Vision Point Application Acquisition Mode
User Guide

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2023		6.3.0

KAYA INSTRUMENTS

www.kayainstruments.com

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1   Revision History

Version	Date	Notes
1.0	07/2014	Initial release - Support for: Predator Frame Grabber
2.0	07/2015	App release 1.0.8.362 Support for: Predator Frame Grabber, Komodo Frame Grabber, Komodo4R4T Frame Grabber, Komodo Fiber Additional options and functionality: - Saves image as .raw file - Extracts XML file from camera - Silent Discovery Mode
3.0	03/2016	Application release 3.0 - Application renamed from Predator to Vision Point
4.0	11/2016	Application release 4.0 Support for: CLHS cameras implementing 10G X protocol and 10G GigE Vision cameras Additional options and functionality: - Windows 10 support - Multiple cameras support - Save Video and Replay Mode - Packed data output and queued buffer mechanism
4.1	07/2017	Application release 4.1 - Support for both Camera Simulator and Frame Grabber - Documentation improvements
4.2	09/2017	Application release 4.2 - Support for all KAYA Instruments JetCam HS Cameras - Documentation improvements - Troubleshoot section was added
4.3	04/2018	Application release 4.3 - New Python API - New .NET API
4.4	09/2018	Application release 4.4 - Saving video buffer - additional file output formats
5.0	03/2019	Application release 2019.1/API 5.0 - Automatic monitoring of PoCXP for CoaXPress cameras - Added description for toolbar new and modified features
5.0.1	05/2019	Application release 2019.1/API 5.0.1 - Added "Grabber Links" parameter to indicate the device link connection - Indication message about camera connection loss - Camera re-detection retains open cameras
5.1	07/2019	Application release 2019.2/API 5.1 - Added "Color Correction" - visualization of image processing features - Added "Color Histogram" - picture color segmentation - Improved representation of IP and MAC address parameter types - Saves video buffer and individual frames in TIFF format
5.1 (patch)	09/2019	Application release 2019.2/API 5.1 (Service pack 7) - Improved description for automatic PoCXP management (section 5.11) - Added automatic PoCXP functionality monitoring option available in Tools-> Options

5.1 (patch)	12/2019	Application release 2019.2/API 5.1 (Service pack 9) - Review and minor corrections in the system requirements section
5.2	06/2020	Application release 2020.1/API 5.2 - Document rearrangement
5.3	08/2020	Application release 2020.2/API 5.3 - Minor corrections in the system requirements section
5.4	12/2020	Application release 2020.3/API 5.4 - Review and minor corrections
5.4 (patch)	04/2021	Application release 2020.3/API 5.4 (Service pack 1) - Review and minor corrections
6.0	09/2021	Application release 2021.1/API 6.0 - New "Dark Field" and "Flat Field" correction features section - New "Grid Lines" features section - Updated Important Notes and Limitations section - Added CXP2 Heartbeats indication section
6.1	04/2022	Application release 2022.1/API 6.1 - Search option added to 'Camera' tab - Code samples added to 'Camera' tab
6.2	09/2022	Application release 2022.2/API 6.2 - Added open/close selected camera section - Review and minor corrections
6.2 (patch)	11/2022	Application release 2022.2/API 6.2 (Service pack 1) - Minor fixes and improvements
6.3.0	01/2023	Application release 2023.1/API 6.3.0 - Figure update - Updated system requirements section - Document rearrangement and description fixes

Table 1 – Revision History

2   Figures and Tables

2.1   List of Figures

2.2   List of Tables

3   Introduction

3.1   Safety precautions

Please take the time to read through the precautions listed below to avoid preventable and unnecessary injuries and damage to you, other personnel, or property. Read these safety instructions carefully before your first use of the product, as these precautions contain safety instructions that must be observed. Be sure to follow this manual to prevent misuse of the product.

⚠️ Caution! Read carefully and do not disregard these instructions.
In the event of a failure, disconnect the power supply Disconnect the power supply immediately and contact our sales personnel for repair. Continuing to use the product in this state may result in a fire or electric shock.
If an unpleasant smell or smoking occurs, disconnect the power supply. Disconnect the power supply immediately! Continuing to use the product in this state may result in a fire or electric shock. After verifying that no smoking is observed, contact our sales personnel for repair.
Do not disassemble, repair or modify the product. Such actions may result in a fire or electric shock due to a circuit shortage or heat generation. Contact our sales personnel before inspection, modification, or repair.
Do not place the product on unstable surfaces. Otherwise, it may drop or fall, resulting in injury to persons or the camera.
Do not use the product if dropped or damaged. Otherwise, a fire or electric shock may occur.
Do not touch the product with metallic objects. Otherwise, a fire or electric shock may occur.
Do not place the product in dusty or humid environments, nor where water may splash. Otherwise, a fire or electric shock may occur.
Do not wet the product or touch it with wet hands. Otherwise, the product may fail or cause a fire, smoking, or electric shock.
Do not touch the gold-plated sections of the connectors on the product. Otherwise, the surface of the connector may be contaminated by sweat or skin oil, resulting in contact failure of a connector, malfunction, fire, or electric shock due to static electricity discharge.
Do not use or place the product in the following locations. ▪ Unventilated areas such as closets or bookshelves ▪ Near oils, smoke, or steam ▪ Next to heat sources ▪ A car with closed doors where the temperature can become hot ▪ Static electricity replete locations ▪ Near water or chemicals Otherwise, a fire, electric shock, accident, or deformation may occur due to a short circuit or heat generation.
Do not place heavy objects on the product. Otherwise, the product may be damaged.
Be sure to discharge static electricity from the body before touching any sensitive electronic components. The electronic circuits in your computer and the circuits on the cameras and the hardware boards are sensitive to static electricity and surges. Improper handling may seriously damage the circuits. In addition, do not let your clothing come in contact with the circuit boards or components. Otherwise, the product may be damaged.

3.2 Disclaimer

KAYA Instruments assumes no responsibility for any damage that may ensue by using this product for any purpose other than intended, as previously stated. Without detracting what was previously written, please be advised that the company takes no responsibility for any damages caused by:

- Earthquake, thunder strike, natural disasters, a fire caused by usage beyond our control, willful and/or accidental misuse and/or use under other abnormal and/or unreasonable conditions
- Secondary damages caused by the use of this product or its unusable state (business interruption or others)
- Use of this product in any manner that contradicts this manual or malfunctions due to connection to other devices.
- Damage to this product that is out of our control or failure due to modification.
- Accidents and/or third parties that may be involved.

Additionally, **KAYA Instruments** assumes no responsibility or liability for:

- Erasure or corruption of data caused by the use of this product
- Any consequences or other abnormalities following the use of this product

3.3 Overview

KAYA Vision Point App is a high-level windows application for supported KAYA PCI devices that provides a way to connect, calibrate, control, and capture images from your camera.
It allows:

- Monitoring and management of PoCXP for CoaXPress cameras
- Interfacing to various cameras
- Configuration of camera parameters
- Configuration of Frame Grabber parameters
- Capturing and viewing video streams
- Analyzing captured images
- Saving captured pictures to file
- Saving Frame Grabber and camera configuration to file
- Loading Frame Grabber and camera configuration from file

Vision Point App also provides an interactive and highly configurable camera simulation interface for the Chameleon camera simulators. Please refer to the KAYA Vision Point Camera simulator application User Guide document for Chameleon Camera Simulator mode.

For other KAYA products, such as cameras, range extenders, etc. please refer to respective documentation in our website: http://www.kayainstruments.com

3.4 System Requirements

To run the Vision Point App, a PC with the following is required:

- Intel x64 processor or compatible
- At least 4 GB of system memory
- One of the following operating systems:

    - Windows 10 64 bit OS
    - Ubuntu 18.04 / 20.04 64 bit OS

- Hard drive with 400 MB of free space
- At least one of KAYA Instruments Frame Grabber boards installed
- Internet connection

## 3.5 Important Notes and Limitations

1. Windows 7 is no longer supported (since version 2020.1, API 5.2)
2. Vision Point 2019.1 is the last version to support Windows 7 OS. We encourage our customers to switch to Windows 10 OS to support our latest updates and hotfixes
3. For Windows OS to support the latest version of Vision Point, please make sure your Windows is up to date, and all the latest updates and hotfixes are installed

    a. If your computer hardware does not support Windows 7 latest updates, please consider using the Vision Point 4.4 software version.
    b. To downgrade the Vision Point application from version 2019.1 to 4.4, please refer to the "Vision_Point_Software_Installation_Guide" document, troubleshooting section.

4. Inserting and/or removing KAYA PCI devices requires a reboot of the computer or restart of the "KAYA Instruments" service. After that, one may use Vision Point Application or open API examples with KAYA devices.
5. KAYA's API should **NOT** be used from the **DllMain** function on Windows OS. There are significant limitations on what you can safely do at a DLL entry point. See General Best Practices for specific Windows APIs that are unsafe to call in DllMain. If you need anything but the simplest initialization, do that with initialization function for the DLL. You can require applications to call the initialization function after DllMain has run and before they call any other functions in the DLL

4 Vision Point App components

The Vision Point App main window with all of its components, as shown in the following image:
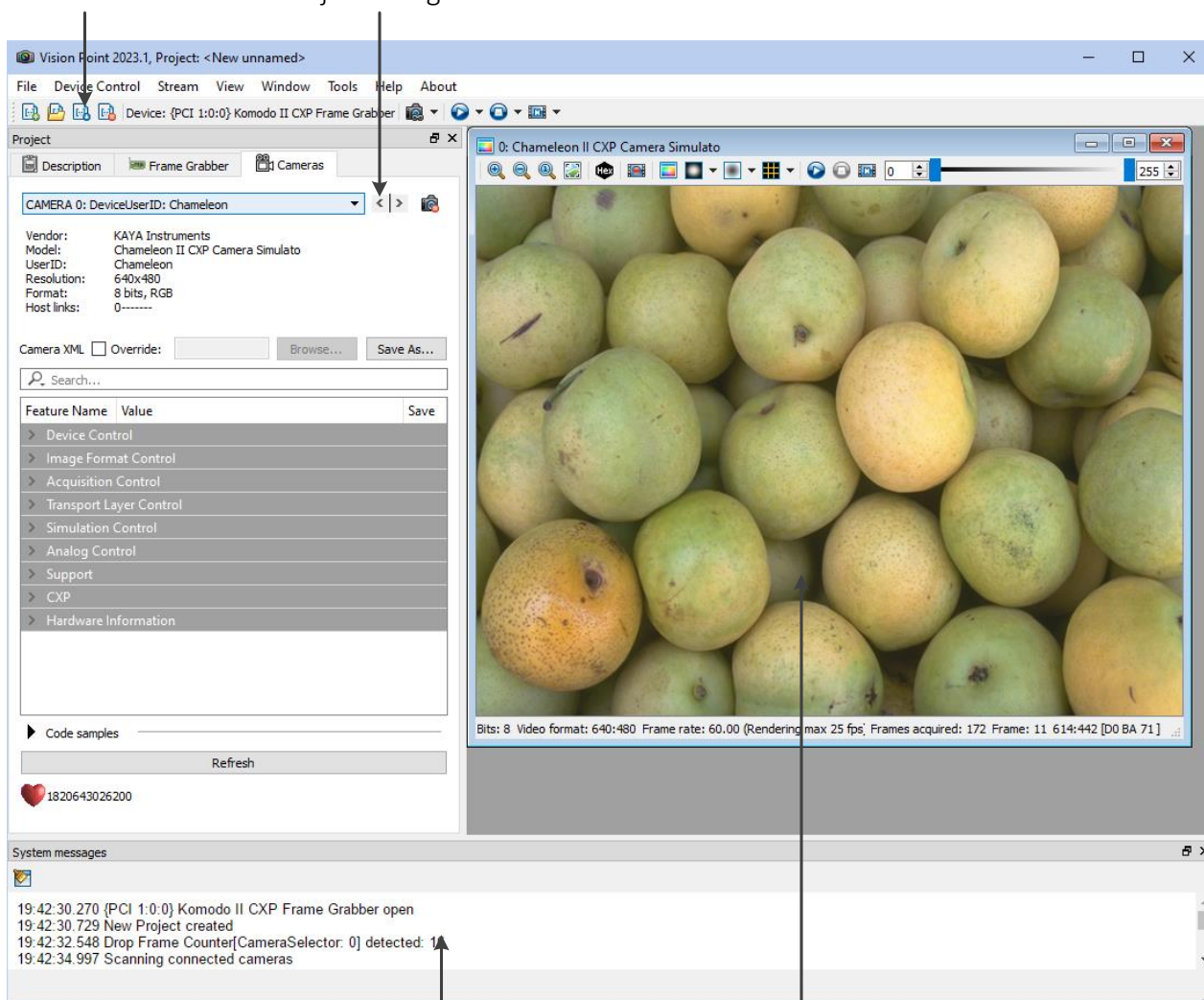
Figure 1 – Vision Point app main window

