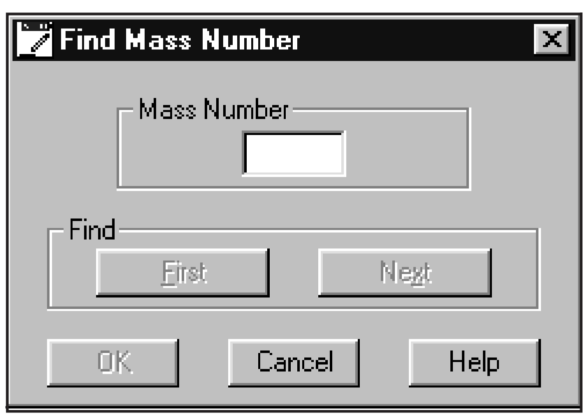


Figure 153 The Find Mass Number Dialog

Once you've entered the mass number, click on the **First** button. The library will be searched until either the mass number is matched or the end is reached. If the end is reached, a message will tell that there was no match. When a matching entry is found the search will stop and the nuclide will be selected for editing.

To search for the next entry that matches the search criterion, click on the **Next** button.

If you want to leave the last entry you found selected for editing, click on **OK**. Click on **Cancel** to restore the name selected before you brought up Find.

The File Menu

The file menu lets you: Start a New library; Open, Save or Save as, a file; print the file as a Report; or Exit the editor.

Creating a New Library

The **File** menu's **New** command erases the current Library from the editing window, allowing you to enter a new Library.

Saving the Library

The File Menu offers the **Save** command for saving the file under the same name and the **Save as** command for saving the file under a different name.

Printing the Library

To print a disk file and a hard copy report of the current Library, click on the **File | Report** command. Click on **Yes** to send the report to a disk file and print the report, or **No** to send the report to the disk file only.

Exiting the Editor

When you are finished with the editor, click on the **Exit** command in the File menu to close it.

The Master Libraries

To help you build tailored libraries, Genie 2000 is shipped with a set of four master libraries, containing about 800 nuclides and 31 000 energy lines, obtained from the

NUDAT database maintained by the National Nuclear Data Center of the Brookhaven National Laboratory. These master libraries, named A_G.NLB, H_O.NLB, P_R.NLB, and S_Z.NLB, contain nuclides with names starting with letters A through G, H through O, P through R, and S through Z, respectively.

The Master Libraries include these 10CFR20 Appendix B parameters: DAC, Effluent Concentrations and Release to Sewers values; class has been set to most restrictive non-zero D, W, Y category.

For practical reasons, the NUDAT data has been somewhat reduced by including only:

- Gamma data
- Gamma energies greater than 50 keV
- Nuclides with half-lives greater than three minutes
- Energy lines with branching ratios greater than 0.1%

To copy nuclide data from one of these libraries into the current library, choose **Options | Extract**, open one of these master libraries, then select the nuclides of interest to copy from the master library to the current library. Further editing may then be done within the current library as desired.

More nuclides may be added to the current library with additional extracts from the same master library or from another master library. Be sure to Save the current library after completing the edits.

6. Using the Certificate File Editor

Certificate Files greatly simplify the calibration process. Those files, which are basically disk copies of the data sheets for your calibration sources, are created and maintained by the Certificate File Editor program included with the Genie 2000 Basic Spectroscopy software.

Getting Started

To start the Editor, double click on its icon in the Genie 2000 folder. When you do that, you'll see the dialog box in Figure 154.

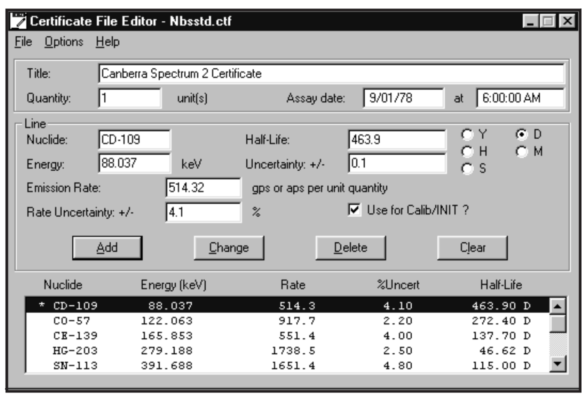


Figure 154 The Certificate File Editor

The Options Menu

The Options menu has three commands that can be used to further tailor the Certificate File: Library Extract, Certificate Extract, and Energy.

Library Extract

This command lets you extract energy lines and their associated information from one or more existing nuclide library files (.NLB). You can extract energy lines from multiple nuclide libraries at any point while editing the current certificate file.

Select **Library Extract**, then double click on the name of a nuclide library in the Files list box. All of the selected library's nuclides will be listed in the Extract Library Nuclides list box, as seen in Figure 155. Specify your library's activity units from the list in the Activity Units drop down list box.

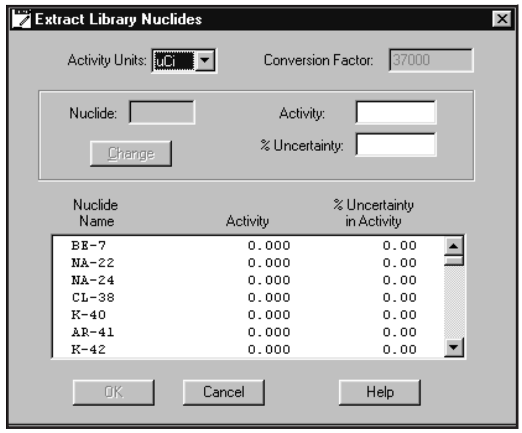


Figure 155 Extracting Nuclides From a Library

If your library uses activity units other than curies or becquerels, you'll have to convert its units to becquerels. Choose "< >" from the Activity Units list box, then type the appropriate conversion factor into the Conversion Factor text box. The conversion factor is the number of becquerels in each < >unit.

Select the nuclides you want to include by clicking on them one at a time in the list box. The activity of each nuclide (in the selected units) must be entered in the edit box provided; any uncertainty should also be entered. When data has been entered in all of the edit boxes, click on the **Change** button to update the list box.

When all the nuclides to be extracted have had activities entered, click on **OK**. This will make entries in the certificate file for all of the energy lines of the selected nuclides. The emission rate for a line will be calculated from the activity and the abundance of that line from the library file.

Certificate Extract

This command lets you extract energy lines and their associated information from one or more existing certificate files (.CTF). You can extract energy lines from multiple certificate files at any point while editing the current certificate file.

Select **Certificate Extract**, then click on **Open** and double click on a certificate file name in the Files list box. The Extract Certificate Nuclides list box will be populated with the energy lines from the selected certificate file, as seen in Figure 156.

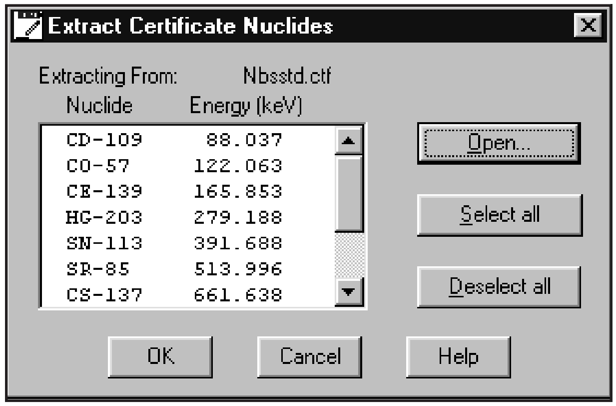


Figure 156 Extracting Nuclides From a Certificate

Selected energy lines can be extracted simply by clicking on those lines in the list box, or click on **Select all** to extract all lines.

Energy Units

Though energies are stored in keV, the **Energy Units** command can change how energy units are shown in the editor's dialog boxes and in reports. The Dialog Box in Figure 157, allows you to select which energy units you want to display: **eV**, **keV**, **MeV**, or **Other**.

The proper Conversion Factor for "other" units is defined as the number of keV units equal to 1 "other unit". For example, the conversion factor for MeV would be 1000 because there are 1000 keV units in 1 MeV.

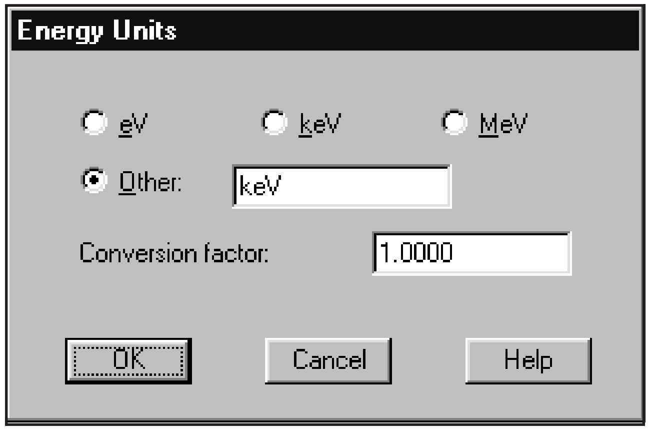


Figure 157 Selecting the Energy Units

Editing a Certificate File

The easiest way to see how the Certificate File Editor works is to edit an existing file, so that's where we'll begin.

Opening a Certificate File

Select the **File** | **Open** command to load a Certificate File, then select the NBSSTD.CTF file. The result will be the screen in Figure 158.

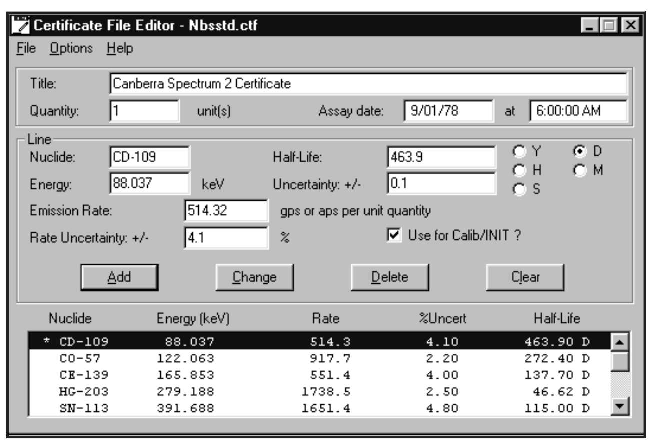


Figure 158 Editing a Certificate File

The Header Data

At the top of the screen are the Title, Quantity, and Assay Date, which are used as follows:

1. **Title.** The title you enter here will be used when a report is printed.

2. **Quantity**. This is the size (volume or mass) of the standard used in efficiency calculations. If the activity of a standard source is known to be the total activity content of the standard, enter 1 in the Quantity field. For example, if a 5 mL standard sample is known to contain 1 μCi of ^{60}Co, the Quantity should be entered as 1, and the activity as 1 μCi (or the equivalent emission rate in gammas or alphas per second).

   If the activity of a standard source is known to be an activity concentration, enter the real standard quantity in the Quantity field. For example, if a 5 mL standard sample is known to contain 0.2 μCi/mL of ^{60}Co, the Quantity should be entered as 5, and the activity as 0.2 μCi/mL (or the equivalent emission rate in gammas or alphas per second per unit volume).

   Either mode of describing the activity content of the standard source is correct. Note, however, that if the Sample Quantity[1] is entered as the real quantity (5 mL), an analysis of both of these examples will report the ^{60}Co activity to be 0.2 μCi/mL. If an analysis of the calibration spectrum is to yield an activity report of 1μ Ci/each, the sample quantity must be entered as 1 each.

3. **Assay Date**. The assay date and time, which are used for an Efficiency Calibration decay correction, can be found on the data sheet that came with the source.

The Line Data

At the bottom of the screen is a List Box that is used to scroll through the contents of the Certificate File. Above the List Box are the edit fields for the currently selected file entry (the one shown in reverse type).

Selecting an Entry to Edit

Each entry describes a single line in the calibration source spectrum. When you click on the line you want to edit, the edit fields will be loaded with the data from the selected entry.

1. The Sample Quantity is entered by way of the Edit | Sample info dialog in the Acquisition and Analysis application.

Editing the Line Data

The fields in the entry are used as follows:

1. **Nuclide.** This is the name of the radionuclide which caused this particular line, and can be any text string of your choice up to a total of eight characters.

2. **Energy.** The photopeak energy of the line, in keV,is shown here.

3. **Emission Rate.** This is the number of gammas per second (gps) or alphas per second (aps) that this line was emitting at the time the source was originally assayed.

4. **Rate Uncertainty.** The uncertainty in the assayed emission rate, expressed as a percent, is displayed here.

5. **Half-Life.** This is the half-life of the nuclide, which can be expressed in **Y**ears, **D**ays, **H**ours, **M**inutes, or **S**econds. The unit should be chosen *before* entering the half-life value.

6. **Uncertainty.** This is the uncertainty of that half-life, expressed in the same units as the half-life. For example, in Figure 158 the data shown would be read as "The half-life is 463.9 Days plus or minus 0.1 Days.

7. **Use for Calib/INIT?** This option is used only when performing an Energy Calibration with Genie 2000's batch commands. Selecting this option for a peak tells the Batch Calibration that the peak is to be used for performing an Initial Energy Calibration before doing a complete calibration. Normally only the first (lowest energy) and last (highest energy) peaks would have this option enabled. For further details, refer to the ECAL section of the "Batch Procedure Reference" chapter in the *Genie 2000 Customization Tools Manual*.

Clear

The **Clear** button clears the list box so that new values can be entered without having to delete the box's contents first.

Updating the Line

Once you've made any needed changes, click on the **Change** button to transfer the new parameters into the List Entry for the line.

Adding a New Line

To add a new line to the list, first use the above editing procedure to alter an existing entry to look like the new one you want to add. When you're finished with the edits, click on the **Add** button instead of the Change button. Since the list is sorted by ascending energy, the new entry will automatically appear in its correct location in the list.

Deleting an Entry

To remove an entry from the list, click on it to select it, then click on the **Delete** button.

The File Menu

The file menu lets you: Open, Save or Save as a file, print the file as a Report, start a New file, or Exit the editor.

Saving the Certificate File

Once you've edited the file you have to save it with either the **Save** or **Save as** command before it can be used.

Printing the Certificate File

Use the File | Report command to print a disk file and a hard copy report of the current Certificate File. Click on **Yes** to send the report to a disk file and print the report, or **No** to send the report to the disk file only.

Creating a New Certificate File

The **File** menu's **New** command erases the current Certificate File from the editing window, allowing you to enter a completely new Certificate File.

Exiting the Editor

When you are finished with the editor, click on the **Exit** command in the File menu to close it.

7. Using the Analysis Sequence Editor

Genie 2000 includes an Analysis Sequence Editor which allows you to create or edit analysis sequences that you can use to automatically analyze your spectra.

Getting Started

To start the editor, type ASE at the command line.[1] When you press ENTER, you'll see a window similar to the one in Figure 159.

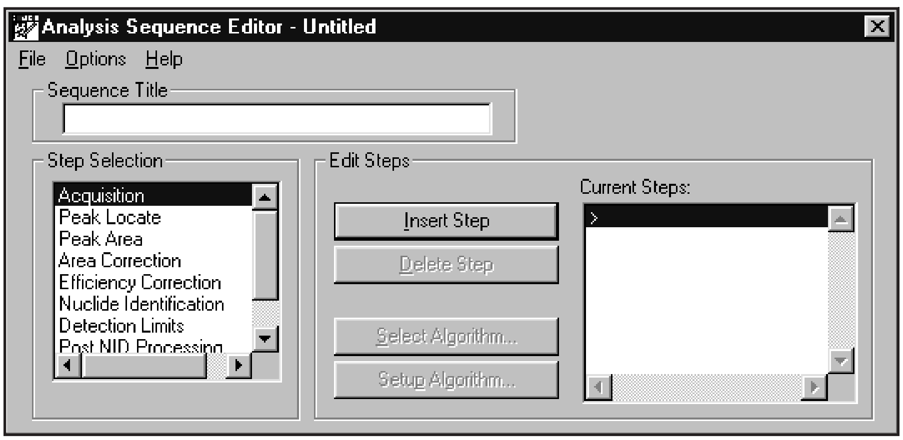


Figure 159 The Analysis Sequence Editor Window

Use the **File | Open** command to open an existing ASF file for editing. The editor with `ASE MDA_sho.asf` opened is shown in Figure 160.

1. See "Batch Command" on page 202 for details of the ASE command.

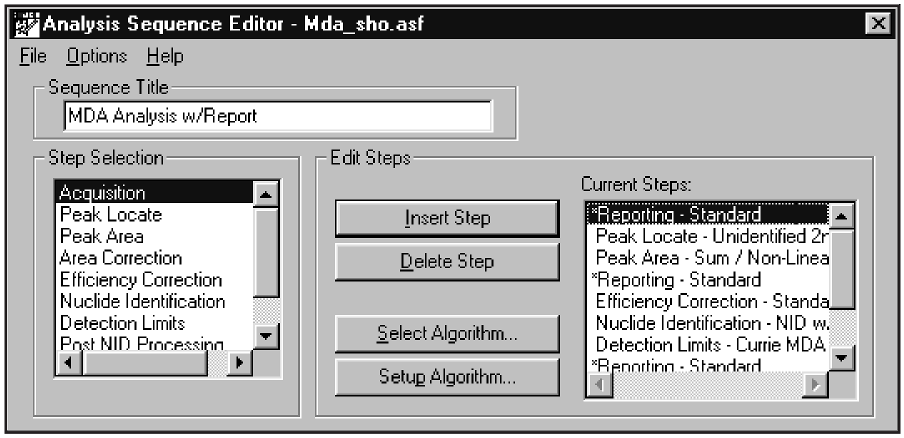


Figure 160 An ASF File Opened for Editing

Editing a Sequence File

The editor allows you to create a new sequence, change an existing sequence's list of steps or edit any of the steps, by:

- Inserting or deleting steps
- Selecting the proper algorithm for each step
- Setting the parameters for each algorithm
- Editing the parameters for a step

Inserting a Step

To add a step to the sequence, highlight a step in the Step Selection list box, then press the **Insert Step** button. The step will be added to the the Current Steps list.

Deleting a Step

To remove a step from the sequence, highlight the step in the Current Steps list that you want to remove, then press the **Delete Step** button.

Selecting an Algorithm

To choose an algorithm for the current step, press the **Select Algorithm** button. For instance, if you had inserted and highlighted the Peak Locate phase step, pressing the Select Algorithm button would bring up the window in Figure 161, which shows the algorithms

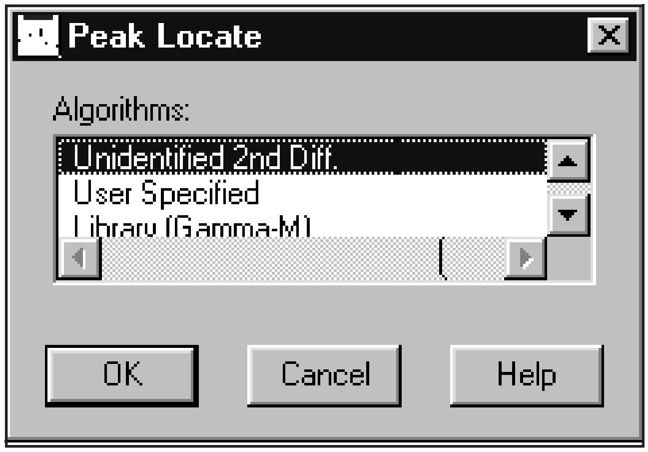


Figure 161 Selecting a Peak Locate Analysis Phase

available for the Peak Locate phase. To associate one of the algorithms with the phase, highlight the algorithm then press **OK** to save the association.

The available analysis phases and algorithms are slightly different for the Gamma Spectroscopy Analysis application and the Alpha Spectroscopy Analysis application. Detailed information on your application's analysis phases and algorithms can be found in the "Analyze Menu" section of your analysis application's manual.

Note that the Peak Locate and Peak Area algorithms' Start Channel and Stop Channel parameters and all Report algorithm parameters can be specified differently each time one of those algorithms occurs in a sequence (the Report algorithm's "Standard" step has an asterisk beside it to indicate this). All other algorithms, steps and parameters *cannot* be specified independently. This means that each time one of those is used in a sequence, a common set of parameters will be used.

Setting the Algorithm's Parameters

After you have associated an algorithm with the phase, highlight the step and press the **Setup Algorithm** button (or double click on the step). Now you can verify or change the algorithm's parameters. The setup screens and parameter choices for each of the analysis phases are described in detail under "Analyze Menu" in your analysis application's manual.

Options Menu

Though energies are stored in keV, the **Energy Units** command can change how energy units are shown in the editor's dialog boxes and in reports. The Dialog Box in Figure 162, allows you to select which energy units you want to display: **eV**, **keV**, **MeV**, or **Other**.

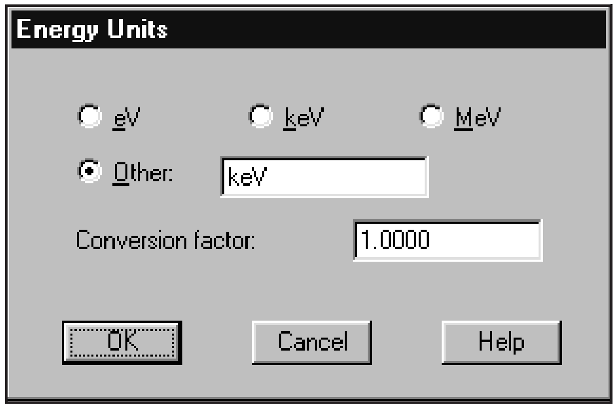


Figure 162 Selecting the Energy Units

The proper Conversion Factor for "other" units is defined as the number of keV units equal to 1 "other unit". For example, the conversion factor for MeV would be 1000 because there are 1000 keV units in 1 MeV.

Saving a New Sequence File

The **File** | **Save as** command lets you save a new sequence file with a Description as shown in Figure 163. The Description is displayed in the editor's Sequence Title field the next time you open the file.

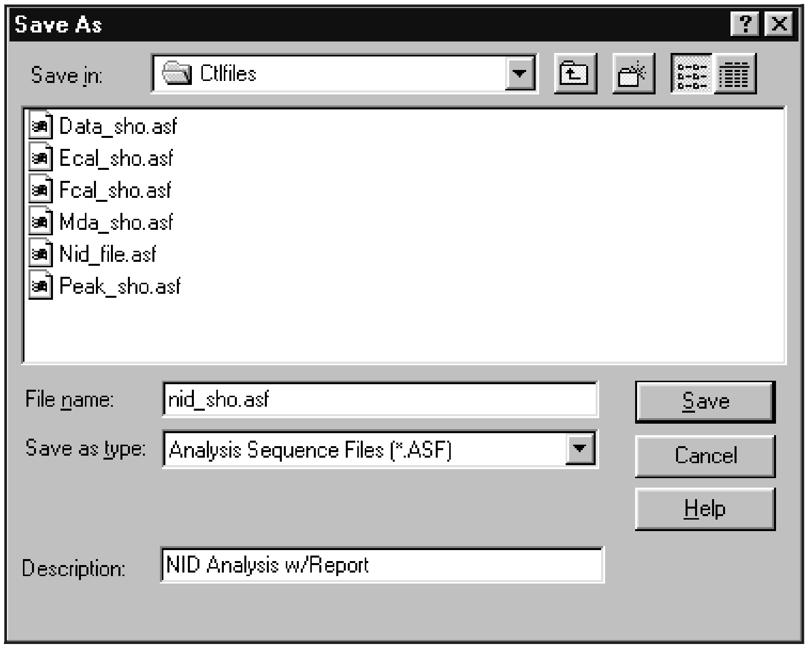


Figure 163 Save As with a Description

Batch Command

The ASE command displays an Analysis Sequence Editor window for creating or changing analysis sequences. If no datasource is specified, a new untitled sequence file will be created.

Several of this command's qualifiers initialize a new file with appropriate detector parameters.[2] These parameters are documented in the "Initial Parameters" section in the "CAM Files" appendix of the *Genie 2000 Customization Tools Manual*.

Before you use this Job Command, you should become familiar with "Introduction to the Batch Procedures Environment", "General Job Commands" and "Job Function Decriptions" in the "Batch Procedure Reference" chapter of the *Genie 2000 Customization Tools Manual*.

2. A new file may be one created with the editor's File | New menu command or may be one created when the editor is opened without specifying a datasource.

Command Format

ASE [<datasource name>] [/Qualifier(s)]

Qualifiers

[/AEF_ALPHA]

Specifies that the editor use alpha spectroscopy analysis algorithms. If this qualifier is not specified, the editor will use gamma spectroscopy algorithms.

[/ALPHA]

Initializes new files using Alpha detector parameter settings; this is the default if AEF_ALPHA is specified. Mutually exclusive with /GE and /NAI qualifiers.

[/GE]

Initializes new files using Ge detector parameter settings; this is the default if AEF_ALPHA is *not* specified. Mutually exclusive with /ALPHA and /NAI.

[/NAI]

Initializes new files using NaI detector parameter settings. Mutually exclusive with /ALPHA and /GE.

[/REVIEWONLY]

Specifies that the editor can be used to review, but not change, the specified datasource.

[/HELP]

Displays help text for this command.

Examples

ASE /AEF_ALPHA

Open the Analysis Sequence Editor and create a new untitled analysis sequence file using alpha spectroscopy analysis algorithms.

ASE AIR_FLTR.ASF /REVIEWONLY

Open the Analysis Sequence Editor and load the AIR_FLTR.ASF analysis sequence file for review only.

8. Using Cascade Correction

The Cascade Correction algorithms included in Genie 2000 software let you more accurately determine the activities of radionuclides that exhibit cascade summing effects, such as ^{88}Y, ^{60}Co and ^{152}Eu.

Prerequisites

Before you execute a Cascade Correction analysis, you must have performed these steps:

1. Install the Model S501 Genie 2000 Gamma Analysis Option software, if that has not already been done.

2. Energy calibrate the detector to be used, as described in “Calibrate” on page 92.

3. Create a Geometry Description for the sample analysis configuration that will be used, as described in Chapter 9, *Using the Geometry Composer*, on page 206.

4. Perform a Peak-to-Total Calibration for that geometry, as described in “Peak-to-Total” on page 107.

5. Perform an Efficiency Calibration for that geometry as described in “Calibrate” on page 92.

CAUTION If you performed a source-based (empirical) efficiency calibration, and your calibration source includes nuclides which give rise to cascade summing (e.g. ^{88}Y, ^{60}Co, ^{152}Eu), you should refer to Appendix E, *Correcting an Efficiency Calibration for Cascade Summing,* on page 341.

Note: Calibrations performed by the optional Model S573 ISOCS or Model S574 LabSOCS applications do not suffer from cascade summing effects and therefore do not need to be corrected as described in Appendix E.

Performing the Analysis

Once the prerequisites have been met, you are ready to use Cascade Summing Correction in your analyses. The details on the procedure can be found in the “NID with Interference Correction” on page 159.

As you perform the procedure outlined there, you will find a reference to the Coincidence Library used for the Cascade Summing Correction calculations. The library includes:

- Nuclides and gamma lines that are affected by cascade summing, as well as those that are free from the effect, and
- Decay parameters such as branching ratio, internal conversion correction factors, and absolute yield percentages for nuclides and gamma lines that are affected by cascade summing.
- The data in this library were obtained from the NuDat online database at the National Nuclear Data Center (http://www.nndc.bnl.gov/nndc/nudat) in December, 2000. Although this library is not user editable, it is quite comprehensive and will be updated periodically by Canberra Industries.

Table 2 The Cascade Correction Data Library

^{24}Na	^{38}Cl	^{42}K	^{47}Ca	^{46}Sc	^{56}Mn
^{59}Fe	^{60}Co	^{65}Ni	^{65}Ni	^{72}Ga	^{77}Ge
^{76}As	^{75}Se	^{82}Br	^{88}Y	^{90}Y (m)	^{97}Zr
^{99}Mo	^{97}Ru	^{103}Ru	^{105}Ru	^{109}Pd	^{111}Pd (m)
^{110}Ag (m)	^{111}Ag	^{111}Cd (m)	^{115}Cd	^{115}Cd (m)	^{114}In (m)
^{116}In (m)	^{117}In	^{117}Sn (m)	^{125}Sn	^{122}Sb	^{124}Sb
^{125}Sb	^{127}Te	^{134}Cs	^{131}Ba	^{133}Ba	^{139}Ba
^{140}La	^{143}Ce	^{147}Nd	^{149}Nd	^{151}Pm	^{153}Sm
^{152}Eu	^{152}Eu (m)	^{154}Eu	^{153}Gd	^{159}Gd	^{160}Tb
^{165}Dy	^{166}Ho	^{171}Er	^{169}Yb	^{175}Yb	^{177}Yb
^{177}Lu	^{175}Hf	^{180}Hf (m)	^{181}Hf	^{182}Ta	^{187}W
^{188}Re	^{185}Os	^{193}Os	^{192}Ir	^{194}Ir	^{197}Pt (m)
^{198}Au	^{199}Au	^{233}Pa	^{239}Np		

9. Using the Geometry Composer

The information developed by the Geometry Composer is used by the Cascade Summing Correction algorithms and the LabSOCS/ISOCS software.

The Composer helps you define sample geometries for HPGe gamma spectroscopy analysis. You can use one of eight sample templates, or customize your own template, to define sample geometries. For each geometry that is defined, you specify:

- The size and shape of the sample and its container.
- The materials from which they are made.
- The type of the detector that will be used for the analysis of this sample.

Starting the Composer

Before you can run the Geometry Composer, you'll have to open a datasource. When the datasource has been opened, select **Options | Geometry Composer**. This brings up the Geometry Composer screen in Figure 164. Many of the Composer's menu commands are available as buttons in the toolbar at the top of the screen.

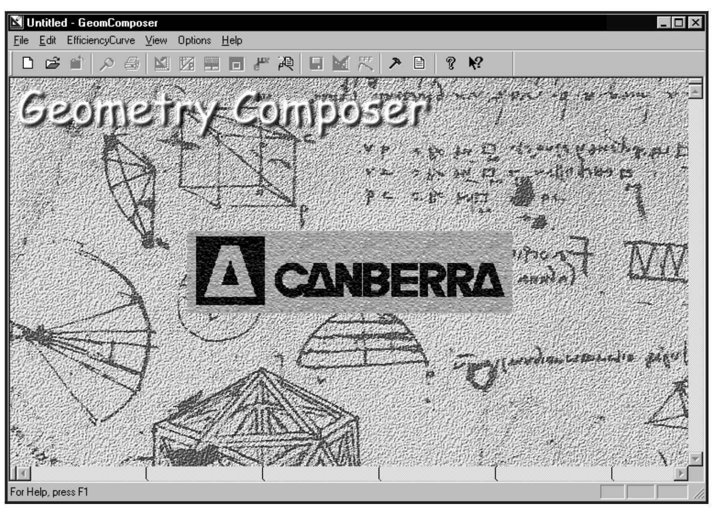


Figure 164 The Geometry Composer

Creating a Geometry Definition

To create a new geometry definition, select the **File** | **New** command to see the dialog box in Figure 165.

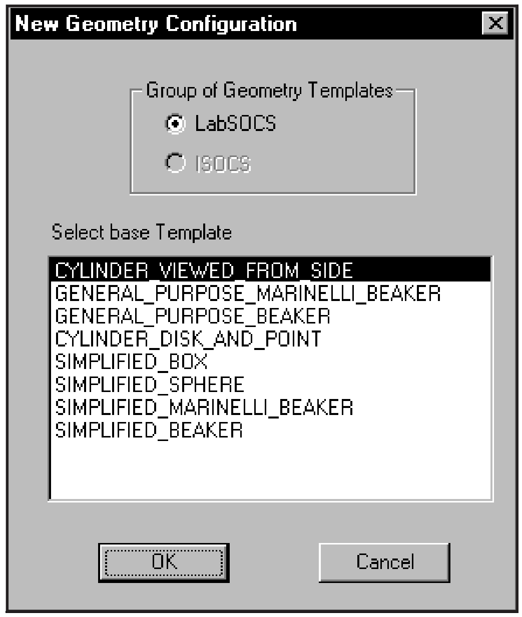


Figure 165 Selecting the Template.

Selecting the Geometry Template

Select one of the **Group of Geometry Templates** buttons to enable the set of template definitions you'll use. Which buttons are enabled depend on the application software option(s) installed on your system (S501 Gamma Analysis, S574 LabSOCS or S573 ISOCS).

The Select Base Template list shows the definitions available in the chosen group. Click on the description which most closely matches the geometry you want to define (Simplified Marinelli Beaker for this example), then click on OK.

For a detailed description of the available templates, refer to Appendix E, *Standard LabSOCS Template Drawings*, in the *Genie 2000 Customization Tools Manual*.

You can either use the default template (Figure 166) or an existing partially defined template based on the Simplified Marinelli Beaker template (Figure 171 on page 214). In

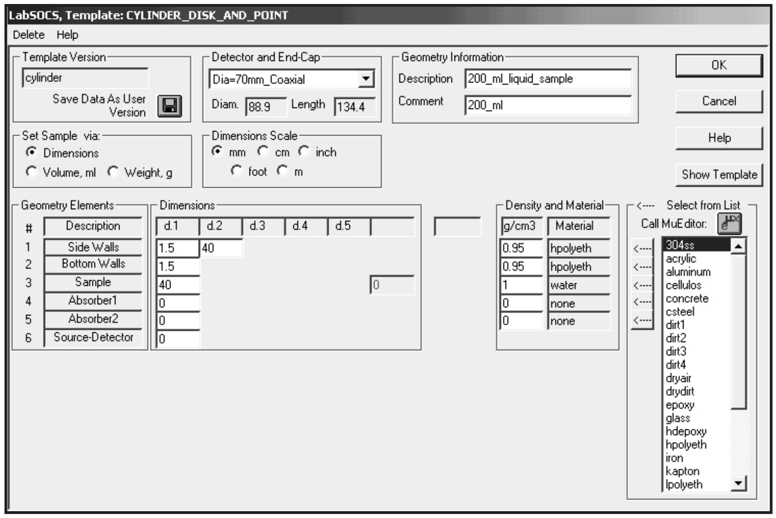


Figure 166 Editing the Sample and Detector Dimensions

Figure 171, select one of the already defined templates to use for the new definition, then click on **OK** to go on to Figure 166. For the following example, the default template has been selected.

