XPS Based Motion System
(status report)

Vanik Kakoyan

Hall D Controls Meeting 4-May-2012

Planed motor-based applications

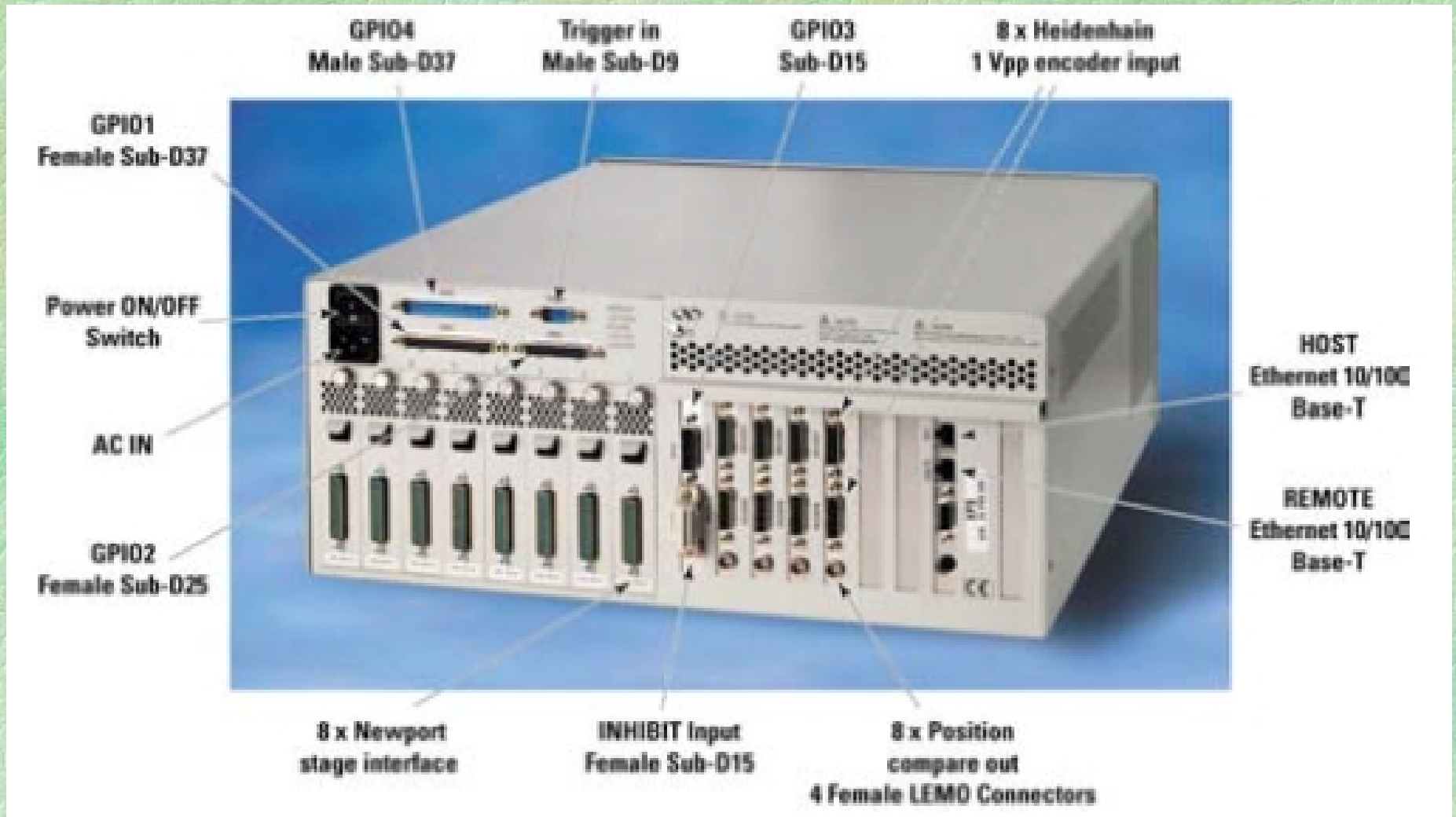
VME / PLC / Newport XPS based (wiki by Hovanes Egiyan)

