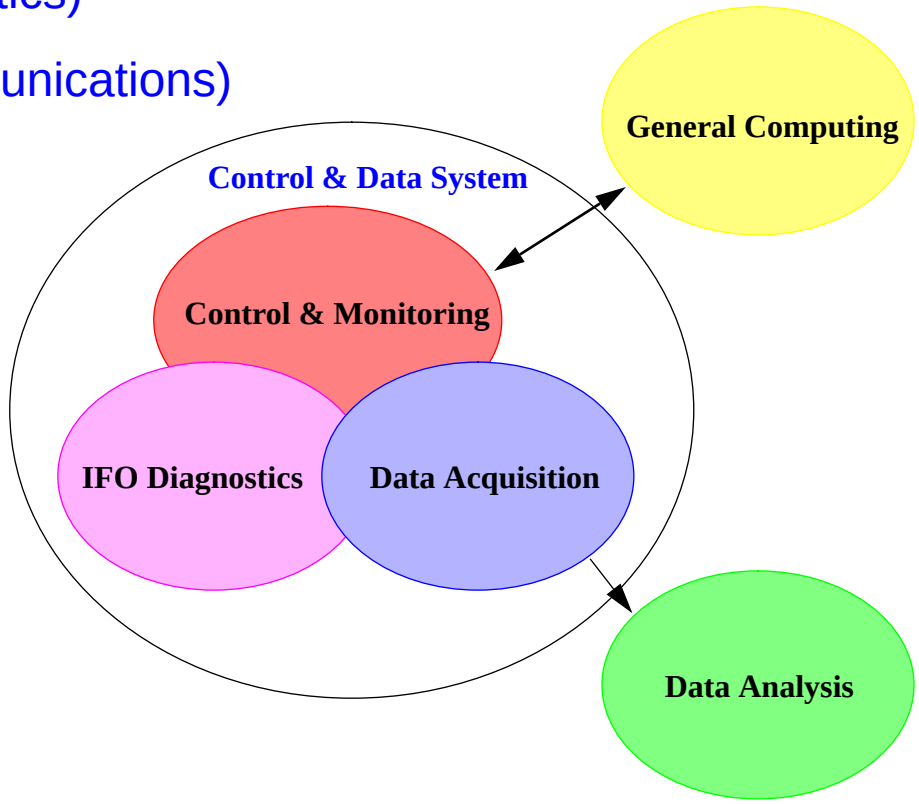
CDS Control & Monitoring
Final Design Review (FDR)

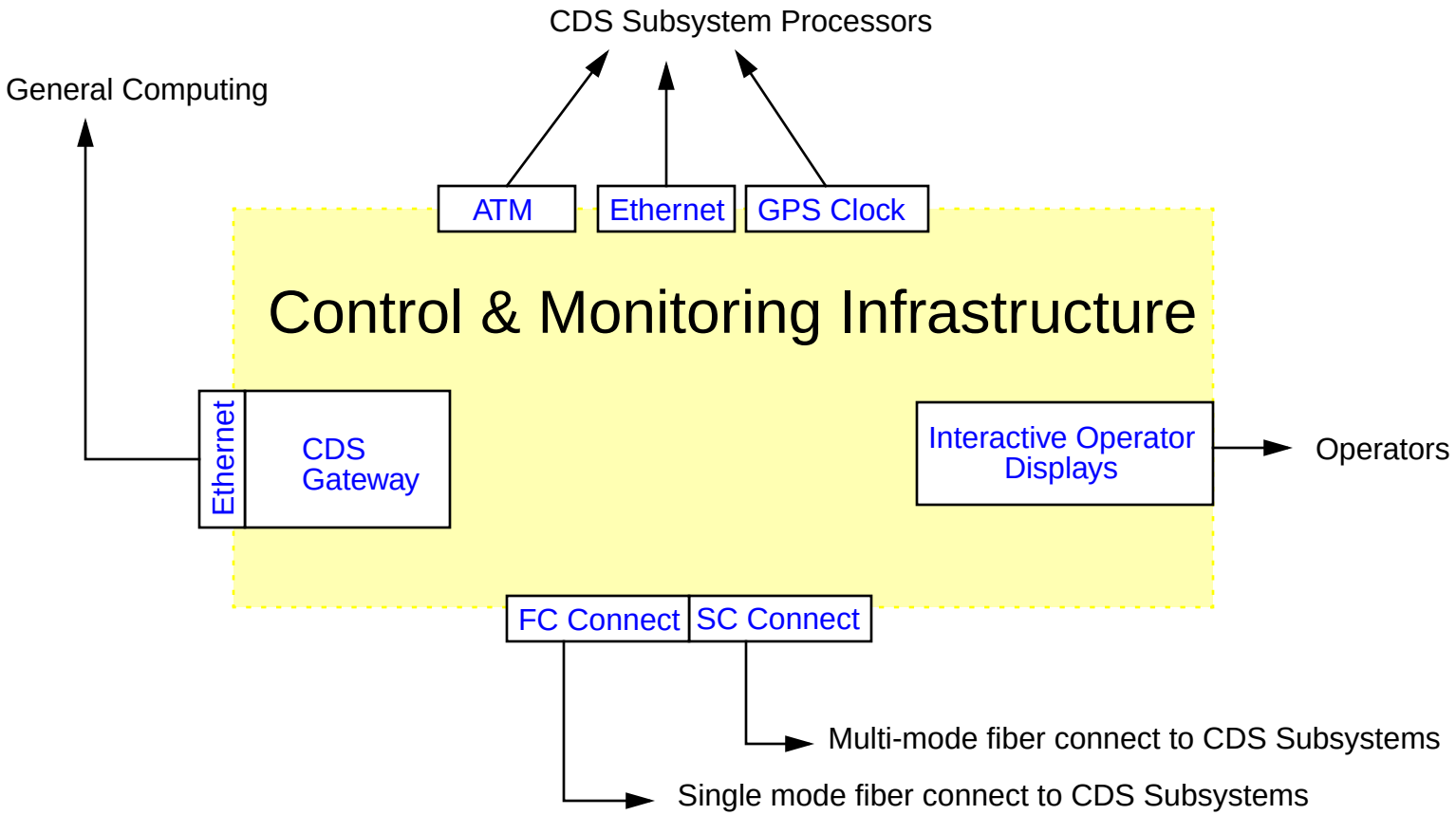
- Scope
- Interfaces
- Facility Control Room
- Networking Systems
- Fiber Optic Plant
- Front End Systems
- Timing System
- Cost
- Schedule

