Allied Vision

APPLICATION NOTE

PIV: Minimum time between exposures for Allied Vision GigE cameras

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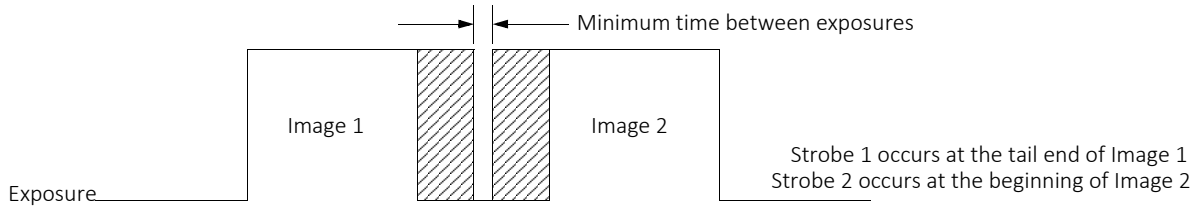
Introduction

Given the ability of CCD and some CMOS sensors to simultaneously readout an image while exposing the next image, this allows for a relatively short time between two images, given the camera's exposure time setting is equal to or greater than the sensor readout time.

The minimum time between exposures value can be useful for particle image velocimetry (PIV) applications, where two images are taken in rapid succession to measure the speed of a moving object.

Because the exposure time setting must be greater than or equal to the sensor readout time, which is approximated as 1/(camera max frame rate) and in the millisecond range, PIV users will need to use precisely timed strobe(s) in an otherwise dark operating environment in order to achieve suitable results:



To set strobe(s), there are two possible options, as determined by the camera type. Both options use the camera `SyncOut1/2/3` signal to trigger a strobe.

Option 1

For cameras in table without an asterisk (*), a single strobe pulse may be used which spans both exposures.

`SyncOut1/2/3 = Strobe1`
`Strobe1Mode = Exposing`
`Strobe1Duration = Required Strobe Length * 2 + Min Time Between Exposures`
`Strobe1Delay = ExposureValue – Required Strobe Length`

With `Strobe1Mode = Exposing`, the strobe pulse is tied to the rising edge of the camera's internal exposure signal. However, every second `SyncOut1/2/3` strobe trigger from the camera must be ignored by the strobe. Otherwise, two strobes are generated for each pair, with the second triggering off the rising edge of the second image and firing at the tail end of the second image.

Option 2

For cameras in table with an asterisk (*), two strobes are necessary. This is due to an existing limitation of the camera firmware, in which the minimum time between exposures varies between two discrete values, from image pair to image pair. For example, the GB2450 has a minimum time of 15.2 µs between the first image pair, and 20.8 µs between the next image pair. All quoted values use the longer of the two measured values. The reason for this variation is unknown, but we are working towards resolving this.

Given the variation, a single strobe pulse cannot be used, as the second image will be brighter and contain motion blur in the case when the minimum exposure time between images is shorter than quoted. Two strobes are necessary.

Strobe1:

`SyncOut1/2/3 = Strobe1`

`Strobe1Mode = Exposing`

`Strobe1Duration = Required Strobe Length`

`Strobe1Delay = ExposureValue – Required Strobe Length`

Strobe2:

Tied to Strobe 1 and triggered with external logic Minimum Time Between Exposures + Required Strobe Length after Strobe1.

As with Option 1, every second `SyncOut1/2/3` strobe trigger from the camera must be ignored by the strobe.

Minimum time between exposures

GB650* 78.0 µs	GC650* 121 µs	GE680* 38.2 µs	GT1290* 90 µs	GX1050 19.9 µs	G-031 15 µs	G-030 96 µs
GB660* 75.0 µs	GC655* 121 µs	GE1050* 134 µs	GT1380* 80 µs	GX1660 19.6 µs	G-032 283 µs	G-032 74 µs
GB1380* 80.0 µs	GC660* 75.0 µs	GE1650* 104 µs	GT1600 64 µs	GX1910 19.9 µs	G-033 93 µs	G-125 70 µs
GB2450* 20.8 µs	GC750 91.0 µs	GE1660* 62.1 µs	GT1660 23.6 µs	GX1920 50.0 µs	G-046 114 µs	G-131 24 µs
	GC780* 113 µs	GE1900* 113 µs	GT1910 26 µs	GX2300 21.4 µs	G-125 63 µs	G-192 34 µs
	GC1020* 123 µs	GE1910* 71.0 µs	GT1920 52 µs	GX2750 N/A	G-145 106 µs	G-223 84 µs
	GC1290* 89.8 µs	GE2040* 115 µs	GT1930 196 µs	GX3300 22.2 µs	G-145-30fps 35 µs	G-234 269 µs
	GC1350* 107µs	GE4000* 110 µs	GT1930L 196 µ	GX6600 44.0 µs	G-146 88 µs	G-419 130 µs
	GC1380* 125 µs	GE4900* 110 µs	GT2000 76 µs		G-201 60 µs	G-503 451 µs
	GC1380H* 84.0 µs		GT2050 116 µs		G-201-30fps 72 µs	
	GC1600* 115 µs		GT2300 25 µs		G-223 69 µs	
	GC1600H* 60.0 µs		GT2450* 24.8 µs		G-235 210 µs	
	GC2450* 20.8 µs		GT2750 55 µs		G-282 47 µs	
			GT3300 29 µs		G-283 47 µs	
			GT3400 54 µs		G-419 107 µs	
			GT4907 56 µs		G-504 29 µs	
			GT6600 48 µs		G-505*** 76 µs	

					G-609 47 µs	
					G-917 47 µs	

*Requires two strobes, as mentioned above.

**No simultaneous readout and exposure mode for this sensor.

***Gives two values; 43 µs and 76 µs; picking the larger of the two = 76 µs.

For GS series: same timing as corresponding GB camera.

For color sensors, and varying sensor classes within a model: use the timing values as listed above.

The measured values for minimum time between the exposures are unlikely to change with future firmware updates.

Additional References

Technical manuals and GigE feature reference
https://www.alliedvision.com/en/support/technical-documentation

For technical support, please contact support@alliedvision.com.
For comments or suggestions regarding this document, please contact info@alliedvision.com.

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