Allied Vision

USB3 Vision cameras

Mako U

Features Reference

V1.1.0

Allied Vision Technologies GmbH // Taschenweg 2a, D-07646 Stadtroda // Germany

2019-Feb-06

Document at a glance

Read this document carefully

To make best use of Mako U cameras.

Applied standards

The document describes in alphabetical order the basic and advanced camera controls for Allied Vision Mako U cameras as seen from **Vimba Viewer**.

These features comply with:

- USB3 Vision Standard V1.0.1
- GenICam Standard Features Naming Convention (SFNC) V2.2
- GenICam Transport Layer Standard Features Naming Convention (GenTL SFNC) V1.0
- AIA Pixel Format Naming Convention (PFNC) V2.0
- GenICam Generic Control Protocol (GenCP) V1.0.

Downloads of applied common standards

For SFNC, GenTL SFNC, and GenCP, see http://genicam.org

For USB3 Vision and PFNC, see https://www.visiononline.org

Allied Vision custom features

Some features in this document are adapted SFNC features. Some features are custom features adding new functions to the features range defined by the SFNC.

Features availability

Availability of transport layer features

Features in the categories StreamInformation and BufferHandlingControl are not available with any other than the Allied Vision transport layer.

Different features for different camera models

This is the master document for all Mako U camera models. Some features are not available for all camera models.

For particular characteristics, see the corresponding technical manual, Chapter *Camera features available in Vimba*.

What else do you need?

The following downloads provide additional information and software.

Document	**Web link**
Mako U Camera Technical Manual	https://www.alliedvision.com/en/support/technical-documentation > Product Documentation > Mako U Cameras
USB Triggering Concept	https://www.alliedvision.com/en/support/technical-papers-knowledge-base
Software	**Web link**
Vimba, including **Vimba Viewer** and **Vimba Driver Installer**	https://www.alliedvision.com/software

Table 1: *Additional downloads overview*

Contact us

Connect with Allied Vision colleagues by function:

www.alliedvision.com/en/contact

Find an Allied Vision office or distributor:

www.alliedvision.com/en/about-us/where-we-are.html

Email:

info@alliedvision.com (for commercial and general inquiries)
support@alliedvision.com (for technical assistance with Allied Vision products)

Sales offices:

Europe, Middle East, and Africa: +49 36428-677-230
North, Central, and South America: +1 877 USA-1394
Asia-Pacific: +65 6634-9027
China: +86 21 64861133

Headquarters:

Allied Vision Technologies GmbH
Taschenweg 2a
07646 Stadtroda
Germany

Tel: +49 36428 677-0
Fax +49 36428 677-24

CEO/Geschäftsführer: Andreas Gerk
Registration Office: AG Jena HRB 208962

Tax ID: DE 184383113

Contents

Document history and conventions

This chapter includes:

Document history

Version	Date	Remarks
V.1.0.0	2015-Nov-06	New document release status
V1.1.0	2019-Feb-06	• Changed formatting • Updated web links • Corrected minor errors • Corrected maximum values for DeviceUserID • Updated the title image

Conventions used in this manual

To give this manual an easily understood layout and to emphasize important information, the following typographical styles and symbols are used:

Styles

Style	Function	Example
Emphasis	Programs, or highlighting important things	**Emphasis**
Publication title	Publication titles	*Title*
Cross reference	Links inside this document	Link
Web reference	Links to web pages	Link
Feature	Feature names	`Feature`
Feature value	Feature values (modes)	***`Value`***
Non-standard feature value	Marked with superscript[1]: Adapted standard features values or custom Allied Vision features values.	***`Value`***[1]

Symbols and notes

Notice: Avoid material damage

Practical Tip

Further information available online

Abbreviations

Abbreviation	Meaning
dB	Decibel
DN	Digital number
Hz	Hertz
µs	Microseconds
ms	Milliseconds
ns	Nanoseconds
R/W	Read and write feature
Rc	Read only feature that is constant
R	Read only feature that may change
s	Seconds
W	Write only feature

Features term use

For easier reading, USB3 Vision features are just named features in this document.

Features order

Features categories and features are listed in alphabetical order.

Selectors

Some features have multiple instances. For these features, `Selector` features define which instance of the feature is accessed.
Example: the `LineInverter` feature, used to invert internal signal polarity, can be applied to all input and output lines of the camera. The line is selected by the `LineSelector` feature.
The headline for the feature description is `LineInverter[LineSelector]`, according to the C language convention for arrays: a pair of brackets follows the feature name, like in `SelectedFeature[Selector]`.

Features description scheme

Features are described according to the formatting scheme:

Category name

Subcategory

Feature[Selector]

[Type] Access mode/s
Range [...]Unit: ...Default: Factory settings

Short feature description, including individual characteristics.

Note: Helpful information.

Value0	Description
Value1	Description
Value2[1]	Description

Non-standard feature values[1]

Feature values with superscript[1] adapted standard features values or custom Allied Vision features values.

Legal notice

Warranty

The information provided by Allied Vision is supplied without any guarantees or warranty whatsoever, be it specific or implicit. Also, excluded are all implicit warranties concerning the negotiability, the suitability for specific applications or the non-breaking of laws and patents. Even if we assume that the information supplied by us is accurate, errors and inaccuracy may still occur.

Copyright and trademarks

All content is subject to change without notice. For the latest version of this document, please visit our website. All trademarks are acknowledged as property of their respective owners. Use of these trademarks, logos, and brands does not imply endorsement.

USB3 Vision features description

This chapter includes:

Different features for different camera models

This is the master document for all Allied Vision USB3 Vision camera models. Some features are not available for all camera models.

To see particular characteristics see the corresponding technical manual, Chapter *Camera features available in Vimba*.

Selectors do not change feature settings

A selector determines a feature to be accessed. No feature settings are changed when a selector is set.

Camera state after reboot

After reboot the camera comes up in UserSetDefault. At delivery this feature is set to factory settings. To change the state of the camera after reboot, you can define UserSets.

AcquisitionControl

AcquisitionAbort

[Command] W

Aborts acquisition immediately. This ends the capture without completing the current frame or waiting for a trigger.

Note: If no acquisition is in progress, the command is ignored.

Deviation from the standard: A started exposure will be aborted immediately. If sensor readout is already active, the respective frame will be completed (behavior like AcquisitionStop).

AcquisitionFrameCount

[Integer] R/W
Unit: Frames

Controls the number of frames to acquire in AcquisitionMode = ***`MultiFrame`***.

AcquisitionFrameRate

[Float] R/W
Unit: Hz

Controls the acquisition rate at which the frames are captured.