CDS Control & Monitoring Scope

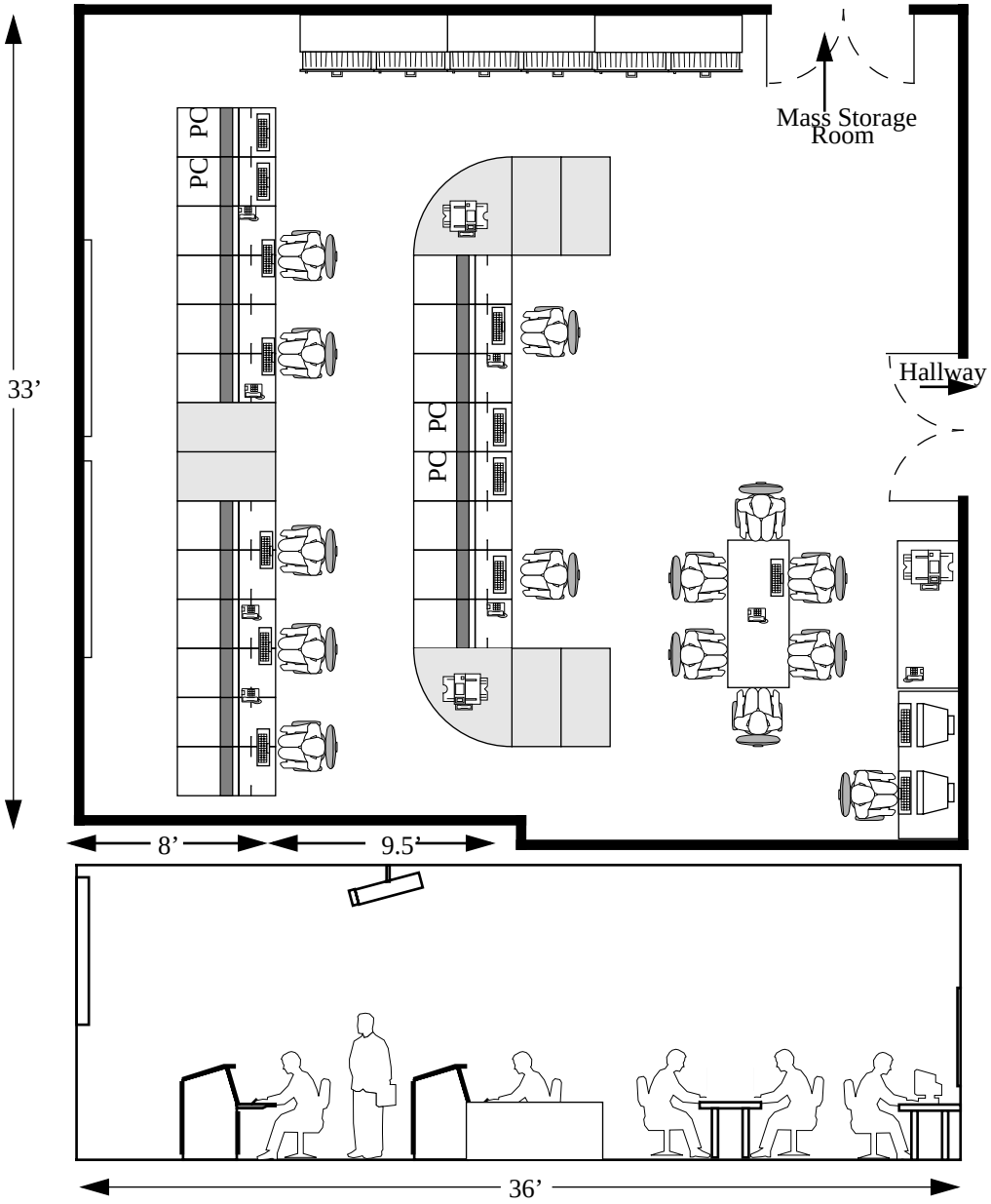
- Provide the infrastructure for CDS subsystems
  - Communication Media (Fiber Optics)
  - Networking (General CDS communications)
  - Facility Control Room systems
  - Timing
- Establish CDS standards
  - Hardware
  - Software