4.1   Main Toolbar Menu

The Toolbar Menu includes project operation buttons, hardware selection, and stream acquisition control buttons. The Toolbar Menu is shown below and includes the following components:

1. New Project button to create a new project from scratch
2. Open Project button to open an existing project or example
3. Save Project button to save the opened project and all of its configurations
4. Close Project button
5. Display of the previously selected device
6. Detect Cameras button to detect connected cameras for the chosen Frame Grabber. Arrow has two options:
   a. Full camera rescan
   b. Scan without open
7. Stop button to stop stream acquisition from a connected camera (arrow to stop acquisition on a specific camera)
8. Start button to start a continuous grab (arrow to start continues grab on a specific camera).
9. Single Grab button to grab one frame at a time (arrow down to grab 1 frame on a specific camera).
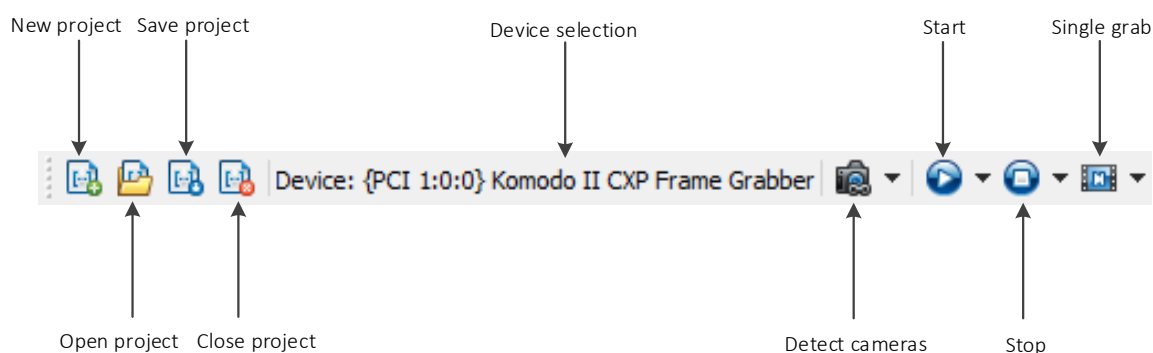

Figure 2 – Main toolbar menu

Starting from Vision Point 2019.1, the PoCXP management has been changed, and automatic power management was improved. KAYA Software stack is now constantly monitoring an available connection state and turning PoCXP on/off automatically. If the feature is not supported or deactivated, additional PoCXP control buttons would appear on the application open, and legacy manual PoCXP management should be used as described in section 5.12.

4.2 Project Navigator

The project navigator allows configuring and controlling the camera via standard Gen<i>Cam interface. It includes several tabs:

1. A Description tab is used to specify the project name and description, as shown in Figure 3.
2. A Frame Grabber tab describes Frame Grabber-related information and configurations, e.g. I/O control and hardware information, controlled using Gen<i>Cam interface. The Frame Grabber tab is shown in Figure 4.
3. A Camera tab enables configuring the camera Gen<i>Cam parameters listed in the camera XML file. An external XML file may be loaded in the absence of a native one from the camera. The camera tab is shown in Figure 5.
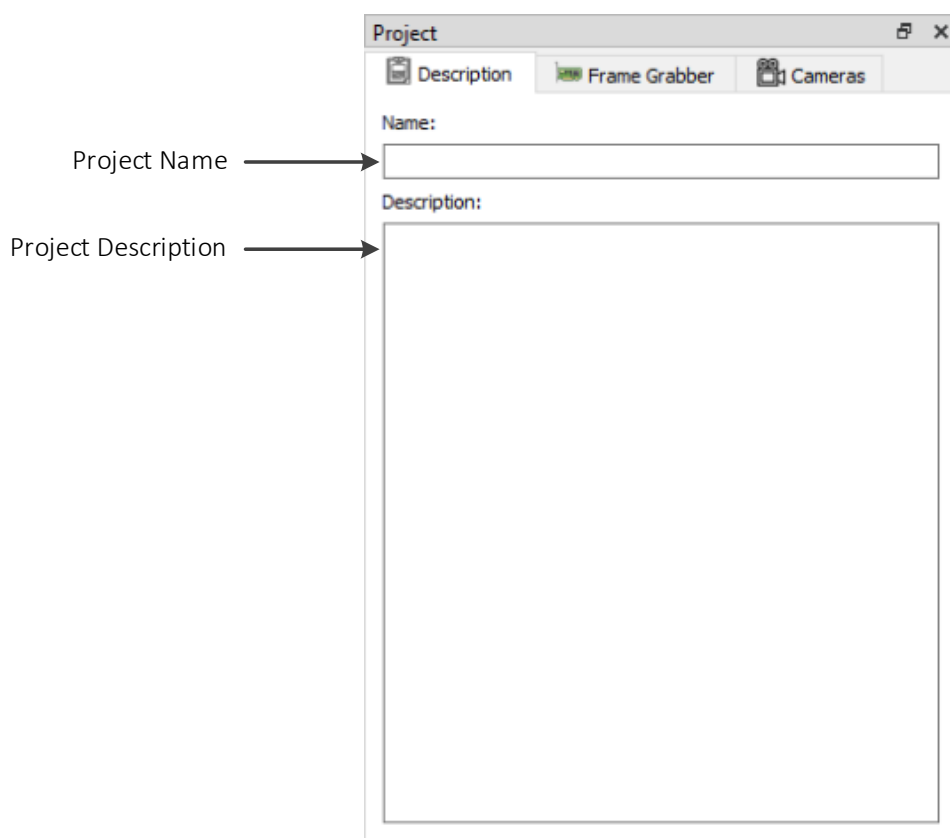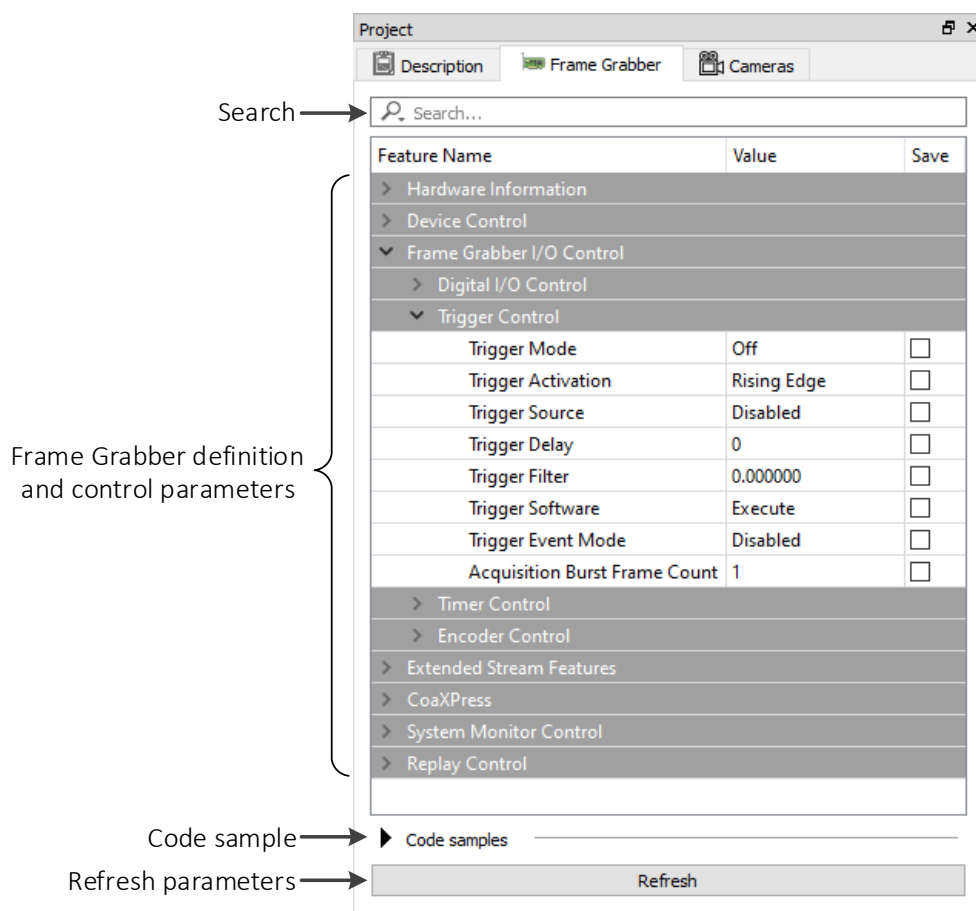

Figure 3 – Project description tab

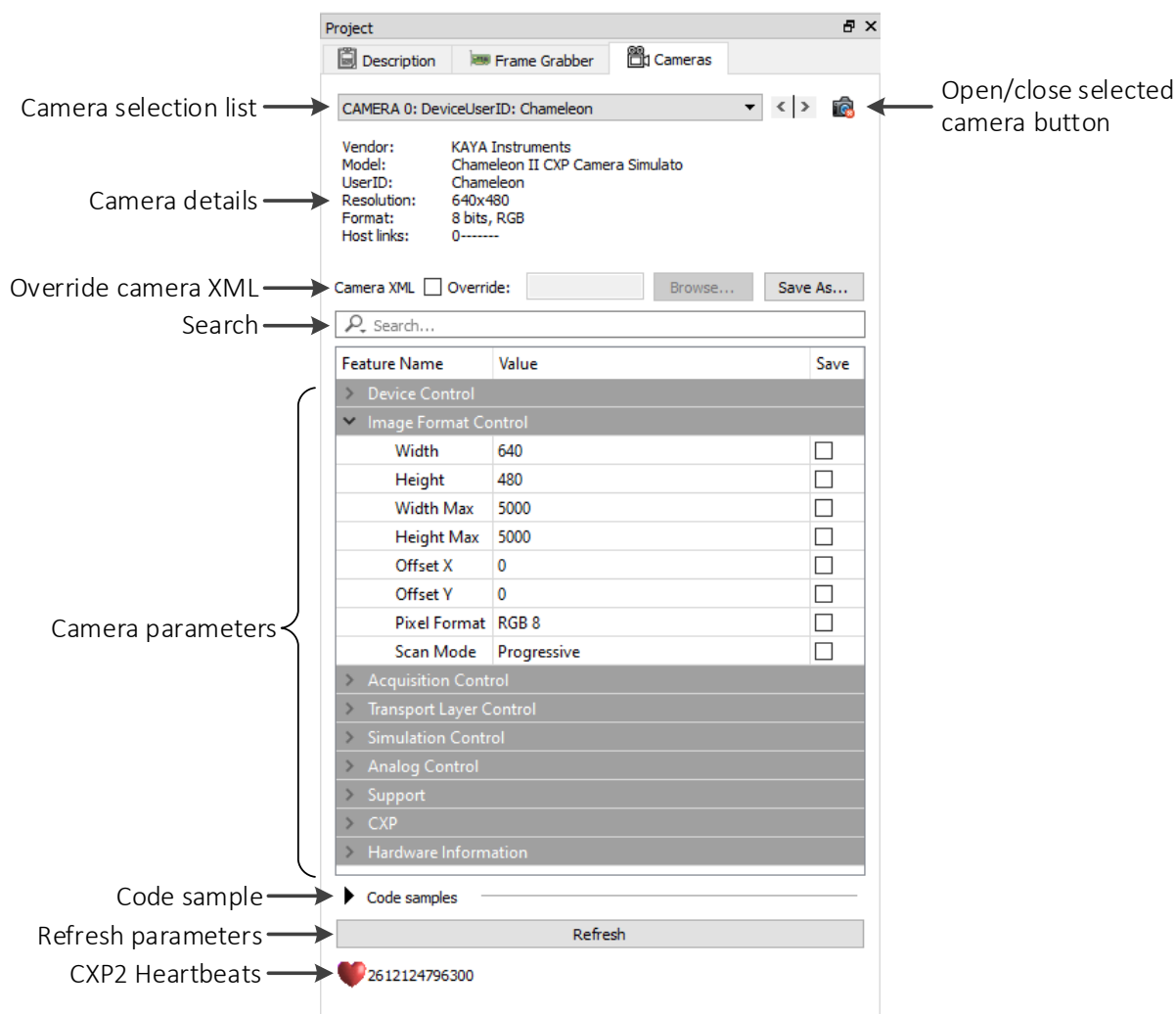Figure 4 – Frame Grabber navigator tab

Figure 5 – Camera navigator tab

4.3 System Messages Window

The system messages window displays general, run-time informational, and error messages regarding the state of stream grabbing and changes to various components. If it is not needed, the message window can be hidden/shown via the View tab of the Vision Point App menu bar. The system messages window is shown in the image below.
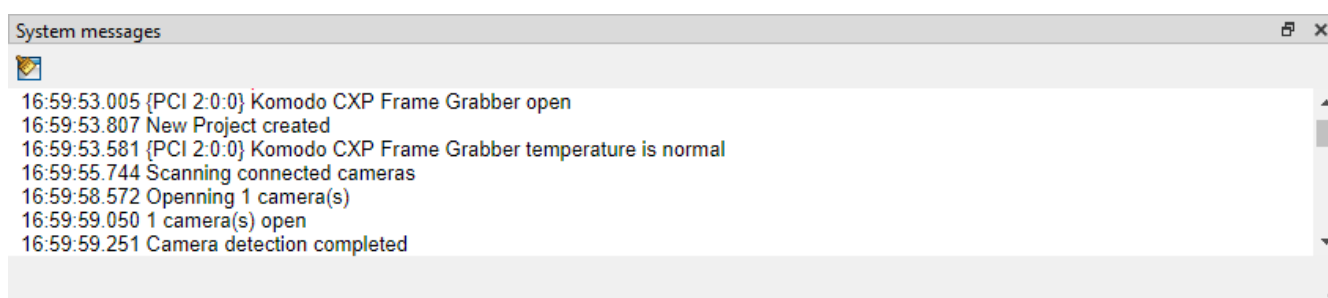

