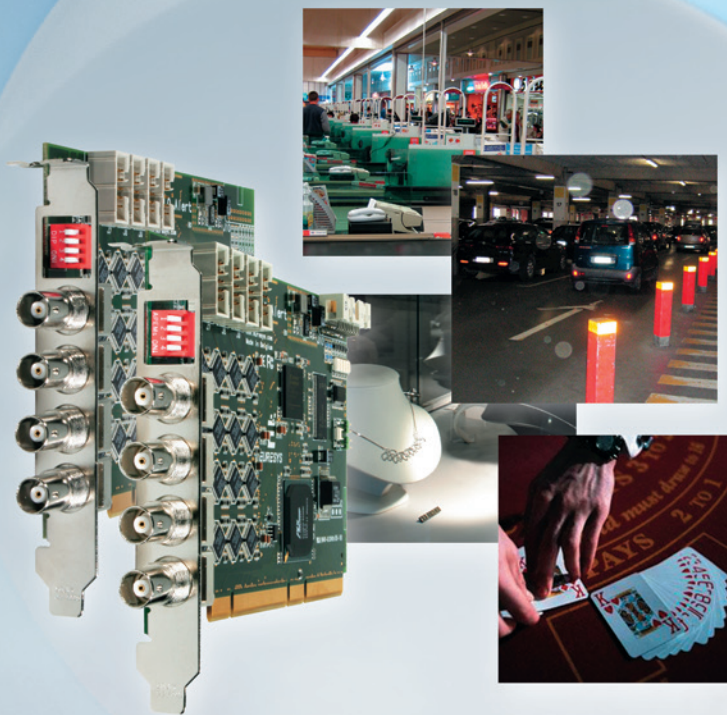


Application Note

PICOLO Alert, Sharing the Digitizing Power



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PICOLO Alert, Sharing the Digitizing Power

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PICOLO Alert, Sharing the Digitizing Power

PICOLO Alert and PICOLO Full Alert

This document applies to both PicoLO Alert and PicoLO Full Alert; they will be referred to as PicoLO Alert below.

PicoLO Alert is a video surveillance capture board with 16 inputs. One can connect up to 16 cameras to the board. PicoLO Alert accepts cameras providing a video signal compliant with the PAL or NTSC video standards.

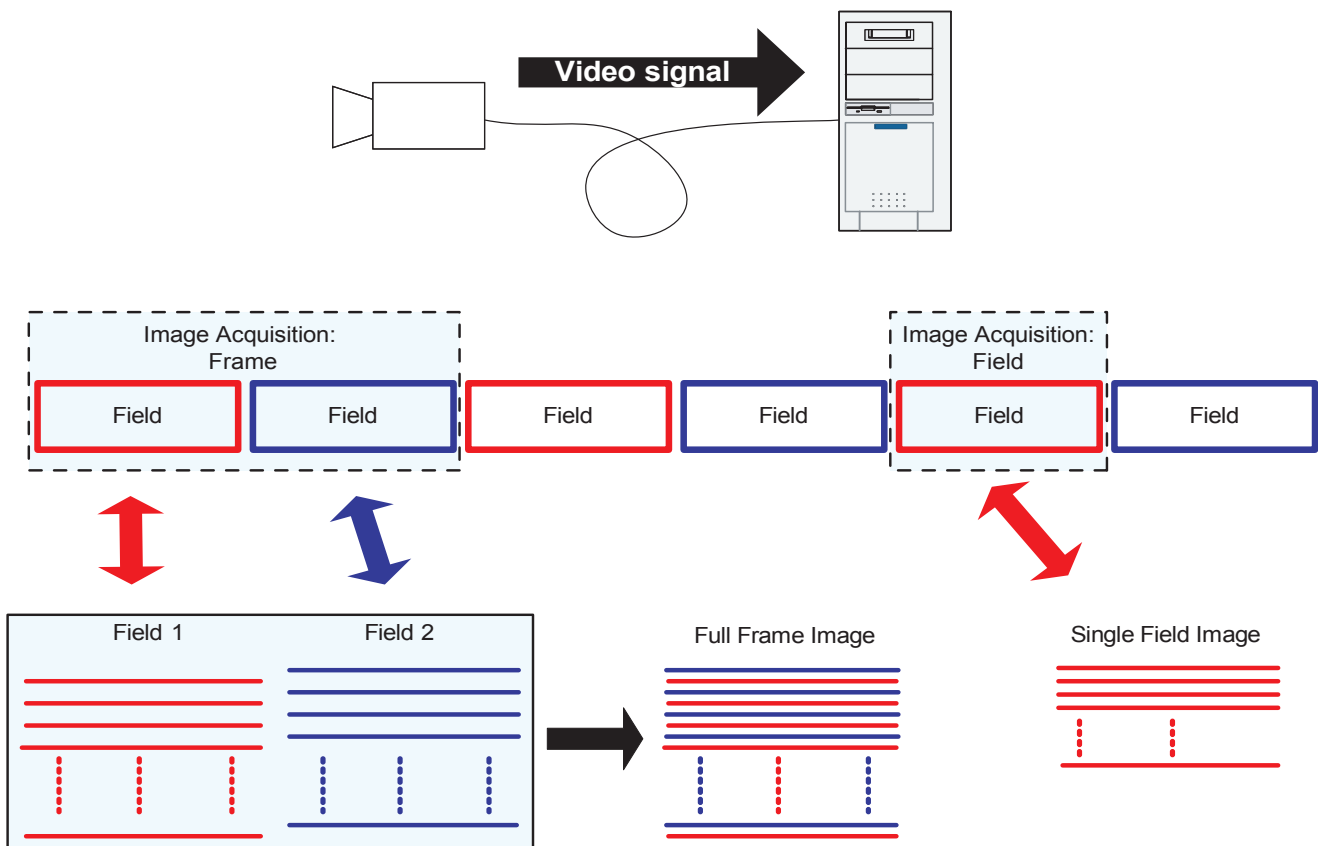
The video signal carries all information to reconstruct the images shot by the camera. The role of a capture board is to digitize the video signal and put a correctly formatted bitmap in PC memory.

