EDOC203

EUROGAM PROJECT

NSF DATA ACQUISITION SYSTEM

EG-Session: The Book

Edition 1.02

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NSF Software Systems Group

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EG-Session: The Book

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Contents

1. About EG-Session

eg-session is a graphical user interface to the EuroGam Data Acquisition system designed to help physicists set up, control, and monitor experiments with the EuroGam array.

eg-session runs on Sun's SPARC workstations and follows the '`Open Windows`' interface conventions. If you are unfamiliar with Open Windows there is an introductory manual from Sun called '`Sun System User's Guide`', but here are the most important things you need to know:

left mouse button The left mouse button is called the '`SELECT`' button. Click (i.e., press and release) with '`SELECT`' to activate control panel command buttons, to tick and untick checkboxes, to make choices among options, and to tag displayed spectra. This is the most frequently used mouse button. If we say, for example, "click on the menu item" we will mean "click with the '`SELECT`' button."

middle mouse button The middle mouse button is called the '`ADJUST`' button. This is needed only for adjusting the endpoint of a piece of selected text for cut-and-paste operations.

right mouse button The right mouse button is called the '`MENU`' button. Control panel command buttons with downward or rightward pointing arrowheads have menus attached to them which pop up when you press and hold down the '`MENU`' mouse button. To make a selection from the menu, move the pointer to the chosen entry while still holding the '`MENU`' button down, and then release it. This is called *dragging* the '`MENU`' button. Releasing the button with the pointer moved off the menu simply dismisses the menu.

eg-session uses a very large number of windows or *frames* to display information about the acquisition system. This gives you the flexibility to arrange the frames on the screen from moment to moment to suit your current activity.

moving frames To move a frame around the screen, place the mouse on the *title-bar* (the strip at the top carrying the frame's title) and drag the frame with the '`SELECT`' button held down.

fronting frames To make a partially obscured frame fully visible, move the mouse to its title-bar and click with '`SELECT`'. This is called bringing the frame *to the front*. If you cannot find the title-bar, place the mouse anywhere on the frame and press the `Front` key. Pressing the `Front` key again will make the frame *go to the back*, behind your other frames.

resizing frames Some frames (in particular, the spectrum display frame) can be made bigger or smaller. These frames have *resize corners*: little L-shaped "handles" on each corner. To resize a frame, place the mouse over one of the corners—the cursor will change from a pointer to a circle with a dot at its centre—press the '`SELECT`' button, drag out the frame to the desired size, and release the button.

closing frames A frame which you might want to keep on the screen for some time (a status display for example) can be *closed* or *iconified*. This reduces the frame to a small labelled picture or icon usually at the foot of the screen, making the screen less cluttered. To close a frame, either click with '`SELECT`' on the square button in its title-bar, or place the mouse anywhere on the frame and press the `Open` key.

To open a closed frame, place the mouse over its icon and either *double-click* with 'SELECT' (i.e., two clicks in quick succession) or press the Open key.

pinned frames Some frames are designed to pop up briefly to let you make adjustments to the parameters for some operation—opening a tape file, for example—and then disappear when the operation is performed. These frames have little drawing-pin or *push-pin* pictures at the left hand end of their title bars. The idea is that while the push-pin is inserted the frame is "pinned" to the screen and will not disappear. You can change the state of the pin by clicking 'SELECT' over it. If you "unpin" such a frame it disappears immediately.

title-bar menu Every frame has a pop-up menu attached to its title-bar. You can select from this menu by placing the mouse over the title-bar and pressing and dragging the 'MENU' button. The most useful entries are 'Close', which iconifies the frame; 'Refresh', which completely repaints the frame (handy if the frame has become damaged in some way); and 'Quit', which destroys the frame for good.

eg-session provides several frames for controlling the EuroGam VXI electronics. These frames contain a variety of interface *widgets* as they are called. The next section briefly explains how to operate these.

sliders Analogue quantities such as thresholds or timers are usually controlled with *sliders*. To set a slider, drag the slider's cursor with the 'SELECT' button. The numerical value of the slider will follow the cursor, but nothing will change in the electronics until you release the mouse button. Alternatively, you can set the slider by clicking with 'SELECT' on the slider's numeric value and keying in a number, followed by Return. Use the Delete key to erase the existing digits.

numbers Discrete integer parameters are controlled with *numeric text* fields. They usually come with *up-down buttons* attached. Click with 'SELECT' on the upward-pointing arrowhead to increase the value by one and on the downward-pointing one to decrement it. Alternatively, click on the number and key in the new value, followed by Return, as for sliders.

check-boxes Electronic control bits that can be either on or off are usually represented by *check-boxes*. A little tick mark in the box means "on" or "enabled", and its absence means "off" or "disabled." Click with 'SELECT' to change the state of the check-box.

choices Parameters that can take one of a small set of discrete values are controlled with *choice* widgets or *choice-stack* widgets. Choice widgets (sometimes called *radio-buttons*) show all the possible alternatives in a row or column with the selected one(s) highlighted. To change from selected to not selected, and vice versa click with 'SELECT'. Choice-stacks are have pop-up menus attached which list the alternatives. The currently selected alternative is shown against the widget's label. To make a selection, pop up the menu by pressing the 'MENU' mouse button and drag it down to your chosen entry.

text fields Parameters such as filenames are entered in *text* widgets. To change a parameter, click with 'SELECT' on the text field and edit in the new filename, or whatever. Use the Delete key to erase characters, and the left and right arrow keys on the keyboard to move within the text. N.B. Don't forget to key a Return at the end of the field when you are satisfied else your changes will not be noticed.

scrolling lists Lists of spectrum names or filenames within a directory are displayed in *scrolling-lists* with attached *scroll-bars*. You can move around within the list by dragging the middle portion of the scroll-bar's *elevator* with the 'SELECT' mouse button. Alternatively, clicking with 'SELECT' on the elevator's up and down arrows moves the list by one entry each way. Names can be selected for subsequent operations by clicking with 'SELECT'. Selected names are shown highlighted. Click again to deselect a list entry.

Here are some other conventions used throughout *eg-session* that it is useful to know:

busy buttons When you click on a command button (or select an entry from a menu button) the button darkens to indicate that it is *busy*. It will remain busy until the operation you have asked for is completed. While one button is busy you are still free to click on others. However, such "mouse-ahead" is not recommended as you can very soon get confused about what is or is not happening. While you are learning how *eg-session* behaves it is better to wait patiently for the buttons to become idle again.

frame footers Operations which do not change the state of their frame in any obvious way usually end up by writing a message into the bottom line (or *footer*) of the frame confirming their successful completion or otherwise. Operations which take more than a few seconds often provide a running commentary on what they are doing by writing a sequence of messages ending in "" into the footer. Very long-running operations may make their whole frame go busy. The mouse pointer will change into a clock-face and there will be no response at all to mouse clicks over the frame.

safe buttons If you are nervous about causing something irreversible to happen, remember this: command buttons with labels ending in "" are always safe. All they do is to pop up further frames, and you are at quite at liberty to throw these away without using them. Just unpin them or `Quit` them from their title-bar menus.

unsafe buttons However, beware of destructive operations like `Clear` or `Delete`. These operations do *not* carry pop-up confirmation notices and will take place immediately, so take care with the mouse!

2. Getting Started

First make sure that your workstation is running '`Open Windows, Version~3`', or a later version. Start a '`Command Tool`' window and enter the command '`eg-session`'. Your system may be set up with *eg-session* on the desktop menu, in which case a '`Command Tool`' window will automatically start when you click on the menu entry. This '`Command Tool`' window is used for printing serious error messages and other diagnostic output, so it is a good idea to keep it open but reduced in size in a corner of the screen where you can keep an eye on it. You can interact directly with *eg-session* by typing statements in its built-in command language into this window, and most of its features have been developed in just this way. This is an advanced topic and rarely needed for running experiments. However, if you want to customise or enhance *eg-session*'s capabilities you will have to learn its command language. A few seconds after starting, *eg-session* pops up two frames: the '`EG Base Frame`' and the '`Session Log`'.

2.1 Base Frame

You can reach any of the facilities in *eg-session* by starting at the '`Base Frame`' menu of command buttons, and you can read about them in their own sections of the manual:

Access Control Acquiring the resources needed to perform an experiment, see section 4 [*Access Control*], page 10, for details.

System Control Controlling and monitoring the flow of event-by-event data, see section 5 [*System Control*], page 13, for details.

Visualisation Starts a copy of the '`Visu`' program for inspecting and analysing spectra.

Spectrum Analyser Simple display and elementary analysis of individual 1d spectra, see section 6 [*Spectrum Analyser*], page 15, for details.

Histogrammer Using the EuroGam hardware histogramming unit, see section 7 [*Using the Histogrammer*], page 23, for details.

Directory Browser Browsing through directories of saved spectra, see section 9 [*Directory Browser*], page 33, for details.

Online Manual Browsing the online help, see section 3 [*Getting Help*], page 6, for details.

Detectors Controlling detector high voltage supplies, see section 8 [*High Voltage*], page 27, and monitoring detector pulse rates, see section **??** [*Rate Monitor*], page **??**, for details.

Card Setup All aspects of setting up and monitoring the data acquisition electronics, see section 10 [*Card Setup*], page 38, for details.

Event Builder Setting up and monitoring the EuroGam event builder, see section 11 [*Event Builder*], page 54, for details.

Online Sort Package Setting up and monitoring the EuroGam online sorter, see section **??** [*Sort Package*], page **??**, for details.

Saving Online Spectra Copying histogrammer and sorter spectra to disc, see section 13 [*Saving Spectra*], page 70, for details.

Tape Control All aspects of using tapes for storing event data, see section 12 [*Tapes*], page 62, for details.

Exception Monitor Keeping an eye on hardware and software faults, see section 15 [*Exception Monitor*], page 73, for details.

Rack Monitor Monitoring temperatures and cooling in the EuroGam electronics racks, see section 14 [*Rack Monitor*], page 72, for details.

test electronique Starts a copy of the '`tcard`' program for checking out individual VXI electronics channels.

Engineering Tests Diagnostic tests for the data acquisition electronics. *Not* for beginners! See section 16 [*Engineering Tests*], page 74, for details.

More Information Opens the '`Manual Browser`' at this section summarising the '`Base Frame`'.

Screen Dump Prints a snapshot of your workstation screen on the default PostScript printer, see section 17.2 [*Obtaining Graphical Hardcopy*], page 75, for details.

Quit EG-Session Terminates this instance of *eg-session*, without waiting for any confirmation.

2.2 Session Log

The '`Session Log`' frame is just a scrolling text window in which it is convenient to display the results of peak fitting and other numerical calculations.

You can save the whole of the log into a file by popping up its text pane menu with the '`MENU`' button and dragging to '`File`' and then to '`Store as New File`'.

You can save part of the log by selecting the text using the '`SELECT`' and '`ADJUST`' buttons, and dragging it into an instance of the '`Text Editor`' invoked from the desktop '`Programs`' menu.

You can print part of the log by selecting the text and dragging it with the '`SELECT`' button into the drop target (the hatched box at top left) of an instance of '`Print Tool`', again invoked from the desktop '`Programs`' menu.

3. Obtaining More Information

You can read an online version of this manual by clicking on the 'Online Manual' button on the 'Base Frame' menu.

3.1 Reading the Online Manual

The 'Manual Browser' presents information about *eg-session* in easily digested gobbets or *nodes*. These appear in the scrolling text window in the bottom half of the 'Manual Browser' frame.

The nodes are organised into chapters, sections and subsections just like a printed manual. At the top of the frame is a contents list showing where the node you are currently reading fits in relation to this chapter and section structure. For example, if you are reading this online the contents list will currently look like this:

```
   Top                         EG-session:The Manual
     Help                      Obtaining more information
-->    Manual Browser          Reading the online manual   <---selected
       Help Buttons            Getting context-sensitive help
       Other Documentation     Obtaining Eurogam Documents
```

The node called 'Top' represents the whole manual. The node 'Help' represents the chapter 'Obtaining More Information' that you are currently reading. The remaining three nodes with the same indentation represent the sections at the same level as the one you are reading, that is, the sections within the 'Help' chapter. The current node is always highlighted.

To move around the online manual just select one of the nodes in the contents list. The list will update to reflect the position of the node to which you have moved. Alternatively, you can click on the buttons in the middle of the frame.

The 'next' button takes you to the next node at the same level as the current one.

'previous' takes you to the node that preceeds the current one, If you are at the first of a sequence of nodes at the same level, then you go up one level.

'up' takes you up one level in the node structure regardless of where you are.

'top' takes you to the top-level contents list of the manual.

3.2 Getting context-sensitive help

Most of the frames within *eg-session* have a 'Help' button which provides some context-sensitive help. Just click on 'Help' and the 'Manual Browser' is opened at the section which describes what you can do in that frame.

3.3 Obtaining EuroGam Documents

There is an extensive set of design and specification documents about the 'EuroGam' system held on the 'nnga' computer at the NSF and distributed by an automatic mail server.

This information server will send out files contained in mail messages, in response to a request contained in a mail message that you have sent it. Requests are of the form (Subject lines in mail headers are ignored):

```
Request: subject
Topic:   topic within that subject
Request: end
```

As an example suppose you want to be mailed a document, you would send a message of the form:

```
Request: document
Topic:   /eurogam/edoc001/latex
Request: end
```

and the document would be mailed back to you (Note! multiple topic lines are supported in a request context). The KEY WORDS supported by the information server are: request, line-limit and topic. These can be upper or lower case or a mixture. They are separated from the remainder of the line by tabs, spaces or ':'.

Line-limit is for use by people who have mail systems that can only deal with small messages. Consider the following request:

```
line-limit 1000
Request: document
Topic:   /eurogam/edoc000/text
Topic:   /eurogam/edoc001/latex
Topic:   /eurogam/edoc002/ps
Request: end
```

This would mail out the information requested in 1000 line chunks (Not including message header information). The line limit must lie between 250 and 20000. The default is send the file in 15000 line chunks. Note! Most lines sent out by the server are about 60 bytes each in length. A complex request could look like this:

```
line-limit 2000
Request: document
Topic:   help
Topic:   index
Topic:   index /eurogam
Request: sources
Topic:   index /lusort2
Topic:   /lusort2/commands
Request: end
```

Within a request subject, an index and also help information are available. These would be:

```
Request: sources
Topic:   index    (or help)
Request: end
```

Indexes can be applied on directory entries gained from previous index requests, again consider the following:

```
Request: document
Topic:   index
Request: end
```

This would, for example, give the following reply:

```
DCAM        <directory>
EUROGAM     <directory>
KERMIT      <directory>
MAIL        <directory>
```

Another index request could then be made as follows:

```
Request: document
Topic:   index /eurogam
Request: end
```

Remember to use the EXACT directory name as supplied to you by a previous index request. Index requests can be applied to as many directories as is required - providing they follow a logical path. Directories are separated by using the '/' character. As an enhancement of the index command there is 'rindex' which recursivly decends directories it is applied on, producing an index for each one. For example:

```
Request: document
Topic:   rindex /eurogam
Request: end
```

would produce an index of all the files in all the directories available under the eurogam directory. Because of the extra work necessary for the server when producing recursive indexes some directories are absolved from the rindex command. Presently these are the top level directory '/'. All blank lines are ignored, and the "request end" is optional, however if it is omitted and there are other lines in the message that do not contain KEY WORDS an automatic error message will be sent to you. The following REQUEST types are supported:

- documents
- sources
- help

For help on individual subjects select a topic out of the following summary:

```
Request: help
Topic:   help        *** This file ***
Topic:   document
Topic:   sources
Request: end
```

4. Access Control

The EuroGam system is built from a number of distinct components: VXI crates, Event Builder crate, Tape Server, and so on, each of which contains at least one processor card. The *eg-session* program running in your workstation communicates with these processors by Ethernet, sending commands telling software in the crates to read and write control parameters in the acquisition cards, to read back counts in spectra, or to open tape files, for example.

Clearly, *eg-session* needs to know what EuroGam components are available, what they can do, and what their network addresses are. In addition, there needs to be a way of controlling which workstations can access which components. This is all done through the concepts of *resources*, *apparatuses*, and *experiments*.

resources A *resource* is a software process (often called a "server") running in a EuroGam crate which controls some equipment (all the VXI cards in a crate, say) and responds to command messages send by *eg-session* over the network. The only access *eg-session* has to the hardware is through the appropriate resource. Before a resource can be used in this way it has to be *claimed* by an *eg-session*. The resource returns a special token called a "capability" which, like a password, has to be quoted in each subsequent command sent to the resource, else the command is rejected. When the resource is no longer needed it can be *freed* by handing back the capability.

apparatuses An *apparatus* is a collection of one or more resource *descriptions* recorded in a file and treated as a unit. Each resource description contains a name, the type of the resource, and its network address.

experiments An *experiment* is a set of resource descriptions and capabilities stored in a "capability file" and shared by one or more instances of *eg-session*. The descriptions tell each *eg-session* what resources exist and what their network addresses are, and the capabilities grant access. *eg-session* has facilities for creating new experiments or joining existing ones, and for modifying the set of resources making up an experiment.

