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Vista Controls Vsystem* at the ISIS pulsed neutron facility

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* – www.vista-control.com

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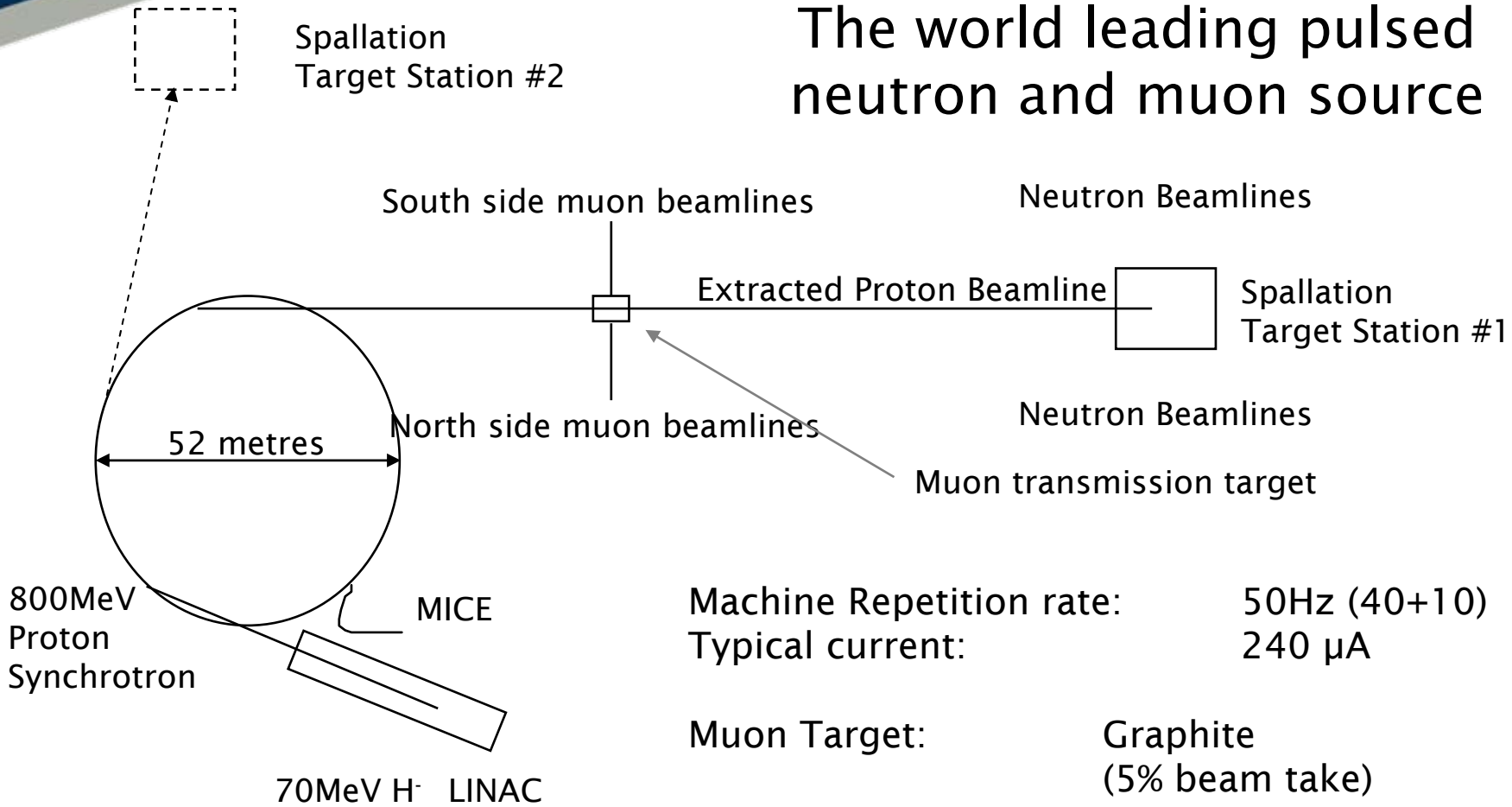
The world leading pulsed neutron and muon source



Machine Repetition rate:	50Hz (40+10)
Typical current:	240 μA
Muon Target:	Graphite (5% beam take)
Neutron Target:	Tantalum
Target moderators:	Methane and Hydrogen

