



Detector Support Group

Weekly Report, 2016-12-07

Status of Projects

Magnet Control System

Solenoid

Estimated date of completion of solenoid PLC programming 12/22/16.

- Investigated issues associated with the Cryo-con temperature monitors.
 - * Discovered incorrect instrumentation grounding of Torus Cryo-con connections.
 - * *Cable shield was not grounded and connection from patch panel to instrumentation was not shielded properly.*
 - Poor shielding can cause a clipping error, which has been seen on temperature monitors.
 - * *No grounding schematic available.*
- Investigated solenoid Helium tank heater instrumentation, interlocking, and PLC programming.
 - * *Incorrect documentation from Magnet Group delayed development of the remote programming interface for tank heaters.*
 - Power supplies use a **current loop** for setting voltage and current for heaters. However, voltage interface on power supply was given on provided instrument documentation.
- Researched model and specifications of power supply needed for He tank heaters.
 - * Found model with special feature (4-20 mA) current output, which will be used as monitoring signal by the PLC controller.
- Verified accuracy of wiring and control drawings that were updated.
- Upgraded solenoid's NI cRIO processor to LabVIEW 2016.
- Wrote *DP_to_Liquid_Level*, *Cryo_Interlock*, and *cPID_Calls* PLC routines.
- Configured PLC I/O analog and digital modules.
- Assigned max and min engineering units according to ranges for each signal that will be used in heaters control.
- Wrote PLC code to control and monitor Helium tank heaters.
- Based on solenoid voltage tap drawing, made schematic of the 20 voltage taps that will be used to measure voltages in the solenoid.
- Generated spreadsheet with PLC tag names used for software comparators (COMP1 to COMP10) and voltage tap combinations (V1 to V15).
- Modified comparators for the *Magnet Calculation* PLC program.
- Made schedule including details of time and percentage of work completed for the Solenoid PLC program.
- Updated GitHub with latest production version PLC program.
- Added shared variables to LV cRIO to monitor CPU Usage and cRIO Uptime.
- Enabled monitoring without connecting to cRIO via NI Distribution Manager.

TORUS

- Moved voltage tap scaling (for Torus) to FPGA VI for Fast-Daq.



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Gas System

- Replaced and modified components on RICH gas panel, as per design authority's instructions.
- Leak-checking LTCC valve panel, corrected scaling factor for Omega pressure readouts.
- Updated SVT EEL cRIO code to add watchdog on EPICS heartbeat PV; if have errors (i.e. connection down) for one minute then reboot controller.

SVT

- Connected R4 Slow Controls and LV cables to crate/patch panel side.
- Rerouted network cable and cooling tubing *to not go through the gantry* so that the gantry could be moved if need be.

DC

- Work started on DC Arg/CO₂ gas supply panel in Hall B gas shed.
 - ★ Modifying gas lines and taking out unnecessary components as per design authority's instructions.

Forward Tagger

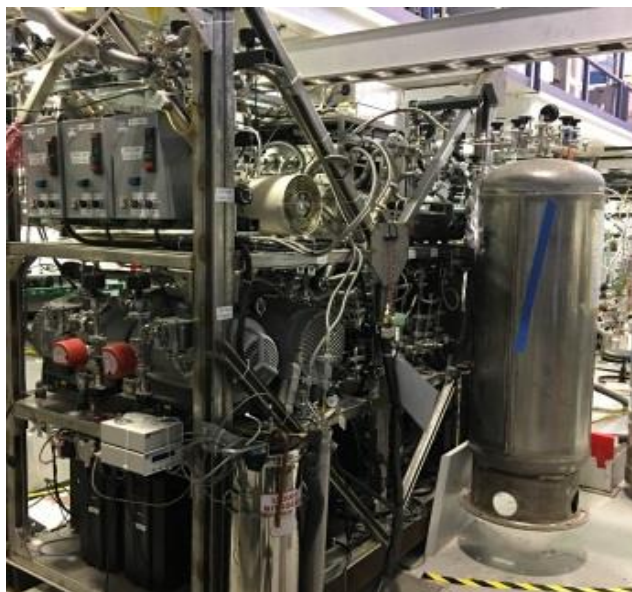
- Upgraded cRIO to LabVIEW 2016 and tested with modified SVT hardware interlock code.

LTCC

- Started N₂ gas flow using gas controls system for detector leak testing.

HDice

- Debugging, testing, and documenting NMR LabVIEW code and instrumentation.
- Working on AutoCAD wiring diagram for pump cart.



