

EPICS Control System Studio Screens for Hall C High Momentum and Super High Momentum Spectrometers

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EPICS CSS-BOY [1] screens are being developed for the control and monitoring systems of Hall C's High Momentum Spectrometer (HMS) and the Super High Momentum Spectrometer (SHMS). Status of the work and an example are given in this note.

Hall C's HMS and SHMS controls and monitoring systems use HMI screens, which can be accessed only by computers that have the HMI software loaded and are on the Hall C subnet. HMI licenses (not the same as the PLC licenses) are expensive, permit only one seat per license, and only a limited number are available at Jefferson Lab.

EPICS CSS-BOY screens, however, have many advantages over the HMI screens [1, 2]. CSS-BOY screens allow controls and monitoring to be performed from any computer connected to a computer that can run EPICS—which is free—has no limitations on the number of individuals who can access it simultaneously, and is used by the other halls in the Physics Division. Using CSS-BOY screens for the controls and monitoring systems of Hall C would therefore standardize these systems across all halls of the Physics Division, thereby making it straightforward to operate, maintain, and upgrade the systems for the Physics Division.

Table I shows the number of CSS-BOY screens for HMS and SHMS that need to be developed, how many have been completed, and how many remain to be completed.

	HMS	SHMS
Number of screens	76	197
Completed	34	33
To be completed	42	164

TABLE I. Tally of EPICS CSS-BOY screens to be developed for the HMS and SHMS.

While developing CSS-BOY screens, the variables of the controls and monitoring screens are being grouped in a more efficient way, making the controls and monitoring systems easier to operate [3]. However, because of such grouping, as the project progresses, the number of screens to be developed can change.

Since the controls system is PLC-based, PLC tags must be associated with the EPICS PVs on the Hall C subnet; then these PVs are linked to the buttons and fields (widgets) of the CSS-BOY screen. If the PVs do not exist on the Hall C subnet, then the PLC tags are associated with proposed (pending approval) PVs.

The quadrupole power supply unit setup (Quad_PSU_Setup) is shown as an HMI example in Fig. 1. This screen is used for HMS quadrupoles Q1, Q2, and Q3.

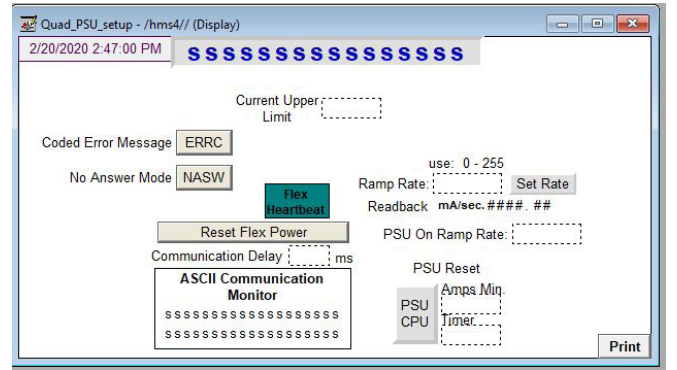


FIG. 1. HMI screen for the power supply unit (PSU) setup.

The title line at the top of the screen, the 16 S's, would upon connection indicate the quadrupole to which the screen is connected, e.g. HMS Q1 PSU Setup.

All dashed boxes are inputs. To set a value, it is entered in the dashed box and the return key is clicked; the entered value is sent to the PLC code. Only the ramp rate value requires pressing the Set Rate button to set the value in the PLC code.

The buttons and fields in the screen are listed below:

Current Upper Limit: sets current upper limit for the quadrupole.

ERRC (Coded Error Message): Boolean button that sets the PLC in a mode in which all errors respond with a code number representing the error.

NASW (no answer): Boolean button that sets the PLC in a mode in which acknowledgements after commands are sent are not required. This is done to speed up communications.

Ramp Rate: sets the ramp rate.

Set Rate: Boolean button that sends the command to set the ramp rate.

Readback: once the ramp rate value is set, it is read back.

Flex Heartbeat: indicates that the communication is alive between the Flex I/O module and its power supply.

Reset Flex Power: button used to reset communication between the PLC and Flex module.

Communication Delay: input sets the wait time to initiate debugging of communications errors with the power supply.

ASCII Communication Monitor: top line displays the command while the bottom line displays the response.

PSU on Ramp Rate: input sets the initial ramp rate for the

magnet power supply.

PSU CPU: Boolean button used to reset the magnet power supply's CPU. For example, it would be used when communication with the magnet power supply is lost.

The dashed box under Amps Min sets the current threshold in amps, above which the PLC code will be ready to trip the supply. The dashed box below, timer, indicates the amount of time (in milliseconds) allowed above the current threshold before the trip is initiated.

Figure 2 shows the equivalent CSS-BOY screen. The layout in this screen is streamlined and clearly labeled. This screen is only for quadrupole Q1. Similar screens have been made for Q2 and Q3, an example of a screen partitioned into additional screens. This feature allows all the screens to be displayed simultaneously, if needed.

Steady progress is being made in this endeavor.

- [1] P. Bonneau, et al., *Hall C EPICS Slow Controls and Monitoring System*, DSG Talk 2018-23, 2018.
- [2] P. Bonneau, et al., *Hall C EPICS Controls and Monitoring System Featuring Control System Studio*, DSG Note 2019-06, 2019.
- [3] A. Brown, et al., *Hall C Magnets' Screen Conversion*, DSG Note 2019-40, 2019.

FIG. 2. CSS-BOY screen that replaces HMI screen shown in Fig. 1.