

# LCLS Magnet Controls

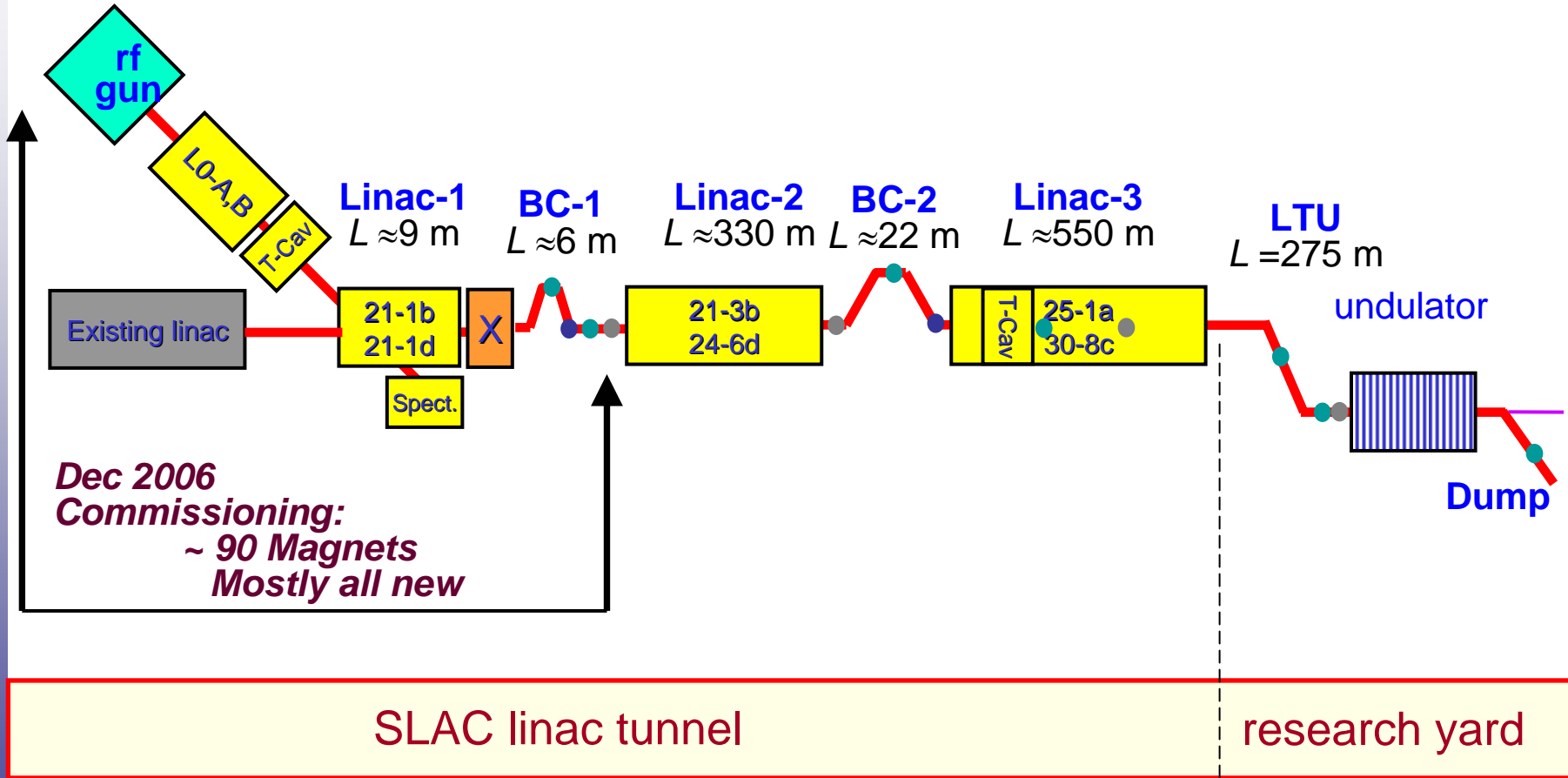
K. Luchini & D. Rogind

- Scope
- Requirements
- Hardware
- Software

## Scope

- New and Existing Magnets
- Magnet Types
  - Bends, Solenoids, Quads, Correctors, Trims, Kickers
- Commissioning
  - Phase I - Apr 2007
    - 89 New - 6 intermediate, 83 low current
    - 20 Existing - 12 correctors, 8 quads
  - Phase II - Dec 2007 (LI22 thru BSY)
    - 29 New – correctors, quads, bends, trims, kicker
    - 225 Existing – 54 correctors, 71 quads
  - Phase III - Jun 2008 (LTU thru E-dump)
    - 106 - 1 Kicker, 24 Intermediate PS, 81 Low Current
    - Note: holding off on powering 66 correctors in the Undulator