Editing the Detector and Sample Dimensions

The next step is to modify the selected geometry template to match the specific detector, container, and sample that will make up this geometry.

Template Version

The template version you selected is shown here (‘default’ in this case).

Detector and End Cap

For the most accurate efficiency calibration and for cascade summing results, the HPGe detector being used in this geometry definition should have been characterized for LabSOCS/ISOCS at the factory. If that option has been purchased, the detector's serial number will appear in the drop down list. Selecting it will automatically insert its dimensions into the **Diam.** and **Length** parameters.

CAUTION If you have LabSOCS or ISOCS installed, do **NOT** use the generic characterizations for ‘Coaxial’ or ‘Planar’ detectors for efficiency calibration purpose. Use the specific characterization template supplied for your particular detector to obtain accurate efficiency calibration results.

- **Coaxial Detectors (GC, GX, GR, etc.):**
  Select the detector named “**Dia=nn.._Coaxial**”, where **nn** is the diameter (in mm) which most closely matches the (germanium crystal) diameter of the actual detector. Consult your detector’s specification sheet to obtain this information.

- **Planar Detectors (BEGe, etc.):**
  Select the detector named “**Dia=nn.._Planar**”, where **nn** is the diameter (in mm) which most closely matches the (germanium crystal) diameter of the actual detector. Consult your detector’s specification sheet to obtain this information.

Using this method, a bias in the cascade summing correction factor of less than ±15% can be expected. For greater detail on the correction factor, refer to Appendix F, *Selecting an ISOCS Detector Characterization*, in the *Genie 2000 Customization Tools Manual*.

Figure 167 shows the result of selecting a generic coaxial detector with 70 mm crystal diameter.

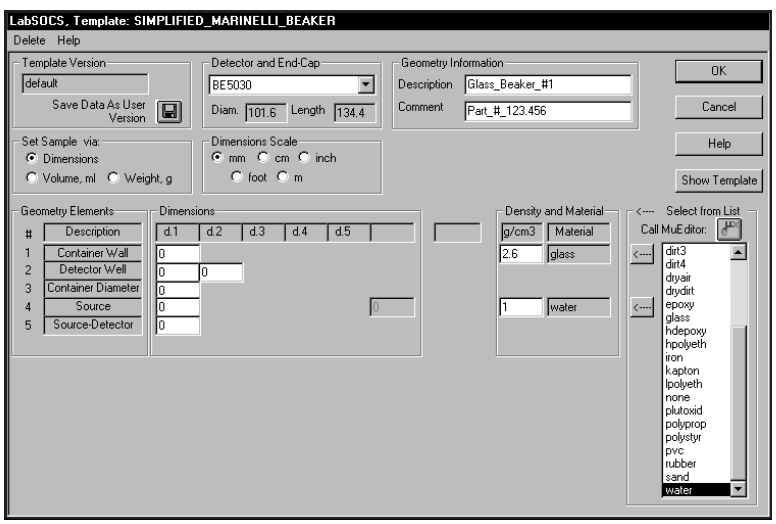


Figure 167 Detector Parameters Have Been Entered

Geometry Information

The definition of the geometry starts with its Description and an optional descriptive Comment. Since the Description is used to identify the geometry, it should be unique.

Density and Material

Enter the density and material of the sample (source). They are used by the calibration process to correct for factors such as attenuation due to sample and container wall composition.

The list at the right of the dialog box is used to specify the material used for the container and source. Double-click on a material to display its name, default density, chemical composition, and mass attenuation coefficients (Figure 168).

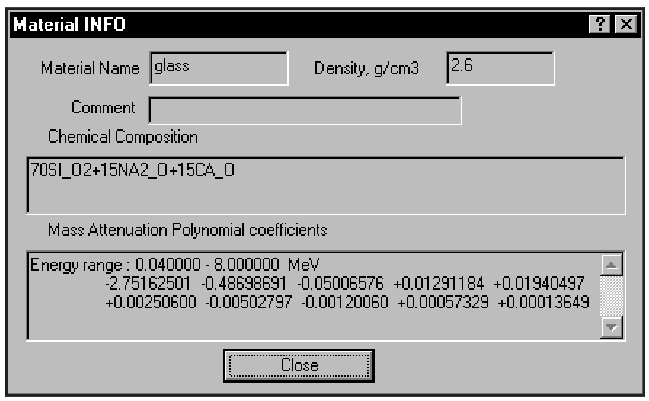


Figure 168 Displaying the Material Parameters

To modify these parameters, or to add further materials to the library, click on the **Call MuEditor** button directly above the material list. This will launch the Materials Library Editor (described in “Editing the Materials Library” on page 219).

To specify the material for the container, click on its name in the list (e.g. glass), then click on the upper arrow (⇐) to copy that choice and its density to the Container Wall Density and Material fields. Next, click on the sample material (e.g. water), then click on the lower arrow (⇐) to copy that data to the Source Density and Material fields. In Figure 167 glass was selected for the beaker and water for the sample.

The density values from the Materials Library entries for the selected materials are automatically inserted into the Geometry Description.

CAUTION Carefully review the default density to assure that it is appropriate for the actual material used.

If necessary, the density can be edited to better fit the sample.

Set Sample Via

By default, the Geometry Composer bases its calculations on the sample's Dimensions. Click on Volume or Weight to select another basis for the calculations.

The selected basis is inserted into the Dimensions table and an entry box for its value is enabled. Once the dimensions of the sample and its container have been entered (see Dimensions, below), the value for the volume or weight is set automatically based upon the sample material type and density previously entered in the Density and Material section of the window.

Dimensions Scale

All dimensions default to the unit selected in "Setting the Default Parameters for New Geometries" on page 227. Use the buttons here in Dimensions Scale to select another unit. Note that the units selected apply to the dimensions for both the detector and the sample.

CAUTION Changing units during data entry will convert all existing entries to the new units.

Sample Dimensions

The Dimensions table in the middle of the window is used to enter the dimensions of the sample and its container. There is one row in the table for each element in the definition of the geometry and one or more columns of data.

Show Template

Click on the **Show Template** button to see a drawing like the one in Figure 169, showing the elements and relationships of the geometry currently being defined.

The numbers in the drawing correspond to the row and column position of the element in the sample Dimensions table. For example, the value for the dimension labeled 2.1 in Figure 169 – the diameter of the detector well – is entered into Row 2 (Detector Well), Column d.1.

Auto and Fixed

The Picture Scale buttons in Figure 169 are used to resize the window for easier viewing. Use the Close button to exit the viewer.

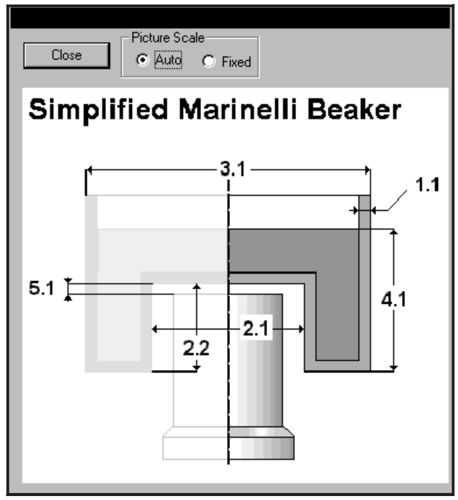


Figure 169 Displaying a Geometry Template

Notes:

1. A Source-to-Detector distance of 0 mm (e.g. The source is resting directly upon the detector end-cap.) is permitted.

2. For geometries where it is physically appropriate, additional Source-to-Detector data fields for parameters such as source orientation relative to the detector's axis will be found. Refer to the descriptions of the various template descriptions in Appendix E, *Standard LabSOCS Template Drawings* in the *Genie 2000 Customization Tools Manual* for further details.

Save Data As User Version

You can save a partial description as a custom template for future use. Click on the **Save Data As User Version** button in the upper left corner of the screen in Figure 167 (page 209) to see Figure 170.

Note: A User-defined Template should only be saved with those parameter values which will be constant from one geometry to the next, because those values can’t be edited when that User-defined Template is used as the basis for a new geometry definition.

Referring again to Figure 170, change “untitled” to an appropriate name for the new template, then click **Add** to add the new definition to the list of available template definitions.

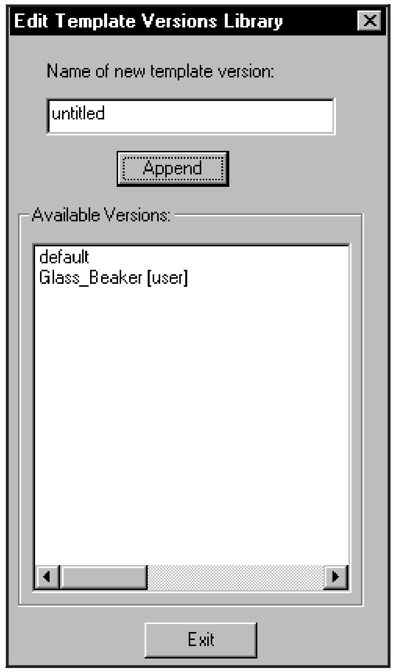


Figure 170 Saving a User Template

Selecting a User Defined Template

To define a geometry based on any partial template you have saved:

1. Select **File** | **New**.
2. Select the same generic definition used previously (in this example, Simplified Marinelli Beaker), then click on OK.
3. This will display the dialog shown in Figure 171, where you can select the custom definition you just saved as your base template, then continue as described in “Detector and End Cap” on page 208.

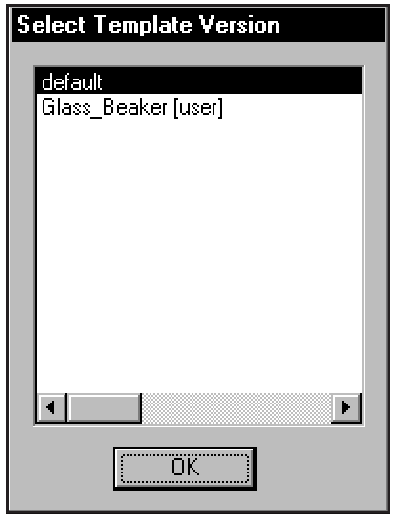


Figure 171 Selecting a User-defined Template.

Verifying the Geometry Definition

When you've completed the geometry definition, click on OK. The Composer will verify the definition and, if a potential problem is found, display an error message. If the definition is valid, you'll see a report like the one in Figure 172.

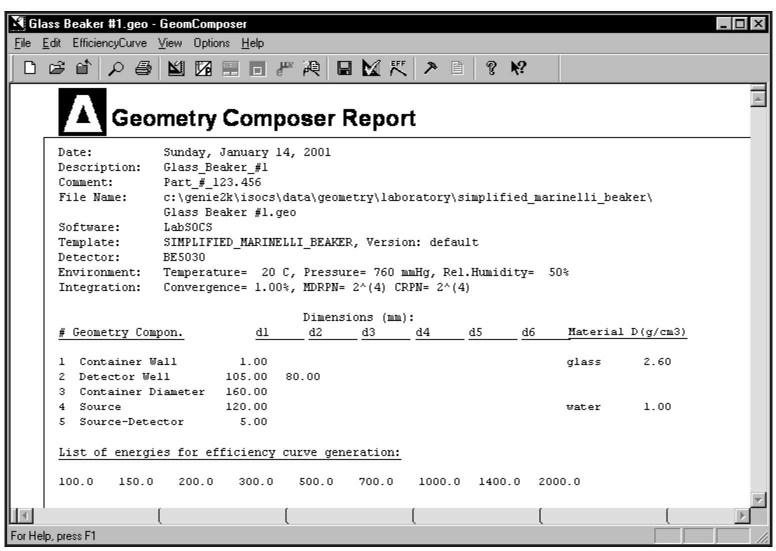


Figure 172 The Geometry Composer Report

Note that if you open an existing definition in the Geometry Composer, you'll inmediately see the Geometry Composer Report for that definition.

Editing a Geometry Definition

If need to change any of the parameters shown in the report (Figure 172), select **Edit | Dimensions and Detector** to open the editing window (Figure 167 on page 209).

Editing the Sample Environment

In the LabSOCS/ISOCS efficiency calibration process, air fills all undefined spaces between the sample and the detector. In order to correctly calculate the attenuation of the air, you'll have to define three environmental (ambient) parameters.

To edit these parameters, temperature, pressure and relative humidity, select **Edit | Environmen**t. You'll see the dialog box in Figure 173.

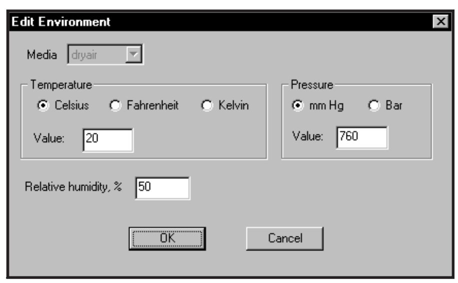


Figure 173 The Edit Environment Dialog

Checking the Geometry's Validity

Select **Edit | Check Geometry Validity** to perform a more extensive validation of the geometry definition than the automatic validity check made when you exit the geometry definition window.

Saving the Definition

Once you are satisfied that all of the parameters are correct, do a **File | Save As** to save the definition before performing the efficiency calibration (mathematical efficiency calibrations are available to LabSOCS/ISOCS users only).

Note: This operation generates two files: a .GEO file and a .GIS file. Each contains the same information, but in two different formats for different sections of the software. To avoid confusion, they should always be treated – deleted, renamed, etc. – as a two-part set.

Editing the Efficiency Parameters

This function is available only on systems with LabSOCS/ISOCS installed. If you don't have at least one of these on your system, the commands in this section will be grayed out.

Note: All of the operations in this section apply only to the geometry definition currently being processed (as displayed in the window shown in Figure 172 on page 214). To change parameters for all new geometries, see "Setting the Default Parameters for New Geometries" on page 227.

Select **Edit | Efficiency Parameters for this Geometry** to modify the Convergence, Maximum Detector Reference Point Number (MDRPN), Energies, and Error Values used in the LabSOCS/ISOCS efficiency calibration process.

Since editing and using these parameters is beyond the scope of this chapter, only an overview of parameter use and editing functions will be presented here. For an in-depth discussion of how the Convergence and MDRPN parameters affect the calibration process, refer to Appendix G, *LabSOCS/ISOCS Technical Notes*, in the *Genie 2000 Customization Tools Manual*.

Editing the Energy List

Select **Edit | Efficiency Parameter**s command to see the Energy List Editor dialog (Figure 174). Select the Energy List tab to activate the Energy List Editor. This editor allows you to define the energies for which efficiencies will be calculated. This feature may be used to establish properly spaced efficiency values for the desired energy range.

Figure 174 shows that the default energy list covers the 100 to 2000 keV range. The error values listed are the estimated uncertainty error values for each energy based on LabSOCS/ISOCS validation testing.

Deleting an Energy from the List

Select the energy line to be deleted, then click on **Remove**.

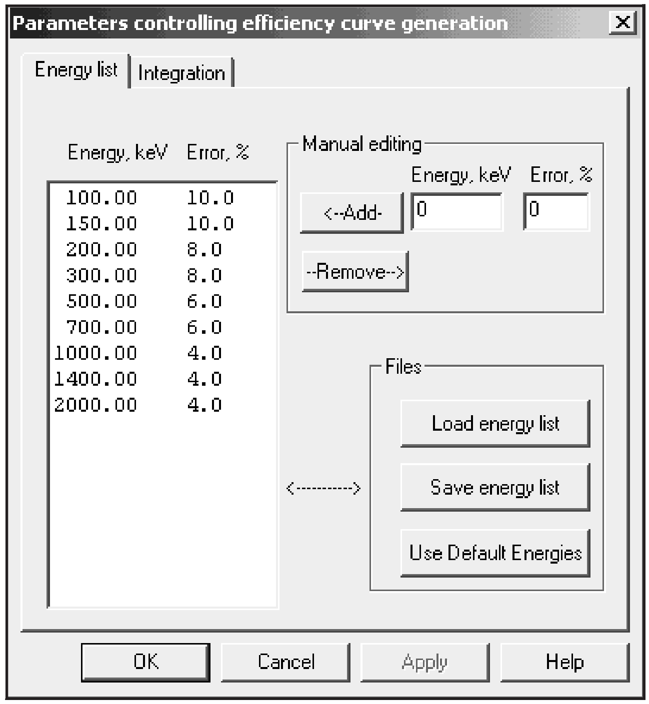


Figure 174 The Energy List Editor

Adding an Energy to the List

Type the new energy value into the “Energy, keV” field and its associated uncertainty into the “Error, %” field, then click on **Add**. The new line will be added to the list.

Restoring the Default Values

To restore the Energy List defaults in Figure 174, click on **Use Default Energies**.

Load Energy List

Use this button to load a previously saved list of energies, replacing the current one.

Save Energy List

This button is used to save a custom list of energies for later use.

Changing the Integration Settings

Selecting Figure 174’s Integration tab brings up the dialog box in Figure 175, which is used to change the integration settings for efficiency calculation. For a discussion on how these parameters affect the efficiency calculation, refer to Appendix G, *ISOCS Technical Notes*, in the *Genie 2000 Customization Tools Manual*.

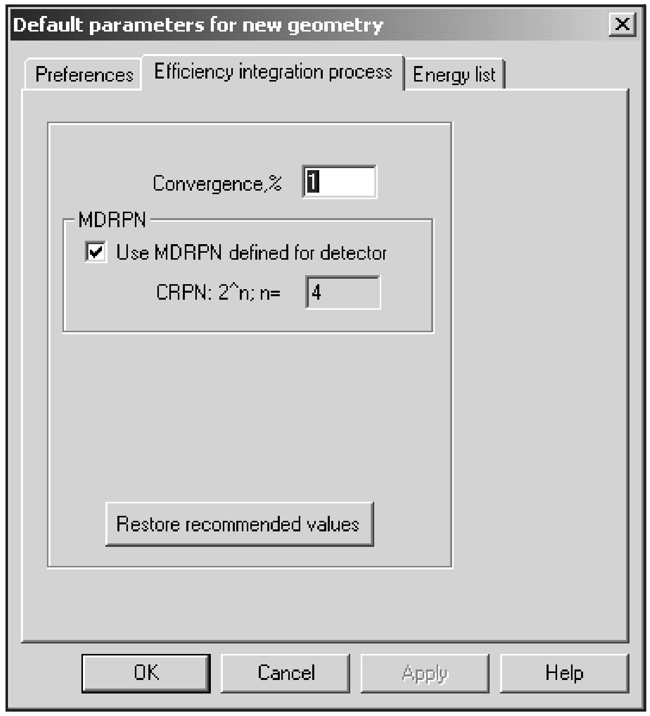


Figure 175 The Integration Settings Tab

Convergence %

This parameter defines the maximum acceptable deviation in the results of the efficiency calibration calculations. The default value of 1% typically yields the best tradeoff between accuracy and computation time.

MDRPN

The Use MDPRN option (Maximum Detector Reference Point Number) should always be checked (default) to enable a process that increases the accuracy of the LabSOCS/ISOCS computations for close-detector geometries.

A Value of 4 has been found to be the optimum for most applications. Accordingly, this value will be used in the calculations if the “Use MDRPN defined for detector” check box is enabled.

Show Progress Bar

Select Yes to enable display of the Progress Bar during the Efficiency Calibration Calculation.

Generating an Efficiency Curve

This function is available only if LabSOCS/ISOCS is installed. If you don't have at least one of these on your system, the commands in this section will be grayed out.

Generating the Efficiency Data Points

First make sure that you have already saved your newly created or modified Geometry Definition. Select "Generate Efficiency Data Points" from the Efficiency Curve menu to calculate the efficiency curve for the defined geometry. This process creates an *.ecc file in a subdirectory defined by the geometry template chosen and displays the full path of this file.

To use the completed calibration, see "By LabSOCS/ISOCS" on page 121and select the *.ecc file you have just created. Refer to Calibration by LabSOCS/ISOCS (page 121) for the rest of the process. Closing the Geometry Composer returns you to the screen shown in Figure 98 (page 122).

Editing the Materials Library

Select Edit | **Materials Library** to edit the library containing the **material** choices and characteristics used to specify the composition of the sample and its container. Selecting the command opens the editing window in Figure 176.

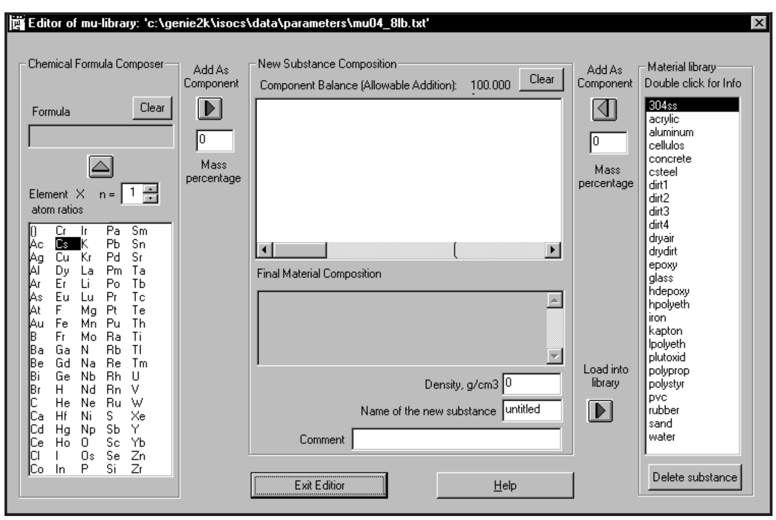


Figure 176 The Materials Library Editor

The Nature of a Library Entry

The uses of the library's editing tools can be better understood by examining the makeup of a Materials Library entry. For example, to view data for the entry named "acrylic", double click on its name in the Material Library list on the right side of the window. The result will look like Figure 177.

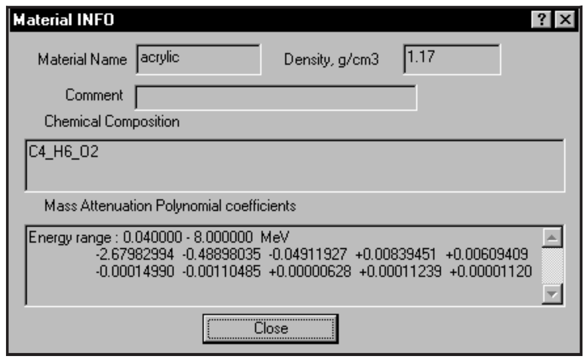


Figure 177 The Library Entry for Acrylic

You'll see the name of the material and its density, any comments, the chemical composition of the material, and the coefficients used to correct for the material's radiation attenuation. These parameters cannot be modified from this display; it is for information purposes only.

A second example, this time for a material named "concrete", is shown in Figure 178. Since this material is a mixture, rather than a compound, a different format is used to display its Chemical Composition. The Chemical Composition shown in Figure 178 is interpreted as:

15.42% C + 35.75% O + 18.77% Si + 26.82% Ca + 0.56% H + 2.68% Mg

The total may not always be 100% because of rounding errors.

Defining New Materials

There are three ways that new materials can be defined:

- By defining a completely new material (page 221).
- By basing the new material on an existing definition (page 224).
- By combining two or more existing materials into a new one (page 225).

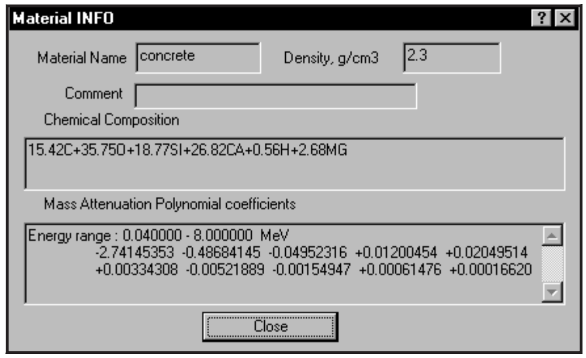


Figure 178 The Library Entry for Concrete

Defining a Completely New Material

The left side of the Material Editor window is used for the definition of a new material. To illustrate how the process, the definition of a new material called “bronze” will be entered. Bronze is composed of 90% Copper and 10% Tin, by weight. The procedure is as follows:

1. Select copper (Cu) from the list of elements at the left.

2. Insure that a value of "1" is displayed in the **n=** parameter.

3. Click on the ▲ button above the list to copy the Cu entry from the list to the Formula box (the button is green, indicating that it’s enabled; red buttons are disabled.)

4. Enter the value "90" in the left-hand Mass Percentage field.

5. Click on the “Add As Component” button (▶) directly above that field.

The result will be a display like the one in Figure 179. The New Substance Composition indicates that we just entered a component that will make up 90% of the mass of our new material, and that component consists of pure (100%) copper. Note the line directly above this field, which tells us we still have 10% of the material's composition left to be defined.

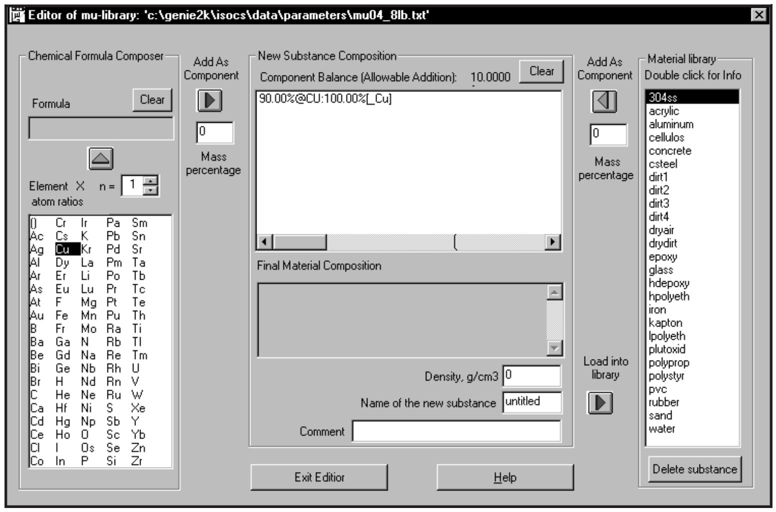


Figure 179 The Copper Component Has Been Added

The same basic procedure is then used for entering the tin component, using Sn for the Element and 10% for the Mass Percentage. After doing that, the window will look like the one in Figure 180. With 100% of the material defined, the Arrow Buttons we have been using have turned red.

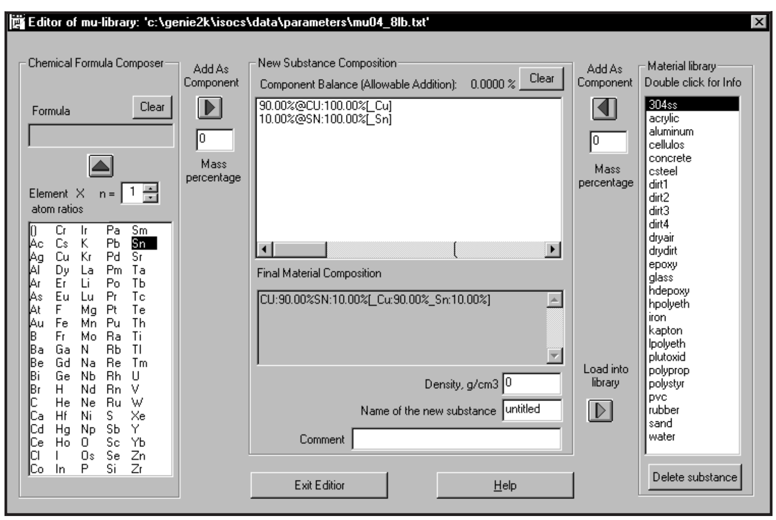


Figure 180 The Tin Component Has Been Added

To complete the definition:

1. Enter the density of the material in the data entry field labeled **Density, g/cm3**. For this example, enter a value of 8.8.

2. Change the Name of the New Substance from "untitled" to the name of the material (8 alphanumeric characters, maximum).

3. Enter a comment if you like (32 characters, maximum).

Once you've done this, as shown in Figure 181, the new material can be added to the Material Library by simply clicking on the **Load into Library** button (▶). A message will be displayed to let you know the entry was successful. Click on OK to acknowledge it, and "bronze" will be found in its correct alphabetical position in the Material List.

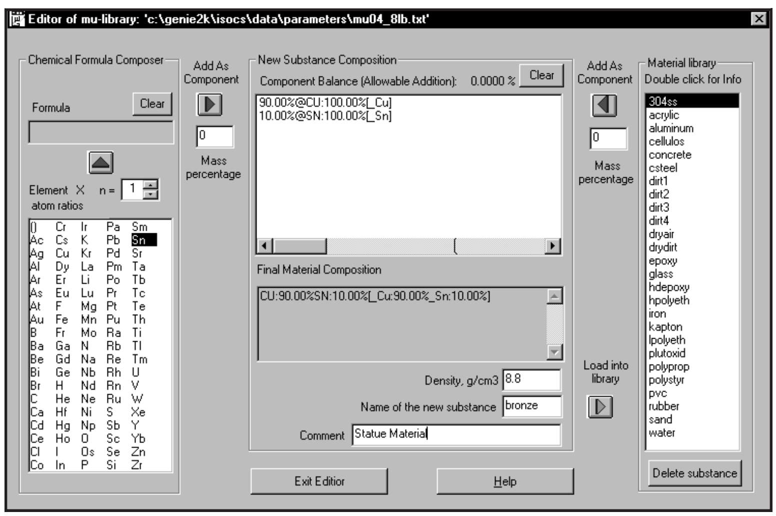


Figure 181 The Completed Definition

Correcting Data Entry Errors

In the Material Editor's window you'll notice two Clear buttons, one at the top of the Chemical Formula Composer and one in the New Substance Composition. These allow you to erase the current contents of these fields and enter new values should a data entry error be made.

Basing a New Material on an Existing Definition

To illustrate how this is done we will take the definition of a material called "dirt1", add some water to it, and save it as "mud1". Assuming a three parts "dirt1" to one part water, the process is as follows:

1. Click on "dirt1" in the Material Library.

2. Enter 75 into the right-hand Mass Percentage field.

3. Click on the green “Add as Component” button (◀) directly above that field.

The result can be seen in the New Substance Composition window of Figure 182, which indicates that 75% of our new material is composed of the elements which make up "dirt1".

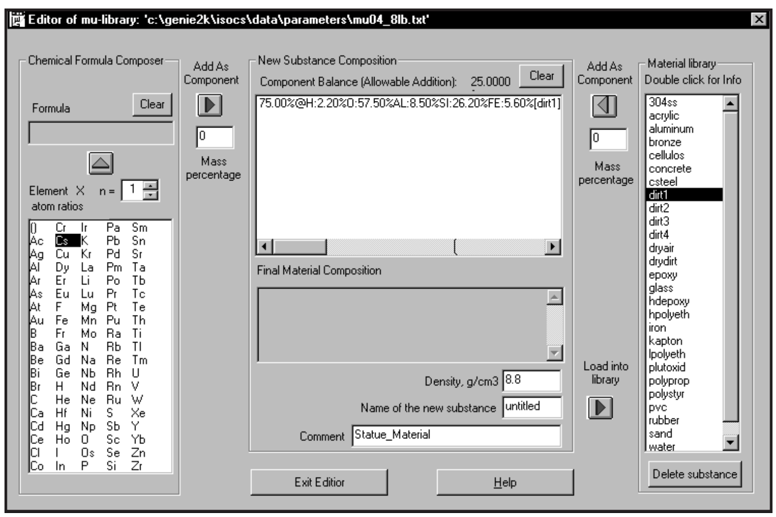


Figure 182 Dirt1 Has been Added

Next we have to add some water, using the Chemical Formula Composer on the left side of the window:

1. Click on the element H.

2. Insure that **n=** is a 2, meaning there will be 2 atoms of Hydrogen.

3. Click on the green ▲ button above the list to copy the H element from the list to the Formula box.

4. Click on the element O.

5. Insure that **n=** has a value of 1, indicating 1 atom of Oxygen.

6. Click on the green ▲ button to complete the formula for water (H2O will be seen in the Formula text box).

7. Type 25 into the left Mass Percentage field, then click on the Add As Component button (▶) directly above it, to add the water to the dirt.

To complete the definition of “mud”, enter the density, name, and comments as we did for "bronze" (see “To complete the definition” on page 223). Now click on the Load into Library button (▶) to add “mud” to the Material Library.

Alternatively, you could have simply used the “Water” already defined in the materials library for the remaining 25%.

Combining Existing Materials to Make a New One

Since "water" and "dirt1" are already in the Material Library, we could have made our "mud1" by simply combining them. This is done by:

1. Selecting "dirt1", entering 75 as its Mass Percentage and clicking on the right-hand Add as Component button.

2. Repeat that process for "water", using 25 as its Mass Percentage.

3. Enter the new name, density, and comments, click on Load into Library, and the definition is complete.

Any of these three techniques make it very easy to define a custom Material Library tailored to the specific needs of your laboratory.

Deleting a Material Library Entry

To delete an entry from the library, select it in the list, then click on the Delete Substance button. If the entry is part of another definition, the deletion will not be allowed. For example, “dirt1” cannot be deleted as long as the just created “mud1” still exists.

Setting the Display Preferences

The View menu contains two commands that can be used to change the look of the Geometry Composer window: Toolbar and Status Bar.