4.1 Accessing an Experiment

The entry '`Experiment Access`' on the '`Access Control`' menu of the '`Base Frame`' pops up a frame for working with "experiments."

The frame displays a scrolling list showing the names of the experiments which presently exist. Each experiment is in fact represented by a directory of the same name within the '`/eg/experiments`' directory. Within an experiment directory, '`/eg/experiments/dy152`' (say), you will find other files associated with the experiment in addition to the all-important capability file.

4.1.1 Joining an existing experiment

Usually you will want to join an experiment that already exists. To do this, make sure that you are not already connected to an experiment, select the one you want to join from the scrolling list, and click on '`Join`'. This experiment becomes the current experiment. N.B. You cannot connect to more than one experiment at a time, but you can switch between experiments by judicious leaving and joining.

4.1.2 Leaving the current experiment

Just click on '`Leave`'.

4.1.3 Creating a new experiment

It is rare that you will need to create a new experiment from scratch, but this is how it is done: Choose a name which does not appear in the scrolling list and key it into the '`experiment:`' field. Don't forget the `Return`. Then click on '`Create`'. A new experiment directory is created and an empty capability file within it.

4.1.4 Destroying an experiment

Again it is rare that you will need to do this. First, make sure that the experiment owns no resources, since you are not allowed to destroy an experiment that does. See section 4.2 [*Accessing an Apparatus*], page 11, for how to do this. Next, make sure that you are not currently joined to this experiment. Finally, select the name of the experiment you want to destroy from the scrolling list and click '`Delete`'. This experiment directory and all files beneath it are removed.

4.1.5 Displaying your experiment's resources

To find out what resources the experiment you have joined actually owns, click on '`Inspect Resources`'. A frame pops up containing a scrolling list showing the resources comprising your experiment. The 16-digit hexadecimal numbers in the rightmost column are the capabilities acquired for each resource. A zero capability means that the resource is unclaimed.

4.2 Accessing an Apparatus

The entry '`Apparatus Access`' on the '`Access Control`' menu of the '`Base Frame`' pops up a frame for working with "apparatuses." The frame displays a scrolling list showing the names of "apparatus files" within the directory '`/eg/apparatus`'. Each file contains a set of resource descriptions that you can use in your experiment.

4.2.1 Adding resource descriptions to your experiment

You can add all the resource descriptions in an apparatus to your experiment. Select the apparatus name from the scrolling list and click on '`Attach`'.

4.2.2 Removing resource descriptions from your experiment

To remove an apparatus's resource descriptions from your experiment, select the apparatus name from the scrolling list and click on '`Detach`'. This operation will fail if one or more of the resources is still claimed.

4.2.3 Claiming resources in an apparatus

First make sure that you have added the resource descriptions to your experiment. Select the apparatus name from the scrolling list and click on '`Claim`'. An attempt is made to claim all the resources in your experiment that were added from the given apparatus. Any resources already claimed are skipped. This operation will result in an error if it is not possible to claim one or more of the remaining resources.

4.2.4 Releasing resources in an apparatus

Select the apparatus name from the scrolling list and click on '`Free`'. An attempt is made to release the capability of each resource added from the given apparatus. This operation will result in an error if it is not possible to contact one or more of the resources, but the resources will nevertheless be marked as free. This situation usually arises from a hardware or software fault in the processor hosting the resource. If so, it may be possible to recover by restarting the remote system.

4.2.5 Displaying the resources in an apparatus

To preview the resources contained in an apparatus, select the apparatus name from the scrolling list and click on '`Inspect Apparatus`'. A frame pops up containing a scrolling list showing the resources described by the given apparatus file.

5. Controlling and monitoring the flow of event data

The '`System Control`' menu button on the '`Base Frame`' provides three frames to allow you to control and monitor the flow of event data through the Eurogam data aquisition system.

5.1 The System Control Frame

The '`Data Flow`' entry on the '`System Control`' button of the '`Base Frame`' pops up a frame for controlling the data flows through the Eurogam data aquisition system.

Each component from the VXI frontend crates to the tape server can be stopped or started. Also individual components and data streams within the event builder can be switched on or off.

The stream association information for the tape server is displayed, but can not be controlled from this frame.

The '`VXI:`' stop/go switch resets the frontend crates in addition to setting the starting the VXI acquisition. The action taken is as follows:

1. Stop VXI
2. Zero event number
3. Flush all VXI cards' FIFOs
4. Reset and enable ROCOs
5. Reset and enable ROHSI
6. Start VXI

The '`Eurogam:`' '`STOP - ARRETE`' and '`GO - MARCHE`' buttons will cause the whole acquisition system to stop or start.

5.1.1 Controlling event data flow

If the event builder or tape server is stopped then data flow will be blocked throughout the system. For this reason it is important to start and stop the components of the Eurogam data aquisition system in the correct order. The system should be started from the downstream end so that as each component is started there is somewhere for the output data to flow. Similarly the system should be stopped from the upstream end.

So, to start the whole system, work from bottom to top and click on '`Tapes: Go`' followed by '`Event Builder: Go`' followed by '`VXI: Go`'. And, to stop the system, work from top to bottom and click on '`VXI: Go`' followed by '`Event Builder: Go`' followed by '`Tapes: Go`'. Alternatively, the '`Eurogam:`' '`GO - MARCHE`' or '`STOP - ARRETE`' buttons will do this automatically.

The '`Event Builder: On/Off`' switches can be left as they are, since the event builder components will not block data flows, but act as a sink. This is useful for system testing when you may just wish to histogram data without building data blocks or sending them on to tape. You will need to set the event builder going in order to keep data flowing through the DT32 bus, but you can then lose the data by switching off the '`input`', '`event`' or '`output`' components.

The tape server can also sink data by clicking the '`Tapes: Test`' switch. data arriving on all four streams will be accepted and thrown away. This is useful for testing flow rates through the data aquisition system without having to mount tapes.

5.2 Viewing event data flow rates

The '`System Statistics`' entry on the '`System Control`' button of the '`Base Frame`' allows you to examine the data flow rates through the Eurogam data aquisition system.

The '`Redisplay`' switch causes the frame to be updated. You can choose to display either the current values of the accumulating counters, or the rate of accumulation. If the rate is chosen then the statistics will be read twice and the rate calculated from the difference.

The '`Refresh`' switch allows the frame to be updated automatically every thirty seconds, so you can keep track of current conditions.

5.3 System watchdog function

The '`System Watchdog`' entry on the '`System Control`' button of the '`Base Frame`' allows you to control the system watchdog. This samples the system statistics every thiry seconds and will attempt to restart the system if the system is running but data is not flowing through the event builder.

To start or stop the watchdog click on the '`Off/On`' switch.

After first checking that the system is switched on and that data is entering the system (i.e., FTR scalers are incrementing) then four tests are performed:

1. If the FT scaler is not incrementing then the VXI crates are stopped and restarted.
2. If the no data is reaching the event builder then the event builder and the VXI crates are stopped and restarted.
3. If ROCO event faults are occuring then all ROCOs are reset.
4. If ROCO word count errors or bad event starts are detected then the ROCOs and the ROHSI are reset.

To disable any of these tests click on the box to the right to remove the tick.

When the watchdog takes any action a report is put onto your screen describing what has been done and why. Also a message is sent to the message logger.

6. Spectrum Analyser

The 'Spectrum Analyser' frame lets you display one-dimensional online and saved spectra, and lets you perform some simple analysis functions upon them.

The frame automatically pops up whenever you have selected a spectrum name and click on the 'show' button in, for example, the 'Directory Browser' or 'Hardware Histogrammer' frames.

Several spectra can be displayed simultaneously, each in its own spectrum *box*. You can choose either to add extra boxes to the frame (upto a maximum of 16) for displaying the newly selected spectra, or to first clear the existing boxes.

The 'View' menu-button pops up a menu of functions for altering the *region of interest* or *zoom state* of the displays. You can apply these functions either to the *current box* or to all boxes. The current box is just the one most recently added to the frame or the one containing the most recently tagged spectrum.

The frame works with the idea of a *current spectrum*. This is always the spectrum that has been most recently displayed or tagged. The analysis functions are always applied to just the current spectrum.

6.1 View Menu

The 'View' menu provides functions for controlling the spectrum display. You can *tear-off* a copy of this menu and leave it permanently pinned to the screen in a convenient place.

When a spectrum is displayed it is presented with all channels visible and vertical axis scaled to a power of ten so that the maximum and minimum counts can be seen. Subsequently you can change the range of channels visible (the *region-of-interest*) and the vertical scaling independently of one another. A particular region-of-interest and vertical scaling are together called a *zoom-state*.

Each box remembers a stack of its four most recent zoom-states and you can move around these using the 'undo' and 'redo' buttons. In addition, the frame as a whole remembers a ring of upto four regions-of-interest which you can choose at will, and you can move around these using the 'revert' button.

The zoom-state changing functions can be applied either to the current display box or all boxes in the frame by means of the 'select' menu.

expand: expands the region-of-interest to lie between the two most recently created tags.

Typical use is to create a tag on each side of a peak and to then click on the 'expand' button. The two tags are automatically removed in order to avoid confusion with tags created for analysis functions.

You can also create a tag by keying a channel number (followed by `RETURN`) into the '`channel:`' text-field in the menu panel.

times2: halves the range of the vertical axis, thus doubling the heights of the displayed counts.

divide2: doubles the range of the vertical axis, thous halving the heights of the displayed counts.

left: shifts the region-of-interest towards higher numbered channels by one quarter of its width, the spectrum thus appearing to move to the left by the same number of channels.

right: shifts the region-of-interest towards lower numbered channels by one quarter of its width, the spectrum thus appearing to move to the right by the same number of channels.

reset: returns the zoom-state to its initial state.

undo: sets the zoom-state to that preceding the current state in the stack of recent zoom-states, if one exists.

redo: sets the zoom-state to that following the current state in the stack of recent zoom-states, if one exists.

retain: pushes the current region-of-interest onto the frame's region-of-interest ring.

revert: rotates the frame's region-of-interest ring by one place and expands the display to the topmost region in the ring.

refresh: offers a pull-right menu for controlling the regular refreshing of the display. You can choose to turn the refreshing off, to refresh just once, or to set the period in seconds between subsequent refreshes and turn refreshing on.

tear-off: pops up a frame containing a copy of the '`View`' menu. You can position this anywhere you wish on the screen.

6.2 Arrange Menu

The '`Arrange`' menu-button offers a menu of functions for controlling the layout of display boxes on the frame.

remove: deletes the current display box from the display. This leaves a gap which may be filled by a subsequent '`show`'. N.B. this does not affect in any way any spectra drawn in the box.

rearrange: redraws the display boxes removing any gaps that may have been created by use of the '`remove`' function.

clear: removes all display boxes from the frame. N.B. this does not affect in any way any of the spectra drawn in the boxes.

In the '`new`' display mode the '`show`' function performs an implicit '`clear`' before creating the new display box(es).

cobalt: displays a Cobalt56 pseudo-spectrum. This is for testing the display functions. The analysis functions do nor work if targeted on the Cobalt56 display.

hardcopy: produces a quick black-and-white hardcopy of the current state of the frame on the workstation's default PostScript laser printer.

another: creates another spectrum analyser frame. The new frame becomes the target frame for '`Show`' and has a tick in the tickbox at the top left. To make a different analyser frame the '`Show`' target, just click on its tickbox.

6.3 Analyse Menu

The pop-up menu attached to the '`Analyse`' button provides a basic set of spectrum analysis functions useful during experiments.

The functions write their results into the '`Session Log`' window. For details of saving results in files or getting hardcopy, see section 2.2 [*Session Log*], page 5.

integrate: assumes that the two most recently created tags denote a peak and performs a very simple linear background subtraction and peak centroid extraction. The two tags are removed and the result, formatted as below, is presented in the '`Session Log`' frame.

```
Integration of /disc/specs/cobalt56 title 56 CO CALIBRATIONS
Limits =  576 and  590, Total area =    386800.00, Background area =    62655.00
Centroid =   582.29+/-0.0057, Energy =   846.70+/-0.0434 KEV
Peak width =  4.21+/-0.0174, Peak area =    324145.00+/-   670.41
```

For the '`energy`' field to be significant the spectrum must possess a valid calibration.

The algorithm is taken from the following reference:

```
Bock, R (ed), "Heavy Ion Collisions", North Holland, 1982,
ISBN 0-444-85353-7 (set)      Table 1.10, page 208.
```

peakfit: performs a more sophisticated peak fitting calculation with multiple options on peak and background shapes, and displays the resulting peak and background fit overlaid on the displayed spectrum.

The function pops tags from the tag-stack associated with the current display box. The number depends on the fitting options you have selected. Normal use requires six tags: two surrounding the peak and four more marking two regions of background, one on either side of the peak. If you have set '`peak type`' to '`none`' on the '`peakfit options`' frame, then just create the four background tags.

The function consumes the appropriate number of tags, computes the fits, presents the numerical results in the format below in the '`Session Log`' window, and displays the fits in the current spectrum box.

```
Background/Peak fit for spectrum /disc/specs/cobalt56, limits [575,590] [545,561]
centroid chan     centroid KEV      peak area              FWHM chan
582.34 (0.04)     846.771 (0.065)    330178.00 (6603.71)    4.38
```

You can get rid of the fits using 'clear fits' from the 'Tags/Fits' menu-button.

peakfit options: options for peak fitting [lots more to come!!!]

calibrate: How to calibrate a spectrum [lots more to come!!!]

peak/total: runs a peak-to-total calculation for the current spectrum, given two peak regions tagged in advance. The function consumes the four latest tags, computes the peak-to-total ration, and presents the numerical results in the format below in the 'Session Log' window.

```
Peak-to-Total for spectrum /disc/specs/Ge1.4MeV.q0 (channel for 100 keV is  200)
peaks defined: 2398:2433   2726:2761
spectrum not calibrated---assuming 2 channels per keV
Peak:    3806, Total:   11353, Peak/Total:  33.5242%
```

total counts: totals the counts in the current spectrum and displays the result in the 'Session Log' window and in the frame footer.

Co60 peak/total: is useful for checking out detectors with a Cobalt60 source. Assuming that the four most recent tags delimit the two Cobalt peaks, the function extracts the peak centroids using the same algorithm as the 'integrate' function, and performs a two-point calibration of the spectrum, followed by a peak-to-total calculation, presenting the results in the 'Session Log' window as follows:

```
Calibration of spectrum /disc/specs/Ge1.4MeV.q0, Title
The fit is of the form A+Bx+Cx^2+Dx^3, with
A =   1.815308    +/-         0.    , B =  0.4849627    +/-         0.
C =         0.    +/-         0.    , D =         0.    +/-         0.
  Channel                Energy keV          Fit                    Difference
  2415.000 +/-  0.100  1173.000 +/-  0.100  1173.000 +/-  0.000     0.000
  2742.860 +/-  0.100  1332.000 +/-  0.100  1332.000 +/-  0.000     0.000
Peak-to-Total for spectrum /disc/specs/run1/Ge1.4MeV.q0 (channel for 100 keV is  202)
peaks defined: 2398:2435   2721:2766
Peak:    3821, Total:   11352, Peak/Total:  33.6593%
```

Co60 auto-calibration: is useful for calibrating many channels using a Cobalt60 source. The peak regions are defined automatically by searching the current spectrum for the two channels with the greatest counts, and allowing five channels on either side. The function extracts the peak centroids and then does a two-point calibration followed by peak-to-total and resolution calculation at the 1332 keV peak. The results are presented in the 'Session Log' window as for 'Co60 peak/total' and a summary in the frame footer.

Eu152 auto-calibration: is useful for calibrating many channels using a Europium152 source. Seven peak regions are defined automatically by searching the current spectrum for the channels with the greatest counts and matching with the expected relative positions of seven of the Eu152 peaks. The peak centroids are extracted using the same algorithm as the 'integrate' function, assuming the peaks lie within five channels on either side of the maximal count. The function then does a seven-point quadratic calibration followed by peak-to-total and resolution calculation at the 1408 keV peak. The results are presented in the 'Session Log' window as for 'Co60 peak/total' and a summary in the frame footer.

gainmatch: is useful for obtaining the online gain coefficients from a set of Cobalt60 or Europium152 source spectra.

