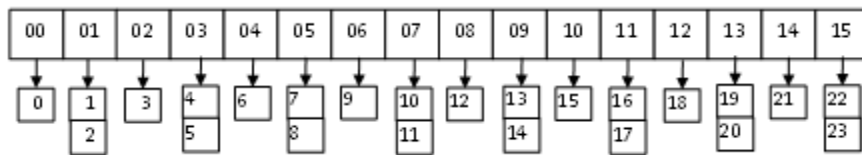# ROMAN POTS MOTORIZATION

01/12/2011   FESA and PXI software
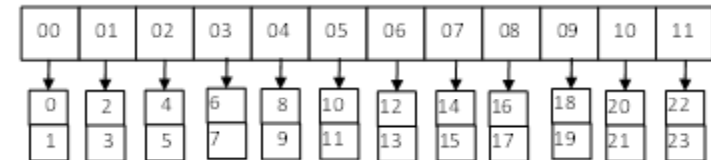
Roman Pots FESA Class

- The same code runs on both production systems - the same version.
  - Internally the FESA code contains 2 distinct maps of pot index to FESA class instance.

TOTEM Mapping   ALFA Mapping

  - A parameter is passed to the FESA instances to account for the different TOTEM/ALFA pot layout. Each FESA instance covers either 2 vertical pots or 1 horizontal pot (TOTEM only).

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RBAC/MCS Settings (1/2)

□ RBAC maps are the same for ALFA and TOTEM with the exception that there are two different expert roles:

- ALFA-XRP-EXPERT
- TOTEM-XRP-EXPERT
- containing the same experts at the moment...

□ MCS settings were added in March 2011

□ Final RBAC maps ready, to be deployed (tighter constraints as per LHC Collimators)

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Current in use

Final

(as LHC Collimators)

Current in use

LHCRomanPots RBAC Access Map

Device Group: *RomanPots-2009*

Roles → Properties Group ↓	LHC-Operator	MCS-Collimation	TOTEM-XRP-EXPERT	ALFA-XRP-EXPERT
Operator	X			
Operator_expert			X	
MCS_properties		X		

MCS config file deployed on *cfc-usc55-cgtotem*: 16 March 2011

Device Group: *RomanPots-ALFA*

Roles → Properties Group ↓	LHC-Operator	MCS-Collimation	TOTEM-XRP-EXPERT	ALFA-XRP-EXPERT
Operator	X			
Operator_expert				X
MCS_properties		X		

MCS config file deployed on *cfc-usa-alfa*: 16March 2011

Propriety Group Details:

Groups → Assigned Properties ↓	Operator	Operator_expert	MCS_properties
Disarm	X	X	X
ErrorsAcknoledge	X	X	X
InnerPotLimits	X	X	X
InterlockThreshold	X	X	X
InterlockThresholdFunct	X	X	X
RequiredAbsolutePosition	X	X	X
SoftwareTrigger	X	X	X
Stop	X	X	X
UpdateAbsolute Position	X	X	X

TOTEM-XRP-EXPERT: *sravat, stefano, sfranz, bfarnham, deile, fravotti*

ALFA-XRP-EXPERT: *sravat, stefano, sfranz, bfarnham, deile, fravotti*

RBAC DB Updated: 16 March 2011

Final

LHCRomanPots RBAC Access Map – Final!

Device Group: *RomanPots-2009*

Roles → Properties Group ↓	LHC-Operator	MCS-Collimation	TOTEM-XRP-EXPERT	ALFA-XRP-EXPERT
Operator	X	X	X	
Operator_expert		X	X	
MCS_properties	X	X	X	

MCS config file deployed on *cfc-usc55-cgtotem*: t.b.d

Device Group: *RomanPots-ALFA*

Roles → Properties Group ↓	LHC-Operator	MCS-Collimation	TOTEM-XRP-EXPERT	ALFA-XRP-EXPERT
Operator	X	X		X
Operator_expert		X		X
MCS_properties	X	X		X

MCS config file deployed on *cfc-usa-alfa*: t.b.d.

Propriety Group Details:

| Groups → Assigned Properties ↓	Operator	Operator_expert	MCS_properties
Disarm	X		
ErrorsAcknoledge	X		
InnerPotLimits			X
InterlockThreshold			X
InterlockThresholdFunct			X
RequiredAbsolutePosition	X		
SoftwareTrigger	X		
Stop	X		
UpdateAbsolute Position		X	

TOTEM-XRP-EXPERT: *sravat, stefano, sfranz, bfarnham, deile, fravotti*

ALFA-XRP-EXPERT: *sravat, stefano, sfranz, bfarnham, deile, fravotti*

RBAC DB Updated: t.b.d.