Figure 6 – System messages window

The system message window displays run-time information and error messages regarding the state of stream-grabbing and changes to various components. Click on the button to clear the Messages Window.

4.4   Acquisition Picture Window

The acquisition picture window displays the last frame that has been grabbed. Information on frame rate and image format can be found at the bottom of the picture window. The picture window can be seen in Figure 7.
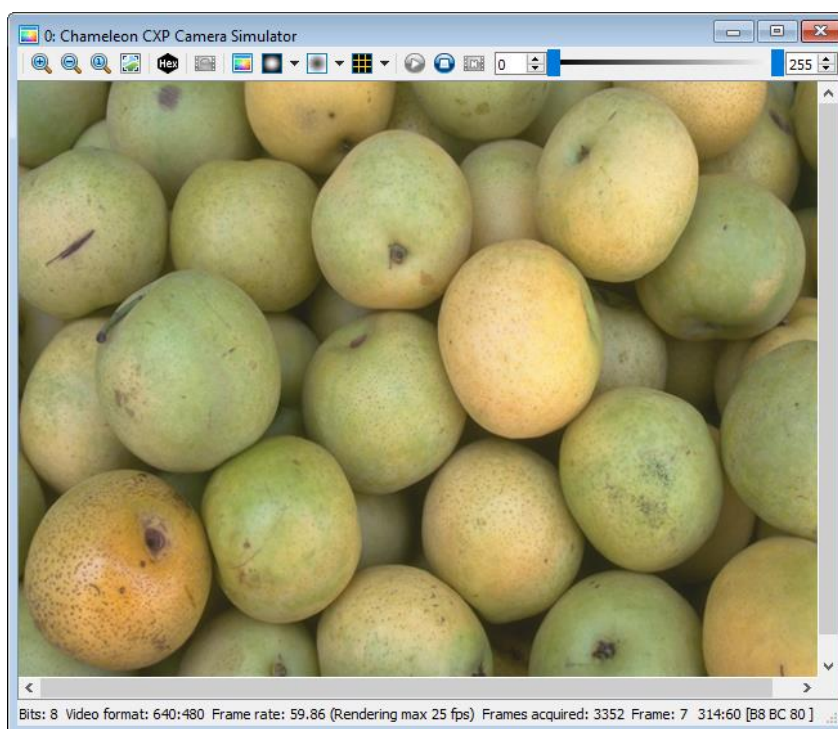

Figure 7 – Picture window

4.4.1   Picture Window Summary

The picture summary display toolbar is shown in Figure 8 and includes the following components:

1. Image format
2. Resolution of the image
3. Frame rate
4. Number of sent frames
5. Current frame number
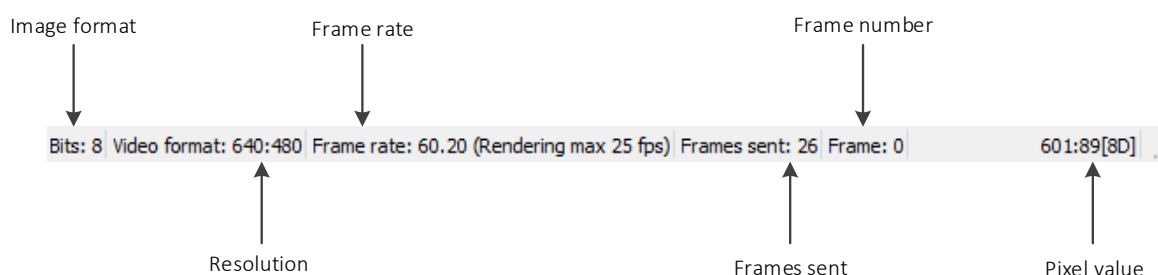6. Pixel value - location of the mouse cursor in x: y [R G B]

Figure 8 – Picture window summary display toolbar

In addition to the image dimension control buttons in the picture window toolbar, two features are available:

1. Moving picture (achieved by holding the left mouse button and moving the mouse)
2. Zoom IN/OUT using the scroll mouse button (achieved by moving the mouse cursor on top of the image and using the scroll button)

4.5   Color Correction Window

The color correction window visualizes the image processing systems, which are available in hardware and software. The image processing features are available for KAYA's Frame Grabbers and Cameras, which include Gen<i>Cam convention parameters. If the relevant parameters are not present in the hardware, the color correction controls become disabled.

4.5.1   Frame Grabber Image Processing

The Frame Grabber image processing features include Bayer de-mosaic (hardware and software) and color transformation matrix. The color transformation can be used for color correction operators, such as adjusting white balance, color transformation, brightness, or contrast. For monochrome images, a particular case of image transformation is applicable to achieve gain/offset operator.

Set the "Transformation Pixel Format" parameter value to "RGB8" to enable the de-mosaic format transformation. The Frame Grabber image processing window can be seen in Figure 9. Detailed information on Gen<i>Cam Frame Grabber parameters can be found in "KAYA Frame Grabber Programming Start-up Guide" sections 9.1.5 and 9.2.

1. Red output selection
    a. RR coef - Gain factor of R on Rin channel in the color transformation matrix
    b. GR coef - Gain factor of R on Gin channel in the color transformation matrix
    c. BR coef - Gain factor of R on Bin channel in the color transformation matrix

2. Green output selection
    a. RG coef - Gain factor of G on Rin channel in the color transformation matrix
    b. GG coef - Gain factor of G on Gin channel in the color transformation matrix
    c. BG coef - Gain factor of G on Bin channel in the color transformation matrix

3. Blue output selection
    a. RB coef - Gain factor of B on Rin channel in the color transformation matrix
    b. GB coef - Gain factor of B on Gin channel in the color transformation matrix
    c. BB coef - Gain factor of B on Bin channel in the color transformation matrix

4.5.2   Camera Image Processing

The Camera image processing features include Analog (Gain. Offset) and LUT Controls. The Analog Control parameters can be used to control and adjust the gain and the black level camera available features, while the LUT Control can be used to re-map the linear camera output differently, mainly to compensate for the non-linear scene emission. The Camera image processing window can be seen in Figure 10.

Detailed information on Gen<i>Cam Camera parameters can be found in "KAYA JetCam/Iron User Guide" sections 7 and 8.

1. Selection of digital gain
    a. Digital All – add gain to all the colors channels
    b. Digital Red – add gain only to the red color channel
    c. Digital Green – add gain only to the green color channel
    d. Digital Blue – add gain only to the blue color channel

2. Black level (offset) selection
    a. All colors channels
    b. Red color channel
    c. Green color channel
    d. Blue color channel

3. LUT color selection
    a. Red color channel
    b. Green color channel
    c. Blue color channel
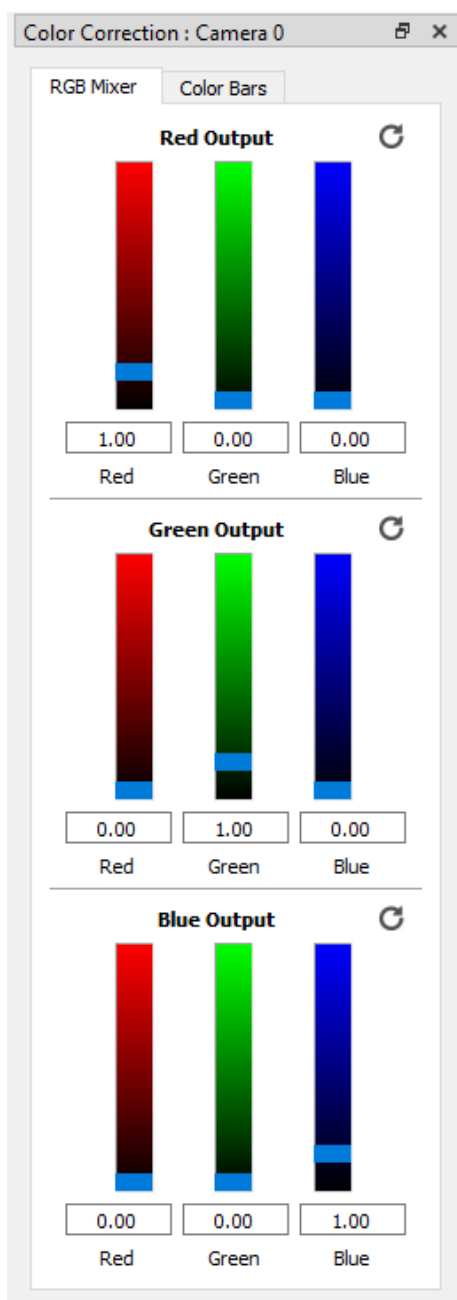   d. LUT Value All – adjust all channels LUT coefficients in a single access

Figure 9 – Frame Grabber image processing tab
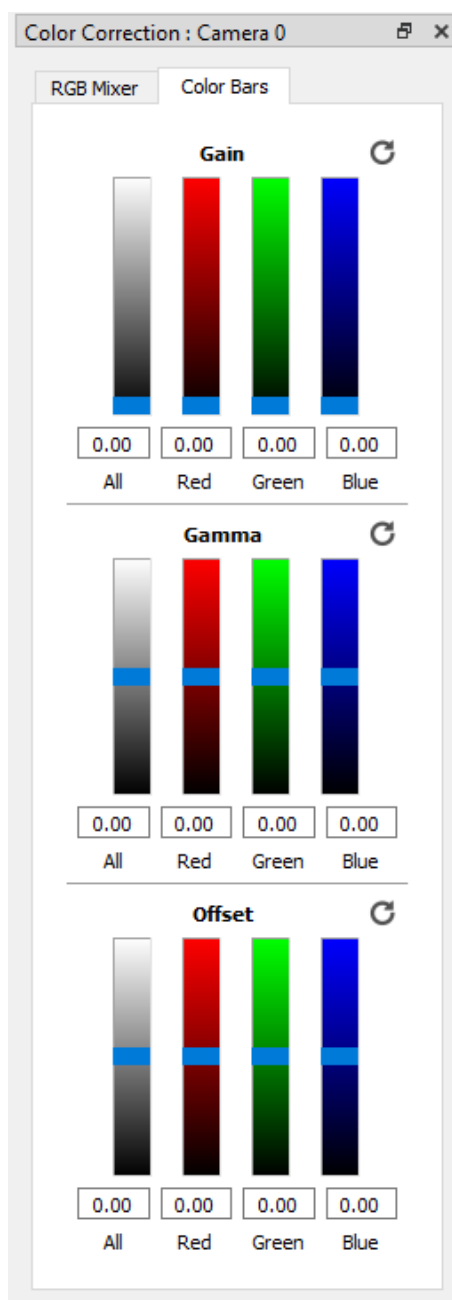

Figure 10 – Camera image processing tab

5 Vision Point App Basics

5.1 Using Vision Point App

This section describes the basic setup for connecting and configuring the Frame Grabber and connected cameras. The basic steps include:

1. Selecting a grabber board
2. Opening, creating, and closing a project
3. Updating the firmware
4. Adjusting the grabber parameters
5. Scanning and adjusting the camera parameters
6. Starting an image acquisition

5.2 Selecting a Grabber Board

A Vision Point App requires selecting a single KAYA Frame Grabber target board among the available boards, or running in demo mode with no hardware connection. Different boards may include different feature sets.
The target board is selected from the combo box and is only available when it's not mounted to any active project; in that case, the active project should be closed first. To select a target board:

- Click the ▼ button of the grabber selection combo box located on the Toolbar Menu
- When the list of available target boards opens, select the required board/demo mode from the list
- Click "Create new project" to create a new project from scratch or "Open existing project..." to open an existing one

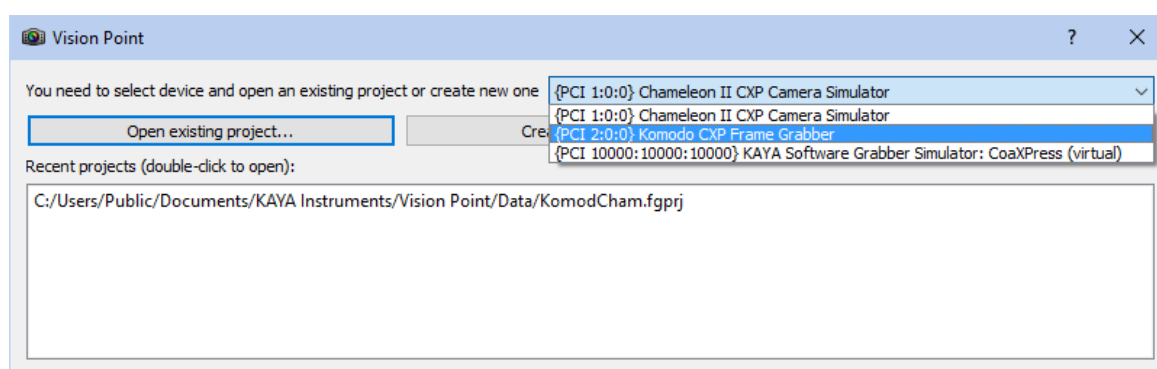The Grabber selection example is shown in the following figure.

Figure 11 – Selecting the Frame Grabber

5.3 Creating a New Project File

After a target board is selected, a new project can be opened.
To create a new project file, choose one of the options:

- Click "Create new project" button located on the application start dialog
- Use the 🖼️ button located on the Toolbar menu
- Click "New Project" located under "File" menu

5.4   Open a Project File

To open a project file, choose one of the options:

- Click "Open existing project" button located on the application start dialog
- Use the button located on the Toolbar menu
- Click "Open Project" located under "File" menu

Select the desired project file (file extension .fgprj). Upon project load, the corresponding parameters for the Frame Grabber and Camera would be retrieved. See section 0 to define the parameters that would be set upon a project load.

NOTE: *Please pay attention that if a project file is loaded with a different camera than the original one, it may cause some values not to be set and may alter the desired operation of the chosen camera.*

After selecting a new/existing project, a connection becomes locked for the chosen device, and you can start working with it. In order to connect to a different Frame Grabber, a new instance of the application should be opened.

5.5   Saving a Project

To save a project file, choose one of the options:

- Click "Save" or "Save As…" located under the "File" menu
- Use the button located on the Toolbar menu

5.6   Closing a Project

To close an opened project use choose one of the options:

- Click "Close" located under the "File" menu
- Use the button on the Toolbar Menu button

Closing a project disconnects it from the previously connected Frame Grabber. Now you can connect to a new Frame Grabber using either the "New Project" or "Open Project" option or connect to the same device.

NOTE: *Closing the project window using the X button simply closes it without closing the project itself. Display options can be found under the "View" menu.*

5.7   Firmware Update

After creating a project, a firmware update option is available. The "Firmware update..." option can be found under the "Grabber Control" category, as shown in Figure 12. For more detailed information, please refer to section 8.2.
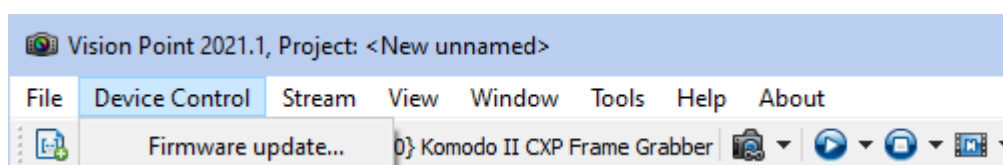

Figure 12 – Firmware update

5.8 Adjusting the Frame Grabber parameters

The Frame Grabber configurations contain its related features and controls. Hardware information, stream state, I/O definition, and more can be modified using the standard Gen<i>Cam interface. Each feature's description is provided via the tooltips in the Vision Point application. The Frame Grabber parameters can be configured under the "Frame Grabber" tab in the project dialog, as shown in Figure 13.

5.9 Adjusting the Camera Parameters

The camera configuration contains many parameters. Some of the parameters are standard CoaXPress features; some are camera dependent and, some affect the image type and geometry. Before starting the image acquisition, the camera should be modified to the desired configurations or simply left with the default ones.
The parameters can be configured under the "Camera" tab in the project dialog, as shown in Figure 5. Please refer to your camera manufacturer manual for a description of the camera parameters.

5.10 Code Sample

This additional tool allows the user to understand better the parameter configuration and command execution related to the Frame Grabber device and the connected cameras. A "Code sample" window can be exposed for each parameter by pressing on the ▶ button, showing a short description of the currently chosen command and a setter/getter function calls (if available). This feature can be found in the Frame Grabber tab, and an example of its usage is shown in the image below.
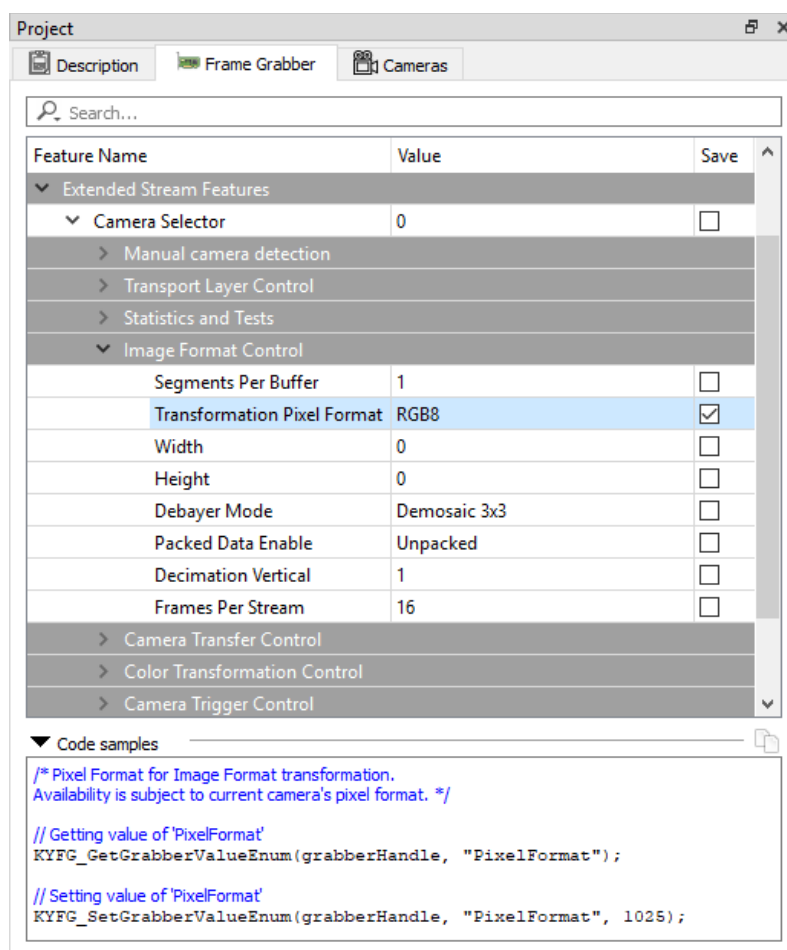

Figure 13 – Code sample

5.11 PoCXP Automatic Management

Starting from Vision Point 2019.1 (API 5.0), the PoCXP management has been changed and improved automatic power management. KAYA Software stack is now constantly monitoring an available connection state and turning PoCXP on/off automatically. The camera's power is turned on in the background by the Frame Grabber, even when no Vision Point or other KAYA API-based application is running.

This improved feature allows an effortless and quick connection to CoaXPress cameras, which support automatic PoCXP management.

This feature is subject to compatible hardware, firmware, and software support. The actual availability of this feature in a particular setup (Grabber card, firmware, and software) can be checked by reading the Grabber parameter "PoCXPAutoAvailable". If the result is positive, the feature is supported; otherwise, this feature is not supported by the given combination. "PoCXPAutoActive" can be used to activate/deactivate this feature on a particular Grabber during application run-time. Those parameters and similar can be found at Frame Grabber tab -> DeviceControl menu.

In addition, the full functionality of automatic PoCXP monitoring can be activated/deactivated using the following option found in Vision Point-> Tools-> Options. Please note that this global setting only takes effect after the system reboot and applies to all connected Grabbers. If you choose to deactivate this functionality globally, you can still activate it on a particular Grabber using above mentioned "PoCXPAutoActive" command at run-time. This command applied to Grabber immediately.
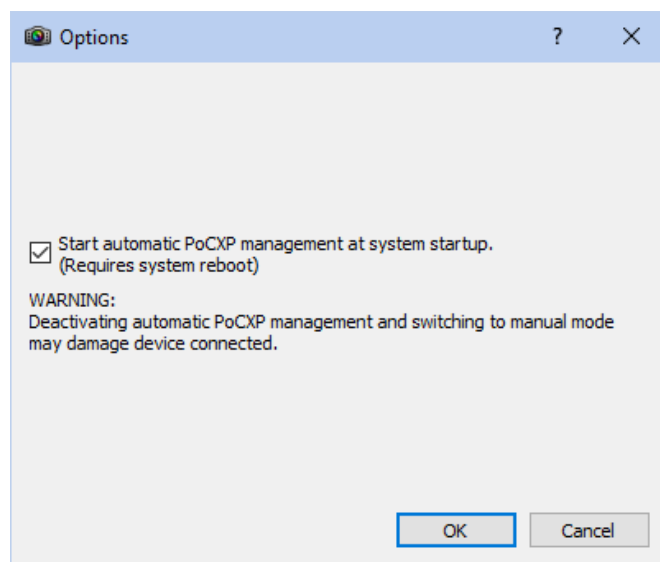

Figure 14 – Automatic PoCXP monitoring activate/deactivate

If the feature is not supported or deactivated, legacy manual PoCXP management should be used as described in section 5.12. In case the feature is supported and activated, the following commands can be used to start/stop camera connection monitoring and changing the PoCXP state according to the presence of a camera on a given CoaXPress channel.

1. To forcibly set PoCXP state to OFF execute command "CxpPoCxpTurnOff". In Vision Point GUI it is found at Frame Grabber tab -> DeviceControl -> CxpPoCxpHostConnectionSelector -> CxpPoCxpTurnOff
2. To activate automatic power management execute command "CxpPoCxpAuto". In Vision Point GUI it is found at Frame Grabber tab -> DeviceControl -> CxpPoCxpHostConnectionSelector -> CxpPoCxpAuto

3. To read current state of the PoCXP monitoring read the "CxpPoCxpStatus" parameter, found at Frame Grabber tab -> DeviceControl -> CxpPoCxpHostConnectionSelector -> CxpPoCxpAuto

The CoaXPress channels affected by these commands depend on the current state of the "CxpPoCxpHostConnectionSelector" parameter value. The command is applied to all available CoaXPress channels or a single channel specified by "CxpPoCxpHostConnectionSelector".

Please note that legacy Grabber parameters "PoCXP0" … "PoCXP7" are still available when automatic PoCXP is active, but they become read-only in this case. You can read the values of those parameters to get the current state of PoCXP on each channel.

Figure 15 – PoCXP automatic management parameters

Please refer to the following table for additional information regarding the devices, which support the described feature.

