Manual to HiRA HV control interface
Release 0.1
February 2004 by Michal Mocko

Before starting:

Make sure the SY2527 (caenhv05) is up and running with ethernet cable connected. Find out the IP number corresponding to caenhv05 (they change it quite often). You can enable the remote control by flipping the switch on SY2527 to "remote" and plugging a TTL signal into the LEMO connector. Then we are ready to run telnet or HiRA_HV_control GUI.

The default directory is HiRA_HV_control where the following file structure is stored:

<spdaq10:HiRA_HV_control >ls
README_caenctl ← readme file explaining caenctl tcl/tk expansion
HiRAChannelAssignment.tcl ← contains channel mapping (must be modified if one   changes card position or cables)
HVControl.tcl   ←   main tcl script containg the interface
HiRAControl.tcl   ←   tcl/tk procedures defining HiRA specifics
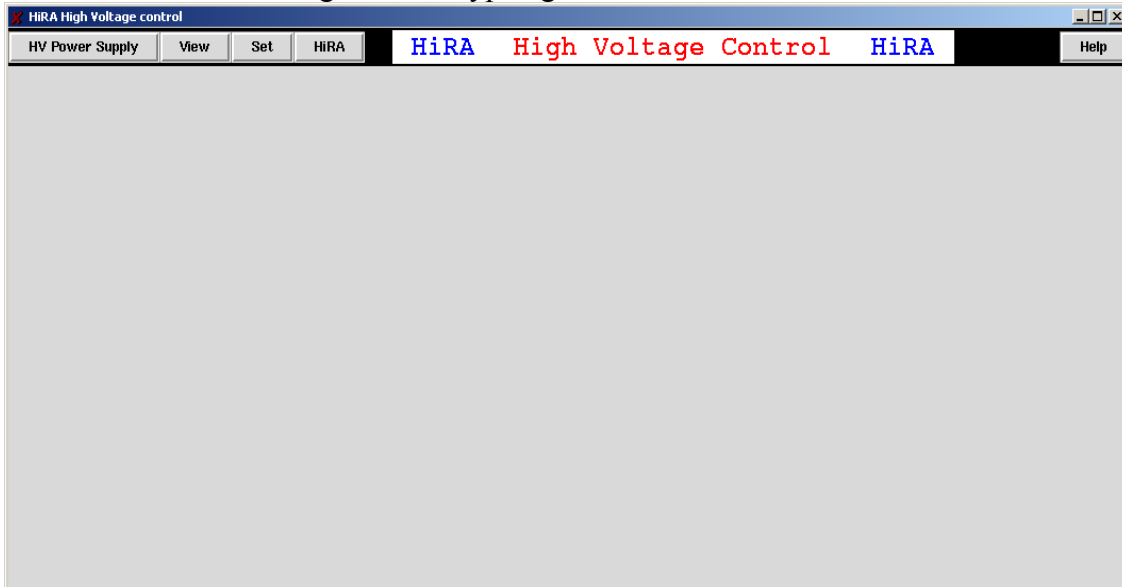**caenctl***   ← executable of tcl/tk expanded for SY2527 control
SaveStatus/   ← directory which can contain log files
Config/   ← directory containing *.hira and *.config files
goHVhira*   ← script starting the interface

check files before starting and then type ./goHVhira to start the interface:

Viewing and setting channel parameter values:

First of all we have to log in to the HV power supply. Go to HV Power Supply→Login to PS:

The default values are shown in the left figure. HV name is just internal name which is used to address the power supply. IP number is the IP number of the SY2527 power supply. User name and password does not have to by changed. After hitting Login button one should see the following:

If there is an error message there is something wrong with connection to Power supply (PS). Check if PS is on and if the network path exists (e.g. running ping).
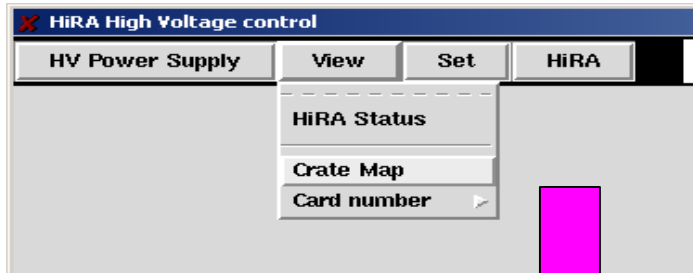
Crate map (map which slots are occupied and which not) is displayed by selecting View→Crate Map menu.

