Detector Support Group
Weekly Report, 2018-04-11

Summary

Hall B Magnets
- Torus had controlled ramp down on 4/5/2018 due to loss of communication with FastDAQ cRIO.
  - cRIO debugged and successfully rebooted using remote serial connection.
  - Ramp down was stopped; Torus ramped back to negative full field.
- Torus had controlled ramp down on 4/10/2018 due to helium vent to atmosphere caused by increase in helium return pressure.
  - Vent to atmosphere stopped once helium return pressure returned to normal, allowing ramp down to be halted.
- Solenoid had fast dump on 4/9/2018 because of trip on Quench Detector #1 Channel 1.
  - No FastDAQ data available due to error in EPICS archiving.
- External cron job added to monitor CPU and memory of both FastDAQ cRIOs.
  - Monitoring will help determine whether CPU-usage error or memory error is cause of unrecoverable FastDAQ cRIO failures.
- Console output adapter cable reinstalled on Torus LV cRIO.
  - Original adapter was moved to Solenoid FastDAQ cRIO when it was replaced on 4/1/2018.

SVT
- Patch panel board used for humidity and temperature sensors received.
  - Populating of patch panel boards started.
- Surface mount RTD wiring tested in a four-wire configuration on patch panel board.
- Operating system and drivers loaded onto replacement Hardware Interlock cRIO.
- Redesign of HTSB completed to use the surface mount RTD.

DC
- Gas switched to 90%-Ar/10%-CO_2 standard to monitor TCU1 voltage.

HDice
- SubVI library developed to calculate data acquisition rates for synchronization.
  - Based on the duration of the NMR scan, the developed subVIs maximize the number of data acquisition points and DAQ rate using the current shunt's settings.
  - Current shunt's DAQ settings used rather than lock-in amplifier's as lock-in amplifier's external triggering rate is limited to 300 Hz in synchronous operation.
- Error-checking routine to scan data length vs. acquisition rate completed.

LTCC

- C_4F_{10} quote requested and received from F2 Chemicals.
  - ★ 500 kg in stock at $135 per kg ($67,500 total).
  - ★ New price of $260 per kg for future purchases once 500 kg on-hand stock is gone.
  - ★ At least six month lead time on any order.
- Quote requested for C_4F_8O from Praxair and 3M.
  - ★ C_4F_8O is no longer available.
- LTCC flows show that Sector 6 leakage has increased over time.

LTCC Sector	Average of Daily Leakage Since November 8, 2017 [L]	Sector Status
1	—	Uninstalled
2	38.91	Flowing nitrogen
3	4.34	Bypassed
4	—	Uninstalled
5	33.65	Flowing C_4F_{10}
6	587.17	Flowing nitrogen

cRIO Test Stand

- Integral nonlinearity automatic test updated to use calculated full-scale voltage.
- Missing code test for automatic mode developed and successfully tested.
- Automatic mode for full set of tests for 9207 ADC module debugged.
  - ★ When full set was run, integral nonlinearity test showed no results.
  - ★ Adding a delay before start of integral nonlinearity test resolved error.
- Set-up and wiring defined for current input test of NI-9207 ADC module.
  - ★ NI-9265 analog output module will be used as current source.

EEL 124 cleanroom

- Moisture content of concrete floor is measured to be ~90 %.
  - ★ Moisture content determines type of epoxy needed for floor repairs.

Workers Safety Committee

- Mike Maier noted that workload will be increasing across the lab and supervisors should be asking, "Can the work be done safely in the time allotted?"
- Questions were brought up as to whether training is needed to use breaker panels.

Antonioli, Mary Ann

- Updated **RICH** N_2 system drawing.

cRIO Test Stand

- Updated integral nonlinearity automatic mode test to use full-scale voltage calculated for previous tests.
- Developed and successfully tested missing code test for automatic mode.
  - ★ Many channels failed.
- Added a status message for each test in automatic mode.
- Tested and debugged automatic mode for full set of 9207 tests
  - ★ Program failed; integral nonlinearity test showed no results.
  - ★ Adding a wait time before integral nonlinearity test resolved error.
  - ★ Successfully ran a shortened test with less samples and less channels.
- Made Visio wiring diagram of module setup for 9207 testing.