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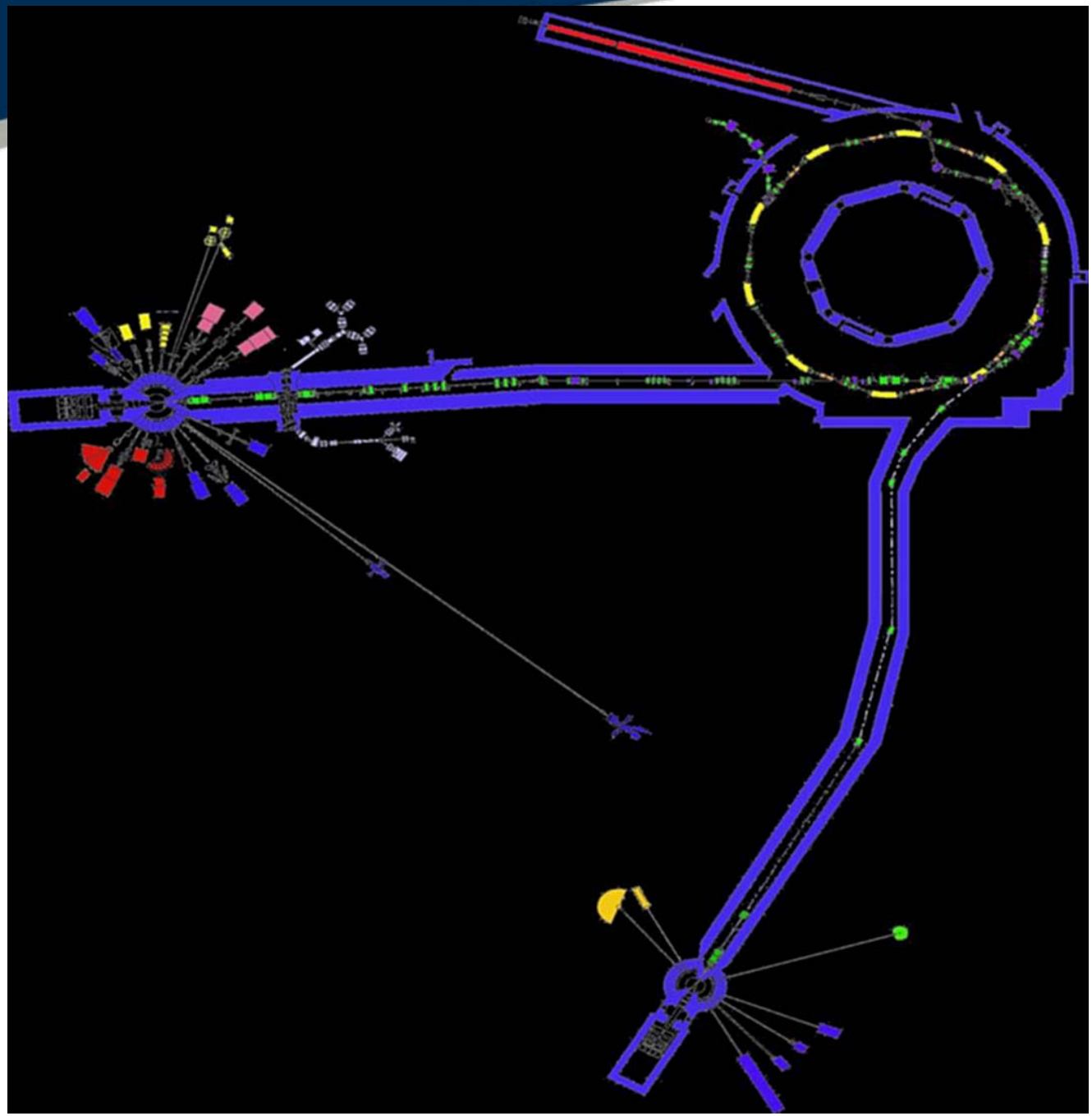

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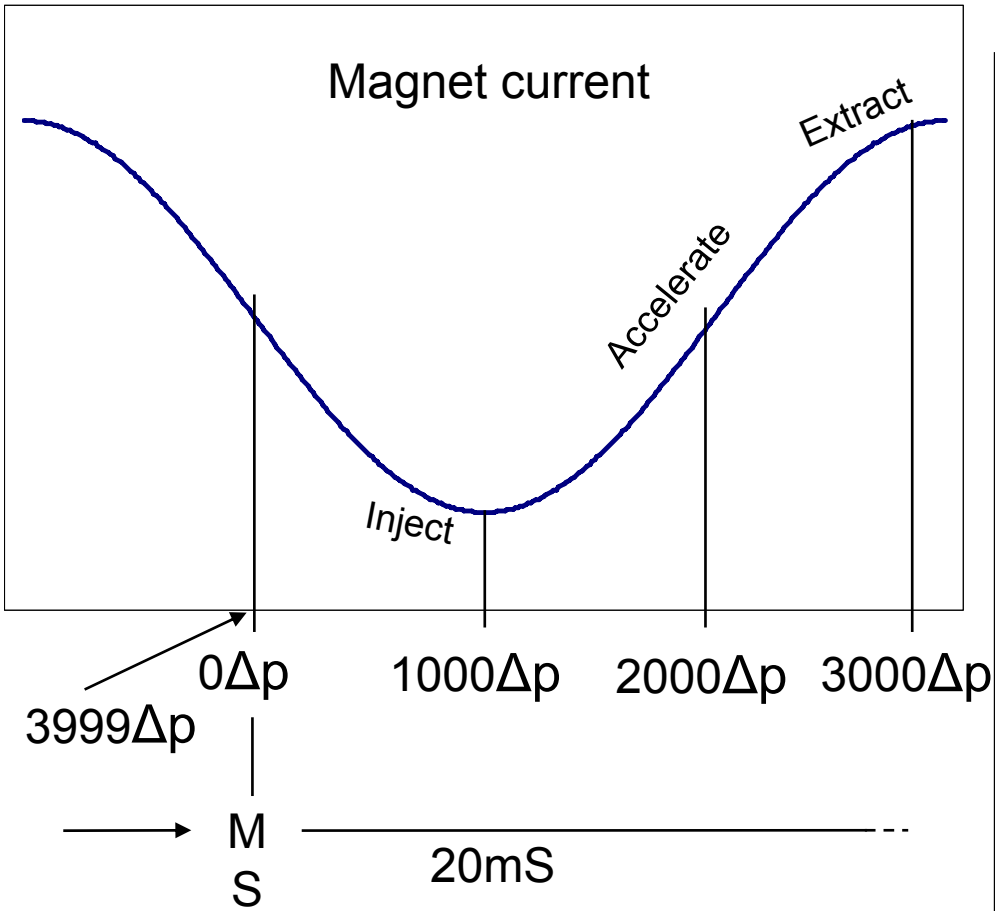
ISIS timing - primary signals



Permanent timing pulses

MS: Machine Start.

