



clas Slow Controls

N. Baltzell

6th 1st CLAS12 Experiment Workshop

June 13, 2017

Overview

Objectives

Reliable monitoring and controls for experiment operations

- Support for all beamline, magnets, detectors, devices, archiving
- Clear, easy, consistent user interface
- Alarm system with audible, visual, auto-emailed notifications, logging and guidance

Organized software system & deployment

- Version control, single production location, build system
- Single EPICS version, unified operating system
- Systems startup/recovery/failover procedures and monitoring

Organization

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

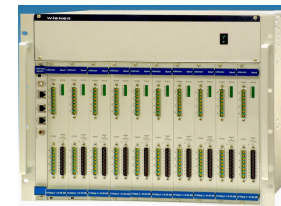
- Software and Servers
- Detectors
 - HV, LV, Gas, Temperature, Chillers, Flashers, PLCs, FEBs, Interlocks
- SC Magnets
 - PLCs, Power Supplies, Vacuum, Cryo
- Beamline
 - Motors, Harps, Halo Monitors, Faraday Cup, Møller Polarimeter
- Targets
 - Saclay Cryotarget
- Hall
 - Weather, Cameras
- DAQ
 -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

Software / Computing Resources

- CLAS12 controls software is version controlled in JLab's github
 - <https://github.com/jeffersonlab/clas12-epics>
- All EPICS R3.14.12.5
 - Many (~100) softIOCs on servers in counting room
 - procServ, cronjobs for startup
 - 3 VME IOCs (beamline) required in the hall
 - with terminal servers and remote reset
 - “autosave”, burt “save/restore”, logs (/usr/clas12/DATA)
- CS-Studio
 - Graphical User Interface (replacing CLAS6's medm)
 - Integrated with BEAST Alarm System
 - Used by Hall-D, and SNS, BNL, FRIB, DESY, ITER, ...
 - Allows for faster development (via scripting, templating)
- Online Operations
 - All software runs from standard production location:
 - /usr/clas12/release/pro/epics
 - All software works from clasrun account
 - And runs locally on any clon machine – no remote logins necessary
- MYA Archiving
 - accelerator's system and maintainence, Hall B purchased servers
 - includes MyaViewer plotter, command line tools, C++ API
- Hall B controls servers/workstations, all RHEL7
 - Users:
 - **clonpc11-22** – workstations in counting room (8 GB memory, 4 cores)
 - **clonsl1-3** – servers for remote controls use (32 GB memory, 12 cores)
 - Experts:
 - **clonioc1-4** – softIOCs (4/32 GB memory, 8/12 cores)
 - **clondb3-4** – alarm system servers, mysql databases (4/32 GB memory, 8/12 cores)
 - All are puppet-managed and Nagios-monitored
 - easy configure & install, deploy updates & changes, unified setups, easy failover
 - disk space, memory, critical processes (e.g. alarm server) with email notifications to controls group
- Channel-Access gateways
 - one read-only for webopi
 - one for access to torus/solenoid and Hall B dev subnets
- Remote Access
 - VNC servers on Hall B machines, VDI on JLab virtual machines
 - for full linux desktop and access to all tools w/o X-forwarding, with write access (2-factor authentication)
 - webopi for simple CS-Studio overviews in webbrowser, read only (CUE authentication)

EPICS Hardware Support in Hall-B

- CAEN HV/LV& Wiener HV/LV
 - Mainframes: SY1527, SY4527, SY2604, CAENET v288
 - Modules: 1535, 1520, 1536HD(M), 1733, 1737, 1821, 2518
- VXS HV/LV
 - Wiener MPOD & PL506, iseg
- VME modules
 - vxWorks OS
 - OMS Stepper Motors (harps, collimators)
 - Beamline/Helicity Scalers (Jorger, Struck)
 - Old Beamline Magnets (XYCOM, SYSTRAN, DATEL, etc)
 - Terminal servers for remote reset
- VXS Crates (e.g. CODA DAQ)
 - temperature, fans, status, remote reboot
- JLab FADC/DISC scalers (TODO: VTP/RICH)
- XPS Motor Controllers (HPS harps, collimators, Moeller target)
- 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/Presto Chillers (SVT, HPS)
- Agilent/Kiethley LV supplies (DCLV, HPS ECAL)
- LED Flasher Controllers (INFN and JLab modules)
- AKCP Weather Sensors (Hall)
- SCE410 power supply (Moller Helmholtz)
- Keithley DMMs (Faraday Cup, Moller Calib)
- Siemens PLCs (Micromega Gas)
- Highland V450 (SVT RTDs)
- Webcams (real-time beam profile monitoring via image processing)
- etc ...



Alarms

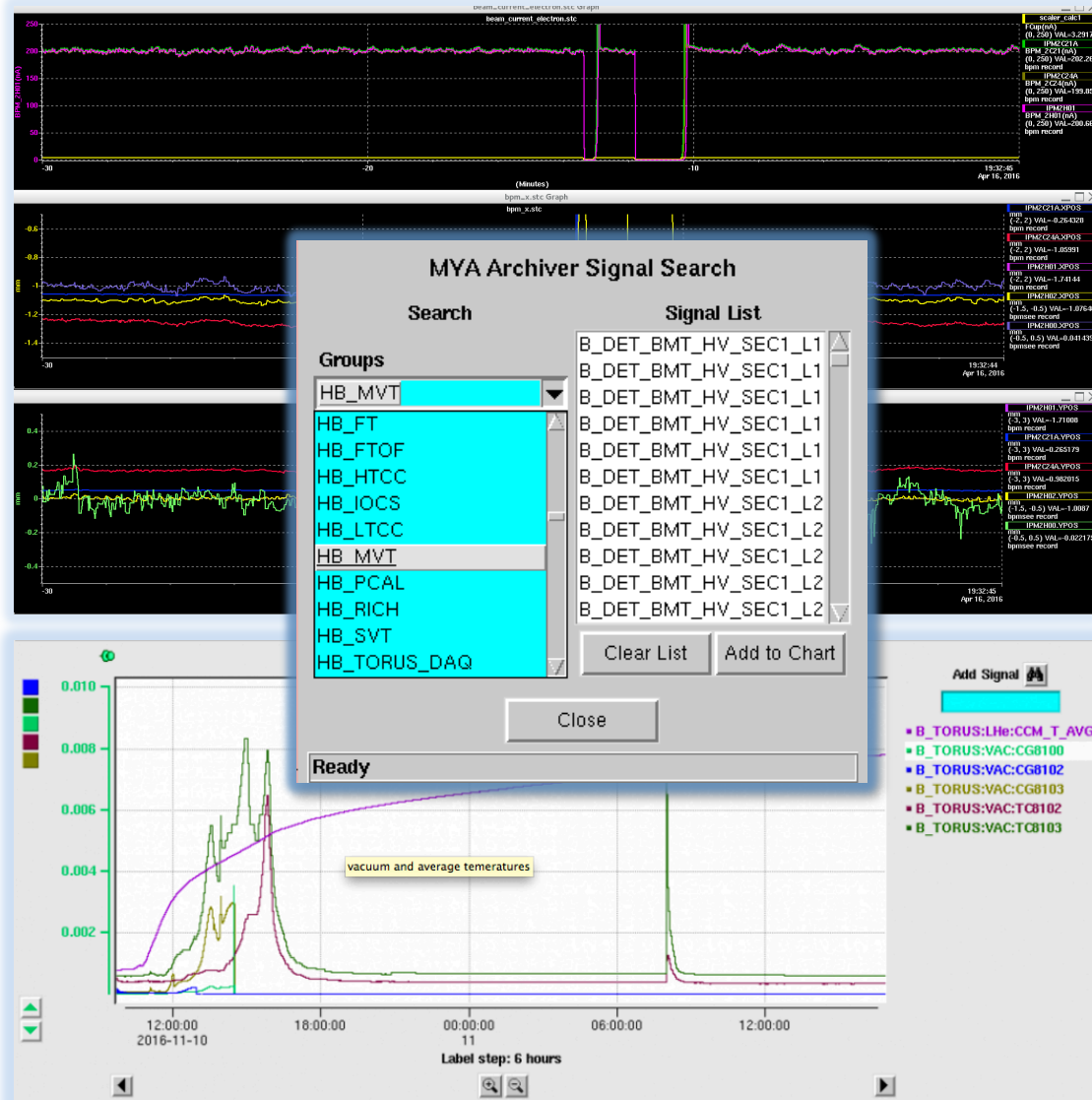
- BEAST alarm system
 - Servers + Databases
 - Alarm
 - monitors PVs, triggers alarms
 - Annunciator
 - makes alarm noises
 - with headless version
 - Notifier
 - automatic emails
 - Messenger
 - activity history is database-logged
 - Client GUI in CS-Studio
 - hierarchical view
 - lists of active & acknowledged alarms
 - guidance info, links to screens necessary to address alarms
- Servers run on clondb3 as a RHEL7 service
 - standard startup, can be moved to any slow controls machine
 - monitored by Nagios with email alerts

The screenshot displays the BEAST alarm system interface within the CS-Studio environment. The interface is divided into several panels:

- Alarm Area Panel (Left):** A hierarchical tree view showing various alarm areas such as Beamline, Solenoid, and Torus, each with sub-areas like CND, CTOF, FT, HTCC, LTCC, RICH, SVT, MVT, Weather, DAQ, and COMMS.
- HV - Single Channel Control Panel (Top Right):** A table showing real-time data for a specific channel. The table includes columns for Description, Pw, Vmon, Imon, Status, Vset (V), and Iset (uA). The status is currently 'UNV' (Under Voltage).
- Alarm Table [HallB] Panel (Bottom Right):** A table showing current and acknowledged alarms. The 'Current Alarms' section shows a single alarm: 'B_DET_ECAL_HV_SEC4_WO_E0' with a description of 'MINOR alarm: High Voltage alarm' and a status of 'MINOR'. The 'Acknowledged Alarms' section shows a large number of acknowledged alarms, including 'B_DET_PCAL_HV_SEC2_W_E62' and 'B_DET_PCAL_HV_SEC2_W_E61'.
- Context Menu:** A menu is open over the 'Current Alarms' section, providing options such as 'Guidance', 'Open HV GUI', 'Copy to clip-board', 'Send E-Mail...', 'Acknowledge', 'Configure Item', 'Disable Alarms', 'Alarm Perspective', 'Create Log Entry', and 'Process Variable'.