The purpose of this document is to give more in depth information about PicoLO Alert image acquisition process. It explains the different strategies that apply when using PicoLO Alert at maximum capture rates.

Image Acquisition

PicoLO Alert acquisition process consists in acquiring the images from the video signal at the desired capture rate.

Because of the nature of the video signal, the acquired image may be constituted of one single field (this is the case in FIELD, CIF and QCIF resolutions) or out of two consecutive interlaced fields (in FRAME resolution). This is shown on the picture below.



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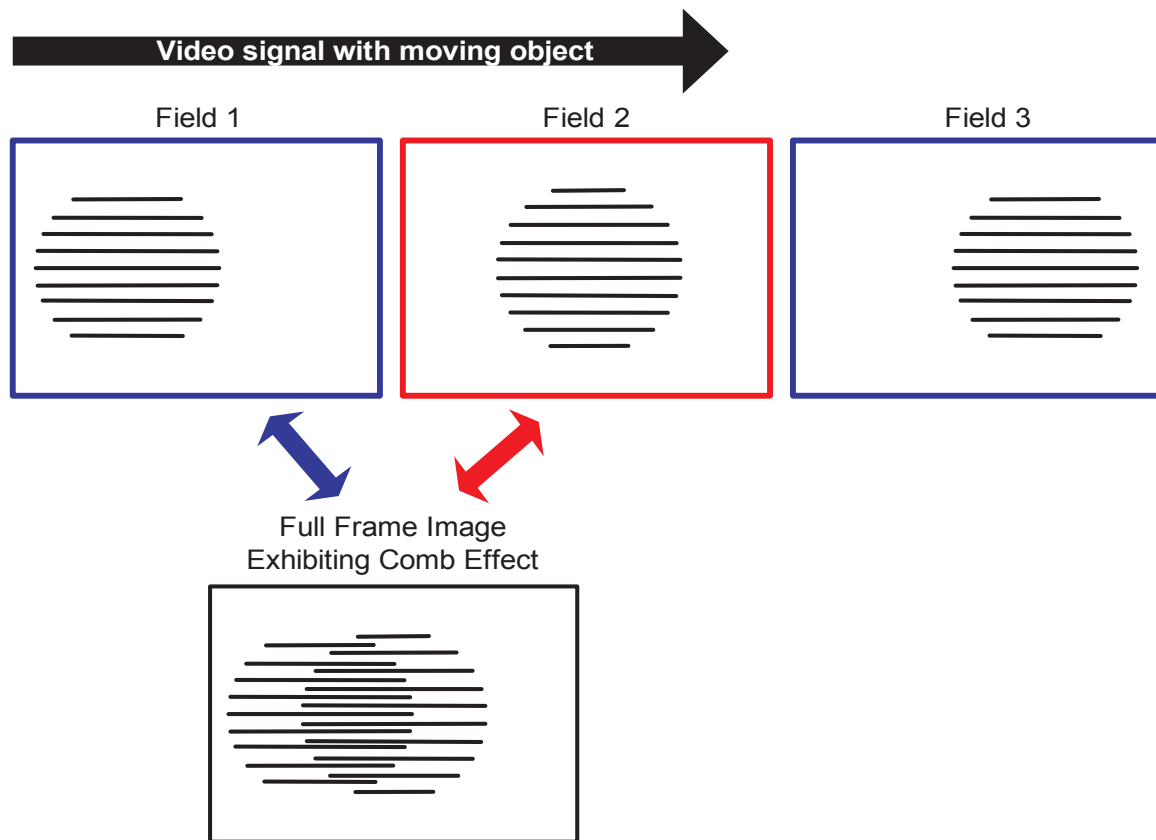
Comb Effect

An NTSC camera provides 30 images per second (one image every 33 ms). Each image is made of two fields. They are 60 fields per second (one field every 16.6 ms).

