Detector Support Group
Weekly Report, 2018-10-17

Summary

Hall C

- Current Loop Regulation routine tested using DSG-PLC and Danfysik Python simulator.
  - ✶ Code was modified to meet Hall C specifications.
  - ✶ Python simulator will ramp up to MOL value (user-input current plus a user-set overshoot), but will not drop back down to initial requested value, as it should.

Hall B Magnets

- Diagram generated to show the two different paths used to acquire voltage tap readouts in the controls system during Solenoid fast dumps.
  - ✶ Diagram also shows sequence of instrumentation used to trigger dump of Solenoid from hardware QDs or through software (PLC).

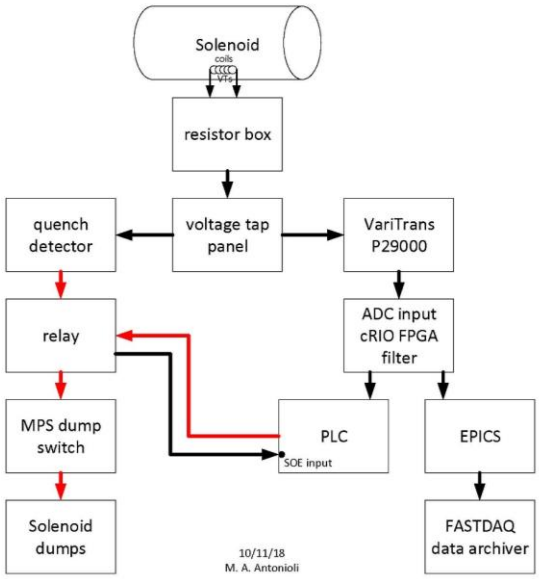


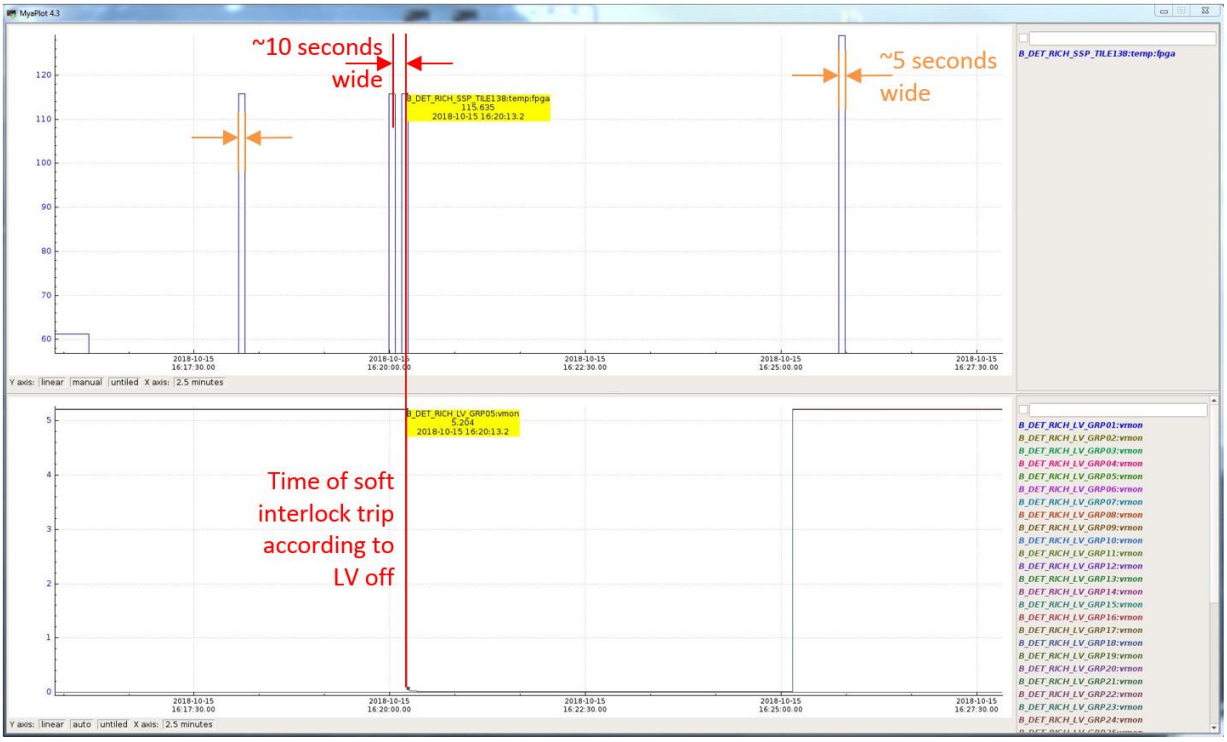
Diagram showing path of voltage tap readouts and instrumentation for Solenoid controls system.