Electrical Stoppers

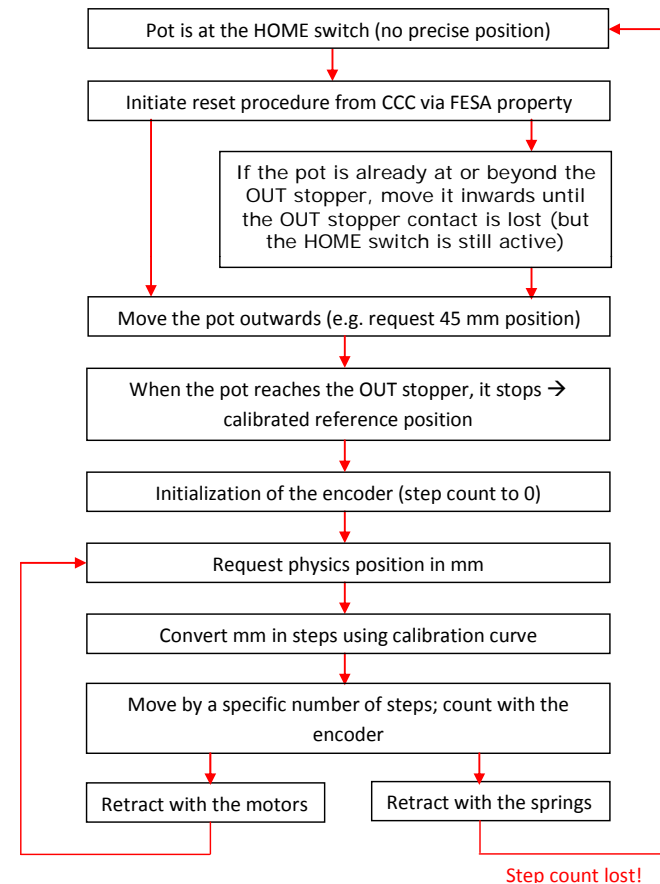➢Mechanical reference for step counters

➢Verification of the LVDTs calibration

•Based on spring test probes

•Test on lab shows a repeatability better than 10µm

•Position In/Out measured during the survey

Sylvain Ravat PH/DT-DI   01/12/2011
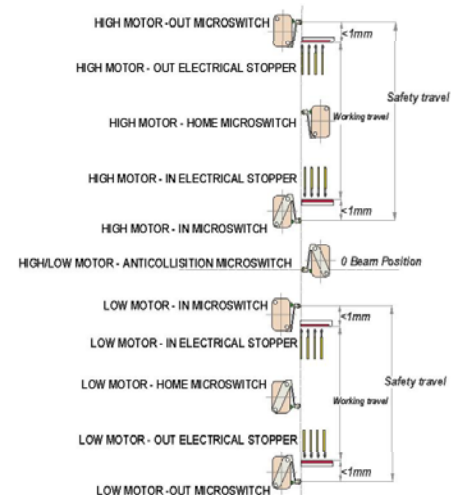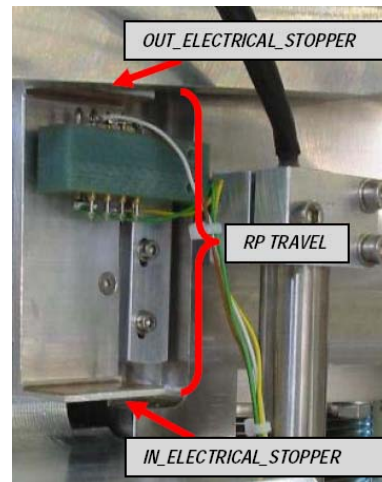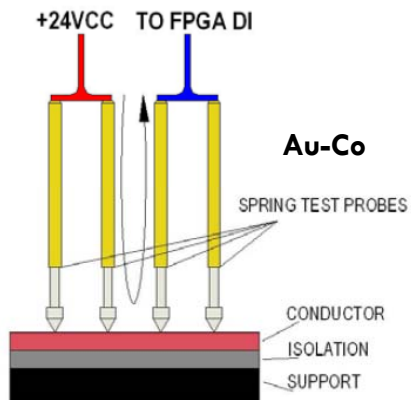
Roman Pot Movement Procedure

The actual procedure is described in the EDMS document No114700 v.1.3.

