Detector Support Group
Weekly Report, 2018-11-07

Summary

Hall C Slow Control Systems

- Investigated Accelerator's jmenu Hall C Status screen.
  - Found EDM file on opsl00.
  - Able to convert EDM files to OPI files using CS-Studio and obtain PVs for HMS and SHMS magnet currents, polarities, and spectrometer rotation angles.
  - Used PVs to develop a test screen that runs only on the accelerator subnet.
  - Next step would be to determine how accelerator is getting PVs.
- Investigations underway of best way to implement EPICS in Hall C slow controls systems.
  - First SHMS & HMS CSS GUI control screens will monitor the magnets.
  - EPICS will monitor only. EPICS write control will not be enabled for any PV.
  - Two DSG computers are being converted to Linux-based EPICS machines for system development.
  - Held status and planning meeting on the implementation of EPICS in Hall C Control systems.
- Researched and ordered two desktop computers for Linux based development & EPICS.
- Rebuilding former VME EPICS test station for software development.

Hall C Magnets

- Quadrupole current regulation loop PLC code modified
  - Added function to hold current (Last current read = new set current in the MPS) when operator stops regulation loop.
  - Modified to PLC routine to ramp down the quadrupoles when interlock is enabled (PSU_Sum_Interlock bit =1).
  - Added pulse-timer that waits for 100 ms and then transmits trigger pulse to enable the sending of 0 A current value.
    - This timer ensures that proper value of 0 A will be sent to the MPS only once, if and when an interlock occurs.
  - Moved "send values" PVs to a separate sheet to make sure that values are sent at the end of the routine.
  - Program tested by using Python code to simulate Danfysik power supply, simulated different scenarios to satisfy the conditions required for this PLC program.
- Writing Python code to keep checking for lock if the NMR PT2026 unit loses its present lock.
  - Tested code by looking at the HMS Dipole current changes
    - NMR PT2026 locked when its current was ~1000A, and got a lock back once the current was raised again.
- Five-page Visio flowchart made to show Python code logic for the MPS Danfysik simulator.

Hall B Magnets

- Solenoid control system supported during Fast Dump event on 11/02/2018 at 2416 A.
  - ✶ Checked sequence of events in the PLC SOE module to determined first trip.
    - First: DumpContact , second: MainContact, and third QD1_Sum

11/02/2018 04:50:03 **Solenoid and Torus SOE Timestamps**

Solenoid

0	VCL_Lead_T	0	0	N/A
1	LHe_LL1	0	0	N/A
2	LHe_LL2	-436267390	358825	2018-11-02 03:58:18.687106
3	Splice_T1	-355545664	358825	2018-11-02 03:59:39.408832
4	Splice_T2	-355544739	358825	2018-11-02 03:59:39.409757
5	MainContact	-523879600	358825	2018-11-02 03:56:51.074896
6	PLC_Fast_Dump	-522575856	358825	2018-11-02 03:56:52.378640
8	Watchdog	0	0	N/A
9	Lead_Water_Flow	0	0	N/A
10	VT_Cable	0	0	N/A
11	System_Cable	0	0	N/A
12	QD1_Sum	-523609177	358825	2018-11-02 03:56:51.345319
13	QD2_Sum	0	0	N/A
15	DumpContact	-523937625	358825	2018-11-02 03:56:51.016871

Torus

0	VCL_Lead_T	0	0	N/A
1	LHe_LL1	0	0	N/A
6	PLC_Fast_Dump	0	0	N/A
8	Watchdog	0	0	N/A
9	Lead_Water_Flow	0	0	N/A
10	VT_Cable	0	0	N/A
11	System_Cable	0	0	N/A
12	QD1_Sum	0	0	N/A
13	QD2_Sum	0	0	N/A
14	QD3_Sum	0	0	N/A

