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**The Machine Vision and
Imaging Specialists**

Perth: +61 (08) 9242 5411
Sydney: +61 (02) 9979 2599
Melbourne: +61 (03) 9555 5621
Email: adept@adept.net.au
Web: <http://www.adept.net.au>

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Differences between JAI proprietary and GenICam SFNC camera settings naming



See the possibilities

Introduction:

This document will explain in details the differences between the new JAI GigE Vision cameras ways of setting up triggers compared to the older JAI proprietary ways. The main difference is that the new cameras use the GenICam Standard Feature Naming Convention for the Acquisition and Trigger Control of the camera as well as for the exposure time control.

The main features used for setting up the cameras are explained in details and the the differences are illustrated for the most common use-cases.

Setting up triggers using the JAI proprietary features:

To set up the trigger system using the JAI proprietary features requires a combination of setting the “Exposure Mode” correctly as well selecting the proper Digital I/O settings in order to connect the correct “signal” to the camera trigger input. The Digital I/O settings can be viewed as a “cross-bar” where the output-signals can be connected to input-signals and thereby creates the internal logic that controls the cameras behavior.

Selecting the Exposure Mode:

The Exposure Mode is used for setting up the trigger system inside the cameras. The trigger system determines the way the exposure is controlled and it is essential for the way the cameras are used.

The ExposureMode feature can be set to one of the following values:

GenICam feature name	Display Name	Description
Continuous	Continuous trigger	Continuous mode where the camera is “free running” without any external trigger signals.
EdgePreSelect	Edge pre-select	Standard trigger mode where an external or internal trigger signal will start the exposure of an image. The exposure time is pre-determined by the current ShutterMode setting.
PulseWidthControl	Pulse-width control	Standard trigger mode where an external or internal trigger signal will start the exposure. The exposure time is controlled by the amount of time the trigger signal is held active.
ResetContinuous	Reset continuous	Triggered mode where the camera is exposing continuously until a trigger signal is received. When the trigger signal is received the continuous capture will be reset

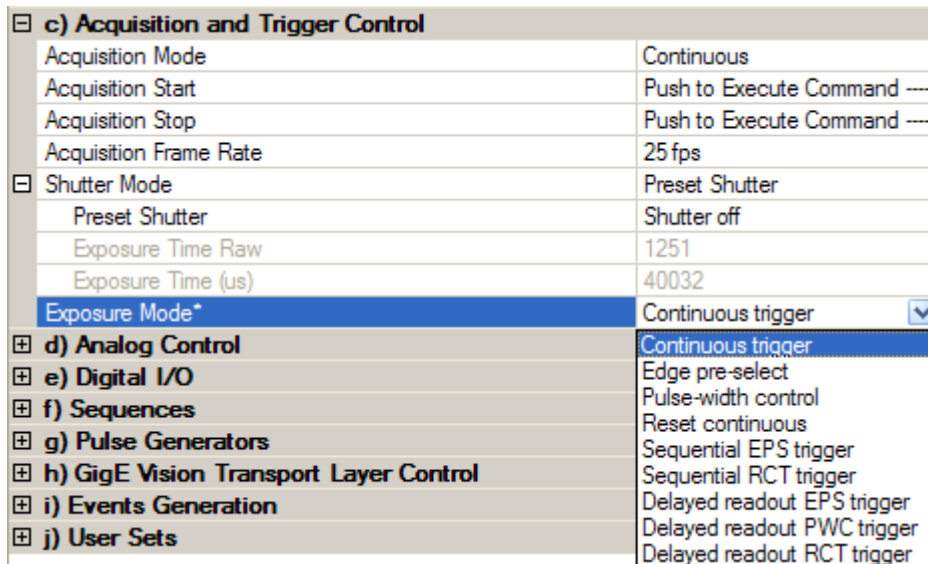
		and the exposure of a single frame will be started. The exposure time is pre-determined by the current ShutterMode setting. This mode is essential if the camera has built-in auto-exposure feature where the iris of the lens is controlled by the camera.
SequentialEPSTrigger	Sequential EPS trigger	Same as EdgePreSelect mode but this is only used in conjunction with the JAI “Sequences”.
SequentialRCTTrigger	Sequential RCT trigger	Same as ResetContinuous mode but this is only used in conjunction with the JAI “Sequences”.
DelayedReadoutEPSTrigger	Delayed readout EPS trigger	Standard trigger mode where an external or internal trigger signal will start the exposure. The exposure time is pre-determined by the current ShutterMode setting. The readout of the image is controlled by an additional Camera Trigger signal.
DelayedReadoutPWCTrigger	Delayed readout PWC trigger	Standard trigger mode where an external or internal trigger signal will start the exposure. The exposure time is controlled by the amount of time the trigger signal is held active. The readout of the image is controlled by an additional Camera Trigger signal.
DelayedReadoutRCTTrigger	Delayed readout RCT trigger	Triggered mode where the camera is exposing continuously until a trigger signal is received. When the trigger signal is received the continuous capture will be reset and the exposure of a single frame will be started. The exposure time is pre-determined by the current ShutterMode setting. This mode is essential if the camera has built-in auto-exposure feature where the iris of the lens is controlled by the camera. The readout of the image is controlled by an additional Camera Trigger signal.