- Attended Workers Safety Committee meeting.
  - ★ According to Mike Maier, workload will be increasing across the lab and supervisors should be asking, "Can the work be done safely in the time allotted?"
  - ★ Question brought up of whether or not training needed to use breaker panels.

Bonneau, Peter

HDice

- Developed subVI library to calculate data acquisition rates for synchronization.
  - ★ Subroutines maximize the number of data acquisition points and DAQ rate depending on the length of the entire NMR scan.
    - ▪ Subroutines based on the current shunt DAQ rate settings rather than the lock-in amplifier.
  - ★ Maximum DAQ rate is lower than non-synchronized NMR due to the lock-in amplifier external triggering limitation ($\sim < 300$ Hz).
  - ★ Started testing and debugging of the DAQ library at various acquisition rates and scan lengths.
- Development continued for data array error-checking routines.
  - ★ Completed error-checking routine to scan array data length vs. acquisition rate.
- Completed assembly of current calibration system for check of CT-box current shunt and Oxford power supply set and read-back settings.

SVT

- Loaded operating system and drivers onto SVT Hardware Interlock System's replacement cRIO model 9035.

Hall D

- Held meetings on Hall D status and EPICS controls monitoring.

Campero, Pablo

Magnets

- Torus had controlled ramp down on 4/5/2018 due to lost communication with FastDAQ cRIO.
  - ✶ cRIO debugged using remote serial connection.
  - ✶ Console output log indicated that the system was rebooted into safe mode.
  - ✶ Rebooted FastDAQ cRIO; cRIO started without any problem
  - ✶ Torus controlled ramp down was stopped and ramped back to negative full field.
- Solenoid Fast Dump on 04/09/2018
  - ✶ Investigated causes for the dump and found that QD#1ch1 tripped first, but there was not FastDAQ data available
    - ▪ Data was not recorded due to software IOCs were not rebooted after the last rebooting of the FastDAQ cRIO.
  - ✶ Found that SOE timestamps used to determine sequence of the trips were not totally correct. Time did not match time recorded in the EPICS archive.
- Created Magnets Health Status report for DSG weekly meeting.

- Switched **DC** gas to standard 90%-Ar/10-CO_2 mix to monitor TCU voltage for one week, with Marc, Tyler, and Amanda.

- For **cRIO Test Station**, set up defined for NI-9207 ADC module to test current inputs.
  - ✶ For current source, an NI-9265 analog output module will be used.
  - ✶ NI-9207 ADC input module will be used for current measurements.
  - ✶ Determined wiring for the modules to be connected.

Eng, Brian

- For **SVT**, tested surface mount SMT RTD wiring that Mindy did on a test board.
  - ✶ RTD works for 4-wire resistance measurement using Keithley 2002.

- For **Gas System**, met with Marc to discuss upgrades to MFC power chassis

Hall B Magnets
- Added external cronjob to monitor CPU and memory of both FastDAQ cRIOs.
- Torus FastDAQ cRIO got into safe mode causing a controlled ramp
  - ✶ Reboot of cRIO fixed it.
  - ✶ https://logbooks.jlab.org/entry/3555317
- Solenoid fast dumped because of QD1.
  - ✶ https://logbooks.jlab.org/entry/3557372
  - ✶ FastDAQ data was not available because of EPICS issue so details on voltage taps were unavailable.
- Reinstalled console output adapter cable on Torus LV cRIO.
  - ✶ https://logbooks.jlab.org/entry/3557384
- Created first draft of Hall B cRIO training slides.

Hoebel, Amanda

DC
- Switched gas to standard 90/10 mix to monitor TCU voltage for 1 week, with Marc, Tyler, and Pablo.

Magnets
- Went over how to check SOE data and reset cRIO remotely for magnet off-hours support with Tyler and Pablo.
- Investigated controlled ramp-down of Torus on 04/05.
  - cRIO booted into safe mode, causing ramp-down.

- Worked on programming:
  - Reviewed arrays, lists, sets, matrices, and dictionaries in Python.
  - Learned vectors, matrices, and lists in R.
- Started SVT health status report.

