

Application Note

Master-Slave Camera synchronisation for Optronis CR high-speed cameras

Version AN Master Slave Synchronisation -01

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Introduction

CamRecord CR high-speed cameras operate at frame rates of about 20 frames per second (fps) up to > 100000 fps depending mainly on the frame size and the required frame rate. Typically each camera behaves –during acquisition- as shown in the figure below.

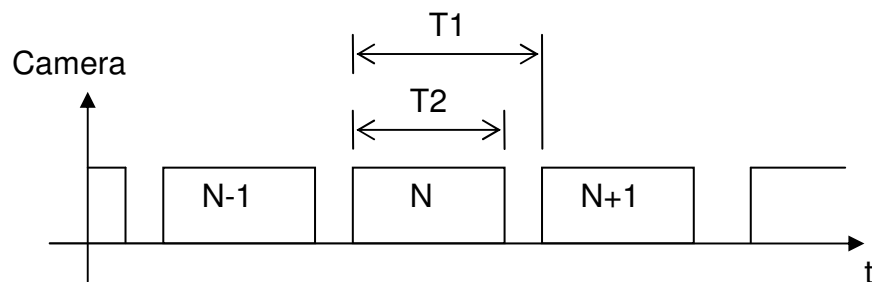


Figure 1: Exposure Time & Frame Rate

T1: Frame interval ($1/T1$: Frame rate)

T2: Exposure time

N: Frame number

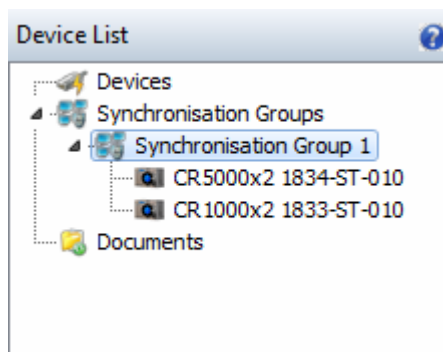
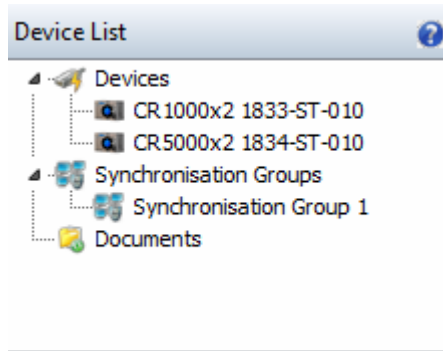
T1-T2: Inter-framing time

To select the frame rate value, either a camera internal repetition rate source (internal synchronisation) or an external repetition rate source (external synchronisation) can be used.

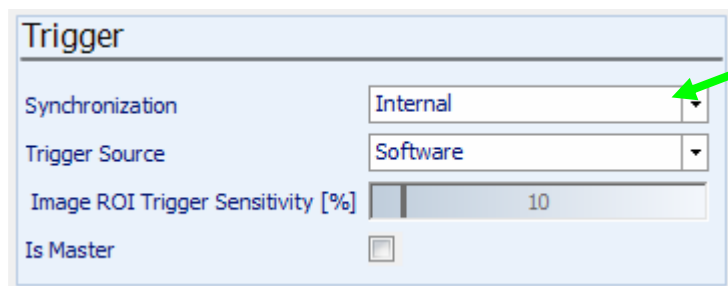
When selecting internal synchronisation, the camera works with an internal frame rate and exposure time, that can be selected inside the standard menu. Please note, that the maximum frame rate value depends on the frame format. When selecting external synchronisation, the camera behaves differently depending on the TimeBench Version. This is, why master-slave synchronisation setup has to be done differently depending on the TimeBench Version.