Hardware device	Firmware version	Details
Komodo CoaXPress 4ch and 8ch	4.11 and higher	Automatic power monitoring support Note: Starting from hardware revision no. 3
Komodo II CoaXPress	All firmware versions	Automatic power monitoring support
Predator CoaXPress	Not supported	No power monitoring support Please refer to the Manual PoXCP control
Predator II CoaXPress	All firmware versions	Automatic power monitoring support

Table 2 – Automatic PoCXP supported devices

5.12 Manual PoCXP Control Configuration

This section describes the manual control of the PoCXP feature, provided by using the dedicated functions via GUI. To control power manually over CoaXPress, disable the automatic connection monitoring in Vision Point-> Tools-> Options.

To control an individual PoCXP channel, follow the PoCXP controls located under the "Frame Grabber Control" category as described in the following image.

PoCXP 0 control	On	☑
PoCXP 1 control	Off	☐
PoCXP 2 control	Off	☐
PoCXP 3 control	Off	☐
PoCXP 4 control	Off	☐
PoCXP 5 control	Off	☐
PoCXP 6 control	Off	☐
PoCXP 7 control	Off	☐

Figure 16 – PoCXP manual control

⚠Caution: *Manually enabling PoCXP drives 24V to all the Frame Grabber ports. Avoid hot-plugging the camera while the PoCXP was manually enabled to reduce the risk of camera damage.*

5.13 Camera Command Timeout Control

The Camera Command Timeout can be configured for a particular camera. Before camera detection, the camera command timeout should be increased for cameras with a longer initialization period than the default value. For multiple camera detection, the Camera Command Timeout should be modified for all the cameras, according to the camera with the longest initialization period, to ensure proper camera detection. This option is located under the Frame Grabber tab "Control" category.

5.14 Scanning for Connected Cameras

After choosing a Frame Grabber, use the 📷 Toolbar Menu button, or click "Detect cameras" in the "Grabber Control" menu to initiate a camera scan. The arrow ▼ near detect cameras button allows to select the detection type from two additional options:

 a. Full camera rescan – scan all available cameras without retaining the already detected ones

 b. Scan without open – scan all available cameras, retain detected ones, without opening them

The Frame Grabber links should first be scanned to detect the connected cameras to successfully connect a camera to the Frame Grabber. Up to 4 cameras can be simultaneously connected to the Frame Grabber while there is no constraint on the order of link connectivity or the default speed of the camera. When a detected camera is disconnected, the title of the camera's picture window changes to "Disconnected," and all its XML parameters disappear.

5.14.1 Silent Discovery Mode

The silent camera discovery process is mainly used for retransmitting applications. A silent scan for connected cameras is made without re-setting any camera parameters (i.e. no writes are made to the camera. nevertheless multiple reads are made). If needed, camera Re-set sequence and speed configuration should be performed from an external source before a camera scan can be initiated using this mode. To activate, set the Silent Discovery Mode to "On".

Silent Discovery Mode	Off	☐
Timestamp counter	4327147523096	☐
Timestamp reset	Execute	☐
Timestamp Latch	Execute	☐
Timestamp Latch Value	0	☐
Device reset	Execute	☐
Device stream control reset	Execute	☐

Figure 17 – Silent camera discovery

5.14.2 Override Camera XML File

To override the camera's native XML file, first the "Override Camera schema definition with file" option, located in the "Camera" tab, should be checked and a legitimate XML file is to be selected. If not checked, the Frame Grabber will try to retrieve the native XML file from the camera. This can be seen in Figure 18. Following this, you can initiate a camera scan.

WARNING: *Override XML re-sets all previous parameters to their default values. The user is responsible to re-set all needed parameters after XML is re-loaded.*
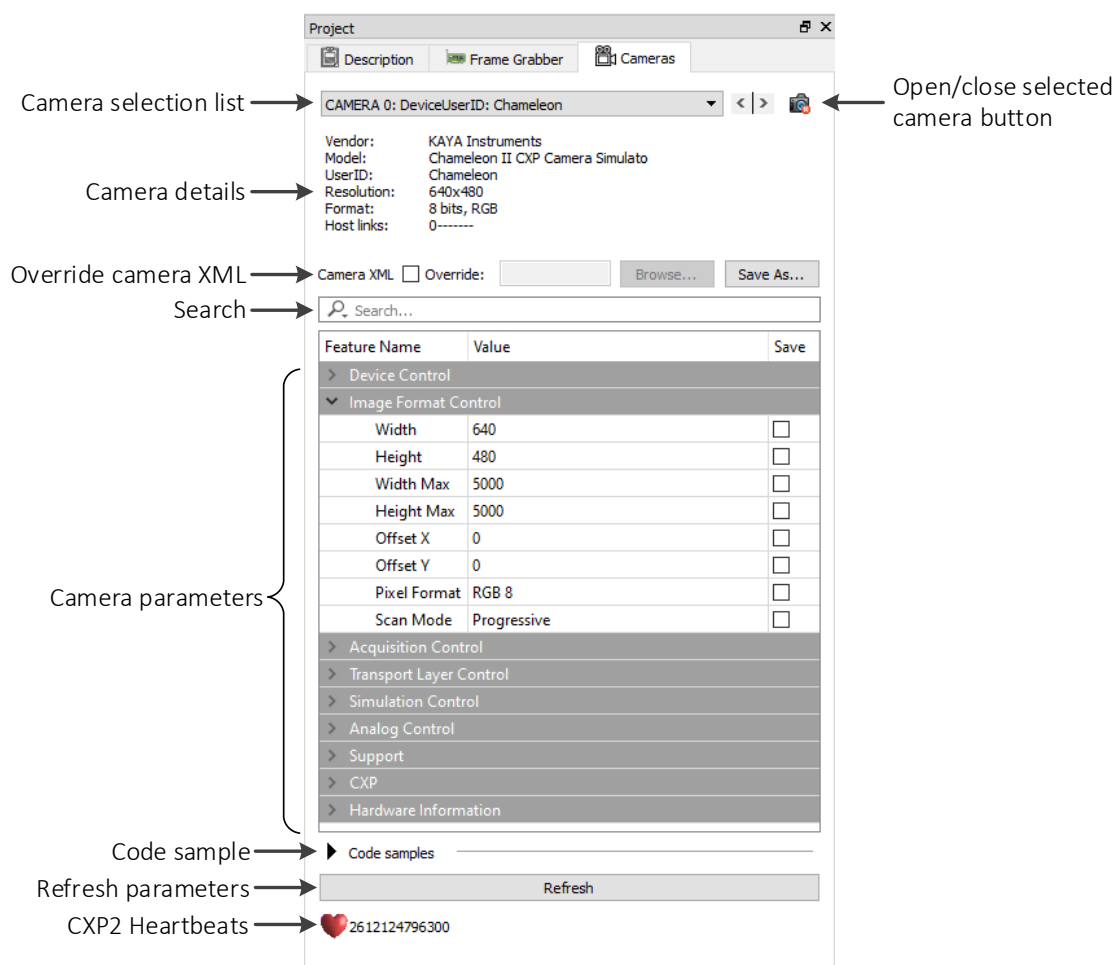
Camera selection list ⟶

Camera details ⟶

Override camera XML ⟶

Search ⟶

Camera parameters ⟶

Code sample ⟶

Refresh parameters ⟶

CXP2 Heartbeats ⟶

Open/close selected camera button ←

Figure 18 – Camera features

5.15 Open/close selected camera

Open/close selected camera button allows the user to open/close a specific camera without performing camera redetection. The open/close camera button is located in 'Camera' tab, near camera selection buttons and applies only on the currently selected camera. The ⬚ (close) button will appear after camera is detected. The ⬚ (open) button will appear after camera is closed using close button.

5.16 CXP2 Heartbeats Indication

CoaXPress 2 support was introduced in the 2021.1 software release, including CXP2 tagged command packets, generate and receive CXP2 heartbeats and Events. Indication of heartbeats arrives from the camera, in case CXP2 feature is available for this device, located at the bottom of project window and shown in the following figure:
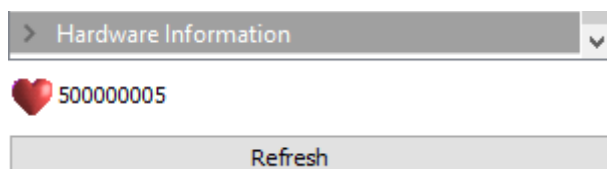

Figure 19 – heartbeats indication

The following firmware versions are required for CoaXPress 2 support.

Hardware device	Firmware version	Details
Predator II CoaXPress	5.x.x	CXP2 support
Komodo II CoaXPress	5.0.7	CXP2 support

Table 3 – CXP2 firmware release notes 2021.1

5.17 Controlling Acquisition

After a camera was selected and configured, the stream acquisition can commence. To start the acquisition from the main Toolbar Menu on all detected cameras, simply press the ⏵ button or select the correct option using the ▾ button. In order to start acquisition on a specific camera, use the ▾ button. To stop the main Toolbar Menu acquisition on all detected cameras, press the ⏹ button or select the correct option using the ▾ button. To start acquisition on a specific camera, use the ▾ button.

- The start acquisition issues the "AcquisitionStart" command to the camera
- The stop acquisition issues the "AcquisitionStop" command to the camera

5.17.1 Controlling Acquisition from Picture Window Toolbar

The Picture window toolbar includes stream acquisition and image dimensions control buttons. After the stream acquisition commenced, acquisition and frame-replying can be controlled via the picture window toolbar.
The Picture window toolbar is shown in Figure 20 and includes the following components:

1. Zoom in 🔍 button to zoom in on the image
2. Zoom out 🔍 button to zoom out on the image
3. Zoom 1:1 🔍 button to re-set the image size
4. Fit to window 🖼 button to fit the image to the current window size
5. Hex view ⬡ of the picture
6. Acquisition / **Replay Mode** 📷 button to switch between live acquisition and replaying frames. In this case, additional icons appear. See section 5.17.2
7. Color Histogram 🖼 button allows the user to show/hide color segmentation of the currently displayed image. See section 5.17.3
8. Dark field correction ⬤ See section 5.17.4.1
9. Flat field correction ⬜ See section 5.17.4.2
10. Grid Lines ▦ See section 5.17.5
11. Start ⏵ button to start acquisition of stream of a specific camera
12. Stop ⏹ button to stop acquisition of stream of a specific camera
13. Single grab 📷 button to acquire one frame at a time of a specific camera
14. Color level threshold bar - Adjust image level in the range of specified minimum and maximum threshold pixel values
15. Minimum threshold pixel value
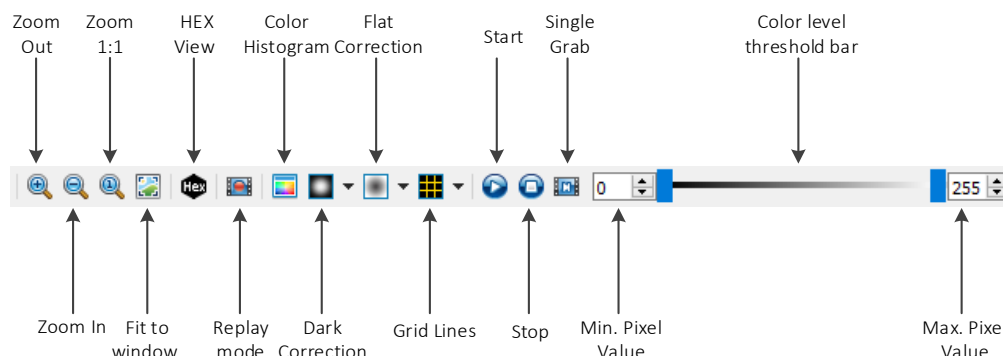16. Maximum threshold pixel value

Figure 20 – Picture window toolbar

5.17.2   Buffer Replay Mode from the Picture Window Toolbar

After the stream acquisition commenced, frame replying can be controlled via the picture window toolbar.
When Replay Mode for a specific camera is enabled, additional icons will appear in the picture window toolbar, as shown in Figure 21.

