An Overview of SLAC Cryogenic Activities

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CryoOps 2004

What Do We Do ?

- This talk will answer a frequent question:

  There are cryogenics at SLAC?

- Cryogenics at SLAC involve:
  - Large scale He refrigerator operation in support of BaBar & other experiments
  - Support of the SLD LAr calorimeter
  - Polarized Gun cooling
  - Site wide He Gas system
  - LN_2 delivery
  - Design and construction support for small scale experiments (EXO, cavity lights, pulsed SC)

What Do We Do ?

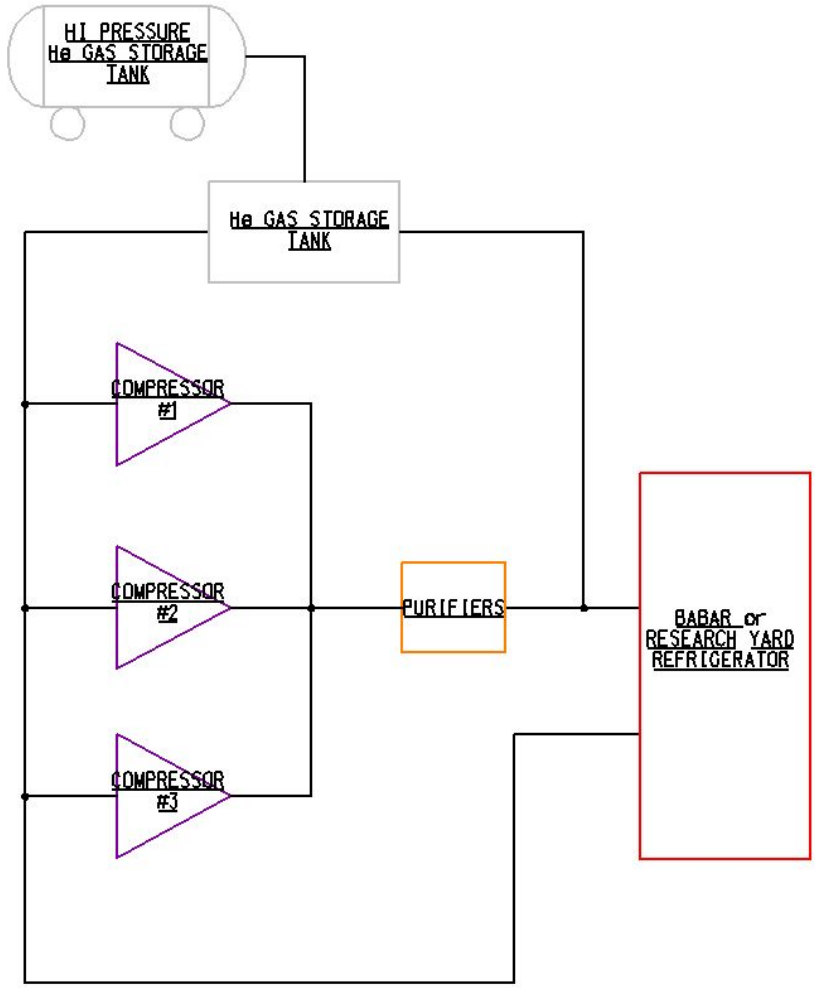
- The SLAC Cryogenics Group also carries out a number of “noncryogenic” tasks
  - Design , construction & installation of specialized beam line components (collimators, vacuum systems, beam pipes, ovens, magnets)
  - Design, construction & repair of specialized electronics for experiments.
- This talk will stress the cryogenic activities

Large Scale Refrigeration

- 2 He refrigerator/liquefiers in operation
  - BaBar (Linde)
  - Research Yard Refrigerator (CTI/Sulzer 4000)
- These systems share a common set of helium compressors: the Central Helium Facility (CHF)