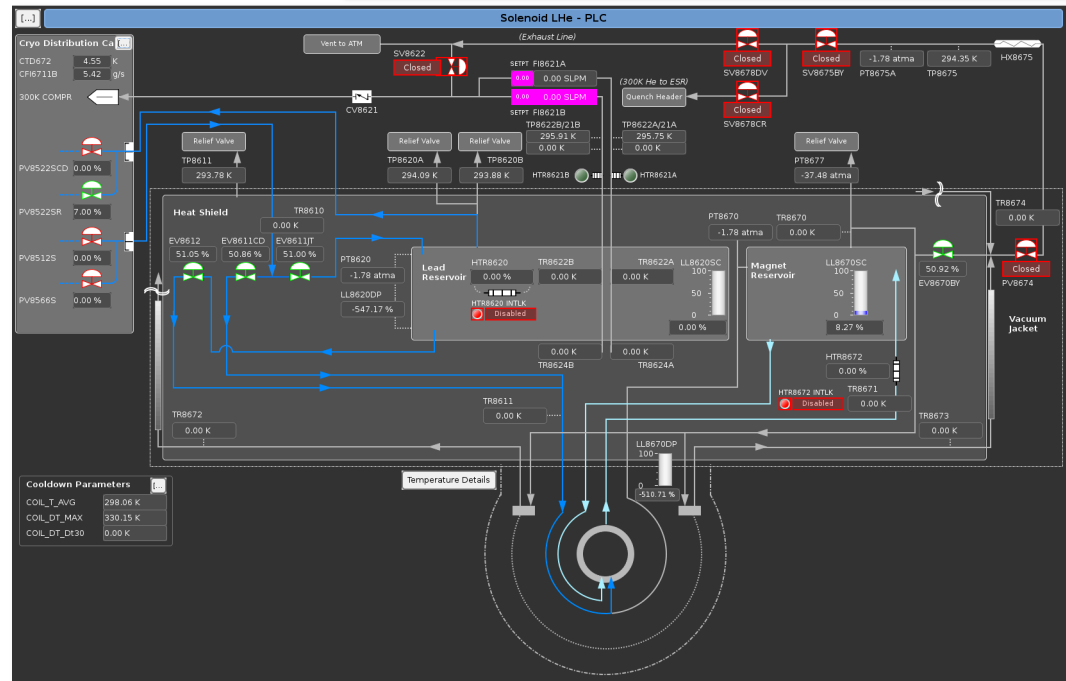
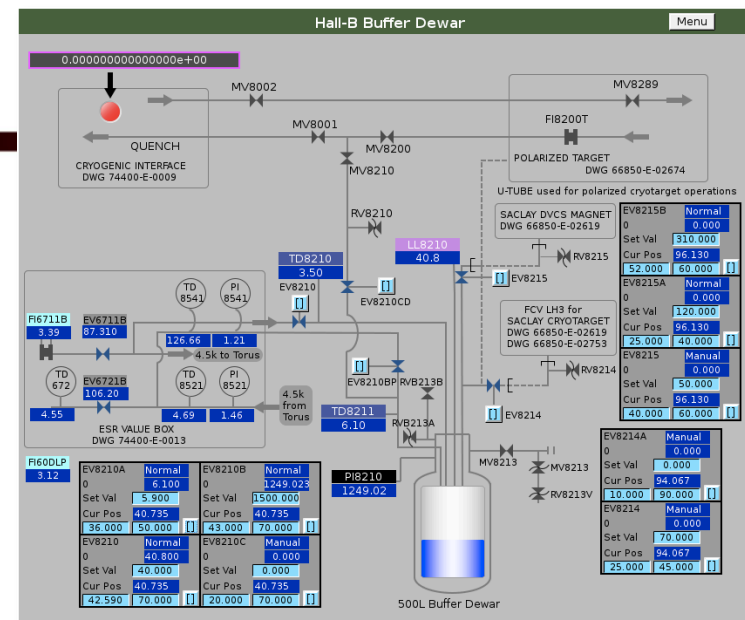
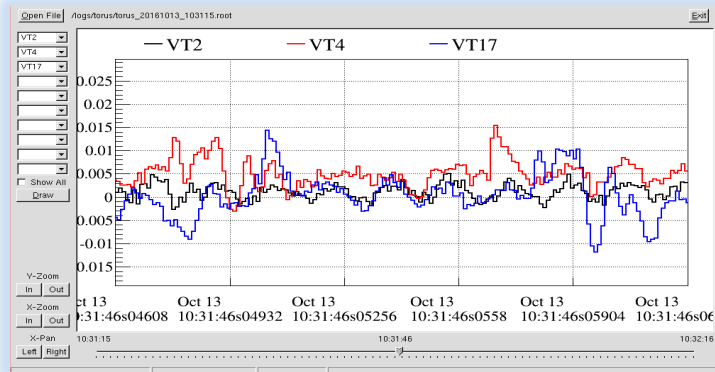
Strip Charts & Archiving

- EPICS strip charts accessible from CS-Studio, with preset configurations stored for easy loading from GUIs
 - *StripTool* ideal for standard online operations
 - And embedded *CS-Studio* plots
 - *MyaViewer* for archive access, expert diagnostics
- MYA archiving
 - works with “deadbands”, the delta before appending archive database
 - organized into “groups”, Hall B’s start with “HB”
 - command line tools (myData, mySampler) to dump archive history to ascii tables



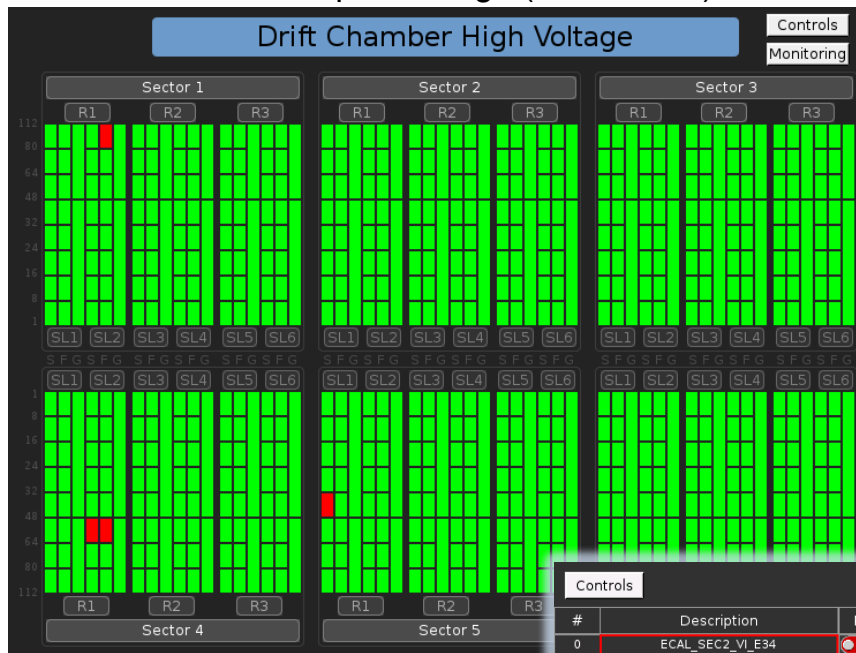
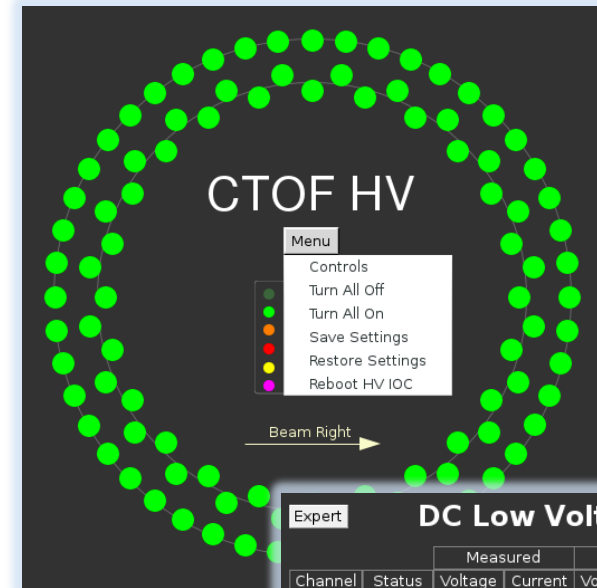
Torus / Solenoid / Cryo

- Complete torus controls and monitoring well tested during torus commissioning and KPP Run
 - Expert & Novice control screens, alarms, automatic email notifications, interlocks
 - Allen-Bradley PLC and National Instruments compactRIOs fully EPICS integrated, hardware programming by DSG / I&C / Eng groups
- Solenoid controls system similar and ~99% complete
- Fastdaq for Quench Analysis
 - Recording voltage taps at 10 kHz via EPICS and ROOT, goes to tape automatically, with GUI analyzer software



High/Low Voltage

- Hardware
 - HV: CAEN, iseg
 - LV: CAEN, Agilent/Hewlett-Packart, Wiener MPOD
- Detector GUIs
 - Global ON/OFF buttons for single detector, detector sections
 - Easily visible channel status
 - Access to detail screens if settings need adjustment
- Alarms
 - Loss of communications with hardware
 - Hardware-reported errors (e.g. tripped)
 - Out of spec voltage (in software)



