The Integration of Web Technology at ATLAS

Debby Quock
Argonne National Laboratory

quock @ phy.anl.gov

http:// www.anl.gov

Overview of Presentation

- Brief look at the history of Argonne National Laboratory and the ATLAS accelerator
- Review the ATLAS Control System
- Discuss the integration of Web technology at ATLAS

Argonne National Laboratory

- Argonne is one of the U.S. Department of Energy's largest research centers, located near Chicago, Illinois. It is also the nation's first national laboratory, chartered in 1946.
- Argonne is a direct descendant of the University of Chicago's Metallurgical Laboratory, part of the World War Two Manhattan Project to build the atomic bomb.
- After the war, Argonne was given the mission of developing nuclear reactors for peaceful purposes.
- Over the years, Argonne's research expanded to include many other areas of science, including:
  - Nanoscale size crystals to create RAM computer memory
  - Fuel reforming reactors for automotive fuel cells
  - Carbon sequestration to reduce atmospheric carbon dioxide
  - Computer models to forecast global climate change
  - X-rays to etch semiconductors
  - and more
- Today, the laboratory has more than 4,000 employees, including about 1,400 scientists and engineers.

Argonne National Laboratory

Argonne, Illinois USA

Pioneering Science and Technology

ARGONNE NATIONAL LABORATORY

A U.S. Department of Energy laboratory
operated by The University of Chicago

ATLAS:
Argonne Tandem Linear Accelerator System

- ATLAS began operations in early 1960's
- World's first superconducting accelerator for projectiles heavier than the electron
- Low-energy, heavy-ion accelerator of elements ranging from hydrogen to uranium
- Beams are provided by one of two 'injector' accelerators, either a 9 million volt (MV) electrostatic tandem Van de Graff, or a 12-MV low-velocity linac and electron cyclotron resonance (ECR) ion source
- Contains 64 individually controlled superconducting resonators
- Ions are accelerated up to a maximum of 20% the speed of light
- ATLAS experiments are used to:
  - Investigate the structure and shape of atoms that are in unstable conditions, such as unusual proton to neutron ratios
  - Learn about the production of elements in stars
  - Help other scientists with the dating of fossils and minerals (million of years old)
  - And many other scientific applications