Toolbar

When enabled, as indicated by a checkmark, this command displays the toolbar at the top of the Geometry Composer window (Figure 164 on page 206).

When the toolbar is enabled, holding the cursor on an icon for a moment will display the name of the tool's command.

Status Bar

The Status Bar command enables and disables the display of the Status Bar at the bottom of the Geometry Composer window.

Viewing and Editing the Composer's Configuration

Select **Options** | **Configuration** to view and edit the Geometry Composer's configuration parameters (Figure 183).

Note: The Geometry Composer's configuration parameters are properly set during the installation of S501, S573 or S574 and normally do not need to be altered.

Geometry Configuration

The Geometry Configuration tab displays the current Version Number and Date of the various modules that make up the software package. Click on the Update Configuration button to insure that the most current information is being displayed.

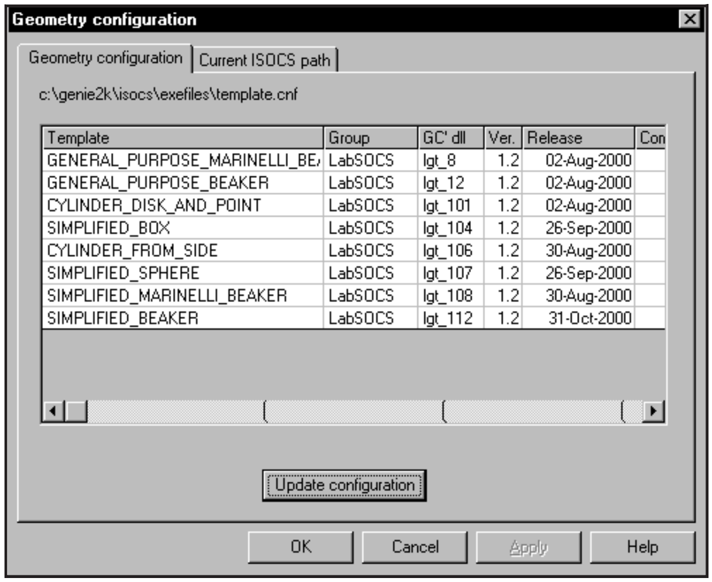


Figure 183 The Geometry Configuration Dialog

Current ISOCS Path

The Current LabSOCS/ISOCS Path tab displays the complete path to all of the data files used by the software (Figure 184).

If you use a different file structure, you can change the data by double-clicking on a path description, then selecting a new path via the dialog box that is displayed.

CAUTION An incorrectly set path can cause the system to stop functioning.

Setting the Default Parameters for New Geometries

Select **Options | Default Parameters** to establish default values for some of the parameters used when creating a new geometry. This command is not available if a geometry definition is open in the Composer.

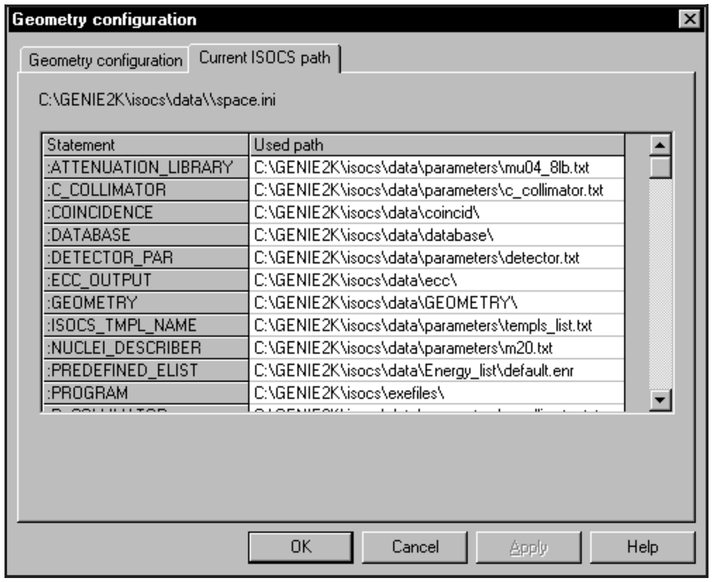


Figure 184 The Current ISOCS Path Tab

Preferences Tab

The Preferences tab (Figure 185) is used to establish the defaults used for the sample, container, and environmental measurement units. Note that the choices made here are simply setting the defaults that will be displayed when a new geometry definition is created. The defaults may be changed as needed when a geometry is defined.

Dimensions

You can select the default measurement unit to be used here.

Medium

You can select the default units for Temperature and Pressure and enter default values for these two units and for Relative Humidity here.

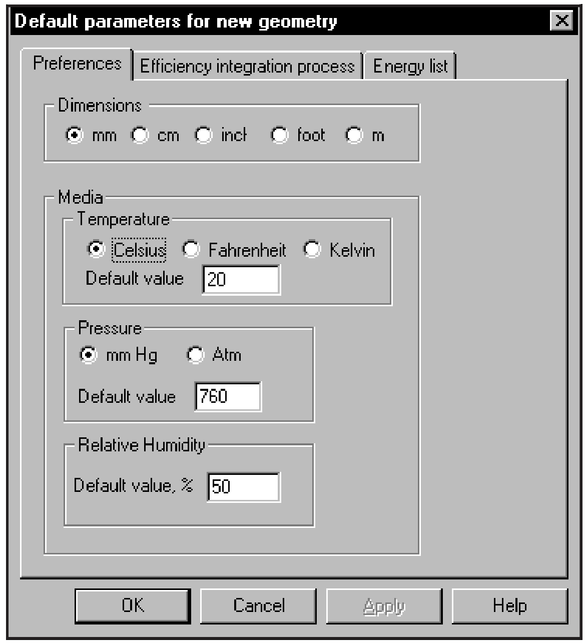


Figure 185 The Preferences Tab

Efficiency Integration Process Tab

The Efficiency Integration Process tab (Figure 186) is used to set default parameters for the efficiency calculation. The CRPN parameter is relevant only for ISOCS; for LabSOCS the CRPN setup can be ignored.

For further information on these parameters refer to “Changing the Integration Settings” on page 217 and to Appendix G, *LabSOCS/ISOCS Technical Notes*, in the *Genie 2000 Customization Tools Manual*. The default values may be re-established by clicking on the Restore Recommended Values button.

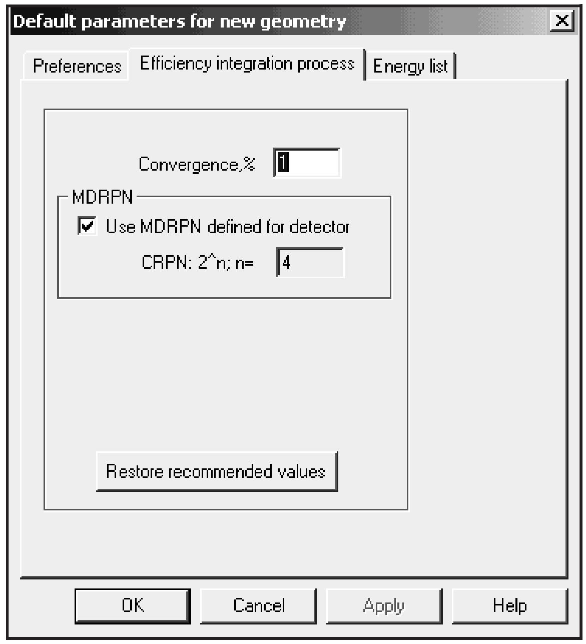


Figure 186 The Efficiency Integration Process Tab

Energy List Tab

The Energy List tab (Figure 187) is used to establish the default energies and uncertainties. that will be used for calibrating a new geometry definition.

Deleting an Energy from the List

Select the energy line to be deleted, then click on the Remove button.

Adding an Energy to the List

Type the new energy value into the Energy, keV field and its associated uncertainty into the Error, % field, then click on the **Add** button. The new line will be inserted into the list.

Deleting a Geometry Definition

To delete a definition that is no longer needed:

1. Select Open from the File menu.

2. Locate the definition to be deleted.

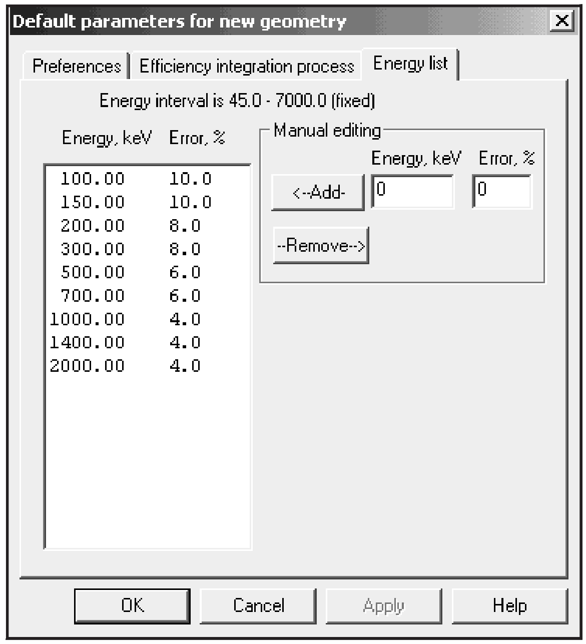


Figure 187 The Energy List Tab

3. Right click on the name of the definition, and select Delete from the list of commands that is displayed.

4. Click on Yes in the confirmation dialog that is displayed.

5. Click on Cancel to close the Open command dialog box.

A. Software Installation

Because of the flexibility of the Genie 2000 system, there are many aspects to system installation and setup. The applicability of these various aspects is a function of the individual installation, its desired capability, its hardware, and so forth.

This chapter serves as a guide to the installation process, directing you to the related information in this manual as required.

Factory Assembled Systems

For complete systems provided by Canberra, the hardware and software have been installed and tested at the factory. After setting up the system, go to Chapter 3, *MCA Input Definition*. Preliminary configuration of inputs will have been done at the factory for testing, but you will probably want to change some of the initial definition (for example, the detector names) for your own operation.

Doing it Yourself

If you are putting the system together yourself, Canberra recommends that you follow the sequence presented here.

Basic System Requirements

Successful installation and operation of Genie 2000 software requires:

Computer:	Industry standard computer with a Pentium®-233 processor and CD-ROM drive is required.
Operating Systems:	Windows 95, Windows 98, Windows ME™, Windows NT® V4.0 or Windows 2000.
RAM:	A minimum of 16 MB (Windows 95) or 64 MB (Windows 98/ME/NT/2000) is recommended, but in the Genie 2000 environment more memory will generally improve performance.
Hard Disk:	100 MB free disk space for Genie 2000 software and sample data file storage.[1]
Display:	Minimum of VGA (800 x 600 color).

1. Due to extensible nature of the CAM file system, you can expect data files, including all parameters, analysis results, library information and calibrations, to average 80-100 KB each.

Security Key: The security key supplied with the Genie 2000 software must be connected to a parallel port.[2]

1. Referring to “Installing Windows” on page 233, install the Windows 95 or Windows NT operating system.

2. Install MCA hardware and any network hardware. Refer to the section of Appendix B, *Hardware Installation*, that describes the specific acquisition hardware you are using. Refer also to the individual manuals associated with AIM and ICB NIM if applicable.

3. Referring to “Installing Genie 2000” on page 234, install the Basic Spectroscopy Software.

4. Referring to “Installing TCP/IP Components” on page 237, install the required TCP/IP network software components.

5. To install any Genie 2000 software options, refer to “Installing Optional Software” on page 236.

6. Additional information on customizing Windows for running Genie 2000, which is not required by most users, can be found in Appendix C, *Genie 2000 Configuration*.

7. To set up your MCA Input Definitions, use the MID Wizard (or MID Editor), both described in Chapter 3, *MCA Input Definition*.

Installing Windows

Windows must be installed on the hard drive; refer to the appropriate Windows manuals for complete instructions. Please follow these guidelines when installing Windows on your system.

1. You’ll need approximately 55 MB (Windows 95), 225 MB (Windows 98) or 550 MB (Windows ME/NT/2000) of free space on your hard disk for the complete Windows installation.

---

2. This parallel port can still be used for most peripherals, but not for control of the Model 8224 Multiplexer.

2. Unplug all Canberra PC-board acquisition devices prior to the installation of Windows 95/98/ME/NT. Windows 95/98/ME/NT supports “Plug-n-Play,” which will automatically detect hardware during installation and attempt to install the proper support. Canberra’s PC-board acquisition devices do not support “Plug-n-Play” and may cause detection problems if plugged in during Windows installation.

3. Canberra recommends that the FAT file system be used except for installations involving large hard disk volumes (greater than 300 MB). The performance gains that can be realized using the advanced systems such as NTFS are minimal on smaller hard disk volumes. In addition, all files will be 100% compatible with all DOS environments.

Installing Genie 2000

This section describes installing the Genie 2000 Basic Spectroscopy and optional software from the distribution CD. Please note that this installation requires 10 to 33 MB of free space on your hard disk, depending on options selected. Note also that Administrator privilege is required under Windows NT/2000 to perform the installation since edits to the registry are made.

Update Procedure

Before performing a software installation or upgrade, it’s highly recommended that you make a complete backup of all of your Genie 2000 directories. If this is not practical, you should at least copy any *.ASF, *.TPL, *.NLB or *.REX files that you modified (but that still use the default file names) to a disk or to a temporary directory to be sure that the software installation procedure does not overwrite them with default files. After the installation is complete, these files can be restored to their original directories.

Release Notes

During installation of each software option, a Release Notes file containing information on the current version of the software, is copied to the GENIE2K directory on your hard disk. It is worthwhile to read this text (ASCII) file, which has a general file name of G2K*.TXT, directly from the installation CD *before* installing the software, to see if there is any variation in the installation procedure.

To install the Genie 2000 software:

1. If you are installing this software as an upgrade from a previous version, make sure that no Genie 2000 software programs, such as the VDM, are running.

2. Insert the CD into the CD-ROM drive.

3. Open an MS-DOS prompt window and at the command line prompt, type:

   `?:\setup`, where `?` is your CD drive,

   or

   Click Start, Run, and type `?:\setup`. Click **OK**.

4. First, you will be presented with an introductory screen describing the installation of the Genie 2000 Basic Spectroscopy software. Press Next to continue or Cancel to exit.

5. Select the Destination Location (i.e. installation directory) for Genie 2000 and click Next.

6. Select the Genie 2000 Basic Spectroscopy package to install: S500/S502 Basic Spectroscopy or S504 Inspector Basic Spectroscopy. You may also select the **Install Documentation Only** option if you want to install only the Genie 2000 Documentation. Click Next.

7. Genie 2000 Documentation may be installed directly to your hard drive or accessed directly from the installation CD. Installing the documentation to your hard drive will require 11MB disk space. If disk space is a concern, you may choose the **Install Genie 2000 Documentation Files as Shortcuts to CD** option, but in this case you will need the CD every time you want to access the documentation. In either case, the **Genie 2000 Documentation** shortcut will be installed and will point to the correct location. You may also choose to not install the documentation at all.

8. To correctly access the Genie 2000 Documentation, Adobe Acrobat® Reader® - version 3.0 or higher - must be installed. Setup will attempt to determine whether Acrobat Reader is currently installed, though it will not determine which version is installed. You will be given the option to install Acrobat Reader version 4.

9. The selected installation options are displayed in a summary dialog. Click Back to go back and change installation options or Next to continue. If you click Next the Genie 2000 Documentation and Acrobat Reader are installed, if selected. After this you will be presented with more options for installing the selected Genie 2000 package, S500/S502 Basic Spectroscopy or S504 Inspector Basic Spectroscopy.

10. Next, you will be asked to choose between "Standard Installation" and "Custom Installation", as described in the following sections.

Standard Installation

This is the choice that most people will use. The Genie 2000 application is installed with predefined defaults – no further user selections are required.

Select the Standard button, then click Next or press the ENTER key. The application will now be installed. When the installation is complete, some final instructions will be displayed.

Custom Installation

The components that comprise the Genie 2000 application are installed in sub-directories under the installation directory specified in step 5 above. If these default sub-directories are not acceptable for a particular installation you can change the location (directory) where these components are installed.

In addition, Setup allows you to modify the values of the following environment settings: SAD_TIMEOUT, DS_LOGON, PSET_DELAY, ADVISE_HOLD and HDW_STATUS. See Appendix C, *Genie 2000 Configuration*, for a description of these settings.

1. Select the Custom button, then click Next or press the ENTER key.

2. A dialog box will appear. Select the components whose directories you want to change. When you have made all your selections click Next or press the ENTER key.

3. For each component selected, a dialog box will prompt you to enter the drive and directory in which to install the component. Change the drive/directory as necessary and click Next or press ENTER. After all selected components are complete the application will be installed.

4. After installing the application, Setup will display each of the above mentioned environment settings. You may keep the default settings or modify the settings. Setup will run through the final installation steps.

5. When the installation is complete, some final instructions will be displayed.

Installing Optional Software

To install another Genie 2000 program, put its first installation disk into your floppy drive, then:

1. Open an MS-DOS prompt window.

2. At the command line prompt, type:

   `a:\setup`

   If you are using drive b:, type `b:\setup`.

3. Follow the instructions presented on the screen.

4. If the instructions on the screen tell you to reboot your system and you are installing several options, you can install all of them before rebooting.

Completing the Installation

After installing all the software:

- Install and configure the TCP/IP network components (page 237).
- Install the AIM system drivers, if required (page 254).
- For Models S500 and S502, you *must* install the security key (page 257).

You might want to consider a few changes which can make it easier to run your system.

- You might want to make the Genie 2000 Virtual Data Manager load automatically each time you start your system (page 257).
- You might want to have a shortcut to the Genie 2000 folder on your desktop (page 257).

Installing TCP/IP Network Components

The TCP/IP subsystem is a standard component of the Windows operating system environments. The Genie 2000 software is a client/server architecture; communications between the client and server components is through Windows sockets using the TCP/IP protocol. The following sections describe the required setup.

- The Windows 95/98/ME TCP/IP setup is described on page 238.
- The Windows NT/2000 TCP/IP setup is described on page 246.

Windows 95/98/ME TCP/IP Setup

The following steps should be performed to ensure proper setup of TCP/IP for use by Genie 2000 under Windows 95/98/ME. If remote VDM access is required, either by this computer or by another remote computer to this computer's VDM, some additional steps may be required; these are described in "Additional Setup Steps for Remote VDM Access" on page 241.

1. To determine if TCP/IP is already installed on your computer, right click on the Network Neighborhood icon, select Properties, then select the Configuration tab.

   If you see TCP/IP in the Configuration list (Figure 188), it is installed and no further action is required. Click on Cancel to exit the Network window without making any changes.

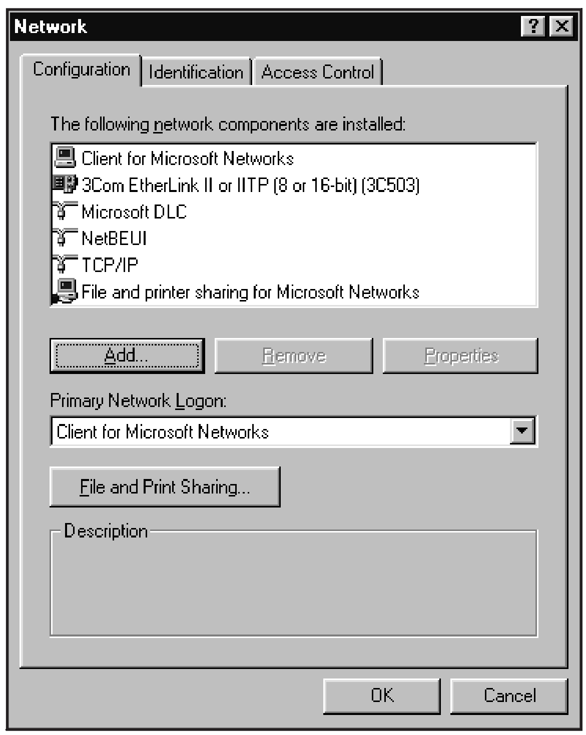


Figure 188 Network Components Screen

2. Only two network components require installation for Genie 2000. First, a network adapter must be added. If your computer does not contain a network adapter card, then a DialUp Adapter must be added. Click on the **Add** button which brings up the following dialog (Figure 189):

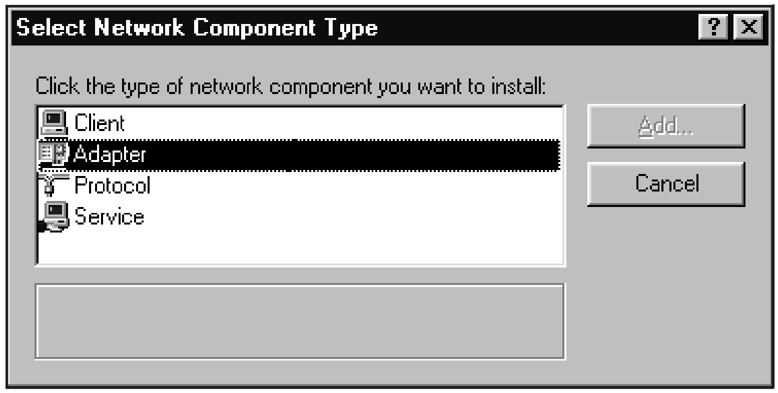


Figure 189 Select Network Component Type

Highlight the Adapter item in the list box and press the **Add** button.

3. Another dialog will appear which allows selection of network adapters (Figure 190). Select the appropriate vendor and network adapter card to match the one

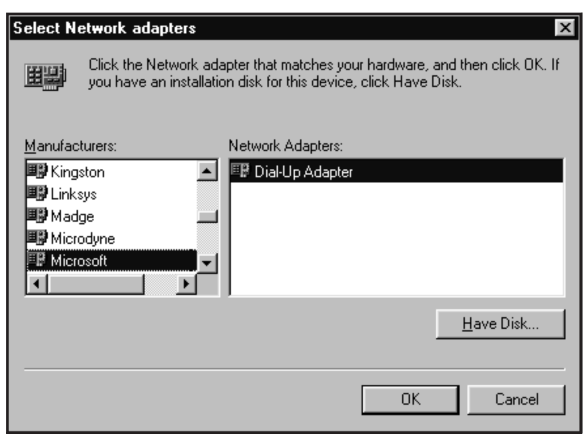


Figure 190 Select Network Adapters

in your machine. If none is present, then select the Microsoft entry in the Manufacturers list and highlight the DialUp Adapter entry in the Network Adapters list (this will be highlighted by default if there is only one entry). Choose **OK** to add the selected adapter.

4. You will be returned to the Network Components Screen. By default, additional protocols and clients (e.g. NetBEUI and IPX/SPX protocols, Clients for Microsoft and Netware Networks) are added with the DialUp Adapter. All of these may be deleted by highlighting the item and pressing the Remove pushbutton.

5. After removing any unneeded items from the list of network components, it is time to add the TCP/IP protocol. Use the **Add** button to bring up the Select Network Component Type dialog. Highlight Protocol from the Network Component Type list and press **Add** to see a dialog as shown in Figure 191.

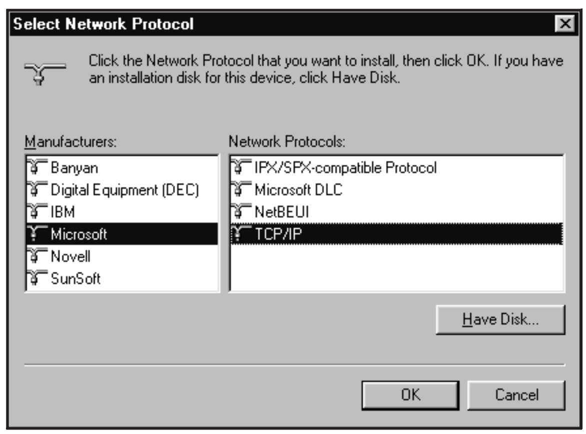


Figure 191 Select Network Protocol

Select Microsoft from the list of Manufacturers and TCP/IP from the list of Network Protocols; press **OK** when finished to add this protocol to the list of network components.

6. If Remote VDM access is required, then proceed to “Additional Setup Steps for Remote VDM Access” on page 241. If not, press **OK** on the Network Settings applet to complete the installation (note that with this setup, Genie 2000 will use the standard loopback IP address, 127.0.0.1).

You will be prompted for your Windows installation disks (CD-ROM) in order to copy the required files for the selected network components (note that on some pre-loaded systems, the Windows distribution is installed on the hard disk partition containing Windows).

7. Once all required files are copied, you will be reminded that your system requires re-booting to complete the installation process and are given the option of restarting your computer immediately.

Additional Setup Steps for Remote VDM Access

If access to this computers VDM is required from another remote computer, then this computer must identify itself via a unique computername. If, after setting up your remote VDM access, you have persistent problems in establishing client connections to the VDM, refer to “Additional TCP/IP Installation Tips” on page 252.

To set up remote VDM acccess, perform the following steps:

1. A network client must be added to the list of network components. Use the Add pushbutton to bring up the Select Network Component Type dialog. Highlight Client from the Network Component Type list and press Add to see a dialog as shown in Figure 192.

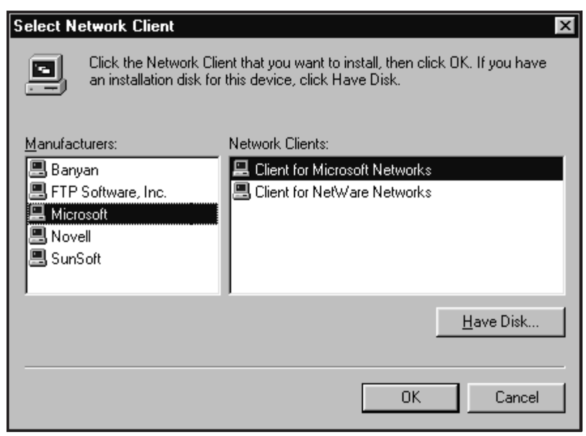


Figure 192 Select Network Client

Select Microsoft from the list of Manufacturers and Client for Microsoft Networks from the list of Network Clients; press **OK** when finished to add this Client to the list of network components.

2. Select the Identification notebook tab in Network Settings to display the dialog shown in Figure 193.

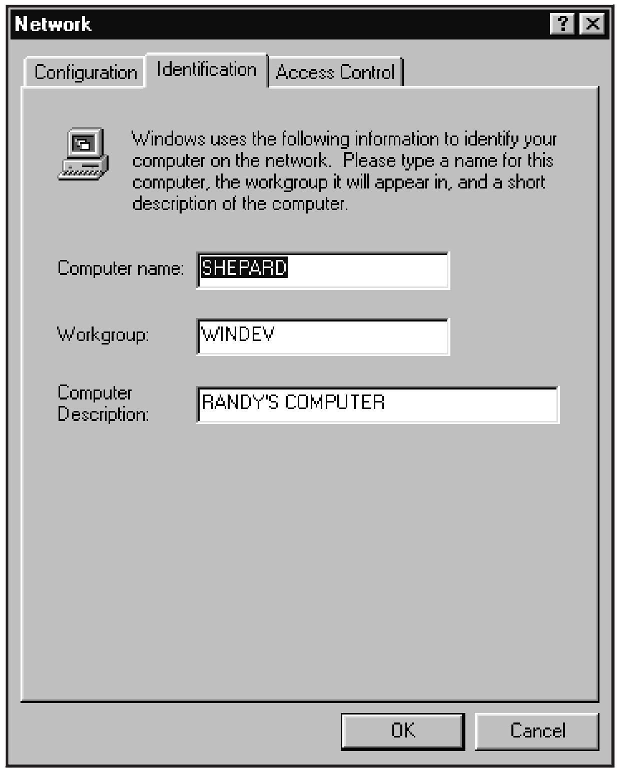


Figure 193 Network Settings - Indentification

Enter a unique computername (maximum of 8 characters; no spaces allowed). This dialog requires entry of a workgroup; this is not used by the Genie 2000 software so the value of this field is at the discretion of the user (this field is typically used in larger networks to help partition them and its users into logical domains).

3. Re-select the Configuration notebook tab in the Network Setting applet and highlight the TCP/IP entry. Press the Properties button to display the TCP/IP dialog box (Figure 194).

An IP address must be defined for this computer so it can be associated with the previously entered computername (this is how computers and applications communicate with each other using TCP/IP; the computer name is translated into an IP address). Either select the radio button “Specify an IP address” and enter in a valid IP address and subnet mask (e.g. IP address of 200.200.200.1

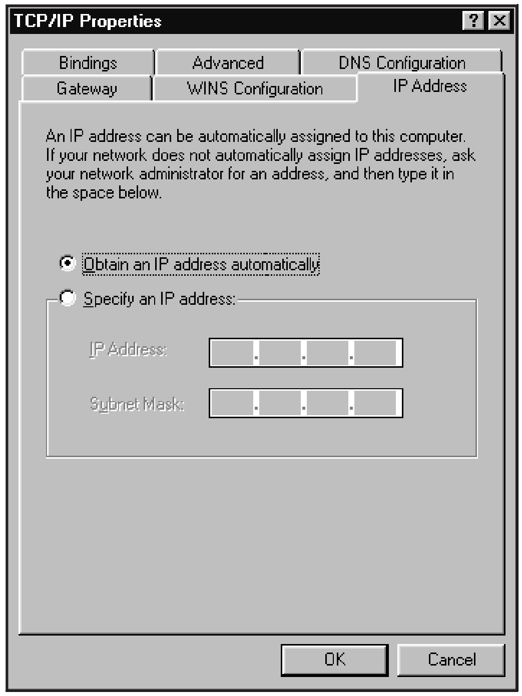


Figure 194 Set TCP/IP Properties

and a subnet mask of 255.255.255.0) or select the radio button “Obtain an IP address automatically” if this computer resides on a network which uses TCP/IP and employs dynamic IP addressing.

It is recommended that you contact your network administrator for guidance in setting up this portion of TCP/IP since IP addresses must be unique on a network. Select **OK** when setup of TCP/IP properties is complete.

4. Press **OK** on the Network Settings applet to complete the installation. You will be prompted for your Windows installation disks (CD-ROM) in order to copy the required files for the selected network components (note that on some pre-loaded systems, the Windows distribution is installed on hard disk partition containing Windows).

5. Once all required files are copied, you will be reminded that your system requires re-booting to complete the installation process and are given the option of restarting your computer immediately. Select No to the restart computer question since some additional setup steps are still required.

6. The Genie 2000 Network Configuration File (as pointed to by the environment variable CINETCFG; typically named G2K_VDM.NCF) must be edited.

Edit the first line of this file to remove the text LOCAL as shown below (this indicates that the computername / IP address information is defined via the network settings information and not defaulted to Local / 127.0.0.1):

Original:

```
1 -\local
1B-\pipe\datasrce
1C-\pipe\configur
```

Edited:

```
1 -\
1B-\pipe\datasrce
1C-\pipe\configur
```

If access to another computer's VDM is required from this computer, then perform the following steps:

1. The Genie 2000 Network Configuration File (as pointed to by the environment variable CINETCFG) must be edited.

   Edit additional lines (after the first three lines) into the file as follows (this example assumes a remote computername of NODE1):

   Original:

   ```
   1 -\local
   1B-\pipe\datasrce
   1C-\pipe\configur
   ```

   Edited:

   ```
   1 -\
   1B-\pipe\datasrce
   1C-\pipe\configur
   1M-\\node1\pipe\datasrce
   1C-\\node1\pipe\configur
   ```

Add additional lines as required to define subsequent remote computers.

2. Assuming your network does not use DNS, WINS or dynamic IP addressing, one additional Windows 95 TCP/IP file will require editing in order for this computer to resolve the remote computer name to an IP address. This file is named HOSTS. and must be located in the directory shown in the following table.

Operating System	**Default Directory**
Windows 95/98/ME	\WINDOWS
Windows NT/2000	\WINNT\SYSTEM32\DRIVERS\ETC

A sample ASCII file named HOSTS.SAM is installed in the default directory and can be used as the template for creating this file.

Computername, IP address entries must be made to this file so the remote computer running the VDM can be accessed by this computer. An example file is shown below with edits for the remote computername NODE1.

```
# Copyright (c) 1994 Microsoft Corp.
#
# This is a sample HOSTS file used by
# Microsoft TCP/IP for Chicago
#
# This file contains the mappings of
# IP addresses to host names. Each
# entry should be kept on an individual
# line. The IP address should
# be placed in first column followed
# by the corresponding host name.

# The IP address and the host name
# should be separated by at least one
# space.
#
# Additionally, comments (such as
# these) may be inserted on individual
# lines or following the machine name
# denoted by a '#' symbol.
#
# For example:
#
# 102.54.94.97  rhino.acme.com  # source server
# 38.25.63.10   x.acme.com      # x client host

127.0.0.1       localhost
200.200.200.5   node1        # Node 1 IP address
```

Windows NT/2000 TCP/IP Setup

The following steps should be performed to ensure proper setup of TCP/IP for use by Genie 2000 under Windows NT/2000. If remote VDM access is required, either by this computer or by another remote computer to this computer's VDM, some additional steps may be required; these are described in "Additional Setup Steps for Remote VDM Access" on page 249.

1. To determine if TCP/IP is already installed on your computer, right click on the Network Neighborhood icon, select Properties, then select the Configuration tab.

   If you see TCP/IP in the Configuration list (Figure 195), it is installed and no further action is required. Click on Cancel to exit the Network window without making any changes.

