



Detector Support Group

Weekly Report, 2018-01-31

Summary

Hall B Magnets

- Torus and Solenoid monitored on a daily basis via EPICS and logbooks.
 - ★ Solenoid fast-dump on January 24, 2018 at full negative current (~ -2416 [A]).
 - SOE data shows fast dump was initiated by QD SUM1 interlock.
 - Analysis of fast DAQ data reveals spikes on voltage taps values.
 - No explanation available at this time for voltage taps' behavior at full negative current.
 - ★ Solenoid QD delay trip thresholds increased to 200 [ms] on 01/29/18.
 - ★ Cascading PID loop controls added to improve cryogenic recovery for the solenoid.
 - ★ Torus went into controlled ramp down on January 24, 2018 due to LHe low level (< 40%)
- Web page made to convert Solenoid/Torus PLC SOE tags to timestamps and sort them according to the time when the trip occurred.
 - ★ Link at: [//userweb.jlab.org/~beng/SOE.html](http://userweb.jlab.org/~beng/SOE.html)

SVT

- Trip delay timers and signal averaging for SVT Hardware Interlock System being tested.
- MFC installed and re-added to the SVT gas system.
 - ★ Current installation is temporary, final location to be determinate by Hall B personnel.
 - ★ Flow set points of MFC controlled via EPICS/CSS.
- E-log issues debugged.
 - ★ Plots did not get added automatically to the log book and axis labels were lost.
 - ★ Plots fixed, but still waiting for beam down period to be fully tested.

RICH

- Wiring for second cRIO chassis completed.
- Remote monitoring for N2 sensors developed in LabVIEW program
 - ★ Program calculates average and standard deviation for each sensor using a user-defined number of samples.
 - ★ Results are displayed in a table and plotted in a graph on front panel of VI.
 - ★ Program written to verify calculation results of LabVIEW program.
- Python programs that uses archived data to calculate average, standard deviation, maximum value, and minimum value for N2 Volume humidity sensors written.
 - ★ Results for January 23, 2018 to January 30, 2018 in table below.



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RICH N2 Volume Humidity Statistics from 2018-01-23 00:00 to 2018-01-30 00:00

	Board 1		Board 2		Board 3		Board 4	
	Humidity 1	Humidity 9	Humidity 2	Humidity 16	Humidity 3	Humidity 10	Humidity 4	Humidity 11
Average	1.96	1.20	0.00	0.00	0.55	0.08	0.14	0.14
Std Dev	0.10	0.10	0.00	0.00	0.10	0.02	0.08	0.10
Minimum	1.76	0.98	0.00	0.00	0.32	0.00	0.00	0.00
Maximum	2.23	1.52	0.00	0.00	0.88	0.19	0.45	0.39

	Board 5		Board 6		Board 7		Board 8	
	Humidity 5	Humidity 12	Humidity 6	Humidity 13	Humidity 7	Humidity 14	Humidity 8	Humidity 15
Average	3.82	3.76	1.88	1.78	0.00	0.96	1.61	1.38
Std Dev	0.10	0.09	0.44	0.10	0.00	0.09	0.11	0.11
Minimum	3.61	3.53	0.67	1.55	0.00	0.70	1.37	1.15
Maximum	4.09	4.02	2.47	2.13	0.00	1.22	1.87	1.74

Results from Python program calculating RICH N2 Volume humidity statistics. Sensors are grouped in columns by which board they are on and in which location they are installed.

RTPC

- RTPC-Mixing P&I diagram created.
- Components spreadsheet for RTCP-Mixing system generated.

HDice

- NMR base program for synchronization modified:
 - ★ Program section which controls power supply communication was modified from VISA to GPIB.
 - ★ Initialization routines for USB-based communication between NMR base program and current shunt developed.
- Fabrication for cable used in the second NMR rack started.