A PAL camera provides 25 images per second (one image every 40 ms). Each image is made of two fields. They are 50 fields per second (one field every 20 ms).

On most video surveillance cameras, two successive fields are shot at different time. They are separated by 16.6 ms in NTSC systems or 20 ms in PAL systems.

When the camera is viewing moving objects (or a changing scene), the successive fields hold images from the objects at different locations. When acquiring full frame images (constituted out of two fields), it causes a visible artifact: the comb effect. This is showed in the diagram below.

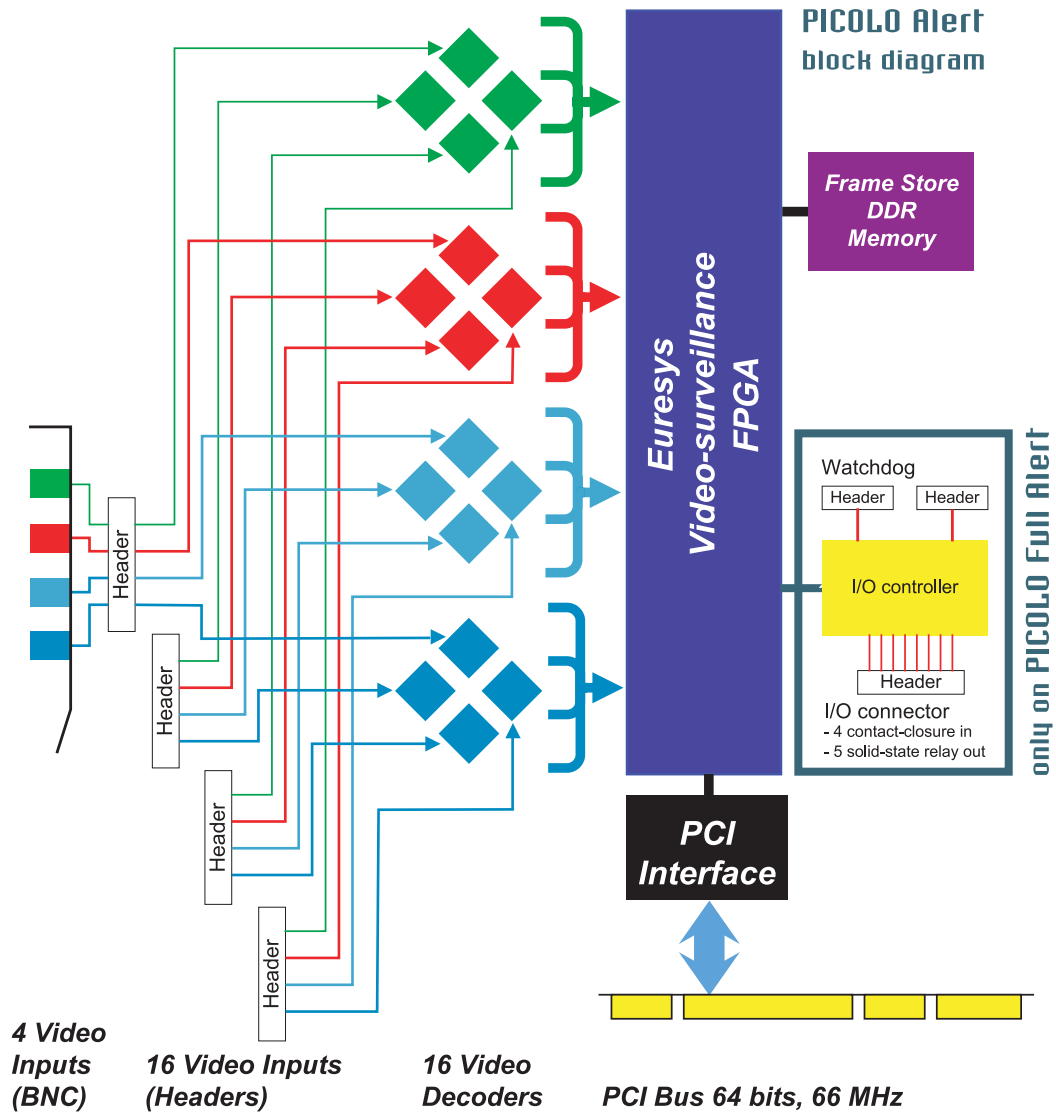


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Digitizing Blocks

Picolo Alert is divided in four identical digitizing blocks. Four cameras are connected to each block.

The digitizing power of each block is 50 / 60 fields (PAL / NTSC) or 25 / 30 frames per second. The total of all four blocks amounts to the specified 200 / 240 fields or 100 / 120 frames per second.



The digitizing power of one block is automatically and optimally shared between all its cameras. The effective acquisition rate for these cameras can amount to the specified digitizing power of one block. This performance is independent of the camera synchronization scheme.