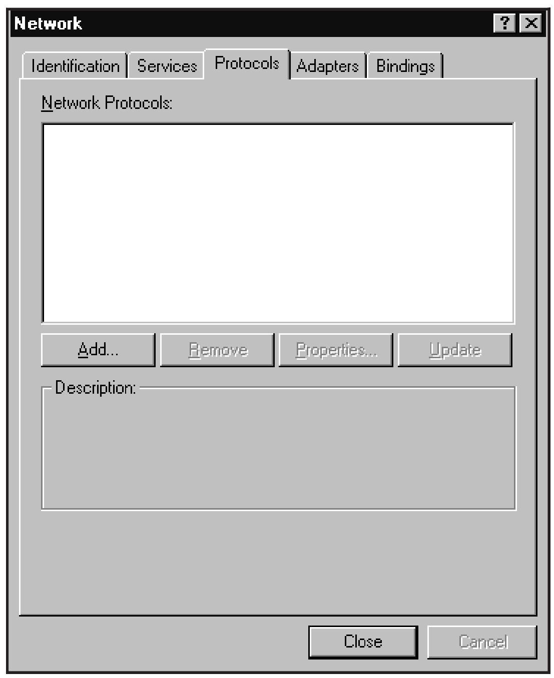


Figure 195 Network Protocol Screen

2. Only two network components require installation for Genie 2000. First, a network adapter must be added. If your computer does not contain a network adapter card, then an MS Loopback Adapter must be added. Click on the Adapters notebook tab (this brings up the Network Adapters selection page); click on the **Add** button to bring up the dialog in Figure 196.

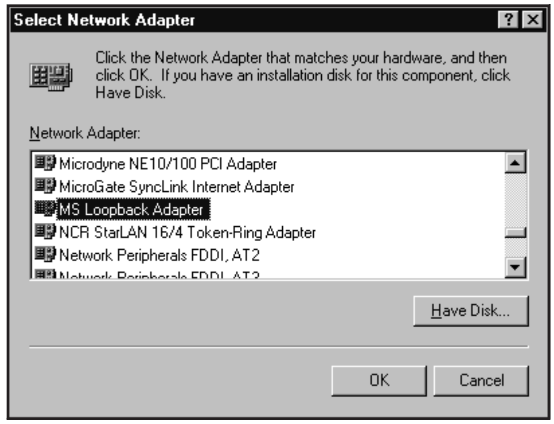


Figure 196 Select Network Adapter

Select the appropriate vendor and network adapter card to match the one in your machine. If none is present, then select the MS Loopback Adapter entry in the Network Adapters list. Choose **OK** to add the selected adapter. You will be prompted for your Windows NT/2000 installation disks (CD-ROM) in order to copy the required files for the selected network adapter (note that on some pre-loaded systems, the Windows NT/2000 distribution is installed on the hard disk partition containing Windows NT/2000).

3. It is now time to add the TCP/IP protocol. Select the Protocols notebook tab on the Network Settings screen and press the **Add** button to bring up the Select Network Component Protocol dialog (Figure 197).

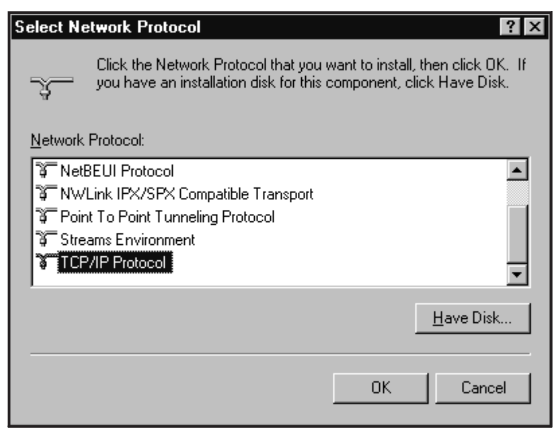


Figure 197 Select Network Protocol

Highlight the TCP/IP Protocol from the Network Protocol list and press **OK** to add. You will be prompted for your Windows NT/2000 installation disks (CD-ROM) in order to copy the required files for the selected network adapter (note that on some pre-loaded systems, the Windows NT/2000 distribution is installed on the hard disk partition containing Windows NT/2000).

4. If remote VDM access is required, then proceed to ”Additional Setup Steps for Remote VDM Access” on page 249.

5. Press the Close pushbutton to exit the Network setting dialog. At this time you will be prompted (via a dialog shown in Figure 198) for setup of TCP/IP properties.

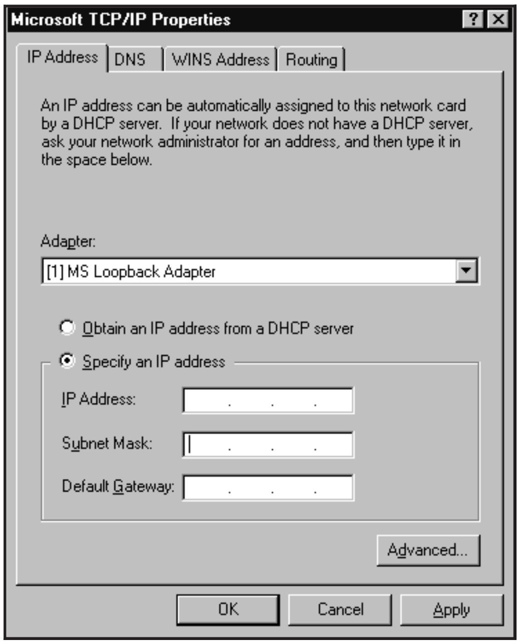


Figure 198 Microsoft TCP/IP Properties

On this dialog, an IP address and subnet mask must be specified. Since the loopback adapter has been selected (i.e. restricting TCP/IP communications to local only), then any legal IP address and subnet mask may be specified (e.g. 200.200.200.1 for IP address and a subnet mask of 255.255.255.0). Note that with this type of setup, Genie 2000 will use the standard loopback IP address, 127.0.0.1, and not the one specified in this dialog. Press **OK** to complete the setup.

6. Once all required files are copied and the installation is complete, you will be reminded that your system requires re-booting to complete the installation process and are given the option of restarting your computer immediately.

Additional Steps for Remote VDM Access

If access to this computers VDM is required from another remote computer, then this computer must identify itself via a unique computername. If, after setting up your remote VDM access, you have persistent problems in establishing client connections to the VDM, refer to “Additional TCP/IP Installation Tips” on page 241.

To set up remote VDM access, perform the following steps:

1. The name of this computer must be defined via the Network Settings applet. To do this, click on the Identification notebook tab which brings up a dialog box.

   Click the **Change** button to enter a unique computername (maximum of 8 characters allowed by Genie 2000; no spaces allowed). This dialog (Figure 199) requires entry of a workgroup; this is not used by the Genie 2000 software so the value of this field is at the discretion of the user (this field is typically used in larger networks to help partition them and its users into logical domains).

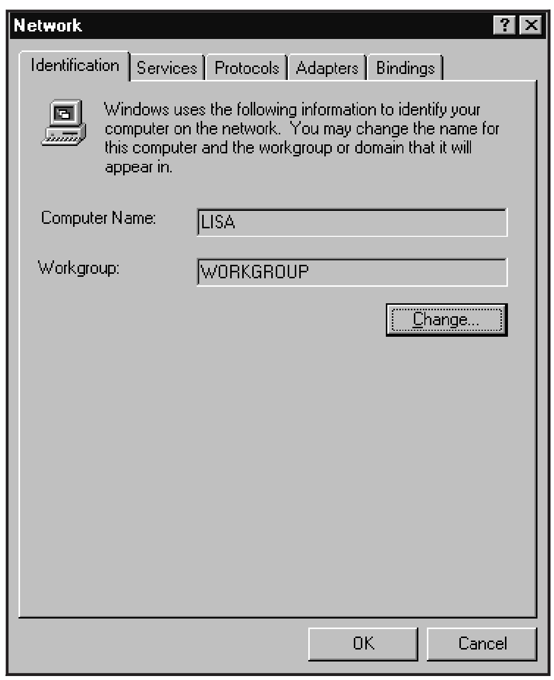


Figure 199 Computer Name Identification

2. Click the **Close** button to exit the Network setting dialog. You'll be prompted (via the dialog in Figure 200) to set up the TCP/IP properties.

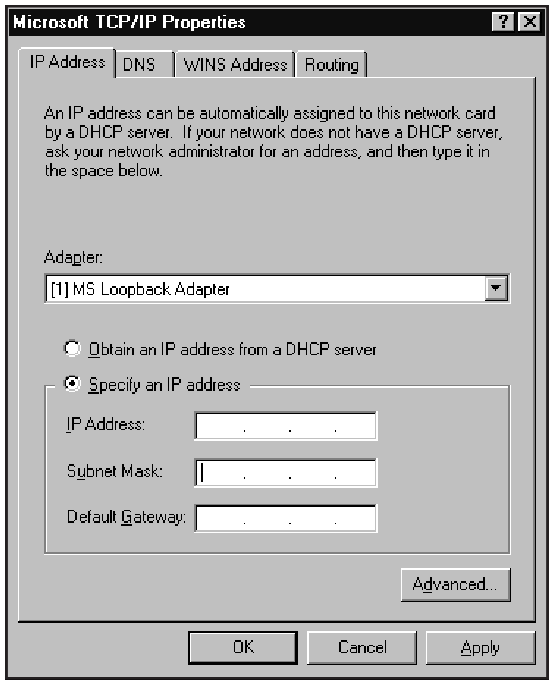


Figure 200 TCP/IP Properties Screen

An IP address must be defined for this computer so it can be associated with the previously entered computername (this is how computers and applications communicate with each other using TCP/IP; the computer name is translated into an IP address). Either select the radio button "Specify an IP address" and enter in a valid IP address and subnet mask (e.g. IP address of 200.200.200.1 and a subnet mask of 255.255.255.0) or select the radio button "Obtain an IP address automatically" if this computer resides on a network which uses TCP/IP and employs dynamic IP addressing.

It is recommended that you contact your network administrator for guidance in setting up this portion of TCP/IP since IP addresses must be unique on a network. Select **OK** when setup of TCP/IP properties is complete.

3. Once all required files are copied, you will be reminded that your system requires re-booting to complete the installation process and are given the option

of restarting your computer immediately. Select No to the restart computer question since some additional setup steps are still required.

4. The Genie 2000 Network Configuration File (as pointed to by the environment variable CINETCFG; typically named G2K_VDM.NCF) must be edited as follows:

   Edit the first line of this file to remove the text LOCAL as shown below (this indicates that the computername/IP address information is defined via the network settings information and not defaulted to Local / 127.0.0.1):

   Original:

   ```
   1 -\local
   1B-\pipe\datasrce
   1C-\pipe\configur
   ```

   Edited:

   ```
   1 -\
   1B-\pipe\datasrce
   1C-\pipe\configur
   ```

If access to another computers VDM is required from this computer, perform the following steps:

1. The Genie 2000 Network Configuration File (as pointed to by the environment variable CINETCFG) must be edited as follows:

   Edit additional lines (after the first three lines) into the file as follows (this example assumes a remote computername of NODE1):

   Original:

   ```
   1 -\local
   1B-\pipe\datasrce
   1C-\pipe\configur
   ```

   Edited:

   ```
   1 -\
   1B-\pipe\datasrce
   1C-\pipe\configur
   1M-\\node1\pipe\datasrce
   1C-\\node1\pipe\configur
   ```

Add additional lines as required to define subsequent remote computers.

2. Assuming your network does not use DNS, WINS or dynamic IP addressing, then one additional Windows NT/2000 TCP/IP file requires editing in order for this computer to resolve the remote computer name to an IP address. This file is named HOSTS. and must be located in the WINNT\SYSTEM32\DRIVERS\ETC directory. A sample file named HOSTS. is installed (located in the aforementioned directory) and can be used as the template for creating this file. Computername, IP address entries must be made to this file so the remote computer running the VDM can be accessed by this computer. An example file is shown below with edits for the remote computername NODE1.

```
# Copyright (c) 1993-1995 Microsoft
# Corp.
#
# This is a sample HOSTS file used by
# Microsoft TCP/IP for Windows/NT
#
# This file contains the mappings of
# IP addresses to host names. Each
# entry should be kept on an individual
# line. The IP address should
# be placed in first column followed
# by the corresponding host name.
# The IP address and the host name
# should be separated by at least one
# space.
#
# Additionally, comments (such as
# these) may be inserted on individual
# lines or following the machine name
# denoted by a '#' symbol.
#
# For example:
#
# 102.54.94.97  rhino.acme.com  # source server
# 38.25.63.10   x.acme.com      # x client host

127.0.0.1       localhost
200.200.200.5   node1       # Node 1 IP address
```

Additional TCP/IP Installation Tips

Genie 2000 uses (by default) the port numbers 1200, 1300, and 2000 when creating socket connections for client/server communications. These are in the range of “user defined” services as specified by the TCP/IP standard. It is possible that these may be defined by another application on your computer which will cause conflicts with Genie 2000. If problems persist in establishing client connections to the VDM, this may be a possible cause of the problems. To verify, examine the file WINDOWS\SERVICES (Windows 95/98/ME) or WINNT\SYSTEM32\DRIVERS\ETC\SERVICES (Windows NT/2000). as shown below.

```
# Copyright (c) 1993-1995 Microsoft Corp.
#
# This file contains port numbers for
# well-known services as defined by
# RFC 1060 (Assigned Numbers).
#
# Format:
#
# <service name>  <port number>/
#    <protocol>  [aliases...]  [#comment>]
```

echo	7/tcp	
echo	7/udp	
discard	9/tcp	sink null
discard	9/udp	sink null
systat	11/tcp	
systat	11/tcp	users
daytime	13/tcp	
daytime	13/udp	
netstat	15/tcp	
	.	
	.	
	.	
kpop	1109/tcp	# Pop with Kerberos
phone	1167/udp	
ingreslock	1524/tcp	
maze	1666/udp	
nfs	2049/udp	# sun nfs.
	.	
	.	
	.	

Check to see if any one of the default Genie 2000 port numbers are defined. If so, then edits must be made to this file as follows:

```
Datasrce     nnnn/tcp     # VDM datasource connection
Advise         nnnn/tcp     # VDM advise connection
```

```
Configur     nnnn/tcp     # VDM configuration connection
```

where nnnn is an undefined port number.

If a Dialup Adapter is used for binding the TCP/IP protocol stack, it is possible that your Windows system is set up to “Connect to the Internet as needed”. This feature will instruct the system to prompt you for an Internet connection whenever a Genie 2000 client application connects to the VDM.

To disable this behavior, bring up the Internet settings applet from within the Control Panel. Use the Connections notebook tab (as shown in Figure 201) and uncheck the checkbox labeled “Connect to the Internet as needed”; click on OK to save this settings change.

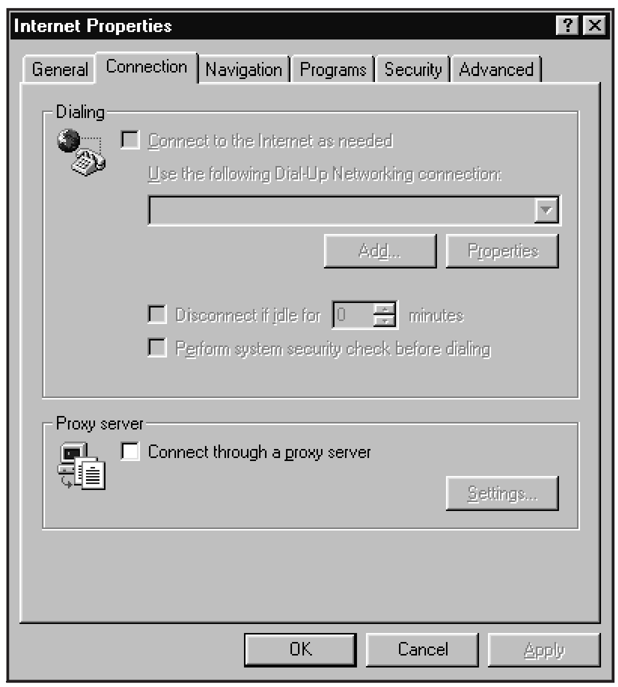


Figure 201 Connect to Internet

Installing AIM Device Drivers

In order to communicate with an AIM acquisition device under Genie 2000, a special protocol stack must be installed.

- The Windows 95/98/ME AIM setup is described on page 255.

- The Windows NT/2000 AIM setup is described on page 256.

For CD-ROM distributions, the following table shows the CD-ROM location of the AIM drivers for each operating system.

Directory	Operating System
95	Windows 95/98
ME	Windows ME
NT	Windows-NT
2000	Windows 2000

Windows 95/98/ME AIM Setup

The following steps should be followed to ensure proper setup of the AIM protocol stack under Windows 95/98/ME:

1. Launch the Network Settings applet (via the Control Panel).

2. Press the Add pushbutton, highlight Protocol from the list, and click on the Have Disk pushbutton.

3. Make sure the CD is still loaded in the CD-ROM drive. Select the directory (?:\95 or ?:\ME) having the required Windows AIM drivers, where ? is your CD-ROM drive.

4. Click **OK**.

5. A dialog box will appear having the following entry: Canberra 802.3 SNAP Protocol driver; click **OK** to accept this protocol.

6. Make sure that the Canberra 802.3 SNAP Protocol has bound to the correct Ethernet adapter (this is not an issue if you have only one Ethernet adapter in your computer). If multiple adaptes are present, the adapter binding can be determined from the network components list box in the Network Settings dialog. The name of the protocol is followed by a “-” and the name of the adapter that it is bound to. To make a change, select the currently bound adapter (by highlighting it in the network components list box) and press the Properties pushbutton. Select the Bindings notebook tab and uncheck the Canberra 802.3 protocol item. Click **OK**, then select the adapter you want to bind the Canberra

802.3 protocol to (again, by highlighting it within the network components list box). Press the Properties pushbutton, select the Bindings notebook tab, and check the Canberra 802.3 protocol item. Click **OK** to save new bindings.

7. Exit the Network settings dialog by clicking on **OK** (follow the prompts for your Windows distribution and reboot your system).

Windows NT/2000 Setup

The following steps should be followed to ensure proper setup of the AIM protocol stack under Windows NT/2000:

1. Launch the Network applet (via the Control Panel).

2. Click on the Protocols notebook tab and then press the Add pushbutton.

3. Click on the Have Disk pushbutton.

4. Make sure the CD is still loaded in the CD-ROM drive. Select the directory (?:\NT or ?:\2000) having the required Windows NT/2000 AIM drivers, where ? is your CD-ROM drive.

4. Click **OK**.

5. A dialog box will appear having the following entry: Canberra 802.3 SNAP Protocol Driver V1.0; click **OK** to accept this protocol.

6. Make sure that the Canberra 802.3 SNAP Protocol is bound to the correct Ethernet adapter (this is not an issue if you have only one Ethernet adapter in your computer). If multiple adapters are present, the adapter binding can be determined from the Bindings dialog. The name of the protocol can be clicked on which brings up a list of adapters it is bound to. Highlight the adapter(s) which do not require the Canberra 802.3 protocol driver and click on Disable. Click on Close to save these new bindings.

7. Exit the Network settings dialog by clicking on **OK** (follow the prompts for your Windows distribution and reboot your system.)

Installing the USB Driver

In order to communicate with Canberra's USB enabled devices (Inspector 2000) a special driver must be installed. The following section describes the required steps to follow for setting this up under Windows 98.

Windows 98 Setup

1. Plug the Inspector 2000 into the USB.

2. Window's 98 will prompt you for the USB driver diskette.

3. Insert the Genie 2000 CD into the CD ROM drive.

4. Specify the CIUSB directory on the CD ROM.

5. Click **OK**. It is not necessary to reboot.

Installing the Security Key

Install the security key in a parallel port. The Models S500 and S502 Genie 2000 software will not operate without this key.

Loading the Virtual Data Manager

Note that all Genie 2000 programs require that the Virtual Data Manager (VDM) program be running before they can be started. If the VDM is not already running when an application is launched, it will be started automatically. This may cause a brief delay when launching an application.

To improve performance, make a copy of the Virtual Data Manager (VDM) shortcut from the Genie 2000 desktop folder and put it in the Startup folder. All programs in the Startup folder are automatically started when Windows is started.

Creating a Shortcut to Genie 2000

After software installation, create a shortcut on the Desktop to the Genie 2000 folder.

1. Click on Start Menu.

2. Select Settings, then click on Taskbar.

3. Click on Start Menu Programs, then select the Advanced button.

4. Double click on the Programs item in the right hand part of the display.

5. Using the secondary mouse button (usually the right button), click on the Genie 2000 item.

7. Select Copy, then move the mouse cursor to the desktop.

8. Click the secondary mouse button, then select Paste Shortcut.

9. Close the Exploring and the Taskbar Properties windows.

You can move the shortcut icon anywhere on the desktop and, if you like, you can rename it.

Uninstalling the Genie Software

Note: The Genie 2000 software components must be uninstalled in the order in which they were installed to ensure that all modified Genie 2000 and system files are returned to their proper state.

To uninstall all or part of the Genie 2000 software:

1. Click on Start Menu.

2. Select Settings.

3. Select Control Panel.

4. Select the Add/Remove Programs icon.

5. In the scroll-down list of programs in the Install/Uninstall pane, highlight the Genie 2000 component(s) you want to uninstall.

6. Select the **Add/Remove** button to remove the highlighted items.

B. Hardware Installation

This chapter covers installation of the System 100 MCA and AccuSpec MCA hardware. AIM and InSpector MCA hardware installation is covered in their manuals.You'll need access to the PC's expansion bus and system board when installing internal options such as:

- MCA boards
- Display adapters
- Memory expansion
- I/O adapters

CAUTION To prevent a loss of data stored on a fixed disk drive, back up all files before altering your system.

Installing System 100 Boards

Canberra has carefully designed the System 100 MCA boards so that there is no conflict with any IBM devices, but if another non-IBM adapter board is installed it is advisable to check its I/O addresses before installing the Canberra board. In the event of an addressing conflict, the System 100 allows for an alternate set of addresses. The System 100 boards can be one of two models. They can be distinguished by the label on chip A63: Model 4610 has a blue label and Model 4611 has a white label, as shown in Figure 202.

There is no restriction on the MCA numbering (see Table 3). For example, if there is a conflict at both the primary and alternate addresses for MCA #1, you can set up the board as MCA #2. Note that two boards can't use the same MCA number.

The System 100 does not require DMA, Interrupt, or Memory Access from the computer's bus – only INput and OUTput at the listed addresses. The required Bus Signals for both PC Bus and Micro Channel Bus MCA Boards are listed in Appendix D, *Technical Information*. The Genie 2000 software allows up to four System 100 MCA boards to operate simultaneously.

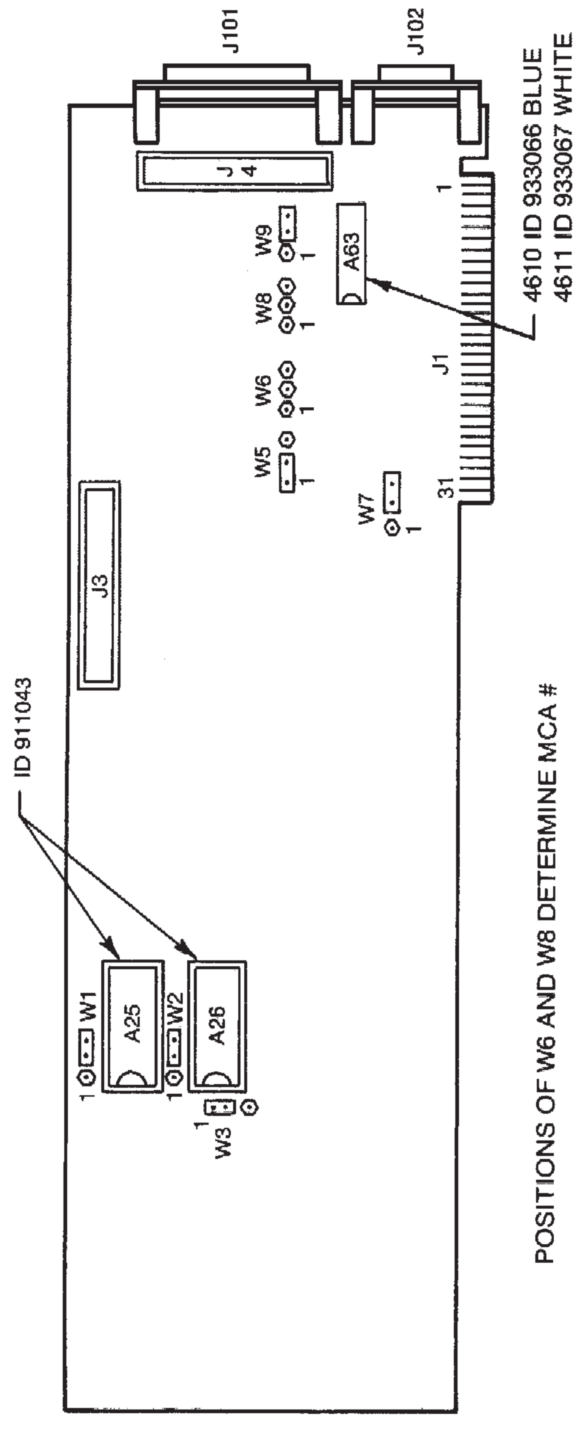


Figure 202 System 100 Board Component Location

Table 3 System 100 PC I/O Address Map

Model 4610				
	Jumpers		Primary Address	Alternate Address
MCA	W6	W8	W9=2-3	W9=1-2
#1	2-3	2-3	$340\text{-}345_H$	$300\text{-}305_H$
#2	2-3	1-2	$348\text{-}34D_H$	$308\text{-}30D_H$
#3	1-2	2-3	$350\text{-}355_H$	$310\text{-}315_H$
#4	1-2	1-2	$358\text{-}35D_H$	None
Model 4611				
	Jumpers		Primary Address	Alternate Address
MCA	W6	W8	W9=2-3	W9=1-2
#1	No selection			
#2	2-3	1-2	$348\text{-}34D_H$	$308\text{-}30D_H$
#3	1-2	2-3	$350\text{-}355_H$	$310\text{-}315_H$
#4	1-2	1-2	$358\text{-}35D_H$	$318\text{-}31D_H$

PC Bus MCAs

Two boards can’t be set for the same MCA number.

Note: If there is an address conflict it will not be possible to install the System 100 board unless the other adapter is removed.

Installing the PC MCA Board

1. Turn OFF the power to the system unit and to all connected external options (display, printer, and so forth). If this is the initial installation, refer to the documents provided with the computer. Unplug the power cord to the system unit.

Note location of all cables and disconnect them from the system unit.

2. Follow the instructions in your computer's manual on how to remove the cover.

3. Remove the rear panel expansion slot cover from one of the unused full length expansion slots. Set the screw aside for later use.

4. Install the board into the selected slot aligned so that the connector sockets are at the rear. The beveled edge of the cover bracket fits into a slot in the rear panel plate and the other end of the board should slide into a plastic support.

   On some computers, it will be easier to install the MCA board if the adjacent boards' brackets are loosened. Press the board in firmly to fully seat it in its expansion bus connector.

5. Install the screw that was removed with the slot cover and secure all boards.

6. Repeat steps 3 through 5 for all boards to be installed in the computer.

7. Install the system unit's cover and tighten the cover screws.

8. Connect the AC power cord.

9. Apply the board label that was provided with the board to the rear panel slot. The MCA number should correspond to the address selected. This will help later when connecting cables.

Micro Channel Bus MCAs

Boards designed for the Micro Channel bus have programmable registers that replace jumpers and switches. These registers are loaded during system configuration at power-on. The Adapter Descriptor File (ADF) for the board is included on the Genie 2000 Basic Spectroscopy disk. This is the same file that is on the S398 disk. If you are upgrading the software of an existing system, it is not necessary to reconfigure your system.

Copying the S100 Configuration File

Before installing an MCA board in the computer, it will be necessary to copy the ADF file from the S400 disk to your *backup* copy of the PS/2 Reference Disk. *Do not* copy it to the original disk supplied with your PS/2 system!

The backup disk is a 1.44 MB (high density) disk that was created from the Reference Disk that came with your computer. The file to copy from the S400 disk is called “@60B2.ADF”.

If DOS is installed, you can use the DOS Copy command to copy the “@60B2.ADF” file to your Backup Reference Disk.

If this is the initial installation, refer to the Quick Reference Manual supplied with your computer. The Backup Reference Disk has a “Copy an Option Disk” function. Booting the computer with the Backup Reference Disk in drive A: will bring up the menu. Follow the instructions on the screen.

Installing the Micro Channel MCA Board

1. Turn power OFF to the system unit and all connected external options (display, printer, and so forth). If this is the initial installation, refer to the documents provided with the computer. Unplug the power cord to the system unit.

   Note location of all cables and disconnect them from the system unit.

2. Follow the instructions in your computer’s Guide to Operations on how to remove the cover.

3. Remove the rear panel cover from one of the unused expansion slots. Loosen the thumbscrew, then slide the cover out. The System 100 Micro Channel MCA board can be plugged into any Micro Channel bus slot.

4. Install the board by pressing it firmly into the slot connector, but don’t force it into the slot (the plate is fairly flexible and will bend if not positioned properly). The notch on the rear panel plate should slide over the grounding screw.

5. Tighten the rear panel screw.

6. Repeat steps 3 through 5 for all boards to be installed in the computer.

7. Install the system unit’s cover and tighten the cover screws. Some computers have a cover lock, which can be used to protect devices and options inside the computer.

8. Connect the AC power cord.

Configuring the Micro Channel Computer

The Backup Reference Disk should be inserted in drive A: Turning on the computer will cause it to recognize that its configuration has changed and an error “165” message will be displayed, followed by an IBM logo display.

Note: If the computer is turned on without the Backup Reference Disk, error “165” will be displayed and you will be prompted to use the Backup Reference Disk. Insert it in drive A: and reboot the computer by pressing CTRL+ALT+DEL.

From the IBM logo screen, press ENTER to continue. An explanation of the “165” error should appear.

1. Press the PG DN key to continue.

2. You will then be asked if “Automatic Configuration” is to be run. Answer Yes (press Y).

   Note: Running this Automatic Configuration affects only the boards that have been added or removed. Boards that have not been moved will remain as previously configured.

3. Press ENTER with the disk still in drive A:. The computer should reboot; this time without error.

4. After the IBM logo screen appears, press ENTER. This time the Main Menu will be displayed.

5. Use the cursor keys to select “Set Configuration”. Then press ENTER. This will cause the Configuration Menu to appear.

Note The “Run Automatic Configuration” command configures the computer and all adapters including the System 100 MCA boards to default settings, which may not be desirable.

6. Select “View Configuration”, then press ENTER. This will show the configuration that is stored in the computer’s battery-backed memory. Press the ESC key after determining if the configuration is acceptable. If it is acceptable, go to step 12.

7. To make changes to the configuration, select “Change Configuration” and press ENTER.

8. Use the cursor keys to move to the line that you want to change.

9. For the MCA board(s), use the F5 and F6 keys to advance through the options until you have the selection you want to use. Boards can be assigned in any order; the computer will inform you of an address conflict by placing an asterisk (*) beside boards with overlapping addresses. The conflicts *must* be resolved by selecting a different board number or alternate address. Refer to Table 4 for primary and secondary addresses.

Table 4 System 100 Micro Channel I/O Adress Map

MCA	Primary Address	Alternate Address
#1	$340\text{-}347_H$	$300\text{-}307_H$
#2	$348\text{-}34F_H$	$308\text{-}30F_H$
#3	$350\text{-}357_H$	$310\text{-}317_H$
#4	$358\text{-}35F_H$	$318\text{-}31F_H$

Note Do not assign the same “MCA#” to multiple boards. The configuration program only checks for overlapping addresses, but the application program will only recognize one board of the same MCA#. You can’t have one board as MCA number *n* at the Primary address and another board with the same MCA number at the Alternate address.

10. After making the changes, press F10 to Save this configuration in the computer’s battery-backed memory.

11. Press ENTER to continue, then press ESC to return to the Set Configuration Menu.

12. You should now make a copy of the configuration on your Backup Reference Disk. Select “Backup Configuration” and press ENTER.

    Note: If the contents of the battery-backed memory are lost because of battery failure, the “Restore Configuration” command in the Set Configuration Menu will transfer the saved configuration from the Backup Reference Disk to the memory.

13. Select “View Configuration”. Note which MCA# is in which slot and apply the corresponding label to the rear panel from the label set included with each MCA board. This will help later when connecting cables.

14. Press ESC to return to the Main Menu. If you are doing the initial installation, you may want to use some of the other programs provided on the Reference Disk before installing the operating system and application programs. Refer to the documentation provided with the computer.

Installing AccuSpec Boards

Five configurations of the AccuSpec board are supported:

- AccuSpec A: 8K channel memory, 8K on-board ADC.
- AccuSpec B: 16K channel memory, no ADC.
- AccuSpec NaI: 8K channel memory, 2K on-board ADC.
- AccuSpec FMS: 18K channel memory (16k optional), no ADC.
- AccuSpec NaI Plus: 4K channel memory, 2 groups, 2K on-board ADC, Amp and HVPS.

To use the Genie 2000 system you will need the following hardware: a detector, front-end electronics, a personal computer system and an AccuSpec board or boards. These devices are connected as shown in Figure 203.

Unpacking

Carefully remove all materials from the shipping container. Check all equipment for possible damage. If damage was incurred during transit, contact Canberra’s Customer Service Department immediately.

For each AccuSpec B board you received, you should have an AccuSpec B ADC Interface Cable (C1704).

For each AccuSpec/NaI Plus board you received, you should have a Preamp Power Adapter Cable (C1552).

If you are going to use the ADT, AMPBSY, SCA or GATE signals from an AccuSpec A or AccuSpec NaI board, you should have a 759618 breakout cable for these signals; it must be ordered separately.

