



Dymin\_FPGA\_Main.vi

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**Dymin\_FPGA\_Main.vi**

**Reminder:** These "Volts" are actually in bits. Use the RT\_Main vi to run this code by inputting actual Volts. Floats aren't possible in an FPGA program.

Step before step with  $t_n=0$  is the last Dymin Step, threshold is ignored on last step, just count APD counts in selected time  
These times are in units of the 80 MHz clock cycle for the SCTLs  
16=200ns  
32=400ns

AOM Volts

nominal 12 bit ADC volts

.1=82  
.2=164  
.3=246

0

0

82

164

246

Threshold (counts)

0

0

0

0

0

0

0

0

0

Time (#80MHz periods)

0

32

32

32

32

0

0

0

0

16=200ns  
32=400ns

PIX CLK (bits)

0

Dymin On?



stop 1



stop 2



stop 3



stop 4

**[U16] AOM Volts****[U16] Max AOM Voltage****[I32] Threshold (counts)****[I32] Theshold (counts)****[I32] Time (#80MHz periods)**



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**I32** dT (# 80MHz periods)



stop 1



stop 2



stop 3



stop 4



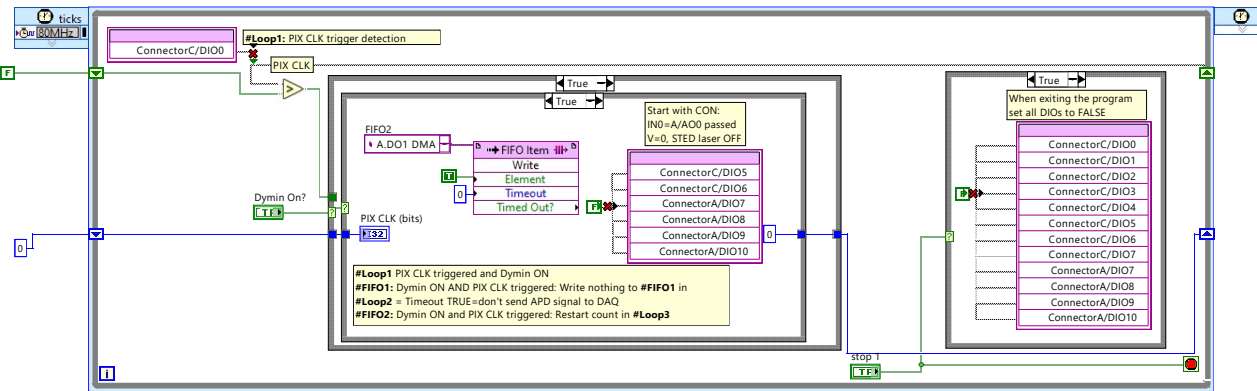
Dymin On?



PIX CLK (bits)

to do:  
clean up diagram  
add comments  
Remove EXC trigger entirely

#Loop1: LOOP DETECTING PIXEL CLOCK TO TRIGGER START OF COUNTING



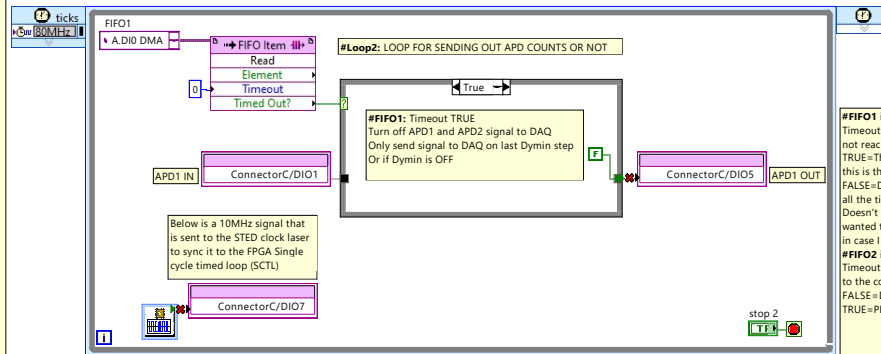
Multiplexer inputs from FPGA DIOs:  
A0=DIO7  
A1=DIO8  
CK=CKBAR=DIO9=0 always  
CS=DIO10=0 (unless High Z desired)

Multiplexer digital input names and truth table:  
CS A1 A0 CK1 CK2 -> Output  
00000 -> IN0 = A/AO0  
00100 -> IN1 = C/AO0  
01000 -> IN2 = C/AO1  
01100 -> IN3 = A/AO1  
1XXXX -> High-Z, X means anything

Other FPGA DIOs  
Connector C is side screw terminal connectors  
Digital Inputs  
C/DIO0=pixel clock IN  
C/DIO1=APD1 IN  
C/DIO2=APD2 IN  
Digital Outputs  
C/DIO5=APD1 OUT  
C/DIO6=APD2 OUT  
C/DIO7=10MHz OUT (to sync with STED clock)

See datasheets for myRIO-1900 and for the Multiplier and EVAL board to find the locations of these inputs and outputs on the FPGA and Eval board.