2.5μS pulse every 20mS at 0Δp

Δp: Delta-p train.

Square wave - 5μS period

These primary signals are phase locked to the magnet current/field waveform. From these other signals are derived...

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The ISIS Facility

- A staggering variety of ancient (50 years max.) and modern equipment with various interface requirements: RS232, RS485, IEEE488, Ethernet, DC Analogue, TTL, BCD digital panel meter outputs, Function generators requiring ISIS timing signals, GPIB instruments, PLC systems, other proprietary embedded systems.

- Over 10000 identifiable parameters which may require control or monitoring (a smaller subset are generally accessed).

- The control system interface electronics consists of about 500 modules in 50 crates of our original multiplex system (GPMPX), 30 installed installed STEbus embedded systems, 20 or so LabView PXI systems, and our replacements for the STEbus systems based on CompactPCI

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ISIS Controls - original

- Classical late 70's/80's approach using minicomputers (GEC 4000 series) with CAMAC, driving our own multiplex system (GPMPX).
- Semi-compiled interpretive language (GRACES)
- Data modules (equipment routines) based on CERN SPS model
- CAMAC based man-machine interface on control desk
- LAN between machines but no external access

ISIS Controls - current

- Ethernet linking control computers (OpenVMS and XP workstations), terminals, programmable knobs, CAMAC, STEbus and all new proprietary processor systems (PLC, PXI/PCI etc)
- Purchased project license for Vista control software with built in graphics package, logging, trending, alarm handling as well as user application programs in C, FORTRAN, BASIC and IDL.
- Equipment handlers and readers written in-house
- X-windows displays and programmable knob units on desk

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Vsystem licensed nodes

- 4 OpenVMS nodes running control desk and accelerator equipment, disk serving, backups etc. (HP DS/10)
- 1 OpenVMS node dedicated to accelerator physics work (HP DS/10)
- 2 OpenVMS nodes for development and non-critical user access (HP DS/10)
- 2 OpenVMS Itanium systems to replace above (HP Integrity RX2660)
- 2 XP nodes for development work + 6 XP Vaccess only licences
- Most Vsystem products used/licensed EXCEPT Vscript
- ALL OpenVMS nodes running Vsystem 4.3/OpenVMS 8.3

ISIS run time databases

- 98 Databases, >10000 channels (more to come!).
- Databases updated by mixture of Vscans/homebuilt readers – XML used for newer systems
- Complex startup files define database mapping and different restart modes
- "LOCAL" database with copies of common data on all nodes to save on network traffic/access servers

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Database definition

DECterm 1

File Edit Commands Options Print Help

```
$PLATES:FM102_HITRIP
        HITRP    PLATES:FM102
$PLATES:FM102_LOTRIP
        LOTRP    PLATES:FM102

$PLATES:FM102
        label            "TARGET CHANNEL #2 INLET FLOW"
        GEN_PARAMS
        GEN_FLOW         0.06
        BLOCKCHAN        53
        SADDRESS         %X4400000
        CARD_CHAN        %X1
        H_TRIP_LEVEL     190.0
        L_TRIP_LEVEL     70.0
        lw               90.0
        uw               175.0
        la               70.0
        ua               190.0

$PLATES:FM103_HITRIP
        HITRP    PLATES:FM103
```