Central Helium Facility

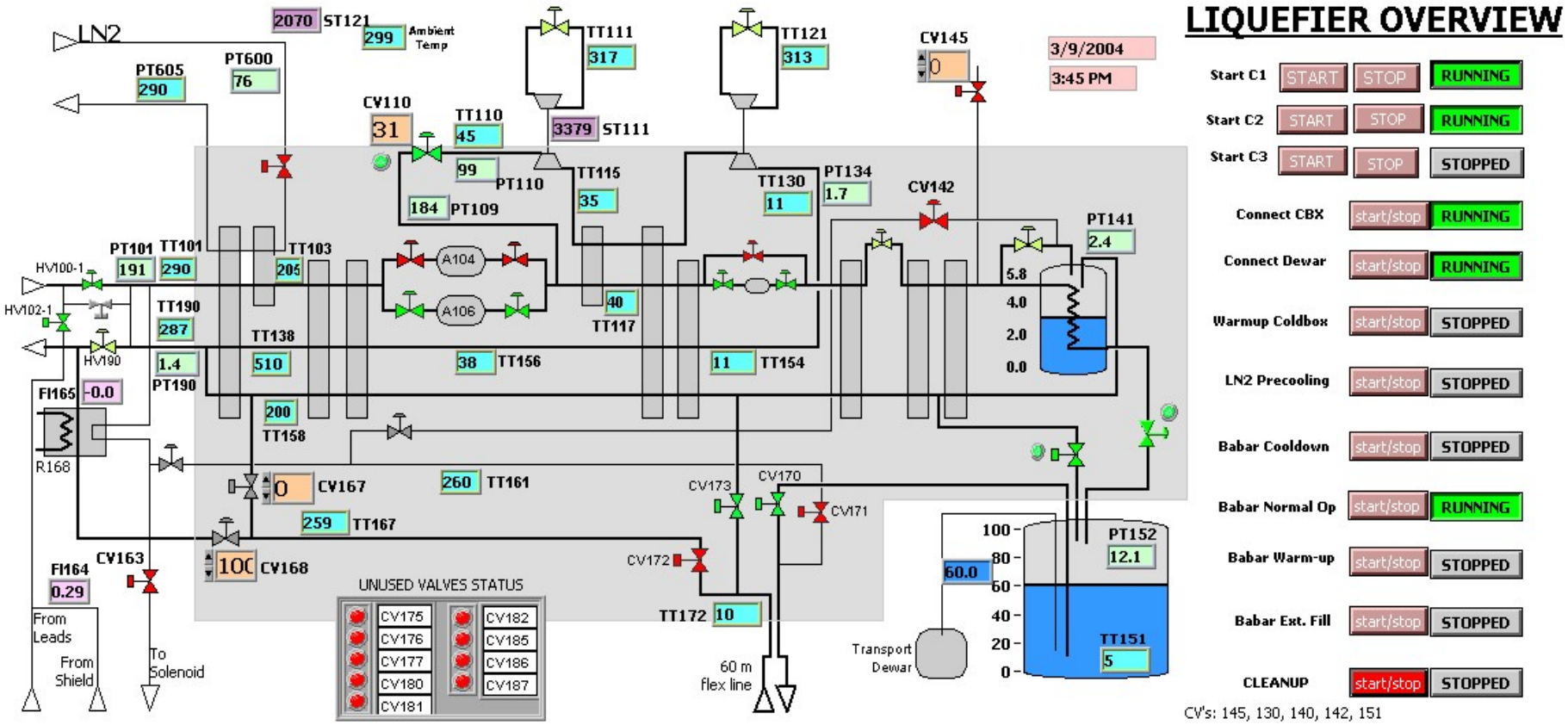
- 3 Sullair screw compressors
  - One 100 g/s
  - Two 50 g/s
- Any compressor can be tied to any refrigerator
- Centralized gas management & cleanup
- Electronics & Controls have been recently upgraded
- Centralized PLC and LabView control system



