

Hall D PXI Calibration

Brian Eng, Mary Ann Antonioli, Peter Bonneau, Pablo Campero, Amanda Hoebel, George Jacobs, Mindy Leffel, Tyler Lemon, Marc McMullen, and Amrit Yegneswaran
 Physics Division, Thomas Jefferson National Accelerator Facility, Newport News, VA 23606

October 5, 2018

The Hall D super-conducting Solenoid magnet has many sensors and signals that must be monitored to ensure proper operations; one of the main sets are the various voltage taps. The ADC modules used in the data acquisition system that collects voltage tap data must be periodically calibrated. This note details the setup and procedure for calibration.

Voltage taps are located between coils and splices to monitor the magnet’s performance. In the event of a failure, e.g. a coil quench, a PXI system from National Instruments (NI) is used to capture data at a rate fast enough to determine the timing of the fault.

The PXI samples data at 250 kHz, then down-samples it to 10 kHz, where it is saved to a .root file. To acquire the most accurate data possible, the ADC modules (PXIe-4300) must be periodically calibrated.

NI provides a calibration procedure [1], which is the basis for verifying and calibrating the modules. The main piece of equipment required is a voltage source, which must have an accuracy of at least 10 ppm; a Krohn-Hite 523 is used, which has an accuracy of 4 ppm.

The first step in the calibration is to perform module self-calibration through NI’s Measurement & Automation Explorer software; any module that fails is sent for repair.

The next step is to perform verification. To expedite this step, a LabVIEW VI [2] was created that uses the PXI controller’s built-in GPIB capability to communicate with the Krohn-Hite, and automatically set the voltage and ADC parameters based on the reference table from the NI procedure. The front panel of the VI, Fig. 1, indicates the status of each of the various voltages injected and if they pass.

The calibration itself is then performed, which updates the timestamp and checksum on the module, Fig. 2.

Finally, a logbook entry [3] is written and the maintenance log [4] updated.

With the software and hardware setup, the time to calibrate an ADC module has been reduced and performing the periodic calibration allows the modules to perform to the advertised specifications.

- [1] www.ni.com/pdf/manuals/373548a.pdf
- [2] <https://github.com/JeffersonLab/hall-d-pxi-4300-calibration> (private repository)
- [3] <https://logbooks.jlab.org/book/hdsolenoid>
- [4] https://halldweb.jlab.org/cgi-bin/maintenance/cgi/long_task.pl?task=PXI%20ADC%20Calibration

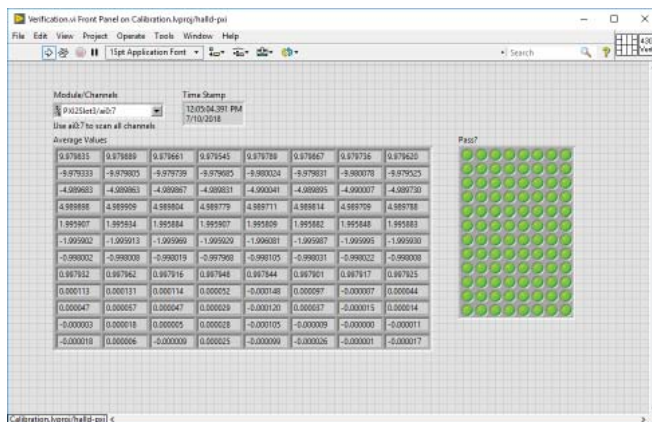


FIG. 1. ADC verification test results on VI front panel.

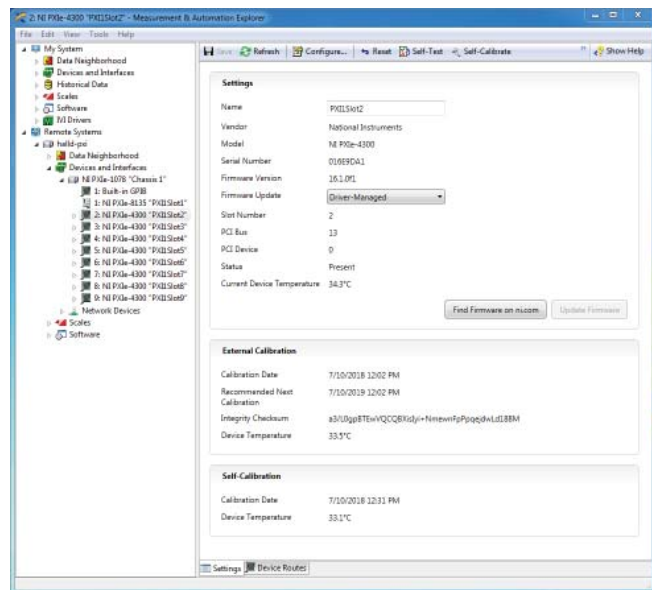


FIG. 2. Updated calibration date and checksum.