Example of Crate map is shown below:

Slot	No of Channels	HV Card Description	Serial
Slot 0	12	12 Ch Float 250V 1/0.1mA	84
Slot 1	12	12 Ch Float 250V 1/0.1mA	83
Slot 2	0	No Card Present	0
Slot 3	0	No Card Present	0
Slot 4	28	28 Ch Neg. 3KV 3mA	17
Slot 5	0	No Card Present	0

Cards IN

Cards not present

Checking channel parameter values for a chosen slot:

By selecting View→Card Number→Slot 0 one can see status of card located in slot number 0. In my case one sees:

HiRA High Voltage control

| HV Power Supply | View | Set | HiRA | HiRA   High Voltage Control   HiRA | Help |

Slot number: 1 Number of Channels: 12 Card description: 12 Ch Float 250V 1/0.1mA 0.1mA

Number	Channel Name	Volt Set	Volt Mon	Current Mon	Current Set	Soft VMax	Power	Ramp Up	Ramp Down	Status
0	LVB13	10.0	10.1	0.0	2.0	20.0	On	1.0	1.0	ON
1	LVB16	10.0	0.0	0.0	2.0	20.0	Off	1.0	1.0	OK
2	LVB14	10.0	9.6	0.0	2.0	20.0	On	1.0	1.0	ON
3	LVB17	10.0	0.0	0.0	2.0	20.0	Off	1.0	1.0	OK
4	LVB15	10.0	9.9	0.2	2.0	20.0	On	1.0	1.0	ON
5	LVB18	10.0	9.6	0.0	2.0	20.0	On	1.0	1.0	ON
6	LVB19	10.0	0.0	0.0	2.0	20.0	Off	1.0	1.0	OK
7	LVB22	10.0	0.2	0.0	3.0	80.0	Off	1.0	1.0	OK
8	LVB20	10.0	0.2	0.0	2.0	20.0	Off	1.0	1.0	OK
9	LVB23	10.0	0.0	0.0	3.0	80.0	Off	1.0	1.0	OverCurrent (Int. trip)
10	LVB21	10.0	2.7	0.0	3.0	80.0	On	1.0	1.0	ON Up
11	LVB24	10.0	0.3	0.2	3.0	80.0	Off	1.0	1.0	OK

ON   OFF   Problem

On   Off

Colors meaning:

Black on Green background – channel is ON

Yellow on Blue background – channel is OFF

Black on Red background – problem!!!

Setting channel parameter values:

By selecting Set→Set Parameters one gets dialog as follows:

Setting Parameters for HV power supply

Channel Name	Voltage	Power	Current	Ramp Up	Ramp Down	Soft Volt Max
0	0	On/Off	0	0	0	0
Set/Do not	Set/Do not	Set/Do not	Set/Do not	Set/Do not	Set/Do not	Set/Do not

Slot Number: 1

Channel: 10   All channels/Only specified

Set   Dismiss

And one can set any channel parameter through this dialog by selecting appropriate Set/Do not check button underneath a parameter. In the above example after hitting Set button I am setting channel number 10 on slot number 1 ON. By checking All channels/Only specified one sets the same parameter value for all channels in a gives slot number. One can see the results of set actions immediately in View→Card Number→Slot 1.

HiRA telescope voltage/current monitoring:

Loading configuration for a given experiment:

There are two different configuration files. First containing information about Towers and Telescopes used and other about voltage and current limits to be set for all the detectors connected to the tower numbers.

Files with extension *.hira contain tower number used and telescope number connected to it in the following format:

```
!
tower0
telescope0 E HVB2
telescope0 dE LVB6
telescope1 E HVB1
telescope1 dE LVB3
telescope2 E HVB26
telescope2 dE LVB2
telescope3 E HVB5
telescope3 dE LVB1
telescope4 E HVB4
telescope4 dE LVB5
common CsI LVB22
tower1
telescope5 E HVB7
telescope5 dE LVB9
telescope6 E HVB6
telescope6 dE LVB8
telescope7 E HVB27
telescope7 dE LVB7
telescope8 E HVB10
telescope8 dE LVB4
telescope9 E HVB9
telescope9 dE LVB12
common CsI LVB23
!
END
```

First of all "!" is a comment character for both configuration files. Everything between keywords towerX and towerY or anything between towerX and END is considered to be connected to towerX. Keyword dE or E or CsI defines detector which is connected to appropriate High/Low Voltage Bias (H/LVB). Keyword of common is to be used only for CsI detectors because they are connected through different cable(connector). Mapping of H/LVBs is defined in file: **HiRAChannelAssignment.tcl** that's why it is **essential to make appropriate changes** in this file if one of the cards is relocated within the power supply or there are changes made in cabling.