Buffer: ISIS_TCRIT.ADB | Write | Insert | Forward

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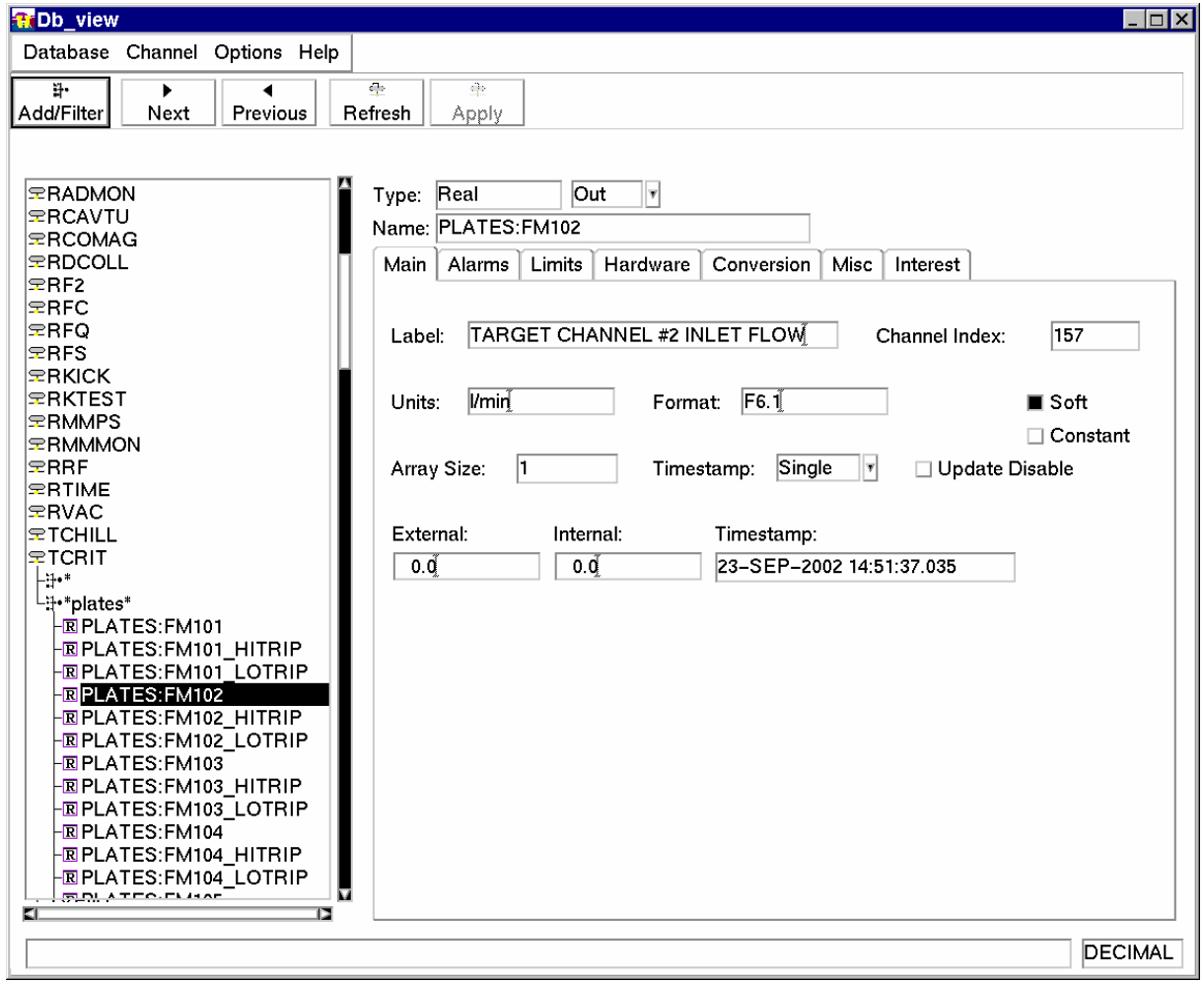
Database viewer



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Simple API

```
%include "con_include:conlib.bas"
        rs=read_chan("local::beam:synchrotron",x)
        print using "ISIS Beam ###.# µA",x
```

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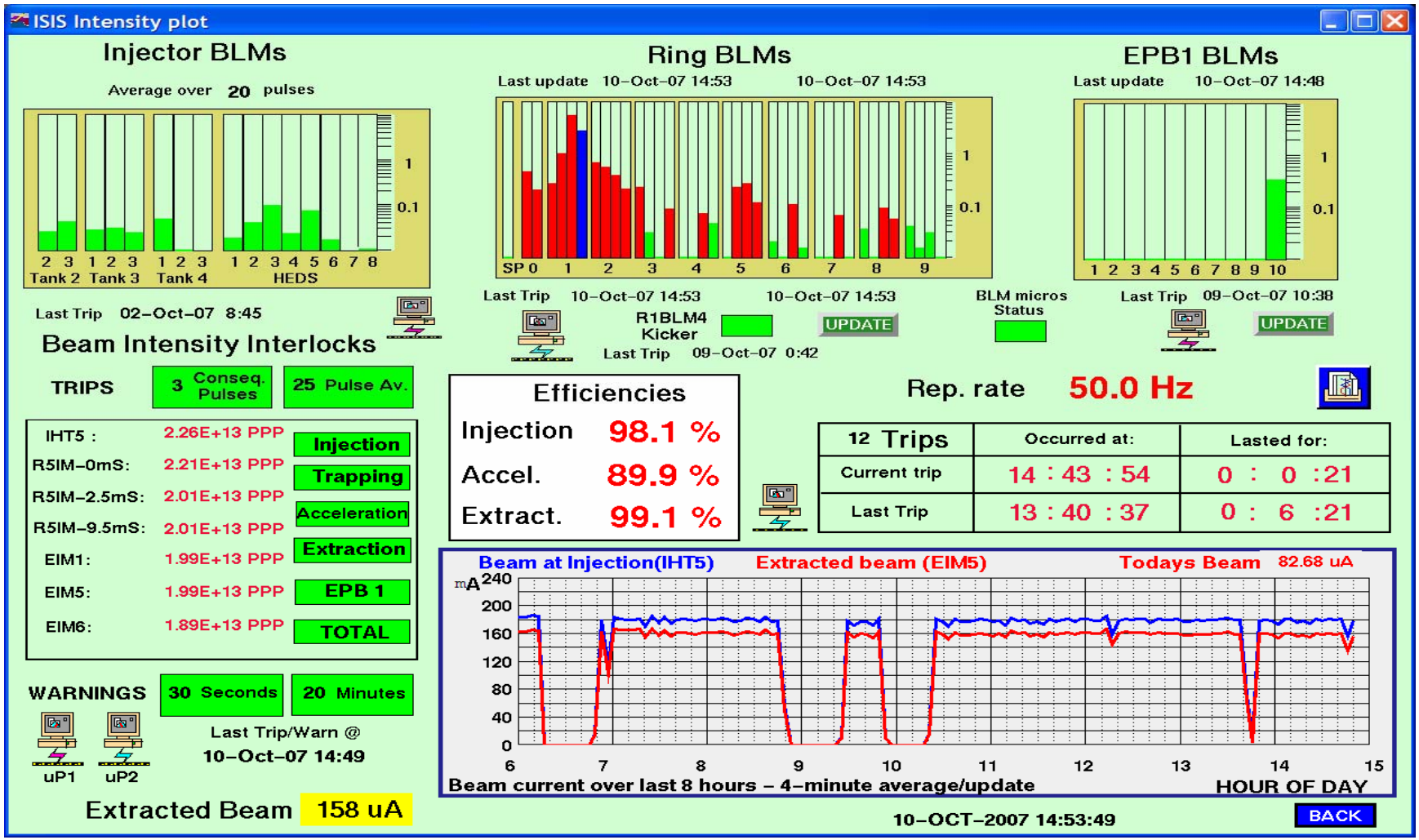
Control windows