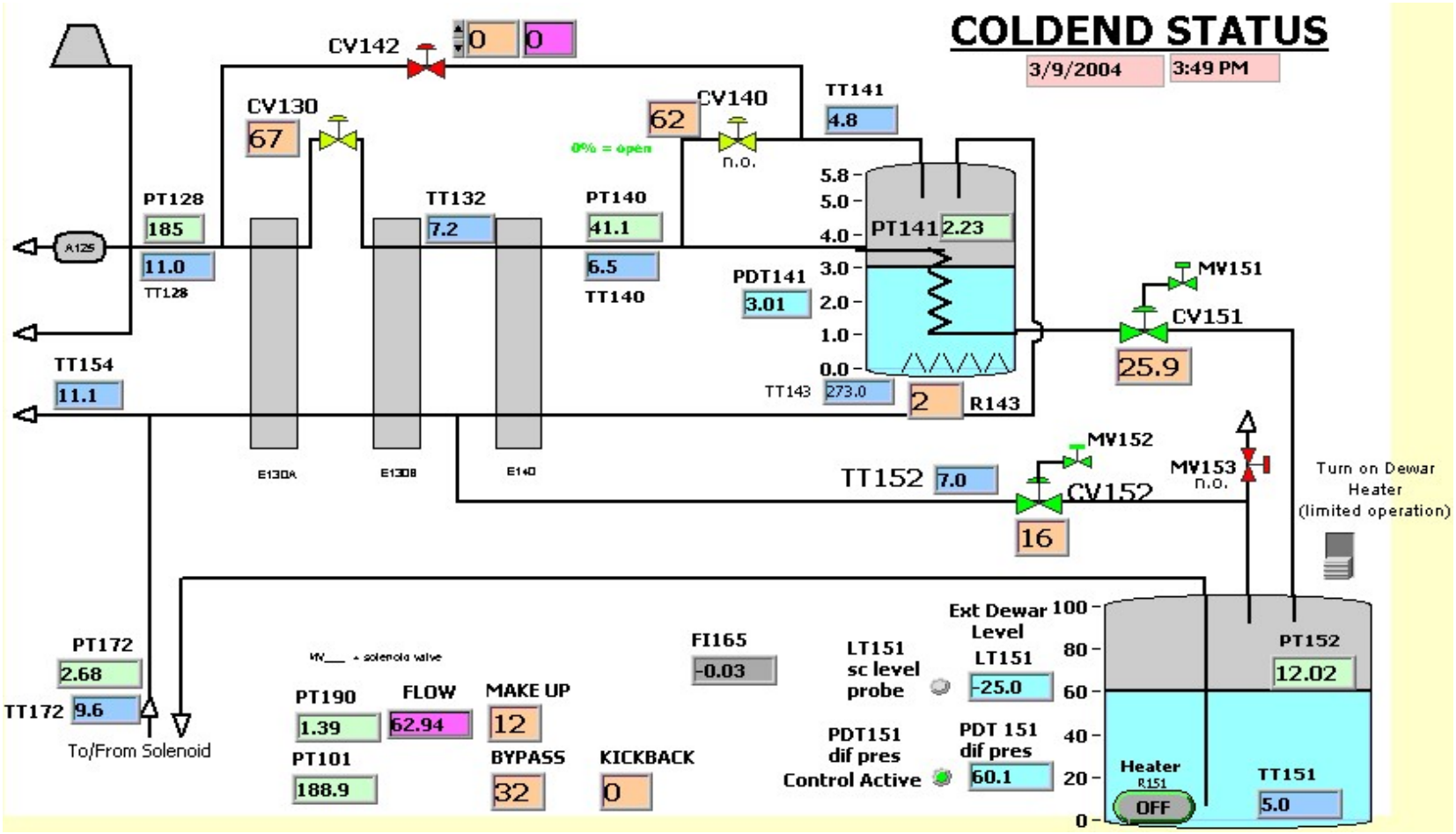
BaBar Refrigerator & Solenoid

– Superconducting Solenoid (1.5 T, 4597 A, 27 MJ)
– A critical component of the BaBar detector
– Operates continuously ~ 10 months/year
– Availability is the key issue (~99%)
– Cooled by 800 W (@100 g/s) Linde refrigerator
– The plant has a significant amount of excess capacity