LTCC

- C₄F₁₀ gas leaks for S5 at its piping connections checked
 - ★ Leak minimized after tightening the connections.
- LTCC filled with C₄F₁₀
 - ★ Steady state flow at 0.065[slpm]

DC

- Thermal Conductivity Units (TCUs), which measure the purity of the gas recalibrated.

ET

- Reviewed LabVIEW interlocks program.

cRIO Test Station

- First version of User Interface LabVIEW program generated:
 - ★ Handle events logic added to the User Interface program.
 - ★ Loop used to send and receive commands between user interface and real time (cRIO controller) implemented.



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- Integral Nonlinearity (INL) testing options for ADC module NI 9207 with a resolution of 24 bit analyzed
 - * Ideal LSB $\sim 1.19 \mu\text{V}$ generates $\sim 16 \cdot 10^6$ transitions.
 - * Reduction of the number of transition to be done for the test by checking the differential between ideal LSB and measured LSB at 1 V step size ($\sim 10^6$ LSB).

MPOD Test Station

- MPOD communication to PC using USB-to-IP drivers debugged.
 - * Communication to MPOD's control board not established.
 - * MPOD crate did not seem to boot correctly and froze on power-up.
 - * WIENER contacted for assistance
 - Received recommendation to send control board in for diagnosis and repairs after their troubleshooting steps did not fix issue.
 - * WIENER shipping documentation for repair submitted.

DSG cRio Development

- Hardware design and layout of the signal and LV power system for the DSG cRio Development System chassis started.



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Antonioli, Mary Ann

- Discussed **cRIO test stand** code with Pablo; waiting on him to write a subVI to continue.
- Made final edits to **Note** 2018-01 and posted to website.

Bonneau, Peter

HDice

- Changed NMR base program for synchronization
 - ★ Modified program section that controls power supply communication from VISA based to GPIB.
 - ★ The HDice lab is currently using the GPIB-based program. The VISA version needs further debugging to use the Oxford Mercury IPS power supplies.
 - ★ Developed initialization routines for USB-based communication between theNMR base program and the current shunt.

SVT

- Worked with Pablo on the SVT Hardware Interlock System upgrades.
 - ★ Discussed testing of the delay trip timers and signal averaging in the interlock control logic.
 - ★ Debugged hardware interlocks control sub-routine. The actions taken during an interlock trip needed to be revised since the deletion of R4.

Magnets

- Met with Amanda, Pablo, and Tyler regarding issues encountered with the Torus and Solenoid magnets during the engineering run.
 - ★ The solenoid fast dump from full field (negative polarity) on 1/24/2018 was started by QD SUM1. Analysis of fast DAq data did not reveal any root cause of the QD trip. Magnet was re-cooled and ramped without incident.
- Worked with Mindy on the hardware design and layout of the signal and LV power system for the **DSG cRio Development** System chassis.
 - ★ Tested internal AC distribution and power supplies.
- Worked with Pablo on development of the National Instruments **cRIO test station**.
 - ★ The use of messaging for communication between a local user interface and cRio real-time program in LabVIEW was discussed.

Campero, Pablo

Magnets

- Monitored Solenoid and Torus magnet on a daily bases through EPICS screens, Mya Archiver and posted logbooks.
 - ★ On 01/24/18 Solenoid had a fast dump due to QD1_Sum, unknown reason for VTs increments when solenoid was at full negative current (- 2416A)
 - ★ On 01/29/18 QD delay trip thresholds were increased.
 - ★ Cascading PID loop controls added to improve cryogenics recovery for the solenoid.

SVT

- With Peter tested SVT Hardware Interlock System upgrades.



