Debugging of Hall C Neutral Particle Spectrometer's CAEN SY4527 High Voltage Mainframe Issues

Aaron Brown, Mary Ann Antonioli, Peter Bonneau, Pablo Campero, Brian Eng, George Jacobs, Mindy Leffel, Tyler Lemon, Marc McMullen, and Amrit Yegneswaran
Physics Division, Thomas Jefferson National Accelerator Facility, Newport News, VA 23606
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The CAEN SY4527 high voltage mainframes of the Neutral Particle Spectrometer (NPS) indicated several high voltage issues during the full system tests. This note presents the reasons and how these issues were resolved.

The NPS high voltage system comprises two CAEN SY4527 mainframes and thirty A7030TN modules. Mainframe features essential for operating the photomultiplier tubes of NPS—voltage stability, current stability, current trip, and voltage ramps—were tested [1,2].

The high voltage mainframes come with a built-in IOC, Fig. 1, which creates the process variables (PVs) needed to communicate with the mainframes via EPICS. The PVs are only created when there is a module inserted into a slot. The mainframes are turned on, connected to the network, and their EPICS service is enabled. A partially populated mainframe will only have PVs for the slots where a module is present.

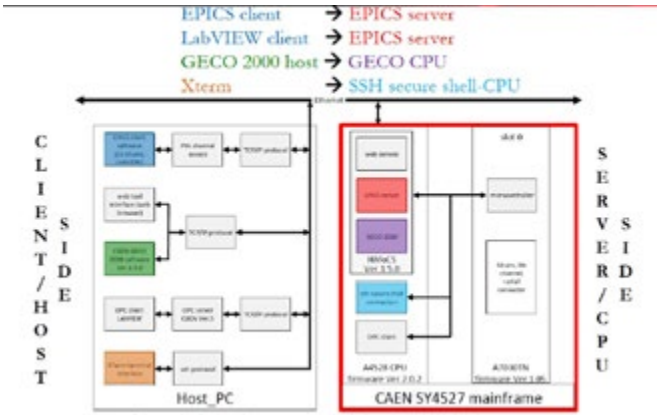

FIG. 1. Schematic of CAEN SY4527 communication modes.

Mainframe communication with PVs created using the database records is performed by EPICS Channel Access commands issued from a computer on the same network.

During first article testing, the service names for the mainframes were set as hvcaentest2 and hvcaentes3. When the mainframes were set up for full system testing, the service names for the mainframes were changed to hchv20 and hchv21 for mainframe one and two, respectively, to conform with the existing naming convention of Hall C CAEN high voltage mainframes. Each PV for the mainframes begins with the service name and are of the form <service name>:<slot number>:<channel number>:<parameter name> (e.g. hchv20:00:000:V0Set).

Once testing began, it was noticed that channel setpoints would randomly change and the voltage for some channels would oscillate around the setpoint—beyond the manufacturer's specifications. Two setpoints were of concern—the current maximum limit and the voltage setpoint.

Debugging indicated that the problems were caused by using the same service names hchv20 and hchv21 that were already in use in Hall C. The issue was resolved by giving each mainframe for the NPS a unique service name.

To conclude, the problems with the CAEN SY4527 high voltage mainframes have been resolved. The EPICS service names for each of the mainframes has been changed to a unique identifier.

[1] P. Campero, et al., *Hall C CAEN SY4527 High Voltage System Test Results*, DSG Talk 2019-30, 2019.
[2] A. Brown, et al., *Report on the Results of the Tests Performed on the CAEN SY4527 Mainframes and A7030TN Modules Procured for the Photomultiplier Tubes of the Hall C Neutral Particle Spectrometer,* DSG Note 2021-03, 2021