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**MAESTRO®-32 MCA Emulator for Microsoft® Windows® 2000 Professional and XP® Professional**

**A65-B32 Software User’s Manual**

**Software Version 6.0**

Printed in U.S.A. ORTEC Part No. 777800 1206 Manual Revision L

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**NOTE!**

We assume that you are thoroughly familiar with 32-bit Microsoft® Windows® usage and terminology. If you are not fully acquainted with the Windows environment, including the use of the mouse, we strongly urge you to read the Microsoft documentation supplied with your Windows software and familiarize yourself with a few simple applications before proceeding.

The convention used in this manual to represent actual keys pressed is to enclose the key label within angle brackets; for example, **<F1>**. For key combinations, the key labels are joined by a + within the angle brackets; for example, **<Alt + 2>**.

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**xii**

**INSTALLATION**

If you are installing a new multichannel buffer (MCB) in addition to **MAESTRO-32**, or if your MCB and/or new **MAESTRO-32** is accompanied by a ***CONNECTIONS-32*** Driver Update Kit (Part No. 797230), follow the installation instructions that accompany the driver update kit.

For information on installation and configuration, hardware driver activation, network protocol configuration, and building the master list of instruments accessible within **MAESTRO-32**, see Chapter 2 (page 5) and the accompanying ***ORTEC MCB CONNECTIONS-32 Hardware Property Dialogs Manual***.

**1. INTRODUCTION**

Welcome to MAESTRO-32 version 6. This latest release extends the capabilities of the world's most popular multichannel analyzer (MCA) emulation software with the addition of a command that gives you the option of using a multi-detector interface that lets you view up eight MCA windows and eight buffer windows at a time, or using the “classic,” single-window interface. In addition, the revised installation wizard provides more guidance in selecting the instrument drivers you will need. MAESTRO-32 v6 uses the GammaVision library editor so you can now create, modify, and use both **.LIB**- and **.MDB**-format (NuclideNavigator®) libraries. This release of MAESTRO also supports our new ASPECTM-927, as well as our DSPEC®-, Detective®-, Detective-EX®-, and trans-SPECTM- instrument families.

**1.1. MCA Emulation**

An MCA, in its most basic form, is an instrument that sorts and counts events in real time. This sorting is based on some characteristic of these events, and the events are grouped together into bins for counting purposes called *channels*. The most common type of multichannel analysis, and the one which is of greatest interest to nuclear spectroscopists, is *pulse-height analysis* (PHA). PHA events are signal pulses originating from a detector.1 The characteristic of interest is the pulse height or voltage, which is proportional to the particle or photon energy. An *analog- to-digital converter* (ADC) is used to convert each pulse into a channel number, so that each channel corresponds to a narrow range of pulse heights or voltages. As pulses arrive over time, the MCA collects in memory a distribution of the number of pulses with respect to pulse height (a series of memory locations, corresponding to ADC channels, will contain the number of pulses of similar, although not necessarily identical, height). This distribution, arranged in order of ascending energies, is commonly referred to as a *spectrum.* To be useful, the acquired spectrum must be available for storage and/or analysis, and is displayed on a graph whose horizontal axis represents the height of the pulse and whose vertical axis represents the number of pulses at that height, also referred to as a *histogram.*

MAESTRO-32, combined with *multichannel buffer* (MCB) hardware and a personal computer, emulates an MCA with remarkable power and flexibility. The MCB performs the actual pulse- height analysis, while the computer and operating system make available the display facility and data-archiving hardware and drivers. The MAESTRO software is the vital link that marries these components to provide meaningful access to the MCB via the user interface provided by the computer hardware.

The MAESTRO-32 MCA emulation continuously shows the spectrum being acquired, the current operating conditions, and the available menus. All important operations that need to be

1In this manual “Detector” (capitalized) means the transducer (high-purity germanium, sodium iodide, silicon surface barrier, or others) plus all the electronics including the ADC and histogram memory. The transducers are referenced by the complete name, e.g., high-purity germanium (HPGe) detector.

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**2**performed on the spectrum, such as peak location, insertion of *regions of interest* (ROIs), and display scaling and sizing are implemented with both the keyboard (accelerators) and mouse (toolbar and menus). Spectrum peak searching, report generation, printing, archiving, calibration, and other analysis tools are available from the menus. Some menu functions have more than one accelerator so that both new and experienced users will find the system easy to use. This version of MAESTRO continues to offer the flexibility of constructing automated sequences or “job streams.”

*Buffers* are maintained in the computer memory to which one spectrum can be moved for display and analysis, either from Detector memory or from disk, while another spectrum is collected in the Detector. As much as possible, the buffer duplicates in memory the functions of the Detector hardware on which a particular spectrum was collected. Data can also be analyzed directly in the Detector hardware memory, as well as stored directly from the Detector to disk. This release of MAESTRO allows you to open up to eight Detector windows and eight buffer windows simultaneously.

MAESTRO-32 uses the network features of Windows so you can use and control ORTEC MCB hardware anywhere on the network.

**1.2. About This User Manual**

This manual is intended to be used in conjunction with the *ORTEC MCB* ***CONNECTIONS-32*** *Hardware Property Dialogs Manual* (Part No. 931001, hereinafter called the *MCB Properties Manual*) included with MAESTRO. The hardware property dialogs manual contains the hardware setup information for our ***CONNECTIONS***-compliant MCBs (these dialogs are discussed in more detail in Section 4.2.7). In addition, it provides detailed instructions on installing ***CONNECTIONS*** software, building the *Master Instrument List* of all ORTEC MCBs connected to your PC locally and across a network, and selecting the proper protocol for communicating with networked ORTEC instruments.**1.3. PC Requirements**

MAESTRO-32 (A65-B32) is designed for use on PCs that run Microsoft Windows 2000 Professional and XP Professional. For PCs with a memory-mapped MCB interface, no other interface can use memory mapped into page D of the PC memory map (see the *MCB Properties Manual*). Data can be saved or retrieved from any number of removable or fixed drives.

*1. INTRODUCTION***1.4. Detectors**

Front-end acquisition hardware supported includes ORTEC’s ***CONNECTIONS-32***-compliant MCBs interfaced to the computer with an appropriate adapter card and cable, or using the printer-port adapter. In a network, the ORSIMTM III can also be used to connect MCBs directly to the Ethernet.

MAESTRO-32 can control and display an almost unlimited number of Detectors, either local or networked; the limit depends on system resources. These can be any mixture of the following types of units, properly installed and hardware-configured: ASPECTM-927; instruments in the DSPEC, Detective, Detective-EX, and trans-SPEC series; digiBASE®; DSP-ScintTM; digiDART®; Models 916A; 917; 918A; 919; 920; 921; 926; 919E; 920E; 921E; 92X; 92X-II; NOMADTM Plus; NOMAD; microBASETM; MicroNOMAD®; OCTÊTE® PC; TRUMPTM; MicroACETM; DART®; MatchMakerTM; M3CA; MiniMCA-166; and other new modules. MAESTRO-32 will correctly display and store a mixture of different sizes of spectra. Multiple MAESTRO windows can be open at one time, displaying Detectors, buffers, spectrum files from disk, and data analyses. The larger and higher-resolution your monitor, the more windows you can comfortably view.

Expanding the system for more Detectors (as well as enabling more than one device on a Model 919) is easy. When the system incorporates a Model 920- or OCTÊTE PC-type MCB, the system can also be expanded using the internal multiplexer/router. In the Model 920 or OCTÊTE PC, the MCB memory is divided into *segments* so that each input has an equal share of the MCB memory, the size of which matches the conversion gain or maximum channel number of the ADC. Note that in the multiple-input MCBs like the Model 919 or Model 920, all inputs are treated as different Detectors. Therefore, all ***CONNECTIONS*** software will address one physical 919 unit as four distinct Detectors.

**1.5. Detector Security**

Detectors can be protected from destructive access by password. If your application supports detector locking and unlocking, passwords can be set within the application. Once a password is set, no application can start, stop, clear, change presets, change ROIs, or perform any command that affects the data in the detector if the password is not known. The current spectrum and settings for the locked device can be viewed read-only. The password is required for any destructive access, even on a network. This includes changing instrument descriptions and IDs with the MCB Configuration program.

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**2. INSTALLING MAESTRO-32**

If your MAESTRO CD is accompanied by a ***CONNECTIONS-32*** Driver Update Kit (Part No. 797230), follow the installation instructions that accompany the update kit, which supersede the instructions below.

**NOTE** For systems using Windows 2000 or XP, ORTEC ***CONNECTIONS-32*** software products

are designed to operate correctly only for users with full Administrator privileges. Limiting user privileges could cause unexpected results.

1. Insert the MAESTRO-32 CD. If it does not autorun, go to the Windows Taskbar and click on

**Start**, then **Run...**. In the Run dialog, enter **D:\Disk 1\Setup.exe** (use your CD-ROM drive designator instead of **D:**), then click on **OK**. This will start the installation wizard; click on **Next** and follow the wizard prompts.

2. On the Instrument Setup page, mark the checkbox(es) that corresponds to the instrument(s)

installed on your PC, as shown in Fig. 1. To see more information on each instrument family, click on the family name and read the corresponding **Item Description** on the right side of the dialog.

If this is a MAESTRO upgrade and not a first-time installation, you probably already have ORTEC ***CONNECTIONS-32*** instruments attached to your PC. If so, they will be included on the **Local Instrument List** at the bottom of the dialog, along with any new instruments. Existing (previously configured before this upgrade) instruments do not have to be powered on during this part of the installation procedure.

**NOTE** You can enable other device drivers later, as described in Section 2.2.

3. If you want other computers in a network to be able to use your MCBs, leave the **Allow**

**other computers to use this computer’s instruments** marked so the MCB Server program will be installed. Most users will leave this box marked for maximum flexibility.

**NOTE** If your PC uses Windows XP and you wish to use or share ORTEC MCBs across a

network, ***be sure to read Section 2.1***.

4. Click on **Done**.

5. At the end of the wizard, restart the PC. Upon restart, remove the MAESTRO CD from the

drive.

6. After all processing for new plug-and-play devices has finished, you will be ready to

configure the MCBs in your system. Connect and power on all local and network ORTEC instruments that you wish to use, as well as their associated PCs. Otherwise, the software will

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**Fig. 1. Choose the Interface for Your Instruments.**

not detect them during installation. Any instruments not detected can be configured at a later time.

7. If any of the components on the network is a DSPEC Plus, ORSIM II or III, MatchMaker, DSPEC, 92X-II, 919E, 920E, 921E, or other module that uses an Ethernet connection, the network default protocol must be set to the **IPX/SPX Compatible Transport with NetBIOS** selection on all PCs that use ***CONNECTIONS*** hardware. For instructions on making this the default, see the network protocol setup discussion in the *MCB Properties Manual*..

8. To start the MCB Configuration program on your PC, click on **Start**, **Programs**,

**MAESTRO 32**, and **MCB Configuration**. Alternatively, you can go to **c:\Program Files\Common Files\ORTEC Shared\Umcbi** and run **MCBCON32.EXE**. The MCB Configuration program will locate all of the (powered-on) ORTEC MCBs attached to the local PC and to (powered-on) network PCs, display the list of instruments found, allow you to enter customized instrument numbers and descriptions, and optionally write this configuration to those other network PCs, as described in detail in the software installation

chapter of the *MCB Properties Manual*. *If this is the first time you have installed ORTEC software on your system, be sure to refer to the MCB Properties Manual for information on initial system configuration and customization*.

MAESTRO-32 is now ready to use, and its MCB pick list can be tailored to a specific list of instruments (see Section 4.4.5).

**2.1. If You Have Windows XP Service Pack 2 and Wish to Share Your Local ORTEC MCBs Across a Network**

**NOTE** If you do not have instruments connected directly to your PC or do not wish to share

your instruments, this section does not apply to you.

If you have installed Windows XP Service Pack 2 and have fully enabled the Windows Firewall, as recommended by Microsoft, the default firewall settings will prevent other computers from accessing the ***CONNECTIONS-32*** MCBs connected directly to your PC. To share your locally connected ORTEC instruments across a network, you must enable **File and Printer Sharing** on the Windows Firewall Exceptions list. To do this:

1. From the Windows Control Panel,

access the **Windows Firewall** entry. Depending on the appearance of your Control Panel, there are two ways to do this. Either open the **Windows Firewall** item (if displayed); or open the **Network Connections** item then choose **Change Windows Firewall Settings**, as illustrated in Fig. 2. This

**Fig. 2. Change the Firewall Settings.** will open the Windows Firewall dialog.

2. Go to the Exceptions tab, then click to mark the **File and Printer Sharing** checkbox (Fig. 3).

**NOTE** This affects only the ability of other users on your network to access your MCBs.

You are *not required* to turn on **File and Printer Sharing** in order to access networked MCBs (as long as those PCs are configured to grant remote access).

