Microscope support in EPICS
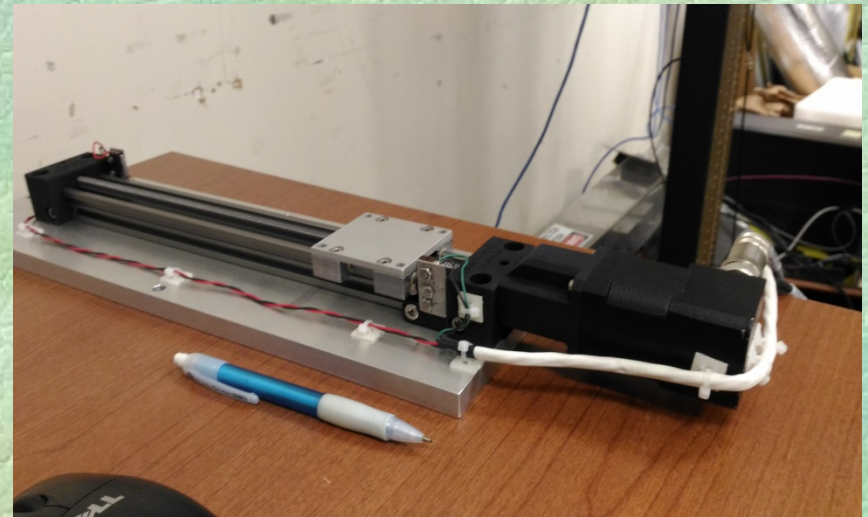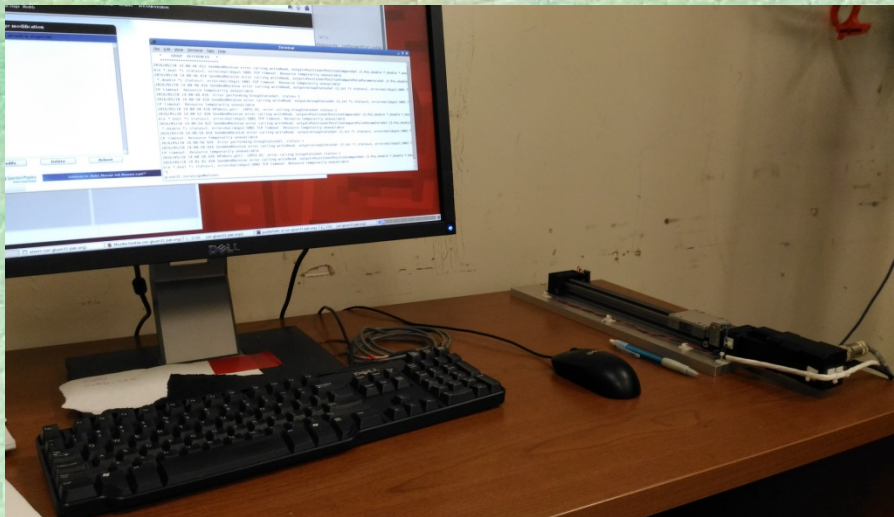## (status report)

