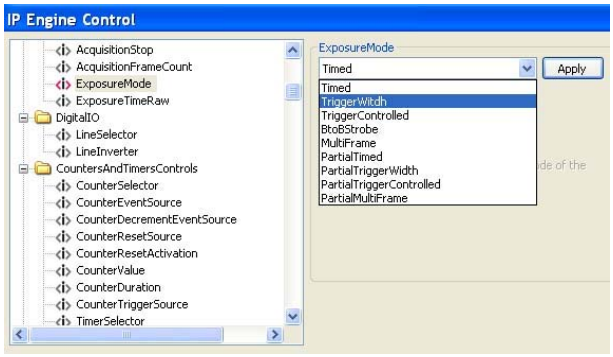
PLC Self-triggering in GEV

PLC programming in GEV environment

GEViCAM GigE cameras have GPIO pins to input and output the external or internal timing pulses such as trigger or strobe control. In GigE Vision (GEV) protocol camera models, model control and GPIO controls are implemented in GenApi using GenIcam naming convention. When GEV API such as GEV Player, IMAQ, MIL Intellicam, camera attribute controls are named differently from iPort protocol models.
Camera hardware and internal firmware is basically the same regardless GEV or iPort but because of GigE Vision standard, GEV must comply with common requirements. GPIO or PLC is one of most unique functions in GEViCAM functions and PLC descriptions and controls need to be redefined in GEV models.

GenAPI tree for PLC related controls

Let's explain these in GEV Player of Pleora SDK 2.3.3. GenApi tree is common to almost identical to all application software providers and looks like Fig. xxx.



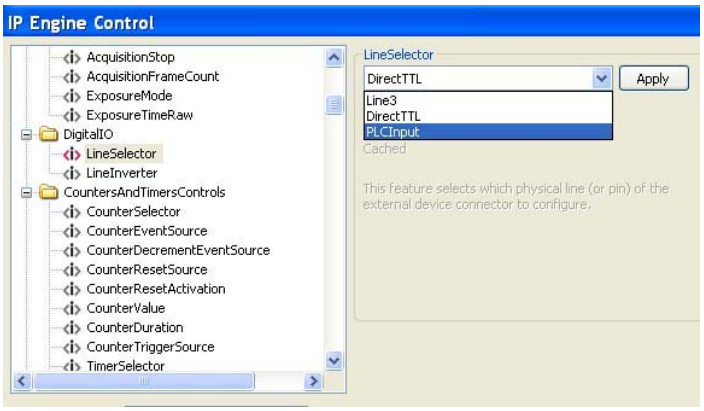
Camera Operation Modes

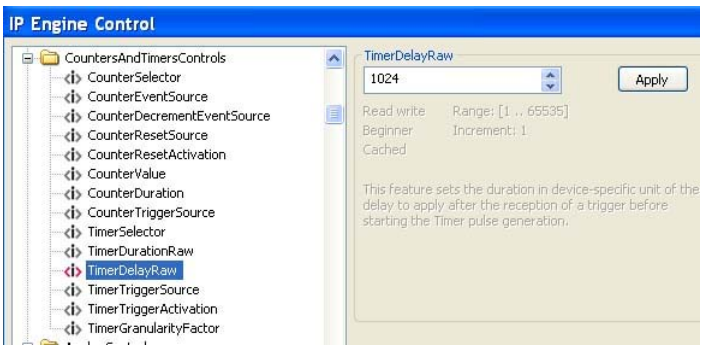
Camera Exposure and Trigger mode is listed in ExposureMode.
"Timed" is normal continuous mode with shutter control activated and do not require trigger pulse input.
"TriggerWidth" is async pulse width control.
"TriggerControlled" is async trigger mode and shutter speed programmable.
"BtoBStrobe" is back to back strobe mode.
"MultiFrame" is 3 image capture with one trigger (ITS mode).
"PartialXxxx" is the same functions with partial scan mode.
Any trigger modes except Timed and PartialTimed will not operate without external or internal trigger.

Internal Software Triggering

With PLC function, we can control repetitive internal triggering for various camera functions.
One of the most versatile application is using the pulse-width control function.

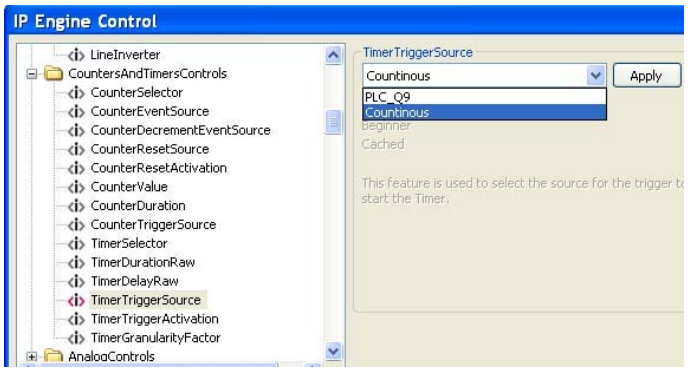
To do this software triggering, go to LineSelector in DigitalIO and select PLCInput. DirectTTL is default.