Second configuration file (*.config) contains voltage and current limits to be set for **all** detectors defined in the *.hira file. Syntax is straightforward and easy to understand:

```
!
telescope0
dE 10 2
E 300 2.0
telescope1
dE 10 2
E 300 2.0
telescope2
dE 10 2
E 300 2.3
telescope3
dE 10 2
E 300 3
!
CsI
tower0 10 3
!
```

Again "!" is a comment character. And keywords of dE and E mean appropriate detectors for telescopeX (above them) and then voltage and current limits are defined (in that order). Again CsI detector biases are defined out of telescopes because they share bias voltage from one source for the whole tower ➔ CsI keyword has to be used and then towerX and voltage and current are defined (in that order).

Configuration files are loaded in the following order:
1. HiRA configuration (HiRA➔Open HiRA configuration)
2. Voltage configuration (HiRA➔Open Voltage configuration)
3. Log directory (HiRA➔ Choose Log Directory) = [**optional**]

If all configuration files are loaded properly one can start with View➔HiRA status. If there is an error while loading configuration file. Please check the syntax of the file. Another common problem is if the two files (*.hira and *.config) have different towers/telescopes defined. **There has to be the same tower/telescope numbers in both files!**

Selecting View→HiRA status we get:

HiRA High Voltage control

| HV Power Supply | View | Set | HiRA | HiRA   High Voltage Control   HiRA | Help |

tower0

Name	V Set	I Set	V Mon	I Mon	Power	Status		
telescope0 dE	10.0	2	0.0	0.0		OK	0,	5
telescope0 E	300.0	2.0	0.0	0.0		OK	4,	1
telescope1 dE	10.0	2	0.0	0.0		OK	0,	4
telescope1 E	300.0	2.0	0.0	0.0		OK	4,	0
telescope2 dE	10.0	2	0.1	0.0		OK	0,	2
telescope2 E	300.0	2.3	0.0	0.0		OK	4,	25
telescope3 dE	10.0	2	0.0	0.0		OK	0,	0
telescope3 E	300.0	3	0.0	0.0		OK	4,	4
telescope4 dE	10.0	2	0.0	0.1		OK	0,	3
telescope4 E	300.0	2.5	0.0	0.0		OK	4,	3
tower0 CsI	10.0	3	0.2	0.0		OK	1,	7

On/Off All | Reverse selection | Un/Lock

tower1

Name	V Set	I Set	V Mon	I Mon	Power	Status		
telescope5 dE	10.0	2.0	0.0	0.0		OK	0,	10
telescope5 E	300.0	3.0	0.0	0.0		OK	4,	6
telescope6 dE	10.0	2.0	0.0	0.0		OK	0,	8
telescope6 E	300.0	3.0	0.0	0.0		OK	4,	5
telescope7 dE	10.0	2.0	0.0	0.0		OK	0,	6
telescope7 E	300.0	2.0	0.0	0.0		OK	4,	26
telescope8 dE	10.0	2.0	0.0	0.0		OK	0,	1
telescope8 E	300.0	3.0	0.0	0.0		OK	4,	9
telescope9 dE	10.0	2.0	0.0	0.0		OK	0,	11
telescope9 E	300.0	3.0	0.0	0.0		OK	4,	8
tower1 CsI	10.0	3.0	0.0	0.0		OverCurrent (int. trip)	1,	9

On/Off All | Reverse selection | Un/Lock

tower2

Name	V Set	I Set	V Mon	I Mon	Power	Status		
telescope10 dE	10.0	2	0.0	0.0		OK	1,	2
telescope10 E	300.0	3.2	0.0	0.0		OK	4,	11
telescope11 dE	10.0	2.0	0.1	0.0		OK	1,	0
telescope11 E	300.0	2.1	0.0	0.0		OK	4,	10
telescope12 dE	10.0	2	0.0	0.0		OK	0,	7
telescope12 E	300.0	2.3	0.0	0.0		OK	4,	27
telescope13 dE	10.0	2	0.0	0.0		OK	0,	9
telescope13 E	300.0	3.2	0.0	0.0		OK	4,	14
telescope14 dE	10.0	2	0.0	0.2		OK	1,	4
telescope14 E	300.0	2.3	0.0	0.0		OK	4,	13
tower2 CsI	10.0	3	0.3	0.2		OK	1,	11