If the requested capture rate for a digitizing block does not exceed its digitizing power and enough PCI bandwidth is available, the target capture rates are met. Otherwise, the capture rates are smoothly and fairly reduced. The capture rates adaptation are performed in hardware by the Video Bridge FPGA without action requested by the user.

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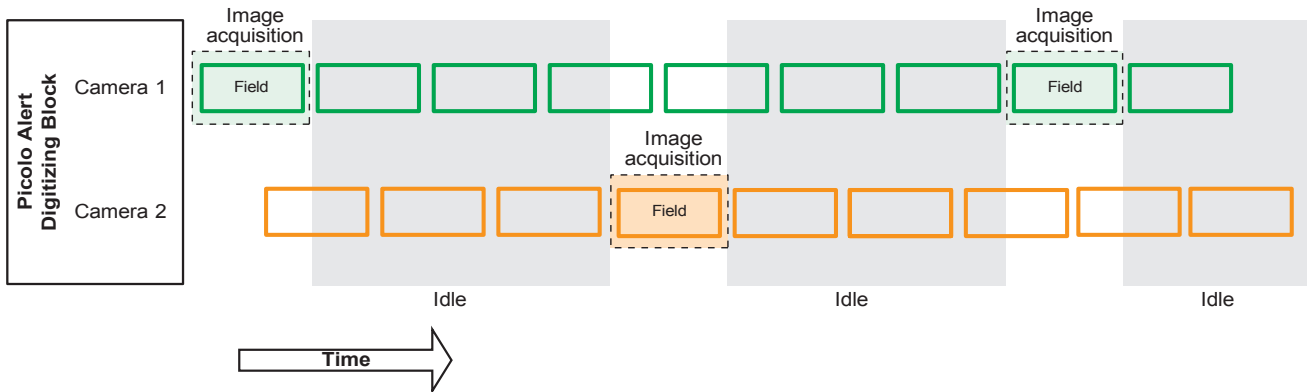
Sharing the Digitizing Power

As mentioned above, when more than one camera is connected to the same digitizing block, the digitizing power is shared between them.

If the total capture rate required from the cameras is below the digitizing power, PicoLO Alert acquires the desired fields or frames from each camera.

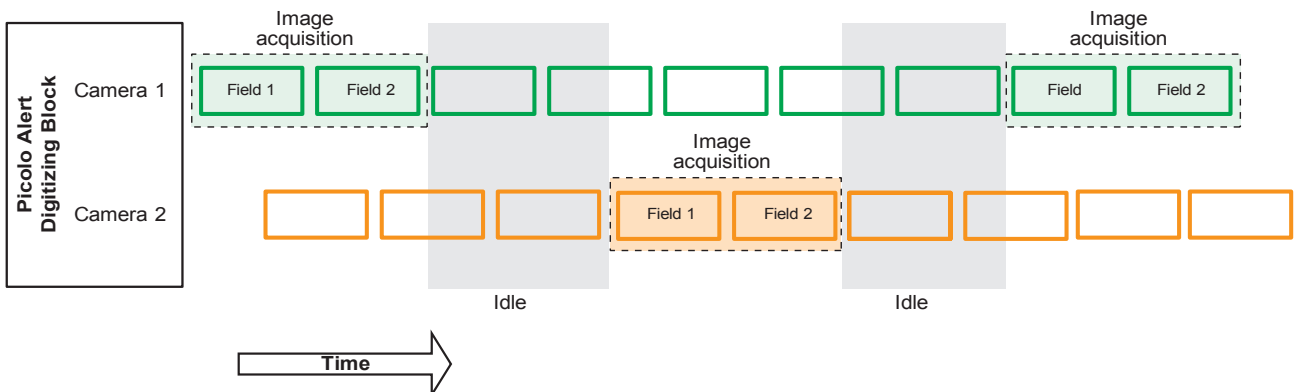
The timing diagram below shows an example of PicoLO Alert acquiring single field images from two cameras connected to the same digitizing block.

Field Acquisition



The timing diagram below shows an example of PicoLO Alert acquiring full frame images from two cameras connected to the same digitizing block. Such images may exhibit comb effect.