HTCC Compensation Coil Voltages

Status	Pw Set	Imon	Iset	V In	V Out	T Shunt	T Sink
OFF	ON	OFF	0.0	0	12.0	0.0	31.9 C
OFF	ON	OFF	0.0	0	12.0	0.0	31.9 C
OFF	ON	OFF	0.0	0	12.0	0.0	31.9 C
OFF	ON	OFF	0.0	0	12.0	0.0	31.9 C
OFF	ON	OFF	0.0	0	12.0	0.0	31.9 C
OFF	ON	OFF	0.0	0	12.0	0.0	31.9 C
OFF	ON	OFF	0.0	0	12.0	0.0	31.9 C
OFF	ON	OFF	0.0	0	12.0	0.0	31.9 C
OFF	ON	OFF	0.0	0	12.0	0.0	31.9 C
OFF	ON	OFF	0.0	0	12.0	0.0	31.9 C

Expert DC Low Voltage

Channel	Status	Measured Voltage	Measured Current	Setpoint Voltage	Setpoint Current
S1 R1	OFF	-0.00 V	-0.00 A	7.50 V	38.00 A
S1 R2	OFF	-0.01 V	-0.01 A	7.00 V	40.01 A
S1 R3	OFF	-0.00 V	0.00 A	8.00 V	20.00 A

0.00 V	-0.01 A	7.50 V	23.01 A
0.00 V	0.01 A	7.50 V	23.00 A
0.00 V	-0.01 A	7.50 V	37.00 A
0.01 V	-0.00 A	7.25 V	36.00 A
0.00 V	0.01 A	8.00 V	29.00 A
0.00 V	0.01 A	7.25 V	36.00 A
0.00 V	-0.01 A	7.50 V	23.00 A
0.00 V	0.00 A	7.20 V	42.00 A
0.00 V	-0.01 A	7.50 V	21.00 A

S5 R3	OFF	-0.00 V	-0.00 A	7.20 V	42.00 A
S6 R1	OFF	-0.00 V	-0.00 A	7.00 V	43.00 A
		8.00 V	43.00 A		
		8.00 V	36.00 A		

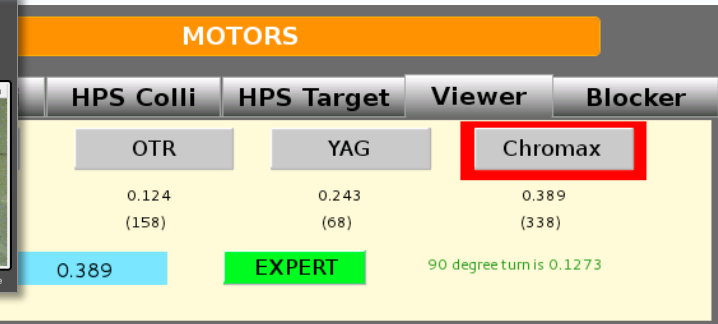
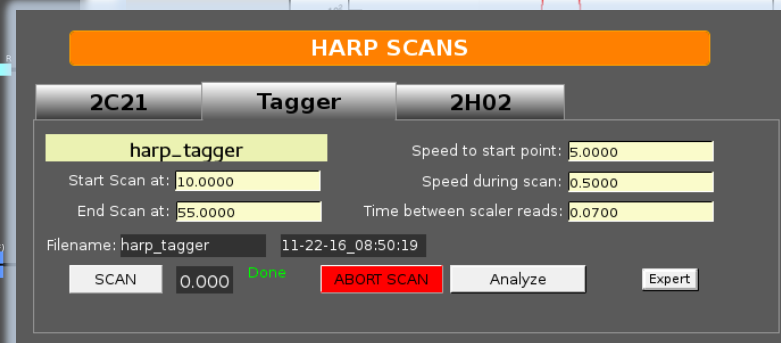
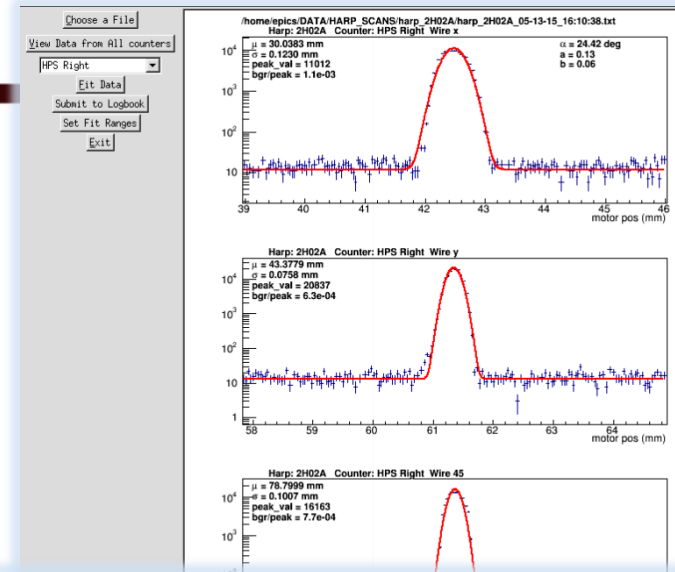
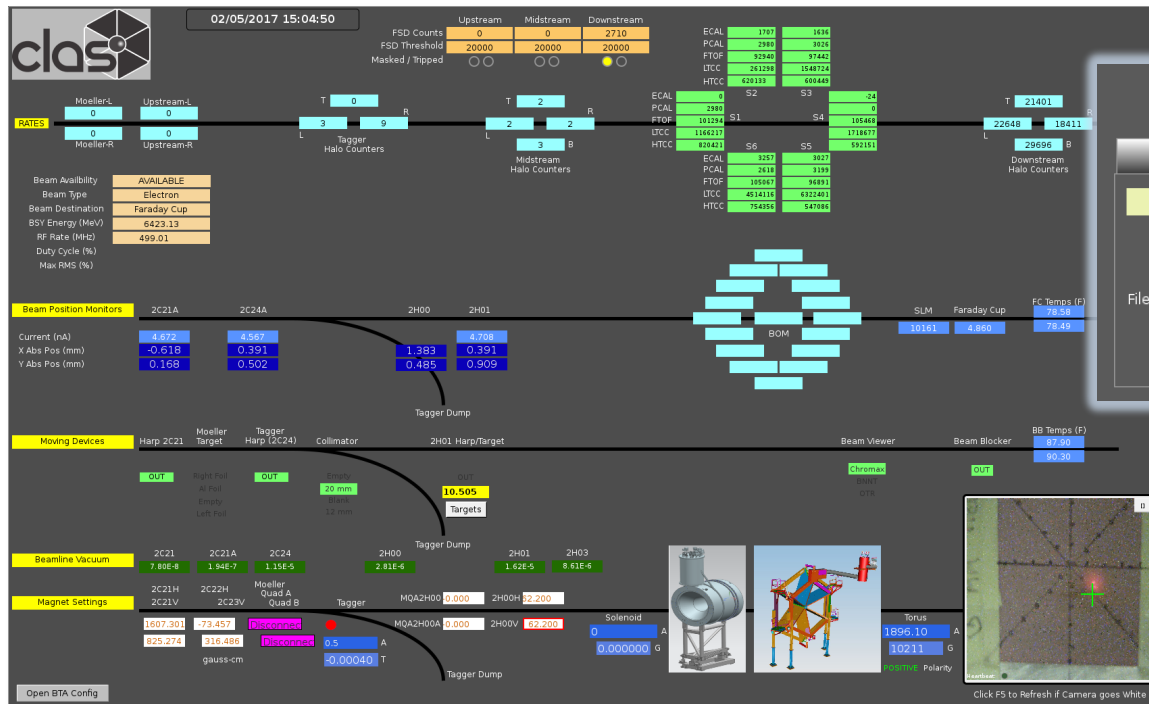
ECAL HV Controls

#	Description	Pw	Vmon	Imon	Status	Vset (V)	Iset (uA)	Vmax (V)	Up (V/s)	Down (V/s)
0	ECAL_SEC2_V1_E34	OFF	0.00	0.00	InTrip	1885.00	1885.00	600	600	2500

Beamline

- Overview Screen
 - Scalers
 - Beamline PMTs
 - Detector sums
 - BPMs
 - Motors
 - Vacuum
 - Magnets
- Motor Controls
 - Harps
 - Scan sequences
 - Fitting analyzer
 - Collimators
 - Beam Viewers
 - OTR / YAG / Chromax
 - Faraday cup blocker

Webcams (beam viewer) read into EPICS, for image processing → real time beam profile



Recent Progress: CVT

- SVT
 - controls now integrated into Hall B system
 - first deployment in early March, ongoing development & improvement for 2 months
 - initially developed by accelerator (older EPICS version, edm, alh)
 - features, summary records, overview screens added
 - bug-fixes, simplified, single-button operation added
- MVT
 - first use last week
 - HV/LV, FEU, gas PLC
 - TODO: add alarms, finish PLC