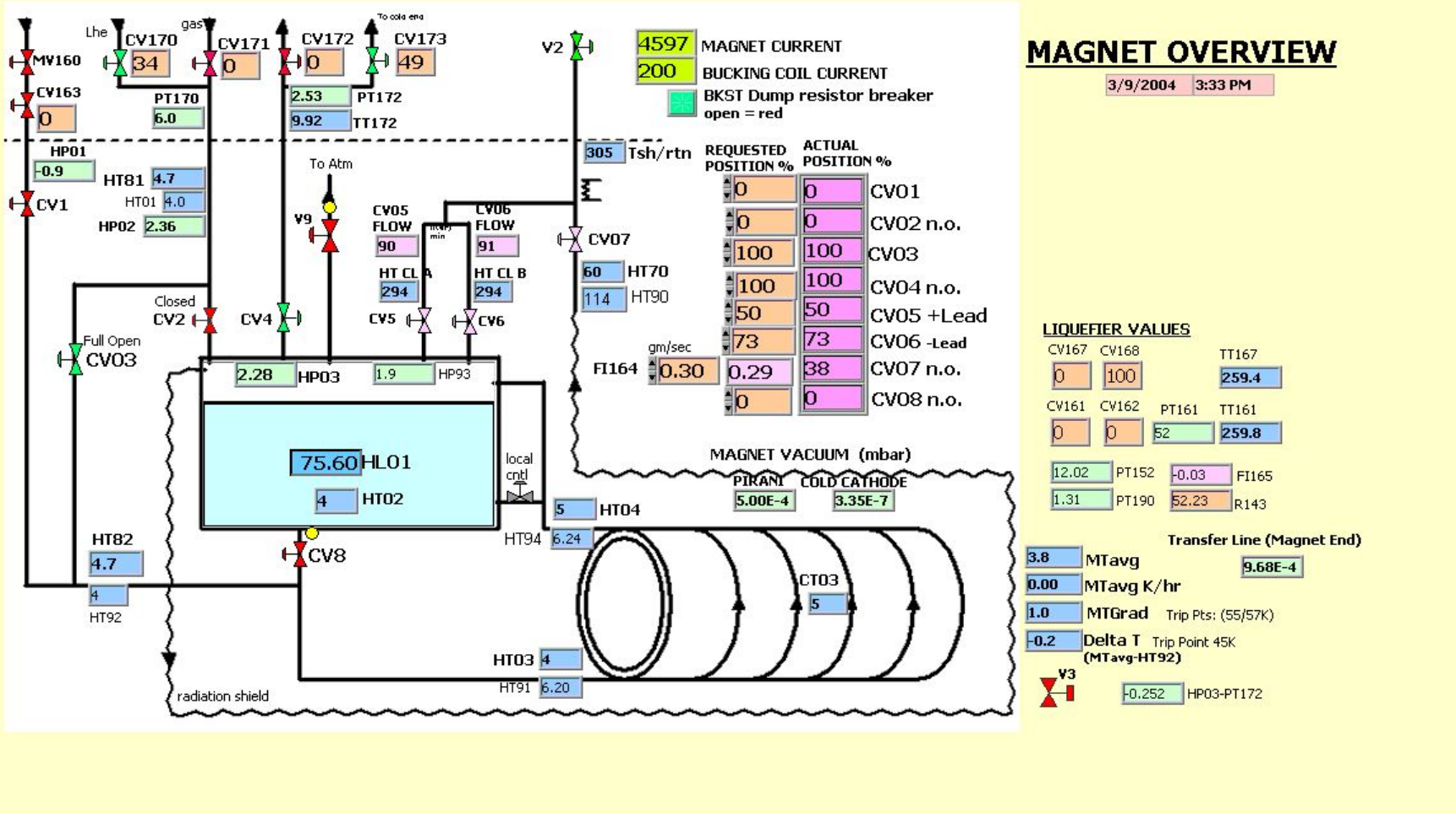
BaBar Refrigerator & Solenoid



BaBar Refrigerator & Solenoid



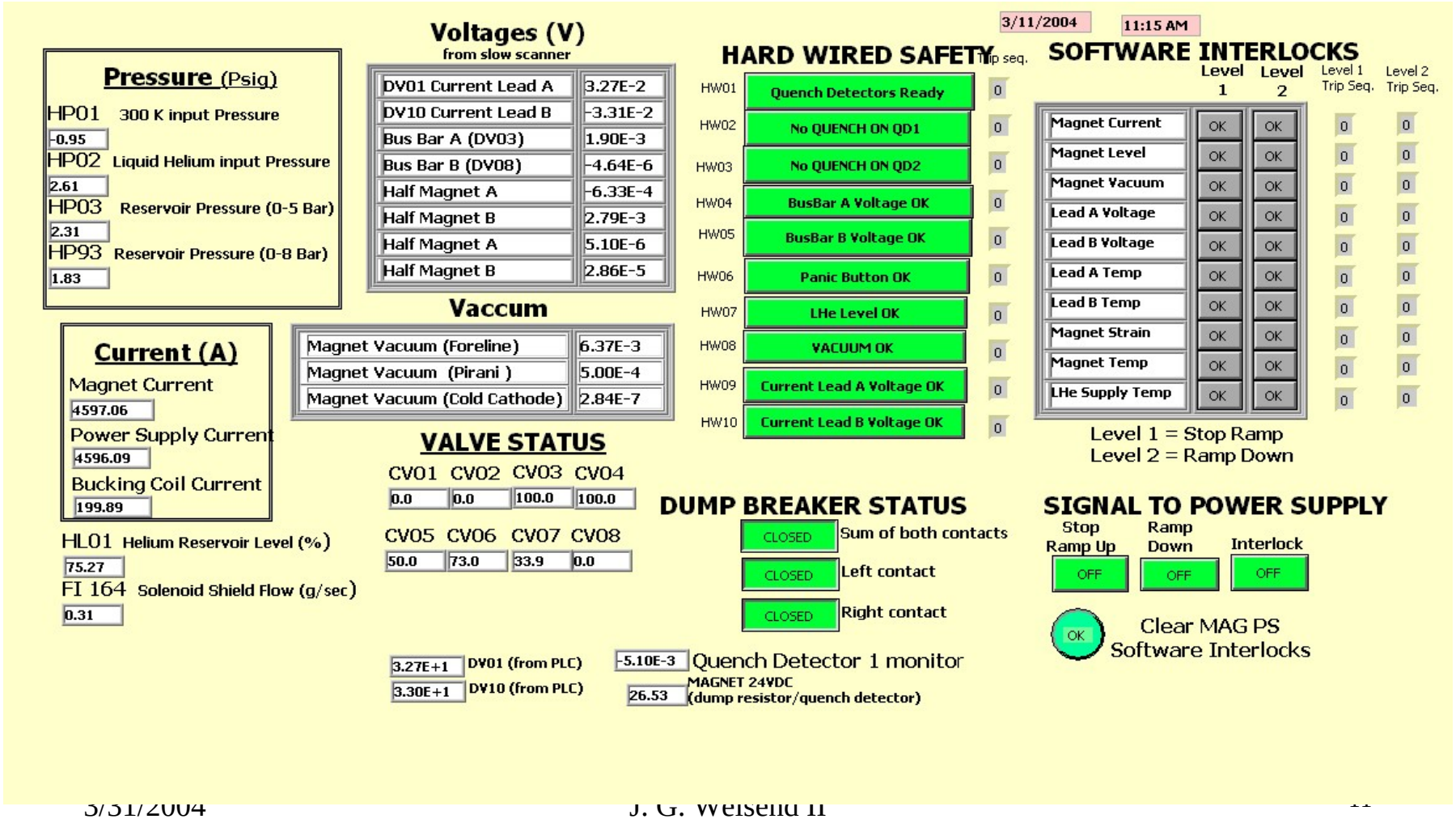
BaBar Refrigerator & Solenoid



BaBar Refrigerator & Solenoid

- Hardware & software interlocks protect the magnet from damage due to quenching
  - Software interlocks ramp magnet down or prevent ramp up of current
  - Hardware interlocks cause dump breaker to open and magnet to fast discharge
- As we have gained more experience some interlocks have been changed or removed to improve reliability

BaBar Refrigerator & Solenoid



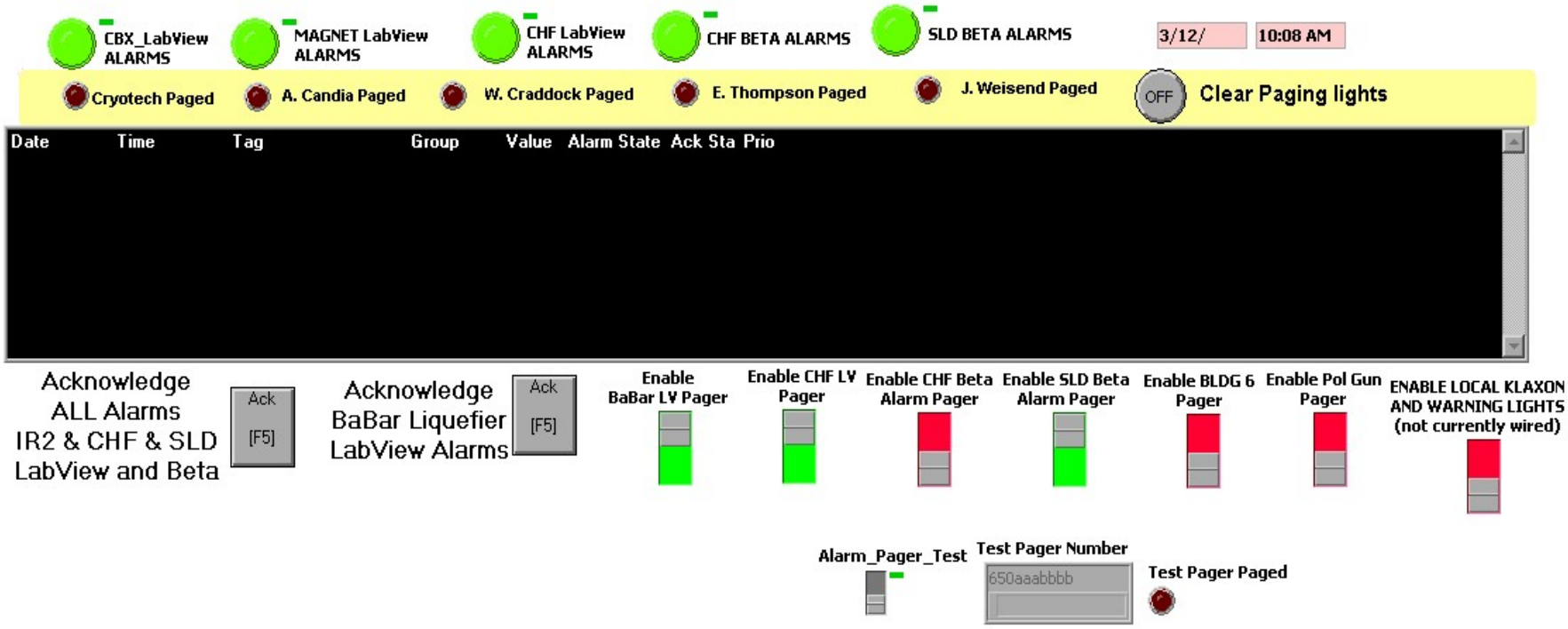
Control Systems

- The Babar Refrigerator & Solenoid as well as the CHF Compressors are controlled by a set of 3 Programmable Logic Controllers (AB SLC 500/4)
- The PLCs run a ladder logic program (RSLogix)
- Operator control is carried out on Win XP PCs running LabView
- The PLCs are tied to each other and PCs via a proprietary network (DH+)
- Critical control components are on UPS backup

Control Systems

- The controls include an automated alarm & paging system
- Alarms can be acknowledged via telephone
- All control screens are available on the web for remote monitoring (but not control) http://cryocon2.slac.stanford.edu:8080/