3. To learn more about exceptions to the Windows Firewall, click on the **What are the risks of**

**allowing exceptions** link at the bottom of the dialog.

4. Click on **OK** to close the dialog. No restart is required.

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**Fig. 3. Turn on File and Printer Sharing.**

**2.2. Enabling Additional ORTEC Device Drivers**

You can enable other device drivers later with the Windows **Add/Remove Programs** utility on the Control Panel. Select **Connections 32** from the program list, choose **Add/Remove**, then elect to **Modify** the software setup. This will reopen the Instrument Setup dialog so you can mark or unmark the driver checkboxes as needed, close the dialog, then re-run the MCB Configuration program as described in Step 8 on page 6.

**3. DISPLAY FEATURES**

This chapter tells how to start MAESTRO, explains its display features, discusses the role of the mouse and keyboard, covers the use of the Toolbar and sidebars, discusses how to change to different disk drives and folders, and shows how to use additional features such as Help.

**3.1. Startup**

To start MAESTRO, click on **Start** on the Windows Taskbar, then on **Programs**, **MAESTRO 32**, and **MAESTRO for Windows** (see Fig. 4). You can also start MAESTRO by clicking on **Start**, **Run...**, and entering a command line in the **Run** dialog, with or without arguments, as described in Section A.1.

**3.2. Screen Features**

Figure 5 shows MAESTRO’s principal screen features:

**1. Title bar**, showing the program name and the source of the currently active spectrum

window. There is also a title bar on each of the spectrum windows showing the source of the data: either the Detector name or the word “Buffer” with the spectrum name. On the far right are the standard Windows Minimize, Maximize, and Close buttons.

**2. Menu Bar**, showing the available menu commands (which can be selected with either the

mouse or keyboard); these functions are discussed in detail in Chapter 4.

**3. Toolbar**, beneath the Menu Bar, containing icons for recalling spectra, saving them to disk,

starting and stopping data acquisition, and adjusting the vertical and horizontal scale of the active spectrum window.

**4. Detector List**, on the Toolbar, displaying the currently selected Detector (or the buffer).

Clicking on this field opens a list of all Detectors currently on the PC’s MAESTRO Detector pick list, from which you can open Detector and/or buffer windows. When you select the buffer or a Detector from the list, a new spectrum window opens, to a limit of eight. If you selected a Detector, the spectrum in its memory (if any) is displayed.

**Fig. 4. Starting MAESTRO.**

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**Fig. 5. Main MAESTRO Screen Features.**

**5. Spectrum Area**, which displays multiple *spectrum windows* — up to eight Detector

windows and eight buffer windows simultaneously. When you attempt to open a ninth spectrum or buffer window, MAESTRO will ask if you wish to close the oldest window of that type. Alternatively, you can turn off the **Multiple Windows** feature and run in the original one-window-at-a-time mode.

Spectrum windows can be moved, sized, minimized, maximized, and closed with the mouse, as well as tiled horizontally or vertically from the **Window** menu. When more than one window is open, only one is active — available for data manipulation and analysis — at a time. The title bar on the active window will normally be a brighter color than those on the inactive windows (the color scheme will depend on the desktop colors you have selected in Windows Control Panel). Detector windows or buffer windows containing a spectrum from an MCB will list the Detector name on the title bar. If you have opened a spectrum file into a buffer window, the title bar will display the filename. To switch windows, click on the

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window that you wish to activate, use the **Window** menu (see Section 4.7), or cycle between windows by pressing **<Ctrl + Tab>**.

Each spectrum window contains an **Expanded Spectrum View** and a **Full Spectrum View** (see items 6 and 7 below).

**6.** The **Expanded Spectrum View** shows all or part of the full histogram; this allows you to zoom in on a particular part of the spectrum and see it in more detail. You can change the expanded view vertical and horizontal scaling, and perform a number of analytical operations such as peak information, marking ROIs, or calibrating the spectrum. This window contains a vertical line called a *marker* that highlights a particular position in the spectrum. Information about that position is displayed on the Marker Information Line (see item 10 below).

**7.** The **Full Spectrum View** shows the full histogram from the file or the Detector memory. The vertical scale is always logarithmic, and the window can be moved and sized (see Section 3.5.4). The Full Spectrum View contains a rectangular window that marks the portion of spectrum now displayed in

**Fig. 6. Contents of Expanded Spectrum View are Highlighted in Full Spectrum View.** the Expanded Spectrum View (see Fig. 6). To quickly move to different part of the spectrum, just click on that area in the Full Spectrum View and the expanded display updates immediately at the new position.

**8. ROI Status Area**, on the right side of the menu bar, indicates whether the ROI marking

mode is currently **Mark** or **UnMark**. This operates in conjunction with the **ROI** menu commands and arrow keys (see Section 4.5).

**9. Status Sidebar**, on the right side of the screen, provides information on the current Detector presets and counting times, the time and date, and a set of buttons for moving easily between peaks, ROIs, and library entries (see Section 3.6).

**10. Marker Information Line**, beneath the spectrum, showing the marker channel, marker

energy, and channel contents.

**11. Supplementary Information Line**, below the Marker Information Line, used to show

library contents, the results of certain calculations, warning messages, or instructions.

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2These replace the **Narrower/Wider** and **Shorter/Taller** commands in older versions of MAESTRO.

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**3.3. Spectrum Displays**

The Full and Expanded Spectrum Views show, respectively, a complete histogram of the current spectrum (whether from a Detector or the buffer) and an expanded view of all or part of the spectrum. These two windows are the central features of the MAESTRO screen. All other windows and most functions relate to the spectrum windows. The Full Spectrum View shows the entire data memory of the Detector as defined in the configuration. In addition, it has a marker box showing which portion of the spectrum is displayed in the Expanded Spectrum View.

The Expanded Spectrum View contains a reverse-color marker line at the horizontal position of the pixel representing the marker channel. This marker can be moved with the mouse pointer, as described in Section 3.5.1, and with the **<**7**>/<**6**>** and **<PgUp>/<PgDn>** keys.

Note that in both spectrum windows the actual spectrum is scaled to fit in its window as it appears on the display. Also, since both windows can be arbitrarily resized (a feature of Windows), it follows that the scaling is not always by powers of two, nor even integral multiples. Therefore, MAESTRO uses algorithms to scale the window properly and maintain the correct peak shapes regardless of the actual size of the window. The vertical scale in the Full Spectrum View is always logarithmic. In the Expanded Spectrum View, use the menus, right- mouse-button menu, accelerator keys, and Toolbar to choose between logarithmic and linear scales, change both axis scales by zooming in and out, and select which region of the spectrum to view.

The spectrum display can be expanded to show more detail or contracted to show more data using the **Zoom In** and **Zoom Out** features.2 Zooming in and out can be performed using the Toolbar buttons, the **Display** menu commands, or the *rubber rectangle* (see Section 3.5.3). The rubber rectangle allows the spectrum to be expanded to any horizontal or vertical scale. The baseline or “zero level” at the bottom of the display can also be offset with this tool, allowing the greatest possible flexibility in showing the spectrum in any detail.

The Toolbar and **Display** menu zoom commands offer a quick way to change the display. These change both the horizontal and vertical scales at the same time. **Zoom In** decreases the horizontal width by about 6% of full width (ADC conversion gain) and halves the vertical scale. The **Zoom In** button and menu item zoom to a minimum horizontal scale of 6% of the ADC conversion gain. **Zoom Out** increases the horizontal width by about 6% of full width (ADC conversion gain) and doubles the vertical scale.

The accelerator keys have also changed. **Keypad<+>** and **Keypad<**!**>**, respectively, duplicate the **Zoom In** and **Zoom Out** Toolbar buttons and **Display** menu commands. The **<F5>/<F6>**

and **<**9**>/<**8**>** keys change the vertical scale by a factor of two without changing the horizontal scale. The **<F7>/<F8>** and ***keyboard* <**!**>/<+>** keys change the horizontal scale by a factor of two without changing the vertical scale.

Depending on the expansion or overall size of the spectrum, all or part of the selected spectrum can be shown in the expanded view. Therefore, the number of channels might be larger than the horizontal size of the window, as measured in pixels. In this case, where the number of channels shown exceeds the window size, all of the channels cannot be represented by exactly one pixel dot. Instead, the channels are grouped together, and the vertical displacement corresponding to the maximum channel in each group is displayed. This maintains a meaningful representation of the relative peak heights in the spectrum. For a more precise representation of the peak shapes displaying all available data (i.e., where each pixel corresponds to exactly one channel), the scale should be expanded until the number of channels is less than or equal to the size of the window.

Note that the marker can be moved by no less than one pixel or one channel (whichever is greater) at a time. In the scenario described above, where there are many more memory channels being represented on the display than there are pixels horizontally in the window, the marker will move by more than one memory channel at a time, even with the smallest possible change as performed with the **<**6**>** and **<**7**>** keys. If true single-channel motions are required, the display must be expanded as described above.

In addition to changing the scaling of the spectrum, the colors of the various spectrum features (e.g., background, spectrum, ROIs) can be changed using the **Display** menu.

**3.4. The Toolbar**

The row of buttons below the Menu Bar provides convenient shortcuts to some of the most common MAESTRO menu functions.

The **Recall** button retrieves an existing spectrum file. This is the equivalent of selecting

**File/Recall** from the menu.

**Save** copies the currently displayed spectrum to disk. It duplicates the menu functions

**File/Save** or **File/Save As...** (depending on whether the spectrum was recalled from disk, and whether any changes have been made to the spectrum window since the last save).

**Start Acquisition** starts data collection in the current Detector. This duplicates

**Acquire/Start** and **<Alt + 1>**.

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the marker. This duplicates **ROI/Clear** and **<Delete>**.

The next section of the Toolbar (Fig. 7) contains the buttons that control the spectrum’s vertical scale. These commands are also on the **Display** menu. In addition, vertical scale can be adjusted by zooming in with the mouse (see Fig. 13).**Vertical Log/Lin Scale** switches between logarithmic and linear

**Fig. 7. Vertical Scaling Section of Toolbar.**

until the largest peak shown is at its maximum height without overflowing the display. Its keyboard duplicate is **Keypad<\*>**.

The field to the left of these two buttons displays **LOG** if the scale is logarithmic, or indicates the current vertical full-scale linear value.

The horizontal scaling section (Fig. 8) follows next. It includes a field that shows the current window width in channels, and the **Zoom In**, **Zoom Out**, **Center,** and **Baseline Zoom** buttons. These commands are also on the **Display** menu. In addition, horizontal scale can be adjusted by zooming in with the mouse (see Fig. 13).

**Fig. 8. Horizontal Scaling Section of Toolbar.**

**Zoom In** decreases the horizontal full scale of the Expanded Spectrum View according to

**Stop Acquisition** stops data collection. This duplicates **Acquire/Stop** and **<Alt + 2>**.

**Clear Spectrum** clears the detector or file spectrum from the window. This duplicates

**Acquire/Clear** and **<Alt + 3>**.

**Mark ROI** automatically marks an ROI in the spectrum at the marker position, according

to the criteria in Section 4.5.4. This duplicates **ROI/Mark Peak** and **<Insert>**.

**Clear ROI** removes the ROI mark from the channels of the peak currently selected with

scaling. When switching from logarithmic to linear, it uses the previous linear scale setting. Its keyboard duplicate is **Keypad</>**.

**Vertical Auto Scale** turns on the *autoscale* mode, a linear scale that automatically adjusts

the discussion in Section 3.3, so the peaks appear “magnified.” This duplicates **Display/Zoom In** and **Keypad<+>**.

The right-most part of the Toolbar is a drop-down list of the available Detectors (Fig. 9). To select a Detector or the buffer, click in the field or on the down-arrow beside it to open the list, then click on the desired entry. The sidebar will register your selection.

Finally, note that as you pause the mouse pointer over the center of a Toolbar button, a pop-up *tool tip* box opens, describing the button’s function (Fig. 10).

**3.5. Using the Mouse**

The mouse can be used to access the menus, Toolbar, and sidebars; adjust spectrum scaling; mark and unmark peaks and ROIs; select Detectors; work in the dialogs — every function in MAESTRO except text entry. For most people, this might be more efficient than using the keyboard. The following sections describe specialized mouse functions.

**Zoom Out** increases the horizontal full scale of the Expanded Spectrum View according

to the discussion in Section 3.3, so the peaks appear reduced in size. This duplicates **Display/Zoom Out** and **Keypad<**!**>**.

**Center** moves the marker to the center of the screen by shifting the spectrum without

moving the marker from its current channel. This duplicates **Display/Center** and **Keypad<5>**.

**Baseline Zoom** keeps the baseline of the spectrum set to zero counts.

**Fig. 9. Drop-Down Detector List.**

**Fig. 10. Tool Tip.**

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**3.5.1. Moving the Marker with the Mouse**

To position the marker with the mouse, move the pointer to the desired channel in the Expanded Spectrum View and click the left mouse button once. This will move the marker to the mouse position. This is generally a much easier way to move the marker around in the spectrum than using the arrow keys, although you might prefer to use the keys for specific motions (such as moving the marker 1 channel at a time).