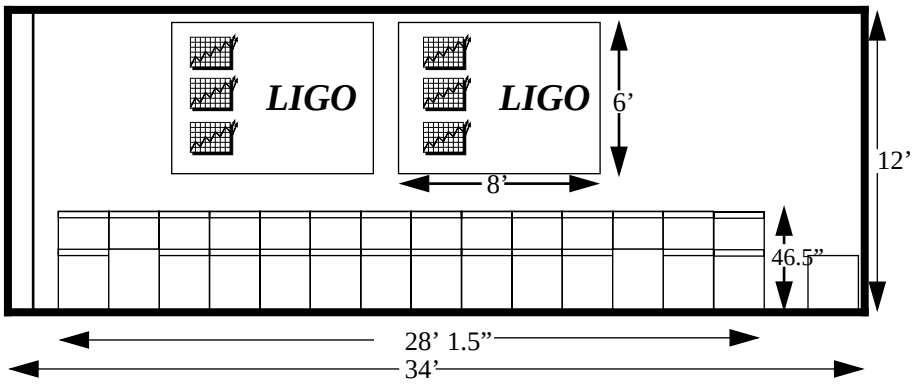


Control and Monitoring Infrastucture Interfaces



LIGO Project
Facility Control Room Layout

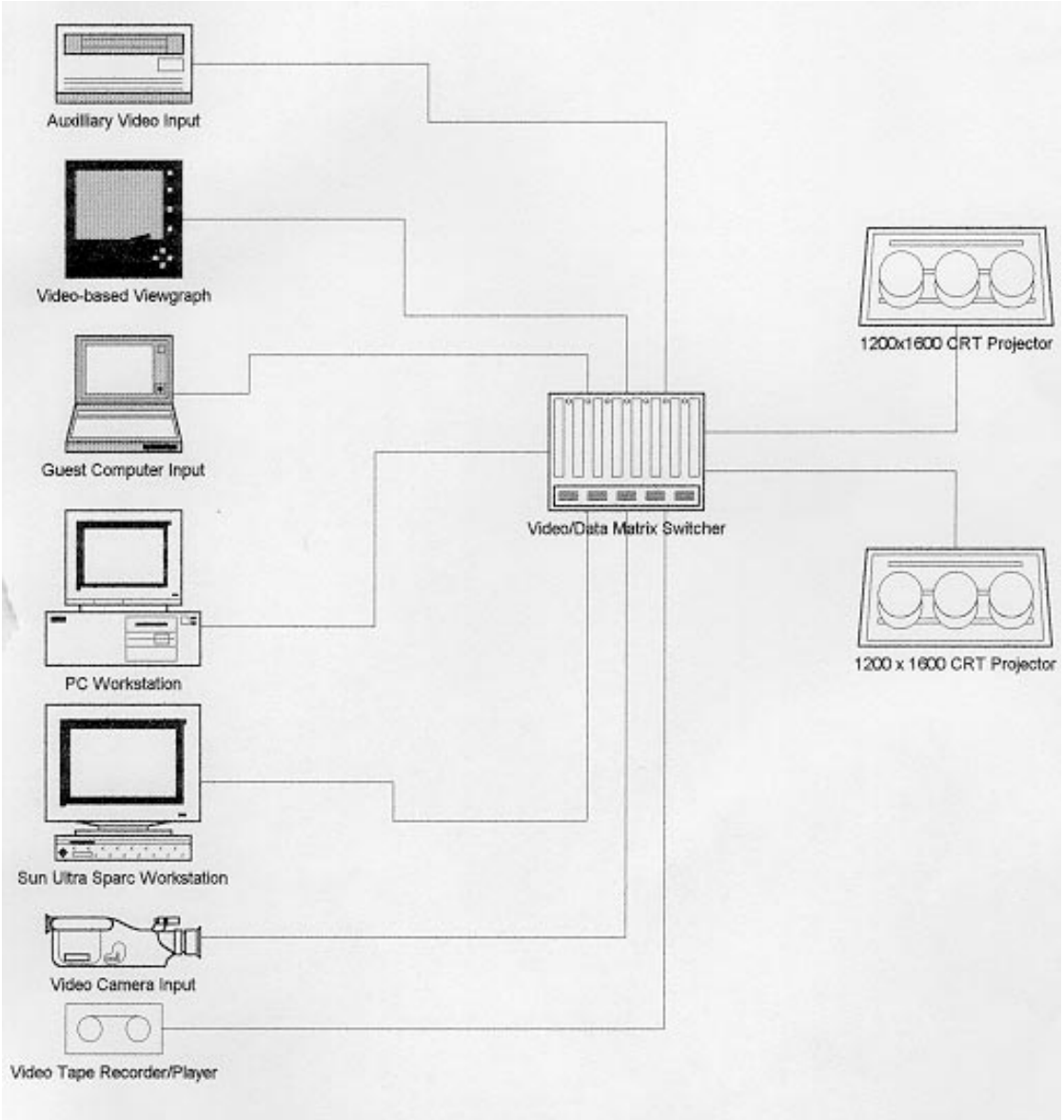




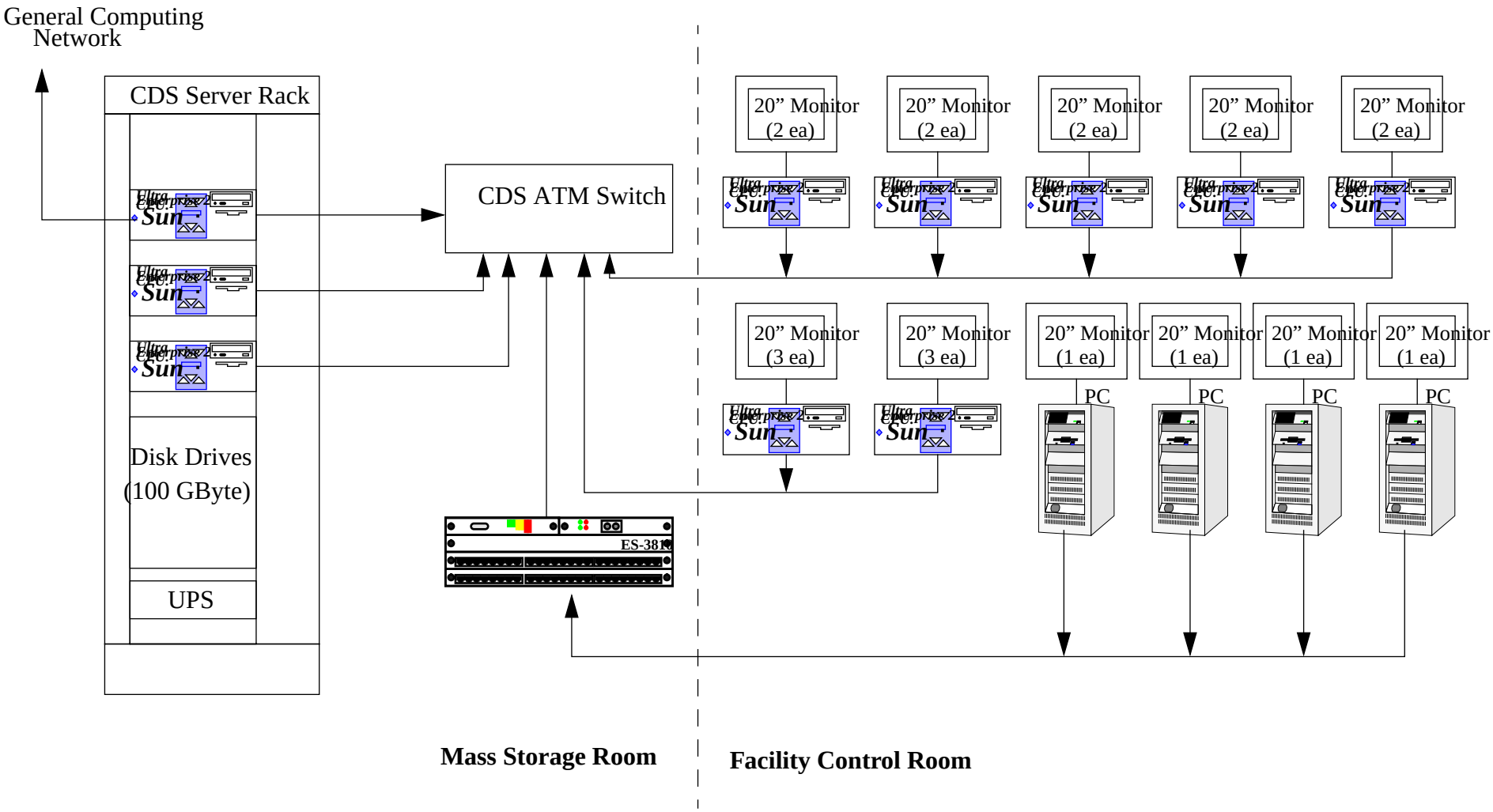
- Five SparcStations w/2 20” monitors ea.
- Two SparcStations w/3 20” monitors ea.
- Four PC w/ Single 21” Monitor
  - FCMS
  - RGA
  - Databases?/Other PC applications
- Two Screen Video Projection System

Facility Control Room
Video Projection System

- Connections from Sparcstations, PC, ASC video system
- Video viewgraph machine
- Video Tape System
- Displays selectable from main operator console or other consoles via RS-232 connection