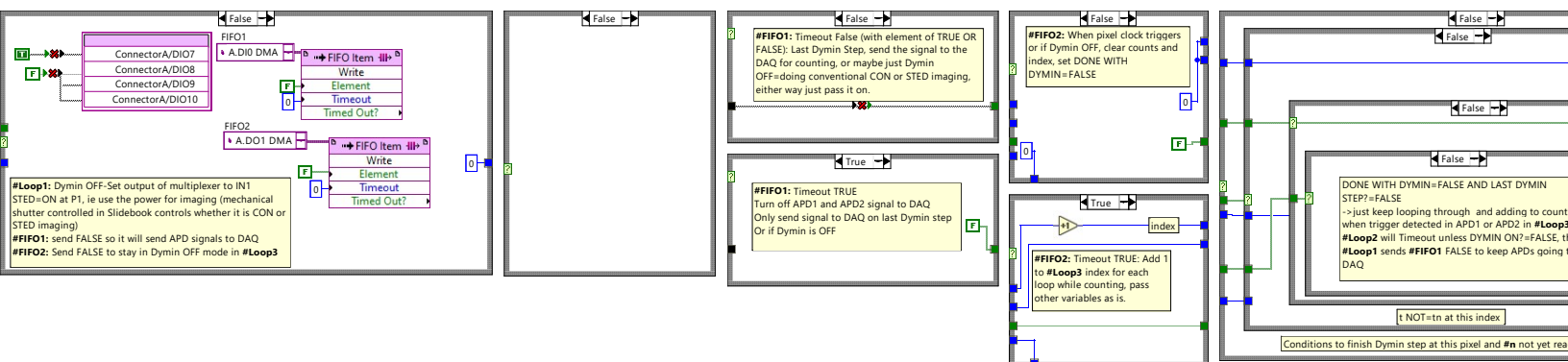
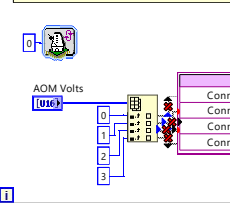
Before last Dymin step:  
-Keep APD's from sending signal to DAQ (APD's OFF)  
During last Dymin step:  
-APD's ON (ie sending signal to DAQ)  
After last Dymin step:  
-Shut off APD's and EXC trigger



#FIFO1 is read in #Loop2  
Timeout: Threshold not reached yet, or threshold not reached in time, abort Dymin, keep APD's off  
TRUE=Threshold reached in time on last step and this is the final step, let the counts go to Slidebook  
FALSE=Dymin OFF, just let counts go to Slidebook all the time  
Doesn't matter which is selected for now, but I wanted to make sure which state I was in is available in case I need to include it in my code someday.  
#FIFO2 is read in #Loop3  
Timeout: True Keep running Dymin Loop 3, adding to the counts and running through the steps  
FALSE=Dymin OFF  
TRUE=PIX CLK triggered