SVT Region 1

LV R1 On HV R1 On HV R1 Off LV R1 Off

Sector 1

A Top LV Off D Top LV Off Top HV Off

A Bot LV Off D Bot LV Off Bot HV Off

LV Top On LV Top Off HV Top On HV Top Off

LV Bot On LV Bot Off HV Bot On HV Bot Off

HV Alarm LV Alarm Temp Alarm

HV OK LV OK TEMP OK

Turn off LV Turn off LV

Sector 2

A Top LV Off D Top LV Off Top HV Off

A Bot LV Off D Bot LV Off Bot HV Off

LV Top On LV Top Off HV Top On HV Top Off

LV Bot On LV Bot Off HV Bot On HV Bot Off

HV Alarm LV Alarm Temp Alarm

HV OK LV OK TEMP OK

Turn off LV Turn off LV

Sector 3

A Top LV Off D Top LV Off Top HV Off

A Bot LV Off D Bot LV Off Bot HV Off

LV Top On LV Top Off HV Top On HV Top Off

LV Bot On LV Bot Off HV Bot On HV Bot Off

HV Alarm LV Alarm Temp Alarm

HV OK LV OK TEMP OK

Turn off LV Turn off LV

Sector 4

A Top LV Off D Top LV Off Top HV Off

A Bot LV Off D Bot LV Off Bot HV Off

LV Top On LV Top Off HV Top On HV Top Off

LV Bot On LV Bot Off HV Bot On HV Bot Off

HV Alarm LV Alarm Temp Alarm

HV OK LV OK TEMP OK

Turn off LV Turn off LV

Sector 6

A Top LV Off D Top LV Off Top HV Off

A Bot LV Off D Bot LV Off Bot HV Off

LV Top On LV Top Off HV Top On HV Top Off

LV Bot On LV Bot Off HV Bot On HV Bot Off

HV Alarm LV Alarm Temp Alarm

HV OK LV OK TEMP OK

Turn off LV Turn off LV

Sector 7

A Top LV Off D Top LV Off Top HV Off

A Bot LV Off D Bot LV Off Bot HV Off

LV Top On LV Top Off HV Top On HV Top Off

LV Bot On LV Bot Off HV Bot On HV Bot Off

HV Alarm LV Alarm Temp Alarm

HV OK LV OK TEMP OK

Turn off LV Turn off LV

Sector 8

A Top LV Off D Top LV Off Top HV Off

A Bot LV Off D Bot LV Off Bot HV Off

LV Top On LV Top Off HV Top On HV Top Off

LV Bot On LV Bot Off HV Bot On HV Bot Off

HV Alarm LV Alarm Temp Alarm

HV OK LV OK TEMP OK

Turn off LV Turn off LV

Sector 9

A Top LV Off D Top LV Off Top HV Off

A Bot LV Off D Bot LV Off Bot HV Off

LV Top On LV Top Off HV Top On HV Top Off

LV Bot On LV Bot Off HV Bot On HV Bot Off

HV Alarm LV Alarm Temp Alarm

HV OK LV OK TEMP OK

Turn off LV Turn off LV

Expert FEUs: Current(A), Temp1, 2, 3, 4 (deg)

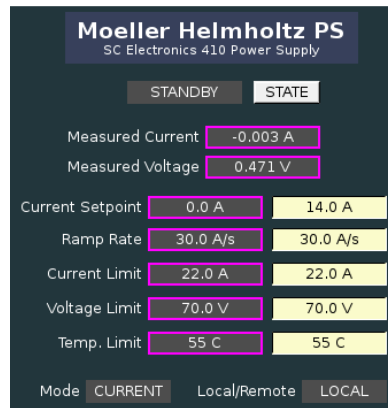
	Slot 2	Slot 3	Slot 4
Crate 1	0.0 0.0 0.0 0.0	0.0 0.0 0.0 0.0	0.0 0.0 0.0 0.0
Crate 2	0.0 0.0 0.0 0.0	0.0 0.0 0.0 0.0	0.0 0.0 0.0 0.0
Crate 3	0.0 0.0 0.0 0.0	0.0 0.0 0.0 0.0	0.0 0.0 0.0 0.0
Crate 4	0.0 0.0 0.0 0.0	0.0 0.0 0.0 0.0	0.0 0.0 0.0 0.0
Crate 5	0.0 0.0 0.0 0.0	0.0 0.0 0.0 0.0	0.0 0.0 0.0 0.0
Crate 6	0.0 0.0 0.0 0.0	0.0 0.0 0.0 0.0	0.0 0.0 0.0 0.0

LV

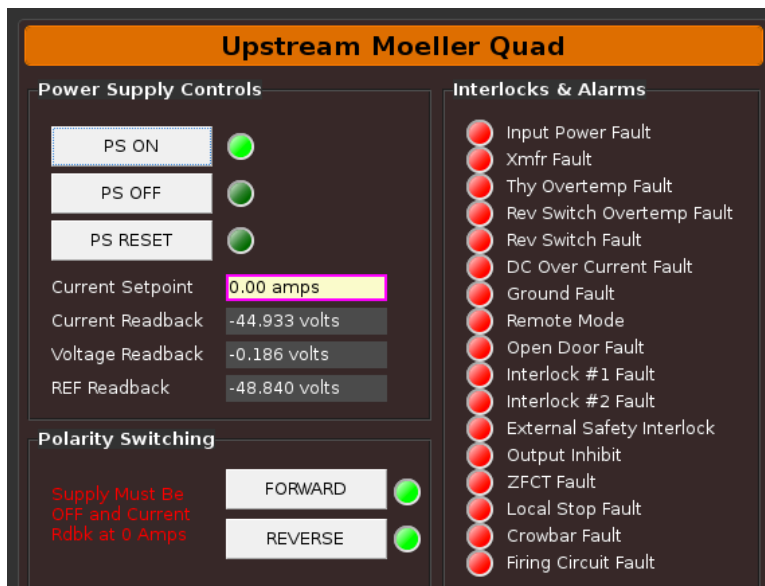
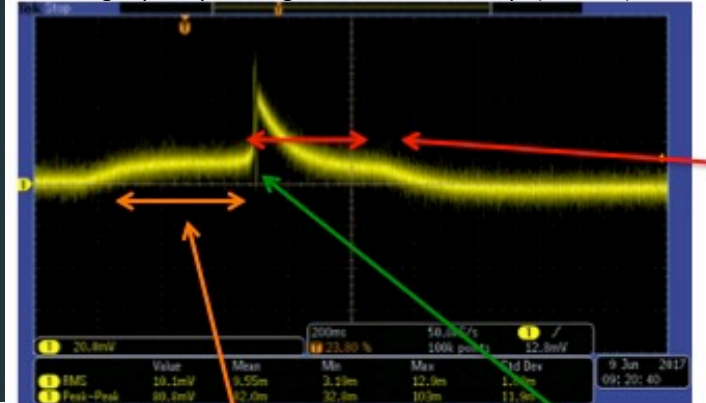
Description	Vmon	Imon	Status	Temp
MVT LV #1	4.499	36.273	ON	31
MVT LV #2	4.498	36.320	ON	30
MVT LV #3	4.501	36.594	ON	31
MVT LV #4	4.502	37.242	ON	31
MVT LV #5	4.500	37.328	ON	33
MVT LV #6	4.500	36.281	ON	35

Recent Progress: Moeller Polarimeter

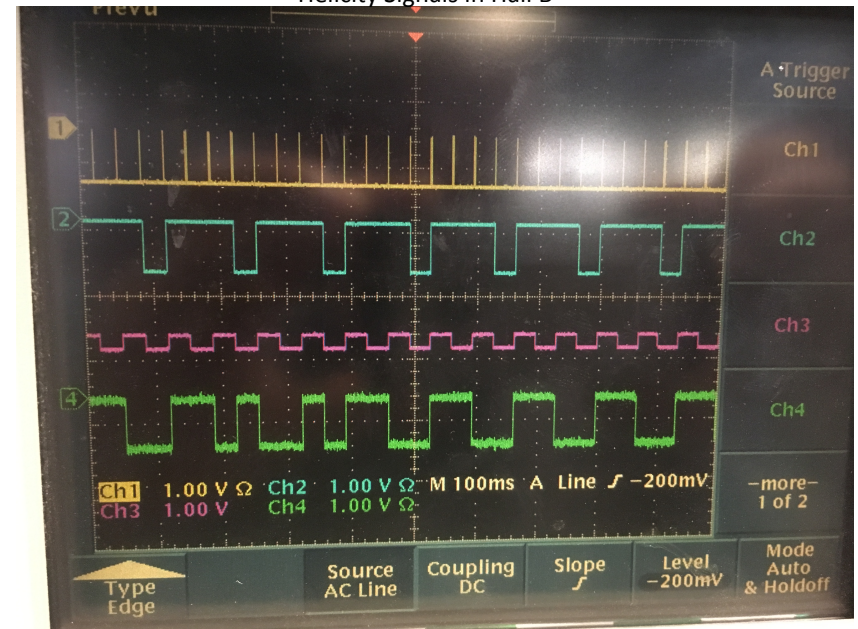
- Helmholtz & Target
 - controls used for target polarization measurement last week (B. Raue)
- Quadrupoles
 - Software controls & wiring restoration finished, work ongoing with Dynapower power supply ZFCT
- Helicity
 - signals routed to SF1N and tested
- Counters
 - ready and tested, to be positioned
- Asymmetry DAQ
 - Upgraded 64 MB Struck scaler ordered for faster helicity signals/flips
 - TODO: NIM logic, coincidence, EPICS-DAQ → Summer 2017



Target pickup-coil signal on Helmholtz Flip (B. Raue)



Helicity Signals in Hall B



Recent Progress: Interlocks

- Software (EPICS) Interlocks
 - Forward Tagger & SVT in use, Micromegas TBD
- Hardware Interlocks
 - Forward Tagger, RICH, SVT
 - National Instruments compactRios programmed with LabView (DSG)
 - CS-Studio Screens (DSG) and alarms in progress

FT Hardware Interlock System User Interface

Calorimeter Interlock Status

Any Calorimeter Interlocks Above Limit?	Calorimeter Chiller Enable Status	Calorimeter Mpod LV Enable Status	Calorimeter CAEN HV Enable Status
OK	Chiller Disabled	LV Disabled	HV Disabled

Hodoscope Interlock Status

Any Hodoscope Interlocks Above Limit?	Hodoscope Mpod LV Enable Status	Hodoscope CAEN HV Enable Status
OK	LV Enabled	HV Enabled

Summary of Interlocks | Interlock Status and Signal Monitoring | (EXPERT) Thresholds and Enable Control Settings

Calorimeter Sensor Status

OK	Calorimeter Temperature Status
OK	Calorimeter Humidity Status
OK	Calorimeter Gas Flow Status