Note: `TriggerMode[TriggerSelector]` for the frame trigger must be set to ***Off***.

Before you can change the value of `AcquisitionFrameRate`, you must set AcquisitionFrameRateMode1 to ***Basic***.

If `AcquisitionFrameRateMode` is set to ***Off***, the value shown in `AcquisitionFrameRate` does not influence the current framerate.

AcquisitionFrameRateMode[1]

[Enumeration] R/W (custom)

Determines the behavior of AcquisitionFrameRate.

Note: If the selected ExposureTime is shorter than the maximum allowed by AcquisitionFrameRate, the maximum allowed value is used.

The maximum `ExposureTime` is also limited by factors such as readout time, camera internal processing, the interface, and DeviceLinkThroughputLimit.

Off	AcquisitionFrameRate turns frame rate to read only.
Basic	ExposureTime has precedence over AcquisitionFrameRate; if `ExposureTime` gets longer than the inverse of `AcquisitionFrameRate`, this will be allowed.

AcquisitionMode

[Enumeration] R/W

Sets the acquisition mode of the camera. It defines mainly the number of frames to capture during an acquisition and the way the acquisition stops.

SingleFrame	One frame is captured.
MultiFrame	Number of frames specified by AcquisitionFrameCount is captured.
Continuous	Frames are captured continuously until stopped with the AcquisitionStop or AcquisitionAbort command.

AcquisitionStart

[Command] W

Starts the acquisition of the camera. The number of frames captured is specified by AcquisitionMode.

Note: In contrast to the SFNC, we normally perform a feature value validation when setting registers; this means before starting acquisition, values do not have to be validated. All features are consistent, you can call AcquisitionStart.

AcquisitionStatus[AcquisitionStatusSelector]

[Boolean] R

Reads the state of the internal acquisition signal selected using AcquisitionStatus-Selector.

Note: Vimba Viewer polls the `AcquisitionStatus` every 500 ms.
The display in the Vimba Viewer may toggle between ***False*** and ***True***, depending on the selected signal and the current camera state.

False	Selected acquisition signal is not active.
True	Selected acquisition signal is active.

AcquisitionStatusSelector

[Enumeration] R/W

Selects the internal acquisition signal to read using image/payload data over the USB interface.

AcquisitionActive	Camera is currently acquiring one or many frames.
AcquisitionTransfer	Camera is currently transferring an acquisition of one or many frames.
AcquisitionTriggerWait	Camera is currently waiting for an AcquisitionStart trigger.
ExposureActive	Camera is currently exposing a frame.
FrameActive	Camera is currently capturing a frame.
FrameTriggerWait	Camera is currently waiting for a FrameStart trigger.

AcquisitionStop

[Command] W

Stops acquisition of the camera at the end of the current frame. It is mainly used when AcquisitionMode is ***Continuous***, but it can be used in any AcquisitionMode.

Note: If the camera is waiting for a trigger, the pending frame will be canceled. If no acquisition is in progress, the command is ignored.

Disabling the running acquisition means that an already running exposure will be finished and all images in the pipeline will be transfered.

ExposureMode

[Enumeration] R/W

Controls the operation mode of the exposure (or shutter).

Timed	Timed exposure. Exposure duration time is set using `ExposureTime`. Exposure starts with ***FrameStart***.
TriggerWidth	Timed exposure. Exposure duration time is set using width of the current frame or line trigger signal(s) pulse.

Note: If the frame or line TriggerActivation[TriggerSelector] is ***RisingEdge*** or ***LevelHigh***, the camera exposes as long as the trigger is high. If TriggerActivation[TriggerSelector] is ***FallingEdge*** or ***LevelLow***, the camera exposes as long as the trigger is low.

ExposureTime

[Float] R/W
Unit: µs

Controls the duration of the photosensitive cells assembling.

TriggerActivation[TriggerSelector]

[Enumeration] R/W

Specifies the activation mode of the trigger.

AnyEdge	Trigger is considered valid on the falling or rising edge of the source signal.
FallingEdge	Trigger is considered valid on the falling edge of the source signal.
LevelHigh	Trigger is considered valid when level is high.
LevelLow	Trigger is considered valid when level is low.
RisingEdge	Trigger is considered valid on the rising edge of the source signal.

TriggerDelay[TriggerSelector]

[Float] R/W
Unit: µs

Specifies the delay to apply after the trigger reception before activating it.

TriggerMode[TriggerSelector]

[Enumeration] R/W

Switches the selected trigger to ***On/Off***.

Off	Disables the selected trigger
On	Enables the selected trigger

TriggerSelector

[Enumeration] R/W

Selects the trigger to configure.

AcquisitionStart	Selects AquisitionStart trigger.
FrameStart	Selects FrameStart trigger.

TriggerSoftware[TriggerSelector]

[Command] W

Generates an internal trigger. TriggerSource[TriggerSelector] must be set to ***Software***.

TriggerSource[TriggerSelector]

[Enumeration] R/W

Specifies the internal signal or physical input line to use as trigger source. The selected trigger must have its TriggerMode[TriggerSelector] set to ***On***.

Software	Specifies that the trigger source will be generated by software using the TriggerSoftware[TriggerSelector] command.
Line0 to Line3	Specifies which physical line (or pin) and associated I/O control block to use as external source for the trigger signal.

AnalogControl

BlackLevel[BlackLevelSelector]

[Float] R/W
Unit: DN

Controls the analog black level as DC offset applied to the video signal.

BlackLevelSelector

[Enumeration] R/W

Selects that the BlackLevel[BlackLevelSelector] is controlled for ***All*** channels.

All	`BlackLevel` will be applied to all channels or taps.

Gain[GainSelector]

[Float] R/W
Unit: dB

Controls the selected gain as an amplification factor applied to the video signal.

GainSelector

[Enumeration] R/W

Selects which gain is controlled by the various `Gain` features.

All	`Gain` will be applied to all channels or taps.

Gamma

[Float] R/W
Unit: dB

Controls the gamma correction of pixel intensity.

BufferHandlingControl

Features availability for third-party software

- Features in this category are usually not available in the camera features of third-party software that is not based on **Vimba**.
- Features marked as custom in this category are not available with any other than the Allied Vision transport layer.

MaxDriverBuffersCount

[Integer] R/W (custom)

Controls the maximum number of driver buffers used by the acquisition engine.

StreamAnnounceBufferMinimum

[Integer] Rc
Default: 0

Displays the minimal number of buffers to announce to enable the selected StreamBufferHandlingMode.

Corresponds to the STREAM_INFO_BUF_ANNOUNCE_MIN command of DSGetInfo function.

