Using the e835 High Voltage Program

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September 12, 1996

Abstract

Many parts of the e835 experiment require the use of the LeCroy high voltage mainframes. These include the hodoscopes H1, H2, and H2', the forward veto, the Cherenkov counters, the forward calorimeter and cosmic ray trigger paddles, and the central calorimeter. Detailed here is what you need to know in order to run the high voltage program.

Contents

1 How to Run the Program

First, you must be logged onto fn835x as daqman. The terminal line to the mainframes is directly connected to a serial port on fn835x, so the program cannot communicate with the mainframes from any other machine. Only daqman is allowed to use the program.

Second, change your current directory to /dart/daqman/hv/bin. This is where the executable 'hv' is located. The source code for the program, hv.f and io.c, are located in /dart/daqman/hv/src.

Then type 'hv' to run the program.

2 What Happens During Initialization

The name file, /dart/daqman/hv/inc/hv.nam, is read into the program. This file associates short names, like 'CC45-15' with each channel of a mainframe that is being used. The program is designed so that one may address a particular channel by this name or the channel number(0-255) in that mainframe.

Next, the program attempts to open the terminal line on fn835x connected with the mainframes. Three things may occur. One is that the terminal line is successfully opened. However, the program will exit if one is not starting the program from fn835x. It will also exit if someone else is already using the high voltage program, i.e. the terminal line is blocked for the second user.

While it is possible for two programs to run at the same time, there is only one terminal line, and the mainframes are daisy-chained together. Both programs can change voltages and turn mainframes on without the other's knowledge, and this presents a safety hazard. Furthermore, responses from the other program will often appear in the other session, so the response received may not match the command given.

The final stage of initialization is zeroing all mainframes that are off. This prevents voltages from being assigned to channels without your knowledge when the mainframe is turned on. Furthermore, some controllers may not be set to zero by default after the power has been turned off. Mainframes that are 'ON' are assumed to be in use, and are not zeroed. If one stores the default voltages in the backup buffer of the mainframe, these values are easily restored if the power has not been turned off. Otherwise, the demand voltages must be restored from a file.

3 Addressing Mainframes and Channels

If a channel has been addressed by its name(from the file hv.nam), the program will address the respective mainframe for you (which saves time and effort). However, if one addresses the channel by its number(0-255), one must address the respective mainframe first manually. For those commands that allow consecutive channels to be addressed, all of these channels must be in one mainframe.

If a mainframe was not the last mainframe to be addressed, it should tell you that it is responding, i.e. 'Mainframe 1 responding'. Until a different mainframe is addressed, further attempts to address this mainframe will not generate a response: This is normal. If a mainframe does not yield a response after another mainframe has been called, then something is wrong with this mainframe. The response of the mainframe in this case is checked by the program, and the user is notified of any error.

4 High Voltage Commands

Commands may be entered with either lowercase or uppercase letters at the prompt 'ENTER 1440 COMMAND>'. Hitting return terminates the command string and executes the command you just typed. These commands are converted by the program into something that the mainframes can understand. Similarly, responses from the mainframe are adjusted by the program.

4.1 HELP

HELP displays the list of commands that you can use with a short description of each command.

4.2 EXIT and QUIT

Both EXIT and QUIT allow you to exit the program. Typing E or Q will work also.

4.3 MAINFRAME

MAINFRAME is used to address a particular mainframe. Further commands operate only on this mainframe unless the channel name is used, whereby the program executes MAINFRAME to talk to the channel's respective mainframe.

For example, 'M 1' addresses mainframe 1. A knob on the front of the 1445 controller dictates which number is assigned to a mainframe. Currently, the experiment has 6 mainframes.

4.4 ON

ON by default turns on the current mainframe. Demand voltages become actual voltages sent through the back of the mainframe. One may also turn on a different mainframe by 'ON 2' for example, or 'ON all', which turns on all the mainframes.

The program will respond with 'M1 Turn on' when mainframe 1 is turned on.

Actual voltages read by the mainframe should be fairly close to the demand voltages. Otherwise, there is an error somewhere in the system.

4.5 OFF

'OFF' behaves similarly to the command 'ON'. Actual voltages become zero. The program will respond with something like 'M1 Turn off'.

