LabVIEW User Interface for the Hardware Interlock System of Hall B's Second Ring Imaging Cherenkov Detector

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This note describes the development of the LabVIEW user interface that monitors and controls at the expert level instrumentation that protects the second ring imaging Cherenkov (RICH) detector's hardware.

The LabVIEW user interface of the second RICH detector, Fig. 1, communicates with the real-time program running in the National Instruments' sbRIO-9629 controller [1, 2]. The user interface, which is independent of the EPICS-based slow controls and monitoring system, provides controls and monitoring features [3, 4] that allow expert users to change system configurations. EPICS GUIs will facilitate only monitoring of the hardware.

Table I shows the type and number of sensors that monitor temperature, humidity, flow, and pressures.

The user interface enables monitoring of the sensors and the status of the interlocks from a Windows PC that has LabVIEW software installed and is on the same subnet as the sbRIO controller. Network variables are used for the data transfer between the user interface program and the sbRIO real-time control program.

Sensor type	Qty	Description
Temperature and humidity	48	nitrogen and electronic panel temperature and humidity
Flow meter	3	cooled air flow and nitrogen flow
Pressure transducer	2	air cooling pressure and nitrogen volume pressure
Differential pressure transducer	2	pressure differential between nitrogen volume and atmosphere and between nitrogen volume and electronic panel
Dew point transmitter	1	air tank's dew point

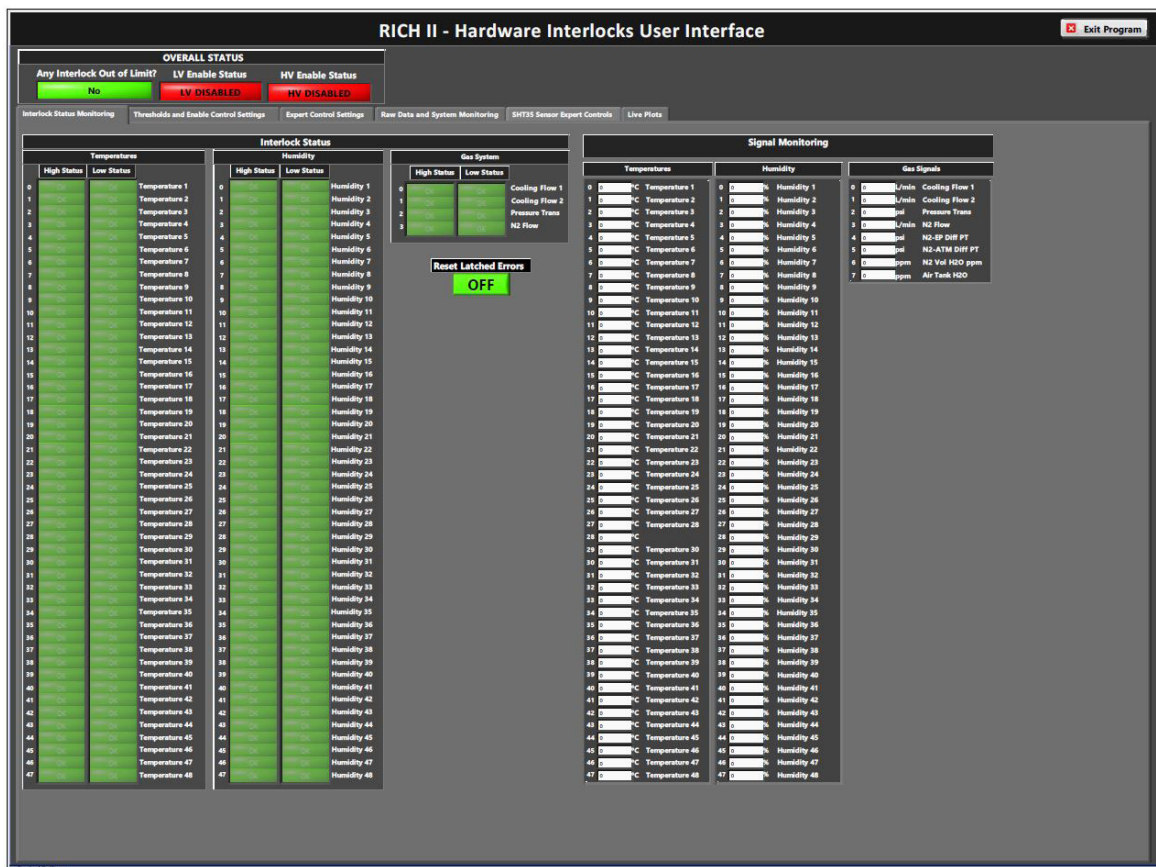Table I. Types of sensors used in the hardware interlock system.

FIG. 1. User interface.

The user interface has three overall status indicators—Any Interlock Out of Limit, LV Enable Status, and HV Enable Status, Fig. 1.

Beneath the Overall Status area there are six tabs, Fig. 1. Each tab allows access to a different controls and monitoring feature. During operation of the system, navigation between the tabs is allowed.

The user interface has been developed; visual attributes for indicators and functions for controls have been tested.

[1] T. Lemon, et al., *Optimizing the I²C Bus for Hall B's RICH II Hardware Interlock System*, DSG Note 2021-11, 2021.

[2] T. Lemon, et al., *Thermal Analysis of sbRIO-9629 to be Used in the Hall B RICH II Hardware Interlock System*, DSG Note 2021-13, 2021.

[3] P. Bonneau, et al., *Data Acquisition System for the Sensirion Humidity and Temperature Sensors*, DSG Note 2020-10, 2020.

[4] T. Lemon, et al., *Testing of the SHT35 Sensor Printed Circuit Boards for Hall B's RICH II*, DSG Note 2021-16, 2021.