**3.5.2. The Right-Mouse-Button Menu**

Figure 11 shows the right-mouse-button menu. To open it, position the mouse pointer in the spectrum display, click the right mouse button, then use the left mouse button to select from its list of commands. Not all of the commands are available at all times, depending on the spectrum displayed and whether the rubber rectangle is active. Except for **Undo Zoom In**, all of these func-tions are on the Toolbar and/or the Menu Bar (**Peak Info** and **Sum** are only on the Menu Bar, under **Calculate**). See Section 4.8 for more information on the commands.

**3.5.3. Using the “Rubber Rectangle”**

The *rubber rectangle* is used for selecting a particular area of interest within a spectrum. It can be used in conjunction with the right-mouse- button menu in Fig. 11 for many functions. To draw a rubber rectangle:

1. Click and hold the left mouse button; this anchors the starting corner

of the rectangle.

2. Drag the mouse diagonally across the area of interest. As you do this,

the mouse will be drawing a reverse-color rectangle bisected by the marker line. Note that when drawing a rubber rectangle, the marker line combines with a horizontal line inside the rectangle to form crosshairs (Fig. 12). They make it easy to select the center channel in the area of interest — this might be the center of an ROI that you wish to mark or unmark, a portion of the spectrum to be summed, or a peak for which you want detailed information.

3. Release the mouse button; this anchors the ending corner of

the rectangle.

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**Fig. 12. The Rubber Rectangle’s Crosshairs.**

**Fig. 11. Right- Mouse-Button Menu for Spectra.**

4. Click the right mouse button to open its menu, and select one of the available commands.

Once an area is selected, the commands can also be issued from the Toolbar, Menu Bar, Status Sidebar, or keyboard.

As an example, Fig. 13 illustrates the process of marking a region with a rubber rectangle and zooming in using the right-mouse-button menu.

**Fig. 13. Zooming In Using the Rubber Rectangle and Right-Mouse- Button Menu.**

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**3.5.4. Sizing and Moving the Full Spectrum View**

To change the horizontal and vertical size of the Full Spectrum View, move the mouse pointer onto the side edge, bottom edge, or corner of the window until the pointer changes to a double-sided arrow (see Fig. 14). Click and hold the left mouse button, drag the edge of the window until it is the size you want, then release the mouse button.

To move the Full Spectrum View to a different part of the screen, move the mouse pointer onto the top edge of the window until the pointer changes to a four-sided arrow (see Fig. 14). Click and hold the left mouse button, drag the window to its new location, and release the mouse button.

**Fig. 14. Two-Sided Pointer for Sizing Full Spectrum View, and Four-Sided Pointer for Moving Window.**

**3.6. Buttons and Boxes**

This section describes MAESTRO’s radio buttons, indexing buttons, and checkboxes. To activate a button or box, just click on it.

**Radio buttons** (Fig. 15) appear on many MAESTRO dialogs, and allow only one of the choices to be selected.

**Checkboxes** (Fig. 16) are another common feature, allowing one or more of the options to be selected at the same time.

The **ROI**, **Peak**, and **Library** indexing buttons on the Status Sidebar are useful for rapidly locating ROIs or peaks, and for advancing between entries in the library. When the last item in either direction is reached, the computer beeps and MAESTRO posts a “no more” message on the Supplementary Information Line. If a library file has not been loaded or the Detector is not calibrated, the **Library** buttons are disabled and shown in gray.

**Fig. 16. Checkboxes.**

The indexing buttons are displayed in two different ways, depending on whether MAESTRO is in Detector or buffer mode. This is shown in Fig. 17.

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**Fig. 15. Radio Buttons.**

In Detector mode, the buttons appear at the bottom of the Status Sidebar. In buffer mode, the buttons are overlaid where the **Presets** and indexing buttons are displayed in Detector mode.

The **ROI**, **Peak**, and **Library** buttons function the same in both modes. In buffer mode, the additional features are the ability to insert or delete an ROI with the **Ins** and **Del** buttons, respectively (located between the **ROI** indexing buttons); and to display the peak information for an ROI with the **Info** button (located between the **Peak** indexing arrows).

The **Library** buttons are useful after a peak has been located to advance forward or backward through the library to the next closest library entry. Each button press advances to the next library entry and moves the marker to the corresponding energy.

Instead of using the **Peak** buttons to index from a previously identified peak, position the marker anywhere in the spectrum and click on the **Library** buttons to locate the entries closest in energy to that point. If a warning beep sounds, it means that all library entries have been exhausted in that direction, or that the spectrum is not calibrated. In any case, if an appropriate peak is available at the location of the marker, data on the peak are displayed on the Marker Information Line at the bottom of the screen.

**Fig. 17. Indexing Buttons (Detector mode, top; buffer mode, bottom).**

The **ROI** and **Peak** indexing buttons are duplicated by **<Shift+** 7**>**/ **<Shift+** 6**>** and **<Ctrl+** 7**>**/ **<Ctrl+** 6**>**, respectively. The **Library** buttons are duplicated by **<Alt+** 7**>**/**<Alt+** 6**>**. The **Del** button function is duplicated by the **<Delete>** key and **Clear ROI** on the menus and Toolbar. The **Ins** button has the same function as the **<Insert>** key and **Mark ROI** on the menus and Toolbar. The **Info** button duplicates the **Calculate/Peak Info** command, **Peak Info** on the right-mouse-button menu, and double-clicking in the ROI.

**3.7. Opening Files with Drag and Drop**

Several types of files can be selected and loaded into MAESTRO using the Windows *drag-and- drop* feature. The file types are: spectra (**.SPC**, **.AN1**, **.CHN**), library (**.LIB**), and region of interest (**.ROI**).

The drag-and-drop file is handled the same as a read (recall) operation for that type of file. For spectra, this means a buffer window is opened, the file is loaded into it, and the spectrum is displayed. Library files become the working library files. The ROIs saved in an **.ROI** file are read and the regions set.

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To drag and drop, open MAESTRO and Windows Explorer, and display both together on the screen. Locate a file in Explorer such as **DEMO.CHN**. Now click and hold the left mouse button, move the mouse (along with the file “ghost”) to the MAESTRO window, and release the mouse button. The spectrum file will open as if you had recalled it from within MAESTRO.

**3.8. Associated Files**

When MAESTRO is installed, it registers the spectrum files in Windows so they can be opened from Windows Explorer by double-clicking on the filename. The spectrum files are displayed in WINPLOTS. These files are marked with a spectrum icon ( ) in the Explorer display. The **.JOB** files ( ) are also registered, and open in Windows Notepad.

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**3.9. Editing**

Many of the text entry fields in the MAESTRO dialogs support the Windows editing functions on the right-mouse-button menu. Use these functions to copy text from field to field with ease, as well as from program to program. Position the mouse pointer in the text field and click the right mouse button to open the menu shown in Fig. 18. Select a function from the menu with the left mouse button.

**Fig. 18. Right- Mouse-Button Menu for Dialogs.**

**4. MENU COMMANDS**

This chapter describes the MAESTRO-32 menu commands and their associated dialogs. As is customary for Windows menus, the accelerator(s) (if any) are shown to the right of the menu function they duplicate. Also, the underlined letter in the menu item indicates a key that can be used together with the **<Alt>** key for quick access in the menu. (So, for example, the **Compare..**. dialog under **File** can be reached with the key sequence **<Alt + F>**, **<Alt + C>**.) The ellipsis (**...**) following a menu selection indicates that a dialog is displayed to complete the function. Finally, a small arrow (“<”) following a menu selection means a submenu with more selections will be shown. The menus and commands covered in this chapter, in the order they appear on the menu bar, are:

**File** (page 23)

Settings... Recall... Save Save As... Export... Import... Print... ROI Report... Compare... Exit About MAESTRO...

**Acquire** (page 38)

Start Alt+1 Stop Alt+2 Clear Alt+3 Copy to Buffer Alt+5 Download Spectra View ZDT Corrected F3 MCB Properties...

**Calculate** (page 82)

Settings... Calibration... Peak Search Peak Info Input Count Rate Sum Smooth Strip...

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**22Services** (page 90) JOB Control... Library file <

Select Peak Select File Sample Description... Lock/Unlock Detector... Edit Detector list...

**ROI** (page 95)

Off F2 or Alt+O Mark F2 or Alt+M UnMark F2 or Alt+U Mark Peak Insert Clear Delete Clear All Auto Clear Save File... Recall File...

**Display** (page 98)

Detector... Ctrl+<Fn> Detector/Buffer F4 or Alt+6 Logarithmic Keypad( / ) Automatic Keypad( \* ) Baseline Zoom Zoom In Keypad( + ) Zoom Out Keypad( - ) Center Keypad( 5 ) Full View Isotope Markers Preferences < Points Fill ROI Fill All Spectrum Colors... Peak Info Font/Color...

**Window** (page 103)

Cascade Tile Horizontally Tile Vertically Arrange Icons Auto Arrange Multiple Windows [List of open Detector and buffer windows]

**Right-Mouse-Button Menu** (page 104)

Start Stop Clear Copy to Buffer Zoom In Zoom Out Undo Zoom In Mark ROI Clear ROI Peak Info Input Count Rate SumMCB Properties

**4.1. File**

The **File** menu is shown in Fig. 19.

**4.1.1. Settings...**

The **File Settings** dialog allows you to specify how the spectrum data are saved, exported, and imported; and to set the directories for file types used by MAESTRO.

**4.1.1.1. General**

The entries on this tab (Fig. 20) control the default spectrum file format and sample description to be saved with the spectrum. You can also activate the ask-on-save feature for the sample description so it can be modified before the spectrum is saved.

**Fig. 19. File Menu.**

When you finish setting the parameters in this dialog and click on **OK**, these settings will be used until changed.

The file types are integer **.CHN**, integer**.SPC** floating-point **.SPC**, and ASCII **.SPE**. The **.CHN** file format is the format used by all versions of MAESTRO. It is the simplest format and, therefore, the easiest to read with other programs. It does not contain the analysis parameter data, the complete calibration, or other data needed for the nuclide analysis. The format is described in the *ORTEC Software File Structure Manual for DOS and Windows® Systems* (Part No. 753800, hereinafter called the *File Structure Manual*).

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The two **.SPC** formats, integer and floating-point, are identical except for the format of the spectrum data. The integer **.SPC** format should be used unless the files are to be used by earlier versions of ORTEC programs. The **.SPC** files written by MAESTRO con- tain the energy calibration data and the hardware parameters. The integer format stores the spectrum as 4-byte integers and the floating-point format uses the 4-byte exponential format used in the hardware math coprocessor (e.g., 80387) and most languages for the PC. The analysis and calibration

**Fig. 20. General Tab.** formats are defined in the *File Structure Manual*.

**Sample Description** allows you to designate the default sample description to be saved with the spectrum (128-character maximum for **.SPC** files; 63 characters for **.CHN** files). If you also mark the corresponding **Ask on Save** checkbox, this description will be presented for acceptance or modification when the spectrum is saved. This is a time-saver that lets you enter the common descriptors for a group of samples ahead of time then add the unique descriptors on a sample-by-sample basis after acquisition.

**4.1.1.2. Export**

Click on the **Export** tab to display the screen shown in Fig. 21. The program, arguments, and file directory to be used when the **Export** function is selected are specified here.

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Choose any program3 that can accept the spectrum filename as an argument on the command line. Use the **Browse...** button to automatically select the complete proper path for the program.

**Arguments** The **Arguments** to the program can be specified as directly entered character strings or you can select from the list of “macros” shown in Fig. 22. The list is displayed by clicking on the arrow button to the right of the **Arguments** field. Entries (macros or direct) must be separated by spaces to be read as separate arguments.

***File Path Name*** This will insert the complete file pathname (e.g., **c:\user\spectrum\test.chn**) into the dialog box. The filename is the name selected in the filename entry dialog.

***File Base Name*** This will insert the file path name *without* the extension (e.g., **c:\user\spectrum\test**) into the dialog box. The filename is the name selected in the filename entry dialog. The extension can be entered manually after the macro (e.g., **$(FullBase).CHN**) into the dialog box. *Note that the “dot” ( . ) must also be entered*. Related filenames can also be made by adding characters before the “dot” (e.g., **$(FullBase)A.CHN**).

***Short Name*** This will insert the filename (e.g., **test.CHN**) into the dialog box. The filename is the name selected in the filename entry dialog. File names can be constructed as **$(file base).$(file extension)**.

3Any executable program that can be executed from the Windows **Run** command can be selected, including DOS batch commands.

**25 Fig. 21. Export Tab.**

**Fig. 22. Export Argument Macros.**

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***Short Base*** This will insert the base filename (e.g., **test**) into the dialog box. The file base name is the name selected in the filename entry dialog.

***File Extension*** This will insert the file extension (e.g., **CHN**) into the dialog box. The file extension is the name selected in the filename entry dialog. *Note that the “dot” is not included*. Any manually inserted input of the macro form (**$(xxx)**) will be included in the argument list without changes.

**Initial Directory** The initial directory for the program to use can be specified as directly entered character strings or the user can select from the list of macros in Fig. 23. The list is displayed by clicking on the arrow button to the right of the **Initial Directory** field.