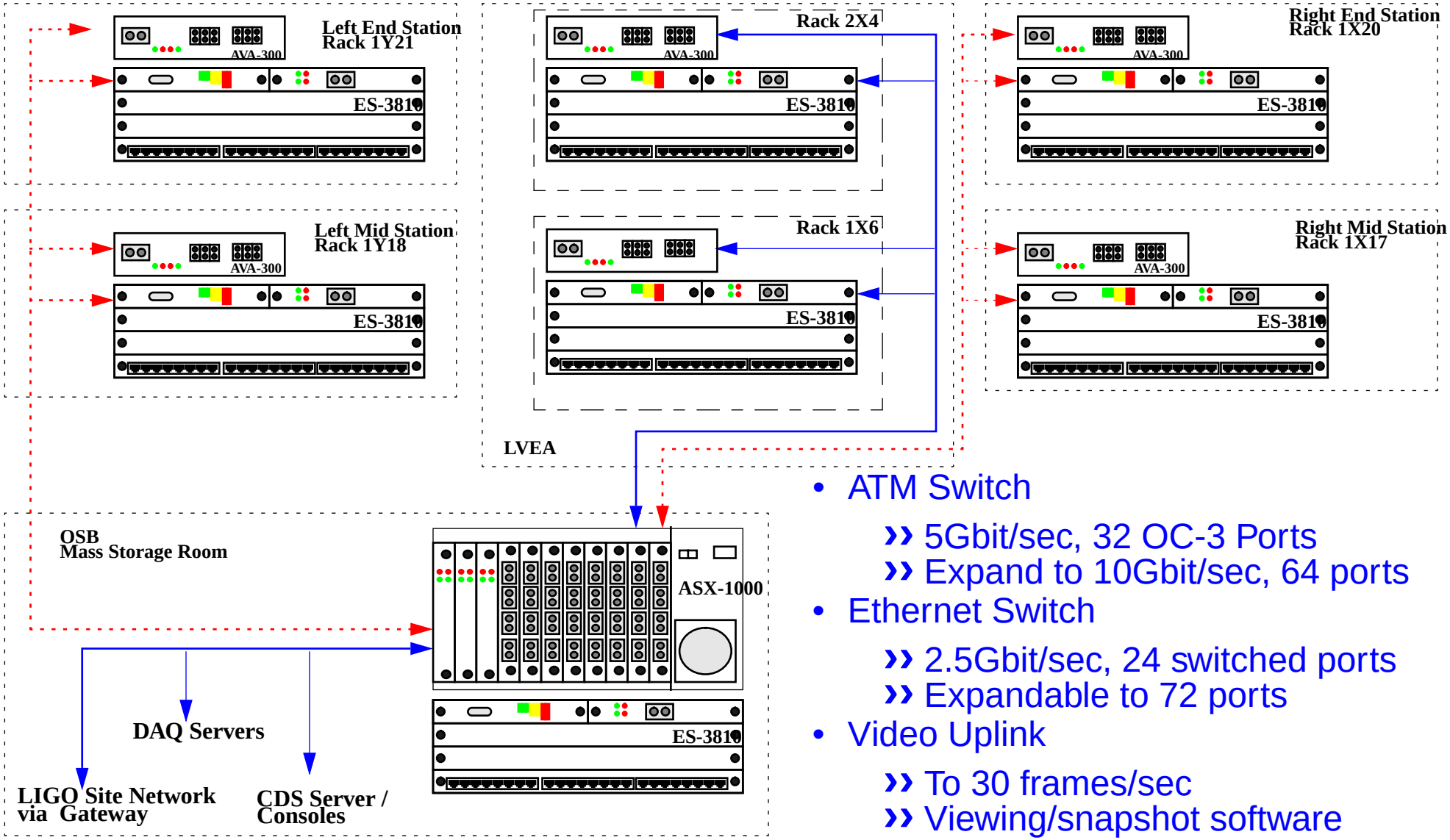
CDS Central Computing Architecture



CDS Networks

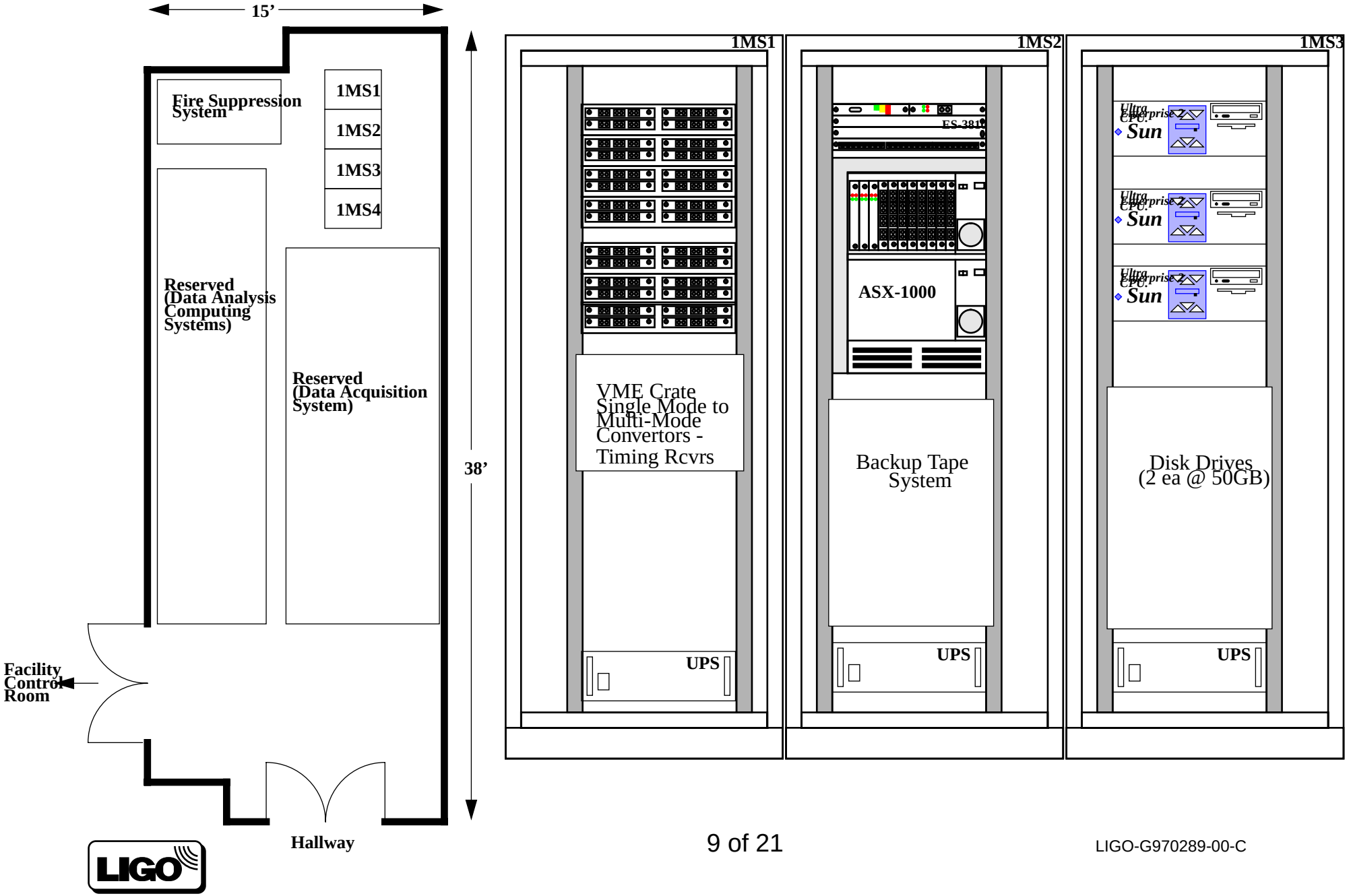
- CDS Infrastructure Network (in scope of CDS control & monitoring)
  - Supervisory Control And Data Acquisition (SCADA) functions
    - Command message passing (EPICS Channel Access)
    - Slow monitoring (10Hz)
    - System boot / software downloading
  - Video backbone
  - Data interface for operator workstations from Control & Monitoring, Data Acquisition and Diagnostics
- Data Acquisition System (DAQS) network
- Subsystem closed loop control networks

