Allied Vision

APPLICATION NOTE

# Multiple Regions of Interest for Goldeye G/CL

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## Scope

A regions of interest (ROI) is used to reduce the image resolution when only a section of the sensor image is needed and to increase maximum frame rates.

Goldeye G/CL cameras support `MultipleRegions` features for multiple ROIs that are non-overlapping. This document explains how to use the these features.

| Supported camera models | Supported number of ROIs | Required firmware version |
|---|---|---|
| All G/CL-008 models | Maximum 32 | V04.04.x or higher |
| G/CL-030 TEC1, G/CL-130 TEC1 | Maximum 8 | V02.26.x or higher |
| All G/CL-034 models | Maximum 32 | V03.06.x or higher |

*Table 1: Supported camera models, number of ROIs and required firmware version*

## Single ROI

With ROI features, you can configure a single ROI by `Height`, `Width`, `OffsetX`, and `OffsetY`:

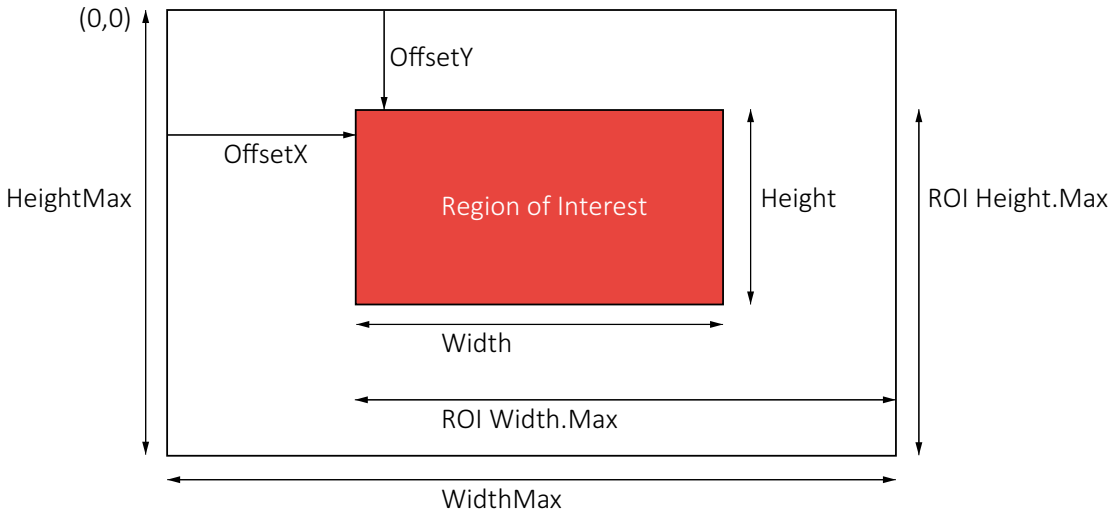



*Figure 1: Features to configure a single ROI*

# Multiple ROIs

## Multiple ROIs merged to a common image

With Multiple ROI, you can configure several ROIs, named subregions. The maximum number of supported subregions depends on the camera model. Figure 2 shows an example with 3 ROIs.

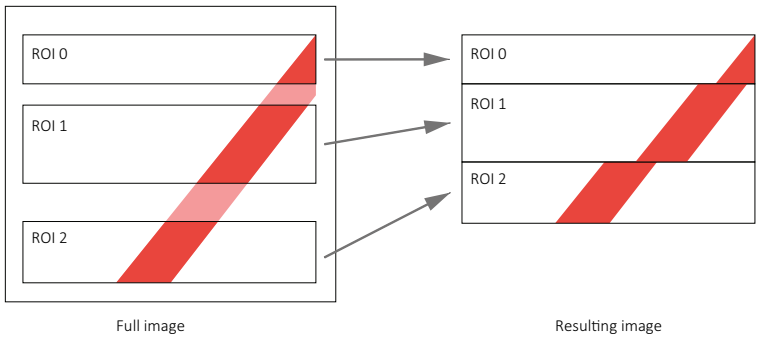



*Figure 2: Mutiple ROIs merged to a common image*

All active ROIs are transmitted in a single frame. For each ROI, you can configure `Height` and `OffsetY`. In contrast, `Width` and the `OffsetX` are common for all regions, as shown in Figure 3.