Note: For Vimba, the value is 0. Vimba buffers can be announced during streaming.

For third-party software, the value is 1, buffers must be announced before starting the streaming.

StreamAnnouncedBufferCount

[Integer] R

Displays the number of announced buffers on this stream (known to the transport layer).
Corresponds to the STREAM_INFO_NUM_ANNOUNCED command of DSGetInfo function.

StreamBufferHandlingMode

[Enumeration] R

Controls the available acquisition modes of this stream.

Note: Use ***`Default`*** value to acquire images with the mean processing time being shorter than acquisition time. (Later GenTL SFNC versions have replaced ***`Default`*** by ***`OldestFirst`***.)

No buffer is discarded or overwritten in the output buffer queue. Filled buffers are delivered in the order they were acquired.

`Default`	In the buffer queue between camera and host, if the number of images exceeds the number of empty buffers, the camera drops new data until empty buffers are available again.

CorrectionControl

This is an Allied Vision custom category. The `CorrectionControl` feature tree enables access to correction data and settings saved in the camera.

To read from or write to the camera, `FileAccessControl` is used. The SFNC describes most included features in detail.

The following flow charts provide an example how to organize file operations. In the example, UserSet data are to be written for the first time. Factory settings are used as base information to be edited.

- Reading the correction settings on page 23
- Reading the data size on page 23
- Deleting the correction settings on page 24
- Writing the correction settings on page 24

Read-Delete-Write

Before writing new data:

- Read previous data to the PC and store it for recovery.
- Delete data from the camera's non-volatile memory.

Keep factory correction settings untouched

On delivery, factory data for ***`DefectPixelCorrection`*** and ***`FixedPatternNoiseCorrection`*** are saved as ***`Factory`*** settings.

Before editing DefectPixelCorrection, store the factory settings. This way, in case of an error, you can reset correction settings to factory settings.

Be extremely careful when writing correction settings

When you have replaced correction settings you cannot return to the previous settings. Read the following description carefully.

Reading the correction settings

The following example shows correction settings being read from the camera to the host PC for the Defect pixel correction (DPC).

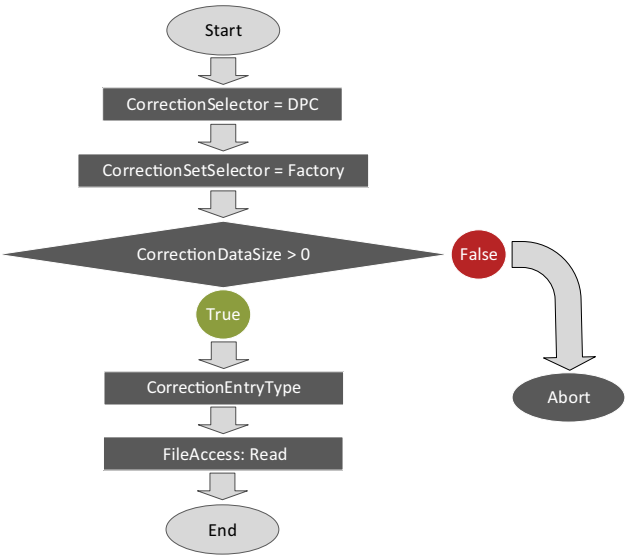

Figure 1: CorrectionControl, reading factory settings from the camera

Reading the data size

The following example shows the `CorrectionDataSizeMaxLimit` for the DPC being read from the camera. The value is camera specific.

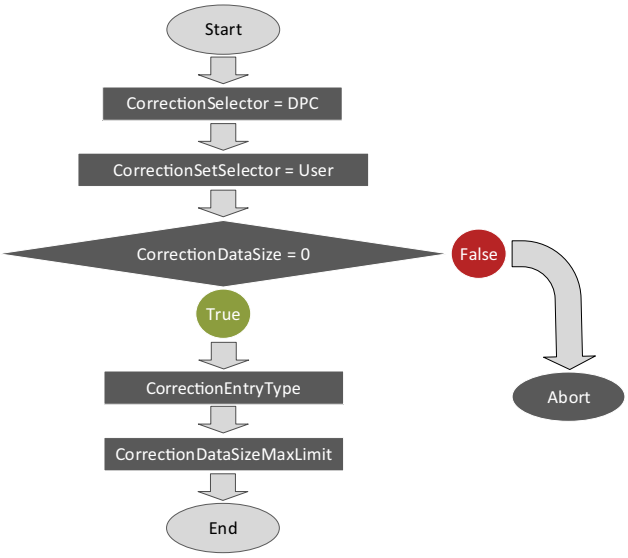

Figure 2: CorrectionControl, reading the CorrectionDataSizeMaxLimit

Deleting the correction settings

The following example shows the correction data for DPC being deleted to prepare writing new data to the camera.

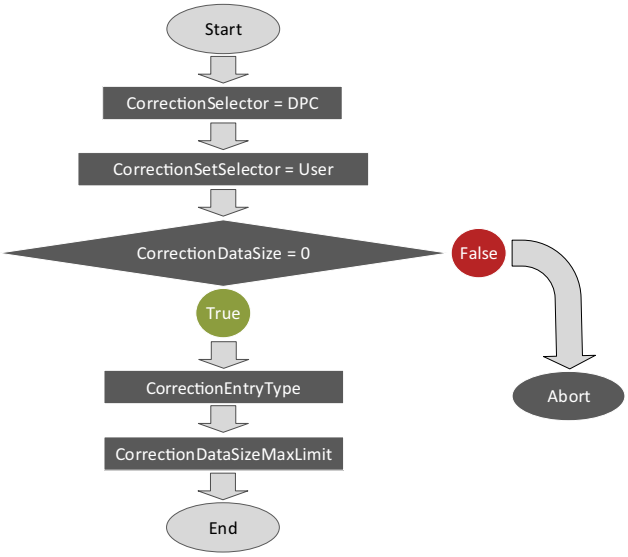

Figure 3: CorrectionControl, deleting the correction settings

Writing the correction settings

The following example shows the correction data for DPC being written to the camera.