Frame Acquisition

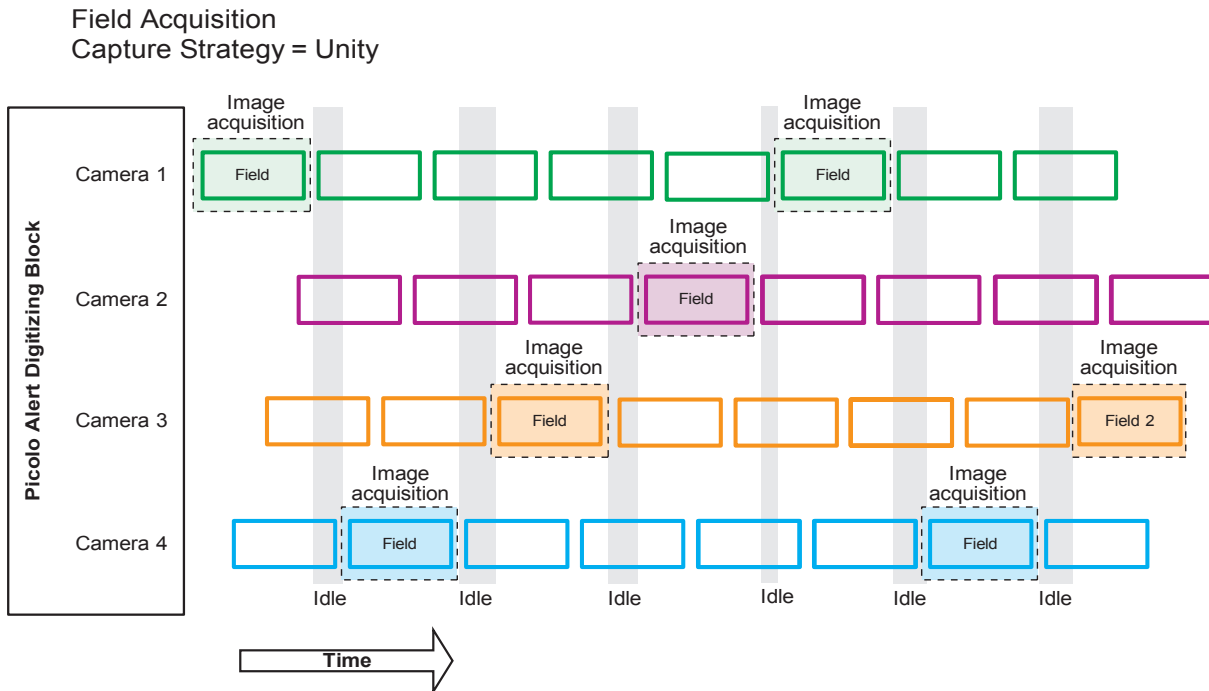


On the diagrams above, the grey areas represent periods where PicoLO Alert does no image acquisition. When the capture rates are increased, these periods become shorter. This leads to several situations explained below.

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Field Acquisition at High Capture Rate

To capture images from multiple cameras feeding the same digitizing block at high capture rate, PicoLO Alert optimizes the image acquisition from the different cameras so that the idle time is minimized. This is shown on the timing diagram below.



In this scenario, PicoLO Alert captures images made out of one single field. But, there are still idle periods (represented in grey) where PicoLO Alert does no image acquisition.

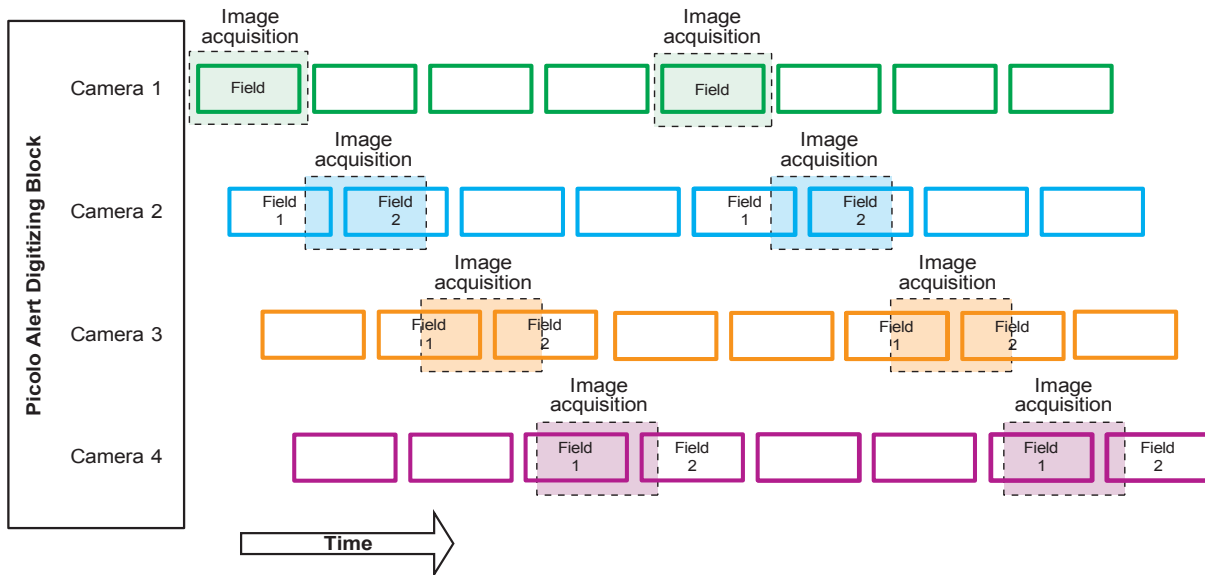
PicoLO Alert may be configured to remove the idle period between two acquisitions from cameras sharing the same digitizing block. When doing so, the image acquisition is not constrained to start at the beginning of a field. This means that an image may be constituted of two parts of consecutive fields.