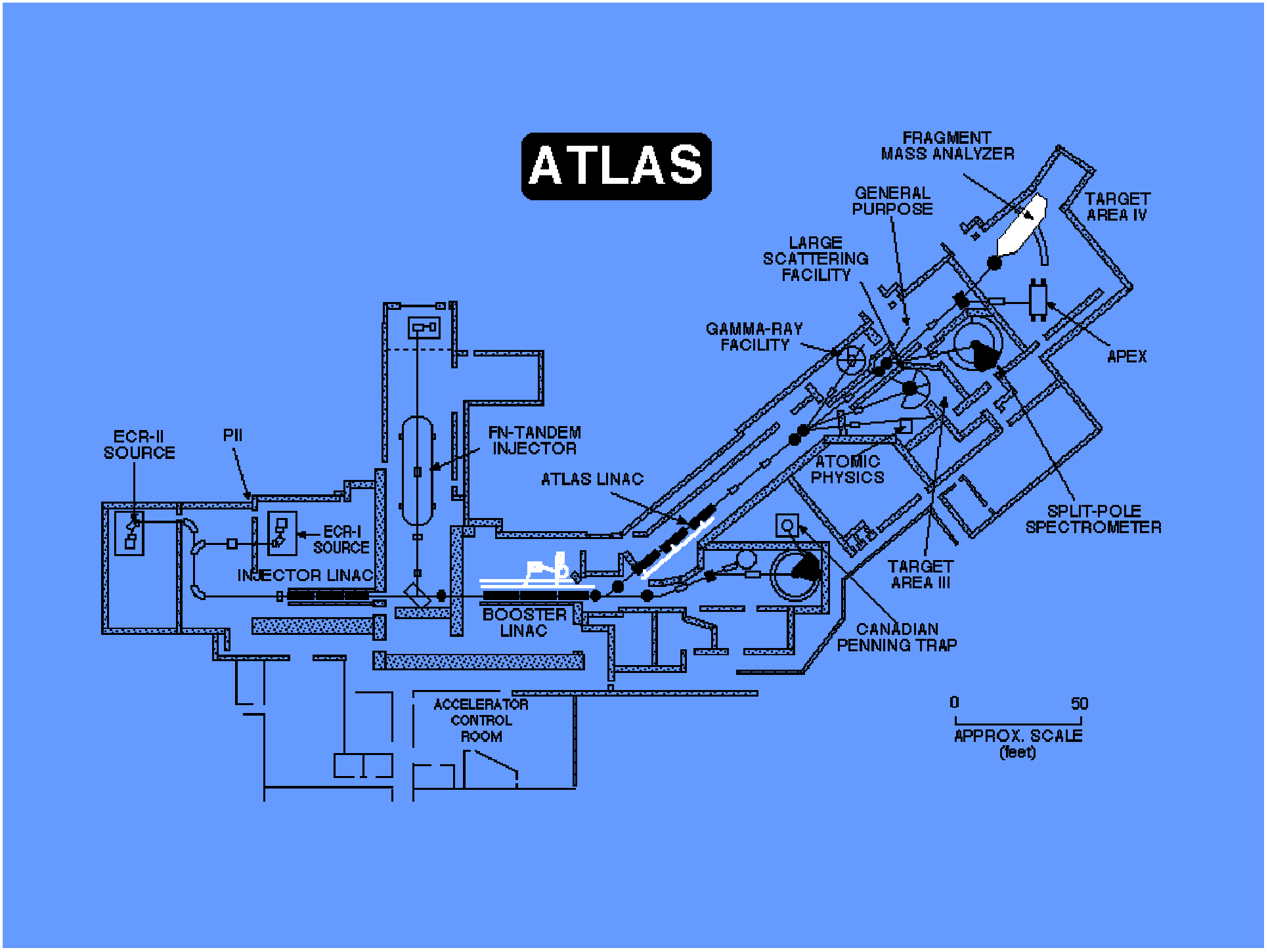
ATLAS:
Demands on the Control System

- ATLAS operates 24 hours a day, 5 ½ days a week, with a new experiment beginning every 3 to 5 days

- Fiscal year 2002 preliminary operations statistics:

  - ☺ Research hours 4321
  - ☺ Beam studies hours 104
  - ☺ Setup/tuning hours 786
  - ☹ Failure and unscheduled shutdown hours 275
  - ☺ Scheduled maintenance hours 657
  - ☺ Total hours 6143
  - ☺ Availability = (Research + Beam studies + Setup) / (Research + Beam studies + Setup + Failure)

  - ☺ Availability = 0.95


ATLAS
FRAGMENT
MASS ANALYZER
GENERAL
PURPOSE
TARGET
AREA IV
LARGE
SCATTERING
FACILITY
GAMMA-RAY
FACILITY
APEX
ECR-II
SOURCE
PII
FN-TANDEM
INJECTOR
ATLAS LINAC
ATOMIC
PHYSICS
SPLIT-POLE
SPECTROMETER
ECR-I
SOURCE
INJECTOR LINAC
TARGET
AREA III
BOOSTER
LINAC
CANADIAN
PENNING TRAP
ACCELERATOR
CONTROL
ROOM
0
50
APPROX. SCALE
(feet)

ATLAS Control Room

ATLAS Control System

- Vista Control System Inc.’s Vsystem Real-Time Database Control Software
- CAMAC Serial Highway
- Oracle Rdb Relational Database Software
- Paradox Relational Database Software