Use the 'gainmatch options' function to specify a v/c for the reaction, the energies of two gamma rays detected in the experiment, and an output file name for the calculated gain coefficients. The mapping between acquisition channel numbers and array positions is read from a configuration file which defaults to '/eg/config/array_positions'.

An auto-calibration is performed on the source spectra to obtain a set of gain coefficients. These values are then modified by dividing by (1 + v/c * cos(theta)) where theta is the compound angle between the detector and beam axis.

The output gain coefficients are written in Eurogam sort language format as a gainarray declaration. This file can be included directly into a sortfile but the gain array name must be specified by the user. See Eurogam document EDOC033 for the sort language specification.

gainmatch options: pops up a subframe for setting parameters for 'gainmatch'. Don't forget to click on 'Apply' after changing the parameters.

peakfind: scans a region of the current spectrum looking for peaks of a given width and significance. The set of peaks is listed in the 'session log' and tagged on the spectrum display.

The criteria for detecting a peak can be set by 'peakfind options'.

The algorithm used is taken from a Chalk River program obtained by John Sharpey-Schafer many moons ago.

peakfind options: pops up a subframe for setting parameters for 'peakfind'.

'Low Channel:' and 'High Channel:' determine the range of channels over which the search works.

'FWHM:' sets an upper limit on the widths of the peaks that will be found.

'Acceptance:' sets the peak acceptance percentage. 'peakfind' works by attempting to fit a Gaussian peak centred at each channel of the spectrum. Only those channels within an interval of *fwhm* channels centred on the putative peak are considered by the fitting routine. The channel is taken to be a peak centroid if

```
PeakAreaError / PeakArea < acceptance / 100
```

Remember to click on 'Apply' if you have altered any of the parameters.

plot: produces an annotated hardcopy plot of the current spectrum in landscape orientation on the default PostScript printer. You can set the characteristics of the plot with 'plot options' before clicking on 'plot'.

If the spectrum is calibrated the horizontal axis of the plot is correspondingly annotated.

plot options: pops up a subframe for setting parameters for 'plot'.

'Low Channel:' and 'High Channel:' indicate the range of channels which will be plotted.

'Scale:' sets the "density" of the plot in channels per inch.

'Strips:' sets the number of separate horizontal strips on which the spectrum is plotted. As you change any of the preceding three parameters, a message appears in the frame footer indicating the recommended number of strips. For example, you can plot 4096 channels at 200 channels per inch using 2 strips. Plotting 4096 channels at 100 channels per inch will need 4 strips.

'Normalisation:' selects between a 'linear' and 'logarithmic' vertical axis.

If you tick 'Label peaks:' your plot will label the peaks recognised by 'peakfind' using the current setting of its options. The labelling shows the peak energy if the spectrum is calibrated.

'Printer:' lets you select which printer you want the plot (and all other hardcopy graphics from *eg-session*) sent to.

'Paper:' chooses between A4 and A3 size paper for your plot.

The horizontal axis of the plot can be split into a number of regions each having its own vertical scaling. These regions are independent of the boundaries of the plotting "strips". The frame contains a scrolling list with an entry for each such region, showing its left-hand and right-hand limits (in channels) and the minimum and maximum extremities of the vertical axis.

Click on 'Reset' to set single plotting region and scaling determined by the zoom-state of the current display box. This will set 'Low channel:' and 'High channel:'.

To set the vertical scaling on a region, first select its entry from the scrolling list. The current spectrum display box will expand to show the region at the chosen scaling. Change the vertical scaling of the display box using the 'times2' and 'divide2' entries from the 'View' menu in the usual way. When you are satisfied, click on 'Take' in the 'plot options' subframe. The selected region's scaling will be taken from the current display box and updated.

The horizontal extents of the plotting regions are set by "splitting" existing regions. First select from the scrolling list the region you want to split. The current spectrum display box will expand to show this region. Tag the channel at which you want to divide the region and click on 'Split'. The region entry will divide into two entries: the first describes the lefthand part of the split region and the second the righthand part. The first of these becomes the selected region and the display box will expand to show it, ready for you to set its vertical scaling.

You can undo a "split" by selecting the first of a pair of region entries from the scrolling list and clicking on 'Join'. The chosen entry and its successor will coalesce into a single region retaining the vertical scaling of the first region.

You can always click on 'Reset' to return to a single plotting region and scaling determined by the zoom-state of the current display box.

When you are satisfied with your adjustments a click on 'Plot' will generate the plot and send it to the printer.

'Save as defaults' takes all your current spectrum plotting options and saves them in your personal '.eg-defaults.tcl' file. These values will become the initial spectrum plotting options the next time you start an *eg-session*.

6.4 Tags/Fits Menu

The 'Tags/Fits' menu has options for removing tags and fits drawn in the spectrum display boxes.

clear tags: removes all tags drawn in the current spectrum box.

clear fits: removes all fits drawn in the current spectrum box.

6.5 Mode menu

The 'mode:' menu of the spectrum display frame lets you control how newly selected spectra are presented.

new: sets the frame into the 'new' display mode. In this mode the 'show' function (for creating spectrum display boxes) does an implicit 'clear' operation before laying out the new boxes.

add: sets the frame into the 'add' display mode. In this mode the 'show' function appends the new display box(es) to the set of existing boxes. This mode allows you to build up a set of displayed spectra incrementally. The existing boxes are rearranged in the frame to accommodate the new ones.

overlap: sets the frame into the 'overlap' display mode. In this mode the 'show' function draws each selected spectrum in the currently selected display box. This allows you to closely compare similar spectra.

On a colour screen the sixteen colours available in the '2d colours' function of the 'Analyse' menu are used to distinguish the spectra.

On a monochrome screen the spectra are drawn in four different dashed line styles. The name and title (if any) of the currently selected spectrum within an overlapped display box appears at the top right of the display box.

6.6 Select Menu

The 'select:' menu has options for controlling how the pan/zoom functions on the 'View' menu affect the spectrum display boxes.

current: applies the '`View`' menu functions to just the current spectrum box.

all: applies the '`View`' menu functions to just all the spectrum boxes.

6.7 Slicing Menu

The '`slicing:`' menu has on/off options for controlling the spectrum display frame's automatic 2d spectrum slicing feature.

When slicing is switched off the display frame responds to dragging the '`ADJUST`' button in a display box by displaying in the frame's footer information about the channel over which the mouse lies.

In addition, when automatic slicing is turned on and the mouse lies over a 2d spectrum, dragging with the '`ADJUST`' button displays simultaneous X and Y cuts through the spectrum in a second spectrum display frame popped up for this purpose.

These cuts can be saved as permanent spectrum files by means of the '`save cuts`' function on the '`Analyse`' menu of the frame they appear in.

7. Histogrammer

The '`Histogrammer`' button on the *eg-session* '`Base Frame`' pops up a frame for controlling the EuroGam histogrammer module.

The histogrammer spies on the DT32 bus and builds histograms from raw events. These histograms are stored as one dimensional spectra and can be accessed by conventional names derived from the channel number and ADC. The histogrammer is controlled by manipulating these spectra.

In general, the frame works by a two stage operation. First the spectra to be acted on must be selected and then the required action can be taken by clicking on one of the buttons at the bottom of frame. The same selection will still be valid for further actions.

7.1 Selection

The spectra to be acted on must first be identified. This can be done either by choosing a pattern of channels, qualifiers and ADCs from the left of the frame, or by selecting spectrum names from the list to the right.

If spectra are selected by pattern then any list selection will be lost, and vice versa.

7.1.1 Selection By Pattern

To select spectra by pattern you must choose the range of channels and ADCs required, and for germananium ADCs the qualifier must also be chosen. Once a pattern has been chosen a list of possible spectrum names can be constructed automatically when required.

To select the range of channels adjust the '`Low Channel`' and '`High Channel`' values. The '`next`' button will set the High Channel at the chosen number of channels above the Low Channel.

To select or deselect the required ADCs click on the ADC boxes. Currently selected ADCs are shown highlighted. For germanium ADCs you must also select the qualifiers in the same manner.

If spectra are selected by pattern then any list selection will be lost.

7.1.2 Selection From List

The list at the right of the frame shows all the spectra that exist in the histogrammer. To select or deselect spectra from this list click on their names. Currently selected spectra are shown highlighted.

If spectra are selected from the list any pattern selection will be lost.

7.1.3 Redisplay

To refresh the list of spectra click the '`Redisplay`' button. The histogrammer will be asked for the names of all current spectra.

7.2 Actions

After selecting the spectra you are interested in, some basic manipulations can be performed by clicking the buttons at the bottom of the frame.

7.2.1 Create

To create new spectra on the histogrammer choose a pattern including the spectra you wish to create and click the '`Create`' button.

The histogrammer will start to fill a spectrum automatically, with counts from the channel implied its name, as soon as it is created.

7.2.2 Delete

The '`Delete`' button causes all the selected spectra to be deleted.

7.2.3 Zero

The '`Zero`' button causes all the selected spectra to be cleared.

7.2.4 Show

The '`Show`' button causes all the selected spectra to be displayed by the spectrum analyser. The '`Spectrum Analyser`' frame will pop up automatically. See section 6 [Spectrum Analyser], page 15.

7.2.5 Analyse

The '`Analyse`' button in the '`Histogrammer`' frame offers the same menu of spectrum analysis functions as does the '`Spectrum Analyser`' frame, but when invoked from the '`Histogrammer`' frame they are applied to *all* the spectra currently selected from the scrolling list, one by one. For example, you can auto-calibrate or plot several spectra without first having to display them in the '`Spectrum Analyser`' frame. For details of the analysis functions see section 6 [*Spectrum Analyser*], page 15.

NOTE: You should beware that applying an analysis function to many spectra can take a long time and while *eg-session* is doing the analysis you will not be able to use any of its other features.

7.2.6 Addresses

The 'Addresses' button displays in the 'Session Log' the VME base addresses of the counts of each of the selected histogrammer spectra

7.3 Electronics

The 'Electronics' frame allows direct control of the histogrammer hardware.

[lots more to come!!!]

7.4 Software Histogramming

The frontend crates provide a software histogrammer emulator, for use in engineering tests. This works with ROCOs disabled by reading the FIFOs directly.

To use this feature click on the 'Software' switch at the top of the frame. A sub frame will pop up allowing you to choose which frontend crate to use. You will then be asked to confirm this action to avoid inadvertently disabling the ROCOs. If you are unsure which crate the channel you are using is connected to then view the 'Crate Layout' frame. The 'Histogrammer' frame can then be used as normal.

If you wish to stop and start the VXI system only use the 'VXI Stop/Go' switch on the 'Trigger Electronics' frame. This is because the 'VXI Stop/Go' switch on the 'System Control' frame will restart the ROCOs.

See section 10.9 [Crate Layout], page 52. See section 5 [System Control], page 13.

7.5 Spectrum Names

Spectra in the histogrammer are given conventional names derived from the channel number and ADC. This allows much of the process to be automated, and saves confusion.

The names take the following forms: *channel*.*adc* and (for germanium channels) *channel*.*adc*.*qual* where:

channel is one of `Trig`, `BGO`*n* or `Ge`*n*, with *n* denoting the acquisition channel number.

adc is one of `20MeV`, `4MeV`, `FT`, `CO`, `Energy`, `TAC`, `Pattern`, `RwGe`, `ClGe`, `BGO`, `User`, `FTVal` or `Start`.

qual is one of `q0`, `q1`, `q2` or `q3`.

Examples: `BGO12.TAC`, `Trig.User`, and `Ge4.20MeV.q2`.

The meaning of the qualifiers is as follows:

ADC	20MeV and 4MeV	FT	CO
q0	no pileup, no veto	all data	no pileup
q1	no pileup, veto	unused	post pileup
q2	pileup, no veto	unused	pre pileup
q3	pileup, veto	unused	pre and post pileup

8. High Voltage

The High Voltage base frame is invoked by clicking on the the '`Detectors`' button on the EG Base Frame and then selecting '`High Voltage`'.

IMPORTANT Two conditions must be satified for High Voltage to a particular detector to be applied.

- The HIGH VOLTAGE GENERATION must be enabled for the mainframe the detector is connected to. The state of the HV generation can be verified physically by checking that the RED light is on on front of the mainframe. This is done by clicking '`ON`' in '`HV mainframe x`'.
- The HV channel connected to the detector must have a '`DEMAND VOLTAGE`' set. This is done in '`BGO voltages`' and '`GE voltages`' frames.

After a reboot of the VME server or any of the mainframes it is always a good idea to set the default values (ramp, voltage limit etc), as the Eurogam defaults differ from LeCroys own. This is done in '`SETUP`' by clicking '`SET DEFAULT`'.

The High Voltage control for Eurogam phase 2 includes the following main components:

- Four LeCroy High Voltage mainframes (1445A controller)
- A VME server to control and monitor the mainframes
- A SUN workstation for user interface and data storage

Commands given by a user on the SUN workstation are sent to the VME server over ethernet, the VME server in turn translates the commands to a format recognised by the LeCroy mainframes. The VME server continuously monitors the state of the LeCroy mainframes and stores the system state, which is then be read and displayed by the SUN workstation. As a general rule there is no automatic update of the various displays. The operator will have to click on the various UPDATE buttons to get the latest status.

The High Voltage USER INTERFACE serves the following purposes

- Display and control the high voltage to the BGO and GE detectors
- Display the state of and control the LeCroy 1445A High Voltage controllers
- Display the state of the VME High Voltage server

This manual refers to Revision 2.0 of the WINDOWS software for the High Voltage user interface.

8.1 High Voltage Base frame

Under normal operation you need only be concerned with the BGO and GE voltages. A message to the right of the respective buttons will at any time tell the state of the HV supply for BGO/GE. Normally it would display OK.

WARNINGS appear when any demand voltage is inconsistenst with the database or any of the detectors are NOT on. With NOT on is understood: (ramping OR turned off). An ERROR message is given if any voltage is out of range. If there is a warning or error you should investigate further by clicking on the respective button. The buttons ABOVE the display window would only be used under exceptional circumstances like a power loss.

Under the heading '`LECROY MAINFRAME`' you will see the buttons for control of the LeCroy mainframes. These need only be used if you have to switch the High Voltage on or off. A frame labelled '`HV mainframe n`' will appear when you click on one of these.

Right of these buttons, information on each mainframe is displayed. Under the heading '`CHANNELS ON`' the number of channels in each mainframe which are ON is given. The sum of these numbers will under normal circumstances equal the number of HV channels used by Eurogam.

Under '`HV`' you can view the state of the High Voltage generation itself, which can be ON,OFF or RAMPING. Note that this status may say ON even when all demands are zero. It does not say whether or not any demands have been set. The ON/OFF status corresponds directly to the RED light on the front of the mainframe. During an experiment this should ALWAYS show on, any other status is abnormal and is thus shown highlighted.

Under '`MAINFRAME STATUS`' a status messages for the mainframes are displayed. Normally it should say OK, error messages are ERROR or DISABLED. The latter reflects the state of the HV DISABLE switch on the front of the LeCroy mainframes. ERROR indicates that some voltage on the mainframe is out of range. The tolerance is +-20 volts for BGOs and +- 30 volts for Germaniums.

The '`HV SERVER`' button would only be used under exceptional situations and is intended as a help for system administrators.

- halt - halts the HV server. The server should be halted whenever you want to swicth any of the mainframes off for swapping cards etc.
- reboot - reboots the VME crate, does also effect the Rate Monitor
- restart - starts the HV server after it has been halted
- error - prints the latest error in the HV server
- info - prints some information about the HV server

The '`state`' of the server is displayed next to the button and can be one of:

- running - the normal state of the system
- uninitialised - should appear only briefly during a restart or reboot
- halted - communication with the LeCroy mainframes is suspended
- initialising - the HV server is initialising and testing the LeCroy mainframes
- configuring - initialising wire list etc.
- down - a fatal error has occurred
- no_vme1131 - not LeCroy vme1131 card is found at the excpected address, fatal error

The server status should be '`running`', any other status will be displayed highlighted. If there is an error in the VME server it will be displayed to the right of the status.

The '`INFO`' button gives some general information about the session you are currently running. The '`UPDATE`' button updates the display.