Hodoscope Sensor Status

OK	Hodoscope Temperature Status
----	------------------------------

Calorimeter Latched Errors

OVER LIMIT	Calorimeter Temperature Latched Error
OK	Calorimeter Humidity Latched Error
OK	Calorimeter Gas Flow Latched Error

Hodoscope Latched Errors

OK	Hodoscope Temperature Latched Error
----	-------------------------------------

FT Calorimeter Soft Interlocks

HV-LV Interlock

	Q1Q4	Q2Q3
STATUS:	● RESET	● RESET
BYPASS:	<input type="checkbox"/>	<input type="checkbox"/>
MIN LV VOLT:	0.5 V	0.5 V
MIN LV CURR:	0.5 A	0.5 A
DELAY:	0 sec	0 sec

SVT Software Intlks

Expert Humidity Interlock OK

Humidity SB1	A	Sensor 1	Sensor 2	20.8	ON
Humidity SB2	A	Sensor 1	Sensor 2	22.7	ON
Humidity SB3	A	Sensor 1	Sensor 2	21.4	ON
Humidity SB4	A	Sensor 1	Sensor 2	19.6	ON
Humidity SB5	A	Sensor 1	Sensor 2	13.4	ON
Humidity SB6	A	Sensor 1	Sensor 2	22.7	ON
Ex Humidity SB1	A	Sensor 1	Sensor 2	48.7	ON
Ex Humidity SB2	A	Sensor 1	Sensor 2	47.5	ON

Expert Dewpoint Interlock OK

DewTempDiff SB1	A	Sensor 1	Sensor 2	15.8	ON
DewTempDiff SB2	A	Sensor 1	Sensor 2	15.5	ON
DewTempDiff SB3	A	Sensor 1	Sensor 2	15.7	ON
DewTempDiff SB4	A	Sensor 1	Sensor 2	16.1	ON
DewTempDiff SB5	A	Sensor 1	Sensor 2	17.3	ON
DewTempDiff SB6	A	Sensor 1	Sensor 2	15.5	ON
Ex DewTempDiff SB1	A	Sensor 1	Sensor 2	10.3	ON
Ex DewTempDiff SB2	A	Sensor 1	Sensor 2	10.5	ON

Expert Ambient Temp Intlk OK

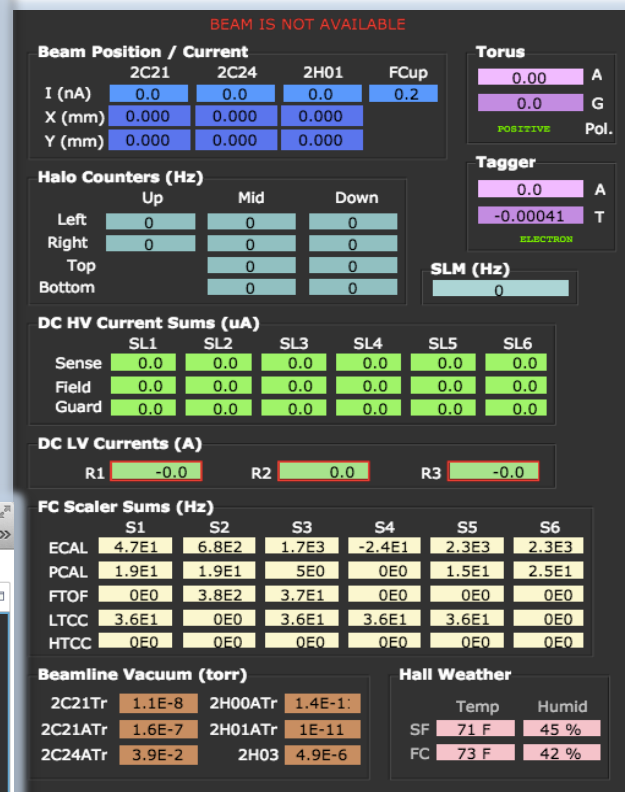
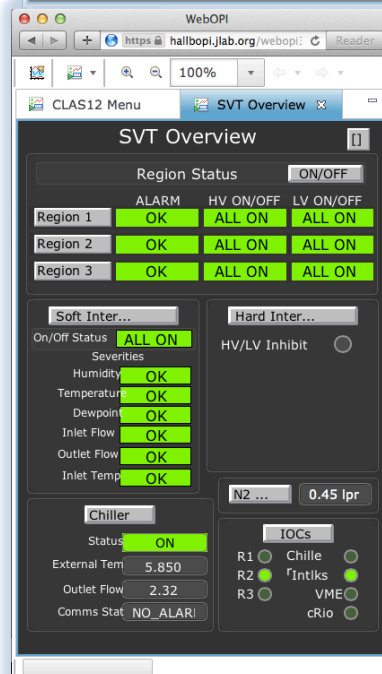
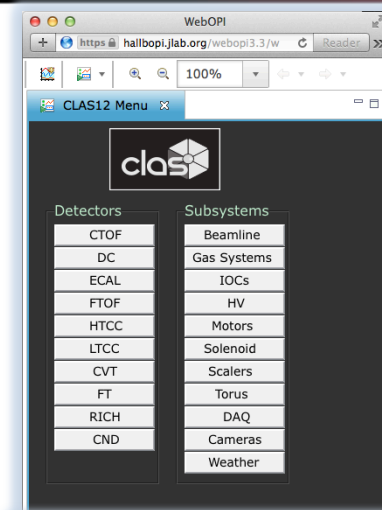
Temp SB1	A	Sensor 1	Sensor 2	19.1	ON
Temp SB2	A	Sensor 1	Sensor 2	19.1	ON
Temp SB3	A	Sensor 1	Sensor 2	18.8	ON
Temp SB4	A	Sensor 1	Sensor 2	18.9	ON
Temp SB5	A	Sensor 1	Sensor 2	19.1	ON
Temp SB6	A	Sensor 1	Sensor 2	19.0	ON
Ex Temp SB11	A	Sensor 1	Sensor 2	21.5	ON
Ex Temp SB12	A	Sensor 1	Sensor 2	22.3	ON

Expert Coolant Flow Interlock

Inlet Flow	A	-0.00 LPM	OK	OFF
Outlet Flow	A	2.29 LPM	OK	OFF
Inlet Temp	A	19.16 deg C	OK	OFF
R4 Outlet Flow	A	0.02 LPM	OK	OFF
Inlet Pressure		7.09 PSI		

webopi

- *Read-only* access to CS-Studio screens in a web browser for convenience
 - requires CUE authentication (no 2-factor)
- <https://hallbopi.jlab.org>
- Hosted on JLab virtual machine, using read-only EPICS channel access gateway in Hall B
- cronjob syncs screens from clas12-epics production build to hallbopi
- Primarily for overview screens, specially requested screens
 - requires some adjustments for some screens to work in both standard CS-Studio and webopi
 - although, in general, all CS-Studio screens *can* be accessible
- Used heavily during torus commissioning and KPP



Summary

Status

- CLAS12 baseline controls system mature
 - Torus complete, Solenoid ready
 - Detector HV/LV systems complete
 - Beamline complete, except Moeller
 - Gas systems, DAQ crates/scalers
 - Alarms system (UI, audible/visual/email alerts)
 - Archiving, Strip Charts, Save/Restore,
- Recent Progress Examples
 - SVT Integrated into Hall B system, simplified
 - MVT controls ~90%, to merge with SVT
 - DC gas system in operation, alarms
 - Hardware Interlocks (e.g. FT) → EPICS (DSG)
 - CAEN Mainframe status reporting (e.g. fans, status)
 - Webcams→EPICS, e.g. for live beam profile monitoring
 - Moeller
 - Target polarization measurement (B. Raue)
 - Quadrupole (dynapower) power supply VME controls software and wiring
 - Helicity signals routed and tested
- 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 Summer 2017

- Moeller Polarimeter Completion
 - Dynapower restoration
 - Asymmetry EPICS-DAQ restoration
- Saclay Cryotarget → EPICS
 - temperature and pressure
 - modbus RS-422 in testing, else ADC→EPICS
- DAQ Integration
 - via activeMQ messaging
- RICH

IOCs

- “Input-Output Controller”
 - The communication layer between the hardware and user interfaces in the EPICS framework
- “procServ” IOC management
 - provides terminal server for real time debugging / interaction
 - provides for cron to autostart missing IOCs
 - tested after resuming from power failure – all IOCs auto start
- Minimizing hard IOCS (VME crates in Hall B)
 - mostly softIOCs, currently ~100 (generally 1 per device, can be combined for less resources)
- Screens for IOC heartbeats, health diagnostics, rebooting
- Alarms on IOC communication failures
- Save / Restore of setpoints
 - “autosave”
 - e.g. alarm setpoints
 - /usr/cls12/DATA/autosave
 - “burt”
 - e.g. snapshots of HV system
 - /usr/cls12/DATA/burt
- Full IOC logs saved
 - /usr/cls12/DATA/logs

IOC Heartbeats - KPP

HV	VME	Misc
ioccaenhv_HVECAL1	iocclassc1	ioccas
ioccaenhv_HVECAL2	iocclassc4	iocagw
ioccaenhv_HVECAL3	iocclassc6	iocgasSystem
ioccaenhv_HVECAL4	iocclassc8	iocgasSystem86
ioccaenhv_HVECAL5		iocvmeCrates
ioccaenhv_HVECAL6		iocmonitor
ioccaenhv_HVFTOF1		iocmcc
ioccaenhv_HVFTOF2		iocweather
ioccaenhv_HVFTOF3		
ioccaenhv_HVFTOF4		
ioccaenhv_HVFTOF5		
ioccaenhv_HVFTOF6		
ioccaenhv_HVCTOF0		
ioccaenhv_HVDCa		
ioccaenhv_HVDCb		
ioccaenhv_HVBLNE		

Torus	JScalers
ioctorusCryo	iocjscalers1
ioctorusForce	iocjscalers2
ioctorusMps	iocjscalers3
ioctorusQD	iocjscalers4
ioctorusVac	iocjscalers5
ioctorusDaq	iocjscalers6
	iocjscalersCTOF