Believe it or not, this million dollar In Beam Cryostat's pump cart has no wiring diagram!



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Antonioli, Mary Ann

HDice

- Discussed project requirements of updating NMR code with Peter and identified areas that need changes.
- Made new version of “read module name” sub-VI (without VISA open and close) and used sub-VI to re-write code in four areas of NMR program.
- Continued drawing flowcharts of In Beam Cryostat (IBC) cart. Requested more specific information from Amanda to complete.
- Made edits to RF Attenuation/Switching Unit flowcharts.
- Changed website photo.
- Compiled, formatted, and edited weekly report.

Arslan, Sahin

- Replaced and modified components on RICH gas panel.
- Working with Mindy on DC Ar/CO₂ gas supply panel in Hall B gas shed, modifying gas lines and taking out unnecessary components.
- Leak-checked LTCC valve panel and MFCs. Added oil to bubblers for three sectors.

HDice

- Attend meetings on pump cart lock and tag out process presented by Tod Kujawa.
- Located and locked out sources of energy to pump cart. Turned off all UPSs and locked out their batteries and power cord, along with two 208 V heaters and roots pump. Identified connections to UPS1-2-3-4.
- Working on AutoCAD wiring diagram for pump cart.
- Organized cabinets in clean room to allow room for RICH assembly.

Bonneau, Peter

Magnet Systems

- Working with Pablo and Tyler on Solenoid magnet programming and instrumentation.
 - ★ Researched issues regarding Cryo-con temperature monitors. Incorrect cable / instrumentation ground was discovered on Torus Cryo-con connections. Cable shield was not grounded and connection from patch panel to instrumentation was not shielded properly. This can cause a clipping error, which has been seen on temperature monitors.
 - ★ Solenoid tank heater instrumentation, interlocking, and PLC programming was evaluated. Incorrect documentation from Magnet Group resulted in delay in remote programming interface for tank heaters. Power supplies use a current loop for setting voltage and current for heaters. Voltage interface on power supply was given on provided instrument documentation.
 - ★ Worked with Tyler on upgrade to LabVIEW 2016 of system software for NI cRIO processor for Solenoid.
- Monitored and analyzed data from Torus instrumentation and cryogenic system status via EPICS while parked at 80 K, until re-cool down for KPP run.



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Forward Tagger

- Upgraded cRIO to LabVIEW 2016 and tested with modified SVT hardware interlock code.
- MKS mass flow meter transducer has not been received by INFN.

HDice

- Worked with Amanda on debug, test, and documentation of NMR LabVIEW code and instrumentation.
 - * Analyzed original Fast Scanner LabVIEW program. Commands that control coax switch in RF box need to be checked since hardware control has changed in box since program was last used on HDice.
 - * Provided analysis and comments on rack test status report.
 - * Received from CAENels firmware modification to CT-Box to allow triggering using oscilloscope mode.
- Worked with Mary Ann on upgrade of DIO drivers in NMR program.

Campero, Pablo

Magnet

- Worked on Solenoid cryogenics PLC programming and instrumentation.
 - * Completed modifications to *DP_to_Liquid_Level* routine.
 - * Completed *Cryo_Interlock* routine that is based on control max limits for bad vacuum.
- Worked with Peter on Solenoid heater control used in lead and magnet reservoirs.
 - * Researched model and specs for power supply heaters. Found that model has a special feature (4-20 mA), which is used as a monitor output signal and will be used for PLC controller.
 - * Verified accuracy of wiring and control drawings that were updated last week.
 - * Configured PLC I/O analog and digital modules, assigning max and min engineering units according to ranges for each signal that will be involve in heaters control.
 - * Wrote code to control and monitor heaters.
- Modified Solenoid *cPID_Calls* program.
 - * Added heaters' signals to implement PID control over heaters.
 - * Added comments to clarify routine.
- Working on Solenoid calculations.
 - * Based on Solenoid voltage tap drawing, made schematic of the 20 voltage taps used to measure Solenoid.
 - * Generated spreadsheet with PLC tag names used for software comparators (COMP1 to COMP10) and voltage tap combinations (V1 to V15).
 - * Completed modification for Magnet Calculation PLC program.
- Made schedule including details of time and percentage completed for each program and subroutine that involves Solenoid PLC program.
- Updated GitHub with latest production version program under development.
- Monitored and used EPICs screen for Solenoid and Torus magnets.



