EDOC028

EUROGAM PROJECT

NSF DATA ACQUISITION SYSTEM

Eurogam HV Control Specification

Edition 1.0
August 1990

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August 1990

1 Introduction

[*This is a first draft for discussion and will be amended and improved following user comment.*]

The Eurogam project has specified that the High Voltage supplied to Ge and BGO detectors is to be computer controlled due to the large number of detector channels involved (approx. 770). This enables the setup and control of the HV supplies to be integrated into the general data acquisition system. The aim is to provide a user friendly computer interface in the same form as the rest of the system.

2 Hardware

The LeCroy 1440 series of HV mainframes has been chosen for this application. The HV outputs are provided by boards which slot into each mainframe. There is space for 16 boards per mainframe and upto 16 mainframes may be daisy-chained together from one computer interface.

The BGO detectors will be fed from boards of type 1443. These boards have 16 output channels of upto 2.5 kV each.

The Ge detectors will be fed from boards of type 1444. These boards have 8 output channels of upto 5.6 kV each.

The computer interface will be the LeCroy 1131 VME interface board. This module has a command list execution feature together with DMA and data memory which all helps to free the controlling cpu from some of the more onerous data transfer tasks.

3 Software

It is proposed that the software controlling access to the HV mainframes be a single task in the crate controller of one of the VME crates in the data acquisition system. Only one VME interface module and very little VME bandwidth will be involved. Suitable crates may be the ones primarily allocated to autofill or histogramming.

There will be a user interface in the Unix workstation allowing the user to control which channels are activated and at what voltage. The user interface will allow the allocation of individual channels in each mainframe to particular detectors.

The control task will be able to interrogate each mainframe to find out which board type is present in each slot. This will allow any mix of board types within a mainframe. This freedom of placement may not in practice be used, but should be incorporated in the design.

The VME task will keep a local database of the current setup state for interrogation by users. This database will list all available supply channels and indicate the state of each. The state will include the following details.

- Demand voltage ... to be set if/when turned on
- Present on/off status
- Trip status ... whether turned off automatically
- Name associated with channel

The control task will monitor the state of each channel to check for any irregularities. In particular, the Ge HV cards have a trip feature which allows the voltage to be ramped down to zero on application of an external signal. This condition will be noticed and a warning message sent to the user. Warning messages may be required for more than one destination. An audible warning in the control room may be desirable.

The Ge HV board (1444) allows the following values to be set ...

- Voltage for each channel
- Ramp rate for all channels on board
- DC current limit for all channels on board
- AC current limit for each channel

The BGO HV boards (1443) allow the voltage to be programmed for each channel.

It is proposed to fix certain parameters to suitable values agreed with the users in order to simplify the software interface. Examples would be the voltage ramp rate and current trip levels.

4 User Requirements

Values provided by the user will be real voltages and not internal register settings.

After a voltage drop on any channel due to the application of the trip signal, that channel will be turned off and will only be re-activated by user command.

A mode should be provided to allow the user control whilst the voltage is applied to a particular channel. The control required will involve quick commands (single key hit?) for stopping, starting and direction of voltage change.

Some thought as to the graphical presentation of 770 channels of HV is necessary. Suggestions range from a message informing of a problem with a certain channel, to histograms of HV channel 'number' versus deviation from set point.

For the BGO detectors there will be curves of HV versus gain for all the tubes. These curves can be parametrised and stored as a database to allow specified gain changes to be evaluated in terms of a voltage change. Then, for example, all detectors could be increased in gain by a certain amount, and each one applied automatically via differing changes in HV.

There will be the need to control HV in terms of BGO shields as well as singly. The 10 HV channels of one BGO shield should be controllable together wherever the channels are located in the various mainframes.

Any more ?