***File Directory*** This is the directory selected in the filename selection dialog when the export file is selected (e.g., **c:\user\spectrum\**).

**Fig. 23. The Initial Character Macros.**

***Program Directory*** This is the directory for the conversion program. It is shown in the first entry of this dialog.

***MAESTRO Directory*** This is the directory where the MAESTRO program is stored. By default, this is **c:\Program Files\MAESTRO**.

***Current Directory*** This is the current default directory for Windows.

**Run Options** These three radio buttons (**Minimized**, **Maximized**, and **Normal Window**) are used to select the window for the program. If the program does not have any user dialogs, any option can be selected. If the program needs user inputs, **Normal Window** should be selected.

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**4.1.1.3. Import**

Click on the **Import** tab to display the dialog shown in Fig. 24. The program to be executed and the default file extension when the Import function is selected can then be specified. You can select any program that can accept the spectrum filename on the command line. Use the **Browse...** button to auto- matically select the complete proper path for the program.

**Arguments** The arguments to the program can be specified as directly entered character strings or you can select from the list of macros shown in Fig. 25. The list is displayed by clicking on the arrow button to the right of the **Arguments** field. The entries (macros or direct) must be separated by spaces to be read as separate arguments.

***File Path Name*** This will insert the *complete* file path name (e.g., **c:\user\spectrum \test.txt**) into the dialog box. The filename is the name selected in the filename entry dialog.

***File Base Name*** This will insert the file path name *without* the extension (e.g., **c:\user\spectrum\test**) into the dialog box. The filename is the name selected in the file name entry dialog. The extension can be entered manually after the macro (e.g., **$(FullBase).CHN**) into the dialog box. *Note that the “dot” ( . ) must also be entered*. Related filenames can also be made by adding characters before the “dot” (e.g., **$(FullBase)A.CHN**).

***Short Name*** This will insert the filename (e.g., **test.TXT**) into the dialog box. The filename is the name selected in the filename entry dialog. File names can be constructed as **$(file base).$(file extension)**.

**Fig. 24. Import Tab.**

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**Fig. 25. Import Arguments.**

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***Short Base*** This will insert the base filename (e.g., **test**) into the dialog box. The file base name is the name selected in the filename entry dialog.

***File Extension*** This will insert the file extension (e.g., **TXT**) into the dialog box. The file extension is the name selected in the filename entry dialog. *Note that the “dot” is not included*. Any manually entered input of the macro form (**$(xxx)**) will be included in the argument list without changes.

**Initial Directory** Specify the initial directory for the program to use either with directly entered character strings or by selecting from the list of macros shown in Fig. 26. The list is displayed by clicking on the arrow button to the right of the **Initial Directory** field.

***File Directory*** This is the directory selected in the filename selection dialog when the import file is selected (e.g., **c:\user\spectrum\**).

**Fig. 26. Import Macros.**

***Program Directory*** This is the directory for the conversion program. It is shown in the first entry of this dialog.

***MAESTRO Directory*** This is the directory where the MAESTRO program is stored. Usually this is **c:\Program Files\MAESTRO**.

***Current Directory*** This is the current default directory for Windows.

**Default** The default extension entered here is used as the extension for the filename in the filename entry dialog. For example, if you enter **TXT**, the name list in the entry dialog will be **\*.TXT**.

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**Run Options** These three radio buttons (**Minimized**, **Maximized**, and **Normal Window**) are used to select the window for the program. If the program does not have any user dialogs, any option can be selected. If the program needs user inputs, **Normal Window** should be selected.

**4.1.1.4. Directories**

Use this tab (Fig. 27) to select the default file directories for libraries, calibrations, **.JOB** files, and other GammaVision file types.

To change the path (**Location**) of a particular **File Type**, click on the desired file type to highlight it, then click on **Modify...**. This will open a standard file-recall dialog. Choose a new path and click on **Open**. When all path changes have been completed, click on **OK** to use them or **Cancel** to retain the previous settings.

**4.1.2. Recall...**

This function reads an ORTEC **.CHN** or **.SPC** spectrum file into a new buffer window. It opens a standard Windows file-open dialog (Fig. 28), allowing you to select the file to be recalled.

Note the **Show Description** checkbox on the lower left of the Recall Spectrum File dialog. Use this to display the sample description, format, and spectrum size of each file without having to open it.

**Fig. 27. Directories Tab.**

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If the maximum eight buffer windows are currently open, MAESTRO will ask if you wish to close the oldest buffer. Answering **No** will cancel the recall operation and the oldest buffer will remain onscreen. Answering **Yes** will close the oldest buffer and open a new buffer containing the recalled file. If the oldest buffer contains data that have not been saved, a warning dialog will first ask if the data should be saved. Click on **Yes** to save and **No** to close without saving.

When the spectrum is successfully recalled, MAESTRO loads its descriptors (e.g., start time, live time, real time, Detector and sample description) and displays the filename on the Title Bar. If the spectrum file has calibration information, it is used to set the calibration for this buffer.

**4.1.3. Save and Save As...**

These functions save the current spectrum to disk. The Save Spectrum File dialog (Fig. 29) opens when **Save As...** is selected, when **Save** is selected for a spectrum that has no previous filename associated with it, or after any operation is performed that can alter the spectrum.

Enter any valid filename (consisting of an optional drive and directory, a filename, and an optional extension) in the **File name** field and click on **Save**. The recommended and default extension are shown in the dialog according to the format chosen. If that file already exists, a message box will open asking you to verify the entry or cancel the operation. Clicking on **OK** will completely overwrite the existing file.

After the disk file has been written, its filename will be displayed on the Title Bar.

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**Fig. 28. Recall Spectrum Dialog.**

**Fig. 29. Save Spectrum File Dialog.**

The format is specified on the General tab under **File/Settings...** (Section 4.1.1.1), so the file extension should be left at the default setting to avoid operator confusion. This is especially true if the spectra are to be used in non-ORTEC programs.

The **.CHN** file format stores the following information along with the spectrum: live time, real time, acquisition start time, Detector and sample descriptions, and calibration (if any). The file structure of all the files is given in the *File Structure Manual*.

Much more information can be saved in the **.SPC** format, which is used primarily in GammaVision. MAESTRO does not have the ability to generate all of this information, so certain parts are not filled. However, MAESTRO does have the ability to generate ROI records and a list of hardware parameters.

**4.1.4. Export...**

The **Export...** function is used to write spectra in formats other than the usual formats, or to perform other functions such as plotting or printing the spectrum directly. The export program is specified on the Export tab under **File/Settings...**, as discussed in Section 4.1.1.2. The program can be one of the programs supplied or can be user-supplied. When **Export...** is selected, the Export Spec- trum File dialog (Fig. 30) opens. Choose the filename of the spectrum to be exported and click on **Open**.

The currently displayed spectrum must be saved to disk before it can be exported. If the currently displayed spectrum has already been stored to disk, that filename is the default. Any file can be selected. The file is then read and the output file is written by the program.

The **Export...** function is not available for a second file until the first file has been exported and the export program has stopped execution.

**Export...** can also be used to generate hardcopy plots. To do this, select the WINPLOTS program (supplied with MAESTRO) as the export program. When **Export...** has been selected, the WINPLOTS program will be executed. If the **-P** switch is specified on the command line (see Sections 4.1.1.2 and 7.1.3), the program will plot the spectrum and exit automatically.

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**Fig. 30. The Export Spectrum File Dialog.**

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**4.1.5. Import...**

The **Import** function is used to read spectrum files that are not in one of the usual formats (i.e., **.CHN** or **.SPC**). The import program is specified on the Import tab under **File/Settings...**, as discussed in Section 4.1.1.3. The program can be one of the programs supplied or can be user- supplied. When selected, the **Import File** dialog (see Fig. 31) opens so that you can select the filename. The file is then read and a spectrum file is written to the specified directory. MAESTRO attempts to read this file (in **.CHN** or **.SPC** format) and displays the spectrum in the buffer.

**Fig. 31. The Import File Dialog.**

If the import program does not produce a file that MAESTRO can read, the buffer is not changed.

**4.1.6. Print...**

The **Print...** function does one of the following:

! If the marker is in an ROI, the data contents of the ROI channels are printed. ! If the marker is not in an ROI, the contents of channels in the expanded view are printed.

Use the **Print** dialog (Fig. 32) to print the output or save it in a disk file (click on **Print to file** to mark it). An abort box appears while the function is being performed, allowing you to cancel the operation. The printer can be selected or its properties changed via a standard Windows printer setup dialog.

The data are formatted at seven channels per line with the channel number on the left.

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**Fig. 32. Print Spectrum.**

**4.1.7. ROI Report...**

The **ROI Report...** function creates a report describing acquisition conditions and contents of all ROIs, and sends the complete report to the printer (the default choice) and/or to a disk file (**Print to file**). In addition, you can select **Print to display** to show on-screen a similar report *only for the ROIs currently displayed in the Expanded Spectrum View.*

The **ROI Report** dialog, shown in Fig. 33, opens first. It allows you to select a file, preview it on-screen or send the report to the printer (via Windows), and select one of two output formats, **Paragraph** or **Column**.

Both report formats supply the same information. If the spectrum is not calibrated, the following are reported for each ROI:

**Fig. 33. ROI Report Dialog.**

1. ROI number and Detector number. 2. Start channel of the ROI. 3. Stop channel of the ROI. 4. Gross area of the peak. 5. Net area of the peak, as calculated in **Calculate/Peak Info**. 6. Error in net area, as calculated in **Calculate/Peak Info**. 7. Centroid channel of peak, as calculated in **Calculate/Peak Info**. 8. Full width at half maximum (FWHM). 9. Full width at one-tenth maximum (FW(1/10)M).

If the spectrum is calibrated, both calibrated and channel values are given for items 1–9 above, and, in addition, the following is included:

10. The best match from the library.

If a match is found in the library, the following additional parameter is supplied:

11. The activity calculated using the net area, the live time, and the factor from the library.

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**4.1.7.1. Printing to a Printer and/or File**

To print an **ROI Report**, leave both the **Print to file** and **Print to display** boxes unmarked. Click on either the **Paragraph** or **Column** radio button to select an output format. Make sure the correct printer is listed in the **Printer Name** field; to select another printer, click on the **Name** field and choose from the droplist. Click on **OK**.

To write an **ROI Report** to an ASCII file, follow the same steps but click on the **Print to file** box to mark it. Then click on **OK**. This will open the **Report File** dialog (see Fig. 34). Enter the desired **File name**: and click on **Open**. This file can then be viewed and printed from ASCII-text handlers such as Windows Notepad.

Examples of the **Paragraph**- and **Column**-style reports are shown in Figs. 36 and 35, respectively.

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**Fig. 34. Report Filename Selection.**

**Detector #65537 ACQ 07-Jun-91 at 0:37:33 RT = 4219.8 LT = 3600.0**

**No detector description was entered Mixed gamma Marinelli on endcap of P40268A**

**ROI # 1 RANGE: 332 = 57.12keV to 360 = 61.64keV**

**AREA : Gross = 224820 Net = 123784 +/- 714 CENTROID: 346.17 = 59.40keV SHAPE: FWHM = 0.93 FW.2M = 1.45 No close library match.**

**ROI # 2 RANGE: 509 = 85.70keV to 537 = 90.22keV**

**AREA : Gross = 449680 Net = 334221 +/- 881 CENTROID: 522.55 = 87.89keV SHAPE: FWHM = 0.93 FW.2M = 1.44 No close library match.**

**Fig. 35. Paragraph-Style ROI Report.**

**Detector #65537 ACQ 07-Jun-91 at 0:37:33 RT = 4219.8 LT = 3600.0 No detector description was entered Mixed gamma Marinelli on endcap of P40268A ROI# RANGE (keV) GROSS NET +/- CENTROID FWHM FW.2M LIBRARY (keV) Bq +/- 1 57.12 61.64 224820 123784 714 59.40 0.93 1.45 No close library match. 2 85.70 90.22 449680 334221 881 87.89 0.93 1.44 No close library match. 3 119.62 124.14 310370 223053 746 121.91 0.95 1.51 No close library match. 4 133.99 138.52 101242 29253 552 136.33 0.97 1.55 No close library match. 5 163.39 167.91 251299 176085 681 165.70 1.00 1.56 No close library match. 6 252.54 257.39 62742 7728 486 254.90 1.02 1.65 No close library match. 7 276.44 281.29 67265 21006 462 278.98 1.09 1.65 No close library match. 8 388.85 394.02 217548 177819 597 391.48 1.20 1.86 No close library match. 9 658.57 667.62 646572 590536 1032 661.39 1.39 2.15 No close library match.**

**Fig. 36. Column-Style ROI Report.**

**4.1.7.2. Print to display**

Figures 37 and 38 show the **ROI Report** displayed on-screen in **Column** and **Paragraph** style. Remember that this report includes *only the ROIs currently displayed in the Expanded Spectrum View*.