CDS Network Architecture

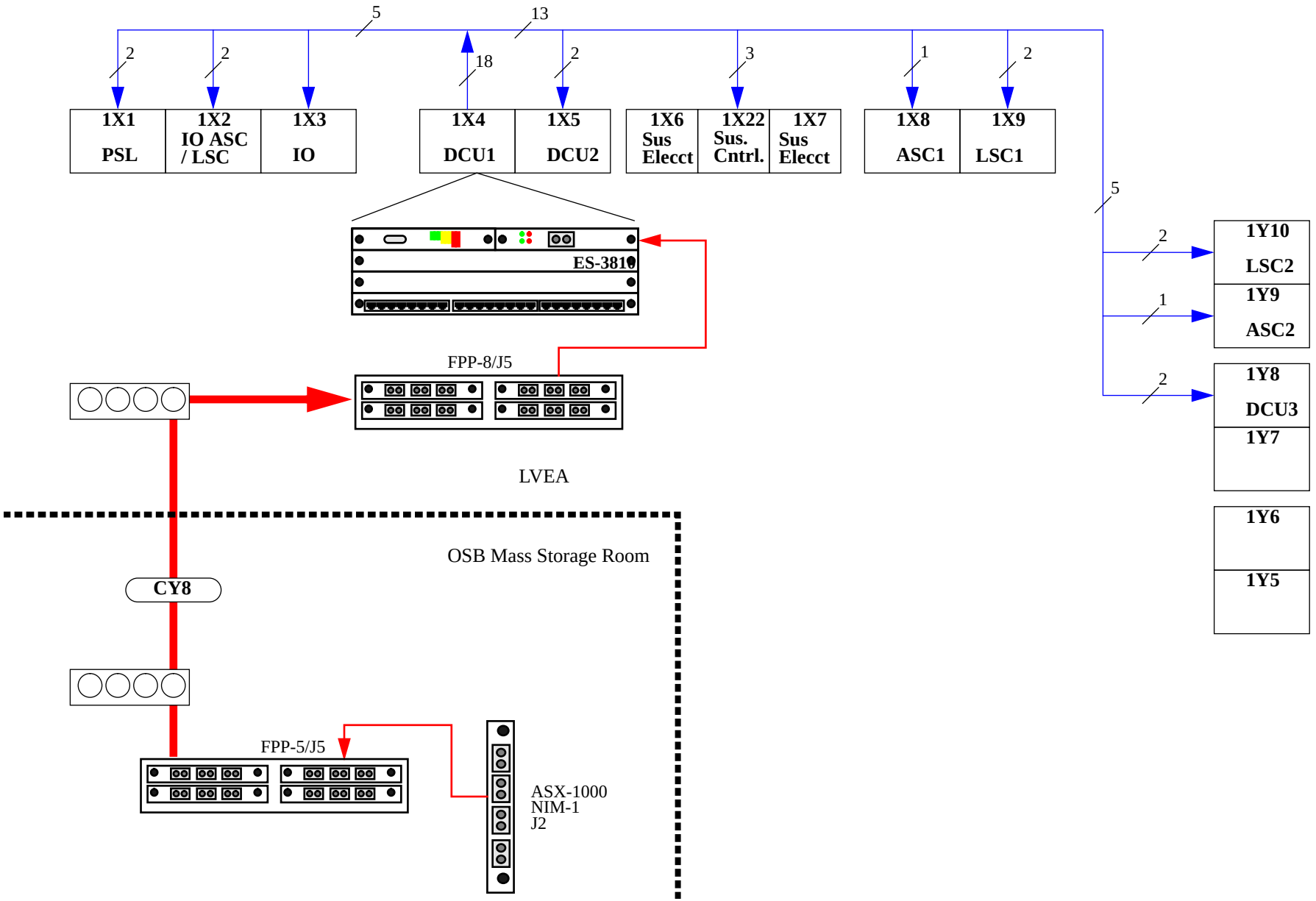


- ATM Switch
  - 5Gbit/sec, 32 OC-3 Ports
  - Expand to 10Gbit/sec, 64 ports
- Ethernet Switch
  - 2.5Gbit/sec, 24 switched ports
  - Expandable to 72 ports
- Video Uplink
  - To 30 frames/sec
  - Viewing/snapshot software

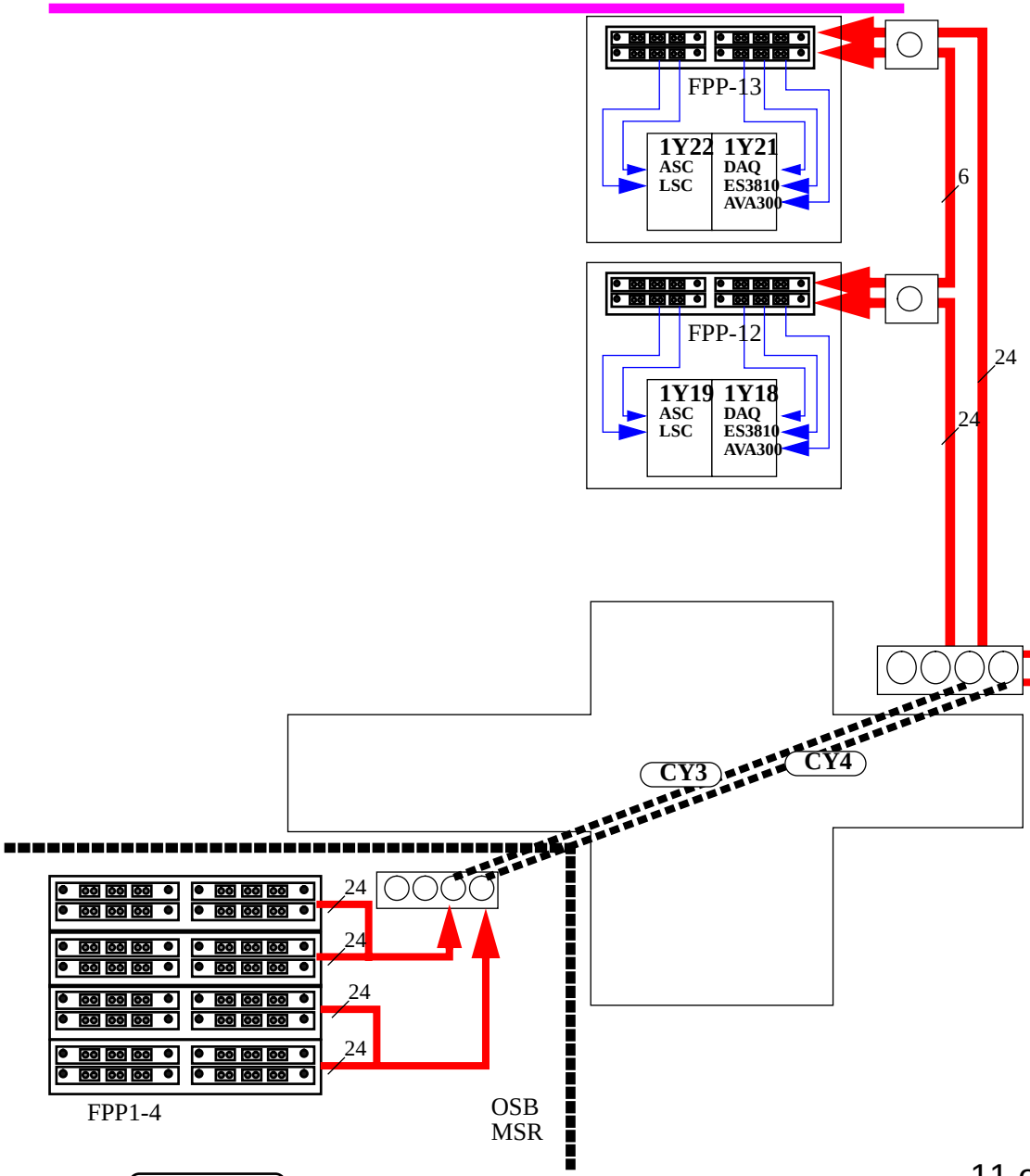
Mass Storage Room Layout

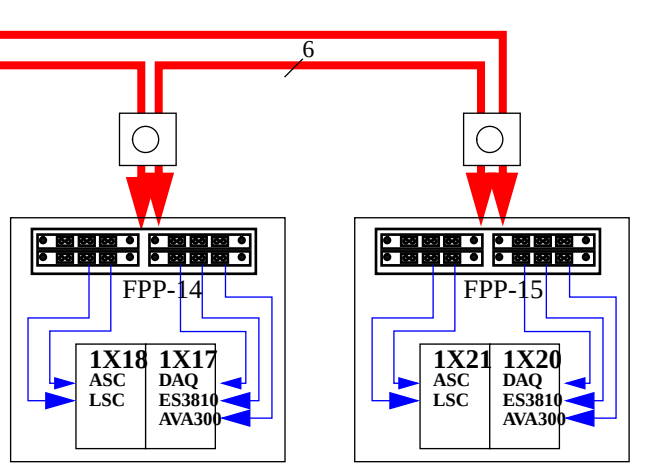


Control & Monitoring Network
LVEA Sector 1



CDS Fiber Optic Plant
OSB to Mid/End Stations





FPP-12 Connection Assignments (FPP-13/14/15 identical):

