Allied Vision

APPLICATION NOTE

Trigger Timing with Alvium in Practice

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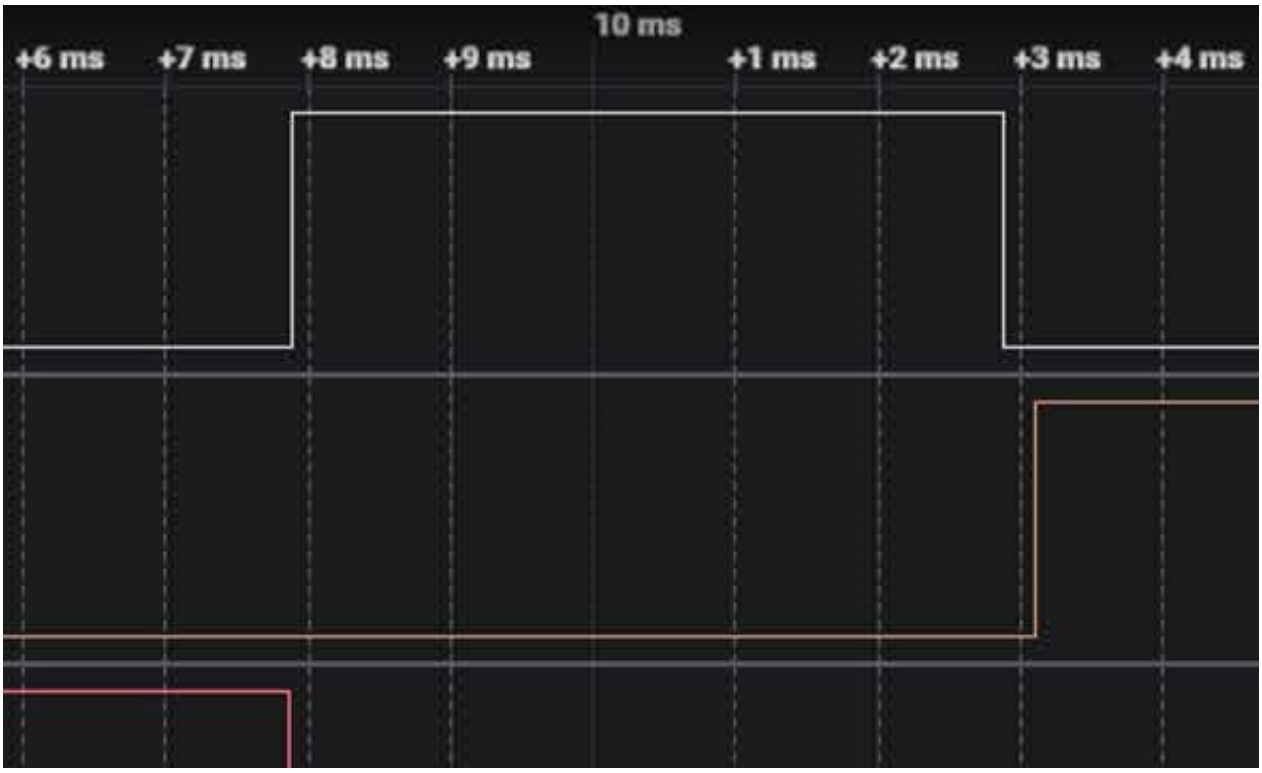

Scope

This document shows a practical example for triggering an Alvium 1800 C-508 camera. The stated values apply only to the described setup. However, you learn about the trigger workflow and how to make rough estimates for the timing of your individual application.

Helpful downloads

Download	Link
User guides for Alvium cameras	www.alliedvision.com/en/support
Additional documentation	
Accessories, such as I/O cables	www.alliedvision.com/en/products/accessories

Table 1: Helpful downloadss

Setup values

Tests described in Practical example on page 3 have been used to derive safe timing values to trigger the next frame, including control changes.

The values in Table 2 are approximations:

Subject	Property	Value[1]
Basic setup	Resolution (W × H)	1600 × 1200
	Lane Count	4
	Lane frequency	750 MHz
	Pixel format	RAW12
	Trigger frequency	~60 Hz
Constant values	Readout time	8.7 ms
	Control value transfer time[2]	1.6 ms
Max. exposure time	Triggering[3]	16.4 ms

[1] Timing values derived from tests are approximate.
[2] See the next paragraph.
[3] Without control changes

Table 2: Safe timing values for triggering and control changes

Term definitions

Control Value Transfer Time

Control Value Transfer Time is a non-deterministic value and taken after multiple tests, so it is an approximate. It defines the period of time to apply control changes on the camera.

Commands to change control parameters are applied to a triggered frame if they occur before control transfer time starts. Later commands are applied to the next frame.

ITR versus IWR

Alvium cameras automatically switch between ITR and IWR modes:

- ITR represents: Integrate then read
- IWR represents: Integrate while read.

Practical example

The following screenshots were taken using a logic analyzer to monitor timing relations between signals.

For the given examples, this section asks:

Trigger: Does a trigger start the next frame as expected?