- ***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

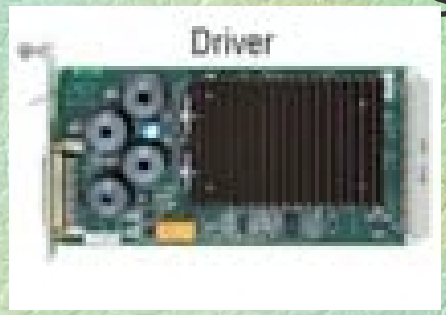
- ***IP Management:*** IP name and address
- ***User Management:*** Manage user accounts. Two type of users defined: ***Administrator*** and ***User***

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

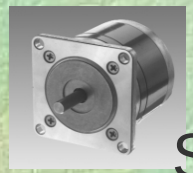
What we have ? Our Setup

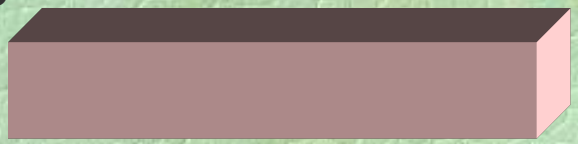
XPS-C8



DRV01
DRV00

SST55DC020



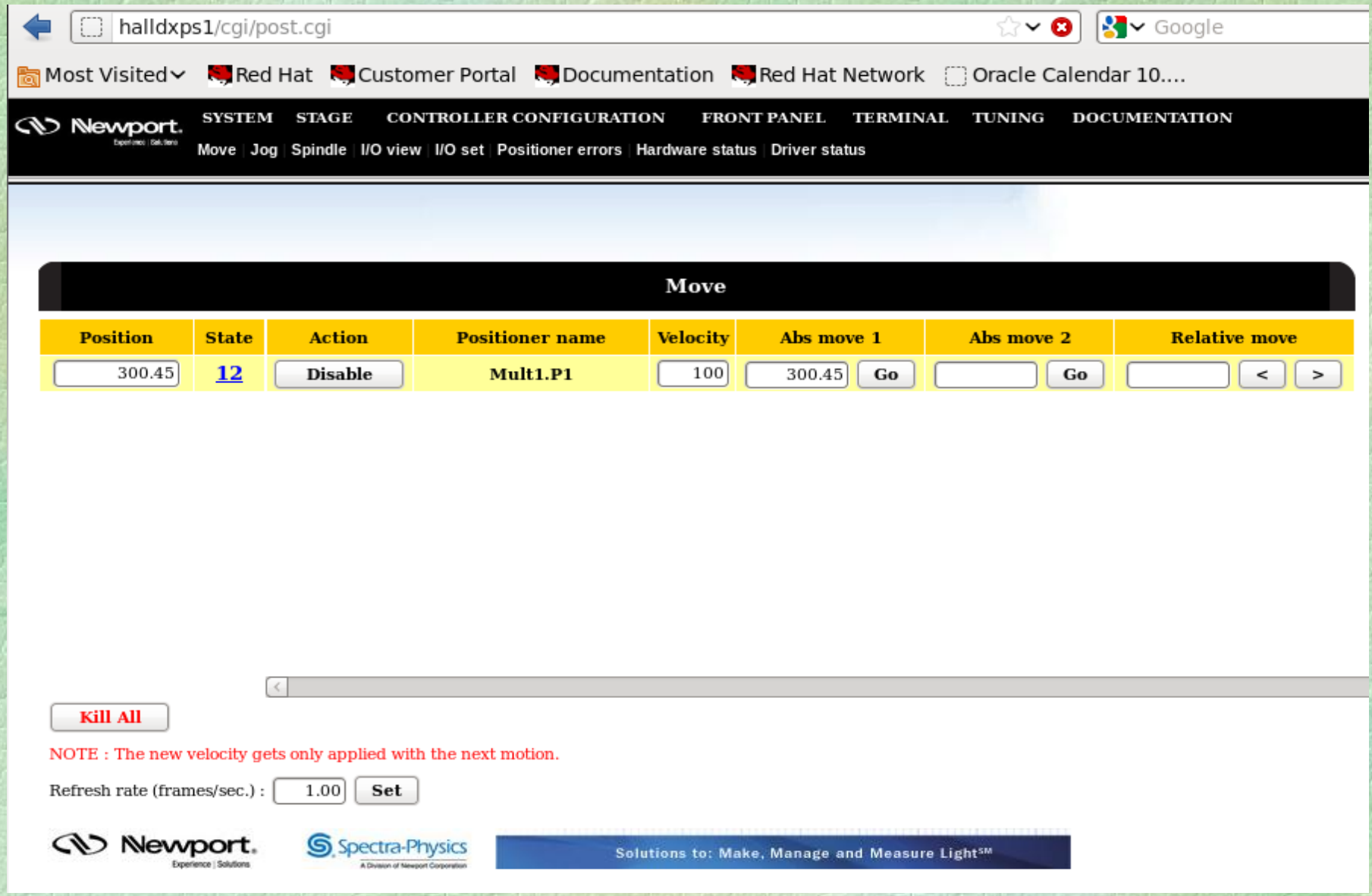


Stage for microscope beam test

Configuration

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

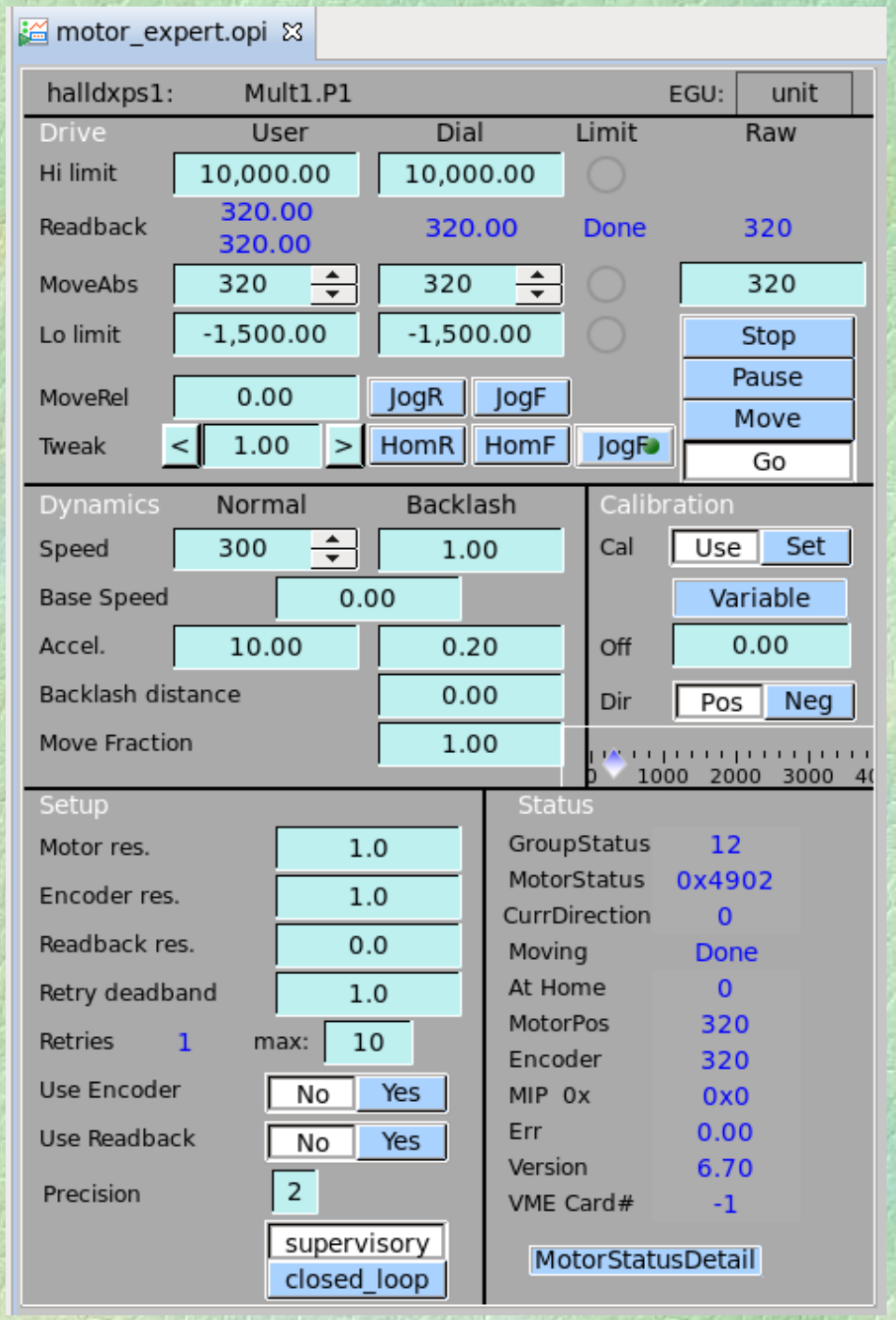
The **WEB** interface provides access to basic group functions: ***initialization, homing, executing relative and absolute moves ...***