The “ExposureMode” feature can be set from JAI SDK using the following command:

```
J_Camera_SetValueString(hCamera, "ExposureMode", <new exposure mode value string>);
```

Where the <new exposure mode value string> is a string taken from the GenICam feature name column from the table above.

From the JAI Camera Control Tool the Exposure Mode value can be selected using the drop-down box like shown in the figure below:



Selecting the Trigger signal:

The primary trigger input for the camera is called “CameraTrigger0”. This is the input signal that needs to be connected to the appropriate input signal in order for the camera to be triggered by a signal. The signal can either be an external input (physical input) or an internal signal (such as the output from a pulse-generator or a Software Trigger signal).

To modify the Digital I/O cross-bar settings the user will have to use the “LineSelector” feature to select the input signal. The LineSelector is found in the category named Digital I/O. So in order to connect the camera trigger to for instance the first GPIO input pin the following features need to be set:

```
LineSelector=CameraTrigger0
LineSource[LineSelector]=GPIO_PortIn1
```

This can be done using the JAI SDK using the following lines of code:

```
J_Camera_SetValueString(hCamera, "LineSelector", "CameraTrigger0");
J_Camera_SetValueString(hCamera, "LineSource", "GPIO_PortIn1");
```

From the JAI Camera Control Tool the value can be selected using the drop-down box like shown in the figure below:

e) Digital I/O	
Line Selector	Camera Trigger 0
Line Source	Camera Trigger 0
Line Polarity	Camera Trigger 1
Software Trigger 0	GPIO PORT 1
Software Trigger 1	GPIO PORT 2
Software Trigger 2	Pulse Generator 0
Software Trigger 3	Pulse Generator 1
User Output Selector	Pulse Generator 2
GPIO Status All	Pulse Generator 3
GPIO output port 1 Status	TimeStamp Reset
GPIO output port 2 Status	NAND 1 In 1
GPIO input port 1 Status	NAND 1 In 2
GPIO input port 2 Status	NAND 2 In 1
	NAND 2 In 2
	False

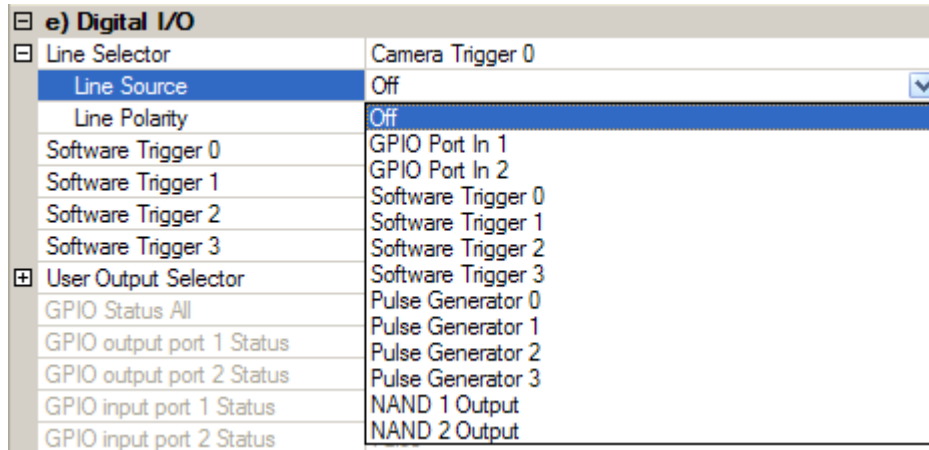
The LineSource[LineSelector] feature can be set to one of the following values:

GenICam feature name	Display Name	Description
Off	Off	The signal is disconnected
LVAL	LVAL	The internal LVAL (Line Valid) signal is connected
DVAL	DVAL	The internal DVAL (Line Valid) signal is connected
FVAL	FVAL	The internal FVAL (Frame Valid) signal is connected
EEN	EEN	The internal EEN (Exposure Enabled) signal is connected
GPIO_PortIn1	GPIO Port In 1	GPIO Port In 1 (Optical in 1) is connected
GPIO_PortIn2	GPIO Port In 2	GPIO Port In 2 (Optical in 2)
SoftwareTrigger0	Software Trigger 0	The internal Software Trigger 0 signal is connected.
SoftwareTrigger1	Software Trigger 1	The internal Software Trigger 1 signal is connected.
SoftwareTrigger2	Software Trigger 2	The internal Software Trigger 2 signal is connected.
SoftwareTrigger3	Software Trigger 3	The internal Software Trigger 3 signal is connected.
PulseGenerator0	Pulse Generator 0	The internal Pulse Generator 0 signal is connected.
PulseGenerator1	Pulse Generator 1	The internal Pulse Generator 1 signal is connected.
PulseGenerator2	Pulse Generator 2	The internal Pulse Generator 2 signal is connected.
PulseGenerator3	Pulse Generator 3	The internal Pulse Generator 3 signal is connected.
NAND1Output	NAND 1 Output	The internal NAND-gate 1 signal is connected.
NAND2Output	NAND 2 Output	The internal NAND-gate 2 signal is connected.

The “LineSource [LineSelector]” feature can be set from JAI SDK using the following command:

```
J_Camera_SetValueString(hCamera, "LineSelector", <line to configure>);
J_Camera_SetValueString(hCamera, "LineSource", <line source to connect>);
```

From the JAI Camera Control Tool the value can be selected using the drop-down box like shown in the figure below:



Selecting the Exposure Time:


The exposure time for the camera can either be set to a fixed value (Timed) or controlled by the duration of time a trigger signal is held active (Pulse-width control). This is determined by the Exposure Mode.

If the exposure time is a fixed value then it is possible to set the actual exposure time value in three ways:

- 1) Preset Shutter: This is selecting an exposure time from a list of pre-configured exposure time values (such as 1/60 sec, 1/100 sec). In order to select a Preset Shutter value then the Shutter Mode has to be set to “PresetShutter”. See the image below with an example of possible Preset Shutter values available for a Compact GigE Vision camera.
- 2) Exposure time in camera specific units: The exposure time is selected as a “raw” value. These values have no “unit” defined.
- 3) Exposure time in microseconds: The exposure time can be set to a specific number of microseconds. This exposure time is an integer value.

Note:

It is important to note that only one of the exposure time features will be enabled at a time. This is controlled by the current Shutter Mode!

c) Acquisition and Trigger Control	
Acquisition Mode	Continuous
Acquisition Start	Push to Execute Command ---->
Acquisition Stop	Push to Execute Command ---->
Acquisition Frame Rate	25 fps
Shutter Mode	Preset Shutter
Preset Shutter	Shutter off 
Exposure Time Raw	Shutter off
Exposure Time (us)	1/60 sec
Exposure Mode	1/100 sec
d) Analog Control	1/250 sec
Gain Raw	1/500 sec
Black Level Raw	1/1000 sec
	1/2000 sec
	1/4000 sec
Preset Shutter	1/8000 sec
Preset Shutter Values	1/10000 sec

Setting up triggers using GenICam SFNC features:

The Acquisition and Trigger Control for the latest generation of JAI cameras now follows the GenICam SFNC for the way the camera trigger is set up. This is difference from the JAI proprietary trigger setup described in the previous chapter but it has a lot of similarities as well.

All features related to the trigger are now put in the “Acquisition and Trigger Control” category shown in the figure below:

c) Acquisition and Trigger Control	
Acquisition Mode	Continuous
Acquisition Start	Push to Execute Command ---->
Acquisition Stop	Push to Execute Command ---->
TriggerSelector*	Frame Start
Trigger Mode*	Off
Trigger Software*	Push to Execute Command ---->
Trigger Source*	Software
Trigger Activation*	Rising Edge
Trigger Source Inverter	False
Exposure Mode	Timed
Exposure Time (us)	16352.47363
Exposure Time (Raw)	596
Pre-dump Mode	Off

The camera trigger setup is now primarily based on the `TriggerSelector` feature as well as the `TriggerSource[TriggerSelector]` feature. The standard camera trigger is named “Frame Start” and it can only be in two modes: Off or On. If the camera trigger mode is Off then the cameras will be in “free running” mode where images are captured continuously at the maximum frame-rate for the camera.