FPP Connection	Cable Number	To Rack	To Device
J1		1Y18	DAQ Refl. Mem.
J2-J6			Spare
J7		1Y19	LSC Refl. Mem.
J8		1Y19	ASC Refl. Mem.
J9		1Y18	DAQ Refl. Mem.
J10		1Y18	ES-3810 (ATM)
J11		1Y18	AVA-300 (Video)
J12-J18			Spare

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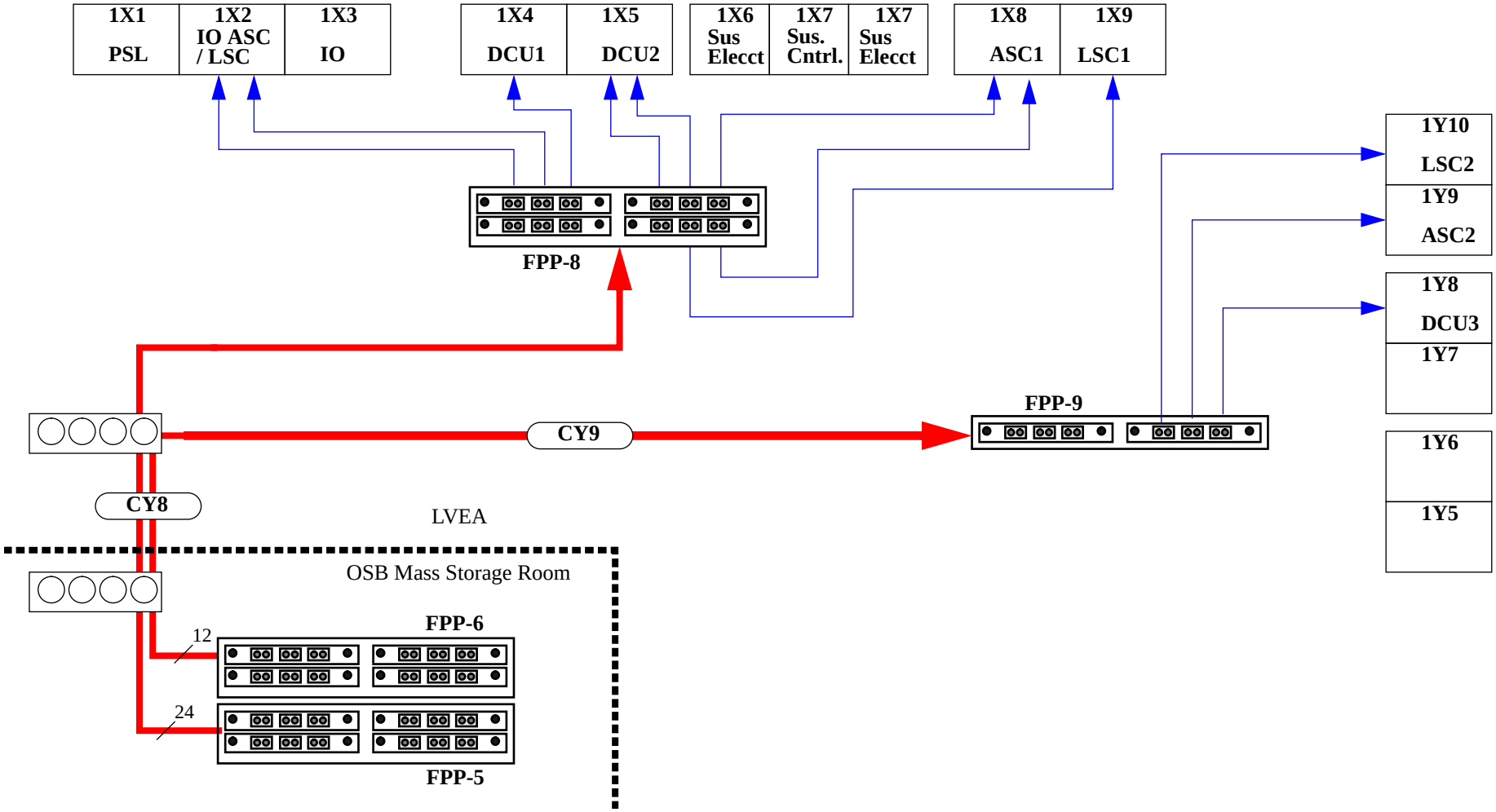
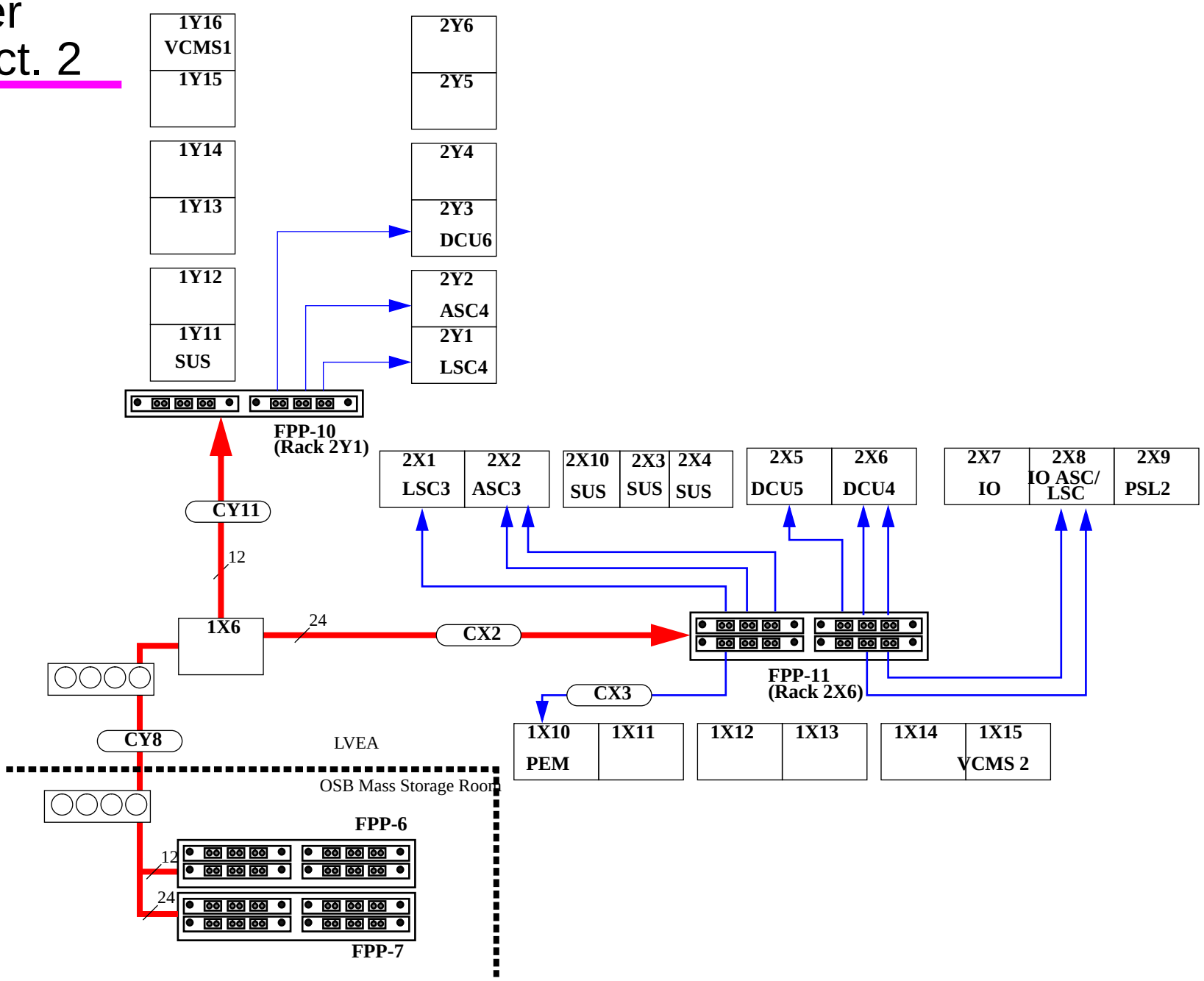
LVEA Fiber Optic Plant
Sector 1