EPICS (driver by Mark Rivers)

IOC using the “motor” record

GUI using CSS



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 µs) 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** (**P**osition**, V**elosity**, T**ime)
  - 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

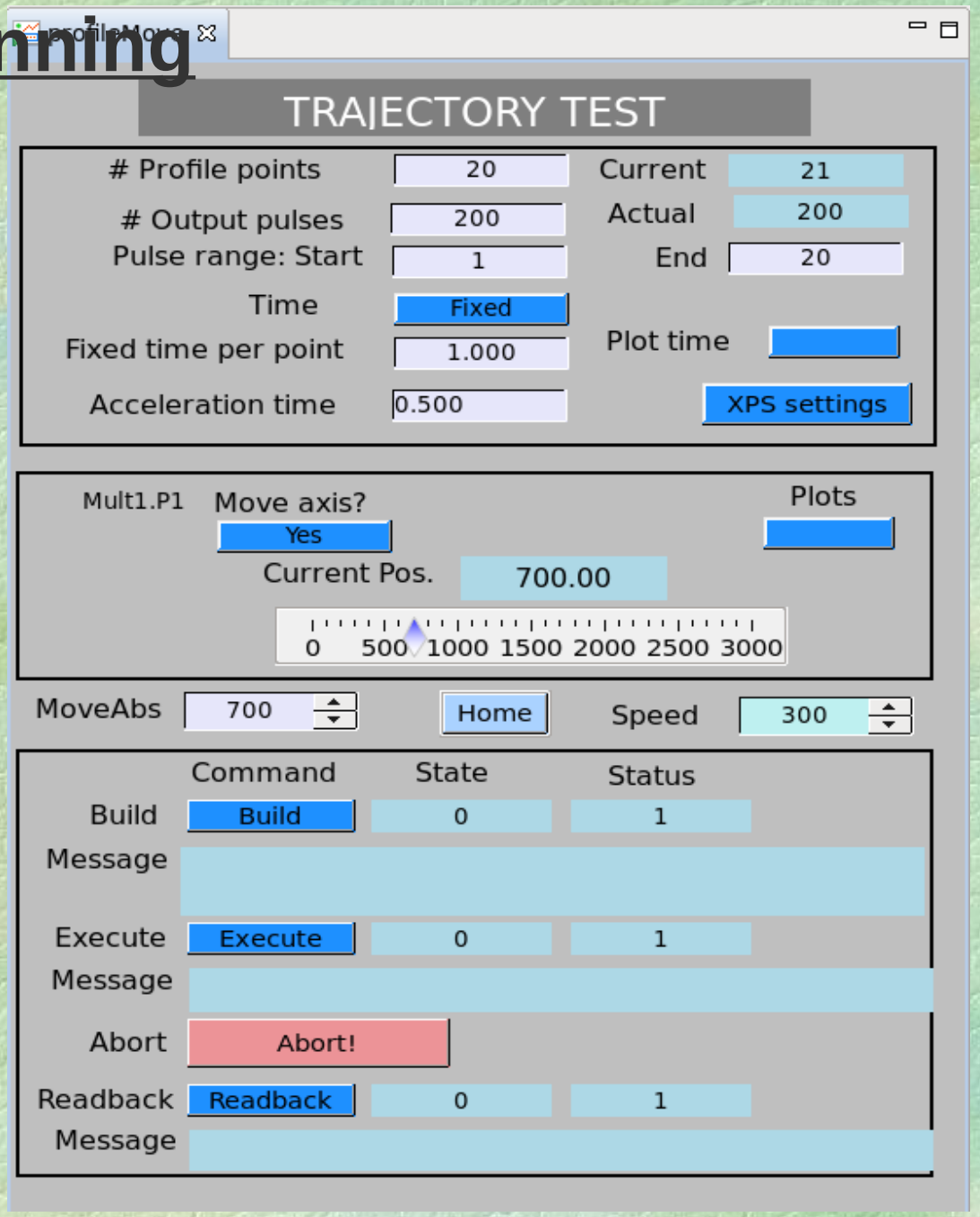
Building

Scanning

of trajectory and

Readback

the actual positions when pulse was output



Testing is in progress...

THANK YOU