Screens to Test the CAEN SY4527 High Voltage Power Supply System's Built-in EPICS Server

Pablo Campero, Mary Ann Antonioli, Peter Bonneau, Brian Eng, George Jacobs, Mindy Leffel, Tyler Lemon, Marc McMullen, and Amrit Yegneswaran

Physics Division, Thomas Jefferson National Accelerator Facility, Newport News, VA 23606

June 28, 2019

This note presents the test set up and the features of control and monitoring screens developed with Control System Studio (CSS) Best OPI Yet (BOY) that was used to test the CAEN SY4527 high voltage power supply system's built-in EPICS server's ability to control and monitor the mainframe and the A7435SN high voltage boards.

To test the CAEN SY4527's built-in EPICS server, screens were developed with CSS BOY (*ver. 4.5.0*). CSS BOY has an editor and a runtime mode, and enables creating GUIs that connect directly to live data. With the use of Jython or Java Script in CSS BOY, process variable (PV) values can be changed in the runtime mode—while the GUIs are active.

SY4527's OPC server comes with plug and play connectivity for easy connection of different hardware devices. The Channel Access (CA) protocol in the built-in EPICS server provides client access to PVs, each of which has a name and a record comprising three fields:

- *VAL* used to transfer data value
- *DESC* describes the PV usage
- *DTYP* shows data type (Boolean, Analog, or String).

System configuration, Fig. 1, consists of:

- a SY4527 mainframe, which can hold up to 16 high or low voltage, generic I/O, or branch controller boards, with a maximum output voltage of 3.5 kV at 0.35 mA, and has a set of PVs that are available in the built-in EPICS server
- A7435SN high voltage boards, each of which has 24 output channels
- Two PCs:

    Windows/Linux on the left, with GECO CAEN software that allows remote control and monitoring capability, and the OPC server configurator, which facilitates remote configuration of the OPC server

    dsg-b-linux1 on the right (on which the CA protocol runs) with CSS software and EPICS and Java compilers. Communications are via Ethernet TCP/IP network.
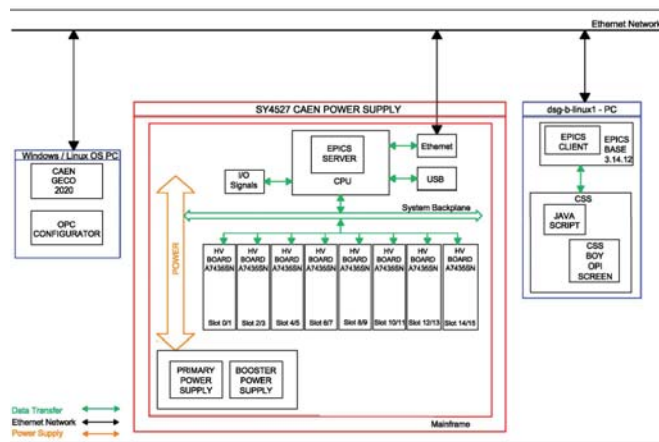

FIG. 1. CAEN SY4527 high voltage EPICS test stand setup.

The main screen, Fig 2, shows statuses of front panel in, front panel out, network, fan, system, and clock. Additionally, the main screen enables monitoring and changing values of PVs, clearing alarms, and resetting system configurations.
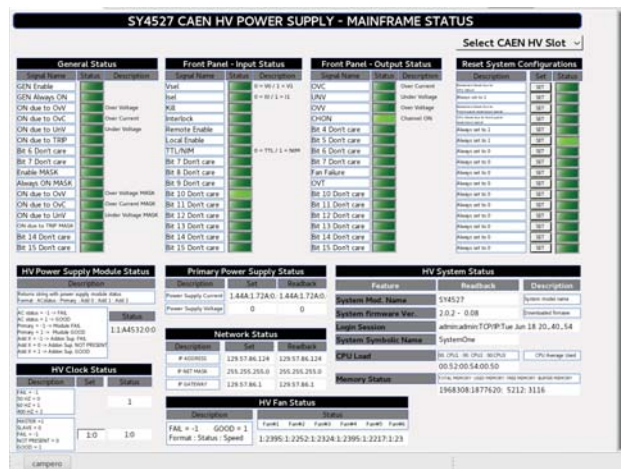

FIG. 2. Main screen.