The diagram below shows field capture under such circumstances.

When doing so and when the camera is viewing moving objects, images captured from this camera may exhibit tearing. Tearing is explained in the following chapter.

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Field Acquisition
Capture Strategy = Speed

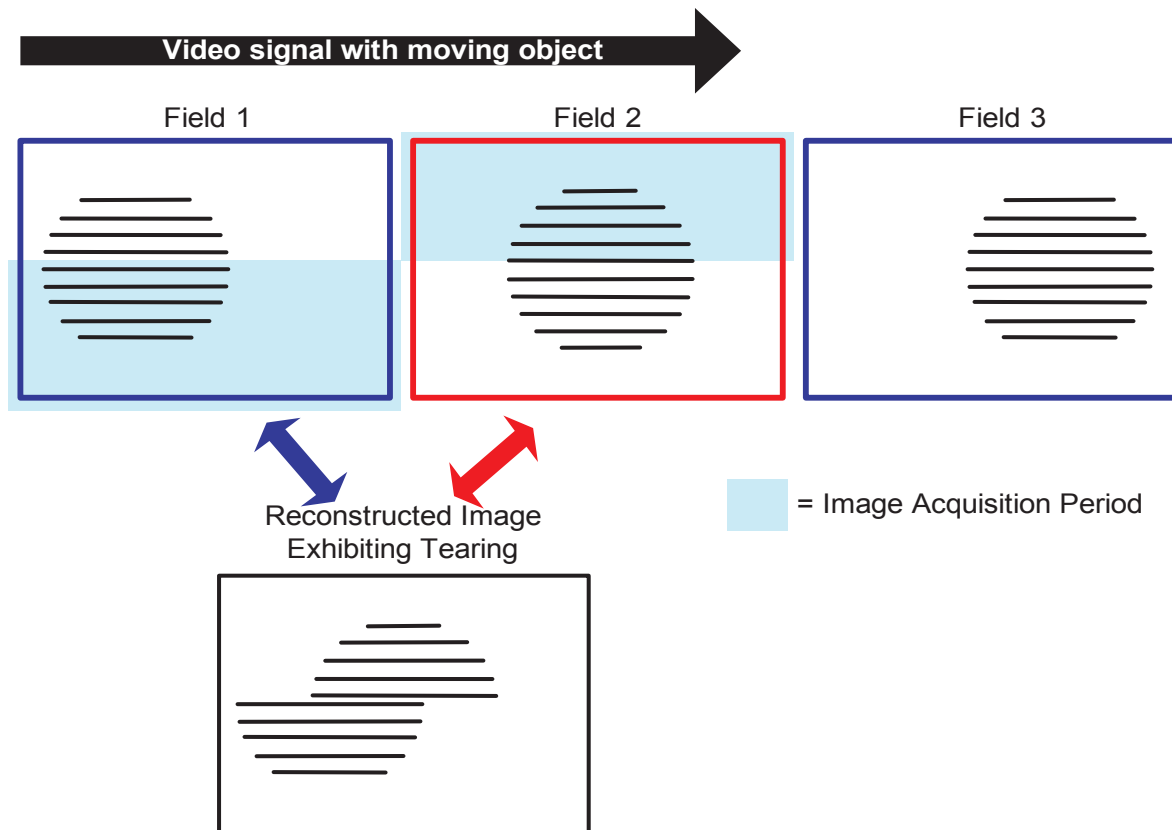


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Tearing in Field Acquisition

As explained above, on most video surveillance cameras, two successive fields are shot at different time. They are separated by 20 ms in PAL systems or 16.6 ms in NTSC systems.

When the camera is viewing moving objects (or a changing scene), the successive fields hold images from the objects at different locations. When acquiring one image made of parts of two successive fields, it may cause a visible artifact: the tearing. This is shown in the diagram below.

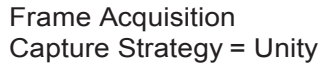


Tearing may appear on images produced by Picolo Alert only when following conditions are met:

- Picolo Alert is configured to favor acquisition speed (by setting the CaptureStrategy parameter to SPEED)
- Multiple cameras share the same digitizing block
- The camera is viewing moving objects (or a changing scene)

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As for Field acquisition, when doing Frame acquisition from multiple cameras feeding the same digitizing block at high capture rate, PicoLo Alert optimizes the image acquisition order from the different cameras so that the idle time is minimized. This is shown on the timing diagram below.