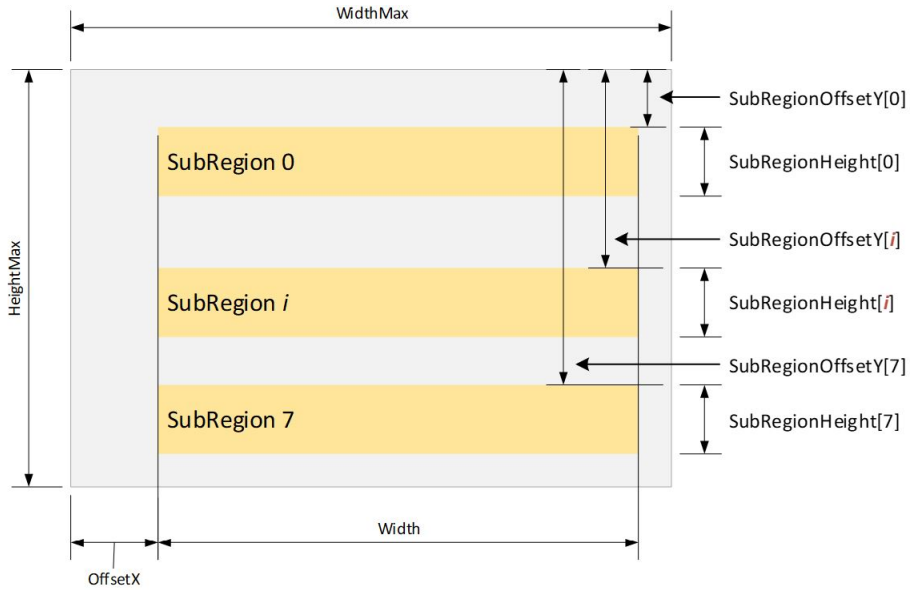



*Figure 3: Subregion parameters and ROI order*

## Rules for configuring subregions

- ROIs must not overlap.
- Keep the order for ROIs as defined in Equation 1 on page 3 and Equation 2 on page 3.
- NUC (non uniformity correction) and DPC (defect pixel correction) are disabled for multiple ROIs.

The `SubRegionHeight` and `SubRegionOffsetY` parameters must meet the conditions shown in Equation 1 and Equation 2 (see Figure 3 on page 2 for reference).))

$$SubRegionOffsetY[i+1] \geq SubRegionOffsetY[i] + SubRegionHeight[i]$$

with $i$ as `SubRegionSelector`

*Equation 1: Rule 1 for the start position of the next SubRegion*

$$SubRegionOffsetY[i] + SubRegionOffsetHeight[i] \leq HeightMax$$

with $i$ as `SubRegionSelector`

*Equation 2: Rule 2 for the maximum height of the next SubRegion*

Therefore, **SubRegion 1** must start after **SubRegion 0**, **SubRegion 2** must start after **SubRegion 1**, and so on. Table 2 gives examples of valid and invalid settings for subregions.

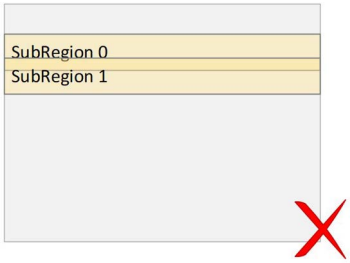
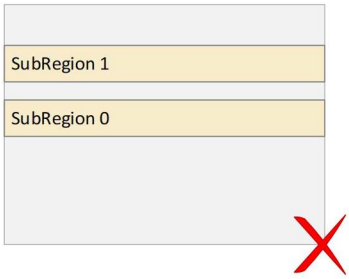
| Example | Description |
|---|---|
|  | Subregions are overlapping. |
|  | Wrong order of subregions. Subregion indices must be increasing. |
|  | Subregion 1 exceeds the maximum height. See Equation 2. |

