

XPS Based Motion System

(status report)

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Hall D Controls Meeting 4-May-2012

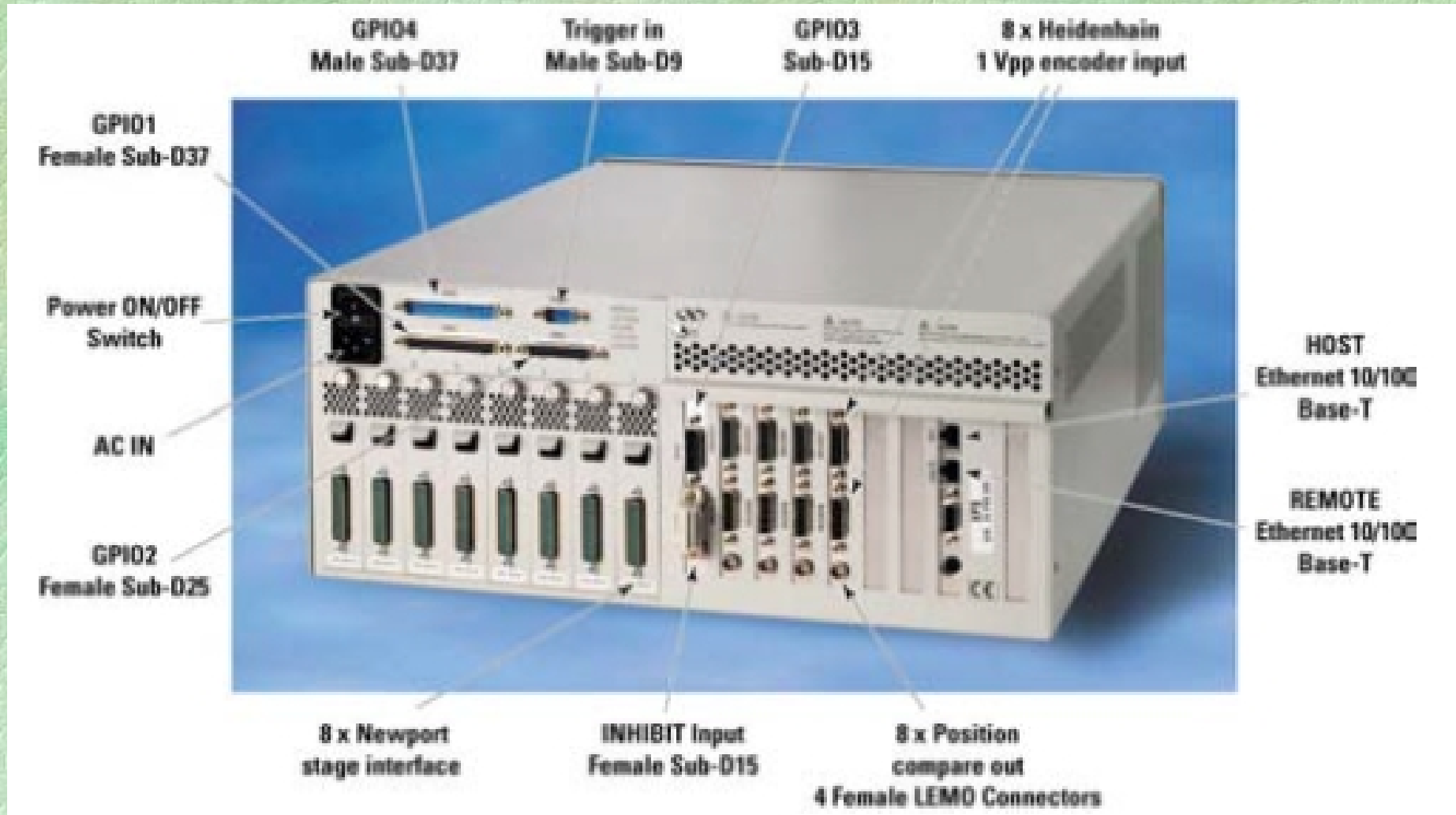
Planned motor-based applications

VME / PLC / Newport XPS based (wiki by Hovanes Egiyan)

- ***In tagger hall (9+)***
 - Goniometer (5 axis)
 - Tagger dump harp (1 axis)
 - Tagger microscope (3 axis)
 - Tagger fixed array (? axis)
- ***in Hall D (4+)***
 - Collimator table (1 axis)
 - Converter/photon harp (1 axis)
 - TAC (1 axis) ?
 - Gamma profiler (1 axis) ?