- Training held for Hall B Staff on Solenoid and Torus operations and troubleshooting.
- *Solenoid Voltage Taps Values at Fast Dumps* table updated to include Fast Dump Event #13 from April 1, 2018 and Fast Dump Event #15 from August 27, 2018.
  - ✶ Synchronization, jitter-removal, and timestamp-correction options used during data retrieval.
  - ✶ For Event #13, QD#1 Ch1 exceeded 200 mV threshold.
  - ✶ For Event #15, no QDs or VTs had spikes that exceeded thresholds.
- Path forward on Solenoid fast dumps reviewed.
  - ✶ Latest indications are that cause of fast dumps might be the MPS itself.
  - ✶ MPS contactor will be added to PLC SOE module.
  - ✶ Power lines on the transistor bank will be added to the cRIO FastDAQ.

- Compared Torus and Solenoid fast dumps during testing of new emergency stop buttons.
  - ✶ Noise at steady state (~0.6 V peak-to-peak) is similar on both magnets.
    - Solenoid has less noise spikes, most likely due to 60 Hz notch filter on the Solenoid FastDAQ cRIO's FPGA.
  - ✶ Current measurements start to fall at a faster rate during dump for Torus than for Solenoid.
    - Suspected cause of time difference is the different inductances for each magnet (Torus has inductance of 2.00 H. Solenoid's is 5.89 H).
- Yokogawa DL850EV received by Magnet Group for evaluation connected to Solenoid MPS to monitor for glitches in power supply.
- Obtained Solenoid load cell data from fast dumps to determine whether load cell readings have changed because of the 19 fast dumps.

RICH

- Components received for the RICH N2 auto-change back up supply.
- Strange buffer tank pressure from October 13 to 14, 2018 found to be caused by large drop in ambient pressure caused by storm.
- FPGA temperature false soft interlock trip on October 15, 2018 investigated.
  - ✶ Only tile 138's FPGA temperature spiked to 115 °C due to DAQ readout error.
  - ✶ Soft interlocks behaved as expected, disabling LV after reading two high temperature measurements separated by 10 seconds.
    - HV had been turned off ~ 6 hours prior by shift workers.
    - Two false spikes occurred ~10 seconds apart, causing consecutive measurements by soft interlocks to be over the 75 °C limit.



Plots from Mya Archiver showing false temperature spikes. Top plot is Tile 138's FPGA temperature. Bottom plot is RICH LV groups. LV was only disabled by soft interlocks after measuring two over-limit temperatures 10 seconds apart.

HDice

- Documentation generated on operation of HDice NMR program synchronous mode.
- NMR program moved to HDice Group's desktop for testing.
- Test program ran for NMR attenuator for attenuation settings from 0 dB to -63 dB in 1 dB steps with 100 waveform measurements taken at each setting.
  - ✶ Input signal was 5 V peak-to-peak amplitude, 1 MHz sine wave centered at 0 V.
  - ✶ Average percent difference between set attenuation and mean of calculated attenuation was 3.26 % ± 3.98 %.
  - ✶ Select results in table below.