Master Slave Synchronisation Setup (TimeBench Version 2.1 and older)

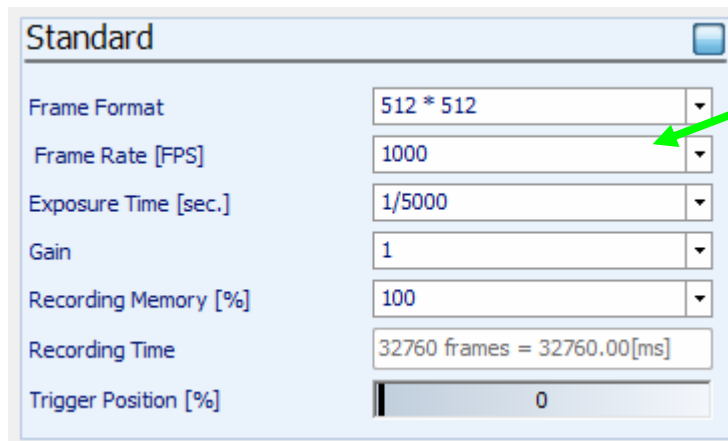
- 1) Connect Sync Out connector of the Master Camera to Sync In connector of the slave camera
- 2) Place the cameras (devices) with drag and drop into the synchronisation group.



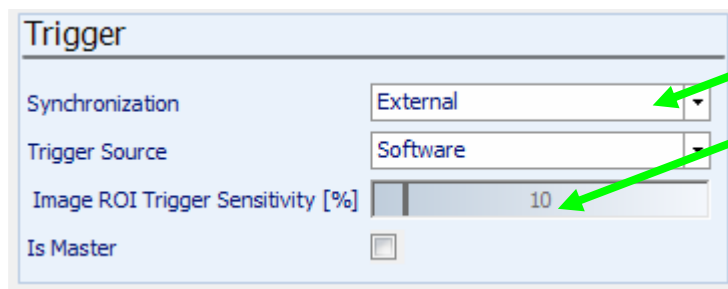
- 3) Set the master camera to internal synchronisation mode.



- 4) Set the internal frame rate of the master camera and check the real frame rate in the information box.



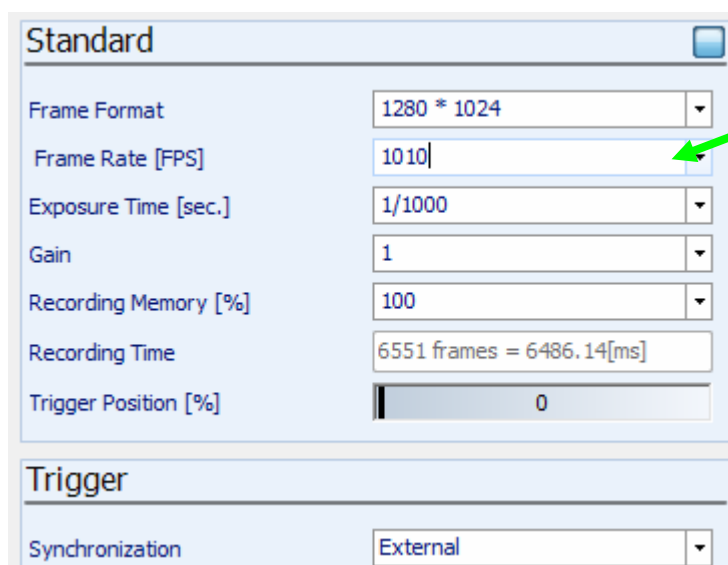
5) Set the slave camera to external synchronisation



6) Set the maximum external frame rate of the slave camera slightly higher than the internal frame rate of the master camera.