The novice screen, Fig. 3, controls each channel's power, and monitors voltages, currents, power status, set voltages, and set current trip values.
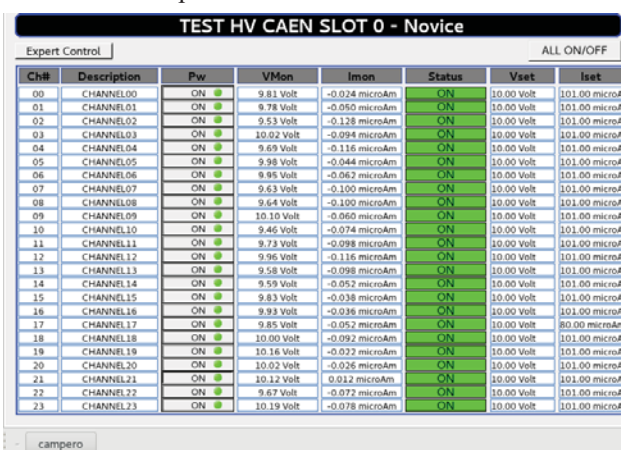

FIG. 3. Novice screen.

The expert screen, Fig. 4, controls and monitors voltages, currents, status, current trip value, maximum allowed output voltage, ramp up and down values, and time over threshold value to initiate a trip. Board (Bd) status allows monitoring of main board parameters such as power fails, firmware errors, voltage calibration issues, and temperature issues.
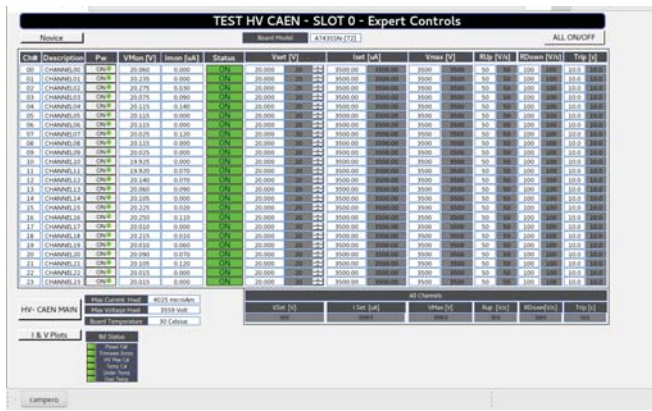
FIG. 4. Expert Controls screen. White boxes monitor readback values from SY4527; gray rectangular boxes allow control of PVs.

Two java scripts provide the capability to turn on or off all channels simultaneously. A pop-up window requires confirmation when this option is selected.

To set the value of all 24 channels of one or more of the six variables (output voltage, current limit, maximum output voltage, ramp up, ramp down and trip time), six java scripts were written; these scripts execute when the user changes the value of any of the six aforementioned variables.

The bar chart screen, Fig. 5, monitors the output voltage and current of A7435SN boards. The top chart displays the voltage vs channel number bar plot; the bottom chart shows the current vs channel number bar plot.
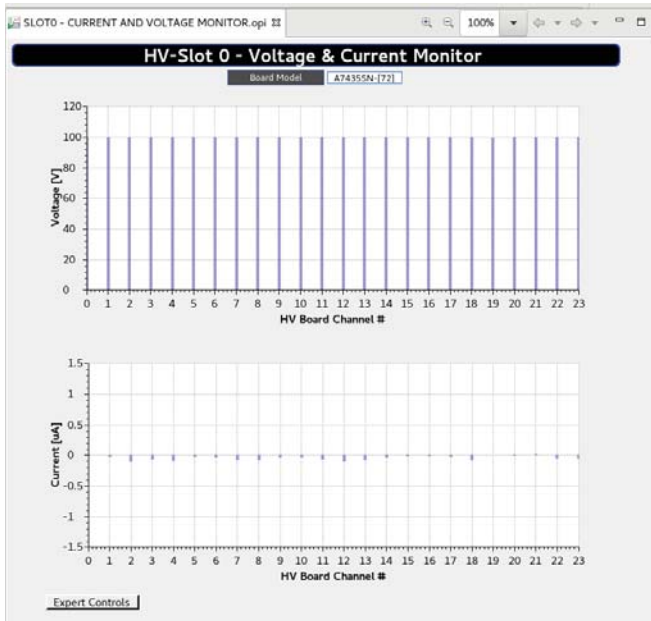

FIG. 5. Voltage and current monitor screen developed for A7435SN.

All screens have buttons to allow easy navigation between screens.

Errors between the CSS screens and CAEN system are displayed as follows:

• Invalid parameter for a PV record field is indicated by pink color border around the widget that displays or controls the PV's read or write from/to the system, Fig. 6.

FIG. 6. Pink border surrounding widget indicating invalid parameter for the PV.

• Incorrect PV name or disconnection of server or high voltage board are indicated by solid pink color in the widget monitoring the PV, Fig. 7.

FIG. 7. Solid pink in the widget indicating disconnection.

SY4527's built-in EPICS server was tested by executing the features of the developed CSS BOY screens. Testing indicated that the built-in EPICS server performs as required.