Detector Support Group
Weekly Report, 2016-11-30

Ongoing Projects

Magnet Control System

- LabView-controls-program for Torus and Solenoid uploaded to Github.
- PLC programming for the Solenoid continuing.
  - ★ Expecting information to continue programming from the magnet group by 12/2/16.
    1. Calibration data for temperature sensor that will be used in the Cryocon unit.
    2. Power on and establishing Ethernet connection for the three Cryocon units, need to download the calibration data.
    3. Mapping (layout) with the locations of temperature sensors in Solenoid Cryocon #3.
    4. Solenoid Voltage Tap Calculation for the Comparators.
    5. Define Process Variable (PV_Array) that will be shared between DBX-Torus-Solenoid.
    6. Formula to be used to calculate the He_Liquid_Level tank in percent based on DP measurements for Lead reservoir
    7. Formula to be used to calculate the He_Liquid_Level tank in percent based on DP measurements for Magnet reservoir.
    8. Need model and specs of the heaters HTR-8620 (Lead Heater Reservoir) and HT 8672 to confirm scale factor and read voltage and current and to make calculations for the output signal.
    9. Max engineering units limit to be implemented for heater HTR 8620 and HT 8672. Will we use them as the Torus does?
    10. The Solenoid vacuum system requires implementation of timer delays to avoid spoiling vacuum readings. How long is it for the Torus?
    11. Threshold limits for process variables that are part of the Magnet Interlocks need to be defined.

  Information was requested four weeks ago!
- For the Excitation Box, unable to get the **electrical schematic** and **FPGA program**. **Important items to have, since DSG is expected to provide long term support.**

Gas System

- **LTCC** pressure system grandfathered because it was previously in use for 15 years; design authority Dave Kashy
- **DC** system being evaluated by Dave Kashy.
  - ★ Upon receiving approval for valves, gas will be ordered.
    - Expect to receive approval for valves by 12/15/16.
    - Expect to receive gas by 1st week of Jan. 2017.

Appears that the pressure system safety rules have become so complex that approval and course of action depends on the *interpretation of the rules* by the DA.

SVT

- Repaired and put together.

DC

- Last R3 moved to hall.

Antonioli, Mary Ann
- Made Visio flowcharts of software for **HDice** RF Switching/Attenuation Unit.
  - ✦ Switch-type test, remote-interlock test, attenuator test, key test.
- Made Visio flowchart of overall **HDice** IBC pump cart software.
- Drew **Torus** voltage taps diagram in Visio.

Arslan, Sahin
SVT
- Moved various SVT items from Saptarshi's office.
- For R3:
  - ✦ added ambient sensor board in L1C area on bottom of inner support tube.
  - ✦ added two gas lines (top, bottom) ending in L1C area.
  - ✦ filled cable slots at flange with foam to provide extra protection against humidity.
  - ✦ closed openings between upstream end of Faraday cage and cold plate with foam.
  - ✦ replaced peeling black tape at downstream end of Faraday cage and secured it with narrow pieces of scotch tape to protect against peeling.
  - ✦ ensured ground wires not in way of R4 integration.
  - ✦ reinserted gas line to R3, which was pulled off barrel while securing cables to tube.
  - ✦ mounted drip pan over R3.
  - ✦ attached drip line to drip pan.
- For R4:
  - ✦ integrated R4 over R1–3.
  - ✦ attached cooling lines.
  - ✦ replaced peeling black tape at downstream end of Faraday cage and secured it with narrow pieces of scotch tape to protect against peeling.
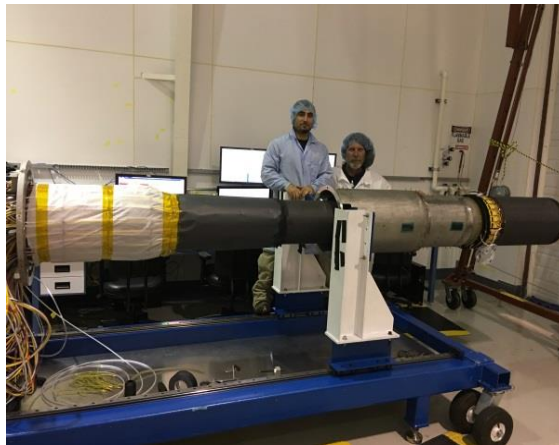
Sahin Arslan and Todd Ewing with repaired SVT

HDice
- Attended meetings concerning pump cart de-wiring and pre job walkthrough.
DC
- Helped with DC movement in cleanroom.