Control Systems



Research Yard Refrigerator Facility

- A CTI/Sulzer 4000 Plant
- Can provide > 1 kW refrigeration @ 4.2 K or >1.2 kW refrigeration @ 16 K
- Most recently used in the E158 LH_2 target experiment (2000 – 2003)
- Available to support future experiments with refrigeration or LHe
- Analog controls with LabView monitoring

Staffing

- 24 people in the SLAC cryogenics group
  - Continuous operations support for the cryogenic systems (BaBar, LAC, LN_2 He gas, Polarized gun)
    - 20 hours onsite M-F, 12 hours onsite Sa, Su + remote monitoring – 7 Cryotechs
  - Design & construction support for both cryogenic and non cryogenic equipment
  - Cryogenic, mechanical, electronic & software engineering capabilities
  - Provides significant support to SLAC safety programs
- Part of the larger Experimental Facilities Dept.

Experimental Facilities Department

John Weisend, Head

Perry Anthony, Deputy Head

Administration

Vickee Flynn
Charlotte Los Baños
Michelle Smith

Research & Facilities Support Group

Perry Anthony, Manager

Carsten Hast, Assistant Manager

Carsten Hast, Physics and Instrumentation

Carl Hudspeth Terry Tuck

Zen Szalata, Computing & DAQ

Richard Torres, Facilities & Rigging

William Anderson Percy Clay
David Engesser Mike Jimenez
George Bradford [50%] Scot Johnson [50%]

Zorb Vassilian, BaBar

Andrew Hau
Jason Krebs
George Bradford [50%] Scot Johnson [50%]

Engineering

Bill Olson

Staff

Gary Bower
Richard Boyce
Ted Fieguth
Dieter Walz

Cryogenics & Electronics Support Group

John Weisend, Manager

Michelle Smith

Staff

Wes Craddock
Ricky Principe
Ron Rogers
Louis Salerno
(Visitor-NASA)
EunJoo Thompson
Tom Weber

Cryo & Detector Systems Operations

Arthur Candia,
Head of Operations

Mike Racine,
Deputy Head of Operations

Lester Harwood
Gary Howell
Robert Moore
Wes Muffett
Matt Neibel
Dennis Norris
Freeman Owens
Domingo Sanchez

Electronics

John Weisend/
Wes Craddock
Supervisors

Angel Angelov
Ronald Badger
Yic Liang
Alex Kacharovsky
Patrick Shen
Paul Stiles
Sam Zalog

EFD CRYOGENIC GROUP-MANPOWER SCHEDULE

MARCH'04

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
	M	T	W	TH	F	S	S	M	T	W	TH	F	S	S	M	T	W	TH	F	S	S	M	T	W	TH	F	S	S	M	T	W
HARWOOD, L.	S	S	S	S	S			S	S	S	S	S			S	S	S	S	S			S	S		N	N	N	N			
HOWELL, G.	S	S	S	S	S			S	S	S	S	S			S	S	S	S	S			S	S	S	S	S			N	N	N
MOORE, R.	S	S	S	S	S			S	S	S	S	S			S	S	S	SL	SL			SL	SL	S	S	S			S	S	S
MUFFETT, W.	N	N	N	N				S	S	S	S	S			S	S	S	S	S			S	S	S	S	S			S	S	S
NEIBEL, M.		S	S		N	N	N	NL		S	S	S			S	S	S	S	S			S	S	S	S	S			S	S	S
NORRIS, D.	S	S	S	S	S			N	N	N	N	N					N	N	N	N		S	S	S	S	S			S	S	S
SANCHEZ, D.	S	S	S	S	S			S	S	S	S		N	N	N	N					N	N	N	N		S			S	S	S

88 HOUR PAY PERIOD

96 HOUR PAY PERIOD

D=DAY SHIFT
N=NIGHT SHIFT

T=TRAINING
L=LEAVE

S=STRAIGHT DAYS

=WEEKEND
=HOLIDAY

Summary

- Cryogenics plays an important role in the SLAC Research Program.
- The cryogenics group is broadly skilled, experienced and able to adapt quickly to changing research priorities.
- Cryogenic facilities at SLAC have significant capabilities & are continuously upgraded.
- Future challenges include replacing retiring workers with trained people and providing support to the LCLS project.