Vanik Kakoyan
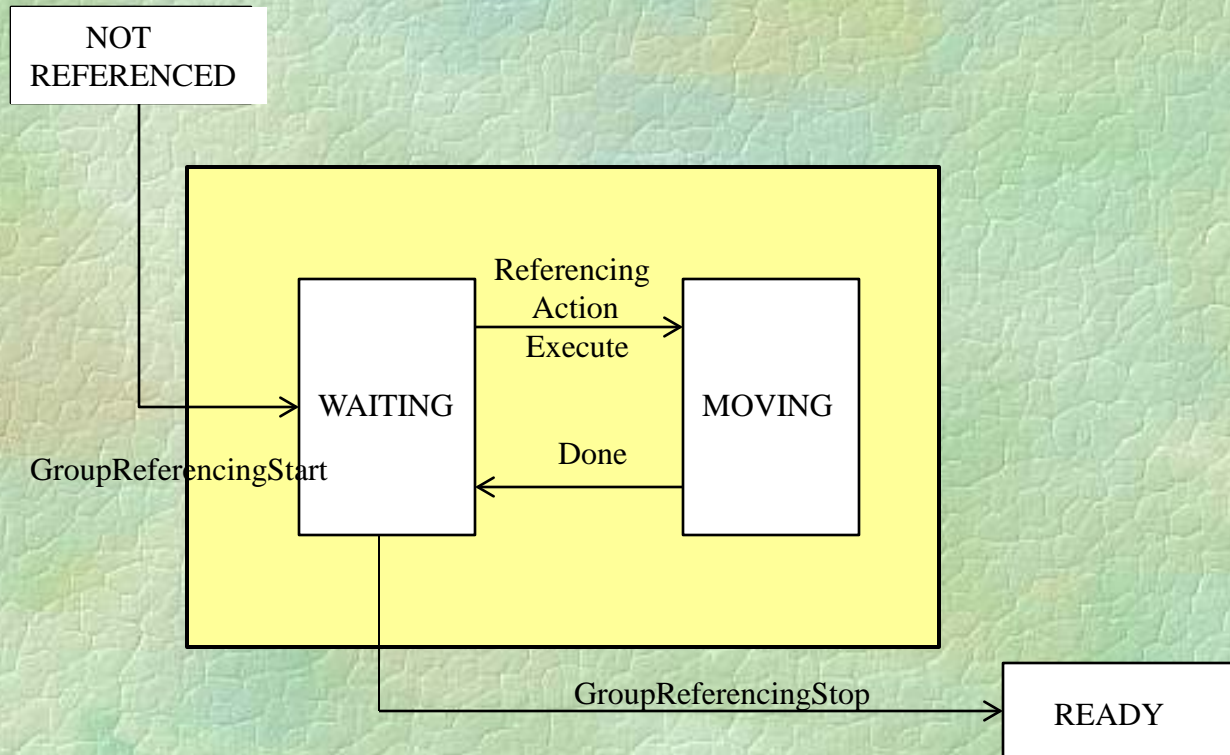
Hall D Controls Meeting 12-May-2016

Test setup

XPS - C8 Universal Motion Controller

REFERENCING

Software

- 100+ functions - using the WEB interface
- EPICS compatible

(Mark Rivers from APS developed EPICS support but it does not support functions for the Referencing)

- *GroupKill(GroupName)*
- *GroupInitialize(GroupName)*
- *GroupReferencingStart(GroupName)*
- *GroupReferencingActionExecute(Posit,Action,Sensor,Parameter)*
- *GroupReferencingStop(GroupName)*

IOC

using the "motor" record and EPICS Sequencer which is using State Notation Language.

GUI using CSS

GroupReferencingActionExecute(Posit,Action,Sensor,Parameter)

The syntax and function of the function
GroupReferencingActionExecute(PositionerName, Action, Sensor, Parameter) will be discussed in detail. With this function there are four parameter to specify:

- PositionerName is the name of the positioner on which this function is executed.

- Action is the type of action that is executed. There are eight actions that can be distinguished in three categories: Moves that stop on a sensor event, moves of certain displacement, and position counter reset actions.

- Sensor is the sensor used for those actions that stop on a sensor event. It can be MechanicalZero, MinusEndOfRun, or None.

- Parameter is either a position or velocity value and provides further input to the function.

The following table summarizes all possible configurations:

Action	Sensor			Parameter	
	MechanicalZero	MinusEndOfRun	None	Position	Velocity
LatchOnLowToHighTransition	∨	∨			∨
LatchOnHighToLowTransition	∨	∨			∨
LatchOnIndex			∨		∨
LatchOnIndexAfterSensorHighToLowTransition	∨	∨			∨
SetPosition			∨	∨	
SetPositionToHomePreset			∨		
MoveToPreviouslyLatchedPosition			∨		∨
MoveRelative			∨	∨	

Base GUI

File   Edit   Search   CSS   Window   Help

OPI Runtime

Referencing.opi

Group Referencing Operations

XPS:	Group:	Positioner:	Group State	Ref State
halldxps1:	S	S.Pos	END_REF	STANDBY

Group Status: 11   Ready state from homing   Run Refer...