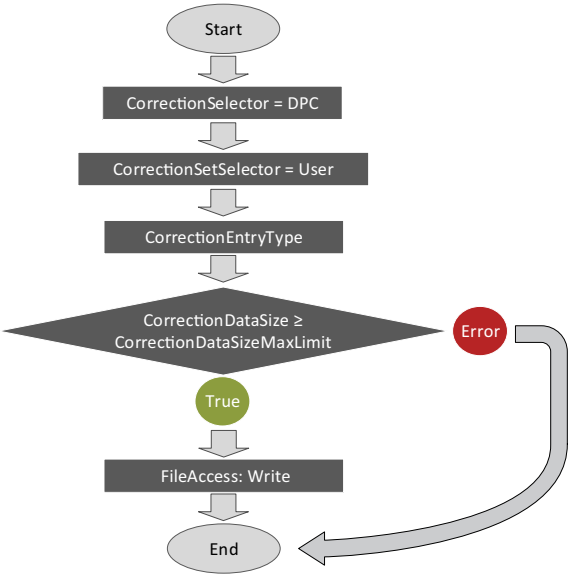

Figure 4: CorrectionControl, writing the correction settings

CorrectionMode[CorrectionSelector][CorrectionSetSelector]

[Enumeration] (custom)

Defines if the selected correction is active.

Note: This feature is disabled if no correction data is found in the camera's non-volatile memory.

Off	Selected correction is inactive.
On	Selected correction is active.

CorrectionSelector

[Enumeration] (custom)

Selects the correction type.

DefectPixelCorrection	Selects `DefectPixelCorrection`.
FixedPatternNoiseCorrection	Selects `FixedPatternNoiseCorrection`.

CorrectionSetSelector

[Enumeration] (custom)
Default: Factory

Defines which correction settings are used.

Factory	Selects the correction set stored by the manufacturer.
User	Selects the correction set created by the user.

CorrectionSetDefault[CorrectionSelector]

[Enumeration] (custom)
Default: Factory

Defines the default CorrectionSet used when the camera is reset.

Note: This default setting is independent from the UserSetDefault feature.

Factory	Selects the correction set stored by the manufacturer.
User	Selects the correction set created by the user.

CorrectionInfo (subcategory)

This Allied Vision custom subcategory defines information about the selected correction type.

CorrectionDataSize[CorrectionSelector][CorrectionSetSelector]

[Integer] R (custom)
Unit: [Byte]

Displays the current size of the correction data that is stored inside the camera.

CorrectionDescription[CorrectionSelector]

[String] R (custom)

Displays information about the selected correction.

CorrectionEntryType[CorrectionSelector]

[Enumeration] R (custom)

Displays the correction type variant used inside the camera.

2	`CorrectionEntryType2` is active.

DeviceControl

DeviceFamilyName

[String] Rc

Identifies the product family of the camera.

DeviceFirmwareID[DeviceFirmwareIDSelector]

[String] Rc (custom)

Displays the ID of the camera, depending on the settings of the DeviceFirmwareIDSelector.

DeviceFirmwareIDSelector

[Enumeration] Rc (custom)

Selects the ID given back by the DeviceFirmwareID[DeviceFirmwareIDSelector] .

Current	Displays the active firmware ID.
Supported	Displays all allowed firmware IDs.

DeviceFirmwareVersion[DeviceFirmwareVersionSelector]

[String] Rc

Displays the version of the camera firmware depending on the settings of the DeviceFirmwareVersionSelector.

Checking consistency of a firmware update

A firmware update is executed in multiple files. On the camera, with each file received, all the firmware files are checked for consistency.

As long as not all the files have a consistent version number, the `DeviceFirmwareVersion` outputs 0.0.0. When all the files have been transferred successfully, the firmware version is displayed.

DeviceFirmwareVersionSelector

[Enumeration] R (custom)

Selects the version given back by the DeviceFirmwareVersion[DeviceFirmwareVersionSelector].

Note: To avoid the following, apply a firmware update according to the instructions only. In an **inconsistent state of the programmed firmware**, after the next restart of the camera, the camera falls back into ***Bootloader Mode***.
In this case, please contact support@alliedvision.com.

Current	Displays the active firmware version.
Programmed	Displays the firmware version after the next restart of the camera.

DeviceGenCPVersionMajor

[Integer] Rc

Displays the major version of the GenCP protocol supported by the camera.

DeviceGenCPVersionMinor

[Integer] Rc

Displays the minor version of the GenCP protocol supported by the camera.

DeviceIndicatorMode

[Enumeration] R/W

Controls the behavior of the LEDs showing the status of the camera.

Active	Device's indicators are active showing their respective status.
ErrorStatus	Device's indicators are inactive unless an error occurs.
Inactive	Device's indicators are inactive (off).

DeviceLinkThroughputLimit

[Integer] R
Unit: bytes per second

Limits the maximum bandwidth of the data that will be streamed out by the camera on the selected link. In order to control the peak bandwidth, delays will be uniformly inserted between transport layer packets.

Note: Any transport layer specific bandwidth control should be kept in sync with this control as much as possible.

DeviceLinkThroughputLimitMode

[Enumeration] R/W

Controls if DeviceLinkThroughputLimit is active.

When disabled, lower level transport layer specific features are expected to control the throughput. **When enabled**, DeviceLinkThroughputLimit controls the overall throughput.

Off	Disables `DeviceLinkThroughputLimit`.
On	Enables `DeviceLinkThroughputLimit`.

DeviceManufacturerInfo

[String] Rc

Displays manufacturer information about the camera.

DeviceModelName

[String] Rc

Displays the model of the camera.

DeviceReset

[Command] W

Resets the camera to its power up state.

Note: After reset, the camera must be rediscovered.

DeviceSFNCVersionMajor

[Integer] Rc

Displays the major version of the Standard SFNC that was used to create the camera's GenICam XML.

DeviceSFNCVersionMinor

[Integer] Rc

Displays the minor version of the SFNC that was used to create the camera's GenICam XML.

DeviceSFNCVersionSubMinor

[Integer] Rc

Displays the sub minor version of the SFNC that was used to create the camera's GenICam XML.

DeviceScanType

[Enumeration] R

Displays the scan type of the sensor of the camera.

Areascan	Using the sensor in area mode (not in line mode).

DeviceSerialNumber

[String] Rc

Identifies the camera's serial number. This string is a unique identifier of the camera.

DeviceTemperature

[Float] R
Unit: °C

Displays the camera temperature measured at the location selected by DeviceTemperatureSelector.

DeviceTemperatureSelector

[Enumeration] R/W

Selects the location within the camera where temperature is measured.

Mainboard	Selects measuring the mainboard temperature.

DeviceUserID

[String] R/W
Range [maximum 63 characters]

Controls a user-programmable camera identifier.

DeviceVendorName

[String] Rc

“Allied Vision” identifies the name of the camera manufacturer.

DeviceVersion

[String] Rc
Range [maximum64 bytes]

Displays the version of the camera as a string, consisting of custom build number, major version, minor version, and patch version of the camera firmware, divided by periods.

Timestamp

[Integer] R
Unit: ns

Displays the current value of the camera timestamp counter.

DigitalIOControl

The `DigitalIOControl` feature tree controls the input of external signals to the camera and the output of camera signals to external cameras. The following flow charts show I/O control settings for the typical use cases:

- Controlling cameras with an external trigger
- Cameras as master and slave

Controlling cameras with an external trigger

In the example, an external signal is used as FrameStart trigger. I/Os need no LineMode[LineSelector] settings. Set GPIOs to input or output as desired.

Optional settings

TriggerActivation[TriggerSelector] selects, for example, the rising edge of the signal as trigger.

LineInverter[LineSelector] enables to set a common logic level as active signal for all in and outputs.

InputDebounceMode[LineSelector] enables to filter the accepted signal by its length defined by InputDebounceTime[LineSelector].

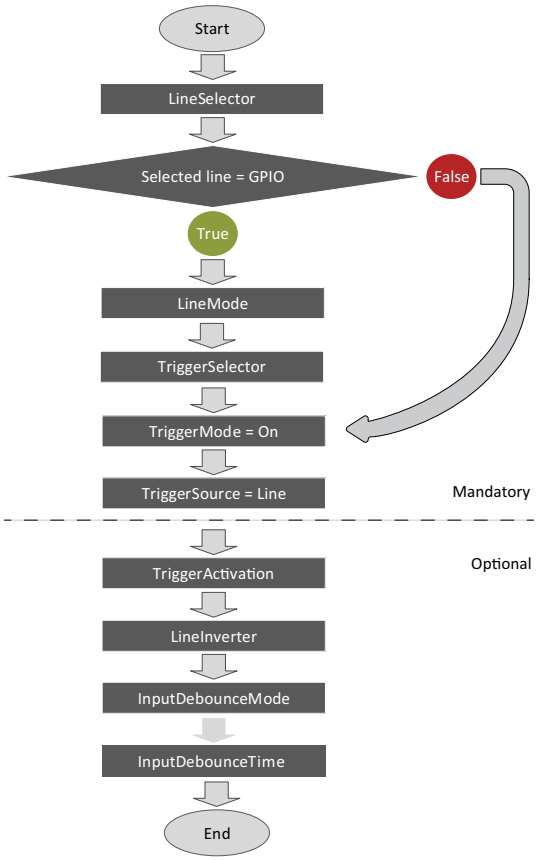

Figure 5: DigitalIOControl, settings to control the camera with an external signal

Cameras as master and slave

For simultaneous exposure, instead of signaling cameras individually, cameras can be signaled as daisy chain with master and slave cameras.

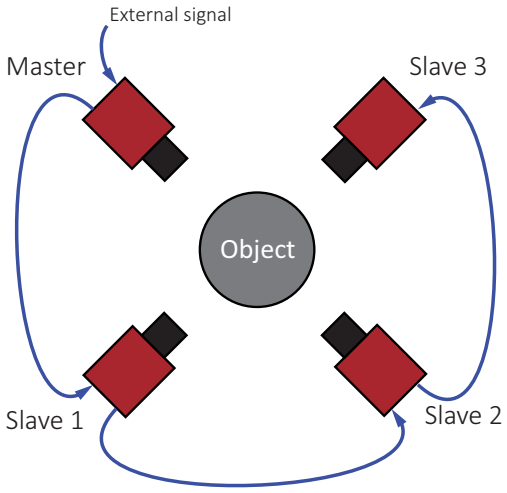

Figure 6: DigitalIOControl, master and slave cameras

Master camera settings

In the example, when the master camera is exposing it signals the slave cameras.

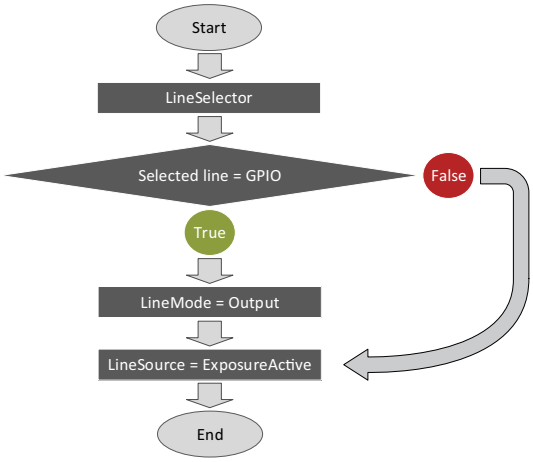

Figure 7: DigitalIOControl, settings to control the camera with an external signal

Slave camera settings

The slave cameras are controlled as shown in Controlling cameras with an external trigger on page 31.

InputDebounceMode[LineSelector]

[Boolean] R/W (custom)

Switches the debounce function for a particular input line to ***On/Off***. If a line is configured as output (dedicated or selectable), this feature has no effect.

Off	Signals of any length are accepted/valid for the I/Os.
On	Only signals are accepted for the I/Os that have a length defined in InputDebounceTime[LineSelector].

InputDebounceTime[LineSelector]

[Float]R/W (custom)
Unit: µs

Sets the minimum time for a glitched input signal to be definite before it is accepted.

Note: If a line is configured as output (dedicated or selectable), this feature has no effect.

LineInverter[LineSelector]

[Boolean] R/W

Controls the inversion of the signal of the selected input or output line.

False	Line signal is not inverted.
True	Line signal is inverted.

LineMode[LineSelector]

[Enumeration] R/W

Controls if the physical Line is used to input or output a signal.

Note: When a line supports input and output mode, the default state is ***Input*** to avoid damage to camera and peripheral electronics.

Input	The selected physical line is used to input an electrical signal.
Output	The selected physical line is used to output an electrical signal.

LineSelector

[Enumeration] R/W

Selects the physical line (or pin) of the external camera connector or which virtual line of the transport layer to configure.

Note: When a line is selected, all other line features will be applied to the line's associated I/O control block and will condition the resulting input or output signal.

Line0	Selects physical Line0 and the associated I/O control block.
Line1	Selects physical Line1 and the associated I/O control block.
Line2	Selects physical Line2 and the associated I/O control block.
Line3	Selects physical Line3 and the associated I/O control block.

LineSource[LineSelector]

[Enumeration] R/W (modified SFNC feature)
Proprietary ***values*** are formatted ***red***.

Selects which internal acquisition or I/O source signal to output on the selected line.

Note: LineMode[LineSelector] must be set to ***Output***.

The ***UserOutput*** can be used to loop a signal from the host through the camera to another camera.

Off	Line output is disabled (Tri-State).
AcquisitionActive	Camera is currently acquiring one or many frames.
AcquisitionTriggerWait	Camera is currently waiting for an AcquisitionStart trigger.
ExposureActive	Camera is currently exposing a frame.
FrameActive	Camera is currently exposing a frame or reading out from the sensor.
FrameTriggerWait	Camera is currently waiting for a FrameStart trigger.
ReadoutActive[1]	Camera is currently reading out from the sensor.
Stream0TransferActive	Image data is transferred over the USB interface. For this transfer the logical channel Stream0 is used. The SFNC defines the ability of multiple streams using multiple channels.
UserOutput0	Bit state of UserOutput0, defined by its current UserOutputValue[UserOutputSelector]
UserOutput1	Bit state of UserOutput1, defined by its current UserOutputValue[UserOutputSelector]
UserOutput2	Bit state of UserOutput2, defined by its current UserOutputValue[UserOutputSelector]
UserOutput3	Bit state of UserOutput3, defined by its current UserOutputValue[UserOutputSelector]

LineStatus[LineSelector]

[Boolean] R

Returns the current status of the selected input or output line.

False	Level of the line signal is low.
True	Level of the line signal is high.

OutputDurationMode[LineSelector]

[Enumeration] R/W (custom)

Switches OutputDurationTime[LineSelector] for a particular output line to ***On/Off***.

Note: If a line is configured as input (dedicated or selectable), this feature has no effect.

Off	`OutputDurationTime` is disabled.
On	`OutputDurationTime` is enabled.

OutputDurationTime[LineSelector]

[Float] R/W (custom)
Unit: µs

Specifies the minimum time a signal is provided at the output line. This feature may be used for internal signals that are active for a very short time frame (such as a single clock cycle).

Note: If a line is configured as input (dedicated or selectable), this feature has no effect.

UserOutputSelector

[Enumeration] R/W

Selects which bit of the UserOutput register will be set by UserOutputValue[UserOutputSelector].

UserOutput0	Selects the bit 0 of the UserOutput register.
UserOutput1	Selects the bit 1 of the UserOutput register.
UserOutput2	Selects the bit 2 of the UserOutput register.
UserOutput3	Selects the bit 3 of the UserOutput register.

UserOutputValue[UserOutputSelector]

[Boolean] R/W

Controls the value of the bit selected by UserOutputSelector.

Note: If a line is configured as input (dedicated or selectable), writing this feature has no effect.

This feature has an effect only on features set up with LineSource[LineSelector]= ***UserOutputX***.

False	Feature is disabled.
True	Feature is enabled.

FileAccessControl

The `FileAccessControl` feature tree enables access to data and settings saved in the camera. The SFNC describes all included features in detail. The following flow charts show general examples how to organize file operations.

- Reading a file on page 38
- Deleting a file on page 39
- Writing a file on page 40

Read-Delete-Write

Before writing new data:

- Read previous data to the PC and store it for recovery.
- Delete data from RAM.

Keep factory correction settings untouched

On delivery, factory data for ***`DefectPixelCorrection`*** and ***`FixedPatternNoiseCorrection`*** are saved as ***`Factory`*** settings.

Before editing DefectPixelCorrection, store the factory settings. This way, in case of an error, you can reset correction settings to factory settings.

Use Vimba Viewer to ease software coding for camera controls

Features in this category are shown in **Vimba Viewer** for completeness, not for using them.

Therefore, we recommend to execute `FileAccessControl` using tools, such as the Firmware Updater.

To get an overview, see coding examples in **Vimba**.

The camera closes the file after timeout

Setting FileOperationSelector[FileSelector] = ***`Open`*** is followed by a 5 s timeout. The timeout is restarted with each FileOperationExecute[FileSelector][FileOperationSelector]. After timeout, the camera automatically returns to `FileOperatioSelector` = ***`Closed`***.

Reading a file

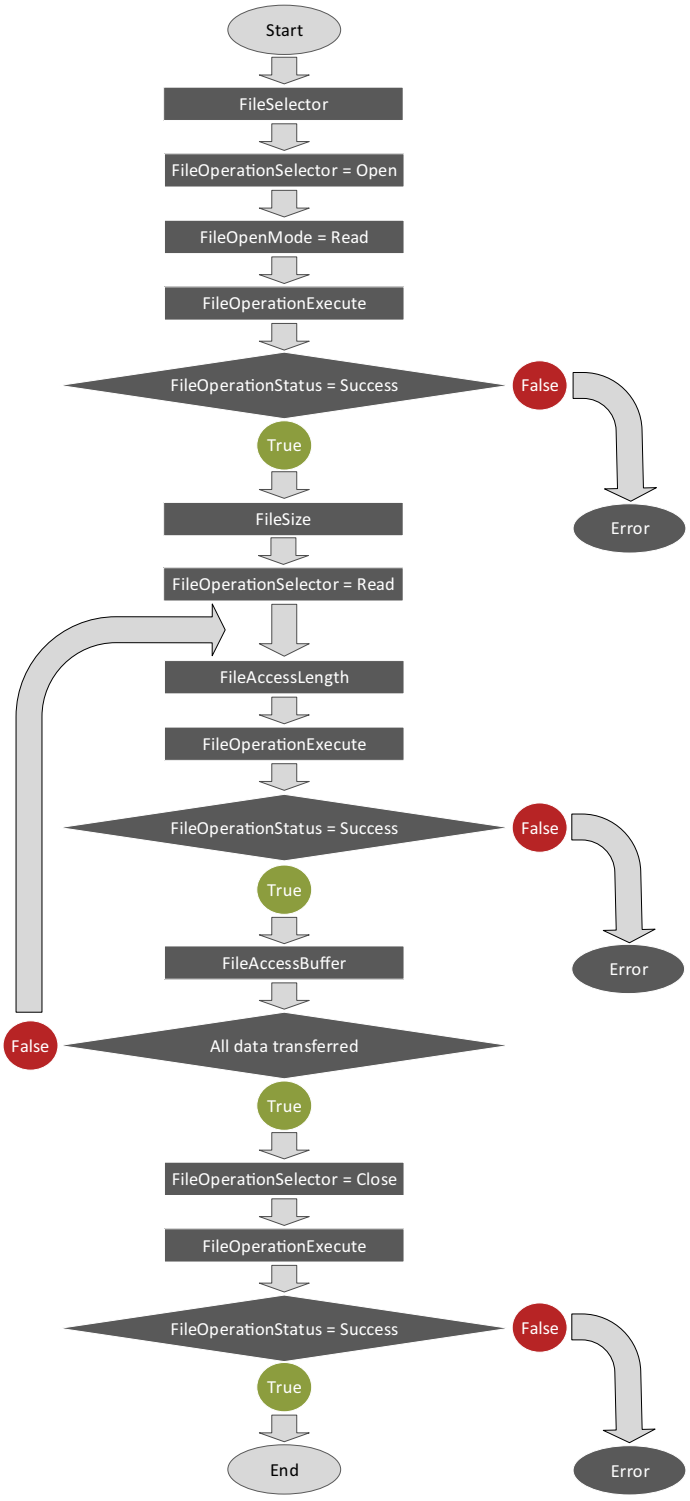

Figure 8: FileAccess, reading a file

Deleting a file

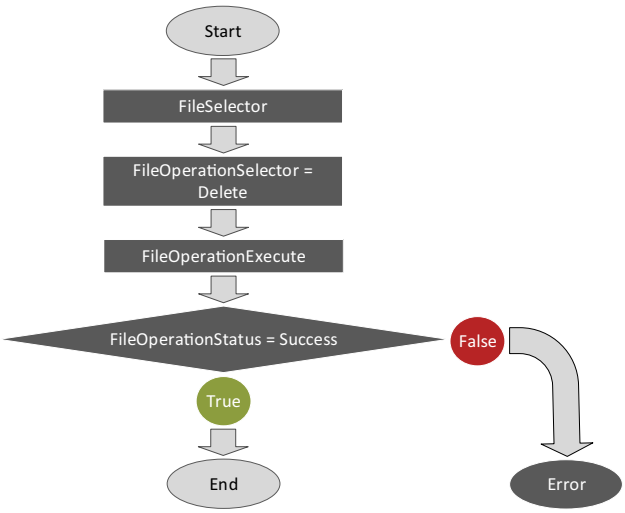

Figure 9: FileAccess, deleting a file

Writing a file

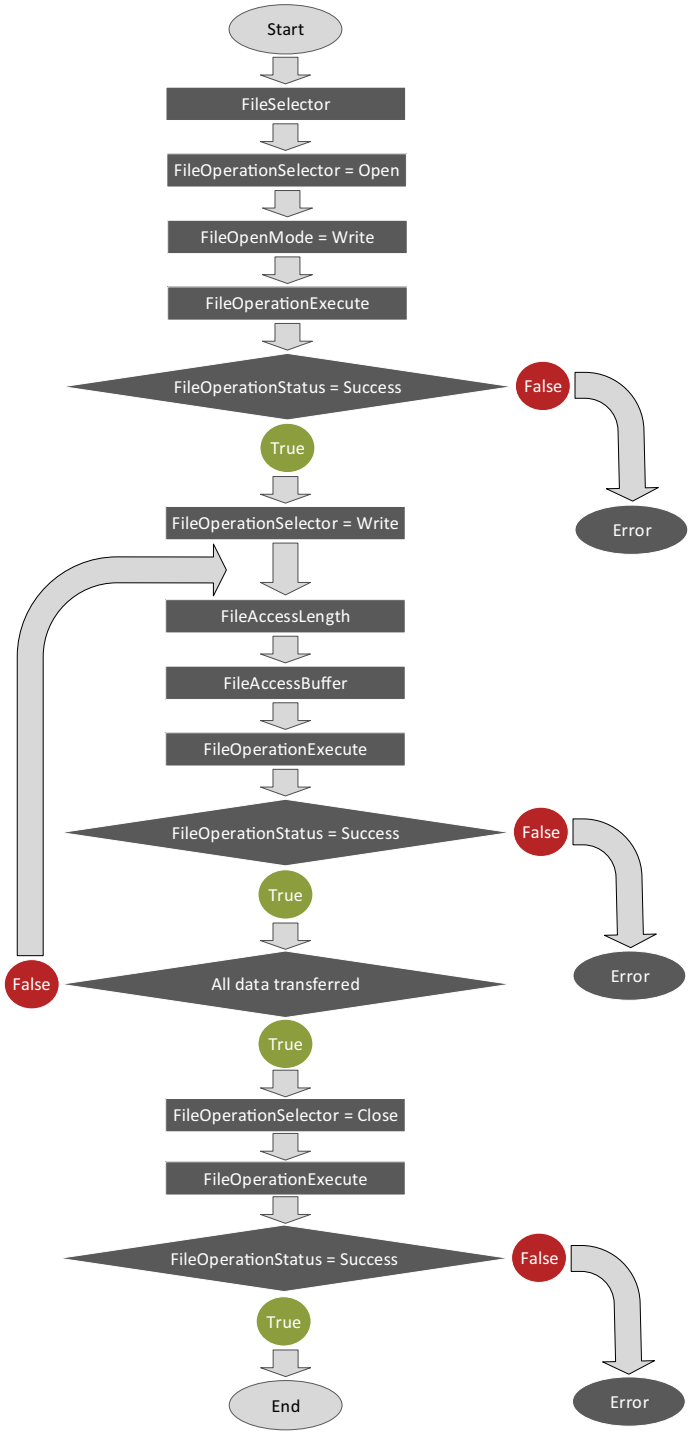

Figure 10: FileAccess, witing a file

FileAccessBuffer

[DataRaw] R

Controls the intermediate access buffer for the exchange of data between the camera file storage and the application.

Note: For write operation, `FileAccessBuffer` must be written with the target data first.

For read operation, data can be read from the `FileAccessBuffer` after the read operation has been executed.

FileOperationExecute[FileSelector][FileOperationSelector] controls the effective data transfer.

Click here to open	Input field to enter data

FileAccessLength[FileSelector][FileOperationSelector]

[Integer] R/W
Unit: bytes

Controls the number of bytes transferred between the camera file storage and the FileAccessBuffer.

Note: This feature is available only when FileOperationSelector[FileSelector] is set to ***Read*** or ***Write***.

FileAccessOffset[FileSelector][FileOperationSelector]

[Integer] R
Unit: bytes

Controls the offset of the mapping between the camera file storage and the FileAccessBuffer.

FileOpenMode[FileSelector]

[Enumeration] R/W

Selects the access mode in which a file is opened in the camera.

Read	Value to select read-only open mode.
Write	Value to select write-only open mode.

FileOperationExecute[FileSelector][FileOperationSelector]

[Command] W

Executes the operation selected by FileOperationSelector[FileSelector] for the selected file.

FileOperationResult[FileSelector][FileOperationSelector]

[Integer] R

Displays the file operation result. For read or write operations, the number of successfully read/written bytes is returned.

FileOperationSelector[FileSelector]

[Enumeration] R/W

Selects the target operation for the selected file in the camera. This operation is executed when FileOperationExecute[FileSelector][FileOperationSelector] is called.