LV
iocdclv_52R1
iocdclv_52R2
iocdclv_52R3

IOC Health

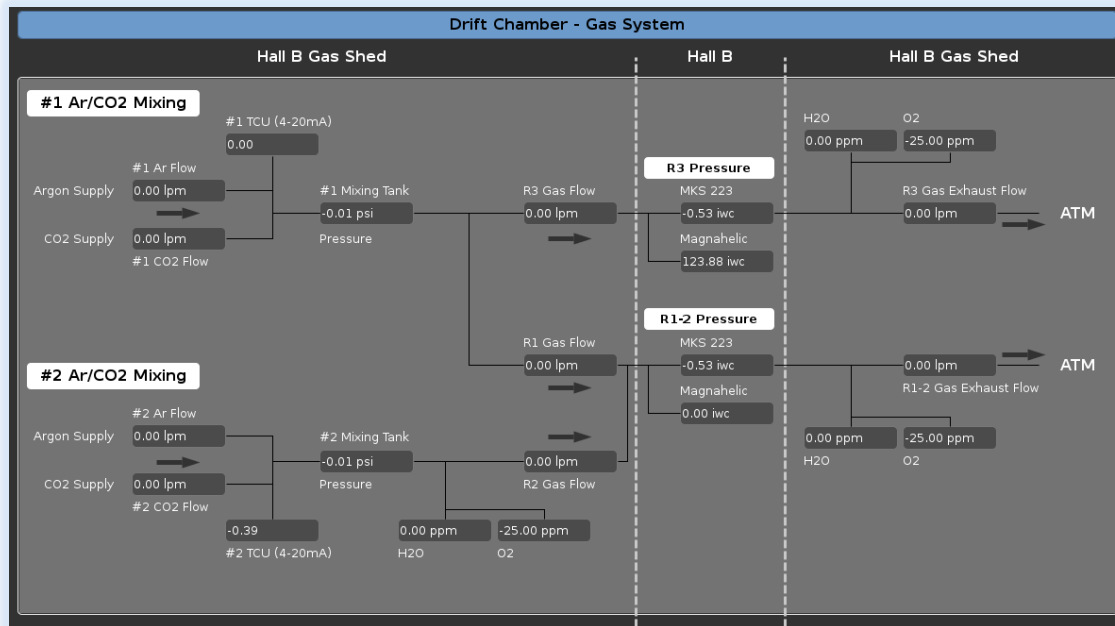
softIOCs

IOC Name	Hostname	Up Time	Heartbeat	Expert	Soft Reboot	Last Reboot	Console	Hard Reboot	Status	Message	Autosave	Recently	Expert
ioccas	clonioc1.jlab.org	15 days, 00:19:00	1297140		Reboot	10/25/2016 13:57:47		Reboot	Warning	2 values not saved	Wrote 'cas_settings.sav1'		
iocctclv	clonioc2.jlab.org	43 days, 21:55:55	3794155		Reboot	09/26/2016 16:20:51		Reboot	Disconnected	Disconnected	Disconnected		
iocctflv	clonioc2.jlab.org	15 days, 05:36:40	1921000		Reboot	10/18/2016 08:40:06		Reboot	Disconnected	Disconnected	Disconnected		
iocctaglv	clonioc1.jlab.org	15 days, 00:19:00	1297140		Reboot	10/25/2016 13:57:47		Reboot	ok	Ok	e 'OmegaCVD218_All_settings.s		
iocctChiller	clonioc1.jlab.org	15 days, 00:19:01	1297141		Reboot	10/25/2016 13:57:46		Reboot	ok	Ok	Wrote 'info_positions.sav1'		
iocctFlasher	clonioc1.jlab.org	15 days, 00:19:29	1297169		Reboot	10/25/2016 13:57:18		Reboot	ok	Ok	Wrote 'info_positions.sav2'		
ioctorusCryo	clonioc1.jlab.org	14 days, 00:14:53	1210493		Reboot	10/26/2016 14:01:54		Reboot	ok	Ok	Wrote 'info_positions.sav0'		
ioctorusDaq	clonioc1.jlab.org	7 days, 01:59:38	611978		Reboot	11/02/2016 12:17:09		Reboot	ok	Ok	Wrote 'info_positions.sav1'		
ioctorusForce	clonioc1.jlab.org	15 days, 00:18:59	1297139		Reboot	10/25/2016 13:57:47		Reboot	ok	Ok	Wrote 'info_positions.sav1'		
ioctorusMps	clonioc1.jlab.org	13 days, 01:00:28	1126828		Reboot	10/27/2016 13:16:19		Reboot	ok	Ok	Wrote 'info_positions.sav2'		
ioctorusQD	clonioc1.jlab.org	7 days, 00:16:44	605604		Reboot	11/02/2016 14:00:02		Reboot	ok	Ok	Wrote 'info_positions.sav0'		
ioctorusVac	clonioc1.jlab.org	15 days, 00:19:00	1297140		Reboot	10/25/2016 13:57:47		Reboot	ok	Ok	Wrote 'info_positions.sav1'		
iocgasSystem	clonioc1.jlab.org	7 days, 22:18:59	685130		Reboot	11/01/2016 15:57:46		Reboot	ok	Ok	Wrote 'info_positions.sav1'		
iocgasSystem86	svtsystem1.jlab.org	5 days, 02:40:39	441639		Reboot	11/04/2016 11:36:08		Reboot	ok	Ok	Wrote 'info_positions.sav1'		
iocagw	clonioc1.jlab.org	15 days, 00:19:00	1297140		Reboot	10/25/2016 13:57:47		Reboot	ok	Ok	Wrote 'info_positions.sav0'		
iocgenFlasher	clonioc1.jlab.org	15 days, 00:19:00	1297140		Reboot	10/25/2016 13:57:47		Reboot	Disconnected	Disconnected	Disconnected		
iocvmeCrates	clonioc2.jlab.org	43 days, 03:25:15	3727515		Reboot	09/27/2016 10:51:32		Reboot	Disconnected	Disconnected	Disconnected		

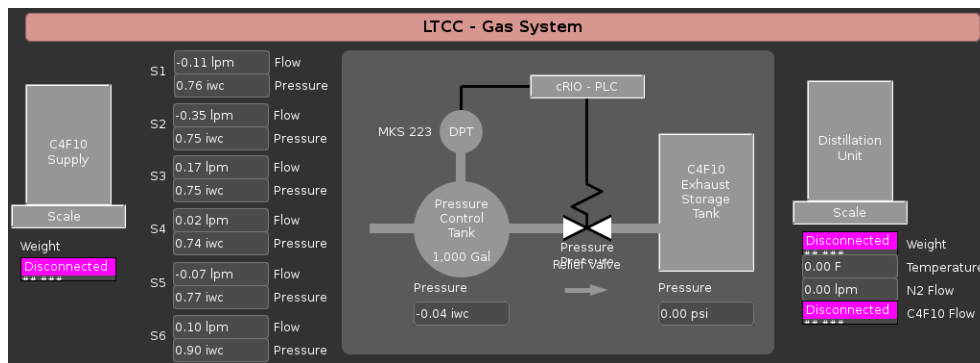
RESTORE HV BACKUP

Name	Size	Modified
MVT_HV-2017_06_10-20_59_58.snp	18.0 kB	Saturday
MVT_HV_default.snp	18.0 kB	Friday
MVT_HV-2017_06_09-15_21_45.snp	18.0 kB	Friday
MVT_HV-2017_06_09-08_08_53.snp	18.0 kB	Friday
MVT_HV-2017_06_09-06_56_53.snp	18.0 kB	Friday
MVT_HV-2017_06_08-17_14_09.snp	18.0 kB	Thursday
MVT_HV-2017_06_08-17_13_38.snp	18.0 kB	Thursday
MVT_HV-2017_06_08-17_05_32.snp	18.0 kB	Thursday

Gas Systems



- Gas systems design and National Instruments cRio programming (LabView) handled by DSG group
 - except Micromegas' (Saclay) Siemens PLC
- cRios push data to softIOCs for EPICS and CS-Studio user interface and alarm system