#Loop4: LOOP FOR CHANGING AO VALUES

Can't be inside of Single cycle times loop so it



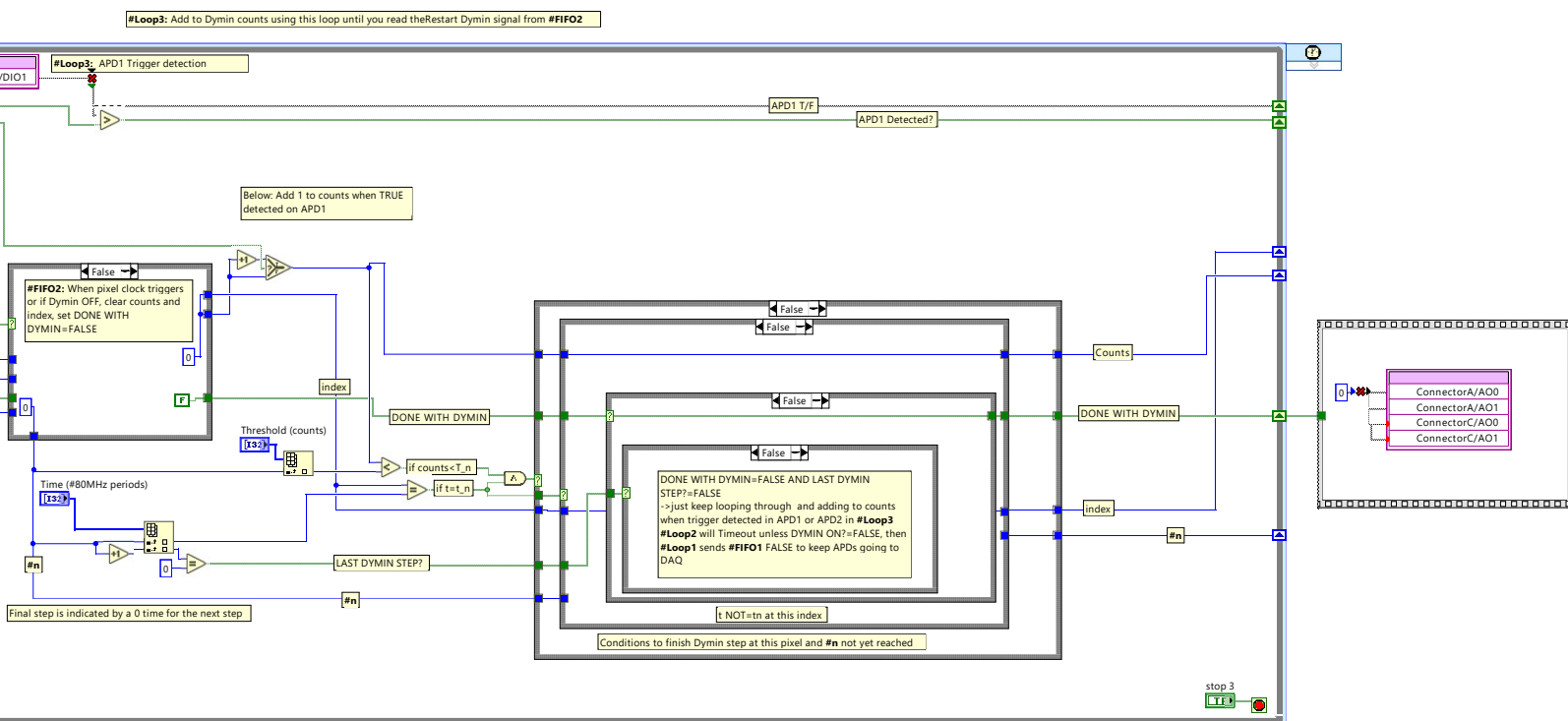


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has it's own loop

ectorA/AO0  
ectorC/AO0  
ectorC/AO1  
ectorA/AO1

stop 4

#### #TODO:

- define all variables used!
- Check pipelining on this complicated logic stuff in #Loop3
- name index and counts
- Is there any way to use more subvi's? Ask LV peeps?

RescueSTED parameters:  
pT=pixel dwell time  
dT=decision time  
lTh=lower threshold  
uTh=upper threshold  
rT=readout time

#### Ideas for adding wait times for laser:

Add extra dummy steps between step 0 and 1 and 1 and 2  
At the end of step 0 the laser power is changed to what is needed for step 1  
step 0.5 starts with counts at the dummy threshold (chose something and set it in the calculate times vi)  
after end of step 0.5 laser power should be ready, then start step 1 at counts of 0 again  
then it runs like a normal step, adding counts as detected, but when the time is up it does the same thing as above  
Final wait is just an extra amount of time on the pixel dwell time.