Likely the Goniometer comes from Newport with the XPS controller.

XPS - C8 Universal High-Performance Motion Controller (rear panel)



XPS-C8 Controller Specifications

Universal Driver Modules

- ***XPS-DRV01*** - for stepper and DC brush motors
(supplies a max output current of 3 A and 48 V)
- ***XPS-DRV02*** - for DC brushless motors
(max current of 5 A per phase and 44 Vpp)
- ***XPS-DRV03*** - for high-performance DC motors
(max current of 5 A and 48 V)
- ***XPS-DRV00, DRV00P, DRVP1*** - for any motion device including brushless motors, voice coils and piezoelectric stages

Number of Axes

- 1 to 8 axes of stepper or DC motors using internal drives
- Other motion devices using external third-party drives

Communication Interfaces

- Internet protocol TCP/IP (RJ45 Ethernet)
- Optional XPS-RC remote control

Input/Output

- 30 TTL inputs and 30 TTL outputs
- 4 synch. analog inputs ± 10 V, 14 Bit
- 4 synch. analog outputs, 16 Bit
- High-performance analog encoder input on each axis

Motion

- Jogging mode (defined direction and velocity)
- Synchronized point-to-point
- Spindle (continuous motion with periodic position reset)
- Line-arc mode (linear and circular interpolation)
- PVT (complex trajectory based on position, velocity and time coordinates)

Command Set

- Object oriented command language TCL (Tool Command Language)
- 100+ functions
- Real time execution of TCL scripts
- Multi-user capability
- EPICS compatible

(Mark Rivers from APS developed EPICS support)

Controller Configuration

Direct connection-PC

to XPS through a cross over cable

- **IP Management:** IP name and address
- **User Management:** Manage user accounts. Two type of users defined: ***Administrator*** and ***User***

WEB connection

- Login as Administrator using the WEB interface
- ***Build data base for each stage*** (stages.ini file)
- **Define Motion groups:** SingleAxis group,XY group,XYZ group and MultipleAxes group

What we have ? Our Setup

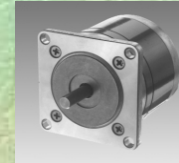


XPS-C8



DRV01
DRV00

SST55DC020



**Stage for microscope
beam test**

Configuration

- ***XPS-C8 name:*** halldxps1.jlab.org (IP: 129.57.37.26)
- ***Positioner name:*** Mult1.P1
- ***Motion Group:*** MultipleAxis group

The **WEB** interface provides access to basic group functions:
initialization, homing, executing relative and absolute moves ...

halldxps1/cgi/post.cgi

Most Visited Red Hat Customer Portal Documentation Red Hat Network Oracle Calendar 10...

Newport SYSTEM STAGE CONTROLLER CONFIGURATION FRONT PANEL TERMINAL TUNING DOCUMENTATION
Move Jog Spindle I/O view I/O set Positioner errors Hardware status Driver status

Move

Position	State	Action	Positioner name	Velocity	Abs move 1	Abs move 2	Relative move
300.45	12	Disable	Mult1.P1	100	300.45 Go	Go	< >

Kill All

NOTE : The new velocity gets only applied with the next motion.