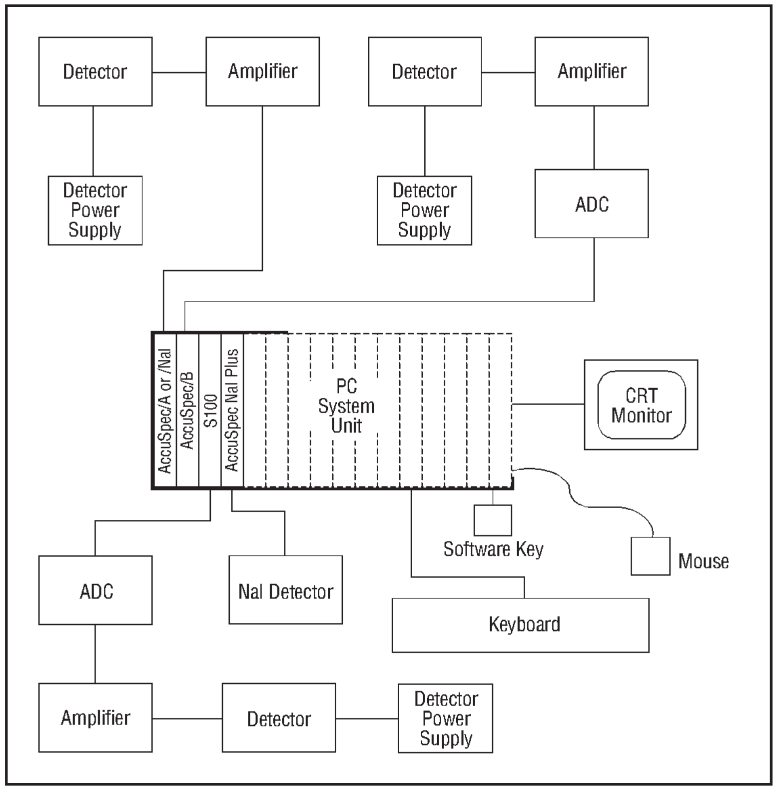


Figure 203 Standalone Genie-PC System

If you are going to use an AccuSpec A or AccuSpec NaI with Model 589 or Model 8224 Analog Multiplexer, you should have a 1.8 m 840617 cable or a 4.5 m 840618 cable. These cables require an additional rear panel slot on the PC.

If you intend to use a Model 589 or 8224 Analog Multiplexer, you must have a 751776 interface cable to connect the multiplexer to a parallel port on the computer (note that this port *must not* have the security key connected to it). This provides the required start/stop control.

Selecting a Memory Address

Data is read from and written to the AccuSpec board's on-board memory through a "window" in the computer's memory address space. All boards in the system should be set to the same window address. The memory window address can be changed by running the MCA Input Definition Editor; see Chapter 3), *MCA Input Definition Editor*.

You must specify an address for the memory window which does not conflict with any other hardware in your system. The memory window normally begins at a 32K or 64K byte boundary. Each channel uses 4 bytes and a window of 64K bytes. A system memory map for Personal Computers is shown in Table 5.

Table 5 PC System Memory Map

Address Range	Size	Name or function
00000 to 9FFFF	640K	Main system memory
A0000 to AFFFF	64K	EGA, VGA AND MCGA
B0000 to BFFFF	64K	EGA and all display adapters
C0000 to DFFFF	128K	Reserved for ROM on I/O adapter such as AccuSpec
E0000 to EFFFF	64K	64K ROM on AT, free on PC/XT.
F0000 to FFFFF	64K	64K ROM on system board

ROM on I/O adapters is usually in the range C0000-CFFFF. Addresses D0000-DFFFF are free in most machines, thus D0000 is used as the default base of the AccuSpec memory window.

When choosing a memory window address for the AccuSpec board in a PS/2 computer with a VGA or better monitor, the address may need to be on a 32K boundary. The following table shows some possible mapping options:

PS/2 with VGA
C8000 (8K channel maximum)
D0000 (16K channel maximum)
D8000 (8K channel maximum)

Selecting Jumper Options

Before installing AccuSpec boards in your computer, you must select the switch and jumper options on each board. Jumpers are factory configured for normal operation. Therefore, only the I/O address switches need to be set for most applications. Instructions for selecting basic options are given below.

NOTE: Some jumpers may be soldered to minimize the chances of invalid configurations.

AccuSpec A and AccuSpec NaI

Specific jumpering instructions for AccuSpec A and AccuSpec NaI boards are shown in Figure 204 and Table 6.

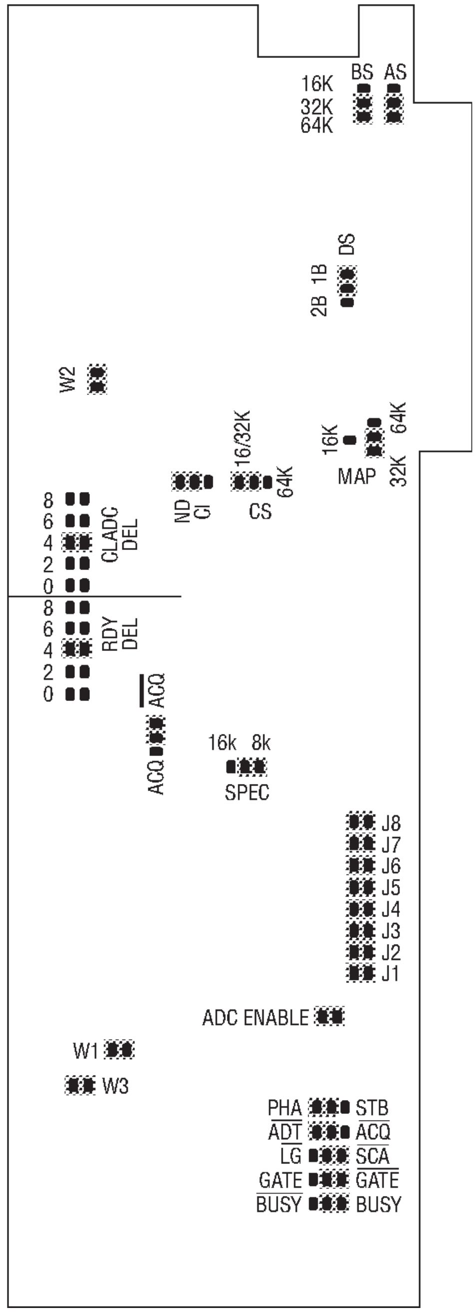


Figure 204 AccuSpec A and NaI Jumper Positions

Table 6 AccuSpec A and NaI Address Settings

ADC No.:	1	2	3	4
I/O Addr	300	310	320	330
Switch: A10	CLOSED	CLOSED	CLOSED	CLOSED
A9	OPEN	OPEN	OPEN	OPEN
A8	OPEN	OPEN	OPEN	OPEN
A7	CLOSED	CLOSED	CLOSED	CLOSED
A6	CLOSED	CLOSED	CLOSED	CLOSED
A5	CLOSED	CLOSED	OPEN	OPEN
A4	CLOSED	OPEN	CLOSED	OPEN

Base I/O Address Switches.

The Base I/O Address Switches should be set to (hexadecimal) 300, 310, 320, and 330 for units 1, 2, 3 and 4, respectively, unless other hardware interferes. The switches are labeled A4 through A10. An OFF or OPEN switch is a 1. An ON or CLOSED switch is a 0.

Switch settings for the four standard addresses are shown in Table 6.

LFC Enable Switches

Must always be in the “CLOSED” or “ON” position. The Model 599 LFC module cannot be used with the AccuSpec/A or /NaI ADC.

ADC Interface Transfer Times

RDY DEL and CLADC DEL jumpers should be in position “4".

Memory Window Mapping.

There are five jumpers used to select the memory size, window size, and window location. The normal settings are:

AS=32/64K
BS=32/64K
CS=16/32K
DS=1B
MAP = 32K.

Other positions for these jumpers are not used by the Genie 2000 software.

Spectrum Size

Leave jumper in the 8K position.

ADC Enable

Leave installed, enabling on-board ADC.

MUX Selection Jumpers

Remove all eight jumpers J1 through J8 when using a Model 589 or Model 8224 Analog Multiplexer; otherwise J1 through J8 should be left installed.

External Strobe Selection

Leave the jumper in the “PHA” mode for normal (discriminator-triggered) PHA operation. Place the jumper in the “STB” position for externally gated conversions. With a Model 589 or Model 8224 Analog Multiplexer, the jumper must be in the STB position.

External Signal Selection

There are four jumpers to select external signal and polarities. The normal settings are “BUSY”, “GATE*”, “SCA*”, and “ADT*”. The optional positions are explained in the external signal descriptions of Appendix D, *Technical Information*.

Interface Signal Selection

Leave jumpers in “ND” and “ACQ*” positions.

W1, W2 and W3

W1, W2, and W3 are manufacturing test jumpers; they must be left installed.

AccuSpec B

Specific jumpering instructions for AccuSpec B boards are given in Figure 205 and Table 7.

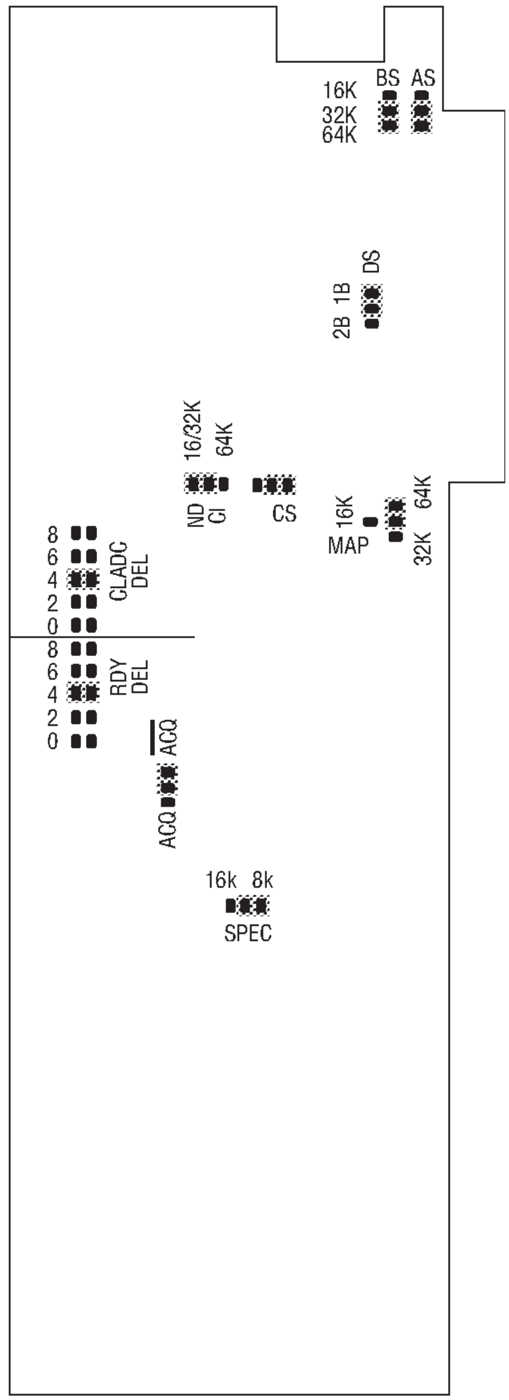


Figure 205 AccuSpec B Jumper Positions

Table 7 AccuSpec B Address Settings

Board No.:	1	2	3	4
I/O Addr Switch:	300	310	320	330
A10	CLOSED	CLOSED	CLOSED	CLOSED
A9	OPEN	OPEN	OPEN	OPEN
A8	OPEN	OPEN	OPEN	OPEN
A7	CLOSED	CLOSED	CLOSED	CLOSED
A6	CLOSED	CLOSED	CLOSED	CLOSED
A5	CLOSED	CLOSED	OPEN	OPEN
A4	CLOSED	OPEN	CLOSED	OPEN

Base I/O Address Switches

The address switches should be set to (hexadecimal) 300, 310, 320 and 330 for units 1, 2, 3 and 4, respectively, unless other hardware interferes. The switches are labeled A4 through A10. An OFF or OPEN switch is a 1. An ON or CLOSED switch is a 0.

Switch settings for the four standard addresses are shown in Table 7.

LFC Enable Switches

Place in the “CLOSED” or “ON” position for normal PHA acquisition. Place in the “OPEN” or “OFF” position to enable LFC acquisition when connected to a Model 599 LFC module.

ADC Interface Transfer Times

The board is shipped with both the RDY DEL and CLADC DEL jumpers in position “4” (1.0 µs delay and transfer times). Longer times may be selected with position “6” (1.5 µs) or position “8” (2.0 µs) when long ADC cables are used; shorter times may be selected with position “2” (0.5 µs) when short cables and fast ADCs are used.

Memory Window Mapping

There are five jumpers used to select the memory size, window size, and window location. The normal settings are:

AS=32/64K
BS=32/64K
CS=64K
DS=1B
MAP = 64K

Other positions for these jumpers are not used by the Genie 2000 software.

Spectrum Size

The SPEC jumper is placed in the "16K" position when a 16K ADC is used. The SPEC jumper must be in the "8K" position if an older 8K ADC is used or if 2 groups of 8K are to be used.

Interface Signal Selection

Jumpers are normally in "ND" and "ACQ" position for use of the interface with a Canberra ADC.

W2

W2 is a manufacturing test jumper; it must be left installed.

AccuSpec NaI Plus

Specific jumpering instructions for AccuSpec NaI Plus boards are given in Figure 206 and Table 8.

Base I/O Address Switches

The address switches should be set to (hexadecimal) 300, 310, 320 and 330 for units 1, 2, 3 and 4, respectively, unless other hardware interferes. The switches are labeled A4 through A10. An OFF or OPEN switch is a 1. An ON or CLOSED switch is a 0.

Switch settings for the four standard addresses are shown in Table 8.

Memory Window Mapping

A jumper in position "16LO" (actually a trace) places the 16K byte memory at a 32K address boundary (for instance, D0000 or D8000).

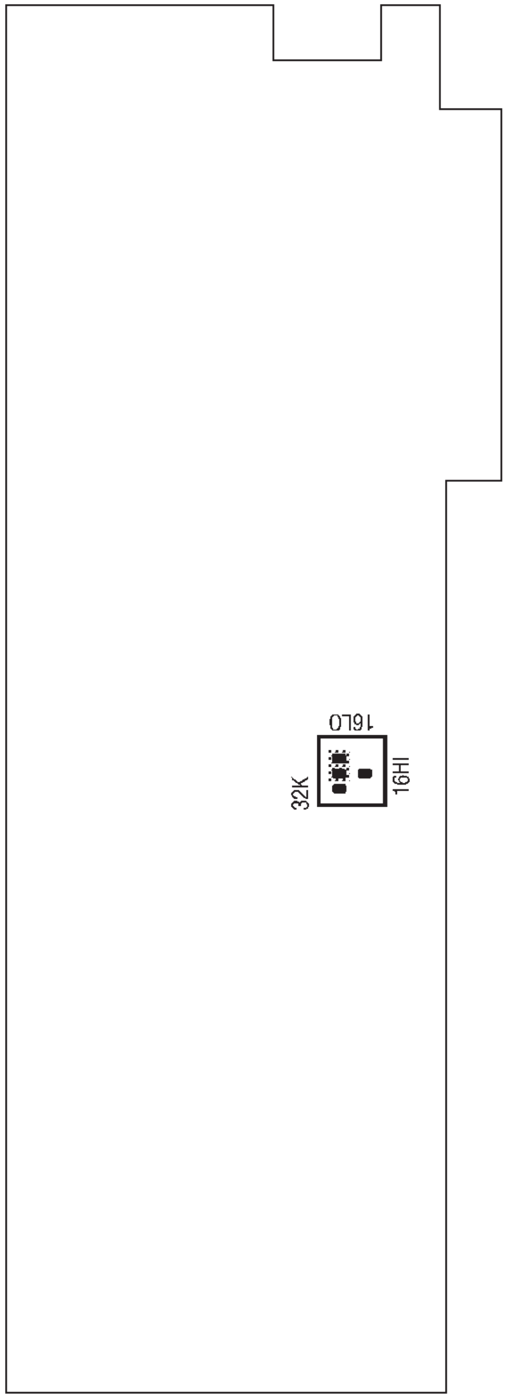


Figure 206 AccuSpec NaI Plus
Jumper Positions

Table 8 AccuSpec NaI Plus Address Settings

Board No.:	1	2	3	4
I/O Addr Switch:	300	310	320	330
A10	CLOSED	CLOSED	CLOSED	CLOSED
A9	OPEN	OPEN	OPEN	OPEN
A8	OPEN	OPEN	OPEN	OPEN
A7	CLOSED	CLOSED	CLOSED	CLOSED
A6	CLOSED	CLOSED	CLOSED	CLOSED
A5	CLOSED	CLOSED	OPEN	OPEN
A4	CLOSED	OPEN	CLOSED	OPEN

AccuSpec FMS

Specific jumpering instructions for AccuSpec FMS boards are given in Table 9.

Base I/O Address Switches

The address switches should be set to (hexadecimal) 300, 310, 320 and 330 for units 1, 2, 3 and 4, respectively, unless other hardware interferes. The switches are labeled A4 through A10. An OFF or OPEN switch is a 1. An ON or CLOSED switch is a 0.

Switch settings for the four standard addresses are shown in Table 9.

Memory Window Mapping

A jumper (labled MAP) places the 16K byte memory at either a 64K or 32K address boundary (for instance, D0000 or D8000).

Table 9 AccuSpec FMS Address Settings

Board No.:	1	2	3	4
I/O Addr Switch:	300	310	320	330
A10	CLOSED	CLOSED	CLOSED	CLOSED
A9	OPEN	OPEN	OPEN	OPEN
A8	OPEN	OPEN	OPEN	OPEN
A7	CLOSED	CLOSED	CLOSED	CLOSED
A6	CLOSED	CLOSED	CLOSED	CLOSED
A5	CLOSED	CLOSED	OPEN	OPEN
A4	CLOSED	OPEN	CLOSED	OPEN

Installing the Boards

Refer to your computer’s operating manual for instructions on installing option cards (also called adapters). Each AccuSpec board requires a full-length option slot. In addition, use of an AccuSpec A or NaI with an analog multiplexer requires an extra rear-panel opening for the multiplexer connector.

If you have a hard disk mounted on a plug-in adapter card, you may need to put the AccuSpec A, NaI and NaI Plus boards as far as possible from the disk drive, as magnetic fields from the drive motor may introduce noise which degrades the usable resolution of the ADC. AccuSpec B boards may be placed anywhere that space allows.

Ensure that you have the required number of slots available for the boards in the computer or in an expansion chassis. To install your board(s):

CAUTION Turn off your computer. Never insert or remove any adapter board when the computer is on; severe damage to your computer or adapter may result.

1. Loosen the screws and gently remove the system’s cover.

2. Remove the expansion slot cover by loosening the screw on the rear of the selected expansion slot lifting it up.

3. Place the AccuSpec board in an available expansion slot.

5. Insert the adapter(s) into the expansion slot(s) and firmly press it into place until the board clicks. Replace and tighten the screw.

6. Replace the system cover.

7. Your board is installed. Now you must configure your system to recognize the board. See Chapter 3, *MCA Input Definition Editor*.

Other Hardware

If there is any other hardware, such as adapters or memory, to be installed, follow the instructions included with each item.

Peripherals

Windows provides for hard copy to printers and plotters using the computer's serial (COMn) and Parallel (LPTn) interfaces. Before replacing the cover, note what interfaces are installed, their addresses (for instance, COM1 or COM2), and slot locations; you'll need this information when you connect the peripheral's cable.

Display Adapters

Though Windows will operate with a wide variety of Display Adapters, Genie 2000 software is optimized for the SVGA display. Note which subsystem you are using; it will be needed in the Windows installation.

Reconnect the cables that were removed earlier, then turn the power ON and verify that the Power On System Test passes.

Turn power OFF and reinstall the cover. Before installing the system unit cover, make sure to check your computer manuals. Some models may require moving internal switches.

Memory

Windows and the Genie 2000 software require a minimum of eight Megabytes of RAM, but will have greatly improved performance with more memory. For better system performance, Canberra recommends you use memory that plugs directly into the motherboard instead of memory boards that plug into the system bus.

Connecting the System

This section describes a typical Genie 2000 system. Refer to Figure 207.

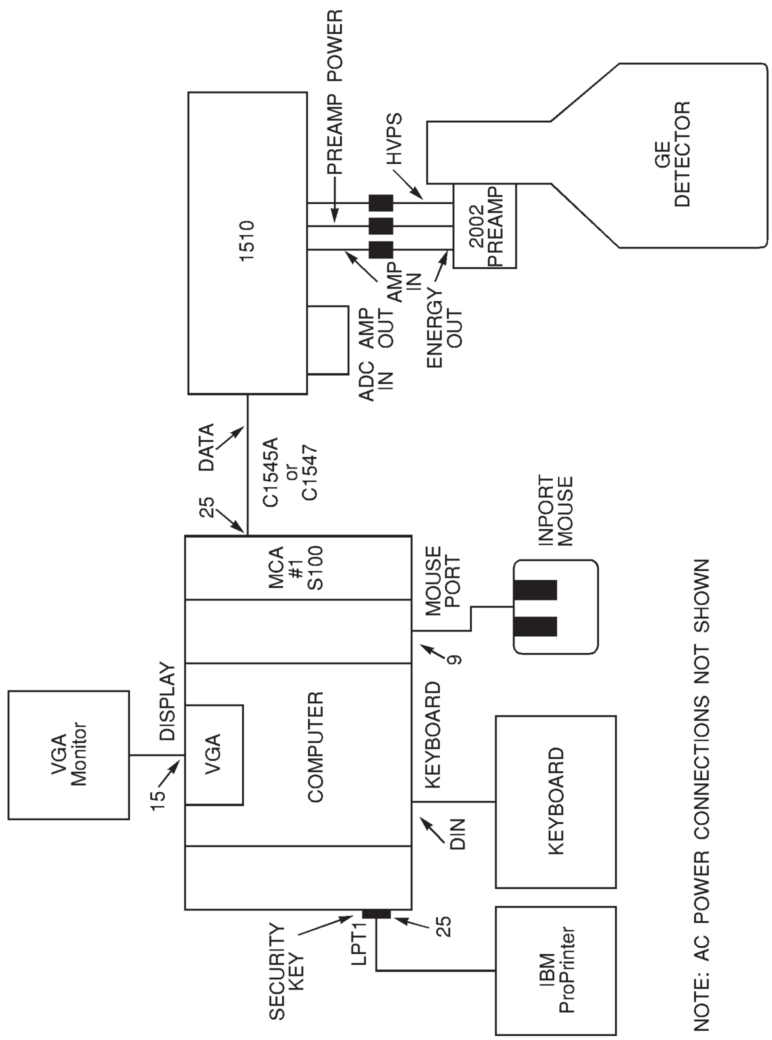


Figure 207 Typical System Configuration

- IBM 386-based computer, or compatible
- VGA display card and monitor
- Genie 2000 security key
- Microsoft InPort Mouse
- IBM ProPrinter
- Canberra Model 4610 Master MCA Board
- Canberra Model 1510 Integrated Signal Processor (or equivalent NIM modules and NIM Bin)
- Canberra Germanium Detector
- Radioisotope Source

1. Connect the keyboard to the DIN connector on the lower part of the computer's rear panel.

2. Connect the Microsoft InPort Mouse to the mouse port on the rear panel.

3. Connect the VGA display's 15-pin video cable to the Display connector.

4. Connect the Genie 2000 security key to any available parallel port.

5. Connect the C-1548 cable, or equivalent, between the printer and LPT1.

6. Connect the 1510's DATA connector to the MCA board with the supplied C1547 cable.

   The optional C-1545A 3 m shielded ribbon cable has a black wire with a ring lug on the ADC end, which is to be grounded on a grounding screw on the ADC's rear panel. The black wire at the computer end of the cable must be retained between the threaded insert on the rear panel and the metal shell on the cable connector.

   Note: To avoid inducing resolution degrading noise into the signal cables, route the coaxial cables away from the Display Monitor.

7. Connect the 1510's ADC IN to its AMP OUT with the 15 cm BNC to BNC coax cable supplied with the 1510.

8. Connect the Preamp's ENERGY output to the 1510's AMP IN cable with another BNC to BNC coax cable.

9. Connect the detector’s PREAMP POWER cable to the 1510 with the supplied A22541 Preamp Power Extender Cable.

10. Connect the 1510’s HVPS OUT connector to the Preamp with the supplied coax cable with SHV connectors at each end. Check the polarity and operating voltage requirements of the detector before turning on the HVPS.

Installing an 8223 or 8224 Multiplexer

Genie 2000 Software supports multiple input systems with the Model 8224 Analog Multiplexer through six of our current MCA hardware systems.

- Model 556 AIM, when used with an 8700 NIM ADC.
- Accuspec A Board, with an on-board ADC.
- Accuspec NAI Board, with an on-board ADC.
- Accuspec B Board, when used with an 8700 NIM ADC.
- System 100 Board, when used with an 8700 NIM ADC.

Note Genie 2000 software does not currently support Group Start/Stop control of the 8224. This means that the accessories for Independent Start/Stop control must be purchased in order to use the 8224 with Genie 2000 and any of these MCA products.

Table 10 summarizes the supported multiplexer configurations and their capabilities for the above MCA hardware systems.

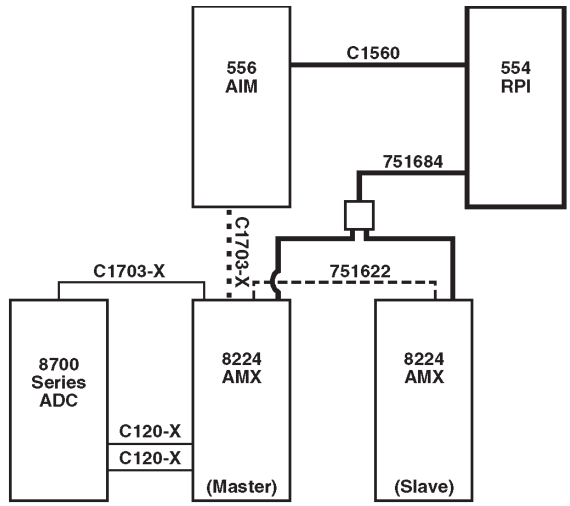
Table 10 Genie-2000 Software vs. ADC and Multiplexer

MCA Hardware	ADC	8223 Group Start/Stop	8224 Group Start/Stop	8224 Independent Start/Stop
AIM	Any 8700 ADC	Not functional	Not functional	16 inputs
AccuSpec AAccuSpec NaI	On board	Not functional	Not functional	8 inputs
AccuSpecB System 100	Any 8700 ADC	Not functional	Not functional	8 inputs

Genie 2000/AIM/8700 ADC Systems

These MCA/ADC systems support up to two Model 8224 AMXs for a maximum of 16 inputs with Independent Start/Stop Control.

Note The Independent Start/Stop control accessories described in Figure 208 are not optional. Independent Start/Stop Control is required when using 8224's with version 1.1 of Genie 2000.



ADC-AMX Connections
Each 8224 AMX is supplied with one C1703-2 Interface Cable.

The C120-X Coax Cables for the Signal and Gate connections must be purchased separately.

AIM-AMX Connection
Each AIM is supplied with two C1703-2 Interface Cables.

AMX Master-Slave Connection
Each slave requires a 751622 Expansion Cable that must be purchased separately.

Independent Start/Stop for the 8224 AMXs
Requires the purchase of a Model 554 Remote Parallel Interface (RPI) and at least one 751684 cable assemblies. Each 751684 Cable Assembly supports two 8224s and each RPI supports 2 such cable assemblies. The 751839 ICB cable to connect the RPI to the AIM is supplied with the AIM.

Independent Start/Stop Control can also be accomplished for a single 8224 with the 751776 Control Cable and a parallel port (LPT), but this is not recommended when using an AIM.

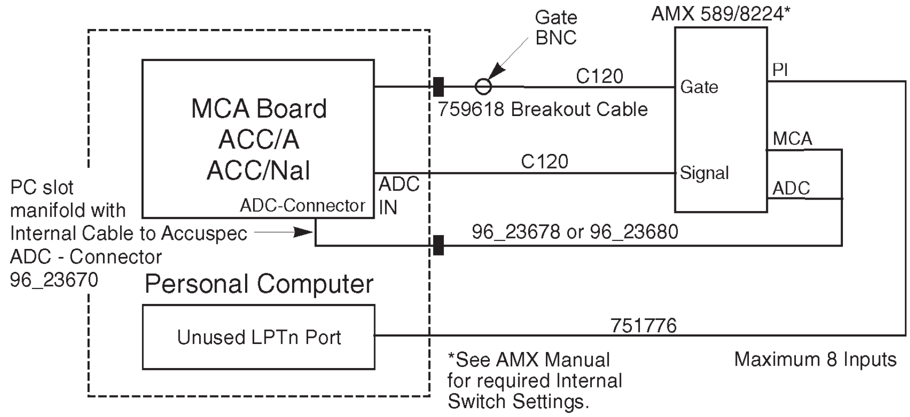
Figure 208 8224 Cabling for Genie-PC/AIM/8700 ADC

Genie 2000/AccuSpec A or NaI Systems

Genie 2000 Software supports multiple input systems with both the Accuspec A and NAI Board MCAs and the Model 8224 AMX. Genie 2000 support is limited to one 8224 per board and is only functional for Independent Start/Stop Control.

The AccuSpec A or NaI board’s jumpers must be set for: STB, $\overline{\text{ADT}}$, $\overline{\text{SCA}}$, $\overline{\text{GATE}}$, BUSY, J1-J8 OUT and the LFC jumper in the CLOSED (disabled) position.

Note The configuration shown in Figure 209 requires a PC with two parallel ports (LPTs), one for the Genie 2000 security key and a second for Independent Start/Stop Control.



Accuspec A or NAI MCA and ADC Connections to the 8224 AMXs
Require interface Kit 840617 or 840618 to be purchased. These kits contain the 96A_23678 or 96A_23680 external PCAI-AMX cable, the 759618 breakout cable for the Gate Connection, and the 96_23670 PC slot manifold.

The C120-X Coax Cables for the Signal and Gate connections must be purchased separately.

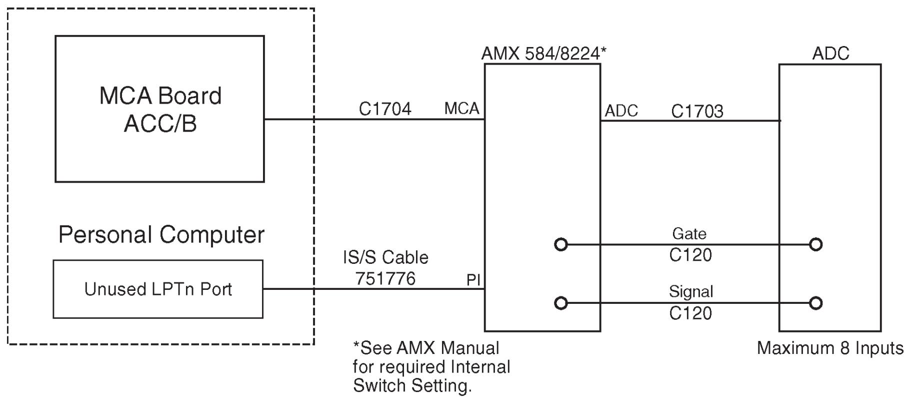
Independent Start/Stop for the 8224 AMX
Requires a free LPT and a 751776 Control Cable. The Cable must be purchased separately.

Figure 209 8224 Cabling with AccuSpec A or NaI

Genie 2000/Accuspec B/8700 ADC Systems

Genie 2000 Software supports multiple input systems with the Accuspec B Board MCAs and the Model 8224 AMX. Genie 2000 support is limited to one 8224 per board and is only functional for Independent Start/Stop Control. The AccuSpec B board’s LFC jumper must be in the CLOSED (disabled) position.

Note The configurations shown in Figure 210 require a PC with two parallel ports (LPTs), one for the Genie 2000 security key and a second for Independent Start/Stop Control.



ADC-AMX Connections
Each 8224 AMX is suplied with one C1703-2 Interface Cable.

The C120-X Coax Cables for the Signal and Gate connections must be purchased separately.

Accuspec B or MC Board to AMX Connection
Each Accuspec B or MC Board is supplied with one C1704-10 Interface Cable.

Independent Start/Stop for the 8224 AMX
Requires a parallel port (LPT) and a 751776 Control Cable. The Cable must be purchased separately.

Figure 210 8224 Cabling for AccuSpec B

Genie 2000/System 100/8700 ADC Systems

Genie 2000 Software supports the use of the 8224 AMX with the System 100 Board MCA and any 8700 Series ADC. Genie 2000 support is limited to one 8224 per system and is only functional for Independent Start/Stop Control.

If you need more than eight inputs with the Genie 2000 System 100 configuration, you'll have to use the 1520 Integrated Signal Processor instead of the 8224 and an 8700 Series ADC. Genie 2000 support for the 1520 is also limited to the Independent Start/Stop Control Mode.

Note   The configuration shown in Figure 211 requires a PC with two parallel ports (LPTs), one for the Genie 2000 security key and a second for Independent Start/Stop Control.