    - Verified that timestamps displayed in new PLC SOE EPICS screen matched with PLC program timestamps; time conversion and events sorting executed correctly.
    - Noticed and proved for first time that MPS initiated the Solenoid fast dump.
  - ✶ Analyzed FastDaq data by using Analyzer and TorDAQConverter scripts.
    - Only VT15 had a voltage spike ~ 180 ms prior to the actual dump, but this is suspicious since analysis of root file indicated ~ 1.58 % duplicates and 3.87 % overlaps.
    - Concluded that VT15 was not shifting correctly, so none of the VTs had real spikes that could have generated the fast dump.
  - ✶ Found potential external source, which could be affecting water flow status in MPS resulting in its internal interlock trip.
    - Plotted LCW: 92_Flow_Makeup signal and found correlation with 9 solenoid fast dumps.
      - Investigation in progress.
- Performed test to correlate the FastDAQ data produced by the Sol-Fast-cRIO with the SOE timestamps provided by PLC.
  - ✶ Connected MPS Dump Contactor that goes to the SOE relay (+24 Vdc signal) to the ISO amp that was used for VT6.
  - ✶ Set up ideal conditions (all interlocks cleared) for the test by disabling software interlock in the PLC, and lowering threshold for liquid level hardware controller.
  - ✶ Performed three fast dumps by using Fast_Dump EPICs button to acquired data to be analyzed.
    - Initial analysis showed ±200 ms time difference between PLC SOE and cRIO FastDAQ data.
      - SOE PLC time ahead of cRIO FastDAQ time.
    - Found 1hr time offset WRT with respect to JLAB time, requested for its correction
  - ✶ Reconnected VT6 to its original location and tested proper readouts.

RICH

- To assist in fiber-drop debugging, started development of an CS-Studio EPICS screen that will record tiles' information in two fiber drop situations:
  - Situation 1: Number of Fibers Connected is less than 138 and FPGA temperature or scalers are zero.
  - Situation 2: Number of Fibers Connected is 138 and FPGA temperatures or scalers are zero (Noticed dropout even with all fibers connected).

HDice

- Reproduced RF-Box attenuation test program's Python calculation in LabVIEW to make a test program more portable.
  - Version with Python calculation requires Python to be installed on test PC.
  - If an equivalent LabVIEW attenuation calculation is developed, it limits the overhead work required to run test in future on other PCs.
  - Attenuation results from new LabVIEW program were within 2.2×10-6 dB ± 2.7×10-5 dB of Python program's results.
  - However, new LabVIEW program takes ~ 2.5 hours to complete attenuation calculations for full-range test (-63 dB to 0 dB) of RF-Box where Python takes ~ 2 minutes.
  - Investigating further methods to replicate Python program in LabVIEW to create a faster, more portable, and complete test program.

LTCC

- Discussed changes needed to the LTCC Solenoid Power system.
  - Solenoids currently draw 2A; however, cRIO relay module is rated for 2A.
  - Switching to 120VAC solenoid coils would reduce the current to ~ 300mA.
  - Researched NEC code on use of flexible cable for 120VAC.
    - Cabling class 1 for remote control circuits will be selected based in the NEC 2017 725.41 table, which states the materials required for the cable.
  - Researched two and three conductor connectors for control chassis.
    - Considering Conxall CPC connectors with soldered contacts.
- Completed work on diagram of controls for gas system updates.
- Logic code for solenoids control valve started.
- Installation of the secondary pressure transducers for S3 and S5 in Hall B started.

Gas Controls

- The 37-pin D-sub custom connector between the cRIO and interface chassis was replaced with a standard one (37-pin D-sub from vendor).
- LabVIEW VIs separated to handle control of MFCs in groups.
  - Addition of more NI-Published Subscribes Protocol in progress (PSP); used to manages Shared Variables over the network.
    - The additions of PSPs will allow for better debugging of individual loops when there are errors (currently all loops are started/stopped by a single control).

Hall A

SOLID-HGC

- Document on the SOLID gas operations reviewed.
- Gas system P&I diagram and components spreadsheet updated.

Hadron Calorimeter

- Cabling project started.
  - ✶ Attended meeting to review project.
  - ✶ Visited storage locations of cables.

Cables located at ESB building

  - ✶ Started testing first group of 2 m cables.

cRIO Test Station

- Wrote final test for cRIO module 9205, automatic test of ±0.02 V.
  - ✶ Automatic mode test run all test on the module (Gain, offset, INL, DNL, and Error tests)
  - ✶ Debugged code, and currently re-testing.
- Wired channel 1 to start testing of next NI-9239 ADC Voltage input module.
  - ✶ NI-9239 is a four channel module, 24 bit resolution, with a range -10V to +10 V.