8.2 LeCroy Mainframes

This frame gives you direct access to the 1445A commands '`ON`' and '`OFF`'. These are crucial in case you need to take a mainframe down or recover after a power failure. The button is located in the top left hand corner of the frame.

The 1445A commands '`copy`' and '`backup`' are also included. BACKUP does an internal RAM backup of the demands in the 1445A. These can be retrieved by COPY. You should not need these commands as voltages will be read from the database as described in the manual for the BGO and GE frames.

Below the control buttons there is a display of each of the 16 slots for High Voltage cards in the mainframe. This display will show card type.

Three types of cards are used in Eurogam phase 2.

- 1443P - BGO detectors (positive)
- 1444P - Clover Germanium detectors (positive)
- 1444N - Phase 1 Germanium detectors (negative)

The top line of the display gives '`HV status`' and '`reboot`' status. These should be ON and REBOOT_WARM during an experiment. The '`MAINFRAME STATE`' is found below the main display and should indicate OK. The messages '`ERROR`' or '`DISABLED`' are errors (described in manual section High Voltage base frame).

If any channel in the mainframe has voltages out of range, a new button '`FIND ERROR`' will appear. Click on it and you will get a listing of the bad channels. It will identify the channels as regards to mainframe number, slot number and channel number. It will also display demand value and the actual voltage. The tolerance is also shown.

8.3 High Voltage BGO voltages

This frame pops up when you click the '`BGO VOLTAGES`' button in the '`HIGH VOLTAGE base frame`'. It gives an overview of the various parameters for the BGOs AS A WHOLE, and also has emergency buttons for switching ALL detectors on and off in one go.

The status of the BGO's are displayed in three columns. By clicking on the buttons labelled with POSITION NUMBER you can look at each position in detail. The position numbers are displayed to the left, then there is information according to which '`SHOW PARAMETER`' is chosen and rightmost an aggregate status for that position.

The value shown is an AVERAGE for the detectors in the shield. It will be highlighted if ANY of the demands in the shield are inconsistent with the database. This highlighting will be there no matter which parameters is shown.

Positions 1 to 29 are phase 1 BGOs and therefore have 10 channels, pos 31-54 are Clover shields and have 16 channels.

The status will be one of

- on - all 10/16 voltages are within 20 volts of the demand
- N off - N voltages are below 100 volts
- N ramping - N channels are ramping
- N err - N voltages are out of range

The three latter are abnormal and will be displayed highlighted. You can use the '`BY POSITION`' to investigate in detail. NB! You can ignore these highlights when the system is off (or is in the process of being switched on/off).

The '`SHOW PARAMETER`' allows you to display a selected parameter for all the positions in one go. Except for the shield names these will be averages for the whole BGO shield. These parameters are:

- voltage
- demand (actual)
- demand (database value)
- ramp
- voltage limit
- shield name

The button '`UPDATE/CHECK`' is used to:

- update all values on the display
- check that demands are consistent with database values
- check the state of each individual BGO channel
- display a summary of the check

A status of the check will be displayed when checking is completed. If the state of the system changes a warning will be output, suggesting a new check might be neccesary. However, as checking all 684 BGO channels is a slow procedure, you should not do this unless you are unsure of the state of the system.

There are two buttons for quickly zeroing and restoring demand values. Clicking on the '`CLEAR DEMANDS (ALL)`' writes demand zero to all BGO detectors, and the voltages will start ramping down if they were on. '`RESTORE DEMANDS (ALL)`' extracts demands from the database and writes them to the relevant HV channels. This will cause the voltages to start ramping providing the LeCroy mainframe have their high voltage turned on.

8.4 High Voltage BGO by position

This frame is invoked by clicking on the 'BY POSITION' on the BGO voltages frame.

The display shows actual voltage, actual demand, database demand and status for each of the 10/16 detectors in the shield. Anything exceptional will be displayed highlighted. The DEMAND is highlighted if inconsistent with the database. The STATUS is highlighted when the channel is OFF, RAMPING or OUT OF RANGE.

You decide which detectors to act on by choosing from the panel below the main display. Here you can select any combination of detectors.

You may adjust the demands by using the slider which appears when you first select a detector. You change the values either directly or by an offset. (tick the OFFSET box to select).

The 'CLEAR DEMAND' button sets the demands of the chosen detectors for the position to zero. This will cause the voltages to ramp down if they were not already off.

The 'RESTORE DEMAND' button sets the demands of the chosen detectors to correspond with the database. If those differ from the previous values the high voltage will ramp to the new values.

The 'SAVE DEMAND' button stores the demands of the chosen detectors in the database.

These operations all require confirmation.

This frame has buttons for removal and insertion of BGO shields, In addition the RAMPS, VOLTAGE LIMITS and TOLERANCES are shown here.

The GE voltages frame lets you manipulate the demand voltages for Germanium detectors. You can zero the demands, apply the database values, modify individual demands and save your new demands to the database. You can chose whether to act on one channel at a time or all of them. You also have access to the GE configuration frame. All actions to change values in the database or in the HV system itself require confirmation.

SELECT POSITION: click on 'Select position' with the right hand mouse button, and chose from there. The selected position will be highlighted in the display, the 'Demand' slider will appear and the buttons for CLEARING, RESTORING and SAVING demands will have labels corresponding to your choice. Subsequent actions will apply to the selected position only. Automatically changes the position in the GE config frame as well.

ACT ON ALL DETECTORS: click on 'Act on all detectors' will select all GEs. All positions will be highlighted in the display, the 'Demand' slider will disappear and the buttons for CLEARING, RESTORING and SAVING demands will be relabelled. Subsequent actions will apply to all detectors.

CLEAR DEMAND(S): clicking here will set the demands for the selected positions to zero. If the channel was on it will start ramping down. Confirmation required.

SAVE DEMAND(S): clicking here will save the demands of the selected positions to the database. Confirmation required.

RESTORE DEMAND(S): clicking here will set the demands of the selected positions equal to the values in the database. The voltages will ramp to the new values providing they differ from the old ones (and the relevant mainframes are on). Confirmation required.

Demand (slider): Use this to modify the demand of an individual position. The upper limit equals the VOLTAGE LIMIT of the detector. Confirmation required before the demand is applied.

UPDATE/CHECK: click to read the most recent values from the HV system and display them. A check of STATUS and DATABASE VERSUS DEMAND will be performed and the result displayed in the top right corner of the window. If any demand differ from database value it will be highlighted. Any STATE is not '`on`' it will be highlighted.

CONFIGURE: click here to bring up the '`GE configuration`' frame.

This frame has buttons for removal and insertion of GE detectors, In addition the RAMPS, VOLTAGE LIMITS, AC TRIPS, TOLERANCES are shown here. The NAMES of the detectors will also be shown.

SELECT POSITION: click on '`Select position`' with the right hand mouse button, and chose from there. The selected position will be highlighted in the display buttons for INSERT and REMOVE will be labelled according to your choice. Automatically changes the position in the GE frame as well.

INSERT xx: This button is used to insert a new detector into the array. A list of available detectors appear at the right hand side, and you then click on the one you want to insert. The database demand is set equal to the detectors voltage limit. Confirmation required.

REMOVE xx: This button is used to remove a detector from the array. Note that the database demand will be lost. Confirmation required.

UPDATE: Updates the display with the most recent values from the HV system.

9. Working with saved spectra

To work with histogrammer or other spectra that you have saved on disc, click on the 'Directory Browser' button on the eg-session 'Base Frame' menu.

Browser frame A frame pops up showing the name of a filing system directory (initially your home directory) and a scrolling list containing the names of the spectra (labelled s) and subdirectories (labelled d) within that directory. Other kinds of file within the directory are not shown.

Directory names The first component of the directory name (usually '/disc') has to be the *name* or *role* of a spectrum server resource that your has been claimed for your experiment. The remainder of the name is taken as a pathname relative to your home directory on the host running the spectrum server.

For example, if you are user 'fred' with home directory on the host 'nnsa' called '/home/users/fred' and have claimed the spectrum server resource 'nnsa-sas' running in 'nnsa', you can refer to your directory 'specs/dy152' as '/nnsa-sas/specs/dy152'.

Resource descriptions are usually set up so that one spectrum server resource (there is usually an obvious choice) is given the rolename 'disc'. This provides a default location for *eg-session* to look for spectra. In the previous example, if the resource 'nnsa-sas' were given the role 'disc' you could refer to your Dysprosium directory as '/disc/specs/dy152'.

The 'Directory Browser' has buttons for moving around the directory tree and for displaying spectra in the 'Spectrum Analysis' frame.

9.1 Moving up the directory tree

To go to the parent directory of the currently displayed directory, click on 'Up'. For example, if you are currently looking at '/disc/specs/dy152/run33' then 'Up' will take you to '/disc/specs/dy152'.

9.2 Moving down the directory tree

To move down the directory tree, select a directory (marked with a d) from the scrolling list, and click 'Down'. For example, if you are currently looking at '/disc/specs/dy152' and have selected the directory 'run33', then 'Down' takes you to '/disc/specs/dy152/run33'.

9.3 Moving across the directory tree

To go immediately to a directory whose name you already know, key or edit the full directory name (usually starting with '`/disc`') into the '`directory:`' field and key `Return`.

9.4 Deleting spectra

Select from the scrolling list the spectra you wish to delete and click '`Delete`'. There is no confirmation notice, so be careful.

9.5 Getting information about spectra

The scrolling list will display more information about each spectrum in the current directory if you click on '`Details`'. The '`Details`' button will itself change to '`Names`'.

9.6 Discarding information about spectra

To show just the names of spectra click on '`Names`'. The '`Names`' button will itself change to '`Details`'.

9.7 Displaying spectra for analysis

To display one or more spectra from the current directory in the '`Spectrum Analysis`' frame, select their names from the scrolling list and click on '`Show and deselect`' from the '`Showing`' menu button. This will automatically deselect the chosen spectra. Alternatively, click on '`Just show`' and the spectra will remain selected.

9.8 Selecting spectra for non-display operations

Most of the spectrum analysis functions are best done with the spectra displayed in front of you. However, this is not always appropriate. For example, 4K by 4K gamma-gamma spectra are too large and slow to display. Instead, for the functions in this section, you first select the spectrum (or spectra) you want to work on from the scrolling list and click on your chosen function pulled down from the '`Select for`' menu button. For each function a pinnable frame pops up or comes to the front with the name(s) of your selected spectra automatically inserted in the appropriate fields.

9.8.1 Spectrum Calibration

Selecting a spectrum from the directory browser's scrolling list and then clicking on '`calibrating`' on the '`Select for`' menu opens the spectrum calibration function, which you can use as if invoked from the spectrum display frame's '`Analyse`' button. For details, see section **??** [*calibrate*], page **??**.

9.8.2 Cuts and Projections

Selecting a spectrum from the directory browser's scrolling list and then clicking on '`projecting`' on the '`Select for`' menu pops up a frame for taking projections and slices from 2d spectra.

The '`2d spectrum:`' field is automatically filled in with the name of the spectrum you selected from the spectrum directory browser. You can change this by editing the field by hand (don't forget the '`RETURN`' key) or by selecting a different 2d spectrum from the browser and clicking on '`projecting`'.

The '`Cuts and Projections`' function chooses names for the 1d spectra it produces, but you can control which directory they are placed in by setting the '`Result directory:`' field. If you leave this field blank the result spectra go into the parent directory of the selected 2d spectrum.

If you tick the '`Show result:`' check-box then the result spectra are automatically displayed in the current spectrum analysis frame.

Before taking slices through a 2d spectrum it's useful to have a total projection spectrum which you can display and use to set gates. To obtain a total projection, click on '`Total project (on X)`'. This forms a n channel 1d spectrum TP from the n by m spectrum S, where TP(x)=Sigma S(x,y) for y in [0..m-1]. This operation may take several tens of seconds and a progress gauge pops up to keep you informed of how long it has yet to run. While this is happenning the '`Cuts and Projections`' frame remains busy, but you can do things in other frames if you wish.

To obtain a cut or slice spectrum, set the '`Peak low:`' and '`Peak high:`' fields and click on '`Gate slice (on X)`'. This operation forms the m channel spectrum GX where GX(y)=Sigma S(x,y) for x in [a..b] with a and b denoting the two peak limits. Usually the peak limits are a few channels apart and this operation takes a second or so.

You can choose to have a background subtracted from your slice. Tick the '`Subtract background:`' check-box and set the '`Background low:`' and '`Background high:`' fields before clicking on '`Gate slice (on X)`'. You then get GX(y)=(Sigma S(x,y) | x in [a..b]) - (b-a+1)/(d-c+1)*(Sigma S(x,y) | x in [c..d]) where c and d are the background limits. Note that the limit channels are always treated inclusively.

To help set the gate and background channels you can click tags onto a displayed spectrum and then click '`Grab tags`'. If '`Subtract background:`' is not ticked then '`Peak low:`' and '`Peak high:`' are taken from the last pair of tags that you created. If you have ticked '`Subtract background:`' then you must have created two pairs of tags and the '`Background low:`' and '`Background high:`' fields are taken from the more rescent pair. You can always adjust a tag by dragging it with the '`ADJUST`' button held down. Just click '`Grab tags`' again to reset the gate limits (and background limits, if ticked).

When the slice spectrum has been written it is presented in the current display frame (if you have ticked 'Show result:') and the directory browser updates to show the new spectrum file.

By judicious toggling between frames you can build up a display of slices in one display frame (in 'add' mode) by tagging gates on a total projection spectrum shown in another.

9.8.3 Spectrum Addition

Selecting one or more spectra from the directory browser's scrolling list and then clicking on 'adding up' on the 'Select for' menu pops up a frame for making linear combinations of (1d) spectra. The frame contains a scrolling list showing each spectrum in the combination and the multiplication factor applied to it. Each spectrum is shown as a name relative to a parent directory. This makes it easy to form combinations from different parent directories.

The spectra you selected from the browser's list are automatically appended to the combination list with a factor of 1.0.

The 'Result:' and 'Directory:' fields specify where the spectrum resulting from the addition is to be written. You must fill in both these fields.

To edit one of the summands click on its entry in the scrolling list and it is displayed in the 'Factor:', 'Name:', and 'Directory:' fields in the top left. Edit these in the usual way (don't forget to key RETURN when satisfied) and then click on 'Replace'. The altered summand appears in the scrolling list.

New summands can be created by editing the 'Factor:', 'Name:', and '(summand)Directory:' fields and clicking on 'Append'. Alternatively, just select them in the spectrum directory browser and click on 'adding up' from its 'select for' menu button. Factors of 1.0 will be given to the new summands.

To remove a summand, select it from the list and click on 'Delete'. To remove all summands, click on 'Delete all'. This behaviour is very similar to that of the 'calibrate' frame.

Finally, when you are satisfied with your summands, click on 'Add up'. The resultant spectrum is computed and (if it's currently showing the resultant's parent directory) the spectrum directory browser updates.

The resultant spectrum is simply calculated channel by channel and inherits a calibration from the first summand spectrum that's calibrated (if any).

9.9 Analysing sets of spectra

The 'Analyse' button in the 'Directory Browser' frame offers the same menu of spectrum analysis functions as does the 'Spectrum Analyser' frame, but when invoked from the 'Directory Browser' frame they are applied to *all* the spectra currently selected from the scrolling list, one by one. For example, you can auto-calibrate or plot several spectra without first having to display them in the 'Spectrum Analyser' frame. For details of the analysis functions see section 6 [*Spectrum Analyser*], page 15.

NOTE: You should beware that applying an analysis function to many spectra can take a long time and while *eg-session* is doing the analysis you will not be able to use any of its other features.

9.10 Repainting the browser frame

Clicking on '`Redisplay`' repaints the '`directory`:' field and the directory contents scrolling list. Any selections you have made are lost.

10. Card Setup

This chapter describes the facilities in 'eg-session' for setting up, monitoring, and adjusting the EuroGam data acquisition cards.

They are all available from the pop-up menu attached to the 'Card Setup' button on the 'Base Frame'.

10.1 Setting up the Trigger Card

The entry 'Trigger' on the 'Card Setup' menu button of the 'Base Frame' pops up a 'Trigger Setup' frame. The frame works by using the standard widget types such as checkboxes, choices, and sliders to represent the states of registers within the trigger card. Changing the state of a checkbox or moving the cursor on a slider, for example, writes a new value into the appropriate register immediately.

10.1.1 Trigger Card Setup Frame

The trigger card setup frame gives an overall picture of the trigger's register set. It is quite complicated but for many experiments you can safely ignore most of the parameters. The values loaded by default at power-up time are consistent with those loaded into the Ge and BGO cards and you should be able to collect data satisfactorily without further adjustments, except perhaps for the Ge sumbus multiplicity threshold.

