EPICS IOC Brick

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The concept: Provide a simple, EPICS aware, field configurable data acquisition system that requires no user programming.

This poster describes a simple, general-purpose data acquisition system that requires minimal configuration and no software programming by the user.

- Support for digital I/O, relays, analog input and output, thermocouple measurement, and strain (bridge) measurements are provided.
- The system uses National Instruments (NI) CompactRIO (cRIO) hardware and communicates to the user OPIs via an Experimental Physics and Industrial Communication System (EPICS) interface.
- All the user need do is plug in and connect the types of IO modules needed for the measurement or control. The system will auto-discover this hardware, configure itself and communicate to its EPICS EDM (or CSS BOY) screens.
- The screens will then also automatically configure for the hardware selected. The system supports hot-swapping to add or change hardware on-the-fly.
- This system is being used in several instances at the SNS in a more permanent capacity than it was intended. More specific screens have been developed for these systems beyond the dynamic screens provided.

We use NI cRIO-9073 and 9074 controllers with LabVIEW 2014, but others could be used.
The NI data acquisition modules supported are:
9205 AI
-Differential or Single Ended.
-Range selection (0.2, 1, 5, 10V) for each of two banks, available channels split in half. 9263 AO
- Four channel +-10V
9401 Digital IO
- Eight channels configurable in direction in two banks.
9481 Relay
- Four channel.
9213 Thermocouple
- Type (J,K,T,E,R,S,N,B) for each of two banks (TC0-7, TC8-15). Default is J.
- Display scale (Volts, Kelvin, Celsius, Fahrenheit, Rankine) for each bank.
9237 Bridge AI
- Single excitation (2.5, 3.3, 5, 10V, Extern) for all channels. Default is 2.5V.
- For each of the four channels individual: Full or half bridge.

The default update rate is 5Hz, but other user-controlled selections are available.

The front panel of the cRIO has a set of small DIP switches, one labeled “User1”. This switch was programmed to allow capturing configuration settings (D-IO direction, TC type, etc.) for default use in subsequent restarts.

An example module configuration and its resultant matching run-time OPI screen:

Changing the slot number and type of modules causes a new run-time screen configuration to match:

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