**Fig. 37. Column-Style ROI Report On-Screen.**

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**Fig. 38. Paragraph-Style ROI Report On-Screen.**

To close the report display window, click on its Close button ( ), or click on the control icon on the left of the title bar and select **Close** from the drop-down menu.

**4.1.8. Compare...**

This function displays a spectrum from disk along with the current spectrum so the two can be visually compared. A standard file-recall dialog box opens. Once the desired spectrum file is selected, the Expanded Spectrum View shows both spectra, as illustrated in Fig. 39.

Note that the spectra in this illustration are displayed in **Fill All** mode, in which all of the area under the peaks is filled with a color different from the background (see **Display/Preferences/ Fill All**, Section 4.6.11.1).

The Compare spectrum is offset from the starting spectrum, and can be moved up and down incrementally with the **<Shift +** 8**>** and **<Shift +** 9**>** accelerators. In addition, the vertical scale of both spectra can be simultaneously changed with **<**8**>/<**9**>**. Note that the Compare spectrum’s ROIs (if any were saved with the file) are not marked in this mode.

Figure 40 is a zoomed-in portion of Fig. 39. In this illustration, the starting spectrum is displayed in color **(1)**, the Compare spectrum is shown in color **(2)**, the starting spectrum’s ROIs are marked in color **(3)**, and the portion of the starting spectrum that exceeds the Compare spectrum is indicated by color **(4)**. These colors — called **Foreground**, **Compare**, **ROI**, and **Composite**, respectively — are chosen on the **Color Preferences** dialog discussed in Section 4.6.11.2.

Press **<Esc>** to leave Compare mode.

**4.1.9. Exit**

This exits MAESTRO and returns to Windows. If the buffer contains a spectrum that has not been saved, a warning message is displayed. Any JOBs are terminated. All MCBs continue acquisition.

**Fig. 39. Compare Mode Screen.**

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**Fig. 40. Spectrum Colors in Compare Mode.**

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**4.1.10. About MAESTRO...**

Figure 41 shows the **About** box for MAESTRO. It provides software version information that will be useful should you need customer support.

**Fig. 41. About MAESTRO.**

If you are connected to the Internet, click on the **Visit ORTEC On-Line** button to browse our website which, in addition to our product catalog, includes application notes, technical papers, information on training courses, and access to our Global Service Center.

**4.2. Acquire**

The **Acquire** menu is shown in Fig. 42. Access to the various functions depends on whether the a Detector or buffer window is currently active. For example, if a buffer window is active, **Clear** is the only active Detector control and **MCB Properties...** is read- only. If a Detector window is active, **MCB Properties...** is inter- active. The **Download Spectra** and **View ZDT Corrected** com- mands are available only for supported hardware (which is listed in the discussion for each of these functions).

**NOTE** In some cases, a Detector option might be grayed because

**Fig. 42. Acquire Menu.**

it is disabled for the current Detector (while it might still be valid for some other Detector in the system, or for this Detector under different conditions).

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**4.2.1. Start**

This initiates data collection in the selected Detector. Any warnings arising from problems detected at the hardware level will appear in a message box or on the Supplemental Information Line at the bottom of the display. The Detector can also be started with the **<Alt + 1>** accelerator, the **Start Acquisition** button on the Toolbar, or the **Start** command on the right- mouse-button menu. If the Detector is already started or if a buffer is the active window, this entry is grayed.

**4.2.2. Stop**

**Stop** terminates data collection in the selected Detector. The display must be in Detector mode. If the Detector is not active, the entry is grayed. The Detector can also be stopped with the accelerator **<Alt+ 2>,** the **Stop Acquisition** button on the Toolbar, and the **Stop** command on the right-mouse-button menu.

**4.2.3. Clear**

**Clear** erases the spectral data and the descriptors (e.g., real time, live time, start time) for the currently active Detector or buffer window. The presets are not altered. (This function might not operate on some types of Detectors when they are collecting data.) The data can also be cleared with **<Alt+ 3>**, the **Clear Spectrum** button on the Toolbar, or the **Clear** command on the right- mouse-button menu.

**4.2.4. Copy to Buffer**

The **Copy to Buffer** function transfers the data and descriptors (e.g., live time, real time), from the selected Detector to a new buffer window. This function can also be performed with **<Alt + 5>**, the **Copy Spectrum to Buffer** Toolbar button, or the **Copy to Buffer** command on the right-mouse-button menu.

**4.2.5. Download Spectra...**

This command supports the Detective, trans-SPEC, digiDART, and DART, and is used to download the spectra from the MCB to the computer disk. The files are stored in the directory and format specified in the dialog under **File/Settings** (Section 4.1.1), and are named according to this format:

**sss iiiiiiii ddddddddd ttttttttt.ext**

where

**sss** is the sequence number as shown on the digiDART spectrum list display

or the storage sequence in the DART.

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4Patent number 6,327,549.

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**iiiiiiii** is the ID string entered on the digiDART when the spectrum was saved

and shown on the digiDART spectrum list display or the text string from the barcode reader in the DART.

**ddddddddd** is the date the spectrum was collected, as recorded in the MCB.

**ttttttttt** is the time the spectrum was collected, as recorded in the MCB.

**ext** is the extension for the file type selected.

If any **Ask on Save Options** are set in the File Settings dialog, they will be asked for each spectrum individually. Note that if you cancel an ask-on-save prompt for a particular spectrum, any remaining ask-on-save prompts for that spectrum are not displayed, and the spectrum is not saved to disk.

The spectra are not erased from the MCB after download.

**4.2.6. View ZDT Corrected**

This command is active only for a Detector that supports Zero Dead-Time (ZDT) Mode4 and that has a **ZDT** mode enabled on the ADC tab under **Acquire/MCB Properties...**. When the Detector is in a ZDT mode, two spectra are collected: either live-time corrected (LTC) and ZDT; or uncertainty (ERR) and ZDT (see Fig. 43 and the discussion in Section ?). The spectrum is labeled in the upper-right corner of the Full Spectrum View. When you choose **ZDT Display Select**, the ZDT spectrum is displayed, the **ZDT** label appears in the Full Spectrum View, and this command has a checkmark beside it on the menu. This function is duplicated by **<F3>**.

**4.2.7. MCB Properties...**

ORTEC ***CONNECTIONS-32*** applications now use a uniform data-acquisition setup dialog called Properties. In MAESTRO, the Properties dialog opens when you select the **Acquire/MCB Properties...** command. Two of our most commonly used Detectors — the DSPEC Pro and digiDART — are described here. To see the Properties dialogs for our other ***CONNECTIONS***- compliant MCBs, see the *MCB Properties Manual*.

Depending on the currently selected MCB, the Properties dialog displays several tabs of hardware controls including ADC setup parameters, acquisition presets, high-voltage controls, amplifier gain adjustments, gain and zero stabilizers, pole-zero and other shaping controls, and access to the InSightTM Virtual Oscilloscope. In addition, the Status tab for certain MCBs monitors conditions such as alpha chamber pressure, detector status, charge remaining on

**Fig. 43. Comparison of Uncertainty and ZDT Spectra Showing Labels in Full Spectrum View.**

batteries, and the number of spectra collected in remote mode. Find your Detector’s setup section here or in the *MCB Properties Manual*, move from tab to tab and set your hardware parameters, then click on **Close**. Note that as you enter characters in the data-entry fields, the characters will be underlined until you move to another field or until 5 seconds have lapsed since a character was last entered. During the time the entry is underlined, no other program or PC on the network can modify this value.

If the Detector is locked (see Section 4.4.4), you must know the password before you can modify its MCB properties. To view a locked Detector’s properties in read-only mode, click on **Cancel** when the Unlock Password dialog opens.

**4.2.7.1. DSPEC Pro**

**Amplifier** Figure 44 shows the Amplifier tab. This tab contains the controls for **Gain**, **Baseline Restore**, **Preamplifier Type**, **Input Polarity**, and **Optimize**.

**NOTE** Be sure that all of the controls on the tabs have been set *before* clicking the **Start Auto**

(optimize) button. The changes you make on most property tabs *take place immediately*. There is no cancel or undo for these dialogs.

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***Gain*** Set the amplifier coarse gain by selecting from the **Coarse** droplist, then adjust the **Fine** gain with the horizontal slider bar or the edit box, in the range of 0.45 to 1.00. The resulting effective gain is shown at the top of the **Gain** section. The two controls used together cover the entire range of amplification from 0.45 to 32.

***Input Polarity*** The **Input Polarity** radio buttons select the preamplifier input signal polarity for the signal from the detector. Normally, GEM (p-type) detectors have a positive signal and GMX (n-type) have a negative signal.

***Baseline Restore*** The **Baseline Restore** is used to return the baseline of the pulses to the true zero between incoming pulses. This improves the resolution by removing low frequency noise from dc shifts or mains power ac pickup. The baseline settings control the time constant of the circuit that returns the baseline to zero. There are three fixed choices (**Auto**,5 **Fast**, and **Slow**). The fast setting is used for high count rates, the slow for low count rates. **Auto** adjusts the time constant as appropriate for the input count rate. The settings (**Auto**, **Fast**, or **Slow**) are saved in the DSPEC Pro even when the power is off. The time constant can be manually set on the InSight display (see the discussion in Section 4.2.7.3).

You can view the time when the baseline restorer is active on the InSight display as a **Mark** region (see the discussion on Marks, page 73). In the automatic mode, the current value is shown on the InSight sidebar (Fig. 65). For a low-count-rate system, the value will remain at about 90.

***Preamplifier Type*** Use the **Preamplifier Type** section to choose **Transistor Reset** or **Resistive Feedback** preamplifier operation. Your choice will depend on the preamplifier supplied with the germanium detector being used.

5Patent number 5,912,825.

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**Fig. 44. DSPEC Pro Amplifier Tab.**

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***Optimize*** The DSPEC Pro is equipped with both automatic pole-zero logic6 and automatic flattop logic.7 The **Start Auto** (optimize) button uses these features to automatically choose the best pole zero and flattop tilt settings. Note that if you selected **Transistor Reset** as the **Preamplifier Type** for this DSPEC Pro, the optimize button does not perform the pole zero.

As with any system, the DSPEC Pro should be optimized any time the detector is replaced or if the flattop width is changed. For optimization to take place, the DSPEC Pro must be processing pulses. The detector should be connected in its final configuration before optimizing is started. There should be a radioactive source near the detector so that the count rate causes a dead time of ~5%. Dead time is displayed on the DSPEC Pro front panel and on the Status Sidebar during data acquisition.

Select either the **Resistive Feedback** or **Transistor Reset** option and click on **Start Auto**. The optimize command is sent to the DSPEC Pro at this time and, if the DSPEC Pro is able to start the operation, a series of short beeps sounds to indicate that optimization is in progress. When optimizing is complete, the beeping stops.

During optimization, pole zeroes are performed for several rise-time values and the DSPEC Pro is cycled through all the rise time values for the determination of the optimum tilt values. As all of the values for all the combinations are maintained in the DSPEC Pro, the optimize function does not need to be repeated for each possible rise time. The optimization can take from 1 to 10 minutes depending on count rate.

You should repeat the optimization if you change the flattop width.

The effect of optimization on the pulse can be seen in the InSight mode, on the Amplifier 2 tab. Note, however, that if the settings were close to proper adjustment before starting optimization, the pulse shape may not change enough for you to see. (In this situation, you also may not notice a change in the shape of the spectrum peaks.) The most visible effect of incorrect settings is high- or low-side peak tailing or poor resolution.

**Amplifier 2** Figure 45 shows the Amplifier 2 tab, which accesses the advanced DSPEC Pro shaping controls including the InSight Virtual Oscilloscope mode.

6Patent number 5,872,363.

7Patent number 5,821,533.

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The many choices of **Rise Time** allow you to precisely control the tradeoff between resolution and throughput. The value of the rise time parameter in the DSPEC Pro is roughly equivalent to twice the integration time set on a conventional analog spectroscopy amplifier. Thus, a DSPEC Pro value of 12 μs corresponds to 6 μs in a conventional amplifier. Starting with the nominal value of 12.0, you should increase values of the rise time for better resolution for expected lower count rates, or when unusually high count rates are anticipated, reduce the

**Fig. 45. DSPEC Pro Amplifier 2 Tab.**

rise time for higher throughput with somewhat worse resolution.

Use the up/down arrows to adjust the **Rise Time** within the range of 0.8 to 23.0 μs. After all the controls have been adjusted, return to the Amplifier tab and click on **Start Auto**. The most recent settings are saved in the DSPEC Pro firmware even when the power is turned off.

For the more advanced user, the InSight mode allows you to directly view all the parameters and adjust them interactively while collecting live data. To access the InSight mode, go to the **Insight** section on the Amplifier 2 tab and click on **Start**. The InSight mode is discussed in more detail in the following section.

Note that the Amplifier 2 tab graphically presents a *modeled shape*. This is *not* a sampled waveform of the actual pulse shape, only a model based on the current parameters. The modeled shape is nominally a quasi-trapezoid whose sides and top may be adjusted by the controls in this dialog. While a particular control is being adjusted, the model is updated to represent the changes made.