Attenuation Setting [dB]	Mean Calculated Attenuation [dB]	Standard Deviation [dB]
0	-0.306	0.094
-10	-10.173	0.417
-20	-20.483	0.097
-30	-31.106	0.094
-40	-40.221	0.127
-50	-51.754	0.095
-60	-58.284	0.249

Results from RF-Box attenuation test. Results only shown for attenuation settings in multiples of 10, but all settings from 0 to -63 dB at 1 dB steps were tested.

Hall B Gas System

- Fabrication of third and fourth MFC power chassis continued.
  - ✶ AC power entry modules wired to 24V DC power supplies.
  - ✶ Wiring of YR2 power redundancy modules started.
  - ✶ Connections that were too short modified.
- Loose connection in second MFC power chassis repaired.
- 37-pin D-sub replaced on gas shed cRIO.
- Gas Shed controls updated to add debugging controls to expert screen of GUI.
- Training session held on calibrating the DC mix and the thermal conductivity (TC) analyzers.
  - ✶ The TC value for the 5000 gallon tanks initially had a higher reading than expected.
  - ✶ Indicates a CO_2 percentage much closer to 15%.
  - ✶ CO_2 percentage came down to ~11% after a few days.
  - ✶ Hall B has installed connections so that Mix 2 gas can be reroute to the Mix 1 TC.

10/11/2018	TCU(I)	Omega DP25(V)	Comment
8:10	8.36	2.73	Mix 1. Setpoint 10.3% CO2, Temp is 72
8:21	3.99	-0.0133	Mix 1. Setpoint 0% CO2
8:28	20.14	10.1	Mix 1. Setpoint 100% CO2
8:37	8.41	2.76	Mix 1. Setpoint 10.3% CO2
8:50	8.69	2.94	Standard 10.2% (+/-2%)
9:35	8.41	2.75	Standard 10.2% (+/-2%)
14:30	9.28	3.32	Sample from R1 MFC output
10/12/2018 9:19	8.64	2.9	Sample from R1 MFC output

Results from DC mix and TC analyzer calibration

LTCC

- To upgrade the Forward Carriage gas controls cRIO to accommodate Hall B's changes to use a pressure controlled system for LTCC:
  - The interface chassis may need modification to control the solenoids.
  - The Forward Carriage cRIO will need up to two additional relay modules.

RTPC

- Two 0 – 100 PSI pressure transducers with 0 – 10 V output provided to RTPC Group for testing at William & Mary.

DSG

- In preparation for DSG talk at senior staff meeting:
  - Talk compiled to present all of DSG's recent work and projects to senior staff.
  - DSG website's top-level index page revised and edited
    - New section added for DSG meeting minutes from Hall A, B, C, D and HDice.
  - DSG photo log reorganized, revised, and updated.

cRIO Test Stations

- NI 9694 RIO Mezzanine Card added to single-board cRIO (sbcRIO) for FPGA I/O.
- Development started of test program for sbcRIO.

Antonioli, Mary Ann

Vacation

Bonneau, Peter

HDice

- Generated documentation on HDice NMR program synchronous mode operation.

DSG

- Preparation for DSG project talk at senior staff meeting.
  - Revised, edited, and developed new top-level index pages for DSG website
  - Added new section on website for DSG meeting minutes for Hall A, B, C, D and HDice.
  - Reorganized, revised, and added to DSG photo log.

cRIO Test Stations

- Added NI 9694 RIO Mezzanine Card to single-board cRIO (sbcRIO) for FPGA I/O.
- Started development of test program for sbcRIO.

Campero, Pablo

Hall C

- Collaborated with Amanda with quadrupole current regulation PLC code
  - Code modified based on Hall C specifications.
  - Used Python code to simulate ramping up/down of Danfysik power supply.