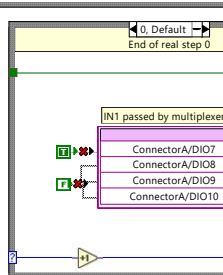
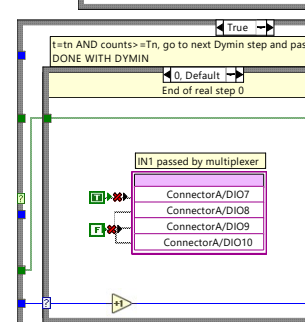
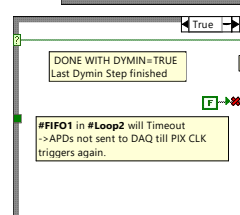
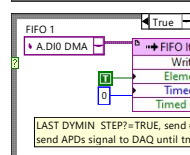
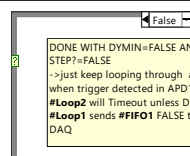
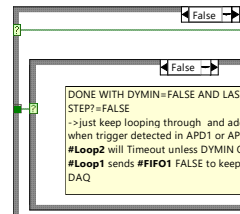
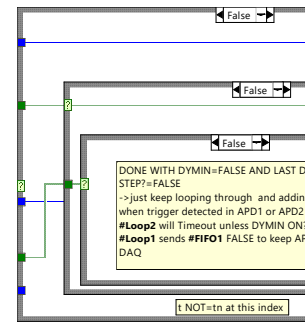
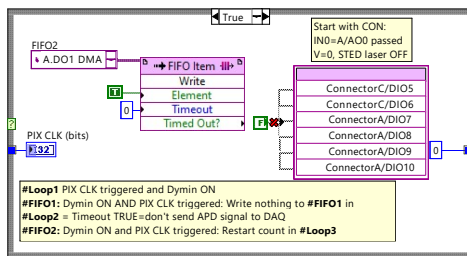
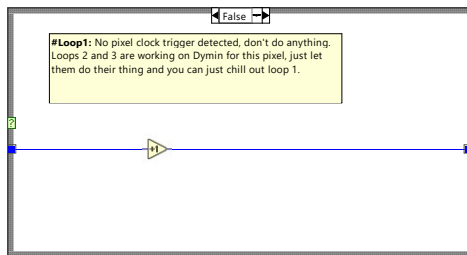
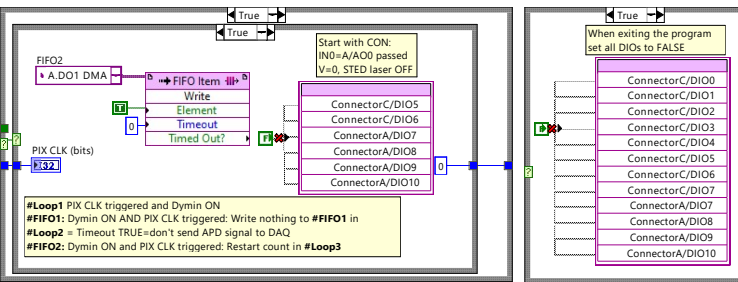


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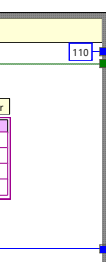
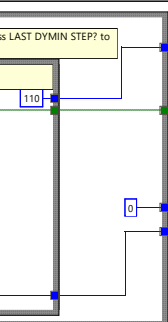
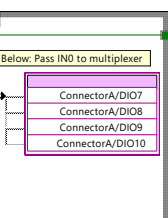
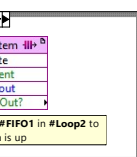
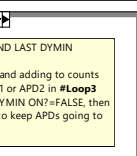
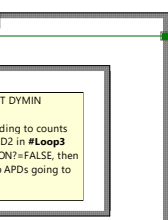
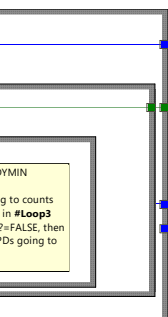


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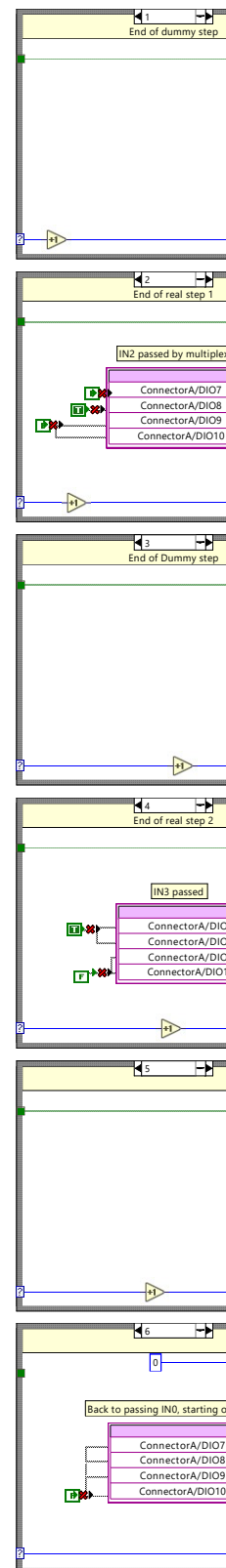


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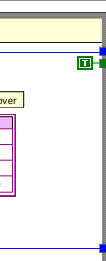
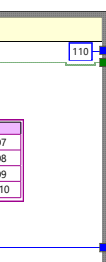
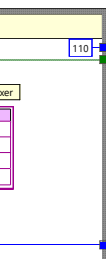


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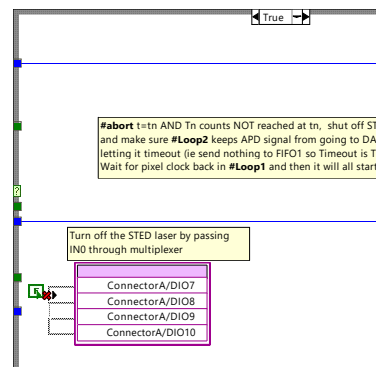
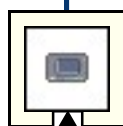


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