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Eng, Brian

- Attended CLAS12 Subsystems portion of ERR.
- Reconnected power and networking to MVT rack in EEL/124 and made sure network was operational so they could do remote tests on SC software.

SVT

- Participated in survey of R4.
- Connected R4 SC and LV to crate/patch panel side.
- Rerouted network cable and cooling tubing to not go through the gantry so it could be moved if need be.

Gas System

- Leak-checking LTCC valve panel, corrected scaling factor for Omega pressure readouts.
- Updated SVT EEL cRIO code to add watchdog on EPICS heartbeat PV; if have errors (i.e. connection down) for 1 minute then reboot controller.

Hoebel, Amanda

HDice

- Debugged one change in RF code of NMR program with Mary Ann.
- Screen on replaced RF box went blank so replaced RS232-to-USB com box.
- Worked on In Beam Cryostat (IBC) pump cart wiring diagram with Mindy and Sahin.
 - * Obtained LTT locks.
 - * Listed instrumentation powered to UPS1-4.

Jacobs, George

DC

- Discussions with Mac Mestayer about gas system operation critical path prior to KPP.
- Meeting with Bob Miller on routing lines for TORUS manifolds.
- Walk-through with Dave Kashy in gas shed to formulate plan to bring gas system into pressure system compliance.
- Began gas piping modifications in gas shed to bring system into compliance with pressure system requirements.

RICH

- Continued replacing valve panel components to comply with DA requirements.
- Purchased gas system components via e-commerce to comply with DA requirements.

GAS Systems

- Discussions and meetings with Dave Kashy on pressure system requirements for Wire Test Stand (WTS) gas mixing system and N₂ purge systems.
- Updated WTS P&I diagram with orifices and relief valves.
- Contacted Okeefe Controls about orifice purchase.
- Contacted Aquatrol Valve about relief valve purchase.
- Ordered relief valves and orifices for WTC, FT, and SVT gas supplies in EEL.
- Ordered and received new CO₂ pressure regulator for WTC.

LTCC

- Leak-checking started. All sectors leak to a greater or lesser extent.



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Leffel, Mindy

DC

- Worked Sahin and George modifying and installing components on the Argon CO2 supply panel.
- Continued working with M. Taylor in Hall.
 - * Hooking up signal cables.
 - * Labeling HV distribution boxes.
 - * Disassembling original HV cables for modification and reuse.

HDICE

- In Beam Cryostat (IBC) Pump cart.
 - * Attended several meetings to discuss lock, tag and try (LTT).
 - * Worked with Sahin identifying items on Mike Lowry's list.
 - * Worked with Amanda and Sahin establishing equipment connected to all four power supplies.

Lemon, Tyler

Solenoid

- Moved voltage tap scaling to FPGA VI for Fast-Daq.
 - * Scaling originally done in Real Time VI on cRIO.
 - * Move to FPGA allows for better data acquisition if more voltage taps are added and allows Real Time VI wiring to be neater.
 - * Program needs to be tested before final deployment and use on Fast-Daq cRIO.
- Updated Fast-Daq cRIO and VIs from LabVIEW 2014 to LabVIEW 2016.
 - * cRIO firmware and base software updated.
 - * Recompiled VIs in LabVIEW 2016, set as startup, and deployed to cRIO.
- Added shared variables to Solenoid LV cRIO.
 - * For monitoring of cRIO CPU Usage and cRIO Uptime.
 - * Enable monitoring without connecting to cRIO via NI Distribution Manager.
- Program needs to be tested before final deployment and use on LV cRIO.
- Discussed Cryo-con unit grounding solution.
 - * Cryo-con units were not grounded.
 - * Initial solution executed last week: add grounding wire from Cryo-con to rack.
 - * New solution to be executed: replace sensor cables from terminal block to Cryo-con with shielded, twisted pair cables that are grounded at terminal block.

McMullen, Marc

Hall B

Gas System

- Conducted multiple energy source lock-out procedure for HDice.
 - * Completed LTT multiple energy source form.
 - * Went over procedure with DSG electrical workers and HDice management.
- Started LTCC N₂ gas flow with Brian Eng, using gas controls system for detector leak testing.
 - * System leaks found on sectors 1,2,3,4,and 6.

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Monitoring LTCC pressure and flow.



LTCC filled with N_2 .



Adjusting parameters on Omega process controller.

- Continued work on RICH TOSP for detector assembly.
- Modified DC mass flow controller cable to be used for flow coefficient test.