On/Off All | Reverse selection | Un/Lock

tower3

Name	V Set	I Set	V Mon	I Mon	Power	Status		
telescope15 dE	10.0	2	0.0	0.0		OK	1,	6
telescope15 E	300.0	3.0	0.0	0.0		OK	4,	16
telescope16 dE	10.0	2	0.0	0.0		OK	1,	1
telescope16 E	300.0	2.0	0.0	0.0		OK	4,	15
telescope17 dE	10.0	2	0.0	0.0		OK	1,	3
telescope17 E	300.0	2.0	0.0	0.0		OK	4,	26
telescope18 dE	10.0	2	0.0	0.0		OK	1,	5
telescope18 E	300.0	3.0	0.0	0.0		OK	4,	19
telescope19 dE	10.0	2	0.2	0.0		OK	1,	8
telescope19 E	300.0	2.0	0.0	0.0		OK	4,	18
tower3 CsI	10.0	3.0	0.0	0.0		OK	1,	10

On/Off All | Reverse selection | Un/Lock

tower4

Name	V Set	I Set	V Mon	I Mon	Power	Status		
telescope20 dE	10.0	2	0.0	0.0		OK	1,	6
telescope20 E	300.0	3.2	0.0	0.0		OK	4,	21
telescope21 dE	10.0	2	0.2	0.0		OK	1,	8
telescope21 E	300.0	2.1	0.0	0.0		OK	4,	20
telescope22 dE	10.0	2	0.0	0.0		OK	1,	5
telescope22 E	300.0	2.3	0.0	0.0		OK	4,	27
telescope23 dE	10.0	2	0.0	0.2		OK	1,	4
telescope23 E	300.0	3.2	0.0	0.0		OK	4,	24
telescope24 dE	10.0	2	0.0	0.0		OK	1,	2
telescope24 E	300.0	2.3	0.0	0.0		OK	4,	23
tower4 CsI	10.0	3	0.2	0.0		OK	1,	7

On/Off All | Reverse selection | Un/Lock

Detector name — Channel is ON
Detector name — Channel is OFF
Problem ... — Channel is in problematic status

Log HiRA status every [10] minutes   Logging
HiRA configuration file: HiRAConfiguration.hira
Voltage input file: Voltage.config

Again the same coloring scheme is used (explained in the bottom of the window). In the above figure one can see configuration of all HiRA telescopes loaded. At the first glance one sees all channels are OFF. The window is divided into 5 canvases for 5 towers. Each canvas contains list of all telescopes and appropriate CsI LVB bias as shown

Name	V Set	I Set	V Mon	I Mon	Power	Status		
telescope0 dE	10.0	2	0.0	0.0		OK	0,	5
telescope0 E	300.0	2.0	0.0	0.0		OK	4,	1
telescope1 dE	10.0	2	0.0	0.0		OK	0,	4
telescope1 E	300.0	2.0	0.0	0.0		OK	4,	0
telescope2 dE	10.0	2	0.1	0.0		OK	0,	2
telescope2 E	300.0	2.3	0.0	0.0		OK	4,	25
telescope3 dE	10.0	2	0.0	0.0		OK	0,	0
telescope3 E	300.0	3	0.0	0.0		OK	4,	4
telescope4 dE	10.0	2	0.0	0.2		OK	0,	3
telescope4 E	300.0	2.5	0.0	0.0		OK	4,	3
tower0 CsI	10.0	3	0.2	0.0		OK	1,	7

On/Off All | Reverse selection | Un/Lock | tower0

in the above figure.