## LCLS Conceptual Diagram



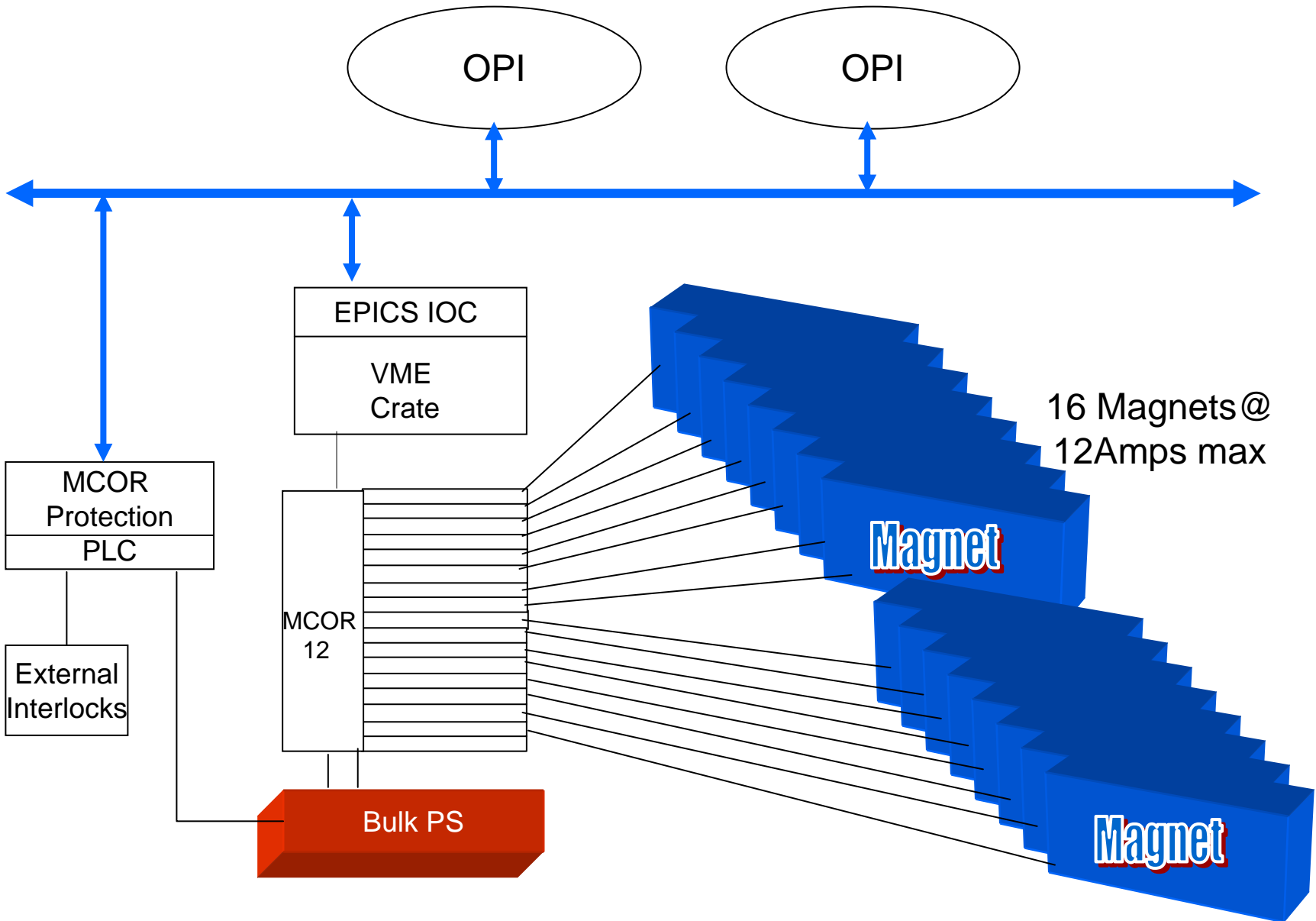
## Requirements

- Power Supplies Stability
  - Bends and solenoids
    - Short term : 100 ppm RMS, over 1 second
    - Long term: 100 ppm RMS, over 10 seconds
  - Correctors, quads and trim coils
    - Short term: 30 ppm RMS, over 1 second
    - Long term: 400 ppm RMS, over 10 seconds
- Temperature
  - must operate in diurnal temp drifts of +/- 15 deg C (Linac gallery)
- Secondary Transducer required bends and solenoids
- Existing magnet in Linac must work for 50GeV beam and LCLS 4-14Gev beam
- Interface Controls
  - Fast feedback - most correctors at 10Hz , 4 correctors in LTU at 120Hz
  - Timing – Sync timestamp with beam pulse
  - MPS – some bends, and BYKIK in the LTU.
  - PPS – Stopper in Injector BX01-BX02

