

## Software Development to Test National Instruments' CompactRIO NI-9265

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A test stand to test and debug issues with CompactRIO modules that are used in the experimental halls is being developed [1]. The setup and LabVIEW code for the 4-channel, current, analog output module NI-9265 are discussed.

National Instruments' NI-9265, a 4-channel, analog output module, with a range of 0 mA to 20 mA, is used in the hardware safety interlock system of Hall B's Forward Tracker detector.

The test setup for NI-9265 is shown in Fig. 1. A Krohn-Hite model 523 DC source supplies a voltage from 5 V to 12 V (10 V used for this setup) to the NI-9265 to enable it to generate current. After the LabVIEW code sets the current value for the NI-9265, the current output is read by a Keithley 2002 multimeter. Figure 2 shows the wiring connections of the NI-9265. Terminals 8 and 9 are connected to the Krohn-Hite and 0-7 are used, pairwise, to connect one channel at a time to the Keithley. In Fig. 2, channel 0 is connected to the Keithley.

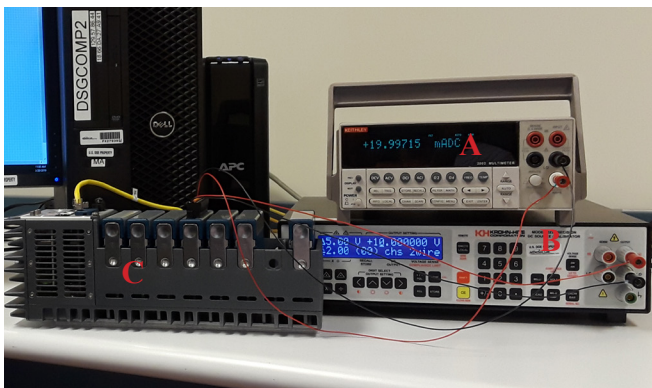


FIG. 1. Test station setup for NI-9265. (A) Keithley 2002 multimeter, (B) Krohn-Hite model 523 DC source, (C) cRIO system with NI-9265 module.

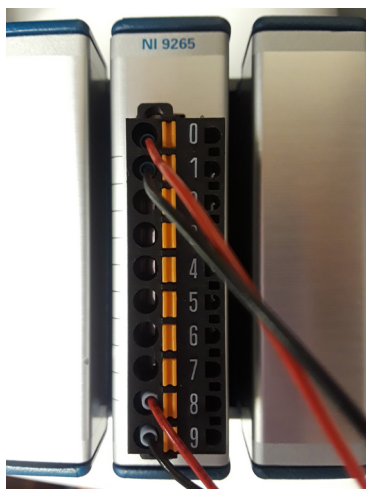


FIG. 2. Wiring of NI-9265.

Tests written for this module were as follows: mean, accuracy, standard deviation, differential nonlinearity, dynamic range, gain error %, integral nonlinearity, and offset error [2]. It was discovered that for NI-9265 all channels could not be wired at once, since the Keithley can only read one channel at a time. Therefore, the LabVIEW code for the automatic test (all tests on all channels) needed to accommodate the re-wiring of NI-9265 for each successive channel to be set and read. A pop-up message (Fig. 3.) was written into the code to inform the user to wire the next channel.

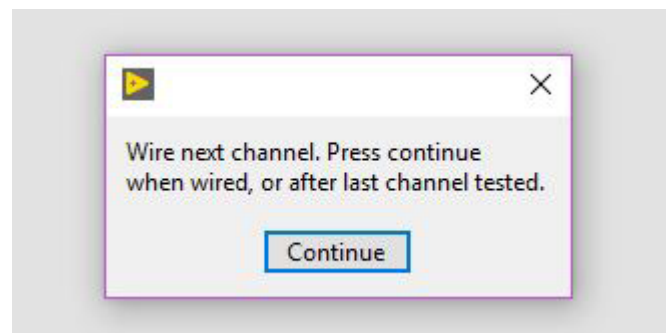


FIG. 3. Pop-up message included in test code.

All tests were run on one NI-9265 and the results recorded in Excel. The module passed all tests, meeting specifications for the hardware interlock system, and for those that specifications were provided, such as gain error and offset error, results were better than specification.

- [1] M.A. Antonioli, et al. *Test Stand for CompactRIO Analog Input Modules*, DSG Note 2017-10, 2017.
- [2] M.A. Antonioli, et al. *Software Development to Test cRIO Module 9207 and Results*, DSG Note 2018-11, 2018.