Positioner Status: 0x400000   ZM low level - First driver powered on

ABORT

Positioner Error: 0x0

GroupKill	GroupInitialize	GroupHomeSearch
Kill Status: Success	Init Status: Success	Home Status: Undefined

GroupReferencingStart	GroupReferencingStop
Start Status: Success	Stop Status: Success

Action   Sensor: Parameter

SetPositionToHomePreset   None   0

- LatchOnLowToHighTransit   MinusEndOfRun
- LatchOnHighToLowTransit   MechanicalZero
- LatchOnIndex   PlusEndOfRun
- LatchOnIndexAfterHighT...   None
- SetPosition   PStatDetail
- SetPositionToHomePreset   MotorExpert
- MoveToPrevLatchedPos
- MoveRelative

GroupReferencingActionExecute

ActionExecute Status: Success

Referencing Error Mesage:

-10

-100 -80 -60 -40 -20 0 20 40 60 80 100 120 140 160

---

positionerStatus_detail.opi

101%

Positioner Hardware Status Detail

XPS: halldxps1:   Positioner: S.Pos

- Second driver powered on
- First driver powered on
- Second driver in fault
- First driver in fault
- Unused
- Unused
- Hard interpolation encoder quadrature error
- Hard interpolation encoder error
- Unused
- Unused
- Encoder frequency or coherence error
- Encoder quadrature error
- Plus end of run glitch
- Minus end of run glitch
- Plus end of run activated
- Minus end of run activated
- Unused
- Unused
- Unused
- Unused
- Unused
- ZM high level
- Unused
- General inhibition detected

---

motor_expert.opi

halldxps1:	Mult1.P1		EGU:	unit

Drive

	User	Dial	Limit	Raw
Hi limit	10,000.00	10,000.00	○	
Readback	320.00 320.00	320.00	Done	320
MoveAbs	320	320	○	320
Lo limit	-1,500.00	-1,500.00	○	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	

0 1000 2000 3000 4000

Setup

		Status	
Motor res.	1.0	GroupStatus	12
Encoder res.	1.0	MotorStatus	0x4902
Readback res.	0.0	CurrDirection	0
Retry deadband	1.0	Moving	Done
Retries	1 max: 10	At Home	0
Use Encoder	No Yes	MotorPos	320
Use Readback	No Yes	Encoder	320
Precision	2	MIP 0x	0x0
		Err	0.00
		Version	6.70
		VME Card#	-1

supervisory

closed_loop

MotorStatusDetail

Run Referencing


```
iocRun: All initialization complete
## Start any sequence programs
seq groupRef,"GRP=S,pref=halldxps1,POS=Pos"
Sequencer release 2.1.12, compiled Wed Nov 20 10:32:16 2013
Spawning sequencer program "groupRef", thread 0x85a9ca0: "groupRef"
seq posRef,"GRP=S,POSIT=S.Pos,pref=halldxps1,POS=Pos,R=m1"
Sequencer release 2.1.12, compiled Wed Nov 20 10:32:16 2013
Spawning sequencer program "posRef", thread 0x85abf48: "posRef"
#seq posRef,"GRP=uScope,POS=Middle"
#seq posRef,"GRP=uScope,POS=Downstream"
groupRef[0]: all channels connected & received 1st monitor
posRef[0]: all channels connected & received 1st monitor
epics>
epics>
epics>
epics>
epics>
epics>
        ********************************************
        *    Group: S    START  Referencing
        ********************************************
 Group: S  - GroupKill  - OK
 ------------
 Group: S - GroupInitialize - OK
 ------------
 Group: S - GroupReferencingStart - OK
 ------------
**** Positioner: S.Pos   ---  Low Limit Switch is ON  -->  MoveRelative
 Positioner: S.Pos  *  Action=MoveRelative;  Sensor=None;  Param(position)=10.000000
 Positioner: S.Pos - MoveRelative - OK
 ------------
 Positioner: S.Pos  *  Action=LatchOnlowToHighTransit  Sensor=MinusEndOfRun  Param(velocity)=-1.000000
 Positioner: S.Pos - LatchOnLowToHighTransition - OK
 ------------
 Positioner: S.Pos  *  Action=LatchOnIndexAfterHighToLo;  Sensor=MinusEndOfRun;  Param(velocity)=1.000000
 Positioner: S.Pos - LatchOnIndexAfterHighToLowTransition - OK
 ------------
 Positioner: S.Pos  *  Action=MoveToPrevLatchedPos;  Sensor=None;  Param(velocity)=1.000000
 Positioner: S.Pos - MoveToPreviuslyLatchedPosition - OK
 ------------
 Positioner: S.Pos  *  Action=SetPositionToHomePreset;  Sensor=None;
 Positioner: S.Pos - SetPositionToHomePreset - OK
 ------------
 Group: S - GroupReferencingStop - OK
 ------------

    ********************************************
    *    Group: S    REFERENCED
    ********************************************
epics> █
```

THANK YOU