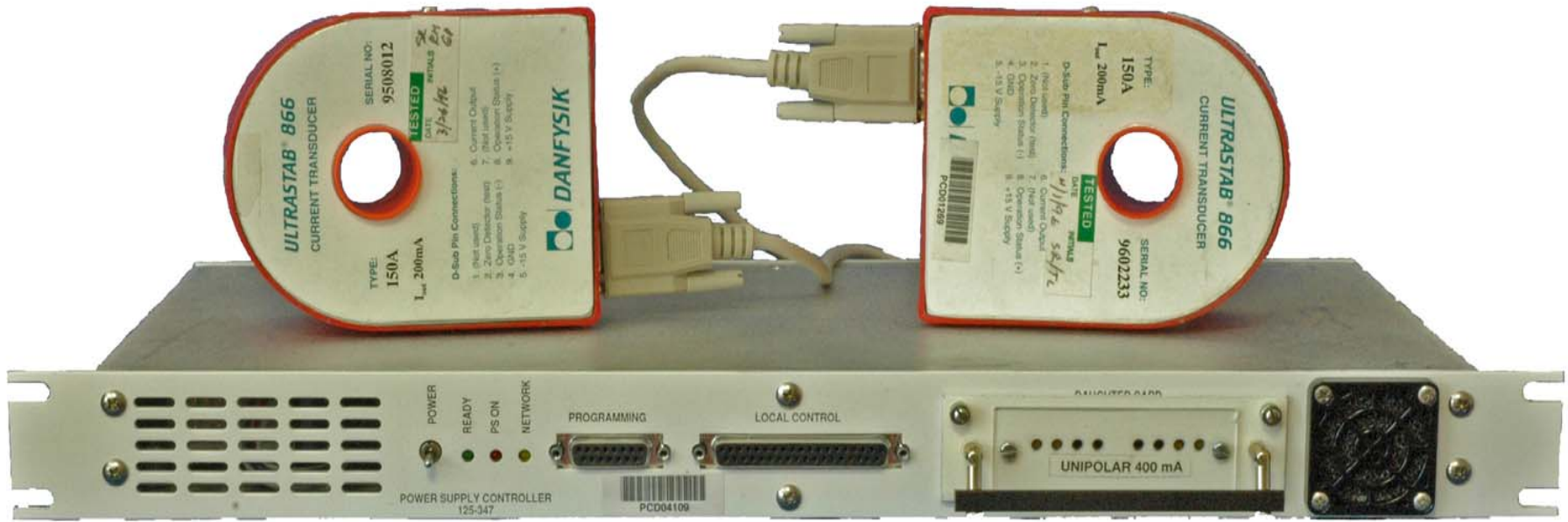
# Hardware

- Power Supply Controllers
  - Ethernet Power Supply Controller - 2ppm per deg C
    - for intermediates ps - Used at SPEAR 3
  - MCOR Controllers - 15ppm per deg C
    - for low current , 30A and below
- I/O
  - VME 64X - MCOR Current Monitor and Control
    - Wiener VME 64X Crate
    - Acromag 9670 IP Carrier
    - Acromag Trans 200 – Transtion Module
    - Acromag 231-E, 16-bit, 16chan +/-10V DAC
    - Hytec IP-8413-ADC, 16-bit, 16-chan, +/-10V ADC
  - PMC - Micro Research EVR-200 - Event Receiver
  - PLC - Model 1756 (PS Protection System)
    - MCOR Bulk PS Current Monitor, PS On/Off, Reset
    - MCOR Local/Remote Status, PPS Fault Reset,
    - MCOR Ground Current Monitor
    - Thermal Switches Faults
    - Water Flow Switches Faults
    - MCOR Bulk PS Ramp