DC Gas Alarm Settings									
	Value	LO/LO	LO	HI	HI/Hi	LO/LO	LO	HI	HI/Hi
	111.35 psi	100.00 psi	0.00 psi	0.00 psi	0.00 psi	MAJOR	NO_ALARM	NO_ALARM	NO_ALARM
	14.04 lpm	3.20 lpm	3.50 lpm	0.00 lpm	0.00 lpm	NO_ALARM	NO_ALARM	NO_ALARM	NO_ALARM
Mix1 CO2 Flow	1.56 lpm	0.39 lpm	0.43 lpm	0.00 lpm	0.00 lpm	NO_ALARM	NO_ALARM	NO_ALARM	NO_ALARM
Mix1 Pressure	76.09 psi	40.00 psi	80.00 psi	100.00 psi	120.00 psi	NO_ALARM	NO_ALARM	NO_ALARM	MAJOR
Mix1 TCU	2.71	0.00	0.00	0.00	0.00	NO_ALARM	NO_ALARM	NO_ALARM	NO_ALARM
Mix2 Argon Flow	8.64 lpm	0.00 lpm	0.00 lpm	0.00 lpm	0.00 lpm	NO_ALARM	NO_ALARM	NO_ALARM	NO_ALARM
Mix2 CO2 Flow	0.96 lpm	0.00 lpm	0.00 lpm	0.00 lpm	0.00 lpm	NO_ALARM	NO_ALARM	NO_ALARM	NO_ALARM
Mix2 Pressure	64.90 psi	40.00 psi	80.00 psi	100.00 psi	120.00 psi	NO_ALARM	NO_ALARM	NO_ALARM	MAJOR
Mix2 TCU	1.91	0.00	0.00	0.00	0.00	NO_ALARM	NO_ALARM	NO_ALARM	NO_ALARM
R12 Manifold Press	-0.02 iwc	0.03 iwc	0.00 iwc	0.00 iwc	0.20 iwc	NO_ALARM	NO_ALARM	NO_ALARM	MAJOR
R12 Pressure	0.02 iwc	0.03 iwc	0.00 iwc	0.00 iwc	0.20 iwc	NO_ALARM	NO_ALARM	NO_ALARM	NO_ALARM
R12 Return Flow	0.37 lpm	0.00 lpm	0.00 lpm	0.00 lpm	0.00 lpm	NO_ALARM	NO_ALARM	NO_ALARM	NO_ALARM
R12 Return H2O	2962.29 ppm	0.00 ppm	0.00 ppm	0.00 ppm	0.00 ppm	NO_ALARM	NO_ALARM	NO_ALARM	NO_ALARM
R1 Supply Flow	3.00 lpm	0.00 lpm	0.00 lpm	0.00 lpm	0.00 lpm	NO_ALARM	NO_ALARM	NO_ALARM	NO_ALARM
R2 Supply Flow	8.00 lpm	0.00 lpm	0.00 lpm	0.00 lpm	220.00 lpm	NO_ALARM	NO_ALARM	NO_ALARM	NO_ALARM
R2 Supply H2O	8.43 ppm	0.00 ppm	0.00 ppm	0.00 ppm	100.00 ppm	NO_ALARM	NO_ALARM	NO_ALARM	NO_ALARM
R2 Supply O2	0.79 ppm	0.00 ppm	0.00 ppm	0.00 ppm	25.00 ppm	NO_ALARM	NO_ALARM	NO_ALARM	NO_ALARM
R3 Manifold Press	0.01 iwc	0.03 iwc	0.00 iwc	0.00 iwc	0.20 iwc	NO_ALARM	NO_ALARM	NO_ALARM	MAJOR
R3 Pressure	0.00 iwc	0.03 iwc	0.00 iwc	0.00 iwc	0.20 iwc	NO_ALARM	NO_ALARM	NO_ALARM	NO_ALARM
R3 Return Flow	0.74 lpm	0.00 lpm	0.00 lpm	0.00 lpm	0.00 lpm	NO_ALARM	NO_ALARM	NO_ALARM	NO_ALARM
R3 Return H2O	2995.70 ppm	0.00 ppm	0.00 ppm	0.00 ppm	100.00 ppm	NO_ALARM	NO_ALARM	NO_ALARM	NO_ALARM
R3 Supply Flow	10.00 lpm	24.00 lpm	0.00 lpm	0.00 lpm	170.00 lpm	NO_ALARM	NO_ALARM	NO_ALARM	NO_ALARM

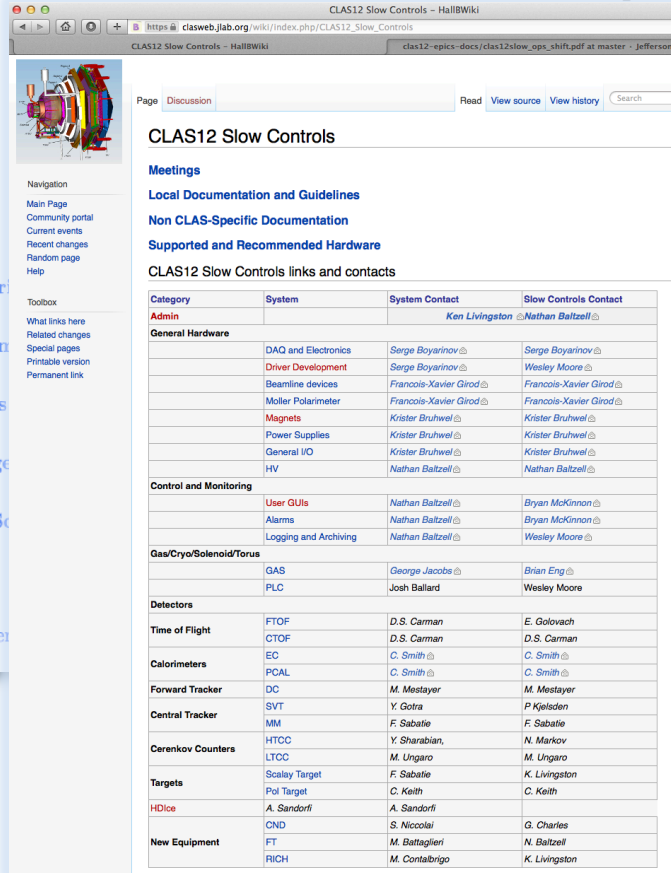
Documentation

- Shift Worker's Manual
 - Under version control:
 - <https://github.com/jeffersonlab/clas12-epics-docs/shift>
 - Includes necessary information for shift operations, e.g.
 - gui startup and layout
 - alarm interaction
 - restarting IOC's
 - paging experts
 - controls contacts
- Expert Manual in development
 - <https://github.com/jeffersonlab/clas12-epics-docs/expert>
 - most info already on wiki:
 - https://clasweb.jlab.org/wiki/index.php/CLAS12_Slow_Controls

CLAS12 Slow Controls Operations Manual - v2.0
(Dated: February 2, 2017)

Contents

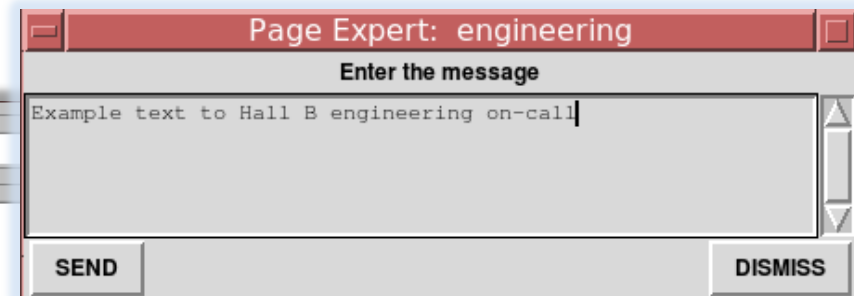
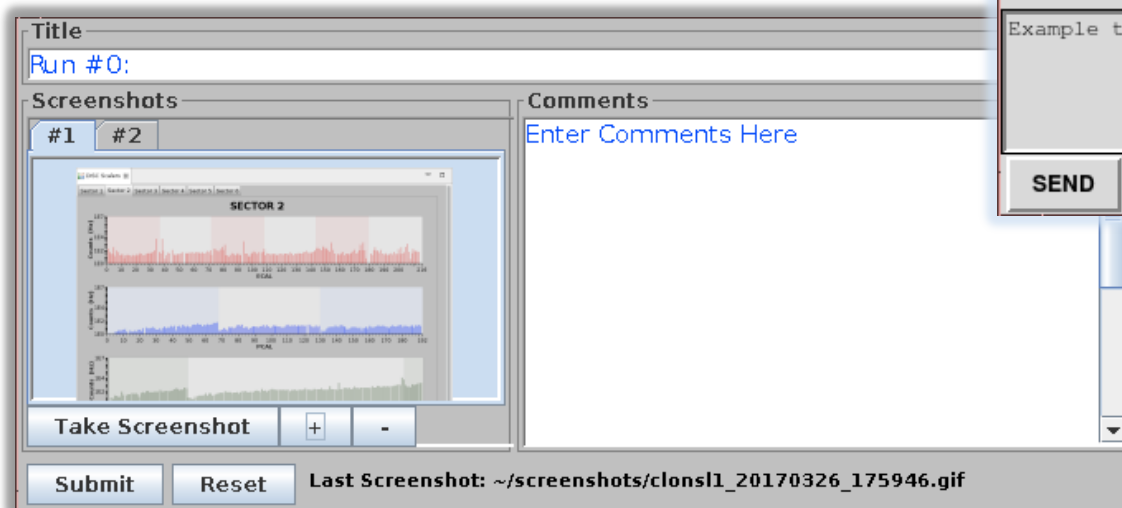
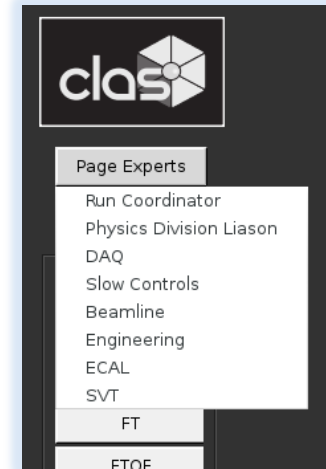
- I. Overview
- II. Alarms
- III. IOC's
- IV. High Voltage
- V. Strip Charts
- VI. Logbook Entry
- VII. Paging System
- VIII. Slow Controls
- IX. Remote Usage
- X. Accelerator Systems
 - A. Tagger
 - B. FSD
 - C. Beam Viewers



Category	System	System Contact	Slow Controls Contact
Admin		Ken Livingston	Nathan Baltzell
General Hardware			
	DAC and Electronics	Serge Boyarinov	Serge Boyarinov
	Driver Development	Serge Boyarinov	Wesley Moore
	Beamline devices	Francois-Xavier Girod	Francois-Xavier Girod
	Moller Polarimeter	Francois-Xavier Girod	Francois-Xavier Girod
	Magnets	Kristen Bruhwell	Kristen Bruhwell
	Power Supplies	Kristen Bruhwell	Kristen Bruhwell
	General I/O	Kristen Bruhwell	Kristen Bruhwell
	HV	Nathan Baltzell	Nathan Baltzell
Control and Monitoring			
	User GUIs	Nathan Baltzell	Bryan McKinnon
	Alarms	Nathan Baltzell	Bryan McKinnon
	Logging and Archiving	Nathan Baltzell	Wesley Moore
Gas/Cryo/Solenoid/Torus			
	GAS	George Jacobs	Brian Eng
	PLC	Josh Ballard	Wesley Moore
Detectors			
Time of Flight	FTOF	D.S. Carman	E. Golovach
	CTOF	D.S. Carman	D.S. Carman
	EC	C. Smith	C. Smith
Calorimeters	PCAL	C. Smith	C. Smith
Forward Tracker	DC	M. Mestayer	M. Mestayer
Central Tracker	SVT	Y. Gotra	P. Kjesliden
	MM	F. Sabatie	F. Sabatie
	HTCC	Y. Sharabian	N. Markov
Cerenkov Counters	LTCC	M. Ungaro	M. Ungaro
Targets	Scailey Target	F. Sabatie	K. Livingston
	Pol Target	C. Keith	C. Keith
HDice	A. Sandorfi	A. Sandorfi	
	CND	S. Nicolai	G. Charles
New Equipment	FT	M. Battaglieri	N. Baltzell
	RICH	M. Contalbrigo	K. Livingston