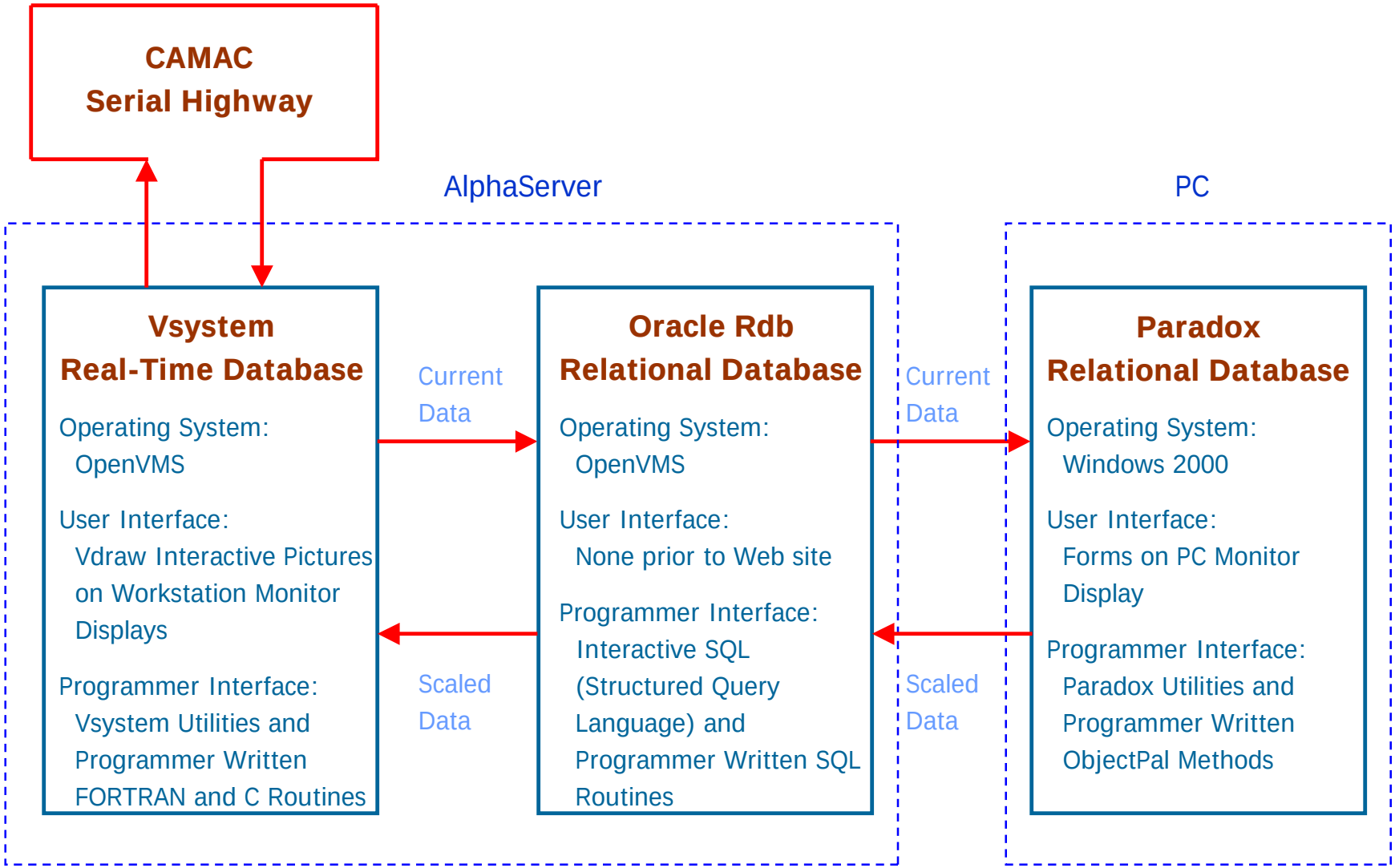
Hardware Configuration

- All control system computers are linked via Ethernet
- Real-time control system server is an AlphaServer 1200 with 1 GB of main memory running OpenVMS 7.2 and TCP/IP
- Four Alpha workstations running OpenVMS and TCP/IP
- Six remote PCs running Windows NT and Excursion X Server for remote accelerator monitoring
- One control room PC for accelerator tune archiving database system
- Two Hytec knob units are used as operator interfaces
- The I/O subsystem is CAMAC, and it is interfaced to the AlphaServer via a Kinetic System model 2115 to PCI bus adapter. The CAMAC serial highway operates in the “byte-serial” mode at 2.5 MHz
- There are 18 CAMAC crates on the serial highway

Control System Software Components

- Vista's Vsystem 4.2 Real-Time Database Control Software
  - 56 Vdb databases
  - 900 Vdraw pictures (vcd, vcf, and vcl files)
  - 72 facility specific control system processes written by ATLAS staff
  - 34 handlers and conversion routines implemented as shareable images
- Oracle Rdb Relational Database Software
  - 45 tables
  - 21 views
- Corel Paradox Relational Database Software
  - 297 tables
  - 69 forms
  - 95 reports
  - 50 queries
- Web Pages
  - 213 HTML files
  - 45 Microsoft Active Server Pages (ASP)

