Overview of Control and Monitoring Software for the Neutral Particle Spectrometer

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This note presents an overview of the code written in LabVIEW to control and monitor the Neutral Particle Spectrometer (NPS).

LabVIEW code was written to control and monitor different areas of the NPS—the front and back crystal zones, the electronics zone, the detector frame, and the Hall. Figure 1 is a flowchart of the code.
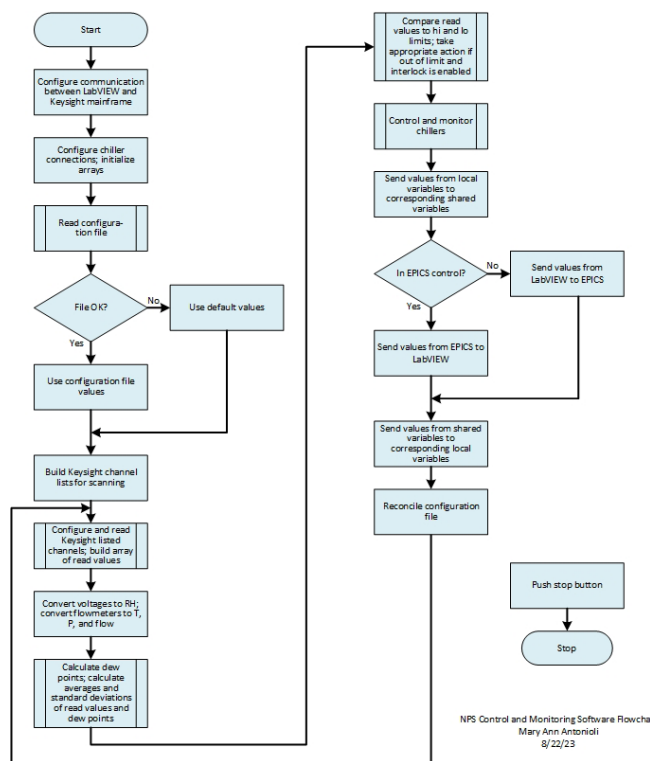

FIG. 1. Flowchart of NPS control and monitoring software.

To start the code, the communication is set up between LabVIEW and the Keysight mainframe that will read the temperatures in the different areas of the NPS. The setup includes opening the Virtual Instrument Software Archecture (VISA) session and configuring the communication port.

Communication is then set up with the two chillers and arrays are initialized. The *hi* and *lo* latch arrays are initialized to false. The buffer arrays, standard deviation arrays, Keysight values, latch timestamps, and status timestamps are all initialized to zero.

The configuration file is checked to see if it exists and is readable. If this is so, then the configuration file values are used; if not, the default values written into the code are used.

The Keysight mainframe has seven cards, each with 40 channels. A list of channels to be scanned for each card is built from these 40 channels. The channels are configured and read and an array is built of the read values.

Voltage values read for the detector frame and Hall are removed from the built array, converted to relative humidity, and reinserted into the array. Voltage values read from the electronics zone and crystal zone flowmeters are also removed from the built array, converted to temperatures, pressures, and flows and then reinserted into the array.

Dew points are calculated for the detector frame and Hall. Averages and standard deviations are calculated from the read temperature values and the calculated dew points, temperatures, pressures, and flows.

The read and converted values are compared to their *hi* and *lo* limits. If the value is out of the limit and the interlock is enabled, then appropriate action will be taken with the chillers, which are monitored and controlled, and high voltage.

Values are sent from the local variables to the corresponding shared variables and vice versa. If the program is under EPICS control, the values are sent from EPICS to LabVIEW. If it is in LabVIEW control, then values are sent from LabVIEW to EPICS.

If any configuration file data has been changed, then a new configuration file is made. The program returns to reading of the Keysight values and runs until the Stop button is pushed.

The control and monitoring program is being tested.