# MCOR Bulk PS System Architecture for Magnets 30A and under

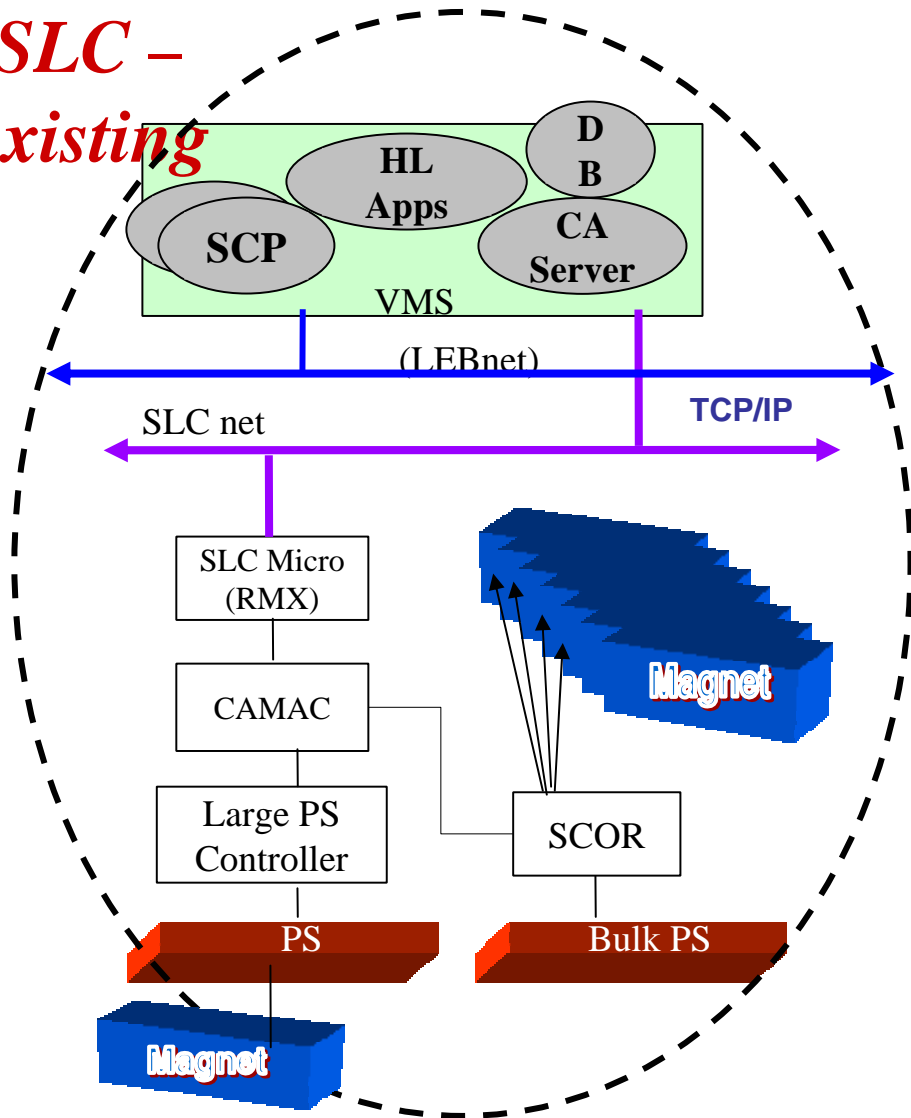


# Intermediate PS - Ethernet PS Controller (EPSC)

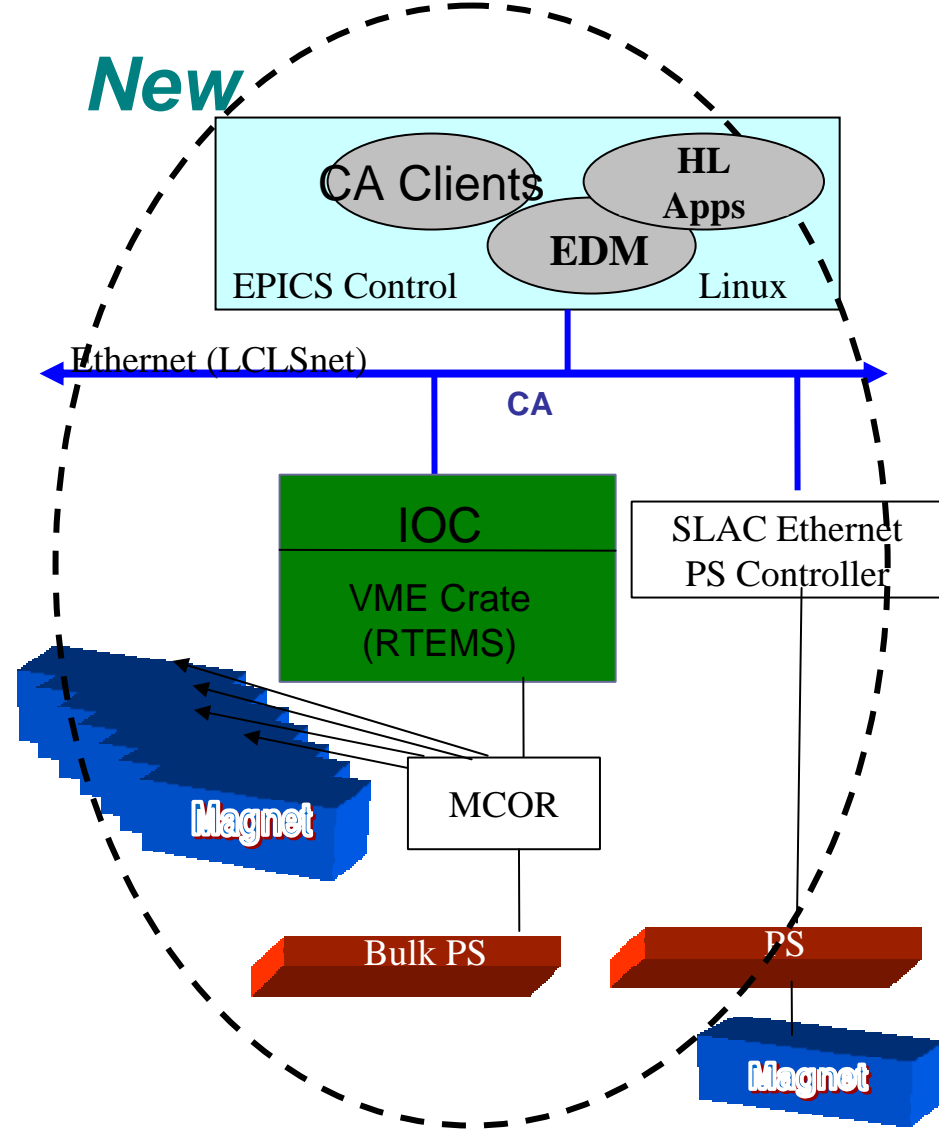


# Existing and New Magnet Subsystem Architectures

*SLC - existing*



*New*





## Software

- SLC Aware IOC – D. Rogind, D. Fairley, S. Allison
  - Provides bidirectional communication between the legacy control system and EPICS
- SNL – All magnet control functions go through sequence – D. Rogind
  - Trim, Standardize, PS On, Off, Reset, Degauss, etc
- EPICS Drivers and Device Support – existing except for adc
  - Acromag 9760 (use xycom driver)
  - Acromag IP231-E
  - Acromag IP-ADC-8413
  - etherPSC for Ethernet PS Controller (EPSC)
  - etherIP for PLC
- PLC Ladder Logic and PanelView Displays – Power Conversion Engineer