So to switch the camera into free-running mode you will have to do the following:

```
TriggerSelector=FrameStart
TriggerMode[TriggerSelector]=Off
```

And to activate the camera trigger mode you will have to do the following:

```
TriggerSelector=FrameStart
TriggerMode[TriggerSelector]=On
TriggerSource[TriggerSelector]=<input source to be used for the camera trigger>
```

Delayed readout modes are now configured using the `TriggerSelector=TransferStart` and it is configured like this:

```
TriggerSelector=TransferStart
TriggerMode[TriggerSelector]=On
TriggerSource[TriggerSelector]=<input source to be used for the image readout>
```


The `TriggerSource[TriggerSelector]` feature can be set to one of the following values:

GenICam feature name	Display Name	Description
Line5	Line5 - Optical In 1	External input port 1 is connected
Line6	Line6 - Optical In 2	External input port 2 is connected
Software	Software	The internal Software trigger signal (from <code>TriggerSoftware</code> command) is connected
UserOutput0	User Output 0 (Software Trigger 0)	The internal user output signal 0 (<code>SoftwareTrigger0</code> feature) is connected
UserOutput1	User Output 1 (Software Trigger 1)	The internal user output signal 1 (<code>SoftwareTrigger1</code> feature) is connected
UserOutput2	User Output 2 (Software Trigger 2) / Action 1	The internal user output signal 2 (<code>SoftwareTrigger2</code> feature) is connected as well as the new Action Command 1
UserOutput3	User Output 3 (Software Trigger 3) / Action 2	The internal user output signal 3 (<code>SoftwareTrigger3</code> feature) is connected as well as the new Action Command 2
PulseGenerator0	Pulse Generator 0	The internal Pulse Generator 0 signal is connected.
PulseGenerator1	Pulse Generator 1	The internal Pulse Generator 1 signal is connected.
PulseGenerator2	Pulse Generator 2	The internal Pulse Generator 2 signal is connected.
PulseGenerator3	Pulse Generator 3	The internal Pulse Generator 3 signal is connected.
NAND1Output	NAND 1 Output	The internal NAND-gate 1 signal is connected.
NAND2Output	NAND 2 Output	The internal NAND-gate 2 signal is connected.
Action1	Action 1	The new Action Command 1 is connected
Action2	Action 2	The new Action Command 2 is connected
NotConnected	Not Connected	No signal is connected

The “`TriggerSource[TriggerSelector]`” feature can be set from JAI SDK using the following commands:

```
J_Camera_SetValueString(hCamera, "TriggerSelector", <trigger to configure>);
J_Camera_SetValueString(hCamera, "TriggerSource", <new trigger signal to connect>);
```

From the JAI Camera Control Tool the value can be selected using the drop-down box like shown in the figure below:

c) Acquisition and Trigger Control	
Acquisition Mode	Continuous
Acquisition Start	Push to Execute Command ---->
Acquisition Stop	Push to Execute Command ---->
TriggerSelector*	Frame Start
Trigger Mode*	Off
Trigger Software*	Push to Execute Command ---->
Trigger Source*	Software <input type="button" value="v"/>
Trigger Activation*	Line5 - Optical In 1
Trigger Source Inverter	Line6 - Optical In 2
Exposure Mode	Software
Exposure Time (us)	User Output 0 (Software Trigger 0)
Exposure Time (Raw)	User Output 1 (Software Trigger 1)
Pre-dump Mode	User Output 2 (Software Trigger 2) / Action 1
	User Output 3 (Software Trigger 3) / Action 2
d) JAI Acquisition and Trigger Control	
Acquisition Frame Rate	Pulse Generator 0
Shutter Mode	Pulse Generator 1
Preset Shutter	Pulse Generator 2
Exposure Time (us)	Pulse Generator 3
Exposure Mode	NAND 1 Output
	NAND 2 Output
	Action 1
	Action 2
e) Analog Control	
	Not Connected

Selecting the Exposure Time:

The exposure time for the camera can either be set to a fixed value (Timed) or controlled by the pulse-width of a trigger signal (Trigger Width). The Exposure Mode feature controls which way to control the exposure time.