When the mainframe is off, it is safe to work with any cables attached to the mainframe, or with the mainframe itself. But it is advisable to be running the high voltage program while working so that nobody else can turn on that mainframe. One may also turn off the power in the front of the mainframe and/or disable the mainframe for safety as well.

4.6 STATUS

STATUS tells you what the current mainframe is, whether it is on or off, and the present current limits. It optionally takes one argument, which is either the mainframe number, or ALL.

A typical response of the program to the status command is

M1 HV Enabled HV off Current limit = + 255, - 255

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The reply indicates which mainframe is current, whether the mainframe is enabled or disabled in front via the interlock, whether it is on or off, and what the current(Amperes) limit is. In addition, there may be an additional 'Ch error' to this string if the mainframe detects something wrong with a specific channel.

4.7 RESTORE

RESTORE accepts voltages for the demand and backup buffers from a file. This file has to be created by the STORE command, because the program looks for information at predefined locations in each string of the file.

After typing 'RESTORE', the program will ask you for the name of the file. If the file you want is not in the same directory as the executable, then you should include the full pathname with the filename. Then you may choose which set of detectors in this file are to be restored, or restore all channels in this file. A line at the top of this file tells the program the range of mainframes included in this file.

4.8 STORE

STORE reads the demand, backup, and actual voltages and writes these along with the channel name, channel number in that mainframe(0-255), 1443 card number(0-15), and the channel number in that card(0-15) to a file. The STORE command does not do anything with the entry for the actual voltage.

4.9 READ

In order to find out what the current set of voltages are, one must execute a READ. READ has two arguments. The first argument is the channel name or number of the first channel to be read out. The second is the total number of channels to be read, including the first one.

So to read the voltages for the first 10 FCAL channels, one would type 'READ FC-1 10'. Lines like those in the file made by STORE are displayed for each channel in this set.

You can only read channels in one mainframe at a time.

4.10 PRINT

PRINT is exactly like READ except the output is sent to a printer. The printer for the high voltage program is ap50_hp4si, located in the AP-50 counting room.

4.11 SET

The 'SET' family of commands is used to write voltages to the demand or backup buffers. SET accepts 3 arguments: The channel name or number(0-255) start with, the number of channels to set, and the voltage that will be written to the demand buffer of every channel in this range for this mainframe.

For example, if one wanted to set all 256 channels in the current mainframe to 100 Volts, the command would be 'SET 0 256 100'. The program then tells you which channel is currently being set, and at the end how many channels were successfully set.

4.12 SET^

SET^allows one to increment a range of channels by the same voltage. This also takes three arguments. If one wanted to change every channel in the mainframe from 100 Volts to 150 Volts, one could use 'SET^0 256 50'.

4.13 SETB

SETB is exactly the same as SET, except that SETB is used to write voltages to the backup buffer.

4.14 NSET

NSET is a new addition to the high voltage program, and is only to be used for the CCAL channels. It allows you to set up to 10 different channels individually, while the rest of the channels in each respective mainframe are set to zero. These 10 channels may be in any of the 5 CCAL mainframes (2-6). NSET takes no arguments at the command prompt.

Before using NSET, you must first place a set of voltages you want to use in the demand buffer, either by a swap with the backup buffer or by restoring voltages from a file. NSET then puts the demand buffer in the backup buffer, and if nset has not used a channel's mainframe before in the current session, it zeroes the demand buffer of said mainframe.

NSET only zeroes a mainframe and places demand voltages in the backup buffer once(to save time). Previous channels used by NSET in this mainframe are set to zero after the demand voltage has been stored in the backup buffer, and the respective mainframe is turned off. Hence it is advantageous for you to keep the program on for a while so that the program will not have to keep zeroing mainframes.

NSET will ask you for the wedge and ring numbers of each channel you want to turn on, set the demand buffer to the value previously stored in the backup buffer, and then turn on the respective mainframe.

CAUTION: Be careful using NSET and SET during the same session. NSET only keeps track of the channels that it has turned on and is about to turn on. So if you turn on CCAL channels with SET, make sure you turn those channels off before using NSET.