1. Play button to play the acquired stream
2. Stop button to stop the acquired stream
3. Show the previous frame button to show the previous acquired frame
4. Show the next frame button to show the next acquired frame
5. Jump to start button to go to the first acquired frame
6. Jump to end button to go to the last acquired frame
7. Looping ON/ OFF button to play/stop the broadcasted frames in a loop
8. Buffer continuation bar
9. Frame rate window to show the current frame rate
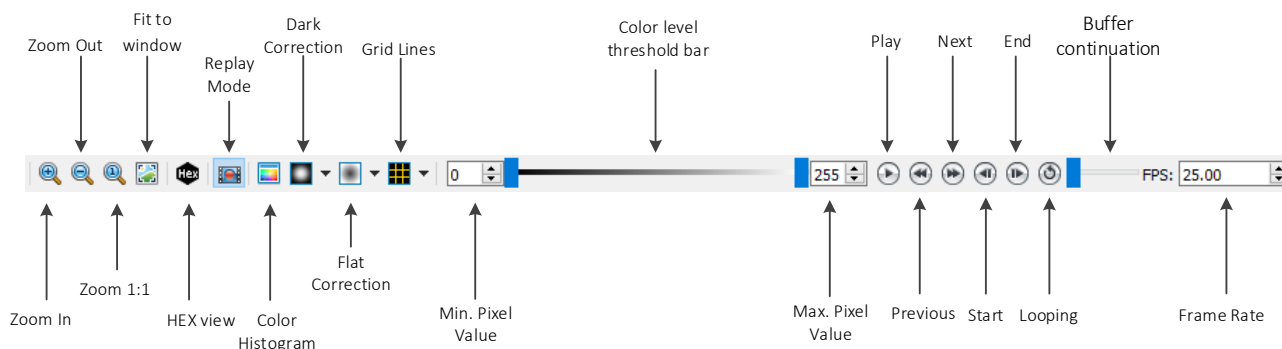
Figure 21 – Replay mode additional toolbar

5.17.3   Color Histogram

When Color Histogram for a specific camera is chosen, an additional display window appears, showing the color segmentation histogram of a picture from which it was triggered. For Mono pixel format cameras, a single histogram is displayed if the de-mosaic mode wasn't enabled.

In case de-mosaic mode is enabled, three histograms are displayed, showing the color segmentation for each color (red, green, blue). An example is shown in Figure 22. Set the "Transformation Pixel Format" parameter value to "RGB8" to enable the de-mosaic format transformation.
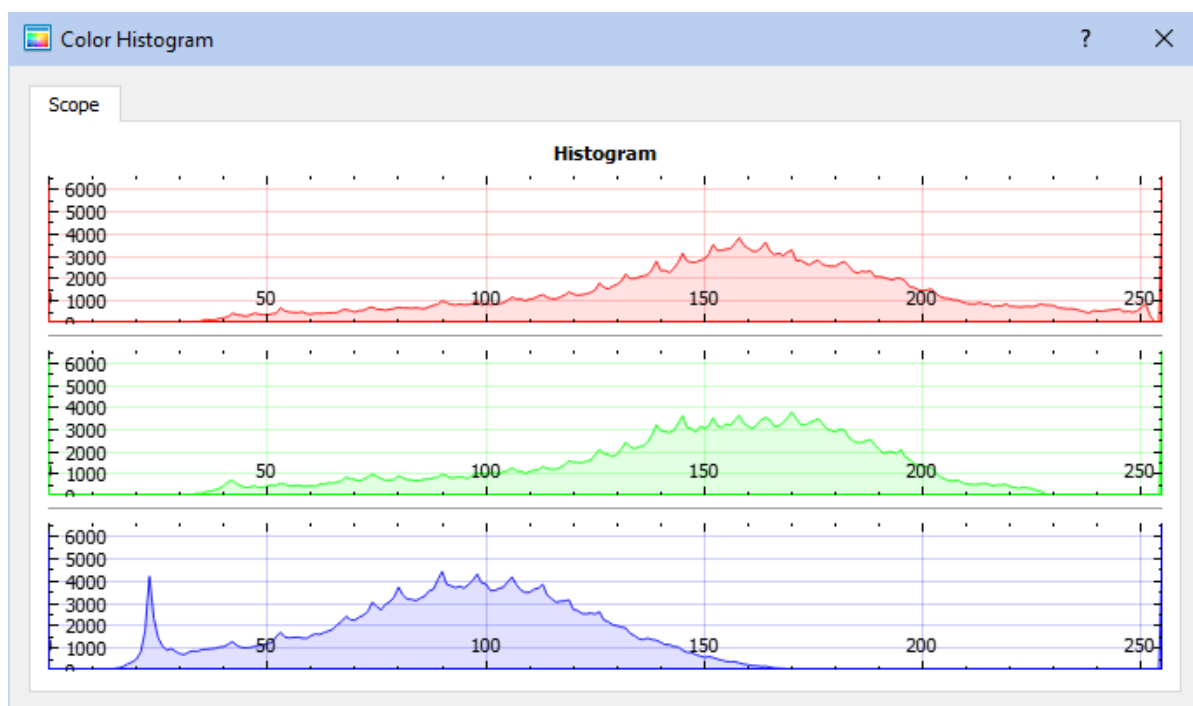
Figure 22 – Color histogram window

5.17.4 Field Correction

The Flat-field and Dark-field corrections can be used to improve the image's quality by removing artifacts caused by fixed-pattern noise and variations in the pixel-to-pixel sensitivity of the detector.

Two pictures should be taken to perform Dark/Flat field corrections: One with the lens closed (offset should be boosted) or completely removed from the camera and covered with a solid cap, and one with **uniform** illumination of around 40% of the sensor's pixels (dark and bright photos, one of each).

The operator is per pixel and defined according to the following formula:

$$\overline{P(x,y)} = Gain(x,y)[P(x,y)-P_{dark}(x,y)]$$

Where P(x,y) is the pixel at the offset, X is horizontal, and Y is vertical. P_{dark}(x,y) is the offset of the pixel at offset X in horizontal and Y in vertical that was measured during the calibration stage. Gain(x,y) is the gain of the pixel at offset X (horizontal) and Y (vertical) that was measured during the calibration stage. This correction is valid for the specific camera settings and conditions (gain, exposure time, temperature, etc.) which were selected during the calibration process.

5.17.4.1 Dark Field Calibration Process

The dark field correction is the easiest one to calibrate. It only requires a reference image to be recorded without illumination on the image sensor. Follow these steps to perform the dark field calibration process:

1. For this calibration, all light should be blocked from the sensor, which can be achieved by removing the lens and covering the lens mount with a solid cap [1]
2. After covering the sensor, start the camera's stream [2]
3. Select the "Calibrate dark field" option located under the ▼ button of the dark field icon ⬛ in the picture window toolbar
4. Stop the camera's stream
5. Enable the dark field correction [3]
6. Restart the camera's stream
7. Save and load dark field calibration options are available after performing the calibration process. A single uncompressed .TIFF file is created upon the "Save dark field correction" operation
8. The load option requires a single uncompressed .TIFF file. Make sure to use the same camera settings with which the loaded calibration was performed

Figure 23 – Dark field calibration actions

5.17.4.2 Flat Field Calibration Process

The choice of which light intensity to use for the bright field calibration requires a little bit more thought. If you perform the calibration with a light intensity too close to camera saturation, you might compensate the camera too much and introduce more PRNU for low light intensities. If you use low-intensity light, the differences in photo response might be too small to calibrate the image properly. Generally, a light intensity that gives a signal somewhere around 40% of the sensor's full scale should give the optimal result. Follow these steps to perform a flat field calibration process:

1. Prepare light source. Uniform light should be applied across the sensor, which can be achieved by removing the lens and setting a uniform light source, such as diffused light or integrating sphere, in front of the camera
2. Perform dark field calibration or load dark field reference image [1]
3. After setting the uniform light source, start the camera's stream [2]
4. Select the "Calibrate flat field" option located under the ▼ button of the flat field icon ▣ in the picture window toolbar
5. Stop camera's stream
6. Enable the flat filed correction [3]
7. Start camera's stream
8. Save and load flat field calibration options are available after performing the calibration process
9. A single uncompressed .TIFF file is created upon the "Save flat field correction" operation
10. The load option requires a single uncompressed .TIFF file. Make sure to use the same camera settings with which the loaded calibration was performed
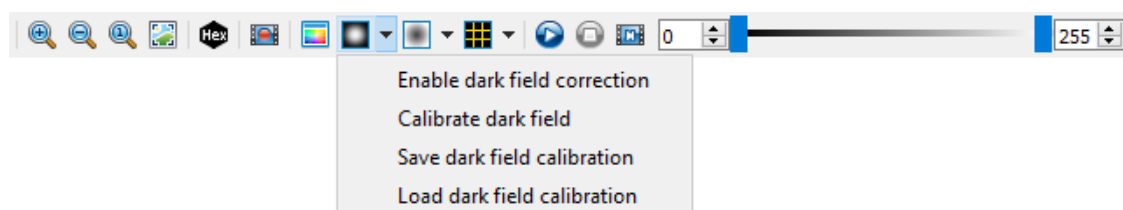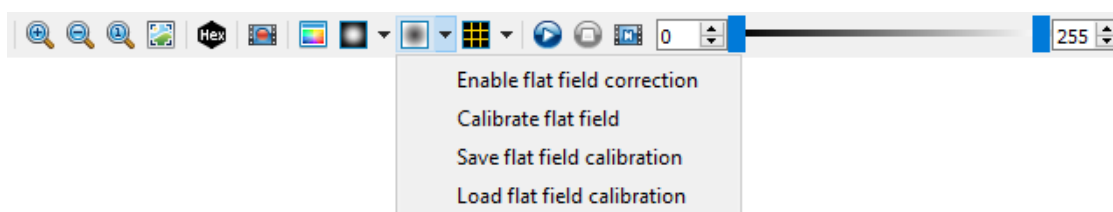

Figure 24 – Flat field calibration actions

Remarks:

1. The Flat field calibration should be performed **after** the Dark field calibration has already been performed for the exact camera settings
2. To summarize, reference images have to be recorded in dark and in a bright field depending on the flat field correction variant. Ensure the sensor is really dark when performing a dark field calibration, and perform a bright field calibration in a light intensity range of around 40% of the sensor's full scale
3. Errors might show when a sudden peak in intensity is present in the reference scene as the correction is a low-frequency correction
4. There might be limits to the absolute difference that you can correct. The correction is often achieved by applying a gain per pixel or pixel segment. If the available gain is insufficient to correct the difference between the weakest and brightest illuminated pixel segment, a flat field cannot be achieved
5. The PRNU and DSNU are valid for specific camera settings and conditions, such as exposure time, gain, temperature, number of active fiber links, etc., which were selected during the calibration process. If the above conditions might change during camera operation, it is advised to pre-calibrate the system on several conditions and save them as different images. Load the previously calibrated images if the conditions have been changed

5.17.5 Grid Lines

The Grid Lines feature allows to overlay the image with one of several grid patterns to ease orientation. Centering the image on a target object is easily achieved using the grid in real-time.
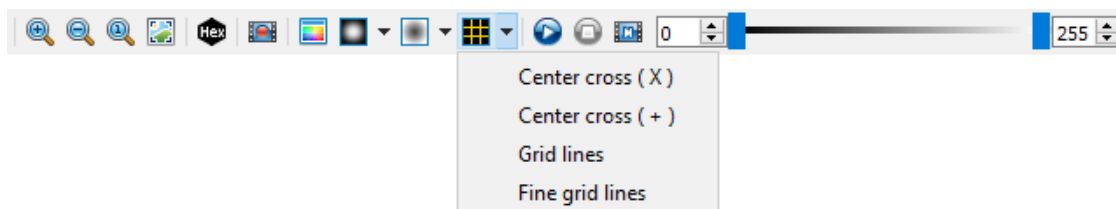
Figure 25 – Grid lines actions

There are four possible patterns:

- Center Cross (X) – see Figure 26 (A)
- Center Cross (+) – see Figure 26 (B)
- Grid lines – see Figure 26 (C)
- Fine grid lines – see Figure 26 (D)
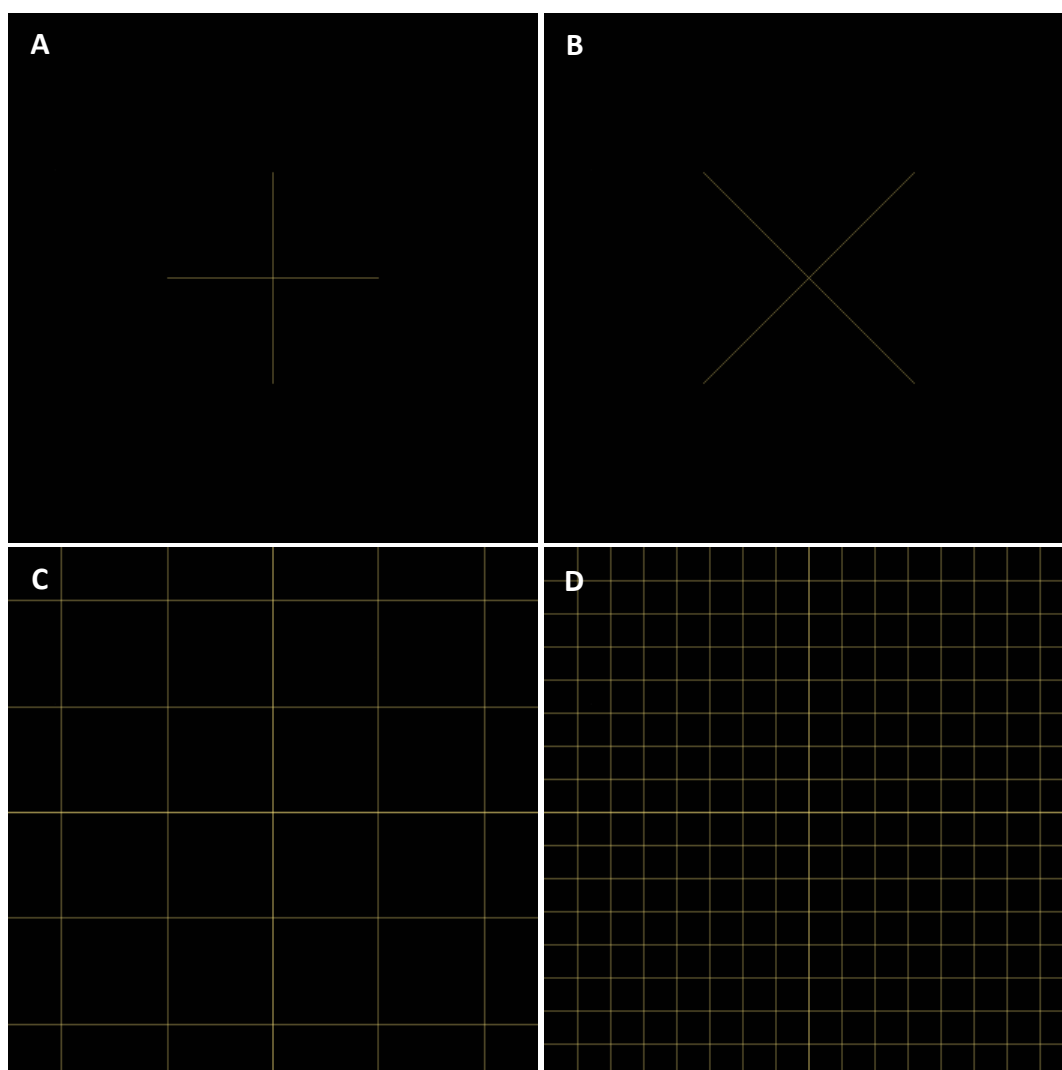
Figure 26 – Grid lines patterns

6 Save Operation

6.1 Saving the Frame Grabber/Camera Parameters

To save a specific Frame Grabber or camera parameter, check the "Save" checkbox, located to the right of each field. Only selected parameters would be saved and retrieved upon load.

Parameters that will be saved and set upon load
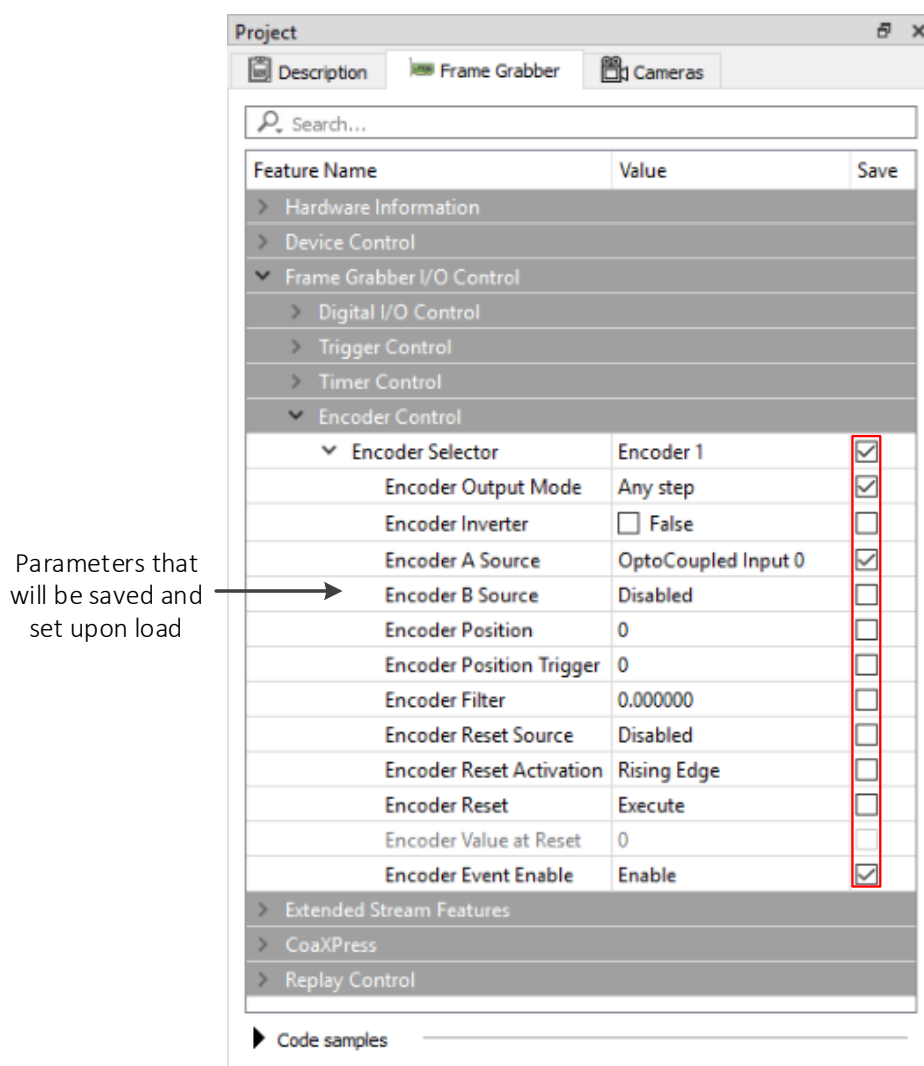
Figure 27 – Saving grabber configurations

6.2 Saving a Project

To save a project file, use the toolbar button or click "Save" or "Save As…" in the "File" menu.

6.3   Saving a Captured Image

To save a captured image, open the "Stream" menu and click the "Save Picture…" option. This option opens a save dialog, where you should choose the image format, destination folder, and file name. Click "Save" to save the image currently captured in the "Picture Window". During the .tiff saving operation, the user may choose whether the image would be shifted or not.

The following options are available:

- ".BMP" – Windows Bitmap
- ".PNG" – Portable Network Graphics
- ".TIFF (LSB)" – Uncompressed tiff file containing complete video captured in allocated buffers. This option saves the actual values and is better for processing.
- ".TIFF (MSB)" – Shifted uncompressed tiff file containing complete video captured in allocated buffers. This option saves a shifted image and is better for visualization.

Example: Saving a 10-bit image, pixel values of 1-1024, will save 16-bit values. A black image (left) shows the case of saving the image as ".TIFF (LSB)". The horizontal pattern (right) displays the shifted image saved as ".TIFF (MSB)".

Figure 28 – Saving .tiff 10 bit image LSB (left) vs. MSB (right)

6.4   Saving a RAW Image

To save a captured image as raw data, open the "Stream" menu and click on the "Save raw file…" option. This opens a save dialog, where you should choose the destination folder and file name. Click "Save" to save the image currently captured in the "Picture Window" as raw data without scaling or reordering. The following options are available:

- "Single .RAW file" – Single uncompressed raw file containing complete video captured in allocated buffers
- "Multiple .RAW files" – Series of uncompressed raw files, one per each captured frame in allocated buffers

NOTE: *If the debayering format transformation is enabled, set the "PixelFormat" parameter value to "RGBxx" so the saved images will be as bayer format raw data.*

6.5   Saving Video Buffer

Open the "Stream" menu and click the "Save video buffer..." option to save a video stream. This opens a save dialog, where you should choose the destination folder, file name, and output format. Click "Save" to save the currently captured video in the "Picture Window".

Available file output formats:

- ".AVI" – uncompressed MPEG output file
- "Single .RAW file" – Single uncompressed raw file containing complete video captured in allocated buffers
- "Multiple .RAW files" – Series of uncompressed raw files, one per each captured frame in allocated buffers
- "Single .TIFF file (LSB)" – Single uncompressed tiff file containing complete video captured in allocated buffers
- "Single .TIFF file (MSB)" – Single shifted uncompressed tiff file containing complete video captured in allocated buffers. See Figure 28.
- "Multiple .TIFF files (LSB)" – Series of uncompressed tiff files, one per each captured frame in allocated buffers
- "Multiple .TIFF files (MSB)" – Series of shifted uncompressed tiff files, one per each captured frame in allocated buffers. See Figure 28.

IMPORTANT NOTE:

Due to 4GB limitation of the AVI format an attempt to save or compose a large video may have unexpected results depending on the codec involved.

Please note that Vision Point is not a full-featured recorder application. The same applies to Vision Point SDK, it's job ends at the point when frames are stored in the PC memory and they does not include any recording facilities.

In case such feature is required, one either may develop it by using our SDK or purchase one of the available recorders software such StreamPix, which we resell.
An optional workaround is to reduce the number of acquired buffers, or instead of saving an AVI file, to save a series of RAW or TIF files, and then use a post-processing utility to convert them into an AVI, MPEG4, etc.

7   References

- CoaXPress 2.0 standard (http://jiia.org/en/standard_dl/CoaXPress-wg/)
- Gen<i>cam standard (http://www.emva.org/cms/index.php?idcat=47)
- Vision Point Installation and hardware reference manual
- Vision Point API reference manual

8 Troubleshooting

8.1 PoCXP Automatic Management

Starting from Vision Point API 5.0, the PoCXP protocol has been changed to automatic PoCXP management, and additional features, including "KYService" control, were added to support it. This feature is subject to compatible hardware, firmware, and software support. When using it, please make sure the following is carried out:

1. Vision Point software and hardware device is updated to the latest available firmware version
2. Make sure KYService "Startup type" is set to "Automatic" and that the service status is "Running". This option can be found under: "Computer Management" -> Services -> "KAYA Instruments Service" -> properties -> "Startup type"
3. If the service is not found, it can be registered using the "KYService_register.bat" file located in "C:\Program Files\KAYA Instruments\Common\bin". A computer restart is required to complete KYService registration
4. Checked your setup (Grabber card, firmware, and software) by reading Grabber parameter "PoCXPAutoAvailable" found in Grabber tab -> DeviceControl. Additional information regarding the devices, which support the described feature found in the table below
5. The full functionality of automatic PoCXP monitoring is activated using the following option found in Vision Point-> Tools-> Options. This global setting only takes effect after system reboot and is applied to all connected Frame Grabbers
6. In case the feature is not supported or deactivated, legacy manual PoCXP management should be used as described in section 5.12

Hardware device	Firmware version	Details
Komodo CoaXPress 4ch and 8ch	4.11 and higher	Automatic power monitoring support Note: Starting from hardware revision no. 3
Komodo II CoaXPress	All firmware versions	Automatic power monitoring support
Predator CoaXPress	Not supported	**No** power monitoring support Please refer to the Manual PoXCP control section
Predator II CoaXPress	All firmware versions	Automatic power monitoring support

Table 4 – Automatic power monitoring support

8.2   Updating KAYA PCI Device Firmware Using Vision Point Application

An "XXX_XX.bin" file is needed to update the firmware of a KAYA Instrument's PCI device, in which the XXX is the board name and XX is the desired firmware number.

