Detector Support Group

Weekly Report, 2017-06-07

Status

Solenoid

- Option to enter set point values for flow rates in vapor cooled leads A and B written and tested.
- Circuit diagram to calculate current in *Dump Resistor* verified.
- Formulas to relate resistance to estimate temperature analyzed.
- PLC code for Solenoid and Torus magnets verified.
  - ✶ Found *EPICS_Watchdog fail* is not an interlock for Torus or Solenoid.
- Updates on Solenoid PLC code made to solve issues with EPICS screens tested.

RICH

- User Interface LabVIEW program completed.
- Procedure reviewed to implement NI work-around solution for loss of communication with EPICS.
- Hardware Interlock System CSS screen updated to include EPICS control status indicator and indicator color changes.
- Electronics “dark box” testing will use SVT R4 cover.

FT

- System Monitoring and Expert Control Setting tabs on GUI for EPICS hardware monitoring system created.
- Installation, testing, and debug of interlock system performed.
- EPICS GUI interface for client CLAS12 PV signal names programmed.
- Two humidity sensor cables and various other cables fabricated.
- Two cables incorrectly wired from FT group repaired.
- Hardware interlock system ready for FT group to test.

SVT

- Region 4 removed.
- Data and pulser cables rearranged.
- MVT integrated with SVT.

Gas System

- Purge lines for eCal installed for 4 sectors.
  - ✶ Crane operator required for remaining 2 sectors.

Hall D

- PXI communication errors debugged.
  - ✶ Started working again after multiple reboots.
- Newly repaired and calibrated solenoid GHe mass flow controllers installed and tested on upstream and downstream VCLs.
- Temperature in BCAL chillers increased to 18 °C on 06/06/17.

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Antonioli, Mary Ann

FT

- Using CS Studio, created cRIO System Monitoring and Expert Control Setting tabs on GUI for EPICS hardware monitoring system.
  - ✶ Created EPICS names for signals read on tab.
  - ✶ Assigned signal names to CS Studio objects.
- Began AutoCAD wiring diagram of cRIO chassis.
  - ✶ Drew chassis and components.
  - ✶ Most of power system, temperature, and humidity completed.

Arslan, Sahin

Absent

Bonneau, Peter

- Worked with Amanda, Tyler, and Pablo on EPICS interface for **RICH** real-time program, reviewing procedure to implement NI work-around solution for loss of communication with EPICS.

Forward Tagger Interlock System.

- Worked with Amanda on installation, testing, and debug of interlock system in EEL.
  - ✶ Programmed calorimeter chiller to accept input pump disable signal from interlock system. Programmed chiller output analog interface to provide pump pressure and status to NI ADC.
  - ✶ Tested interlock enable and threshold controls for calorimeter internal temperature and humidity sensors and N_2 MKS mass flow meter.
  - ✶ Programmed Mpod LV controller to accept individual channel enables for calorimeter and hodoscope.
  - ✶ Verified interlock system control of HV and LV supplies.
  - ✶ Tested HV to LV trip delay controls for calorimeter and hodoscope.
  - ✶ Tested threshold and enable controls for hodoscope temperature using temporary sensors. DSG has requested hodoscope temperature cable length from FT Group.
- Programmed CS-Studio EPICS GUI interface for client CLAS12 PV signal names.
- Developed and tested EPICS client interface and test program for FT Interlock System.
- Installed and tested work-around solution for loss of communication between EPICS and NI cRIO processor. Tested on both cRIO server and client modes.
- Worked with Mary Ann on programming of CSS signal monitoring tabs and wiring diagram for cRIO.
- Worked with Mindy on required cables.

- Held daily meeting on Hall D status and EPICS controls monitoring.
  - ✶ Newly repaired and calibrated solenoid GHe mass flow controllers were installed and tested on both upstream and downstream VCLs. Controllers were set to final configuration of 31.15 SLPM.

Campero, Pablo

Solenoid

- Wrote and tested PLC code to add option to enter set point values for flow rates in vapor cooled leads A and B.
- Discussed with Tyler and Probir calculations of new estimated temperatures that will be implemented for each coil.
  - ✶ Verified circuit diagram to calculate current in *Dump Resistor*.
  - ✶ Defined that voltage across *Dump Resistor* will be taken as voltage over whole magnet, which is voltage tap measurement for VT-20_DAQ.
  - ✶ Analyzed formulas to relate resistance to estimated temperature.
  - ✶ Defined five tag names that will be used to monitor these values in PLC and EPICS.
- Verified PLC code for Solenoid and Torus magnets and found that *EPICS_Watchdog fail* is not an interlock for Torus or Solenoid.
  - ✶ PLC logic for *EPICS_Watchdog fail* is disabled at this time.
- Tested updates on Solenoid PLC code that were made to solve issues with EPICS screens.
  - ✶ Load Cell, EM-Forces, Temperature Details, Hall Sensors and LHe-SST screens were fixed; mismatch on tag names and data type were solved.
  - ✶ Tested correct readback values on each screen.

RICH

- Completed User Interface LabVIEW program.
  - ✶ Wrote LabVIEW code to complete User Interface, Hardaware Interlock Event Handling, and Control Configuration loops.
  - ✶ Completed EPICS Interface to UI loop. Configured indicators to display updates on thresholds that will be entered from EPICS side to User Interface VI.
  - ✶ Debugged front panel view by organizing indicators and buttons in correct tabs and tables.

- Monitored and analyzed Logbook entries and EPICs screens daily.
  - ✶ On 6/6 noticed that temperature in the BCAL chillers increased to 18 °C.