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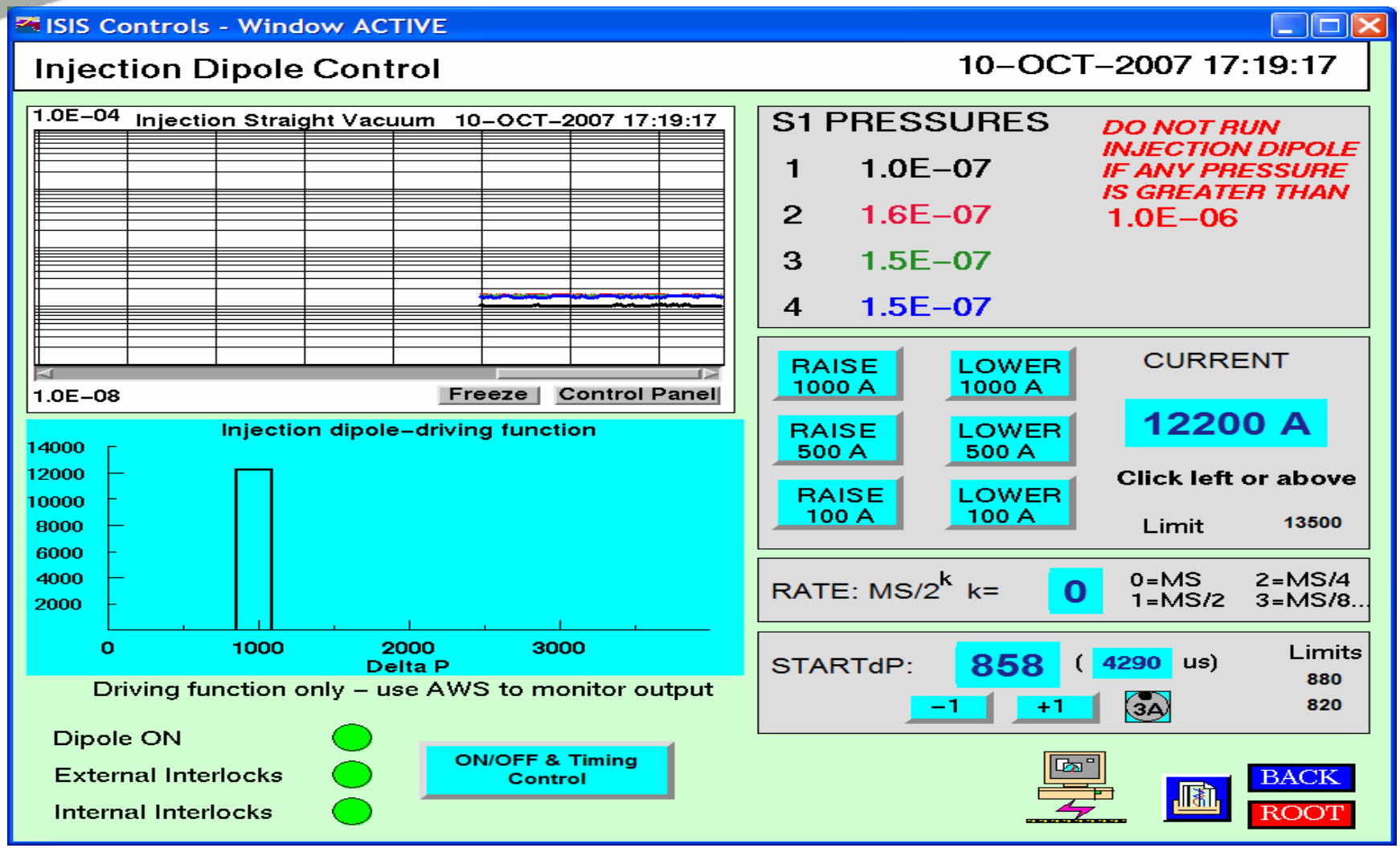
Control Windows



