Test Stand for CompactRIO Analog Input Modules

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National Instruments CompactRIO (cRIO) systems are used for various detectors in Hall B. A test stand is being developed for testing of modules used in these cRIO systems.

A cRIO system consists of a controller with a built-in processor and up to eight I/O modules, usually housed in a chassis. Communication can be through either Ethernet, USB, or serial connection.

Currently, cRIO-based slow controls are used for eight systems in Hall B , Table I. Within these eight systems, eighteen types of modules are used, including inputs, outputs, RTD, relay, serial, and TTL DIO.

To enable troubleshooting of problems in the eight systems, a module test stand is being developed. Figure 1 shows the setup to test the NI-9485, a relay module, and the NI-9207, an analog input module. Table I lists which systems use these two modules, and additional analog input modules.
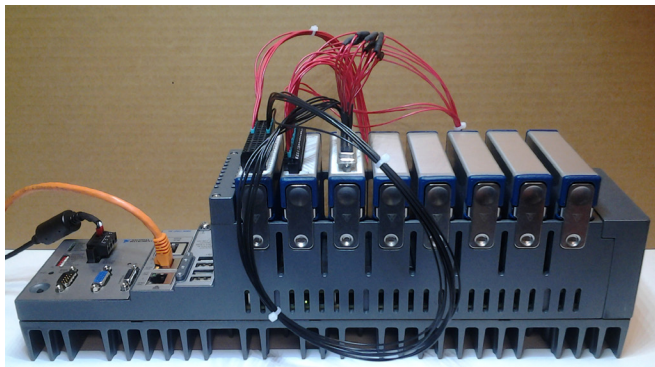

FIG. 1. Test setup for relay module NI-9485 and analog input module NI-9207.

The analog input modules listed in the Table have similar features. Code will be written to test set, readback, and precision; dynamic range; offset error; gain error; differential non-linearity; and integral non-linearity.

Currently, code is being developed to test the NI-9207. A specific input voltage will be sent to its channels from an NI-9264 voltage output module, via the NI-9485 relay module. The voltage will then be read back, compared to the sent value, and the readback precision computed. This will be performed with an appropriate step-size, over the dynamic range of the module. This test will be conducted for all the channels of the module. For analysis, data will be exported to Excel and the analyzed data will be databased in SQLite.

To summarize, LabVIEW code is currently being written to test cRIO modules used in Hall B systems. Over the upcoming year, a comprehensive test, measurement, analysis, and databasing procedure will be developed for all the modules.

System	NI-9485	NI-9207	NI-9205	NI-9215	NI-9239
Forward Tagger hardware interlock	✓		✓		
Silicon Vertex Tracker hardware interlock	✓		✓		✓
RICH hardware interlock	✓		✓		✓
Torus low voltage					
Torus data acquisition					✓
Solenoid low voltage					
Solenoid data acquisition					✓
Gas system	✓	✓		✓	

TABLE I. Systems using cRIO analog input modules, for which tests are currently being written.