DSG

- Contacted Jlab Public Affairs regarding adding DSG to the Physics Technical Groups webpage.
  - ✶ DSG will create its own content on this page with Drupal (platform for web content management).
- Revised top-level DSG website index pages for mailing lists and gas system meetings.

Antonioli, Mary Ann

cRIO Test Station

- Wrote final test for cRIO module 9205, automatic test of ±0.02 V.
  - Debugged code, and currently re-testing.
- Wired channel 1 of next module to be tested (9239).

Hall C Magnets

- Drew five-page Visio flowchart of Hall C Python MPS.

Bonneau, Peter

HDice

- DSG note in progress on the LabVIEW hardware drivers needed for the development of CAENels CT-box current measurement system on HDice.

RICH

- Investigating with Tyler false FPGA false temperatures occurring without dropping the fiber connection.
  - Another occurrence happened over the weekend.
  - Python script and hardware interlock will be used to indicate and track these failures.
  - Will be correlated with scaler data to check if DAq is also corrupt.

Hall C Slow Control Systems

- Investigated implementation of EPICS in Hall C slow control systems.
  - First SHMS & HMS CSS GUI control screens will monitor the magnets. EPICS will monitor only. EPICS write control will not be enabled for any PV.
  - Two DSG computers converted to Linux-based EPICS machines for system development are nearing operating system install completion.
- Held status and planning meeting on the implementation of EPICS in Hall C Control systems.
- Researched and ordered two desktop computers for Linux based development & EPICS.
- Rebuilding former VME EPICS test station for software development.

Hall D

- Attended Hall D Slow Controls Meeting.
  - Controls development for ComCal & DIRC progressing.
  - ComCal will be installed the week of Nov26.
  - DIRC Will be installed after the Christmas shutdown.

- Contacted David Chopard in Jlab Public Affairs regarding adding DSG to the Physics Technical Groups webpage. We will create our own content on this page with Drupal.
- Revised top-level DSG website index pages for mailing lists and gas system meetings.
- Created top-level DSG website index pages for Hall B subsystems.

Campero, Pablo

Hall C

- Collaborated with Amanda to modify Quadrupole Current Regulation Loop PLC code
  - Added function to hold current (Last Read current = set current in the MPS) when operator stops regulation.
  - Modified to PLC code to ramp down the quadrupoles when interlock (PSU_Sum_Interlock bit =1) is enabled.
  - Program tested by using Python code to simulate Danfysik power supply, simulated different scenarios to satisfy the conditions required for this PLC program.

Hall B Magents

- Supported control system during solenoid Fast Dump event on 11/02/2018 at 2416 A.
  - Checked sequence of events in the PLC SOE module to determined first trip.
    - First: MPS Dump Contact , Second: MPS Main Contact, and third QD1:Ch1
    - Verified that timestamps showed in new PLC SOE EPICS screen matched with PLC program timestamps; time conversion and sorting executed correctly.
    - Noticed for first time that MPS initiated the Solenoid fast dump.
  - Analyzed FastDaq data by using Analyzer and TorDAQConverter scripts
    - Only VT15 had a voltage spike ~ 180 ms prior to the actual dump, but this was suspicious since analysis of root file indicated ~ 1.58 duplicates and 3.87 % overlaps.
    - Concluded that VT15 was not shifting correctly, so none of the VTs had real spikes that could generated fast dump.
  - Posted logbook with relevant information for the dump: https://logbooks.jlab.org/entry/3619588
  - Found potential external source, which could be affecting water flow status in MPS resulting in its internal interlock trip.
    - Plotted LCW: 92_Flow_Makeup signal and found correlation with 9 solenoid dumps, investigation in progress.

- Performed test to correlate the FastDAQ data produced by the Sol-Fast-cRIO and SOE timestamps provided by PLC.
  - Connected MPS Dump Contactor that goes to the SOE relay (+24 Vdc signal) to the ISO amp that was used for VT6.
  - Set up ideal conditions (all interlocks cleared) for the test by disabling software interlock in the PLC, and lowering threshold for liquid level hardware controller.
  - Performed three fast dumps by using Fast_Dump EPICs button to acquired data to be analyzed.
    - Initial analysis showed ±200 ms time difference between PLC SOE and FastDAQ data.
    - SOE PLC time ahead of cRIO FastDAQ time.
    - Found 1hr time offset in FastDaq time, requested for its correction
  - Reconnected VT6 to its original location and tested proper readouts of the signal

- Collaborated with Mary Ann to start next test in the cRIO Test Station.

