

# **HV (CAEN) Software for Hall-D**

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Mar 22, 2012

# What we need?

- HV/LV are needed by most of detectors
- HV are needed by DC, CDC, TOF, etc..
- The CAEN hardware we are planning to use is sy1527 HV mainframes and A1535 HV boards or similar
- We need to control, monitor, archive and plot evolution of parameters.
- To achieve these goals we decided to use EPICS which provides distributed soft real-time control system, with built-in features like alarms, archiving, GUI, backup/restore of hardware initial parameters all based on custom network protocol (CA).

# The CAEN Hardware



- SY1527
- Up to 16 slots for boards, distributors and branch controllers
- 6 fans arranged on two rows
- Up to 3 power supply units



- A1535
- 24 Channel 3.5 kV/3 mA Common Floating Return Board
- 0 ÷ 3.5 kV output
- 3 mA current full scale, with 500 nA resolution
- 500 mV resolution
- Programmable  $I_{TRIP}$
- Radial 52 pin connector

# What we need? (cont.)

- Parameters to be used may be classified as mainframe, board and channel associated
  - Mainframe – fan speed, temperature, status of PS units
  - Boards – temperature, hardware HV limits, status
  - Channel – Voltage (set/actual), Current (readback/trip limit), Ramp Up/Down speeds, Status, Switch

# Software requirements

- Easy to make a configuration change
- Easy to maintain software
- 2 hierarchical sources of information are available:
  - From hardware and it is up-to-date information on hardware configuration
  - From detector experts and contains the detector components logical names to HV channel mapping

# Software requirements (cont.)

- As a consequence we need:
  - Interface with hardware hierarchy to pull out and display hardware configuration
    - good for test setups (plug, restart IOC and use)
    - does not require the detector to hardware mapping
  - Interface with detector component hierarchy for shift takers (operators)

# Available Software

- We used software available from Ru Igarashi (Canadian Light Source) based on the HV Wrapper library from CAEN
- Has ability to reconnect to the crate after loss of connection
- Readout is possible if Busy flag is cleared (single read per crate). Not possible to readout in parallel due to limitations from CAEN HV wrapper library
- Channel configuration is made with generated templates
- No alarms
- No Board or Mainframe information only channels
- Defining of crates on the command line
- Hard coded username and password
- Polarity of boards (CAEN uses only absolute value)

# Configuration of the IOC

- The configuration of EPICS Input Output Controller (IOC) is made simple.
- To add a crate add 1 line to IOC startup configuration and restart
- Automatically will discover the boards installed and will load DB configuration.
- We will have EPICS CA PVs associated with hardware

```
#!/../bin/linux-x86/HVCAENx527
```

```
< envPaths
```

```
cd ${TOP}
```

```
## Register all support components
```

```
dbLoadDatabase "dbd/HVCAENx527.dbd"
```

```
HVCAENx527_registerRecordDeviceDriver  
pdbbase
```

```
CAENx527ConfigureCreate "halltesthv",  
"halltesthv"
```

```
CAENx527DbLoadRecords
```

```
cd ${TOP}/iocBoot/${IOC}
```

```
ioclnit
```



# GUI for experts and operators

- Expert GUI will present parameters grouped by hardware (mainframe, board, channel)
- Operator GUI will present information grouped by detector (detector, detectors subgroup, channel)

The screenshot shows the CSS HV configurator GUI. The window title is "CSS" and the menu bar includes "File", "Edit", "CSS", "Window", and "Help". The toolbar contains various icons and a search bar with "100%". The main window displays "HV configurator.opi" with a tab labeled "HV Tab 1".

The main content area is titled "Crate: halltesthv Board: 6" and contains a table with the following columns: Ch. Logical Name, Ch Physical Name, V measured, V set readback, V setpoint, Switch, Status, and I measured.

Ch. Logical Name	Ch Physical Name	V measured	V set readback	V setpoint	Switch	Status	I measured
halltesthv:6:1	halltesthv:6:0	0.50 V	1,982.00 V	1,982	OFF	Off	0.00 uA
halltesthv:6:1	halltesthv:6:1	0.50 V	1,999.00 V	1,999	OFF	Off	0.00 uA
halltesthv:6:3	halltesthv:6:2	0.00 V	2,000.00 V	2,000	OFF	Off	0.00 uA
halltesthv:6:2	halltesthv:6:3	0.00 V	200.00 V	200	OFF	Off	0.00 uA
halltesthv:6:4	halltesthv:6:4	0.50 V	500.00 V	500	OFF	Off	0.00 uA
halltesthv:6:4	halltesthv:6:5	0.00 V	200.00 V	200	OFF	Off	0.00 uA
halltesthv:6:0	halltesthv:6:6	0.00 V	100.00 V	100	OFF	Off	0.00 uA
halltesthv:6:0	halltesthv:6:7	0.50 V	500.00 V	500	OFF	Off	0.00 uA
halltesthv:6:0	halltesthv:6:8	0.00 V	200.00 V	200	OFF	Off	0.00 uA
halltesthv:6:0	halltesthv:6:9	0.00 V	200.00 V	200	OFF	Off	0.00 uA
halltesthv:6:0	halltesthv:6:10	0.00 V	200.00 V	200	OFF	Off	0.00 uA
halltesthv:6:0	halltesthv:6:11	0.00 V	200.00 V	200	OFF	Off	0.00 uA
halltesthv:6:0	halltesthv:6:12	0.50 V	200.00 V	200	OFF	Off	0.00 uA
halltesthv:6:0	halltesthv:6:13	0.00 V	500.00 V	500	OFF	Off	0.00 uA
halltesthv:6:0	halltesthv:6:14	0.00 V	200.00 V	200	OFF	Off	0.00 uA
halltesthv:6:0	halltesthv:6:15	0.00 V	200.00 V	200	OFF	Off	0.00 uA
halltesthv:6:0	halltesthv:6:16	0.50 V	200.00 V	200	OFF	Off	0.00 uA

On the left side, there is a "Select the crate" dropdown menu showing "halltesthv". Below it, the "Crate Host Name/IP" is "129.57.36.224". The "HV Boards" section lists boards 00 through 15, with some boards (01, 06, 10) highlighted in red. Board 01 is labeled "A1932 (49 ch)" and boards 06 and 10 are labeled "A1535 (24 ch)".

The bottom right corner of the window displays "Not logged in".

# Future plans

- Add monitoring of mainframe status
- Better GUI with dynamic content
- Detector wise display
  - DB for keeping the HV to detector logical component mapping with expert interface
  - GUI for operator interface with logical names
- Alarm system for HV will require interfaces:
  - To configure alarms (would be part of expert mapping interface)
  - Operator display of alarms integrated with archiver and data browser
- Integration of Wiener mpod crates and the Indiana Univ. LV units