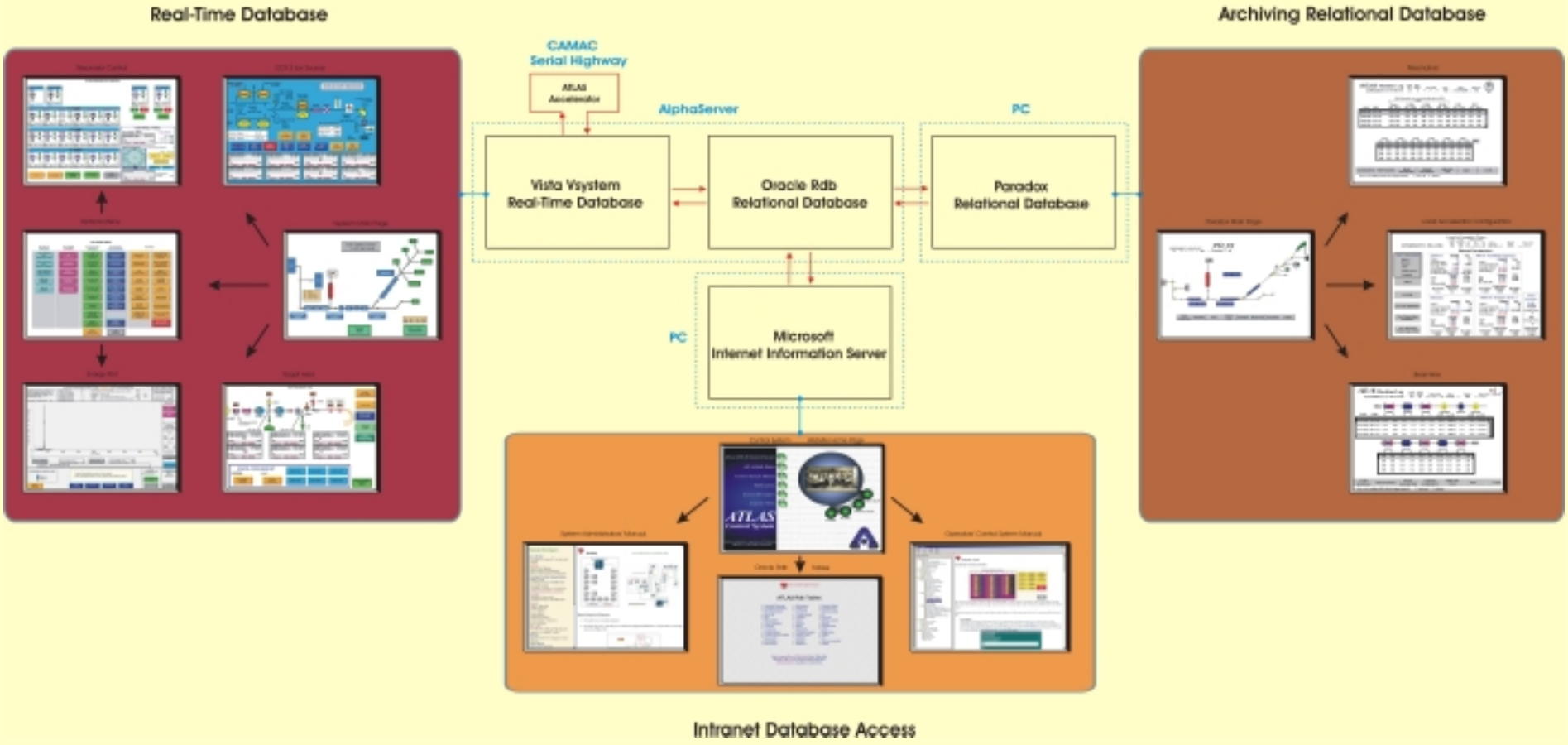
ATLAS Tune Archiving System



Why Use Internet Technology?

- Client-side interface is standardized with commercial Internet browsers (interface already familiar to users)
- Client-side machine is, for the most part, platform independent
- Control system information is stored in a central location, and yet made available on a wide-scale basis
- Control system information is made available to many concurrent users
- Provides a means for interfacing different software products
- Many Internet programming tools and objects are available for free or at minimal cost

ATLAS Control System
Database Management System



Control System Web Site Utilities

- Interactive query of the Oracle Rdb database
- Operators' control system manual
- Control system developers' manual
- Control system publications
- Contact information

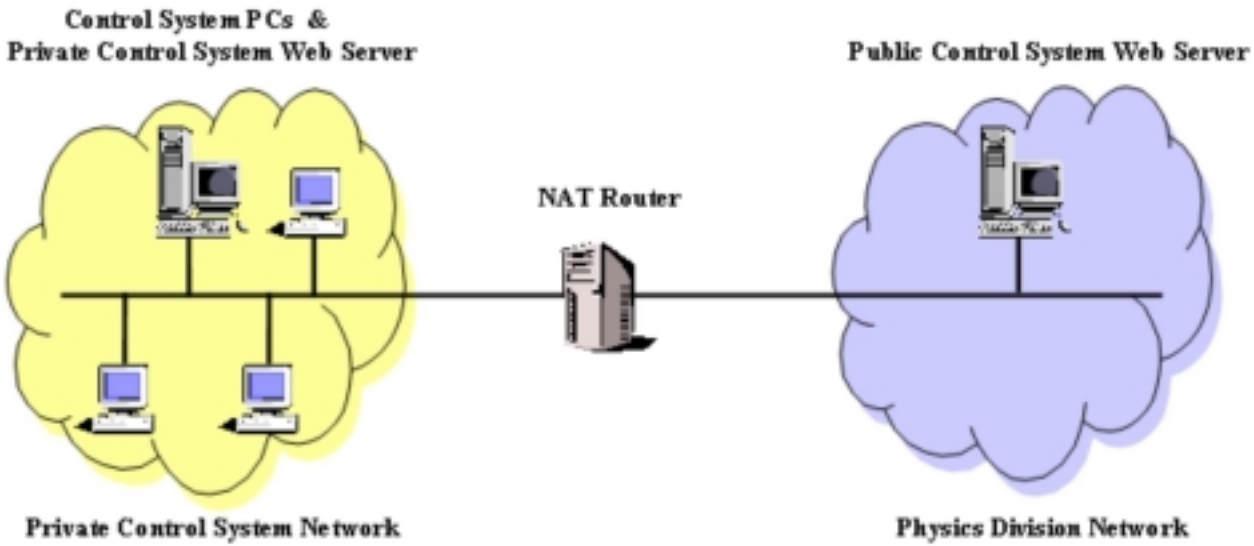
Web Site Components

- Microsoft Internet Information Server (IIS)
- Windows NT Server platform
- Two Web Server PCs:
  1. Low-security network Web site
  2. High-security network Web site
- Network Address Translation (NAT) router