  - Used SNS Coding Standards
- VMS/Alpha
  - Minimal modification of existing software
  - Transparent to users, if magnet ps is controlled by old or new control system.
  - Database - VMS and EPICS db must be sync'ed
  - Model (uses SLC Database information) M. Woodley, R. Iverson



POWER FOR LKG-01  
120V QUAD PLEX PANEL PP-6 CB-1  
120V PLUGWELD PANEL PP-6 CB-2  
480V MCC-4PL120MCC-D CB-F1



WARNING

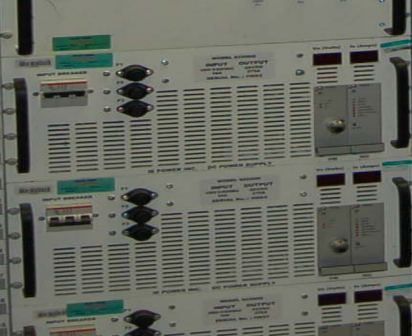
POWER FOR LKG-02  
120V QUAD PLEX PANEL PP-6 CB-1  
120V PLUGWELD PANEL PP-6 CB-2  
480V MCC-4PL120MCC-D CB-F2



WARNING



PIR CONTROL DIAGNOSIS  
8341 BDC DIAGNOSIS PWR SUPPLY



24 VOLTS  
D.C.

CAUTION







## Injector, Sector 21 and BC1 Racks



Field test 6 new  
Intermediate  
and 83 new  
MCOR systems