



## Detector Support Group

### Weekly Report, 2017-10-11

## Status

### Torus

- Problems with Cernox temperature sensors in the Low Voltage Chassis #4 solved.
  - \* Fuse blew in Q0131 card taking out all the Cernox sensors on chassis #4.
  - \* All Cernox temperature sensors back on-line after card was replaced.

### RICH

- Features updated for Hardware Interlock program.
  - \* Shared variable added to send HV-LV override status to EPICS.
  - \* Logic added to refresh EPICS PVs to prevent them from showing as disconnected on CS-Studio screen.
  - \* Calculation modified to convert voltage pressure transducer to pressure in psi.
  - \* Humidity sensor calculations modified to use look-up table for calibration constants.
- Reflectivity test station optics re-aligned due to relocation to EEL 121b.
- Air pressure and output air velocity calculated for the RICH E-Panel air cooling system.
  - \* Bernoulli's equation used to calculate:
    - The air output velocity ~ 7 m/s at one of the six outlet orifices (d =25 mm) of the E-Panel.
    - Pressure ~ 101,354 Pa (14.7 psi) inside the E-Panel.
    - $\Delta P$  between inside pressure and output pressure (atmosphere) ~ 30 Pa.
- Humidity decrease calculated for Nitrogen cooling system at max flow rate of 40 SLPM.
  - \* Volume of the RICH nitrogen purge ~ 5000 L.
  - \* Time to go from 50% humidity to 1% humidity is ~ 8 hr.
  - \* Time to fill RICH ~2 hr.
- Three cable bundles fabricated.
  - \* Each bundle has 4-wire RTD and 3-wire humidity sensor.

### HDIce

- Troubleshoot 1G error in power supply.
  - \* Power supply would display incorrect field value.
  - \* Problem was due to an incorrect text command for GPIB VI.

### FT

- Hardware installation and test procedure completed for the water detection instrumentation for FT Hardware Interlock System.

### SVT

- Hardware Interlock System updated.
  - \* Error checking real-time base code routines for water leak detectors developed.
  - \* Debug testing of real-time and user interface programs for the removal of region 4 instrumentation, threshold settings, and interlock control completed.
  - \* Twenty-seven EPICS interface sub-VIs that control and monitor system thresholds for temperature, humidity, and coolant flow completed.



## Detector Support Group

### Weekly Report, 2017-10-11

#### Gas Systems

- Flow-limiting orifice installed on HTCC gas supply.
- Admin lockout placed on HTCC CO<sub>2</sub> supply valve.
- CO<sub>2</sub> ordered for DC.
- TCUs calibrated and run on standard gas.
- LN<sub>2</sub> high pressure dewar ordered for RICH testing.



## Detector Support Group

### Weekly Report, 2017-10-11

#### Antonioli, Mary Ann

- Assisted Mindy with **RICH** cable fabrication.
  - \* Crimped ferrules.
  - \* Made three 4-cable, 65', bundles, attaching 1" pieces of heatshrink along the bundle to keep cables from tangling.
- On cRIO **test stand**, began adding subVI for reading one channel of NI-9207 module to overall test for reading all eight channels.
  - \* Researching combining all eight arrays from the eight channels into one array.
- Formatted and edited Brian's **Note**.
- Attended Workers Safety Committee meeting.
- As member of Workers Safety Committee, reviewed 17-page safety document.

#### Bonneau, Peter

##### Forward Tagger

- Completed hardware installation and test procedure for the water detection instrumentation for FT Hardware Interlock System.
  - \* Developed interface sub-vi's for EPICS water detection PV's.

##### HDice

- Worked with Amanda and Pablo on the NMR program refinements.
  - \* Investigation into ~ 1 gauss offset during NMR scans.
- To continue hardware work on NMR synchronization of the current shunt measurements, the instrumentation from Rack #1 is needed.

##### SVT

- Worked on SVT Hardware Interlock System.
  - \* Developed error checking real-time base code routines for water leak detectors.
  - \* Completed debug testing of real-time and user interface programs for the removal of region 4 instrumentation, threshold settings, and interlock control.
  - \* Completed 27 EPICS interface sub-VIs that control and monitor system thresholds for temperature, humidity, and coolant flow.
  - \* Started development of threshold configuration file control library.

##### RICH

- Worked with Tyler and Mindy on the installation debugging of the RICH Hardware Interlock System hardware.
  - \* Procedure for testing humidity and temperature sensor assemblies was reviewed with Mindy.
  - \* Cabling and feed-thrus for the temperature & humidity sensors were discussed.
  - \* Mounting of the temperature & humidity sensors within the detector was reviewed.



# Detector Support Group

## Weekly Report, 2017-10-11

### Campero, Pablo

#### Torus

- Solved issues related to read Cernox temperature sensors in the Low Voltage Chassis # 4 with Brian.
  - ★ Fuse blew in Q0131 card taking out all the Cernox sensors on this chassis.
  - ★ Found that fuse blew due to the filter capacitor C34 between +12 V and GND failed and generated a hard short.
  - ★ All temperature Cernox sensors were back on line after the PCB card was replaced by spare available.

#### RICH

- Calculated air pressure (at steady conditions) and output air velocity for the RICH E-Panel air cooling system.
  - ★ Used Bernoulli continuity equations to calculate:
    - The air output velocity ~ 6.79 [m/s] at one of the six outlet orifices (d =25 mm) of the E-Panel.
    - Pressure ~ 101354 [Pa] inside the E-Panel
    - Found  $\Delta P$  between the inside pressure and output pressure (atmosphere) ~ 30 [Pa].
- Calculated humidity decrease for the RICH Nitrogen cooling system at max flow rate of 40 [SLPM].
  - ★ Found volume of the RICH nitrogen purge is about 5000 [l]
  - ★ Used exponential decay equations to found the time to go from 50 % humidity to 0 % humidity is ~ 8 [hr].

#### DC

- With Marc and Amanda on 10/06/17 re-calibrated TCU#1 and TCU#2.
  - ★ The following table displays the calibration values obtained.

Device	At 0 % of CO <sub>2</sub>		At 100 % of CO <sub>2</sub>		Standard 10/90	
	Current Omega [mA]	Voltage AI cRIO [V]	Current Omega [mA]	Voltage AI cRIO [V]	Current Omega [mA]	Voltage – AI cRIO [V]
TCU #1	4.00	0.08	20.01	10.02	8.41	2.75
TCU #2	4.01	- 0.03	20.13	10.06	8.26	2.66

#### HDice

- Modified NMR program with Amanda.
  - ★ Change appearance of the user interface (front panel) used to monitor the status of the helium liquid level and target temperature.
  - ★ Added automatic change to temperature tap screen, when thresholds for the target temperature and LHe level are exceeded.
- Issues with the GPIB Extended Resolution command used to have one decimal digit precision in the reading of the power supply.
  - ★ Tested the response of the power supply by using VISA Extended Resolution command.



## Detector Support Group

### Weekly Report, 2017-10-11

- The power supply allowed another digit in the read-back. It works properly.
- ★ Found that GPIB Extended Resolution command had a typo error (“/”) and the command was not being recognized by the power supply.

#### Eng. Brian

##### SVT

- R2 S6 U2 is now working again, despite no active changes being made. The data cable was probably moved during MVT operations.

##### MVT

- Configured MFCs for mixing system: got IPs on 160 subnet and setup gases on them.

##### RICH

- Swapped LN2 dewars for humidity test: <https://logbooks.jlab.org/entry/3487453> & <https://logbooks.jlab.org/entry/3487469>

##### Torus

- Swapped Q0131C04 PCB in LV chassis #4 after another failed capacitor on the +12V side: <https://logbooks.jlab.org/entry/3487421>
- Taking data directly for the Cernox sensors on this chassis in order to do a comparison test with and without the capacitor installed.

#### Hoebel, Amanda

- Calibrated DC TCUs with Marc and Pablo.

##### HDICE

- Troubleshoot 1G error in power supply.
  - ★ Power supply would display field value + or – 1 G.
  - ★ Problem was incorrect text command for GPIB VI.

##### RICH

- Calculated time to purge detector and drop humidity level from 50% to 1%.
  - ★ Calculated time to be 8 hours.
  - ★ Made presentation on purge calculations.

- Created and edited weekly report.

#### Jacobs, George

##### GAS Systems

- Installed flow limiting orifice on HTCC gas supply.
- Received fresh N<sub>2</sub> dewar for RICH.
- Placed admin lockout on HTCC CO<sub>2</sub> supply valve.
- Ordered CO<sub>2</sub> for DC.
- Completed mandatory security briefing.
- Submitted PR 373104 for continued funding of the LN<sub>2</sub> contract.
- Ordered LN<sub>2</sub> high pressure dewar for RICH testing.



## Detector Support Group

### Weekly Report, 2017-10-11

#### Leffel, Mindy

##### HDICE

- Made two SHV to SHV cables, 31' and 41'.

##### RICH

- Worked with Mary Ann to complete first four HTSB cables.

#### Lemon, Tyler

##### RICH

- Updated and added features to Hardware Interlock program
  - ★ Added shared variable to send HV-LV override status to EPICS
  - ★ Added logic to refresh EPICS PVs to prevent them from showing as disconnected on CS-Studio screen.
  - ★ Modified calculation converting voltage pressure transducer to pressure in psi.
    - Previously, converted straight from volts to psi, causing incorrect pressure to be read by cRIO.
    - Added additional step to convert volts to Torr (native units of pressure transducer) and then from Torr to psi.
  - ★ Modified humidity sensor calculations to use look-up table for calibration constants.
    - Previously, each humidity sensor serial number had its own subVI with hardcoded calibration constants.
    - Changed LabVIEW program to use look-up table based on humidity sensor's serial number to find calibration constants.
      - Advantage of look-up table is that it is easier to add or modify humidity sensor calibrations than with individual subVIs.
    - Program version containing look-up table VI does not give correct humidity values; still requires debugging.
- Aligned reflectivity test station optics in EEL 121b (DSG small cleanroom).
  - ★ Optics of test station went out of alignment during move from EEL 108A to EEL 121b.
- Created public directory on DSGCOMP2 for use with cRIO test station.
  - ★ Public directory allows LabVIEW program stored in directory to be accessed by anyone logged on to computer.
- Created VI to write string arrays from LabVIEW to Excel.
  - ★ VI does not rely on any subVIs, preventing dependencies on internal subVIs from causing errors when moving VI to new project.
- Designated space for projects occurring in EEL 124/ EEL 125.
  - ★ Area in EEL 124 formerly occupied by FT cleared of tables for use by MVT.
  - ★ Area near Atlas Copco compressor designated as RICH assembly, storage, and test area.



## Detector Support Group

### Weekly Report, 2017-10-11



Former FT area in EEL 125 cleared for MVT use.

- Notified collaborators of ability to reuse shoe covers.
  - \* Ran out of shoe covers in EEL 124 soon after providing large box of them.
  - \* Collaborators tended to use shoe covers only once before throwing them away.
  - \* More shoe covers bought by Mary Ann from stockroom.

### **McMullen, Marc**

#### **DC**

- Zeroed TCUs with Amanda and Pablo.
  - \* Reconnected standard bottle.

#### **RICH**

- Installed compressed air manifolds in RICH electronics panel for testing.
- Wrote a requisition for extruded aluminum kit.
  - \* This kit will be assembled as the second front panel installation tool.
- Started modifications to gas panel to increase the compressed air supply line to 1 inch.

#### **MVT**

- Continued work on MVT gas mixing software
  - \* Tested the automatic mix controls for the Forward Vertex Tracker, which uses C<sub>4</sub>H<sub>10</sub>, CF<sub>4</sub>, and Ar.

Submitted PR for MFC power cable and Pressure Transducer data/power cable.