ControlView to EPICS Conversion of the TRIUMF TR13 Cyclotron Control System

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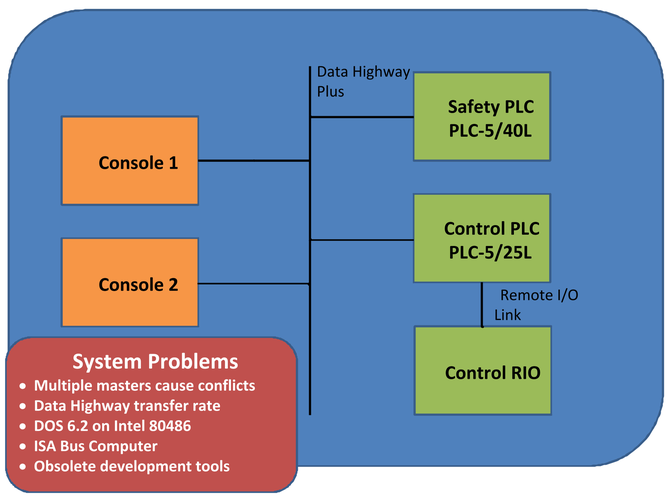
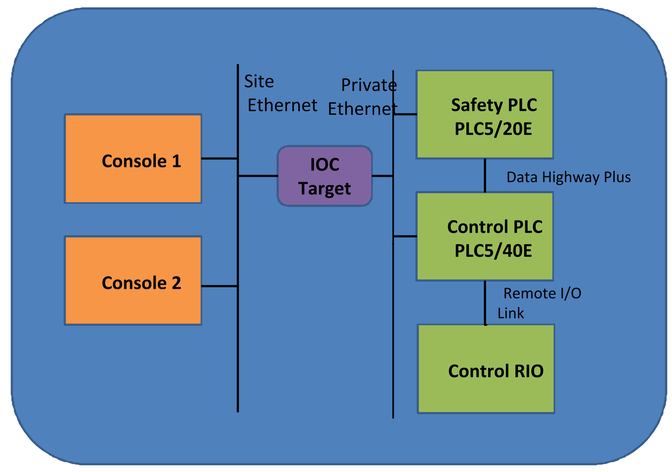
Original System



Hardware Options for Upgrade

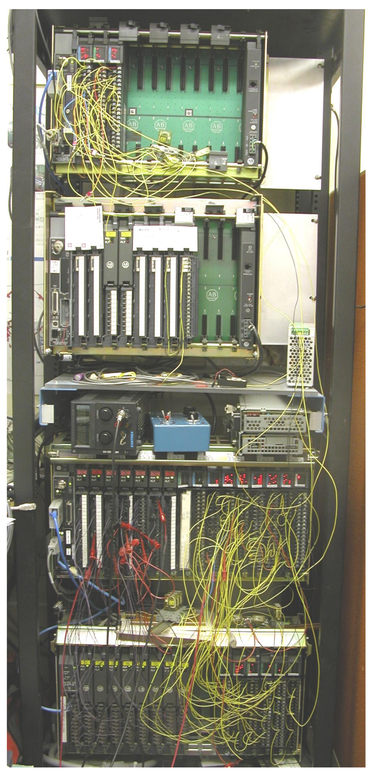
- Ethernet Coprocessor
  - No room without shifting modules, would require PLC program changes
- Serial Port to DH+ module
  - Speed limitations
- Replace with ControlLogix or other PLC
  - Rewrite not allowed
- Data Link Ethernet to DH+ Module
  - Speed limitations, limited size of translation blocks
- Replace PLCs with Ethernet enabled units
  - No change in PLC I/O hardware
  - Parallel deployment of EPICS with existing OPI
  - Fast private communication, standard architecture

Replacement System



PLC System Mockup

- ❑ Build equivalent hardware system for testing EPICS replacement
- ❑ Recycled parts from Hermes experiment gas system
- ❑ E-Bay for missing low cost parts – non production
- ❑ Cost ~ $2500
- ❑ LadderLogistics (DOS based) did not support Ethernet enabled PLCs
- ❑ WinLogic5 (Windows 98 based) used for testing mockup and EPICS interface
- ❑ RSLogix (Windows XP) purchased in 2nd year and used for monitoring and maintenance