The **Rise Time** value is for both the rise and fall times; thus, changing the rise time has the effect of spreading or narrowing the quasi-trapezoid symmetrically.

The **Flattop** controls adjust the top of the quasi-trapezoid. The **Width** adjusts the extent of the flattop (from 0.3 to 2.4 μs). The **Tilt** adjustment varies the “flatness” of this section slightly. The **Tilt** can be positive or negative. Choosing a positive value results in a flattop that slopes downward; choosing a negative value gives an upward slope. Alternatively, the optimize feature on the Amplifier tab can set the tilt value automatically. This automatic value is normally the

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best for resolution, but it can be changed on this dialog and in the InSight mode to accommodate particular throughput/resolution tradeoffs. The optimize feature also automatically adjusts the pole-zero setting.

The dead time per pulse is (3 × *Rise Time*) % (2 × *Flattop Width*).

In the **Pole Zero** section, the **Start** button performs a pole zero at the specified rise time and other shaping values. Unlike the optimize feature, it performs a pole zero for only the one rise time. The pole-zero **Stop** button aborts the pole zero, and is normally not used.

When you are satisfied with the settings, **Close** the Properties dialog and prepare to acquire data.

Once data acquisition is underway, the advanced user may wish to return to **MCB Properties...** and click on the **Insight** section’s **Start** button to adjust the shaping parameters interactively with a “live” waveform showing the actual pulse shape, or just to verify that all is well.

**Amplifier PRO** This tab (Fig. 46) contains the controls for the **Low Frequency Rejector** (LFR) filter, **Resolution Enhancer**, and **Enhanced Through-put Mode**. To enable a particular feature, mark the corresponding checkbox. Any or all of these features can be used at one time, however, the LFR and enhanced throughput modes must be set up before the resolution enhancer is configured, as discussed below. Note that once an MCB is “trained” for the **Resolution Enhancer** (see the following section), it must be “retrained” if any settings are changed that can affect peak shape

**Fig. 46. DSPEC Pro Amplifier PRO Tab.**

or position (e.g., bias, gain, rise time, flattop, PZ).

**Low Frequency Rejector**8 — See the DSPEC Pro hardware user’s manual for a discussion of this feature. You *cannot* optimize or pole-zero the DSPEC Pro while in LFR mode. The **Optimize** feature should be used with the LFR filter *off.* Subsequent measurements can then

8Patent pending.

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**46**be taken with the LFR filter on. Also, LFR mode affects the available range of protection times in **Enhanced Throughput Mode**, as discussed in the next paragraph.

**Enhanced Throughput Mode** — See the DSPEC Pro hardware user’s manual for a discussion of this feature. The valid **Protection Time** settings, in 25-ns increments, are:

! LFR mode off 1.1 μs to 48.4 μs ! LFR mode on 3.0 μs to 145.2 μs

Turning on this feature automatically sets the minimum protection time (highest throughput rate) based on your current **Rise Time** and **Flattop** settings, however, you can adjust this value at any time. Each time you change the rise time or flattop, the DSPEC Pro will automatically set itself to the new minimum protection time.

***“Training” the Resolution Enhancer*** The resolution enhancer can help alleviate the low-side peak tailing that results from increased charge trapping; see the discussion in the DSPEC Pro hardware manual. This function will *not* improve low resolution due to other causes (and might exacerbate the problem).

1. Set the bias, gain, rise time, flattop, and PZ as you would for data collection.

2. If you wish to use LFR Mode, turn it on.

3. If you wish to use Enhanced Throughput Mode, turn it on and either accept the automatically

calculated, highest-throughput protection time, based on the current rise time and flattop; or enter the desired setting. (The latter might require one or more data acquisitions. When finished, proceed to Step 4).

4. Clear the MCB and acquire a well-isolated peak.

5. You will now use the gain stabilization section of the Stabilizer tab to configure the

resolution enhancer. (The gain stabilizer and resolution are somewhat similar in function, and only one of these features can be used at a time.) Enter the **Center** channel and **Width** of the peak acquired in Step 4; the maximum **Width** is 255 channels. If you wish, use the **Suggest** button.

6. If you have already used the resolution enhancer, you can either use the previously

established settings (which will go into effect when you turn on the enhancer in Step 7), or click on **Initialize** to clear all settings. Initialization does not change the current **Center** channel and **Width**.

7. Return to the Amplifier PRO tab and turn on the resolution enhancer.

8. Clear the MCB, re-start acquisition, and monitor the FWHM of the target peak until it no

longer changes. Typically, the more charge trapping exhibited by the detector, the longer the data collection time.

9. When you are satisfied that the FWHM has reached the best possible value, clear the MCB

and collect another spectrum for confirmation.

10. At this point, the resolution enhancer is now “trained” for the current peak shape parameters and can be turned off. (You can leave it on, if you wish, but you might notice some peak broadening.)

11. If you change any parameters that affect peak position and/or shape, you must repeat this

“training” procedure.

**ADC** This tab (Fig. 47) contains the **Gate**, **ZDT Mode**, **Conversion Gain**, **Lower Level Disc**riminator, and **Upper Level Disc**riminator controls. In addition, the current real time, live time, and count rate are monitored at the bottom of the dialog.

***Gate*** The **Gate** control allows you to select a logic gating function. With this function **Off**, no gating is performed (that is, all detector signals are processed); with the function in **Coincidence**, a gating input

**Fig. 47. DSPEC Pro ADC Tab.** signal *must be* present at the proper time for the conversion of the event; in **Anticoincidence**, the gating input signal *must not be* present for the conversion of the detector signal. The gating signal must occur prior to and extend 500 ns beyond peak detect (peak maximum).

***ZDT Mode*** Use this droplist to choose the **ZDT Mode** to be used for collecting the zero dead time (corrected) spectrum (see Section 4.2.7.6). The three modes are **Off** (LTC only), **NORM\_CORR** (LTC and ZDT), and **CORR\_ERR** (ERR and ZDT). If one of the ZDT

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modes is selected, both spectra are stored in the same spectrum (**.SPC**) file. If you do not need the ZDT spectrum, you should select **Off**.

In MAESTRO, the display can show either of the two spectra. Use **<F3>** or **Acquire/ ZDT Display Select** to toggle the display between the two spectra. In the Compare mode, **<F3>** switches both spectra to the other type and **<Shift+F3>** switches only the compare spectrum. This allows you to make all types of comparisons.

***Conversion Gain*** The **Conversion Gain** sets the maximum channel number in the spectrum. If set to 16384, the energy scale will be divided into 16384 channels. The conversion gain is entered in powers of 2 (e.g., 8192, 4096, 2048). The up/down arrow buttons step through the valid settings for the DSPEC Pro.

***Upper- and Lower-Level Discriminators*** In the DSPEC Pro, the lower- and upper-level discriminators are under computer control. The **Lower Level Disc**riminator sets the level of the lowest amplitude pulse that will be stored. This level establishes a lower-level cutoff by channel number for ADC conversions.

The **Upper Level Disc**riminator sets the level of the highest amplitude pulse that will be stored. This level establishes an upper-level cutoff by channel number for storage.

**Stabilizer** The DSPEC Pro has both a gain stabilizer and a zero stabilizer (see Sections 4.2.7.4 and 4.2.7.5). The Stabilizer tab (Fig. 48) shows the current values for the stabilizers. The value in each **Adjustment** section shows how much adjustment is currently applied. The **Initialize** buttons set the adjust-ment to 0. If the value approaches 90% or above, the amplifier gain should be adjusted so the stabilizer can continue to function — when the adjustment value reaches 100%, the stabilizer cannot make further corrections in that direction.

**Fig. 48. DSPEC Pro Stabilizer Tab.**

The **Center Chan**nel and **Width** fields show the peak currently used for stabilization.

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To enable the stabilizer, enter the **Center Chan**nel and **Width** values manually or click on the **Suggest Region** button. **Suggest Region** reads the position of the marker and inserts values into the fields. If the marker is in an ROI, the limits of the ROI are used. If the marker is not in an ROI, the center channel is the marker channel and the width is 3 times the FWHM at this energy. Now click on the appro-priate **Enabled** checkbox to turn the stabilizer on. Until changed in this dialog, the stabilizer will stay enabled even if the power is turned off. When the stabilizer is enabled, the **Center Chan**nel and **Width** cannot be changed.

**High Voltage** Figure 49 shows the High Voltage tab, which allows you to turn the high voltage on or off; set and monitor the voltage; and choose the **Shutdown** mode. The polarity is set in the DIM module.

The high voltage is overridden by the detector bias remote shutdown signal from the detector; high voltage cannot be enabled if the remote shutdown or overload signals prevent it. Enter the detector high voltage in the **Target** field, click **On**, and monitor the voltage in the **Actual** field. Click the **Off** button to turn off the high voltage.

**Fig. 49. DSPEC Pro High Voltage Tab.**

The shutdown can be **ORTEC**, **TTL**, or **SMART**. The **ORTEC** mode is used for all ORTEC detectors except SMART-1 detectors. Use the **SMART** option for those detectors. Check with the detector manufacturer for other detectors. The **TTL** mode is used for most non-ORTEC detectors.

The high voltage in the DSPEC Pro is supplied by the SMART-1 module or in a separate DIM. The recommended HV for SMART-1 is displayed on the dialog. For other detectors, see the detector manual or data sheet for the correct voltage. The polarity is determined by the DIM or SMART-1 module.

To use a **Sodium Iodide Detector**, mark the checkbox. This changes the gain and zero stabilizers to operate in a faster mode. For the DIM-296, the HV is controlled by the adjustment in the Model 296 and not here.

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**About** This tab (Fig. 50) displays hardware and firmware information about the currently selected DSPEC Pro as well as the data **Acquisition Start Time** and **Sample** description. In addition, the **Access** field shows whether the Detector is currently locked with a password (see Section 4.4.4). **Read/ Write** indicates that the Detector is unlocked; **Read Only** means it is locked.

**Status** Figure 51 shows the Status tab. There are 21 values monitored at all times. You can select any six of these to be displayed simultaneously on the Status tab. The parameters you choose can be changed at any time, so you can view them as needed. Two types of values are presented: **OK** or **ERR**, and numeric value. The state-of-health (SOH) parameters are all **OK** or **ERR**. If the state is **OK**, the parameter stayed within the set limits during the spectrum acquisition. If the parameter varied from the nominal value by more than the allowed limit, the **ERR** is set until cleared by the program. The numeric values are displayed in the units reported by the DSPEC Pro. **Security**, **Detector temperature**, and **Live detector temperature** are available only for SMART-1 detectors. For non-SMART-1 detectors, they show **N/A**.

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**Fig. 50. DSPEC Pro About Tab.**

**Fig. 51. DSPEC Pro Status Tab.**

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The parameters displayed are:

**Detector State of Health**

This is OK if all the SOH are OK and ERR if any one is ERR.

**DIM +24V State of Health**

This is OK if the +24 volt supply in the DIM has stayed within 200 mV of +24 volts since the last time the SOH was cleared.

**DIM +12V State of Health**

This is OK if the +12 volt supply in the DIM has stayed within 200 mV of +12 volts since the last time the SOH was cleared.

**DIM -12V State of Health**

This is OK if the !12 volt supply in the DIM has stayed within 200 mV of !12 volts since the last time the SOH was cleared.

**DIM -24V State of Health**

This is OK if the !24 volt supply in the DIM has stayed within 200 mV of !24 volts since the last time the SOH was cleared.

**Temperature State of Health**

This is OK if the detector temperature has stayed below the high temperature limit set in the detector since the last time the SOH was cleared. This is available only for SMART-1 detectors.

**High Voltage State of Health**

This is OK if the HV supply in the DIM has stayed within 200 V of specified bias voltage since the last time the SOH was cleared.

**Shutdown State of Health**

This is OK if the detector shutdown has not activated since the last time the SOH was cleared.

**Preamplifier overload State of Health**

This is OK if the preamplifier overload has not activated since the last time the SOH was cleared.

**Security State of Health**

This is OK if the security test was passed at the end of the last spectrum acquisition. This is available only for SMART-1 detectors.

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**52Power State of Health** This is OK if the power to the DIM was constant during the last spectrum acquisition.

**+24 volts**

This is the current value of the +24 volt supply in the DIM as delivered to the detector.

**+12 volts**

This is the current value of the +12 volt supply in the DIM as delivered to the detector.

!**12 volts**

This is the current value of the -12 volt supply in the DIM as delivered to the detector.

!**24 volts**

This is the current value of the -24 volt supply in the DIM as delivered to the detector.

**High Voltage**

This is the current value of the high voltage bias supply in the DIM as delivered to the detector.

**Detector temperature**

This is the detector temperature at the time the current spectrum acquisition stopped. This is available only for SMART-1 detectors.

**Live detector temperature**

This is the detector temperature at the current time. This is available only for SMART-1 detectors.

**Battery voltage**

This is not used in the DSPEC Pro.

**Battery % full**

This is not used in the DSPEC Pro.

**Battery time remaining**

This is not used in the DSPEC Pro.