Refresh rate (frames/sec.) : 1.00 Set

Newport Spectra-Physics
Experience | Solutions A Division of Newport Corporation

Solutions to: Make, Manage and Measure LightSM

EPICS (driver by Mark Rivers)

IOC using the “motor” record

GUI using CSS

motor_expert.opi

halldxps1:		Mult1.P1		EGU:	unit
Drive	User	Dial	Limit	Raw	
Hi limit	10,000.00	10,000.00	<input type="radio"/>		
Readback	320.00 320.00	320.00	Done	320	
MoveAbs	320	320	<input type="radio"/>	320	
Lo limit	-1,500.00	-1,500.00	<input type="radio"/>	Stop	
MoveRel	0.00	JogR JogF		Pause	
Tweak	< 1.00 >	HomR HomF	JogF	Move	
				Go	

Dynamics	Normal	Backlash	Calibration
Speed	300	1.00	Cal Use Set
Base Speed	0.00		Variable
Accel.	10.00	0.20	Off 0.00
Backlash distance		0.00	Dir Pos Neg
Move Fraction		1.00	

Setup

Motor res. 1.0

Encoder res. 1.0

Readback res. 0.0

Retry deadband 1.0

Retries 1 max: 10

Use Encoder No Yes

Use Readback No Yes

Precision 2

supervisory

closed_loop

Status

GroupStatus 12

MotorStatus 0x4902

CurrDirection 0

Moving Done

At Home 0

MotorPos 320

Encoder 320

MIP 0x 0x0

Err 0.00

Version 6.70

VME Card# -1

MotorStatusDetail

Test Results

- ***Movements of stage.*** OK
- ***Limit switches.*** When a limit switch is detected an emergency brake and the group goes in **NOT_INITIALIZED** status.
- ***Homing***
 - Current Position As Home. **OK**
 - Low/High Switch As Home. **OK**
 - Home Switch As Home. **Problem.**

Home searching direction: from high position to low

With Encoder it should work

We used **LowSwitchAsHome**

Output logic pulses during the execution of the trajectory

- *Distance spaced trigger output pulses*
 - *Time spaced trigger output pulses*
- } with **Encoder**

First output pulse is generated when the positioner enters the **defined position window**. A new pulse is generated at every **position/time step** until the stage exits the window.

- *Trigger output on trajectories*

Output of pulses at constant time (100 μ s) intervals on a PVT trajectory

Trajectory Scanning

The XPS supports 3 different types of trajectories

- **The line-arc trajectory:** for positioners in *XY* groups
 - Trajectory defined by a number of straight and curved segments
- **The spline trajectory:** for positioners in *XYZ* groups
 - 3rd order polynomial curve
- **The PVT- trajectory (Position, Velocity, Time)**
 - Each trajectory element is defined by the ***move time***, the ***end position***, and ***end speed*** for each positioner
 - No limit to the trajectory elements
 - Available with ***MultipleAxes*** groups

PVT- trajectory scanning

Mark Rivers developed a **new** EPICS **driver** for support of trajectory scanning

This GUI provides

Definition

Building

Scanning

of trajectory and

Readback

the actual positions when pulse was output

The screenshot shows a software window titled "TRAJECTORY TEST" with a tab labeled "profile move". The interface is divided into several sections:

- Configuration Section:** Contains input fields for "# Profile points" (20), "# Output pulses" (200), "Pulse range: Start" (1), "End" (20), "Time" (Fixed), "Fixed time per point" (1.000), and "Acceleration time" (0.500). It also displays "Current" (21) and "Actual" (200) values. A "Plot time" field and an "XPS settings" button are also present.
- Positioning Section:** Includes a "Mult1.P1" label, a "Move axis?" button (Yes), and a "Current Pos." display (700.00). Below this is a horizontal scale from 0 to 3000 with a slider.
- Control Section:** Features a "MoveAbs" field (700), a "Home" button, and a "Speed" field (300).
- Command Log Section:** A table with columns "Command", "State", and "Status". It lists three commands: "Build" (State: 0, Status: 1), "Execute" (State: 0, Status: 1), and "Abort" (State: Abort!, Status: 1). Each command has an associated "Message" field.

Testing is in progress...

THANK YOU