*Table 2: Valid and invalid conditions for subregions (sheet 1 of 2)*

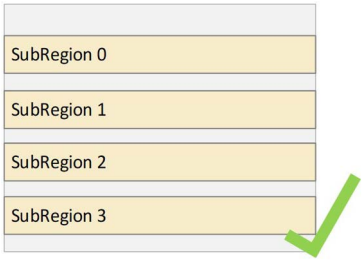
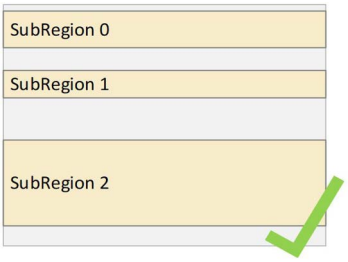
| Example | Description |
|---|---|
|  | Correct order of subregions |
|  | Subregions may be omitted as long as the indices are increasing. |
|  | Subregions may have different height values. |

*Table 2: Valid and invalid conditions for subregions (sheet 2 of 2)*

## Application workflow

We recommend you to configure the MultipleRegions features as follows:

1. Stop the acquisition.
2. Set `MultipleRegionsEnable` to ***True*** to enable multiple regions. (If this feature is set to ***False***, only a single region is active that can be configured as usual by `Width`, `Height`, `OffsetX`, and `OffsetY`.)
3. Select a subregion through `SubRegionSelector`.
4. Set `SubRegionMode` to ***On*** to activate the selected subregion.
5. Set the subregion's height by `SubRegionHeight`.
6. Set the subregions's vertical offset by `SubRegionOffsetY`.
7. Check the subregion's status by `SubRegionStatus`. The feature must be shown as ***Valid***. Otherwise continue the configuration from Step 5 again.
8. Continue with Step 3 to set up further subregions.
9. Adjust width and horizontal offset for all subregions by `Width` and `OffsetX` features if desired.
10. Start the acquisition.

Result: The frames are merged from the subregions.

# MultipleRegions features

**Goldeye G/CL Features Reference**

This is an excerpt of the Goldeye G/CL Features Reference, see www.alliedvision.com/en/support/technical-documentation/goldeye-gcl-documentation.

## MultipleRegions (subcategory)

This subcategory holds the features to configure and control the multiple regions of the camera.

**Notes**

- Multiple regions are **available only for** all Goldeye G/CL-008 models, on G/CL-030 TEC1, all G/CL-034 models, and G/CL-130 TEC1.
- Features in the `NonUniformityCorrection` and `DefectPixelCorrection` subcatogries are not supported when `MultipleRegionsEnable` is set *`True`*.
- Enabling `NonUniformityCorrection` and `DefectPixelCorrection` features disables `MultipleRegions` features and vice versa.

| | |
|---|---|
| **Display name** | MultipleRegions |
| **Origin of feature** | Camera |
| **Feature type** | (Subcategory) |
| **Category** | /ImageFormatControl |

### MultipleRegionsEnable

Selects between single region and multiple regions mode. The number of subregions to be configured depends on the camera model.

**Note**: The height and Y-offset for each active subregion can be configured individually, but the horizontal dimensions are commonly set by `Width` and `OffsetX` for all subregions.

| | |
|---|---|
| **Display name** | MultipleRegionsEnable |
| **Origin of feature** | Camera |
| **Feature type** | Boolean |
| **Access** | R/W |
| **Affected features** | `Height`, `OffsetY` |
| **Category** | /ImageFormatControl/MultipleRegions |

| Values | Description |
|---|---|
| *`False`* | Single region mode is enabled, subregions mode is disabled (**default**). `Height` and `OffsetY` can be used as usual. |
| *`True`* | Subregions mode is enabled. `Height` and `OffsetY` features are locked and are automatically aligned with the values set for subregions. |

## SubRegionMode

[SubRegionSelector]

Enables or disables the selected subregion.

| | |
|---|---|
| **Display name** | SubRegionMode |
| **Origin of feature** | Camera |
| **Feature type** | Boolean |
| **Access** | R/W |
| **Affected features** | `Height`, `OffsetY`, `SubRegionStatus` |
| **Category** | /ImageFormatControl/MultipleRegions |

| **Values** | **Description** |
|---|---|
| *On* | The selected subregion is enabled. |
| *Off* | The selected subregion is disabled. |

## SubRegionHeight

[SubRegionSelector]

Height of the selected subregion.

