

Development of the EPICS Software Input/Output Controller for Testing the Phoebus Alarm System of the Hall C Neutral Particle Spectrometer

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To test the Phoebus Control System Studio Alarm System, which is under development for Hall C’s Neutral Particle Spectrometer, an EPICS input/output controller (IOC) has been designed and implemented. The alarm system is a client application that monitors EPICS PVs from IOCs to detect alarm conditions.

For the Phoebus alarm system being developed, [1] an IOC, hosted by the Linux alarm system development computer, has been designed and implemented. The advantages of such a host-based IOC, called a softIOC, for alarm system development and testing are that the host-based IOC is compiled and executed within the same computer used for alarm system development, thereby reducing complexity of the alarm system development.

The EPICS IOC, Fig.1, simulates detector signals for testing and transmits the signals as PVs to clients via EPICS channel access. The simulated detector signal for each PV is generated by an individual random number generator. The range, minimum value, and data scan rate of the signal are controlled via the EPICS IOC user interface, Fig. 2.

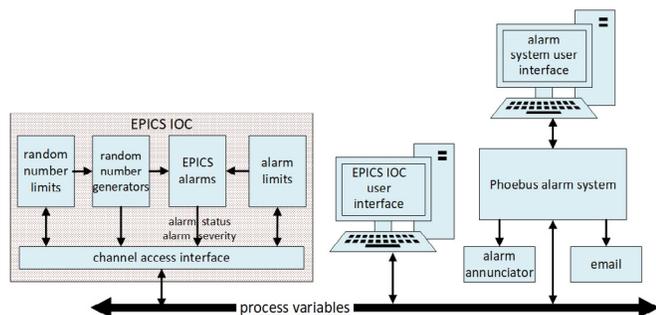


FIG. 1. Phoebus alarm test system.

Hall-C NPS softioc-test-2													
PV Name	PV Readback	HIHI Readback	HIHI set	HIGH Readback	HIGH set	LOW Readback	LOW set	LOLO Readback	LOLO set	Scan Rate	Range °C	Min temp °C	Max temp °C
NPS-C2-TEMP-1	20.85	21.00	21.00	20.98	20.98	15.02	15.02	15.00	15.00	1 second	6	15	21.00
NPS-C2-TEMP-2	20.96	21.00	21.00	20.98	20.98	15.02	15.02	15.00	15.00	1 second	6	15	21.00
NPS-C2-CHILLER-TEMP-1	17.23	21.00	21.00	20.98	20.98	15.02	15.02	15.00	15.00	1 second	6	15	21.00
NPS-C2-CHILLER-TEMP-2	15.97	21.00	21.00	20.98	20.98	15.02	15.02	15.00	15.00	1 second	6	15	21.00

FIG. 2. EPICS IOC user interface.

The IOC contains the EPICS alarm limits for each PV. Each time the PV is scanned in the IOC, the EPICS alarm limits are compared with the PV value. If the PV value is equal to or exceeds the HIGH or LOW limits, the IOC sets the PV alarm status field (STAT) to HIGH or LOW and sets the alarm severity field (SEVR) to MINOR. If the PV value is equal to or exceeds the HIHI or LOLO limits, the IOC sets STAT to HIHI or LOLO and sets SEVR to MAJOR. If the PV value is within all limits, both STAT and SEVR are set to NO_ALARM by the IOC. The PV value, STAT, and SEVR

will be used to test the Phoebus alarm system. The EPICS IOC flowchart is shown in Fig. 3.

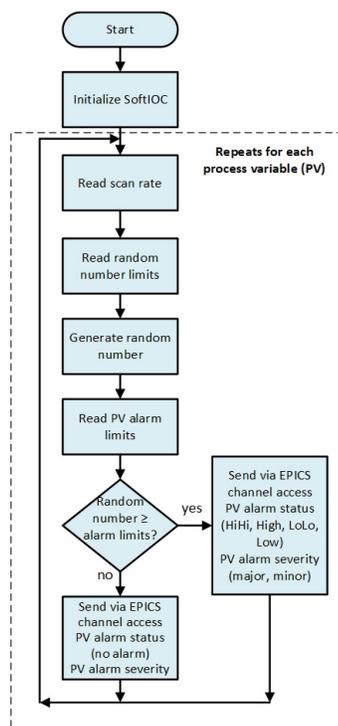


FIG. 3. Phoebus EPICS IOC flowchart.

To test the alarm system, the IOC simulates four temperatures. The IOC is loaded and a template substitution text file containing the chosen PV names and field values is used to create the EPICS database. As the alarm system development progresses, this same IOC can be used as a template for any number of PVs.

In conclusion, to test the Phoebus Control System Studio Alarm System, an EPICS IOC has been designed and implemented. Four PVs for temperatures are being loaded and tested.

[1] P. Bonneau, et al., *Proposal to Implement Alarm System in Control System Studio Phoebus for the Hall C Neutral Particle Spectrometer*, DSG Note 2021-37, 2021.