Jacobs, George

LTCC
- Monitored daily LTCC S5 single sector test detector pressure and gas usage.
  - Updated LTCC S5 single-sector test status power point.
- Discussed with Hall B the LTCC C_4F_{10} recovery system status and requirements for the path forward.
- Requested and received C_4F_{10} quote from F2 Chemicals.
  - 500 kg in stock at $135 per kg.
  - New price of $260 per kg for future purchases once 500 kg on-hand stock is gone.
- Requested quote for C_4F_8O from Praxair and 3M.
  - Both reply stating C_4F_8O is no longer available.

Leffel, Mindy

Hall B

SVT
- Started populating patch panel boards.
  - Tested five boards for continuity
  - Soldered 25-pin D-sub connectors.

DSG
- Continued review for overhead crane training.

Lemon, Tyler
- Revised **RICH** detector health report.

Hall B Magnets
- Recovered Torus FastDAQ cRIO from failure with Pablo, Amanda, and Brian.
  - On 4/5/2018, Torus FastDAQ cRIO stopped communicating to the Torus PLC, causing a controlled ramp down.
  - cRIO could not be connected to through NI-MAX or pinged, but could be communicated with through serial connection to terminal server.

- Noted from terminal server log that cRIO had put itself into safe-mode, but reason why is unknown.
  - ✶ cRIO was rebooted using terminal server, Torus FastDAQ program restarted and cRIO returned to normal operation.
  - ✶ Controlled ramp down was able to be halted and the magnet ramped back to previous setting.
- Investigated cause controlled ramp down on 4/10/2018.
  - ✶ Cause of ramp down: an issue with ESR caused helium return pressure to increase and vent helium to atmosphere for long enough to cause a controlled ramp down.
    - ▪ If helium vents to atmosphere for 30 seconds, controlled ramp down is initiated.
    - ▪ Solenoid did not ramp down as it did not vent helium to atmosphere for the 30 seconds required for ramp down initiation.
  - ✶ Noted during investigation that Cryo-Sum interlock indicator for both Torus and Solenoid did not show status of helium vent to atmosphere in breakdown of summed interlocks.
    - ▪ Caused summation of Cryo interlocks to show as tripped without an explaination in the breakdown of the summation.
- Investigated cause of Solenoid's fast dump on 4/9/2018.
  - ✶ Fast dump triggered by QD#1:Ch1:lower.
  - ✶ Had issue during investigation with improper conversion of SOE timestamps.
    - ▪ Conversion program gave timestamp ~10 minutes later than time of dump.
- Investigated lack of FastDAQ data for Torus and Solenoid since 4/1/2018.
  - ✶ Noted during 4/9/2018 Solenoid investigation that no FastDAQ data had been archived since 4/1/2018.
  - ✶ Cause determined to be communication error between cRIO and IOC when cRIO is rebooted.
  - ✶ Fix is to reboot IOC if cRIO is rebooted.
  - ✶ Changes added to magnet energization procedure to confirm FastDAQ files are being written.

- Assisted with drilling of EEL 124 floor to determine moisture content of the concrete.
  - ✶ Moisture content of concrete will determine type of epoxy needed for floor repairs.
  - ✶ After moisture content is read, quote for floor repair will be generated.

McMullen, Marc
SVT
- Completed redesign of HTSB.
  - ✶ The new design uses a 1206 surface mount RTD.
  - ✶ Mindy and Brian have tested the replacement temperature sensor.
- Received Patch Panel board #2 used to measure humidity and temperature.

Gas System
- Modified new MFC power chassis design per Brian's recommendations.

- ★ Chassis will be reduced from a double DIN to a single DIN size.
- DC Mix TCU switched over to measure from the 10%-CO_2 standard.
- LTCC flows show that sector 6 leakage has increased over time.
  - ★ Sector 2 is still relatively leak tight.

LTCC Sector	Daily Average Since November 8, 2017 [L]	Sector Status
1	56.93	Uninstalled
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4	10.96	Uninstalled
5	33.65	Flowing C_4F_{10}
6	587.17	Flowing nitrogen