Turning channel(s) ON/OFF:

Is rather easy. To turn a channel ON one checks the appropriate check button:

Name	V Set	I Set	V Mon	I Mon	Power	Status		
telescope0 dE	10.0	2	0.0	0.0	☐	OK	0,	5
telescope0 E	300.0	2.0	0.0	0.0	☐	OK	4,	1
telescope1 dE	10.0	2	10.1	0.0	■	ON	0,	4
telescope1 E	300.0	2.0	0.0	0.0	☐	OK	4,	0
telescope2 dE	10.0	2	0.1	0.0	☐	OK	0,	2
telescope2 E	300.0	2.3	0.0	0.0	☐	OK	4,	25
telescope3 dE	10.0	2	0.0	0.0	☐	OK	0,	0
telescope3 E	300.0	3	0.0	0.0	☐	OK	4,	4
telescope4 dE	10.0	2	0.0	0.1	☐	OK	0,	3
telescope4 E	300.0	2.5	0.0	0.0	☐	OK	4,	3
tower0 CsI	10.0	3	0.2	0.0	☐	OK	1,	7
☐ On/Off All	☐ Reverse selection		☐ Un/Lock			tower0		

Now the status is changed and telescope1 dE detector is fully biased (10V).
By clicking on check button "**On/Off All**" (lower left corner) all channels for given tower are biased. "**Reverse selection**" check button turns off all channels which are turned off and vice versa.

V(I) Set columns list values which are set (desired) for each telescope. **V(I) Mon** columns list values which are monitored (response collected from HV power supply).
Status column lists status of the channel (OK or ON means everything is fine with the channel if there is a different status the field is changed to red – indicating the problem).
Last two columns describe Slot and Channel number to which the detector is connected.

|| *Attention:* the current limits for detectors are rather low (for semiconductor detectors it
|| is the leakage current). That's why the program raises the current limit (I Set) by a
|| factor determined by Tcl variable "**FactorCurrent**" defined in file HiRAControl.tcl.

Modifying voltage/current limits:

Is possible after checking **Un/Lock** check button (in the bottom row for each tower):

Name	V Set	I Set	V Mon	I Mon	Power	Status		
telescope0 dE	10.0	2	0.0	0.0	☐	OK	0,	5
telescope0 E	300.0	2.0	0.0	0.0	☐	OK	4,	1
telescope1 dE	10.0	2	10.1	0.0	■	ON	0,	4
telescope1 E	300.0	2.0	299.2	0.0	■	ON	4,	0
telescope2 dE	10.0	2	10.1	0.1	■	ON	0,	2
telescope2 E	300.0	2.3	0.0	0.0	☐	OK	4,	25
telescope3 dE	10.0	2	0.0	0.0	☐	OK	0,	0
telescope3 E	300.0	3	0.0	0.0	☐	OK	4,	4
telescope4 dE	10.0	2	0.0	0.1	☐	OK	0,	3
telescope4 E	300.0	2.5	0.0	0.0	☐	OK	4,	3
tower0 CsI	10.0	3	0.2	0.0	☐	OK	1,	7
☐ On/Off All	☐ Reverse selection			■ Un/Lock		tower0		

All fields with yellow background are editable now. One can change Voltage/Current limit for single detector. After the changes are made user can save voltage/current configuration through HiRA→Save Voltage Configuration and selecting a file name. Saved configuration has appropriate format so it can be loaded next time with HiRA→Open Voltage Configuration.

Advice: It is better to keep all editable fields locked whenever not necessary to change voltage/current values to prevent from accidental changes to be made.

Attention: Some detectors share channels (are connected to the same channel of the HV PS). If user modifies parameters for such a detector the same value is modified for the shared channel as well! The same applies for turning ON/OFF channels!

Writing Log file automatically:

In order to write log files (files where status information is saved for each defined detector in the setup) user must select Log File Directory (HiRA→Choose Log Directory). In the lower right corner of the main window (HiRA Status):

User can select frequency of log file writing (default if 10 minutes as shown in the example) and then after checking "**Logging**" check button log file writing starts. Unselecting the check button disables the writing. While writing is active the whole line is illuminated with yellow:
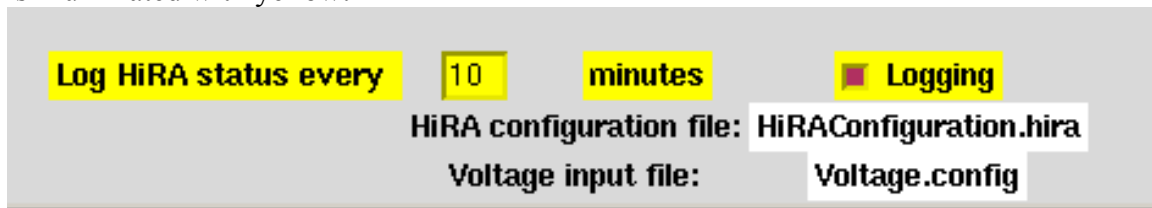
Manual to HiRA HV control interface
Release 1.0
August 2004 by Michal Mocko

HiRA telescope voltage/current monitoring:

Loading configuration for a given experiment:

There are two types of configuration files for HiRA HV control interface. First containing information about Towers and Telescopes used and other about voltage and current limits to be set for all the detectors connected to the tower numbers.