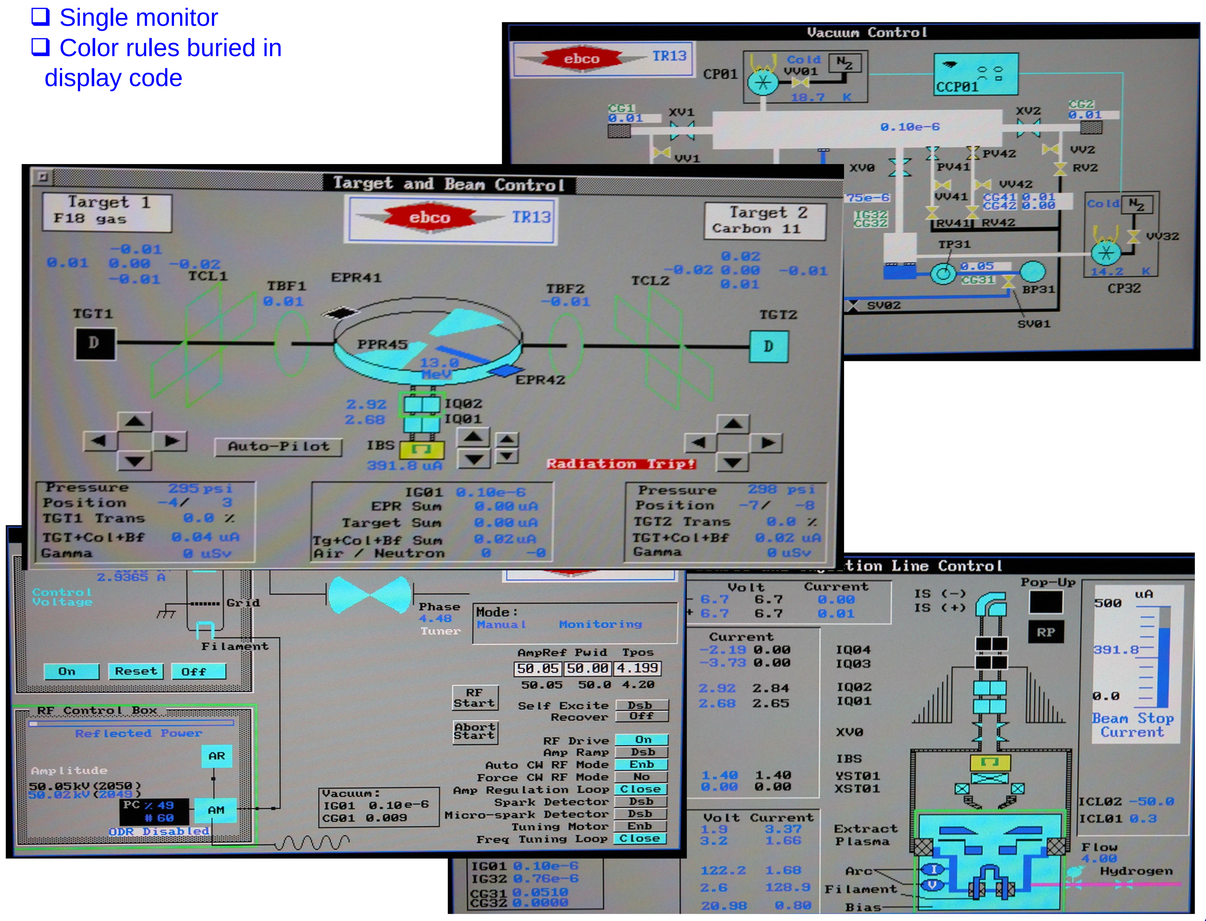


EPICS Device Support

- ❑ Standard driver layout – device support, driver support, low level communication via Ethernet
- ❑ Designed for reserved communication block in PLC memory, with command word overwrite if externally changed by PLC
- ❑ TR13 command bits do not follow pattern, with command bits, status bits, internal and one-shot bits combined into words. The EPICS driver would detect changes in a word and overwrite the full word, resulting in unexpected behaviour.
- ❑ Rewritten to incorporate single word and bit access, optional scanning of word and bit changes.
- ❑ Timer and Counter read functions added
- ❑ Enhanced diagnostics
- ❑ Still to do: Reconnection of closed pipes from a PLC reset or power loss.