10.1.1.1 Input Sumbus Group

At the front end of the trigger card is a block of comparators and gate and delay generators. These circuits derive logic signals for input to the FT (Fast Trigger) LCA from the four EuroGam analogue sumbuses. Each sumbus generates four signals (labelled 1,,4) each of which has its own threshold, delay, and width conditioning parameters. For convenience, we call the signals with a common suffix a "sumbus group". Each group consists of one 'Raw Ge' sumbus signal, one 'Clean Ge', one 'BGO', and one 'User' sumbus signal.

Most experiments will be concerned with only the first group of sumbus signals. The default LCA programs ignore all the input sumbuses except those in group 1.

Group: Selects a group (1,,4) of sumbus inputs. The signal conditioning parameters for this group are read from the trigger card and displayed.

Raw Ge: Denotes the raw Ge sumbus.

Clean Ge: Denotes the clean Ge sumbus.

BGO: Denotes the BGO sumbus.

User: Denotes the User sumbus.

Delay (ns): Sets the time delay between the input sumbus signal crossing the comparator threshold and the rising edge of the derived logic signal.

Width (ns): Sets the width of the derived logic signal.

Threshold (mult): Sets the comparator threshold expressed in multiplicity units and hence controls the lowest multiplicity of the events you collect. You will almost certainly want to adjust this parameter.

10.1.1.2 Input Logic Group

In addition to logic signals derived from the EuroGam sumbuses, the Trigger card provides 6 front panel inputs routed to the Fast Trigger LCA, and another 6 routed to the Validation LCA. Each of these inputs has its own adjustable delay and width and there is a single adjustable threshold common to all 12. For display purposes, the parameters for these inputs are grouped into 6 pairs, each pair being one FT and one Validation input.

The default LCA programs ignore all the logic inputs.

Group: Selects a pair (1,,6) of FT and Validation logic inputs. The delay and width parameters for this pair are read from the trigger card and displayed.

Fast Trigger: Denotes the Fast Trigger LCA.

Validation: Denotes the Validation LCA.

Delay (ns): Sets the time delay between receipt of the logic signal at the front panel and its propagation to the appropriate LCA.

Width (ns): Sets the width of the logic signal propagated to the LCA.

Threshold (mV): Sets the common threshold for all the front panel logic signals.

Presets: Provides a pop-ip menu for setting the common logic threshold. Choose entry '`TTL`' for 2.0V, '`Fast NIM`' for -600mV, and '`ECL`' for -900mV.

10.1.1.3 Output Pulse Timing

The logic signals generated by the Fast Trigger and Validation LCAs are subject to further conditioning through gate and delay circuits before being broadcast to the individual acquisition channels.

Fast Trigger: Denotes the '`Fast Trigger`' pulse seen by the acquisition channels.

Inhibit: Denotes the '`Inhibit`' pulse seen by the acquisition channels, derived the Fast Trigger LCA.

FT->Validation: Denotes an internal pulse received by the Validation LCA derived from the Fast Trigger LCA. This signal determines the Validation timing relative to the Fast Trigger. You will certainly need to adjust this for Recoil Separator experiments.

Validation: Denotes the '`Validation`' pulse seen by the acquisition channels.

Delay (ns): Sets the delay between the generation of the pulse by the appropriate LCA and its external appearance.

Width (ns): Sets the width of the external pulse.

10.1.1.4 Scalers

The Trigger card has seven 32-bit scalers. These are good indicators of the level of activity of the acquisition system.

FTR*n*: Labels '`Fast Trigger Request`' scaler n, n=1,,4. This counts the number of Fast Trigger n request pulses generated by the Fast Trigger LCA. Dead-time effects prevent some of these from promotion to actual broadcast Fast Triggers.

Fast Trigger: Labels the '`Fast Trigger`' scaler. This counts the Fast Trigger pulses broadcast by the Trigger card.

Validation: Labels the '`Validation`' scaler. This counts the Validation pulses broadcast by the Trigger card.

Test: Labels the '`Test`' scaler. This counts pulses appearing at a certain output from the Fast Trigger LCA. If you are using the default LCA program it counts the event readout cycles seen by the Trigger card.

Enable: When ticked, indicates that the scaler is enabled and will count.

Counts/Rates: Click on '`Counts`' to read the scalers and display their current values. Click on '`Rates`' to display an approximate rate in counts per second for each scaler. The rates are calculated by taking the increase in each scaler over a three second interval.

Overflow: A tick indicates that the scaler has overflowed since it was last cleared.

Clear Scalers: Click on '`Clear Scaler`' to zero each of the counts.

10.1.1.5 Inspection Lines

The EuroGam VXI crates provide a way of bringing out selected internal signals within the Trigger and other acquisition cards to an external socket. See the discussion in section 10.2 [*Using VXI Inspection Lines*], page 43, for more details. In particular, inspection points within the Trigger card enable you to check the signals on the four multiplicity sumbuses.

Analogue 1,2: Click on the appropriate pop-up menu entry to assign an analogue inspection point to an inspection line.

Digital 1,2: Click on the appropriate pop-up menu entry to assign a digital inspection point to an inspection line.

The Trigger card is always located in the first VXI crate.

10.1.1.6 Readout Parameters

The Trigger card can insert up to six parameters into each event read out. You can enable these individually by ticking the corresponding check-boxes on the Trigger setup frame. The hexadecimal number displayed against each parameter is its address tag. By convention the trigger card is assigned group number `0xff` (255).

Raw Ge Mult: The '`Raw Germanium`' sumbus level coded into 8 bits.

Clean Ge Mult: The '`Clean Germanium`' sumbus level coded into 8 bits.

BGO Mult: The '`BGO`' sumbus level coded into 8 bits.

User Mult: The '`User`' sumbus level coded into 8 bits.

Event Type: A 16-bit word of the form `0xff`vf where f and v are the "type" numbers (1,,4) of the Fast Trigger and Validation LCA output signals that triggered the event. The default LCA programs generate only type 1 FTs and Validations.

TAC: The Trigger card's on-board TAC. This can be set to measure the time interval between a selected group 1 sumbus threshold crossing and an external fast NIM "stop" signal.

WARNING: If you disable readout of a sumbus multiplicity parameter then the corresponding sumbus is ignored by the Fast Trigger generation LCA. Hence, in general, you must always enable readout of at least one of the four sumbus multiplicity parameters. In particular, if you are using the default FT LCA program you must have the '`Raw Ge Mult`' parameter enabled for readout.

10.1.1.7 Timing Calibration

The Trigger card supports some special features which can be of use in setting up and calibrating the timing of individual Ge and BGO channels.

Ge CFD: Need more about Ge CFD.

Ge TAC: Need more about Ge TAC.

External delay: Need more about External delay.

Sumbus: Select from this pop-up menu the sumbus which is to start the on-board TAC.

10.1.1.8 FTR Prescaling

Each of the four possible '`Fast Trigger Request`' pulses generated by the FT LCA can be prescaled before promotion to broadcast Fast Triggers. Scaling factors of 1, 2, 4, 8, and 16 are possible.

FTR*n*: Select the prescaling factor for '`Fast Trigger Request`' number *n* from then '`FTR`'*n* pop-up menu.

10.1.2 Programming the Trigger LCAs

The '`Trigger LCAs`' subframe allows you to reprogram the trigger LCAs by downloading files. Click on the '`LCAs`' button on the trigger setup frame to start it.

To load a new program, first select the desired file from the list to the right of the frame. The selected file name will appear on the '`File`' line. Second, click the '`Load`' button for the desired LCA to download the file and program the LCA. If you wish to load a file from a different directory then edit the '`Directory`' line. To revert to the default configuration select the '`Default`' option for the '`Load`' button.

The names of the current programs are shown on the '`Validation`' and '`Trigger`' lines. During normal opperation the '`Loaded`' box should be ticked and the switches should show '`Master`' and '`Normal`' modes.

10.1.3 Trigger Electronics Frame

The '`Trigger Electronics`' frame allows engineers to control some of the more arcane features of the master trigger card. Click on the '`Electonics`' button on the trigger setup frame to start it.

10.1.3.1 Resetting the Trigger Card

The master trigger card can be reset by clicking the '`Reset`' button. This will cause all the registers in the trigger to revert to default values which may need adjusting.

10.1.3.2 Trigger Test Mode Functions

The trigger can be switched to test mode by clicking the '`Test Mode`' tick box. This allows some test operations to be performed.

[more to come]

10.1.3.3 Software Pulser Test Function

The '`Software Pulser`' causes the trigger synch pulse line to be wiggled in order to generate events to test the readout mechanism.

10.1.3.4 Software Histogrammer Test Function

The '`Software histogrammer`' feature emulates the hardware histogrammer for use in engineering tests. This works with ROCOs disabled by reading the FIFO directly. It can also be used to flush the FIFO.

The '`Software histogrammer`' should not be enabled during normal readout.

See section 7.4 [(hist)Software Histogramming], page 25

10.2 Setting up Germanium, BGO, and NAM channels

The entries '`Ge Card`', '`BGO Card`', and '`NAM`' on the '`Card Setup`' menu of the '`Base Frame`' pop up frames to help in setting up Germanium, BGO, and NAM VXI acquisition channels. The frames work by using the standard widget types such as checkboxes, choices, and sliders to represent the states of registers within the acquisition cards. Changing the state of a checkbox or moving the cursor on a slider, for example, writes a new value into the appropriate register immediately.

10.2.1 Setup features available on all channels types

The frames work in either or two modes:

- "By Channel" mode, which presents all the parameters on a particular channel at a time.
- "By Parameter" mode, which presents the same parameter across all channels at once.

The following buttons are common to all channel types and modes.

Redisplay: Click on '`Redisplay`' to bring the information displayed in the frame up to date. The current values of the parameters are read (in most cases from the actual hardware registers in the VXI cards) and redisplayed.

NOTE: *eg-session* does not try to keep the frame up to date automatically. If someone else is making adjustments at another workstation, for example, their changes do not automatically appear on your screen. So, if ever you are in doubt, just click on '`Redisplay`'.

Print: To get a printout of the parameters currently displayed, click on '`Print`'.

By Channel: When working in the "By Parameter" mode, a click on '`By Channel`' takes you to the mode in which all parameters on a particular acquisition channel are displayed.

By Parameter: When working in the "By Channel" mode, a click on '`By Parameter`' takes you to the mode in which all instances of a particular parameter across all the acquisition channels are displayed.

Electronics: When working in the "By Channel" mode, a click on '`Electronics`' pops up a frame displaying mostly static information about the card containing the currently selected acquisition channel. This is mainly of interest only to electronics engineers.

10.2.2 Working with a single Ge channel

In the "By Channel" mode of the Ge channel setup frame you can control all the parameters on a single Germanium channel.

Channel: Press and drag with the '`MENU`' button to select the Ge channel you are interested in. The parameters for that channel are read and displayed.

Enable: When ticked, indicates that the channel is enabled. This means that the channel contributes to the Ge sumbus and will participate in events.

Act on all Channels: When working in "By Channel" mode you can still adjust parameters on other channels by ticking '`Act on all Channels:`'. Then, when you next adjust a parameter to a new value, the same value is written to the corresponding parameter on all the other Ge channels as well, and the tick disappears. If you want to make a further adjustment to all channels you must tick '`Act on all Channels:`' again.

Veto: Selects the path by which a BGO channel can "veto" a Ge channel event. '`Bus`' selects the physically adjacent BGO channel via the crate backplane. This is the normal setting. '`Lemo`' selects the BGO channel wired to the Ge channel's front panel Lemo socket labelled '`Veto`'. This would be chosen if a substitute BGO channel were to be used to veto the Ge channel.

Amp: Selects between the shaping amplifier internal to the Ge channel and an externally connected one. Normally set to '`Int`'.

Pileup/Veto: Selects how the channel behaves when it detects either pre-pulse pileup or BGO veto. Choose '`Mark`' to cause the channel to read out the event but flag the resulting data word by setting a qualifier bit. Pre-pulse pileup will set the high order qualifier bit and a BGO veto will set the low order bit. Choose '`Reject`' to cause the channel to suppress generation of a '`Clean Ge`' sumbus pulse, and to suppress readout of the event. Conversions of pulses suffering from post-pulse pileup cannot be rejected and will always be marked. See also section 7.5 [*Spectrum Names*], page 25, for more about the qualifier bits.

TFA Gain: Selects the gain of the channel's timing filter amplifier to either '`High`' (normal setting) or '`Low`'.

BDC: Turns on and off the channel's (Hinshaw method) ballistic deficit correction feature.

20 MeV: Denotes the channel's 20 MeV range ADC.

4 MeV: Denotes the channel's 4 MeV range ADC.

Fast Trigger: Denotes the channel's Fast Trigger TAC.

Cross Over: Denotes the channel's Cross Over TAC.

SS: When ticked, enables the ADC or TAC's sliding scale feature. Normally enabled.

RO: When ticked, enables readout of data from the ADC or TAC.

Address: Denotes the "address" of the ADC or TAC. This is the identifier or tag attached to each conversion readout from the ADC.

Threshold: Sets the digital threshold applied to conversions from the ADC or TAC. Conversions less than this value are not read out. Normal value~0.

CFD Width (ns): Sets the width of the Sumbus pulse generated by the channel's CFD circuit.

CFD Delay (ns): Sets the delay of the Sumbus pulse generated by the channel's CFD circuit, relative to the moment at which the discriminator fires.

Fast Trigger Sample (ns): Sets the time at which the channel samples the '`Fast Trigger`' signal from the Trigger card relative to the moment at which the discriminator fires.

Validation Sample (ns): Sets the time at which the channel samples the '`Validation`' signal from the Trigger card relative to the moment at which the discriminator fires.

LT Watchdog Timeout (ns): Sets the watchdog timeout in the channel's local trigger circuit. This detects failure of the channel to read out and causes a reset.

PDS Gate (ns): Sets the width of the channel's peak detect and stretch gate signal. Conversion starts on the falling edge of PDS gate. It must be wide enough to cover the positive-going peak of the channel's shaping filter signal but not so wide that conversion is unnecessarily deferred.

CFD Threshold (keV): Sets the threshold at which the channel's CFD fires.

Pole Zero: Adjuster for the pole zero circuit in the channel's shaping amplifier. The TFA has a fixed pole zero.

10.2.3 Working with a single BGO channel

In the "By Channel" mode of the BGO channel setup frame you can control all the parameters on a single BGO channel.

Channel: Press and drag with the '`MENU`' button to select the BGO channel you are interested in. The parameters for that channel are read and displayed.

Enable: When ticked, indicates that the channel is enabled. This means that the channel generates vetos, contributes to the BGO sumbus, and participates in events.

Act on all Channels: When working in "By Channel" mode you can still adjust parameters on other channels by ticking '`Act on all Channels:`'. Then, when you next adjust a parameter to a new value, the same value is written to the corresponding parameter on all the other Ge channels as well, and the tick disappears. If you want to make a further adjustment to all channels you must tick '`Act on all Channels:`' again.

Energy: Denotes the channel's summed energy ADC.

TAC: Denotes the channel's TAC.

Pattern: Denotes the channel's hit pattern. This encodes which of the individual scintillator elements in the shield have fired, with crystal '`a`' in bit 1, '`b`' in bit 2,, and crystal '`j`' in bit 10.

SS: When ticked, enables the ADC or TAC's sliding scale feature. Normally enabled, except on the '`Pattern`' parameter.

RO: When ticked, enables readout of data from the ADC or TAC.

Address: Denotes the "address" of the ADC or TAC. This is the identifier or tag attached to each conversion readout from the ADC.

Threshold: Sets the digital threshold applied to conversions from the ADC or TAC. Conversions less than this value are not read out. Normal value˜0.

Veto Width (ns): Sets the width of the Veto pulse generated by the channel.

Dead Time Width (ns): Sets the channel's dead-time. This is the length of time the channel ignores further scintillator pulses following the start of an event. Need more about Dead Time Width

Sum Width (ns): Sets the width of sumbus pulse generated by the channel.

Fast Trigger Sample (ns): Sets the time at which the channel samples the '`Fast Trigger`' signal from the Trigger card relative to the moment at which the first discriminator fires.

Validation Sample (ns): Sets the time at which the channel samples the '`Validation`' signal from the Trigger card relative to the moment at which the discriminator fires.

PDS Gate (ns): Sets the width of the channel's peak detect and stretch gate signal. Conversion starts on the falling edge of PDS gate. It must be wide enough to cover the peak of the channel's UP4 signal but not so wide that conversion is unnecessarily deferred.