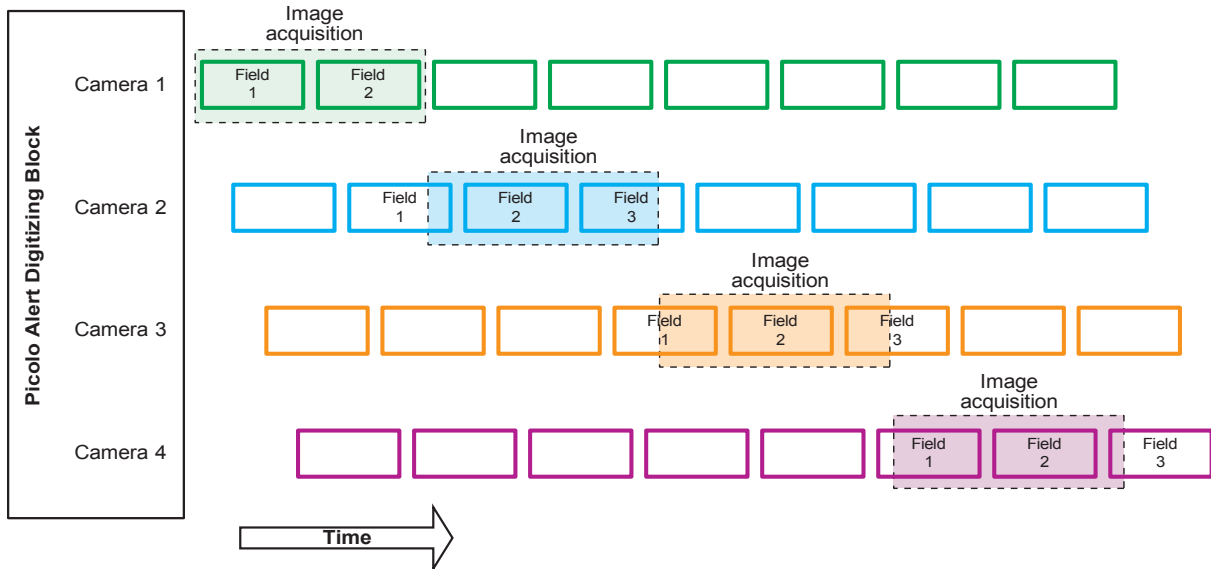
In this scenario, Picolo Alert captures images made out of two successive fields. But, there are still idle periods (represented in grey) where Picolo Alert does no image acquisition.

Picolo Alert may be configured to remove the idle period between two acquisitions from cameras sharing the same digitizing block. When doing so, the image acquisition is not constrained to start at the beginning of a field. This means that an image may be constituted out of parts of three consecutive fields.

The diagram below shows frame capture under such circumstances.

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Frame Acquisition
Capture Strategy = Speed



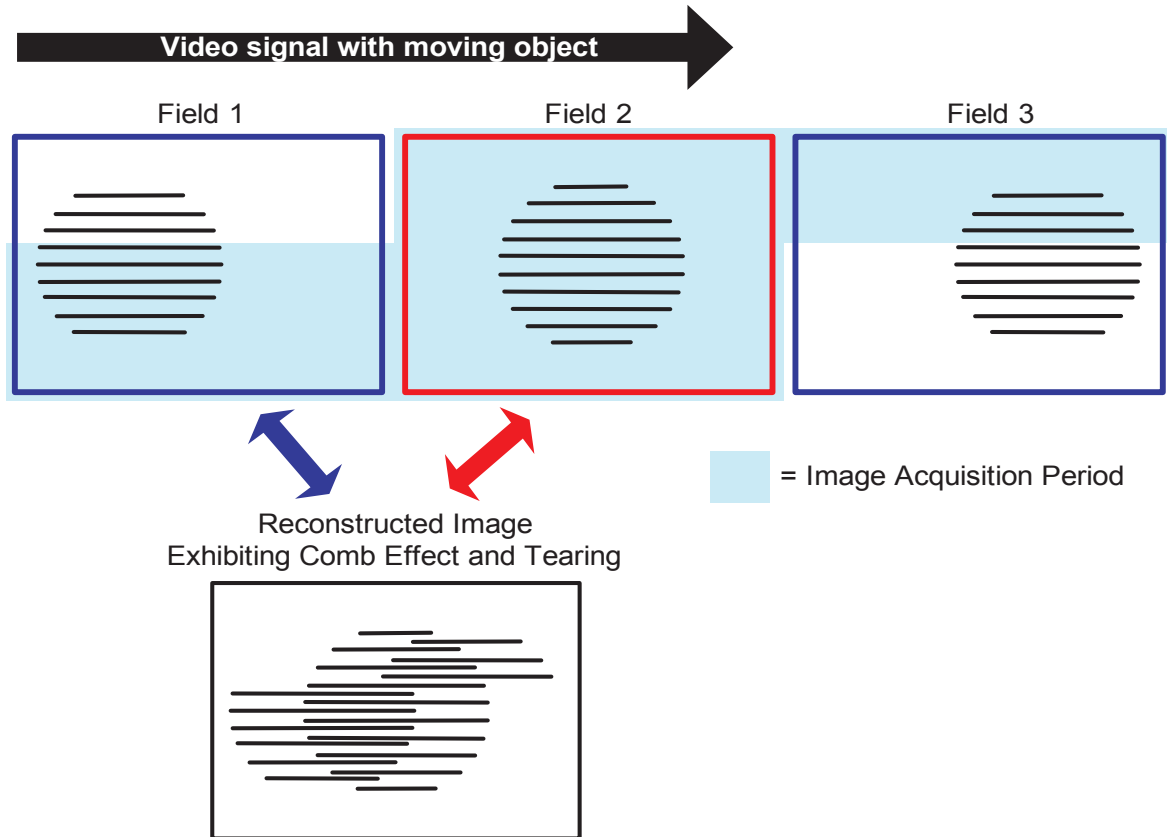
When doing so and when the camera is viewing moving objects, images captured from this camera may exhibit both tearing and comb effect. This is explained in the following chapter.