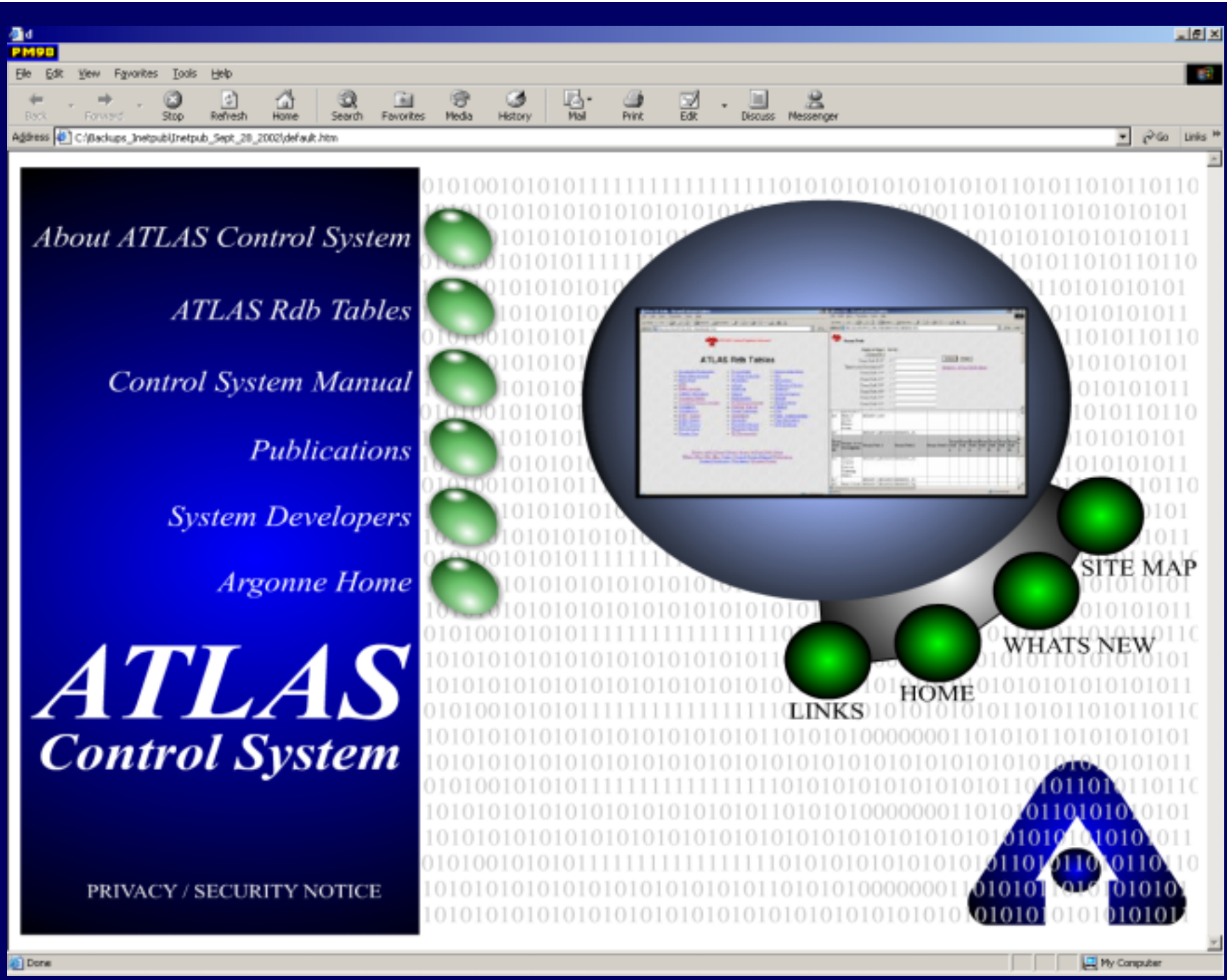
Internet Development Software

Software	Application
Microsoft Internet Information Server (IIS)	Web Server
Microsoft Active Server Pages (ASP)	Database Query and Web Page Forms
Microsoft ASP.NET	Advanced Database Query and Web Page Forms
Macromedia Flash MX	Home Web Page
Microsoft HTML Help Workshop	Online Keyword Search and Index
Microsoft Visual Studio	HTML Pages
Microsoft Visual Studio.NET	HTML Smart Pages
Microsoft Front Page	Web Page Image Maps
CorelDRAW	Convert PostScript Images to JPEG
Microsoft Photo Draw	JPEG Sizing