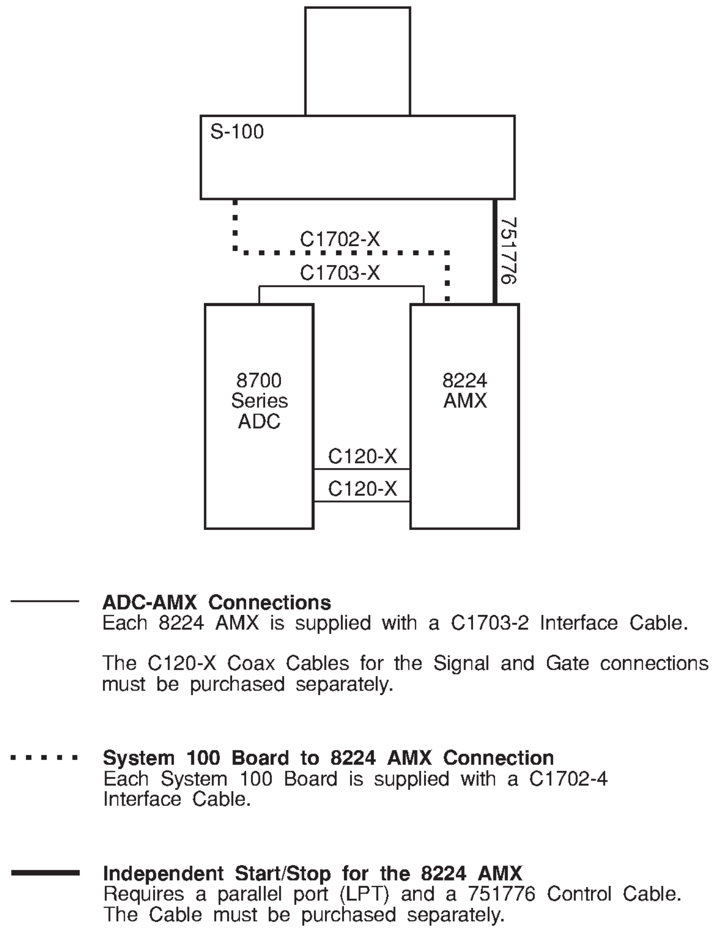


Figure 211 Cabling with System 100 and 8700 ADC

Multi-Channel Scaling Experiments

If you are using a Model 8082 MCS Unit, it can be substituted for the ADC. Note the following:

1. The 8082 requires a +6 V supply from its NIM Bin (Model 2100 or equivalent).

2. If you’re using the normal 1.2 m cable, the “ear-type” cable latches must be removed.

3. Cables C-1545A, C1545B and C1550A are available. These optional 3 m shielded cables connect the MCA board to the 25-pin data and 9-pin control connectors on the module. The shield leads must be grounded at the MCS unit. One of the screws in the side cover makes a convenient ground point. The black

wire at the computer end must be retained between the threaded insert on the rear panel and the metal shell on the cable connector.

Sample Changer Control

With a System 100 MCA, a sample changer control output is provided by the board. For sample changer control with an AIM MCA, refer to the Model 556 AIM and Model 554 RPI User's Manuals. Figure 212 shows the sample changer signals timing diagram.

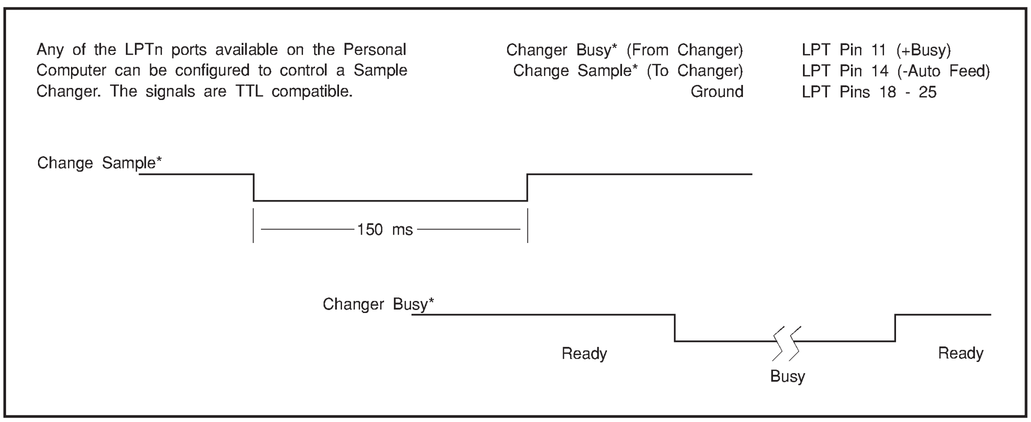


Figure 212 Sample Changer Timing Diagram

LPT Parallel Port Assignments

In order to control a sample changer or an AMX module through an LPT (parallel) port, the port must be assigned to the device to be controlled (refer to “Address Settings” on page 53). In order to know which LPT port number to use, you must know which physical address is assigned to which logical port number.

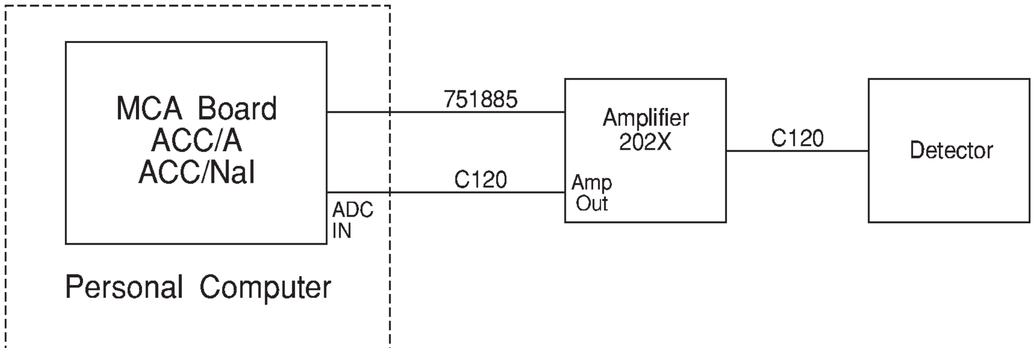
Refer to your computer's technical documentation or use the Windows Control Panel's System icon to determine which physical parallel ports are available and what address has been assigned to each one.

AccuSpec Setup Diagrams

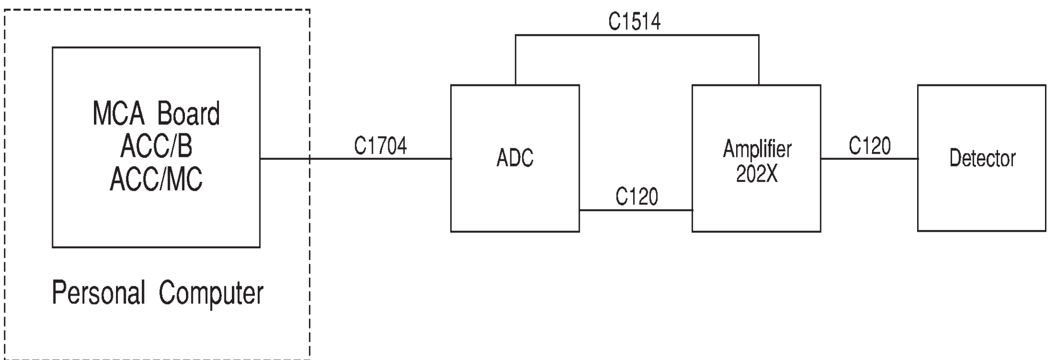
These diagrams are included to help you set up your AccuSpec system. The board jumper positions for each of the systems are shown in the following table.

System	**MCA Board**						
A	AccuSpec A/NaI	PHA	$\overline{\text{ADT}}$	$\overline{\text{LG}}$	$\overline{\text{GATE}}$	$\overline{\text{BUSY}}$	J1-J8 IN
B	AccuSpec B/MC	–	–	–	–	–	–
C	AccuSpec B/MC	–	–	–	–	–	–
System	**LFC Switch**						
A	CLOSED (disabled)						
B	CLOSED (disabled)						
C	OPEN (enabled)						
System	**Amplifier**						
A	ALL	DT	Output to ADC				
B	ALL	DT	Output to ADC				
C	Except 2020	BSY	Output to ADC				

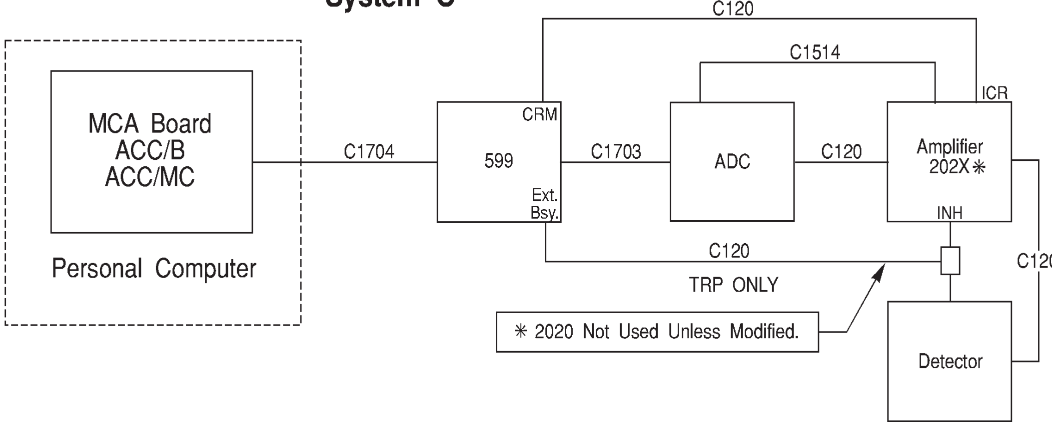
System A



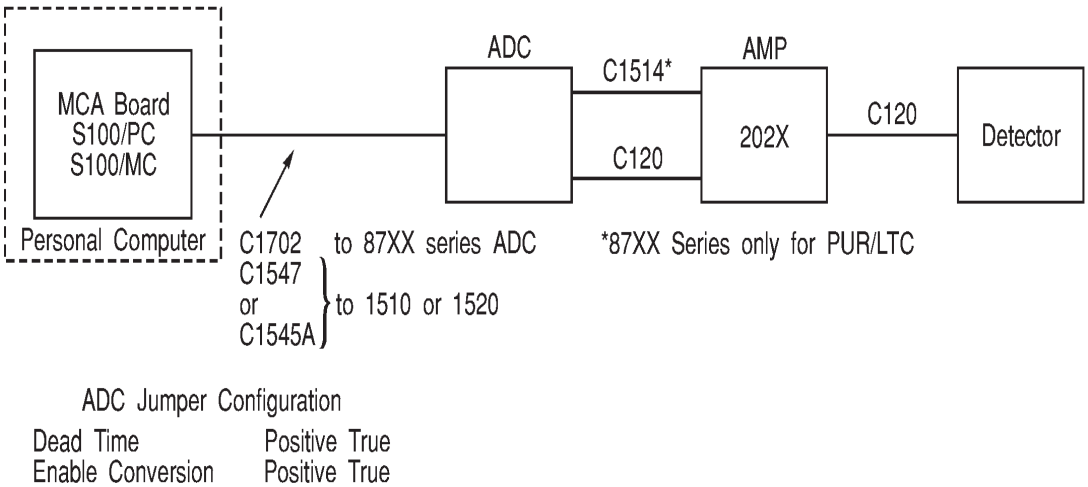
System B



System C



System 100 Setup Diagram



C. Genie 2000 Configuration

Though most users won’t need to customize their Genie 2000 setup, the information in this chapter is useful for configuring Genie 2000 for specific situations.

Genie 2000 Environment Settings

Starting with V1.2, Genie 2000 stores all its environment settings in the registry (as opposed to defining environment variables via SET statements in AUTOEXEC.BAT). The registry key location of these settings will be:

```
HKEY_LOCAL_MACHINE\SOFTWARE\Canberra Industries,Inc.\
    Genie 2000 Environment
```

The software installation scripts for Genie 2000 now perform just two modifications to the AUTOEXEC.BAT file:

1. Modifications as required to the PATH environment variable.

2. On upgrades from V1.0/V1.1 systems, all Genie 2000 environment definitions are removed.

A special batch file, GENIE2K.BAT, containing all environment variables will be created in the GENIE2K/EXEFILES directory during Genie 2000 software installation. This file can be executed to recreate the full set of Genie 2000 environment variable definitions, if necessary.

Note that Genie 2000 environment settings can be altered in one of two ways after installation:

1. Using the Windows registry editor, REGEDIT, you can select and modify the appropriate Genie 2000 setting.

2. A registry setting can be overridden by defining the corresponding environment variable in AUTOEXEC.BAT. For instance, if you would like to override the default report format setting of WYSIWYG, you can add the following line to AUTOEXEC.BAT:

   ```
   SET RPTFORMAT=DRAFT
   ```

CAUTION Use extreme caution if you elect to modify settings using REGEDIT; any erroneous edits/deletions can result in problems when running your Windows environment.

The following is a list of the various environment settings that are defined in the registry. Each of the setting descriptions is followed by its default value during installation.

CINETCFG — Fully specified pathname of Network Configuration File.

SET CINETCFG=C:\GENIE2K\CTLFILES\G2K_VDM.NCF

CAMFILES — Pathname used for storing CAM (.CNF), Certificate (.CTF), Workspace (.WSP) and Nuclide Library (.NLB) files.

SET CAMFILES=C:\GENIE2K\CAMFILES

VDM$TEMPS — Pathname which the VDM will use to manage temporary files.

SET VDM$TEMPS=C:\GENIE2K\VDMTEMP

EXEFILES — Pathname where all Genie 2000 .EXE and .DLL files are stored.

SET EXEFILES=C:\GENIE2K\EXEFILES

GENIE2K — Pathname defining the root directory in which Genie 2000 was installed.

SET GENIE2K=C:\GENIE2K

MCA$DRIVERS — Pathname which the VDM will search for Programmable Device Driver (.DRD) files.

SET MCA$DRIVERS=C:\GENIE2K\DRIVERS

ASEQFILES — Pathname which the Acquisition and Analysis applications will search for Analysis Sequence (.ASF) files so that the Analyze menu can be populated with a list of predefined sequences; the Edit Current Sequence menu will also use this when opening and saving analysis sequence files.

SET ASEQFILES=C:\GENIE2K\CTLFILES

MCA$DEFINES — Pathname used by the VDM for managing MCA Input Definition (.MID) files and MCA Configuration Files.

SET MCA$DEFINES=C:\GENIE2K\MIDFILES

RTPLFILES — Pathname which the Acquisition and Analysis applications will search for Report Template (.TPL) files when displaying the setup dialog for the standard report module.

SET RTPLFILES=C:\GENIE2K\CTLFILES

REPFILES	Pathname used by the standard report module when creating report (.RPT) disk files.

SET REPFILES=C:\GENIE2K\REPFILES

GAMMAAEF	Fully specified pathname of the Analysis Module File used by the Gamma Acquisition and Analysis window.

SET GAMMAAEF=C:\GENIE2K\CTLFILES\GAMMA32.AEF

OS2FCTSFILE	Fully specified pathname of the Genie 2000 Job Functions File used by REXXFCTS job command to register functions with the REXX language environment.

SET OS2FCTSFILE=C:\GENIE2K\CTLFILES\REXXFC32.DAT

CAMDB	Fully specified pathname of the CAM schema file.

SET CAMDB=C:\GENIE2K\CTLFILES\CAMDB.DAT

CALFILES	Pathname which the Acquisition and Analysis windows use to manage calibration files (for LOAD and STORE).

SET CALFILES=C:\GENIE2K\CALFILES

CIJOBHELP	Pathname which the various Genie 2000 job commands will search for HELP files.

SET CIJOBHELP=C:\GENIE2K\JOBHELP

SAD_TIMEOUT	Timeout value (in tenths of a second) used internally by applications during its handling of communications with the VDM. This value may need to be increased based on the actual communications throughput of your system.

SET SAD_TIMEOUT=300

DS_LOGON	Timeout value (in tenths of a second) used internally by the VDM during its handling of the create/logon process.

SET DS_LOGON=50

PSET_DELAY	Timeout value (in milliseconds) used by the VDM to control the cycle time of the preset checking thread.

SET PSET_DELAY=31

ADVISE_HOLD	Timeout value (in milliseconds) used by the VDM to control the cycle time of the advice-handling checking thread.

SET ADVISE_HOLD=31

HDW_STATUS	Timeout value (in milliseconds) used by the VDM to control the cycle time of the hardware status checking thread.

SET HDW_STATUS=5000

MVCPREFS	Fully specified pathname of the preferences file used by the Acquisition and Analysis applications.

SET MVCPREFS=C:\GENIE2K\CTLFILES\MVCPREFS.INI

GENIE2K_VERSION	Version number of the currently installed Basic Spectroscopy Software. This environment variable *must not* be edited in any way since it is checked by the optional Genie 2000 software packages during their installation.
RPTFORMAT	This setting, which is *not* written to the registry during software installation, specifies how reports are to be sent to the printer device. If your system needs this setting, you must add it to the registry (or add the environment definition to AUTOEXEC.BAT). WYSIWYG (default value if setting is not defined) specifies that the report system is to send all data to the printer device through the printer drivers. DRAFT specifies that the report system is to send all data to the printer device in “draft mode” (if supported by the printer). This means that all Windows printer driver settings are overridden and that the local printer settings are used.

SET RPTFORMAT=WYSIWYG

AIMPROTO_RETRIES	This setting, which is not written to the registry during software installation, specifies the number of retries attempted by the AIM driver when it encounters an Ethernet communications error. The default value for this setting, if not defined, is 3. This setting may need to be increased on Ethernet networks that contain heavy traffic.

File Formats

The Genie 2000 reporting system, Analysis Engine files, and Network Configuration file can be configured to your own requirements with the information in the next three sections.

Report Template Files

Report Template Files are ASCII files that govern the content and format of report data as generated by the Acquisition and Analysis windows as well as the Report job command (the location of these files is defined by the environment variable RTPLFILES, which is described on page 292). Please refer to the “Report Module and Template Files” chapter in the Genie 2000 Customization Tools Manual for details of file content and syntax.

Analysis Engine Files

The Analysis Engine File (AEF) is an ASCII file (using `$’ as the delimiter) which contains a table that defines analysis phases, a list of descriptions for the engines supported by a phase, and their operating-system dependent command line and resource file name. There is only one AEF per client node (the file name is defined by the Genie 2000 environment variable GAMMAAEF); this file will be updated automatically during installation of Genie 2000 analysis package options. This file can also be edited to add user-defined sections (phases and engines). The format of an AEF is as follows:

PHASE (Max. 24 chars.)

The name of the analysis phase. This list of phases is used to construct the Manual menu in the Gamma Analysis application. Note that multiple engines can be defined for a given phase; the phase name only appears once in the menu.

PHASE TYPE (Max. 3 chars.)

The analysis phase type is used by applications that need to determine what particular engine to execute for a given phase of analysis (that is, efficiency calibration in batch will automatically execute a peak locate and peak analysis engine during its operation). Types 1-499 are reserved for internal Canberra use.

DESCRIPTION (Max. 24 chars.)

The descriptive name of an analysis engine. This name is used by the Gamma Analysis application when listing the various engines available for a given phase (i.e. the contents of the Algorithms list box within the Algorithm Selection dialog box).

ENGINE (Max. 16 chars.)

This field represents the generic (language independent) name of the engine for a particular phase. It is this field that is stored in the Analysis Control block CAM record structure to define the analysis sequence.

TYPE (Max. 1 char.)

The engine types are:

- **Type 1**: Analysis Engine (subroutine) – uses predefined common CAM parameters
- **Type 2**: Analysis Engine (subroutine) – uses *both* predefined common CAM parameters *and* optional parameters from the `analysis sequence’ record structure within the Analysis Control Parameters block.
- **Type 3**: Report Engine (subroutine) – uses *both* predefined common CAM parameters *and* optional parameters from the analysis sequence record structure within the Analysis Control Parameters block.

LOCATION (Max. 64 chars.)

This is the engine location. The portion of the line preceding the `!’ is the name of the system dependent DLL (Windows) that contains the engine. The name of the entry point for the engine follows the `!’.

As mentioned above, there are different Types of engines. They can make use of a step number passed to them as follows:

- **Type 1** entries in the AEF are restricted to using common CAM parameters *only* (this implies that when these entries are used as part of an analysis sequence, one common set of parameters are used for multiple invocations).
- **Type 2/3** entries in the AEF have additional flexibility in that they determine the source of required input parameters based on how they are invoked. Specifically, a Type 2/3 entry that is invoked from the Manual menu, will be called with the step number parameter being zero (0). This instructs the entry to read its required input parameters from the appropriate common CAM parameters section. If a Type 2/3 entry is invoked as part of an analysis sequence (through the Analyze menu), then its step number parameter will be non-zero and indicate the record number from within the Analysis Control Block from which it will read its required input parameters.

RESOURCE (Max. 64 chars.)

This is the engine setup screen location. The portion of the line preceding the `!’ is the name of the DLL (Windows) which contains the setup screen dialog procedure and resource; it is system dependent. The name of the entry point for the setup screen function follows the `!’.

A typical record in the AEF would look like this:

```
Peak Analysis$2$Simple$PSSIMP$1$
    C:\DLL\PSSIMP.DLL!PSSIMP$
    C:\DLL\PSSRES.DLL!PSSPROC$
    ANALYSIS.TPL!PeakAnalysis
```

TEMPLATE NAME (Max. 12 chars.)

This is the name of the default report template used by the engine when “generate report” is selected.

SECTION NAME (Max. 8 chars.)

This is the name of the default report section used by the engine when “generate report” is selected.

Genie 2000 Network Configuration File

A Network Configuration File is required on all computer nodes that are running the Genie 2000 software environment (the name and location of the file is defined by the environment variable CINETCFG as described in "Genie 2000 Environment Variables" on page 291. This file defines both the location and the functions of the Virtual Data Managers (VDMs) that the client node has access to.

Example

This example of a typical Network Configuration File is followed by a detailed explanation of format and content.

```
1 -\Local
1F-\pipe\datasrce
1M-\\node1\pipe\datasrce
1C-\\node1\pipe\configur
1M-\\node2\pipe\datasrce
1C-\\node2\pipe\configur
```

The format of a Network Configuration record is:

- **Node System Type (1 char.):** Specify type 1 for Intel nodes.
- **VDM Type Code (1 char.):** Type code as follows:

M:	VDM supports hardware control access
F:	VDM supports file access
B:	VDM supports both hardware control and file access
C:	VDM supports hardware configuration access

- **VDM Connection Identifier:** This identifier must be in the form of [\\nodename]\pipe\pipeid where:

\\Nodename	Optional identifier which is the name of the remote node; the \\ are required.
\pipe	Required text for connection identifier.
pipeid	Actual name of the connection; *must* be either DATASRCE for M, F, or B type VDMs or CONFIGUR for C type VDMs.

The first record of this file indicates whether "local only" TCP/IP or "network" TCP/IP connections are allowed. If the first line contains Local as the entry, then a loopback IP address is used for socket connections. If the first line contains anything other than local, the computer name/IP address is defined via the system network settings.

Given the above explanation of the file format, the example file defines the following information:

- The local node is named LOCAL and is an Intel node.
- There is a local VDM which support access to files only.
- There are two remote VDM's (on nodes NODE1 and NODE2) which support both control access and configuration of hardware.

Please be aware that F and B type VDMs are only supported locally; they *cannot* be a remote node.

Note also that a default Network Configuration File (named G2K_VDM.NCF) is automatically installed with the Genie 2000 software; this file is configured to allow access to a local VDM for both file/MCA and MCA configuration operations.

Genie 2000 Font Customization

It is possible to customize fonts used in selected portions of Genie 2000. Specifically, the following areas within Genie 2000 now support font customization:

1. Report window (within the Gamma/Alpha Acquisition and Analysis windows and the QA Editor window)
2. Status bar and Status pages (within the Gamma/Alpha Acquisition and Analysis windows)
3. Owner drawn listboxes (such as those within the various calibration screens, QA editor screens, etc.)
4. Graphical Batch Tools reporting window (GBT main screen and GBT_VIEW window)
5. Certificate Editor listboxes
6. Nuclide Library Editor listboxes
7. Quality Assurance list boxes.
8. Reports directed to a printer

To customize Genie 2000 fonts, an INI file (named G2KFONTS.INI) must be created and stored in the GENIE2K|CTLFILES directory.

A section is required in the INI file for each font you wish to customize. The following is an example illustrating all the available custumization options:

```
[MVC Report]
Point=9
Facename=Courier New
Italic=0
Bold=1
Underline=0
Strikeout=0
FixedWidth=1
Charset=0
```

This will customize the MVC report window to be Bold, 9 point, Courier New. Not all of the fields must be specified, only the values the user wishes to change from the default. The following are the valid values for each of the customization options :

```
Point=6,7,8,9,…
Facename=Courier New, MS Sans Serif, …
Italic=0 or 1
Bold=0 or 1
Underline=0 or 1
Strikeout=0 or 1
FixedWidth=0 or 1
Charset=0 (ANSI), 1 (Default), 204 (Russian), 136
(CHINESEBIG5), 255 (OEM)
```

Facename can be any valid font facename currently installed in the system. Valid point sizes are determined based upon the font selected. Most fonts support a range from 6 to 72. The valid sectionnames are :

```
[MVC Report]
[MVC Status Bar]
[MVC Status Pages]
```

```
[MVC Lists]
[GBT View]
[Cfed List]
[Nuclib List]
[Reporter]
[QA Edit]
[QA Lists]
```

The only sections required in the INI file are for the fonts the user wishes to customize..

Sample Files

A number of sample files are automatically installed with the Basic Spectroscopy software:

- Spectral data files, gamma and alpha (.CNF)
- Certificate file (.CTF)
- Nuclide library files (.NLB)
- Analysis sequence files (.ASF)
- Report template files (.TPL)
- Batch procedure files (.REX)

D. Technical Information

This appendix covers the specifications of Genie 2000's System 100 and AccuSpec hardware and includes troubleshooting tips. Genie 2000 AIM hardware information will be found in the AIM User's Manual and ICB NIM hardware information in the Model 9600 AIM/ICB Hardware System Setup Manual. It also contains instructions on adjusting the PUR/LTC, performing a manual pole/zero for an amplifier, adjusting a TRP preamp's reset pulse width and additional information on some of Status Screen's entries.

For consistency, all negative true signals are followed by a slash (SIGNAL/). Note, however, that on all AccuSpec schematics negative true signals are shown by a following asterisk (SIGNAL*).

System 100 MCA Boards

The System 100 MCA boards are standalone microprocessor based sub-systems. Commands from the Host computer are sent to the boards for execution. These commands include:

- Acquire Start
- Acquire Stop (The board looks for presets, but Host can stop if operator does an Acquire Stop.)
- Clear
- Read out/Read in Data
- Read out Scaled Data for Display
- Read out Calculated ROI Data (Integral, Area, % Error, etc.)
- Clear Timers/Sweep Counter
- Abort Command

All communication with the board is done using INput and OUTput commands on the 8-bit computer (PC or Micro Channel) bus. Single word commands cause an NMI interrupt to the MCA processor. Multi-word commands and all data transfer to the Host is done through the on-chip DMA controller between the computer bus and on-board dynamic RAM. The MCA program resides in EPROM.

The System 100 may be configured with up to four plug-in multichannel analyzer boards. Each board includes its own 16-bit microprocessor and 16-bit on-board data paths. Sufficient RAM, ROM and logic is included to enable the MCA/Memory board to operate as a standalone high performance 16K-channel MCA for data acquisition, storage, and display buffering.

System 100 ISA Specs

Specifications for the ISA Bus MCA Boards.

MCA/Memory

Processor

Intel 80186 16-bit microprocessor, 8 MHz, zero wait state RAM.

Memory

16 384 data channel memory, 2^{32}-1 counts per channel. Configurable as 16 384, 8192, or 4096 channel full memory, divisable into halves, quarters, eighths and sixteenths.

Storage Modes

PHA and MCS, choice of Add or Subtract

Presets

PHA: Live Time or True Time, from 1 to 10^7-1 seconds in 1.0 second increments; counts in a range of channels; and gross integral or net area of a Region of Interest.

MCS: Number of sweeps, from 1 to 10^9-1.

Display Formatting

Maximum of 1024 points with 11-bit resolution per data channel.

Collect Interface

Type: Direct Memory Access (DMA) to an on-board, dual port 16 384 channel data memory.

PHA: Compatible with all Canberra ADCs.

Mixer/Router: System 100 expandable to 16 PHA inputs using the Model 1520 Integrated ADC-Mixer/Router and Model 4622 Control Interface. Individual inputs on the 1520 Mixer/Router will have an independent Live Time or True Time preset. For eight PHA inputs, a Model 8224 AMX with a 75-1776 Control Cable can be used.

MCS: Compatible with Canberra Model 8082 NIM MCS Unit.

Cycle Time: Less than 3 µs (average)

Sample Changer

TTL Outputs: Sample Advance and Acquire Status.

TTL Inputs: Changer Ready and Acquire Stop.

Host Bus Interface

Type – 8-bit PC Bus Interface, I/O mapped, Program Polling Interface (no interrupt).

I/O Address

Primary Range – 340_H through $35D_H$. Alternate Range – 300_H through $31D_H$

Power

+5 V, 1.3 A, nominal
-12 V, 0.5 mA

Self Test

Power on check of PROM, RAM, DMA channels, and Timer.

Physical

Size: 33.53 x 10.67 cm (13.2 x 4.2 in.) length x height

Weight: 340 gm (12 oz)

Rear Panel: J101 – 25-pin female D style for ADC/MCS Interface. J102 – 9-pin female D style for Remote Control

Internal Controls:
- Board Number (2).
- Alternate Address Select (1).
- Bus Ready Select (2).
- PROM/EPROM/RAM Select (3).

Expansion Connectors: Two 34-pin ribbon headers.

See Figure 219 on page 332 for jumper locations.

Internal Controls

W1 Prom Select

1 to 2 – 64K or 128K
2 to 3* – 256K

W2 SRAM/EEPROM/PROM Select

1 to 2 – SRAM/EEPROM
2 to 3* – PROM

W3 Prom Select

1 to 2* – K (64K, 128K, 256K)
2 to 3 – 512 K

W5 Ready Select Decode

1 to 2* – Port 2
2 to 3 – Port 3 Read

W7 Ready Select Output

1 to 2 – SDO
2 to 3* – I/O CH RDY

*Factory default, all boards

Board Select Jumpers

W6 MB Code

1 to 2 – MB
2 to 3 – NOT MB

W8 MA Code

1 to 2 – MA
2 to 3 – NOT MA

MCA#	W6	W8
1[1]	2to 3	2 to 3
2[2]	2 to 3	1 to 2
3	1 to 2	2 to 3
4	1 to 2	1 to 2

W9 PC Address Select

1 to 2 – Alternate
2 to 3[3] – Primary

[1]Factory Default, Model 4610

[2]Factory Default, Model 4611

[3]Factory Default, All Boards

Input/Output

This is a brief overview of the PC bus MCA's two I/O connectors, J101 and J102 (J103 is a connector for automated test equipment). For more detailed information, refer to the J101 Connector description on page 305 or the J102 Connector description on page 308.

J101 – ADC/MCS

Function	Direction	TTL Polarity
14 Address Lines	In/Out[4]	L
Data Ready	In	L
Data Invalid	In	L
Inhibit Add One	In	L
Dead Time	In	H
Enable Data	Out	L
Enable Converter	Out	H
Data Accepted	Out	L
MCS Mode	Out	L
I/O CMD[4]	Out	L
I/O ACK[4]	In	L

4. With the optional Model 4612. Address lines are made bidirectional.

J102 – Remote Control

Changer Ready	In	H
Abort Collect	In	L
MCS End of Sweep	In	H
Changer Advance	Out	L
Collect Status	Out	L

Rear Panel Connectors

J101 ADC/MCS Data Connector

25-pin female D-connector with threaded inserts. ADC Timing is shown in Figure 213.

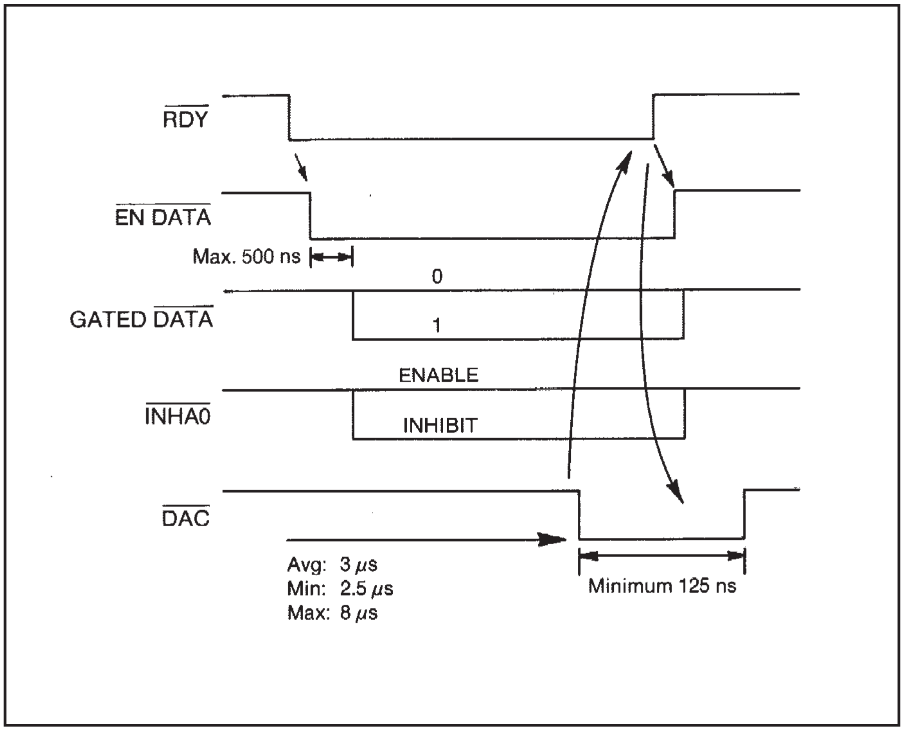


Figure 213 J101 Timing During ADC Storage

Unless otherwise stated, the Data Signal parameters are:

Inputs: Positive = 2.4 V to 5.0 V.
Negative = 0.0 V to 0.3 V.