**Goldeye G/CL-030 and G/CL-130**: If values are entered that are not dividable by 8, `SubRegionHeight` is increased automatically to the next higher available value. For example, if *9* is entered, the value is increased to *16*.

**All Goldeye G/CL-008 models, G/CL-034 and G/CL-034 XSWIR models**: The total sum of all active SubRegionsHeights must be >= 4.

| | |
|---|---|
| **Display name** | SubRegionHeight |
| **Origin of feature** | Camera |
| **Feature type** | Integer |
| **Access** | R/W |
| **Unit** | Pixels |
| **Affected features** | `Height`, `SubRegionStatus` |
| **Category** | /ImageFormatControl/MultipleRegions |

| **Values**[1] | **Description** |
|---|---|
| *8* ; *1* | Minimum |
| (Height max) | Maximum, depending on the height of other subregions |
| *8* ; *1* | Increment |

[1] G/CL-030, G/CL-130 ; all G/CL-008 models, G/CL-034, G/CL-034 XSWIR

## SubRegionOffsetY

[SubRegionSelector]

Y-offset of the selected subregion.

**Notes for Goldeye G/CL-030 and G/CL-130**: If values are entered that are not dividable by 8, `SubRegionOffsetY` is increased automatically to the next higher available value. For example, if *9* is entered, the value is increased to *16*.

| | |
|---|---|
| **Display name** | SubRegionOffsetY |
| **Origin of feature** | Camera |
| **Feature type** | Integer |
| **Access** | R/W |
| **Unit** | Pixels |
| **Affected features** | `OffsetY`, `SubRegionStatus` |
| **Category** | /ImageFormatControl/MultipleRegions |

| **Values**[1] | **Description** |
|---|---|
| *8* ; *1* | Minimum |
| (Height max) | Maximum, depending on the height of other subregions |
| *8* ; *1* | Increment |

[1] G/CL-030, G/CL-130 ; all G/CL-008 models, G/CL-034, G/CL-034 XSWIR

## SubRegionSelector

Selects the subregion in a range from *0* to *n*, where *0* is the index of the first subregion and *n* is the index of the last one.

| | |
|---|---|
| **Display name** | SubRegionSelector |
| **Origin of feature** | Camera |
| **Feature type** | Enumeration |
| **Access** | R/W |
| **Affected features** | `SubRegionHeight`, `SubRegionMode`, `SubRegionOffsetY`, `SubRegionStatus` |
| **Category** | /ImageFormatControl/MultipleRegions |

| **Values**[1] | **Description** |
|---|---|
| *0* ; *0* | Minimum |
| *7* ; *31* | Maximum |

[1] G/CL-030, G/CL-130 ; all G/CL-008 models, G/CL-034, G/CL-034 XSWIR

## SubRegionStatus

[SubRegionSelector]

Displays the status of the selected subregion.

**Note**: The `SubRegionStatus` is updated only if `MultipleRegionsEnable` is *`True`* and the corresponding `SubRegionMode` is set to *`On`*.

| | |
|---|---|
| **Display name** | SubRegionStatus |
| **Origin of feature** | Camera |
| **Feature type** | Enumeration |
| **Access** | R |
| **Affected features** | (None) |
| **Category** | /ImageFormatControl/MultipleRegions |

| Values | Description |
|---|---|
| *`Disabled`* | The selected subregion is disabled. |
| *`Valid`* | The selected subregion is enabled and has a valid configuration. |
| *`OverlapError`*[1] | The selected subregion is enabled but has an invalid configuration. |

[1]**Note**: Invalid subregions are excluded automatically from the resulting frame.

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