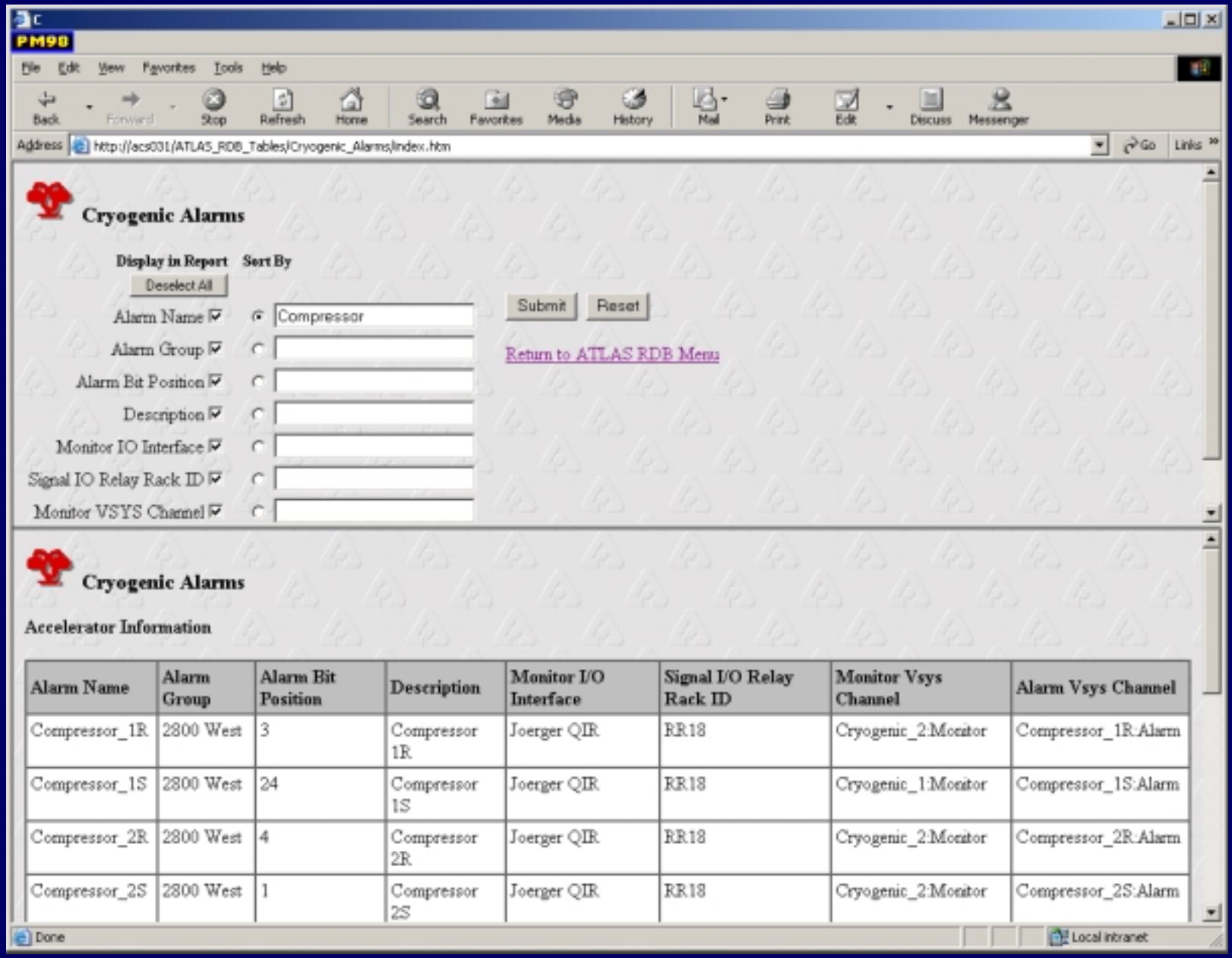
Network Address Translation (NAT)



- Oracle Rdb Tables
- Developers' Manual
- Operators' Manual
- Publications


PM98
File Edit View Favorites Tools Help
Back Forward Stop Refresh Home Search Favorites Media History Mail Print Edit Discuss Messenger
Address C:\Backups_Inetpub\Inetpub_Sept_28_2002\default.htm
Go Links
About ATLAS Control System
ATLAS Rdb Tables
Control System Manual
Publications
System Developers
Argonne Home
ATLAS
Control System
PRIVACY / SECURITY NOTICE
SITE MAP
WHATS NEW
HOME
LINKS
Done
My Computer

Oracle Rdb Database Query Using Microsoft Active Server Pages (ASP)



Alarm Name	Alarm Group	Alarm Bit Position	Description	Monitor I/O Interface	Signal I/O Relay Rack ID	Monitor Vsys Channel	Alarm Vsys Channel
Compressor_1R	2800 West	3	Compressor 1R	Joerger QIR	RR18	Cryogenic_2:Monitor	Compressor_1R:Alarm
Compressor_1S	2800 West	24	Compressor 1S	Joerger QIR	RR18	Cryogenic_1:Monitor	Compressor_1S:Alarm
Compressor_2R	2800 West	4	Compressor 2R	Joerger QIR	RR18	Cryogenic_2:Monitor	Compressor_2R:Alarm
Compressor_2S	2800 West	1	Compressor 2S	Joerger QIR	RR18	Cryogenic_2:Monitor	Compressor_2S:Alarm

Control System Operators' Manual - HTML Help System

HTML Help

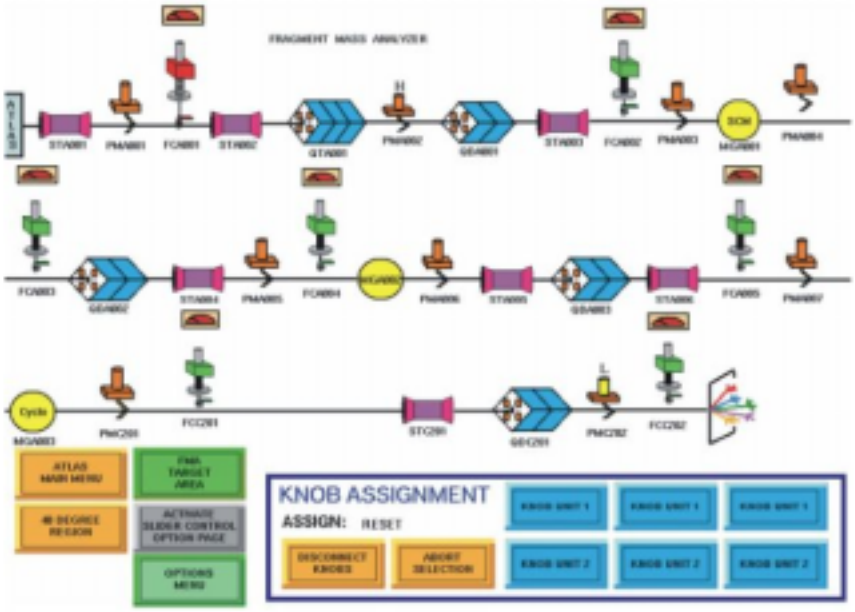
Hide | Back | Print | Options

Contents | Search

- Introduction
  - Statement of Introduction
  - Overview of ATLAS Control Syster
  - Explanation of Sections
- Control System Menu
  - Starting
  - Using
- Control Tools
- Slider Bar Control
  - Anatomy
  - Using
- Slit Control
  - Anatomy
  - Using
- User Menus
  - Anatomy
- Real Time Control
- Beamline Device Control
  - Starting Graphical Display
  - ATLAS Main
  - Beamline Control Pages
  - Beamline Devices
  - Express Control Pages
- Solenoid Control
- Resonator Control
- Utilities
- System Commands
  - Start Up Graphical Displays
  - Check Status of a Control Syst
- Options Menu
  - Overview
  - How To Use
  - Beamline Options
  - Solenoid Options
  - Resonator Options
  - Cryogenic Information
  - Utilities
- VAlarm
- Strip Chart Recorders
- Paradox ATLAS Logbooks
  - Introduction
  - General Notes
  - Trouble Shooting
  - Help Topics