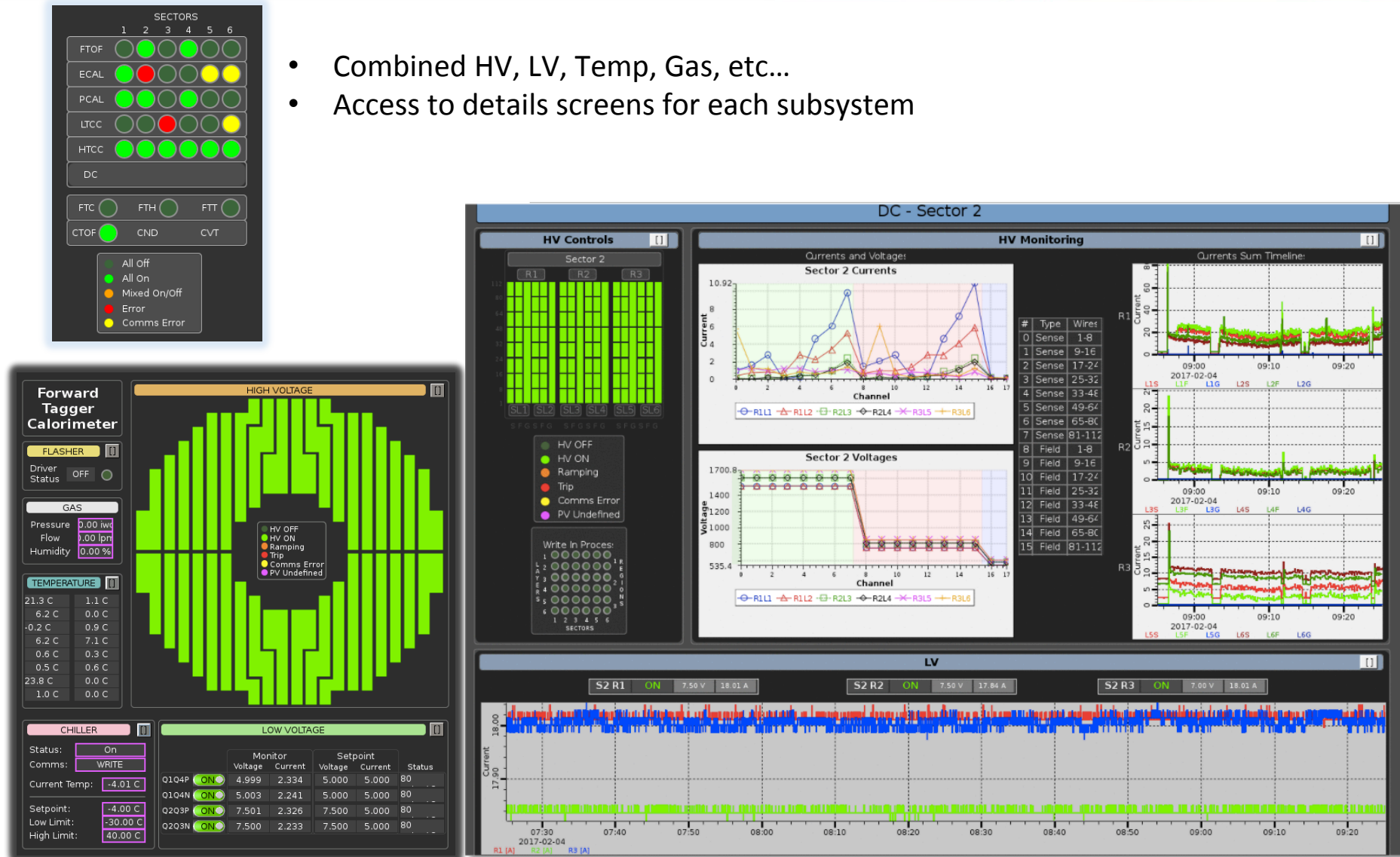
Paging Experts & Logbook

- Paging
 - Page On-Call expert phones from CS-Studio
 - DAQ / SlowControls / ECAL / ...
 - with message entry box
 - Additional Slow Controls Contacts in Shift Manual
 - Automatic notifications sent by the alarm system if desired by subsystem experts
 - CS-Studio also provides automatic screen capture → email
- JLab logbook
 - Via web browser with CUE authentication, or
 - Easy Hall B GUI with automatic screenshot functionality



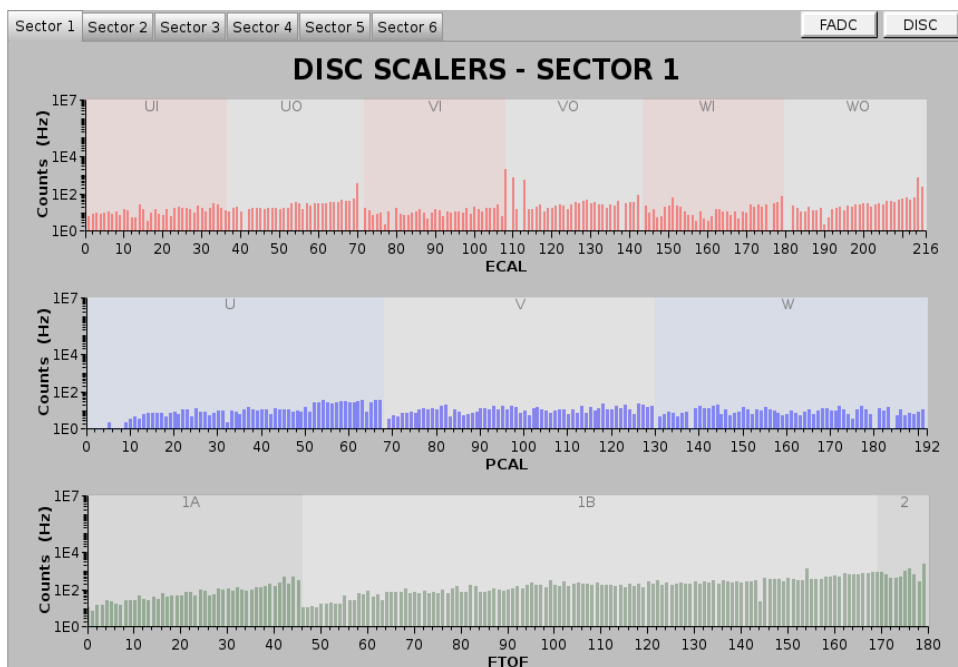
Detector Overview Screens

- Combined HV, LV, Temp, Gas, etc...
- Access to details screens for each subsystem



DAQ Scalers & Crates

- VXS Crates monitored with EPICS, with screens in CS-Studio
 - Alarms on temperatures, voltages, fans ...
- JLab FADC/DISC scalers read into EPICS with “histogram” displays
 - TODO: VTP scalers



Crate Name	Stat	Voltages				Temps		Fan Speed			
		1	2	3	4	Int	Ext	1	2	3	Set
adcecal1	80	5.00	11.94	3.30	12.01	34.2	32	6011	5835	6018	6000
adcecal2	80	5.00	12.00	3.31	11.98	30.6	29	5872	5936	6026	6000
adcecal3	80	5.00	11.98	3.31	11.96	29.8	22	5925	5955	5996	6000
adcecal4	80	4.98	11.97	3.29	12.00	30.2	24	4946	4968	4931	5000
adcecal5	80	4.98	11.95	3.31	11.98	37.0	34	6037	5872	5936	6000
adcecal6	80	4.98	12.01	3.31	11.98	37.4	35	6011	5940	5921	6000
tdcecal1	80	5.00	12.01	3.31	12.00	31.6	30	3337	3375	3487	3600
tdcecal2	80	5.00	11.98	3.30	11.99	34.0	34	3397	3405	3495	3600
tdcecal3	80	5.01	11.99	3.31	12.02	31.0	30	3442	3397	3528	3600
tdcecal4	80	5.00	12.03	3.30	11.98	30.0	26	3270	3198	3251	3600
tdcecal5	80	4.99	11.98	3.31	12.00	34.4	30	3243	3311	3416	3600
tdcecal6	80	5.01	11.99	3.31	12.02	38.0	36	3307	3431	3483	3600
adcpal1	80	4.99	12.00	3.29	11.99	33.6	29	5981	5917	5966	6000
adcpal2	80	5.00	11.99	3.29	11.94	28.8	20	5928	5940	5988	6000
adcpal3	80	4.99	12.00	3.29	11.98	29.2	19	5958	5966	5966	6000
adcpal4	80	5.01	12.02	3.31	11.95	29.2	28	4953	5013	4931	5000
adcpal5	80	5.00	12.00	3.31	11.99	38.0	34	6007	5898	5955	6000
adcpal6	80	5.01	12.02	3.32	11.98	34.8	30	6048	5928	5898	6000
tdcpal1	80	5.02	11.98	3.30	12.01	32.6	30	3303	3345	3393	3600
tdcpal2	80	5.01	12.00	3.30	12.01	31.8	29	3255	3217	3311	3600
tdcpal3	80	5.01	11.96	3.28	11.99	32.6	25	3300	3408	3438	3600