LT Watchdog Timeout (ns): Sets the watchdog timeout in the channel's local trigger circuit. This detects failure of the channel to read out and causes a reset.

Disc Theshold (keV): Sets the common threshold at which each crystal's discriminator fires.

10.2.4 Working with a single NAM channel

Need more about NAM channel

10.2.5 Working with a particular Ge, BGO, or NAM parameter

Each of the Ge, BGO, and NAM channel setup frames can be switched into "By Parameter" mode. In the this mode you select a particular parameter—Ge channel CFD thresholds, say—and can inspect and adjust the instances of this parameter on every Ge channel. Choose the parameter from the '`Parameter:`' pop-up menu using the '`MENU`' button.

In "By Parameter" mode the frame displays all instances of the selected parameter, labelled by the channel number. You can adjust each channel's instance of this parameter individually by clicking on the appropriate widget. Alternatively, tick '`Act on all Channels`' in advance, and you can adjust all instances simultaneously by clicking an arbitrary instance. As in the "By Channel" mode, '`Act on all Channels`' unticks itself after each use.

10.2.6 Using VXI inspection lines

Each EuroGam VXI crate provides five inspection lines (two for analogue signals, two for digital, and one for power rail voltages) for monitoring the signals inside the acquisition cards. Each acquisition channel has a number of points where signals can be monitored and you can choose which of these are routed onto the crate's inspection lines.

At the NSF the analogue and digital inspection lines from the two VXI crates are brought into the control room and connected to two oscilloscopes. To find out which VXI crate houses a particular acquisition channel (and hence which 'scope displays its inspection points), you can use the '`Crate Layout`' function. See section 10.9 [*Crate Layout*], page 52.

The voltage inspection line leads to a "slow" ADC in the crate's Resource Manager card. You can check the level of the voltage line from the '`Resource Manager`' frame. See section 10.4 [*Resource Manager*], page 49, for details.

When working in the 'By Channel' mode, the acquisition channel setup frames provide pop-up menus for assigning the inspection lines. Assigning an inspection point to a line automatically disconnects any other point that is currently connected.

Analogue Inspection *n*: Press and drag with the 'MENU' button to select which analogue inspection point in the current channel is assigned to analogue inspection line *n* of the crate.

Digital Inspection *n*: Press and drag with the 'MENU' button to select which digital inspection point in the current channel is assigned to digital inspection line *n* of the crate.

Voltage Inspection: Press and drag with the 'MENU' button to select which voltage inspection point in the current channel is assigned to the crate's voltage inspection line.

Presets: The 'Presets:' menu button provides an accelerator for common sets of inspection line assignments. You can assign up to four monitoring points within the current channel with a single click. For example, the entry '//CFDDirect/CFDDelay' assigns the two CFD inspection points to the two digital inspection lines and leaves the analogue lines unchanged.

Grab Setting: You can add your own entries to the 'Presets:' menu. Just click on 'Grab Setting' and the current set of inspection line assignments is added to the menu.

Drop Setting: If the current selection of inspection line assignments appears as an entry on the 'Presets:' menu you can remove it by clicking on 'Drop Setting'.

Disconnect All: Disconnects all the current channel's monitor points from the inspection lines.

10.2.7 Ge Electronics

When in "By Channel" mode, clicking on 'Electronics' in the Ge channel setup frame pops up a subframe showing the properties of the electronics card carrying the currently selected channel.

Last Card: Indicates that the card is the rightmost card of its crate to participate in EuroGam VXI event readout.

Model Code: The card's model code. The value 0x110 identifies the card as a EuroGam Phase I Germanium card.

Test Mode: Indicates that the card is in its test mode. This enables built-in diagnostic features.

Serial Number: The card's serial number.

Controle Fenetres: A simple and elegant (but unexplained) way of setting up a channel's timing windows.

Modification Level: The card's modification level. A small (!) integer.

Software Histogram: Need more about Ge electronics software histogram.

Manufacturer ID: The card's manufacturer code number. A value of 0xf5a denotes France.

Test Gen Attenuation: Need more about ge electronics test gen attn.

Offset Register: The value in the card's VXI '`Offset`' register.

Test Generator (keV): Sets the height of the pulses generated by the card's on-board test facility.

10.2.8 BGO Electronics

When in "By Channel" mode, clicking on '`Electronics`' in the BGO channel setup frame pops up a subframe showing the properties of the electronics card carrying the currently selected channel.

BGO cards have the same parameters as those found on the Germanium cards (see section **??** [*Ge Electronics*], page **??**). In addition, you can use the '`Test Mode:`' choice buttons to put an individual BGO element's circuit into its test mode.

10.3 Clover Card Setup

The entry '`Clover Card`' on the '`Card Setup`' menu button of the '`Base Frame`' pops up a '`Clover Card Setup`' frame. The frame works by using the standard widget types such as checkboxes and choicesto represent the states of registers within a clover card.

Channel: Press and drag with the '`MENU`' button to select the Clover channel you are interested in. The parameters for that channel are read and displayed. This will also refresh parameters displayed in the '`Clover Ge Channel Setup`' and the '`Clover Ge Channel Setup`' frames.

Enable: When highlighted, indicates that the segment is enabled. This means that the channel contributes to the sumbus and will participate in events. There is one box for each clover segment on the card (segment E is a spare) and one for the BGO channel.

Suppression Mode: Press and drag with the '`MENU`' button to select suppression mode desired for that channel. The VXI data aquisition must be stopped when doing this. At present three modes are available. With '`Simple`' mode a valid event is recorded if one of more Ge segments record a hit and no BGO elements. '`Exactly-One-Ge`' suppresses events where more than on Ge segment is hit. '`Ignore-Oposite-Corner`' mode is similar to '`Exactly-One-Ge`' mode, except that BGO hits in the corner opposite to the Ge hit will not veto the event.

Spare Channel: On each clover card there is a spare channel '`E`' in case the electronics fails for one of the other segments. To reconfigure the spare channel to take the place of one of another channel press and drag with the '`MENU`' button to select the segment you wish to replace. This will enable the channel if the replaced channel was enabled, it will disable the replaced channel, and it will set the spare channels address registers as if it were the channel it was replacing.

10.4 Slot 0 Resource Manager Card

The 'Resource Manager' frame available on the 'Card Setup' menu of the 'Base Frame' allows you to control and view registers in the resource manager card. You can select which resource manager is displayed by choosing from the 'RM' menu.

Some of the VXI lines are displayed on this frame. The ADC measures the voltage on the voltage inspection line. The current states of the TTLTRG and ECLTRG lines are also shown.

Control registers are used for engineering tests only and should not be fiddled with during normal opperation.

10.5 Initialising the Acquisition System

When the acquisition VXI crates are powered up or rebooted, the crate software loads a default set of parameters into the acquisition cards. These values have been set in the middle of their permitted ranges so that there is a goo chance of that the acquisition system will collect data regardless of variations in detectors, cabling, and so on. You will no doubt want to try to "sharpen up" some of these settings, notably the timing parameters. While doing this you may find that you have pushed certain values too close to their limits and the system will no longer take data. You can always return to the boot-time default values by means of the 'System Reset' function available on the 'Card Setup' menu of the 'Base Frame'.

To reset the defaults just click on the 'Apply' button.

NOTE: this function sets all the Ge card CFD width and delay parameters to a common value, so that any time-alignment of the acquisition channels that you may have done will be lost. It's therefore a good idea to save a time-aligned setup before going on to adjust further parameters. See section 10.6 [*Saving and Restoring Card Setups*], page 49, for details.

NOTE: this function leaves all Ge and BGO acquisition channels disabled.

10.6 Saving and Restoring Card Setups

After making lots of tedious and time-consuming adjustments to VXI card parameters (such as the Ge card CFD widths and delays, for example), you can save your current settings in a disc file. Subsequently, you can restore these settings (or a subset of them) from the disc file.

The item 'Save/Restore' on the 'Card Setup' menu of the 'Base Frame' pops up a window for doing this.

Your setups are saved in and restored from the directory given by the 'Setups directory:' field. By default this is '/eg/experiments/*experiment*/setups', where *experiment* is the name you have given to your current experiment. The files in this directory are shown in the scrolling list underneath. You can go to another setups directory by editing 'Setups directory:'.

The save-files are named with time stamps such as '28-Sep-92(Mon)17:23:47' to help you distinguish between them.

10.6.1 How to save your current setup

Click on the 'Save' button to capture your current setup into the save-file named 'latest'. Any file of this name will be over-written.

10.6.2 Time-stamping your latest save

Click on the 'Time Stamp' button to rename the save-file called 'latest' with the present date and time.

10.6.3 How to restore a saved setup

To restore a save-file, first make sure that data acquisition is halted. Select the save-file you want to restore from the directory contents list and click on 'Restore'.

10.6.4 Restoring a subset of a save-file

You are not obliged to reinstate *all* the parameters held in a save-file. Instead, you can restrict attention to a particular acquisition card type and range of acquisition channels. Select the card type (Trigger, Ge, or BGO) from the 'Card type:' menu, select the range of channels between 'Low channel:' and 'High channel:' and click on 'Partial Restore'.

10.6.5 If a save or restore fails

If an error occurs during a save (perhaps for some reason it is not possible to read some VXI card register) the save will be abandoned and an error report frame will appear. The save-file 'latest' will be left incomplete and you should try repeating the save. Similarly, if an error occurs while restoring the VXI cards will be left in an indeterminate state and you should try the restore again. Remember that a common cause of problems is trying to save or restore while the VXI data acquisition is going.

10.7 Time Alignment of Ge CFDs

The entry 'CFD Alignment' entry on the 'Card Setup' menu of the 'Base Frame' provides an automatic procedure for aligning in time all the Ge card CFDs. The method uses the TAC in the Trigger card accurately to measure the detector/cabling delay of each acquisition channel. One can then compensate for these variable delays by adjusting the 'CFD Delay' parameter on each channel.

Each cable delay is measured as follows: all acquisition channels are disabled except for the one to be measured. The Trigger card is set into a mode in which the TAC is started by any raw Ge sumbus pulse of multiplicity level one (that is, by the output pulse of the chosen CFD). The TAC is stopped by an external signal obtained by delaying the pulse from a scintillator by (say) 400 nanoseconds. A spectrum of the TAC measurement is accumulated in the hardware histogrammer. The position of the TAC peak gives a measure of the mean time T nanoseconds between the CFD firing and the stop pulse arriving at the TAC, and hence the cable etc delay before the CFD fires is 400-T-D nanoseconds (where D is the current setting of the programmable delay between the CFD "firing" and the generation of its output pulse).

The automatic procedure operates on a range of acquisition channels given by '`Low channel:`' and '`High channel:`'. For each channel, the TAC spectrum is accumulated for '`Time:`' seconds. The TAC spectrum peak is found by looking for the maximum count in the interval given by '`Zone left:`' and '`Zone right:`', and taking the centroid over a region 25 channels on either side of the maximum. As each CFD is measured, the TAC centroid, and the T, D and T+D time measurements appear in the scrolling list.

Some preparation is needed before the automatic procedure can be run:

1. Set up the scintillator detector and the delayed TAC stop pulse.
2. Create a TAC spectrum using the '`Histogrammer`' window.
3. On the '`Trigger Setup`' frame, under '`Timing Calibration`' tick '`Ge CFD:`', untick '`Ge TAC:`' and '`External delay:`', and select '`Raw Ge`' from the '`Sumbus:`' menu.
4. Again on the '`Trigger Setup`' frame, select '`Input Sumbus Group:`' 1 and set the '`Raw Ge Threshold:`' to multiplicity level 1.
5. "Go" data acquisition and check that the TAC spectrum is accumulating as expected. With several Ge channels enabled you should see distinct peaks emerging for each channel (unless the delays are already very well adjusted).

To start the measurment procedure click on the '`Start`' button (which will promptly change to '`Stop`'). The cycle can be interrupted at any time by clicking on '`Stop`'. While the cycle procedes you can observe the TAC spectrum repeatedly accumulating and clearing by turning on the automatic refresh in the '`Displaying Spectra`' frame.

When the cycle completes the '`Stop`' button will turn back into '`Start`'. To make the compensating adjustments to bring the CFD pulses form the selected channels into line, click on '`Adjust delays`'. Clicking on '`Clear list`' will discard the current set of measurements. The list is not cleared by '`Start`' so you can accumulate measurements for several groups of channels before making the adjustments.

NOTE: The alignment is done by finding the channel with the longest cable delay, leaving its programmable delay setting fixed, and adjusting all the other channels to align with it. Hence it is advisable to start with the programmable delays all set to a small value, since the range of adjustment is 200 ns and most channels have to be adjusted upwards.

NOTE: Because of uncertainties in the calibration of the Trigger car TAC and in the DACs that control the delays in each CFD, it may not be possible to get perfect alignment in one pass of the procedure. However, all is not lost as the procedure can be iterated and will converge on exact alignment even without accurate calibrations.

10.8 Checking Setup Timing Constraints

It's important that you appreciate that some of the timing parameters that you can alter on the acquisition cards must obey certain constraints in order to collect data. For example, the rising edge of each channel's 'FT Sample' must fall within the envelope of the trigger's 'FT Pulse' signal, else the channel will not contribute data to events. Other constraints are more subtle and can prevent the acquisition system from working *at all*.

To help avoid this calamity you can use the 'Timing Checker' available on the 'Card Setup' menu of the 'Base Frame'.

To run the timing check just click on the 'Apply' button. The important timing parameters are read from the acquisition cards and fed into a set of constraint inequalities. If any of these is broken a message will appear in the 'Warnings:' window. You can rerun the timing checks after making adjustments to the acquisition cards.

10.9 Location of Cards in Crates

The 'Crate Layout' function available on the 'Card Setup' menu of the 'Base Frame' displays a schematic of a VXI crate showing the serial number of the card (if any) in each slot, and, where appropriate, the acquisition channel associated with each of the six front panel connectors on each card.

You can select which crate is displayed by choosing from the 'Crate:' menu.

If the 'Crate Layout' frame does not show the correct layout (for example due to rewiring a germanium detector to a different channel) then the crate can be reconfigured online using the 'Reconfiguration' function.

10.9.1 Reconfiguration of the Crate Layout

The 'Crate Reconfiguration' function allows you to reconfigure the registers in a crate to reflect a new layout. This is achieved by loading a file containing a description of the crate configuration. After reconfiguration any channels with unchanged configurations will be unaffected, however, reconfigured channels will be set up with default settings and may need adjusting. When the crate is rebooted the default configuration file will be used, so any permanent changes must be made to that file.

To load a new configuration, first select the desired file from the list to the right of the frame. The selected file name will appear on the 'File:' line. Second, click the 'Load' button to download the file. The display will be updated and the new configuration will be shown in the 'Crate Layout' frame. If you wish to load a file from a different directory then edit 'Directory:'. To revert to the default configuration select the 'Default' option for the 'Load' button.

To view or alter the selected configuration file click the 'Edit' button (there is a choice of editors: textedit or emacs).

10.9.1.1 Configuration File Format

A configuration file contains a description of a crate layout that can be downloaded to a crate so that registers can be named according to the detectors they are associated with.

The file consists of keyword/name pairs with 4 keywords: `module`, `slot`, `detector` and `channel`. For each card in the crate there should be a line of the form:

`module` *m* `slot` *s*

and for each channel of a Germanium or BGO card there should be a line of the form:

`detector` *d* `channel` *c*

where:

- *m* is the module name. Must be one of `RM`*n*, `Trig`, `ROCO`*n*, `G#`*m*, `B#`*m* with *n*=1 thru 47 and *m* = anything.
- *s* is the slot number within the crate (0 thru 12).
- *d* is the detector position name. Must be `Ge`*n* or `BGO`*n* with *n* = 1 thru 60.
- *c* is the channel number within the module (1 thru 6).

For example: to configure a crate with a resource manager in slot 0, the master trigger card in slot 1, a readout controller in slot 2 and BGO and germanium cards in slots 3 and 4 respectively connected to detectors 1, 2, 3, 10, 11 and 17 you would use the following file:

```
module RM1 slot 0
module Trig slot 1
module ROCO47 slot 2
module B#123 slot 3
detector BGO1  channel 1
detector BGO2  channel 2
detector BGO3  channel 3
detector BGO10 channel 4
detector BGO11 channel 5
detector BGO17 channel 6
module G#547 slot 4
detector Ge1   channel 1
detector Ge2   channel 2
detector Ge3   channel 3
detector Ge10  channel 4
detector Ge11  channel 5
detector Ge17  channel 6
```

11. Event Builder

The Event Builder (EB) does the following:

- receives 32 bit oriented event data from the EG acquisition crates;
- checks the structure and self-consistency of each event;
- filters and routes the events under user control;
- gathers various statistics;
- converts the event stream into a 16 bit oriented format before passing it on to the EG Event Sorter.