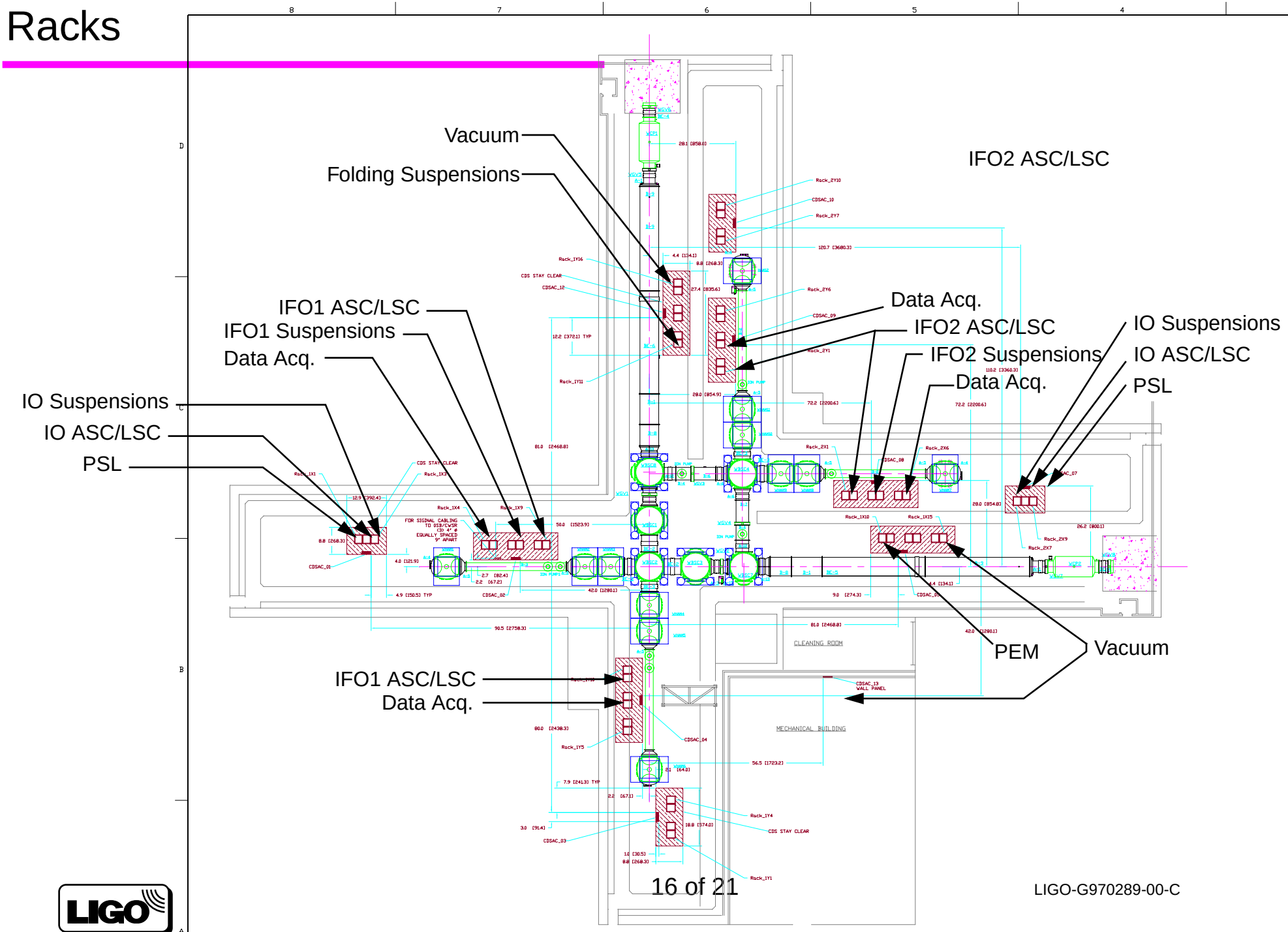
LVEA Fiber Plant - Sect. 2



Control & Monitoring
Front End System Hardware

- VME based
  - 21 Slot powered units
  - < 35db acoutic noise generation
- MIPS 4700 based processors
  - Heurikon Baja4700 running VxWorks 5.3
  - 176 MHz
  - 16MByte RAM (expandable to 64MB)
- Majority of I/O available from commercial manufacturers
- Custom electronics built into 6U Eurocard format or 19” rack mount chassis.