1. In the Toolbar Menu, under the Device Control tab, chose the "Firmware update" option. Then, a new window opens displaying the current device firmware version
2. Click the "Browse…" button, as shown in Figure 29, and select the desired firmware update file, in accordance with the device chosen (.bin file extension), and Click the "Next >" button
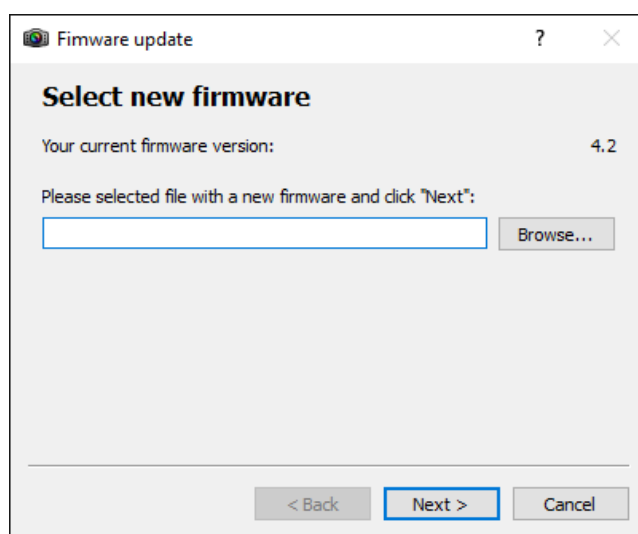

Figure 29 – Firmware update selection window

3. The following window displays both current and new firmware, as shown in Figure 30
4. The confirmation is made by clicking the "Next >" button, and the firmware update starts immediately
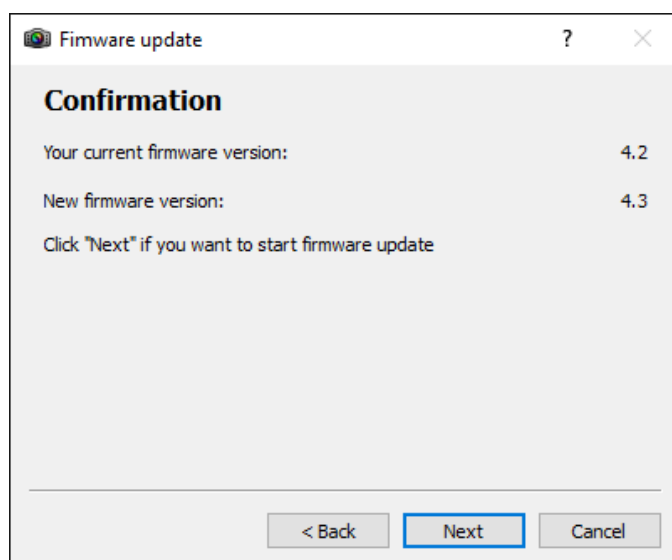

Figure 30 – Firmware update confirmation window

5. The following window displays the initiated firmware update. The firmware update process is displayed in the first progress bar, and the firmware validation is displayed in the second, as shown in Figure 31

6. **Do not interrupt the process!**
   In case of an error, the firmware update will fail and return to the previous operation mode
7. A successful update results in reaching 100% on both progress bars
8. **A complete PC power off cycle is required to activate the new firmware**
9. Turn on the PC and check the firmware version by opening the Vision Point application, Frame Grabber tab. The firmware version is located under Hardware information. Make sure that the firmware version matches the version supplied. That would ensure the success of the firmware update operation
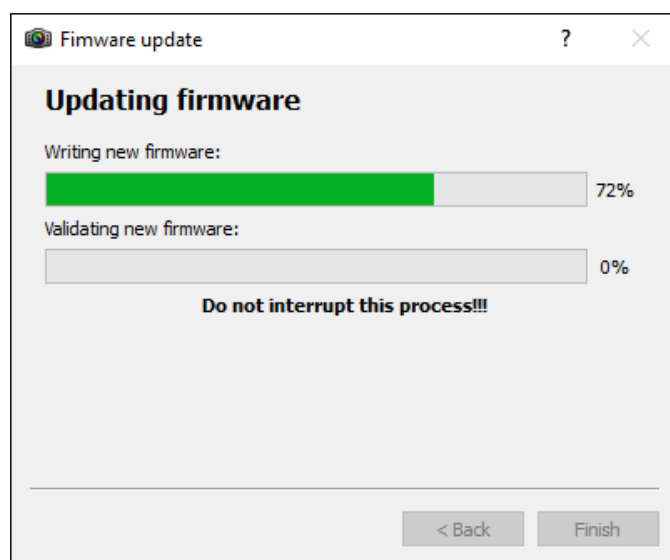

Figure 31 – Firmware Update process window

8.3 Updating KAYA PCI Device Firmware Using a Pre-Built Utility for Linux

An "XXX_XX.bin" file is needed to update the firmware of a KAYA Instrument's PCI device, in which the XXX is the board name and XX is the desired firmware number.

WARNING: *Currently, this method is not suitable in setups where more than one board has the same product ID installed on the same machine.*

Please reach out to KAYA's support if you need to update the firmware in such a setup
1. Make sure the .bin file is present in a local directory
2. Open the Terminal and enter the directory path of the KAYA Hardware Update executable file:
   "cd 'opt/KAYA_Instruments/bin' "
3. Execute the KAYA Hardware Update using the full path to the firmware update file as a parameter
   Example: "./KAYA_Hardware_Update <path_to_folder_with_bin_file>/Komodo_4_3.bin"
4. Press Enter and wait for a message that indicates the end of the process
5. **Do not interrupt the process!**
6. **A complete PC power off cycle is required to activate the new firmware**
7. The sequence of the steps is illustrated in the screenshot below

Please, Contact KAYA Instruments' representative with any questions.

Figure 32 – Firmware update via terminal process window

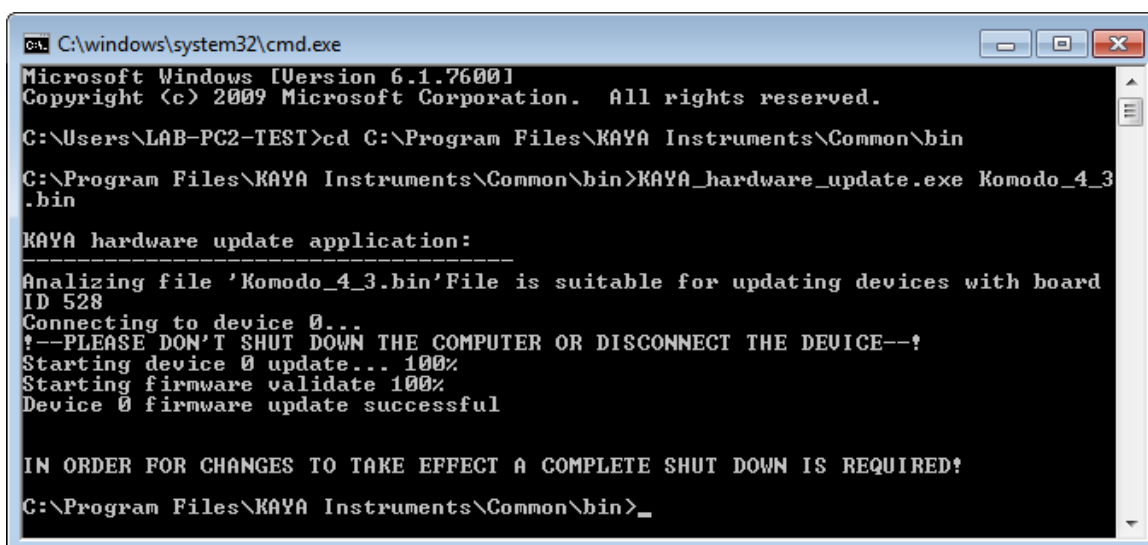## 8.4 Updating KAYA PCI Device Firmware Using a Pre-Built utility for Windows

An "XXX_XX.bin" file is needed to update the firmware of a KAYA Instrument's PCI device, in which the XXX is the board name and XX is the desired firmware number.

WARNING: *Currently, this method is not suitable in setups where more than one board has the same product ID installed on the same machine.*

Please reach out to KAYA's support if you need to update the firmware in such a setup.

1. Make sure the .bin file is present in a local directory
2. Open the Command line and enter the directory path of the KAYA Hardware Update executable file: "cd '\Program Files\KAYA_Instruments\Common\bin' "
3. Execute the KAYA Hardware Update using the full path to the firmware update file as a parameter
4. Example: "KAYA_Hardware_Update <path_to_folder_with_bin_file>/Komodo_4_3.bin ".
5. Press Enter and wait for a message that indicates the end of the process
6. **Do not interrupt the process!**
7. **A complete PC power off cycle is required to activate the new firmware**
8. The sequence of the steps is illustrated in the screenshot below

Please, Contact KAYA Instruments' representative with any questions.

Figure 33 – Firmware update via Command line process window

8.5   Collecting Log Files

The log files are created and override each time the application is launched.

8.5.1.1   Windows Operating System

KAYA's log folder can be easily opened using one of the two ways listed below:

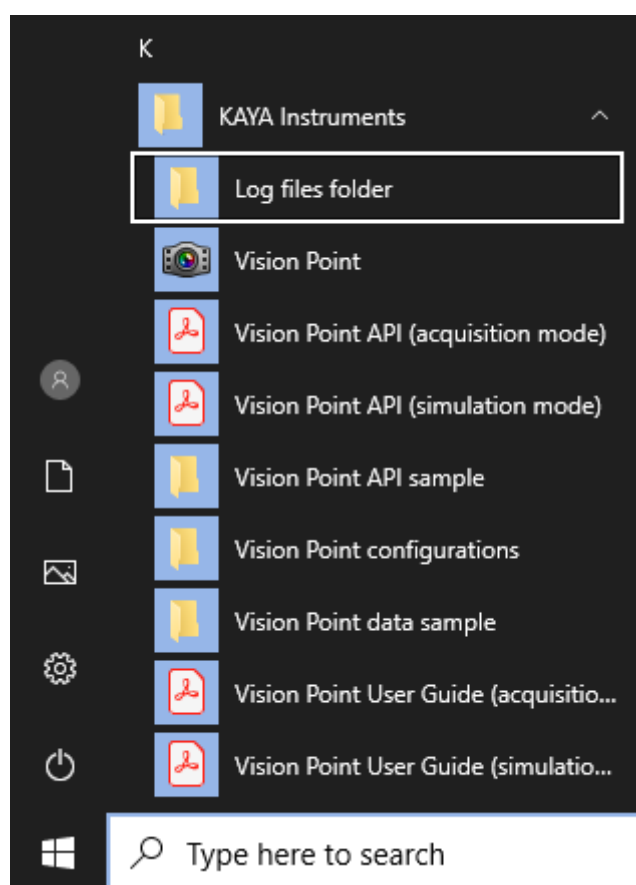1. Choose Log files folder under KAYA Instruments from the quick start:

Figure 34 – Log files folder from the quick start menu path

2. Using the Vision Point application, enter the "Help" tab and click on the "Open logs folder" option.
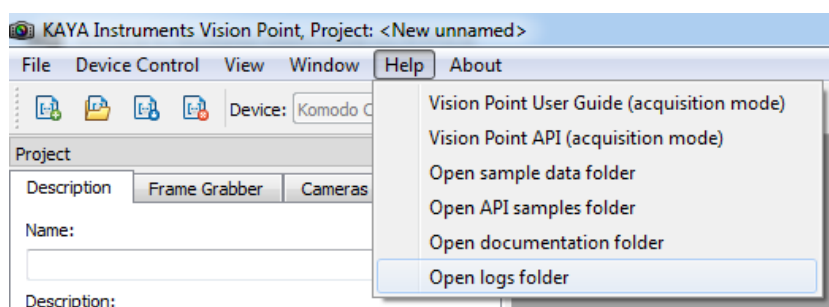

Figure 35 – Log files folder from Vision Point Help menu path

Remarks:
1.   A separate log file is created for each application, which uses KAYA API, with a display name of the primary executable with addition of process ID and timestamp
2.   The Vision Point application installation log files folder can be found under the user's primary driver: C:\Program Files\KAYA Instruments\Log\Installer folder

8.5.2   Linux Operating System

KAYA's log files folder can be easily opened following the path: /var/log/KAYA_Instruments

8.5.2.1   Logs Retaining Policy

The user may configure the retaining policy of the log files by using the following setting in the registry:

▪   Number of files to keep in 'Archive' when (Default) is 2 - Keep N latest
     KYSettings::FeatureType::UserConf, "LogFilesKeep.Amount"
▪   Maximum age in seconds of a file to keep in 'Archive' when (Default) is 3 - Keep max age
     KYSettings::InitInteger(KYSettings::FeatureType::UserConf, "LogFilesKeep.MaxAge", 1

8.6   Technical Support and Professional Services

If you searched the Vision Point API Data Book document and could not find the answers you need, contact KAYA Instruments support service. Phone numbers for our office are listed at the beginning of this document. You can also visit us at kayainstruments.com, which provides up-to-date contact information, support phone numbers, email addresses, and current events.

You can send mail to: support@kayainstruments.com
You can also create a support request on the web: http://support.kayainstruments.com
Our knowledge base is available on: http://support.kayainstruments.com/kb/index.php

8.7   Submitting a Support Request

When opening a support request, please provide the following information when applicable:

▪   Logs form Vision Point where applicable (See section 8.5)
▪   PC configuration
▪   Operation System
▪   Card part number or full name
▪   Firmware in use
▪   Software in use