Hall B Magnets

- Generated abbreviated diagram for Solenoid Dump
  - Diagram shows the two different paths to acquire the voltage tap readouts in the control system.
  - Shows the sequence and instrumentation related to dump the solenoid ether from hardware (QDs) or Software (PLC)
- Attended Hall B Solenoid Operations training.
- Updating Solenoid Voltage Taps Values at Fast Dumps table.
  - Completed fast dump event 13 (04/01/2018) and 15 (08/27/2018).
  - -JSD options used to extract VT values from fastDAQ data.
    - For dump 13, noticed that QD#1 ch1 used to compare the voltages on QD lower and upper channels as (VT11+VT12+VT13+VT14) - (VT5+VT6+VT7+VT8+VT9+VT10) exceeded its threshold of 200 mV.
    - For dump 15, noticed that no VTs had spikes that exceeded the thresholds to generate a fast dump. All higher voltage signals appeared after MPS contactor was opened.

DSG

- Completed Hall C power point for DSG project talk.
- Provided and labeled pictures for DSG photo log web for Hall C, Hall D and Hall B magnets controls.
- Sorted and verified all Hall B magnets meeting minutes for DSG web page.

Eng, Brian

Hall B Magnets

- Training for Hall B Staff on cRIO (overview and how to reset) for magnets.
  - All presentations stored at *M:\hallb_eng\CLAS12\Magnets\Operations\Training - October 2018*
- Met to review path forward on Solenoid fast dumps
  - Indications are it might be the MPS itself
  - Nick found some MPS lines to add to SOE
  - Onish suggested some power lines on the transistor bank to add to the cRIO FastDAQ.
- Compared Torus and Solenoid fast dumps
  - https://logbooks.jlab.org/entry/3609881
- Set up Yokogawa DL850EV Ruben got as an eval/loaner unit for connecting to Solenoid MPS to try to catch any glitches.

Hall B Gas System

- Replaced 37-pin D-sub on gas shed and added MFC debug to GUI: https://logbooks.jlab.org/entry/3610452

Hoebel, Amanda

HDice

- Moved NMR program to Xiangdong's desktop for him to test the program.
  - Waiting for test results.

Hall C

- Tested Current Loop Regulation routine using DSG-PLC and Danfysik python simulator.
  - Python simulator will ramp up to MOL value but will not drop back down to initial requested value, as it should.

Hall B Magnets

- Attended training for solenoid and torus magnets.
- Attended meeting on solenoid trip.
  - Plan is to set internal fault indicator to determine if trips are fault of MPS.

Jacobs, George

RICH

- RICH N2 gas system note in progress
- Received components for the RICH N2 auto-change test setup

SOLID-HGC

- Created SOLID-HGC gas system power point
- More work on SOLID-HGC gas system P&I diagram and Components spreadsheet

Leffel, Mindy

Gas System

- Continued fabricating third and fourth MFC power chassis.
    - ✶ Wired AC power entry modules to 24V DC power supplies.
    - ✶ Started wiring YR2 power redundancy modules.
    - ✶ Modified some connections that were too short.
- Did some troubleshooting on second chassis to find and repair loose connection.

