Multiple pulse generator by PLC programming

PLC programming for multi pulse per trigger

This describes one method of generating multi-shot triggers to GP / GD series cameras per one trigger input.

By using internal PLC functions, you can generate multiple pulses from one single trigger. If camera is set to async reset mode (0x00 23 00 00 00 01), it can generate number of images which is programmed from the multi-shot generator.

Step 1
Create feed back to PLC Pulse generator in trigger mode (unmarked periodic pulse selection).
Trigger input to pulse generator_0 is Q9.
The trigger can be external trigger (Line 0) or internal trigger (PLC control bit 0 for example). Let's use I0 as the trigger input and select GPIO control bit 0.
The output from the pulse generator_0 can be selected as the LUT but default is I7.
If periodic pulse is unmarked, the pulse generator creates a single shot pulse from the trigger.
In order to make feed back loop to retrigger from the first one shot, the output must be fed back to the trigger.

Q9=I0 & !I7 will generate continuous pulses after the trigger.

Step 2
Let's make pulse generator to create 10ms pulse per trigger. We need the first pulse immediately after the trigger. So delay is minimum and set width to be 10ms. If we make the granularity = 33, each count is 1µs. So, 10ms width is 10,000.

Enhanced Function Block	
Pulse Generator 0	
Width (high)	10000
Delay (low)	1
Granularit…	33
Emit perio…	☐
Trigger mode	Triggered on rising edge
Pulse peri…	10202040
Pulse freq…	98.019612
Pulse Generator 1	

Step 3
Now we have to set pulse numbers from the trigger. This case we need to create 4 pulses (4 images) per trigger at 10ms of interval.
PLC counter is convenient to program the number.
The clear input to counter_0 is Q3 and increment input is Q17 (Q16 is decrement). In this application, first pulse is generated from the original trigger and counter number is required n-1. If we need 4 pulses to create, the counter is set at 3 for compare value.

Counter 0	
Incremen…	Rising edge
Decreme…	Disabled
Clear trigg…	Rising edge
Clear signal	Q3
Compare …	3
Current c…	3
Timestamp Counter	

The inputs to this counter is coming from pulse generator_0 output and trigger.

Q3 = I0 trigger
Q17 = I7 increment

After counting up to the compare value (3), it outputs "greater" and "equal" signal. In this application we use greater signal to limit pulses from the pulse generator. Counter output Greater is chosen in I5.

Step 4
Feed back to pulse generator_0 with counter value is done as follows,

Q9 = I0 & !7 & !5

All together, the LUT looks like this.

Signal Routing Block and Lookup Table	
I0	GPIO Control Bit 0
I1	Camera Link Frame Valid
I2	LVDS Input
I3	Optically-Isolated Input
I4	GPIO Control Bit 1
I5	Counter 0 Greater
I6	Pulse Generator 1 Output
I7	Pulse Generator 0 Output
Lookup Table	Q0 = (!I7 & !I5) Q1 = I1 Q3 = I0 Q9 = (!I7 & !I5 & I0) Q17 = I7
Enhanced Function Block	

Note:
Camera function is set to Async mode. The minimum pulse duration must be set with exposure + frame output period. If frame rate is 100fps (10ms) and exposure is 2ms, the duration must be 12 ms.
For Async_0 option, it can be set at the same frame rate as continuous frame rate.