Eng, Brian

SVT

- Removed R4, including all electronics.
- Rearranged data and pulser cables: https://logbooks.jlab.org/entry/3474885

MVT

- Integrated MVT with SVT.
- Swapped Ar bottle.
- Met with Bob and Stephan concerning gas mixing system. Equipment was removed to save costs. Bob is aware this will be less automated and therefore require more manual oversight.

Magnets

- Got a 325 K error (according to cRIO), but no corresponding spike in EPICS data. Will continue running either until we get a clear error and recovery or Hall B is ready to power on Torus (so we can deploy the real-time executable .

- Debugging **PXI** downtime with Tyler: https://logbooks.jlab.org/entry/3474459

Hoebel, Amanda

- De-cabled **SVT** electronics rack with Brian.
- Analyzed **LTCC** leakage rates.
  - ✶ Created histograms of fill times in Python.
  - ✶ Calculated average leakage in L/day for each sector.
  - ✶ Leakage rates based on flow similar to Brian's measurements.

LTCC Leak (in L/day)

	S1	S2	S3	S4	S5	S6	Total
Amanda	102.69	61.15	134.47	84.08	57.34	149.11	20609.54 L
Brian	112.54	51.59	125.8	54.01	43.52	139.89	18456.90 L

Leakage based on flow rates for 6 LTCC sectors from Python program compared to Brian's measurements, from 2017-04-25 to 2017-05-30, omitting 2017-05-10 and 2017-05-11.

FT

- Tested interlocks with Peter.
  - ✶ Confirmed functionality of sensor enables.
  - ✶ Verified interlock errors latched by system and checked reset function.
  - ✶ Checked trip threshold values for calorimeter temperature, humidity sensors, and gas flow.
  - ✶ Tested HV-LV trip delay.
  - ✶ Verified system turn-off of chiller pump.
- Added rules to EPICS interlock PV indicators.
  - ✶ Indicators are red when status trips.

Gas System

- Attended eCAL safety walkthrough.
- Ran gas lines for eCAL with Tyler, Mindy, and George.

- Monitored EPICS and logbook.
  - ✶ Two mass flow controllers repaired and re-installed for solenoid on 05/31/17.

Jacobs, George

No report received.

Leffel, Mindy

- Worked in hall B with Amanda, Tyler, and George running eCal **gas system** purge lines.

FT

- Contributed to chassis installation, setup, and testing.
  - ✶ Fabricated two humidity sensor cables and various other cables.
  - ✶ Repaired two cables incorrectly wired by FT.

HTCC

- Discussed repair of signal cable with Youri.
  - ✶ Started repair in hall B, could not finish, as was given incorrect connectors.
  - ✶ Located correct connectors and returned wrong ones to stockroom.

Lemon, Tyler

- Attended **Solenoid** Cooldown ERR dry run.
- Ran three **ECAL** gas lines with Mindy, Amanda, and George.
- Updated **RICH** Hardware Interlock System CSS screen.
  - ✶ Added indicator to show EPICS control status.
  - ✶ Added rules to blink sensor value indicators yellow and red if sensor is out of bounds.
  - ✶ Added rules to change sensor status color to yellow and display "disabled" if that sensor is disabled.
- Wrote program in Python to analyze **LTCC** gas leak data.
  - ✶ Program calculates gas leak using pressure drop, as follows:
    - Reads data from Excel sheet.
    - Finds "pressure decay periods" (periods less than 150 minutes with no flow).
    - Calculates leak rate using absolute pressure drop over pressure decay period.
    - Fits each pressure decay period's data to an exponential decay equation.
    - Calculates leak rate using pressure drop as given by fit results.
    - Generates histograms for all decay periods' leak rates, pressure drops, mean ambient pressure, and time interval.
  - ✶ Numerical results do not match what Brian has measured, but ranking from best to worst for results obtained using exponential decay fit match (Python results below).

Leak Rate from Pressure Decay

From 2017-04-25 17:04:16 to 2017-05-30 08:45:33*

Calculation Results Ordered Lowest to Highest Average Leak Rate

Sector	Average Leak Rate [L/Day]	Standard Deviation [L/Day]	Total Flow [L]
5	42.01	6.22	1455.65
2	42.06	8.16	1457.58
6	45.65	10.32	1582.04
4	45.83	15.38	1588.01
1	50.53	11.49	1751.16
3	52.62	15.03	1823.36

Fit Results Ordered Lowest to Highest Average Leak Rate

Sector	Average Leak Rate [L/Day]	Standard Deviation [L/Day]	Total Flow [L]
5	39.54	7.60	1370.35
2	40.54	10.53	1404.85
4	42.96	9.14	1488.86
6	44.25	11.33	1533.33
1	47.64	12.00	1650.73
3	50.23	14.86	1740.52

*2017-05-09 11:00:00 to 2017-05-11 19:00:00 skipped due to incorrect data from deadband experimentation.

- Debugged **Solenoid** PXI communication errors with Brian.
  - PXI was not sending data to EPICS and was not responding to pings.
  - No errors initially on console, but error received when PXI power-cycled.
  - Changed PXI to use static IP address.
  - Updated PXI software and LabVIEW program to LabVIEW 2016.
  - On later power-cycles, error remained or PXI self-rebooted into safe mode.
  - Was not able to start LabVIEW project consistently.
    - Start-up app would not deploy, but was able to deploy VI manually.
    - Able to restart program after opening VI in debug session, then stopping and starting VI after it froze during initialization.

McMullen, Marc

Absent