If the Exposure Mode is set to “Timed” then the exposure time is controlled using either the ExposureTimeRaw feature or the ExposureTimeAbs feature. The ExposureTimeRaw sets the exposure time in camera specific units (integer value) and the ExposureTimeAbs sets the exposure time in microseconds (floating-point value). Typically there will be a one-to-one relationship between the ExposureTimeAbs and ExposureTimeRaw so the ExposureTimeAbs is “limited” to the values that can be represented with a single step of the ExposureTimeRaw feature. So to determine the “real” exposure time should be done by writing a new value to either the ExposureTimeRaw or ExposureTimeAbs features and then right after to read back the ExposureTimeAbs feature to see the exact exposure time value used by the camera. The camera will internally “round off” the value that is set and return the actual value used by the camera.

Use Cases

This chapter contains use cases that illustrate how to set up different trigger scenarios using both JAI proprietary features and the SFNC features:

Use Case 1: Setting the camera into “Continuous” mode with an exposure time of 100 μ s.

JAI proprietary settings	SFNC settings
<p>1) Set the ExposureMode to be Continuous: ExposureMode=Continuous</p> <p>2) We can then disconnect the Camera Trigger input signal by setting the source to “Off”: LineSelector=CameraTrigger0 LineSource[LineSelector]=Off</p> <p>3) Set the exposure time to 100 us: ShutterMode=ExposureTimeAbs ExposureTimeAbs=100 // Note: Integer value</p>	<p>1) Select the Frame Start trigger: TriggerSelector=FrameStart</p> <p>2) Switch it into “not triggered” mode TriggerMode[TriggerSelector]=Off</p> <p>3) Set the exposure time to be controlled by the ExposureTimeAbs/ExposureTimeRaw: ExposureMode=Timed ExposureTimeAbs=100.0 // Note: Float value</p>

Use Case 2: Setting the camera into “Software Trigger” mode with an exposure time of 250 μ s.

JAI proprietary settings	SFNC settings
<p>1) Set ExposureMode to Edge Pre-Select: ExposureMode=EdgePreSelect</p> <p>2) Select the SoftwareTrigger0 signal as the camera trigger: LineSelector=CameraTrigger0 LineSource[LineSelector]=SoftwareTrigger0</p> <p>3) Set the exposure time to 250 us: ShutterMode=ExposureTimeAbs ExposureTimeAbs=250 // Note: Integer value</p> <p>To trig the camera:</p> <p>1) Pulse the SoftwareTrigger0 signal to trigger the camera: SoftwareTrigger0=0 SoftwareTrigger0=1 SoftwareTrigger0=0</p>	<p>1) Select the Frame Start trigger and switch it On: TriggerSelector=FrameStart TriggerMode[TriggerSelector]=On</p> <p>2) Select the Software trigger command as source for the camera trigger: TriggerSource[TriggerSelector]=Software</p> <p>3) Set the exposure time to be controlled by the ExposureTimeAbs/ExposureTimeRaw: ExposureMode=Timed ExposureTimeAbs=250.0 // Note: Float value</p> <p>To trig the camera:</p> <p>1) Execute the software trigger command: TriggerSoftware()</p>

Use Case 3: Setting the camera into “Hardware Trigger” mode with a fixed exposure time of 500 μ s.

JAI proprietary settings	SFNC settings
<p>1) Set ExposureMode to Edge Pre-Select: ExposureMode=EdgePreSelect</p> <p>2) Select the GPIO_PortIn1* signal as the camera trigger: LineSelector=CameraTrigger0 LineSource[LineSelector]=GPIO_PortIn1</p> <p>3) Set the exposure time to 500 us: ShutterMode=ExposureTimeAbs ExposureTimeAbs=500 // Note: Integer value</p> <p>* The GPIO input port name will depend on camera model and which physical input pin to be used for triggering</p>	<p>1) Select the Frame Start trigger and switch it On: TriggerSelector=FrameStart TriggerMode[TriggerSelector]=On</p> <p>2) Select the Line1* as source for the camera trigger: TriggerSource[TriggerSelector]=Line1</p> <p>3) Set the exposure time to be controlled by the ExposureTimeAbs/ExposureTimeRaw: ExposureMode=Timed ExposureTimeAbs=500.0 // Note: Float value</p> <p>* The line number will depend on camera model and which physical input pin to be used for triggering</p>

Use Case 4: Setting the camera into “Hardware Trigger” mode where the exposure time is controlled by the pulse-width of the external trigger signal.