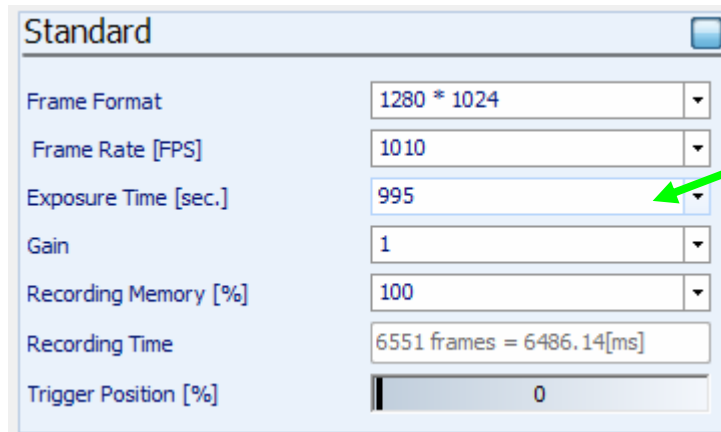
(Example: set the master camera to 1000fps and the slave camera to e.g. 1010fps.)

Check possible frame rates in internal synchronisation with the information window.

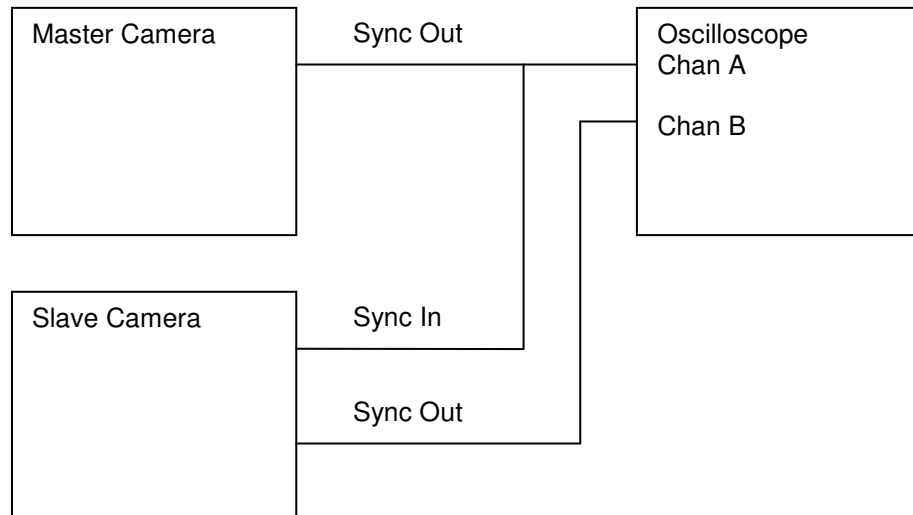


7) Set Exposure Time of Master and Slave camera slightly shorter (min. 5Microseconds) than 1/Frame Rate.
(Example: Frame Rate Master 1000fps, Exposure Time max. 995 Microseconds)

Please note, that Exposure Time Value can be given in Microseconds (995) or as inverted value (1/1005).

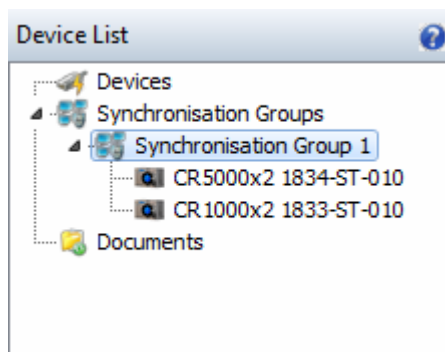
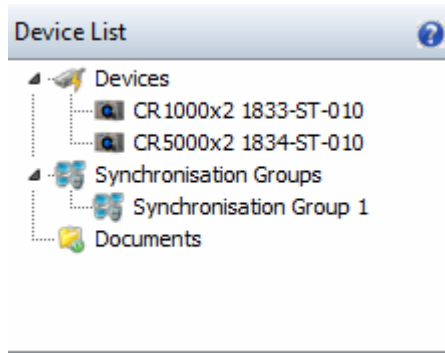


8) Go into Live View or Record mode.
Synchronisation may be checked by measuring signal at sync Out connectors with an Oscilloscope:

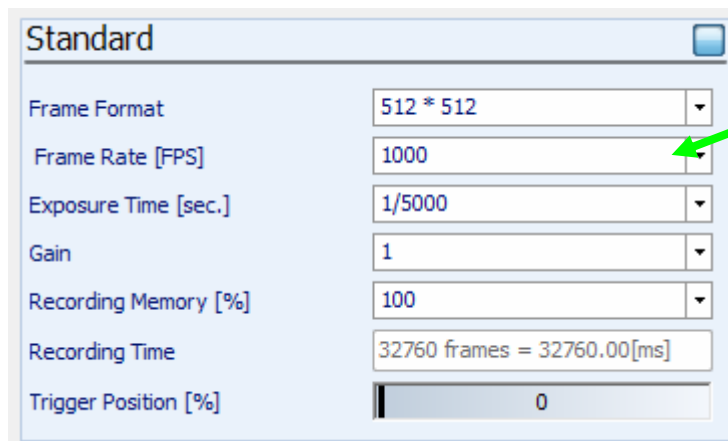


Master Slave Synchronisation Setup (TimeBench Version 2.3 and newer)

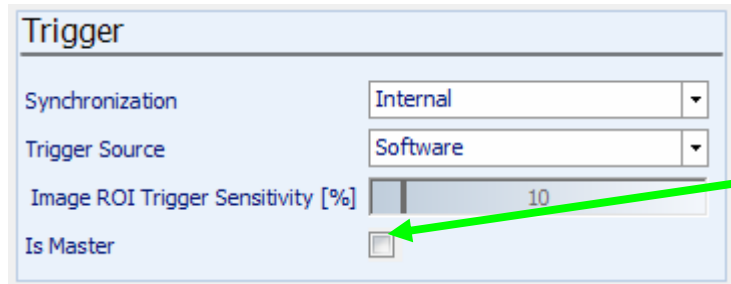
- 1) Connect Sync Out connector of the Master Camera to Sync In connector of the slave camera
- 2) Place the cameras (devices) with drag and drop into the synchronisation group.



- 3) Set the internal frame rate of the master camera.
(Example: set the master camera to 1000fps.)

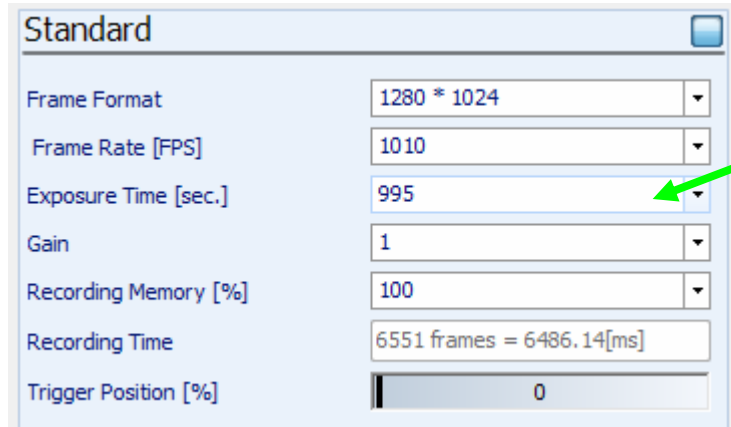


4) Set the master camera to is Master. (This sets for cameras, that are placed inside the synchronisation group, master camera to synchronisation internal and all slave cameras to synchronisation external). Additionally, the frame rate information of the master camera will be moved to the slave cameras.



5) Set Exposure Time of Master and Slave camera slightly shorter (min. 5 Microseconds) than 1/Frame Rate.
(Example: Frame Rate Master 1000fps, Exposure Time max. 995 Microseconds)

Please note, that Exposure Time Value can be given in Microseconds (995) or as inverted value (1/1005).



6) Go into Live View or Record mode.
Synchronisation may be checked by measuring signal at sync Out connectors with an Oscilloscope:

