



clas Slow Controls

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5th 1st CLAS12 Experiment Workshop

March 28, 2017

Overview

Organization

- Biweekly Meetings: 9:00 on Fridays in L210A
- Wiki: https://clasweb.jlab.org/wiki/index.php/CLAS12_Slow_Controls
 - With meeting agendas and minutes, documentation, subsystem specs
- Main Team: N. Baltzell, K. Livingston, B. McKinnon, W. Moore (JLab & Glasgow)
- Working with DAQ, FE, DSG, Engineering, I&C, IT groups

Framework

- Everything in EPICS (R3.14.12.15)
- CS-Studio for uniform user interface (java-based)
- BEAST alarm system (databases+servers+clients)
- JLab ops's MYA archiving system

Components

- Software and Servers
- Detectors
 - HV, LV, Gas, Temperature, Chillers, Flashers, PLCs, FEBs
 - JLab FADC/DISC Scalers
- SC Magnets
 - PLCs, Power Supplies, Vacuum, Cryo
- Beamline
 - Motors, Harps, Møller Polarimeter
- Targets
 - Saclay Cryotarget
- Hall
 - Weather, Cameras
- DAQ
 - Crate monitoring/reset
 - Trigger rates, config, livetime, BTA

Software / Computing

All CLAS12 online software is version controlled in JLab's github @ clas12-epics, clas12-plc, clas12-coda, ...

- Shift operations always use our github hotfix build at:
/usr/c las12/release/pro

Controls servers/workstations

- All 64-bit RHEL7
- OS installs and configs deployed and managed with Puppet and monitored by Nagios with regular automatic checks on
 - cpu/disk/memory usage
 - necessary software running (e.g. alarm server)
 - with email notifications
- Current lineup:
 - clonpc11-22 shifters' workstations
 - clons1-3 servers for non-counting-house use
 - clonioc1-4, clondb3 for servers, softIOCs, gateways

EPICS

- Soft IOCs started/checked automatically, procServ-managed
 - minimize hard-IOCs (beamline scalers, motors, old magnets)
 - autosave, full ioc logging, burt save/restore
- BEAST alarm system with notifications, alarm history logging



EPICS Hardware Support in Hall-B

- CAEN & Wiener HV/LV (detectors & beamline)
 - SY527, SYX527, SY2604, mpod, iseg, PL506, etc
- VME modules
 - vxWorks OS
 - OMS Stepper Motors (harps, collimators)
 - Beamline/Helicity Scalers (Jorger, Struck)
 - Old Magnets' PS (xycom, systran, etc) (Pairspec, Frascatiss, Moller quads)
 - Terminal servers for remote reset
- Wiener Crates (DAQ: adcfToF#, tdcecal#...)
 - Linux OS (centos5)
 - temperature, fans, status, remote reboot
- JLab FADC/DISC scalers (adding CLAS12 trigger boards soon)
- XPS Motor Controllers (harps, collimators)
- National Instruments' CompactRIOs (Gas system & SC Magnets)
- Allen Bradley PLCs (SC Magnets)
- Prologix GPIB-ETH converters (DCLV)
- MOXA serial-eth converters (RS232/422/485)
- Omega Digital Transmitters (Thermocouples, RTDs)
- Anova/Lauda Chillers
- Agilent/Kiethley LV supplies (DCLV, HPS ECAL)
- LED Controllers (INFN and JLab modules)
- AKCP Weather Sensors
- SCE410 power supply (Moller Helmholtz)
- Keithley DMMs (Faraday Cup, Moller Calib)
- Siemens PLCs
- Highland V450 (SVT RTDs)
- etc ...



Recent Progress (1)

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- CLAS12 ERR resulted in no controls recommendations
- KPP Run exercised and validated the current baseline system
 - Torus controls & monitoring
 - CTOC/DC/EC/FTOF/HTCC/LTCC – HV/LV, scalers
 - Beamline - scalers, HV, motors, FSD, overview screen
 - Alarm system, MYA archiving, GUIs
 - Shift workers manual mature, Expert manual in progress

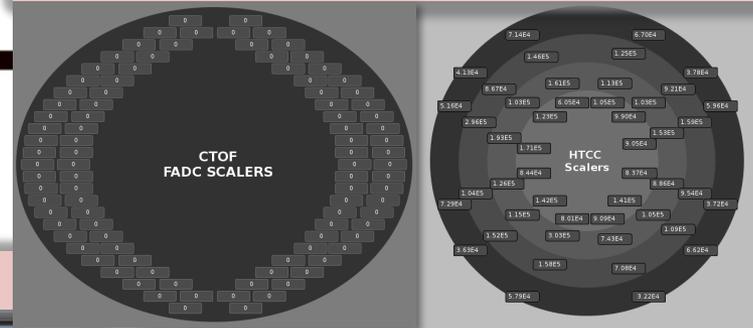
- Easy logbook entry gui
- Improved DC HV/LV monitoring screens
- Optimized speed of DC HV serial comms (ERR)
- Various additions to alarm system
- Geographic detector scaler views
- More web-browser screens developed
 - e.g. KPP overview screens
- Hall Weather sensors installed and live in EPICS
- Added SC magnets CA gateway

Location	Temperature	Humidity
Space Frame - Level 1	71 F	46 %
Forward Carriage - Level 1	73 F	44 %
Forward Carriage - Level 2	74 F	42 %
Forward Carriage - Level 3	71 F	46 %
Subway	71 F	46 %
Pie Tower	70 F	49 %

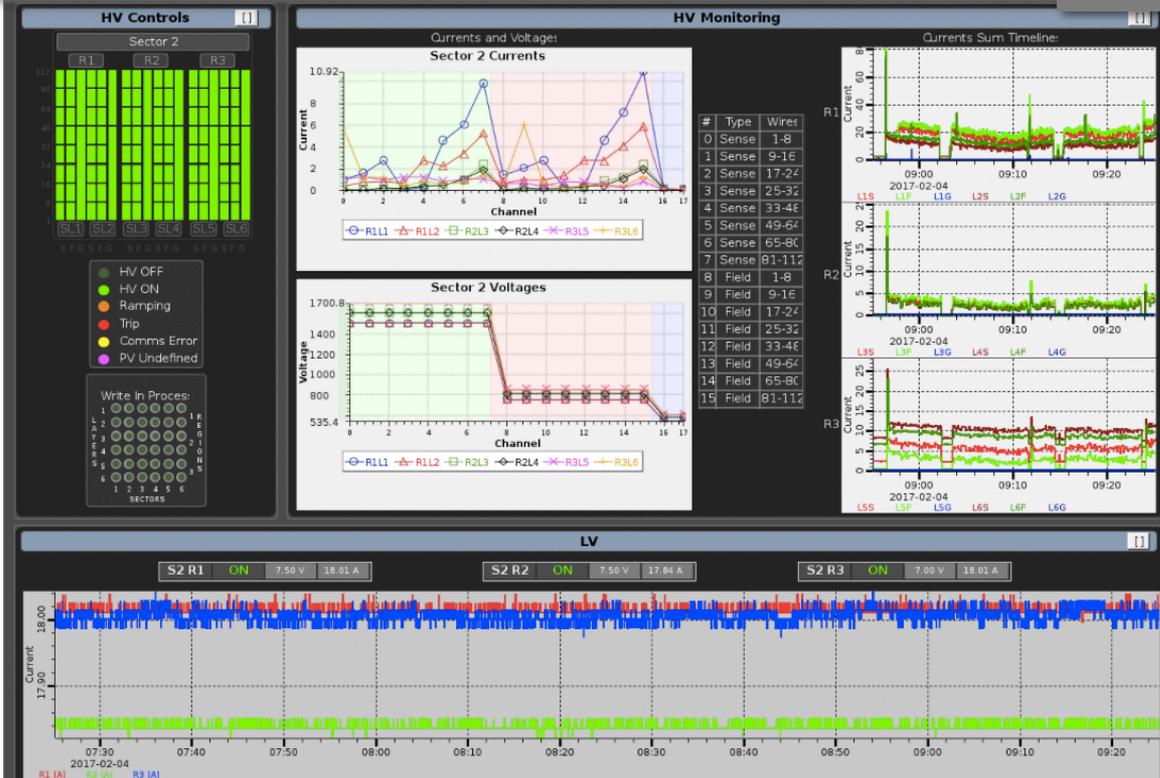
Recent Progress

Examples from KPP

Geographic Scalars Screens



DC HV/LV: Histograms & Strip Charts



WebBrowser KPP Overview Screen

BEAM IS NOT AVAILABLE

Beam Position / Current				
	2C21	2C24	2H01	FCup
I (nA)	0.0	0.0	0.0	0.2
X (mm)	0.000	0.000	0.000	
Y (mm)	0.000	0.000	0.000	

Torus	
0.00	A
0.0	G
POSITIVE	Pol.

Tagger	
0.0	A
-0.00041	T
ELBCTRON	

Halo Counters (Hz)			
	Up	Mid	Down
Left	0	0	0
Right	0	0	0
Top	0	0	0
Bottom	0	0	0

DC HV Current Sums (uA)						
	SL1	SL2	SL3	SL4	SL5	SL6
Sense	0.0	0.0	0.0	0.0	0.0	0.0
Field	0.0	0.0	0.0	0.0	0.0	0.0
Guard	0.0	0.0	0.0	0.0	0.0	0.0

DC LV Currents (A)			
R1	-0.0	R2	0.0
R3	-0.0		

FC Scaler Sums (Hz)						
	S1	S2	S3	S4	S5	S6
ECAL	4.7E1	6.8E2	1.7E3	-2.4E1	2.3E3	2.3E3
PCAL	1.9E1	1.9E1	SE0	0E0	1.5E1	2.5E1
FTOF	0E0	3.8E2	3.7E1	0E0	0E0	0E0
LTCC	3.6E1	0E0	3.6E1	3.6E1	3.6E1	0E0
HTCC	0E0	0E0	0E0	0E0	0E0	0E0

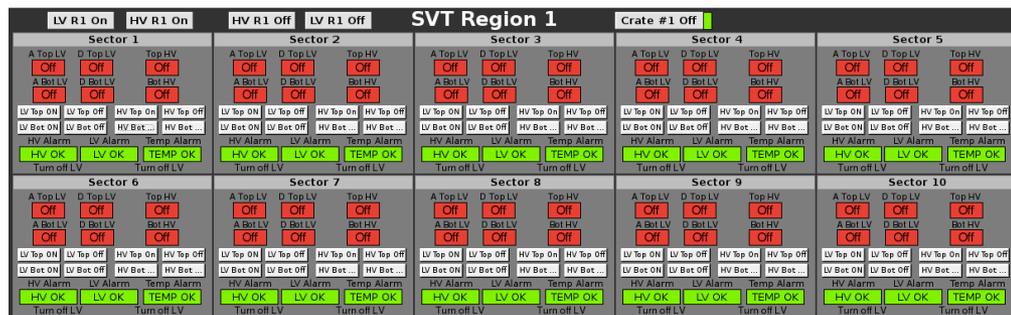
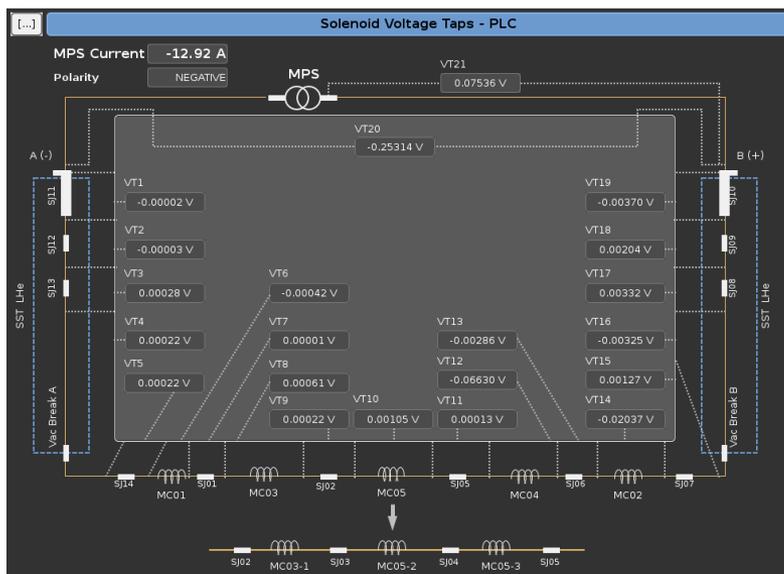
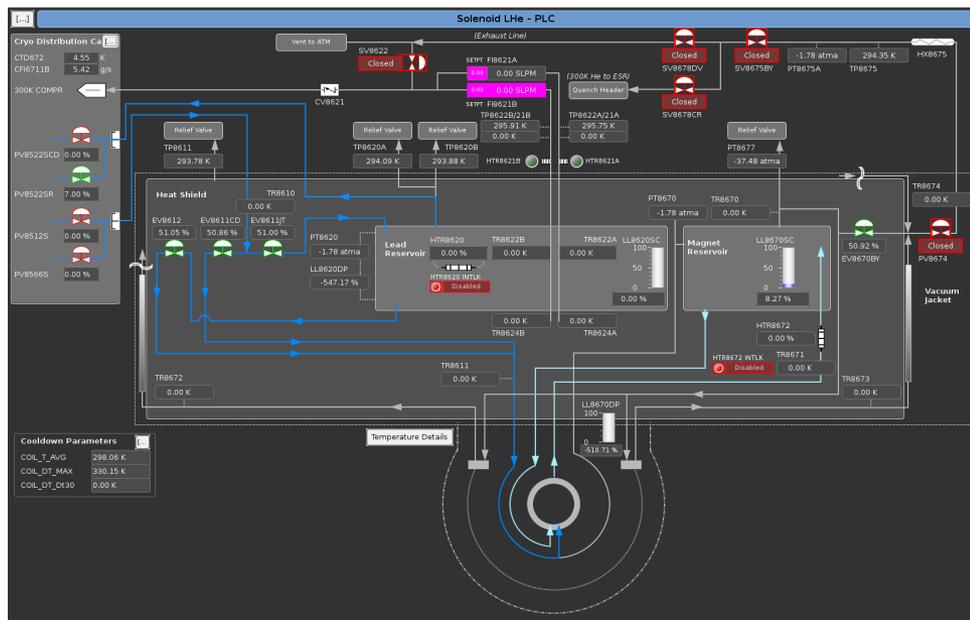
Beamline Vacuum (torr)			
2C21Tr	1.1E-8	2H00ATr	1.4E-1
2C21ATr	1.6E-7	2H01ATr	1E-11
2C24ATr	3.9E-2	2H03	4.9E-6

Hall Weather		
	Temp	Humid
SF	71 F	45 %
FC	73 F	42 %

<https://hallbopi.jlab.org/webopi3.3/w>

Recent Progress (2)

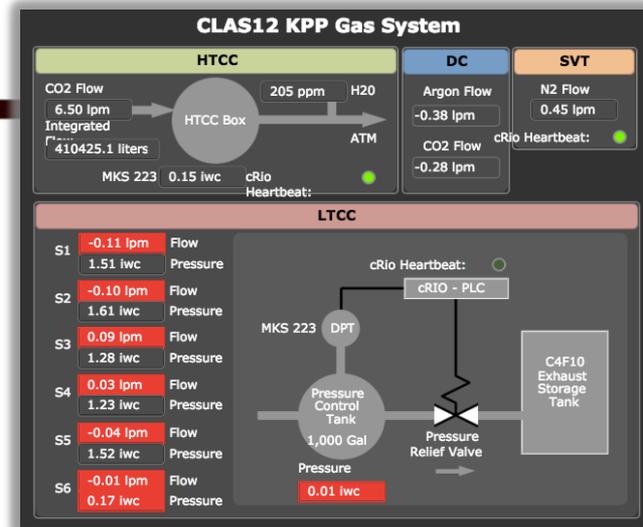
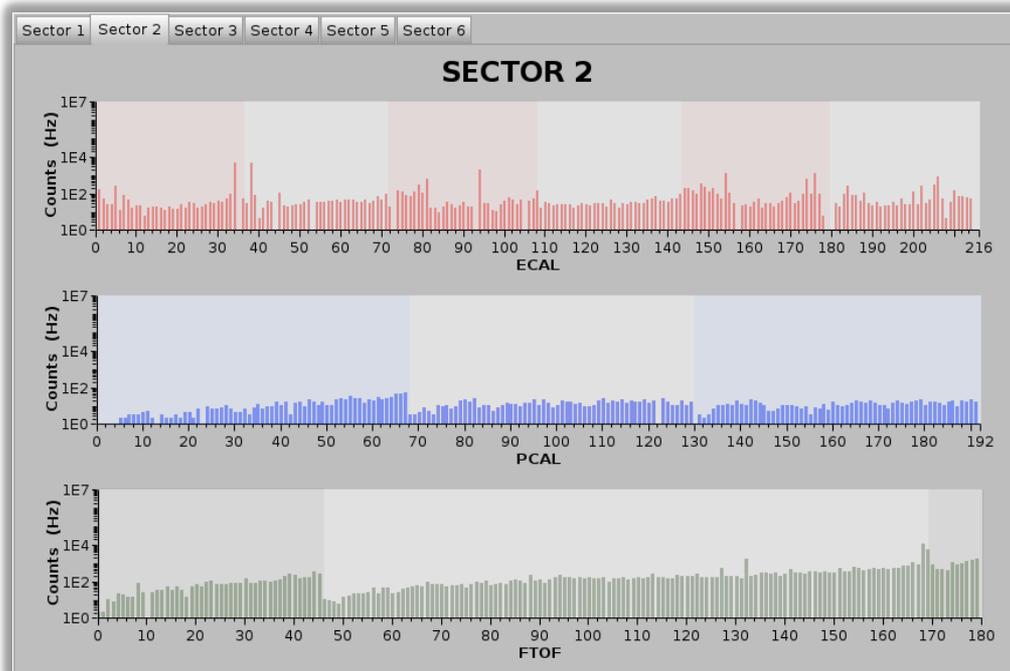
- Solenoid EPICS controls & monitoring ready for magnet
- SVT controls & monitoring imported to Hall B system (~95%)
 - 5 of 6 iocs running on clone machines & tested
 - all screens ported to CS-Studio & tested, w/ improvements
 - software interlocks ported from alh to IOCs & tested
 - alarms ported to BEAST & tested
- Moeller polarimeter restoration ongoing
 - restoring helicity DAQ, optical signal patched to SF1
 - quadrupole controls rewiring started
- CND controls done
- Simpler overview screens in development (e.g. SVT)
- Cameras into EPICS explored
 - live beam profile (means/sigmas) at fcpu viewer anticipated



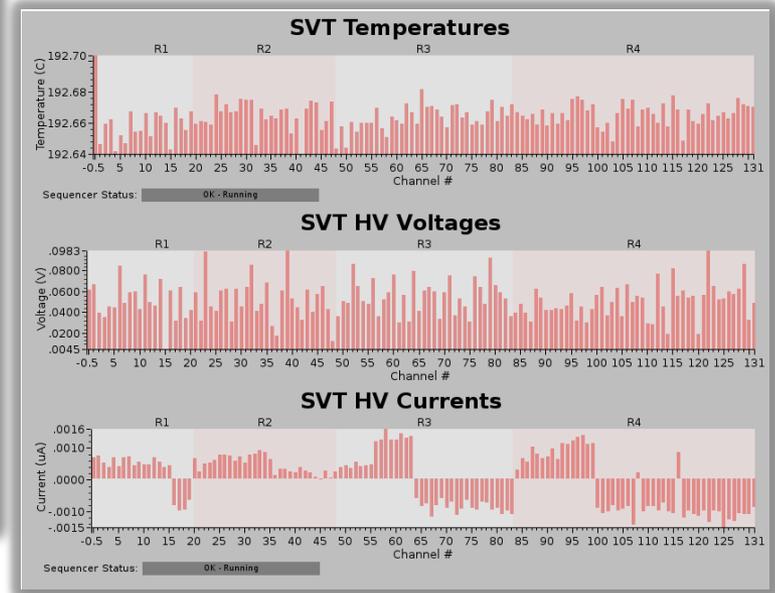
Recent Progress

Overview Screens Examples

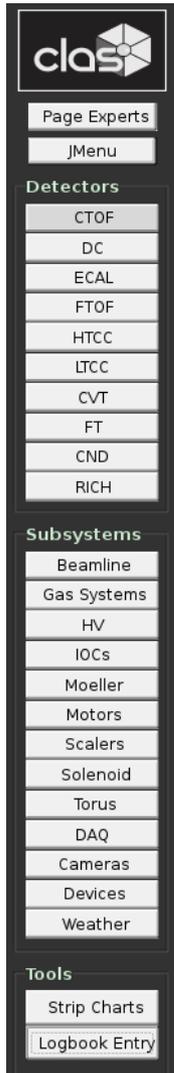
- Forward Carriage scaler histograms
- Gas system overviews (and web screen)
- SVT overviews in progress



<https://hallbopijlab.org/webopi3.3/w?opi=apps/cRioApp/gas-KPP.opi>



Summary



The sidebar contains the following sections and items:

- clas logo
- Page Experts
- JMenu
- Detectors
 - CTOF
 - DC
 - ECAL
 - FTOF
 - HTCC
 - LTCC
 - CVT
 - FT
 - CND
 - RICH
- Subsystems
 - Beamline
 - Gas Systems
 - HV
 - IOCs
 - Moeller
 - Motors
 - Scalers
 - Solenoid
 - Torus
 - DAQ
 - Cameras
 - Devices
 - Weather
- Tools
 - Strip Charts
 - Logbook Entry

Status

Large progress, converging on a reliable, consistent, easy controls system

- Passed ERR and KPP milestones
- CLAS12 Baseline controls system mature
 - Torus/Solenoid complete
 - Detector HV/LV systems complete
 - Beamline complete, except Moller
 - Alarms system (UI, audible/visual/email alerts) archiving, GUIs
- SVT integration into CLAS12 at ~95%
- Non-baseline controls at ~75%
- Software/computing system organized and robust
- Web overview screens in use/progress
- Utilizing JLab IT resources (e.g. webopi, VDI)
- much more ...

Main Projects for Engineering Run

- Restoration of Moller Polarimeter
 - Done: Target motor, Helmholtz controls, target polarization DAQ
 - In progress: quadrupole controls rewiring (Krister), restore helicity electrons and helicity DAQ
- Saclay Cryotarget → EPICS
- Finish MM controls
 - Expected for Saclay MM group at JLab in June
 - FEU/PLC/HV/LV all started
 - Integrate into SVT scheme (or vice-versa)
- Simplified SVT screens for shift workers
- New gas hardware / controls / intlks (DSG)
- DAQ integration (with Segey/Ben)
- RICH controls (already designed/simulated with EPICS and CS-Studio by Justin Goodwill @ Duquesne)