Bonneau, Peter
Magnet Systems
- Working with Pablo Campero and Tyler Lemon on development of Solenoid magnet programming and instrumentation.
  - Analyzed PID loops needed for implementation of interlocks and cooldown procedure.
  - Investigated issues regarding Cryocon temperature monitors.
    - Unit displays clipping error message, which can be caused by incorrect grounding, sensor connections, and/or instrumentation programming.
  - Evaluated PLC programming for signals that require time-averaging, such as temperature-based cooldown interlocks.
  - Reviewed PLC programming regarding value control and position readback.
- Monitored and analyzed data from Torus instrumentation and cryogenic system status via EPICS while parked at 80 K.
  - Magnet recovered from brief weekend ESR outage without operator intervention.

Forward Tagger
- FT Hardware Interlock System.
  - CAEN HV cable interlock interface completed.
  - cRIO processor installed into chassis.
  - cRIO issued Hall B IP address.

HDice
- Worked with Amanda Hoebel on debug, test, and documentation of NMR instrumentation and IBC pump cart.
  - cRIO processor replacement completed, works properly.
  - RF box replaced due to intermittent errors on front panel LCD.
  - Received quote from CAENels for second CT-box and forwarded it to HDice mailing list.

Campero, Pablo
Magnet
- Worked on Solenoid Vacuum System.
  - Defined vacuum gauge CG8606 to monitor and generate controlled ramp down in case of bad vacuum.
  - Modified Vacuum_Calculation Routine to properly read vacuum gauges.
  - Modified Vacuum Routine to set up maximum vacuum degradation limit at any value greater than 8*10-5 Torr.
  - Modified Vacuum_Rate Routine to calculate vacuum rate in time intervals of 1 min, 10 min, and 10 hour. In progress.
  - Wrote code to interlock vacuum system by closing supply valves.
- Worked on Solenoid magnet PLC programming and on Solenoid cryogenics instrumentation.
  - Updated Solenoid DBX PID with needed PID control loops.
  - Modified Cryo program to calculated Helium Max, Min and differential Cold Mass temperatures.

* ✦ Modified PLC code to send and read temperature sensors from three Cryocon temperature monitoring units.
  * ✦ Defined portion of logic that will be made in DBX PLC controller, since some Solenoid cryogenics processes needs to take action over some process variables that are involved in DBX to interlock its system.
  * ✦ Modified DP_to_Liquid_Level program to calculate Helium liquid level in tanks for Solenoid Service Tower.
    * ▪ Cryo group provided formula to make calculations.
    * ▪ Confirmed heights (Liquid He levels) for Magnet and Lead Reservoirs.
  * ✦ Began to modify PLC code to calculate Cooldown rate in Solenoid cryogenics process.
* Worked with Tyler on Voltage Injection Test Solenoid.
  * ✦ Modified star position for array in Voltage_Tap PLCprogram that reads data from cRIO Fast_sol_DAQ.
  * ✦ Injected 1 V and 200 mV in each channel 1–20 of Solenoid voltage tap panel.
  * ✦ Checked correct scale factor implemented in some channels.
  * ✦ VT6 and VT20 seem to have noise about 40 mV.
  * ✦ cRIO and EPICs tests were performed and pictures taken of screens for behavior of each individual signal.
* Modified Solenoid Sequence Of Events (SOE) program
  * ✦ Configured module and channels to sort timestamp of events.
  * ✦ Added comments to sections of code.
  * ✦ Discussed with Peter Bonneau about implementations of time stamps for interlock status.
* Modified MPS_Control program for Solenoid magnet power supply.
* Monitored and used EPICs screen for FAST_DAq live system for Solenoid magnet.
* Monitored and used EPICs screen for the Solenoid magnet.
  * ✦ Seven new screens were added, for Vacuum systems, Fast_Daq, DAQ_Live, MPS, Helium Temperatures, Load Cells and Analyzer. They are still under development.