Config: To continuously achieve best imaging results, timing must allow to adjust control values from frame to frame. Does the timing allow to apply changes for **Frame 2** based on **Frame 1**?
Timing includes:

- Reading out and transferring image data to the host
- Receiving and calculating data on the host
- Transferring changed parameters to the camera.

ITR > Proper triggering and control change

Arrows in Figure 1 show how signal levels interact.

The exposure time for this scenario is 5 ms.
Frames are readout **after exposure**.

Trigger: **Trigger 1** starts **Frame 1**, and **Trigger 2** starts **Frame 2**.

Config: The period of time (dashed lines) between the end of `ReadoutActive` and **Control transfer time** is approximately 1.6 ms. Depending on the performance of the host system, control changes may be applied to **Frame 2**. Otherwise, changes will be applies to **Frame 3**.

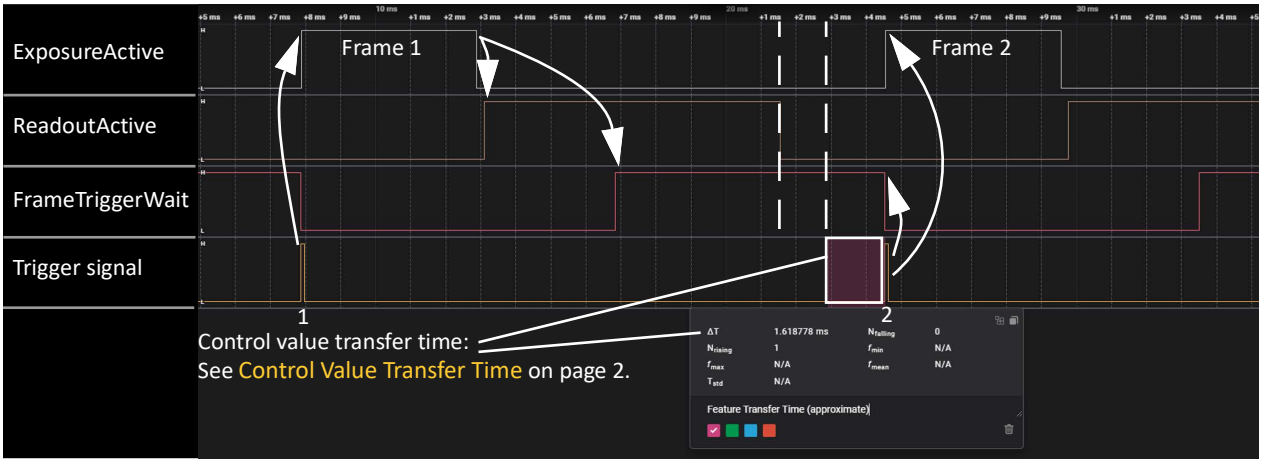

Figure 1: ITR > Proper triggering and control change

Table 3 describes the terms shown in Figure 1.

Term (SFNC feature)	The level is high when...
ExposureActive	...the camera is exposing an image.
ReadoutActive	...the camera is reading out image data from the sensor.
FrameTriggerWait	...the camera is idle and ready to expose a new image.

Table 3: Term descriptions

ITR > Deferred control change > Scenario 1

The scenario for 7.5 ms in Figure 2 is an edge case.
Frames are readout **after exposure**.

Trigger: **Trigger 1** starts **Frame 1**, and **Trigger 2** starts **Frame 2**.

Config: The end of `ReadoutActive` overlaps with **Control transfer time**.
Therefore, control changes cannot be applied to **Frame 2**.
Instead, changes will be applied to **Frame 3**.

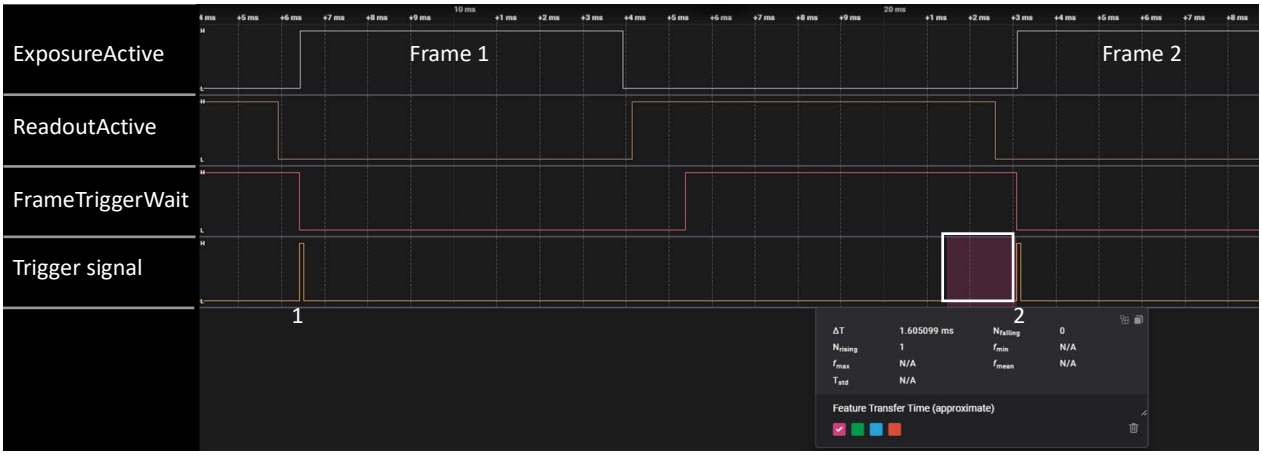

Figure 2: ITR > Proper triggering, but deferred control change > Scenario 1

IWR > Deferred control change > Scenario 2

The scenario for 15 ms in Figure 3 is another edge case.
Frames are readout **during exposure**. The behavior is the same as for Scenario 1:

Trigger: **Trigger 1** starts **Frame 1**, and **Trigger 2** starts **Frame 2**.

Config: The start of `ReadoutActive` overlaps with **Control transfer time**.
Therefore, control changes cannot be applied to **Frame 2**.
Instead, changes will be applied to **Frame 3**.

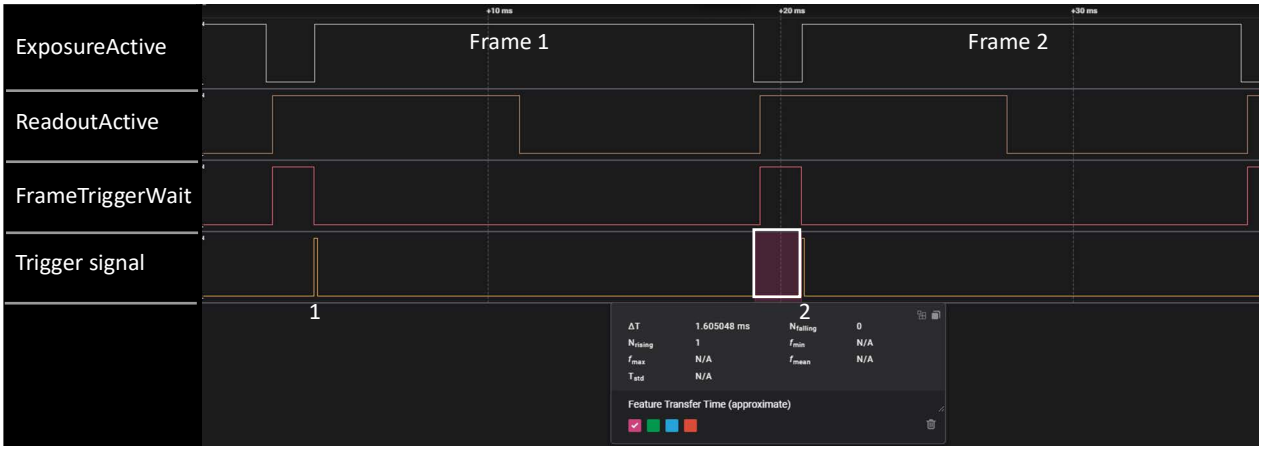

Figure 3: IWR > Proper triggering, but deferred control change > Scenario 2

ITR > Overtriggered

The exposure time for the scenario in Figure 4 is 17.5 ms.

Trigger: Exposure has been completed and `FrameTriggerWait` is high:
Trigger 1 starts **Frame 1** and **Trigger 3** starts **Frame 2**.

Config: Exposure is active and `FrameTriggerWait` is low:
Trigger 2 and **Trigger 4** are dropped.

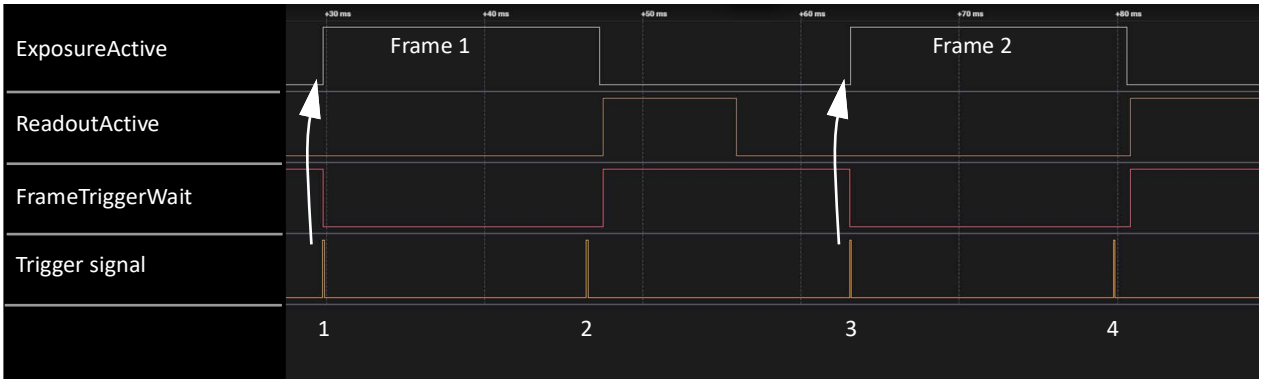

Figure 4: ITR > Triggers 2 and 4 are dropped because they occur while exposure is active

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