**Presets** Figure 52 shows the Presets tab. MDA presets are shown on a separate tab.

The presets can only be set on a Detector that is not acquiring data (during acquisition the preset field backgrounds are gray indicating that they are inactive). You can use any or all of the presets at one time. To disable a preset, enter a value of zero. If you disable all of the presets, data acquisition will continue until manually stopped.

When more than one preset is enabled

**Fig. 52. DSPEC Pro Presets Tab.**

(set to a non-zero value), the first condition met during the acquisition causes the Detector to stop. This can be useful when you are analyzing samples of widely varying activity and do not know the general activity before counting. For example, the **Live Time** preset can be set so that sufficient counts can be obtained for proper calculation of the activity in the sample with the least activity. But if the sample contains a large amount of this or another nuclide, the dead time could be high, resulting in a long counting time for the sample. If you set the **ROI Peak** preset in addition to the **Live Time** preset, the low-level samples will be counted to the desired fixed live time while the very active samples will be counted for the ROI peak count. In this circumstance, the **ROI Peak** preset can be viewed as a “safety valve.”

The values of all presets for the currently selected Detector are shown on the Status Sidebar. These values do not change as new values are entered on the Presets tab; the changes take place only when you **Close** the Properties dialog.

Enter the **Real Time** and **Live Time** presets in units of seconds and fractions of a second. These values are stored internally with a resolution of 20 milliseconds (ms) since the Detector clock increments by 20 ms. *Real time* means elapsed time or clock time. *Live time* refers to the amount of time that the Detector is available to accept another pulse (i.e., is not busy), and is equal to the real time minus the *dead time* (the time the Detector is not available).

Enter the **ROI Peak** count preset value in counts. With this preset condition, the Detector stops counting when any ROI channel reaches this value unless there are no ROIs marked in the Detector, in which case that Detector continues counting until the count is manually stopped.

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Enter the **ROI Integral** preset value in counts. With this preset condition, the Detector stops counting when the sum of all counts in all channels for this Detector marked with an ROI reaches this value. This has no function if no ROIs are marked in the Detector.

The **Uncertainty** preset stops acquisition when the statistical or counting uncertainty of a user- selected net peak reaches the value you have entered. Enter the **Preset in %** value as percent uncertainty at 1 sigma of the net peak area. The range is from 99% to 0.1% in 0.1% steps. You have complete control over the selected peak region. The region must be at least 7 channels wide with 3 channels of background on each side of the peak. As the uncertainty is calculated approximately every 30 seconds, the uncertainty achieved for a high count-rate sample may be lower than the preset value.

Use the **Start Chan**nel and **Width** fields to enter the channel limits directly, or click on **Suggest Region**. If the marker is positioned in an ROI around the peak of interest, **Suggest Region** reads the limits of the ROI with the marker and display those limits in the **Start Chan** and **Width** fields. The ROI can be cleared after the preset is entered without affecting the uncertainty calculation. If the marker is not positioned in an ROI, the start channel is 1.5 times the FWHM below the marker channel and the width is 3 times the FWHM.

The net peak area and statistical uncertainty are calculated in the same manner as for the MAESTRO **Peak Info** command.

Marking the **Overflow** checkbox terminates acquisition when data in any channel exceeds 231!1 (over 2×109) counts.

**MDA Preset** The MDA preset (Fig. 53) can monitor up to 20 nuclides at one time, and stops data collection when the values of the *minimum detectable activity* (MDA) for all of the user-specified MDA nuclides reach the needed value. The MDA preset is implemented in the hardware. The formula for calculating the MDA can be generally represented as follows:

*MDA* ' *a*% *b*%*c*(*Counts*

*Live time* ( (*Eff* ( *Yield*)

The coefficients *a*, *b*, and *c* are determined by the MDA formula to be used. The *Eff* (detector efficiency) is determined from external programs. The *Yield* (branching ratio) is read from the working library using the nuclide and energy specified. The **MDA** value is the one you have entered in the dialog. *Counts* is the gross counts in the specified region and *Live time* is the live time. The *MDA* value is calculated in the MCB given the values *a*, *b*, *c*, *Live time*, and *Yield*. The

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calculated value is compared with the **MDA** value on the dialog and when it is lower, acquisition is stopped.

**Coefficients A**, **B**, and **C** can be entered as numbers for the MDA calculation desired.

Select the **Nuclide** and **Energy** from the droplists. The **Nuclide** list contains all the nuclides in the working library. The **Energy** list shows all the gamma- ray energies for the selected nuclide in the library.

**Fig. 53. DSPEC Pro MDA Preset Tab.**

The **MDA** field is labeled **Correction** because MAESTRO does not use efficiency. In this case, the *Eff* value is set to 1.0. The *Yield* value is taken from the library. If the **Correction** value entered is the actual MDA times the efficiency (known from other sources), the MDA preset will function normally.

**4.2.7.2. digiDART**

**Amplifier** Figure 54 shows the Amplifier tab. This tab contains the controls for **Gain**, **Baseline Restore**, **Preamplifier Type**, **Input Polarity**, and optimization. Be sure that all of the controls on the tabs have been set *before* clicking the **Start Auto** (optimize) button.

**NOTE** The changes you make on this

tab ***take place immediately***. *There is no cancel or undo for this dialog*.

***Gain*** Set the amplifier coarse gain by selecting from the **Coarse** droplist, then adjust the **Fine** gain with the horizontal slider bar or the

**Fig. 54. digiDART Amplifier Tab.**

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**56**edit box, in the range of 0.45 to 1.00. The resulting effective gain is shown at the top of the **Gain** section. The two controls used together cover the entire range of amplification from 0.45 to 100.

***Input Polarity*** The **Input Polarity** radio buttons select the preamplifier input signal polarity for the signal from the detector. Normally, GEM (p-type) detectors have a positive signal and GMX (n-type) have a negative signal.

***Baseline Restore*** The **Baseline Restore** is used to return the baseline of the pulses to the true zero between incoming pulses. This improves the resolution by removing low frequency noise such as dc shifts or mains power ac pickup. The baseline settings control the time constant of the circuit that returns the baseline to zero. There are three fixed choices (**Auto**,5 **Fast**, and **Slow**). The fast setting is used for high count rates, the slow for low count rates. **Auto** adjusts the time constant as appropriate for the input count rate. The settings (**Auto**, **Fast**, or **Slow**) are saved in the digiDART even when the power is off. The time constant can be manually set on the InSight display (see the discussion in Section 4.2.7.3).

You can view the time when the baseline restorer is active on the InSight display as a **Mark** region (see the discussion on Marks, page 73). In the automatic mode, the current value is shown on the InSight sidebar (Fig. 65). For a low-count-rate system, the value will remain at about 90.

***Preamplifier Type*** Use the **Preamplifier Type** section to choose **Transistor Reset** or **Resistive Feedback** preamplifier operation. Your choice will depend on the preamplifier supplied with the type of germanium detector being used.

***Optimize*** The digiDART is equipped with both automatic pole-zero logic6 and automatic flattop logic.7 The **Start Auto** optimization button uses these features to automatically choose the best pole zero and flattop tilt settings. Note that if you selected **Transistor Reset** as the **Preamplifier Type** for this digiDART, the **Start Auto** button does not perform the pole zero.

As with any system, the digiDART should be optimized any time the detector is replaced or if the flattop width is changed. For optimization to take place, the digiDART must be processing pulses. The detector should be connected in its final configuration before optimizing is started. There should be a radioactive source near the detector so that the count rate causes a dead time of ~5%. Dead time is displayed on the digiDART front panel and on the Status Sidebar during data acquisition.

Select either the **Resistive Feedback** or **Transistor Reset** option and click on **Start Auto**. The optimize command is sent to the digiDART at this time and, if the digiDART is able to start the operation, a series of short beeps sounds to indicate that optimization is in progress. When optimizing is complete, the beeping stops.

During optimization, pole zeroes are performed for several rise-time values and the digiDART is cycled through all the rise time values for the determination of the optimum tilt values. As all of the values for all the combinations are maintained in the digiDART, the optimize function does not need to be repeated for each possible rise time. The optimization can take from 1 to 10 minutes depending on count rate.

You should repeat the optimization if the flattop width is changed.

The effect of optimization on the pulse can be seen in the InSight mode, on the Amplifier 2 tab. Note, however, that if the settings were close to proper adjustment before starting optimization, the pulse shape might not change enough for you to see. (In this situation, you also might not notice a change in the shape of the spectrum peaks.) The most visible effect of incorrect settings is high- or low-side peak tailing or poor resolution.

**Amplifier 2** Figure 55 shows the Amplifier 2 tab, which accesses the advanced digiDART shaping controls including the InSight Virtual Oscilloscope mode, which is discussed in Section 4.2.7.3.

The many choices of **Rise Time** allow you to precisely control the tradeoff between resolution and throughput. Section 4.2.7.7 discusses this tradeoff and contains a guide to choosing rise time according to count rate. The value of the rise time parameter in the digiDART is roughly equivalent to twice the integration time set on a

**Fig. 55. digiDART Amplifier 2 Tab.**

conventional analog spectroscopy amplifier. Thus, a digiDART value of 12 corresponds to 6 in a conventional amplifier. Starting with the nominal value of 12.0, you should increase values of the rise time for better resolution for expected lower count rates, or when unusually high count rates are anticipated, reduce the rise time for higher throughput with somewhat worse resolution.

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**58**Use the up/down arrows to adjust the rise time within the range of 0.2 to 23.0. After all the controls have been adjusted, return to the Amplifier tab and click on **Start Auto**. The most recent settings are saved in the digiDART firmware even when the power is turned off.

For the more advanced user, the InSight mode allows you to directly view all the parameters and adjust them interactively while collecting live data. To access the InSight mode, go to the **InSight** section on the Amplifier 2 tab and click on **Start**.

Note that the Amplifier 2 tab graphically presents a *modeled shape*. This is *not* a sampled waveform of the actual pulse shape, only a model based on the current parameters. The modeled shape is nominally a quasi-trapezoid whose sides and top can be adjusted by the controls in this dialog. While a particular control is being adjusted, the model is updated to represent the changes made.

The **Rise Time** value is for both the rise and fall times; thus, changing the rise time has the effect of spreading or narrowing the quasi-trapezoid symmetrically.

The **Flattop** controls adjust the top of the quasi-trapezoid. The **Width** adjusts the extent of the flattop (from 0.3 to 2.4 μs). The **Tilt** adjustment varies the “flatness” of this section slightly. The **Tilt** can be positive or negative. Choosing a positive value results in a flattop that slopes downward; choosing a negative value gives an upward slope. Alternatively, the optimize feature on the Amplifier tab can set the tilt value automatically. This automatic value is normally the best for resolution, but it can be changed on this dialog and in the InSight mode to accommodate particular throughput/resolution tradeoffs. The optimize feature also automatically adjusts the pole-zero setting.

The dead time per pulse is (3 × *Rise Time*) % (2 × *Flattop Width*).

In the **Pole Zero** section, the **Start** button performs a pole zero at the specified rise time and other shaping values. Unlike the optimize feature, it performs a pole zero for only the one rise time. The pole-zero **Stop** button aborts the pole zero, and is normally not used.

When you are satisfied with the settings, **Close** the Properties dialog and prepare to acquire data.

Once data acquisition is underway, the advanced user might wish to select **MCB Properties...** and click on the **InSight** section’s **Start** button to adjust the shaping parameters interactively with a “live” waveform showing the actual pulse shape, or just to verify that all is well.

**ADC** This tab (Fig. 56) contains the **Gate**, **Conversion Gain**, **Lower Level Disc**riminator, and **Upper Level Disc**riminator controls. In addition, the current real time, live time, and count rate are monitored at the bottom of the dialog.

***Gate*** The **Gate** control allows you to select a logic gating function. With this function **Off**, no gating is performed (that is, all detector signals are processed); with the function in **Coincidence**, a gating input

**Fig. 56. digiDART ADC Tab.** signal *must be* present at the proper time for the conversion of the event; in **Anticoincidence**, the gating input signal *must not be* present for the conversion of the detector signal. The gating signal must occur prior to and extend 500 nanoseconds beyond peak detect (peak maximum).

***Conversion Gain*** The **Conversion Gain** sets the maximum channel number in the spectrum. If set to 16384, the energy scale will be divided into 16384 channels. The conversion gain is entered in powers of 2 (e.g., 8192, 4096, 2048, ...). The up/down arrow buttons step through the valid settings for the digiDART.

***Upper- and Lower-Level Discriminators*** In the digiDART, the lower- and upper-level discriminators are under computer control. The **Lower Level Disc**riminator sets the level of the lowest amplitude pulse that will be stored. This level establishes a lower-level cutoff, by channel number, for ADC conversions. Setting that level above random noise increases useful throughput because the MCB is not unproductively occupied processing noise pulses.

The **Upper Level Disc**riminator sets the level of the highest amplitude pulse that will be stored. This level establishes an upper-level cutoff, by channel number, for ADC conversions.

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**Stabilizer** The digiDART has both a gain stabilizer and a zero stabilizer (see Sections 4.2.7.4 and 4.2.7.5).