Pot is at the HOME switch (no precise position)
Initiate reset procedure from CCC via FESA property
If the pot is already at or beyond the OUT stopper, move it inwards until the OUT stopper contact is lost (but the HOME switch is still active)
Move the pot outwards (e.g. request 45 mm position)
When the pot reaches the OUT stopper, it stops → calibrated reference position
Initialization of the encoder (step count to 0)
Request physics position in mm
Convert mm in steps using calibration curve
Move by a specific number of steps; count with the encoder
Retract with the motors	Retract with the springs

Step count lost!

Flow diagram of the RP movement procedure.

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RESET Procedure

- The RESET procedure initialize the step position to the electrical stopper position measured during the survey of the RP,

- This procedure must be used after each extraction of a roman pot by the springs. Indeed, the step count is lost and must be re-initialized,

- This operation must be carried out when the roman pot is in HOME position. This allows to limit the displacement of the roman pot and avoid blocking the operation of the machine.

Problems during last ALFA Run (1/2)

Sylvain Ravat PH/DT-DI   01/12/2011
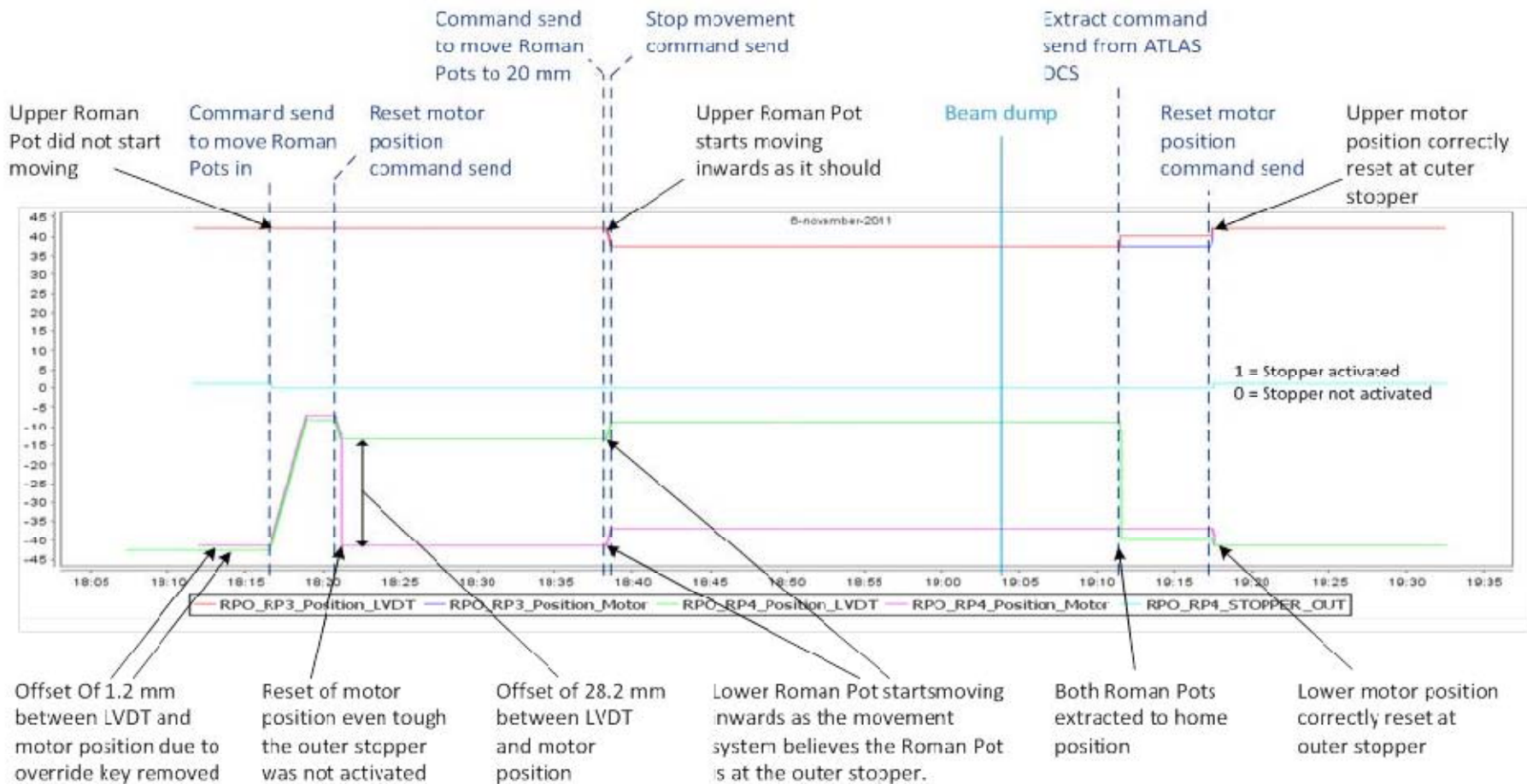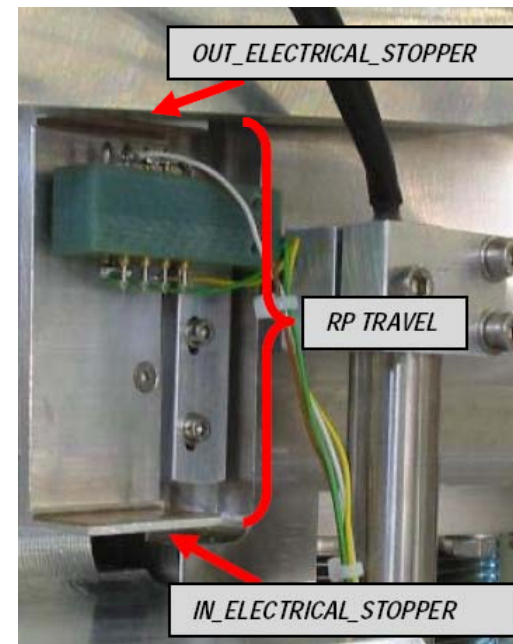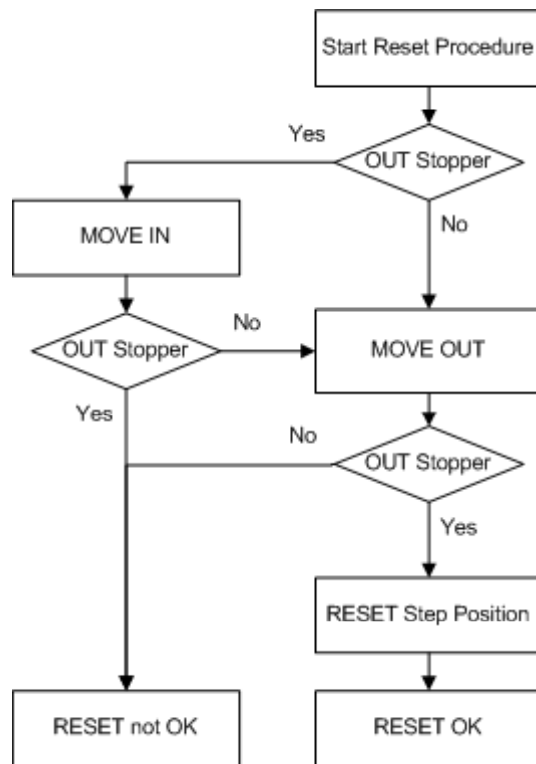
Problems during last ALFA Run (2/2)

During the last ALFA run :

- ➢ After a RESET realized with success, the OVERRIDE key was turned. The mode of the beam was not compatible with the displacement of the roman pots, the system of interlock has caused an extraction of the roman pots by the springs. This created an offset ~1mm between the two positions read (LVDT and step position).

- ➢ A RESET was required although the roman pot had already carried out a displacement. It resulted that the two positions read (LVDT and step engine) were totally different.

- ➢ After a start command, one roman pot did not start to move.

