Frame-rate Calculation

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The frame-rate generated by a camera depends largely on the following parameters:

Parameter	Abbr.	Units	Description
Pixels Per Line	PPL	Num.	Defined by the Window of Interest (WOI)
Lines Per Frame	LPF	Num.	Defined by the Window of Interest (WOI)
Pixel Rate	RATE	MHz	Camera speed
Row Blanking Time	RBT	us	Dead time between lines
Integration Time	IntTime	us	User defined, depends on available light

The general formula for the time required to read out one frame of data is as follows:

Frame Time = FTime = ((PPL / RATE) + RBT) x LPF

> Example:
> A 40 MHz BCi5 camera with Window of Interest 1280 x 1024 (full frame)
> The BCi5 has a row-blanking time of 3.5us and no frame overhead.
>
> Frame Time = ((1280/40)+ 3.5) x 1024 = 36352 us.
>
> With a user-defined Integration Time of 100 us we calculate:
>
> Frame rate = 1000000 / (100 + 36352) = **27.43** frames per second

> If the WOI is reduced to 128 x 128 pixels we calculate a frame rate of **1044** frames per second.

Integrate-Then-Read
The simplest form of image acquisition consists of an Integration period followed by a readout period.
In this case we must add together the Integration Time and Frame Time to determine the total time required:

Frame-Rate = 1000000 / (IntTime + FTime)

Integrate-While-Read
Some cameras can integrate the next image while the previous image is being read out.
In this case the Frame Rate is determined by the longer of the two times: Frame Time or Integration Time.

Parameters for C-Cam Technologies cameras:

Model	Pixel Rate (MHz)	Max.PPL[1]	Max.LPF[1]	RBT (us)
BCi4	20	1280[2]	1024	6.3
BCi5	40	1280	1024	3.5
BCi4-6600	40	2208	3000	7.15
FCm-1300[3]	640	1280	1024	0.2
FCi4-14000	60	3048[4]	4560[4]	17.5

Notes:
1) Refer to the User's Manual of the camera for restrictions to where a WOI may start and end.
2) For the BCi4 the readout of a line always starts at pixel 0, even if the WOI has an X-Start > 0.
3) The High-speed camera has an inter-frame delay of 5us (to be added to the Frame Time)
4) Sensor is scanned vertically