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- * Latest developmental Interlock LabVIEW program V61 was corrupted and got unavailable to be run.
- * Generated V62. to test the delay trips and averaging features implemented on the program.
- Worked with Peter on development of communication between User Interface and Real-Time for the **cRIO test station.**
 - * Began the implementation of messaging feature to the cRIO test station project.
 - * Generated 1st version of User Interface LabVIEW for the cRIO Test Station
 - Added logic to handle the events during communication with the real-time
 - Implemented loop to send commands to the Real-time program.
 - * Troubleshooting communication errors to set up connections properly.
- With Mary Ann and Amrit discussed Integral Nonlinearity (INL) ADC test to be performed in the **cRIO Test Station.**
 - * Analyzed INL testing options for ADC module NI 9207 with a resolution of 24 bit
 - Ideal LSB $\sim 1.19 [\mu V]$ generates $\sim 16 \cdot 10^6$ transitions. If the test is performed for each transition the time will be extended for 38 days, considering 200 [ms] per transition.
 - Agreed to reduce number of transition considered for the test by checking the differential between ideal LSB and measured LSB at 1 V step size ($\sim 10^6$ LSB).

Eng. Brian

Magnets

- Supported magnets after controlled ramp down and fast dump events.
 - * Solenoid fast dumped: <https://logbooks.jlab.org/entry/3519932>
 - * Torus went into controlled ramp: <https://logbooks.jlab.org/entry/3519937>
- Made web page that uses Javascript to convert PLC SOE tags to timestamps and sorts them: <https://userweb.jlab.org/~beng/SOE.html>

SVT

- Installed MFC and re-added to gas system: <https://logbooks.jlab.org/entry/3523230>
- Debugged e-log issues, sometimes plots don't get added and the plots lost axis labels and titles.
 - * Plots have been fixed, waiting on beam down time to test. Still not sure about NFS issues yet.
- Attended slow controls meeting and discussed possible changes to actions when PXI communications are lost, current spare status.
- Completed GEN150 Annual Property Custodian training and property validation.



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Hoebel, Amanda

DC

- Recalibrated TCUs with Marc.
 - * TCU1 did not drift since recalibrated 10/17.
 - * TCU2 drifted and had to be recalibrated.
- Took measurements with 75/25 mix of Argon/CO₂ for calibration curve.

ET

- Reviewed LabVIEW interlocks program.

Jacobs, George

Gas Systems

- Created RTPC-Mixing-01-24-2018 P&I diagram and Components spreadsheet
- Leak checked S5 LTCC piping connection for bubbler and bubblers
- Ordered CO2 for DC and HTCC

Leffel, Mindy

RICH

- Completed wiring for second cRIO chassis

HDICE

- Started fabricating cable for second rack.
 - * Soldered adapters on connectors, four SMA and four N panel mount.
 - * Fabricated two cables with SMA and N terminations.
- Completed physics division work governance training.

Lemon, Tyler

RICH

- Developed remote monitoring program in LabVIEW for N2 cRIO sensors.
 - * Program uses network shared variables on N2 cRIO to monitor sensor values.
 - * Program calculates average and standard deviation for each sensor using a user-defined number of samples.
 - * Results are displayed in a table and plotted in a graph on front panel of VI.
- Wrote program in Python that uses archived data to calculate average, standard deviation, maximum value, and minimum value for N2 Volume humidity sensors.
 - * Program written to verify calculation results of LabVIEW program.
 - * Results for January 23, 2018 to January 30, 2018 in table below.
 - * Note: Humidity 2, 16, and 7 are zero because of very low humidity and proximity to nitrogen inlet lines.



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 - * Could not establish communication to MPOD's control board.
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 - * Contacted WIENER for assistance
 - Received recommendation to send control board in for diagnosis and repairs after their troubleshooting steps did not fix issue.
 - * WIENER shipping documentation for repair submitted.