- Provided wiring connection, pinouts and main specs to test NI9239 ADC input module.
- Initial test to be started when DSG-COMP2 PC will be fixed.

Eng, Brian

Hall B Magnets

- Solenoid fast dumped again: https://logbooks.jlab.org/entry/3619588
- Tested timing with dump contactor going to SOE: https://logbooks.jlab.org/entry/3619757
- Looks like LCW issues might be the cause of the unknown solenoid fast dumps: https://userweb.jlab.org/~beng/images/Solenoid%20Fast%20Dumps%20&%20LCW/

Hall B Gas System

- Swapped 37-pin D-sub on FC cRIO: https://logbooks.jlab.org/entry/3621342
- Separate VI to handle groups of MFCs, still need to add more PSPs to better debug of the individual loops when there are errors (currently all loops are started/stopped by a single control).

Hall C Magnets

- NMR Python code handled losing a lock (HMS Dipole current was ~1000A) and got a lock back once the current was raised again.

Hall A -SOLID

- Reviewed George's document on the SOLID gas operations.

Hoebel, Amanda

Hall C Magnets

- Completed Current Loop Regulation program, with Pablo.
  - Moved "send values" to a separate sheet to make sure that values are sent at the end of the routine.
  - Added pulse-timer that counts to 100ms and sends pulse if interlock occurs.
    - This keeps the current value from sending to the MPS constantly, as the interlock tag will remain at a value of 1 until the interlocks are cleared.

Jacobs, George

Hall A SOLID-HGC

- Hall A SOLID HGC gas system note in progress
- Hall A SOLID-HGC Gas System detailed doc in progress
- More work on SOLID-HGC gas system P&I diagram and Components spreadsheet

- Completed Annual Standards of Conduct training, GEN101

Leffel, Mindy

LTCC

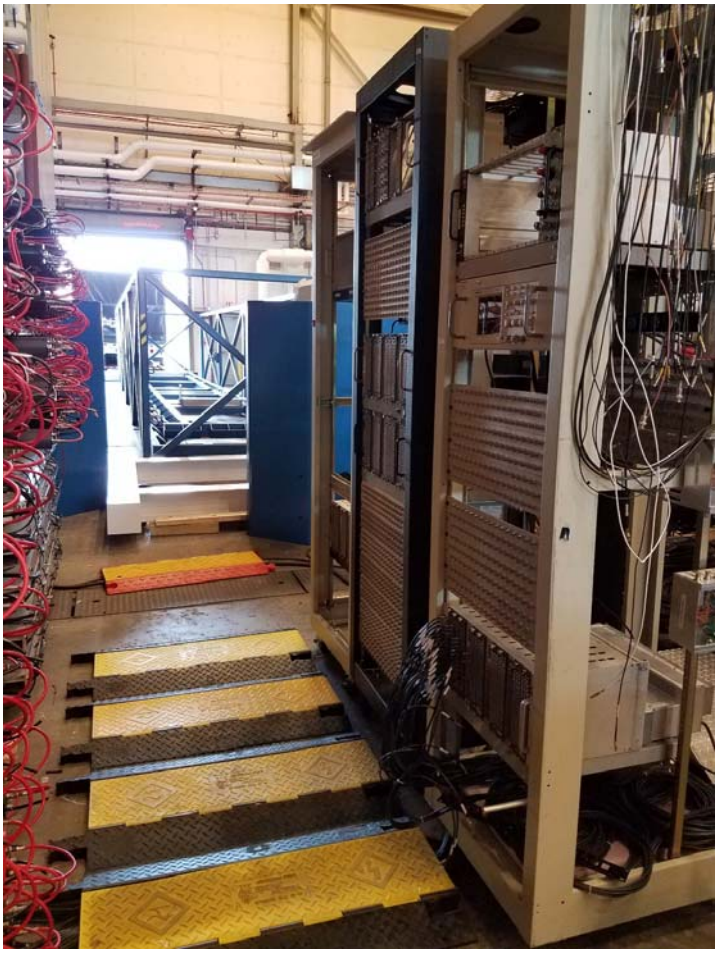
- Researched two and three conductor connectors for control chassis.
  - ✶ Considering Conxall CPC connectors with soldered contacts.
  - ✶ Need to verify conductor gauge.