JAI proprietary settings	SFNC settings
<p>1) Set ExposureMode to Pulse-Width Control: ExposureMode=PulseWidthControl</p> <p>2) Select the GPIO_PortIn1* signal as the camera trigger: LineSelector=CameraTrigger0 LineSource[LineSelector]=GPIO_PortIn1</p> <p>* The GPIO input port name will depend on camera model and which physical input pin to be used for triggering</p>	<p>1) Select the Frame Start trigger and switch it On: TriggerSelector=FrameStart TriggerMode[TriggerSelector]=On</p> <p>2) Select the Line1* as source for the camera trigger: TriggerSource[TriggerSelector]=Line1</p> <p>3) Set the exposure time to be controlled by the pulse-width of the input signal: ExposureMode=TriggerWidth</p> <p>* The line number will depend on camera model and which physical input pin to be used for triggering</p>

Use Case 5: Setting the camera into “Delayed Readout” mode with two external hardware signals and with an exposure time of 100 μ s.

JAI proprietary settings	SFNC settings
<p>1) Set ExposureMode to Delayed readout Edge Pre-Select: <code>ExposureMode=DelayedReadoutEPSTrigger</code></p> <p>2) Select the GPIO_PortIn1* signal as the camera trigger: <code>LineSelector=CameraTrigger0</code> <code>LineSource[LineSelector]=GPIO_PortIn1</code></p> <p>2) Select the GPIO_PortIn2* signal as the image readout trigger: <code>LineSelector=CameraTrigger1</code> <code>LineSource[LineSelector]=GPIO_PortIn2</code></p> <p>3) Set the exposure time to 100 us: <code>ShutterMode=ExposureTimeAbs</code> <code>ExposureTimeAbs=100 // Note: Integer value</code></p> <p>* The GPIO input port names will depend on camera model and which physical input pin to be used for triggering</p>	<p>1) Select the Frame Start trigger and switch it On: <code>TriggerSelector=FrameStart</code> <code>TriggerMode[TriggerSelector]=On</code></p> <p>2) Select the Line1* as source for the camera trigger: <code>TriggerSource[TriggerSelector]=Line1</code></p> <p>3) Select the image readout trigger and switch it On: <code>TriggerSelector=TransferStart</code> <code>TriggerMode[TriggerSelector]=On</code></p> <p>4) Select the Line2 as source for the image readout: <code>TriggerSource[TriggerSelector]=Line2</code></p> <p>5) Set the exposure time to be controlled by the ExposureTimeAbs/ExposureTimeRaw: <code>ExposureMode=Timed</code> <code>ExposureTimeAbs=100.0 // Note: Float value</code></p> <p>* The line number will depend on camera model and which physical input pin to be used for triggering</p>

Use Case 6: Setting the camera into “Delayed Readout” mode with a Pulse Generator setting the delay and with an exposure time of 100 μ s.

JAI proprietary settings	SFNC settings
<p>1) Set ExposureMode to Delayed readout Edge Pre-Select: ExposureMode=DelayedReadoutEPSTrigger</p> <p>2) Select the GPIO_PortIn1* signal as the camera trigger: LineSelector=CameraTrigger0 LineSource[LineSelector]=GPIO_PortIn1</p> <p>3) Select the PulseGenerator0 signal as the image readout trigger when it becomes Low: LineSelector=CameraTrigger1 LineSource[LineSelector]=PulseGenerator0 LineInverter[LineSelector]=ActiveLow</p> <p>4) Set the exposure time to 100 us: ShutterMode=ExposureTimeAbs ExposureTimeAbs=100 // Note: Integer value</p> <p>5) Setup PulseGenerator0 to be started by the same input signal as the camera trigger and to create a delay of 1 second before reading out the image: ClockSource= MHz25 ClockPreScaler=2500 // 10KHz PulseGeneratorSelector=PulseGenerator0 PulseGeneratorLength=10001 // 1.0001s PulseGeneratorStartPoint=0 PulseGeneratorEndPoint=10000 // 1s pulse PulseGeneratorRepeatCount=1 // Only once PulseGeneratorClear=RisingEdge</p> <p>6) Select the GPIO_PortIn1* signal as the input to the PulseGenerator0: LineSelector=PulseGenerator0 LineSource[LineSelector]=GPIO_PortIn1</p> <p>* The GPIO input port name will depend on camera model and which physical input pin to be used for triggering</p>	<p>1) Select the Frame Start trigger and switch it On: TriggerSelector=FrameStart TriggerMode[TriggerSelector]=On</p> <p>2) Select the Line1* as source for the camera trigger: TriggerSource[TriggerSelector]=Line1</p> <p>3) Select the image readout trigger and switch it On: TriggerSelector=TransferStart TriggerMode[TriggerSelector]=On</p> <p>4) Select the PulseGenerator0 as source for the image readout trigger when it becomes Low: TriggerSource[TriggerSelector]=PulseGenerator0 TriggerSourceInverter[TriggerSelector]=True</p> <p>5) Set the exposure time to be controlled by the ExposureTimeAbs/ExposureTimeRaw: ExposureMode=Timed ExposureTimeAbs=100.0 // Note: Float value</p> <p>6) Setup PulseGenerator0 to be started by the same input signal as the camera trigger and to create a delay of 1 second before reading out the image: ClockSource= MHz25 ClockPreScaler=2500 // 10KHz PulseGeneratorSelector= PulseGenerator0 PulseGeneratorLength=10001 // 1.0001s PulseGeneratorStartPoint=0 PulseGeneratorEndPoint=10000 // 1s pulse PulseGeneratorRepeatCount=1 // Only once PulseGeneratorClearActivation=RisingEdge PulseGeneratorClearSource=Line1</p> <p>* The line number will depend on camera model and which physical input pin to be used for triggering</p>

Use Case 7: Setting the camera into “Sequential trigger” mode with external hardware trigger and a two-step sequence.

JAI proprietary settings	SFNC settings
<p>1) Set ExposureMode to Sequential Edge Pre-Select: <code>ExposureMode=SequentialEPSTrigger</code></p> <p>2) Select the GPIO_PortIn1* signal as the camera trigger: <code>LineSelector=CameraTrigger0</code> <code>LineSource[LineSelector]=GPIO_PortIn1</code></p> <p>3) Set up the two-step sequence <code>SequenceRepetitions=0 // Forever</code> <code>SequenceEndingPosition=2 // Two steps</code> <code>SequenceSelector=Sequence1 // First step</code> <code>SequenceExposureTimeRaw=100 // Exposure</code> <code>SequenceMasterGain=0 // Gain=0</code> <code>SequenceROIOffsetX=0</code> <code>SequenceROIOffsetY=0</code> <code>SequenceROISizeX=100</code> <code>SequenceROISizeY=200</code> <code>SequenceSelector=Sequence2 // Second step</code> <code>SequenceExposureTimeRaw=100 // Exposure</code> <code>SequenceMasterGain=0 // Gain=0</code> <code>SequenceROIOffsetX=0</code> <code>SequenceROIOffsetY=0</code> <code>SequenceROISizeX=400</code> <code>SequenceROISizeY=600</code> <code>SequenceSaveCommand() // Save to flash</code></p> <p>* The GPIO input port name will depend on camera model and which physical input pin to be used for triggering</p>	<p>1) Select the Frame Start trigger and switch it On: <code>TriggerSelector=FrameStart</code> <code>TriggerMode[TriggerSelector]=On</code></p> <p>2) Select the Line1* as source for the camera trigger: <code>TriggerSource[TriggerSelector]=Line1</code></p> <p>3) Set up the two-step sequence <code>SequenceMode=On // Switch on the sequence</code> <code>SequenceRepetitions=0 // Forever</code> <code>SequenceEndingPosition=2 // Two steps</code> <code>SequenceSelector=Sequence1 // First step</code> <code>SequenceExposureTimeRaw=100 // Exposure</code> <code>SequenceMasterGain=0 // Gain=0</code> <code>SequenceROIOffsetX=0</code> <code>SequenceROIOffsetY=0</code> <code>SequenceROISizeX=100</code> <code>SequenceROISizeY=200</code> <code>SequenceSelector=Sequence2 // Second step</code> <code>SequenceExposureTimeRaw=100 // Exposure</code> <code>SequenceMasterGain=0 // Gain=0</code> <code>SequenceROIOffsetX=0</code> <code>SequenceROIOffsetY=0</code> <code>SequenceROISizeX=400</code> <code>SequenceROISizeY=600</code> <code>SequenceSaveCommand() // Save to flash</code></p> <p>* The line number will depend on camera model and which physical input pin to be used for triggering</p>