McMullen, Marc

LTCC

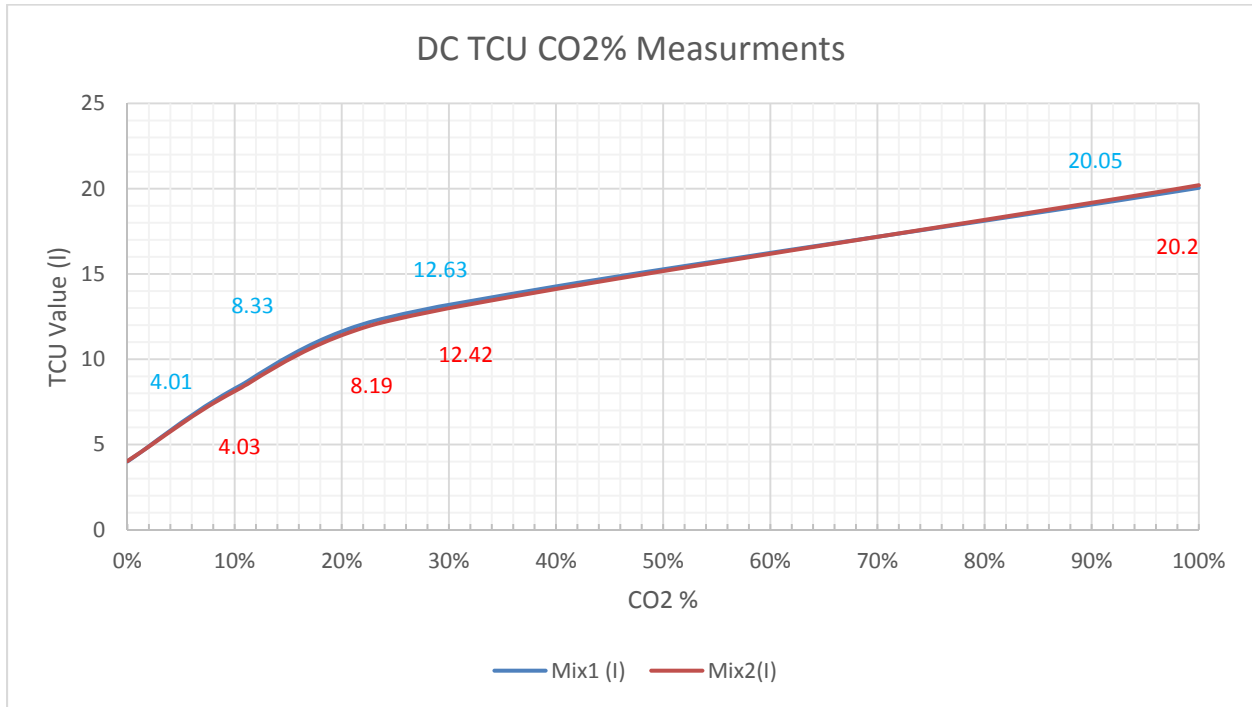
- LTCC filling with C₄F₁₀
 - * Pressure at 2.11 [inH₂O] as of January 30, 2018.
 - * Steady state flow at 0.065[slpm]
- With George used V.O.C sniffer to checked leak in the gas supply connections
 - * Noticed small leak < 1[oz./year] which was eliminated after tightening the connections.

DC

- With Amanda zeroed and spanned TCUs.
 - * Mix 1 TCU measured and noticed that it did not need zero.
 - * Mix 2 TCU measured ~ 3.08 [mA] at 0 [%] CO₂. After adjustment of zero Mix 2 measured ~ 4.03 [mA] (after adjustments potentiometer went worse)
 - * Span of Mix 1 and 2 measured 20.05 [mA] and 20.2 [mA] respectively.

CO ₂ [%]	Mix1 Current [mA]	Mix2 Current [mA]
0	4.01	4.03
10.20%	8.33	8.19
25.50%	12.63	12.42
100%	20.05	20.2

Table shows measured TCU's current at different percentages of CO₂ standard samples.



Measured TCU's current [mA] vs % of CO2 measured at Mix Tank Buffer. It shows currently that buffer tank volume is very close to the 10.2% standard.

Mix Name	Time [hh:min]	Current [mA]	Voltage [V]	Comments
mix 1	11:17	8.08	2.54	mix volume sample, Switch to tank
Mix1_tank	11:53	8.65	2.923	Tank sample
Mix1_tank	13:57	8:36	2.72	Tank sample, switch to premix
10.2% premix	14:20	8.38	2.74	Premix