4.15 SWAP

When the command SWAP is given, the demand buffer becomes the backup buffer, and what was the backup buffer becomes the new demand buffer. By default, the buffers in the current mainframe are exchanged. However, one can give SWAP the mainframe number or ALL as an argument, and the respective buffers will be switched.

4.16 COPY

COPY copies the demand buffer to the backup buffer. No changes are made to the demand buffer. By default the current mainframe is copied, but as with SWAP one may execute this command in a different mainframe or in all mainframes.

4.17 CURLIMIT

CURLIMIT sets the limit on the current in the presently used mainframe. 'CURLIMIT 100' will set the current limit to +- 100. The LeCroy manual says that the maximum current allowed at 2500 Volts is 2.5 mA.

4.18 UPDATE

To see more on the LeCroy UPDATE command, read the LeCroy manual.

5 Safety

Using high voltage is serious business, so do not overlook potential safety hazards.

In general, mainframes that are not in use should be OFF. Before working with the high voltage cables or the mainframes themselves, one should run the program, check which mainframes are off, and avoid the mainframes that are off.

If you need to work on a mainframe while someone else is running the program, tell them what you are doing, so that voltage will not be accidentally delivered to the back of the mainframe. It may also be wise to disable the mainframe by engaging the interlock in front so that nobody can turn that mainframe on accidentally. Although the program locks out other users, someone can kill the program and start their own. One can also turn off the power if the mainframe cannot be disabled.

If for some reason you do not trust the actual voltage that the mainframe reads, one should only check the voltage directly with the aid of a high voltage probe instead of a stand-alone voltmeter.

6 General Tips

It is always wise to save voltages with STORE so they can be restored later. If the power is cycled, voltages saved in both buffers will be lost, so simply saving voltages in the backup buffer is not enough. The program will zero all the demand buffers in the beginning anyway for safety, so demand voltages are not secure unless the mainframe is left on.

Sometimes, for some unknown reason, the mainframe will spit out extra characters that the program does not expect. The program will not progress if the response to the command from the mainframe is not what it expected. After trying a series of mainframe commands to empty out the buffer, you will have to exit or kill the program and start over. If the problem persists, then there may be a problem with one of the controllers or one of the cables connecting the controllers.

If the mainframe responds with non-alphanumeric characters, then the problem is probably that the baud rate of the controller is not set correctly.

Both the -15 and +5 lights on the controller should be lit. If they are not lit while the mainframe is powered, then something is wrong with the neighboring low voltage power supply. The controller will probably not respond to any commands in this case.

7 Summary of High Voltage Commands

commands	actions
HELP	displays this help-list
EXIT	exits program
QUIT	exits program
NSET	turn on up to 10 individual CCAL channels
BOOT	boots mainframe (temporarily disabled)
OFF	turns HV off
ON	turns HV on
STATUS	reports mainframe status
STORE	stores Actual,Demand,Backup values on disk
RESTORE	restores Demand,Backup values from disk
SWAP	swaps Demand and Backup buffers
COPY	copies Demand buffer to Backup buffer
UPDATE	executes Lecroy UPDATE command
MAINFRAME	addresses mainframe
CURLIMIT	sets + or - current limit
READ	displays Actual,Demand,Backup values
PRINT	prints Actual,Demand,Backup to printer
SET	writes value to Demand buffer
SET^	increments Demand buffer value
SETB	writes value to Backup buffer

commands	arguments ([ ] is optional)	arguments
HELP		0
EXIT		0
QUIT		0
NSET		0
BOOT	[mainframe# or ALL]	0,1
OFF	[mainframe# or ALL]	0,1
ON	[mainframe# or ALL]	0,1
STATUS	[mainframe# or ALL]	0,1

STORE	[mainframe# or ALL]			0,1
RESTORE	[mainframe# or ALL]			0,1
SWAP	[mainframe# or ALL]			0,1
COPY	[mainframe# or ALL]			0,1
UPDATE	[mainframe# or ALL]			0,1
MAINFRAME	mainframe#			1
CURLIMIT	±value			1
READ	start ch# name	# of chs to read		2
PRINT	start ch# name	# of chs to read		2
SET	start ch# name	# of chs to set	value	3
SET^	start ch# name	# of chs to set	value	3
SETB	start ch# name	# of chs to set	value	3

NOTE: arguments must be separated by at least 1 space