

Sequencer: Multiple acquisitions on one incoming trigger

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Description

This document describes the general approach of using the sequencer with Baumer industrial cameras. It explores the application of counters in order to record multiple images as a reaction of one incoming trigger signal.

Products

Baumer VCXG cameras

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1 Sequencer basics

1.1 Introduction

The sequencer enables the possibility of image series recording including automated re-parameterization of the camera based on different events and signals. Therefore the desired camera settings for each step are stored in so called sequencer sets. Stringing together a number of these sequencer sets results in a sequence. The connection of sequences is done by using different paths. Alongside the camera features the path related features are also part of a sequencer set.

1.2 Sequencer sets

Sequencer sets combine camera features – comparable with a user set – and sequencer (set and path) related parameters.

Settings for several camera features such as

- exposure time
- gain
- partial scan
- user output
- counter

...can be controlled by the sequencer and thus stored to a sequencer set as well as information for the set switch-over via four different paths.

Each path involves

- the destination for the set switch-over that is mapped by the 'SequencerSetNext' feature
- the signal, whose change of state is used for triggering the set switch-over and that is mapped as 'SequencerTriggerSource'
- the change of state triggering the set switch-over and that is mapped as 'SequencerTriggerActivation'

As with user sets the camera's current settings are overwritten once a sequencer set is loaded and the sequencer is activated.

1.3 Sequencer configuration

In order to avoid overwriting current camera settings while configuring a sequencer, the camera needs to be set to the sequencer configuration mode.

Once the camera is set to the sequencer configuration mode, the individual sequencer sets can be selected via the SequencerSetSelector, configured and saved by executing SequencerSetSave.

Starting the configured sequence requires to switch the sequencer configuration mode off and to enable the sequencer mode.

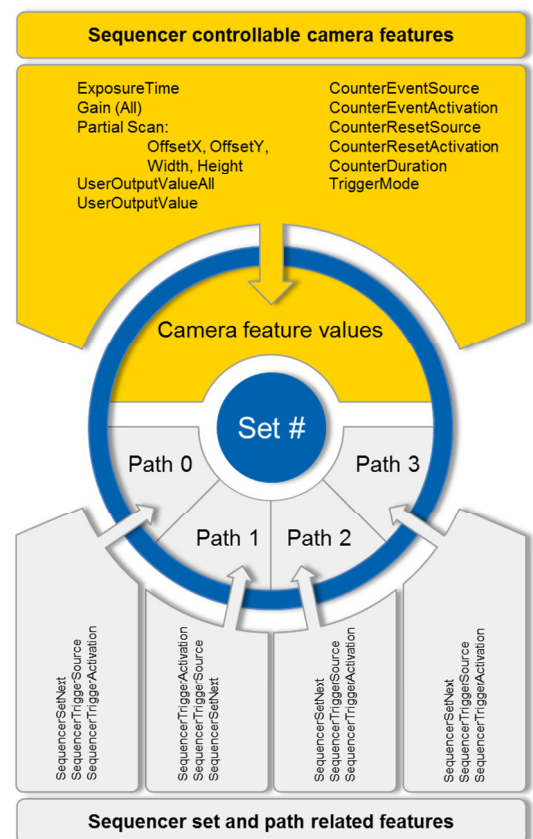


Figure 1: Structure of a sequencer set

1.4 Sequencer command overview

Features	Values	Description
SequencerMode	On/Off	Enables / disables the sequencer mechanism To use this feature, the SequencerConfigurationMode must be off.
SequencerConfigurationMode	On/Off	Enables / disables the sequencer configuration mode Here the sequencer configuration can take place but there is no image acquisition. To use this feature, the SequencerMode must be off.
SequencerFeatureSelector	ExposureTime Gain (All) OffsetX OffsetY Width Height UserOutputValueAll UserOutputValue CounterEventSource CounterEventActivation CounterResetSource CounterResetActivation CounterDuration TriggerMode	Selects the camera features that are controlled by the sequencer.
SequencerFeatureEnable	true/false [RO]	Enables / disables the selected feature.
SequencerSetSelector	0...127	Selects the sequencer set that contains the feature settings coming afterward.
SequencerSetSave		Stores the current device settings to the selected sequencer set.
SequencerSetLoad		Loads the currently selected sequencer set.
SequencerSetActive	0...127 [RO]	Displays the currently active sequencer set.
SequencerSetStart	0...127	Defines the initial sequencer set.
SequencerPathSelector	0...3	Selects the path that contains the settings coming afterward.
SequencerSetNext	0...127	Defines the Set, that will be next
SequencerTriggerSource	Counter1End Counter2End ExposureActive Line0 ReadoutActive Timer1End Off	Defines the internal or external event that is used as trigger source for the sequencer.
SequencerTriggerActivation	RisingEdge FallingEdge AnyEdge	Defines the signals edge that triggers the sequencer.

The blue marked features are only available in the sequencer configuration mode.

2 Multiple acquisitions on one incoming trigger

The described sequence shows the approach of capturing multiple images by using one incoming trigger.

2.1 Desired camera behavior

The theoretical approach is to set the camera to trigger mode and for each incoming trigger signal a certain number of images (using the same exposure time) is captured.

2.2 Concept for the sequencer procedure

Taking the sequencer basics into consideration makes the parameterization of the sequencer a lot more complex than originally expected:

- Since the 1st image acquisition is started via hardware trigger and all images starting from the 2nd image need to be started automatically afterwards, two different sequencer sets are unavoidable.
- The first set (Set0) contains the necessary parameters for the Trigger Mode configuration as well as the desired exposure time for the 1st image.
- In the 2nd set (Set1) the camera will be set back to free-running operation. Besides the exposure time the desired / required counter data is configured.

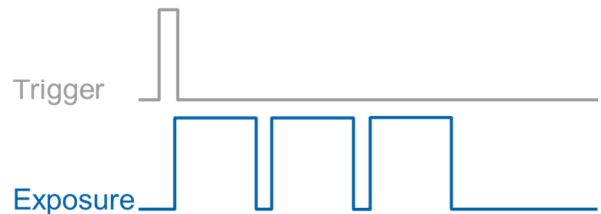
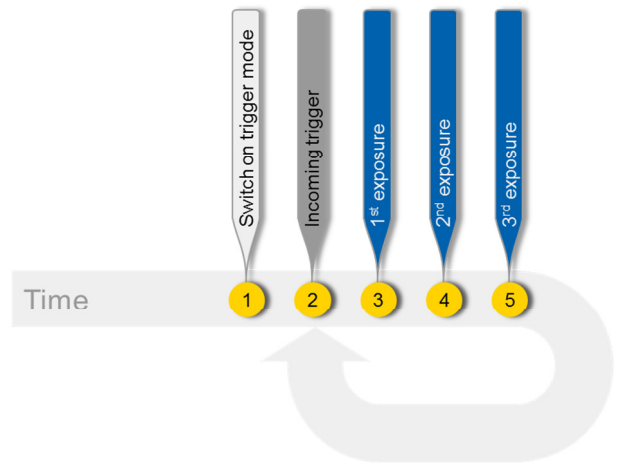
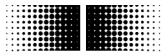


Figure 2: Desired camera behavior

In addition to this, both sets need to contain sequencer set and path related information.



Figure 3: Concept for the sequencer parameterization



2.3 Implementation

Since the sequence should be started by an incoming trigger, a `TriggerSource` needs to be defined. For this example this is `Line0` where the hardware trigger is attached to.

2.3.1 First sequencer set

In `Set0` the sequencer controllable camera features are `ExposureTime` and the `TriggerMode` that is turned on. The sequencer set and path related features are

- `SequencerPathSelector = 0` Defines the path for switching to the next sequencer set. Here it is `Path0`.
- `SequencerTriggerSource = ExposureActive` Defines the internal or external signal that is used as sequencer trigger source. In this case it's the internal signal `ExposureActive`.
- `SequencerTriggerActivation = RisingEdge` Defines the signal's status change that triggers the sequencer set change. Here `RisingEdge` was selected.
- `SequencerSetNext = 1` Defines the sequencer set that will be next when this path is used. In this example this is `Set1`.

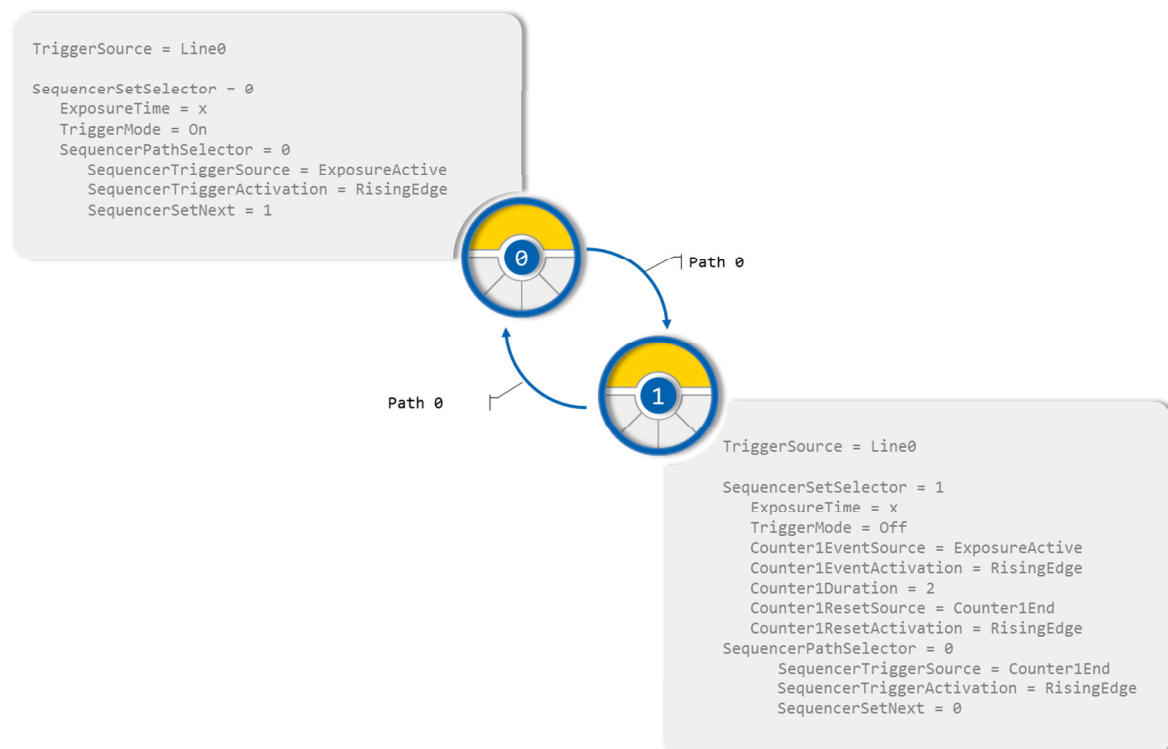


Figure 4: Implementation

2.3.2 Second sequencer set

Set1 contains the ExposureTime for all recorded images (except the 1st one) and switches the TriggerMode off. Besides that the counter for the image repetition is configured as follows:

- | | |
|--|---|
| ▪ Counter1EventSource = ExposureActive | Defines the internal or external signal that is used to control the counter. |
| ▪ Counter1EventActivation = RisingEdge | Defines the signal's status change that triggers counter. Here RisingEdge was selected. |
| ▪ Counter1Duration = 2 | Defines the number of images that should be recorded within this sequencer set. |
| ▪ Counter1ResetSource = Counter1End | Defines the internal or external signal that is used to reset the counter to 0. |
| ▪ Counter1ResetActivation = RisingEdge | Defines the signal's status change that resets the counter. Here RisingEdge was selected. |

The sequencer set and path related features are

- | | |
|---|---|
| ▪ SequencerPathSelector = 0 | Defines the path for switching to the next sequencer set. For the way back to Set0 it is Path0. |
| ▪ SequencerTriggerSource = Counter1End | Defines the internal or external signal that is used as sequencer trigger source. In this case it's the internal signal Counter1End, that features a rising edge once the counter has reached |
| ▪ SequencerTriggerActivation = RisingEdge | Defines the signal's status change that triggers sequencer set change. Here RisingEdge was selected. |
| ▪ SequencerSetNext = 0 | Defines the sequencer set that will be next when this path is used. For the way back this is Set0. |

2.4 Result

The opposite figure shows the resulting image acquisition that matches the desired camera behavior mentioned in section 2.1 on page 4 of this document.

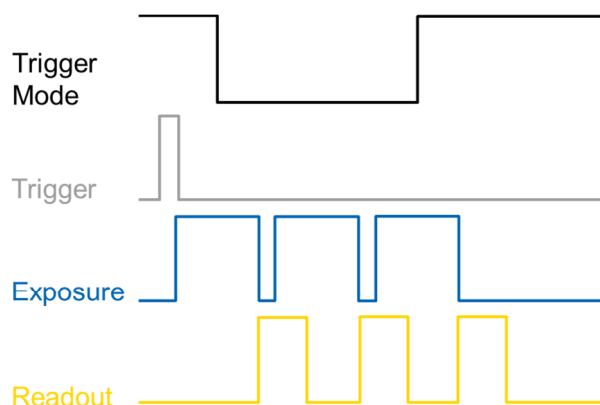


Figure 5: Resulting camera behavior

3 Related Topics

Sequencer: Realization of a double shutter
 Realization of a "moving" Region of Interest (ROI)

4 Support

In the case of any questions or for troubleshooting please contact our support team.

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