The Stabilizer tab (Fig. 57) shows the current values for the stabilizers. The value in each **Adjustment** section shows how much adjustment is currently applied. The **Initialize** buttons set the adjustment to 0. If the value approaches 90% or above, the amplifier gain should be adjusted so the stabilizer can continue to function — when the adjustment value reaches 100%, the stabilizer cannot make further corrections in that direction. The **Center Chan**nel and **Width** fields show the peak currently used for stabilization.

**Fig. 57. digiDART Stabilizer Tab.**

To enable the stabilizer, enter the **Center Chan**nel and **Width** values manually or click on the **Suggest Region** button. **Suggest Region** reads the position of the marker and inserts values into the fields. If the marker is in an ROI, the limits of the ROI are used. If the marker is not in an ROI, the center channel is the marker channel and the width is 3 times the FWHM at this energy. Now click on the appropriate **Enabled** checkbox to turn the stabilizer on. Until changed in this dialog, the stabilizer will stay active even if the power is turned off. When the stabilizer is enabled, the **Center Chan**nel and **Width** cannot be changed.

**High Voltage** Figure 58 shows the High Voltage tab, which allows you to turn the high voltage on or off, set and monitor the voltage, and choose the **ShutDown** mode.

The high voltage is overridden by the detector bias remote shutdown signal from the detector; high voltage cannot be enabled if the remote shutdown or overload signals prevent it. Enter the detector high voltage in the **Target** field, click **On**, and monitor the voltage in the **Actual** field. Click the **Off** button to turn off the high voltage.

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The shutdown can be **ORTEC**, **TTL** or **SMART**. The **ORTEC** mode is used for all **ORTEC** detectors except SMART-1 detectors; use the SMART option for those detectors. Check with the detector manufacturer for other detectors. The **TTL** mode is used for most non-ORTEC detectors.

The high voltage in the digiDART is supplied by the SMART-1 module or in a separate DIM. The recommended HV for SMART-1 is displayed on the dialog. For other detectors, see the detector manual or data sheet for the correct voltage. The polarity is determined by the DIM or SMART-1 module.

**Field Data** This tab (Fig. 59) is used to view the digiDART spectra collected in Field Mode, that is, in remote mode, detached from a PC. The digiDART is always in Field Mode when disconnected from the PC. The spectrum can then be viewed as the “active” spectrum in the digiDART. The active spectrum is the spectrum where the new data are collected. The current active spectrum is lost.

The lower left of the tab shows the total number of spectra (not counting the active spectrum) stored in the digiDART memory. The spectrum ID

**Fig. 59. The digiDART Field Mode Spectrum Tab.**

of the active spectrum is shown in the lower right. The spectrum ID is the eight-character alphanumeric value stored with the spectrum. The stored spectra cannot be viewed or stored in the PC until they are moved to the active spectrum position.

To move a spectrum from the stored memory to the active memory, enter the spectrum number and click on **Move**. Use the up/down arrow buttons to scroll through the list of spectra. The label

**Fig. 58. digiDART High Voltage Tab.**

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on the lower right does not update until a spectrum is moved. The numbers are the same as the numbers shown on the digiDART display in the stored spectrum list. Note that this only moves the spectrum inside the digiDART. To save the current active spectrum to the PC disk, use the **File/Save** commands in the application.

The **Acquire/Download Spectra** command can also be used to download all the stored spectra and save them to disk automatically. They can then be viewed in a buffer window.

**About** This tab (Fig. 60) displays hardware and firmware information about the currently selected digiDART as well as the data **Acquisition Start Time** and **Sample** description. In addition, the **Access** field shows whether the MCB is currently locked with a password (see Section 4.4.4). **Read/ Write** indicates that the MCB is unlocked; **Read Only** means it is locked.

**Status** Figure 61 shows the Status tab. Twenty-one parameters are monitored at all times. Use the droplists to select any six parameters to be displayed simultaneously on the Status tab (normally these would be the six that are most important to you). The items you select can be changed at any time.

Two types of status responses are displayed: **OK** or **ERR**, and a numeric value. The state-of-health (SOH) parameters all respond with **OK** or

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**Fig. 61. digiDART Status Tab.**

**Fig. 60. digiDART About Tab.**

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**ERR**. If the state is **OK**, the parameter stayed within the set limits during the spectrum acquisition. If the parameter varied from the nominal value by more than the allowed limit, the **ERR** is set until cleared by the program. The numeric values are displayed in the units reported by the digiDART. **Security**, **Detector temperature**, and **Live detector temperature** are available only for SMART-1 detectors. For non-SMART-1 detectors, they respond with **N/A**.

The parameters are:

**Detector State of Health**

This is OK if all the SOH are OK and ERR if any one is ERR.

**DIM +24V State of Health**

This is OK if the +24 volt supply in the DIM has stayed within 200 mV of +24 volts since the last time the SOH was cleared.

**DIM +12V State of Health**

This is OK if the +12 volt supply in the DIM has stayed within 200 mV of +12 volts since the last time the SOH was cleared.

**DIM -12V State of Health**

This is OK if the !12 volt supply in the DIM has stayed within 200 mV of !12 volts since the last time the SOH was cleared.

**DIM -24V State of Health**

This is OK if the !24 volt supply in the DIM has stayed within 200 mV of !24 volts since the last time the SOH was cleared.

**Temperature State of Health**

This is OK if the detector temperature has stayed below the high temperature limit set in the detector since the last time the SOH was cleared. This is available only for SMART-1 detectors.

**High Voltage State of Health**

This is OK if the HV supply in the DIM has stayed within 200 V of specified bias voltage since the last time the SOH was cleared.

**Shutdown State of Health**

This is OK if the detector shutdown has not activated since the last time the SOH was cleared.

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**64Preamplifier overload State of Health** This is OK if the preamplifier overload has not activated since the last time the SOH was cleared.

**Security State of Health**

This is OK if the security test was passed at the end of the last spectrum acquisition. This is available only for SMART-1 detectors.

**Power State of Health**

This is OK if the power to the DIM was constant during the last spectrum acquisition.

**+24 volts**

This is the current value of the +24 volt supply in the DIM as delivered to the detector.

**+12 volts**

This is the current value of the +12 volt supply in the DIM as delivered to the detector.

!**12 volts**

This is the current value of the !12 volt supply in the DIM as delivered to the detector.

!**24 volts**

This is the current value of the !24 volt supply in the DIM as delivered to the detector.

**High Voltage**

This is the current value of the high-voltage bias supply in the DIM as delivered to the detector.

**Detector temperature**

This is the detector temperature at the time the current spectrum acquisition stopped. This is available only for SMART-1 detectors.

**Live detector temperature**

This is the detector temperature at the current time. This is available only for SMART-1 detectors.

**Battery voltage**

This is the present voltage of the internal battery.

**Battery % full**

This is an estimate of the amount of power remaining in the battery.

**Battery time remaining**

This is an estimate of the time remaining when using the internal battery and the digiDART operating in the present mode.

**Presets** Figure 62 shows the Presets tab. MDA presets are shown on a separate tab.

The presets can only be set on an MCB that is *not* acquiring data (during acquisition the preset field backgrounds are gray indicating that they are inactive). You can use any or all of the presets at one time. To disable a preset, enter a value of zero. If you disable all of the presets, data acquisition will continue until manually stopped.

**Fig. 62. digiDART Presets Tab.** When more than one preset is enabled (set to a non-zero value), the first condition met during the acquisition causes the MCB to stop. This can be useful when you are analyzing samples of widely varying activity and do not know the general activity before counting. For example, the **Live Time** preset can be set so that sufficient counts can be obtained for proper calculation of the activity in the sample with the least activity. But if the sample contains a large amount of this or another nuclide, the dead time could be high, resulting in a long counting time for the sample. If you set the **ROI Peak** preset in addition to the **Live Time** preset, the low-level samples will be counted to the desired fixed live time while the very active samples will be counted for the ROI peak count. In this circumstance, the **ROI Peak** preset can be viewed as a “safety valve.”

The values of all presets for the currently selected MCB are shown on the Status Sidebar. These values do not change as new values are entered on the Presets tab; the changes take place only when you **Close** the Properties dialog.

Enter the **Real Time** and **Live Time** presets in units of seconds and fractions of a second. These values are stored internally with a resolution of 20 milliseconds (ms) since the MCB clock increments by 20 ms. *Real time* means elapsed time or clock time. *Live time* refers to the amount of time that the MCB is available to accept another pulse (i.e., is not busy), and is equal to the real time minus the *dead time* (the time the MCB is not available).

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Enter the **ROI Peak** count preset value in counts. With this preset condition, the MCB stops counting when any ROI channel reaches this value unless there are no ROIs marked in the MCB, in which case that MCB continues counting until the count is manually stopped.

Enter the **ROI Integral** preset value in counts. With this preset condition, the MCB stops counting when the sum of all counts in all channels for this MCB marked with an ROI reaches this value, unless no ROIs are marked in the MCB.

The **Uncertainty** preset stops acquisition when the statistical or counting uncertainty of a user- selected net peak reaches the value you have entered. Enter the **Preset in %** value as percent uncertainty at 1 sigma of the net peak area. The range is from 99% to 0.1% in 0.1% steps. You have complete control over the selected peak region. The region must be at least 7 channels wide with 3 channels of background on each side of the peak. As the uncertainty is calculated approximately every 30 seconds, the uncertainty achieved for a high count-rate sample might be better than the preset value.

Use the **Start Chan**nel and **Width** fields to enter the channel limits directly, or click on **Suggest Region**. If the marker is positioned in an ROI around the peak of interest, **Suggest Region** reads the limits of the ROI with the marker and display those limits in the **Start Chan** and **Width** fields. The ROI can be cleared after the preset is entered without affecting the uncertainty calculation. If the marker is not positioned in an ROI, the start channel is 1.5 times the FWHM below the marker channel and the width is 3 times the FWHM. The net peak area and statistical uncertainty are calculated in the same manner as for the MAESTRO **Peak Info** command, which is discussed in Section 4.3.4. Note that the **Suggest Region** button is not displayed during data acquisition.

Marking the **Overflow** checkbox terminates acquisition when data in any channel exceeds 231-1 (over 2×109) counts.

**MDA Preset** The MDA preset (Fig. 63) can monitor up to 20 nuclides at one time, and stops data collection when the minimum detectable activity for each of the user-specified MDA nuclides reaches the designated value. The MDA preset is implemented in the hardware. The formulas for the MDA are given in various textbooks and in the “Analysis Methods” chapter in the GammaVision user manual and can be generally represented as follows:

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*MDA* ' *a*% *b*%*c*(*Counts*

*Live time* ( *Eff* ( *Yield*

The coefficients *a*, *b*, and *c* are determined by the MDA formula to be used. The *Eff* (detector efficiency) is determined from the calibration. The *Yield* (branching ratio) is read from the working library using the nuclide and energy specified. The **MDA** value is the one you have entered in the dialog. *Counts* is the gross counts in the specified region and *Live time* is the live time. The *MDA* value is calculated in the MCB given the values *a*, *b*, *c*, *Live time*, *Eff*, and *Yield*. The calculated value is compared with the **MDA** value on the dialog and when it is lower, acquisition is stopped.

**Coefficients A**, **B**, and **C** can be entered as numbers. If the application, such as GammaVision, supports MDA calculations, you can click on the **Suggest** button to enter (from an internal table) the values for the MDA type selected. The MDA type should be chosen before the preset is selected here.

Select the **Nuclide** and **Energy** from the droplists. The **Nuclide** list contains all the nuclides in the working library. The **Energy** list shows all the gamma- ray energies for the selected nuclide in

**Fig. 63. digiDART MDA Preset Tab.**

the library.

If the application supports efficiency calibration and the digiDART is efficiency calibrated, the **MDA** is entered in the units selected in the application. If the unit is not efficiency calibrated (e.g., in MAESTRO, which does not support efficiency calibration), the **MDA** field is labeled **Correction**, the efficiency (*Eff*) is set to 1.0 and the preset operates as before. If the **Correction** factor is the actual MDA times the efficiency (known from other sources), the MDA preset will function normally.

**Nuclide Report** Figure 64 shows the Nuclide Report tab. The Nuclide Report displays the activity of up to 9 user-selected peaks. Once the report is set up you can view the Nuclide Report at any time on the digiDART display. The peak area calculations in the hardware use the same methods as the MAESTRO **Peak Info** calculation described in Section 4.3.4, so the Nuclide Report display is the same as the **Peak Info** display on the selected peak in the spectra stored in the PC. The calculated value is computed by multiplying the net peak count rate by a user-defined constant.

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If the constant includes the efficiency and branching ratio, the displayed value is the activity. You enter the nuclide label and the activity units.

The report has this format:

**Nuclide keV uCi/m2 ±%**

CO-60 1332.5 1.21E+01 10.2

CO-60 1173.2 1.09E+01 12.3

CO-57 122.1 1.48E+00 86.2

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**Fig. 64. Nuclide Report Setup Tab.**