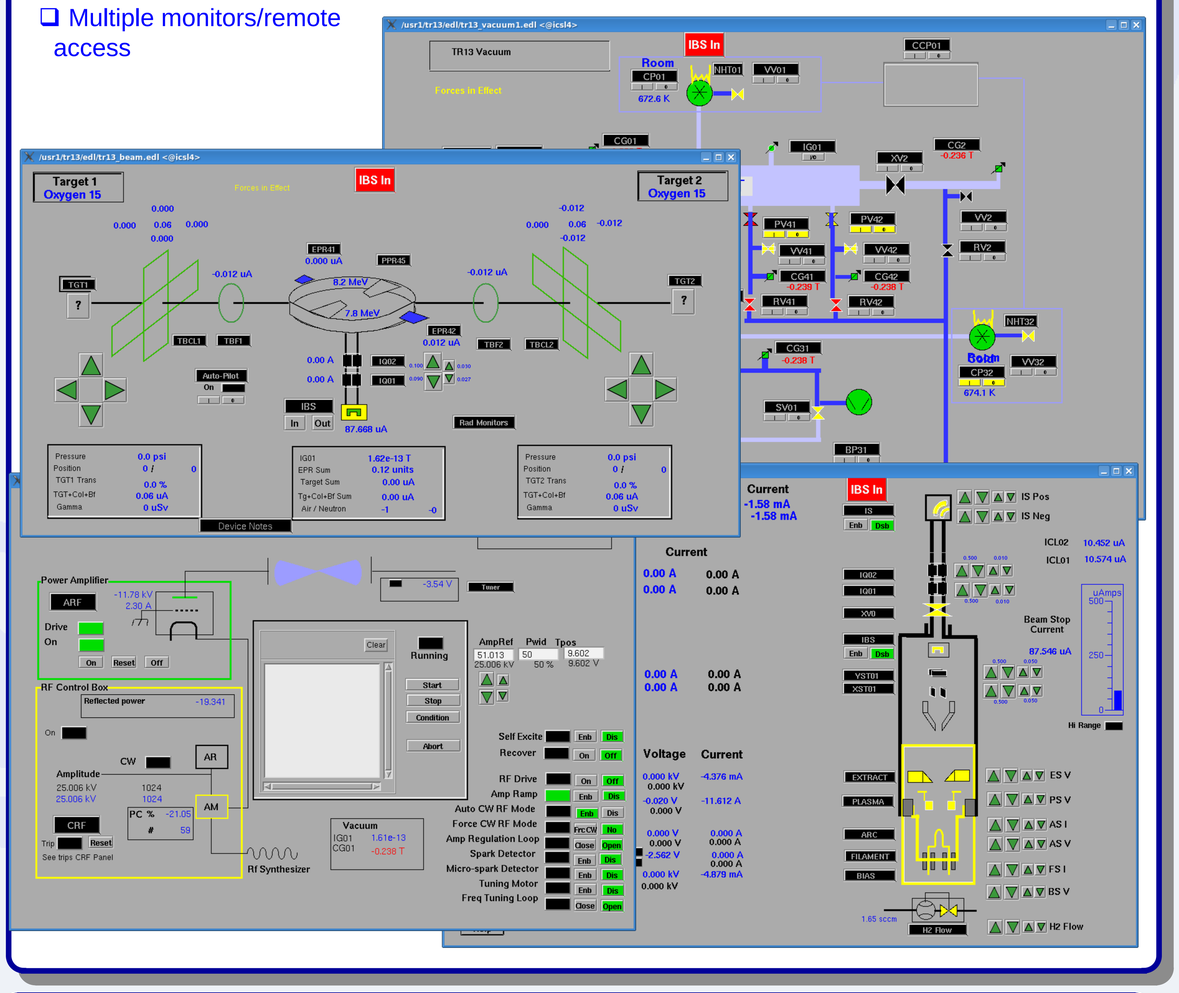
Original Console Displays

- ❑ Keyboard oriented
- ❑ Limited windows
- ❑ Single monitor
- ❑ Color rules buried in display code



EDM Replacement Displays

- ❑ Mouse oriented
- ❑ Windows unlimited
- ❑ Multiple monitors/remote access



Atom based Linux IOC Target

- ❑ Small low power fanless computer for Linux SoftIOC deployment
- ❑ Dual Ethernet for firewall
- ❑ Multiple serial ports, parallel port
- ❑ PCI slot for other field busses
- ❑ Small Linux distribution for easy management

System Summary

- ❑ 10 subsystems, 103 schematics, 92 symbols, 2831 EPICS records
- ❑ 29 edm main screens, 88 device panels, 153 screens total
- ❑ 13 automation scripts
- ❑ 2 main consoles

Acknowledgments

- ❑ John Sinclair – SNS – PLC 5 Device Driver and much advice
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- ❑ ISAC Controls Group – TRIUMF - patience
- ❑ Nuclear Medicine Group – TRIUMF – even more patience