- ➢ In the future, we should ensure that:

  - ➢ the roman pots can not be moved after an extraction by the springs
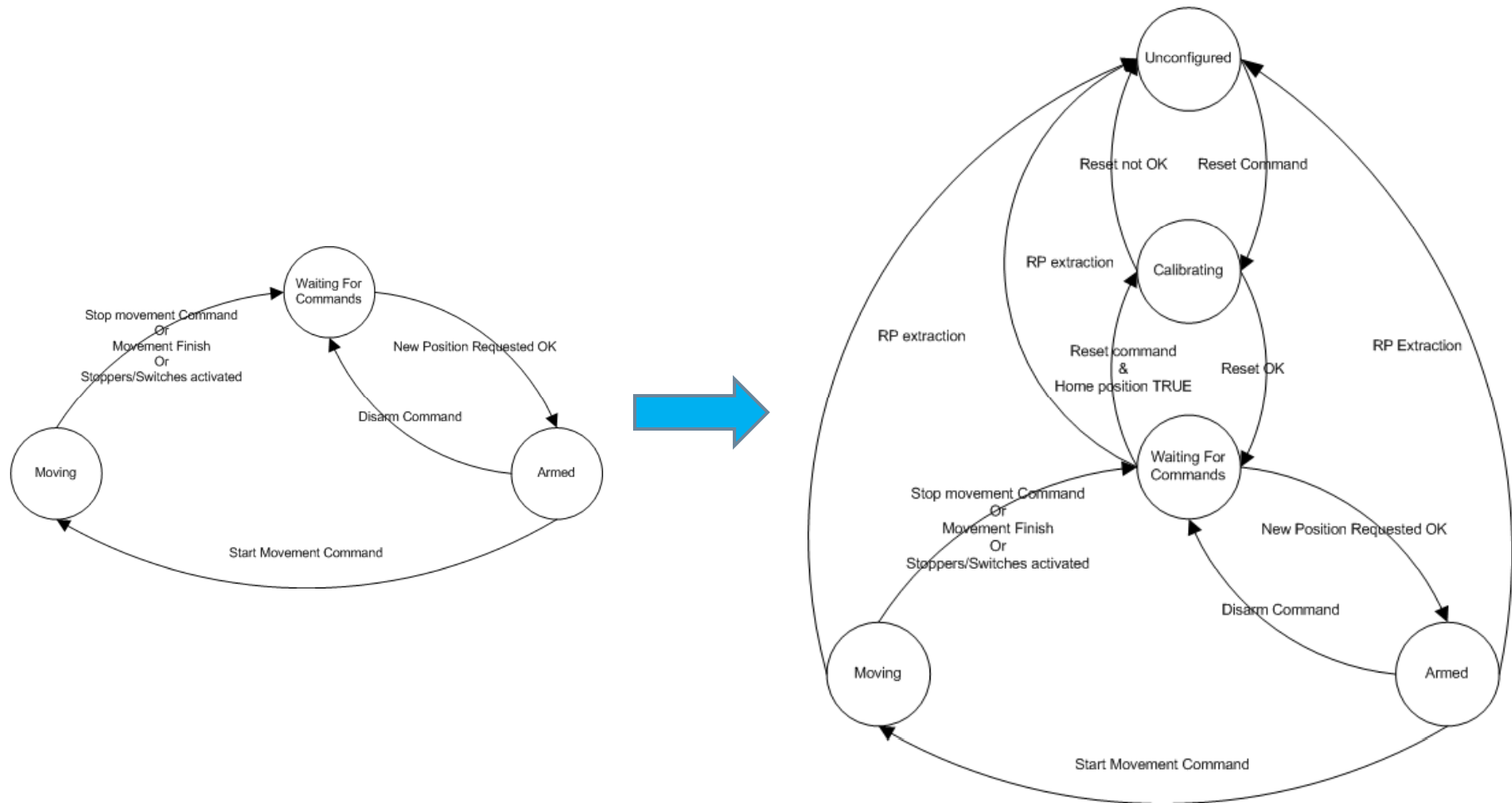 - ➢ The RESET control can only be sent if the roman pot is in Home position

RESET Procedure

Start Reset Procedure → OUT Stopper
- Yes → MOVE IN → OUT Stopper
  - No → MOVE OUT
  - Yes → RESET not OK
- No → MOVE OUT → OUT Stopper
  - No → MOVE OUT
  - Yes → RESET Step Position → RESET OK

OUT_ELECTRICAL_STOPPER

RP TRAVEL

IN_ELECTRICAL_STOPPER

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New Roman Pot State Machine

Electrical Stoppers (1/2)

During a movement and when the roman pot leaves one of the stoppers, it causes spikes on the other stopper. It results a stop of the movement in progress.
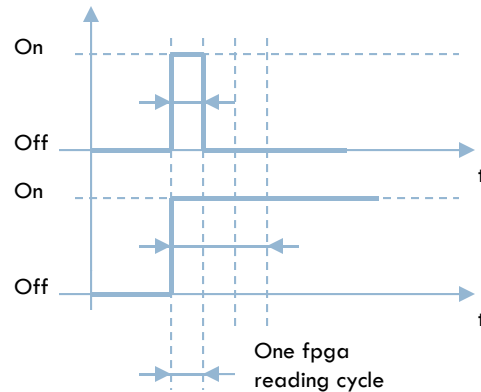
➢ Two solutions :

➢A filter to ignore these spikes

➢By combining the signals of the two stoppers with the signal of the home switch.