Lemon, Tyler

Hall B Magnets

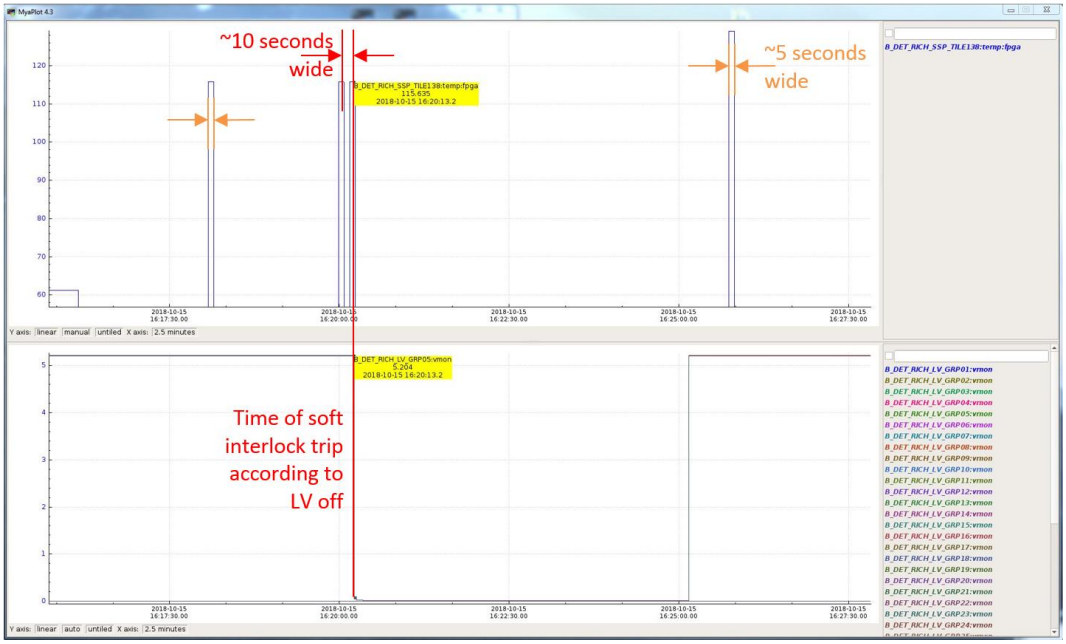
- Attended training sessions on magnet operations and troubleshooting.
- Obtained Solenoid load cell data from fast dumps to determine whether load cell readings have changed because of the 19 fast dumps.

HDice RF-Box Test Station

- Added Excel data logging to RF-Box attenuation test program.
    - ✶ Also added feature to generate fake data for development of Excel code.
- Ran test program for NMR attenuator for attenuation settings from 0 dB to -63 dB in 1 dB steps.
    - ✶ At each attenuation setting, took 100 measurements of signal from RF-Box.
    - ✶ Input signal was 5 V peak-to-peak amplitude, 1 MHz sine wave centered at 0 V.
    - ✶ Average percent difference between set attenuation and mean of calculated from signal attenuation is 3.26 % ± 3.98 %.
    - ✶ Select results in table below.

RICH

- Investigated strange buffer tank pressure from October 13 to 14, 2018.
  - ✶ Large drop in ambient pressure caused by storm affected pressure in buffer tank enough to cause different behavior of system.
- Investigated FPGA temperature false soft interlock trip on October 15, 2018.
  - ✶ Only tile 138's FPGA temperature spiked to 115 °C due to DAQ readout error.
    - Archiver shows multiple five-second long false temperature spikes on tile.
    - FPGA temperatures are read every five seconds, indicating that spikes are not true temperature readings.
  - ✶ Soft interlocks behaved as expected, disabling LV after reading two high temperature measurements separated by 10 seconds.
    - HV had been turned off ~ 6 hours prior by shift workers.
    - Two false spikes occurred ~10 seconds apart, causing consecutive measurements by soft interlocks to be over the 75 °C limit (see plot below).



McMullen, Marc

LTCC

- Accessed Hall B to evaluate hardware changes needed to upgrade the Forward Carriage gas controls to accommodate Hall B's changes to use a pressure controlled system.
  - ✶ The current interface chassis may need modification in order to control the solenoids.
  - ✶ The cRIO will need up to two relay modules added.

Gas Controls

- Updated the Gas Shed controls to use the latest iteration of the GUI, adding debug controls to the expert screen.
- Held training session on calibrating the DC mix and the thermal conductivity (TC) analyzers.
  - ✶ The TC value for the 5000 gallon tanks initially had an higher than expected reading, indicating a CO2 percentage much closer to 15%, according to a 3/18 plot. The value came down significantly over the weekend, to about 11% (according to the plot).
  - ✶ A new plot with will be generated later this week, as Hall B has installed connections so that mix 2 can be reroute to the Mix 1 TC.

10/11/2018	TCU(I)	Omega DP25(V)	Comment
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RTPC

- RTPC requested two absolute pressure transducers for testing at W&M; DSG provided two 0 – 100 PSI transducer with 0 – 10 V output.

DSG

- Prepared slides for the DSG Manager's presentation to Physics management.
  - ✶ Slides included gas controls information and flow diagrams for the gas system controls.