Status of the Control System for ILCTA Cryogenic Complex at Fermilab

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ABSTRACT

One of the basic components of the ILC Test Area (ILCTA) is a greatly distributed cryogenic system. Part of it is already operational at Fermilab's Meson Detector Building (MDB) with cryogenic plant located in separate building 500 m away, Cryogenic Test Facility (CTF), and another part is still under construction at New Muon Lab (NML). In the MDB a new test facilities related to superconducting radio frequency (SRF) cavities are located while in NML the test ILCTA accelerator will be build.

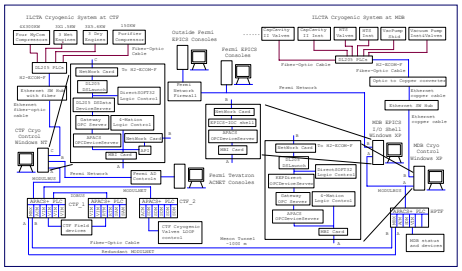
To control and monitor ILCTA cryogenic utilities, a sophisticated multilayer control system has been developed and partially deployed.

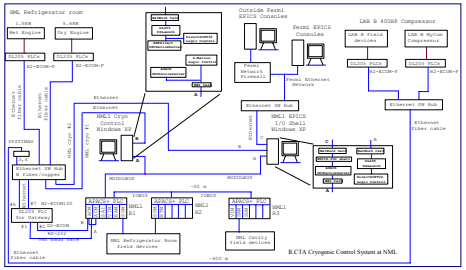
At the lower level DirectLogic205 PLC's by Koyo are used as the field level interface to most cryogenic components such as expansion engines, screw compressors, valves, etc.

At the middle level APACS* Process Automation System from Siemens-Moore was chosen to configure and control PLC's : control loops, automation and central database all reside at this level. The OLE for Process Control (OPC) technology, via OPC server running on a dedicated Windows XP node, is used as the communication bridge from the field PLC's to APACS*.

At the top level of this system EPICS (Experimental Physics and Industrial Control System) is used as a SCADA/HMI. The EPICS control system accesses the APACS* OPC server via an EPICS soft IOC (Input Output Controller) which runs on the same XP node. The usage of EPICS provides operators the ability to remotely control and monitor cryogenic devices and use various EPICS user applications such as graphical chart displays with control loops, real-time strip plots, historical data archiving, and alarm tools.

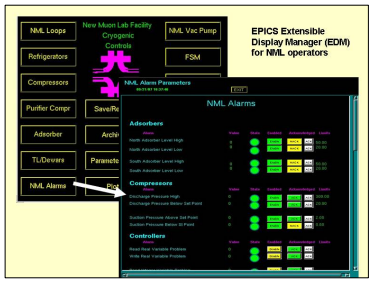
Such a distributed control system has been proven to be reliable and flexible allowing for growth and adaptation to new cryogenic equipment and end users. At the moment 29 PLC's, four APACS* nodes and two dedicated EPICS IOC are successfully operating at ILCTA locations.



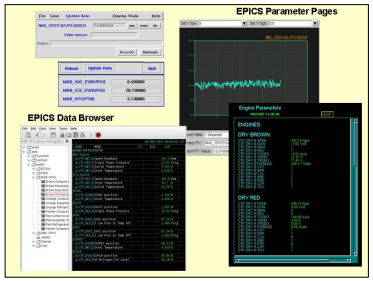


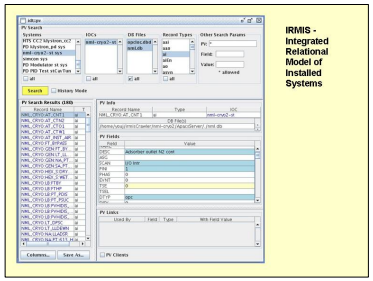
I/O Details

	CTF	MDB	NML
Positive Pressure Transmitters	50	29	60
Vacuum Pressure Transmitters	0	13	28
Temperature Sensors	55	47	36
Misc. Analog Transmitters	112	33	24
Oxygen Deficiency Safety Transmitters	5	16	4
Analog Outputs	0	6	32
Digital Inputs	45	119	58
Digital Outputs	77	75	50
TOTALS	344	338	292



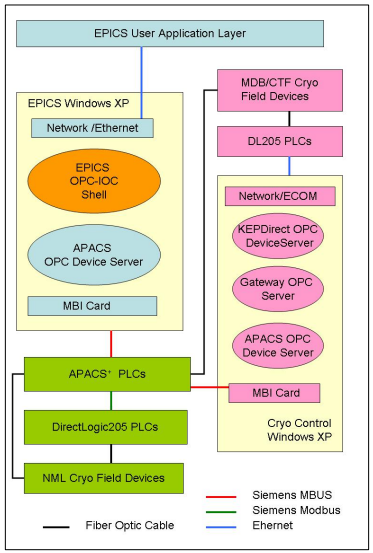
EPICS Extensible Display Manager (EDM) for NML operators

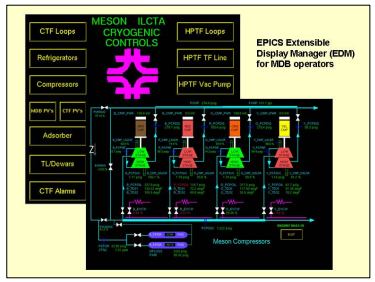




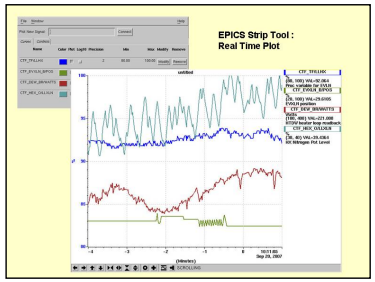
IRMIS - Integrated Relational Model of Installed Systems

Control System Architecture

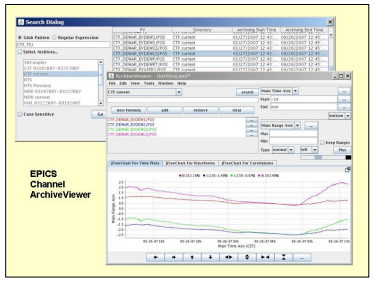




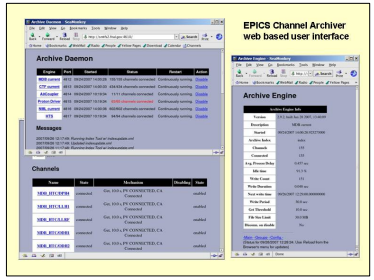
EPICS Extensible Display Manager (EDM) for MDB operators



EPICS Strip Tool : Real Time Plot



EPICS Channel ArchiveViewer



EPICS Channel Archiver web based user interface

Vacuum Pump Control

MDB/CTF Facility

Projects: Horizontal Test System, Capture Cavity II, Spoke Resonators Test Area, High Intensity Neutrino Source Test

Cryogenic system: three 0.6 kW refrigerators at 4.5 K each, compressor system, 400 m cryogenic transfer line, warm vacuum pump system

HTC Control Package

Engine Controllers

Instrument I/O Box

Valve Control Box

APACS* Crate

Control Rack with Master DL205 PLC

NML Facility

Projects: Photo-Injector Laboratory, ILC Module Test Area, CW Test Area

Cryogenic system:

- temporary: two refrigerators 0.6 kW at 4.5 K each, warm vacuum pumping system
- permanent: new hybrid plant or modified SSC plant

Engine Control Cabinets

MICOM Control Cabinet