Outputs: Positive = 2.4 to 5 V (0.4 mA at 2.4 V).
Negative = 0.0 to 0.5 V at 2 mA.

Pin	Signal	In/Out
1	2^0/	IN[5]
2	2^1/	IN[5]
3	2^2/	IN
4	2^3/	IN[5]
5	2^4/	IN[5]
6	2^5/	IN[5]
7	2^6/	IN[5]

8	2^7/	IN^5
9	2^8/	IN^5
10	2^9/	IN^5
11	2^{10}/	IN^5
12	2^{11}/	IN^5
13	2^{12}/	IN^5
15	2^{13}/	IN^5

Gated binary address data from ADC or MCS module from TTL Tri-state drivers. Enabled by signal ENDATA. TTL negative true signal. With the exception of 2^{12} and 2^{13}, unused inputs must be at stable logic level during ENDATA.

5. With the optional Model 4612, the address lines are bidirectional. In the OUT mode, controls are transferred to the Model 1520 ADC-M/R.

14	RDY/	IN	ADC conversion complete

TTL negative true signal. Stays True until DAC/ generated.

16	INHAO/	IN	Inhibit Add One

TTL Negative true signal. Signal state while ENDATA is true determines if memory is incremented. The open input is pulled positive.

17	DAC/	OUT	Data Accepted

TTL negative true signal. Generated at end of ADC/MCS cycle. Stays True until ADC RDY/ goes false.

18	ENC	OUT	Enable Converter

TTL positive true signal. Drive: 2 mA at 2.4; 2 mA at 0.4 V

19	MCS/	OUT	Multiscale Enabled

TTL Negative true signal.

20	INV/	IN	Invalid ADC Conversion

TTL negative true signal. No function with standard 4610/4611.

21	DT	IN	Dead Time

Controls PHA Live time gating. TTL positive true signal. $V_{in} > 2.4V$ at 0.4 mA, disables PHA Live Timer from counting. $V_{in} < 0.5$ V, or open circuit, enables PHA Live Timer to count.

22 ENDATA/ OUT Enable Address Data

TTL negative true signal. Drive: 2 mA at 2.4 V; 2 mA at 0.4 V.

23 I/O ACK IN

Optional; only with Model 4612. Enables I/O controls from Model 4612. TTL negative true signal.

24 Ground

25 I/O CDM OUT

Optional; only with Model 4612. Request from Model 4612 to send control signal to Model 1520. TTL negative true signal.

J102 Remote Control

9-pin female D-connector with threaded inserts. Remote Control Timing is shown in Figure 214.

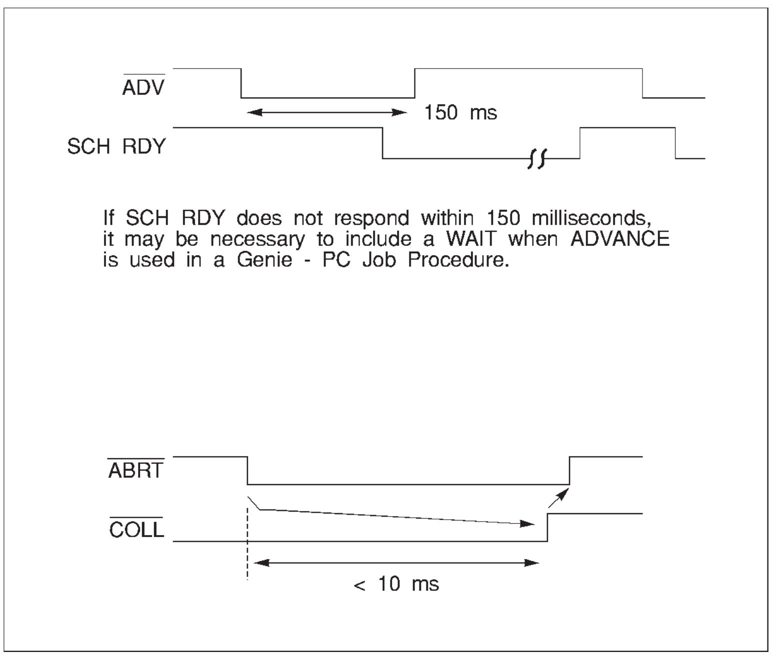


Figure 214 Remote Control Timing Diagram

Unless otherwise stated, the Remote Control Signal parameters are:

Inputs: Positive = 2.4 V to 5.0 V.
Negative = 0.0 V to 0.3 V at 1 mA.

Outputs: Positive = 2.4 to 5 V (0.4 mA at 2.4 V).
Negative = 0.0 to 0.5 V at 2 mA.

Pin	Signal	In/Out	Description
1	ABRT/	IN	Abort In
	TTL negative true signal. Ends Collect. Hold low until status changes (pin 4).		
2	SCH RDY	IN	Sample Changer Ready In
	TTL positive true signal. If SCH RDY does not respond within 150 ms, it may be necessary to include a WAIT when ADVANCE is used in a Genie 2000 Job Procedure.		
3	ADV/	OUT	Advance Out
	TTL negative true signal Approximate 150 ms pulse after command.		
4	COLL/	OUT	Collect Status
	TTL negative true signal. True (low) when in Acquire Mode.		
5	Ground		
6	Ground		
7	Ground		
8	AOF	IN	End of Sweep In
	TTL positive true signal. Used for MCS sweep counting. Minimum width 1 µs.		

PC Host Bus Signals

SA0 through SA9. Latched Address lines used for I/O device decoding. TTL positive true. HCT buffers used for essentially zero dc loading.

SD0 through SD7. Data Bus bits 0 through 7 for byte transfer IN and OUT to Host. Gated onto bus during -IOR. TTL positive true.

Bus Loading: 20.0 µA at 2.7 V; 0.2 mA at 0.4 V.

Bus Drive: 3.0 mA at 2.4 V; 24.0 mA at 0.5 V

AEN

Address Enable. When TTL low indicates that Host processor is controlling bus. HCT buffer used for essentially zero dc loading.

-IOR

I/O Read Signal. TTL negative true. Signals board that Host is doing an Input instruction. HCT buffer for essentially zero dc loading.

-IOW

I/O Write Signal. TTL negative true. Signals board that Host is doing an OUTput instruction. HCT buffer for essentially zero dc loading.

RESET DRV

Reset Drive. TTL positive true. Initializes MCA board. HCT buffer for essentially zero dc loading.

I/O CH RDY

I/O Channel Ready Output from board during access to Port 2. TTL positive True. Driven from tri-state device.

Bus Drive: 2.6 mA at 2.4 V; 12.0 mA at 0.4 V

Bus Loading in Tri-State: 20 µA at 2.4 V; 20 µA at 0.4 V

+5 V dc. Power to board: 1.3 A, nominal.

-12 V dc. Bias voltage to board. 0.5 mA.

System 100 Micro Channel Specs

Specifications for the Micro Channel Bus MCA Board.

MCA/Memory

Processor

Intel 80C186 16-bit microprocessor, 12 MHz, zero wait state RAM.

Memory

16 384 data channel memory, 2^{32}-1 counts per channel. Configurable as 16 384, 8192, or 4096 channel full memory, divisible into halves, quarters, eighths and sixteenths.

Storage Modes

PHA and MCS, choice of Add or Subtract

Presets

PHA: Live Time or True Time, from 1 to 10^7-1 seconds in 1.0 second increments; counts in a range of channels; and gross integral or net area of a Region of Interest.

MCS: Number of sweeps, from 1 to 10^9-1.

Display Formatting

Maximum of 1024 points with 11-bit resolution per data channel.

Collect Interface

Type: Direct Memory Access (DMA) to an on-board, dual port 16 384 channel data memory.

PHA: Compatible with all Canberra ADCs.

Mixer/Router: System 100 expandable to 16 PHA inputs using the Model 1520 Integrated ADC-Mixer/Router and Model 4612 Control Interface. Individual inputs on the 1520 Mixer/Router will have an independent Live Time or True Time preset. For eight PHA inputs, a Model 8224 AMX with a 75-1776 Control Cable can be used.

MCS: Compatible with Canberra Model 8082 NIM MCS Unit.

Cycle Time: Less than 3 µs (average)

Sample Changer

TTL Outputs: Sample Advance and Acquire Status.

TTL Inputs: Changer Ready and Acquire Stop.

Host Bus Interface

Type – I/O mapped, Program Polling Interface (no interrupt).

I/O Address

Primary Range – 340_H through $35F_H$. Alternate Range – 300_H through $31F_H$

Power

+5 V, 0.8 A, nominal
-12 V, 0.5 mA

Self Test

Power on check of PROM, RAM, DMA channels, and Timer.

Physical

Size: 29.2 x 8.83 cm (11.5 x 3.475 in.) length x height

Weight: 255 gm (9 oz)

Rear Panel: J101 – 25-pin female D style for ADC/MCS Interface. J102 – 8-pin female DIN style for Remote Control

Expansion Connectors: Two 34-pin ribbon headers.

Input/Output

This is a brief overview of the Micro Channel bus MCA's two I/O connectors, J101 and J102 (J103 is a connector for automated test equipment). For more detailed information, refer to the J101 Connector description on page 313 or the J102 Connector description on page 315.

J101 – ADC/MCS

Function	Direction	TTL Polarity
14 Address Lines	In/Out[6]	L
Data Ready	In	L
Data Invalid	In	L
Inhibit Add One	In	L
Dead Time	In	H
Enable Data	Out	L
Enable Converter	Out	L
Data Accepted	Out	L
MCS Mode	Out	L
I/O CMD[6]	Out	L
I/O ACK[6]	In	L

[6]With the optional Model 4622. Address lines are made bidirectional.

J102 – Remote Control

Changer	ReadyIn	H
Abort Collect	In	L
MCS End of Sweep	In	H
Changer Advance	Out	L
Collect Status	Out	L

Reset	In	L

Rear Panel Connectors

J101 ADC/MCS Data Connector

25-pin female D-connector with threaded inserts. ADC Timing is shown in Figure 215.

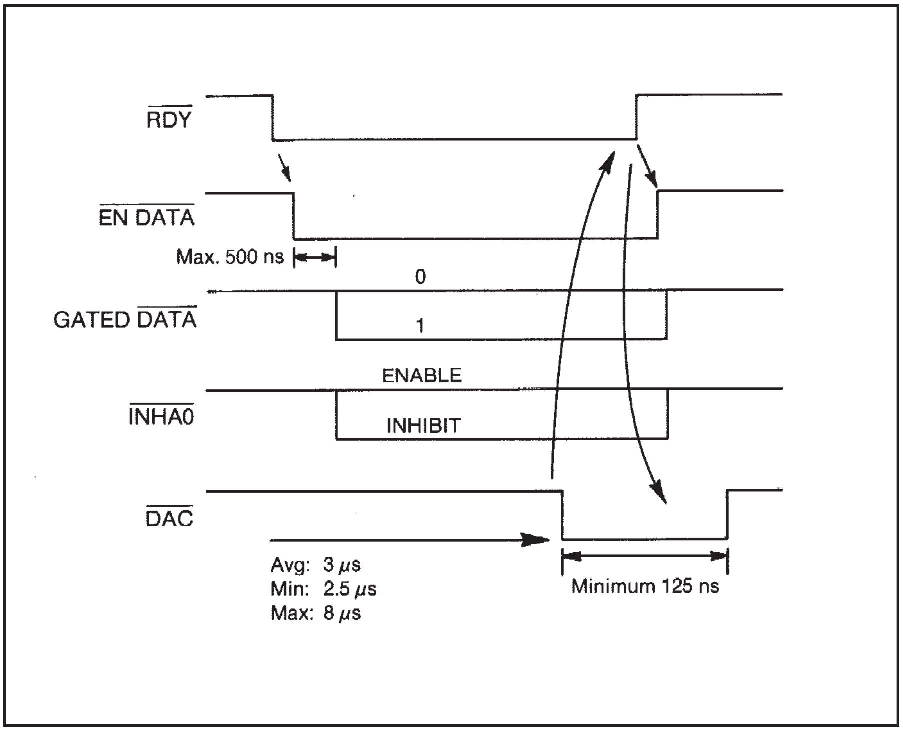


Figure 215 J101 Timing During ADC Storage

Unless otherwise stated, the Data Signal parameters are:

Inputs: Positive = 2.4 V to 5.0 V.
Negative = 0.0 V to 0.3 V.

Outputs: Positive = 2.4 to 5 V (0.4 mA at 2.4 V).
Negative = 0.0 to 0.5 V at 2 mA.

Pin	Signal	In/Out
1	2^0/	IN[7]

2	2^{1}/	IN[7]
3	2^{2}/	IN[7]
4	2^{3}/	IN[7]
5	2^{4}/	IN[7]
6	2^{5}/	IN[7]
7	2^{6}/	IN[7]
8	2^{7}/	IN[7]
9	2^{8}/	IN[7]
10	2^{9}/	IN[7]
11	2^{10}/	IN[7]
12	2^{11}/	IN[7]
13	2^{12}/	IN[7]
15	2^{13}/	IN[7]

Gated binary address data from ADC or MCS module from TTL Tri-state drivers. Enabled by signal ENDATA. TTL negative true signal. With the exception of 2^{12} and 2^{13}, unused inputs must be at stable logic level during ENDATA.

7. With the optional Model 4622, the address lines are bidirectional. In the OUT mode, controls are transferred to the Model 1520 ADC-M/R.

14	RDY/	IN	ADC conversion complete

TTL negative true signal. Stays True until DAC/ generated.

16	INHAO/	IN	Inhibit Add One

TTL Negative true signal. Signal state while ENDATA is true determines if memory is incremented. The open input is pulled positive.

17	DAC/	OUT	Data Accepted

TTL negative true signal. Generated at end of ADC/MCS cycle. Stays True until ADC RDY/ goes false.

18	ENC	OUT	Enable Converter

TTL positive true signal. Drive: 2 mA at 2.4; 2 mA at 0.4 V

19	MCS/	OUT	Multiscale Enabled

TTL Negative true signal.

20 INV/ IN Invalid ADC Conversion

TTL negative true signal. No function with standard 4610/4611.

21 DT IN Dead Time

Controls PHA Live time gating. TTL positive true signal. V_{in} > 2.4V at 0.4 mA, disables PHA Live Timer from counting. V_{in} < 0.5 V, or open circuit, enables PHA Live Timer to count.

22 ENDATA/OUT Enable Address Data

TTL negative true signal. Drive: 2 mA at 2.4 V; 2 mA at 0.4 V.

23 I/O ACK IN

Optional; only with Model 4622. Enables I/O controls from Model 4622. TTL negative true signal.

24 Ground

25 I/O CMD OUT

Optional; only with Model 4622. Request from Model 4622 to send control signal to Model 1520. TTL negative true signal.

J102 Remote Control

8-pin female DIN Connector. Remote Control Timing is shown in Figure 216.

Unless otherwise stated, the Remote Control Signal parameters are:

Inputs: Positive = 2.4 V to 5.0 V.
Negative = 0.0 V to 0.3 V at 1 mA.

Outputs: Positive = 2.4 to 5 V (0.4 mA at 2.4 V).
Negative = 0.0 to 0.5 V at 2 mA.

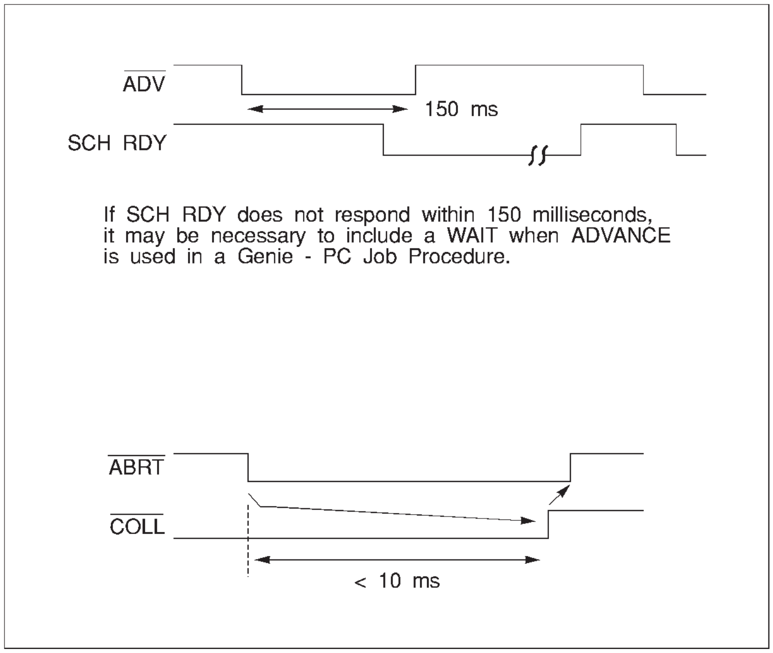


Figure 216 Remote Control Timing Diagram

Pin	Signal	In/Out	Description
1	ABRT/	IN	Abort In
	TTL negative true signal. Ends Collect. Hold low until status changes (pin 4).		
2	SCH RDY	IN	Sample Changer Ready In
	TTL positive true signal. If SCH RDY does not respond within 150 ms, it may be necessary to include a WAIT when ADVANCE is used in a Genie 2000 Job Procedure.		
3	ADV/	OUT	Advance Out
	TTL negative true signal Approximate 150 ms pulse after command.		
4	COLL/	OUT	Collect Status
	TTL negative true signal. True (low) when in Acquire Mode.		
5	Ground		

6	XRES/	IN	Reset In
	TTL negative true signal. Causes hardware reset of microprocessor on MCA board. Minimum width 100 ms.		
7	Ground		
8	AOF	IN	End of Sweep In
	TTL positive true signal. Used for MCS sweep counting. Minimum width 1 µs.		

Micro Channel Host Bus Signals

Except as noted, all inputs are through CMOS (HCT) receivers for essentially zero dc loading.

A0 through A15. Address lines used for I/O device decoding. TTL positive true.

D0 through D7. Data Bus bits 0 through 7 for byte transfer IN and OUT to Host. Gated onto bus during I/O Read cycles. TTL positive true.

Bus Loading: 20.0 µA at 2.7 V; 0.2 mA at 0.4 V.

Bus Drive: 3.0 mA at 2.4 V; 24.0 mA at 0.5 V

–ADL

Address Decode Latch. Input signal from system to latch addresses and status bits. Data valid on trailing edge of –ADL.

M/–IO

Memory/–Input Output. input signal that distinguishes a memory cycle from an I/O cycle. TTL low indicates I/O cycle in progress.

–S0,–S1

–Status bits 0 and 1. These bits are inputs that indicate the type of bus cycle.

–CMD

–Command. Input signal that defines when data on the bus is valid. The positive-going (trailing) edge of this signal indicates the end of a bus cycle.

–CD SFDBK

–Card Selected Feedback. This output signal goes active (low) when board is addressed, except during the configuration cycle. Positive: > 2.4 V at 2 mA; negative: < 0.4 V at 6 mA

CD CHRDY

Channel Ready. Output to signal when board requires additional time to complete a channel operation. Ready is TTL positive. Positive: > 2.4 V at 2 mA; negative: < 0.4 V at 6 mA

–CD SETUP

–Card Setup. This input is driven low during system configuration and error recovery procedures. It selects the card slot.

CHRESET

Channel Reset. This input is driven high to initialize the board's Micro Channel interface circuitry during power on/power fail and while doing a soft boot.

+5 V dc. Logic power to board. < 0.8 A, nominal.

–12 V dc. Bias voltage to board. < 0.5 mA.

AccuSpec Boards

This section details the Rear Panel Connections and Specifications for the AccuSpec A, NaI, B, NaI Plus, and FMS boards.

For consistency, all negative true signals are followed by a slash (SIGNAL/). Note, however, that on all AccuSpec schematics negative true signals are shown by a following asterisk (SIGNAL*).

AccuSpec A and NaI Boards

The AccuSpec A and AccuSpec NaI boards have a BNC connector for connection to the analog input signal and a 9-pin male D-style connector which provides signals for various external applications.

A special cable is available to make the connections to the rear panel D-style connector. Standard BNC connections to the signals are provided by cable 759618. Cable 751885 is an adapter cable to allow connection to the PUR/LTC signals on the Model 2020, 2024, 2025, 2026, and 9615 amplifiers.

BNC Signal Input

- DC-coupled only.
- Nominally 8.0 V full scale.

- Positive monopolar or initially positive bipolar semi-Gaussian shaped pulses with a time constant of 0.5 to 10 µs or gated integrator shaped pulses.
- Flat-top pulses with a minimum pulse width of 3.0 µs are also acceptable
- Input impedance greater than 10 kΩ

External Signals On a 9-Pin Male D-Style

Breakout cable 759618 can be purchased separately.

Pin	Signal	Description
1-5	GND	Common signal return path
6	ADT/	TTL compatible Output signal; normally +5 V.

In PHA mode, the output signal ADT/ goes low (0 - 0.5 V) when the ADC is busy processing an event. This is considered to be the ADC DEADTIME or the time during which the ADC is unable to process another input event. PHA Mode Timing is shown in Figure 217.

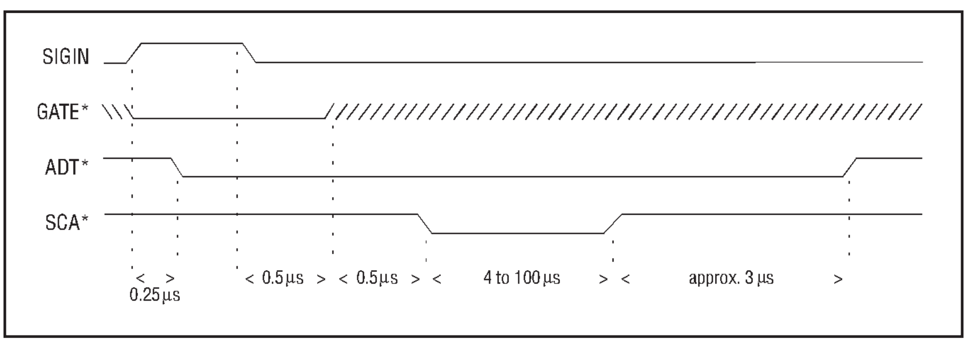


Figure 217 Timing Diagram - PHA Mode

The approximate ADC DEADTIME can be calculated according to the following formula(s):

100 MHz = Tr+4µs+(N*10 ns)+(CG/16*10 ns)

Where:

Tr = Input pulse rise time or 1.5 µs, whichever is greater
N = Channel number converted
CG = Conversion gain selected

In STROBE mode, the signal ADT/ goes low (0 - 0.5 V) when the input GATE/ signal is non-asserted (high) and goes high (4.5 - 5.0 V) when the GATE/ signal is asserted (low). Strobe Mode Timing is shown in Figure 218.

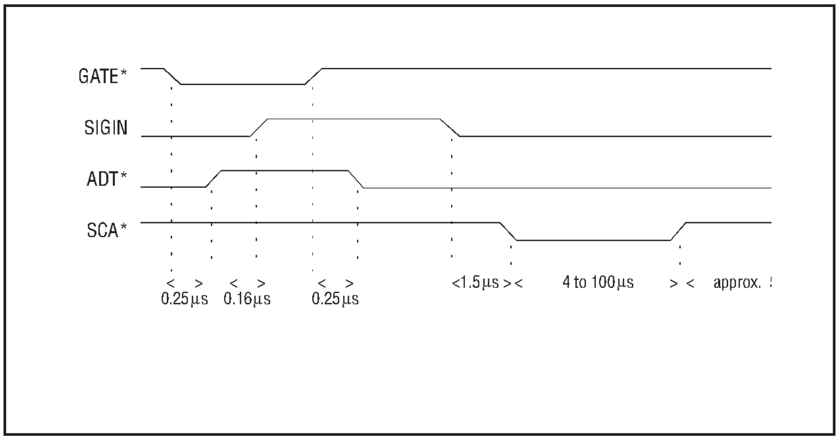


Figure 218 Timing Diagram - Strobe Mode

The ADT/ output signal can source 1 mA or sink up to 10 mA maximum. External loading of this signal in excess of these ratings should be avoided since it will interfere with the normal operation of the ADC or damage the output driver.

Alternately, signal ACQ/ may be selected as an output on pin 6. This is accomplished with a jumper option by removing jumper ADT/ and installing jumper ACQ/. ACQ/ is a TTL compatible signal that normally stays at +5 V. In either PHA or STROBE mode signal ACQ/ will go low (0 - 0.5 V) when acquisition is enabled by the CPU and returns high (4.5 - 5.0 V) when acquisition times out or is turned off by the computer system.

7 AMPBSY

TTL compatible input signal that allows logical ORing of an amplifier busy signal with the internal ADC busy signal.

The AMPBSY input signal allows control of the MCA live time clock from an external signal. This signal will stop the MCA live time clock when asserted (4.5 - 5.0 V). The MCA live time clock will be allowed to run only when:

Acquisition is enabled, AMPBSY signal is not asserted (0 - 0.5 V) and the ADC is not busy (signal ADT/ is high).

The AMPBSY input signal impedance is 1 kΩ.

TTL high: +3.5 to 5.0 V
TTL low: 0.0 to 0.5 V

Alternately, the polarity of the AMPBSY input signal may be inverted. This can be accomplished with a jumper option by removing jumper BUSY and installing jumper BUSY/. This jumper allows a low signal to stop the MCA live time clock.

When used with the Model 2020, 2024, 2025, 2026 or 9615 Amplifiers in PUR/LTC mode, the jumper must be in the BUSY/ position.

8 SCA/

TTL compatible output signal that provides a negative going output pulse for every event that falls within the LLD/ULD window.

The SCA/ output signal is normally high (4.5 - 5.0 V) and goes low (0 - 0.5 V) whenever the ADC has converted an event. Since no event is converted unless its amplitude falls between the LLD and ULD (lower and upper level discriminators), this signal can be used as the output of SCA (single channel analyzer). The duration of the SCA/ signal is a function of the ADC conversion time.

During normal PHA mode acquisition, the length of this pulse represents the conversion time of the ADC. In SCA mode, this pulse is typically 1 to 2 μs, maximum. External loading of this signal in excess of these ratings should be avoided since it will interfere with the normal operation of the ADC or damage the output driver.

Alternately, signal LG/ may be selected as an output on pin 8. This is accomplished with a jumper option by removing jumper SCA/ and installing jumper LG/.

Signal LG/ is used for live time correction with the Model 2020, 2024, 2025, 2026 or 9615 Amplifiers in PUR/LTC mode.

Signal LG/ goes low (0 - 0.5 V) when an input pulse crosses the lower level discriminator (LLD) and remains low until the peak of the input pulse.

9 GATE/

TTL compatible input signal used to control the linear gate. (+5 V disables linear gate.) This signal may be used for PUR, coincidence gating, or trigger in STROBE mode.

With the Model 2020, 2024, 2025, 2026 or 9615 Amplifiers, the jumper is in the GATE/ position for PUR/LTC mode.

In PHA mode, the GATE/ signal may be used to selectively reject events converted by the ADC. As an example, it may be connected to the INHIBIT or BLOCK output of a nuclear spectroscopy amplifier to reject events subject to pulse pileup.

A low (0 - 0.5 volt) GATE/ signal is normal and this allows all incoming events to be converted and stored. A high (4.5 - 5.0 volt) GATE/ signal inhibits all incoming events from being converted and stored. In order for the ADC to convert and store an event, the GATE/ signal must be low BEFORE the input pulse arrives at the ADC and must remain low a minimum of 0.5 µs after the peak amplitude of the input pulse.

Allowing the GATE/ signal to go high any time during the rise time of the input pulse will cause the event to be rejected (the ADC will be reset and no count added to memory).

With the Model 2020, 2024, 2025, 2026 or 9615 Amplifiers, the jumper is in the GATE/ position for PUR/LTC mode.

In STROBE mode, the GATE/ signal serves as an external trigger to start the ADC conversion. Normally, a negative going pulse should be used to start the operation. When the GATE/ signal goes from the high to the low state, the ADC linear gate will open and sample the voltage applied to the input. The linear gate will remain open as long as the GATE/ signal remains in the low state. Approximately 1.5 µs after the GATE/ signal switches back to the high state, the linear gate will close and the conversion will commence. The duration of the GATE/ signal must be a minimum of 1 µs in either the high or low state.

The minimum time that the linear gate can be open is about 2.5 µs.

STROBE mode is selected by removing jumper PHA and installing jumper STB.

The GATE/ input signal impedance is 1 kΩ.

A logical 0 = 4.5 - 5.0 V. A logical 1 = 0.0 - 0.5 V

Alternately, the polarity of the GATE/ input signal may be inverted. This can be accomplished with a jumper option by removing jumper GATE/. This jumper option allows a low signal (0 - 0.5 V) to inhibit incoming events in PHA mode or allows the use of a positive GATE pulse in STROBE mode.

When any of the AMX modules (Models 589 or 8224) is to be used, the STROBE mode must be enabled and the Gate polarity is negative true (GATE/).

AccuSpec B Board

The AccuSpec B board have the ADC interface on a 37-pin male D-style connector. An external MCA to ADC interface cable is provided with the board.

Pin	Wire	Signal	Description
1-6	1,3,5 7,9,11	GND	Logic signal common
7	13	ADC13/	Input data lines ADC0/ through ADC13/ are TTL compatible devices. Logic 1 = 0 to 0.5 V, Logic 0 = 2.5 to 5.0 V. Z_{in} = 2.2 kΩ to +5 V. Data will be latched on the leading edge of the CLADC pulse.
8	15	ADC7/	
9	17	ADC8/	
10	19	ADC9/	
11	21	ADC10/	
12	23	ADC11/	
13	25	ADC12/	
14	27	Reserved	
15	29	Reserved	
16	31	Reserved	
17	33	Reserved	

18	35	Reserved	
19	37	Reserved	
20	2	CLADC/	Clear ADC output

The steady state condition of signal CLADC/ is +5 V. The ADC interface logic resets when signal CLADC/ goes from +5 to 0 V. A pulse duration of 1 µs is provided. Logic 1 = 0 V at 10 mA Logic 0 = 2.5 - 5.0 V at 1 mA

21	4	ATR/	ADC transfer output

The steady state condition of signal ATR/ is +5 V. Data transfer occurs when signal ATR/ goes from +5 V to 0 V. A pulse duration of 1µs is provided. Logic 1 = 0 V at 10 mA Logic 0 = 2.5 to 5.0 V at –1 mA

22	6	ADCB/	ADC busy input (live time)

ADCB/ represents the time the ADC cannot validly accept input pulses; that is, the linear gate is closed. When not in acquire mode, ADCB/ should remain at +5 V. (ADCB/ is intended to be used for live time control.) Input impedance = 2.2 kΩ to +5 V

23	8	ACQ/	Acquire output

Signal ACQ/ switches to 0 V to enable the ADC or +5 V to disable the ADC.

24	10	READY/	Ready Input

The steady state condition of signal READY/ is +5 V. When ADC conversion is complete, signal READY is pulled low, signaling the computer that data is ready to be transferred. Input impedance = 2.2 kΩ to +5 V

25	12	INH/	Inhibit Input

Signal INH/ is at +5 V when information is acceptable and at 0 V when information is to be rejected. Input impedance = 2.2 kΩ to +5 V.

26	14	ADC0/	Input data lines ADC0/ through ADC13/ are TTL compatible devices.
27	16	ADC1/	
28	18	ADC2/	
29	20	ADC3/	
30	22	ADC4/	
31	24	ADC5/	

32	26	ADC6/
33	28	Reserved
34	30	Reserved
35	32	Reserved
36	34	Reserved
37	36	Reserved

AccuSpec/NaI Plus Board

The AccuSpec NaI/Plus board has a BNC connector for amplifier input, a SHV connector for high voltage output, and a 9-pin female D-style connector for preamp power output.

BNC Amplifier Signal Input

- Voltage Sensitive input accepts positive or negative tail pulses.
- 0 to 12 V maximum
- Rise time <0.5 µs
- Decay time constant = 40 µs to ∞ (factory set to 50 µs).
- Input impedance ≈ 470 Ω

SHV High Voltage Output

- 0 to +1.0 kV at 300 µA

Preamp Power on a 9-Pin Female D-Style Connector

Six inch C1552 Adapter Cable is provided with the board.

Pin	Signal	Description
1-2	GND	Common power return path
3	KEY	Key position
4	+12 V	+12 V preamp power
5	KEY	Key position
6-7	N/C	No connection
8	KEY	Keyed position
9	-12V	–12 V preamp power

AccuSpec FMS Board

The AccuSpec FMS is a full-sized PC/XT card which can work concurrently with the AccuSpec family of MCA boards in multi-board configurations. The FMS board has a BNC connector for the SCA analog input and a 15-pin DB connector for TTL input and output control signals.

BNC Signal Input

This BNC connects to the input of the SCA. An analog signal, in the form of positive pulses, is applied through this BNC connector. The voltage range is 0 to 8 V with an input impedance l KΩ. Maximum counting frequency is 1 MHz.

External Signal On a 15-Pin DB Connector

All the input control and output status signals are provided through this connector. The TTL input signal, allowing count rates to 100 MHz, is provided here also.

Pin	Signal	Description
1	DAC	Analog output signal (0 to +5 V). This amplitude of this signal is proportional to the current sweep channel address, 5 volts representing the last channel and 0 volts representing the first channel.
2	SCA*	TTL output signal. This signal is the negative pulse from the SCA.
3	E0CH*	TTL output signal. A positive pulse, of which the transition from high to low indicates the end of the channel dwell time.
4	TRIG*	TTL input signal. A transition from low to high (negative pulse recommended) starts a sweep.
5	ADV*	TTL input signal. A transition from low to high (negative pulse recommended) terminates the current dwell time and advances the channel address.
7	“TTL”	TTL input signal. A positive pulse applied to this signal causes one count to be added to memory at the current channel address. The count occurs on the low to high transition. The pulse width must be a minimum of 5 ns for rates up to 100 MHz. Input impedance is 50 Ω. Input low = 0 to 0.5 V. Input high = 2.5 to 5 V. This input signal is not protected against over voltage. Under *no circumstances* should the input signal level be greater than 5.5 V or less than –0.5 V.
12	ACQEN*	TTL output signal. This signal indicates that acquisition is in progress. ACQEN* goes low at the start and high at the end of a sweep provided XTRIG is being used. In continuous sweep mode, XTRIG goes low at the start of the first sweep and high at the end of the last sweep.