Eng, Brian
Magnet

* Attended meetings to discuss software development version control, changes to go on GitHub.
* Looked over MPS EPICS screen for Ruben just to verify wording of functionality.
* Worked with Tyler on getting Fast DAQ cRIO code on GitHub; releases done for Solenoid.
* Also did a release for Solenoid LV cRIO, to match what was deployed before I stopped working on it.

SVT

* With Sahin Arslan, recovered from coolant leak when R4 was disconnected (need another valve installed if want to properly isolate it from R1-3).
* Logbook script broke; compiling ROOT6 from source seems to have fixed it.

- Working on backing up calibration data from clonfs work partition and deleting image files as drive was full; currently ~86% .
  - ✦ Initially doing this manually, but since there's ~5 K scans left to check, started working on script to automate checking (verify files are on raid backup before deleting them from work partition).

Gas System

- Updated list of existing EPICS PVs.
- Worked with Wesley to add remaining missing PVs to CSS screen, also added them to cRIO. Tested that CSS was updating properly and that alarms worked.

Hoebel, Amanda

HDice

- Troubleshooting NMR program.
  - ✦ Field reading 0.0399 T instead of 0.0400 T.
  - ✦ Integer 2 in calculation needed to be 2.0000.
- Replaced, with Mindy's assistance, RF box because LCD screen was not working.
- Troubleshooting RF box screen with Mary Ann.
  - ✦ Ribbon cable sends signals.
  - ✦ Leaving box and screen on to see if screen blanks again.
- Scheduled and attended safety meeting for discussion of work on IBC pump cart.
- Replaced cRIO in IBC pump cart; pumps work as expected with new cRIO.
- Sketched flow chart of IBC front panel LabVIEW VI for all instrumentation.

Jacobs, George

DC

- Discussions with Mac Mestayer about gas system operation critical path.
- Meetings with Dave Kashy on gas pressure system considerations.
- Researched gas supply pressure regulator specs for DA, Fairchild model 10.
- Discussions with Volker B on gas system critical path.

RICH

- Meeting with Dave Meekins about pressure system requirements for gas systems.
- Developed plan for gas system valve panel modifications to conform to pressure system requirement. Purchased gas system components and started replacing valve panel components.

GAS Systems

- Ordered gas for wire test stand in EEL Rm. 124.
- Ordered N_2 gas for SVT purge in EEL Rm. 124.
- Requested and received quote for replacing HTCC MFC with rotameter and MFM.
- Estimated cost of switching gas used from N_2 to CO_2 for HTCC in TEDF.
- Sent Ken Livingston spreadsheet with gas system signals for archiving and alarms.
- Provided FT group with a rotameter recommendation for calorimeter.
- Discussions and meetings with Dave Kashy on pressure system requirements for the Wire Test Stand (WTS) gas mixing system.
- Added a 0-1000 torr absolute Baratron to Argon supply just upstream of MFC for WTS.

- Ordered 0-15 psig pressure regulator for WTS CO_2 gas supply.
- Performed flow vs pressure test on MKS 1179A MFC used for WTS.

- Performed monthly safety inspection of Hall B gas shed.
- Placed PR for new gas contract bid process as per SCO (SOTR).
- Signed SOTR agreement for new gas contract.

Leffel, Mindy
- Worked with Tyler grounding **Magnet** Cryocon sensors.
- Fabricated 15-pin, D-sub, PID chassis cable for **HTCC**.

DC
- Accommodating work request from Fast Electronics Group, working with Mark Taylor.
  - ✦ Finished installing HV distribution boxes.
  - ✦ Continued labeling boxes.
  - ✦ Continued hooking up signal cables.

HDice
- Made replacement, BNC – N, RF cable for NMR rack.
- Pump cart.
  - ✦ Meeting with Amanda Hoebel, Peter Bonneau, and Sahin Arslan to determine configuration of equipment and how to proceed with wiring diagram.
  - ✦ Attended meeting to determine safety procedures for disassembling pump cart.
  - ✦ Worked with Amanda Hoebel to replace RF Attenuation/Switching Unit.
  - ✦ Worked with Amanda Hoebel and Sahin Arslan to replace cRIO.

Lemon, Tyler

Torus
- Added six new PT100s located in Torus relief valves into LV excitation chassis' LabVIEW code.
  - ✦ Additional information is needed on PT100 serial numbers; LabVIEW code has been modified to allow for serial numbers to be easily added.

Solenoid
- Performed Fast-DAq communication check with Pablo.
  - ✦ Injected voltage into all twenty voltage taps to confirm correct communication between Fast-DAq cRIO and PLC and between Fast-DAq cRIO and EPICS.
  - ✦ Two voltage injection tests: 1 V DC and 1 V AC at 10 Hz.
  - ✦ All tests were successful; able to see injected voltage via cRIO, PLC, and EPICS.
- Resolved Fast-DAq cRIO indexing error.
  - ✦ Spreadsheet used to correlate cRIO inputs to Voltage Taps incorrect causing incorrect data to be sent to PLC and EPICS.
  - ✦ Used corrected spreadsheet to fix indexing in LabVIEW VI.
- Debugged and resolved Fast-DAq LabVIEW VI deployment issue.
  - ✦ Could not run Fast-DAq LabVIEW VI from local PC in Hall B (Local-PC); had to run VI via remote log-in to PC (Remote-PC) in TEDF building.

- ★ Local-PC did not have Waveform Library required for FPGA communication: reinstalled library in correct directory.
  - ★ Copied library to Local-PC; VI can now *sometimes* be deployed from Local-PC.
  - ★ VI deployment works intermittently from Local-PC; other drivers may need installing.
- Added EPICS PVs for VT21_DAq data to Solenoid Fast-DAq.
- Created GitHub repositories for Solenoid Fast-DAq VIs and Torus Fast-DAq VIs.
- Debugging Cryo-con "clip" error.
  - ★ "Clip" error yet to be resolved.
  - ★ In past, Cryo-con units display "..*clip*." for Cernox RTDs temperature readouts.
  - ★ Attempted to replicate "clip" error using test adapter with resistors to simulate two Cernox sensors
  - ★ Could not cause "clip" error unless test adapter was partially unplugged or completely removed.
  - ★ Added ground reference to Cryo-con with Mindy by connecting back plane of Cryo-con unit to rack with ground wire; did not resolve issue.
  - ★ Discussed with Peter other grounding solution: sensor cable shielding should be grounded to a single point.

McMullen, Marc
Gas System
DC

- Secured all gas supplies from gas shed and in EEL clean room with Brian Eng. Waiting for design authority's approval to reconnect systems and flow gas.
- Fabricated one absolute value pressure transducer cable and one mass flow controller cable with Leffel. Cables will be used to help design authority determine C/V of mass flow controller by flowing gas through transducer.

RICH

- Met with Dave Meekins (design authority), Brian Eng, and George Jacobs to discuss corrective steps for associated pressure systems.
- Reviewed detector assembly document in order to start TOSP document for assembling the detector body.
  - ★ Document will not cover installation of electronics, as procedure has not been written by INFN.
  - ★ Wrote THA for detector assembly.

HDice

- DSG members (Leffel, Hoebel, Sahin Arslan, and Marc McMullen) met with EH&S staff (Bert Manzlak and Todd Kujawa) on securing electrical power to pump cart.
  - ★ Lock-out procedure was defined.

HTCC

- Worked with George Jacobs and Brian Eng on improvements to gas supply to mitigate issues associated with power outages.