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Tearing and Comb Effect in Frame Acquisition

As explained above, on most video surveillance cameras, successive fields are shot at different time. They are separated by 20 ms in PAL systems or 16.6 ms in NTSC systems.

When the camera is viewing moving objects (or a changing scene), the successive fields hold images from the objects at different locations. When acquiring one image made of parts of three successive fields, tearing and comb effect are both present. This is showed in the diagram below.



As for the Field acquisition setup described earlier, tearing appears only under given conditions and it can be prevented through the setting of the CaptureStrategy Channel parameter.

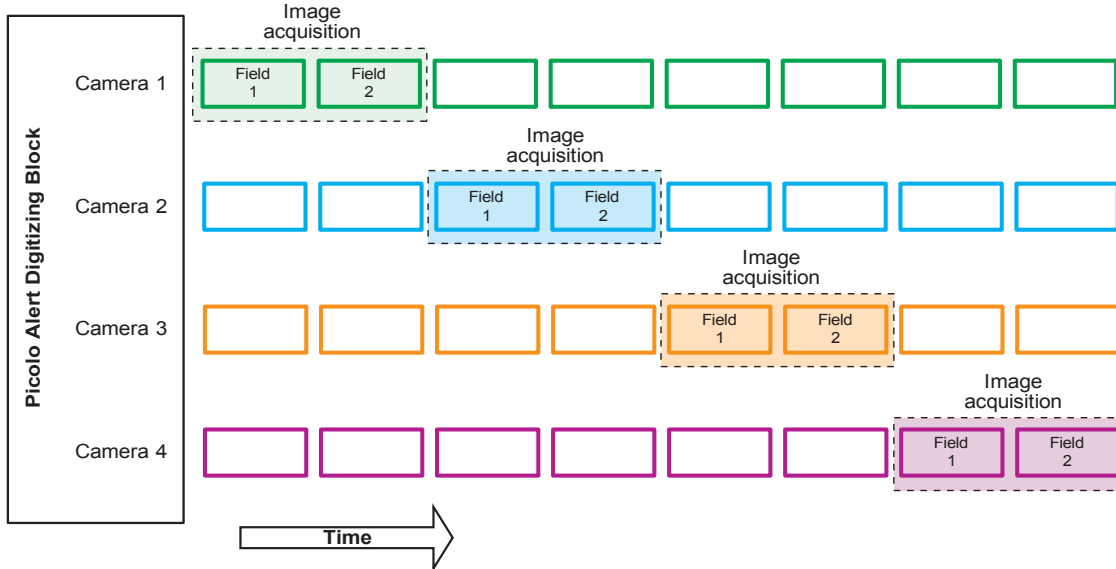
Application Note.
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Acquisition with Synchronized Cameras

When synchronized cameras are connected to the same digitizing block, the maximum performance is reached, without tearing artifact when the scene or objects viewed by the camera are moving.

This is true for both Field and Frame acquisitions. The CaptureStrategy parameter is irrelevant in this configuration.

Frame Acquisition Synchronized cameras



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Relevant MultiCam Parameters

Relevant MultiCam Channel parameters are summarized below. Refer to the electronic documentation provided with MultiCam for more information.

Capture Rate

The capture rate is configured through the TargetFrameRate_Hz channel parameter. It is expressed in Hertz (i.e. images per second).

CaptureStrategy

CaptureStrategy is a channel parameter. Its default value is SPEED. This allows achieving the highest capture rates but may induce tearing under some circumstances depicted earlier.

Setting CaptureStrategy to UNITY may reduce slightly the capture rate but ensures that images are made out of one single field when doing Field acquisition (or two successive fields when doing Frame acquisition).

When the requested capture rates are low, one may set CaptureStrategy to UNITY to prevent tearing without affecting the capture rate.

Image Resolution

The image resolution is set through the following channel parameters:

- GrabField to select acquisition of images made out of one or two fields. Possible values are FRAME, FLD, UP and DOWN.
- PixelTiming to select between SQUARE (for square pixel timing) or BROADCAST (for broadcast pixel timing).
- ImageSizeX to select the image width.
- ImageSizeY to select the image height.



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