13	EOP	TTL output signal. This signal switches high at mid sweep and low at sweep end.

AccuSpec A and NaI Specifications

The AccuSpec A and AccuSpec NaI boards are plug-In MCA boards for an IBM PC or compatible PCs. The AccuSpec A board contains a computer-controlled, 8K channel, 100 MHz on-board Wilkinson-type ADC plus 8K channels of spectral memory. The AccuSpec NaI board contains a computer-controlled, 2K channel, 100 MHz on-board Wilkinson-type ADC plus 2K channels of spectral memory.

Conversion Gain (channels full scale, software selectable) - 256, 512, 1024, 2048, 4096 or 8192 (A); 256, 512, 1024 or 2048 (NaI).

Clock Rate (All Conversion Ranges) - 100 MHz

Signal Input - Amplitude: 0 to +8 V, nominal; dc coupled; Input Impedance = 10 kΩ

Polarity - Positive monopolar or initially positive bipolar semi-Gaussian or gated integrator shaped pulses with shaping times from 0.5 to 10 μs or flat top pulses with a minimum width of 3 μs.

Integral Linearity - > ±0.05% over the top 99% of full scale.

Differential Linearity - <1.0% deviation from mean channel width over the top 99% full scale.

Temperature Stability - < ±0.01% gain shift and less than ±0.005% zero drift per 1 °C from 0 to 50 °C.

ULD/LLD - Adjustable from 0 to 100% of full scale via software control.

Fine LLD - Adjustable from 0 to 6% of full scale via software control.

Analog Zero - Adjustable between ±3% of full scale via software control.

PHA Mode - Pulse height analysis with or without coincidence gating.

SCA Mode - The ADC can be operated as a gated or ungated single channel analyzer.

Strobe Mode - The ADC can be operated in a sample voltage analysis mode using an external strobe at rates up to 70 kHz, conversion gain dependent.

Rear Panel Connector - SIGNAL BNC: 9-pin D-type connector for GATE, AMP BUSY, SCA and DT signals.

Rear Panel Indicator - BUSY LED.

Dimensions - 32.8 x 9.9 cm (12.9 x 3.9 in.).

Weight - Approximately 0.45 kg (1 lb).

Operating Temperature Range - 0 to 50 °C.

Power Requirements - +5 V dc at 1.6 A, max.

AccuSpec B Specifications

The AccuSpec B Board is a plug-in MCA board for the IBM PC or compatible computer. The AccuSpec B contains 16K data channels of spectral memory. C1704 Interface Cable included for connection to ADCs with 34-pin ribbon connector.

Dimensions - 32.8 x 9.9 cm (12.9 x 3.9 in.).

Weight - Approximately 0.45 kg (1 lb).

Operating Temperature Range - 0 to 50 °C.

Power Requirements - +5 V dc at 0.8 A, max.

AccuSpec/NaI Plus Specifications

The AccuSpec/NaI Plus board is a plug-in MCA board for IBM PCs or compatible computers. This board contains complete front end electronics for connection to photomultiplier type (PMT) preamp base assemblies, allowing PHA acquisition from NaI or other scintillation detectors.

Wilkinson ADC

Conversion Gain (Channels Full Scale, software Selectable) - 256, 512, 1024, 2048.

Clock Rate (All Conversion Ranges) - 100 MHz.

Integral Nonlinearity - Less than ±0.02% of full scale over the top 99% of selected range.

Differential Nonlinearity - Less than 1.0% deviation from mean channel width over the top 99% full scale.

Gain Drift - <0.01%/°C.

Zero Drift - <0.005% of full scale per °C.

ULD/LLD - Adjustable from 0 to 100% of full scale via software control.

Fine LLD - Adjustable from 0 to 6% of full scale via software control.

Analog Zero - Adjustable between ±3% of full scale via software control.

Mode - Pulse Height Analysis (PHA).

Amplifier

Input Signal - Voltage sensitive input accepts positive or negative tail pulses from an associated preamplifier; amplitude 0 to ±12 V, maximum; polarity positive or negative, software selectable; rise time <0.5 µs; decay time constant 40 µs to ∞ (factory set to 50 µs) internal pole/zero adjustment; input impedance 470 Ω; board mounted rear panel BNC connector.

Gain - Programmable from X2 to X1000.

Pulse Shape - Bipolar 1µs shaping time constant; time to peak 1.3 µs; time to crossover 2.5 µs; pulse width 10 µs.

Integral Nonlinearity - <±0.1% of full scale output measured at gain of 150.

Peak Shift - <±0.05% of full scale to 25 kHz.

Gain Drift - <0.02%/°C.

Zero Drift - <25 mV/°C.

Noise Contribution - <35 mV rms referenced to input at maximum gain.

Overload Recovery - Recovers to within ±2% of full scale output from X200 overload in 20 µs when properly pole/zeroed.

High Voltage Power Supply:

Power - 0 to 1.0 kV at 300 µA, continuously adjustable via software control.

Control - Software control of on/off and HV setting.

Resolution - HV settable within 0.4% of full scale.

Nonlinearity - <±0.3% of full scale.

Calibration Error - <±0.2% of full scale.

Drift - <±0.01%/°C after 30 minute warmup.

Regulation - Line <±0.05% from 10% change in supply voltage; load <±0.3% at 0 to 300 µA.

Output Ripple - <20 mV peak-peak at full load, dc to 1 MHz.

Overload Protection - Short circuit proof; must be reset by software to turn on after fault removed.

HV Indicator - Board mounted rear panel LED indicates HV on.

Dimensions - 30.5 x 9.9 x 2.0 cm (12 x 3.9 x 0.8 in.)

Weight - 0.68 kg (1.5 lb)

Operating Temperature Range - 0 to 35 °C, ambient

Power Requirements - +5V dc at 1.5 A, +12 V dc at 150 mA, –12 V dc at 100 mA. (Includes loading contributed by 2007P Tube-base Preamp at maximum HV setting.)

Outputs

HV Output - 0 to +1.0 kV at 300 µA, adjustable via software control; board rear panel mounted SHV connector.

Preamp Power - ±12V for powering external preamplifier; board rear panel mounted 9-pin female D-style connector; C1552 Adapter Cable provided with board.

AccuSpec FMS Board Specifications

The AccuSpec FMS provides multi-channel scaling capability to any PC system equipped with a spare ISA connector capable of accepting a standard full size board. The FMS board includes 64K byte SRAM for on-board data storage of up to 16K channels. In addition, the board contains a SCA for counting output pulses directly from a detector/amplifier front-end and an optional DAC for applications requiring an analog ramp output.

Input Count Rate - 100 MHz for TTL signal, 1 MHz for SCA input

Dwell Time - Adjustable from 2 µs to 1 hr via software control.

Interchannel Dead Time - < 10 ns

Intersweep - < 10 ns

Sweep Counter - 1 to 65 536

Counts per Channel - 2^{31} - 1

SCA LLD/ULD - Adjustable from 0 to 100% of full scale via software control.

Dimensions - 32.77 x 9.91 cm (12.9 x 3.9 in.)

Weight - 0.45 kg (1.0 lb)

Operating Temperature Range - 0 to 50 °C.

Power Requirements - +5 V dc at 1.6 A, max.

Troubleshooting

If Canberra Customer Service assistance is needed, please note the Genie 2000 software version number, and for the System 100, the MCA board’s firmware version number. The software version number is shown on the label of the Genie 2000 Installation CD. The MCA board’s Firmware Version can be found on the labels attached to:

Chips A25 and A26 on S100 ISA Bus MCAs (Figure 219).
Chip A18 on S100 Micro Channel Bus MCAs (Figure 220)

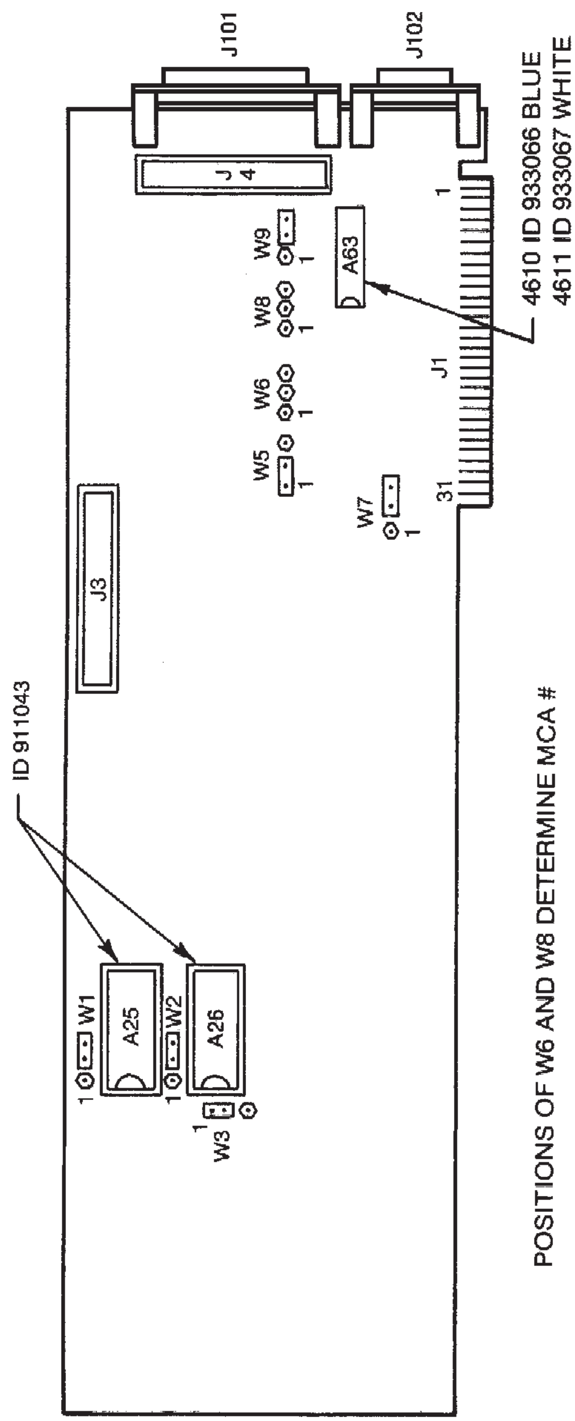


Figure 219 System 100 IPC Board Layout

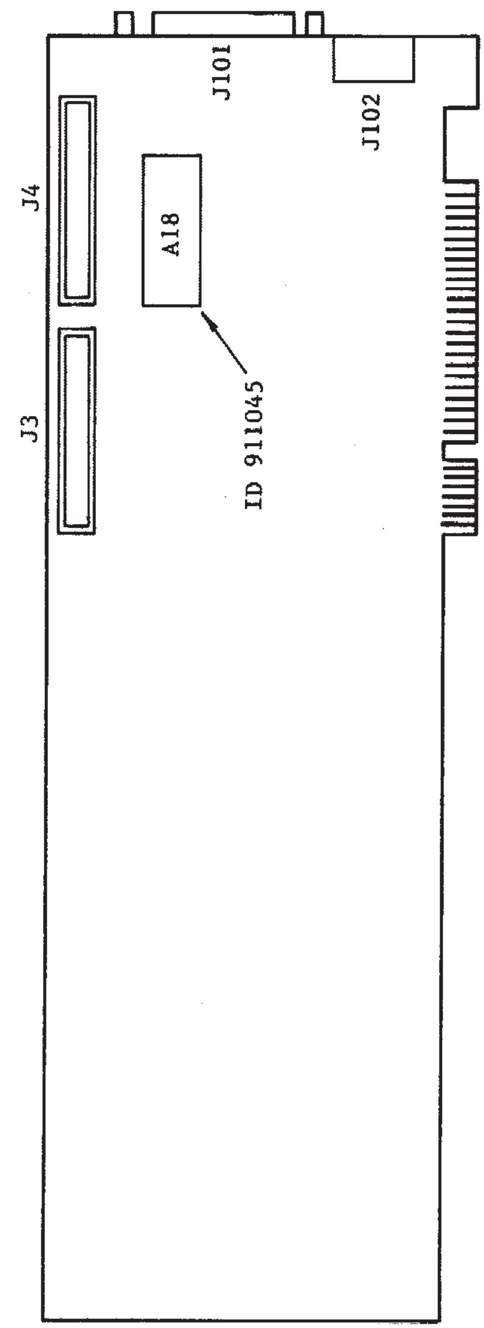


Figure 220 System 100 Micro Channel
Board Layout

Adjusting the PUR/LTC

To achieve the highest performance of your amplifier's Live Time Corrector, it may be necessary to adjust the ADC's LLD control. This adjustment must be made after the amplifier and ADC have been set to process the energy range of interest.

To make the adjustment, two radioactive sources with high activity are required: Source A with an energy peak in the upper part of the desired spectrum and Source B, a high activity source with an energy peak in the lower part of the spectrum. The following LTC optimizing process assumes that Source A is ^{60}Co and Source B is ^{137}Cs. The 1173.2 keV peak of ^{60}Co will be used as a reference. The upper peak, at 1332.5 keV, is not a good choice because a sum peak of ^{137}Cs at 2 x 661.6 = 1323.2 keV would interfere with the measurement.

1. Put Source A near the detector so that the total count rate from this source is < 5 kcps.
2. Set the LLD for a low value so that only energy above the noise level is acquired.
3. Enter an ROI about the reference peak and, with PUR *enabled*, acquire data until there are ≈ 30 kcounts in the peak area.
4. Clear the data from the spectrum, then put Source B near the detector. Adjust the total count rate to be the maximum expected in the course of normal measurements. Repeat the acquisition, stopping when the area of the reference peak reaches 30 kcounts.
5. Compare the count rates (Peak Area divided by the Elapsed Live Time) of Steps 3 and 4. If they are within several percent of each other, the LLD is properly adjusted.
6. If you feel improvement is desirable, adjust the LLD about 1% or 2% higher.
7. Repeat Steps 3 through 6 until an optimum setting has been achieved.

Manual Pole/Zero

At high count rates, the pole/zero adjustment is extremely critical for maintaining good resolution and low peak shift. Figure 221 shows how misadjustment will affect peak shape and resolution.

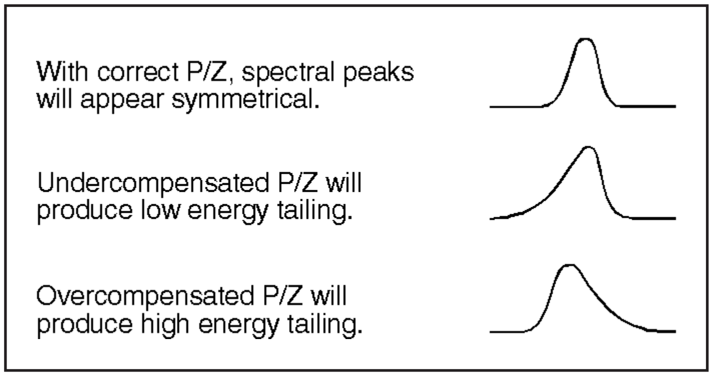


Figure 221 The Effect of Pole/Zero on a Spectral Peak

For a precise and optimum setting of the pole/zero, a scope vertical sensitivity of 50 mV/div should be used. However, most scopes will overload for a 7 V input signal when the vertical sensitivity is set for 50 mV/div. Overloading the scope input will distort the signals' recovery to the baseline.

Thus, the pole/zero will be incorrectly adjusted resulting in a loss of resolution at high count rates.[1]

When performing the manual pole/zero, set the scope vertical sensitivity to 50 mV/div, clamping the signal with the clamp box or the equivalent. The AMP signal will now be clamped, eliminating potential scope overload allowing precise pole/zero adjustment.

Pole/Zero Using a Ge Detector and a ^{60}Co Source

Adjust the position of the source so that the count rate is between 2 kcps and 25 kcps. While observing the signal at the amplifier's output connector, adjust the pole/zero control so that the trailing edge of the unipolar pulse returns to the baseline with no overshoots or undershoots, as shown in Figures 223, 222 and 224.

Some amplifier shapings may exhibit small undershoots. These arise primarily from amplifier shaping component tolerances and secondary time constants associated with the detector/preamp system. If an undershoot is present and is less than 20 mV, its impact on performance is insignificant. However, these small shaping undershoots should not be confused with pole/zero misadjustment undershoots which exhibit a much longer time constant and have a larger performance impact.

1. The Model LB1502 Schottky Clamp Box is available from Canberra to prevent this problem. The Schottky clamp is built into the Model 1510 Intergrated Signal Processor and Models 2025 and 2026 Spectroscopy Amplifiers.

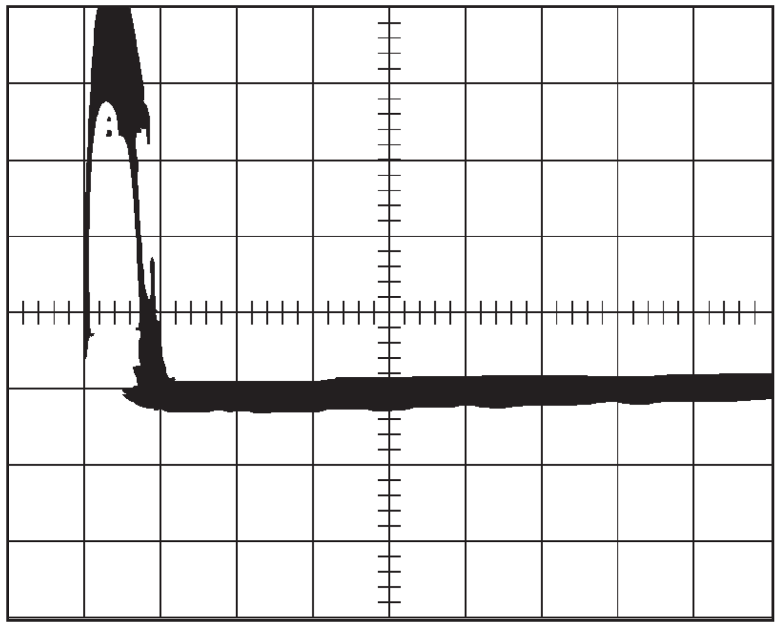


Figure 223 Correctly Adjusted Pole/Zero

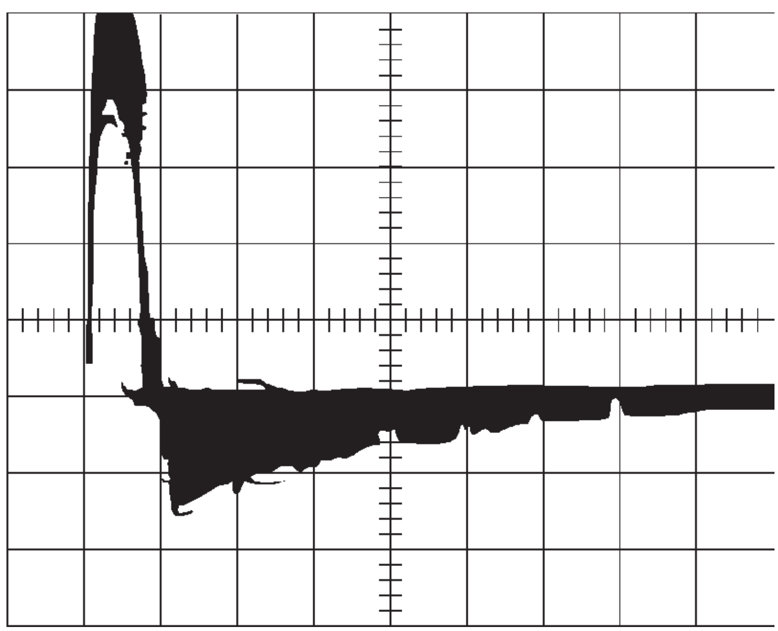


Figure 222 Undercompensated Pole/Zero

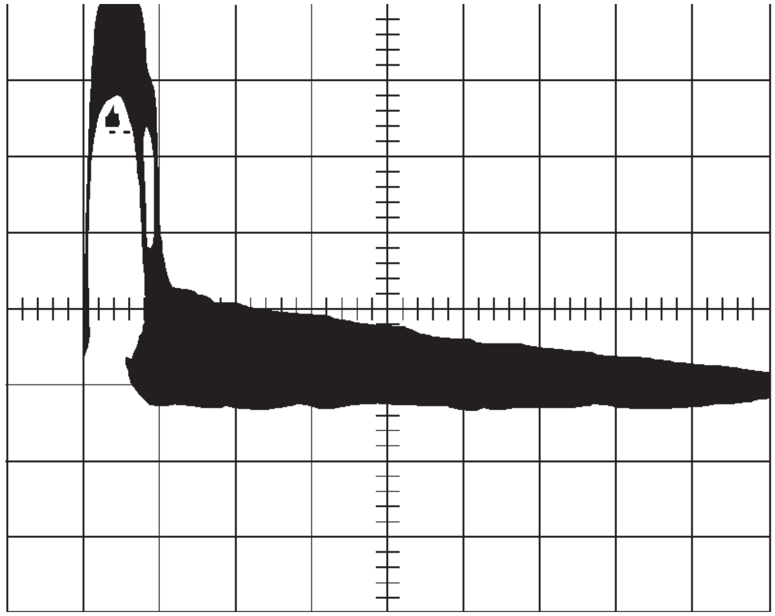


Figure 224 Overcompensated Pole/Zero

Adjusting the TRP Reset Pulse

When a Transistor Reset Preamp (TRP) is used, its Reset ouput is connected to the amplifier's Inhibit input and the pole/zero is fixed at 0. For proper operation, you'll have to make an adjustment on the TRP preamp so that the amplifier and ADC are gated off during the preamp's reset time.

The adjustment is made with an oscilloscope connected to the amplifier's output[2] Trigger the scope on the leading edge of the Reset pulse and adjust its width so that it returns to its baseline *after* the amplifier's output returns to within 2 mV of the baseline, as shown in Figures 225 and 226.

2. The Model LB1502 Schottky Clamp Box is available from Canberra. The Schottky clamp is built into the Model 1510 Intergrated Signal Processor and Models 2025 and 2026 Spectroscopy Amplifiers.

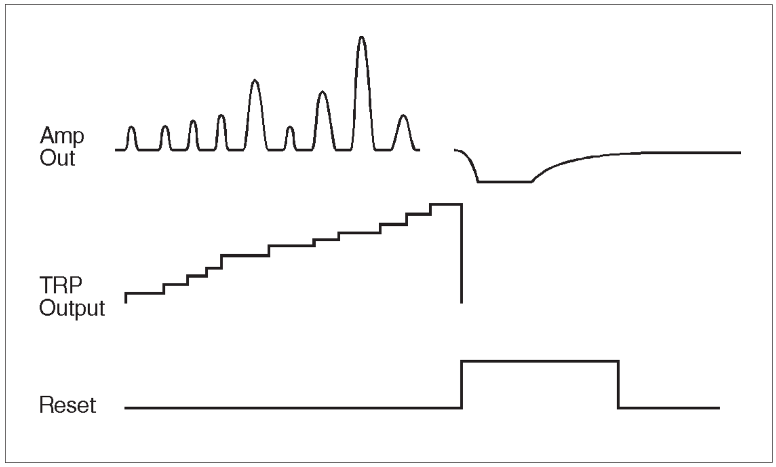


Figure 225 Amp, TRP, and Reset Signals Compared

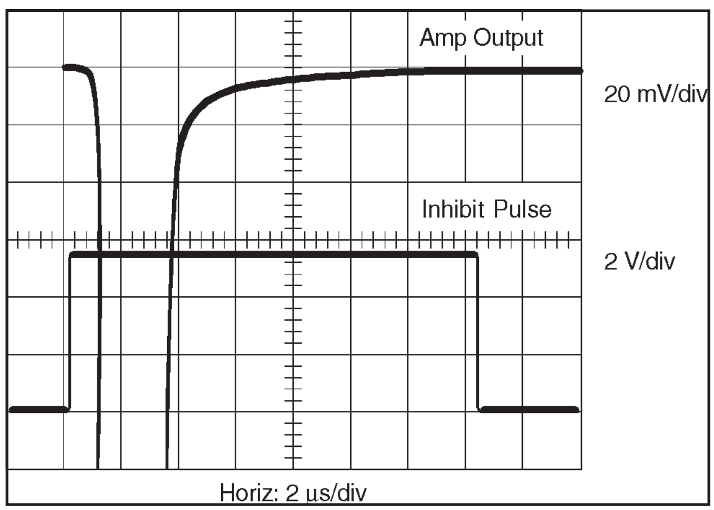


Figure 226 Setting the TRP Inhibit Pulse Width

Status Screen Entries

Though the majority of the entries in the Status Report are direct reflections of the MCA Input Definition Editor settings or the Analsysis and Acquisition application's Adjust settings, a few of them are explained in greater detail here.

Stabilizer

This section refers to adjustments for the Inspector MCA only. The Zero and Gain correction values are the numbers representing the amount of correction made to the ADC. The range of correction is 0 to 4095, with 2048 representing *no* correction. If data drift causes either the Gain or the Zero correction to reach the limit of 0 or 4095, that stabilizer function will be changed to Hold and an overrange error flag will be set. To clear the flag, set that function to *off* to clear the overrange flag (and set the value to 2048), then correct the cause of the excessive drift before returning the mode to *on*.

Power Manager

This section refers to adjustments for the Inspector MCA only.

Battery A and B Status

Bat A (or B) Status is reported as:

Good, when the battery voltage is > 5.8 V
Low, when the battery voltage is ≤ 5.8 V
Discharged, when the battery voltage is ≤ 5.5 V

When the Power Manager detects a “Discharged” battery, it will no longer use that battery port until the battery is removed (voltage detected as ≤ 0.5 V) and replaced with a battery with a voltage > 5.5 V. The Power Manager specifically looks for the battery to be removed because an unloaded battery will recover some of its voltage but will not have enough capacity to support a load for more than a few seconds.

Batteries

The line labeled “Batteries” shows the status of the Inspector’s batteries.

If this line reads “Warning”, you have only a few minutes of power left before the Inspector shuts down.

“Good” means that at least one battery’s voltage is > 5.8 V.

“Warning” means that the voltage of both batteries, or just one if only one is connected, is ≤ 5.8 V.

RAM Batt Back

The “RAM Batt Back” line shows the condition of the internal lithium battery used for maintaining data in the spectrum memory when the Inspector’s power switch is turned off. This battery, with an operating life of at least five years, is in a socket on the Inspector’s MCA Board. When its status changes from “Good” to “Disc” (discharged), replace it with a Panasonic CR2025 battery, or equivalent.

±12 V Fault

The ±12 V Fault status tells you that because there is an an overload on the +12 V or –12 V power supply, the Power Manager has put the supply into a Power Save condition. The most likely cause of this is that the preamplifier connected to the rear panel Preamp connector requires more power than the Inspector can supply. The proper remedial action is to disconnect the preamplifier's power cable and change the power mode to Battery Full or AC Full. If successful, the fault will be cleared.

E. Correcting an Efficiency Calibration for Cascade Summing

In gamma-ray counting laboratories, it is a common practice to use mixed gamma-ray standard sources for performing an empirical efficiency calibration of the detector. Nuclides such as ^{60}Co and ^{88}Y are almost invariably present in these mixed standards. This is because, the gamma rays emitted by ^{60}Co and ^{88}Y can be used to extend the efficiency calibration up to an energy of 1836 keV. ^{152}Eu may also be used due to its multiple energies and long half-life.

Note: If a mathematical efficiency calibration method such as ISOCS or LabSOCS is used instead of a source-based method, the problem of having to correct the efficiency calibration for cascade summing effects will not arise. LabSOCS and ISOCS users can therefore ignore this chapter.

Why Efficiency Calibration Correction is Needed

Unfortunately, the gamma rays emitted by ^{60}Co, ^{88}Y, or even ^{152}Eu, are affected by the phenomenon of cascade summing. As a result, counts are lost from the full energy peaks of these nuclides, and smaller detection efficiency will be measured at the gamma-ray energies.

An efficiency calibration performed using such data points affected by cascade summing will, therefore, be in error. The magnitude of the error depends on the source-detector counting geometry. The closer the source is to the detector, the larger the error due to cascade summing. Also, the larger the detector size, the larger will be the error due to cascade summing.

Efficiency errors of 10-30% are not uncommon in such scenarios. It is therefore necessary to correct the empirical efficiency calibration for cascade summing losses (or gains) to obtain the true efficiency. This section describes the procedure for correcting the efficiency calibration.

Correcting the Calibration

This procedure assumes that a spectrum has been acquired using a mixed gamma-ray standard source, and that it has been energy and shape calibrated. The mixed gamma-ray standard is assumed to contain nuclides that are affected by cascade summing. It is further assumed that a peak analysis has been performed on the spectrum, including an optional background correction.

1. Perform a Peak-to-Total Calibration for the detector, as described in “Peak-to-Total” on page 107. Alternatively, you can load a Peak-to-Total calibration file previously created for the same detector.

2. Select **Calibrate | Efficiency | By Certificate File**. Select the source certificate file for the gamma ray standard, and use it to perform an efficiency calibration. During the course of performing the calibration, display the efficiency calibration curve by clicking on the **Show** button. Depending on the counting geometry, the data points affected by cascade summing losses (such as ^{60}Co , ^{88}Y, etc.) could be conspicuously lower in efficiency. This will affect the fitted curve.

3. Complete the efficiency calibration process as described in “Calibrate” on page 92. You have now established an uncorrected empirical efficiency calibration for your specific detector and geometry. The remaining steps will guide you through the process required to correct this empirical calibration for cascade summing losses:

4. From the Analyze menu, run the Efficiency correction engine.

5. From the Analyze menu, set up the Nuclide Identification step using the NID/w Interf. Corr. algorithm. In addition to setting up the usual NID parameters, the Cascade correction computations must also be set up.

    a. Select the Geometry Composer (.GIS) file that you created for the given counting geometry. If your HPGe detector is not characterized for LabSOCS/ISOCS, you should select the closest generic detector characterization while editing the Geometry Composer parameters. For guidelines on selecting a generic detector characterization, see Appendix F, *Selecting a Generic LabSOCS Detector Characterization*, in the *Genie 2000 Customization Tools Manual*.

    b. Once a geometry file has been selected, note that the Coincidence Library field in the NID setup screen is automatically populated with the coincidence library file.

    c. Enable the Perform Cascade Correction check box.

    d. Enable the Generate Report check box.

    e. Click on the **Execute** button.

6. The NID analysis will be run, and as part of it, the cascade correction will be computed. The generated report will indicate the correction factors for those nuclides and gamma rays that are affected by cascade summing.

7. For those gamma rays that are used in the efficiency calibration and are affected by cascade summing, make a note of the correction factors given in the report.

8 Select **Calibrate | Efficiency: By Certificate File**. Select the source certificate file for the given gamma ray standard. Click the **Auto** button to populate the Energy, Efficiency, and Error (%) triplets.

9. Scroll down the list of triplets and highlight the data corresponding to gamma ray energy that is affected by cascade summing.

10. Note down the efficiency value displayed in the Peak Edits dialog, and divide by the corresponding cascade summing correction factor that was computed in Step 6.

11. Enter the corrected efficiency value in the Efficiency field of the Peak Edits dialog.

12. If a generic LabSOCS/ISOCS detector characterization had been used to compute the cascade summing correction, in addition to the uncertainties given in the source certificate for the nuclide activity, assign an uncertainty of ±15% (for ^{60}Co and ^{88}Y, the appropriate value is ±10%). Add this in quadrature to the certificate uncertainty and enter the value in the Error (%) field of the Peak Edits dialog. Click the **Accept** button.

13. Scroll down to the next gamma ray energy affected by cascade summing and repeat Steps 10 through 12.

14. After all of the data affected by cascade summing have been corrected, click on the **Show** button to display the Genie 2000 calibration curve fit. Select the appropriate polynomial fit to the efficiency data points. Click on the **OK** button when you are done.

15. In the Efficiency Calibration window, click on the **OK** button to accept the calibration. The empirical efficiency calibration has been corrected for the effect of cascade summing and should now closely represent the true efficiency. Use the Calibrate/Store function to save your corrected efficiency calibration as required.

16. At this point you may want to count the calibration source again as an unknown sample. Analyze the spectrum using the Cascade Correction option. Then compare the found line activities to the expected, certified values.

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Warranty

Canberra's product warranty covers hardware and software shipped to customers within the United States. For hardware and software shipped outside the United States, a similar warranty is provided by Canberra's local representative.

DOMESTIC WARRANTY

Canberra (we, us, our) warrants to the customer (you, your) that equipment manufactured by us shall be free from defects in materials and workmanship under normal use for a period of one (1) year from the date of shipment.

We warrant proper operation of our software only when used with software and hardware supplied by us and warrant that our software media shall be free from defects for a period of 90 days from the date of shipment.

If defects are discovered within 90 days of receipt of an order, we will pay for shipping costs incurred in connection with the return of the equipment. If defects are discovered after the first 90 days, all shipping, insurance and other costs shall be borne by you.

LIMITATIONS

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We are under no obligation to provide warranty service if adjustment or repair is required because of damage caused by other than ordinary use or if the equipment is serviced or repaired, or if an attempt is made to service or repair the equipment, by other than our personnel without our prior approval.

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