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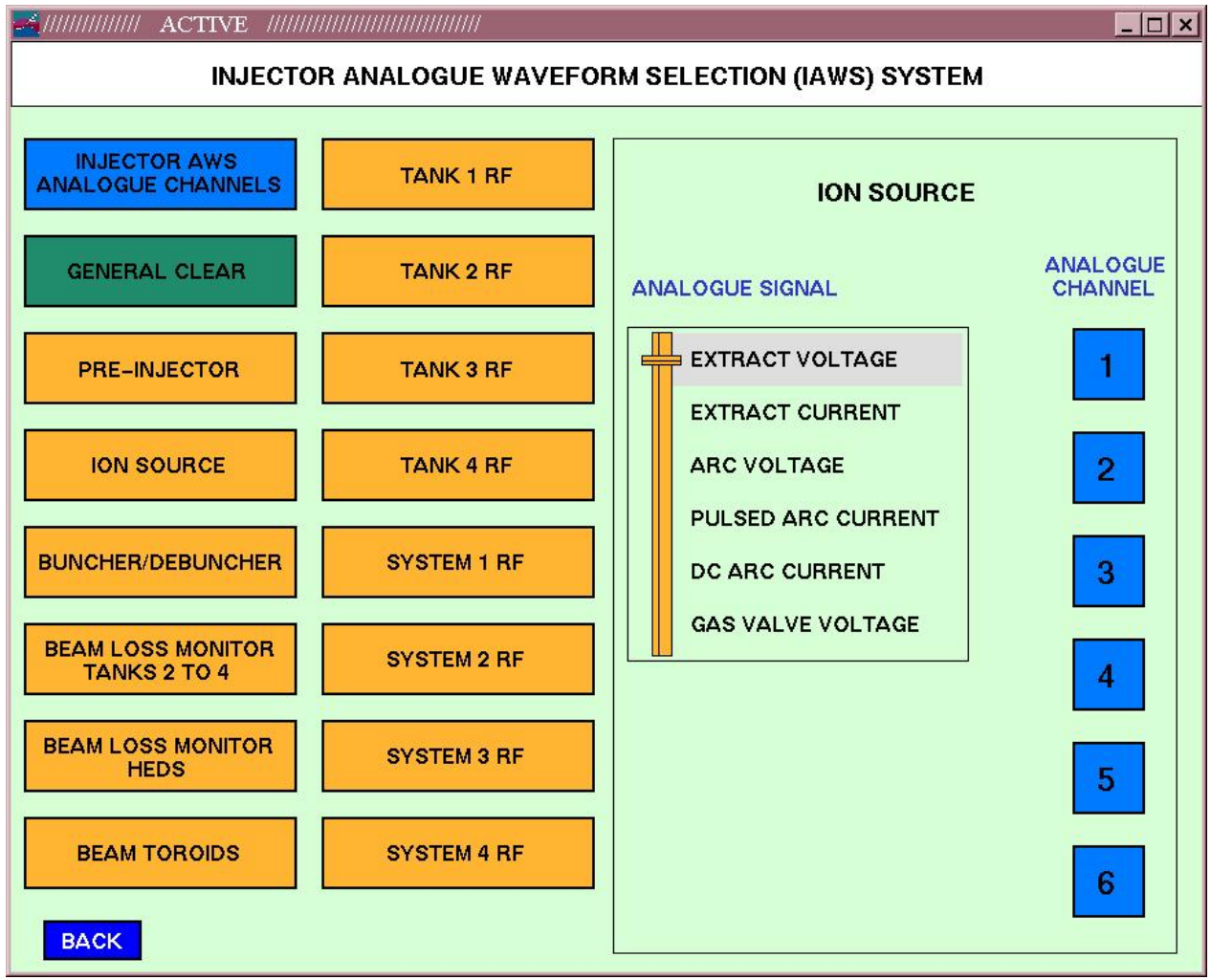
Control windows



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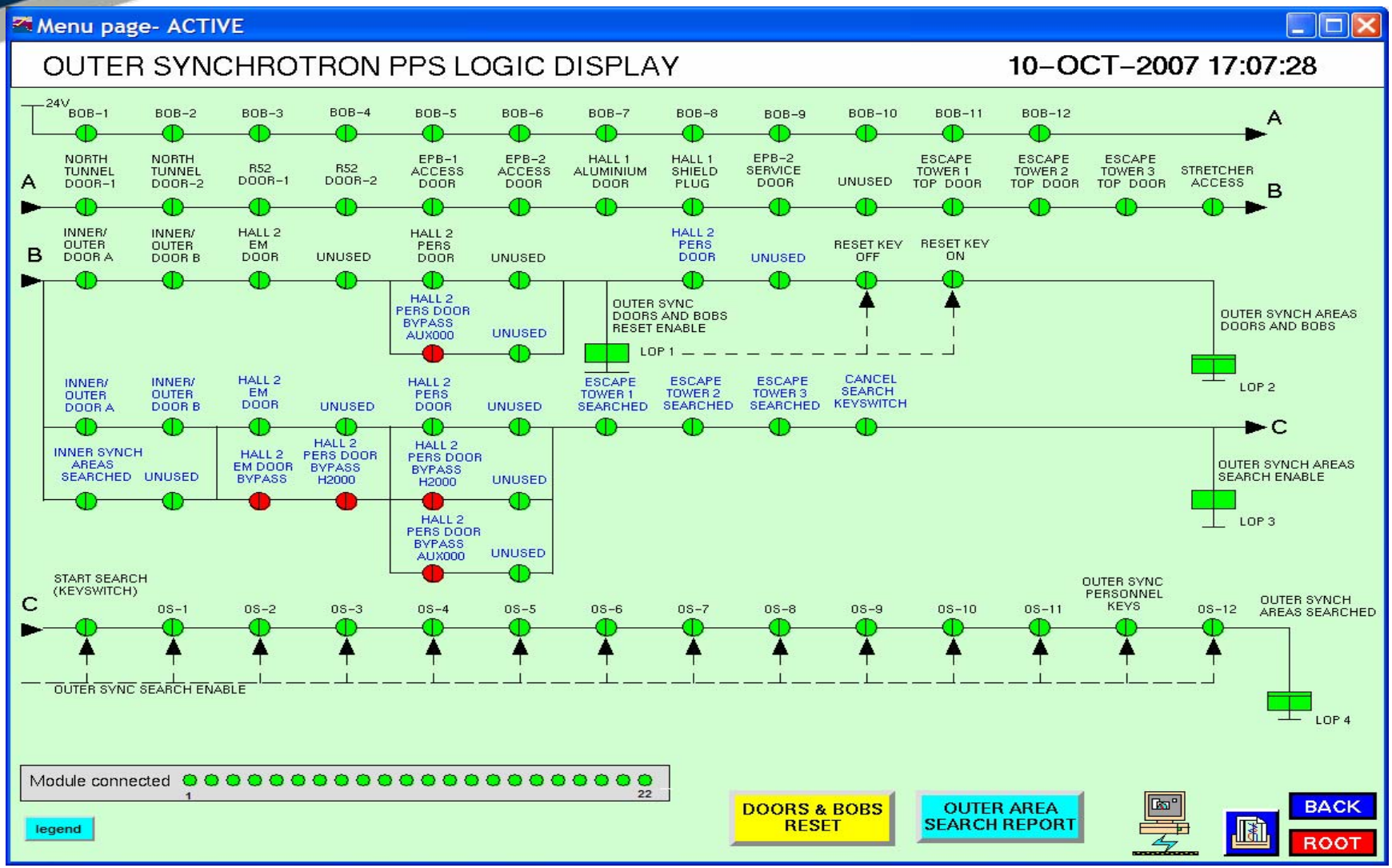
Control windows



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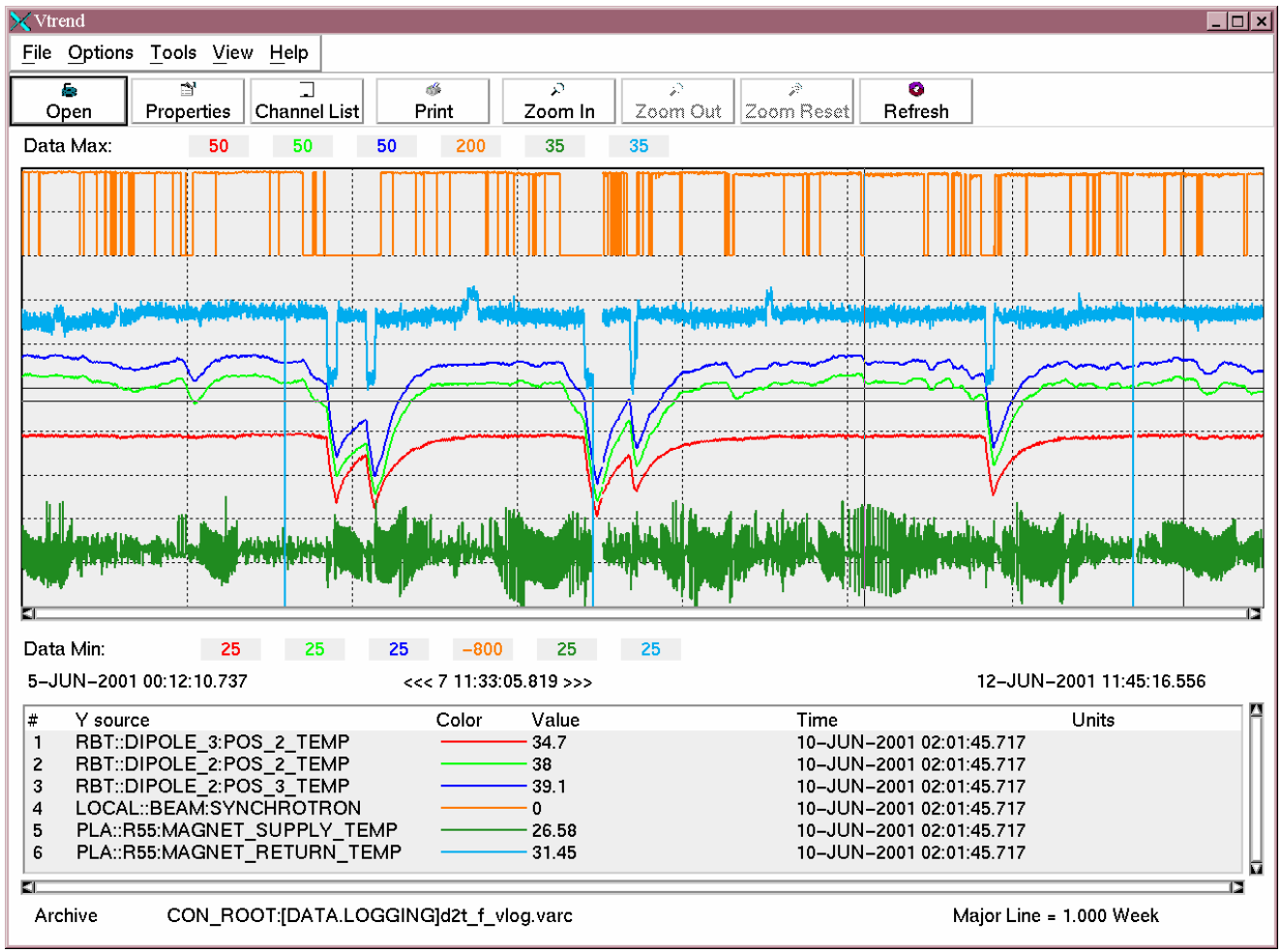

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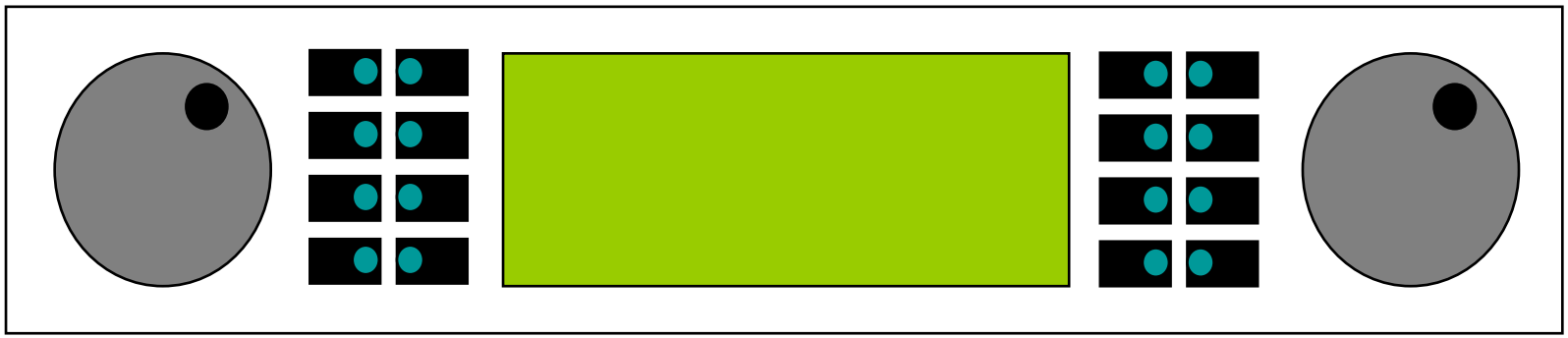
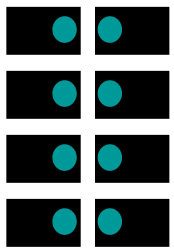
Programmable knob





Coarser

Finer

Enable

Disconnect

Nudge up

Nudge down

Mark

Restore

Vsystem conclusions

- OpenVMS - but we have no evidence that different conclusions would be reached on other operating systems.
- Support has always been excellent
- Since version 2.7, downtime caused by software has been 99% in our own software and other third-party software, not in Vsystem
- Upgrading early versions (up to 2.7) could be problematic. Recent upgrades (now stable at 4.3) have been happy experiences.
- Vista have hosted user-group meetings where user requests can be channelled effectively into Vsystem development
- Vsystem suits an organization that cannot afford the highest levels of software expertise but which wants to do its own system development.

Vsystem conclusions

- We felt it necessary to write our own front-end, user-friendly channel access functions (“read_chan, write_chan”) but this is not hard to do. Using Vscript would remove some of this requirement.
- For high-level imaging of data, Vsystem is not suitable but should be used in conjunction with another package (IDL in our case).
- Vsystem fell out of favour in the accelerator world, due to EPICS being developed for accelerator physics and control as a collaborative venture between the participating laboratories.
- Vsystem is now more successful in the commercial world, where support rather than a chance to participate in software development is more important

World Vsystem

- Power utilities
- Alumin[i]um & Steel forge & rolling facilities
- Cyclotron control, Synchrotron control
- Aviation engine testing (civil and US military)
- Weapon test telemetry (US military)
- Industrial motor drives
- Water management utilities
- Satellite broadcasting

Vsystem advantages

- Controls Group cheaper
  - Smaller, less (expensive) expertise, no need for "gurus"
- Support and development from Vista
  - Single source with tracking, not collaborative
- Cheaper overall
- QA accreditation/verification
- Source protected in escrow

Vsystem disadvantages

- Not part of accelerator “family”
- Equipment doesn’t come with drivers
- Less accelerator-specific product
- Have to take what you get to a certain extent but always access to code through Vsystem API.

The Vsystem "experience"

- We didn't really have an experience just a need and a solution
- "Experiences" are interesting, challenging, fulfilling and can be….expensive!