Beamline Device Control

EXPRESS CONTROL PAGES

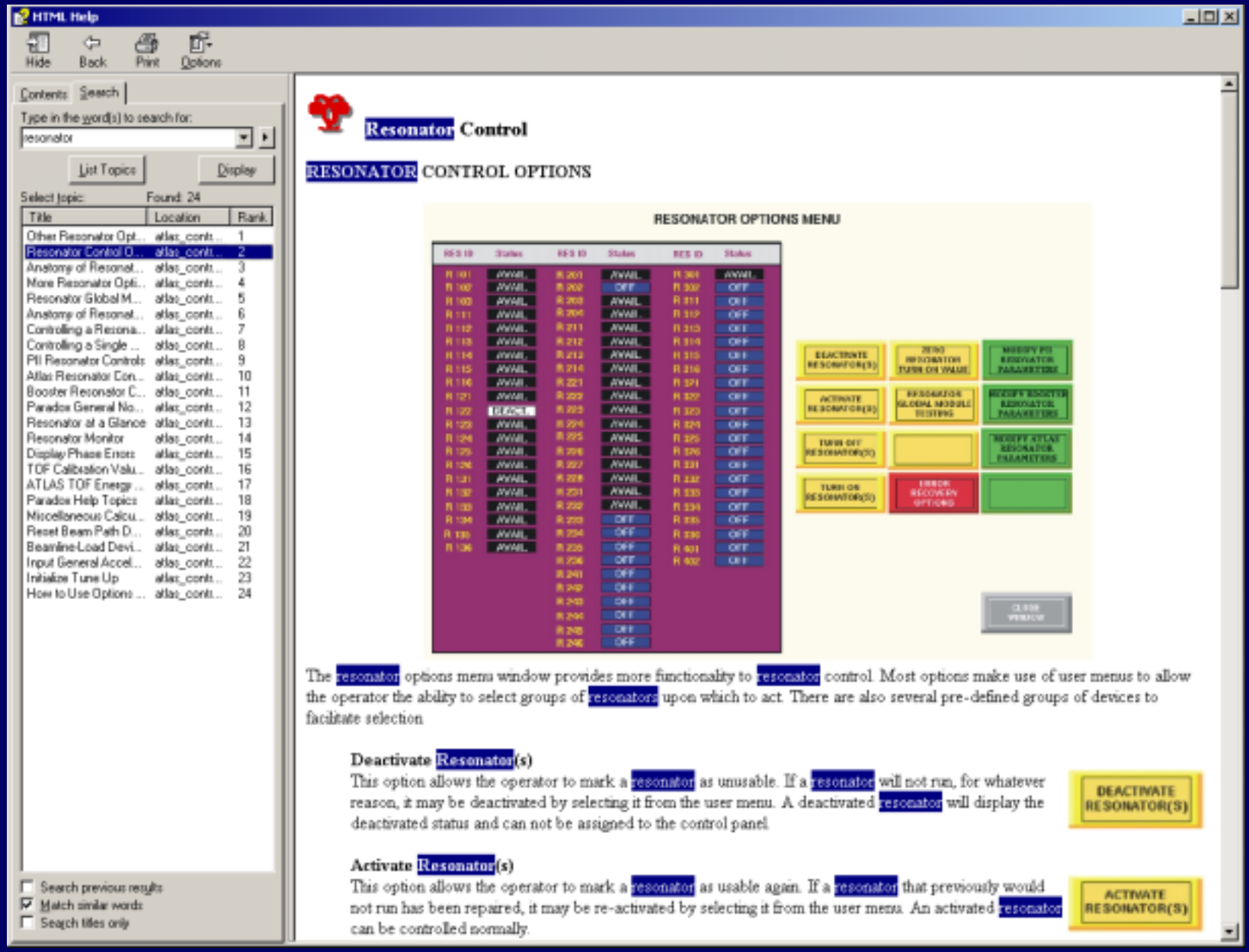


The *area express beamline control pages* are designed for operator convenience when tuning the beamline. Emphasis was placed on getting the most devices onto one page--at the expense of information that is less useful for tuning. The typical devices found on an *area express page* include faraday cups, scanners, steerers, magnets, and quadrupoles. Slits, valves, and other information have been left off to conserve space, and place the maximum amount of tuning devices at the operators disposal.

There is an *area express page* for the section of beamline from the exit of ATLAS to each of the seven target lines after ATLAS. There is also an *area express page* for the 180-degree bend region in PII.

With the exception of the PII *area express page*, all *area express pages* are organized into lines of devices such that in each line, the left is the upstream end, the right is the downstream end. The top line of devices is further upstream than the bottom line of devices.

HTML Help System - Keyword Search Option



System Developers

Procedure for Installing Modular Plug onto Category-4 or Category-5 Cable

This procedure is designed to help you install a modular plug at the end of a cable. Use this as a guide when you are placing a modular plug at the end of a cable. If you have any questions about the directions or anything else please contact Debby Quock.

Required Hardware

- Crimping Tool
- Wire Cutters
- Cable
- Modular Plug

Instructions

1. With the wire cutters cut approximately a ½ inch slit down the side of the cable's rubber cover.
2. Locate the white string inside the cable and pull the string downward to create a slit that is about 1 inch in length. This is done to expose the internal insulated wires that should be free of any nicks that might have been caused by wire cutters.
3. Untwist the four sets of colored wires and spread them out into a flat fan shape. See *Diagram A*.

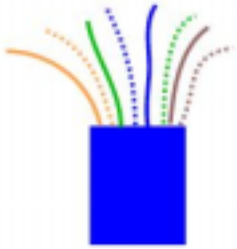
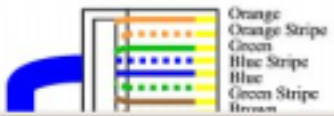


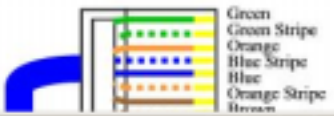
Diagram A

4. Arrange the wires by color as shown in the drawing for the desired type of cable. See *Diagrams B* and *C*.

Straight Through Cable



Crossover Cable



Work in Progress…

- Migration from Microsoft Active Server Pages to ASP.NET software
- Addition of Vsystem operator display hyperlinks to Web-based control system manual

Benefits of Migrating to ASP.NET

- Improved performance (ASP.NET pages are compiled, and therefore execute faster)
- Security enhancements (password protection and encryption of ASP.NET pages)
- Interactive flexibility (can programmatically add new objects to a page or hide existing ones)
- Data transfer options (can save array data to a file)
- 3,400 .NET Framework classes (used to add Web page functionality)
- ASP and ASP.NET can coexist on the same Web server

Comments and Questions

Gratitude and acknowledgement are given to:

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Ryan Enshiwat, College Student Intern – Flash MX and HTML Help