# PLC Self-triggering and Strobe out

## PLC programming for Strobe output

GEViCAM GigE cameras have GPIO pins to output the internal timing pulses which may be used for external strobe control. In the normal operation without external trigger, there is no output on Pin #3 of GPIO connector. With the evaluation power supply, a green wire is attached for pin #3 which can be monitored externally for trigger responses.

The simplest method to output internal pulses for synchronizing the external strobe is to use the FVAL (Frame Valid) signal in the iPort protocol version (Pleora protocol models).

After setting up camera connection with Coyote application, go to "Configure" and "IP Engine" and "Programmable Logic Controller"

Program the PLC to follow the LUT in Signal Routing

Configu	uration - Adv	aprod	and Lookup Ta-
IP Engi	Des Communic	andere Cashkar Divel Jacob Cashkar Estantions DCD Elsa	ble Block;
E TP	Findine	ation drabber river image drabber Extensions hab river	Q0 = 10
	w Control		01 - 11
E Pro	Image: state of the state	Logic Controller	
Ξ 9	Signal Routing E	Block and Lookup Table	I1 = "Camera
I	0	TTL Input 0	Link Frame Valio
	1	Camera Link Frame Valid 🛛 🖌 🖌	
I	2	TTL Input 2	The camera con
I	3	Optically-Isolated Input	figuration ro
I	4	GPIO Control Bit 1	ilguration re-
I	5	GPIO Control Bit 0	mains as factory
I	6	Pulse Generator 1 Output	dofoult
I	7	Pulse Generator 0 Output	uerault
L	.ookup Table	Q0 = I0 Q1 = I1	(continuous im- age output with- out external trig-
Name	e: I1	<u>^</u>	aer).

le Block: 0 = 10Q1 = I1 I1 = "Camera ink Frame Valid" he camera conguration renains as factory efault continuous imge output withut external trigger).

When GPIO pin #3 (green wire) is monitored, you will see pulses. Use the negative going edge for strobe triggering point. The image will appear in the next FVALhigh period.

### Internal Software Triggering

With the PLC function, we can control repetitive internal triggering for various camera modes.

PE	ngine Port Communica	tion Grabber Pixel Image Grabber Extensions RGB Filte	a			
+ .	IP Engine		î			
•	Flow Control					
Programmable Logic Controller						
	Signal Routing B	lock and Lookup Table				
	IO	Pulse Generator 0 Output 🛛 👻				
	I1	TTL Input 1				
	I2	TTL Input 2				
L	I3	Optically-Isolated Input				
	I4	GPIO Control Bit 1				
	15	GPIO Control Bit 0				
	I6	Pulse Generator 1 Output				
	I7	Pulse Generator 0 Output				
	Lookup Table	Q0 = 10 Q1 = 11				
			~			
Ja	<b>me</b> : 10		^			
np ar on CyF	ut 0 Selection Para ameter is an enun nection to the dev ParameterReposito	ameter of the GPIO Look-Up Table. This neration parameter which is filled during the rice. An application can use the ry:::GetParameterRange method to obtain the available. As well it is used by the abatis the	*			

One of the most versatile applications is using the pulse width control function. To do this software triggering, we use pulse generator 0 of Enhanced Function block. First. we set LUT as follows, Q0 = 10I0 = "Pulse generator 0" Q1 = 1111 = "TTL Input 1"

The TTL Input 1 is connected to internal Strobe out signal and is also connected to GPIO Pin #3.

This is positive going pulse and indicating internal exposure period during the high state.

Strobe trigger can be driven with this pulse.

## Pulse Generator 0

The pulse generator is controlled by selecting numbers for delay and width.

Open the Enhanced Function Block and select pulse generator 0. Mark "Emit Periodic Pulses" to supply continuous triggers. Select adequate numbers for granularity. 1 count is 3.03ns. So granularity 33 makes 1µs.

Engine	Port Communication	n Grabber Pixel Image Grabber Extensions RGB Filt	er		
🗉 Enł	nanced Function	n Block			
Ξļ	Pulse Generator	0			
1	Nidth (high)	10000			
1	Delay (low)	500			
(	Granularit	100			
I	Emit perio				
	Trigger mode	Triggered on rising edge			
F	Pulse peri	31818030			
F	Pulse freq	31.428721			
	Pulse Generator 1				
Pulse Generator 2 Pulse Generator 3					
					Rescaler 0
	Delayer 0		×		

The delay is pulse state low and width is high. For pulse width control the camera responds to low period as the exposure control and the total cvcle as the trigger duration. In the example. granularity is 3 µs

and pulse low is 1.5ms, duration is 32ms.