Next, we will use Timer in CounterTimerControls.
In Timer control, set the values of TimerDurationRaw and TimerDelayRaw. The duration defines the pulse Hi and delay defines Lo. One negative going trigger pulse is (Delay + Duration). Example is Duration=4096, Delay=1024.

Next, let's select TimerTriggerSource. In this case we chose "Continous" to demonstrate triggered modes.

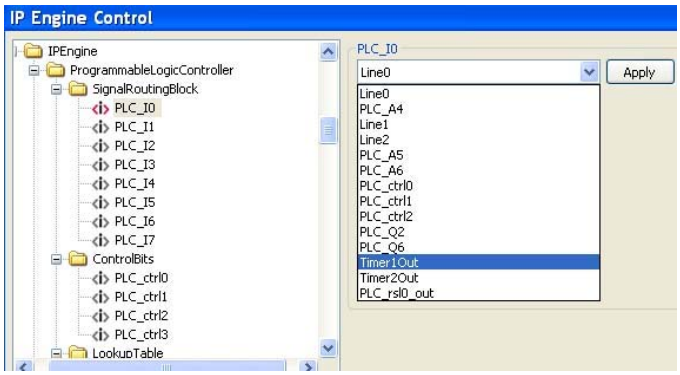


Then, select adequate numbers for TimerGranulaityFactor. 1 count is 3.03ns. So granularity 33 makes 1µs and above Duration becomes 4ms and Delay is 1ms. duration.

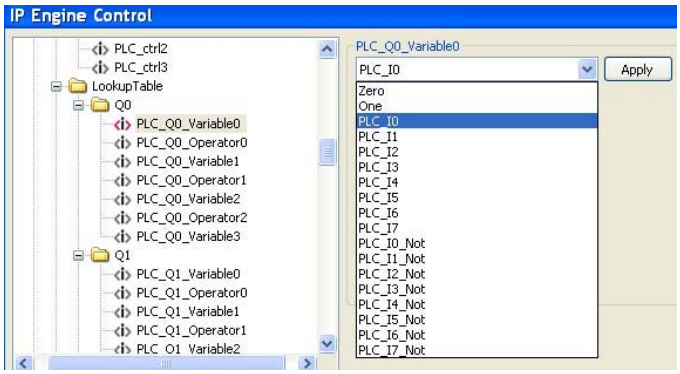
PLC Self-triggering in GEV (page 2)

PLC LUT

PLC Lookup Table is listed in SignalRoutingBlock of ProgrammableLogicController. This is advanced feature controlled by GEV.

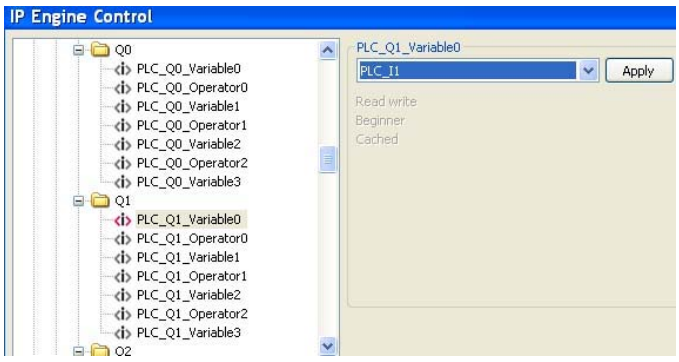


Open PLC_I0 and select Timer1Out, which is programmed previously. Next, use LUT to set PLC_Q0 to PLC_I0.



This selection connects the timer1 output to Trigger input inside camera and enable to use the timer to generate repetitive pulses to keep triggering with programmed duration.

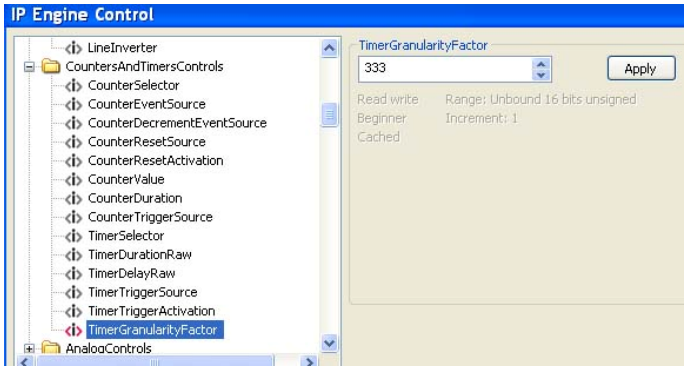
Next, we can monitor the internal pulse by connecting to the Strobe output.



PLC_Q1 is connection to GPIO pin #3 and if PLC_I1 is Selected (Q1=I1), the internal strobe signal is output. If PLC_I0 is selected (Q1=I0), signal from the Timer1 is output to monitor the timer function.

Try out

Let's try to see how these PLC programming work. Set ExposureMode to TriggerWidth while image is displayed. If all programming of the PLC are done properly, you will see live but different brightness images. If PLC is not done properly, image will be frozen. Make sure



DigitalIO selection (=PLC), TimerSource (=Continuos), PLC_Q0 = PLC_I0.

Once the timer output is functioning, you can change TimerGranularityFactor to change the pulse delay and duration. The delay portion is pulse width to control the exposure. The image will change the brightness.