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

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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.

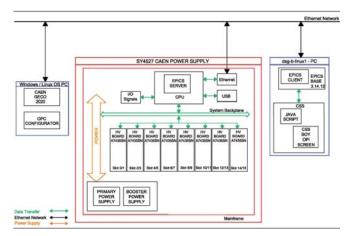


FIG. 1. CAEN SY4527 high voltage EPICS test stand setup.

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.

Expert Control ALL ON/O						LL ON/OFF	
Ch#	Description	Pw	VMon	Imon	Status	Vset	Iset
00	CHANNEL00	ON 0	9.81 Volt	+0.024 microAm	ON	10.00 Volt	101.00 micr
01	CHANNEL01	ON 0	9.78 Volt	-0.050 microAm	ON	10.00 Volt	101.00 micr
02	CHANNEL02	ON @	9.53 Volt	-0.128 microAm	ON	10.00 Volt	101.00 mics
03	CHANNEL03	ON 🧶	10.02 Volt	-0.094 microAm	ON	10.00 Volt	101.00 micr
04	CHANNEL04	ON 0	9.69 Volt	-0.116 microAm	ON	10.00 Volt	101.00 micr
05	CHANNEL05	ON @	9.98 Volt	-0.044 microAm	ON	10.00 Volt	101.00 micr
06	CHANNEL06	ON @	9.95 Volt	-0.062 microAm	ON	10.00 Volt	101.00 mics
07	CHANNEL07	ON @	9.63 Volt	-0.100 microAm	ON	10.00 Volt	101.00 mics
08	CHANNEL08	ON 🧶	9.64 Volt	-0.100 microAm	ON	10.00 Volt	101.00 micr
09	CHANNEL09	ON 0	10.10 Volt	-0.060 microAm	ON	10.00 Volt	101.00 micr
10	CHANNEL10	ON @	9.46 Volt	-0.074 microAm	ON	10.00 Volt	101.00 micr
11	CHANNEL11	ON 🧶	9.73 Volt	-0.098 microAm	ON	10.00 Volt	101.00 mics
12	CHANNEL12	ON 0	9.96 Volt	-0.116 microAm	ON	10.00 Volt	101.00 mics
13	CHANNEL13	ON 0	9.58 Volt	-0.098 microAm	ON	10.00 Volt	101.00 mics
14	CHANNEL14	ON @	9.59 Volt	-0.052 microAm	ON	10.00 Volt	101.00 mic
15	CHANNEL15	ON @	9.83 Volt	-0.038 microAm	ON	10.00 Volt	101.00 micr
16	CHANNEL16	ON 🧶	9.93 Volt	+0.036 microAm	ON	10.00 Volt	101.00 mics
17	CHANNEL17	ON 0	9.85 Volt	-0.052 microAm	ON	10.00 Volt	80.00 micro
18	CHANNEL18	ON @	10.00 Volt	-0.092 microAm	ON	10.00 Volt	101.00 mics
19	CHANNEL19	ON @	10.16 Volt	+0.022 microAm	ON	10.00 Volt	101.00 mics
20	CHANNEL20	ON @	10.02 Volt	-0.026 microAm	ON	10.00 Velt	101.00 mics
21	CHANNEL21	ON @	10.12 Volt	0.012 microAm	ON	10.00 Volt	101.00 mics
22	CHANNEL22	ON 🧶	9.67 Volt	-0.072 microAm	ON	10.00 Volt	101.00 micr
23	CHANNEL23	ON @	10.19 Volt	+0.078 microAm	ON	10.00 Volt	101.00 mics

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.

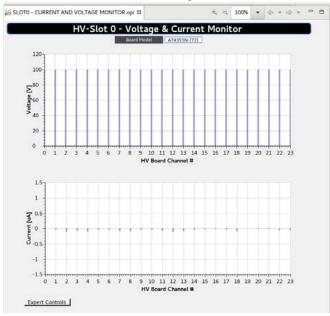


FIG. 5. Voltage and current monitor screen developed for A7435SN.

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.

All Channels								
VSet [V]	I Set [uA]	VMax [V]	Rup [V/s]	RDown[V/s]	Trip [s]			
Label	101.0	3000.0	50.0	50.0	10.0			

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.

	TEST HV CAEN - SLOT 0							
Expert	Expert Control ALL ON/OFF							
Ch#	Description	Pw	VMon	Imon	Status	Vset	Iset	
00	CHANNEL00	OFF @	1.35 Volt	-0.020 microAm	OFF	0.00 Volt	101.00 microA	
01	CHANNEL01	OFF @	0.72 Volt	-0.040 microAm	OFF	0.00 Volt	101.00 micro#	
02	CHANNEL02	OFF @	1.08 Volt	-0.108 microAm	OFF	0.00 Volt	101.00 micro#	
03	CHANNEL03	OFF @	0.91 Volt	-0.080 microAm	OFF	0.00 Valt	101.00 micro#	
04	CHANNEL04	OFF @	1.10 Volt	-0.100 microAm	OFF	0.00 Volt	101.00 microA	
05	Disconnected	Disconnected	Disconnected	Disconnected	OFF	0.00 Volt	101.00 microA	
06	CHANNEL06	OFF @	1.36 Volt	-0.044 microAm	OFF	0.00 Volt	101.00 micro#	
07	CHANNEL07	OFF @	1.29 Volt	-0.094 microAm	OFF	0.00 Volt	101.00 microA	

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.