Hall A - Hadron Calorimeter

- Cabling project.
  - ✶ Attended meeting to review project.
  - ✶ Visited storage locations of cables with Bogdan
  - ✶ Started testing first group of 2 m cables.

Cables located at ESB building

Cables located at Physics storage



HCAL patch panel in test lab

- Started reviewing DOE Standard Human Performance Improvement handbook, in preparation for upcoming HPI course.

Lemon, Tyler

Hall C Slow Controls

- Investigated Accelerator's *jmenu* Hall C Status screen.
  - Found EDM file on *opsl00*.
  - Able to convert EDM files to OPI files using CS-Studio and obtain PVs for HMS and SHMS magnet currents, polarities, and spectrometer rotation angles.
  - Used PVs to develop a test screen that runs only on the accelerator subnet.
  - Next step would be to determine how accelerator is getting PVs.
    - Is it directly from PLC or is there an intermediate Hall C subnet softIOC?

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  - Situation 1: Number of Fibers Connected is less than 138 and FPGA temperature or scalers are zero.
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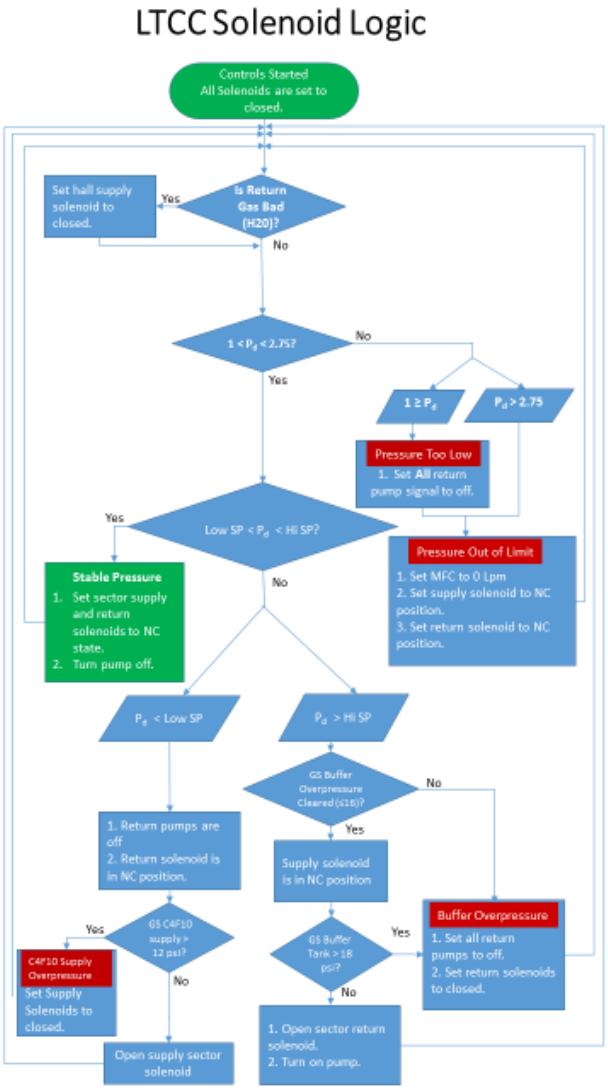
  - Investigating further methods to replicate Python program in LabVIEW to create a faster, more portable, and complete test program.

McMullen, Marc

LTCC

- Discussed changes needed to the LTCC Solenoid Power system with Brian.
  - The solenoids currently draw 2A; however the cRIO relay module is only rated for 2A.
  - Switching to 120VAC solenoid coils would reduce the current to < 300mA.
  - Researched the NEC code on the use of flexible cable for 120VAC. In accordance with NEC 2017 725.41 a table is given, which states what materials are required to use for cabling class 1 remote-control circuits.
- Started installation of the secondary pressure transducers for S3 and S5 in Hall B.

- Started logic code for solenoids control.
- Completed work on diagram of controls for gas system updates.



Flow diagram showing the updates for the LTCC gas controls

Hall A SOLID-HGC

- Reviewed the SOLID HGC C4F10 Gas System document.
- Discussed recommended changes to the document with George.