The user controls the details of the filtering and routing of events by writing a short program in a special language. The program must then be compiled and downloaded into the Event Builder VME crate.

In order for many of the facilities on the Event Builder window to work properly, the users current EUROGAM session must have access to the event builder crate. This is accomplished via the frames brought up by the Experiment Access and Apparatus Access buttons on the base frame. The session must be attached to an experiment and the event builder must be claimed for use by that experiment.

11.1 Event builder frame

The event builder frame is a user interface for the event builder and the event builder compiler, ebc.

Information needed by the package is:

- the location of a file in event builder language. The user specifies this with the name of the file and the directory where the file is to be found. The compiler expects the file name to end in the suffix '`.ebl`'.
- the location of a directory that can be used for event builder setup files. The user specifies the name of the directory and the path. Typically the directory will be called after the experiment or run3 or something, with several setups on the same path.

Note: In the current implementation, in order for text typed into text fields to be registered and to alter variables used by the package, strings must be checked in by pressing RETURN after the end of the text. Failure to do so will result in the previous string checked in being used for whatever function is called up, Compile or whatever. This is not necessary if the text has been placed in the text field by the package itself, say as an initial default value or as the result of selecting something with the mouse. A side effect of most of the functions is to redisplay the values the package has, so if the user is unsure what has been checked in, (s)he can choose a button like Toggle or Status that does not need any file information to refresh the display. Picking Refresh from the frame menu WILL NOT WORK. With any luck, this unfortunate inelegancy will be fixed one day.

ebsrc dir: The name of the directory in which the event builder language file is contained. This directory is referred to as the source directory and the initial default is '`ebdir`' in the users home directory. Any other directory name has to be typed into the text field and checked in. An arrow pointing to the '`ebsrc dir`' label indicates that the mini-window is currently displaying the contents of this directory, if any.

ebl file: The name of the event builder language file to be compiled to make the event builder code. This can be set by entering the name of the file in the text field or by clicking on the name of a file in the mini-window when the source directory is listed there (indicated by an arrow pointing to the '`ebsrc dir`' label). When an entry is made in the '`ebsrc dir`' field, '`ebl file`' defaults to the first entry in the source directory. Otherwise there is no default. The compiler expects a filename with the extension '`.ebl`'

ebsetup path: The search path for '`ebsetup dir`'. The initial default is subdirectory '`ebsetup`' in the users home directory. Any other path has to be typed in to the text field and checked in. An arrow pointing to the '`ebsetup path`' label indicates that the mini-window is currently displaying the contents of this directory, if any.

ebsetup dir: The name of the directory where the compiler is to write its generated code and from where the module to be downloaded into the event builder crate will be taken. There is no initial default. It can be set by typing and checking in the name of the directory in the text field or clicking on a directory name in the mini-window when the '`ebsetup path`' directory is being displayed there (indicated by an arrow next to the '`ebsetup path`' label).

no rocos: The number of rocos that will be sending data to the event builder when the compiled code is run in the event builder crate, which is the same as the number of EUROGAM data acquisition crates. The default value is 2. It is changed by typing and checking in a number in the text field or by clicking on the up and down buttons. The minimum is 1 and the maximum is 20. Values outside this range default to 1 or 20, depending which is the nearer.

status at time: A read only field that gives the time at which the other status fields were last checked with the '`Status`' button or updated for some other reason (which happens when the Event Builder window is started up and when the '`Download`' command is used successfully).

crate status: A read only field that displays the status of the event builder crate when it was last updated. If the register read is unsuccessful, the status is UNKNOWN. Other values are UNINITIALISED, INITIALISED, STOPPED and GOING.

program status: A read only field that displays the load status of the event builder code when it was last updated. If the register read is unsuccessful, the status is UNKNOWN. Other values are READY, LOAD, LOADED, LOADING, NOTLOADED and NEW.

directory contents: There is one read only list or mini-window on the event builder frame. This is for displaying the contents of directories. Initially it displays the contents of the default source directory (~/ebdir), if it exists. The mini-window display can be switched between the contents of the '`ebsrc dir`' and '`ebsetup path`' directories with the '`Toggle`' button. Which directory is currently displayed is indicated by an arrow pointing to the label of the appropriate text field. The mouse can be clicked on the mini-window to select '`ebl file`' or '`ebsetup dir`' depending which directory is being displayed. The directory listing can be scrolled with the slider.

Toggle: Toggles between 2 possible directory lists, that for '`ebsrc dir`' and that of '`ebsetup path`'. Which directory is displayed at any time is indicated by an arrow pointing to the appropriate label.

Status: Attempts to update the '`crate status`' and '`program status`' fields by enquiring of the event builder crate via a register read the value of the state and load registers respectively.

Edit: Brings up an editor session for the file specified by '`ebsrc dir`' and '`ebl file`'. Only existing files may be edited this way and the name must have the extension .ebl. There is a choice of editors: textedit or emacs. The default is textedit. Exactly how this button and its menu behaves depends on how the users OpenWindows environment is set up, but generally the menu appears below the button and a menu item has to be selected using the Right mouse button. Using the '`Edit`' button repeatedly will start additional editing sessions. (This is not a sensible thing to do in the case of emacs, which allows editing of multiple files in one session.)

Compile: Attempts to compile the event builder language file specified by the '`ebsrc dir`' and '`ebl file`' fields. It takes the number of roco crates from the no rocos text field, and if it is successful, writes a module called event in the ebsetup directory specified by '`ebsetup path`' and '`ebsetup dir`'. A file called ebc.list is produced in '`ebsrc dir`' and files called ssn.list are produced to correspond to the shared suppression files. This button can be used without access to the event builder crate because ebc runs on the sun and not in the crate so the compilation can run successfully without having claimed the crate.

Download: Attempts to download the module event in the directory specified by the '`ebsetup path`' and '`ebsetup dir`' fields into the event builder crate. The download is initialised. If response is slow, the program status may appear as a few different values. The download has completed successfully if the program status is READY, so the '`Status`' button should be used to update the status until the '`program status`' field displays READY.

Eventflow: Brings up a subwindow that enables the user to set the registers that control the dataflow through the event builder. If the window is already going, but is hidden from view by other windows, then the sole effect will be to bring the window to the front of the display. In this case, the state of the display will not be refreshed or initialised.

Statistics: Brings up a window displaying the event builder statistics. This gives information on blocks of data and number of events input and output on the various streams and the number of various types of error that the event builder has detected in the data sent to it from the rocos. For a description of the types of error see the event builder technical manual. If the window is already running and is hidden by other windows and/or it is in iconic form, the sole effect of this button is to open up the window at the front of the display. The window state is not then updated or initialised.

Histogram: Brings up a window to display the addresses histogram produced by the event builder. If the window is already running and is hidden by other windows and/or it is in iconic form, the sole effect of this button is to open up the window at the front of the display. The window state is not updated or initialised.

Help: Displays this help file in the Event Builder Help Frame. All that is possible with this is to scroll up and down the information or the normal options from the frame menu. If the help window is already running but is hidden behind other windows and/or it is in iconic form, the sole effect of clicking the help button is to re-open the help file and display it at the front of the desktop without losing the users scroll position, etc.

messages: The frame has a footer region that consists of the area at the bottom of the event builder window where message text appears, but is not delineated in any other way. It is used for reporting progress, errors compiler returns, etc. The other windows explained below have similar footer regions that are used in the same way.

11.2 Event flow frame

This frame displays the state and allows the user to set the registers that control the way data flows into and out of the event builder. It is intended more for development and testing modes than experimental conditions.

Errors and messages are reported in the frame footer.

When the frame starts up, the crate is queried for the current register values. If the values are successfully read, the states of the 7 switches are set accordingly. If the read is unsuccessful, the choice switches are inactivated. This appears as the switches being greyed out.

input transmit switch: Controls whether input into the event builder HSM is enabled.

event transmit switch: Controls whether the data is passed on from the HSM into the processors and beyond.

stream(n) switches: (4 off) Controls whether the output from stream number n is enabled.

output transmit switch: A global output switch. Overrides the stream switches. Controls whether the output is passed on to the data router.

Diagnostics: Brings up a window displaying information concerning each board in the event builder crate and allowing boards to be reset individually. If the diagnostics window is already running and is hidden by other windows and/or it is in iconic form, the sole effect of this button is to open up the window at the front of the display. The window state is not updated or initialised.

Refresh: Attempts to read the current values of the eventflow registers in the crate. A successful read activates the switches if they have been inactivated and updates the display. If the refresh fails, the switches are inactivated.

Last refresh: This is a read only text field which displays the time stamp for the last successful refresh command.

11.3 Event Builder Diagnostics Frame.

This frame is intended to help diagnose problems in the operation of the event builder at the board by board by board level. It displays information about how well the data is being passed along the data path. The same information is given for each board that is displayed. The crate contains upto 3 sets of boards, each set consisting of i/p control and upto 4 CPUs. There can also be a single o/p board. The information for this is displayed first, with the information for each set that is present following below it. The format is like that of a table, with the information for a given board being read along a row.

The following two features apply to the whole of the event builder board diagnostics frame:

Redisplay: Using this button causes an attempt to interrogate the crate for fresh information. If successful the screen display is updated. Otherwise the board values are set to UNKNOWN.

Last redisplayed at: A read-only text field containing the time at which the last successful redisplay was performed.

Features for individual boards appear in the following columns:

Board status: The status value for the board. If the appropriate register read fails then the value is displayed as UNKNOWN. This is different to a value of NO RESPONSE, which is a valid register value. Other values seen are RESETTING, STOPPED and GOING.

Queue length: Something about queue lengths.

Block rate: This displays a crude measure of the rate at which blocks are being processed by the board made by taking the difference in block count between 2 register reads.

Reset: Initiates a reset of the board by writing to the appropriate status register in the crate. The status is displayed as RESETTING and the progress of the reboot should be determined with the Redisplay button. Click on the button with the Left mouse button to set the reset going.

The following board fields appear:

o/p FIC: The single board controlling the o/p into the optical data link (ODL) on towards the data router crate.

Setn: The title for the ensuing set of boards, where n is the set number, which has range 1-3. Even though upto 3 sets are allowed in a crate, but they are not necessarily all displayed. All the boards in a set are displayed.

i/p HSM: The board controlling the i/p for the current set.

pn 165: The 4 CPU 165 boards, where n is the processor number, which is unique within the crate and has range as follows: set 1, 1-4, set 2, 5-8 and set 3, 9-12.

11.4 Event Builder Statistics Frame

This frame is for displaying the results of reading the statistics registers from the event builder crate.

There is one read only text window in the event builder statistics frame:

This window is for listing the values of the statistics. They are only displayed if the register read is successful. The display fits into the default size of the window. The display can be scrolled so the values of statistics at different times can be compared. Two sets of values are displayed, the most recent and the previous values if any are listed alongside in brackets. The text in the window is wiped clean every 6 listings.

Errors and messages are reported in the frame footer.

Mode: This switch determines in what form the statistics information will be in displayed, either as a list of straight counts or as a list of rates (in units of Hz). Click on one of the buttons in the switch with the Left mouse button to select a mode. The current display is not updated or altered, but the next time the Update button is clicked, the new listing will be in the new mode.

Update: Attempts to update the statistics listing by reading the statistics registers from the crate. The text window is accumulative and scrollable, so the current statistics listing can be compared with that from previous reads. Each listing is headed with a time stamp.

Clear: Attempts to reset the values of the statistics registers to zero. If this is attempted while the crate state is GOING, inconsistent statistics may result, as each statistic cannot be cleared simultaneously. For this reason a warning is given if this occurs. The statistics values are read back in order to verify that the clear has been successful, but this does not affect the display. A timestamp is written into the scrollable window when a successfully verified clear is performed.

Log: Writes the most recent version of the statistics listing displayed in the statistics window to the session log window. This is not done if there is no valid listing available.

11.5 Event Builder Histogram Frame

This frame is for displaying the addresses histogram produced by the event builder. It simply records the number of words seen with each address. The data is displayed using horizontal gauges. Only a limited number of gauges fit on the screen, so the data can be paged using the Next and Previous buttons. Initially, the top page of data is displayed. Unused gauges (gauges for which there is no data) appear greyed out.

On the left of a gauge is shown the address and on the right of the gauge the count in that address is given. The addresses appear in numerical order and addresses for which the count is zero are not displayed. The count is represented by the solid bar within the gauge. The layout of the frame using gauges is intended to produce a histogram effect. The limits for the gauges are displayed on the threshold slider: the upper limit to the immediate right of the slider and the lower limit to the right of that. Initially, the lower limit is set to 0 and the upper limit is set to the appropriate power of 10 dictated by the maximum count in the data (this is referred to as the ceiling value.) The upper limit can be adjusted using the x10 and /10 buttons. The lower limit can adjusted using the threshold slider, by typing a value into the number field or by clicking on the up and down arrows.

Errors and messages are reported in the frame footer.

Threshold: The slider is at the top of the first column of gauges. Adjusting this alters the lower limit parameter for the gauges. That is to say that an address with a count of this value or less will produce a bar of zero length, but for any higher count, the bar will appear longer. The current upper limit is displayed to the immediate right of the slider. Any value between 0 and the current upper limit can be chosen. If the upper limit is chosen as the value, all the gauges will show a bar of zero length. The current value of the lower limit is shown in the number field to the right of the upper limit. To adjust the slider, position the mouse pointer over the slider knob and hold the Left mouse button down, drag the knob to the left or right and then release.

Threshold: This is the value field for the threshold slider and it lines up in a column with the value fields on the gauges. It displays the current value for the lower limit on the gauges. It can be adjusted by typing in a value into the field or clicking on the up and down arrows to the right of the number field with the Left mouse button. Any value between 0 and the current ceiling value (the next power of 10 up from the maximum count) can be chosen. If the value chosen is above the current upper limit, then all the gauges will show a bar of zero length.

Last update: This is a read-only text field for the time stamp for the last time the histogram data was successfully updated from the crate.

Max count: This is a read-only text field for the maximum count in the data. This is not necessarily the largest count displayed, as it could be for an address on another page of data. It is the value that determines the initial value of the ceiling upper limit for the gauges.

Update: Attempt to read the latest version of the histogram data from the event builder crate and update the display. However, the limits to the gauges are not adjusted. The display does not revert to the top page, but an attempt is made to maintain the current position in the data list.

Next: Display the next page of the current data. The data is not read from the crate again. Paging past the end of the data is prevented.

Previous: Display the previous page of the current data. The data is not read from the crate again. Paging back before the start of the data is prevented.

Format: The initial display has 3 columns of gauges to fit the most data on the screen at the same time. This button alters the number of columns of gauges in the display. The gauges change size correspondingly. This is a menu button and the details of how it behaves depend on the users environment, but the menu for the formats available is obtained using the Right mouse button. The default format is the 1 column format. The user should not be alarmed that it takes a few seconds to do the reformat and that the entire frame disappears momentarily during the process.

x10: This alters the scale of the gauges by increasing the upper limit by a factor of 10. There is a ceiling value determined by the data, above which the scale is left as it is. The limits for the threshold slider are also altered.

/10: This alters the scale of the gauges by decreasing the upper limit by a factor of 10. The scale is left as it is if the upper limit already has a value of 10. The limits for the threshold slider are also altered, but the value is unaltered, even if the lower limit should subsequently be above the upper limit.

12. Event-by-Event Data Tapes

The '`Tape Server Control`' frames allow you to control the tape server.

The tape server looks after the tape drives allowing them to store Event-by-Event data as it comes from the data router/sorter.

The frames control three aspects of tape access, to the tape drives, to the Eurogam data streams and the multiple tape handler (if present). In general, the frames work by a two stage operation. First the tape drive or data stream to be acted on must be selected and then the required action can be taken by clicking on one of the buttons elsewhere in the frame. In most cases the same selection will still be valid for further actions.

The frames are described separately below.

12.1 Controlling tape drives

There are two common occasions when it necessary to use the tape drive control functions. These are when tapes are being inserted and when they are being removed from drives.

It is possible to operate on several tapes at once. In this case it is not necessary wait for each action to complete on one drive before launching another on another drive. However, actions on the same drive must be caried out in the correct sequence.

A likely sequence of actions is listed below. More details are given in further subsections.