Go to "Config" and select Port Communication to set up camera function in the Pulse Width Mode. In Hex commands, type 57 00 23 00 00 00 02 (remember to include spaces).

This will activate the camera mode in pulse width mode and you will see the TTL output from Pin #3. Change the delay number. You will see different exposure and pulse width of the high period.

# Pulse Generator Controller

The pulse generator control is also done from the IP Engine tab of Coyote application. In the main dialog box (Menu), open "Pulse Generators".

Pulse Generators					You can use
Controls		to an an		-	the slide bars
Selection	Pulse Generator #0	~			or type to
Delay (low duration)	0	500	1,515,000	ns	change the
Width (high duration)		10000	30,300,000	ns	numbers
Granularity	0	100 3	3,030	ns	
Periodic					

### **Save Functions**

These new PLC functions can be saved in XML. Go to file and use "Save As" to store the parameter. Then, you can open this file after power up.

Note: Camera control mode cannot be saved in the Config (XML) file. Contact GEViCAM for saving power up default.

# PLC Delayer page 2

## **Delay Circuit**

When the strobe output requires variable timing from the original pulse, GEViCAM PLC is also to move the pulse with programmed delays.

Let's change the original strobe out put of,

Q0 = I0 Q1 = I1 I1 = "Camera Link Frame Valid" FVAL Output Strobe Drive 1

(Note: Strobe drive signal must be generated externally using falling edge of FVAL pulses.)

Now we want to delay the strobe drive timing by a certain amount.

In order to do this, we have to delay FVAL output from the camera.

11 of FVAL is connected to Delayer input Q3. In Enhanced Function Block, the delayer 0 input is assigned to Q3.

- Q0 = I0 (default TTL 0)
- Q3 = I1 (Delayer input signal)
  - I1 = Camera Link FVAL

X

Q1 = I2 (Delayer output)

#### Configuration - Advanced

IP	Engine Port Communica	tion Grabber Pixel Image Grabber Extensions RGB F	ilter			
	IP Engine					
+	Flow Control					
-	Programmable Logic Controller					
	Signal Routing Block and Lookup Table					
	IO	TTL Input 0				
	I1	Camera Link Frame Valid				
	I2	Delayer 0 Output				
I3 Optically-Isolated Input						
I4 GPIO Control Bit 1						
I5 GPIO Control Bit 0						
	I6	Pulse Generator 1 Output				
	I7	Pulse Generator 0 Output				
	Lookup Table	Q0 = 10 Q3 = 11 Q1 = 12	_			
			~			
Na	ame: Lookup Table					
str #C	ing label for param Y_GPIO_LUT_PAR	eter AM_GPIO_LUT_PROGRAM				
d fu	entifier: 8 ( <i>Decin</i> ine: String	nai), 00000008 (Hex)				

#### **Delayer Programming**

The Delayer must have an internal clock. Here, let's use Pulse Generator 0 for the clock generator. Click Reference in Delayer 0 and look for Pulse Genera-

Pengine Port Communical	ion Grabber Pixel Image Grabber Extensions RGB	Filter			
🗆 Pulse Generat	or 0	^			
Width (high)	50				
Delay (low)	50	1			
Granularit	33				
Emit perio					
Trigger mode	Triggered on rising edge				
Pulse peri	103020				
Pulse freq	Pulse freq 9706.853038				
🗉 Pulse Generat	or 1				
🗉 Pulse Generat	or 2				
🗉 Pulse Generat	▪ Pulse Generator 3				
⊞ Rescaler 0					
🗆 Delayer 0	⊟ Delayer 0				
Delay count	100				
Reference	Pulse Generator 0 output				
Input signal	Q3	~			
ame: Delay count		~			
ne delay parameter	of a delayer extension.				
lentifier: 0 ( <i>Deam</i>	al), 00000000 (Hex)	4			
<b>ype</b> : Integer					

Also in Pulse Generator 0, set periodic and clock frequency. In this example, we set granularity to 33 to make 1µs pulse duration at minimum and Width and Delay for 50 each making 1 cycle of 100 counts (=100  $\mu$ s = 10KHz).

Then, Delayer generates delays of 100  $\mu$ s per count. Above picture is set fort 100 delay counts (100x100 $\mu$ s= 10ms).

Note: If delay is used for continuous image output (normal mode), you cannot exceed the total delay of more than one frame.

### Other signals to delay

By selecting Q3 input, this program can delay other signals. For example in Async mode (external trigger in),

$$Q0 = I0$$
  
 $Q3 = I1$   
 $I1 = TTL 1$  (internal Strobe out signal)  
 $Q1 = I2$ 

The exposure and strobe output signal can be delayed.

082807

**GEVICAM**: A GigE Vision Camera Company