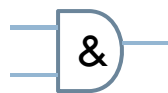# Electrical Stoppers (2/2)

□ **Filter**

On

Off

On

Off

t

t

One fpga
reading cycle
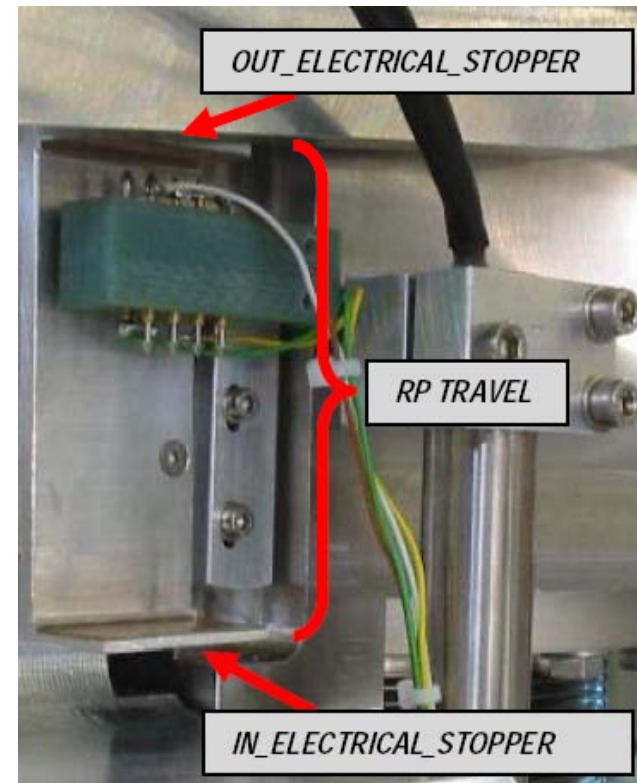
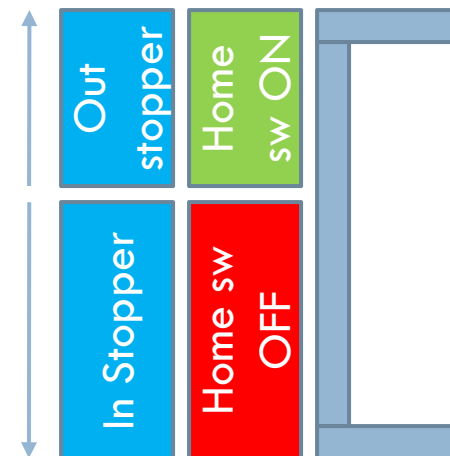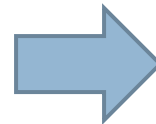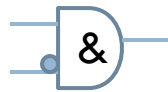The duration of spikes lasts less than one cycle of reading of the FPGA.

➢The stopper is therefore considered ON if it stays ON during at least three cycles.

□ **Combination Stopper/Home switch**

Out stopper

Home Switch

&

In stopper

Home Switch

&

Out stopper

Home sw ON

In Stopper

Home sw OFF

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Laboratory test bench bld. 21

PXI

FESA FEC 2

FESA FEC 1

1 H. POT

2 V. POTS

Rack with Motor control drivers

56-220-F-H / XRPH.B6R5.B
56-220-F-T/B / XRPV.B6R5.
56-220-N-H / XRPH.A6R5.B
56-220-N-T/B / XRPV.A6R5
RPH.21.TEST / RPH.21.TEST
RPV.21.TEST / RPV.21.TEST
XRPV-TEST-187 / XRPV.187.
XRPV.A7L1.B2 / XRPV.A7L1.B
XRPV.A7R1.B1 / XRPV.A7R1.E
XRPV.B7L1.B2 / XRPV.B7L1.B
XRPV.B7R1.B1 / XRPV.B7R1.B

OK   Cancel

Test bench visible from the CCC app.