12.1.1 Mounting tapes

1. Select a tape drive.
2. Claim it, if it is not already allocated.
3. Insert a new tape in the drive.
4. Initialise the tape, automatically mounting it when it is done.
5. Open a file on the tape.

12.1.2 Dismounting tapes

1. Select the tape drive.
2. Close the currently open file.
3. Dismount the tape.
4. Remove the tape from the drive.

5. If wanted, free the drive. This is not necessary if further volume are to be mounted in the same drive.

12.1.3 Selecting a drive

The tape drive to be acted on must first be chosen. This is done by clicking on the appropriate name in the '`Available`' or '`Claimed`' lists. This drive is then shown as the '`Selected drive`'. The current '`State`' of the drive is also shown.

The available drive '`TAPE`' is special. It deselects the currently selected drive for the special case of '`Claim`', described below. Clicking on the list entry of the selected drive also deselects it.

12.1.4 Carrying out an action on a drive

Once a drive has been chosen actions can be carried out on it. In general this is done by optionally entering some text data then clicking on a button. Only those actions appropriate to the current state of the selected drive are allowed. Disallowed action buttons are `"greyed out"`.

12.1.5 Claim

A drive must be claimed before it can be acted on by other commands. A drive that has been claimed is said to be in the '`allocated`' state.

To claim a drive choose one from the '`Available`' list and click on the 'Claim' button. The selected drive will be allocated to this session. If there are no more free free drives, the server will return an error. In the special case of no selected drive the tape server will allocate the next available drive. It is only possible to claim a drive that is in the unallocated state.

12.1.6 Free

A claimed drive can be freed by selecting it from the '`Claimed`' list and clicking on the 'Free' button. It is only possible to free a drive that is in the allocated state.

12.1.7 Carrying out an action on a volume

Once a drive has been chosen and claimed actions can be carried out on the tape in it. In general this is done by optionally entering some text data then clicking on a button. Only those actions appropriate to the current state of the selected drive are allowed. Disallowed action buttons are `"greyed out"`.

N.B. When data is entered in a text field in one of the control panels, it is important to press the Return key at the end of data entry. If this is not done the data will not be entered even though it appears in the window.

12.1.8 Initialise

A tape in an allocated drive can be initialised by choosing one of the items from the '`Initialise`' menu. Clicking the left mouse button on the menu button selects the choice to initialise a new tape.

All the initialise choices bring up a popup window. Enter a volume name for the tape and the existing volume name for a tape that is being reinitialised, then click on the '`Initialise`' button in the popup window. By default the tape will be mounted after it has been initialised, if this is not wanted click on the '`Mount`' tick box to remove the the tick.

If the default values for labelling and density are not required use the '`Custom`' menu choice. This displays a window that allows control over these parameters.

12.1.9 Mount

An initialised tape in an allocated drive can be mounted by choosing one of the items from the '`Mount`' menu. Clicking the left mouse button on the menu button selects the choice to mount a known volume.

The first '`Mount`' choice brings up a popup window. Enter the volume name of the tape and click on the '`Mount`' button in the popup window.

The second '`Mount`' choice is labelled '`Identify`'. It will attempt to identify and mount an unknown but initialised volume. This choice can take a long time.

12.1.10 Identify

An initialised tape with an unknown volume label can be mounted in an allocated drive by choosing the second item in the '`Mount`' menu. This will attempt to identify and mount the volume.

N.B. This choice can take a long time.

12.1.11 Dismount

A mounted tape can be dismounted by clicking on the '`Dismount`' button as long as all files on the tape are closed. Dismounting a tape causes the drive door to open.

12.1.12 Carrying out an action on a file

Once a tape volume has been mounted file actions can be carried out on it. In general this is done by optionally entering some text data then clicking on a button. Only those actions appropriate to the current state of the selected drive are allowed. Disallowed action buttons are `"greyed out"`.

N.B. When data is entered in a text field in one of the control panels, it is important to press the Return key at the end of data entry. If this is not done the data will not be entered even though it appears in the window.

12.1.13 Open

A file can be opened on a mounted tape by choosing either of the items from the 'Open' menu. Clicking the left mouse button on the menu button selects the choice to open a file with default parameters. Both choices bring up a popup window.

The first 'Open' choice will open a file with default parameters. Enter the volume name of the file and click on the 'Open' button in the popup window. The defaults are listed below.

- Access mode is write.
- labelling is undefined, that is as found on the volume label.
- record length is 0.
- block length is 0.

If the default values are not wanted use the 'Custom' menu choice. This allows control over the parameters.

12.1.14 Close

An open file on the tape in the selected drive can be closed by clicking on the 'Close' button.

12.1.15 Status Displays

Displays of three aspects of the tapes may be displayed.

Click on the 'Status' button in the 'Tape Drive Control' window to display a summary of information about the currently claimed drives and Eurogam data stream statuses. By default the window is refreshed every 10 seconds. The window shows information from four drives at a time; use the menu from the 'More Drives' button to display a different set of drives. The summary window can also be displayed from the 'Tape Stream Control' frame.

The 'Status' button can also bring up a menu with 'Summary' and two other choices; these are 'File' and 'Drive'.

'File' shows information specific to the tape in the selected drive. The information is not refreshed except when another drive is selected. The 'Information' line is useful when there has been an error. It shows information returned from the server about the last error.

'Drive' shows information specific to the selected drive. The information is not refreshed except when another drive is selected.

12.1.16 Controlling the window appearance

Click on the 'Redisplay' button in the 'Tape Drive Control' window to refresh the contents of this window and its associated subwindows. It is possible, for example if a user has claimed tape drives from another workstation, for the window contents to be incorrect. 'Redisplay' will update the contents of all the currently displayed tape drive windows.

The 'Redisplay' button can also bring up a menu with 'Redisplay' and two other choices; these are 'Enable All Buttons' and 'Disable Inactive Buttons'.

'Enable All Buttons' makes all the 'Drive:', 'Volume:' and 'File:' buttons active, that is not "greyed out". This means they can be clicked on even if their action would be inappropriate to the current state of the selected drive. This is sometimes useful if the server, a tape drive or the display is in an unexpected state.

'Disable Inactive Buttons' "greys out" any disallowed 'Drive:', 'Volume:' or 'File:' buttons. This means they can only be clicked on if the action would be appropriate to the current state of the selected drive.

12.2 Controlling tape streams

In order to send Eurogam data to a tape it is necessary to 'associate' the Eurogam stream(s) on which it is appearing to a physical tape drive or drives. Data from one or more Eurogam streams can be directed to one or more different tapes.

There are two modes of association, 'striped' and 'duplicated'. Striped data is spread across several tapes. In this way the data rate through the tape server can be increased although the rate to any individual drive is not. In the duplicated case all the data is written to all the drives, in this way several tapes of the same data can be made for sharing between collaborators without subsequent copying.

The usual order of actions is as follows.

1. Halt the tape server.
2. Select a Eurogam data stream.
3. Select the tape drives to which the data will be directed.
4. Associate the stream and drives together in the required mode.

12.2.1 Server State

Data will only flow from the data acquisition system onto tape when the Eurogam tape server is is in the 'Going' state. Streams can only be associated with tape drives when the server is in the halted state. The 'Server state' buttons reflect the state of the tape server and can be used to change its state. Click on the appropriate button to start or stop the tape server. This can also be carried out from the 'System Control' frame.

12.2.2 Stream Selection

A Eurogam stream is chosen by clicking on one of the choice buttons labelled '`Stream`'.

12.2.3 Drive Selection

The tape drives to be associated with a Eurogam stream are selected from the '`Claimed`' list. Select drives by clicking on them in the list. The list is updated every time a new drive is claimed or freed from the Tape Drive Control frame.

12.2.4 Association

When the required stream and drives have been chosen click on the '`Mode`' button labelled with the appropriate association mode. This will select the mode shown on the button. When this has been done click on the '`Associate`' button. This action will associate the chosen Eurogam stream with the selected drives using the chosen mode.

To cancel all associations for the stream click either on the '`Associate`' button with no drives selected or on the '`Dissociate All`' button.

12.2.5 Status

Click on the '`Status`' button to display the status of the four Eurogam streams. This information is not automatically updated. Click on '`Redisplay`' in the popup status window to update it.

Choose the second, '`Summary`' item in the '`Status`' menu to display a summary of the current drives and Eurogam data stream statuses. The summary display window is the same as the one that appears from the '`Tape Drive Control`' frame.

12.3 Controlling the tape handler

The multiple tape handler is used to allow the (semi) automatic selection and insertion of tape cartridges into a drive mechanism.

Currently the tape handling mechanism is an "Exabyte 10i Cartridge Tape Handling Subsystem". This can hold up to 10 cartridges and load them into the associated Exabyte cartdrige tape drive.

The window presents a list that shows buttons representing the slots that can store tape cartridges. These include the drive mechanism and the "changer" or "carrier" that moves cartridges between locations. It also shows a set of buttons that initiate actions by the tape handler.

N.B. It should be noted that due to the mechanical nature of the device these choices can take a very long time, several tens of seconds.

12.3.1 Handler Selection

When the handler window is started the first allocated drive will be chosen as the current drive and its status will be read and displayed.

Click on any drive in the '`Drives`' list to select it for subsequent use.

12.3.2 Slot Selection

Click on a '`Slot`' choice to select it for action. The selected choice and its status line are highlighted.The drive and the changer mechanism are also in the list with the storage slots and can be selected.

N.B The "selected" slot is the one highlighted in the '`Slot`' list. It is not the same as the current slot in a semi-automatic sequence.

12.3.3 Moving Cartridges

Tape cartridges can be moved from location to location either "manually", by selecting the source and destination and then sending the move command to the handler, or in a partially automated way.

12.3.4 Manual

Choose a location from the '`To:`' list for the destination then click on the '`Move Selected`' button. The currently selected choice (highlighted in the '`Slot`' list) will be moved to the chosen destination location.

12.3.5 Sequence

The '`Sequence`' buttons demonstrate semi-automatic loading and unloading of the drive.The start and end of a numerical sequence can be defined, then the next tape in sequence can be loaded into the drive with a single button click.

The '`Sequence`' buttons are not affected by the other '`Load`' or '`Move`' buttons.

First:: Press and drag with the '`MENU`' button to define the first tape slot of the sequence.

Last:: Press and drag with the '`MENU`' button to define the last tape slot of the sequence.

Current: This item displays which slot is current in the sequence. This slot is the one that is currently being used or has just been used as the source of a tape cartridge. N.B The current slot in a semi-automatic sequence is not the same as the "selected" slot, which is the one highlighted in the '`Slot`' list.

Set Current: Press this button to modify the sequence by making the currently selected '`Slot`' the current one.

Select Current: Press this button to select the current slot, in the 'Slot' list.

Load Current: Press this button to unload the drive, if necessary, and then reload it with the cartridge from the current slot.

Load Next: Press this button to unload the drive, if necessary, and then reload it with the cartridge from the next slot in the sequence. This slot then becomes the current slot. If the next slot is empty the cartridge from the next full slot will be used and this slot will become the current one. The sequence will stop after the 'Last' tape has been loaded.

Restart: Press this button to unload the drive, if necessary, and then reload it with the cartridge from the first slot in the sequence. This slot then becomes the current slot. If the first slot is empty the cartridge from the next full slot will be used and this slot will become the current one

12.3.6 Loading

The drive can be loaded, unloaded or unloaded then reloaded without using the 'Move Selected' button.

The carrier can also be parked out of the way.

12.3.7 Load

Click on the 'Load' button to load the drive with the cartridge from the currently selected slot. The drive must be open and empty for this operation to succeed.

12.3.8 Unload

Choose the 'Unload Only' item from the 'Unload' menu to unload the cartridge from the drive and replace it in the slot it came from.

Choose the 'Unload-Load' item from the 'Unload' menu to unload the cartridge from the drive, replace it in the slot it came from and then to load the drive with the cartridge from the currently selected slot.

If the handler does not "know" where the cartridge came from an error message will be displayed. In this case it will be necessary to select 'Drive' from the 'Slot' list, choose a suitable destination from the 'To' list and then use the 'Move Selected' button. This can be followed, if necessary, by the 'Load' button.

12.3.9 Park

Click on the 'Park' button to park the cartridge carrier mechanism. Parking the mechanism moves it out of the way so the drive or any of the slots can be accessed. This is useful, for example, when inserting new tapes in the slots.

13. Saving Online Spectra

The 'Saving Online Spectra' button on the *eg-session* 'Base Frame' pops up frame for saving to disc some or all of your online spectra.

The frame works as if you were copying files from one directory to another—the online spectra in the histogrammer and sorter can be thought of as in separate directories—and you can copy a subset of the spectra by giving a pattern that their names must match.

13.1 Selecting the source of online spectra

To save spectra from the histogrammer choose '/hist' from the 'Online directory:' menu. To save spectra from the online sorter choose '/sort'. The scrolling list will update to show which spectrum names from the newly chosen source match the 'Match with:' pattern (if any).

13.2 Selecting the destination disc directory

If you want to save your spectra into an existing directory, edit its name into the 'Disc directory:' field. Don't forget the Return. If you want to save into a brand new directory, use the 'Create Directory' button as described below.

13.3 Selecting spectra by pattern matching

You can save a subset of the spectra in the online directory by entering a pattern in the 'Match with:' field (followed by Return). The scrolling list will update to show those spectrum names from your chosen online directory that match the pattern.

The pattern can contain special characters as follows:

- `*` matches any sequence of zero or more characters.
- `?` matches any single character.
- [*m*-*n*] matches all integers in the range *m* to *n* inclusive.
- An empty pattern matches everything.

For example, `Ge*.4MeV.q0` matches just the non-vetoed, non-pileup 4 MeV Germanium spectra, and `BGO[22-33].*` matches all the BGO spectra defined on acquisition channels 22 thru 33.

13.4 Making a new disc directory

To make a new disc directory, edit its name into the field adjacent to the '`Create Directory`' button (don't forget the `Return`), and click the button. N.B. You may have to create a parent directory first (and possibly a parent for that, and so on, upwards) if one does not already exist, but you can do that with '`Create Directory`' too. For example, if you want to put the spectra into the directory '`/disc/specs/dy152/run1`' you may have to create '`/disc/specs/dy152`' first. You can use the '`Directory Browser`' (see section 9 [*Directory Browser*], page 33) to find out what directories already exist.

13.5 Setting the save going

Just click on the '`Save Spectra`' button. As each spectrum is saved to disc it is reported in the frame's footer.

14. Rack Monitor

The '`Rack Monitor`' frame displays the status of the electronics rack monitoring system.

The rack monitoring system monitors the temperature of each rack and also the condition of up to five fan trays. You can select rack to be displayed from the menu at the top of the frame.

If any faults are detected messages are sent to the message logging system. These messages can be disabled for any rack, or for any fan tray within that rack, by clicking on the '`Enable`' tick boxes to the right of the frame.

15. Monitoring Problems

This chapter talks about the Exception Monitor.

16. Running Diagnostic Tests

This chapter talks about online diagnostics for the EG hardware and software.

17. Obtaining Graphical Hardcopy

There are three ways of getting a paper copy of what you can see on your workstation screen. All three methods rely on converting what you see on the screen into Postscript and sending it to a default Postscript printer. In the NSF Control Room this is the SPARCprinter attached to the workstation '`nnsj`'.

At present there is no support for printing in colour, and no provision for preparing plots for publication.

17.1 Plotting spectra

The '`hardcopy`' entry on the '`Arrange`' menu of the '`Spectrum Analyser`' frame produces an A4, landscape copy of the current contents of the spectrum display window. The image is scaled to fit the paper and takes just a few seconds to appear (on the SPARCprinter).

17.2 Full screen dumps

The '`Screen Dump`' button on the '`Base Frame`' produces an A4, landscape full screen dump. The image is scaled to fit the paper and takes about one minute to appear (on the SPARCprinter).

17.3 Partial screen dumps

There is no provision within *eg-session* for making partial screen dumps. However, you can always use the standard deskset tool '`snapshot`' to dump the full screen, a single window, or a rectangular region selected with the mouse.

By default, '`snapshot`' does not scale the image to fit the available paper, so you will probably need to adjust the '`snapshot`' print options: For a landscape copy set '`Orientation:`' to '`Sideways`', '`Position:`' to '`Center`', '`Scale to:`' to '`Both`', and set suitable values for '`Width:`' and '`Height:`'. Set '`Printer:`' to '`lw`' for output on the LaserWriter or to '`sp`' for output on the SPARCprinter. The latter is recommended for screendumps as it is much quicker.