Setting Interlocks and Latches in the Neutral Particle Spectrometer Control and Monitor Software

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This note presents details of the latching and interlocking portion of the LabVIEW code written to control and monitor the Neutral Particle Spectrometer (NPS).

LabVIEW code was written to control and monitor the front and back crystal zones, the electronics zone, the detector frame, the Hall, and chillers [1]. Figure 1 is a flowchart of the code that determines if an interlock or latch is needed.

To start the code, the averages of read sensor values previously calculated [2] are each compared to its hi limit set in the configuration file. If the average is greater than or equal to the limit, and the interlock is enabled, the interlock status is set to true. If the two conditions are not met, the status is set to false. Latch status is set to match the interlock status.

If the interlock status is true, and interlocks are reset, then the interlock status and latch status are set to false, high voltage is reset if needed, and the chillers are reset.

If the interlocks are not reset, a check is made on whether trip delay is enabled. If not, and the latch status and the interlock status are not true, then the code stops. If the latch status and interlock status are true, then the chillers are turned off and high voltage channels are turned off as needed. Both the LED indicators are changed to red on the user interface and the code stops.

If the trip delay is enabled, latch status and interlock status are checked for whether they are true. If not true, then the code stops. If they are true, the time that the latch and the interlock occurred are subtracted from the current time. The result is compared to the set value for the trip delay, and if the time difference is equal to or greater than the trip delay value, the chillers are turned off and high voltage channels are turned off as needed. Both the LED indicators are changed to red on the user interface and the code stops. If the time difference is less than the trip delay value, the code stops.

To conclude, a section of the LabVIEW code that controls and monitors the NPS determines if a latch or interlock is needed; this part of the code has been tested.

[1] M.A. Antonioli, et al., *Overview of Control and Monitoring Software for the Neutral Particle Spectrometer*, DSG-Note 2023-36, 2023.

[2] M.A. Antonioli, et al., *Calculating Averages and Standard Deviations for the Neutral Particle Spectrometer Control and Monitor Software*, Note 2023-40, 2023.
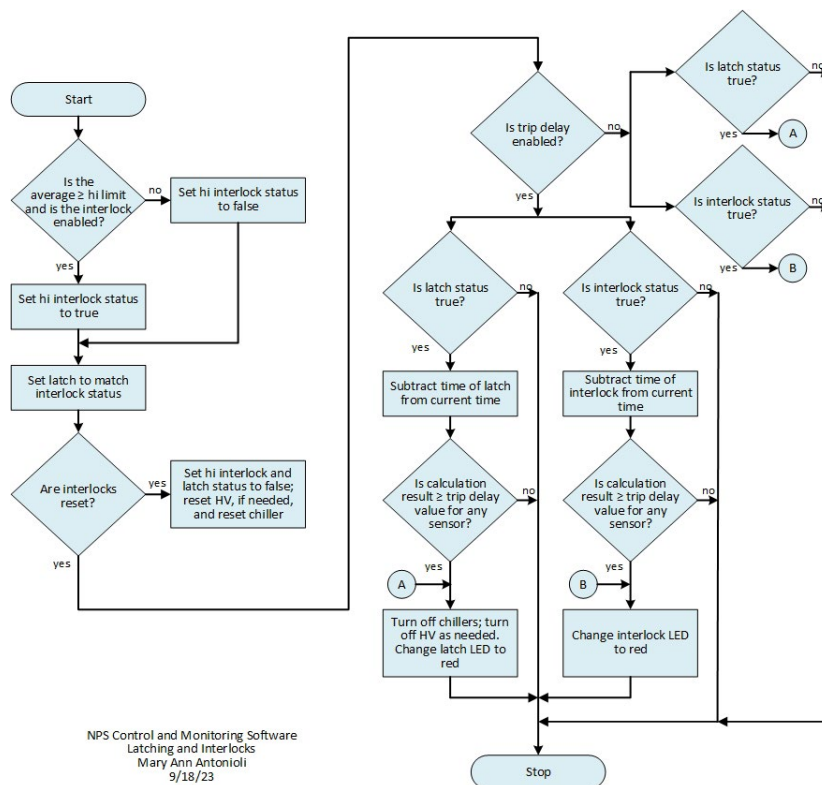

FIG. 1. Flowchart of the code to set latch and interlock status.