LVEA Racks



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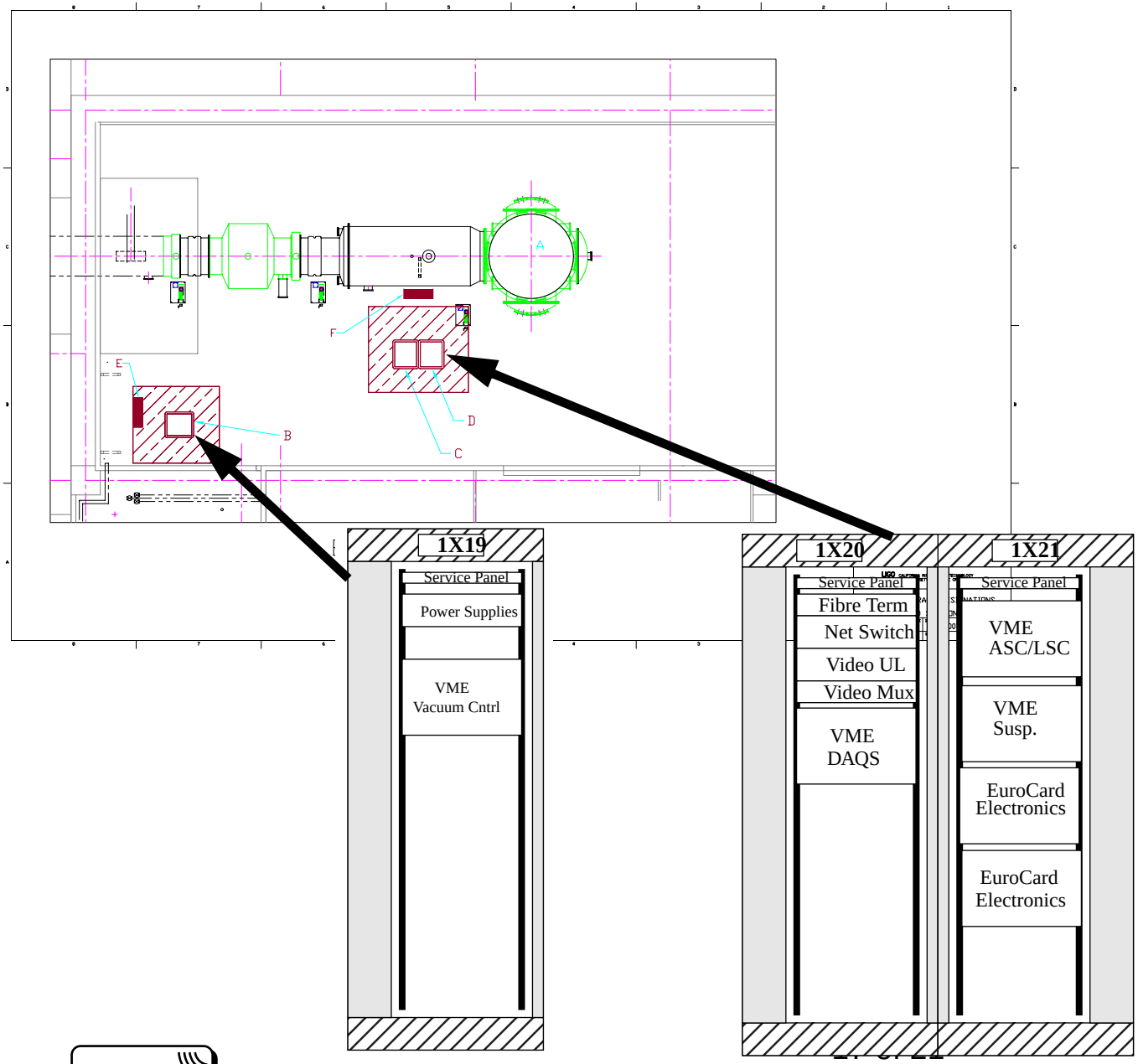
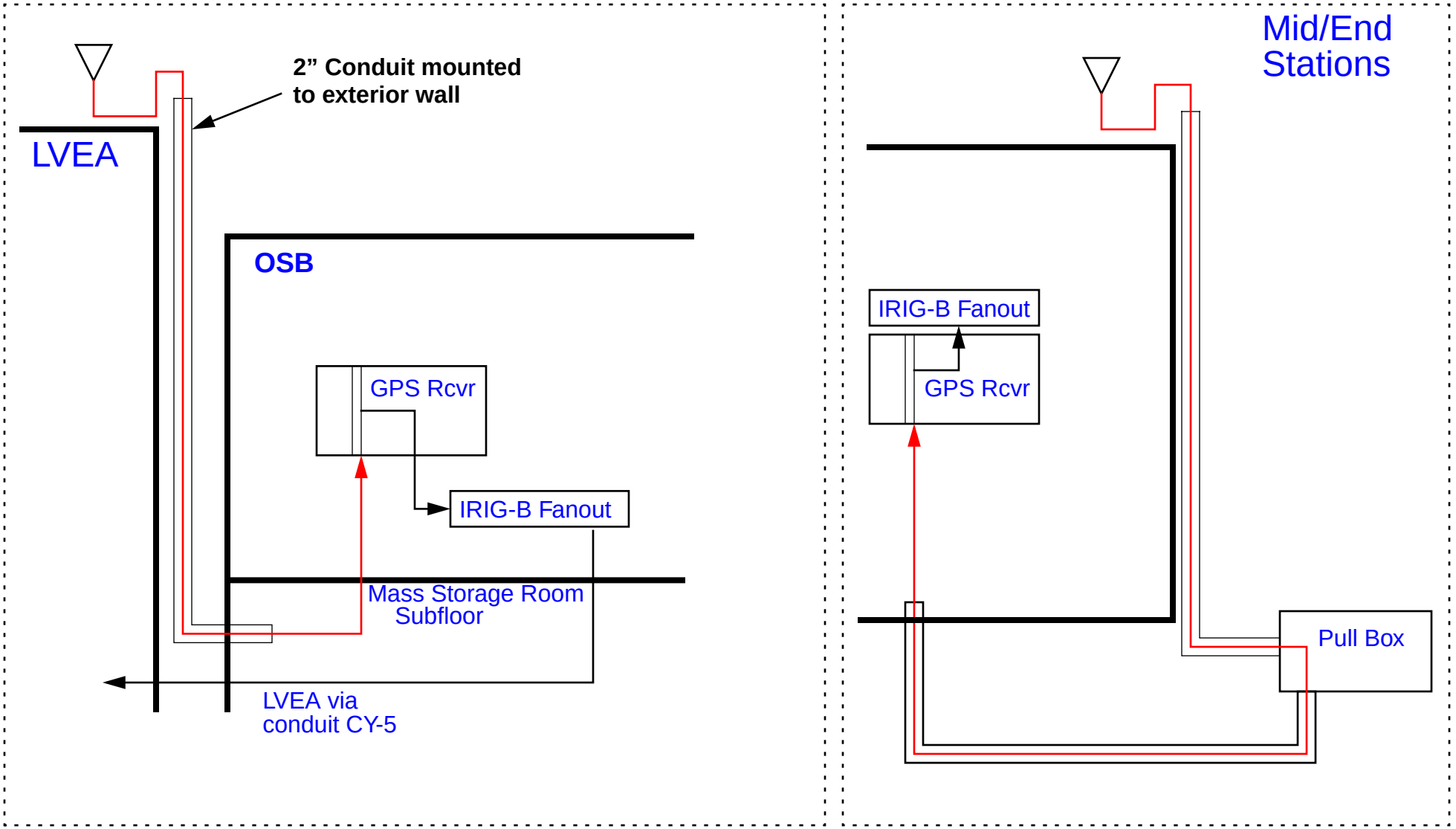
CDS Rack Assignments
Mid and End Stations



Timing System

- Provides time synchronization for control and monitoring and data acquisition system
  - ASC/LSC closed loop servos will require additional synchronization clocks; to be provided as part of these subsystems.
- Based on Global Positioning System (GPS)
- Receiver Specifications
  - 1PPS Sync Accuracy: 100nsec
  - Code Sync Accuracy: 1usec
  - Clocks: 2^n from 1Hz to 4MHz (data acq. clock)
- Two receivers at LVEA and one each mid/end station
- Connection of receivers to slaves via IRIG-B

Timing System Installation



CDS Software Standards

- General
  - Standards and style guide outlined in T960004-A-C.
  - CVS as configuration management tool
  - ANSII C/C++ standard software languages
- Realtime
  - VxWorks operating system
  - EPICS realtime database and channel access communications
- Unix
  - EPICS MEDM and Kinesix Sammi displays
  - EPICS ALH alarm handler, BURT backup and restore tools
- Digital Signal Processors
  - TBD (Prototype will be dual C40 VME units from Spectrum)

Control & Monitoring System
Cost Estimate

Description	Cost Estimate
ATM System	$167,000
Control Room Furnishings	$60,000
CDS FCR/MSR computing equipment	$277,000
FCR Video System	$88,000
19” Racks (50)	$83,000
VME Crates (35)	$100,000
Fiber Optic Plant	$115,000
Timing System	$25,000
Total	**$915,000**
Budget	$819,000
Difference	***-$96,000***