Files with extension *.hira contain tower number used and telescope number connected to it in the following format:

```
!
tower0
telescope0 E HVB2
telescope0 dE LVB6
telescope1 E HVB1
telescope1 dE LVB3
telescope2 E HVB26
telescope2 dE LVB2
telescope3 E HVB5
telescope3 dE LVB1
common CsI LVB22
!.....
```

Which is the same as in the previous version (0.1), but voltage configuration files went through changes. I was asked to include SoftwareMaximum, RampUp and Telescope Name parameters to the voltage configuration file. So the new format is:

```
!
telescope0
dE 10 2 20 5 tele0.dE
E 300 2.0 300 5 tele1.dE
telescope1
dE 10 2 20 5 tele1.dE
E 300 2.0 300 5 tele1.E
telescope2
dE 10 2 20 5 tele2.dE
E 300 2.3 300 5 tele2.E
telescope3
dE 10 2 20 5 tele3.dE
E 300 3 300 5 tele3.E
CsI
tower0 10 3 20 5
!
```

Where the order is as follows: V0Set, I0Set, SVMax, RampUp after each detector.

I added these two parameters to HiRA Status as well:

So one can edit two more parameters (SVMax and RampUp):

In exactly the same fashion as in the previous version Voltage and Current.

Appendix A:

Compilation and maintenance of the code:

Right now (as of June 9, 2005) the HiRA HV power supply GUI is stored in /user/03014 (test run for HiRA). The directory struture is as follows:

```
<spdaq29:HiRA_HV_control >ls -R
.:
Config/          HiRAChannelAssignment.tcl   README_caenctl  goHVhira*
HVControl.tcl    HiRAChannelAssignment.tcl~  SaveStatus/     src/
HVControl.tcl~   HiRAControl.tcl             caenctl*

./Config:
FourTowers.config  Tower0.config   Tower1.config  Tower2.hira
Tower4.config
FourTowers.hira    Tower0.config~  Tower1.hira    Tower3.config
README             Tower0.hira     Tower2.config  Tower3.hira

./SaveStatus:
2004Aug03_14:26:43.log   2004Aug04_10:58:40.log
2004Aug03_16:22:08.log   2005Jun08_17:01:34.log

./src:
HVCaen.cpp       Harness.o                    HiRA_HV_howto.pdf  TCLinc/
HVCaen.h         HiRA.config                  Lib/
Voltage.config
HVCaen.o         HiRAChannelAssignment.tcl    Log/               caenctl*
HVControl.tcl    HiRAControl.tcl              Makefile           goHVhira*
Harness.cpp      HiRAControl.tcl~             Makefile~          include/
Harness.h        HiRA_HV_howto.doc            README_caenctl     temp.config

./src/Lib:
hscaenetlib.so.1.6  libcaenhvwrapper.so       libhscaenet.so
hvwrapperlibs.tar   libcaenhvwrapper.so.2.11  libhscaenet.so.1.6

./src/Log:
2004Feb02_09

./src/TCLinc:
ErrnoException.h  TCLCommandPackage.h       TCLInterpreter.h
TCLString.h
Exception.h       TCLException.h            TCLInterpreterObject.h
TCLTimer.h
NamedItem.h       TCLFileHandler.h          TCLList.h
TCLVariable.h
RangeError.h      TCLHashTable.h            TCLObject.h
buffer.h
Refptr.h          TCLHashTableItem.h        TCLPackagedCommand.h
buftypes.h
StreamIOError.h   TCLHashTableIterator.h    TCLProcessor.h
daqtypes.h
TCLApplication.h  TCLIdleProcess.h          TCLResult.h
histotypes.h

./src/include:
CAENHVWrapper.h  CAENHVWrapper.h.2.11  caenhvoslib.h  caenhvoslib.h.2.11
```

Directory source contains source files for everything you need to run HiRA HV GUI. There are source files for **caenctl** interface (extension to Tcl/tk). To remake the executable of caenctl one needs to run "make" command in the src/ directory. If these files are to be moved one needs to modify paths in the Makefile.Two paths are to be

changed: SRCDIR (directory where the source is) and INST_HV(directory where the HV GUI interface resides).