

## Software Development and Test Results for CompactRIO Module 9205

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January 10, 2019

A test stand was developed for testing CompactRIO modules used in several Hall B slow control systems [1] [2]. In this Note, an overview of the LabVIEW code written to test module NI 9205, and test results, are presented.

NI 9205 is a 16-channel, analog input module with four programmable input ranges of  $\pm 0.2$  V,  $\pm 1$  V,  $\pm 5$  V, and  $\pm 10$  V. To provide test input values for the  $\pm 0.2$  V and  $\pm 1$  V ranges, a Krohn-Hite model 523 precision DC source is used; the other two ranges use an NI 9264 module. Wiring diagrams for the two test sources are shown in Figs. 1 and 2.

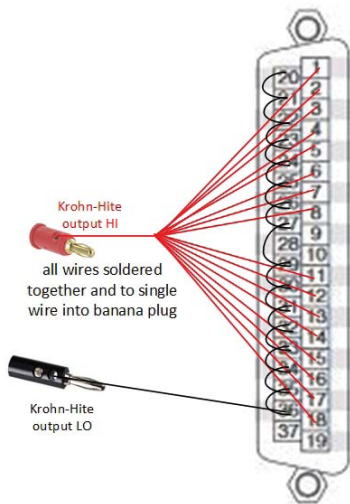


FIG. 1. Wiring of NI 9205 to Krohn-Hite source.

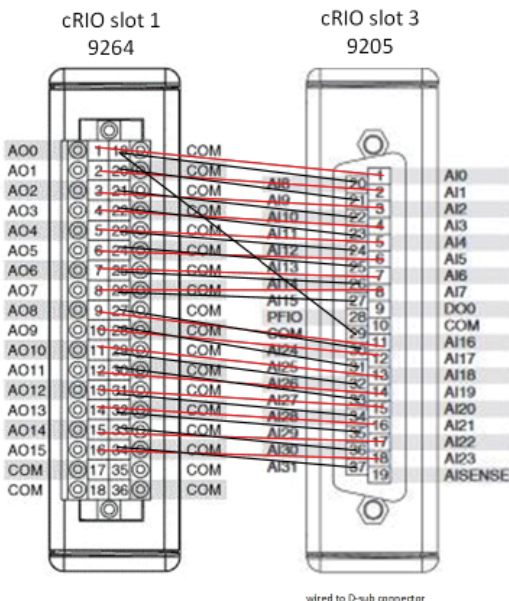


FIG. 2. Wiring of NI 9205 to NI 9264 source.

Twenty individual voltage tests were written in LabVIEW for testing channels. When choosing a particular test to run from the drop-down menu on the Manual tab of the user interface, a test range must be selected for the differential nonlinearity, dynamic range, gain error, and offset error tests. Integral nonlinearity and samples, mean, accuracy and standard deviation tests are based upon which source is used for the input voltage. Figure 3 shows the drop-down menu.

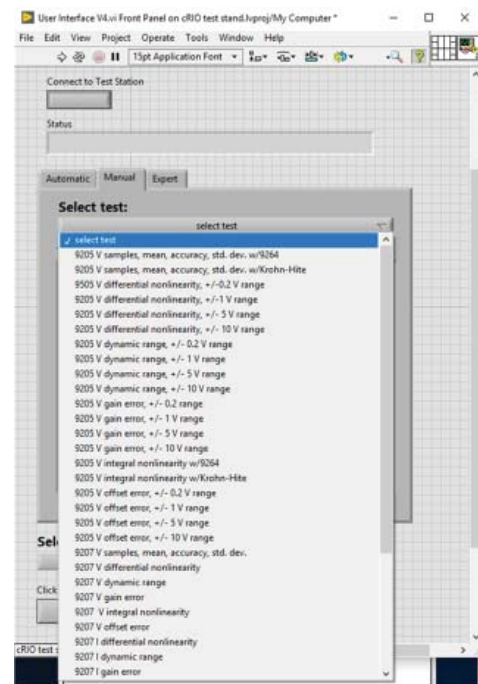


FIG. 3. LabVIEW drop-down menu for choosing a particular test for the NI 9205.

To run all tests on all channels, the test is chosen from the drop-down menu on the Automatic tab of the user interface, Fig. 4. The voltage range defines the choice to be made.

Results for channel 3 of automatic testing are shown in Table I.

LabVIEW code to test NI 9205 has been written and tested and is working successfully on the cRIO test stand. Results for the tested module are acceptable.

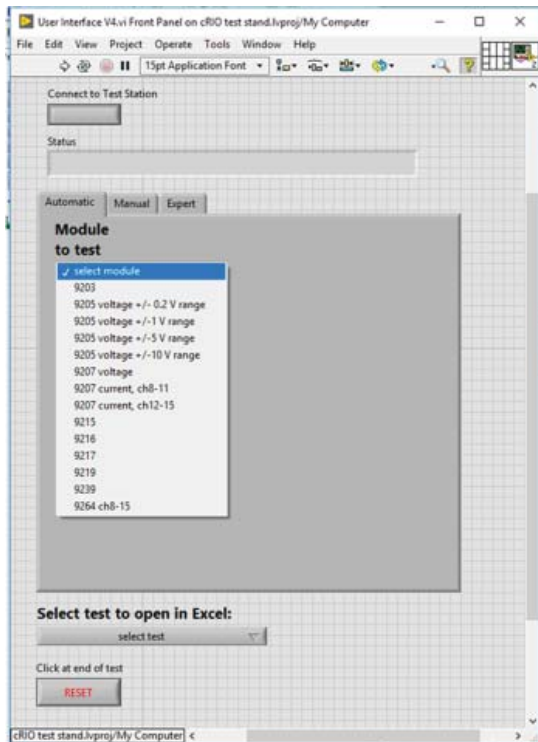


FIG. 4. LabVIEW drop-down menu to choose all tests of all channels of the NI 9205. Based on the desired test range, one of the four NI 9205 voltage options is selected.

Test results for NI 9205, channel 3, $\pm 0.2$ V range	
Test	Result [V]
Mean (-0.12 V input)	-0.120
Accuracy (-0.12 V input)	0.117
Standard deviation (-0.12 V input)	0.000
Dynamic range difference	0.000
Offset error	0.000
Gain error %	0.212
Differential nonlinearity	0.000
Integral nonlinearity (-0.12 V input)	0.000

TABLE I. Test results of module NI 9205, channel 3.

- [1] M.A. Antonioli, et al. *Test Stand for CompacRIO 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.