Close	Closes the file selected by FileSelector in the camera.
Delete	Deletes the file selected by FileSelector in the camera. Note that deleting a camera file should not remove the associated FileSelector entry to allow future operation on this file.
Open	Opens the file selected by FileSelector in the camera. The access mode in which the file is opened is selected by FileOpenMode[FileSelector].
Read	Reads FileAccessLength[FileSelector][FileOperationSelector] bytes from the camera storage at the file relative offset FileAccessOffset[FileSelector][FileOperationSelector] into FileAccessBuffer.
Write	Writes FileAccessLength[FileSelector][FileOperationSelector] bytes taken from the FileAccessBuffer into the camera storage at the file relative offset FileAccessOffset[FileSelector][FileOperationSelector].

FileOperationStatus

[Enumeration] R

Displays the file operation execution status.

Success	File operation was successful.

FileProcessStatus[FileSelector][FileOperationSelector]

[Enumeration] R (custom)
Default: None

Displays the status of files processing during a file access to the host, saving time and data traffic.

None	No action by the host is required, either because no file is being processed or because file processing is executed properly.
UpdateNotRequired	The resident file version is current. Therefore, no update is needed.

FileSelector

[Enumeration] R/W

Selects the target file in the camera.

Note: UserData are stored in the camera's non-volatile memory.

Firmware	Selects firmware.
DefectPixelCorrection	Selects Defect pixel correction.
FixedPatternNoiseCorrection	Selects Fixed pattern noise correction.
UserData	Selects UserData.

FileSize[FileSelector]

[Integer] R
Unit: bytes

Displays the size of the selected file in bytes.

FileStatus

[Enumeration] R (custom)

Represents the status of the selected file.

Open	Selected file is open.
Closed	Selected file is closed.

ImageFormatControl

Height

[Integer] R/W
Unit: Pixels

Controls the height of the image provided by the camera used for region of interest (ROI).

Note: This dimension is calculated after vertical binning, decimation or any other function changing the vertical dimension of the image.

For other ROI settings concerning image height, see HeightMax and OffsetY.

HeightMax

[Integer] R
Unit: Pixels

Displays the maximum height of the image.

Note: This dimension is calculated after vertical binning, decimation or any other function changing the vertical dimension of the image.

For other ROI settings concerning image height, see Height and OffsetY.

OffsetX

[Integer] R/W
Unit: Pixels

Controls the horizontal offset from the origin to the region of interest (ROI).

OffsetY

[Integer] R/W
Unit: Pixels

Controls the vertical offset from the origin to the region of interest (ROI).

PixelFormat

[Enumeration] R

Controls the format of the pixels provided by the camera.

Download PFNC standard

For AIA Pixel Format Naming Convention (PFNC) see:
https://www.visiononline.org

Mono8	Mono8 unpacked according to PFNC.
Mono10	Mono10 unpacked according to PFNC.
Mono10p	Mono10 packed according to PFNC.
Mono12	Mono12 unpacked according to PFNC.
Mono12p	Mono12 packed according to PFNC.

PixelSize

[Enumeration] R

Despite the name, this feature returns the bit depth of the current `PixelFormat`.

Note: This may be useful when controlling the BlackLevel[BlackLevelSelector] if the values of the enumeration (hence the register values) correspond directly to the bit depth.

Bpp8	bit depth per pixel is 8 bit.
Bpp10	bit depth per pixel is 10 bit.
Bpp12	bit depth per pixel is 12 bit.

ReverseX

[Boolean] R/W

Flips the image horizontally.

Note: Region of interest (ROI) is applied after the flipping.

False	Image is not flipped horizontally.
True	Image is flipped horizontally.

SensorHeight

[Integer] Rc
Unit: Pixels

Displays the effective height of the sensor.

SensorWidth

[Integer] Rc
Unit: Pixels

Displays the effective width of the sensor.

Width

[Integer] R/W
Unit: Pixels

Controls the width of the image provided by the camera for region of interest (ROI).

Note: This dimension is calculated after horizontal binning, decimation or any other function changing the horizontal dimension of the image.

For other ROI settings concerning image height, see WidthMax and OffsetX.

WidthMax

[Integer] R
Unit: Pixels

Displays the maximum width of the image.

Note: This dimension is calculated after horizontal binning, decimation or any other function changing the horizontal dimension of the image.

For other ROI settings concerning image height, see Width and OffsetX.

StreamInformation

Features availability for third-party software

Features in this category are usually not available in the camera features of third-party software that is not based on the **Vimba transport layer** (TL).

StreamID

[String] R

Displays the camera's unique ID for the stream, for instance a globally unique identifier (GUID).

StreamIsGrabbing

[Boolean] R

Indicates whether the acquisition engine is started or not.

False	Acquisition engine is not started.
True	Acquisition engine is started.

StreamType

[Enumeration] R

Displays the transport layer type of the data stream.

USB3	USB3 Vision type is active.

TestControl

TestPendingAck

[Integer] R/W
Values: ≥0 Unit: ms

Tests the camera's pending acknowledge feature. When this feature is written, the camera waits the time period corresponding to the value of `TestPendingAck` before acknowledging the write.

Note: For writing this feature, the camera must use a pending acknowledge during the completion of this request if its duration exceeds the maximum camera response time.

When read, the camera returns the current feature value within the defined time. However, communications with the host can exceed this time.

TransportLayerControl

PayloadSize

[Integer] R
Unit: bytes

Displays the number of bytes transferred for each image on the stream channel. This is the total size of data payload for a data block.

UserSetControl

UserSetDefault and trigger settings

When you save a UserSet including trigger settings, consider that after restart, the camera expects a trigger before you can receive an image.

UserSetDefault

[Enumeration] R/W

Selects the UserSet to be loaded by default when the camera is reset.

Note: In ***Default*** value, the camera boots with the default factory settings for continuous acquisition.

Default	Selects the factory settings UserSet.
UserSet1	Selects UserSet1.
UserSet2	Selects UserSet2.
UserSet3	Selects UserSet3.
UserSet4	Selects UserSet4.

UserSetLoad[UserSetSelector]

[Command] W

Loads the UserSet specified by UserSetSelector to the camera to enable it.

UserSetSave[UserSetSelector]

[Command] W

Saves the UserSet specified by UserSetSelector to the camera's non-volatile memory.

UserSetSelector

[Enumeration] R/W

Selects the UserSet to be loaded, saved, or configured.

Default	Selects the factory settings UserSet, read only.
UserSet1	Selects UserSet1.
UserSet2	Selects UserSet2.
UserSet3	Selects UserSet3.
UserSet4	Selects UserSet4.

Index

W

µ